

FINAL DOCUMENTS

FOR

IG-01 FIRE PROTECTION SYSTEM

CONFIDENTIAL

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FOR CONSTRUCTION

2011/04/05	1	ISSUED FOR CONSTRUCTION	SANCO	A.TAHERIAN	A.ROSHAN
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SANCO

Fire Protection and Safety Technology

Galliate, March 01th 2010

Messrs.
IRASCO S.r.l.
Via di Francia 3
16149 GENOVA

To the kind attention of Mr. Shahram Loghmani

TECHNICAL - COMMERCIAL OFFER

Your ref.: Enquiry for Argon (IG01) Fire Protection System
& For Fire Alarm System - Ghadir D.R. project
Our ref.: G3939.09/FB_EZ Rev. 3

Subject: ARGON fire fighting systems for "Control House Protected Areas"

Referring to your kind request, which we thank you for, please find herewith attached our best technical and economical proposal revision 3 for the prospective supply of:

- a) Argon (IG-01) System (Clean Agent System)
- b) Fire Alarm System

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REFERENCE RULES

For the dimensioning of the standard systems, which are subject of this offer, the reference rules are:

NFPA 2001:	clean agent fire extinguishing systems (edition 2004)
UNI ISO 14520-12:	gaseous fire-extinguishing systems – Argon (IG-01) extinguishant
NFPA 72:	national fire alarm code
NFPA 850:	electric-generating plants

GENERAL SPECIFICATIONS FOR ARGON (IG01) CLEAN AGENT SYSTEM

1. Please note that our offer foresees a minimum 10% of IG01 increasing quantity for leakage. We would like to highlight that this increase of IG01 has considerable impact with the limits of NOAEL and LOAEL concerning liveableness of the ambient.
(NOAEL is a level that should be considered safe and requires no application of a safety factor to determine a safe intake, based on the most sensitive subgroup;
LOAEL is a level that should NOT be considered safe for everyone and may require the application of a safety factor to calculate a safe intake)
2. Please note that 22,8 kg @ 200 bar of cylinder capacity is relate to IG 55 or Argonite clean agents extinguishers, our offer foresees 28,17 kg of IG 01/cylinder.
3. Where applicable, the components and proposed equipment will be CE certified or according to CE rules, instead of UL/FM approved.
4. The above ground piping is included in Sanco scope of supply, will be ASTM A106 Gr. B, sch.40 $\leq$ DN150, galvanised steel, supplied in free commercial lengths (not prefabricated), with support, threaded fittings ASA 3000. Please note that the above mentioned schedules are in compliance with NFPA.
5. We exclude from our scope of supply:
 - All cables and cable trays from field equipment to local JB, and from local JB to Fire Alarm Control Panels .

CLARIFICATIONS FOR FIRE ALARM SYSTEM

6. All the quoted equipment will be manufactured according to European standards.

We would like to point out that Fire Detection and Alarm Equipment will be managed by a modular type control panel manufactured by us **Model FB6100** (micropocessor based, addressable type). For further information see data sheets in attached.

Please note that our FB6100 allow maximum loop extension not more than:

- **Analogue/balanced inlets**
For these types of signal, it is advised to use screened cable **IEC 331 2x1.5 mm**;
- **Addressed loops**
For these types of signal, it is recommended to use screened cable **IEC 331**. For cable lengths up to 1 km, use 2x 1.5 mm cables. For cable lengths up to 2 km, use 2x2.5 mm cables.

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7. The control panels will be manufactured in accordance with European Standards, in particular FB6100 has the following certification:

Conformity with the EN 54-2 standard for fire protection centrals	Certified by the producer according to the currently applicable laws. It has also been submitted to IMQ to get a third party laboratory certification, in the time-limits foreseen by CPD harmonization (Construction Products Directive)
Conformity with the EN 54-4 standard for battery-charging feeder	Feeder - battery charger 2.5 A IMQ certified according to the CPD directive. The feeder - battery charger 5 A certified by the producer has been submitted to IMQ to get a third party laboratory certification.
Conformity with the EN 12094-1 standard for gas-extinguishing centrals	This standard has inspired the project stage of the product, with certification of the producer while the third party laboratory certification is still pending
Conformity with the IEC61508 Functional Safety standards	This standard was used as a reference during the project phase, at a TÜV laboratory they are verifying the conformity with the SIL 2 level.
Conformity with the CEI 79-2 standard for intrusion detection devices	Certified by the producer according to the currently applicable laws. It has also been submitted to IMQ to get a third party laboratory certification,
Conformity with the NFPA 72 standard directive	The control panel may be shaped and organised to meet the logics and functional requirements foreseen by the standard.

8. We would like to highlight that control panel stand-battery will be lead-acid type.
9. We would like to point out that the display of control panel Model FB6100 will be in English language.
10. Referring to Control Panel the electrical power supply are 110/230 Vac 50/60 Hz.
11. We would like to point out that the body of all siren, beacons, smoke/heat detectors, manual push button suitable for using in safe area will be made of thermoplastic material.
12. The enclosed data sheets shall be considered as standards, in fact in some case these data sheets state different technical information from the one we have quoted.
13. In case of order, the materials will be of course in accordance with our quotation.
14. We inform you that the interconnection for digital input devices such smoke detectors, heat detectors, manual call points, etc., should be realised with 2x2,5mm² flame retardant cables.



15. We inform you that the interconnection for digital output devices such fire alarm bells, visual beacon, etc., should be realised with 2x2,5mm² flame retardant cables.
16. We have foreseen detection LOOPS for the detection lines, without end of line resistors.
17. Are excluded of our scope of supply mounting accessories to install the devices, Junction boxes, conduits, cables.
18. We have foreseen addressable modules (see our technical data sheet CHQ-Z & CHQ-DSC SCI) that have different performances instead of request in your specifications. Please consider these differences for possible adjustment of the Junction Boxes composition and dimension during the engineering phase. Therefore please inform us concerning the field equipment distribution and quantities in order of each relevant protected room/zones.

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a) Argon (IG-01) System (Clean Agent System)

19. The system dimensioning has been made on the bases of the documents supplied by you.
20. Please note that we will supply the automatic clean agent Argon (IG-01) extinguishing system for:
- "M.V. Switchgears Area" (*),
 - "LV Panel Area" (*),
 - "Power & Light Center" (*),
 - "Battery Room" (*),
 - "Cable Room (level + 5,25) (*),
 - "main Control Room" (*),
 - "Cabinet Room" (*).

(*) the above mentioned protected areas have a mutual IG01 feeding system, with directional valves, in practice one cylinder group protects simultaneously more zone.

21. The Argon (IG-01) cylinders will be provided with T-PED certification (Pressure Equipment Directive) and will have a 28,17 Kg. charge with a capacity of 80Lt.
22. Argon (IG-01) cylinder skid, support frame and pressure gauge with switch contacts (instead of weighing device system) will be supplied prefabricated but not preassembled. They should be assembled by your personnel on site.
23. We would like to clarify that all Argon (IG-01) cylinders will be painted manufactured std.
24. Being a total flooding system, dimensioned on the volume, the room must have a good sealing.
25. Please note that all the components we supply are standard type (brass, aluminium, etc.) and suitable for non classified area.

b) Fire Alarm System

26. We would like to point you out that all the detection equipment and relevant accessories for ARGON extinguishing actuation will be included in "Fire Detection and Alarm System" package. Please refer to our quotation n° D4368-09.
27. We would like to point out that all the electrical devices will be suitable for non classified area applications (safe areas).

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BILL OF MATERIALS

a) Argon (IG-01) System (Clean Agent System)

Extinguishing agent

For the protection of the rooms we will use Argon (IG-01).

The main features of the Argon (IG-01) are:

- clean agent extinguishing
- inert gas
- addressed in NFPA 2001 and ISO14520 as IG01
- NOAEL (no observed adverse effect level) = 43%
- LOAEL (lowest observed adverse effect level) = 52%
- no reduction of the visibility during the discharge
- suitable for total flooding

According to NFPA 2001 and ISO14520 the design of the systems following these rules:

minimum design concentration for class A: 41,9%

time discharge: 60 sec

For clean agent discharging systems it is necessary:

- provide a time delay (20-30 sec) discharge
- provide the hazard with optical and audible devices to allow personnel evacuation prior to discharge
- to prevent loss of agent through openings such as ventilating systems, adjacent hazard, false ceiling
- shut down or close automatically forced-air ventilation systems
- test the integrity of the protected hazard
- to perform fan door test according to NFPA 2001 appendix C or ISO 14520 annex E

Dimensioning

- The system (total flooding) has been dimensioned as per NFPA 2001 (2000 edition) and UNI ISO 14520, and the quantity of the inert gas and the cylinders are calculated on the base of these room dimension:

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➤ **M.V. Switchgears Area**

Volume: 889,10 m³

Argon (IG-01): 881,697 kg charged in 32 cylinders 80 lt capacity, 200 bar pressurised

➤ **L.V. Panel Area**

Volume: 914,82 m³

Argon (IG-01): 907,203 kg charged in 33 cylinders 80 lt capacity, 200 bar pressurised

➤ **Power & Light Centre**

Volume: 607,87 m³

Argon (IG-01): 602,809 kg charged in 22 cylinders 80 lt capacity, 200 bar pressurised

➤ **Battery Room**

Volume: 96,04 m³

Argon (IG-01): 95,240 kg charged in 4 cylinders 80 lt capacity, 200 bar pressurised

➤ **Cable Room (level, + 5,25)**

Volume: 690,07 m³

Argon (IG-01): 684,324 kg charged in 25 cylinders 80 lt capacity, 200 bar pressurised

➤ **Main Control Room**

Volume: 432,63 m³

Argon (IG-01): 429,028 kg charged in 16 cylinders 80 lt capacity, 200 bar pressurised

➤ **Cabinets Room**

Volume: 344,06 m³

Argon (IG-01): 341,195 kg charged in 13 cylinders 80 lt capacity, 200 bar pressurised

Eventual openings between adjacent rooms or towards outside of building, should be closed to guarantee the gas concentration inside the protected zones.

During the final planning of the system we will communicate data for the determination of venting devices (if necessary) to prevent excessive pressures.

Size and number of venting device depend of the structural strength of the protected enclosure.

Cylinder bank

The Argon (IG-01) necessary to the fire extinguishing will be stored in cylinders with 80 litres (200 bar pressure tested and with European certificate) capacity and the cylinders will be placed on suitable skids complete with pressure gauge with switch contacts (instead of weighing device system), the "empty cylinder" signal will be sent to the control panel.

All the supports for the cylinders will be fixed directly on the ground without metallic basement.

The cylinder banks will be installed in the dedicated room adjacent to "Diesel Generator room" at the ground floor.

Each cylinder will be provided with a cylinder valve complete with spring-type closure and security device.

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Two pilot cylinders are provided with an electrical automatic opening device, while the control of the opening of the rest of the valves (slave cylinders) will be caused by the Argon (IG-01) discharged from the pilot cylinders, by means of a pneumatic actuator.

The cylinders will be connected to a discharge manifold by means of flexible hoses and check valve on the manifold.

Moreover, the electric automatic opening device located on the pilot cylinder is provided with a manual mechanical control to actuate the local discharge of the system.

The "discharged system" signal to be sent to the control panel will be obtained by a pressure-operated switch located on the discharge pipe downstream of the directional valve.

On the manifold, before the discharge piping, is located a pressure reduction device (calibrated orifice) to reduce the pressure in according to flow calculations.

On the discharge piping will be located some metal nozzles in an adequate number in order to guarantee the project rate.

Equipment list:

n° 1	Cylinder main racks, 33 seats c/w all the accessories for the good functioning and the pressure gauge with switch contacts (instead of weighing device system)
n° 33	Argon (IG-01) main cylinders, 80 litres capacity 200 (bar), c/w valve, cap, weighing device
n° 14	Electric Actuator 24 Vdc IP54 for pilot cylinder
n° 7	Electric Actuator 24 Vdc IP54 for pilot directional valves
n° 1	Ø 1'1/2" directional valve
n° 3	Ø 2" directional valve
n° 3	Ø 2'1/2" directional valve
n° 1	Discharge manifold
n° 7	Emergency Manual release
n° 7	Pressure switch IP55
n° 1	JB IP55 for electric connection
n° 148	1/2" Argon (IG-01) discharge nozzle
kg 5150	Piping ASTM A106 Gr. B, sch.40, galvanised steel, supplied in free commercial lengths (not prefabricated) With relevant support With relevant threaded fittings ASA 3000

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b) Fire Alarm System

Fire Alarm Control Panel (FACP) and Fire Fighting Control Panel (FFCP)

The multifunctional control panel FB6100 has been designed using the most modern criteria, aiming at implementing a highly reliable programmable modular electronic panel which can manage and integrate all the typical safety systems of a user. This can range from a whole industrial complex to what is nowadays called an "intelligent building".

According to its designers, the FB6100 control panel had to include, with simplicity and in a versatile way which could be easily updateable in the future, some fundamental safety redundant concepts, typical of the most sophisticated and expensive safety PLCs.

It is widely thought, as a matter of fact, that an inalienable degree of flexibility is represented by the need of updating and suiting the system to new requirements as also to the changes required by the customer.

This coupling between simplicity and high technology and flexibility could be reached in order to fully satisfy the standards applied in the field.

FB6100 Main features

- built complying with fireproof (EN 54, EN 12094-1) and anti-intrusion standards (CEI 79)
- completely modular
- easy to program
- it suits to all the different types of subsystems
- possibility of redundancy in "hot back-up" even for the subsystem cards
- battery charger group controlled through severed double functions
- interfacing to other control panels and/or systems of graphic supervision
- connection in copper or direct in optic fibres without converters
- source Ethernet protocol or other protocols on request.

FB6100 Composition

- The FB6100 control panel is provided with:
- basic rack in which the two CPUs and the operator interface devices are housed
- wide back-lit LED graphic display (84 x 114 mm)
- variable rack number (up to 10) with 13 slots each for housing the modular cards of the subsystem.

System Features

FB6100 Control Panel

The FB6100 control panel is a fully programmable and modular device, specially designed for fire and integrated protection applications.

The FB6100 is a system panel; each can be connected to the others by LAN or Fiber Optic and together can be connected to a supervision program in a Personal Computer dedicated. With FB6100 we can manage all of safety (and security too) plants application.

FB6100 control panel is a PES (Programmable Electronic System) Safety Related.

The design of FB6100 has been made according to some indication of the IEC 61508 standard, but the panel isn't certified for this; instead FB6100 will be certified according to Fire

Application European standard EN 54-2 (Control Panel) EN 54-4 (power supply) and CEI 79-2 (Italian Standard for security).

The more important functions drawn by the IEC 61508 standard are the followings:

- CPU redundancy (possibility): we can insert a couple of CPU (in the main rack) connected in redundancy hot backup architecture. Each CPU is connected with each-other and a own bus for the modules inserted in the racks.
- Rack Buses :For each rack (in a FB6100 panel we can control up to 10 racks) we have a couple of bus, each one connected to all cards.

Hot Swap Cards

All the cards can be removed from the rack during operation without the necessity to put in off condition the panel. This performance is useful when it is necessary to replace a faulted card without putting the plant off duty.

System Cards

The FB6100 control panel is of modular design type on 19" – 3HE racks. These racks will support a complete range of cards to meet any expansion requirements even after installation.



BILL OF MATERIALS

Fire Alarm Control Panel (FACP)

- N° 1 Fire Alarm Control Panel composed of:
 - n.1 Cabinet self standing type, steel made, dimension 2100x800x600mm , Protection degree IP54 , colour RAL 7032
 - n.1 Feeder group – mod. FB-PU-A0001/1
 - n.1 Switching universal feeder – mod. FB-PU-A0005
 - n.2 CPU card - mod. FB-CPU1.1
 - n.1 Card for communication MODBUS RTU
 - n.1 Base Rack c/w display, I/O card, Bus – mod. FB-FP001
 - n.2 Card Rack (n° 13 card slot each) c/w card controller – mod. FB-CTRL1.1
 - n.2 Card eight conventional detection lines - mod. FB-M001.1
 - n.2 Card sixteen open collector – mod. FB-C0002.1
 - n.6 Card eight control output 500mA each - for siren - mod FB-C003.1
 - n.3 Card four control output 2A each - for solenoid valves - mod. FB-C004.1
 - n.6 ZONE Control card for addressable devices (loop 127 equipment each) – mod. FB-LP001.1
 - n. 6 blank cap
 - n.2 Battery suitable for 1 hour back up after primary 220 VAC power failure

Fire Fighting Control Panel (FFCP)

- N° 1 Repeater Panel composed of:
 - n.1 Cabinet self standing type, steel made, dimension 2100x800x600mm , Protection degree IP54 , colour RAL 7032
 - n.1 Feeder group – mod. FB-PU-A0001/1
 - n.1 Switching universal feeder – mod. FB-PU-A0005
 - n.1 CPU card - mod. FB-CPU1.1
 - n.1 Card for communication MODBUS RTU
 - n.1 Base Rack c/w display, I/O card, Bus – mod. FB-FP001
 - n.2 Card Rack (n° 13 card slot each) c/w card controller – mod. FB-CTRL1.1
 - n.4 Card sixteen open collector – mod. FB-C0002.1
 - q.s. Card four control output 2A each - for solenoid valves - mod. FB-C004.1
 - q.s. ZONE Control card for addressable devices (loop 127 equipment each) – mod. FB-LP001.1
 - n. 8 blank cap
 - n.2 Battery suitable for 1 hour back up after primary 220 VAC power failure

Fire Brigade Repeater Panel (FBRP)

- N° 1 Fire Brigade Repeater Panel composed of:
 - n.1 Small Panel with alphanumeric screen, type LCD character mode, capacity 2 lines of 20 characters, active screen area 74 x 12 (mm), character size 5,55 (mm) x 3,2 (mm),

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Fire Protection and Safety Technology

FB6100 PROGRAMMABLE SYSTEM COMPONENTS DATA SHEET

ONLY FOR INFORMATION

FB6100-DSC
MAIN PANEL

7/4/2020



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Important notes

SANCO S.p.A has the objective to continuously improve the characteristics of its products, therefore this manual can be modified without notice. All technical statements and data listed in this manual have been checked very carefully. This does not exclude the possibility that the manual may contain defects or orthographic mistakes. SANCO S.p.A will not be held legally liable for possible consequences caused by mistakes or changes of this manual.

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Index of revisions

Index of revision	Brief Description of the Content	Issuing date
Rev. 0	Preliminary version	30-10-2007
Rev. 1	Version for Certification	21-03-2008
Rev. 2	Last revision	06-03-2009

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Symbology

Some symbols are used in this manual to draw the attention on some particularly important aspects. This section defines their meaning.



CAUTION

This symbol identifies instructions that must be followed to prevent physical damages to objects or to the operator.



WARNING

This symbol identifies instructions that must be followed to prevent physical system's failures.



IMPORTANT

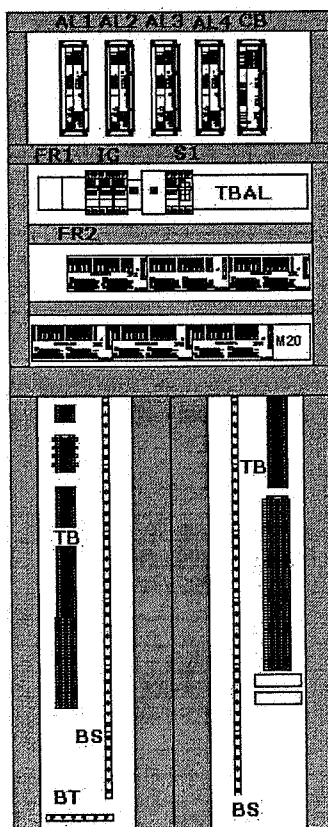
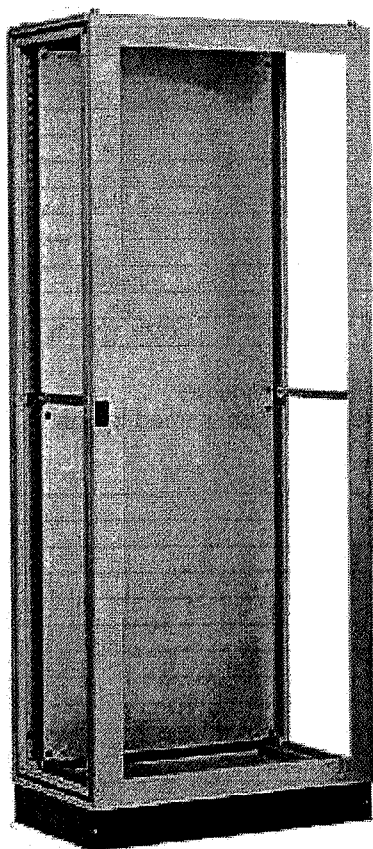
This symbol identifies important information to understand the meaning of an operation.

1. Structural work

Characteristic	FB-		
Maximum number of central unit's rack	1		
Maximum number of I/O rack	10		
Rack feeder	YES		
Maximum number of I/O cards	130		
Anchoring type	To Base		
Suction vent	YES		
Maximum output of batteries that can be allocated	2x12V 120A/h		

1.1 FB6100 DESCRIPTION

Complete cabinet made up by a steel sheet structure, thickness 15/10 shaped and welded with internal plate, frame and transparent door in PVC. The structural work is equipped with an air suction vent with an anti-dust filter located on the right side. It is equipped with an internal plate made of sheets of thickness 20/10. It is used with units of FB type.



CHARACTERISTICS

- Frame material: Sheet 15/10
- Colour: RAL7035
- Protection degree: IP55
- Anchoring: To floor
- Sizes: L=800 H=2100 P=800 mm
- Model: Series 3964C
- Manufacturer: CEPI ELETTRICA

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[Handwritten signature]

2. Feeder groups

Two feeder groups are available, one to be anchored on the bottom plate and one to be anchored to a 19" rack. Both feeder groups are supplied in different configurations, according to the needs.

POSSIBLE CONFIGURATIONS OF FEEDER GROUP FB-PU001

Characteristic	FB-PU001/1	FB-PU001/2	FB-PU001/4
Number of PU-A0005-1 feeders	1	2	4
Supply voltage	110-240V~	110-240V~	110-240V~
Nominal frequency	50-60Hz	50-60Hz	50-60Hz
Maximum inlet current at 110V~	1,6A	3,3A	6,4A
Maximum inlet current at 240V~	0.79 A	1.8 A	3,2A
Minimum outlet voltage (Note-A)	18,9Vdc	18,9Vdc	18,9Vdc
Residual maximum ripple	266mV	704mV	704mV
Maximum resistance of batteries	1,5 Ω	1,5 Ω	1,5 Ω
Maximum outlet current (Note-B)	4A	8A	16A
Maximum current for batteries	2A	4A	4A
Maximum output of batteries	2x12V 26A/h	2x12V 26A/h	2x12V 65A/h

POSSIBLE CONFIGURATIONS OF FEEDER GROUP FB-PU002

Characteristic	FB-PU002/1	FB-PU002/2	FB-PU002/4
Number of PU-A0008-1 feeders	1	2	4
Supply voltage	110-240V~	110-240V~	110-240V~
Nominal frequency	50-60Hz	50-60Hz	50-60Hz
Maximum inlet current at 110V~	8A	16,3A	35A
Maximum inlet current at 240V~	4 A	9 A	20A
Minimum outlet voltage (Note-A)	18,9Vdc	18,9Vdc	18,9Vdc
Residual maximum ripple	266mV	704mV	704mV
Maximum resistance of batteries	1,5 Ω	1,5 Ω	1,5 Ω
Maximum outlet current (Note-B)	20A	40A	40+40A
Maximum current for batteries	6A	6A	6A
Maximum output of batteries	2x12V 120A/h	2x12V 120A/h	2x12V 120A/h

Note-A: Outlet voltage at full load with discharged batteries and no network voltage

Note-B: It indicates the maximum current destined to loads and the current consumed by the unit.

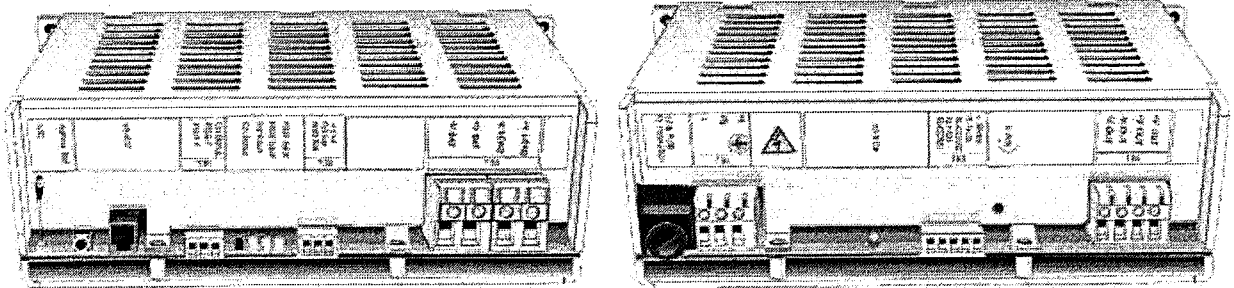
INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-PU001-1	Complete group with 1 PU-A0005-1 module	
FB-PU001-2	Complete group with 2 PU-A0005-1 modules	
FB-PU001-3	Complete group with 4 PU-A0005-1 modules	
PU-A0005-1	125 Watt feeder module	
PU-A0004-1	Battery charger module	
FB-PU002-1	Group with an PU-A0008-1 feeder module	
FB-PU002-2	Group with two PU-A0008-1 feeder modules	
FB-PU002-3	Group with three PU-A0008-1 feeder modules	
PU-A0007-1	Basket with cooling unit	With 3 metre temperature probe
PU-A0008-1	500 Watt feeder module	
PU-A0009-1	Battery charger module	
B84115-E-B110	115/250Vac 10A 50/60Hz network filter	
LS502	Fuse disconnecting switch for batteries	
FS10	10x38 10A fuse	For battery disconnecting switch FB-PU001/1/2
FS20	10x38 20A fuse	For battery disconnecting switch FB-PU001/4
FS50	10x38 50A fuse	For battery disconnecting switch FB-PU002/1/2/4
F6.3	Ultra-quick 5x20 6.3A fuse	For
F10	Ultra-quick 5x20 10A fuse	For PU-A0008-1
SK12-26	12V 26A/h batteries	
SK12-65	12V 65A/h batteries	
SK12-120	12V 120A/h batteries	

2.1 FB-PU0001

DESCRIPTION

It is a feeder group that is secured on the bottom plate. It is made up by maximum four 125 Watt feeders, PU-A0005-1 model, and a battery charging module PU-A0004-1 able to supply a current to charge batteries that can be set to 2 or 4 amper. The feeders are connected to each other in parallel mode up to a maximum of four feeders, for a total of 16 amper. In normal conditions, it performs a brief test every 30 seconds to check the presence of batteries while every hour, it performs a complete test to check the efficiency of batteries and electric connections. During charging, the batteries' voltage is automatically compensated based on the temperature. In case network voltage is lacking, the batteries are automatically commuted on the load without any interruption. If the loading phase does not end within 24 hours, the feeder signals a batteries' failure. In case of absence of primary voltage, the device shuts down the batteries when the voltage on the load is lower than 18Vdc to avoid to damage the same batteries. The group is equipped with three open collector outlets for the repetition of the different types of failure to the detection unit and a RS232 port for connection to a monitoring system.



GENERAL CHARACTERISTICS

Inlet voltage	110-240V~ (-15% ÷ +10%)
Frequency of inlet voltage	47/63 Hz
Operating temperature	-5 C° ÷ +50 C° in free air
Relative humidity	93% without condensate
Protection degree	IP20

FEEDER'S SECTION

Outlet nominal voltage	25Vdc
Minimum outlet voltage	18,9Vdc
Maximum outlet current	4A/8A/16A
Protections	Line fuse T6.3A H 250V (5x20)

BATTERY LOADING SECTION

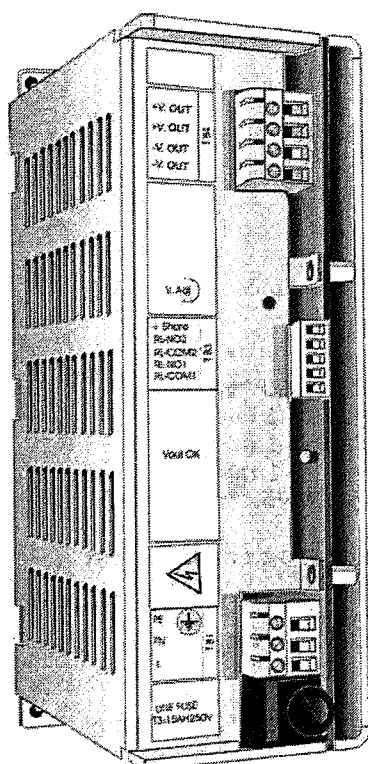
Battery voltage	from 26.2 to 28.7 Vdc automatically compensated
Ripple VBAT	< 100mV pK-pK at maximum current
Capacity in case of network's deficit current (with PU-A0005)	>=20mS at maximum
Maximum current of batteries	4A
Protections	Overvoltage short-circuit and battery inversion

REFERENCE STANDARDS

Reference standards	EN54-4
EC Reference standards (environment)	EN50081-2 and EN50082-2 (industrial)
Safety	EN60950 (CEI-74-2)

POSSIBLE CONFIGURATIONS

Characteristic	FB-PU001/1	FB-PU001/2	FB-PU001/4
Number of PU-A0005-1 feeders	1	2	4
Supply voltage	110-240V~	110-240V~	110-240V~
Nominal frequency	50-60Hz	50-60Hz	50-60Hz
Maximum inlet current at 110V~	1,6A	3,3A	6,4A
Maximum inlet current at 240V~	0,79 A	1,8 A	3,2A
Minimum outlet voltage (Note-A)	18,9Vdc	18,9Vdc	18,9Vdc
Residual maximum ripple	266mV	704mV	704mV
Maximum resistance of batteries	1,5 Ω	1,5 Ω	1,5 Ω
Maximum outlet current (Note-B)	4A	8A	16A
Maximum current for batteries	2A	4A	4A
Maximum output of batteries	2x12V 26A/h	2x12V 26A/h	2x12V 65A/h



DESCRIPTION

It is a switching universal feeder able to supply a maximum current of 4A at 25Vdc. It can be used with the battery charger, PU-A0004-1 model to comply with EN54-4 standard. The feeder is equipped with a circuit to share the load which allows to connect more feeders in parallel mode up to maximum four feeders.

CONNECTION TO INLET POWER SUPPLY			
Tag.	Terminal	Name	Function
TB1	M1	L input	Phase (protected by internal fuse)
	M2	N input	Neutral
	M3	PE	Ground
CONNECTIONS, STATUS REPETITIONS AND CURRENT SHARING			
Tag.	Terminal	Name	Function
TB2	M1	RL-COM1	Common status relay 1
	M2	RL-NO1	NA status relay 1
	M3	RL-COM2	Common status relay 2
	M4	RL-NO2	NA status relay 2
	M5	SHARE (+)	Signal for load sharing
CONNECTIONS TO OUTLET POWER SUPPLY			
Tag.	Terminal	Name	Function
TB3	M1	V.	Negative outlet voltage
	M2	- V.	Negative outlet voltage
	M3	+V. OUT	Positive outlet voltage
	M4	+V.	Positive outlet voltage

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GENERAL CHARACTERISTICS

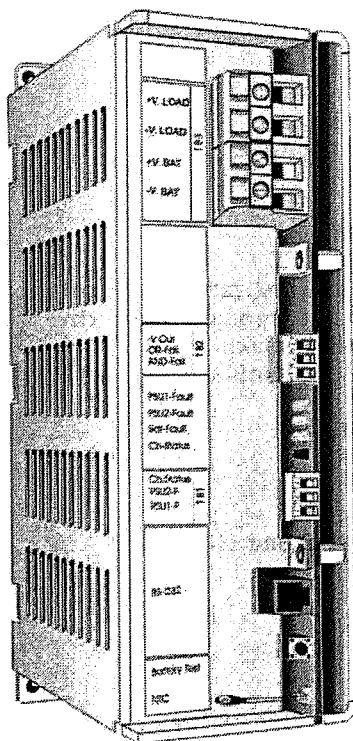
Inlet voltage	110-240V~ (-15% ÷ +10%)
Maximum absorbed current at 110V~:	1,6A
Maximum absorbed current at 240V~:	0,79A
Operating temperature	-5 C° ÷ +50 C° in free air
Relative humidity	93% without condensate
Frequency	47/63 Hz
Power factor (W/VA)	0.6 Typical
Output	> 80%
Protection degree	IP20
Sizes	200mm x 110mm x 60mm
Self-extinguishing degree	UL94V2
Insulation between inlet and outlet	>2 Mohm (500Vdc)
Insulation between inlet and mass	>2 Mohm (500Vdc)
Insulation between outlet and mass	>2 Mohm (500Vdc)
Electric rigidity between inlet and outlet	3000 Vac for 1 minute
Dielectric rigidity between inlets and mass	1500 Vac for 1 minute
Dielectric rigidity between outlets and mass	1500 Vac for 1 minute
VLOAD voltage	25Vdc (adjustable from +23Vdc to +26Vdc)
VLOAD current	4A
Ripple VLOAD	< 266mV pK-pK at maximum current

PROTECTIONS

Line Fuse	T6.3A H 250V (5x20)
PROTECTIONS	Overvoltages short-circuit

REFERENCE STANDARDS

REFERENCE STANDARDS	EN54-4
EC Reference standards environment)	EN50081-2 and EN50082-2 (industrial



2.3 FB-PU-A0004-1

DESCRIPTION

It is an uninterruptible power supply group able to control and charge two 12 volt batteries with maximum capacity of 65A/h. The maximum charging current of batteries can be set through a dip-switch onboard of the card. In normal conditions, it performs a brief test every 30 seconds to check the presence of batteries while every hour, it performs a complete test to check the efficiency of batteries and electric connections. During charging, the batteries' voltage is automatically compensated based on the temperature. In case network voltage is lacking, the batteries are automatically commuted on the load without any interruption. If the loading phase does not end within 24 hours, the feeder signals a batteries' failure. In case of absence of primary voltage, the device shuts down the batteries when the voltage on the load is lower than 18Vdc to avoid to damage the same batteries. The group is equipped with three open collector outlets for the repetition of failures to the detection unit, two inlets for monitoring feeders and a RS232 port for connection

to a monitoring system. It can be used with one or more feeders, PU-A0005-1 model. In this case, a feeder group is obtained that fully complies with PU-A0005-1 standard.

CONNECTION WITH STATUS OPEN COLLECTOR'S OUTLETS			
Terminal board	Terminal	Name	Function
TB1	M1	PSU1 Fault	Open collector outlet, failure of feeder's section
	M2	PSU2 Fault	Open collector outlet, failure of battery charger's section
	M3	Charge Status	Status outlet of battery charger (enabled in the full charge phase)
CONNECTIONS FOR FEEDERS' STATUS INDICATIONS			
Terminal board	Terminal	Name	Function
TB2	M1	AND-Fail	Inlet no voltage for all feeder units
	M2	OR-Fail	Inlet no voltage for one feeder units
	M3	-Vout	Common inlets M1 and M2
CONNECTIONS TO BATTERIES AND CHARGE			
Terminal board	Terminal	Name	Function
TB3	M1	- V.	Negative electricity to batteries
	M2		Positive electricity to batteries
	M3		Negative electricity for Charging
	M4		Positive electricity for Charging

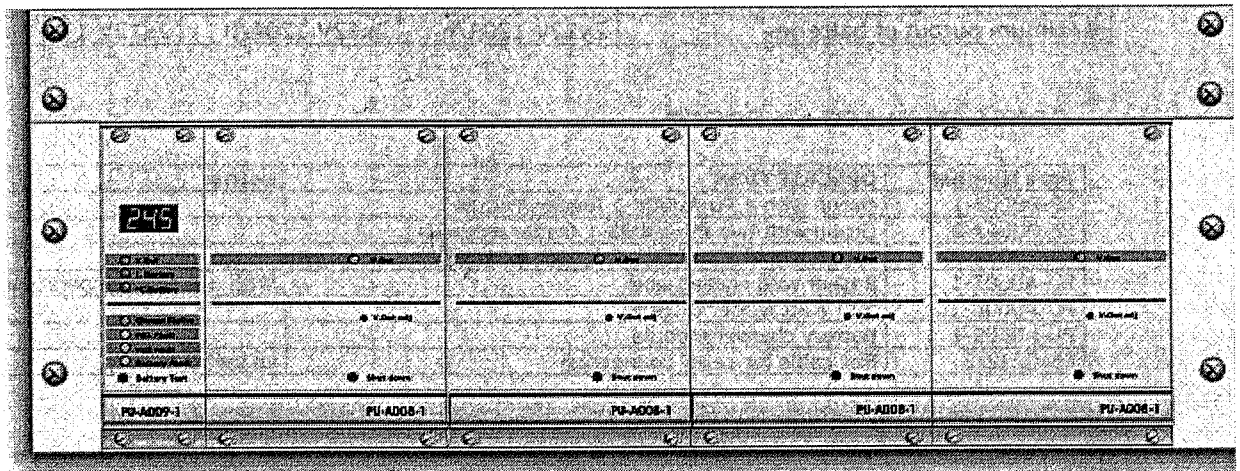
GENERAL CHARACTERISTICS

Inlet voltage	22-28 Vdc
Maximum absorbed current:	4A
Operating temperature	-5 C° ÷ +50 C° in free air
Relative humidity	93% without condensate
Output	> 83%
Protection degree	IP20
Sizes	200mm x 110mm x 60mm
Self-extinguishing degree	UL94V2
Battery voltage	from 26.2 to 28.7 Vdc automatically compensated
Battery current	(1/2/4A) It can be isolated through dip switch
Ripple VBAT	< 100mV pK-pK at maximum current
Capacity in case of network's deficit current (with PU-A0005)	>=20mS at maximum
Maximum resistance of batteries' circuits	1,5 ohm
Maximum output of batteries	65 A/h
Current to batteries	Automatically limited
Current to load	protected by a 20A internal fuse
REFERENCE STANDARDS	EN54-4 EN50081-2 and EN50082-2

2.4 FB-PU0002

DESCRIPTION

It is a power supply group able to supply a maximum current of 40+40A to the load and control and load two 12 volt batteries with maximum capacity of 120A/h. The maximum current to charge batteries is of 6 amper. In normal conditions, it performs a brief test every 30 seconds to check the presence of batteries while every hour, it performs a complete test to check the efficiency of batteries and electric connections. During charging, the batteries' voltage is automatically compensated based on the temperature. In case network voltage is lacking, the batteries are automatically commuted on the load without any interruption. If the loading phase does not end within 24 hours, the feeder signals a batteries' failure. In case of absence of primary voltage, the device shuts down the batteries when the voltage on the load is lower than 18Vdc to avoid to damage the same batteries. The group is equipped with seven open collector outlets for the repetition of the different types of failure to the detection unit and a RS232 port for connection to a monitoring system. All modules can be substituted under voltage (Hot-Plug)



GENERAL CHARACTERISTICS

Inlet voltage	110-240V~ (-15% ÷ +10%) / 115-250Vdc
Maximum absorbed current at 110V~:	12A
Maximum absorbed current at 240V~:	6A
Operating temperature	-5 C° ÷ +50 C° in free air
Relative humidity	93% without condensate
Frequency of inlet voltage	50/60 Hz
Power factor (W/VA)	0.6 Typical
Protection degree	IP20
Sizes	483mm x 178mm x 300mm
Self-extinguishing degree	UL94V2
Insulation between inlet and outlet	>2 Mohm (500Vdc)
Insulation between inlet and mass	>2 Mohm (500Vdc)
Insulation between outlet and mass	>2 Mohm (500Vdc)

FEEDER'S SECTION

VLOAD voltage	25Vdc
VLOAD current	40+40A
Maximum breakaway starting current	25A
Ripple VLOAD	< 100mV pK-pK at maximum current
Stability of VLOAD outlet	> 1%

BATTERY LOADING SECTION

Battery voltage	from 26.2 to 28.7 Vdc automatically compensated
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Ripple VBAT	< 100mV pK-pK at maximum current
Capacity in case of network's deficit current	>=20mS at maximum
Maximum current of batteries	6A
PROTECTIONS	
Line Fuse	T10A H 250V (5x20)
PROTECTIONS	Overvoltages short-circuits and battery
inversion REFERENCE STANDARDS	EN54-4 EN50081-2 EN50082-2 EN60950
(CEI-74-2)	

CONFIGURATIONS

Characteristic	FB-PU002/1	FB-PU002/2	FB-PU002/4
Number of PU-A0008-1 feeders	1	2	4
Maximum inlet current	5A at 110V~	10A at 110V~	10A at 110V~
Overall maximum voltage	20A	40A	40A
Maximum voltage for batteries	6A	6A	6A
Maximum voltage on load (Parallel)	14A	34A	ND
Maximum voltage on load (Redounded)	ND	17A+17A	40A+40A
Maximum output of batteries	2x12V 120A/h	2x12V 120A/h	2x12V 120A/h

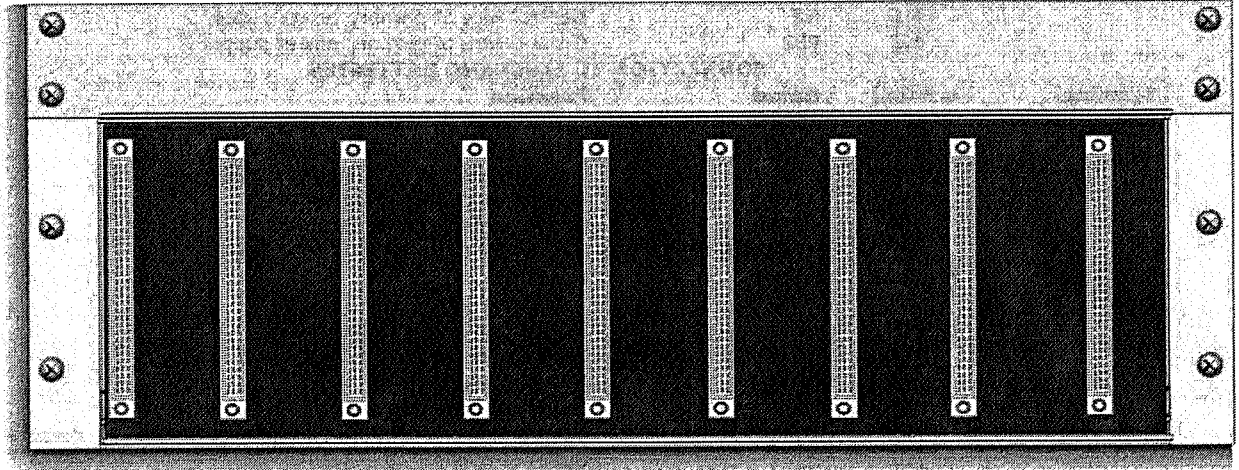
CODES TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-PU002-1	Group with a PU-A0008-1 feeder module	
FB-PU002-2	Group with two PU-A0008-1 feeder modules	
FB-PU002-3	Group with 4 PU-A0008-1 feeder modules	
PU-A0007-1	Basket with cooling unit	With 3 metre temperature probe
PU-A0008-1	500 Watt feeder module	
PU-A0009-1	Battery charger module	
FB-C232/2	Flat cable for serial connection	Length 2 metres

2.5 FB-PU-A0007-1

DESCRIPTION

It is a 19" rack which may contain a PU-A0009-1 battery charging module and up to four feeder modules, PU-A0008-1 model. It is equipped with a ventilation unit with three vents of 120 mm diameter. The terminal boards are located at the back of the basket for the connection of power supplies and status repetitions.



GENERAL CHARACTERISTICS

Material	Anodized aluminium
Protection degree	IP20
Sizes	483mm x 178mm x 300mm
Self-extinguishing degree	UL94V2
Vents absorption	70mA for each vent

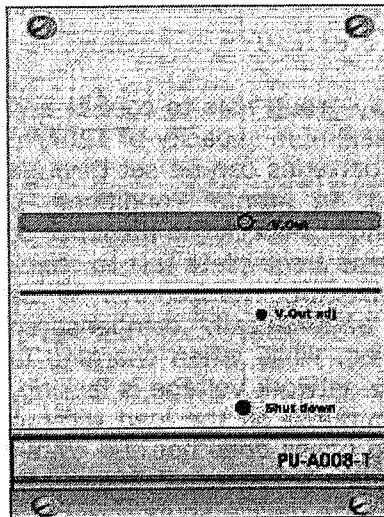
CONFIGURATIONS

Characteristic	FB-PU002/1	FB-PU002/2	FB-PU002/4
Number of PU-A0008-1 feeders	1	2	4
Maximum inlet current	5A a 110V~	10A at 110V~	10A at 110V~
Overall maximum voltage	20A	40A	40A
Maximum voltage for batteries	6A	6A	6A
Maximum voltage on load (Parallel)	14A	34A	ND
Maximum voltage on load (Redounded)	ND	17A+17A	40A+40A
Maximum output of batteries	2x12V 120A/h	2x12V 120A/h	2x12V 120A/h

CONNECTIONS

CONNECTION TO PRIMARY POWER SUPPLY			
Terminal board	Terminal	Name	Function
TB1	M1	L1	Phase of primary power supply 1
	M2	N1	Neutral wire of primary power supply 1
	M3	PE1	Ground wire of primary power supply 1
	M4	L2	Primary power supply phase 2
	M5	N2	Neutral wire of primary power supply 2
	M6	PE2	Ground wire of primary power supply 2
CONNECTION TO LOAD AND BATTERIES			
Terminal board	Terminal	Name	Function
TB2	M1	+VLOAD	Positive electricity of supply voltage
	M2	-VLOADI	Negative electricity of supply voltage
	M3	+VBAT	Positive electricity of batteries
	M4	-VBAT	Negative electricity of batteries
CONNECTION WITH STATUS OPEN COLLECTOR'S OUTLETS			
Terminal board	Terminal	Name	Function
TB3	M1	PSU1-Fault	Failure to primary power supply
	M2	PSU2-Fault	Failure to secondary power supply
	M3	Fault	Internal failure
	M4	Battery status	Battery status (charge/supply)
	M5	Charge Status	Charge status of batteries (fully charged/charge preservation)
	M6	Rip.1	Outlet of configurable status
	M7	Rip.2	Outlet of configurable status
	M8	GND	Screen of external temperature probe
	M9	+S	Positive pole of external temperature probe
	M10	-S	Negative pole of external temperature probe

2.6 FB-PU-A0008-1



DESCRIPTION

It is a switching universal feeder able to supply a maximum current of 20A at 25Vdc. It is inserted in a 19" rack which can be used with the battery charger, PU-A0009-1 model to comply with EN54-4 standard. The feeder is equipped with a circuit to share the load which allows to connect more feeders in parallel mode up to maximum four feeders. The module can be substituted when hot (Hot Plug). A green light which is on during regular operating conditions, a trimmer to adjust voltage and a button to shut-down the module prior to substitute it are located on the front panel.

GENERAL CHARACTERISTICS

Inlet voltage	110-240V~ (-15% ÷ +10%) / 115-250Vdc
Maximum absorbed current at 110V~:	8,8A
Maximum absorbed current at 240V~:	4,4A
Operating temperature	-5 C° ÷ +50 C° in free air
Relative humidity	93% without condensate
Frequency of inlet voltage	50/60 Hz
Power factor (W/VA)	0.6 Typical
Output	> 80%
Protection degree	IP20
Sizes	128mm x 96mm x 250mm
Self-extinguishing degree	UL94V2
Insulation between inlet and outlet	>2 Mohm (500Vdc)
Insulation between inlet and mass	>2 Mohm (500Vdc)
Insulation between outlet and mass	>2 Mohm (500Vdc)
Electric rigidity between inlet and outlet	3000 Vac for 1 minute
Dielectric rigidity between inlets and mass	1500 Vac for 1 minute
Dielectric rigidity between outlets and mass	1500 Vac for 1 minute
VLOAD voltage	25Vdc (adjustable from +23Vdc to +26Vdc)
VLOAD current	20A
Maximum breakaway starting current	25A
Ripple VLOAD	< 100mV pK-pK at maximum current
Stability of VLOAD outlet	> 1%

PROTECTIONS

Line Fuse	T10A H 250V (5x20)
PROTECTIONS	Overvoltages short-circuit

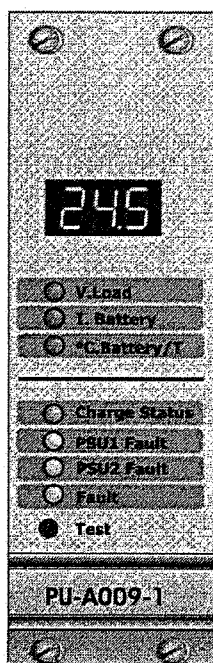
REFERENCE STANDARDS

EC Reference standards environment)	EN50081-2 and EN50082-2 (industrial
Safety	EN60950 (CEI-74-2)

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2.7 FB-PU-A0009-1



DESCRIPTION

It is an uninterruptible power supply group able to control and charge two 12 volt batteries with maximum capacity of 120A/h. The maximum charging current of batteries can be set through a dip-switch onboard of the card. In normal conditions, it performs a brief test every 30 seconds to check the presence of batteries while every hour, it performs a complete test to check the efficiency of batteries and electric connections. While charging, the battery voltage is automatically compensated based on the temperature measured, while when charging in full, it is kept at 27.6 Vdc. In case network voltage is lacking, the batteries are automatically commuted on the load without any interruption. If the full charging phase does not end within 24 hours, the battery charger signals a batteries' failure. In case of absence of primary voltage, the device shuts down the batteries when the voltage on the load is lower than 18Vdc to avoid to damage the same batteries. The group is equipped with seven open collector outlets for the repetition of the different types of failure, a series of inlets to control the status of feeder modules and cooling vents, and a RS232 port for connection to a monitoring system. It can be used with one or more feeders, PU-A0005-8 model. In this case, a feeder group

is obtained that fully complies with EN54-4:1997/A2:2006 standard.

GENERAL CHARACTERISTICS

Inlet voltage	22-28 Vdc
Maximum absorbed current:	7A
Operating temperature	-5 C° ÷ +50 C° in free air
Relative humidity	93% without condensate
Output	> 83%
Protection degree	IP20
Sizes	128mm x 40mm x 250mm
Self-extinguishing degree	UL94V2
Battery voltage compensated	from 26.2 to 28.7 Vdc automatically
Battery current switch	(4/6A) It can be isolated through dip
Ripple VBAT	< 100mV pK-pK at maximum current
Capacity in case of network's deficit current (with PU-A0005)	>=20mS at maximum
Maximum output of batteries	120 A/h

PROTECTIONS

Current to batteries	Automatically limited
Current to load	50A external fuse
Protections inversion	Overvoltages short-circuits and battery

REFERENCE STANDARDS

REFERENCE STANDARDS	EN54-4
EC Reference standards environment)	EN50081-2 and EN50082-2 (industrial

3. Central unit's rack

The central unit is made up by the elaboration units, (CPU) with relative bus, the display module and by the management module of default I/O. It performs elaboration functions of data coming from cards, it manages the operator's interface and the communications with supervision systems.

INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-BASE	Complete central unit	With basket in aluminium, 3 units of 19"
FB-CPU1.1	Elaboration unit with 10/100baseT Ethernet outlet	
FB-CPU1.2	Elaboration unit with 100baseFX Ethernet outlet	
FB-CPUBUS-1	Bus with two slots for central unit	
FB-FP001.1	Operator's interface unit	
FB-TB004.1	I/O default module	
FB-TB001.1	termination module with 16 terminals	
FB-TB007.1	termination module with 16 relays	
FB-TB002.1	RS232/Curren loop converter module	
FB-U0000-1	Closing panel for central unit	
FB-BL00-1	Closing panel	Used only with systems with single CPU
FB-CFT20/05	Flat cable for termination module	Length 5 centimetres
FB-CFT10/2	Flat cable for serial connection	Length 2 metres
FB-CFT14/2	Flat cable for connection to FB-TB004.1 module	Length 2 metres
EDS-205	Ethernet Switch 24Vdc MOXA	5 ports 10/100BaseT RJ45

3.1 FB-MBUS

DESCRIPTION

This card performs the function of interface between the two CPUs and other peripherals that make up the system.

CHARACTERISTICS

Supply voltage: 22-29Vdc
Absorption in idle status: 0mA
Operating temperature: -10 / +50 °C
Storage temperature: -30 / +80 °C
Maximum humidity: 95% without condensate

CONNECTIONS

TB1-TB2 +V/-V

These two Faston terminals are used to connect the supply voltage.

TAG	Function	Cable colour
TB 1	Positive pole of 25Vdc power supply	Red
TB 2	Negative pole of 25Vdc power supply	Black

J1 Default I/O

It is a connector for a 14-pole flat cable that allows connection with the FB-TB004.1 card (default I/O).

J2 BUS-IN		Direction	J3 BUS-OUT	
Pin	Signal		Signal	Pin
1	STE-	→	STE-	1
2	STE+	→	STE+	2
3	SIMO-	→	SIMO-	3
4	SIMO+	→	SIMO+	4
5	SOMI-	←	SOMI-	5
6	SOMI+	←	SOMI+	6
7	UCLK-	→	UCLK-	7
8	UCLK+	→	UCLK+	8
9	GND	↔	GND	9
10	GND	↔	GND	10
11	GND	↔	GND	11
12	GND	↔	GND	12
13	GND	↔	GND	13
14	GND	↔	GND	14

J2-J3 Link with LVDS bus loop

It consists of 2 RJ45 connectors per cable of category 5 that allows to connect the two CPUs with peripheral cards. The connection is of loop type to increase the reliability degree of the system. The J2 connector (Bus-IN) must be connected to the BUS-OUT terminal of the last rack while the J3 connector (Bus-OUT) must be connected to the BUS-IN terminal of the first rack.

Connection cable UTP RJ45

J3 BUS-OUT		Direction/ Colour	J2 BUS-IN	
Pin	Signal		Signal	Pin
1	RXA-IN+	→ white/green	TXA-OUT+	1
2	RXA-IN-	→ green	TXA-OUT-	2
3	TXA-IN+	→ white/blue	RXA-OUT+	3
4	TXA-IN-	→ blue	RXA-OUT-	4
5	RXB-IN+	← white/orange	TXB-OUT+	5

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6	RXB-IN-	← orange	TXB-OUT-	6
7	TXB-IN+	→ white/brown	RXB-OUT+	7
8	TXB-IN-	→ brown	RXB-OUT-	8

J4 Printer/Debug

It is a connector for a 10-pole flat cable that connects a 40 or 80 column serial printer to a terminal in order to debug the application program. To connect the terminal, use cable FB-CFT10/2.

J4 connector		Direction	DB9 Female	
Pin	Signal		Signal	Pin
1	DTR	→	DCD	1
3	TXD	→	RXD	2
5	RXD	←	TXD	3
7	DCD	←	DTR	4
9	GND	↔	GND	5
2	DTR	→	DSR	6
4	CTS	←	RTS	7
6	RTS	→	CTS	8
8				9
10	NU			

J5 Host Computer

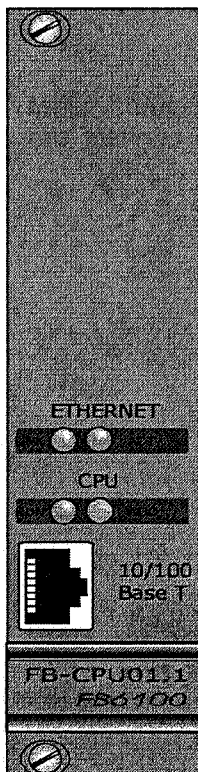
It is connector for a 10-pole flat cable that allows for connection with the serial port of a personal computer or alternatively with the FB-TB002.1 card which allows to convert the signal from RS232 to current loop. The connections are the same ones used on the printer's port.

J6Display

It is a connector for a 20-pole flat cable that allows connection with the FB-FP001 display card.

J6 FB-MBUS		Direction	J1 FB-FP001	
Pin	Signal		Signal	Pin
1	SOMI+	→	SOMI+	1
2	SOMI-	→	SOMI-	2
3	SIMO+	←	SIMO+	3
4	SIMO-	←	SIMO-	4
5	UCLK+	←	UCLK+	5
6	UCLK-	←	UCLK-	6
7	STE+	←	STE+	7
8	STE-	←	STE-	8
9	LCDRXA+	→	LCDRXA+	9
10	LCDRXA-	→	LCDRXA-	10
11	LCDTXA+	←	LCDTXA+	11
12	LCDTXA-	←	LCDTXA-	12
13	LCDRXB+	→	LCDRXB+	13
14	LCDRXB-	→	LCDRXB-	14
15	LCDTXB+	←	LCDTXB+	15
16	LCDTXB-	←	LCDTXB-	16
17	GND	↔	GND	17
18	GND	↔	GND	18
19	GND	↔	GND	19
20	GND	↔	GND	20

3.2 FB-CPU1.1



DESCRIPTION

This card represents the system's central unit. In addition to the micro-controller onboard the card, there are the Flash memory, buffered static Ram, watch dog circuit and Ethernet controller. The CPU card can be used in single and redounded configuration; in this case two CPUs in parallel mode are used. Both CPUs elaborate the information coming from the cards but only one of them performs commands. When the primary CPU stops working, the other continues to perform its activities without interrupting the machine's cycle.

CHARACTERISTICS

- Microcontroller: Renesas H8-2318 at 25Mhz
- RAM memory: 4 Mbit buffered with lithium battery
- FLASH memory: 2 Mbit
- Ethernet outlet: 10/100BaseT with RJ 45 connector
- Watch Dog: external
- Hot Plug: YES
- Redundancy: YES
- Supply voltage: 22-29Vdc
- Absorption in idle status: 70mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Four lights are located at the front of the card which indicate the following statuses:

Light	Mode	Condition
Link	⊗	Presence of Ethernet connection link
	-	Absence of Ethernet connection link
Activity	⊘	Transmission/receipt of data on the Ethernet port
	-	No activity on the Ethernet port
Run	⊗	Blocked CPU
	⊘	Secondary CPU
	-	Blocked CPU
Wdo	-	Operating CPU
	⊗	Blocked CPU
⊘ =flashing ⊗ = steady on; - = light off;		

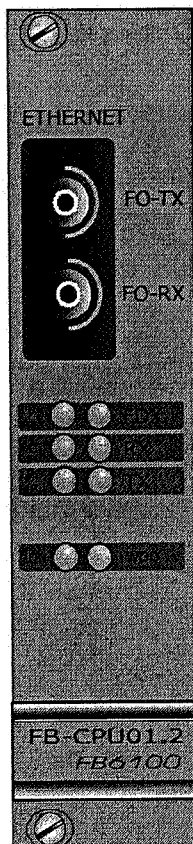
CONNECTIONS

An 8-pole RJ45 connector is located at the front of the card in order to connect the card to the Ethernet network. Through this port, it is possible to perform connections at a maximum distance of 100 metres by using a cable of category 5.

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3.3 FB-CPU1.2



DESCRIPTION

This card represents the system's central unit. In addition to the micro-controller onboard the card, there are the Flash memory, buffered static Ram, watch dog circuit and Ethernet controller. The CPU card can be used in single and redounded configuration; in this case two CPUs in parallel mode are used. Both CPUs elaborate the information coming from the cards but only one of them performs commands. When the primary CPU stops working, the other continues to perform its activities without interrupting the machine's cycle.

CHARACTERISTICS

- | | |
|------------------------------|--------------------------------------|
| ▪ Microcontroller: | Renesas H8-2318 at 25Mhz |
| ▪ RAM memory: | 4 Mbit buffered with lithium battery |
| ▪ FLASH memory: | 2 Mbit |
| ▪ Ethernet outlet: | 100BaseFX with ST connection |
| ▪ Watch Dog: | external |
| ▪ Hot Plug | YES |
| ▪ Redundancy | YES |
| ▪ Supply voltage: | 22-29Vdc |
| ▪ Absorption in idle status: | 100mA |
| ▪ Operating temperature: | -10 / +50 °C |
| ▪ Storage temperature: | -30 / +80 °C |
| ▪ Maximum humidity: | 95% without condensate |

SIGNALS

Eight lights are located at the front of the card which indicate the following statuses:

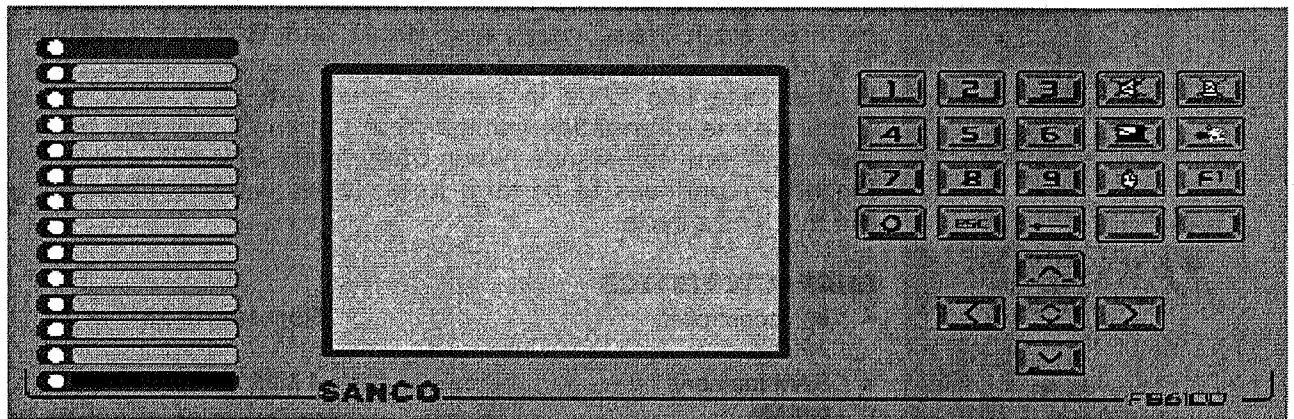
CONNECTIONS

An 8-pole RJ45 connector is located at the front of the card in order to connect the card to the Ethernet network. Through this port, it is possible to perform connections at a maximum distance of 100 metres by using a cable of category 5.

3.4 FB-FP001

DESCRIPTION

The display card performs the function of interface between the unit and the operator. It is made up by a back-lit graphic display made up by 30 rows of 52 characters, 19 lights, 23 keys and a Buzzer.



CHARACTERISTICS

- Supply voltage: 22-29Vdc
- Absorption in idle status: 70mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate
- LCD resolution: 320 x 128 pixel
- Back-light: of led type

SIGNALS

14 lights are located on the front panel that performs the following functions:

Light	Mode	Condition
	Ø	Not recognized alarm status
	⊗	Recognized alarm status
Common Fault	Ø	General anomaly status
Sounders Fault	Ø	Anomaly to alarm siren
PSU1 Fault	Ø	Anomaly to primary power supply
PSU2 Fault	Ø	Anomaly to secondary power supply
Earth Fault	Ø	Dispersion towards the ground
System Fault	Ø	System's anomaly
Test Zone	Ø	Zone testing in progress
Common Disabled	⊗	General disabling status
Devices Disabled	⊗	Disabled sensor/actuator
Sounders Disabled	⊗	Disabled alarm siren
Output Delayed	⊗	Enabling of delay timing in progress
Power On	⊗	Presence of primary voltage
Ø = Flashing ⊗ = steady on;		

5 lights are located at the back of the card that perform the following functions:

Light	Mode	Condition
LD15	-	Currently not used
LD16	-	Currently not used

Link CPU-A	Ø	Communication link with current CPU-A
Link CPU-B	Ø	Communication link with current CPU-B
Link FB-TB004.1	Ø	Communication link with current FB-TB004.1

KEYS

Key	Meaning of Key	level	Description of function
	Acknowledgement of local sound signal	1-2-3	It disables the local buzzer
	Acknowledgement of system's sirens	2-3	It acknowledges the fire alarm sirens located in the system
	Resetting of unit	2-3	It resets the unit
	Evacuation command	2-3	It enables the fire alarm sirens located in the system
	Zeroing of delay times	1-2-3	It cancels the current timing on the outlets
	It cancels a selection	1-2-3	To cancel an operation or to go back to the previous page
	Enter key	1-2-3	It confirms a selection while browsing the menus of the operator's cycle
	Arrow keys to select direction inside menus	2-3	They allow to browse inside the menus of the operator's cycle
	Numeric keys 0-9	1-2-3	They are used to enter parameters and access passwords
	Scroll Key	1-2-3	It allows to visualize the complete list inside the menus of the operator's cycle
	Key F1	1-2-3	It allows to directly access the main page of the active access level

CONNECTIONS

BR1-BR2 +V/-V

These two Faston terminals are used to connect the supply voltage.

TAG	Function	Cable colour
BR1	Positive pole of 25Vdc power supply	Red
BR2	Negative pole of 25Vdc power supply	Black

J2

It is a connector for a 20-pole flat cable that allows connection with the FB-MBUS-1 Bus card.

J3

It is a 4-pole connector that feeds the display's back-illumination lights.

J5

It is a 10-pole connector which connects the membrane keyboard to the display.

4. I/O rack

Up to a maximum of ten expansion racks containing up to thirteen I/O cards can be connected to a FB base. Position 14 is reserved to FB-CTRL1.1-1 rack controller.

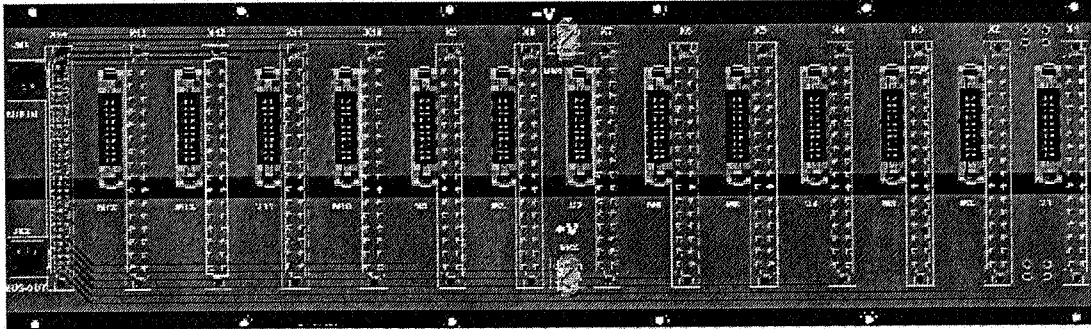
INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-RACK BASE	Complete expansion rack	With basket in aluminium, 3 units of 19"
FB-RACK1.1	13-slot bus for terminations with flat cable	It does not allow redundancy of I/O modules
FB-RACK1.2	13-slot bus for terminations with multiple cable	It allows redundancy of I/O modules
FB-CTRL1.1	Rack controller module	

4.1 FB-RACK1.1

DESCRIPTION

This card collects the thirteen cards and the rack controller. The connections between the cards and the field are made by using the Flat cable with relative termination cards of DIN bar. The use of this bus does not allow to realize systems with redounded I/O modules.



CHARACTERISTICS

- Supply voltage: 22-29Vdc
- Absorption in idle status: 0mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate
- Maximum number of I/O modules: 13
- Connections towards the field: 20-way flat cable

CONNECTIONS

BR2/BR4

These two Faston terminals are used to connect the supply voltage.

TAG	Function	Cable colour
BR2	Positive pole of 25Vdc power supply	Red
BR4	Negative pole of 25Vdc power supply	Black

JB1

Inlet cable of Bus coming from previous rack.

JB2

Bus' Outlet Cable towards the following rack.

Connection cable UTP RJ45

JB2 BUS-OUT		Direction/ Colour	JB BUS-IN	
Pin	Signal		Signal	Pin
1	RXA-IN+	white/green	TXA-OUT+	1
2	RXA-IN-	→ green	TXA-OUT-	2
3	TXA-IN+	→ white/blue	RXA-OUT+	3
4	TXA-IN-	→ blue	RXA-OUT-	4
5	RXB-IN+	← white/orange	TXB-OUT+	5
	-IN-	← orange	TXB-OUT-	6
7	TXB-IN+	→ white/brown	RXB-OUT+	7
8	TXB-IN-	→ brown	RXB-OUT-	8

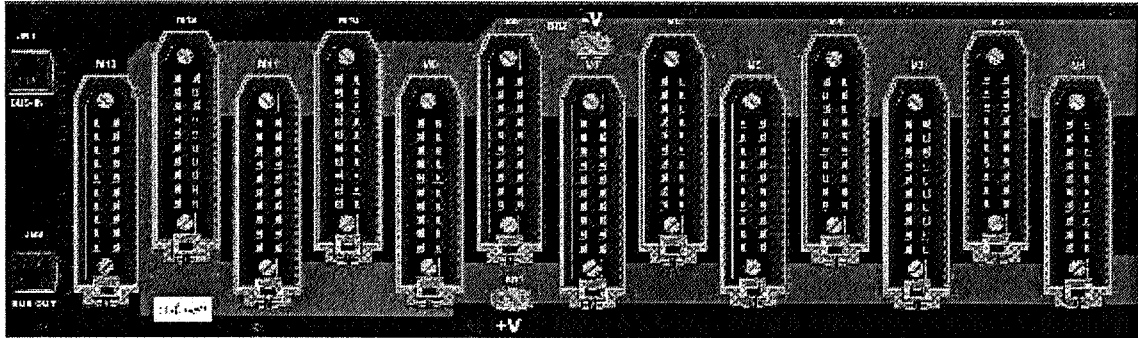
M1-/M13

Connectors for Flat Cable which connects the cards and termination ends.

4.2 FB-RACK1.2

DESCRIPTION

This card collects the thirteen cards and the rack controller. The connections between the cards and the field are realized by using pre-assembled cables of three metres in length. The use of this bus allows to realize systems with redounded I/O modules.



CHARACTERISTICS

- Supply voltage: 22-29Vdc
- Absorption in idle status: 0mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate
- Maximum number of I/O modules: 13
- Connections towards the field: Multiple cables

CONNECTIONS

BR2/BR4

These two Faston terminals are used to connect the supply voltage.

TAG	Function	Cable colour
BR1	Positive pole of 25Vdc power supply	Red
BR2	Negative pole of 25Vdc power supply	Black

JB1

Inlet cable of Bus coming from previous rack.

JB2

Bus' Outlet Cable towards the following rack.

Connection cable UTP RJ45

JB2 BUS-OUT		Direction/ Colour	JB1 BUS-IN	
Pin	Signal		Signal	Pin
1	RXA-IN+	→ white/green	TXA-OUT+	1
2	RXA-IN-	green	TXA-OUT-	2
3	TXA-IN+	→ white/blue	RXA-OUT+	3
4	TXA-IN-	→ blue	RXA-OUT-	4
5	RXB-IN+	← white/orange	TXB-OUT+	5
6	RXB-IN-	← orange	TXB-OUT-	6
7	TXB-IN+	→ white/brown	RXB-OUT+	7
8	TXB-IN-	→ brown	RXB-OUT-	8

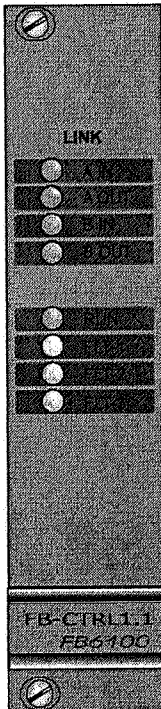
M1-/M13

Connectors for multiple cables which connect the cards and termination board.

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4.3 FB-CTRL1.1



DESCRIPTION

This card performs the function of rack controller. It allows to exchange information between the CPUs and the cards inside the rack. It manages 13 point-to-point links with the cards inside the rack and two links of loop type for the communication with the two CPUs.

CHARACTERISTICS

- Supply voltage: 22-29Vdc
- Absorption in idle status: 20mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

VISUAL SIGNALS

Eight lights are located on the front panel that perform the following functions:

Light	Condition
Link A-IN	Steady-on when the inlet LINK CPU-0 of loop type is present
Link A-OUT	Steady-on when the outlet LINK CPU-0 of loop type is present
Link B-IN	Steady-on when the inlet LINK CPU-1 of loop type is present
Link B-OUT	Steady-on when the outlet LINK CPU-1 of loop type is present
Run	It flashes during functioning
FLT1	It is steady-on in the presence of a local interrupt
FLT2	It is steady-on in the presence of an interrupt on the CPU-A loop
FLT3	It is steady-on in the presence of an interrupt on the CPU-B loop

CONFIGURATION

The card's configuration takes place through a 4-way dip switch which sets the number of racks from 1 to 10 according to the following table:

SW1-1	SW1-2	SW1-3	SW1-4	Rack no.
OFF	OFF	OFF	OFF	1
ON	OFF	OFF	OFF	2
OFF	ON	OFF	OFF	3
ON	ON	OFF	OFF	4
OFF	OFF	ON	OFF	5
ON	OFF	ON	OFF	6
OFF	ON	ON	OFF	7
ON	ON	ON	OFF	8
OFF	OFF	OFF	ON	9

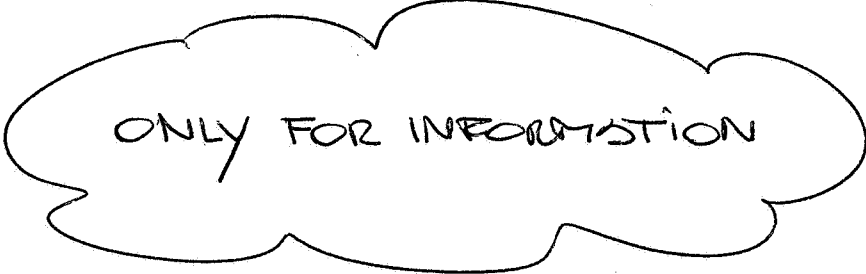
42

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SANCO

Fire Protection and Safety Technology

FB6100 PROGRAMMABLE SYSTEM COMPONENTS DATA SHEET



ONLY FOR INFORMATION

FB6100-DSC
I/O MODULES

7/4/2020
Jury

Important notes

SANCO S.p.A has the objective to continuously improve the characteristics of its products, therefore this manual can be modified without notice. All technical statements and data listed in this manual have been checked very carefully. This does not exclude the possibility that the manual may contain defects or orthographic mistakes. SANCO S.p.A will not be held legally liable for possible consequences caused by mistakes or changes of this manual.

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Index of revisions

Index of revision	Brief Description of the Content	Issuing date
Rev. 0	Preliminary version	30-10-2007
Rev. 1	Version for Certification	21-03-2008
Rev. 2	Last revision	06-03-2009

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Symbology

Some symbols are used in this manual to draw the attention on some particularly important aspects. This section defines their meaning.



CAUTION

This symbol identifies instructions that must be followed to prevent physical damages to objects or to the operator.



WARNING

This symbol identifies instructions that must be followed to prevent physical system's failures.



IMPORTANT

This symbol identifies important information to understand the meaning of an operation.

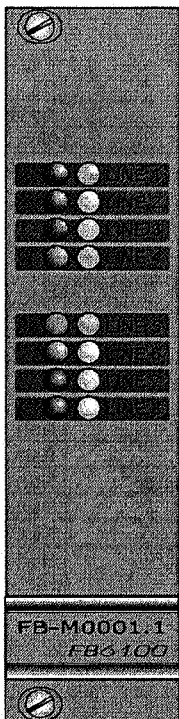
5. I/O modules

Voltage can be supplied or removed to all modules. The following types of modules are available:

INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-M0001.1-1	Module with 8 controlled inlets for conventional 24Vdc detectors	Non redounding
FB-M0001.1-2	Module with 8 24Vdc controlled inlets for standard detectors	Redounding
FB-AN001.1	Module with a 4-20mA analogue inlet	Non redounding
FB-AN001.1-2	Module with a 4-20mA analogue inlet	Redounding
FB-AN002.1	Module with two 4-20mA analogue inlets	Non redounding
FB-AN002.1-2	Module with two 4-20mA analogue inlets	Redounding
FB-C0001.1	Module with 8 500mA controlled outlets for solenoids	Non redounding
FB-C0001.1-2	Module with 8 500mA controlled outlets for solenoids	Redounding
FB-C0002.1	Module with 16 500mA non controlled outlets	Non redounding
FB-C0003.1	Module with 8 500mA controlled outlets for sirens	Non redounding
FB-C0004.1	Module with 4 2A controlled outlets for solenoids	Non redounding
FB-C0004.1-2	Module with 4 2A controlled outlets for solenoids	Redounding
FB-S0001.1	Module with 8 outlets for the management of fire extinguishing systems	Non redounding
FB-LP001.1-1	Loop control module for ESP addressed devices	Non redounding
FB-MOD001.1	Modbus RTU Master/Slave Module	Non redounding
FB-LBUS0001.1	Bus control module with Scame Sistemi	Non redounding

5.1 FB-M0001.1



DESCRIPTION

Card with eight balanced inlets for sensors of conventional type with safety related functions. All channels can be reset singularly and they are reset during operation every 30 seconds. This card is suitable to manage detection systems with conventional lines; it is particularly suitable to be used in systems with already existing detection lines, to command automatic extinguishing systems with double consent logics or intrinsic safety systems. It is also used to control all typical devices of extinguishing systems (pressure gauges, discharge keys, etc)

CHARACTERISTICS

- Operating mode: Safety or Security
- Redundancy: FB-M0001.1-2 model
- alarm threshold: 2 programmable thresholds
- Test of channels: performed every 30 seconds
- Operating modes: configurable through software.
- S.I. barriers that can be used: uZ680+ by Pepperl & Fuchs
- Supply voltage: 22-29Vdc
- Absorption in idle status: 18mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Two status lights for each of the eight channels are located on the front panel.

Signals of status lights	Indications in SAFETY mode		Indications in SECURITY mode	
	Yellow light		Yellow light	
Normal channel	-	-	-	-
Excluded/disabled channel	⊗	-	⊗	-
Channel subject to anomaly	∅	-	∅	-
Channel subject to failure	x	x	-	∅
Channel subject to pre-alarm	-	∅	x	x
Channel subject to alarm	-	⊗	-	⊗
∅ =flashing ⊗ = steady on - =off x =not available				

CONFIGURATION

It is possible to set the following parameters through ProFB configuration program for each single channel:

Parameter	SAFETY mode	SECURITY mode
Channel's operating mode	NA / NO	C
Alarm/Active status	Held/Not held	Held
Alarm's acknowledgement function	Enabled / Disabled	Disabled
Alarm thresholds programmable on 255 levels	Pre-alarm / Alarm	Steady
Channel status with line in short-circuit	Anomaly / Alarm	Failure
Alarm signalling methods	Normal / Silent / Buzzer only	Normal / Silent

CONNECTIONS

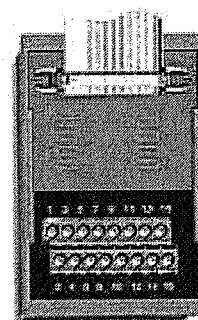
This card can be terminated with the 16-terminal module FB-TB001.1 or with FB-CCT1/FB-CTT1 cables.

Connections with termination card

By using the bus of FB-RACK1.1 model, the connection between the card and the field takes place through a 20-way flat cable and termination module FB-TB001.1 positioned on DIN card inside the panel. It is not possible to redound modules with this type of termination.

Connections of FB-TB001.1 end		
Terminal		Function
Ø 1	1	+ Input 1
Ø 2	2	- Input 1
Ø 3	3	+ Input 2
Ø 4	4	- Input 2
Ø 5	5	+ Input 3
Ø 6	6	- Input 3
Ø 7	7	+ Input 4
Ø 8	8	- Input 4
Ø 9	9	+ Input 5
Ø 10	10	- Input 5
Ø 11	11	+ Input 6
Ø 12	12	- Input 6
Ø 13	13	+ Input 7
Ø 14	14	- Input 7
Ø 15	15	+ Input 8
Ø 16	16	- Input 8

Connection to rack 19"

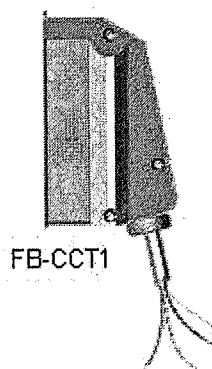


FB-TB001

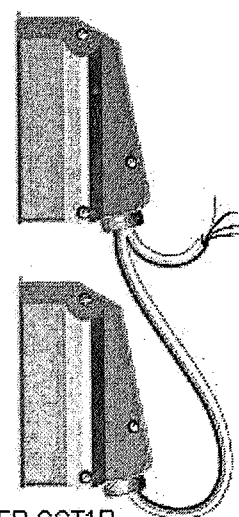
Connections with termination cable

By using the bus of FB-RACK1.2 model, the connection between the card and the field takes place through the 16-conductor multipolar cable FB-CTT1. Using cable FB-CTT1R, it is possible to connect two modules in parallel mode.

Connections with FB-CCT1/FB-CTT1R cables	
Cable colour	Function
White	+ Input 1
Brown	- Input 1
Green	+ Input 2
Yellow	- Input 2
Grey	+ Input 3
Pink	- Input 3
Blue	+ Input 4
Red	- Input 4
Black	+ Input 5
Purple	- Input 5
Grey / Pink	+ Input 6
Red / Blue	- Input 6
white/green	+ Input 7
Brown / Green	- Input 7
white / yellow	+ Input 8
Yellow/Brown	-Input 8



FB-CCT1



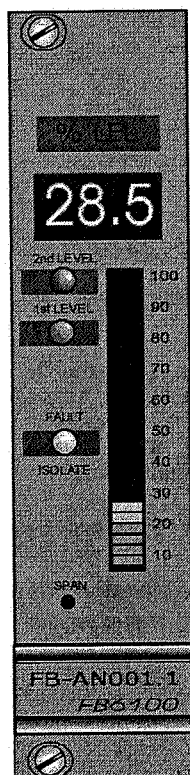
FB-CTT1R

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INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-M0001.1	Module with 8 24Vdc controlled inlets for sensors	Non redounding
FB-M0001.2	Module with 8 24Vdc controlled inlets for sensors	Redounding
FB-TB001.1	Termination with 16 terminals for FB-M0001.1-1 modules	
FB-CFT20/2	Flat cable for termination module FB-TB001.1	Length 2 metres
FB-CCT1	Termination cable for modules FB-M0001.1	Length 3 metres
FB-CCT1R	Termination cable for modules FB-M0001.2	Length 3 metres
uZ680+	Safety zener barrier intrinsic to a channel	Pepperl & Fuchs

5.2 FB-AN001.1



DESCRIPTION

Card with a safety related 4-20mA analogue inlet with two thresholds that can be set on the card through the operator's cycle. The following types of transducers can be connected to this card: Explosivity Sensors, Toxicity Sensors, Oxygen Sensors, Temperature Sensors, General 4-20mA sensors. The channel is tested during operation every 30 seconds. The card is equipped with a 4-20mA outlet that supplies the current value measured at the inlet. The analogue value can be transferred to a DCS through a RTU Modbus module, FB-MOD001.1-1 model. The refreshing time of the analogue value is of 30 seconds.

CHARACTERISTICS

- Redundancy: FB-AN001.1-2 model
- alarm thresholds: 2 programmable
- Test of channel: performed every 30 seconds
- Operating modes: configurable through software.
- Measurement range: 0-24mA
- Short circuit status on the line: with current >23.5mA
- Supply voltage: 22-29Vdc
- Absorption in idle status: 35mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Three lights, a graphic bar of led type and a three-digit display are located on the front of the card.

Lights' signals based on the channel's status	Fault Disabled		
Normal channel	-	-	-
Excluded/disabled channel	⊗	-	-
Failed channel	∅	-	-
Channel subject to calibration	∅	-	-
Exceeding of first threshold (pre-alarm)	-	∅	-
Exceeding of second threshold (alarm)	-	⊗	⊗

∅ = flashing ⊗ = steady on; - = light off;

Led bar

It represents the percentage from 0 to 100% of the measured value.

Three-digit display

The measured value is generally visualized on the display in the format set in the programming cycle. In addition, some error and failure codes are visualized according to the following table.

Code	Status
---	Initialization phase (non configured card)
F00	Disabled card (waiting to be enabled by the unit)
F01	Anomaly due to opening on inlet line (Note-A)
F02	Anomaly due to overrange on inlet line (Note-B)
F03	Anomaly due to failed internal test
CAL	Detector in calibration phase (Note-C)
Fx.x	Device anomaly (Note-D)
E00	Error of EEPROM data (Note-E)
E01	Non valid thresholds' value (Note-F)
E02	Range not supported by the card (Note-G)
xxx	Engineered value / exchanging points under diagnostics

Note-A: In range 4-20mA, it occurs with current lower than 3.7 mA, while in the other ranges, with current lower than 1 mA.

Note-B: It occurs when the current measured by the card is higher than 23.5mA.

Note-C: The card automatically enters in calibration mode when the measured current value is within the two programmed calibration thresholds. Not available in range 4-20mA.

Note-D: The current value in mA preceded by the letter F is visualized on the display for current values higher than 1 mA and lower than the lower calibration threshold. Refer to the manual of the connected device to determine the type of anomaly. This function is not available in range 4-20 mA.

Note-E: It occurs after an error concerning the data registered in EEPROM (checksum error). Thresholds must be re-programmed from the operator's cycle to eliminate this condition.

Note-F: It occurs when the card is initialized by the CPU with a measurement range different from the previously configured one. (For example after substituting a card when hot) To eliminate this failure, re-program the thresholds from the operator's cycle.

Note-G: It occurs if the programmed range is not allowed. In this case the card is put in safety mode.

CONFIGURATION

It is possible to set the following parameters through ProFB configuration program for each single channel:

Parameter	Mode
Analogue value on modbus cards	YES/NO
operating mode	UP / DOWN
Alarm status	Held/Not held
Measurement range	See table
Alarm signalling methods	Normal /Silent / Buzzer only

Programmable measurement ranges

Measurement range	Measured range	Range Lev.1-2	Default value Lev.1	Default value Lev.2
0~5 ppm	-0.1~+6.1 ppm	0.0~5.0	2.0	3.0
0~10 ppm	-0.2~+12.2 ppm	0.0~10.0	2.0	4.0
0~15 ppm	-0.3~+18.3 ppm	0.0~15.0	3.0	7.0
0~20 ppm	-0.4~+24.4 ppm	0.0~20.0	4.0	8.0
0~25 ppm	-0.5~+30.5 ppm	0.0~25.0	5.0	9.0
0~50 ppm	-0.9~+60.9 ppm	0.0~50.0	10.0	25.0
0~100 ppm	-2~+122 ppm	0~100	20	40
0~200 ppm	-4~+245 ppm	0~200	40	80
0~500 ppm	-9~+609 ppm	0~500	100	250
0~999 ppm	-18~+999 ppm	0~999	150	300
0~100 %LEL	-2~+122 %LEL	0~100	15	30
0~25 O2	-0.5~+30.5 O2	0.0~25.0	20.0	22.0
15~25 O2	-14.8~+27.1 O2	15.0~25.0	21.0	23.0
4~20 mA	+3.7~+23.5 mA	4.0~20.0	8.0	12.0
0~100 °C	-2~+122 °C	0~100	20	40
0~150 °C	-3~+183 °C	0~150	20	40
0~220 °C	-4~+168 °C	0~220	150	178
0~300 °C	-5~+366 °C	0~300	150	178

Threshold configuration

The thresholds of the two alarm levels and calibration current are set from the configuration menu of area 1. For each card, the following can be set:

- The pre-alarm threshold based on the measurement range defined in configuration.
- The alarm threshold based on the measurement range defined in configuration.
- The lower calibration threshold
- The upper calibration threshold



NB: When a card is substituted, remember to manually re-program the thresholds with the same values of the substituted card.

Zero point calibration

The zero point calibration can be performed manually or automatically.

To perform the manual calibration of the zero point, proceed as follows:

- Disable the channel relative to the card that must be calibrated from the operator's cycle.
- Enter in the diagnostic cycle of the card that must be calibrated.
- Press key "0" to cancel possible previous calibrations
- Adjust the zero point of the sensor connected to the card until obtaining value "0C3" on the card's display.
- Exit the diagnostic cycle and enable the channel.

To perform the automatic calibration of the zero point, proceed as follows:

- Disable the channel relative to the card that must be calibrated from the operator's cycle.
- Enter in the diagnostic cycle of the card that must be calibrated.
- Press key "1" to perform the automatic calibration of the zero point.
- The new zero value is registered in the card's memory.
- Exit the diagnostic cycle and enable the channel.

Full scale calibration

To perform the full scale calibration, proceed as follows:

- Disable the channel relative to the card that must be calibrated from the operator's cycle.
- Enter in the diagnostic cycle of the card that must be calibrated.
- Apply a current generator adjusted at 24mA at the card's inlet.
- Adjust the SPAN trimmer at the front of the card to obtain a value between 3FE and 3 FF on the display.
- Disconnect the current generator and reset the connection with the field.
- Exit the diagnostic cycle and enable the channel.

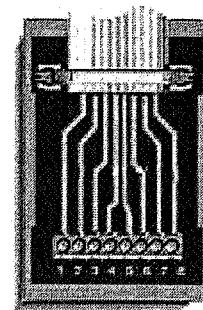
CONNECTIONS

This card can be terminated with the 8-terminal module FB-TB003.1 or with FB-CCT2/FB-CTT2R cables.

Connections with termination card

By using the bus of FB-RACK1.1 model, the connection between the card and the field takes place through a 20-way flat cable and termination module FB-TB003.1 positioned on DIN bar inside the panel. It is not possible to redound modules with this type of termination.

Connections of FB-TB003.1 end		
Terminal		Function
Ø	1	+ Analogue Input 1
Ø	2	- Analogue Input 1
Ø	3	N.C.
Ø	4	N.C.
Ø	5	+ Analogue Output 1
Ø	6	- Analogue Output 1
Ø	7	N.C.
Ø	8	N.C.

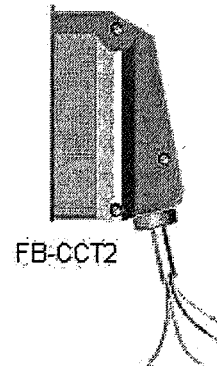


FB-TB003

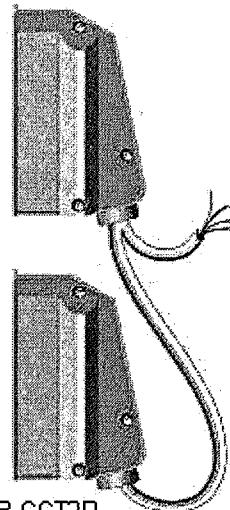
Connections with termination cable

By using the bus of FB-RACK1.2 model, the connection between the card and the field takes place through the 4-conductor multipolar cable FB-CTT2. Using cable FB-CTT2R, it is possible to connect two modules in parallel mode.

Connections with FB-CCT2/FB-CCT2R cables	
Cable colour	Function
White	+ Analogue Input 1
Brown	- Analogue Input 1
Green	+ Analogue Output 1
Yellow	- Analogue Output 1



FB-CCT2



FB-CCT2R

TYPICAL CONNECTION

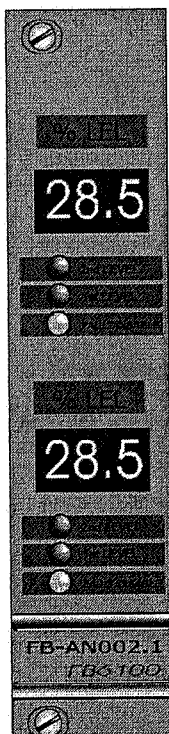
INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-AN001.1-1	Module with 1 4-20mA analogue inlet	Non redounding
FB-AN001.1-2	Module with 1 4-20mA analogue inlet	Redounding
FB-TB003.1	Termination with 8 terminals for FB-AN001.1-1 modules	
FB-CFT20/2	Flat cable for termination module FB-TB003.1	Length 2 metres
FB-CCT2	Termination cable for modules FB-AN001.1-1	Length 3 metres
FB-CCT2R	Termination cable for modules FB-AN001.1-2	Length 3 metres

Signature

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5.3 FB-AN002.1



DESCRIPTION

Card with two safety related 4-20mA analogue inlets with two thresholds that can be set on the card through the operator's cycle. The following types of transducers can be connected to this card: Explosivity Sensors, Toxicity Sensors, Oxygen Sensors, Temperature Sensors, General 4-20mA sensors. The channel is tested during operation every 30 seconds. The card is equipped with a 4-20mA outlet that supplies the current value measured at the inlet.

CHARACTERISTICS

- Redundancy: model
- alarm thresholds: 2 that can be programmed
- Test of channels: performed every 30 seconds
- Operating modes: configurable through software.
- Measurement range: 0-24mA
- Short circuit status on the line: with current >23.5mA
- Supply voltage: 22-29Vdc
- Absorption in idle status: 45mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Three lights and a three-digit display are located on the front of the card for each of the two channels.

Lights' signals based on the channel's status	Fault Disabled		
Normal channel	-	-	-
Excluded/disabled channel	⊗	-	-
Failed channel	∅	-	-
Channel subject to calibration	∅	-	-
Exceeding of first threshold (pre-alarm)	-	∅	-
Exceeding of second threshold (alarm)	-	⊗	⊗

∅ = flashing ⊗ = steady on; - = light off;

Three-digit display

The measured value is generally visualized on each of the two displays in the format set in the programming cycle. In addition, some error and failure codes are visualized according to the following table.

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Code	Status
---	Initialization phase (non figured card)
F00	Disabled card (waiting to be enabled by the unit)
F01	Anomaly due to opening on inlet line (Note-A)
F02	Anomaly due to overrange on inlet line (Note-B)
F03	Anomaly due to failed internal test
CAL	Detector in calibration phase (Note-C)
Fx.x	Device anomaly (Note-D)
E00	Error of EEPROM data (Note-E)
E01	Non valid thresholds' value (Note-F)
E02	Range not supported by the card (Note-G)
xxx	Engineered value / exchanging points under diagnosis

Note-A: In range 4-20mA, it occurs with current lower than 3.7 mA, while in the other ranges, with current lower than 1 mA.

Note-B: It occurs when the current measured by the card is higher than 23.5mA.

Note-C: The card automatically enters in calibration mode when the measured current value is within the two programmed calibration thresholds. Not available in range 4-20mA.

Note-D: The current value in mA preceded by the letter F is visualized on the display for current values higher than 1 mA and lower than the lower calibration threshold. Refer to the manual of the connected device to determine the type of anomaly. This function is not available in range 4-20 mA.

Note-E: It occurs after an error concerning the data registered in EEPROM (checksum error). Thresholds must be re-programmed from the operator's cycle to eliminate this condition.

Note-F: It occurs when the card is initialized by the CPU with a measurement range different from the previously configured one. (For example after substituting a card when hot) To eliminate this failure, re-program the thresholds from the operator's cycle.

Note-G: It occurs if the programmed range is not allowed. In this case the card is put in safety mode.

CONFIGURATION

It is possible to set the following parameters through ProFB configuration program for each single channel:

Parameter	Mode
Analogue value on modbus cards	YES/NO
Operating mode	UP / DOWN
Alarm status	Held/Not held
Measurement range	See table
Alarm signalling methods	Normal / Silent / Buzzer only

Programmable measurement ranges

Measured range	Measured range	Range Lev.1-2	Default value Lev.1	Default value Lev.2
0~5 ppm	-0.1~+6.1 ppm	0.0~5.0	2.0	3.0
0~10 ppm	-0.2~+12.2 ppm	0.0~10.0	2.0	4.0
0~15 ppm	-0.3~+18.3 ppm	0.0~15.0	3.0	7.0
0~20 ppm	-0.4~+24.4 ppm	0.0~20.0	4.0	8.0
0~25 ppm	-0.5~+30.5 ppm	0.0~25.0	5.0	9.0
0~50 ppm	-0.9~+60.9 ppm	0.0~50.0	10.0	25.0
0~100 ppm	-2~+122 ppm	0~100	20	40
0~200 ppm	-4~+245 ppm	0~200	40	80
0~500 ppm	-9~+609 ppm	0~500	100	250
0~999 ppm	-18~+999 ppm	0~999	150	300
0~100 %LEL	-2~+122 %LEL	0~100	15	30
0~25 O2	-0.5~+30.5 O2	0.0~25.0	20.0	22.0
15~25 O2	-14.8~+27.1 O2	15.0~25.0	21.0	23.0
4~20 mA	+3.7~+23.5 mA	4.0~20.0	8.0	12.0
0~100 °C	-2~+122 °C	0~100	20	40
0~150 °C	-3~+183 °C	0~150	20	40
0~220 °C	-4~+168 °C	0~220	150	178
0~300 °C	-5~+366 °C	0~300	150	178

Threshold configuration

The thresholds of the two alarm levels and calibration current are set from the configuration menu of area 1. For each of the two channels, the following can be set:

- The pre-alarm threshold based on the measurement range defined in configuration.
- The alarm threshold based on the measurement range defined in configuration.
- The lower calibration threshold
- The upper calibration threshold



NB: When a card is substituted, remember to manually re-program the thresholds with the same values of the substituted card.

Zero point calibration

The zero point calibration can be performed manually or automatically.

To perform the manual calibration of the zero point, proceed as follows:

- Disable the channel relative to the card that must be calibrated from the operator's cycle.
- Enter in the diagnostic cycle of the card that must be calibrated.
- Press key "0" to cancel possible previous calibrations
- Adjust the zero point of the sensor connected to the card until obtaining value "0C3" on the card's display.
- Exit the diagnostic cycle and enable the channel.

To perform the automatic calibration of the zero point, proceed as follows:

- Disable the channel relative to the card that must be calibrated from the operator's cycle.
- Enter in the diagnostic cycle of the card that must be calibrated.
- Press key "1" to perform the automatic calibration of the zero point.
- The new zero value is registered in the card's memory.
- Exit the diagnostic cycle and enable the channel.

Full scale calibration

To perform the full scale calibration, proceed as follows:

- Disable the channel relative to the card that must be calibrated from the operator's cycle.
- Enter in the diagnostic cycle of the card that must be calibrated.
- Apply a gas concentration known to the sensor connected to the card.
- Press Up/Down arrows to obtain the value corresponding to the concentration applied to the detector on the display.
- Exit the diagnostic cycle and enable the channel.

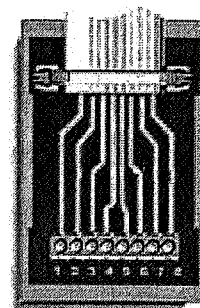
CONNECTIONS

This card can be terminated with the 8-terminal module FB-TB003.1 or with FB-CCT3/FB-CTT5R cables.

Connections with termination card

By using the bus of FB-RACK1.1 model, the connection between the card and the field takes place through a 20-way flat cable and termination module FB-TB003.1 positioned on DIN bar inside the panel. It is not possible to redound modules with this type of termination.

Connections of FB-TB003.1 end		
Terminal	Function	Flat cable
Ø 1	+ Analogue Input 1	
Ø 2	- Analogue Input 1	
Ø 3	+ Analogue Input 2	
Ø 4	- Analogue Input 2	
Ø 5	+ Analogue Output 1	
Ø 6	- Analogue Output 1	
Ø 7	+ Analogue Output 2	
Ø 8	- Analogue Output 2	



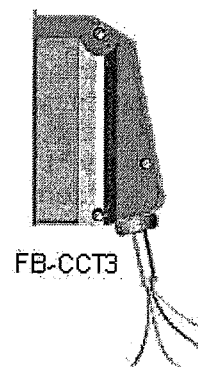
FB-TB003

Connections with termination cable

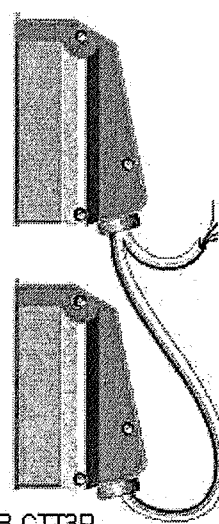
By using the bus of FB-RACK1.2 model, the connection between the card and the field takes place through the 8-conductor multipolar cable FB-CTT3. Using cable FB-CTT5R, it is possible to connect two modules in parallel mode.

TYPICAL CONNECTION

Connections with FB-CCT3/FB-CCT3R1 cables	
Cable colour	Function
White	+ Analogue Input 1
Brown	- Analogue Input 1
Green	+ Analogue Input 2
Yellow	- Analogue Input 2
Grey	+ Analogue Output 1
Pink	- Analogue Output 1
Blue	+ Analogue Output 2
Red	- Analogue Output 2



FB-CCT3



FB-CTT3R

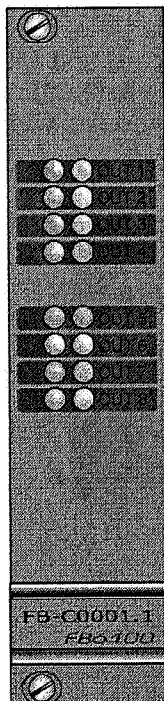
INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-AN002.1	Module with 2 4-20mA analogue inlets	Non redounding
FB-AN002.1	Module with 2 4-20mA analogue inlets	Redounding
FB-TB003.1	Termination with 8 terminals for FB-AN002.1-1 modules	
FB-CFT20/2	Flat cable for termination module FB-TB003.1	Length 2 metres
FB-CCT3	Termination cable for modules FB-AN002.1-1	Length 3 metres
FB-CCT5R	Termination cable for modules FB-AN002.1-2	Length 3 metres

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FB-C0001.1



DESCRIPTION

Card with eight controlled outlet channels of 500mA for the command of solenoids with safety related functions. The card performs the test on the single channels cyclically, inverting the signal on the outlet for about 200 micro-seconds. In case of discrepancy between the set signal and the read signal, the unit promptly warns about the failure condition. The following situations are checked for each single outlet: line opening, short circuit towards positive pole, short circuit towards negative pole, failure of piloting DMOS device, over-temperature of piloting DMOS device, power voltage outside the limits allowed. All channels are tested during operation every 2 seconds. It is possible to connect more channels in parallel mode to increase the outgoing current.

CHARACTERISTICS

- Redundancy: FB-C0001.1-2 model
- Test of channels: performed every 2 seconds
- Operating modes: configurable through software.
- Maximum current of outlets: 500mA
- Automatic protection of outlets: YES
- Supply voltage: 22-29Vdc
- Absorption in idle status: 35mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Two status lights for each of the eight channels are located on the front panel.

Signals of status lights	Led OUT1/OUT8	
	Yellow light	
Normal channel	-	-
Excluded/disabled channel	⊗	-
Failed channel	∅	-
Active channel	-	⊗
∅ =flashing ⊗ = steady on; - = light off;		

CONFIGURATION

It is possible to set the following parameters through ProFB configuration program for each single outlet channel:

Parameter	Mode
Activation mode	Fixed-NE, Fixed-ND, Periodical, Impulsive-1, Impulsive-2, ISA-1A, Delayed activation, delayed activation, delayed disabling
Period	from 1 to 255 seconds (only in impulsive and periodical modes)
Type of outlet	Normal / Sounder

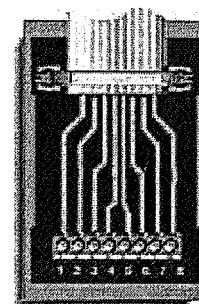
CONNECTIONS

This card can be terminated with the 8-terminal module FB-TB003.1 or with FB-CCT3/FB-CTT3R cables.

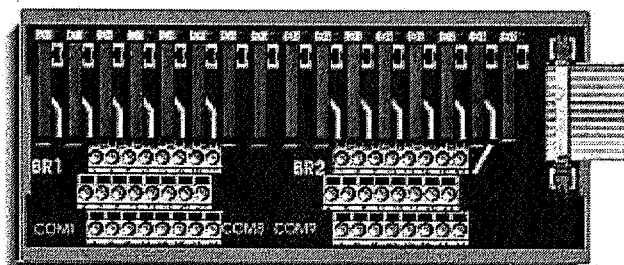
Connections with termination card

By using the bus of FB-RACK1.1 model, the connection between the card and the field takes place through a 20-way flat cable and termination module FB-TB003.1 positioned on DIN bar inside the panel. It is not possible to redound modules with this type of termination.

Connections of FB-TB003.1 end		
Terminal		Function
Ø	1	+ Output 1
Ø	2	+ Output 2
Ø	3	+ Output 3
Ø	4	+ Output 4
Ø	5	+ Output 5
Ø	6	+ Output 6
Ø	7	+ Output 7
Ø	8	+ Output 8



FB-TB003



Connections with the 8-relay module

Alternatively, the card can be terminated with the 8-relay module FB-TB006.1 positioned on DIN bar inside the panel. It is not possible to redound modules with this type of termination. In this configuration, the outlets are of relay type with a SPDT 4A contact.

FB-TB006.1		Relays order																	
NO= Normally Closed NO= Normally Open COM= Common		K1		K2		K3		K4		K5		K6		K7		K8			
N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
		M			M			M			M			M			M		
Ter	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
min																			
al																			
boa																			
rds																			

Connections with termination cable

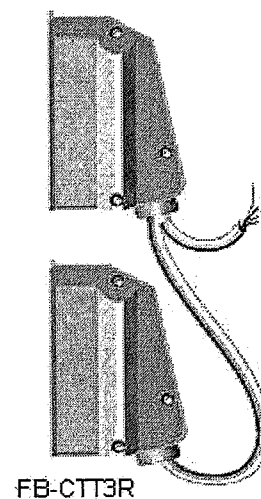
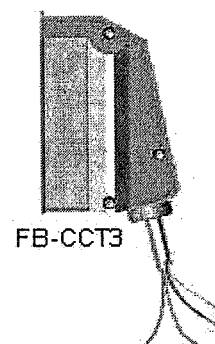
By using the bus of FB-RACK1.2 model, the connection between the card and the field takes place through the multipolar cable FB-CTT3. Using cable FB-CTT3R, it is possible to connect two modules in parallel mode.

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Connections with FB-CCT3/FB-CCT3R cables	
Cable colour	Function
White	+ Output 1
Brown	+ Output 2
Green	+ Output 3
Yellow	+ Output 4
Grey	+ Output 5
Pink	+ Output 6
Blue	+ Output 7
Red	+ Output 8

TYPICAL CONNECTIONS



The card is able to command resistive or inductive loads with a maximum current of 500mA. In case the card is used to pilot filament lamps, the maximum power of the load must not exceed 4W.

INFORMATION TO PLACE AN ORDER

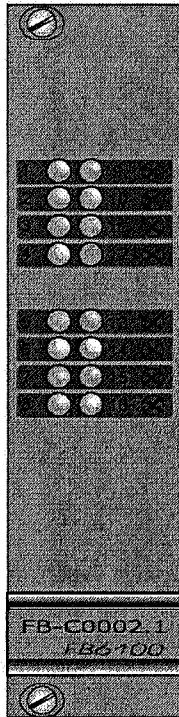
Part Number	DESCRIPTION	notes
FB-C0001.1	Module with 8 500mA controlled outlets for solenoids	Non redounding
FB-C0001.2	Module with 8 500mA controlled outlets for solenoids	Redounding
FB-TB003.1	Termination with 8 terminals for FB-C0001.1-1 modules	
FB-CFT20/2	Flat cable for termination module FB-T80003-1	Length 2 metres
FB-CCT3	Termination cable for modules FB-C0001.1-1	Length 3 metres
FB-CCT3R	Termination cable for modules FB-C0001.1-2	Length 3 metres

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5.5 FB-C0002.1

DESCRIPTION

Card with sixteen open collector, non controlled outlet channels of 250mA. This card is mainly used to pilot the 16-relay card FB-TB007.1.



CHARACTERISTICS

- Redundancy: NO
- Test of channels: NO
- Operating modes: configurable through software.
- Maximum current of outlets: 250mA
- Protection protection of outlets: NO
- Supply voltage: 22-29Vdc
- Absorption in idle status: 12mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

A status light is located on the front panel for each of the sixteen channels.

Signals of status lights	Led OUT1/OUT16
Disabled channel	-
Active channel	⊗
⊗ = steady on; - = light off;	

CONFIGURATION

It is possible to set the following parameters through ProFB configuration program for each single outlet channel:

Parameter	Mode
Activation mode	Fixed-NE, Fixed-ND, Periodical, Impulsive-1, Impulsive-2, ISA-1A, Delayed activation, delayed activation, delayed disabling
Period	from 1 to 255 seconds (only in impulsive and periodical modes)

CONNECTIONS

This card can be terminated with the 16-terminal module FB-TB001.1, with the 16-relay module or with the FB-CCT1 cable.

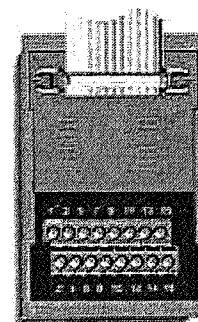
Connections with termination card

By using the bus of FB-RACK1.1 model, the connection between the card and the field takes place through a 20-way flat cable and termination module FB-TB001.1 positioned on DIN bar inside the panel. It is not possible to redound modules with this type of termination.

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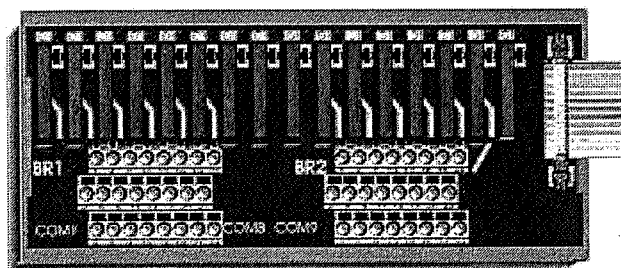
Connections of FB-TB001.1 end		
Terminal	Function	Flat cable
Ø 1	- Output 1	
Ø 2	- Output 2=	
Ø 3	- Output 3	
Ø 4	- Output 4	
Ø 5	- Output 5	
Ø 6	- Output 6	
Ø 7	- Output 7	
Ø 8	- Output 8	
Ø 9	- Output 9	
Ø 10	- Output 10	
Ø 11	- Output 11	
Ø 12	- Output 12	
Ø 13	- Output 13	
Ø 14	- Output 14	
Ø 15	- Output 15	
Ø 16	- Output 16	



FB-TB001

Connections with the 16-relay module

Using a bus of FB-RACK1.1 model, the connection between the card and the 16-relay module takes place through a 20-way flat cable. It is not possible to redound modules with this type of termination. In this configuration, the outlets are of relay type with a SPDT 4A contact.



FB-T 8007-1			BLOCK	Relays order															
20	11	20		K1				K2				K3				K4			
N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
		M			M			M			M			M			M		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

			BLOCK	Relays order															
				K9				K10				K11				K12			
N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
		M			M			M			M			M			M		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

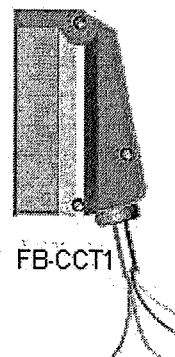
Connections with termination cable FB-CTT3/FB-CTT3R

Using a bus of FB-RACK1.2 model, the connection between the card and the field takes place through a 16-conductor multipolar FB-CTT1 cable.

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Connections with FB-CCT1 cables	
Cable colour	Function
White	- Output 1
Brown	- Output 2
Green	- Output 3
Yellow	- Output 4
Grey	- Output 5
Pink	- Output 6
Blue	- Output 7
Red	- Output 8
Black	- Output 9
Purple	- Output 10
Grey / Pink	- Output 11
Red/Blue	- Output 12
white/green	- Output 13
Brown / Green	- Output 14
white / yellow	- Output 15
Yellow/Brown	- Output 16

INFORMATION TO PLACE AN ORDER

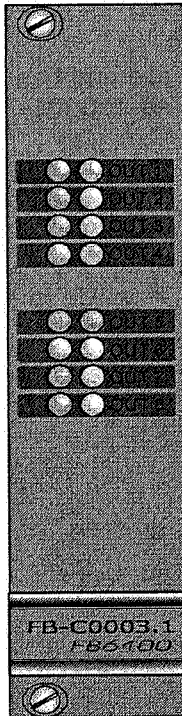


Part Number	DESCRIPTION	notes
FB-C0002.1	Module with 16 250mA non controlled outlets	Non redounding
FB-TB001.1	Termination with 8 terminals for FB-C0002.1-1 module	
FB-TB007.1	16-relay module for DIN bar	output of 4A contacts
FB-CFT20/2	Flat cable for termination module FB-TB001.1	Length 2 metres
FB-CCT1	Termination cable for FB-C0002.1-1 module	Length 3 metres

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5.6 FB-C0003.1



DESCRIPTION

Card with eight controlled outlet channels of 500mA for the command of sirens. The outlets' command takes place through two virtual commands to pilot the outlets in a steady and intermittent mode. The line is monitored through the inversion of polarities.

CHARACTERISTICS

- Redundancy: NO
- Test of channels: NO
- Operating modes: configurable through software.
- Maximum current of outlets 500mA
- Protection protection of outlets YES
- Supply voltage: 22-29Vdc
- Absorption in idle status: 25mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Two status lights for each of the eight channels are located on the front panel.

Signals of status lights	Led OUT1/OUT8	
	Yellow light	
Normal channel	-	-
Excluded/disabled channel	⊗	-
Failed channel	∅	-
Active channel	-	⊗

∅ =flashing ⊗ = steady on; - = light off;

CONFIGURATION

It is possible to set the following parameters through ProFB configuration program for each single outlet channel:

Parameter	Mode
Activation mode	Fixed-NE, Fixed-ND, Periodical, Impulsive-1, Impulsive-2, ISA-1A, Delayed activation, delayed activation, delayed disabling
Period	from 1 to 255 seconds (only in impulsive and periodical modes)
Type of outlet	Normal / Sounder

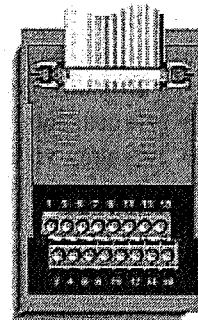
CONNECTIONS

This card can be terminated with the 16-terminal module FB-TB001.1 or with FB-CCT1 cable.

Connections with termination card

By using the bus of FB-RACK1.1 model, the connection between the card and the field takes place through a 20-way flat cable and termination module FB-T80001-1 positioned on DIN bar inside the panel.

Connections of FB-TB001.1 end		
Terminal	Function	Flat cable
Ø 1	+ Output 1	
Ø 2	- Output 1	
Ø 3	+ Output 2	
Ø 4	- Output 2	
Ø 5	+ Output 3	
Ø 6	- Output 3	
Ø 7	+ Output 4	
Ø 8	- Output 4	
Ø 9	+ Output 5	
Ø 10	- Output 5	
Ø 11	+ Output 6	
Ø 12	- Output 6	
Ø 13	+ Output 7	
Ø 14	- Output 7	
Ø 15	+ Output 8	
Ø 16	- Output 8	



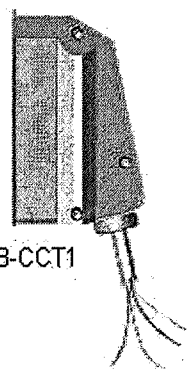
FB-TB001

TYPICAL CONNECTION

Connections with termination cable

Using a bus of FB-RACK1.2 model, the connection between the card and the field takes place through a 16-conductor multipolar FB-CTT1 cable.

Connections with FB-CTT1 cables	
Cable colour	Function
White	+ Output 1
Brown	- Output 1
Green	+ Output 2
Yellow	- Output 2
Grey	+ Output 3
Pink	- Output 3
Blue	+ Output 4
Red	- Output 4
Black	+ Output 5
Purple	- Output 5
Grey/Pink	+ Output 6
Red/Blue	- Output 6
White/Green	+ Output 7
Brown/Green	- Output 7
White/Yellow	+ Output 8
Yellow/Brown	- Output 8



FB-CTT1

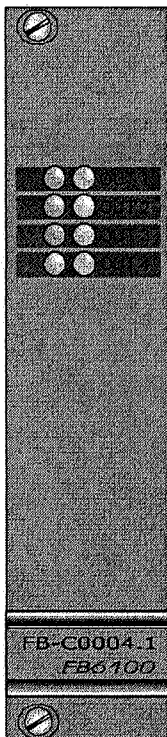
TYPICAL CONNECTION

INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-C0003.1	Module with 8 500mA controlled outlets for sirens	Non redounding
FB-TB001.1	Termination with 16 terminals for B-C0003.1-1 modules	
FB-CFT20/2	Flat cable for termination module FB-TB001.1	Length 2 metres
FB-CCT1	Termination cable for FB-C0003.1-1 modules	Length 3 metres



5.7 FB-C0004.1



DESCRIPTION

Card with 4 controlled outlet channels of 20A for the command of solenoids with safety related functions. The card performs the test on the single channels cyclically, inverting the signal on the outlet for about 200 micro-seconds. In case of discrepancy between the set signal and the read signal, the unit promptly warns about the failure condition. The following situations are checked for each single outlet: line opening, short circuit towards positive pole, short circuit towards negative pole, failure of piloting DMOS device, over-temperature of piloting DMOS device, power voltage outside the limits allowed. All channels are tested during operation every 2 seconds. It is possible to connect more channels in parallel mode to increase the outgoing current.

CHARACTERISTICS

- Redundancy: FB-C0004.1-2 model
- Test of channels: performed every 2 seconds
- Operating modes: configurable through software.
- Maximum current of outlets: 2A
- Protection: protection of outlets YES
- Supply voltage: 22-29Vdc
- Absorption in idle status: 35mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Two status lights for each of the four channels are located on the front panel.

Signals of status lights	Led OUT1/OUT8	
	Yellow light	
Normal channel	-	-
Excluded/disabled channel	⊗	-
Failed channel	∅	-
Active channel	-	⊗
∅ = flashing ⊗ = steady on; - = light off;		

CONFIGURATION

It is possible to set the following parameters through ProFB configuration program for each single outlet channel:

Parameter	Mode
Activation mode	Fixed-NE, Fixed-ND, Periodical, Impulsive-1, Impulsive-2, ISA-1A, Delayed activation, delayed activation, delayed disabling
Period	from 1 to 255 seconds (only in impulsive and periodical modes)
Type of outlet	Normal / Sounder

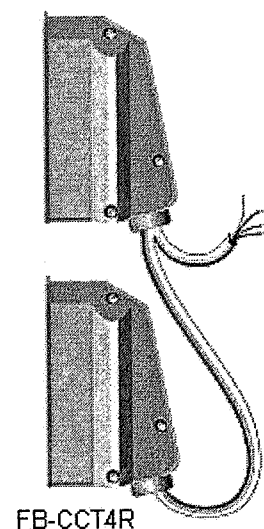
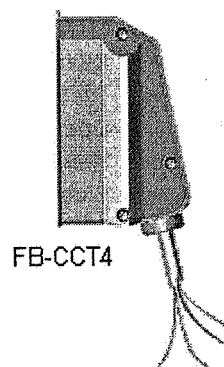
CONNECTIONS

This card can be exclusively terminated by using termination cables FB-CCT4/FB-CTT4R.

Connections with termination cable

By using the bus of FB-RACK1.2 model, the connection between the card and the field takes place through the 4-conductor multipolar cable FB-CTT4. Using cable FB-CTT4R, it is possible to connect two modules in parallel mode.

Connections with FB-CCT4/FB-CCT4R cables	
Cable colour	Function
White	+ Output 1
Brown	+ Output 2
Green	+ Output 3
Yellow	+ Output 4



TYPICAL CONNECTION



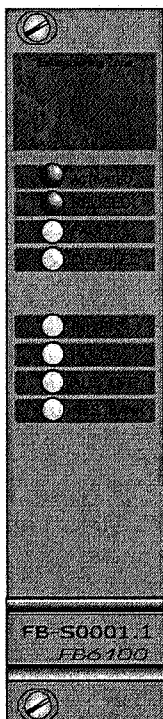
The card is able to command resistive or inductive loads with a maximum current of 2A. In case the card is used to pilot filament lamps, the maximum power of the load must not exceed 10W.

INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-C0004.1	Module with 4 2A controlled outlets	Non redounding
FB-C0004.2	Module with 4 2A controlled outlets	Redounding
FB-CCT4	Termination cable for FB-C0004.1-1 modules	Length 3 metres
FB-CCT4R	Termination cable for FB-C0004.1-2 modules	Length 3 metres

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5.8 FB-S0001.1



DESCRIPTION

This card is used to manage logics and signals relative to an extinguishing area in order to meet the requirements of EN12094-1 standard. It manages ten outlet variables and four inlet variables. In addition to warnings, it also performs some logics which are typical of extinguishing systems, as discharge delay and resetting inhibition time. It is also equipped with eight non programmable open collector outlets which indicate the main statuses of the extinguishing area.

CHARACTERISTICS

- Redundancy: NO
- Test of channels: NO
- Operating modes: configurable through software.
- Maximum current of outlets 250mA
- Protection protection of outlets NO
- Supply voltage: 22-29Vdc
- Absorption in idle status: 12mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Eight lights are located on the front panel that performs the following functions:

Light	Signs
	It turns on steady in the active status. It turns off after the reset command
	It turns on steady in the release status. It turns off after the reset command
Fault	It flashes after an anomaly is detected in the extinguishing area
Disabled	It turns on steady after a disabling in the extinguishing area
Inhibit	It turns on steady in the inhibit status
Hold	It turns on steady in the Hold status
Aut. OFF	It turns on steady in the excluded Automatic status
Res. Bank	It turns on steady by selecting the back-up battery

CONFIGURATION

The card manages the following variables:

variable	Type	DESCRIPTION
V1	In	Active status
V2	In	Main primary discharge
V3	In	Back-up primary discharge
V4	In	Main secondary discharge
V5	In	Back-up secondary discharge
V6	In	Intermittent sound signals
V7	In	Steady sound signals
V1	OUT	Manual enabling
V2	OUT	Automatic enabling
V3	OUT	Automatic mode excluded
V4	OUT	Emergency extension (Hold)
V5	OUT	Extinguishing inhibition
V6	OUT	Back-up battery
V7	OUT	Secondary discharge
V8	OUT	System intervened
V9	OUT	General anomaly
V10	OUT	General disabling

It is possible to set the following parameters through ProFB configuration program for each virtual parameter:

Parameter	Type	Mode
Channel's operating mode	Inlet	NA
Alarm/Active status	Inlet	Not held
Alarm signalling methods	Inlet	Normal / Silent / Buzzer only
Activation mode	Outlet	Fixed-ND
Type of outlet	Outlet	Normal

It is possible to set the following parameters through the operator's cycle for each card:

Parameter	Mode
Extinguishing delay time	0-60 seconds
Resetting inhibition time	1-30 minutes
Hold function mode	Mode-A / Mode-B

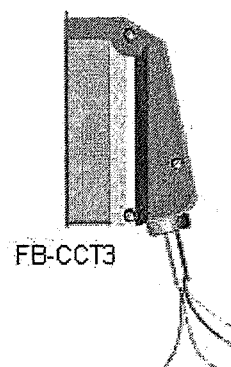
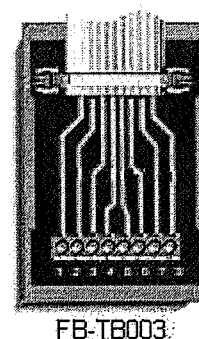


NB: When a card of this type is substituted, remember to manually re-program these values.

CONNECTIONS

This card can be terminated with the 8-terminal module FB-TB003.1 or with FB-CCT3 cable.

Connections of FB-TB003.1 end		
Terminal		Flat cable
Ø 1	- Activated outlet	rack connection
Ø 2		
Ø 3	- Fault outlet (*)	
Ø 4	- Disabled outlet	
Ø 5	- Inhibit outlet	
Ø 6	- Hold outlet	
Ø 7	- Automatic-Off outlet	
Ø 8	- Reserve Bank outlet	

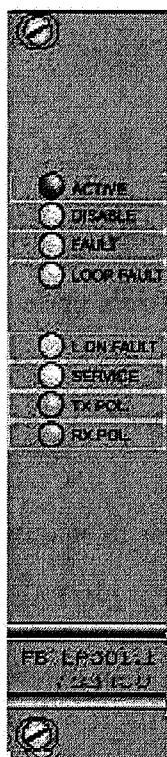


(*) usually engineered outlet

INFORMATION TO PLACE AN ORDER

Part Number	Description	Notes
FB-S0001.1	Control module for extinguishing systems	Non redounding
FB-TB003.1	Termination with 8 terminals for FB-S0001.1-1 modules	
FB-CFT20/2	Flat cable for FB-TB003.1 termination modules	Length 2 metres
FB-CCT3	Termination cable for FB-S0001.1-1 modules	Length 3 metres

5.9 FB-LP001.1



DESCRIPTION

Control card for devices addressed with ESP protocol. It manages up to 127 devices of max. 3 points each.

CHARACTERISTICS

- Redundancy: NO
- Operating modes: configurable through software.
- No. of devices for each loop 127
- Maximum loop's current 250mA
- Supply voltage: 22-29Vdc
- Absorption in idle status: 65mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Eight lights are located on the front panel that performs the following functions:

Light	Signs
	It turns on steady with an inlet in alarm/active status
Disabled	It turns on steady with a disabled inlet or outlet
Fault	It flashes in the presence of a Fault status.
Loop Fault	It flashes after a short circuit or an opening on the loop
Log on Fault	It flashes in case of discrepancy between detected and programmed devices
Service	It flashes in presence of smoke detectors with dirty optics
TX Pol.	It turns on each time the card transmits data towards the devices on the loop
RX Pol.	It turns on each time the data coming from the devices on the loop are received

This type of card is able to manage the following types of modules:

type of device	Controlle d Inlets	Non controlled inlets	Analogue inlets	Controlled outlets	Non Controlled outlets	notes
ALG-E	-	-	1	-	-	Fed by loop
ATG-E	-	-	1	-	-	Fed by loop
AIE-E	-	-	1	-	-	Fed by loop
ACA-E	-	-	2	-	-	Fed by loop
ACB-E	-	-	2	-	-	Fed by loop
	-	-	1	-	-	Need for external supply
CHQ-CP	-	1	-	-	-	Fed by loop
FB-Mod-HS	-	1	-	-	-	Fed by loop
CHQ-CP	1	-	-	-	-	Fed by loop
CHQ-Z	2	-	-	-	1	Need for external supply
FB-Mod-Z	2	-	-	-	1	Need for external supply
CHQ-S	-	2	-	-	-	Fed by loop
CHQ-R	1	-	-	3	2	Fed by loop
FB-Mod-R	1	-	-	3	2	Fed by loop
CHQ-B	1	-	-	2	-	Need for external supply
FB-Mod-B	1	-	-	2	-	Need for external supply
CHQ-BS	-	-	-	-	1	Fed by loop

YBO-BS	-	-	-	-	1	Fed by loop
CHQ-WS2	-	-	-	-	1	Fed by loop
YBO-BSB	-	-	-	-	2	Fed by loop
CHQ-ARI	-	-	-	-	1	Fed by loop
CHQ-AB	-	-	-	-	1	Fed by loop

CONFIGURATION

Through configuration program ProFB, it is possible to set the following parameters for each point of the single devices, based on the type of device:

Parameter	Type	Mode
Operating mode	Inlet	NA / NO
Alarm/Active status	Inlet	Held/Not held
Sensitivity	Inlet	High / Average / Low
Measurement range	Inlet	See table
Thresholds	Inlet	Pre-alarm / Alarm (See table)
Alarm signalling methods	Inlet	Normal / Silent / Buzzer only
Activation mode	Outlet	Fixed-NE, Fixed-ND, Periodical, Impulsive-1
Period	Outlet	from 1 to 15 seconds (only in impulsive and periodical modes)
Type of outlet	Outlet	Normal / Sounder
Siren's sound	Outlet	from 1 to 7
Siren's volume	Outlet	50,55,60,70,78,80,85,88,90,93,94,95,98 decibel

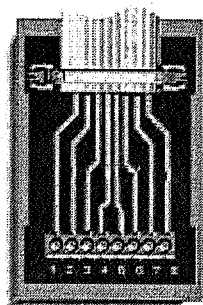
For the analogue module of FB-Mod-AN type, the following measurement ranges can be programmed with the relative thresholds:

Measurement range	Pre-alarm threshold	alarm threshold
0-10 ppm	0.0-10.0	0.0-10.0
0-20 ppm	0.0-20.0	0.0-20.0
0-50 ppm	0-50	0-50
0-100 ppm	0-100	0-100
0-200 ppm	0-200	0-200
0-100 %LEL	0-100	0-100
0-25 %O2	0.0-25.0	0.0-25.0
15-25 %O2	15.0-25.0	15.0-25.0
4-20 mA	4.0-20.0	4.0-20.0
0-100 °C	0-100	0-100

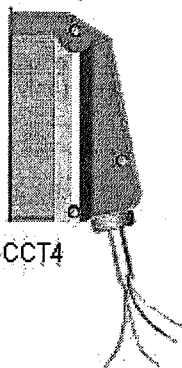
CONNECTIONS

This card can be terminated with the 8-terminal module FB-TB003.1 or with FB-CCT4 cable.

Connections of FB-TB003.1 end			
Terminal		Function	Flat cable
Ø	1	+ Loop Output	rack connection
Ø	2	- Loop Output	
Ø	3	+ Loop Input	
Ø	4	- Loop Input	
Ø	5	N.C.	
Ø	6	N.C.	
Ø	7	N.C.	
Ø	8	N.C.	



FB-TB003



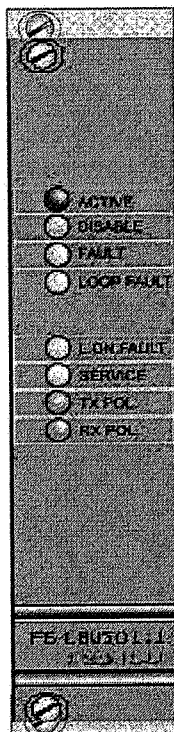
FB-CCT4

TYPICAL CONNECTION

INFORMATION TO PLACE AN ORDER

Part Number	Description	notes
FB-LP001.1	Control module for ESP bus	Non redounding
FB-TB003.1	Termination with 8 terminals for FB-LP001.1 modules	
FB-CFT20/2	Flat cable for termination module FB-TB003.1	Length 2 metres
FB-CCT4	Termination cable for FB-S0001.1-1 modules	Length 3 metres

5.10 LP002.1



DESCRIPTION

Control card for devices addressed with SSP protocol. It manages up to 127 devices.

CHARACTERISTICS

- Redundancy: NO
- Operating modes: configurable through software.
- No. of devices for each loop: 127
- Maximum loop's current: 250mA
- Supply voltage: 22-29Vdc
- Absorption in idle status: 65mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Eight lights are located on the front panel that performs the following functions:

Light	Signs
Active	It turns on steady with an inlet in alarm/active status
Disabled	It turns on steady with a disabled inlet or outlet
Fault	It flashes in the presence of a Fault status.
Loop Fault	It flashes after a short circuit or an opening on the loop
Log on Fault	It flashes in case of discrepancy between detected and programmed devices
Service	This light is not used
TX Pol.	It turns on each time the card transmits data towards the devices on the loop
RX Pol.	It turns on each time the data coming from the devices on the loop are received

This type of card is able to manage the following types of modules:

type of device	Controlle d Inlets	Non controlled inlets	Analogue inlets	Controlled outlets	Non Controlled outlets	notes
FB-Mod-DI	-	8	-	-	-	Need for external supply
FB-Mod-AI020	-	-	1 (4-20mA)	-	-	Need for external supply
FB-Mod-AV010	-	-	1 (0-10V)	-	-	Need for external supply
FB-Mod-DO	-	-	-	-	8	Need for external supply
FB-Mod-DISP	-	-	-	-	-	255 message display (*)

(*) Maximum 64 modules of this type can be counted on one loop.

CONFIGURATION

Through configuration program ProFB, it is possible to set the following parameters for each point of the single devices, based on the type of device:

Parameter	Type	Mode
Operating mode	Inlet	NA / NO
Alarm/Active status	Inlet	Held/Not held
Measurement range	Inlet	See table
Thresholds	Inlet	Pre-alarm / Alarm (See table)
Alarm signalling methods	Inlet	Normal / Silent / Buzzer only
Activation mode	Outlet	Fixed-NE, Fixed-ND, Periodical, Impulsive-1
Period	Outlet	from 1 to 255 seconds (only in impulsive and periodical modes)

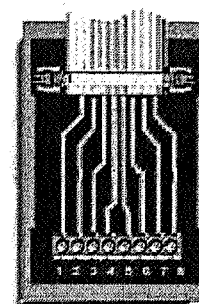
For the analogue module, the following measurement ranges can be programmed with the relative thresholds:

Measurement range	Pre-alarm threshold	alarm threshold
0-255 Bit	0-255	0-255
0-10 ppm	0.0-10.0	0.0-10.0
0-20 ppm	0.0-20.0	0.0-20.0
0-50 ppm	0.0-50.0	0.0-50.0
0-100 ppm	0-100	0-100
0-200 ppm	0-200	0-200
0-500 ppm	0-500	0-500
0-999 ppm	0-999	0-999
0-100 %LEL	0-100	0-100
0-25 %O ₂	0.0-25.0	0.0-25.0
15-25 %O ₂	15.0-25.0	15.0-25.0
4-20 mA	4.0-20.0	4.0-20.0
0-100 °C	0-100	0-100
0-150 °C	0-150	0-150
0-10 V	0.0-10.0	0.0-10.0

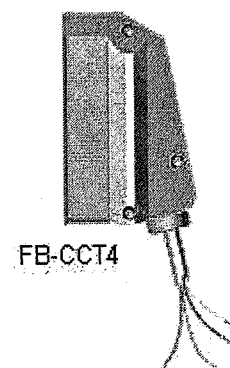
CONNECTIONS

This card can be terminated with the 8-terminal module FB-TB003.1 or with FB-CCT4 cable.

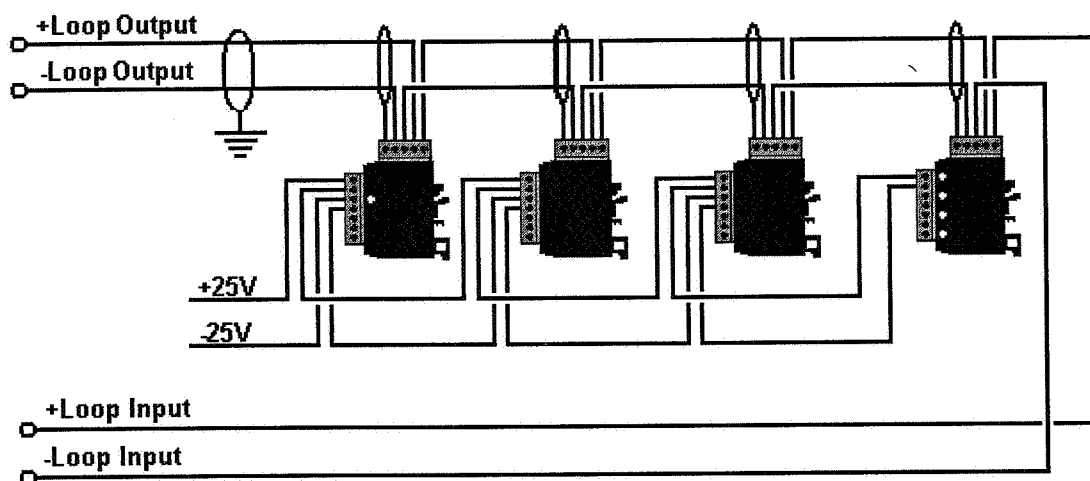
Connections of FB-TB003.1 end		
Terminal	Function	Flat cable
Ø 1	+ Loop Output	Rack connection
Ø 2	- Loop Output	
Ø 3	+ Loop Input	
Ø 4	- Loop Input	
Ø 5	N.C.	
Ø 6	N.C.	
Ø 7	N.C.	
Ø 8	N.C.	



FB-TB003



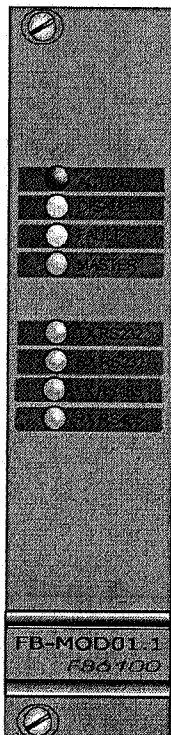
TYPICAL CONNECTION



INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-LP001.1-	Control module for ESP bus	Non redounding
FB-TB003.1	Termination with 8 terminals for FB-LP001.1-1 modules	
FB-CFT20/2	Flat cable for termination module FB-TB003.1	Length 2 metres
FB-CCT4	Termination cable for FB-S0001.1-1 modules	Length 3 metres
FB-Mod-DI	Addressed module with 8 non controlled inlets	
FB-Mod-AI020	Addressed module with 1 4-20Ma analogue inlet	
FB-Mod-AV010	Addressed module with 1 0-10V analogue inlet	
FB-Mod-DO	Addressed module with 8 non controlled outlets	
FB-Mod-DISP	Addressed module, display that shows 255 programmable messages	Max 64 modules per loop
FB-Mod-PRG	Programmer for addressed modules	

5.11 FB-MOD001.1



DESCRIPTION

Communication card with RTU Master/slave Modbus protocol. Its outlet supplies two independent connections, a RS485 Half Duplex and a RS232. It manages the following modbus variables:
512 inlet variables (32 16-bit words)
512 outlet variables (32 16-bit words)
130 16-bit analogue variables.
The analogue variables boast the engineered values relative to 4-20 mA cards, of FB-AN001.1 type.

CHARACTERISTICS

- Redundancy: NO
- Operating modes: configurable through software.
- No. of devices for each loop 127
- Maximum loop's current 250mA
- Supply voltage: 22-29Vdc
- Absorption in idle status: 16mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Eight lights are located on the front panel that performs the following functions:

Light	Signal
	It turns on steady with an inlet in active status
Disabled	It turns on steady with a disabled inlet or outlet variable
Fault	It flashes after a communication failure. (Only in Master mode)
Master	It turns on steady in the Master status.
TX RS232	It turns on at each transmission on RS232 door
RX RS232	It turns on at each receipt on RS232 door
TX RS485	It turns on at each transmission on RS485 door
RX RS485	It turns on at each receipt on RS485 door

CONFIGURATION

Through configuration program ProFB, it is possible to set the following parameters for each point of the single devices, based on the type of device:

Parameter	Type	Mode
Operating mode	inlet	NA / NO
Alarm/Active status	Inlet	Held/Not held
Alarm signalling methods	Inlet	Normal /Silent / Buzzer only
Activation mode	Outlet	Fixed-NE, Fixed-ND, Periodical, Impulsive-1
Period	Outlet	from 1 to 15 seconds (only in impulsive and periodical modes)

The configuration of modbus addresses and communication parameters takes place through two 8-position dip switches located on board of the card.

SW1 Configuration of modbus address

Dip switch SW1 Configures the card's modbus address in 1-255 range. In Slave mode, it defines the card's modbus address, while in master mode, it defines the address of the Slave peripheral, to which the commands are sent. Address 00 is not allowed.

SW1-1	Weight 1 modbus address (on = active)
SW1-2	Weight 2 modbus address (on = active)
SW1-3	Weight 4 modbus address (on = active)
SW1-4	Weight 8 modbus address (on = active)
SW1-5	Weight 16 modbus address (on = active)
SW1-6	Weight 32 modbus address (on = active)
SW1-7	Weight 64 modbus address (on = active)
SW1-8	Weight 128 modbus address (on = active)

SW2 Configuration of modbus parameters

Dips 1-2-3 of switch SW2 configure the Baud rate according to the following table:

SW2-1	SW2-2	SW2-3	Baud Rate
Off	Off	Off	1200
On	Off	Off	2400
Off	On	Off	4800
On	On	Off	9600
Off	Off	On	19200
On	Off	On	38400
Off	On	On	57600
On	On	On	115200

Dips 4-5 of switch SW2 configure the parity and number of stop bits.

SW2-4	SW2-5	Parity
Off	Off	No parity
On	Off	Even
Off	On	Odd
On	On	Not allowed

Dips 6-7-8 of switch SW2 configure the other options

SW2-6	ON	2 stop bits
	OFF	1 stop bits
SW2-7	ON	Card in Master mode
	OFF	Card in Slave mode
SW2-8	ON	It freezes the last acquired status in case of disconnection with the Slave (*)
	OFF	It puts in anomaly status due to communication failure all the entities in case of disconnection with the Slave (*)

(*) Valid only in Master mode

In addition, a Jumper is present on the card to enable the 120 ohm termination resistance on RS485 line.

JP1	ON	Termination on primary enabled RS485 line
	OFF	Termination on primary disabled RS485 line

Implementation of RTU Modbus protocol

The structure of messages relative to the Modbus protocol is the following:

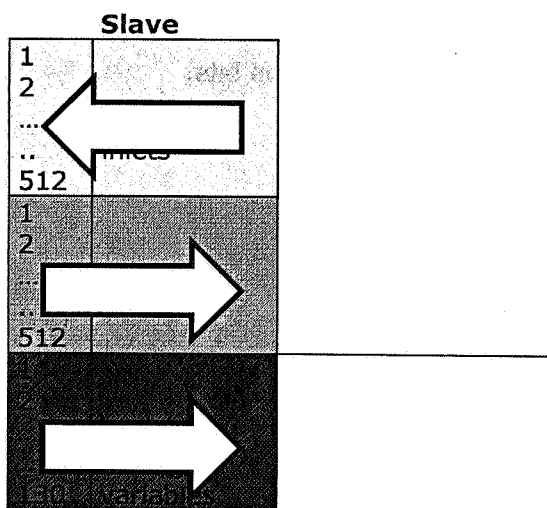
T1	Slave Address	Function Code	Data	CRC	T1
T2					T2
T3	1 byte	1 byte	N° byte(s)	2 byte(s)	T3

- The Slave Address field contains the address of the peripheral to which the command is sent.
- The Function Code contains the code of the function requested by the Master.
- The Data field contains the data sent to the Slave or the Slave's reply to a command.
- The CRC field contains the checksum value relative to the message.
- Sequence T1-T2-T3 represents the time during which data on the communication bus must not be exchanged in order to allow the devices available to identify the end of a message and the beginning of the following one. This time is equal to 3.5 characters and therefore it depends on the set communication speed.

SLAVE operating mode

In this operating mode, the card manages the following functions:

Function	DESCRIPTION	Parameters
0x01	Multiple reading V-IN	Initial address = (1-512), Bit number = (1-512)
0x02	Multiple reading V-OUT	Initial address = (1-512), Bit number = (1-512)
0x03	Analogue Variable Readings	Initial address = (1-130), Bit number = (1-125)
0x05	Single writing V-IN	Address = (1-512)
0x08	Diagnostics	Sub-function 00
0x15	Multiple writing V-IN	Address = (1-512)



The card in Slave mode replies to the Master's requests on RS232 door and on RS485 door with the following parameters:

Baud Rate: Configurable of 1200/115200 Bps
Parity: Even/Odd/None configurable
Stop bit: 1/2 configurable
Maximum reply time: 100 milliseconds
Typical reply time: 50 milliseconds

After a request coming from the master, the slave behaves as follows:

Request	Reply
The slave receives a message with no errors and is able to formulate the reply	The Slave replies to the master, by sending the requested data
The slave receives a wrong message after a communication error (Parity error / Frame error)	The Slave does not send any reply to the Master
The slave receives a wrong message after a communication error (CRC error)	The Slave does not send any reply to the Master
The slave receives a message with no communication errors but it is not able to satisfy the reply	The Slave sends an exception code to the Master, notifying it about the type of error

Modbus exception codes

In Slave mode, the card manages the following exception codes:

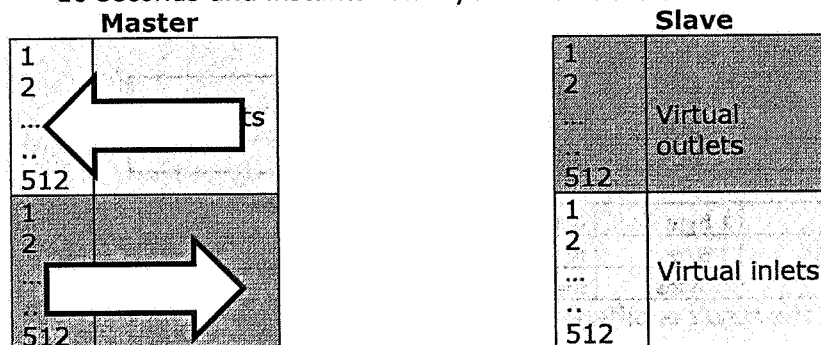
Code	Name	DESCRIPTION
01	Illegal function	Non supported function
02	Illegal address	Non valid address for the type of function
03	Illegal values	Non valid data for the type of function
04	Slave device error	Error on peripheral (e.g. in case of failure of the central unit)
06	Busy Slave device	The requested data is not currently available (e.g. during initialization)

MASTER operating mode

This operating mode is exclusively used to connect two units of FB type to each other in point/point Master/Slave mode. In this operating mode, the card performs the following functions:

Function	DESCRIPTION	Parameters
0x02	Multiple reading V-OUT	Initial address = 1, bit no. = 512
0x15	Multiple writing V-IN	Initial address = 1, bit no. = 512

- Function 0x02 reads 512 bits (virtual outlets) from the slave peripheral and after their variation, it updates its virtual inlets. It is performed every second.
- Function 0x15 reads 512 bits (virtual inlets) from the slave peripheral after the variation of its virtual outlets. It is performed in normal conditions every 10 seconds and instantaneously after the status variation of an outlet.



The card in Master mode performs interrogations using exclusively RS485 door with the following parameters:

Baud Rate:	Configurable of 1200/115200 Bps
Parity:	Even/Odd/None configurable
Stop bit:	1/2 configurable
Scan Rate in reading mode:	1 second
Scan Rate in writing mode:	10 seconds of instantaneous rest on outlet variation
Timeout replies from Slave:	2 seconds

Function 01 – Multiple reading of inlet variables (Bytes)

This function is used to read the status of contiguous bits relative to the inlet variables from 1 to 512. In the request, the start address and the number of contiguous bits that must be read are specified. In the reply, bits are grouped up in 8-bit bytes.

Request

Function Code	1 Byte	0x01
Initial address	2 Bytes	from 0 to 511
Bit number	2 Bytes	from 1 to 512

Reply

Function Code	1 Byte	0x01
Number of Bytes returned	1 Byte	N*
Bit status	n Bytes	n=N or N+1

N= bit number /8 If the rest of the division is different from 0 N=N+1

Errors

Function Code	1 Byte	Function Code + 0x80H
Error code	1 Byte	01/02/03/04/06

In the following example, it is requested to read 20 contiguous bits starting from address 46.

Request		Reply	
Field Name	Hex value	Field Name	Hex value
Function Code	01	Function Code	01
Address HI	00	Number of bytes sent	03
Address LOW	2D	Bits status value 27-20	xx
Bit number HI	00	Bits status value 35-28	xx
Bit number LOW	14	Bits status value 36-39*	xx

* bits 40-43 are forced to zero

Function 02 – Multiple reading of outlet variables (Bytes)

This function is used to read the status of contiguous bits relative to the outlet variables from 1 to 512. In the request, the start address and the number of contiguous bits that must be read are specified. In the reply, bits are grouped up in 8-bit bytes.

Request

Function Code	1 Byte	0x02
Initial address	2 Bytes	from 0 to 511
Bit number	2 Bytes	from 1 to 512

Reply

Function Code	1 Byte	0x02
Number of Bytes returned	1 Byte	N*
Bit status	n Bytes	n=N or N+1

N= bit number /8 If the result is different from 0 N=N+1

Errors

Function Code	1 Byte	Function Code + 0x80H
Error code	1 Byte	01/02/03/04/06

In the following example, it is requested to read 24 contiguous bits starting from address 1.

Request		Reply	
Field Name	Hex value	Field Name	Hex value
Function Code	02	Function Code	02
Address HI	00	Number of bytes sent	03

Address LOW	00	Bits status value 27-20	xx
Bit number HI	00	Bits status value 35-28	xx
Bit number LOW	18	Bits status value 36-43	xx

Function 03 – Multiple reading of analogue variables (Word)

This function is used to read the status of contiguous bits relative to the analogue variables from 1 to 130. In the request, the start address and the number of contiguous words that must be read are specified. In reply, variables are grouped up in 16-bit words. These variables represent the engineered 16-bit analogue value (expressed in tenths) of FB-AN001.1 cards defined in configuration as Modbus type. With this function it is possible to read up to 125 analogue variables with a single command. The address table relative to analogue variables depends on the position of AN001.1 cards in the racks. The first card of AN001.1 type corresponds to address 1, the second to address 2 and so on.

example: The following AN001.1 cards of modbus type are available in the station:

Card A: rack 1 pos 5
Card B: rack 1 pos 6
Card C: rack 1 pos 10
Card D: rack 5 pos 1
Card Erack 6 pos 13

The mapping is the following:

Card A: address 1
Card B: address 2
Card C: address 3
Card D: address 4
Card E: address 5

In this case, command 0x03 must comply with the following parameters:

- Initial address between 1 and 5
- number of words to read between 1 and 5
- The sum of the initial address and the number of words to read must NOT be higher than 6

Request

Function Code	1 Byte	0x03
Initial address	2 Bytes	from 0 to 130
Word number	2 Bytes	N=From 1 to 125

Reply

Function Code	1 Byte	0x03
Number of Bytes returned	1 Byte	2xN*
Status of variables	N Bytes	N x 2 bytes

N = Word number

Errors

Function Code	1 Byte	Function Code + 0x80H
Error code	1 Byte	01/02/03/04/06

In the following example, it is requested to read 3 words starting from address 20.

Request		Reply	
Field Name	Hex value	Field Name	Hex value
Function Code	03	Function Code	03
Address HI	00	Number of bytes sent	06
Address LOW	13	registry value HI (20)	xx

Programmable system FB6100
Components Sheet

Data

Word number HI	00	Registry value LOW (20)	xx
Word number LOW	03	registry value HI (21)	xx
		Registry value LOW (21)	xx
		Value of registry HI (22)	xx
		Registry value LOW (22)	xx

W12



Function 05 – Writing of a single inlet variable (bit)

This function is used to write/edit a single inlet variable of address 1 to 512. The change of status ON/OFF takes place by writing a constant in the reply message to the slave. The constant is written in two bytes. For the ON status, the constant will be 0x00 and 0xFF, while for the OFF status, the constant will be 0x00 and 0x00. Any other value has no effect on the variable.

Request

Function Code	1 Byte	0x05
Variable address	2 Bytes	from 0 to 511
Value	2 Bytes	0x00,0xFF=HI 0x00,0x00=LOW

Reply

Function Code	1 Byte	0x05
Variable address	2 Bytes	from 0 to 511
Value	2 Bytes	0x00,0xFF=HI 0x00,0x00=LOW

Errors

Function Code	1 Byte	Function Code + 0x80H
Error code	1 Byte	01/02/03/04/06

In the following example, inlet variable 128 is forced to 1.

Request		Reply	
Field Name	Hex value	Field Name	Hex value
Function Code	05	Function Code	05
Variable address HI	00	Variable address HI	00
Variable Address LOW	7F	Variable Address LOW	80
Value HI	FF	Value HI	FF
value LOW	00	value LOW	00

Function 08 – Diagnostics of serial line

This function is used to test the communication status of the serial line. This function is only supported by the sub-function 00 that allows to return the received data to the Master.

Request

Function Code	1 Byte	0x08
Sub-function code	2 Bytes	0x00, 0x00
Value	2 Bytes	N x 2 bytes

Reply

Function Code	1 Byte	0x08
Sub-function code	2 Bytes	0x00, 0x00
Value	2 Bytes	N x 2 bytes

Errors

Function Code	1 Byte	Function Code + 0x80H
Error code	1 Byte	01/03/04/06/06

In the example below, command 08 is represented with sub-function 00.

Request		Reply	
Field Name	Hex value	Field Name	Hex value
Function Code	08	Function Code	08
Sub-function HI	00	Sub-function HI	00
Sub-function LOW	00	Sub-function LOW	00
Value HI	27	Value HI	27
value LOW	AA	value LOW	AA

Function 15 – Multiple writing of outlet variables (Bytes)

This function is used to read the status of contiguous bits relative to the outlet variables from 1 to 512. In the request, the start address, the number of contiguous bits that must be read, the number of N* bytes that follow and N* bytes with outlet status ON/OFF are specified. In the reply, the requested bits are grouped up in 8-bit bytes.

Request

Function Code	1 Byte	0x15
Initial address	2 Bytes	from 0 to 511
Bit number	2 Bytes	from 1 to 512
Number of bytes	1 Byte	N*
Bit value	N*x 1 byte	

N= bit number /8 If the result is different from 0 N=N+1

Reply

Function Code	1 Byte	0x15
Initial address	2 Bytes	from 0 to 511
Bit number	2 Bytes	from 1 to 512

Errors

Function Code	1 Byte	Function Code + 0x80H
Error code	1 Byte	01/02/03/04/06

In the example below, it is requested to write 10 contiguous bits starting from address 20. The bit value to write is contained in two CD 01 Hex bytes. The binary representation of outlets is the following:

bit	1	1	0	0	1	1	0	1	0	0	0	0	0	0	0	1
Output	27	26	25	24	23	22	21	20	-	-	-	-	-	-	29	28

The first transmitted byte (CD) is relative to address from 27 to 20. The following transmitted byte (01) is relative to addresses 28-29. Non used bytes must be brought to zero.

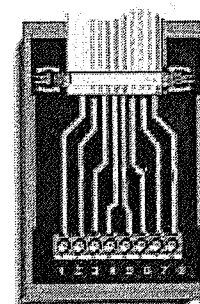
Request		Reply	
Field Name	Hex value	Field Name	Hex value
Function Code	0F	Function Code	0F
Address HI	00	Address HI	00
Address LOW	13	Address LOW	13
Bit number HI	00	Bit number HI	00
Bit number LOW	0A	Bit number LOW	0A
Number of bytes	02		
Byte number LOW	CD		
Byte number LOW	18		

CONNECTIONS

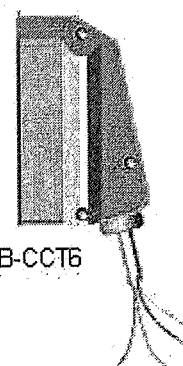
This card can be terminated with the 8-terminal module FB-TB003.1 or with FB-CCT6 cable.

Connections of FB-TB003.1 end		
Terminal		Function
Ø	1	TX Data RS232
Ø	2	RX Data RS232
Ø	3	GND RS232
Ø	4	Positive RS485
Ø	5	Negative RS485
Ø	6	GND RS485
Ø	7	N.C.
Ø	8	N.C.

Rack connection



FB-TB003



FB-CCT6

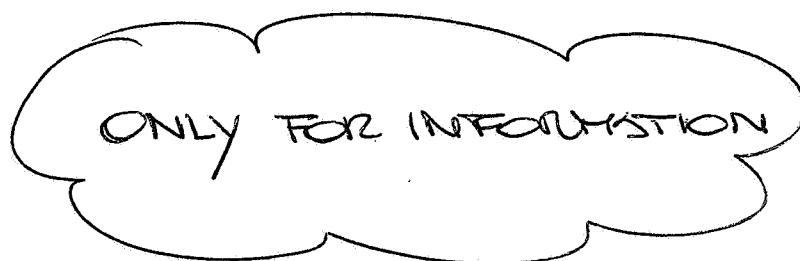
INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-MOD001.1-1	Module for RTU Modbus protocol	Non redounding
FB-TB003.1	Termination with 8 terminals for FB-MOD001.1-1 modules	
FB-CFT20/2	Flat cable for termination module FB-TB003.1	Length 2 metres
FB-CCT6	Termination cable for FB-MOD001.1-1 modules	Length 3 metres

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FB6100 PROGRAMMABLE SYSTEM

COMPONENTS DATA SHEET



FB6100-DSC
ADDRESSABLE
MODULES

Important notes

SANCO S.p.A has the objective to continuously improve the characteristics of its products, therefore this manual can be modified without notice. All technical statements and data listed in this manual have been checked very carefully. This does not exclude the possibility that the manual may contain defects or orthographic mistakes. SANCO S.p.A will not be held legally liable for possible consequences caused by mistakes or changes of this manual.

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Index of revisions

Index of revision	Brief Description of the Content	Issuing date
Rev. 0	Preliminary version	30-10-2007
Rev. 1	Version for Certification	21-03-2008
Rev. 2	Last revision	06-03-2009

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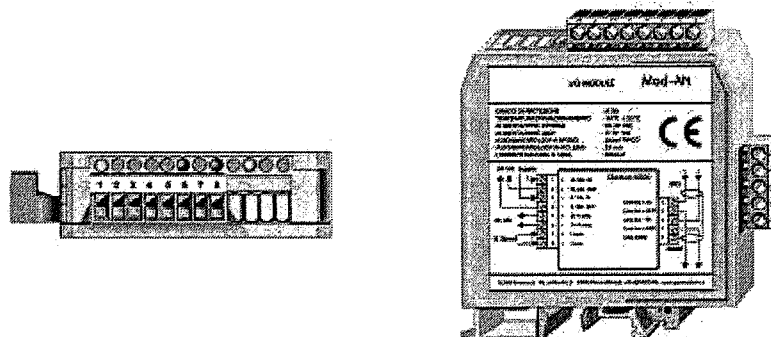
6.0 Addressed modules

Addressed modules are used in combination with FB-LP001.1 and FB-LP002.1 loop cards.

INFORMATION TO PLACE AN ORDER

PN module	DESCRIPTION	Protocol	notes
ALG-E	Optical smoke detector	ESP	Used with FB-LP001.1 modules
ATG-E	Temperature detector	ESP	Used with FB-LP001.1 modules
AIE-E	Ionic smoke detector	ESP	Used with FB-LP001.1 modules
ACA-E	Combined smoke/temperature detector	ESP	Used with FB-LP001.1 modules
ACB-E	Multi-task temperature detector	ESP	Used with FB-LP001.1 modules
FB-BASE	4-20mA analogue module for DIN bar	ESP	Used with FB-LP001.1 modules
CHQ-CP	Alarm addressed key	ESP	Used with FB-LP001.1 modules
FB-Mod-HS	Alarm addressed key	ESP	Used with FB-LP001.1 modules
CHQ-CP	Minizone module	ESP	Used with FB-LP001.1 modules
CHQ-Z	Dual zone module	ESP	Used with FB-LP001.1 modules
FB-Mod-Z	Dual zone module for DIN bar	ESP	Used with FB-LP001.1 modules
CHQ-S	Dual switch module	ESP	Used with FB-LP001.1 modules
CHQ-R	Dual module relay	ESP	Used with FB-LP001.1 modules
FB-Mod-R	Dual module relay for DIN bar	ESP	Used with FB-LP001.1 modules
CHQ-B	Dual module sounders	ESP	Used with FB-LP001.1 modules
FB-Mod-B	Dual module sounders for DIN bar	ESP	Used with FB-LP001.1 modules
YBO-BS	Base Sounder	ESP	Used with FB-LP001.1 modules
CHQ-WS2	Wall Sounder	ESP	Used with FB-LP001.1 modules
YBO-BSB	Base Sounder beacon	ESP	Used with FB-LP001.1 modules
CHQ-ARI	Remote indicator	ESP	Used with FB-LP001.1 modules
CHQ-AB	Addressable beacon	ESP	Used with FB-LP001.1 modules
FB-Mod-DI	Module with 8 non controlled inlets	SSP	Used with FB-LBUS0001.1 modules
FB-Mod-AI020	Module with 1 4-20mA analogue inlet	SSP	Used with FB-LBUS0001.1 modules
FB-Mod-AV010	Module with 1 0-10V analogue inlet	SSP	Used with FB-LBUS0001.1 modules
FB-Mod-DO	Module with 8 open collector outlets	SSP	Used with FB-LBUS0001.1 modules
FB-Mod-DISP	Display showing 255 programmable messages	SSP	Used with FB-LBUS0001.1 modules
FB-Mod-PRG	Programmer for addressed modules	ESP/SSP	Used for all types of modules

6.1 FB-MOD-AN



DESCRIPTION

FB-MOD-AN module allows to monitor analogue signals, of 4-20mA type. It is equipped with two extractable terminals, a 5-pole one for the connection of the communication bus and a 8-pole one for the connection to power and transducer. 4 lights are located on the front panel that performs the following functions:

- Led Polling:** It flashes at each interrogation by the control card.
- Led Prealarm:** It turns on steady when the inlet current exceeds the pre-alarm threshold.
- Led Alarm:** It turns on steady when the inlet current exceeds the alarm threshold.
- Led Fault:** It turns on steady when the inlet current is lower than 3mA.

For each module, two alarm thresholds can be programmed on the control station, within the following measurement ranges:

Measurement range	Pre-alarm threshold	alarm threshold	Measurement range	Pre-alarm threshold	alarm threshold
0-255 Bit	0-255	0-255	0-999 ppm	0-999	0-999
0-10 ppm	0.0-10.0	0.0-10.0	0-100 %LEL	0-100	0-100
0-20 ppm	0.0-20.0	0.0-20.0	0-25 %O2	0.0-25.0	0.0-25.0
0-50 ppm	0.0-50.0	0.0-50.0	15-25 %O2	15.0-25.0	15.0-25.0
0-100 ppm	0-100	0-100	4-20 mA	4.0-20.0	4.0-20.0
0-200 ppm	0-200	0-200	0-100 °C	0-100	0-100
0-500 ppm	0-500	0-500	0-150 °C	0-150	0-150

Mechanical sizes

Assembly

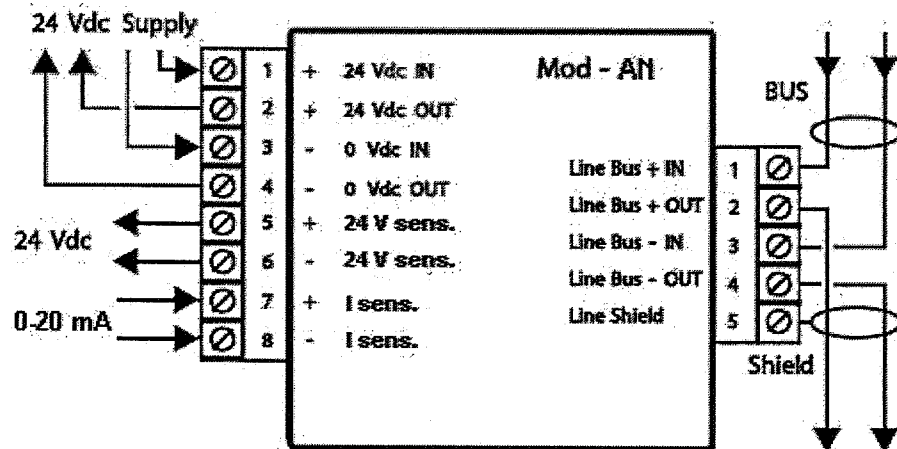
The module is conceived to be mounted on DIN bar, inside a panel or anyhow a junction box with mechanical protection suitable for the installation environment. Do not install the module outdoors.

Address Programming

For proper functioning, an address between 1 and 127 must be assigned to the module, through the specific programmer. To set the address, proceed as follows:

- Connect the extraction terminal to five poles of the programmer to the module to program.
- Press the grey key at the left of the programmer. The module's address appears on the display.
- Set the requested address, by pressing the two grey keys.
- Press the red key to program the address.
- Press the grey key at the right of the programmer to turn it off.
- Disconnect the programmer from the module.
- Write the programmed address in the relative white tag with an indelible marker.

Electric connections



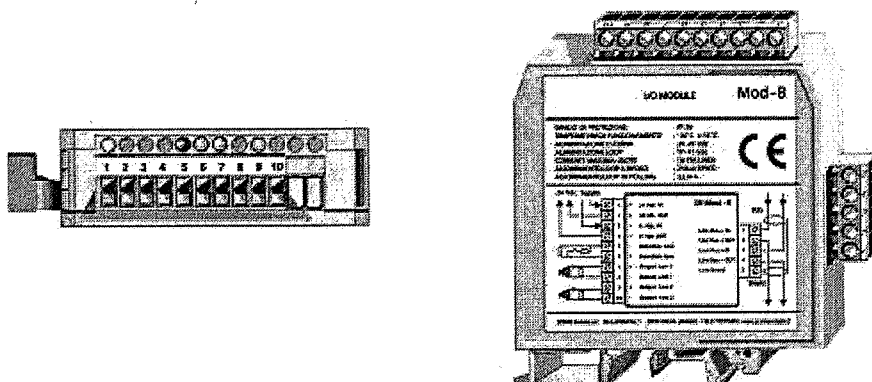
Technical characteristics

Container's material	Thermoplastic, of Green colour
Protection degree	IP 30
Operating temperature	-5 +50°C
Loop's supply voltage	17-41Vdc
Absorption of idle loop	250uA typical
Loop absorption during polling	22mA typical
Supply voltage 24Vdc	22-28Vdc
Maximum current of outlets of V Sens.	500mA
Resolution	62,5uA (8 bit)
Linearity	+/- 1LSB
Inlet impedance	47 ohm
Compatible control cards	FB-LP002.1

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6.2 FB-MOD-B



DESCRIPTION

FB-MOD-B module is equipped with two outlet lines and an inlet line supervised against short circuit and opening. It is equipped with two extractable terminals, a 5-pole one for the connection of the communication bus and a 10-pole one for the connection to power and field utilities. It is mainly used to command sirens or sound, optical indicators. NB: The inlet line is not suitable for the control of smoke detectors or current absorption sensors. Therefore, it must be exclusively used to control contacts which are not under voltage. 5 lights are located on the front panel that performs the following functions:

- Led Polling:** It flashes at each interrogation by the control card.
- Led Alarm DL1:** It turns on steady when the inlet channel is in alarm status.
- Led Fault DL1:** It turns on steady when the inlet channel is in anomaly status caused by opening or line's short circuit.
- Led Fault OL1:** It turns on steady when the outlet line one is in anomaly status caused by opening or line's short circuit.
- Led Fault OL2:** It turns on steady when the outlet line two is in anomaly status caused by opening or line's short circuit.

Assembly

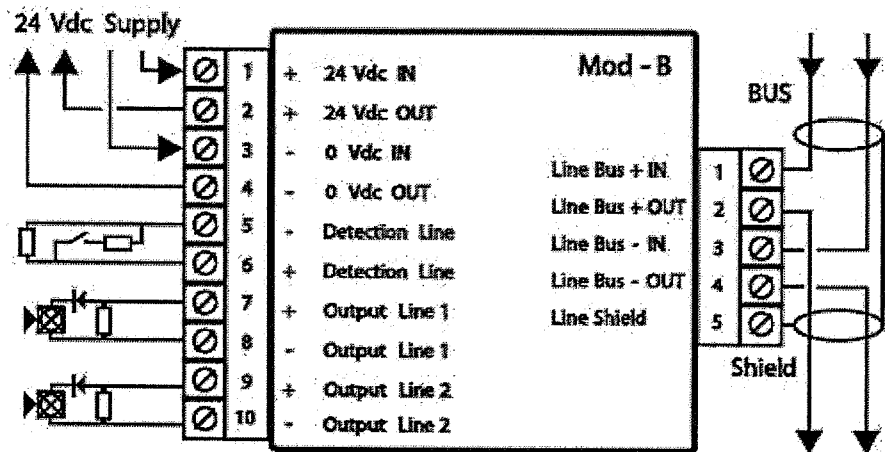
The module is conceived to be mounted on DIN bar, inside a panel or anyhow a junction box with mechanical protection suitable for the installation environment. Do not install the module outdoors.

Address Programming

For proper functioning, an address between 1 and 127 must be assigned to the module, through the specific programmer. To set the address, proceed as follows:

- Connect the extraction terminal to five poles of the programmer to the module to program.
- Press the grey key at the left of the programmer. The module's address appears on the display.
- Set the requested address, by pressing the two grey keys.
- Press the red key to program the address.
- Press the grey key at the right of the programmer to turn it off.
- Disconnect the programmer from the module.
- Write the programmed address in the relative white tag with an indelible marker.

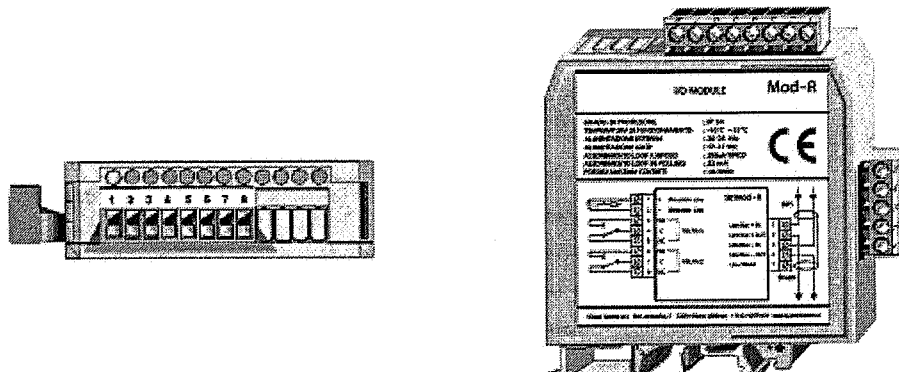
Electric connections



Technical characteristics

Container's material	Thermoplastic, of Green colour
Protection degree	IP 30
Operating temperature	-5 +50°C
Loop's supply voltage	17-41Vdc
Absorption of idle loop	250uA typical
Loop absorption during polling	22mA typical
Supply voltage 24Vdc	22-28Vdc
Maximum current of outlets	1A per outlet
Alarm resistance	1Kohm
End line resistances	5,6Kohm
Compatible control cards	FB-LP001.1

6.3 FB-MOD-R



DESCRIPTION

Addressed control module for outlet devices. It is equipped with two non supervised outlet lines of relay type and an inlet line supervised against short circuit and opening. It is mainly used to command systems in which a contact which is not under voltage must be present, of magnet type, shutters, etc... It is equipped with two extractable terminals, a 5-pole one for the connection of the communication bus and a 8-pole one for the connection to field elements.

NB: The inlet line is not suitable to control smoke detectors or current absorption sensors and it must therefore be used exclusively to control contacts which are not under voltage.

A light is located on the front panel that performs the following functions:

Led Polling: It flashes at each interrogation by the control card.

Assembly

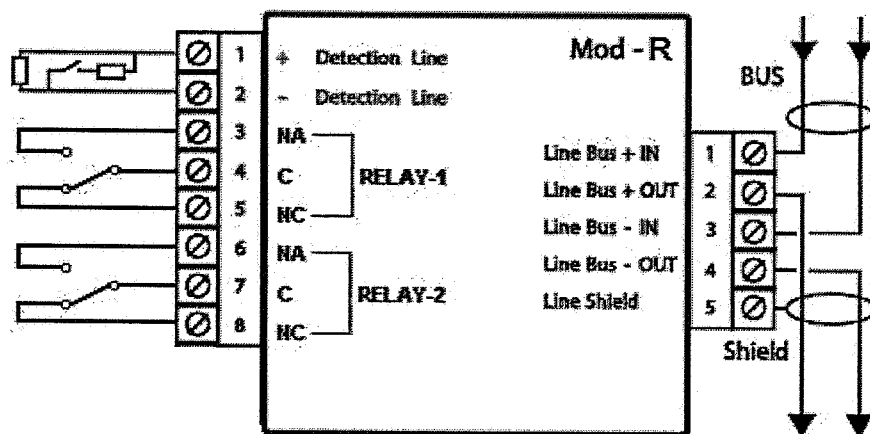
The module is conceived to be mounted on DIN bar, inside a panel or anyhow a junction box with mechanical protection suitable for the installation environment. Do not install the module outdoors.

Address Programming

For proper functioning, an address between 1 and 127 must be assigned to the module, through the specific programmer. To set the address, proceed as follows:

- Connect the extraction terminal to five poles of the programmer to the module to program.
- Press the grey key at the left of the programmer. The module's address appears on the display.
- Set the requested address, by pressing the two grey keys.
- Press the red key to program the address.
- Press the grey key at the right of the programmer to turn it off.
- Disconnect the programmer from the module.
- Write the programmed address in the relative white tag with an indelible marker.

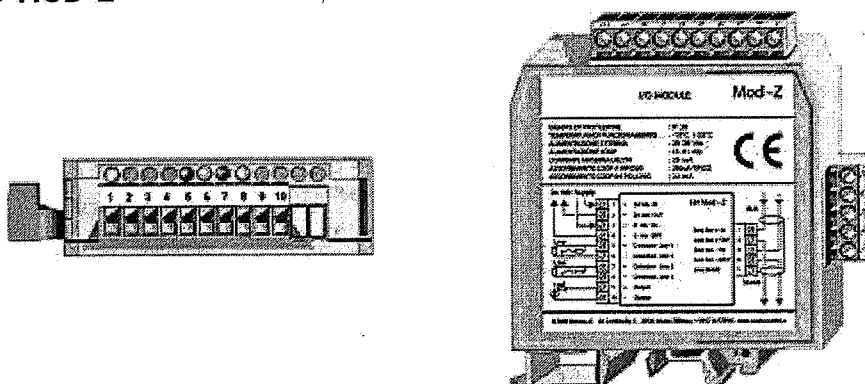
Electric connections



Technical characteristics

Container's material	Thermoplastic, of Green colour
Protection degree	IP 30
Operating temperature	-5 +50°C
Loop's supply voltage	17-41Vdc
Absorption of idle loop	250uA typical
Loop absorption during polling	22mA typical
Contacts' maximum capacity	1A-30Vdc
Alarm resistance	1Kohm
End line resistances	5,6Kohm
Compatible control cards	FB-LP001.1

6.4 FB-MOD-Z



DESCRIPTION

FB-MOD-Z module is used to control devices with different absorption, fed at 24 Vdc. It is equipped with two lines able to detect short circuit and line opening as failure and intermediate values of current as alarm. An outlet is available to command a Light or another load, automatically limited to 25 mA, 24 Vdc. This module is mainly used to connect traditional smoke detectors, of current absorption type. It is possible to connect an intrinsic safety barrier of Zener type on the two detection lines. It is equipped with two extractable terminals, a 5-pole one for the connection of the communication bus and a 10-pole one for the connection to power and field elements. 5 lights are located on the front panel that performs the following functions:

- Led Polling:** It flashes at each interrogation by the control card.
- Led Alarm L1:** It turns on steady when the channel is in alarm status.
- Led Fault L1:** It turns on steady when the channel one is in anomaly status caused by opening or line's short circuit.
- Led Alarm L2:** It turns on steady when the channel two is in alarm status.
- Led Fault L2:** It turns on steady when the channel two is in anomaly status caused by opening or line's short circuit.

Assembly

The module is conceived to be mounted on DIN bar, inside a panel or anyhow a junction box with mechanical protection suitable for the installation environment. Do not install the module outdoors.

Address Programming

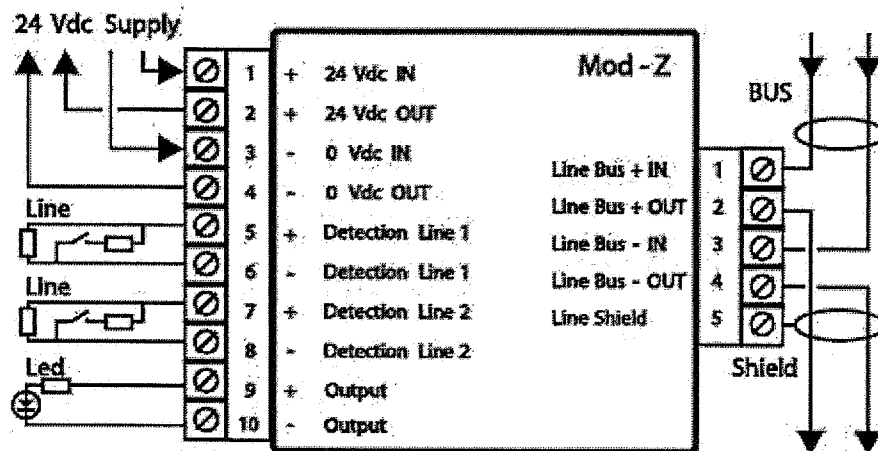
For proper functioning, an address between 1 and 127 must be assigned to the module, through the specific programmer. To set the address, proceed as follows:

- Connect the extraction terminal to five poles of the programmer to the module to program.
- Press the grey key at the left of the programmer. The module's address appears on the display.
- Set the requested address, by pressing the two grey keys.
- Press the red key to program the address.
- Press the grey key at the right of the programmer to turn it off.
- Disconnect the programmer from the module.
- Write the programmed address in the relative white tag with an indelible marker.

Electric connections

WR

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Technical characteristics

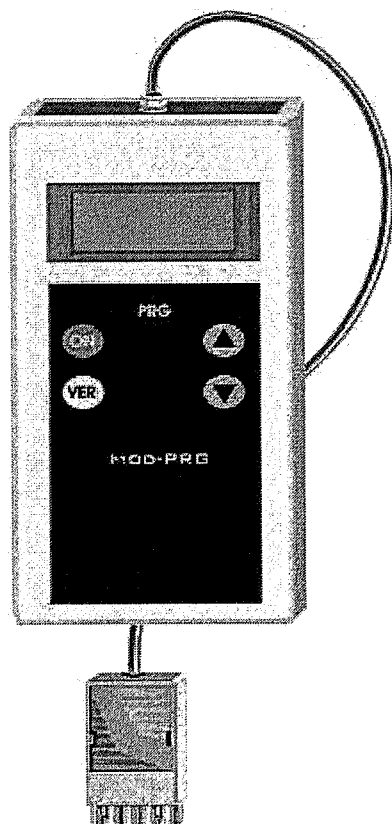
Container's material	Thermoplastic, of Green colour
Protection degree	IP 30
Operating temperature	-5 +50°C
Loop's supply voltage	17-41Vdc
Absorption of idle loop	250uA typical
Loop absorption during polling	22mA typical
Supply voltage 24Vdc	22-28Vdc
Light outlet maximum current	25mA
Alarm resistance	1Kohm
End line resistances	5,6Kohm
Intrinsic safety zener that can be used	ELCON Z680+
Compatible control cards	FB-LP001.1

6.5 FB-Mod-PRG

Programming circuit used to configure address and check the functioning of addressed modules, FBMod series, produced by SCAME Sistemi.

CHARACTERISTICS

- VISUALIZATION ON ALPHANUMERIC DISPLAY
- PROGRAMMING OF MODULES' ADDRESS FBMod
- CHECKING OF MODULE'S ADDRESS
- FUNCTIONAL TEST OF MODULE
- POWER SUPPLY WITH 9 VDC ALKALINE BATTERY
- QUICK FITTING CONNECTOR INSIDE MODULES
- Membrane keys
- Automatic selection of the protocol
- Discharged battery indication
- Compatible with units of series FB and AFP 21
- Addressing of module of static type



FUNCTIONS ONBOARD THE MODULE

	KEYS	FUNCTIONS
	ON KEY	It is used to turn on the device. The programmer turns off automatically after 30 seconds without being used.
	CHECK FUNCTION	It reads the address set on the module and checks functioning
	SCROLL UP	It increases the address to program, travel is limited to the number of programmable addresses
	SCROLL DOWN	It decreases the address to program
	PROGRAMME	It programmes the address selected, by writing it in the device's flash

INDICATIONS ON THE DISPLAY

Err = Non connected or failed module

LOBAT = Battery to substitute

= Module's address

7.0 Termination modules

I/O modules can be ended with termination modules or directly through multiple cables based on the type of bus used.

PN module	DESCRIPTION	Termination with Flat cable	Termination with cable
FB-M0001.1	Module with 8 22Vdc controlled inlets	FB-TB001.1	FB-CCT1
FB-M0001.2	Module with 8 22Vdc controlled inlets	Not available	FB-CCT1R
FB-AN001.1	Module with 1 4-20mA analogue inlet	FB-TB003.1	FB-CCT2
FB-AN001.2	Module with 1 4-20mA analogue inlet	Not available	FB-CCT2R
FB-AN002.1	Module with 2 4-20mA analogue inlets	FB-TB003.1	FB-CCT3
FB-AN002.2	Module with 2 4-20mA analogue inlets	Not available	FB-CCT5R
FB-C0001.1	Module with 8 500mA controlled outlets	FB-TB006.1 FB-TB003.1	FB-CCT3
FB-C0001.1	Module with 8 500mA controlled outlets	Not available	FB-CCT3R
FB-C0002.1	Module with 16 250mA non controlled outlets	FB-TB007.1 FB-TB001.1	FB-CCT1
FB-C0003.1	Module with 8 500mA controlled outlets for sirens	FB-TB001.1	FB-CCT1
FB-C0004.1	Module with 4 2A controlled outlets for solenoids	Not available	FB-CCT4
FB-C0004.1	Module with 4 2A controlled outlets for solenoids	Not available	FB-CCT4R
FB-C005.1	Module with 4 2A controlled outlets for sirens	Not available	FB-CCT3
FB-S0001.1	Module for EN-12094-1 extinguishing systems	FB-TB003.1	FB-CCT3
FB-LP001	Bus control module with ESP protocol	FB-TB003.1	FB-CCT4
FB-MOD001	Modbus RTU Master/Slave Module	FB-TB003.1	FB-CCT6
FB-LP002.1	Bus control module with SSP protocol	FB-TB003.1	FB-CCT4

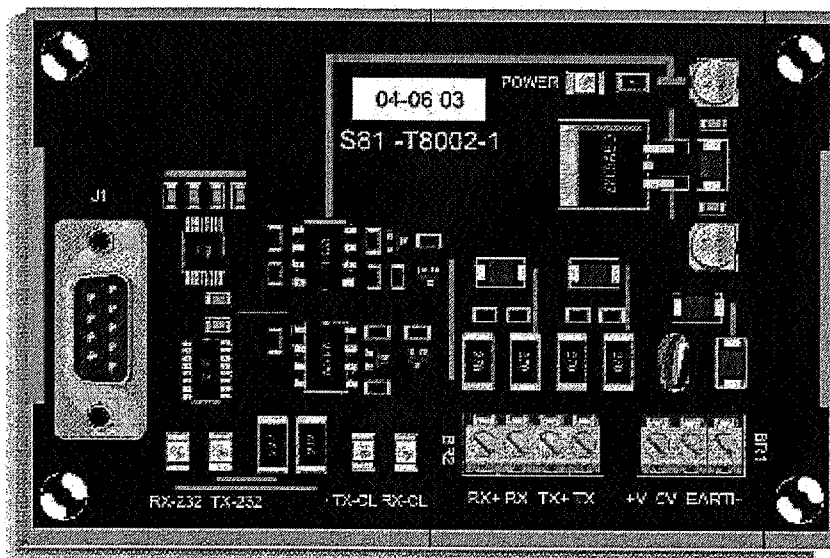
INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-TB001.1	termination module with 16 terminals	Anchoring to DIN bar
FB-TB002.1	RS232/ passive current loop converter module	Anchoring to DIN bar
FB-TB003.1	termination module with 8 terminals	Anchoring to DIN bar
FB-TB004.1	Default I/O module	Anchoring to DIN bar
FB-TB006.1	Module with 8 4A 30Vdc relays	Anchoring to DIN bar
FB-TB007.1	Module with 16 4A 30Vdc relays	Anchoring to DIN bar

7.1 FB-TB002.1

DESCRIPTION

This card is used to transform the signal of Host remote serial outlet from RS232 to current loop with galvanic insulation. The card works passively therefore the other side needs a converter operation in active mode. The use of this card allows to connect a Host remote computer at a maximum distance of 2000 metres.



CHARACTERISTICS

- Supply voltage: 22-29Vdc
- Absorption in idle status: 30mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -10 / +50 °C
- Maximum humidity: 95% without condensate
- Maximum distance: 2000 metres at 9600 Bps

SIGNALS

Five SMD lights are located on the card that perform the following functions:

Light	Condition
	Steady-on when voltage is present
	It flashes after receiving data on RS232
	It flashes after transmitting data on RS232
	It flashes after receiving data on the current loop
	It flashes after transmitting data on the current loop

CONNECTIONS

J1 RS232

Serial line RS232 connection. Connect to connector J5 of FB-U2003-1 card using FB-C232/2 cable.

BR1 Power supply

These three screw-type terminals are used to connect the power supply (+25Vdc) and ground connection.

TAG	Function	Cable colour
Ø M1	Positive pole of 25Vdc power supply	Red
Ø M2	Negative pole of 25Vdc power supply	Black
Ø M3	Ground	Yellow/Green

BR2 Current loop

TAG	Function	Cable colour
Ø M1	Positive pole of Right data inlet	White
Ø M2	Negative pole of Right data inlet	Brown
Ø M3	Positive pole of TX data inlet	green
Ø M4	Negative pole of TX data inlet	yellow

INFORMATION TO PLACE

AN ORDER

Part Number	DESCRIPTION	notes
FB-TB002.1	RS232/ passive current loop converter module	
232/CL	active converter for table connection	
FB-C232/2	Flat cable for serial connection	Length 2 metres

7.2 FB-TB004.1

DESCRIPTION

This card manages 10 digital inlets, 16 open collector outlets and a 250mA controlled outlet to command the local siren relative to the fire functions. In addition, this card performs the dispersion check towards the ground of the main supply voltage. It can be used in combination with FB-TB001.1 card to have 16 open collector outlets of 250mA each or with FB-LBUS0001.1-1 card to have 16 SPDT contacts.

CHARACTERISTICS

- Supply voltage: 22-29Vdc
- Absorption in idle status: 100mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate
- Maximum current of O.C. outlets: non protected 250 mA
- Maximum current of local siren's outlet: 250mA electronically protected

SIGNALS

Two green lights are located on the card that perform the following functions:

Light	Condition
Power	Steady-on when voltage is present
Link	Steady-on when the communication link with FB-FP001.1 card is present

CONFIGURATION

A one-way dip-switch is present on the card, which is used to enable the dispersion control towards the ground of the power supply.

SW1	DESCRIPTION
ON	Dispersion control towards the ground of power supply enabled
OFF	Dispersion control towards the ground of power supply disabled



Warning: The power supply of FB unit is not referred to the ground. Some devices as for example personal computers have the negative pole of the power supply connected to the ground for safety reasons. The connection of these devices to the unit causes to signal the anomaly of dispersion anomaly. To avoid this, position dip switch SW1 in position OFF.

CONNECTIONS

TB1-TB2-TB3 Power supply

These three faston connectors are used to connect the power supply (+25Vdc) and ground connection.

TAG	Function	Cable colour
TB1	Positive pole of 25Vdc power supply	Red
TB2	Negative pole of 25Vdc power supply	Black
TB3	Ground	Yellow/Green

J1 -> J1 FB-CPUBUS-1

It is a connector for a 14-pole flat cable that allows connection with the FB-CPUBUS-1 Bus card. To perform this connection, use FB-CFT14/2 cable.

J2 -> J1 FB-TB001.1 or J1 FB-TB007.1

It is a connector for a 20-pole flat cable that allows connection with the FB-TB001.1 termination card or with a 16-relay FB-TB007.1 card. To perform this connection, use FB-CFT20/05 cable.

Connections with 16-terminal FB-TB001.1 termination card. In this configuration, the outlets are of open collector type able to supply a maximum current of 250mA.

TAG	Function	Safety	Security	Normal Energized
Ø M1	General pre-alarm	☒		
Ø M2	General alarm	☒		
Ø M3	General anomaly	☒		☒
Ø M4	General disabling	☒		
Ø M5	Local buzzer	☒		
Ø M6	Currently not used	-	-	-
Ø M7	General alarm		☒	☒
Ø M8	General alteration		☒	☒
Ø M9	General anomaly		☒	☒
Ø M10	External siren, intrusion alarm		☒	☒
Ø M11	Currently not used	-	-	-
Ø M12	Running system (RUN)	☒	☒	☒
Ø M13	System's failure	☒	☒	☒
Ø M14	Power supply's failure	☒	☒	☒
Ø M15	CPU's failure	☒	☒	☒
Ø M16	Unit's resetting	☒		Impulsive

Connection with a 16-relay FB-TB007.1 termination card. In this configuration, the outlets are of relay type with a SPDT 4A contact.

T 8007-1			BR1 BLOCK			Relays order																				
Z011 Z012 Z013						K1			K2			K3			K4			K5			K6			K7		
N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
		M			M			M			M			M			M			M			M			M
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			

			BR2 BLOCK			Relays order																				
						K9			K10			K11			K12			K13			K14			K15		
N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
		M			M			M			M			M			M			M			M			M
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			

Description of relays of FB-TB007.1 card.

Relay	Function	Safety		Normal Energized
K1	General pre-alarm	☒		
K2	General alarm	☒		
K3	General anomaly	☒		☒
K4	General disabling	☒		
K5	Local buzzer	☒		
K6	Currently not used	-		-
K7	General alarm			☒
K8	General alteration			☒
K9	General anomaly			☒
K10	External siren			☒
K11	Currently not used	-		-
K12	Running system (RUN)	☒		☒
K13	System's failures.	☒		☒
K14	Power supply's failure	☒		☒
K15	CPU's failure	☒		☒
K16	Unit's resetting	☒		Impulsive

BR1 terminal

It is a 12-way terminal for the connection of ten default inlets and local fire alarm siren.

TAG	Function	notes
Ø M1	Remote inlet, local acknowledgement	N.A.
Ø M2	Remote inlet, sirens' acknowledgement	N.A.
Ø M3	Remote inlet, Panel Resetting	N.A.
Ø M4	Evacuation remote inlet	N.A.
Ø M5	Battery status (charge/supply)	OV under charge
Ø M6	Anomaly to primary power supply PSU1	N.C.
Ø M7	Anomaly to secondary power supply PSU2	N.C.
Ø M8	Charge status of batteries (Fully charged/Maintenance)	OV fully charged
Ø M9	External Fault	N.C.
Ø M10	External Tamper	N.C.
Ø M11	Positive pole of outlet, local fire alarm siren	250mA max.
Ø M12	Negative pole of outlet, local fire alarm siren	250mA max.

TYPICAL CONNECTION

INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-TB004.1	Default I/O module	
FB-TB001.1	termination module with 16 terminals for DIN bar	
FB-TB007.1	Module with 16 relays with 4A 24Vac/dc SPDT contact	For default outlets
FB-CFT20/05	Flat cable for termination module	Length 5 centimetres
FB-CFT14/2	Flat cable for connection to FB-CPUBUS-1 FB-CPUBUS-1 card	Length 2 metres

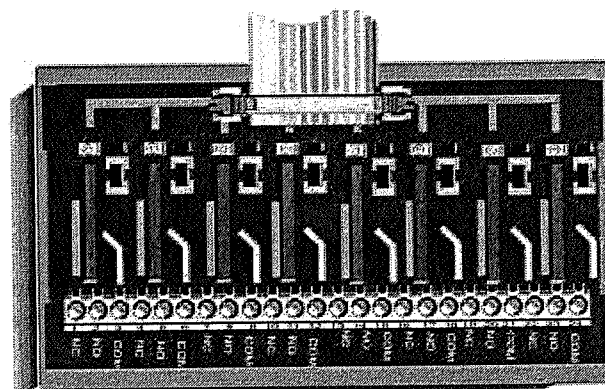
7.3 FB-TB006.1

DESCRIPTION

It is used with buses of FB-RACK1.1 type to terminate FB-C0001.1-1 cards.
It supplies eight SPDT outlet contacts of 4 Ampere at 30Vdc.

CHARACTERISTICS

- Contacts in C/NO/NO exchange
- 5 A 30 Vdc contacts capacity
- Assembly on DIN bar
- Status light for each relay
- Sizes: L 135 x H 77 x D 40 mm



CONNECTIONS

FB-TB006.1						Relays																					
NO= Normally Closed NO= Normally Open COM= Common						K1		K2		K3		K4		K5			K6		K7			K8					
N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
		M			M			M			M			M			M			M			M			M	
Ter	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
min																											
al																											
boa																											
rds																											

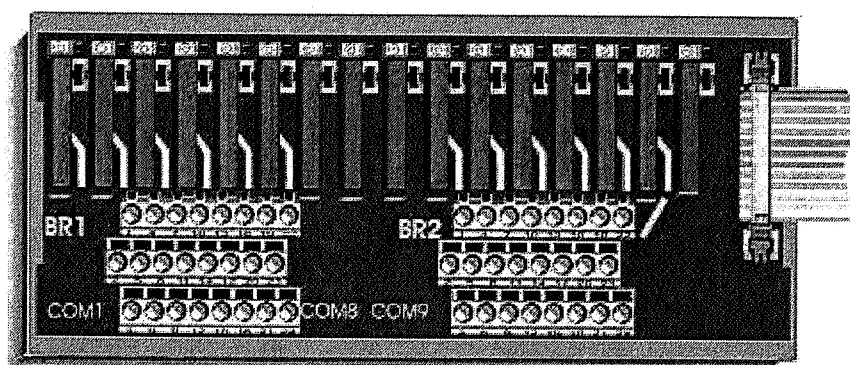
INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-TB006.1	8-relay module for DIN bar	
FB-CFT20/2	Flat cable for FB-TB006.1 termination module	Length 2 metres

7.4 FB-TB007.1

DESCRIPTION

It is used on combination with buses of FB-RACK1.1 type to terminate FB-C0002.1-1 cards. It supplies sixteen outlet SPDT contacts of 4 Ampere at 30Vdc.



CHARACTERISTICS

- Contacts in C/NO/NO exchange
- 5 A 30 Vdc contacts capacity
- Assembly on DIN bar
- Status light for each relay
- Sizes: L 135 x H 77 x D 40 mm

CONNECTIONS

T 8007-1			BR1			Relays																				
						K1			K2		K3		K4		K5		K6		K7		K8					
N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
		M			M			M			M			M			M			M			M			M
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			

			BR2 BLOCK			Relays																				
						K9		K10		K11		K12		K13		K14		K15		K16						
N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C	N	N	C
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
		M			M			M			M			M			M			M			M			M
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			

INFORMATION TO PLACE AN ORDER

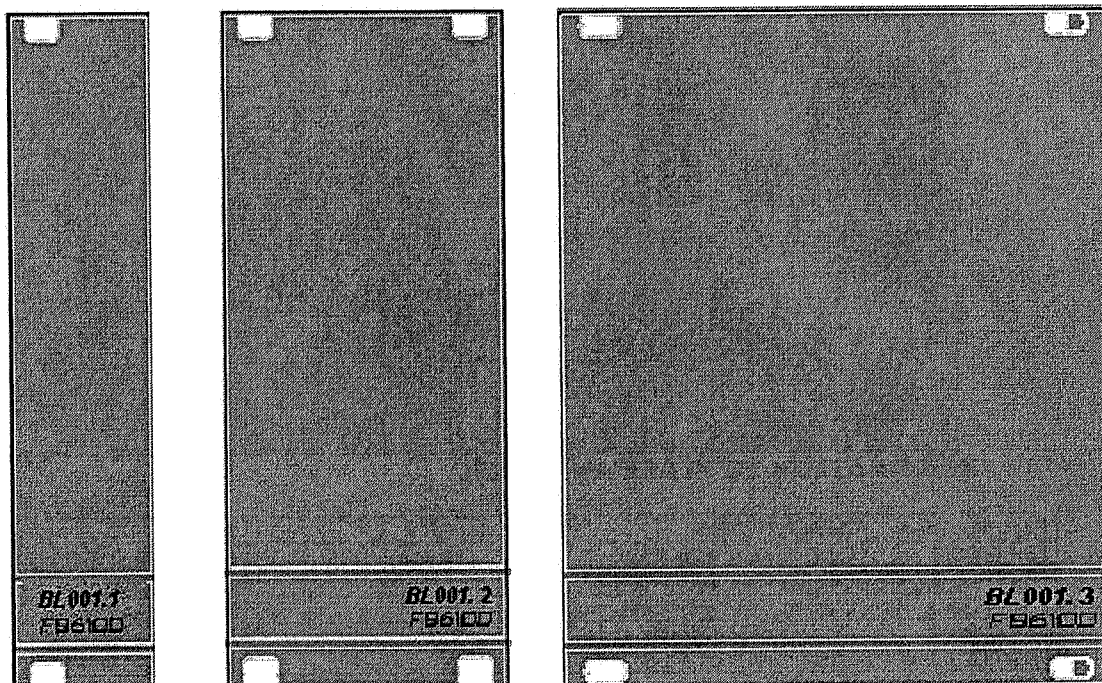
Part Number	DESCRIPTION	notes
FB-TB007.1	16-relay module for DIN bar	
FB-CFT20/2	Flat cable for FB-TB007.1 termination module	Length 2 metres

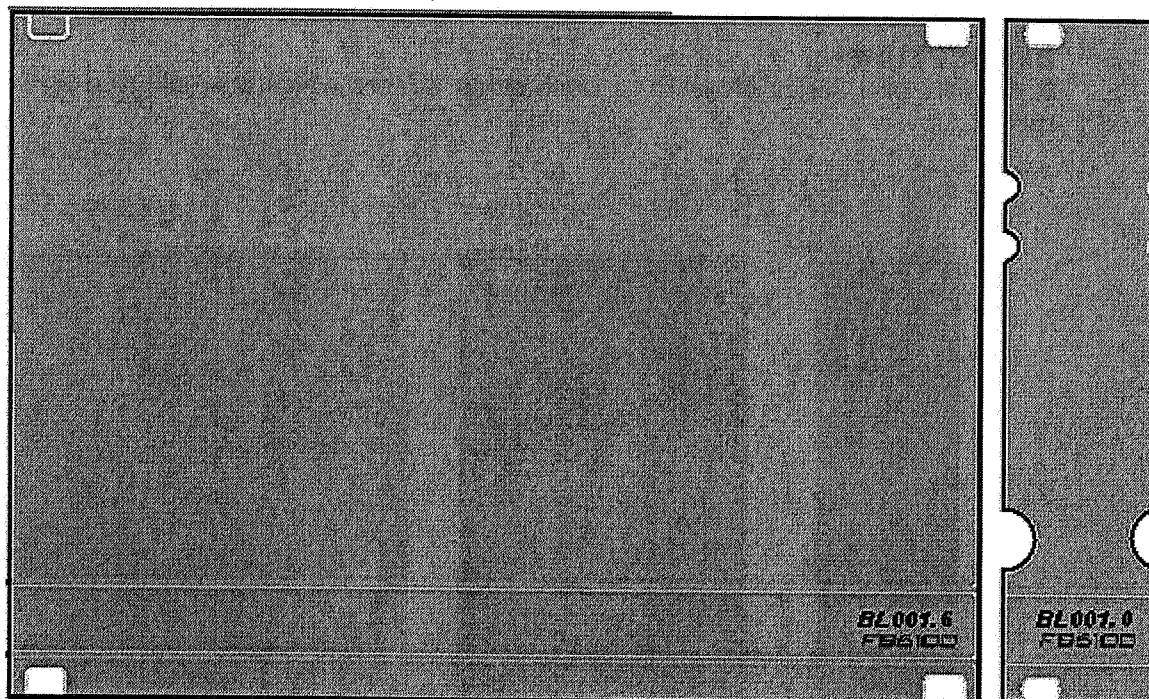
8.0 Closing panels

They are used to close the card areas which are not used inside the racks.

DESCRIPTION

It consists of a series of risers to close cards' spaces which are not used on I/O racks.





INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-F0000-1	Closing riser with a slot	For I/O rack and central unit
FB-F0000-2	Closing riser with two slots	For I/O rack
FB-F0000-3	Closing riser with three slots	For I/O rack
FB-F0000-6	Closing riser with six slots	For I/O rack
FB-U0000-1	Closing riser of a slot	For central unit

WR

[Handwritten signature]

9.0 Cables

Possible connections for the various types of cards:

PN card	DESCRIPTION	Modules' redundancy	Termination with Flat cable	Termination with cable
FB-M0001.1	Card with 8 22Vdc controlled inlets	NO	FB-TB001.1	FB-CCT1
FB-M0001.1	Card with 8 22Vdc controlled inlets	YES	Not available	FB-CCT1R
FB-AN001.1	Card with 1 4-20mA analogue inlet	NO	FB-TB003.1	FB-CCT2
FB-AN001.1	Card with 1 4-20mA analogue inlet	YES	Not available	FB-CCT2R
FB-AN002.1	Card with 2 4-20mA analogue inlets	NO	FB-TB003.1	FB-CCT3
FB-AN002.1	Card with 2 4-20mA analogue inlets	YES	Not available	FB-CCT5R
FB-C0001.1	Card with 8 500 mA controlled outlets	NO	FB-TB006.1 FB-TB003.1	FB-CCT3
FB-C0001.1	Card with 8 500 mA controlled outlets	YES	Not available	FB-CCT3R
FB-C0002.1	Card with 16 250 mA non controlled outlets	NO	FB-TB007.1 FB-TB001.1	FB-CCT1
FB-C0003.1	Card with 8 500 mA controlled outlets for sirens	NO	FB-TB001.1	FB-CCT1
FB-C0004.1	Card with 4 2A controlled outlets for solenoids	NO	Not available	FB-CCT4
FB-C0004.1	Card with 4 2A controlled outlets for solenoids	YES	Not available	FB-CCT4R
FB-C0005-1	Card with 4 2A controlled outlets for sirens	NO	Not available	FB-CCT3
FB-S0001.1	Card for extinguishing systems EN-12094-1	NO	FB-TB003.1	FB-CCT3
FB-LP001.1	Bus control card with ESP protocol	NO	FB-TB003.1	FB-CCT4
FB-MOD001.1	Modbus RTU Master/Slave Card	YES	FB-TB003.1	FB-CCT6
FB-LP002.1	Bus control card with SSP protocol	NO	FB-TB003.1	FB-CCT4

Types of cables:

Type of cable	Scame code	Manufacturer code	Cable diameter	Manufacturer
FROH2R 16x0.22	FB-CCT1	B0116022	6,9mm	Berica Cables
FROH2R 16x0.22	FB-CCT1R	B0116022	6,9mm	Berica Cables
FROR 4x0.5	FB-CCT2	B8104050	5,3mm	Berica Cables
FROR 4x0.5	FB-CCT2R	B8104050	5,3mm	Berica Cables
FROR 8x0.5	FB-CCT3	B8108050	7,2mm	Berica Cables
FROR 8x0.5	FB-CCT3R	B8108050	7,2mm	Berica Cables
FROR 4x0.5	FB-CCT4	B8104050	5,3mm	Berica Cables
FROR 4x0.5	FB-CCT4R	B8104050	5,3mm	Berica Cables
FROR 8x0.5	FB-CCT5R	B8108050	7,2mm	Berica Cables
FROH2R 6x0.22	FB-CCT6	B0106022	4,9mm	Berica Cables

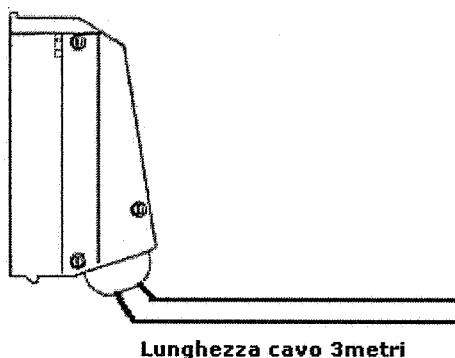
Cables' colour according to DIN41700

- 1 White
- 2 Brown
- 3 Green
- 4 Yellow
- 5 Grey
- 6 Pink
- 7 Blue
- 8 Red
- 9 Black
- 10 Purple
- 11 Grey / Pink
- 12 Red/blue
- 13 white/green
- 14 Brown / Green
- 15 white / yellow
- 16 Yellow/Brown

Cable of FB-CCT1 type

FROH2R 16x0.22

J4 connector DIN41618	Cable colour
10°	]*
10b	
9°	White
9b	Brown
8°	Green
8b	Yellow
7°	Grey
7b	Red
6°	Blue
6b	Red
5°	Black
5b	Purple
4°	Grey/Pink
4b	Red/Blue
3°	White/Green
3b	Brown/Green
2°	White/Yellow
2b	Yellow/Brown
1°	
1b	



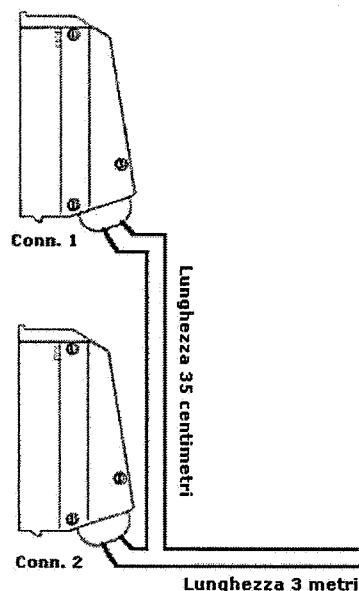
Bianco
Marrone
Verde
Giallo
Grigio
Rosa
Blu
Rosso
Nero
Viola
Grigio/Rosa
Rosso/Blu
Bianco/Verde
Marrone/Verde
Bianco/Giallo
Giallo/Marrone

* The two pins 10a and 10b must be welded together

Cable of FB-CCT1R type FROH2R 16x0.22

* The two pins 10a and 10b must be welded together
In connector 1, weld a 10 ohm resistance 1/4Watt 1% between:

- pin 2b and pins 10a, 10b
- pin 3b and pins 10a, 10b
- pin 4b and pins 10a, 10b
- pin 5b and pins 10a, 10b
- pin 6b and pins 10a, 10b
- pin 7b and pins 10a, 10b
- pin 8b and pins 10a, 10b
- pin 9b and pins 10a, 10b

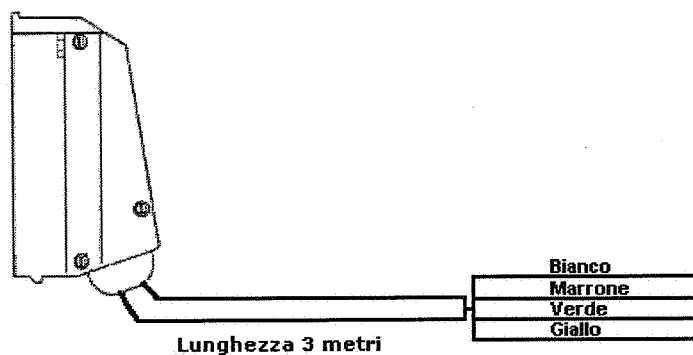


Bianco
Marrone
Verde
Giallo
Grigio
Rosa
Blu
Rosso
Nero
Viola
Grigio/Rosa
Rosso/Blu
Bianco/Verde
Marrone/Verde
Bianco/Giallo
Giallo/Marrone

Cable of FB-CCT2 type

FROR 4x0.5

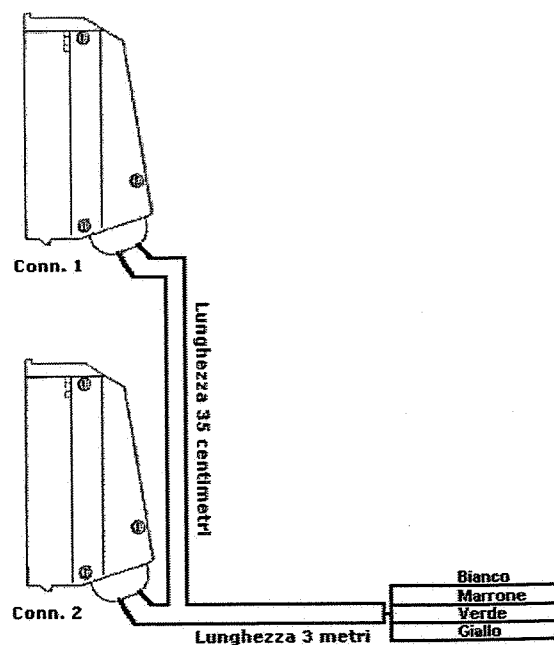
Conn.1 DIN41618	Cable colour
10a	]*
10b	
9°	]-White
9b	
8°	]-Brown
8b	
7°	
7b	
6°	
6b	
5°	]-Green
5b	
4a	]-Yellow
4b	
3a	
3b	
2a	
2b	
1a	
1b	



* The two pins 10a and 10b must be welded together

Cable of FB-CCT2R type

FROR 4x0.5

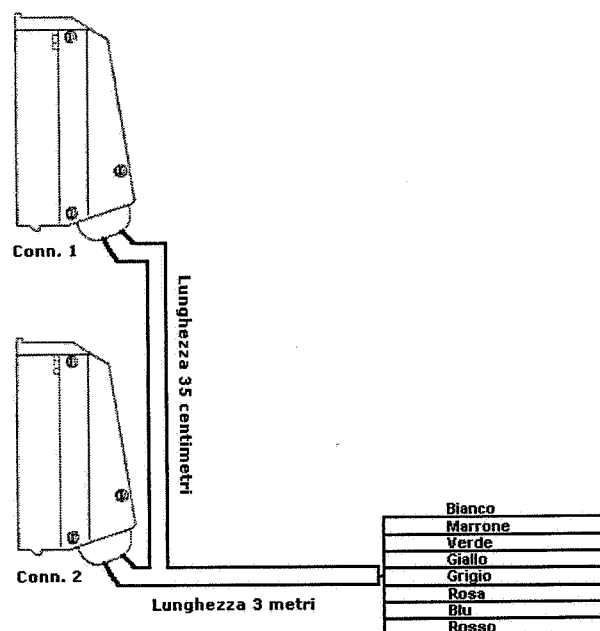


Conn. 1 DIN41618		Conn. 2 DIN41618	Cable colour
10a	]-----[	10°	*
10b		10b	*
9a	]-----[	9°	]- White
9b		9b	
8a	]-----[	8°	]- Brown
8b		8b	
7a	]-----[	7°	
7b		7b	
6a		6°	
6b		6b	
5a	]-----[	5°	]- green
5b		5b	
4a	]-----[	4°	]- yellow
4b		4b	
3a	]-----[	3°	
3b		3b	
2a		2°	
2b		2b	
1a	]-----[	1°	
1b		1b	

* The two pins 10a and 10b must be welded together
NB: In connector 1 weld 1 47 ohm resistance 1/4Watt 1% between pins 9a, 9b, and pins 10a, 10b.

FROR 8x0.5

Cable of FB-CCT3R type
FROR 8x0.5

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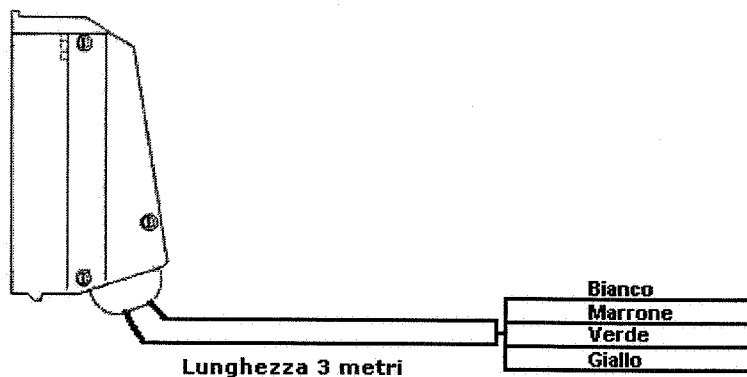
1A2

[Signature]

Cable of FB-CCT4 type

FROR 4x0.5

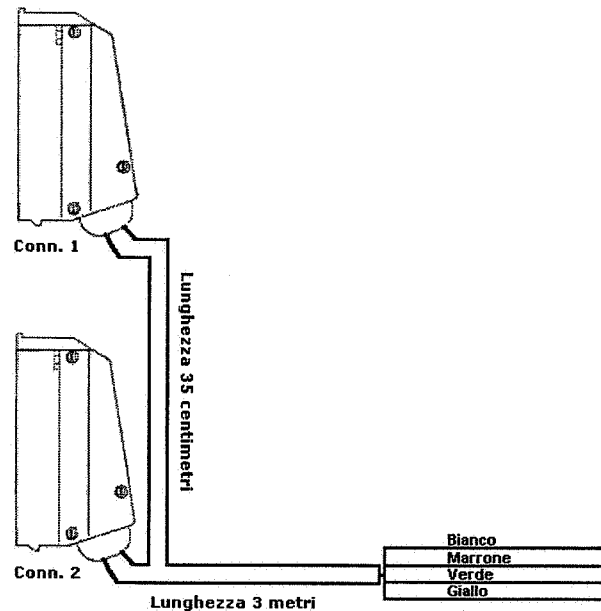
Conn. 1 DIN41618	Cable colour
10a	
10b	
9a	]-white
9b	
8a	]-brown
8b	
7a	]-green
7b	
6a	]-yellow
6b	
5a	
5b	
4a	
4b	
3a	
3b	
2a	
2b	
1a	
1b	



Cable of FB-CCT4R type

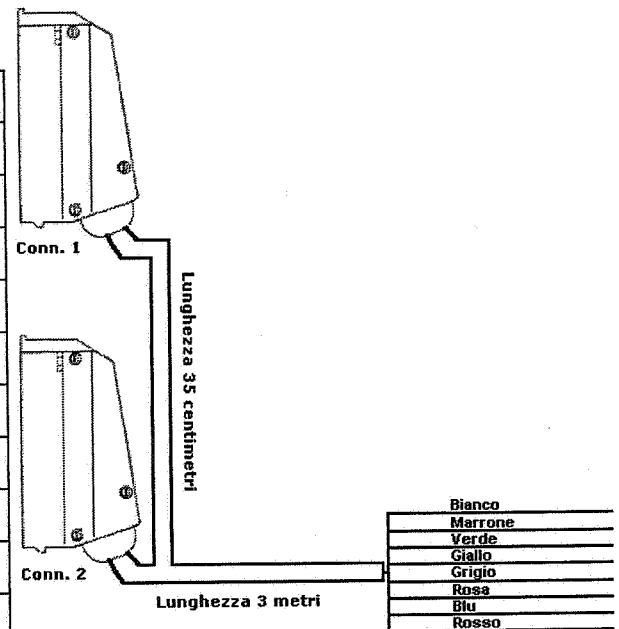
FROR 4x0.5

Conn. 1 DIN41618		Conn. 2 DIN41618	Cable colour
10a		10a	
10b		10b	
9a	]------[	9a	]-white
9b		9b	
8a	]------[	8a	]-brown
8b		8b	
7a	]------[	7a	]-green
7b		7b	
6a	]------[	6a	]-yellow
6b		6b	
5a		5a	
5b		5b	
4a		4a	
4b		4b	
3a		3a	
3b		3b	
2a		2a	
2b		2b	
1a		1a	
1b		1b	



Cable of FB-CCT5R type
FROR 8x0.5

Conn. 1 DIN41618		Conn. 2 DIN41618	Cable colour
10a	]-----[	10a	
10b		10b	
9a	]-----[	9a	]--white
9b		9b	
8a	]-----[	8a	]--brown
8b		8b	
7a	]-----[	7a	]--green
7b		7b	
6a	]-----[	6a	]--yellow
6b		6b	
5a	]-----[	5a	]--Grey
5b		5b	
4a	]-----[	4a	]--pink
4b		4b	
3a	]-----[	3a	]--Blue
E3b		3b	
2a	]-----[	2a	]--Red
2b		2b	
1a		1a	
1b		1b	



* The two pins 10a and 10b must be welded together

NB: In connector 1, weld:

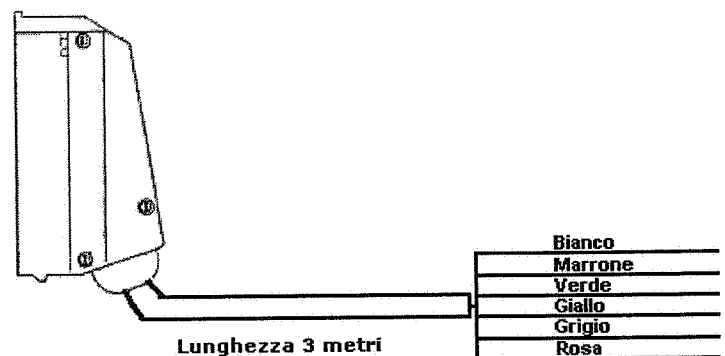
1 47 ohm resistance 1/4Watt 1% between pins 9a, 9b and pins 10a, 10b

1 47 ohm resistance 1/4Watt 1% between pins 7a, 7b and pins 10a, 10b

Cable of FB-CCT6 type

FROH2R 6x0.22

Pin DIN41618	Cable colour
10a	
10b	
9a	]--white
9b	
8a	]--brown
8b	
7a	]--green
7b	
6a	]--yellow
6b	
5a	]--Grey
5b	
4a	]--pink
4b	
3a	
3b	
2a	
2b	
1a	
1b	



INFORMATION TO PLACE AN ORDER

Part Number	DESCRIPTION	notes
FB-CTT1	16x0.22 cable for non redounded modules	Length 2 metres
FB-CTT1R	16x0.22 cable for redounded modules	Length 2 metres
FB-CTT2	4x0.5 cable for non redounded modules	Length 2 metres
FB-CTT2R	4x0.5 cable for redounded modules	Length 2 metres
FB-CTT3	8x0.5 cable for non redounded modules	Length 2 metres
FB-CTT3R	8x0.5 cable for redounded modules	Length 2 metres
FB-CTT4	4x0.5 cable for non redounded modules	Length 2 metres
FB-CTT4R	4x0.5 cable for redounded modules	Length 2 metres
FB-CTT5R	8x0.5 cable for redounded modules	Length 2 metres
FB-CTT6	6x0.5 cable for non redounded modules	Length 2 metres
FB-CFT10/2	10-way flat cable	Length 2 metres
FB-CFT14/2	14-way flat cable	Length 2 metres
FB-CFT20/05	20-way flat cable	Length 5 centimetres
FB-CFT20/2	20-way flat cable	Length 2 metres
FB-CVSC4	8-way RJ cable	Length 19 centimetres
FB-CVSC5	8-way RJ cable	Length 36 centimetres
FB-CVSC12	8-way RJ cable	Length 60 centimetres

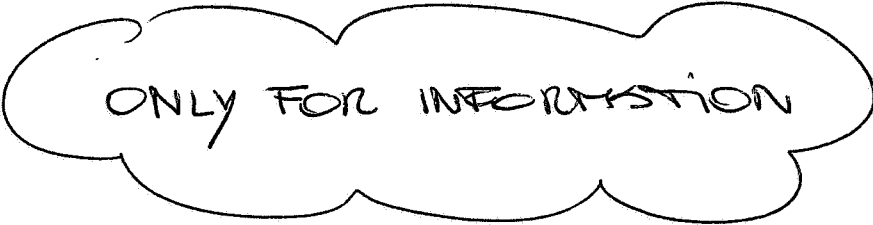
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FB6100 PROGRAMMABLE SYSTEM

Integrated Fire & Gas Detection and Control Panel

COMPONENTS DATA SHEET



ONLY FOR INFORMATION

FB6100-DSC

October 2008 Edition

AR

7/4/2010
JWA

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Important notes

SANCO S.p.A has the objective to continuously improve the characteristics of its products, therefore this manual can be modified without notice. All technical statements and data listed in this manual have been checked very carefully. This does not exclude the possibility that the manual may contain defects or orthographic mistakes. SANCO S.p.A will not be held legally liable for possible consequences caused by mistakes or changes of this manual.

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Index of revisions

Index of revision	Brief Description of the Content	Issuing date
Rev. 0	Preliminary version	30-10-2007
Rev. 1	Version for Certification	21-03-2008



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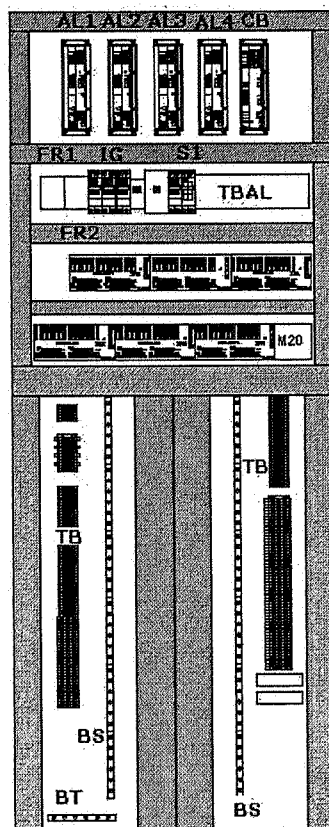
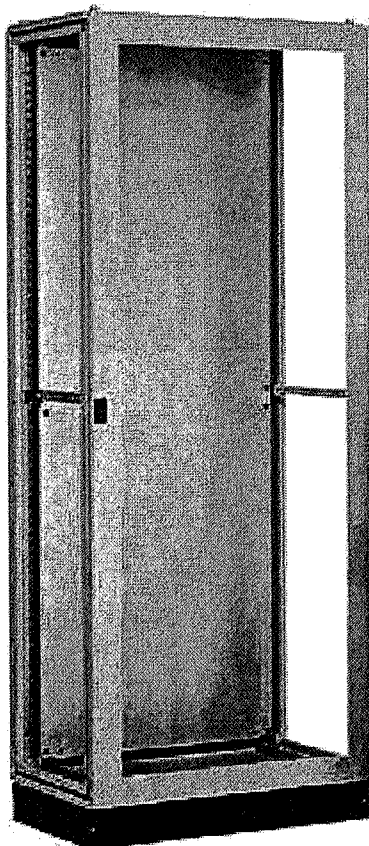
1. Structural work

FEATURES	FB-		
Maximum number of central unit's rack	1		
Maximum number of I/O rack	10		
Rack feeder	YES		
Maximum number of I/O cards	130		
Anchoring type	To Base		
Suction vent	YES		
Maximum output of batteries that can be allocated	2x12V 120A/h		

1.1 FB6100

DESCRIPTION

Complete cabinet made up by a steel sheet structure, thickness 15/10 shaped and welded with internal plate, frame and transparent door in PVC. The structural work is equipped with an air suction vent with an anti-dust filter located on the right side. It is equipped with an internal plate made of sheets of thickness 20/10. It is used with units of FB type.



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WIR

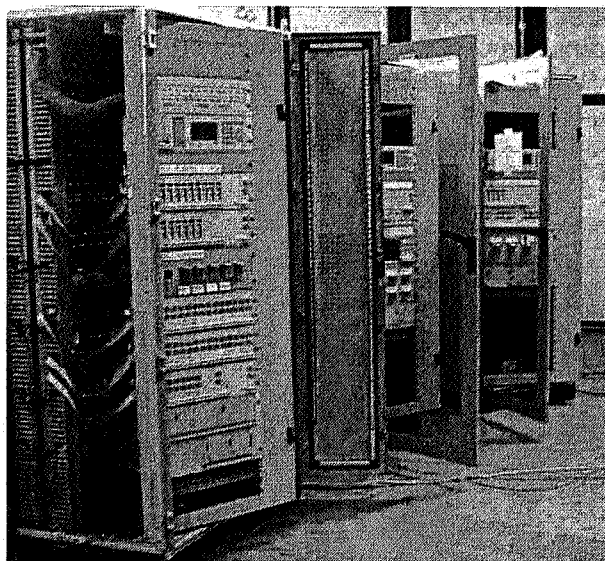
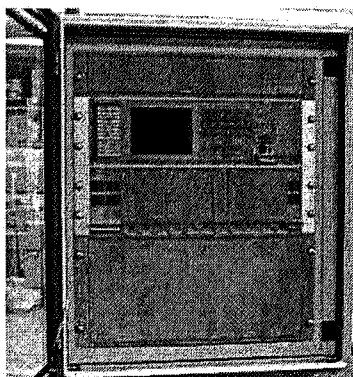
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FEATURES

- | | |
|----------------------|-----------------------|
| ▪ Frame material: | Steel Sheet 15/10 |
| ▪ Colour: | RAL7035 |
| ▪ Protection degree: | IP55 |
| ▪ Anchoring: | To floor |
| ▪ Sizes: | L=800 H=2100 P=800 mm |
| ▪ Model: | Series 3964C |

**A wall modular cabinet having
customized dimensions is also available**



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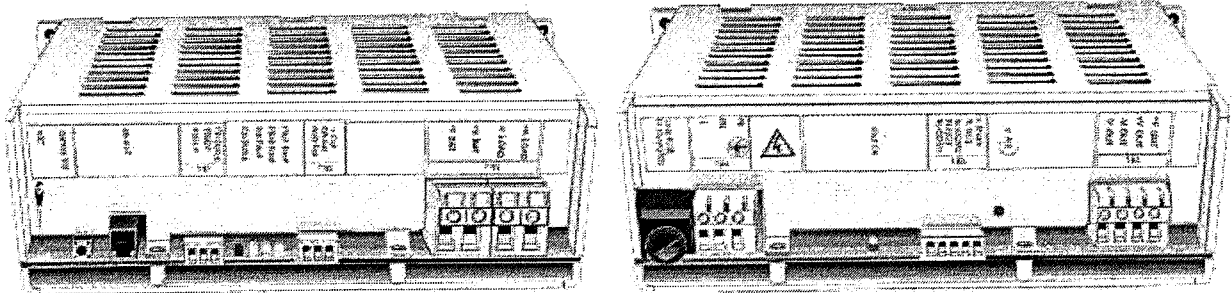
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2. FB-PU0001

DESCRIPTION

It is a feeder group that is secured on the bottom plate. It is made up by maximum four 125 Watt feeders, PU-A0005-1 model, and a battery charging module PU-A0004-1 able to supply a current to charge batteries that can be set to 2 or 4 amper. The feeders are connected to each other in parallel mode up to a maximum of four feeders, for a total of 16 amper. In normal conditions, it performs a brief test every 30 seconds to check the presence of batteries while every hour, it performs a complete test to check the efficiency of batteries and electric connections. During charging, the batteries' voltage is automatically compensated based on the temperature. In case network voltage is lacking, the batteries are automatically commuted on the load without any interruption. If the loading phase does not end within 24 hours, the feeder signals a batteries' failure. In case of absence of primary voltage, the device shuts down the batteries when the voltage on the load is lower than 18Vdc to avoid to damage the same batteries. The group is equipped with three open collector outlets for the repetition of the different types of failure to the detection unit and a RS232 port for connection to a monitoring system.



GENERAL FEATURES

Inlet voltage	110-240V~ (-15% ÷ +10%)
Frequency of inlet voltage	47/63 Hz
Operating temperature	-5 C° ÷ +50 C° in free air
Relative humidity	93% without condensate
Protection degree	IP20

FEEDER'S SECTION

Outlet nominal voltage	25Vdc
Minimum outlet voltage	18,9Vdc
Maximum outlet current	4A/8A/16A
Protections	Line fuse T6.3A H 250V (5x20)

BATTERY LOADING SECTION

Battery voltage	from 26.2 to 28.7 Vdc automatically compensated
Ripple VBAT	< 100mV pK-pK at maximum current
Capacity in case of network's deficit	>=20mS at maximum current (with PU-A0005)
Maximum current of batteries	4A
Protections	Overvoltage short-circuit and battery inversion

REFERENCE STANDARDS

Reference standards	EN54-4
EC Reference standards	EN50081-2 and EN50082-2 (industrial environment)
Safety	EN60950 (CEI-74-2)



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POSSIBLE CONFIGURATIONS

Features	FB-PU001/1	FB-PU001/2	FB-PU001/4
Number of PU-A0005-1 feeders	1	2	4
Supply voltage	110-240V~	110-240V~	110-240V~
Nominal frequency	50-60Hz	50-60Hz	50-60Hz
Maximum inlet current at 110V~	1,6A	3,3A	6,4A
Maximum inlet current at 240V~	0.79 A	1,8 A	3,2A
Minimum outlet voltage (Note-A)	18,9Vdc	18,9Vdc	18,9Vdc
Residual maximum ripple	266mV	704mV	704mV
Maximum resistance of batteries	1,5 Ω	1,5 Ω	1,5 Ω
Maximum outlet current (Note-B)	4A	8A	16A
Maximum current for batteries	2A	4A	4A
Maximum output of batteries	2x12V 26A/h	2x12V 26A/h	2x12V 65A/h



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Technical drawing of the front panel of a 1500W 3-phase power supply unit. The panel includes a large ventilation grille on the left, a central control area with a 'V. OUT' meter, a 'V. ACB' meter, a 'Vout OK' indicator, a lightning bolt warning symbol, a 'PE' terminal, and a 'LINE FLUTE' switch. On the right, there are two sets of terminal blocks for output connections, labeled 'V. OUT', 'V. ACB', and 'V. OUT'.

It is a switching universal feeder able to supply a maximum current of 4A at 25Vdc. It can be used with the battery charger, PU-A0004-1 model to comply with EN54-4 standard. The feeder is equipped with a circuit to share the load which allows to connect more feeders in parallel mode up to maximum four feeders.

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GENERAL FEATURES

Inlet voltage	110-240V~ (-15% ÷ +10%)
Maximum absorbed current at 110V~:	1,6A
Maximum absorbed current at 240V~:	0,79A
Operating temperature	-5 C° ÷ +50 C° in free air
Relative humidity	93% without condensate
Frequency	47/63 Hz
Power factor (W/VA)	0.6 Typical
Output	> 80%
Protection degree	IP20
Sizes	200mm x 110mm x 60mm
Self-extinguishing degree	UL94V2
Insulation between inlet and outlet	>2 Mohm (500Vdc)
Insulation between inlet and mass	>2 Mohm (500Vdc)
Insulation between outlet and mass	>2 Mohm (500Vdc)
Electric rigidity between inlet and outlet	3000 Vac for 1 minute
Dielectric rigidity between inlets and mass	1500 Vac for 1 minute
Dielectric rigidity between outlets and mass	1500 Vac for 1 minute
VLOAD voltage	25Vdc (adjustable from + 23Vdc to +26Vdc)
VLOAD current	4A
Ripple VLOAD	< 266mV pK-pK at maximum current

PROTECTIONS

Line Fuse

PROTECTIONS

T6.3A H 250V (5x20)
Overvoltages short-circuit

REFERENCE STANDARDS

REFERENCE STANDARDS

EC Reference standards

EN54-4
EN50081-2 and EN50082-2
(industrial environment)



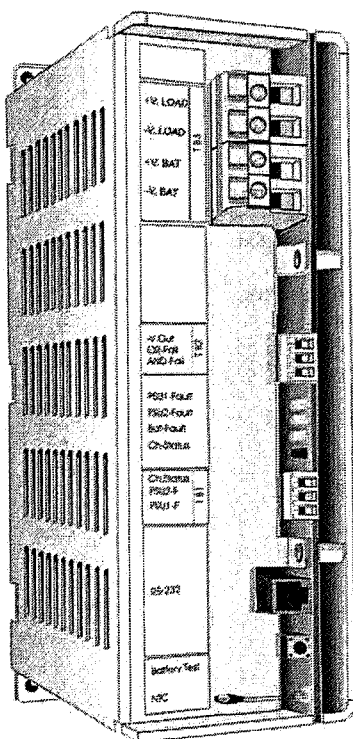
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2.2 FB-PU-A0004-1

DESCRIPTION



It is an uninterruptible power supply group able to control and charge two 12 volt batteries with maximum capacity of 65A/h. The maximum charging current of batteries can be set through a dip-switch onboard of the card. In normal conditions, it performs a brief test every 30 seconds to check the presence of batteries while every hour, it performs a complete test to check the efficiency of batteries and electric connections. During charging, the batteries' voltage is automatically compensated based on the temperature. In case network voltage is lacking, the batteries are automatically commuted on the load without any interruption. If the loading phase does not end within 24 hours, the feeder signals a batteries' failure. In case of absence of primary voltage, the device shuts down the batteries when the voltage on the load is lower than 18Vdc to avoid to damage the same batteries. The group is equipped with three open collector outlets for the repetition of failures to the detection unit, two inlets for monitoring feeders and a RS232 port for connection to a monitoring system. It can be used with one or more feeders, PU-A0005-1 model. In this case, a feeder group is obtained that fully complies with PU-A0005-1 standard.

CONNECTION WITH STATUS OPEN COLLECTOR'S OUTLETS			
Terminal board	Terminal	Name	Function
TB1	M1	PSU1 Fault	Open collector outlet, failure of feeder's section
	M2	PSU2 Fault	Open collector outlet, failure of battery charger's section
	M3	Charge Status	Status outlet of battery charger (enabled in the full charge phase)
CONNECTIONS FOR FEEDERS' STATUS INDICATIONS			
Terminal board	Terminal	Name	Function
TB2	M1	AND-Fail	Inlet no voltage for all feeder units
	M2	OR-Fail	Inlet no voltage for one feeder units
	M3	-Vout	Common inlets M1 and M2
CONNECTIONS TO BATTERIES AND CHARGE			
Terminal board	Terminal	Name	Function
TB3	M1	- V.	Negative electricity to batteries
	M2		Positive electricity to batteries
	M3		Negative electricity for Charging
	M4		Positive electricity for Charging



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GENERAL FEATURES

Inlet voltage	22-28 Vdc
Maximum absorbed current:	4A
Operating temperature	-5 C° ÷ +50 C° in free air
Relative humidity	93% without condensate
Output	> 83%
Protection degree	IP20
Sizes	200mm x 110mm x 60mm
Self-extinguishing degree	UL94V2
Battery voltage	from 26.2 to 28.7 Vdc automatically compensated
Battery current	(1/2/4A) It can be isolated through dip switch
Ripple VBAT	< 100mV pK-pK at maximum current
Capacity in case of network's deficit	>=20mS at maximum current (with PU-A0005)
Maximum resistance of batteries' circuits	1,5 ohm
Maximum output of batteries	65 A/h
Current to batteries	Automatically limited
Current to load	protected by a 20A internal fuse
REFERENCE STANDARDS	EN54-4 EN50081-2 and EN50082-2



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2.3 FB-PU0002

DESCRIPTION

It is a power supply group able to supply a maximum current of 40+40A to the load and control and load two 12 volt batteries with maximum capacity of 120A/h. The maximum current to charge batteries is of 6 amper. In normal conditions, it performs a brief test every 30 seconds to check the presence of batteries while every hour, it performs a complete test to check the efficiency of batteries and electric connections. During charging, the batteries' voltage is automatically compensated based on the temperature. In case network voltage is lacking, the batteries are automatically commuted on the load without any interruption. If the loading phase does not end within 24 hours, the feeder signals a batteries' failure. In case of absence of primary voltage, the device shuts down the batteries when the voltage on the load is lower than 18Vdc to avoid to damage the same batteries. The group is equipped with seven open collector outlets for the repetition of the different types of failure to the detection unit and a RS232 port for connection to a monitoring system. All modules can be substituted under voltage (Hot-Plug)



GENERAL FEATURES

Inlet voltage	110-240V~ (-15% ÷ +10%) / 115-250Vdc
Maximum absorbed current at 110V~:	12A
Maximum absorbed current at 240V~:	6A
Operating temperature	-5 C° ÷ +50 C° in free air
Relative humidity	93% without condensate
Frequency of inlet voltage	50/60 Hz
Power factor (W/VA)	0.6 Typical
Protection degree	IP20
Sizes	483mm x 178mm x 300mm
Self-extinguishing degree	UL94V2
Insulation between inlet and outlet	>2 Mohm (500Vdc)
Insulation between inlet and mass	>2 Mohm (500Vdc)
Insulation between outlet and mass	>2 Mohm (500Vdc)



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FEEDER'S SECTION

VLOAD voltage 25Vdc
VLOAD current 40+40A
Maximum breakaway starting current 25A
Ripple VLOAD < 100mV pK-pK at maximum current
Stability of VLOAD outlet > 1%

BATTERY LOADING SECTION

Battery voltage from 26.2 to 28.7 Vdc automatically compensated
Ripple VBAT < 100mV pK-pK at maximum current
Capacity in case of network's deficit ≥ 20 ms at maximum current
Maximum current of batteries 6A

PROTECTIONS

Line Fuse T10A H 250V (5x20)
PROTECTIONS Overvoltages short-circuits and battery inversion
REFERENCE STANDARDS EN54-4 EN50081-2 EN50082-2 EN60950
(CEI-74-2)

CONFIGURATIONS

Characteristic	FB-PU002/1	FB-PU002/2	FB-PU002/4
Number of PU-A0008-1 feeders	1	2	4
Maximum inlet current	5A at 110V~	10A at 110V~	10A at 110V~
Overall maximum voltage	20A	40A	40A
Maximum voltage for batteries	6A	6A	6A
Maximum voltage on load (Parallel)	14A	34A	ND
Maximum voltage on load (Redounded)	ND	17A+17A	40A+40A
Maximum output of batteries	2x12V 120A/h	2x12V 120A/h	2x12V 120A/h

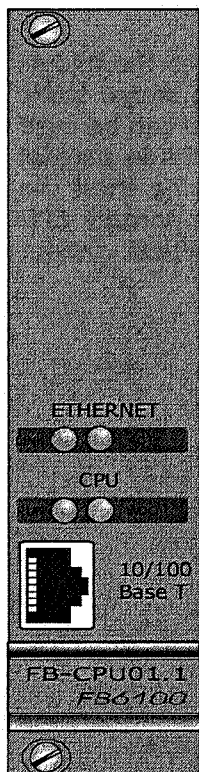


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3. FB-CPU1.1



DESCRIPTION

This card represents the system's central unit. In addition to the micro-controller onboard the card, there are the Flash memory, buffered static Ram, watch dog circuit and Ethernet controller. The CPU card can be used in single and redounded configuration; in this case two CPUs in parallel mode are used. Both CPUs elaborate the information coming from the cards but only one of them performs commands. When the primary CPU stops working, the other continues to perform its activities without interrupting the machine's cycle.

CHARACTERISTICS

- Microcontroller: Renesas H8-2318 at 25Mhz
- RAM memory: 4 Mbit buffered with lithium battery
- FLASH memory: 2 Mbit
- Ethernet outlet: 10/100BaseT with RJ 45 connector
- Watch Dog: external
- Hot Plug: YES
- Redundancy: YES
- Supply voltage: 22-29Vdc
- Absorption in idle status: 70mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Four lights are located at the front of the card which indicate the following statuses:

Light	Mode	Condition
Link	⊗	Presence of Ethernet connection link
	-	Absence of Ethernet connection link
Activity	⊘	Transmission/receipt of data on the Ethernet port
	-	No activity on the Ethernet port
Run	⊗	Blocked CPU
	⊘	Secondary CPU
	-	Blocked CPU
Wdo	-	Operating CPU
	⊗	Blocked CPU
⊘ = flashing ⊗ = steady on; - = light off;		

CONNECTIONS

An 8-pole RJ45 connector is located at the front of the card in order to connect the card to the Ethernet network. Through this port, it is possible to perform connections at a maximum distance of 100 metres by using a cable of category 5.

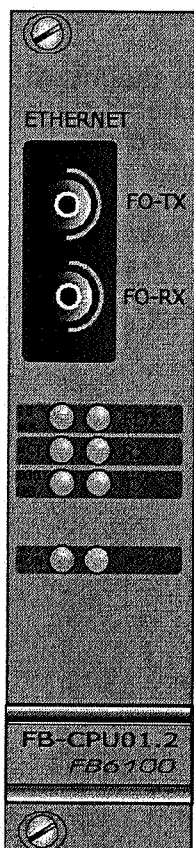


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3.1 FB-CPU1.2



DESCRIPTION

This card represents the system's central unit. In addition to the micro-controller onboard the card, there are the Flash memory, buffered static Ram, watch dog circuit and Ethernet controller. The CPU card can be used in single and redounded configuration; in this case two CPUs in parallel mode are used. Both CPUs elaborate the information coming from the cards but only one of them performs commands. When the primary CPU stops working, the other continues to perform its activities without interrupting the machine's cycle.

CHARACTERISTICS

- Microcontroller: Renesas H8-2318 at 25Mhz
- RAM memory: 4 Mbit buffered with lithium battery
- FLASH memory: 2 Mbit
- Ethernet outlet: 100BaseFX with ST connection
- Watch Dog: external
- Hot Plug: YES
- Redundancy: YES
- Supply voltage: 22-29Vdc
- Absorption in idle status: 100mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

SIGNALS

Eight lights are located at the front of the card which indicate the following statuses:

Light	Mode	Condition
10 MB	⊗	10Mbits Ethernet connection
100 MB	⊗	100Mbits Ethernet connection
FDX	⊗	Ethernet connection of full duplex type
Activity	⊗	Transmission/receipt of data on the Ethernet port
RX	⊗	Receipt of data on the Ethernet port
TX	⊗	Transmission of data on the Ethernet port
Run	⊗	Blocked CPU
	⊗	Secondary CPU
Wdo	-	Blocked CPU
	-	Operating CPU
	⊗	Blocked CPU
=flashing = steady on; - = light off;		

CONNECTIONS

A connector for optical fibre with ST connection is located at the front of the card in order to connect the card to the Ethernet network. Through this port, it is possible to perform connections at a maximum distance of 200 metres by using a multimodal optical fibre.



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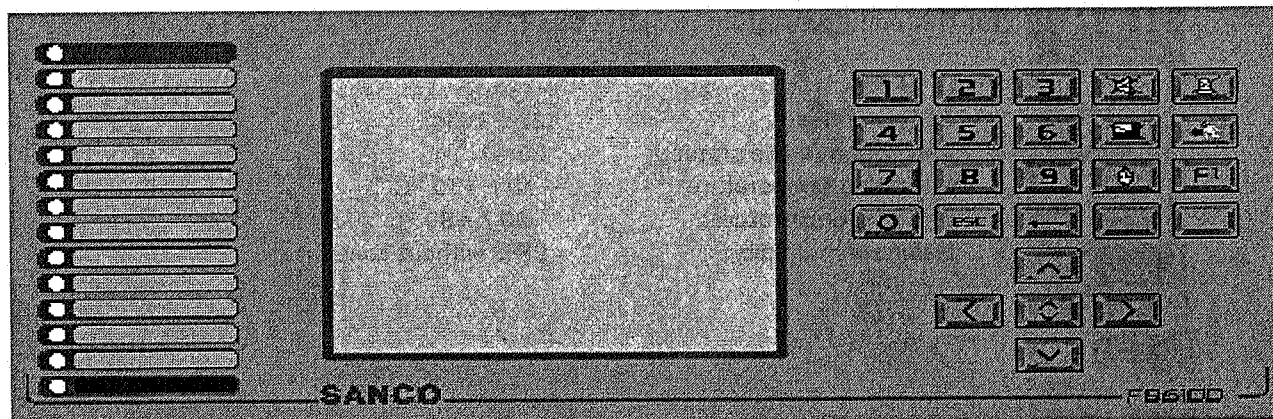
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3.2 FB-FP001

DESCRIPTION

The display card performs the function of interface between the unit and the operator. It is made up by a back-lit graphic display made up by 30 rows of 52 characters, 19 lights, 23 keys and a Buzzer.



FEATURES

- Supply voltage: 22-29Vdc
- Absorption in idle status: 70mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate
- LCD resolution: 320 x 128 pixel
- Back-light: of led type

SIGNALS

14 lights are located on the front panel that performs the following functions:

1.1 Light	Mode	Condition
	Ø	Not recognized alarm status
	⊗	Recognized alarm status
Common Fault	Ø	General anomaly status
Sounders Fault	Ø	Anomaly to alarm siren
PSU1 Fault	Ø	Anomaly to primary power supply
PSU2 Fault	Ø	Anomaly to secondary power supply
Earth Fault	Ø	Dispersion towards the ground
System Fault	Ø	System's anomaly
Test Zone	Ø	Zone testing in progress
Common Disabled	⊗	General disabling status
Devices Disabled	⊗	Disabled sensor/actuator
Sounders Disabled	⊗	Disabled alarm siren
Output Delayed	⊗	Enabling of delay timing in progress
Power On	⊗	Presence of primary voltage

Ø = Flashing ⊗ = steady on;



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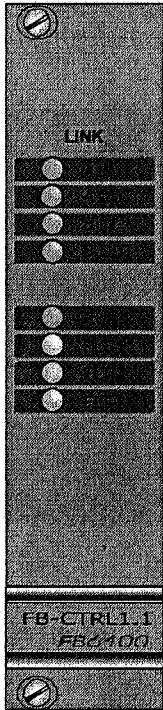
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SANCO

Fire Protection and Safety Technology

4. FB-CTRL1.1



DESCRIPTION

This card performs the function of rack controller. It allows to exchange information between the CPUs and the cards inside the rack. It manages 13 point-to-point links with the cards inside the rack and two links of loop type for the communication with the two CPUs.

FEATURES

- Supply voltage: 22-29Vdc
- Absorption in idle status: 20mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

VISUAL SIGNALS

Eight lights are located on the front panel that perform the following functions:

Light	Condition
Link A-IN	Steady-on when the inlet LINK CPU-0 of loop type is present
Link A-OUT	Steady-on when the outlet LINK CPU-0 of loop type is present
Link B-IN	Steady-on when the inlet LINK CPU-1 of loop type is present
Link B-OUT	Steady-on when the outlet LINK CPU-1 of loop type is present
Run	It flashes during functioning
FLT1	It is steady-on in the presence of a local interrupt
FLT2	It is steady-on in the presence of an interrupt on the CPU-A loop
FLT3	It is steady-on in the presence of an interrupt on the CPU-B loop

CONFIGURATION

The card's configuration takes place through a 4-way dip switch which sets the number of racks from 1 to 10 according to the following table:

SW1-1	SW1-2	SW1-3	SW1-4	Rack no.
OFF	OFF	OFF	OFF	1
ON	OFF	OFF	OFF	2
OFF	ON	OFF	OFF	3
ON	ON	OFF	OFF	4
OFF	OFF	ON	OFF	5
ON	OFF	ON	OFF	6
OFF	ON	ON	OFF	7
ON	ON	ON	OFF	8
OFF	OFF	OFF	ON	9
ON	OFF	OFF	ON	10

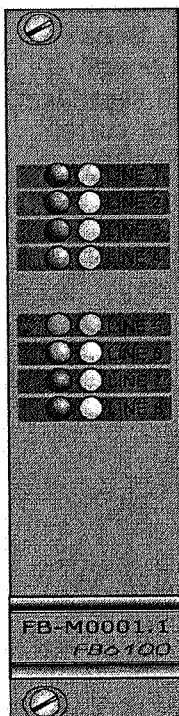


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Fire Protection and Safety Technology

5. FB-M0001.1



DESCRIPTION

Card with eight balanced inlets for sensors of conventional type with safety related functions. All channels can be reset singularly and they are reset during operation every 30 seconds. This card is suitable to manage detection systems with conventional lines; it is particularly suitable to be used in systems with already existing detection lines, to command automatic extinguishing systems with double consent logics or intrinsic safety systems. It is also used to control all typical devices of extinguishing systems (pressure gauges, discharge keys, etc)

FEATURES

- | | |
|-----------------------------------|--|
| ▪ Operating mode: | Safety or Security |
| ▪ Redundancy: | FB-M0001.1-2 model |
| ▪ alarm threshold: | 2 programmable thresholds
on 255 levels |
| ▪ Test of channels: | performed every 30 seconds |
| ▪ Operating modes: | configurable through software. |
| ▪ S.I. barriers that can be used: | uZ680+ by Pepperl & Fuchs |
| ▪ Supply voltage: | 22-29Vdc |
| ▪ Absorption in idle status: | 18mA |
| ▪ Operating temperature: | -10 / +50 °C |
| ▪ Storage temperature: | -30 / +80 °C |
| ▪ Maximum humidity: | 95% without condensate |



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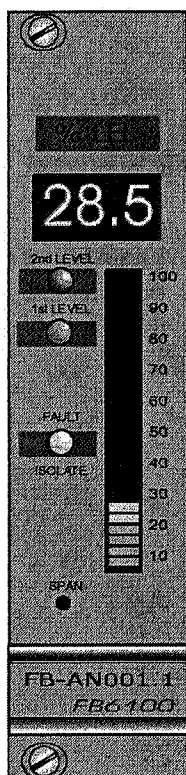
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SANCO

Fire Protection and Safety Technology

5.1 FB-AN001.1



DESCRIPTION

Card with a safety related 4-20mA analogue inlet with two thresholds that can be set on the card through the operator's cycle. The following types of transducers can be connected to this card: Explosivity Sensors, Toxicity Sensors, Oxygen Sensors, Temperature Sensors, General 4-20mA sensors. The channel is tested during operation every 30 seconds. The card is equipped with a 4-20mA outlet that supplies the current value measured at the inlet. The analogue value can be transferred to a DCS through a RTU Modbus module, FB-MOD001.1-1 model. The refreshing time of the analogue value is of 30 seconds.

FEATURES

- | | |
|-------------------------------------|--------------------------------|
| ▪ Redundancy: | FB-AN001.1-2 model |
| ▪ alarm thresholds: | 2 programmable thresholds |
| ▪ Test of channel: | performed every 30 seconds |
| ▪ Operating modes: | configurable through software. |
| ▪ Measurement range | 0-24mA |
| ▪ Short circuit status on the line: | with current >23.5mA |
| ▪ Supply voltage: | 22-29Vdc |
| ▪ Absorption in idle status: | 35mA |
| ▪ Operating temperature: | -10 / +50 °C |
| ▪ Storage temperature: | -30 / +80 °C |
| ▪ Maximum humidity: | 95% without condensate |



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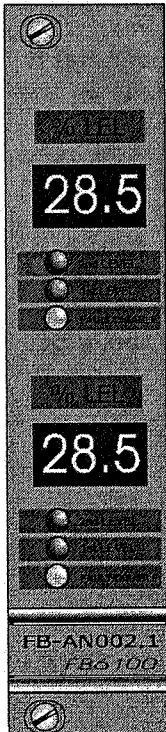
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Fire Protection and Safety Technology

5.2 FB-AN002.1



DESCRIPTION

Card with two safety related 4-20mA analogue inlets with two thresholds that can be set on the card through the operator's cycle. The following types of transducers can be connected to this card: Explosivity Sensors, Toxicity Sensors, Oxygen Sensors, Temperature Sensors, General 4-20mA sensors. The channel is tested during operation every 30 seconds. The card is equipped with a 4-20mA outlet that supplies the current value measured at the inlet.

FEATURES

- | | |
|-------------------------------------|--------------------------------|
| ▪ Redundancy: | model |
| ▪ alarm thresholds: | 2 that can be programmed |
| ▪ Test of channels: | performed every 30 seconds |
| ▪ Operating modes: | configurable through software. |
| ▪ Measurement range | 0-24mA |
| ▪ Short circuit status on the line: | with current >23.5mA |
| ▪ Supply voltage: | 22-29Vdc |
| ▪ Absorption in idle status: | 45mA |
| ▪ Operating temperature: | -10 / +50 °C |
| ▪ Storage temperature: | -30 / +80 °C |
| ▪ Maximum humidity: | 95% without condensate |

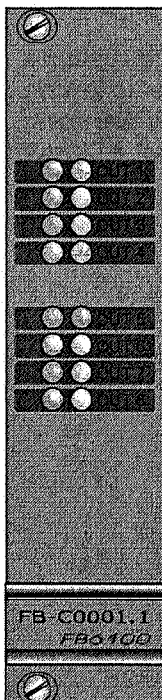


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Fire Protection and Safety Technology

5.3 FB-C0001.1



DESCRIPTION

Card with eight controlled outlet channels of 500mA for the command of solenoids with safety related functions. The card performs the test on the single channels cyclically, inverting the signal on the outlet for about 200 micro-seconds. In case of discrepancy between the set signal and the read signal, the unit promptly warns about the failure condition. The following situations are checked for each single outlet: line opening, short circuit towards positive pole, short circuit towards negative pole, failure of piloting DMOS device, over-temperature of piloting DMOS device, power voltage outside the limits allowed. All channels are tested during operation every 2 seconds. It is possible to connect more channels in parallel mode to increase the outgoing current.

FEATURES

- | | |
|-----------------------------------|--------------------------------|
| ▪ Redundancy: | FB-C0001.1-2 model |
| ▪ Test of channels: | performed every 2 seconds |
| ▪ Operating modes: | configurable through software. |
| ▪ Maximum current of outlets | 500mA |
| ▪ Automatic protection of outlets | YES |
| ▪ Supply voltage: | 22-29Vdc |
| ▪ Absorption in idle status: | 35mA |
| ▪ Operating temperature: | -10 / +50 °C |
| ▪ Storage temperature: | -30 / +80 °C |
| ▪ Maximum humidity: | 95% without condensate |

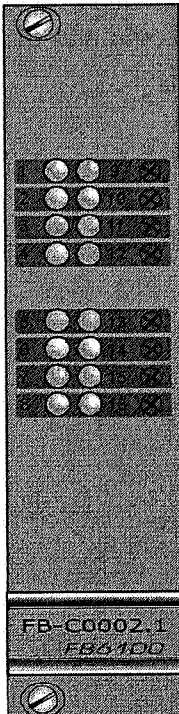


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Fire Protection and Safety Technology

5.4 FB-C0002.1



DESCRIPTION

Card with sixteen open collector, non controlled outlet channels of 250mA. This card is mainly used to pilot the 16-relay card FB-TB007.1.

FEATURES

- | | |
|------------------------------------|--------------------------------|
| ▪ Redundancy: | NO |
| ▪ Test of channels: | NO |
| ▪ Operating modes: | configurable through software. |
| ▪ Maximum current of outlets | 250mA |
| ▪ Protection protection of outlets | NO |
| ▪ Supply voltage: | 22-29Vdc |
| ▪ Absorption in idle status: | 12mA |
| ▪ Operating temperature: | -10 / +50 °C |
| ▪ Storage temperature: | -30 / +80 °C |
| ▪ Maximum humidity: | 95% without condensate |

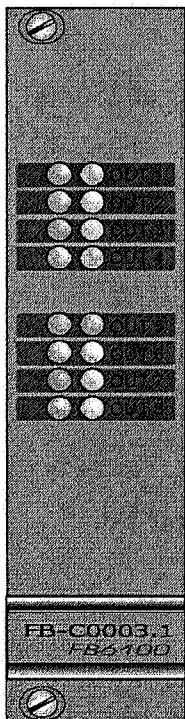


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Fire Protection and Safety Technology

5.5 FB-C0003.1



DESCRIPTION

Card with eight controlled outlet channels of 500mA for the command of sirens. The outlets' command takes place through two virtual commands to pilot the outlets in a steady and intermittent mode. The line is monitored through the inversion of polarities.

FEATURES

- | | |
|------------------------------------|--------------------------------|
| ▪ Redundancy: | NO |
| ▪ Test of channels: | NO |
| ▪ Operating modes: | configurable through software. |
| ▪ Maximum current of outlets | 500mA |
| ▪ Protection protection of outlets | YES |
| ▪ Supply voltage: | 22-29Vdc |
| ▪ Absorption in idle status: | 25mA |
| ▪ Operating temperature: | -10 / +50 °C |
| ▪ Storage temperature: | -30 / +80 °C |
| ▪ Maximum humidity: | 95% without condensate |



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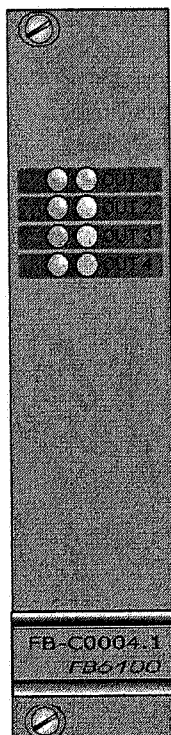
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5.6 FB-C0004.1



DESCRIPTION

Card with 4 controlled outlet channels of 20A for the command of solenoids with safety related functions. The card performs the test on the single channels cyclically, inverting the signal on the outlet for about 200 micro-seconds. In case of discrepancy between the set signal and the read signal, the unit promptly warns about the failure condition. The following situations are checked for each single outlet: line opening, short circuit towards positive pole, short circuit towards negative pole, failure of piloting DMOS device, over-temperature of piloting DMOS device, power voltage outside the limits allowed. All channels are tested during operation every 2 seconds. It is possible to connect more channels in parallel mode to increase the outgoing current.

FEATURES

- | | |
|------------------------------------|--------------------------------|
| ▪ Redundancy: | FB-C0004.1-2 model |
| ▪ Test of channels: | performed every 2 seconds |
| ▪ Operating modes: | configurable through software. |
| ▪ Maximum current of outlets | 2A |
| ▪ Protection protection of outlets | YES |
| ▪ Supply voltage: | 22-29Vdc |
| ▪ Absorption in idle status: | 35mA |
| ▪ Operating temperature: | -10 / +50 °C |
| ▪ Storage temperature: | -30 / +80 °C |
| ▪ Maximum humidity: | 95% without condensate |



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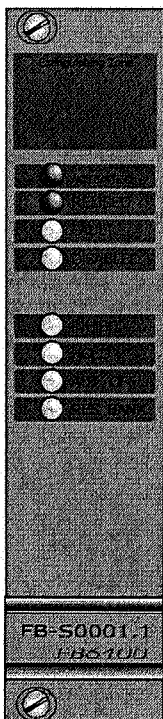
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Fire Protection and Safety Technology

5.7 FB-S0001.1



DESCRIPTION

This card is used to manage logics and signals relative to an extinguishing area in order to meet the requirements of EN12094-1 standard. It manages ten outlet variables and four inlet variables. In addition to warnings, it also performs some logics which are typical of extinguishing systems, as discharge delay and resetting inhibition time. It is also equipped with eight non programmable open collector outlets which indicate the main statuses of the extinguishing area.

FEATURES

- | | |
|------------------------------------|--------------------------------|
| ▪ Redundancy: | NO |
| ▪ Test of channels: | NO |
| ▪ Operating modes: | configurable through software. |
| ▪ Maximum current of outlets | 250mA |
| ▪ Protection protection of outlets | NO |
| ▪ Supply voltage: | 22-29Vdc |
| ▪ Absorption in idle status: | 12mA |
| ▪ Operating temperature: | -10 / +50 °C |
| ▪ Storage temperature: | -30 / +80 °C |
| ▪ Maximum humidity: | 95% without condensate |

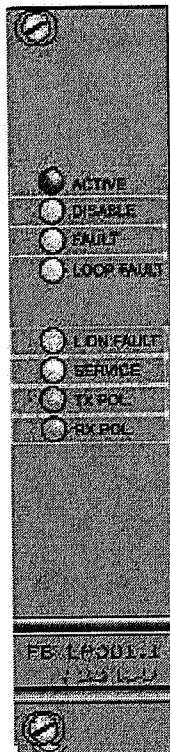


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Fire Protection and Safety Technology

5.8 FB-LP001.1



DESCRIPTION

Control card for devices addressed with ESP protocol. It manages up to 127 devices of max. 3 points each.

FEATURES

- Redundancy: NO
- Operating modes: configurable through software.
- No. of devices for each loop 127
- Maximum loop's current 250mA
- Supply voltage: 22-29Vdc
- Absorption in idle status: 65mA
- Operating temperature: -10 / +50 °C
- Storage temperature: -30 / +80 °C
- Maximum humidity: 95% without condensate

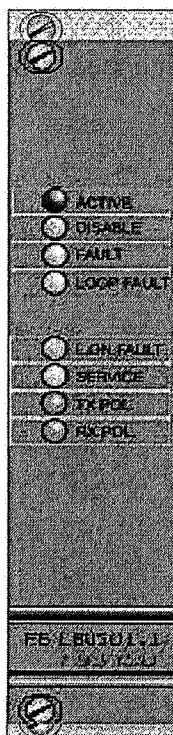


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SANCO

Fire Protection and Safety Technology

5.9 LP002.1



DESCRIPTION

Control card for devices addressed with SSP protocol. It manages up to 127 devices.

FEATURES

- | | |
|--------------------------------|--------------------------------|
| ▪ Redundancy: | NO |
| ▪ Operating modes: | configurable through software. |
| ▪ No. of devices for each loop | 127 |
| ▪ Maximum loop's current | 250mA |
| ▪ Supply voltage: | 22-29Vdc |
| ▪ Absorption in idle status: | 65mA |
| ▪ Operating temperature: | -10 / +50 °C |
| ▪ Storage temperature: | -30 / +80 °C |
| ▪ Maximum humidity: | 95% without condensate |

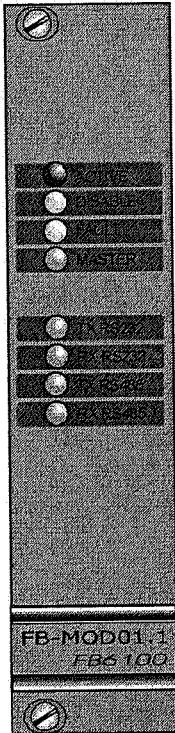


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5.10 FB-MOD001.1



DESCRIPTION

Communication card with RTU Master/slave Modbus protocol. Its outlet supplies two independent connections, a RS485 Half Duplex and a RS232. It manages the following modbus variables:

512 inlet variables (32 16-bit words)

512 outlet variables (32 16-bit words)

130 16-bit analogue variables.

The analogue variables boast the engineered values relative to 4-20 mA cards, of FB-AN001.1 type.

FEATURES

▪ Redundancy:	NO
▪ Operating modes:	configurable through software.
▪ No. of devices for each loop	127
▪ Maximum loop's current	250mA
▪ Supply voltage:	22-29Vdc
▪ Absorption in idle status:	16mA
▪ Operating temperature:	-10 / +50 °C
▪ Storage temperature:	-30 / +80 °C
▪ Maximum humidity:	95% without condensate



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SANCO

SISTEMI
ANTINCENDIO
COSTRUZIONI

CONTROL PANEL
FB -6100

CONTROL PANEL

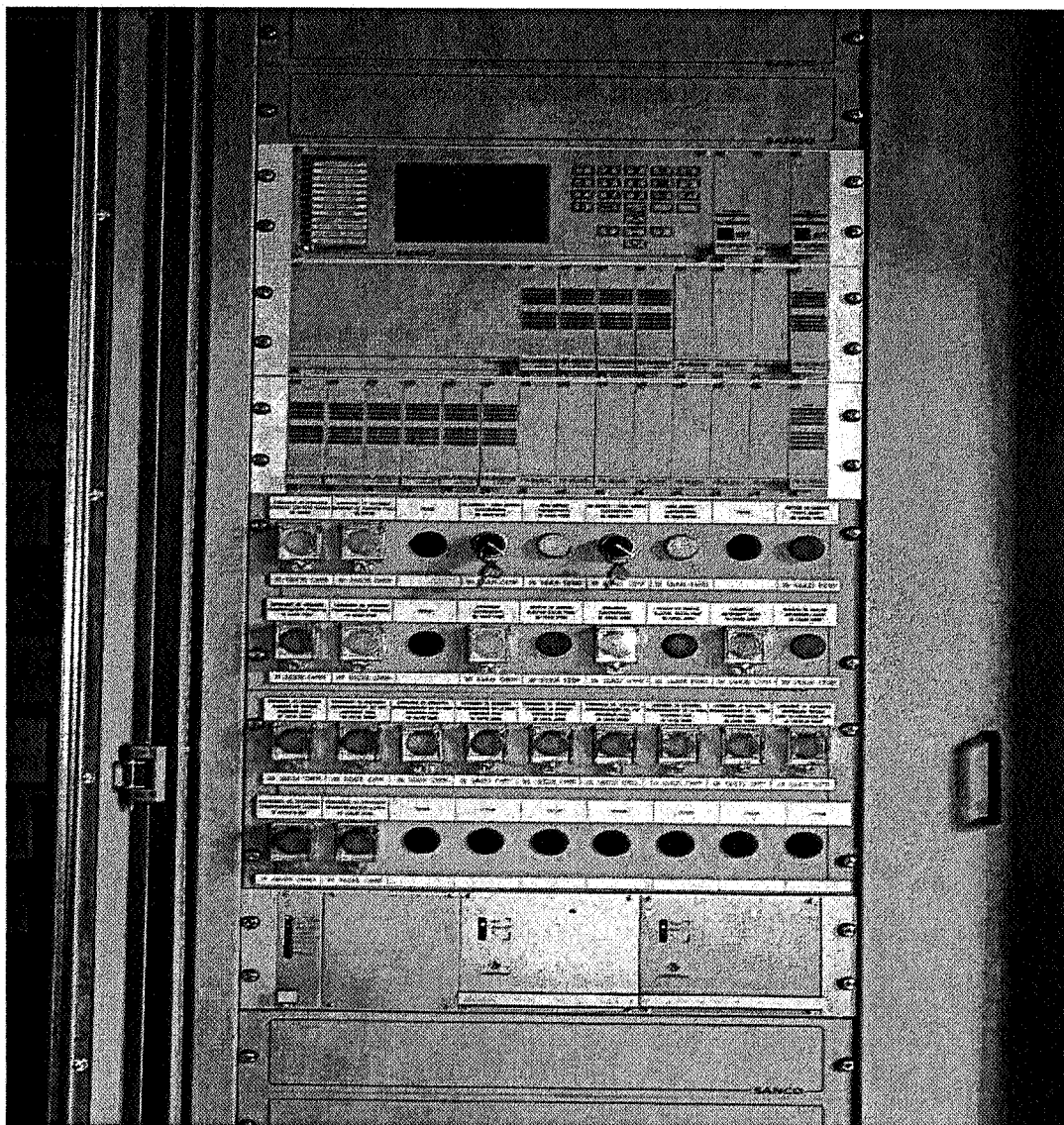
FB - 6100

ONLY FOR INFORMATION



Main characteristics:

- CPU redundance with hot Back-up.
- Hot swap of all I/O cards.
- Serial communication completely programmable
- Multi-lingual operating software
- Supervision system realised with active graphic maps.
- Program flexibility to control addressable and conventional sensors/modules.



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SANCO FB-6100 is a multi-functional control panel designed for the fire fighting protection in any application field.

It has a modular 19" rack structure and it has a single or double redundant CPU with hot swap back-up function. Actually it is possible to substitute a CPU card without having to execute the system shut-down, it is also implemented the PnP function in case the substitute card is a CPU without software program.

The most important characteristic of the FB-6100 is the possibility to guarantee a total redundancy not only for the CPU cards but also for all the I/O of the system and of the feeding groups, with the hot-swap function of all the relevant components.

FB-6100 can be interfaced with a huge range of equipment, such characteristic makes it the best solution for the revamping of existing systems and above all it provides a wide potential for new installations.

FB-6100 controls addressable and conventional systems relevant to the fire, smoke, gas and flame detection and the control and command of water, CO₂, inert gases, foam and powder extinguishing systems.

FB-6100 operating software allows the realisation of very complicated intervention algorithms, this characteristic together with the new technology which uses connectors for the I/O links allows FB-6100 to manage system having important dimensions and particular logics in small dimensions cabinets.

FB-6100 has a big display with multi-function keyboard which guarantee a perfect communication between the system and the operator and by means a password protected access it is possible to supervise all the systems and visualise an historical events log updated in real time by the CPU

FB-6100 communicate towards the other systems by means of serial signals MODBUS, ETHERNET single or redundant, it can be connected to a printer for the report of all the events and it is also possible to realise a communication BUS for local alphanumeric displays to be installed locally.

Moreover, FB-6100 is provided with a supervision system realised with electronic graphic maps, this technology allows the operator to manage all the system very simply by means of a graphic visualisation. There can be several stations provided with the supervision system and and they can be connected to several FB-6100.

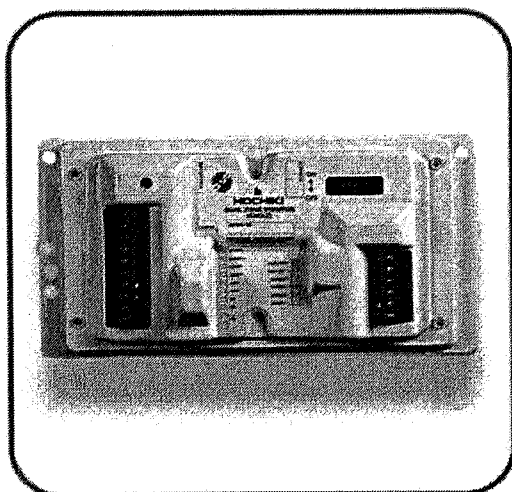
SANCO leader in the mechanical field present FB-6100 the fire fighting control panel with unique characteristics which makes it unique in the market.



Certified:
EN54-2,
EN54-4,
CEI 79-2
EN12094-1

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Analogue Dual Zone Monitor **CHQ-Z**



Features

- ▶ Single Loop Address
- ▶ Requires an auxiliary 24Vdc Supply
- ▶ Supports Two Independent Zones of Conventional Detectors
- ▶ Both Zones Fully Monitored for Short/Open Circuit
- ▶ Approved to EFSG for line units

Description

Model CHQ-Z is a Dual Circuit Zone Controller designed to allow up to 60 conventional detectors (30 on each zone) to be interfaced to Hochiki's ESP analogue addressable system.

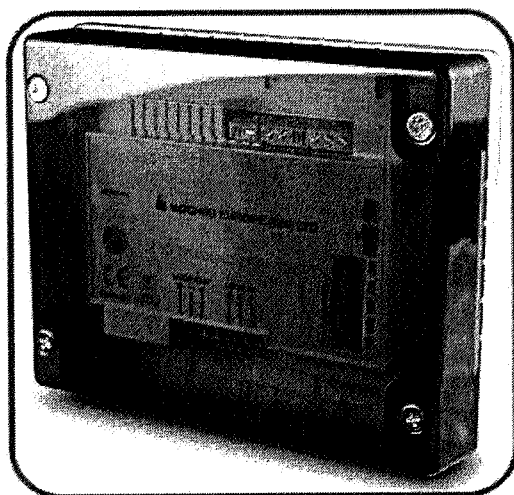
Full monitoring against malfunction or disconnection, together with a self-test feature through the ESP protocol, ensure the integrity of the CHQ-Z at all times. The CHQ-Z utilises simple DIL switches for reliable addressing. It is available as an OEM version (as illustrated above) with an optional IP67 rated enclosure also available.

The conventional zone on the CHQ-Z does not support any line continuity options, therefore if Call Points are being interfaced they should be wired at the beginning of the zone.

Specification	
Ordering Code	CHQ-Z/OEM (without box as shown)
Operating Voltage	17 - 41Vd.c.
Low Power Mode (typ)	110µA
Quiescent Current (typ)	300µA
Current Consumption (External)	(Quiescent) 800µA
	(Alarm) 70mA (both zones in fire)
Capacitance on Zone	0.3µF Max
Resistance on Zone	50Ω Max
Operating Temperature Range	-10°C to +50°C
Storage Temperature Range	-30°C to +60°C
E.O.L Device	TE-RH-E
Open Collector Output Rating	30Vdc 30mA
Quantity per Zone	DFE - no limit
	SLR, SIJ, DCD - 30 max
Weight (g) / Dimensions (mm)	(OEM) 118 / L187 x H92 x D30
	(OEM with box) 673 / L235 x W160 x H92
Approval	LPCB

titolo / title Addressable Output module - mod. CHQ-DSC SCI	documento n° / document no PRELIMINARY	fig / sh 1	di / of 1
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Analogue Dual Sounder Controller *CHQ-DSC*



Features

- ▶ Single Loop Address
- ▶ Each Alarm Circuit Fused at 1 amp
- ▶ Two Independent Sounder Circuits, each Fully Monitored for Open and Short Circuit Faults
- ▶ Auxiliary Monitored Input
- ▶ Outputs can be Driven Continuously or Synchronised Pulsed Sounder Drive
- ▶ "Smart-Fix" Housing System for flexibility
- ▶ Available as DIN-Rail version
- ▶ Both versions available with or without integral SCI

Description

Model CHQ-DSC is a Dual Sounder Controller, which has been designed to provide two sounder outputs (that can be driven separately) with full fault monitoring. The monitored input can be used for local power supply fault monitoring or as a general-purpose input. The unit utilises simple DIL switches for reliable addressing. A back box is also available (CHQ-BACKBOX) which, when used in conjunction with the CHQ-DSC, increases the IP rating to IP65.

Specification

Order codes *1			CHQ-DSC (module) CHQ-DSC(SCI) (module with SCI) CHQ-DSC/DIN (DIN module) CHQ-DSC/DIN(SCI) (DIN module with SCI)
Operating voltage			17 - 41 Vd.c.
Low power mode			200µA*2
Quiescent current (typ)*3			290µA*2
Current consumption			22mA ± 20 % (polling)
Current in short-circuit			8mA (CHQ-DSC/DIN(SCI))
Maximum short-circuit current (Loop)			1A (CHQ-DSC/DIN(SCI))
External supply voltage			20-28.8 Vd.c. (24Vd.d. nominal)
Current consumption (per Bell circuit)			Sounder On - 8 mA, Sounder Fault - 6 mA
Sounder output current			1A/line (max) fused @ 1.25A
Sounder line capacitance			0.3µF/line max/line
Sounder E.O.L resistor			1kΩ, ±5%, 2W
Input E.O.L resistor			10kΩ, ±5%, 0.25W
Input threshold levels			ON=470Ω, short cct< 50Ω, open cct>100KΩ,
Weights & Dimensions	CHQ-DSC	354g	L=157mm x W=127mm x D=35mm (Module plus Lid) D=79mm (CHQ Module plus Lid plus CHQ-BACKBOX) (add 235g to module weight when using CHQ-BACKBOX)
	CHQ-DSC(SCI)	360g	
	CHQ-DSC/DIN	140g	L=119mm x W=108mm x D=24mm
	CHQ-DSC/DIN(SCI)	145g	
Colour and enclosure material			CHQ Module & CHQ-BACKBOX White ABS, DIN Module Green ABS, Module Lid Semi-Opaque Black ABS as standard, white version available (CHQ-LID(WHT))

*1 Fire alarm control panel compatibility required for these products. *2 SCI versions will take additional current (50µA).

*3 Add 200µA per Active Sounder Line.

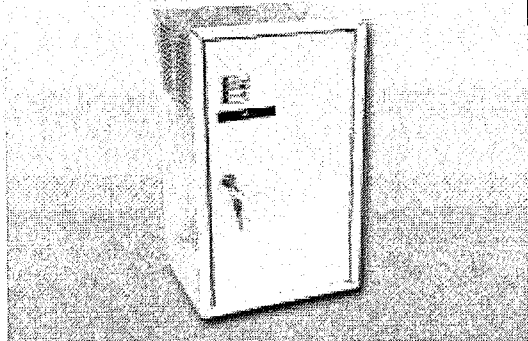
CHQ

titolo / title
24 V/DC power supply/w battery - mod. 82450 SBG

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SERIES 82000 SB



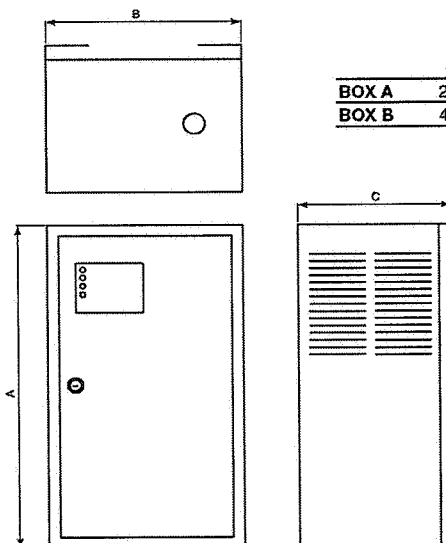
Metallic box switching power supply unit 27,6V DC

- Switching technology
- Output voltage 27,6V DC
- High efficiency
- Small or big metallic box
- Lead battery charging
- Output currents available:
1,5 A, 2,5 A, 5A
- According to EN 54-4

High quality switching power supply unit with 27,6V DC and current from 1.5A to 5A. Thanks to switching technology, it has maximum reliability and reduce at the least heating dissipation. High protection degree: overload, polarity inversion and short circuit. 4 leds indicate power supply status: mains power (green), battery recharging (green), battery discharged (red), fault (red). All leds are visible and intelligible thanks to printed door. It is suitable for medium systems that need an additional power supply. The most common use is supplying into fire system signalling panels, electromagnet door holders, bells with higher consumption than central unit capacity. For big systems, their use cancels long cable section, simplifying installation. Box has a mechanical key lock for opening or closing door.

GENERAL SPECIFICATIONS

Box material	Epoxy painting plate
Connection type	Terminal
Power supply	230V AC -15+10%, 50÷60 Hz
Lines	Voltage input, battery output, load output, open collector output for remote signals, general alarm output by relay contacts, opening door alarm
Electric protection	Earth and battery fuses, overload, short circuit, polarity battery inversion, opening box tamper
Operating temperature	+5°C÷+40°C
Insulation class	Class I
Ingress protection	IP 30
Standard equipment	2 keys for lock
Packaging	1 pcs. / package

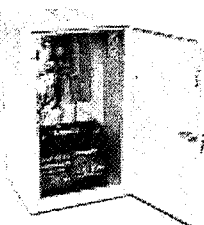


	A	B	C
BOX A	290	250	180
BOX B	450	260	205

ORDER CODES

Code	Nominal power	Output current	Output voltage	Qty and compatible battery type	Package weight	Notes
82415 SBP	42 W	1,5 A	27,6V DC	2 x 12V 3A Lead Gel	4,1 kg	Box A (battery not supplied)
82415 SBG	42 W	1,5 A	27,6V DC	2 x 12V 3A Lead Gel	6,2 kg	Box B (battery not supplied)
82425 SBG	70 W	2,5 A	27,6V DC	2 x 12V 7A Lead Gel	6,5 kg	Box B (battery not supplied)
82450 SBG	140 W	5 A	27,6V DC	2 x 12V 17A Lead Gel	6,7 kg	Box B (battery not supplied)

Open power supply unit
(note battery not supplied).



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CAJZ

SANCO S.p.A. FIRE PROTECTION AND SAFETY TECHNOLOGY

TITOLO / TITLE

UGELLI RD ½ E RD ¾ PER CO₂, ARGON, AZOTO
NOZZLES RD ½ AND RD ¾ FOR CO₂, ARGON, NITROGEN

DOCUMENTO No / DOCUMENT No

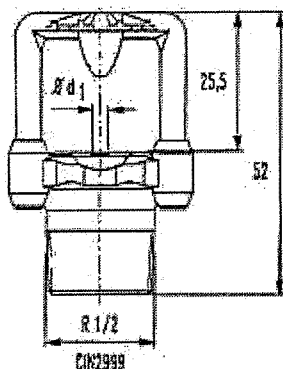
SA-006830-DS-A4

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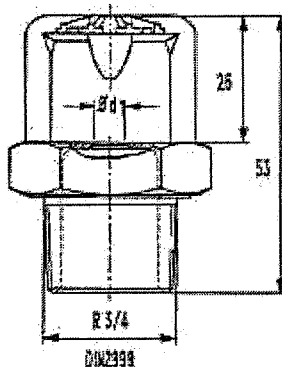
Ugelli RD ½ e RD ¾

dimensioni in mm; peso in kg/pc



Nozzle RD ½ and RD ¾

dimensions in mm; weight in kg/pc



Düse Nozzle RD	Art.-Nr. Orden no.	Ød ₁	A Ideell/imaginary [mm ²]	Gewicht Weight	BA Source
½x 3,0	18 6004	3,0	5	0,07	LG/stock
½x 3,7	18 6028	3,7	8		
½x 4,6	18 6041	4,6	12,5		
½x 5,2	18 6053	5,2	16		
½x 6,6	18 6077	6,6	25		
½x 7,4	18 6099	7,4	31,5		
½x 8,3	18 6107	8,3	40		
½x 9,2	18 6090	9,2	50		
½x 9,8	59 4840	9,8	57		
½x 10,3	18 6119	10,3	63		
½x 10,9	59 4838	10,9	70		
½x 11,5	18 6120	11,5	80		
½x 12,0	59 4826	12,0	87		
½x 12,7	59 4814	12,7	100		
¾x 13,7	25 2621	13,7	110	0,10	LG/stock
¾x 14,6	18 6170	14,6	125		
¾x 15,6	25 2633	15,4	140		
¾x 16,4	18 6181	16,4	160		
¾x 17,2	25 2645	17,2	180		
¾x 17,9	18 6193	17,9	200		

Dati tecnici :

Tipo..... RD ½, RD ¾
 Tipo RD ½ Agente estinguente CO₂, Argon, Azoto
 Tipo RD ¾ Agente estinguente CO₂
 Filettatura Raccordo..... Acc.to DIN. 2999
 Gamma di pressione Operativa..... min. 10bar. max 60 bar
 Temperatura -20°C up to + 50 °C
 Ugello..... Ottone

Technical data :

Type..... RD ½, RD ¾
 Agent type RD ½..... CO₂, Argon, Nitrogen
 Agent type RD ¾..... CO₂
 Connection thread..... acc.to DIN. 2999
 Operating pressure range..... min. 10 bar. max 60 bar
 Temperature range -20°C up to + 50 °C
 Nozzle body..... brass

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REV.	DATA/DATE	DESCRIZIONE/DESCRIPTION	EMES/ISSUED	CONT/CHECK	APP/APPROV

WR

TITOLO / TITLE

**MANICHETTA ARGON/CO₂
ARGON/CO₂ HOSE**

DOCUMENTO No / DOCUMENT No

SA-009441-DS-A4

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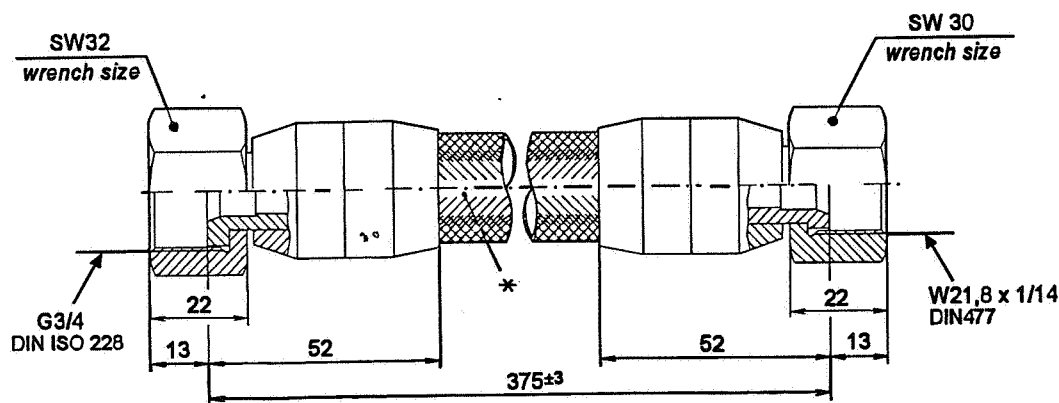
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Manichetta Argon/CO₂

dimensioni in mm; peso in kg/pc

Argon/CO₂ Hose

dimensions in mm; weight in kg/pc



Descrizione Designation	Peso Weight
Manichetta W21,8 x 3/4 x 375	0,54
Hose W21,8 x 3/4 x 375	

Dati tecnici :

Raggio di piegatura..... > 160
 Angolo di piegatura..... max. 90°
 Campo temperatura..... 40 °C a + 50 °C
 Pressione operativa..... 235 bar
 Pressione di prova..... 353 bar
 Pressione di scoppio..... min. 705 bar
 Costruttore..... SANCO

Technical data :

Bending radius..... > 160
 Bending angle..... max. 90°
 Temperatura range..... 40 °C until + 50 °C
 Operating pressure..... 235 bar
 Test pressure..... 353 bar
 Bursting strength..... min. 705 bar
 Manufacturer..... SANCO

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REV.	DATA/DATE	DESCRIZIONE/DESCRIPTION	EMES/ISSUED	CONT/CHECK	APP/APPROV
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SANCO

S.p.A.

FIRE PROTECTION AND SAFETY TECHNOLOGY

TITOLO / TITLE

**BOMBOLA ARGON
CYLINDER ARGON**

DOCUMENTO No / DOCUMENT No

SA-006860-DS-A4

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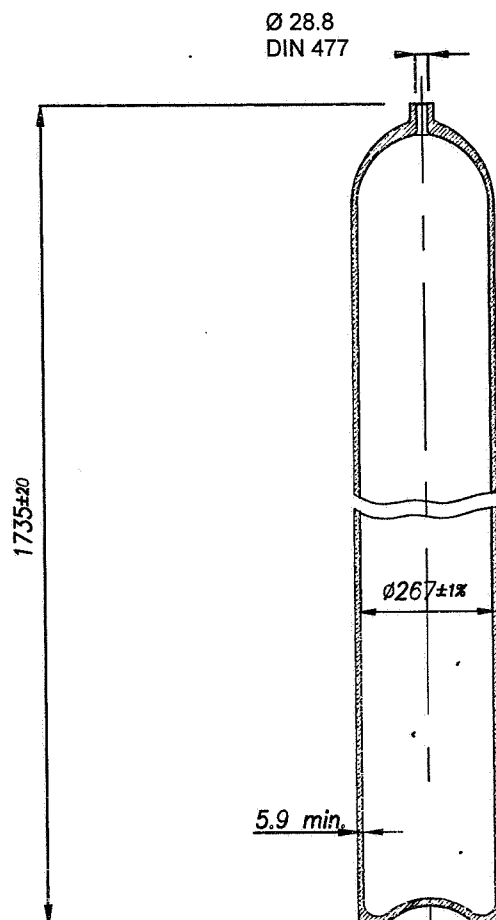
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Bombola Argon 80 Lt

dimensioni in mm; peso in kg/pc

Argon Cylinder 80 Lt

dimensions in mm; weight in kg/pc



Dati tecnici:

Capacità.....80 lt
Pressione max di carica.....200 bar
Pressione di prova.....300 bar
Peso bombola vuota.....90 Kg
Materiale.....acciaio bonificato (34 Cr Mo 4)

Technical data:

Capacity.....80 lt
Max filling pressure.....200 bar
Test pressure.....300 bar
Weight of empty cylinder.....90 Kg
Materialquenched and tempered alloy steel (34 Cr Mo 4)

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REV.	DATA/DATE	DESCRIZIONE/DESCRIPTION	EMES/ISSUED	CONT/CHECK	APP/APPROV

LOE

TITOLO / TITLE

VALVOLA ARGON ARGON CYLINDER VALVE

DOCUMENTO No / DOCUMENT No

SA-006862-DS-A4

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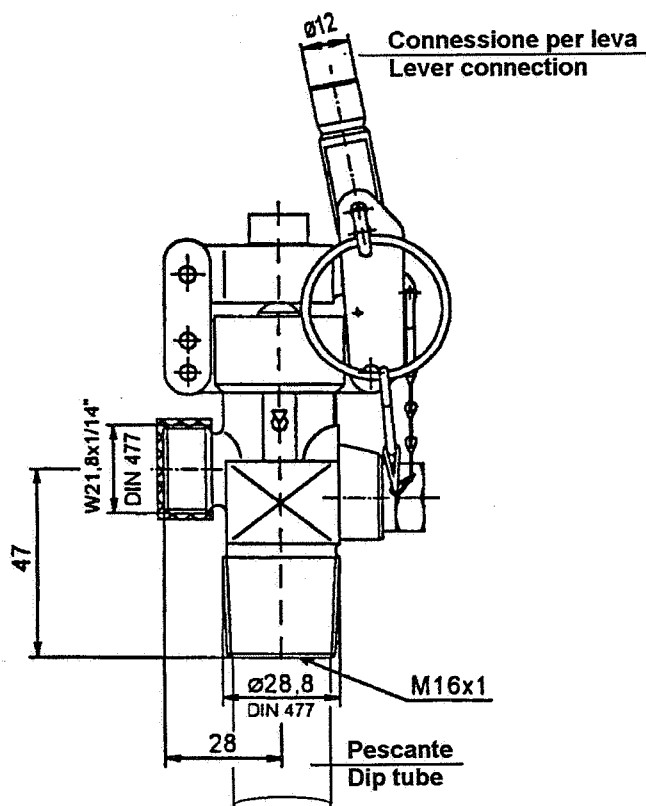
1 1

Valvola Argon

dimensioni in mm; peso in kg/pc

Argon cylinder valve

dimensions in mm; weight in kg/pc



Valvola Argon Cylinder valve	Peso Weight
K85-11,0-S39	0,68

Dati tecnici :

Pressione operativa.....235 bar
Pressione test.....353 bar
Materiale.....ottone

Technical data :

Operating pressure.....235 bar
Test pressure.....353 bar
Material.....brass

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REV.	DATA/DATE	DESCRIZIONE/DESCRIPTION	EMES/ISSUED	CONT/CHECK	APP/APPROV

Bourdon Tube Pressure Gauges with Switch Contacts Stainless Steel Case Model PGS11

Data Sheet PV 21.01

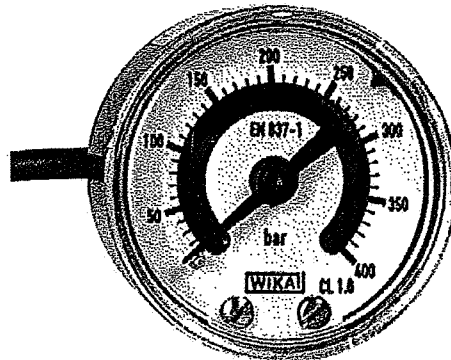
switchGAUGE

Applications

- Pressure gauge for indicating and monitoring the pressure in tanks and for signalling leaks
- Pressure gauge for use in gas extinguishing systems per EN 12 094-10 (VdS/CE)
- General industrial applications

Special Features

- High switching reliability and long service life
- Design per EN 837-1 and EN 12 094-10
- Pressure indication over 270 angular degrees
- Adjustable contact between 10 and 90 % of the scale range



switchGAUGE Model PGS11

Description

Design

per EN 837-1 and EN 12 094-10

Nominal size in mm

40, 50

Accuracy class

1.6 / 2.5

Switch point tolerance

+/- 2.5 %

Scale ranges

NS 40: 0 ... 2.5 to 0 ... 400 bar

NS 50: 0 ... 0.6 to 0 ... 400 bar

or all other equivalent vacuum or combined pressure and vacuum ranges

Pressure limitation

Steady: 3/4 x full scale value

Fluctuating: 2/3 x full scale value

Short time: full scale value

Operating temperature

Ambient: -40 ... +60 °C

Medium: +60 °C maximum

Temperature effect

When temperature of the measuring system deviates from reference temperature (+20 °C):

max. $\pm 0.4 \text{ \%}/10 \text{ K}$ of the span

Process connection

Cu-alloy, male thread

Lower mount (LM) or centre back mount (CBM)

Pressure element

Cu-alloy

$\leq 60 \text{ bar}$: C-type

$> 60 \text{ bar}$: helical type

Movement

Cu-alloy

Dial

Aluminium, white

W2

Pointer
Plastic, black

Case
Stainless steel

Window
Polycarbonate

Ingress protection
IP 54 per EN 60 529 / IEC 529

Helium leakage test
Leak rate 10^{-5} mbar^l/s

Electrical data
Switching voltage: 4.5 ... 24 VDC/VAC
Switching current: 5 ... 100 mA
Contact load: max. 2.4 W
Switching contact: breaks (NC - normally closed) or
makes (NO - normally open)
(adjustable between 10 and 90 % of the
scale range)

Potential-free

Electrical connection
Flying leads or plug

Approval
Approval for VdS and CE per EN 12 094-10

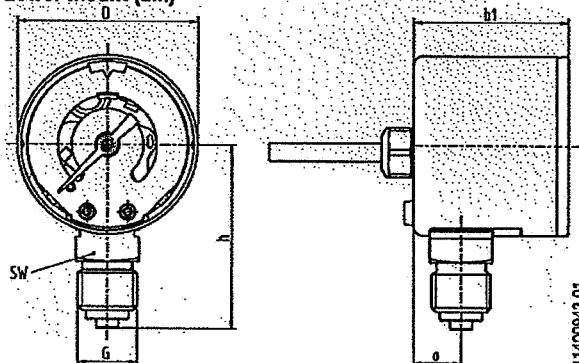
Options

- Other process connection
- Ingress protection IP 65 (Model PGS21)
- Double contact

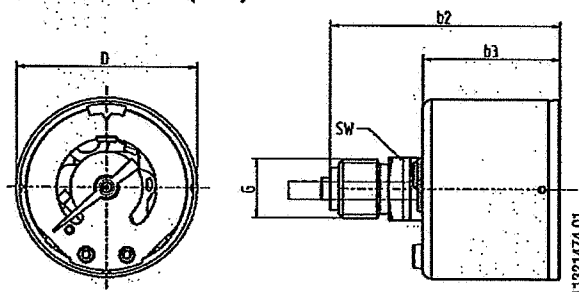
Dimensions in mm

Standard version

Lower mount (LM)



Centre back mount (CBM)



NS	Dimensions in mm					Weight in kg	
	D	b ₁ ± 0.5	b ₂ ± 1	b ₃ ± 0.5	G	SW	
40	40	34.5	51	30.5	G 1/8 B	14	0.10
50	50	35.5	53.5	35.5	G 1/4 B	14	0.12

Process connection per EN 837-1 / 7.3

Ordering information

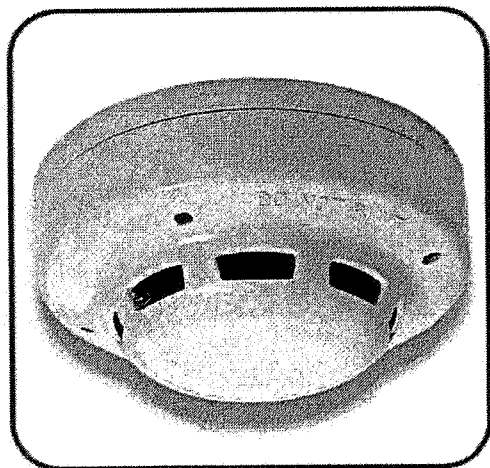
Model / Nominal size / Scale range / Connection size / Connection location / Switch point and function / Options

Modifications may take place and materials specified may be replaced by others without prior notice.
Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.

CSR

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Conventional Photoelectric Smoke Detector **SLR-E3**



Features

- ▶ Removable, High Performance chamber
- ▶ Remote Indicator output
- ▶ Wide voltage range (9.5 ~ 30Vd.c.)
- ▶ Low profile design with one piece outer cover
- ▶ Twin fire LED's allow 360° viewing
- ▶ Range of mounting bases
- ▶ Approved by LPCB & VdS
- ▶ Also available in white or black

Description

The SLR-E3 is a Photoelectric Smoke Detector, which is fully compatible with the majority of existing Conventional systems.

The SLR-E3 incorporates Hochiki's unique High Performance photoelectric smoke chamber removing the need to use Ionisation Detectors in the majority of applications. This also allows the Detector threshold level to be increased, thereby improving the signal to noise ratio and reducing susceptibility to false alarms. An integral third terminal provides a remote indicator output.

The smoke chamber is easily removed or replaced for cleaning and utilises a unique baffle design which allows smoke to enter the chamber whilst keeping out ambient light.

Specification

Ordering Code	SLR-E3 / SLR-E3(WHT) / SLR-E3(BLK)	
Replacement Chamber	SLR/ALG REPLACEMENT CHAMBER	
Operating Voltage	9.5 - 30Vd.c.	
Quiescent Current (typ)	35µA	
Maximum Current Alarm	40mA	
Remote Indicator Drive	20mA (max) / 9.5-14mA (typ)	
Operating Temperature Range	-10°C to + 50°C	
Storage Temperature Range	-30°C to + 60°C	
Maximum Humidity	95%RH - Non Condensing (at 40°C)	
Ingress Protection Rating	IP42	
Colour / Case Material	Ivory, White or Black / ABS	
Weight (g) / Diameter (mm) / Height (mm)	95 / 100 / 38	
Compatible Bases	YBN-R6 YBN-R/6SK	YBO-R/6R, YBO-R/6RS YBO-R/6RN, YBO-R/6PA
Base Heights (mm)	8	13
Base Fixing Centres (mm)	48 ~ 74	
Approvals to EN54:2000 Part 7	LPCB	
	VdS (G204043)	

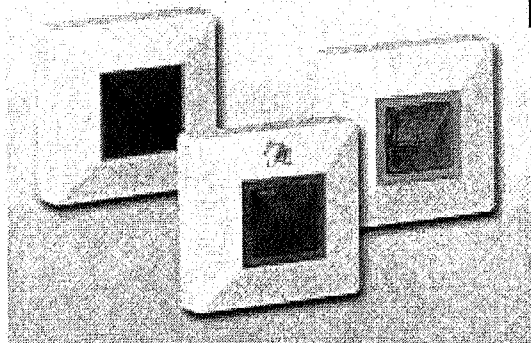
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Remote indicator lamp - mod. 1491CR

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SERIES 1491

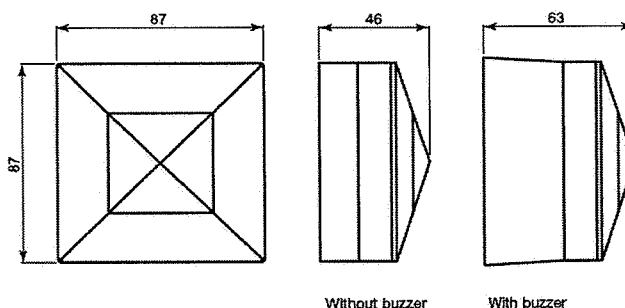
Compact optical-acoustical LED indicator

- Indoor use
- High luminosity red, green yellow LED
- 7 - 48V DC power supply
- Acoustical version (complete with buzzer)
- Flush mounting accessory

Optical indicator with a very high quality /price ratio that allows remote signalling of alarms, faults or other signals through high luminosity led and low consumption. BZ versions incorporate a buzzer for intermittent or continuous optical acoustical signalling. Power supply available from 7 to 48VDC. It is consistent with analogue and traditional systems. The led is available in red, green and yellow colour and wide diffusion ensures good visibility in all directions. Simple and quick installation thanks to terminal connection and possibility of fixing on different support. Available kit for flush mounting installation.

GENERAL SPECIFICATIONS

Housing material	Thermoplastic, white body
Connection type	Terminals
Buzzer features	75 dB at 30 cm intermittent sound 2300 Hz 0.5s ON - 0.5s OFF
Operating temperature	-20°C to +60°C
Protection degree	IP 40
Standard equipment	-
Packaging	1 pcs./package



ORDER CODES

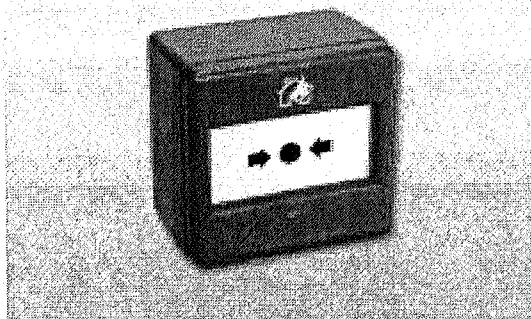
Code	Rated voltage	LED current	Buzzer current	Buzzer	LED	Flashlight frequency	Package weight	Notes
1491 CR	7 - 48V DC	10 mA	-	no	red	60/min	0,06 kg	
1491 CV	7 - 48V DC	10 mA	-	no	green	60/min	0,06 kg	
1491 CG	7 - 48V DC	10 mA	-	no	yellow	60/min	0,06 kg	
1491 BZR	7 - 48V DC	10 mA	20 mA	yes	red	60/min	0,06 kg	
1491 BZV	7 - 48V DC	10 mA	20 mA	yes	green	60/min	0,06 kg	
1491 BZG	7 - 48V DC	10 mA	20 mA	yes	yellow	60/min	0,06 kg	

ACCESSORIES AVAILABLE

Code	Description
1491 IN	Flush mounting fixing base

W12

SERIES 2570



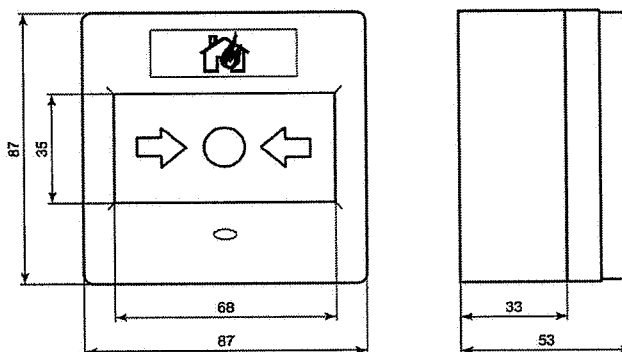
EN 54-11 manual call point

- Resettable or break glass call point
- IP 42 and IP 67 protections
- 1 changeover contact
- Functional test with key included
- With EN54-11 compliance

The range of manual call points has been styled and engineered to the framework of requirements set out in EN 54-11. This innovative range, which includes both glass and resettable plastic elements, features on the resettable element a highly visible alarm "flag" to speed location of operated call points. In the break glass version, by pressing the middle of the glass (protected by anti-injury film) it breaks and activates the alarm. The included key allows to reset the button (in the resettable version), it is used as test key and tool to open the call point. The internal printed circuit is completely encapsulated with polyurethane resin, thus ensuring utmost reliability. W version available for outdoor applications. Symbols are universal, i.e. "press in the middle" and "house in flames". Sealable protection cover code 2572 SP available, as accessorie, with clamp 2572 PB. The series is also available in blue, green, yellow and white color, and can be provided with slots for I/O boards (for info contact sales department).

GENERAL SPECIFICATIONS

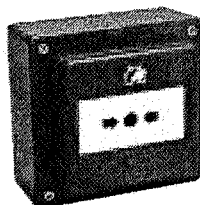
Housing material	Thermoplastic, red color
Operation	Direct activation
Connection type	6 terminals (3 double terminals for shunting)
Operating temperature	-10°C to +70°C -25°C to +70°C for W versions
Standard equipment	Key for resetting, test and opening
Packaging	1 pcs./package



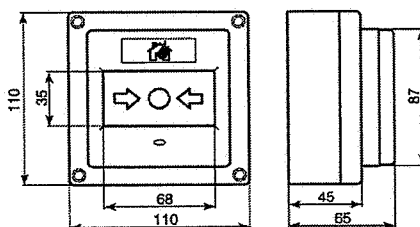
ORDER CODES

Code	Contacts	Max contact current	Max contact voltage	LED	Test	Color	IP degree	Package weight	Notes
2570	1 changeover	3 A	24V DC	no	yes	Red	IP 42	0,20 kg	Break glass
2570 P	1 changeover	3 A	24V DC	no	yes	Red	IP 42	0,20 kg	Resettable plastic
2570 W	1 changeover	3 A	24V DC	no	yes	Red	IP 67	0,32 kg	Break glass
2570 WP	1 changeover	3 A	24V DC	no	yes	Red	IP 67	0,32 kg	Resettable plastic

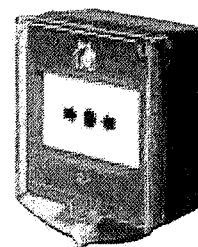
2570 WP



2570 WP



Manual call point with flap 2572 SP and security tag 2572 PB



ACCESSORIES AVAILABLE (see accessories page)

Code	Description
2572 VR	Universal spare glasses
2572 SP	Polycarbonate flap
2572 PB	Security tag for polycarbonate flap

titolo / title
Heat detector, fixed & rate of rise - mod. DCD

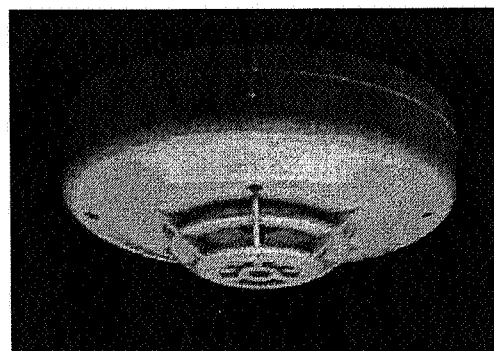
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Conventional Combined Heat Detector Model DCD-1E Grade 1 (60°C)

Features

- ▶ Electronic linear heat detection
- ▶ Twin fire LED's allow 360° viewing
- ▶ Grade 1 Rate of Rise detector
- ▶ Full range of mounting bases
- ▶ Approved to EN54 Part 5



Description

Model DCD-1E is a Rate of Rise Heat Detector with a 60° fixed temperature element, the DCD-1E uses a thermistor and linearising circuit to provide an accurate linear response Heat Detector.

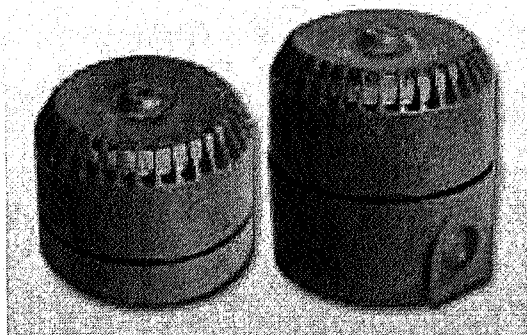
The DCD-1E is ideal for use where medium ambient temperatures exist, such as drying rooms or where Smoke Detectors are unsuitable because of the presence of steam or cooking fumes such as in a kitchen.

The DCD-1E is supported by a wide range of bases for different applications and these are supported on the majority of conventional systems.

Specification

Ordering Code	DCD-1E
Operating Voltage	15-30V
Quiescent Current	35µA
Max. Current in Alarm	40mA
Operating Temp. Range	-10°C to +50°C
Storage Temp. Range	-30°C to +70°C
Maximum Humidity	95%RH - Non Condensing (at 40°C)
Case Material	Polycarbonate
Diameter	100mm
Height with Base	47mm
Compatible Bases	YBN-R4, YBK-R5 /5SK /5ZD /5R2
Base Fixing Centres	48mm through to 74mm
Weight (inc. base)	95g (105g)

SERIES ROSHNI



Electronic sounder

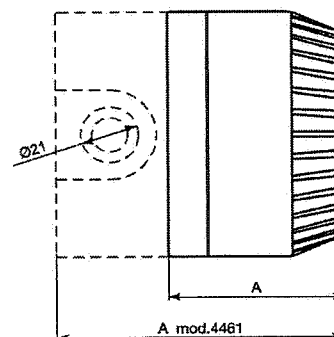
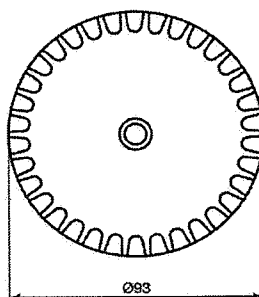
- 28 to 32 tones selectable
- Second tone for two-stage alarms
- Volume control
- IP 65 protection with deep base
- 9 to 28V DC power supply
- Red or white moulding
- Low current consumption
- Only 63 mm deep

The Roshni range of electronic sounders has become the industry standard for use within fire alarm, intruder and industrial signalling systems. Designed for reliability in operation, the Roshni LP is a high specification wall mounting sounder suitable for signalling within open areas or corridors and passages. The rugged low profile casing and encapsulated electronics provide a high level of durability and resistance to environmental conditions. With 32 signal tones available the Roshni LP is compatible with the majority of fire and emergency signalling tones in use throughout the world. The base formats are compatible with the beacon and beacon sounders.

Utmost sound signal control thanks to 28 or 32 tones that can be selected during installation through 5 internal dip switches, and volume control through trimmer. Second tone for two-stage alarms. Mounting is simplified by the sounder bayonet mount on the related base and the double terminals that allow connection shunting. The 9 to 28V DC supply voltage allows the use both in 12V and 24V systems.

GENERAL SPECIFICATIONS

Housing material	Thermoplastic, red or white color
Connection type	(6) double terminals for shunting
Operating temperature	-25°C to +70°C
Packaging	1 pcs./package



ORDER CODES

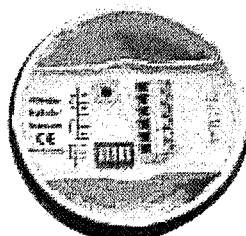
Codice	Rated voltage	Rated current*	Allowed voltage	Acoustic output @ 1 m	N° of tones	Height A	Color	IP degree	Package weight	Notes
4459	12-24V DC	8 mA@12V DC 16 mA@24V DC	9-28V DC	102 dB@24V DC	32	63 mm	Red	IP 54	0,24 kg	Roshni LP low base
4460	12-24V DC	8 mA@12V DC 16 mA@24V DC	9-28V DC	100 dB@24V DC	28	75 mm	Red	IP 54	0,31 kg	Low base
4460 W	12-24V DC	8 mA@12V DC 16 mA@24V DC	9-28V DC	100 dB@24V DC	28	75 mm	White	IP 54	0,31 kg	Low base
4461	12-24V DC	8 mA@12V DC 16 mA@24V DC	9-28V DC	100 dB@24V DC	28	105 mm	Red	IP 65**	0,34 kg	Deep base
4461 W	12-24V DC	8 mA@12V DC 16 mA@24V DC	9-28V DC	100 dB@24V DC	28	105 mm	White	IP 65**	0,34 kg	Deep base
4461-220	230 V AC	35 mA @ 230V AC	110÷240 V AC	100 dB @ 230V AC	32	105 mm	Red	IP 65**	0,34 kg	Deep base

For Tone references, see Sounder Tones Table

* Rated current and sound pressure depend on the selected tone (indicated values correspond to tone 3)

** To obtain IP65 use suitable cable gland

Terminals, dip switches and volume control view



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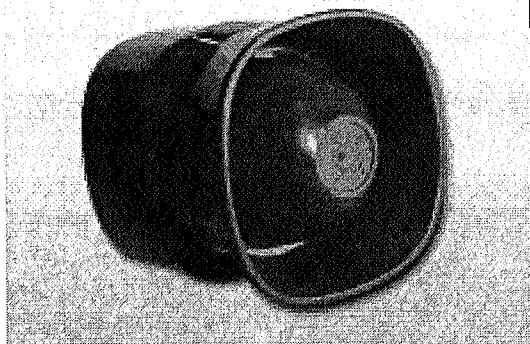
4461

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Fire Alarm Horn - mod. 4831R

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SERIES SYMPHONI



Horn electronic sounder

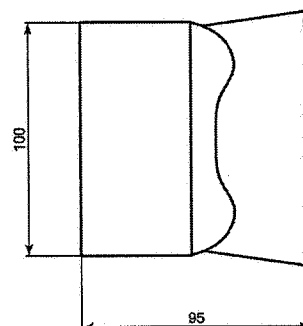
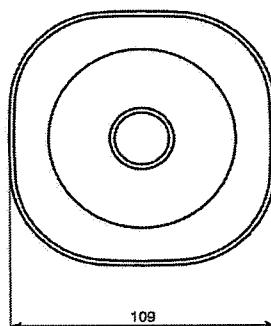
- IP 42 protection
- Low current consumption
- Ultra high 120 dB output
- For 12 and 24 V systems
- Red or white color
- Compatibility with Roshni, Squashni, Askari
- Double entry back box for simplified installation

The Symphoni sounder is a general purpose internal sounder, available either as a very high output sounder for noisy areas or high output low current sounder for applications where power is limited. Both versions share the same horn and back box, which has double cable entries for easy of installation.

Version 4830 (low power): the innovative design use for this version of the sounder allows outputs of up to 100 dB for a current consumption of only 5 mA. The low consumption lends itself to operation from the limited power available from loop driven systems and the sounder includes facilities for fixing address circuit boards. The sounder has 3 selectable tones, which may be employed for one, two, or three stage alarm applications. Version 4831 (high output): this sounder offers very high sound outputs while retaining tone compatibility with the Roshni, Squashni and Askari products. The high output and range of alarm tones suits the sounder to noisy environments and general alarm signalling.

GENERAL SPECIFICATIONS

Housing material	Thermoplastic, red or white color
Connection type	Terminals
Operating temperature	-25°C to +55°C
Protection degree	IP 42
Packaging	1 pcs./package



ORDER CODES

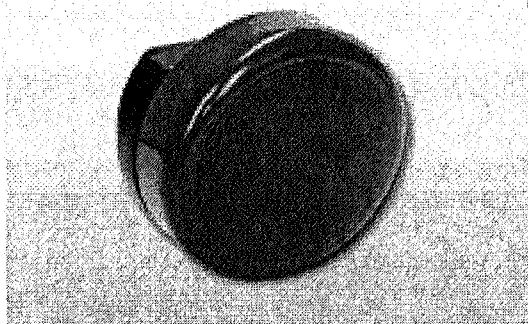
Code	Rated voltage	Rated current	Allowed voltage	Acoustic output @ 1 m	N° of tones	Color	IP degree	Package weight	Notes
4830 R	12-24V DC	5 mA @ 24V DC	12÷30V DC	100 dB @ 24V DC	3	Red	IP 42	0,21 kg	29, 33, 34 selectable tones. Low power
4830 W	12-24V DC	5 mA @ 24V DC	12÷30V DC	100 dB @ 24V DC	3	White	IP 42	0,21 kg	29, 33, 34 selectable tones. Low power
4831 R	12-24V DC	240 mA* @ 24V DC	9÷28V DC	114 dB @ 12V DC* 120 dB @ 24V DC**	32	Red	IP 42	0,58 kg	Symphoni HO. High output
4831 W	12-24V DC	240 mA* @ 24V DC	9÷28V DC	114 dB @ 12V DC* 120 dB @ 24V DC**	32	White	IP 42	0,58 kg	Symphoni HO. High output

For tone references, see Sounder Tones Table

* With tone N° 3

** With tone N° 6

SERIES e-Bell



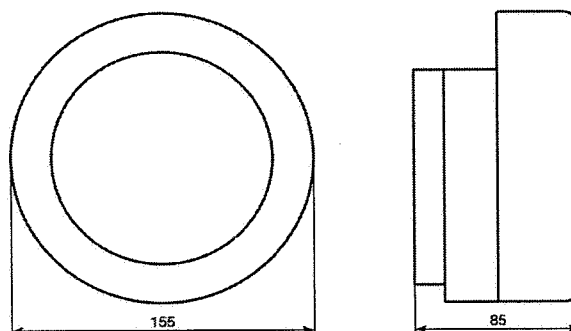
IP 55 electronic bell

- Outdoor use
- Steel dome, 6" diameter
- Integrated control circuit
- Low current consumption
- IP 55 protection
- 12 or 24V DC
- Red and gray colors

A unique, patented alarm bell designed for use in fire, alarm, security, industrial and other signalling systems. The combination of a miniature solenoid with an integrated control circuit ensures excellent sound coverage, minimum current consumption and increased reliability. Easy and quick mounting thanks to the snap hook of the dome and the split power supply terminals. Available in red and gray color and with 12V or 24V DC power supply. The protection degree IP 55 allows outdoor use, but thanks to its particularly fine aesthetics, it is highly suitable also for all applications including the most prestigious locations.

GENERAL SPECIFICATIONS

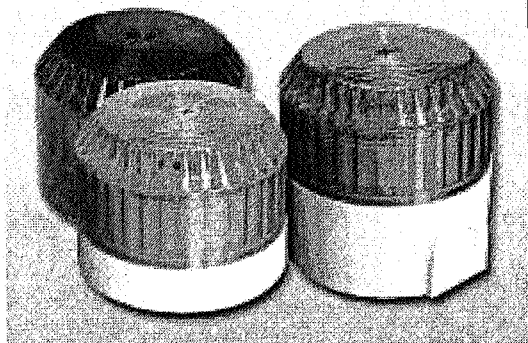
Dome material	Enameled steel, red or gray color
Base material	Polycarbonate, black color
Connection type	4 x 2.5 mm ² terminals
Operating temperature	-10°C to +55°C
Protection degree	IP 55
Packaging	1 pcs./package



ORDER CODES

Code	Rated voltage	Rated current	Allowed voltage	Acoustic output @ 1 m	Color	Package weight	Notes
4479-12	12V DC	60 mA	9 to 15V DC	93/95 dB	Red	1,1 kg	6 inches
4479-24	24V DC	30 mA	18 to 30V DC	93/95 dB	Red	1,1 kg	6 inches
4479 GY 12	12V DC	60 mA	9 to 15V DC	93/95 dB	Gray	1,1 kg	6 inches
4479 GY 24	24V DC	30 mA	18 to 30V DC	93/95 dB	Gray	1,1 kg	6 inches

SERIES BEACONS



Xenon beacon

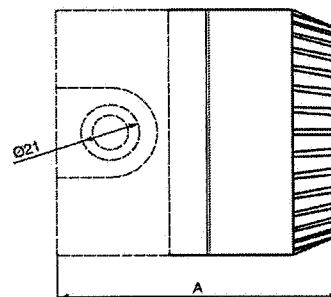
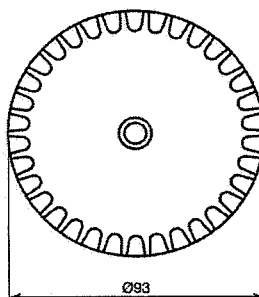
- No switch on current surge
- No more blowing fuses
- ACM (Active Current Management) circuitry to reduce current consumption
- Built in terminal block saves expense of external terminal boxes
- IP 65 when used with a deep or "U" base
- Choice of clear, red, amber, blue, or green lenses

The Beacons have been designed to overcome the problems of high current pulses commonly associated with conventional xenon flash tube units. All versions have SCS (Surge Current Suppression) to eliminate the need for heavy duty power supplies and to prevent fuses failing. The Beacons are base compatible with both the Roshni sounders and Flashni combined beacon-sounders and are suitable for internal or external use.

The Xenon beacons have been designed to complement other products in the range both technically and aesthetically. The beacons will mount neatly onto a Squashni base sounder to provide a low profile sounder/beacon. Similarly the beacon can be supplied coupled to a Roshni electronic sounder to provide a high output audio visual unit. The beacons have a built in terminal block for ease of installation and utilise the same range of bayonet fitting bases as other products in the range. A range of lens colour is available which must be specified when ordering as they are not interchangeable. Beacons for use in hazardous areas are also available, for the full specifications and details please see page 53.

GENERAL SPECIFICATIONS

Base material	Thermoplastic
Cover material	Polycarbonate
Connection type	(4) double terminals for shunting (6 terminals for code 4482 AT)
Operating temperature	-20°C to +55°C
Packaging	1 pcs./package



ORDER CODES

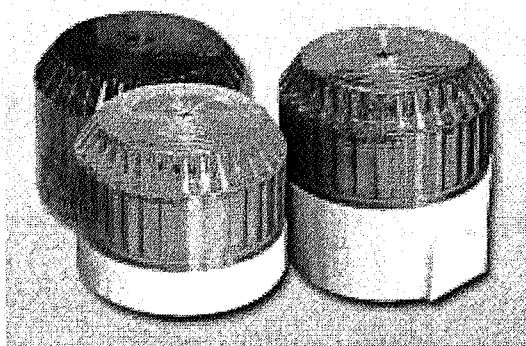
Code	Rated voltage	Rated current	Allowed voltage	Lamp	Flashlight frequency	Height A	Base color	Cover color	IP degree	Package weight	Notes
4480	24V DC	45 mA	20÷30V DC	0,65 J Xeno	60 / min	72 mm	Red	Red	IP 54	0,30 kg	
4480-12	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	72 mm	Red	Red	IP 54	0,30 kg	
4481	24V DC	45 mA	20÷30V DC	0,65 J Xeno	60 / min	105 mm	Red	Red	IP 65	0,34 kg	
4482	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	72 mm	White	Orange	IP 54	0,30 kg	
4482 AT	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	72 mm	White	Orange	IP 54	0,30 kg	With anti-tampering
4482 B	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	72 mm	White	Blue	IP 54	0,30 kg	
4482 G	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	72 mm	White	Green	IP 54	0,30 kg	
4482-24	24V DC	45 mA	20÷30V DC	0,65 J Xeno	60 / min	72 mm	White	Orange	IP 54	0,30 kg	
4482-24 B							<i>like 4482-24 with blue cover</i>				
4483	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	105 mm	White	Orange	IP 65**	0,34 kg	
4483 B	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	105 mm	White	Blue	IP 65**	0,34 kg	
4483 G	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	105 mm	White	Green	IP 65**	0,34 kg	

** To obtain IP65 use suitable cable gland

SERIES BEACONS

Xenon beacon

- No switch on current surge
- No more blowing fuses
- ACM (Active Current Management) circuitry to reduce current consumption
- Built in terminal block saves expense of external terminal boxes
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- Choice of clear, red, amber, blue, or green lenses

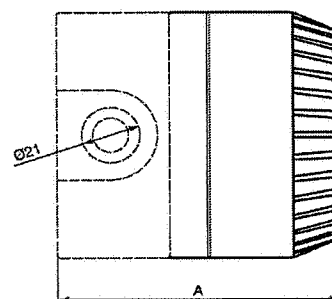
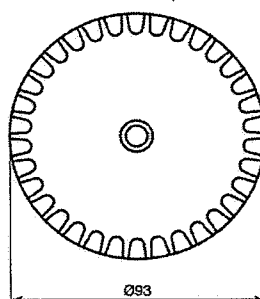


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Packaging	1 pcs./package



ORDER CODES

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4480-12	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	72 mm	Red	Red	IP 54	0,30 kg	
4481	24V DC	45 mA	20÷30V DC	0,65 J Xeno	60 / min	105 mm	Red	Red	IP 65	0,34 kg	
4482	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	72 mm	White	Orange	IP 54	0,30 kg	
4482 AT	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	72 mm	White	Orange	IP 54	0,30 kg	With anti-tampering
4482 B	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	72 mm	White	Blue	IP 54	0,30 kg	
4482 G	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	72 mm	White	Green	IP 54	0,30 kg	
4482-24	24V DC	45 mA	20÷30V DC	0,65 J Xeno	60 / min	72 mm	White	Orange	IP 54	0,30 kg	
4482-24 B							like 4482-24 with blue cover				
4483	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	105 mm	White	Orange	IP 65**	0,34 kg	
4483 B	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	105 mm	White	Blue	IP 65**	0,34 kg	
4483 G	12V DC	90 mA	10÷15V DC	0,65 J Xeno	60 / min	105 mm	White	Green	IP 65**	0,34 kg	

** To obtain IP65 use suitable cable gland

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SECTION 1: Site Conditions

1.1 Site Location:

This project will be located at a site in Ardakan-Yazd in Iran.

1.2 Climatic Conditions:

Climatic Condition

Air temperature:

- Max. temperature (summer) 45°C
- Min. temperature (winter) -16°C
- Max. air humidity 66%
- Min. air humidity 11%

Rainfall:

- Average precipitation 60mm
- Maximum Rainfall Intensity (Per day) 28mm
- Atmospheric pressure: 866mbar

Wind:

- Direction NE to SW
- Velocity (from ground level to 40m height) 125km/hr

Seismic conditions

According to Iranian code for seismic resistance design of building No. 2800, 2nd edition 1999.

Plant location

- Latitude 32° 22' N
- Longitude 53° 47' E
- Site altitude (above sea level): 1142 m

SECTION 2: Scope of Work

2.1 General:

Scope of work includes Engineering, Procurement, fabrication, Inspection, commissioning, site supervision and testing, packing , preparation, transportation, delivery (to be negotiated with buyer), insurance and tax (to be negotiated with buyer).guarantee of all equipment listed in section MTO and spare parts for fire detection and alarm system.

INQUIRY DOCUMENT FOR FIRE DETECTION AND ALARM SYSTEM

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All the relevant equipments will be suitable for indoor installation with max. Temp. 50 degrees centigrade in IRANIAN GHADIR DR.PROJECT.

Important Notes:

The responsibility of matching the fire detection and alarm system (subject of this inquiry document) and fire fighting system (refer to fire fighting system inquiry document) is by supplier i.e. the supplier shall consider these two systems as an integrated package. So the performance guarantee of this package in scope of work of supplier. (These two systems (Alarm and Fighting) shall be coordinate to each other as a unique package).

The description of the equipment included in this document does not relieve the vendor of his duties of supplying the equipment complete with all accessories necessary for proper operation.

The vendor shall specify each deviation with this inquiry document by issuing a deviation list, a lack of such listing shall be taken to mean that no such deviation exist this inquiry document will be the base of the contract just except for the deviation list, a lack of such listing shall be taken to mean that no such deviation exist. This inquiry document will be the base of the contract just except for the deviation list.

The attached price list shall be filled up to have the separate price for each of above mentioned scope of work. (by defining the unit price)

2.2 Scope of Supply:

The works outlined above and related to this inquiry document includes Fire Detection and Alarm System devices and accessories as mentioned in MTO in section 15. The supplier is responsible of system appropriate function, So the proposal shall be complete and any other devices / accessories that the necessary for system function shall be added by supplier to the MTO list and considered in Unit Price.

Important Note:

Vendor shall review the technical fire alarm system design (design review) and shall implement his corrective comments on the drawings & documents (which are approved by client) and revise the drawings in order to have a proper working system.

SECTION 3: Technical Specification**3.1 General**

The specification of Fire Detection and Alarm System and its devices is summarized in the following data sheets:

CAR

Fire Detection and Alarm System		
Item	Unit	Particulars
1. Type		Combination of conventional and addressable
2. Main power supply		
- Voltage	V	
- Distribution		Centralized, from control panel
3. Emergency power supply		
- Voltage	V	
- Type		Battery and charger
- Distribution		Centralized, from control panel
4. System <i>functional description</i> drawing		As in <i>attachment drawing</i>

*

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INQUIRY DOCUMENT FOR FIRE DETECTION AND ALARM SYSTEM

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Fire Alarm Control Panel (FACP)

Item	Unit	Particulars
1. Type		Addressable and programmable
2. Protection degree	IP	42
3. Detection Loop no.		4
4. Spare Loop		2
5. Operating voltage	V	24 V/DC
6. Redundancy on central CPU & card Modules	Yes/No	Yes
7. Main power supply		
- Voltage	V	230 VAC/50Hz
- Power consumption	KVA	
8. Emergency power supply		
- Voltage	V	
- Battery:		
▪ Type		Ni-Cd / Sealed lead acid
▪ Size	Ah	
▪ Operation time	h	72
▪ Alarms activated time	minutes	30
- Charger size	A	
9. Each controlled zone signals, alarms and controls:		
- Signal of detection system on	Yes/No	Yes
- Signal of fault of detection system	Yes/No	Yes
- Signal of fire	Yes/No	Yes
- Zone protection cut off	Yes/No	Yes
- Alarms test push button	Yes/No	Yes
- Acknowledgement signal push button	Yes/No	Yes
10. General signals, alarms and controls:		
- Signal of normal feeding	Yes/No	Yes
- Signal of emergency feeding	Yes/No	Yes
- Signal of battery on charge	Yes/No	Yes
- Signal of battery low voltage	Yes/No	Yes
- Lamp test push button	Yes/No	Yes

"FM00TI03.Q0D- Report Form"

Fire Alarm Control Panel (FACP)

Item	Unit	Particulars
11.Ability to connect to monitoring system	Yes/No	Yes
12.Programmable relay module for each zone shutdown command to HVAC system, if sensed fire in that zone		
13.Capability of connection to upstream control panel / fire brigade panel or graphic panel	Yes/No	Yes
- Transmission of all data	Yes/No	Yes
- Transmission of filtered (resuming) data	Yes/No	Yes
14.Data communication module (port)		
15.Control modules		Plug in type
16.Capability of short circuit monitoring	Yes/No	Yes
17.Structure:		
- Material		Steel plate
- Door		Front open, with handle and key lock
- Cable entry		Bottom of panel
- Inside electrical devices installation		Modular type for future expansion
18.Ability to connect conventional devices via addressable to conventional modules	Yes/No	Yes
19.Audio & visual Alarm (BUZZER & LED) in alarm & fault situation	Yes/No	Yes

*

"FM00T103.Q0D- Report Form"

EXTERNAL POWE SUPPLY & CABINET

Item	Unit	Particulars
1. Proper external power supply to feed 24V/DC for each loop .	Yes/No	Yes
2. Back up Battery for emergency situation	Yes/No	Yes
3. Input voltage	V	230VAC/50Hz
4. Output voltage	V	24VDC
5. Output current	A	?
Note : supplier shall be consider field instrument parameters such as : Voltage , current , power consumption specifications in operating , stand-by & alarm mod for choice proper power supply .		
6. Separate miniature keys to break and connect each loop power in maintenance or emergency situations .	Yes/No	Yes
Important : The location of the external power supply with it's batteries and addressable fire alarm control panel (with it's batteries) is in unique proper cabinet , Therefore the supplier shall be consider proper cabinet or rack (Relevant to his panel & power supply dimension) for this purpose .		

Detection and Alarm Devices		
Item	Unit	Particulars
1. Manual Call Point		
- Type		Conventional
- Application type		Industrial type/Break glass
- Protection degree	IP	42 for indoor & 54 for outdoor
- Operating voltage	V	13 ~ 32 VDC
- Installation		Flush and surface mounting ability
- Color		Red
- Built in bidirectional short-circuit isolator	Yes/No	Yes
2. Heat Detector, Rate of Rise/fixed temperature / combined type		
- Type		Conventional
- Application type		Industrial type
- Protection degree	IP	42
- Coverage area:	m2	50
- Operating voltage	V	13 ~ 32 VDC
- Local response indicator inside the holder	Yes/No	Yes, red LED
- Installation		Flush and surface mounting ability
- Built in bidirectional short-circuit isolator	Yes/No	Yes
3. Smoke Detector, Photoelectric Type		
- Type		Conventional
- Application type		Industrial type
- Protection degree	IP	42
- Coverage area:	m2	100
- Operating voltage	V	13~32VDC
- Local response indicator inside the holder	Yes/No	Yes, red LED
- Installation		Flush and surface mounting ability
- Built in bidirectional short-circuit isolator	Yes/No	Yes

Detection and Alarm Devices		
Item	Unit	Particulars
4. Response Indicator - Type - Application type - Installation - LED indicator color		Conventional Industrial type Flush and surface mounting ability Red
5. UV Flame Detector - Ray detection method - Type - Application type - Location - Require any additional power supply - Detector acceptance angle - Operating voltage - Installation : The base of the flame detector shall be fasten to the ceiling - Built in bidirectional short-circuit isolator	Yes/No V Yes/No	Ultra violet Conventional Industrial type Indoor No 100° ± 50° 13~32 V.dc Yes

Detection and Alarm Devices		
Item	Unit	Particulars
6. Addressable to Conventional Module		
- Type		Addressable
- Application type		Industrial Type
- Operating voltage	V	13-32 V.dc
- Capable to connect conventional devices to the module	Yes/No	Yes
- Free contact relay for actuating alarm zone (siren, flasher, ...) in alarm situation	Yes/No	Yes
- Built in bidirectional short-circuit isolator	Yes/No	Yes
Note : Each module shall be supported one conventional zone with at least 30 conventional devices .		
7. Output module		
- Type		Addressable
- Applicable type		Industrial Type
- Operating voltage	V	13-32 V.dc
- Capable to sending shut-down Command for external fans or HVAC in alarm situation	Yes/No	Yes
- Built in bidirectional short – circuit isolator	Yes/No	Yes
8. Fire alarm bell		
- Type		Conventional
- Application type		Industrial type
- Protection degree		
▪ Outdoor type	IP	54
▪ Indoor type	IP	42
- Operating voltage	V	18-30 V.dc
- Sound Level at 1m		
▪ Outdoor type	db	100
▪ Indoor type	db	85
- Installation		Surface mounted
- Color		Red

Detection and Alarm Devices

Item	Unit	Particulars
9. Fire alarm siren		
- Type		Conventional
- Application type		Industrial type
- Protection degree		
▪ Outdoor type	IP	54
▪ Indoor type	IP	42
- Operating voltage	V	18-30 V.dc
- Sound Level at 1m		
▪ Outdoor type	db	100
▪ Indoor type	db	85
- Installation		Surface mounted
- Color		Red
10. Fire alarm horn		
- Type		Conventional
- Application type		Industrial type
- Protection degree		
▪ Outdoor type	IP	54
▪ Indoor type	IP	42
- Operating voltage	V	18-30 V.dc
- Sound Level at 1m		
▪ Outdoor type	db	100
▪ Indoor type	db	85
- Installation		Surface mounted
- Color		Red

Detection and Alarm Devices

Item	Unit	Particulars
11. Visual Signal Generator (Beacon)		
- Type		Conventional
- Application type		Industrial type
- Protection degree		
▪ Outdoor type	IP	54
▪ Indoor type	IP	42
- Operating voltage	V	18-30 V.dc
- Installation		Surface mounted
- Color		Red
12. Junction box		
- Application type		Industrial type
- Protection degree		
▪ Outdoor type		54
▪ Indoor type		42
- Structure:		
▪ Material		Steel
▪ Color		Red
- Terminal:		
▪ Type		Screw type/Supported in DIN Rail & with column arrangement at least 30 terminals for each JB.
▪ Material		
- Installation		Surface mounted
- Door		Hinged type
- With proper Tag	Yes/No	Yes

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FIRE BRIGADE PANEL(REPEATER PANEL)

Item	Unit	Particulars
13.FIRE BRIGADE PANEL		
- Main fire Alarm Brigade Panel for supervision of whole plant shops in fire brigade building		
1- Voltage	V	230VAC/50Hz
2- Emergency power supply		
- Voltage	V	
- Battery		
• Type		Lead Acid , sealed Type/NIC-cadmium
• Capacity	Ah hour	According requirements
• Operation time		72
• Back – up battery time	Hour	5hour, continuous load
- Charger size	A	
3- Capable to monitor each local fire alarm control panels zone, in alarm & fault situation	Yes/No	Yes
4- Audio & visual alarm (buzzer & LED) in Alarm & fault situation.	Yes/No	Yes
5- Display LCD	Yes/No	Yes
6- Protection degree	IP	42
7- Monitoring of detection line	Yes/No	Yes
8- Activation of annunciators on central plant control panel	Yes/No	Yes
9- Supervision audible signaling devices	Yes/No	Yes
10- Supervision of battery	Yes/No	Yes

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For more information about the above data sheets we clear that:

Fire Alarm System:

For the fire alarm system function, which is a combination of conventional and addressable, refer to attached **functional description** drawing.

All detection circuits shall be monitored against open-short circuits and ground faults. If malfunction occurs in any circuit this shall result in a trouble condition in this detection zone, while other zone shall continue to operate normally.

Fire Alarm Control Panel (FACP):

Fire alarm control panel shall have valid **certification**.

Detection and Alarm Devices:

Detectors shall have valid **certification** such as ATEX.

Detectors shall have built-in circuitry to protect against reverse polarity and voltage surges.

Detector Holder

The detectors are fitted into common type of standard holder, once installed, shall be possible to insert/remove/exchange different types of detectors.

The holder shall be delivered with installed sealing plate preventing dirt/dust/condensation of water in the conduit, before the equipment installation. A removable dust cover shall be foreseen for protection during installation/construction phases.

Monitoring System:

Monitoring system shall be offered as **option**. This monitoring system shall show all general faults, zone faults, zone alarms on a screen. The monitoring shall be according to exact location of activated zone shown graphically. This monitoring screen shall be a large LCD. Any driver and software for monitoring system or interface to central fire alarm control panel shall be considered in offer.

Operating Temperature :

For all of the devices operating temperature shall be consider -25 to 70 . °

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Devices :

All of the devices shall be consider conventional type and compatible for connecting to addressable loop with addressable to conventional module .

Junction Box :

The J.B for each area shall be have proper space to set addressable to conventional modules and output modules for that area .

- If there are any questions and/or need any clarifications with respect to this inquiry suppliers are welcome to contact us before submission of their proposal .
- This section and fire fighting system shall be considered as an integrated package .
- Any coordination between fire alarm & fire fighting control system's is in scope of vendor .
- Number of detectors , sensors and JB's are listed in MTO sheet attached to this enquiry but exact quantity shall be confirmed before contract .

SECTION 4: Surface Protection

The equipment shall be coated/painted in accordance with buyer approval.

Large iron components shall be galvanized or properly paint-coated. Small items such as screws, washers, etc shall be of non-corrosive metal such as stainless steel or bronze or shall be protected by cadmium-plating, nickel-plating or silver-plating.

Machined surfaces and bright parts normally left unpainted shall be coated with corrosion protective compounds which shall be easily removable during installation.

SECTION 5: Standards and Codes

The design, fabrication, inspection and testing, performance and ratings of all equipment shall conform to the latest edition including any amendment of the following standard:

- IEC = International Electro-technical Commission
- NFPA = National Fire Protection Association
- BS = British Standard

And specially:

- INFPA 72: Automatic fire detectors
- BS 3116: Automatic fire alarm systems in buildings, control and indicating equipment
- BS 5445: Specifications for components of automatic fire detection
- BS 5446: Specification for normal call points for electrical fire alarm system.

Other reputable standards e.g. following standards may be used in some definite cases but with prior approval of buyer:

- DIN = Deutsche Industrie Normen
- VDE = Verband Deutscher Elektrotechniker
- ISO = International Organization for Standardization
- NEMA = National Electrical Manufacturers Association.

compounds which shall be easily removable during installation.

SECTION 6: Documentation

6.1 General

All drawings should be prepared as a hard-copy as well as soft-copy.

Type and number of drawings and technical documents shall be as follows:

- For information : 1-fold in original size (hard-copy + soft-copy)
- For approval : 1-fold in original size (hard-copy + soft-copy)
- For construction : 2-fold in original size (hard-copy + soft-copy)
- As built : 2-fold in original size (hard-copy + soft-copy).

Detailed documents shall be submitted for equipment, each section and the whole system.

The vendor shall be fully responsible and undertake to perform all analysis and calculations as required, by the terms of these specifications or necessary in his own opinion or asked for by the buyer.

Drawing shall be accordance to DIN standard sizes (A0, A1, A2, A3 and A4).

Metric unit shall be used for drawings/documents.

Documents for approval shall be submitted to buyer at least 3 weeks before construction.

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6.2 Language

All drawings, design information, documentations, operation and maintenance manuals shall be in English. Correspondence could be in English or Persian language.

6.3 Documents to be Provided by the Bidder

The following detailed documents shall be submitted:

- Bidder's experience and reference list
- Type test report
- License certificate
- General catalogues & data sheets
- Confirmation of the standards that the equipment is designed on
- Filled-up technical questionnaires
- Filled-up **price list**
- Part list (Material List) for all equipments with the following information as minimum:
 - Designation/Description
 - Reference/Definition in drawings
 - Quantity
 - Rating
 - Vendor
 - Type
 - Material, weight and dimensions
 - Attached catalogue (with marking the exact equipment/item)
- Proposal technical documents as follows:
 - Typical dimensional drawings
 - Typical termination drawing
- Complete time schedule for design, a.m. **documents submitting**, fabrication, inspection, testing and delivery
- **Deviation list.**

6.4 Documents to be Provided by the Vendor

The following detailed documents shall be submitted:

- Part list (Material List) for all equipments with the following information as minimum:
 - Designation/Description
 - Reference/Definition in drawings
 - Quantity
 - Rating
 - Vendor
 - Type
 - Material, weight and dimensions
 - Attached catalogue (with marking the exact equipment/item)
- Technical documents as follows:
 - Dimensional shop drawings
 - Termination drawing
 - Final fire alarm lay outs and Block diagram
 - I/O list
 - Cause & effect
 - Logic diagram
 - Wiring diagram
- Design calculations
- QC plan
- QCTM (including QC plan and approved Inspection and testing report)
- Packing instruction
- Erection manual and installation details
- Commissioning instruction
- Setting data with its calculation
- Operation manual
- Maintenance manual
- Spare part list
 - Commissioning spare part list
 - Two years operation spare part list
- Complete time schedule for design, a.m. **documents submitting**, fabrication, inspection, testing and delivery
- Civil information and drawings.

SECTION 7: Quality Control, Inspection and Testing

7.1 General

The vendor shall have a comprehensive quality control procedure.

Inspection and testing shall be based on the related standards.

Within 2 weeks of the placing the contract the vendor shall submit a QC plan prepared based on the related standards and including at least the following items:

- Quality control procedure
- Type test certificate
- Routine tests:
 - Visual inspection
 - Dimensional inspection
 - Standard tests.

Approved QC plan will be the base of quality control, inspection and testing.

The supplier shall issue the buyer the QCTM (including QC plan and approved Inspection and testing report) eventually.

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7.2 QC Plan

A QC plan shall be issued by vendor for approval of buyer and after approval shall be the base of inspection and testing . .

SECTION 8: Tagging, Marking, Packing and Delivery

For tagging, marking and packing procedure the vendor shall submit a *packing instruction* to the buyer for approval.

Approved packing instruction will be the base of tagging, marking, packing and delivery.

A copy of packing list and supply list will accompany each package.

The vendor shall deliver all equipment items at site.

The vendor is responsible for proper and safe transport and delivery of the equipment to the site.

SECTION 9: Erection and Commissioning

The vendor shall prepare *erection and commissioning instructions* giving detailed instruction for the handling, erection, settings and commissioning of the equipment.

Site testing and no-load commissioning program to be agreed between the vendor and the buyer, shall be performed by vendor.

SECTION 10: Guarantee

Satisfactory and trouble free operation of equipment under specified conditions shall be guaranteed for a period of 18 months from starting operation or 24 months from delivery of equipment, whichever comes earlier.

Vendor shall undertake to supply the equipment spare parts for a period of 15 years.

SECTION 11: Training

If required according to buyer recognition, training schedules for operation and maintenance and setting to work shall be provided by the vendor.

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SECTION 12: Spare parts and Special Tools

The vendor shall provide all special tools that may be necessary to enable equipment to be erected, commissioned and maintained. These tools will become the property of the buyer.

The vendor shall submit in its offer lists of recommended spare parts for the following categories:

- Commissioning spare parts:

For the commissioning of the equipment the vendor shall provide a complete set of spare parts which in his opinion and experience are necessary during this period. These spares shall be in addition to those spare parts as below bought by buyer for the running of the equipment after commissioning.

- Two years operation spare parts:

These are spares which the vendor recommends shall be held in stock in order to maintain the equipment in operation for a period of 2 years normal operation after setting to work. These spares will not be available for use by the vendor during commissioning of the plant.

SECTION 13: Technical Questionnaire

Technical Questionnaire shall be filled up by supplier.

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Technical Questionnaire		
Fire Detection and Alarm System		
Particulars	Unit	Item
230 VAC/50 Hz 24 VDC BATTERY Shall be attached a <i>function description drawing</i>.	V V	1. Type 2. Main power supply - Voltage - Distribution 3. Emergency power supply - Voltage - Type - Distribution 4. System functional description drawing

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Technical Questionnaire		
Fire Alarm Control Panel (FACP)		
Particulars	Unit	Item
SANCO - ITALY (EC) CE; EN 54-2; EN 54-4; CPD 12/09/01 QOST-APRAD-SIL 2-3 FB 6100 IP 54 4 2 230VAC / 50 Hz YES 230VAC / 50Hz 24VDC SEALED TYPE n°2 M0 48 STAND BY 30 5 YES YES YES YES NO YES	IP V Yes/No V KVA Ah h minutes A Yes/No Yes/No Yes/No Yes/No Yes/No Yes/No	- Supplier / Country - Certification - Model - Type - Protection degree - Detection loop no. - Spare loop no. - Operating voltage - Redundancy on central CPU&Card Modules - Main power supply - Voltage - Power consumption - Emergency power supply - Voltage - Power consumption - Battery: - Type - Size - Operation time - Alarms activated time - Charger size - Each controlled zone signals, alarms and controls: - Signal of detection system on - Signal of fault of detection system - Signal of fire - Zone protection cut off - Alarms test push button - Acknowledgement signal push button

Technical Questionnaire		
Fire Alarm Control Panel (FACP)		
Particulars	Unit	Item
YES	Yes/No	13. General signals, alarms and controls:
YES	Yes/No	- Signal of normal feeding
NO	Yes/No	- Signal of emergency feeding
YES	Yes/No	- Signal of battery on charge
YES	Yes/No	- Signal of battery low voltage
NO	Yes/No	- Lamp test push button
YES	Yes/No	14. Ability to connect to monitoring system
		15. Programmable relay module for each zone shutdown command to HVAC system, if sensed fire in that zone
YES	Yes/No	16. Capability of connection to upstream control panel / fire brigade panel or graphic panel
YES	Yes/No	- Transmission of all data
YES	Yes/No	- Transmission of filtered (resuming) data
YES		17. Data communication module (port)
YES		18. Control modules
YES	Yes/No	19. Capability of short circuit monitoring
YES		20. Structure:
YES		- Material
YES		- Door
YES FROM BOTTOM		- Cable entry
YES		- Inside electrical devices installation
YES	Yes/No	21. Ability to connect conventional devices via addressable to conventional modules
YES	Yes/No	22. Audio & visual alarm (buzzer & LED) in alarms & fault situation .

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Technical Questionnaire

EXTERNAL POWER SUPPLY & CABINET

Particulars	Unit	Item
SANCO / ITALY (EC) ACCORDING TO EN54 82450 SBC YES	Yes/No	1. Supplier /Country 2. certification 3. model 4. proper external power supply to feed 24 V/DC for each loop .
YES	Yes/No	5. Back up battery for emergency situation
230VAC / 50 Hz	V	6. Input voltage
27VDC	V	7. Output voltage
5A max	A	8. Output current
NO		9. Separate miniature keys to break and connect each loop power in maintenance or emergency situations .
YES		10. Proper cabinet or rack to keep panel & power supply & their batteries :
PLEASE SEE RELEVANT DATA SHEET		- Other specifications or general considerations. - The technical catalogue shall be attached .

Technical Questionnaire		
Detection and Alarm Devices		
Particulars	Unit	Item
SANCO/ITALY (EE) COMPLIANCE WITH EN54-11 2570 BREAK GLASS IP67 24VDC 87(W) x 87(H) x 53(D) 0.20 KG RED NO PLEASE SEE RELEVANT DATA SHEET	IP V mm Kg Yes/No	1. Manual Call Point - Supplier / Country - Certification - Model - Type - Application type - Protection degree - Operating voltage - Connected wire no. (terminal no.) - Dimension - Weight - Installation - Color - Built in bidirectional short-circuit isolator - Other specifications or general considerations (e.g. the design criteria and coverage area description) The technical catalogue shall be attached.

Technical Questionnaire		
Detection and Alarm Devices		
Particulars	Unit	Item
SANCO / ITALY (EC) EN 54 PART 5 DCD - 1 E GRADE 1 CONVENZIONAL COMBINED HEAT DETECTOR ABOUT 30 m² 15 - 30 V YES DIAMETER 100(mm); HEIGHT WITH BASE 47(mm) 0,105 NO PLEASE SEE RELEVANT DATA SHEET	IP m² V Yes/No mm Kg Yes/No	2. Heat Detector, Rate of Rise/Fixed Temperature/combined Type - Supplier / Country - Certification - Model - Type - Application type - Protection degree - Coverage area - Operating voltage - Connected wire no. (terminal no.) - Local response indicator inside the holder - Dimension - Weight - Installation - Built in bidirectional short circuit isolator - Other specifications or general considerations (e.g. the design criteria and coverage area description) The <i>technical catalogue</i> shall be attached.

Technical Questionnaire

Detection and Alarm Devices

Particulars	Unit	Item
SANCO/ ITALY (EC) APPROVED BY LPCB & VDS CONVENTIONAL PHOTOELECTRIC SMOKE DET. SLR-E3 42 FROM 30 TO 50 9.5 - 30VDC YES DIAMETER 100 (mm), HEIGHT 38 (mm) 0.095 NO PLEASE SEE THE ATTACHED DATA SHEET	IP m2 V Yes/No mm Kg Yes/No	3. Smoke Detector, Photoelectric Type - Supplier / Country - Certification - Model - Type - Application type - Protection degree - Coverage area - Operating voltage - Connected wire no. (terminal no.) - Local response indicator inside the holder - Dimension - Weight - Installation - Built in bidirectional short-circuit isolator - Other specifications or general considerations (e.g. the design criteria and coverage area description) The technical catalogue shall be attached.

Technical Questionnaire		
Detection and Alarm Devices		
Particulars	Unit	Item
SANCO / ITALY (EC) 1491 40 7-48 VDC 87 (W) x 46 (H) x 87 (D) 0.06 PLEASE SEE RELEVANT DATA SHEET	IP V mm Kg	4. Response Indicator - Supplier / Country - Certification - Model - Type - Application type - Protection degree - Operating voltage - Connected wire no. (terminal no.) - Dimension - Weight - Installation - Other specifications or general considerations (e.g. the design criteria) The technical catalogue shall be attached.

Technical Questionnaire		
Detection and Alarm Devices		
Particulars	Unit	Item
NOT APPLICABLE	Yes/No V Yes/No	5. UV flame Detector - Supplier/Country - Certification - Model - Ray detection method - Type - Application Type - Location - Require any additional power supply - Detector acceptance angle - Operating voltage - Installation : The base of the flame detectors shall be fasten to the ceiling - Built in bidirectional short-circuit isolator - Other specifications or general considerations - The technical catalogue shall be attached

Technical Questionnaire

Detection and Alarm Devices

Particulars	Unit	Item
SANCO/ ITALY (EC) APPROVED EFSC AND LPCB CHQ-2 /DEM DUAL CIRCUIT ZONE CONTROLLER 17- 41VDC YES YES YES PLEASE SEE THE ATTACHED DATA SHEET	V Yes/No Yes/No Yes/No Yes/No	6. Addressable to conventional module - Supplier/country - Certification - Model - Type - Application type - Operating voltage - Capable to connect conventional devices to the module - Free contact relay for actuating alarm zone (siren, flasher,...) in alarm situation - Built in bidirectional short-circuit isolator - Each module support one conventional zone with at least 20 ^{20 FOR EACH ZONE} conventional devices - Other specifications or general considerations - The technical catalogue shall be attached

Technical Questionnaire

Detection and Alarm Devices

Particulars	Unit	Item
SANED/ITALY (EC) CE CHQ - DSC (SCI) 17-41 VDC YES YES PLEASE SEE THE ATTACHED DATA SHEET	V Yes/No Yes/No	7. Out put module - Supplier/country - Certification - Model - Type - Application type - Operating voltage - Capable to sending shut-down Command for external fans or HVAC in Alarm situation - Built in bidirectional short-circuit isolator - Other specifications or general considerations - The technical catalogue shall be attached

Technical Questionnaire

Detection and Alarm Devices

Particulars	Unit	Item
SAVED/ITALY (EC) 4479-24 (OUTDOOR) - 4476-24 (INDOOR) ELECTRONIC BELL 55 42 18 ÷ 30 VDC 30 mA model 4479-24 (OUTDOOR) 25 mA model 4476-24 (INDOOR) 93 ÷ 95 93 ÷ 95 DIAMETER 155 x 85 (H) model 4479-24 DIAMETER 150 x 60 (H) model 4476-24 1.1 model 4479-24 0.85 model 4476-24 SEE ATTACHED DATA SHEET	IP IP V VA db db mm Kg	8. Fire alarm bell - Supplier / Country - Model - Type - Application type - Protection degree ▪ Outdoor type ▪ Indoor type - Operating voltage - Power consumption - Sound Level at 1m ▪ Outdoor type ▪ Indoor type - Connected wire no. (terminal no.) - Dimension - Weight - Installation - Color - Other specifications or general considerations (e.g. the design criteria) The technical catalogue shall be attached.

Technical Questionnaire		
Detection and Alarm Devices		
Particulars	Unit	Item
SANCO/ITALY (EC)		9. Fire alarm siren - Supplier / Country - Model - Type - Application type - Protection degree ▪ Outdoor type ▪ Indoor type - Operating voltage - Power consumption - Sound Level at 1m ▪ Outdoor type ▪ Indoor type - Connected wire no. (terminal no.) - Dimension - Weight - Installation - Other specifications or general considerations (e.g. the design criteria) The technical catalogue shall be attached.
4461		
65	IP	
	IP	
9÷28VDC	V	
16 mA	VA	
	db	
100	db	
	mm	
	Kg	
DIAMETER 93 x 105 (H)		
0.34		
PLEASE SEE THE ATTACHED DATA SHEET		

Technical Questionnaire

Detection and Alarm Devices

Particulars	Unit	Item
SANED/ITALY (EC) LB31-R 42 9-28VDC 240 mA 120 109(W) x 95(H) 0.58 RED PLEASE SEE THE ATTACHED DATA SHEET	IP IP V VA db db mm Kg	10.Fire alarm horn - Supplier / Country - Model - Type - Application type - Protection degree ▪ Outdoor type ▪ Indoor type - Operating voltage - Power consumption - Sound Level at 1m ▪ Outdoor type ▪ Indoor type - Connected wire no. (terminal no.) - Dimension - Weight - Installation - Color - Other specifications or general considerations (e.g. the design criteria) The technical catalogue shall be attached.

Technical Questionnaire

Detection and Alarm Devices

Particulars	Unit	Item
SANCO / ITALY (EN) 4481 65 20 ÷ 30 VDC 45 mA DIAMETER 93 x 105 (H) 0.34 RED PLEASE SEE ATTACHED DATA SHEET	IP IP V VA mm Kg	11. Visual Signal Generator (Beacon) - Supplier / Country - Model - Type - Application type - Protection degree ▪ Outdoor type ▪ Indoor type - Operating voltage - Power consumption - Connected wire no. (terminal no.) - Dimension - Weight - Installation - Color - Other specifications or general considerations (e.g. the design criteria) The technical catalogue shall be attached.

Technical Questionnaire		
Detection and Alarm Devices		
Particulars	Unit	Item
SANCO / ITALY (EC) 55 ALUMINIUM GREY 392 (W) x 298 (H) x 144 (D) 5,5	mm Kg	12. Junction Box - Supplier / Country - Application type - Protection degree ▪ Outdoor type ▪ Indoor type - Structure: ▪ Material ▪ Color - Terminal Number: ▪ Type ▪ Material - Dimension - Weight - Door Type - Tag - Installation - Other specifications or general considerations (e.g. the design criteria) The technical catalogue shall be attached.

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[Signature]

Technical Questionnaire

Fire Brigade Panel(REPEATER PANEL)

Particulars	Unit	Item
SANCO/ITALY (EC) CONFORM TO EN 60079-15; EN 60281-1-1; IEC 61241-0; IEC 61241-1 MAGELISXBTN 5VDC FROM FBG100		13.FIRE BRIGADE PANEL a. Supplier/Country b. Certification c. Model d. Type e. Protection degree f. Operating voltage g. Redundancy on central CPU
	IP	
	V	
	V	1.Voltage
	V	1.Emergency power supply
		- Voltage
		- Battery
		2)Type
	Ah hour	3)Capacity
	Hour	4)Operation time
	A	5)Back – up battery time
	Yes/No	- Charger size
	Yes/No	3. Capable to monitor each local fire alarm control (panels zone, in alarm & fault situation)
	Yes/No	4. Audio & visual alarm (buzzer & LED) in Alarm & fault situation .
	Yes/No	5. Display LCD

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SECTION 14: Deviation List

Deviation List		
Fire Detection and Alarm System		
Bidder/vendor proposal	Buyer request	Item

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SECTION 15: Material Take Off (MTO) and Price List

MTO and Price List (Unit)				
Distribution Transformer				
Total Price	Unit Price	Quantity	Unit	Item
		1	Set	1. Fire Alarm Control Panel (FACP)
		50	No.	2. Manual Call Point
		40	No.	3. Heat detector, fixed & rate of rise combined
		120	No.	4. Smoke Detector, photo electric type
		50	No.	5. Fire Alarm End of Line Resistor
		5	No.	6. Fire Alarm Bell
		25	No.	7. Fire Alarm Siren
		10	No.	8. Fire Alarm Horn
		10	No.	9. Fire Alarm Beacon
		20	No.	10. Fire Alarm junction Box (JB)
		35	No.	11. Addressable to conventional module
		35	No.	12. Output module
		30	No.	13. Remote indicator lamp
		1	Set.	14. 24 V/DC power supply with battery backup
		1	No.	15. Cabinet or Rack to set fire alarm control panel, power
		30	No.	supply & batteries in that
		1	Set.	16. Repeater Panel
Note: The supplier is responsible of system appropriate function, so the proposal shall be complete and any other devices/accessories that are necessary for system function shall be added by supplier to this list and considered in price list.				

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Price List (Total)		
Distribution Transformer		
Particulars	Price	Item
		1.Design, procurement, fabrication, inspection and testing, packing and guarantee
		2.Delivery
		3.Insurance
		4.Tax
		5.Erection
		6.Supervision of erection
		7.Setting
		8.Commissioning
		9.Training
		10.Proposal spare parts: ▪ Commissioning ▪ Two years operation

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Note: The bidder shall enclose the fulfilled price list in price proposal envelope (envelope "A").



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SECTION 16: GENERAL BLOCK DIAGRAM

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ALL DETECTION AND ALARMING CIRCUITS SHALL BE PROTECTED AGAINST SHORT CIRCUIT.

IN EACH COMMUNICATION ZONE THE LAST DEVICE SHALL BE EQUIPPED WITH END OF LINE RESISTOR ON DOWNE.

OUTPUT MODULES SHALL HAVE CONTACTS WITH 220V AND MINIMUM 1A RATING.

ALL ADDRESSABLE DEVICE (EQUIPMENT) SUCH AS SENSORS, OUT PUT MODULES AND I/O MODULES AS SHOWN IN BLOCK DIAGRAM SHALL BE INSTALLED IN A.

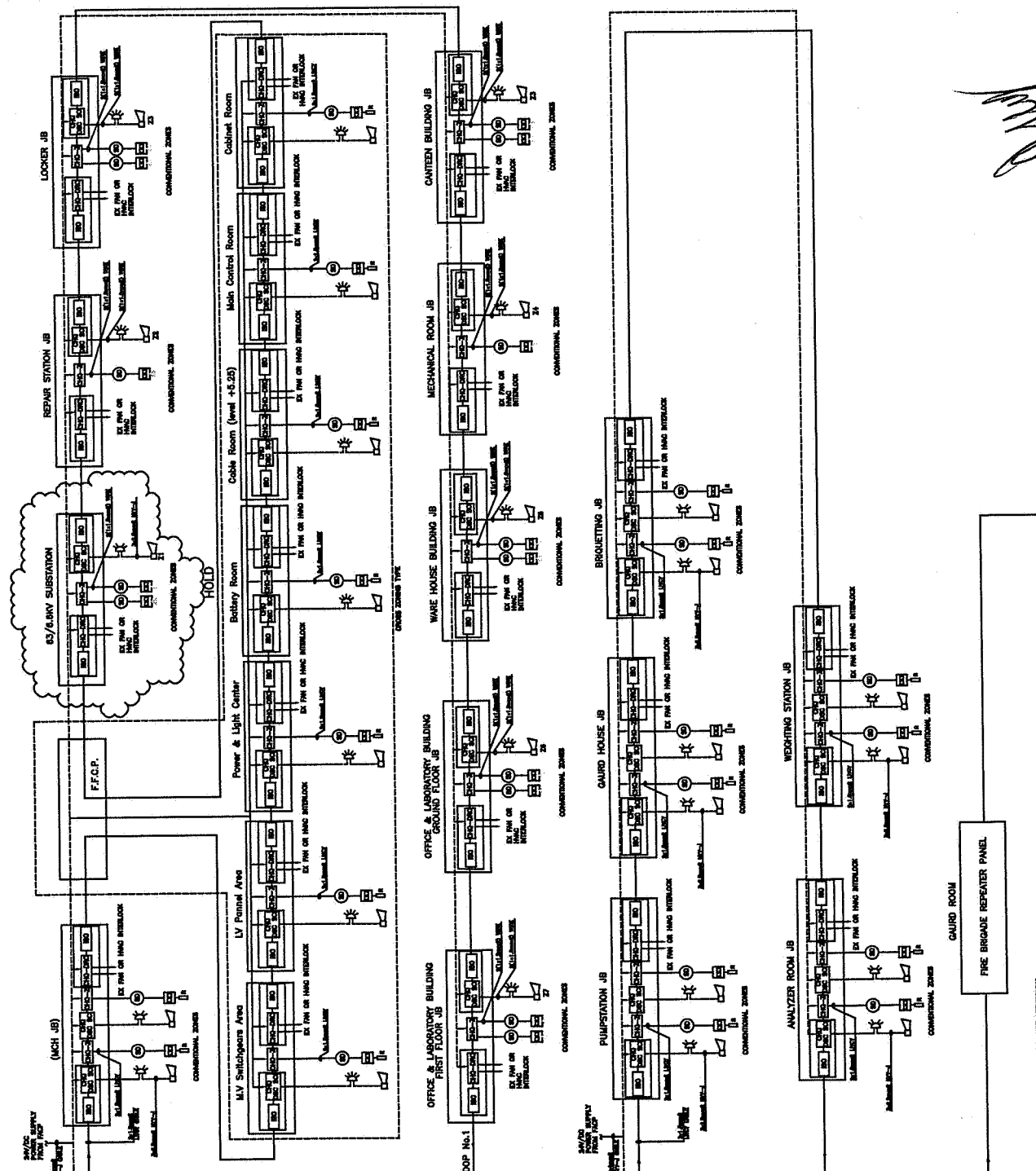
EACH DEVICE (EQUIPMENT) SHALL BE SPECIFIED BY A UNIQUE TAG NUMBER INCLUDING BELOW ITEMS AREA IDENTIFICATION, TAG IDENTIFICATION, LOOP No., ZONE No., DEVICE IDENTIFICATION AND TAG IDENTIFICATION.

- ALL DETECTION AND ALARMING CIRCUITS SHALL BE PROTECTED AGAINST SHORT CIRCUIT.
- IN EACH COMBINATION, ZONE THE LAST DEVICE SHALL BE EQUIPPED WITH END OF LINE RESISTOR OR DIODE.
- OUTPUT MODULES SHALL HAVE CONTACTS WITH 220V AND MINIMUM 1A RATING.
- ALL ADDRESSABLE DEVICE (EQUIPMENT) SUCH AS SOLICITORS, OUT PUT MODULES AND ZONE MODULES AS SHOWN IN BLOCK DIAGRAM SHALL BE INSTALLED IN A.
- EACH DEVICE (EQUIPMENT) SHALL BE SPECIFIED BY A UNIQUE TAG NUMBER INCLUDING BELOW ITEMS AREA IDENTIFICATION, TAG IDENTIFICATION, LOOP No., ZONE No., DEVICE IDENTIFICATION AND TAG IDENTIFICATION.

TITLE		DWG. No.

LEGEND		DESCRIPTION
1	SMOKE DETECTOR	1
2	FIRE ALARM MANUAL CALL POINT	2
3	FIRE ALARM END OF LINE RESISTOR	3
4	FIRE ALARM CONTROL PANEL	4
5	BELL STROBE, Model 611m	5
6	ADDRESSABLE TO CONVENTIONAL MODULE	6
7	ISOLATION SWITCH	7
8	OUT PUT MODULE	8
9	JUNCTION BOX	9
10	FIRE ALARM SIREN	10
11	FIRE ALARM CIRCUIT	11
12	24VDC POWER LINE	12
13	FIRE FIGHTING CONTROL PANEL	13

PRELIMINARY

[illegible]

ADDRESSABLE FIRE ALARM CONTROL PANEL

DATE		TIME		REMARKS	
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9
10	10	10	10	10	10
11	11	11	11	11	11
12	12	12	12	12	12
13	13	13	13	13	13
14	14	14	14	14	14
15	15	15	15	15	15
16	16	16	16	16	16
17	17	17	17	17	17
18	18	18	18	18	18
19	19	19	19	19	19
20	20	20	20	20	20
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ARGON SYSTEM
OPERATING & MAINTENANCE MANUAL

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1.0. SYSTEM DESCRIPTION

1.1. GENERAL DESCRIPTION

GENERALITIES:

The following systems described were installed for fire - fighting protection of areas which have electrical apparatus and/or live wires, by means of high pressure type argon systems.

The protected areas are:

- TO POWER & LIGHT CENTER
- TO MAIN CONTROL ROOM
- TO CABLE ROOM
- TO CABINETS ROOM
- TO BATTERY ROOM
- TO L.V. PANEL AREA
- TO M.V. SWITCHGEARS AREA

The system, of the fixed type, is made up of piping normally empty, connected to a set of argon storage cylinders.

Nozzles of the open type, distributed and orientated in accordance with the applicable standards installed onto the piping, release the gas within the protected area to contain and extinguish the fire.

The intervention of the system is activated: Automatically by means of the fire detection system which will power up the electric controls located on the pilot cylinder and directional valve, and/or manually, on site, by means of suitable handle controls acting exclusively on the pilot cylinder of the argon storage set and directional valve.

The intervention of the pilot cylinder will control the opening of all other slave cylinders.

The release of gas will activate, by means of a pressure switch, the alarm signals, which will then be displayed as the intervention on the control panel.

GENERAL NOTES REGARDING ARGON:

The fire fighting system supplied by Sanco S.p.A. - Galliate (No), uses Argon as extinguishing agent. Argon is a rare totally inert gas, odourless, flavourless, colourless. It is part of the earth's atmosphere (air) in a percentage of 0.93, it is not toxic and therefore it does not causes damages to the human body, it is dielectric (minor electric conductivity) and it is heavier than air.

The extraction is done dividing the gases composing air by means of condensation and distillation, by virtue of the different boiling points.

The air is compressed at 6 bar and cooled at -180°C , so we can divide oxygen and nitrogen in fluid condition, respectively at -183°C (O_2) and -196°C (N_2) and keep them liquid in suitable cylinders at 200 bars.

By means of a compressor 40000 m^3/h capacity we obtain 1860 m^3 Argon and some minor gases (Neon 3.6 m^3 , Elio 1.0 m^3 , ecc.).

The Argon at -122°C (breaking point) is in a completely gaseous form.

The Argon is used to extinguish fires of different nature, it is suitable for liquid or solid combustibles fires.

It is suitable for the protection of volumes in compartment rooms and not for the local protection in open zones, except local protections in side a controlled volume.

The advantage to use it as extinguishing agent in gaseous phase is that during the discharge there is no evaporation and during the adiabatic expansion we have a minimum cooling of the protected zone.

In this way the thermal shock due to the cold is completely eliminated and the particularly delicate equipment, such as control panels, calculators, etc., are preserved.

Moreover there is no condensation production, which together with the combustion products could cause damages to the electrical and electronic systems; actually even in extreme utilisation conditions it is never in solid phase.

It is very important to highlight that the most important characteristic is the extreme compatibility of the gas with the environment and man.

Actually Argon is not dangerous for human being as it is completely non-toxic and without secondary actions for the metabolic process of human body. When used as an extinguishing agent, the possible risk for man is the oxygen reduction in the discharge interested area and the toxic gas inhalations of toxic gases or decomposition products of the combustion or the reactions due to fear or shock.

In any case each project foresees always an Argon concentration suitable for the fire extinction maintaining an minimum oxygen concentration which guarantees, in case of man presence, the vital functions without causing physical damages.

The discharge does not produce fog effect, nor any deposit of substances which could make necessary the "washing" of the room as it is in case of chemical extinguishing agents.

The only requirement, at the end of the extinction, is to ventilate the room in order to restore the original oxygen conditions (20,90%/V).

ARGON STORAGE UNIT:

The fire is extinguished by means of a discharge of a certain quantity of Argon in the protected zones; the gas is stored in cylinders located in safe position, on a suitable rack

The quantity is calculated as per the particular project requirements.

Each cylinder is provided with a special valve having quick opening.

Each cylinder is provided with a pressure gauge complete with low pressure contact for the cumulative remote signalling, suitable to signal that the gas pressure in the cylinder is less 10% of its nominal charge.

The argon is charged in the cylinders at 200 bar pressure at 20°C, with a filling capacity of 80 lt.

The cylinders are built in a special steel and tested as per the Italian rules in force, they have to be tested every 10 years.

All the cylinders are connected to the manifold by means of flexible pipes, each connection is provided with suitable check valves.

DISTRIBUTION NETWORK:

The distribution network is made of carbon steel hot dip galvanised pipes thickness suitable for discharge gas pressure, connected between each other by means of a forged steel fitting.

The nozzles, are provided with a hole suitably dimensioned and they are installed on the piping in suitable positions.

The number of the nozzles and their position, are determined on the bases of the type of protection, of the discharge timing and of the zone/equipment characteristic.

SYSTEM OPERATION:

In case of fire inside the protected area, the detection system will cause, after 30" delay, by means of the activation of the solenoids of the electric actuators located on the pilot cylinders dedicated to the protected zone, the openings of the valves of the same cylinders.

Part of the gas, by means of the pneumatic circuit of the check valve, will pressurise the pneumatic pistons; these ones, by means of their levers pull the opening control bars of all the interested slave cylinders.

At the same time, there is the activation of directional solenoid valves of the protected areas and part of gas through the pneumatic circuit (flexible hoses) pressurises the piston and allows the opening of the directional valve corresponding to the zone that will be protect.

To signal the intervention of the system, on the discharge pipe of each single zone is positioned a pressure switch with manual rearm, connected to the control panel.

In case of fault of control panel, the fire fighting protection can be manually actuated locally, by mean on solenoid valves manual controls for the direction valves opening and manual release boxes for the pilot cylinders opening following operation described on the "Manual release procedure" sign located near the argon rack.

WARNING: Before actuate the manual control intervention devices, be sure that nobody is in the protected zone or it the nearby or communicant zones.

PROJECT INFORMATION

Both the technical and the project information relevant to the protected areas are listed below.

- POWER & LIGHT CENTER

- Reference rules	NFPA 2001
- Protected volume	Ambient = 607.87 m ³
- Design concentration	41.9%
- Argon quantity supplied	622.6 Kg
- Cylinders supplied	N° 22 - 80 liters capacity
- Filling	28.3 Kg / Cylinder at 200 bar
- Quantity of the Argon Nozzles	See Doc. SA-013524-007
- Calculated Discharge Time	~ 1 Minutes

- MAIN CONTROL ROOM

- Reference rules	NFPA 2001
- Protected volume	Ambient = 365 m ³
- Design concentration	41.9%
- Argon quantity supplied	1358.4 Kg
- Cylinders supplied	N° 48 - 80 liters capacity
- Filling	28.3 Kg / Cylinder at 200 bar
- Quantity of the Argon Nozzles	See Doc. SA-013524-007
- Calculated Discharge Time	~ 1 Minutes

- MAIN CONTROL ROOM

- Reference rules	NFPA 2001
- Protected volume	False ceiling = 63 m ³
- Design concentration	41.9%
- Argon quantity supplied	84.9 Kg
- Cylinders supplied	N° 3 - 80 liters capacity
- Filling	28.3 Kg / Cylinder at 200 bar
- Quantity of the Argon Nozzles	See Doc. SA-013524-007
- Calculated Discharge Time	~ 1 Minutes

- CABLE ROOM

- Reference rules	NFPA 2001
- Protected volume	Ambient = 690.07 m ³
- Design concentration	41.9%
- Argon quantity supplied	707.5 Kg
- Cylinders supplied	N° 25 - 80 liters capacity
- Filling	28.3 Kg / Cylinder at 200 bar
- Quantity of the Argon Nozzles	See Doc. SA-013524-007
- Calculated Discharge Time	~ 1 Minutes

- CABINETS ROOM

- Reference rules	NFPA 2001
- Protected volume	Ambient = 310 m ³
- Design concentration	41.9%
- Argon quantity supplied	1358.4 Kg
- Cylinders supplied	N° 48 - 80 liters capacity
- Filling	28.3 Kg / Cylinder at 200 bar
- Quantity of the Argon Nozzles	See Doc. SA-013524-007
- Calculated Discharge Time	~ 1 Minutes

- CABINETS ROOM

- Reference rules	NFPA 2001
- Protected volume	False ceiling = 30.61 m ³
- Design concentration	41.9%
- Argon quantity supplied	56.6 Kg
- Cylinders supplied	N° 2 - 80 liters capacity
- Filling	28.3 Kg / Cylinder at 200 bar
- Quantity of the Argon Nozzles	See Doc. SA-013524-007
- Calculated Discharge Time	~ 1 Minutes

- BATTERY ROOM

- Reference rules	NFPA 2001
- Protected volume	Ambient = 96.04 m ³
- Design concentration	41.9%
- Argon quantity supplied	113.2 Kg
- Cylinders supplied	N° 4 - 80 liters capacity
- Filling	28.3 Kg / Cylinder at 200 bar
- Quantity of the Argon Nozzles	See Doc. SA-013524-007
- Calculated Discharge Time	~ 1 Minutes

- L.V. PANEL AREA

- Reference rules	NFPA 2001
- Protected volume	Ambient = 914.82 m ³
- Design concentration	41.9%
- Argon quantity supplied	933.9 Kg
- Cylinders supplied	N° 33 - 80 liters capacity
- Filling	28.3 Kg / Cylinder at 200 bar
- Quantity of the Argon Nozzles	See Doc. SA-013524-007
- Calculated Discharge Time	~ 1 Minutes

- M.V. SWITCHGEARS

- Reference rules	NFPA 2001
- Protected volume	Ambient = 889.1 m ³
- Design concentration	41.9%
- Argon quantity supplied	905.6 Kg
- Cylinders supplied	N° 32 - 80 liters capacity
- Filling	28.3 Kg / Cylinder at 200 bar
- Quantity of the Argon Nozzles	See Doc. SA-013524-007
- Calculated Discharge Time	~ 1 Minutes

EXPLANATORY DOCUMENTS

SCHEMATIC DIAGRAMS: They show the main components of the Argon systems and their operative conditions.

The above mentioned documents are included in the engineering supplied together with the system.

1.2 SYSTEM COMPONENTS

Systems are made up of the following components:

Argon Skid:

- Argon cylinders
- Suspension device
- Pressure gauge with low pressure contact for monitoring cylinder gas loss
- Manual release box
- Pneumatic piston
- Argon discharging valve (pilot & slave)
- Argon discharge flexible hose
- Argon check valve
- Argon valve control lever
- Argon cylinder support

Argon manifold:

- Interception valves 2½" with pneumatic piston and limit switch.
- Interception valves 2" with pneumatic piston and limit switch.
- Interception valves 1½" with pneumatic piston and limit switch.
- Directional solenoid valves ¼"
- Emergency manual ball valves ½"
- Pressure switches manual re-setting

Argon Distribution network

- Argon discharge nozzles

In order to have further information about the components, please refer to system data-sheet collection supplied with the project documents (Doc. N° SA-013524-014).

2.0. SYSTEM OPERATIONS

2.1 START-UP PROCEDURES

When the systems are completely assembled and tested, as indicate in the instruction manual, the following control operations must be executed:

- a) Argon skid, please check:
 - that the structures are properly fixed, one to the other and to the floor;
 - that the suspension devices are blocked within the relevant nuts and bolts;
 - the pneumatic circuits are properly connected and the fittings properly sealed;
 - the electric circuit are connected to the equipment and to the signalling and control system;
 - the safety pins are positioned in the valves.
- b) Directional valve manifold, please check:
 - the piping are completely assembled, connected and the supports are properly fixed on the structures and walls;
 - the pneumatic circuits are properly connected and the fittings properly sealed;
 - the electric circuit are connected to the equipment and to the signalling and control system;
- c) Distribution net, please check:
 - the piping are completely assembled, connected and the supports are properly fixed on the structures, walls and ceilings;
 - the Argon nozzles are installed.
- d) Protected area, please check:
 - all passages of the piping through walls and ceilings are well sealed;

Now, the system is ready to be “started”

Remark: The start up of the Argon system can be effected only if the detection system (Not supplied) has been inspected and tested.

FINAL TESTS

Proceed with the final test which do not with interfere with the Argon discharge but only the actuation of the automatic devices and the local and remote signal.

Cylinders group:

- With the pilot cylinder valve lever extensions disconnected from the same valve, test the electro-mechanical actuator with the actuation by means of electrical impulse controlled by the relevant control panel;
- Set and rearm the electro-mechanical actuator without positioning the lever extensions;

Argon manifold:

- Actuate by means of the relevant internal piston the “system released” pressure switch (for this operation the pressure switch will be disconnected from their coupling).

START-UP: to make the system working it is necessary to authorise the “AUTOMATIC” function in the control panel if available. At the end of all the above described operations, verify that the control panel is fully functioning and that it does not signal any fault or alarm condition.

REMOVE ALL THE SAFETY PINS FROM THE CYLINDER VALVES

THE SYSTEM IS NOW READY TO OPERATE

2.2. NORMAL OPERATIONS

Once the system here described is working in accordance with all procedures described in the previous chapters and is kept in perfect condition always in accordance with the maintenance instructions described in the proper chapters of this manual, is in a position of operate in an independent way on condition that all required values concerning pressure and flow are respected. At the same time, also detection and control system must be on operating condition, as indicated in the relevant manual.

Particular care must be taken as for new structures or storage conditions of the goods in the protected hazard do not imply the good working of the same, or modify the characteristics of the protected hazard, making the system not suitable.

2.3 SHUT DOWN PROCEDURE

WARNING: The system should be placed out of service only for repairs. The work to be done must be completed in a manner to minimise the time that the system must be out of service. All hazardous activities in the effected area shall be terminated until the system is placed back in service. Any system impairment shall be co-ordinated with the owner, local authority having jurisdiction and other related parties. Place a roving fire patrol in the area covered by the system until the system is back in service.

Prior to turning off any valves or activating any alarms, notify local security guards and/or central alarm station (if used) so that a false alarm will not be signalled and result in a local fire department response.

After the precautions indicated above and before any disassembly of the parts of the system, follow the instructions listed below:

- Disconnect the pneumatic line which controls the pneumatic operators that open the cylinders from the discharge collector;
- Disconnect the opening control levers of the valves mounted on the pilot cylinder;
- Put, in the appropriate drills, the shear pins which are fixed to the valves body by a small wire rope inhibiting the function of the valve itself;
- Put **“SYSTEM OUT OF ORDER”** warning notices into positions where they can be well noticed;

REPAIRS: When necessary, owing to intervention or damages occurred, please execute repairs and mind to use same material as the original ones and following in this way the initial project.

Any difference need to be approved in writing, by SANCO S.p.A. or by the local Authority having jurisdiction.

Repairs must be carried out in accordance with the **“START-UP PROCEDURES”** guidelines, including the **TEST PROCEDURE** described in the Erection Manual.

RESTART: See Section 2.1 of this Manual **“START-UP PROCEDURES”** for all operations concerning the operative restoration of the system. At the end of those operations which have required the replacement of some parts, the components which are normally stored as spare parts and which have been used for repairs, should be replaced; the new components should be identical to those which have been used for repairs or of an equivalent type, authorised by the Manufacturer.

3.0. INSPECTION AND MAINTENANCE

3.1 INSPECTION AND TEST

It is imperative that the system must be inspected and tested on a regular basis. The following recommendations are minimum requirements, the frequency of the inspection may vary due, in function of the system operating condition, for example in case of particularly aggressive atmospheres.

Prior to testing the equipment, notify appropriate personnel.

All inspections and tests here below described, must be carried on by qualified personnel and results must be reported on a proper document with all eventual notes for repairs or removal of differences from original projects.

INSPECTION TABLE

The minimum inspection operations to carry out on the system, complete with a note which indicates the time scale with which these operations must be executed, are listed below.

PROCEDURE DESCRIPTION	FREQUENCY				NOTES
	W	M	S	A	
1. Check the electrical connections to the electro-mechanical actuators, to the pressure switches and to the pressure gauge contacts.	X				After every maintenance or intervention
2. Check that the extensions levers of the Argon cylinders valves are properly installed.	X				After every maintenance or intervention
3. Check that the system has not suffered any damage and, if this is the case, repair them.		X			After every maintenance or intervention
4. Check the expiry date of the Argon cylinder test.		X			According to local regulation (ie: in Italy every 10 years)
5. Check the "armed" or "rest" position of the electro-mechanical actuators and pressure switches.	X				
6. Verify that the safety pins are removed from the cylinder valves.	X				After every maintenance or intervention
7. Check the pneumatic connections between the manifold and the pneumatic actuators.	X				After every maintenance or intervention
8. Check the correct assembling of the control bars, of the Argon valve opening and the good connection of the manual release boxes.	X				After every maintenance or intervention
9. Check that the nozzles are free for Argon diffusion.		X			After every intervention

W = Weekly

S= Semestral

M = Monthly

A= Annual

TEST TABLE

The periodical tests which must be executed on the system and the expiry dates for the execution of these tests, are listed below.

PROCEDURE DESCRIPTION	FREQUENCY				NOTES
	W	M	S	A	
1. Operate the electro-mechanical actuators (without causing the argon release), after removing the cylinders valves levers extensions, by means of the control panel		X			After every maintenance or intervention
2. Simulate the intervention of the pressure switches, by means of a bridge between its contacts or by pushing the internal piston.		X			After every maintenance or intervention

W = Weekly

S= Semestral

M = Monthly

A= Annual

3.2. MAINTENANCE

Argon systems components, since they are not continuously in operation, have a low wear degree.

Therefore a normal use and a preventive maintenance carried out as protection from corrosion and from possible mechanical damages which should be caused by accidental impacts allow the system to have lifelong reliability.

Here below you will find the recommended maintenance operations and the relevant expiry dates on which the same must be effected.

MAINTENANCE SCHEDULE

PROCEDURE DESCRIPTION	FREQUENCY				NOTES
	W	M	S	A	
1. Flexible hoses: as soon as they show damage on their surfaces with aged or worn-out rubber coatings, they have to be replaced immediately.	-	-	-	-	When it is necessary during inspection or after the intervention
2. Painting touch-up: it is advised to touch-up all the points where the paint is damaged in order to avoid corrosion in every part of the system.	-	-	-	-	When it is necessary during inspection
3. Remove the nozzles and clean the drills.	-	-	-	-	After every intervention or when it is necessary during inspection

W = Weekly

S= Semestral

M = Monthly

A= Annual

3.3. SYSTEM DISASSEMBLY AND RE-ASSEMBLY PROCEDURE

When, in the case of maintenance operations or intervention on other system placed within the protected area, which recommend to take the equipment out operation or eventually its disassembly, it's necessary to observe following indications:

NOTIFY: before putting the system out of order, notify to the concerned Office, responsible for the safety, and other Units involved, in order to obtain the authorisation to execute all operations.

OUT OF ORDER: operate as described in Chapter 2.3 of this manual, and in other ones eventually mentioned, included original manuals of the specials components.

Make necessary operations, following instructions relative to different stages, which are described in this manual, included eventual check, or in other connected manuals.

The operations must be executed by qualified personnel, equipped with specific equipment, who have received all information and has taken note of the contents of this manual and other applicable manuals of the system.

IN SERVICE: operate as described in the Chapter 2.1 of this manual, and other connected manuals.

Make necessary operations, following instructions relative to different stages, which are described in this manual, included the testing operation, or in other connected manuals.

At the end, when the system will be perfectly operating, notify to the concerned Office, responsible for safety, and other Units involved, the end of works.

3.4 SYSTEM TROUBLE-SHOOTING INSTRUCTION

Due to the fact that the Argon components do not function continuously, they manifest a low degree of wear. Therefore, with normal use and preventive maintenance carried out, protecting against corrosion and eventual mechanical damage caused by accidental impacts, the system should be reliable for a long time.

PROBLEM TABLE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
1. At the intervention control the electrical heads and directional solenoid valves does not operates	1a. Electrical connection interrupted	1a. Check the electrical connection between the panel and the device
	1b. The electrical supply valves are not correct	1b. Check and correct
2. Pressure gauge with electric contact.	2a. Electrical connection interrupted	2a. Check the electrical connection between the panel and the device
3. The cylinder valve does not open on electro-mechanical actuator intervention	3a. The extension lever of the cylinder valve is not properly installed	3a. Install the lever extension
4. The discharge time is too long	3a. The nozzle drills are partially closed	3a. Remove the nozzles and clean the pipes and the drills.

4.0. INSTRUCTIONS FOR THE REFILLING OF THE CYLINDERS

When, after an intervention discharge or for the restoration of the nominal charge of the extinguishing agent, it is necessary to refill the cylinders, proceed as follows:

4.1 REMOVAL

- Temporarily put the system out of order, acting on the control and signalling panel, according to the procedures described in the relevant manual
- Verify that all precautions have been taken, in order to act in complete safety condition on the cylinders batteries, included the warning by means of a proper notice indicating 'SYSTEM OUT OF ORDER'.
- Disarm the emergency control systems, where existing and the electromechanical controls of the cylinders and on the release cabinet.
- Draw off the valve lever from the cylinder valve.
- Disconnect the discharge hose from the cylinder.
- Disconnect the cylinder from the rack following backwards the indications contained in the chapter concerning the installation of the same.
- Send the cylinder to the supplier for relevant recharging and checking, it will have to be sent complete with the relevant protections (cap, seal, etc.)

4.2. RECHARGING

- Carry out the weighing of the cylinder for the definition of the quantity necessary for the restoring of the discharge conditions.
- Verify if it is a restoration, the seal of the valve by means of proper liquids or sprays for searching of little leakage. In case some leakage could be found out, completely discharge the cylinder, after having blocked it firmly and provide for maintenance or replacement of the valve with another of the same type.
- Place the cylinder on a balance, fixing it and verifying its stability.
- Connect the valve, outlet site, to the hose of the recharging system, provided with the shut-off and vent valves.
- Steadily tighten the connections.
- Open the cylinder valve, and verify that the shut-off and vent valves are closed. Verify the seals, if they works with cylinders partially charged.
- Open the charging valve and transfer the extinguishing agent in the cylinder. When the desired suspension devices is reached, close the charging valves and the cylinder valve. Open the vent valve and verify that there are no leakage from the circuit. If it is necessary close again and verify the closing of the other valves

- Disconnect the hose from the cylinder and the same one from the balance. Take note of the date of the recharging on a proper register, included the possible maintenance carried out. Verify the seal of the valve and apply the transport seals and the proper protections

4.3. REINSTALLATION

- Place again the cylinder in its rack following the instructions indicated in the chapter for the installation.
- Reset all the operative conditions in accordance with the indicated procedures and put the system in condition to work.

4.4. LIST OF RECOMMENDED SPARE PARTS

Spare parts list for 2 years operation and commissioning see SANCO Doc. N° SPLG3939/10.

4.5. LIST OF RECOMMENDED TOOLS

The system operation and maintenance does not require any equipment or device.

A standard tester will be necessary to verify the electric connections.

The test execution does not require any specific test, equipment or device.

5.0. REFERENCE DRAWING

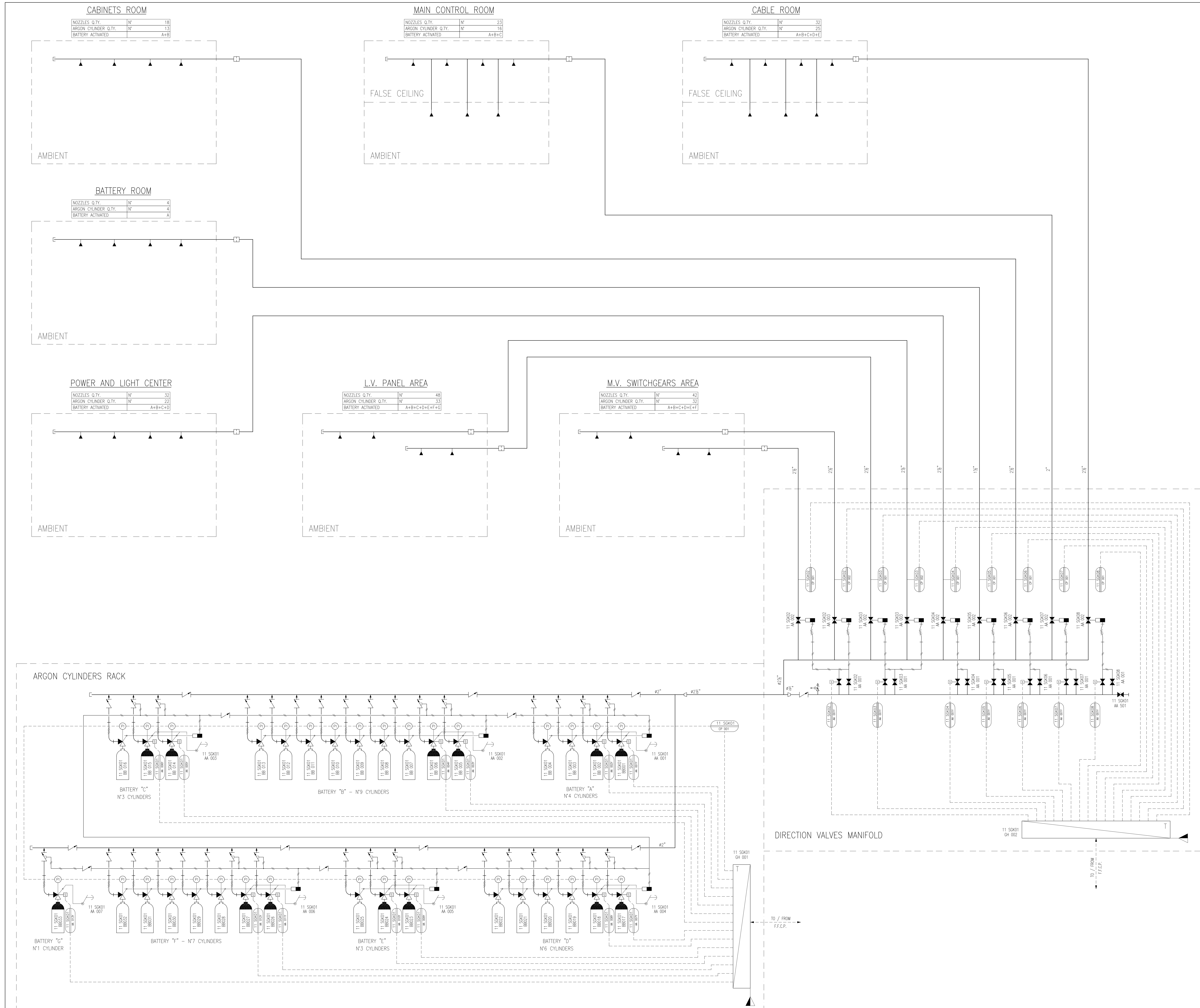
Some principal project documents, which have particular relevance to the use of the system, are listed below; so that reference to them concerning location and consultation, if required, are possible. Documents are not enclosed in this manual.

- FIRE FIGHTING ARGON SYSTEM
P&I DIAGRAM.....Doc. N°SA-013524-001
- FIRE FIGHTING ARGON SYSTEM
ASSEMBLY DRAWING.....Doc. N°SA-013524-002
- FIRE FIGHTING ARGON SYSTEM
PIPING LAYOUT.....Doc. N°SA-013524-003
- FIRE FIGHTING ARGON SYSTEM
PIPING SKETCH.....Doc. N°SA-013524-004
- FIRE FIGHTING ARGON SYSTEM
BILL OF MATERIAL.....Doc. N°SA-013524-005
- FIRE FIGHTING ARGON SYSTEM
DATA SHEET.....Doc. N°SA-013524-006
- FIRE DETECTION & ALARM SYSTEM (FACP)
DIMENSIONAL DWG.....Doc. N°SA-013524-010
- FIRE DETECTION & ALARM SYSTEM (FACP)
WIRING DIAGRAM.....Doc. N°SA-013524-011
- FIRE DETECTION & ALARM SYSTEM (FFCP)
DIMENSIONAL DWG.....Doc. N°SA-013524-012
- FIRE DETECTION & ALARM SYSTEM (FFCP)
WIRING DIAGRAM.....Doc. N°SA-013524-013

6.0. ANNEXES

- SPARE PARTS FOR ARGON SYSTEM.....Doc. N°SPL G3939/10

SANCO S.p.A. Fire Protection and Safety Technology			VIA RAVIZZA 13/A 28066 GALLIATE (NO) ITALY			
CLIENTE Client		IRASCO S.r.l.	DOC. N°	SPL G3939/10		
COMMESSA Plant		G3939/10 Arfa-Ghadir	DATA Date	31/08/2010	REV. 0	
TITOLO Title		SPARE PARTS FOR ARGON SYSTEM		Sheet : 1 of 1		
Item	ID. TAG	Description	Data-sheet	u.m.	Quantity	Notes
1.01		COMMISSIONING SPARE PARTS				
1.02		PRESSURE SWITCH PSH	SA-006826-DS-A4	n.	2	
1.03		NOZZLE Ø½"	SA-012865-DS-A4	n.	5	
1.04		PRESSURE GAUGE WITH SWITCH CONTACT	SA-013646-DS-A4	n.	2	
1.05		ELECTRIC ACTUATOR 24 Vdc IP54 FOR PILOT CYLINDER	SA-013719-DS-A4	n.	1	
1.06		ELECTRIC ACTUATOR 24 Vdc IP54 FOR PILOT DIRECTIONAL VALVES	SA-013719-DS-A4	n.	1	
1.07		FLEXIBLE HOSE	/	n.	1	
1.08						
1.09						
1.10						
1.11		2 YEARS SPARES PARTS				
1.12		PRESSURE SWITCH PSH	SA-006826-DS-A4	n.	4	
1.13		NOZZLE Ø½"	SA-012865-DS-A4	n.	1	
1.14		PRESSURE GAUGE WITH SWITCH CONTACT	SA-013646-DS-A4	n.	4	
1.15		ELECTRIC ACTUATOR 24 Vdc IP54 FOR PILOT CYLINDER	SA-013719-DS-A4	n.	2	
1.16		ELECTRIC ACTUATOR 24 Vdc IP54 FOR PILOT DIRECTIONAL VALVES	SA-013719-DS-A4	n.	2	
1.17		FLEXIBLE HOSE	/		5	
1.18						
1.19						
1.20						
1.21						
1.22						
1.23						
1.24						
1.25						
1.26						
1.27						



LEGEND	
	SUPPLY LIMIT
	PIPE
	PNEUMATIC LINE
	ELECTRIC LINE
	ARGON PILOT CYLINDER – 80 L CAPACITY, 28.3 Kg CHARGED WITH ELECTRIC/MANUAL ACTUATOR, PRESSURE GAUGE AND LOW PRESSURE CONTACT
	ARGON CYLINDER – 80 L CAPACITY, 28.3 Kg CHARGED WITH PRESSURE GAUGE AND LOW PRESSURE CONTACT
	FLEXIBLE HOSE
	ARGON MANUAL RELEASE BOX
	CHECK VALVE
	CHECK VALVE WITH LATERAL CONNECTION
	PNEUMATIC PISTON
	SYSTEM RELEASED LIMIT PRESSURE SWITCH
	JUNCTION BOX WITH TERMINALS
	SOLENOID VALVE (N.C.)
	BALL VALVE (N.C.)
	PRESSURE REDUCER (RESTRICTOR)
	ARGON NOZZLE
	SAFETY VALVE

NOTES	
1- ARGON PIPES DIAMETERS AND NOZZLES Q.TY WILL BE CONFIRMED AFTER ARGON CALCULATION NOTE	
2- Q.TY OF ARGON DIRECTION VALVES AND RELEVANT PIPELINES RUNNING TO PROTECTED ZONES WILL BE CONFIRMED AFTER ARGON CALCULATION NOTE	
3- PRESSURE REDUCERS POSITION WILL BE CONFIRMED AFTER ARGON CALCULATION NOTE	

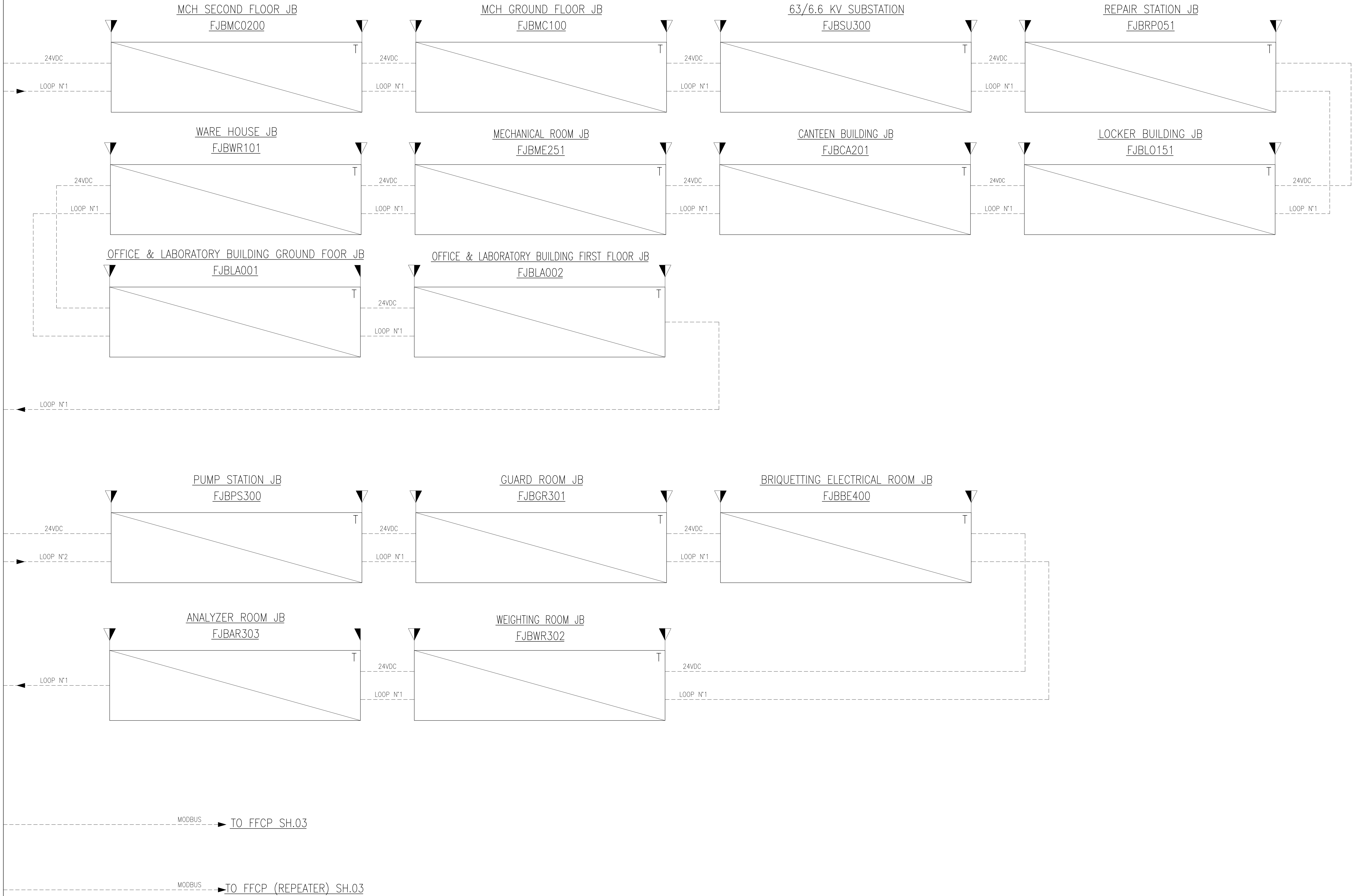
DEFINITIONS	
1 1	SDX 01 ZZ WW
1	TYPE
1	ZONE NUMBER
1	ARGON SYSTEM

ARGON AUTOMATIC RELEASE													
SOLENOID VALVES ACTIVATION LOGIC BY FIRE FIGHTING CONTROL PANEL (F.F.C.P.)													
PROTECTED ZONES	CORRESPONDING SOLENOID VALVES TO BE ACTUATED												
	DIRECTION VALVES MANIFOLD						ARGON CYLINDERS RACK						
	11.25000 11.25000 11.25000 11.25000	11.25000 11.25000 11.25000 11.25000	11.25000 11.25000 11.25000 11.25000	11.25000 11.25000 11.25000 11.25000	11.25000 11.25000 11.25000 11.25000	11.25000 11.25000 11.25000 11.25000	11.25000 11.25000 11.25000 11.25000	11.25000 11.25000 11.25000 11.25000	11.25000 11.25000 11.25000 11.25000	11.25000 11.25000 11.25000 11.25000	11.25000 11.25000 11.25000 11.25000	11.25000 11.25000 11.25000 11.25000	11.25000 11.25000 11.25000 11.25000
BATTERY ROOM			X				X						
CABINETS ROOM				X				X					
MAIN CONTROL ROOM					X				X				
POWER & LIGHT C.		X								X			
CABLE ROOM						X					X		
M.V. SWITCHG. AREA	X											X	
L.V. PANEL AREA		X										X	X

ARGON EMERGENCY MANUAL RELEASE													
MANUAL CONTROLS ACTIVATION													
PROTECTED ZONES	CORRESPONDING MANUAL CONTROLS TO BE ACTUATED												
	DIRECTION VALVES MANIFOLD						ARGON CYLINDERS RACK						
	11.520002 AA.001	11.520003 AA.001	11.520004 AA.001	11.520005 AA.001	11.520006 AA.001	11.520008 AA.001	11.520001 AA.001	11.520001 AA.002	11.520001 AA.003	11.520001 AA.004	11.520001 AA.005	11.520001 AA.006	11.520001 AA.007
BATTERY ROOM			X				X						
CABINETS ROOM				X				X					
MAIN CONTROL ROOM					X				X				
POWER & LIGHT C.		X								X			
CABLE ROOM						X					X		
M.V. SWITCHG. AREA	X											X	
L.V. PANEL AREA		X											X

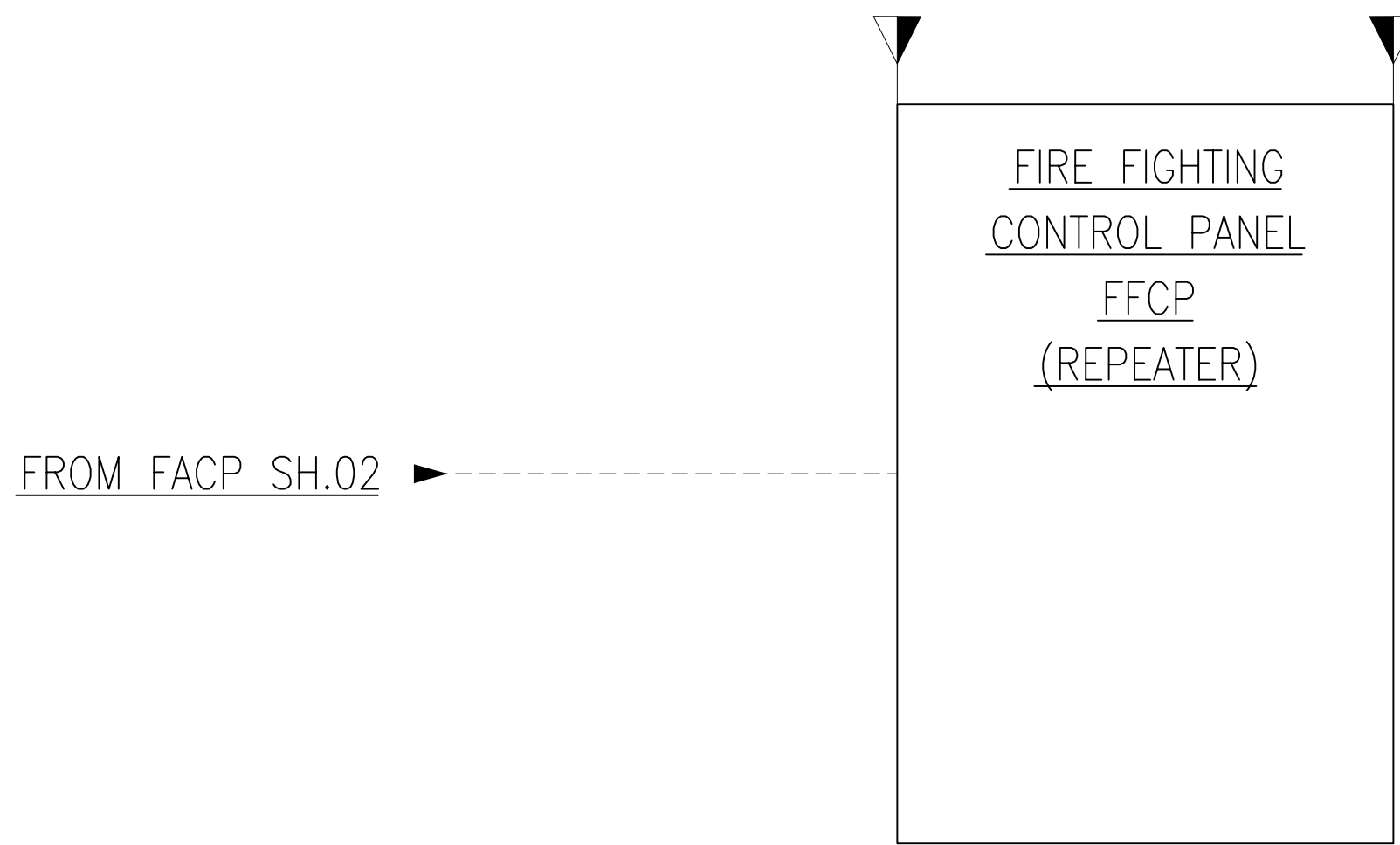
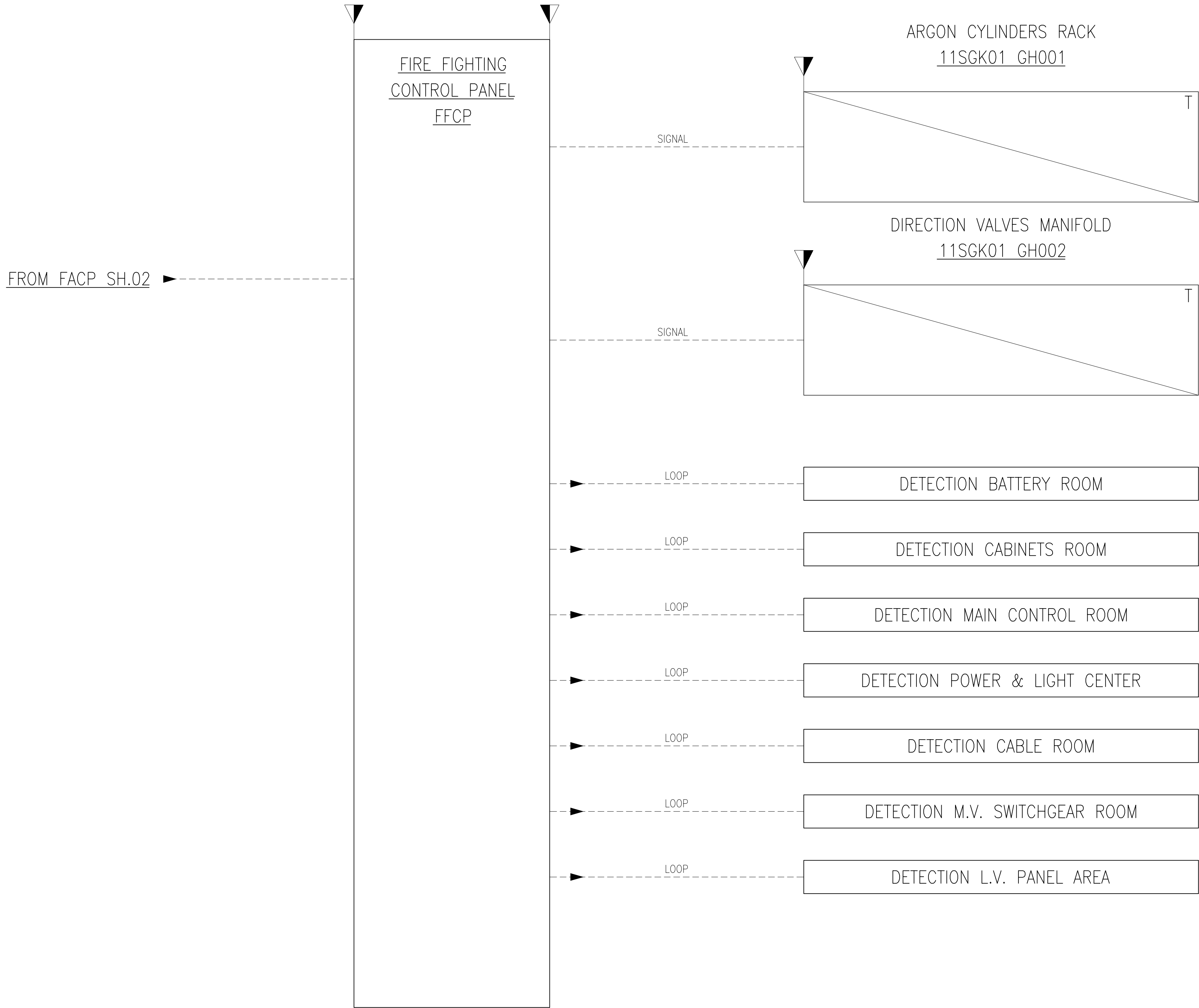
1	07/12/10	REVISED FOR ADDED SHEETS 2 & 3	S. NITRESAVALI	A. BIGNAZZO	D. PORZIO
2	03/12/10	ISSUED FOR APPROVAL	M. LAURO	A. BIGNAZZO	D. PORZIO
REV.	DATE	ISSUE	DRAWN	CHECK	APPROV.
SANCO S.p.A. Fire Protection and Safety Technology			JOB: G3939/10		
VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY			CUSTOMER: RASCO s.r.l.		
GHADIR DIRECT REDUCTION PROJECTS			SCALE: -		
FIRE FIGHTING ARGON SYSTEM			CODE: -		
PIPING & INSTRUMENTS DIAGRAM			SHEET 1 OF 3		
THIS DRAWING IS LEGALLY EXCLUSIVE PROPERTY OF SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. AND IT CAN NEVER BE REPRODUCED NEAR WHOLE, ALSO PARTIAL, TO THIRD PARTIES WITHOUT OUR WRITTEN ASSENT.			DRAWING: SA-013524-041		

ADDRESSABLE FIRE
ALARM CONTROL PANEL
MCH BUILDING
(SECOND FLOOR)



LEGEND	
	SUPPLY LIMIT
	ELECTRIC LINE
	JUNCTION BOX WITH TERMINALS
DEFINITIONS	
	UNIT NUMBER
	PROGRESS
	TYPE
	ZONE NUMBER
	ARCON SYSTEM

1	07/12/10	REVISED FOR ADDED SHEETS 2 & 3	S. INTRESSAVALI	A. BIGNAZZOLI	D. PORZIO
0	03/12/10	ISSUED FOR APPROVAL	M. LAURO	A. BIGNAZZOLI	D. PORZIO
REV.	DATE	ISSUE	DRAWN	CHECK	APPROV.
SANCO S.p.A. Fire Protection and Safety Technology VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY			JOB G3939/10		
TITLE GHADIR DIRECT REDUCTION PROJECTS FIRE FIGHTING ARCON SYSTEM PIPING & INSTRUMENTS DIAGRAM			CUSTOMER IRASCO s.r.l.		
THIS DRAWING IS LEGALLY EXCLUSIVE PROPERTY OF SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. AND IT CAN NEVER BE REPRODUCED NEAR WHOLLY, ALSO PARTIAL, TO THIRD PARTIES WITHOUT OUR WRITTEN ASSENT.			SCALE —		
			CODE —		
			SHEET 2 OF 3		
			DRAWING SA-013524-041		



1	07/12/18	REVISED FOR ADDED SHEETS 2 & 3	S. INTRESSALVI	A. BIGNAZZI	D. PORZIO
0	03/12/18	ISSUED FOR APPROVAL	M. LAURO	A. BIGNAZZI	D. PORZIO
REV.	DATE	ISSUE	DRAWN	CHECK	APPROV.
SANCO S.p.A. Fire Protection and Safety Technology VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY			JOB G3939/10		
TITLE GHADIR DIRECT REDUCTION PROJECTS FIRE FIGHTING ARGON SYSTEM PIPING & INSTRUMENTS DIAGRAM			CUSTOMER IRASCO s.r.l.		
			SCALE —		
			CODE —		
			SHEET 3 OF 3		
THIS DRAWING IS LEGALLY EXCLUSIVE PROPERTY OF SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. AND IT CAN NEVER BE REPRODUCED NEITHER WHOLLY NOR PARTIAL TO THIRD PARTIES WITHOUT OUR WRITTEN ASSENT.			DRAWING SA-013524-041		

ARGON SYSTEM
ERECTION MANUAL

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1.0 PURPOSE

This manual has the scope to give the contractor or user all the information necessary for the installation, preliminary and final verification, before the start-up of the system or of the special equipment supplied.

2.0 INTRODUCTION

The manual describes in different chapters, starting from the summary description of assimilable systems, the operations to be carried out, the controls and tests necessary for the perfect working of the system.

3.0 SYSTEM DESCRIPTION

In principle all the systems are composed of a storage unit for the extinguishing agent, of a control unit for the automatic and/or manual intervention, of a piping distribution net on which the nozzles of the extinguishing agent are installed.

In particular the systems and protected zones/equipments are:

- TO POWER & LIGHT CENTER
- TO MAIN CONTROL ROOM
- TO CABLE ROOM
- TO CABINETS ROOM
- TO BATTERY ROOM
- TO L.V. PANEL AREA
- TO M.V. SWITCHGEARS AREA

4.0 STORAGE REQUIREMENTS

All materials necessary to carry out the installation are dispatched in suitable packages in accordance with the Purchaser specifications.

Ordinary mechanical materials, loose components concerning pipes, supports and prefabricated pipes are usually contained in crates or wooden cases.

Special mechanical materials and ordinary electric ones, or particular equipment are usually contained in wooden cases, and inside its original package: cardboard boxes or little light wooden cases.

Special electric material is normally contained in wooden cases, inside are barrier sacks together with salts against dampness, in its original packages: cardboard boxes or little light wooden cases.

During the whole transport and storage phase, the integrity of the material will have to be preserved by examining the packages. The packages should not be damaged so as to avoid damages of the goods themselves.

A regular maintenance must be carried out, particularly as for packages containing electric materials which need for example a replacement of salts, and so on, according to specific instructions.

All materials, except for pipes and steel drawn products, will have to be stocked in airy storehouses contained in their own original packages, till installation is carried out.

Electric panels and electric / electronic components will have to be stocked in storehouses at an internal temperature not above a maximum of +45°C and not below a minimum of -16°C.

Cylinders for gas storage, complete with protection caps, must be stored in covered and airy rooms, with an ambient temperature not higher than +50°C

5.0 INSTALLATION PROCEDURE

5.1. REFERENCE DOCUMENTS

The technical documentation necessary for the erection of the system is listed in the “Engineering plan”, of the job.

Each planned system is complete of layout, construction details and data relevant to the main components.

The specific document are listed below:

- FIRE FIGHTING ARGON SYSTEM
P&I DIAGRAM.....Doc. N°SA-013524-001
- FIRE FIGHTING ARGON SYSTEM
ASSEMBLY DRAWING.....Doc. N°SA-013524-002
- FIRE FIGHTING ARGON SYSTEM
PIPING LAYOUT.....Doc. N°SA-013524-003
- FIRE FIGHTING ARGON SYSTEM
PIPING SKETCH.....Doc. N°SA-013524-004
- FIRE FIGHTING ARGON SYSTEM
CALCULATION NOTE.....Doc. N°SA-013524-007
- FIRE FIGHTING ARGON SYSTEM
BILL OF MATERIAL.....Doc. N°SA-013524-005
- FIRE FIGHTING ARGON SYSTEM
DATA SHEET.....Doc. N°SA-013524-006
- FIRE DETECTION & ALARM SYSTEM (FACP)
DIMENSIONAL DWG.....Doc. N°SA-013524-010
- FIRE DETECTION & ALARM SYSTEM (FACP)
WIRING DIAGRAM.....Doc. N°SA-013524-011
- FIRE DETECTION & ALARM SYSTEM (FFCP)
DIMENSIONAL DWG.....Doc. N°SA-013524-012
- FIRE DETECTION & ALARM SYSTEM (FFCP)
WIRING DIAGRAM.....Doc. N°SA-013524-013

5.2. COMPONENTS IDENTIFICATION

The main components as cylinders, valves, instruments and prefabricated parts, are identified by item marks, in order to enable the purchaser to recognize each supplied parts.

The item marks are reproduced both in the installation drawings and in the packing list.

Please find hereunder reference and instructions for the components identification:

a) Assembly drawings:

They show the classification, given by the customer or, in default of this one, the classification given by Sanco to the different components.
In the classification given by Sanco the references are:

- Prefabricated pipes (Not Applicable):

Item "XXX-01" where "XXX" is the progressive number of the drawings of Sanco and "01" is the progressive number of the prefabricated pipe.
Such code is marked or written by an indelible felt pen on the same pipe.
In some cases, the number of the relevant line is inserted between the drawing number and the pipe progressive number; i.e. "XXX-001-01".
The same one is not indicated on the pipe.

- Supports:

Item "Mx" or "xxx-S1" where "xxx" is the progressive number of the Sanco plan and "S1" is the progressive number of the housing; "A" identifies a housing of the "S1" series but with some dimensions different to others of the same type.

On the component of the prefabricated housing plan, there is inscribed or written with an indelible pen, the item mentioned above. The other commercial components, interchangeable with other housings, are not itemised. They are supplied in groups according to their type and dimension.

b) Materials list:

They show the item reference indicated on the assembly drawings, as per previous chapter “a”, of the different components. Each assembly drawing is complete of its own materials list, where the reference are repeated.

c) Packing list:

They show the item reference indicated on the drawings and materials list. The drawing showing the position of the component is also indicated on the packing list.

5.3. TOOLS

Suitable for the installation of the system are all usual tools for electric or mechanical installations, such as:

- All usual tools normally used by electricians
- All usual tools normally used by plumbers
- Tools for cut and preparation of the pipes up to 3" diameter
- Tools for cut and threat of pipes up to 3" diameter
- Suitable lifting systems
- Stairs and scaffolds.

All these equipment must be in accordance with all regulations in force and be in good condition.

5.4. SAFETY RULES

Safety rules to be observed during the assembling are those indicated by regulations in force and all further regulations prescribed by the purchaser or by the Authorities having jurisdiction.

Staff: Safety belts
 Safety helmets
 Glasses for welding and grinding
 Safe gloves
 Suitable clothes
 Suitable and safe shoes

Work tools: According to rules for mechanical and electromechanical tools.

Generally: Circumscribe the working area with indications of "NO ENTRY"
 for unauthorized persons.

5.5. ASSEMBLING SEQUENCE

According to the project drawings. Once identified and found the suitable material, carry out the assembling by following the chronological sequence of the main operations.

CYLINDER UNIT

a) Unit preassembled in open structures

- Pick out the position of the structure in the project drawings, and then locate and fix it by means of expansion bolts.
- Go on with the installation of cylinders, hooking them on to the suspension devices by means of suitable threaded cylinder support supplied with movable holders.
- Connect hoses to the cylinders valves, fitting in gaskets both on cylinder side and manifold side, locking well by a fixed key and not by pincers.
- Fit in valve cylinder levers extensions, with the exception of those relating to pilot cylinders.
- Install the electric drive on pilot cylinders by means of suitable nuts with clamps.
- Connect the group to the detection and control system electrically, and it will have to be and remain in a defused position.

b) Groups supplied not preassembled. (See doc. N° G3939-10-AS-001)

- Pre-assemble the edges and the upper span by-means of the fixing nut.
- Install the check valves and the check valves with lateral connection for pilot cylinders with gaskets and the hoses on the manifold and fix up the manifold on the structure by means of the "U"-bolt $\varnothing 2$ "

Remarks: All the threaded connections have to be garnished with sealing liquids (Teflon or similar). Teflon band are not admitted.

- Fix up the suspension device by means of the relevant pins and split pins.
- Fix up the pneumatic release pistons by means suitable supports and screws.
- Fix up the slides and relevant release bars together by means of the relevant supplied screws with distance piece.
- Connect the release pistons to the check valve with lateral connection by means AISI 316. Tubing and special pressure fittings supplied.
- Fix up the anti-oscillation by means suitable supports and screws.
- At this point the structure is totally erected and you will be able to complete the installation as per point "a".
- Then, all the electric circuit connections of the different test and control devices must be realised following the indication of the relevant drawings and wiring diagram.

c) Cylinders assembly

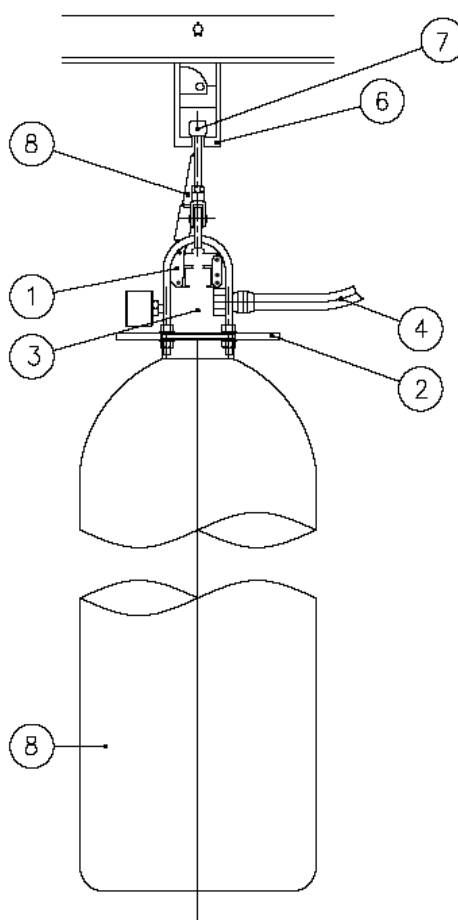
Argon gas has a pressure equal to 200 bars at 20°C in the cylinders and consequently such cylinders must be handled with care; before moving them make sure that all the valve connections are duly closed, avoid knocks or accidental falls.

Accidental gas discharge, from cylinders not fixed to the rack, is extremely dangerous.

- A) Before the installation make sure that the safety pin **(1)** is in the correct position
- B) Screw down on the cylinder, the cylinder support **(2)** c/w bars to be positioned on the balance
- C) Connect the cylinder valve **(3)** on the discharge hose **(4)** inserting the relevant gasket
- D) Lift the cylinder **(5)**.
- E) Engage the rods **(6)** in the suspense balance **(7)**

PAY ATTENTION:

The lever **(8)** of the valve **(3)** must be fixed on the same valve just when all the equipment has been assembled.



F) Install the pressure gauges on the argon valves and carry out the electric connections for the low pressure remote signalling by means of the waterproof connection kit supplied in order to extend the pressure gauge cables.

DISTRIBUTION NET

Proceed in the following way:

- Preparation of the non prefabricated pipes and supports including cleaning and execution of the protective coating according to specifications.

- Installation of necessary supports.
- Installation of pipes and tightening of the connections and supporting components.
- Installation of special equipment while taking into account the indications described in the Chapters 5.6 and 5.7 here below described for the execution of preliminary tests hampering the installation itself.
- Connection to the feeding unit.

Remarks: All the threaded connections must be complete with teflon liquid, other materials are not acceptable.

ASSEMBLING TOLERANCES AND CONTROLS

It is not necessary to carry out particular checks during the assembling works of the system or of the considered equipment.

The dimensions indicated in the drawings will be considered with an average tolerance degree, as normally done in mechanical constructions executed for plumbers and carpenters works.

Dimensions to be observed are mainly those ones concerning the positioning of supports and special components.

Particular care will be taken for the erection of the nozzles and of the system instrument.

5.6. FINAL OPERATIONS

At the end of each erection work, the following operations will be carried out according to the different system sections.

a) Cylinder units:

In the event some cylinder units will be supplied with prefabricated components, non pre-assembled, a pneumatic test has to be carried out on the whole circuit, together with cylinder manifold connections, as described in the next chapter.

N.B. Before this test, the pneumatic pressurized circuits of cylinder batteries control pistons must be disconnected.

At the end, the pneumatic circuits must be brought back into use.

The electric system of whole group will be submit to test operations together with ones relating to signaling and control system, described in the relevant manual.

b) Distribution net:

- Carry out a pneumatic test on the whole circuit, by pressurizing with compressed air, in order to verify the tightness of the couplings and the integrity of the components. The test pressure will be about 3 Bar. The period of the test will be at least 10'. Longer periods will be expressly indicated on the project documents.
- A test pressure decrease within 20% after 10' will be acceptable.

During the test possible leakage will be verified. They will have to be eliminated and the test will have to be repeated till the relevant result will be positive.

The direction valves will have to be closed (as the direction valves manifold is tested in factory) and instead of the nozzles, some caps will be assembled.

The verification can be carried out in different system section, in case the system is particularly extended or in case some particular considerations are necessary.

- At the end of the pneumatic test, by removing all the caps, carry out the blowing of the piping by means of inlet of compressed air or nitrogen. The flow must have the direction from control unit to nozzles.

Clean any obstructed connection, even if partially, before installing the nozzles (See Doc. SA-013524-007).

At the end of the operation install the nozzles, taking care that all the couplings are tightened.

c) Whole system:

- Check that the installation is complete and that the nozzles and the special components have been correctly placed.
- Issue test reports indicating that the final operations have been carried out. The documents should be complete with the registered data, the date and the name of the persons who took part in the operations.

5.7. FINAL CHECK

a) Cylinders units :

- Verify that the structures are well fixed both among them and to the floor, the counterweight of weighing devices are locked between the relevant nuts and lock nuts, the pneumatic circuits are connected and couplings well closed.
- Verify that all electric equipments are correctly connected, but that the relevant control panels are not energized.
For all operations of test of the control and signaling circuits, refer to the relevant manuals.

b) Distribution system

- Verify that the pipes are completely assembled and connected and supports are well fixed on the structures, walls and ceilings; the discharge nozzles are correctly installed.

c) Protected area :

- Verify that all pipes passing through walls and ceilings are sealed; the existence of all warning intervention devices to evacuate the protected area.

d) Whole system

- Carry out the test operations as below described, in order to verify, where possible, the correct working of the equipment before the possible "START UP".
- In order to carry out the "OPERATING TESTS", it will be necessary to complete the assembly of extension pilot cylinder levers and the removal of all safety pins of cylinder valves.

6.0 TEST PROCEDURE

At the end of the control operations previously described, proceed with the hereunder listed test operations, which do not involve the gas discharge but only the activation of signaling and control devices.

6.1. FUNCTIONAL TEST

Carry out the functional test of the different components in order to make sure of their working, without causing the intervention of the extinguishing systems, connected to the different components or controlled by them.

- Test the pressure switch pushing in the internal piston
- Test the electromechanical actuators with lever extension of pilot cylinder valves disconnected from the same valves, in order to verify their activation by means of an electric impulse controlled by the relevant fire control panel.

6.2. OPERATIONAL TEST

Carry out the operational test of the systems in order to make sure that the project characteristics are observed, causing the intervention of the systems with the distribution of the extinguishing agent in the considered area, if possible.

In particular:

- Check of intervention of the electromechanical actuators
- Check of intervention of the cylinder groups
- Check of direction valves
- Check of intervention of the alarm devices
- Check of the intervention time, the degree of concentration of the extinguishing agent.

The execution of the test must be entrusted to trained personnel, who are also provided with all necessary safety equipment.

At the end of the test, a final test report has to be issued, signed by all persons representing the firm charged with the installation, the purchaser / final customer.

On the report all data relevant to the test and possible remarks will have to be indicated.

7.0 OBSERVATION

At the end of the test, a final test report has to be issued, signed by all persons representing the firm charged with the installation, the purchaser/final customer.

On the report all data relevant to the test and possible remarks will have to be indicated.

8.0 ANNEXES

- ARGON CYLINDER VALVE.....Doc. N°SA-013727-DS-A4
- ARGON CYLINDERS SKID INSTALLATION DWG.....Doc. N°G3939-AS-001

REMARK.

Please refer to system data sheet collection supplied with the project documents (Doc. N° SA-013524-006) and if necessary to the reference drawing listed in chapter 5.1 of this manual, in order to have further information about the assembly and identification components.

TITLE / TITOLO

ARGON CYLINDER VALVE VALVOLA BOMBOLA ARGON

DOCUMENT N° / N° DOCUMENTO

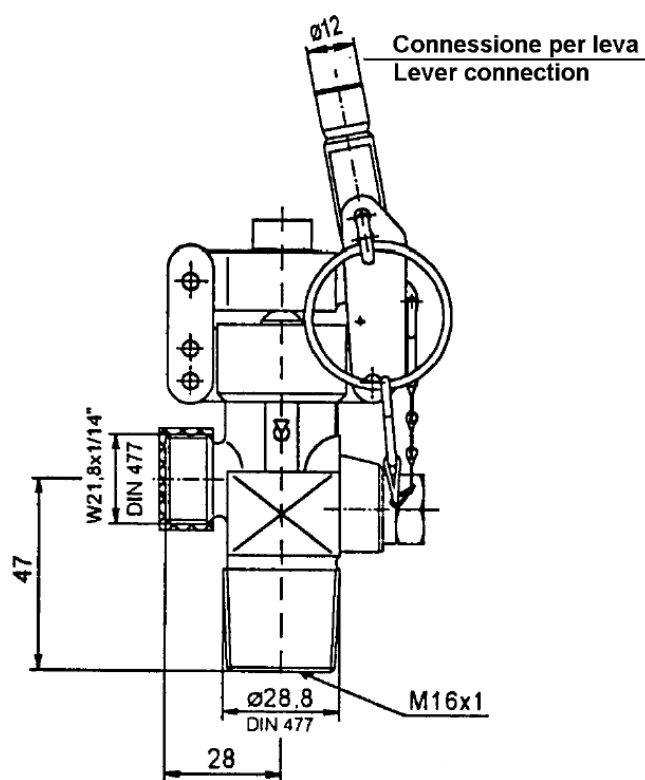
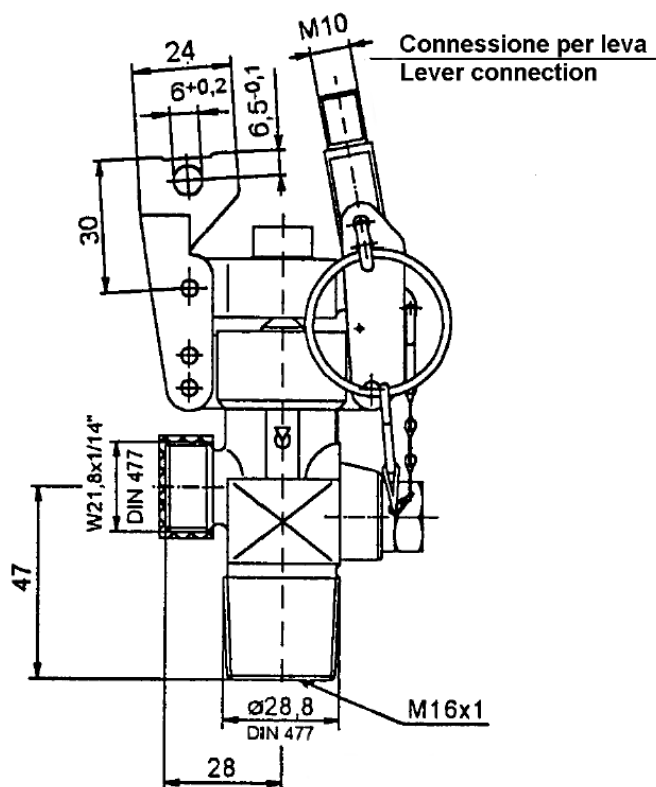
SA-013727-DS-A4

SH / FG OF / DI

1 1

Type K85-20 for pilot cylinder
Tipo K85-20 per bombola pilota

Type K85-11 for slave cylinder
Tipo K85-11 per bombola pilotata



TECHNICAL DATA:

Nominal operating pressure.....235 bar
Test pressure.....353 bar
Material.....brass
Weight.....0,68 kg
Manufacturer.....VTI

dimensions in mm

DATI TECNICI:

Pressione operativa nominale.....235 bar
Pressione di test.....353 bar
Materiale.....ottone
Peso.....0,68 kg
Costruttore.....VTI

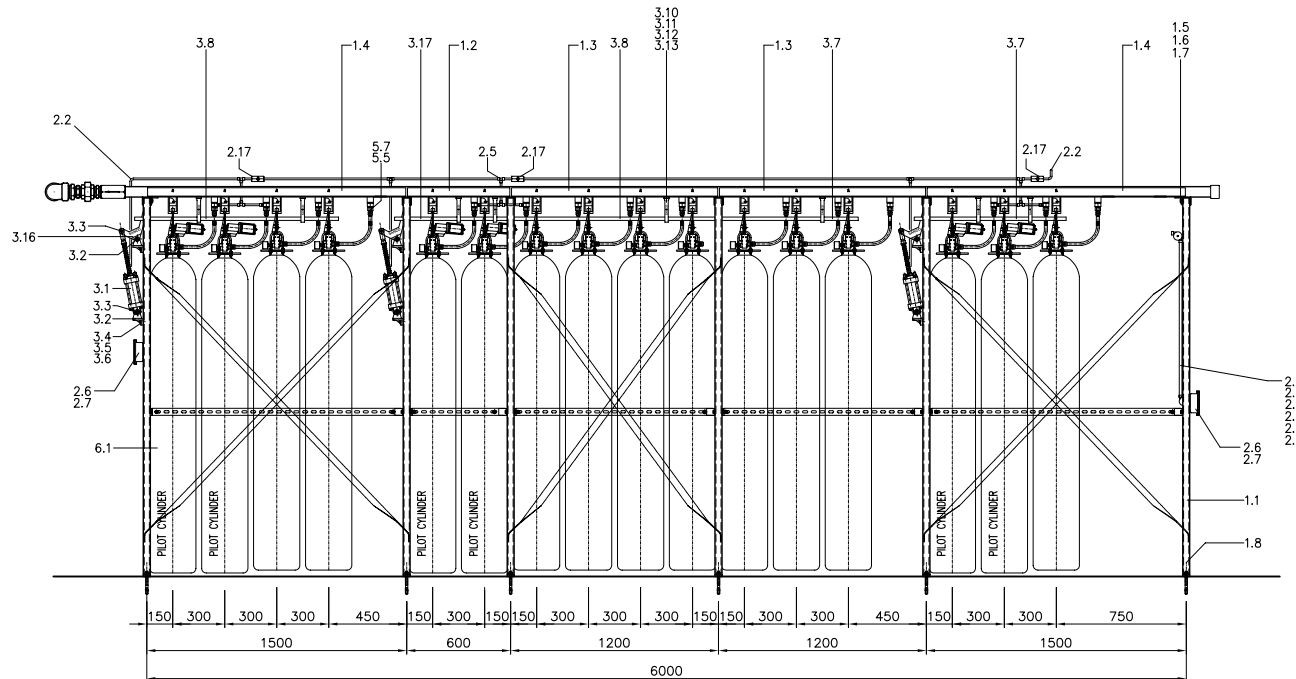
dimensioni in mm

0	03/08/10	ISSUED/EMESSO	M.LAURO	A.BIGANZOLI	D.PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emesso	Checked/Controllato	Approved/Approvato

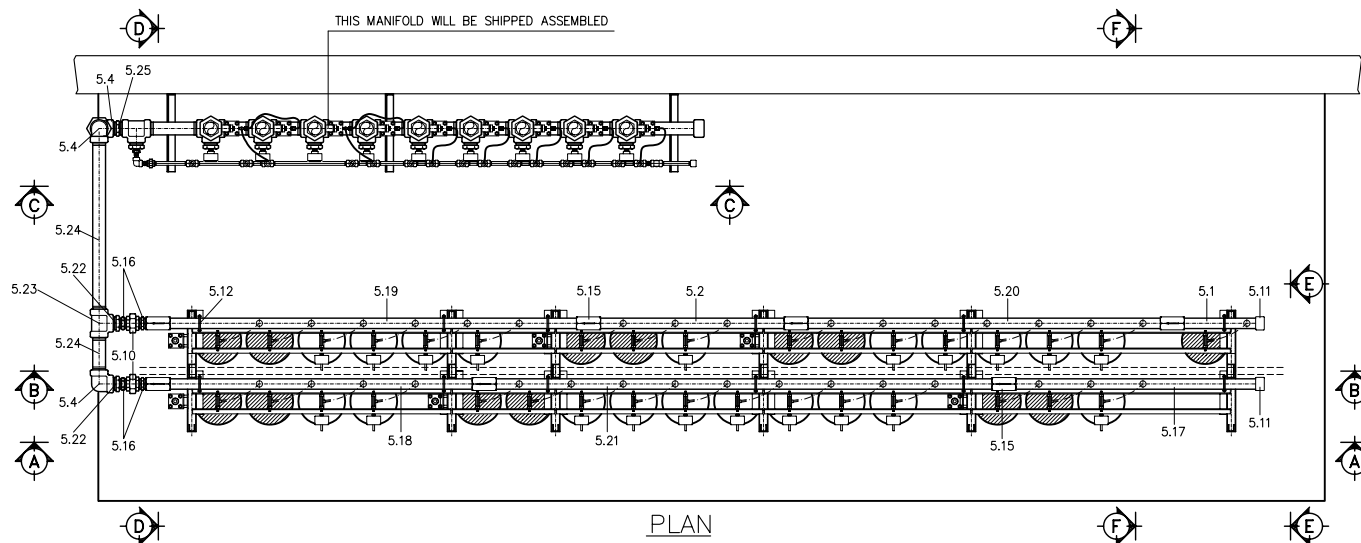
ARGON CYLINDERS SKID
INSTALLATION DRAWING

SANCO S.p.A. Fire Protection and Safety Technology
VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY

COMMESSA / JOB	REV. / REV.
G3939/10	0
DISEGNO / DRAWING	FG./SH. SEG./NEXT
G3939-AS-001	0 1



VIEW A-A



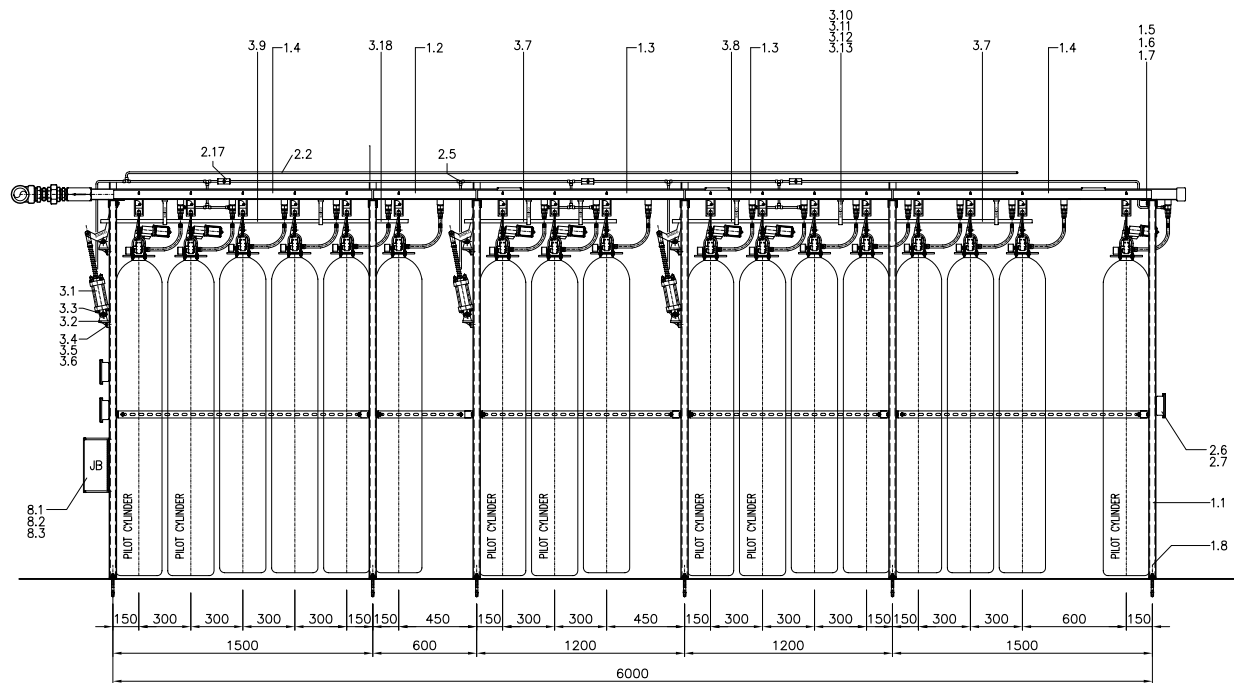
PLAN

SANCO S.p.A. Fire Protection and Safety Technology

VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY

COMMESSA / JOB
G3939/10
DISEGNO / DRAWING
G3939-AS-001

REV. / REV.
0
FG./SH. SEG./NEXT
1 2



VIEW B-B

SANCO S.p.A. Fire Protection and Safety Technology

VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY

COMMESSA / JOB
G3939/10

DISEGNO / DRAWING

G3939-AS-001

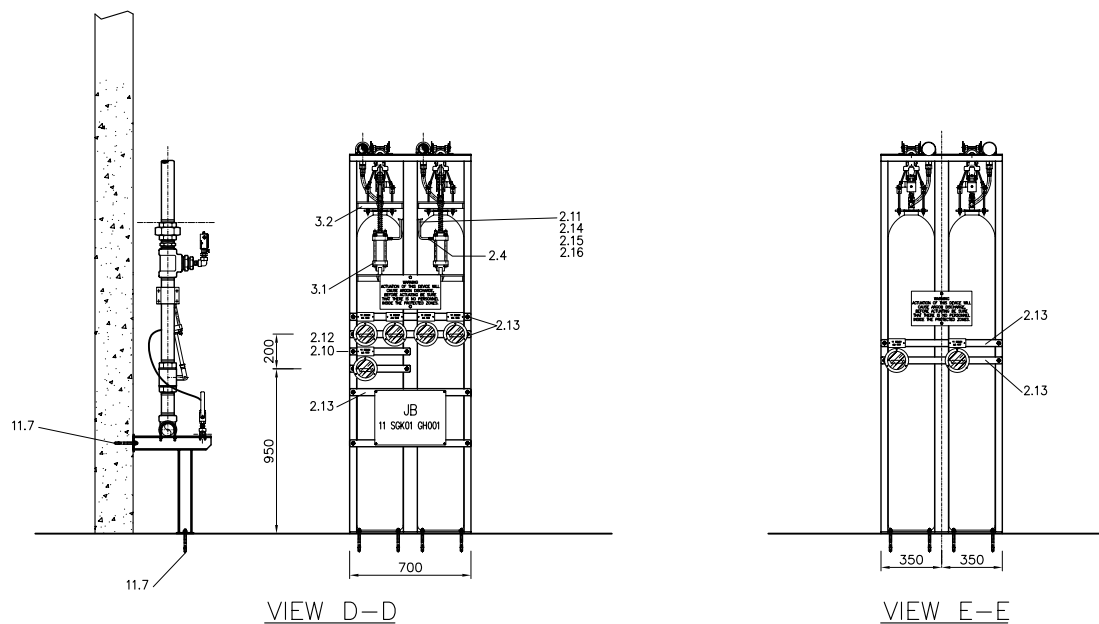
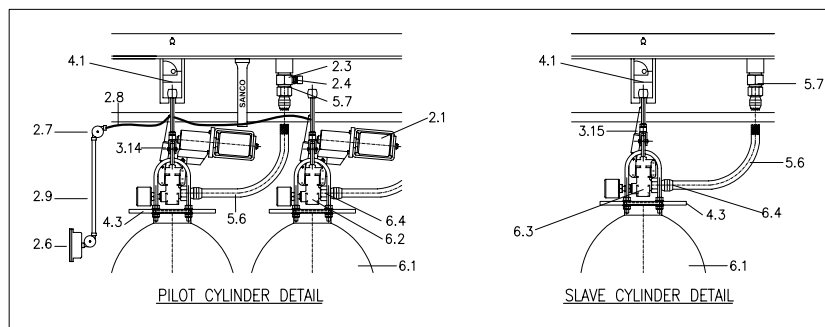
REV. / REV.

0

FG./SH. SEG./NEXT

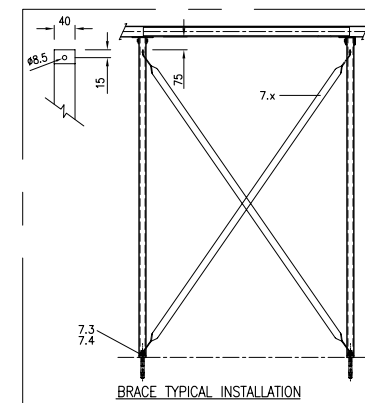
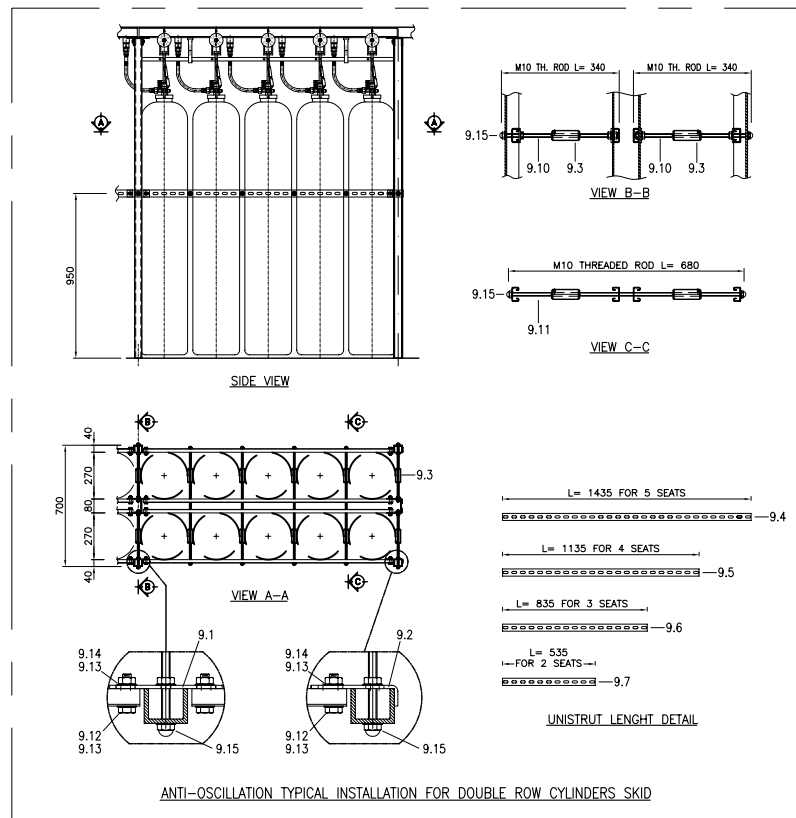
2

3



SANCO S.p.A. Fire Protection and Safety Technology
VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY

COMMESSA / JOB	REV. / REV.
G3939/10	0
DISEGNO / DRAWING	FG./SH. SEG./NEXT
G3939-AS-001	3 4



SANCO S.p.A. Fire Protection and Safety Technology
VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY

COMMESSA / JOB	REV. / REV.
G3939/10	0
DISEGNO / DRAWING	FG./SH. SEG./NEXT
G3939-AS-001	4 5

[illegible]

3					
2					
1	22/11/10	REVISED	M.LAURO	A.BIGANZOLI	D. PORZIO
0	26/10/10	ISSUED FOR APPROVAL	M.LAURO	A.BIGANZOLI	D. PORZIO
REV.	DATA DATE	EMISSIONE ISSUE	DISEGN. DRAWN.	CONTROL. CHECK	APPR. APPROVED
SANCO Fire Protection and Safety Technology VIA RAVIZZA 13/A – 28066 GALLIATE (NO) ITALY			COMMESSAJOB G3939-10		
			CLIENTECUSTOMER IRASCO s.r.l.		
GHADIR PROJECT ARGON CALCULATION NOTE			SCALASCALE —		
			CODICECODE —		
			FOGLIO SHEET	GRD	DI OF 44
A TERMINE DI LEGGE LA SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. SI RISERVA LA PROPRIETA' DEL PRESENTE DISEGNO E NE VIETA LA RIPRODUZIONE O LA DIVULGAZIONE, ANCHE PARZIALE, A TERZI SENZA IL PROPRIO BENESTARE.		THIS DRAWING IS LEGALLY EXCLUSIVE PROPERTY OF SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. AND IT CAN NEITHER REPRODUCED NOR SHOWN, ALSO PARTIAL, TO THIRD PARTIES WITHOUT OUR WRITTEN ASSENT.		DISEGNODRAWING SA-013524-047	

Titolo Title ARFA AND GHADIR PROJECT ARGON CALCULATION NOTE	Documento N°/ Document N° SA-013524-047	Rev. Rev. 1	Fg. / Sh. 2	Di / Of 44
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TECHNICAL DESIGN
 Argon HP System
 M I N I M A X
G m b H

Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : POWER & LIGHT CEN. Name : ARGON No: SA-013524-047

(3.06)

Data of system and quantity flow

Cylinder bank data

 Average temperature tf = 20.0 °C
 Specific quantity Q(60) = 548.0 kg
 Design quantity Q = 576.9 kg
 Cylinder size chosen Fg = 80.0 l / 28.3 kg / 200 bar
 Number of cylinders chosen .. Fz = 22
 Supply quantity Qg = 622.6 kg
 Flooding proportion Q(60)/Qg = 0.88

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlt. [bar]
0	0	1	12	4.0	24.9	0 0 0 0	4.0 0.0	191.3	175.9
1	1	2	65 *h	9.3	548.0	0 5 1 0	16.8 0.3	175.9	161.1
2	2	3	65 *h	3.4	548.0	0 3 0 0	6.4 -1.6	161.1	155.0
3	3	4	65 *h	1.2	548.0	0 0 1 0	3.7 1.2	155.0	151.5
4	4	5	65 *h	2.5	548.0	0 0 0 0	2.5 2.5	151.5	149.0
5	5	6	65 *h	16.0	548.0	0 1 0 0	17.0 0.0	149.0	131.1
6	6	7	65 DK	----	548.0	0 0 0 0	16.6 0.0	131.1	57.6
7	7	8	65 *d	1.1	548.0	0 1 0 0	2.1 0.0	57.6	55.0
8	8	9	65 *d	6.6	274.0	0 1 1 0	10.1 0.0	55.0	51.8
9	9	10	50 *d	2.7	137.0	0 0 1 0	6.1 0.0	51.8	50.5
10	10	11	32 *d	2.1	68.5	0 0 1 0	4.4 0.0	50.5	48.4
11	11	12	32 *d	1.3	34.3	0 0 1 0	3.6 0.0	48.4	48.0
12	12	13	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	48.0	47.9
13	13	14	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	47.9	45.4
14	12	15	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	48.0	47.9
15	15	16	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	47.9	45.4
16	11	17	32 *d	1.3	34.2	0 0 1 0	3.6 0.0	48.4	48.0
17	17	18	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	48.0	47.9
18	18	19	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	47.9	45.4
19	17	20	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	48.0	47.9
20	20	21	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	47.9	45.4
21	9	80	50 *d	1.7	137.0	0 0 1 0	5.1 0.0	51.8	50.7
22	80	81	32 *d	2.0	68.5	0 0 1 0	4.3 0.0	50.7	48.7
23	81	82	32 *d	1.2	34.2	0 0 1 0	3.5 0.0	48.7	48.3
24	82	83	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	48.3	48.2
25	83	84	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	48.2	45.7
26	82	85	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	48.3	48.2
27	85	86	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	48.2	45.7
28	81	87	32 *d	1.2	34.2	0 0 1 0	3.5 0.0	48.7	48.3
29	87	88	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	48.3	48.2

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : POWER & LIGHT CEN. Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m]	inlet pressure [bar]	outlt. [bar]
Continued									
30	88	89	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	48.2	45.7
31	87	90	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	48.3	48.2
32	90	91	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	48.2	45.7
33	80	92	50 *d	1.4	68.5	0 0 1 0	4.8 0.0	50.7	50.4
34	92	93	32 *d	1.0	34.2	0 0 1 0	3.3 0.0	50.4	50.1
35	93	94	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	50.1	50.0
36	94	95	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	50.0	47.5
37	93	96	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	50.1	50.0
38	96	97	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	50.0	47.5
39	92	98	32 *d	1.0	34.2	0 0 1 0	3.3 0.0	50.4	50.1
40	98	99	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	50.1	50.0
41	99	100	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	50.0	47.5
42	98	101	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	50.1	50.0
43	101	102	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	50.0	47.5
44	8	33	65 *d	16.1	274.0	0 2 1 0	20.6 0.0	55.0	48.2
45	33	34	50 *d	2.8	137.0	0 0 1 0	6.2 0.0	48.2	46.7
46	34	35	32 *d	1.1	68.5	0 0 1 0	3.4 0.0	46.7	45.0
47	35	36	32 *d	1.5	34.2	0 0 1 0	3.8 0.0	45.0	44.6
48	36	37	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
49	37	38	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
50	36	39	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
51	39	40	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
52	35	41	32 *d	1.5	34.2	0 0 1 0	3.8 0.0	45.0	44.6
53	41	42	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
54	42	43	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
55	41	44	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
56	44	45	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
57	34	46	32 *d	1.1	68.5	0 0 1 0	3.4 0.0	46.7	45.0
58	46	47	32 *d	1.5	34.2	0 0 1 0	3.8 0.0	45.0	44.6
59	47	48	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
60	48	49	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
61	47	50	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
62	50	51	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
63	33	57	50 *d	2.8	137.0	0 0 1 0	6.2 0.0	48.2	46.7
64	57	58	32 *d	1.0	68.5	0 0 1 0	3.3 0.0	46.7	45.1
65	58	59	32 *d	1.5	34.2	0 0 1 0	3.8 0.0	45.1	44.6
66	59	60	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
67	60	61	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
68	59	62	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
69	62	63	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
70	58	64	32 *d	1.5	34.2	0 0 1 0	3.8 0.0	45.1	44.6
71	64	65	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
72	65	66	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
73	64	67	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
74	67	68	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
75	57	69	32 *d	1.0	68.5	0 0 1 0	3.3 0.0	46.7	45.1

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : POWER & LIGHT CEN. Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlt. [bar]
Continued									
76	69	70	32 *d	1.5	34.2	0 0 1 0	3.8 0.0	45.1	44.6
77	70	71	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
78	71	72	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
79	70	73	32 *d	1.0	17.1	0 0 1 0	3.3 0.0	44.6	44.5
80	73	74	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
81	69	75	32 *d	1.5	34.2	0 0 1 0	3.8 0.0	45.1	44.6
82	75	76	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
83	76	77	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
84	75	78	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
85	78	79	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
86	13	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	47.9	-.-
87	15	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	47.9	-.-
88	18	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	47.9	-.-
89	20	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	47.9	-.-
90	10	22	32 *d	1.3	68.5	0 0 1 0	3.6 0.0	50.5	48.8
91	22	23	32 *d	1.3	34.2	0 0 1 0	3.6 0.0	48.8	48.4
92	23	24	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	48.4	48.3
93	24	25	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	48.3	45.8
94	23	26	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	48.4	48.3
95	26	27	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	48.3	45.8
96	22	28	32 *d	1.3	34.2	0 0 1 0	3.6 0.0	48.8	48.4
97	28	29	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	48.4	48.3
98	29	30	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	48.3	45.8
99	28	31	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	48.4	48.3
100	31	32	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	48.3	45.8
101	24	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.3	-.-
102	26	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.3	-.-
103	29	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.3	-.-
104	31	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.3	-.-
105	85	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.2	-.-
106	83	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.2	-.-
107	88	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.2	-.-
108	90	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.2	-.-
109	94	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	50.0	-.-
110	96	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	50.0	-.-
111	99	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	50.0	-.-
112	101	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	50.0	-.-
113	37	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
114	39	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
115	42	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
116	44	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
117	48	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
118	50	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
119	46	52	32 *d	1.5	34.2	0 0 1 0	3.8 0.0	45.0	44.6
120	52	53	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
121	53	54	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : POWER & LIGHT CEN. Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlt. [bar]
Continued									
122	52	55	32 *d	0.5	17.1	0 0 1 0	2.8 0.0	44.6	44.5
123	55	56	15 *d	0.2	17.1	0 0 1 0	1.2 -0.2	44.5	41.7
124	53	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
125	55	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
126	60	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
127	62	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
128	65	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
129	67	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
130	71	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
131	73	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
132	76	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-
133	78	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	44.5	-.-

Calculation of nozzles

nozzle no.	pipe point	Q(60)nozzle theor. [kg/min]	nozzle pressure [bar]	nozzle orifice theor. actual [mm2] [mm2]	type of nozzle
1	14	17.1	45.4	60.0 54.1	RD 1/2 x 8.3
2	16	17.1	45.4	59.9 54.1	RD 1/2 x 8.3
3	19	17.1	45.4	59.9 54.1	RD 1/2 x 8.3
4	21	17.1	45.4	59.9 54.1	RD 1/2 x 8.3
5	25	17.1	45.8	59.4 54.1	RD 1/2 x 8.3
6	27	17.1	45.8	59.4 54.1	RD 1/2 x 8.3
7	30	17.1	45.8	59.4 54.1	RD 1/2 x 8.3
8	32	17.1	45.8	59.4 54.1	RD 1/2 x 8.3
9	38	17.1	41.7	65.1 66.5	RD 1/2 x 9.2
10	40	17.1	41.7	65.1 66.5	RD 1/2 x 9.2
11	43	17.1	41.7	65.1 66.5	RD 1/2 x 9.2
12	45	17.1	41.7	65.1 66.5	RD 1/2 x 9.2
13	49	17.1	41.7	65.1 66.5	RD 1/2 x 9.2
14	51	17.1	41.7	65.1 66.5	RD 1/2 x 9.2
15	54	17.1	41.7	65.1 66.5	RD 1/2 x 9.2
16	56	17.1	41.7	65.1 66.5	RD 1/2 x 9.2
17	61	17.1	41.7	65.0 66.5	RD 1/2 x 9.2
18	63	17.1	41.7	65.0 66.5	RD 1/2 x 9.2
19	66	17.1	41.7	65.0 66.5	RD 1/2 x 9.2
20	68	17.1	41.7	65.0 66.5	RD 1/2 x 9.2
21	72	17.1	41.7	65.0 66.5	RD 1/2 x 9.2
22	74	17.1	41.7	65.1 66.5	RD 1/2 x 9.2
23	77	17.1	41.7	65.0 66.5	RD 1/2 x 9.2
24	79	17.1	41.7	65.0 66.5	RD 1/2 x 9.2
25	84	17.1	45.7	59.5 54.1	RD 1/2 x 8.3

Titolo Title	Documento N° / Document N°	Rev. Rev.	Fg. / Sh.	Di / Of
ARFA AND GHADIR PROJECT ARGON CALCULATION NOTE	SA-013524-047	1	6	44

Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : POWER & LIGHT CEN. Name : ARGON No: SA-013524-047

Calculation of nozzles

nozzle no.	pipe point	Q(60)nozzle theor. [kg/min]	pressure [bar]	nozzle orifice theor. actual [mm2] [mm2]	type of nozzle
Continued					
26	86	17.1	45.7	59.5 54.1	RD 1/2 x 8.3
27	89	17.1	45.7	59.5 54.1	RD 1/2 x 8.3
28	91	17.1	45.7	59.5 54.1	RD 1/2 x 8.3
29	95	17.1	47.5	57.2 54.1	RD 1/2 x 8.3
30	97	17.1	47.5	57.2 54.1	RD 1/2 x 8.3
31	100	17.1	47.5	57.2 54.1	RD 1/2 x 8.3
32	102	17.1	47.5	57.2 54.1	RD 1/2 x 8.3

Provided pressure reducer:

Pressure reducer type DK 65 / 65 x 27.8

Pressure relief

The minimum pressure relief opening into the air is

600 N/m² => 4655 cm²

The mass flow rate is 22.75 kg/s. The standard volume flow rate is 45910 m³/h

Note: pressure for enclosure is to be checked with the client !

Assumed openings can be taken into account for pressure relief.

Pipe definition

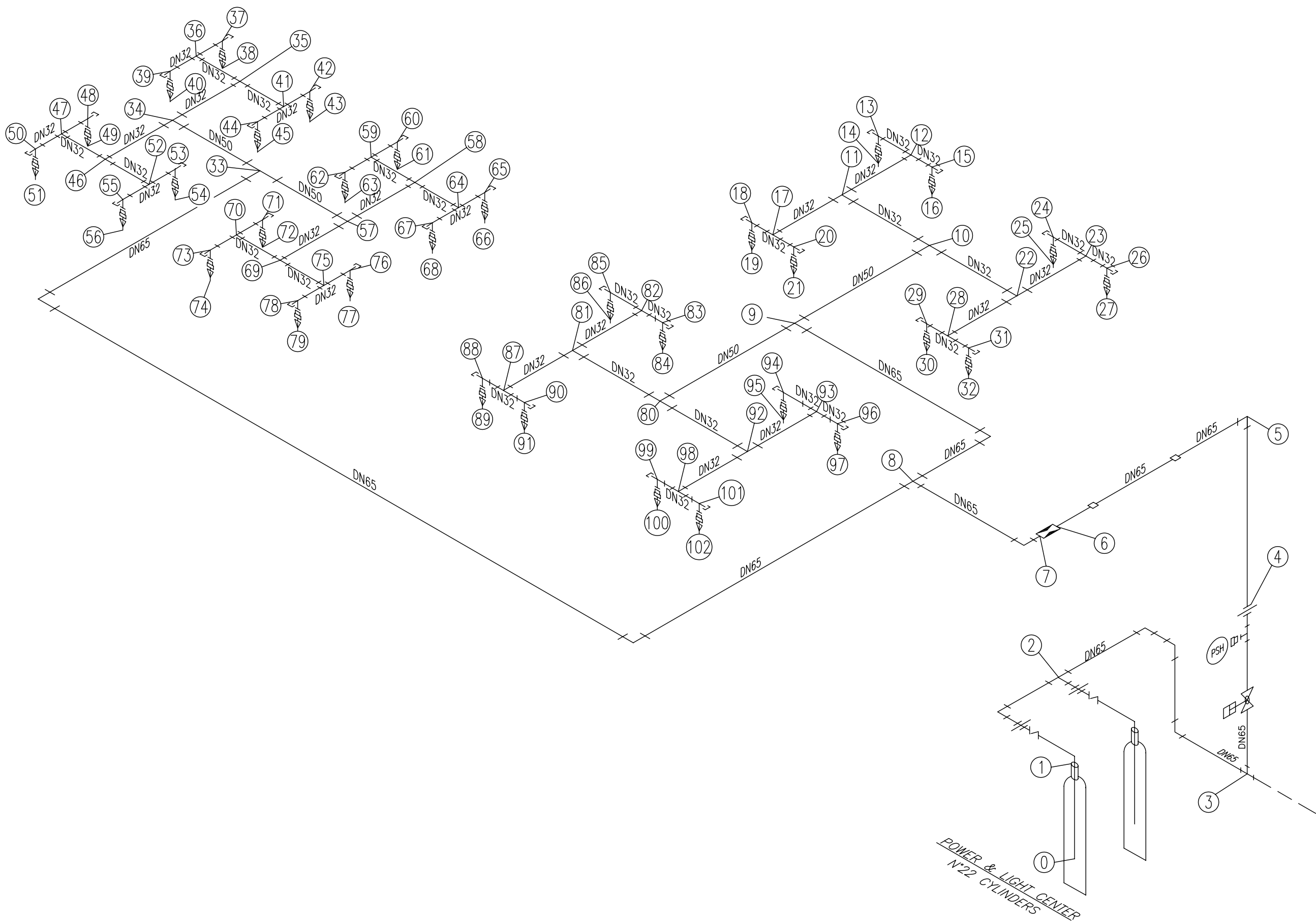
(* Pipe table ASTM A106 Grade B Schedule 40//80/160 *)

*h => upstream pipe 200 bar, threaded

*d => downstream pipe 60 bar, threaded

DK => Pressure reducer

Titolo Title	ARFA AND GHADIR PROJECT ARGON CALCULATION NOTE	Documento N° / Document N°	Rev. Rev.	Fg. / Sh.	Di / Of
		SA-013524-047	1	7	44



Titolo Title ARFA AND GHADIR PROJECT ARGON CALCULATION NOTE	Documento N°/ Document N° SA-013524-047	Rev. Rev. 1	Fg. / Sh. 8	Di / Of 44
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TECHNICAL DESIGN M I N I M A X
 Argon HP System G m b H

Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : MAIN CONTROL ROOM Name : ARGON No: SA-013524-047

(3.06)

Data of system and quantity flow

Cylinder bank data

 Average temperature tf = 20.0 °C
 Specific quantity Q(60) = 390.0 kg
 Design quantity Q = 410.6 kg
 Cylinder size chosen Fg = 80.0 l / 28.3 kg / 200 bar
 Number of cylinders chosen .. Fz = 16
 Supply quantity Qg = 452.8 kg
 Flooding proportion Q(60)/Qg = 0.86

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlt. [bar]
0	0	1	12	4.0	24.4	0 0 0 0	4.0 0.0	196.1	182.6
1	1	2	50 *h	6.7	390.0	0 4 0 0	13.5 0.3	182.6	163.9
2	2	3	65 *h	3.7	390.0	0 3 0 0	6.7 -1.6	163.9	160.9
3	3	4	50 *h	1.2	390.0	0 0 1 0	4.6 1.2	160.9	154.0
4	4	5	50 *h	4.4	390.0	0 1 0 0	6.1 3.2	154.0	144.3
5	5	6	50 *h	7.1	390.0	0 1 0 0	8.8 7.0	144.3	129.1
6	6	7	50 DK	----	390.0	0 0 0 0	9.9 0.0	129.1	59.1
7	7	8	50 *d	4.8	390.0	0 1 0 0	6.5 0.0	59.1	49.3
8	8	9	50 *d	3.3	205.9	0 0 1 0	6.7 0.0	49.3	46.1
9	9	10	40 *d	1.7	103.0	0 0 1 0	4.4 0.0	46.1	44.0
10	10	54	40 *d	0.4	51.5	0 0 1 0	3.1 0.0	44.0	43.6
11	54	55	15 *d	0.2	7.7	0 0 1 0	1.2 0.2	43.6	43.1
12	54	11	40 *d	0.9	43.8	0 1 0 1	3.0 -0.2	43.6	43.3
13	11	12	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	43.3	43.2
14	12	13	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	43.2	38.8
15	11	14	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	43.3	43.2
16	14	15	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	43.2	38.8
17	10	52	40 *d	0.8	51.5	0 0 1 0	3.5 0.0	44.0	43.5
18	52	53	15 *d	0.2	7.7	0 0 1 0	1.2 0.2	43.5	43.0
19	52	16	40 *d	0.7	43.8	0 1 0 1	2.8 0.0	43.5	43.3
20	16	17	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	43.3	43.2
21	17	18	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	43.2	38.8
22	16	19	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	43.3	43.2
23	19	20	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	43.2	38.8
24	9	21	40 *d	1.7	103.0	0 0 1 0	4.4 0.0	46.1	44.0
25	21	56	40 *d	0.8	51.5	0 0 1 0	3.5 0.0	44.0	43.5
26	56	57	15 *d	0.2	7.7	0 0 1 0	1.2 0.2	43.5	43.0
27	56	22	40 *d	0.7	43.8	0 1 0 1	2.8 0.0	43.5	43.3
28	22	23	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	43.3	43.2
29	23	24	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	43.2	38.8

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : MAIN CONTROL ROOM Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlt. [bar]
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Continued

30	22	25	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	43.3	43.2
31	25	26	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	43.2	38.8
32	21	58	40 *d	7.5	51.5	0 0 1 0	10.2 0.0	44.0	42.7
33	58	59	15 *d	0.2	7.7	0 0 1 0	1.2 0.2	42.7	42.2
34	58	27	40 *d	0.7	43.8	0 1 0 1	2.8 0.0	42.7	42.4
35	27	28	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	42.4	42.4
36	28	29	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	42.4	37.8
37	27	30	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	42.4	42.4
38	30	31	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	42.4	37.8
39	8	32	50 *d	2.4	184.1	0 0 1 0	5.8 0.0	49.3	47.1
40	32	33	40 *d	2.0	103.0	0 0 1 0	4.7 0.0	47.1	44.9
41	33	60	40 *d	0.6	51.5	0 0 1 0	3.3 0.0	44.9	44.5
42	60	61	15 *d	0.2	7.7	0 0 1 0	1.2 0.2	44.5	44.0
43	60	34	40 *d	0.6	43.8	0 1 0 1	2.7 0.0	44.5	44.3
44	34	35	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	44.3	44.2
45	35	36	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	44.2	39.8
46	34	37	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	44.3	44.2
47	37	38	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	44.2	39.8
48	33	62	40 *d	0.6	51.5	0 0 1 0	3.3 0.0	44.9	44.5
49	62	63	15 *d	0.2	7.7	0 0 1 0	1.2 0.2	44.5	44.0
50	62	39	40 *d	0.6	43.8	0 1 0 1	2.7 0.0	44.5	44.3
51	39	40	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	44.3	44.2
52	40	41	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	44.2	39.8
53	39	42	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	44.3	44.2
54	42	43	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	44.2	39.8
55	32	44	40 *d	2.0	81.1	0 0 1 0	4.7 0.0	47.1	45.7
56	44	64	40 *d	0.6	51.5	0 0 1 0	3.3 0.0	45.7	45.3
57	64	65	15 *d	0.2	7.7	0 0 1 0	1.2 0.2	45.3	44.8
58	64	45	40 *d	0.6	43.8	0 1 0 1	2.7 0.0	45.3	45.1
59	45	46	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	45.1	45.0
60	46	47	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	45.0	40.8
61	45	48	40 *d	0.5	21.9	0 0 1 0	3.2 0.0	45.1	45.0
62	48	49	15 *d	0.2	21.9	0 0 1 0	1.2 -0.2	45.0	40.8
63	44	50	40 *d	3.1	29.6	0 0 1 0	5.8 0.0	45.7	45.5
64	50	51	15 *d	0.2	21.9	0 0 1 0	1.2 0.2	45.5	41.3
65	50	66	40 *d	0.5	7.7	0 0 0 1	1.3 0.0	45.5	45.5
66	66	67	15 *d	0.2	7.7	0 0 1 0	1.2 -0.2	45.5	45.0
67	12	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.2	-.-
68	15	-	15 *d	0.2	-.-	0 0 0 1	0.5 0.0	38.8	-.-
69	17	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.2	-.-
70	19	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.2	-.-
71	23	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.2	-.-
72	25	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.2	-.-
73	28	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	42.4	-.-
74	30	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	42.4	-.-
75	35	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	44.2	-.-

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Client : IRASCO Project: G3939-10 Date : 22.11.2010
 Build. : MAIN CONTROL ROOM Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va	eb	ts	tt	total eleva. length [m]	diff. [m]	inlet pressure [bar]	outlt. [bar]
Continued													
76	37	-	40 *d	0.2	-. -	0	0	0	1	1.0	0.0	44.2	-. -
77	40	-	40 *d	0.2	-. -	0	0	0	1	1.0	0.0	44.2	-. -
78	42	-	40 *d	0.2	-. -	0	0	0	1	1.0	0.0	44.2	-. -
79	46	-	40 *d	0.2	-. -	0	0	0	1	1.0	0.0	45.0	-. -
80	48	-	40 *d	0.2	-. -	0	0	0	1	1.0	0.0	45.0	-. -
81	66	-	40 *d	0.2	-. -	0	0	0	1	1.0	0.0	45.5	-. -

Calculation of nozzles

nozzle no.	pipe point	Q(60)nozzle theor. [kg/min]	pressure [bar]	nozzle orifice theor. [mm2]	actual [mm2]	type of nozzle
1	13	21.9	38.8	86.3	83.3	RD 1/2 x 10.3
2	15	21.9	38.8	86.3	83.3	RD 1/2 x 10.3
3	18	21.9	38.8	86.4	83.3	RD 1/2 x 10.3
4	20	21.9	38.8	86.4	83.3	RD 1/2 x 10.3
5	24	21.9	38.8	86.4	83.3	RD 1/2 x 10.3
6	26	21.9	38.8	86.4	83.3	RD 1/2 x 10.3
7	29	21.9	37.8	88.5	93.3	RD 1/2 x 10.9
8	31	21.9	37.8	88.5	93.3	RD 1/2 x 10.9
9	36	21.9	39.8	84.1	83.3	RD 1/2 x 10.3
10	38	21.9	39.8	84.1	83.3	RD 1/2 x 10.3
11	41	21.9	39.8	84.1	83.3	RD 1/2 x 10.3
12	43	21.9	39.8	84.1	83.3	RD 1/2 x 10.3
13	47	21.9	40.8	82.1	83.3	RD 1/2 x 10.3
14	49	21.9	40.8	82.1	83.3	RD 1/2 x 10.3
15	51	21.9	41.3	81.1	83.3	RD 1/2 x 10.3
16	53	7.7	43.0	27.4	21.2	RD 1/2 x 5.2
17	55	7.7	43.1	27.4	21.2	RD 1/2 x 5.2
18	57	7.7	43.0	27.4	21.2	RD 1/2 x 5.2
19	59	7.7	42.2	27.9	34.2	RD 1/2 x 6.6
20	61	7.7	44.0	26.8	21.2	RD 1/2 x 5.2
21	63	7.7	44.0	26.8	21.2	RD 1/2 x 5.2
22	65	7.7	44.8	26.3	21.2	RD 1/2 x 5.2
23	67	7.7	45.0	26.2	21.2	RD 1/2 x 5.2

Provided pressure reducer:

Pressure reducer type DK 50 / 50 x 23.2

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : MAIN CONTROL ROOM Name : ARGON No: SA-013524-047

Pressure relief

The minimum pressure relief opening into the air is
600 N/m² => 3203 cm²
The mass flow rate is 15.66 kg/s. The standard volume flow rate is 31590 m³/h

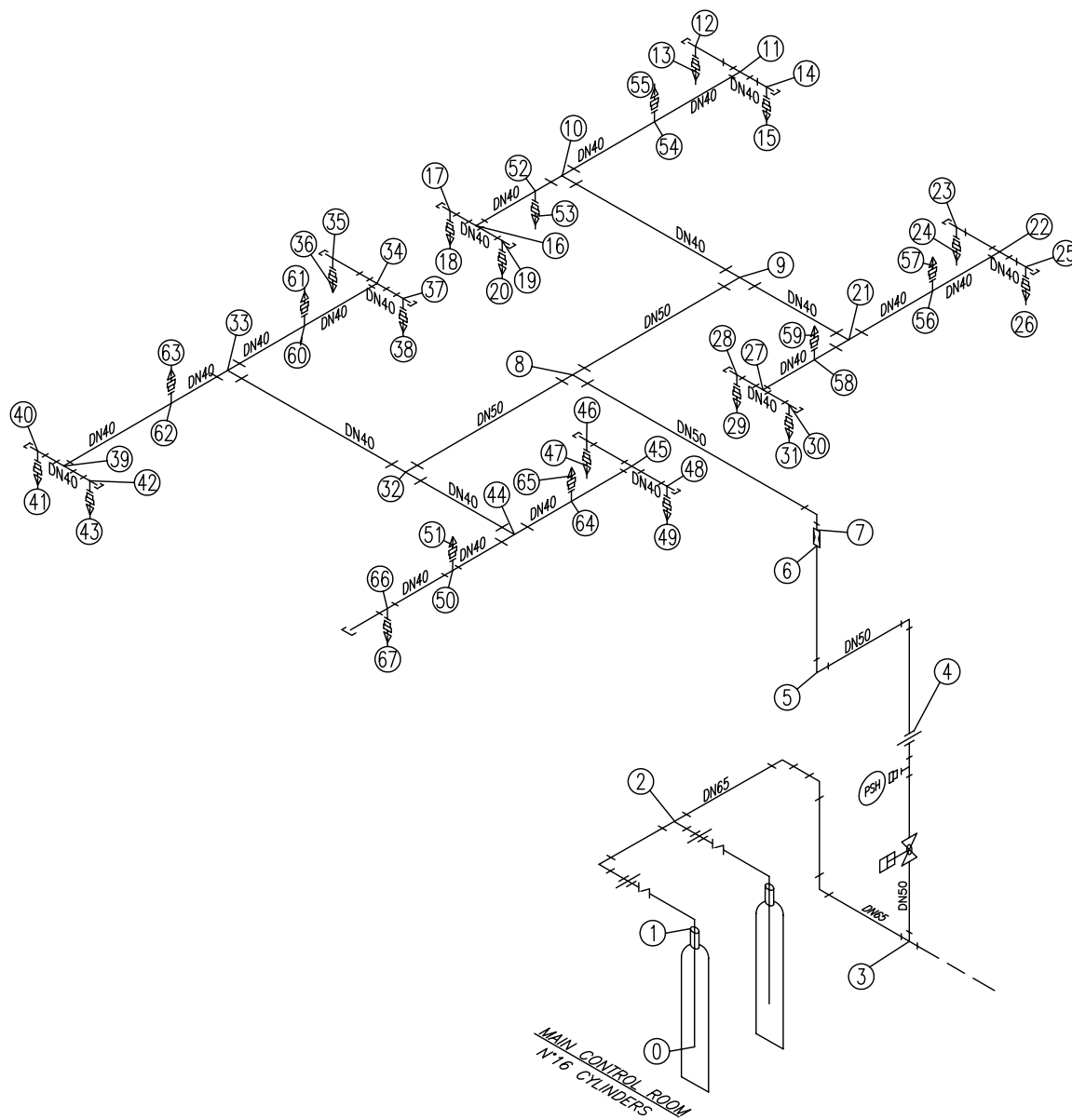
Note: pressure for enclosure is to be checked with the client !
Assumed openings can be taken into account for pressure relief.

Pipe definition

(* Pipe table ASTM A106 Grade B Schedule 40//80/160 *)

*h => upstream pipe 200 bar, threaded
*d => downstream pipe 60 bar, threaded
DK => Pressure reducer

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TECHNICAL DESIGN M I N I M A X
Argon HP System G m b H

Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : CABLE ROOM Name : ARGON No: SA-013524-047

(3.06)

Data of system and quantity flow

Cylinder bank data

Average temperature tf = 20.0 °C
Specific quantity Q(60) = 622.1 kg
Design quantity Q = 654.9 kg
Cylinder size chosen Fg = 80.0 l / 28.3 kg / 200 bar
Number of cylinders chosen .. Fz = 25
Supply quantity Qg = 707.5 kg
Flooding proportion Q(60)/Qg = 0.88

Pressure drop calculation

pipe sec.	from	to	Nominal		Argon quantity [kg/min]	pipe fitt.				total eleva.		inlet pressure [bar]	outlt. [bar]	
			width [mm]	length [m]		va	eb	ts	tt	length [m]	diff. [m]			
0	0	1	12		4.0	24.9	0	0	0	0	4.0	0.0	190.6	175.4
1	1	2	65	*h	10.7	622.1	0	6	1	0	19.2	0.3	175.4	153.2
2	2	3	65	*h	4.0	622.1	0	3	0	0	7.0	-1.6	153.2	144.3
3	3	4	65	*h	1.2	622.1	0	0	1	0	3.7	1.2	144.3	139.4
4	4	5	65	*h	18.0	622.1	0	3	0	0	21.0	2.7	139.4	107.4
5	5	6	65	*h	10.0	622.1	0	3	0	0	13.0	3.2	107.4	81.4
6	6	7	65	DK	----	622.1	0	0	0	0	9.8	0.0	81.4	59.2
7	7	8	65	*d	4.8	622.1	0	1	0	0	5.8	0.0	59.2	49.9
8	8	9	65	*d	4.9	311.1	0	1	1	0	8.4	0.0	49.9	46.1
9	9	10	65	*d	6.3	155.5	0	1	1	0	9.8	0.0	46.1	44.9
10	10	11	50	*d	1.2	77.8	0	0	1	0	4.6	0.0	44.9	44.6
11	11	12	40	*d	3.2	38.9	0	1	1	0	7.2	-0.2	44.6	44.0
12	12	13	20	*d	0.5	19.4	0	1	0	0	1.2	0.0	44.0	43.3
13	13	14	15	*d	0.2	19.4	0	0	1	0	1.2	-0.2	43.3	39.6
14	12	15	20	*d	0.5	19.4	0	0	1	0	1.9	0.0	44.0	42.8
15	15	16	15	*d	0.2	19.4	0	0	1	0	1.2	-0.2	42.8	39.1
16	11	17	40	*d	1.4	38.9	0	1	1	0	5.4	-0.2	44.6	44.2
17	17	18	20	*d	0.5	19.4	0	0	1	0	1.9	0.0	44.2	42.9
18	18	19	15	*d	0.2	19.4	0	0	1	0	1.2	-0.2	42.9	39.2
19	17	20	20	*d	0.5	19.4	0	0	1	0	1.9	0.0	44.2	42.9
20	20	21	15	*d	0.2	19.4	0	0	1	0	1.2	-0.2	42.9	39.2
21	10	22	50	*d	1.2	77.8	0	0	1	0	4.6	0.0	44.9	44.6
22	22	23	40	*d	3.2	38.9	0	1	1	0	7.2	-0.2	44.6	44.0
23	23	24	20	*d	0.5	19.4	0	0	1	0	1.9	0.0	44.0	42.8
24	24	25	15	*d	0.2	19.4	0	0	1	0	1.2	-0.2	42.8	39.1
25	23	26	20	*d	0.5	19.4	0	0	1	0	1.9	0.0	44.0	42.8
26	26	27	15	*d	0.2	19.4	0	0	1	0	1.2	-0.2	42.8	39.1
27	22	28	40	*d	3.2	38.9	0	1	1	0	7.2	-0.2	44.6	44.0
28	28	29	20	*d	0.5	19.4	0	0	1	0	1.9	0.0	44.0	42.8
29	29	30	15	*d	0.2	19.4	0	0	1	0	1.2	-0.2	42.8	39.1

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : CABLE ROOM Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff.	inlet pressure [bar]	outlt. [bar]
Continued									
30	28	31	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
31	31	32	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
32	9	33	65 *d	6.3	155.5	0 1 1 0	9.8 0.0	46.1	44.9
33	33	34	50 *d	1.2	77.8	0 0 1 0	4.6 0.0	44.9	44.6
34	34	35	40 *d	3.2	38.9	0 1 1 0	7.2 -0.2	44.6	44.0
35	35	36	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
36	36	37	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
37	35	38	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
38	38	39	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
39	34	40	40 *d	3.2	38.9	0 1 1 0	7.2 -0.2	44.6	44.0
40	40	41	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
41	41	42	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
42	40	43	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
43	43	44	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
44	33	45	50 *d	1.2	77.8	0 0 1 0	4.6 0.0	44.9	44.6
45	45	46	40 *d	3.2	38.9	0 1 1 0	7.2 -0.2	44.6	44.0
46	46	47	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
47	47	48	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
48	46	49	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
49	49	50	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
50	45	51	40 *d	3.2	38.9	0 1 1 0	7.2 -0.2	44.6	44.0
51	51	52	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
52	52	53	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
53	51	54	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
54	54	55	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
55	8	101	65 *d	4.9	311.1	0 1 1 0	8.4 0.0	49.9	46.1
56	101	102	65 *d	6.3	155.5	0 1 1 0	9.8 0.0	46.1	44.9
57	102	56	50 *d	1.2	77.8	0 0 1 0	4.6 0.0	44.9	44.6
58	56	57	40 *d	3.2	38.9	0 1 1 0	7.2 -0.2	44.6	44.0
59	57	58	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
60	58	59	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
61	57	60	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
62	60	61	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
63	56	62	40 *d	3.2	38.9	0 1 1 0	7.2 -0.2	44.6	44.0
64	62	63	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
65	63	64	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
66	62	65	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
67	65	66	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
68	102	67	50 *d	1.2	77.8	0 0 1 0	4.6 0.0	44.9	44.6
69	67	68	40 *d	3.2	38.9	0 1 1 0	7.2 -0.2	44.6	44.0
70	68	69	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
71	69	70	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
72	68	71	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
73	71	72	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
74	67	73	40 *d	3.2	38.9	0 1 1 0	7.2 -0.2	44.6	44.0
75	73	74	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : CABLE ROOM Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlt. [bar]
Continued									
76	74	75	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
77	73	76	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.0	42.8
78	76	77	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	42.8	39.1
79	101	78	65 *d	0.3	155.5	0 1 1 0	3.8 0.0	46.1	45.6
80	78	79	50 *d	1.2	77.8	0 0 1 0	4.6 0.0	45.6	45.3
81	79	80	40 *d	3.2	38.9	0 1 1 0	7.2 -0.2	45.3	44.8
82	80	81	40 *d	0.5	19.4	0 0 1 0	3.2 0.0	44.8	44.7
83	81	82	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	44.7	41.2
84	80	83	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.8	43.6
85	83	84	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	43.6	39.9
86	79	85	40 *d	3.2	38.9	0 1 1 0	7.2 -0.2	45.3	44.8
87	85	86	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.8	43.6
88	86	87	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	43.6	39.9
89	85	88	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.8	43.6
90	88	89	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	43.6	39.9
91	78	90	50 *d	1.2	77.8	0 0 1 0	4.6 0.0	45.6	45.3
92	90	91	40 *d	3.2	38.9	0 1 1 0	7.2 -0.2	45.3	44.8
93	91	92	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.8	43.6
94	92	93	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	43.6	39.9
95	91	94	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.8	43.6
96	94	95	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	43.6	39.9
97	90	96	40 *d	3.2	38.9	0 1 1 0	7.2 -0.2	45.3	44.8
98	96	97	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.8	43.6
99	97	98	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	43.6	39.9
100	96	99	20 *d	0.5	19.4	0 0 1 0	1.9 0.0	44.8	43.6
101	99	100	15 *d	0.2	19.4	0 0 1 0	1.2 -0.2	43.6	39.9
102	13	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	43.3	-.-
103	15	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
104	18	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.9	-.-
105	20	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.9	-.-
106	24	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
107	26	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
108	29	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
109	31	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
110	36	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
111	38	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
112	41	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
113	43	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
114	47	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
115	49	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
116	52	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
117	54	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
118	58	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
119	60	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
120	63	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-
121	65	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	42.8	-.-

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Client : IRASCO Project: G3939-10 Date : 22.11.2010
 Build. : CABLE ROOM Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va	eb	ts	tt	total eleva. length [m]	inlet diff. pressure [m] [bar]	outlet [bar]
Continued												
122	69	-	20 *d	0.2	-. -	0	0	0	1	0.6	0.0	42.8
123	71	-	20 *d	0.2	-. -	0	0	0	1	0.6	0.0	42.8
124	74	-	20 *d	0.2	-. -	0	0	0	1	0.6	0.0	42.8
125	76	-	20 *d	0.2	-. -	0	0	0	1	0.6	0.0	42.8
126	81	-	40 *d	0.2	-. -	0	0	0	1	1.0	0.0	44.7
127	83	-	20 *d	0.2	-. -	0	0	0	1	0.6	0.0	43.6
128	86	-	20 *d	0.2	-. -	0	0	0	1	0.6	0.0	43.6
129	88	-	20 *d	0.2	-. -	0	0	0	1	0.6	0.0	43.6
130	92	-	20 *d	0.2	-. -	0	0	0	1	0.6	0.0	43.6
131	94	-	20 *d	0.2	-. -	0	0	0	1	0.6	0.0	43.6
132	97	-	20 *d	0.2	-. -	0	0	0	1	0.6	0.0	43.6
133	99	-	20 *d	0.2	-. -	0	0	0	1	0.6	0.0	43.6

Calculation of nozzles

nozzle no.	pipe point	Q(60)nozzle theor. [kg/min]	pressure [bar]	nozzle theor. [mm2]	orifice actual [mm2]	type of nozzle
1	14	19.4	39.6	77.4	75.4	RD 1/2 x 9.8
2	16	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
3	19	19.4	39.2	78.2	75.4	RD 1/2 x 9.8
4	21	19.4	39.2	78.2	75.4	RD 1/2 x 9.8
5	25	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
6	27	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
7	30	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
8	32	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
9	37	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
10	39	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
11	42	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
12	44	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
13	48	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
14	50	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
15	53	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
16	55	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
17	59	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
18	61	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
19	64	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
20	66	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
21	70	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
22	72	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
23	75	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
24	77	19.4	39.1	78.5	75.4	RD 1/2 x 9.8
25	82	19.4	41.2	74.6	75.4	RD 1/2 x 9.8

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Client : IRASCO Project: G393-10 Date : 22.11.2010

Build. : CABLE ROOM Name : ARGON No: SA-013524-047

Calculation of nozzles

nozzle pipe Q(60)nozzle nozzle orifice type of nozzle
no. point theor. pressure theor. actual
 [kg/min] [bar] [mm2] [mm2]

Continued
26 84 19.4 39.9 76.8 75.4 RD 1/2 x 9.8
27 87 19.4 39.9 76.8 75.4 RD 1/2 x 9.8
28 89 19.4 39.9 76.8 75.4 RD 1/2 x 9.8
29 93 19.4 39.9 76.8 75.4 RD 1/2 x 9.8
30 95 19.4 39.9 76.8 75.4 RD 1/2 x 9.8
31 98 19.4 39.9 76.8 75.4 RD 1/2 x 9.8
32 100 19.4 39.9 76.8 75.4 RD 1/2 x 9.8

Provided pressure reducer:

Pressure reducer type DK 65 / 65 x 40.1

Pressure relief

The minimum pressure relief opening into the air is
600 N/m2 => 5254 cm2
The mass flow rate is 25.68 kg/s. The standard volume flow rate is 51820 m3/h

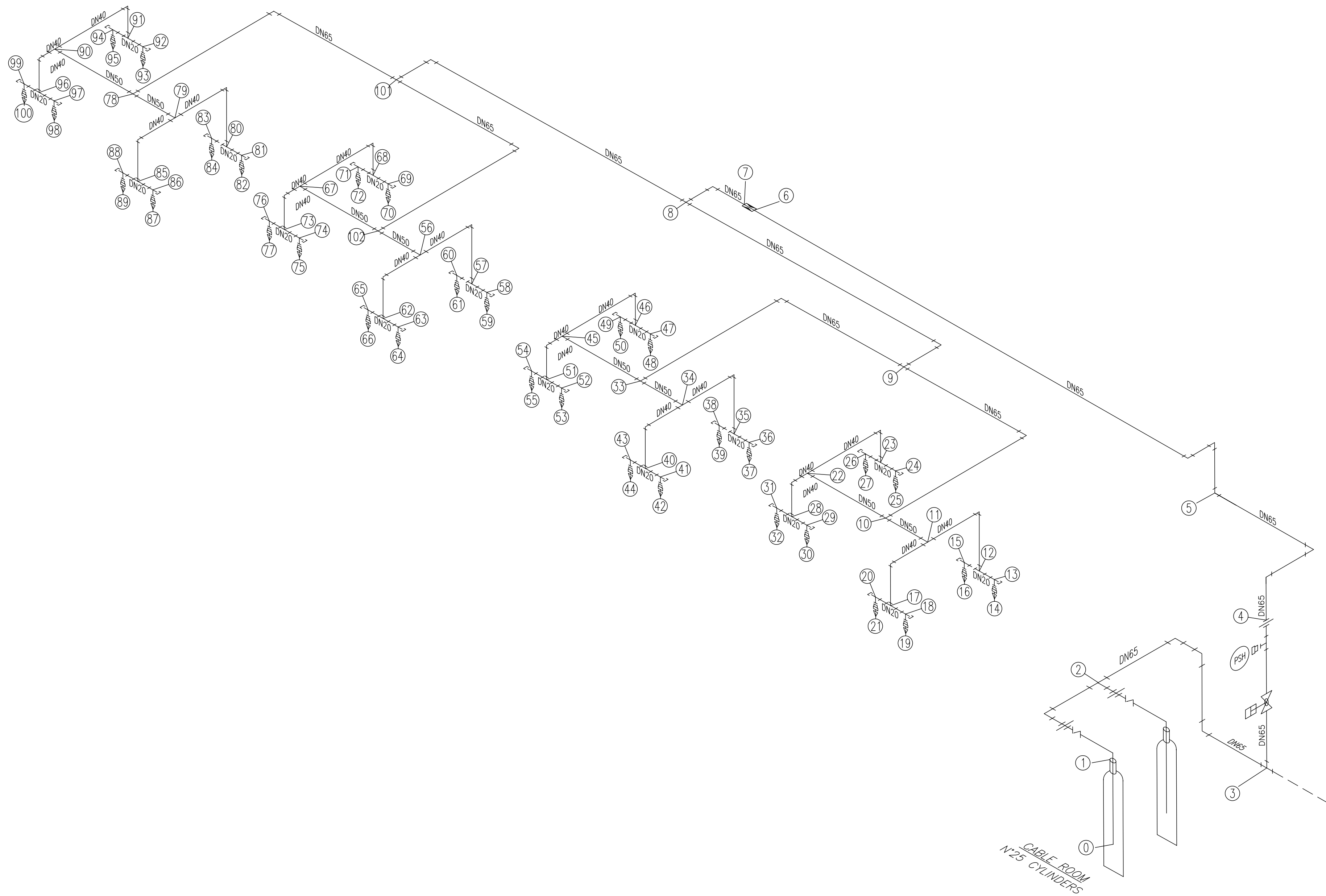
Note: pressure for enclosure is to be checked with the client !
Assumed openings can be taken into account for pressure relief.

Pipe definition

(* Pipe table ASTM A106 Grade B Schedule 40//80/160 *)

*h => upstream pipe 200 bar, threaded
*d => downstream pipe 60 bar, threaded
DK => Pressure reducer

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SANCO S.p.A. FIRE PROTECTION AND SAFETY TECHNOLOGY

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TECHNICAL DESIGN
Argon HP System

M I N I M A X
G m b H

Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : CABINET ROOM Name : ARGON No: SA-013524-047

(3.06)

Data of system and quantity flow

Cylinder bank data

Average temperature tf = 20.0 °C
 Specific quantity Q(60) = 310.2 kg
 Design quantity Q = 326.5 kg
 Cylinder size chosen Fg = 80.0 l / 28.3 kg / 200 bar
 Number of cylinders chosen .. Fz = 13
 Supply quantity Qg = 367.9 kg
 Flooding proportion Q(60)/Qg = 0.84

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlet. [bar]
0	0	1	12	4.0	23.9	0 0 0 0	4.0 0.0	187.0	174.7
1	1	2	50 *h	5.2	310.2	0 3 1 0	13.7 0.3	174.7	163.3
2	2	3	65 *h	4.3	310.2	0 3 0 0	7.3 -1.6	163.3	161.4
3	3	4	65 *h	1.2	310.2	0 0 1 0	3.7 1.2	161.4	160.5
4	4	5	65 *h	8.5	310.2	0 1 0 0	9.5 2.5	160.5	158.1
5	5	6	65 *h	10.0	310.2	0 1 0 0	11.0 0.0	158.1	155.2
6	6	7	65 DK	----	310.2	0 0 0 0	12.1 0.0	155.2	59.3
7	7	8	65 *d	13.8	310.2	0 2 0 0	15.8 8.0	59.3	54.0
8	8	9	50 *d	0.9	103.4	0 0 1 0	4.3 0.0	54.0	53.6
9	9	10	40 *d	0.4	51.7	0 0 1 0	3.1 0.0	53.6	53.3
10	10	11	15 *d	0.2	4.6	0 0 1 0	1.2 0.2	53.3	53.2
11	10	12	40 *d	0.5	47.1	0 1 0 1	2.6 0.0	53.3	53.1
12	12	13	40 *d	0.5	23.5	0 0 1 0	3.2 0.0	53.1	53.1
13	13	14	15 *d	0.2	23.5	0 0 1 0	1.2 -0.2	53.1	49.2
14	12	15	40 *d	0.5	23.5	0 0 1 0	3.2 0.0	53.1	53.1
15	15	16	15 *d	0.2	23.5	0 0 1 0	1.2 -0.2	53.1	49.2
16	9	17	40 *d	1.0	51.7	0 0 1 0	3.7 0.0	53.6	53.3
17	17	18	15 *d	0.2	4.6	0 0 1 0	1.2 0.2	53.3	53.1
18	17	19	40 *d	1.6	47.1	0 1 0 1	3.7 0.0	53.3	53.0
19	19	20	40 *d	0.5	23.5	0 0 1 0	3.2 0.0	53.0	52.9
20	20	21	15 *d	0.2	23.5	0 0 1 0	1.2 -0.2	52.9	49.1
21	19	22	40 *d	0.5	23.5	0 0 1 0	3.2 0.0	53.0	52.9
22	22	23	15 *d	0.2	23.5	0 0 1 0	1.2 -0.2	52.9	49.1
23	8	24	50 *d	2.5	206.8	0 0 1 0	5.9 0.0	54.0	51.6
24	24	25	40 *d	1.0	51.7	0 0 1 0	3.7 0.0	51.6	51.3
25	25	26	15 *d	0.2	4.6	0 0 1 0	1.2 0.2	51.3	51.1
26	25	27	40 *d	1.6	47.1	0 1 0 1	3.7 0.0	51.3	51.0
27	27	28	40 *d	0.5	23.5	0 0 1 0	3.2 0.0	51.0	50.9
28	28	29	15 *d	0.2	23.5	0 0 1 0	1.2 -0.2	50.9	46.9
29	27	30	40 *d	0.5	23.5	0 0 1 0	3.2 0.0	51.0	50.9

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : CABINET ROOM Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlt. [bar]
Continued									
30	30	31	15 *d	0.2	23.5	0 0 1 0	1.2 -0.2	50.9	46.9
31	24	32	50 *d	0.5	155.1	0 0 0 1	1.6 0.0	51.6	51.3
32	32	33	40 *d	0.2	51.7	0 0 1 0	2.9 0.0	51.3	51.0
33	33	34	15 *d	0.2	4.6	0 0 1 0	1.2 0.2	51.0	50.8
34	33	35	40 *d	0.7	47.1	0 1 0 1	2.8 0.0	51.0	50.7
35	35	36	40 *d	0.5	23.5	0 0 1 0	3.2 0.0	50.7	50.7
36	36	37	15 *d	0.2	23.5	0 0 1 0	1.2 -0.2	50.7	46.7
37	35	38	40 *d	0.5	23.5	0 0 1 0	3.2 0.0	50.7	50.7
38	38	39	15 *d	0.2	23.5	0 0 1 0	1.2 -0.2	50.7	46.7
39	32	40	50 *d	2.5	103.4	0 0 0 1	3.6 0.0	51.3	50.9
40	40	41	40 *d	0.2	51.7	0 0 1 0	2.9 0.0	50.9	50.6
41	41	42	15 *d	0.2	4.6	0 0 1 0	1.2 0.2	50.6	50.5
42	41	43	40 *d	0.5	47.1	0 1 0 1	2.6 0.0	50.6	50.4
43	43	44	40 *d	0.5	23.5	0 0 1 0	3.2 0.0	50.4	50.3
44	44	45	15 *d	0.2	23.5	0 0 1 0	1.2 -0.2	50.3	46.3
45	43	46	40 *d	0.5	23.5	0 0 1 0	3.2 0.0	50.4	50.3
46	46	47	15 *d	0.2	23.5	0 0 1 0	1.2 -0.2	50.3	46.3
47	40	48	40 *d	1.0	51.7	0 0 1 0	3.7 0.0	50.9	50.5
48	48	49	15 *d	0.2	4.6	0 0 1 0	1.2 0.2	50.5	50.4
49	48	50	40 *d	1.6	47.1	0 1 0 1	3.7 0.0	50.5	50.2
50	50	51	40 *d	0.5	23.5	0 0 1 0	3.2 0.0	50.2	50.1
51	51	52	15 *d	0.2	23.5	0 0 1 0	1.2 -0.2	50.1	46.1
52	50	53	40 *d	0.5	23.5	0 0 1 0	3.2 0.0	50.2	50.1
53	53	54	15 *d	0.2	23.5	0 0 1 0	1.2 -0.2	50.1	46.1
54	13	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	53.1	-.-
55	15	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	53.1	-.-
56	20	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	52.9	-.-
57	22	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	52.9	-.-
58	28	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	50.9	-.-
59	30	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	50.9	-.-
60	36	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	50.7	-.-
61	38	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	50.7	-.-
62	44	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	50.3	-.-
63	46	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	50.3	-.-
64	51	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	50.1	-.-
65	53	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	50.1	-.-

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : CABINET ROOM Name : ARGON No: SA-013524-047

Calculation of nozzles

nozzle no.	pipe point	Q(60)nozzle theor. [kg/min]	pressure [bar]	nozzle orifice theor. actual [mm2] [mm2]	type of nozzle
1	14	23.5	49.2	70.4 66.5	RD 1/2 x 9.2
2	16	23.5	49.2	70.4 66.5	RD 1/2 x 9.2
3	21	23.5	49.1	70.6 66.5	RD 1/2 x 9.2
4	23	23.5	49.1	70.6 66.5	RD 1/2 x 9.2
5	29	23.5	46.9	73.8 75.4	RD 1/2 x 9.8
6	31	23.5	46.9	73.8 75.4	RD 1/2 x 9.8
7	37	23.5	46.7	74.2 75.4	RD 1/2 x 9.8
8	39	23.5	46.7	74.2 75.4	RD 1/2 x 9.8
9	45	23.5	46.3	74.8 75.4	RD 1/2 x 9.8
10	47	23.5	46.3	74.8 75.4	RD 1/2 x 9.8
11	52	23.5	46.1	75.1 75.4	RD 1/2 x 9.8
12	54	23.5	46.1	75.1 75.4	RD 1/2 x 9.8
13	11	4.6	53.2	12.8 10.8	RD 1/2 x 3.7
14	18	4.6	53.1	12.8 10.8	RD 1/2 x 3.7
15	26	4.6	51.1	13.3 10.8	RD 1/2 x 3.7
16	34	4.6	50.8	13.3 10.8	RD 1/2 x 3.7
17	42	4.6	50.5	13.4 10.8	RD 1/2 x 3.7
18	49	4.6	50.4	13.5 10.8	RD 1/2 x 3.7

Provided pressure reducer:

Pressure reducer type DK 65 / 65 x 18.5

Pressure relief

The minimum pressure relief opening into the air is

600 N/m2 => 2453 cm2

The mass flow rate is 11.99 kg/s. The standard volume flow rate is 24190 m3/h

Note: pressure for enclosure is to be checked with the client !

Assumed openings can be taken into account for pressure relief.

Pipe definition

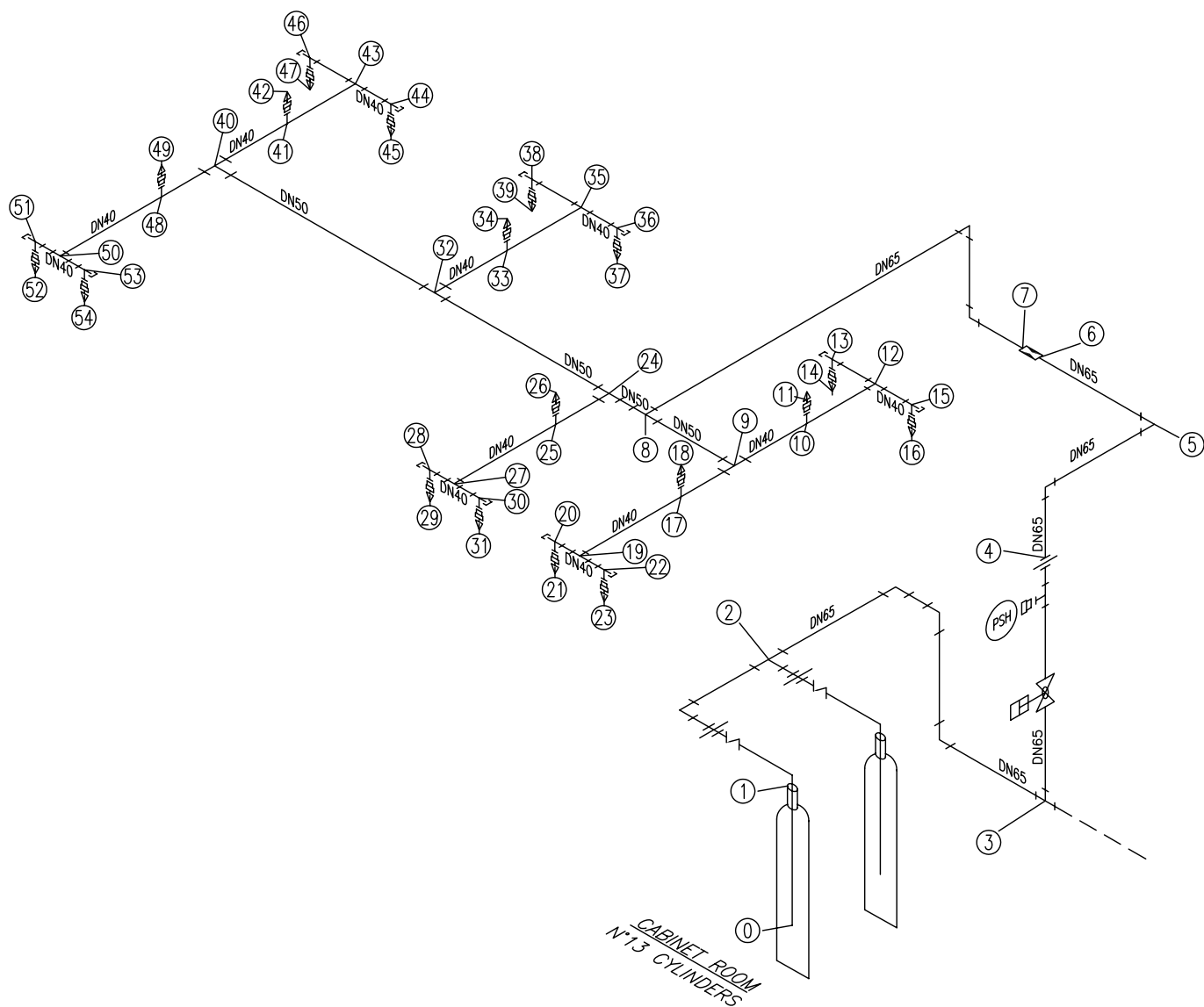
(* Pipe table ASTM A106 Grade B Schedule 40//80/160 *)

*h => upstream pipe 200 bar, threaded

*d => downstream pipe 60 bar, threaded

DK => Pressure reducer

Titolo Title ARFA AND GHADIR PROJECT ARGON CALCULATION NOTE	Documento N° / Document N° SA-013524-047	Rev. Rev. 1	Fg. / Sh. 22	Di / Of 44
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Titolo Title ARFA AND GHADIR PROJECT ARGON CALCULATION NOTE	Documento N° / Document N° SA-013524-047	Rev. Rev. 1	Fg. / Sh. 23	Di / Of 44
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TECHNICAL DESIGN
Argon HP System

M I N I M A X
G m b H

Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : BATTERY ROOM Name : ARGON No: SA-013524-047

(3.06)

Data of system and quantity flow

Cylinder bank data

Average temperature	tf	=	20.0	°C
Specific quantity	Q(60)	=	86.6	kg
Design quantity	Q	=	91.1	kg
Cylinder size chosen	Fg	=	80.0	l / 28.3 kg / 200 bar
Number of cylinders chosen ..	Fz	=	4	
Supply quantity	Qg	=	113.2	kg
Flooding proportion	Q(60)/Qg	=	0.77	

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va	eb	ts	tt	total eleva. length [m]	inlet diff. pressure [m]	outlt. [bar]

0	0	1	12	4.0	21.7	0	0	0	0	4.0	0.0	178.3	169.5
1	1	2	50 *h	2.2	86.6	0	8	1	0	19.2	0.3	169.5	168.5
2	2	3	65 *h	4.6	86.6	0	3	0	0	7.6	-1.6	168.5	168.3
3	3	4	40 *h	1.2	86.6	0	0	1	0	3.9	1.2	168.3	167.7
4	4	5	40 *h	7.6	86.6	0	1	0	0	8.9	2.4	167.7	166.1
5	5	6	40 *h	8.4	86.6	0	1	0	0	9.7	0.0	166.1	164.3
6	6	7	40 DK	----	86.6	0	0	0	0	20.6	0.0	164.3	57.1
7	7	8	40 *d	4.6	86.6	0	2	0	0	7.2	0.0	57.1	55.6
8	8	9	40 *d	1.3	43.3	0	0	1	0	4.0	0.0	55.6	55.3
9	9	10	32 *d	0.5	21.7	0	0	1	0	2.8	0.0	55.3	55.3
10	10	11	15 *d	0.2	21.7	0	0	1	0	1.2	-0.2	55.3	52.7
11	9	12	32 *d	0.5	21.7	0	0	1	0	2.8	0.0	55.3	55.3
12	12	13	15 *d	0.2	21.7	0	0	1	0	1.2	-0.2	55.3	52.7
13	8	14	40 *d	1.3	43.3	0	0	1	0	4.0	0.0	55.6	55.3
14	14	15	32 *d	0.5	21.7	0	0	1	0	2.8	0.0	55.3	55.3
15	15	16	15 *d	0.2	21.7	0	0	1	0	1.2	-0.2	55.3	52.7
16	14	17	32 *d	0.5	21.7	0	0	1	0	2.8	0.0	55.3	55.3
17	17	18	15 *d	0.2	21.7	0	0	1	0	1.2	-0.2	55.3	52.7
18	12	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	55.3	-.-
19	10	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	55.3	-.-
20	15	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	55.3	-.-
21	17	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	55.3	-.-

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ARFA AND GHADIR PROJECT ARGON CALCULATION NOTE	SA-013524-047	1	24	44

Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : BATTERY ROOM Name : ARGON No: SA-013524-047

Calculation of nozzles

nozzle no.	pipe point	Q(60)nozzle theor. [kg/min]	pressure [bar]	nozzle orifice theor. actual [mm2]	type of nozzle
1	11	21.6	52.7	53.6	RD 1/2 x 8.3
2	13	21.6	52.7	53.6	RD 1/2 x 8.3
3	16	21.6	52.7	53.6	RD 1/2 x 8.3
4	18	21.6	52.7	53.6	RD 1/2 x 8.3

Provided pressure reducer:

Pressure reducer type DK 40 / 40 x 9.1

Pressure relief

The minimum pressure relief opening into the air is

600 N/m² => 629 cm²

The mass flow rate is 3.07 kg/s. The standard volume flow rate is 6200 m³/h

Note: pressure for enclosure is to be checked with the client !

Assumed openings can be taken into account for pressure relief.

Pipe definition

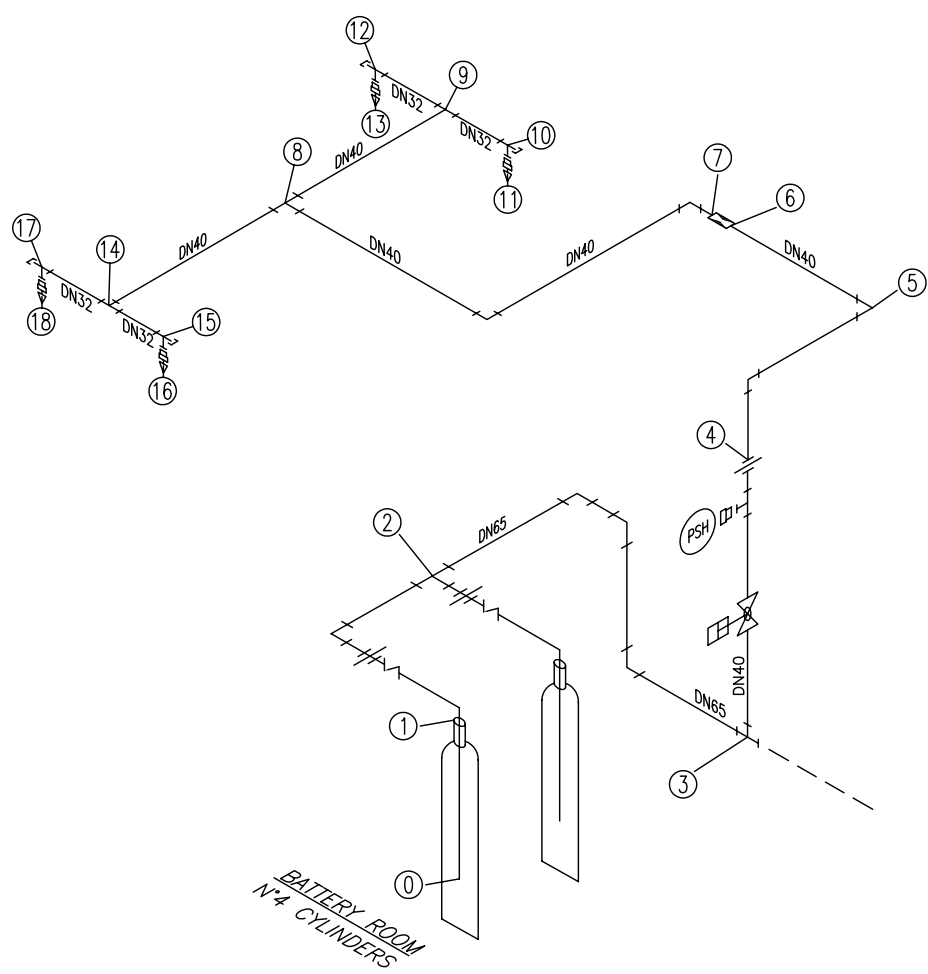
(* Pipe table ASTM A106 Grade B Schedule 40//80/160 *)

*h => upstream pipe 200 bar, threaded

*d => downstream pipe 60 bar, threaded

DK => Pressure reducer

Titolo Title	ARFA AND GHADIR PROJECT ARGON CALCULATION NOTE	Documento N° / Document N° SA-013524-047	Rev. Rev. 1	Fg. / Sh. 25	Di / Of 44
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TECHNICAL DESIGN M I N I M A X
Argon HP System G m b H

Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : LV PANEL AREA 1 Name : ARGON No: SA-013524-047

(3.06)

Data of system and quantity flow

Cylinder bank data

Average temperature tf = 20.0 °C
Specific quantity Q(60) = 395.1 kg
Design quantity Q = 415.9 kg
Cylinder size chosen Fg = 80.0 l / 28.3 kg / 200 bar
Number of cylinders chosen .. Fz = 16
Supply quantity Qg = 452.8 kg
Flooding proportion Q(60)/Qg = 0.87

Pressure drop calculation

pipe			Nominal		Argon	pipe fitt.				total eleva.		inlet	outlt.
sec.	from	to	width	length	quantity	va	eb	ts	tt	length	diff.	pressure	
			[mm]	[m]	[kg/min]					[m]	[m]	[bar]	[bar]
0	0	1	12	4.0	24.7	0	0	0	0	4.0	0.0	183.6	168.8
1	1	2	65 *h	12.6	395.1	0	8	1	0	23.1	0.3	168.8	158.3
2	2	3	65 *h	4.9	395.1	0	0	0	0	4.9	-1.6	158.3	156.0
3	3	4	65 *h	1.2	395.1	0	0	1	0	3.7	1.2	156.0	154.3
4	4	5	65 *h	7.0	395.1	0	2	0	0	9.0	2.0	154.3	149.9
5	5	6	65 *h	19.0	395.1	0	0	0	0	19.0	0.0	149.9	140.3
6	6	7	65 DK	----	395.1	0	0	0	0	11.6	0.0	140.3	59.2
7	7	8	65 *d	6.8	395.1	0	3	0	0	9.8	0.4	59.2	53.2
8	8	9	65 *d	5.1	197.6	0	1	1	0	8.6	0.0	53.2	51.8
9	9	10	50 *d	1.1	98.8	0	0	1	0	4.5	0.0	51.8	51.3
10	10	11	32 *d	1.8	49.4	0	1	1	0	5.2	-0.2	51.3	50.2
11	11	12	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	50.2	50.0
12	12	13	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	50.0	45.0
13	11	14	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	50.2	50.0
14	14	15	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	50.0	45.0
15	10	16	32 *d	1.8	49.4	0	1	1	0	5.2	-0.2	51.3	50.2
16	16	17	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	50.2	50.0
17	17	18	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	50.0	45.0
18	16	19	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	50.2	50.0
19	19	20	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	50.0	45.0
20	9	21	50 *d	1.1	98.8	0	0	1	0	4.5	0.0	51.8	51.3
21	21	54	32 *d	1.8	49.4	0	1	1	0	5.2	-0.2	51.3	50.2
22	54	22	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	50.2	50.0
23	22	23	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	50.0	45.0
24	54	24	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	50.2	50.0
25	24	25	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	50.0	45.0
26	21	26	32 *d	1.8	49.4	0	1	1	0	5.2	-0.2	51.3	50.2
27	26	27	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	50.2	50.0
28	27	28	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	50.0	45.0
29	26	29	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	50.2	50.0

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Client : IRASCO Project: G3939-10 Date : 22.11.2010
 Build. : LV PANEL AREA 1 Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va	eb	ts	tt	total eleva. length [m]	inlet diff. pressure [m] [bar]	outlt. [bar]
Continued												
30	29	30	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	50.0
31	8	31	65 *d	7.0	197.6	0	1	1	0	10.5	0.0	53.2
32	31	32	50 *d	1.3	98.8	0	0	1	0	4.7	0.0	51.5
33	32	33	32 *d	3.7	49.4	0	1	1	0	7.1	-0.2	51.0
34	33	34	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	49.4
35	34	35	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	49.2
36	33	36	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	49.4
37	36	37	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	49.2
38	32	38	32 *d	3.7	49.4	0	1	1	0	7.1	-0.2	51.0
39	38	39	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	49.4
40	39	40	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	49.2
41	38	41	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	49.4
42	41	42	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	49.2
43	31	43	50 *d	1.3	98.8	0	0	1	0	4.7	0.0	51.5
44	43	44	32 *d	2.9	49.4	0	1	1	0	6.3	-0.2	51.0
45	44	45	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	49.6
46	45	46	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	49.4
47	44	47	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	49.6
48	47	48	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	49.4
49	43	49	32 *d	2.9	49.4	0	1	1	0	6.3	-0.2	51.0
50	49	50	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	49.6
51	50	51	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	49.4
52	49	52	32 *d	0.5	24.7	0	0	1	0	2.8	0.0	49.6
53	52	53	15 *d	0.2	24.7	0	0	1	0	1.2	-0.2	49.4
54	12	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	50.0
55	14	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	50.0
56	17	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	50.0
57	19	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	50.0
58	22	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	50.0
59	24	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	50.0
60	27	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	50.0
61	29	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	50.0
62	34	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	49.2
63	36	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	49.2
64	39	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	49.2
65	41	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	49.2
66	45	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	49.4
67	47	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	49.4
68	50	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	49.4
69	52	-	32 *d	0.2	-.-	0	0	0	1	0.9	0.0	49.4

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ARFA AND GHADIR PROJECT ARGON CALCULATION NOTE	SA-013524-047	1	28	44

Client : IRASCO Project: G3939-10 Date : 22.11.2010
Build. : LV PANEL AREA 1 Name : ARGON No: SA-013524-047

Calculation of nozzles

nozzle no.	pipe point	Q(60)nozzle	pressure	nozzle orifice		type of nozzle
		theor. [kg/min]		theor. [mm2]	actual [mm2]	
1	13	24.7	45.0	85.1	83.3	RD 1/2 x 10.3
2	15	24.7	45.0	85.1	83.3	RD 1/2 x 10.3
3	18	24.7	45.0	85.1	83.3	RD 1/2 x 10.3
4	20	24.7	45.0	85.1	83.3	RD 1/2 x 10.3
5	23	24.7	45.0	85.1	83.3	RD 1/2 x 10.3
6	25	24.7	45.0	85.1	83.3	RD 1/2 x 10.3
7	28	24.7	45.0	85.1	83.3	RD 1/2 x 10.3
8	30	24.7	45.0	85.1	83.3	RD 1/2 x 10.3
9	35	24.7	44.1	86.8	83.3	RD 1/2 x 10.3
10	37	24.7	44.1	86.8	83.3	RD 1/2 x 10.3
11	40	24.7	44.1	86.8	83.3	RD 1/2 x 10.3
12	42	24.7	44.1	86.8	83.3	RD 1/2 x 10.3
13	46	24.7	44.3	86.4	83.3	RD 1/2 x 10.3
14	48	24.7	44.3	86.4	83.3	RD 1/2 x 10.3
15	51	24.7	44.3	86.4	83.3	RD 1/2 x 10.3
16	53	24.7	44.3	86.4	83.3	RD 1/2 x 10.3

Provided pressure reducer:

Pressure reducer type DK 65 / 65 x 22.5

Pressure relief

The minimum pressure relief opening into the air is

600 N/m2 => 3284 cm2

The mass flow rate is 16.05 kg/s. The standard volume flow rate is 32390 m3/h

Note: pressure for enclosure is to be checked with the client !

Assumed openings can be taken into account for pressure relief.

Pipe definition

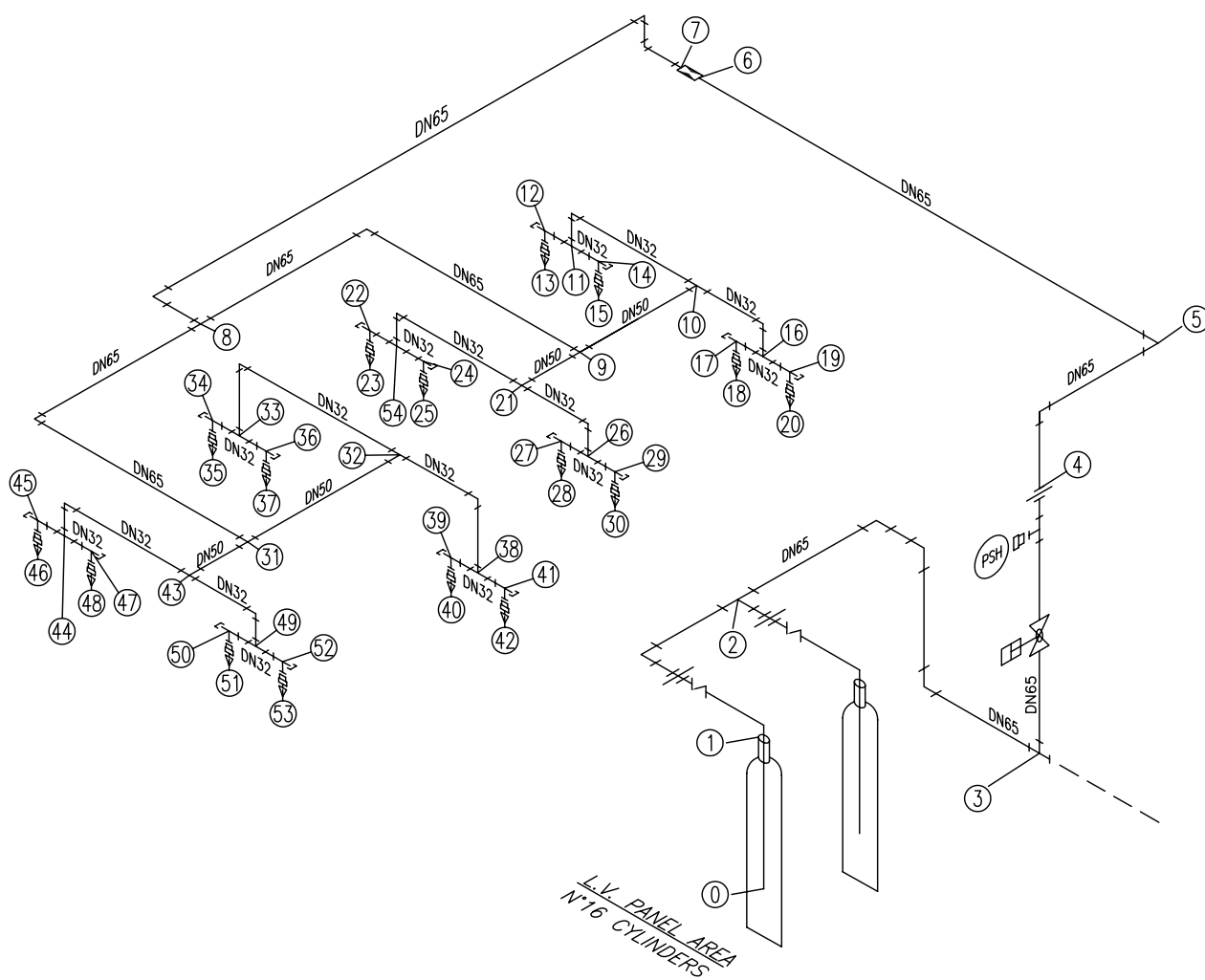
(* Pipe table ASTM A106 Grade B Schedule 40//80/160 *)

*h => upstream pipe 200 bar, threaded

*d => downstream pipe 60 bar, threaded

DK => Pressure reducer

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TECHNICAL DESIGN M I N I M A X
 Argon HP System G m b H

Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : LV PANEL AREA 2 Name : ARGON No: SA-013524-047

(3.06)

Data of system and quantity flow

Cylinder bank data

 Average temperature tf = 20.0 °C
 Specific quantity Q(60) = 429.5 kg
 Design quantity Q = 452.1 kg
 Cylinder size chosen Fg = 80.0 l / 28.3 kg / 200 bar
 Number of cylinders chosen .. Fz = 17
 Supply quantity Qg = 481.1 kg
 Flooding proportion Q(60)/Qg = 0.89

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlt. [bar]
0	0	1	12	4.0	25.3	0 0 0 0	4.0 0.0	183.2	166.8
1	1	2	65 *h	12.6	429.5	0 8 1 0	23.1 0.3	166.8	153.6
2	2	3	65 *h	5.2	429.5	0 3 0 0	8.2 -1.6	153.6	148.6
3	3	4	65 *h	1.2	429.5	0 0 1 0	3.7 1.2	148.6	146.4
4	4	5	65 *h	12.2	429.5	0 2 0 0	14.2 1.9	146.4	137.3
5	5	6	65 *h	20.0	429.5	0 0 0 0	20.0 0.0	137.3	123.3
6	6	7	65 DK	----	429.5	0 0 0 0	22.5 0.0	123.3	59.9
7	7	8	65 *d	15.0	429.5	0 3 0 0	18.0 0.0	59.9	45.5
8	8	9	50 *d	2.4	214.8	0 0 1 0	5.8 0.0	45.5	41.9
9	9	10	50 *d	2.6	107.4	0 0 1 0	6.0 0.0	41.9	40.9
10	10	11	50 *d	1.3	53.7	0 1 1 0	6.4 -0.2	40.9	40.7
11	11	12	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
12	12	13	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
13	13	14	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
14	12	15	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
15	15	16	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
16	11	17	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
17	17	18	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
18	18	19	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
19	17	20	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
20	20	21	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
21	10	45	50 *d	1.3	53.7	0 1 1 0	6.4 -0.2	40.9	40.7
22	45	46	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
23	46	47	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
24	47	48	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
25	46	49	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
26	49	50	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
27	45	51	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
28	51	52	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
29	52	53	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : LV PANEL AREA 2 Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m]	inlet pressure [bar]	outlt. [bar]
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30	51	54	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
31	54	55	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
32	9	22	50 *d	2.6	107.4	0 0 1 0	6.0 0.0	41.9	40.9
33	22	23	50 *d	1.3	53.7	0 1 1 0	6.4 -0.2	40.9	40.7
34	23	24	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
35	24	25	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
36	25	26	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
37	24	27	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
38	27	28	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
39	23	29	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
40	29	30	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
41	30	31	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
42	29	32	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
43	32	33	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
44	22	34	50 *d	1.3	53.7	0 1 1 0	6.4 -0.2	40.9	40.7
45	34	35	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
46	35	36	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
47	36	37	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
48	35	38	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
49	38	39	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
50	34	40	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
51	40	41	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
52	41	42	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
53	40	43	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
54	43	44	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
55	8	56	50 *d	2.4	214.8	0 0 1 0	5.8 0.0	45.5	41.9
56	56	57	50 *d	2.6	107.4	0 0 1 0	6.0 0.0	41.9	40.9
57	57	58	50 *d	1.3	53.7	0 1 1 0	6.4 -0.2	40.9	40.7
58	58	59	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
59	59	60	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
60	60	61	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
61	59	62	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
62	62	63	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
63	58	64	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
64	64	65	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
65	65	66	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
66	64	67	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
67	67	68	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
68	57	69	50 *d	1.3	53.7	0 1 1 0	6.4 -0.2	40.9	40.7
69	69	70	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
70	70	71	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
71	71	72	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
72	70	73	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
73	73	74	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
74	69	75	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
75	75	76	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : LV PANEL AREA 2 Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlet. [bar]
Continued									
76	76	77	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
77	75	78	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
78	78	79	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
79	56	80	50 *d	2.6	107.4	0 0 1 0	6.0 0.0	41.9	40.9
80	80	81	50 *d	1.3	53.7	0 1 1 0	6.4 -0.2	40.9	40.7
81	81	82	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
82	82	83	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
83	83	84	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
84	82	85	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
85	85	86	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
86	81	87	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
87	87	88	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
88	88	89	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
89	87	101	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
90	101	102	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
91	80	90	50 *d	1.3	53.7	0 1 1 0	6.4 -0.2	40.9	40.7
92	90	91	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
93	91	92	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
94	92	93	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
95	91	94	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
96	94	95	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
97	90	96	50 *d	0.5	26.8	0 0 1 0	3.9 0.0	40.7	40.6
98	96	97	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
99	97	98	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
100	96	99	20 *d	0.5	13.4	0 0 1 0	1.9 0.0	40.6	40.0
101	99	100	15 *d	0.2	13.4	0 0 1 0	1.2 -0.2	40.0	38.1
102	13	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
103	15	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
104	18	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
105	20	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
106	25	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
107	27	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
108	30	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
109	32	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
110	36	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
111	38	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
112	41	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
113	43	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
114	52	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
115	54	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
116	47	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
117	49	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
118	60	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
119	62	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
120	65	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-
121	67	-	20 *d	0.2	-.-	0 0 0 1	0.6 0.0	40.0	-.-

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : LV PANEL AREA 2 Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff.	inlet pressure	outlet. [bar]

Continued									
122	83	-	20 *d	0.2	-. -	0 0 0 1	0.6 0.0	40.0	-. -
123	85	-	20 *d	0.2	-. -	0 0 0 1	0.6 0.0	40.0	-. -
124	88	-	20 *d	0.2	-. -	0 0 0 1	0.6 0.0	40.0	-. -
125	101	-	20 *d	0.2	-. -	0 0 0 1	0.6 0.0	40.0	-. -
126	71	-	20 *d	0.2	-. -	0 0 0 1	0.6 0.0	40.0	-. -
127	73	-	20 *d	0.2	-. -	0 0 0 1	0.6 0.0	40.0	-. -
128	76	-	20 *d	0.2	-. -	0 0 0 1	0.6 0.0	40.0	-. -
129	78	-	20 *d	0.2	-. -	0 0 0 1	0.6 0.0	40.0	-. -
130	94	-	20 *d	0.2	-. -	0 0 0 1	0.6 0.0	40.0	-. -
131	92	-	20 *d	0.2	-. -	0 0 0 1	0.6 0.0	40.0	-. -
132	97	-	20 *d	0.2	-. -	0 0 0 1	0.6 0.0	40.0	-. -
133	99	-	20 *d	0.2	-. -	0 0 0 1	0.6 0.0	40.0	-. -

Calculation of nozzles

nozzle no.	pipe point	Q(60)nozzle theor. [kg/min]	pressure [bar]	nozzle orifice theor. actual [mm2] [mm2]	type of nozzle

1	14	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
2	16	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
3	19	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
4	21	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
5	26	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
6	28	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
7	31	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
8	33	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
9	48	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
10	50	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
11	53	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
12	55	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
13	42	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
14	44	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
15	37	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
16	39	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
17	61	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
18	63	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
19	66	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
20	68	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
21	84	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
22	86	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
23	89	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
24	102	13.4	38.1	56.2 54.1	RD 1/2 x 8.3
25	72	13.4	38.1	56.2 54.1	RD 1/2 x 8.3

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : LV PANEL AREA 2 Name : ARGON No: SA-013524-047

Calculation of nozzles

nozzle pipe Q(60)nozzle nozzle orifice type of nozzle
no. point theor. pressure theor. actual
 [kg/min] [bar] [mm2] [mm2]

Continued

26	74	13.4	38.1	56.2	54.1	RD 1/2 x	8.3
27	77	13.4	38.1	56.2	54.1	RD 1/2 x	8.3
28	79	13.4	38.1	56.2	54.1	RD 1/2 x	8.3
29	93	13.4	38.1	56.2	54.1	RD 1/2 x	8.3
30	95	13.4	38.1	56.2	54.1	RD 1/2 x	8.3
31	98	13.4	38.1	56.2	54.1	RD 1/2 x	8.3
32	100	13.4	38.1	56.2	54.1	RD 1/2 x	8.3

Provided pressure reducer:

Pressure reducer type DK 65 / 65 x 25.4

Pressure relief

The minimum pressure relief opening into the air is
600 N/m2 => 3653 cm2
The mass flow rate is 17.86 kg/s. The standard volume flow rate is 36030 m3/h

Note: pressure for enclosure is to be checked with the client !
Assumed openings can be taken into account for pressure relief.

Pipe definition

(* Pipe table ASTM A106 Grade B Schedule 40//80/160 *)

*h => upstream pipe 200 bar, threaded
*d => downstream pipe 60 bar, threaded
DK => Pressure reducer

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TECHNICAL DESIGN M I N I M A X
 Argon HP System G m b H

Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : M.V. SWITCH ROOM 1 Name : ARGON No: SA-013524-047

(3.06)

Data of system and quantity flow

Cylinder bank data

 Average temperature tf = 20.0 °C
 Specific quantity Q(60) = 400.8 kg
 Design quantity Q = 421.9 kg
 Cylinder size chosen Fg = 80.0 l / 28.3 kg / 200 bar
 Number of cylinders chosen .. Fz = 16
 Supply quantity Qg = 452.8 kg
 Flooding proportion Q(60)/Qg = 0.89

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlt. [bar]
0	0	1	12	4.0	25.1	0 0 0 0	4.0 0.0	179.0	163.4
1	1	2	65 *h	12.0	400.8	0 7 1 0	21.5 0.3	163.4	153.1
2	2	3	65 *h	5.5	400.8	0 3 0 0	8.5 -1.6	153.1	148.8
3	3	4	65 *h	1.2	400.8	0 0 1 0	3.7 1.2	148.8	146.9
4	4	5	65 *h	6.2	400.8	0 2 0 0	8.2 1.7	146.9	142.6
5	5	6	65 *h	19.0	400.8	0 0 0 0	19.0 0.0	142.6	132.1
6	6	7	65 DK	----	400.8	0 0 0 0	9.7 0.0	132.1	59.3
7	7	8	65 *d	7.7	400.8	0 3 0 0	10.7 0.7	59.3	52.6
8	8	9	65 *d	7.1	133.6	0 1 1 0	10.6 0.0	52.6	51.8
9	9	10	32 *d	1.0	66.8	0 0 1 0	3.3 0.0	51.8	50.5
10	10	11	32 *d	2.5	33.4	0 1 1 0	5.9 -0.2	50.5	49.8
11	11	12	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	49.8	49.8
12	12	13	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	49.8	47.5
13	11	14	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	49.8	49.8
14	14	15	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	49.8	47.5
15	10	16	32 *d	2.5	33.4	0 1 1 0	5.9 -0.2	50.5	49.8
16	16	17	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	49.8	49.8
17	17	18	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	49.8	47.5
18	16	19	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	49.8	49.8
19	19	20	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	49.8	47.5
20	9	21	32 *d	1.0	66.8	0 0 1 0	3.3 0.0	51.8	50.5
21	21	22	32 *d	2.5	33.4	0 1 1 0	5.9 -0.2	50.5	49.8
22	22	23	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	49.8	49.8
23	23	24	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	49.8	47.5
24	22	25	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	49.8	49.8
25	25	26	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	49.8	47.5
26	21	27	32 *d	2.5	33.4	0 1 1 0	5.9 -0.2	50.5	49.8
27	27	28	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	49.8	49.8
28	28	29	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	49.8	47.5
29	27	30	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	49.8	49.8

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : M.V. SWITCH ROOM 1 Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlet [bar]
Continued									
30	30	31	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	49.8	47.5
31	8	63	65 *d	3.0	267.2	0 0 1 0	5.5 0.0	52.6	51.0
32	63	32	65 *d	3.4	133.6	0 0 1 0	5.9 0.0	51.0	50.5
33	32	33	32 *d	1.0	66.8	0 0 1 0	3.3 0.0	50.5	49.1
34	33	34	32 *d	2.5	33.4	0 1 1 0	5.9 -0.2	49.1	48.5
35	34	35	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.5	48.4
36	35	36	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.4	46.1
37	34	37	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.5	48.4
38	37	38	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.4	46.1
39	33	39	32 *d	2.5	33.4	0 0 1 0	4.8 -0.2	49.1	48.6
40	39	40	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.6	48.5
41	40	41	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.5	46.2
42	39	42	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.6	48.5
43	42	43	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.5	46.2
44	32	44	32 *d	1.0	66.8	0 0 1 0	3.3 0.0	50.5	49.1
45	44	45	32 *d	2.5	33.4	0 0 1 0	4.8 -0.2	49.1	48.6
46	45	46	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.6	48.5
47	46	47	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.5	46.2
48	44	50	32 *d	2.5	33.4	0 0 1 0	4.8 -0.2	49.1	48.6
49	50	51	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.6	48.5
50	51	52	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.5	46.2
51	50	53	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.6	48.5
52	53	54	15 *d	0.2	16.7	0 0 1 0	1.2 0.0	48.5	46.2
53	63	55	65 *d	7.4	133.6	0 1 0 1	9.2 0.0	51.0	50.2
54	55	56	32 *d	1.0	66.8	0 0 1 0	3.3 0.0	50.2	48.8
55	56	58	32 *d	2.5	33.4	0 1 1 0	5.9 -0.2	48.8	48.2
56	58	59	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.2	48.1
57	59	60	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.1	45.8
58	58	61	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.2	48.1
59	61	62	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.1	45.8
60	56	64	32 *d	2.5	33.4	0 1 1 0	5.9 -0.2	48.8	48.2
61	64	65	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.2	48.1
62	65	66	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.1	45.8
63	64	67	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.2	48.1
64	67	68	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.1	45.8
65	55	69	32 *d	1.0	66.8	0 0 1 0	3.3 0.0	50.2	48.8
66	69	70	32 *d	2.5	33.4	0 1 1 0	5.9 -0.2	48.8	48.2
67	70	71	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.2	48.1
68	71	72	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.1	45.8
69	70	73	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.2	48.1
70	73	74	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.1	45.8
71	69	76	32 *d	2.5	33.4	0 1 1 0	5.9 -0.2	48.8	48.2
72	76	77	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.2	48.1
73	77	78	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.1	45.8
74	76	79	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.2	48.1
75	79	80	15 *d	0.2	16.7	0 0 1 0	1.2 -0.2	48.1	45.8

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : M.V. SWITCH ROOM 1 Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff.	inlet pressure	outlet [bar]
Continued									
76	12	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	49.8	-.-
77	14	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	49.8	-.-
78	17	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	49.8	-.-
79	19	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	49.8	-.-
80	23	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	49.8	-.-
81	25	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	49.8	-.-
82	28	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	49.8	-.-
83	30	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	49.8	-.-
84	35	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.4	-.-
85	37	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.4	-.-
86	40	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.5	-.-
87	42	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.5	-.-
88	46	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.5	-.-
89	51	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.5	-.-
90	53	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.5	-.-
91	59	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.1	-.-
92	61	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.1	-.-
93	65	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.1	-.-
94	67	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.1	-.-
95	71	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.1	-.-
96	73	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.1	-.-
97	77	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.1	-.-
98	79	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.1	-.-
99	45	48	32 *d	0.5	16.7	0 0 1 0	2.8 0.0	48.6	48.5
100	48	49	15 *d	0.2	16.7	0 0 1 0	1.2 0.0	48.5	46.2
101	48	-	32 *d	0.2	-.-	0 0 0 1	0.9 0.0	48.5	-.-

Calculation of nozzles

nozzle no.	pipe point	Q(60)nozzle theor. [kg/min]	pressure [bar]	nozzle orifice theor. actual [mm2] [mm2]	type of nozzle
1	13	16.7	47.5	54.7 54.1	RD 1/2 x 8.3
2	15	16.7	47.5	54.7 54.1	RD 1/2 x 8.3
3	18	16.7	47.5	54.7 54.1	RD 1/2 x 8.3
4	20	16.7	47.5	54.7 54.1	RD 1/2 x 8.3
5	24	16.7	47.5	54.7 54.1	RD 1/2 x 8.3
6	26	16.7	47.5	54.7 54.1	RD 1/2 x 8.3
7	29	16.7	47.5	54.7 54.1	RD 1/2 x 8.3
8	31	16.7	47.5	54.7 54.1	RD 1/2 x 8.3
9	36	16.7	46.1	56.4 54.1	RD 1/2 x 8.3
10	38	16.7	46.1	56.4 54.1	RD 1/2 x 8.3
11	41	16.7	46.2	56.3 54.1	RD 1/2 x 8.3

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Client : IRASCO Project: G3939-10 Date : 22.11.2010
Build. : M.V. SWITCH ROOM 1 Name : ARGON No: SA-013524-047

Calculation of nozzles

nozzle pipe no.	point	Q(60)nozzle theor. [kg/min]	pressure [bar]	nozzle orifice theor. actual [mm2] [mm2]	type of nozzle
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Continued

12	43	16.7	46.2	56.3 54.1	RD 1/2 x 8.3
13	52	16.7	46.2	56.3 54.1	RD 1/2 x 8.3
14	54	16.7	46.2	56.3 54.1	RD 1/2 x 8.3
15	47	16.7	46.2	56.3 54.1	RD 1/2 x 8.3
16	49	16.7	46.2	56.3 54.1	RD 1/2 x 8.3
17	60	16.7	45.8	56.8 54.1	RD 1/2 x 8.3
18	62	16.7	45.8	56.8 54.1	RD 1/2 x 8.3
19	66	16.7	45.8	56.8 54.1	RD 1/2 x 8.3
20	68	16.7	45.8	56.8 54.1	RD 1/2 x 8.3
21	72	16.7	45.8	56.8 54.1	RD 1/2 x 8.3
22	74	16.7	45.8	56.8 54.1	RD 1/2 x 8.3
23	78	16.7	45.8	56.8 54.1	RD 1/2 x 8.3
24	80	16.7	45.8	56.8 54.1	RD 1/2 x 8.3

Provided pressure reducer:

Pressure reducer type DK 65 / 65 x 23.4

Pressure relief

The minimum pressure relief opening into the air is

600 N/m2 => 3334 cm2

The mass flow rate is 16.30 kg/s. The standard volume flow rate is 32880 m3/h

Note: pressure for enclosure is to be checked with the client !

Assumed openings can be taken into account for pressure relief.

Pipe definition

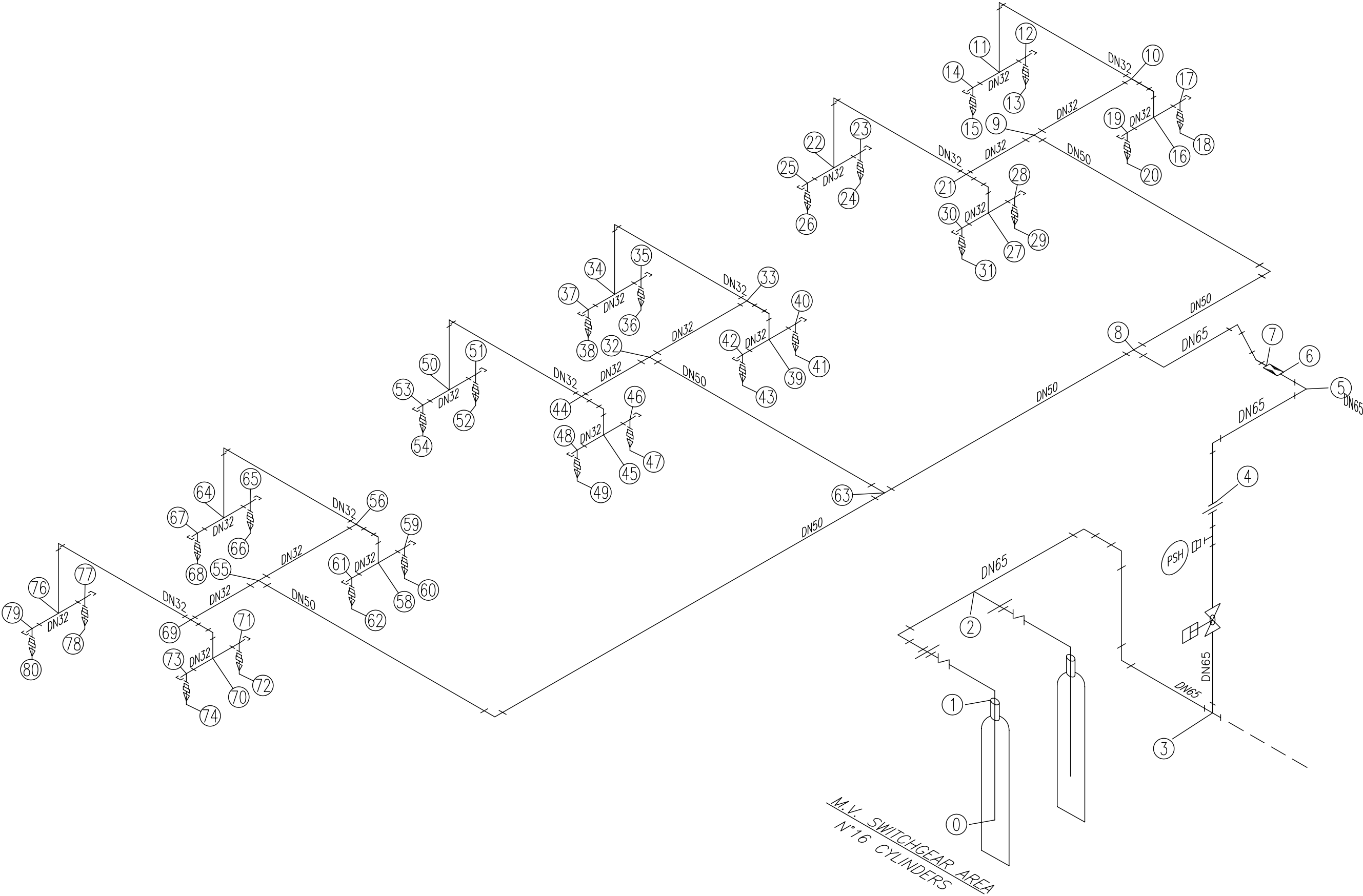
(* Pipe table ASTM A106 Grade B Schedule 40//80/160 *)

*h => upstream pipe 200 bar, threaded

*d => downstream pipe 60 bar, threaded

DK => Pressure reducer

SANCO S.p.A. FIRE PROTECTION AND SAFETY TECHNOLOGY				
Titolo Title		Documento N° / Document N°	Rev. Rev.	Fg. / Sh.
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TECHNICAL DESIGN M I N I M A X
 Argon HP System G m b H

Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : M.V. SWITCH ROOM 2 Name : ARGON No: SA-013524-047

(3.06)

Data of system and quantity flow

Cylinder bank data

 Average temperature tf = 20.0 °C
 Specific quantity Q(60) = 400.8 kg
 Design quantity Q = 421.9 kg
 Cylinder size chosen Fg = 80.0 l / 28.3 kg / 200 bar
 Number of cylinders chosen .. Fz = 16
 Supply quantity Qg = 452.8 kg
 Flooding proportion Q(60)/Qg = 0.89

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m] [m]	inlet pressure [bar]	outlt. [bar]
0	0	1	12	4.0	25.1	0 0 0 0	4.0 0.0	178.1	162.3
1	1	2	65 *h	12.0	400.8	0 7 1 0	21.5 0.3	162.3	151.8
2	2	3	65 *h	5.5	400.8	0 3 0 0	8.5 -1.6	151.8	147.4
3	3	4	65 *h	1.2	400.8	0 0 1 0	3.7 1.2	147.4	145.5
4	4	5	65 *h	16.3	400.8	0 2 0 0	18.3 1.6	145.5	135.6
5	5	6	65 *h	15.0	400.8	0 1 0 0	16.0 0.0	135.6	126.3
6	6	7	65 DK	----	400.8	0 0 0 0	8.7 0.0	126.3	58.2
7	7	8	65 *d	12.0	400.8	0 1 0 0	13.0 0.0	58.2	49.6
8	8	9	65 *d	6.2	178.1	0 1 1 0	9.7 0.0	49.6	48.2
9	9	10	40 *d	1.1	89.1	0 0 1 0	3.8 0.0	48.2	46.9
10	10	11	40 *d	2.5	44.5	0 1 1 0	6.5 -0.2	46.9	46.3
11	11	12	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	46.3	46.2
12	12	13	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	46.2	41.8
13	11	14	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	46.3	46.2
14	14	15	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	46.2	41.8
15	10	16	40 *d	2.5	44.5	0 1 1 0	6.5 -0.2	46.9	46.3
16	16	17	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	46.3	46.2
17	17	18	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	46.2	41.8
18	16	19	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	46.3	46.2
19	19	20	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	46.2	41.8
20	9	21	40 *d	1.0	89.1	0 0 1 0	3.7 0.0	48.2	46.9
21	21	22	40 *d	2.5	44.5	0 1 1 0	6.5 -0.2	46.9	46.3
22	22	23	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	46.3	46.2
23	23	24	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	46.2	41.8
24	22	25	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	46.3	46.2
25	25	26	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	46.2	41.8
26	21	28	40 *d	2.5	44.5	0 1 1 0	6.5 -0.2	46.9	46.3
27	28	29	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	46.3	46.2
28	29	30	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	46.2	41.8
29	28	31	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	46.3	46.2

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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : M.V. SWITCH ROOM 2 Name : ARGON No: SA-013524-047

Pressure drop calculation

pipe sec.	from	to	Nominal width [mm]	length [m]	Argon quantity [kg/min]	pipe fitt. va eb ts tt	total eleva. length diff. [m]	inlet pressure [bar]	outlet [bar]
Continued									
30	31	32	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	46.2	41.8
31	8	33	65 *d	6.2	222.7	0 1 1 0	9.7 0.0	49.6	47.4
32	33	34	40 *d	1.2	111.3	0 0 1 0	3.9 0.0	47.4	45.2
33	34	35	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	45.2	45.1
34	35	36	15 *d	0.4	22.3	0 0 1 0	1.4 -0.4	45.1	39.8
35	34	37	40 *d	1.2	89.1	0 0 0 1	2.0 0.0	45.2	44.5
36	37	38	40 *d	2.5	44.5	0 1 1 0	6.5 -0.2	44.5	43.8
37	38	39	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	43.8	43.8
38	39	40	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	43.8	39.1
39	38	41	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	43.8	43.8
40	41	42	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	43.8	39.1
41	37	43	40 *d	2.5	44.5	0 1 1 0	6.5 -0.2	44.5	43.8
42	43	44	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	43.8	43.8
43	44	45	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	43.8	39.1
44	43	46	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	43.8	43.8
45	46	47	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	43.8	39.1
46	33	48	40 *d	1.2	111.3	0 0 1 0	3.9 0.0	47.4	45.2
47	48	49	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	45.2	45.1
48	49	50	15 *d	0.4	22.3	0 0 1 0	1.4 -0.4	45.1	39.8
49	48	51	40 *d	1.2	89.1	0 0 0 1	2.0 0.0	45.2	44.5
50	51	52	40 *d	2.5	44.5	0 1 1 0	6.5 -0.2	44.5	43.8
51	52	53	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	43.8	43.8
52	53	54	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	43.8	39.1
53	52	55	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	43.8	43.8
54	55	56	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	43.8	39.1
55	51	57	40 *d	2.5	44.5	0 1 1 0	6.5 -0.2	44.5	43.8
56	57	58	40 *d	0.5	22.3	0 0 1 0	3.2 0.0	43.8	43.8
57	58	59	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	43.8	39.1
58	57	60	40 *d	0.2	22.3	0 0 1 0	2.9 0.0	43.8	43.8
59	60	61	15 *d	0.2	22.3	0 0 1 0	1.2 -0.2	43.8	39.1
60	12	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	46.2	-.-
61	14	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	46.2	-.-
62	17	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	46.2	-.-
63	19	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	46.2	-.-
64	23	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	46.2	-.-
65	25	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	46.2	-.-
66	29	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	46.2	-.-
67	31	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	46.2	-.-
68	39	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.8	-.-
69	41	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.8	-.-
70	44	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.8	-.-
71	46	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.8	-.-
72	35	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	45.1	-.-
73	49	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	45.1	-.-
74	53	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.8	-.-
75	55	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.8	-.-
76	58	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.8	-.-
77	60	-	40 *d	0.2	-.-	0 0 0 1	1.0 0.0	43.8	-.-

Titolo Title ARFA AND GHADIR PROJECT ARGON CALCULATION NOTE	Documento N° / Document N° SA-013524-047	Rev. Rev. 1	Fg. / Sh. 43	Di / Of 44
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Client : IRASCO Project: G3939-10 Date : 22.11.2010

Build. : M.V. SWITCH ROOM 2 Name : ARGON No: SA-013524-047

Calculation of nozzles

nozzle no.	pipe point	Q(60)nozzle theor. [kg/min]	pressure [bar]	nozzle orifice theor. actual [mm2] [mm2]	type of nozzle
1	13	22.3	41.8	83.1 83.3	RD 1/2 x 10.3
2	15	22.3	41.8	83.1 83.3	RD 1/2 x 10.3
3	18	22.3	41.8	83.1 83.3	RD 1/2 x 10.3
4	20	22.3	41.8	83.1 83.3	RD 1/2 x 10.3
5	24	22.3	41.8	83.0 83.3	RD 1/2 x 10.3
6	26	22.3	41.8	83.0 83.3	RD 1/2 x 10.3
7	30	22.3	41.8	83.0 83.3	RD 1/2 x 10.3
8	32	22.3	41.8	83.0 83.3	RD 1/2 x 10.3
9	40	22.3	39.1	88.8 83.3	RD 1/2 x 10.3
10	42	22.3	39.1	88.8 83.3	RD 1/2 x 10.3
11	45	22.3	39.1	88.8 83.3	RD 1/2 x 10.3
12	47	22.3	39.1	88.8 83.3	RD 1/2 x 10.3
13	36	22.3	39.8	87.2 83.3	RD 1/2 x 10.3
14	50	22.3	39.8	87.2 83.3	RD 1/2 x 10.3
15	54	22.3	39.1	88.8 83.3	RD 1/2 x 10.3
16	56	22.3	39.1	88.8 83.3	RD 1/2 x 10.3
17	59	22.3	39.1	88.8 83.3	RD 1/2 x 10.3
18	61	22.3	39.1	88.8 83.3	RD 1/2 x 10.3

Provided pressure reducer:

Pressure reducer type DK 65 / 65 x 24.0

Pressure relief

The minimum pressure relief opening into the air is

600 N/m2 => 3347 cm2

The mass flow rate is 16.36 kg/s. The standard volume flow rate is 33010 m3/h

Note: pressure for enclosure is to be checked with the client !

Assumed openings can be taken into account for pressure relief.

Pipe definition

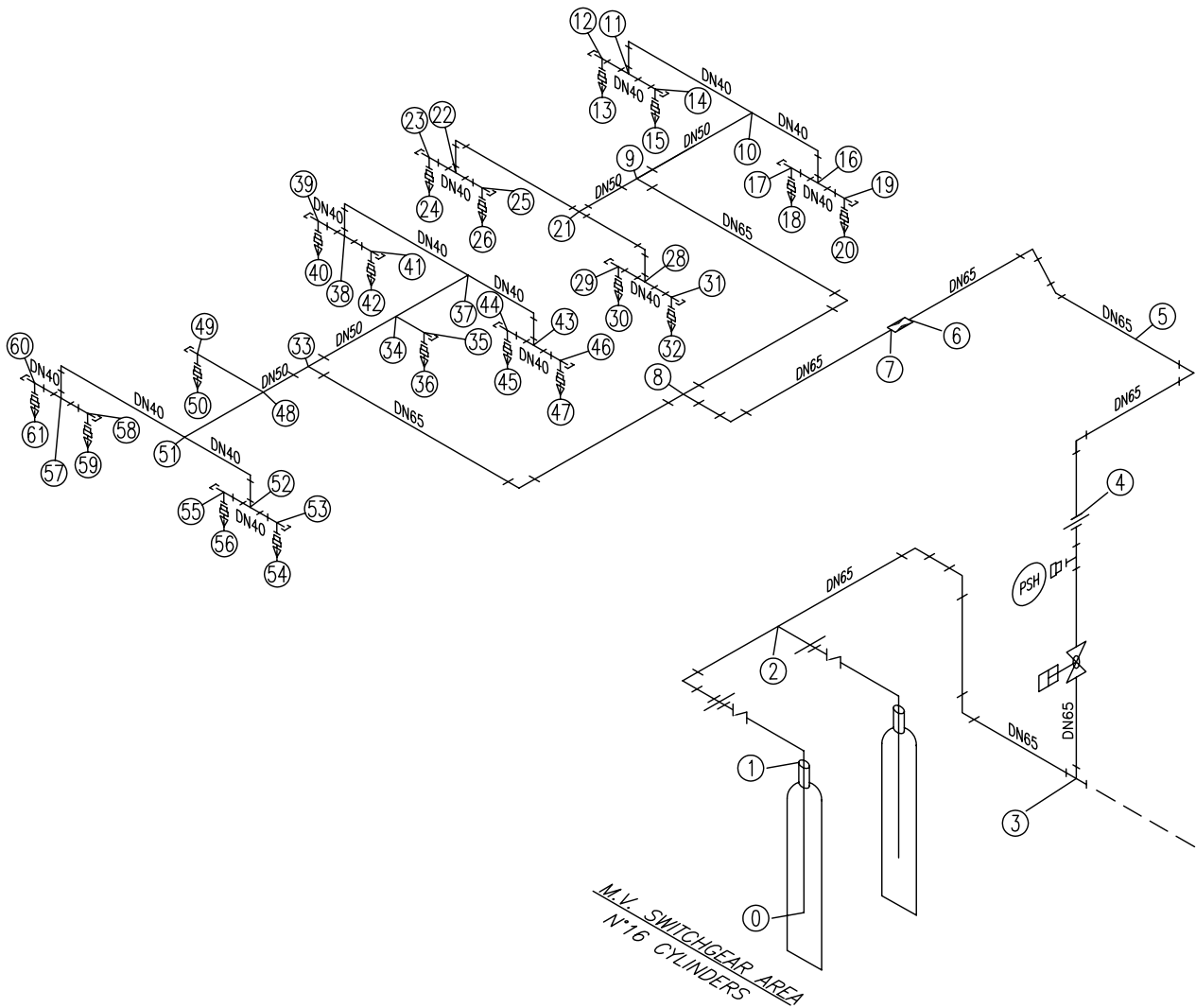
(* Pipe table ASTM A106 Grade B Schedule 40//80/160 *)

*h => upstream pipe 200 bar, threaded

*d => downstream pipe 60 bar, threaded

DK => Pressure reducer

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REV.	DATA DATE	EMISSIONE ISSUE	DISEGN. DRAWN.	CONTR. CHECK	APPR. APPROVED
SANCO Fire Protection and Safety Technology VIA RAVIZZA 13/A – 28066 GALLIATE (NO) ITALY			COMMESSAJOB G3939/10		
			CLIENTECUSTOMER IRASCO s.r.l.		
GHADIR PROJECT FIRE FIGHTING ARGON SYSTEM JUNCTION BOX			SCALA	SCALE	
			CODICE	CODE	
			FOGLIO SHEET	1	DI OF 41
A TERMINE DI LEGGE LA SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. SI RISERVA LA PROPRIETA' DEL PRESENTE DISEGNO E NE VIETA LA RIPRODUZIONE O LA DIVULGAZIONE, ANCHE PARZIALE, A TERZI SENZA IL PROPRIO BENESTARE.			THIS DRAWING IS LEGALLY EXCLUSIVE PROPERTY OF SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. AND IT CAN NEITHER REPRODUCED NOR SHOWN, ALSO PARTIAL, TO THIRD PARTIES WITHOUT OUR WRITTEN ASSENT.		
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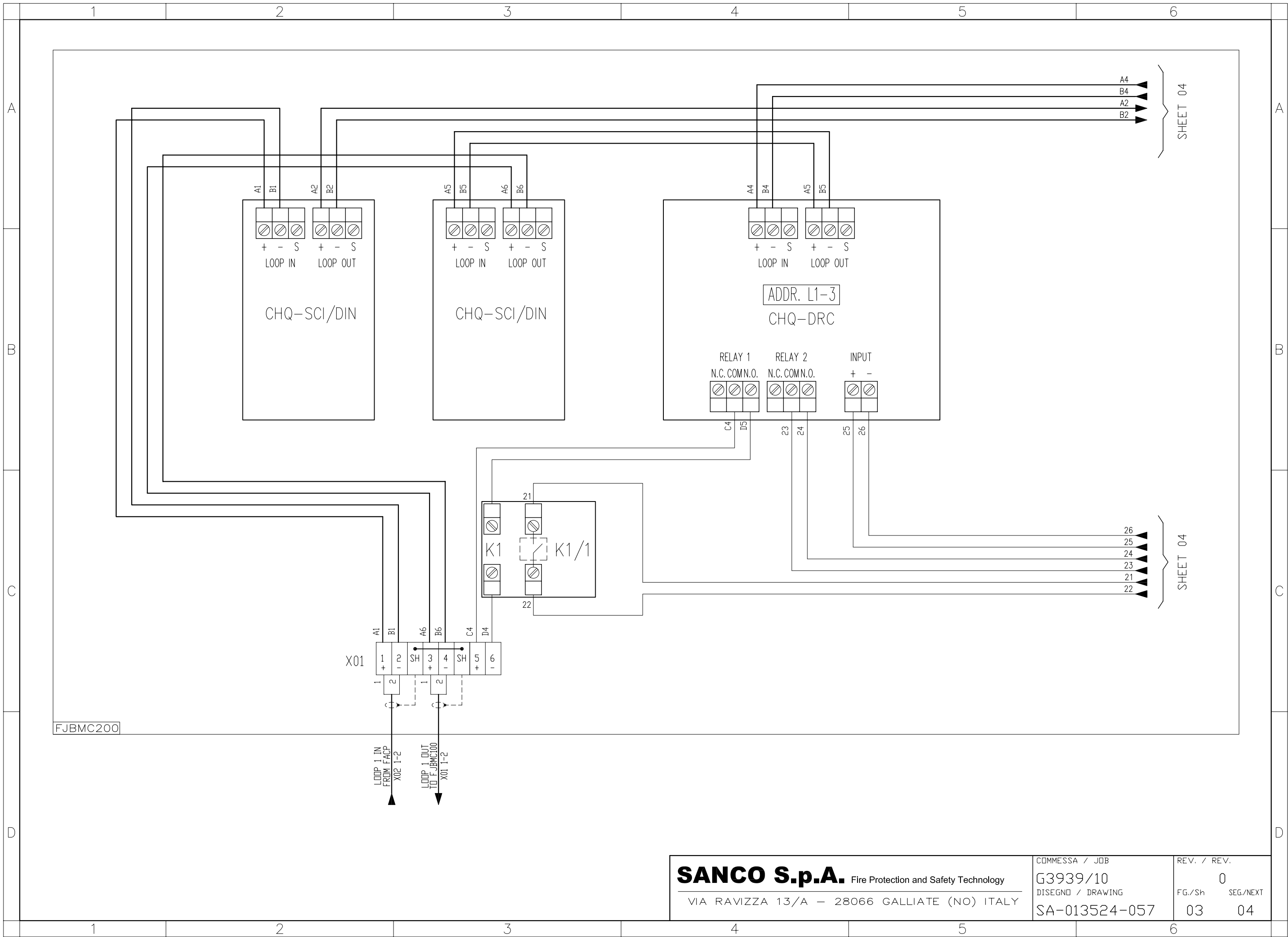
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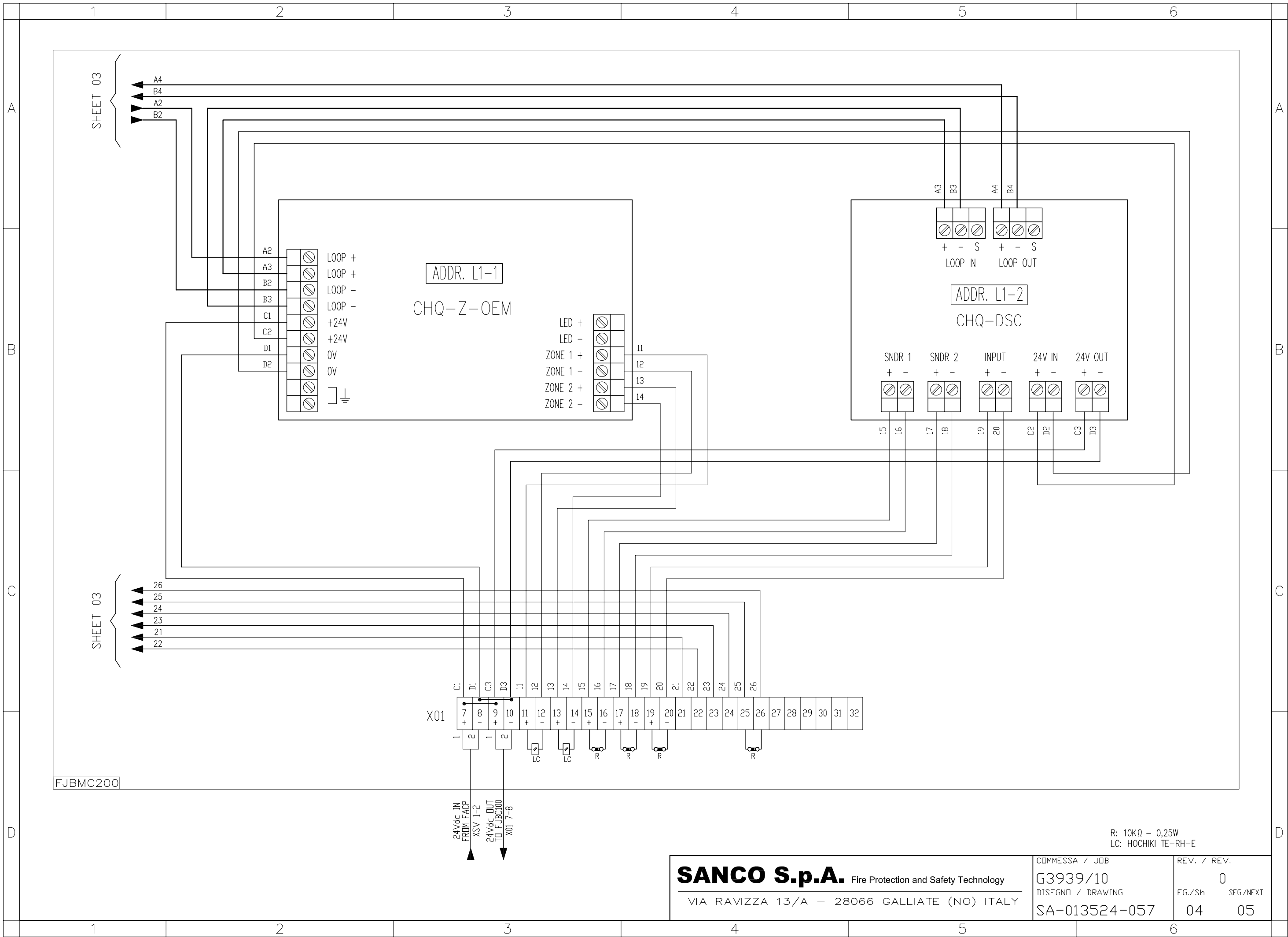
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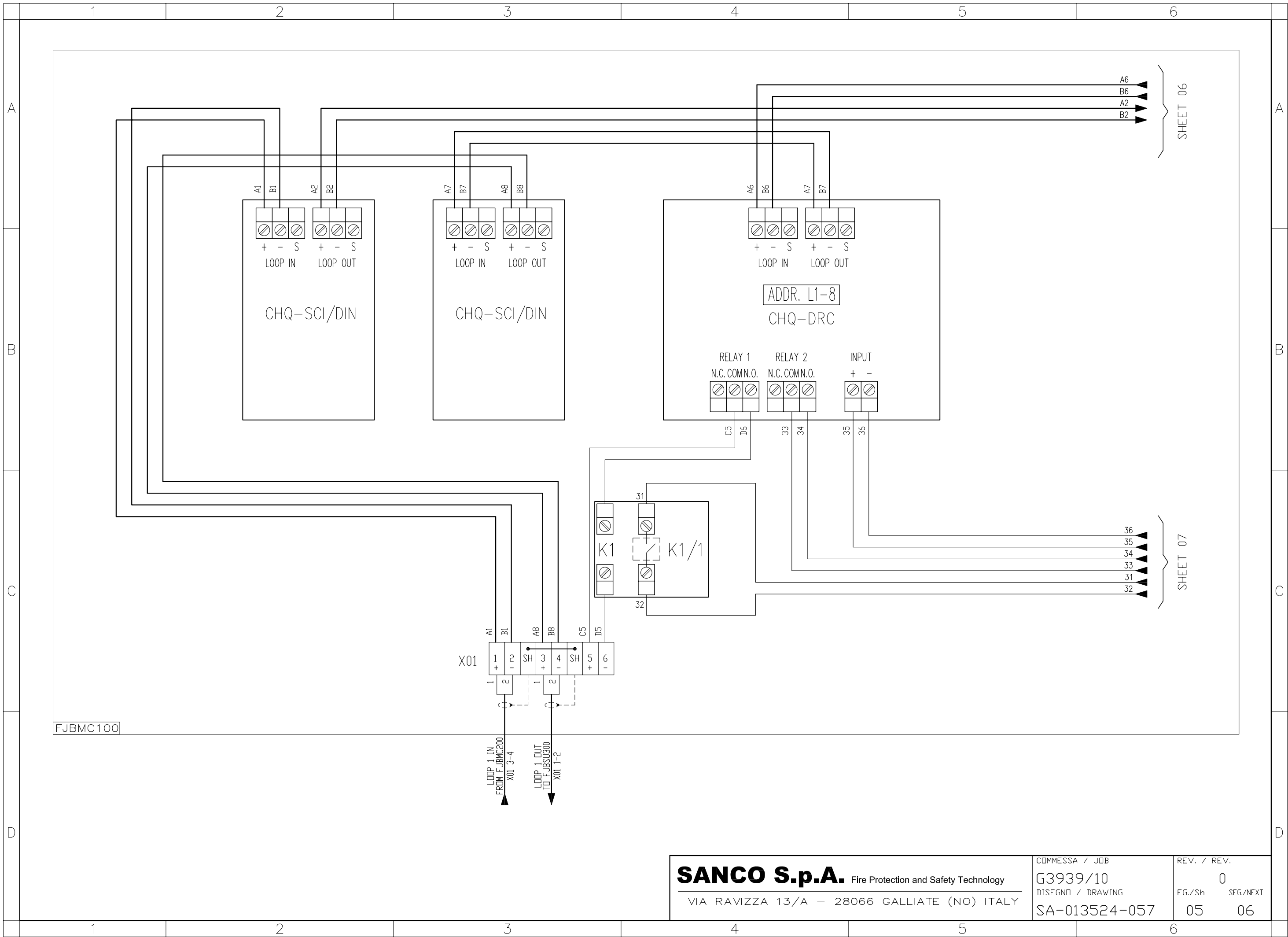
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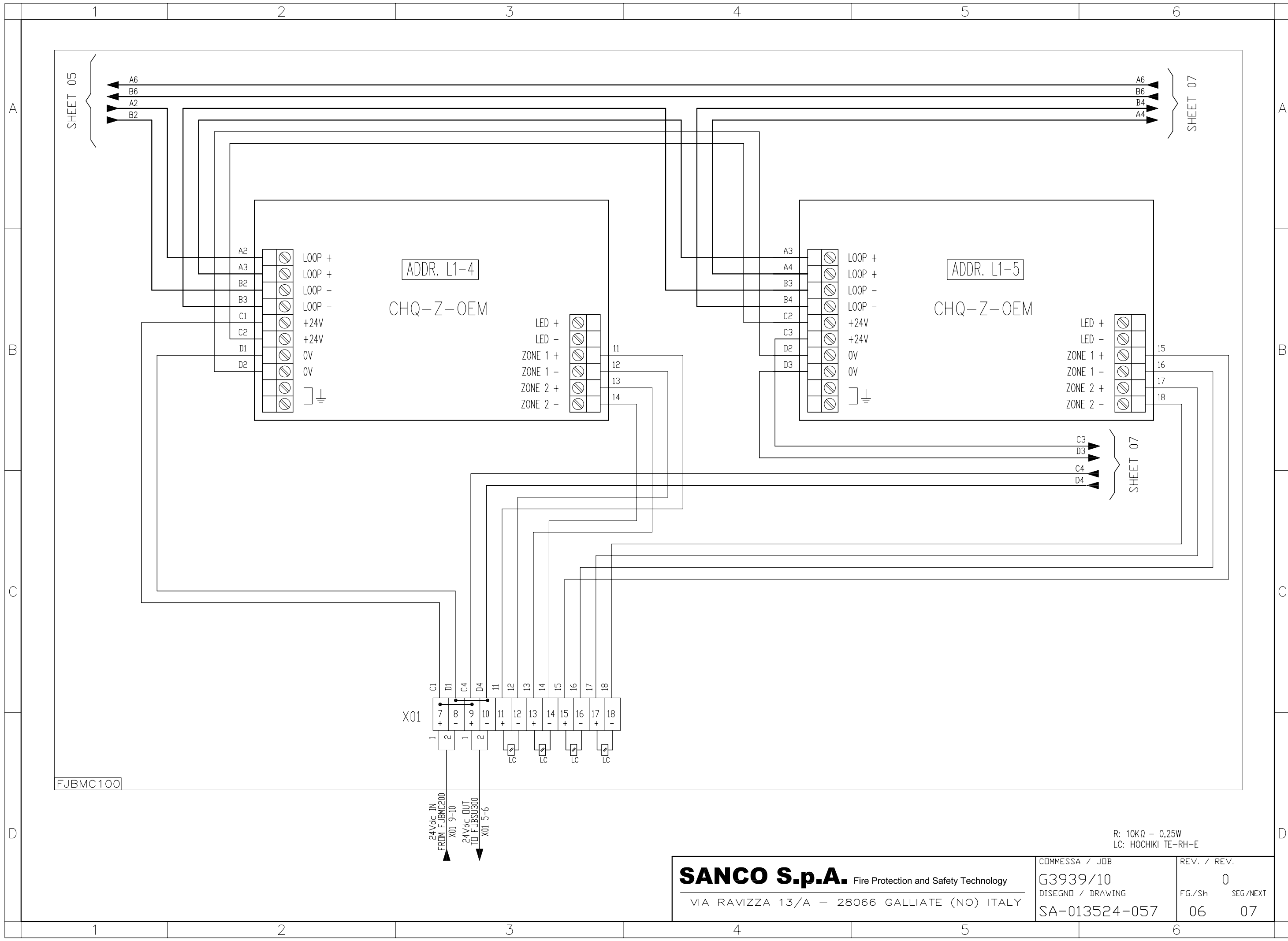
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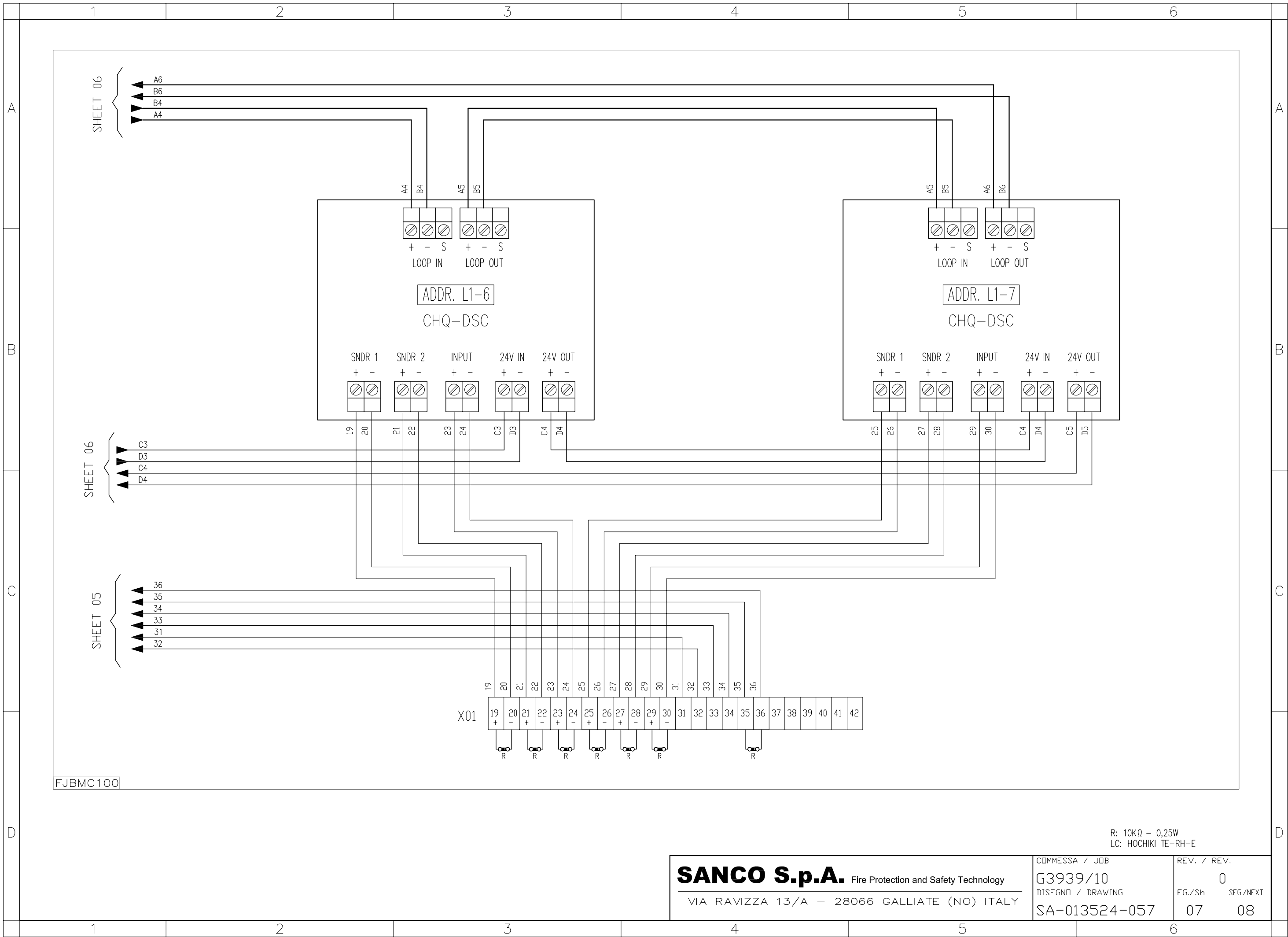
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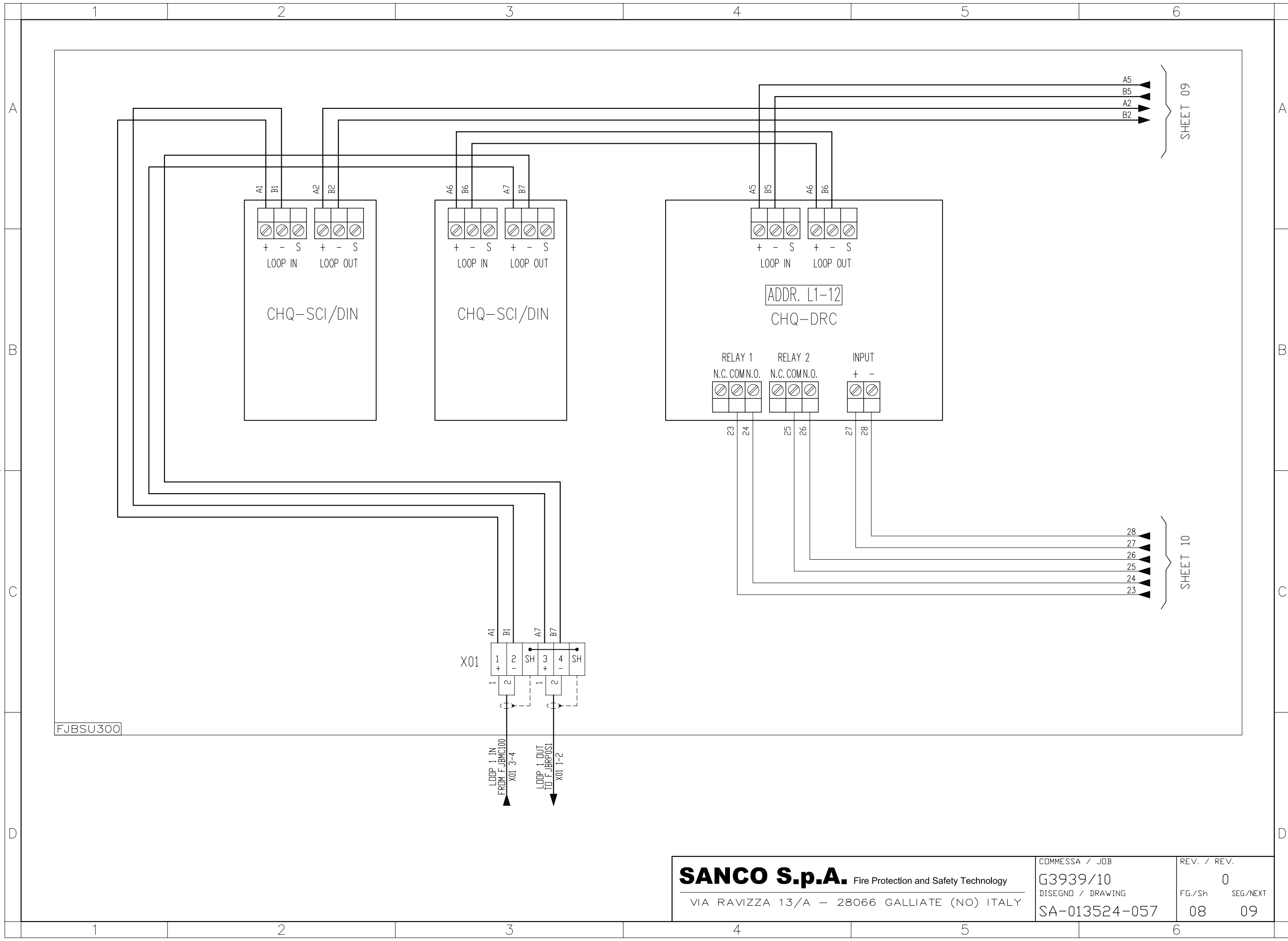
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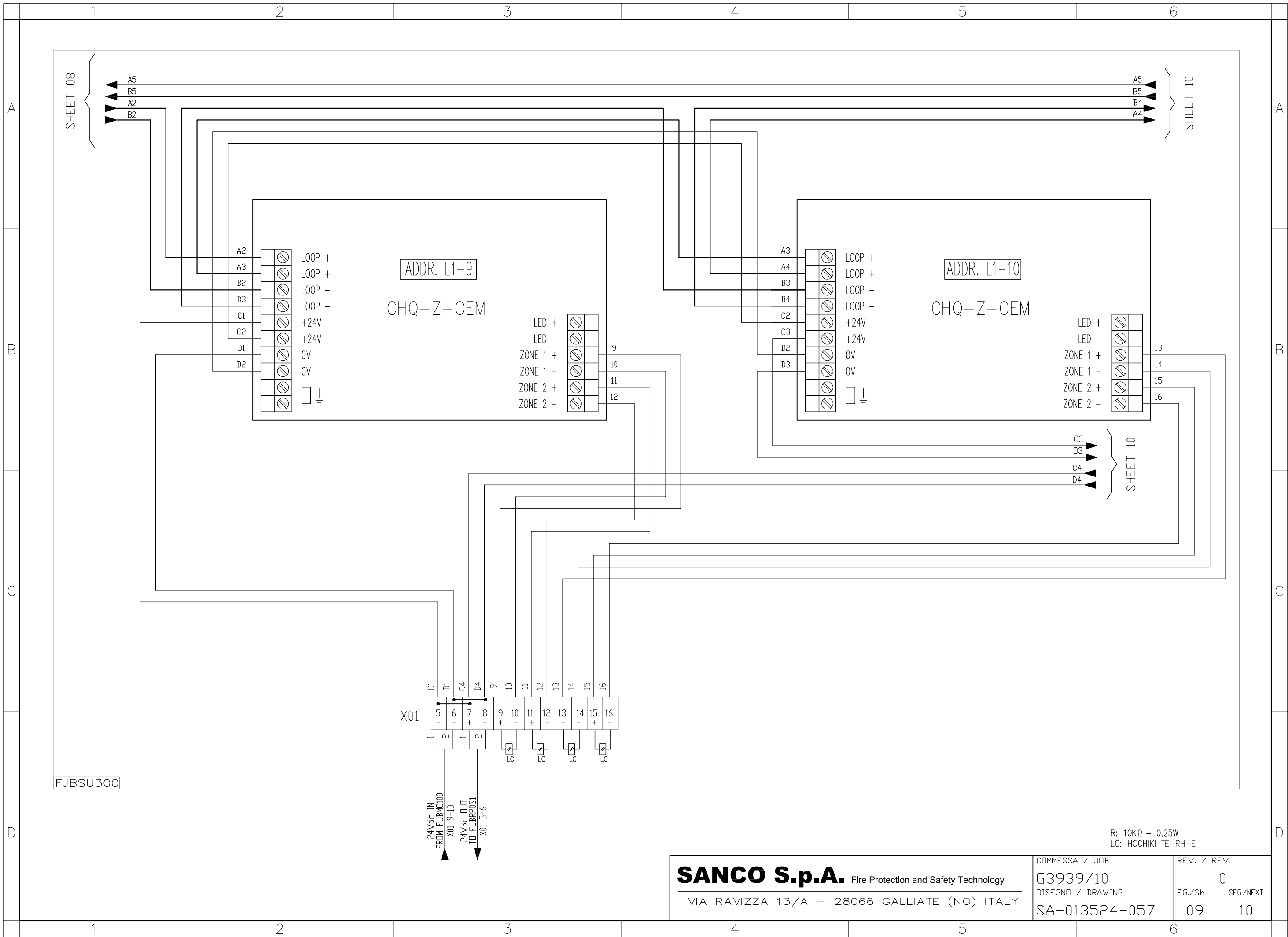












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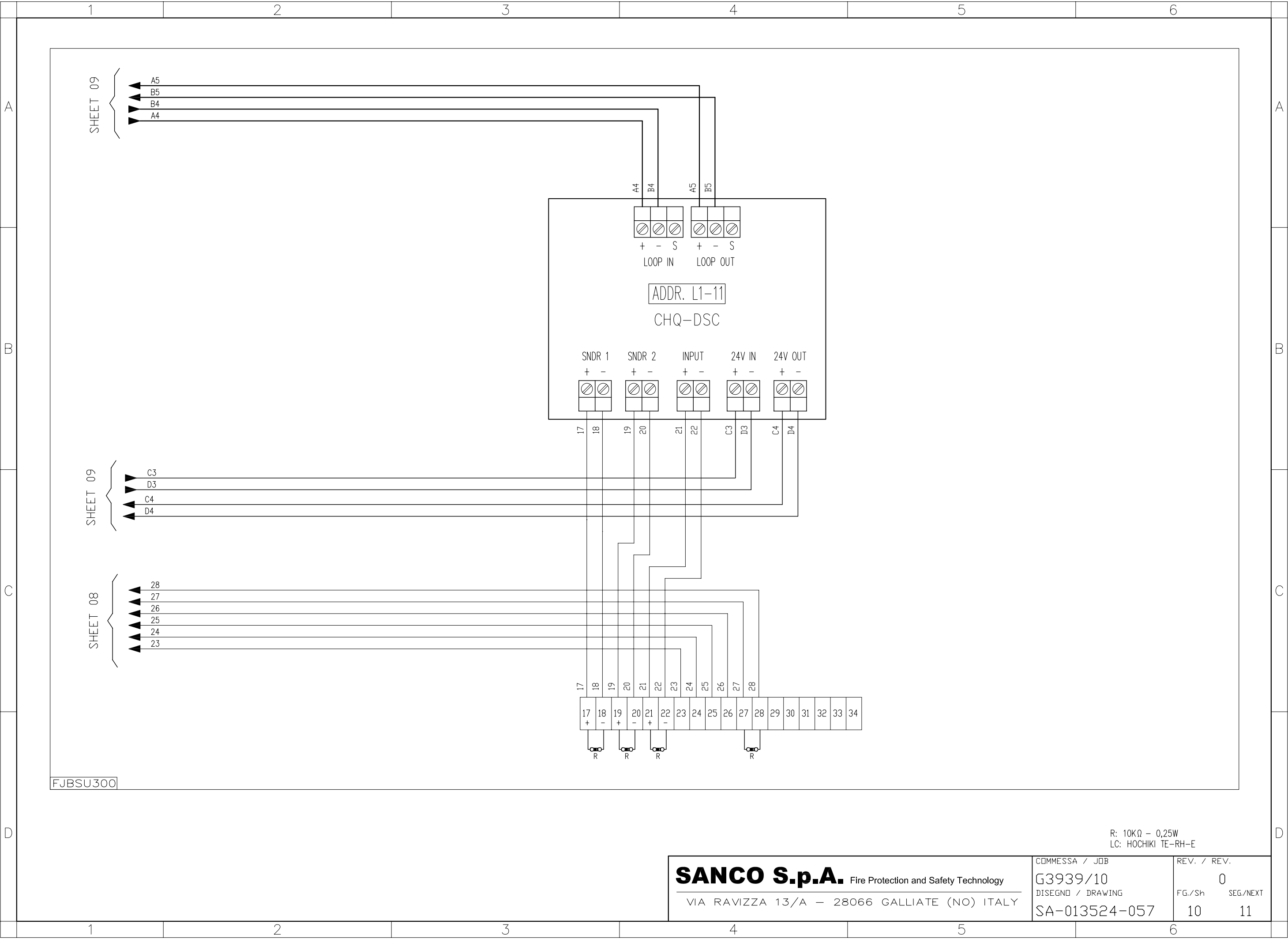
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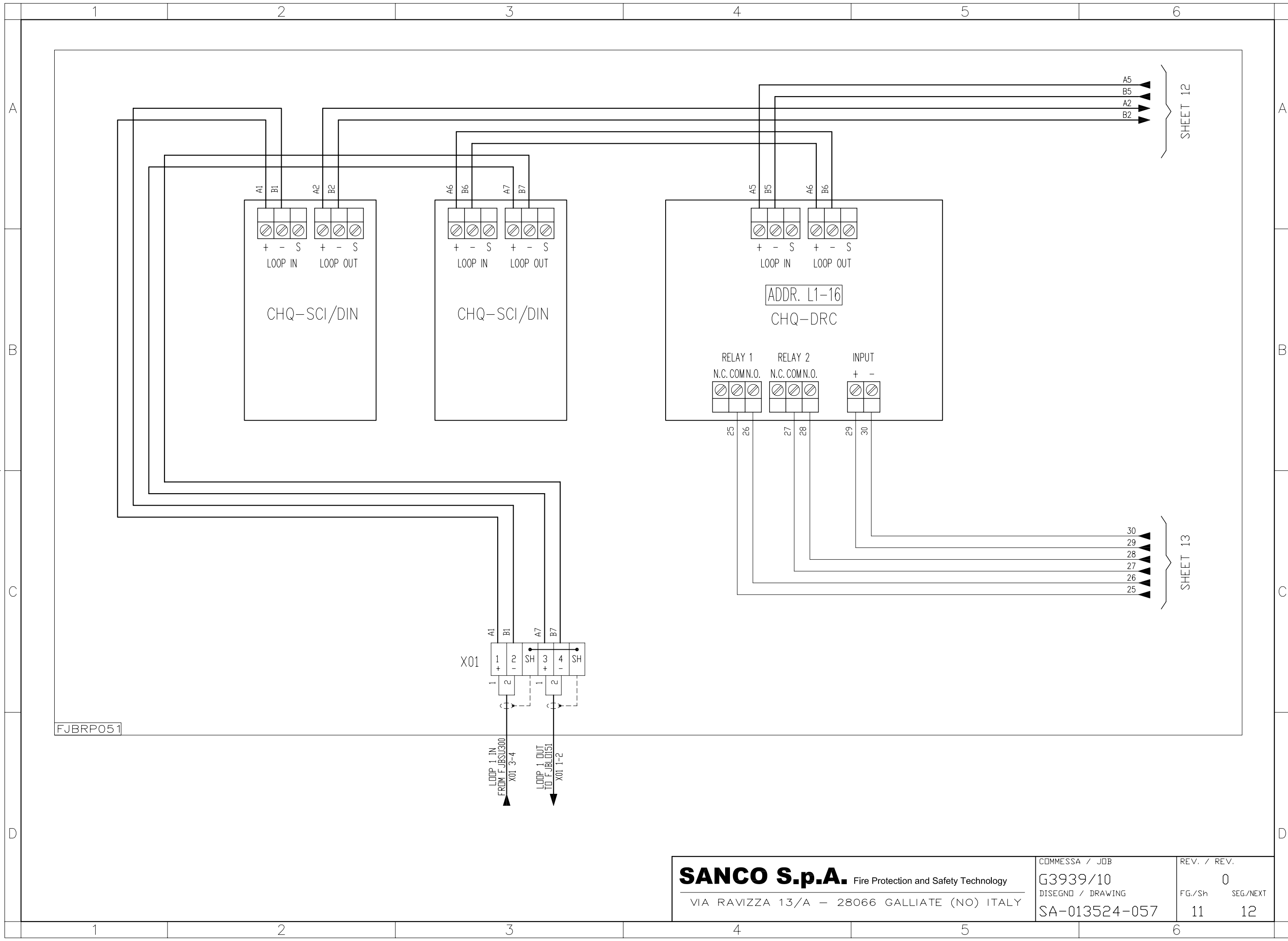
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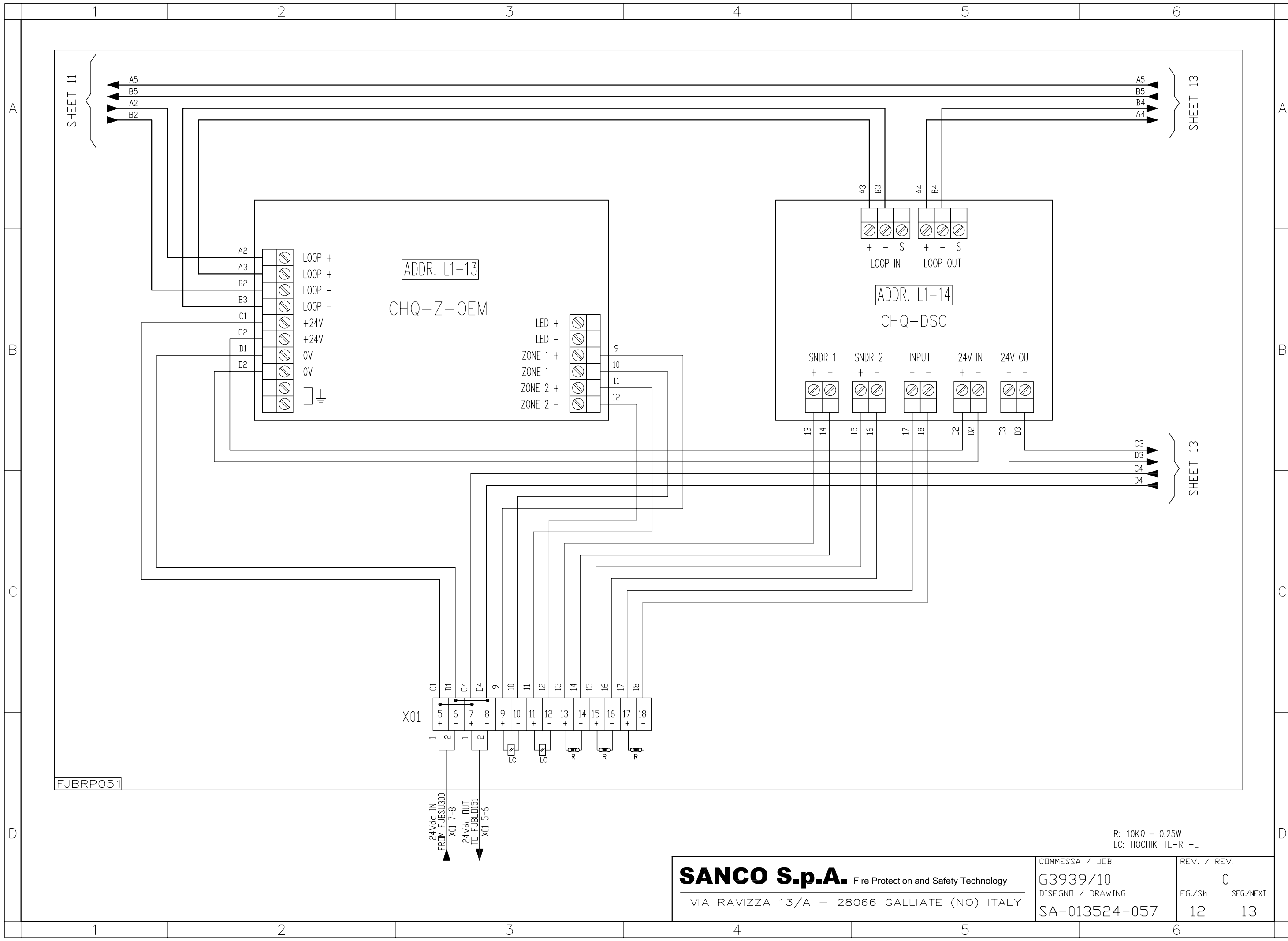
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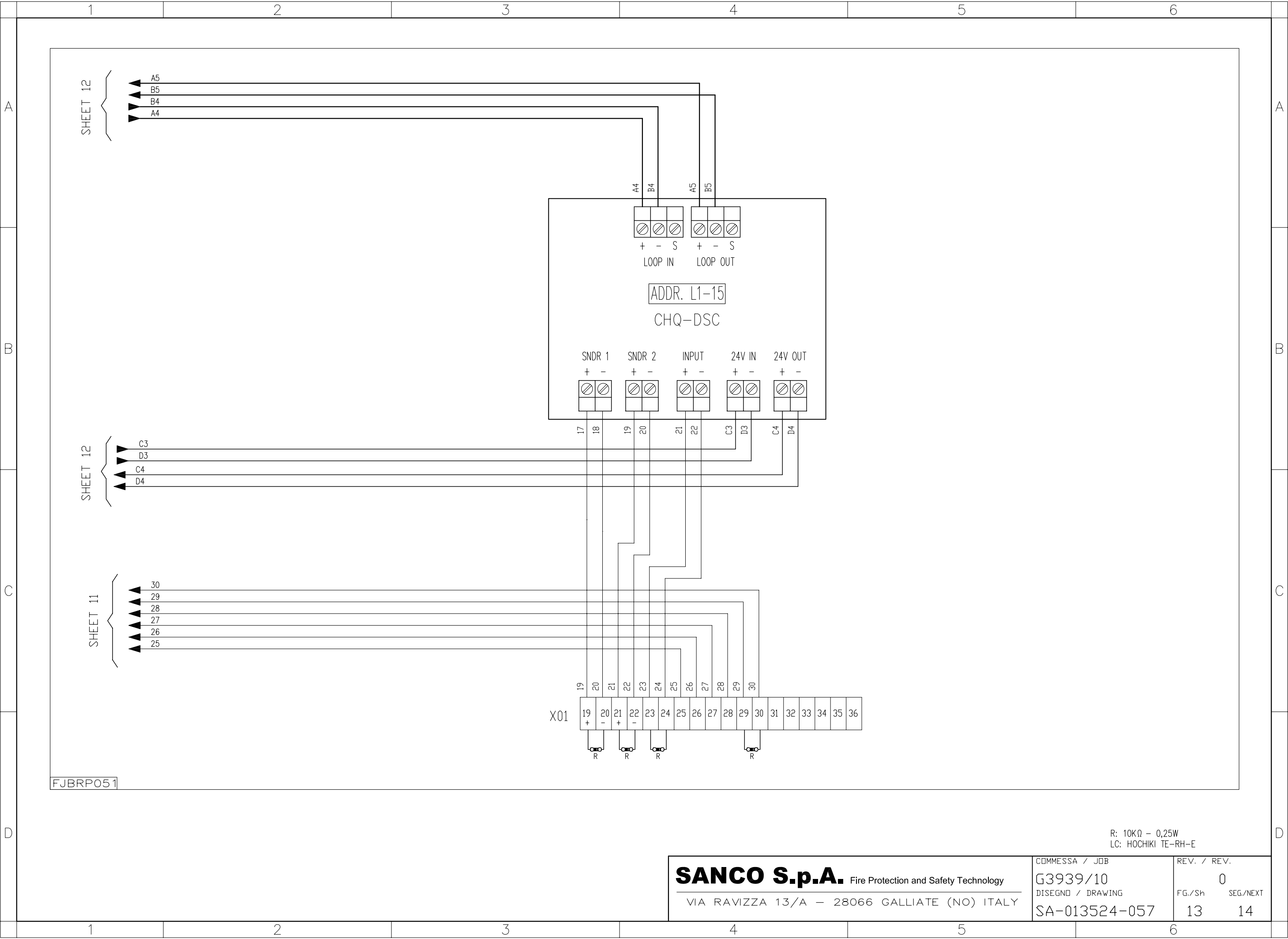


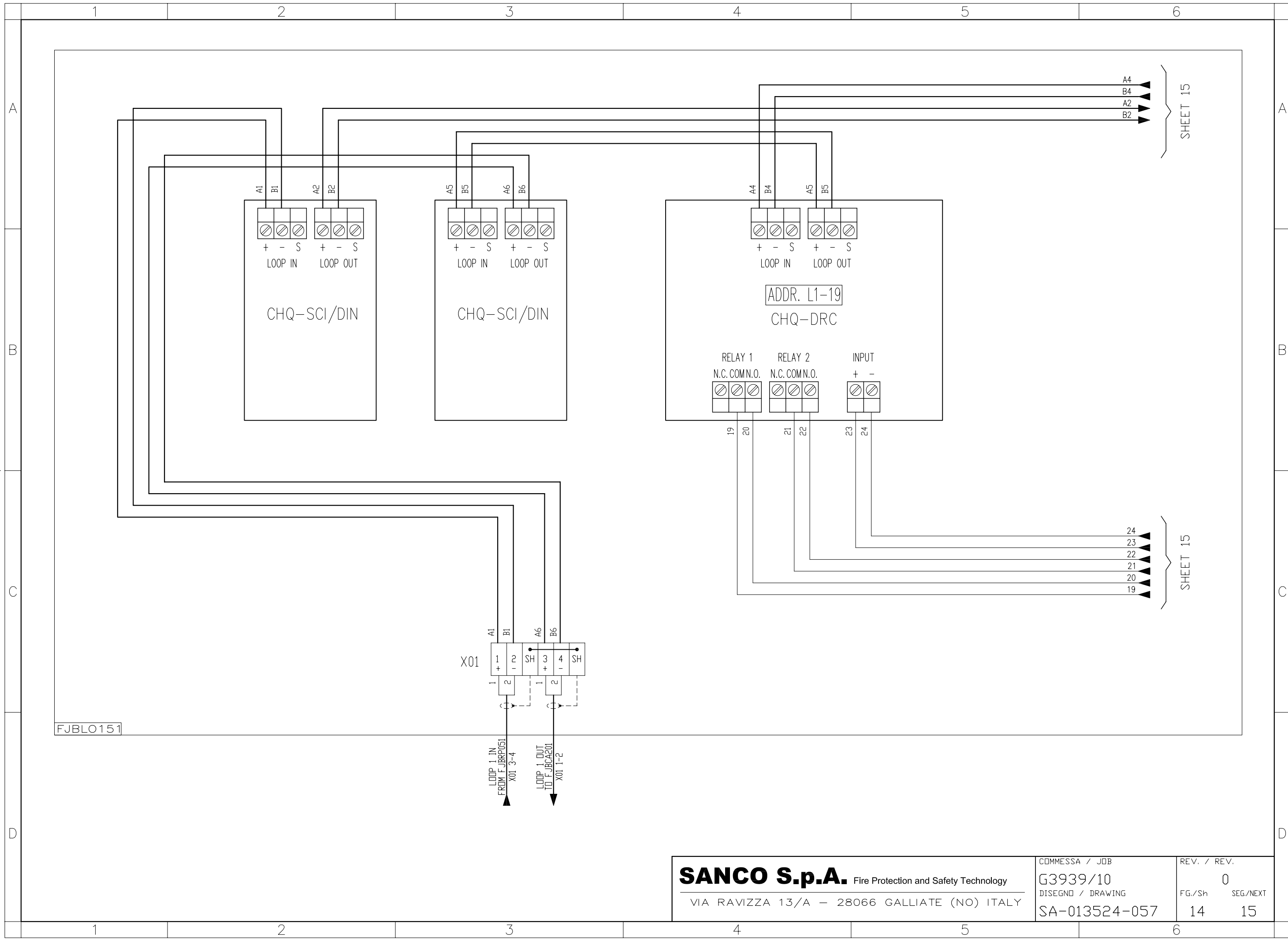


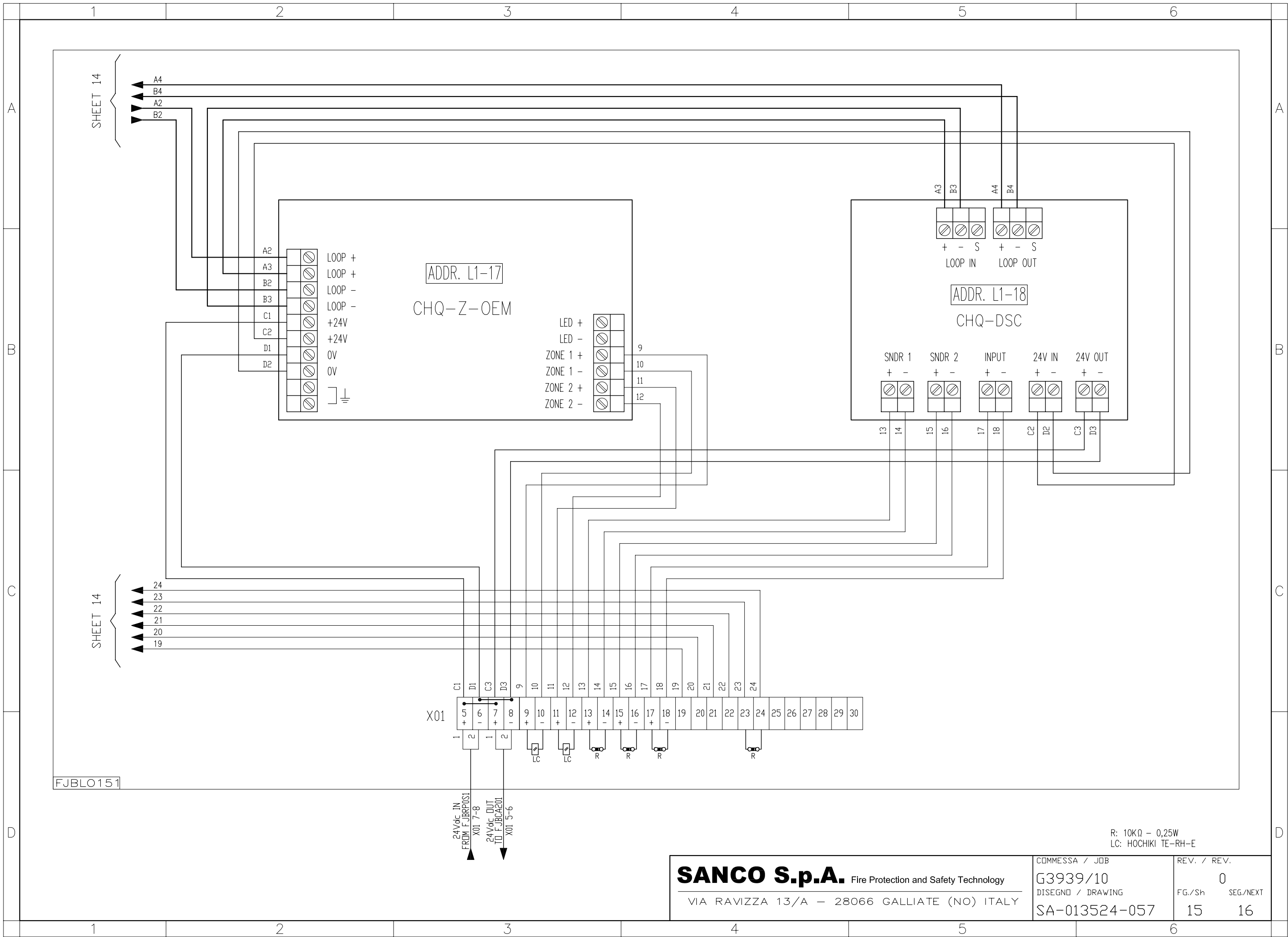


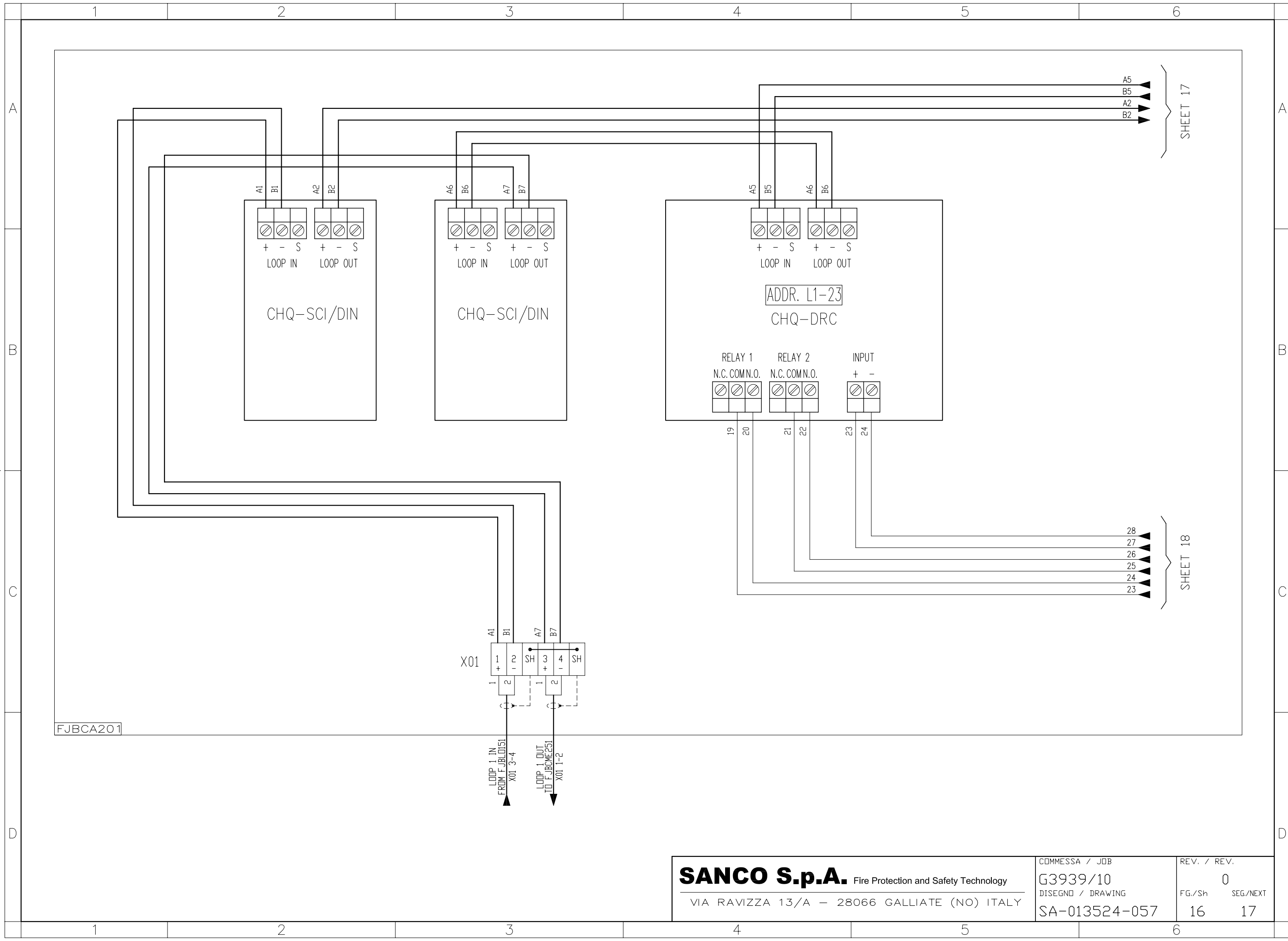
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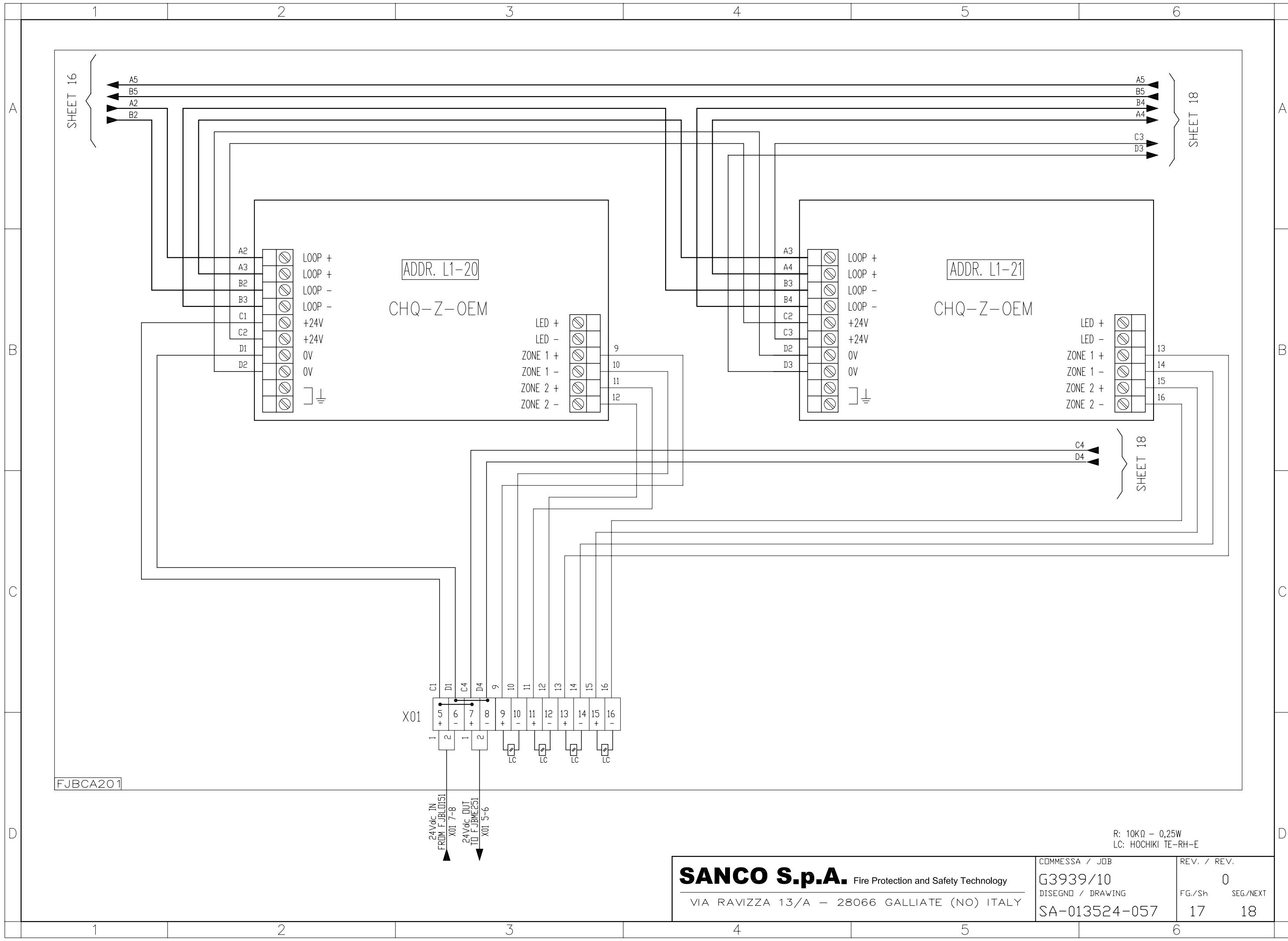
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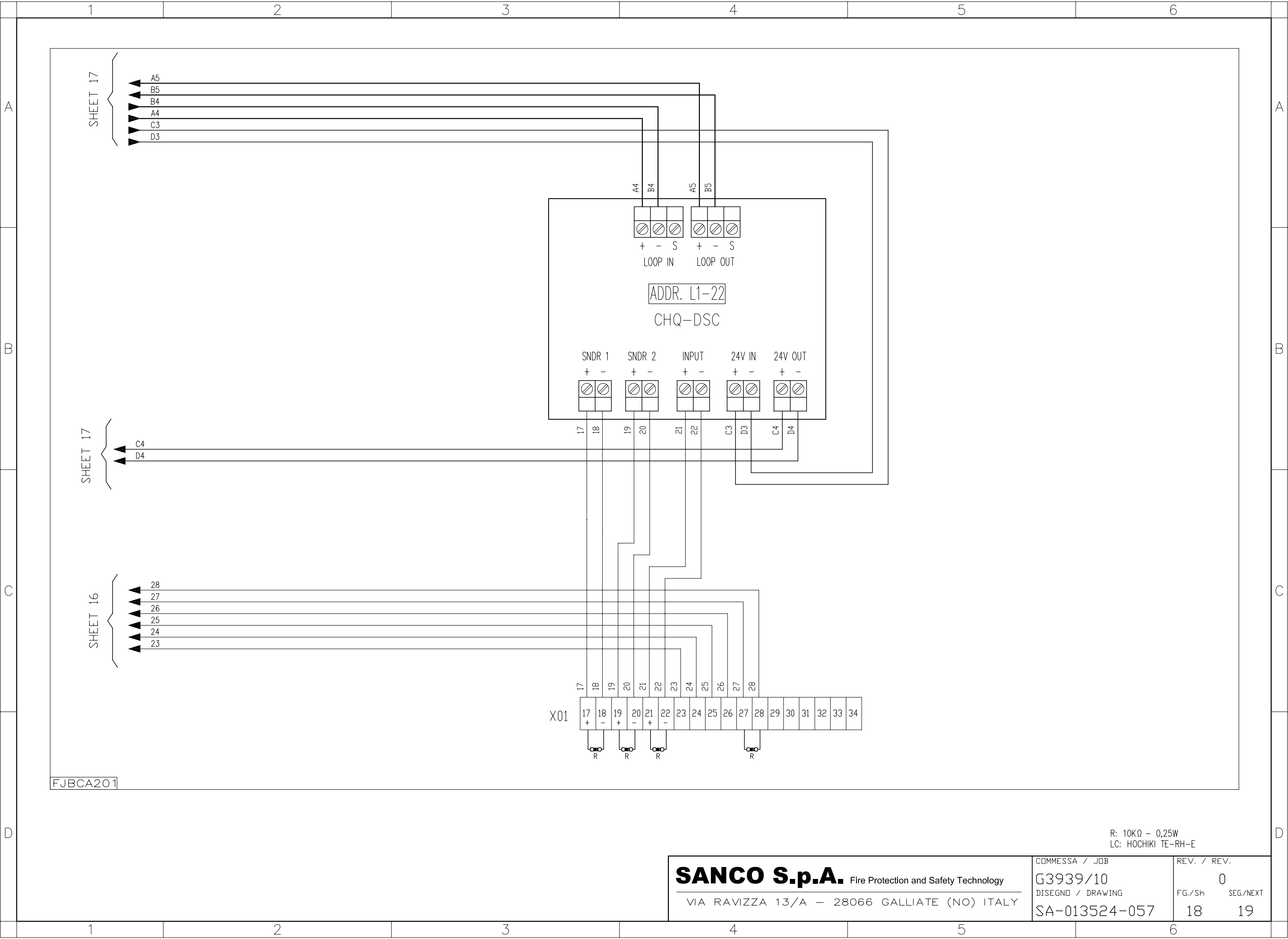


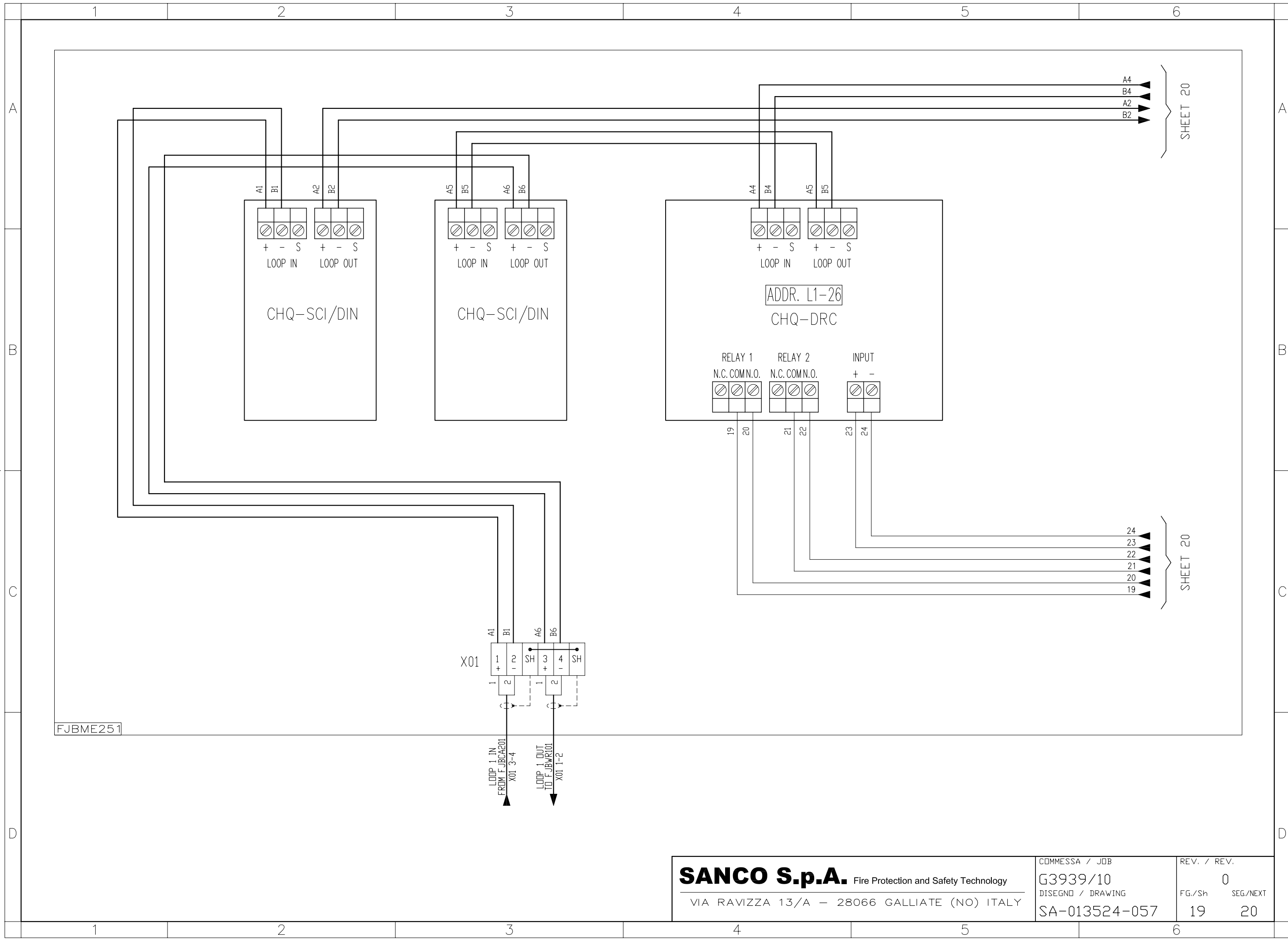


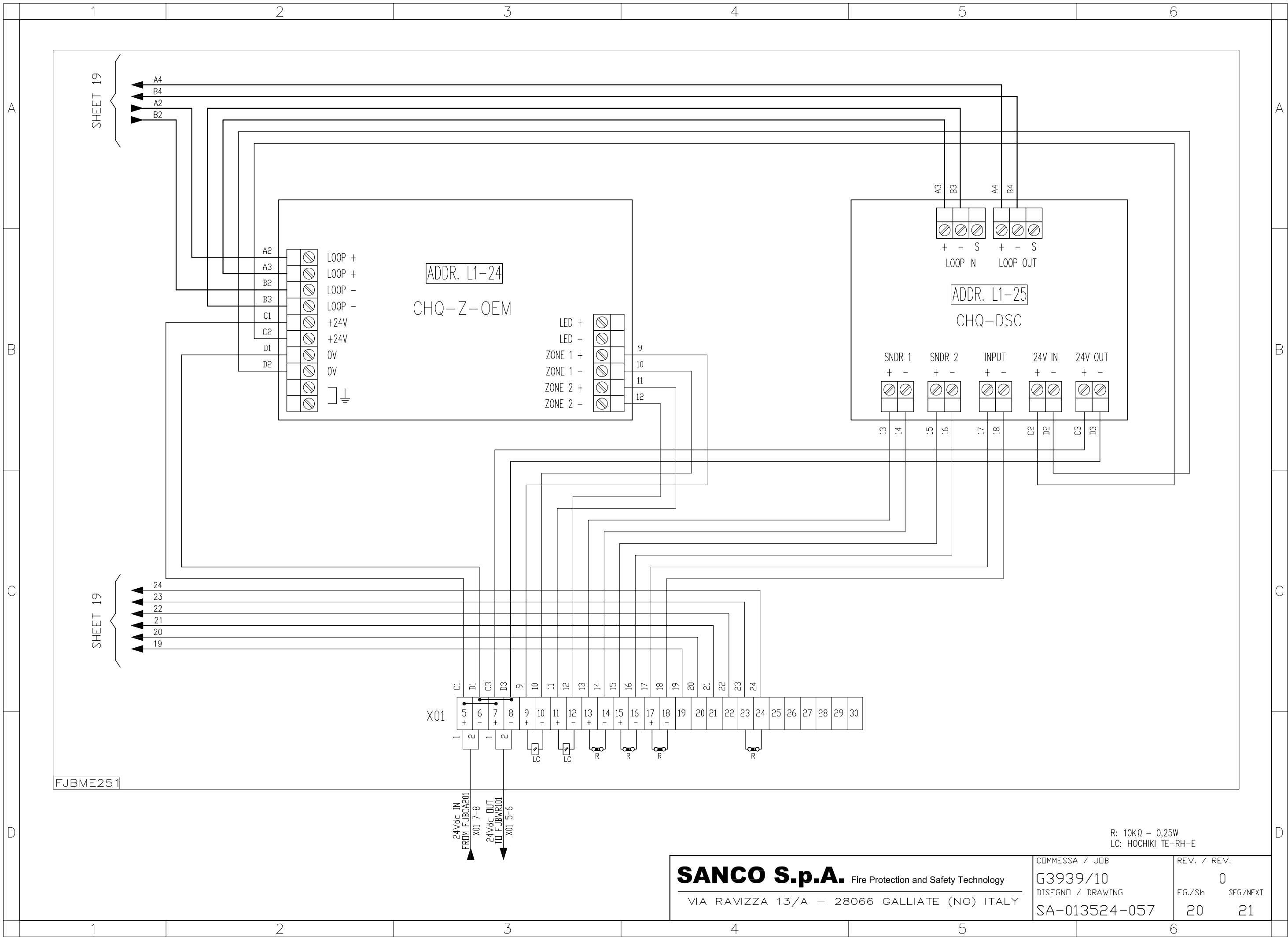
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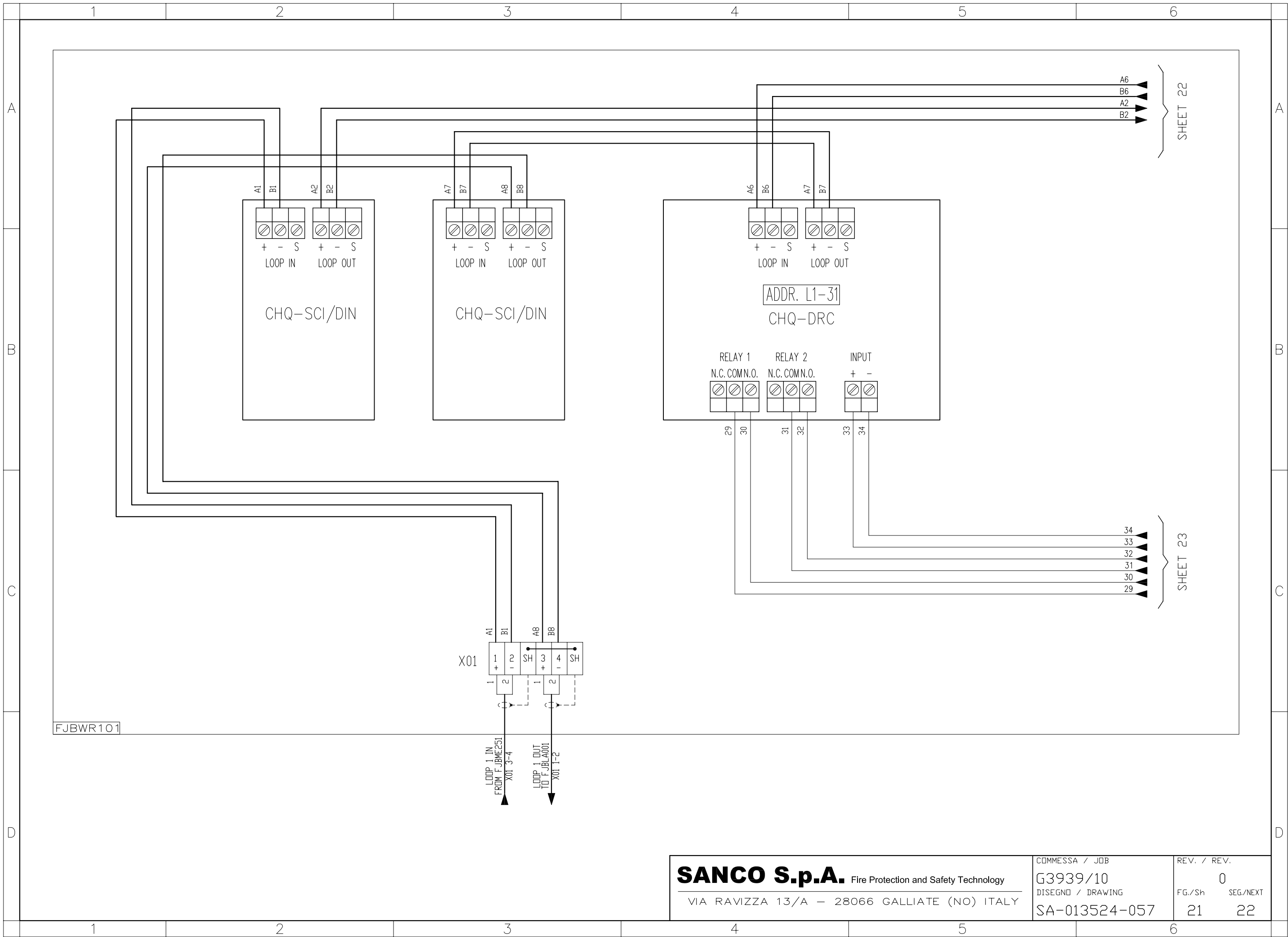
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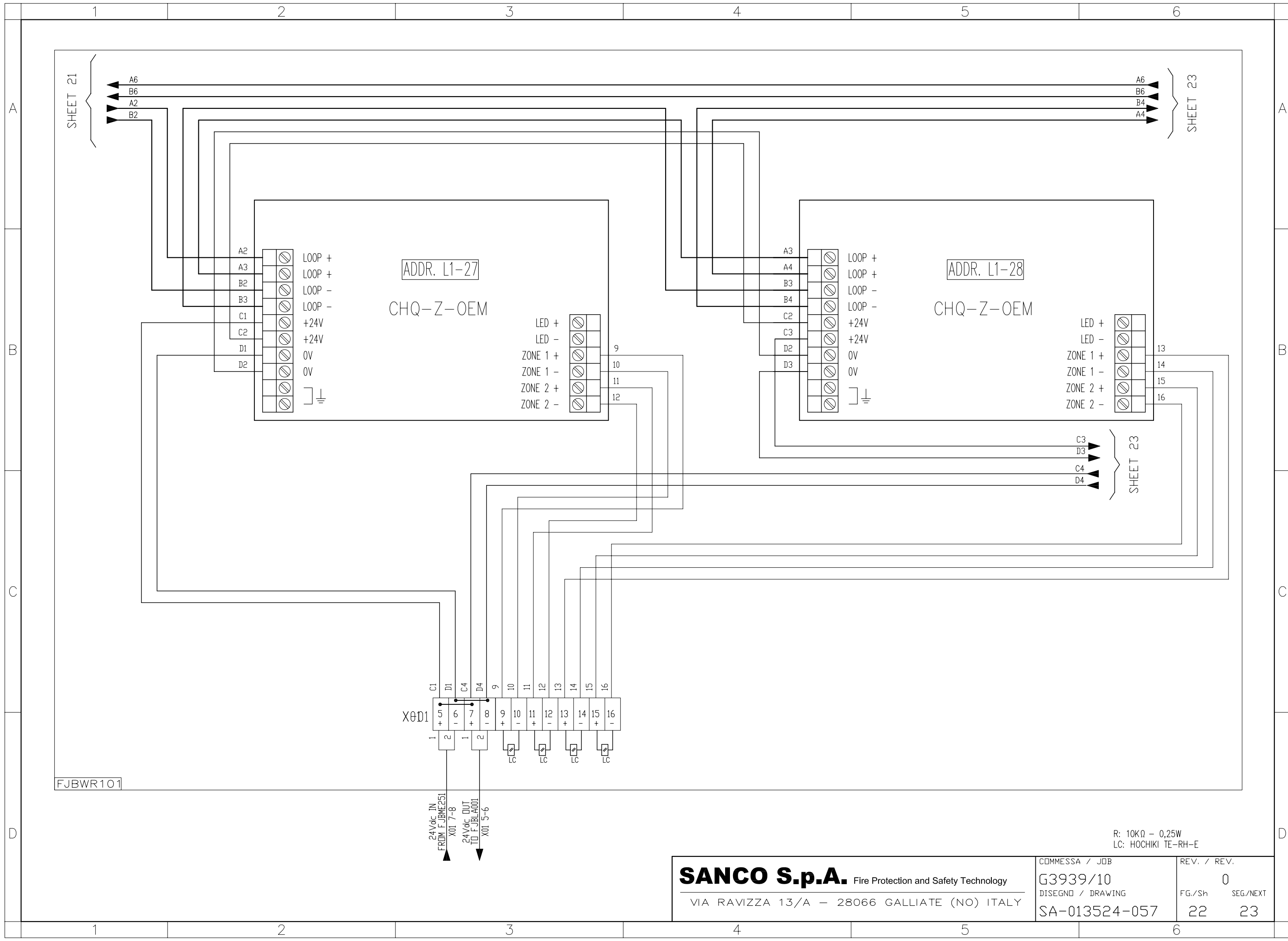
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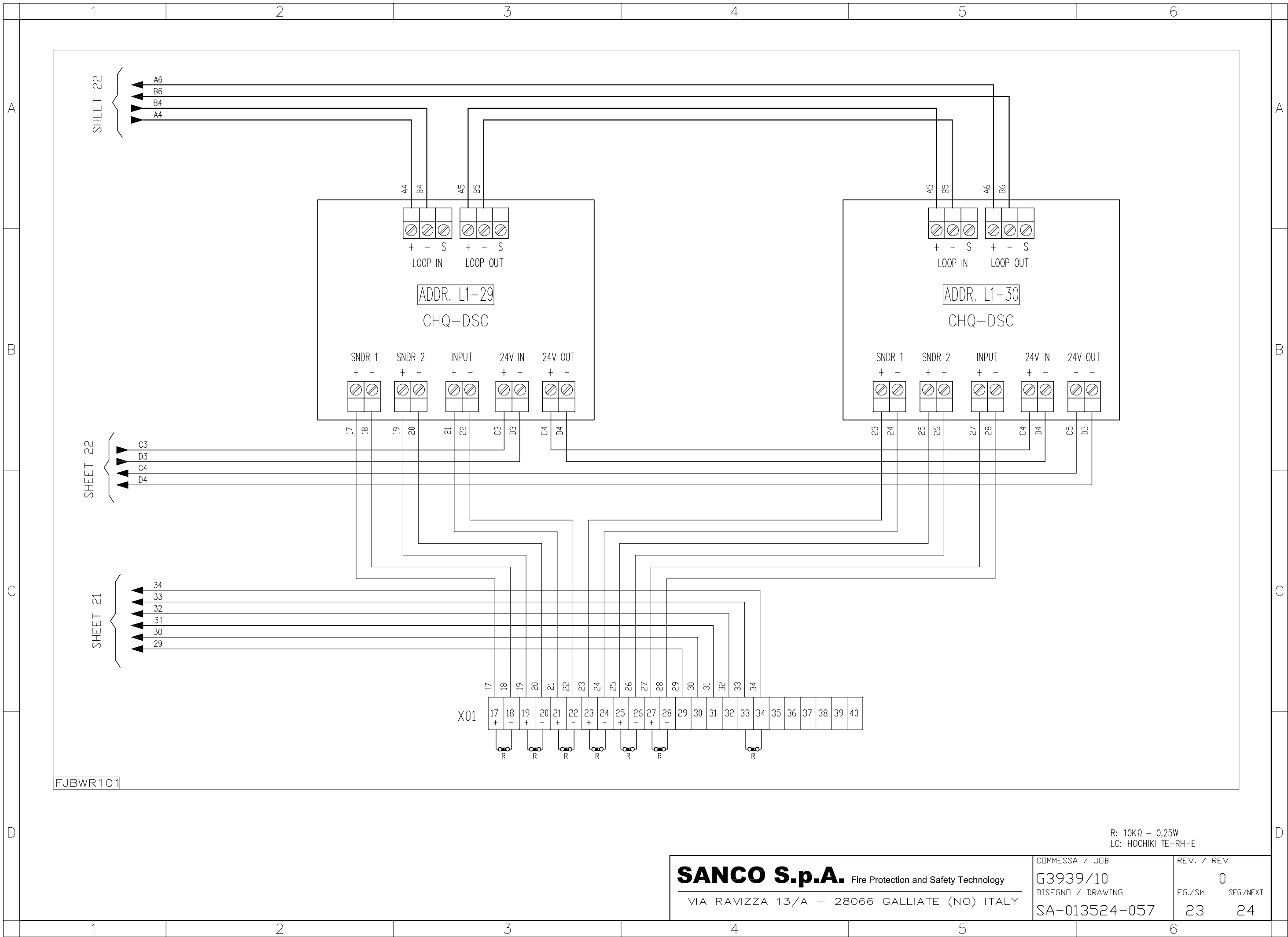




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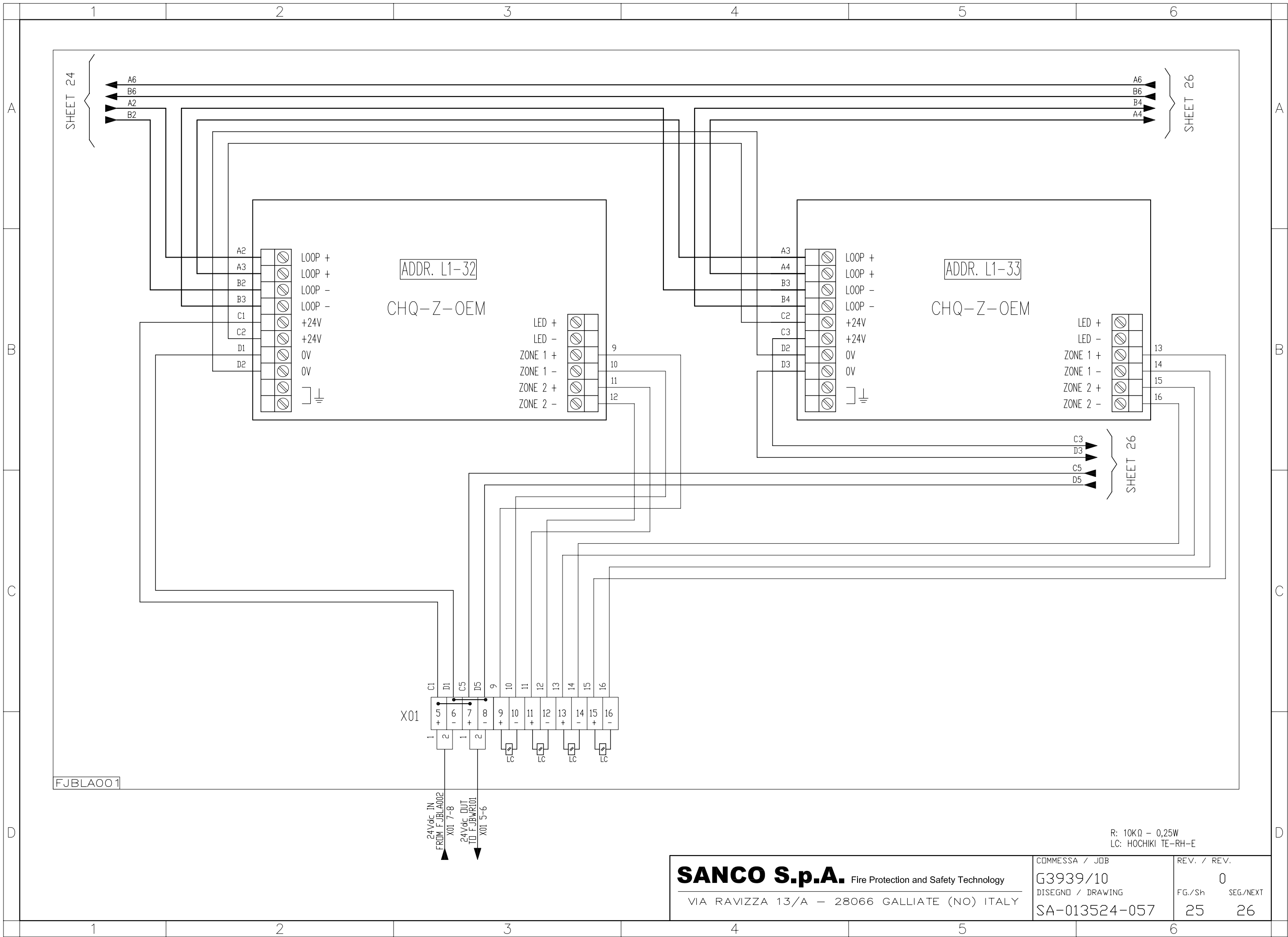
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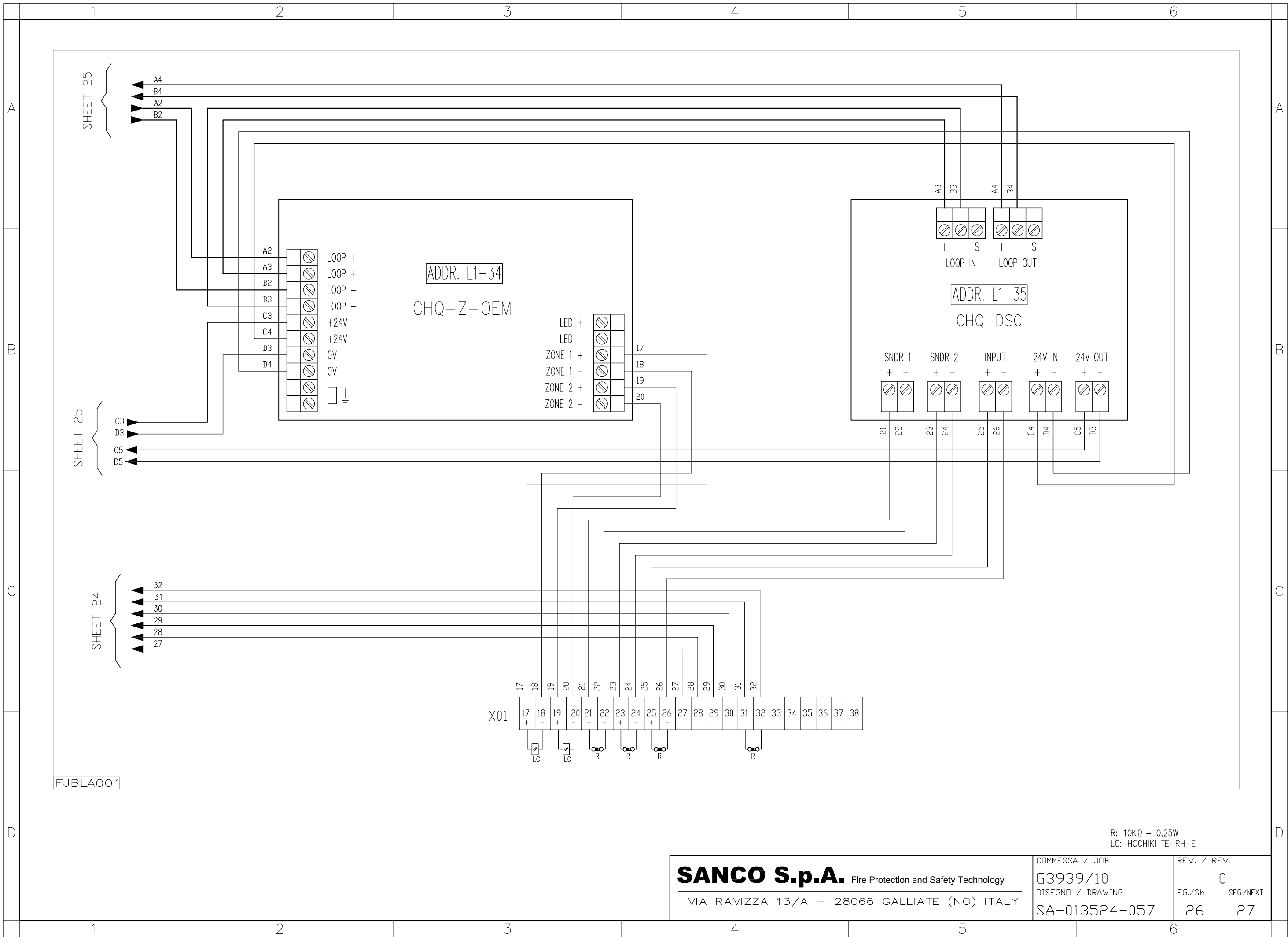
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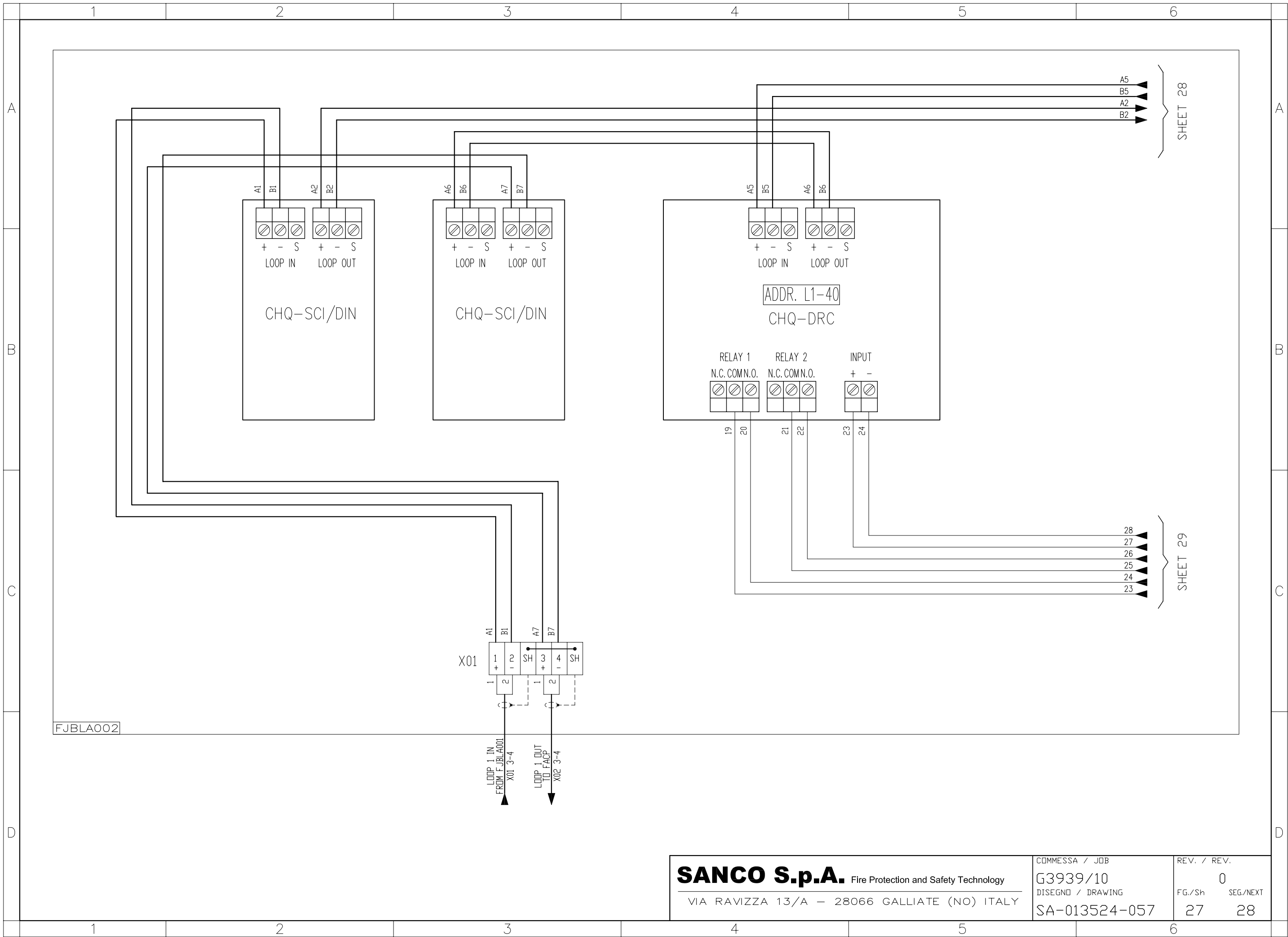
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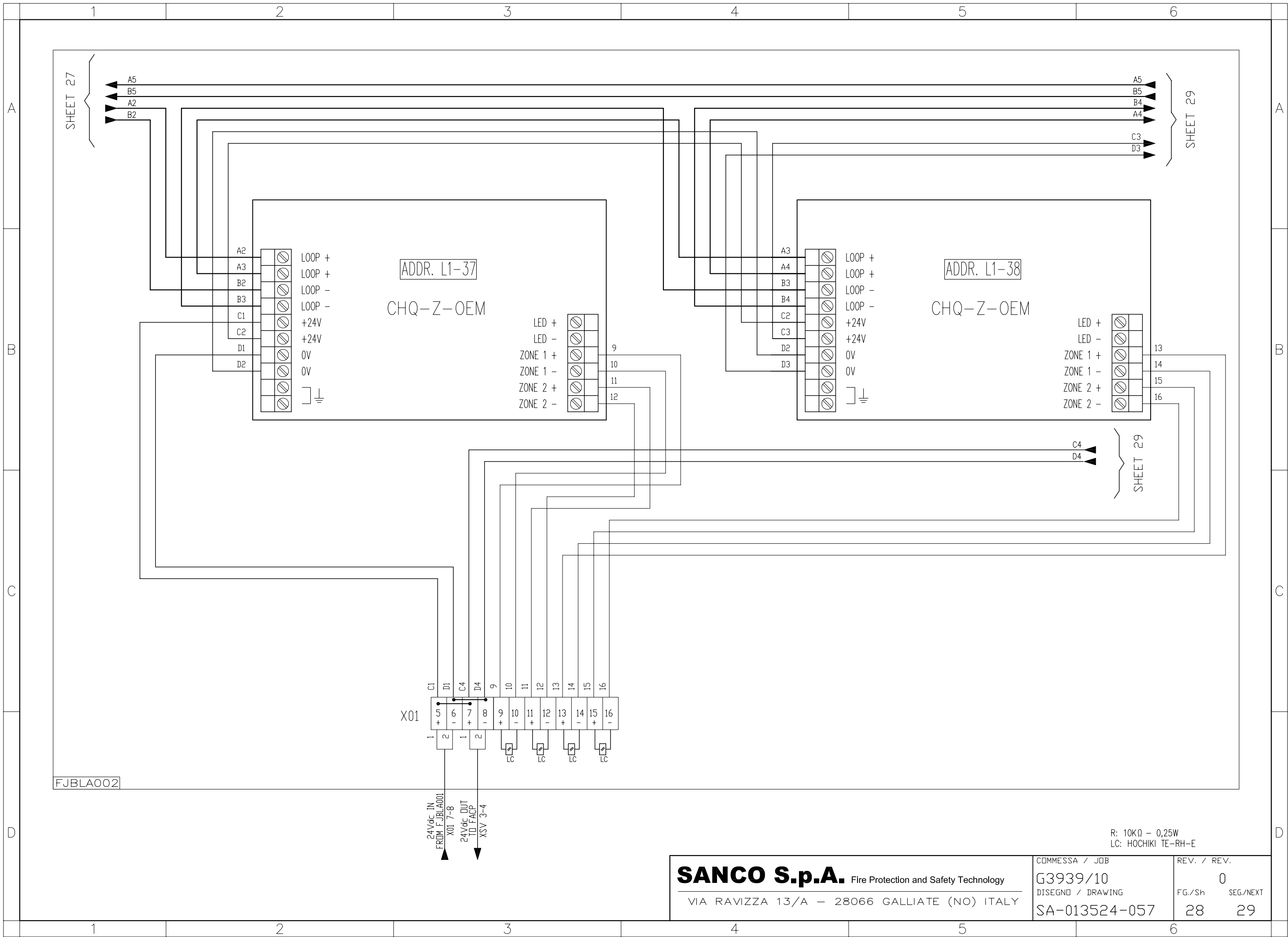
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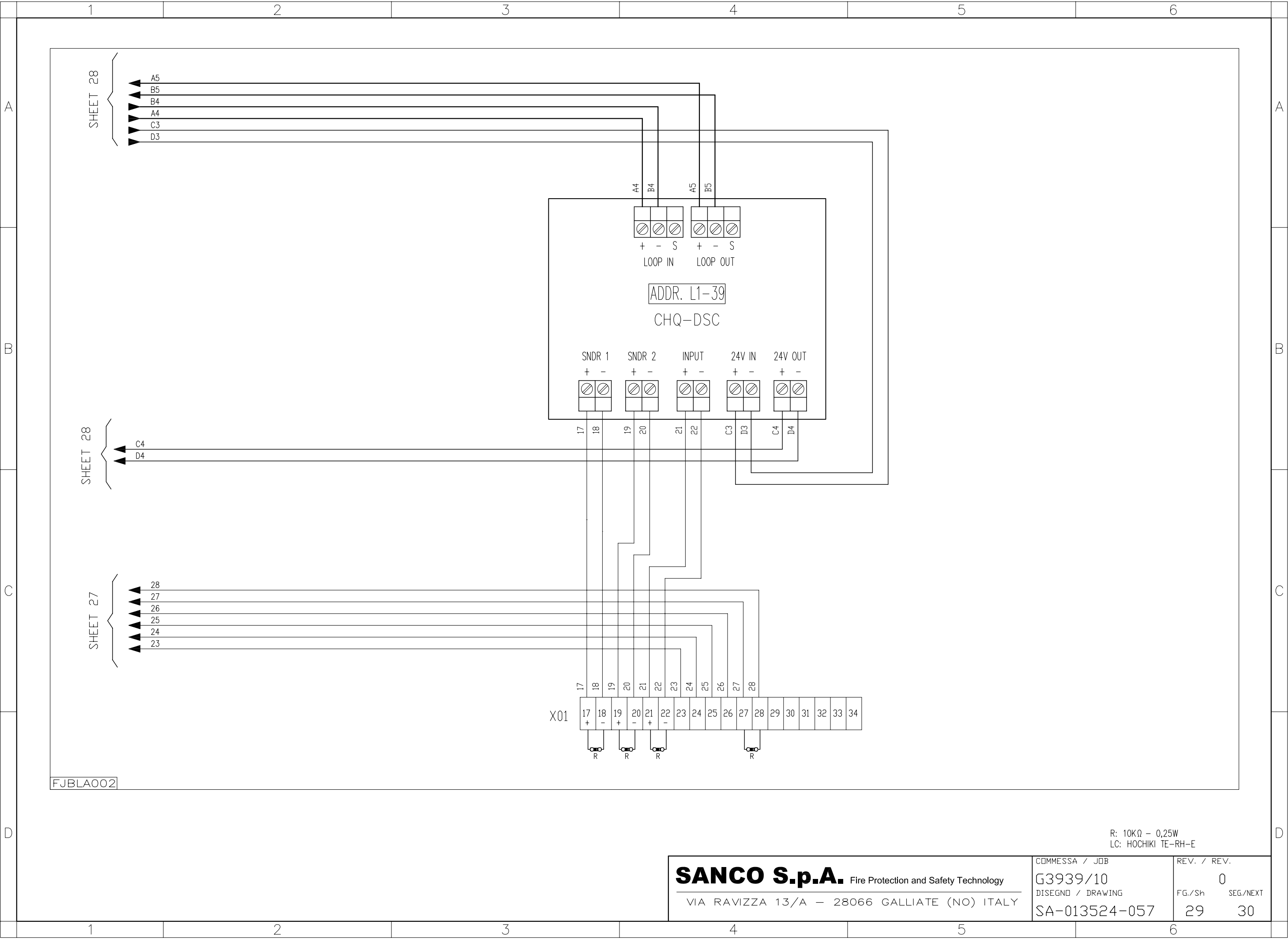
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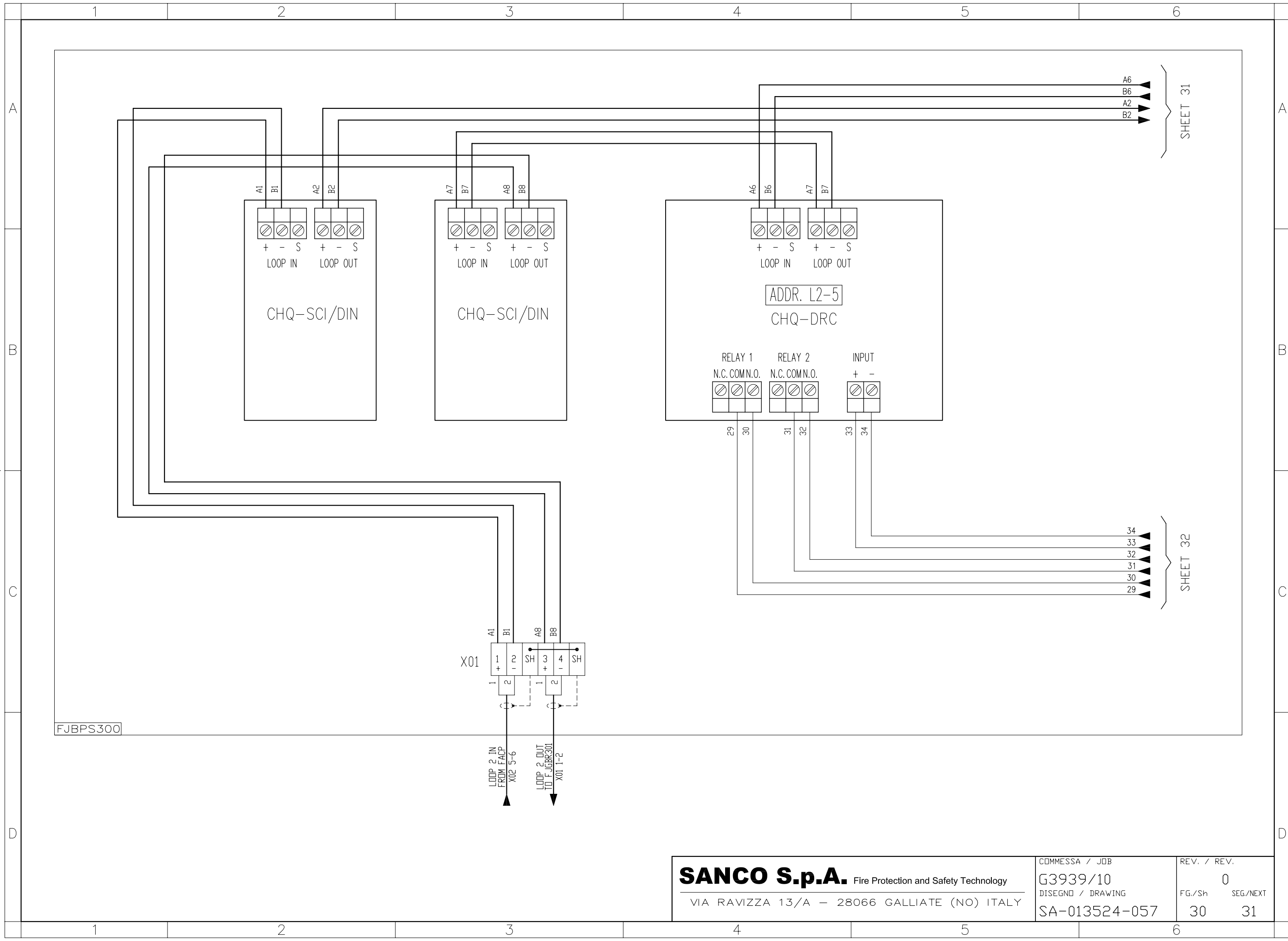
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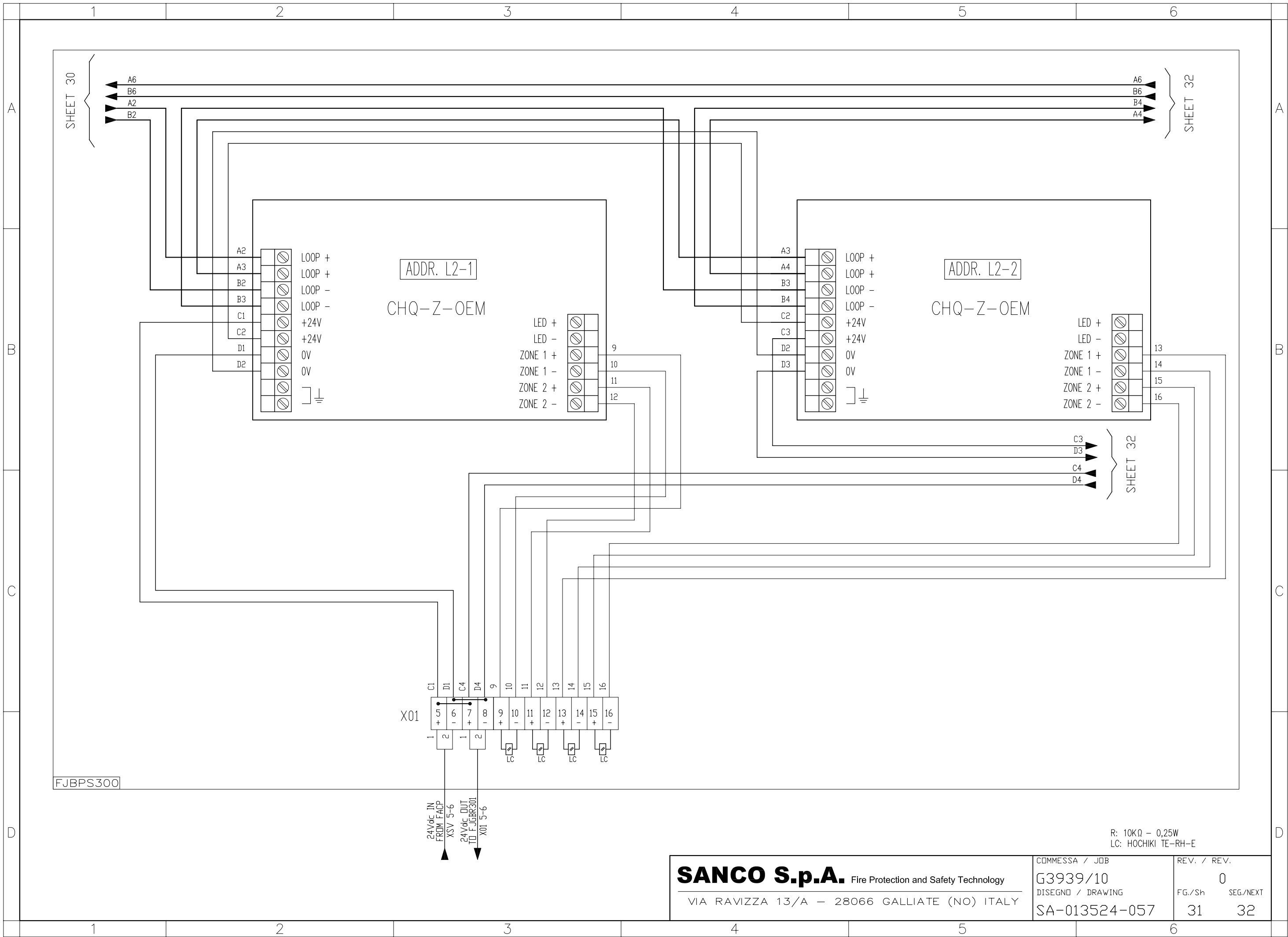
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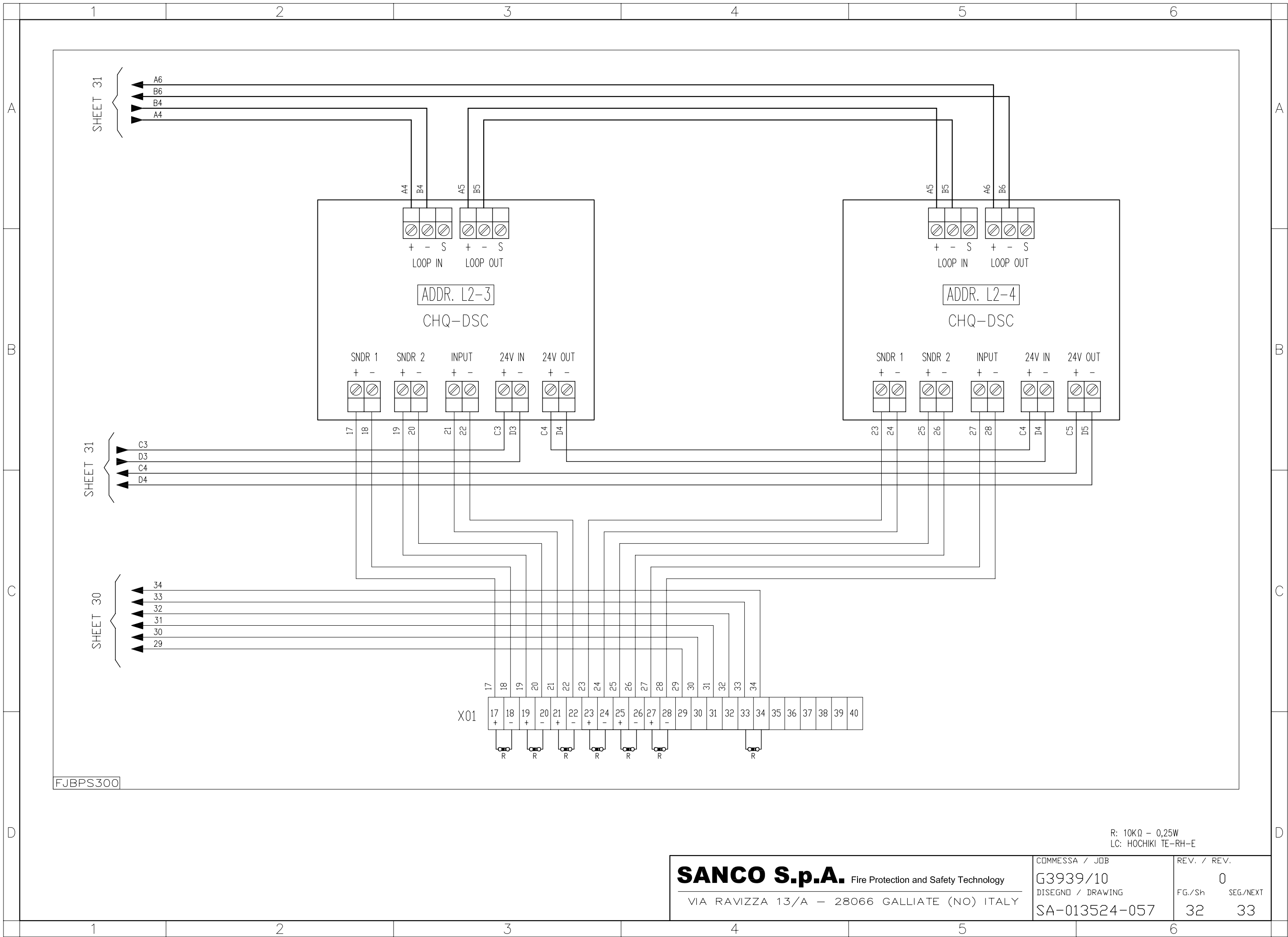
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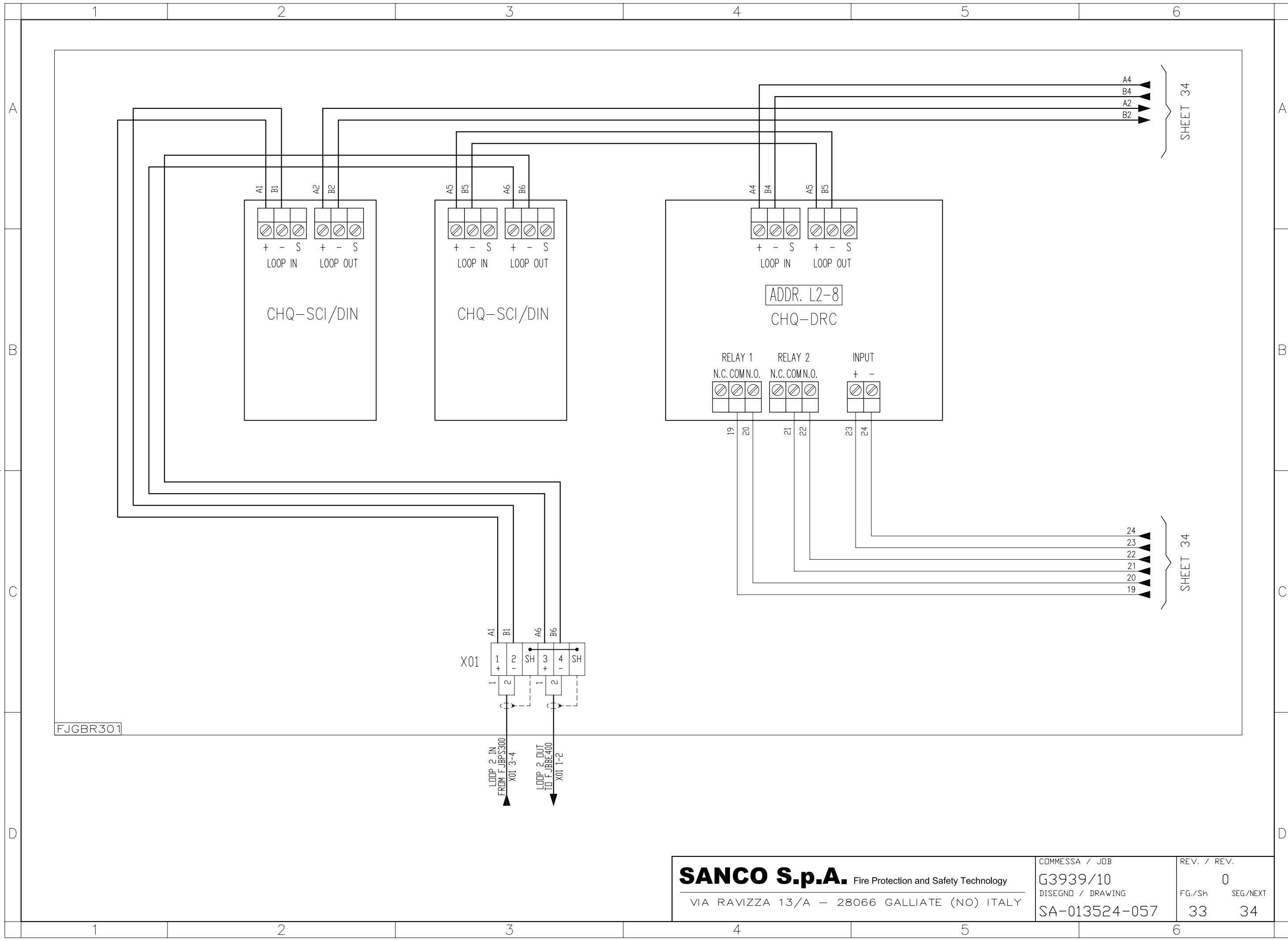
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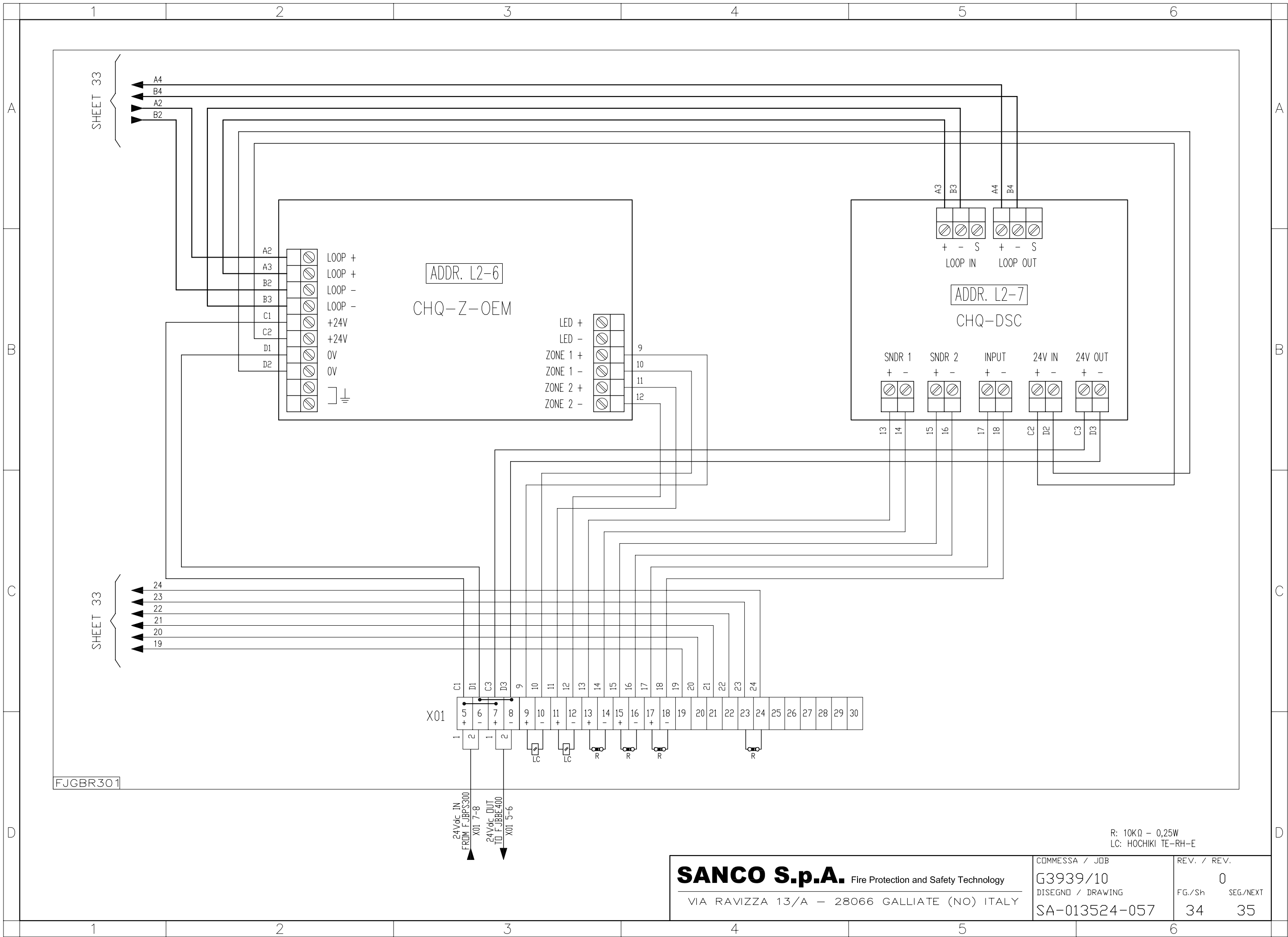
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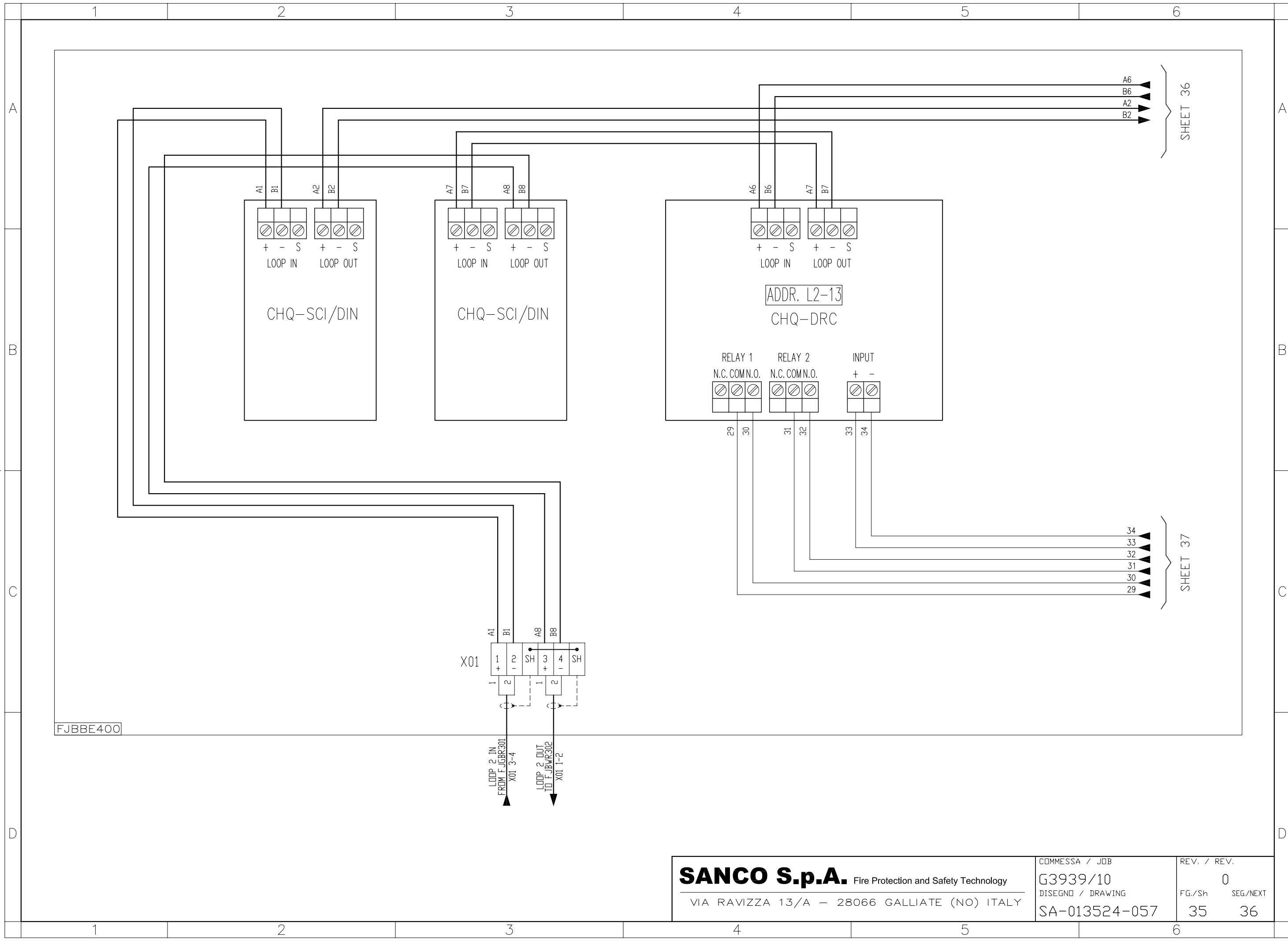
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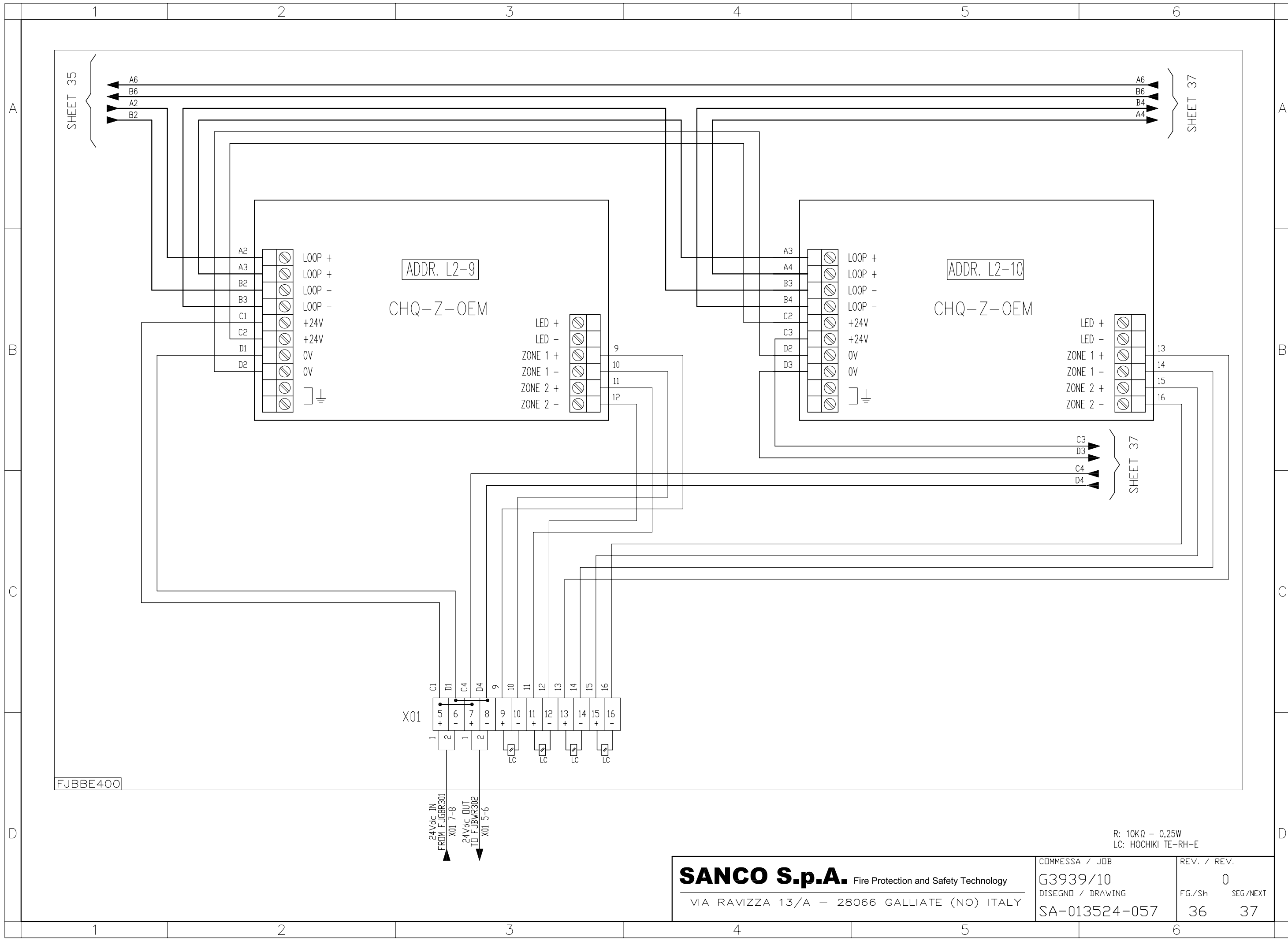
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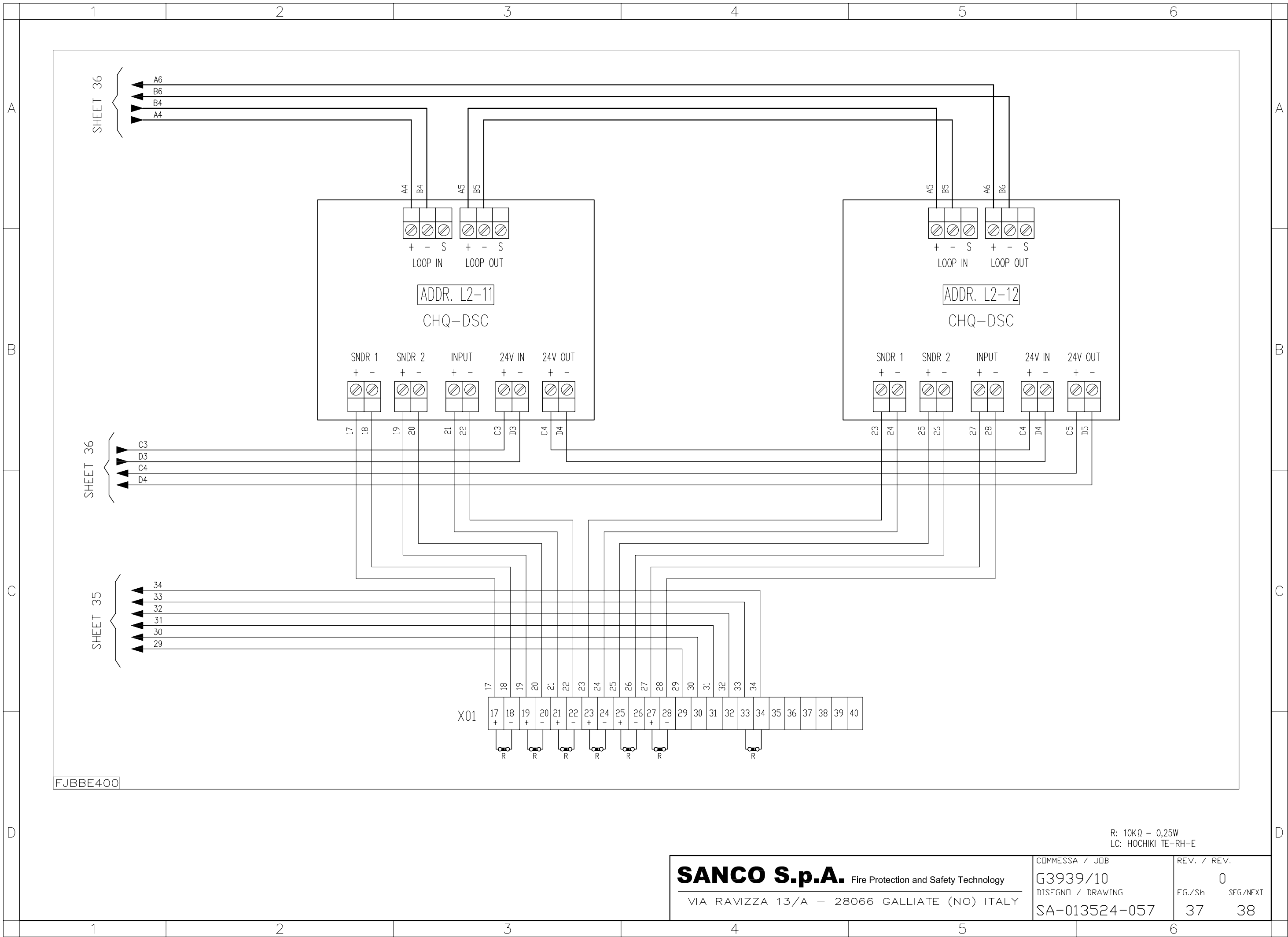




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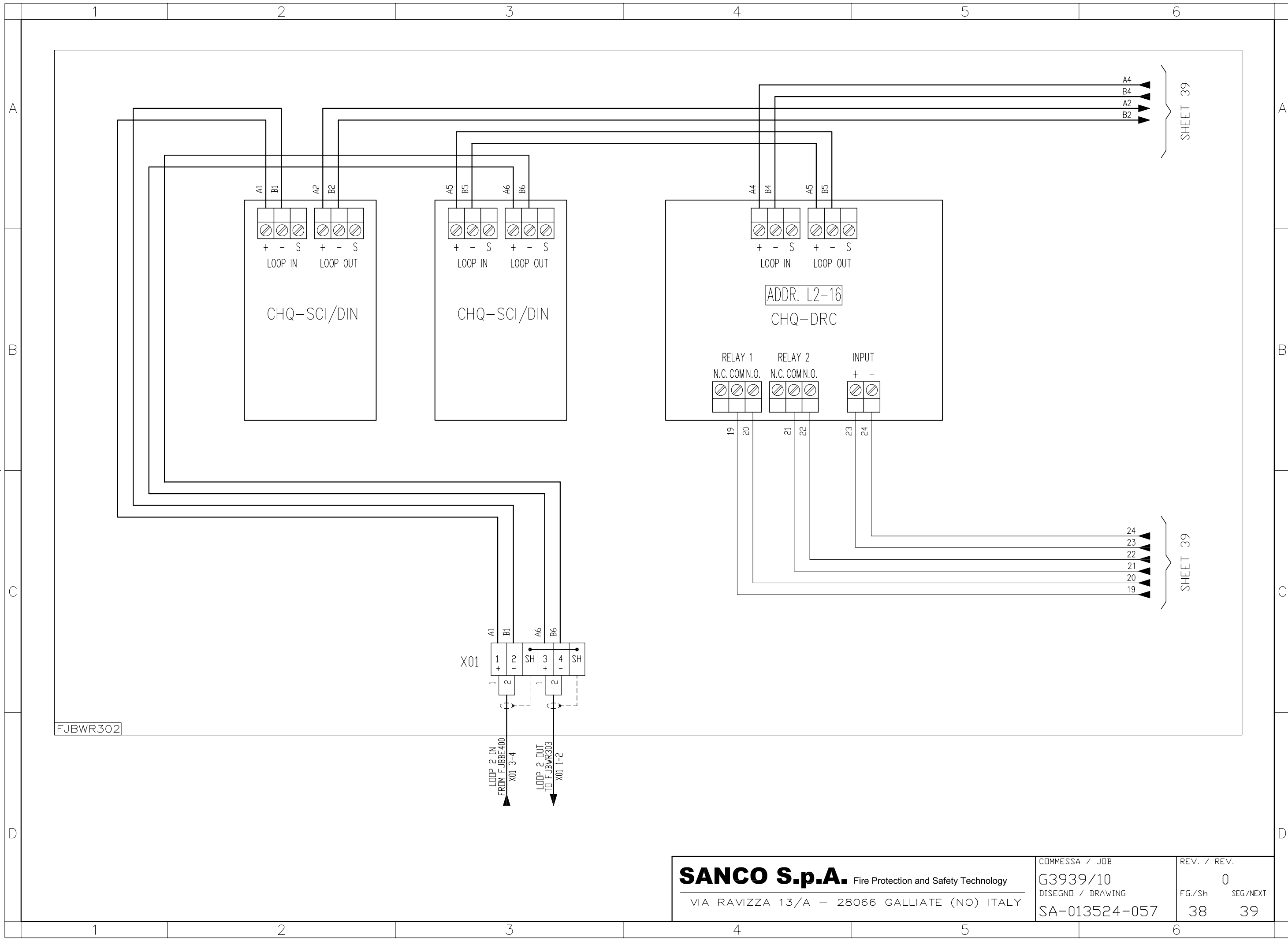
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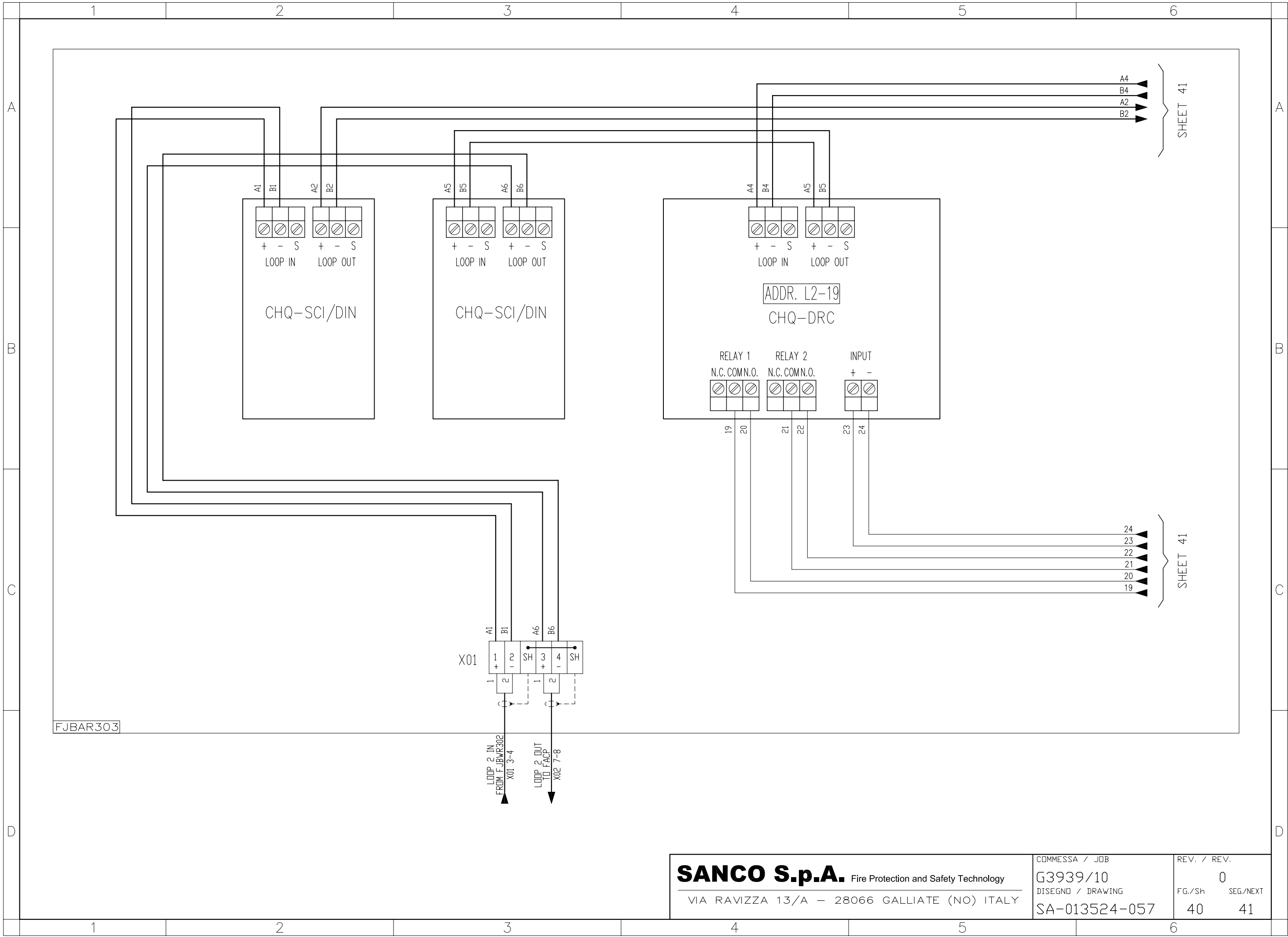
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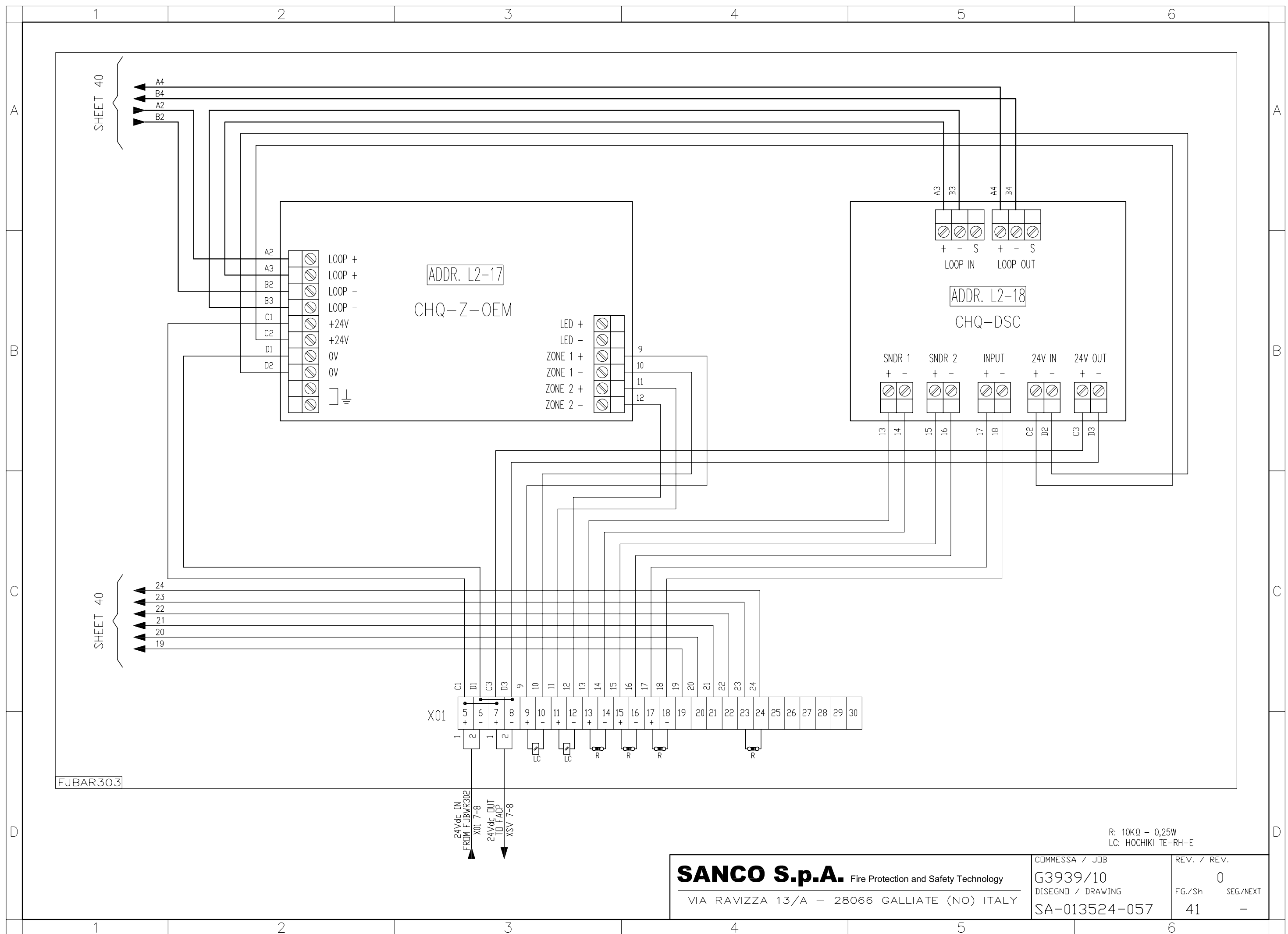
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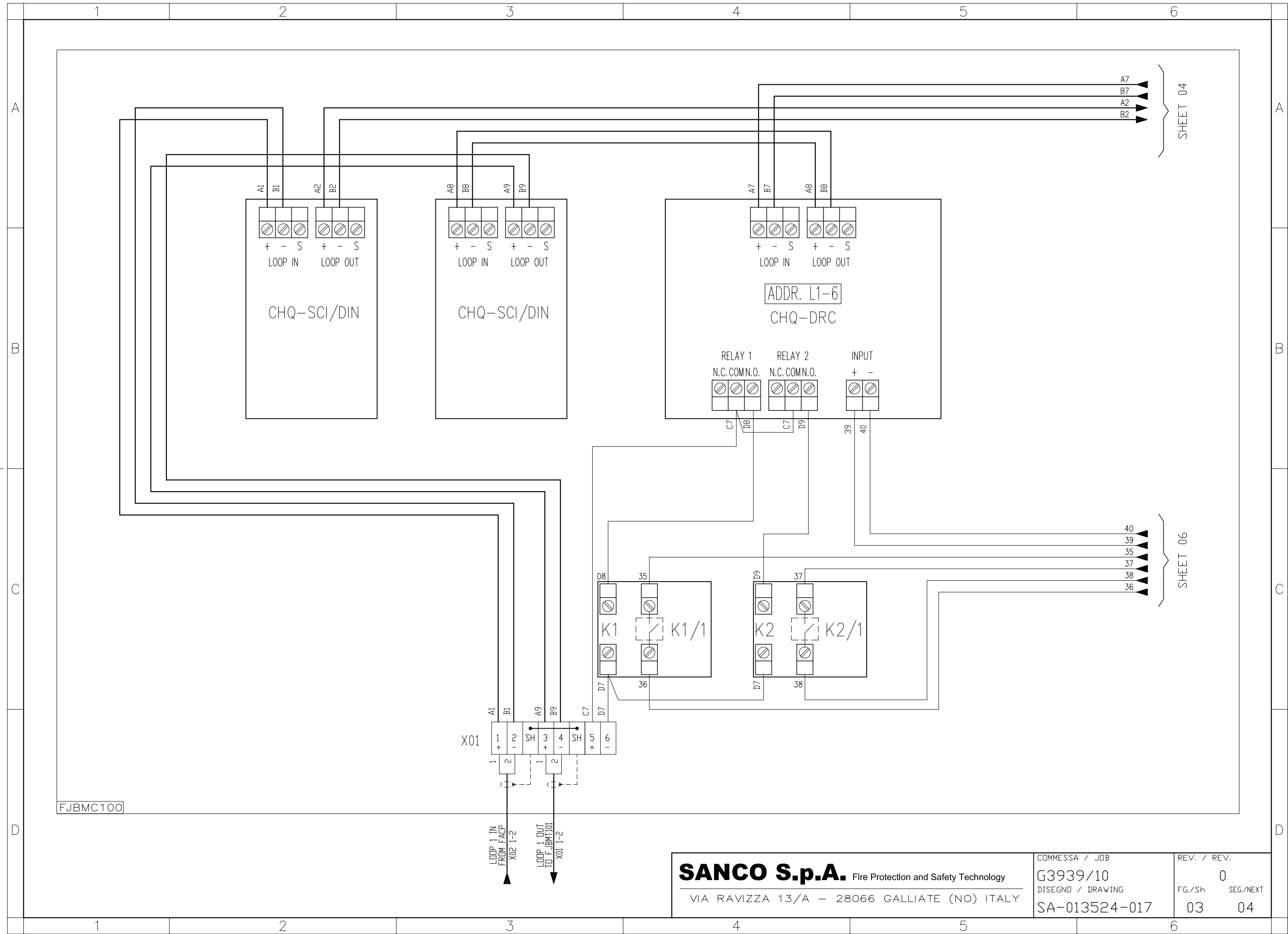
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			CLIENTECUSTOMER IRASCO s.r.l.		
ARFA PROJECT FIRE FIGHTING DETECTION SYSTEM JUNCTION BOX			SCALASCALE —		
			CODICECODE —		
			FOGLIOSHEET1DI OF 32		
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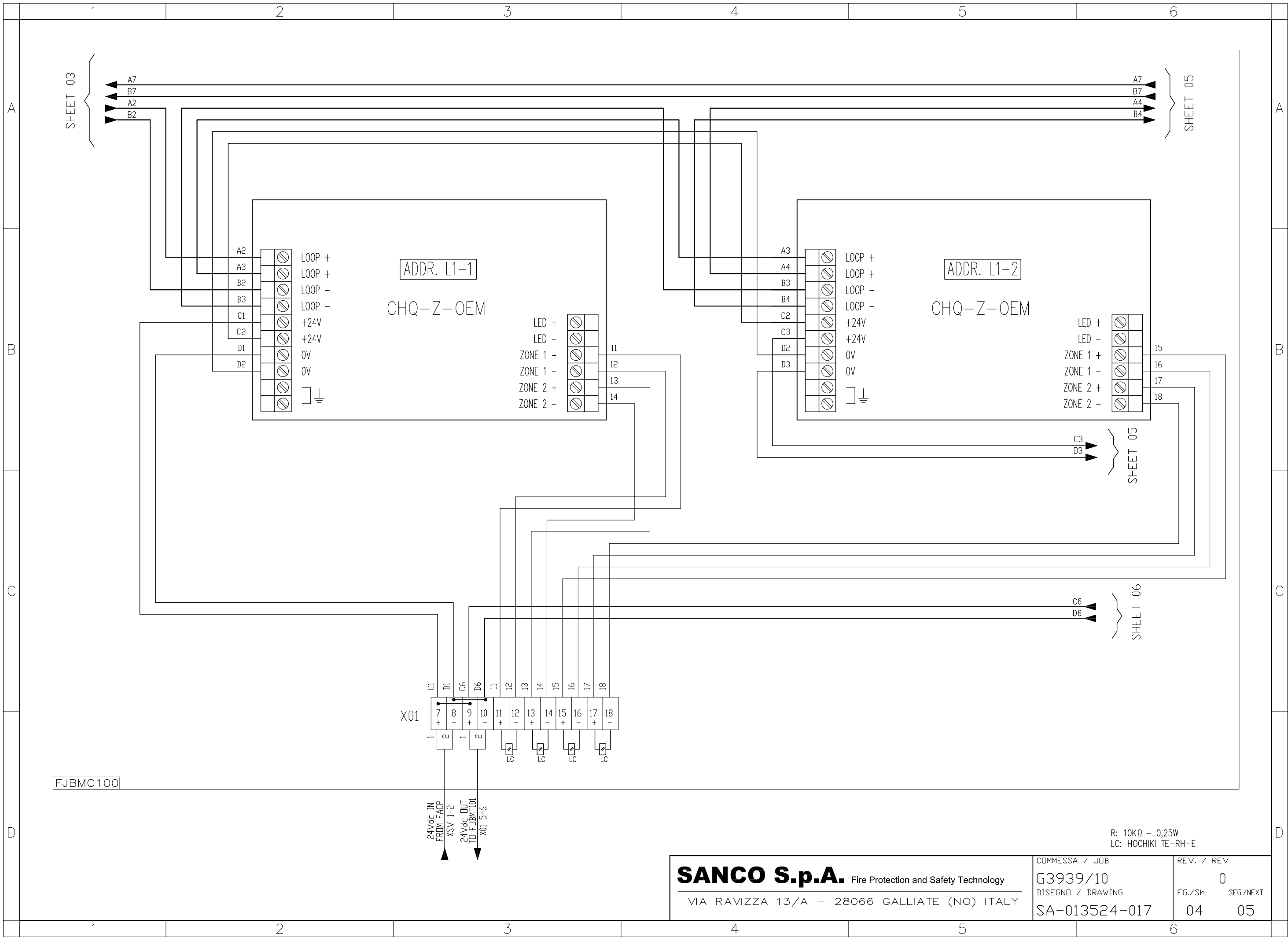
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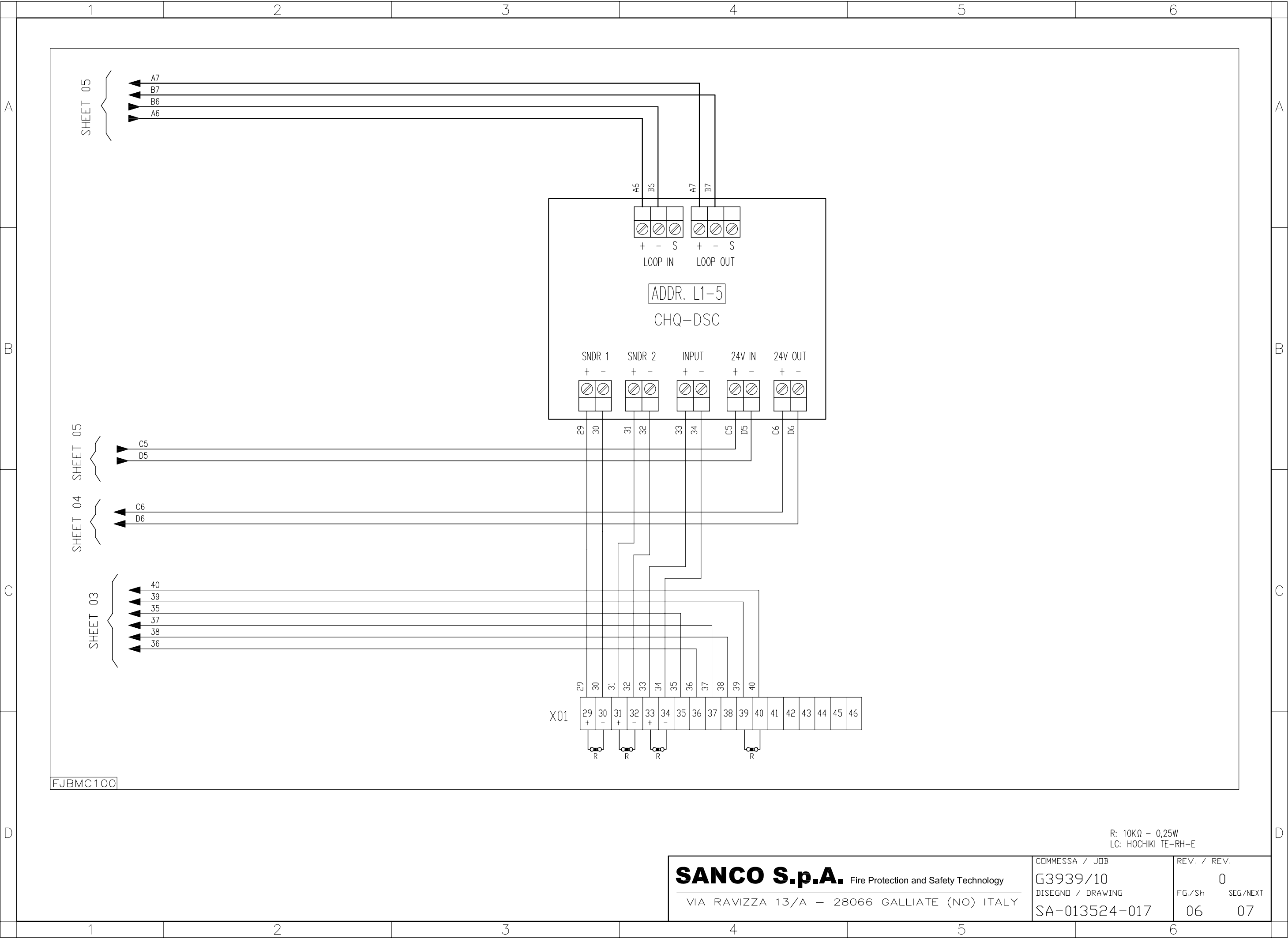
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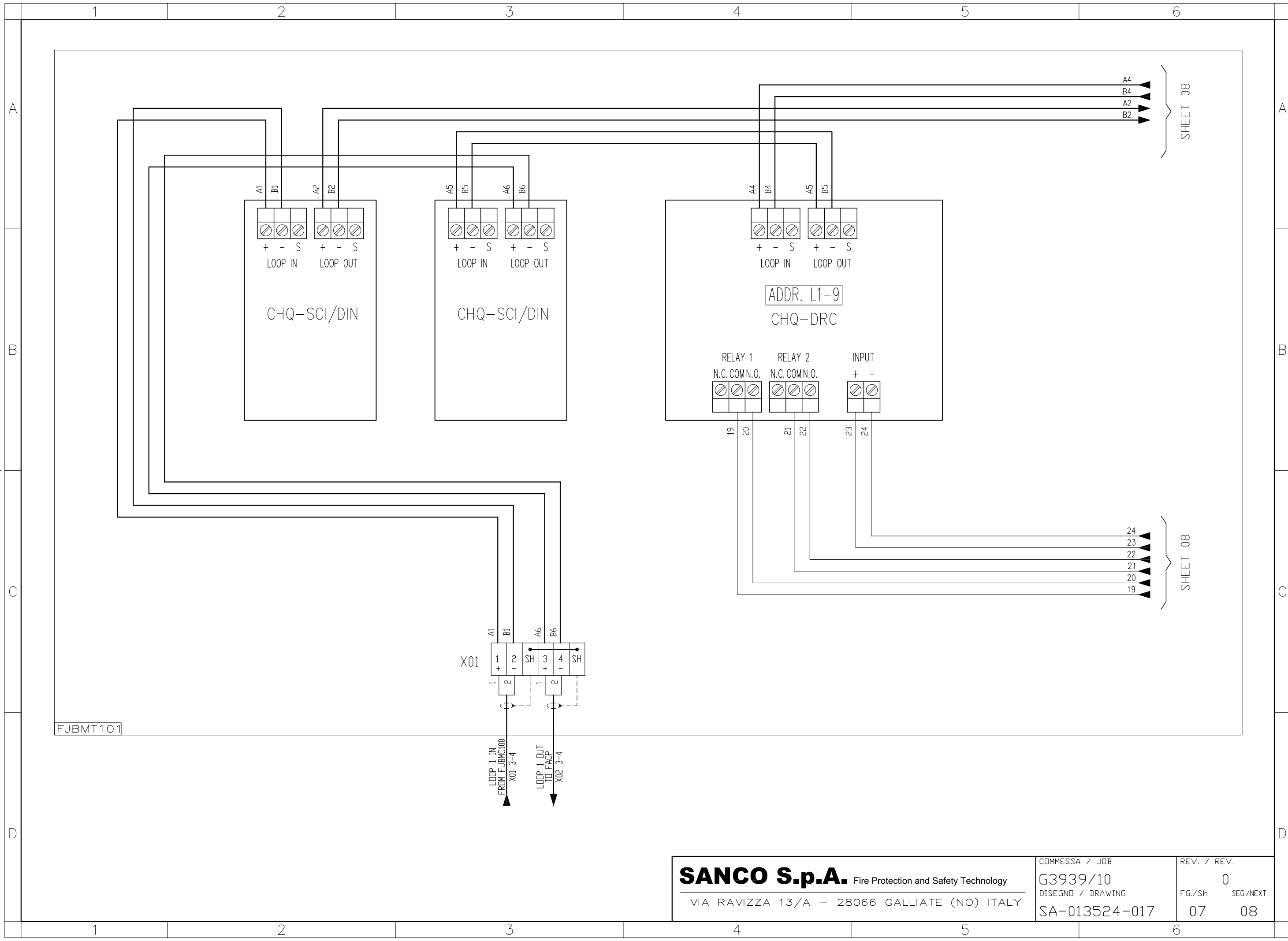
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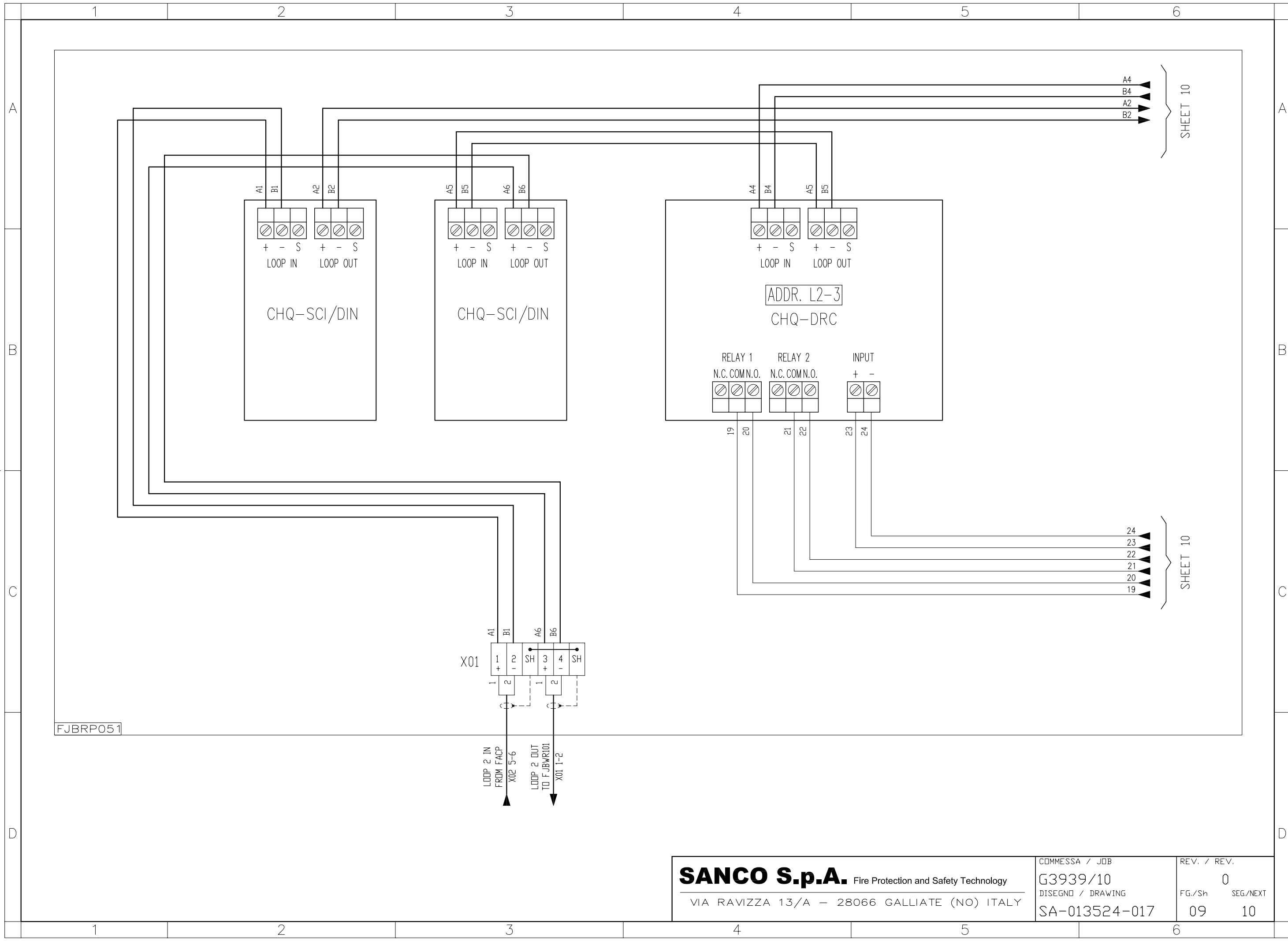
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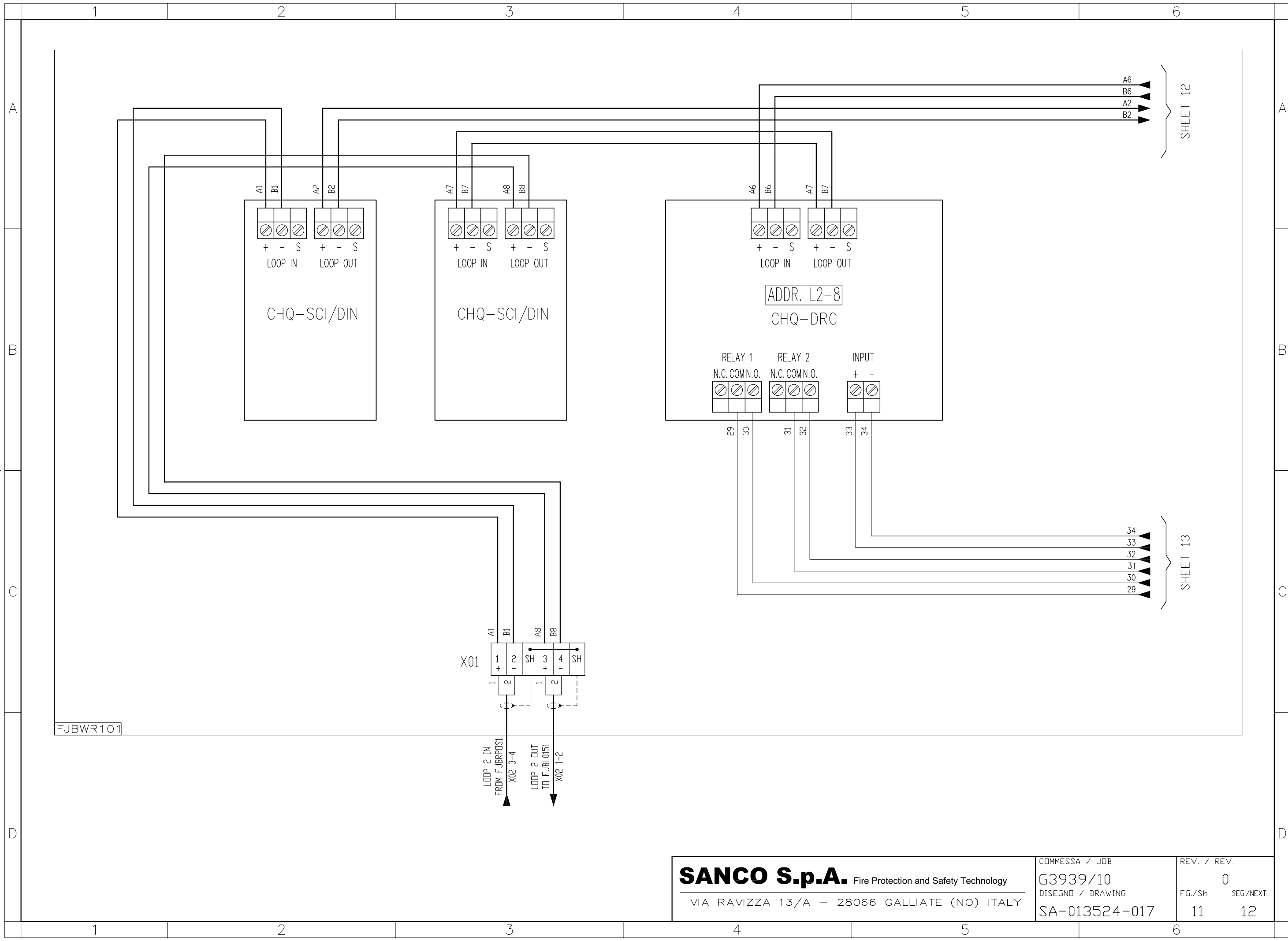
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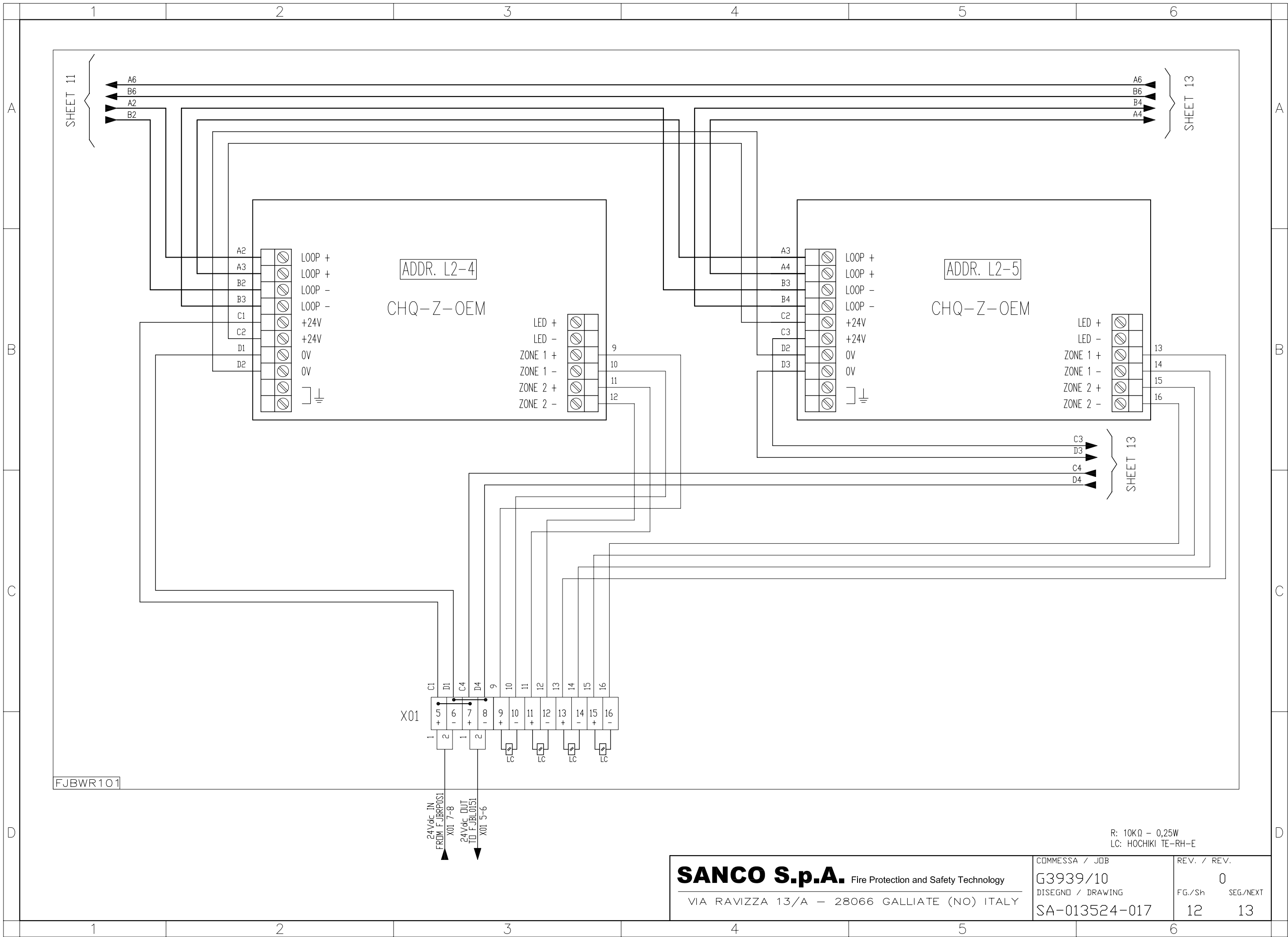












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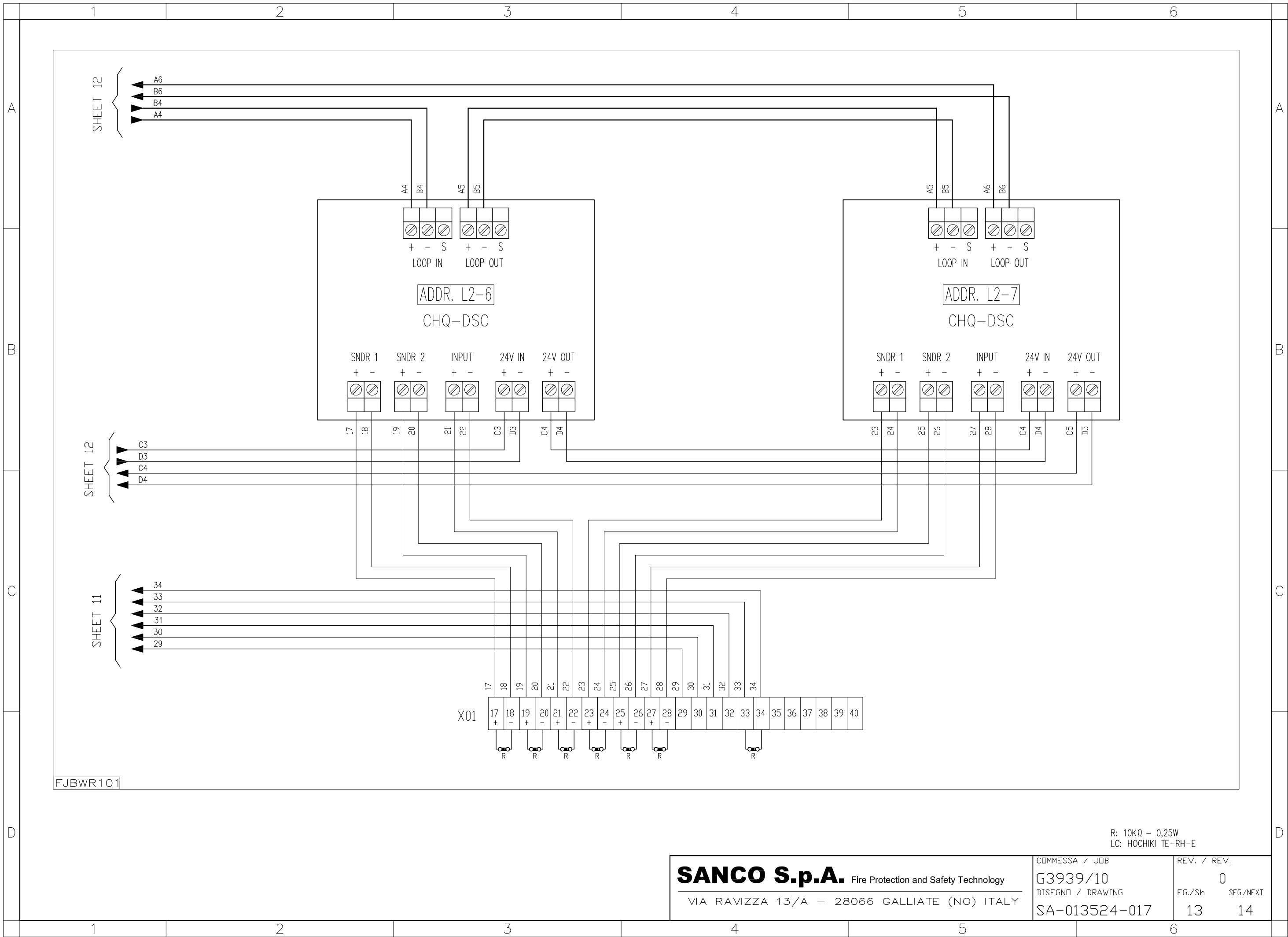
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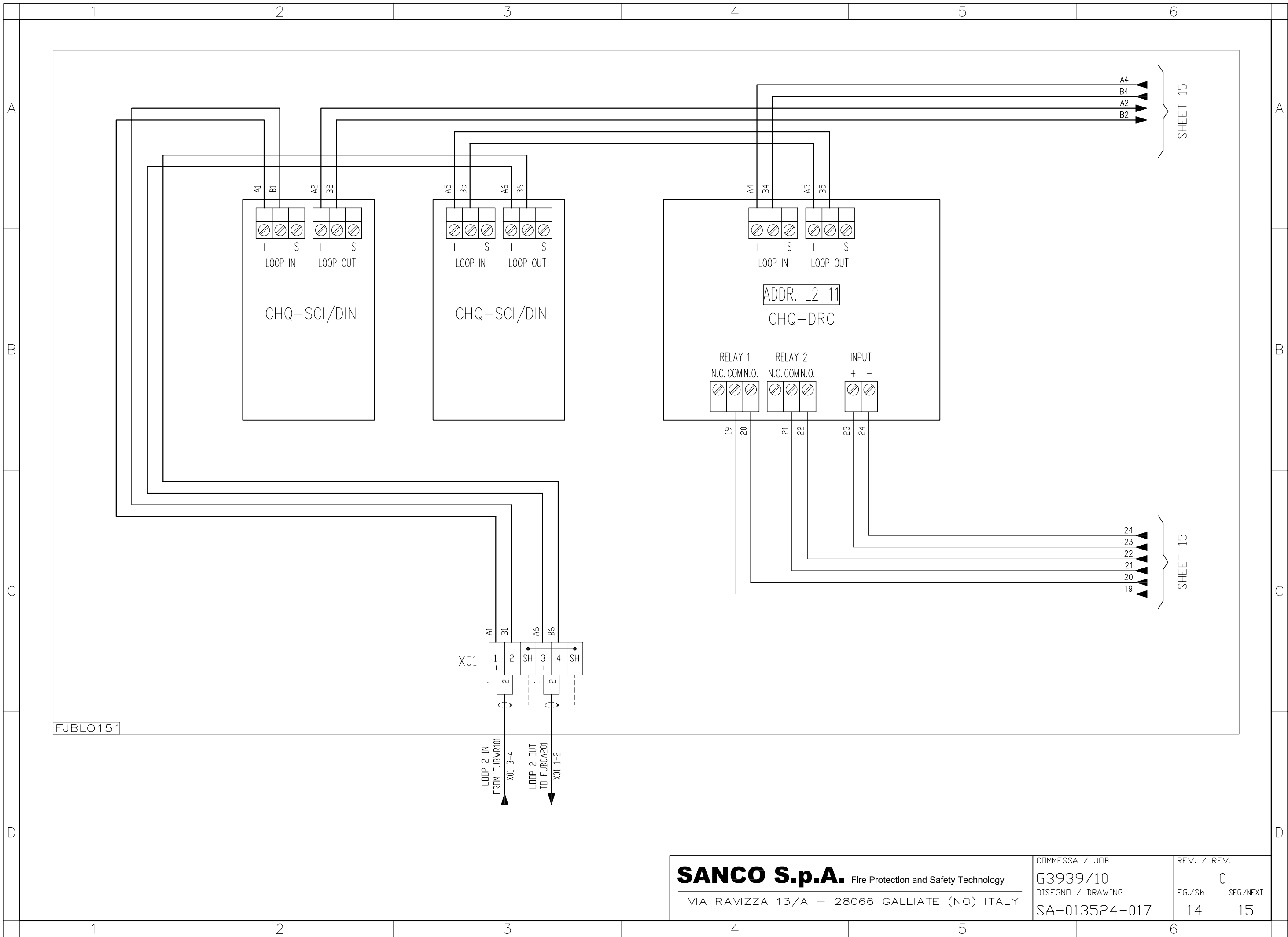
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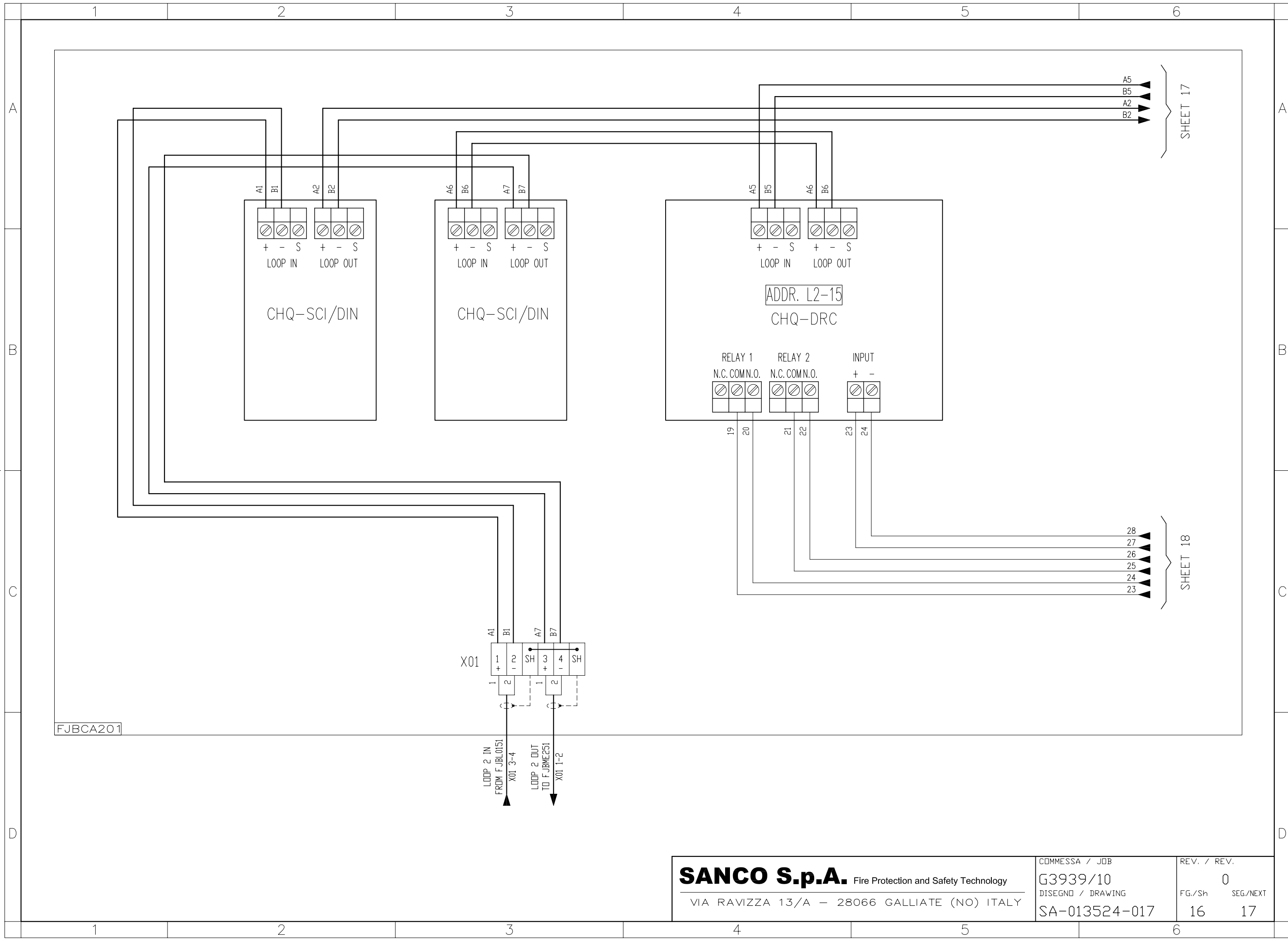


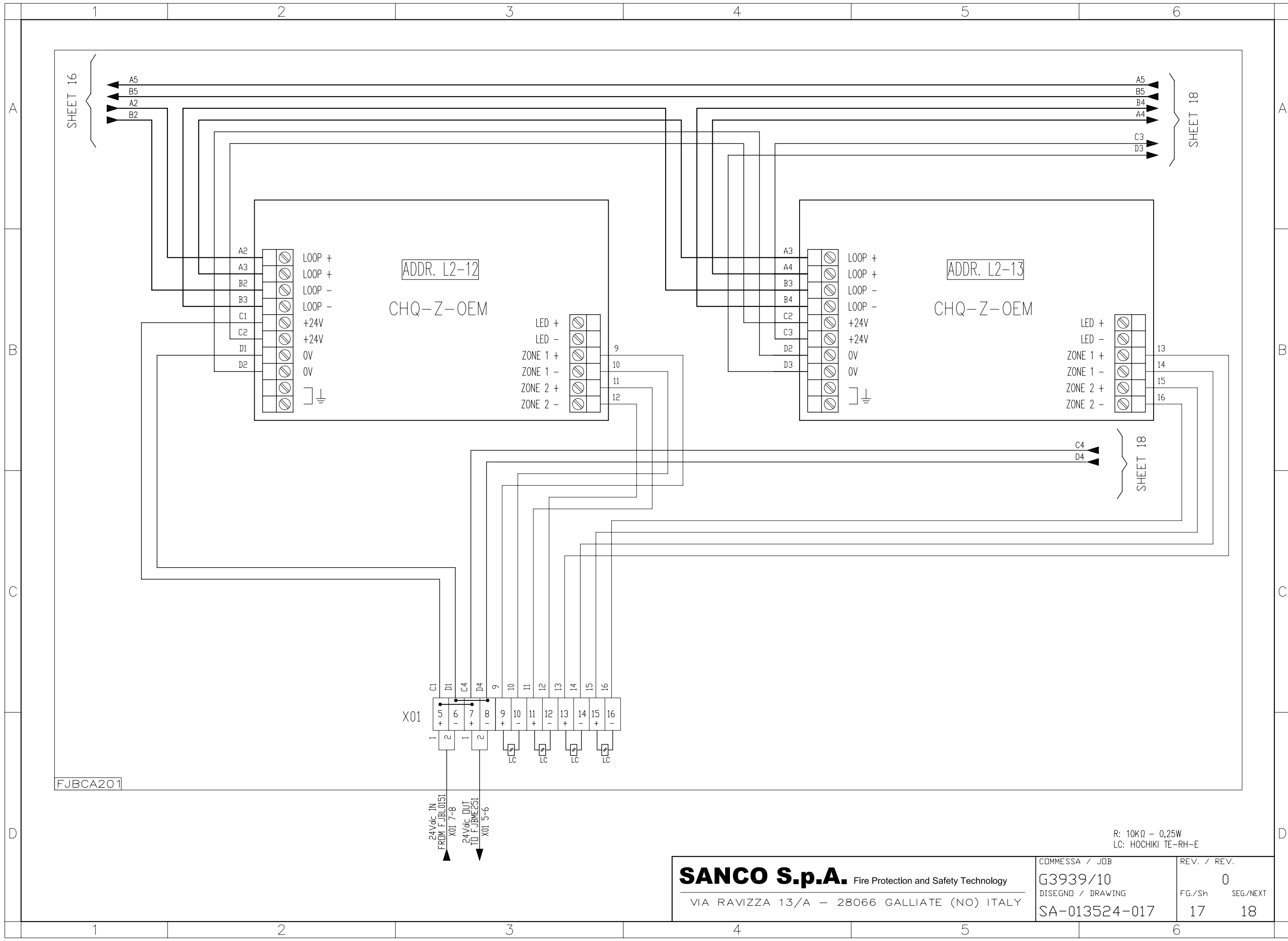


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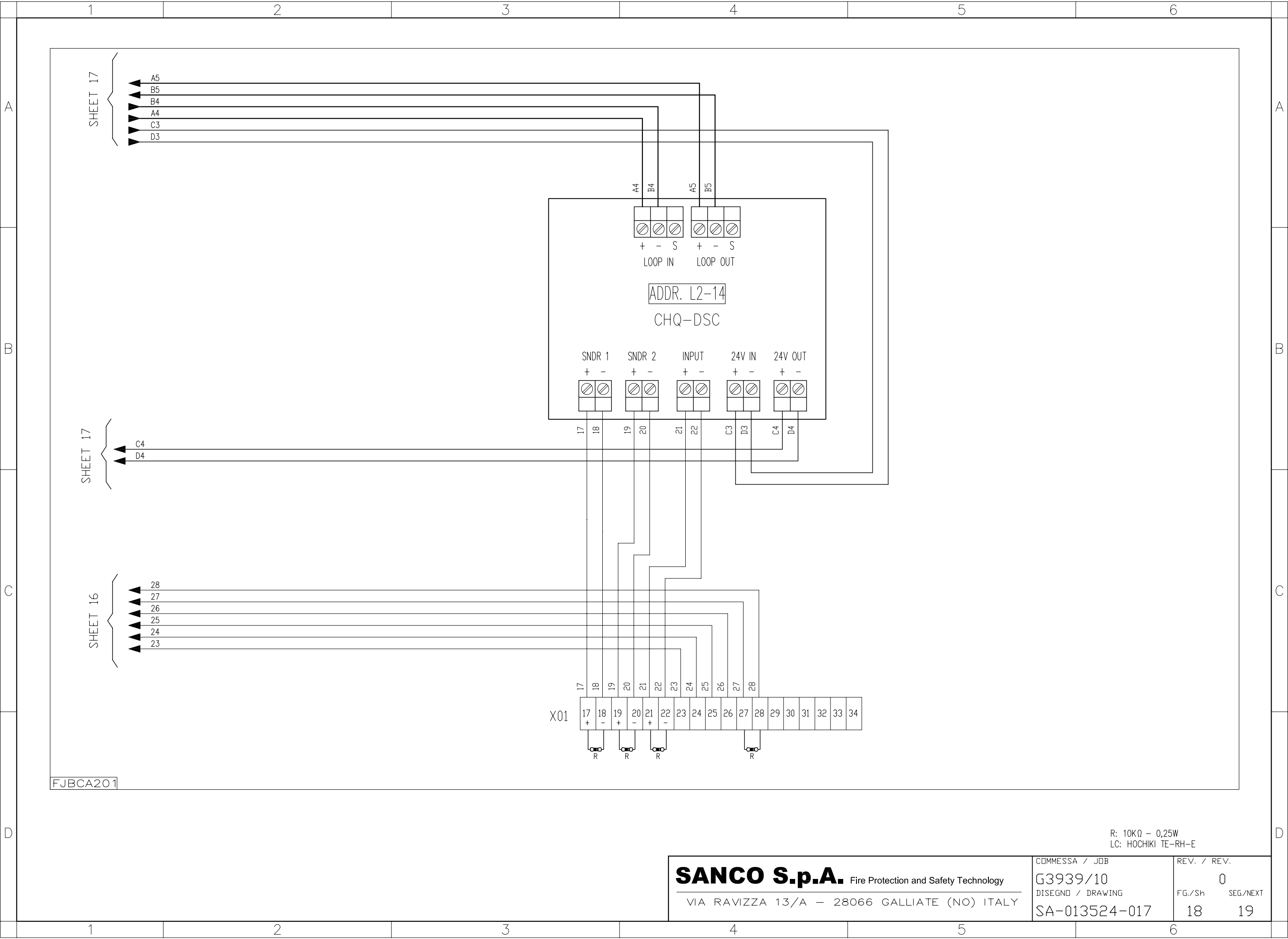


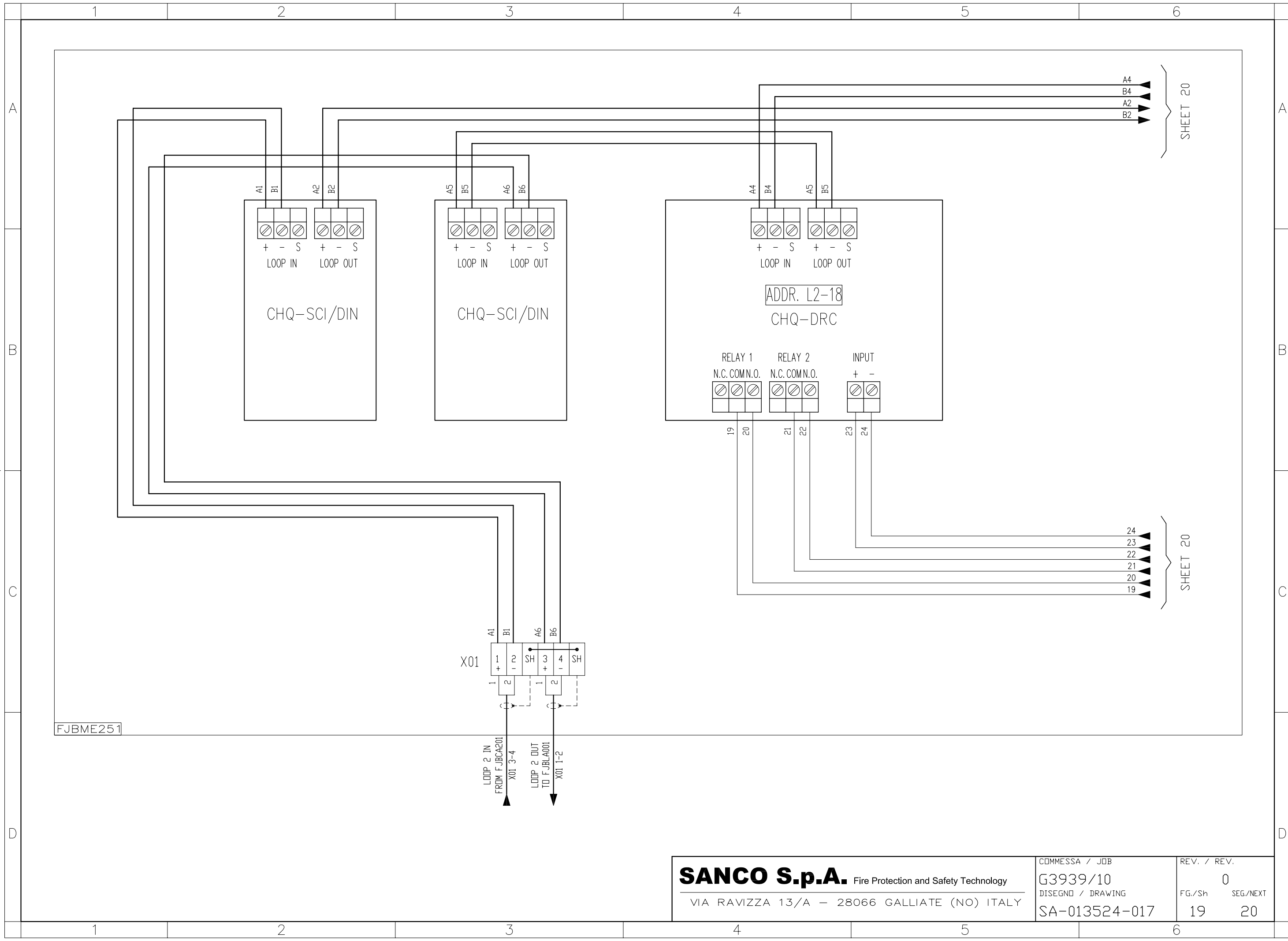
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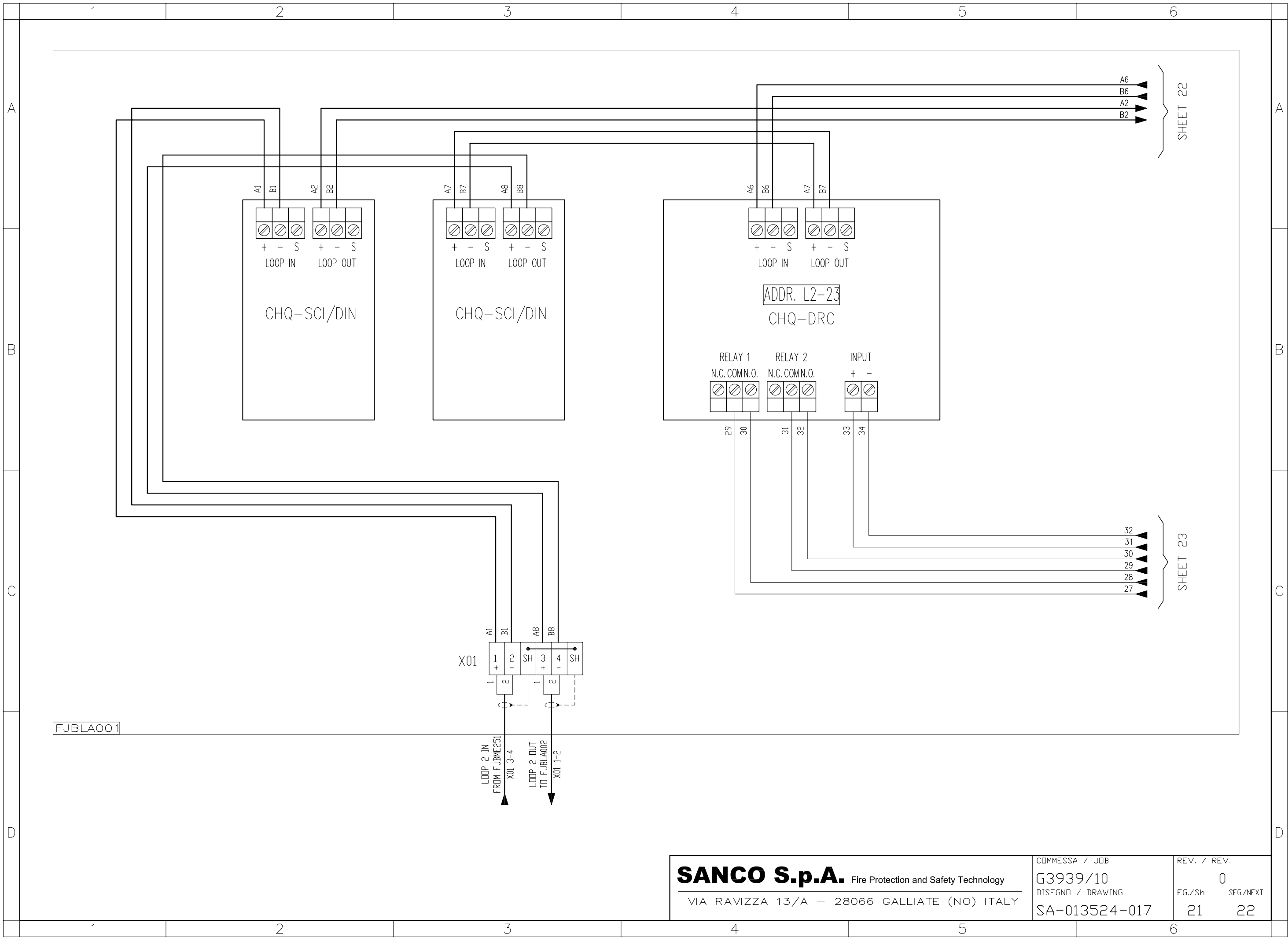
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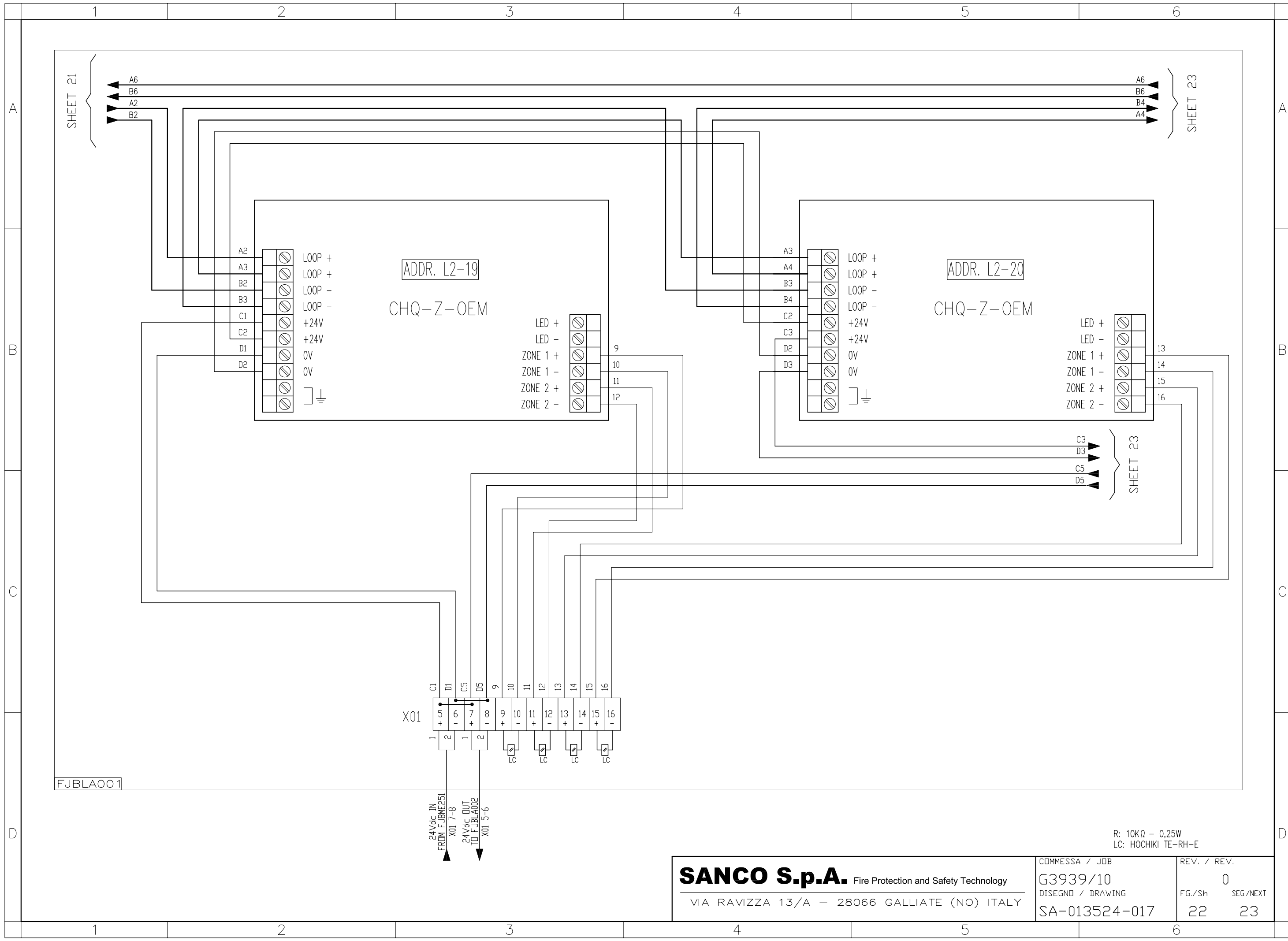
SANCO S.p.A. Fire Protection and Safety Technology
VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY

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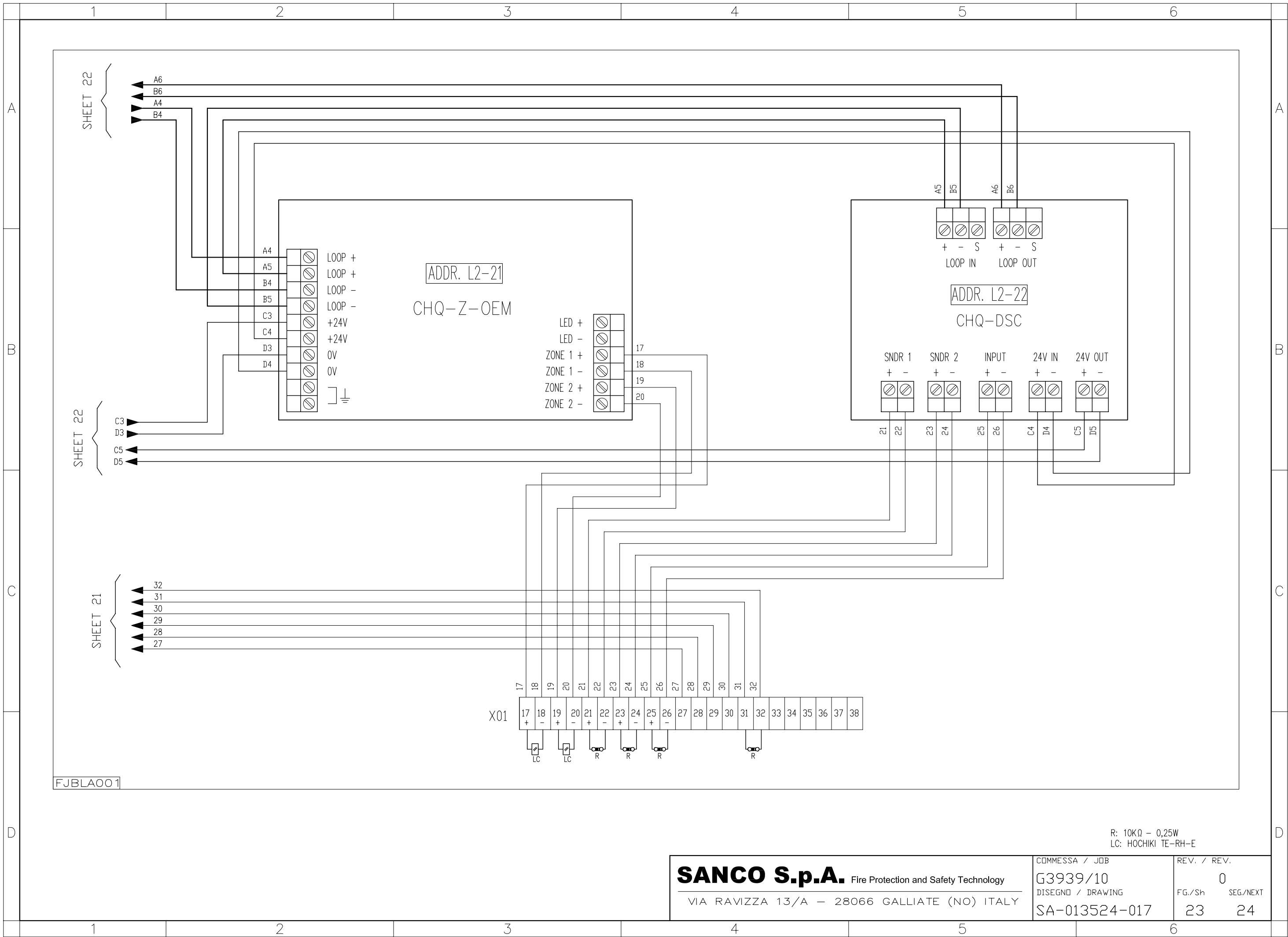


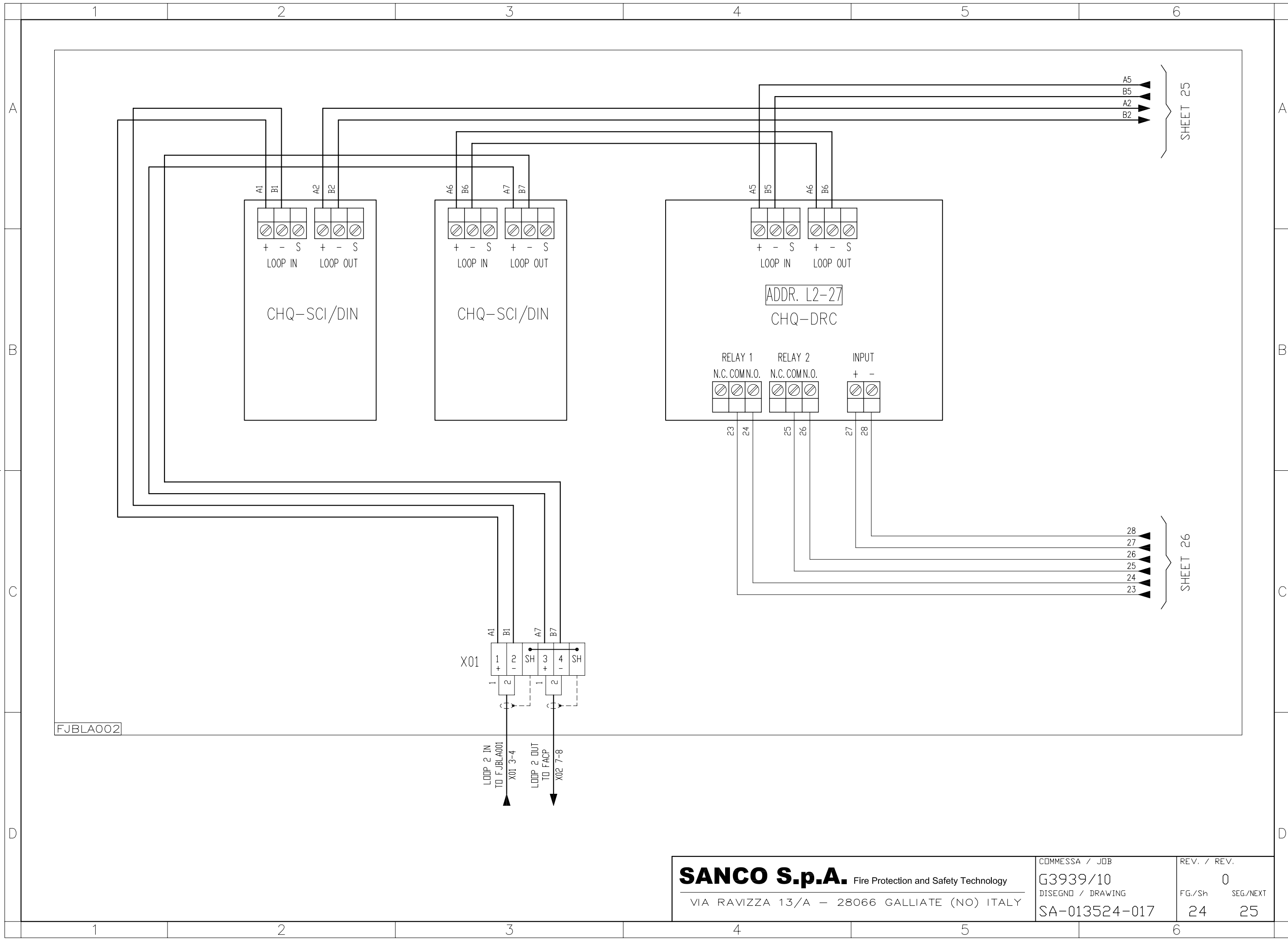


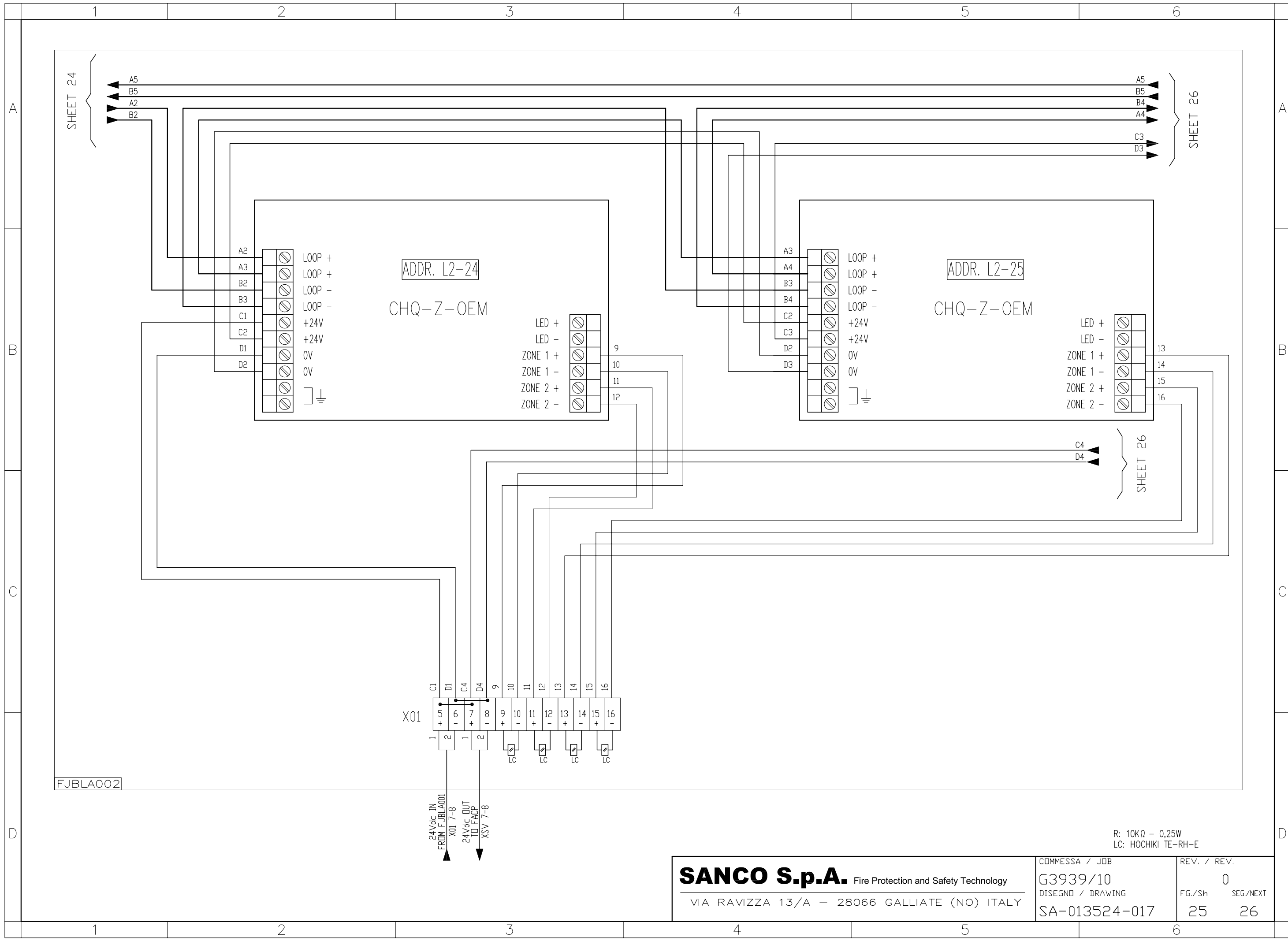
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VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY

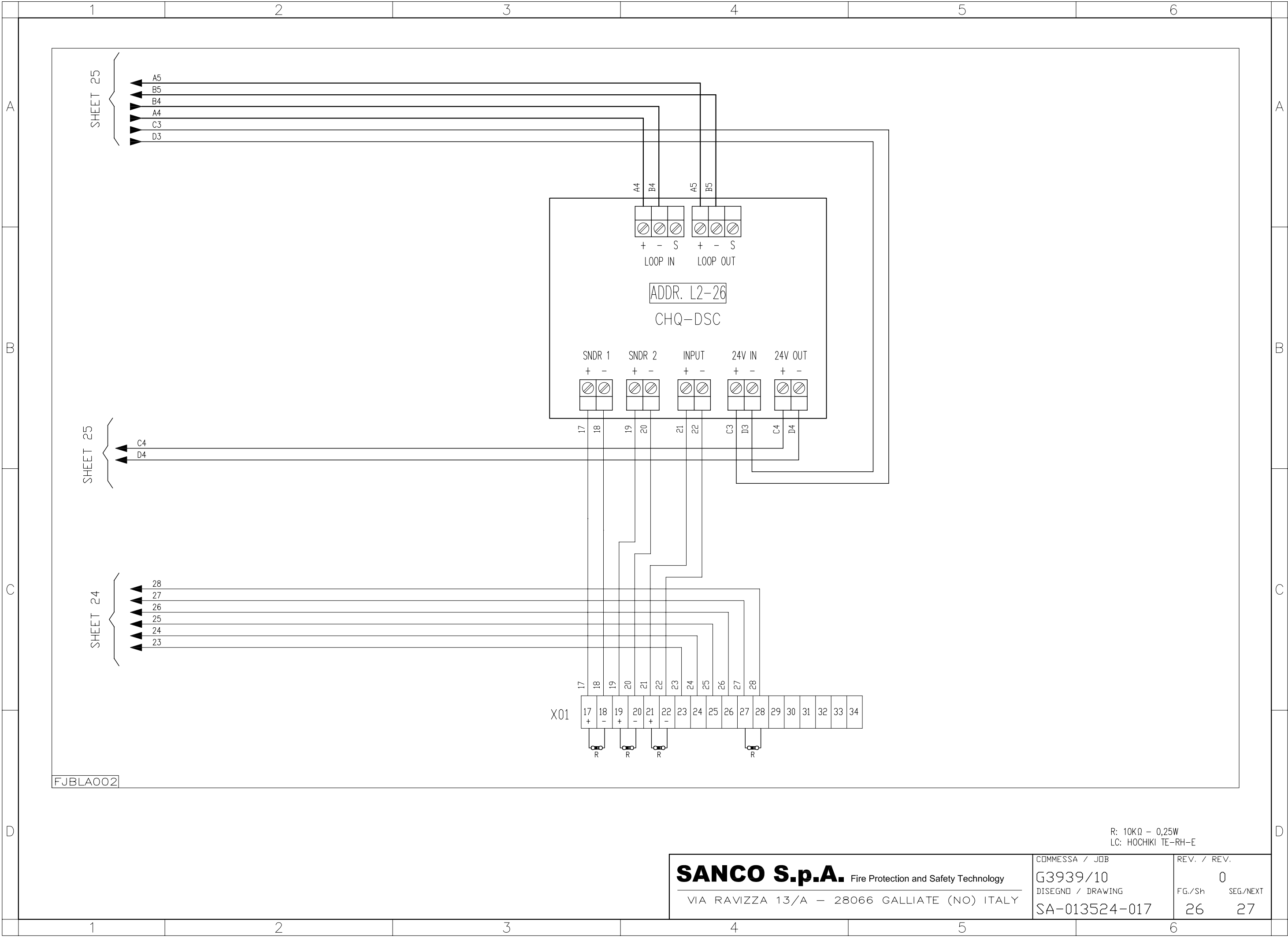
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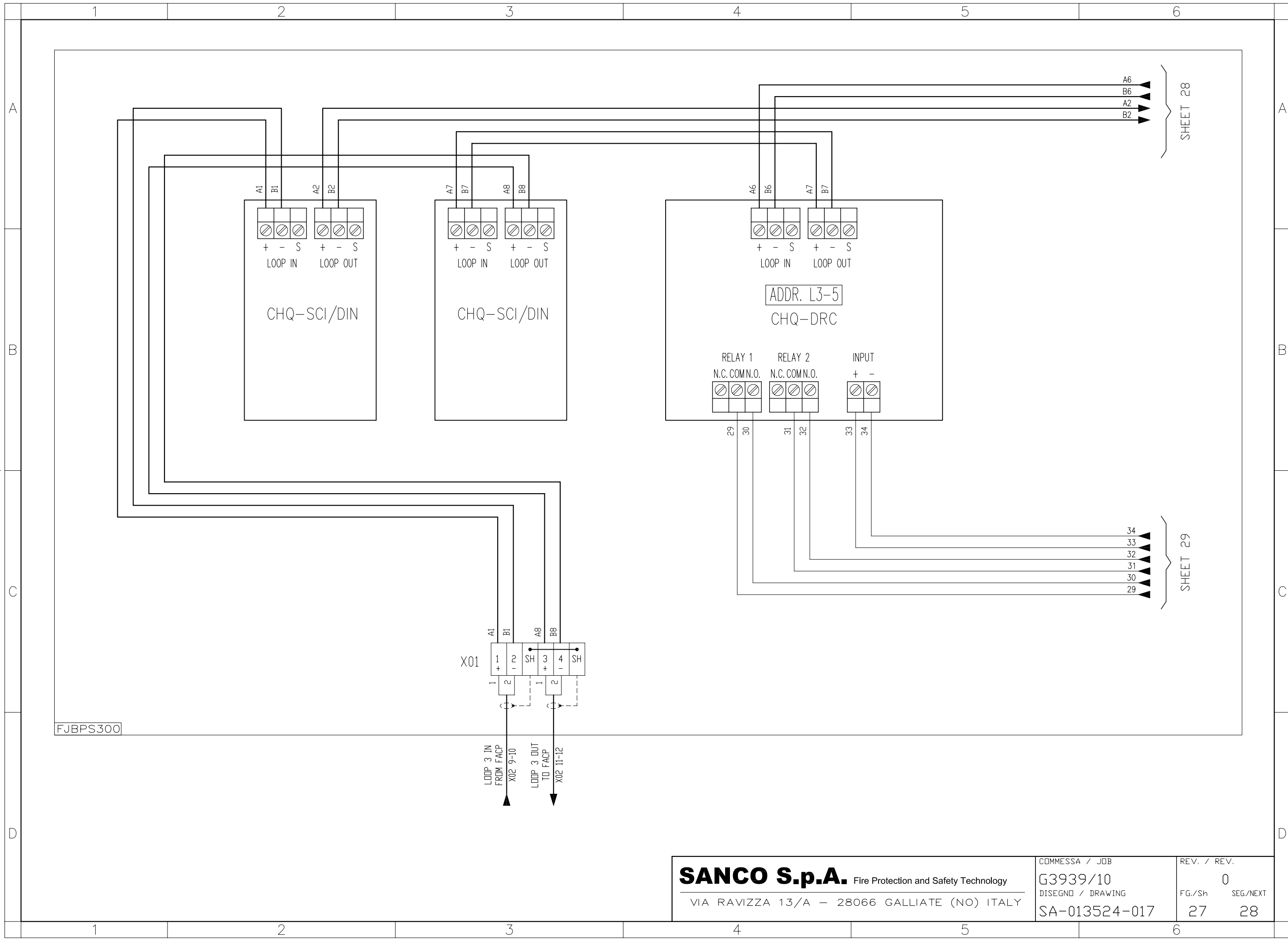
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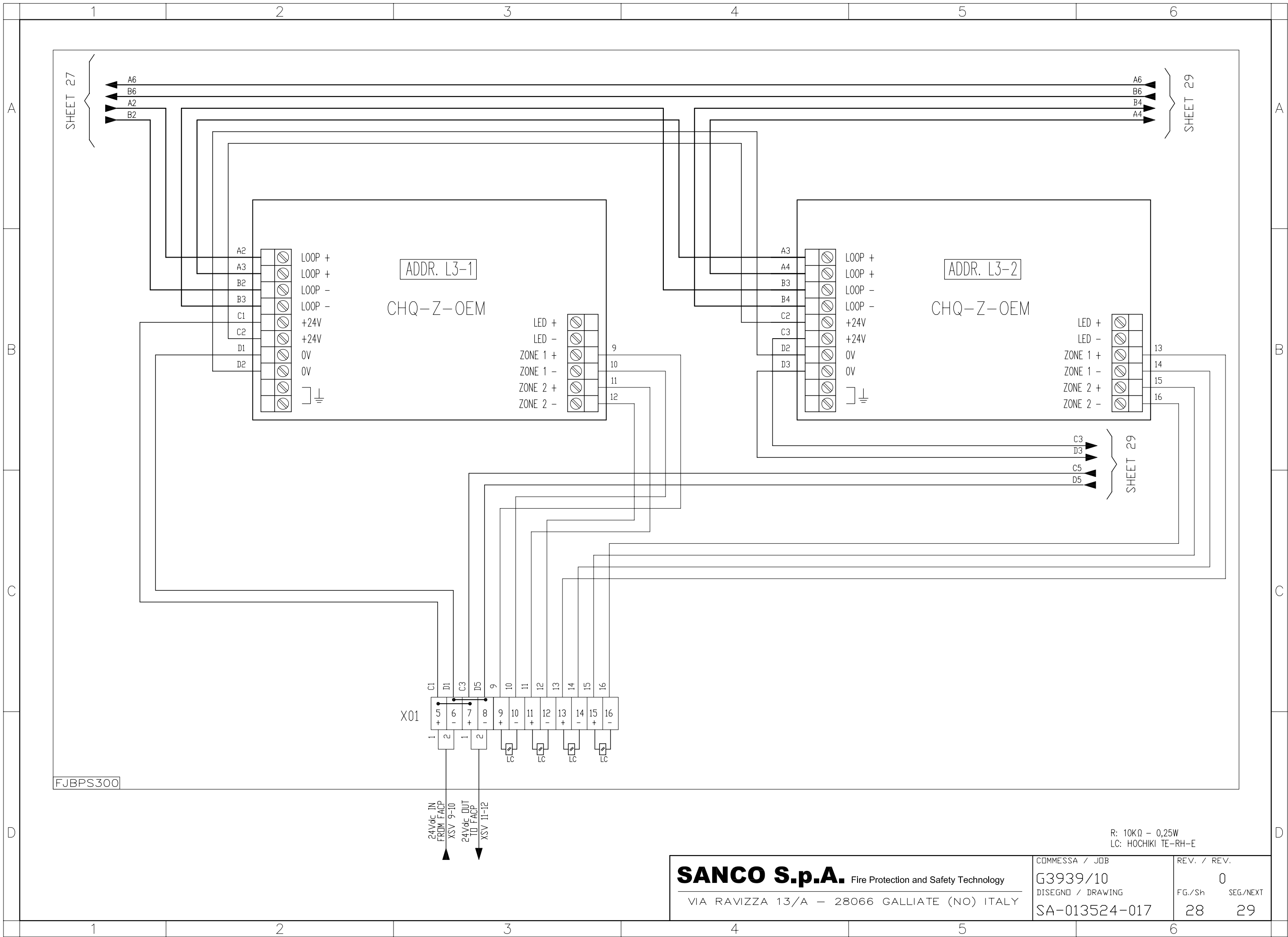












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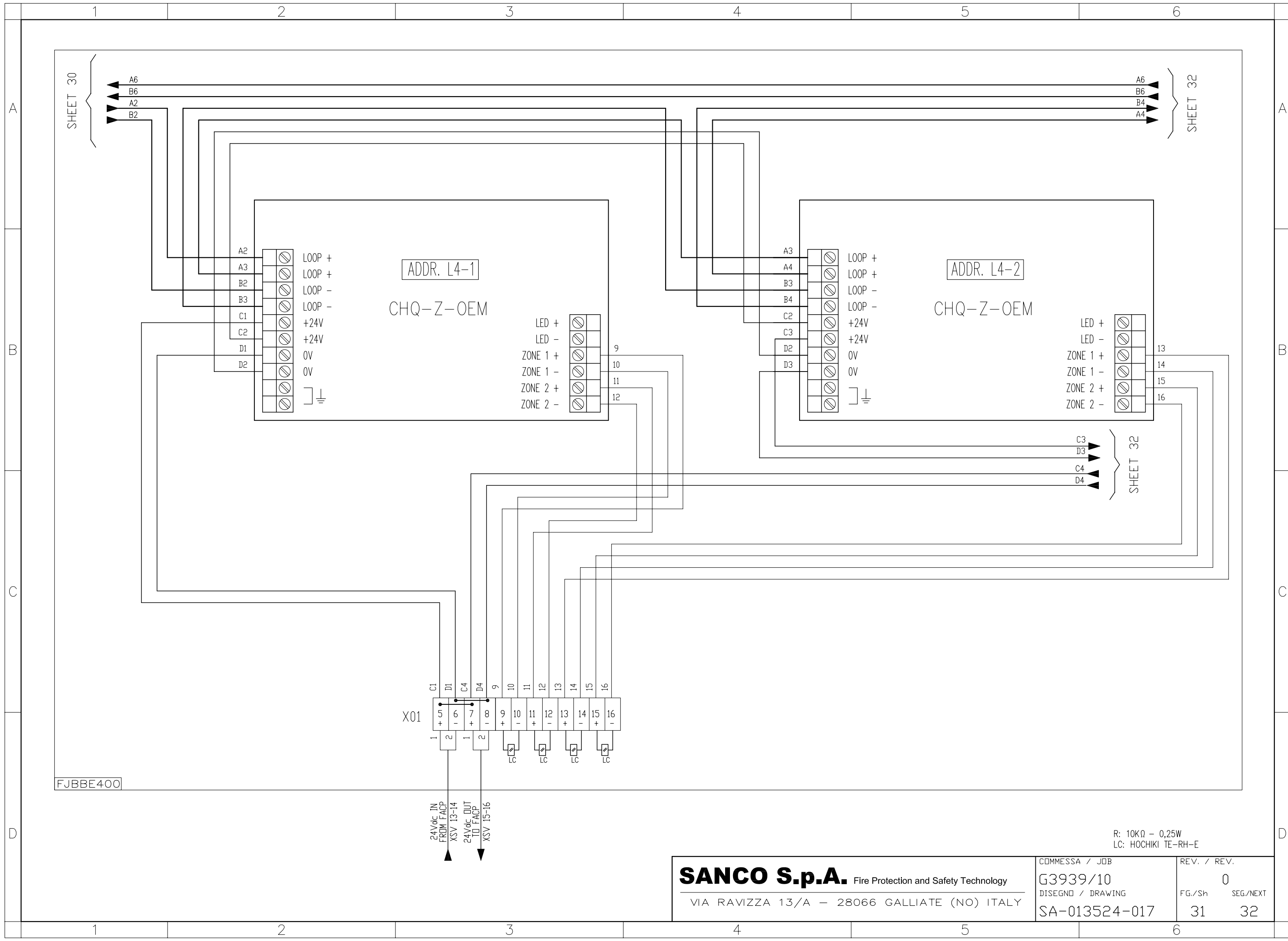
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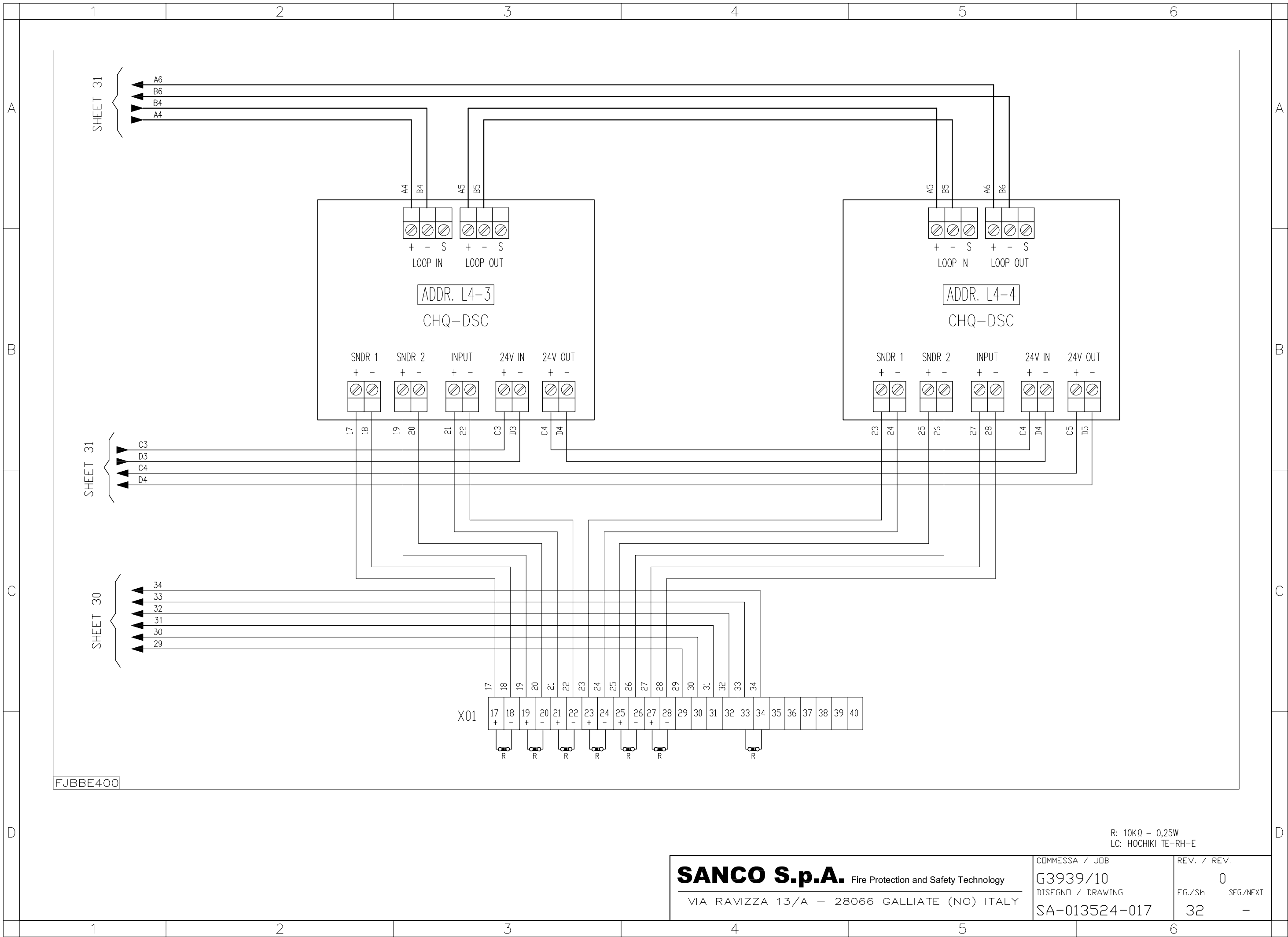
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VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY

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GHADIR PROJECT FIRE FIGHTING ARGON SYSTEM DIMENSIONAL ELECTRICAL JB			CLIENTE	CUSTOMER	
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A TERMINE DI LEGGE LA SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. SI RISERVA LA PROPRIETA' DEL PRESENTE DISEGNO E NE VIETA LA RIPRODUZIONE O LA DIVULGAZIONE, ANCHE PARZIALE, A TERZI SENZA IL PROPRIO BENESTARE.			THIS DRAWING IS LEGALLY EXCLUSIVE PROPERTY OF SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. AND IT CAN NEITHER REPRODUCED NOR SHOWN, ALSO PARTIAL, TO THIRD PARTIES WITHOUT OUR WRITTEN ASSENT.		

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Fire Protection and Safety Technology

VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY

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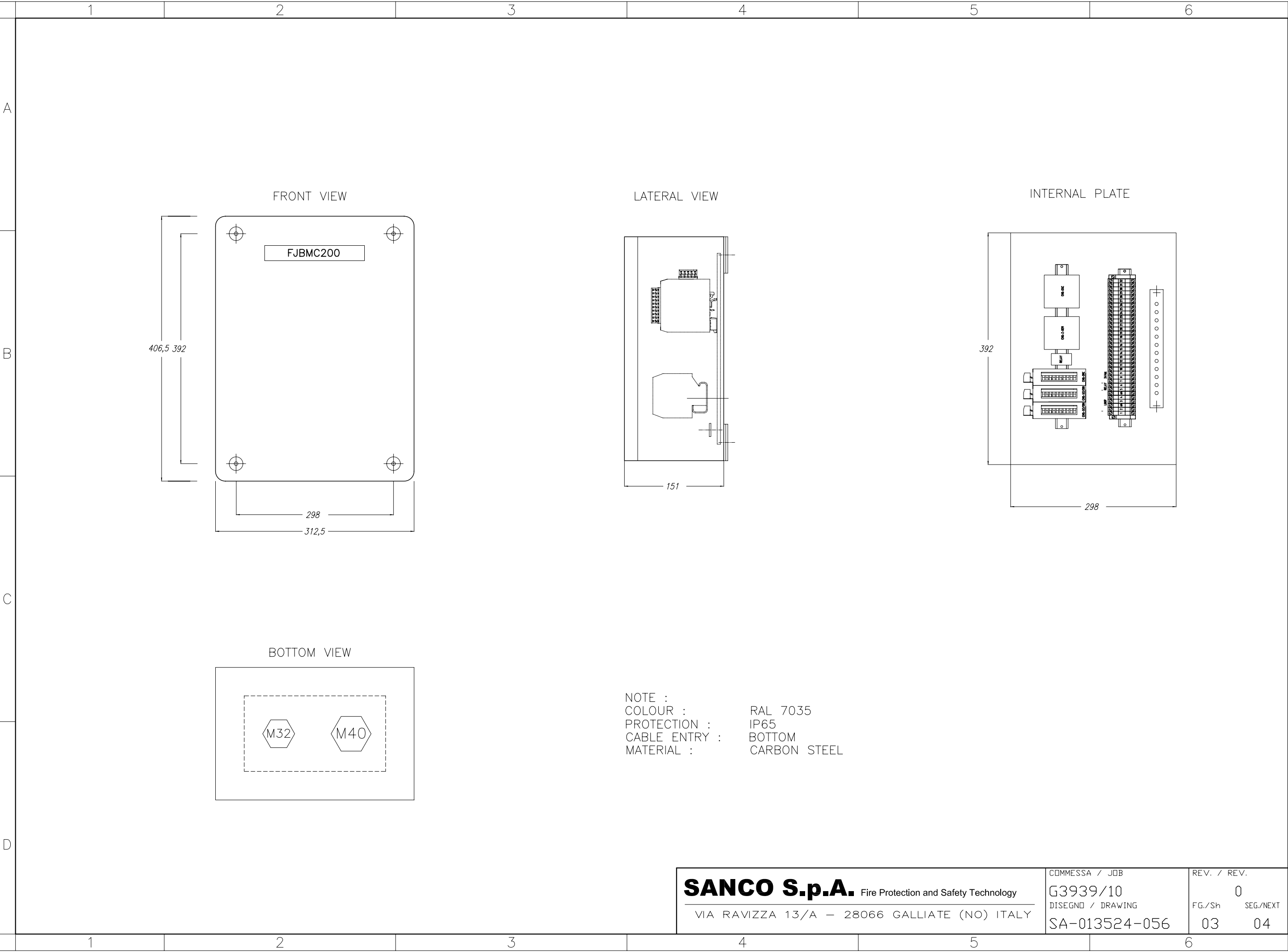
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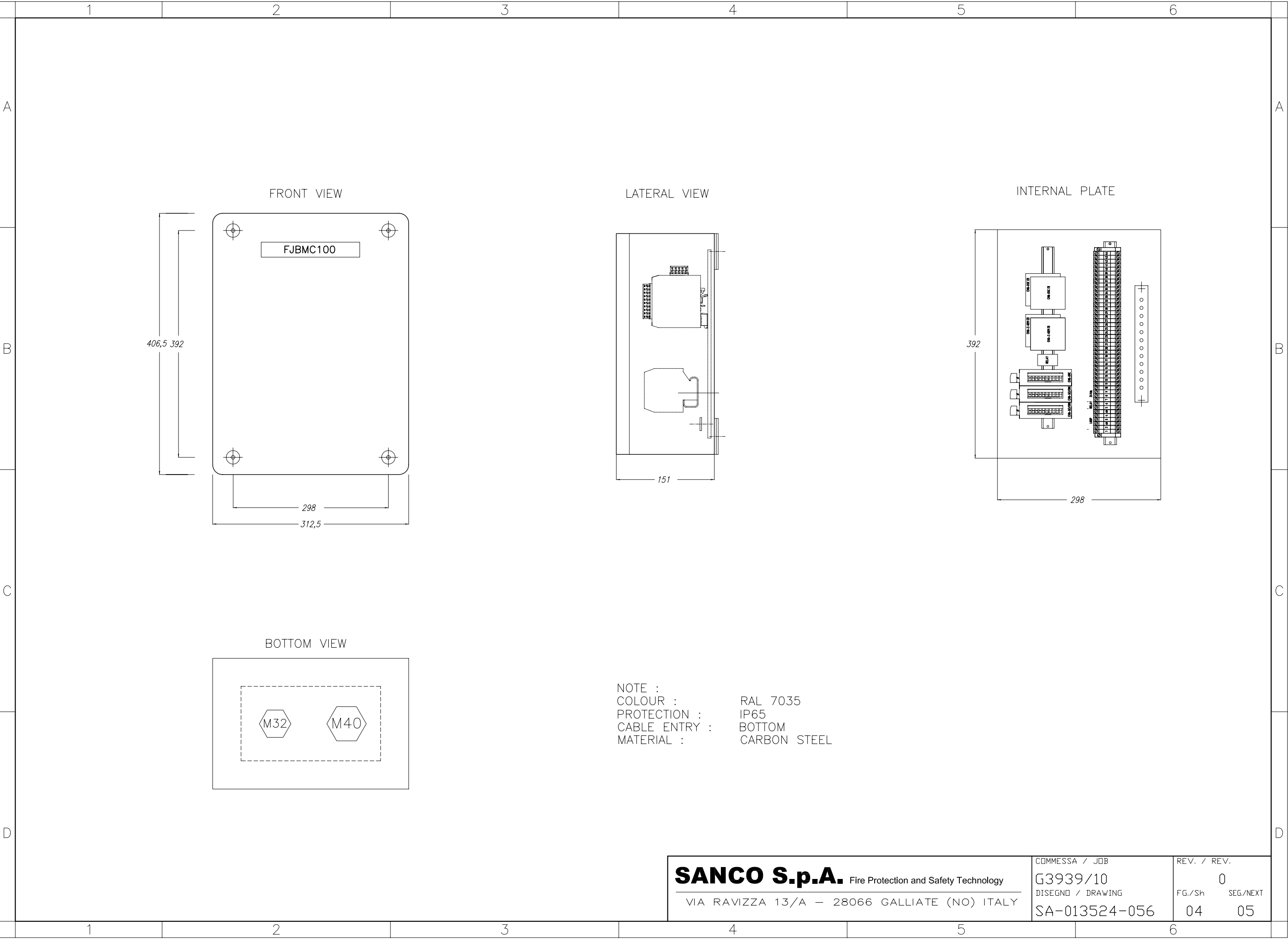
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VIA RAVIZZA 13/A – 28066 GALLIATE (NO) ITALY

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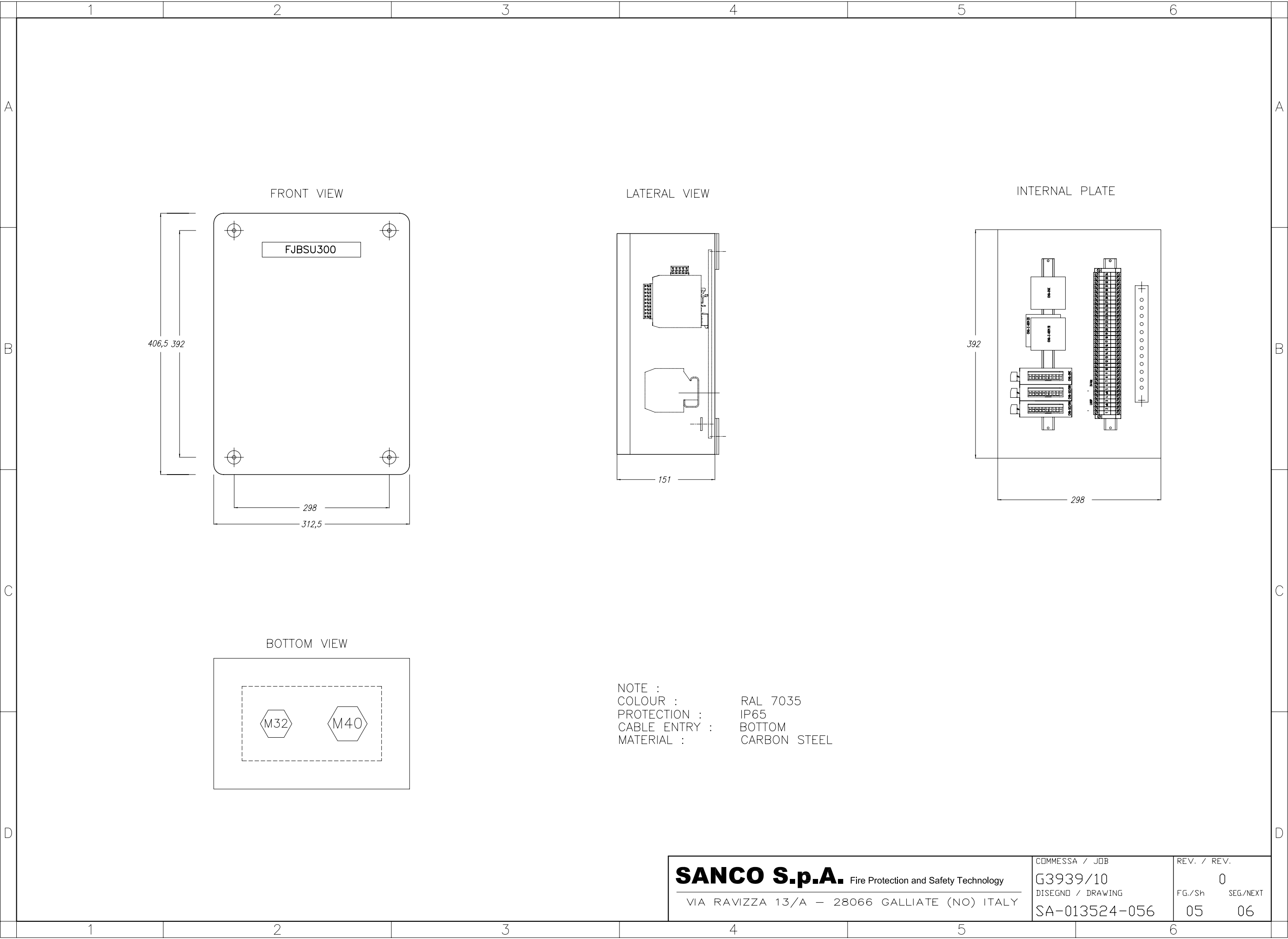
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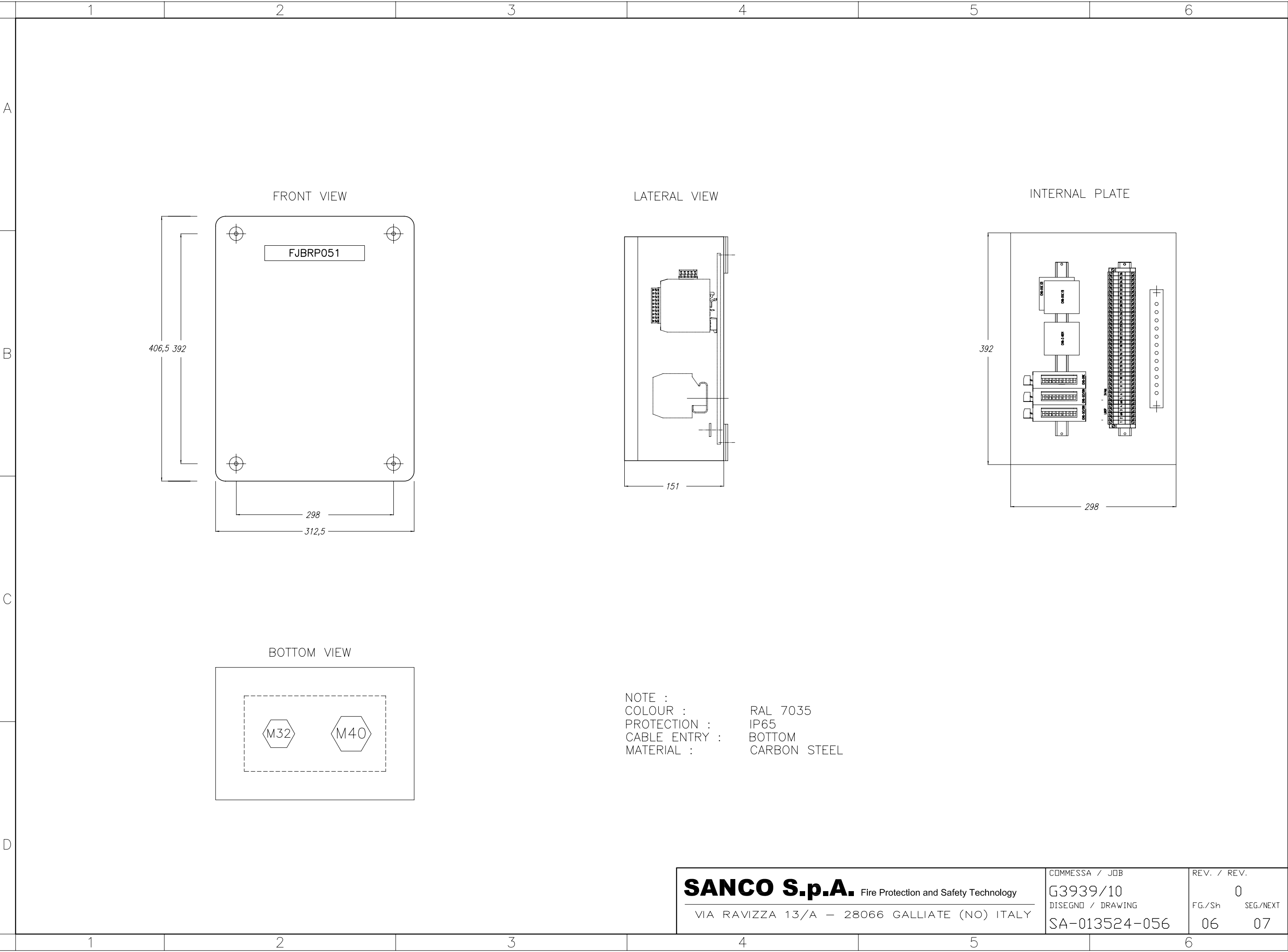
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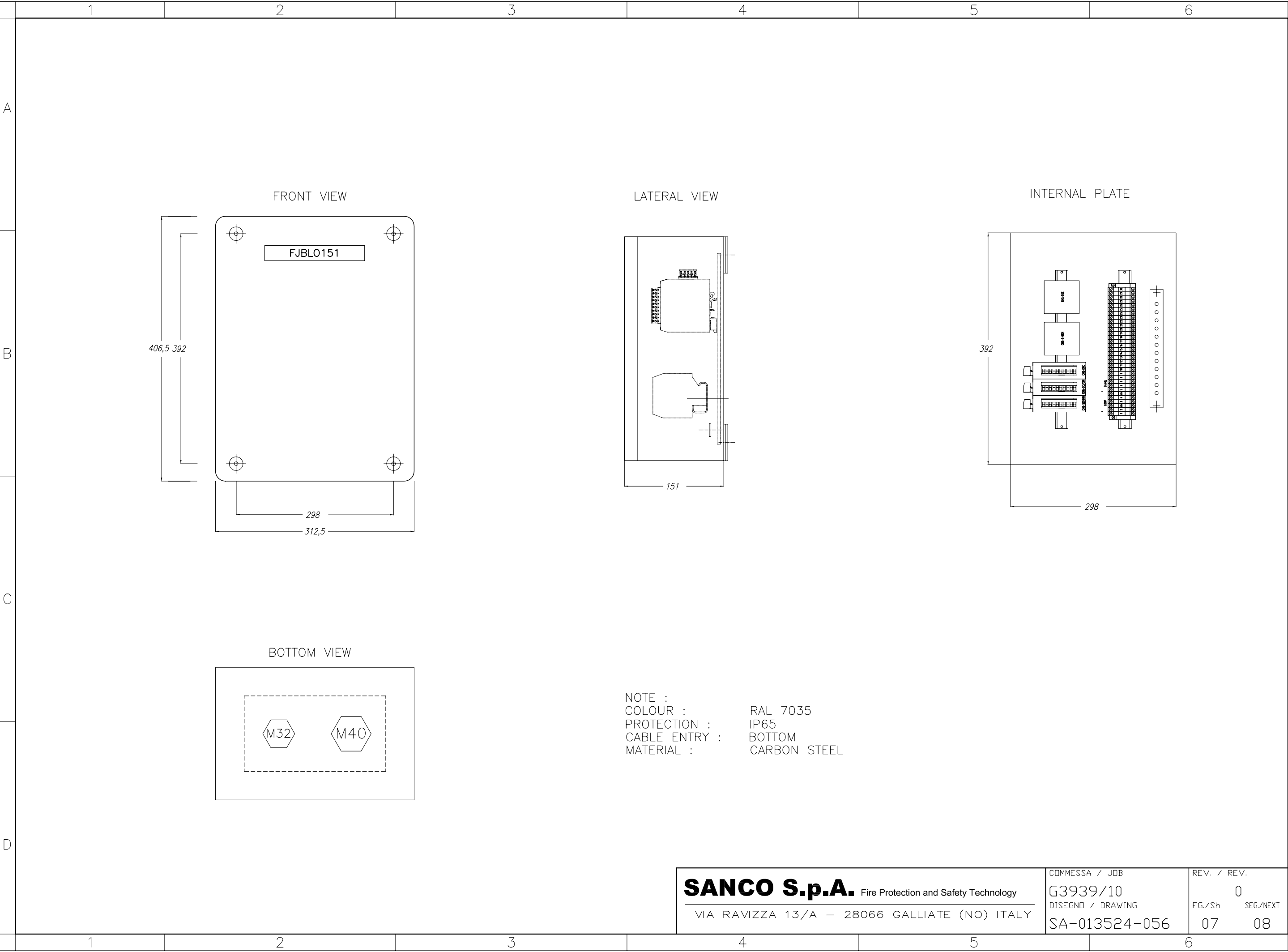
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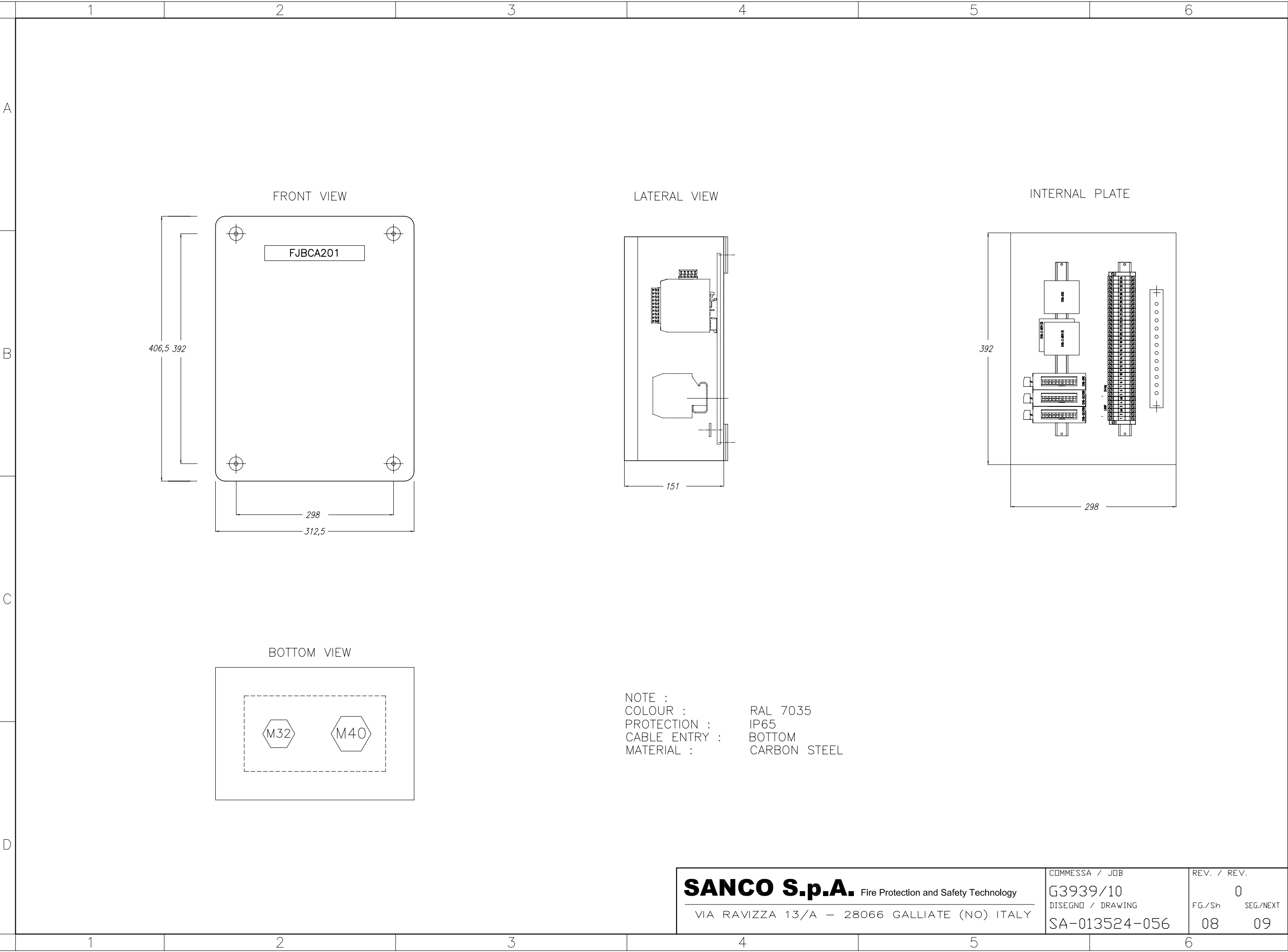
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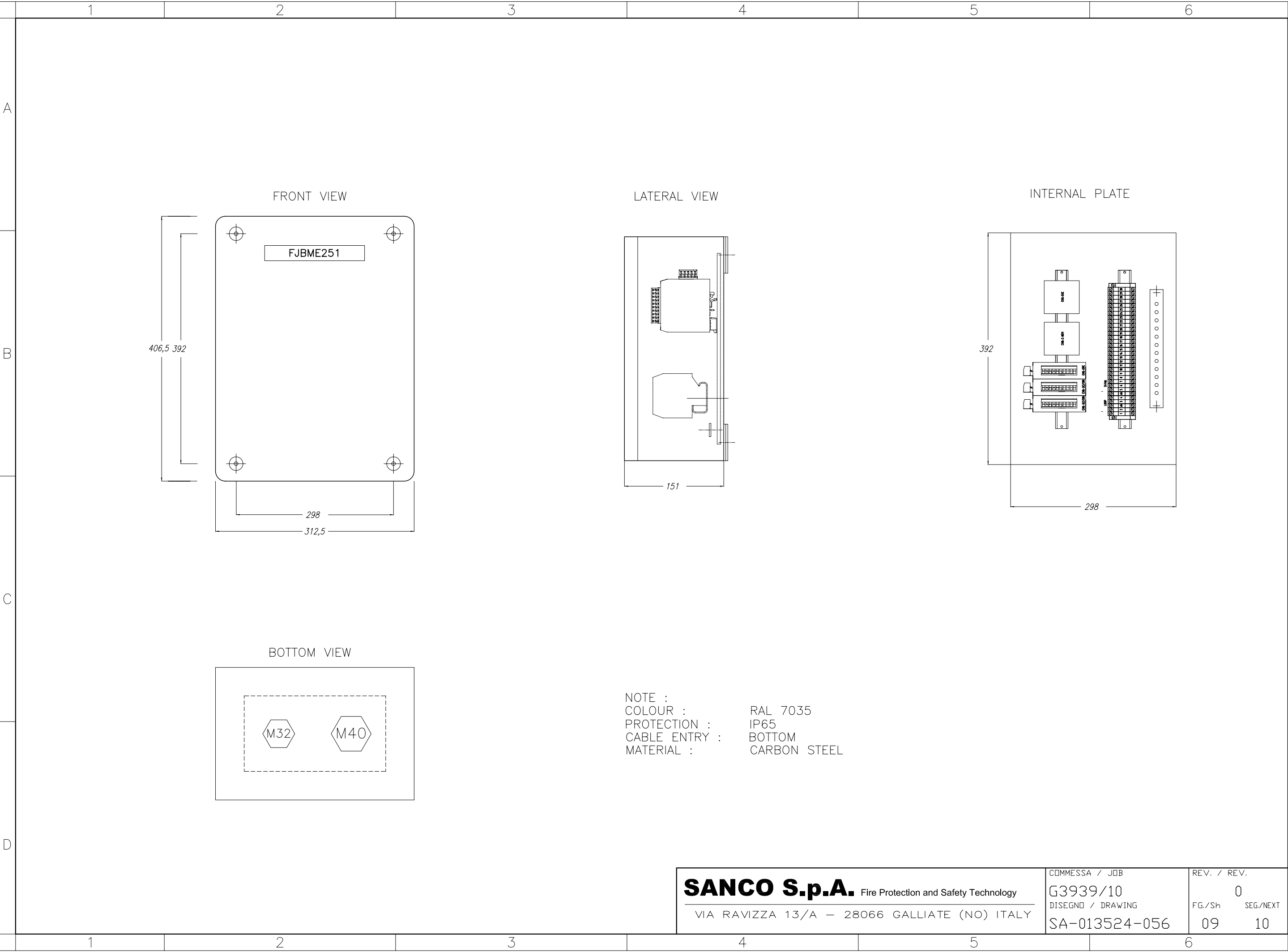
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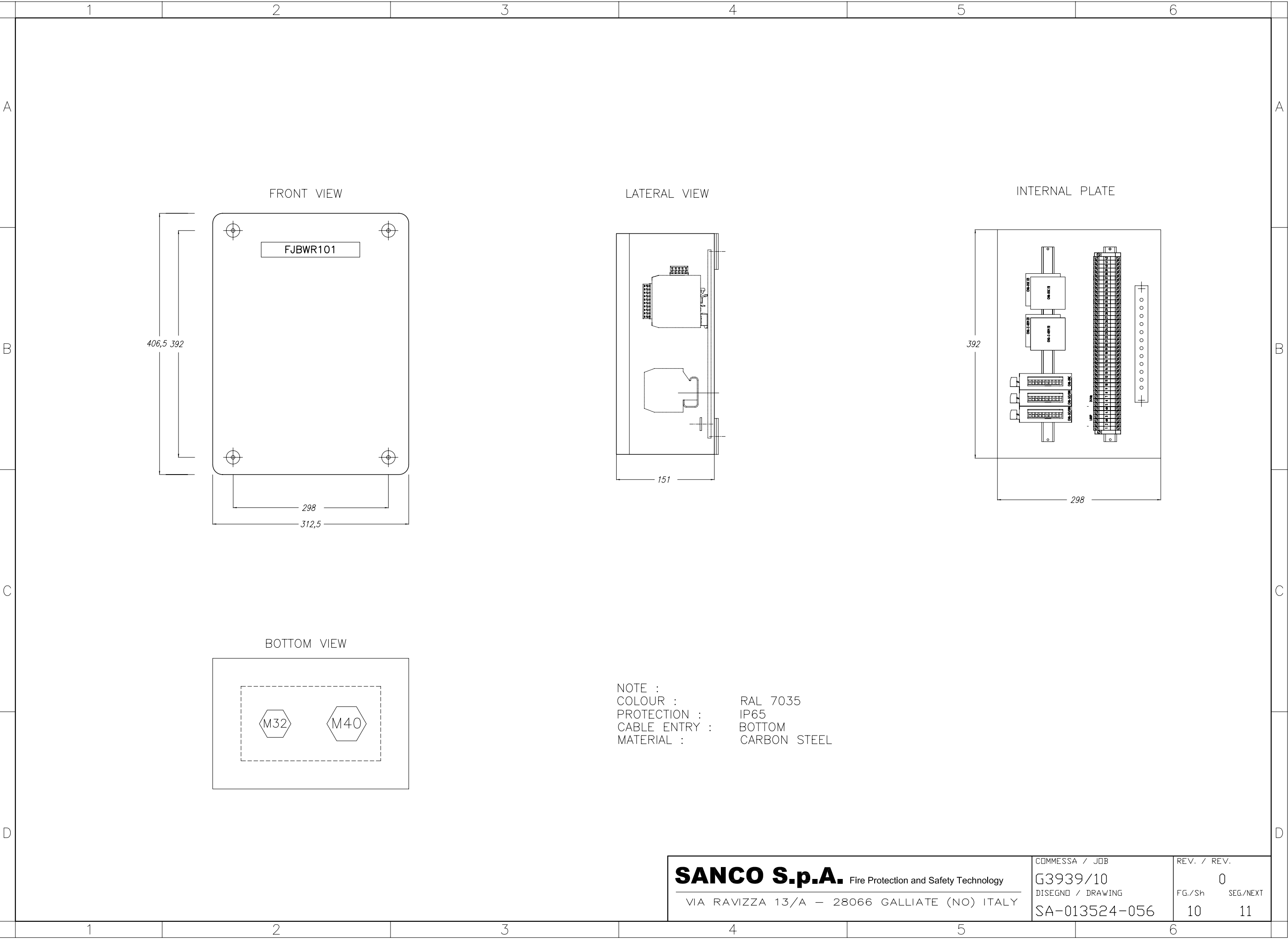


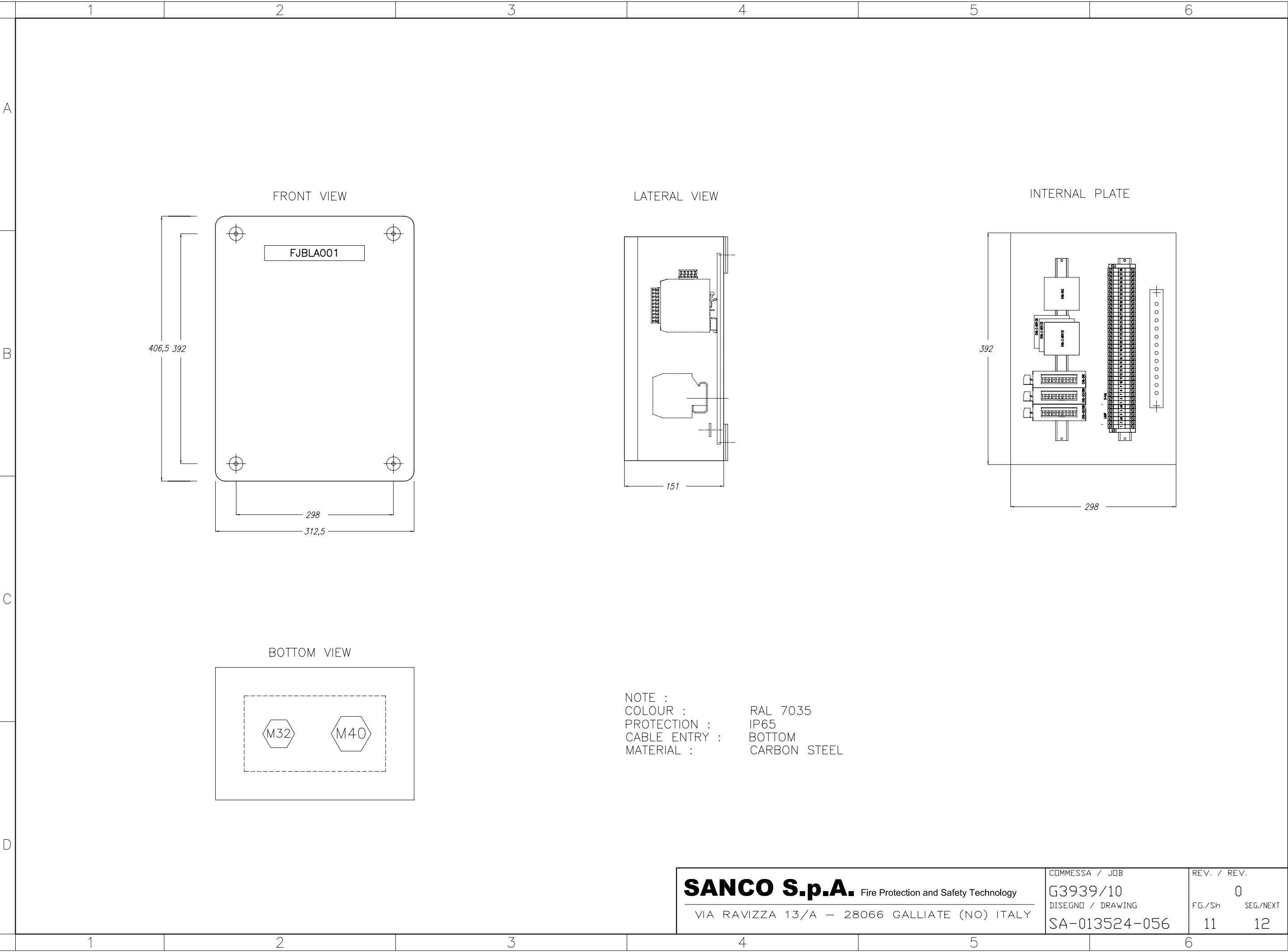












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VIA RAVIZZA 13/A – 28066 GALLIATE (NO) ITALY

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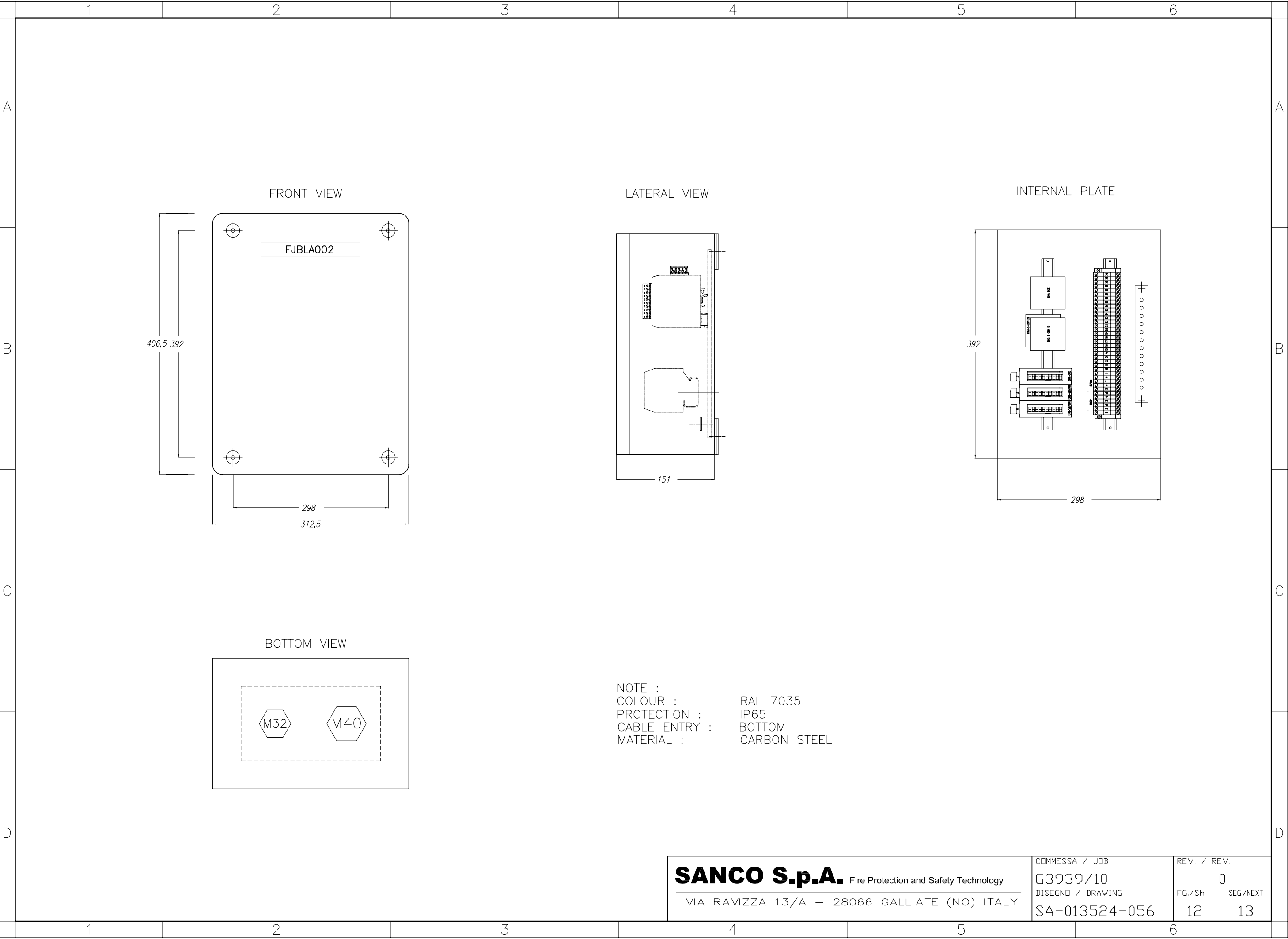
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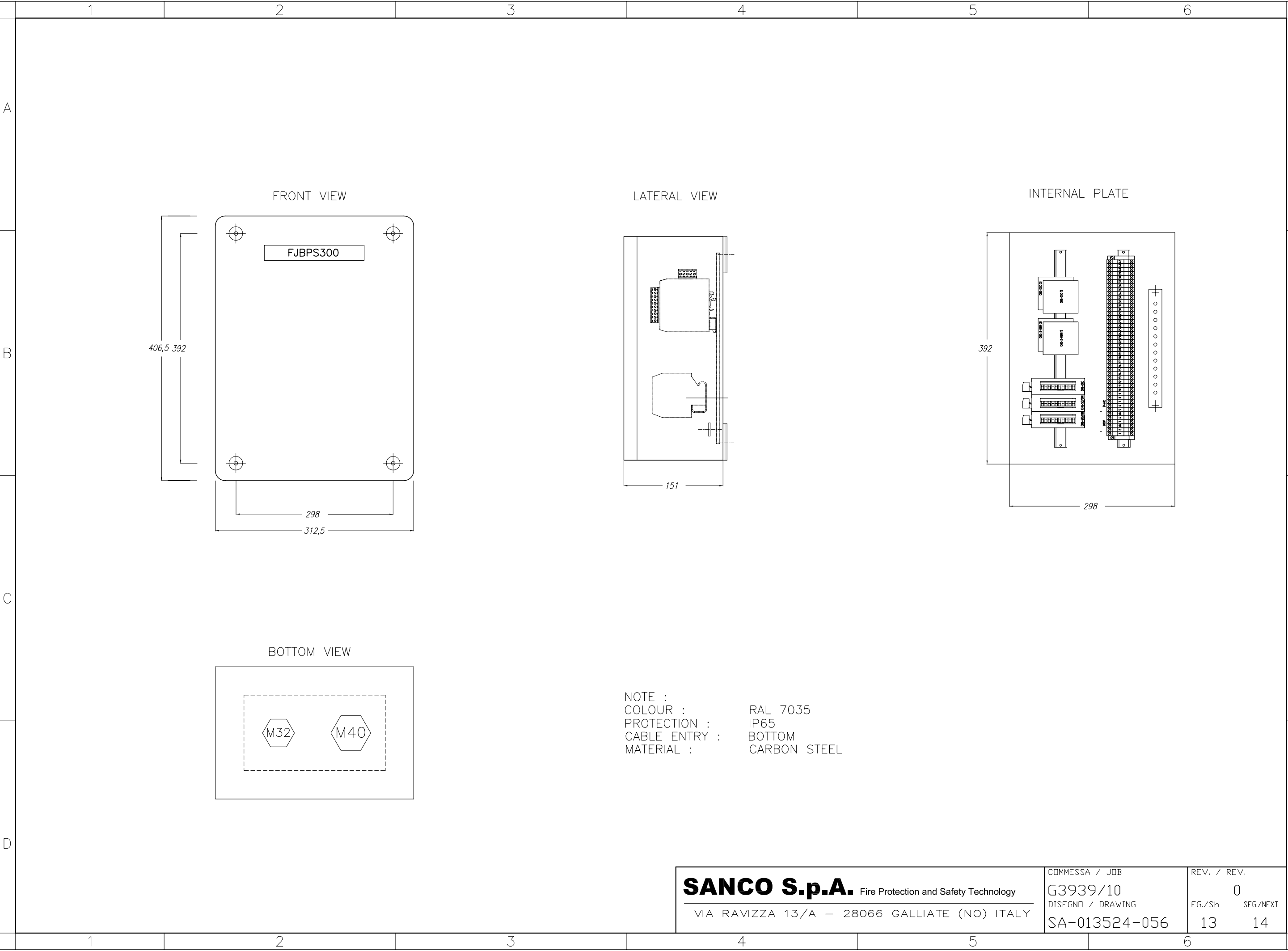
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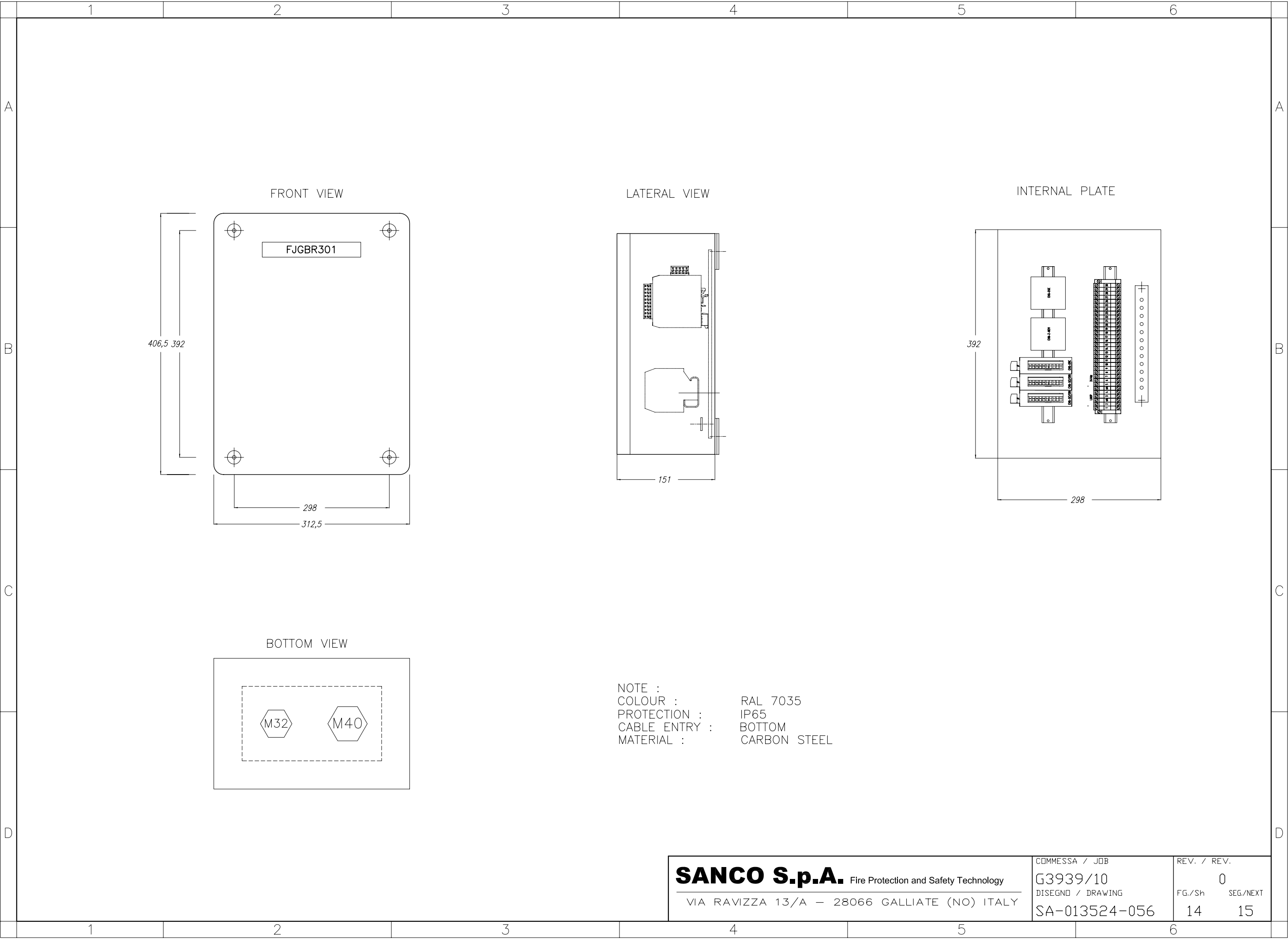
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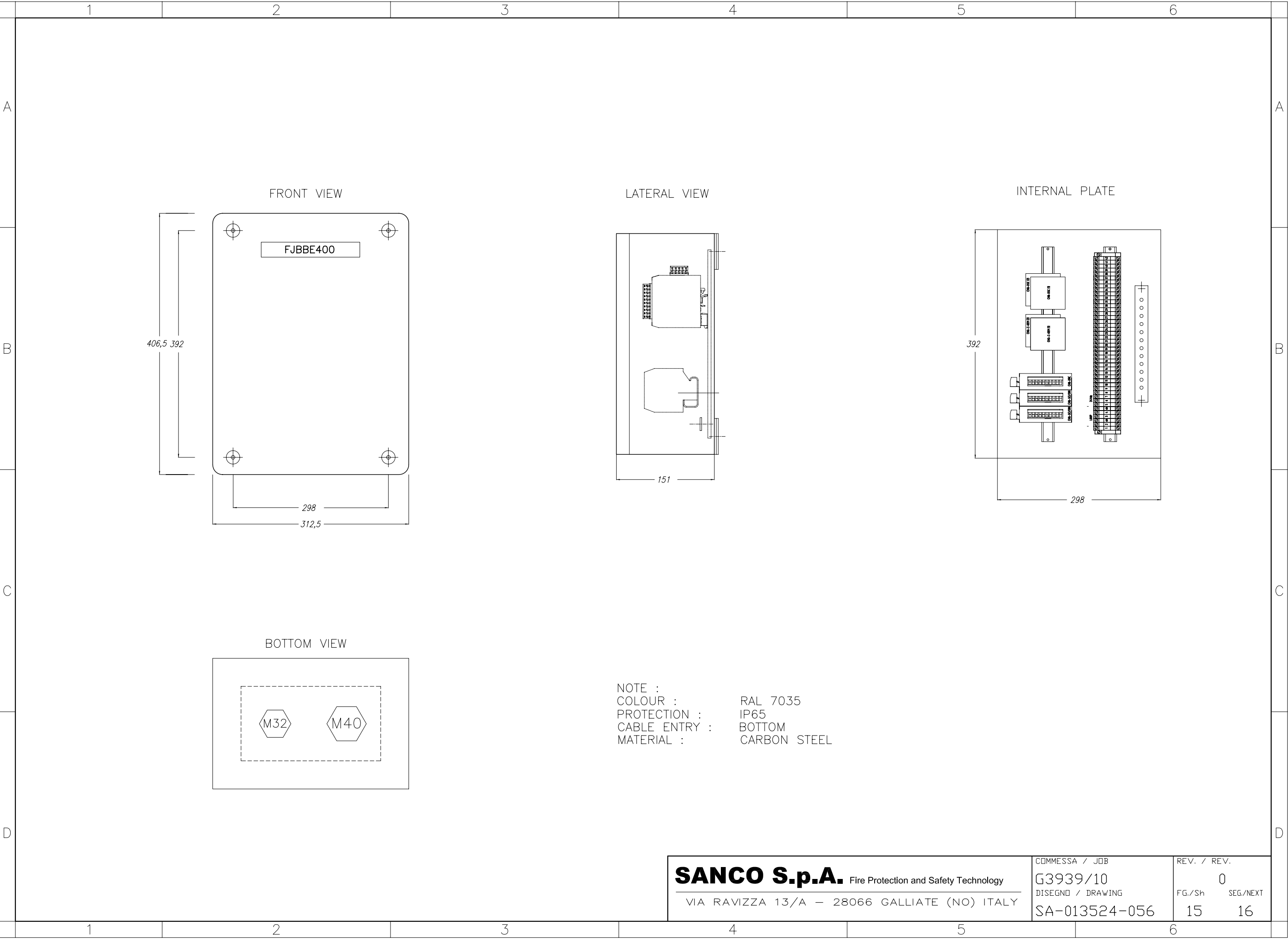
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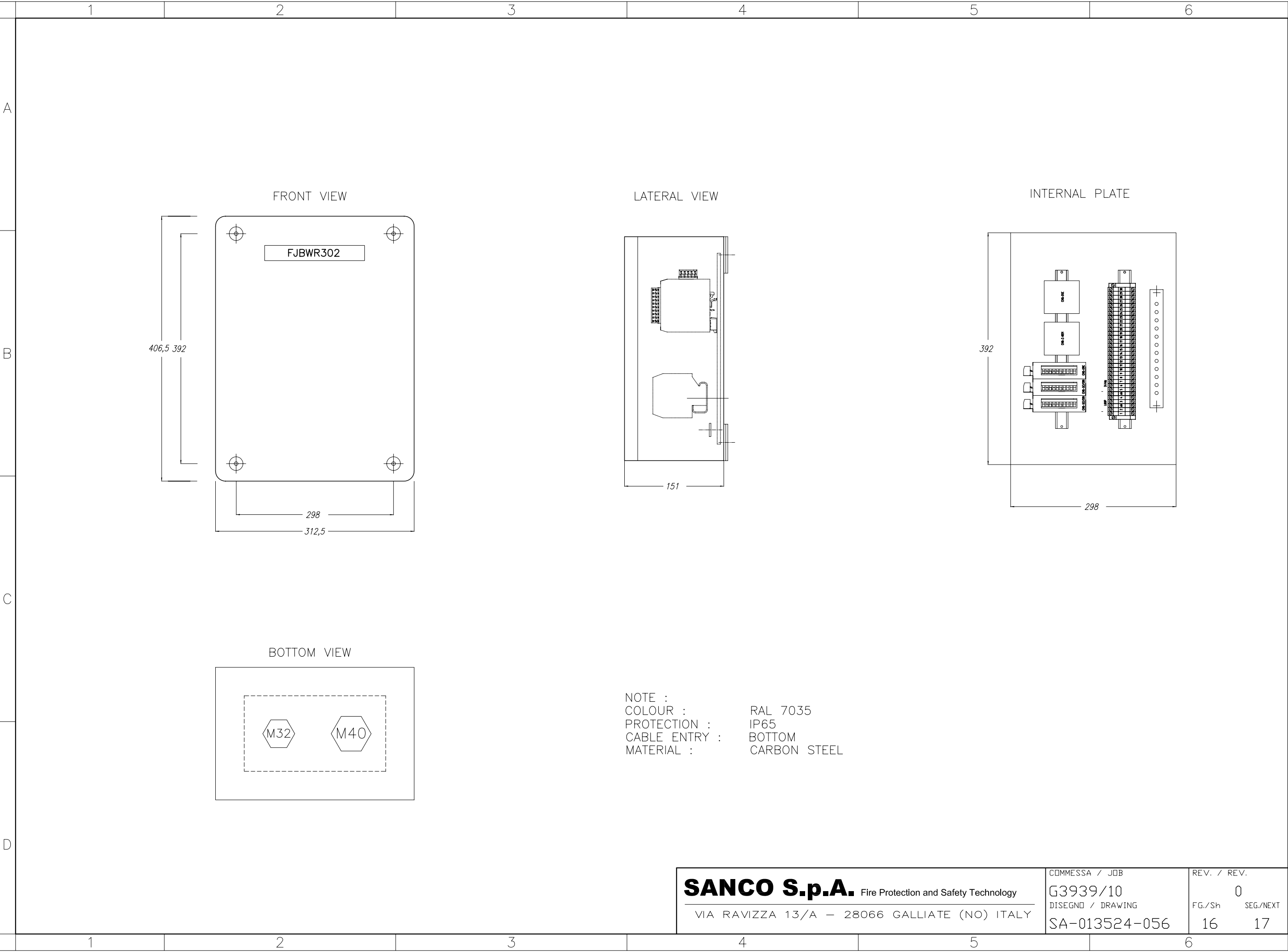
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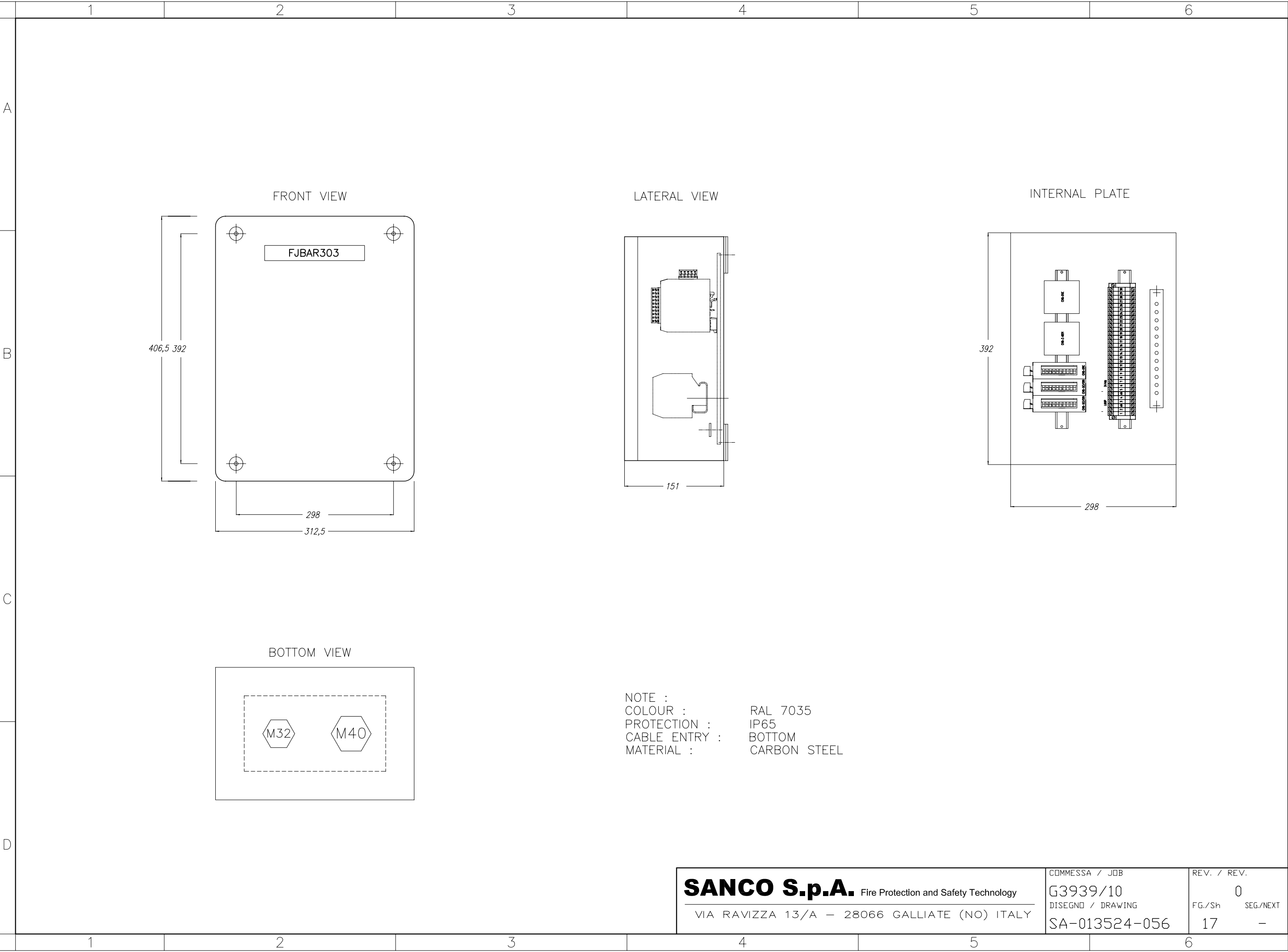
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REV.	DATA DATE	EMISSIONE ISSUE	DISEGN. DRAWN.	CONTR. CHECK	APPR. APPROVED
SANCO Fire Protection and Safety Technology VIA RAVIZZA 13/A – 28066 GALLIATE (NO) ITALY			COMMESSA	JOB	
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GHADIR PROJECT FIRE FIGHTING ARGON SYSTEM WIRING DIAGRAM JB			CLIENTE	CUSTOMER	
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			SA-013524-055		
A TERMINE DI LEGGE LA SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. SI RISERVA LA PROPRIETA' DEL PRESENTE DISEGNO E NE VIETA LA RIPRODUZIONE O LA DIVULGAZIONE, ANCHE PARZIALE, A TERZI SENZA IL PROPRIO BENESTARE.			THIS DRAWING IS LEGALLY EXCLUSIVE PROPERTY OF SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. AND IT CAN NEITHER REPRODUCED NOR SHOWN, ALSO PARTIAL, TO THIRD PARTIES WITHOUT OUR WRITTEN ASSENT.		

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SANCO S.p.A.

Fire Protection and Safety Technology

VIA RAVIZZA 13/A – 28066 GALLIATE (NO) ITALY

COMMESSA / JOB

F3939/10

DISEGNO / DRAWING

SA-013524-055

REV. / REV.

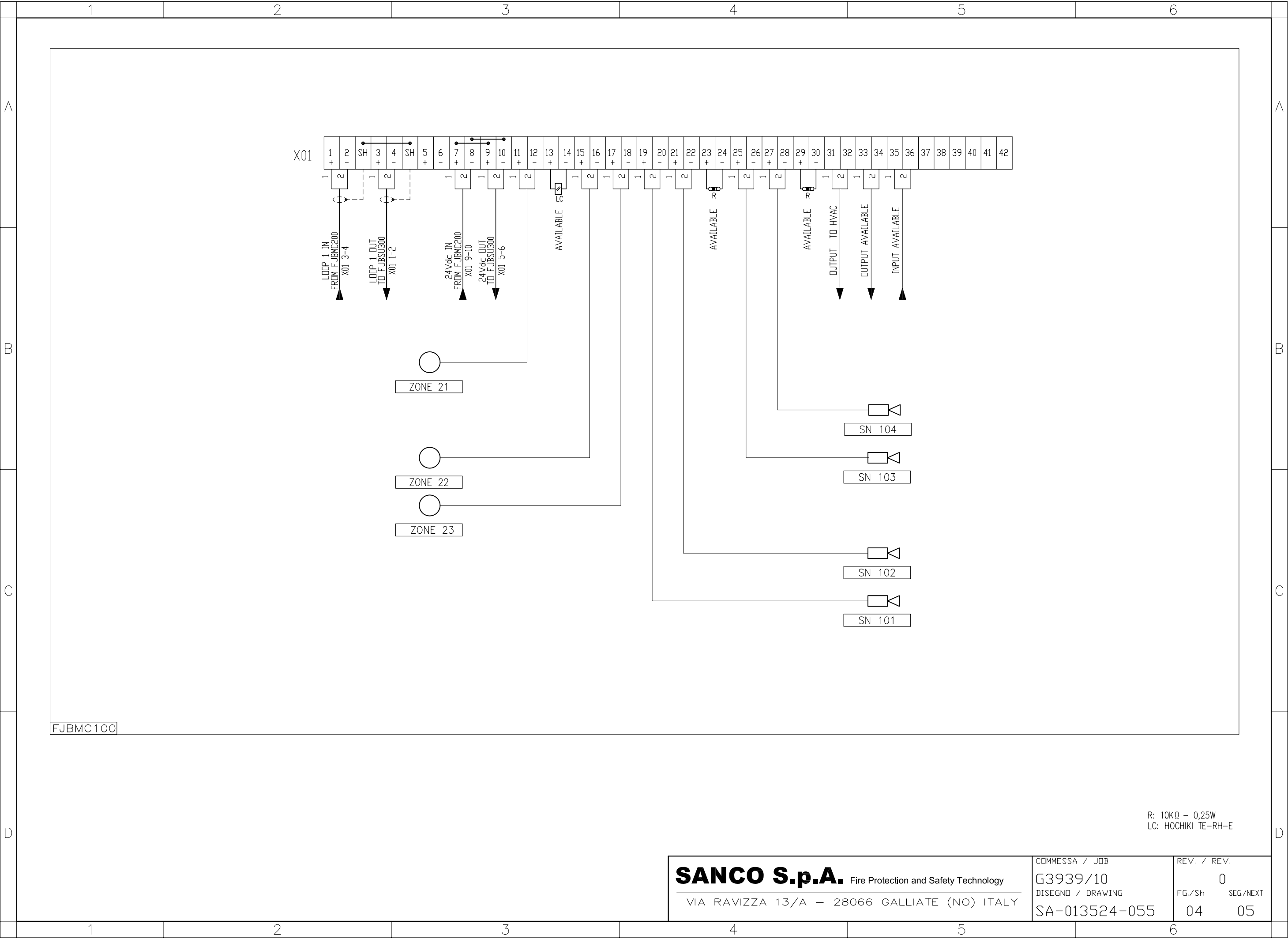
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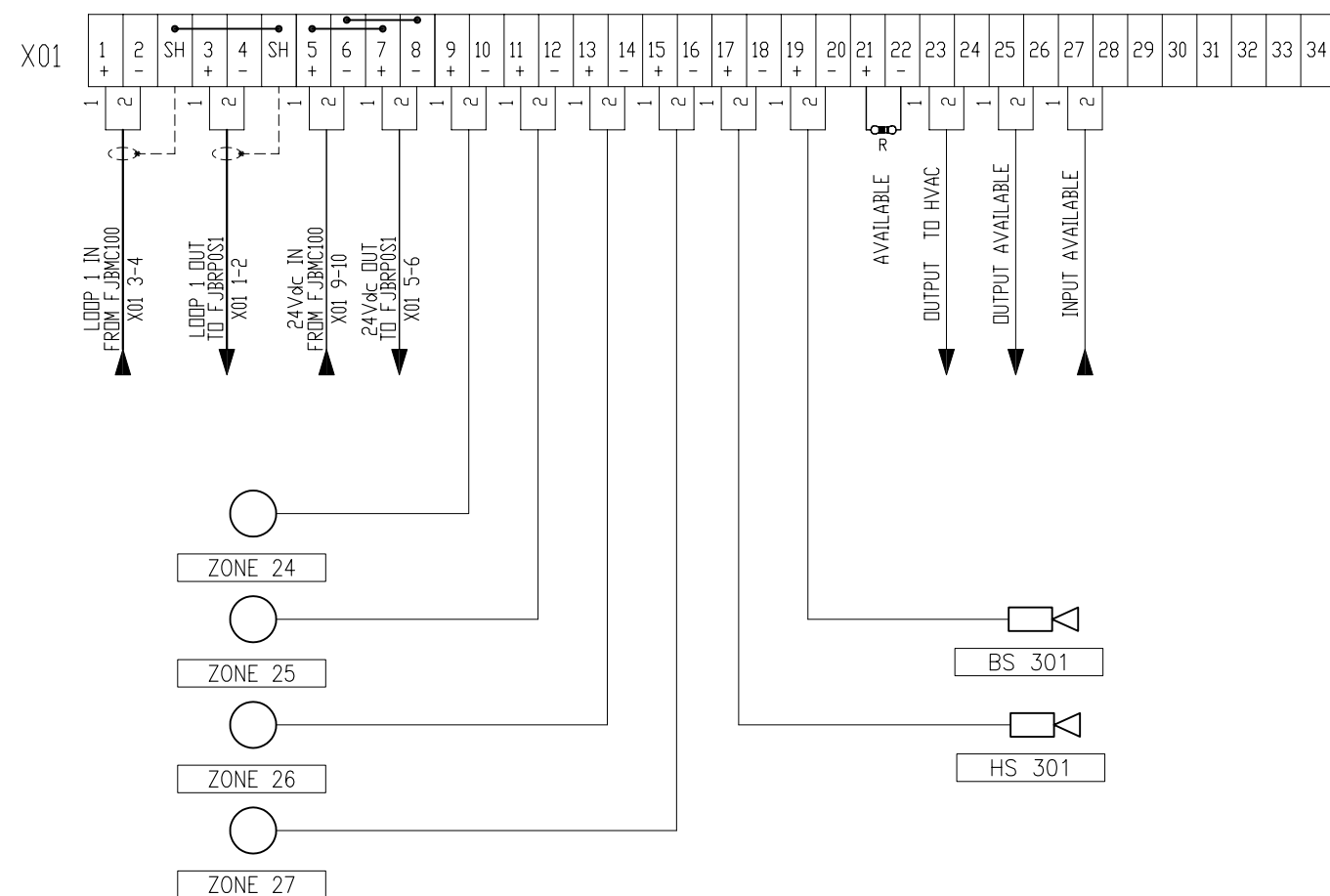
FG./Sh

02

SEG./NEXT

03





R: 10K Ω – 0,25W
LC: HOCHIKI TE-RH-E

SANCO S.p.A. Fire Protection and Safety Technology

VIA RAVIZZA 13/A – 28066 GALLIATE (NO) ITALY

COMMESSA / JOB

G3939/10

DISEGNO / DRAWING

SA-013524-055

REV. / REV.

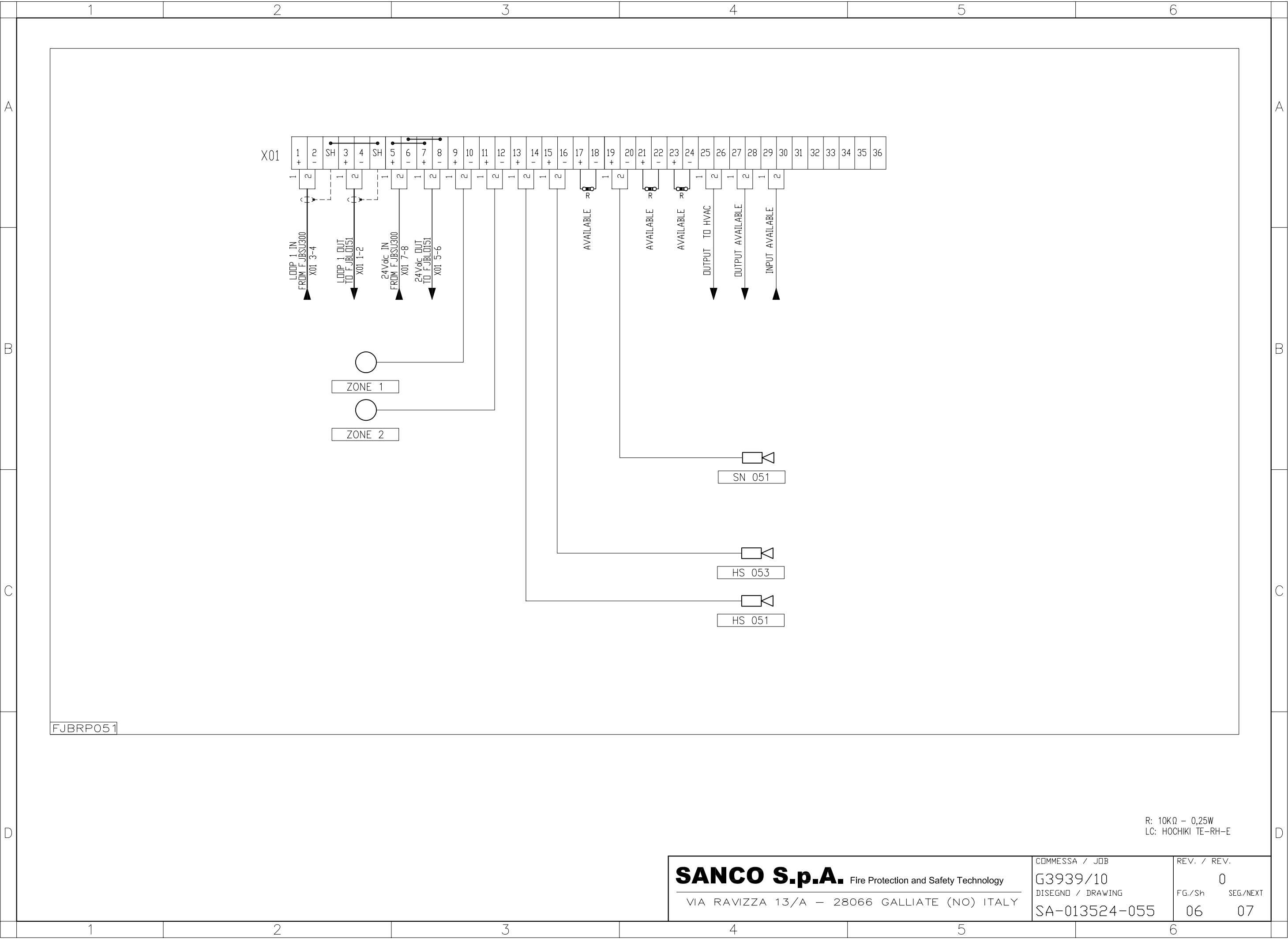
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FG./Sh

SEG./NEXT

05

06



R: 10KΩ - 0,25W
LC: HOCHIKI TE-RH-E

SANCO S.p.A.

Fire Protection and Safety Technology

VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY

COMMESSA / JOB

G3939/10

DISEGNO / DRAWING

SA-013524-055

REV. / REV.

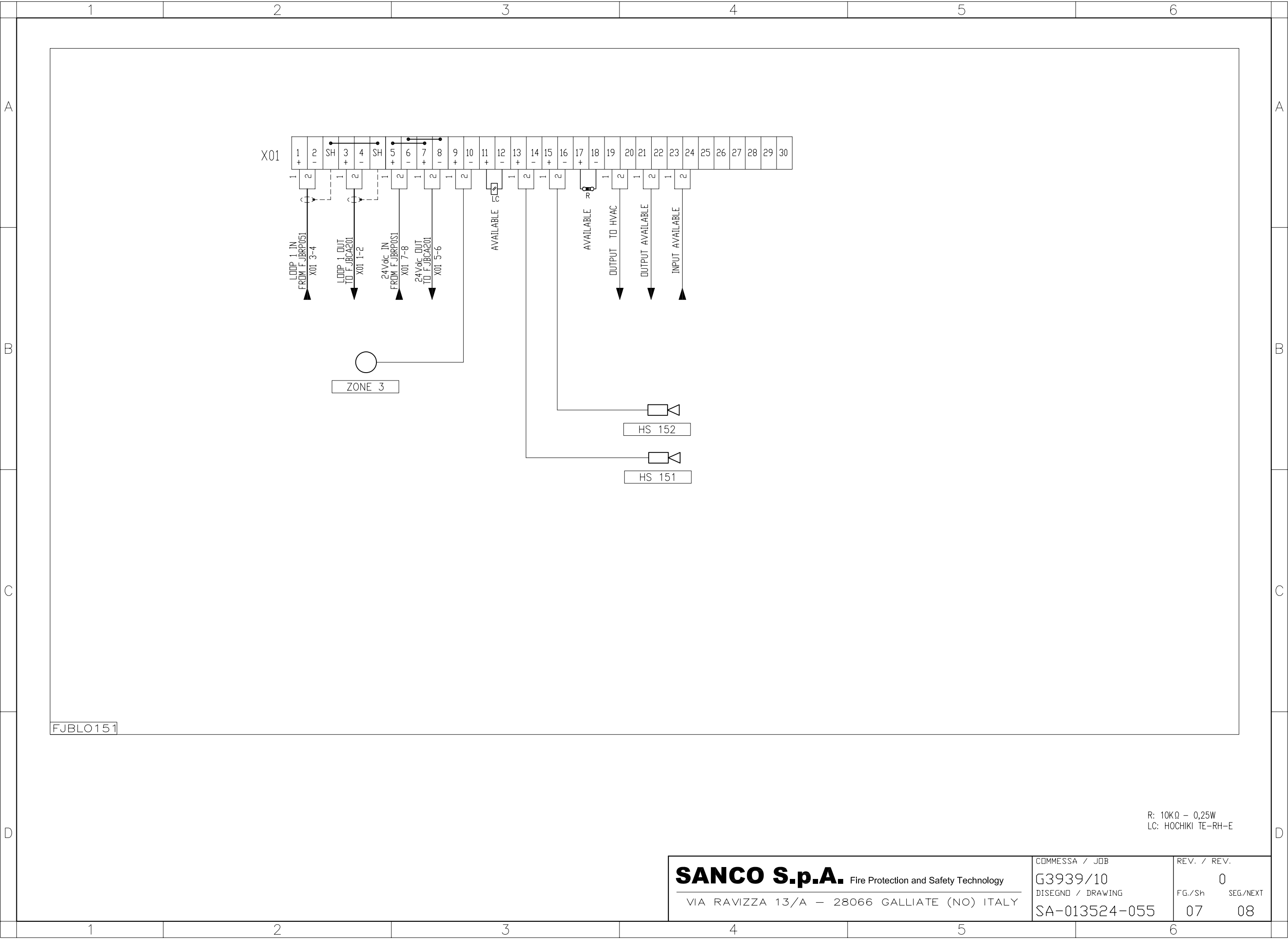
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FG./Sh

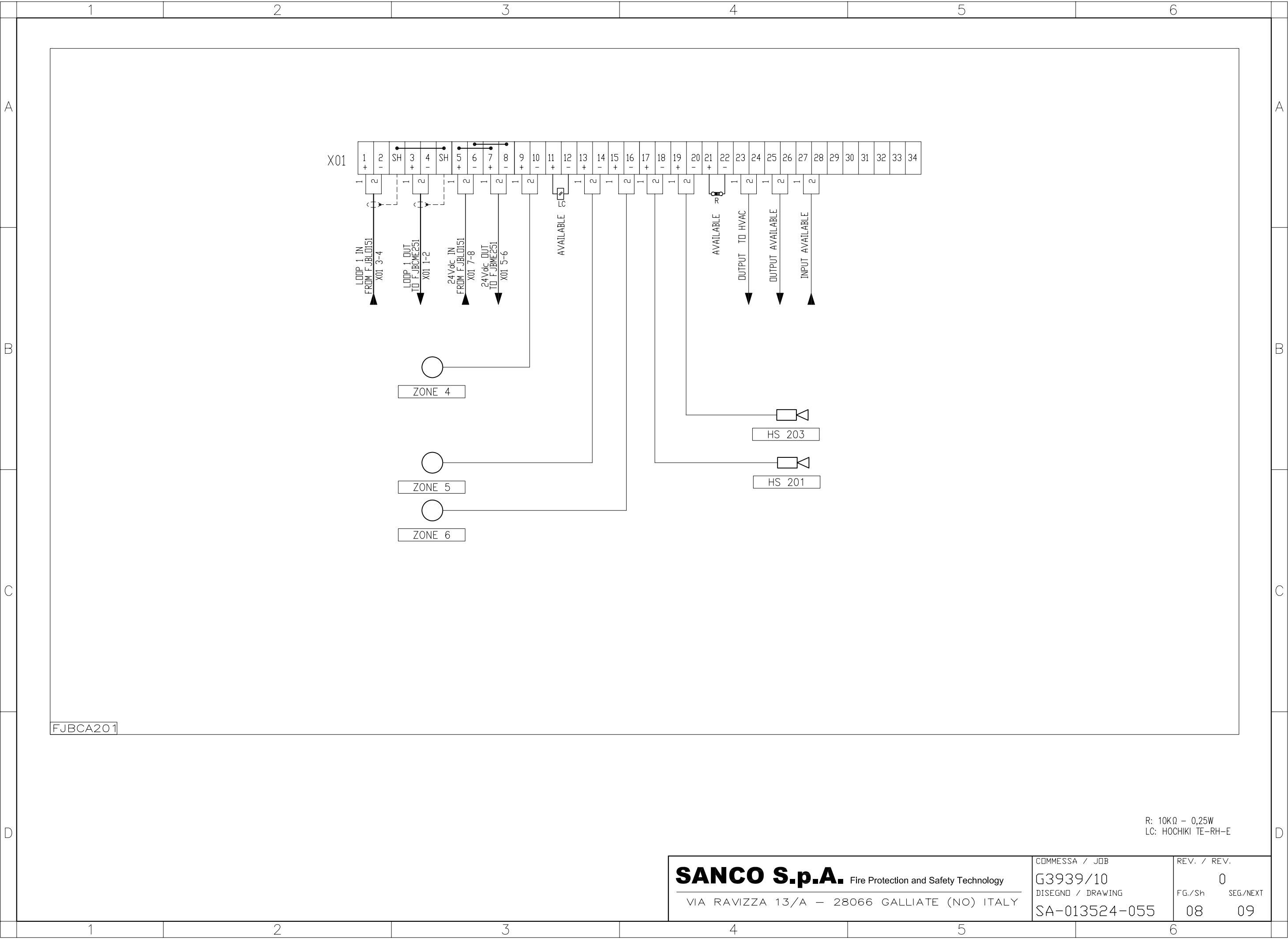
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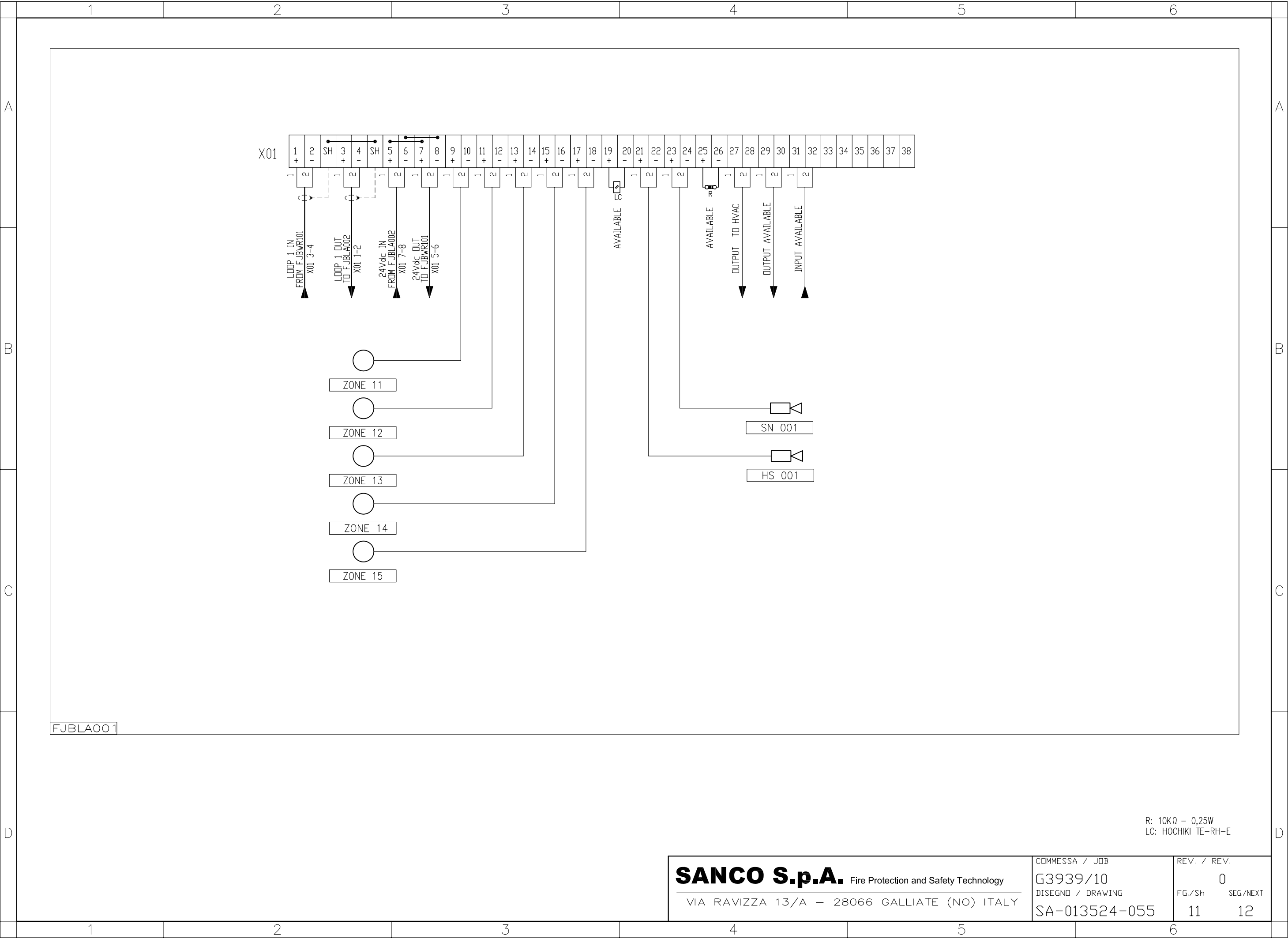
SEG./NEXT

07



R: 10KΩ – 0,25W
LC: HOCHIKI TE-RH-E





R: 10K Ω - 0,25W
LC: HOCHIKI TE-RH-E

SANCO S.p.A. Fire Protection and Safety Technology

VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY

COMMESSA / JOB

G3939/10

DISEGNO / DRAWING

SA-013524-055

REV. / REV.

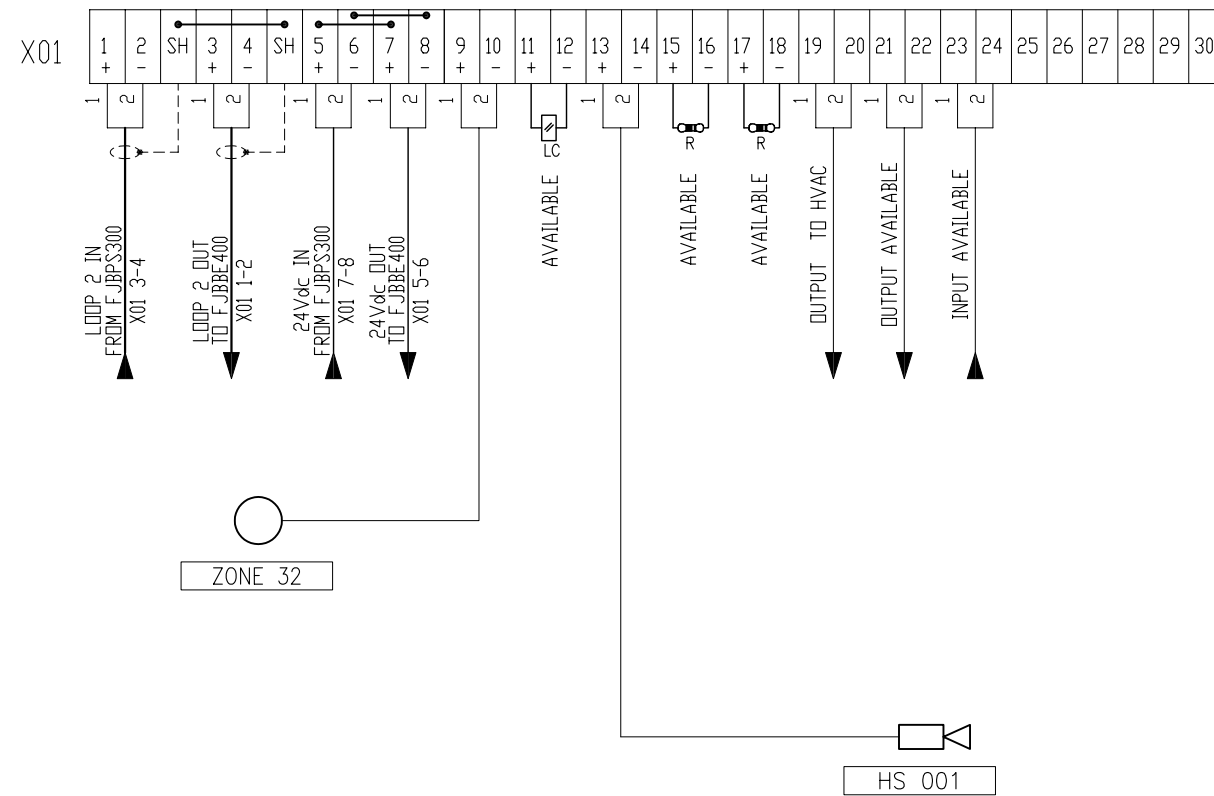
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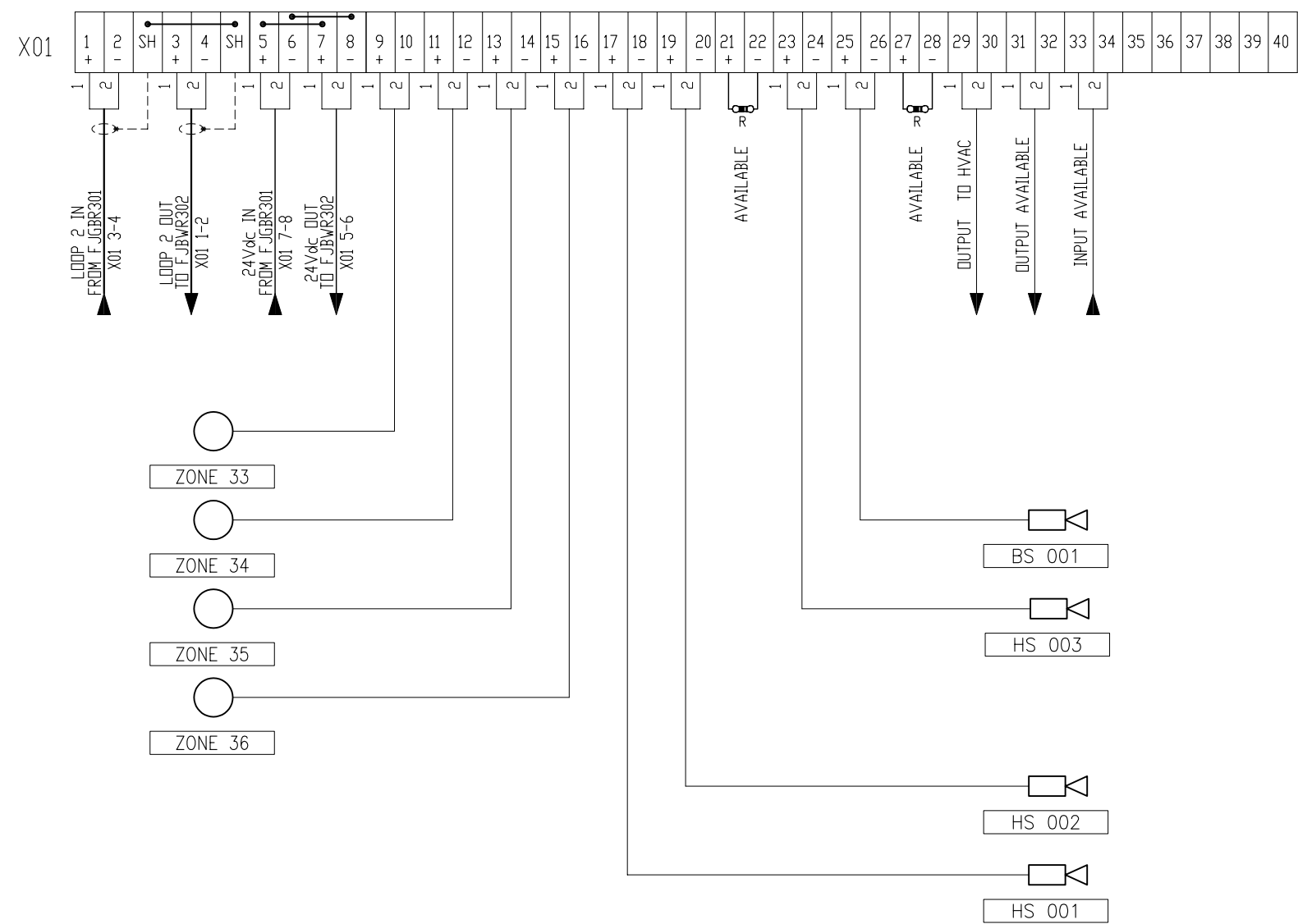
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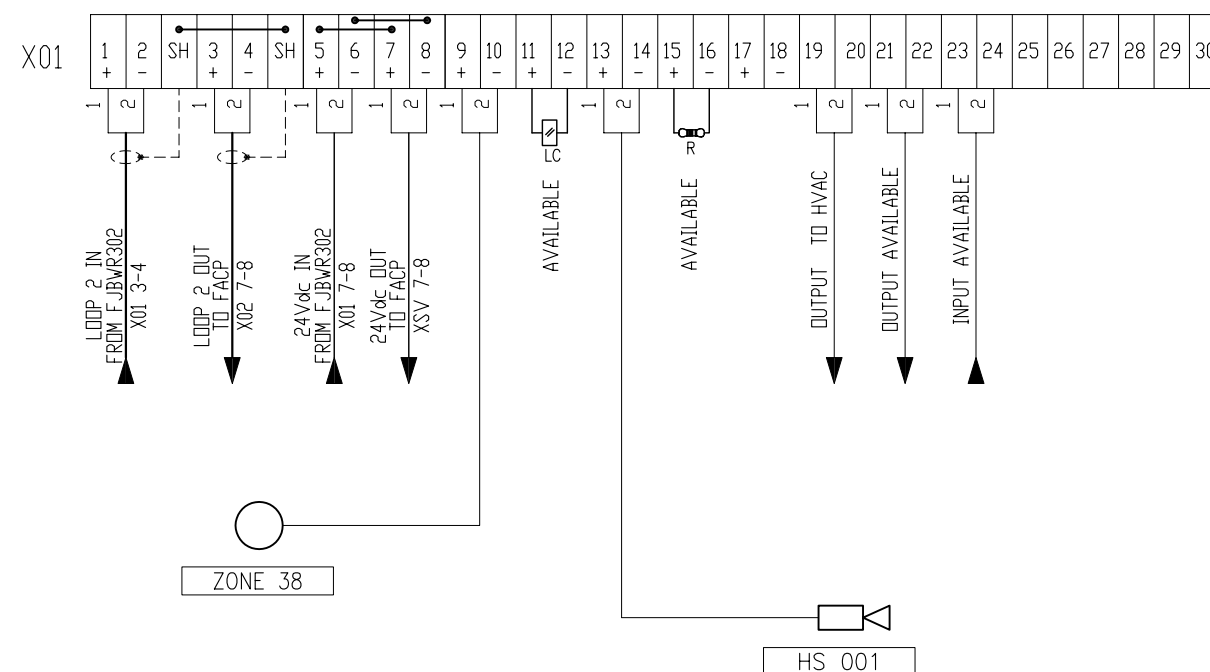
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R: 10K Ω – 0,25W
LC: HOCHIKI TE-RH-E



R: 10K Ω – 0,25W
LC: HOCHIKI TE-RH-E



0	07/12/10	ISSUED FOR INFORMATION	M. LAURO	E. RAMO'	D. PORZIO
REV.	DATA DATE	EMISSIONE ISSUE	DISEGN. DRAWN.	CONTR. CHECKED.	APPR. APPROVED
SANCO S.p.A. Fire Protection and Safety Technology VIA RAVIZZA 13/A – 28066 GALLIATE (NO) ITALY			COMMESSA JOB F3939/10		
			CLIENTE CUSTOMER IRASCO		
TITOLO / TITLE GHADIR DIRECT REDUCTION PROJECTS FIRE DETECTION & ALARM SYSTEM DATA SHEET			SCALA SCALE —		
			CODICE CODE —		
			FOGLIO DI SHEET 1 OF 107		
A TERMINE DI LEGGE LA SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. SI RISERVA LA PROPRIETA' DEL PRESENTE DISEGNO E NE VIETA LA RIPRODUZIONE O LA DIVULGAZIONE, ANCHE PARZIALE, A TERZI SENZA IL PROPRIO BENESTARE.			THIS DRAWING IS LEGALLY EXCLUSIVE PROPERTY OF SANCO FIRE PROTECTION AND SAFETY TECHNOLOGY S.p.A. AND IT CAN NEITHER REPRODUCED NOR SHOWN, ALSO PARTIAL, TO THIRD PARTIES WITHOUT OUR WRITTEN ASSENT.		
			DISEGNO DRAWING SA-013524-054		

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4	SA-013651-DS-A4	BASE DETECTOR MODEL YBN-R/6	1
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SANCO S.p.A. Fire Protection and Safety Technology

VIA RAVIZZA 13/A - 28066 GALLIATE (NO) ITALY

COMMESSA/JOB

G3939/10

DISEGNO/DRAWING

SA-013524-054

REV./REV.

0

FG/SH

2

DI/OF

107

Titolo/Title

**CONVENTIONAL TEMPERATURE HEAT DETECTOR MODEL DCD-AE3
RIVELATORE DI TEMPERATURA CONVENZIONALE MODELLO DCD-AE3**

Documento No / Document No

SA-013642-DS-A4

Fg./Sh

1

Di/Of

1**TECHNICAL DATA:**

Ordering Code.....DCD-AE3
Operating Voltage.....9.5-30V.d.c.
Operating Temp. Range.....-10°C to +50°C
Maximum Humidity.....95%RH Non Condensing (at 40°C)
Ingress protection.....IP63
Diameter.....100mm
Height With Base.....46mm
Compatible Bases.....YBN-R6, YBO-6R
Weight.....76g
Case material.....ABS
Colour.....white

DATI TECNICI:

Codice d'ordine.....DCD-AE3
Tensione di lavoro.....9.5-30V.d.c.
Temperatura di lavoro.....-10°C to +50°C
Umidità massima.....95%RH senza condensa (a 40°C)
Grado di protezione.....IP63
Diametro.....100mm
Altezza con base.....46mm
Basi compatibili.....YBN-R6, YBO-6R
Peso.....76g
Materiale involucro.....ABS
Colore.....bianco

dimensions in mm

dimensione in mm

0	01/06/10	ISSUED/EMESSO	S.INTRESSALVI	E.RAMO'	D.PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emesso	Check/Contr.	Approval/App

Title/Titolo

BASE MODEL YBN-R/6
BASE MODELLO YBN-R/6

Document No / Documento No

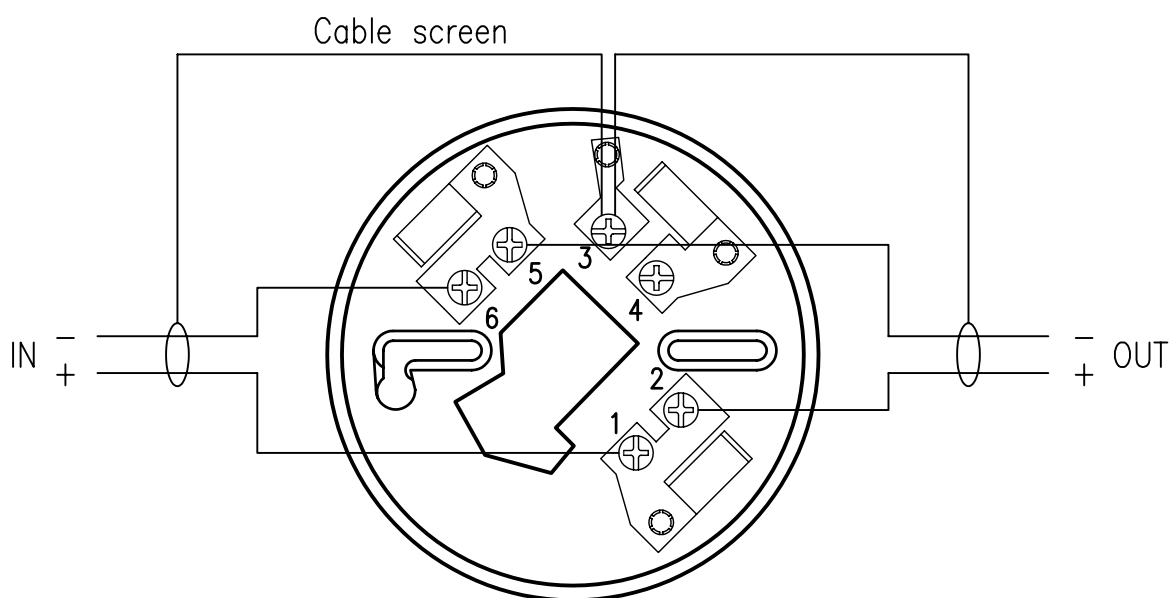
SA-013588-DS-A4

Sh./Fg.

1

Of/Di

1



TECHNICAL DATA:

Ordering Code.....YBN-R/6
Maximum Humidity.....95%RH Non Condensing (at 40°C)
Diameter.....100mm
Height.....8mm
Weight.....51g
Colour.....White

dimensions in mm

DATI TECNICI:

Codice d'ordine.....YBN-R/6
Umidità massima.....95%RH senza condensa (a 40°C)
Diametro.....100mm
Altezza.....8mm
Peso.....51g
Colore.....bianco

dimensione in mm

0	01/06/10	ISSUED/EMESSO	S.INTRESSALVI	E.RAMO'	D.PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emesso	Check/Cont	Approval/App

TITLE / TITOLO

SMOKE DETECTOR RIVELATORE DI FUMO

DOCUMENT N° / N° DOCUMENTO

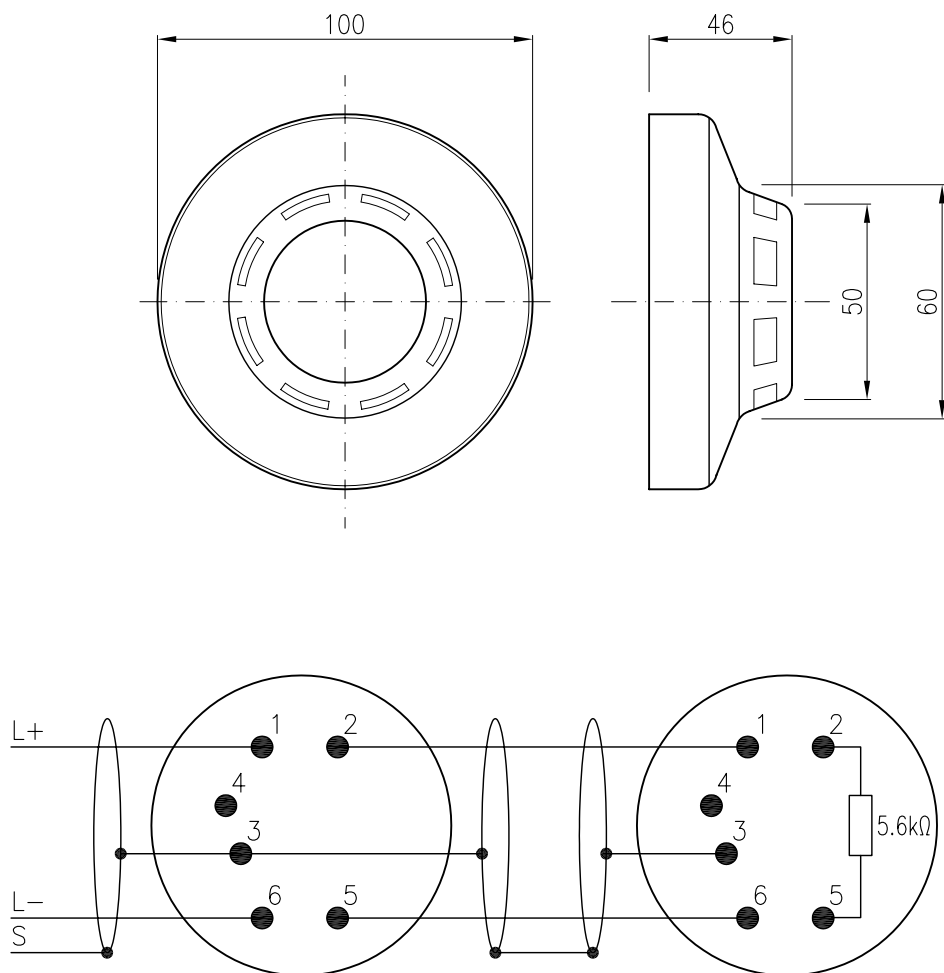
SA-013640-DS-A4

SH / FG

1

OF / DI

1



FIRST DETECTOR/PRIMO RIVELATORE

LAST DETECTOR/ULTIMO RIVELATORE

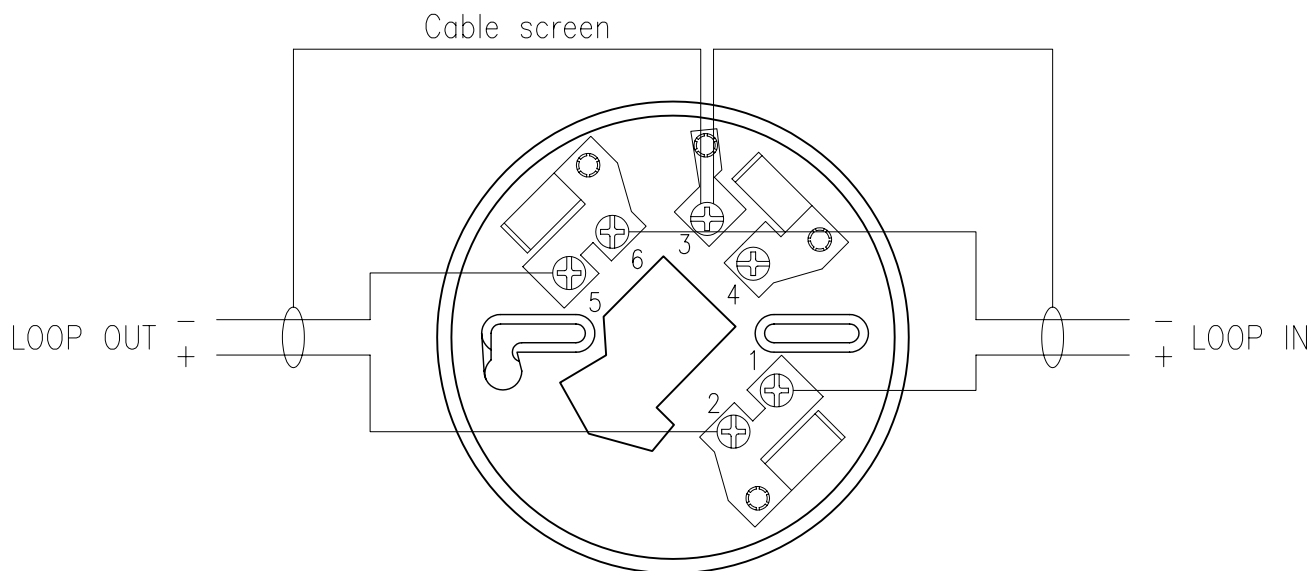
TECHNICAL DATA:

Model.....SLR-E3
Type.....photoelectrical
Operating voltage.....9.5 ÷ 30 Vdc
Maxim current alarm.....40 mA
Operating temperature.....-10 ÷ +50 °C
Storage temperature.....-30 ÷ +60 °C
Max operative damp.....95%RH-without condensation (40°C)
Material.....ABS
Color.....ivory
Protection rating.....IP42
Approval.....EN54 – part 7 LPCB
Weight.....145 g
Manufacturer.....Hochiki
dimensions in mm

DATI TECNICI:

Modello.....SLR-E
Tipo.....fotoelettrico
Tensione di lavoro.....9.5 ÷ 30 Vcc
Massima corrente dall'allarme.....40 mA
Temperatura di lavoro.....-10 ÷ +50 °C
Temperatura di stoccaggio.....-30 ÷ +60 °C
Max umidità operativa.....95%RH-senza condensa (40°C)
Materiale.....ABS
Colore.....avorio
Grado di protezione.....IP42
Approvazione.....EN54 – parte 7 LPCB
Peso.....145 g
Costruttore.....Hochiki
dimensioni in mm

A	01/06/10	ISSUED/EMESSO	S. INTRESSALVI	E. RAMO'	D. PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emesso	Checked/Controllato	Approved/Approvato

**TECHNICAL DATA:**

Ordering Code.....YBN-R/3
Maximum Humidity.....95%RH Non Condensing (at 40°C)
Diameter.....100mm
Height.....8mm
Weight.....50g
Colour.....White

dimensions in mm

DATI TECNICI:

Codice d'ordine.....YBN-R/3
Umidità massima..... 95%RH senza condensa (a 40°C)
Diametro.....100mm
Altezza.....8mm
Peso.....50g
Colore.....bianco

dimensione in mm

0	31/05/10	ISSUED/EMESSO	C.P.	C.P.	D.P.
Rev.	Data/Date	Descrizione/Description	Emes/Issued	Cont/Check	App/Approval

TITLE / TITOLO

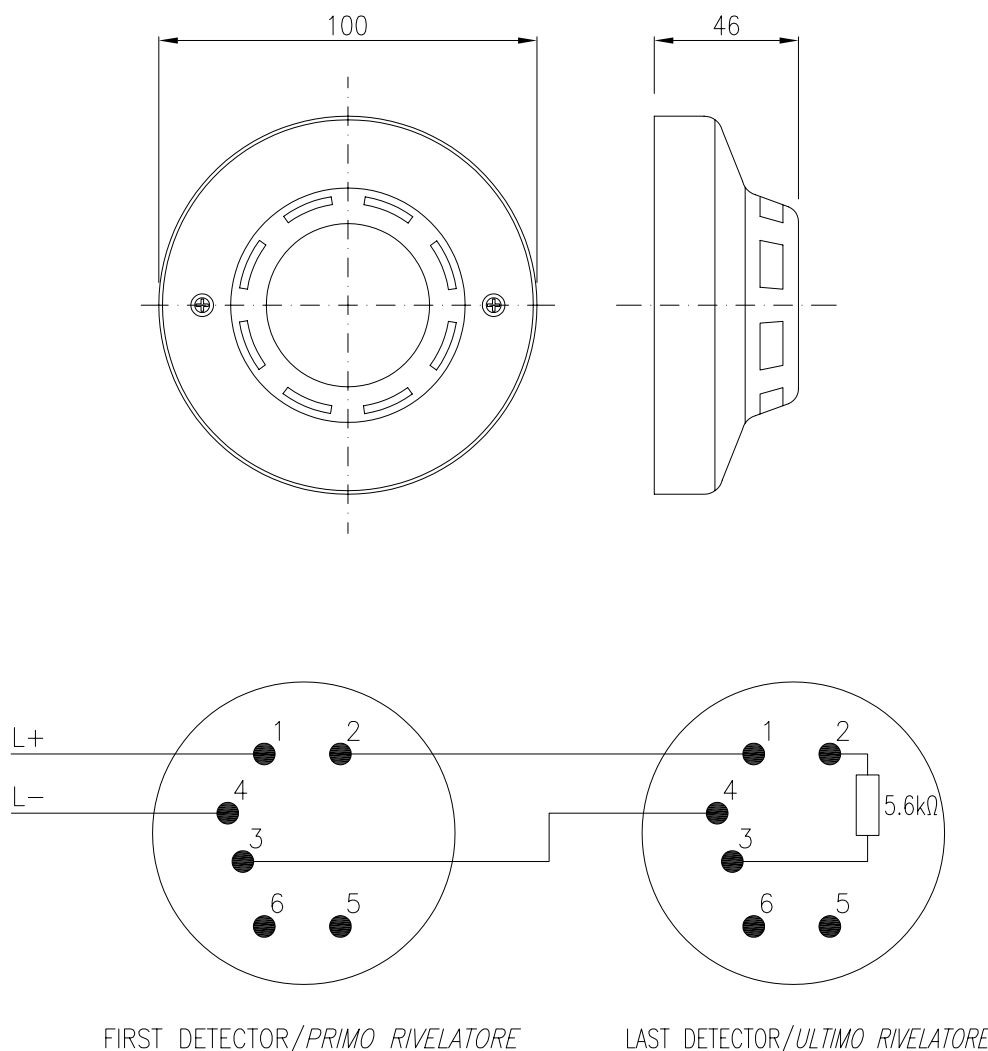
PHOTOELECTRIC SMOKE DETECTOR RIVELATORE DI FUMO FOTOELETTRICO

DOCUMENT N° / N° DOCUMENTO

SA-013816-DS-A4

SH / FG OF / DI

1 1



TECHNICAL DATA:

Model.....SLR-835
 Type.....photoelectrical
 Operating voltage.....8.0 ÷ 35 Vdc
 Maxim current alarm.....150 mA Max
 Operating temperature.....0 ÷ +49 °C
 Max operative damp.....95%RH-without condensation (40°C)
 Material.....ABS
 Color.....white
 Weight.....145 g
 Manufacturer.....Hochiki

DATI TECNICI:

Modello.....SLR-835
 Tipo.....fotoelettrico
 Tensione di lavoro.....8.0 ÷ 35 Vcc
 Massima corrente dall'allarme.....150 mA Max
 Temperatura di lavoro.....0 ÷ +49 °C
 Max umidità operativa.....95%RH-senza condensa (40°C)
 Materiale.....ABS
 Colore.....bianco
 Peso.....145 g
 Costruttore.....Hochiki

dimensions in mm

dimensioni in mm

A	02/10/10	ISSUED/EMESSO	S. INTRESSALVI	E. RAMO'	D. PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emesso	Checked/Controllato	Approved/Approvato

Title/Titolo

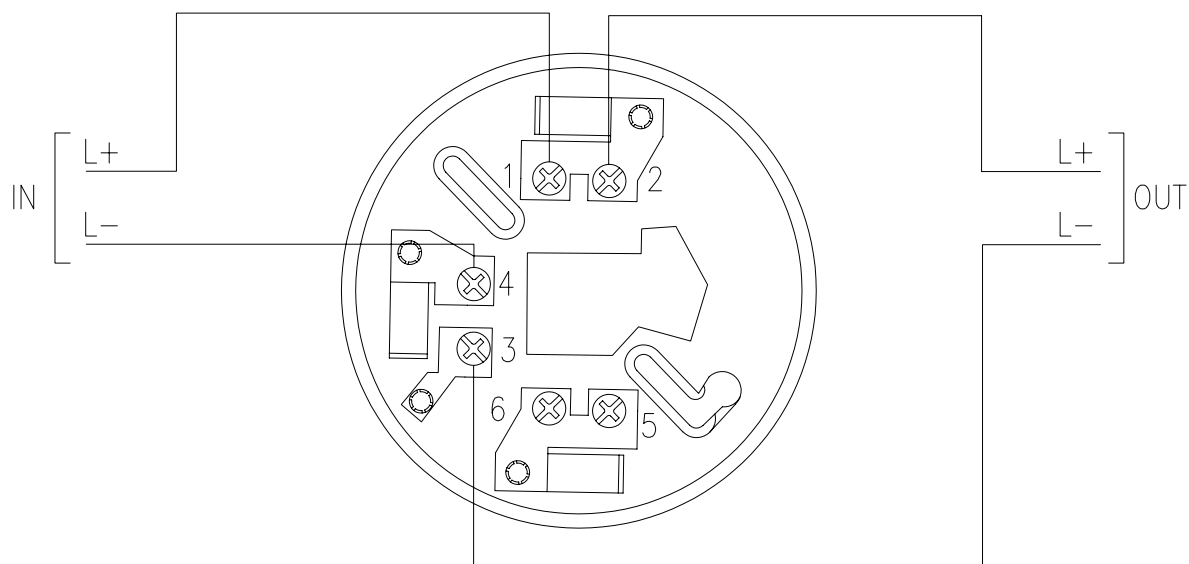
**BASE MODEL NS4-100
BASE MODELLO NS4-100**

Document No / Documento No

SA-013817-DS-A4

Sh./Fg.

Of/Di

1**1****TECHNICAL DATA:**

Ordering Code..... NS4-100
Maximum Humidity.....95%RH Non Condensing (at 40°C)
Diameter.....100mm
Height.....8mm
Weight.....51g
Colour.....White

dimensions in mm

DATI TECNICI:

Codice d'ordine..... NS4-100
Umidità massima..... 95%RH senza condensa (a 40°C)
Diametro.....100mm
Altezza.....8mm
Peso.....51g
Colore.....bianco

dimensione in mm

0	02/11/10	ISSUED/EMESSO	S.INTRESSALVI	E.RAMO'	D.PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emesso	Check/Cont	Approval/App

Title/Titolo

**WATER PROOF - ALARM PUSH BUTTON OR CO2 DISCHARGE
PULSANTE DI ALLARME O COMANDO SCARICA**

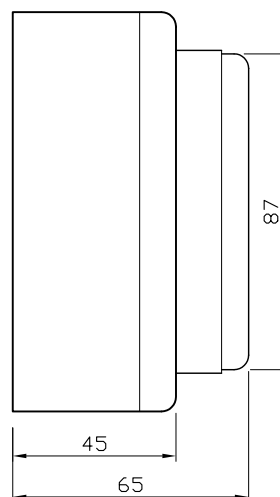
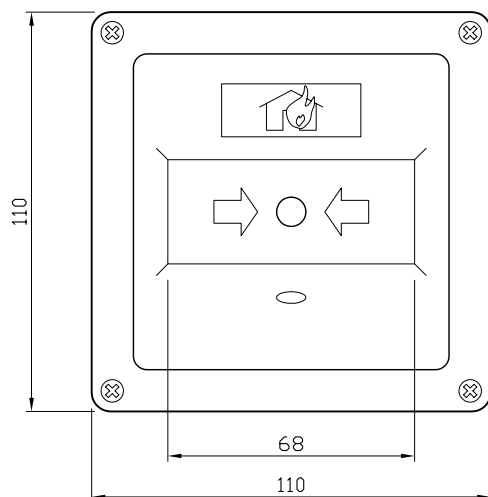
Document No / Documento No

SA-013523-DS-A4

Fg./Sh

1

Di/Of

1**TECHINCAL DATA:**

Model.....MOD-2570 W
Materials.....thermoplastic, red colour
Protection degree.....IP 67
Temperature.....-25 + 70° C
Operating voltage.....24 Vcc
Manufacturer.....Sicurtron or equivalent

dimensioni in mm

DATI TECNICI:

Modello.....MOD-2570 W
Materiale.....termopalstico, colore rosso
Grado di protezione.....IP 67
Temperatura.....-25 + 70° C
Tensione operativa.....24 Vcc
Costruttore.....Sicurtron o equivalente

dimensioni in mm

1	01/06/10	REVISED/REVISIONATO	S.INTRESSALVI	E.RAMO'	D.PORZIO
0	19/04/10	ISSUED/EMESSO	G.RIZZUTO	G.MASSARA	D.PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emesso	Check/Contr.	App/Approval

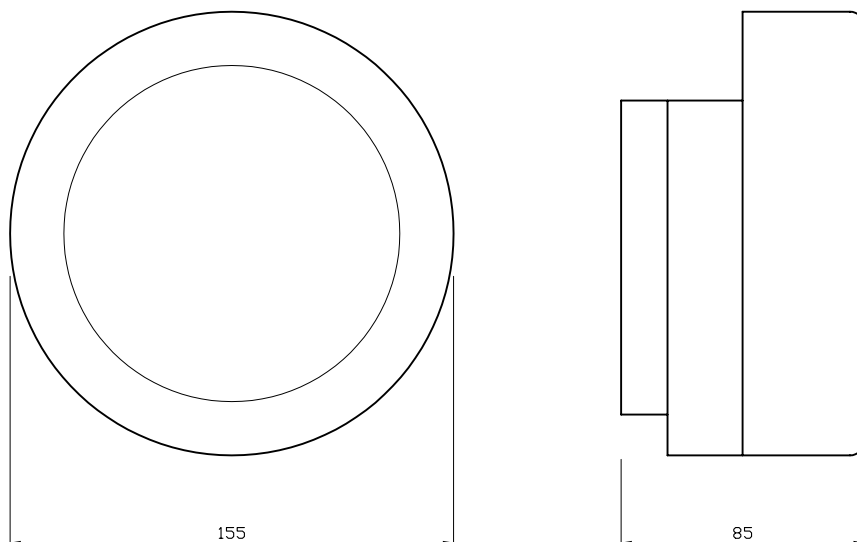
Title/Titolo

FIRE ALARM ELECTRONIC BELL MOD. 4479-24
SIRENA DI ALLARME INCENDIO ELETTRONICA MOD. 4479-24

Document No / Documento No

SA-013645-DS-A4

Sh/Fg. Of/Di

1 1**TECHNICAL DATA**

Model.....4479-24
Housing.....Polycarbonate
Connection.....4x2,5mm² terminals
Colour.....red
Power supply.....18÷30 Vdc
Absorption.....30 mA @ 24 Vdc
Acoustic output @ 1m.....93/95dB
Protection degree.....IP 55
Working temperature.....-10 ÷ +55 °C
Weight.....1,1 Kg

dimensions in mm

DATI TECNICI

Modello.....4479-24
Materiale.....Polycarbonato
Connessione.....morsetti 4x2,5mm²
Colore.....rosso
Alimentazione.....18÷30 Vcc
Consumo.....30mA @ 24Vcc
Frequenza acustica ad 1m.....93/95 dB
Grado di protezione.....IP 55
Temperatura di funzionamento.....-10 ÷ +55 °C
Peso.....1,1 Kg

dimensioni in mm

0	01/06/10	EMESSO/ISSUED	S.INTRESSALVI	E.RAMO'	D.PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emes	Check/Cont	Approval/App

SANCO

S.p.A.

FIRE PROTECTION AND SAFETY TECHNOLOGY

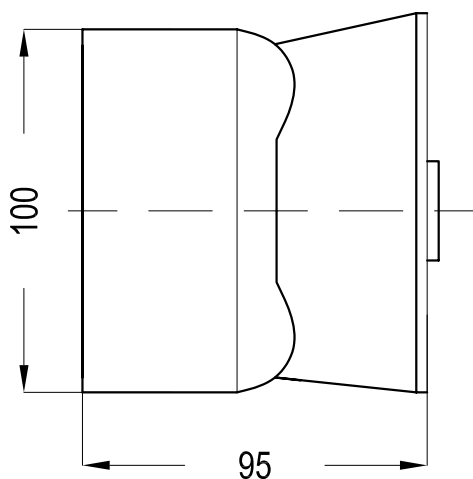
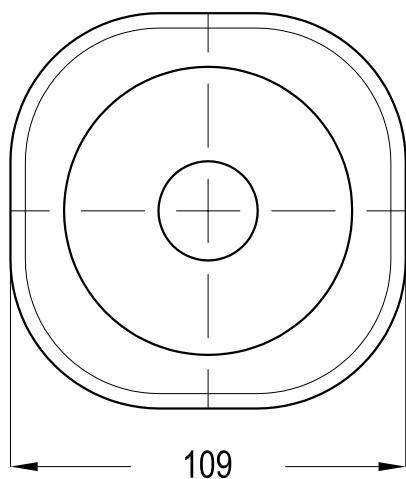
Title/Titolo

HORN ELECTRONIC SOUNDER MOD. 4831R
SIRENA DI ALLARME INCENDIO MOD. 4831R

Document No / Documento No

SA-013643-DS-A4

Sh./Fg. Of/Di

1 1**TECHNICAL DATA :**

Manufacturer Menvier
Model 4831R
Material Thermoplastic
Protection degree IP42
Sound power 120dB @ 1m
Supply and current absorption 24Vdc - 240mA

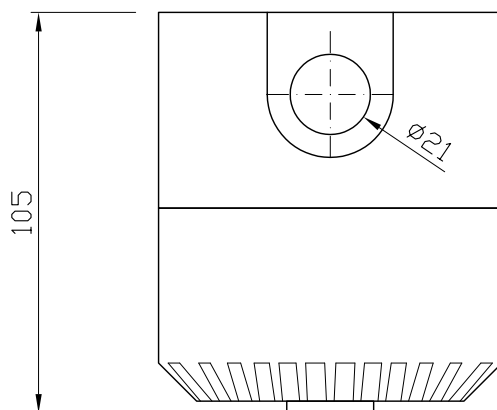
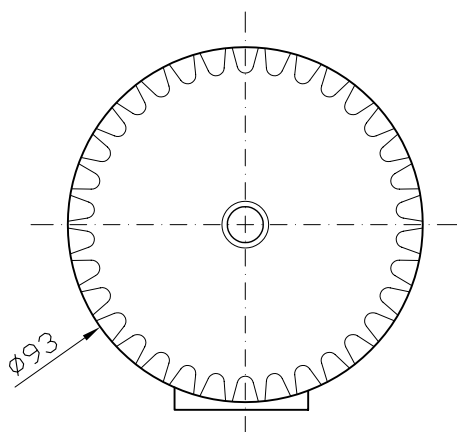
dimensions in mm

DATI TECNICI :

Costruttore Menvier
Modello 4831R
Materiale Termoplastico
Grado di protezione IP42
Intensità sonora 120dB @ 1m
Alimentazione e consumo 24Vcc - 240mA

dimensione in mm

0	09/06/10	ISSUED/EMESSO	S.INTRESSALVI	E.RAMO'	D. PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emesso	Check/Contr.	Approval/App.



TECHNICAL DATA

Model.....4481
Housing.....ABS plastic case
Connection.....terminal blocks
Colour base/cover.....red/red
Power supply.....20÷30 Vdc
Absorption.....45 mA @ 24 Vdc
Lamp.....Xenon 0.65 J
Flashlight frequency.....60 / min
Protection degree (with suitable cable gland).....IP 65
Working temperature.....-20 ÷ +55 °C
Weight.....350 g
Manufacturer.....CSA

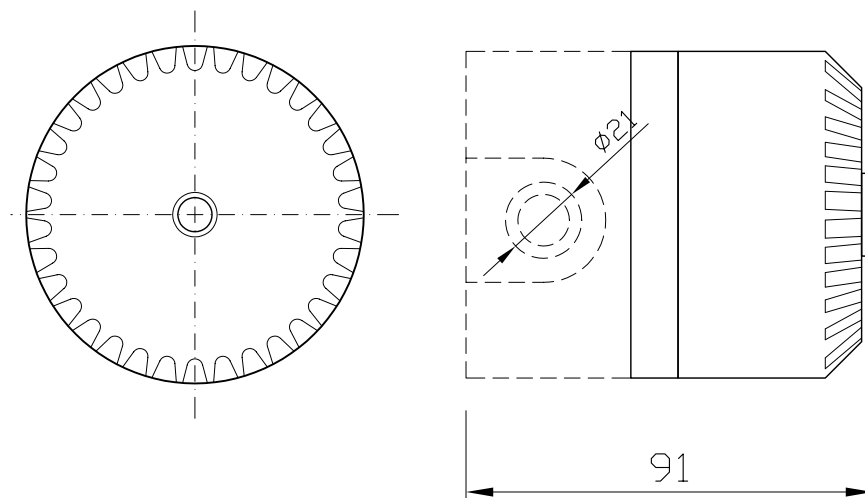
DATI TECNICI

Modello.....4481
Materiale.....termoplastico ABS
Connessione.....morsetti
Colore base/calotta.....rosso/rosso
Alimentazione.....20 ÷ 30 Vcc
Consumo.....45mA @ 24Vcc
Lampada.....Xeno 0.65 J
Frequenza lampeggio.....60 / min
Grado di protezione (con pressacavo adatto).....IP 65
Temperatura di funzionamento.....-20 ÷ +55 °C
Peso.....350 g
Costruttore.....CSA

dimensions in mm

dimensioni in mm

1	01/06/10	REVISED/REVISIONATO	S.INTRESSALVI	E.RAMO'	D.PORZIO
0	27/08/09	ISSUED/EMESSO	A.BIGANZOLI	R.BARBASSI	D.PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emesso	Check/Contr.	Approval/App.

**TECHNICAL DATA**

Model.....Roshni 4461
Housing.....ABS plastic case
Connection.....terminal blocks
Colours available.....red
Power supply.....9÷28 Vcc
Absorption.....8mA(a 12Vcc)–18mA(a 24Vcc)
Sound output.....100 dB a 1 mt.
Protection degree.....IP 65
Weight.....350 gr.
Manufacturer.....Fulleon Cooper or equivalent

DATI TECNICI

Modello.....Roshni 4461
Materiale.....termoplastico ABS
Connessione.....morsetti
Colori disponibili.....rosso
Alimentazione.....9÷28 Vcc
Consumo.....8mA(a 12Vcc)–18mA(a 24Vcc)
Pressione sonora.....100 dB a 1 mt.
Grado di protezione.....IP 65
Peso.....350 gr.
Costruttore.....Fulleon Cooper or equivalent

dimensions in mm

dimensioni in mm

2	01/06/10	REVISED/REVISIONATO	S.INTRESSALVI	E.RAMO'	D.PORZIO
1	19/04/10	REVISED/REVISIONATO	G.RIZZUTO	G.MASSARA	D.PORZIO
0	01/09/08	EMESSO/ISSUED	G.MASSARA	R.BARBASSI	D.PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emesso	Check/Contr.	App/Approval

Title/Titolo

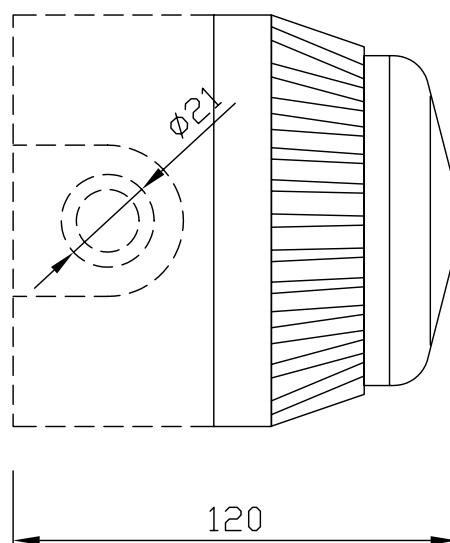
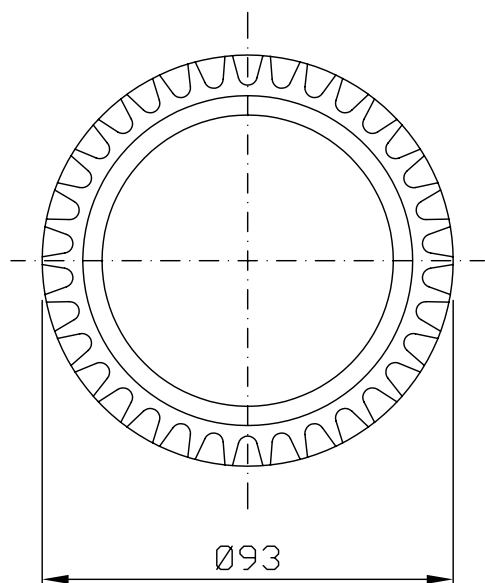
**HORN WITH BEACON
SIRENA CON LAMPEGGIATORE**

Document No / Documento No

SA-013659-DS-A4

Sh/Fg.

Of/di

1**1****TECHNICAL DATA**

Model.....Flash
Housing.....polycarbonate, colour red
Connection.....terminal blocks
Colours available.....red
Power supply.....18-30 Vcc
Absorption.....68 mA
Protection degree.....IP 65
Sound output.....101 dB a 1 mt.
Weight.....350 gr.
Manufacturer.....Fulleon Cooper

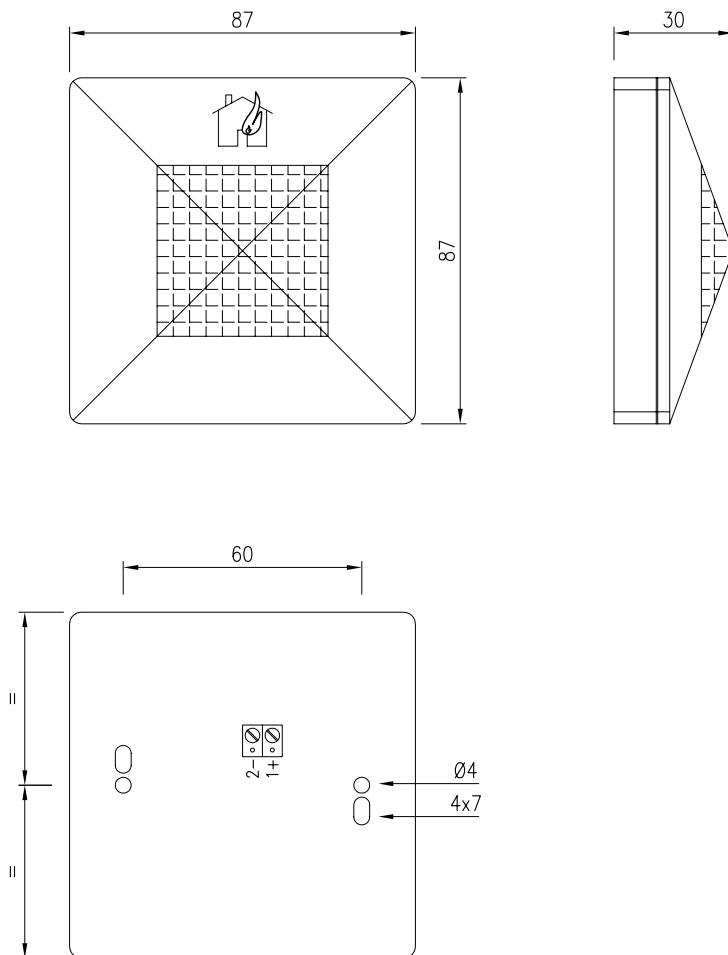
DATI TECNICI

Modello.....Flash
Materiale.....polycarbonato, colore rosso
Connessione.....morsetti
Colori disponibili.....rosso
Alimentazione.....18-30 Vcc
Consumo.....68 mA
Grado di protezione.....IP 65
Pressione sonora.....101 dB a 1 mt.
Peso.....350 gr.
Costruttore.....Fulleon Cooper

dimensions in mm

dimensioni in mm

0	01/06/10	EMESSO/ISSUED	S.INTRESSALVI	E.RAMO'	D.PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emes	Check/Cont	Approval/App



TECHNICAL DATA:

Material.....thermoplastic
Colour.....white
Type of connection.....clamp
Operating voltage.....7-24 Vdc
Operating current.....10mA
Operating temperature.....0°C to +60°C
Frequency of flashing.....60/min
Degree of protection.....IP40

DATI TECNICI:

Materiale.....termoplastico
Colore.....bianco
Tipo di connessione.....morsetti
Tensione di funzionamento.....7-24 Vdc
Corrente di funzionamento.....10mA
Temperatura di funzionamento.....0°C a +60°C
Frequenza del lampeggio.....60/min
Grado di protezione.....IP40

dimensions in mm

dimensione in mm

0	01/06/10	ISSUED/EMESSO	S.INTRESSALVI	E.RAMO'	D.PORZIO
Rev.	Data/Date	Descrizione/Description	Emes/Issued	Cont/Check	App/Approval

Titolo/Title

SIGN BOARD MODEL 5553
PANNELLO DI SEGNALAZIONE MODELLO 5553

Documento No / Document No

SA-013818-DS-A4

Fg./Sh

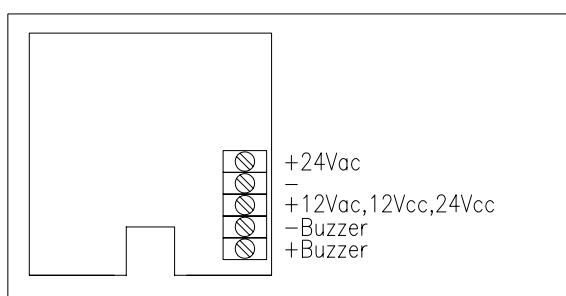
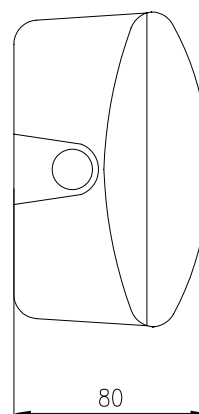
1

Di/Of

1

dimensions in mm

dimensione in mm

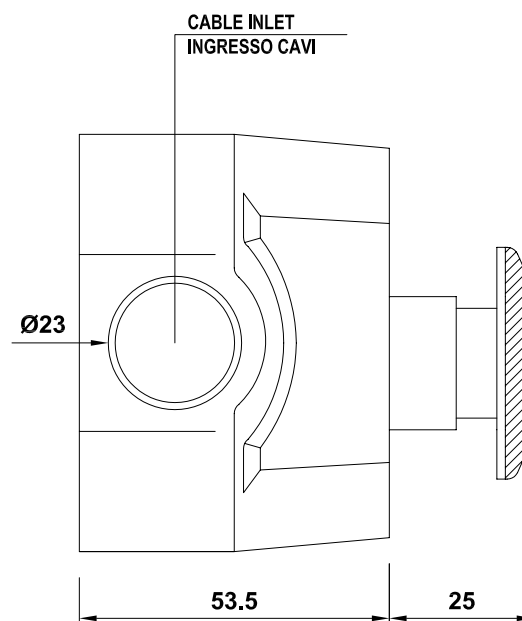
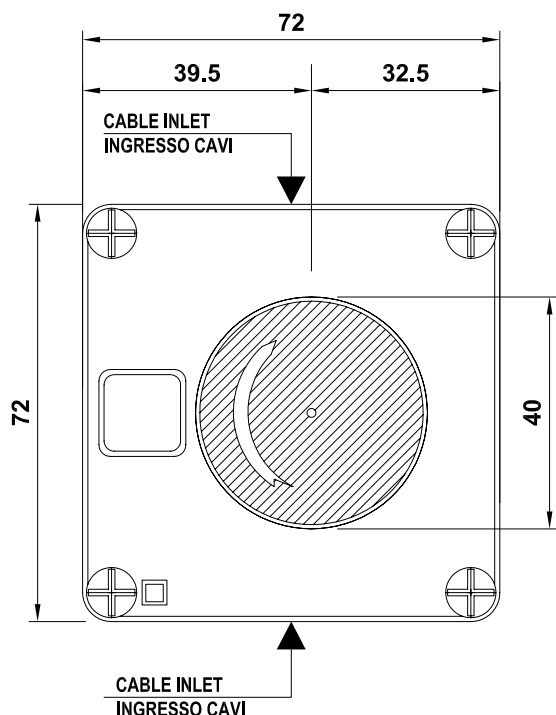
**TECHNICAL DATA:**

Housing material.....self-extinguishing thermoplastic
Housing color.....white
Diffuser material.....self-extinguishing polycarbonate
Diffuser color.....clear
Connection type.....terminals
Operating temperature.....-10°C to +50°C
Protection degree.....IP65
Buzzer sound output.....1 meter: 108dB
Rated voltage.....24Vdc
Rated current.....65mA
Weight.....0,75kg

DATI TECNICI:

Materiale contenitore.....termoplastico autoestinguente
Colore contenitore.....bianco
Materiale diffusore.....polycarbonato autoestinguente
Colore diffusore.....trasparente
Tipo di connessione.....a morsetti
Temperatura di funzionamento.....-10°C a +50°C
Grado di protezione.....IP65
Pressione sonora buzzer.....1 metro: 108dB
Tensione nominale.....24Vdc
Corrente nominale.....65mA
Peso.....0,75kg

0	02/11/10	ISSUED/EMESSO	S. INTRESSALVI	E. RAMO'	D. PORZIO
Rev.	Data/Date	Descrizione/Description	Emes/Issued	Cont/Check	App/Approval



TECHNICAL DATA

Model.....Junction box P9 c/w mushroom button
Type.....Twist to release
Material.....Thermoplastic
Colour push button.....red
Protection degree.....IP 66

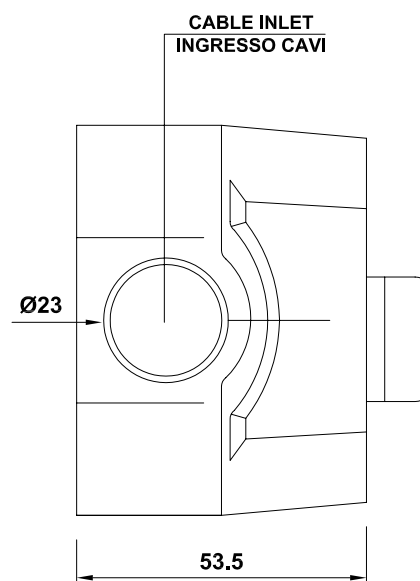
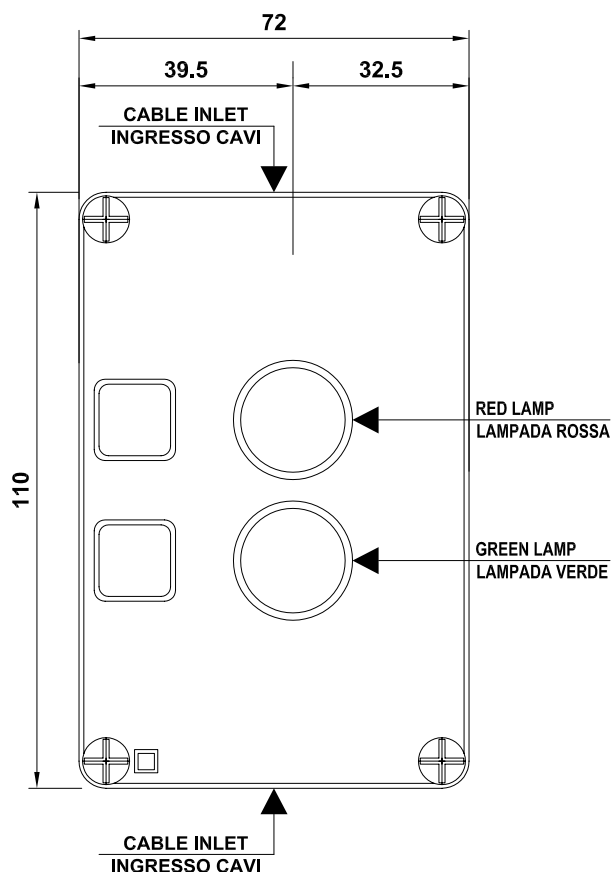
dimensions in mm

DATI TECNICI

Modello.....scatola P9 completa di pulsante a fungo
Tipo.....Sblocco a rotazione
Materiale.....Termoplastico
Colore. pulsante.....rosso
Grado di protezione.....IP 66

dimensioni in mm

0	02/11/10	EMESSO/ISSUED	S.INTRESSALVI	E.RAMO'	D.PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emes	Check/Cont	Approval/App



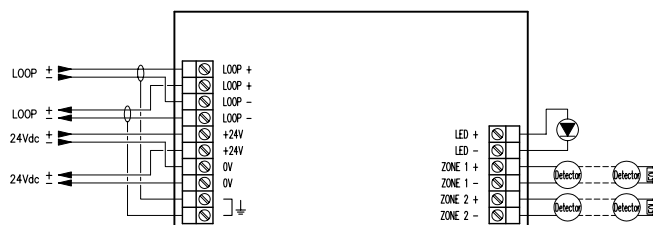
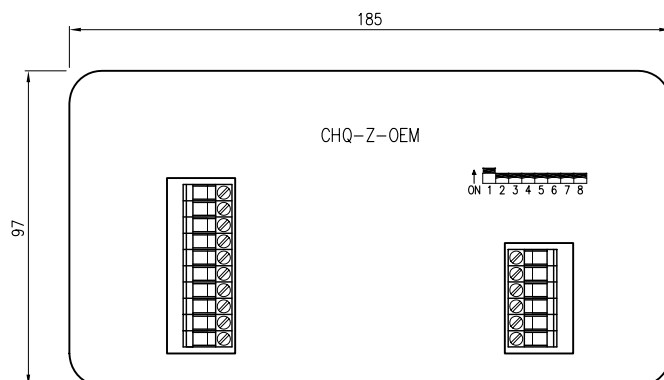
TECHNICAL DATA

Model.....Junction box P9 c/w lamp
Housing.....Thermoplastic
Colour lamp.....green/red
Operating voltage.....24Vdc
Protection degree.....IP 66
dimensions in mm

DATI TECNICI

Modello.....scatola P9 completa di lampade
Materiale.....Termoplastico
Colore lampade.....verde/rosso
Tensione di funzionamento.....24Vdc
Grado di protezione.....IP 66
dimensioni in mm

0	02/11/10	EMESSO/ISSUED	S.INTRESSALVI	E.RAMO'	D.PORZIO
Rev.	Date/Data	Description/Descrizione	Issued/Emes	Check/Cont	Approval/App



ADDRESS SETTING
IMPOSTAZIONE INDIRIZZO

- The address is set using the first 7 switches
- L'indirizzo si imposta utilizzando i primi 7 switch

[illegible]

TECHNICAL DATA:

TECHNICAL DATA

Material body.....	ABS
Color.....	white
Operating temperature.....	-10°C / +50°C
Umidità massima.....	80% RH non condensata
Operating voltage.....	17-31 Vcc
Quiescent current.....	300 uA
Absorption on functioning.....	70 mA

DATI TECNICI:

Materiale del contenitore..... ABS
 Colore..... bianco
 Temperatura di funzionamento..... -10°C / +50°C
 Maximum humidity..... 80% uncondensed
 Tensione di funzionamento..... 17-31 Vcc
 Assorbimento a riposo..... 300 uA
 Assorbimento in funzionamento..... 70 mA

dimensions in mm

dimensione in mm

0	23/09/09	ISSUED/EMESSO	C.B.	C.P.	D.P.
Rev.	Data/Date	Descrizione/Description	Emes/Issued	Cont/Check	App/Approval

Titolo/Title
ANALOGIC DUAL OUTPUT CIRCUIT AND ONE MONITOR MODEL CHQ-DSC/DIN(SCI)
CIRCUITO DOPPIA USCITA ANALOGICA E UN INGRESSO SUPERVISIONATI MODELLO CHQ-DSC/DIN(SCI)

Documento No / Document No
SA-013613-DS-A4

Fg./Sh **1** *Di/Of* **1**



ADDRESS SETTING IMPOSTAZIONE INDIRIZZO

- The address is set using the first 7 switches of SW1
- L'indirizzo si imposta utilizzando i primi 7 switch di SW1

1	2	3	4	5	6	7	IND.	1	2	3	4	5	6	7	IND.	1	2	3	4	5	6	7	IND.	1	2	3	4	5	6	7	IND.	1	2	3	4	5	6	7	IND.	1	2	3	4	5	6	7	IND.	1	2	3	4	5	6	7	IND.	1	2	3	4	5	6	7	IND.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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□=OFF
■=ON

- Exclusion monitoring INPUT = switch 8 of SW1 in the ON
- Esclusione monitoraggio INPUT = switch 8 di SW1 in ON

- Exclusion monitoring SNDR1 and SNDR2 = switch 1 and 2 of SW2 in the ON
- Esclusione monitoraggio SNDR1 e SNDR2 = switch 1 e 2 di SW2 in ON

TECHNICAL DATA:

Material body.....ABS
Color.....green
Operating temperature.....-10°C / +50°C
Operating voltage.....17-41 Vcc
Quiescent current.....340 uA
Absorption on functioning.....22 mA ±20%
External supply.....20-28,8 Vcc
Output current.....1A max (for line)
Current in short circuit.....8 mA
Maximum short circuit current.....1A
dimensions in mm

DATI TECNICI:

Materiale del contenitore.....ABS
Colore.....verde
Temperatura di funzionamento.....-10°C / +50°C
Tensione di funzionamento.....17-41 Vcc
Assorbimento a riposo.....340 uA
Assorbimento in funzionamento.....22 mA ±20%
Alimentazione esterna.....20-28,8 Vcc
Corrente di uscita.....1A max (per linea)
Corrente in corto circuito.....8 mA
Massima corrente di corto circuito.....1A
dimensione in mm

0	01/06/10	ISSUED/EMESSO	S.INTRESSALVI	E.RAMO'	D.PORZIO
<i>Rev.</i>	<i>Date/Data</i>	<i>Description/Descrizione</i>	<i>Issued/Emesso</i>	<i>Check/Contr.</i>	<i>Approval/Aprr.</i>

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PROGRAMMABLE SYSTEM FB6100

INSTALLATION MANUAL

FB6100-M

Important notes

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Index of revisions

Index of revisions	Brief Description of Content	Release date
Rev. 0	Preliminary Version	30-10-2007
Rev. 1	Review for certification	21-03-2008
Rev. 2	General revision	02-02-2009

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Notes on the use of this manual

Prior to operate on FB6100, read this manual carefully. All assembly and maintenance operations described in this manual must be performed by qualified staff. Systems FB6100 must be used only in applications for which they were developed and they must operate in the operative conditions indicated in chapter 3. In addition, the field devices connected to the system must be compatible and approved to work with systems FB6100. The improper use of this type of equipment, the non compliance with the indications supplied in this manual or the intervention of non qualified staff may cause serious damages to people and objects, for which SANCO S.p.A will not be liable.

This manual is subdivided into the following chapter:

- | | |
|-----------|--|
| Chapter 1 | General description
It contains a general description of system FB6100 in its possible configurations |
| Chapter 2 | Safety and availability of FB6100 system
It describes some concepts relative to FB6100 system |
| Chapter 3 | Technical data
It lists the characteristics and operative conditions of FB6100 system. |
| Chapter 4 | Installation
It supplies the necessary information in order to install the product correctly. |
| Chapter 5 | Start-Up and maintenance
It describes the various phases relative to the first start-up, commissioning of the system and substitution of failed modules. |
| Chapter 6 | List of components
It lists the characteristics of all components that constitute FB6100 system. |
| Chapter 7 | Application notes
Some useful information to comply with reference standards is included in this chapter. |

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Symbology

Some symbols are used in this manual to draw the attention on some aspects of particular importance. This section defines the meaning.



WARNING

This symbol identifies the instructions that must be followed to prevent physical damages to objects or to the operator.



WARNING

This symbol identifies the instructions that must be followed to prevent system's failures.



IMPORTANT

This symbol identifies important information required to understand the meaning of an operation.

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Acronyms

CAL	Central elaboration unit
EMC	Electro-magnetic compatibility
I/O	Input/Output
PSU	Supply unit
TCP/IP	Network protocol
START-UP	System start-up
c.c.s.	Control and signalling unit
d.e.c.	Control and automatic delay electronic device
a.d.a.	Feeder equipment

Glossary

This term is used to describe the systems to which it is requested to perform a specific function or functions, in order to ensure that risk is kept at an acceptable level. These functions are called safety functions.

Hot Plug A Hot plug is a module that may be also substituted when the system is running.

Availability The availability of a module defines the time percentage in which it is operative. In general this value is expressed in percentage and is obtained from the following formula:

$$A = \frac{MTBF}{MTBF + MTTR}$$

MTBF It defines the average time estimated by the manufacturer before a failure in the module occurs.

MTTR It defines the time needed to repair a failed module. In system FB6100, for repairing it is meant the substitution of the failed module which is generally estimated of 8 hours.

SELV Safety Extra - Low Voltage

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1. General description

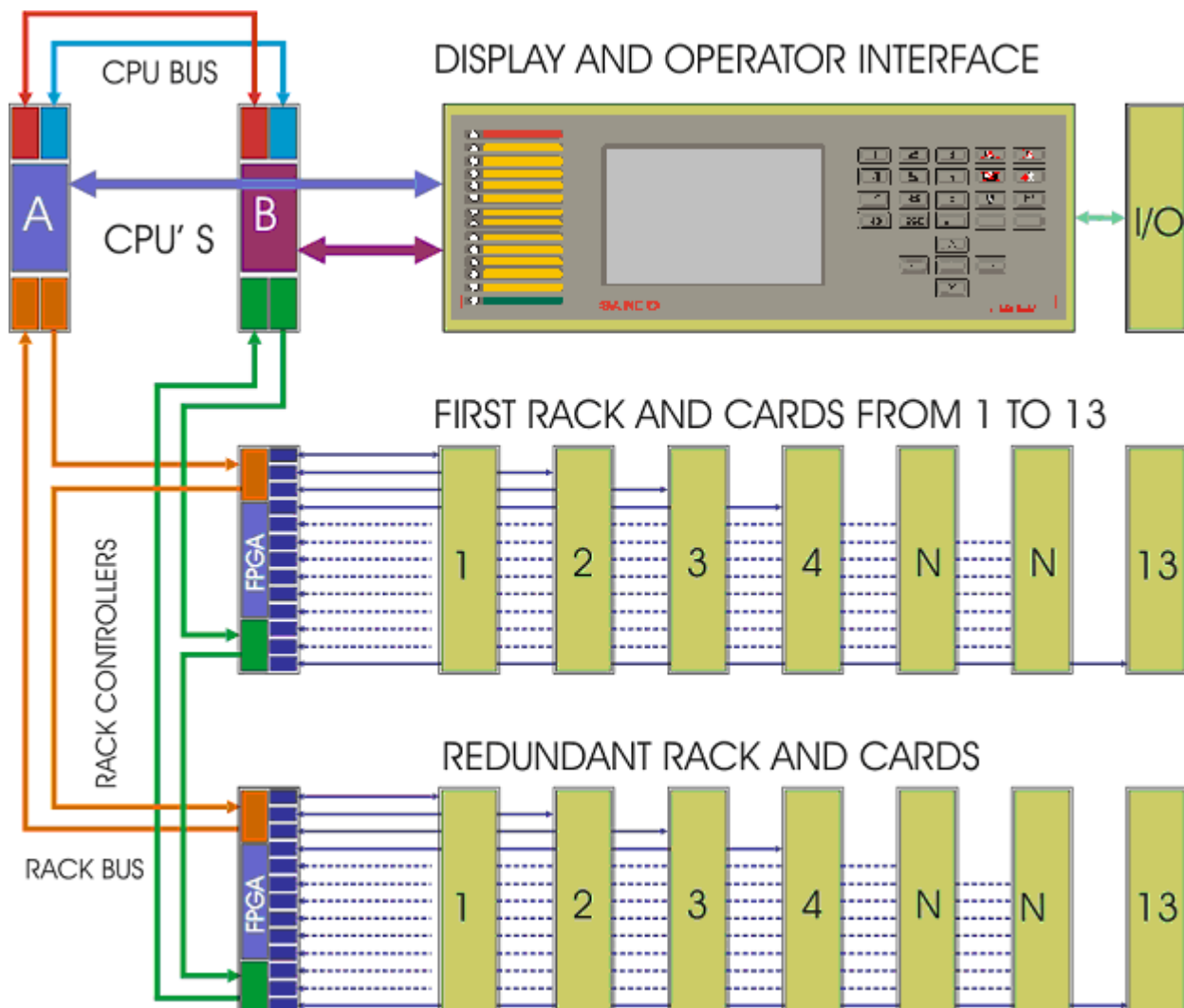
The units of series FB6100 are suitable to be used in fire detection systems, extinguishing command systems and intrusion detection systems and they are made in full compliance with European standards applicable for the type of product. They can be supplied in various configurations based on the safety degree and availability required by the application.

Each system is made up by a feeder unit, by an elaboration unit that also covers the functions of operator's interface and by I/O cards that control field elements. The elaboration unit and I/O cards are stored in a 19" rack.

To connect the cards to the field elements, two solutions are available.

The first solution uses some end brackets equipped with a terminal board that allows to connect the cables coming from the field. In this case the connection from I/O module and the end bracket is performed through a flat, 20-way cable. The type of bracket and relative connections depend on the type of module that must be connected. The second solution uses some multi-polar cables connected through a DIN41618 connector directly at the back of the bus. This solution is used to connect redounded modules or outlet modules with high current which cannot be connected with the first solution.

System FB6100 is equipped with a modular structure. The elaboration rack includes the central unit and an interface panel for the operator. Up to a maximum of 10 racks containing up to 13 I/O cards each, for a total of 130 cards can be connected to each central unit. I/O cards can be introduced in the racks without any time of restriction, based on the needs set forth by the system that must be controlled.



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The system is supplied in its standard configuration:

FB6100/ System composed by a rack 3HU for the elaboration unit plus 1..10 rack 3HU for I/O cards supplied in structural work with rotary door for fastening to floor.

The programming of the application and the relative compilation are performed on a personal computer, using configuration programme **Pro-FB6100** without being connected to the system. Transferring of the application program from the computer to the system takes place by using the serial port Host or through Ethernet connection with TCP/IP protocol. In the latter case, it is also possible to update the configuration from a remote station.

2. Safety and availability of system FB6100

System FB6100 was designed to be used in applications where it is required a high safety degree combined to a high availability of the system. Based on the required safety level and availability, system FB6100 can be supplied in different configurations.

2.1 Possible configurations in system FB6100

Solution A

The solution shown in figure 1 foresees the single central unit, the single I/O modules and the single I/O bus.

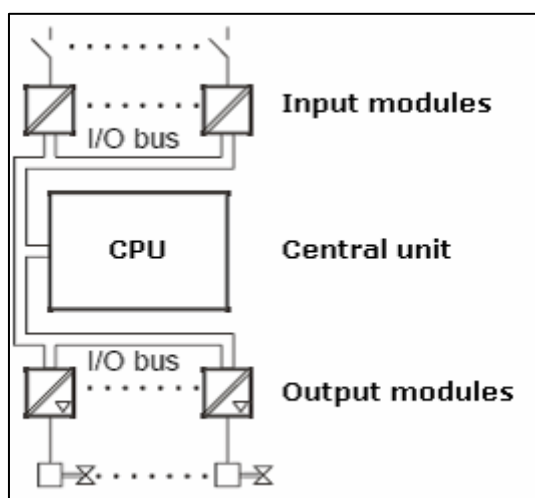


Fig. 1

Solution B

The solution shown in figure 2 foresees the redounded central unit, the single I/O modules and the single I/O bus.

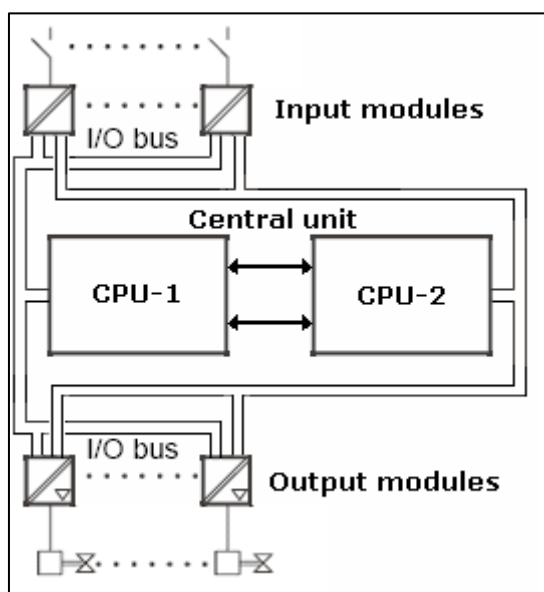


Fig. 2

Solution C

The solution shown in figure 3 foresees the single central unit, the redounded I/O modules and the single I/O bus.

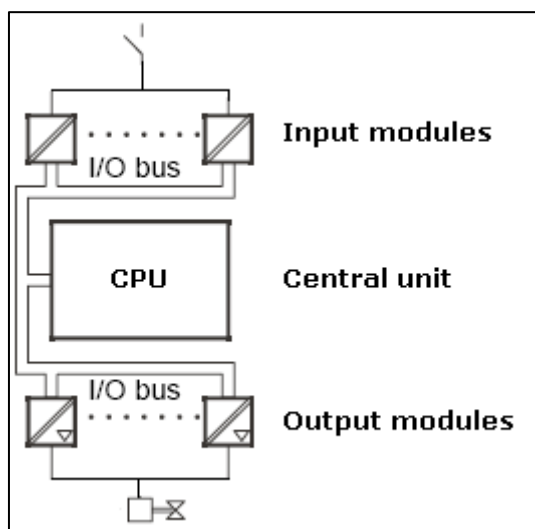


Fig. 3

Solution D

The solution shown in figure 3 foresees the central unit, the I/O modules and the redounded I/O bus.

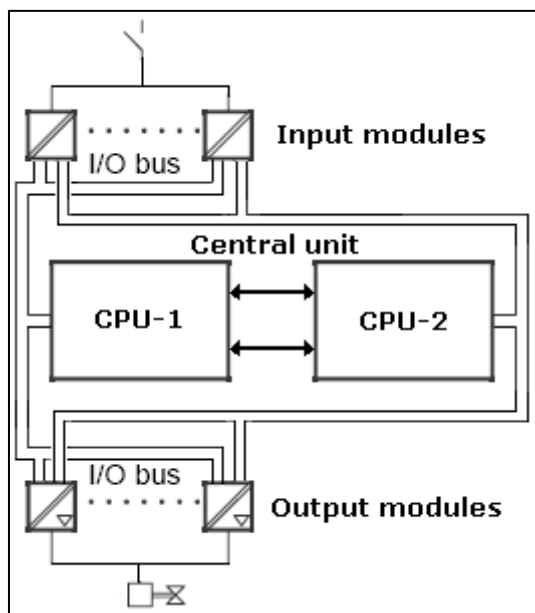


Fig. 4

The redundancy of modules and of CAL increases the system's availability. In case of error or failure of a **safety related** module, this is automatically put in safety condition (OFF) while the redounded module continues to operate normally.



The redundancy of I/O modules is possible only by using cards with Safety Related functions.

2.2 Safety-related modules in FB6100 system

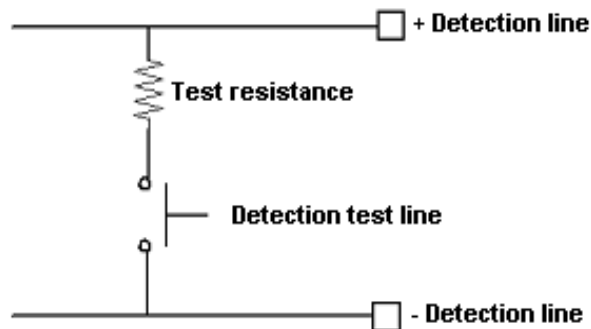
2.2.1 Central unit

CAL is equipped with an external watch dog circuit which intervenes in case of failure of the elaboration module.

During regular operation, CAL cyclically performs a series of checks on the memory's integrity, on internal voltages, and on the status of the RAM's lithium battery. In case of failure, the module goes in safety status. If a redounded CAL is present, this continues to perform controlling functions without any interruption. It is possible to substitute the failed CAL without turning off the system.

2.2.2 Digital inlet modules

The safety related digital inlet modules are equipped with a circuit that allows to simulate the opening and closing of each single channel. During operation, the channels are cyclically tested and in case of failure on one channel, the module puts all inlets in failed status (shut down). The entire module is excluded from operation. If a redounded module is present, the unit continues its regular operation, acquiring data from the same module, guaranteeing the utmost system's availability. It is possible to substitute the failed module without turning off the system.

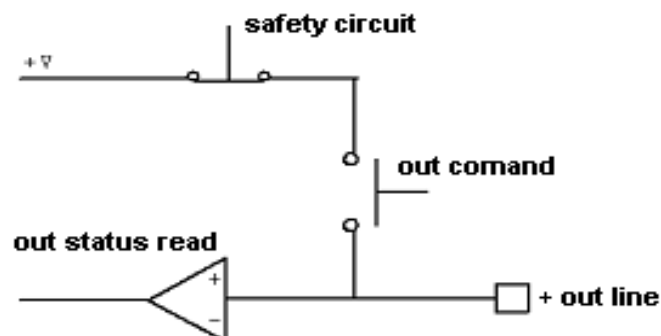


2.2.3 Analogue inlet modules

The safety related analogue inlet modules are equipped with two separate measuring circuits for each inlet channel. The two read voltage values are then compared and if a difference is present between the two values, the channel is put in failed status. The entire module is excluded from operation. If a redounded module is present, the unit continues its regular operation, acquiring data from the same module, guaranteeing the utmost system's availability. It is possible to substitute the failed module without turning off the system.

2.2.4 Outlet modules

The safety related outlet modules have two piloting semi-conductors connected in sequence. During operation, the outlet channels are tested cyclically, inverting the outlet status for a few hundredths of micro-seconds. In case of discrepancy between the set status and the one read on a channel, the entire module is excluded from operation and the outlets are put in safety status. (Shut-down) If a redounded module is present, the unit continues its regular operation, acquiring data from the same module, guaranteeing the utmost system's availability. It is possible to substitute the failed module without turning off the system.



2.3 Safety switch-off of central unit

The central unit cyclically performs a check during operation on the secondary supply voltage value. In case the voltage does not fall within the allowed range (18,5Vdc – 32Vdc), the central unit performs a safety switch-off sequence to put the entire system in safety status. During this sequence, the following operations are performed:

- Enabling of general FAULT and SYSTEM FAULT outlets.
- Disabling of general RUN outlet.
- Signalling on the display of the PANEL SHUT-OFF condition
- Recording of END OPERATION message in the events archive.
- Transmission of END OPERATION message to communication peripherals (Host/Printer).

In this condition, the outlets' status is frozen. At the end of the sequence, the central unit does not perform any type of operation on the peripherals, except the external watch dog resetting. To exit this status, re-boot the system.

2.4 Safety shut-down of central unit

In case of critical failures, the central unit performs a shut-down sequence during operation, to put the entire system in safety status. The failures that determine the shut-down status are the following:

- Error in verifying the memory content (Flash/Ram).
- Voltage $3.3V > 3.6V$ (with voltage lower than 3.15 V, the function is performed by the external reset circuit)

At the end of the sequence, the central unit does not perform any type of operation on the peripherals, including the external watch dog resetting. To exit this status, re-boot the system.

In configurations with redounded CAL, if the sequence is performed by the primary CAL, the secondary CAL signals the failure of the primary CAL and takes over the system's control without interrupting regular functioning. If instead the sequence is performed by the secondary CAL, the primary CAL signals the failure of the secondary CAL and continues to perform its functions.

3 Technical data

3.1 Mechanical characteristics

FB6100

Type of structural work	In sheet with internal rotary door and transparent door
Colour	RAL 7032 – RAL 7035
Protection degree	IP30
Fastening type	To floor
Sizes	H=2100mm L=800mm P=800mm

3.2 Electrical characteristics

FB6100

Power supply group	FB6100-PU001-x	FB6100-PU002-x
Supply voltage	110-240 V~ (-15% + 10%)	110-240 V~ (-15% + 10%)
Nominal supply frequency	50-60Hz	50-60Hz
Maximum incoming voltage	8A a 110V~	10A a 110V~
Outlet voltages of power supply group	Vload 25Vdc/Vbat 26-29Vdc	Vload 25Vdc/Vbat 26-29Vdc
Maximum voltage of power supply group	16A	40A redounded (40A+40A)

3.3 General characteristics

Processor	Renesas HD64F2318VTE25
Clock frequency	25Mhz
Program memory	Flash Eprom for operative system and program
Data memory	Static RAM
Data maintenance	Lithium battery
Checking of status of RAM's battery	Signalling of failed/low battery
Serial communication interface	No. 2 RS232
Ethernet communication interface	10/100BaseT with connector RJ45 (100BaseFX optional)
Maximum number of programmable areas	300 fire areas + 300 intrusion areas
Maximum number of points of each area	99 inlets 99 outlets 99 associations
Exportable variables on network (remote rules)	999
System's variables (local)	64
Maximum number of cards	130 (version with 10 racks)
Time frames with management of Holidays	10 (each made up by 10 intervals)
CALs' redundancy	Optional
Redundancy of I/O buses	Optional
Cards' redundancy	Optional only on safety related cards
Substitution of cards in warm condition	Possible for all types of card
Centralization between units	Through LAN network with RCP protocol
Monitoring system	Max three supervisors for each unit
Management of Time Frames	10 categories with management of holidays
Default outlets	16 + two Sounders outlets
Default inlets	10 opto-isolated inlets
Available protocols	MODBUS RTU



To comply with the requirements set forth by EN54-2 standard in each zone of area 1, maximum 32 detectors and/or fire alarm keys can be defined.

3.4 Operative conditions

3.4.1 Reference standards

System FB6100 was developed in compliance with the requirements of the following European standards:

Reference standard	Description
EN-54-2:1997	Fire detection and fire alarm systems Part 2: Control and indicating equipment
EN-54-4:1999	Fire detection and fire alarm systems Part 4: Power supply equipment
EN-12094-1:2003	Fixed fire fighting systems. Components for gas extinguishing systems. Requirements and test methods for electrical automatic control and delay devices
EN-60950-1:2001	Information technology equipment – Safety - part 1: General requirements

3.4.2 Climatic conditions

The following table indicates the climatic conditions needed to operate and store system FB6100. The climatic conditions are referred to the system in its whole.

Parameter	Allowed range	Notes
Operating temperature	-5....+50°C	dry
Storing temperature	-40....+85°C	dry
Operating humidity	5....95% RH	Without condensate
Storing humidity	5....95% RH	Without condensate



It is important to notice that the operating temperature inside electronic equipment has an important impact on the duration of its useful life. High operating temperatures and sudden temperature increases significantly reduce the useful life of electronic devices. For this reason, operating environment conditions must fall within the range allowed.



In the presence of storing temperatures lower than -30°C and higher than +60°C, the lithium battery on the central units must be removed (FB6100-CPU001.1 cards).

3.4.3 Mechanical conditions

The following table indicates the types of mechanical tests to which system FB6100 is subject.

Standard	Test	Testing levels
IEC 68-2-6	Vibration sinusoidal test (endurance)	Frequency range: 10...150Hz Acceleration amplitude: 0,5g Number of axis: 3 Number of sweep cycles: 20 per axis
IEC 817	Impact test	Impact energy: 0,5J Number of impact per point: 3

3.4.4 Electro-magnetic compatibility (EC)

System FB6100 was designed and tested to resist to normal levels of radiated, conducted electro-magnetic interferences and electro-static charges. The following table indicates the types of tests and levels to which system FB6100 is subject.

Standard	Test	Testing levels
EN 61000-4-2	Electrostatic discharge immunity test	6 kV contact discharge 8 kV air discharge
EN 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity test	10 V/m 80 MHz...1 GHz, 80 % AM
EN 61000-4-4	Electrical fast transients/bursts immunity test	2 kV power supply 1 kV signal lines
EN 61000-4-5	Surge immunity test	2 kV common mode 1 kV differential mode
EN 61000-4-6	Conducted disturbances induced by radio-frequency fields immunity test	10 V, 150 kHz...80 MHz, AM
EN 61000-4-11	Voltage dips, short interruptions and voltage variations immunity test	60% 200ms 100% 100ms



The electrical disturbances change considerably based on the type of installation, type of cabling and distance with other types of equipment. Therefore, it is important to make sure that the levels of electro-magnetic interferences do not exceed those listed in the table.

4 Installation

4.1 Power supply group

FB6100 system must be fed with direct voltage of 25Vdc. The standard power supply groups comply with European standard EN54-4 and with EC directives on immunity against disturbances and safety. Two types of power supply groups are available.

4.1.1 Power supply group FB6100-PU001/x

This power supply group is secured on the plate located at the bottom of the structural work and it consists of maximum four 125 watt-feeders, model **AL-A0005-1** plus a battery-charging module **AL-A0004-1** able to supply a charging current to batteries which can be set to 2 or 4 ampere. The feeders are connected to each other in parallel up to a maximum of four for a total of 16 ampere. The following table indicates the electrical characteristics based on the possible available configurations.

Characteristic	FB6100-PU001/1	FB6100-PU001/2	FB6100-PU001/4
Number of feeders AL-A0005-1	1	2	4
Supply voltage	110....240V~	110....240V~	110....240V~
Nominal frequency	50-60Hz	50-60Hz	50-60Hz
Maximum inlet voltage 110V~	1,6A	3,3A	7A
Maximum inlet voltage 240V~	0.79 A	1.8 A	4A
Minimum outlet voltage (Note-A)	18,9Vdc	18,9Vdc	18,9Vdc
Residual maximum undulation	266mV	704mV	704mV
Maximum resistance of batteries	1,5 Ω	1,5 Ω	1,5 Ω
Maximum outlet voltage (Note-B)	4A	8A	16A
Maximum voltage for batteries	2A	4A	4A
Maximum batteries' output	26A/h	26A/h	65A/h

Note-A: Gross outlet voltage with low batteries and with no network's voltage

Note-B It indicates the maximum voltage destined to loads, plus the voltage consumed by the unit.

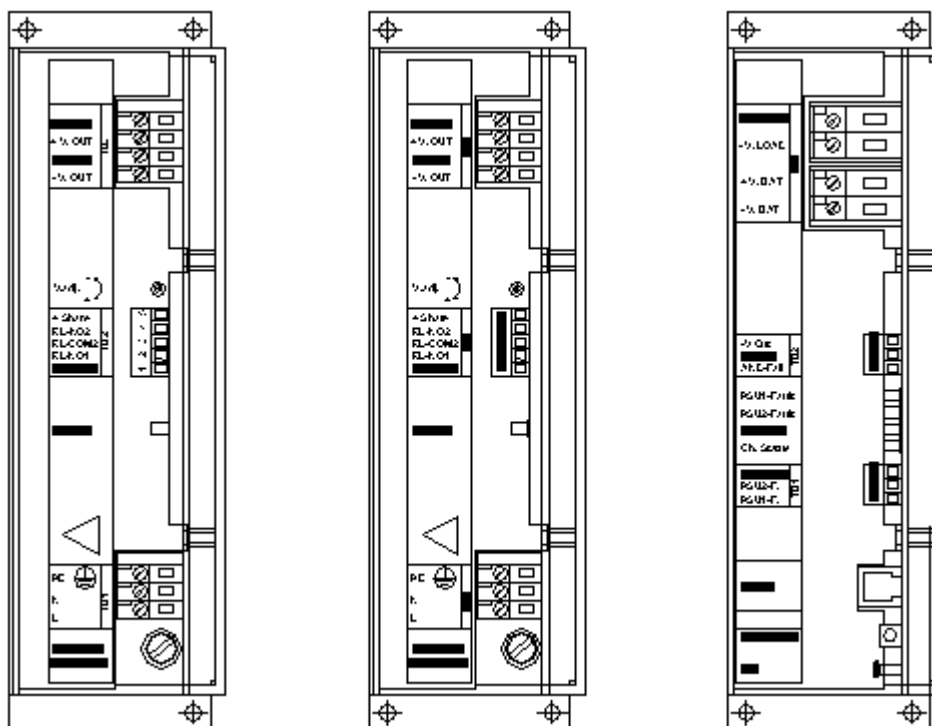


Fig. 5

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To properly secure this power supply group and for electrical connections, refer to the specific manuals for this product.

4.1.2 Power supply group FB6100-PU002/x

This power supply group must be used only in configurations with structural works secured to the ground. (Model FB6100) The group is secured on the rotary place of the structural work. It is made by a 19"-rack in which up to four-20 ampere feeders, model **AL-A0008-1** can be introduced, plus a battery charging module **AL-A0009-1** able to supply a supply voltage to batteries of 6 ampere. The feeders are connected to each other in parallel up to a maximum of four for a total of 40+40 ampere. The following table indicates the electrical characteristics based on the possible available configurations. All modules can be substituted under voltage.

Characteristic	FB6100-PU002/1	FB6100-PU002/2	FB6100-PU002/4
Number of feeders AL-A0008-1	1	2	4
Supply voltage	110....240V~	110....240V~	110....240V~
Nominal frequency	50-60Hz	50-60Hz	50-60Hz
Maximum inlet voltage 110V~	8A	16,3A	35A
Maximum inlet voltage 240V~	4 A	9 A	20A
Minimum outlet voltage (Note-A)	18,9Vdc	18,9Vdc	18,9Vdc
Residual maximum undulation	266Mv	704mV	704mV
Maximum resistance of batteries	1,5 Ω	1,5 Ω	1,5 Ω
Maximum outlet voltage (Note-B)	20A	40A	40+40A
Maximum voltage for batteries	6A	6A	6A
Maximum batteries' output	2x12V 120A/h	2x12V 120A/h	2x12V 120A/h

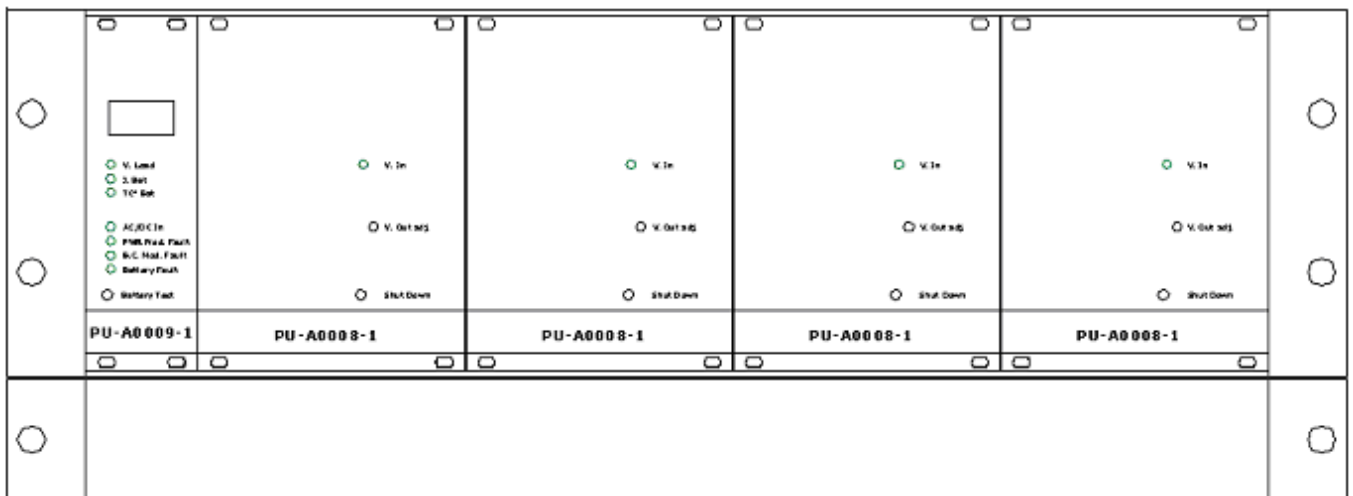


Fig. 6



To properly secure this power supply group and for electrical connections, refer to the specific manuals for this product.

4.1.3 Sealed lead batteries

The batteries are used to guarantee the unit operation in case no network voltage is present. The batteries must be positioned inside the structural work and must have flammability degree HB or higher. The batteries' output depends on the voltage absorbed by the system and by the required autonomy. To calculate the batteries' output, apply the following formula:

$$\text{Batteries' output (A/h)} = h * [(I_a + I_b) * 1.2]$$

h Number of hours of autonomy required

I_a Absorption of the entire idle system

I_b Absorption of the most burdensome area in alarm status



To guarantee recharge within the times established by EN54-4 standard, the maximum batteries' output must not exceed that envisaged by the type of charger used and by the set charging voltage.

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Maximum charging voltage set on the charger	Maxim batteries' output
1 Ampere	18A/h
2 Ampere	24A/h
4 Ampere	64A/h
6 Ampere	120A/h

4.2 Measurements for installation in compliance with EC standard

To install the system properly inside the structural work, adopt the following measures:

- Use only certified power supply groups for the product.
- Position the power supply group on the position indicated in the construction drawings.
- Assemble one or more network filters at the inlet of the power supply group.
- Use separate paths for feeder cables and the terminating cables of field devices.
- Use screened cables to connect field devices and I/O cards
- Comply with all indications supplied for the system's ground connections.
- For devices installed permanently, a sectioning device must be foreseen in the building's electrical system (magneto-thermal/ differential) which is easy to access.



All components used in FB6100 systems have been selected based on the purpose foreseen and are suitable to operate in compliance with technical specifications and specified environmental conditions.

4.3 Arrangement of components inside FB6100 systems

Figure 9 shows the arrangement of the components on the plate located at the bottom of the structural work to adopt in FB6100 systems. In this configuration, the cables of field elements can be connected to I/O cards through **TB** terminals or through termination brackets **M**. The connection between the terminals and cards takes place through multiple cables or through flat 20-way cables. In this type of configuration, it is possible to alternatively assemble the power supply group from rack AL-0002. The cable-holder channels marked in black are used to hold the cables of primary supplies in alternating current and must not be used to hold any other type of cables.

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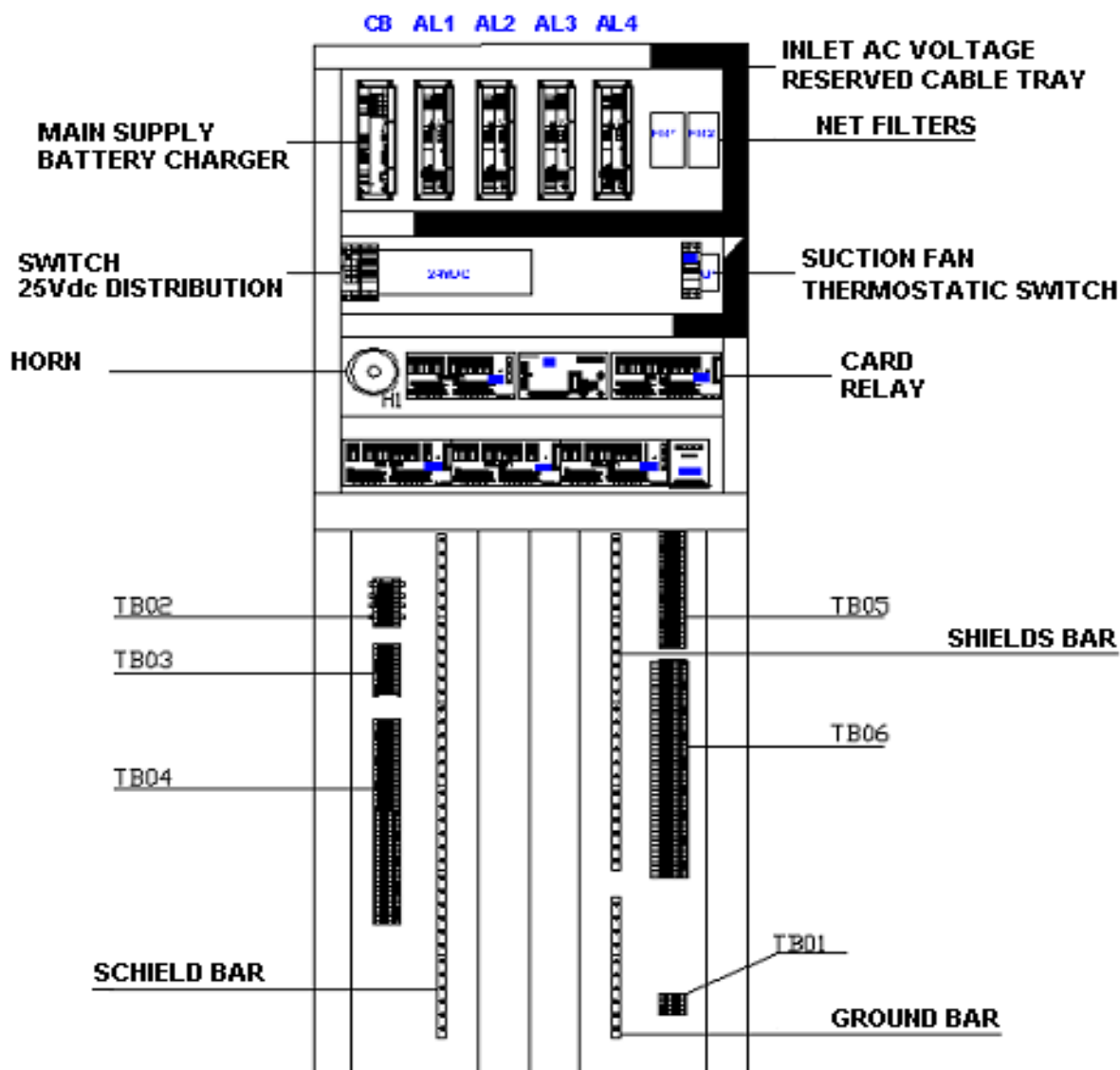


Fig. 9

4.4 Instructions for ground connection

Proper connection to the ground and consequent compliance with EMC standards applicable for FB6100 systems is obtained by adopting the measures described below. To improve electro-magnetic compatibility, FB6100 systems are supplied with two types of ground connection, separate from each other. The ground bar marked **BT** is used for the ground connection of the structural work, sub-racks and power supply groups and must be connected to the system's power ground. The ground bars marked **BS** are used to connect the cables' screens coming from the field and must be connected to the system's instrumental ground.



If the system is not equipped with a ground connection for instruments, ground bars **BS** must be connected to ground bar **BT**.

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4.4.1 Ground connection of power supply group

System FB6100 can exclusively operate with the negative and positive supply poles detached from the ground. For this reason, the unit cyclically measures the dispersion level of the supply voltage towards the ground. If the dispersion level is higher than 50%, an **Earth Fault** status is signalled. The power supply group must be connected to the power ground bar **BT** using two separate conductors, one for the connection of the network filters to the ground and one for the connection of feeders to the ground.



Some devices such as personal computers have the negative supply pole connected to the ground for safety reasons. The direct connection of these devices to FB6100 system will generate an **Earth Fault** status warning.

4.4.2 Connection of Sub-racks to the ground

All accessible parts of the 19" sub-racks are conductive to allow the discharge towards the ground of the energy produced by electro-static discharges. For this reason, it is important to connect all sub-racks and the front panel to the main ground bar through conductors of suitable section, as indicated in figure 10.

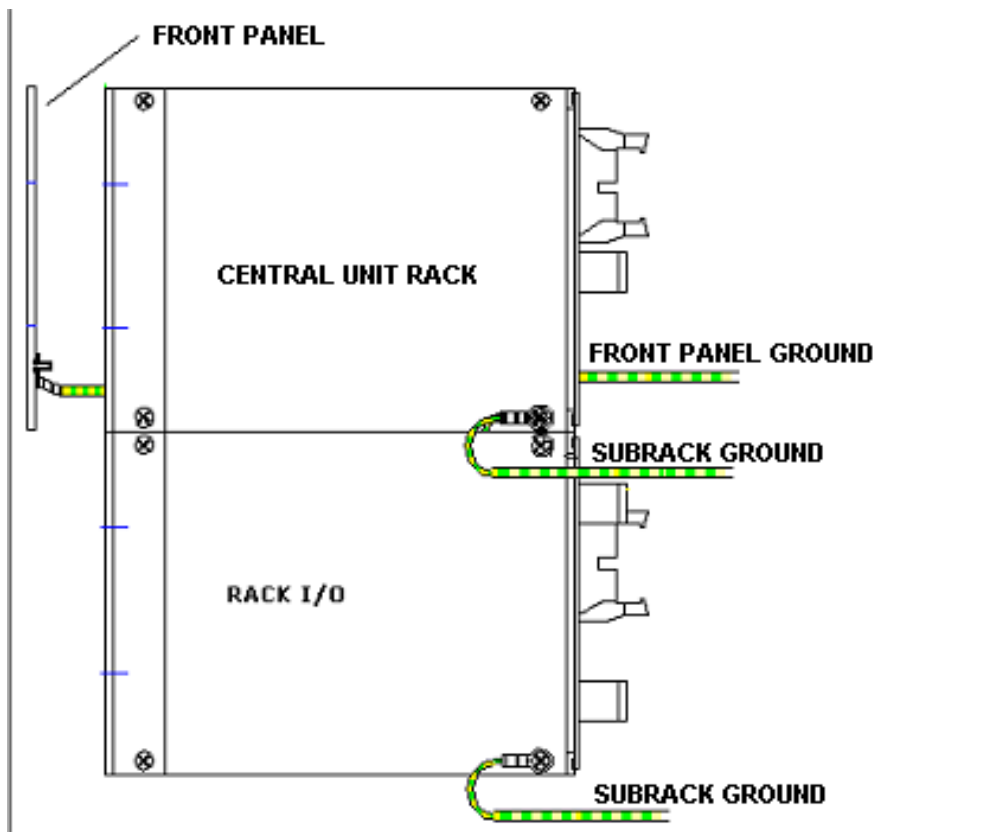


Fig. 10

4.4.3 Connection of structural work to ground

All removable parts of the structural work as the side walls, rotary door, base, etc., must be connected to the power ground bar through cable tracts to ensure proper connection to the ground of all removable parts.



All the connections of ground cables must be performed by using eye-terminals and they must be screwed to the ground bar through grover washers, in order to guarantee the terminal's fastening.

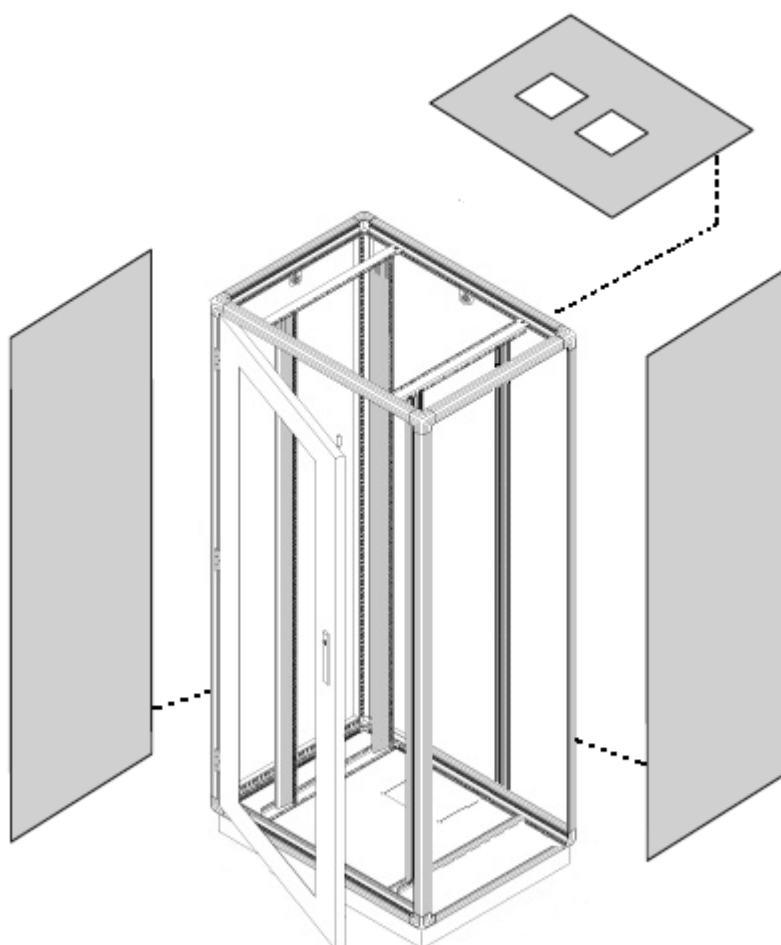


Fig. 11

The following table indicates the minimum sections of ground cables to use in order to assemble the system.

Type of connection	Cable section
Connection of network filters and feeders	1.5 mm ²
Connection of racks and front panel to the ground	1.5 mm ²
Side panels of structural work	16 mm ²
Ground bars	16 mm ²

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4.5 Instructions for cabling

All inter-connection cables must be properly identified and finished. During cabling, make sure that the cables of field devices (Inlets/Outlets) are separated from feeder cables.



Connection to the supply network must take place in compliance with applicable national standards.

4.5.1 Cables' colour code according to DIN IEC 60757 standard

Code	Colour	Code	Colour
BK	black	VT	violet
BN	brown	GY	grey
RD	red	WH	white
OG	orange	PK	pink
YE	yellow	GD	gold
GN	green	TQ	turquoise
BU	blue	SR	Silver

4.5.2 Cabling of FB6100 power supply group

Figure 14 shows the diagram of the electrical connections relative to the inlet voltage of the power supply group for systems FB6100/1-10R. It is important to notice that since feeders are redounded, two separate supply lines must be foreseen, with relative network filters.

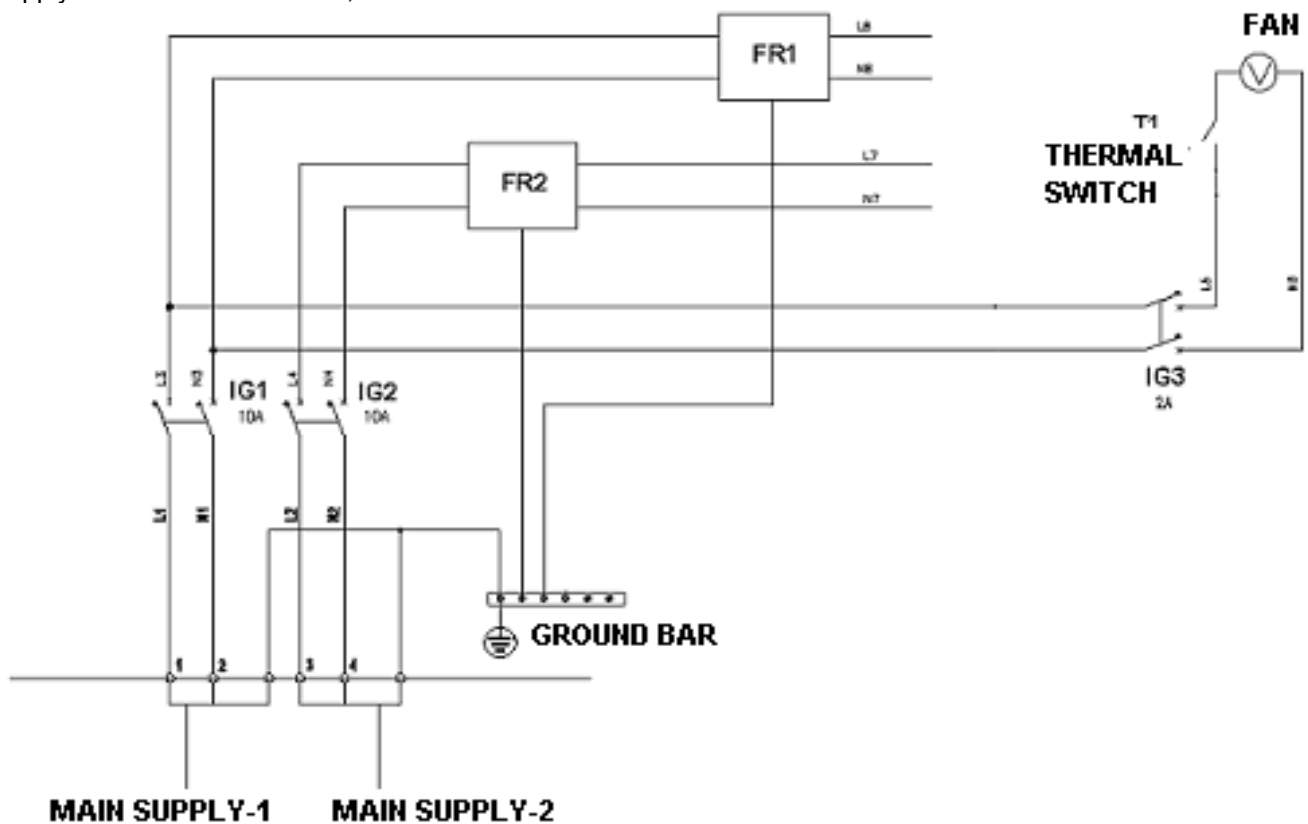


Fig. 14

Figure 15 shows the diagram of the electrical connections relative to **FB6100-PU001/4** power supply group in the configuration with four redounded feeders PU-A0005-1 (two-two) with charger PU-A0004-1.

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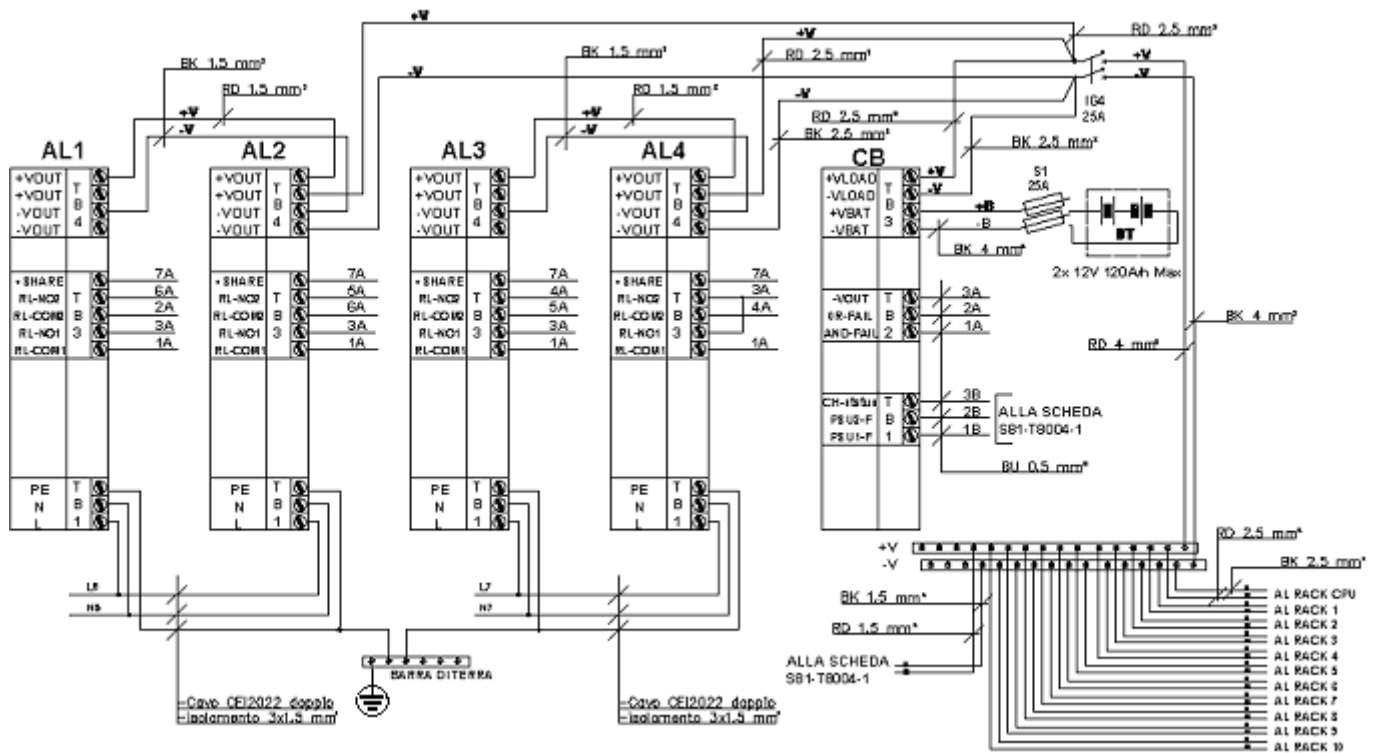


Fig. 15

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Figure 16 shows the diagram of the electrical connections relative to power supply group AL-0002-4.

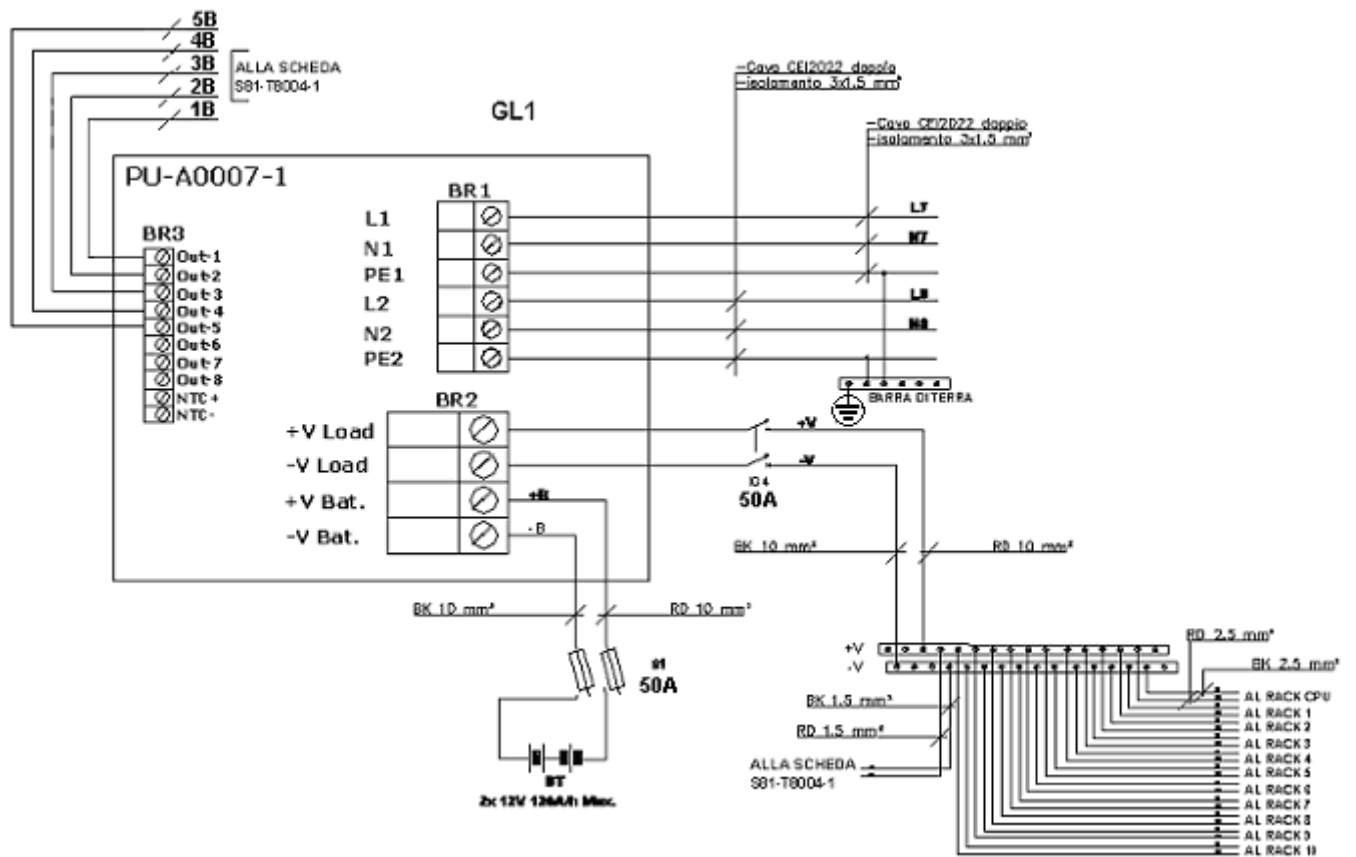


Fig. 16

4.5.3 Cabling of rack of central unit

Figure 17 shows the diagram of the electrical connections relative to the central unit's rack and default FB6100-TB004.1 I/O card.

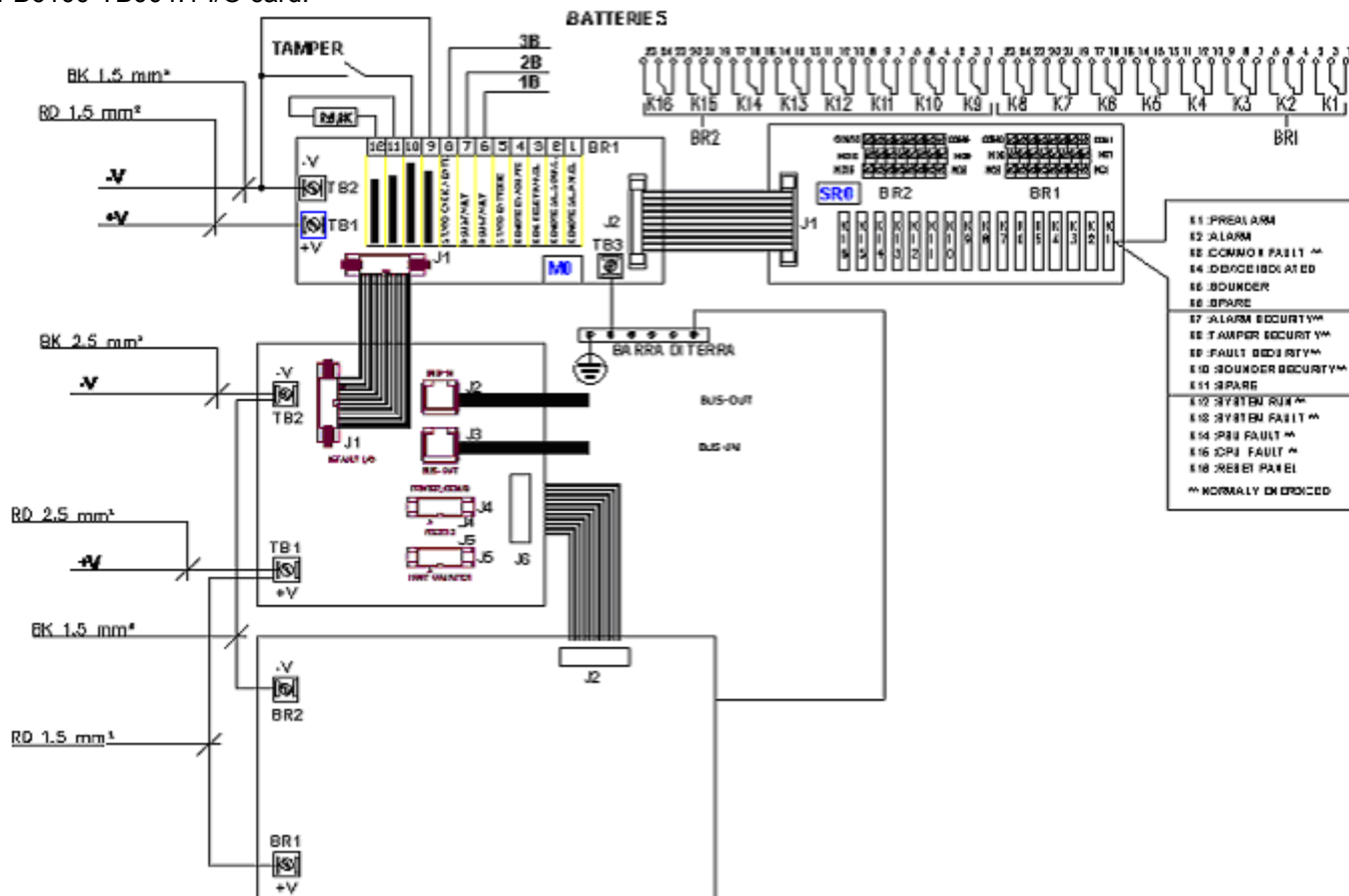


Fig. 17

4.5.4 Cabling of racks of I/O card

Figure 18 shows the connections relative to the racks of the I/O card.

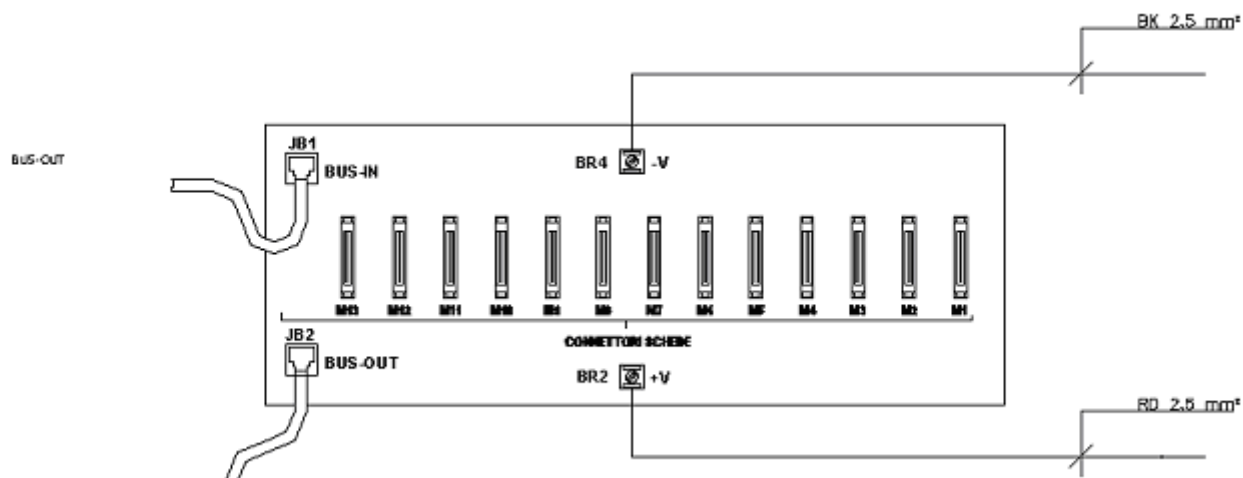


Fig. 18

To connect LVDS bus, use only the cables supplied.

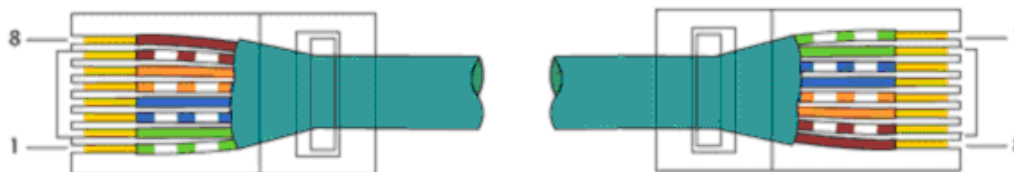


Fig. 19

4.5.5 Cabling of cables of I/O card

The type of connection between the rack of the I/O card and the terminal depends on the type of bus used on the rack.

FB6100-RACK1.2 Bus

In this case, pre-cabled wires are used to connect the rack and the terminal. The standard length of cables is 2 metres. The type of cable and relative connections depend on the type of terminated module (see relative data sheet). In order to easily perform field sectioning, use terminals equipped with disconnecting knife-switches.

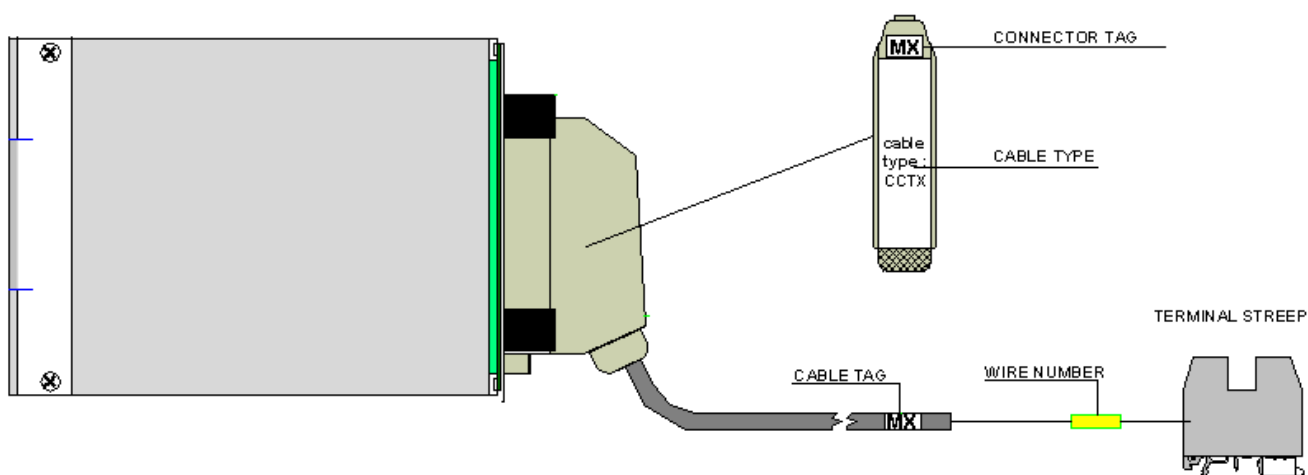


Fig. 21

Use preferably screened cables to connect sensors, by connecting the screens to the signalling ground bars **BS**.



The cables' screens relative to ring-type loops (Cards FB6100-LP001.1-1) must be connected to the ground bar only from one side, in order to avoid ground loops.

4.6 Types of cables

The following cables have been approved for use in the following applications:

Analogue/balanced inlets

For these types of signal, it is advised to use screened cable **CEI 2022** 2x1.5 mm².

Addressed loops

For these types of signal, it is recommended to use screened cable **CEI 2022**. For cable lengths up to 1 km, use 2x 1.5 mm² cables. For cable lengths up to 2 km, use 2x2.5 mm² cables.



In case of ring-type loops, for cable length it is meant the total length from the starting point until the end point. It is not possible to use multiple cables in loops connection.

25Vdc power supplies

For power supplies from the unit towards field devices, use cable **CEI 2022** 2x1.5 mm². Pay particular attention in the selection of the conductors' section, in order to avoid that drops of voltage along the cable could hinder the operation of devices.

Static outlets

For the connection between the unit and outlets (sirens, electro valves, tags), use fire-resistant cable **CEI 2036** of sizes 2x1.5 mm². Also in this case, verify the drop of voltage on the cable and eventually increase the section.

Relay outlets



All relays must be used only with SELV voltages.

4.7 Absorptions

The following table shows the typical absorptions of the central unit in the various configurations.

Absorptions of central unit	Central unit with 1 CAL	Central unit with 2 CAL
Typical absorption in idle condition	260mA	330mA

The following table shows the typical absorptions of the expansion rack.

Absorption of expansion racks	FB6100 RACK1.1
Typical absorption in idle condition	50Ma

The following table shows the absorptions of the modules of the I/O card and the various operating methods.

Absorption of the modules of the I/O card	M 001.1	AN 001.1	AN 001.2	C 001.1	C 002.1	C 003.1	C 004.1	S 001.1	LP 001.1	
Absorption in idle condition	18mA	35mA	60mA	35mA	12mA	25mA	40mA	12mA	65mA	
Increase for each terminated line in idle conditions	5mA	4mA	4mA	*	*	*	*	*	*	
Increase for each terminated line in alarm conditions	60mA	16mA	16mA	*	*	*	*	*	*	
Increase for each active relay's outlet	*	*	*	8mA	8mA	8mA	*	*	*	
Increase for each active outlet	*	*	*	(A)	(A)	(A)	(B)	(A)	*	

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Increase for each addressable module in idle condition	*	*	*	*	*	*	*	*		
Increase for MCP controller	*	*	*	*	*	*	*	*	*	

(A) Depending on the load. Maximum 500mA for each active channel

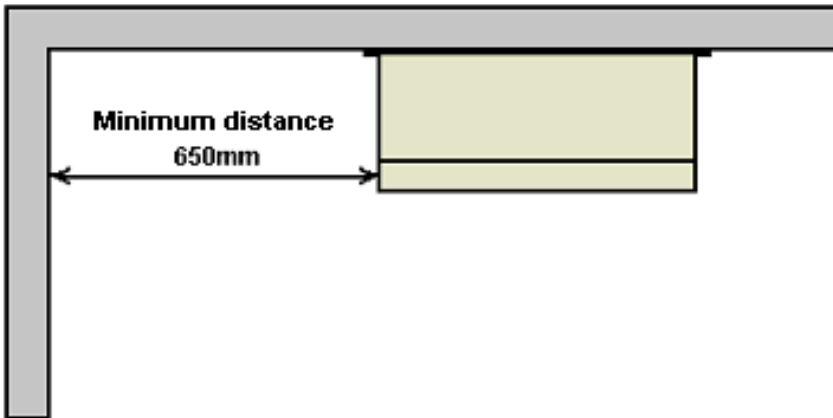
(B) Depending on the load. Maximum 2A for each active channel

(C) Depending on the type of module

4.8 Instructions for anchoring to the structural work



Anchoring to the wall structure takes place by using six standard fins. For anchoring on masonry walls, use expansion brackets of Fisher type, of 8 mm.



If the structural work is installed onto the wall besides a corner wall, the minimum distance from the latter must be of 650 mm, so as to allow the opening of the front panel. In addition, it must be installed at such a height so as to allow good visibility of the display and easy access to the operator.

4.9 Introduction of cables

For the introduction of cables, use the relative plates located on the structural work, which must be properly perforated in order to host the gland nuts.



Use exclusively gland nuts with flammability degree V1 or higher.

5 Start-Up

This chapter describes the operations that must be performed prior to turn on the system.

5.1 Material needed

To properly perform the various start-up phases, the following equipment is needed:

- A digital multimeter
- A voltage generator 0-20mA to simulate analogue sensors.

5.2 Preliminary checks

- Check that the ground connections are properly carried out as described in chapter 4.6. Check also that the system's ground resistance is lower than 20 ohm.
- Visually check the connections on the terminals inside the panel, and check in particular the polarity of feeder cables and batteries.
- Check that all cards are properly introduced inside the racks with the two tightened anchoring screws.

5.3 Checks on cables coming from the field



In order to avoid damaging the I/O cards, prior to perform these checks, cables must be isolated by opening the disconnecting knife-switches or by disconnecting the flat cables of the termination brackets.

Balanced inlet cables (Cards FB6100-M001.1)

- Check that both conductors (+L/-L) are isolated from the ground.
- Disconnect the screen from the screens' bar and check that this is isolated from the ground.
- Check that a resistance of about 5600ohm between line positive and negative poles.

Analogue inlet cables (Cards FB6100-AN001.1/FB6100-AN002.1)

- Check that both conductors (+L/-L) are isolated from the ground.
- Disconnect the screen from the screens' bar and check that this is isolated from the ground.

Addressed Loop Cables (Cards FB6100-LP001.1)

- Check that the conductors (+Lout/-Lout e +Lin/-Lin) are isolated from the ground.
- Disconnect the screen from the screens' bar and check that this is isolated from the ground.
- Check that the resistance between -Lout and -Lin is lower than 30 ohm
- Check that no short-circuit is present between terminals +Lout and +Lin

Command cables of acoustic signals (Cards FB6100-C0003.1/FB6100-C0005.1)

- Check that both conductors (+L/+L) are isolated from the ground.
- Check that a resistance of about 5600ohm between line positive and negative poles.

Solenoid command cables (Cards FB6100-C0004.1)

- Check that both conductors (+L/-L) are isolated from the ground.
- Check that the resistance between terminals +Lout and +Lin is higher than 10 ohm.

25Vdc supply cables

- Check that both conductors (+L/-L) are isolated from the ground.

5.4 Start-up

- Make sure that the disconnecting switch that supplies 25Vdc voltage to the system and field is disabled.
- Enable disconnecting switch **S1** which connects the batteries to the supply group.
- Enable the general switch that feeds the supply group.
- Check with a voltmeter that voltage **Vload** exiting from the supply group is of 25Vdc.
- Check with a voltmeter that voltage **Vbat** exiting from the supply group is of about 27Vdc.
- Enable the disconnecting switch that supplies the system and field and wait for the initialization cycle to end.
- During this phase, the presence of possible failures will be visualized on the display of the central unit.
- Remove voltage from the supply group. Check that message “**Failure primary voltage**” is visualized on the display of the central unit.
- Check with a voltmeter that voltage **Vload** on distribution bars is of 25Vdc.
- Restore voltage to the supply group. The failure status must be reset.
- Disconnect the positive pole of batteries. Check that message “**Failure secondary voltage**” is visualized on the display of the central unit within 30 seconds.
- Re-connect the positive pole of batteries. The failure status must be reset.
- At this point, it is possible to check all single I/O cards through the diagnostic menu for which you can refer to the relative manual.

5.5 Functional tests

The purpose of the functional test is to verify the full operation of the system and compliance with the specifications requested by the client.



Particular attention must be paid to the checking of logistics relative to extinguishing areas to ensure that the system performs the activities requested in case of fire alarm.



Prior to perform functional tests, disconnect all solenoids that control the extinguishing systems. Eventually connect a 25Vdc 2Watt lamp instead of solenoids to verify the correct execution of logics.

The functional test of a safety related system is 100% considered if the following points are followed:

- All inlets must be tested in their possible operation statuses.
- All outlets must be tested in the possible statuses defined by the application program.
- All various logic paths of the program must be tested.
- All scheduled delays must be verified.
- All exchange combinations of digital signals including failure conditions must be checked.

5.6 Failures

5.6.1 Failure of central unit

In systems with redounded CAL, in case of failure of one of the two modules, the system continues to work without interruption. The failed module is indicated on the display. With this regard, we also remember that indication CAL-0 on the display indicates the CAL in the left slot while indication CAL-1 indicates the CAL in the right slot.

In systems with one single CAL, in case of failure of the central unit, the entire system will be switched-off. In order to substitute the failed module, see paragraph 6.5.

5.6.2 Failure of a I/O module

The failure of an I/O module is detected by the central unit during operation. The position of the failed module and the type of failure are indicated on the display. The substitution of the failed module can be done during operation, by following the instructions indicated in paragraph 6.7.

5.6.3 Failure of power supply group

A failure to the power supply group is detected by the central unit during operation. The indications with the type of failure are visualized on the display. Prior to proceed to the substitution of a module of the power supply group, read carefully the indications included in paragraphs 5.7, 5.8, 5.9.

5.7 Repairing of a failed module



The repairing of a failed module must be exclusively performed by the manufacturer. Failed modules must be sent to SANCO S.p.A for repairing with a brief description of the type of failure detected.

5.7.1 Assistance and training service

The assistance service of SANCO S.p.A. is able to support the end user during the designing, production and testing phases of systems FB6100. In addition, upon request, it is possible to attend specific training courses at our premises on the product. For any information of technical character, refer to the following contacts:

SANCO S.p.A
Tel. 39-0321-807575
Fax. 39-0321-807575
Mail: sanco@sanco-spa.it

5.8 Maintenance



Maintenance of the equipment and system must be only performed by qualified staff adopting suitable protection measures against ESD discharges.

5.9 Substitution of batteries

To perform the substitution of lithium batteries, proceed as follows:

- Open disconnecting switch S1 which connects the batteries to the supply group.
- Disconnect cables +B and –B from the batteries' terminals.
- Substitute the batteries with two identical ones of the same model.
- Connect cables +B –B to the batteries' terminals, being careful not to invert the polarity.
- Close disconnecting switch S1.

5.10 Substitution of a module of FB6100-PU001-x power supply group



Prior to proceed to the substitution of a module of power supply group FB6100-PU001-x, voltage must be removed from the entire system. For this reason, this operation foresees the disabling of the entire system.

To perform the substitution of a module of group **AL-001** proceed as follows:

- Open disconnecting switch **S1** which connects the batteries to the supply group.
- Enable the disconnecting switch that supplies the system and field.
- Disable the disconnecting switches inside and outside the panel for primary supply.
- Measure with a voltmeter on inlet terminals and verify that no voltage is present.
- Disconnect the wires connected to the module to substitute.
- Remove the 4 anchoring screws that block the module to the bottom plate.
- Remove the module to substitute and assemble the new one, by screwing the 4 screws.
- Perform the connections by following the indications on the cabling diagram.
- Enable the disconnecting switches that feed the power supply group.
- Check with a voltmeter that voltage **Vload** exiting from the supply group is of 25Vdc.
- Check with a voltmeter that voltage **Vbat** exiting from the supply group is of about 27Vdc.
- Enable disconnecting switch **S1** which connects the batteries to the supply group.
- Enable the disconnecting switch that supplies the system and field and wait for the initialization cycle to end.

5.11 Substitution of a module of FB6100-PU002-x power supply group



The substitution of the modules that constitute FB6100-PU002-x A power supply group can be done in warm conditions and does not require to switch off the system.

For the substitution of the battery charging module **AL-A0009-1**, proceed as follows:

- Open disconnecting switch **S1** which connects the batteries to the supply group.
- Unscrew the four screws located on the front panel.
- Extract firmly the module from the rack, using the handle located on the front panel.
- Set the two dip-switches located on the new module, exactly in the same way in which they are set in the failed one.
- Introduce the new module in the rack and screw the 4 anchoring screws located on the front panel.
- Check with a voltmeter that voltage **Vbat** exiting from the supply group is of about 27Vdc.
- Enable disconnecting switch **S1** which connects the batteries to the supply group.

To perform the substitution of a supply module **PU-A0008-1** proceed as follows:

- Press the shut-down key located on the front panel, pressing with a screw driver.

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- Unscrew the four screws located on the front panel.
- Extract firmly the module from the rack, using the handle located on the front panel.
- Introduce the new module in the rack and screw the 4 anchoring screws located on the front panel.



Absolutely avoid to touch the tracks and internal parts of the removed module, since the energy stored in the electrolytic condensers may cause serious damages to people.

5.12 Substitution of the display module

The substitution of this module can be done in warm conditions and does not require to switch off the system.

For the substitution of the display **FB-FP001** module proceed as follows:

- Unscrew the four screws located on the front panel.
- Disconnect flat cable **J6** located on the internal side of **FB6100-MBUS** module.
- Disconnect the two fastons **+V** and **-V** located at the back of the module.
- Unscrew the 3mm nut that connects the ground wire to the module's aluminium plate.
- Remove the failed module.
- Remove the new module from its package, avoiding to touch electronic components with your hands.
- Secure the ground cable on the new module through the proper nut.
- Connect the two fastons **+V** and **-V** located at the back of the module, paying attention to the polarity.
- Connect flat cable **J6** located on the internal side of **FB6100-MBUS** module.
- Secure the module to the rack, screwing the four screws located on the front panel.

5.13 Substitution of central unit

The substitution of this module can be done in warm conditions and does not require to switch off the system.

For the substitution of **FB-CPU01.1** central unit, proceed as follows:

- Fully unscrew the two screws on the front panel, making sure that they are completely free.
- Extract firmly the failed module using the handle located on the front panel.
- Remove the new module from its package, avoiding to touch electronic components with your hands.
- Introduce firmly the new module and screw the two anchoring screws located on the front panel.
- Wait a few seconds (the time depends on the size of the configuration file) until the failure signal disappears on the display.

5.14 Substitution of rack controller

The substitution of this module can be done in warm conditions and does not require to switch off the system.

To perform the substitution of a **FB6100-RACK1.1** rack controller, proceed as follows:

- Fully unscrew the two screws on the front panel, making sure that they are completely free.
- Extract firmly the failed module using the handle located on the front panel.
- Remove the new module from its package, avoiding to touch electronic components with your hands.
- Set properly the 4-way dip switch located on the card.
- Introduce firmly the new module and screw the two anchoring screws located on the front panel.
- Wait a few seconds until the failure signal disappears on the display.

5.15 Substitution of an I/O module

The substitution of I/O cards can be done in warm conditions and does not require to switch off the system.

To perform the substitution of an I/O module, proceed as follows:

- Fully unscrew the two screws on the front panel, making sure that they are completely free.
- Extract firmly the failed module using the handle located on the front side of the card.
- Remove the new module from its package, avoiding to touch electronic components with your hands.
- Introduce firmly the new module and screw the two anchoring screws located on the front panel.
- Wait a few seconds until the failure signal disappears on the display.

5.16 Substitution of fuses



The substitution of fuses must be performed using exclusively fuses of the same type and value. Refer to the following table for fuse types.

Location	Type	Value
Feeder fuse AL-A0005-1	5x20 Fuse in ultra-quick glass	T6,3A H250V
Feeder fuse AL-A0008-1	5x20 Fuse in ultra-quick glass	T10A H250V
Fuse for feeder group AL-0001-x	10x38 Fuse cartridge	20A-G
Fuse for feeder group AL-0002-1	10x38 Fuse cartridge	50A-G

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6 List of components

This chapter describes the main characteristics and order references of the devices that make up the system, subdivided according to the type of product.

6.1 Structural work

Three models of structural works are available, two for wall anchoring and one for floor anchoring.

Characteristic	FB6100		
Maximum number of central unit's rack	1		
Maximum number of I/O rack	10		
Rack feeder	yes		
Maximum number of I/O cards	130		
Anchoring type	To Base		
Suction vent	Syes		
Maximum output of batteries that can be allocated	2x12V 120A/h		

INFORMATION TO PLACE AN ORDER

Part Number	Description	notes
FB6100	Structural work to base for FB6100 units	L=800 H=2100 P=800 mm

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6.2 Feeder groups

Two feeder groups are available, one to be anchored on the bottom plate and one to be anchored to a 19" rack.

Both feeder groups are supplied in different configurations, according to the needs.

POSSIBLE CONFIGURATIONS OF FB6100-PU001 FEEDER GROUP

Characteristic	FB6100-PU001/1	FB6100-PU001/2	FB6100-PU001/4
Number of feeders	1	2	4
Maximum inlet voltage	2A a 110V~	4A a 110V~	8A a 110V~
Overall maximum voltage	4A	8A	16A
Maximum voltage for batteries	4A	4A	4°
Maximum voltage on load (Parallel)	4A	8A	16A
Maximum voltage on load (Redounded)	ND	4A+4A	8A+8A
Maximum output of batteries	2x12V 26A/h	2x12V 26A/h	2x12V 65A/h

POSSIBLE CONFIGURATIONS OF FB6100-PU002 FEEDER GROUP

Characteristic	FB6100-PU002/1	FB6100-PU002/2	FB6100-PU002/4
Number of AL-A0008-1 feeders	1	2	4
Maximum inlet current	5A a 110V~	10A a 110V~	10A a 110V~
Overall maximum voltage	20A	40A	40A
Maximum voltage for batteries	6A	6A	6A
Maximum voltage on load (Parallel)	14A	34A	ND
Maximum voltage on load (Redounded)	ND	17A+17A	40A+40A
Maximum output of batteries	2x12V 120A/h	2x12V 120A/h	2x12V 120A/h

INFORMATION TO PLACE AN ORDER

Part Number	Description	notes
FB6100-PU001-1	Complete group with 1 AL-A0005-1 module	
FB6100-PU001-2	Complete group with 2 AL-A0005-1 modules	
FB6100-PU001-3	Complete group with 4 AL-A0005-1 modules	
PU-A0005-1	125 Watt feeder module	
PU-A0004-1	Battery charger module	
FB6100-PU002-1	Group with an AL-A0008-1 feeder module	
FB6100-PU002-2	Group with two AL-A0008-1 feeder modules	
FB6100-PU002-3	Group with three AL-A0008-1 feeder modules	
AL-A0007-1	Basket with cooling unit	With 3 metre temperature probe
AL-A0008-1	500 Watt feeder module	
AL-A0009-1	Battery charger module	
B84115-E-B110	115/250Vac 10A 50/60Hz network filter	
LS502	Fuse disconnecting switch for batteries	
FS20	10x38 20A fuse	
FS50	10x38 50A fuse	
F6.3	Ultra-quick 5x20 6.3A fuse	For AL-A0005-1
F10	Ultra-quick 5x20 10A fuse	For AL-A0008-1
SK12-26	12V 26A/h batteries	
SK12-65	12V 65A/h batteries	
SK12-120	12V 120A/h batteries	

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6.3 Central unit's rack

The central unit is made up by the elaboration units, (CAL) with relative bus, the display module and by the management module of default I/O. It performs elaboration functions of data coming from cards, it manages the operator's interface and the communications with supervision systems.

INFORMATION TO PLACE AN ORDER

Part Number	Description	notes
FB6100-BASE	Complete central unit	With basket in aluminium, 3 units of 19"
FB6100-CPU01.1	Elaboration unit with 10/100baseT Ethernet outlet	
FB6100-CPU01.2	Elaboration unit with 100baseFX Ethernet outlet	
FB6100-MBUS	Bus with two slots for central unit	
FB6100-FB-FP001	Operator's interface unit	
FB6100-TB004.1	I/O default module	
FB6100-TB001.1	termination module with 16 terminals	
FB6100-RK0016.1	termination module with 16 relays	
FB6100-TB002.1	RS232/Current loop converter module	
FB6100-BL000-1	Closing panel for central unit	
FB6100-BL001.1	Closing panel	Used only with systems with single CAL
FB6100-CFT20/05	Flat cable for termination module	Length 5 centimetres
FB6100-CFT10/2	Flat cable for serial connection	Length 2 metres
FB6100-CFT14/2	Flat cable for connection to FB6100-TB004.1 module	Length 2 metres
EDS-205	Ethernet Switch 24Vdc MOXA	5 ports 10/100BaseT RJ45

6.4 I/O rack

Up to a maximum of ten expansion racks containing up to thirteen I/O cards can be connected to a FB6100 base. Position 14 is reserved to FB6100-CTRL1.1 rack controller.

INFORMATION TO PLACE AN ORDER

Part Number	Description	notes
FB6100-BASE	Complete expansion rack	With basket in aluminium, 3 units of 19"
FB6100-RACK1.1	13-slot bus for terminations with flat cable	It does not allow redundancy of I/O modules
FB6100-RACK1.2	13-slot bus for terminations with multiple cable	It allows redundancy of I/O modules
FB6100-CTRL1.1	Rack controller module	

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6.5 I/O modules

Voltage can be supplied or removed to all modules. The following types of modules are available:

INFORMATION TO PLACE AN ORDER

Part Number	Description	notes
FB6100-M001.1	Module with 8 controlled inlets for conventional 24Vdc detectors	Non redounding
FB6100-M001.2	Module with 8 controlled inlets for conventional 24Vdc detectors	Redounding
FB6100-AN001.1-1	Module with a 4-20mA analogue inlet (Note- A)	Non redounding
FB6100-AN001.1	Module with a 4-20mA analogue inlet (Note- A)	Redounding
FB6100-AN002.1	Module with two 4-20mA analogue inlets (note-A)	Non redounding
FB6100-AN002.2	Module with two 4-20mA analogue inlets (note-A)	Redounding
FB6100-C0001.1	Module with 8 500mA controlled outlets for solenoids	Non redounding
FB6100-C0001.2	Module with 8 500mA controlled outlets for solenoids	Redounding
FB6100-C0002.1	Module with 16 500mA non controlled outlets	Non redounding
FB6100-C0003.1	Module with 8 500mA controlled outlets for sirens	Non redounding
FB6100-C0004.1	Module with 4 2A controlled outlets for solenoids	Non redounding
FB6100-C0004.2	Module with 4 2A controlled outlets for solenoids	Redounding
FB6100-S0001.1	Module with 8 inlets for the management of fire extinguishing systems	Non redounding
FB6100-LP001.1	Loop control module for ESP devices	Non redounding
FB6100-MOD001.1	Modbus RTU Master/Slave Module	Non redounding

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6.6 Addressed modules

Addressed modules are used in combination with FB6100-LP001.1 loop cards.

INFORMATION TO PLACE AN ORDER

PN module	Description	Protocol	notes
ALG-E	Optical smoke detector	ESP	Used with FB6100-LP001.1 modules
ATG-E	Temperature detector	ESP	Used with FB6100-LP001.1 modules
AIE-E	Ionic smoke detector	ESP	Used with FB6100-LP001.1 modules
ACA-E	Combined smoke/temperature detector	ESP	Used with FB6100-LP001.1 modules
ACB-E	Multi-task temperature detector	ESP	Used with FB6100-LP001.1 modules
FB6100-Mod-AN	4-20mA analogue module for DIN bar	ESP	Used with FB6100-LP001.1 modules
CHQ-CP	Alarm addressed key	ESP	Used with FB6100-LP001.1 modules
FB6100-Mod-HS	Alarm addressed key	ESP	Used with FB6100-LP001.1 modules
CHQ-MZ	Minizone module	ESP	Used with FB6100-LP001.1 modules
CHQ-Z	Dual zone module	ESP	Used with FB6100-LP001.1 modules
FB6100-Mod-Z	Dual zone module for DIN bar	ESP	Used with FB6100-LP001.1 modules
CHQ-S	Dual switch module	ESP	Used with FB6100-LP001.1 modules
CHQ-R	Dual module relay	ESP	Used with FB6100-LP001.1 modules
FB6100-Mod-R	Dual module relay for DIN bar	ESP	Used with FB6100-LP001.1 modules
CHQ-B	Dual module sounders	ESP	Used with FB6100-LP001.1 modules
FB6100-Mod-B	Dual module sounders for DIN bar	ESP	Used with FB6100-LP001.1 modules
YBO-BS	Base Sounder	ESP	Used with FB6100-LP001.1 modules
CHQ-WS2	Wall Sounder	ESP	Used with FB6100-LP001.1 modules
YBO-BSB	Base Sounder beacon	ESP	Used with FB6100-LP001.1 modules
CHQ-ARI	Remote indicator	ESP	Used with FB6100-LP001.1 modules
CHQ-AB	Addressable beacon	ESP	Used with FB6100-LP001.1 modules
FB6100-Mod-PRG	Programmer for addressed modules	ESP/SSP	Used for all types of modules

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6.7 Termination modules

I/O modules can be ended with termination modules or directly through multiple cables based on the type of bus used.

PN module	Description	Termination with Flat cable	Termination with cable
FB6100-M001.1	Module with 8 22Vdc controlled inlets	FB6100-TB001.1	FB6100-CCT1
FB6100-M001.2	Module with 8 22Vdc controlled inlets	Not available	FB6100-CCT1R
FB6100-AN001.1	Module with 1 4-20mA analogue inlet	FB6100-T8003-1	FB6100-CCT2
FB6100-AN001.2	Module with 1 4-20mA analogue inlet	Not available	FB6100-CCT2R
FB6100-AN002.1	Module with 2 4-20mA analogue inlets	FB6100-T8003-1	FB6100-CCT3
FB6100-AN002.2	Module with 2 4-20mA analogue inlets	Not available	FB6100-CCT5R
FB6100-C001.1	Module with 8 500mA controlled outlets	FB6100-T8006-1 FB6100-T8003-1	FB6100-CCT3
FB6100-C001.2	Module with 8 500mA controlled outlets	Not available	FB6100-CCT3R
FB6100-C002.1	Module with 16 250mA non controlled outlets	FB6100-RK0016.1 FB6100-TB001.1	FB6100-CCT1
FB6100-C003.1	Module with 8 500mA controlled outlets for sirens	FB6100-TB001.1	FB6100-CCT1
FB6100-C004.1	Module with 4 2A controlled outlets for solenoids	Not available	FB6100-CCT4
FB6100-C004.2	Module with 4 2A controlled outlets for solenoids	Not available	FB6100-CCT4R
FB6100-C005.1	Module with 4 2A controlled outlets for sirens	Not available	FB6100-CCT3
FB6100-S0001.1	Module for EN-12094-1 extinguishing systems	FB6100-T8003-1	FB6100-CCT3
FB6100-LP001.1	Bus control module with ESP protocol	FB6100-T8003-1	FB6100-CCT4
FB6100-MOD001.1	Modbus RTU Master/Slave Module	FB6100-T8003-1	FB6100-CCT6

INFORMATION TO PLACE AN ORDER

Part Number	Description	Notes
FB6100-TB001.1	termination module with 16 terminals	Anchoring to DIN bar
FB6100-TB002.1	RS232/ passive current loop converter module	Anchoring to DIN bar
FB6100-T8003-1	termination module with 8 terminals	Anchoring to DIN bar
FB6100-TB004.1	Default I/O module	Anchoring to DIN bar
FB6100-T8006-1	Module with 8 4A 30Vdc relays	Anchoring to DIN bar
FB6100-RK0016.1	Module with 16 4A 30Vdc relays	Anchoring to DIN bar

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6.8 Closing panels

They are used to close the card spots which are not used inside the racks.

INFORMATION TO PLACE AN ORDER

Part Number	Description	Notes
FB6100-BL00-1	Closing panel with holes for Ethernet cables	It occupies one card spot
FB6100-BL001.1	Closing panel in aluminium	It occupies one card spot
FB6100-BL000-2	Closing panel in aluminium	It occupies two card spots
FB6100-BL000-3	Closing panel in aluminium	It occupies three card spots
FB6100-BL000-6	Closing panel in aluminium	It occupies six card spots

6.9 Cables

INFORMATION TO PLACE AN ORDER

Part Number	Description	Notes
FB6100-CTT1	16x0.22 cable for non redounded modules	Length 2 metres
FB6100-CTT1R	16x0.22 cable for redounded modules	Length 2 metres
FB6100-CTT2	4x0.5 cable for non redounded modules	Length 2 metres
FB6100-CTT2R	4x0.5 cable for redounded modules	Length 2 metres
FB6100-CTT3	8x0.5 cable for non redounded modules	Length 2 metres
FB6100-CTT3R	8x0.5 cable for redounded modules	Length 2 metres
FB6100-CTT4	4x0.5 cable for non redounded modules	Length 2 metres
FB6100-CTT4R	4x0.5 cable for redounded modules	Length 2 metres
FB6100-CTT5R	8x0.5 cable for redounded modules	Length 2 metres
FB6100-CTT6	6x0.5 cable for non redounded modules	Length 2 metres
FB6100-CFT10/2	10-way flat cable	Length 2 metres
FB6100-CFT14/2	14-way flat cable	Length 2 metres
FB6100-CFT20/05	20-way flat cable	Length 5 centimetres
FB6100-CFT20/2	20-way flat cable	Length 2 metres
FB6100-CVSC4	8-way RJ cable	Length 19 centimetres
FB6100-CVSC5	8-way RJ cable	Length 36 centimetres
FB6100-CVSC12	8-way RJ cable	Length 60 centimetres

7 Application Notes

The paragraphs described in this chapter contain some indications that must be adopted to build systems in compliance with the requirements set forth by European standards.

7.1 Notes to build systems in compliance with EN 54-2 / EN54-4 standard

For fire detection systems compliant with EN 54-2 standard, the following requirements must be fulfilled:

- Use exclusively certified and approved feeder groups for this type of device.
- No more than 32 detectors and/or alarm systems can be configured in an area.
- Maximum 32 detectors/ alarm systems must be connected to each conventional detection line (FB6100-M001.1 cards).
- Maximum 512 detectors/ alarm systems must be used on each loop line (FB6100-LP001.1-1 cards).
- A short-circuit insulator must be installed on loop lines (FB6100-LP001.1-1 every 32 detectors and/or alarm systems).
- The systems with more than 512 detectors and/or alarm systems must have CAL redundancy.
- The maximum number of cards for addressed devices in the various configurations must not exceed the values indicated in the following table:

Configuration	Maximum no. of Loop cards FB6100-LP001.1-1
FB6100	64

7.1.1 EN54-2 EN54-4 adhesive label

The units compliant with EN54-2 standard must be equipped with an adhesive label as required by the same standard.

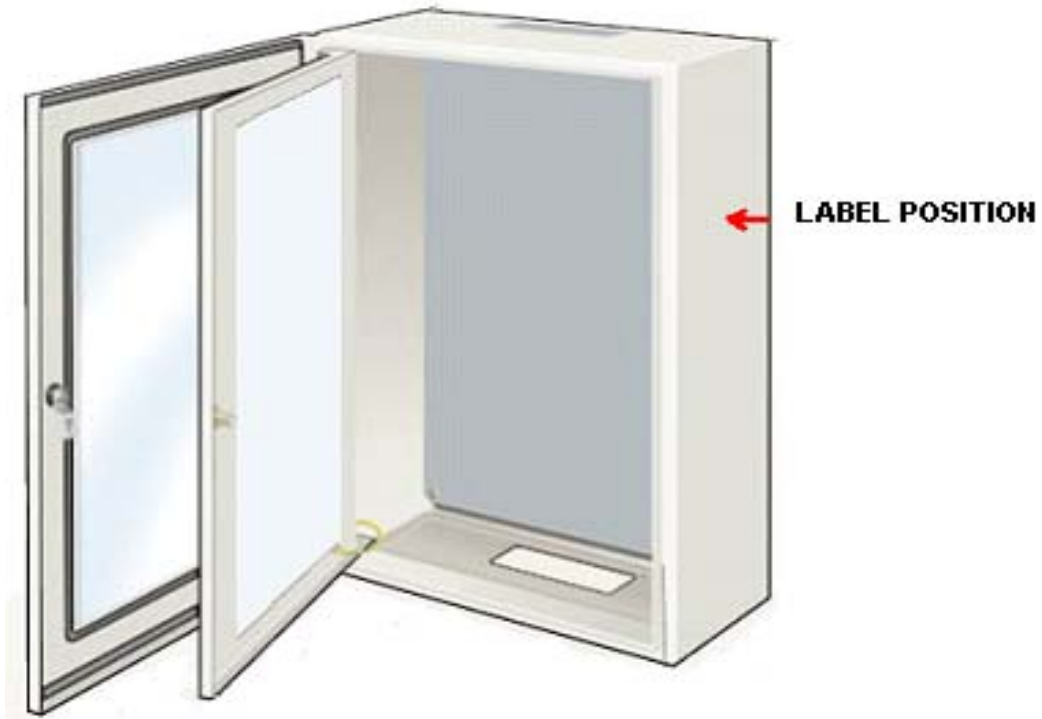
SANCO S.p.A		
Galliate (ITALY)		CE
Numero di Serie <i>Serial Number</i>		
Commessa <i>Job Number</i>		
Anno di Costruzione <i>Construction Year</i>	2008	
Modello <i>Model</i>	FB6100	
Norme Applicate <i>Applied Standards</i>	EN 54-2 EN 54-4	
Tensione di Alimentazione <i>Supply Voltage</i>	110-240V ~ (-15% + 10%)	
Corrente Massima <i>Maximum Current</i>	6,4 A	
Fissaggio <i>Operating Position</i>	PAVIMENTO/FLOOR	
Grado di Protezione <i>Protection Degree</i>	IP 30	

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Instructions for affixing EN54-2 EN54-4 adhesive label

The adhesive label described in 7.1.1 must be applied on the right side of the structural frame as indicated in the following figure.



7.2 Notes to build systems in compliance with EN 12094-1 standard

According to EN 12094-1 standard, d.e.c. must be a separate device or an integral part of a c.c.s.

In FB6100 systems, the functions relative to detection and those relative to extinguishing are performed by a single elaboration unit. As a consequence, even warnings are visualized on a single interface in compliance with EN 54-2 and EN 12094-1 standards. For this reason, in the following paragraphs, d.e.c. and c.c.s. acronyms are grouped up in FB6100 system. FB6100 system is fed by a feeder group compliant with European standard EN 54-4. The inlets and outlets relative to extinguishing systems must be monitored by the following types of cards:

FB6100-M001.1 Card with 8 controlled inlets to supervise systems, pressure gauges, selectors, etc...

FB6100-C001.1 Card with 8 monitored outlets for the command and control of solenoids or actuators in general.

FB6100-C004.1 Card with 4 monitored outlets for the command and control of solenoids or actuators in general.

FB6100-C003.1 Card with 8 outlets for the command and control of optical sound signalling devices.

FB6100-C002.1 Card with 16 outlets of relay type for the command of blocks, repetitions, etc...

FB6100-S001.1 Card that groups up the visual warnings of an extinguishing area.

FB6100-M001.1, FB6100-C001.1, and FB6100-C004.1 cards can be used in redounded configuration to increase the system's availability. The maximum number of extinguishing cards in the various configurations must not exceed the values indicated in the following table:

Configuration	Maximum no. of extinguishing cards FB-S0001.1
FB6100	32

7.2.1 Environmental class

Since d.e.c. constitutes an integral part of FB6100 system, the environmental class will be the one of the system in its whole. Class A: Temperature field from -5°C to +50 °C.

7.2.2 Elaboration of signals and warnings

FB6100 system receives and visualizes the signals relative to extinguishing areas. The elaboration of logics is performed by the central unit. The information is sent to the visualization unit. Both compulsory and optional functions are performed by the cards as described in paragraphs 7.2.3 and 7.2.4.

7.2.3 Compulsory functions

FB6100 system is able to perform the following compulsory functions:

- Receipt and elaboration of the sequence begin signal coming from detection.
- Supervision of a controlled inlet line for manual enabling devices.
- Supervision and command of outlet lines for solenoid command.
- Supervision and command of outlet lines for optical/sound detectors.
- Visual and unmistakable indication of the various statuses.
- Command of a failure open collector outlet.
- Command of an open collector outlet and visual warning of the release status.

7.2.4 Optional functions

FB6100 system is able to perform the following optional functions:

- Extinguishing delay management.
- Signal that represents the flow of the extinguishing agent
- Emergency extension (Hold)
- Starting of a secondary flooding sequence
- Manual mode only (Aut-Off)
- Enabling commands of devices inside the system
- Extinguishing signals with back-up bottles
- Enabling commands of devices outside the system
- Emergency interruption device
- Enabling of alarm devices with different signals

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7.2.5 Warning lights

A card of FB6100-S001.1-1 model must be foreseen for each extinguishing area, which has the purpose to group up all the main signals relative to a single extinguishing area. Eight warning lights are located on the front panel of this card which indicates the following statuses:

Function	Colour	Label	notes
Active status	Red	Activated	Compulsory
Release status	Red	Released	Compulsory
Failure status	Yellow	Fault	Compulsory
Out of Service status	Yellow	Disabled	Compulsory
Emergency interruption	Yellow	Inhibit	Optional
Emergency extension	Yellow	Hold	Optional
Manual mode only	Yellow	Automatic-Off	Optional
Reserve bench selection	Yellow	Reserve bench	Optional
Monitoring of components' status (*)	Yellow		Optional

(*) This option must be used as an alternative to the optional function.

All detailed indications relative to alarm, anomaly and failure statuses are visualized on the unit's display.

7.2.6 Monitored inlets

Use cards of FB6100-M001.1 type to monitor the following devices:

- Inlets for manually enabled devices (manual discharge systems)
- Inlets for devices that indicate the flow of the extinguishing agent such as pressure gauges or flow gauges (PSH)
- Inlets for monitoring devices of components' status (Weighting devices or devices for the control of a valve's position)
- Inlets for devices that extend the discharge sequence (HOLD)
- Inlets for devices that allow to switch operation from Manual/Automatic to Manual only (AUT-OFF)
- Inlets for devices that allow to select Main/Reserve (MAIN/RESERVE)



Up to a maximum of manual discharge systems and a maximum of 5 devices to extend emergency (Hold) can be connected to each extinguishing area.

The cards of this type can be used in a redounded mode to increase the system's availability in case of failure of one of the two cards.

7.2.7 Monitored outlets

Use FB-C0004.1 card to monitor and command the following devices:

- Outlets for the command of extinguishing devices. (Solenoids, flood valves, etc)
- Outlets for the command of equipment inside the system (pilot bottles, etc...)

The cards of this type can be used in a redounded mode to increase the system's availability in case of failure of one of the two cards.

Use FB-C0003.1, FB-C0005.1 cards to monitor and command the following devices:

- Outlets for the command of optical/sound signals.

7.2.8 Non monitored outlets

Use cards of FB-S0001.1 type to monitor the following devices:

- Repetition of activated condition
- Repetition of Release condition
- Repetition of Fault condition
- Repetition of Disabled condition
- Repetition of Inhibit condition
- Repetition of Hold condition
- Repetition of Automatic-off condition
- Repetition of Reserve bench condition

In addition, through cards of FB-C0002.1 type, it is possible to command outlets for control devices outside the systems (release of doors, interruption of ventilation, etc).

7.2.9 Receipt and elaboration of incoming enabling signals

The system is able to receive an automatic enabling signal coming from detection cards and an enabling signal coming from manually enabled devices, connected to cards of FB-M001.1. type.



After receiving the enabling signal (enabled status), it is no longer possible to perform any disabling operation in the extinguishing area involved.

7.2.10 Transmission of extinguishing signals

After receiving the enabling signal, the system transmits said signal to the extinguishing devices (Solenoids). The transmission of this signal (enabling) only takes place on the selected bench (Main/Reserve).

7.2.11 Enabling of alarm devices

After receiving the enabling signal, the system transmits said signal to the Alarm devices.



The acknowledgement of alarm devices takes place at access level 2 (acknowledgement of sirens) only after establishing the release status.

7.2.12 Signalling the presence of network's voltage

The signalling of the presence of voltage applies to the entire system (Led Power-ON on the display).

7.2.13 Active status

The system enters into Active status after one second from receiving the incoming enabling signals. After having established the active status of the d.e.c., it enables the alarm devices within one second. The Active status is signalled through:

- the Enabling of the local sound signal
- the Enabling of the steady light of the Activated area on FB-S0001.1 card
- the enabling in flashing mode, of the command outlet for alarm devices. (TOA)

7.2.14 Release status

The release status is activated when the signal that represents the flow of the extinguishing agent (PSH) is received or when the outlet of the extinguishing devices is enabled (EV). The way in which the release status is activated can be defined during the programming phase.

The Release status is signalled through:

- the Enabling in steady mode, of the Released light of FB-S0001.1 card.
- the Enabling of the repetition outlet of the release status (Released condition)
- the enabling in steady mode, of the command outlet for alarm devices (TOA)

If the release status is due to the receipt of the signal that presents the extinguishing agent and the d.e.c. is not Activated (manual extinguishing through mechanical command), the local sound signal is also activated.

7.2.15 Resetting of Active and Release statuses

The Active and Release statuses are reset with the manual Reset command at access level 2 (Reset Panel).



The resetting of the Active and Release statuses is inhibited for a period of time that can be configured between 1 and 30 minutes. This time is set on the extinguishing cards in the operator's cycle at access level 3.

7.2.16 Failure status

The system is able to recognize and signal the following failure conditions:

- Interruption of the automatic enabling signal coming from the central unit (Failure of the detection card).
- Interruption of short-circuit of all monitored inlet and outlet lines.
- Failures of the internal power supply.
- System's failures.
- Improper execution of the program and/or corruption of the memory content.

Failures are signalled as follows:

- Enabling of the local sound signal
- Enabling in steady mode, of the Fault light located on the unit's display.
- Detailed visualization of the type of failure and total number of failures on the unit's display.
- Enabling of the repetition outlet of the failure status.

7.2.17 Out of Service status

All inlets and outlets relative to extinguishing areas can be disabled/enabled singularly or globally at access level 2. Disabling operations are not influenced by the reset command (Reset).

The release status is not attained during out of service, except in case the signal that represents the flow of the extinguishing agent is received (PSH).



The enabling of a function and/or transmission support to actuators when an alarm is activated causes the discharging of the extinguishing agent only at the end of the set discharge activation delay time.

The out of service status is indicated at access level 1 on FB-S0001.1 cards through a cumulative optical signaller. The details of all exclusions can be viewed at access level 1 on the unit's display.

7.2.18 Delay of the extinguishing signal. The system is able to delay the extinguishing command for a period of time between 0 and 60 seconds. This setting is performed with one second increases on extinguishing cards through the operator's cycle at access level 3.

7.2.19 Signal that represents the flow of the extinguishing agent

The system is equipped with inlets to receive the signal that represents the flow of the extinguishing agent (PSH).

Receiving this signal without an active status generates the release status. As a consequence, all suitable outlets will be enabled.

7.2.20 Emergency extension (Hold)

The system is equipped with inlets to receive the signal to extend emergency. (Hold). This function works in the following ways:

Mode- A

The extinguishing command outlets are not enabled until the emergency holding device is active. The disabling of the emergency holding device after the extinguishing delay time causes the immediate activation of the extinguishing command outlets (EV).

Mode- B

The extinguishing command outlets are not enabled until the emergency holding device is active. The extinguishing delay time is started up again at each releasing of the emergency holding device. After the enabling of the emergency holding inlet, the system performs the following activities:

- Enabling of the local sound signal (If previously acknowledged)
- Enabling in steady mode, of the HOLD light on FB-S0001.1 card.
- Enabling of a repetition outlet signalling the emergency hold status.



The failure status of the emergency hold inlet line inhibits the activation of the extinguishing command outlets.

7.2.21 Starting of a secondary flooding sequence

The system is able to command a secondary flooding sequence. This sequence is activated through a manual device. The secondary flooding sequence is activated only in the following conditions:

- The primary extinguishing sequence has ended (release status)
- The sound devices have not been acknowledged
- The system has not been reset
- The manual enabling inlet of the secondary sequence is active.



The outlet that commands the secondary flooding is immediately activated after enabling the manually enabled inlet without any delay.

7.2.22 Manual mode only (Aut-Off)

The system is equipped with inlets to receive the commutation signal of the operation mode from manual only to automatic/manual and vice versa. After enabling this inlet, the system performs the following activities:

- Enabling of Aut-Off steady light on FB-S0001.1 card.
- Enabling of the repetition outlet in manual mode only (AUT-OFF)

During manual mode only, the enabling of the d.e.c. takes place only by activating the manually enabled device (PB).

7.2.23 Enabling commands of devices inside the system

The system is able to command devices located inside the extinguishing area. E.g. Pilot bottles, optical warning devices, etc...

For this purpose, the cards to use are:

- FB-C0003.1, FB-C0005.1 for the command of optical/sound signals
- FB-C0001.1, FB-C0004.1 for the command of solenoids, valves, etc...

7.2.24 Extinguishing signals with back-up bottles

The system is equipped with outlets to receive the commutation signal of the extinguishing command from the main battery to the back-up battery and vice versa. After enabling these inlets, the system performs the following activities:

- Enabling of the Reserve Bench steady light on FB-S0001.1 card.
- Enabling of the repetition outlet of the Reserve battery.

7.2.25 Enabling commands of devices outside the system

The system is able to command devices located outside the extinguishing area. E.g. Closing of doors, stopping of ventilation, etc... For this purpose, the card to use is model FB-C0002.1.

7.2.26 Emergency interruption devices

The system is equipped with inlets to receive the signal coming from emergency interruption devices.

During the idle status and the active status, the enabling of these devices causes the inhibition of extinguishing command signals until the status has ended and the active status has been reset.

The failure status of the emergency interruption inlet line inhibits the activation of the extinguishing command outlets.

7.2.27 Enabling of alarm devices with different signals

The d.e.c. is able to command the outlet of alarm devices with two different signals. For this reason, the command outlet of alarm devices flashes during the warning time (pre-unloading) and it is steady during the release of emergency hold statuses.

7.2.28 EN-12094-1 adhesive tag

FB-S0001.1 card is supplied with the following adhesive label which indicates the tag data relative to EN-12094-1 standard.

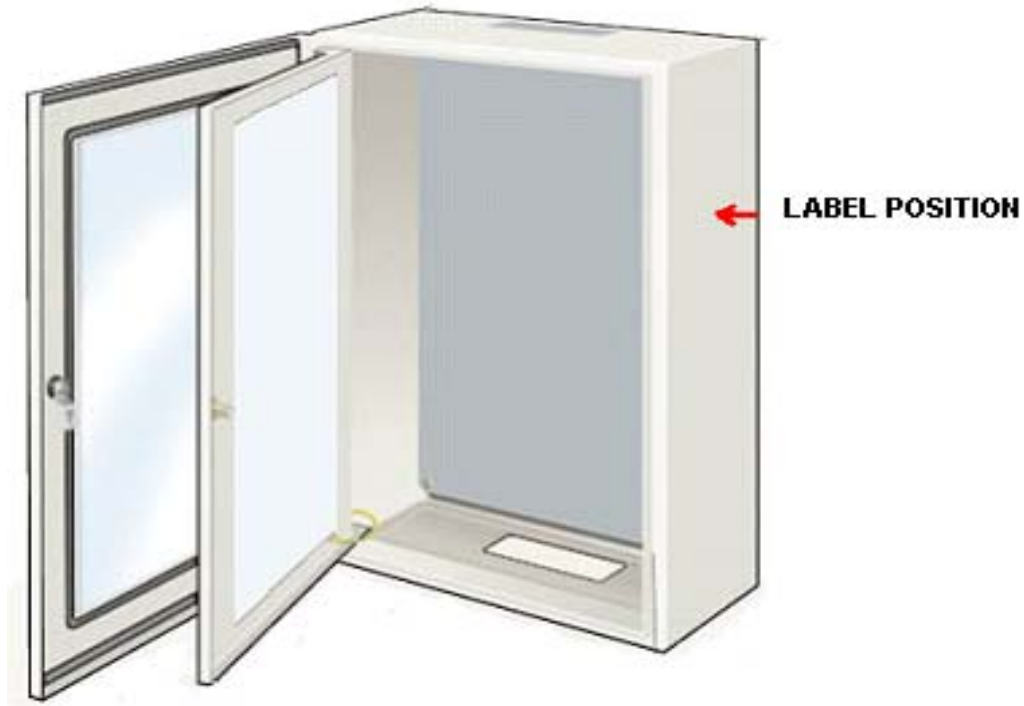
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SANCO S.p.A Galliate (ITALY) 08 0051-CPD- 0143	   0051
EN-12094-1 Electrical Automatic control and delay device Model FB6100 Panel equipped with extinguishing cards FB-S0001.1 Environmental Class A Flooding zone (s): 1..32 CO₂, Inert gas system, Halogenated Hydrocarbons Provided options: - Delay of extinguishing signal - Signal representing the flow of extinguishing agent - Emergency Hold device - Initiation of secondary flooding - Manual only mode - Triggering signals to equipment within the system - Triggering signals to equipment outside the system - Extinguishing signal to spare cylinders - Emergency Abort device - Activation of alarm devices with different signals Response delay activated condition maximum 1 sec. Response delay triggering of outputs maximum 1 sec. Install in accordance with Installation manual	

7.2.29 Instructions for affixing EN-12094-1 adhesive label

The adhesive label described in 7.2-28 must be applied on the right side of the structural work, underneath the existing one relative to EN54-2, EN54-4 standard.



7.3 Notes on the redundancy of I/O modules

The modules of safety related type can be redounded to increase the system's availability. In this case, the two modules must be located on different racks and their relative channels must be exactly configured the same way. If a module is redounded, the channels of the two modules are seen by the unit independently, in order to elaborate logics and diagnostics. The concept of modules' redundancy adopted in FB6100 systems is based on the following concepts:

- An I/O module is considered failed by the central unit if it does not reply to the following queries on the LVDS bus or after three periodical tests failed consecutively on at least one of the channels.
- If one of the two modules is subject to failure, the other one becomes valid in order to elaborate logics. As a consequence, the logics on redounded channels must be always of OR type and not of AND type.

7.4 Redundancy concept of I/O modules

For redundancy of an I/O module, it is meant the possibility to connect a field user to two cards at the same time. Therefore, the type of redundancy that we described in this document is only referred to modules and not to field elements. For this purpose, we remind that full redundancy (Module + field user) is possible for all I/O modules without any limitation. The I/O modules of system FB6100 can be subdivided into two categories:

- Non redounding
- Redounding with limitations

Non redounding modules

For the following cards, it is not possible to perform any type of redundancy:

- FB-C0002.1** Module with 16 non controlled outlets
- FB-C0003.1** Module with eight controlled outlets with polarity inversion for sound signals
- FB-S0001.1** Control module for extinguishing systems
- FB-LP001.1** loop control module ESP
- FB-MOD001.1** Master/Slave Modbus interface module

Even if FB6100-F7006 module is not redounding, it is equipped with two communication lines, an independent RS485 and RS232, therefore it can be stated that the communication towards DCS is redounded.

Redounding modules with limitations

For the following modules, it is possible to perform redundancy with some limitations or precautions:

FB-M0001.1 Inlet modules with safety related functions

These modules can be redounded with the following limitations:

- To isolate a line, both channels connected to the line must be isolated.
- By using a supervision system, each single user must be represented with two different objects.
- The modules must be located in two contiguous buses with DIN41618 connectors, FB6100-RACK1.2 model, possibly in the same position.

FB6-AN001.1 FB-AN002.1 Inlet modules 4-20mA with safety related functions

These modules can be redounded with the following limitations:

- The modules cannot have 4-20mA outlet since the outlet current is added up when the cards are placed parallelly. It is possible to enable this function on one of the two cards without obtaining redundancy on the outlet function.
- To isolate a line, both channels connected to the line must be isolated.
- By using a supervision system, each single user must be represented with two different objects.
- The modules must be located in two contiguous buses with DIN41618 connectors, FB6100-RACK1.2 model, possibly in the same position.

FB-C0004.1 Outlet modules with safety related functions

This card can be redounded with the following limitations:

- To isolate an outlet line, all channels connected to the line must be isolated.
- By using a supervision system, each single user must be represented with two different objects.
- The modules must be located in two contiguous buses with DIN41618 connectors, FB6100-RACK1.2 model, possibly in the same position.

7.5 Precautions for the use of redounded I/O modules

If redounded I/O modules are used, the following precautions must be adopted:

- Redounded cards must always be located in different and contiguous racks in order to guarantee redundancy also in case of failure of a rack controller.
- In case of failure of a channel, the module will put all channels in safety mode. For this reason, the redundancy of the two modules must be performed on all channels used and not only on some of them, otherwise in case of failure of one channel, all functions on non redounded channels would be interrupted.
- Redounded channels must be configured exactly in the same way.

7.6 Communication network between units

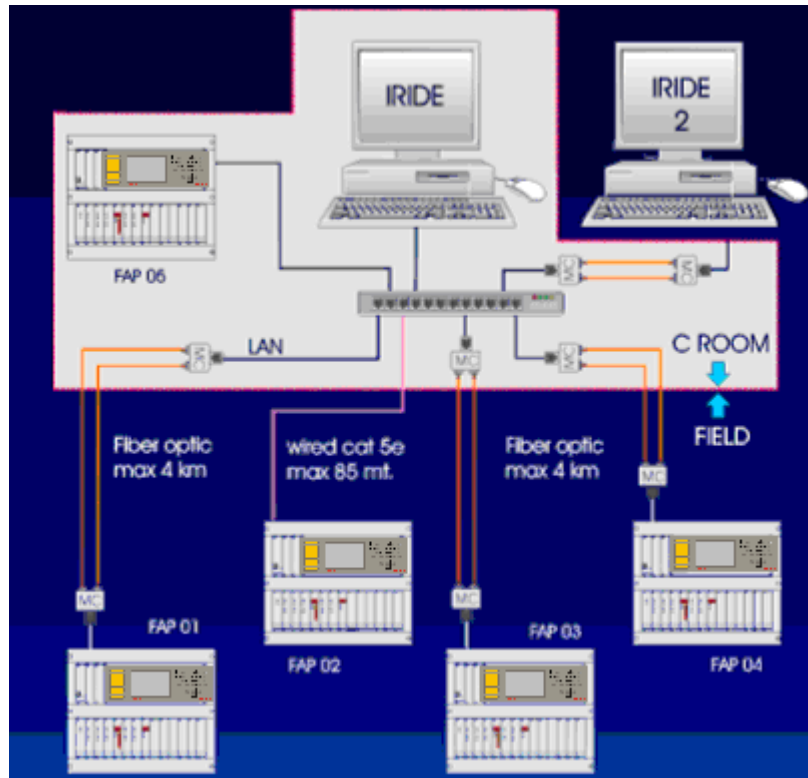
By using the Ethernet interface on the CAL, it is possible to transfer the logic status of rules (Checked/ Not checked) among different units. The units are divided into two Transmitting (Slave) and Receiving (Master) categories. Each unit on the network can be transmitting only, receiving only or transmitting/receiving indifferently. Transmitting units (Slave) send all rules' status variations defined on the receiving unit as remote to Receiving units (Master). 999 rules can be defined and therefore disclosed for each unit. Maximum 99 units can be connected to each other inside the network. Receiving units (Master) receive and elaborate the status variations coming from transmitting units and cyclically check the connection with the Slave units connected to them. When Master units are turned on, they request the IP address to the Slave available in the configuration. Then they send the message identification code (ID code) to them. This code is generated randomly and is changed dynamically every minute and it is compared with the one present in the messages coming from Slave units to validate messages. If a message received has an invalid code, it is discarded. Master units perform a new subscribe every hour to Slave units in order to check the changes to the configuration. If Slave units reply correctly, the Master unit waits for the status changes coming from Slave units. During operation, the Master unit cyclically checks the efficiency of the connection with Slave units and in case of disconnection, it signals it on the display. The propagation time of signals among the various units changes based on the network's traffic. Anyhow, in case of dedicated networks, it does not exceed two seconds. The units' network can be in copper or optical fibre, equipped with specific converters that allow a redounded connection of ring type, able to support a failure or rupture of the fibre.

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7.7 Communication protocol for supervision systems

FB6100 systems can be connected to a SCADA supervisor through LAN network or through point to point serial connections. Maximum 2 supervisors on LAN network and a supervisor on the serial Host port can be configured for each unit. A dedicated protocol is used in both cases. The connection between units and supervisors can be made in copper, optical fibre or mix, to satisfy the various system's needs.



Example of mix connection

7.8 Programming

The programming of FB6100 systems is performed on a personal computer in OFF-LINE mode, through a specific configuration program. After having created the configuration and checked the correctness of data, it is possible to perform transferring to the central unit. Once transferring is completed, the central unit substitutes the old configuration with the one received and re-boots the system. In case two CALs are present, the personalization is transferred to the two CALs at the same time. To use configuration program Pro-FB refer to the specific manual.

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PROGRAMMABLE SYSTEM FB6100

OPERATOR'S MANUAL

FB6100-MO

Important notes

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Index of revisions

Index of revisions	Brief Description of Content	Release date
Rev. 0	Preliminary Version	30-10-2007
Rev. 1	Review for certification	21-03-2008

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1 GENERAL DESCRIPTION

The units of series FB6100 are suitable to be used in fire detection systems, extinguishing command systems and intrusion detection systems. They are built in full compliance with the following European standards:

EN 54-2 Fire detection units. (Safety)

EN 54-4 Feeder equipment. (Safety)

EN12094-1 Components for fire extinguishing systems that use gas. (Safety)

They can be supplied in the following configurations:

Code	Description	No. Rack	Max of cards	no. FB. S001.1 S001.1 cards	IMQ brand	Sizes of carpentry (mm)
FB6100	10-rack standard unit	10	130	32	No	H2000 L800 P800
FB6100/C	Custom unit	1-10	130	32	No	Custom

General characteristics

Control types	Fire/Intrusion/Technological/TVCC
Supply voltage.	110-220Vac 50/60Hz
Reference standards	EN54-2/EN54-4/EN12094-1
Maximum number of programmable areas	300 fire areas + 300 intrusion areas
Maximum number of points for each area	99 sensors 99 actuators 99 associations
Maximum number of cards	130
CPUs' Redundancy	Optional
I/O Bus redundancy	Optional
Cards' redundancy	Optional only on conventional cards
Substitution of cards under warm conditions	Possible for all types of cards
Centralization between units	With RCP protocol
Monitoring system	Maximum three supervisors for each unit
Printer	Optional serial from 40 to 80 columns
Host outlet	RS232 configurable or Passive Current Loop
Ethernet outlet	100Mbps for copper and optical fibre
Management of Hourly Bands	10 categories with management of festivities
Default outlets	16 + two Sounder outlets
Default inlets	10 opto-isolated inlets

1.1 Operator's interface

The operator's interface of the FB6100 unit is made up by a graphic display, 14 signalling lights and a keyboard with 23 keys.

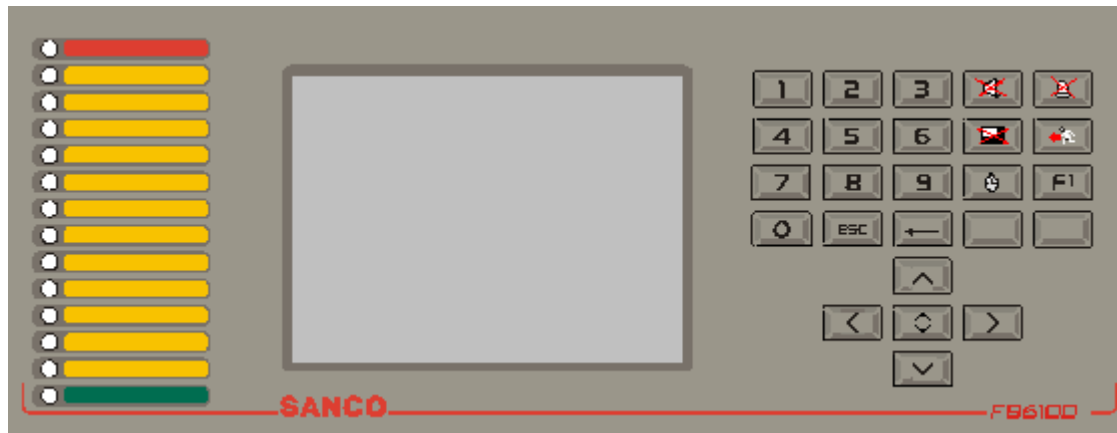


Figure 0
Visual signals

☐ **ALARM** **ALARM light (fire function)**

It is activated intermittently after receiving an alarm status coming from one of the area cards. It turns on solidly after giving the command of Central Acknowledgement. It turns off after giving the reset command.

☐ **COMMON FAULT** **COMMON FAULT light (fire /intrusion function)**

It turns on intermittently after receiving any failure condition. It turns off once the cause is solved or after giving the anomaly resetting command.

☐ **DEVICES FAULT** **DEVICES FAULT light (fire function)**

It turns on intermittently due to an anomaly condition coming from a sensor or actuator (not defined as sounders). It turns off once the cause is solved or after giving the anomaly resetting command.

☐ **SOUNDERS FAULT** **SOUNDERS FAULT light (fire function)**

It turns on intermittently due to an anomaly condition coming from an actuator defined as sounders. It turns off once the cause is solved or after giving the anomaly resetting command.

☐ **PSU1 FAULT** **PSU1 FAULT light (fire /intrusion function)**

It turns on intermittently due to a failure condition of the primary supply. It turns off automatically once the cause has been solved.

☐ **PSU2 FAULT** **PSU2 FAULT light (fire /intrusion function)**

It turns on intermittently due to a failure condition of the secondary supply. It turns off automatically once the cause has been solved.

☐ **EARTH FAULT** **EARTH FAULT light (fire /intrusion function)**

It turns on intermittently due to the dispersion of supply voltage towards the ground. It turns off automatically once the cause has been solved.

☐ **SYSTEM FAULT** **SYSTEM FAULT light (fire /intrusion function)**

It turns on intermittently due to a system's failure. It turns off automatically once the cause has been solved.

 TEST ZONE**TEST ZONE light (fire function)**

It turns on intermittently once an area is set in test mode. It turns off automatically once the test mode is quitted.

 COMMON DISABLED**COMMON DISABLED light (fire function)**

It turns on solidly after any type of disabling relative to area 1 (Safety).

 DEVICES DISABLED**DEVICES DISABLED light (fire function)**

It turns on solidly after disabling a sensor or an actuator defined in area 1 with the exclusion of outlets of sounder type.

 SOUNDERS DISABLED**SOUNDERS DISABLED light (fire function)**

It turns on solidly after disabling an actuator defined in area 1 as sounder type.

 OUTPUTS DELAYED**OUTPUTS DELAYED light (fire function)**

It turns on intermittently during the counting time relative to the enabling delay of the actuator in area 1. It turns off automatically at the end of said counting or after pressing the "Delay override" key.

 POWER ON**POWER-ON light (fire/intrusion function)**

It turns on solidly when the primary supply voltage is present (PSU1). It turns off when this is missing.

Three lights are located at the back of the card and have the following functions:

Green light Link CAL-A

When it turns on solidly, it indicates the presence of the communication link with CAL-0.

Green light Link CAL-B

When it turns on solidly, it indicates the presence of the communication link with CAL-1.

Green light Link T8004-1

When it turns on solidly, it indicates the presence of the communication link with default I/O card.

KEYS**Silence Panel key (fire function)**

It acts at access level 1 or higher, and it only disables the central siren relative to fire functions. An acknowledgement message is visualized on the display, stored in the events archive and sent to eventual peripherals (host/printer).

**Reset Key (fire function)**

It acts at access level 2 or higher and it resets all alarm or anomaly situations active in that moment on the unit of area 1. A reset message is visualized on the display, stored in the events archive and sent to eventual peripherals (host/printer). This function can be enabled only after having turned off the buzzer and sounders.

**Scroll key (fire/intrusion function)**

It acts at access level 1 or higher, it chronologically scores the active alarms and anomalies at that moment for the selected zone in area 1, visualizing the single events in details. It also acts in the archive's sub-menus for area 1 and area 2.

**Silence Sounder key (fire function)**

It acts at access level 2 or higher and it disables the controlled outlet of the default sounder and all outlets identified as sounder in default. An acknowledgement message is visualized on the display, stored in the events archive and sent to eventual peripherals (host/printer). This function can be enabled only after having turned off the buzzer.

**Delay override key (fire function)**

It acts at access level 1 or higher and cancels the enabling delay time of those actuators that are undergoing a delay counting in that moment, located in area 1 of default.

Evacuate Key (fire function)

It acts at access level 2 or higher and it disables the controlled outlet of the default sounder and all outlets identified as sounder in default. An evacuation message is visualized on the display, stored in



the events archive and sent to eventual peripherals (host/printer).

Esc Key (fire /intrusion function)

It acts in the various operator's menus by exiting the pressed keys or the menus selected on the display. It brings you back to the previous menu.

**Enter key (fire /intrusion function)**

It acts in the various operator's menus by confirming the pressed keys or the menus selected on the display.

**Up arrow Key (fire /intrusion function)**

It is used to vertically select the various options in menus or to scroll towards the top.

**Down arrow Key (fire /intrusion function)**

It is used to vertically select the various options in menus or to scroll towards the bottom.

**Right arrow Key (fire /intrusion function)**

It is used to horizontally select the various options in menus.

Left Arrow Key (fire /intrusion function)

It is used to horizontally select the various options in menus.

**Function Key (fire /intrusion function)**

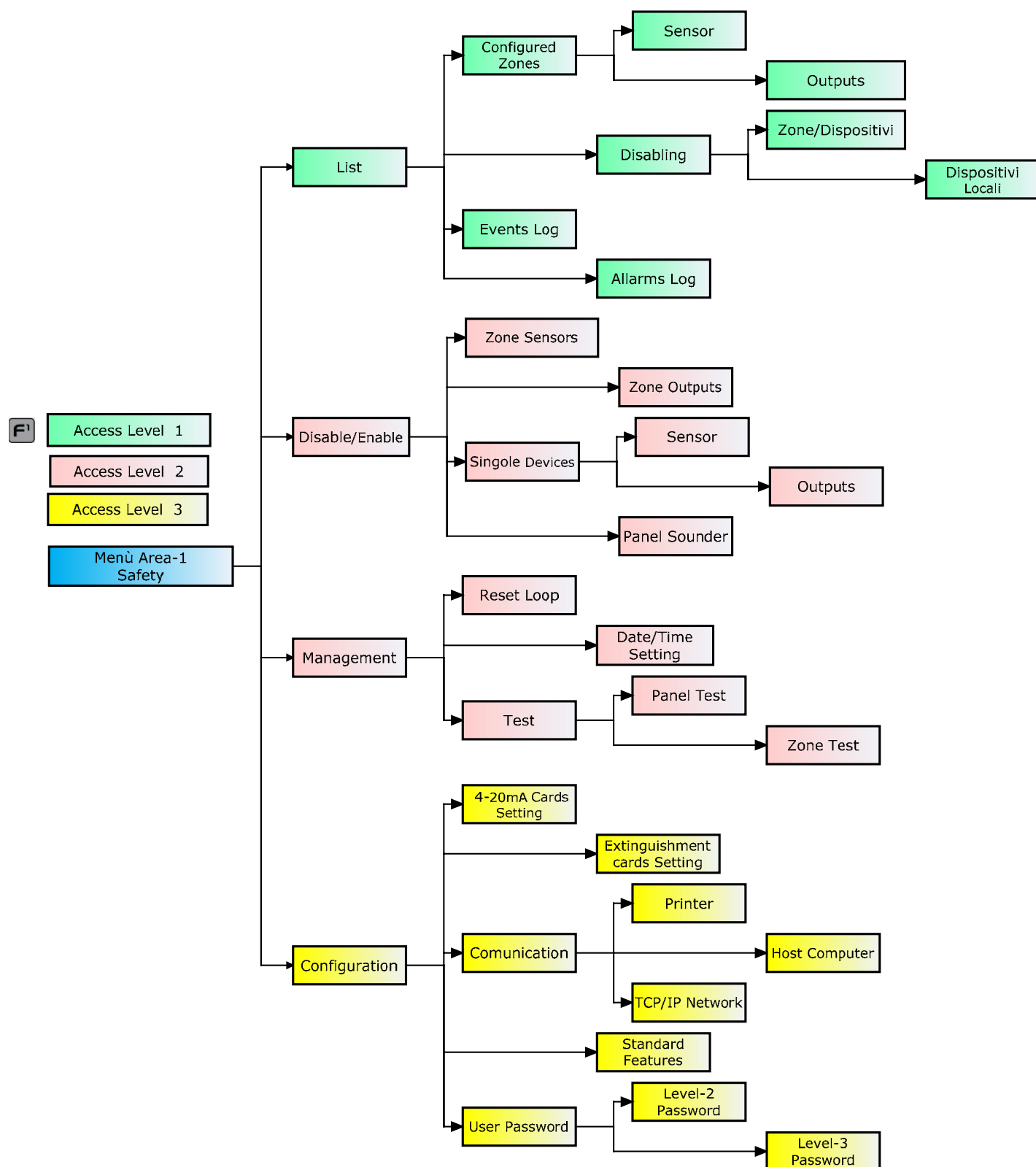
It allows to directly access the menu relative to the active level which is activated when the key is pressed.

Numeric Keys 1 / 9 (fire /intrusion function)

They are used to select the digits of passwords and to introduce data in the various menus of the operator's cycle.

1.2 Fire section (Safety)

The following figure represents the tree structure of the menus available in the fire section.



1.3 Access to operator's functions

Access to the various functions of the fire section is organized on 4 different levels.

- Level 1: accessible to the PUBLIC
- Level 2: accessible to the USER
- Level 3: accessible to the MAINTENANCE OPERATOR
- Level 4: reserved to the MANUFACTURER

Access to level 1 is obtained without the need of a password, by pressing key F1, while a password is needed to access level 2 or 3. The units are supplied with the following passwords which can be edited during the operator's cycle:

Access Level	Prefix	Password
Level 2 Area 1 (Safety)	1	51729
Level 3 Area 1 (Safety)	1	61841

The following table represents the access levels needed to perform the main functions relative to the fire section.

OPERATOR'S ACTIONS	Level 1	Level 2	Level 3
Acknowledgement of local buzzer	✓	✓	✓
Cancelling of timing in progress	✓	✓	✓
Visualization of alarms, anomalies and failures	✓	✓	✓
Acknowledgement of sirens		✓	✓
Resetting of alarm/anomaly (reset)		✓	✓
Activation of sirens (evacuation)		✓	✓
Access to display menu	✓	✓	✓
Access to disable/enable menu		✓	✓
Access to management menu		✓	✓
Access to configuration menu			✓

1.4 Operations at access level 1

At the end of the initialization cycle, in idle conditions, the unit's status appears on the display as indicated in figure 1.

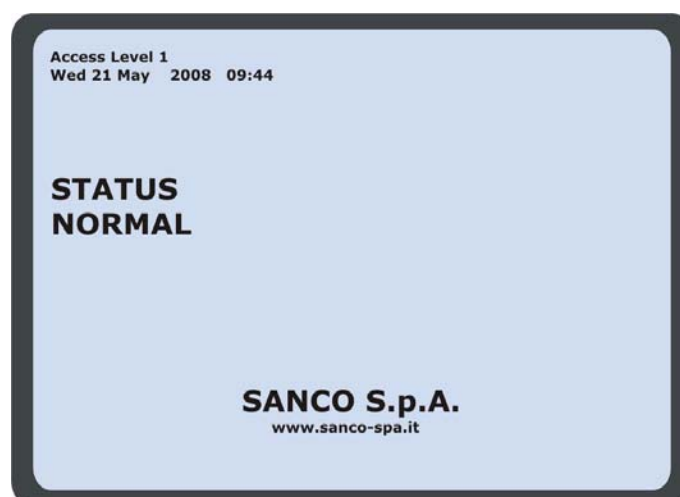


Figure 1

The following operations can be performed at access level 1:

1.5 Acknowledgement of local buzzer

This operation is done by pressing key 
A confirmation notice will be displayed on the last row for two seconds.

1.5.1 Delay Override

This operation is done by pressing key 
This operation is possible only if the Output Delayed light is on and causes to override the delays on the activations in progress.

1.5.2 Visualization of alarm areas

A page is visualized in the presence of alarms as indicated in figure 2.



Figure 2

In this page it is possible to see:

- The total number of alarm areas
- the name and number of the first alarm area
- The names and numbers of other alarm areas
- the name and number of the last alarm area

By positioning the cursor on the central row using the arrow keys and pressing



it is possible to chronologically visualize alarm areas.

To see the list of alarm devices, position the cursor on the area that you wish and press key 



Figure 3

In this page it is possible to see:

- The total number of alarm areas
- the name and number of the first alarm area
- the name and number of the first sensor of the alarm area.
- The current number and the total number of alarm sensors in the area.

In this phase it is possible to see the complete list of alarm sensors, by pressing key



1.5.3 Visualization of pre-alarm areas

The visualization of pre-alarm areas takes place in the same way used to visualize the alarm areas.

1.5.4 Visualization of areas with anomalies

The visualization of areas with anomalies takes place in the same way used to visualize the alarm areas.

1.5.5 Visualization of system's failures

In the presence of one or more system's failures, a page is visualised as shown in figure 4.

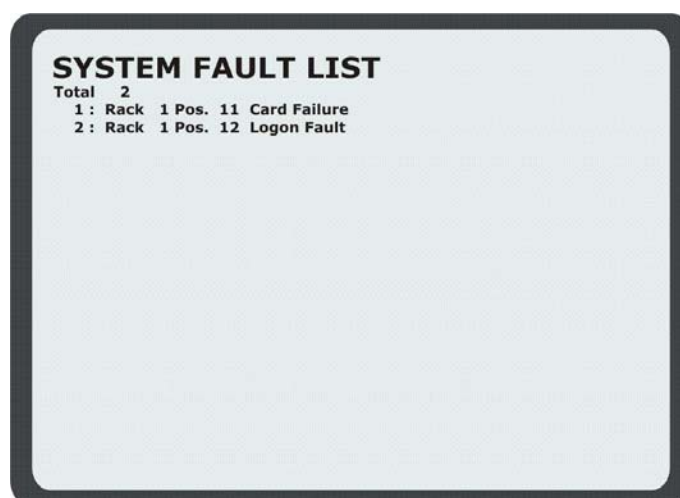


Figure 4

In the presence of different events, by pressing key Esc, it is possible to visualize the various pages of events list in order. In any case, the alarm page is displayed automatically after one minute of inactivity. If during the visualization of anomalous events, an event with greater priority occurs, this will be immediately visualized on the display. In this case, it will also be pointed out that events with lower priority are present.



1.6 Visualize

By pressing key F1 at access level 1, it is possible to access the visualization phase as shown in figure 5.

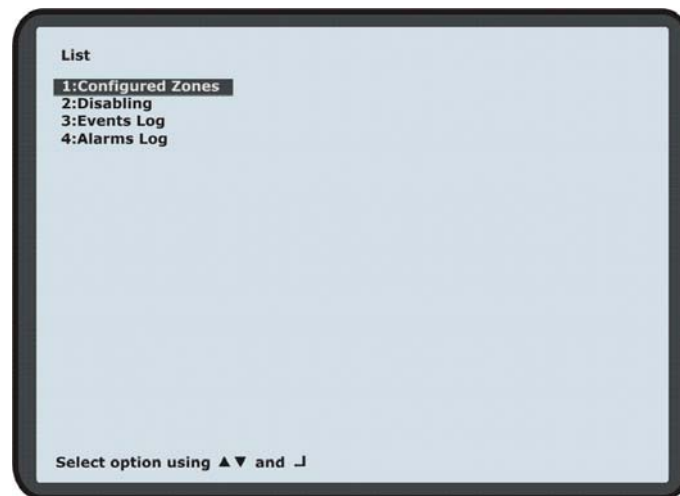


Figure 5

Configured areas

To visualize the complete list of areas configured in area 1. For each area, it is possible to visualize the complete list of sensors and actuators.

Disabling

To visualize the list of disabled areas and devices.

Events archive

To visualize the chronological archive of the last 250 events.

Alarms archive

To visualize the chronological archive of the last 100 alarms.

The visualization of archives is shown in figure 7. For each event, the following is visualized:

- The progressive number
- The date and time in which it occurred
- The number and name of the area to which the event refers
- The type of device to which the event refers
- The type of event.

It is possible to scroll the archive in chronological order, by using the arrow keys.

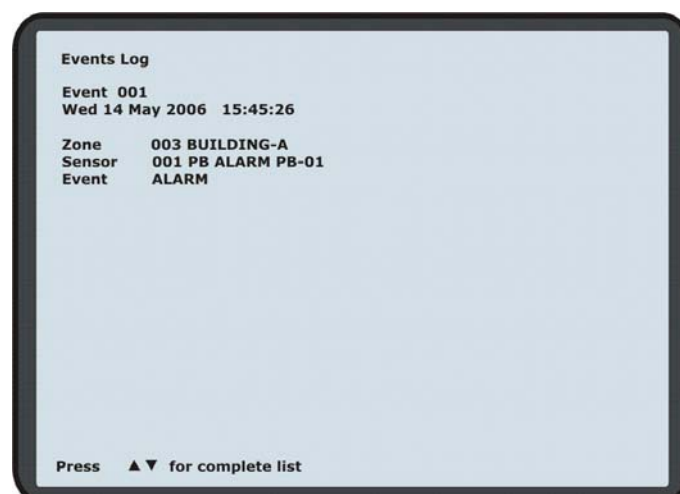


Figure 6

1.7 Operations at access level 2

By entering the password of level 2, preceded by prefix 1, it is possible to access the main menu shown in figure 5.

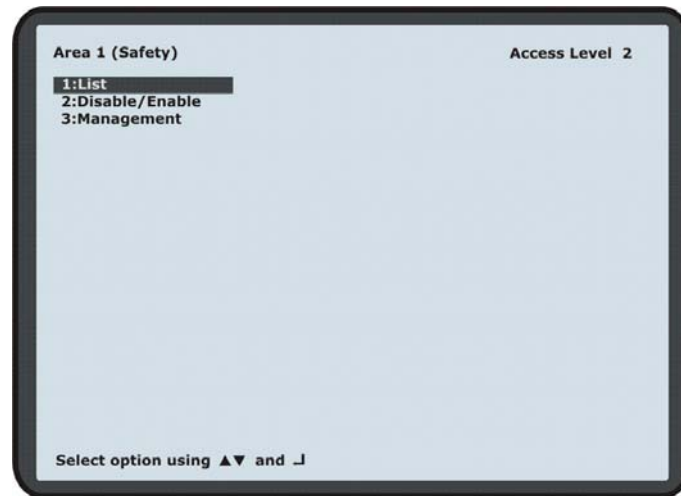


Figure 7

The unit will automatically exit from the selected access level after one minute of operator's inactivity. The following operations can be performed at access level 2:

1.7.1 Acknowledgement of sirens

By pressing the silence key, it is possible to disable all actuators defined in configuration as sounders. This key is enabled only during an alarm condition, after having silenced the local buzzer.

1.7.2 Reset



By pressing the reset key, it is possible to reset the alarm conditions of the sensors defined in hold modality, and anomalous conditions for the types of anomaly or failure that need resetting. This key



is enabled only after having silenced the local buzzer and sirens.

1.7.3 Evacuation

By pressing the evacuate key, it is possible to immediately activate all actuators defined in configuration as sounders.



1.7.4 Disable/Enable

By selecting this option from the main menu, it is possible to access the disabling/enabling phase as shown in figure 8.

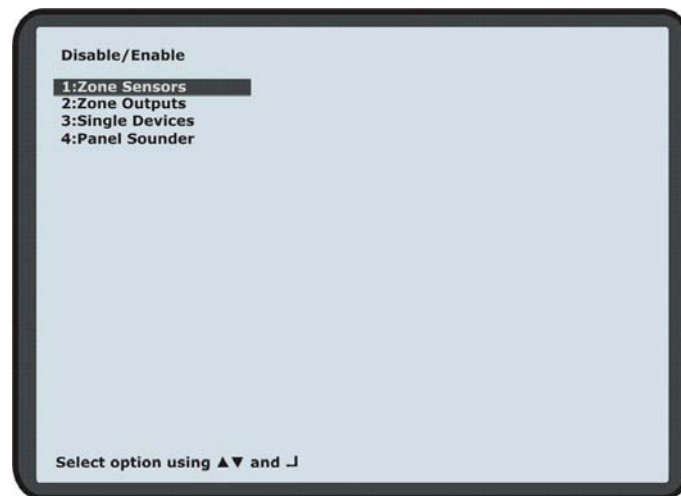


Figure 8

Complete Sensors Area

Select this option to disable/enable all sensors of an area.

Complete Actuators Area

Select this option to disable/enable all actuators of an area.

Single devices

Select this option to disable/enable a single sensor or a single actuator.

Local Siren

Select this option to disable/enable the local siren.

NB: To comply with the requirements of EN12094-1 standard, it is not possible to perform any disabling in the extinguishing areas during the enabling phase of the discharge sequence.

1.7.5 Management

By selecting this option from the main menu, it is possible to access the management phase as shown in figure 9.

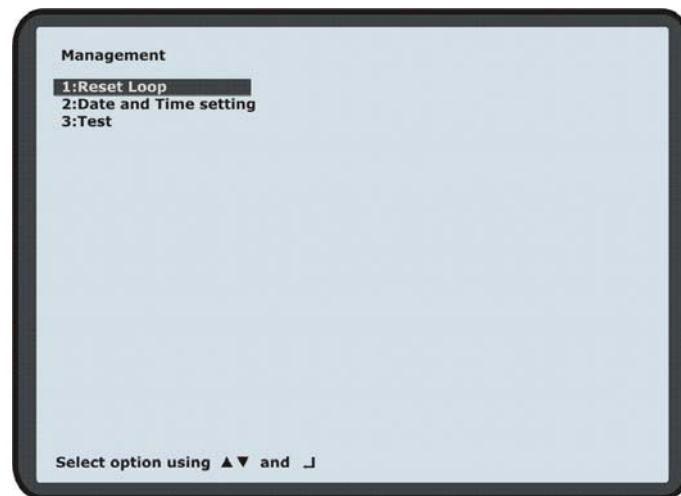


Figure 9

Loop resetting

Select this option to perform the loop resetting on cards of FB6100-LP001.1 type.

If the card is not present or is of different type, an error message is displayed. A loop resetting must be performed in case a short circuit must be reset or to eliminate a Logon Fault warning.

Editing of Date and Time

By selecting this option, it is possible to access the editing page of the system's clock as shown in figure 10. In this phase it is possible to modify the various parameters. If the value entered is outside the range allowed, an error message is displayed.

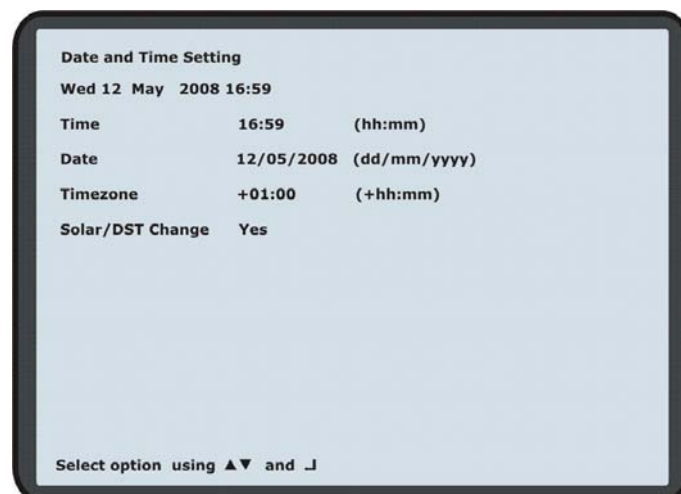


Figure 10

Test

By selecting this option, it is possible to access the Test Menu. In this phase it is possible to perform the test on the unit or on an area.

Test on Unit

By selecting this option, the unit will perform the following operations:

- Test on LCD display.
- Enabling of Lights located on the front panel.
- Enabling of local Buzzer for 2 seconds.
- Enabling of all cards' lights.
- Test on keyboard.

Test on Areas

It is possible to test an area through this option. In order to test an area, this must be selected from the list. It is not possible to test more areas at the same time. When an area is in test mode, the relative light turns on the front panel. It is not possible to test an area if it is under an isolated status of alarm, pre-alarm or anomaly. When an area is in test mode, the unit performs the automatic resetting of alarm sensors after 5 seconds and does not enable outlets. The test area mode is exited automatically after 2 hours or manually, by acting on the same menu and disabling the test on the area. During the test, the remaining time is displayed in the main page.

Operations at access level 3

By entering the password of level 3, preceded by prefix 1, it is possible to access the main menu shown in figure 11.

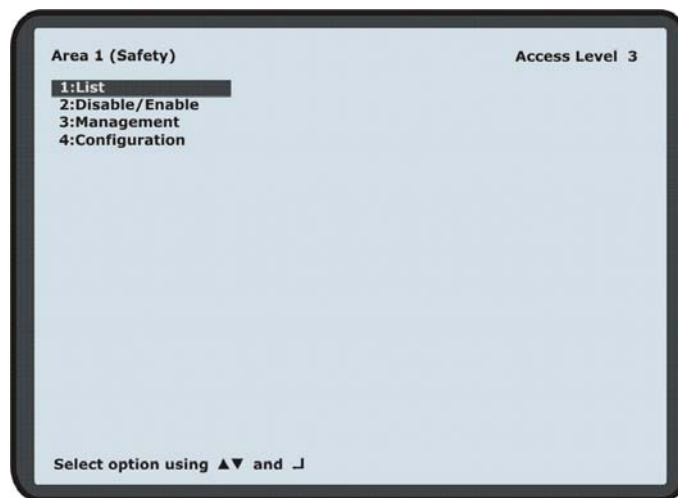


Figure 11

During this phase, it is possible to perform the same options in access level 2, with the addition of the Configuration menu.

1.7.6 Configuration

By selecting this option from the main menu, it is possible to access the configuration phase as shown in figure 12.

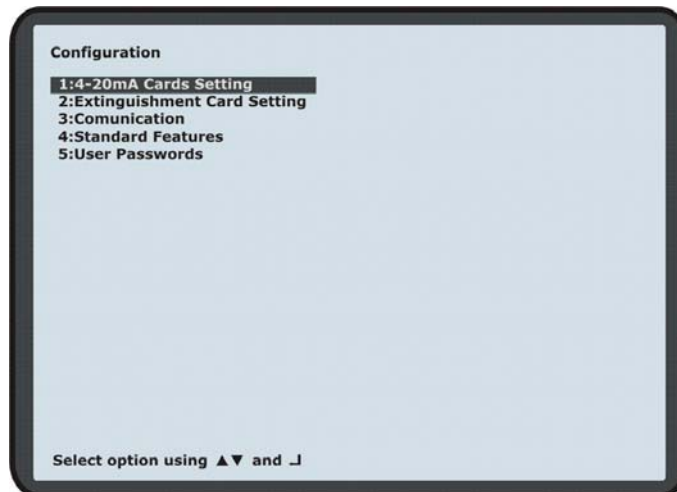


Figure 12

4-20mA cards

By selecting this option, it is possible to access the editing phase of the thresholds of FB6100-AN001.1 and FB6100-AN001.2 cards. First of all, the rack number and the position of the card whose thresholds will be edited, must be entered. If the card is not present or is of different type, an error message is displayed. If the card is present and of correct type, the screen of figure 13 is displayed.

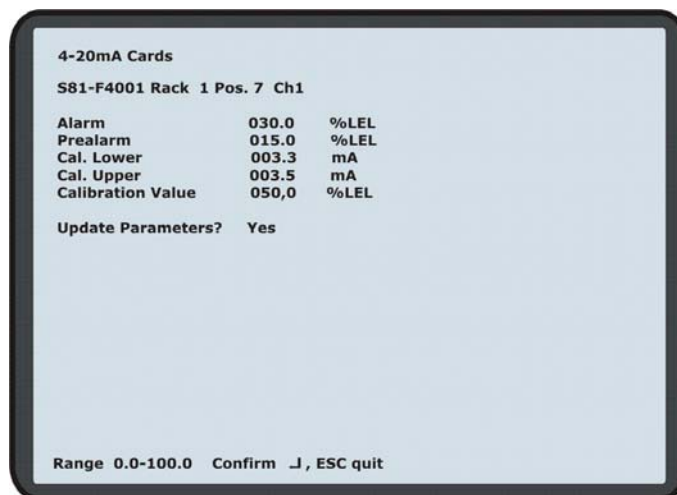


Figure 13

The type of card and its position will be indicated in the first row.

The pre-alarms threshold with relative unit of measurement will be displayed on the second row.

The alarm threshold with relative unit of measurement will be displayed on the third row.

The lower calibration threshold with relative unit of measurement will be displayed on the fourth row.

The upper calibration threshold with relative unit of measurement will be displayed on the fifth row.

The range permitted for each of the 4 parameters is visualized on the last row.

After having modified the values, position the cursor on the field "Update parameters" and press

key  to send the new parameters to the card.

Extinguishing cards

By selecting this option, it is possible to access the editing phase of the parameters relative to the extinguishing areas for FB6100-S001.1 cards. First of all, the rack number and the position of the card whose parameters will be edited, must be entered. If the card is not present or is of different type, an error message is displayed. If the card is present and of correct type, the screen of figure 14 is displayed.

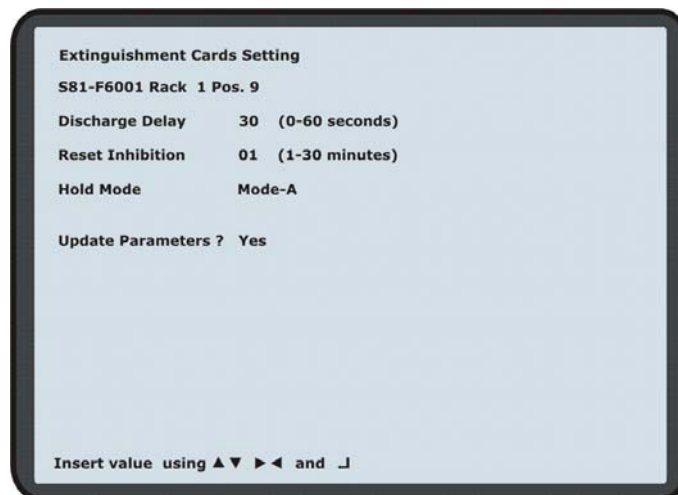


Figure 14

The first editable parameter indicates the extinguishing delay time. It can be set with values between 0 and 60 seconds. The second parameter indicates the inhibition time to reset the conditions at the beginning of the sequence and to enable extinction. It can be set with values between 1 and 30 minutes. The third parameter indicates the functioning mode of the Hold function. In mode A, the Hold condition does not interrupt the measuring of the discharge delay time, while in mode B, the Hold condition resets this time. The editing of parameters takes place with the arrow keys in the following way:

- Key (Arrow up) increases the value set at one.
- Key (Arrow down) decreases the value set at one.
- Key (Arrow up) increases the value set at one.
- Key (Left Arrow) decreases the value set at five.

Communications

By selecting this option, it is possible to access the configuration phase of communication peripherals as shown in figure 15.

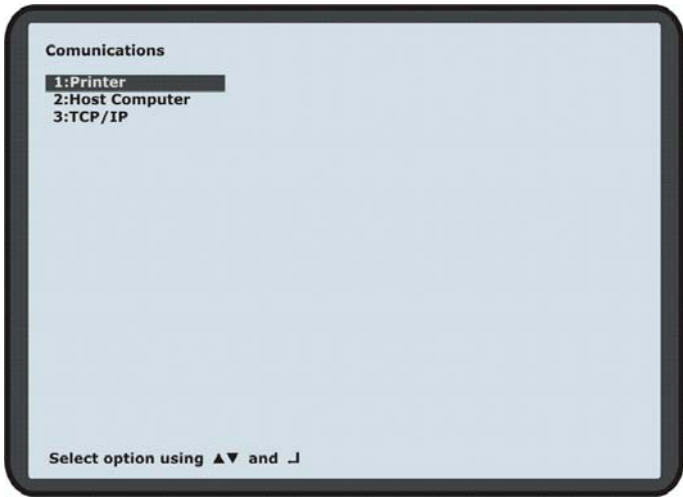


Figure 15

Printer

By selecting this option, it is possible to access a sub-menu in which it is possible to configure the printer as shown in figure 16.

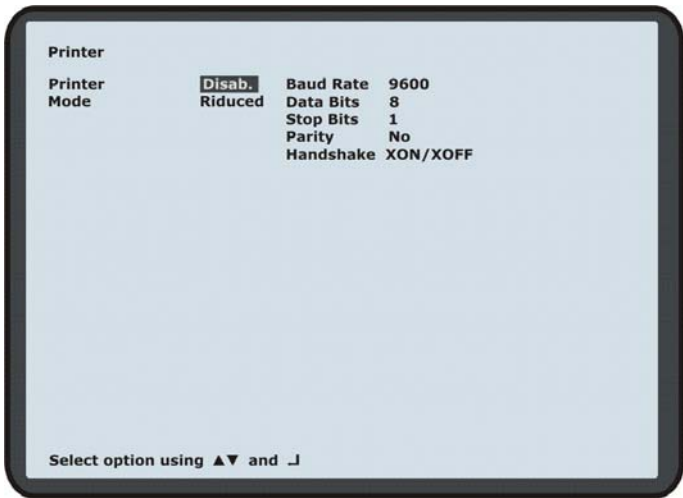


Figure 16

To edit said parameters, use the arrow keys (up and down arrows) and confirm with Enter. By pressing Enter it is possible to access the next parameter to edit. Press ESC to exit and go back to previous menus. The values allowed and the meaning for each field are the following:

Printer

- Disab.: The serial printer is disabled.
- 40 col.: The serial printer is enabled to print on 40 columns.
- 80 col.: The serial printer is enabled to print on 80 columns.

Mode

- It configures the printer mode in the operative cycle.
- Reduced: Only alarm/enabled events and failure notices are printed;
- Complete: All events are printed.

Baud Rate

- It configures the communication speed of the serial port.
- The values allowed are: 1200,2400,4800,9600 and 19200

Data Bits

It configures the number of data bits of the serial communication.

The values allowed are: 7 and 8.

Stop Bits

It configures the number of stop bits of the serial communication.

The values allowed are: 1 and 2.

Parity

It configures the parity check of the serial communication.

The values allowed are: No (no parity), Odd (odd) and Even (even).

Handshake

It configures the handshake type of the serial communication.

The values allowed are: Xon/Xoff, Rts/Cts and None.

Host Computer

By selecting this option, it is possible to access sub-menus in which it is possible to configure the communication parameters of the Host Computer peripheral as shown in figure 17.

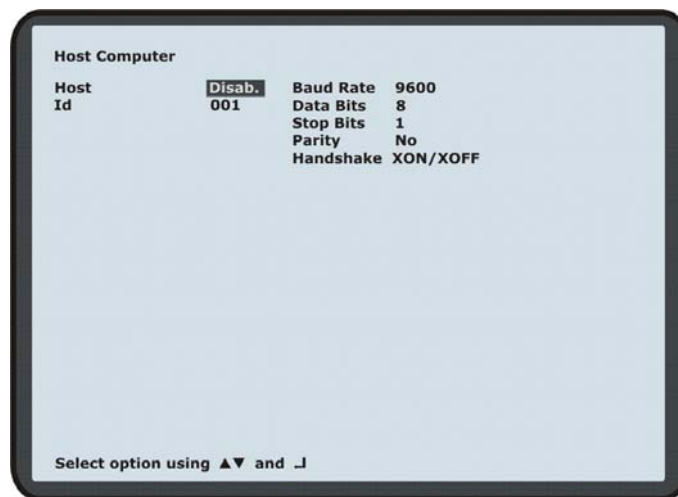


Figure 17

To edit said parameters, use the arrow keys (up and down arrows) and confirm with Enter. By pressing Enter it is possible to access the next parameter to edit. Press ESC to exit and go back to previous menus.

The values allowed and the meaning for each field are the following:

Host

Disab.: The Host Computer's communication peripheral with serial protocol is disabled.

Enabled: The Host Computer's communication peripheral with serial protocol is enabled.

ID

It identifies the unit number in case more systems must be centralized. It must be a progressive number from 1 to 999. This parameter is used by the serial communication protocol and by the TCP/IP communication protocol.

Baud Rate

It configures the communication speed of the serial port.

The values allowed are: 1200,2400,4800,9600 and 19200

Data Bits

It configures the number of data bits of the serial communication.

The values allowed are: 7 and 8.

Stop Bits

It configures the number of stop bits of the serial communication.

The values allowed are: 1e 2.

Parity

It configures the parity check of the serial communication.

The values allowed are: No (no parity), Odd (odd) and Even (even).

Handshake

It configures the handshake type of the serial communication.

The values allowed are: Xon/Xoff, Rts/Cts and None.

By selecting this option, it is possible to access sub-menus in which it is possible to configure the parameters relative to TCP/IP protocol as shown in figure 18.

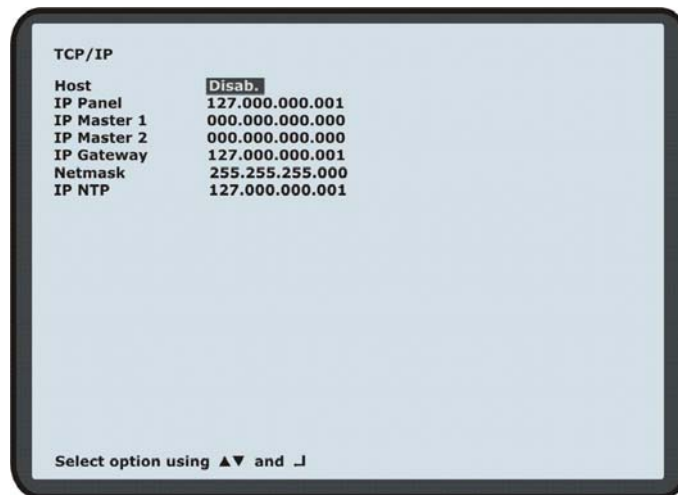


Figure 18

To edit said parameters, use the arrow keys (up and down arrows) and confirm with Enter. By pressing Enter it is possible to access the next parameter to edit. Press ESC to exit and go back to previous menus. The values allowed and the meaning for each field are the following:

Host

Disab.: The Host Computer's communication peripheral with TCP/IP protocol is disabled.

Enabled: The Host Computer's communication peripheral with TCP/IP protocol is enabled.

IP Panel

It identifies the IP address of the unit.

IP Master 1

It identifies the IP address of the main TCP/IP Host Computer.

IP Master 2

It identifies the IP address of an eventual second Host Computer.

IP Getway

It identifies the IP address of the access point of geographical network (VAN).

Netmask

It identifies the Netmask address of the local network.

IP NTP

It identifies the IP address of the NTP server to perform the alignment of the system's clock.

NB: Values 127.000.000.001 and 000.000.000.000 indicate that the relative function is disabled.

Standard options

The standard configuration parameters are visualized with this option, as indicated in figure 19. To edit said parameters, use the arrow keys and numeric keys and confirm with Enter. By pressing Enter it is possible to access the next parameter to edit. Press ESC to exit and go back to previous menus.

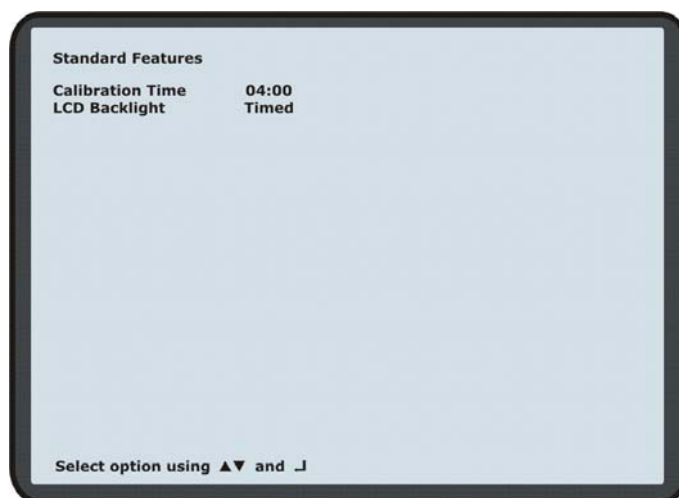


Figure 19

Calibration time

This parameter allows to set the calibration time of analogue smoke detectors. The manufacturer's setting is at 4:00 a.m.

LCD backlight

This parameter defines the operation methods of the display's back light.

The possible choices are:

On: The display's back light always remains on;

Off: The display's back light always remains off;

Timed: The display's back light automatically shuts off after one minute of inactivity on keys.

Editing of Password

This option allows to edit the user password. It is initially requested to select the access level to which the password must be modified. Once selected the wanted level, the screen in figure 20 will appear.



Figure 20

In this phase it is prompted to enter the new password twice which must consist of 5 numbers. Then press Enter. At each number entered, for safety reasons, symbol # will appear.

1.8 Visualization of events on the display

A description about how the events are represented on the display in the various operation phases of the unit is enclosed below.

1.9 Initialization cycle

It is performed upon start-up and after having transferred the Areas/Zones through the Pro-FB6100 program.

The initialization cycle is made up by the following phases:

Checking of hardware

The primary CPU verifies the operation of the secondary CPU and of the Display card. (Figure 21)

Checking of Cards

The primary CPU checks if the cards present on the bus are functioning and of correct type.

Checking of cards' release software

The primary CPU checks the compatibility of the software release of configured cards.

Initialization of Cards

The primary CPU sends the configuration parameters of programmed devices to each card.

Enabling of cards

The primary CPU enables the functioning of cards.

Synchronization of clock

The primary CPU synchronizes the system's clock to verify the status of time bands.

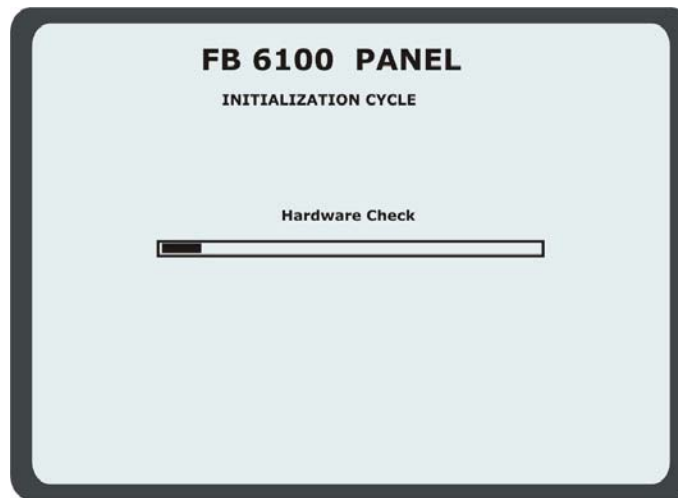


Figure 21

If instead a system's failure is detected during the initialization phase, for example a broken card, the type of failure is visualized on the display as shown in figure 22.

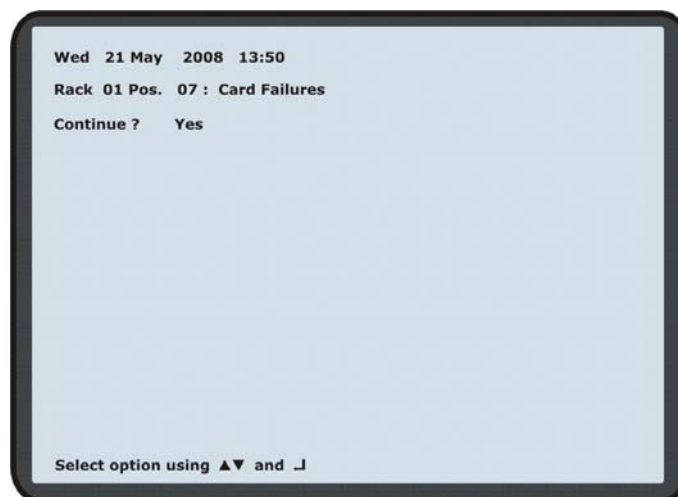


Figure 22

By pressing Enter, the unit will perform the following actions:

- Enabling of Common Fault light intermittently.
- Enabling of System Fault light intermittently.
- Disabling of default Fault and System fault relays.

By selecting the option to not continue through the arrow keys, the unit will stop and remains blocked until it is turned on again.

Disabled condition

After disabling a device, the unit performs the following actions:

- Enabling of Common Disabled light solidly.
- Enabling of Devices Disabled light solidly.
- Enabling of default Disabled relay.
- Enabling the Sounders Disabled light solidly. (only if outlet is of Sounders type)

The display will show the notice of figure 23.



Figure 23

1.9.1 Condition of Anomaly

When an Anomalous condition occurs, the unit performs the following actions:

- Enabling of local Buzzer
- Enabling of Common Fault light intermittently.
- Enabling of Devices Fault light intermittently. (if it is not a system's failure)
- Enabling of System Fault light intermittently. (If it is a system's failure)
- Enabling of Sounders Fault light intermittently.
- Disabling of default Fire Fault relay.

The display will show the notice of figure 24.



Figure 24

1.9.2 Pre-alarm condition

When a pre-alarm condition occurs, the unit performs the following actions:

- Enabling of local Buzzer
- Enabling of default fire pre-alarm relay.

The display will show the notice of figure 25.



Figure 25

1.9.3 Alarm condition

When an alarm condition occurs, the unit performs the following actions:

- Enabling of local Buzzer
- Enabling of local siren
- Enabling of Alarm light intermittently.
- Enabling of default fire alarm relay.

The display will show the notice of figure 26.



Figure 26

2 NOTES ON CPU REDUNDANCY

If more than 512 fire alarm sensors are connected to the unit, a system with double CPU must be used, as indicated in paragraph 13.7 of EN54-2 standard.

In systems with double CPU, the one at the left (CAL-0) is the primary one (green light Run, which is on solidly), while the one at the right (CAL-1) is the secondary one (green light Run, which is on intermittently). Each operation performed by the primary CPU is performed by the secondary CPU at the same time, so that in case of failure of one of the two CPUs, the other continues to operate with no interruptions. The failed CPU is signalled on the display, in the system's failures list, as indicated in figure 27.

It is possible to substitute CPU in warm conditions.

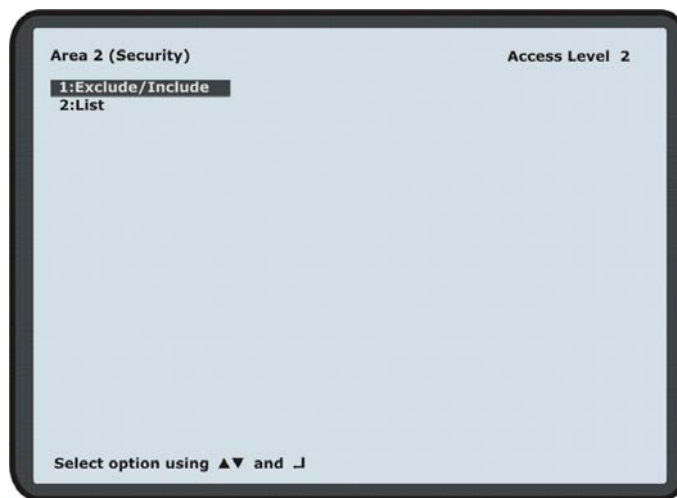


Figure 27

In system with single CPU, in case of failure of the CPU, the unit is put in safety mode. The failure condition is visualized on the display as shown in figure 28. The Common Fault and System Fault lights are turned on, and the default relays relative to the Fault condition are disabled.

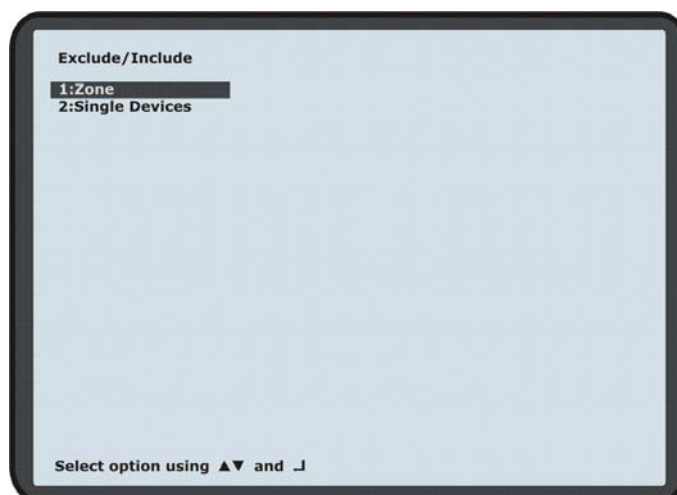


Figure 28