

C.A.T.

Technical Service Center



DULEVO

F A Y A T G R O U P

Workshop Manual

6000 6000
COMBI

EU 4

EURO 5

EURO 6

TIER 3

TIER 4



This publication provides unit and relevant component repair data, specifications, instructions and methodologies.

This publication has been drawn up for qualified and specialized personnel.

Before performing any operation check that the part relevant to the sweeper on which you must work is available along with all safety devices for accident-prevention, such as, goggles, helmet, gloves, shoes, etc. and hoisting and transporting equipment.

Operations are to be performed by following the indications included here, using the special equipment indicated and assuring proper repair, compliance with schedule and operator's safety requirements.

Each repair must aim to restore operating efficiency and safety in compliance with the DULEVO INTERNATIONAL provisions.

DULEVO INTERNATIONAL cannot be held liable for modifications, alterations or other interventions not authorized by DULEVO INTERNATIONAL on the vehicle and if the sweeper is warranted the above mentioned interventions will cause its expiration.

DULEVO INTERNATIONAL is not liable for repairing interventions.

DULEVO INTERNATIONAL will provide further details required to carry out the interventions and all the instructions that are not included on this publication.

Data included in this publication may not be up-to-date therefore subject to Manufacturer's modifications that can be added at any time for technical or commercial purposes and also to meet new law regulations in other Countries.

If issues on this publication differ from what is actually noticed on the sweeper, please get in touch with the DULEVO INTERNATIONAL network before starting any intervention.

It is forbidden to copy this text or any of its parts and all illustrations included.

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CHAPTER 1
Preface

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1.1. Symbology of manual

The following symbols will be used in the manual to highlight indications and warnings particularly important:



This symbol indicates a note of the handbook considered particularly important.
Read the note closely.



This symbol indicates important security messages that are fundamental for the operator and the machine.
Read the note closely.

1.1.1. Accident-prevention rules for maintenance



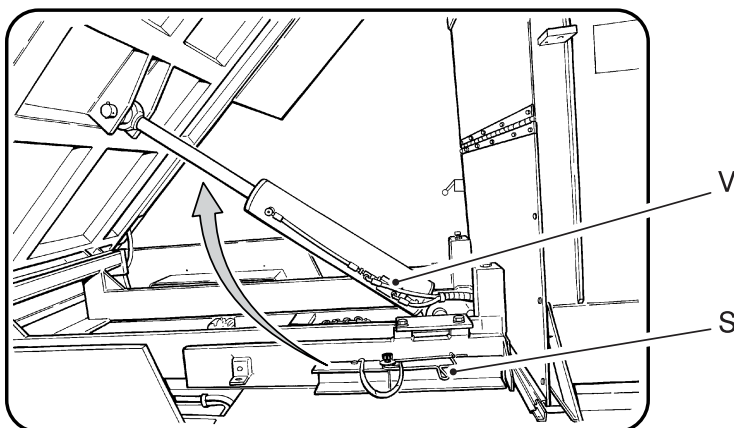
WARNING: all maintenance operations must be made with Diesel engine off and without the ignition key on the dashboard.

Use specialized staff.

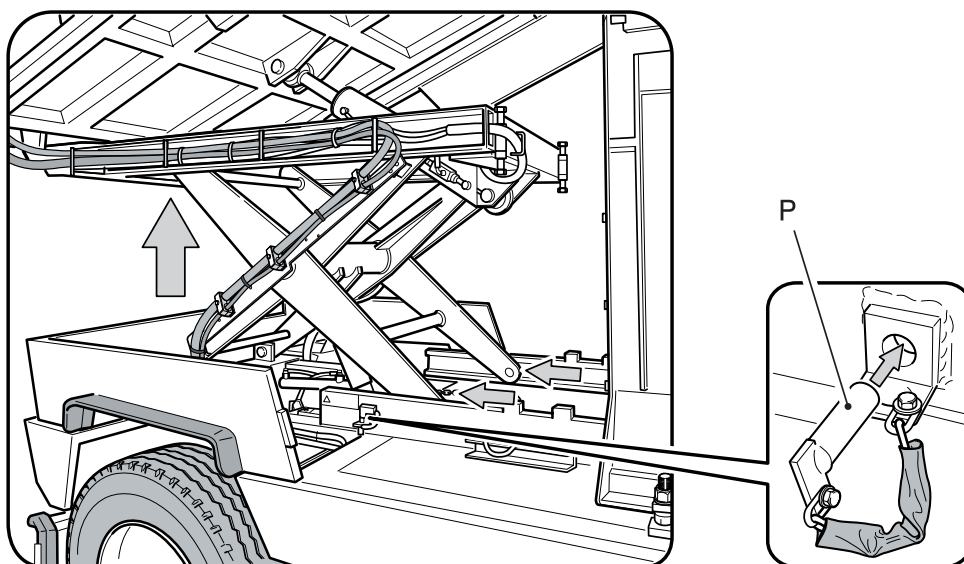
Observe the regulations in force in the country and in any case ask for Safety Head.

Hopper locking:

When it's necessary to work under the hopper, even if a safety valve (V) on the cylinder stops oil flow and prevents the hopper from lowering, the hopper must be empty, tilted completely and blocked with proper safety (S).



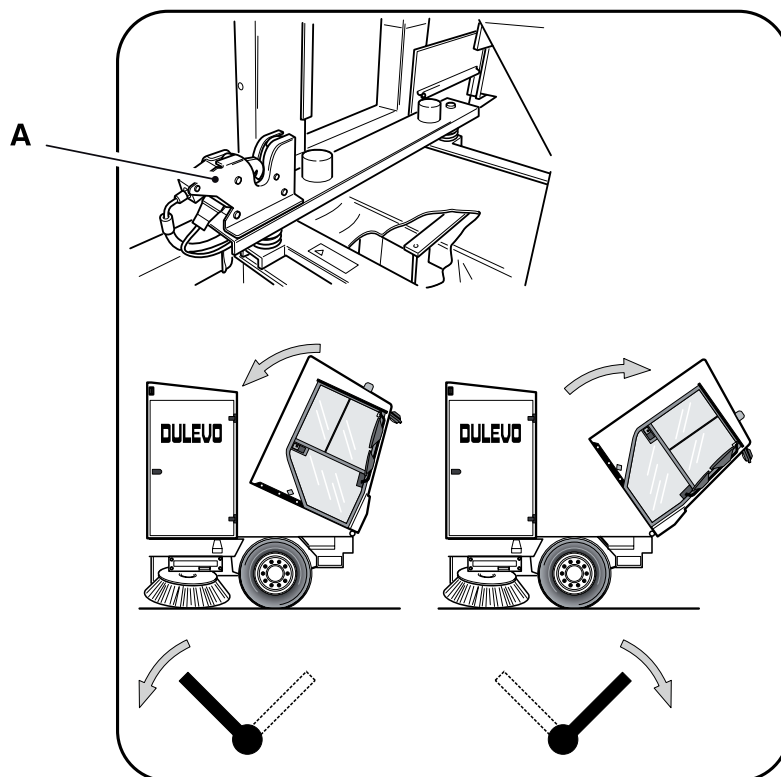
In case of repair interventions with the lifted hopper, take the hopper to the end of-stroke and lock it with two proper pins (P).



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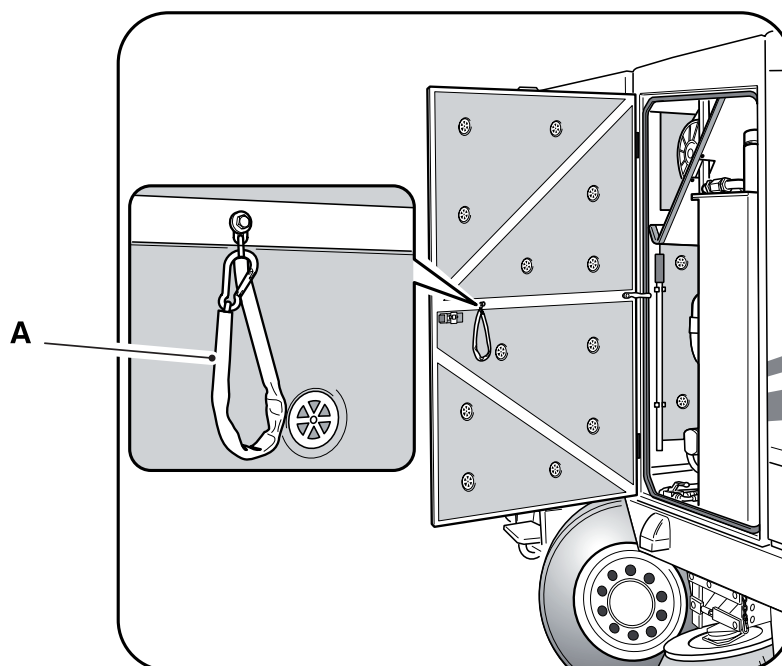
Cabin tilting:

Tilt the cabin in case of checks under it to avoid uncontrolled lowering.
Be sure the cabin hook (A) is correctly locked; if so the red warning light inside the cabin is switched off.



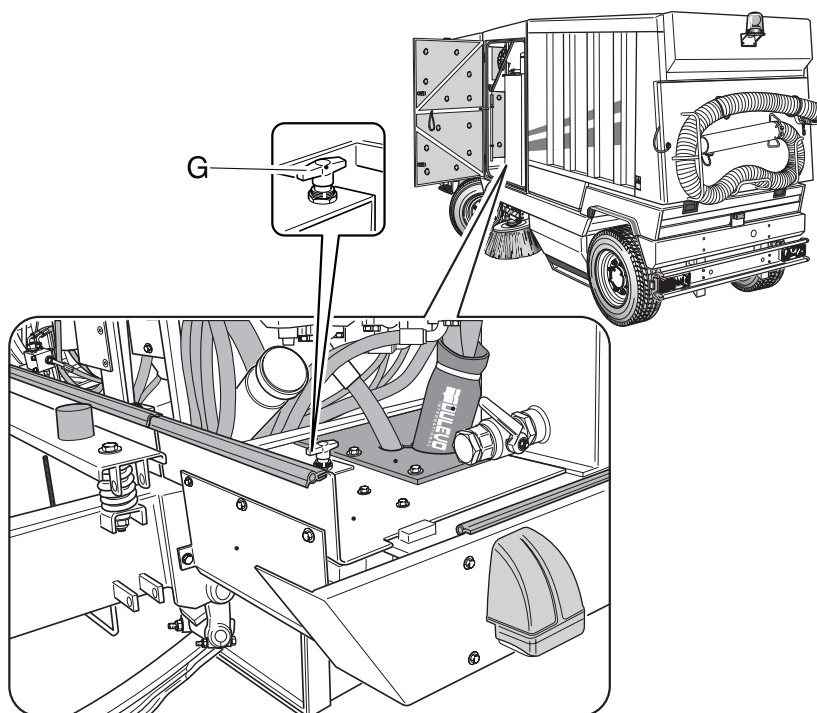
Side doors:

Side doors are equipped with padlocks; in any case, safety chains (A) have always to be hooked.



Starting batteries:

The batteries are filled with electrolyte, a highly toxic and corrosive liquid. In case of maintenance interventions, the operator has to wear special gloves and goggles. Moreover, do not approach with flames or lit cigarettes since the released gases can generate strong and dangerous explosion. In any case, ask the Safety Head for advice. If terminals are not protected by the special sheaths, the latter have to be mounted and a lot of care has to be paid not to cause short-circuits due to the accidental fall of keys or tools that could seriously damage people and property. In case of special maintenance interventions, mainly in case of soldering, terminals have to be disconnected from the battery or battery switch (G) has to be disconnected. Battery terminals must be protected with Vaseline in order to avoid rust and corrosion. Such switch is necessary to insulate the batteries during the maintenance operations, is fitted behind the cabin by opening the left door. This switch is not able to stop the diesel engine.



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Guards for moving parts:	Re-place moving parts guards before restarting the machine in case they have been removed for maintenance interventions.
Wheel replacement:	The machine lifting for the replacement wheel must be made by using a hydraulic jacks with internal safety device; they must be fitted under the axels in the proper supports. The tightening torque of the wheel nuts is 30 Kgm.
Conveyor:	The conveyor is the mechanic part more dangerous because has got rotation blades; in particular is dangerous stand near the upper opening.
Disassembling:	Before dismounting some heavy parts, it's necessary to support them properly. Don't stand under the loads. Use hoisting chains and belts in good condition.
Accident prevention stickers:	Replace the stickers when are broken.

CHAPTER 2
Technical data

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2.1. Technical data

DATA		VALUE (tolerance 5-10%)
DIMENSIONS	LENGTH WITH 3RD BRUSH	5920 mm
	WIDTH WITH BRUSHES	2350 mm
	HEIGHT WITH BEACON	2990 mm
WEIGHT	EMPTY (with 3RD brush)	7850 Kg
	PAYLOAD WITH 3RD BRUSH	5300 Kg
	PAYLOAD WITH 3RD BRUSH (3 meter high dump version)	2250 Kg
SWEEPING WIDTH WITH	CENTRAL BRUSH	1300 mm
	SIDE BRUSHES (industrial version)	2250 mm
	SIDE BRUSHES (road version)	2600 mm
	THIRD BRUSH (industrial version)	3350 mm
	THIRD BRUSH (road version)	3500 mm
MAX GRADIENT		20%
MAX SPEED		40 km/h
DIESEL ENGINE TIER3	TYPE	FPT NEF N45ENTX20.00A009 Turbo Intercooler
	POWER	107 KW a 2000 giri/1'
	CUBIC CAPACITY	4485 cm ³ (4 CYLINDERS)
	ALTERNATOR	90A 28V
	WORKING PHASE RPM	1600-1800 rev/1'
	TRAVELLING PHASE RPM	2300 rev/1'
DIESEL ENGINE TIER3	TYPE	CUMMINS QSB 4.5 Turbo Intercooler
	POWER	113 KW a 2200 giri/1'
	CUBIC CAPACITY	4460 cm ³ (4 CYLINDERS)
	ALTERNATOR	90A 28V
	WORKING PHASE RPM	1600-1800 rev/1'
	TRAVELLING PHASE RPM	2300 rev/1'
DIESEL ENGINE TIER4	TYPE	FPT NEF N45ENT2W26.00L001 Turbo Intercooler
	POWER	103 KW a 2200 giri/1'
	CUBIC CAPACITY	4485 cm ³ (4 CYLINDERS)
	ALTERNATOR	90A 28V
	WORKING PHASE RPM	1600-1800 rev/1'
	TRAVELLING PHASE RPM	2300 rev/1'
DIESEL ENGINE Euro5	TYPE	FPT NEF N40ENT526.00A015 Turbo Intercooler
	POWER	118 KW a 2700 giri/1'
	CUBIC CAPACITY	3920cm ³ (4 CYLINDERS)
	ALTERNATOR	90A 28V
	WORKING PHASE RPM	1600-1800 rev/1'
	TRAVELLING PHASE RPM	2300 rev/1'

DATA		VALUE (tolerance 5-10%)
DIESEL ENGINE Euro6	TYPE	FPT NEF N45ENT6W26.00A007 Turbo Intercooler
	POWER	118 KW a 2500 giri/1'
	CUBIC CAPACITY	4485cm ³ (4 CYLINDERS)
	ALTERNATOR	90A 28V
	WORKING PHASE RPM	1600-1800 rev/1'
	TRAVELLING PHASE RPM	2300 rev/1'
HYDROSTATIC TRANSMISSION	TRACTION MOTOR	Rexroth A6VM 107 HA2R2/63W - VZB0270TA
	TRACTION PUMP	Rexroth A4VG71DA 2D7/32R - NZF02F021SP
CENTRAL BRUSH	DIAMETER	650 mm
	RPM	160 rev/1'
SIDE BRUSHES	DIAMETER (industrial version)	1000 mm
	DIAMETER (road version)	1060 mm
	RPM	0-70 giri/1'
SUCTION SYSTEM	TURBINES	2
	TURBINES RPM	2600 rpm (with engine at 1800 rpm) 3000 rpm (with engine at 2200 rpm)
	VACUUM (MIN - MAX)	62 mBar - 106 mBar
CONVEYOR	NUMBER OF BLADES	11
	RPM	120-125 rev/1'
WASTE HOPPER	MATERIAL	INOX AISI 304/Fe 360
	VOLUME	6,2 m ³
	VOLUME (3 meter high dump version)	5,5 m ³
	NET VOLUME	4,68 m ³
	NET VOLUME (COMBI version)	4,03 m ³
	NET VOLUME (3 meter high dump version)	4,00 m ³
DUMPING HEIGHT	MINIMUM HEIGHT	1150 mm
	MAX HEIGHT (with tilted hopper)	2200 mm
	MAX HEIGHT (with tilted hopper, 3 meter high dump version)	3000 mm
DUST FILTER	FILTER SURFACE	22 m ²
	FILTER CAPACITY	3 micron
FUEL	TANK CAPACITY	140 L
	CONSUMPTION	11 - 12 L/h
HYDRAULIC OIL	TYPE	ISO VG 46
	TANK CAPACITY	133 L
WATER SPRINKLING SYSTEM	TANK MATERIAL	AISI 304
	TANK CAPACITY (EU4 engine)	500 L
	TANK CAPACITY (EURO5 engine)	425 L
	TANK CAPACITY (EURO6 engine)	400 L
	ADDITIONAL TANK CAPACITY (6000 COMBI)	650 L
	1 st PUMP	13 L/1' - 3,5 BAR
	2 nd PUMP HIGH PRESSURE (OPTION)	15 L/1' - 200 BAR
TYRES	TYPE	285/70 R19,5 150/148J

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DATA		VALUE (tolerance 5-10%)
BATTERIES	PRESSURE	9 BAR
	QUANTITY	2
	TYPE	12 V - 135 Ah
SOUND PRESSURE LEVEL AT CABIN (LpA)		65,7 dB (A) (EURO6) 70 dB (A) (EURO5 - EU4 - TIER3)
STEERING RADIUS (CUNA)	External wheel center	4,65 m

CHAPTER 3
Maintenance and washing

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3.1. Planned maintenance

The planned maintenance includes:

DAILY MAINTENANCE	Performed by the operator.
WEEKLY MAINTENANCE	Performed by the operator.
PERIODIC MAINTENANCE	performed by an Authorized DULEVO Service Center.



N.B.

All documents about the planned maintenance are in the cabin, in order to be used for a continuous check of the sweeper.

3.1.1. Daily maintenance (perform every 8 hours or in any case at the end of each workshift)

OPERATION	EVERY 8 HOURS	TA	CA
Emptying the sprinkling system in case of freeze (OPT)	●	●	
Check chain or belt conveyor	●	●	
Machine cleaning and groups washing	●	●	
Radiators cleaning	●	●	
Check if material is wrapped around the brushes	●	●	
Engine air filter cleaning	●	●	

TA = Company's Technician - CA = Authorized DULEVO Service Center

3.1.2. Weekly maintenance (perform every 40 hours or in any case at the end of each working week)

OPERATION	EVERY 40 HOURS	TA	CA
Check hydraulic oil level	●	●	
Check engine oil level	●	●	
Check coolant level	●	●	
Check chain or belt conveyor	●	●	
Check axle end reduction gears for oil leaks	●	●	
Check wheel alignment	●	●	
Check tires pressure	●	●	
Check wheel nuts tightening	●	●	
Check brushes efficiency (inclination and length of bristles)	●	●	
Cab air filter cleaning	●	●	
Water filter cleaning (OPT)	●	●	
Cleaning of the sprinkling system nozzles (OPT)	●	●	
General lubrication	●	●	
Conveyor chains lubrication	●	●	

TA = Company's Technician - CA = Authorized DULEVO Service Center

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3.1.3. Periodic maintenance (perform every 600 hours or in any case once a year)

FOR DESCRIPTION OF OPERATIONS REFER TO USE&MAINTENANCE MANUAL OF SWEEPER OR ENGINE OR TUTORIAL VIDEO PRESENT ON WEB SITE WWW.DULEVOSERVICE.COM



Operation	ore 100	ore 600 7800 15000	ore 1200 8400 15600	ore 1800 9000 16200	ore 2400 9600 16800	ore 3000 10200 17400	ore 3600 10800 18000	ore 4200 11400 18600	ore 4800 12000 19200	ore 5400 12600 19800	ore 6000 13200 20400	ore 6600 13800 21000	ore 7200 14400 21600	CA	Reference
Engine oil replacement															A
Engine oil filter replacement															B
Fuel filter replacement															C
Fuel pre-filter replacement															D
Hydraulic oil filter replacement															E
Hydraulic oil replacement															F
Engine air filter replacement															G
Cab air filter replacement															H
Hopper dusts filter cleaning															I
Blow by filter replacement (EU4 – TIER4)															L
Blow by filter replacement (EURO6)															L1
Check the wear of the third brush bearings (OPT)															M
Check batteries electrolyte level															N
Differential oil level check															O
Differential oil replacement															P
AdBlue circuit pre-filter replacement															Q
AdBlue circuit filter replacement															R
Wheel hubs oil replacement															S
High pressure water pump oil replacement (OPT)															T
Brakes efficiency check															U
Engine belt replacement															V
A/C Dehydrator filter replacement															Z
Motor / differential joint greasing															X

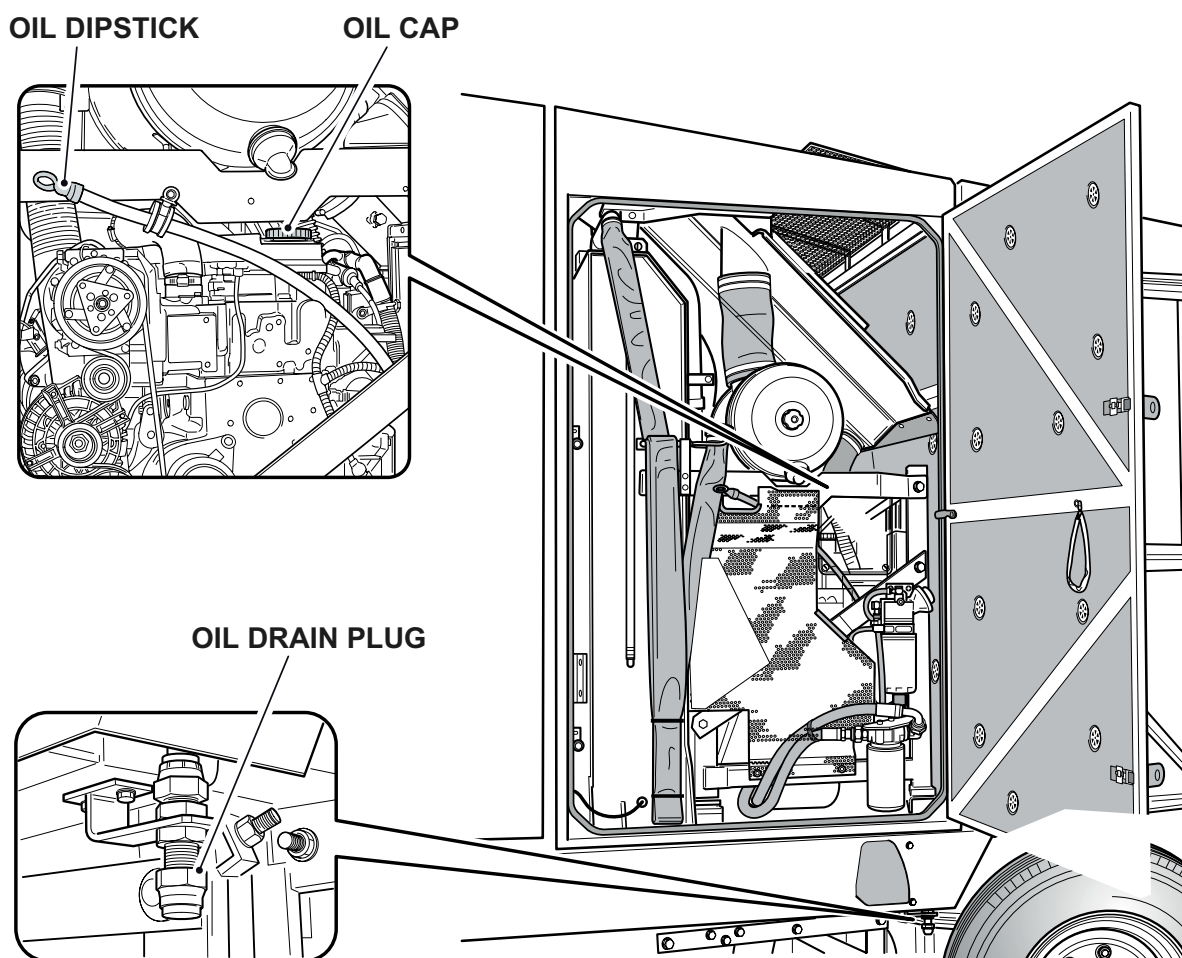
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CA: Authorized DULEVO Service Center



FOR SWEEPERS EQUIPPED WITH CUMMINS ENGINE, THE MAINTENANCE INTERVAL IS EVERY 500 HOURS.

A-Engine oil replacement

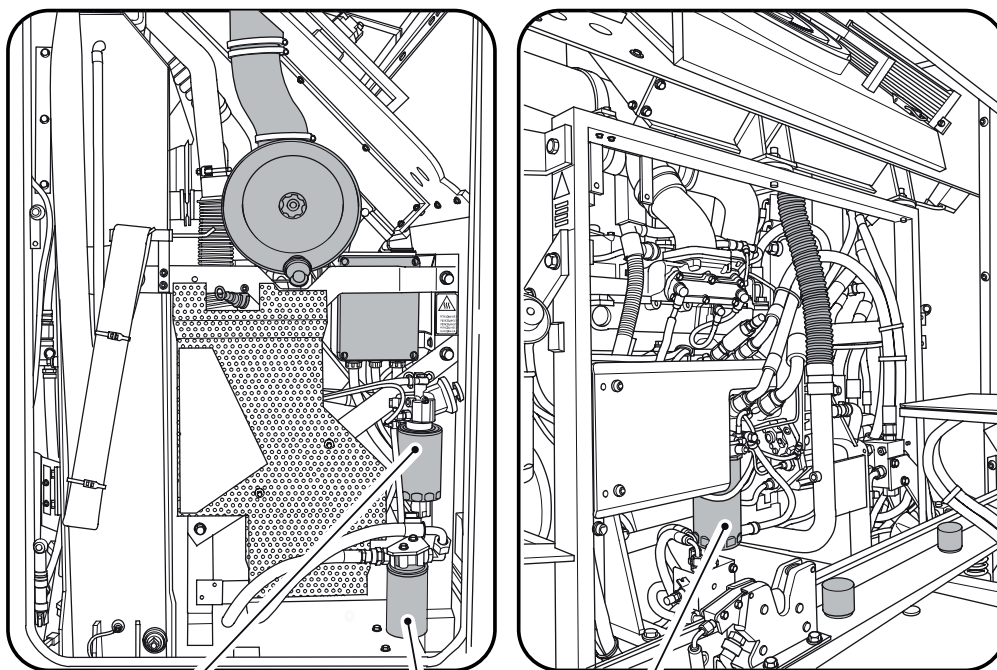


	Q.TY	OIL TYPE
EU4	10,5 L	SAE 15W - 40 (ACEA E3-E5/APICH4)
EURO5	10,5 L	SAE 15W - 40 (ACEA E7/APICI4)
EURO6 - TIER4	10,5 L	SAE 10W - 40 (ACEA E9-E6/APIJ-4)
TIER3	12 L	SAE 10W - 40 (ACEA E3-E5/APICH4)

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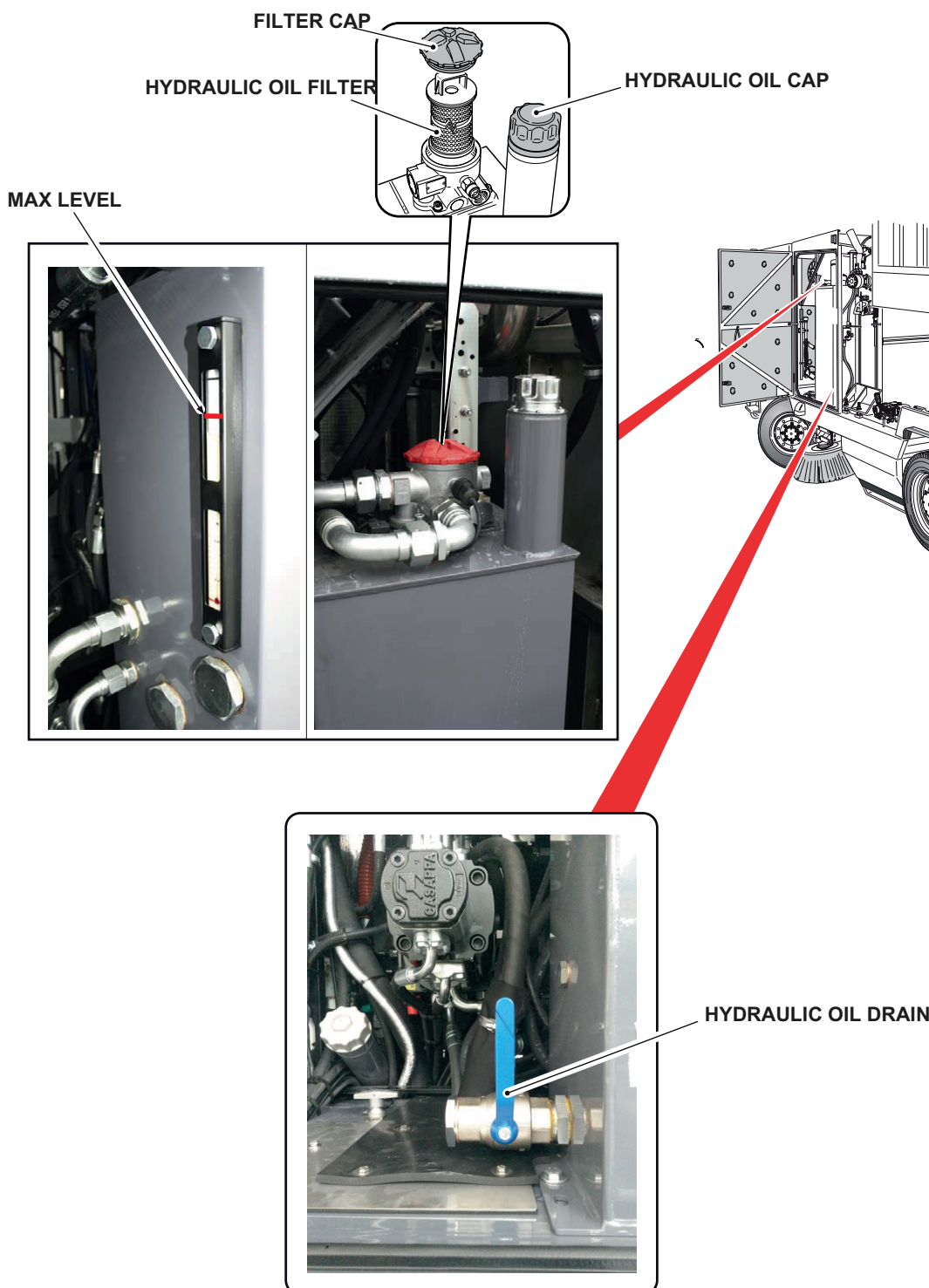


B-Engine oil filter replacement
C-Fuel filter replacement
D-Fuel pre-filter replacement



FUEL PRE-FILTER OIL FILTER FUEL FILTER

E-Hydraulic oil filter replacement
F-Hydraulic oil replacement

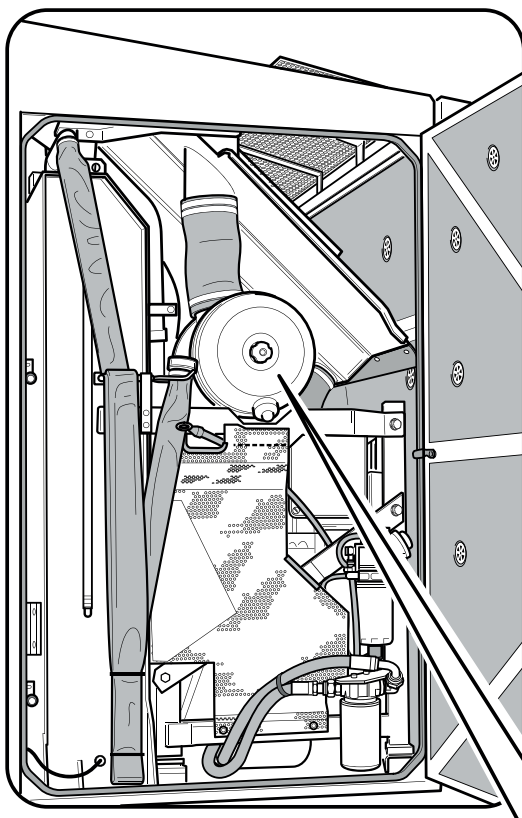


Q.TY	OIL TYPE
120 L	ISO VG 46
113 L (EURO6 - TIER4)	ISO VG 46

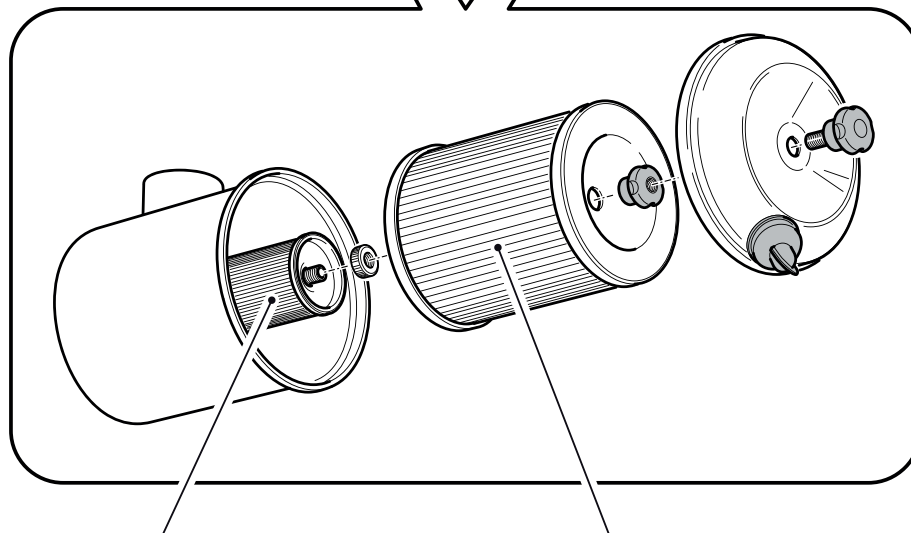
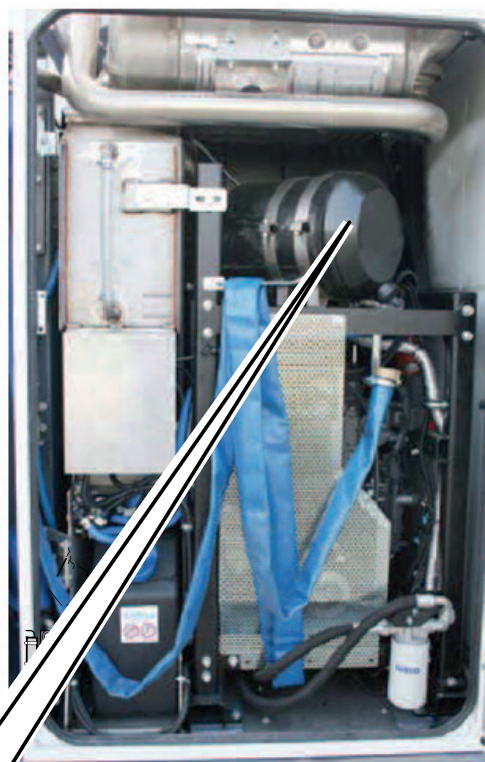
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G-Engine air filter replacement

TIER3 - EU4 - EURO5



EURO6 - TIER4

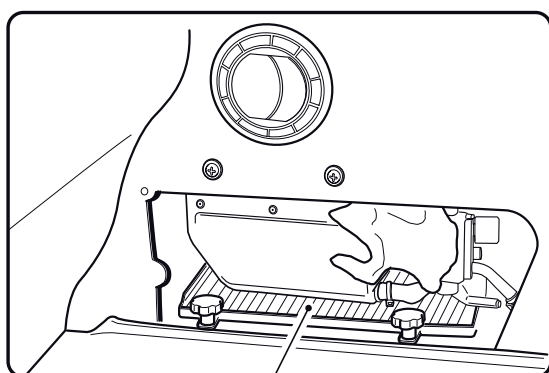


SAFETY AIR FILTER ELEMENT

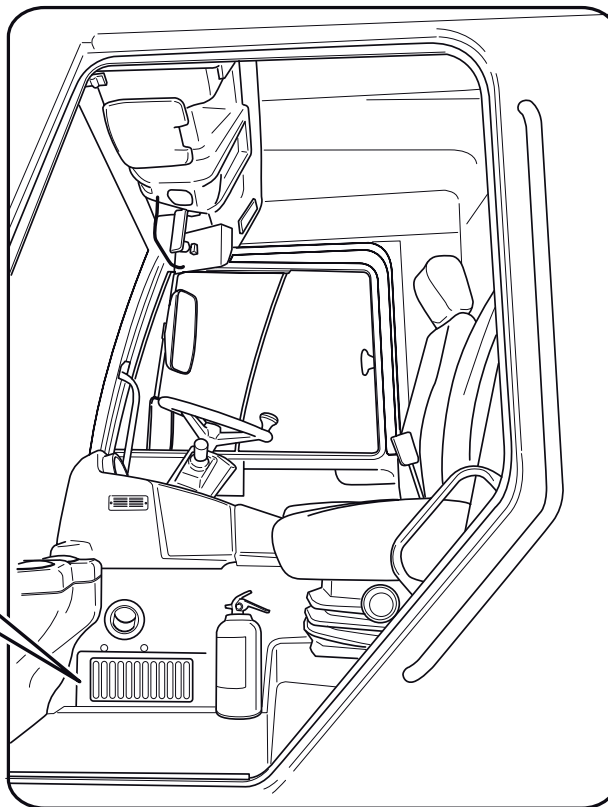
PRIMARY AIR FILTER ELEMENT

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H-Cab air filter replacement

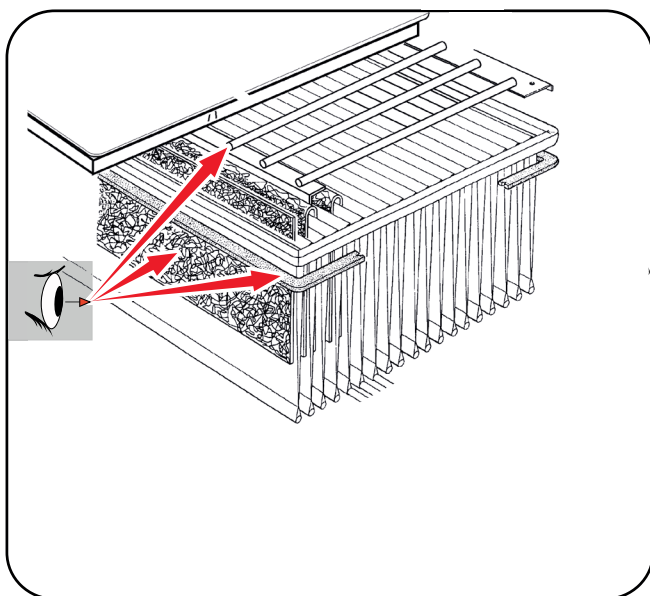
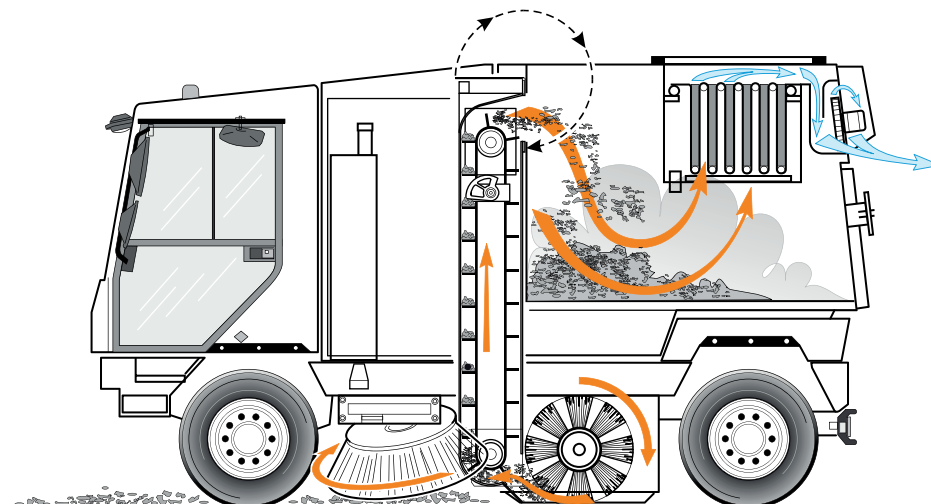


CABIN FILTER



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I-Hopper dusts filter cleaning

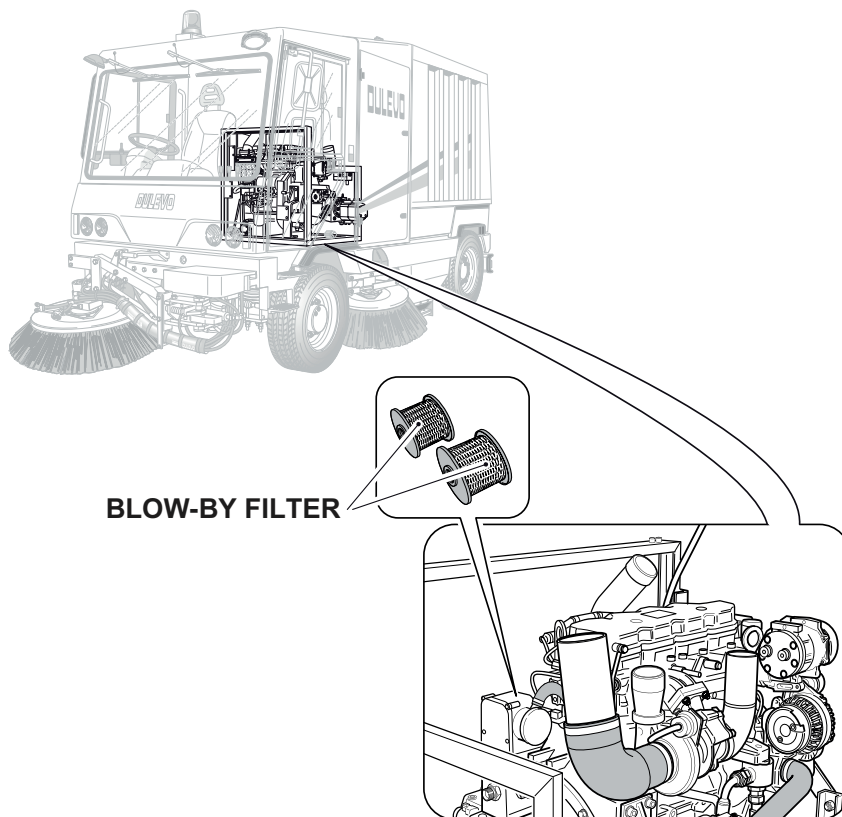


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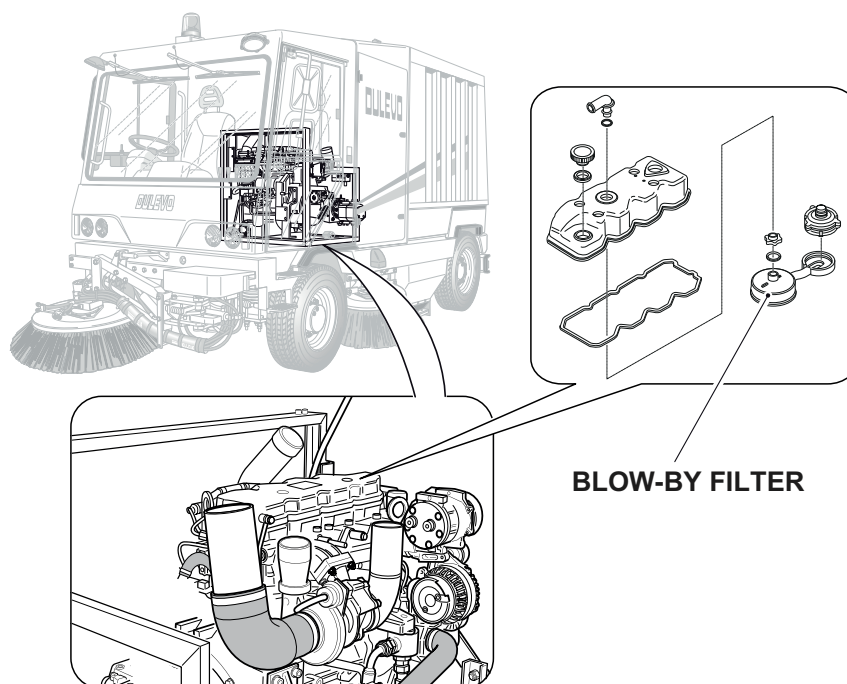
L-Blow-by filter replacement (EU4 – TIER4)



BLOW-BY FILTERS ARE NOT PRESENT ON CUMMINS ENGINE

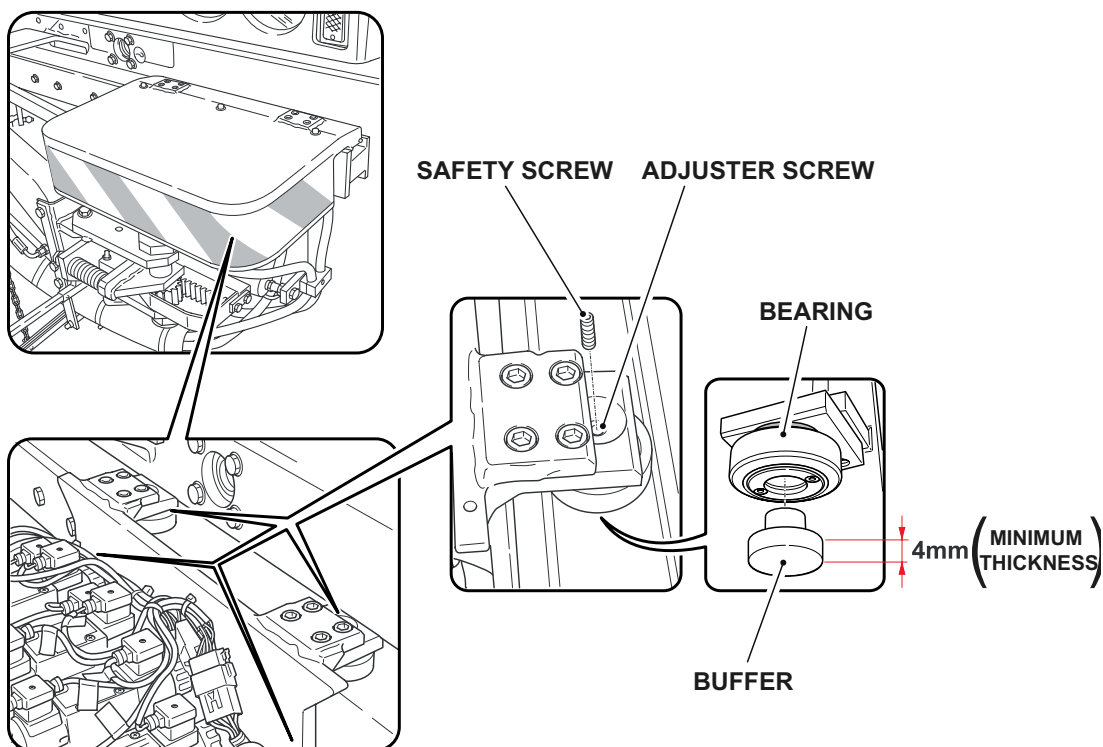


L1-Blow-by filter replacement (EURO6)

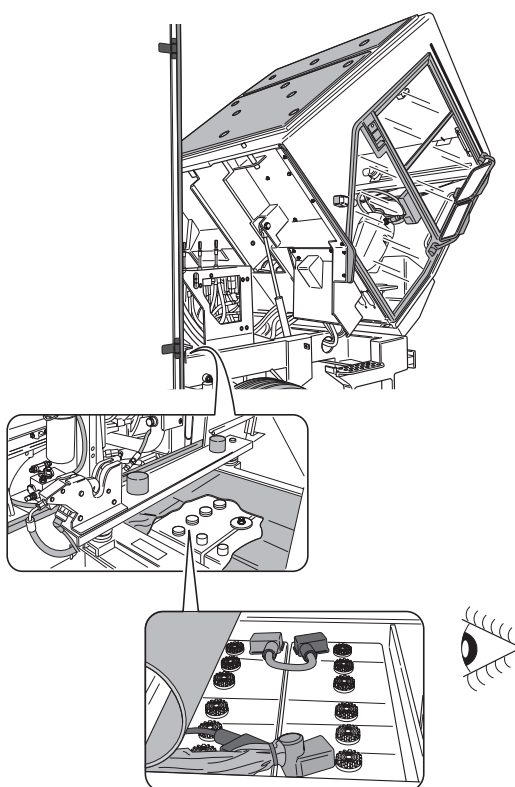


6000 6000
COMBI

M-Check the wear of the third brush bearings (OPT)



N-Check batteries electrolyte level

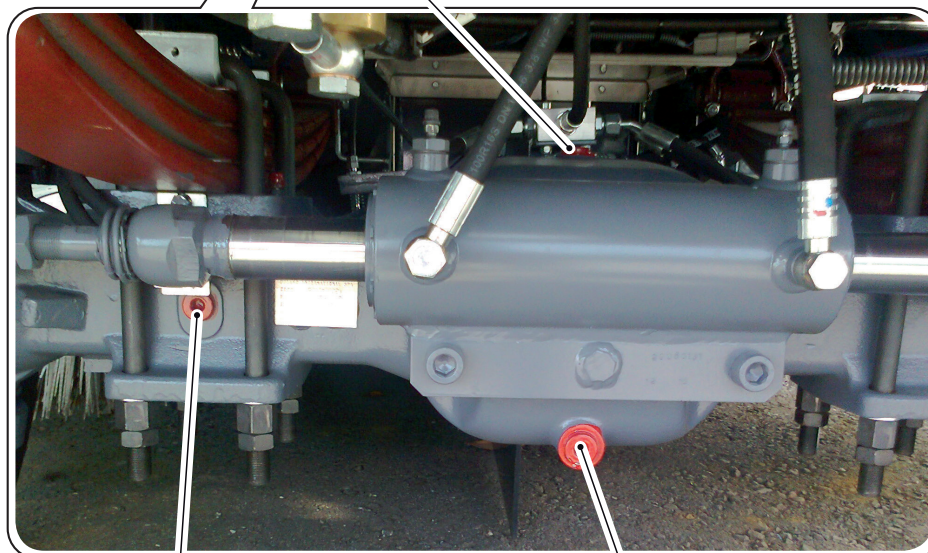


6000 6000
COMBI

O-Differential oil level check
P- Differential oil replacement



FILLING PLUG



LEVEL PLUG

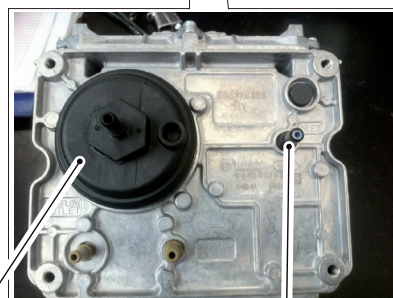
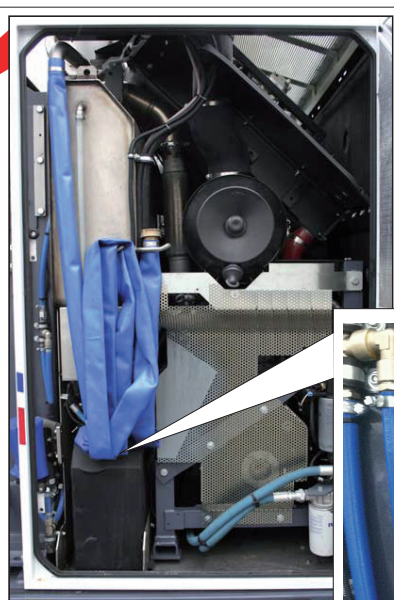
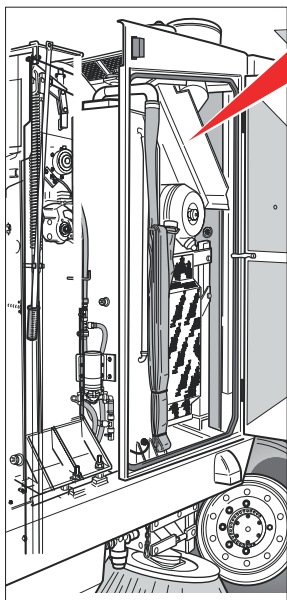
DRAIN PLUG

Q.TY	OIL TYPE
6 L	SAE 80W - 90 (API GL5)

6000 6000
COMBI

Q-AdBlue circuit pre-filter replacement
R-AdBlue circuit filter replacement

(only EURO5 - EURO6 - TIER4)



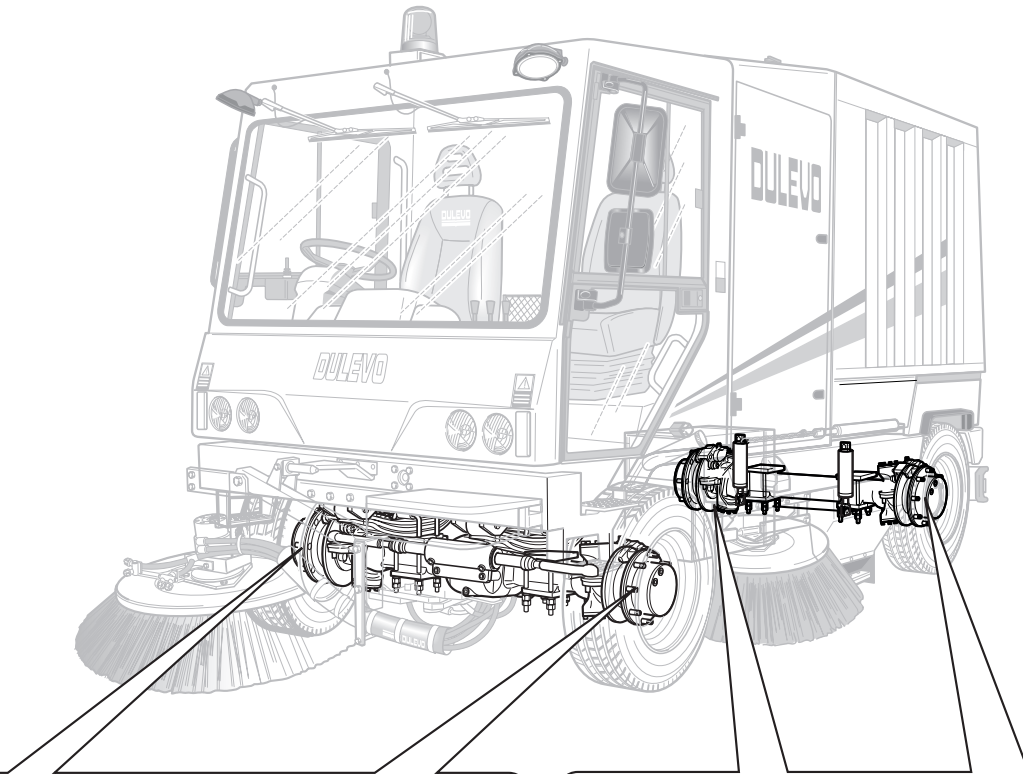
ADBLUE CIRCUIT PREFILTER

ADBLUE MODULE FILTER

ADBLUE MODULE PREFILTER

Q.TY	ADBLUE TYPE
26 L (EURO5)	ISO 22241
30 L (EURO6 - TIER4)	ISO 22241

S-Wheel hubs oil replacement

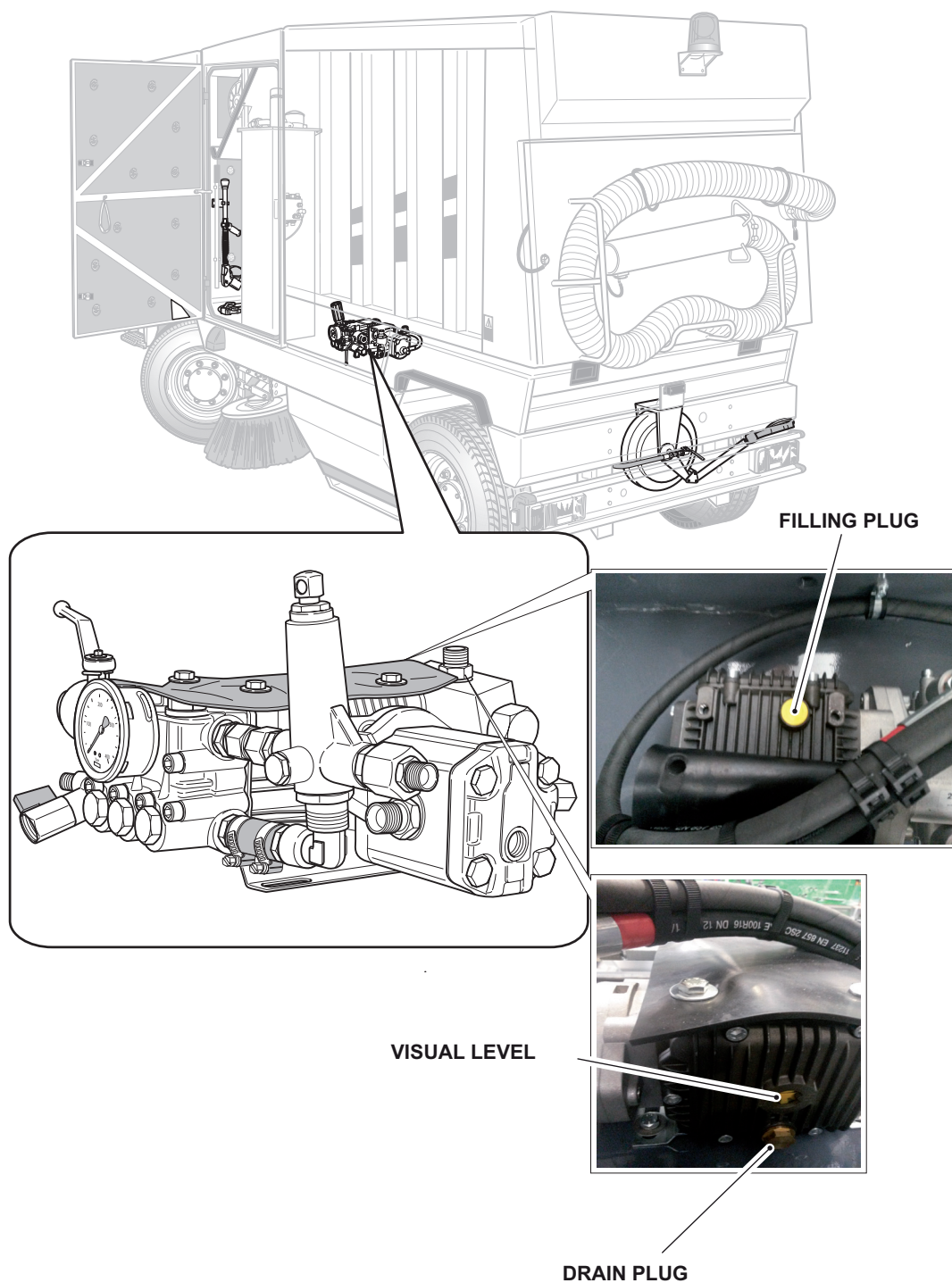


Q.TY	OIL TYPE
0,8 L	SAE 80W - 90 (API GL5)



Q.TY	OIL TYPE
0,6 L	SAE 80W - 90 (API GL5)

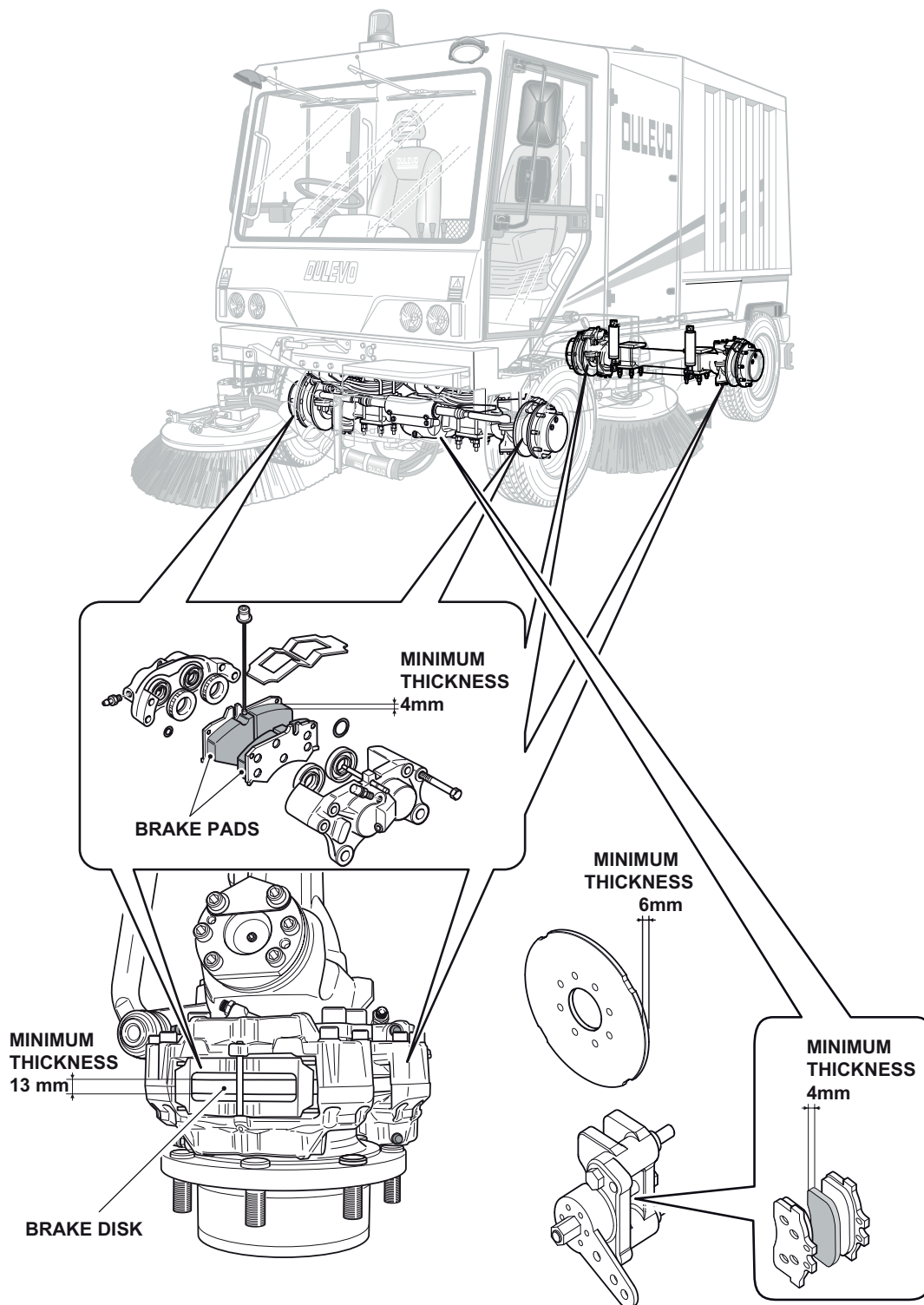
T-High pressure water pump oil replacement (OPT)



Q.TY	OIL TYPE
0,5 L	SAE 15W - 40

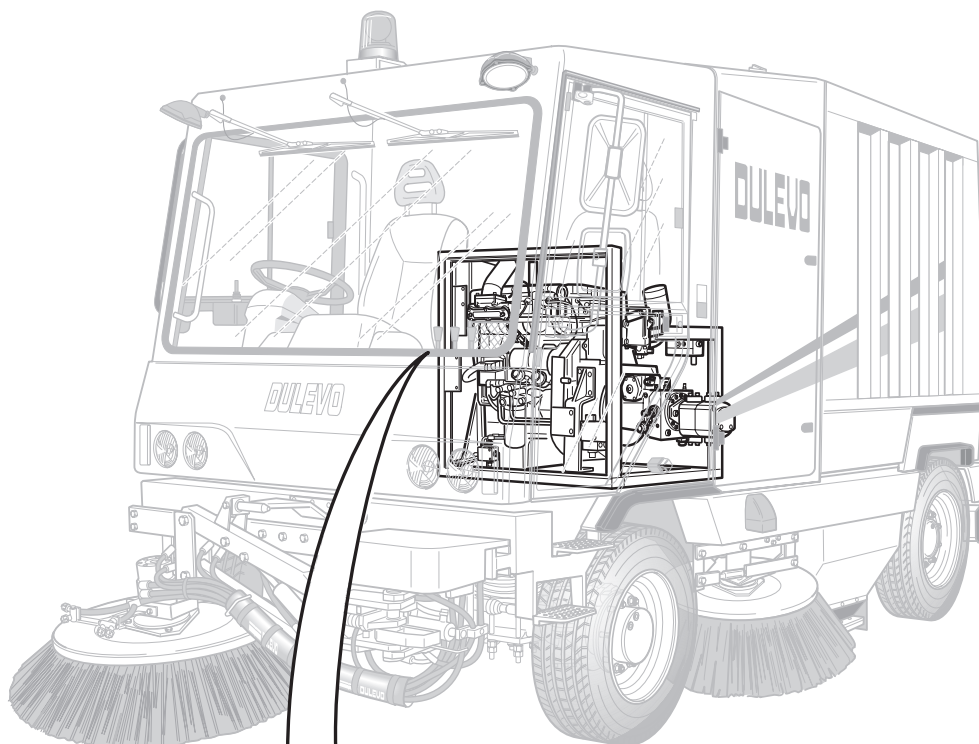
6000 6000
COMBI

U-Brakes efficiency check



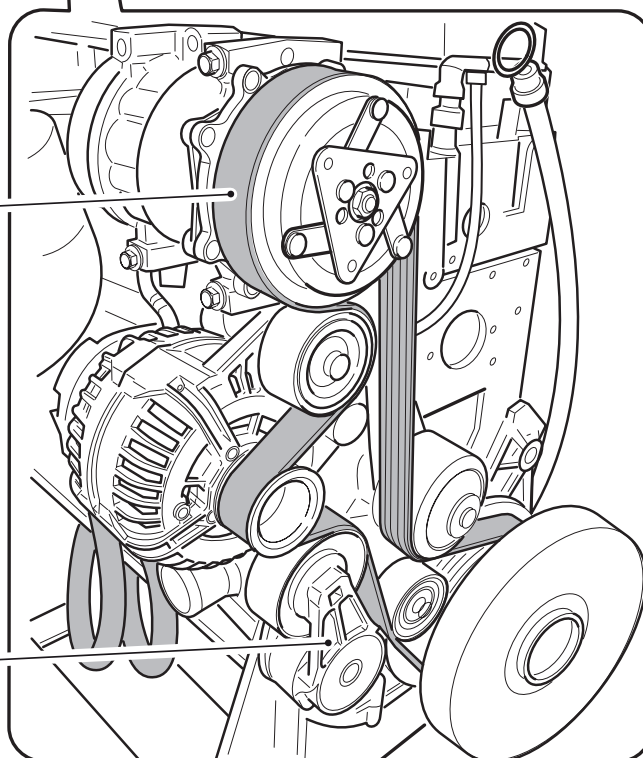
6000 6000
COMBI

V-Engine belt replacement



BELT

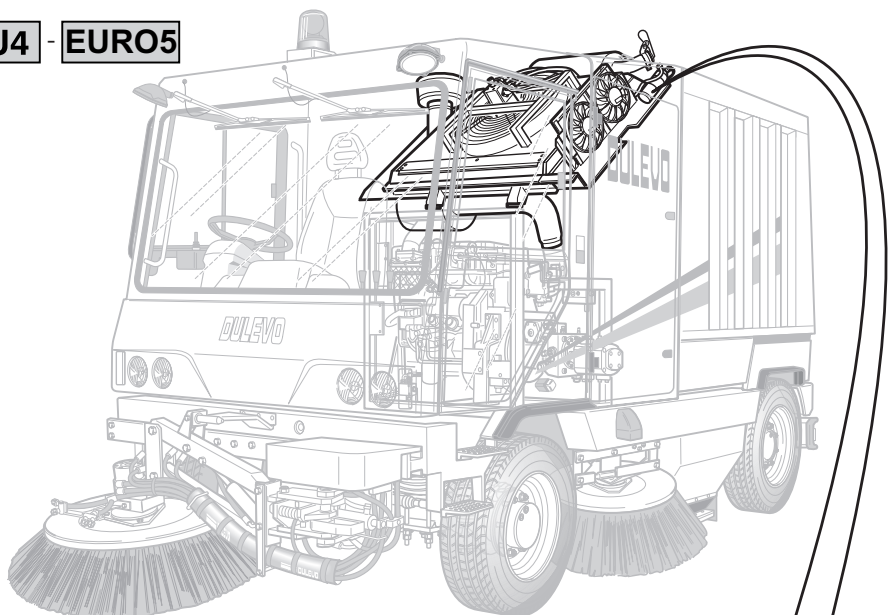
AUTOMATIC
TENSIONER



6000 6000
COMBI

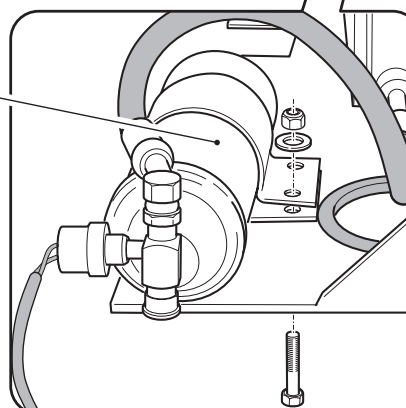
Z-A/C Dehydrator filter replacement

TIER3 - EU4 - EURO5

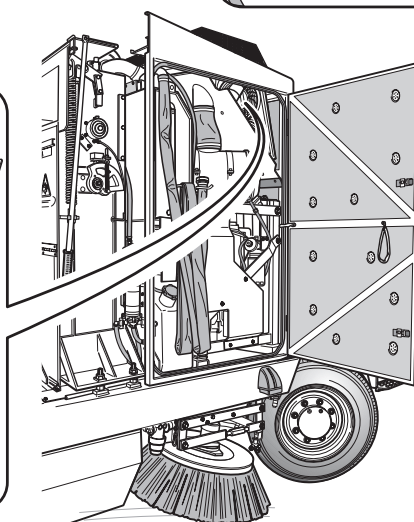
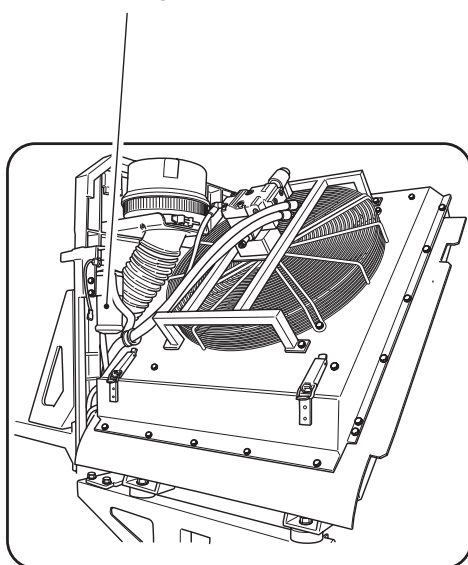


DEHYDRATOR FILTER

GAS Q.TY	GAS TYPE
1,2 Kg (EURO6 - TIER4)	R 134 a
0,95 Kg (TIER3-EU4-EURO5)	R 134 a



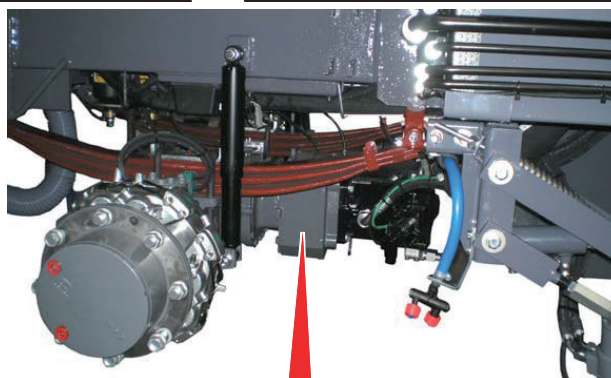
DEHYDRATOR FILTER



EURO6 - TIER4

6000 6000
COMBI

X-Motor / differential joint greasing



GREASE
FITTING



3.2. Greasing

The greasing points are 30 as per below list.

The grease that must be used is indicated in the Refuelling Table (fluid and clean grease).



WARNING

It's necessary to grease once per week.

In all greasing systems type (manual or automatic) it's necessary to verify the grease arrive to the point (the grease must go out from that point), in particular if the points are connected by a flexible tube that can be damaged or clogged.

The points list to grease are:

1.	Rear suspension cylinders and rear leaf springs
2.	Front leaf springs
3.	Conveyor
4.	Hopper elevator bearings
5.	Central brush pulley pin
6.	Motor / differential joint
7.	Wheel articulations



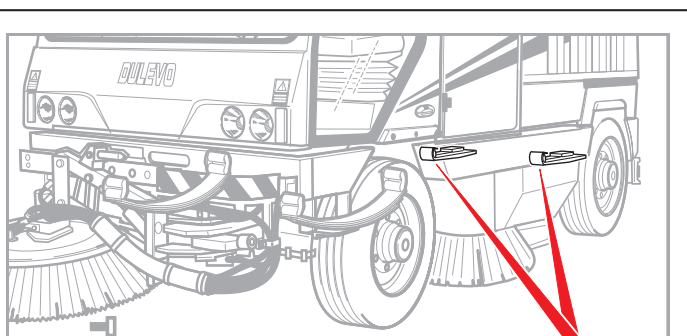
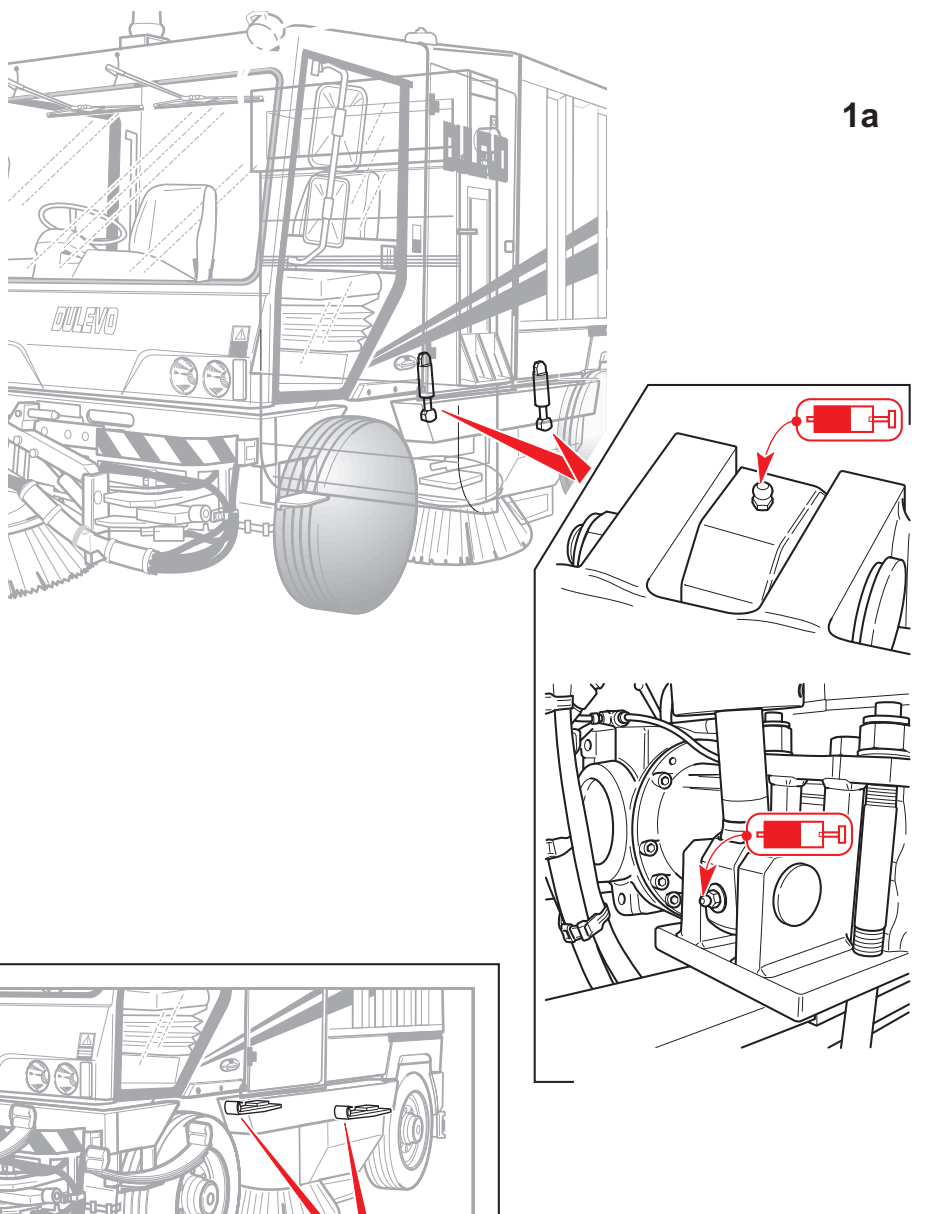
WARNING

In case of manual lubrication use grease with NLGI 2 gradation.

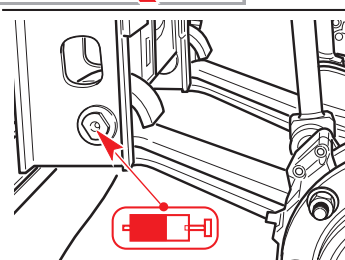
In case of automatic lubrication use grease with NLGI 00 gradation.

6000 6000
COMBI

ELEMENT	N. POINTS TO GREASE
1a. Rear suspension cylinders :	n. 4 points
1b. Rear leaf springs:	n. 2 points

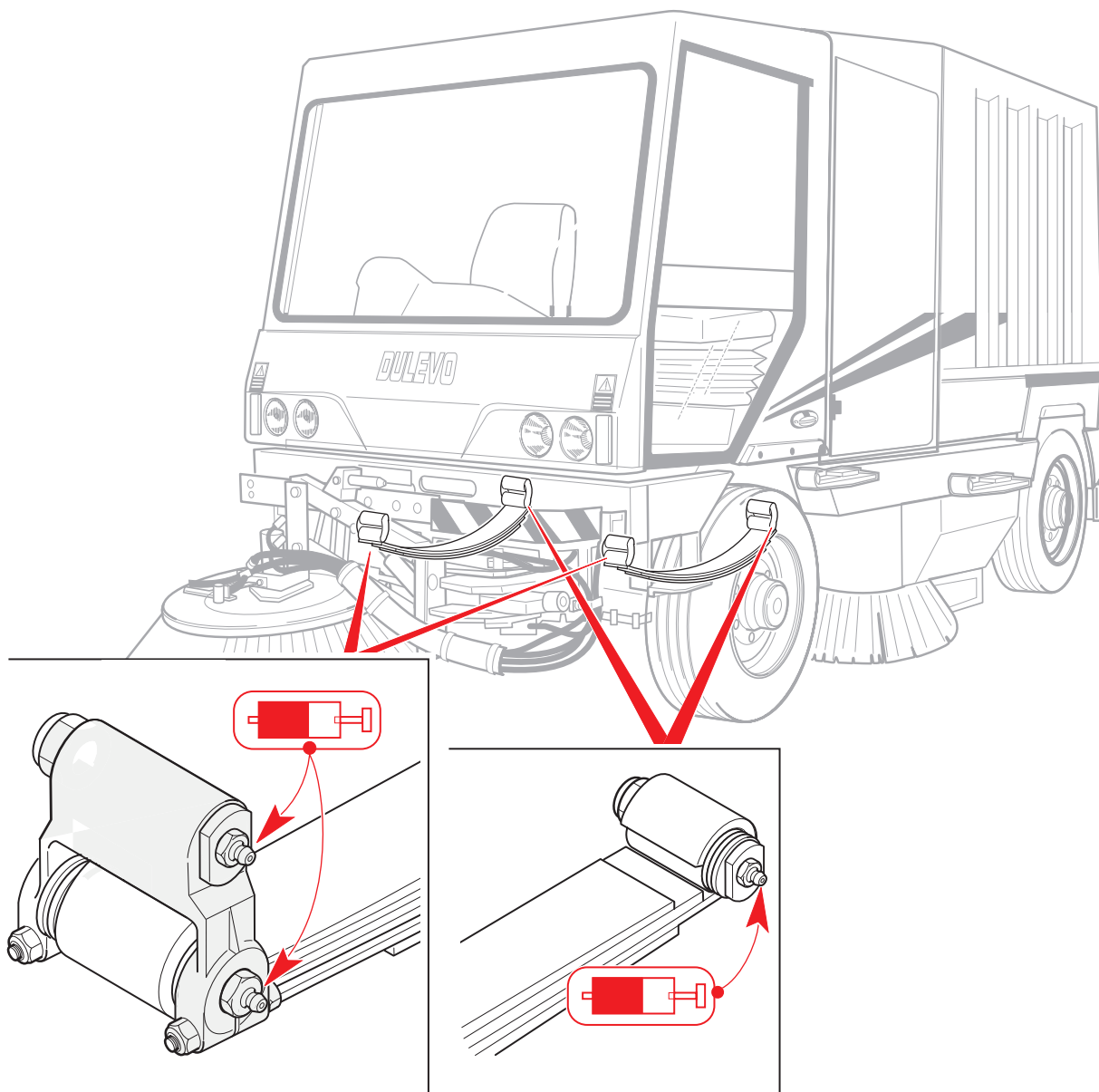


1b



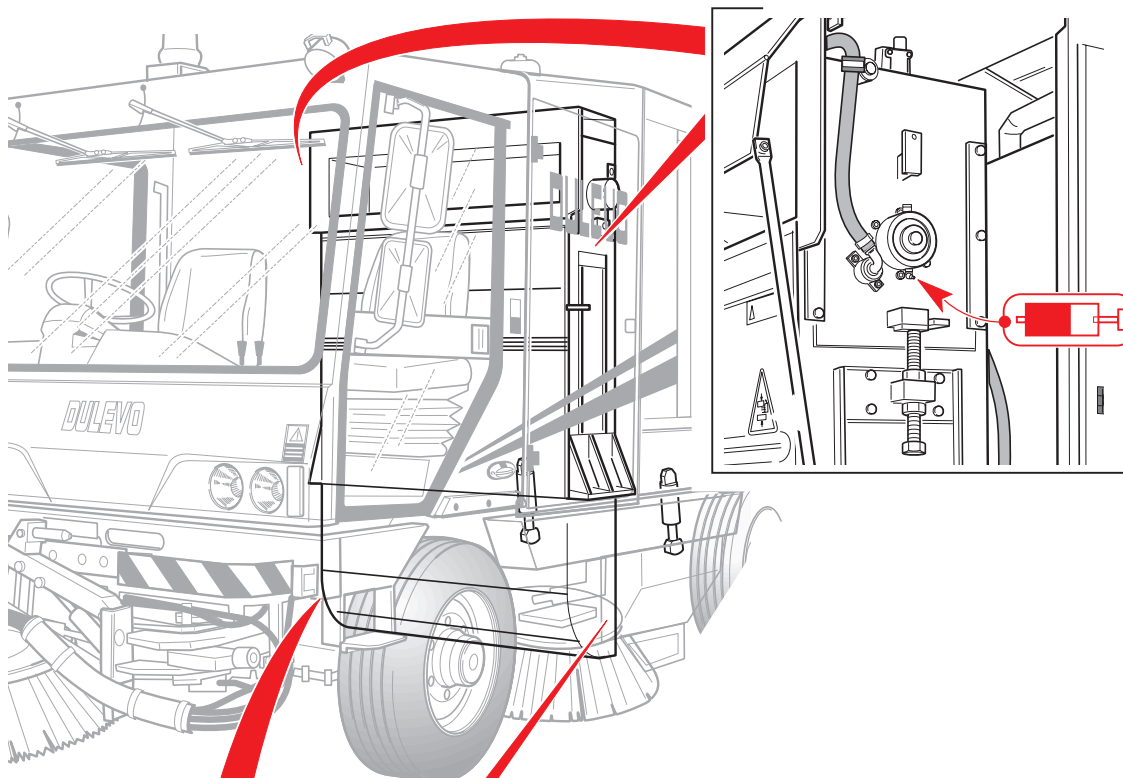
6000 6000
COMBI

ELEMENT	N. POINTS TO GREASE
2. Front leaf springs:	n. 6 points



6000 6000
COMBI

ELEMENT	N. POINTS TO GREASE
3. Conveyor:	n. 4 points

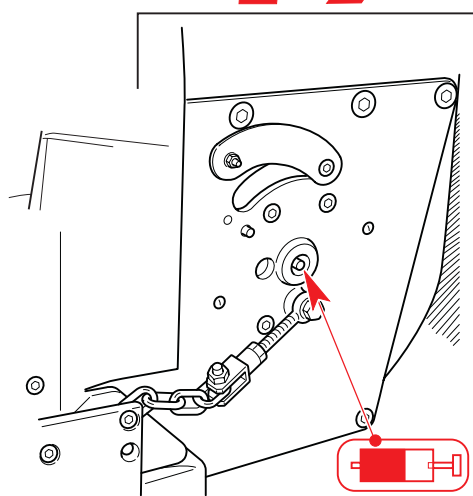


Chain lubrication



WARNING

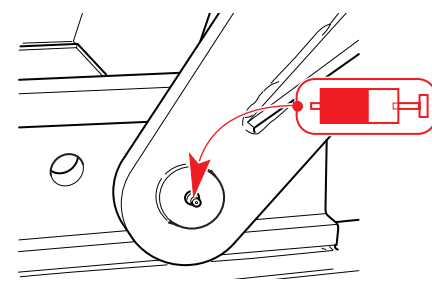
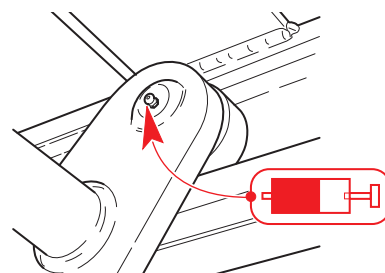
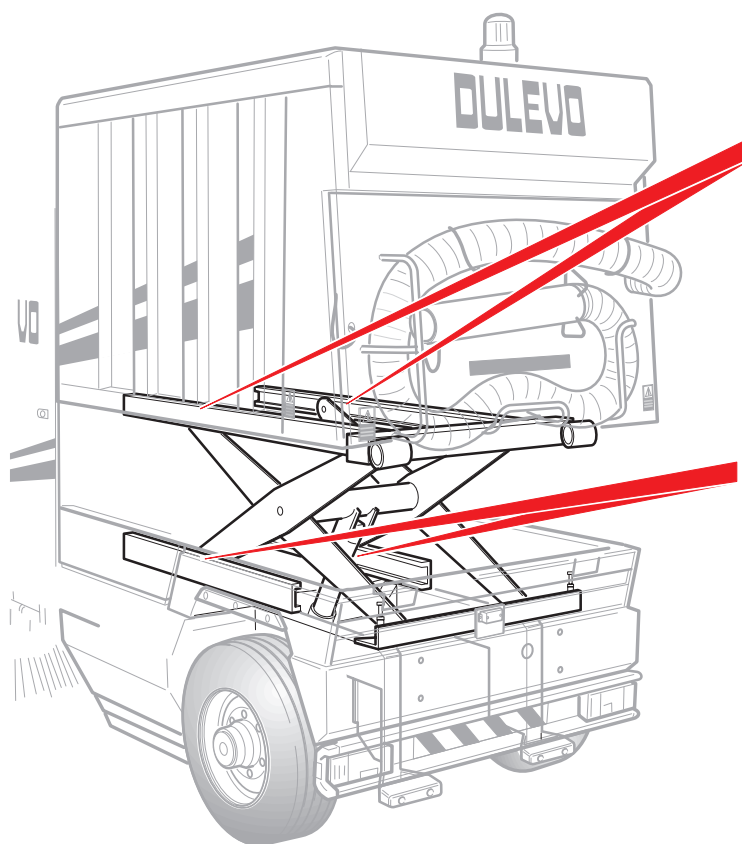
This operation must be carried out with stopped blades.



1. Carefully wash chains and tooth wheels with water without using any steam or thinner
2. Dry the chains with a compressed air jet
3. Lubricate the chains by using a Tefon-based spray product (PTFE) in order to avoid rust and maintain efficient the o-rings of links.
4. Manually turn the conveyor by pushing on the blades in order to be able to lubricate the whole chains

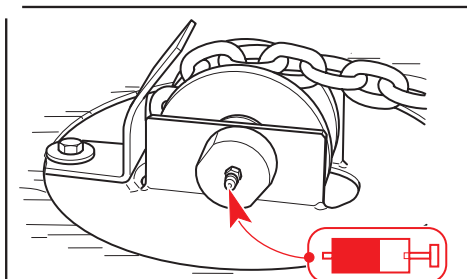
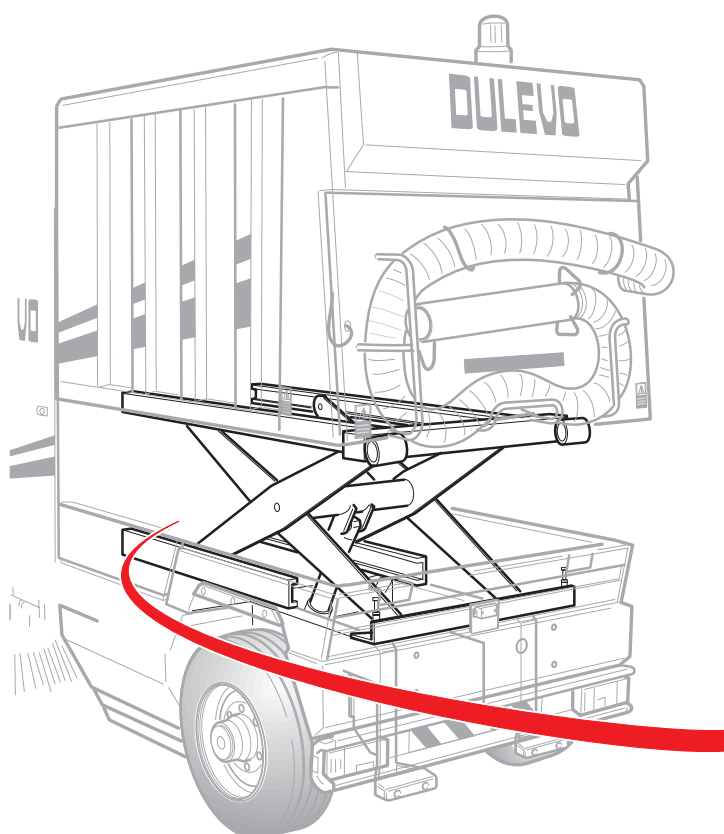
ELEMENT	N. POINTS TO GREASE
---------	---------------------

4. Hopper elevator bearings:	n. 4 points
------------------------------	-------------



6000 6000
COMBI

ELEMENT	N. POINTS TO GREASE
5. Central brush pulley pin:	n. 1 points

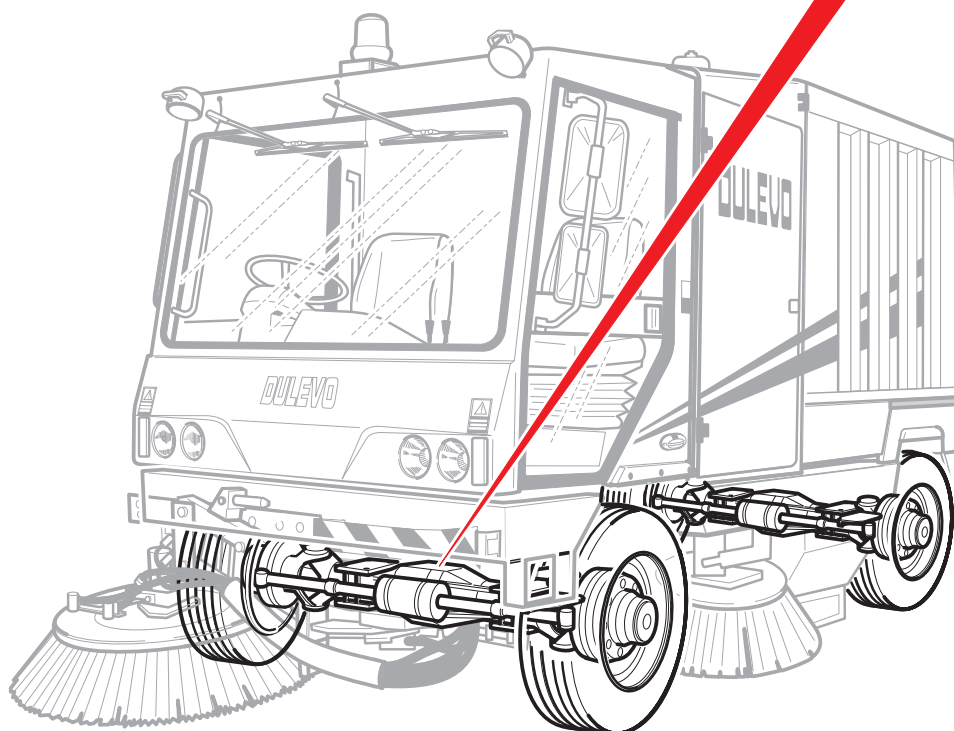
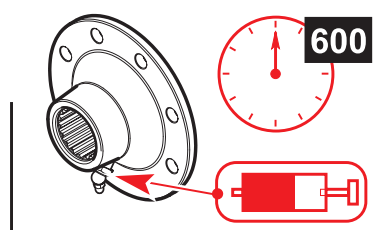


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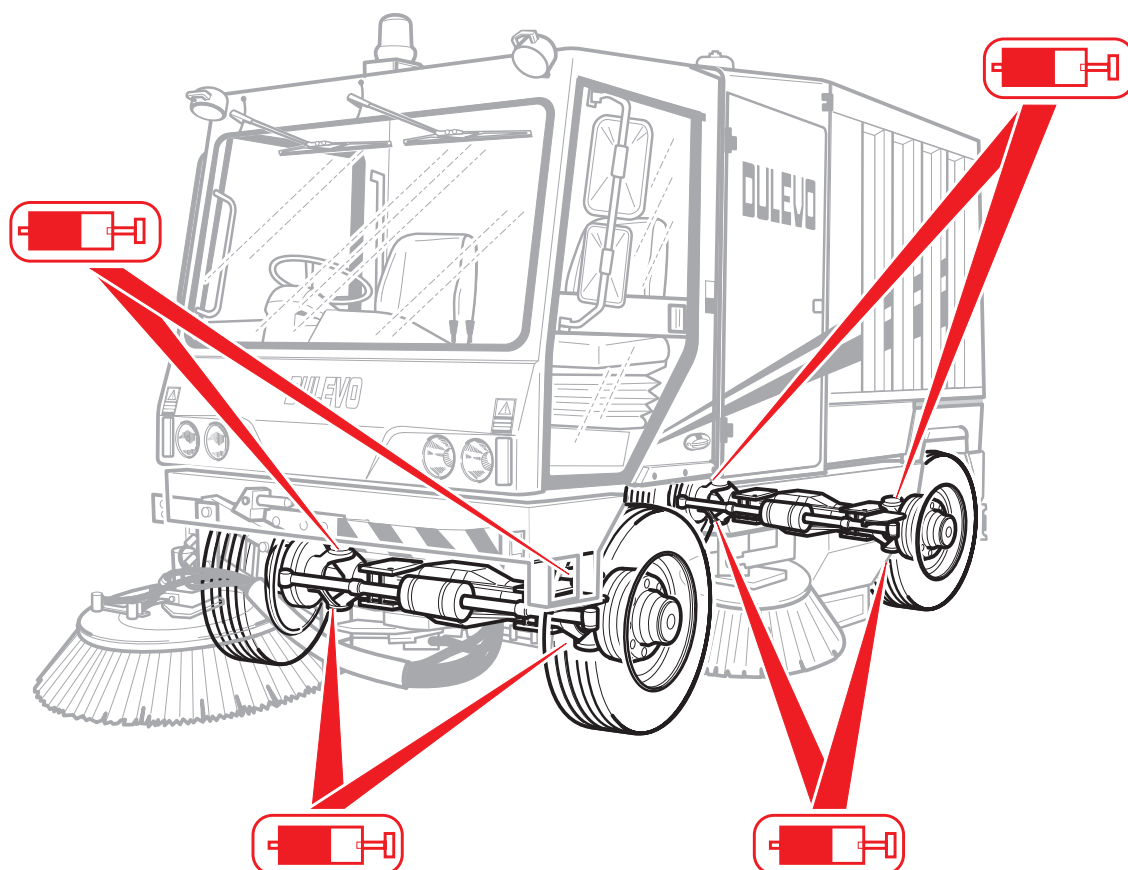
6000 6000

COMBI

ELEMENT	N. POINTS TO GREASE
6. Wheel articulations:	n. 1 points



ELEMENT	N. POINTS TO GREASE
7. Wheel articulations:	n. 8 points



6000 6000
COMBI

3.2.1. Manual greasing point per point

It's necessary to use a portable grease pump, connect it in the grease point of the component and pump till the lever gets hard.

**WARNING**

The greasing is correct if the grease goes out from the point.

3.2.2. Manual centralized system

This system is composed by a grease fittings equal to number of greasing points, all fitted in a single area (or two areas at the conveyor sides).

**WARNING**

Use a portable grease pump and fluid grease, pump till the lever gets hard and the grease goes out from the point.

3.2.3. Centralized system with manual pump on board

This system is composed by a grease tank with manual pump on board that send grease to centralized automatic progressive distributors and then to the single grease distributors.

**WARNING**

The cover of the manual pump mustn't be unscrew in order to avoid the air inside.
To fill the grease tank it's necessary to use the proper grease fitting fitted on the pump's valve by means of a portable grease pump.

3.2.4. Centralized system with automatic pump on board

This system is composed by a grease tank with electric pump that send grease in the same way described previously.

**WARNING**

Also in this system the tank cover mustn't be open in order to avoid air inside.
To fill the grease tank it's necessary to use the proper grease fitting fitted on the pump's valve by means of a portable grease pump.

**N.B.**

The electric pump is adjusted by Dulevo: pause time 6 hours, greasing time 3 minutes.

3.3. Washing of the sweeper

1. Tilt the hopper about 30°.
2. Open the hopper door and block it with the proper lever and safety pin.
3. Open the two side doors of the main brush and block them with the proper device.
4. Open the two big side doors.



WARNING

Don't tilt the cabin, in order to avoid water inside the cabin.



N.B.

Use decalcified water for a good cleaning.

6000 6000

COMBI

3.3.1. Groups washing

By using a water gun nozzle, wash the following groups with light pressure:

1. Internal part of the waste hopper, don't wash the filter.
2. Internal area of central brush, in particular the top part of the brush frame in order to remove all debris accumulated.
3. Internal area of the conveyor: chains/belts and tooth wheels/pulley, wash through the upper opening without stand up.

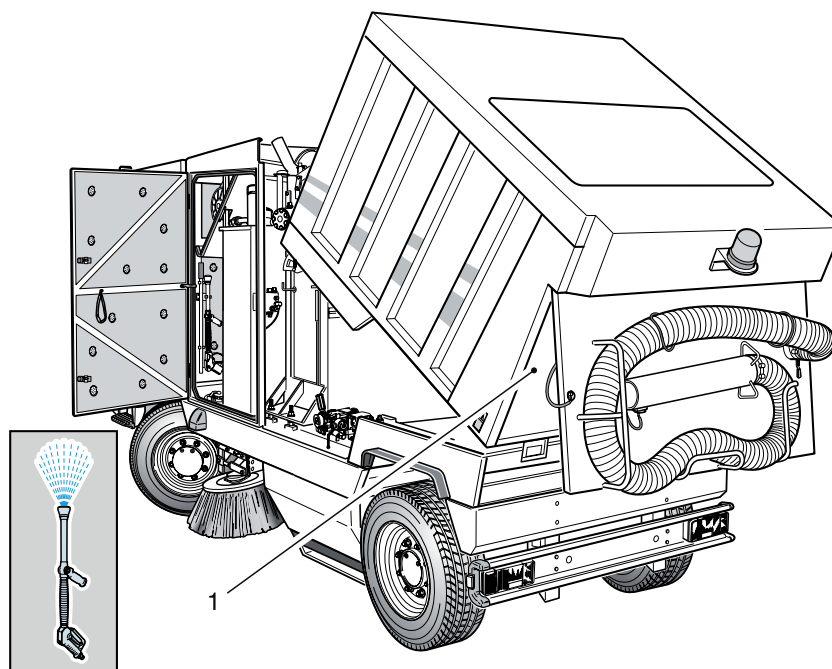


WARNING
Blades in rotation.



N.B.
It's better to rotate slowly the conveyor in reverse.

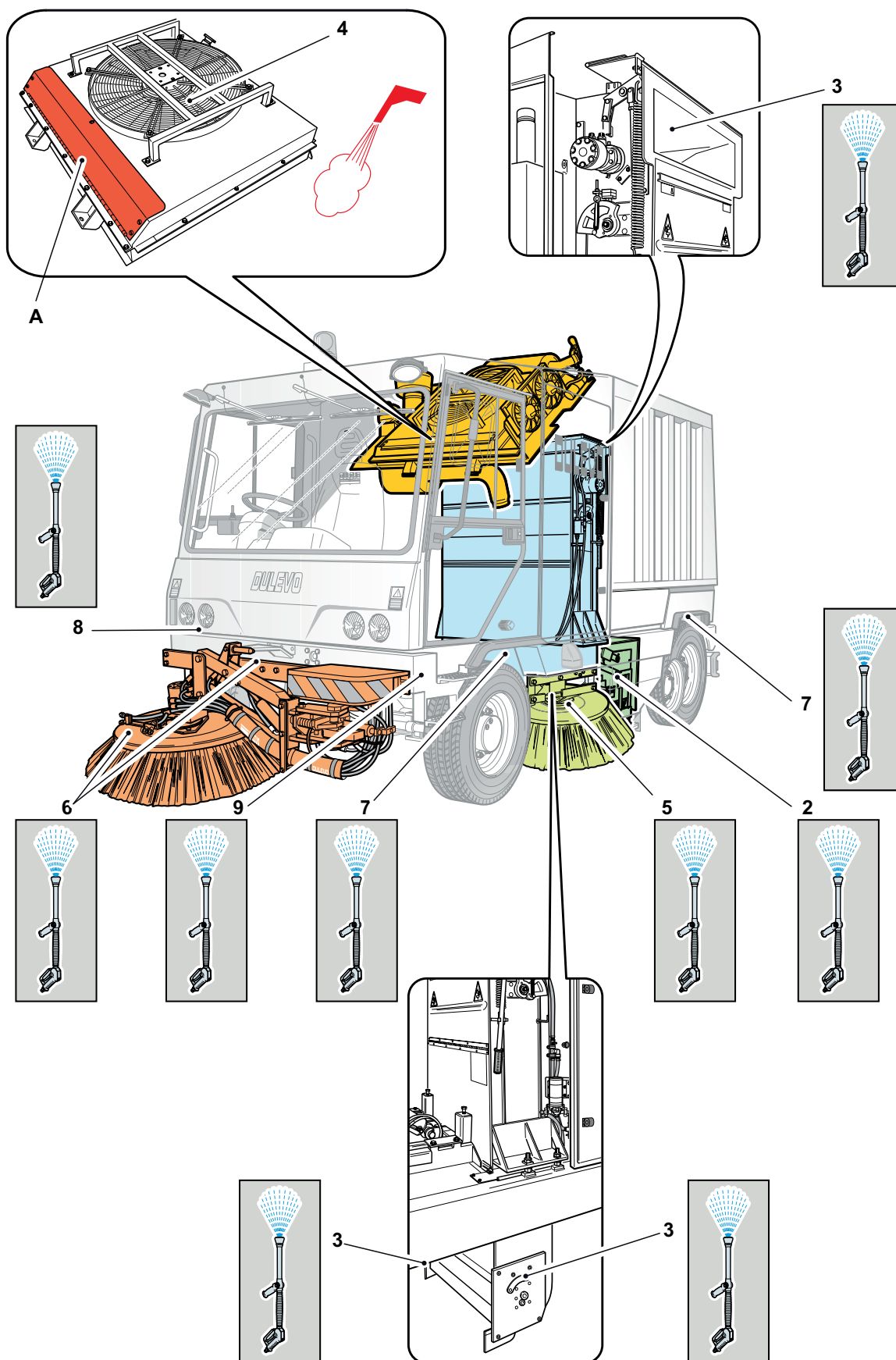
In order to wash the lower tooth wheels/pulleys it's possible to jet water through right and left lower splits.



Radiators. Don't wash with high pressure, in order to avoid damages of cooling fins.

4.  **WARNING**
Open the door (A) of radiator conveyor in order to clean the area between fan and radiators.

5. Side brushes groups.
6. Third brush, in particular the rail bar.
7. Front and rear mudguards.
8. Area under the cabin (Don't tilt the cabin).
9. Chassis.



6000 6000
COMBI

3.3.2. External washing

1. Lower the waste hopper.
2. Close the rear door.
3. Close the main brush doors.
4. Close the big side doors.
5. Wash the external of machine by paying attention not to get water jets against sliding windows to avoid water inside the cabin.

CHAPTER 4

Filtering-suction-mechanical system

6000 6000

COMBI

4.1. Main components

4.1.1. Mechanical system

The mechanical system collect the wastes and it is composed by:

- a. one or more side brushes (1) that turn and direct the material in the centre of the machine
- b. one central brush (2) (see Chapter 6) that brings the material into the conveyor (3)
- c. one conveyor (see Chapter 7) with blades (4) that turn and bring the material into the waste hopper

4.1.2. Suction-filtering system

The suction-filtering system needs to collect the fine dust inside the waste hopper and on filter itself, system is composed by:

- a. two turbines in series (5), driven by two hydraulic motors
- b. a sack filter (6)
- c. a mechanical filter-shaker (7), controlled by operator in the cabin

4.1.3. Filter-shaker

Filter-shaker is composed by eccentric shaft (7) duly supported and driven by hydraulic motor (12), the shaft rotates and hits the filter sacks thus causing the dusts fall.



N.B.

In case the shaft cannot rotate check not only the electro-hydraulic control (see Chapter 9), but also be sure the bushing (13) in the shaft support is not seized.

4.2. Checks and disassembly

4.2.1. Measurement of the turbines max vacuum

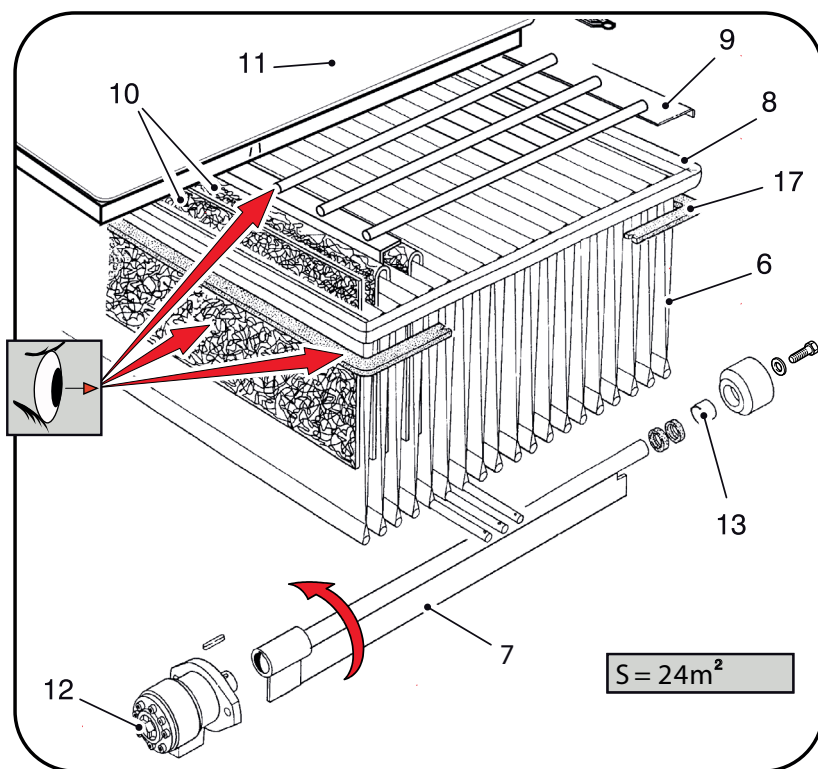
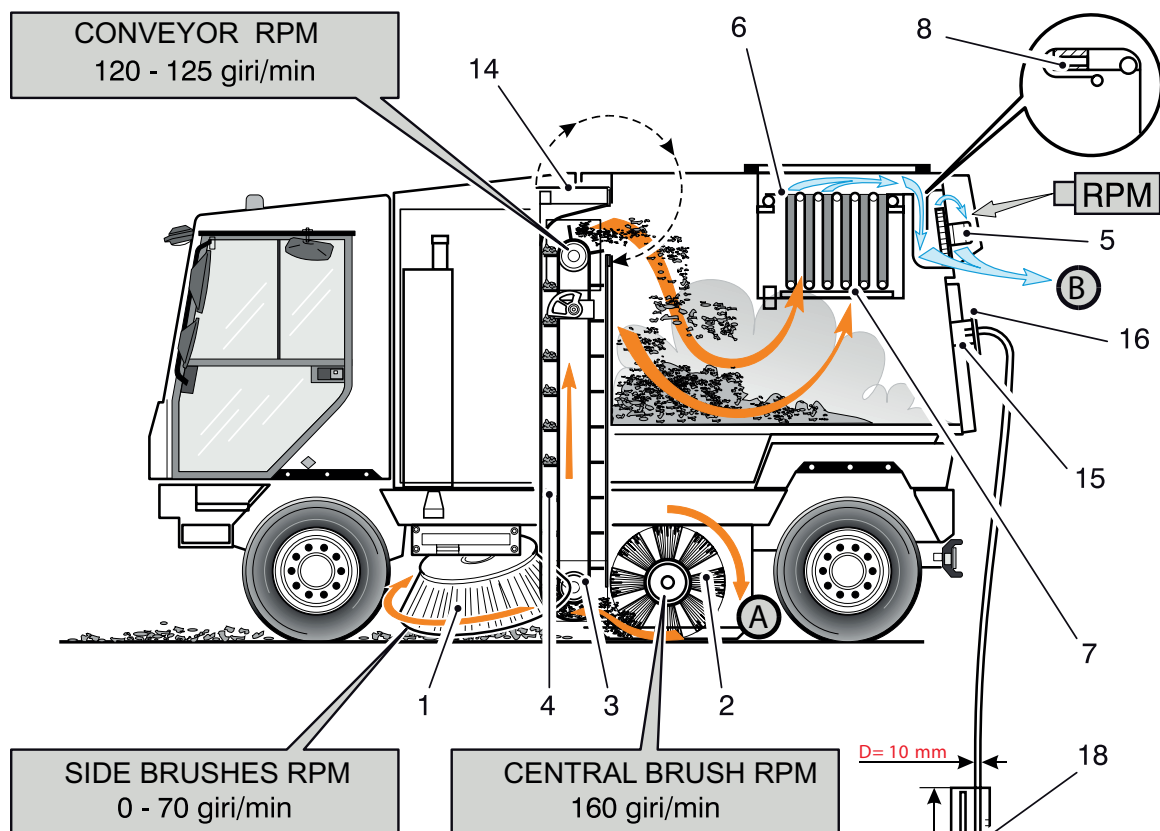
For a correct operation of the turbines, measure the maximum vacuum it can reach using the Pitot tube. Such hose, filled with water, when under vacuum creates a level that can be measured in mm of water column. The read value can be compared to that indicated in Technical Data of Chapter 2 (1 mm Water = 0,098 millibar).

This kind of measurement is possible only in the version with additional wandering hose:

- a. Close the conveyor shutter (14)
- b. Open the flap (15) fitted on the hose
- c. Put the Pitot tube (18) into opening with the gasket (16)
- d. Start the turbines with the engine at 1800 rpm & 2200 rpm and verify the vacuum values

In case values indicated in Technical Data are not reached, be sure that:

- a. the gasket (16) is efficient
- b. the turbines rotate at the rpm indicated in Technical Data
- c. all gaskets/rubbers are in good condition (see paragraph 4.3)



RPM MOTORE DIESEL ENGINE DIESEL RPM	1800 - 2200 $\pm$ 10%
$\triangle$ mm H ₂ O	630 - 1080 $\pm$ 10%
RPM	2600 - 3000 $\pm$ 10%

6000 6000
COMBI

4.2.2. Dust emission from the central brush (zone A)

Be sure that:

- Rubbers around the central brush are integral
- The filter shaker is operating and the filter is not clogged by dust
- Separators (10) are present inside sacks
- The turbine reaches the vacuum and flow values indicated in the Technical Data
- Filter is completely dry; filter doesn't suffer water but if dry it favors the passage of the air.



WARNING

The filter must be kept dry. For this reason at end of work-shift it is advisable to keep the rear door open for a while so that the air may dry the filter.

4.2.3. Dust emission from the turbines (zone B)

Be sure that:

- The filter is not broken or unstitched
- The filter is correctly fitted around the rack (8) and on the gasket (17) and also correctly pressed by proper fastening plate (9)

4.2.4. Filter disassembly

In case the filter needs to be removed, comply with the following procedure:

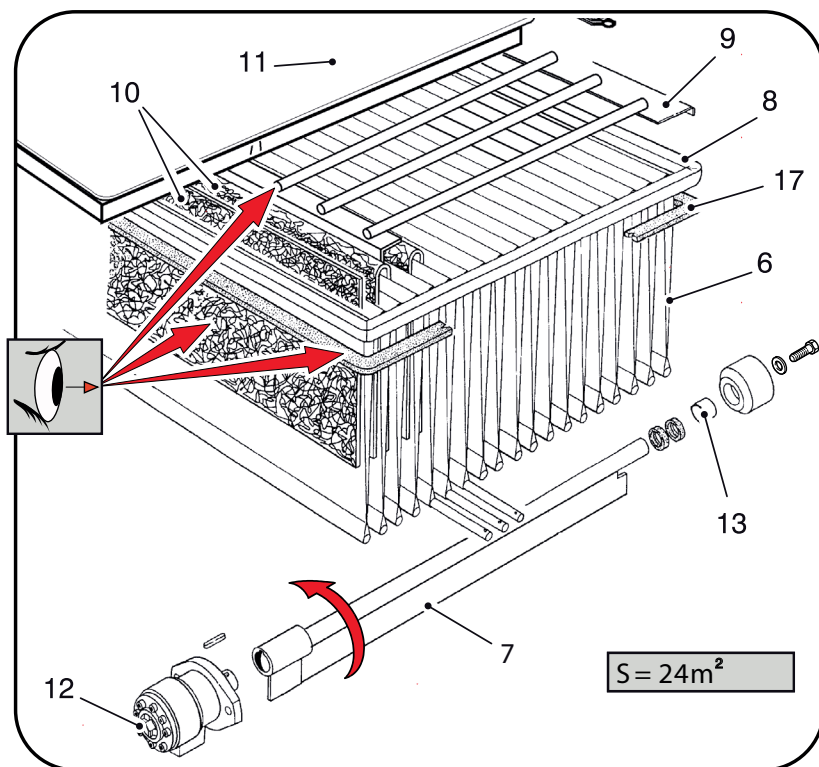
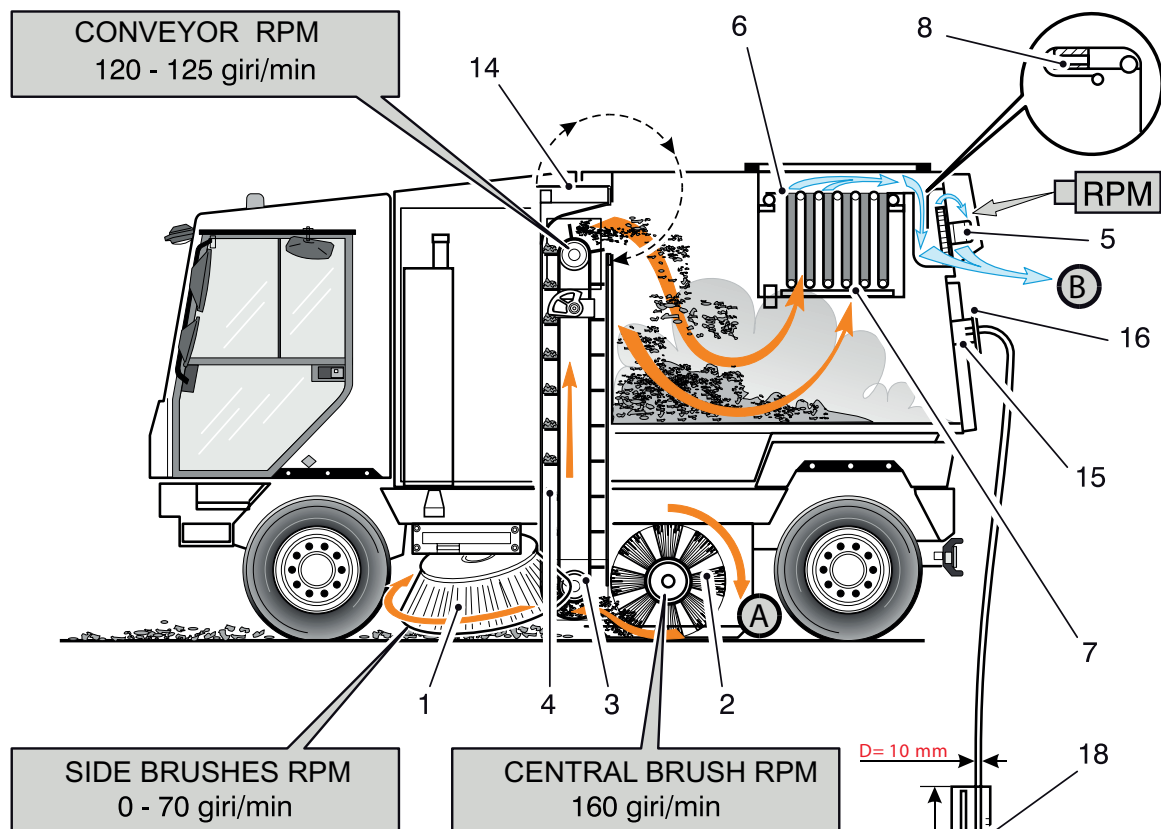
- Remove the cover (11) of the waste hopper
- Remove the rack (8)
- Before reassembling the filter make sure that the ropes are well stretched around and under the rack. Insert the new separators (10) into the filter sacks. Replace the rubber gasket onto which the filter rests.



WARNING

Checks of these points is fundamental in order to avoid dust emission into air.

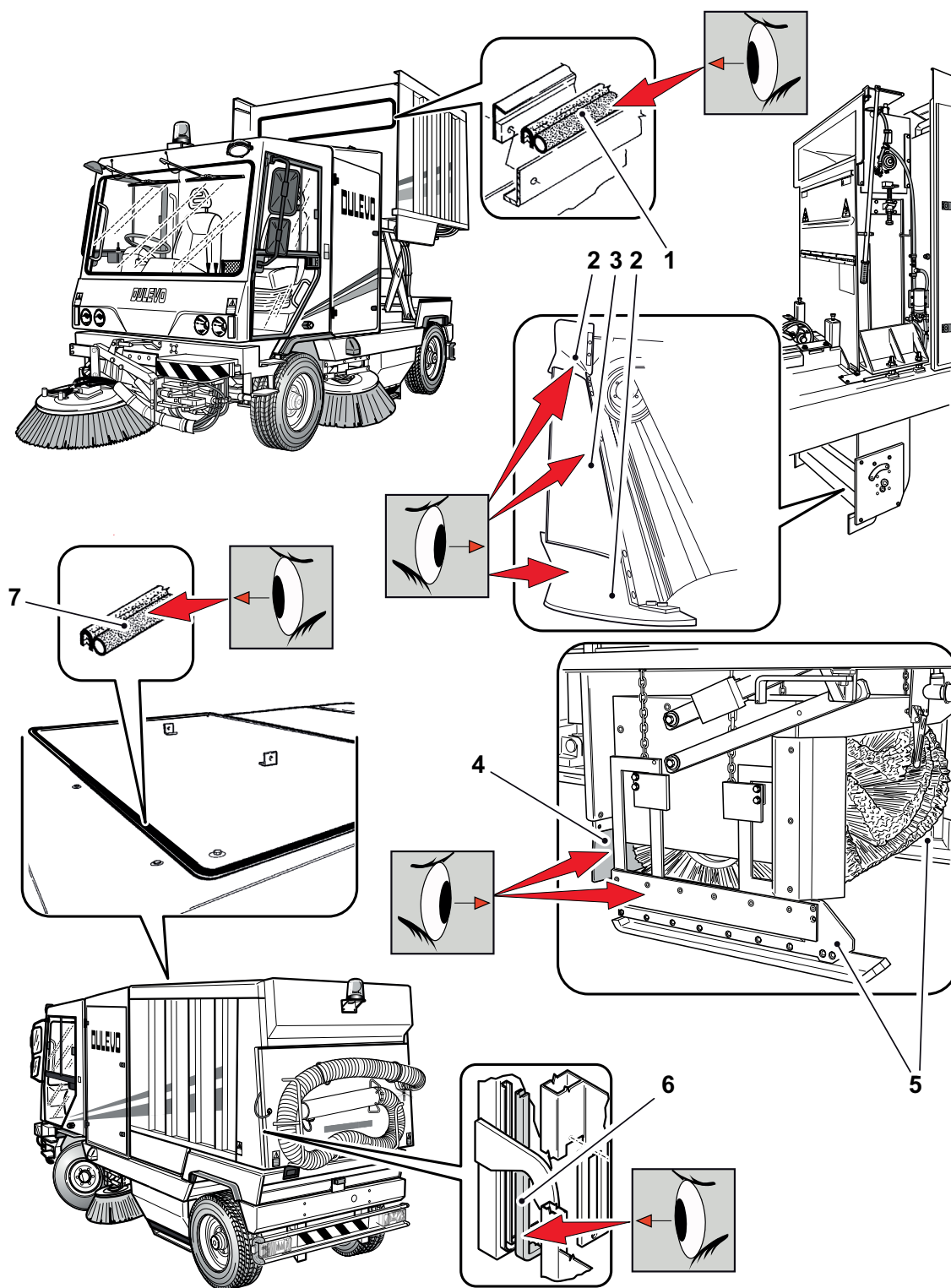
- Refit filter (6) and block it thorough nuts
- Reinstall the cover (11) by checking gasket of the cover is correctly sealing against the hopper



RPM MOTORE DIESEL	1800 - 2200 $\pm$ 10%
ENGINE DIESEL RPM	
$\triangle$ mm H ₂ O	630 - 1080 $\pm$ 10%
RPM	2600 - 3000 $\pm$ 10%

6000 6000
COMBI

4.3. Sealing gaskets and dust proof rubbers



CHAPTER 5

Axles, steering system, brake system

6000 6000

COMBI

5.1. Front axle and rear axle

5.1.1. General description

The front axle is composed of a central reducer with Gleason bevel gear, two reducer on the wheels, service brake on the wheels and a parking mechanical brake. Steering is made on pins and bearings and the movement is provided by an hydraulic cylinder.

Rear axle is composed of a rear idle steering group , service brake on the wheels; steering is made on pins and bearings and the movement is provided by an hydraulic cylinder.

The axle structure is a spheroidal cast-iron, with flat surfaces to be fixed on the vehicle chassis.

The bevel gear is a Gleason type, mounted on a spheroidal cast-iron differential box.

The torque is transmitted to the wheel by a epicycloidal gear, a floating crown and a central planetary.

The disk brakes with 4 hydraulic brake calipers are hydraulically moved with mineral oil.

Steering angles are different on the 2 wheels and they are achieved by the usage of a double effect hydraulic cylinder.

Lubrication is made by shaking on the wheel groups and on the differential group; the front axle is provided of a grease fitting on the output flange.

5.1.2. Controls and suggestions

Periodically control the screws tightening, if necessary adjust them with the proper tightening torque as per their strength class (see table A).

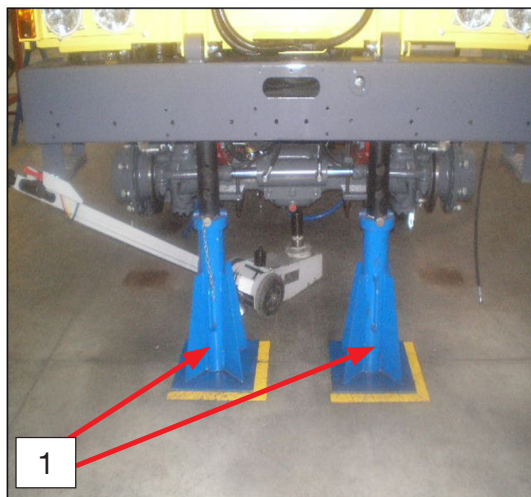
Table A :

Screw	Strength class	Tightening torque (Nm)
M6	8.8	11 ± 1,1
M8	8.8	25 ± 2,5
M10	8.8	50 ± 5
M10	10.9	72 ± 7
M12	12.9	145 ± 15
M14	8.8	138 ± 14
Screw pin M14x1,5		200 ± 20
Stud bolt M14x1,5		80 ± 8
Nut M14x1,5		200 20
M14x1,5	8.8	146 ± 15
M18	12.9	488 ± 48
M18x1,5	8.8	314 ± 15
Ring nut M30x1,5		350 ± 35

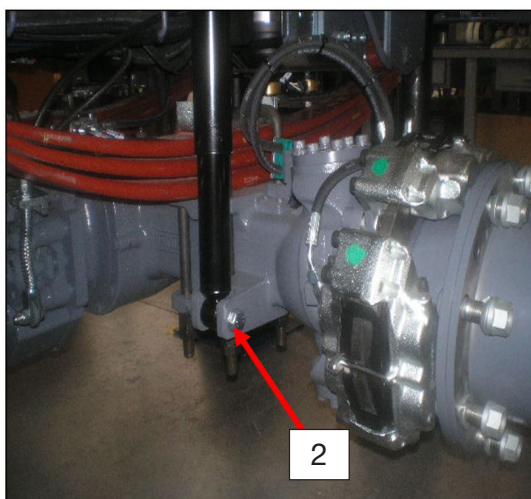
When remove/refit carters and covers, after the proper regulations, on the closing surfaces put some fluid sealant (e.g. Loctite).

5.1.3. Front axle disassembly

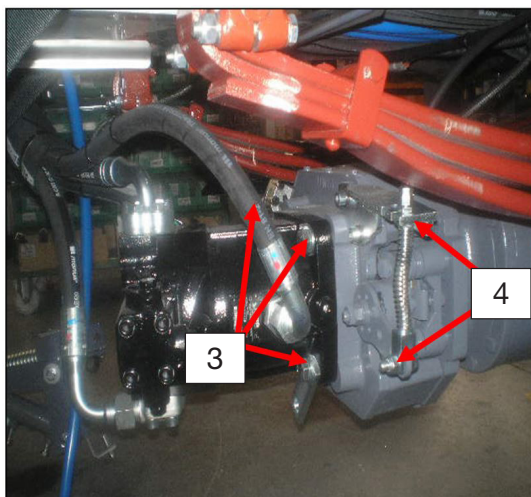
- 1) It's necessary to lift up the machine with a jack and fit a couple of stands (1) at 90 cm at least under the chassis, as shown in the photo, then remove the wheels.



- 2) Disconnect the shock absorbers on the lower side of the axle as shown by the red arrows (2).

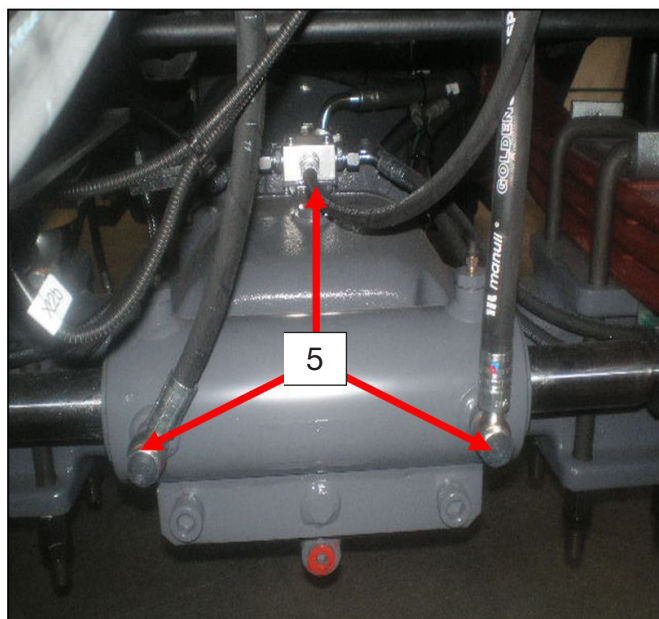


- 3) Release the 4 bolts (3) fixing the traction motor, then pull it until the shaft is completely out, finally disconnect the hand brake cable as shown by the red arrows (4).

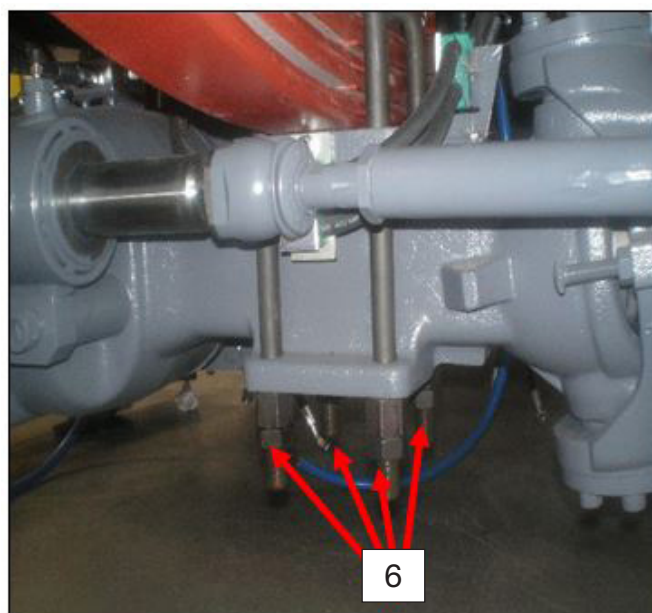


6000 6000
COMBI

- 4) Disconnect the hydraulic hoses fitted on the steering cylinder; disconnect also the hose on the brake calipers, as shown by the red arrows (5).



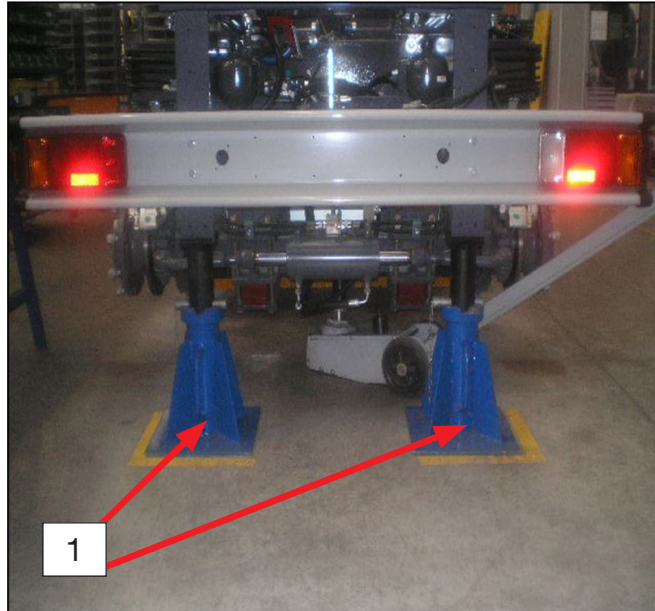
- 5) Last, it's necessary to support the axle with a forklift, release the 8 screws on the U-bolts which fix the structure to the leaf springs, as shown by the red arrows (6). Now you can pull the axle out.



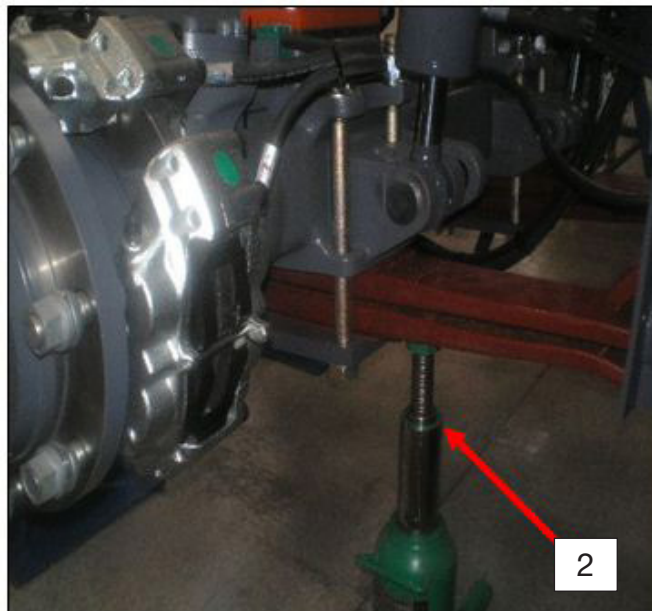
- 6) In order to refit the axle, follow the instructions upside down.

5.1.4. Rear axle disassembly

- 1) It's necessary to lower the suspensions, lift up the sweeper with a jack, and fit a couple of stands under the bumper supports (1) as shown in the photo, at a height which allows the wheels to be raised off the ground, then remove the wheels.

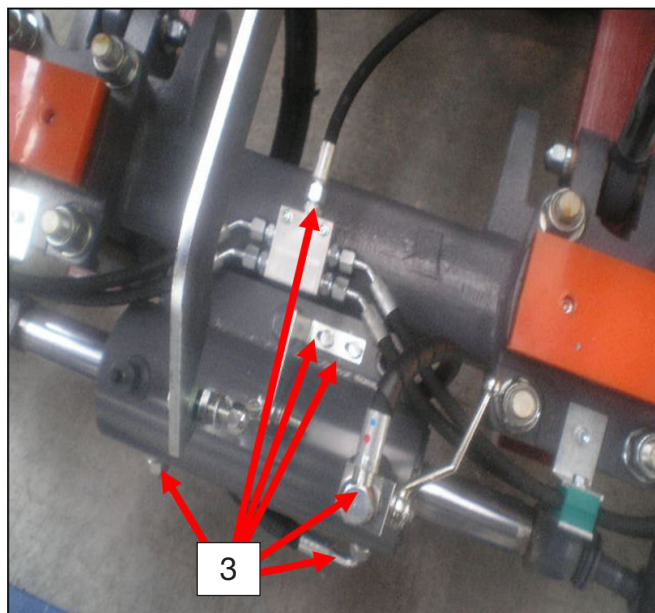


- 2) In order to support the rear axle, fit two bottle jacks (2) under the leaf springs as shown in the photo.

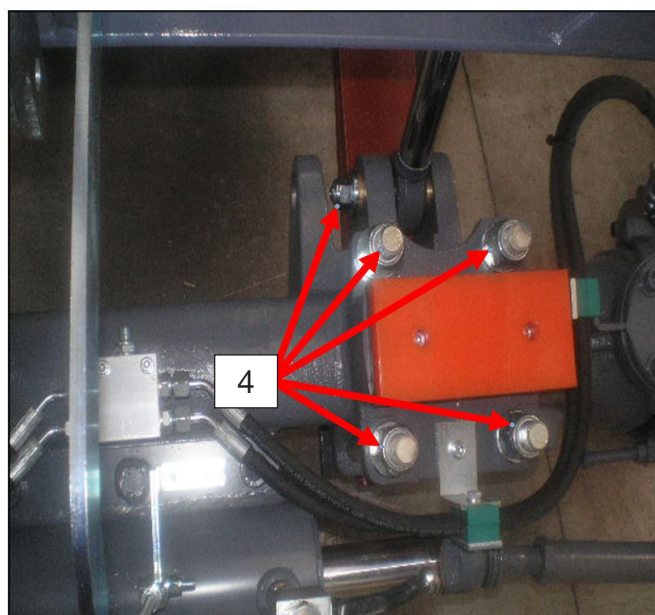


6000 6000
COMBI

- 3) Disconnect the hydraulic hoses fitted on the steering cylinder, disconnect also the hose on the brake calipers, together with the two M8 bolts fixing the control bar of the suspensions sensors as shown by the red arrows (3).



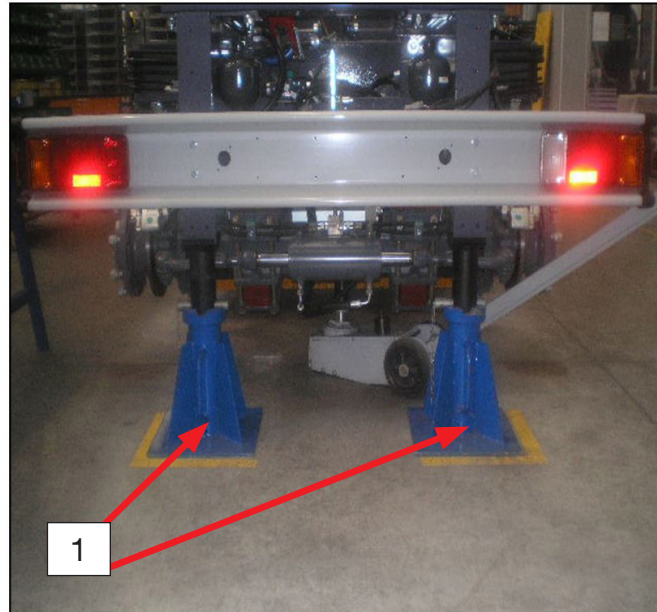
- 4) Last, it's necessary to support the axle with a forklift, release the 8 screws on the U-bolts which fix the structure to the leaf springs and the 2 pins which fix the suspensions cylinder to the structure, as shown by the red arrows (4). Now you can pull the axle out.



- 5) In order to refit the axle, follow the instructions upside down.

5.1.5. Bearings/spherical bearing replacement on the wheels articulation

- 1) Lift up the sweeper with a jack so that to raise the wheels off the ground, fit a couple of safety stands (1), then remove the wheels.

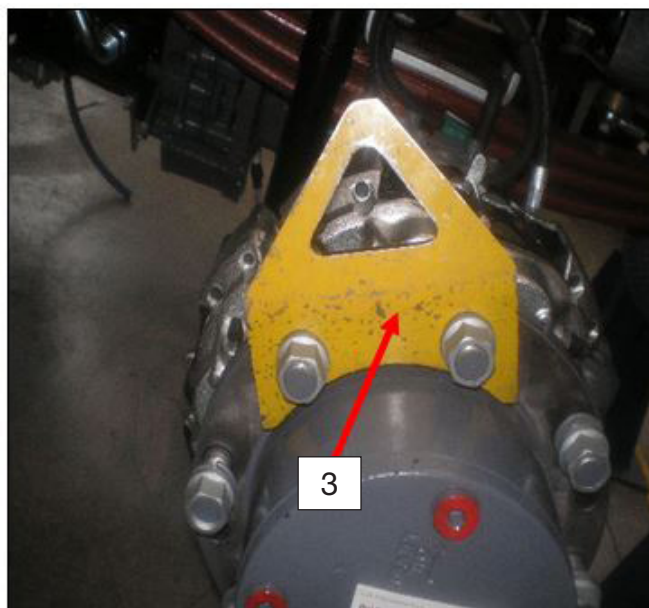


- 2) Release the nut shown by the arrow (2), fit a bottle jack under the nut and push upwards; hit laterally with a hammer as shown by the arrow (2) until the head is detached.



6000 6000
COMBI

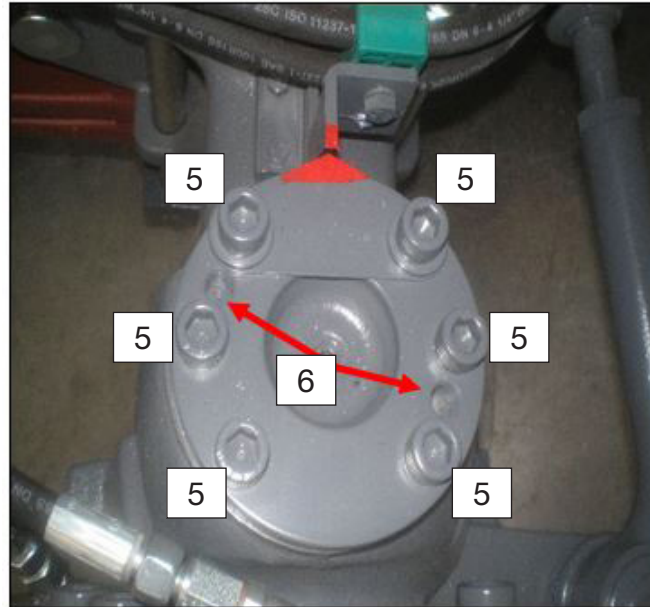
- 3) Insert a support hook (3), use a crane to help you to fit a lifting hook so that to keep the group raised.



- 4) Remove the hydraulic hoses from the brake calipers as shown by the arrow (4).



- 5) With an allen wrench release and remove the six screws (5), fit two of the screws on the free holes (6) and use them to help you to pull the pin out; the same operation to be done for the lower pin. Now, you can remove the hub of the rear axle using the crane; on the front axle, it's necessary first to pull out the drive shaft from the differential (be careful because part of the oil will flow out from the differential).



- 6) Use a puller to remove the old bearing/spherical bearing and its grease retainer as shown by the arrow (7); replace them with new ones.



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- 7) Use a puller to remove the ring of the old bearing/spherical bearing and replace it with the new one, as shown by the arrow (8).



- 8) Now work backwards to refit everything, paying particular attention to the correct shimming of the pins using the proper shims as shown by the arrow (9). A correct pre-load allows you to move the hub only with the hands (it must not be neither completely blocked nor free). Concerning the front axle, pay attention when fitting the drive shaft.

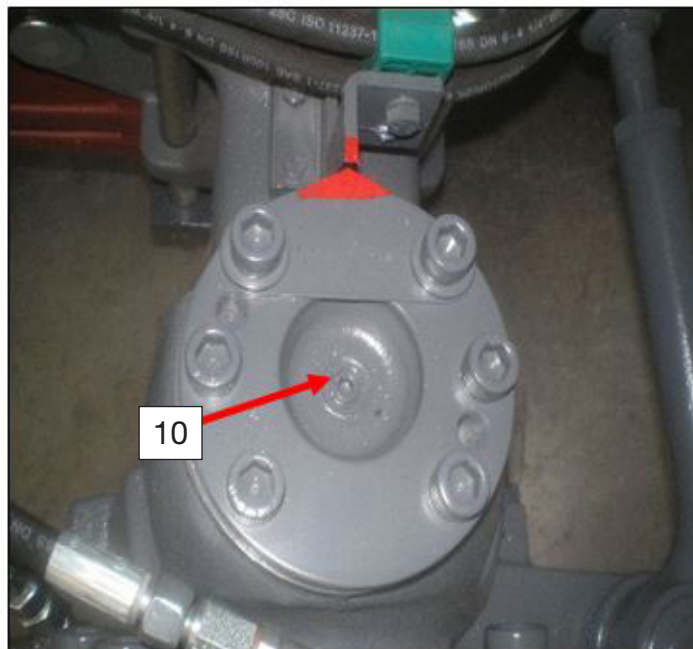


- 9) Now remove the grub screw shown by the arrow (10), pre-load the bearings with a proper grease with NLGI 2 consistency, then refit the grub screw.

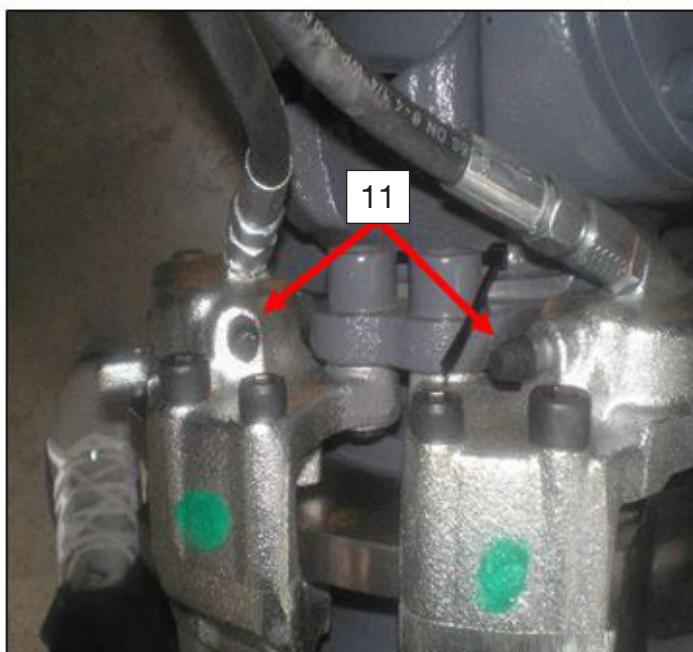


NB

In the spherical bearing version it's necessary to fit a M10x1 grease fitting to allow a periodical greasing.



- 10) Brake bleed: start the sweeper, keep the brake pedal pushed, bleed the air through the proper vents shown by the arrow (11), until the oil flow is completely airless. Remember that the oil of the braking system comes from the hydraulic oil tank.



NB

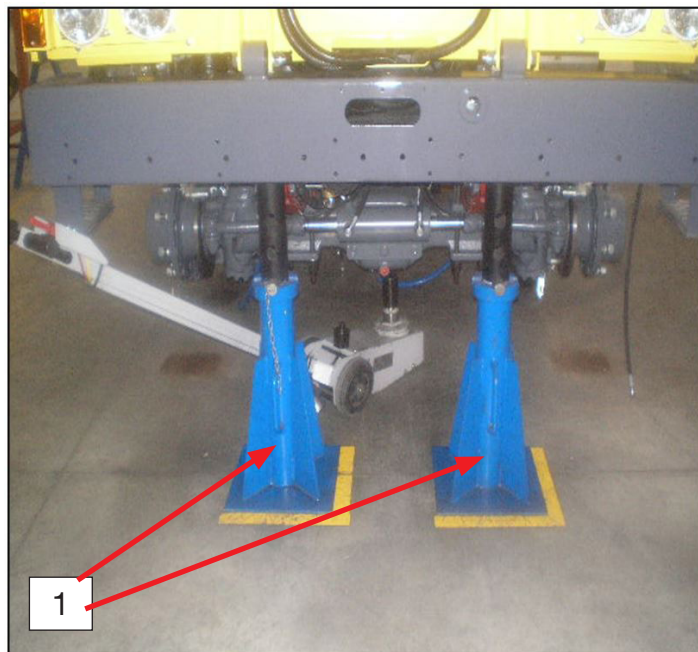
When replacing the bearings on the front axle, it's necessary to top up the oil inside the differential (the same oil come out when removing the drive shaft).

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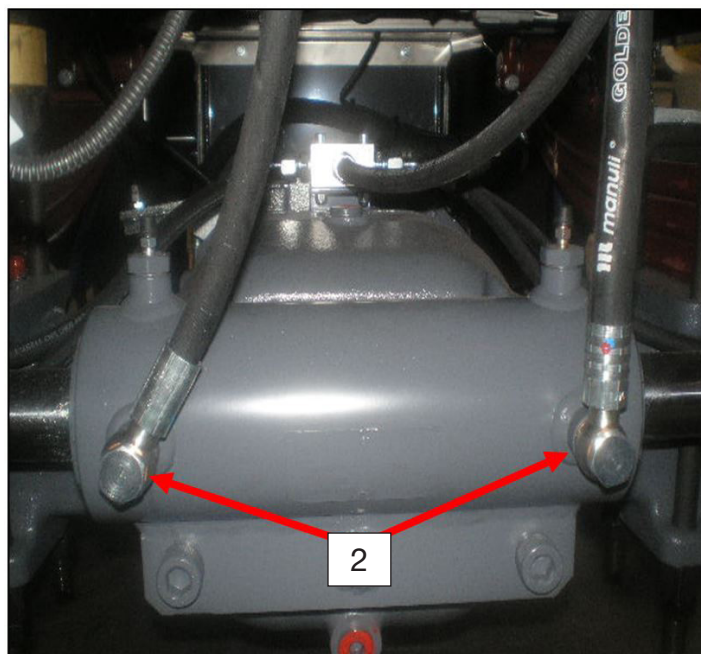
5.2. Steering circuit

5.2.1. Front steering cylinder removal and cylinder gaskets replacement

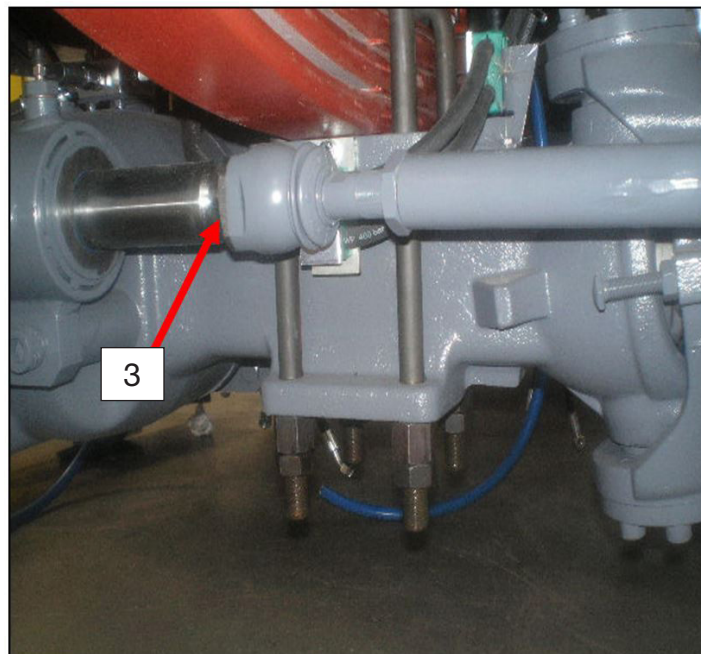
- 1) Lift up the sweeper with a jack so that to raise the wheels off the ground, fit a couple of safety stands (1). It's not necessary to remove the wheels.



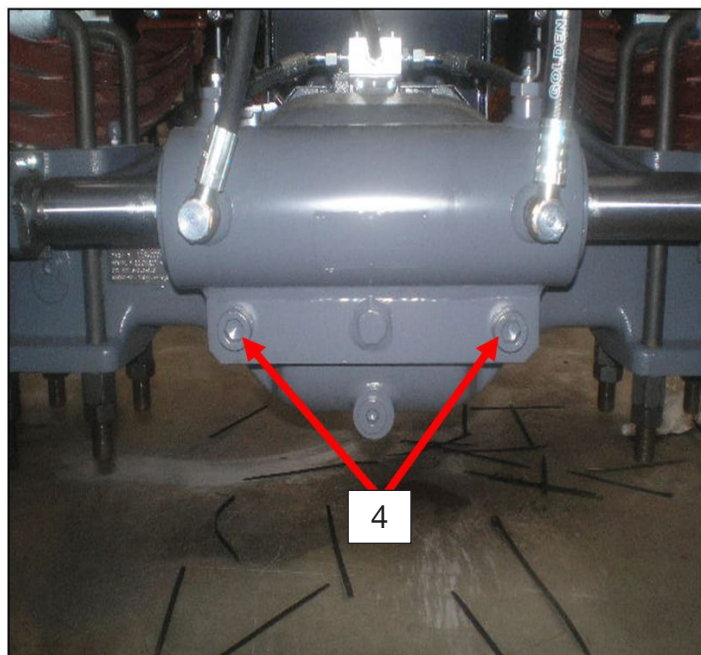
- 2) Disconnect the hydraulic hoses indicated by the arrows (2).



- 3) By using the wrench, release the steering arms directly on the rod cylinder as shown by the arrow (3), this way we avoid to modify the toe-in.

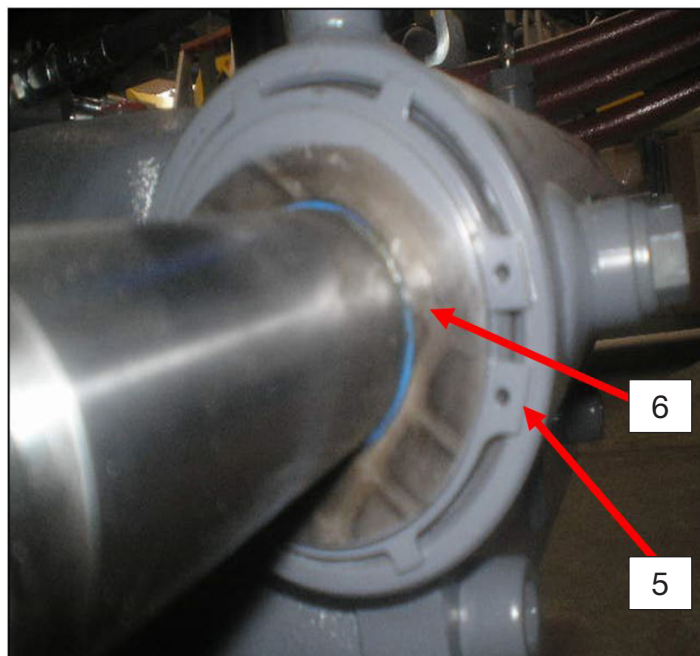


- 4) Now, ultimately, release the fixing screws (4) of the cylinder.



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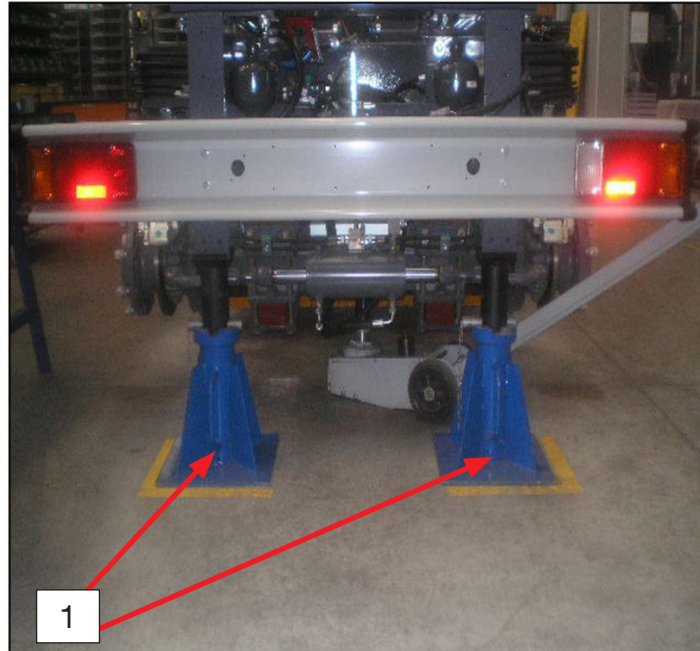
- 5) For a correct gaskets kit replacement, use some pliers to remove the seeger (5), then push a little bit inside the end cap (6), remove the elastic ring with a flat screwdriver; repeat the same operation on the other side. Once the end caps are free, pull out the rod and replace the gaskets with the new ones, paying attention not to pinch them.



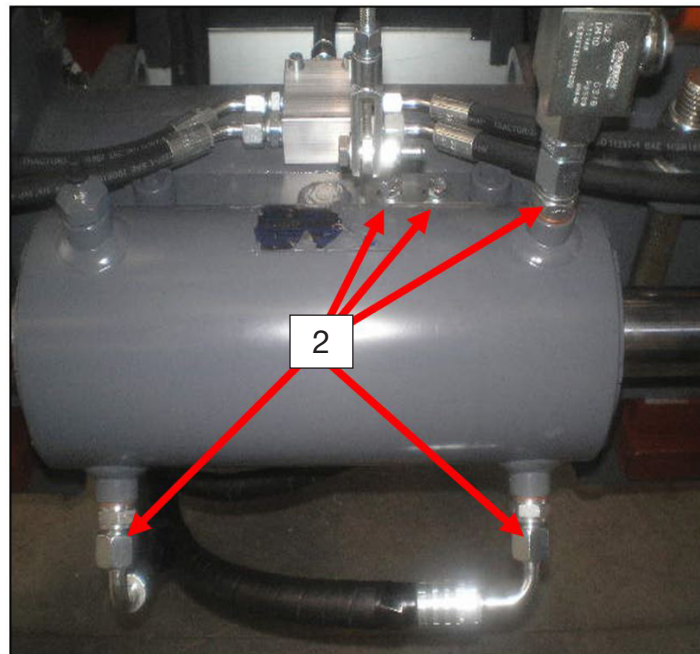
- 6) Now, work backwards to refit the cylinder, paying particular attention to the tightening of the screws (4) which fix them to the axle. For this purpose use some blue Loctite. The same care must be taken for the tightening of the arms on the rod cylinder as shown by the arrow (3). Use the same blue Loctite.

5.2.2. Rear steering cylinder removal and cylinder gaskets replacement

- 1) Lift up the sweeper with a jack so that to raise the wheels off the ground, fit a couple of safety stands (1). It's not necessary to remove the wheels.

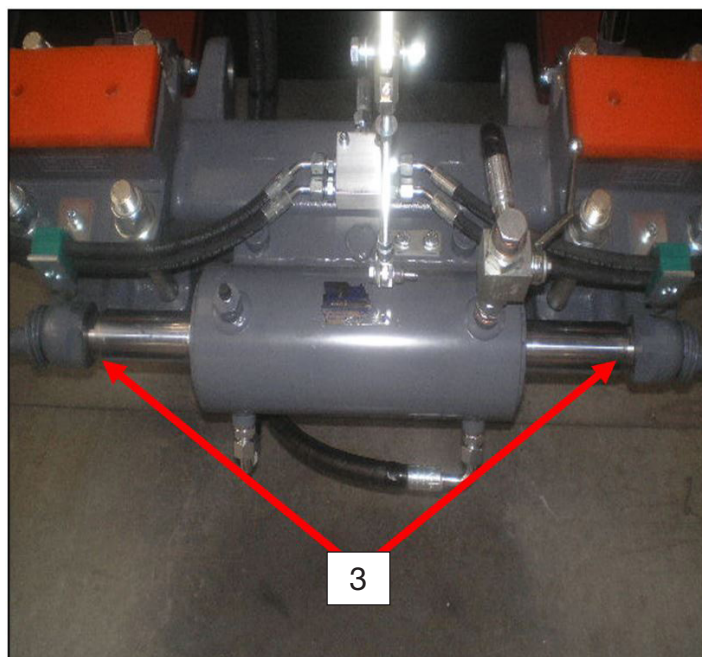


- 2) Disconnect the two hydraulic hoses, the valve lever and the screws of the sensors rod support, as indicated by the arrows (2).

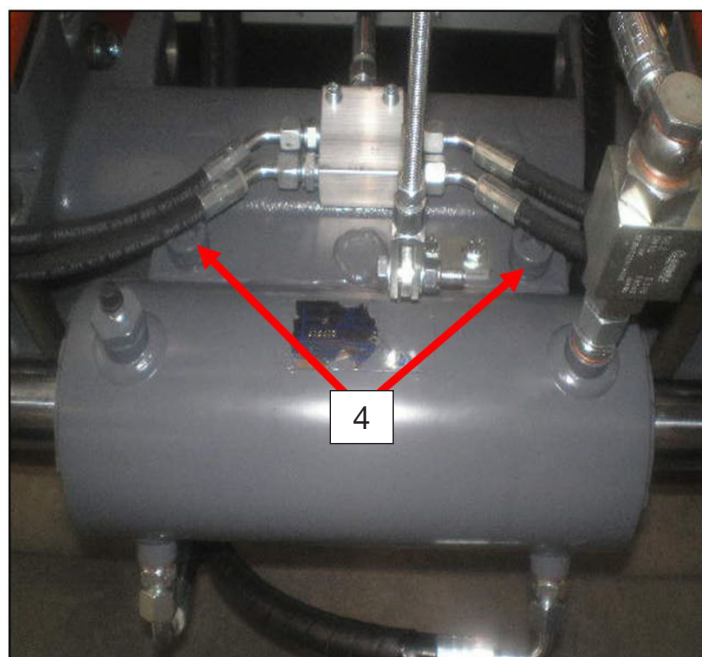


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COMBI

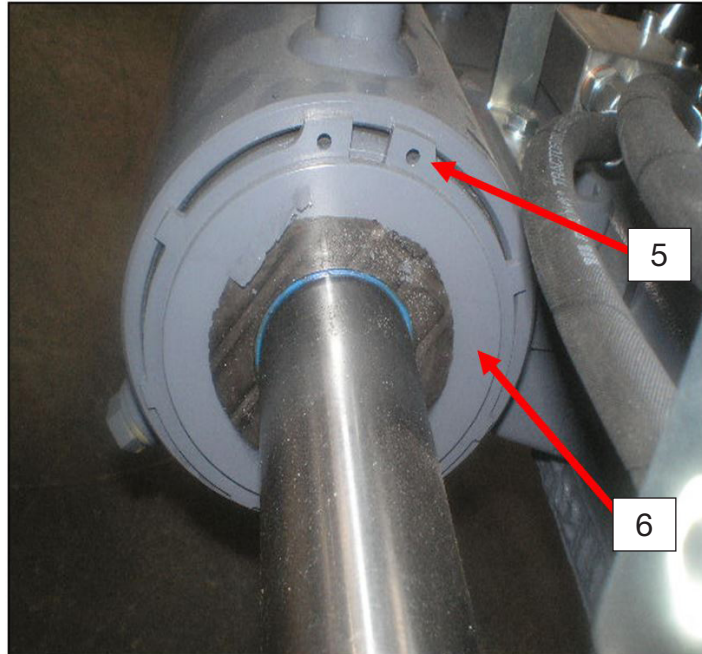
- 3) By using the wrench, release the steering arms directly on the rod cylinder as shown by the arrow (3), this way we avoid to modify the toe-in.



- 4) Now, ultimately, release the fixing screws (4) of the cylinder.



- 5) For a correct gaskets kit replacement, use some pliers to remove the seeger (5), then push a little bit inside the end cap (6), remove the elastic ring with a flat screwdriver; repeat the same operation on the other side; once the end caps are free, pull out the rod and replace the gaskets with the new ones, paying attention not to pinch them.

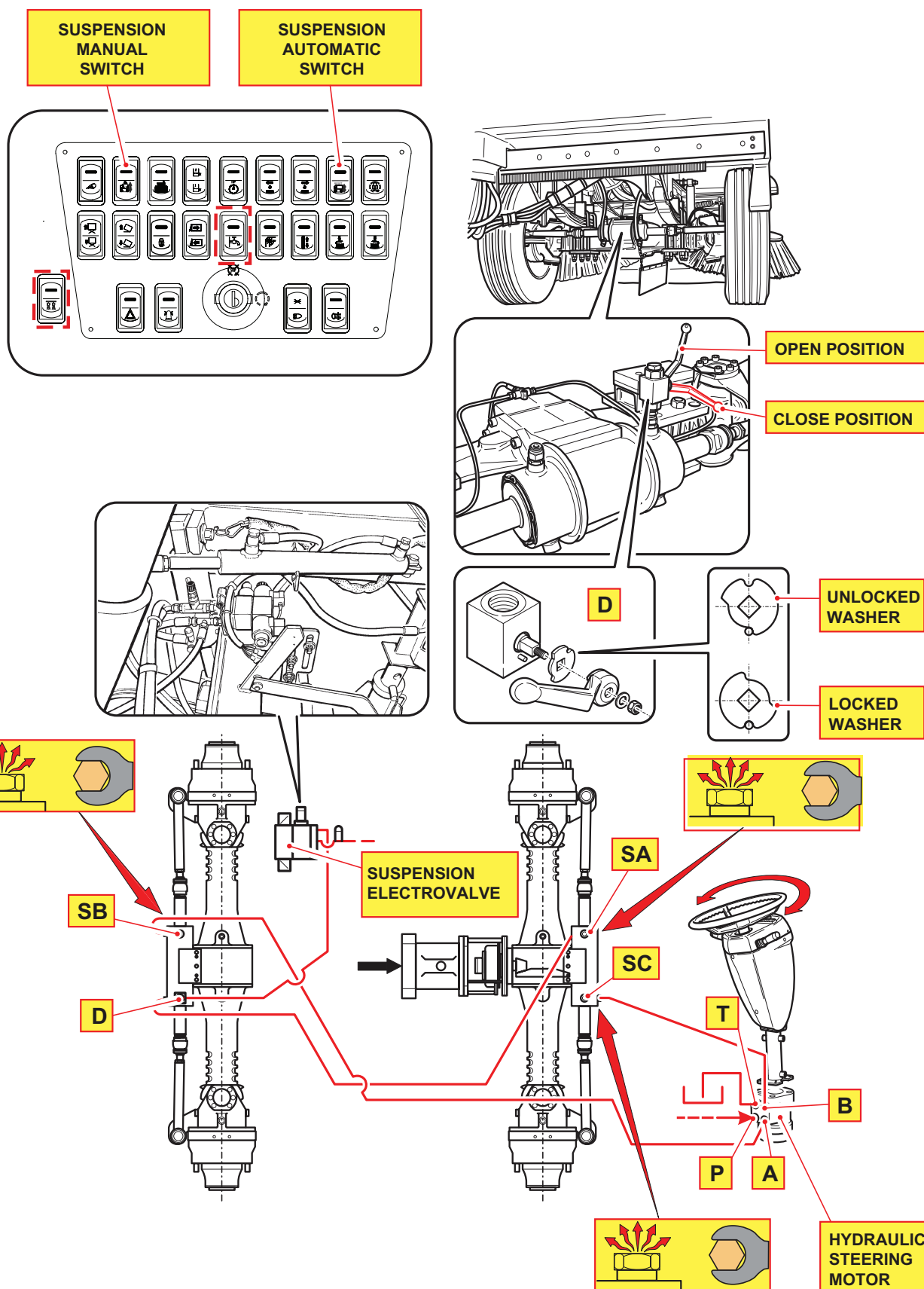


- 6) Now, work backwards to refit the cylinder, paying particular attention to the tightening of the screws (4) which fix them to the axle. For this purpose use some blue Loctite. The same care must be taken for the tightening of the arms on the rod cylinder as shown by the arrow (3). Use the same blue Loctite.

5.2.3. Steering circuit bleed

It takes two people: one inside the cabin and one outside, a small tank, and a transparent pipe to connect to the vents.

1	Start the engine, open SB vent on the rear cylinder, turn the steering wheel to the right until the out flowing oil is air free, close the vent and switch off the engine.
2	Start the engine, open SC vent on the front cylinder, turn the steering wheel to the left until the out flowing oil is air free, close the vent and switch off the engine.
3	Open valve D on the rear cylinder, start the engine, place the suspensions automatic switch in the central position, pull downwards the manual switch of the suspensions, then open SA vent on the front cylinder until the out flowing oil is air free, close the vent, switch off the engine and close valve D.
4	Now you can carry out the wheels alignment as per Use & Maintenance manual.

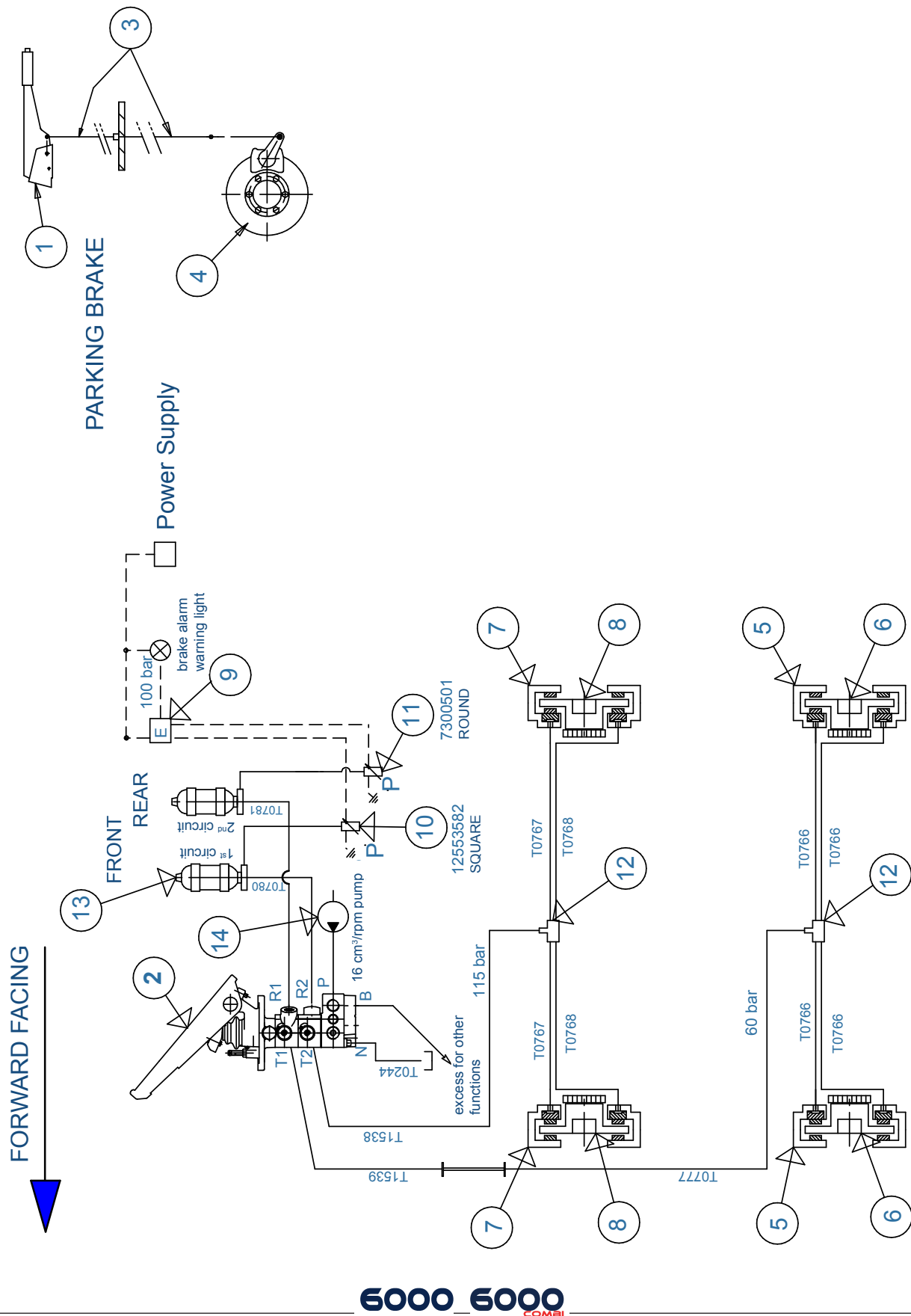


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COMBI

5.3. Brake system

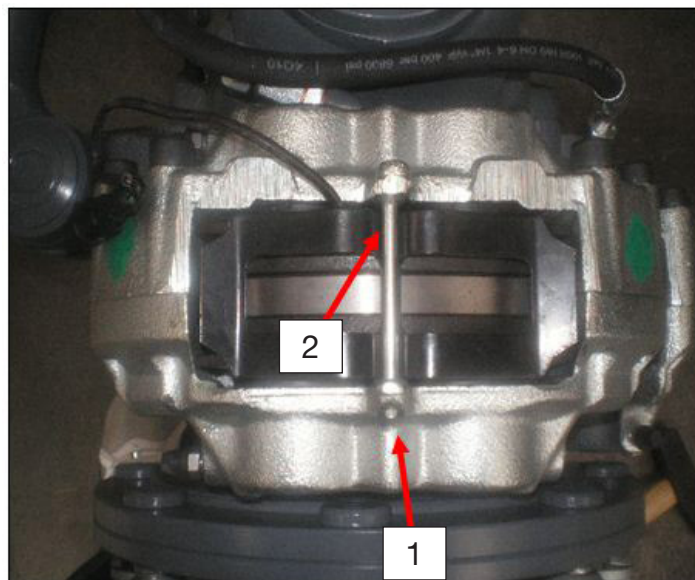
5.3.1. Brake system scheme

1	hand brake lever
2	brake pedal
3	hand brake cable
4	hand brake disk
5	rear axle brake calipers
6	rear axle brake disk
7	front axle brake calipers
8	front axle brake disk
9	rpm counter instrument
10	front brake transducer
11	rear brake transducer
12	5-ways diverter
13	accumulators
14	hydraulic gear pump

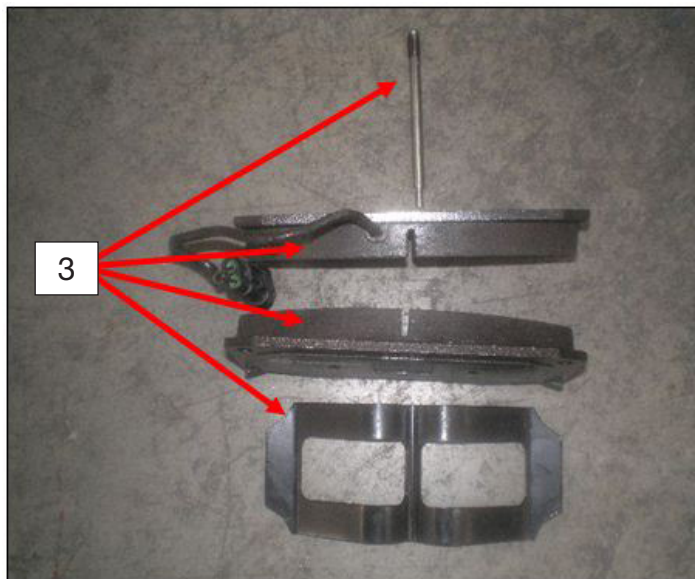


5.3.2. Replacement of the wheel hub brake pads

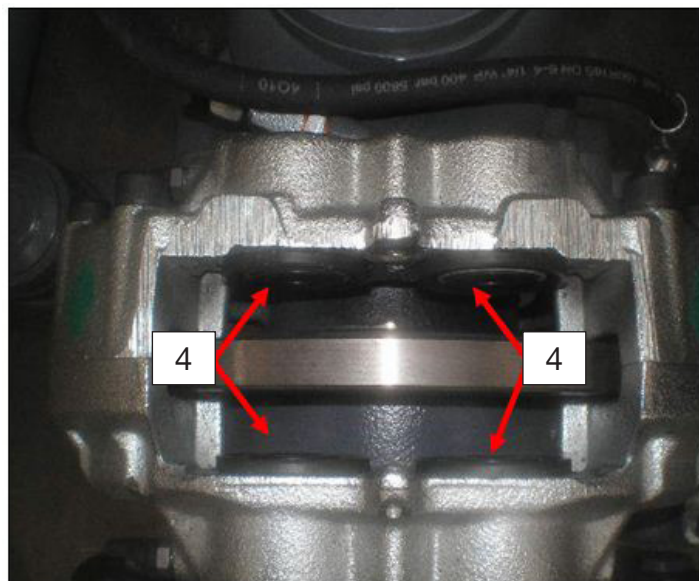
In order to replace the brake pads, first lift up the sweeper with a jack, then remove the wheel. With a hammer and a pin punch hit on the hole (1) so that to pull out the retaining pin (2) and remove the old pads.



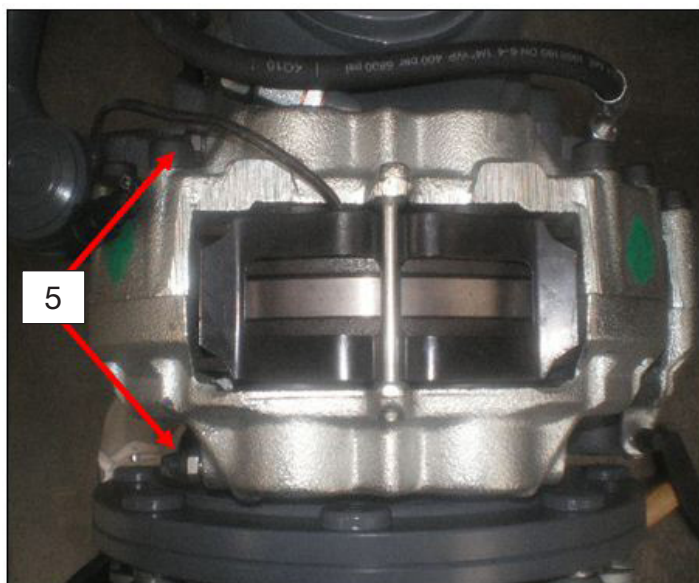
Then remove completely the pin, the retaining plate and the worn pads as shown by the arrows (3).



Now, push inside the small cylinders to create the necessary space to insert the new pads , as shown by the arrow (4).



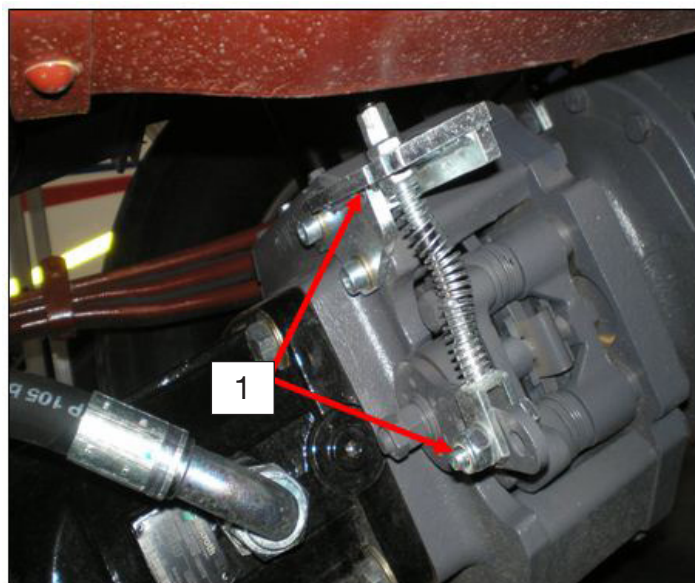
Insert the new pads and refit everything, paying attention to install all the parts correctly. Should be necessary to bleed the brakes, start the engine, keep the brake pedal pushed, and bleed the system through the vents shown by the arrows (5), until the oil flow is air free. Remember that the oil of the braking system comes from the hydraulic oil tank.



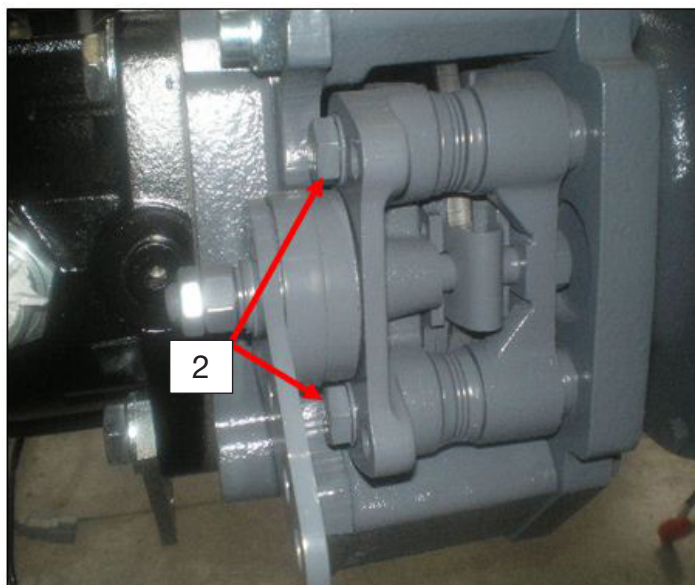
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5.3.3. Replacement of hand brake pads

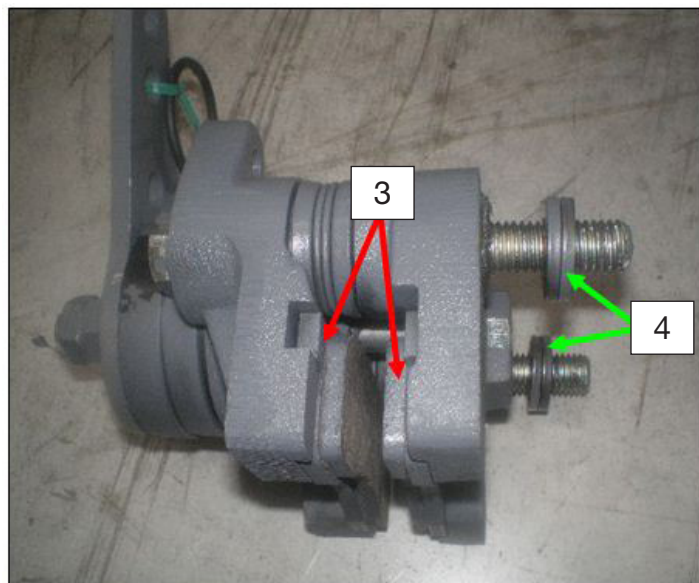
In order to replace the pads, first disconnect the brake cable as shown by the arrows (1).



Then loose the fixing screws on the brake caliper shown by the arrows (2), remove the brake caliper.



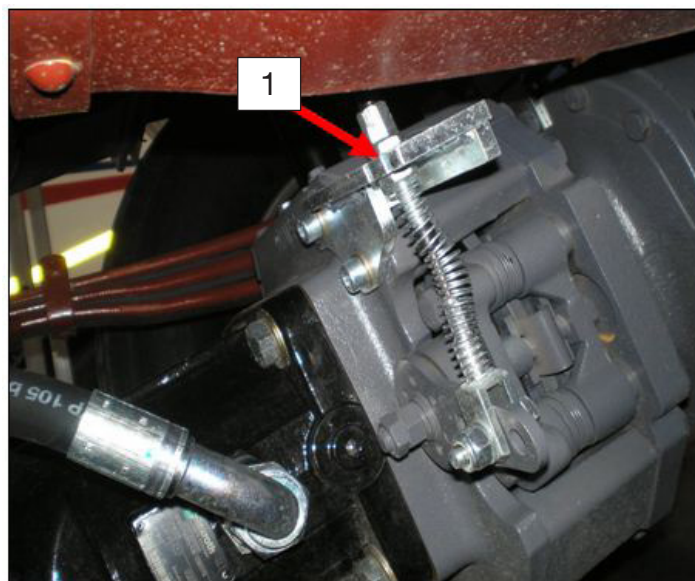
Once the brake caliper has been removed, replace the old pads (3) with the new ones.
Work backwards to refit the parts, ensure to fit the 2 spacer washers (4) and block the fixing screws (2) of the caliper using some blue Loctite.



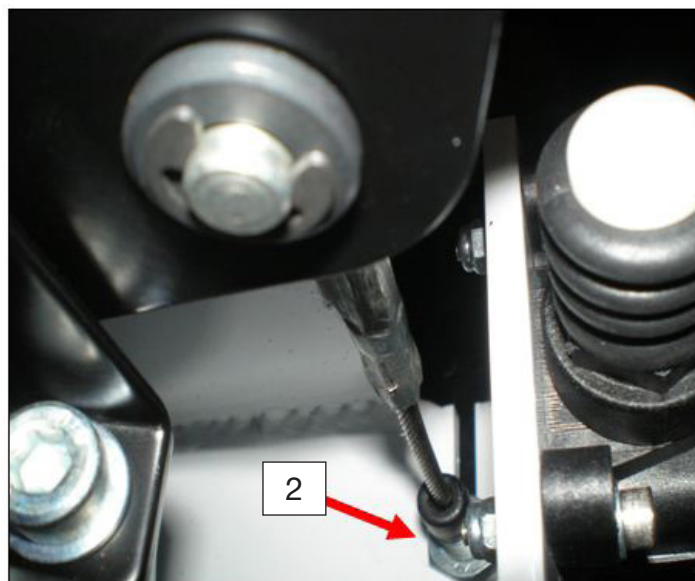
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COMBI

5.3.4. Hand brake adjustment

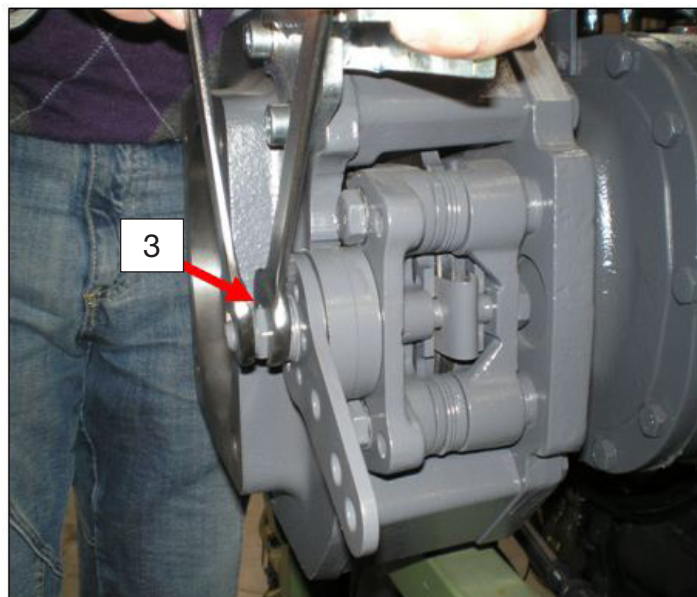
First, check the cable adjustment using its adjuster (1) as shown in the photo.



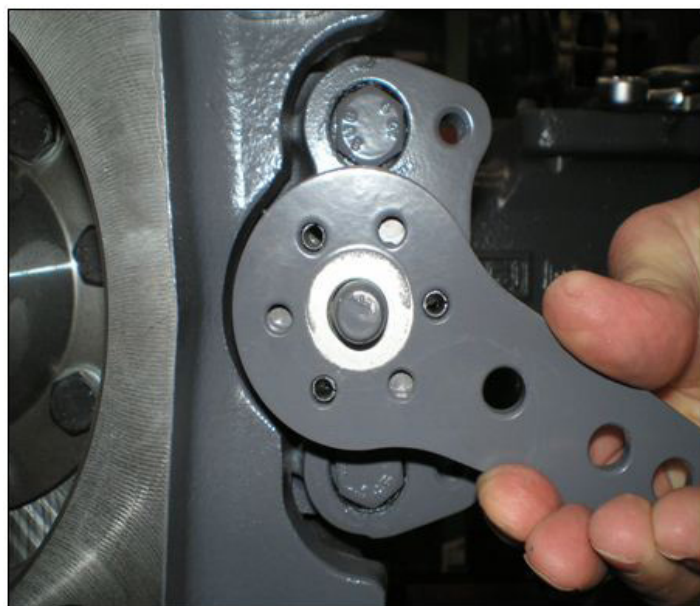
Should adjuster (1) be insufficient, you can also use adjuster (2) under the hand brake lever; a correct adjustment prevents the lever not to comply more than 5 clicks.



The adjustment can also be carried out using the brake caliper lever, releasing the counter-nut (3) with the usage of two 19 wrenches.

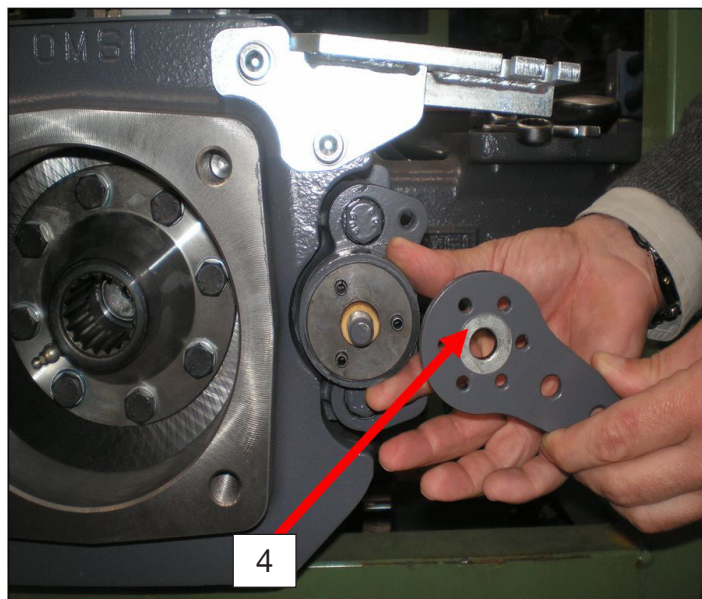


Remove completely the nut and the counter-nut to allow the lever to be pulled out from its seat.

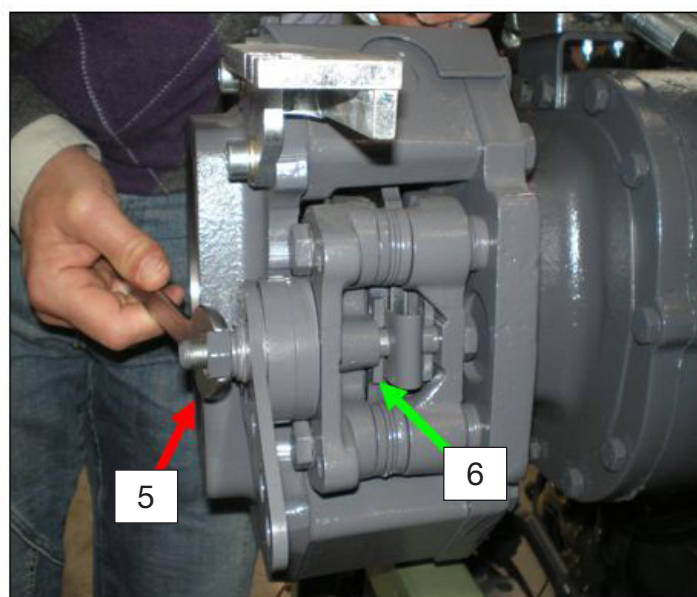


6000 6000
COMBI

Turn the brake lever (4) a one hole clockwise for tightening, and one anticlockwise to loosen.



Refit the washer with its nut (5), paying particular attention to the nut tightening so that the calipers are not in touch with the disk; there must be a clearance of 2 mm as shown by the green arrow (6).



Last, refit the counter-nut (7) and fix it with a couple of 19 wrenches.



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CHAPTER 6

Central brush, side brushes, third brush

6000 6000

COMBI

6.1. Central brush

6.1.1. Brush specifications

Diameter:	650 mm
Length:	1280 mm
RPM:	160 rpm
Type:	PPL (polypropylene)
	PPL + STEEL (polypropylene + steel)

6.1.2. Brush working

The central brush is controlled by 4 arms (A): two of them are on the right side, two on the left side; the brush is supported in the central point through a chain which is moved by an hydraulic cylinder (B) together with a pulley (C).

The pressure of the brush on the ground, in order to avoid premature wear, can be adjusted by operator through regulator (R) located into the cabin that varies the hydraulic pressure inside the cylinder: higher is the hydraulic pressure, lower is the brush pressure onto the ground and therefore the longer is the brush life.

The pressure of the brush is controlled by the integrated valve (T) with two solenoids: the upper temporized solenoid (EV11) and the lower solenoid (EV10). The solenoid (EV11) keep energized itself for few seconds when the switch (I) is enabled, then automatically the solenoid (EV10) keep open the valve.

Suggested pressure: 8-10 bar visible through the pressure gauge (M) fitted next to the regulator (R).



N.B.

Pressure control: the correct hydraulic pressure corresponds to a rectangular mark of the brush on the ground having a 80 mm – 120 mm width.



N.B.

Minimum bristles length: 40 – 50 mm.



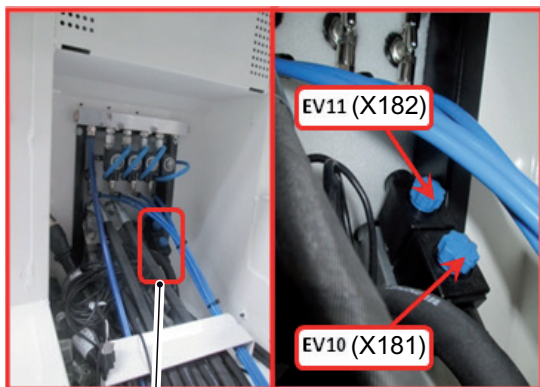
N.B.

Be sure there is no waste blocking up the pulley (C), so that the brush can be lowered with a fixed pressure.

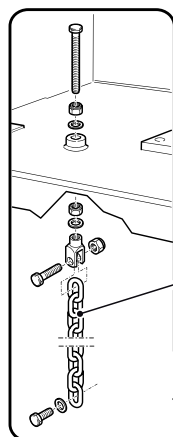


N.B.

In case of machine stop for some days, the brush cylinder must be hooked up with proper hook (H), in order to prevent falling down on ground with consequent deformation.



T

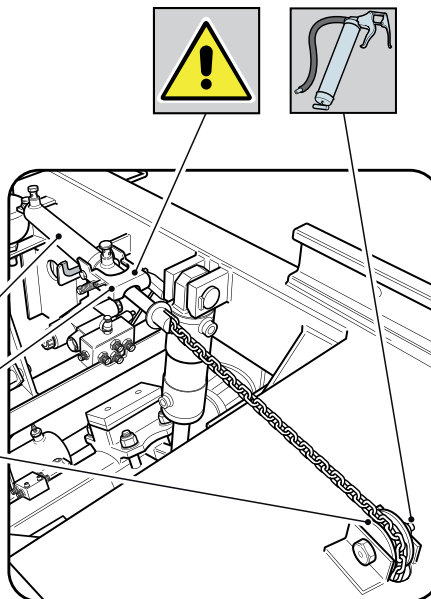


B

H

C

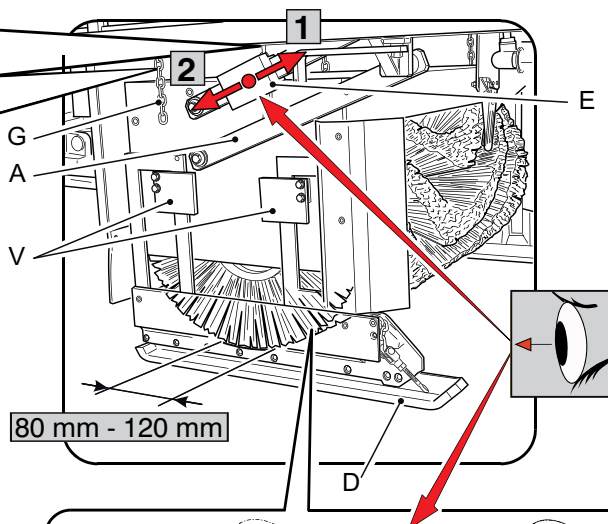
G



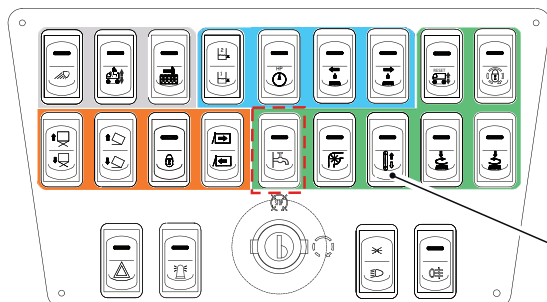
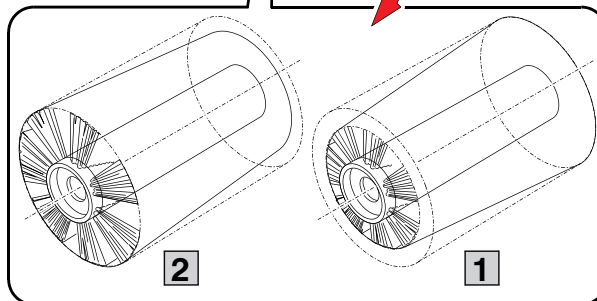
8-10 BAR

M

R



80 mm - 120 mm



I

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COMBI

6.1.3. Irregular wear of the brush and balance

If the mark on ground is not regular (rectangular) but trapezoidal, the cause must be found:

Be sure there's no waste on the upper part of the brush frame that could irregularly increase the weight of the whole assembly; in case of waste presence use high water pressure to clean.

Be sure that the side slides (D) are not obstructed by waste, thus preventing the brush from lowering freely; in case of waste presence use high water pressure to clean. Be sure that Guides (V) are not jammed.

Be sure that 4 arms (A) have proper clearance on 4 rotation pins.

In case of negative test results the whole assembly has to be balanced again. On the upper right arm there's a weight (E) which can run along the arm after having released the clamping bolts.

Move the weight (E) towards the brush if bristles of this side is longer and vice versa.



WARNING

The Operator has to check the brush once a week, verify the length of the bristles on the right side and left side.

If the difference is upper to 20 mm it's necessary to adjust by a weight (E).

6.1.4. Side slides

Side slides (D) have to be adjusted through the chains (G) so that they skim the ground during operation, adjustment can be done through proper screws fitted on chassis linked to chains.

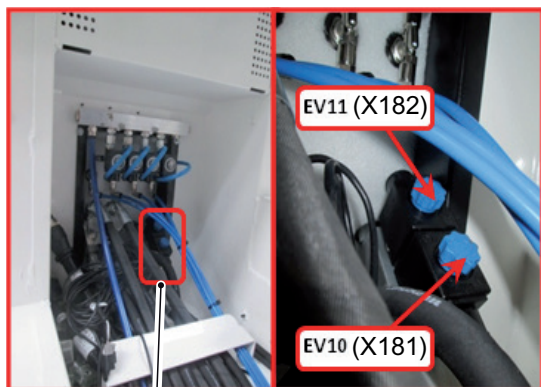
If the slide is distant from the ground can form a side line of waste, if the slide touch too much the ground there is a fast wear.

Instead of a steel slide, it's possible to use a slide made in synthetic material, that guarantee better slipping (without sparks) and better safety against accidental impacts, but its life could be shorter.

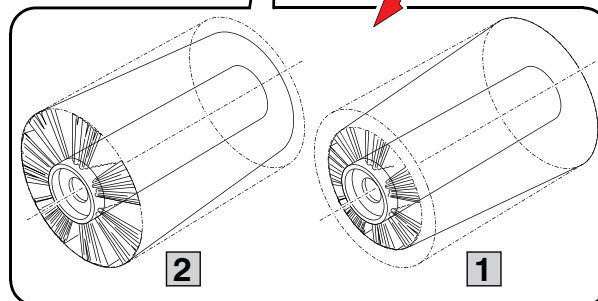
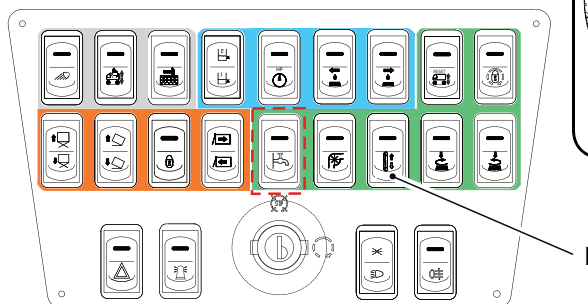
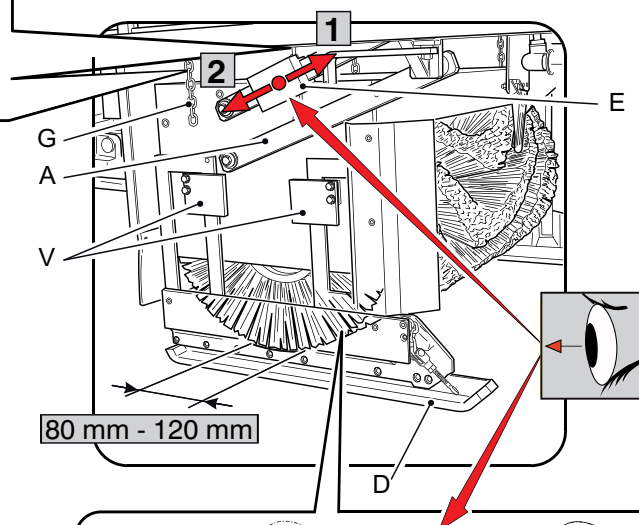
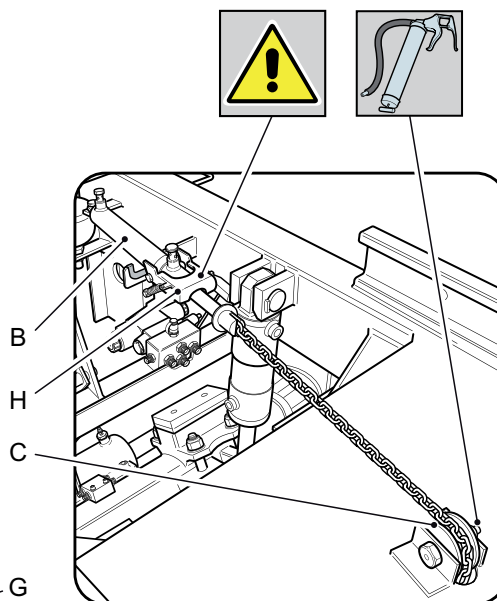
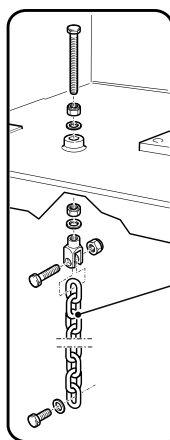


N.B.

Minimum thickness of slides: 4 mm



T



6000 6000
COMBI

6.2. Side brushes

6.2.1. Brush specifications

Diameter:	1000 mm (industrial version) 1060 mm (road version)
RPM:	0-70 rpm
Type:	PPL (polypropylene) PPL + STEEL (polypropylene + steel)

6.2.2. Side brushes adjustment

The side brushes enable to collect waste from corners. The brushes tilting may be mechanically adjusted.

The brushes may oscillate so as to avoid breakings in case of impact against a fixed obstacle.



N.B.

The brush must touch the ground as indicated in the picture only with the front side and never with its rear side.

6.2.3. Inclination adjustment

Side inclination

- Release the nuts (1)
- Turn the support (2) of the brush (3) so that the external edge of the brush is lower than the inner one.
- Tighten the nuts (1)

Front inclination

- release the nuts (4) and (5)
- adjust the inclination by turning the tie-rod (6)
- tighten the nuts (4) and (5)

6.2.4. Side position adjustment

Through the screw (7) the brush may be positioned so that is more or less projecting out of the chassis, and it is kept in that position by the spring (11) which is adjusted by the screw (12).

6.2.5. Pressure adjustment on the ground

To decrease the pressure it's necessary to tight the spring (9), by acting on the adjusters (8); to increase the pressure loosen the spring (9).



N.B.

Minimum bristles length: 120 mm.

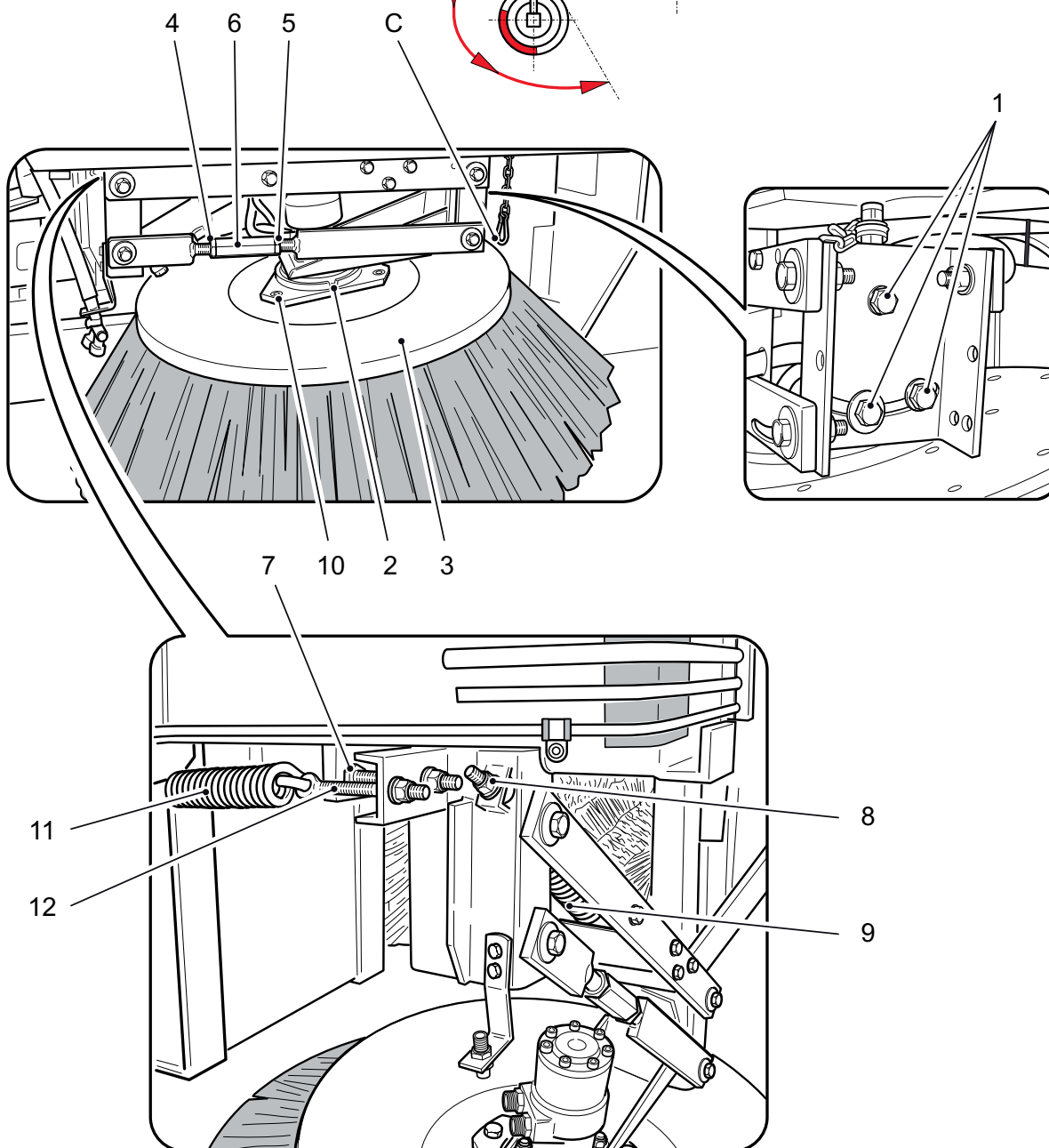
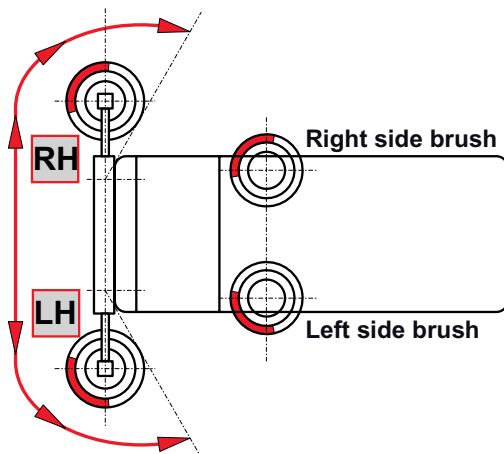


N.B.

While moving the machine the side brushes have to be hooked to the proper chains (C) to avoid their fall. In case of impact the brushes can oscillate and automatically back to the neutral position.



Contact area with
the ground



6000 6000
COMBI

6.3. Third brush

6.3.1. Brush specifications

Diameter:	1280 mm
RPM:	0-60 rpm
Type:	PPL (polypropylene)
	PPL + STEEL (polypropylene + steel)

6.3.2. Safety sensors adjustment of third brush

RH-LH Brush version

If the brush keeps being retracted to the machine or if in case of impact the brush is not retracted, it is necessary to adjust the positioning of safety sensors (1) and (2). The sensor (1) intervenes when the brush works on the right while the sensor (2) intervenes when the brush works on the left.

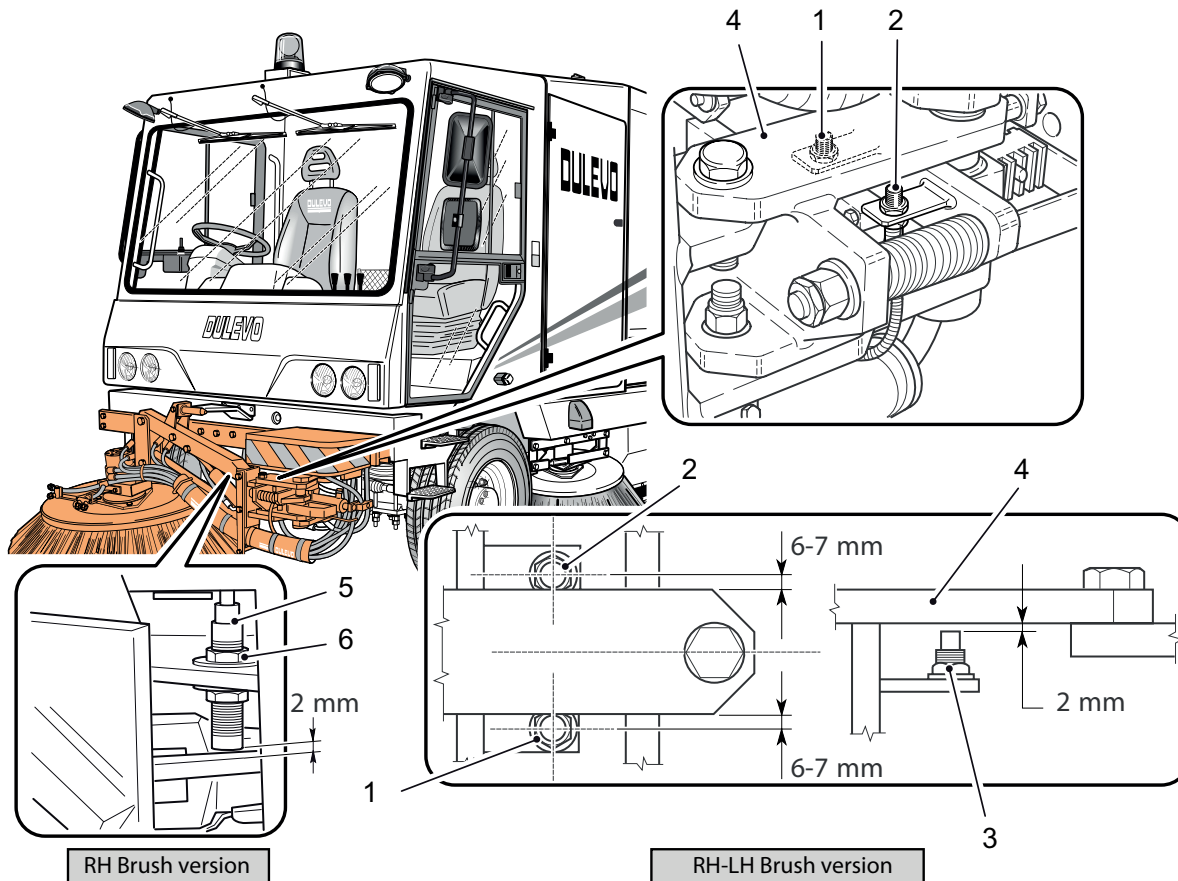
The sensor must be adjusted as follows:

- In height, by adjusting the ring nut (3) so that the head of the sensor is located 2 mm away from the plate.
- In the horizontal position, through the support slot; the centre of the sensor must be positioned to 6-7 mm from the external edge of the plate (4).

RH Brush version

If the brush keeps being retracted to the machine or if in case of impact the brush is not retracted, it is necessary to adjust the positioning of safety sensor (5).

The sensor must be adjusted in height through the ring nut (6) and positioned to 2 mm from the plate and properly fitted along the slot.



6.3.3. Bearings adjustment of third brush

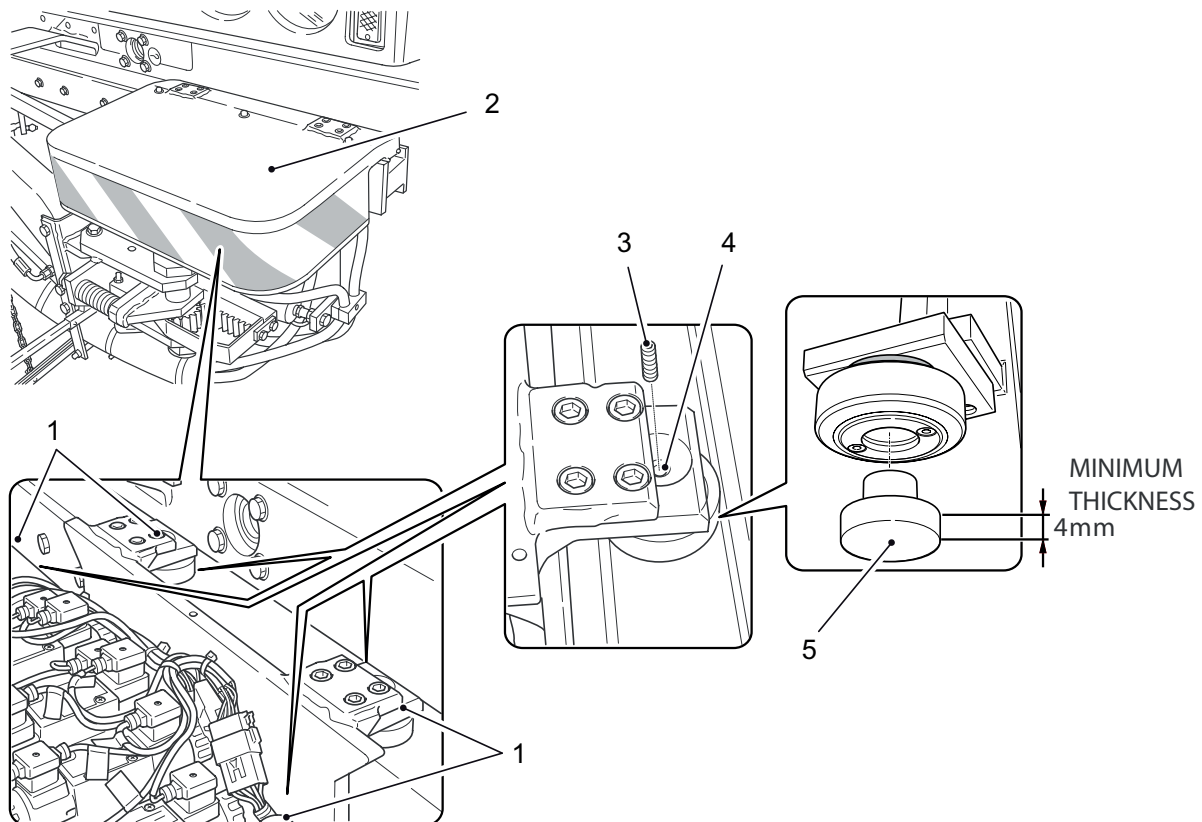
In case of strong jerking of the 3rd brush, the four bearings of the traverse carriage have to be adjusted.
To adjust bearings (1) follow instructions below:

- Remove the casing (2) after unscrewing its screws.
- Unscrew the locking grub screw (3).
- Screw the adjusting grub screws (4) evenly on the four bearings until the end of stroke, measure by a caliper the distances between the bearing and the rail bar; distances have to be equal between every pair of bearings.
- Loosen the four adjusting grub screws to create some clearance and let the carriage shift freely.
- Screw the four locking grub screws (3) again, lock deeply and install again the casing (2).



WARNING

Replace the pads (5) of the bearings when they are less than 4 mm thickness.



6000 6000
COMBI

6.3.4. Third brush safety

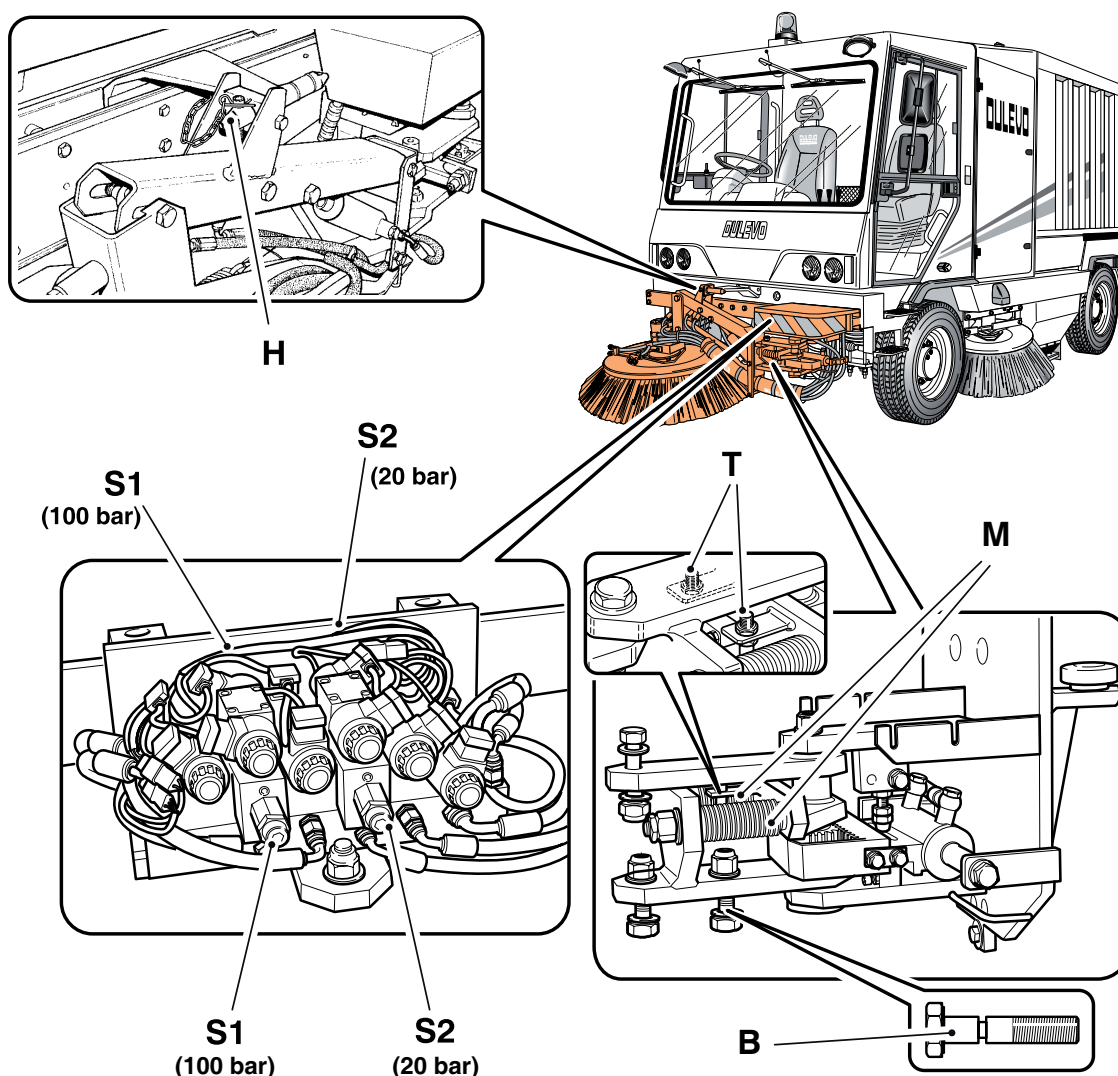
The 3rd brush can work both on the right and on the left side. In case of impact the assembly is protected by several devices:

1. Hydraulic safety device: thanks to 4 safety valves (S1) and (S2) set at fixed pressure (100 bar and 20 bar) control respectively the cylinder of swinging arm and motor of traverse carriage
2. Mechanic safety device: thanks to the 2 belleville springs (M) the assembly can oscillate in case of impact.
3. Electric safety device: thanks to 2 sensors (T) the assembly returns automatically into the machine.
4. Total safety: through the break of a safety bolt (B) the assembly gets floating; it is necessary for the operator to restore that bolt, which must be kept on board.



N.B.

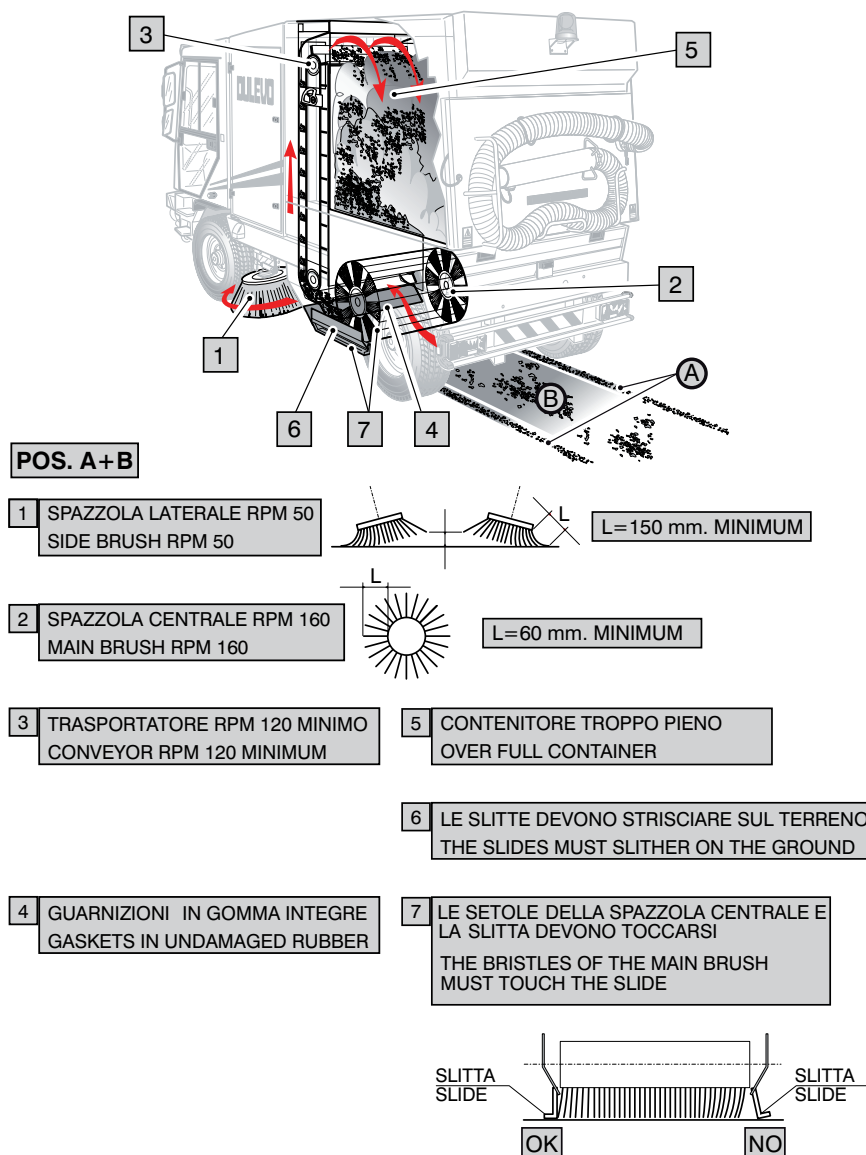
If the brush is not used, it's necessary to put it on its proper holder and hook it by using the safety pin (H).



6.4. Sweeping problems

The sweeper works leaving a line of wastes on the right or left side (A) or in the middle (B), verify:

1. Correct side brushes rpm (50 rpm) and bristles minimum length (120 mm)
2. Correct central brush rpm (160 rpm) and bristles minimum length (50 mm)
3. Correct conveyor rpm (minimum 120 rpm)
4. Correct status of dust proof gaskets
5. Waste hopper is not too much full
6. Side slides skim the ground, are vertical and closed to the central brush
7. The central brush is good product with the bristles present also on the terminal part of the body, not deformed, next to the slides, in order that between the slides and bristles there is no space.



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CHAPTER 7
Belt and chain conveyor

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7.1. General characteristics and components

7.1.1. Function

The waste conveyor gathers wastes collected by the central brush and unloads them into the waste hopper.

7.1.2. Technical data

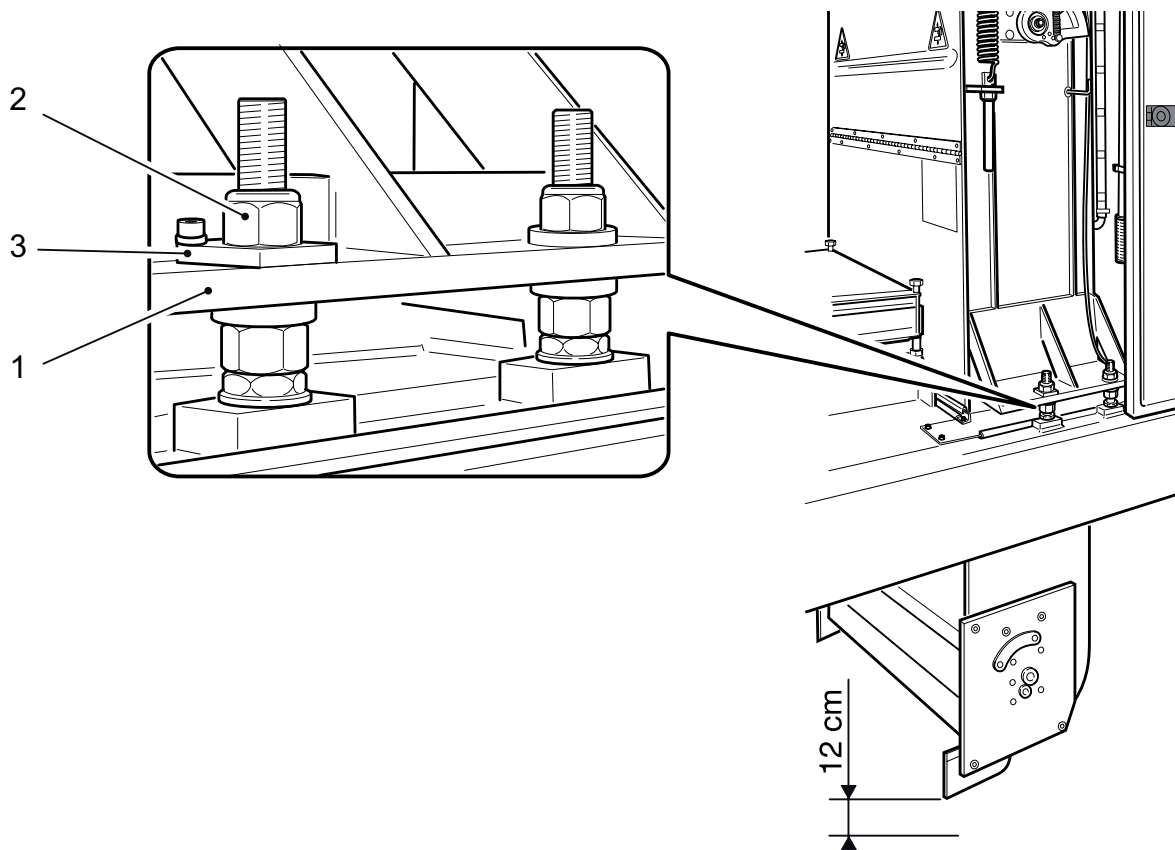
See Chapter 2.

7.1.3. Positioning

The conveyor must be positioned in vertical way and perpendicular to the chassis, 12 cm from the ground (working phase with lowered suspensions), with the upper opening against to the hopper gasket compressed about 10 mm.

The conveyor is provided with support plates (1) with slots, it's fixed with two bolts and two nuts (2) per side which permit to move and position it.

Block it with the proper plate (3) after positioning the conveyor.



7.1.4. Mechanic and hydraulic components

- a. Bottom and upper plate It is made in abrasion-resistant material and can be replaced in case of break or wear. Check whether the bottom plate is deformed due to impacts on the ground: that could cause a big noise for the impact against collection blades and a high power consumption.
- b. Blades Blades are comprised of a main iron support and a rubber sheet that could deform in case of collision. Securing bolts are in stainless steel. Be sure the iron support is not deformed and that the rubber sheet is not missing due to a cut caused by waste.



N.B.
Rubber sheets with minor breaks must not be replaced.

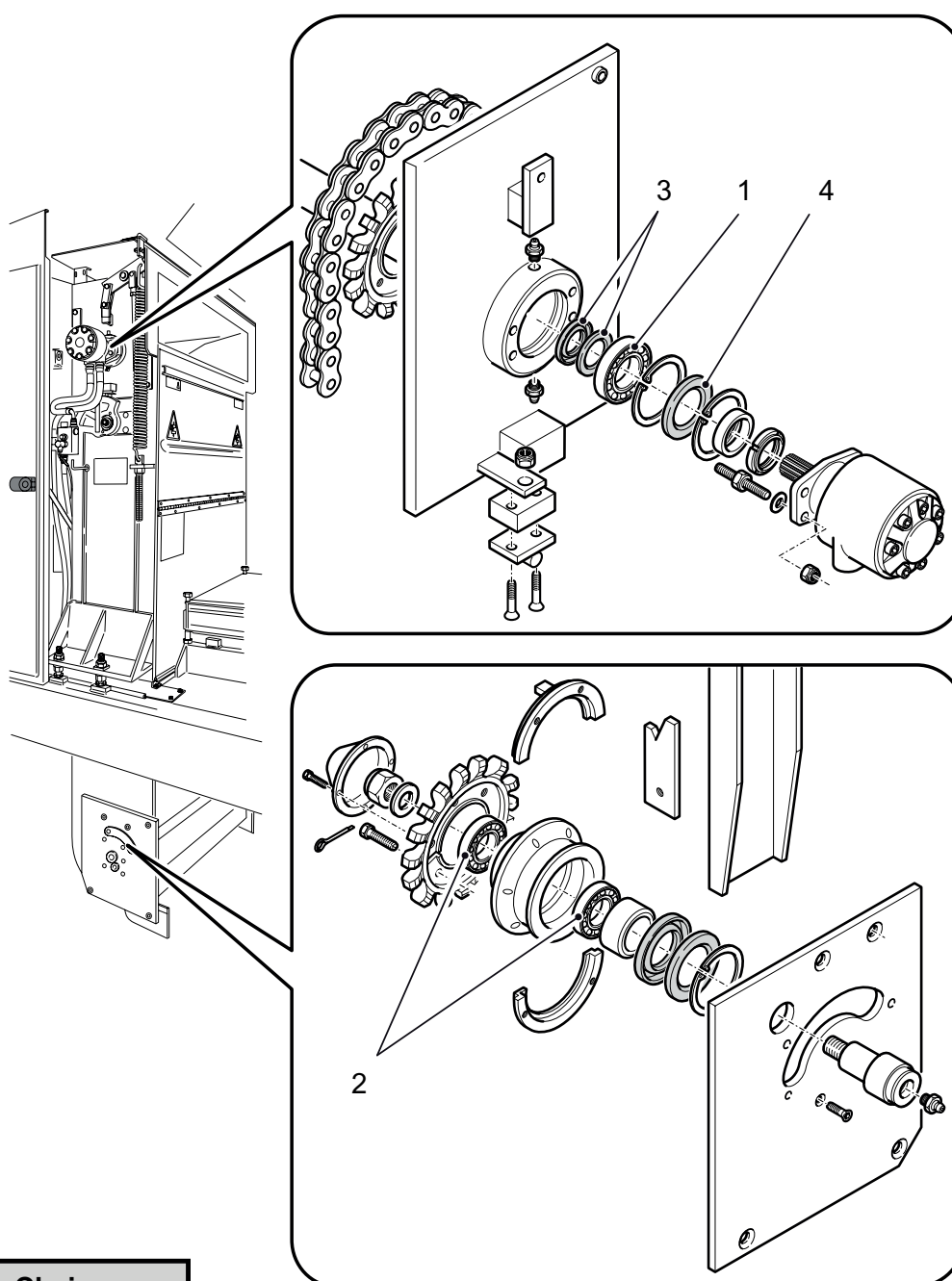
- c. Chains /Belts Chains pins are protected by a ring gasket. Wear can cause over time an elongation whose maximum value equals 2-3% of length, that is approx 4-7 cm on the rotary axle base.
To increase chains life two links can be removed by extracting split pins in the joint area.
The belts are without junction, this means that the textile layers are 3 times wrapped around each other and then vulcanised in a special mould to form the rubber profile. This means that the tensile strength is the same all over the complete length of the belt.

d. Tooth wheels /
Pulleys

The two chains or belts are driven by a shaft placed at upper part coupled to two tooth wheels or toothed pulleys; in the lower part chains or belts rotate around two idle and independent tooth wheels or smooth pulleys.

These components are made in highly resistant material with a surface carburizing treatment of 2,5 mm depth.

The upper shaft supporting bearings (1) are of the convex roller type to match different elongation of the two chains; while bearings (2) supporting the two lower tooth wheels are of the conical roller type.



Chain

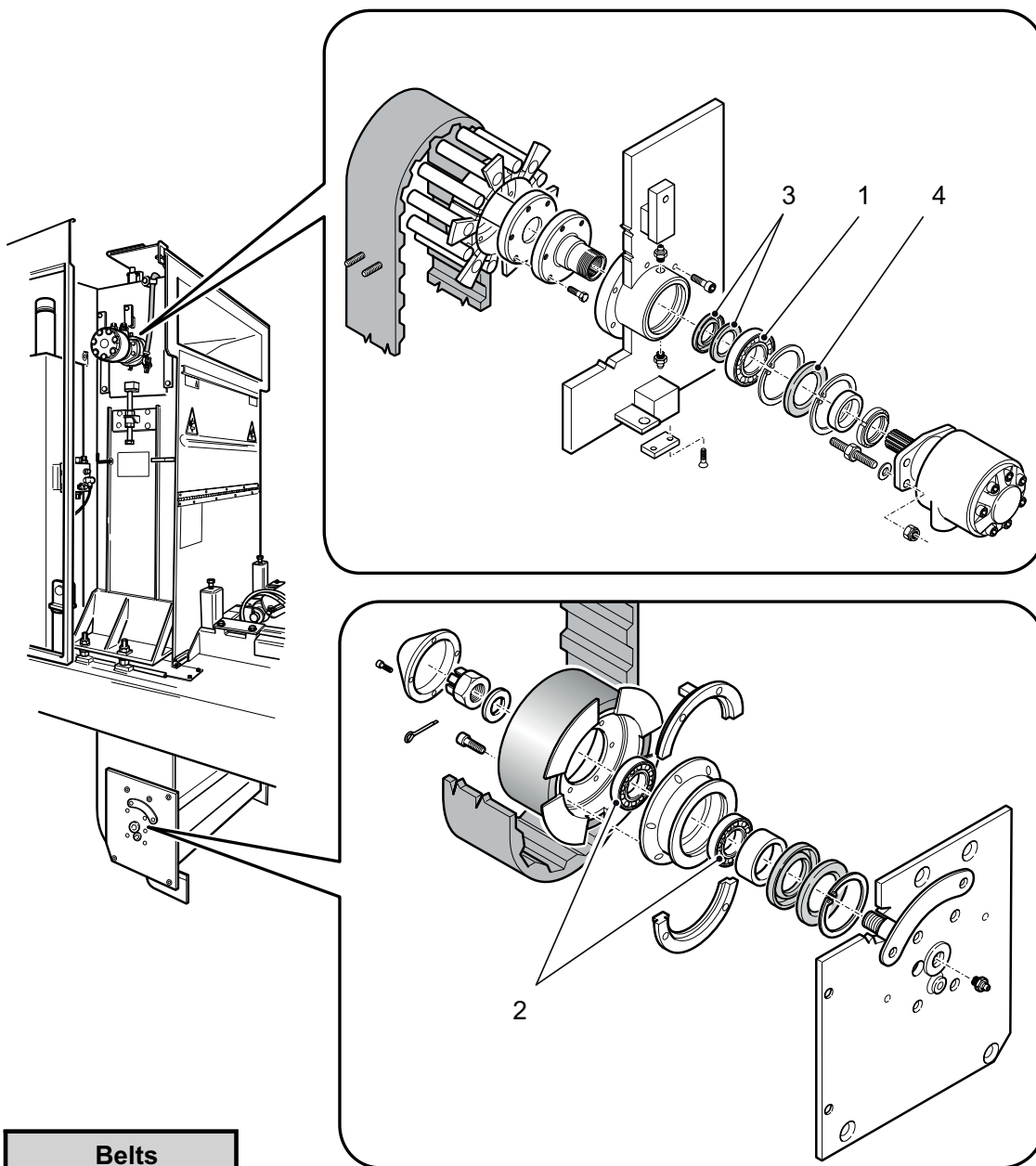
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N.B.

In case of maintenance on bearings pay attention also to the wear of oil seals (3 and 4) that protect bearings from dust and of chromium-plated steel bushings on which seals rotate. In case of bearing replacement seals and bushing, in case they are worn, should be replaced too.

Such bushings, being chromium-plated, preserve seals from fast wear.



Belts

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e. Chains stretching system

Due to chain elongation, to avoid the “tooth jump” the upper shaft is stretched upward through a constant force supplied by two springs (1). These springs act on respective plates (2) whose lowering movement is prevented by the two cams (3) hinged onto the free wheels (4) that enables only one-direction rotation, clockwise on left side and anticlockwise on right side.

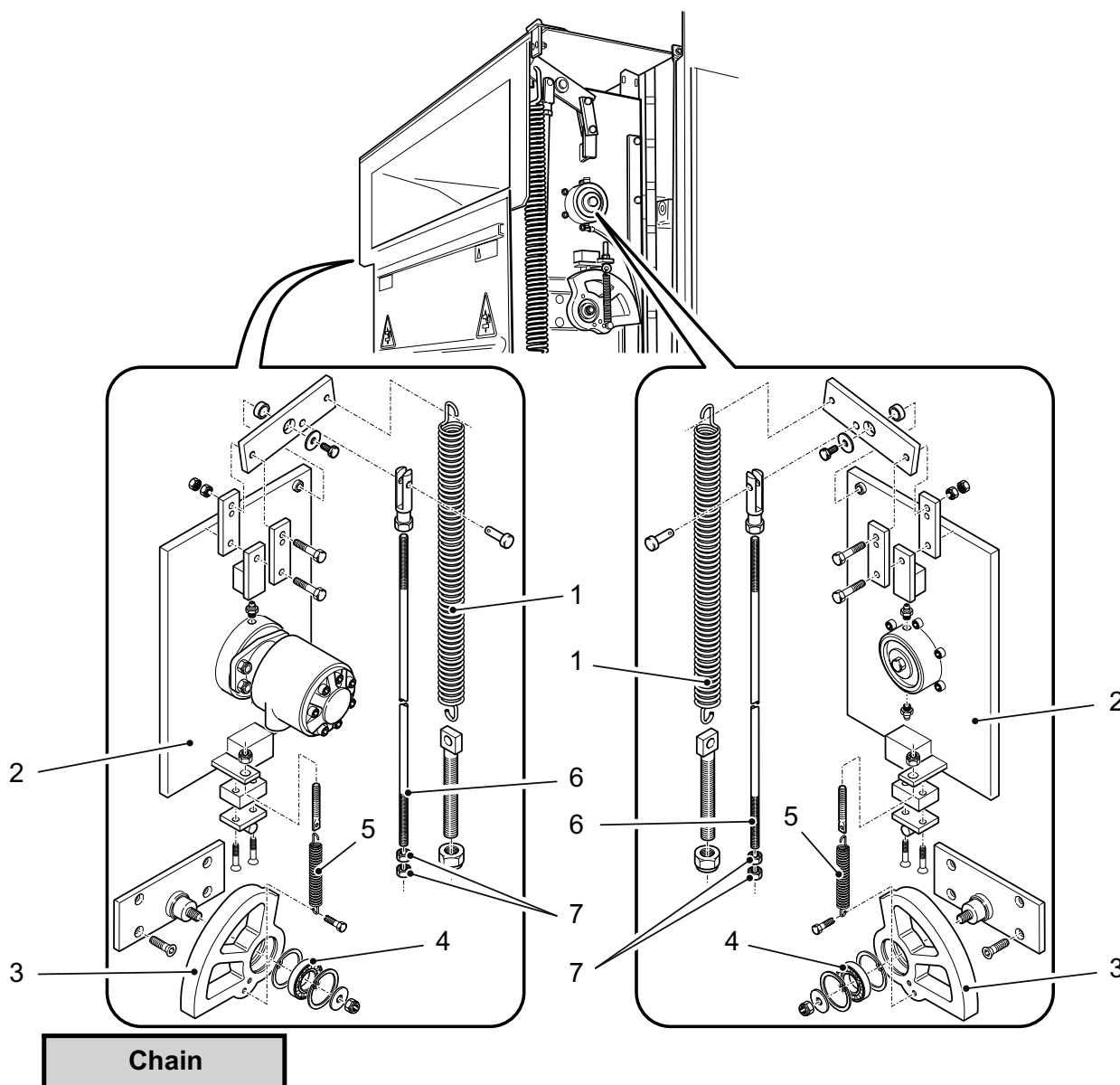
Cams keeping contact with plates through a spring (5).

As extra safety device, two tie-rods (6) are present that must be stretch every 100 hours approx through the nuts (7) screwing them till almost the end.



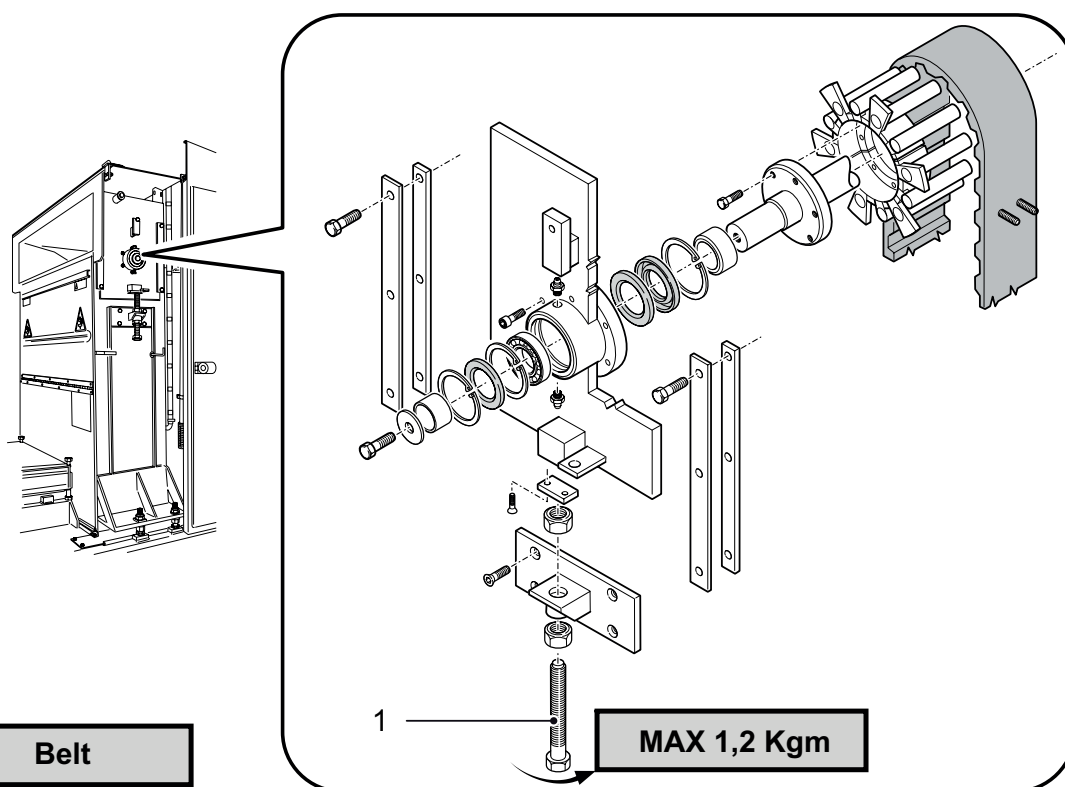
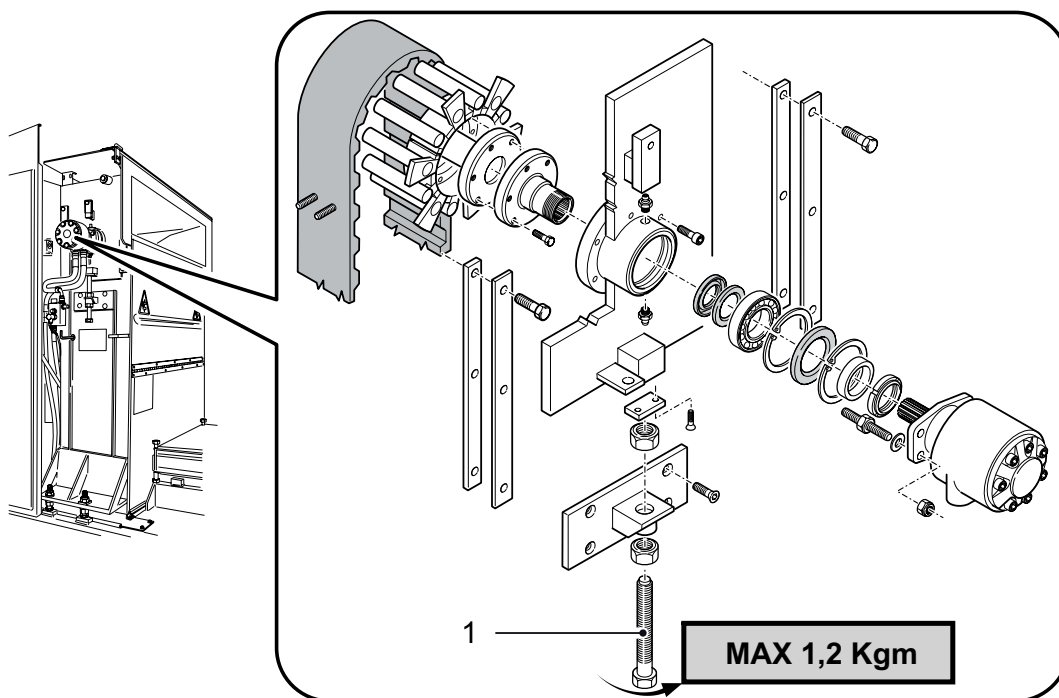
N.B.

Since elongation is different in the two chains, when one cam reaches the end-of-stroke both chains have to be shortened, as already explained in point C (this type of intervention is possible only once).



f. Belts stretching system

Belts stretching is carried out through by screws (1).



Belt

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- g. Driving hydraulic motor The motor (1) is coupled directly to the driving shaft by means of a splined coupling.



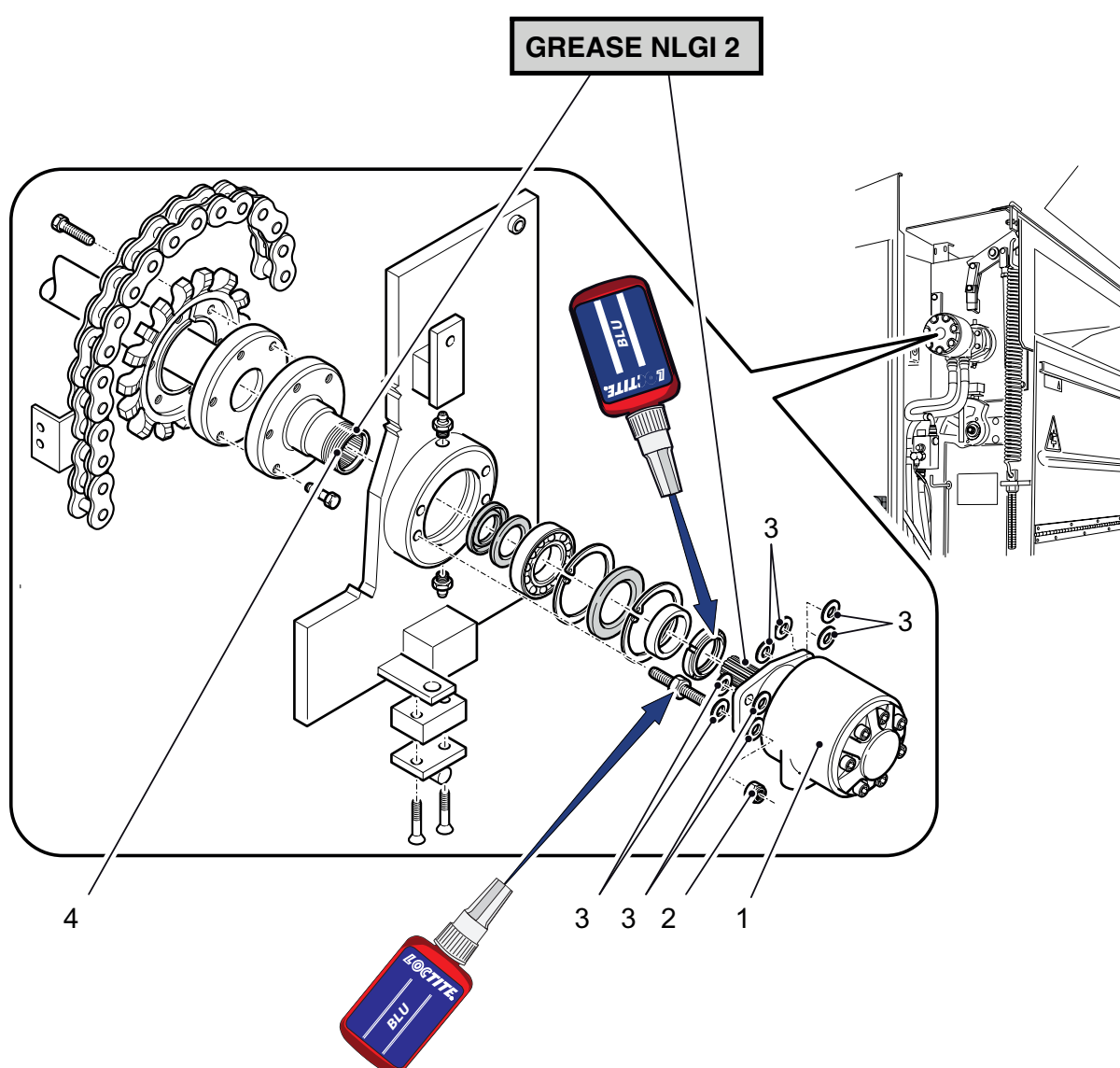
N.B.

The motor is secured to the shaft by 4 nuts (2) with 8 rubber rings (3); nuts have to be screwed so as not to tighten rings. The motor has proper play into flange in order to adapt to plate.



N.B.

Graphite grease has to be spread on the splined coupling (4) between the hydraulic motor and the shaft, after removing the hydraulic motor.



h. Valve group

Such group is provided with safety valve (S), flow adjustment valve (R) that fix the hydraulic motor rpm, pressure-switch (P) that send sound alarm in cabin in case of excessive load and at last a hydraulic test point (M).

RPM: 120 – 125 rpm. The revolution number of the upper shaft must not be lower than 120 rpm, otherwise wastes tend to recycle and clog the conveyor.

Rpm can be increased by means of adjuster (R) fitted on valve.



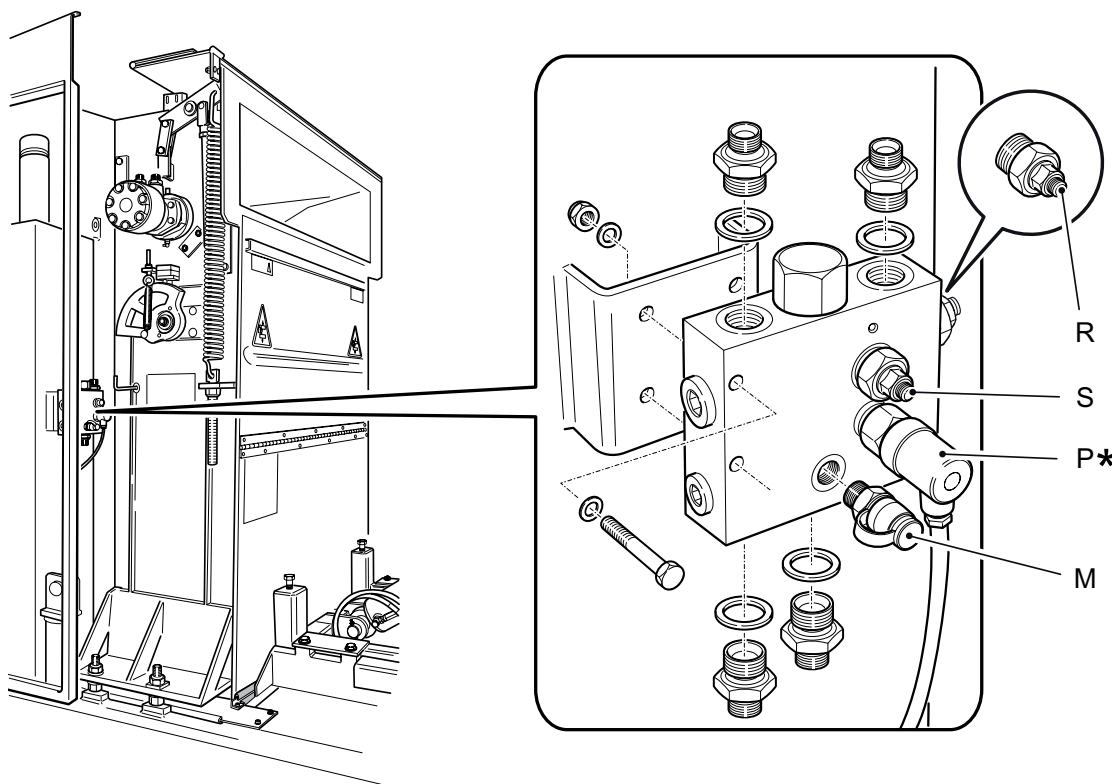
N.B.

Measurement of rpm is also possible without tool.

Max pressure. The max pressure can be measured using a 0-250 bars pressure gauge on the hydraulic test point (M). Block the conveyor by interposing a 30 cm long iron bar after turning off the conveyor and verify that pressure values are the ones defined:

- MAX PRESSURE = 130 BAR WITH CHAINS CONVEYOR
- MAX PRESSURE = 110 BAR WITH BELTS CONVEYOR

Pressure can be increased by means of adjuster (S) fitted on valve.



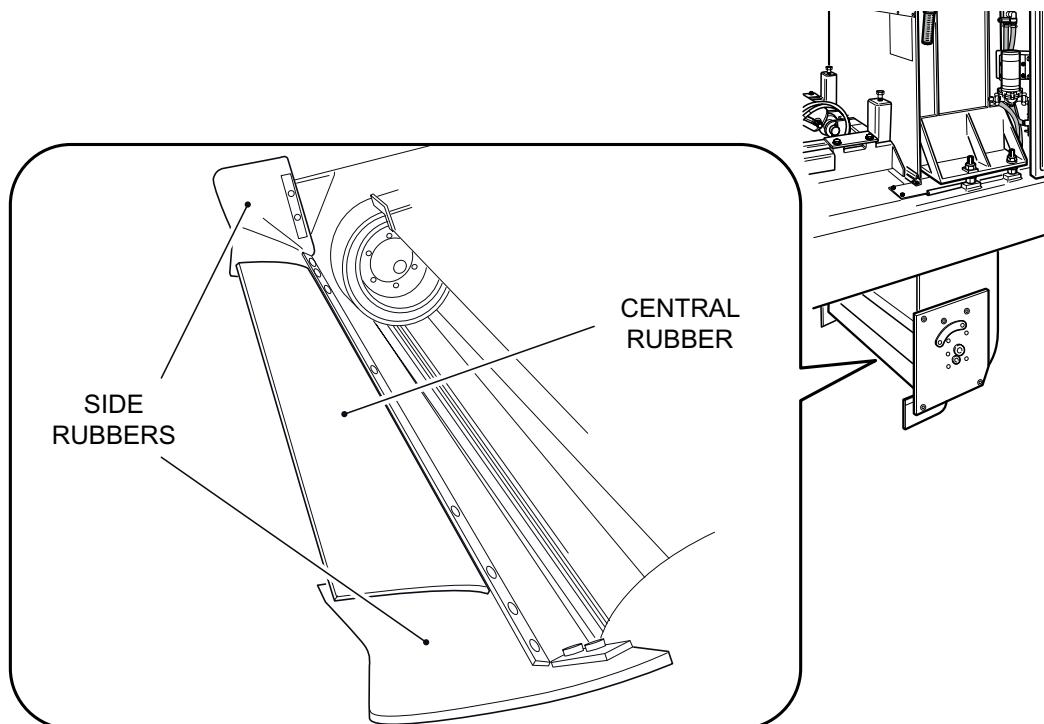
90 bar with belts conveyor
100 bar with chains conveyor

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i. Front dust proof rubbers

Such rubbers are formed by 3 pieces, the central one longer and more flexible in order to facilitate the passage of light waste. The failure of these rubbers can cause dust and bad collecting.

To change these rubbers is enough to unscrew the relevant screws.



7.1.5. Tooth jump

In case of tooth jump by chain or belt, it's necessary to reset the position and then eliminate the cause.

To restore the chain position:

1. Tilt the hopper and put the safety devices;
2. Take the side of conveyor where blades are lower;
3. Fit a round bar of 20 mm diameter between the tooth and the chain; to lock it in position rotate the shaft using tongs;
4. Loosen the nuts of two tie-rods;
5. Start engine and run reverse rotation of the conveyor through the lever in the cabin, thus restoring the chain correct position;
6. Screw again the nuts of tie-rods.

To restore the belt position:

1. Tilt the hopper and put the safety devices;
2. Take the side of conveyor where blades are lower;
3. Loosen the belt by acting on stretching screw;
4. Manually lift and turn the belt till obtain the horizontality of blades;
5. Stretch again the belt.



N.B.

Usually the cause is due non sliding of the side plates probably blocked by wastes: clean the sliding area and be sure the spring can pull upward the plates, then stretch chains/belts.

7.2. Replacement and disassembling

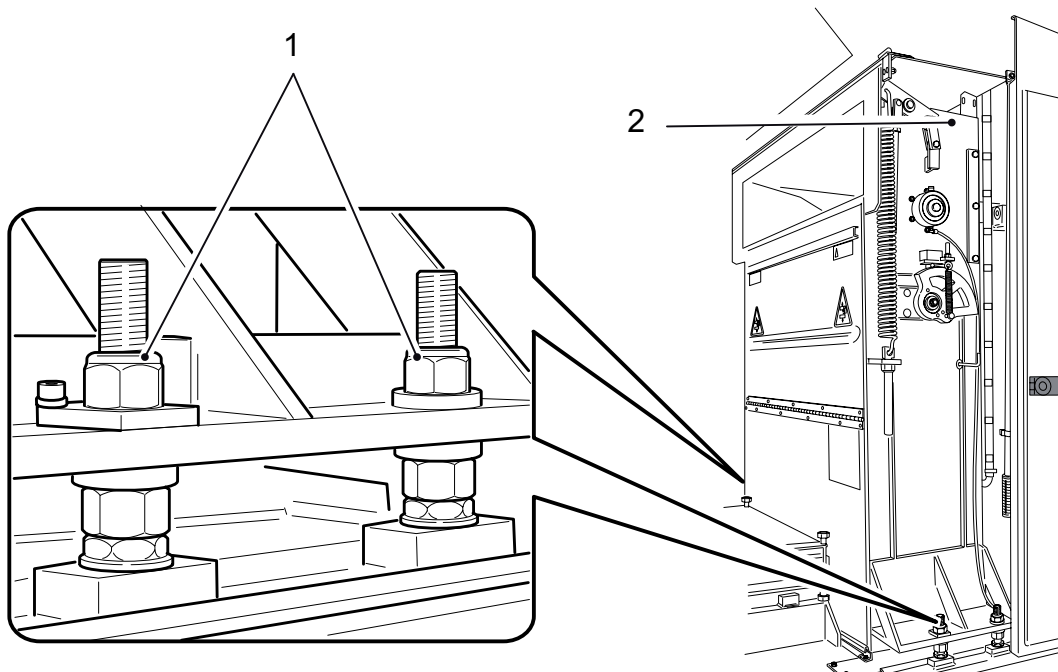
7.2.1. Conveyor disassembling

The conveyor is an independent unit that can be removed:

- Disconnect the motor hydraulic hoses and water tubes.
- Disconnect the slide chains (one per side).
- Unscrew the 4 nuts (1) that block the conveyor to the chassis.
- Hook the conveyor in the two proper holes (2) present on top and lift it by using a forklift or hoist.

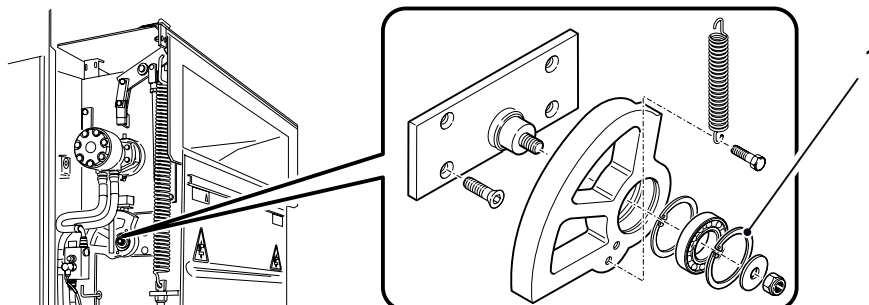


WARNING
Don't stand under the loads.



7.2.2. Cams disassembling

Disassembly is carried out by removing the seeger (1) and taking out the whole assembly, through a puller using the two threaded holes.

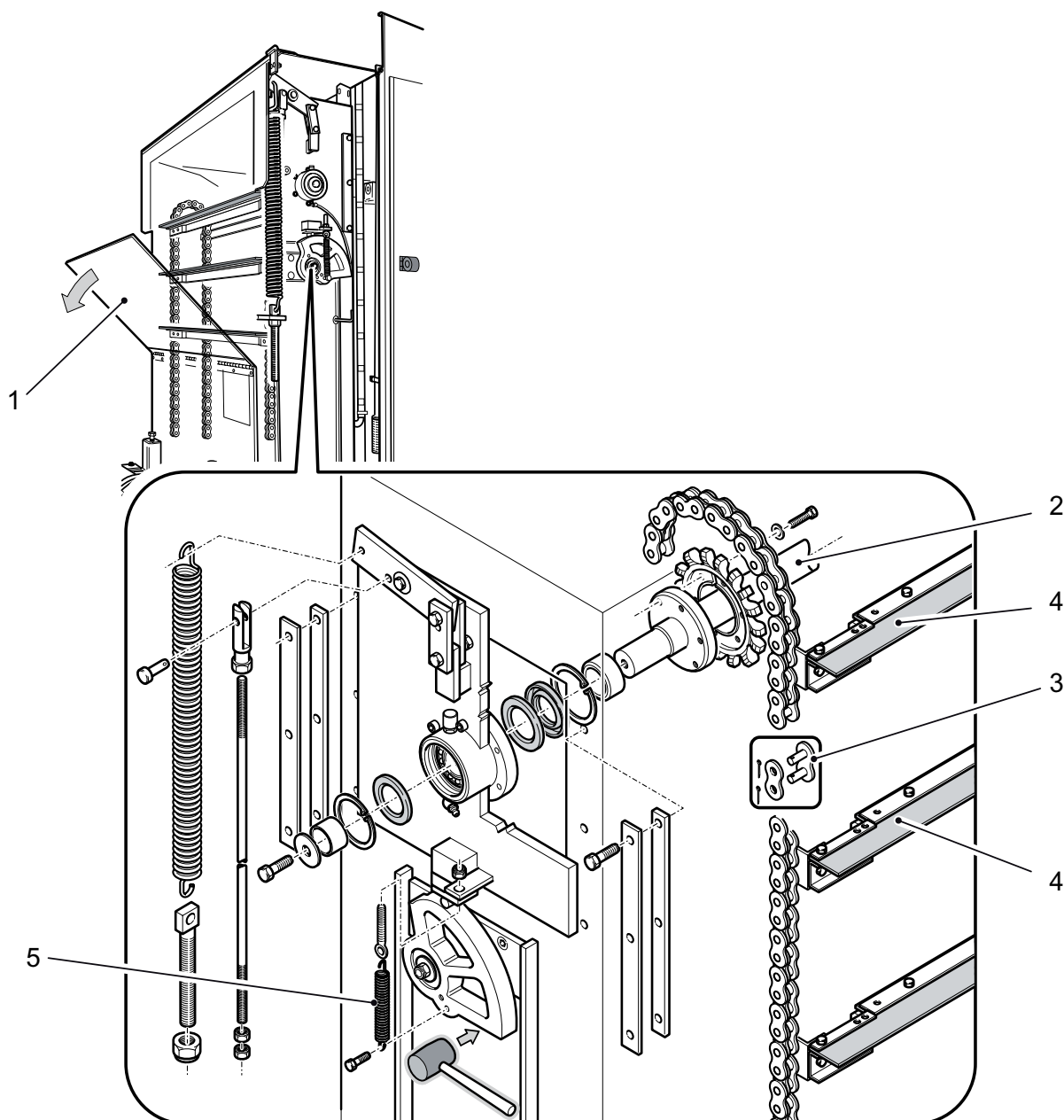


N.B.
The cam can rotate only in one direction (clockwise on the left side and anticlockwise on the right side); if need to rotate in opposite direction it's necessary to hit it lightly with a hammer and move it by hand.

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7.2.3. Chains shortening procedure

1. Lift up the hopper to the top and fix it with the proper safety pins
2. Lower the front sheet (1) of the conveyor, by releasing the lock bolts.
3. Rotate the upper shaft (2) until you find the chains junction links (3) .
Remove two blades (4) between the junction link.
4. Pull off the cams springs (5), rotate the cam using a hammer so that to release the stretch of the chains.
5. With an adjustable hook join the parts of the chain between the junction link.
6. Remove the junction links (one for each chain) and hook again the chains with the split pins
7. Go on and tighten the cams springs (5).



7.2.4. Tooth wheels replacement procedure

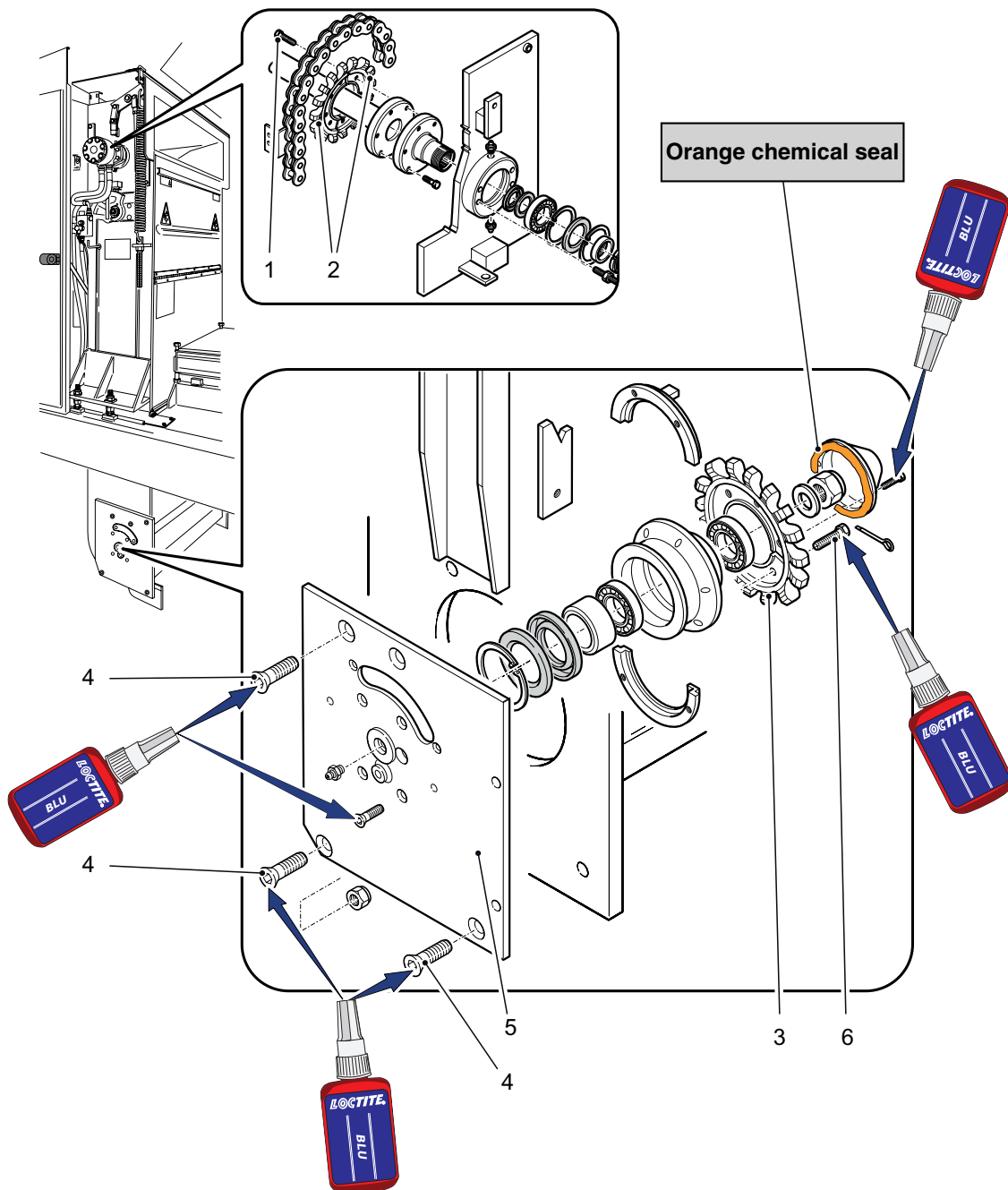
1. Remove the blades and chains as described in the following paragraph.
2. Remove the upper tooth wheels by unscrewing the six screws (1).



N.B.

Upper tooth wheels (2) are divided in two parts to be replaced without disassembling the shaft.

3. To replace the lower tooth wheels (3), it's recommended to unscrew the four screws (4) and remove completely two plates (5) in order to make the operation easier. Remove the screws (6) and remove the tooth wheels (3)
4. Clean with care the support and centring surfaces, install the new components using 10.9 stainless steel screws, lock washer and blue Loctite.



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7.2.5. Chains replacement procedure

1. Lift up the hopper to the top and fix it with the proper safety pins
2. Lower the front sheet (1) of the conveyor, by releasing the lock bolts.
3. Remove all the blades (2) from the conveyor chains.
4. Remove the side cams (3) by taking off the two small springs (4) and releasing eight fixing screws.



N.B.

Pay attention and remember which was the left or right hand cam.

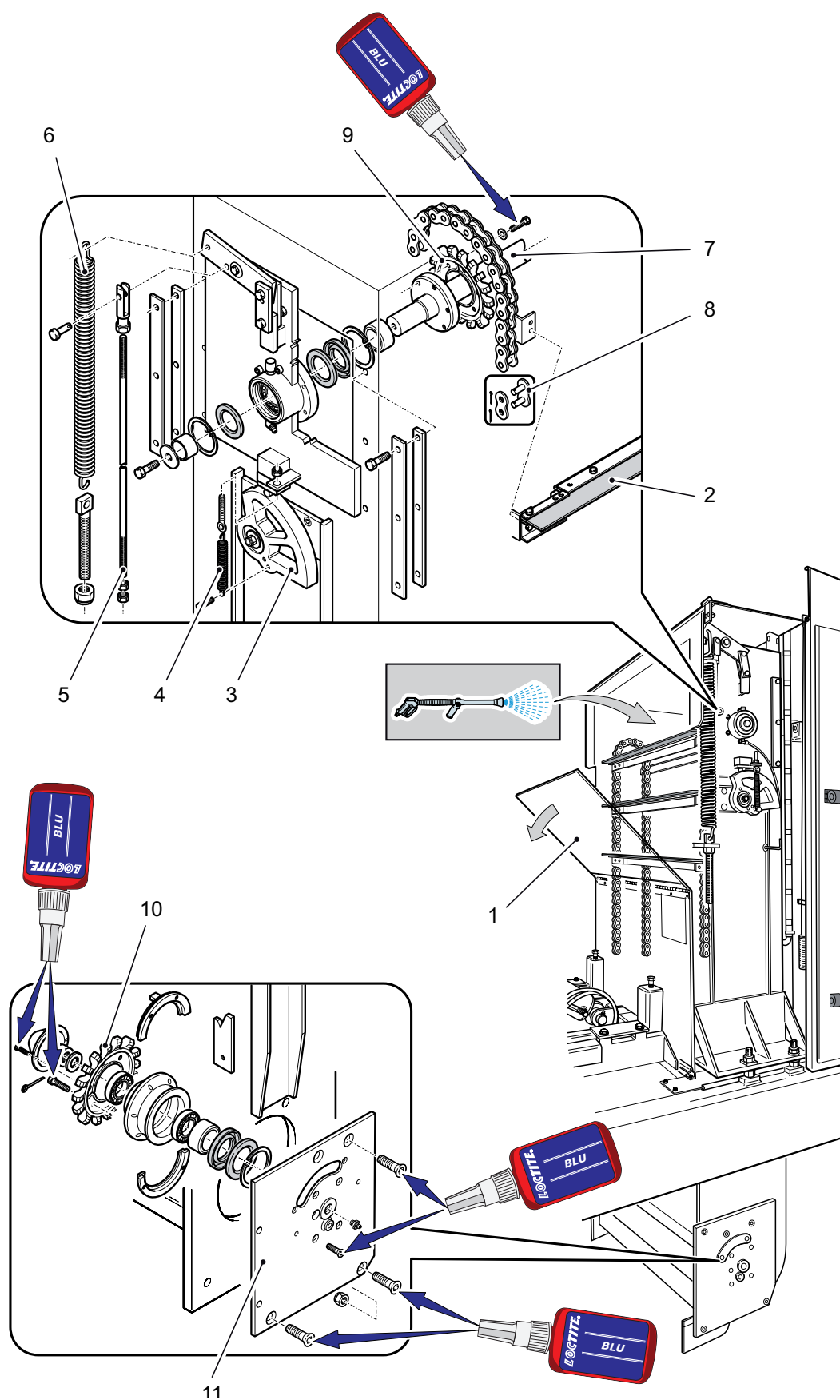
5. Remove the tie-rods (5) and two big springs (6), in order to reduce the chain tension.
6. Rotate the upper shaft (7) until you find the junction links (8), at this point it's possible to remove the chains.
7. Remove upper (9) and lower (10) tooth wheels by releasing their fixing screws.



N.B.

For lower tooth wheels remove the plates (11) from the casing.

8. Wash and clean the inside of the conveyor before starting the installation of the new chains
9. Install the lower tooth wheels (10) paying attention to the bolts tightening.
10. Before installing the upper tooth wheels (9) check that both halves have the same number on them; once both halves of each pinion are well coupled, put them on top of one another (follow the installation direction), match all the holes and all the teeth. With a pen, mark one tooth (it doesn't matter which one) of one pinion and its corresponding tooth on the other one; install the tooth wheels on the shaft so as to match the marked teeth (this operation is very important for the blades horizontality).
11. At this point, extend the new chains (a r.h. one and a l.h. one) on a clean surface, with the blades fitting facing the inside and perfectly aligned. With a pen, mark one link of one chain and its corresponding link on the other chain. Insert the marked links into the upper tooth wheels teeth that you had previously marked. Fix the chains with the split pins.
12. Reinstall the big springs (6), at their stroke end, install the tie-rods (5) on the side of the big springs. Between the nut and the plate there must always be a clearance of 5 mm and no nut must be on the above.
13. Reinstall the cams (3) be sure to install the right hand and the left hand in the correct position, tighten the springs (4) at their stroke end and check that the eight cams fixing screws are well tightened.
14. Reinstall all the conveyor blades (2) and check the good tightening of the bolts.
15. Check again the blades must be perfectly horizontally aligned, the chains well hooked to their junction links, the springs completely tightened; there must be a clearance of 5 mm between the nuts and the plates on the side tie-rods of the big springs, and finally check the good tightening of all bolts; then you can go on with working operation.



7.2.6. Upper bearings replacement

Bearings have to be replaced, if possible, during the chains replacement. Otherwise, chain stretch has to be loosened as already described and support the upper shaft retaining it with wire metal through upper holes.

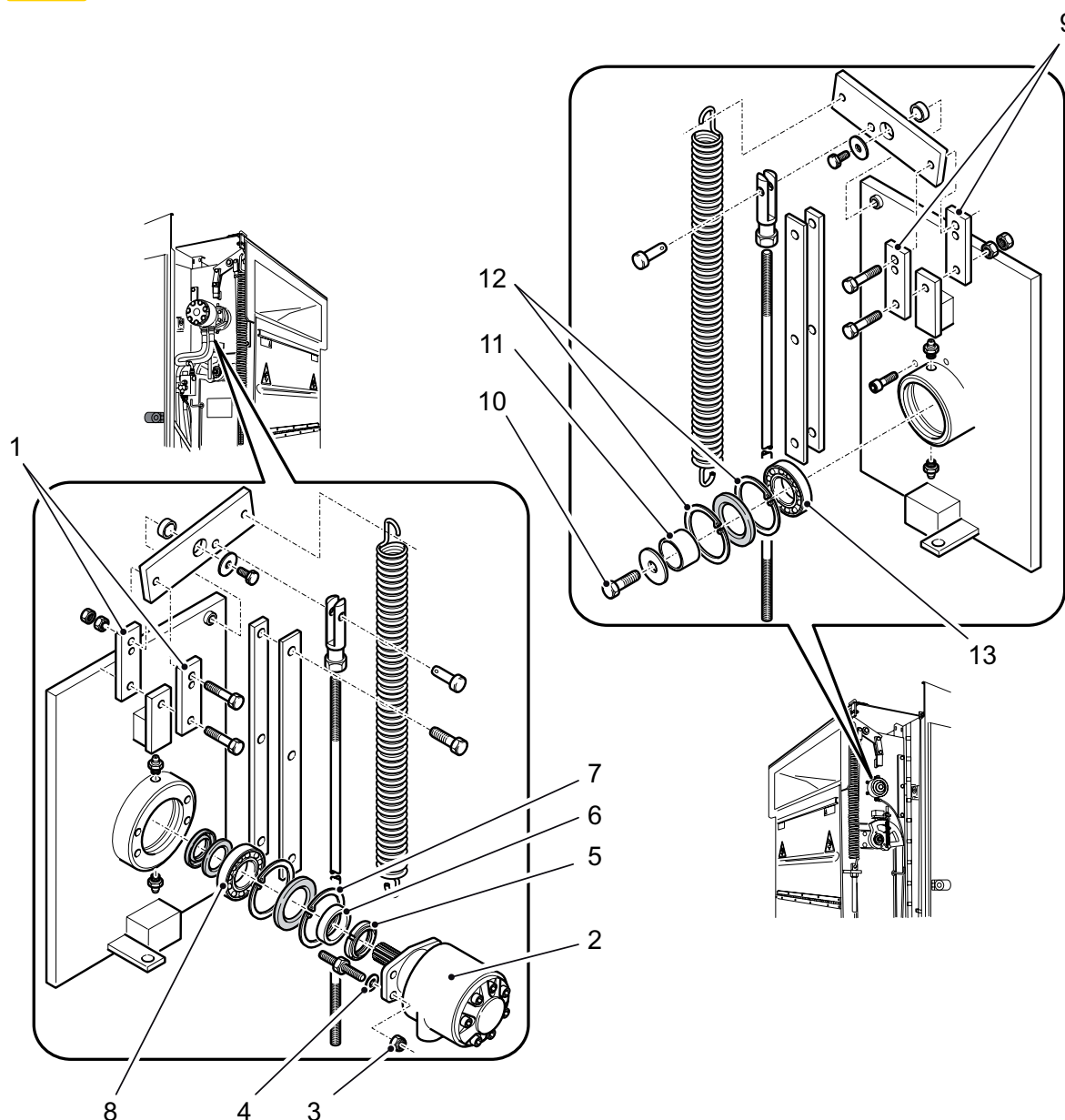
Left hand bearing: disassemble the two guides (1), disassemble the hydraulic motor (2) unscrewing the four nuts (3) and the rubber washers (4), unscrew the ring nut (5), remove the bushing (6) and the seeger (7), extract the whole plate and disassemble the bearing (8).

Right hand bearing: disassemble the two guides (9), unscrew screw (10), extract the bushing (11), remove the two seegers (12), extract the whole plate, then disassemble the bearing (13).



WARNING

Before assembly, check whether seals are efficient, otherwise replace them.



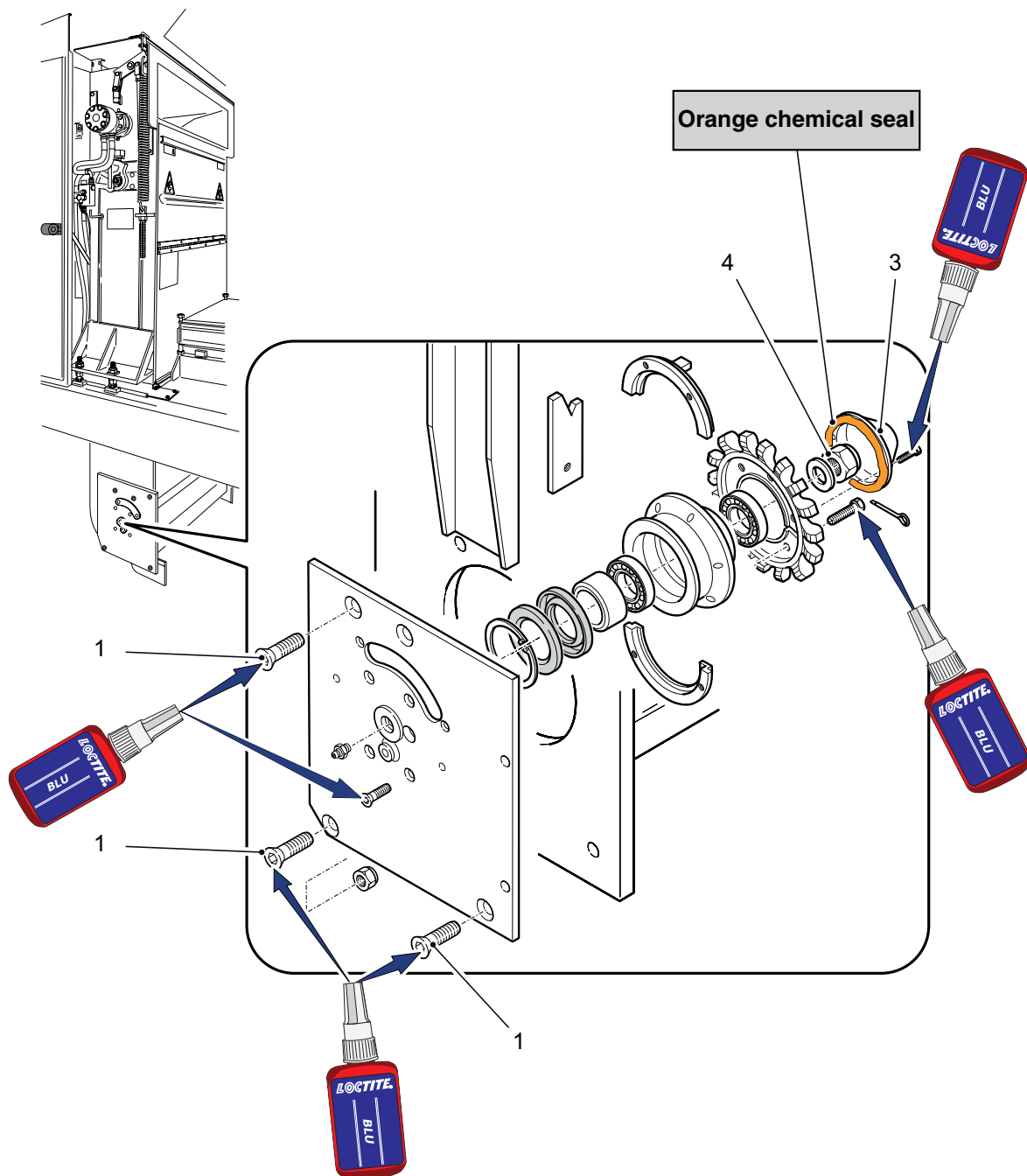
7.2.7. Lower bearings replacement

Remove the whole assembly by unscrewing the screws (1) securing the plate to the casing.
Then remove bearings after removing the cover (3) and the nut (4).
Check whether seals are efficient, otherwise replace them.



WARNING

Conical bearings must not be tightened too strongly: the hub has to rotate manually.



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7.2.8. Belts replacement procedure

1. Lift up the hopper to the top and fix it with the proper safety pins.
2. Lower the front sheet (1) of the conveyor, by releasing the lock bolts.
3. Remove all the blades (2) from the conveyor belts.
4. Release the nuts (3) and the screws (4) so that the side plates (5) and (8) can be lowered for some cm.
5. On the right hand side remove six screws (6) together with the central one (7) then, pull out the complete plate (8) with all its components.



N.B.

For the lower pulleys remove the plates (15) from the casing

6. Remove the upper (11) and lower (12) pulleys, releasing their fixing screws.



N.B.

The upper pulleys (11) can be replaced every two belts replacements, except in case of early wearing. Change the lower ones (12) only if necessary.

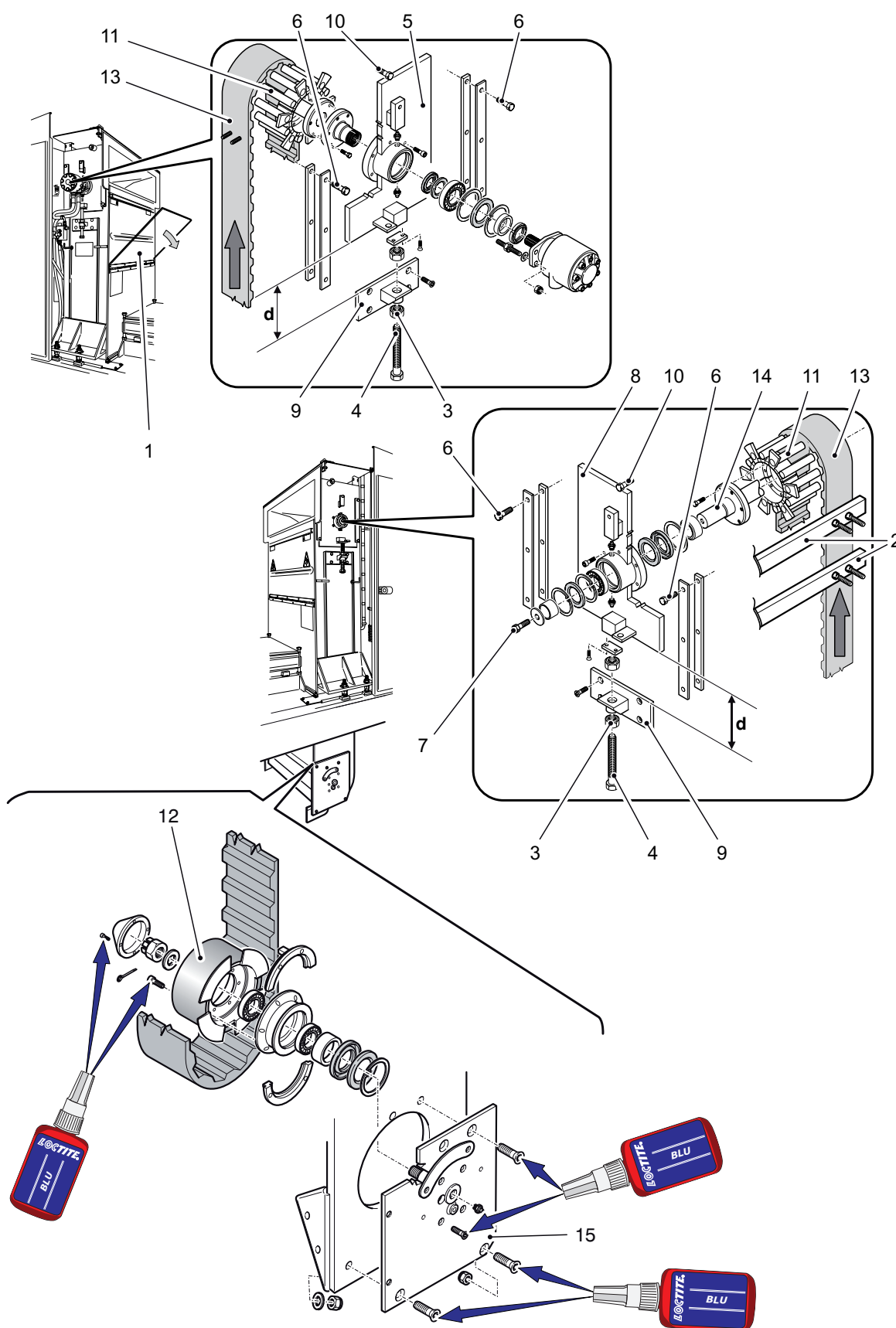
7. Wash and clean the inside of the conveyor before starting the installation of the new belts.



N.B.

The belts must be installed in the same direction as the one indicated by the arrow on the belts selves.

8. Remove the belts (13) and install the new ones through the opening that you got by removing the plate (8).
9. Install the lower pulleys paying attention to the bolts tightening.
10. Once both halves of each pulley are well coupled, put them on top of one another (follow the installation direction), match all the holes and all the teeth. With a pen, mark one tooth (it doesn't matter which one) of one pulley and its corresponding tooth on the other one; install the pulleys on the shaft so as to match the marked teeth (this is very important for the blades horizontality).
11. Place the belts on one another on a clean surface and make them slide until all the teeth and screws match perfectly. With a pen, mark one tooth of one belt (no matter which one) and its corresponding tooth on the other belt. Insert the marked teeth into the upper pulleys teeth that you have previously marked.
12. Reinstall the conveyor blades and check the good tightening of the bolts (1,5 Kgm).
13. Stretch out the belts by tighten their corresponding screws (4)
14. With a dynamometric key (adjusted at 1 Kgm) tighten the right side screw (4). Take the left side plate at the same level.
15. Wet the belts with water in order to reduce the friction.



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16. With a pipe-wrench turn the upper shaft (14) and check the coupling between belts and pulleys.
17. Start the engine, raise it at 1600 rpm, make the conveyor work for 20 minutes. If necessary, tighten the screws (4) a little bit more to help the coupling between pulleys and belts. The noise can be considerably reduced by the good coupling of belts and pulleys.



WARNING

The maximum torque with the dynamometric key must not be over 1,2 Kgm

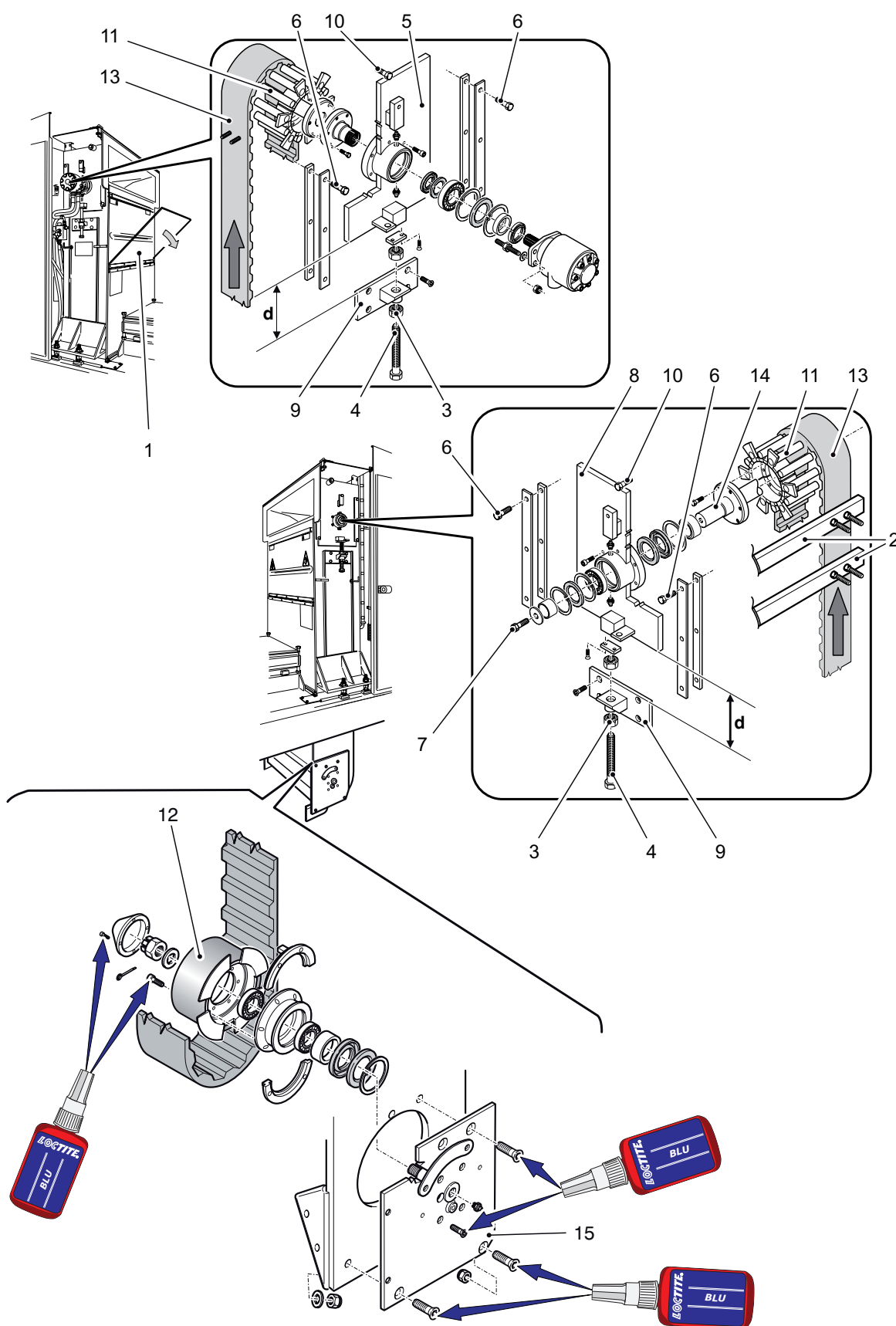
18. Fix the screws (4) with the nuts (3).



N.B.

If the stretching has been well carried out, the distance (d) between plate (5) / (8) and plate (9) must be between 35 and 40 mm.

19. In order to block the plates (5) and (8), tighten a screw (10) above them, because the belts must not be stretched anymore.



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CHAPTER 8

Water sprinkling system

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8.1. Standard water sprinkling

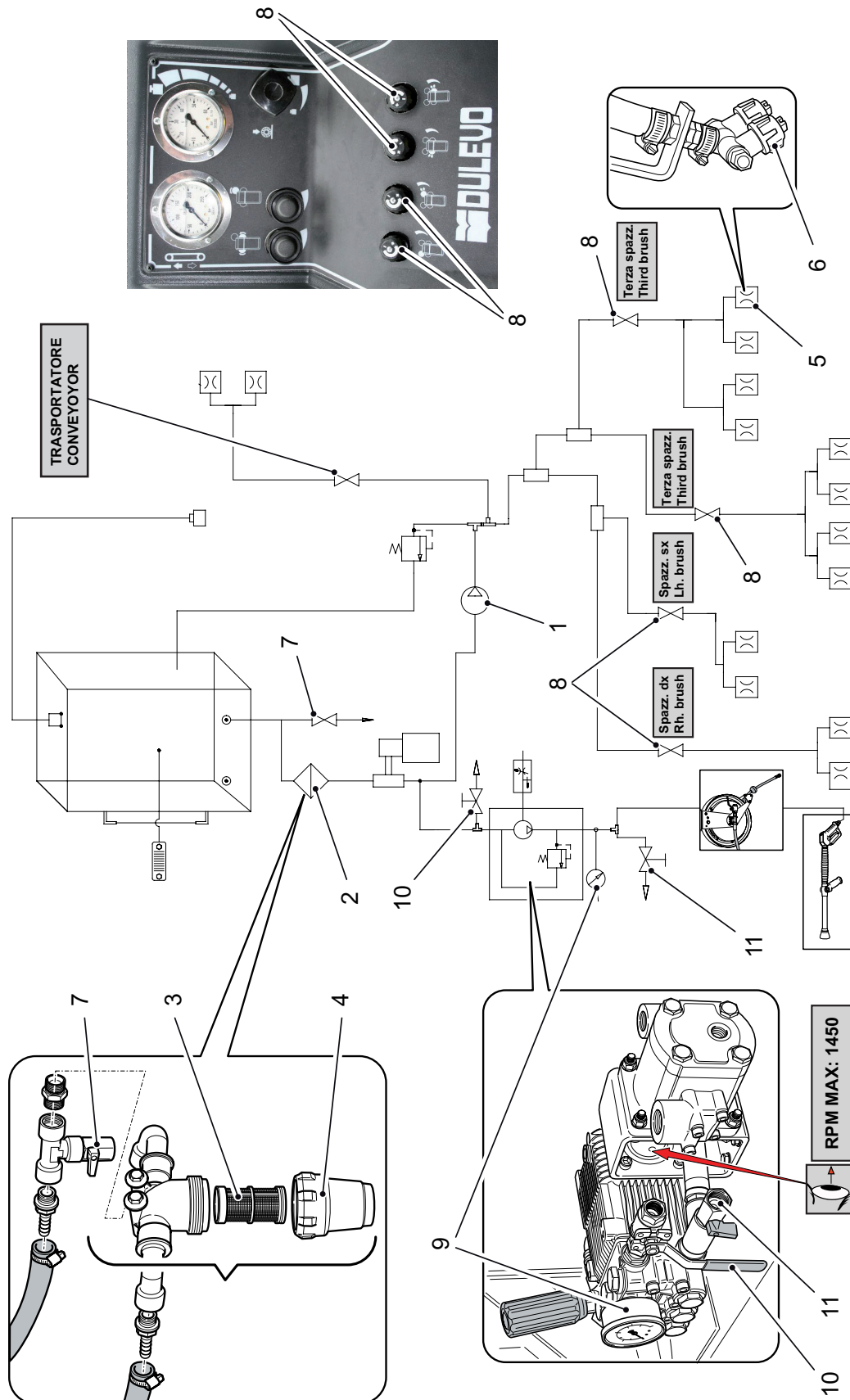
Main components of system are:

WATER TANK	The tank is made in stainless steel. The visual level check is carried out by means of a transparent hose on the outside. The air is purged through an upper opening with a rubber cap. The filling hose has a diameter of 45 mm with UNI 45 connector.
WATER PUMP (1)	It is a diaphragm pump, without gasket, dry operating for few seconds, self-priming and activated by a 24 V dc electrical motor with permanent magnets, internally protected by thermal switch and in compliance with 89/336/EEC rules for magnetic compatibility. The pump is controlled by an internal by-pass valve adjusted at 4,1 bars.
WATER FILTER (2)	The filter is equipped with 100 Mesh internal cartridge (3) accessible after unscrewing the cap (4). To clean it blow the cartridge with air.
SPRINKLING NOZZLES	Nozzles (5) can be oriented. In case of wrong operation unscrew the ring nut (6) and clean the hole with compressed air.
HIGH PRESSURE PUMP ASSEMBLY (optional)	This assembly is mounted to use a water gun nozzle to clean the machine. Pump is piston type. Pressure is adjusted by relief valve fitted on pump and visible by pressure gauge (9) located on pump.



IN CASE OF COLD TEMPERATURE

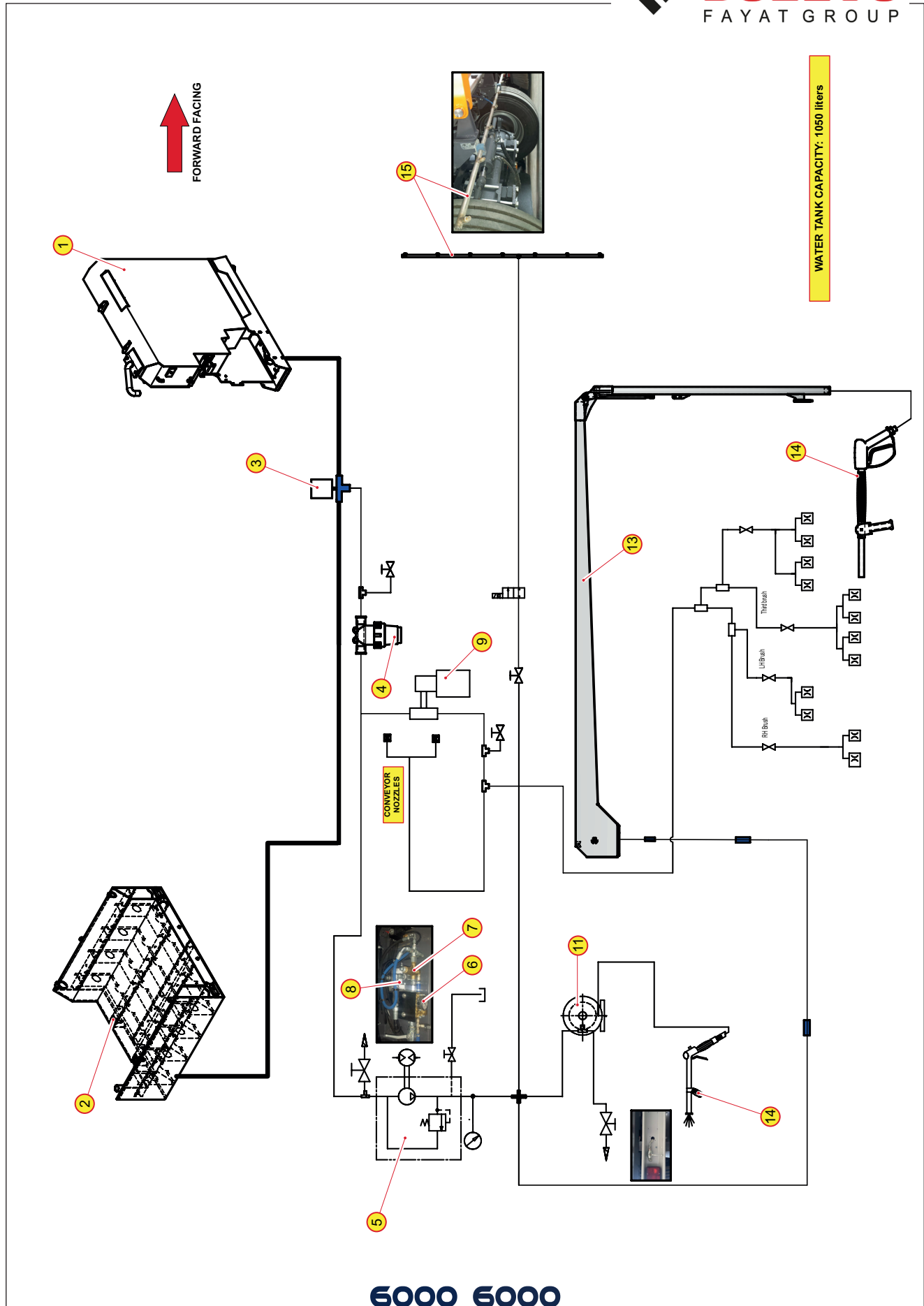
To avoid the components break it's necessary to drain the water from the system: Open the valve (7) for the tank water drain, open the cap (4) of the filter and all the valves (8) inside the cabin furthermore drain water through the 2 valves fitted on the high pressure pump inlet (10) and outlet (11).



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8.2. Water sprinkling on 6000 Combi

1. Main water tank
2. Additional water tank
3. Motorized electric valve
4. Water filter
5. High pressure water pump
6. Water pressure gauge
7. Water pressure adjuster valve
8. Hydraulic motor
9. Low pressure water pump
10. Water valve in cabin
11. Water reel
12. Water drain valve
13. Articulated arm
14. Water gun nozzle
15. Rear or front sprinkling bar





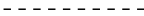
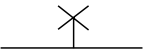
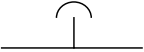
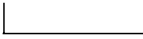
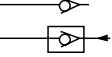
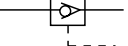
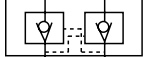
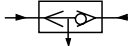
CHAPTER 9
Hydraulic system

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9.1. General notes

9.1.1. Hydraulic components with ISO Symbol

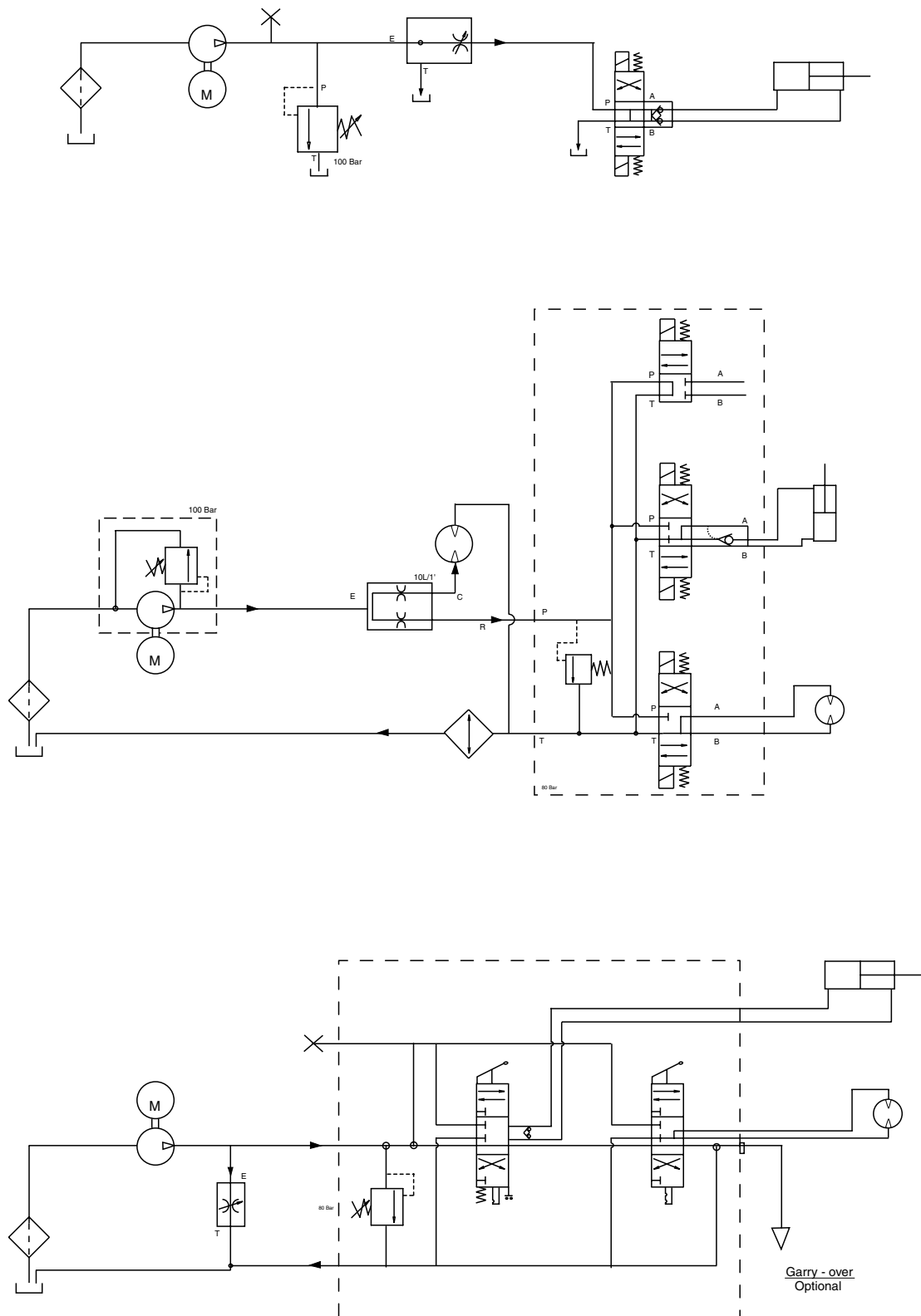
A	TUBO HOSE 	TUBO PILOTAGGIO PILOT HOSE 	PRESA PRESSIONE PRESSURE INTAKE 	SFIATO BREATHER 	
B	SERBATOIO TANK 	FILTRO FILTER 	RADIATORE RADIATOR 		
C	MOTORE ELETTR. ELECTR. MOTOR 	MOTORE TERMICO THERMIC MOTOR 			
D	POMPA PUMP 	POMPA A PISTONE MANUALE MANUAL PISTON PUMP 			
E	POMPA IDROSTATICA VARIABILE HYDROSTATIC VARIABLE PUMP 	POMPA IDROSTATICA SERVOCOMANDO HYDROSTATIC PUMP SERVOCONTROL 			
F	MOTORE A UNIDIREZIONALE 1 DIRECTION MOTOR 	MOTORE BIDIREZIONALE 2 DIRECTION MOTOR 	MOTORE IDROSTATICO VARIABILE VARIABLE HYDROSTATIC MOTOR 		
G	MOLLA SPRING 	MOLLA REGOLABILE ADJUSTABLE SPRING 			
H	VALVOLA UNIDIREZIONALE CHECK VALVE 	VALVOLA UNIDIREZ. TARATA ADJUSTED CHECK VALVE 			
J	VALVOLA UNIDIREZIONALE PILOTATA CHECK VALVE WITH PILOT 	VALVOLA UNIDIREZ. PILOTATA DOPPIA DOUBLE CHECK VALVE WITH PILOT 			
K	VALVOLA DI COMMUTAZIONE COMMUTATION VALVE 				

I	VALVOLA SICUREZZA SAFETY VALVE		VALVOLA SICUREZZA PILOTATA SAFETY VALVE WITH PILOT				
L	VALVOLA SEQUENZA SEQUENCE VALVE		VALVOLA SEQUENZA CON DRENAGGIO SEQUENCE VALVE WITH DRAINAGE				
M	VALVOLA RIDUTTRICE PRESSIONE PRESSURE REDUCER VALVE		VALVOLA RIDUTTRICE PRESSIONE CON PILOTA E DRENAGGIO PRESSURE REDUCER VALVE WITH PILOTA E DRENAGGIO				
N	STROZZATORE NARROW		STROZZATORE REGOLABILE ADJUSTABLE NARROW				
O	REGOLATORE DI FLUSSO 2 VIE FLOW REGULAT. VALVE 2 WAY		REGOLATORE DI FLUSSO 3 VIE FLOW REGULAT. VALVE 3 WAY		VALVOLA PRIORITARIA PRIORITY VALVE		
P	BOBINA COIL	LEVA MANUALE MANUAL LEVER	PEDALE PEDAL	MOLLA SPRING	BLOCCAGGIO BLOCK	INTERRUTTORE MICROSWITCH	IDRAULICO HYDRAULIC
Q	RUBINETTO A 2 VIE COCK A 2 WAY		RUBINETTO A 3 VIE COCK A 3 WAY		RUBINETTO A 4 VIE COCK A 4 WAY		

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R	ELETTROVALVOLA 1 BOBINA ELECTROVALVE 1 COIL		PEDIPOLATORE FOOT CONTROL	
	ELETTROVALVOLA 2 BOBINE ELECTROVALVE 2 COILS			
	BASE ELETTROVALVOLA ELECTROVALVE BASE			
S	RUBINETTO DI ESCLUSIONE COCK	MANOMETRO MANOMETER	TERMOMETRO THERMOMETER	MISURATORE DI PORTATA FLOW METER
	CILINDRO 1 EFFETTO CYLINDER - 1 ACTING	CILINDRO 2 EFFETTI CYLINDER - 2 ACTING		CILINDRO A PIU' STADI TELESCOPIC CYLINDER
T				
U	ACCUMULATORE ACCUMULATOR	PRESSOSTATO PRESSURE GAUGE	MICROINTERRUTTORE MICROSWITCH	



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9.1.2. Cleaning and disassembly

All interventions on an hydraulic system have to be accompanied by utmost cleanness: indeed, the presence of minor impurities in the oil can cause serious damages to hydraulic components, mainly to hydrostatic drive components.

Note that the hydraulic oil of the tank can get polluted with water deriving from the condensation of atmospheric steam.

Such water can break hydraulic components, mainly the drive piston pumps.

Hence it is suggested to change oil as indicated in the periodic maintenance chart.

Each disassembly intervention has to be accompanied by a careful identification of components position, to avoid incorrect assembly and consequent malfunction. Components have to be disassembled, if needed, and placed on a clear area of the working table.

9.1.3. Fittings

In case of oil leak from fittings, the relevant fitting can be tighten by using the proper wrench. If the leak continues, replace the fitting and the copper washers.

In case of fitting replacement use new copper washers.

Before screwing a rotating fitting of a hose on its nipple, grease the contact area and screw while keeping the fitting correctly aligned.

Such small interventions can be done by customer without losing the warranty.

9.1.4. Tighten torque of the splined joints on pump or motor

The splined joint must be tightened on the pump or motor shaft with a torque of 4 Kgm, in order to avoid the broken of the joint.

9.1.5. Hydraulic oil specifications

Hydraulic oil specifications are:

Grade:	ISO VG 46
Viscosity at 40 C°:	45 cSt
Viscosity at 100 C°:	7,97 cSt
Colour:	Yellow
Viscosity index:	150
Yield value:	-36 C°



N.B.

If the sweeper works in a freezing place, it's possible to use hydraulic oil ATF DEXRON II (red colour).

9.1.6. Hydraulic system

On all models the hydraulic system is comprised of two parts:

1. Services hydraulic system comprised of gear pumps coupled to the endothermic engine that send oil to services, that is to hydraulic motors and cylinders.
2. Hydrostatic transmission such transmission is comprised of an hydrostatic pump directly coupled to the endothermic engine and a variable displacement hydraulic motor located on the front axle, in closed circuit. The forward and reverse gear control is composed of an electric lever on the dashboard; while the running speed is varied through a hydraulic pedal accelerator.



N.B.

In model 6000 the oil tank, the filter and the radiator are shared for the two systems.

9.1.7. Pressure checks

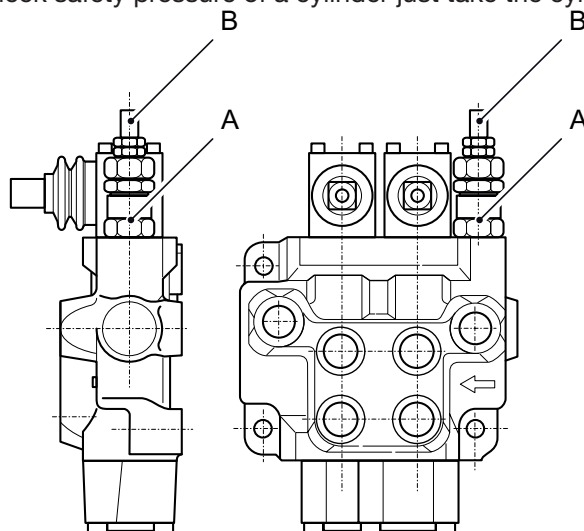
9.1.7.1 Services system (see "Services hydraulic system" and "Hydraulic Schemes")

Each circuit is protected by a relief valve.

The relief valve (A) is usually fitted into the manual or electrical distributor and is accessible from outside; it can be adjusted by a screw (B) after unloosening the lock-nut: screw to increase pressure, unscrew to decrease it.

The pressure value has to be checked by a 0-250 bar pressure gauge: fit it through its female quick connection to the pressure test point of system, as indicated in the hydraulic scheme.

To check the safety pressure start the equipment and stop it somehow so as to increase pressure to the maximum value. To check safety pressure of a cylinder just take the cylinder to the end-of-stroke.



The pressure of hydraulic steering motor cannot be adjusted by end user.

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9.1.7.2 Hydrostatic transmission system (see "Hydrostatic transmission", Chapter 10)

On this system are fitted 3 relief valves:

- 2 on the main circuit for the forward and reverse gear, adjusted at 420 bar
- 1 on the filling circuit, adjusted at 28 bar

9.1.8. Oil flow checks

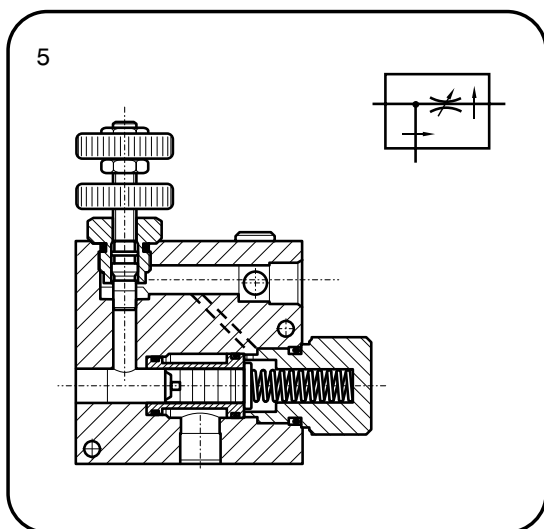
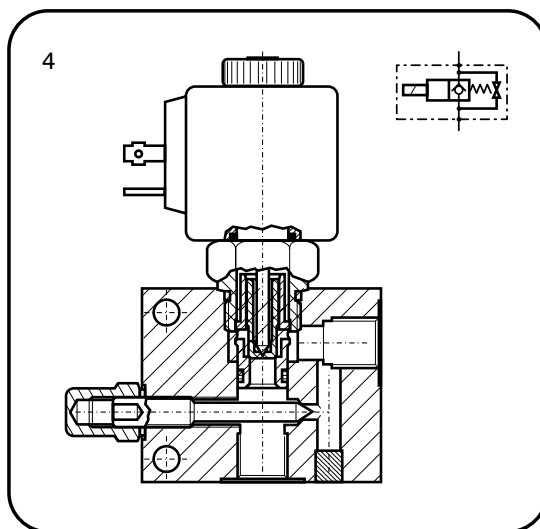
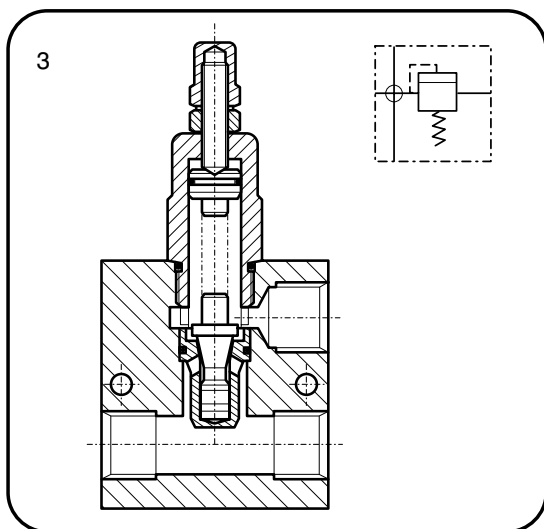
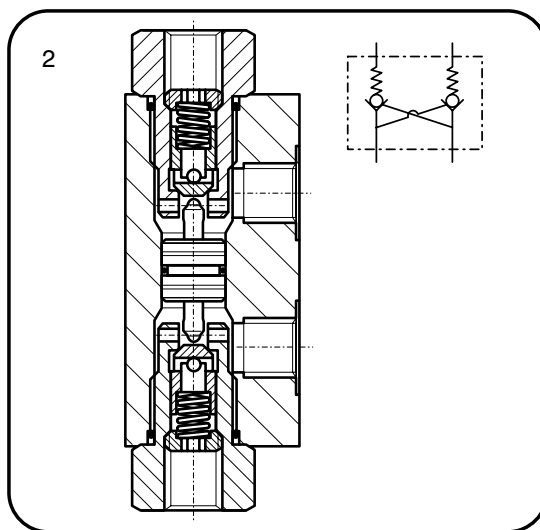
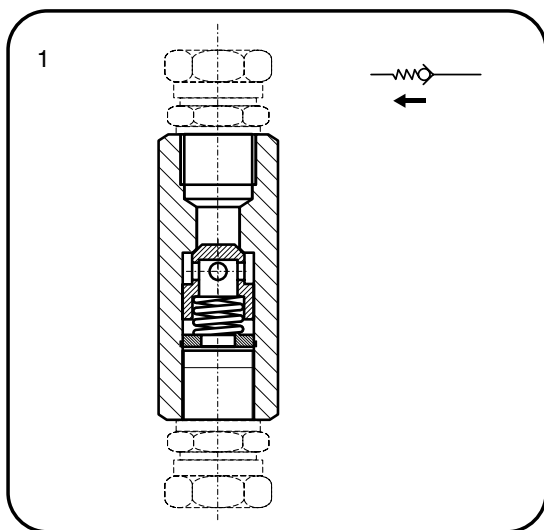
Such controls are directly difficult to implement. They can be indirectly checked through the measure of the REV NUMBER of the concerned service (brushes, wheels, etc.).

See Technical Data (Chapter 2).

In the same way it is possible to check the flow adjusting valves whose adjusted value (l/1') is usually indicated in the hydraulic scheme close to the valve.

9.1.9. Damages to hydraulic components

ELECTRODISTRIBUTOR:	a damage on this components is usually due to the drop of current or the break of the control solenoid. The component can be in any case enabled by pushing with a screwdriver the rod located in the middle of the solenoid. Replace the solenoid to repair.
CHECK VALVE (1), PILOT VALVE (2), PRESSURE ADJUSTING VALVE (3), 2-WAYS ELECTROVALVE (4):	usually the damage of these valves is due to some impurity deposit on the seal "cone": that causes an internal oil leak that is identified since the operator may notice a shift in the position of the concerned mechanic assembly. To repair dismount the valve and clean it inside, be sure the cone seal surfaces are not damaged. In case replace the valve.
FLOW ADJUSTING VALVE (5):	the damage is caused by impurity that lock the adjusting spool thus varying the oil flows. To repair disassemble the valve and clean it inside.
CYLINDERS:	if wear concerns the rod external seal the oil is present outside; if wear concerns the internal seals the rod position changes. Repair by replacing seals; do not pinch during assembly.
MOTORS AND PUMPS:	the repair intervention of these components is quite difficult, their replacement is hence suggested. The Motors more used are: a. Orbital Motors: 0-1000 rpm and 200 bar of pressure b. Gear Motors: 1000-4000 rpm and 200 bar of pressure c. Axial/Radial piston Motors: 0-3500 rpm and 420 bar of pressure, particularly for hydrostatic transmission. The Pumps more used are: a. Gear Pumps, used for general services with max pressure of 200 bar b. Axial piston Pumps, used for hydrostatic transmission with max pressure of 420 bar



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9.1.10. Life of an hydraulic system

The life of a component can reach at least 5000 hours if a due maintenance is performed.

Early wear may occur in case of:

1. Low level of hydraulic oil
2. Obstructed filter or filter having a filtering capacity other than that indicated
3. Use of hydraulic oil having specifications other than those indicated
4. Highly abrasive dusts environment; in such event double the oil and filter replacement and clean carefully tank between replacement.
5. Introduction of impurity during filling up.

9.1.11. Hydraulic oil tank

Model 6000 is equipped with a single hydraulic tank (1) for both the hydrostatic transmission and the services system.

When changing the hydraulic oil, replenish only the oil inside the tank, whose amount is indicated in the Refuelling Table.

Level switch (2): when the oil level drops below a set value due to leaks or pipe breaks, such device prompts the turning on of a red warning light in the cabin: the Operator has to stop immediately the Diesel Engine and check for possible hydraulic oil leaks.

Oil drain valve (3): it's necessary to empty the tank.

9.1.12. Filtering

In model 6000 the Filter (4) is located on the upper part of oil tank.

The Filter is housed in the tank upper side hence during its replacement no oil leak may occur.

Moreover, a special valve (1,5 bars) enables to keep under pressure the hydrostatic pump (5) suction pipe thus avoiding dangerous cavitation and breaks. The filter assembly also houses a safety valve set to 2,5 bars, in order to avoid breaks of the cartridge.

The gear pumps (6) and (7) take the oil directly from the tank, then it's necessary the tank is clean before starting.

9.1.13. Hydraulic oil cooling

The cooling is carried out by air radiator (8): in model 6000 is present a single shared radiator. The tank oil working temperature must not exceed 82 C°. A higher temperature could mean that radiator is clogged: clean it with compressed air or water paying attention not to bend the cooling fins.

9.1.14. Starting operation

The Tank filling phase includes:

Oil charge through the plug (9) on the tank until complete refilling. Such plug is equipped with filter to avoid accidental fall of materials inside the tank.

When the tank is full, unscrew the big plug (10) on the filter and charge more oil to fill the pump suction hose and complete the charge of the filter housing; to facilitate the hose filling purge air through plug (11) on the pump; then screw plug (11) and remount plug (10).

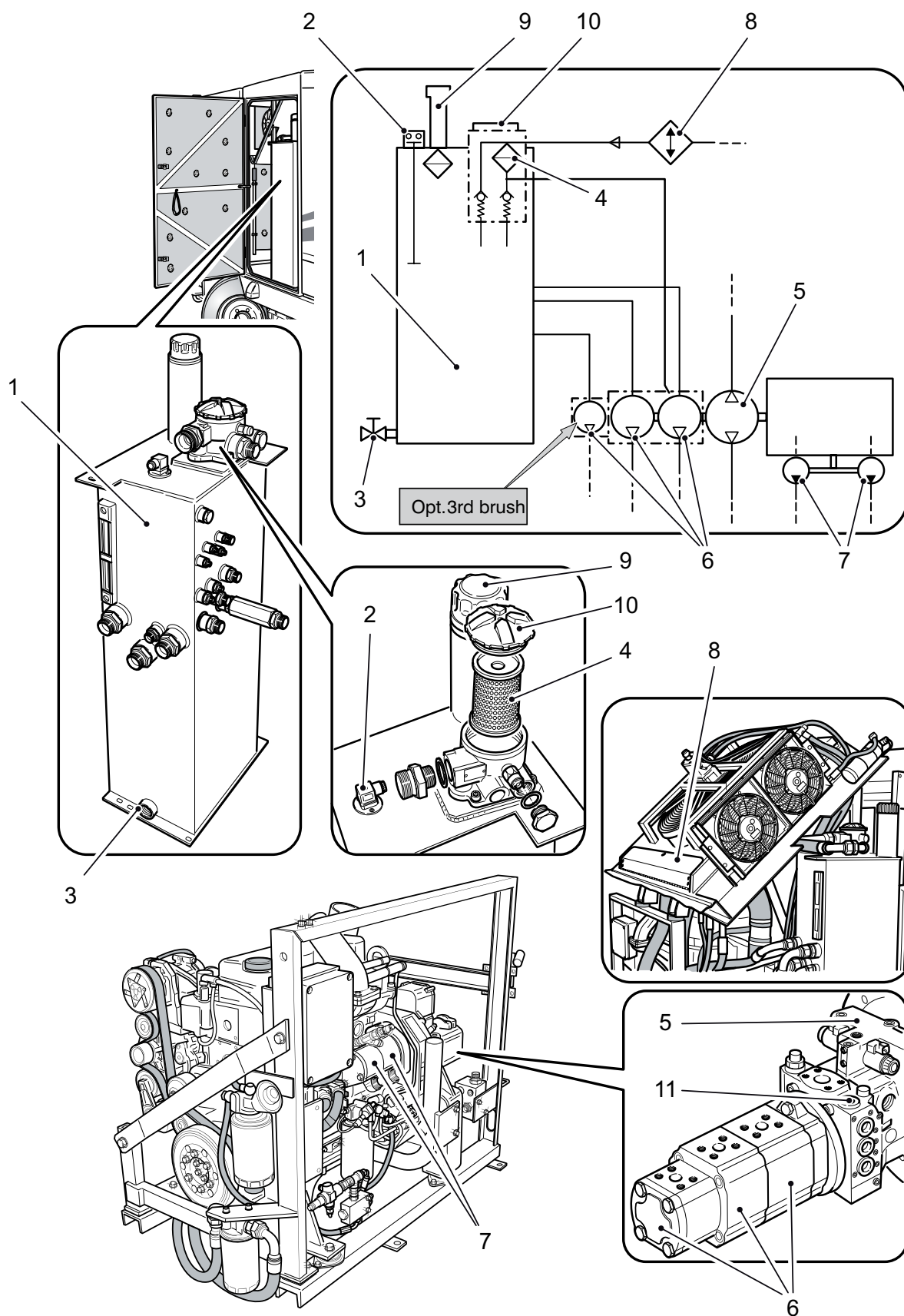
Start the diesel engine at idle and stop it filling up oil to hold the level.

Repeat many times at idle.



WARNING

The oil filling into the filter housing through the plug (10) has to be carried out after any maintenance intervention on the hydraulic system.

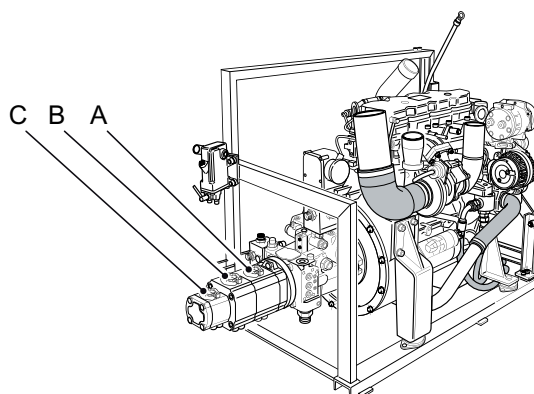


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9.2. Services hydraulic system with 3rd brush

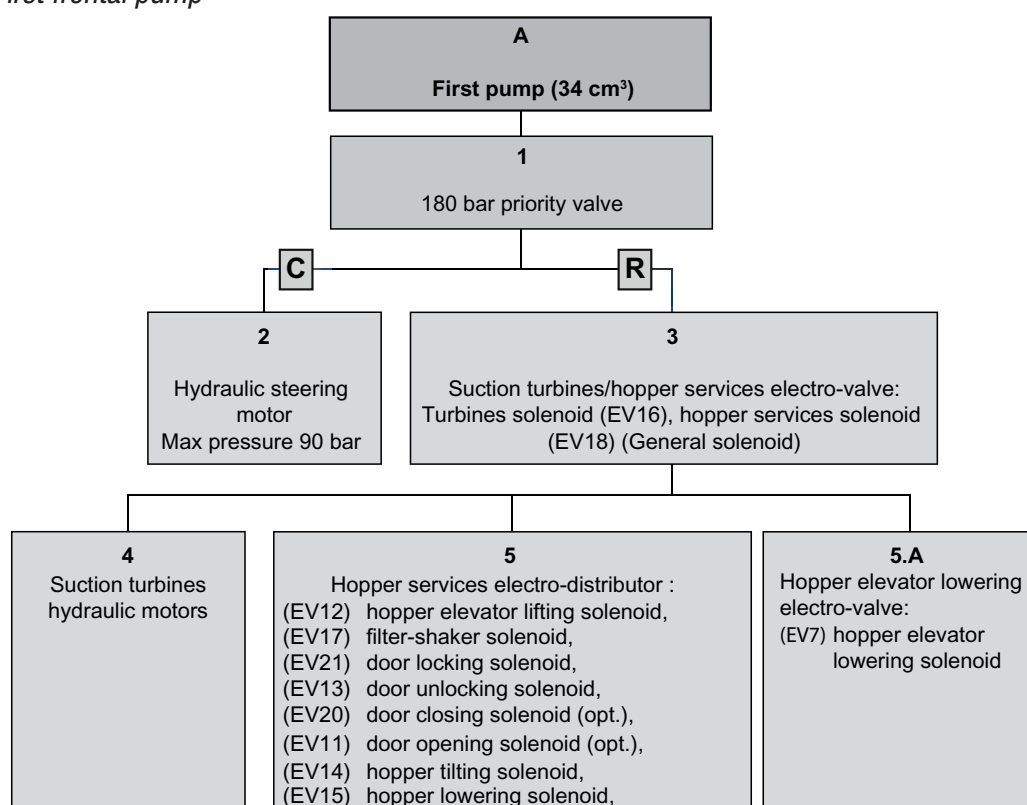
All checks must be made with 250 bar pressure gauge.
The services hydraulic circuits are 5, fed by 5 gear pumps.
See hydraulic schemes and relatives pictures.

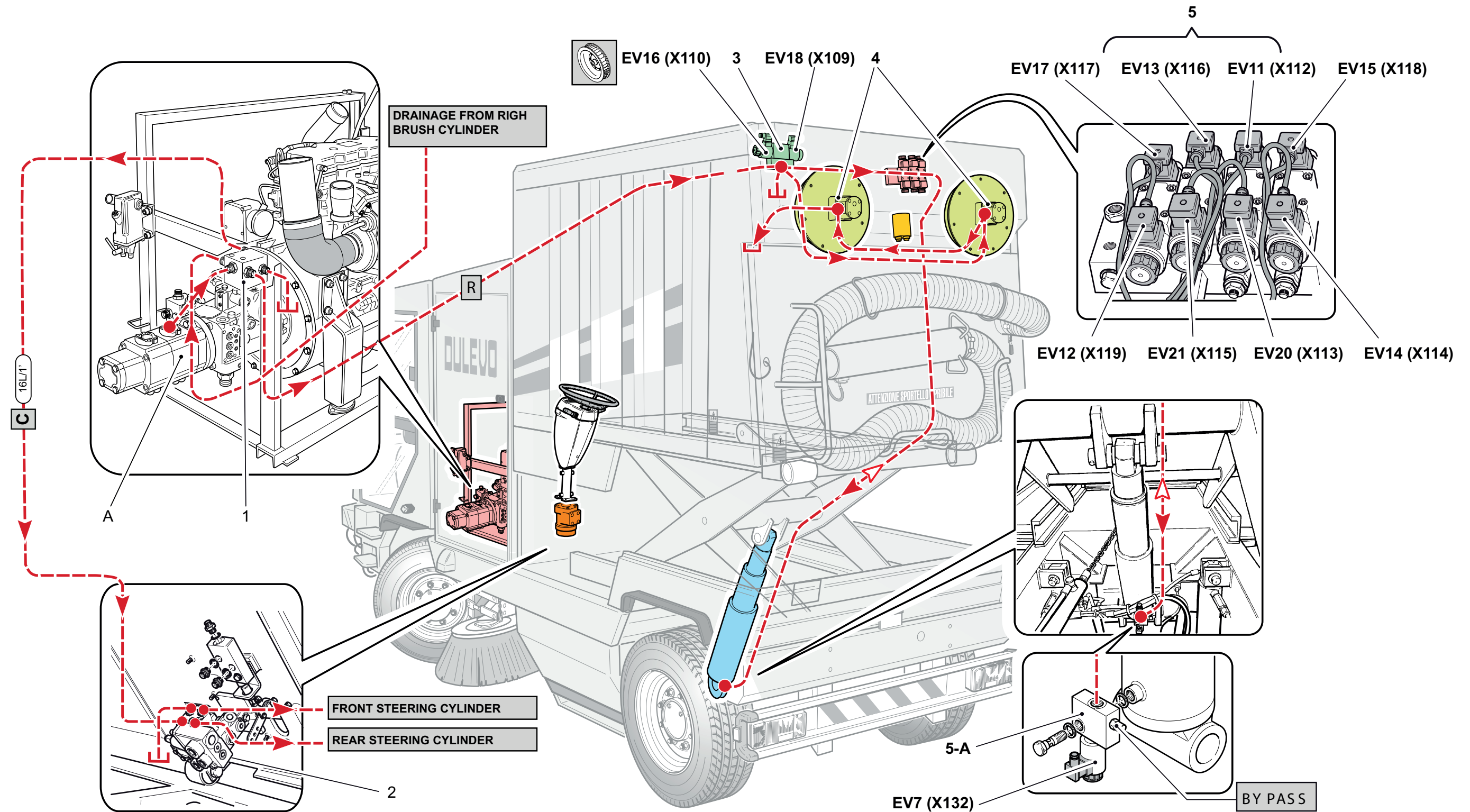
9.2.1. Frontal pumps group



- A: First pump
- B: Second pump
- C: Third pump

9.2.1.A First frontal pump

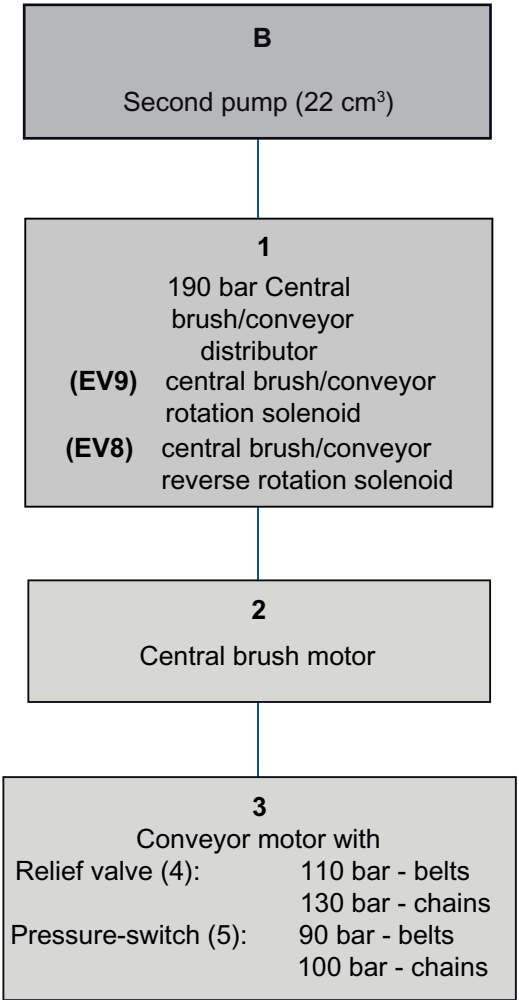


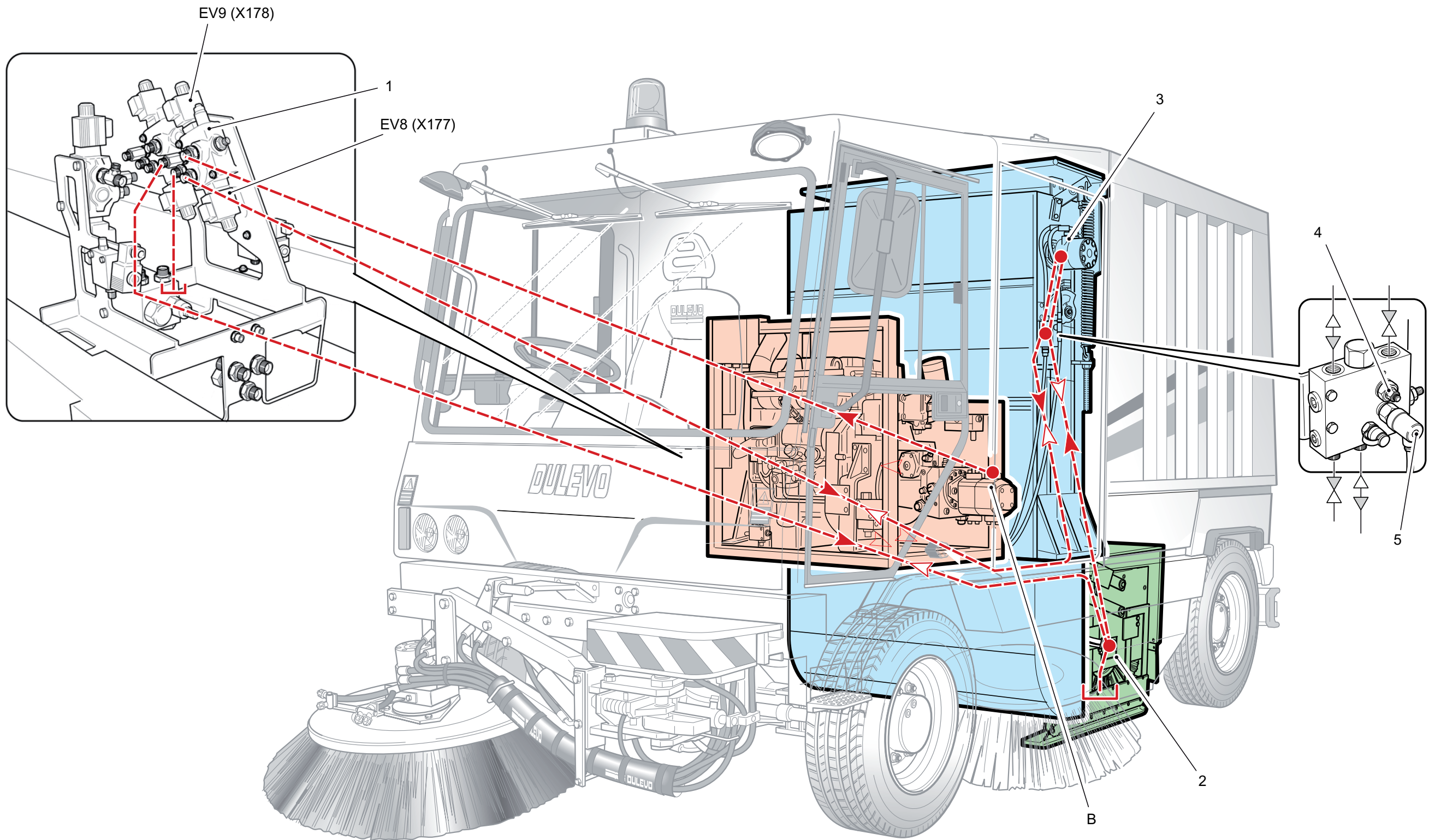


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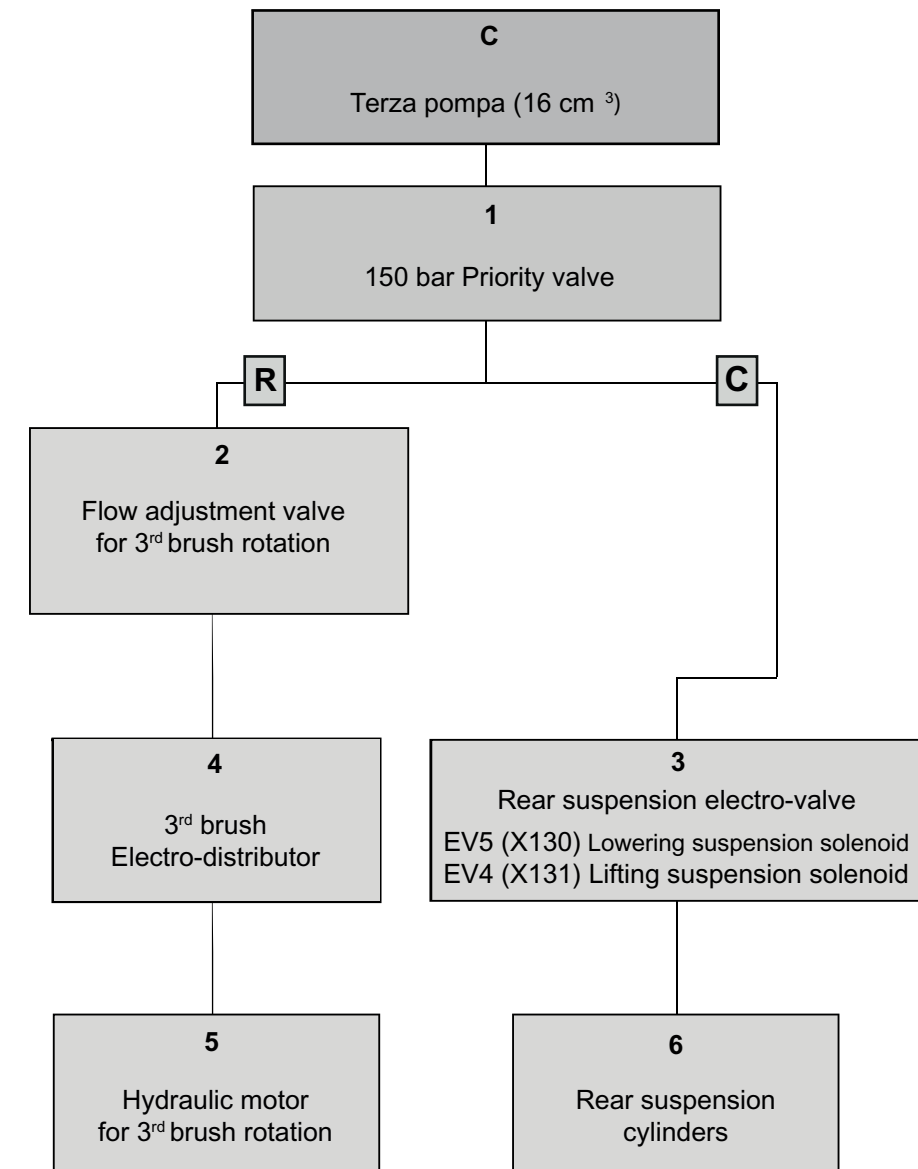
EU 4 **EURO 5** **EURO 6** **TIER 3** **TIER 4**

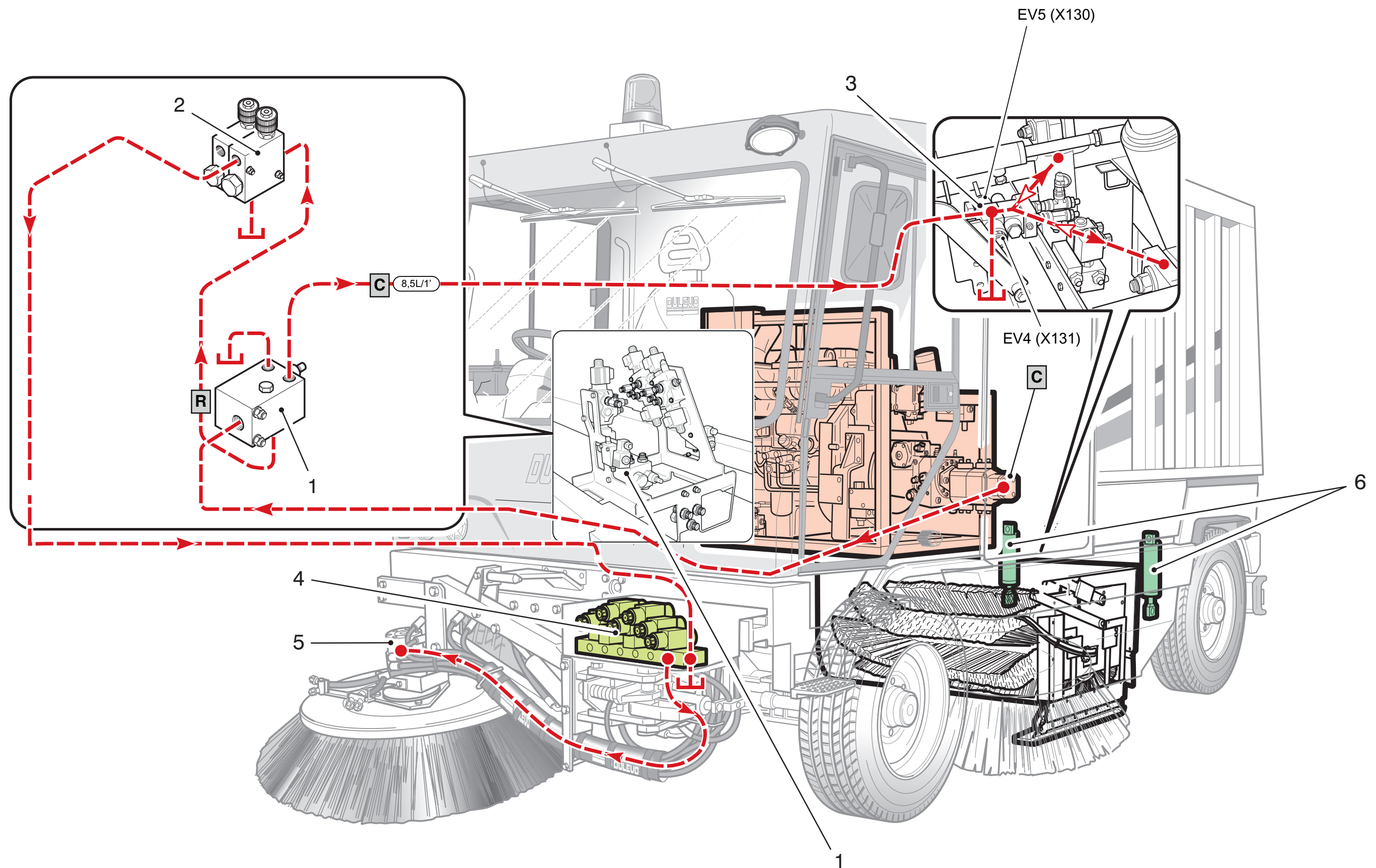
9.2.1.B Second frontal pump



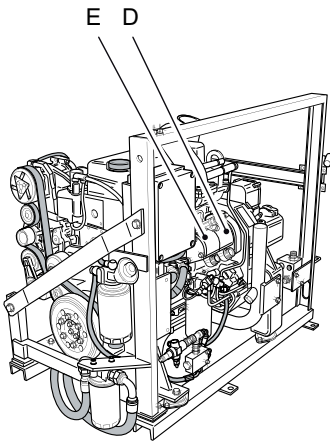


9.2.1.C Third frontal pump



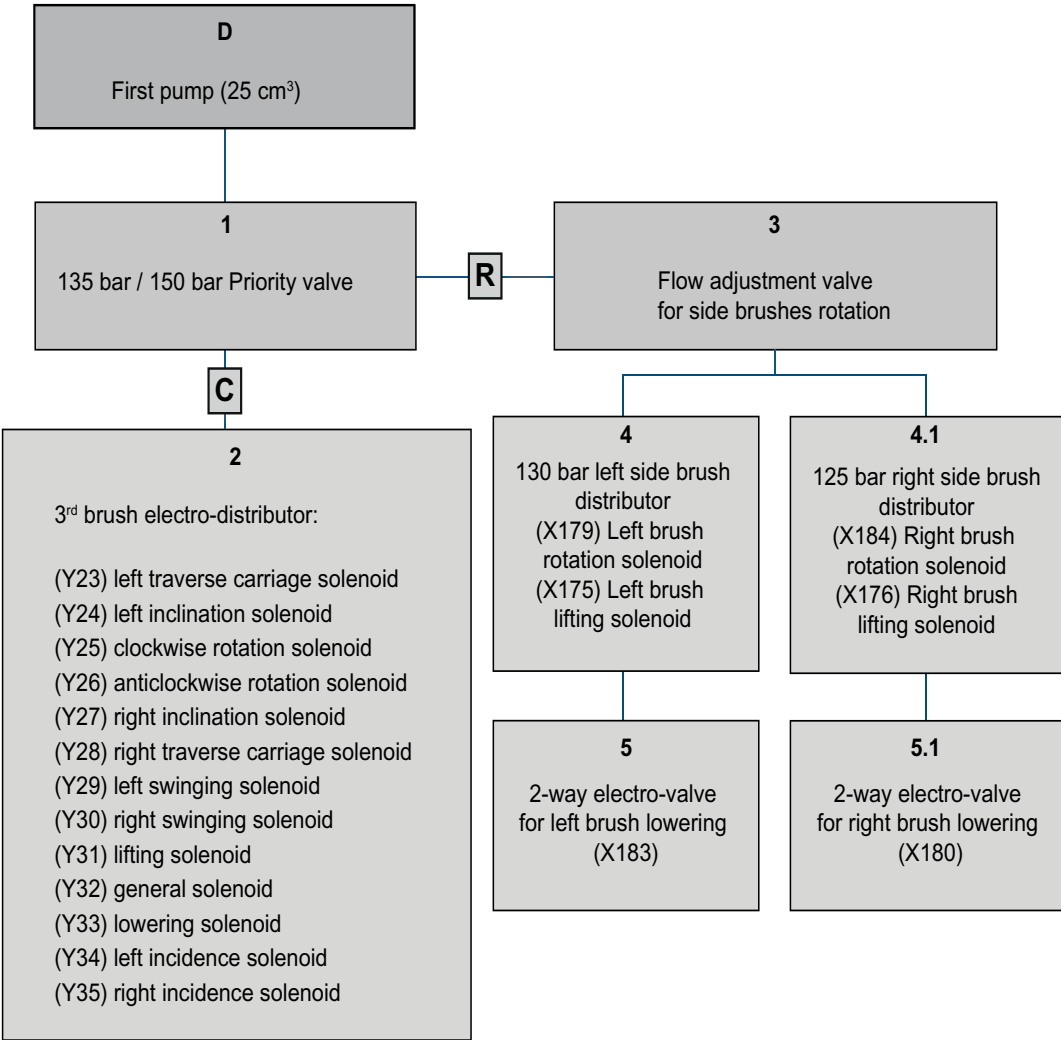


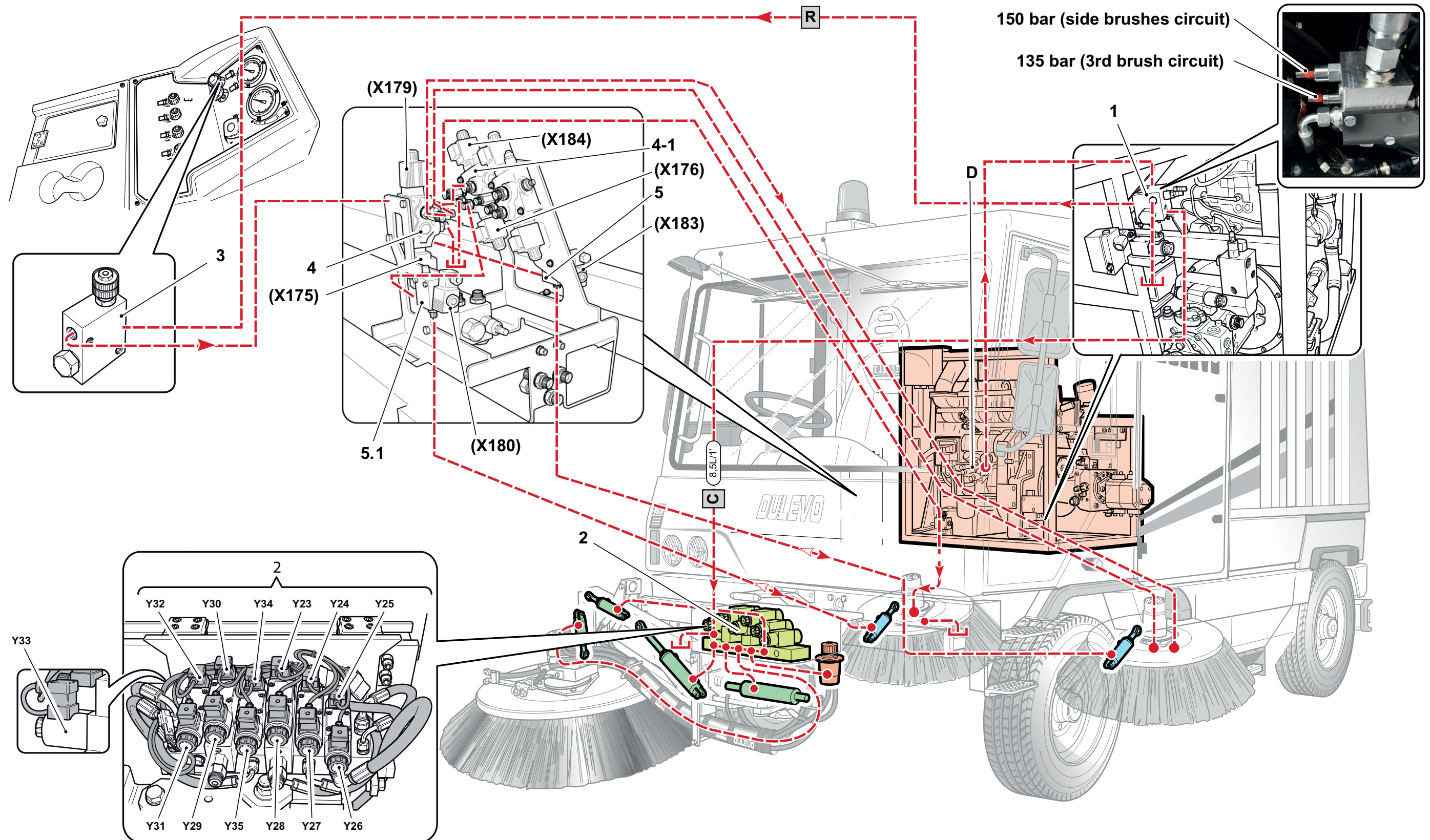
9.2.2. Lateral pumps group



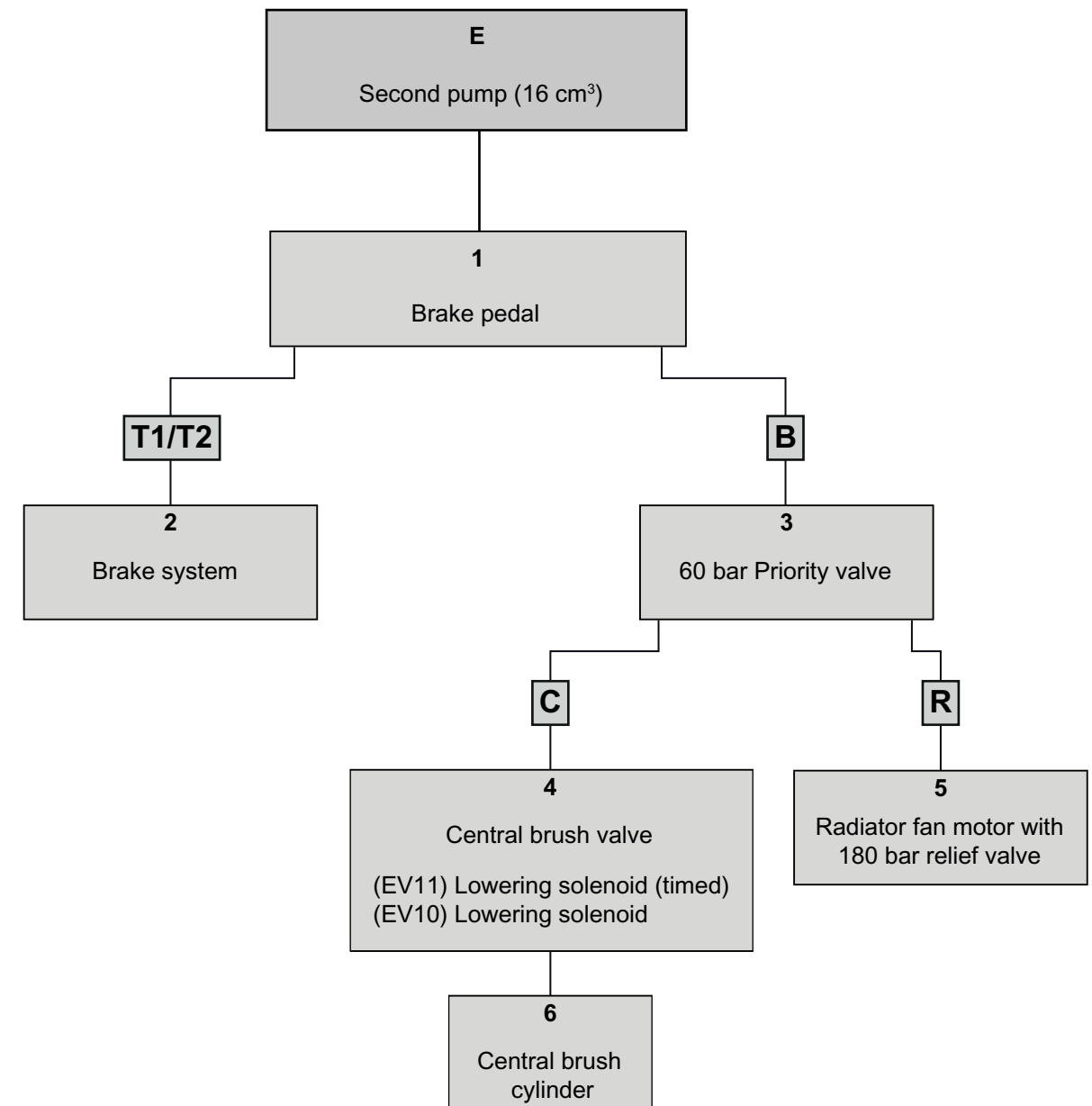
D: First pump
E: Second pump

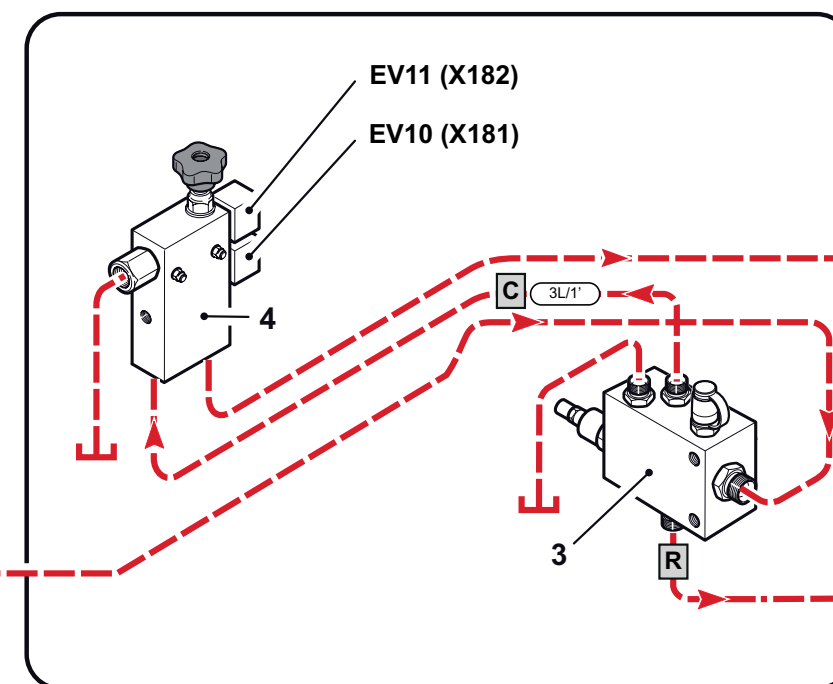
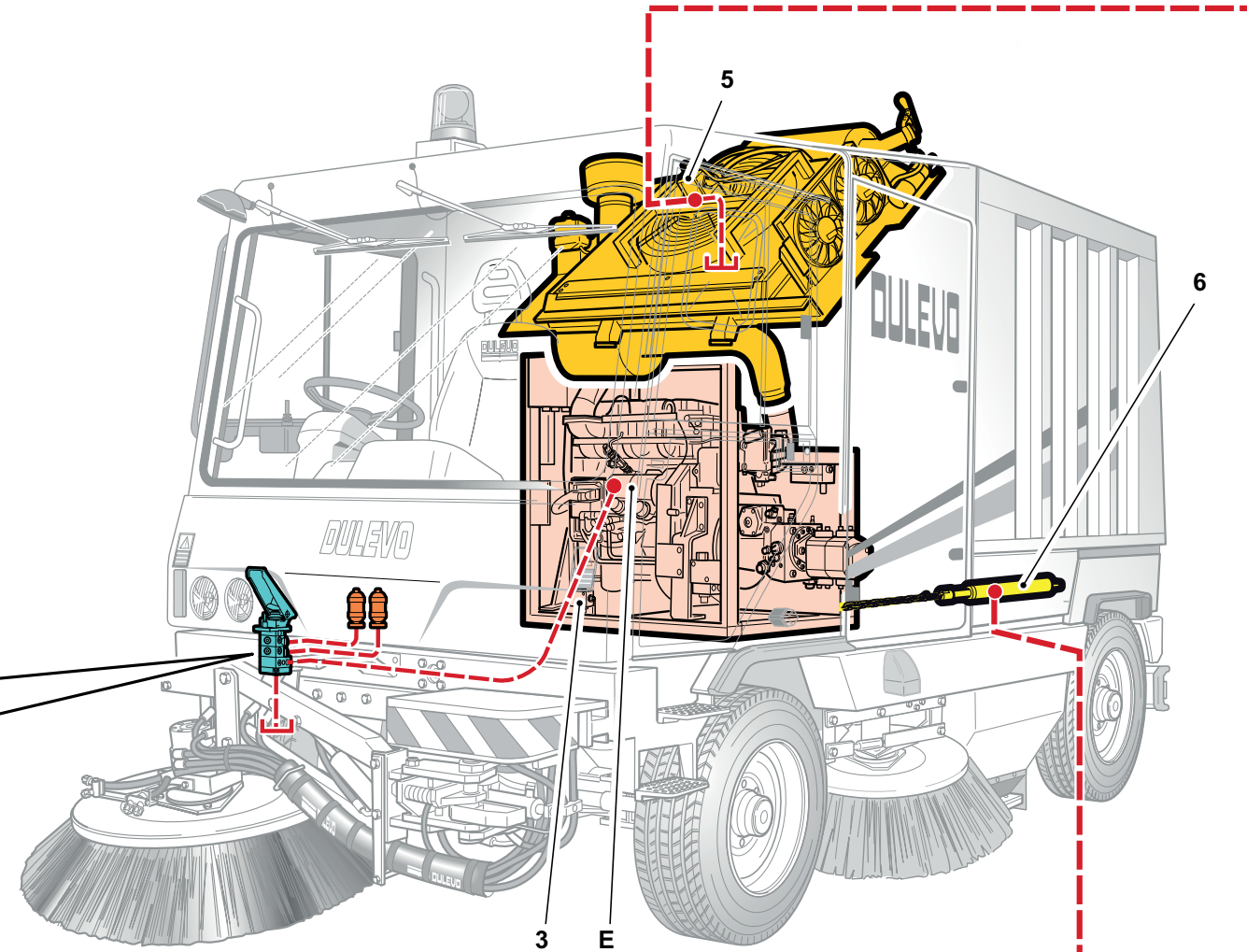
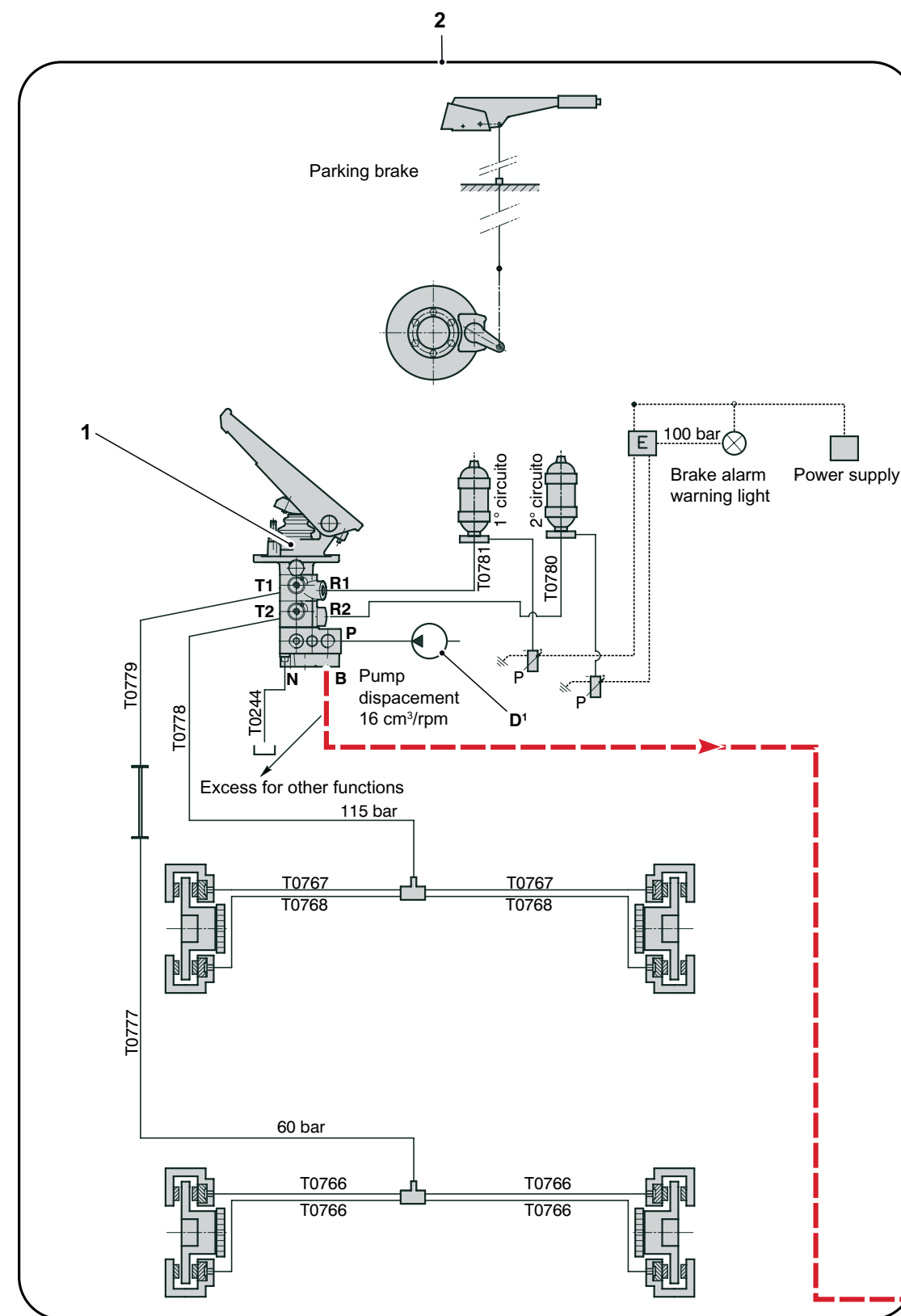
9.2.2.A First lateral pump





9.2.2.B Second lateral pump





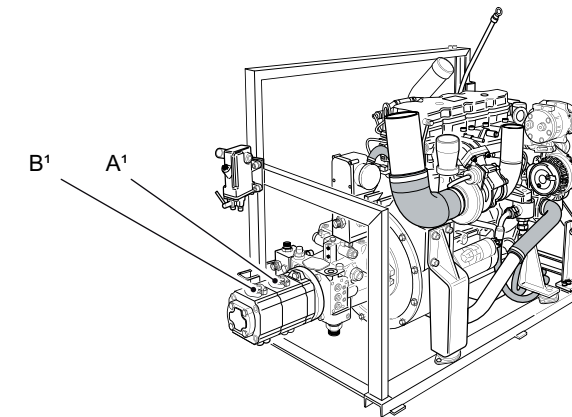
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9.3. Services hydraulic system without 3rd brush

All checks must be made with 250 bar pressure gauge.
The services hydraulic circuits are 4, fed by 4 gear pumps.
See hydraulic schemes and relatives pictures.

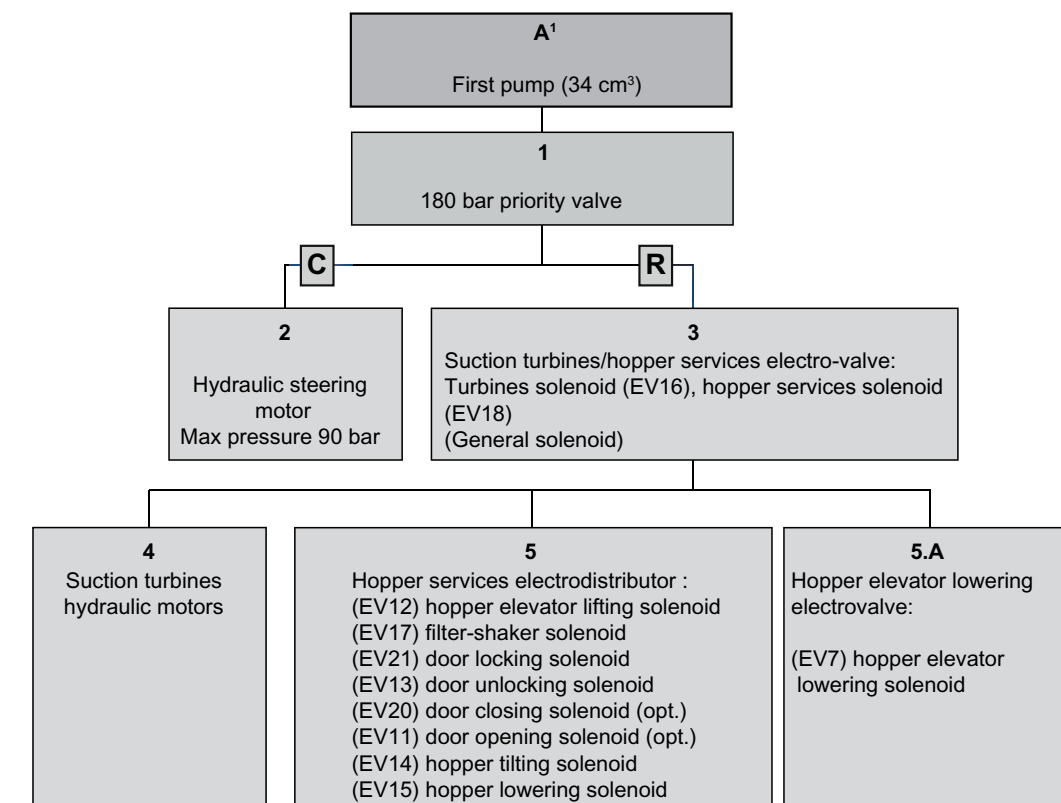
9.3.1. Frontal pumps group

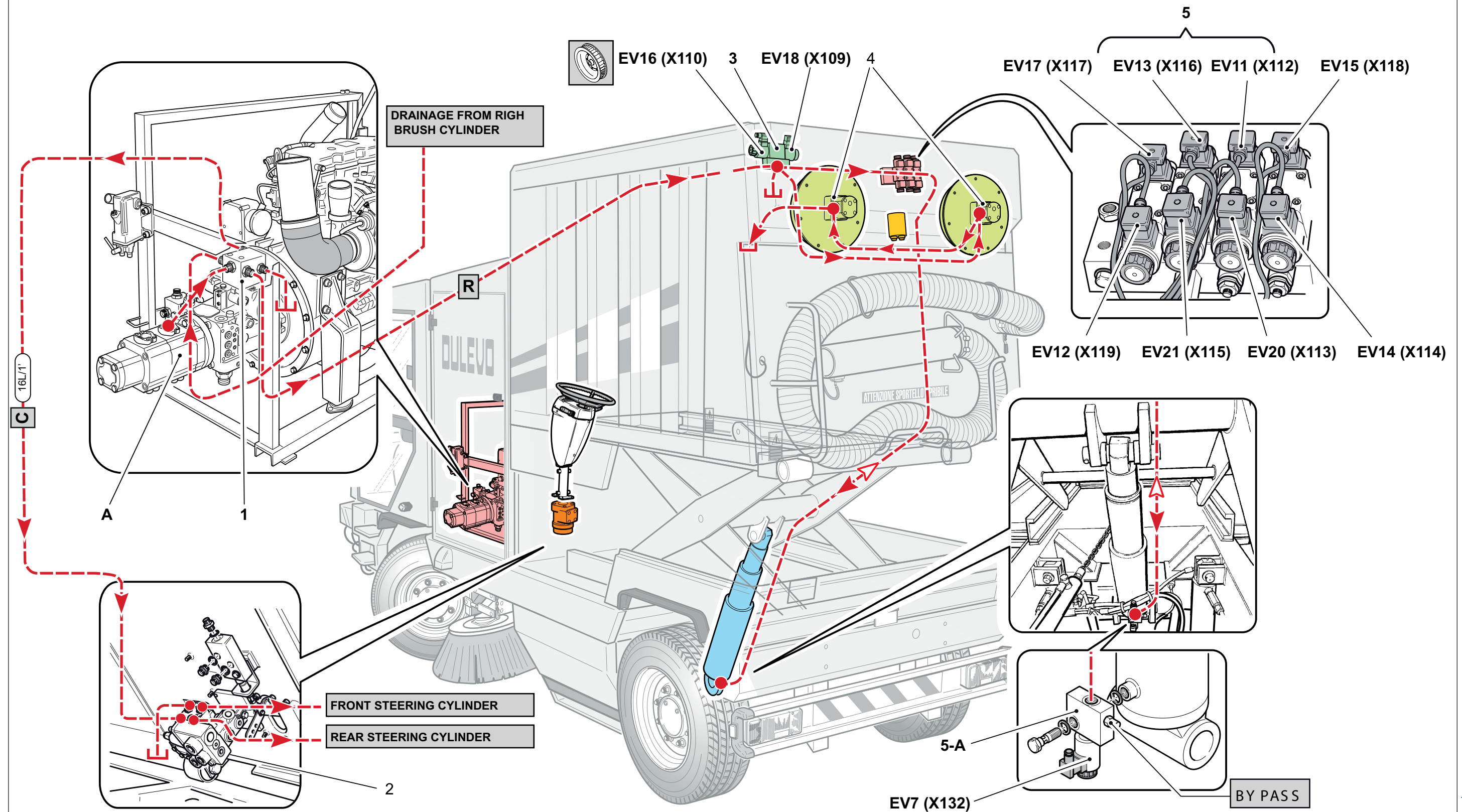


A': First pump

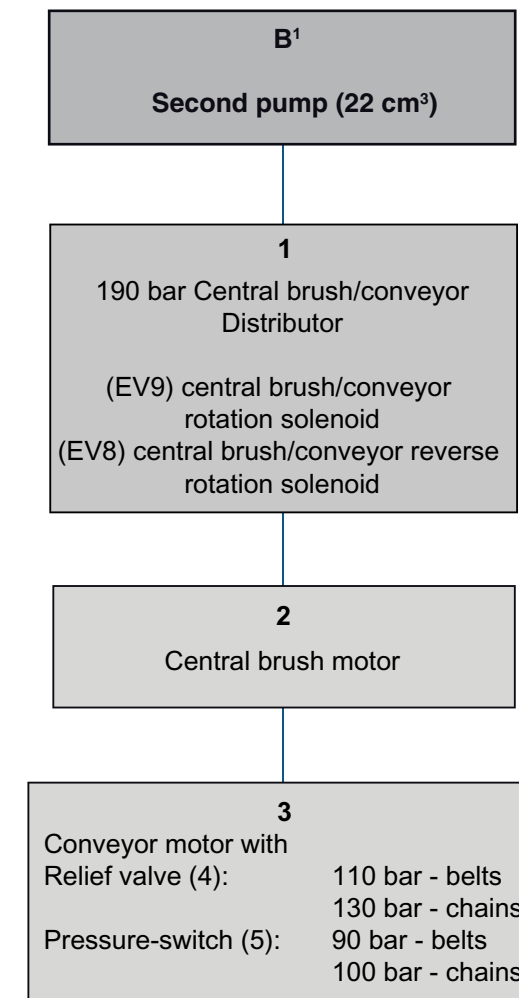
B': Second pump

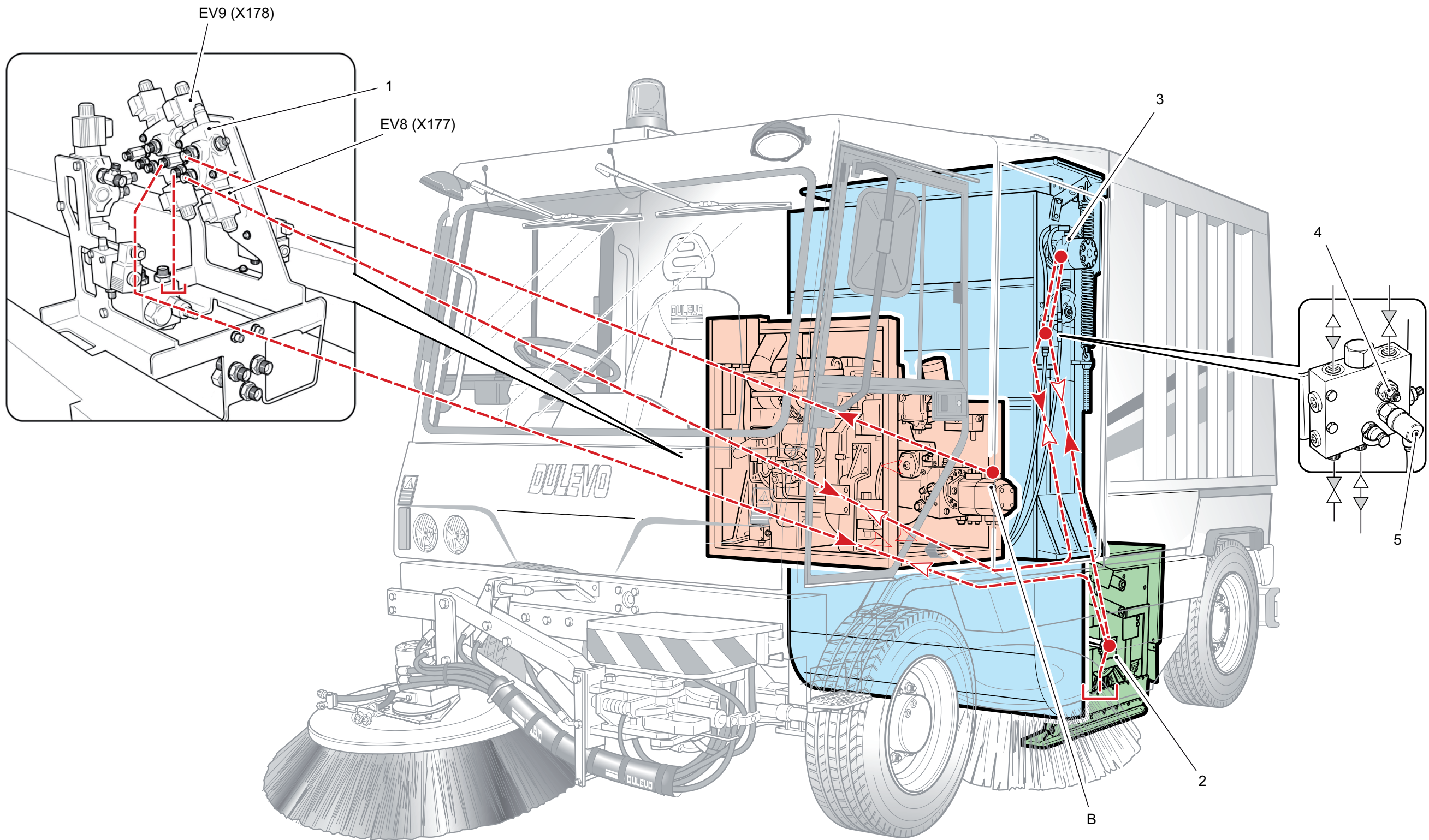
9.3.1.A First frontal pump



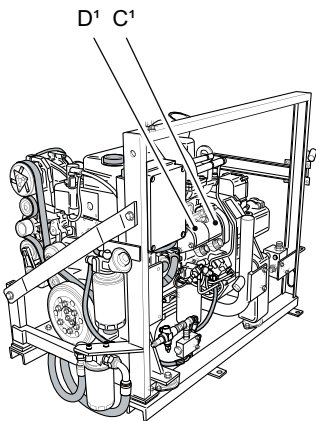


9.3.1.B Second frontal pump



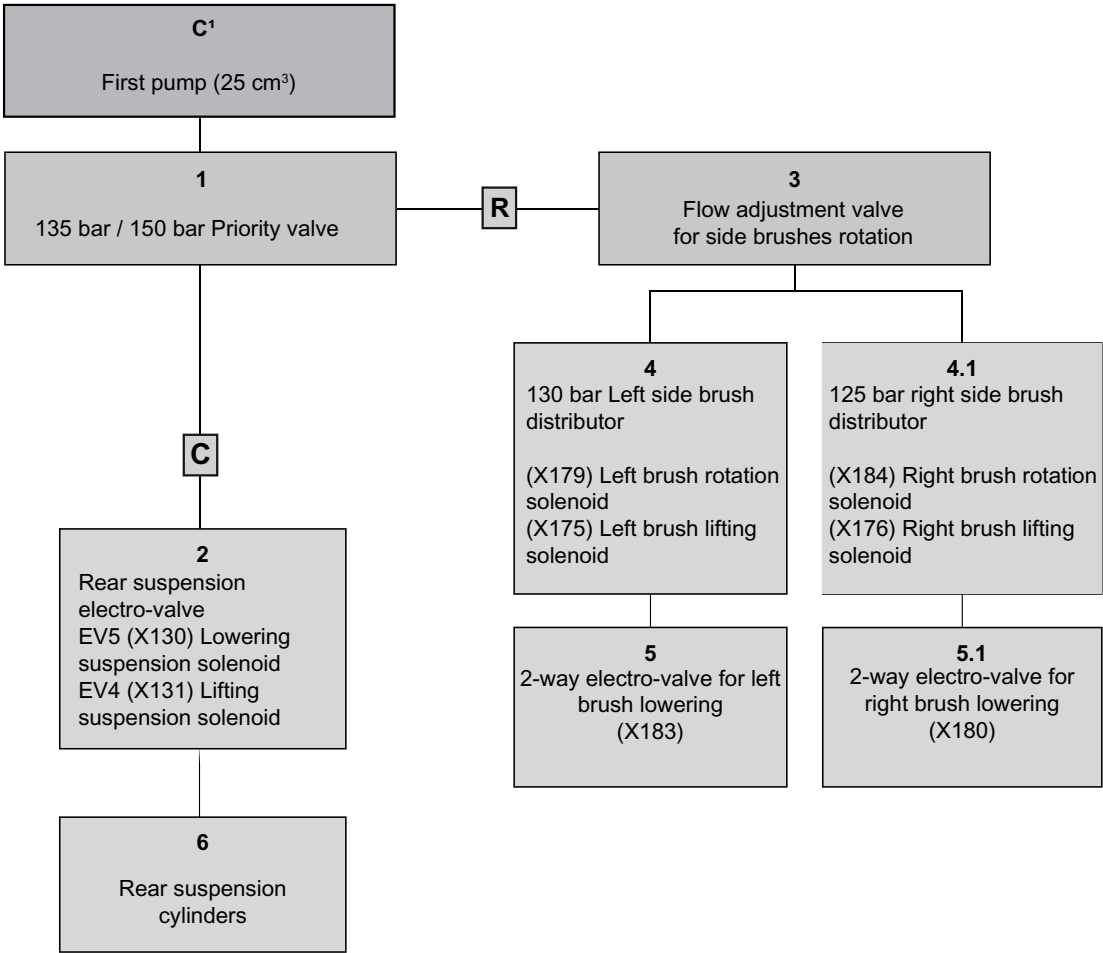


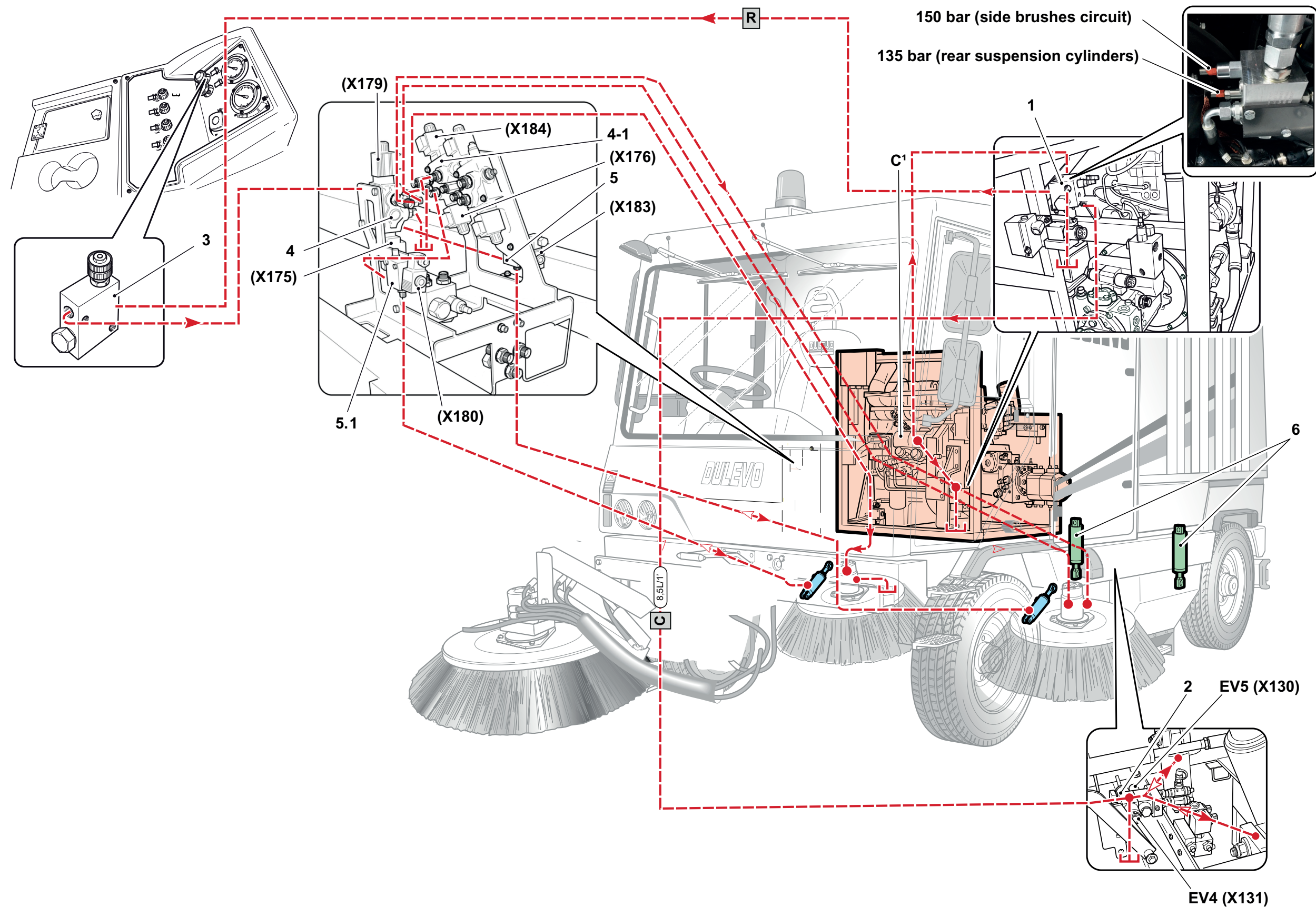
9.3.2. Lateral pumps group



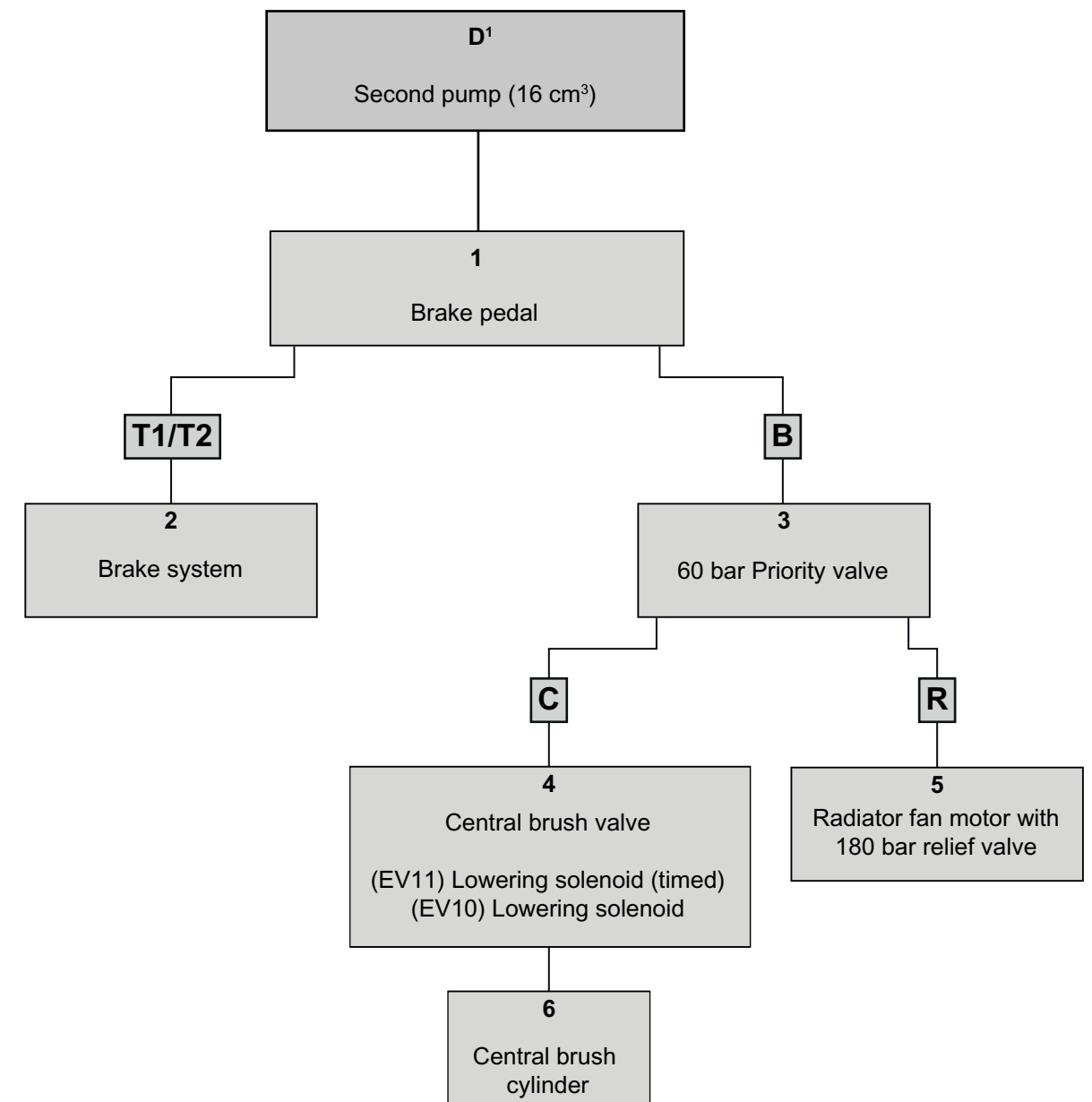
C1: First pump
D1: Second pump

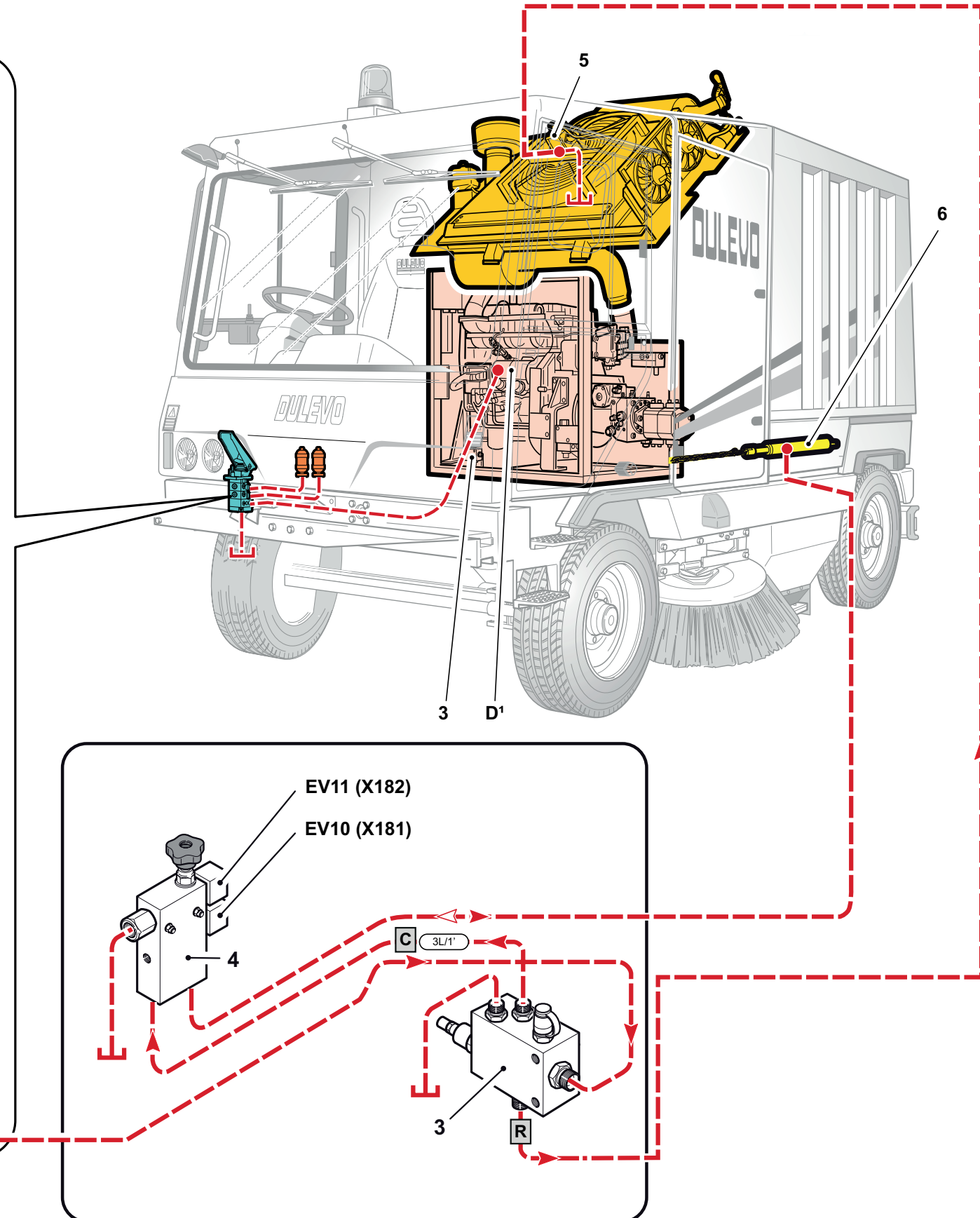
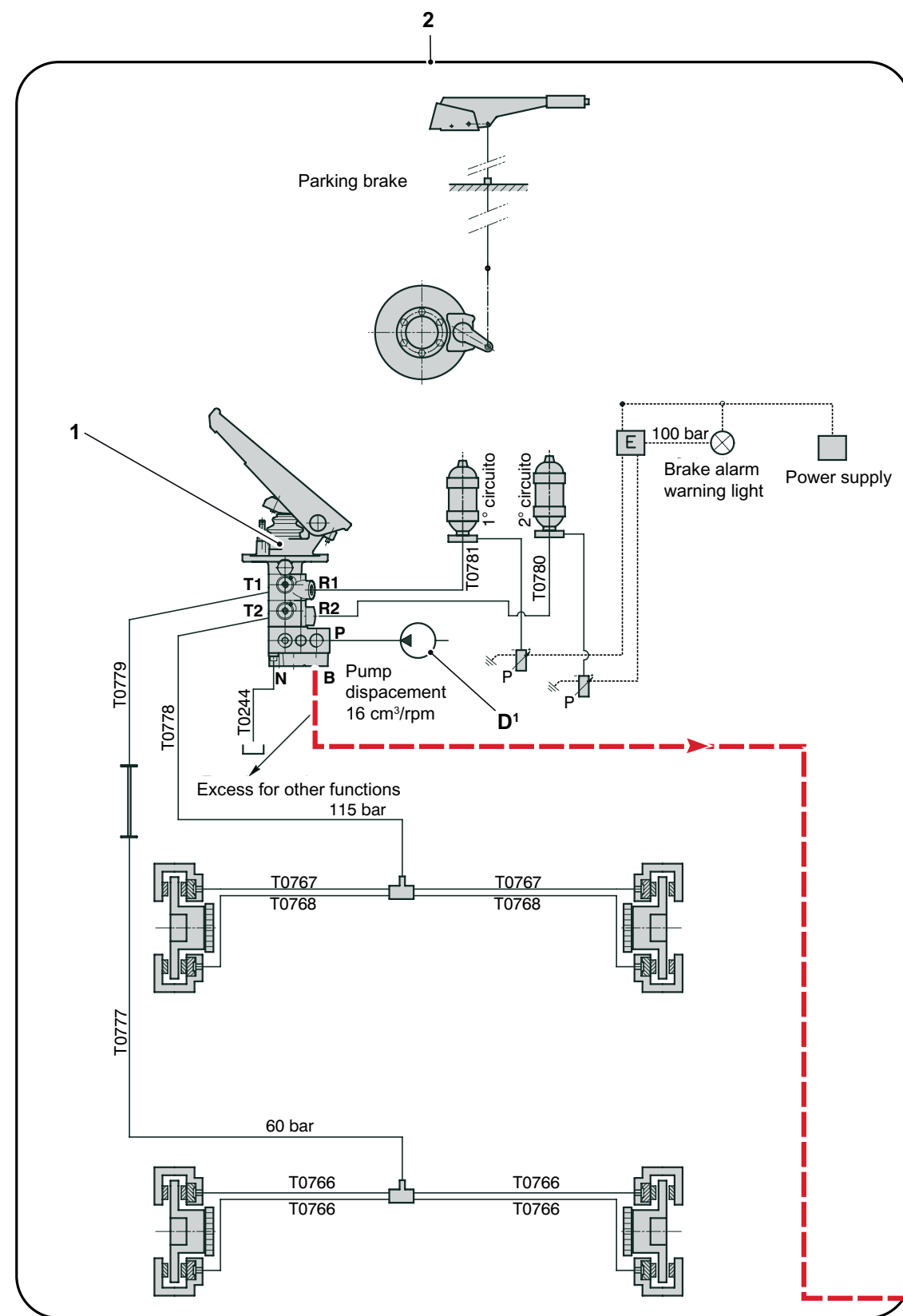
9.3.2.A First lateral pump





9.3.2.B Second lateral pump

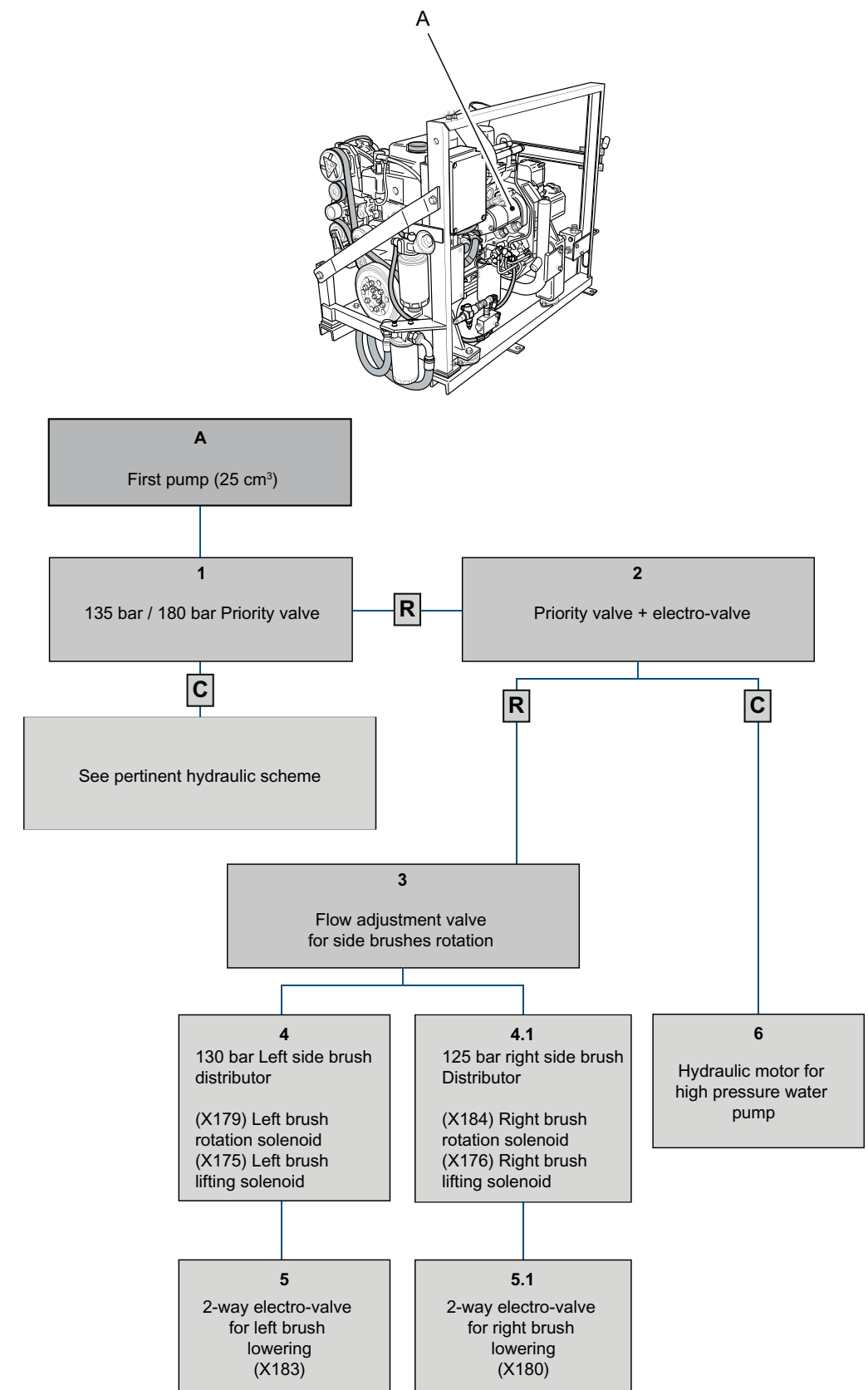


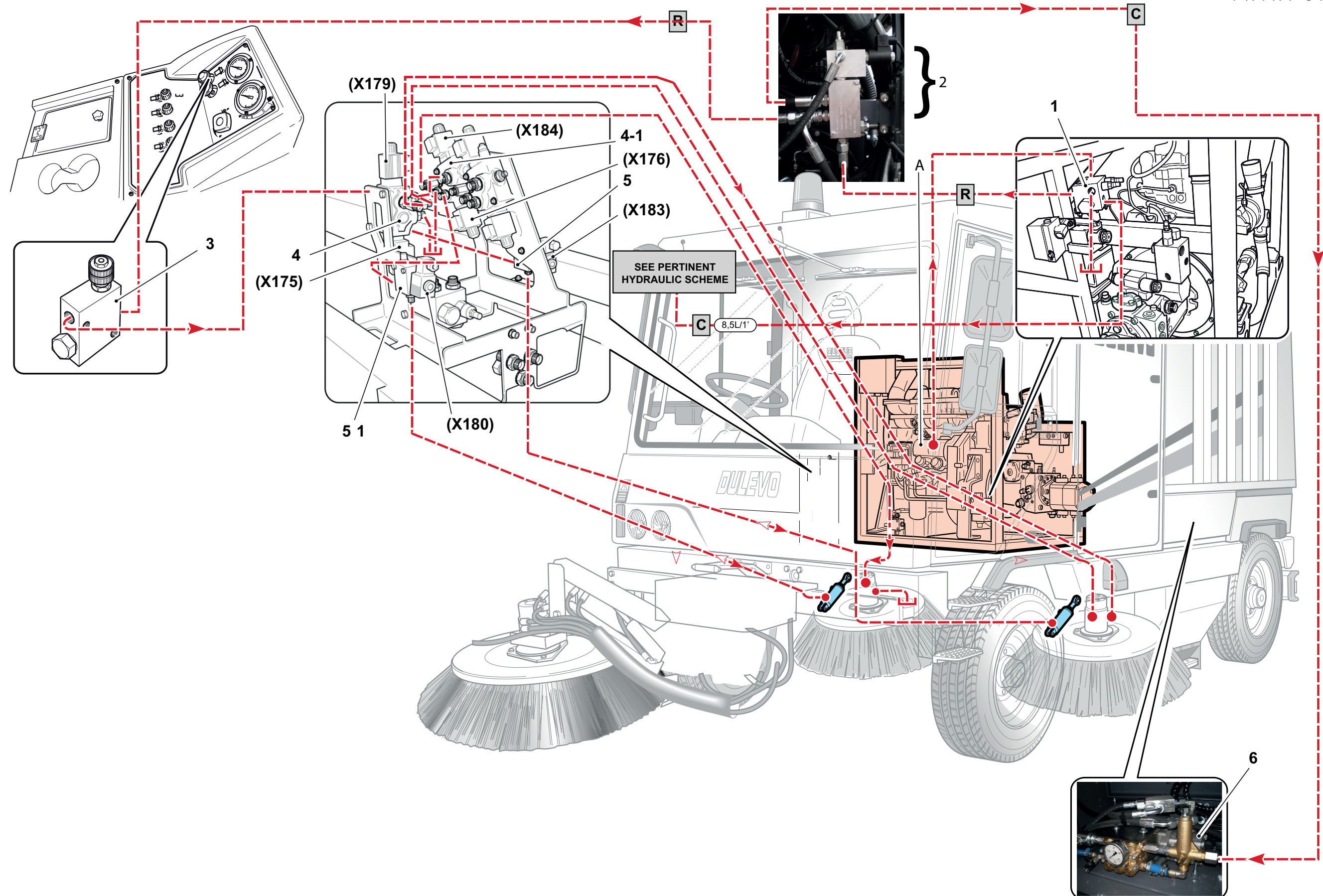


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9.4. Hydraulic system with high pressure water pump "Combi"





CHAPTER 10

Hydrostatic transmission

Hydraulic pump: A4VG71DA2D7/32R - NZF02F021SP

Hydraulic motor: A6VM 107HA2R2/63W - VZB0270TA

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10.1. General checks of hydrostatic transmission

10.1.1. Preparation

Before any of the interventions described below take the hydraulic oil at a temperature of at least 40 c°. Then fit two pressure gauges, with 0-600 bar scale, on the motor into ports G and M1 (M14x1,5) and a pressure gauge, with 0-60 bar scale, on pump into port Fa (M26x1,5).

10.1.2. Check of the circuit max pressure

Carry out this check in case the machine varies its initial performance. Accelerate progressively the diesel engine (with gear engaged) by the right pedal accelerator holding the machine with the brake pedal to lock the wheels: the two pressure gauges fitted on (G) and (M₁) have to reach a pressure of 420/430 bars both during forward gear and reverse.

10.1.3. Pump or motor wear check

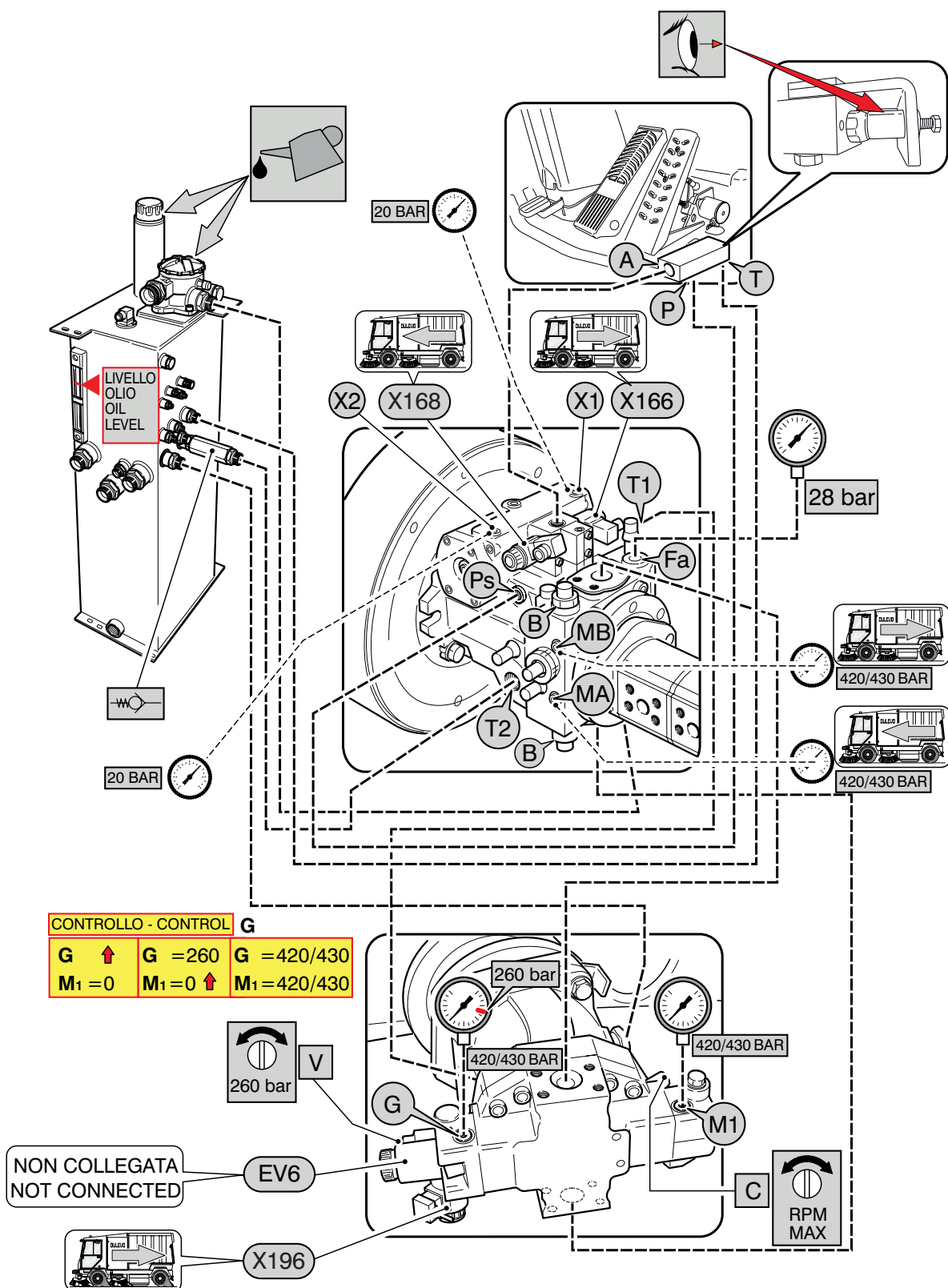
Carry out this check in case the machine varies its initial performance. The pressure gauge on Fa has to indicate a min value of 28 bars: brake the machine and accelerating in forward gear with right accelerator pedal, the value of 28 bar must remain constant. In case it drops, wear may affect either the pump or the motor.

Check the pump isolating it from the motor:

In order to do this, disconnect the two high pressure hoses on the pump and close with proper plugs (p/n 6260046FVY) two ports of the pump.

Engaging the gear (forward and reverse) verify if 28 bar pressure remains constant as described above; if that pressure is not kept this means pump is worn out, otherwise is the motor.

Last check: fitting a pressure gauge in X1 and engaging the forward gear with the accelerator pedal pressed, pressure has to reach approx.20 bars, not lower values. The same is true in X2 with reverse gear. The same value must be read by fitting a pressure gauge in PS.
If this valve is not reached, verify the hydraulic pedal accelerator.



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10.1.4. Displacement change check

This check has to be carried out if the machine on a climb decelerates too much or in case the diesel engine rpm drops too much on a climb.

In the forward gear and with the brake engaged, slowly accelerate by the pedal accelerator. The pressure gauge on (G) indicates an ever increasing pressure: when the value of 260 bars is reached the other pressure gauge has to move too.

Increasing acceleration, the two gauges have to reach a max pressure of 420/430 bars.

In case the 260 bar is not started, act on the "V" adjuster: slightly screw if read pressure is below 260 bars or vice versa.

10.1.5. Machine start point check

In forward gear, slowly accelerating through the pedal accelerator, at about 1000 rpm wheels should move.

10.1.6. Check the hydraulic pedal accelerator

The hydraulic pedal accelerator fitted underneath the cabin and actuated by the operator's foot, varies the machine speed acting on the hydraulic pump displacement: the max displacement corresponds to the max speed.

Be sure the control pin performs the whole stroke and is not blocked.

To be sure the hydraulic pedal accelerator sends out the whole signal, lift the front axle by a jack and be sure wheels rotate at 235 rpm (or better, calculate the mean of values on the two wheels) with pedal completely pressed and diesel engine at max rpm.

If wheels don't rotate at mentioned value, join directly two hoses that arrives in (P) and (A) and put two plugs on ports of valve in order to avoid oil exit.



WARNING

In this situation the pump is fed directly and wheels start to rotate.

Accelerate at max rpm the diesel engine and verify that the wheels rotate at the above value.

10.1.7. Electrovalves on hydraulic motor

Electrovalve "EV6" is not connected since not used.



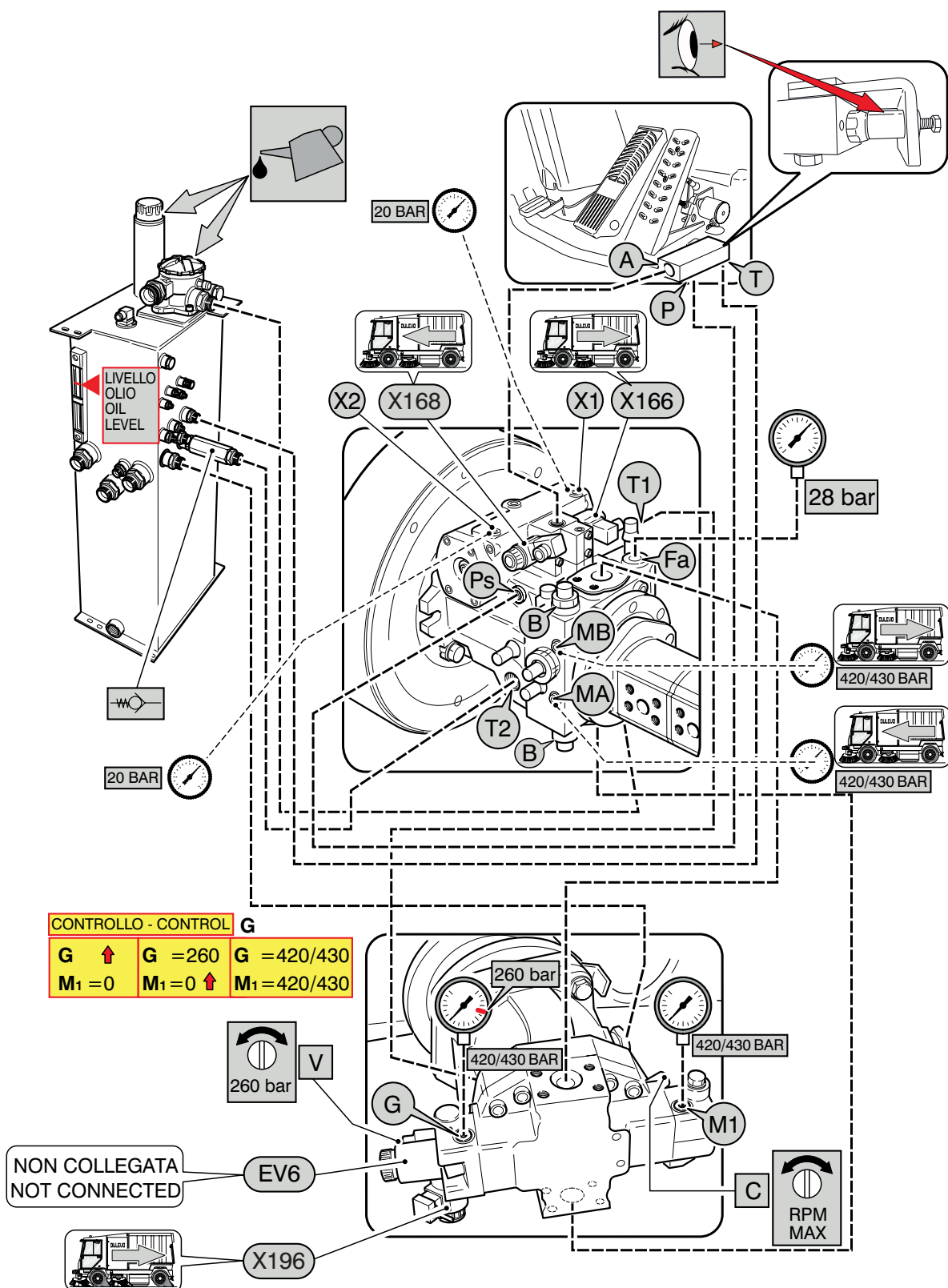
N.B.

The electrovalve "X196" is energized only in the reverse gear.

In case "X196" is not energized or internal spool is blocked the following problems could rise: the motor does not reach the maximum displacement, so the machine has problems on climbs only in reverse gear.

During the accelerator pedal release the motor reaches immediately the max displacement and causes a sudden braking, always in reverse gear.

The pressure gauge fitted on (M₁) does not indicate pressure.

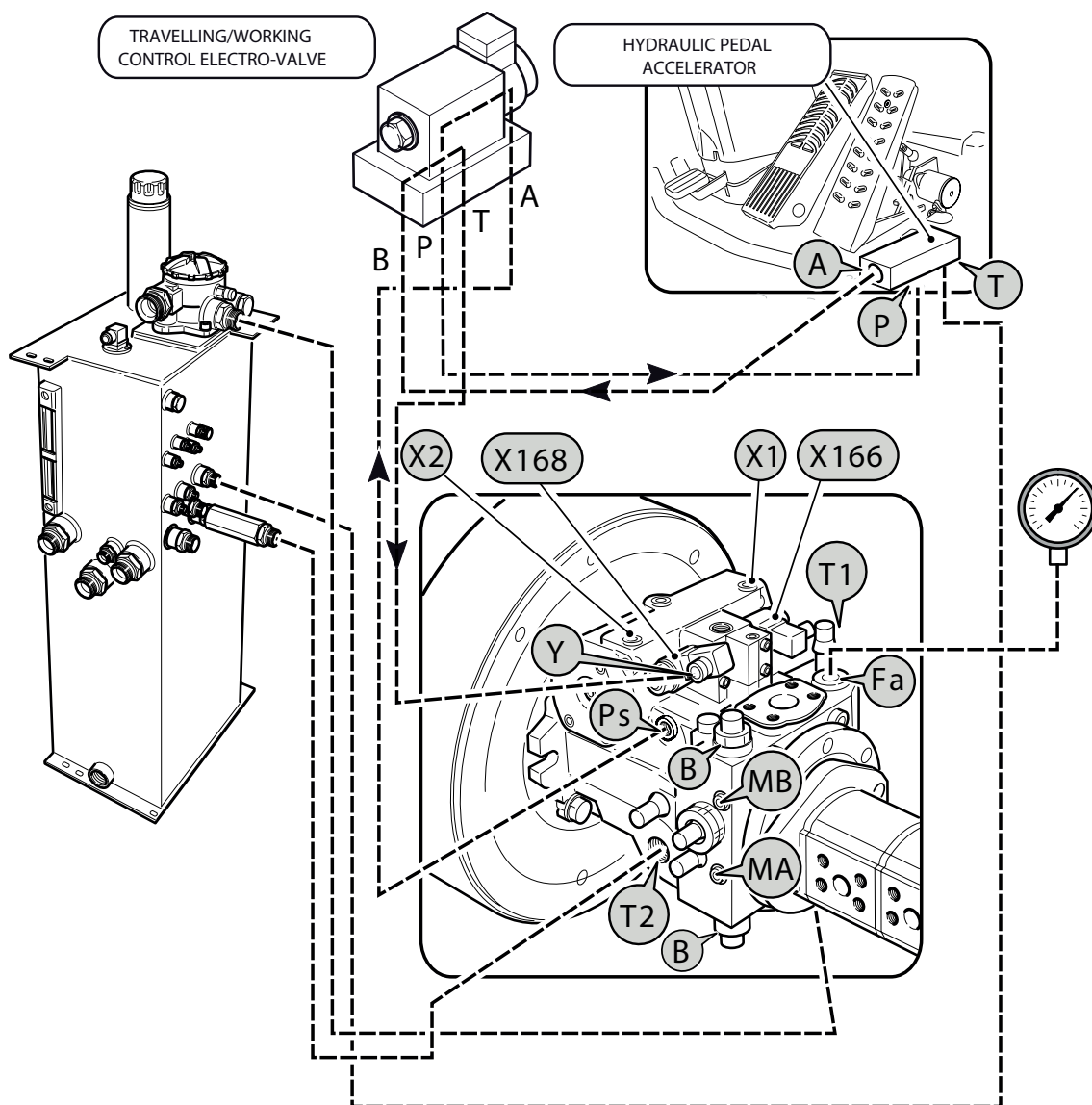


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10.1.8. Travelling/working control electro-valve

Such electro-valve is fitted closed to the manual cabin pump on the left side, it is energized by the switch in the cabin in order to pass from the working phase to travelling phase and vice versa.

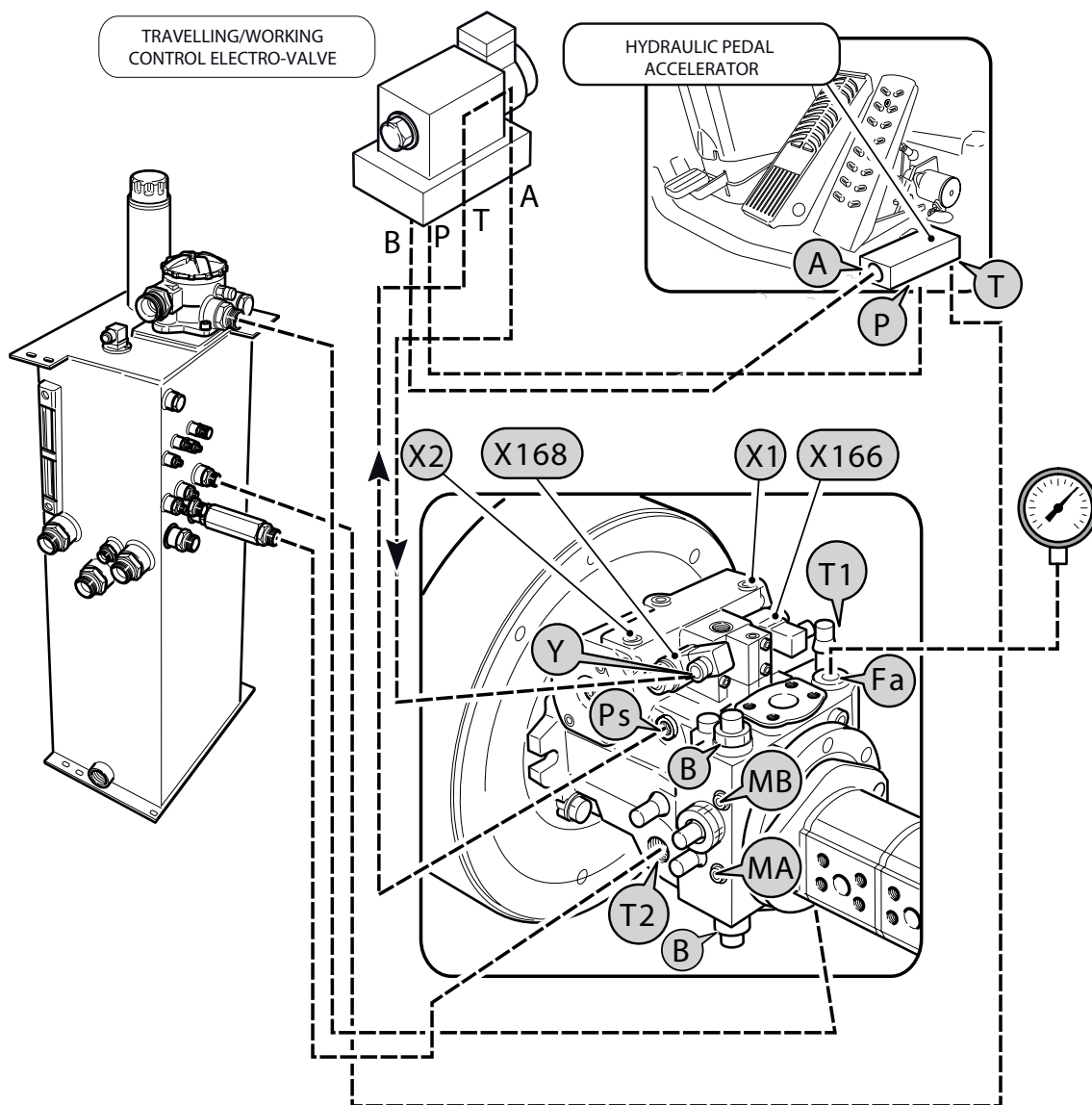
Working phase "A": in this phase, the hand accelerator is activated and the motion of sweeper is done through the hydraulic pedal accelerator.



Travelling phase "B":

in this phase, the electric pedal accelerator is activated and motion of sweeper is done through the same pedal.

In this phase the solenoid of the travelling/working electro-valve is energized in such a way that hydraulic pedal is in by-pass.



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10.2. Machine towing

In case of failure to the hydrostatic transmission the machine has to be towed at a max speed of 3 km/h, in order to do this open the two valves "B" on the pump that are both relief and by-pass valves. Remove the plastic caps, unlock the counter-nut by a 22 mm wrench and unscrew the allen screws with 4 mm wrench: counting exactly 3 turns.

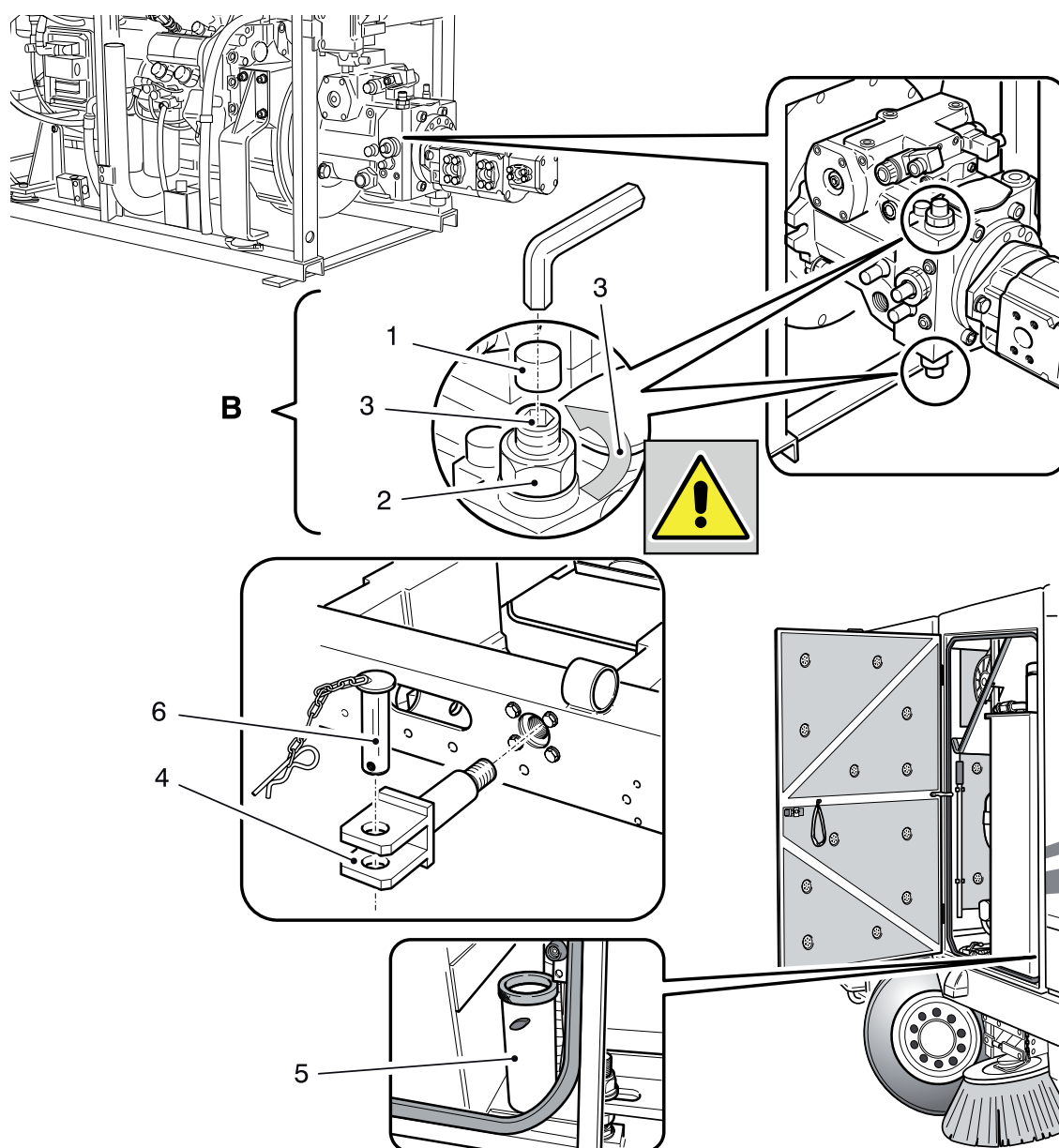
Take the tow hook (4) in the proper tube (5) situated on the conveyor side and screw it in the threaded hole in front of the chassis. Use also the pin (6).

The hand brake must be disconnected.



WARNING

Screw again the screws (3) with same turns at the end of the intervention.



CHAPTER 11
Electric system

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11.1. Main logics

11.1.1. Starting battery

No. 2 batteries of 12 volt and 135 Ah in series for a total of 24 volts.

11.1.2. Starting the machine

Starting of machine is carried out using the ignition switch (1) located on the dashboard.

As the diesel engine, with the 1st click, the air preheating and the diesel preheating start through the relays K04 and K02.

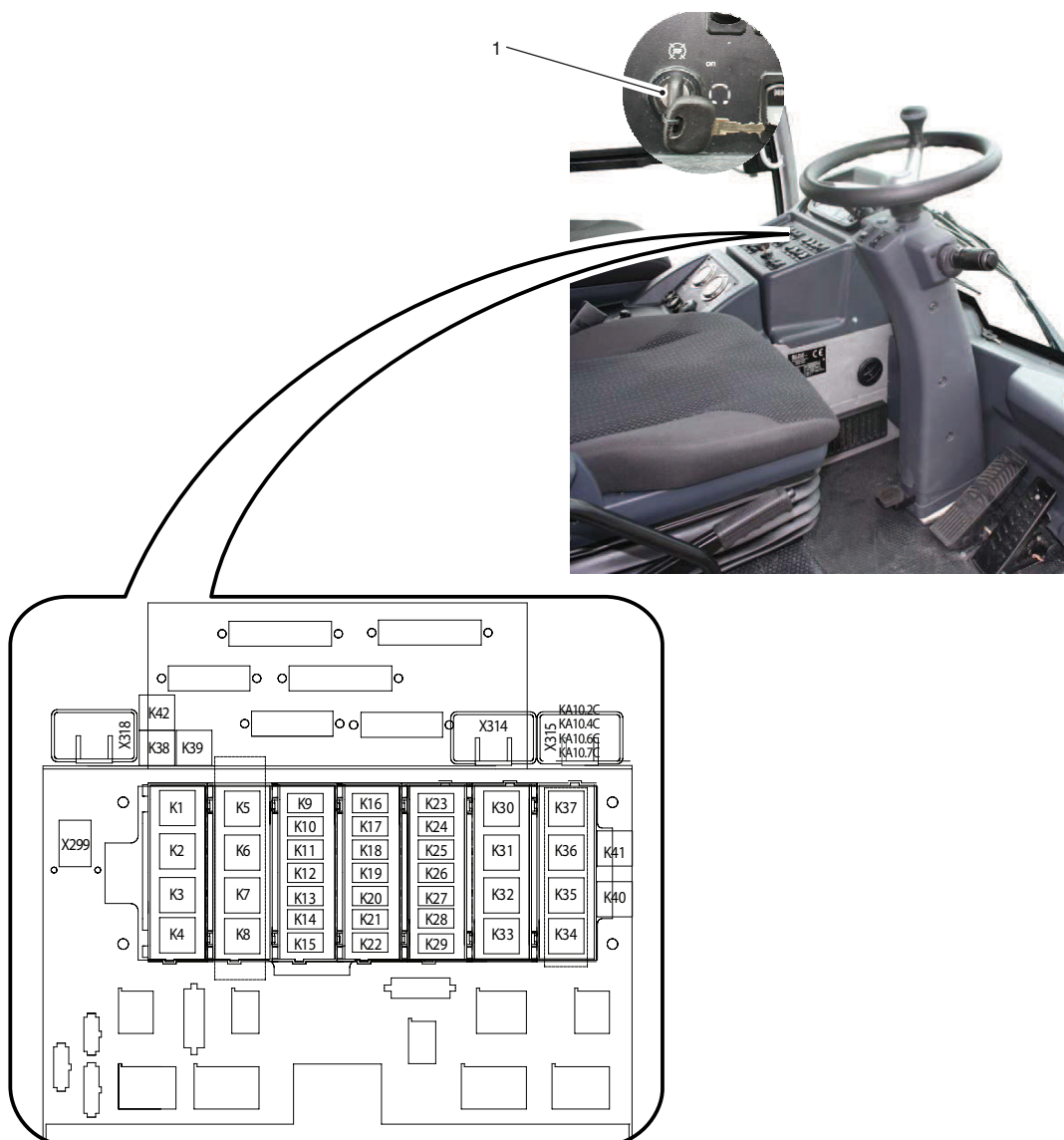
The relay K20 located under the dashboard realizes the safety that starting can only take place if the gear lever is in neutral position.

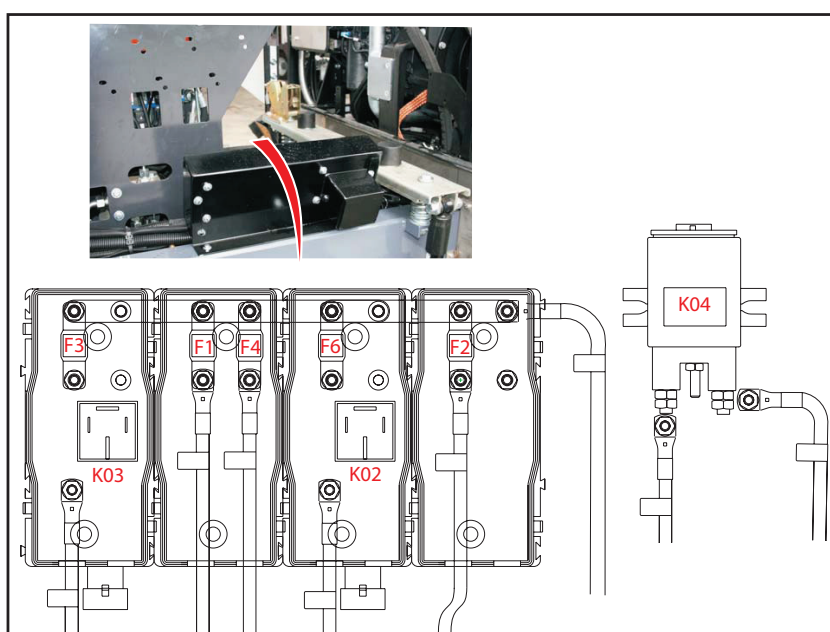
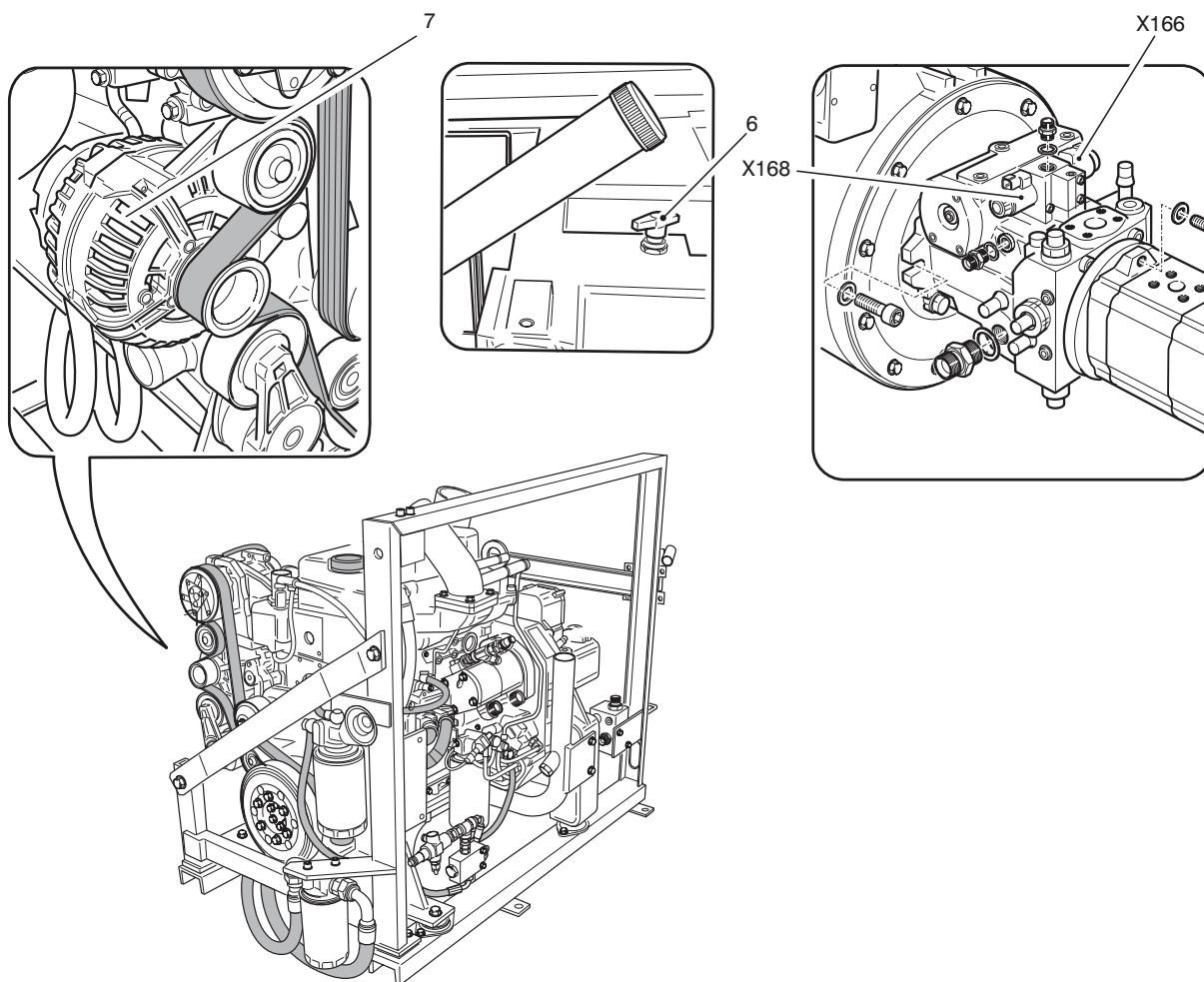
The fuse F3 of 30 ampere control the starting circuit.

The (6) is the manual battery switch to disconnect the batteries in case of emergency.

The (7) is the 90 Ampere alternator.

The "Forward and Reverse" switch directly controls the two solenoids placed on the hydrostatic pump: X166 for reverse gear and X168 for forward gear.

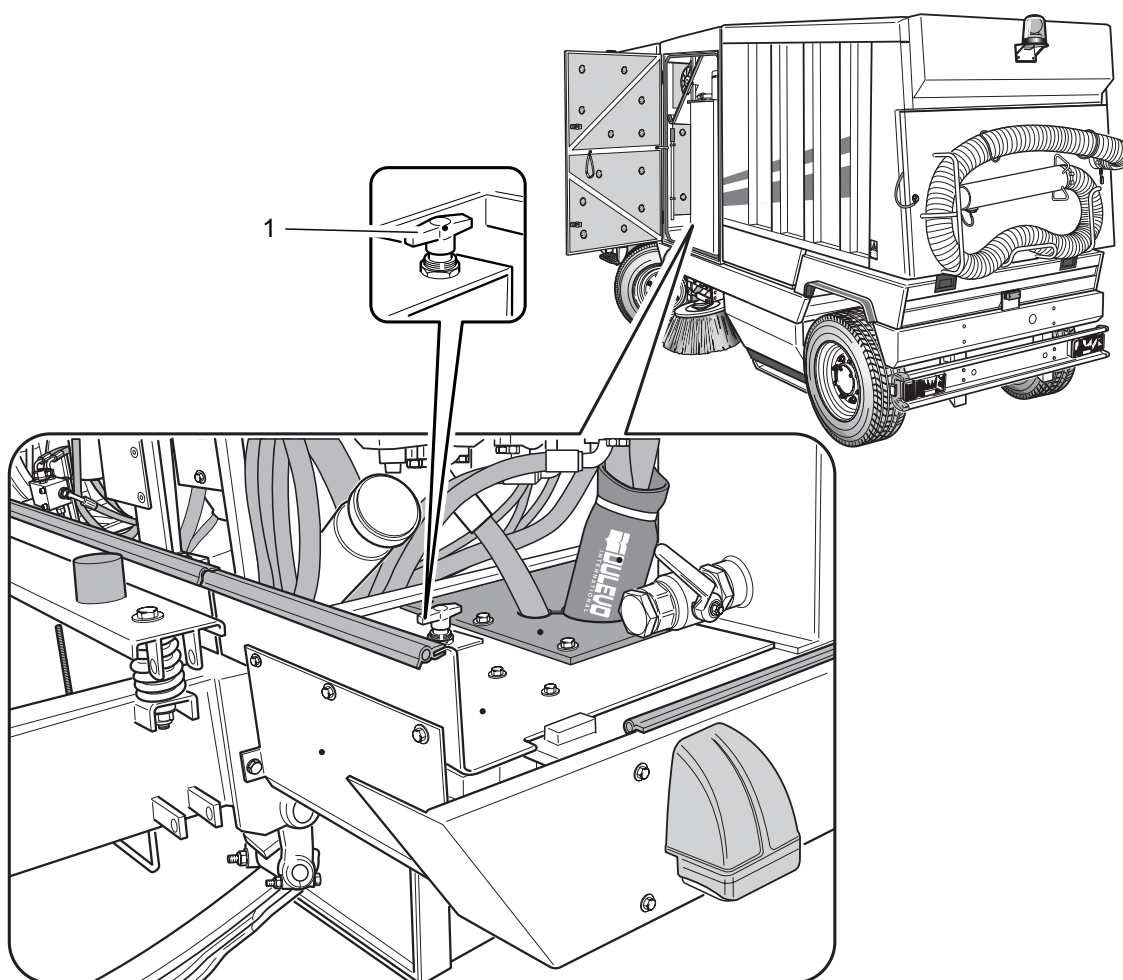




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11.1.3. Manual battery switch

Such switch (1) insulate batteries for maintenance interventions or in case of danger.
Such device is located behind the cabin, covered by the left hand door.



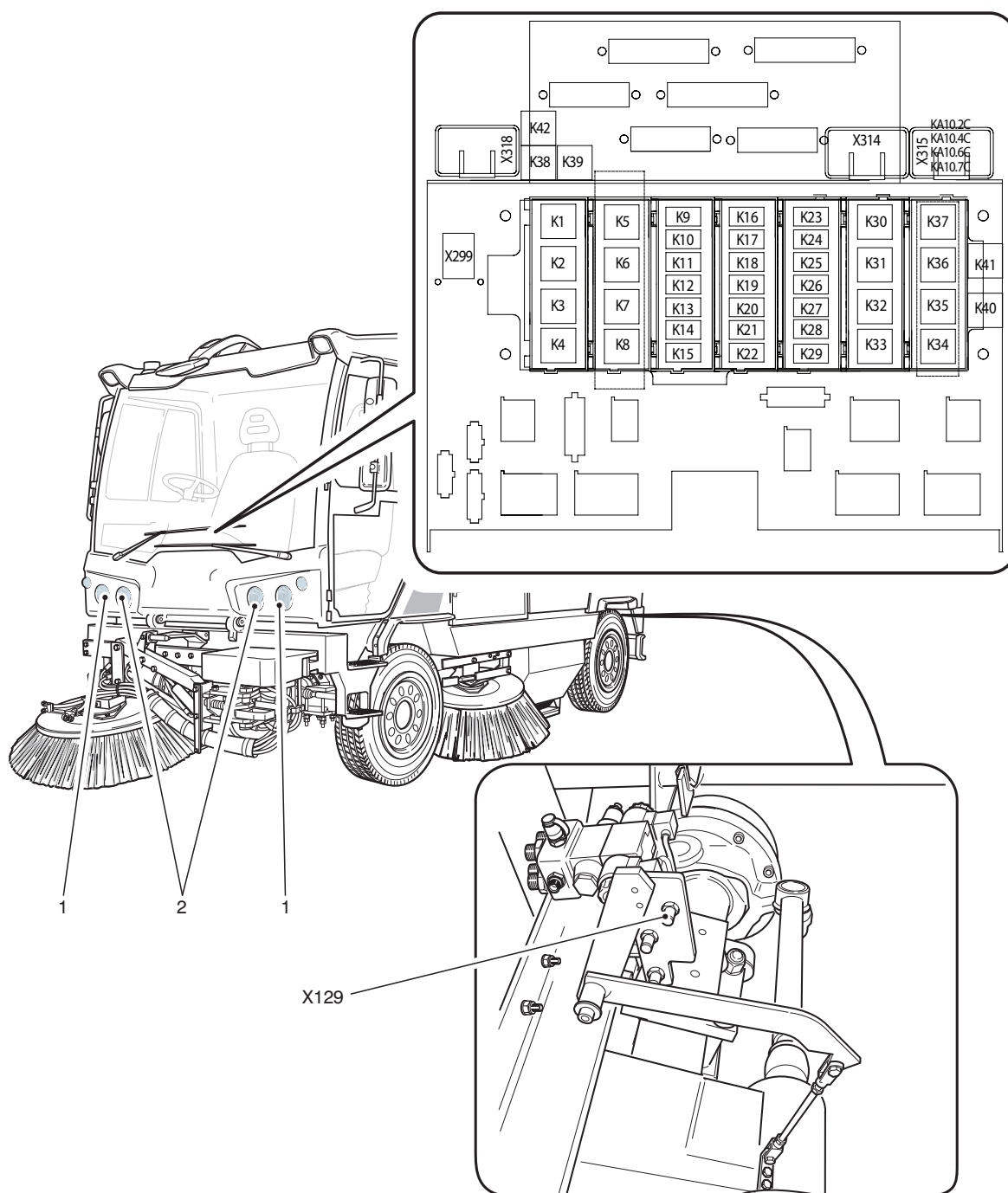
11.1.4. Front lights

The machine is equipped with no. 4 front lights with different orientation to the ground:

- No. 2 outer lights for travelling phase (1)
- No. 2 inner lights for working phase (2)

The exchange occurs automatically when rear hydraulic suspensions is lowered by energizing the sensor (X129).

Such sensor energizes the K10 relay then K11 and K12 relays to exchange the dipped headlights and the main beam headlights.

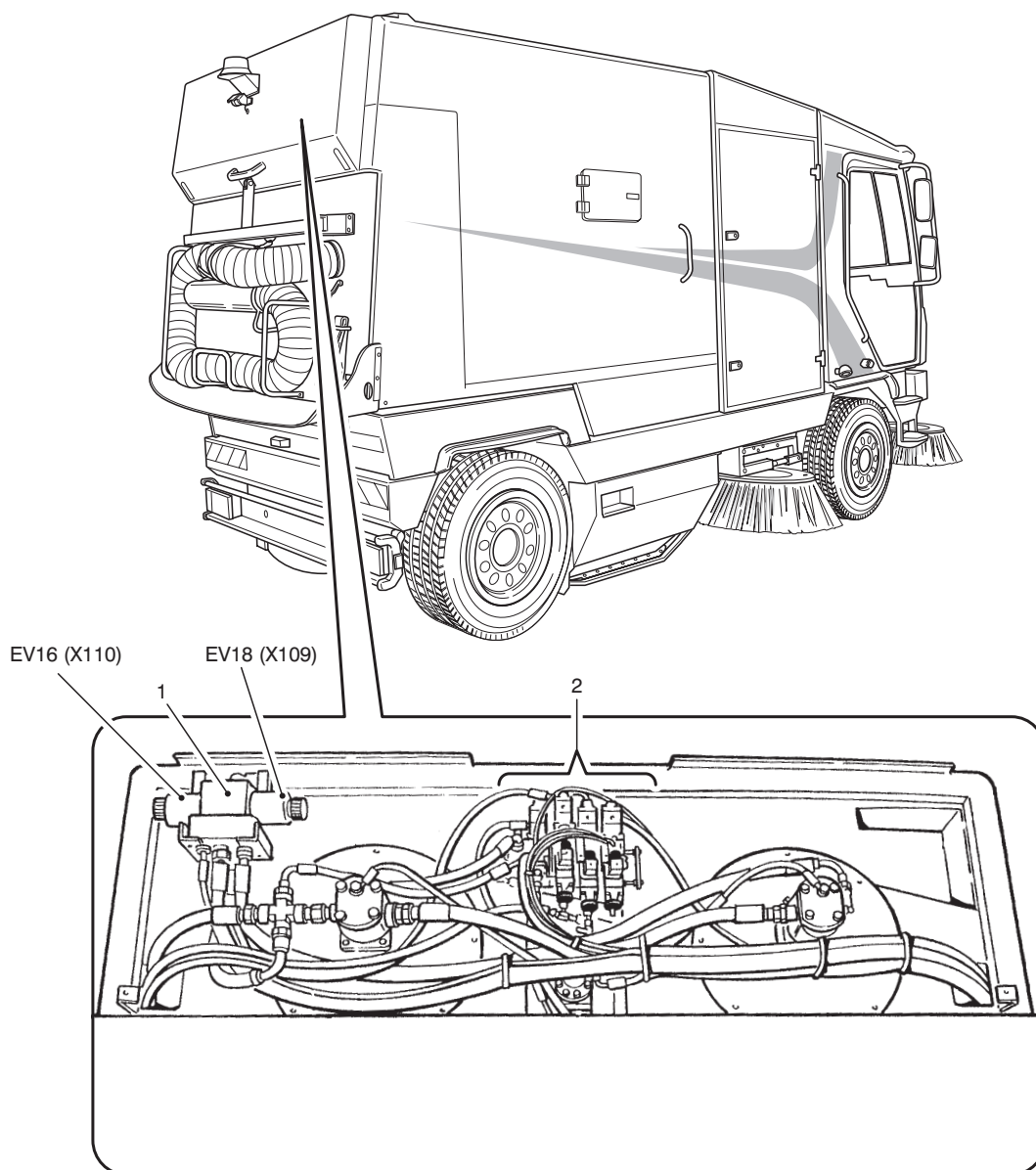


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11.1.5. Hopper

The solenoid valve for turbines operation is the EV16.

All other hopper functions (see hydraulic scheme) are controlled by electro-valves block (2): whenever a hopper function is activated, the EV18 solenoid valve is energized.



11.1.6. Rear suspensions levelling

The lever (L) connecting the chassis to rear axle moves and enables sensors (X127, X128, X129) PNP inductive type.

When the sensor is energized, the little led on the back is switched on.

During the travelling phase the lever shifts between sensors (X127) and (X128).

If the lever energizes sensor (X128), the latter energizes through the K1 and K5 relays, the solenoid (EV4) by injecting oil into cylinders (C) and lifting hydraulic suspensions.

If the lever energizes sensor (X127), the latter energizes through the K1 and K5 relays, the solenoid (EV5), by taking oil from cylinders and lowering suspensions.

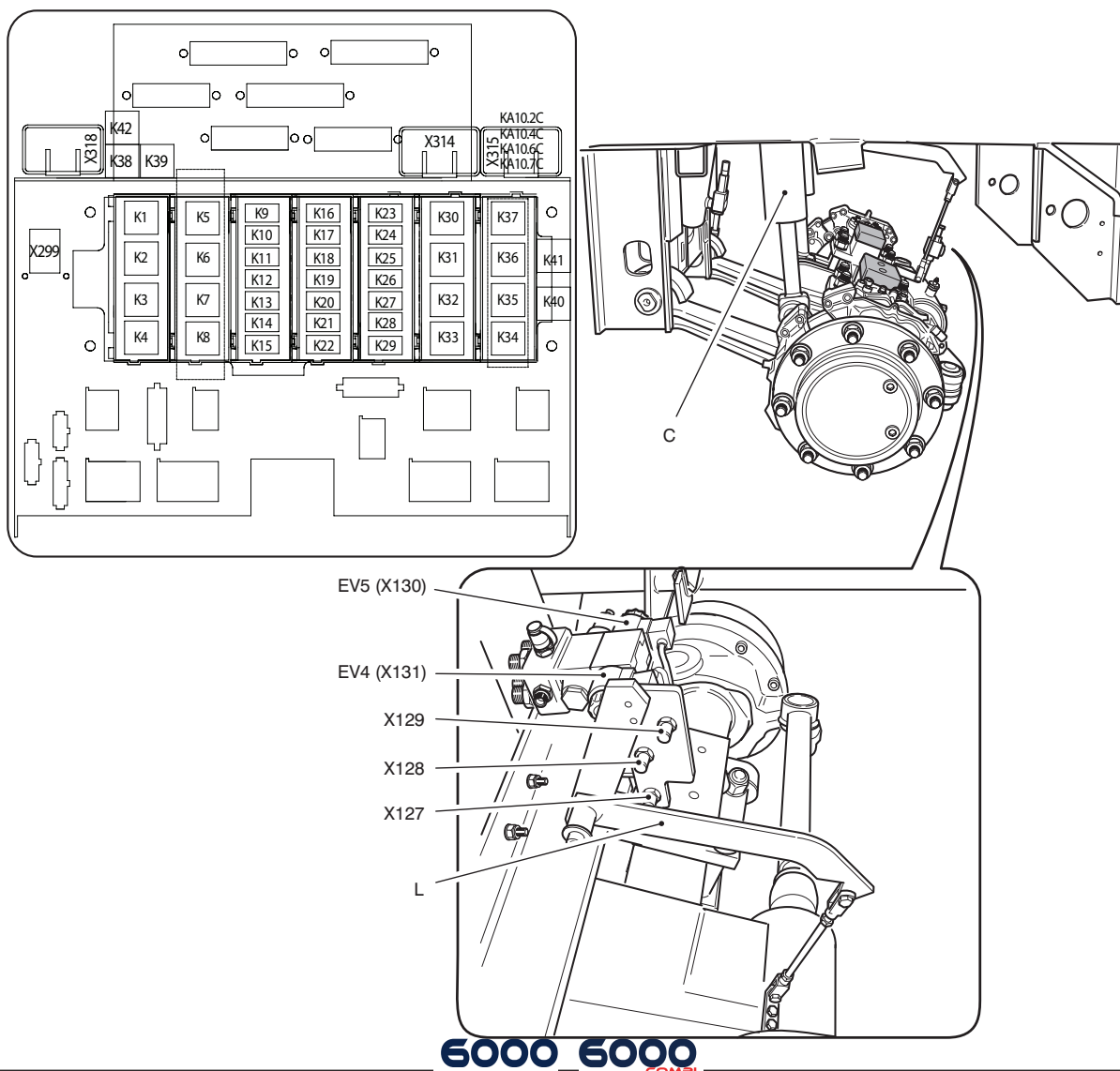
The two solenoids (EV4) and (EV5) can be energized also directly by suspensions manual switch for shifting of operator's choice.

During the working phase the lever energizes the sensor (X129), that energizes the K10 relay which sends to the cabin the "machine in working position" signal, keeps energized the solenoid (EV5) and exchanges dipped headlights and main beam headlights through the K11 and K12 relays.



WARNING

Lever (L) has to be checked since there must be no clearance on the rotary pin and it has to keep a distance from the sensor of 2-4 mm; if the value is higher it does not energize it, if it is lower it could break the sensor.



11.1.7. Third brush

To enable the joystick on the door, the operator must first use the switch of the brush rotation. In the block (1) of the electro-distributor there is a “General” solenoid Y32 to all other solenoids of the block, that is, the electrical system is made so that when you energize any one solenoid of the block also “General” must be energized, the otherwise nothing works.

The block (5) of the electro-distributor can also be controlled by two sensors for the automatic return of the brush in case of impact.



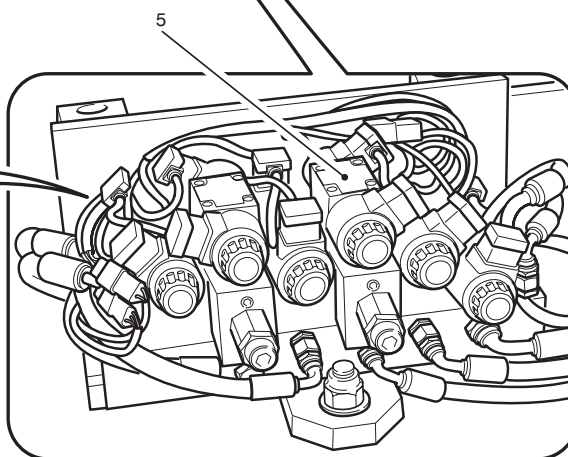
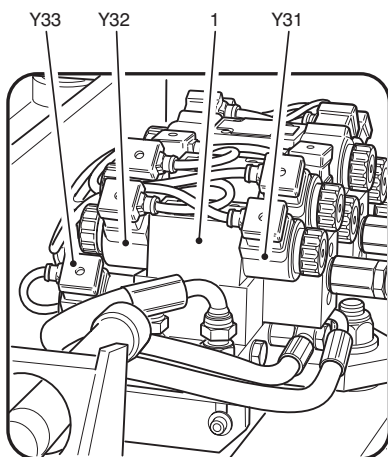
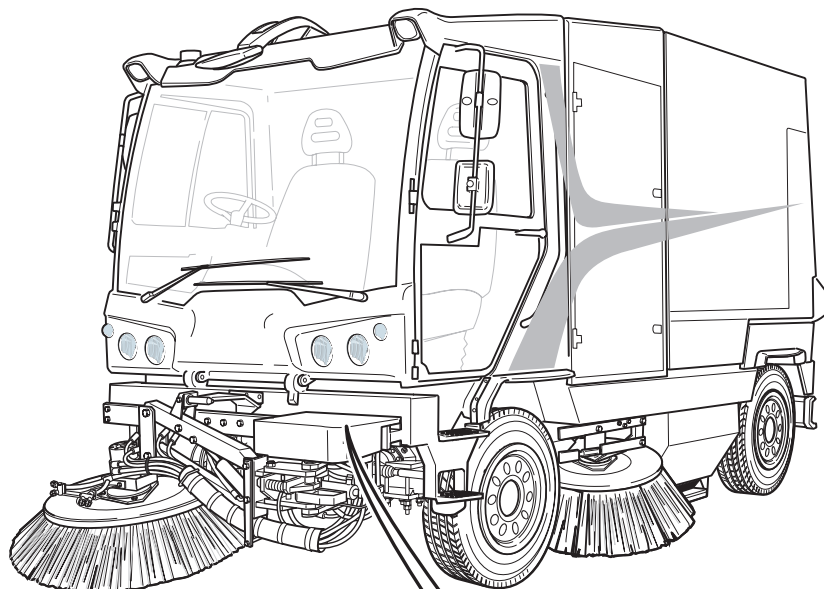
N.B.

In case of automatic return it's necessary to eliminate the clearance of the brush arm and adjust the sensors position through proper slots.



N.B.

The sensors are PNP inductive type and the back led is switched on when are in action.



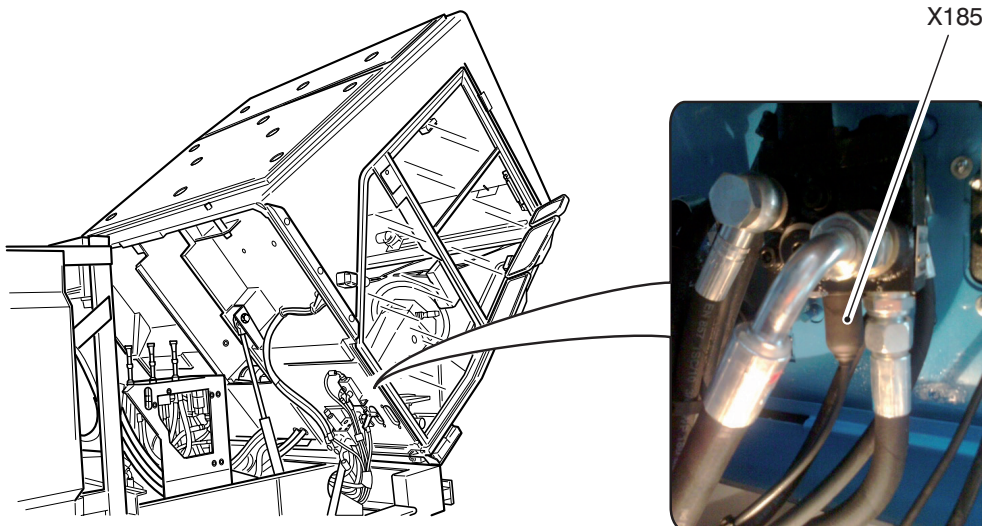
6000 6000
COMBI

11.1.8. Stop lights

The stop lights turn on when the brake pedal is pressed, that is when hydraulic pressure of the brake circuit increases: in this case the pressure-switch (X185) fitted under the brake pedal, sends a direct signal to the stop lights. Such pressure-switch is normally open and can be adjusted by means the screw under the plastic cap.



N.B.
The pressure-switch is controlled by K16 relay.



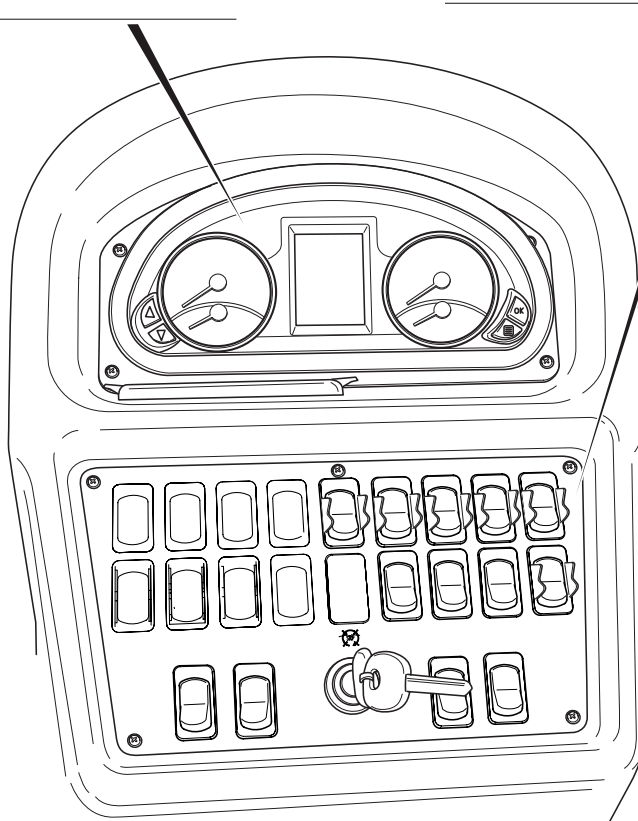
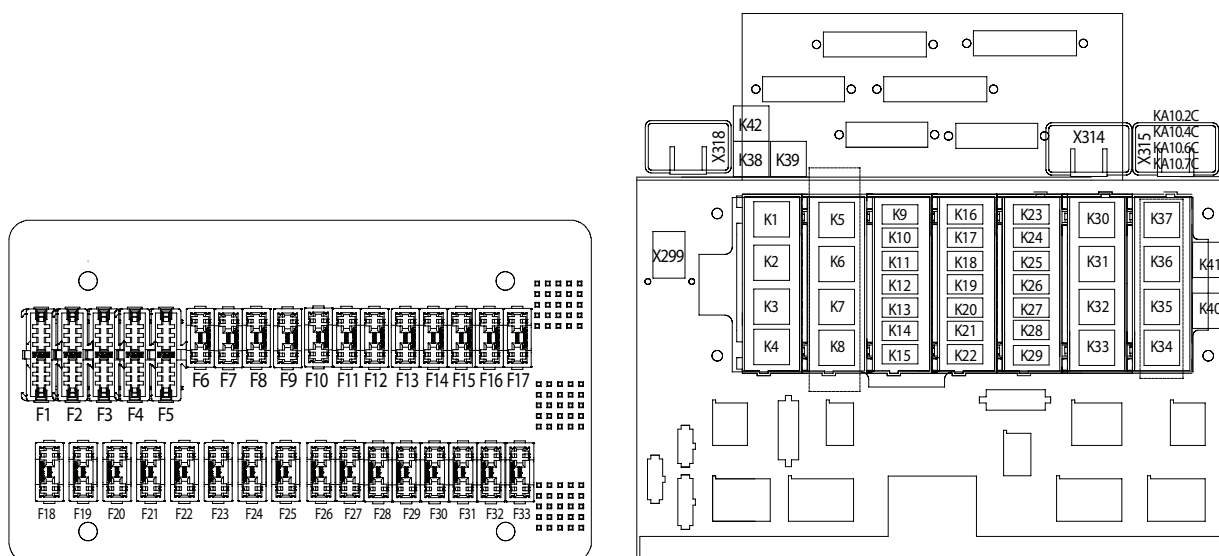
11.2. Main components

11.2.1. Cabin fuses and relays (EU4 - EURO5 - EURO6)

Such components are located under the dashboard as in the picture.

FUSES - (EU4 – EURO5 – EURO6)

F1	20A	Exhaust manifold throttle valve (EURO6)
F1		Free (EU4 – EURO5)
F2	20A	NOx sensors (EURO6)
F2		Free (EU4 – EURO5)
F3	20A	Air-conditioner
F4	10A	Pneumatic seat
F5		Free (EURO6)
F5	20A	Adblue module (EURO5)
F6	15A	Lights lever
F7	5A	Brake system transducers
F8	7.5A	Hopper waste functions
F9	15A	Windscreen wiper – radio – 12V auxiliary plug
F10	10A	Indicator lights
F11	5A	Warning lights
F12	10A	Water tanks exchange valve (6000 Combi)
F13	10A	Water pump
F14	5A	Stop lights
F15	10A	Forward&reverse gear lever
F16	7.5A	andrive electrovalve (EURO6) – traction pump piloting electrovalve – GPS (+15)
F16	7.5A	Adblue module + 15 (EURO5)
F17	5A	Engine ECU
F18	5A	Reverse buzzer&light
F19	5A	Suspensions
F20	10A	Hazard lights
F21	5A	Courtesy light
F22	15A	Rotating beacons
F23	5A	Parking lights
F24	5A	Parking lights
F25		Free
F26	15A	Cabin electro-fan
F27	10A	Brushes
F28	10A	Dipped headlights
F29	10A	Camera – Horn
F30	10A	Front & Rear working lights
F31	10A	3 rd brush (opt.)
F32	10A	Water electrovalves
F33	10A	Main beam headlights



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COMBI

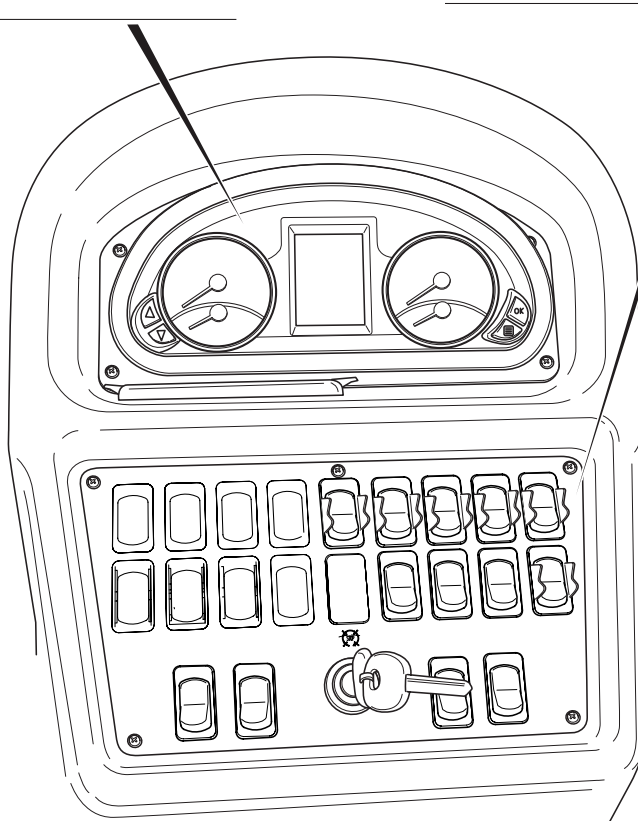
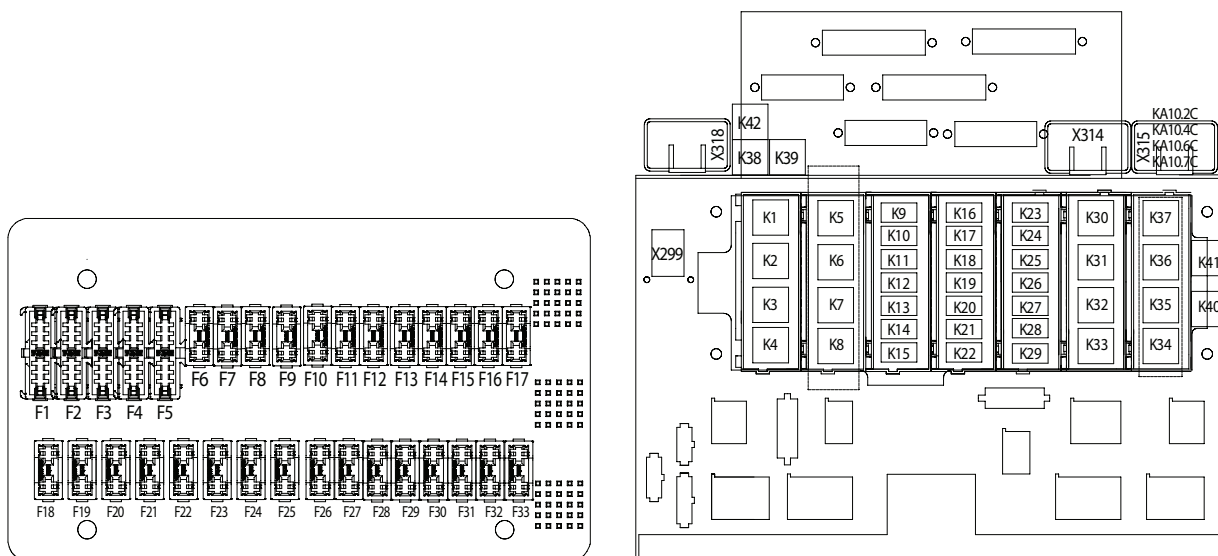


RELAYS - (EU4 – EURO5 – EURO6)

K1	Suspension (static relay)
K2	Rear fog light
K3	Air-conditioner
K4	High pressure water pump
K5	Suspension (static relay)
K6	Indicator lights intermittence
K7	3rd brush water electrovalve RH (OPT.)
K8	3rd brush water electrovalve LH (OPT.)
K9	Rotating beacons
K10	Lights exchange
K11	Dipped headlights exchange
K12	Main beam headlights exchange
K13	Main beam headlights
K14	Dipped headlights
K15	Horn
K16	Stoplights
K17	Water tanks exchange valve (6000 Combi)
K18	Water tanks exchange valve (6000 Combi)
K19	Water pump
K20	Starting safety
K21	First windscreen speed
K22	Second windscreen speed
K23	Forward gear
K24	Reverse gear
K25	Free
K26	Free
K27	Free (EURO6)
K27	Resistances module FPT/IVECO (EU4 – EURO5)
K28	Working lights
K29	Central brush lifting in reverse gear
K29	Free (EURO5)
K30	Central brush
K31	Central brush timer relay
K32	Left side brush
K33	Right side brush
K34	Left brush water electrovalve
K35	Right brush water electrovalve
K36	RH 3 rd brush rotation electrovalve (OPT.)
K37	LH 3 rd brush rotation electrovalve (OPT.)
K38	Key supplement
K39	Suction turbines electrovalve
K40	Wandering hose water (OPT.)
K41	Engine auxiliary for fuses F1 and F2 (EURO6)
K41	Traction pump piloting electrovalve (EU4 – EURO5)
K42	Conveyor reverse rotation (EU4 – EURO6)
X299	Windscreen wiper intermittence

OTHER COMPONENTS

X135	3 rd brush relay box	
	KA10.2C	3 rd brush sensor for right return (OPT.)
	KA10.4C	3 rd brush sensor for left return (OPT.)
	KA10.6C	3 rd brush lowering (OPT.)
	KA10.7C	3 rd brush lifting (OPT.)
X314	3 rd brush diodes box (OPT.)	
X318	Water electrovalves diode box	

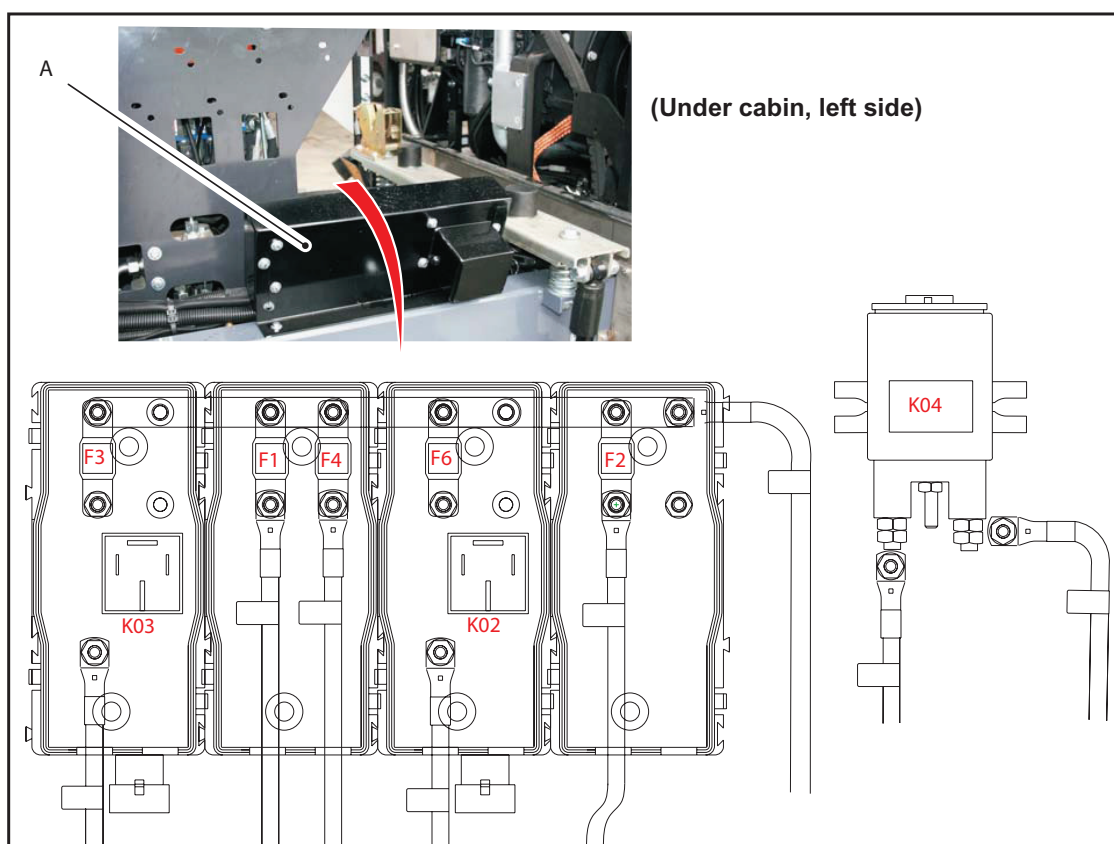


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COMBI

11.2.2. Power fuses and engine relays (EU4 – EURO5 – EURO6)

Tilt the cabin and remove the cover (A) unscrewing the related screws.

K02	Fuel filters preheating relay
K03	Starting relay
K04	Air preheating grid relay
F1	Engine fuse 30A
F2	Ignition key general fuse 70A
F3	Starting relay fuse 30A
F4	Air preheating grid fuse 100A
F6	Fuel filters preheating fuse 30A



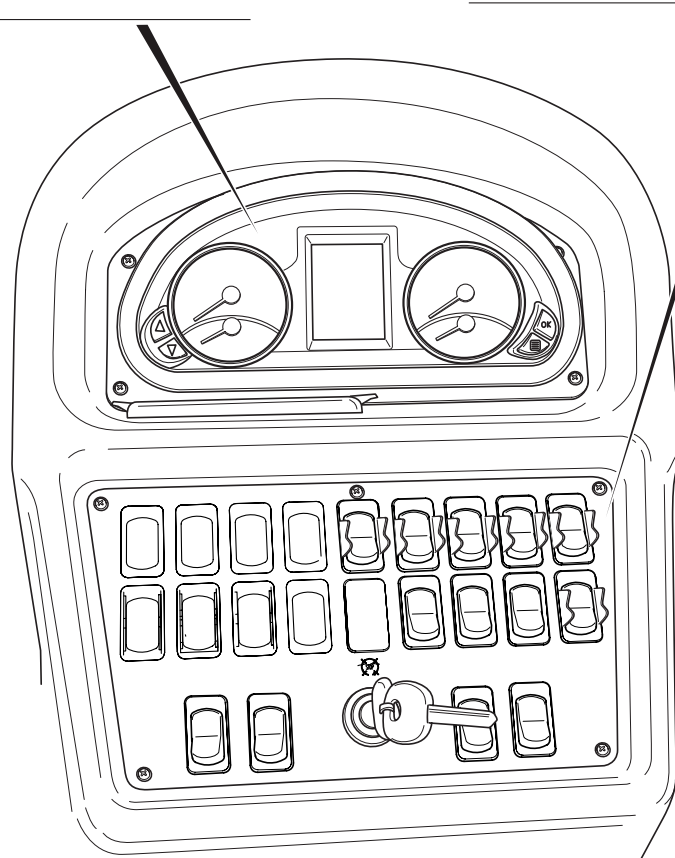
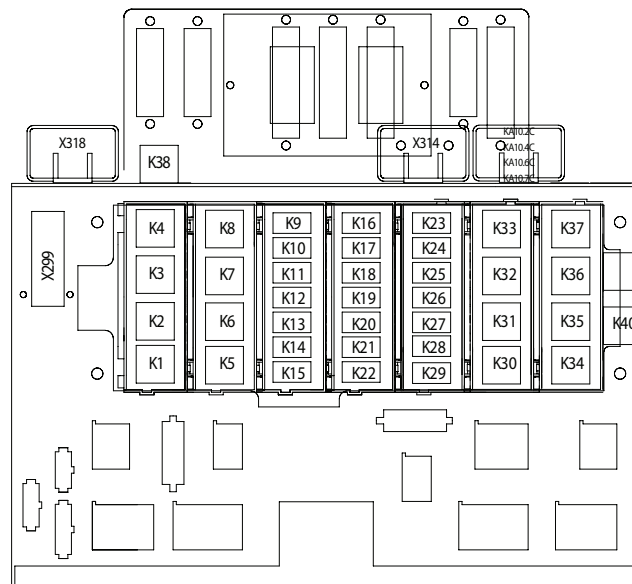
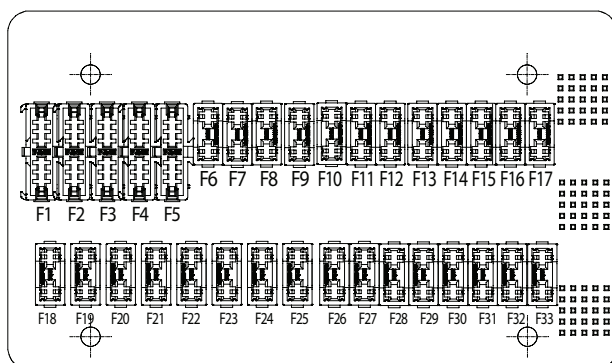
6000 6000
COMBI

11.2.3. Cabin fuses and relays (TIER3)

Such components are located under the dashboard as in the picture.

FUSES - (TIER3)

F1	10A	Hopper waste functions
F2	10A	Suspensions sensors
F3	20A	Air-conditioner
F4	10A	Pneumatic seat
F5		Free
F6	15A	Lights lever
F7	5A	Brake system transducers
F8	10A	Hopper waste functions (electrovalves)
F9	15A	Windscreen wiper – radio – 12V auxiliary plug
F10	10A	Indicator lights
F11	5A	Warning lights
F12	10A	Water tanks exchange valve (6000 Combi)
F13	10A	Water pump
F14	5A	Stop lights
F15	10A	Forward&reverse gear lever
F16	10A	Traction pump piloting electrovalve – GPS (+15) – cabin control unit
F17	5A	Engine ECU
F18	5A	Reverse buzzer&light
F19		Free
F20	10A	Hazard lights
F21	5A	Courtesy light
F22	15A	Rotating beacons
F23	5A	Parking lights
F24	5A	Parking lights
F25	10A	Chassis control unit (power supply)
F26	15A	Cabin electro-fan
F27	10A	Brushes
F28	10A	Dipped headlights
F29	10A	Camera – Horn
F30	10A	Front & Rear working lights
F31	10A	3 rd brush (OPT.)
F32	10A	Water electrovalves
F33	10A	Main beam headlights



6000 6000
COMBI

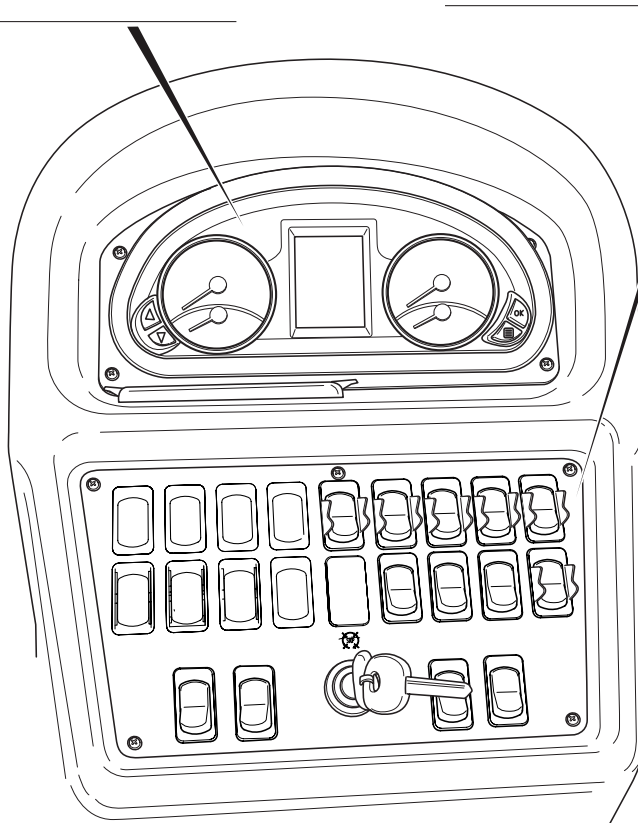
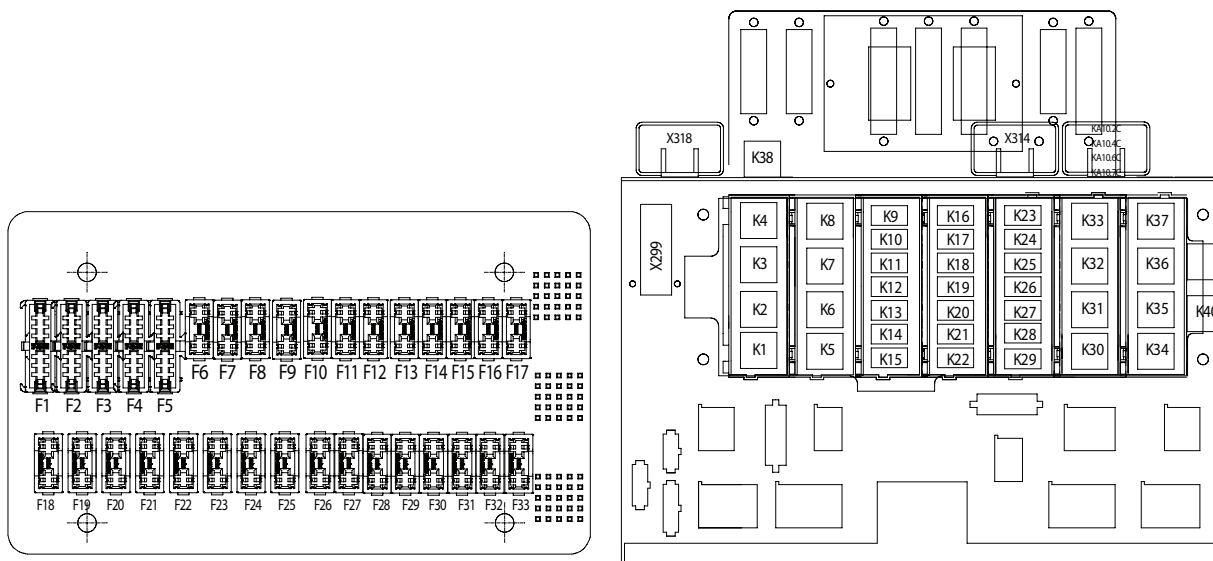


RELAYS - (TIER3)

K1	Free
K2	Rear fog light
K3	Air-conditioner
K4	High pressure water pump
K5	Free
K6	Indicator lights intermittence
K7	3 rd brush water electrovalve RH (OPT.)
K8	3 rd brush water electrovalve LH (OPT.)
K9	Rotating beacons
K10	Free
K11	Dipped headlights exchange
K12	Main beam headlights exchange
K13	Main beam headlights
K14	Dipped headlights
K15	Horn
K16	Stoplights
K17	Water tanks exchange valve (6000 Combi)
K18	Water tanks exchange valve (6000 Combi)
K19	Water pump
K20	Starting safety
K21	First windscreen speed
K22	Second windscreen speed
K23	Forward gear
K24	Reverse gear
K25	Free
K26	Free
K27	Free
K28	Working lights
K29	Free
K30	Free
K31	Free
K32	Left side brush
K33	Right side brush
K34	Left brush water electrovalve
K35	Right brush water electrovalve
K36	RH 3 rd brush rotation electrovalve (OPT.)
K37	LH 3 rd brush rotation electrovalve (OPT.)
K38	Key supplement
K39	Free
K40	Wandering hose water (OPT.)
X299	Windscreen wiper intermittence

OTHER COMPONENTS

X315	3 rd brush relay box	
	KA10.2C	3 rd brush sensor for right return (OPT.)
	KA10.4C	3 rd brush sensor for left return (OPT.)
	KA10.6C	3 rd brush lowering (OPT.)
	KA10.7C	3 rd brush lifting (OPT.)
X314	3 rd brush diodes box (opt.)	
X318	Water electrovalves diode box	

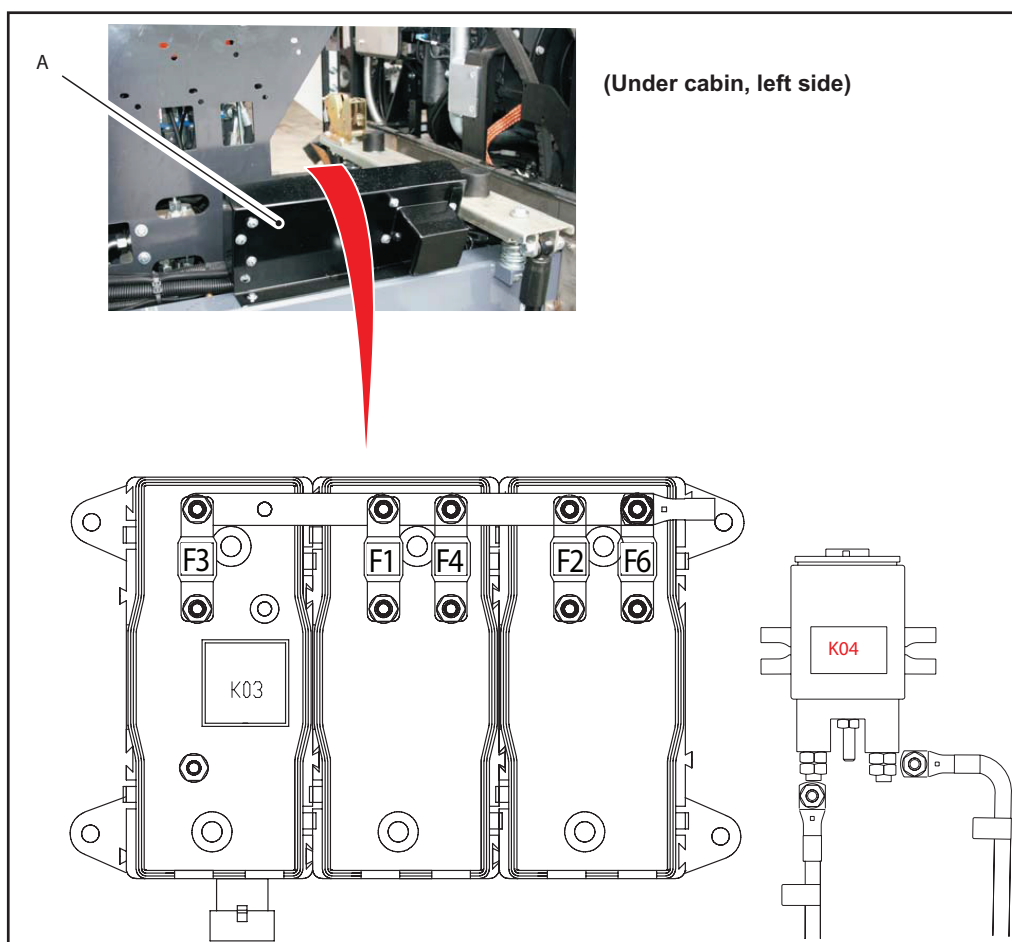


6000 6000
COMBI

11.2.4. Power fuses and engine relays (TIER3)

Tilt the cabin and remove the cover (A) unscrewing the related screws.

K03	Starting relay
K04	Air preheating grid relay
F1	Engine fuse 30A
F2	Ignition key general fuse 70A
F3	Starting relay fuse 20A
F4	Air preheating grid fuse 100A
F6	Alternator fuse 80A



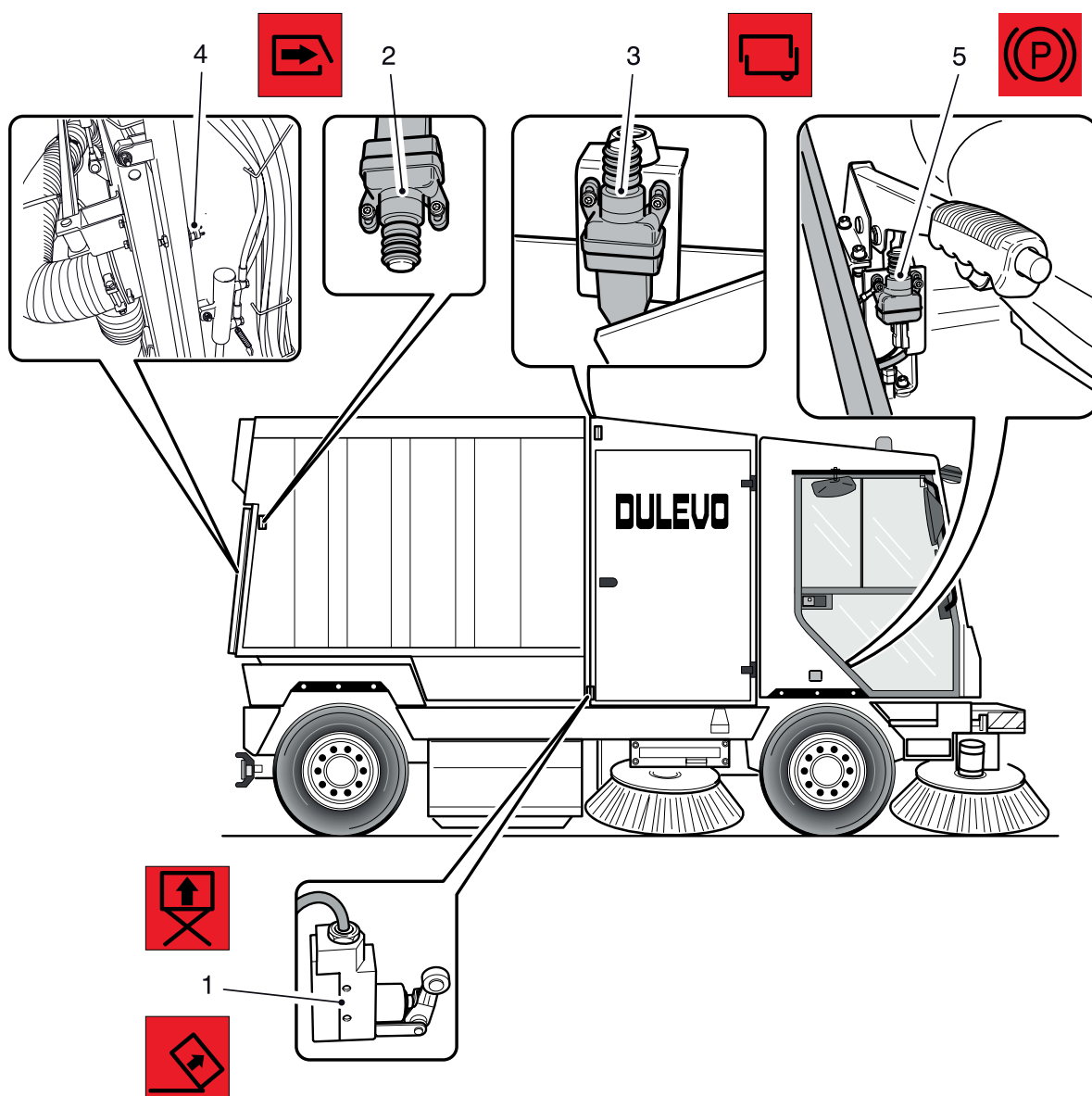
6000 6000
COMBI

11.2.5. Micro-switches for warning lights (normally closed)

The machine is equipped with 5 Micro-switches for warning lights:

1. detect if the hopper is completely lowered
2. detect if the rear door of hopper is locked
3. detect if the conveyor shutter is closed
4. detect if the rear door of hopper is closed (only TIER3 – TIER4)
5. detect if handbrake is engaged

In all cases the 5 micro-switches indicate the anomaly, if any, with the turning on of a red warning light on the cabin dashboard.



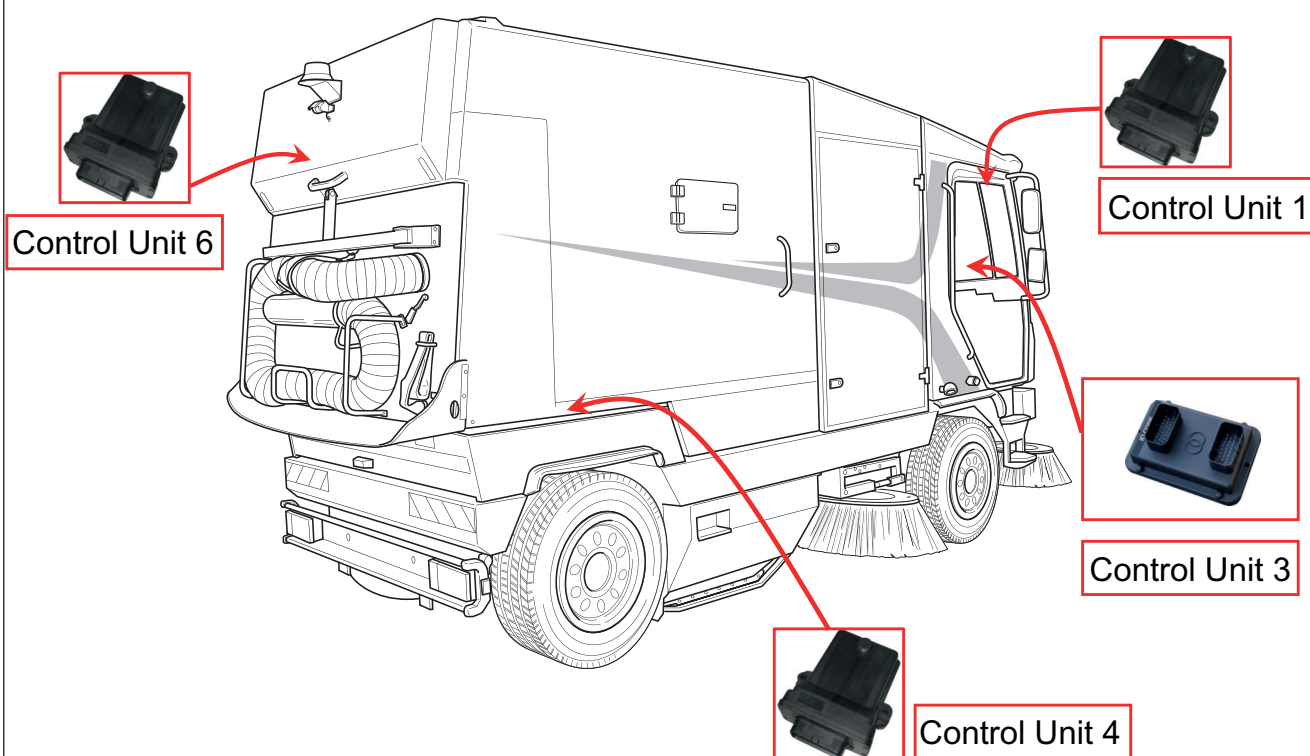
11.2.6. Electronic control units

Control unit 1 (EURO6 – TIER3 – TIER4) – Control unit that manages traction pump piloting electrovalve, fandrive electrovalve, engine revolutions in the working phase

Control unit 3 (TIER3 – TIER4) – Control unit that converts analog signals into digital signals for the open Can Bus line

Control unit 4 (TIER3 – TIER4) – Control unit that manages waste hopper position, suspensions, central brush lowering, conveyor rotation

Control unit 6 (TIER3 – TIER4) – Control unit that manages waste hopper functions

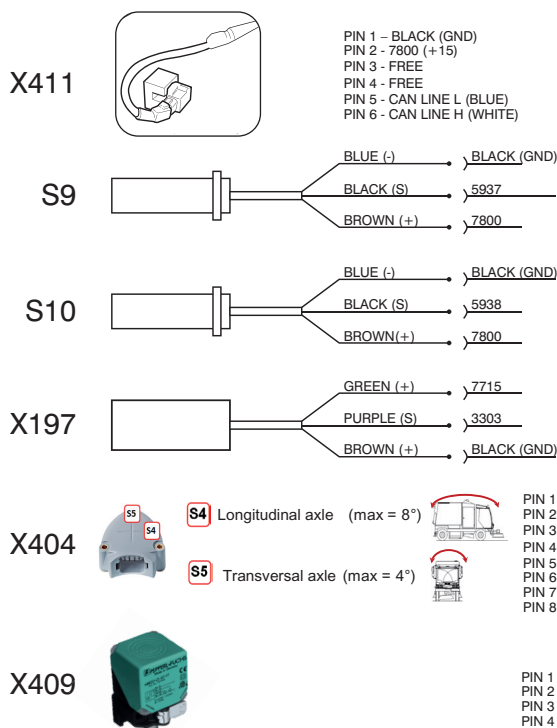
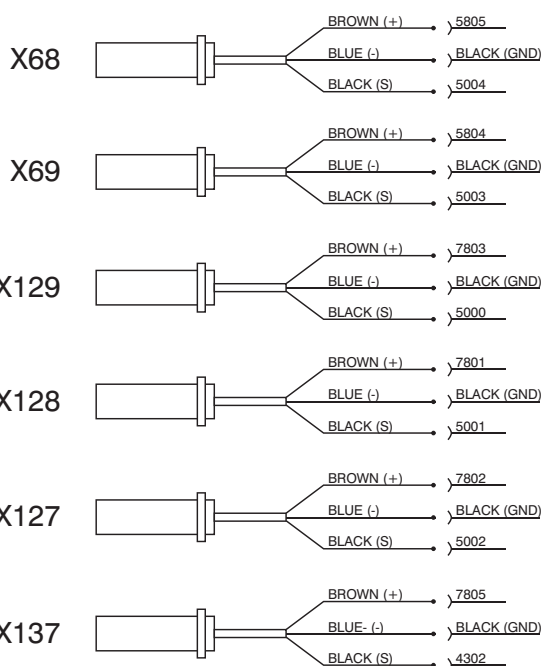


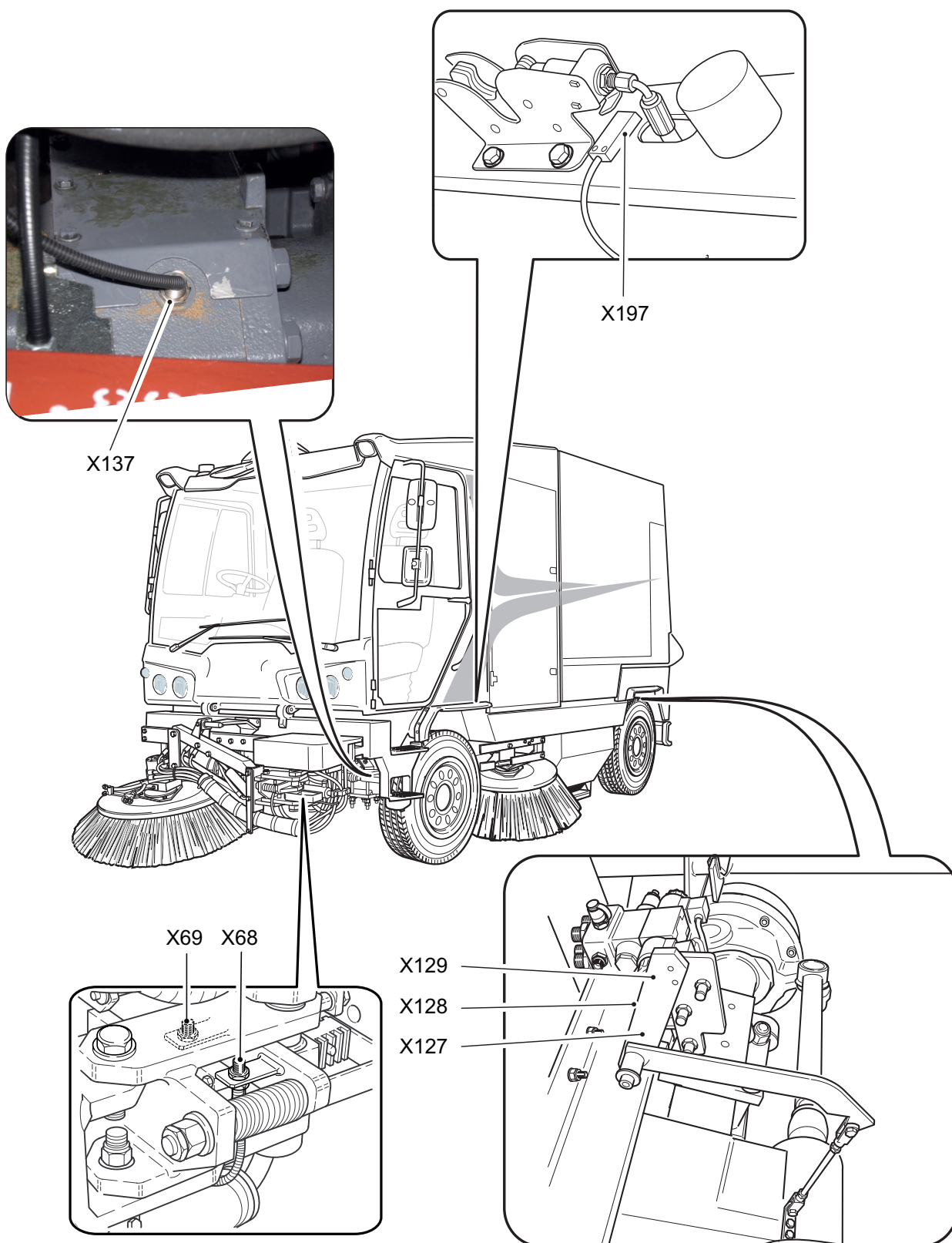
6000 6000
COMBI

11.2.7. Sensors

The sensors present on sweeper are:

X68	3 rd brush safety sensor (return to right side): PNP inductive sensor
X69	3 rd brush safety sensor (return to left side): PNP inductive sensor
X129	front lights exchange sensor: PNP inductive sensor
X128	rear suspension lifting sensor: PNP inductive sensor
X127	rear suspension lowering sensor: PNP inductive sensor
X137	speedometer sensor (located on front axle): NPN inductive sensor
X197	cabin hook sensor: NPN inductive sensor
X411	suspension angular sensor: CAN BUS sensor (only on TIER3 – TIER4)
X404 (5A)	inclinometer sensor: CAN BUS sensor (only on TIER3 – TIER4)
X 409 (5B)	waste hopper position sensor: PNP inductive sensor (only on TIER3 – TIER4)
S9	right cylinder door sensor: PNP inductive sensor (only on TIER3 – TIER4)
S10	left cylinder door sensor: PNP inductive sensor (only on TIER3 – TIER4)

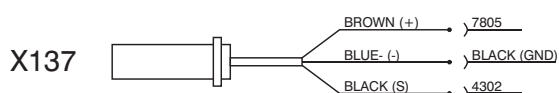
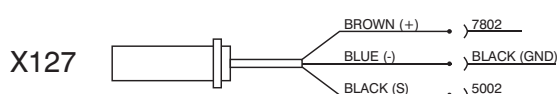
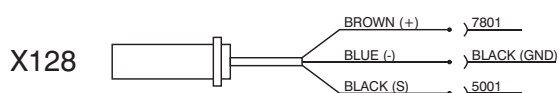
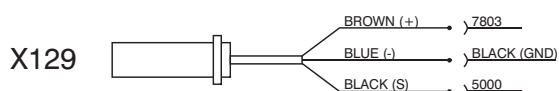
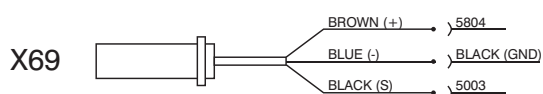
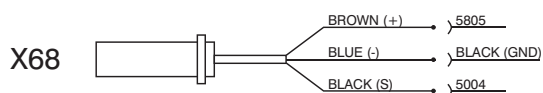




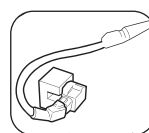
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COMBI

The sensors present on sweeper are :

X68	3 rd brush safety sensor (return to right side): PNP inductive sensor
X69	3 rd brush safety sensor (return to left side): PNP inductive sensor
X129	front lights exchange sensor: PNP inductive sensor
X128	rear suspension lifting sensor: PNP inductive sensor
X127	rear suspension lowering sensor: PNP inductive sensor
X137	speedometer sensor (located on front axle): NPN inductive sensor
X197	cabin hook sensor: NPN inductive sensor
X411	suspension angular sensor: CAN BUS sensor (only on TIER3 – TIER4)
X404 (5A)	inclinometer sensor: CAN BUS sensor (only on TIER3 – TIER4)
X 409 (5B)	waste hopper position sensor: PNP inductive sensor (only on TIER3 – TIER4)
S9	right cylinder door sensor: PNP inductive sensor (only on TIER3 – TIER4)
S10	left cylinder door sensor: PNP inductive sensor (only on TIER3 – TIER4)

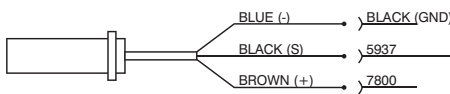


X411

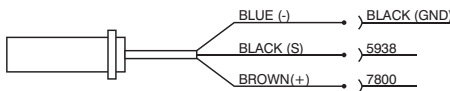


PIN 1 - BLACK (GND)
PIN 2 - 7800 (+15)
PIN 3 - FREE
PIN 4 - FREE
PIN 5 - CAN LINE L (BLUE)
PIN 6 - CAN LINE H (WHITE)

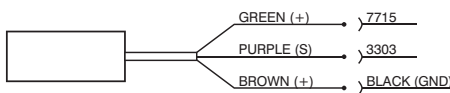
S9



S10



X197



X404



S4 Longitudinal axle (max = 8°)
S5 Transversal axle (max = 4°)



PIN 1 - 7800 (+15)
PIN 2 - 0007 (GND)
PIN 3 - CAN LINE L (BLUE)
PIN 4 - CAN LINE H (WHITE)
PIN 5 - 7800 (+15)
PIN 6 - 5008
PIN 7 - 7800 (+15)
PIN 8 - 5007

X409



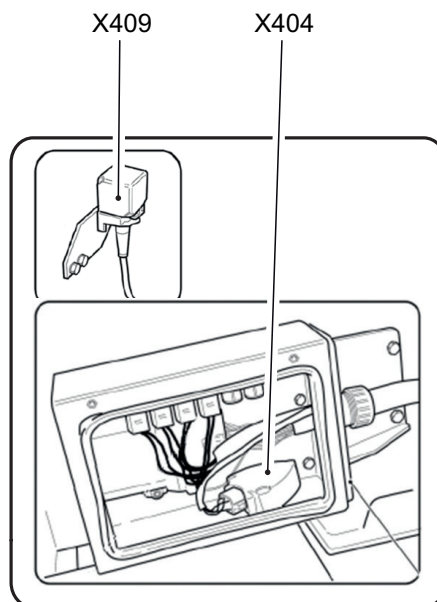
PIN 1 - BROWN (+15)
PIN 2 - WHITE (NC)
PIN 3 - BLACK (NA)
PIN 4 - BLUE (GND)



S10



S9

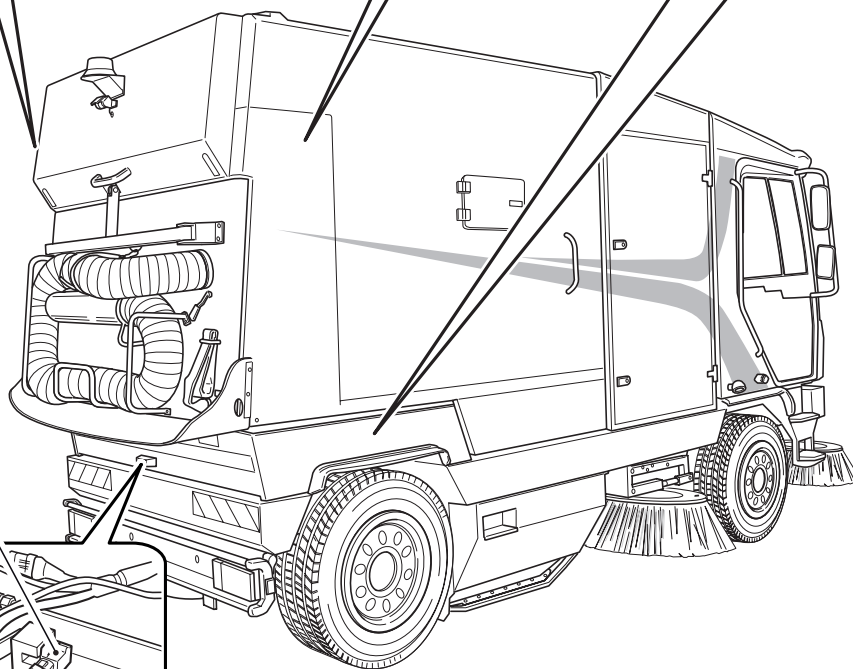
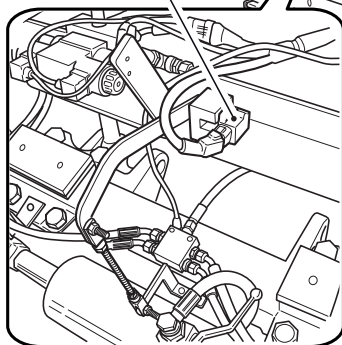


X409

X404

Eje

X411

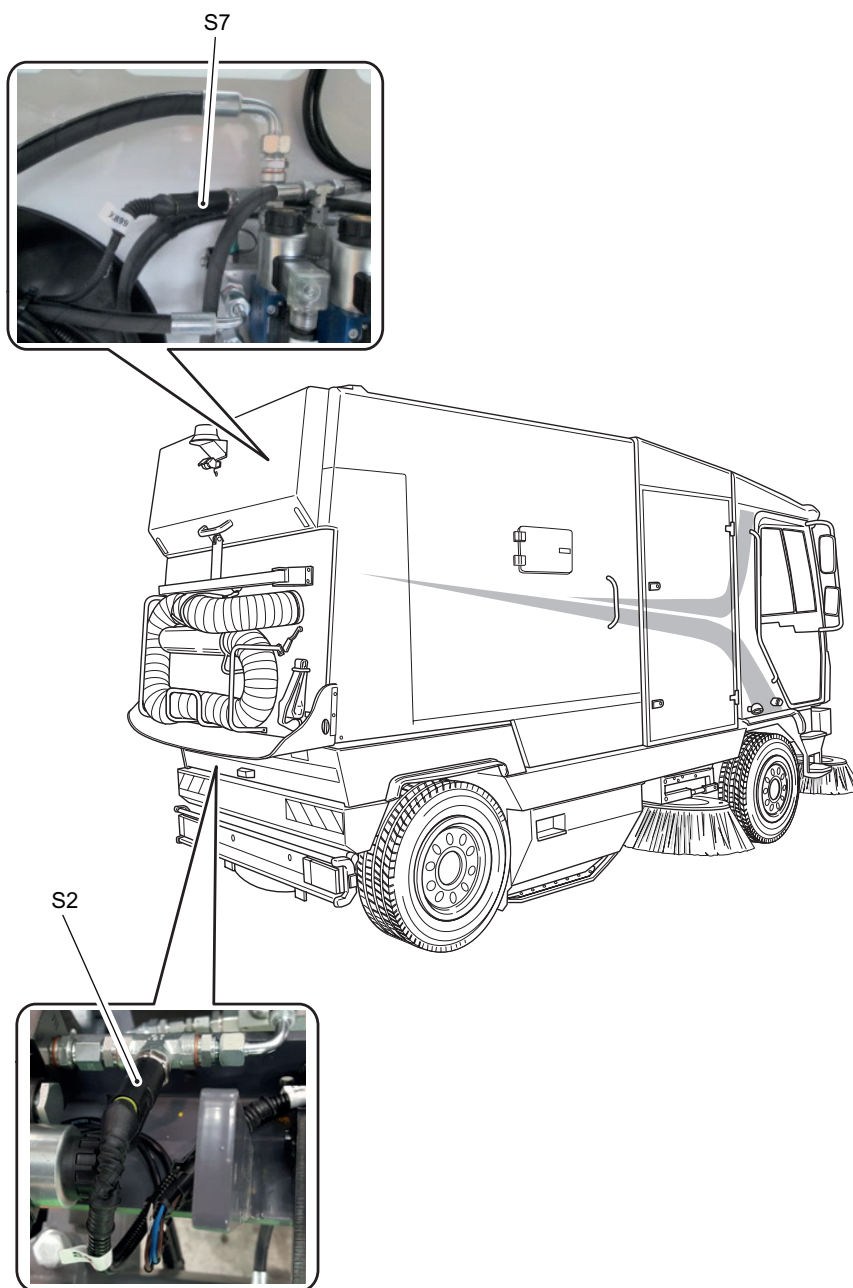


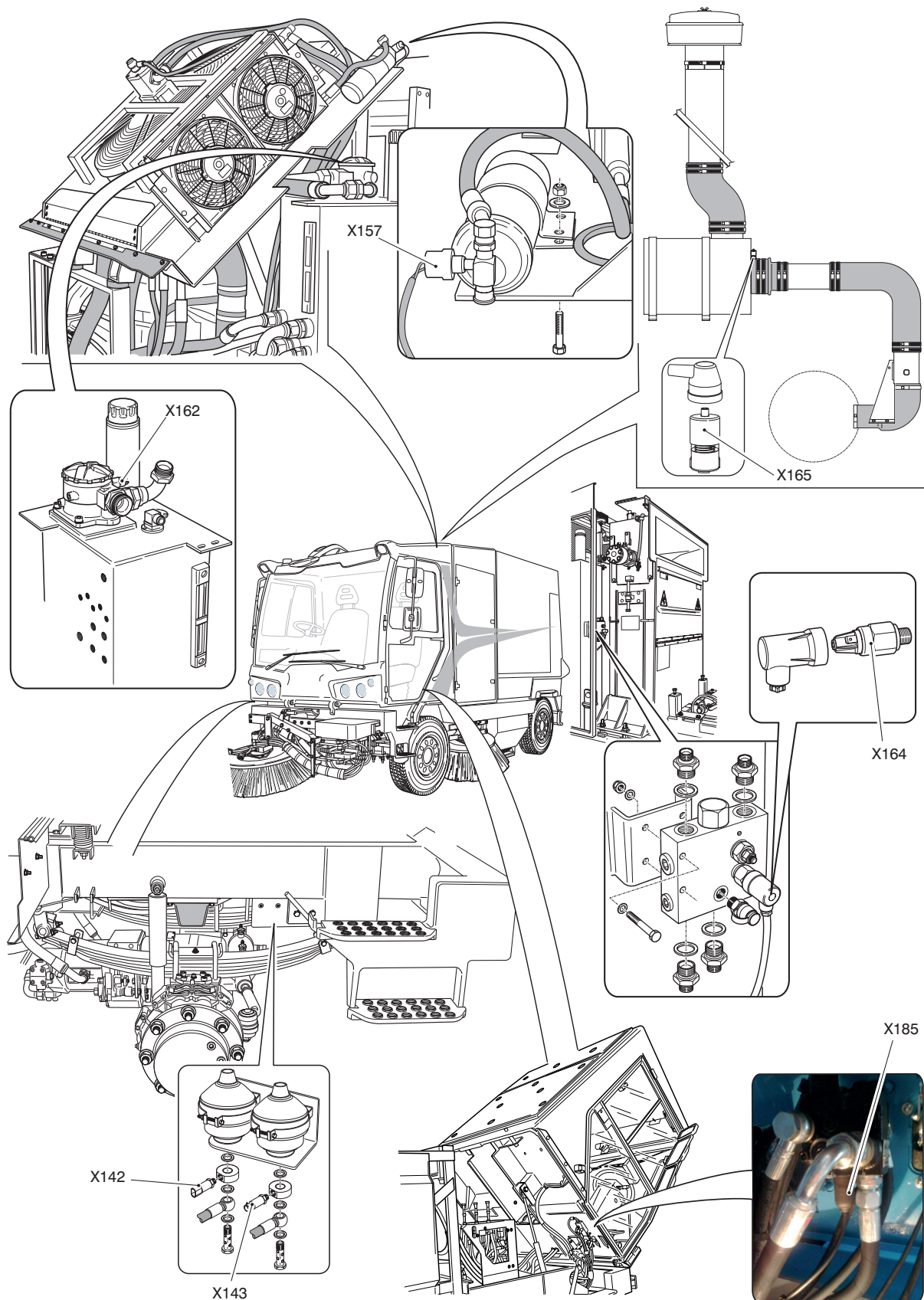
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COMBI

11.2.8. Pressure-switches and transducers

On sweeper hydraulic system are present following pressure-switches and transducers:

- X164 conveyor pressure-switch (90 bar for belts, 100 bar for chains) – Normally Open
- X162 hydraulic oil filter pressure-switch (2,5 bar) – Normally Open
- X165 engine air filter pressure-switch
- X157 AC dehydrator filter pressure-switch
- X185 stoplights pressure-switch – Normally open
- X142 front brakes accumulator transducer
- X143 rear brakes accumulator transducer
- S2 Suspension cylinder transducer (only on TIER3 – TIER4)
- S7 Hopper elevator cylinder transducer (only on TIER3 – TIER4)





6000 6000
COMBI



CHAPTER 12

Diesel engine:

FPT - N45ENT6W26.00A007	EURO6 (4 cylinders)
FPT - N40ENT526.00A015	EURO5 (4 cylinders)
FPT - N45ENTX20.00A009	TIER3 (4 cylinders)
FPT - N45ENT2W26.00L001	TIER4 (4 cylinders)
CUMMINS - QSB 4.5	TIER3 (4 cylinders)

6000 6000

COMBI

12.1. Diesel engine

12.1.1. Main components

Engine specifications are listed in the technical data (Chapter 2).
Concerning to engine maintenance, please refer to engine manual enclosed to machine.

The drawing shows the engine main components:

1	Fuel pre-filter (remote)
2	Fuel filter
3	Starter motor
4	Inlet manifold with pre-heating
5	High pressure injection pump
6	Air conditioner compressor
7	Oil charge plug
8	Fuel feed pump (manual)
9	Common rail
10	Water pump
11	Alternator
12	Belt for water pump and alternator
13	Oil dipstick
14	Engine lifting eyelet
15	Outlet manifold
16	Turbo supercharger
17	Oil filter
18	Engine control unit (ECU)

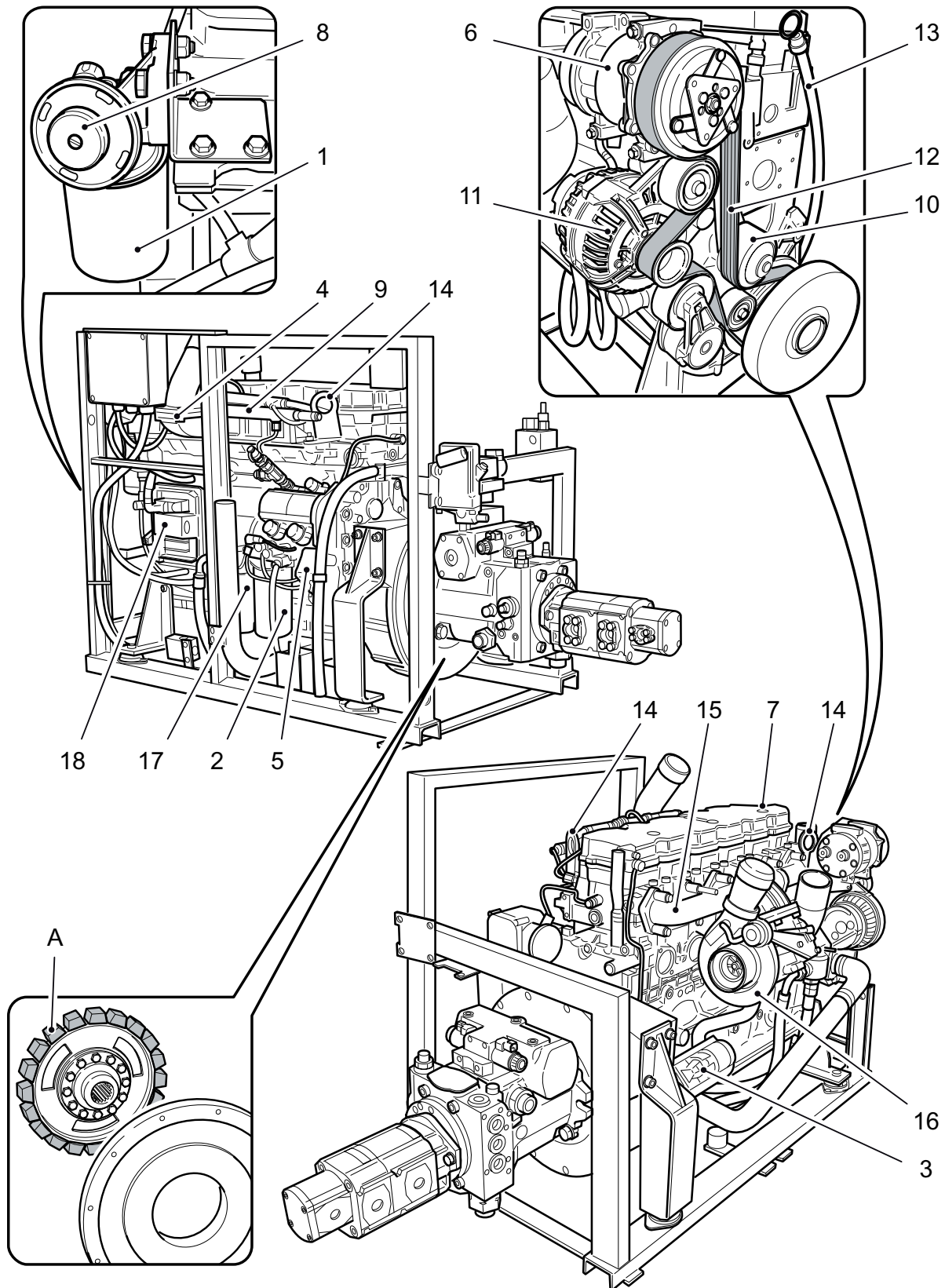
REVOLUTION NUMBER AT TRAVELLING 2300 giri / 1'

REVOLUTION NUMBER DURING WORKING 1800 rpm, such value during operation can be lowered to 1600 rpm in case of use of the machine downtown. During operation never exceed a value of 2000 rpm, since that could cause a fast wear of components and in particular of the conveyor.

DIESEL SUPPLY For the first start the diesel has to be fed using the manual feed pump (8), by opening the air vent screw located on the fuel pre-filter (1).

REVOLUTION NUMBER ADJUSTMENT The revolution number is adjusted by the engine ECU which defines an idle and a maximum speed. By pressing the manual accelerator or the accelerator pedal the value of this field is changed.

COUPLING The coupling with the hydrostatic pump is realized by means of a coupling with rubber inserts (A): half coupling is fixed to the pump shaft and the other half coupling is flanged to the engine flywheel.



6000 6000
COMBI

12.1.2. Generality

To reduce "PARTICULATE" emissions and as a consequence PM10 and smokes, FPT applies a system called COMMON RAIL using in particular the following devices:

- Fuel pump (low and high pressure) reaching very high pressures of 1450 bar, able to atomize the diesel for a high combustion efficiency. This pump can also reduce consumptions being able to change pressure and fuel capacity.
- A common manifold for every injector, COMMON RAIL, with overpressure valve able to keep pressure constant.
- Electric control injectors able to adjust the injection time and to send the diesel into the cylinders as appropriate following a mapping controlled by the electronic control unit EDC.
- An electronic control unit EDC optimizing the engine working, by changing the working values of the engine OUTPUT, by the continuous control of the INPUT parameters.

Fundamental components

1	Electronic control unit EDC
2	COMMON RAIL. Fuel common manifold under pressure (1450 bar)
3	Counterpressure limiting device (1,3-2 bar) of the fuel back from the injectors to the tank
4	Rail overpressure valve: 1450 bar
5	Fuel pre-filter
6a	High pressure pump
6b	Mechanic low pressure pump with rotors (unique body with high pressure pump)
7	Fuel filter
18	Electroinjectors

INPUT

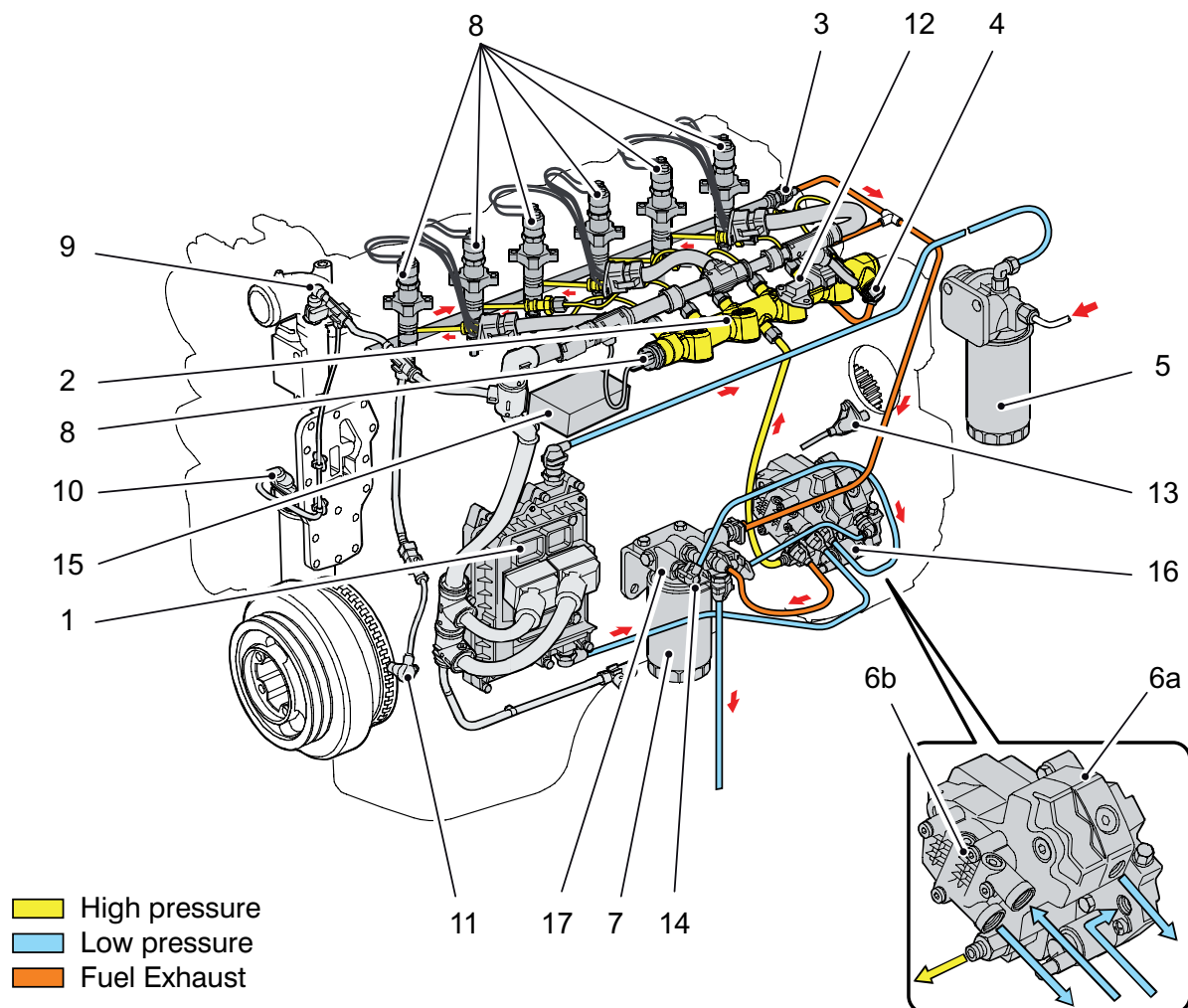
8	Fuel pressure sensor in the COMMON RAIL
9	Coolant temperature sensor
10	Engine oil temperature and pressure sensor
11	Crankshaft revolutions sensor
12	Combustion air pressure and temperature sensor
13	Camshaft revolutions sensor
14	Fuel temperature sensor

OUTPUT

15	Starting air heater
16	Pump pressure adjuster that is limiter of quantity of fuel fed to the pump
17	Fuel heater
18	Electroinjectors: injection time and injection point

EDC performs in particular the following functions:

- It processes the INPUT signals coming from the various sensors and following a working logics it sends the inputs to components enabled for OUTPUT controls in particular to the electroinjectors (18) regulating their opening time and the injection point and to the fuel pressure adjuster (16).
- Self-testing. It checks signals coming from the sensors by comparing them to the limit data: ALARMS.
- At starting it enables the engine pre-heaters (fuel (17) and air (15)), in case even only one of the following sensors - oil temperature (10), coolant (9), fuel (14) and air combustion (12) - indicates a temperature lower than 5°C.
- It recognizes the phase by the crankshaft (11) and camshaft (13) revolutions sensors and sends the opening signal to the electroinjectors.
- It controls the injection point, the injection duration by the electroinjectors and the injection pressure (250- 1350 bar) through the adjuster (16)
- It limits the maximum speed, by the sensor (11), at 2700 rpm and the opening time of the electroinjectors until their deactivation at 3000 rpm.
- It limits smokes during acceleration, by adjusting the fuel through the adjuster (16) and the opening time of the injectors, according to the diesel rpm by the sensors (11 and 13).
- It limits smokes during deceleration (cut off) in the same way.



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12.1.3. Disassemblings

JOINT DISASSEMBLY

Without removing the hydraulic pipes, remove the double pump (B) by unscrewing the two M12 fixing screws.
Open the red plug (E) fitted on the hydraulic tank filter.
Remove the hydraulic pipe (C) of the hydrostatic pump.
Unscrew the no. 12 M10 fixing screws of the engine flange (D) then remove the flange, by lifting the pump with hoist, to have access the coupling (G).

BELT DISASSEMBLY

To disassemble belt it's necessary to loosen the automatic tensioner with proper square wrench.

DIESEL ENGINE DISASSEMBLY

Remove all components located on the engine: air filter, muffler, frame and upper plate, etc.
Remove the water pipes connecting the radiator to the engine and the cooling fan. Disconnect electric cables, diesel feed pipes and shock absorbers of the 4 supports. Unscrew the no.12 screws securing the front flange to the engine. Remove the hydraulic pipe (C) and the discharge pipe (F) from the radiator to the filter. Shift the whole pump assembly to the outside using a hoist. Lift the engine through a hoist after securing it to the eyelets (A) by means of chains.

SARTER MOTOR DISASSEMBLY

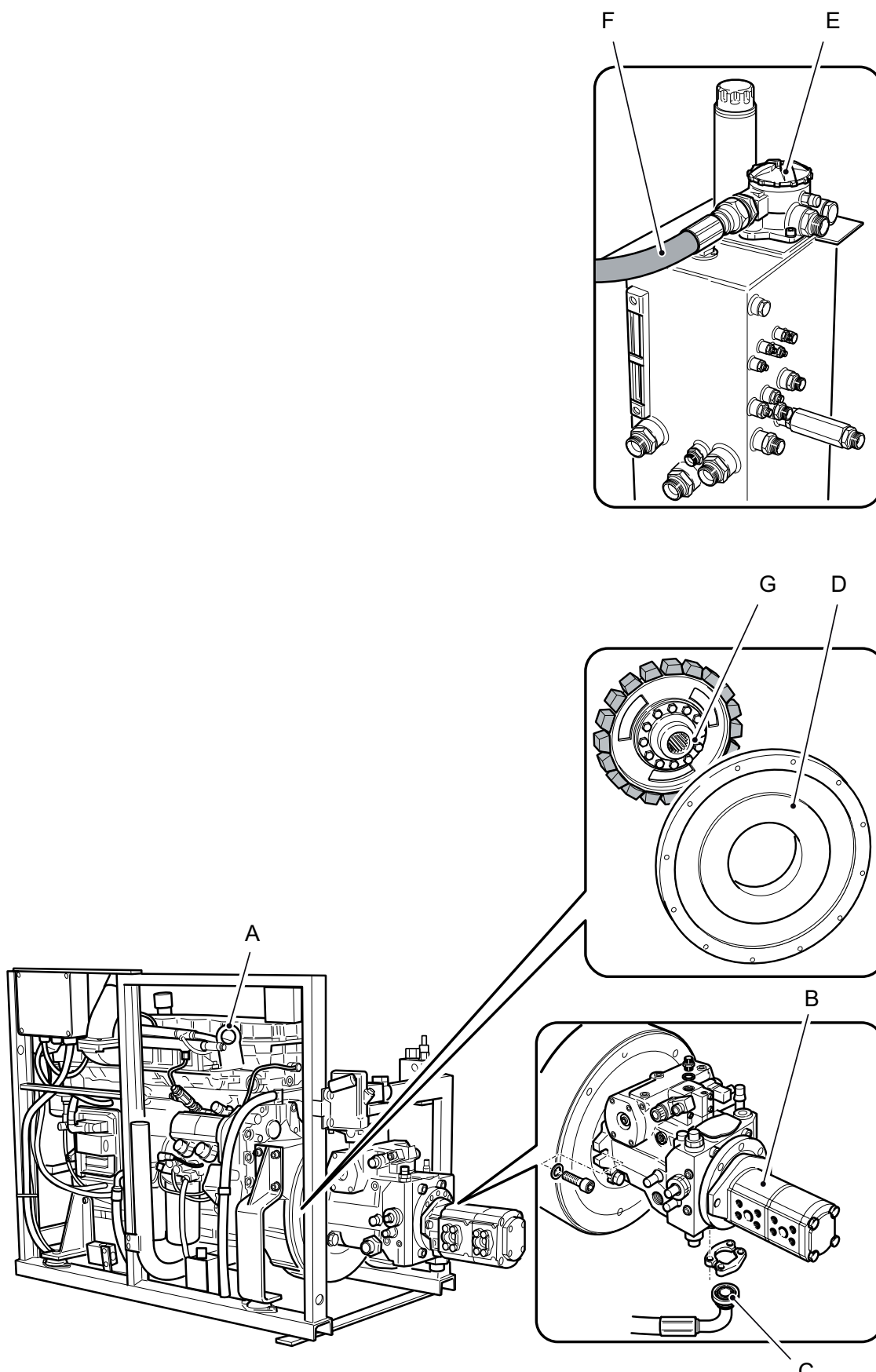
1. Open the right side door.
2. Disassembly protection metal grid and side vertical rod.
3. Disassembly the belt then AC compressor, pulley, alternator and automatic tensioner.

WARNING



If the compressor is connected to the 2 pipes of the air conditioning system, do not unscrew the pipes to prevent leakage of gas coolant.

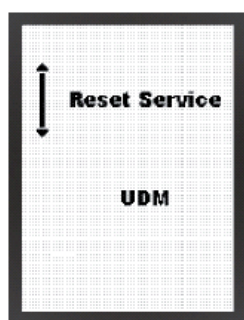
4. At this point by using a 1 meter long articulated socket wrench (17 mm) unscrew the fixing nuts.



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12.1.4. Reset service messages procedure

1.  Push together the buttons with the 2 arrows (see Picture 1) and turn the key to position 1. Keep the buttons pushed for 10 seconds until the message on Picture 2 has changed.
2.  Push the "OK" button to enter and reset the maintenance message. The display shows image as Picture 3.
3.  Push the "OK" button for 10 seconds until "RESET OK" appears as shown in Picture 4.
4.  If you don't want to proceed to reset the message, push the EXIT button "EXIT" as shown in Picture 3.



Picture 2



Picture 3



Picture 4

12.1.5. Diesel engine diagnostics

To read the active errors relating to the diesel engine, press the button "", the display will show the following page; at this point press the OK button to display the list of active errors.

Make a note of the SPN errors and check the corresponding DTC error code on the conversion table.

Press the button "" to return to the initial screen.



For errors related to the EURO6 engine, contact: assistenza@dulevo.com



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FPT ENGINES ERROR CODES TABLE

CODES ON DISPLAY (SPN)	CODES IVECO (DTC)	CODES ON DISPLAY (SPN)	CODES IVECO (DTC)	CODES ON DISPLAY (SPN)	CODES IVECO (DTC)
65554	112	65621	155	196766	39E
65555	113	131146	24A	196783	3AF
65558	116	65622	156	262319	4AF
65559	117	262302	49E	327855	5AF
65561	119	65623	157	131246	2AE
65564	11C	327837	59D	65713	1B1
13103	21F	65624	158	65714	1B2
65567	11F	65625	159	65715	1B3
65569	121	131161	259	65716	1B4
65570	122	196697	359	131252	2B4
65571	123	65627	15B	65717	1B5
65572	124	65631	15F	65719	1B7
65573	125	65633	161	65721	1B9
131089	211	65634	162	65722	1BA
131109	225	65635	163	65724	1BC
131101	21D	65636	164	65725	1BD
131102	21E	65637	165	131266	2C2
65574	126	65638	166	65730	1C2
65575	127	65639	167	65731	1C3
65576	128	65640	168	65734	1C6
131112	228	65641	169	196770	3A2
65577	129	65642	16A	131270	2C6
65578	12A	65643	16B	65736	1C8
65579	12B	65644	16C	131272	2C8
65580	12C	65645	16D	196808	3C8
65582	12E	65646	16E	262344	4C8
196703	35F	327838	59E	131273	2C9
65585	131	65649	171	196809	3C9
65586	132	65651	173	65745	1D1
131122	232	65660	17C	65746	1D2
65587	133	131196	27C	65747	1D3
65588	134	65665	181	131283	2D3
65589	135	65673	189	196819	3D3
65590	136	262239	45F	65748	1D4
131126	236	65681	191	65749	1D5
65591	137	65682	192	65750	1D6
65592	138	131218	292	65751	1D7
131128	238	196754	392	65752	1D8
65594	13A	327775	55F	65753	1D9
131130	23A	65683	193	131297	2E1
65596	13C	131229	29D	65761	1E1
131167	25F	131234	2A2	65762	1E2
65601	141	65688	198	65763	1E3
65602	142	65689	199	65764	1E4
65603	143	65690	19A	65765	1E5
65604	144	65691	19B	65766	1E6
65605	145	65694	19E	65767	1E7
65608	148	65695	19F	65768	1E8
65609	149	65698	1A2	65769	1E9
65613	14D	65699	1A3	65770	1EA
65615	14F	65700	1A4	65771	1EB
65617	151	65701	1A5	393374	69E
65618	152	65702	1A6	65786	1FA
196637	31D	65704	1A8	196858	3FA
65619	153	131238	2A6	262394	4FA
196638	31E	65710	1AE	65787	1FB
65620	154	65711	1AF	65788	1FC
196639	31F	131247	2AF	131327	2FF

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DTC	Failing component	Visible failures	Possible causes	Repair actions	Checks to be performed	Measuring conditions	Values to be detected	Remarks
112	ACCELERATOR PEDAL	Pedal accelerator (potentiometer) doesn't work	Defective potentiometer or harness interrupted	Check the harness between potentiometer and engine (ECU) or replace the potentiometer				
113	ACCELERATOR PEDAL/BRAKE PEDAL SUSPECT	Vehicle acceleration very slow. Engine idle speed: 500 rpm.	Accelerator pedal and brake pressed simultaneously (for too long); Accelerator pedal blocked or faulty; Incorrect use of vehicle.	Check the accelerator pedal signal and pedal mechanical movement.				
116	CLUTCH SIGNAL SUSPECT	The parameter reading shows that the clutch is pressed.	Clutch switch faulty or wiring problems in pedal.	Check clutch pedal switch and wiring.				
117	BRAKE PEDAL SIGNAL ERROR	Slight power reduction.	One of the two brake pedal switches may be stuck. Main and secondary brake switch not synchronised.	Check the synchronisation of both switches (signal) and wiring.				
119	PLAUSIBILITY +15		Possible mechanical problem (in pawl) or electrical problem.	Check wiring.				
121	SPEED LIMITER W/ LIGHT	Warning light permanently off.	Short circuit or defective wiring.	Check wiring.				
122	WARNING LIGHT EOBD	Warning light permanently off.	Short circuit or defective wiring.	Check wiring.				
123	EDC LAMP	Warning light permanently off.	Short circuit or defective wiring.	Check wiring.				
124	COLD START LAMP	Warning light permanently off.	Short circuit or defective wiring.	Check wiring.				
125	MAIN RELAY DEFECT	Possible problems during after-run.	Relay short circuit to battery positive or earth.	Check wiring between ECM and battery. Replace relay if necessary.				

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DTC	Failing component	Visible failures	Possible causes	Repair actions	Checks to be performed	Measuring conditions	Values to be detected	Remarks
127	ENGINE BRAKE ELECTROVALVE	Engine brake not operational.	Relay or wiring short-circuited or interrupted.	Check wiring. Replace relay if necessary.				
11C	WATER IN FUEL DETECTED	Warning light for fuel filter water presence is switched on	Housing separator or fuel filter full of water or sensor / filter faulty	Drain the water from filter, check sensor harness or replace sensor and/or filter.				
12C	THERMOSTATER RELAY 2	Heater not working.	Relay or wiring short-circuited or interrupted.	Check wiring. Replace relay if necessary.				
12E	MANAGEMENT SYSTEM PRE/POST-HEATING (ACTIVE)	Grid heater permanently operating.	Grid heater short circuited to earth.	Check wiring and component.				
145	FAN RELAY	No reaction perceivable by the driver. Fan off.	Short circuit or fan actuator faulty.	Check the wiring and the fan actuator. Replace the actuator if necessary.				
148	AIR-CONDITIONER COMPRESSOR RELAY	Air conditioner permanently off.	Wiring or relay short-circuited.	Check the wiring. Replace relay if necessary.				
149	PRE-HEATING RELAY FUEL FILTER	Filter heater not working.	Wiring or filter heater short-circuited.	Check the wiring. Replace the filter heater if necessary.				
151	HIGH PRESSURE SYSTEM							



DTC	Failing component	Visible failures	Possible causes	Repair actions	Checks to be performed	Measuring conditions	Values to be detected	Remarks
152	FAULT ON THE FUEL PRESSURE CONTROL OF THE RAIL (POSITIVE DEVIATION)	Possible loss of performance.	High pressure system: • possible leaks; • injectors stuck open; • High pressure pump faulty. Low pressure system: • low pressure upstream of pump; • Diesel filter blocked or leak upstream of high pressure pump.	Check the possible causes listed above.				
16D	COMPRESSION TEST IN PROGRESS		Compression Test in progress.	After carrying out the compression test, turn the key OFF (after-run).				
189	EGR POWER ST. SHORT TO BATT.	No fault perceived by the driver. EGR not working.	Short circuit or EGR actuator faulty.	Check wiring. Replace the EGR actuator if necessary.				

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DTC	Failing component	Visible failures	Possible causes	Repair actions	Checks to be performed	Measuring conditions	Values to be detected	Remarks
191	TURBINE ACTUATOR CONTROL ELECTROVALVE	Poor performance.	Attuatore VGT o cablaggi difettosi.	Verificare cablaggi e Attuatore VGT.				
192	TURBINE ACTUATOR CONTROL ELECTROVALVE SHORT CIRCUIT TO POSITIVE	Poor performance.	VGT actuator or wiring defective.	Check VGT wiring and actuator.				
193	TURBINE WHEEL REVS SENSOR	Poor performance.	Air filter blocked or turbine rpm sensor signal implausible.	Check the air filter and check parameters linked with the turbine by performing a road test (parameter acquisition).				
198	FAULT ON AT LEAST TWO OF THE FOLLOWING SENSORS: TURBINE SPEED, BOOST PRESSURE AND EXHAUST GAS PRESSURE	Poor performance.	Sensor signal implausible. Sensor may be faulty.	Determine which turbine component caused the problem.				
199	TURBOCHARGER CONTROL BOOST PRESSURE FAILURE (PCR)	Poor performance.	Turbo sensor or actuator may be faulty. Air filter may be blocked.	Check turbine sensors and actuator (parameter acquisition). Check whether air filter is blocked.				
19A	TURBINE IN OVERSPEED (the fault is not displayed if it is caused by a low atmospheric pressure)	Poor performance.	Turbo sensor or actuator may be faulty. Air filter may be blocked.	Check turbine sensors and actuator (parameter acquisition). Check whether air filter is blocked.				



DTC	Failing component	Visible failures	Possible causes	Repair actions	Checks to be performed	Measuring conditions	Values to be detected	Remarks
19B	TURBINE SPEED EXCEEDING EVERY PERMITTED RANGE	Poor performance.	Air filter blocked or turbine rpm sensor signal implausible.	Check the air filter and				
IFA	TOO HIGH NUMBER OF REGENERATIONS DEMAND	Noreaction perceivable by the driver. Too many filter regenerations carried out.	Particulate filter may be blocked.	Check filter.				
IFB	PERMANENT RIGENERATION ON TRAP PARTICLE	Noreaction perceivable by the driver.	Catalytic converter not installed or damaged.	Check catalytic converter visually.				
IFC	FIRST SENSOR EXHAUSTED GAS TEMPERATURE	Noreaction perceivable by the driver.	Temperature sensors damaged or incorrectly fitted.	Check information and condition of sensors.				
21F	TOO HIGH EFFICIENCY OF CATALYST SYSTEM	No reaction noticeable on behalf of the driver.	Actuator coil faulty or not within specified tolerance limits.	Check actuator condition.				
292	TURBINE ACTUATOR CONTROL ELECTROVALVE SHORT CIRCUIT TO GROUND	Poor performance. VGT actuator or wiring defective.	Check VGT wiring and actuator.	Verificare i cablaggi e attuatore VGT.				
2FF	ERROR CHECK OF CRITICAL TIME FOR OIL DILUTION	No reaction noticeable on behalf of the driver.	Slight power reduction Oil over-diluted.	Change the engine oil.				
392	NO LOAD/EXCESSIVE TEMP.FOR BPA POWER STAGE	Poor performance.	Connection damaged. Battery voltage excessive (ECU overheating).	Check VGT connection and actuator.				

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DTC	Failing component	Visible failures	Possible causes	Repair actions	Checks to be performed	Measuring conditions	Values to be detected	Remarks
3AF	DM1DCU SPN3 MESSAGE	No effect perceived by the driver.	Problems in Ad-Blue dosing system.	Check the faults in the Denoxtronic and consult the control unit troubleshooting guide.				
3FA	REGENERATION DEMAND NUMBER 2	No effect perceived by the driver.	Too many regenerations carried out.	Check particulate filter and faults in sensors.				
4FA	REGENERATION DEMAND NUMBER 3	No effect perceived by the driver.	Too many regenerations carried out.	Check particulate filter and faults in sensors.				



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
Veicolo 1 (Sensori/Controlli Plausibilità)							
119	Terminal 15 failure	"Non"	Due to a short circuit in the ignition switch the EDC is switched on, although T15 has not been activated.	Check wiring for correct installation and for short circuits	No		"Mil OFF"
11F	SCR Temperatures plausibility	"catalyst monitoring"	Temperature sensor downstream of catalyst is inaccurate or defective, defect in wiring (also check connectors)	"Check wiring and signal of temperature sensor. Ensure complete cool down of vehicle (>10 hours) without sun exposure and and measure all 3 sensors signals. If temperature differences are above 20°C replace defective sensor"	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)	yes (OBD)	"Mil ON"
			Temperature sensor upstream of catalyst is inaccurate or defective, defect in wiring (also check connectors)	"Check wiring and signal of temperature sensor. Ensure complete cool down of vehicle (>10 hours) without sun exposure and and measure all 3 sensors signals. If temperature differences are above 20°C replace defective sensor"			

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
11F	SCR Temperatures plausibility	"catalyst monitoring"	Ambient temperature sensor or both upstream and downstream catalyst temperature sensors are inaccurate, defect in wiring (also check connectors)	"If the ambient temperature sensor is inaccurate it is likely that the urea pump module (DTC \$E4) and urea tank temperature (DTC \$E5) are also reported implausible by the DCU. Check wiring and signal of temperature sensors. Ensure complete cool down of vehicle (>10 hours) without sun exposure and and measure all 3 sensors signals. If temperature differences are above 20°C replace the sensors which seem implausible."	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)	yes (OBD)	"Mil ON"
211	Vehicle Speed Sensor failure	"non"	Defective or incorrect functioning speed measuring device, see CAN message Tachograph Output (TCO1).	Check speed measuring device for proper functioning and for its CAN configuration	No		"Mil OFF"
21D	SCR Catalyst Thermal Ageing Limit exceeded	"non"	Excessive ageing of SCR-Catalyst	Replace catalyst and reset EEPROM value of catalyst ageing time via tester	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)		"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
21E	SCR Catalyst Efficiency below first threshold	"catalyst monitoring"	Measured catalyst efficiency lower than the estimated (NH3 slip present), inaccurate NOx measurement (value too high) downstream of catalyst, incorrect NOx estimation (value too low) upstream of catalyst, estimated catalyst efficiency too high (due to inaccuracies in the exhaust mass flow calculation, the estimated NH3 storage, temperature measurements up- and downstream of the catalyst) or catalyst degradation, excessive urea deposits in exhaust system	"Check urea dosing system for correct dosing amount (perform UDST and Dosing Valve Check, check DCU error memory for leakage failures), check accuracy of NOx-sensor and NOx-model (humidity, boost pressure and temperature) for plausible values, check NOx-conversion efficiency of catalyst, check exhaust system for excessive urea deposits"	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)		"Mil ON"
31D	DCU State Monitoring	"catalyst monitoring"	Defect or abnormal behaviour of urea dosing system	Read out failure memory of the DCU and perform troubleshooting, check behaviour of urea dosing system closely	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)	yes (OBD)	"Mil ON"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
31E	SCR Catalyst Efficiency below second threshold	"catalyst monitoring"	Measured catalyst efficiency lower than the estimated (NH3 slip present), inaccurate NOx measurement (value too high) downstream of catalyst, incorrect NOx estimation (value too low) upstream of catalyst, estimated catalyst efficiency too high (due to inaccuracies in the exhaust mass flow calculation, the estimated NH3 storage, temperature measurements up- and downstream of the catalyst) or catalyst degradation, excessive urea deposits in exhaust system	"Check urea dosing system for correct dosing amount (perform UDST and Dosing Valve Check, check DCU error memory for leakage failures), check accuracy of NOx-sensor and NOx-model (humidity, boost pressure and temperature) for plausible values, check NOx-conversion efficiency of catalyst, check exhaust system for excessive urea deposits"	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)	yes (OBD)	"Mil ON"

DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
31F	SCR Catalyst System Efficiency too high	"non"	Measured catalyst efficiency higher than the estimated (danger of NH3 slip), inaccurate NOx measurement (value too low) downstream of catalyst, incorrect NOx estimation (value too high) upstream of catalyst, estimated catalyst efficiency too low (due to inaccuracies in the exhaust mass flow calculation, the estimated NH3 storage, temperature measurements up- and downstream of the catalyst), excessive urea deposits in exhaust system	"Check urea dosing system for correct dosing amount (perform UDST and Dosing Valve Check, check DCU error memory for leakage failures), check accuracy of NOx-sensor and NOx-model (humidity, boost pressure and temperature) for plausible values, check exhaust system for excessive urea deposits"	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)		"Mil OFF"
Vehicle 2 (Lamps/relays/actuators)							
125	Main Relay 2 failure (Grid Heater 1, Fan 1, VGT, Lambda Heater, EGR Bypass Valve, EGR Actuator, Blow By Valve))	"non"	Short circuit of main relay 2 output to external source, defect in one of the connected components or defective main relay 2 Short circuit of main relay 2 output to ground, defect in one of the connected components or defective main relay 2o	Check the wiring and all components connected to main relay 2, if defect remains main relay inside ECU could be defective, replace ECU Check the wiring and all components connected to main relay 2, if defect remains main relay inside ECU could be defective, replace ECU	No		"Mil OFF"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
126	Battery Voltage failure	"non"	Alternator voltage governor defect "Battery defect, alternator defect, wiring problems (too high resistance) or ECU defect. Occurrence possible during cold start."	Replace alternator governor device or alternator. Replace battery or alternator. Check ECU and wiring.	No		"Mil OFF"
128	Main Relay 1 (High Pressure Pump) Short to Battery	"non"	Short circuit of main relay 1 output to external source, defect in one of the connected components or defective main relay 1	Check the wiring and all components connected to main relay 1, if defect remains main relay inside ECU could be defective, replace ECU	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil OFF"
129	Main Relay 3 failure (A/C Compressor, Fuel Filter Heater, Intercooler Bypass Valve, Additive Valve, Grid Heater 2, Fan 2, OBD/Cold Start/Adjustable Speed Limiter Lamp)	"non"	Short circuit of main relay 3 output to external source, defect in one of the connected components or defective main relay 3 Short circuit of main relay 3 output to ground, defect in one of the connected components or defective main relay 3o	Check the wiring and all components connected to main relay 3, if defect remains main relay inside ECU could be defective, replace ECU Check the wiring and all components connected to main relay 3, if defect remains main relay inside ECU could be defective, replace ECU	No		"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
12A	Engine-Brake Exhaust Valve (Main Relay 4) failure	"non"	Short circuit of wiring to external source or inside relay, broken or disconnected wiring or defective relay	Check of wiring or replace relay	No		"Mil OFF"
12B	Air Heater 1 Power Stage failure	"non"	Short circuit of wiring to ground or inside relay	Check of wiring or replace relay	No		"Mil OFF"
12E	Air Heater always on	"non"	Short circuit of wiring to external source or inside relay	Check of wiring or replace relay	No		"Mil OFF"
225	Main Relay failure (Interrupted Afterrun))	"comprehensive components"	Broken or disconnected wiring or defective relay	Check of wiring or replace relay	No		"Mil OFF"
228	Main Relay 1 (High Pressure Pump) Short to Ground	"non"	Short circuit to ground of grid heater	Check grid heater switch and replace it	No		"Mil OFF"
			The ECU is switched off by main electrical switch instead of terminal 15, defective main relay, wiring problem	Inform driver about correct vehicle shut off, check wiring, replace main relay	No		"Mil ON"
			Short circuit of main relay 1 output to ground, defect in one of the connected components or defective main relay 1	Check the wiring and all components connected to main relay 1, if defect remains main relay inside ECU could be defective, replace ECU	Failure is a NOx dependent (potentially) longterm failure (via LTF group 1 Fuel System)		"Mil OFF"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
Motore 1 (sensori di pressione e temperatura)							
131	Coolant Temperature Sensor failure	"non"	Sensor defective or short circuit to external source Sensor defective or short circuit to ground See OTS plausibility check (Dfp_OTSCD.Npl)	Check wiring or replace sensor Check wiring or replace sensor See OTS plausibility check (Dfp_OTSCD.Npl)	No		"Mil OFF"
132	Coolant Temperature Dynamic failure	"non"	Extreme ambient conditions. Or inaccurate sensor (although sensor does not exceed its signal range)	Ensure that engine was not running in extreme ambient conditions. Check wiring and accuracy of sensor, replacement of sensor	No		"Mil OFF"
133	Boost Air Temperature Sensor failure	"non"	Sensor defective or short circuit to external source Sensor defective or short circuit to ground	Check wiring or replace sensor Check wiring or replace sensor	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)		"Mil OFF"
134	Boost Pressure Sensor failure	"non"	Sensor defective or short circuit to external source Sensor defective or short circuit to ground Difference of ambient and boost pressure is out of range..	Check wiring or replace sensor Check wiring or replace sensor Check ambient and boost pressure sensor for accuracy	Failure is a NOx dependent (potentially) longterm failure (via LTF group3 Air System)		"Mil OFF"
135	Fuel Temperature Sensor failure	"non"	Sensor defective or short circuit to external source Sensor defective or short circuit to ground	Check wiring or replace sensor Check wiring or replace sensor	No		"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
136	Rail Pressure Sensor failure	"non"	Short circuit of wiring to external source or defective pressure sensor; rail pressure overshoot Short circuit of wiring to ground or defective pressure sensor	Check wiring and proper functioning of rail pressure sensor Check wiring and proper functioning of rail pressure sensor	Failure is a NOx dependent (potentially) longterm failure (via LTF group 1 Fuel System)		"Mil OFF"
137	Common Rail Pressure Limiting Valve failure	"non"	Defective rail pressure sensor, defect in other injection relevant component PRV does not open once the pressure limit is reached: Mechanical defect or wrong application parameter PRV does not open even after pressure shock: Stuck PRV or wrong application parameter	Check rail pressure sensor for plausible values, ensure proper functioning of the injection components Check application value of maximum rail pressure, check functioning of the PRV Check application value of maximum rail pressure, check functioning of the PRV	No	yes (technical)	"Mil OFF"
138	Oil Pressure Sensor failure	"non"	Sensor defective or short circuit to external source Sensor defective or short circuit to ground Monitoring function for ADC Sig-error not explained in documentation???	Check wiring or replace sensor Check wiring or replace sensor	No		"Mil OFF"
			Inaccurate oil pressure sensor or defect (e.g. blocked piping) in the oil system.	Check oil pressure sensor for accuracy and check oil system			

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
13A	Oil Temperature Sensor failure	"non"	Sensor defective or short circuit to external source	Check wiring or replace sensor	No		"Mil OFF"
			Sensor defective or short circuit to ground	Check wiring or replace sensor			
			Inaccurate oil or coolant temperature sensors or insufficient oil or coolant recirculation (low coolant level etc.).	Check oil and coolant temperature sensor for accuracy and check oil and coolant system for proper functioning			
13C	Ambient Air Temperature Sensor failure (of Humidity Sensor)	"non"	Sensor defective or short circuit to external source	Check wiring or replace sensor	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)		"Mil OFF"
			Sensor defective or short circuit to ground	Check wiring or replace sensor			
232	Coolant Temperature Test failure	"non"	Extreme ambient conditions. Or inaccurate sensor (although sensor does not exceed its signal range)	Ensure that engine was not running in extreme ambient conditions. Check wiring and accuracy of sensor, replacement of sensor	No		"Mil OFF"
236	Rail Pressure Sensor Offset Monitoring	"comprehensive components"	Rail pressure sensor inaccurate	Ensure correct wiring and proper functioning of rail pressure sensor, replace sensor	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)	yes (technical)	"Mil ON"
			Rail pressure sensor inaccurate	Ensure correct wiring and proper functioning of rail pressure sensor, replace sensor			



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
238	Oil Pressure too low	"non"	Inaccurate oil pressure sensor or defect (e.g. too low oil level, leakage...) in the oil system	Check oil pressure sensor for accuracy and check oil system	No		"Mil OFF"
23A	Temperatura olio eccessivamente alta	"non"	Inaccurate oil temperature sensor or defect (e.g. blockage, insufficient recirculation) in the oil system.	Check oil temperature sensor for accuracy and check oil system	No		"Mil OFF"
Engine 2 (Speed sensing/actuators)							
141	Crankshaft Speed Signal failure	"non"	Signal interrupted do to wiring problem, defective or incorrectly installed crankshaft speed sensor	Check wiring, sensor installation and proper functioning of crankshaft sensor (evaluate raw signals)	Failure is a NOx dependent (potentially) longterm failure (via LTF group2 Injection Timing System)	yes (technical)	"Mil ON"
			Signal interrupted do to wiring problem, defective or incorrectly installed crankshaft speed sensor	Check wiring, sensor installation and proper functioning of crankshaft sensor (evaluate raw signals)			
142	Engine runs with Camshaft Speed only	"non"	Signal interrupted do to wiring problem, defective or incorrectly installed crankshaft speed sensor	Check wiring, sensor installation and proper functioning of crankshaft sensor (evaluate raw signals)	No	yes (technical)	"Mil OFF"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
143	Camshaft Speed Signal failure	"non"	Signal interrupted do to wiring problem, defective or incorrectly installed camshaft phase sensor Signal interrupted do to wiring problem, defective or incorrectly installed camshaft phase sensor	Check wiring, sensor installation and proper functioning of camshaft phase sensor (evaluate raw signals) Check wiring, sensor installation and proper functioning of camshaft phase sensor (evaluate raw signals)	No	yes (technical)	"Mil OFF"
144	Offset between Camshaft and Crankshaft	"non"	Signal interrupted do to wiring problem, defective or incorrectly installed camshaft or crankshaft sensor	Check wiring, sensor installations and proper functioning of camshaft and crankshaft sensors (evaluate raw signals)	Failure is a NOx dependent (potentially) longterm failure (via LTF group2 Injection Timing System)		"Mil ON"
14D	Info: Engine Overspeed Protection	"non"	Engine overspeed has occurred	No reactions necessary only if this fault/information status reoccurs frequently. In this case check driving conditions of vehicle, engine speed acquisition and injection system for quantity setpoint and actual value during fault recognition, check also for ECU errors	No		"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
14F	Info: OBD Performance Limiter Intervention by Legislation	"non"	A defect has occurred (in the EDC or DCU) which triggered a performance limitation via corresponding Fids	Advice operator not to press button too long, check device for mechanical and electrical defects, check wiring	No		"Mil OFF"
24A	Engine Compartment Stop Button stuck	"non"	Wrong manipulation of operator, button mechanically stuck in actuated position, electrical defect in device, defective wiring	Advice operator not to press button too long, check device for mechanical and electrical defects, check wiring	No		"Mil OFF"
Fuel metering CR Systems							
152	Rail Pressure Positive Deviation High and High Fuel Flow Setpoint Value	"non"	High pressure side: Leakage in high pressure section, injection nozzle stuck in open position, worn high pressure pump, worn injector, leaking pressure relieve valve Low pressure side: Pressure before gear pump too low, gear pump output too low (fuel filter clogged, leakage in low pressure side).	Check for defects according to 'reason of failure' list.	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System))	yes (technical)	"Mil OFF"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
153	Rail Pressure Negative Deviation too High on Minimum Metering	"non"	"Metering unit stuck in open position, zero-delivery throttle clogged, metering unit without power due to electrical error. Low pressure side: Pressure before gear pump too high (e.g. by pressure relieve valve), pressure after zero-delivery throttle too high." High pressure side: Leakage in the high pressure section, injection nozzle stuck in open position, worn high pressure pump, worn injector, leaking pressure relieve valve. Low pressure side: Pressure before gear pump too low or gear pump output too low (clogged fuel filter, leak on output side).	Check for defects according to 'reason of failure' list.	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)	yes (technical)	"Mil OFF"
154	PRail Pressure below Minimum Limit in Controlled Mode	"non"		Check for defects according to 'reason of failure' list.	No		"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
155	Rail Pressure above Maximum Limit in Controlled Mode	"non"	"Metering unit stuck in open position, zero-delivery throttle clogged, metering unit without power due to electrical error. Low pressure side: Pressure before gear pump too high (e.g. by pressure relieve valve), pressure after zero-delivery throttle too high."	Check for defects according to 'reason of failure' list	No		"Mil OFF"
156	Rail Pressure Drop Rate too High	"non"	Leakage in the high pressure section, injection nozzle stuck in open position, worn high pressure pump, worn injector, leaking pressure relieve valve, injector reflux too high.	Check for defects according to 'reason of failure' list.	No	yes (technical)	"Mil OFF"
157	Setpoint of Rail Metering Unit not plausible in Overrun	"non"	"High pressure system: Leakage in the high pressure section, injection nozzle stuck in open position, worn or defective high pressure pump, worn injector, leaking pressure relieve valve. Low pressure system: 'Zero delivery' is not active in metering unit (excessive leakage in metering unit)."	Check for defects according to 'reason of failure' list.	No	yes (technical)	"Mil OFF"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
158	Fuel Flow Setpoint of Common Rail Metering Unit too low	"non"	"High pressure system: Rail pressure sensor inaccurate, high pressure pump defective. Low pressure system: Metering unit reflux too low, fuel system leakage, metering unit jammed in closed position."	Check for defects according to 'reason of failure' list.	No	yes (technical)	"Mil OFF"
159	Common Rail Metering Unit Power Stage failure	"non"	Broken or disconnected wiring or defective relay Defective wiring, ECU, powerstage or metering unit	Check of wiring or replace relay Check wiring, ECU, power stage and metering unit	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil OFF"
15B	Info Fault: High Pressure Test (Rail Pressure Monitoring deactivated)	"non"	The 'High Pressure Test' is requested via a diagnostic tester	Wait until the 'High Pressure Test' has terminated	No		"Mil OFF"
15F	Info: Long Term Fuel system Failure	"non"	High NOx emissions due to various possible defects	Identify the defect triggering this fault path and follow the troubleshooting procedure of that failure.	Failure is a direct longterm failure (via counter 576000 mins)		"Mil ON"
259	Common Rail Metering Unit Power Stage Short to Battery	"non"	Short circuit of wiring to external source or inside relay	Check of wiring or replace relay	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil OFF"
25F	Info: Long Term Injection timing Failure	"non"	High NOx emissions due to various possible defects	Identify the defect triggering this fault path and follow the troubleshooting procedure of that failure	Failure is a direct longterm failure (via counter 576000 mins)		"Mil ON"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
359	Common Rail Metering Unit Power Stage Short to Ground	"non"	Short circuit of wiring to ground or inside relay	Check of wiring or replace relay	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil OFF"
35F	Info: Long Term air system failurea	"non"	High NOx emissions due to various possible defects	Identify the defect triggering this fault path and follow the troubleshooting procedure of that failure.	Failure is a direct longterm failure (via counter 576000 mins)		"Mil ON"
45F	Info: Long Term NOx Sensor Failure	"non"	High NOx emissions due to various possible defects	Identify the defect triggering this fault path and follow the troubleshooting procedure of that failure.	Failure is a direct longterm failure (via counter 576000 mins)		"Mil ON"
55F	Info: Long Term SCR System FailureR	"non"	High NOx emissions due to various possible defects	Identify the defect triggering this fault path and follow the troubleshooting procedure of that failure.	Failure is a direct longterm failure (via counter 576000 mins)		"Mil ON"
Injectors 1							
161	Injector Cylinder 1 failure	"fuel system"	Short circuit in wiring with external source	Check the wiring or replace injector	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil ON"
			BDefective coil of injector	Check the wiring and replace injector.			
			Depending on the pattern, various reasons can cause the defect, internal ECU problems also possible	Check the wiring and the injection signals, replace ECU			

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
162	Injector Cylinder 2 failure	"fuel system"	Short circuit in wiring with external source	Check the wiring or replace injector	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil ON"
			Defective coil of injector	Check the wiring and replace injector.			
			Depending on the pattern, various reasons can cause the defect, internal ECU problems also possible	Check the wiring and the injection signals, replace ECU			
163	Injector Cylinder 3 failure	"fuel system"	Short circuit in wiring with external source	Check the wiring or replace injector	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil ON"
			Defective coil of injector	Check the wiring and replace injector.			
			Depending on the pattern, various reasons can cause the defect, internal ECU problems also possible	Check the wiring and the injection signals, replace ECU			
164	injector Cylinder 4 failure	"fuel system"	Short circuit in wiring with external source	Check the wiring or replace injector	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil ON"
			Defective coil of injector	Check the wiring and replace injector.			
			Depending on the pattern, various reasons can cause the defect, internal ECU problems also possible	Check the wiring and the injection signals, replace ECU			



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
165	Injector Cylinder 5 failure	"non"	Short circuit in wiring with external source	Check the wiring or replace injector	No		"Mil OFF"
			Defective coil of injector	Check the wiring and replace injector.			
			Depending on the pattern, various reasons can cause the defect, internal ECU problems also possible	Check the wiring and the injection signals, replace ECU			
166	Injector Cylinder 6 failure	"non"	Short circuit in wiring with external source	Check the wiring or replace injector	No		"Mil OFF"
			Defective coil of injector	Check the wiring and replace injector.			
			Depending on the pattern, various reasons can cause the defect, internal ECU problems also possible	Check the wiring and the injection signals, replace ECU			
167	Injector Cylinder 1 warning	"fuel system"	Broken wire or disconnection of wiring or inside injector	Check the wiring or replace injector.	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil ON"
168	Injector Cylinder 1 warning	"fuel system"	Broken wire or disconnection of wiring or inside injector	Check the wiring or replace injector.	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil ON"
169	Injector Cylinder 1 warning	"fuel system"	Broken wire or disconnection of wiring or inside injector	Check the wiring or replace injector.	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil ON"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
16A	Injector Cylinder 1 warning	"fuel system"	Broken wire or disconnection of wiring or inside injector	Check the wiring or replace injector.	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil ON"
16B	Injector Cylinder 1 warning	"non"	Broken wire or disconnection of wiring or inside injector	Check the wiring or replace injector.	No		"Mil OFF"
16C	Injector Cylinder 1 warning	"non"	Broken wire or disconnection of wiring or inside injector	Check the wiring or replace injector.	No		"Mil OFF"
16E	Minimum Injections Number not reached	"non"	"See individual injector and injection-bank errors (InjVivCyl... and InjVivBnk...) which have triggered the shut-off or error in the component"	"See individual injector and injection-bank errors (InjVivCyl... and InjVivBnk...) which have triggered the shut-off or error in the component"	No		"Mil OFF"
Injectors 2							
171	Injector Bank 1 failure	"fuel system"	"Short circuit of high-side to battery or ground."	Check the wiring or replace injector.	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil ON"
			"Short circuit of low-side to ground in injector cable"	Check the wiring or replace injector.			
			Depending on the pattern, various reasons can cause the defect, internal ECU problem	Check the wiring and the injection signals, replace ECU			



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
173	Injector Bank 2 failure	"fuel system"	"Short circuit of high-side to battery or ground." "Short circuit of low-side to ground in injector cable." Depending on the pattern, various reasons can cause the defect, internal ECU problem	Check the wiring or replace injector. Check the wiring or replace injector.. Check the wiring and the injection signals, replace ECU	Failure is a NOx dependent (potentially) longterm failure (via LTF group1 Fuel System)		"Mil ON"
17C	ECU Hardware for Injection: CY33X Chip specific failure (1)	"non"	Clock error or irruption of the power supply voltage Defective ECU Internal failure of ECU or "TESTMODE" takes too long Defective SPI-bus participant, timing problem due to software bug	Check the power supply or replace ECU if problem reoccurs. Reset ECU. If no recovery, replace ECU. "Check 'TESTMODE' parameters or replace ECU if problem reoccurs" Replace ECU if problem reoccurs (Send in ECU for investigation)	No		"Mil OFF"
27C	ECU Hardware for Injection: CY33X Chip specific failure (2)	"non"	Defective ECU Defective ECU Defective ECU Defective ECU	Replace ECU if problem reoccurs Replace ECU if problem reoccurs Replace ECU if problem reoccurs Replace ECU if problem reoccurs	No		"Mil OFF"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
Air inlet system / EGR							
181	Differential Pressure Sensor Failure between Exhaust and Intake (EGR Valve)	"comprehensive components"			No		"Mil ON"
Boost system and turbine speed							
19E	Torque Reduction due to Smoke Limitation	"non"	Active power reduction due to smoke limitation	"No actions necessary due to this failure alone. If powerreduction occurred due to actual defect, the failure triggering the torque limitation should also be in the failure memory. Follow troubleshooting of this root error."	No		"Mil OFF"
19F	NOx Estimation failure	"non"	Application dependent: Implausible sensor signals or defective sensors etc.	Determine what defect has set the Fid and resolve the problem causing this original defect.	No		"Mil OFF"
29D	Info: Torque Limitation due to Negative Torque Coordinator	"non"	Active power reduction due to engine break shut off event	"No actions necessary due to this failure alone. If powerreduction occurred due to actual defect, the failure triggering the torque limitation should also be in the failure memory. Follow troubleshooting of this root error."	No		"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
39E	Info: Torque Limitation due to Turbo Charger Protection	"non"	Active power reduction due to turbo charger protection	"No actions necessary due to this failure alone. If powerreduction occurred due to actual defect, the failure triggering the torque limitation should also be in the failure memory. Follow troubleshooting of this root error."	No		"Mil OFF"
49E	Info: Torque Limitation due to Engine Protection (against Excessive Torque, Engine Overspeed and Overheat)	"non"	Active power reduction due to engine mechanics protection	"No actions necessary due to this failure alone. If powerreduction occurred due to actual defect, the failure triggering the torque limitation should also be in the failure memory. Follow troubleshooting of this root error."	No		"Mil OFF"
59D	Info: Torque Limitation due to SCR Catalyst Overheat Protection	"non"	Active power reduction due to excessive temperatures in the SCR catalyst	"No actions necessary due to this failure alone. If powerreduction occurred due to actual defect, the failure triggering the torque limitation should also be in the failure memory. Follow troubleshooting of this root error."	No		"Mil OFF"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
59E	Info: Torque Limitation due to Noise Limitation	"non"	Active power reduction due to noise control	"No actions necessary due to this failure alone. If powerreduction occurred due to actual defect, the failure triggering the torque limitation should also be in the failure memory. Follow troubleshooting of this root error."	No		"Mil OFF"
69E	Info: Torque Limitation due to Fuel Quantity Limitation because of Injection System Errors	"non"	Active power reduction due to limiting fuel quantity	"No actions necessary due to this failure alone. If powerreduction occurred due to actual defect, the failure triggering the torque limitation should also be in the failure memory. Follow troubleshooting of this root error."	No		"Mil OFF"
Exhaust system (Aftertreatment)							
1A2	NOx Sensor Plausibility failure	"comprehensive components"	CAN communication disturbed, defective or inaccurate NOx sensor	Check for proper CAN communication and check accuracy and proper functioning of NOx sensor.	Failure is a NOx dependent (potentially) longterm failure (via LTF group4 NOx Sensor)	yes (OBD)	"Mil ON"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
1A3	NOx Sensor Failure	"comprehensive components"	Disconnected cable in the wiring of the NOx sensor or defective NOx sensor.	Check wiring of NOx sensor and its proper functioning. If necessary replace NOx sensor.	Failure is a NOx dependent (potentially) longterm failure (via LTF group4 NOx Sensor)	yes (OBD)	"Mil ON"
			Short circuit in the wiring of the NOx sensor or defective NOx sensor.	Check wiring of NOx sensor and its proper functioning. If necessary replace NOx sensor.			
			Strange driving cycle or improper installation of the sensor, defective NOx sensor	Check installation (including wiring) and functionality of sensor. If necessary change NOx sensor			
1A4	CAN Message timeout Nox (from Nox Sensor)	"non"	Defective CAN controller of NOx Sensor , undervoltage of NOx Sensor, missing NOx Sensor, CAN cable connecting the NOx Sensor is disconnected or broken. Short circuit in wiring.	"Check presence and correct connection of the NOx Sensor to the network, Check correct functioning of the NOx Sensor CAN controller and its voltage supply. Check wiring."	Failure is a NOx dependent (potentially) longterm failure (via LTF group4 NOx Sensor)	yes (OBD)	"Mil ON"
1A5	CAN Message timeout DM1DCU (from DCU)	"catalyst monitoring"	Defective CAN controller of DCU, undervoltage of DCU, missing DCU, CAN cable connecting the DCU is disconnected or broken. Short circuit in wiring	Check presence and correct connection of the DCU to the network, check correct functioning of the DCU CAN controller and its voltage supply. Check wiring.	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)	yes (OBD)	"Mil ON"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
1A6	CAN Message timeout SCR1 (from DCU)	"catalyst monitoring"	Defective CAN controller of Dosing Control Unit, undervoltage of DCU, missing DCU, CAN cable connecting the DCU is disconnected or broken. Short circuit in wiring	Check presence and correct connection of the DCU to the network, Check correct functioning of the DCU CAN controller and its voltage supply. Check wiring.	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)	yes (OBD)	"Mil ON"
1A8	Info: SCR Dosing Valve Overheat ProtectionR	"non"	"Failure due to engine switch off after a high load period, leading to high temperatur in exhaust system. A defect occurred in the urea dosing system which can impair the cooling of the urea dosing valve"	LRead out the DCU failure memory and perform troubleshooting according to DCU support.	No		"Mil OFF"
			A defect occurred in the urea dosing system which can impair the cooling of the urea dosing valve	Read out the DCU failure memory and perform troubleshooting according to DCU support.			
1AE	Humidity Sensor Signal Ratio failure	"non"	Sensor defective or short circuit to external source	Check wiring. Replace sensor if necessary	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)		"Mil OFF"
			Sensor defective or short circuit to ground	Check wiring. Replace sensor if necessary			
1AF	Info: DCU Error1 via CAN message DM1DCU	"non"	A certain error has occurred in the DCU System and is reported via CAN to the EDC.	Check what SPN and corresponding DCU error is active and perform troubleshooting according to DCU support.	No	yes (OBD)	"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
2A2	NOx Sensor Drift failure	"comprehensive components"	NOx sensor inaccurate or defective, defect in wiring, urea injection valve or fuel injector jammed open, excessive urea deposits in exhaust system, strange behaviour of SCR catalyst	Check NOx sensor for correct functioning (dismount sensor -> NOx value should be 0ppm during driving), check wiring of sensor, check fuel injectors, check urea dosing system for correct dosing amount (perform UDST and Dosing Valve Check, check DCU error memory for leakage failures), check SCR catalyst for correct functioning, check exhaust system for excessive urea deposits	Failure is a NOx dependent (potentially) longterm failure (via LTF group4 NOx Sensor)	yes (OBD)	"Mil ON"
2A6	CAN Message timeout SCR2 (from DCU)	"catalyst monitoring	Defective CAN controller of Dosing Control Unit, undervoltage of DCU, missing DCU, CAN cable connecting the DCU is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the DCU to the network, Check correct functioning of the DCU CAN controller and its voltage supply. Check wiring.	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)	yes (OBD)	"Mil ON"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
2AE	Info: Humidity Sensor possibly saturated with water droplets	"non"	Sensor possibly saturated with water droplets	"If failure 1AE 'IAHSCDStrDly' also stored in memory: proceed according that description If failure ACTIVE: run engine at medium speed > 10 min, if failure does NOT get INACTIVE: check wiring harness and replace sensor if necessary If failure not active AND ratio 'active time' / 'occurrence' < 10 min/occurrence: no action needed If failure not active AND ratio 'active time' / 'occurrence' > 10 min/occurrence: possible short circuit: check wiring harness or replace sensor, if necessary" Check wiring. Replace sensor if necessary	Failure is a NOx dependent (potentially) longterm failure (via LTF group5 SCR System)		"Mil OFF"
2AF	Info: DCU Error2 via CAN message DM1DCU	"non"	Sensor defective or short circuit to ground A certain error has occurred in the DCU System and is reported via CAN to the EDC.	Verificare quale SPN e relativo errore DCU è attivo ed individuare ed eliminare il problema secondo il supporto DCU.	No	yes (OBD)	"Mil ON"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
3A2	NOx Sensor Plausibility failure	"comprehensive components!"	NOx sensor inaccurate or defective, defect in wiring, inaccurate NOx estimation, urea injection valve jammed open or excessive urea deposits in exhaust system, defective SCR catalyst	Check urea dosing system for correct dosing amount (perform UDST and Dosing Valve Check, check DCU error memory for leakage failures), check NOx sensor for correct functioning, check wiring of sensor, check NOx estimation (humidity, boost pressure and temperature) for plausible values, check SCR catalyst for correct functioning, check exhaust system for excessive urea deposits	Failure is a NOx dependent (potentially) longterm failure (via LTF group4 NOx Sensor)	yes (OBD)	"Mil ON"
4AF	Info: DCU Error4 via CAN message DM1DCU	"non"	A certain error has occurred in the DCU System and is reported via CAN to the EDC.	Check what SPN and corresponding DCU error is active and perform troubleshooting according to DCU support.	No	yes (OBD)	"Mil ON"
5AF	Info: DCU Error5 via CAN message DM1DCU	"non"	A certain error has occurred in the DCU System and is reported via CAN to the EDC.	Check what SPN and corresponding DCU error is active and perform troubleshooting according to DCU support.	No	yes (OBD)	"Mil ON"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
Interfaces 1 (CAN-Bus)							
1B1	CAN A Bus off	"non"	Wrong configuration of CAN timing (Prescaler, synchronization jump width, sampling, propagation and phase segments), bad termination resistors, defective network connection and contacts or defective CAN controller with erroneous messages.	Check timing configuration with hardware compatibility, check termination resistors and network connection and contacts. Short circuits to external source, ground or CAN High to Low. Monitor CAN communication for erroneous behaviour of a participant.	No		"Mil OFF"
1B2	CAN B Bus off	"non"	Wrong configuration of CAN timing (Prescaler, synchronization jump width, sampling, propagation and phase segments), bad termination resistors, defective network connection and contacts or defective CAN controller with erroneous messages.	Check timing configuration with hardware compatibility, check termination resistors and network connection and contacts. Short circuits to external source, ground or CAN High to Low. Monitor CAN communication for erroneous behaviour of a participant.	No		"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
1B3	CAN C Bus off	"non"	Wrong configuration of CAN timing (Prescaler, synchronization jump width, sampling, propagation and phase segments), bad termination resistors, defective network connection and contacts or defective CAN controller with erroneous messages.	Check timing configuration with hardware compatibility, check termination resistors and network connection and contacts. Short circuits to external source, ground or CAN High to Low. Monitor CAN communication for erroneous behaviour of a participant.	No		"Mil OFF"
1B4	CAN Message timeout BC2EDC1 (from Body Computer)	"non"	Defective CAN controller of Body Computer, undervoltage of BC, missing BC, CAN cable connecting the BC is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the BC to the network, Check correct functioning of the BC CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
1B5	CAN Message timeout VM2EDC (from VCM)	"non"	Defective CAN controller of Vehicle Control Module, undervoltage of VCM, missing VCM, CAN cable connecting the VCM is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the VCM to the network, Check correct functioning of the VCM CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
1B7	CAN Transmit Message timeout	"non"	Disturbed CAN, incorrect configuration of the CAN, EDC is disconnected from the network, EDC CAN controller defective	Check CAN communication, check CAN configuration, ensure proper connection of the EDC to the network, replace EDC	No	yes (OBD)	"Mil OFF"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
1B9	Info: MIL visualization not available	"comprehensive components"	Defective MIL/Body Controller or disturbed CAN communication	Consult trouble shooting of body controller and check correct functioning of the CAN communication.	No		"Mil ON"
1BA	CAN Message timeout Dash Display (from VCM)	"non"	Defective CAN controller of Vehicle Control Module , undervoltage of VCM, missing VCM, CAN cable connecting the VCM is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the VCM to the network, Check correct functioning of the VCM CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
1BC	CAN Message timeout AMCON (from VCM)	"non"	Defective CAN controller of Vehicle Control Module , undervoltage of VCM, missing VCM, CAN cable connecting the VCM is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the VCM to the network, Check correct functioning of the VCM CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
1BD	CAN Message timeout CCVS (from Body Computer or VCM)	"non"	Defective CAN controller of Body Computer or Vehicle Control Module , undervoltage of BC or VCM, missing BC or VCM, CAN cable connecting the BC or VCM is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the BC or VCM to the network, check correct functioning of the BC or VCM CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
2B4	CAN Message timeout BC2EDC2 (from Body Computer)	"non"	Defective CAN controller of Body Computer , undervoltage of BC, missing BC, CAN cable connecting the BC is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the BC to the network, Check correct functioning of the BC CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
Interfaces 2 (CAN messages timeout)							
1C2	CAN Message timeout ETC1 (from Electronic Transmission Controller)	"non"	Defective CAN controller of Gearbox Control Unit , undervoltage of ETC, missing ETC, CAN cable connecting the ETC is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the ETC to the network, check correct functioning of the ETC CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
1C3	CAN Message timeout TCO1 (from Tachograph Output)	"non"	Defective CAN controller of Tachograph Output , undervoltage of TCO, missing TCO, CAN cable connecting the TCO is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the TCO to the network, check correct functioning of the TCO CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
1C6	"CAN Message timeout active TSC1-PE (Torque/Speed Control Request from PTO to Engine)"		Defective CAN controller of Power Take Off , undervoltage of PTO, missing PTO, CAN cable connecting the PTO is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the PTO to the network, Check correct functioning of the PTO CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
1C8	"CAN Message timeout active TSC1-VE (Torque/Speed Control Request from VCM/BC to Engine)"	"non"	Defective CAN controller of Vehicle Control Module or Body Computer , undervoltage of VCM/BC, missing VCM/BC, CAN cable connecting the VCM/BC is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the VCM/BC to the network, Check correct functioning of the VCM/BC CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
2C2	CAN Message timeout ETC2 (from Electronic Transmission Controller)	"non"	Defective CAN controller of Gearbox Control Unit , undervoltage of ETC, missing ETC, CAN cable connecting the ETC is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the ETC to the network, Check correct functioning of the ETC CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
2C6	"CAN Message timeout inactive TSC1-PE (Torque/Speed Control Request from PTO to Engine)"	"non"	Defective CAN controller of Power Take Off , undervoltage of PTO, missing PTO, CAN cable connecting the PTO is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the PTO to the network, Check correct functioning of the PTO CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
2C8	"CAN Message timeout active TSC1-VR (Torque/Speed Control Request from VCM/BC to Retarder)"	"non"	Defective CAN controller of Vehicle Control Module or Body Computer , undervoltage of VCM/BC, missing VCM/BC, CAN cable connecting the VCM/BC is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the VCM/BC to the network, Check correct functioning of the VCM/BC CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
2C9	Time/Date CAN timeout (from Tachograph or VCM)	"non"	Defective CAN controller of Tachograph , undervoltage of TC, missing TC, CAN cable connecting the TC is disconnected or broken. Short circuit in wiring	Check presence and correct connection of the TC to the network, Check correct functioning of the TC CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
3C8	"CAN Message timeout inactive TSC1-VE (Torque/Speed Control Request from VCM/BC to Engine)"	"non"	Defective CAN controller of Vehicle Control Module or Body Computer , undervoltage of VCM/BC, missing VCM/BC, CAN cable connecting the VCM/BC is disconnected or broken. Short circuit in wiring	Check presence and correct connection of the VCM/BC to the network, Check correct functioning of the VCM/BC CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
3C9	CAN Message timeout HRVD (from Tachograph - High Resolution Vehicle Distance)	"non"	Defective CAN controller of Tachograph - High Resolution Vehicle Distance , undervoltage of BC, missing BC, CAN cable connecting the BC is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the BC to the network, Check correct functioning of the BC CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"
4C8	"CAN Message timeout inactive TSC1-VR (Torque/Speed Control Request from VCM/BC to Retarder)"	"non"	Defective CAN controller of Vehicle Control Module or Body Computer , undervoltage of VCM/BC, missing VCM/BC, CAN cable connecting the VCM/BC is disconnected or broken. Short circuit in wiring.	Check presence and correct connection of the VCM/BC to the network, Check correct functioning of the VCM/BC CAN controller and its voltage supply. Check wiring.	No		"Mil OFF"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
ECU 1 (internal checks)							
1D1	ECU Hardware: SPI Communication failure	"non"	Electric disturbances, internal defect of the ECU leading to a SPI bus communication error	Replace ECU if failure remains present	No		"Mil OFF"
1D2	ECU Hardware: EEPROM failure	"non"	Wrong programming/flashings of the EDC, internal defect of the EDC.	Try to flash the EDC correctly with a proper dataset, if defect persists: replace EDC.	No		"Mil OFF"
			Wrong programming/flashings of the EDC, internal defect of the EDC.	Try to flash the EDC correctly with a proper dataset, if defect persists: replace EDC.			
			Wrong programming/flashings of the EDC, internal defect of the EDC.	Try to flash the EDC correctly with a proper dataset, if defect persists: replace EDC.			
1D3	ECU recovery - locked	"non"	Electronic disturbances, various hardware defects (ECU internal) or configuration problems	Analyze what error triggered the recovery (Read out label HWEMon_numRecovery and compare the value with the according table). If error occurs repeatedly, reprogram EDC. If error remains, replace EDC.	No		"Mil OFF"
1D4	ECU Hardware: Microcontroller Watchdog failure	"non"	Defective monitoring module or CPU (e.g. impaired functioning of the CPU clock) of the EDC. Disturbed SPI-Bus.	If error exists only temporary (i.e. injection reoccurs) error can be ignored and error deleted in the fault memory. In case of a permanent error the injection remains blocked and the ECU has to be replaced	No		"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
ECU 1 (controlli interni)							
1D5	ECU Hardware: Shut off during Initialization	"non"	Watch dog switch off path defect	If failure remains after ECU initialisation: replace ECU	No	yes (technical)	"Mil OFF"
			Electronic disturbances, internal ECU problem	If failure remains after ECU initialisation: replace ECU			
			Electronic disturbances, internal ECU problem	If failure remains after ECU initialisation: replace ECU			
1D6	ECU Hardware: TPU Monitoring	"non"	Electronic disturbances, wrong TPU timebase	If failure persists: Replace ECU	No		"Mil OFF"
			See general remarks	See general remarks			
1D7	ECU Software: Variant Dataset failure	"non"	See general remarks	See general remarks	No		"Mil OFF"
			See general remarks	See general remarks			
1D8	ECU Hardware: Controller Watchdog failure	"non"	Disturbed SPI-Bus	If ECU functions correctly after recovery only temporary SPI error occurred and fault memory can be deleted and error ignored. If permanent SPI error is present and the ECU does not leave boot block --> Replace ECU	No		"Mil OFF"
1D9	ADC Monitoring failure	"non"	Buffer overrun		No		"Mil OFF"
2D3	ECU recovery - suppressed	"non"	Electronic disturbances, various hardware defects (ECU internal) or configuration problems	Analyze what error triggered the recovery (Read out label HWEMon_numRecov ery and compare the value with the accordingly table). If error occurs repeatedly, reprogram EDC. If error remains, replace EDC.	No		"Mil OFF"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
3D3	ECU recovery - visible	"non"	Electronic disturbances, various hardware defects (ECU internal) or configuration problems	Analyze what error triggered the recovery (Read out label HWEMon_numRecov ery and compare the value with the according table). If error occurs repeatedly, reprogram EDC. If error remains, replace EDC.	No		"Mil OFF"
ECU 2 (Powerst./Immobil./Overrun/Sensor supply)							
1E1	ECU Hardware: High Side Power Stage Short to Ground or Battery	"non"	Short circuit of wiring to ground or inside relay	Check of wiring or replace relay	No	yes (technical)	"Mil OFF"
1E2	Immobilizer failure (no fuel release)	"non"	"1) Defective CAN or immobilizer and new control unit (here no PIN entry is possible) OR T15 was toggled more than a calibratable value OR number of allowed incorrect PIN entries is exceeded. 2) Defective CAN or immobilizer OR wrong code AND code is known by the EDC AND T15 has not been toggled excessively"	"1) Ensure correct CAN functioning (timeout errors), unlock fuel release via a tester request, replace immobilizer 2) Enter PIN code via accelerator pedal or instrument cluster, ensure correct CAN functioning (timeout errors), replace immobilizer"	No		"Mil OFF"
1E3	Overrun Monitoring failure	"non"	Electronic disturbances, requested torque increase via tester, wrong application of injection relevant parameters, defective ECU	Check injection relevant application, if failure persists replace ECU	No		"Mil OFF"
1E4	Redundant Engine Speed in Overrun Monitoring	"non"	Electronic disturbances, internal ECU problem	If failure persists after reinitialization replace ECU	No		"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
1E5	ECU Hardware: Sensor 12V Supply Voltage failure	"non"	Excessive battery voltage, defect in wiring harness, electrical failure of the EDC Insufficient battery voltage, defect in wiring harness, electrical failure of the EDC	Check battery voltage, check wiring for correct voltage supply of the sensor and the EDC, replace EDC Check battery voltage, check wiring for correct voltage supply of the sensor and the EDC, replace EDC	No		"Mil OFF"
1E6	ECU Hardware: Sensor Supply Voltage 1 failure	"comprehensive components"	Excessive battery voltage, defect in wiring harness, electrical failure in connected sensors or in the EDC Insufficient battery voltage, defect in wiring harness, electrical failure in connected sensors or in the EDC	Check battery voltage, check wiring for correct voltage supply of the sensor and the EDC, replace EDC Check battery voltage, check wiring for correct voltage supply of the sensor and the EDC, replace EDC	No	yes (technical)	"Mil ON"
1E7	ECU Hardware: Sensor Supply Voltage 2 failure	"non"	Excessive battery voltage, defect in wiring harness, electrical failure in connected sensors or in the EDC Insufficient battery voltage, defect in wiring harness, electrical failure in connected sensors or in the EDC	Check battery voltage, check wiring for correct voltage supply of the sensor and the EDC, replace EDC Check battery voltage, check wiring for correct voltage supply of the sensor and the EDC, replace EDC	No	yes (technical)	"Mil OFF"

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DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term-Failure	Power Red.	Mil.
1E8	ECU Hardware: Sensor Supply Voltage 3 failure	"non"	Excessive battery voltage, defect in wiring harness, electrical failure in connected sensors or in the EDC Insufficient battery voltage, defect in wiring harness, electrical failure in connected sensors or in the EDC	Check battery voltage, check wiring for correct voltage supply of the sensor and the EDC, replace EDC Check battery voltage, check wiring for correct voltage supply of the sensor and the EDC, replace EDC	No	yes (technical)	"Mil OFF"
1E9	ECU internal Supply Voltage too high	"non"	Excessive voltage supply of a CJ940 component: High battery voltage, defective wiring, internal defect of the EDC	Check the battery for correct voltage supply, check wiring. If defect remains replace EDC (internal defect)	No		"Mil OFF"
1EA	ECU internal Supply Voltage too low	"non"	Insufficient voltage supply of a CJ940 component: Low battery voltage, defective wiring, internal defect of the EDC	Check the battery for sufficient voltage supply, check wiring. If defect remains replace EDC (internal defect)	No		"Mil OFF"



DTC	Description	OBD-System	Reason of Failure	Possible failure correction	Long Term- Failure	Power Red.	Mil.
1EB	Atmospheric Pressure Sensor failure	"non"	Ambient pressure sensor inside ECU is defect	Replace ECU (not necessary if never running in high altitude and if turbocharger without VGT)	No		"Mil OFF"
			Ambient pressure sensor inside ECU is defect	Replace ECU (not necessary if never running in high altitude and if turbocharger without VGT)			
			Ambient pressure sensor inside ECU is defect	Replace ECU (not necessary if never running in high altitude and if turbocharger without VGT)			
2E1	ECU Hardware: Low Side Power Stage Short to Ground or Battery	"non"	Short circuit of wiring to external source or inside relay	Check wiring or replace relay	No	yes (technical)	"Mil OFF"

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CUMMINS ENGINES ERROR CODES TABLE

FAULT CODE	J1939 SPN	J1939 FMI	Lamp Color	J1939 SPN Description	Cummins Description
111	629	12	Red	Controller #1	Engine Control Module Critical internal failure - Bad intelligent Device or Component
115	612	2	Red	System Diagnostic Code # 2	Engine Speed/Position Sensor Circuit lost both of two signals from the magnetic pickup sensor - Data Erratic, Intermittent, or incorrect
122	102	3	Amber	Boost Pressure	Intake Manifold Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
123	102	4	Amber	Boost Pressure	Intake Manifold Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
124	102	16	Amber	Boost Pressure	Intake Manifold 1 Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level
131	91	3	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source
132	91	4	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
133	974	3	Red	Remote Accelerator	Remote Accelerator Pedal or Lever Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source
134	974	4	Red	Remote Accelerator	Remote Accelerator Pedal or Lever Position Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
135	100	3	Amber	Engine Oil Pressure	Oil Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
141	100	4	Amber	Engine Oil Pressure	Oil Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
143	100	18	Amber	Engine Oil Pressure	Oil Pressure Low - Data Valid but Below Normal Operational Range - Moderately Severe Level
144	110	3	Amber	Engine Coolant Temperature	Coolant Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
145	110	4	Amber	Engine Coolant Temperature	Coolant Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
146	110	16	Amber	Engine Coolant Temperature	Coolant Temperature High - Data Valid but Above Normal Operational Range - Moderately Severe Level
147	91	1	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor Circuit - Abnormal Frequency, Pulse Width, or Period
148	91	0	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor Circuit - Abnormal Frequency, Pulse Width, or Period
151	110	0	Red	Engine Coolant Temperature	Coolant Temperature Low - Data Valid but Above Normal Operational Range - Most Severe Level

FAULT CODE	J1939 SPN	J1939 FMI	Lamp Color	J1939 SPN Description	Cummins Description
153	105	3	Amber	Intake Manifold #1 Temp	Intake Manifold Air Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
154	105	4	Amber	Intake Manifold #1 Temp	Intake Manifold Air Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
155	105	0	Red	Intake Manifold #1 Temp	Intake Manifold Air Temperature High - Data Valid but Above Normal Operational Range - Most Severe Level
187	3510	4	Amber	5 Volts DC Supply	Sensor Supply Voltage #2 Circuit - Voltage Below Normal, or Shorted to Low Source
193	520199	3	Amber	Cruise Control	Cruise Control (Resistive) Signal Circuit - Voltage Above Normal, or Shorted to High Source
194	520199	4	Lamp Color	J1939 SPN Description	Cummins Description
195	111	3	Red	Coolant Level	Coolant Level Sensor Circuit - Voltage Above Normal, or Shorted to High Source
196	111	4	Amber	Coolant Level	Coolant Level Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
197	111	18	Amber	Coolant Level	Coolant Level - Data Valid but Below Normal Operational Range - Moderately Severe Level
199	1661	4	Amber	Engine Automatic Start Lamp	Engine Automatic Start Lamp Driver Circuit - Voltage Above Normal, or Shorted to High Source
211	1484	31	None	J1939 Error	Additional Auxiliary Diagnostic Codes logged - Condition Exists
212	175	3	Amber	Oil Temperature	Engine Oil Temperature Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source
213	175	4	Amber	Oil Temperature	Engine Oil Temperature Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source
214	175	0	Red	Oil Temperature	Engine Oil Temperature - Data Valid but Above Normal Operational Range - Most Severe Level
221	108	3	Amber	Barometric Pressure	Barometric Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
222	108	4	Amber	Barometric Pressure	Barometric Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
227	3510	3	Amber	5 Volts DC Supply	Sensor Supply Voltage #2 Circuit - Voltage Above Normal, or Shorted to High Source
231	109	3	Amber	Coolant Pressure	Coolant Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
232	109	4	Amber	Coolant Pressure	Coolant Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
233	109	18	Amber	Coolant Pressure	Coolant Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level

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FAULT CODE	J1939 SPN	J1939 FMI	Lamp Color	J1939 SPN Description	Cummins Description
234	190	0	Red	Engine Speed	Engine Speed High - Data Valid but Above Normal Operational Range - Most Severe Level
235	111	1	Red	Coolant Level	Coolant Level Low - Data Valid but Below Normal Operational Range - Most Severe Level
237	644	2	Amber	External Speed Input	"External Speed Input (Multiple Unit Synchronization) - Data Erratic, Intermittent, or Incorrect"
238	3511	4	Amber	System Diagnostic code # 1	Sensor Supply Voltage #3 Circuit - Voltage Below Normal, or Shorted to Low Source
239	3511	3	Amber	System Diagnostic code #2	Sensor Supply Voltage #3 Circuit - Voltage Above Normal, or Shorted to High Source
241	84	2	Amber	Wheel-based Vehicle Speed	Vehicle Speed Sensor Circuit - Data Erratic, Intermittent, or Incorrect
242	84	10	Amber	Wheel-based Vehicle Speed	Vehicle Speed Sensor Circuit tampering has been detected - Abnormal Rate of Change
244	623	4	Amber	Red Stop Lamp	Red Stop Lamp Driver Circuit - Voltage Below Normal, or Shorted to Low Source
245	647	4	Amber	Fan Clutch Output Device Driver	Fan Control Circuit - Voltage Below Normal, or Shorted to Low Source
249	171	3	Amber	Ambient Air Temperature	Ambient Air Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
256	171	4	Amber	Ambient Air Temperature	Ambient Air Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
261	174	16	Amber	Fuel Temperature	Engine Fuel Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level
263	174	3	Amber	Fuel Temperature	Engine Fuel Temperature Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source
265	174	4	Amber	Fuel Temperature	Engine Fuel Temperature Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source
268	94	2	Red	Fuel Delivery Pressure	Fuel Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect
271	1347	4	Amber	Fuel Pump Pressurizing Assembly #1	High Fuel Pressure Solenoid Valve Circuit - Voltage Below Normal, or Shorted to Low Source
272	1347	3	Amber	Fuel Pump Pressurizing Assembly #1	High Fuel Pressure Solenoid Valve Circuit - Voltage Above Normal, or Shorted to High Source
281	1347	7	Amber	Fuel Pump Pressurizing Assembly #1	High Fuel Pressure Solenoid Valve #1 - Mechanical System Not Responding Properly or Out of Adjustment
284	1043	4	Amber	Internal Sensor Voltage Supply	Engine Speed/Position Sensor (Crankshaft) Supply Voltage Circuit - Voltage Below Normal, or Shorted to Low Source

FAULT CODE	J1939 SPN	J1939 FMI	Lamp Color	J1939 SPN Description	Cummins Description
285	639	9	Amber	SAE J1939 Datalink	SAE J1939 Multiplexing PGN Timeout Error - Abnormal Update Rate
286	639	13	Amber	SAE J1939 Datalink	SAE J1939 Multiplexing Configuration Error - Out of Calibration
287	91	19	Red	Accelerator Pedal Position	SAE J1939 Multiplexing Accelerator Pedal or Lever Sensor System Error - Received Network Data In Error
288	974	19	Red	Remote Accelerator	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Data Error - Received Network Data In Error
292	441	14	Red	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 - Special Instructions
293	441	3	Amber	OEM Temperature	Auxiliary Temperature Sensor Input # 1 Circuit - Voltage Above Normal, or Shorted to High Source
294	441	4	Amber	OEM Temperature	Auxiliary Temperature Sensor Input # 1 Circuit - Voltage Below Normal, or Shorted to Low Source
295	108	2	Amber	Barometric Pressure	Barometric Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect
296	1388	14	Red	Auxiliary Pressure	Auxiliary Pressure Sensor Input 1 - Special Instructions
297	1388	3	Amber	Auxiliary Pressure	Auxiliary Pressure Sensor Input # 2 Circuit - Voltage Above Normal, or Shorted to High Source
298	1388	4	Amber	Auxiliary Pressure	Auxiliary Pressure Sensor Input # 2 Circuit - Voltage Below Normal, or Shorted to Low Source
319	251	2	Maint	Real Time Clock Power Injector	Real Time Clock Power Interrupt - Data Erratic, Intermittent, or Incorrect
322	651	5	Amber	Cylinder #01	Injector Solenoid Cylinder #1 Circuit - Current Below Normal, or Open Circuit
323	655	5	Amber	Injector Cylinder #05	Injector Solenoid Cylinder #5 Circuit - Current Below Normal, or Open Circuit
324	653	5	Amber	Injector Cylinder #03	Injector Solenoid Cylinder #3 Circuit - Current Below Normal, or Open Circuit
325	656	5	Amber	Injector Cylinder #06	Injector Solenoid Cylinder #6 Circuit - Current Below Normal, or Open Circuit
331	652	5	Amber	Injector Cylinder #02	Injector Solenoid Cylinder #2 Circuit - Current Below Normal, or Open Circuit
332	654	5	Amber	Injector Cylinder #04	Injector Solenoid Cylinder #4 Circuit - Current Below Normal, or Open Circuit
334	110	2	Amber	Engine Coolant Temperature	Coolant Temperature Sensor Circuit - Data Erratic, Intermittent, or Incorrect
338	1267	3	Amber	Vehicle Accessories Relay Driver	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage Above Normal, or Shorted to High Source
339	1267	4	Amber	Vehicle Accessories Relay Driver	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage Above Normal, or Shorted to High Source

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FAULT CODE	J1939 SPN	J1939 FMI	Lamp Color	J1939 SPN Description	Cummins Description
341	630	2	Red	Calibration Memory	Engine Control Module data lost - Data Erratic, Intermittent, or Incorrect
342	630	13	Red	Calibration Memory	Electronic Calibration Code Incompatibility - Out of Calibration
343	629	12	Amber	Controller #1	Engine Control Module Warning internal hardware failure - Bad Intelligent Device or Component
349	191	16	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Data Valid but Above Normal Operational Range - Moderately Severe Level
351	627	12	Amber	Controller #1	Injector Power Supply - Bad Intelligent Device or Component
352	3509	4	Amber	5 Volts DC Supply	Sensor Supply Voltage #1 Circuit - Voltage Below Normal, or Shorted to Low Source
386	3509	3	Amber	5 Volts DC Supply	Sensor Supply Voltage #1 Circuit - Voltage Above Normal, or Shorted to High Source
415	100	1	Red	Engine Oil Pressure	Oil Pressure Low - Data Valid but Below Normal Operational Range - Most Severe Level
418	97	15	Maint.	Water in Fuel Indicator	Water in Fuel Indicator High - Data Valid but Above Normal Operational Range - Least Severe Level
422	111	2	Amber	Coolant Level	Coolant Level - Data Erratic, Intermittent, or Incorrect
425	175	2	Amber	Oil Temperature	Engine Oil Temperature - Data Erratic, Intermittent, or Incorrect
428	97	3	Amber	Water in Fuel Indicator	Water in Fuel Sensor Circuit - Voltage Above Normal, or Shorted to High Source
429	97	4	Amber	Water in Fuel Indicator	Water in Fuel Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
431	558	2	Amber	Accelerator Pedal Low Idle Switch	Accelerator Pedal or Lever Idle Validation Circuit - Data Erratic, Intermittent, or Incorrect
432	558	13	Red	Accelerator Pedal Low Idle Switch	Accelerator Pedal or Lever Idle Validation Circuit - Out of Calibration
435	100	2	Amber	Engine Oil Pressure	Oil Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect
441	168	18	Amber	Electrical Potential (Voltage)	Battery #1 Voltage Low - Data Valid but Below Normal Operational Range - Moderately Severe Level
442	168	16	Amber	Electrical Potential (Voltage)	Battery #1 Voltage High - Data Valid but Above Normal Operational Range - Moderately Severe Level
449	157	0	Red	Injector Metering Rail 1 Pressure	Fuel Pressure High - Data Valid but Above Normal Operational Range - Moderately Severe Level
451	157	3	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail #1 Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
452	157	4	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail #1 Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source

FAULT CODE	J1939 SPN	J1939 FMI	Lamp Color	J1939 SPN Description	Cummins Description
488	105	16	Amber	Intake Manifold	Intake Manifold 1 Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level
489	191	18	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Data Valid but Below Normal Operational Range - Moderately Severe Level
497	1377	2	Amber	Switch Circuit	Multiple Unit Synchronization Switch Circuit - Data Erratic, Intermittent, or Incorrect
523	611	2	Amber	System Diagnostic code # 1	OEM Intermediate (PTO) Speed switch Validation - Data Erratic, Intermittent, or Incorrect
527	702	3	Red	Circuit - Voltage	Auxiliary Input/Output 2 Circuit - Voltage Above Normal, or Shorted to High Source
528	93	2	Amber	Switch - Data	Auxiliary Alternate Torque Validation Switch - Data Erratic, Intermittent, or Incorrect
529	703	3	Amber	Circuit - Voltage	Auxiliary Input/Output 3 Circuit - Voltage Above Normal, or Shorted to High Source
546	94	3	Amber	Fuel Delivery Pressure	Fuel Delivery Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
547	94	4	Amber	Fuel Delivery Pressure	Fuel Delivery Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
551	558	4	Amber	Accelerator Pedal Low Idle Switch	Accelerator Pedal or Lever Idle Validation Circuit - Voltage Below Normal, or Shorted to Low Source
553	157	16	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail #1 Pressure High - Data Valid but Above Normal Operational Range - Moderately Severe Level
554	157	2	Amber	Injector Metering Rail 1 Pressure	Fuel Pressure Sensor Error - Data Erratic, Intermittent, or Incorrect
559	157	18	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail #1 Pressure Low - Data Valid but Below Normal Operational Range - Moderately Severe Level
584	677	3	Amber	Starter Solenoid Lockout Relay Driver Circuit	Starter Relay Circuit - Voltage Above Normal, or Shorted to High Source
585	677	4	Amber	Starter Solenoid Lockout Relay Driver Circuit	Starter Relay Circuit - Voltage Below Normal, or Shorted to Low Source
595	103	16	Amber	Turbocharger 1 Speed	Turbocharger #1 Speed High - Data Valid but Above Normal Operational Range - Moderately Severe Level
596	167	16	Amber	Alternate Potential (voltage)	Electrical Charging System Voltage High - Data Valid but Above Normal Operational Range - Moderately Severe Level
597	167	18	Amber	Alternate Potential (voltage)	Electrical Charging System Voltage Low - Data Valid but Below Normal Operational Range - Moderately Severe Level
598	167	1	Red	Alternate Potential (voltage)	Electrical Charging System Voltage Low - Data Valid but Below Normal Operational Range - Most Severe Level

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FAULT CODE	J1939 SPN	J1939 FMI	Lamp Color	J1939 SPN Description	Cummins Description
599	640	14	Red	Engine External Protection Input	Auxiliary Commanded Dual Output Shutdown - Special Instructions
649	1378	31	Maint	Engine Oil Change Interval	Change Lubricating Oil and Filter – Condition Exists
687	103	18	Amber	Turbocharger #1 Speed	Turbocharger #1 Speed Low - Data Valid but Below Normal Operational Range – Moderately Severe Level
689	190	2	Amber	Engine Speed	Primary Engine Speed Sensor Error – Data Erratic, Intermittent, or Incorrect
691	1172	3	Amber	Turbocharger #1 Compressor Inlet Temperature	Turbocharger #1 Compressor Inlet Temperature Sensor Circuit – Voltage Above Normal, or Shorted to High Source
692	1172	4	Amber	Turbocharger #1 Compressor Inlet Temperature	Turbocharger #1 Compressor Inlet Temperature Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
697	1136	3	Amber	Sensor Circuit - Voltage	ECM Internal Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
698	1136	4	Amber	Sensor Circuit - Voltage	ECM Internal Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
719	22	3	Amber	Crankcase Pressure	Extended Crankcase Blow-by Pressure Circuit - Voltage Above Normal, or Shorted to High Source
729	22	4	Amber	Crankcase Pressure	Extended Crankcase Blow-by Pressure Circuit - Voltage Above Normal, or Shorted to High Source
731	723	7	Engine Speed Sensor #2	Engine Speed/Position #2 mechanical misalignment between camshaft and crankshaft sensors - Mechanical System Not Responding Properly or Out of Adjustment	Engine Speed/Position #2 mechanical misalignment between camshaft and crankshaft sensors - Mechanical System Not Responding Properly or Out of Adjustment
757	2802	31	Electronic Control Module	Electronic Control Module data lost - Condition Exists	Electronic Control Module data lost - Condition Exists
778	723	2	Engine Speed Sensor #2	Engine Speed Sensor (Camshaft) Error – Data Erratic, Intermittent, or Incorrect	Engine Speed Sensor (Camshaft) Error – Data Erratic, Intermittent, or Incorrect
779	703	11	Auxiliary Equipment Sensor Input	Warning Auxiliary Equipment Sensor Input # 3 (OEM Switch) - Root Cause Not Known	Warning Auxiliary Equipment Sensor Input # 3 (OEM Switch) - Root Cause Not Known
951	166	2	Cylinder Power	Cylinder Power Imbalance Between Cylinders - Data Erratic, Intermittent, or Incorrect	Cylinder Power Imbalance Between Cylinders - Data Erratic, Intermittent, or Incorrect
1117	627	2	Power Supply	Power Lost With Ignition On - Data Erratic, Intermittent, or Incorrect	Power Lost With Ignition On - Data Erratic, Intermittent, or Incorrect
1139	651	7	Injector Cylinder # 01	Injector Cylinder #1 - Mechanical System Not Responding Properly or Out of Adjustment	Injector Cylinder #1 - Mechanical System Not Responding Properly or Out of Adjustment
1141	652	7	Injector Cylinder # 02	Injector Cylinder #2 - Mechanical System Not Responding Properly or Out of Adjustment	Injector Cylinder #2 - Mechanical System Not Responding Properly or Out of Adjustment
1142	653	7	Injector Cylinder # 03	Injector Cylinder #3 - Mechanical System Not Responding Properly or Out of Adjustment	Injector Cylinder #3 - Mechanical System Not Responding Properly or Out of Adjustment
1143	654	7	Injector Cylinder # 04	Injector Cylinder #4 - Mechanical System Not Responding Properly or Out of Adjustment	Injector Cylinder #4 - Mechanical System Not Responding Properly or Out of Adjustment
1144	655	7	Injector Cylinder # 05	Injector Cylinder #5 - Mechanical System Not Responding Properly or Out of Adjustment	Injector Cylinder #5 - Mechanical System Not Responding Properly or Out of Adjustment
1145	656	7	Injector Cylinder # 06	Injector Cylinder #6 - Mechanical System Not Responding Properly or Out of Adjustment	Injector Cylinder #6 - Mechanical System Not Responding Properly or Out of Adjustment

FAULT CODE	J1939 SPN	J1939 FMI	Lamp Color	J1939 SPN Description	Cummins Description
1239	2623	3	Amber	Accelerator Pedal Position	"Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage Above Normal, or Shorted to High Source"
1241	2623	3	Amber	Accelerator Pedal Position	"Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage Below Normal, or Shorted to Low Source"
1242	91	2	Red	Accelerator Pedal Position	"Accelerator Pedal or Lever Position Sensor 1 and 2 - Data Erratic, Intermittent, or Incorrect"
1256	1563	2	Amber	Control Module Identification Input State	Control Module Identification Input State Error - Data Erratic, Intermittent, or Incorrect
1257	1563	2	Red	Control Module Identification Input State	Control Module Identification Input State Error - Data Erratic, Intermittent, or Incorrect
1852	97	16	Amber	Water in Fuel Indicator	Water in Fuel Indicator - Data Valid but Above Normal Operational Range - Moderately Severe Level
1911	157	0	Amber	Injector Metering Rail	Injector Metering Rail 1 Pressure - Data Valid but Above Normal Operational Range - Most Severe Level
2111	52	3	Amber	Coolant Temperature	Coolant Temperature 2 Sensor Circuit - Voltage Above Normal, or Shorted to High Source
2112	52	4	Amber	Coolant Temperature	Coolant Temperature 2 Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
2113	52	16	Amber	Coolant Temperature	Coolant Temperature 2 - Data Valid but Above Normal Operational Range - Moderately Severe Level
2114	52	0	Red	Coolant Temperature	Coolant Temperature 2 - Data Valid but Above Normal Operational Range - Most Severe Level
2115	2981	3	Amber	Coolant Pressure	Coolant Pressure 2 Circuit - Voltage Above Normal, or Shorted to High Source
2116	2881	4	Amber	Coolant Pressure	Coolant Pressure 2 Circuit - Voltage Above Normal, or Shorted to High Source
2117	2881	18	Red	Coolant Pressure	Coolant Pressure 2 - Data Valid but Below Normal Operational Range - Moderately Severe Level
2182	1072	3	Amber	Engine Brake Output # 1	Engine Brake Actuator Driver 1 Circuit - Voltage Above Normal, or Shorted to High Source
2183	1072	4	Amber	Engine Brake Output # 1	Engine Brake Actuator Driver 1 Circuit - Voltage Below Normal, or Shorted to Low Source
2185	3512	3	Amber	System Diagnostic code # 1	Sensor Supply Voltage #4 Circuit - Voltage Above Normal, or Shorted to High Source
2186	3512	4	Amber	System Diagnostic code # 1	Sensor Supply Voltage #4 Circuit - Voltage Below Normal, or Shorted to Low Source
2195	703	14	Red	Auxiliary Equipment Sensor	Auxiliary Equipment Sensor Input 3 Engine Protection Critical - Special Instructions

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FAULT CODE	J1939 SPN	J1939 FMI	Lamp Color	J1939 SPN Description	Cummins Description
2215	94	18	Amber	Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level
2216	94	1	Amber	Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level
2217	630	31	Amber	Calibration Memory	ECM Program Memory (RAM) Corruption - Condition Exists
2249	157	1	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data Valid but Below Normal Operational Range - Most Severe Level
2261	94	15	Maint	Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid but Above Normal Operational Range - Least Severe Level
2262	94	17	Maint	Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid but Below Normal Operational Range - Least Severe Level
2263	1800	16	Amber	Battery Temperature	Battery Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level
2264	1800	18	Amber	Battery Temperature	Battery Temperature - Data Valid but Below Normal Operational Range - Moderately Severe Level
2265	1075	3	Amber	Electric Lift Pump for Engine Fuel	Fuel Priming Pump Control Signal Circuit - Voltage Above Normal, or Shorted to High Source
2266	1075	4	Amber	Electric Lift Pump for Engine Fuel	Fuel Priming Pump Control Signal Circuit - Voltage Below Normal, or Shorted to Low Source
2292	611	16	Amber	Fuel Inlet Meter Device	Fuel Inlet Meter Device - Data Valid but Above Normal Operational Range - Moderately Severe Level
2293	611	18	Amber	Fuel Inlet Meter Device	Fuel Inlet Meter Device flow demand lower than expected - Data Valid but Below Normal Operational Range - Moderately Severe Level
2311	633	18	Amber	Fuel Control Valve #1	Fueling Actuator #1 Circuit Error - Condition Exists
2321	190	2	None	Engine Speed	Engine Speed / Position Sensor #1 - Data Erratic, Intermittent, or Incorrect
2322	723	2	None	Engine Speed Sensor #2	Engine Speed / Position Sensor #2 - Data Erratic, Intermittent, or Incorrect
2345	103	10	Amber	Turbocharger 1 Speed	"Turbocharger speed invalid rate of change detected - Abnormal Rate of Change"
2346	2789	15	None	System Diagnostic Code #1	Turbocharger Turbine Inlet Temperature (Calculated) - Data Valid but Above Normal Operational Range - Least Severe Level
2347	2790	15	None	System Diagnostic Code #1	Turbocharger Compressor Outlet Temperature (Calculated) - Data Valid but Above Normal Operational Range - Least Severe Level
2363	1073	4	Amber	Engine Compression Brake Output # 2	Engine Brake Actuator Circuit #2 - Voltage Below Normal, or Shorted to Low Source

FAULT CODE	J1939 SPN	J1939 FMI	Lamp Color	J1939 SPN Description	Cummins Description
2365	1112	4	Red	Engine Brake Output # 3	Engine Brake Actuator Driver Output 3 Circuit - Voltage Below Normal, or Shorted to Low Source
2367	1073	3	Amber	Engine Compression Brake Output # 2	Engine Brake Actuator Circuit #2 - Voltage Above Normal, or Shorted to High Source
2368	1112	3	Amber	Engine Brake Output # 3	Engine Brake Actuator Driver 3 Circuit - Voltage Above Normal, or Shorted to High Source
2372	95	16	Amber	Engine Fuel Filter Differential Pressure	Fuel Filter Differential Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level
2373	1209	3	Amber	Exhaust Gas Pressure	Exhaust Gas Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
2374	1209	4	Amber	Exhaust Gas Pressure	Exhaust Gas Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
2375	412	3	Amber	Exhaust Gas Recirculation Temperature	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
2376	412	4	Amber	Exhaust Gas Recirculation Temperature	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
2377	647	3	Amber	Fan Clutch Output Device Driver	Fan Control Circuit - Voltage Above Normal, or Shorted to High Source
2425	730	4		Intake Air Heater # 2	Intake Air Heater 2 Circuit - Voltage Below Normal, or Shorted to Low Source
2426	730	3		Intake Air Heater # 2	Intake Air Heater 2 Circuit - Voltage Above Normal, or Shorted to High Source
2555	729	3	Amber	Inlet Air Heater Driver #1	Intake Air Heater #1 Circuit - Voltage Above Normal, or Shorted to High Source
2556	729	4	Amber	Inlet Air Heater Driver #1	Intake Air Heater #1 Circuit - Voltage Below Normal, or Shorted to Low Source
2557	697	3	Amber	Auxiliary PWM Driver #1	Auxiliary PWM Driver #1 - Voltage Above Normal, or Shorted to High Source
2558	697	4	Amber	Auxiliary PWM Driver #1	Auxiliary PWM Driver #1 - Voltage Below Normal, or Shorted to Low Source
2963	110	15	None	Engine Coolant Temperature	Engine Coolant Temperature High - Data Valid but Above Normal Operational Range - Least Severe Level
2973	102	2	Amber	Boost Pressure	Intake Manifold Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect

12.1.6. SCR system (selective catalytic reduction) – only on TIER4/EURO5/EURO6

In order to conform with the current Euro 4 regulation and with the future Euro 5 - 6 concerning the emission of burnt gases, this system has been installed with the task to reduce Nitric Oxides (NOx), which may have carcinogen effects. To reduce such unhealthy gas into Nitrogen (not unhealthy), atomized Ammonia in the form of reagent called AdBlue (urea 32,5% + water) is introduced in the exhaust pipe, before the silencer; in the silencer working as a Catalyst Converter such a chemical process is optimized.

As the introduced Additive has a freezing point of -11,5C° the system must be equipped with an anti-freeze circuit using a coil introduced in the tank where the hot liquid of the diesel engine flows.

The tank contains 26 litres of AdBlue and its consumption is related to the exploited power. In the case of the sweeper it is about 80 working hours.

Such an additive can be bought at the petrol station.

On the Display placed on the central Dashboard in the cab, the parameter AdBlue can be selected where the present quantity is displayed and, in case of low level (12%), the fuel warning light appears.

Another large alarm light on the dashboard indicates possible failures of the system.

Main components of the SCR system :

AdBlue solution tank (1)

The tank contains :

- Probe for the temperature measurement
- Probe for the "low level" measurement
- Coil for the hot water heating, with control through solenoid valve
- Delivery and return pipe

Pump Module (A). Such a group, placed above the tank, picks up the additive from the tank and sends it to the Dosage Module placed on the inlet pipe of the silencer. The exceeding additive returns to the supplier Module and so to the tank.

This Module houses the following components:

- Pre-filter , membrane Pump , Filter
- Directional control Solenoid valve and additive delivery pressure Sensor.
- Additive temperature control Solenoid valve and temperature control Sensor.
- DCU or Control Unit, placed in the front side of the group. It is connected with all the sensors of the system –input – and it can meter the right quantity of additive by electric control valve –output –, according also to the parameters coming from the diesel engine ECU, to which it is connected.

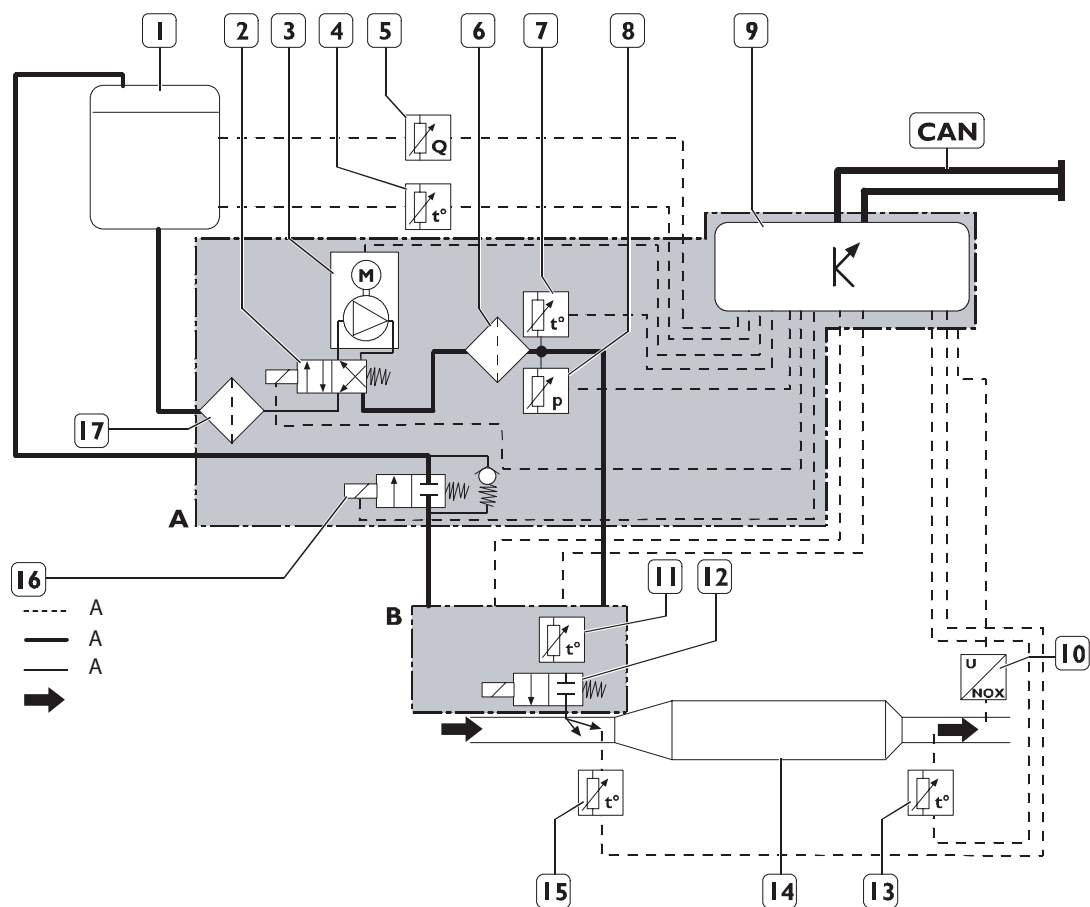
Dosage Module (B). This module placed on the gas exhaust pipe, receives the additive from the Module supplier and sends it in the pipe atomized and in the right quantity, through a dosing Solenoid valve. Inside this Module also a temperature control probe is installed.

The exceeding additive is sent again to the Supplier Module and then to the tank by the already described solenoid valve.

- **Catalyst Converter (14).** It also has the function of Catalyst Converter, that is it increases the speed of the chemical reaction that turns the Nitric Oxide into Nitrogen by means of the additive. At the entry of the Silencer a temperature probe is placed, at the exit there is another probe to measure the presence of Nitric Oxide, every probe is connected to the DCU control unit.

DIAGRAM OF SCR SYSTEM

A	PUMP MODULE
B	DOSING MODULE
1	AdBlue solution tank
2	Intercept solenoid valve
3	Volumetric pump
4	AdBlue solution temperature sensor
5	AdBlue level sensor
6	Filter
7	AdBlue temperature sensor
8	AdBlue solution pressure sensor
9	Pump Module Control unit
10	NOx humidity detection sensor
11	Temperature sensor
12	Injection solenoid valve
13	Outlet exhaust gas temperature sensor
14	Catalytic converter
15	Inlet exhaust gas temperature sensor
16	Cooling solenoid valve
17	Prefilter



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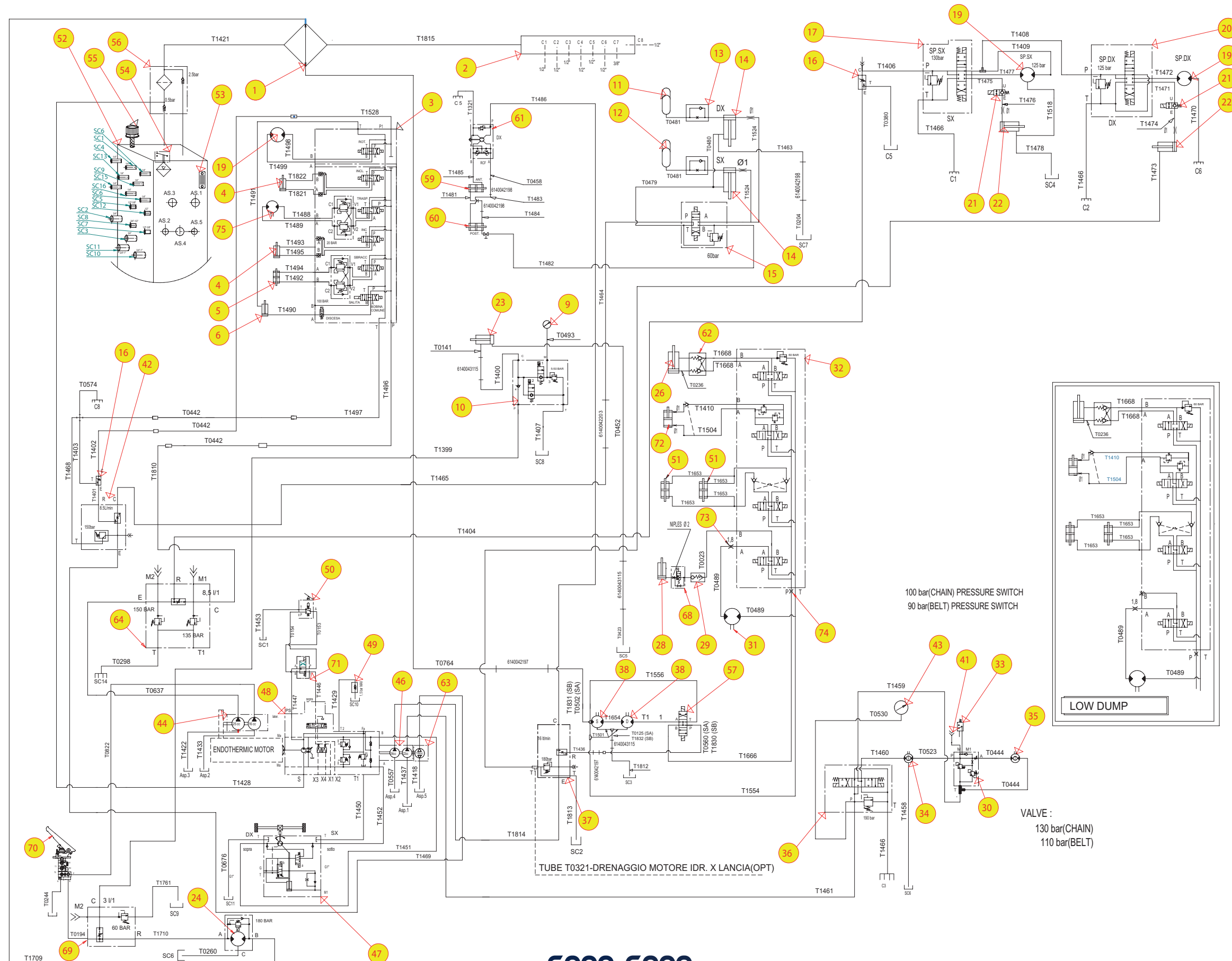
Hydraulic schemes and electric schemes

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13.1. Hydraulic scheme with third brush

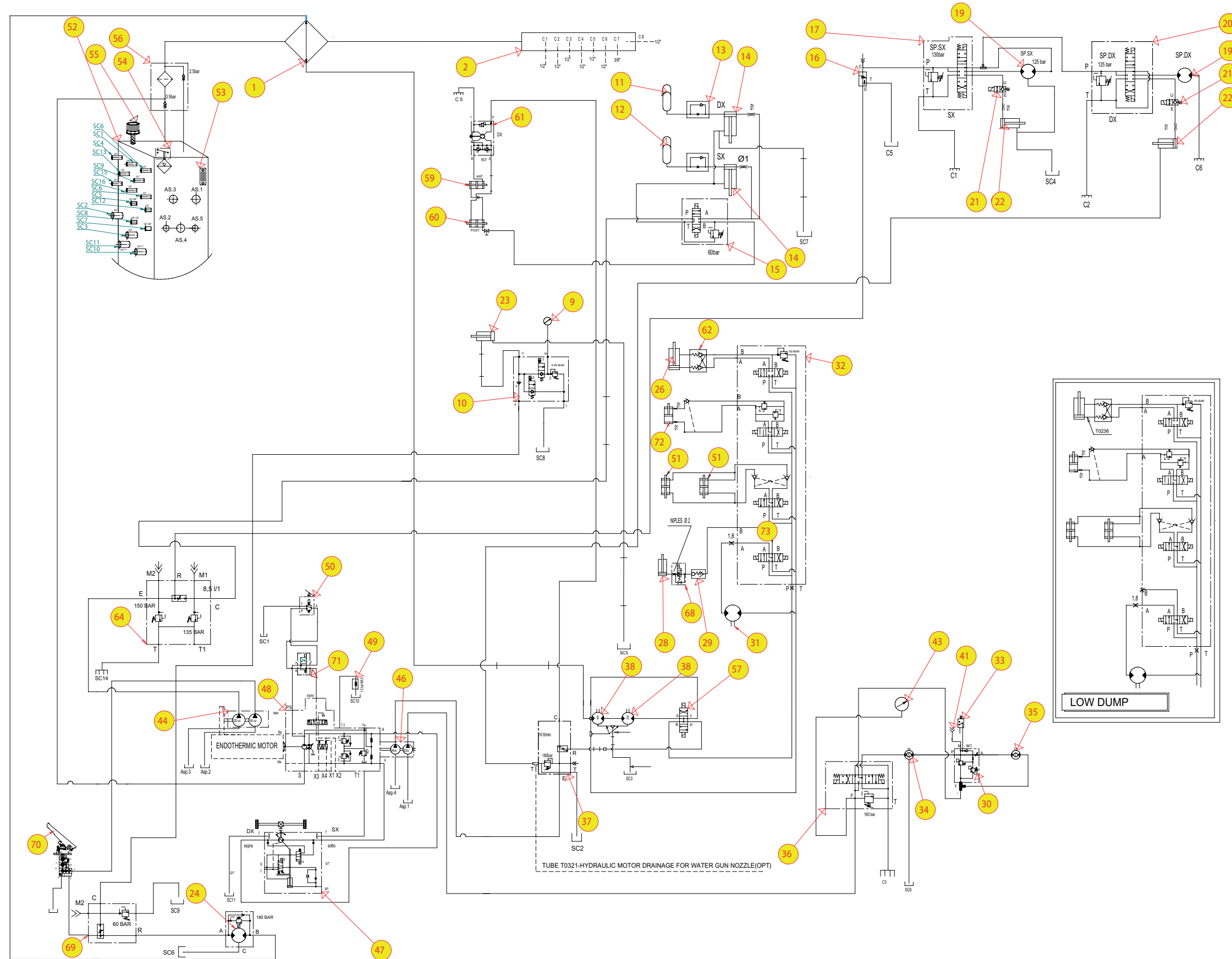
N. Pos.	Description	N. Pos.	Description
1	Hydraulic oil radiator	40	
2	Oil collector	41	¼" pressure test point
3	3 rd Brush electro-distributor	42	150 bar Priority valve
4	3 rd Brush incidence and inclination cylinders	43	0-250 bar Pressure gauge
5	3 rd Brush arm swinging cylinder	44	Service pumps
6	3 rd Brush lifting/lowering cylinder	45	
7		46	Double service pump
8		47	Traction hydraulic motor
9	0-60 bar Pressure gauge	48	Traction hydraulic pump
10	Central brush valve	49	Check valve
11	Suspension accumulator	50	Hydraulic pedal
12	Suspension accumulator	51	Hopper door locking/unlocking cylinders
13	Check valve	52	Hydraulic oil tank
14	Rear suspension cylinders	53	Oil level indicator
15	Suspension electro-valve	54	Level switch
16	Flow adjustment valve	55	Oil charge plug
17	130 bar distributor	56	Hydraulic oil filter
18		57	Turbines/hopper functions electro-valve
19	Hydraulic motor	58	
20	125 bar Distributor	59	Front steering cylinder
21	2-way Electro-valve	60	Rear steering cylinder
22	Side brush cylinders	61	Hydraulic steering motor
23	Central brush cylinder	62	Pilot check valve
24	Radiator fan motor	63	Service pump
25		64	150 bar/135 bar Priority valve
26	Hopper tilting cylinder	65	
27		66	
28	Hopper elevator cylinder	67	
29	Cylinder safety valve	68	Hopper elevator cylinder electro-valve
30	Conveyor adjustment valve	69	60 bar Priority valve
31	Filter-shaker hydraulic motor	70	Brake pedal
32	Hopper electro-distributor (high dump)	71	Traction pump piloting electrovalve
33	Conveyor pressure switch	72	Hopper door opening/closing cylinder (optional)
34	Central brush motor		
35	Conveyor motor		
36	190 bar Distributor	73	1,8 mm orifice nipple
37	180 bar Priority valve	74	2 mm orifice nipple
38	Turbine hydraulic motor	75	3 rd brush motor carriage traverse
39			



13.2. Hydraulic scheme without third brush

N. Pos.	Description	N. Pos.	Description
1	Hydraulic oil radiator	40	
2	Oil collector	41	¼" pressure test point
3		42	
4		43	0-250 bar Pressure gauge
5		44	Service pumps
6		45	
7		46	Double service pump
8		47	Traction hydraulic motor
9	0-60 bar Pressure gauge	48	Traction hydraulic pump
10	Central brush valve	49	Check valve
11	Suspension accumulator	50	Hydraulic pedal
12	Suspension accumulator	51	Hopper door locking/unlocking cylinders
13	Check valve	52	Hydraulic oil tank
14	Rear suspension cylinders	53	Oil level indicator
15	Suspension electro-valve	54	Level switch
16	Flow adjustment valve	55	Oil charge plug
17	130 bar distributor	56	Hydraulic oil filter
18		57	Turbines/hopper functions electro-valve
19	Hydraulic motor	58	
20	125 bar Distributor	59	Front steering cylinder
21	2-way Electro-valve	60	Rear steering cylinder
22	Side brush cylinders	61	Hydraulic steering motor
23	Central brush cylinder	62	Pilot check valve
24	Radiator fan motor	63	
25		64	150 bar/135 bar Priority valve
26	Hopper tilting cylinder	65	
27		66	
28	Hopper elevator cylinder	67	
29	Cylinder safety valve	68	Hopper elevator cylinder electro-valve
30	Conveyor adjustment valve	69	60 bar Priority valve
31	Filter-shaker hydraulic motor	70	Brake pedal
32	Hopper electro-distributor (high dump)	71	Traction pump piloting electrovalve
33	Conveyor pressure switch	72	Hopper door opening/closing cylinder (optional)
34	Central brush motor		
35	Conveyor motor		
36	190 bar Distributor		
37	180 bar Priority valve		
38	Turbine hydraulic motor		
39			

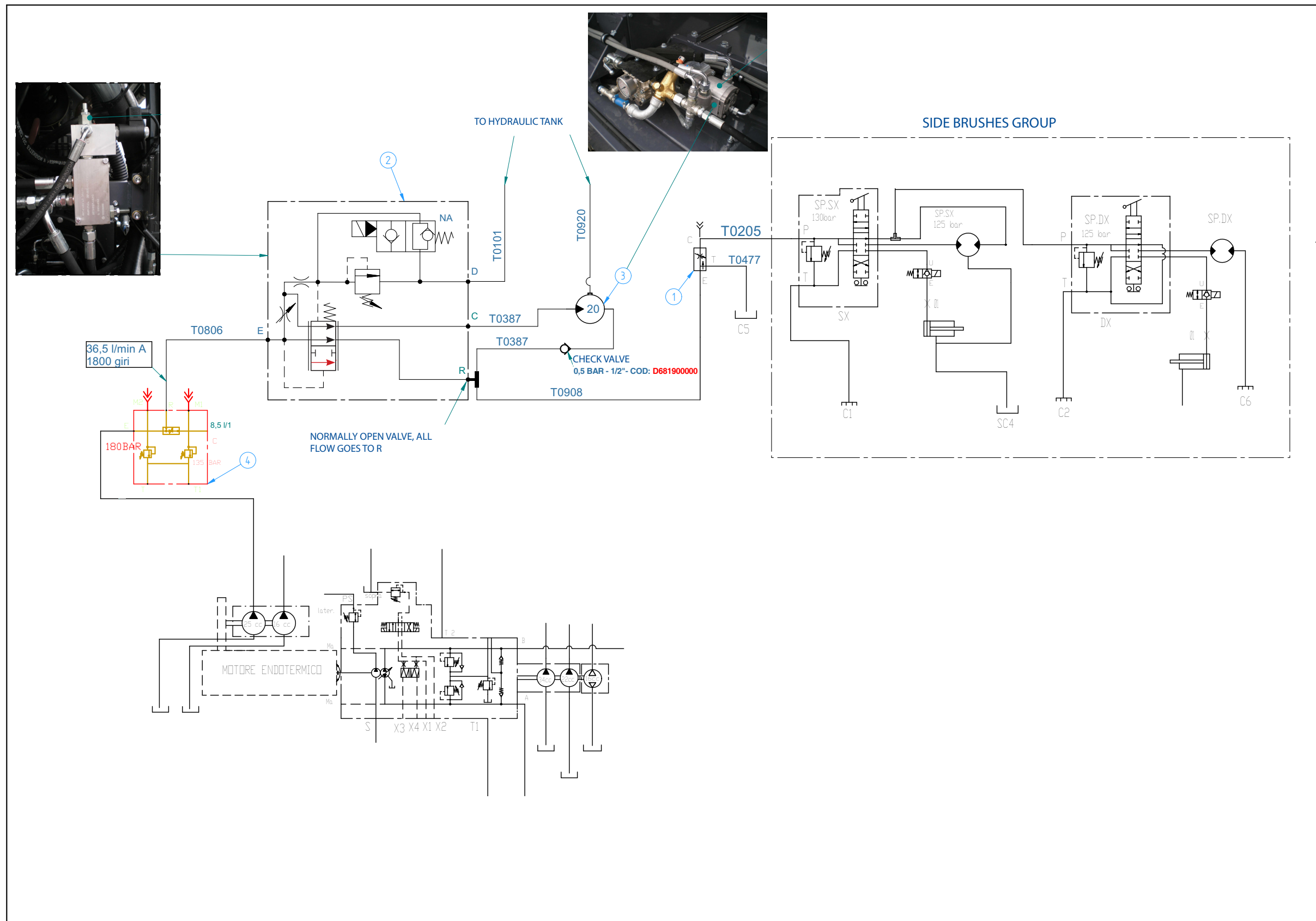
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13.3. Hydraulic scheme with high pressure water pump “Combi”

N. Pos.	Description
1	Flow adjustment valve
2	Priority valve + electro-valve
3	Hydraulic motor
4	180 bar/135 bar priority valve



13.4. Electric scheme

13.4.1. General preface (Reference to CEI 44-6 regulations)

The electric schemes for each model are identified by a number of A4 pages, which have two sides of coordinate (A.....H) and (1.....6) in order to locate the area of sheet and on the lower part there is also a table.

On this table are present the following information:

•	Sweeper model	(e.g. : 1300DL)
•	Progressive sheet	(e.g.: foglio 1)
•	Part of the system	(e.g.: Engine-Generator)

The link among the electric wires of the various sheets is made through the coordinates, which are situated at the beginning and end of each wire (e.g.: 03.1F means the continuation of this wire must be found on the sheet no. 3 and in the cell located by coordinates 1-F).

The pins of the various connectors are graphically identified by a symbol “” and by a code e.g.: XC15.1/3, that means:

•	“XC15” is the connector with 15 pins
•	“1” is the progressive number, because could be more connectors with 15 pins
•	“3” is the pin no. 3 of the connector

All electric components are identified with:

•	a description (e.g.: glow plug relay)
•	a part code with CEI regulations, followed by a number identifying the sheet where is it and the coordinates in the sheet (e.g.: KT.4.3D).
•	Dulevo p/n

Each wire in the scheme is identified by a number of 4 digits corresponding to the number printed along each wire.

13.4.2. Electric components codes - CEI 44-6 regulation

FU	Fuse	SP	Pressure switch, sender
GD	Alternator	PT	Hour-counter
KT	Glow plug relay, intermittence	HL	Warning light, light
GB	Battery	SQ	Micro-switch
MD	Electric motor	E	PCB, electric control unit
KA	Relay	VD	Diode, diodes box
SC	Switch	S	Sensor
YV	Electro-valve	R	Resistance
HA	Buzzer	XC	Connector
SB	Button		

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A	AZZURRO
B	BIANCO
C	ARANCIO
G	GIALLO
H	GRIGIO
L	BLU
M	MARRONE
N	NERO
R	ROSSO
S	ROSA
V	VERDE
Z	VIOLA

A	AZURE
B	WHITE
C	ORANGE
G	YELLOW
H	GREY
L	BLUE
M	BROWN
N	BLACK
R	RED
S	PINK
V	GREEN
Z	VIOLET

NOTE: La colorazione dei fili bicolori viene indicata con la composizione delle sigle sopra indicate.
Esempio: G/V (colore Trasversale) – G-V (colore Longitudinale).

NOTE: The bicoloured wires are indicated with the composition of the above letters. Example: G/V
(Transverse colour) – G-V (Longitudinal colour).

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13.4.3. Electric glossary

ITALIAN	ENGLISH
STACCA BATTERIA	MANUAL BATTERY SWITCH
BATTERIA	BATTERY
FUS. GENERALE	GENERAL FUSE
FUS. MOTORE	ENGINE FUSE
FUS. GENERALE CHIAVE	IGNITION KEY FUSE
FUS. RELE AVVIAMENTO	STARTING RELAY FUSE
FUS. GRIGLIA PRERISCALDO	PREHEATING GRID FUSE
FUS. PRERISC. FILTRI GASOLIO	FUEL FILTERS PREHEATING FUSE
ALTERNATORE	ALTERNATOR
MOTORINO AVVIAMENTO	STARTER MOTOR
RISCALDATORE PREFILTRO GASOLIO	FUEL PREFILTER HEATER
RISCALDATORE FILTRO GASOLIO	FUEL FILTER HEATER
RISCALDATORE ARIA	AIR HEATER
UNITA DI CONTROLLO ELETTRONICO MOTORE	ENGINE ECU
RELE AVVIAMENTO	STARTING RELAY
RELE RISCALDATORE ARIA MOTORE	ENGINE AIR HEATER RELAY
RESISTENZA	RESISTANCE
SENSORE TEMPERATURA UMIDITA	HUMIDITY TEMPERATURE SENSOR
SPIA PRERISCALDO	PREHEATING WARNING LIGHT
SPIA DIAGNOSTICA	DIAGNOSTIC WARNING LIGHT
CENTRALINA CONTROLLO DOSAGGIO ADBLUE	ADBLUE CONTROL UNIT
SENSORE TEMPERATURA E LIVELLO ADBLUE	ADBLUE TEMPERATURE AND LEVEL SENSOR
ELETTROV. DOSATORE ADBLUE	ADBLUE DOSING ELECTROVALVE
ELETTROV. RISCALDATORE ADBLUE	ADBLUE HEATING ELECTROVALVE
FUS. ADBLUE	ADBLUE FUSE
SENSORE TEMPERATURA CATALIZZATORE MONTE	CATALYZER TEMPERATURE SENSOR AT UPSTREAM
SENSORE TEMPERATURA CATALIZZATORE VALLE	CATALYZER TEMPERATURE SENSOR AT DOWNSTREAM
SENSORE NOX	NOX SENSOR
RELE ALIMENTAZIONE SENSORI NOX	NOX SENSOR RELAY
MODULO RESISTENZE	RESISTANCES MODULE
POTENZIOMETRO	POTENTIOMETER
JOYSTICK ACCELERATORE	ACCELERATOR JOYSTICK
SELETTORE LAVORO-TRASFERIMENTO	TRAVELLING-WORKING SELECTOR
RELE PILOTAGGIO POMPA	TRAVELLING-WORKING ELECTR. RELAY
ELETTROV. PILOTAGGIO POMPA	TRAVELLING-WORKING ELECTR.
FUS. CONTACHILOMETRI	SPEEDOMETER FUSE
CONTACHILOMETRI	SPEEDOMETER
SENSORE VELOCITA	SPEEDOMETER SENSOR
SELETTORE CONTACHILOMETRI	SPEEDOMETER BUTTON
MONITOR TELECAMERA	MONITOR
FUS. GUIDA DX-SX	RH-LH DOUBLE STEERING FUSE
RELE DEVIO GUIDA	GEAR LEVER RELAY
RELE SCAMBIO AVVIAMENTO	STARTING EXCHANGE RELAY

ITALIAN	ENGLISH
RELE SCAMBIO FRECCHE	INDICATOR LIGHTS EXCHANGE RELAY
RELE SCAMBIO 3° SPAZZOLA	3rd EXCHANGE RELAY
RELE SCAMBIO LUCI DI POSIZIONE	PARKING LIGHTS EXCHANGE RELAY
COMANDO AVVIAMENTO	IGNITION KEY
FUS. TERGICRISTALLO	WINDSCREEN WIPER FUSE
COMANDO TERGICRISTALLO	WINDSCREEN WIPER SWITCH
COMANDO LAVAVETRI	WINDSCREEN WASHER SWITCH
INTERMITTENZA TERGICRISTALLO	WINDSCREEN WIPER INTERMITTENCE
MOTORE TERGICRISTALLO	WINDSCREEN WIPER MOTOR
RELE TERGICRISTALLO	WINDSCREEN WIPER RELAY
MOTORE LAVAVETRI	WINDSCREEN WIPER WASHER MOTOR
FUS. POMPA ACQUA	WATER PUMP FUSE
FUS. TRASDUTTORI DI PRESSIONE	PRESSURE TRANSDUCERS FUSE
TEMPORIZZATORE	TIMER
RELE POMPA ACQUA	WATER PUMP RELAY
SPIA ACQUA SERBATOIO POST.	REAR WATER TANK WARNING LIGHT
SPIA ACQUA SERBATOIO ANT.	FRONT WATER TANK WARNING LIGHT
COMANDO VALVOLA MOTORIZZATA	ELECTRIC VALVE SWITCH
VALVOLA MOTORIZZATA	ELECTRIC VALVE
POMPA ACQUA	WATER PUMP
ELETTROV. POMPA H.P.	H.P. WATER ELECTROVALVE
SPIA FILTRO OLIO IDRAULICO	HYDR. OIL FILTER WARNING LIGHT
SPIA LIVELLO OLIO IDRAULICO	HYDR. OIL LEVEL WARNING LIGHT
FUS. INDICATORI-SPIE	WARNING LIGHTS FUSE
PRESSOSTATO FILTRO OLIO IDRAULICO	HYDR. OIL FILTER PRESSURE-SWITCH
GALLEGIANTE OLIO IDRAULICO	HYDR. OIL FLOAT
PRESSOSTATO FILTRO ARIA	AIR FILTER PRESSURE-SWITCH
PRESSOSTATO FRENO STAZIONAMENTO	HANDBRAKE PRESSUR-SWITCH
SPIA GENERATORE	ALTERNATOR WARNING LIGHT
SPIA GANCIO CABINA	CABIN HOOK WARNING LIGHT
SPIA GUIDA DX	R.H. STEERING WARNING LIGHT
MICROINTERRUTTORE GANCIO CABINA	CABIN HOOK MICRO-SWITCH
SPIA ALLARME MOTORE	ENGINE ALARM WARNING LIGHT
BUZZER ALLARME MOTORE	ENGINE ALARM BUZZER
SPIA MARCIA AVANTI	FORWARD GEAR WARNING LIGHT
SPIA MARCIA INDIETRO	REVERSE GEAR WARNING LIGHT
SPIA PRESSIONE FRENI	BRAKES PRESSURE WARNING LIGHT
INDICATORE LIVELLO UREA	ADBLUE LEVEL INDICATOR
INDICATORE LIVELLO CARBURANTE	FUEL LEVEL INDICATOR
GALLEGGIANTE CARBURANTE	FUEL FLOAT
RELE SUPPLEMENTEO CHIAVE	KEY SUPPLEMENT RELAY
FUS. UNITA DI CONTROLLO ELETTRONICO MOTORE	ENGINE ECU FUSE
FUS. CENTRALINA DOSAGGIO ADBLUE	ADBLUE CONTROL UNIT FUSE
FUS. CAMBIO	FORWARD&REVERSE LEVER FUSE
DEVIO AVANZAMENTO	FORWARD&REVERSE LEVER

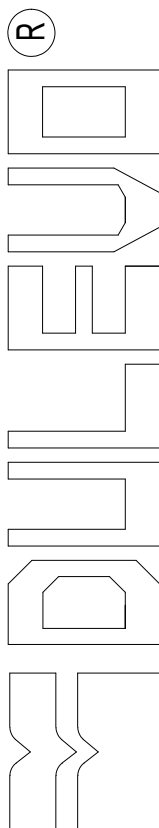
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ITALIAN	ENGLISH
ELETTRPV. MARCIA AVANTI	FORWARD GEAR ELECTROVALVE
ELETTROV. MARCIA INDIETRO	REVERSE GEAR ELECTROVALVE
ELETTROVALVOLA MOTORE TRAZIONE	TRACTION MOTOR ELECTROV.
RELE SIC. AVVIAMENTO	STARTING SAFETY RELAY
CICALINO CABINA	CABIN BUZZER
RELE RETROMARCIA	REVERSE GEAR RELAY
FUS. FUNZIONI CONTENITORE	HOPPER FUNCTIONS FUSE
COMANDO ASPIRATORE/SCUOTIFILTRO	FILTERSHAKER/SUCTION SWITCH
COMANDO ELEVATORE	HOPPER ELEVATOR SWITCH
ELETTROV. GENERALE	GENERAL ELECTROVALVE
ELETTROV. SCUOTIFILTRO	FILTERSHAKER ELECTROVALVE
ELETTROV. ASPIRATORE	SUCTION ELECTROVALVE
ELETTROV. SALITA CONTENITORE	HOPPER ELEVATOR LIFTING ELECTR.
ELETTROV. DISCESA CONTENITORE	HOPPER ELEVATOR LOWERING ELECTR.
COMANDO PORTELLO	HOPPER DOOR SWITCH
COMANDO CONTENITORE	HOPPER SWITCH
ELETTROV. CHIUSURA PORTELLO	DOOR CLOSING ELECTROVALVE
ELETTROV. APERTURA PORTELLO	DOOR OPENING ELECTROVALVE
ELETTROV. RIBALTAMENTO CONTENITORE	HOPPER TILTING ELECTROVALVE
ELETTROV. DISCESA RIBALTAMENT	HOPPER LOWERING ELECTROVALVE
FUS. OPTIONAL	OPTIONAL FUSE
FUS. ELETTROVENTILATORE	ELECTRO-FAN FUSE
FUS. SPAZZOLE	BRUSHES FUSE
COMANDO VENTILATORE	ELECTROFAN SWITCH
ELETTROVENTILATORE CABINA	CABIN ELECTROFAN
TERMOSTATO AC	AC THERMOSTAT
RELE AC	AC RELAY
PRESSOTATO AC	AC PRESSURE-SWITCH
FUS. ARIA CONDIZIONATA	AC FUSE
MICROINTERRUTTORE SPAZZOLA DX	RIGHT BRUSH MICROSWITCH
MICROINTERRUTTORE SPAZZOLA SX	LEFT BRUSH MICROSWITCH
MICROINTERRUTTORE SPAZZOLA CENTRALE	CENTRAL BRUSH MICROSWITCH
ELETTROV. SPAZZOLA LATERALE DX	RIGHT BRUSH ELECTROVALVE
ELETTROV. SPAZZOLA LATERALE SX	LEFT BRUSH ELECTROVALVE
ELETTROV. SPAZZOLA CENTRALE	CENTRAL BRUSH ELECTROVALVE
TEMPORIZZATORE	TIMER RELAY
PULSANTE EXTRAPRESSIONE SPAZZOLA	BRUSH EXTRAPRESSURE SWITCH
SPIA SPAZZOLA CENTRALE	CENTRAL BRUSH WARNING LIGHT
CONTAORE LAVORO	SWEEPING HOURCOUNTER
FUS. FARI	LIGHTS FUSE
COMANDO FARI LAVORO	WORKING LIGHTS SWITCH
FARO ANTERIORE SINISTRO	LEFT FRONT LIGHT
FARO ANTERIORE DESTRO	RIGHT FRONT LIGHT
FARO LAVORO LATERALE SINISTRO	LEFT SIDE WORKING LIGHT
FARO LAVORO LATERALE DESTRO	RIGHT SIDE WORKING LIGHT

ITALIAN	ENGLISH
RELE FARI DI LAVORO	WORKING LIGHTS RELAY
FUS. STOP	STOPLIGHTS RELAY
FUS. FANALE BUZZER RETROMARCIA	REVERSE LIGHT/BUZZER FUSE
LAMPADA STOP	STOPLIGHT
LAMPADA RETROMARCIA	REVERSE LIGHT
BUZZER RETROMARCIA	REVERSE BUZZER
FUS. AVVISATORE ACUSTICO	HORN FUSE
COMANDO RISCALDATORE SPECCHI	MIRRORS HEATING SWITCH
COMANDO SPECCHI	ELECTRIC MIRRORS SWITCH
AVVISATORE ACUSTICO	HORN
SPECCHIO TERMICO	MIRROR HEATING RESISTANCE
SPECCHIO ELETTRICO TERMICO	MIRROR HEATING MOTOR
COMANDO ROTAZIONE 3° SPAZZOLA	3rd BRUSH ROTATION SWITCH
COMANDO SBRACCIAMENTO 3° SPAZZOLA	3rd BRUSH SWINGING SWITCH
ELETTROV. ROTAZIONE DX	ANTICLOCKWISE ROTATION ELECTROVALVE
ELETTROV. ROTAZIONE SX	CLOCKWISE ROTATION ELECTROVALVE
ELETTROV. SBRACCIAMENTO SX	LEFT SWINGING ELECTROVALVE
ELETTROV. SBRACCIAMENTO DX	RIGHT SWINGING ELECTROVALVE
JOYSTICK 3a SPAZZOLA	3rd BRUSH JOYSTICK
ELETTROV. DISCESA 3a SPAZZOLA	3rd BRUSH LOWERING ELECTROVALVE
ELETTROV. SALITA 3a SPAZZOLA	3rd BRUSH LIFTING ELECTROVALVE
ELETTROV. RIENTRO DX 3a SPAZZOLA	RIGHT TRAVERSE CARRIAGE ELECTROVALVE
ELETTROV. RIENTRO SX 3a SPAZZOLA	LEFT TRAVERSE CARRIAGE ELECTROVALVE
SENSORE 3° SPAZZOLA RIENTRO DX	3rd BRUSH SAFETY SENSOR (RETURN TO R.H.)
SENSORE 3° SPAZZOLA RIENTRO SX	3rd BRUSH SAFETY SENSOR (RETURN TO L.H.)
RELE DISCESA 3a SPAZZOLA	3rd BRUSH LOWERING RELAY
RELE SALITA 3a SPAZZOLA	3rd BRUSH LIFTING RELAY
RELE 3° SPAZZOLA RIENTRO DX	3rd BRUSH RELAY (RETURN TO R.H.)
RELE 3° SPAZZOLA RIENTRO SX	3rd BRUSH RELAY (RETURN TO L.H.)
JOYSTICK INCIDENZA 3a SPAZZOLA	3rd BRUSH INCIDENCE JOYSTICK
ELETTROV. INCIDENZA SX	LEFT INCIDENCE ELECTROVALVE
ELETTROV. INCIDENZA DX	RIGHT INCIDENCE ELECTROVALVE
ELETTROV. INCLINAZIONE SX	LEFT INCLINATION ELECTROVALVE
ELETTROV. INCLINAZIONE DX	RIGHT INCLINATION ELECTROVALVE
ELETTROV. GENERALE 3a SPAZZOLA	3rd BRUSH GENERAL ELECTROVALVE
FUS. LUCI EMERGENZA	HAZARD LIGHTS FUSE
COMANDO LUCI EMERGENZA	HAZARD LIGHTS SWITCH
FUS. INDICATORI DIREZIONE	INDICATOR LIGHTS FUSE
DEVIO IND. DIREZIONE	INDICATOR LIGHTS LEVER
INTERMITTENZA	INDICATOR LIGHTS INTERMITTENCE
LAMP. DIREZIONE POST SX	L.H. REAR INDICATOR LIGHT
LAMP. DIREZIONE LAT. SX	L.H. SIDE INDICATOR LIGHT
LAMP. DIREZIONE ANT. SX	L.H. FRONT INDICATOR LIGHT
LAMP. DIREZIONE POST. DX	R.H. REAR INDICATOR LIGHT
LAMP. DIREZIONE LAT. DX	R.H. SIDE INDICATOR LIGHT

ITALIAN	ENGLISH
LAMP. DIREZIONE ANT. DX	R.H. FRONT INDICATOR LIGHT
FUS. LAMPEGGIANTE	ROTATING BEACON FUSE
FUS. ANABBAGLIANTI	DIPPED HEADLIGHTS FUSE
GIROFARO POSTERIORE	REAR ROTATING BEACON
GIROFARO ANTERIORE	FRONT ROTATING BEACON
LAMPADA ANABBAGLIANTE	DIPPED HEADLIGHT
FUS. ABBAGLIANTE	MAIN BEAM HEADLIGHTS FUSE
LAMPADA ABBAGLIANTE	MAIN BEAM HEADLIGHT
FUS. ARIA CONDIZIONATA	AC FUSE
FUSIBILE LUCI CORTESIA	COURTESY LIGHT FUSE
AUTORADIO	RADIO
ALTOPARLANTE DX	RIGHT LOUDSPEAKER
ALTOPARLANTE SX	LEFT LOUDSPEAKER
MOTORE ELETTROVENTILATORE AC	AC ELECTROFAN MOTOR
COMPRESSORE AC	AC COMPRESSOR
LUCE DI CORTESIA	COURTESY LIGHT
CONVERTITORE TENSIONE DC-DC	DC-DC TRANSFORMER
PRESA AUSILIARIA 12V	12V AUXILIARY PLUG
FUS. DEVIO LUCI	LIGHTS LEVER FUSE
RELE AVVISATORE ACUSTICO	HORN RELAY
CENTRALINA DIODI GUIDA SX	L.H. STEERING DIODES BOX
RELE ANABBAGLIANTI	DIPPED HEADLIGHT RELAY
FUS. LUCI POSIZIONE	PARKING LIGHTS FUSE
RELE ABBAGLIANTI	MAIN BEAM HEADLIGHTS RELAY
LAMPADA POSIZIONE POST.	REAR PARKING LIGHT
LAMPADA POSIZIONE ANT.	FRONT PARKING LIGHT
LAMPADA POSIZIONE LAT.	SIDE PARKING LIGHT
COMANDO RETRONEBBIA	RERAFOG SWITCH
LAMPADA RETRONEBBIA	REARFOG LIGHT
RELE BISTABILE = BISTABLE RELAY	RELE BISTABILE = BISTABLE RELAY
SPIA ABBAGLIANTI	MAIN BEAM HEADLIGHTS WARNING LIGHT
SPIA ANABBAGLIANTI	DIPPED HEADLIGHT WARNING LIGHT
SPIA LUCI DI POSIZIONE	PARKING LIGHTS WARNING LIGHT
SPIA DIREZIONE	INDICATOR LIGHTS WARNING LIGHT
FUS. FARO LAVORO BRACCIO AGEVOLATORE	ARTICULATED ARM LIGHT FUSE
COMANDO FARO LAVORO BRACCI AGEVOLATORE	ARTICULATE ARM LIGHT SWITCH
FUS. SOSPENSIONI	SUSPENSIONS FUSE
SENSORE SALITA	LIFTING SENSOR
SENSORE DISCESA = LOWERING SENSOR	SENSORE DISCESA = LOWERING SENSOR
SENSORE FANALI	LIGHTS SENSOR
CENTRALINA SOSPENSIONI	SUSPENSION CARD
ELETTROV. SALITA SOSPENSIONI	LIFTING SUSPENSION ELECTROVALVE
ELETTROV. DISCESA SOSPENSIONI	LOWERING SUSPENSION ELECTROVALVE
COMANDO SOSPENSIONI AUTOMATICO	AUTOMATIC SUSPENSION SWITCH
COMANDO SOSPENSIONI MANUALE	MANUAL SUSPENSION SWITCH

ITALIAN	ENGLISH
SPIA SOSPENSIONI LAVORO	WORKING SUSPENSION WARNING LIGHT
SPIA SOSPENSIONI TRASFERIMENTO	TRAVELLING SUSPENSION WARNING LIGHT
RELE SCAMBIO FANALI	LIGHTS EXCHANGE RELAY
RELE SCAMBIO ANABBABGLIANTI	DIPPED HEADLIGHT EXCHANGE RELAY
RELE SCAMBIO ABBABGLIANTI	MAIN BEAM HEADLIGHTS EXCHANGE RELAY
SENSORE STOP	STOPLIGHTS SENSOR
SPIA FILTRO GASOLIO	FUEL FILTER WARNING LIGHT
SENSORE GASOLIO	FUEL SENSOR
PRESSOSTATO TRASPORTO	CONVEYOR PRESSURE-SWITCH
RELE STOP	STOPLIGHTS RELAY
SPIA SPORTELLLO TRASPORTO	CONVEYOR SHUTTER WARNING LIGHT
SPIA CONTENITORE RIBALTATO	TILTED HOPPER WARNNG LIGHT
SPIA CONTENITORE SOLLEVATO	LIFTED HOPPER WARNING LIGHT
SPIA SPORTELLLO CONTENITORE APERTO	OPEN DOOR WARNING LIGHT
MICROINTER. TRASPORTO	CONVEYOR MICRO-SWITCH
MICROINTER. SPORTELLLO CONTENITORE	HOPPER DOOR SWITCH
COMANDO GIROFARO	ROTATING BEACON SWITCH
SPIA PRESSIONE STAZIONAMENTO	HANDBRAKE WARNING LIGHT
RELE GIROFARO	ROTATING BEACON RELAY
TRASDUTTORE FRENI POST.	REAR BRAKES TRANSDUCER
TRASDUTTORE FRENI ANT.	FRONT BRAKES TRANSDUCER
PRESSOSTATO FRENO STAZIONAMENTO	HANDBRAKE PRESSURE-SWITCH
SPIA OBD	OBD WARNING LIGHT
SPIA POMPA ACQUA HP	HP WATER PUMP WARNING LIGHT
SPIA POMPA ACQUA	WATER PUMP WARNING LIGHT
SPIA RUBINETTO APERTO	MAIN WATER TANK WARNING LIGHT
SPIA RUBINETTO CHIUSTO	ADDITIONAL WATER TANK WARNING LIGHT
COMANDO ROTAZIONE 3a SPAZZOLA	3rd BRUSH ROTATION SWITCH
COMANDO SBRACCIAMENTO 3° SPAZZOLA	3rd BRUSH SWINGING SWITCH
JOYSTICK INCIDENZA 3° SPAZZOLA	3rd BRUSH INCIDENCE JOYSTICK



INTERNATIONAL SpA

33012 FONTANELLO (PARMA) ITALY
VIA GIOVANNINO GUARESCHI N.1
TEL. 0521 827711 FAX. 0521 827797

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TABELLA COLORI
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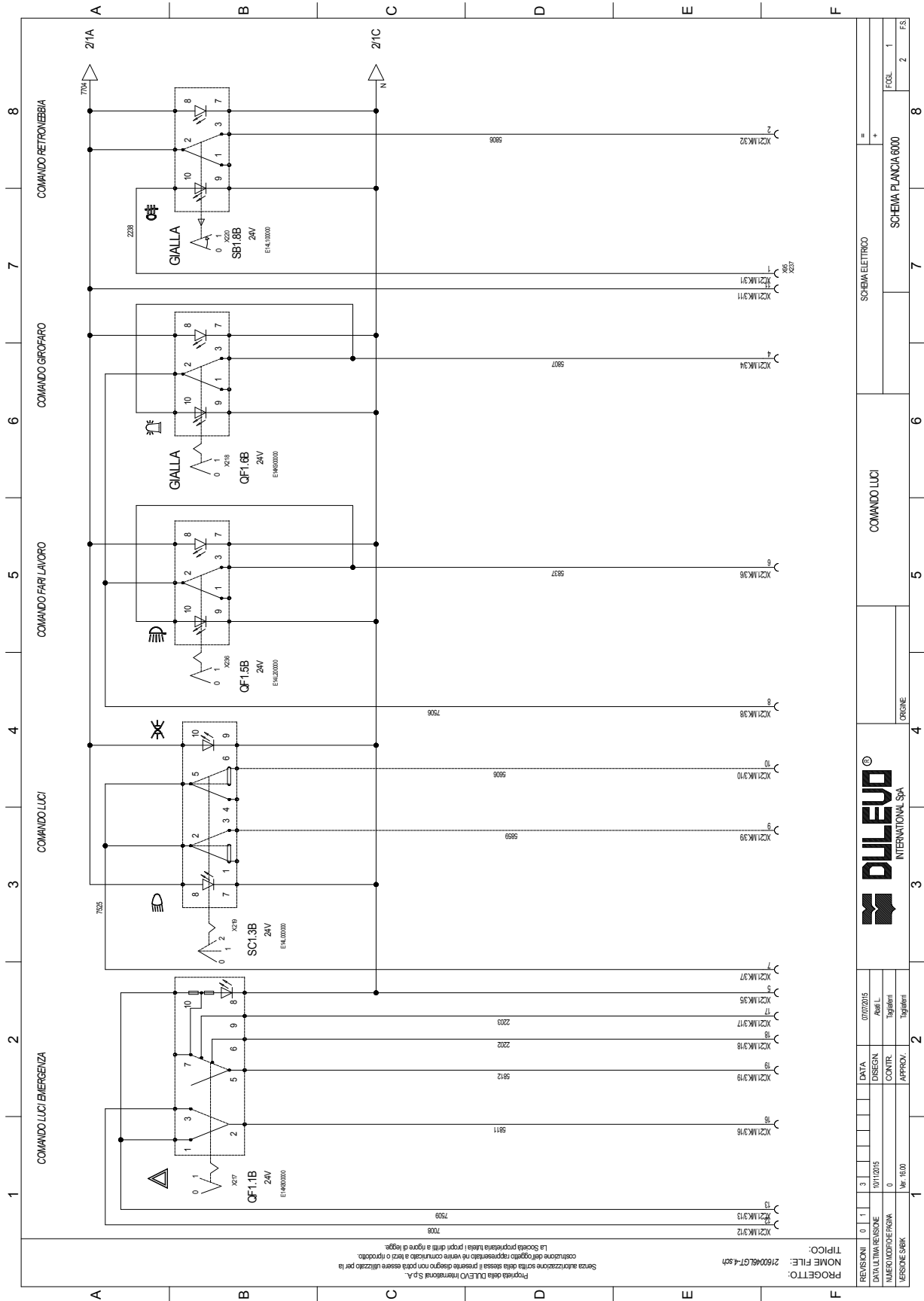
A	AZZURRO - AZURE
B	BIANCO - WHITE
C	ARANCIO - ORANGE
G	GIALLO - YELLOW
H	GRIGIO - GREY
L	BLU - BLUE
M	MARRONE - BROWN
N	NERO - BLACK
R	ROSSO - RED
S	ROSA - PINK
V	VERDE - GREEN
Z	VIOLA - VIOLET

NOTE: La colorazione dei fili bicolori viene indicata con la composizione delle sigle sopra indicate. Esempio: GV (colore Trasversale) – G-V (colore Longitudinale).

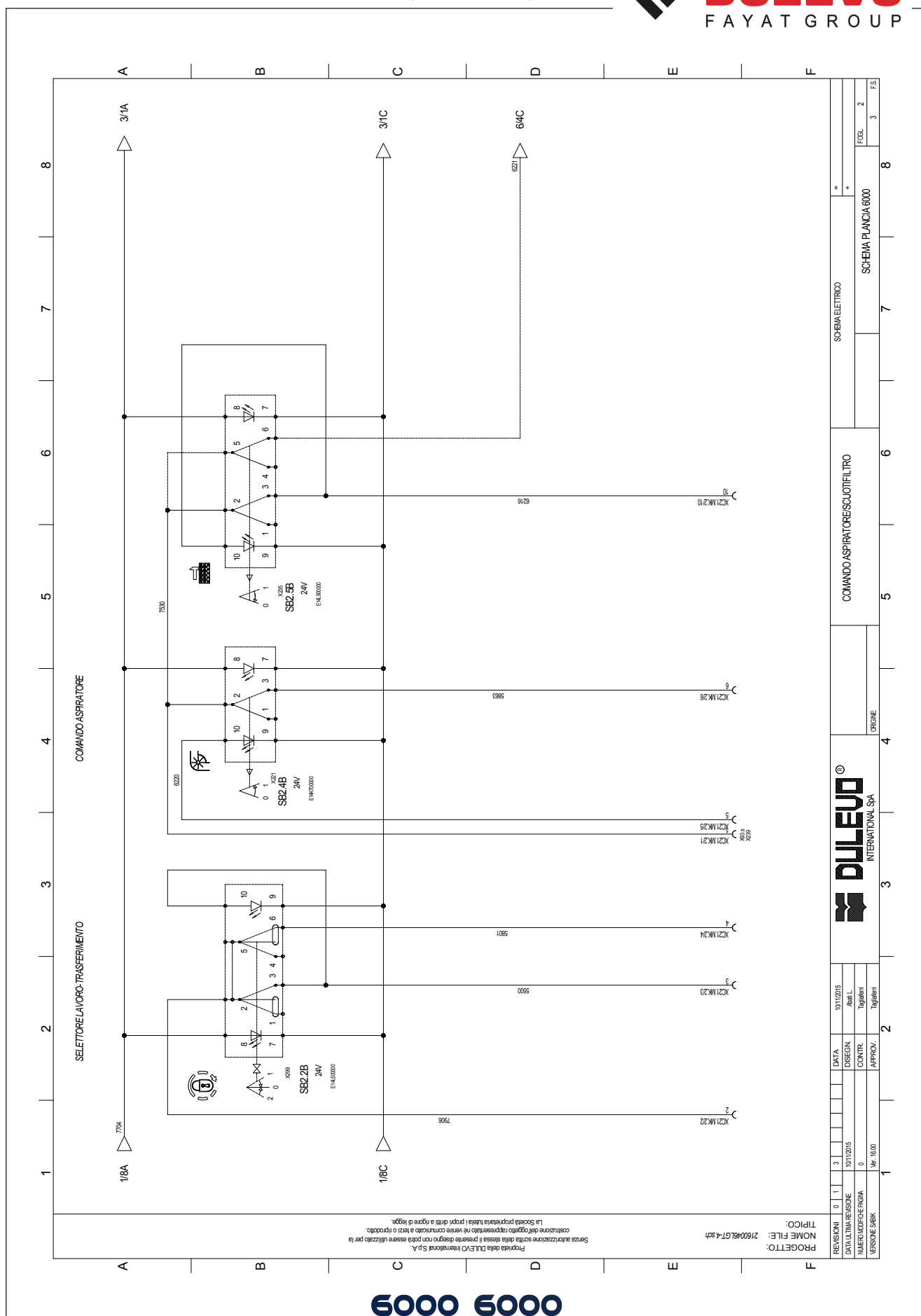
NOTE: The bicoloured wires are indicated with the composition of the above letters.
Example: GV (Transverse colour) – GV (Longitudinal colour).

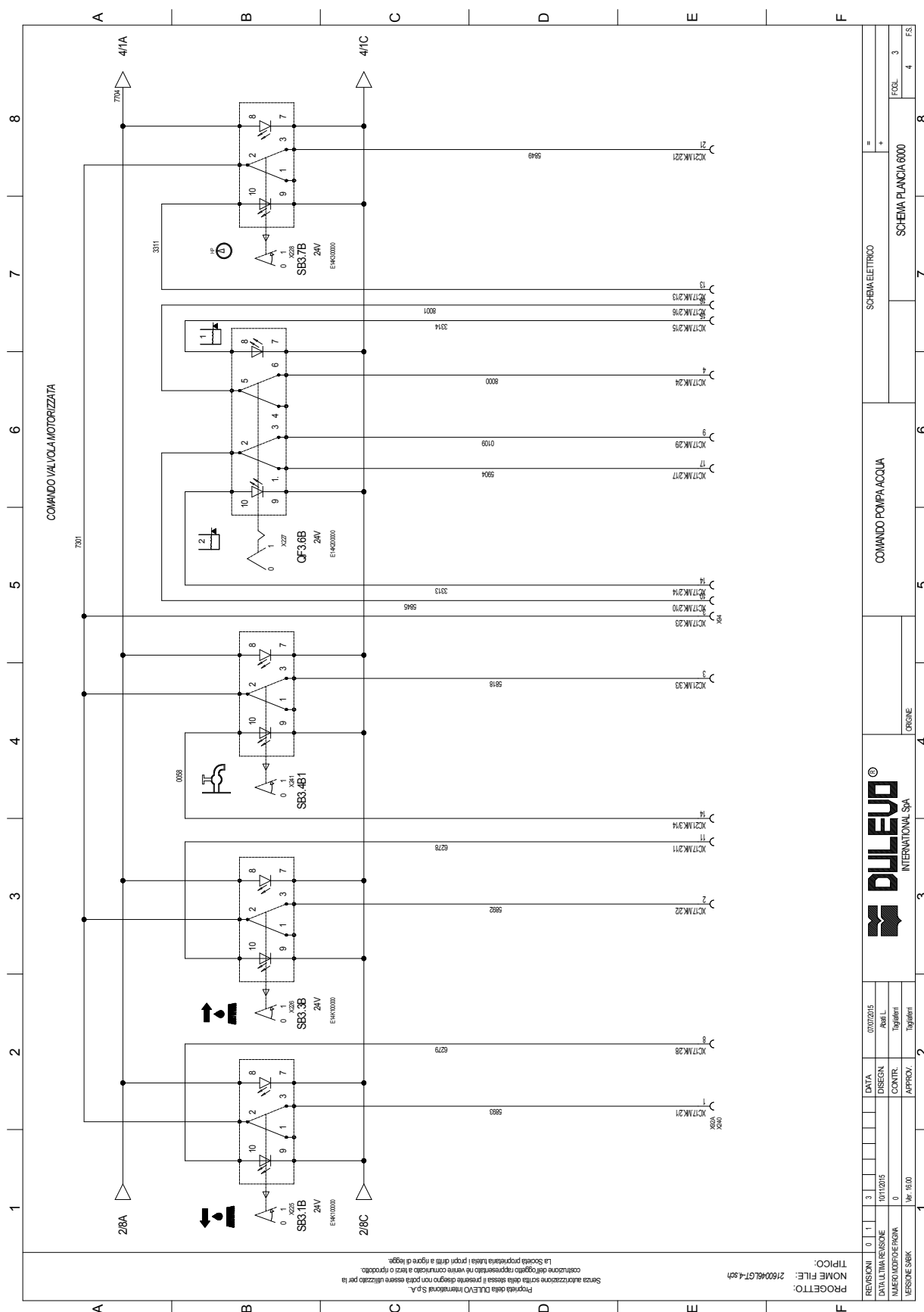
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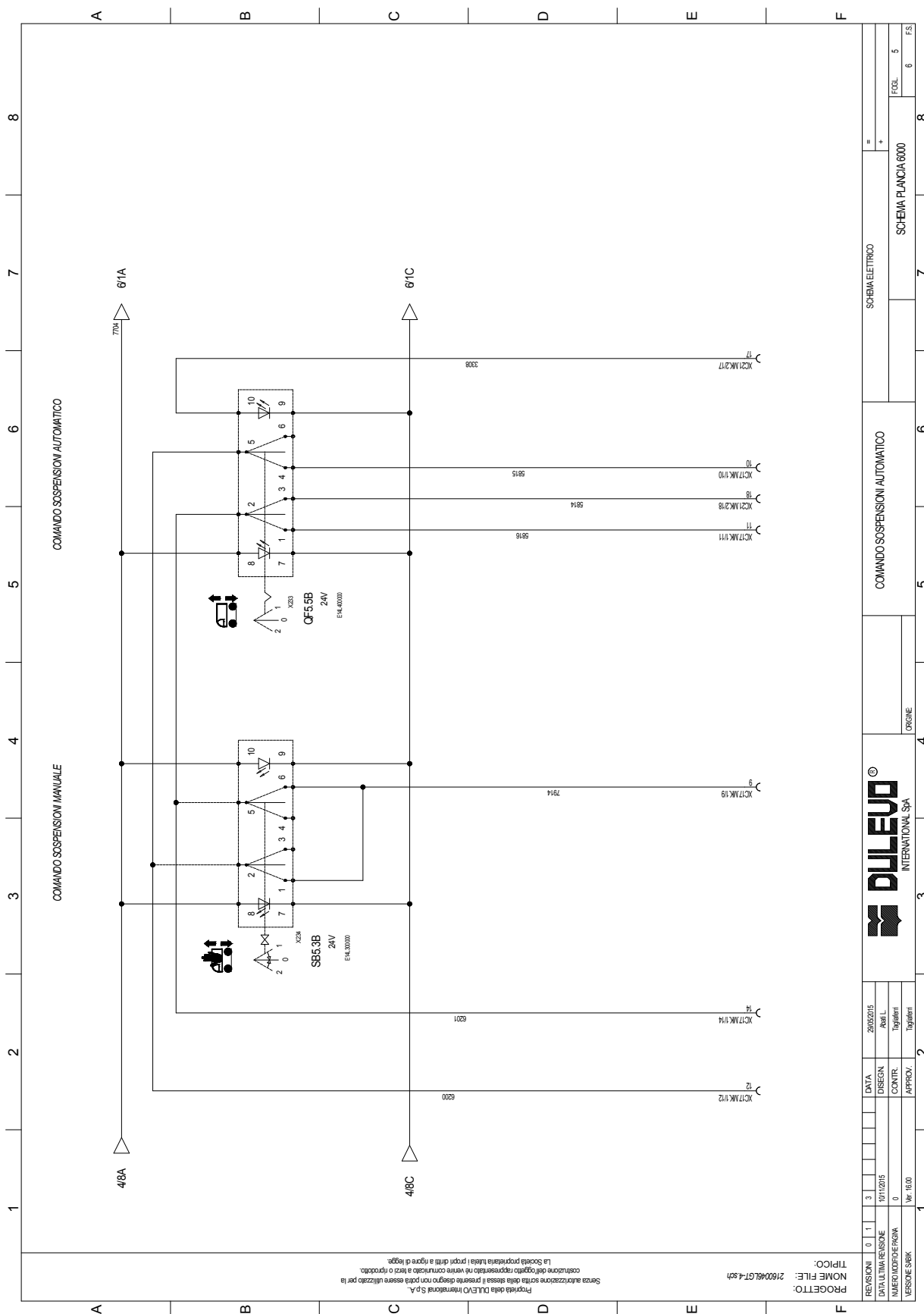
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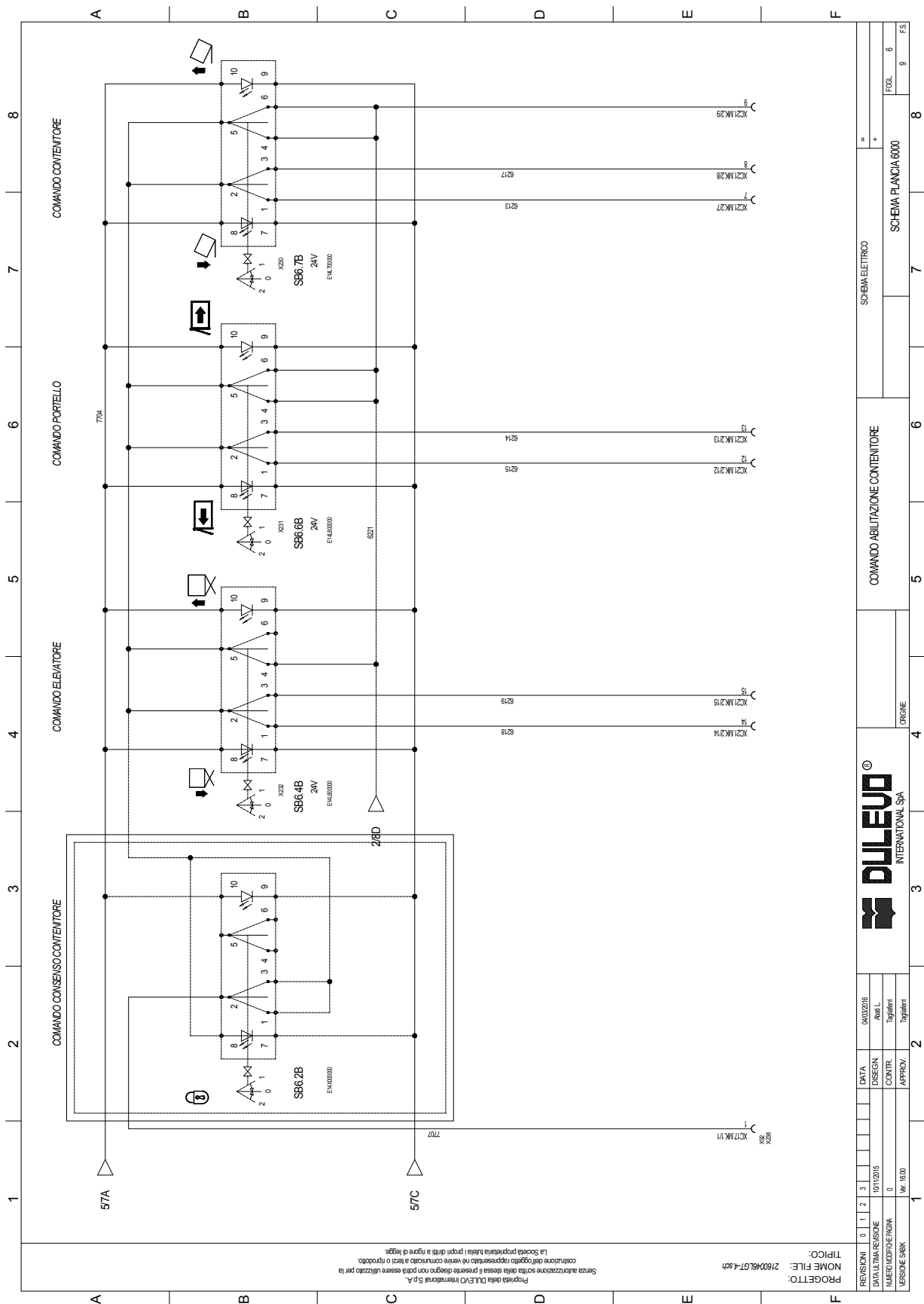




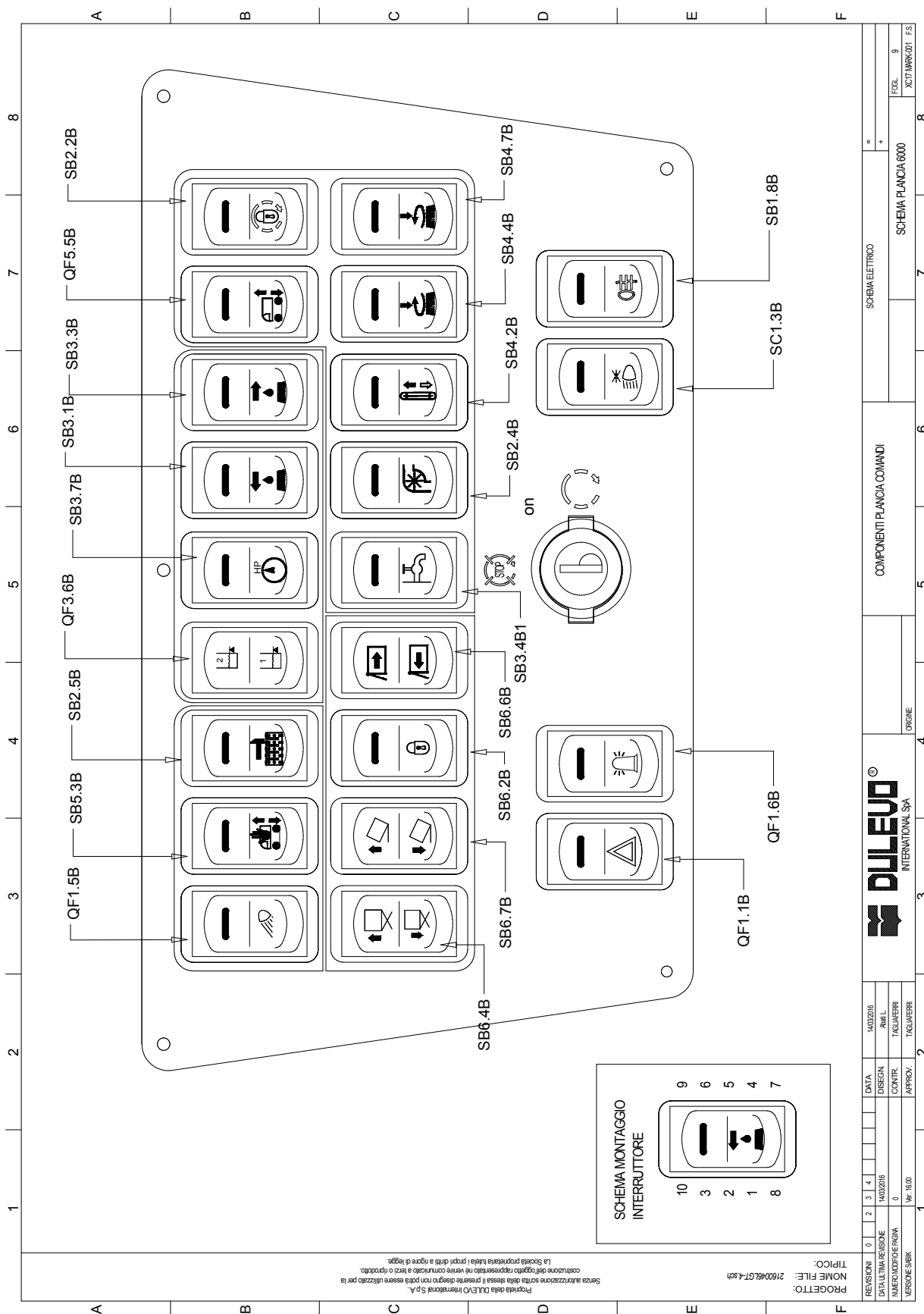


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Senza autorizzazione scritta della stessa il presente disegno non potrà essere utilizzato per la costruzione dell'oggetto rappresentato né venire comunicato a terzi o riprodotto.
La Società proprietaria tutela i propri diritti a rigore di legge.

PROGETTO: 2160048.GT-4.sh
TIPICO:

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DATA	14/03/2016										
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CONTR.	0										
APPROV.	Me 16.00										

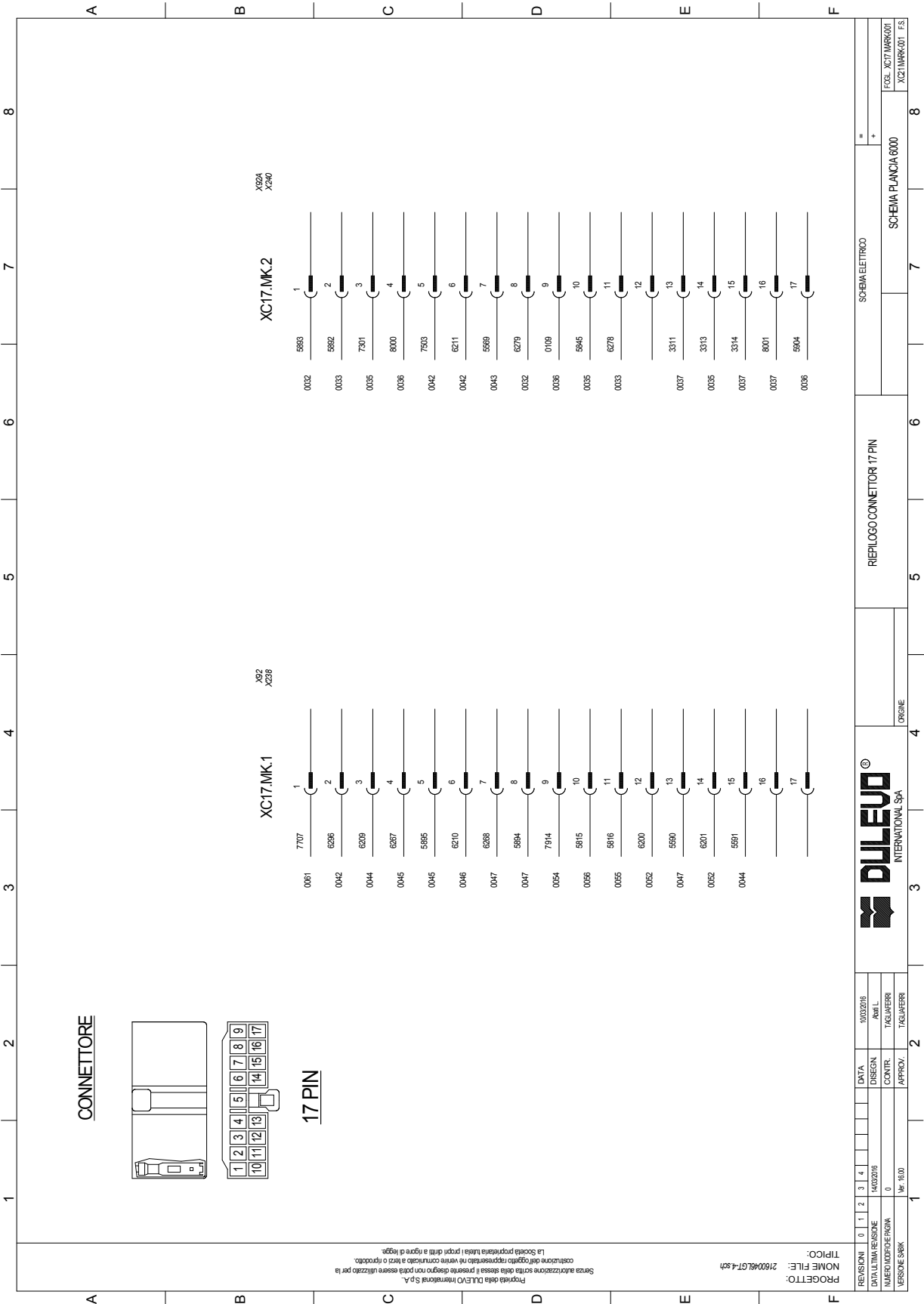
DULEVO
INTERNATIONAL S.p.A.

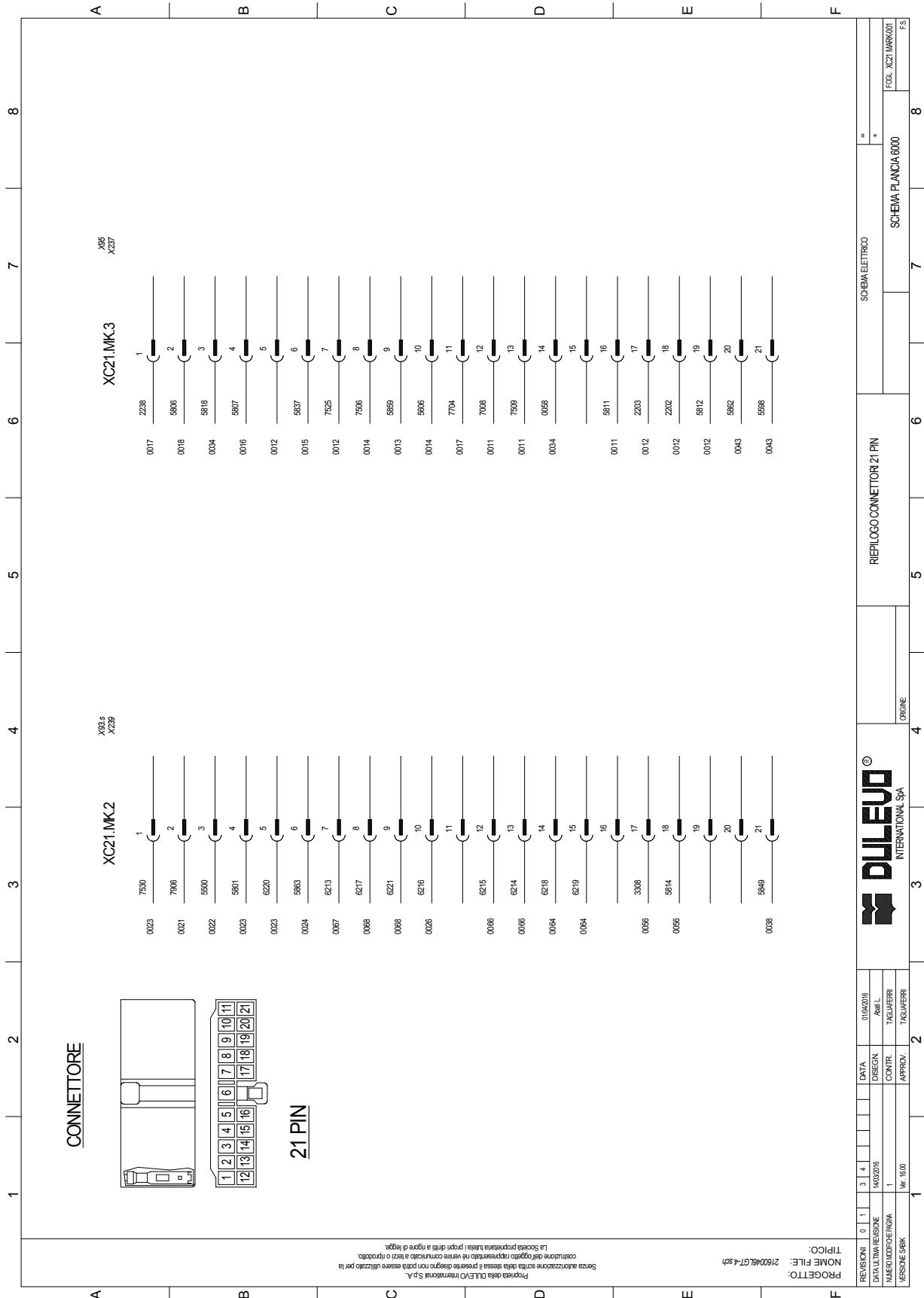
COMPONENTI PLACCA COMANDI

SCHEMA ELETTRICO

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INTERNATIONAL SpA

3012 FONTANELLO (PARMA) ITALY
VIA GIOVANNINO GUARESCHI N.1
TEL. 0521 827711 FAX 0521 827797

Schema comparto relè

Relays & fuses compartment diagram

TABELLA COLORI
COLOUR TABLE

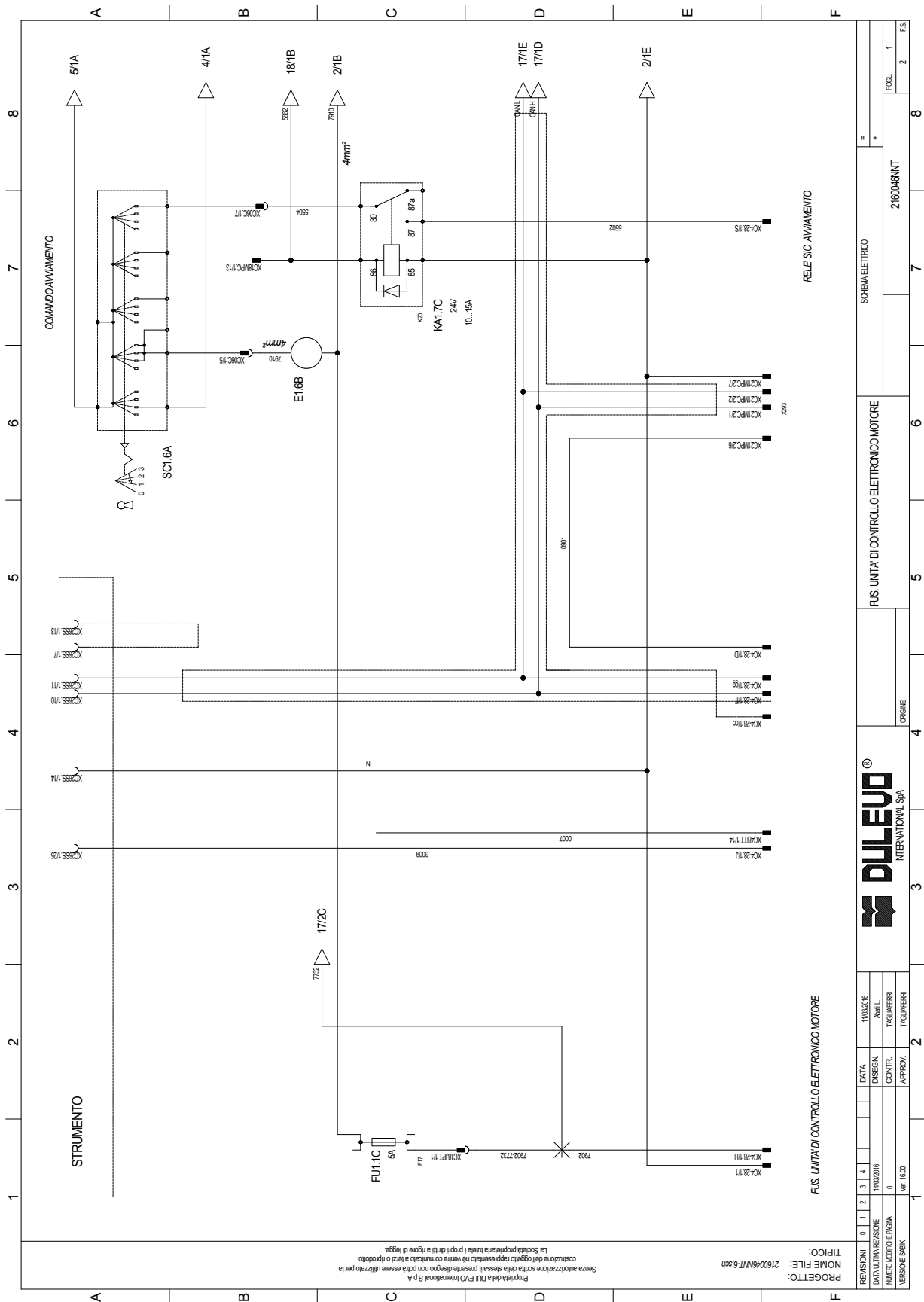
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B	BIANCO - WHITE
C	ARANCIO - ORANGE
G	GIALLO - YELLOW
H	GRIGIO - GREY
L	BLU - BLUE
M	MARRONE - BROWN
N	NERO - BLACK
R	ROSSO - RED
S	ROSA - PINK
V	VERDE - GREEN
Z	VIOLA - VIOLET

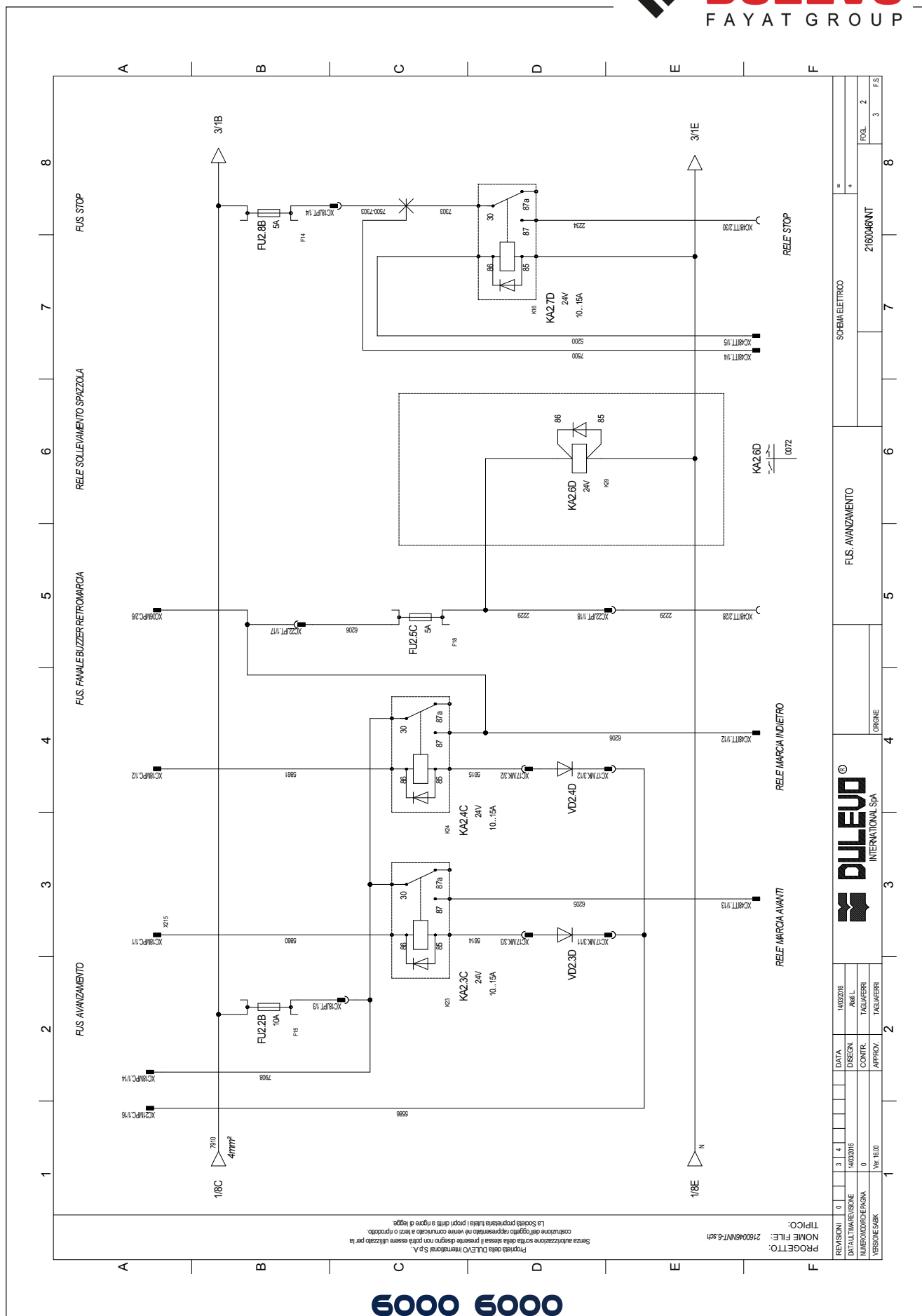
NOTE: La colorazione dei fili bicolori viene indicata con la composizione delle sigle sopra indicate. Esempio: GV (colore Trasversato) – G-V (colore Longitudinale).
NOTE: The bicoloured wires are indicated with the composition of the above letters.
Example: GV (Transverse colour) – G-V (Longitudinal colour).

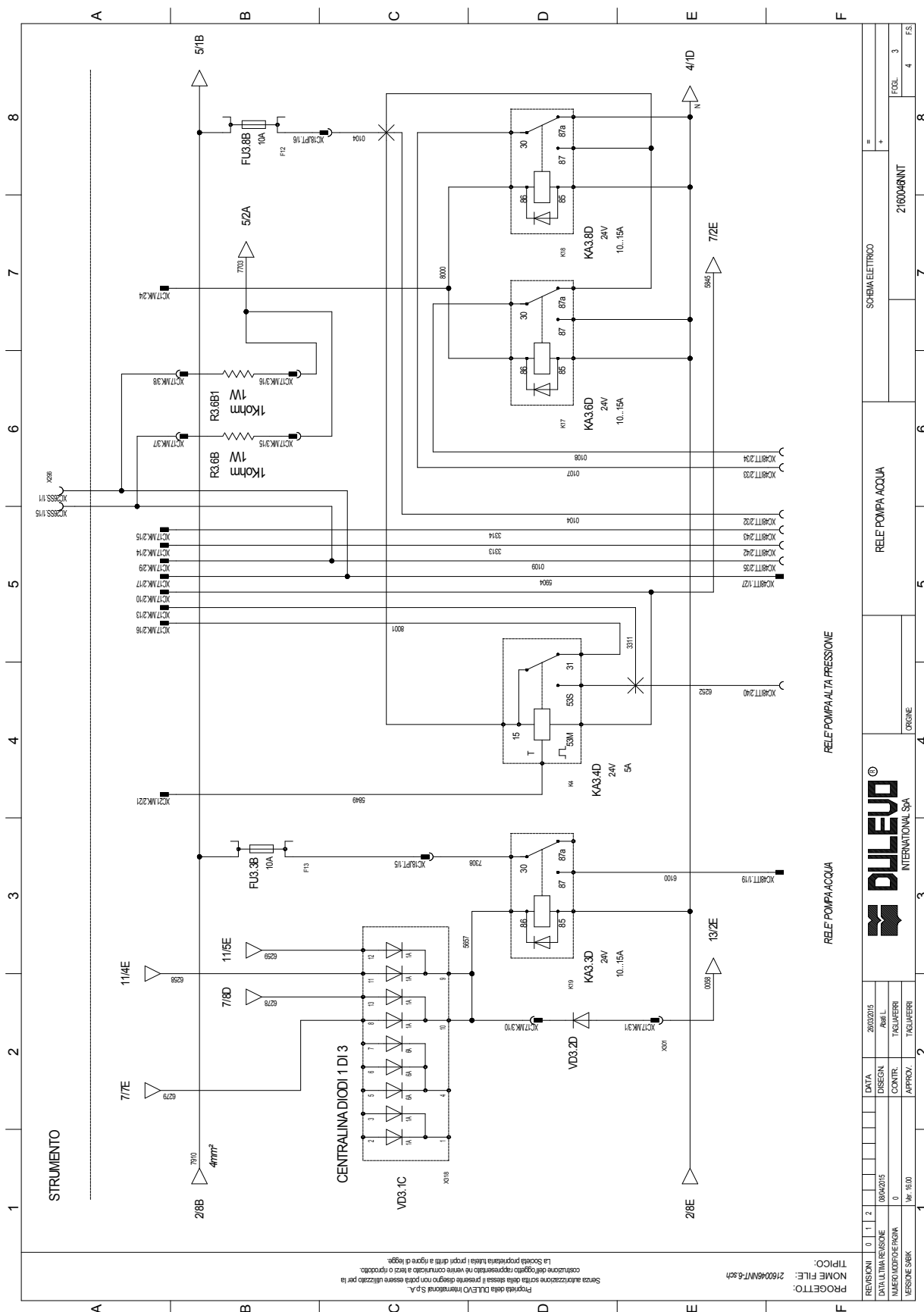
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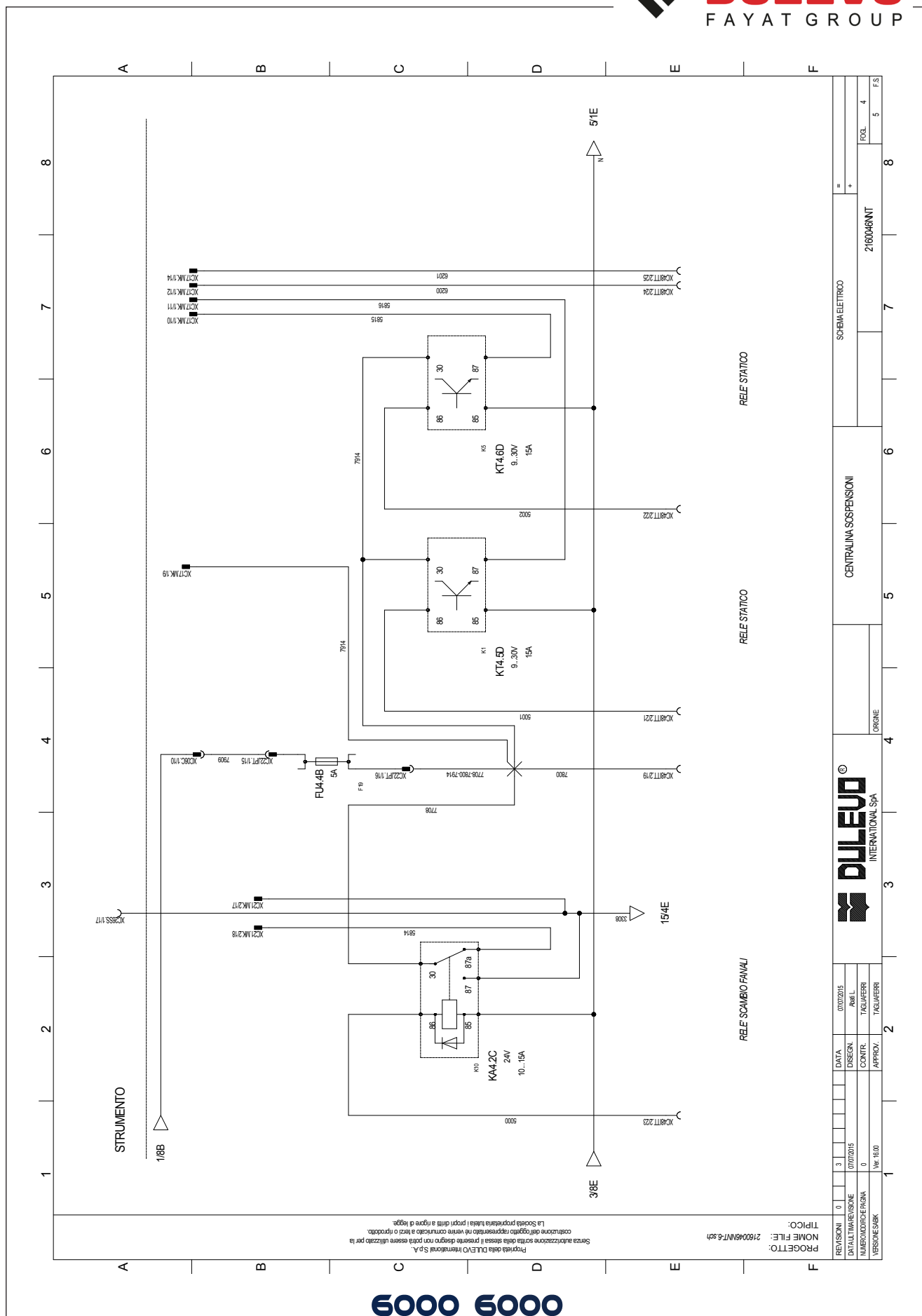
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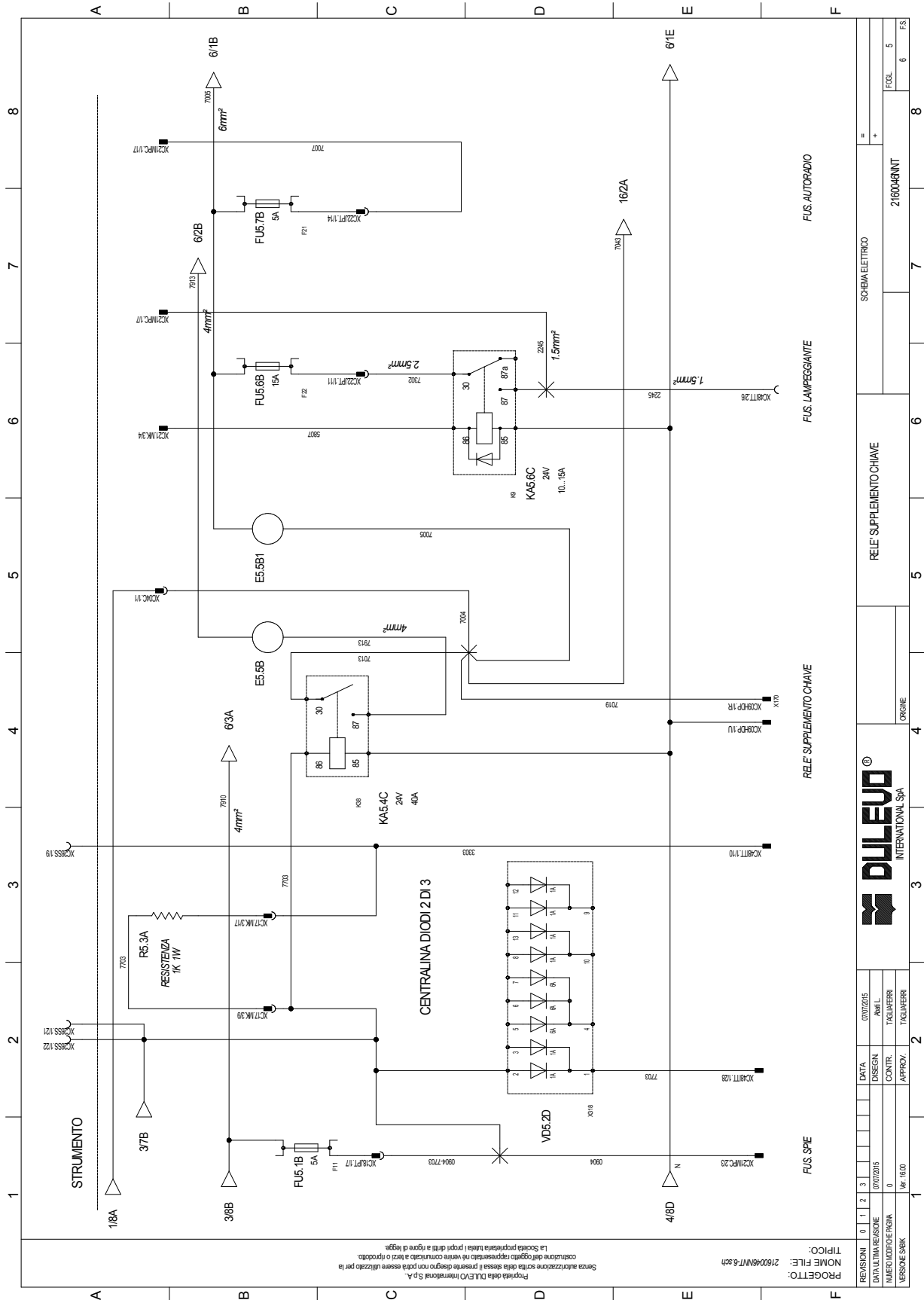
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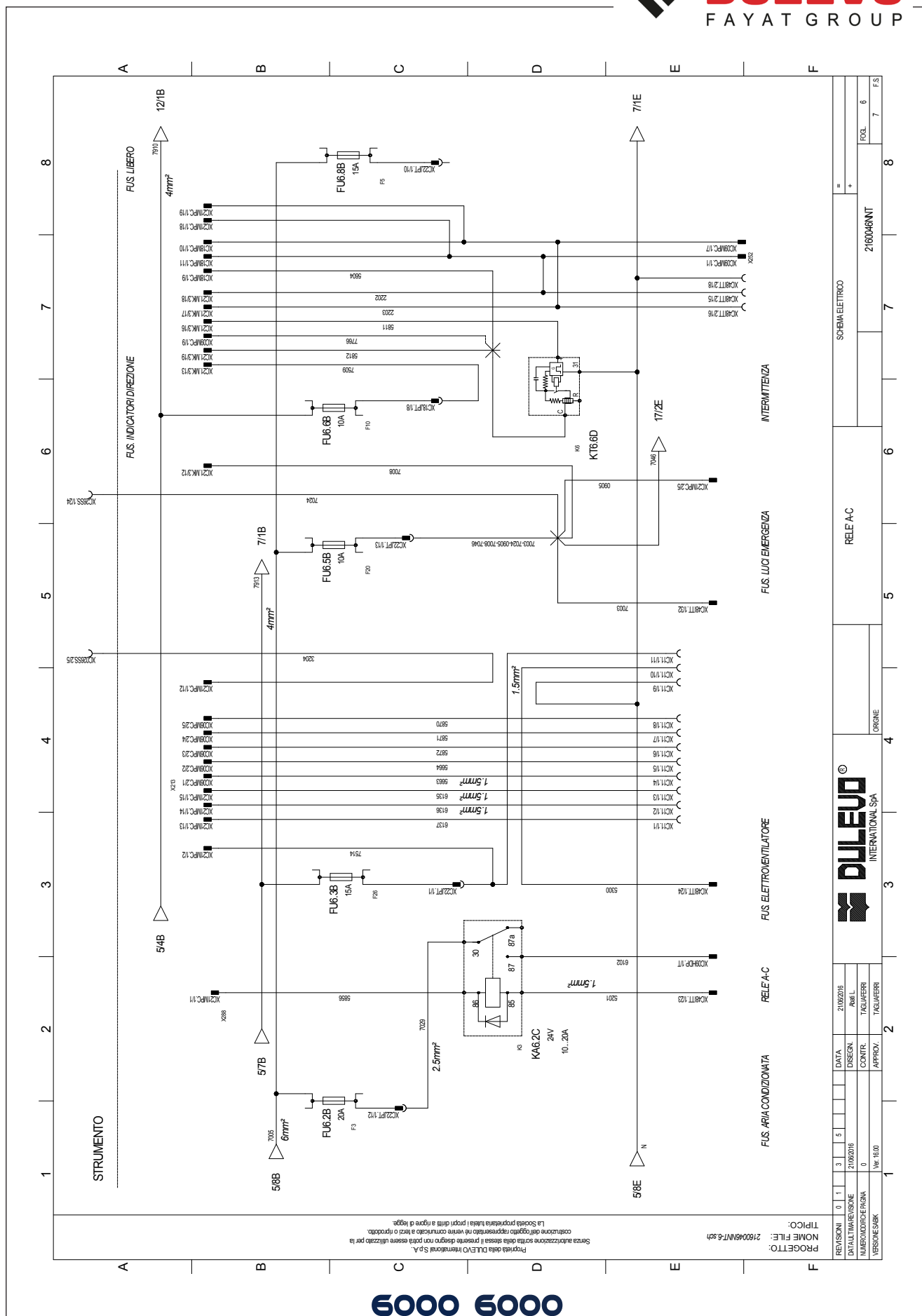


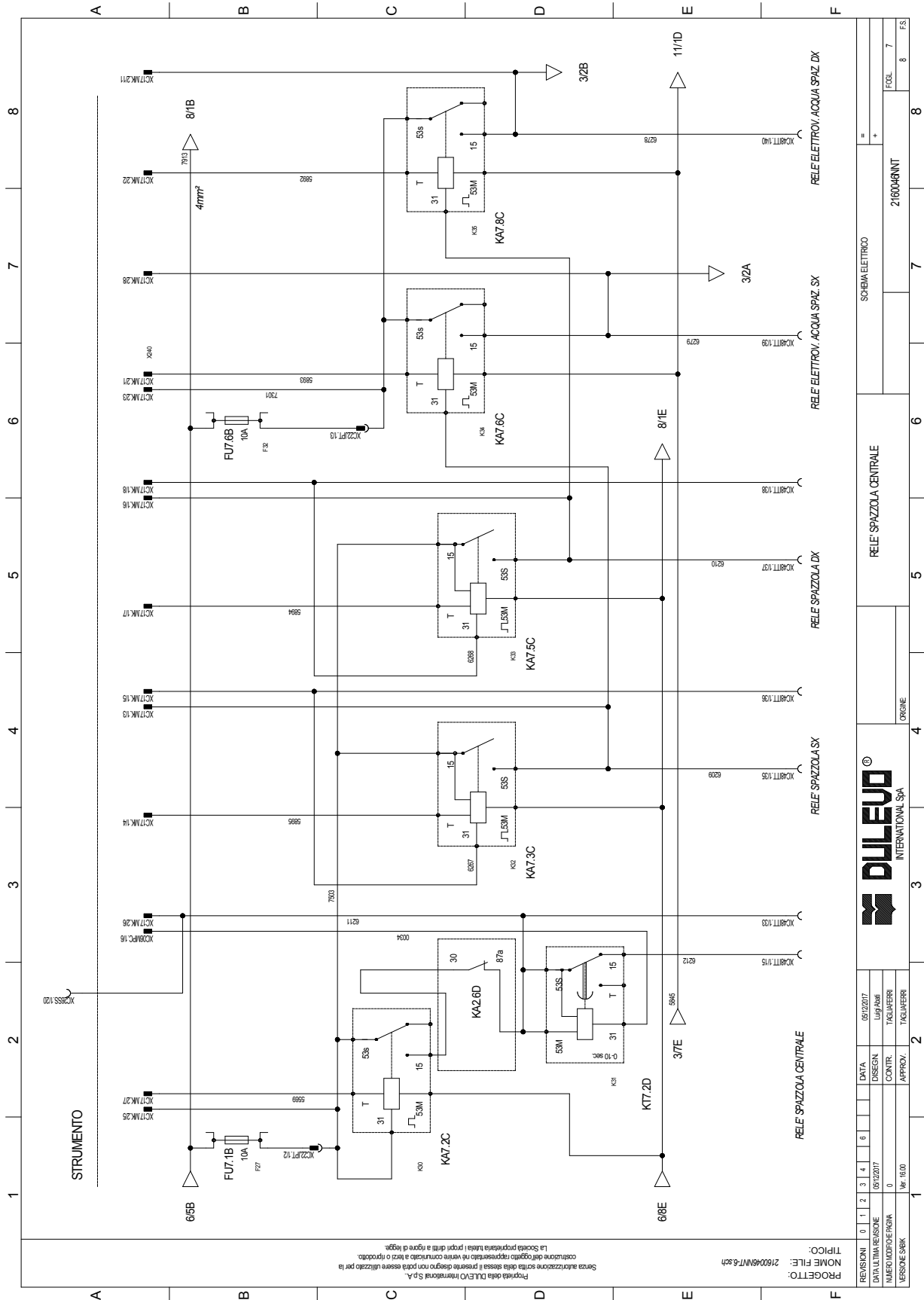












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La Società proprietaria tutela i propri diritti a rigore di legge.

PROGETTO:
NOME FILE: 2160048/INT-6.sh
TIPICO:

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CONTR.	0	0	0	0	0	0	0	0	0
APPROV.	Me 16.00	Me 16.00	Me 16.00	Me 16.00	Me 16.00	Me 16.00	Me 16.00	Me 16.00	Me 16.00
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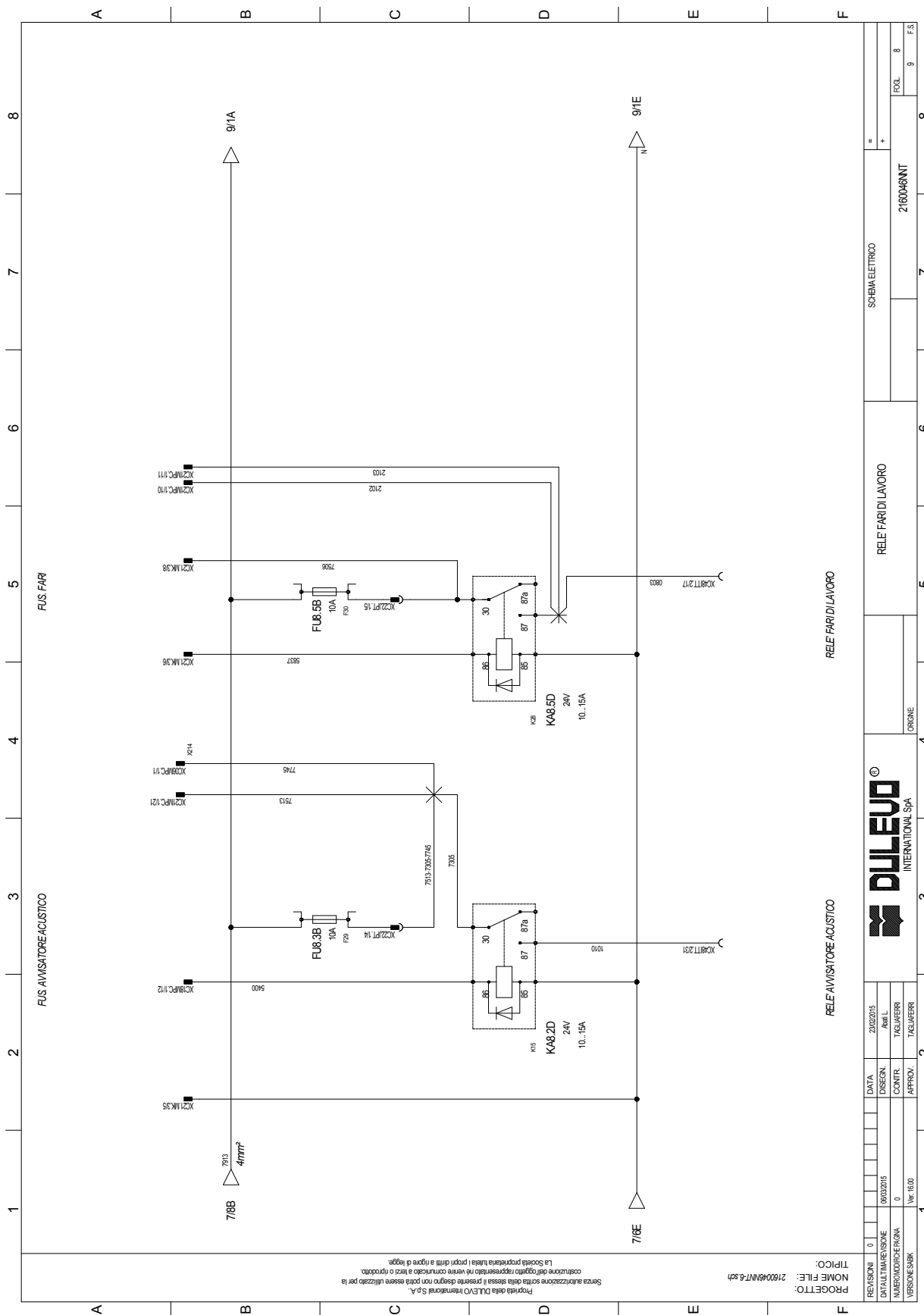


RELE SPAZZOLA CENTRALE

2160048/INT

FOGL 7

F.S.



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NOME FILE: 2160046NVT-6.sch
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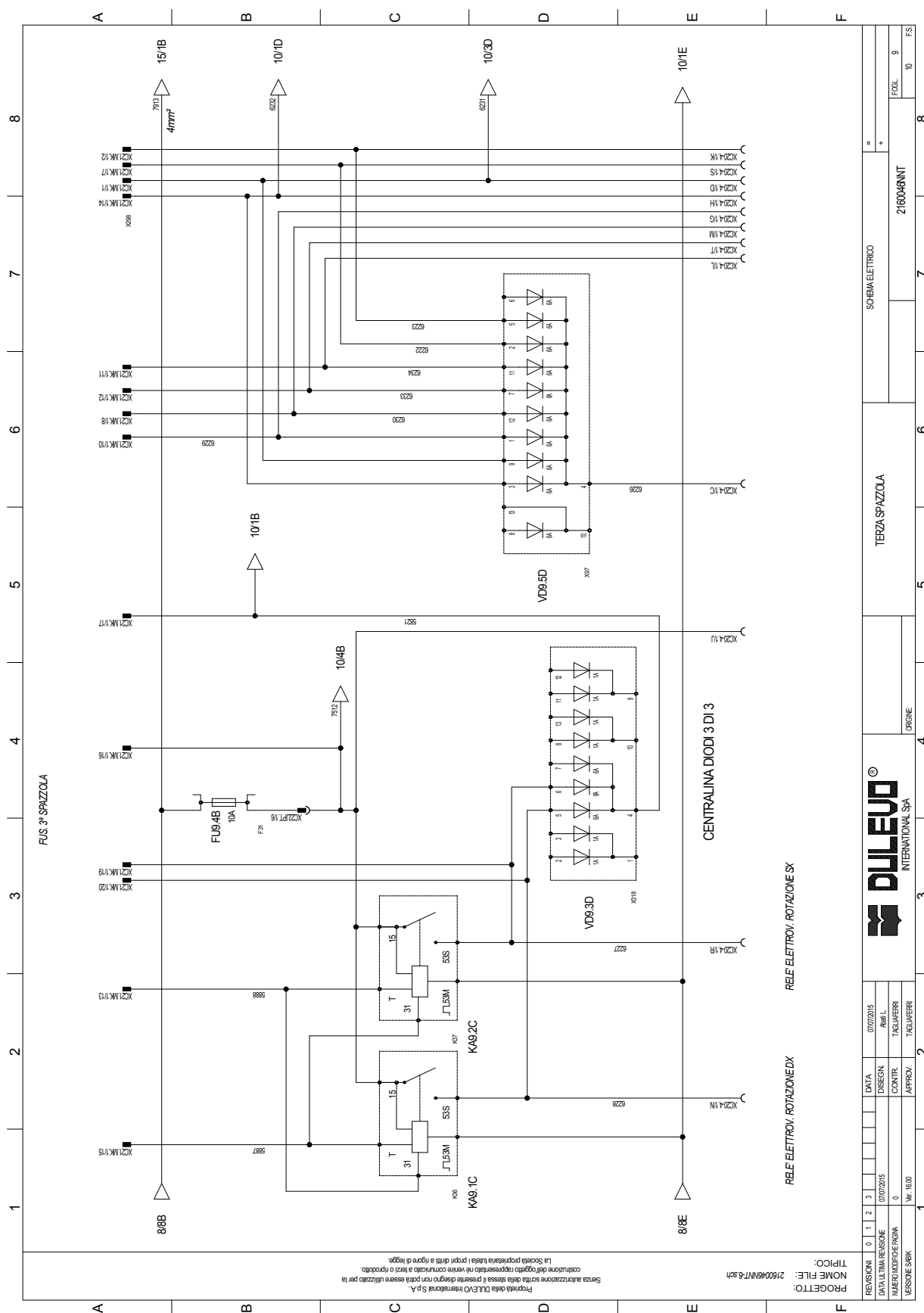
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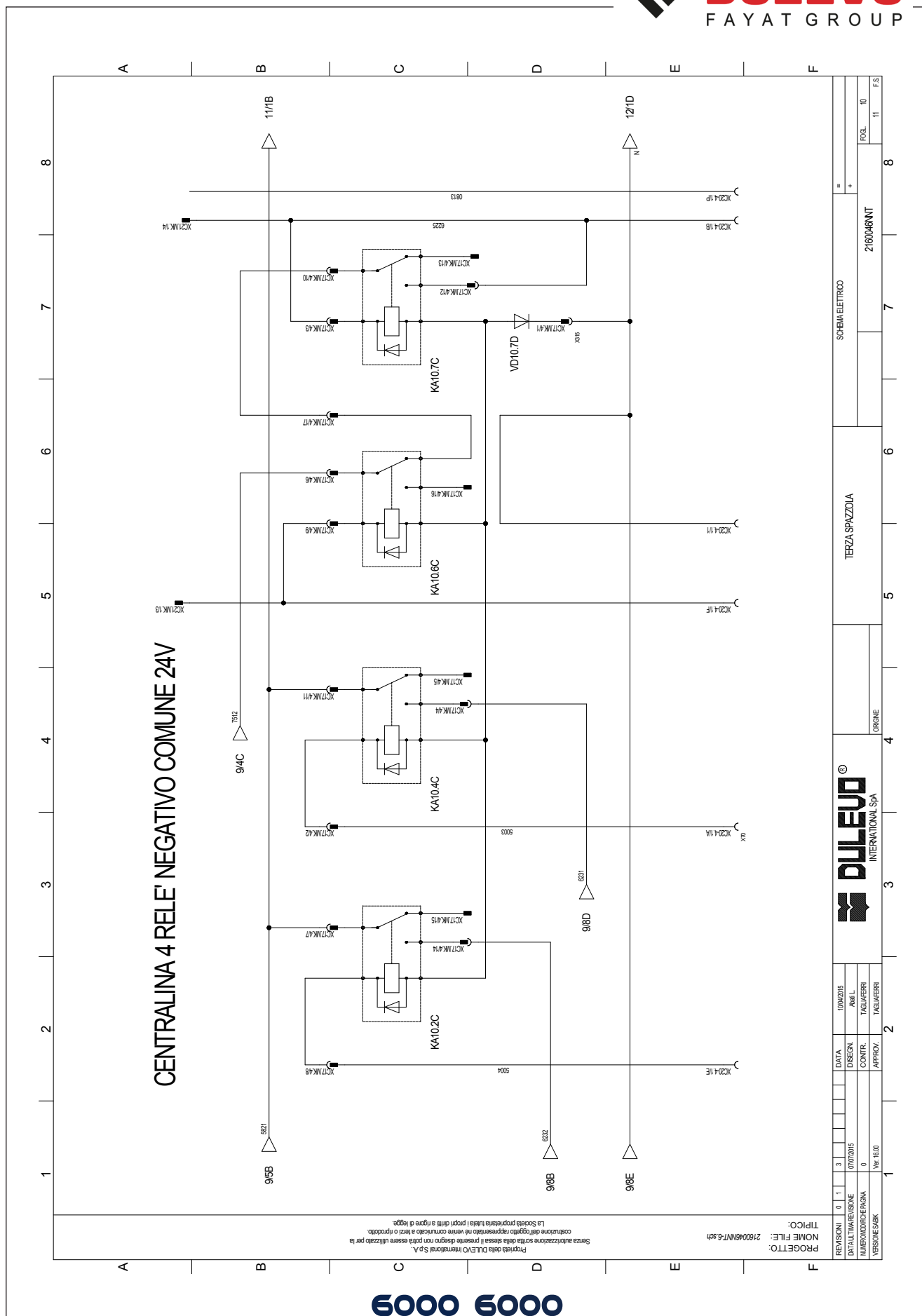
DULEVO
INTERNATIONAL SpA

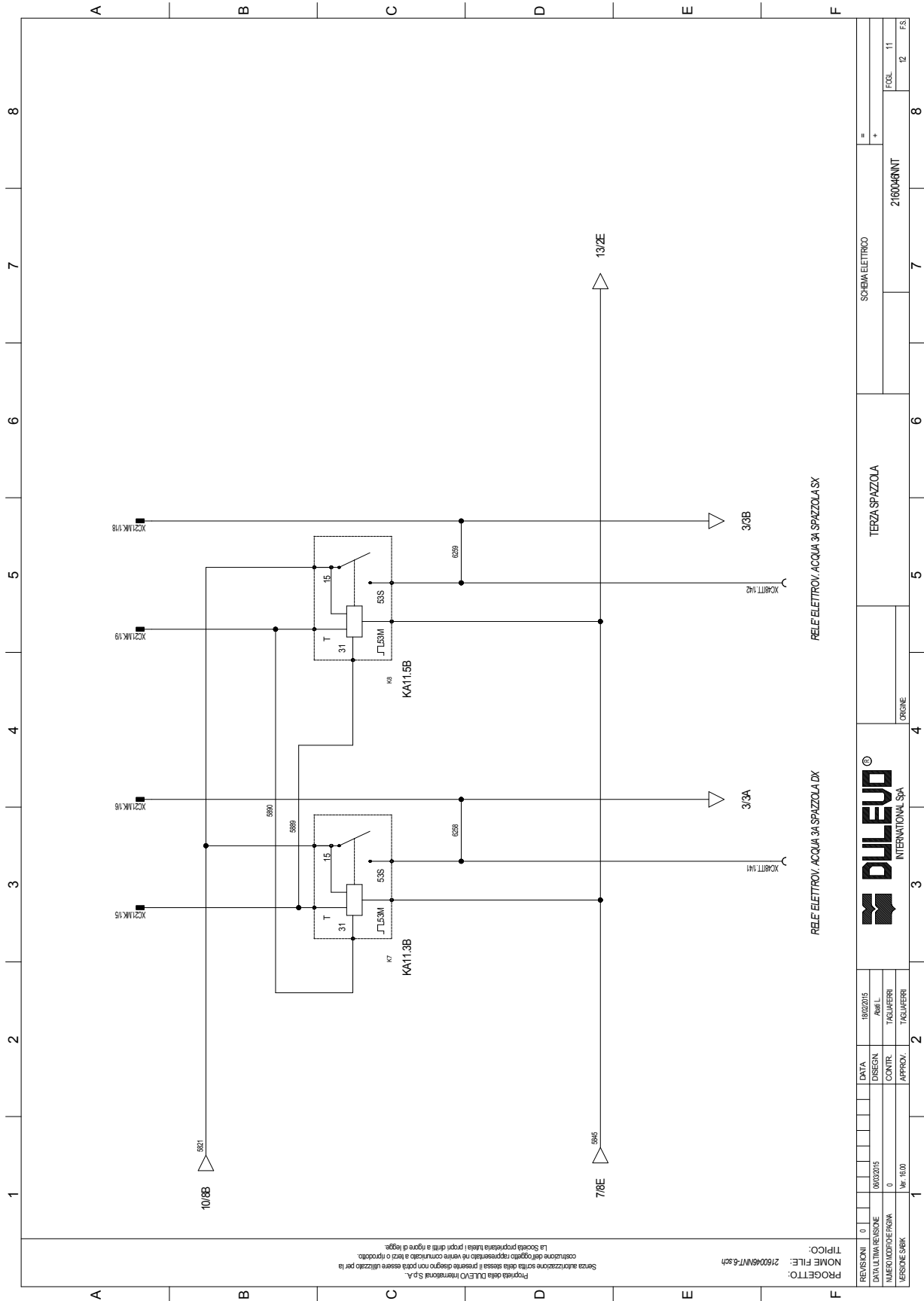
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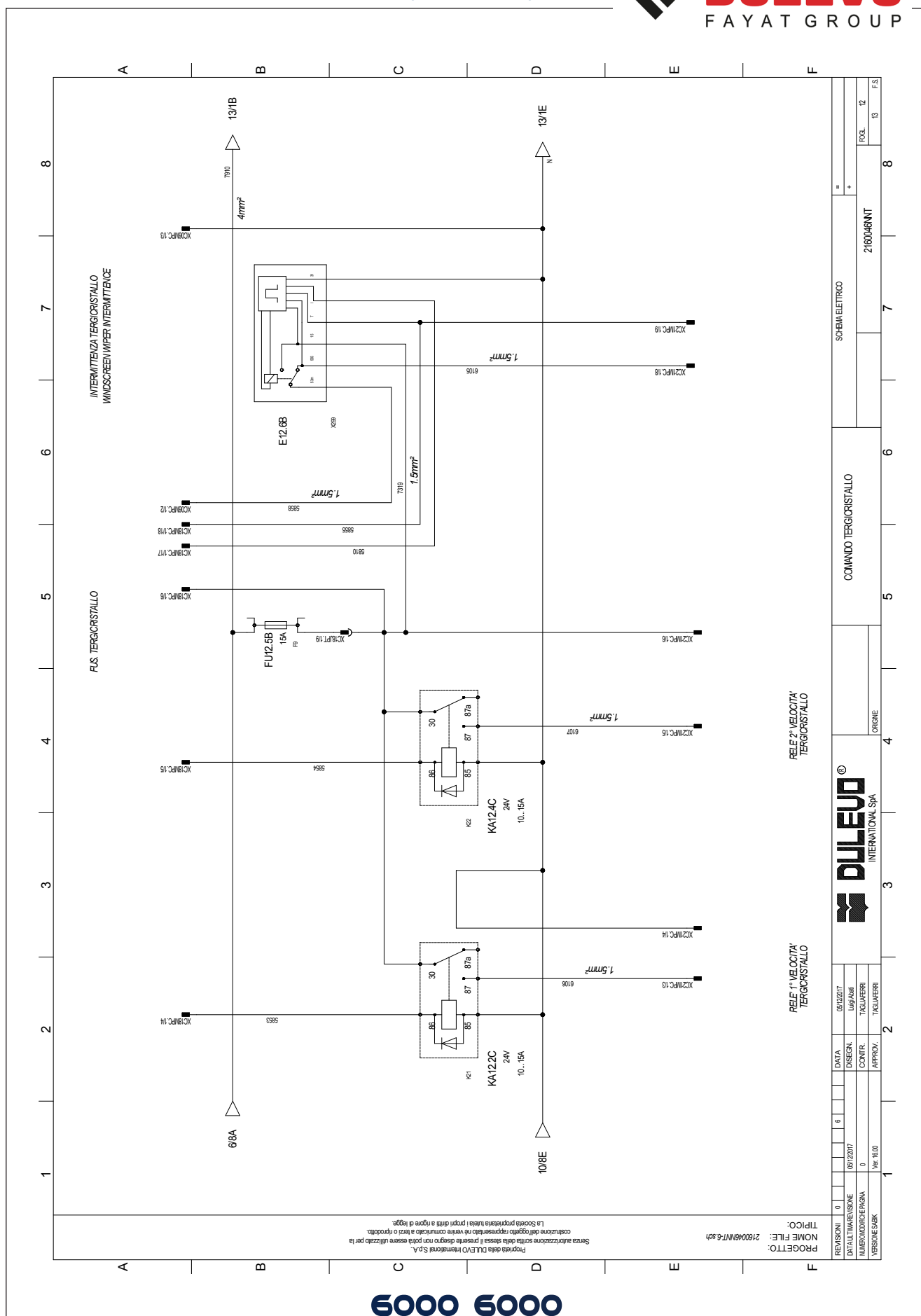
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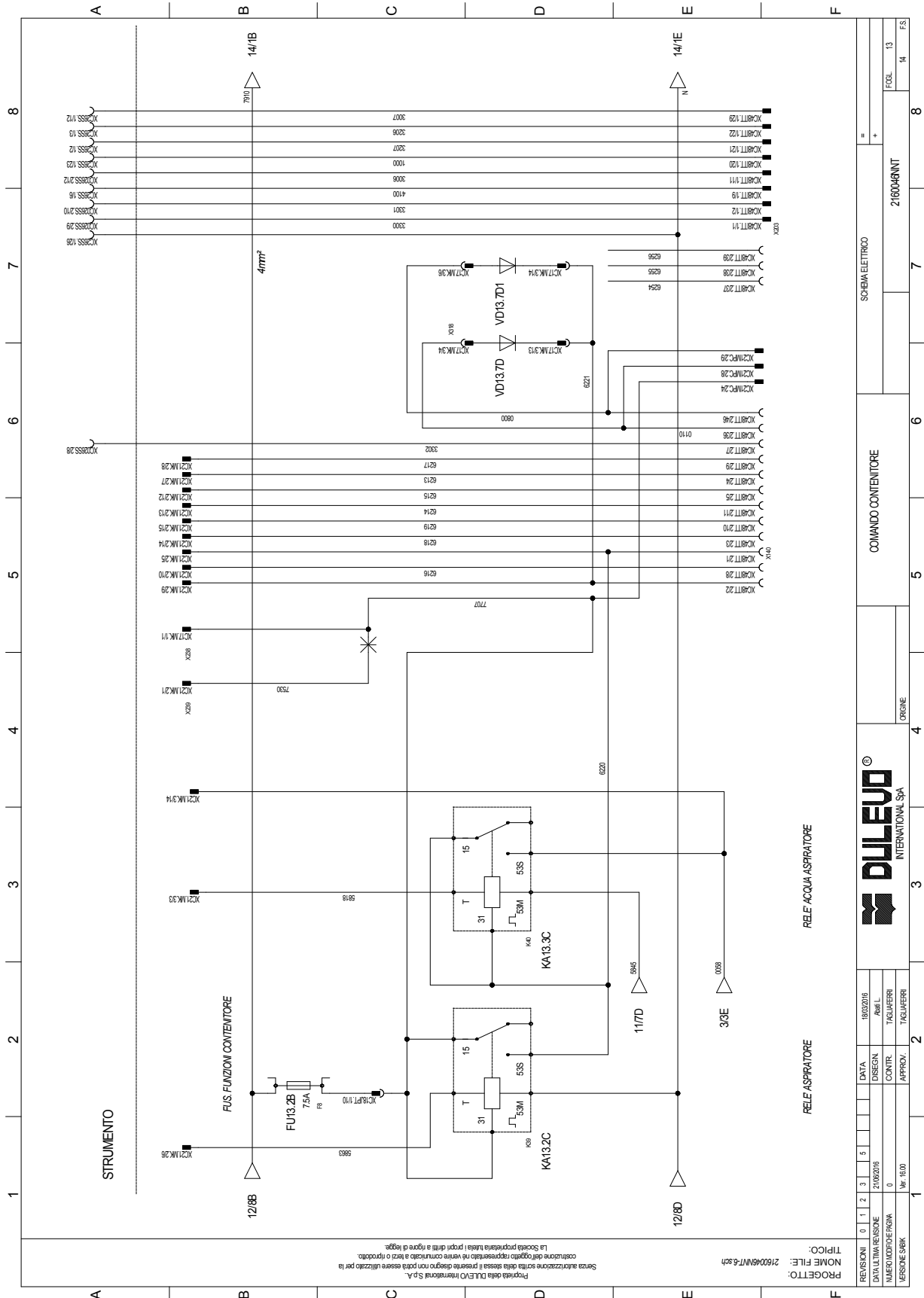
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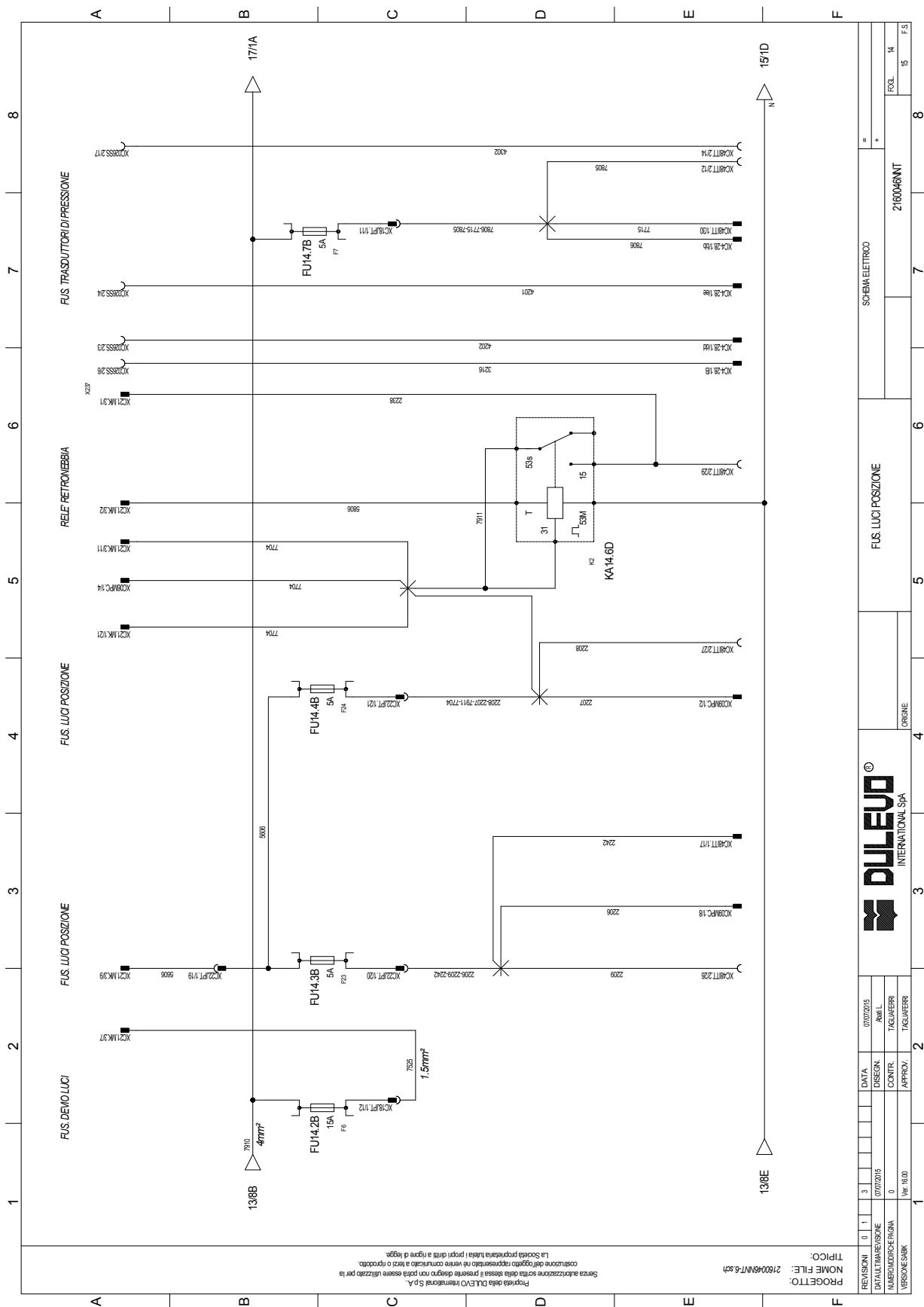


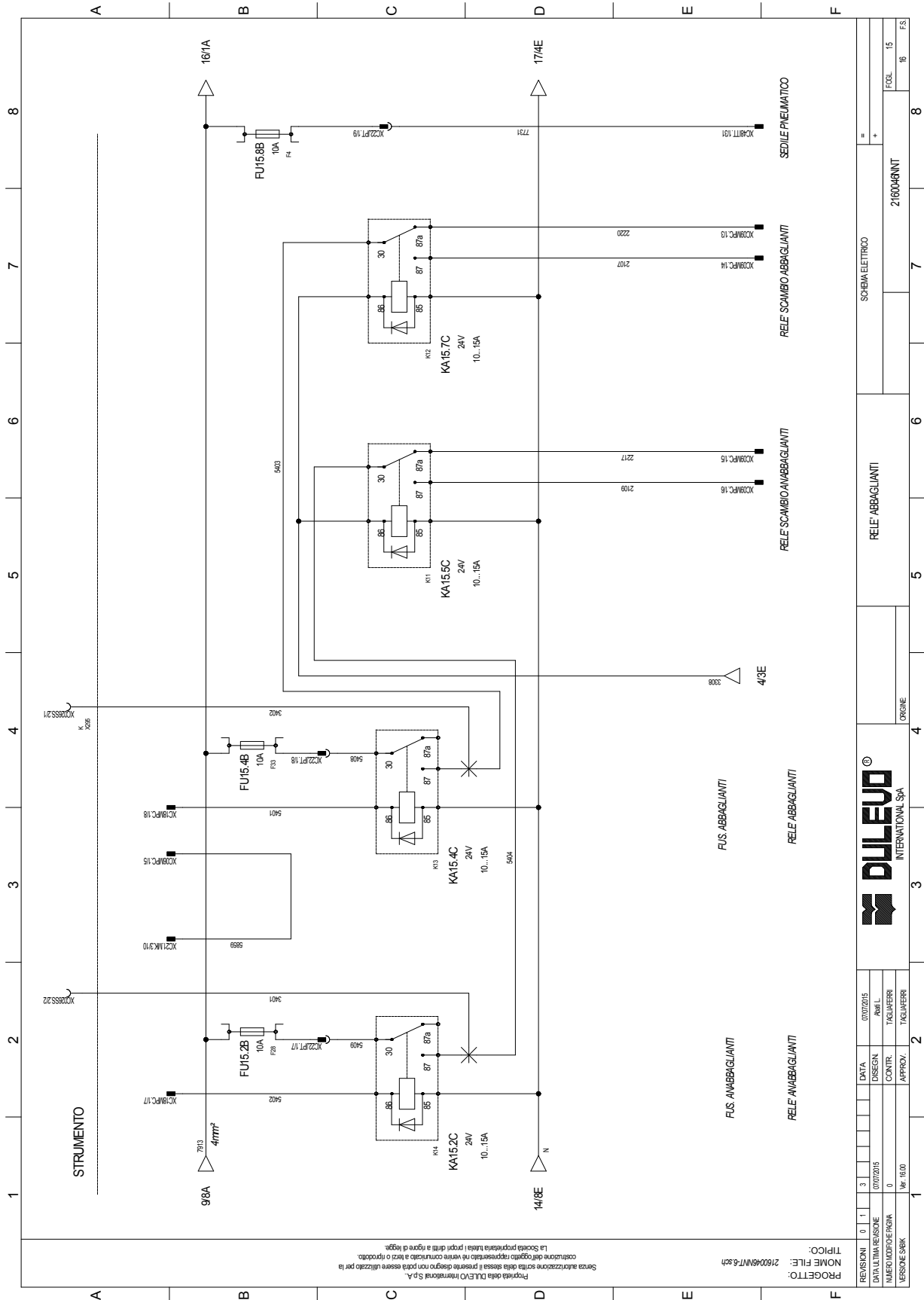










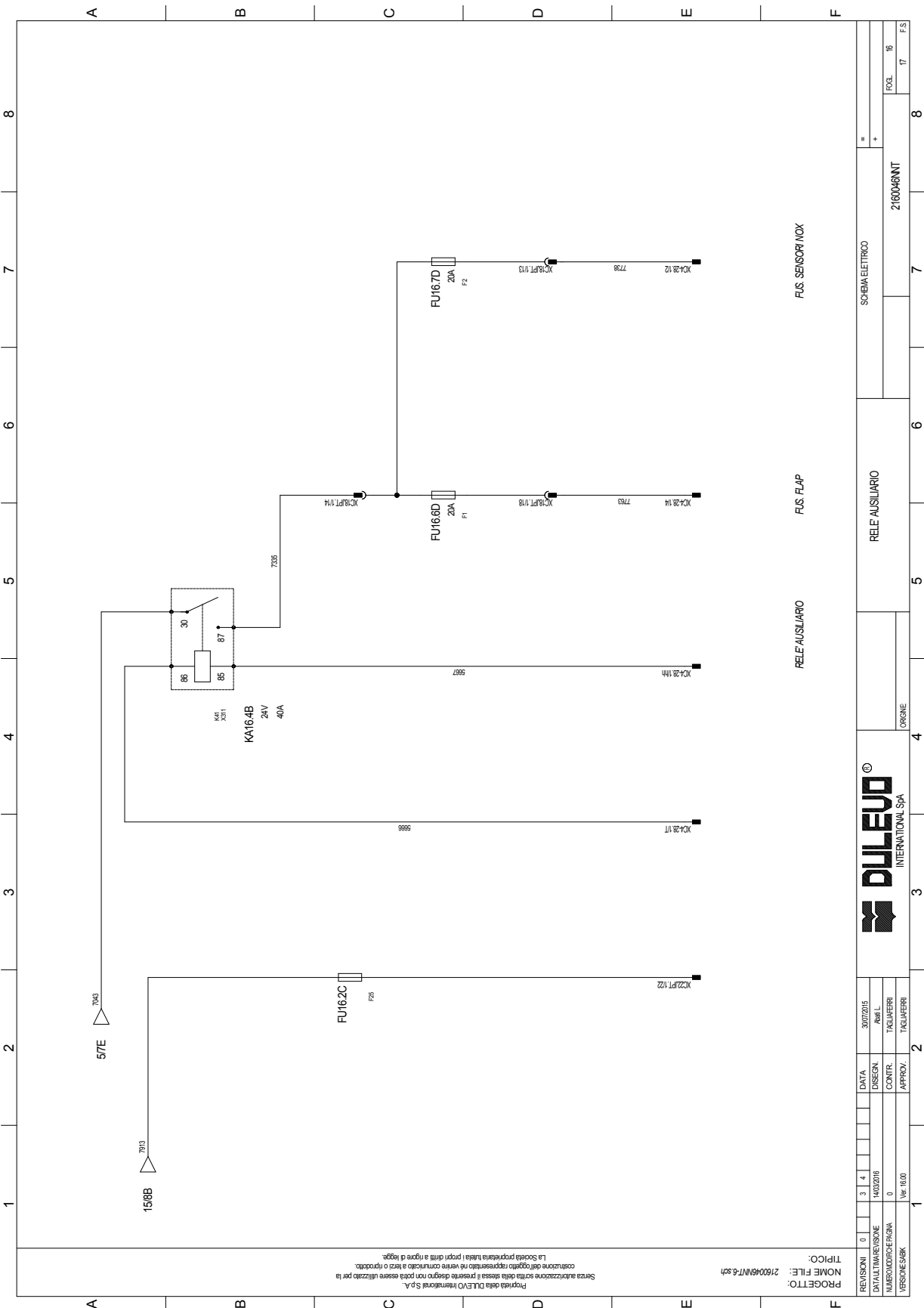


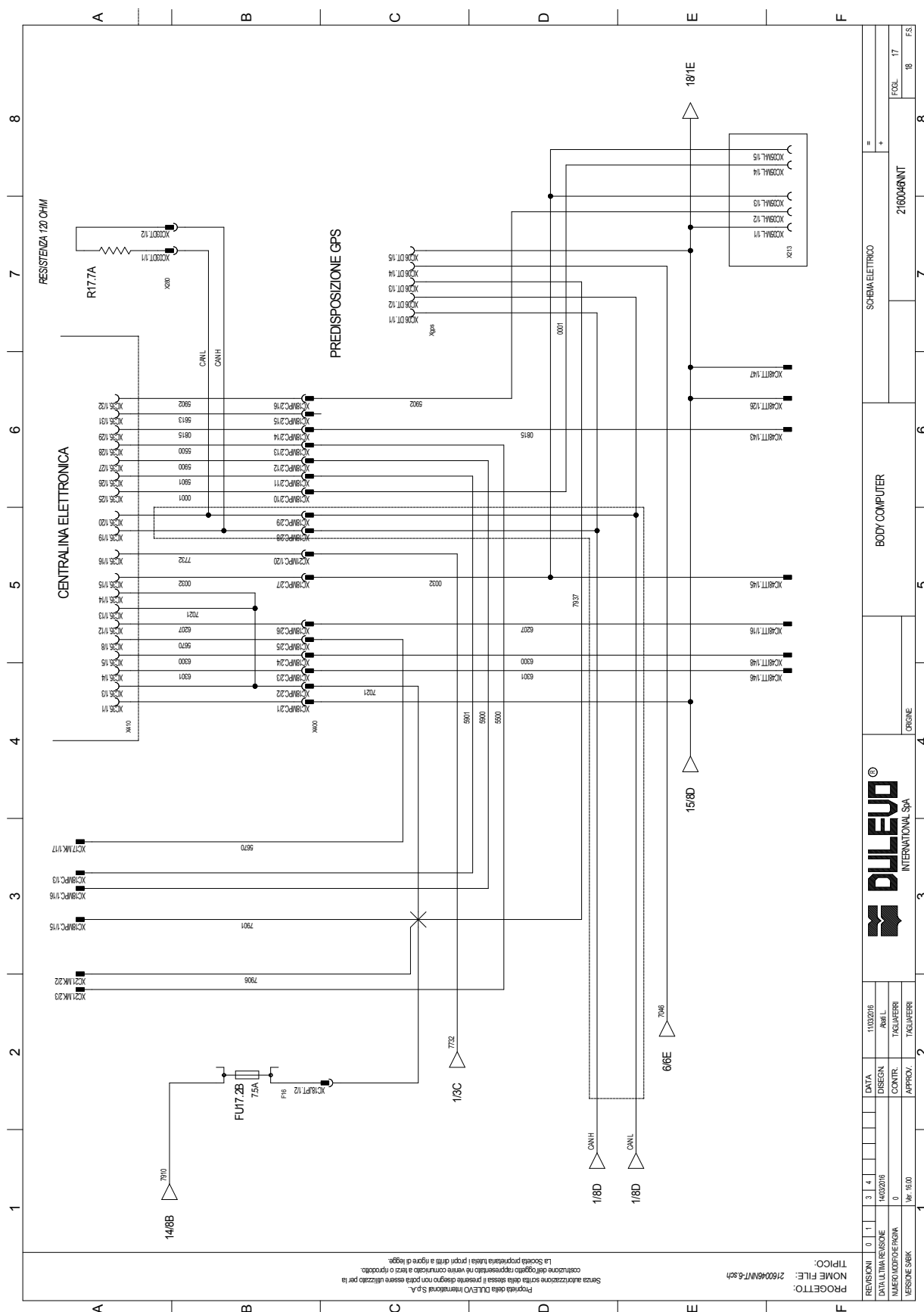
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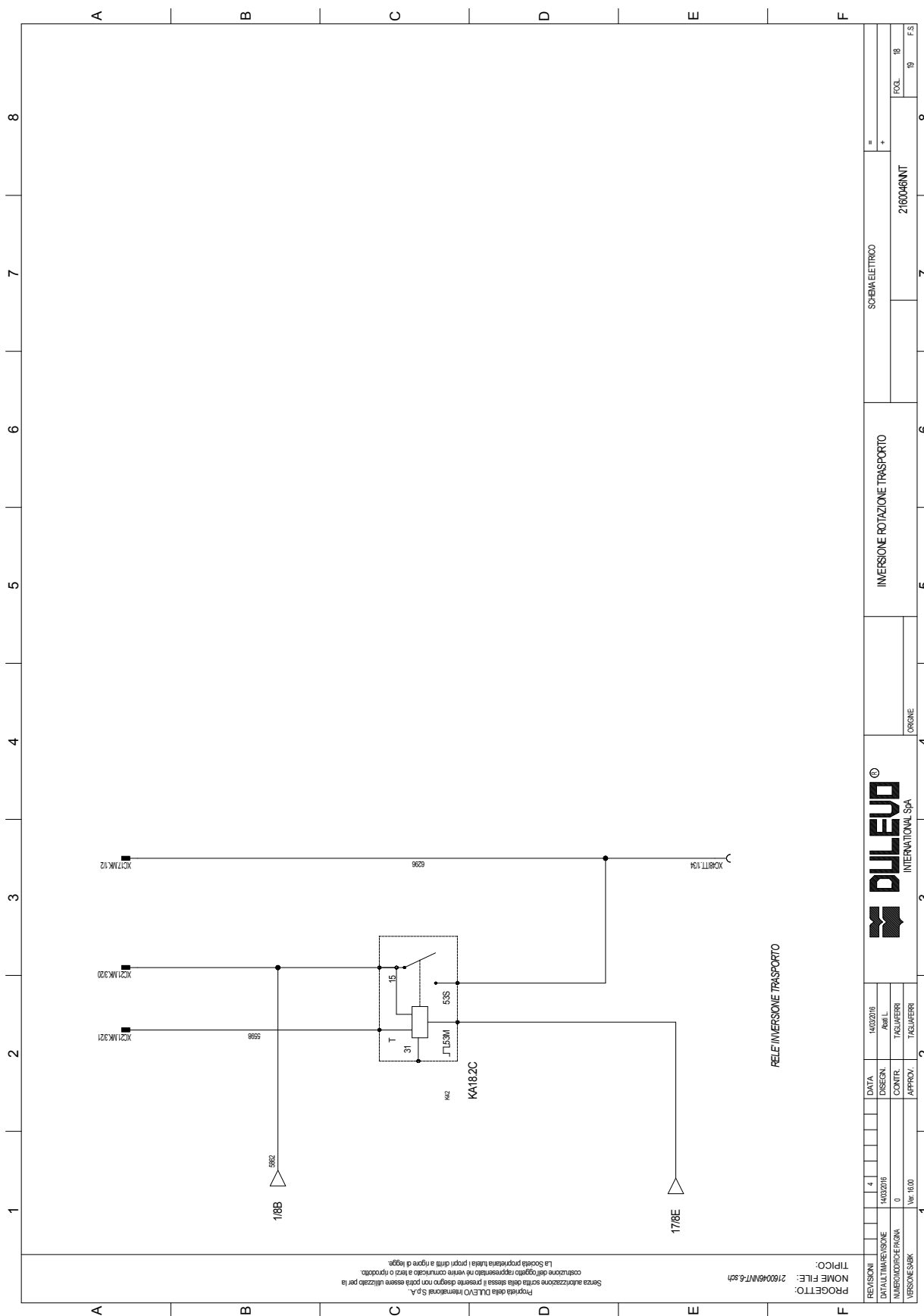


INTERNATIONAL S.p.A.

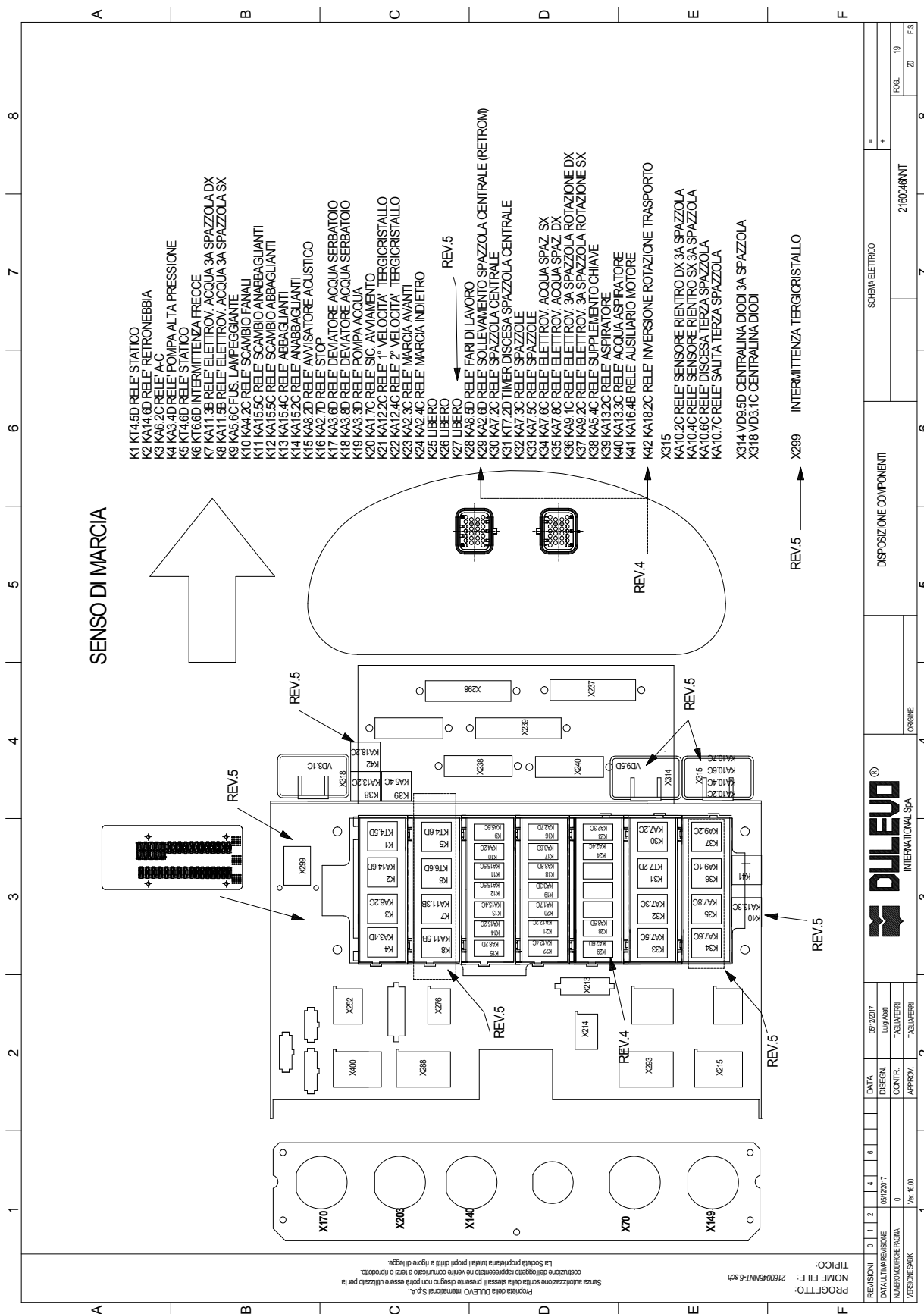
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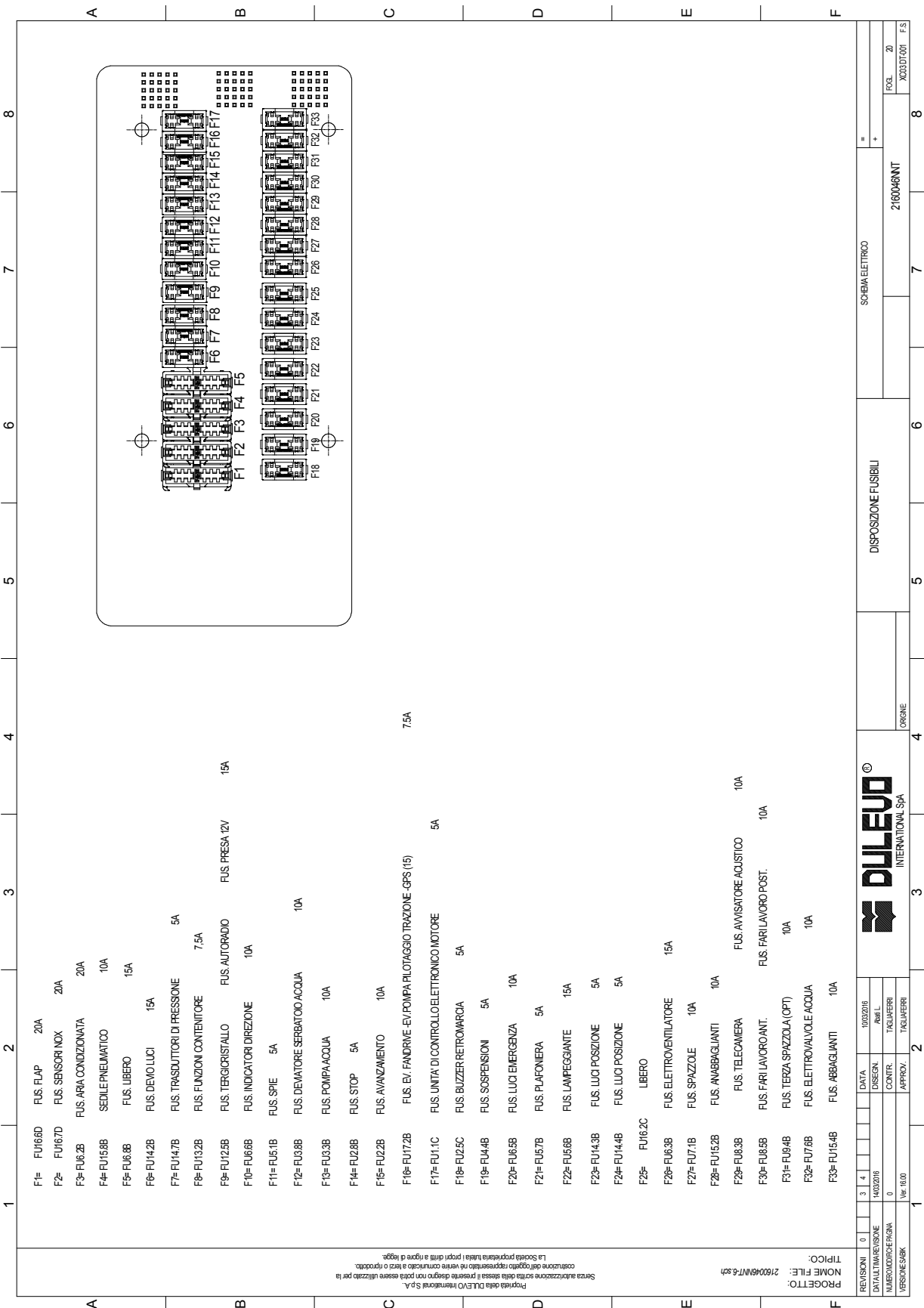


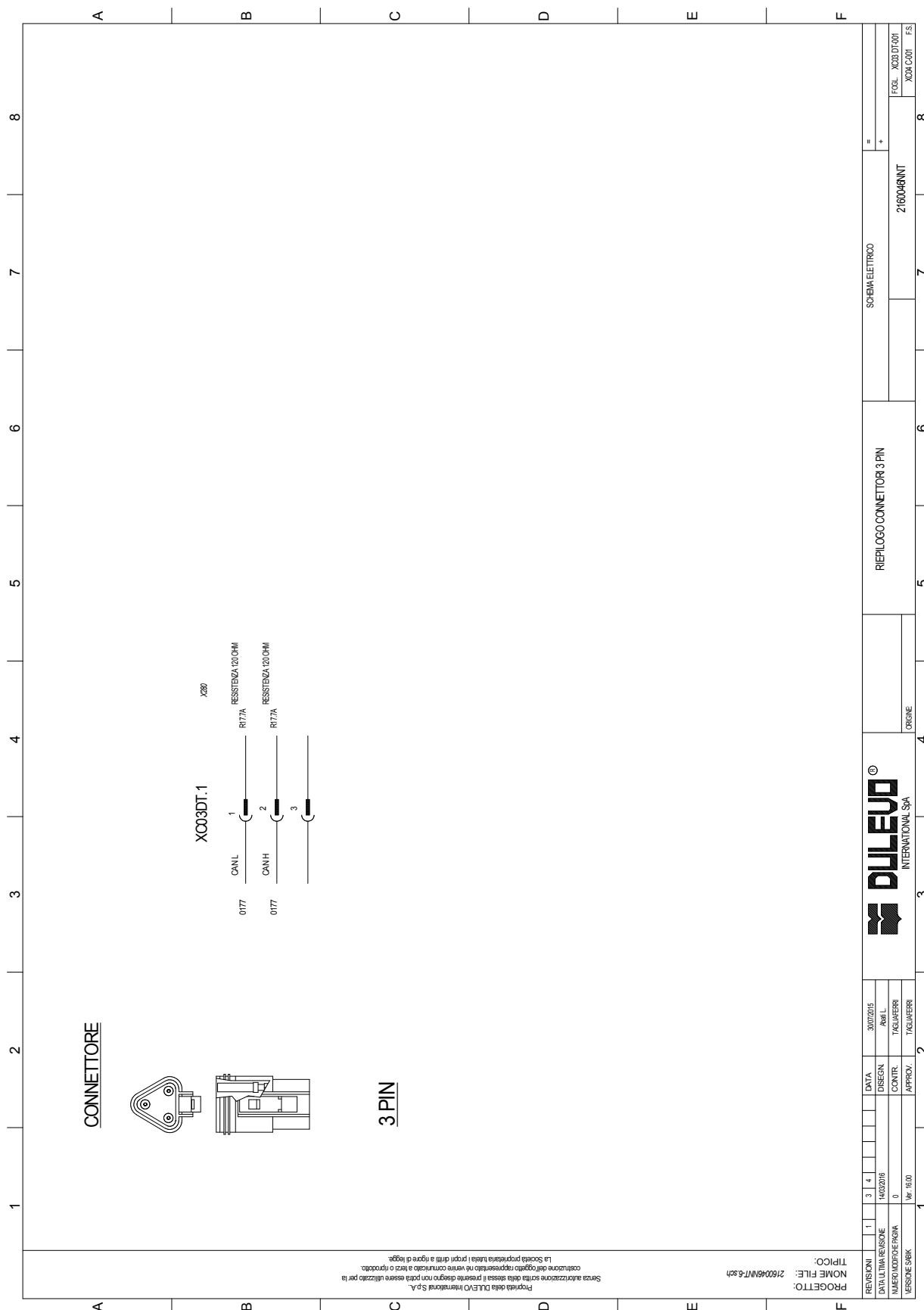


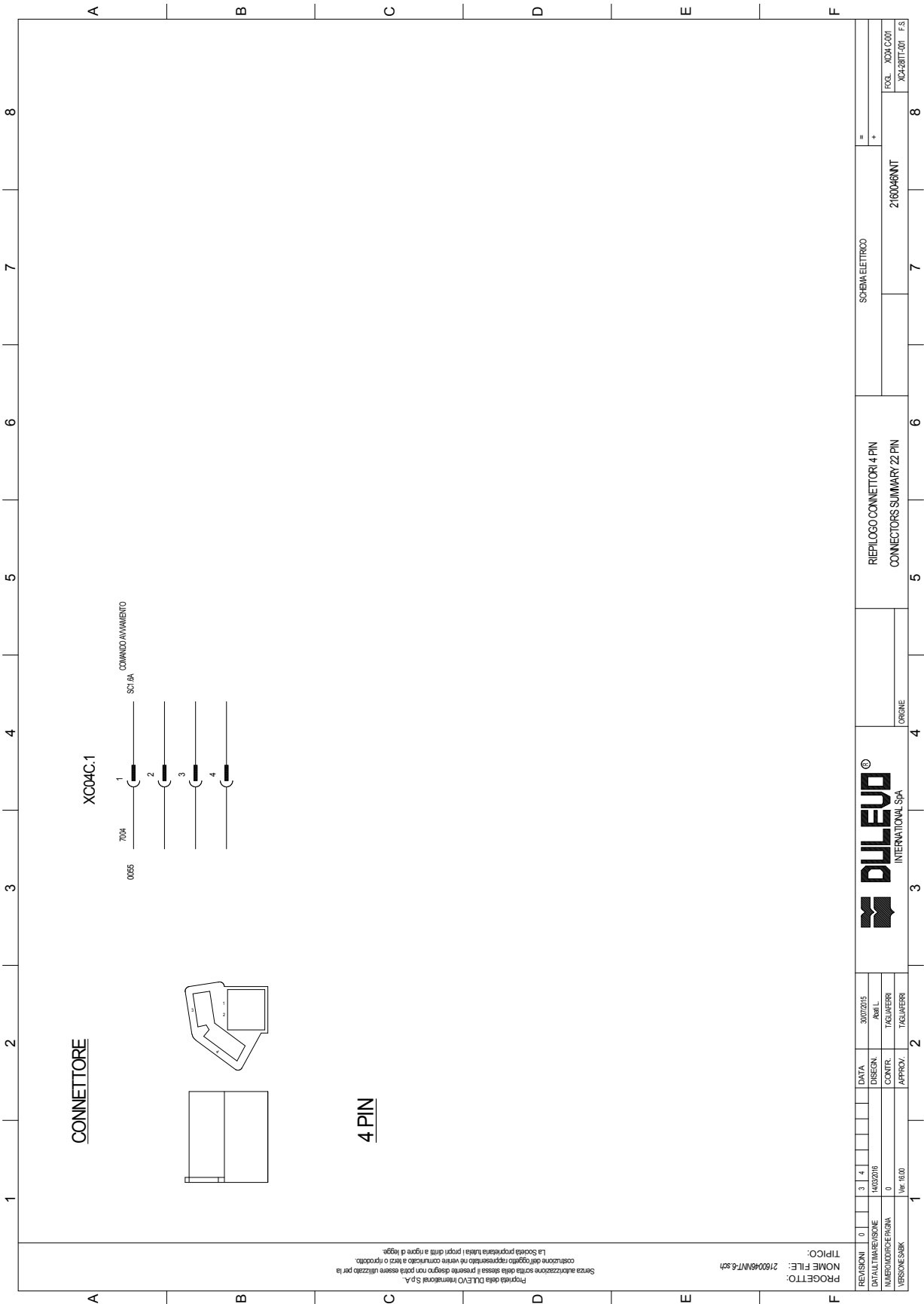


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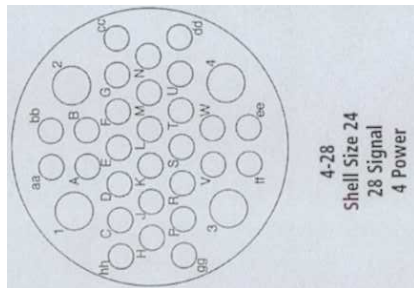








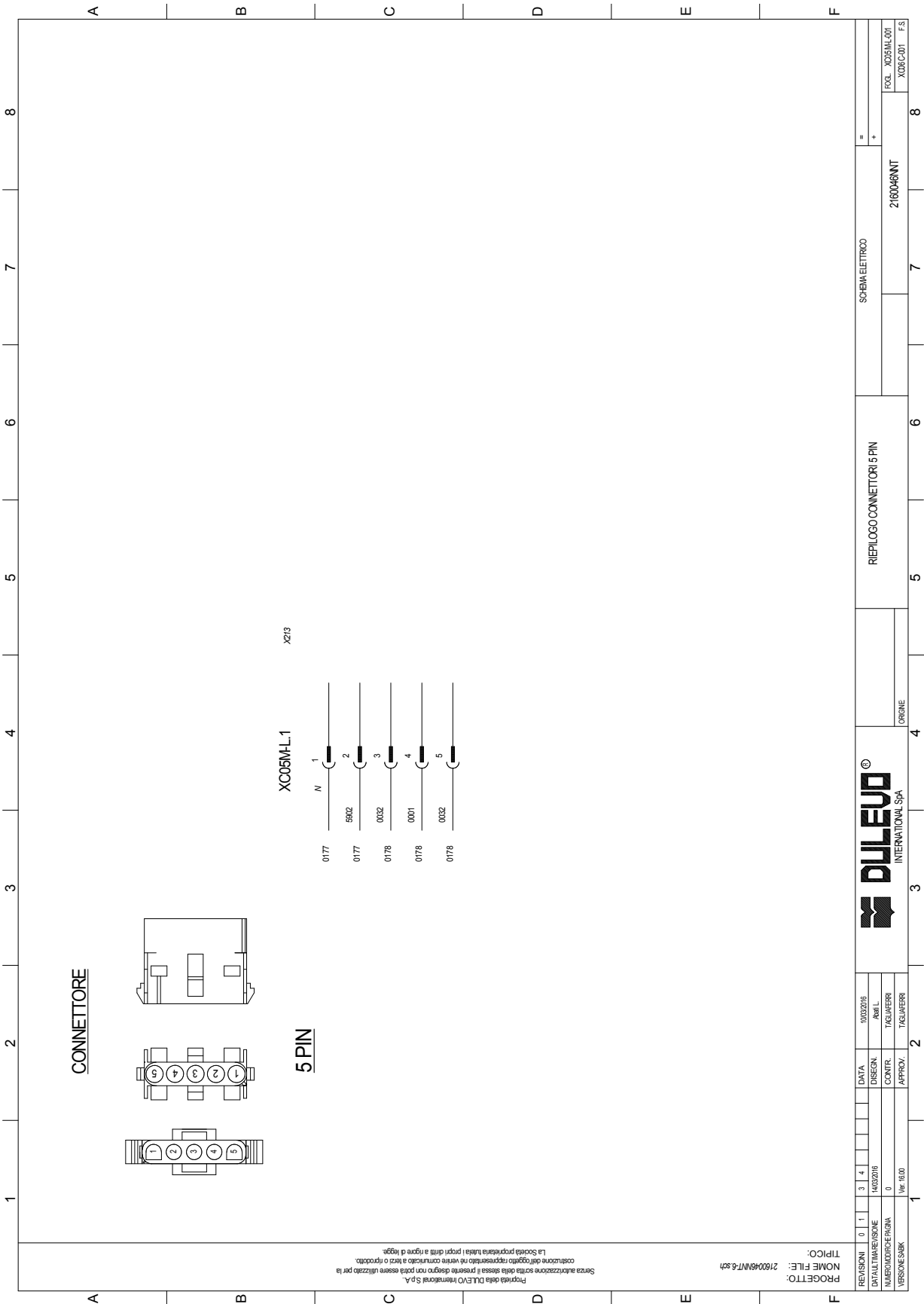
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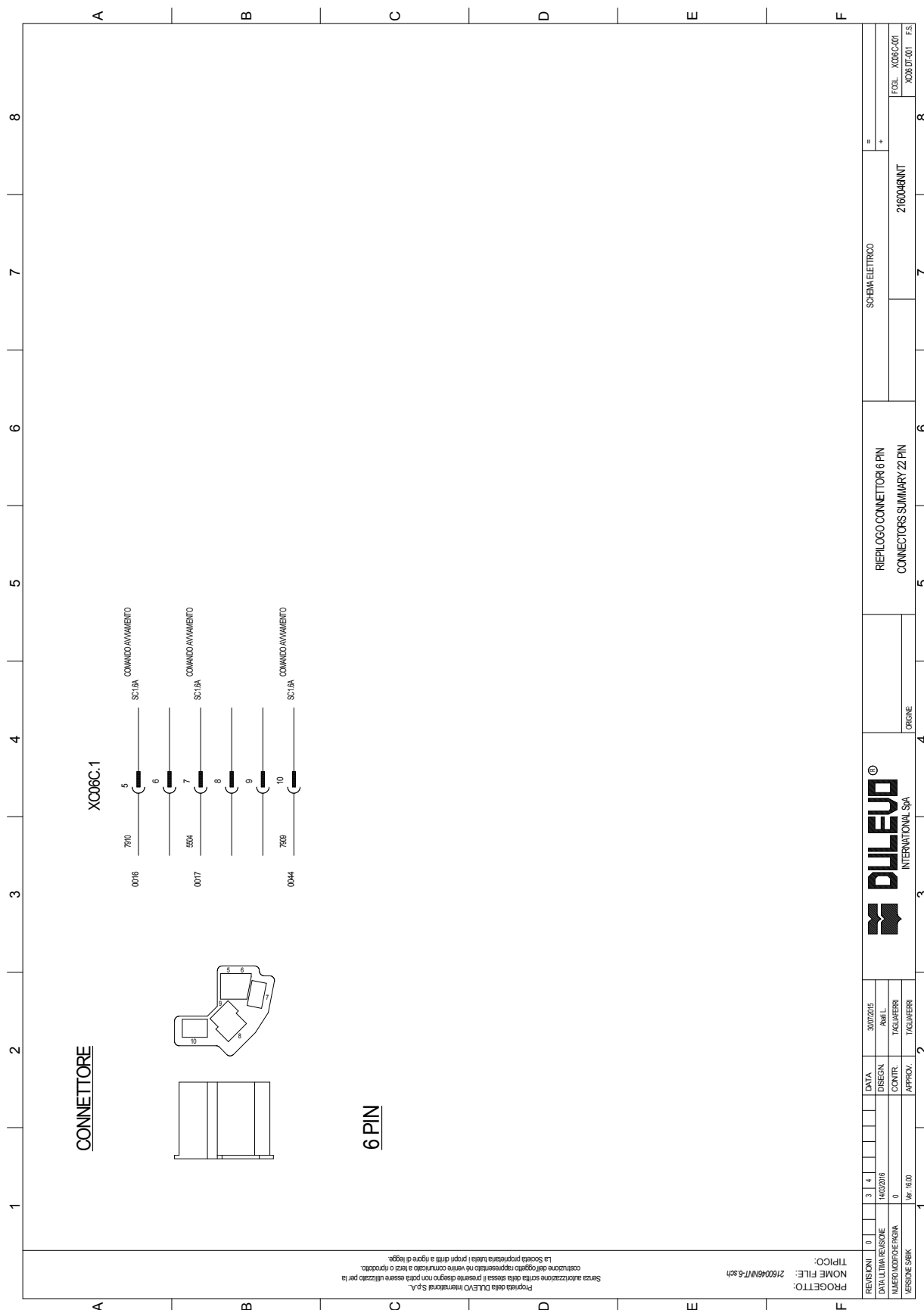


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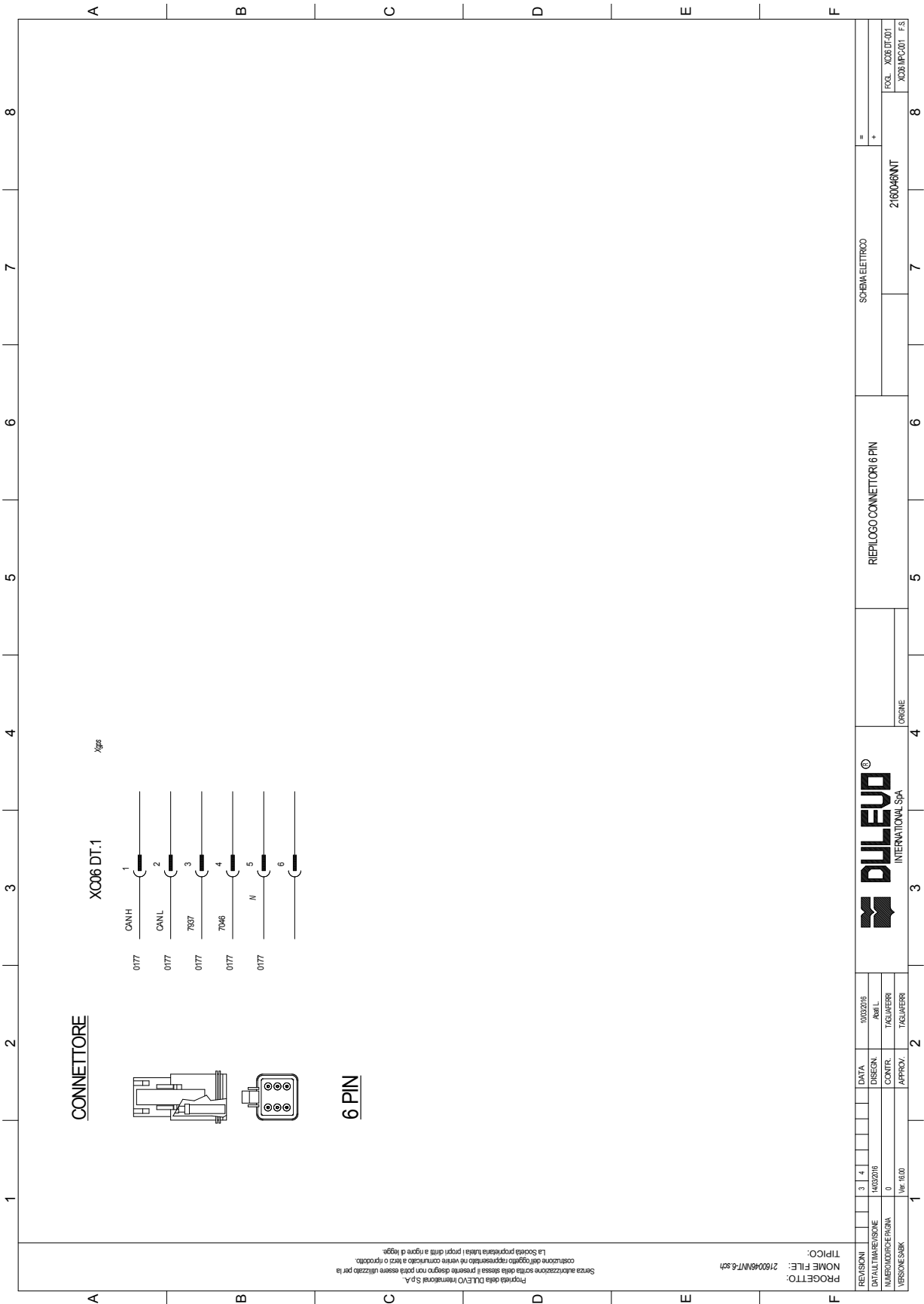


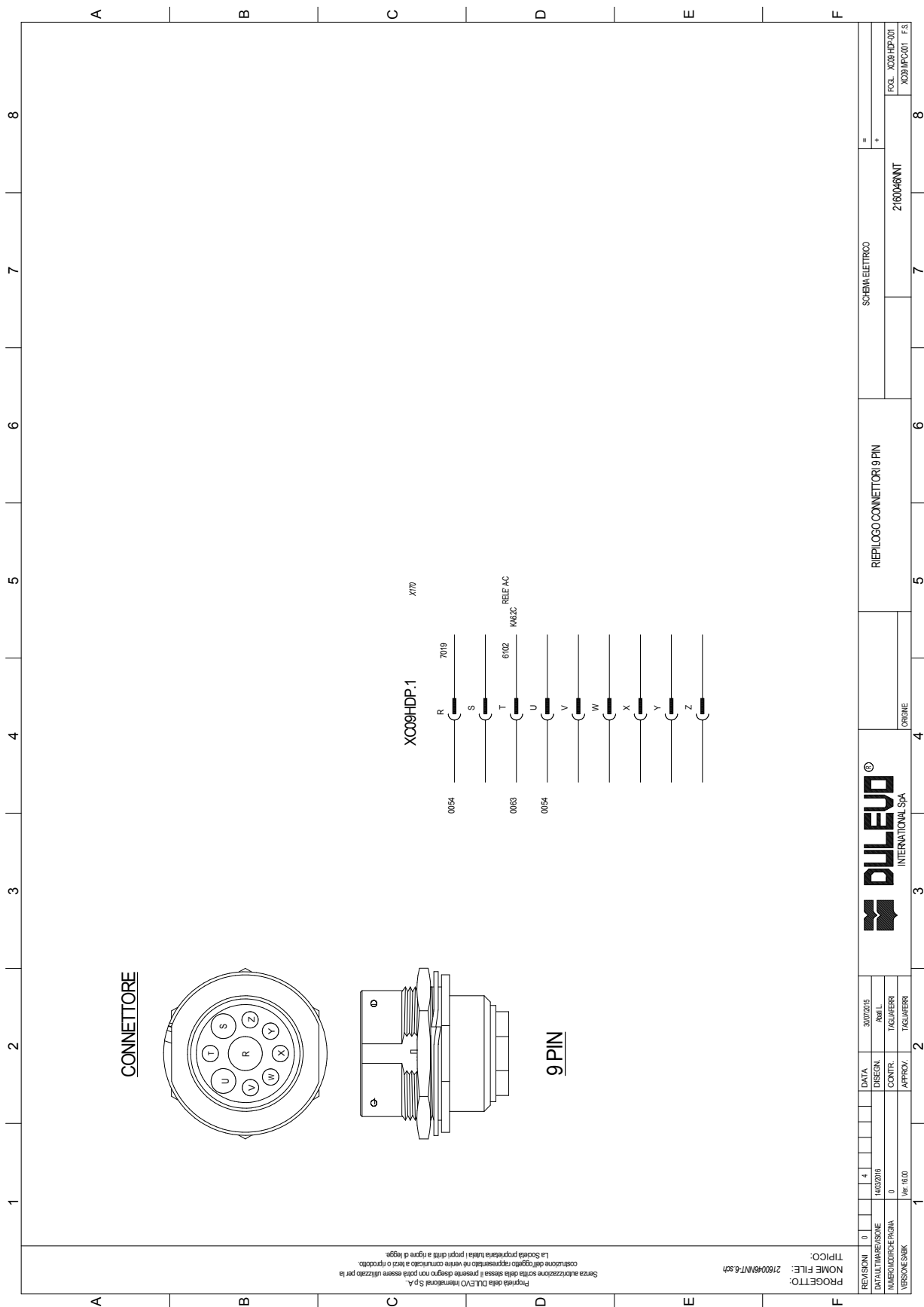


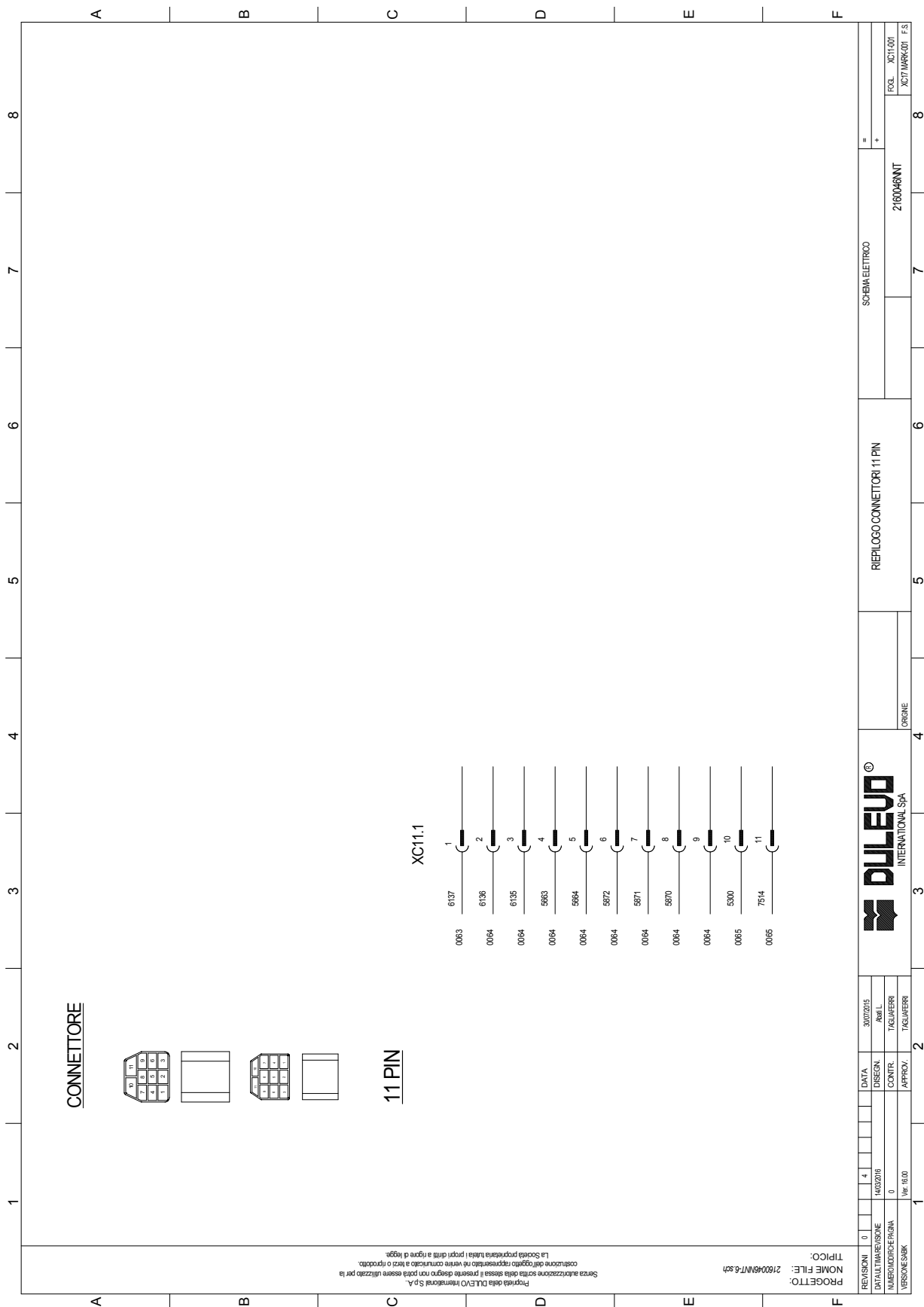
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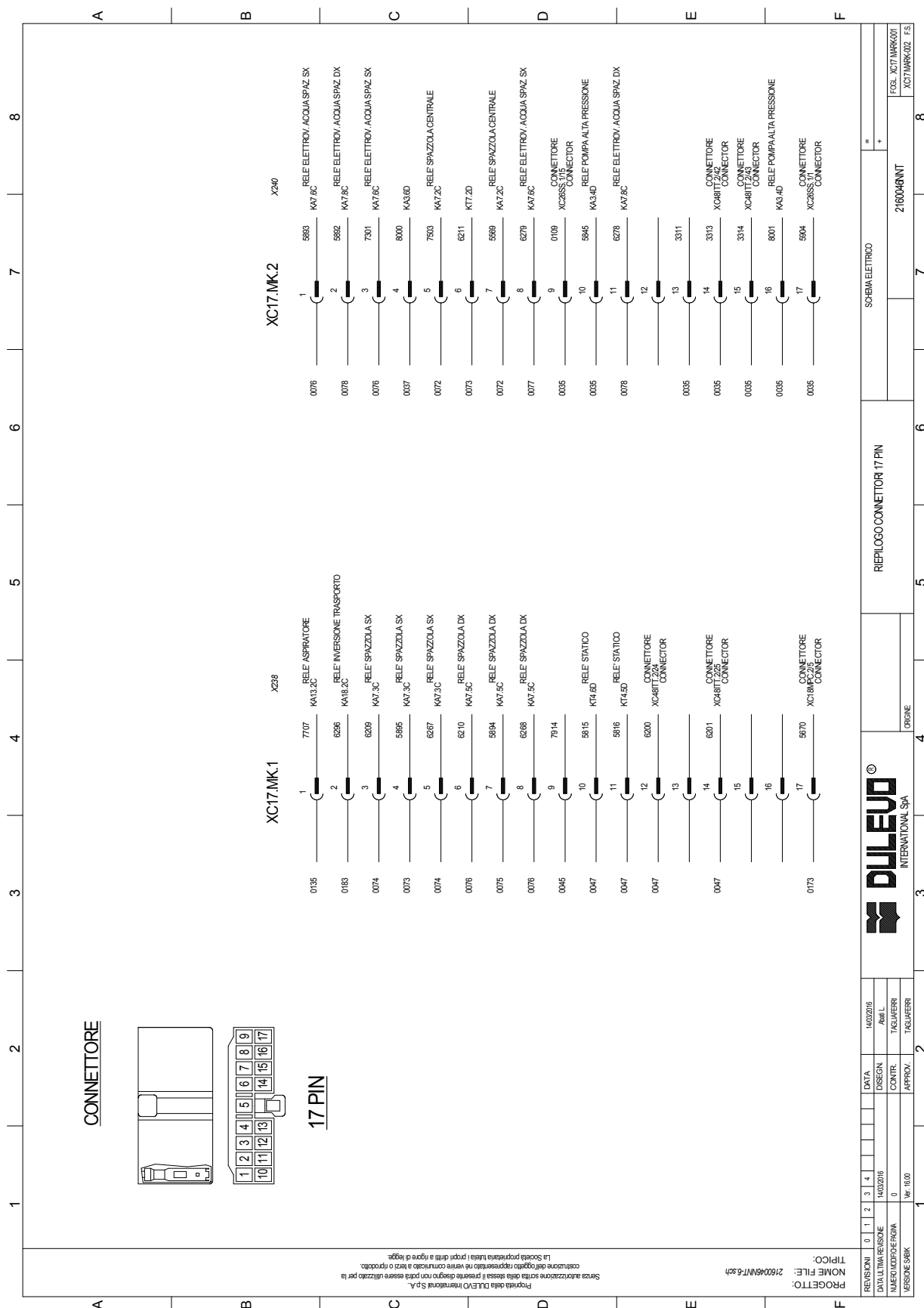
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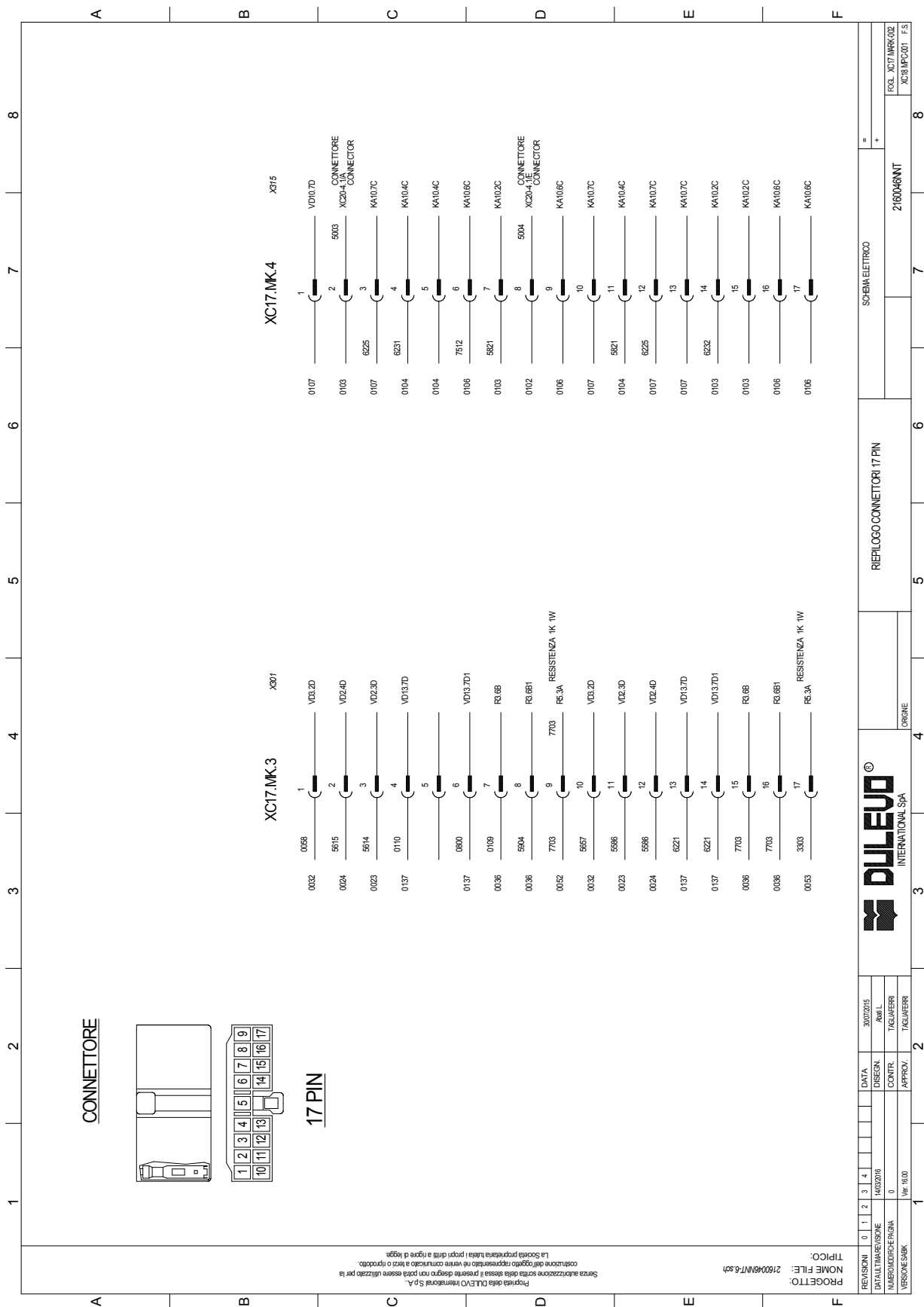
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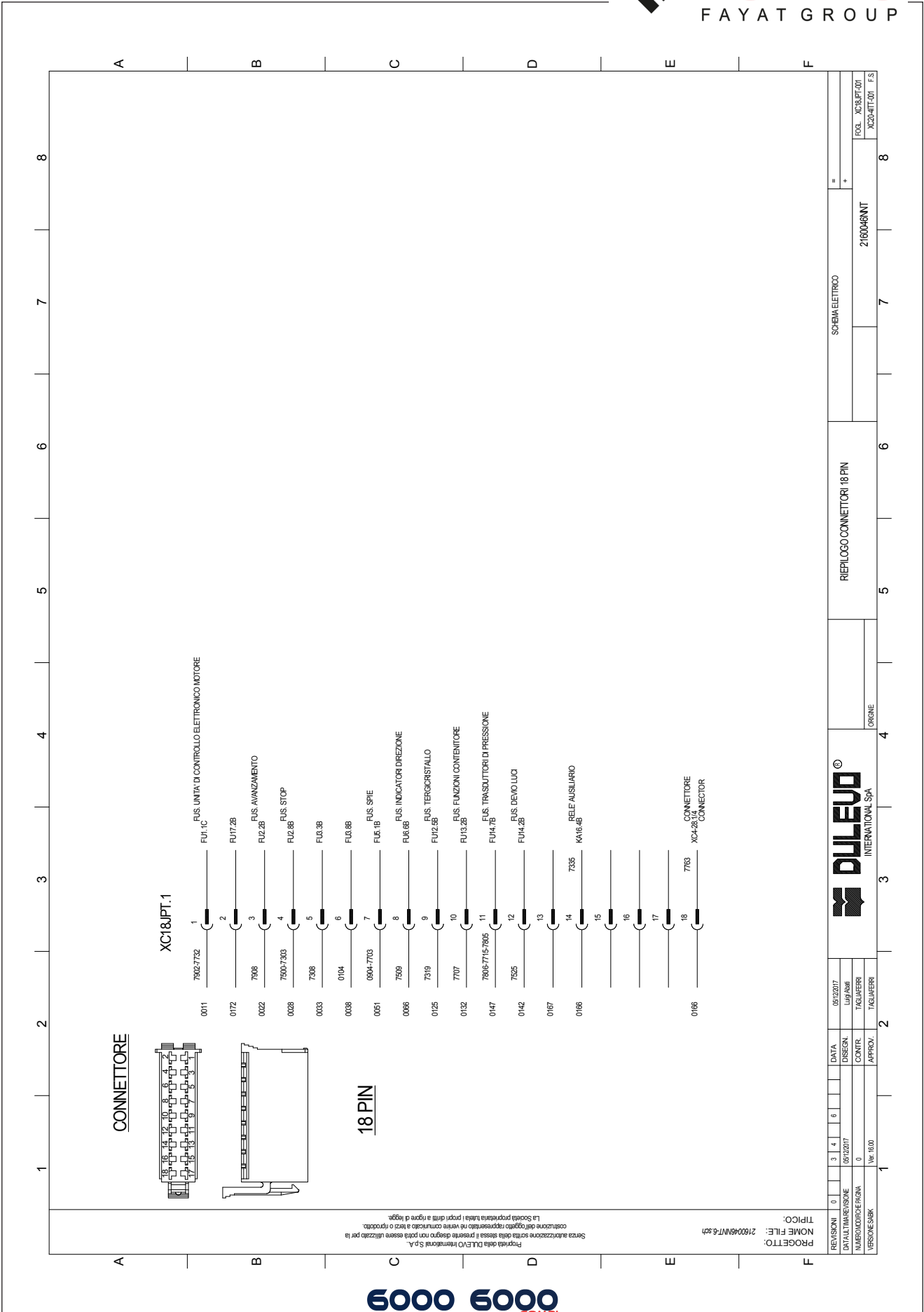


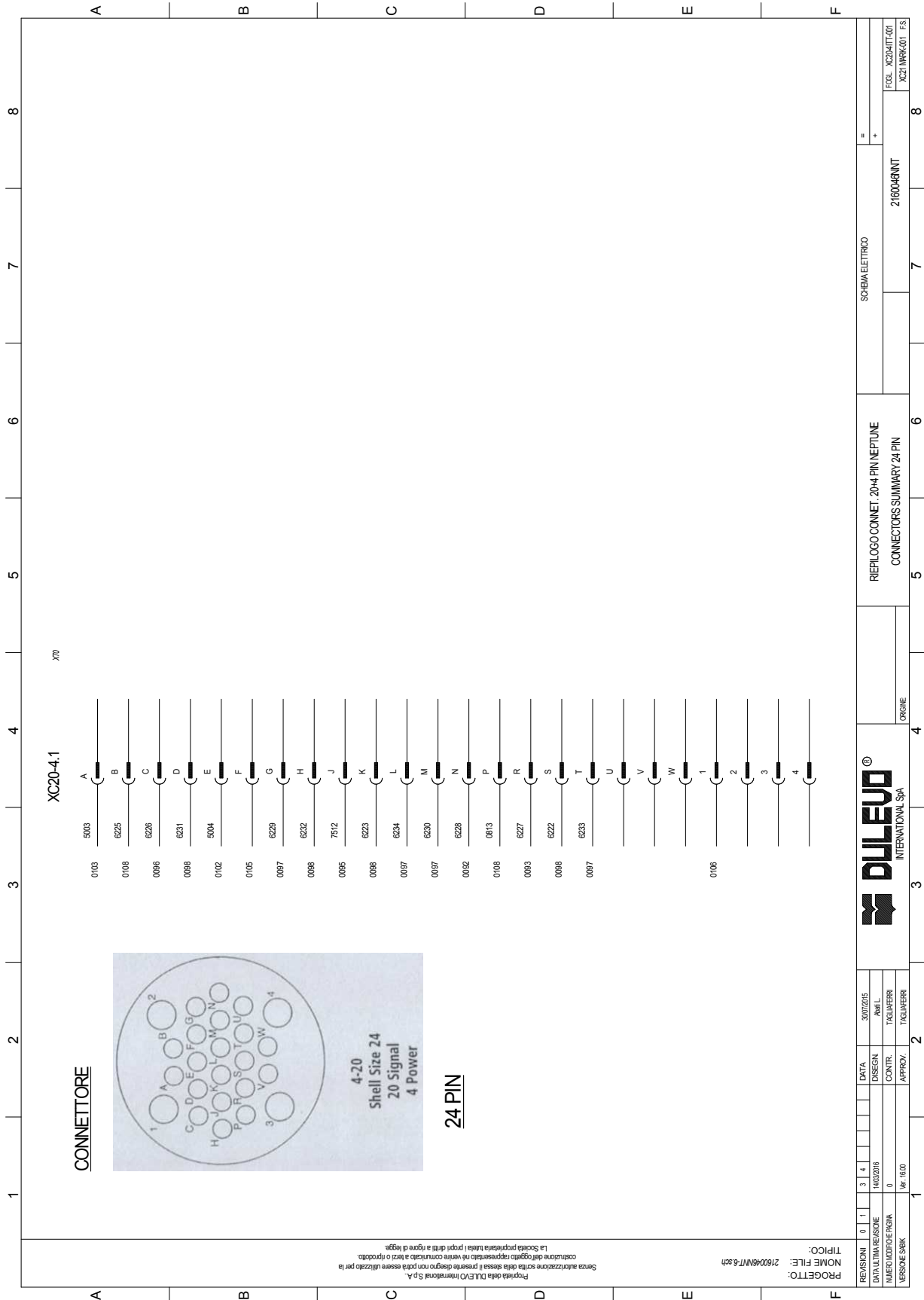




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0173	4	5953	RELE 1° VELOCITA' TERGORISTALLO														
0122	5	9954	RELE 2° VELOCITA' TERGORISTALLO														
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0125	7	5402	RELE AMBAGLIANTI														
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0154	9	5504															
0067	10	2203	CONNETTORE														
0067	11	2202	CONNETTORE														
0067	12	5400	RELE AVVISATORE ACUSTICO														
0082	13	9982	RELE SIC. AVVAMENTO														
0017	14	7308	RELE MARCIA AVANTI														
0022	15	7301															
0173	16	5900	CONNETTORE														
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X400																	
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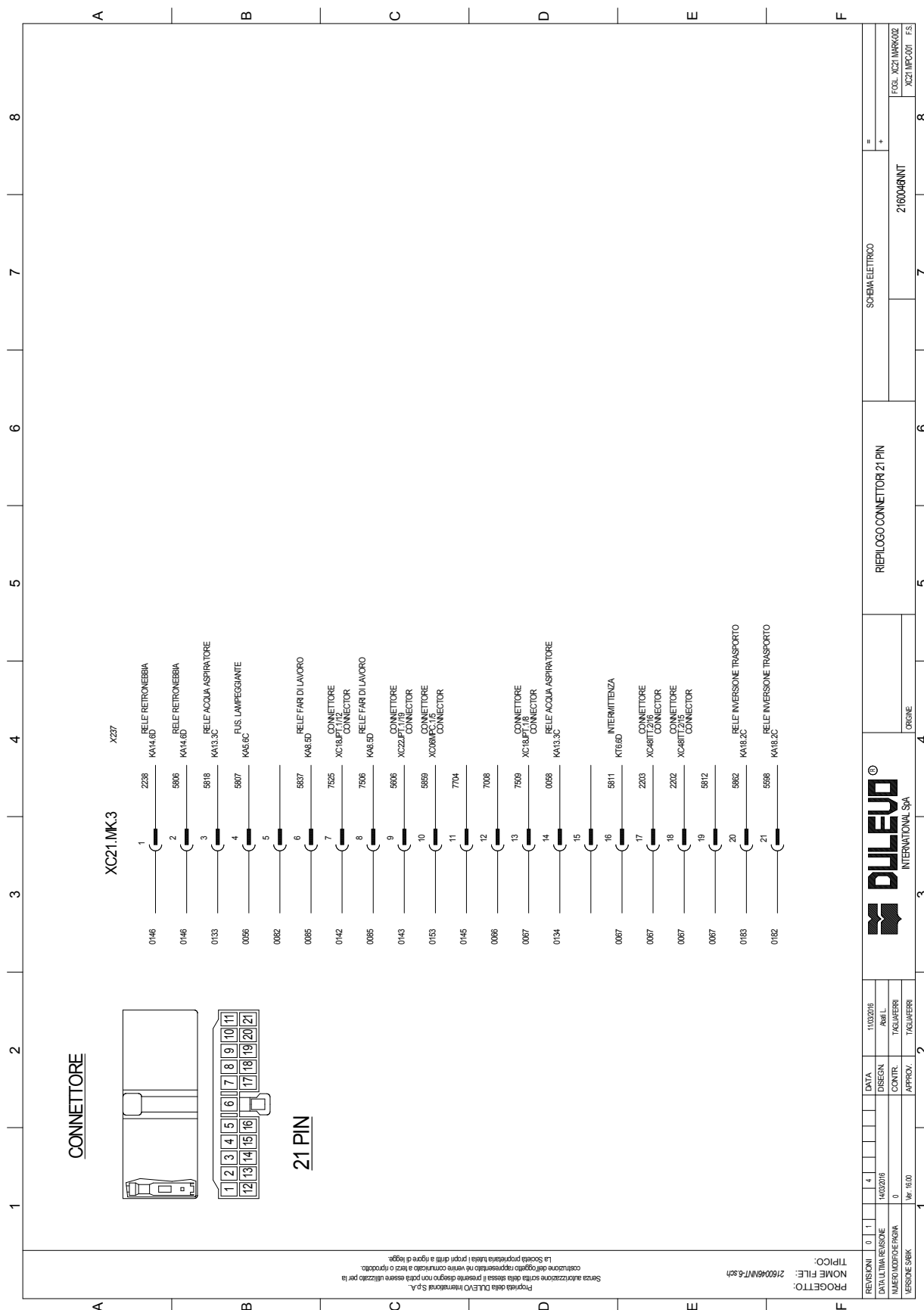


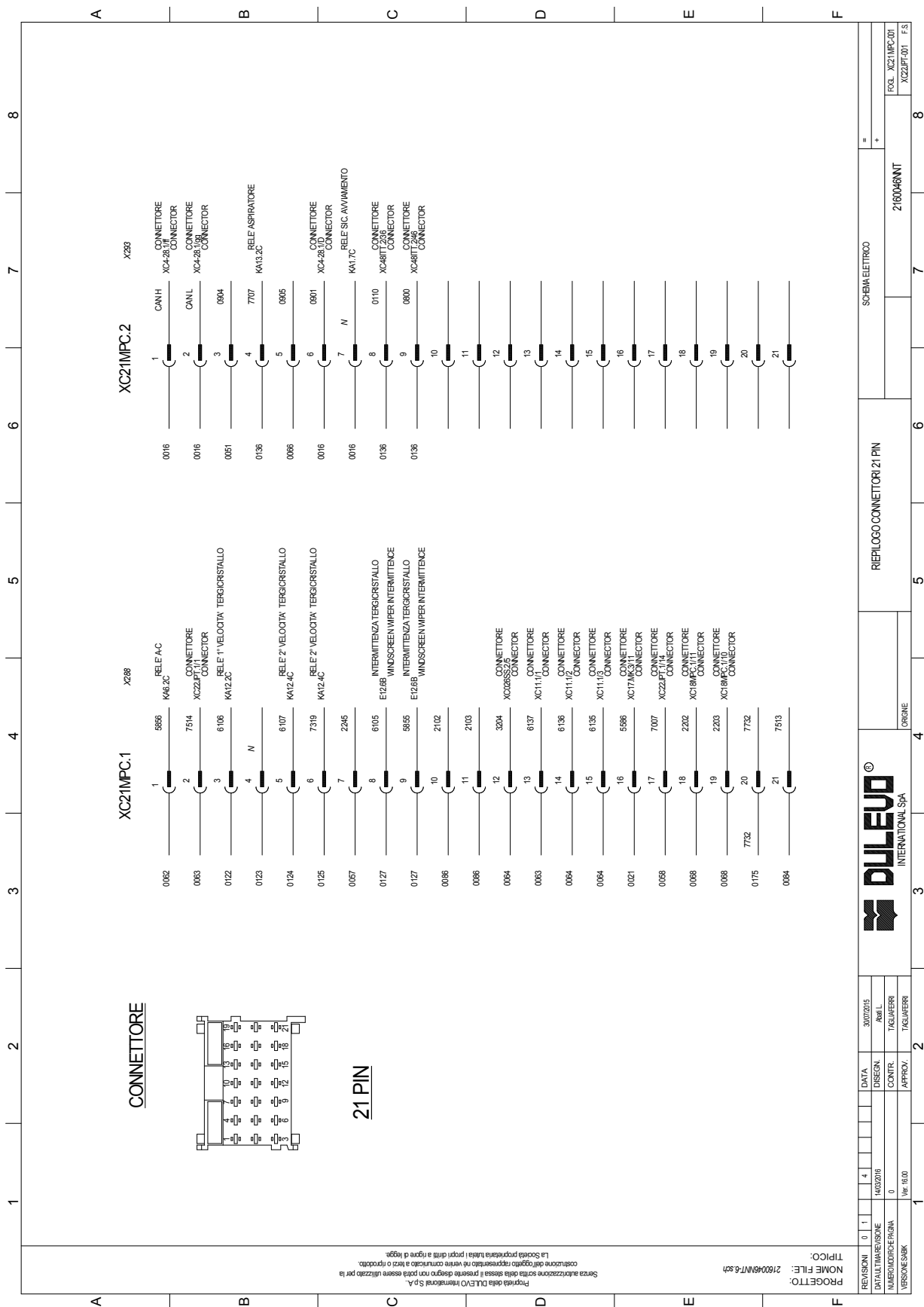


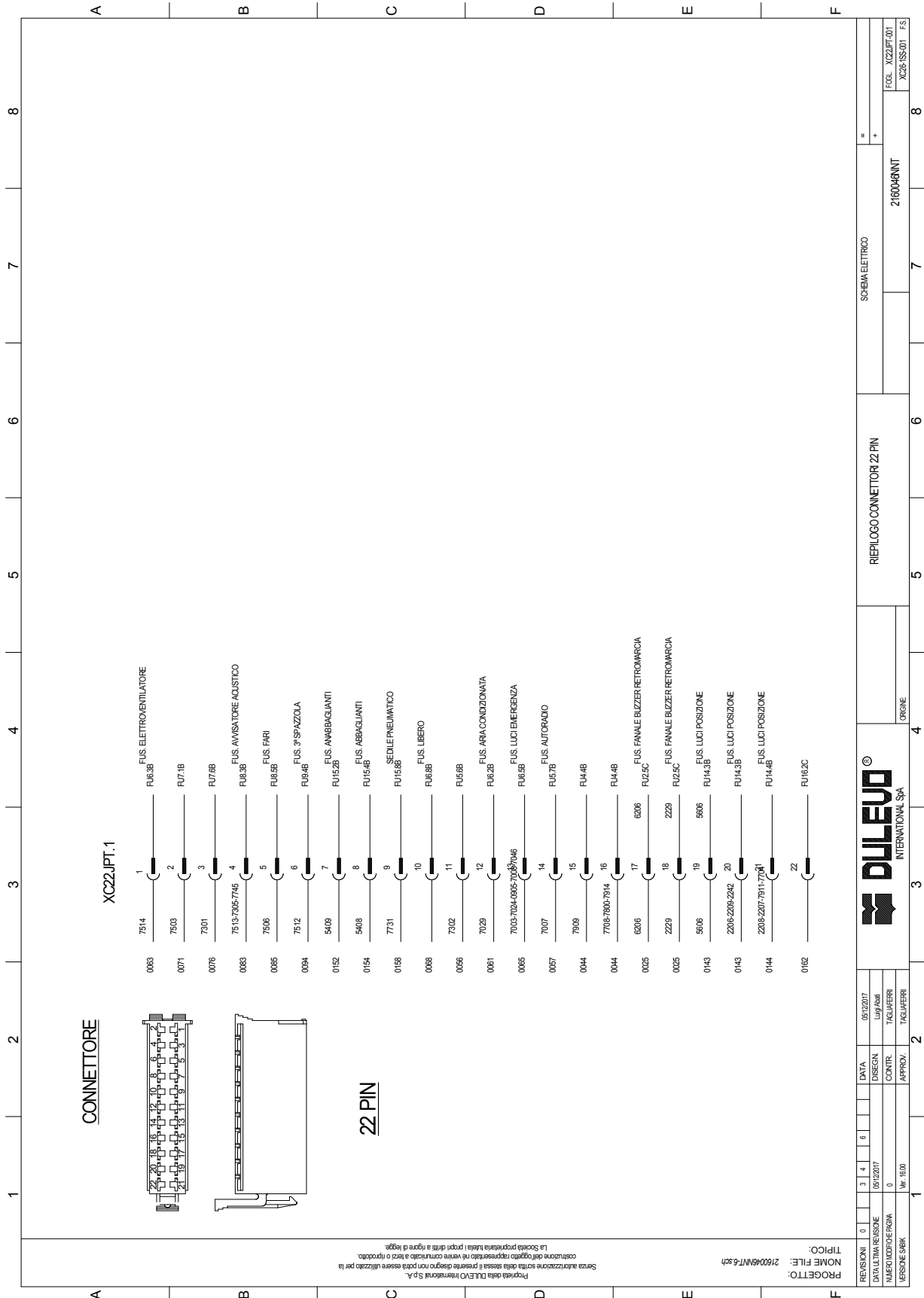
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La Società proprietaria tutela i propri diritti a rigore di legge.

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COMBI

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DATA ULTIMA REVISIONE	05/12/2017								
DATA ULTIMA REVISIONE	05/12/2017								
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VERSIONE SIBK	1								
DATA	05/12/2017								
DESIGN	LUP/AMM								
CONTR.	TAGLIARELLI								
APPROV.	TAGLIARELLI								



INTERNATIONAL S.p.A.

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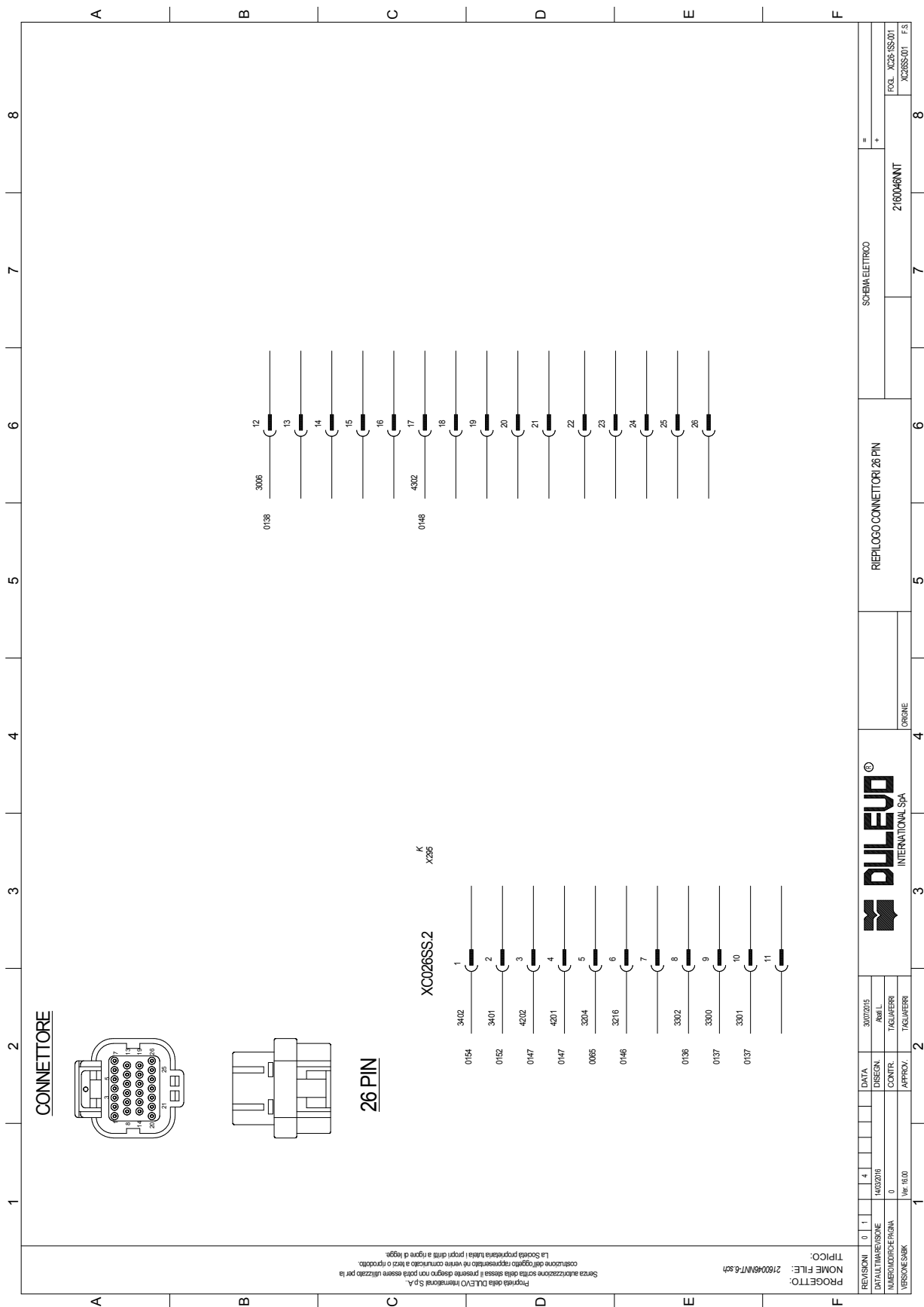
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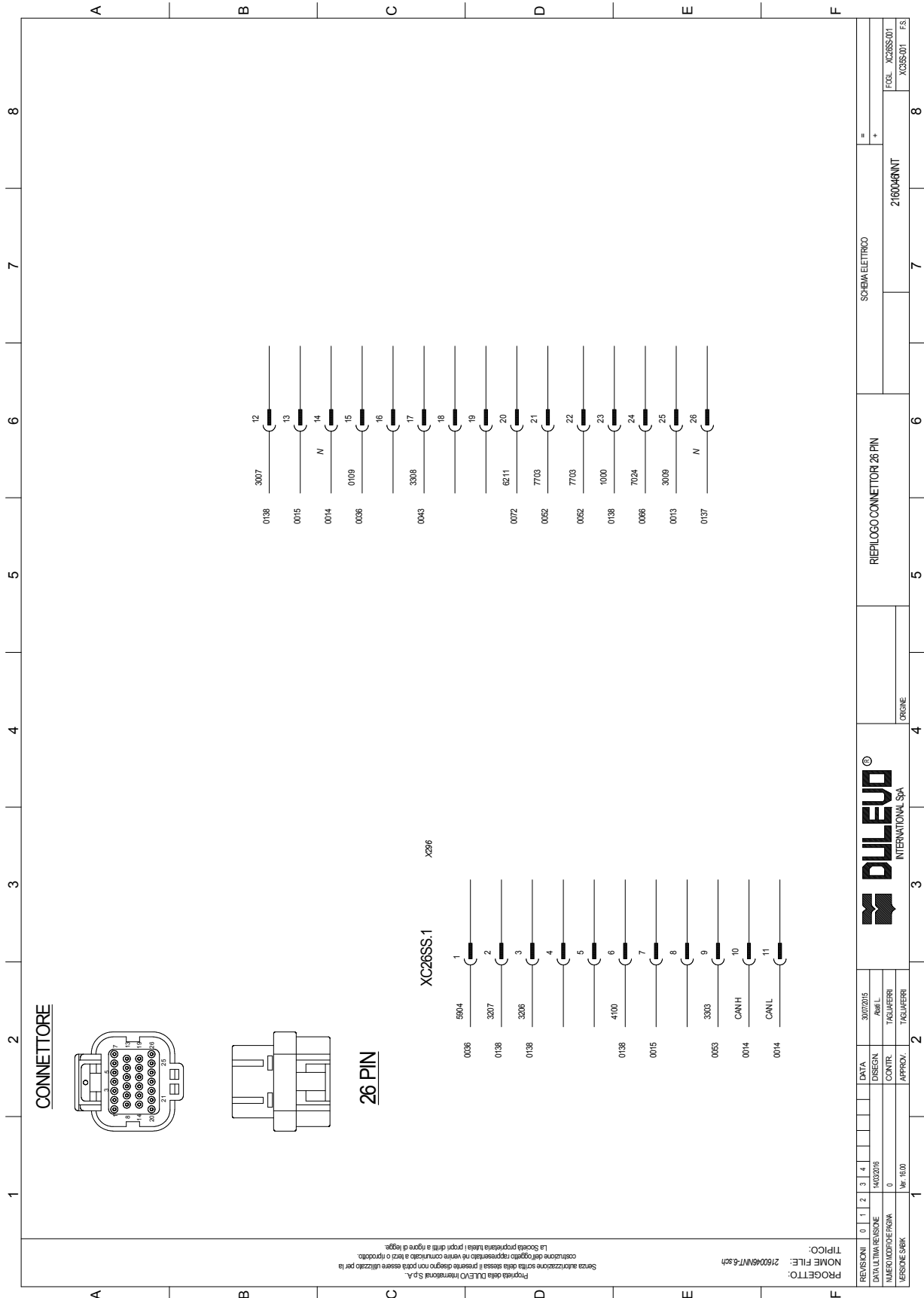
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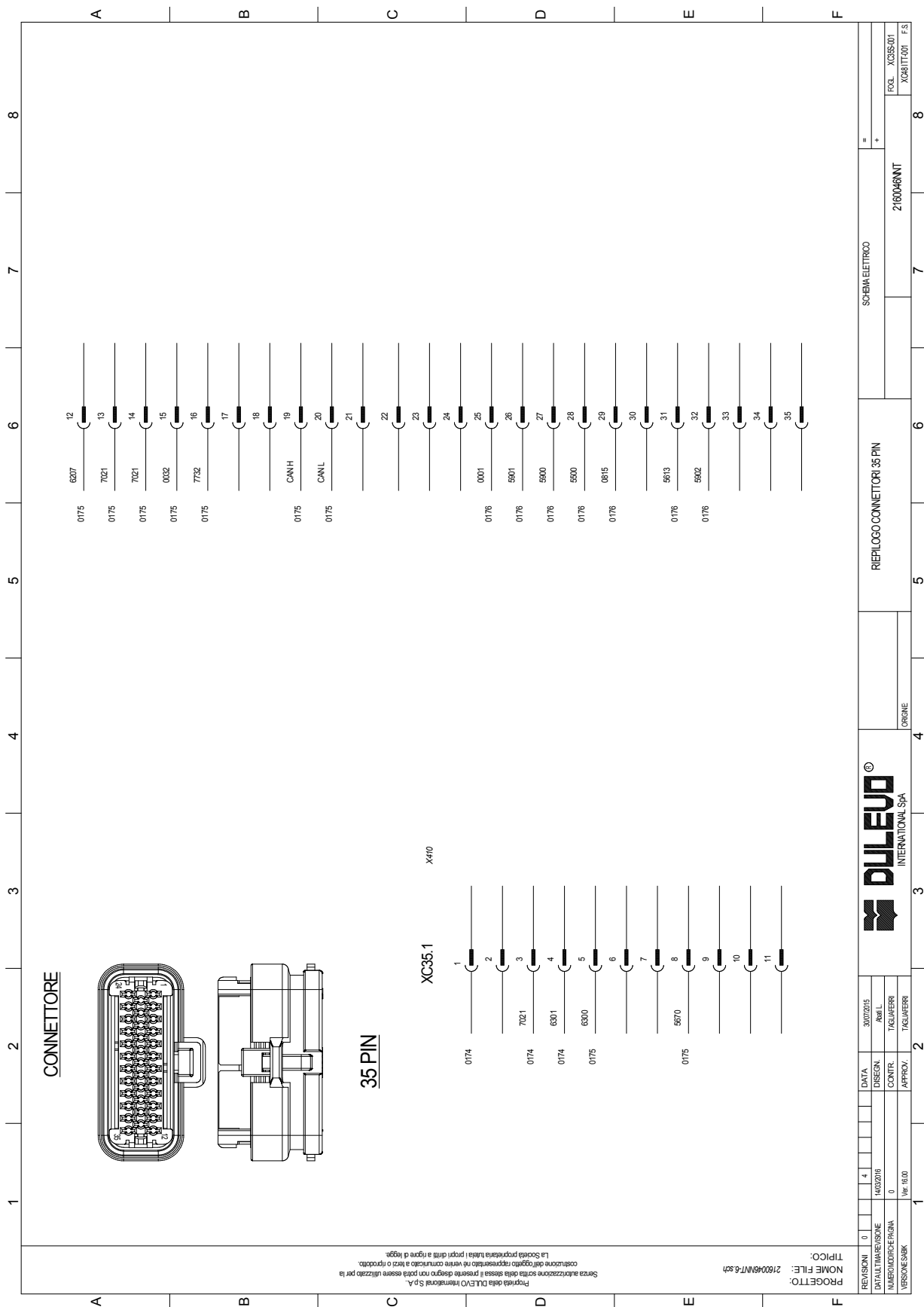
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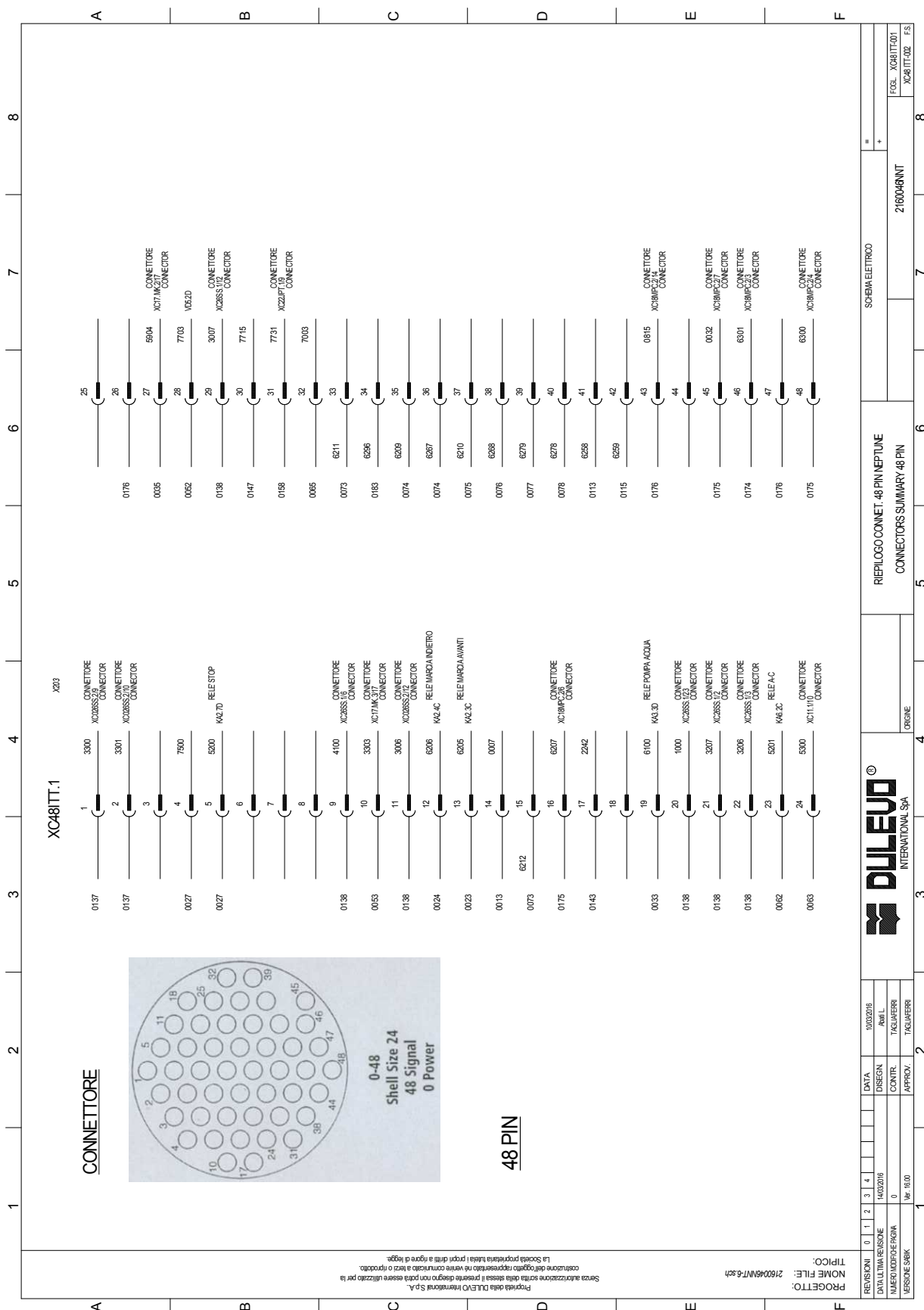
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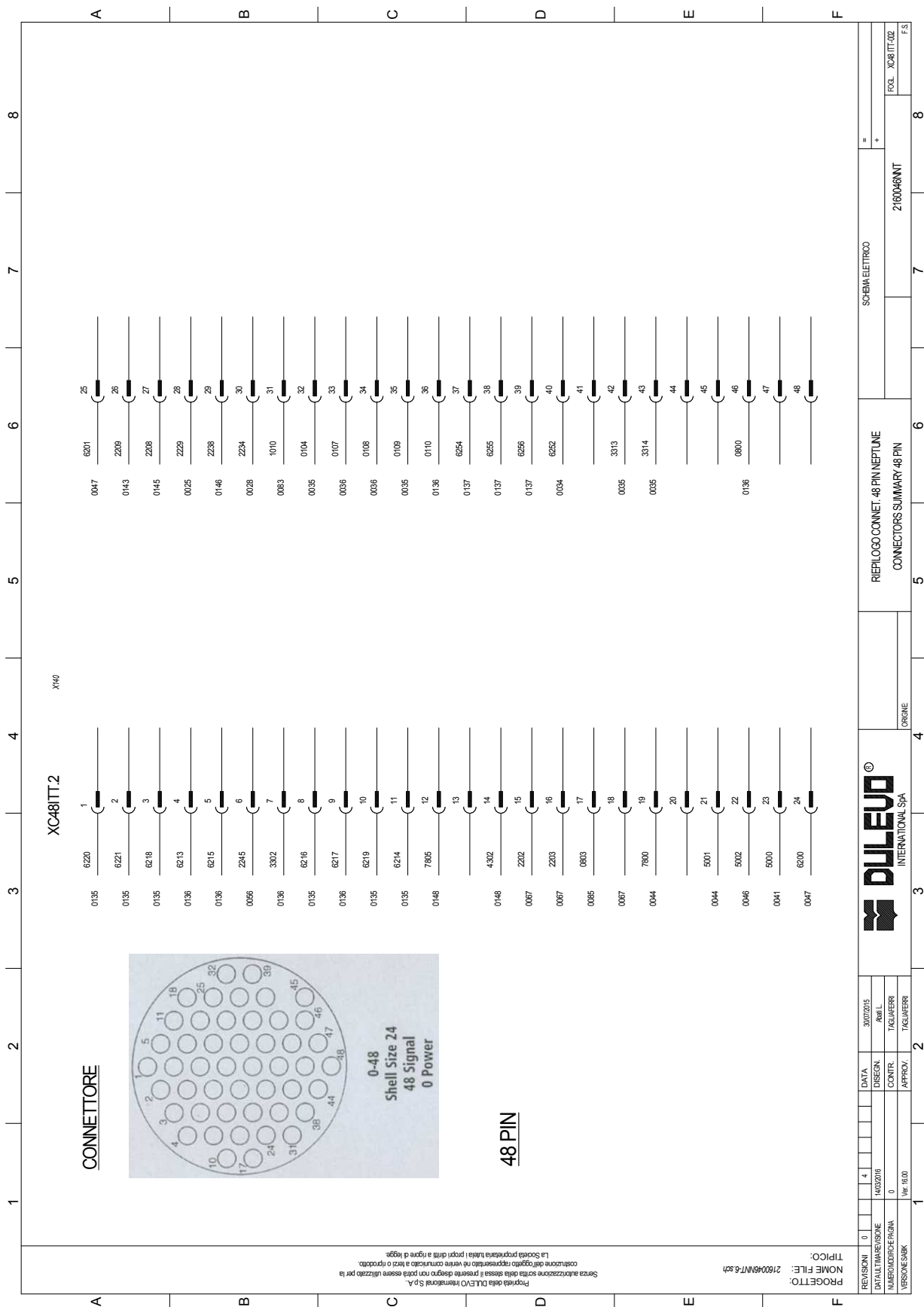
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PROGETTO: 2160046NIMS 1.sch														
TIPOLOGIA: 2160046NIMS 1.sch														
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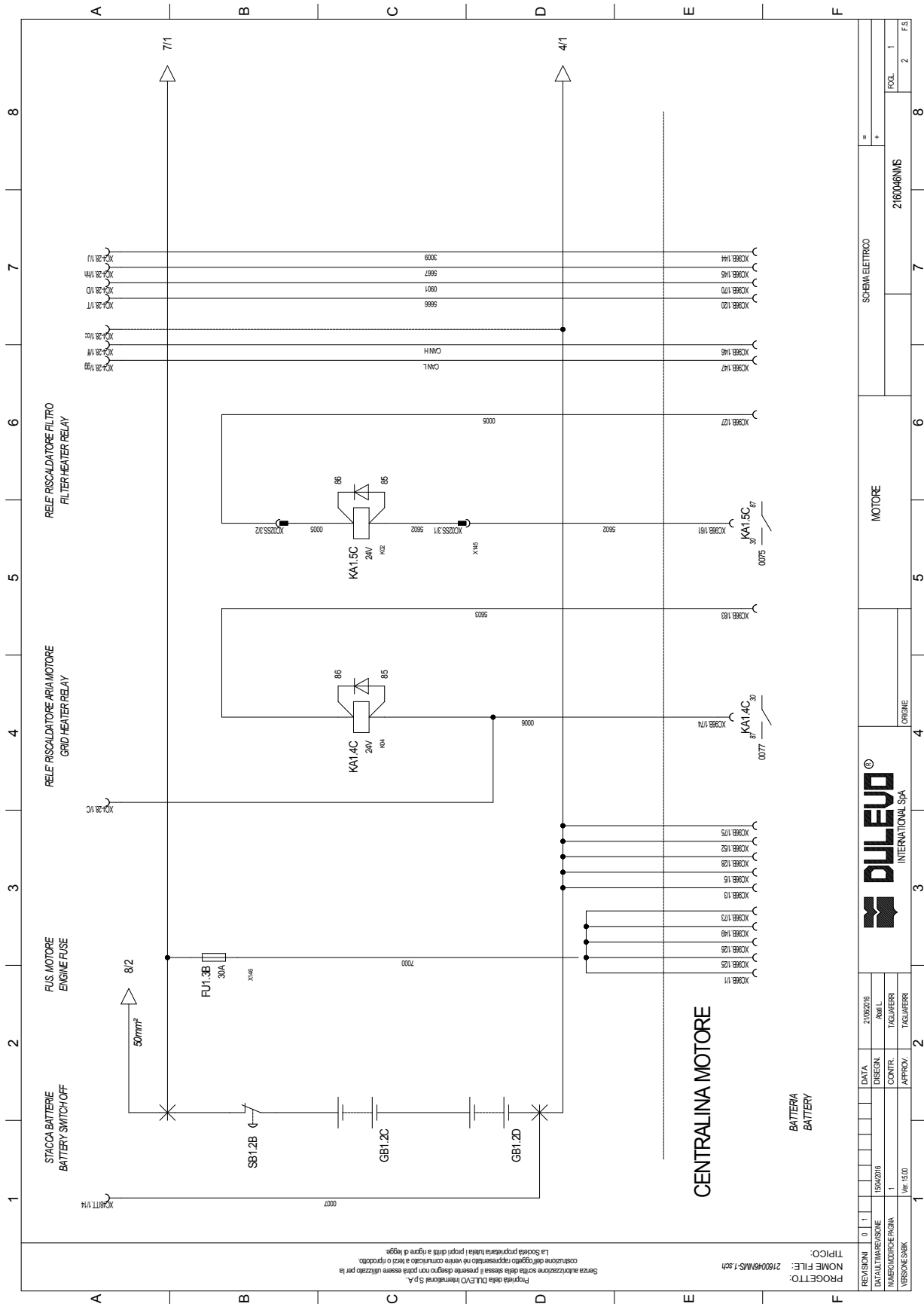


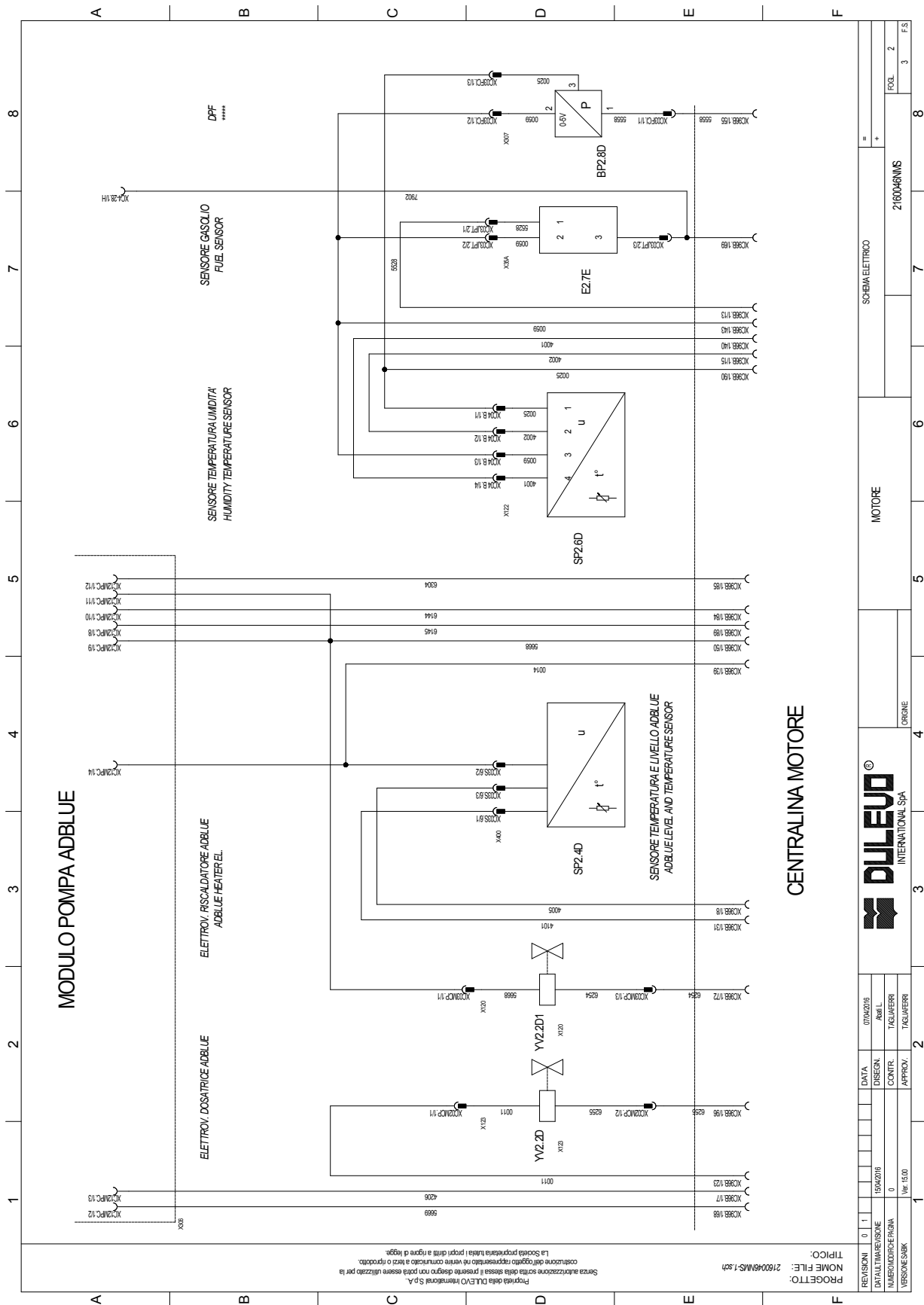
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42 / 83		XC02 MCP-001		RIPILOGO CONNETTORI 2 PIN		61 / 83	
43 / 83		XC02 PK-001		RIPILOGO CONNETTORI 2 POLI		62 / 83	
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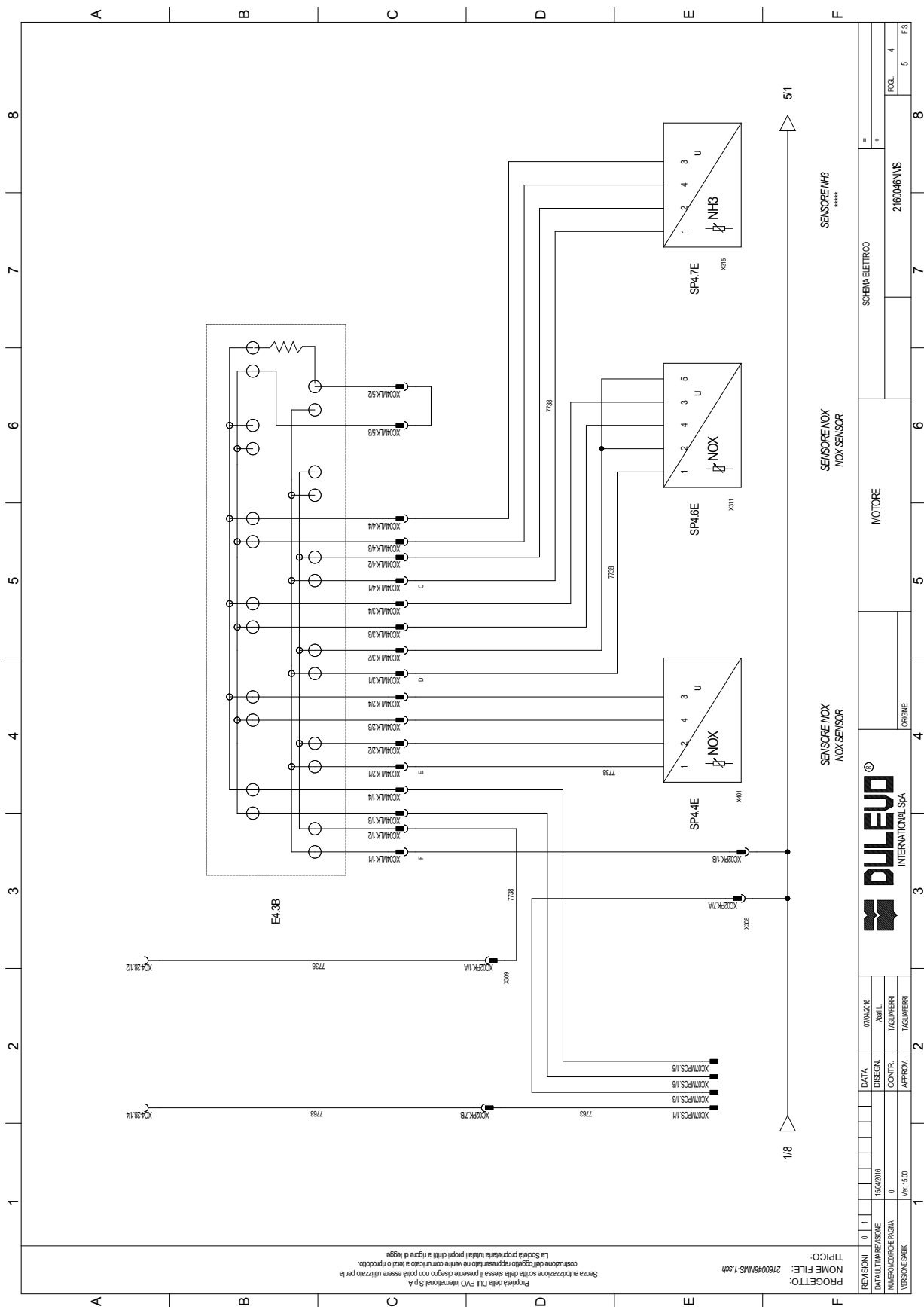
Proprietà della DULEVO International S.p.A.
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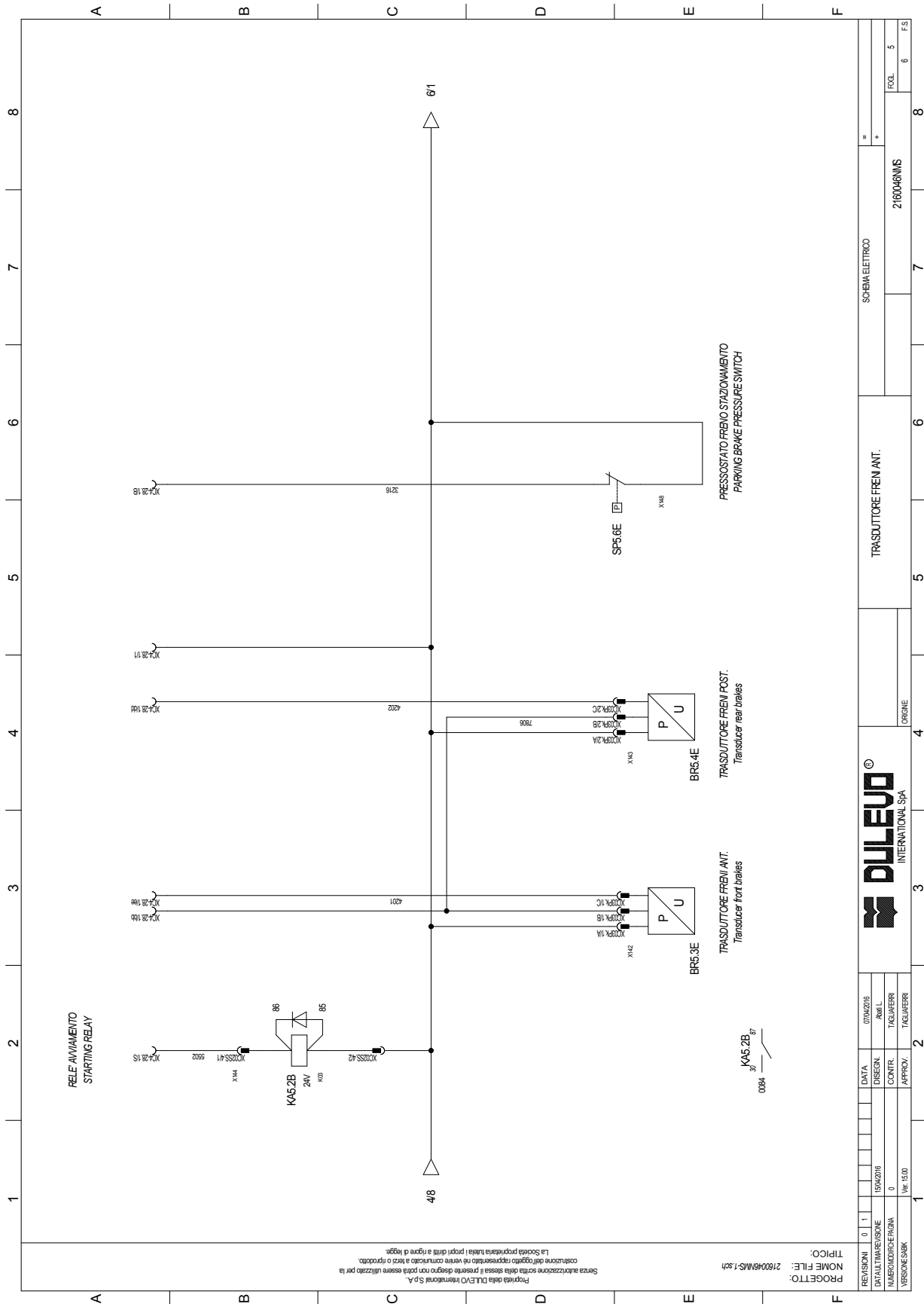
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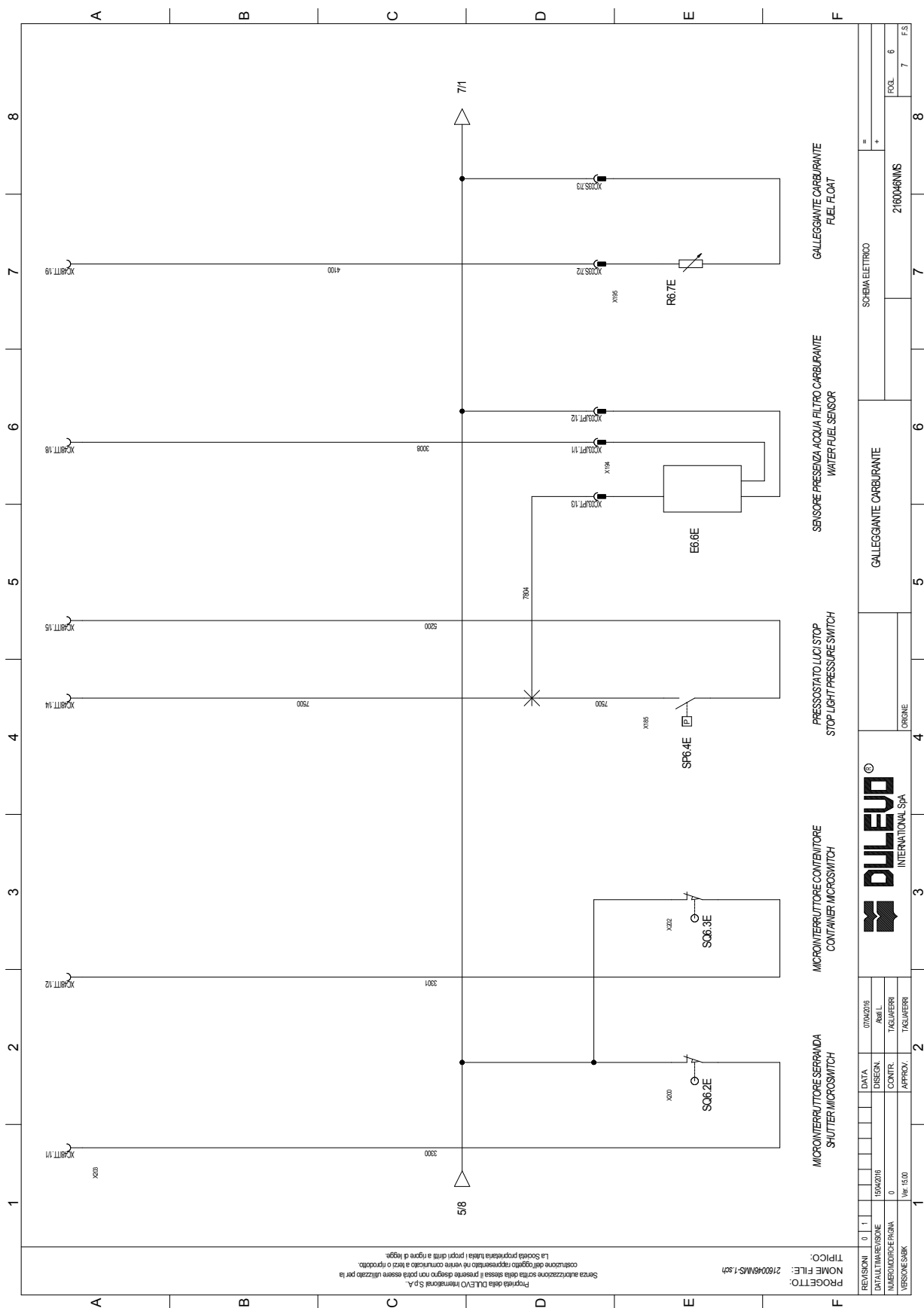


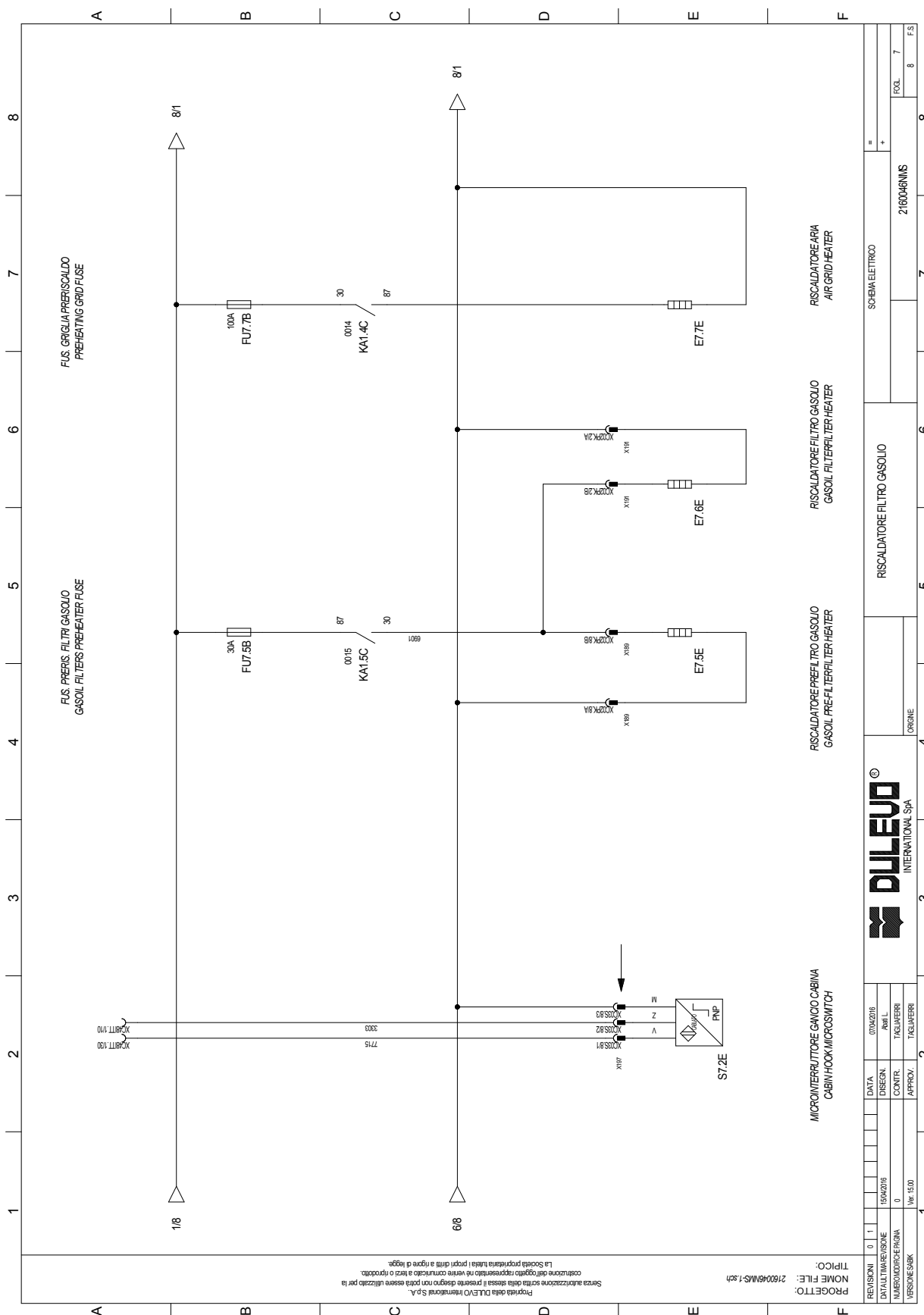


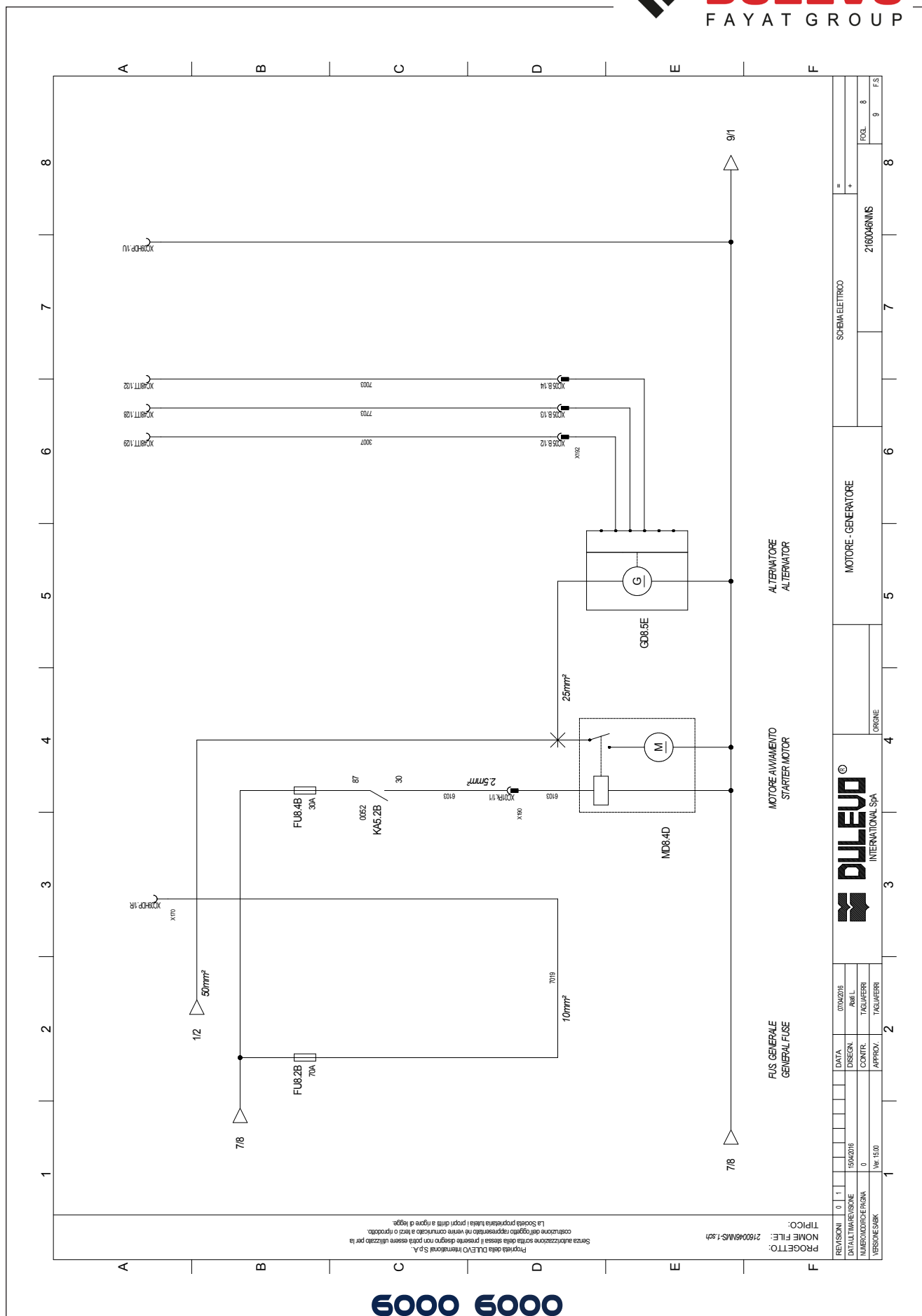
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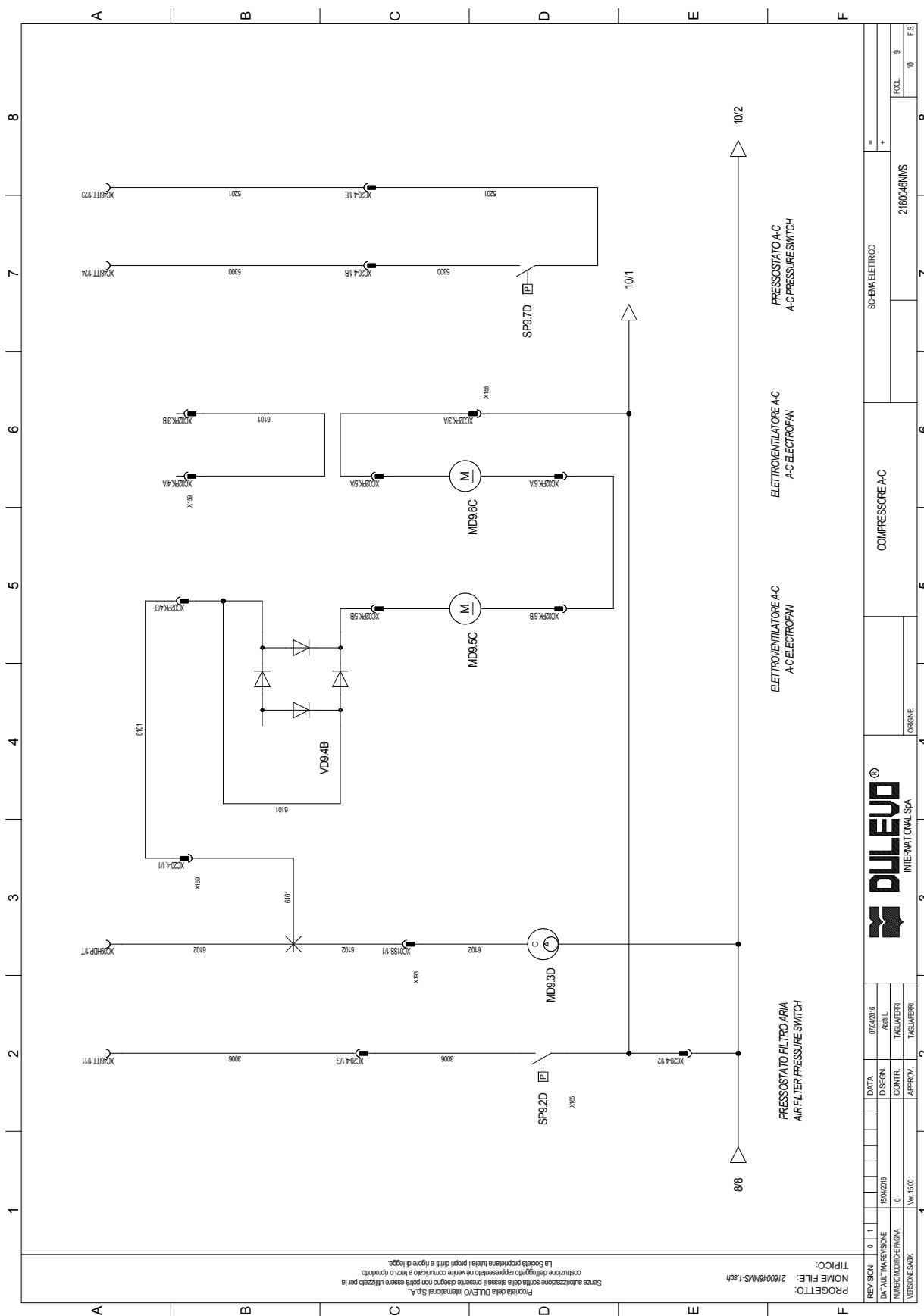


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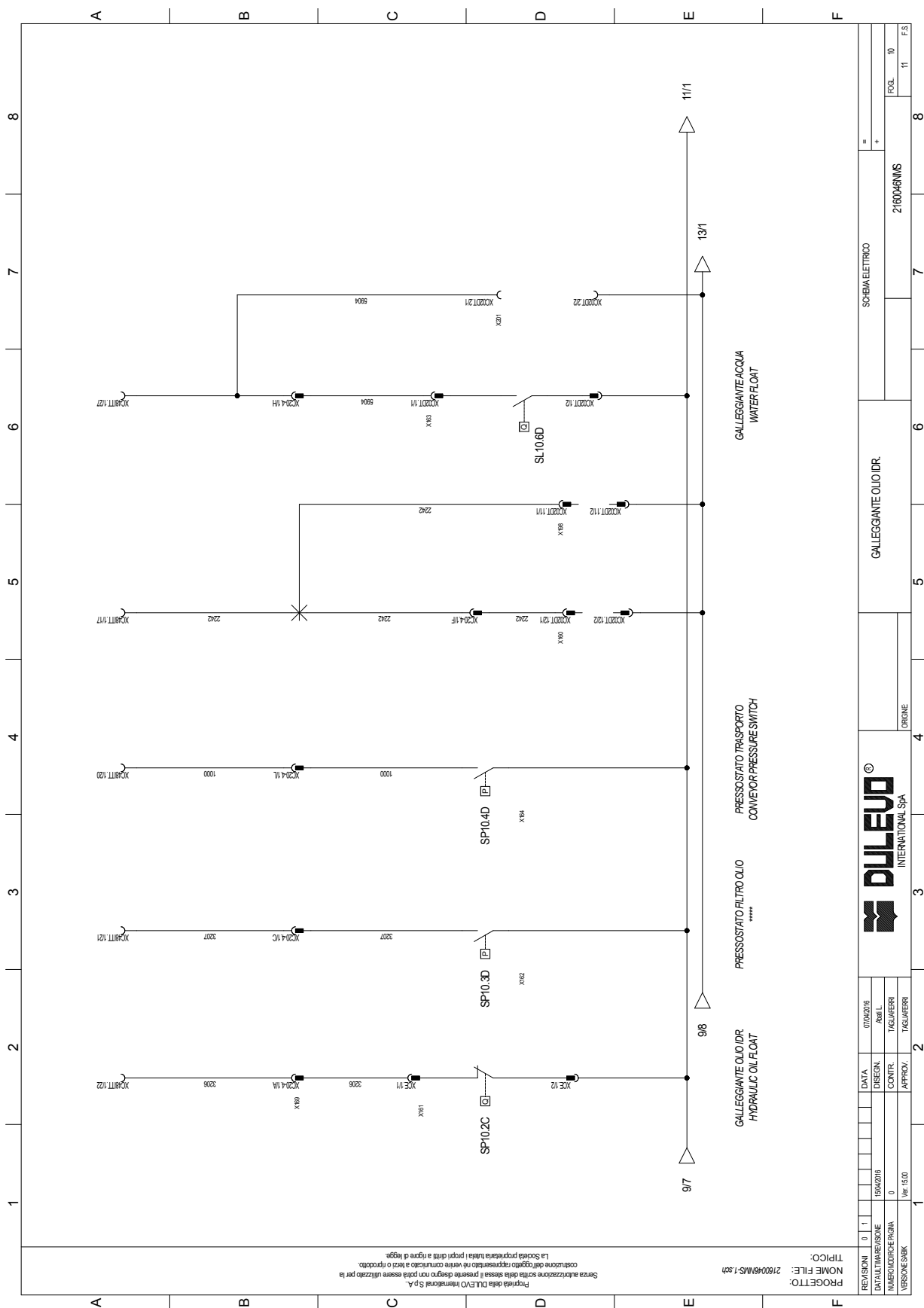


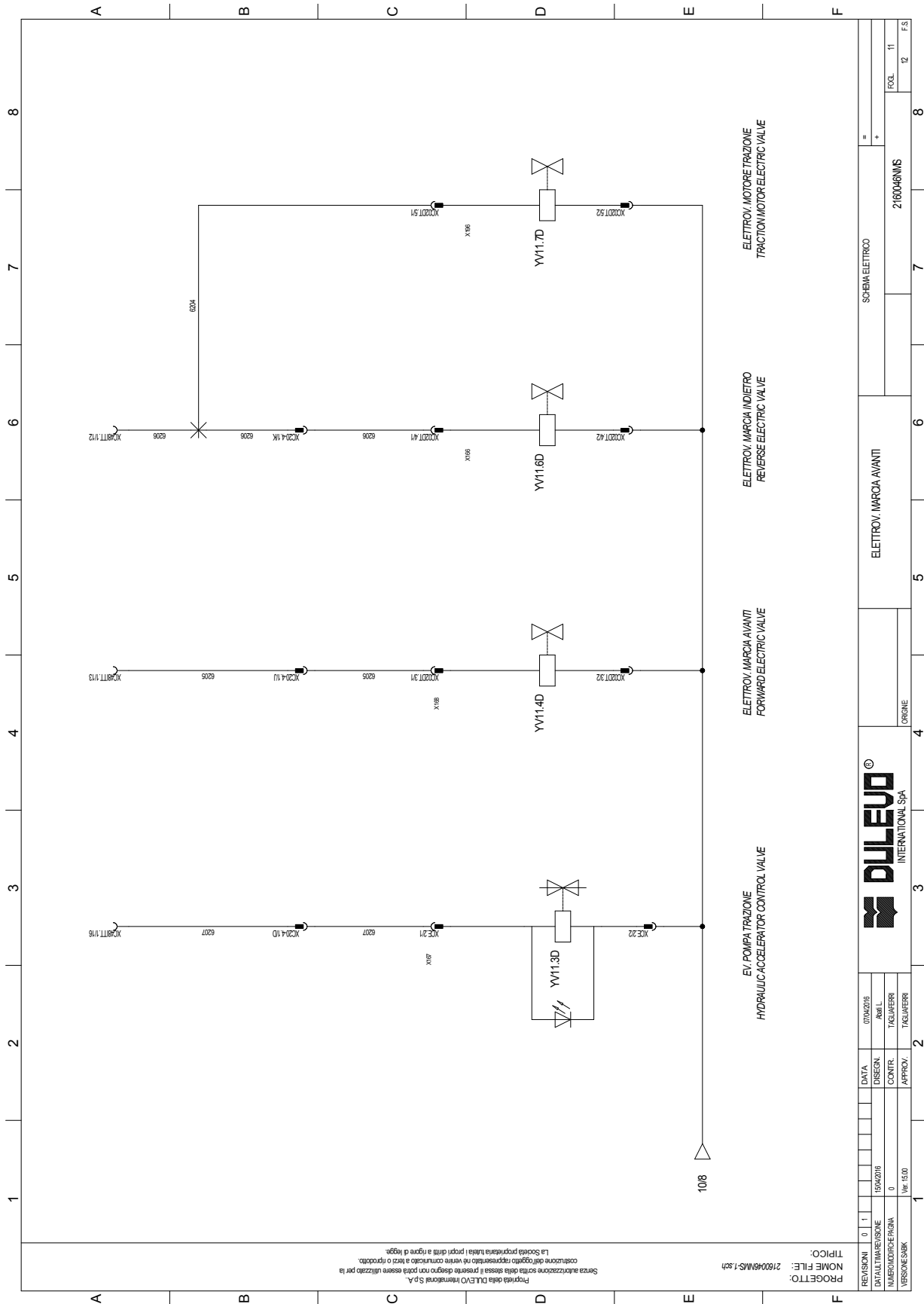


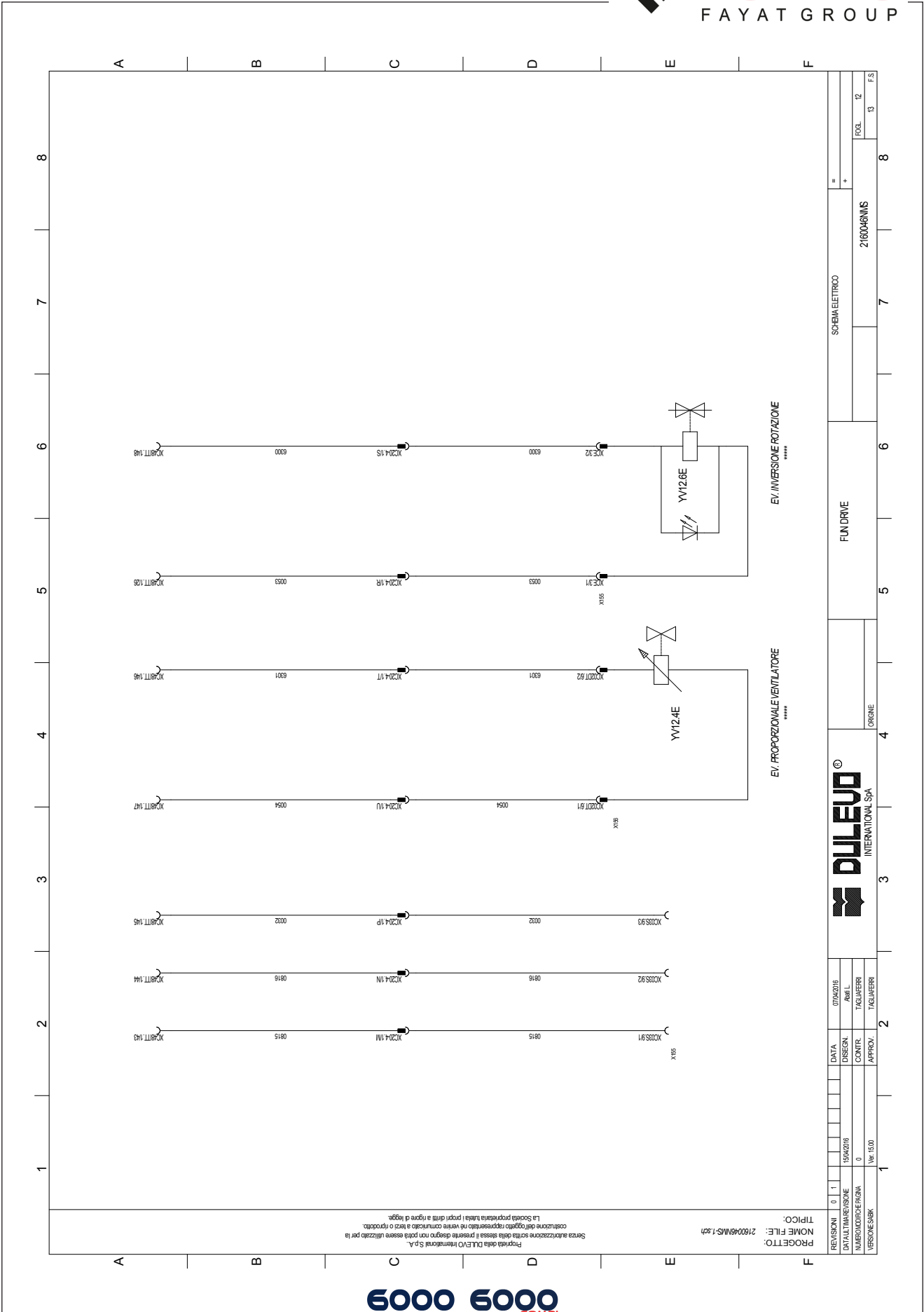


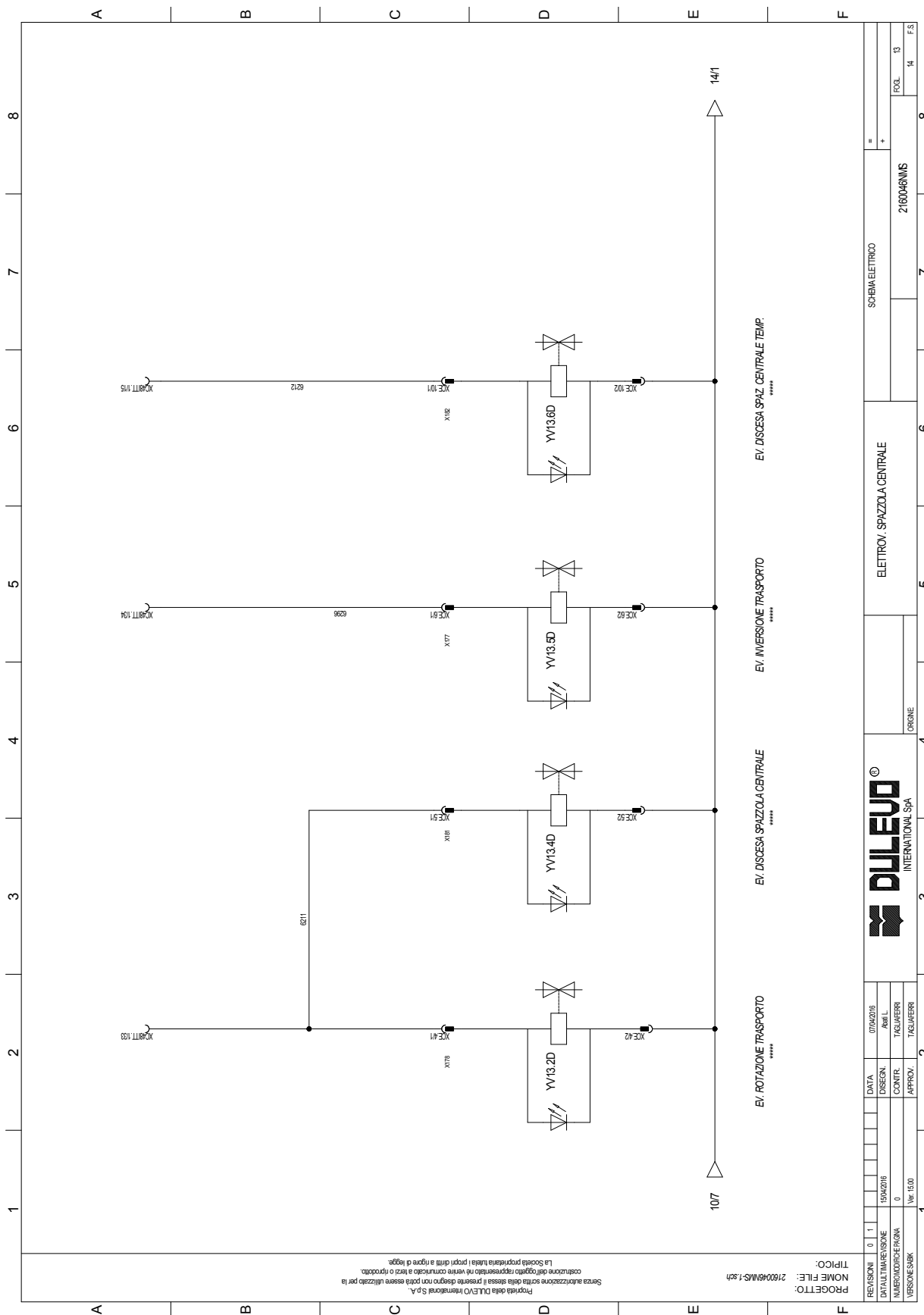


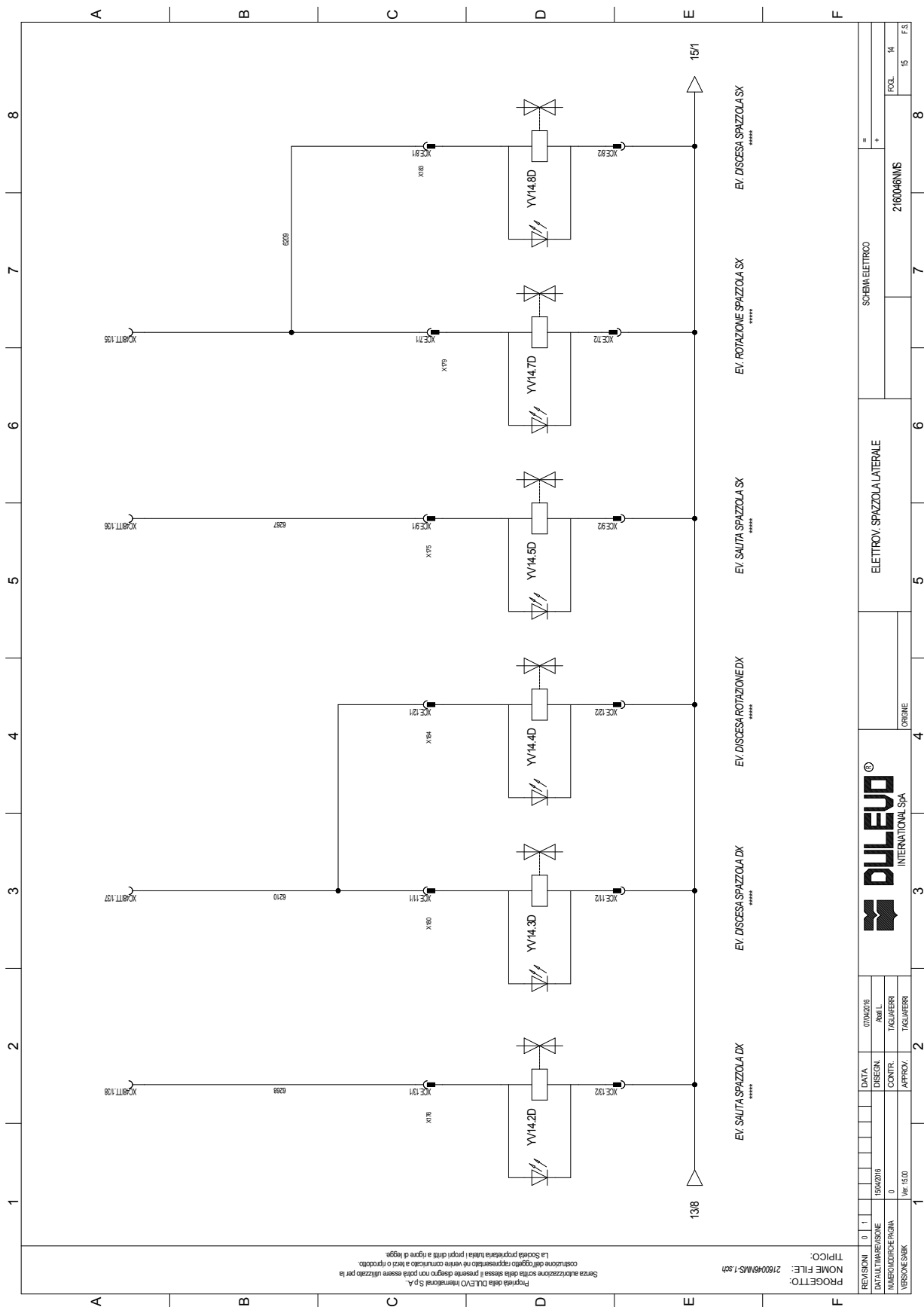
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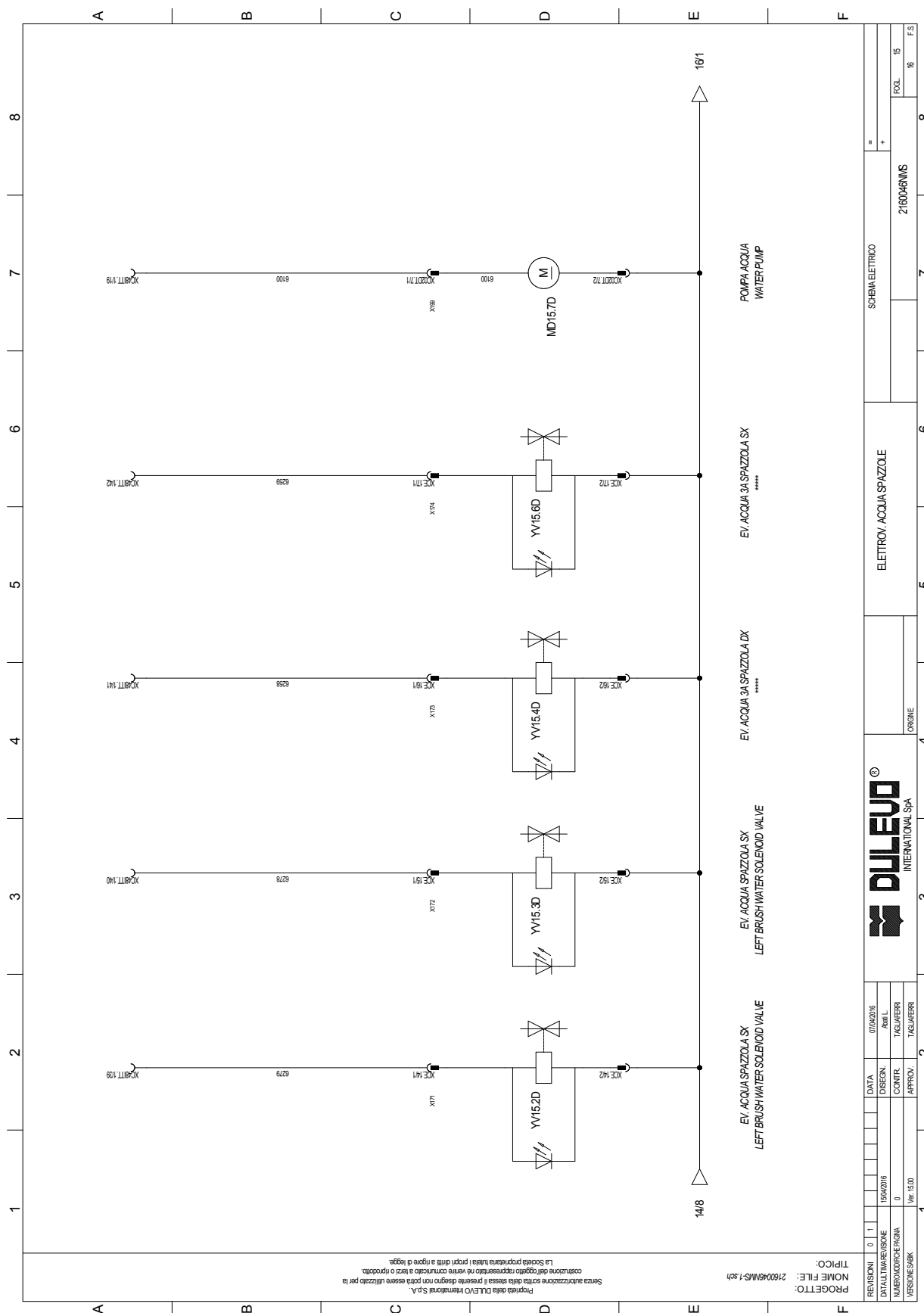


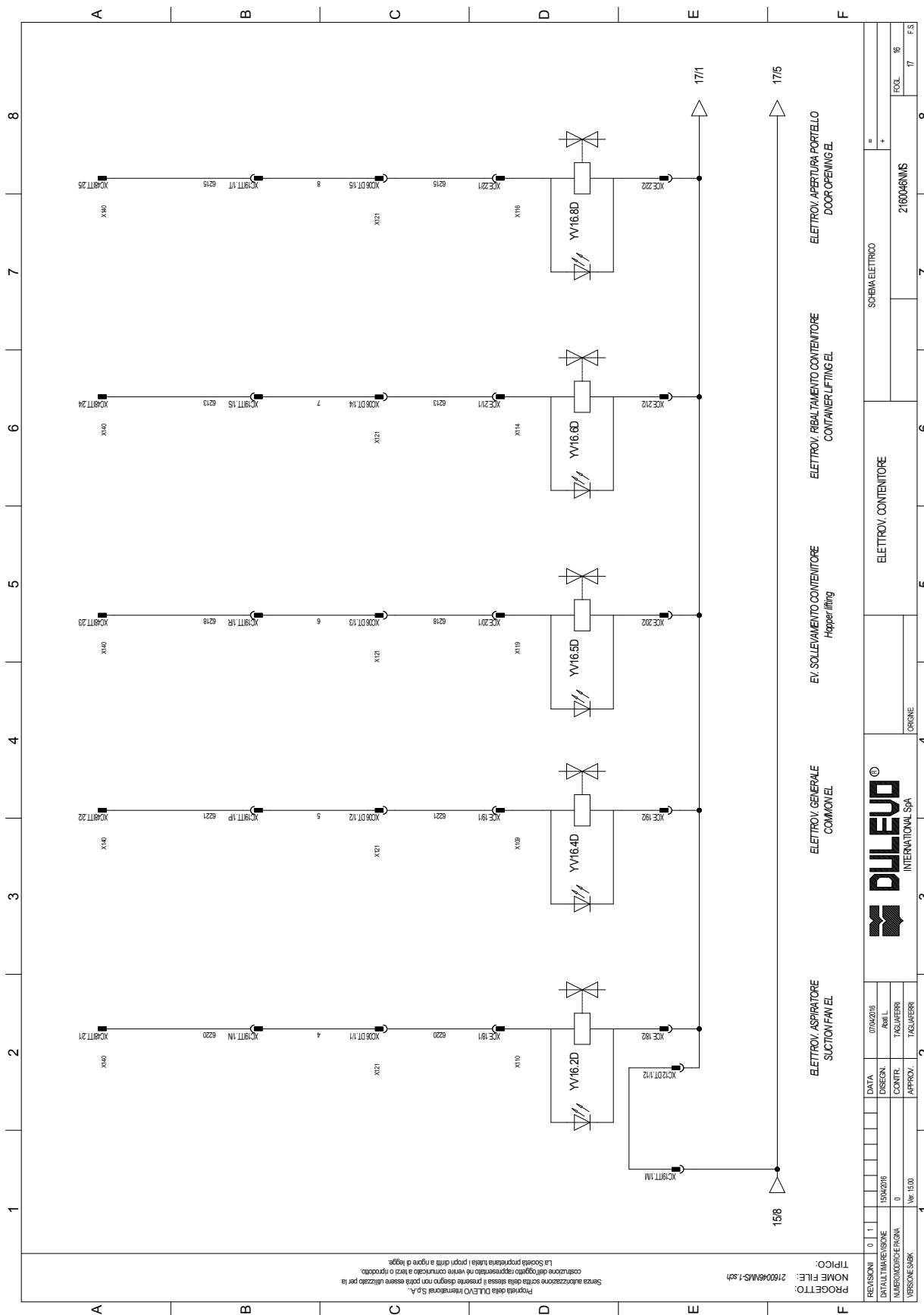


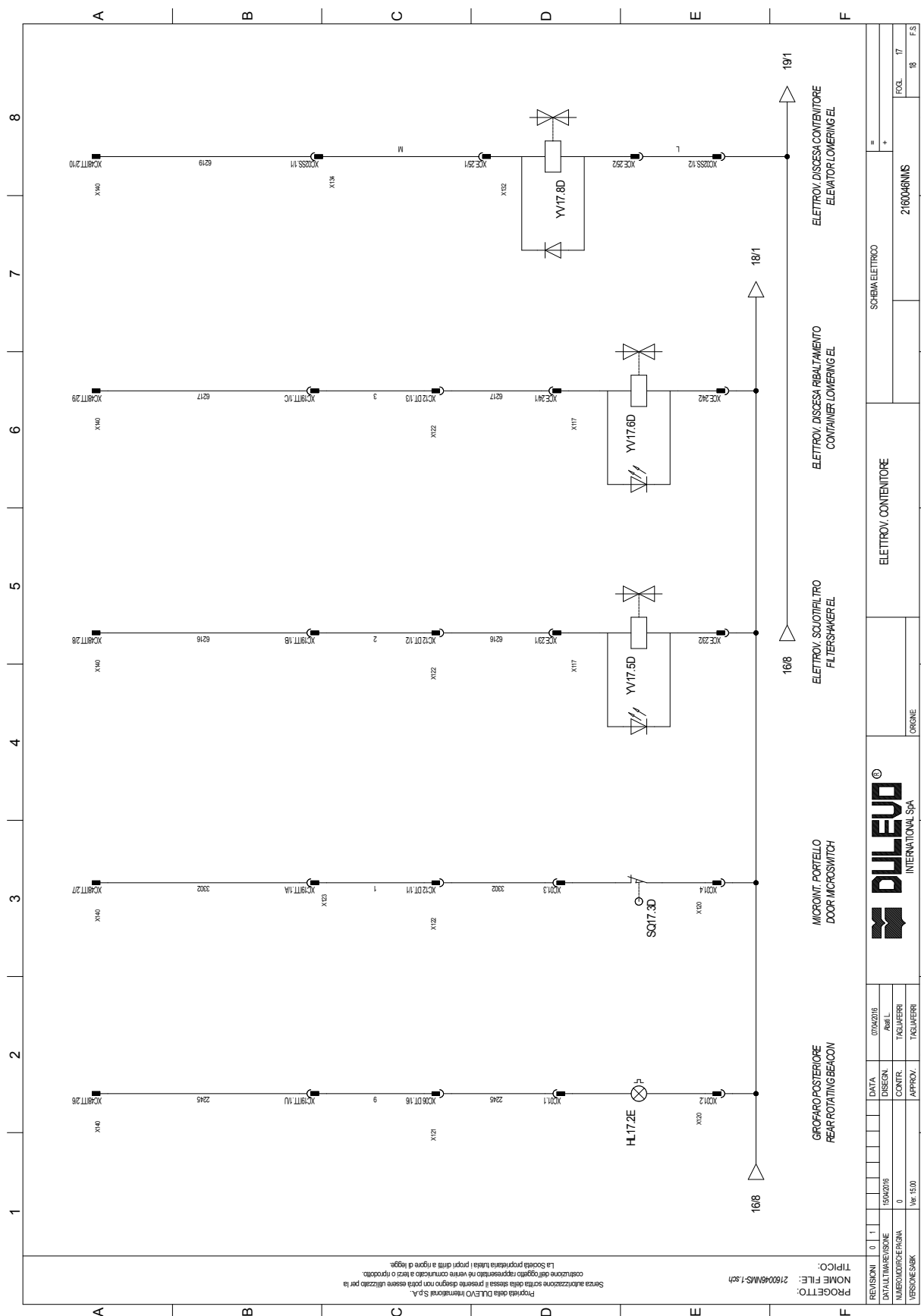


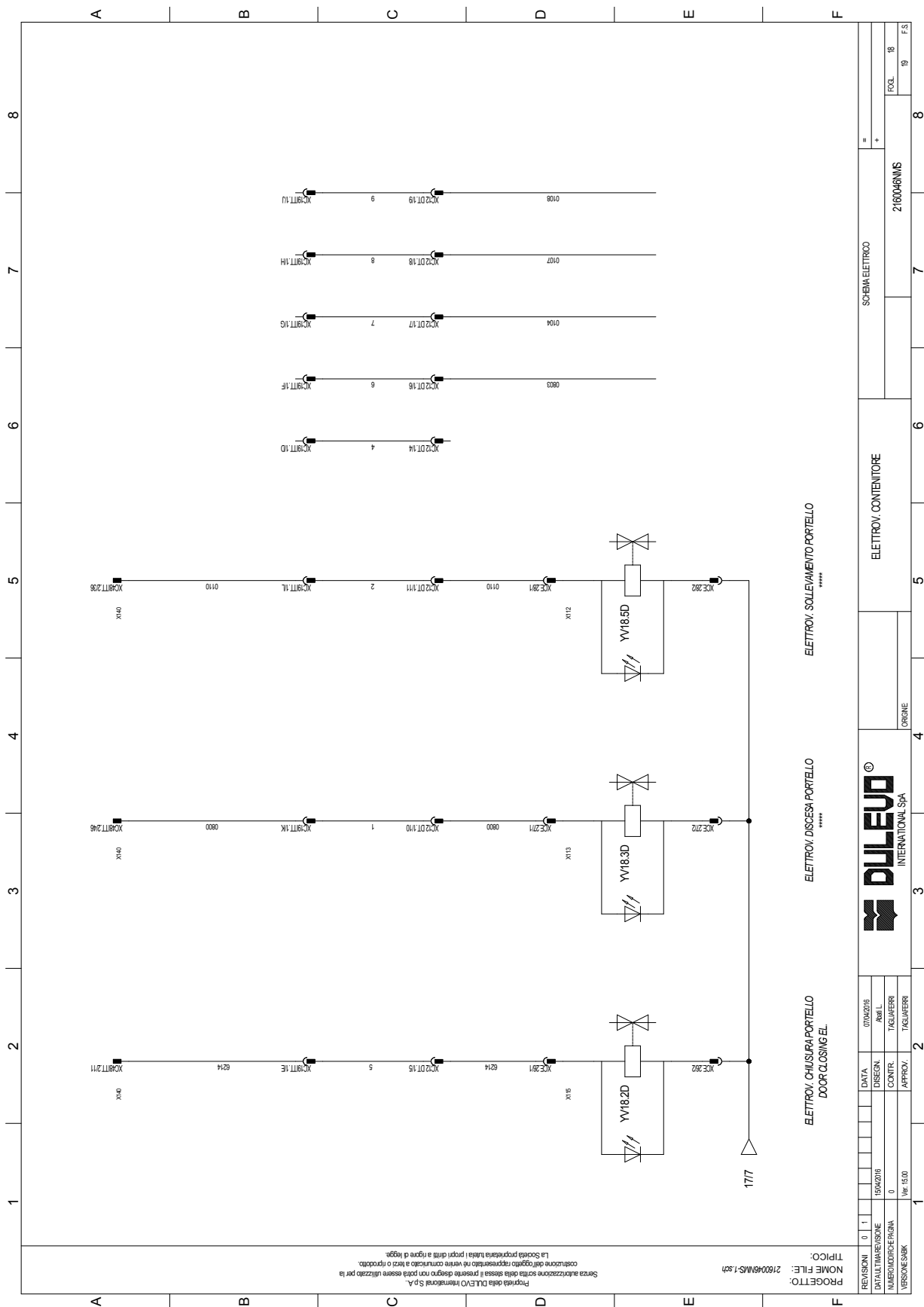


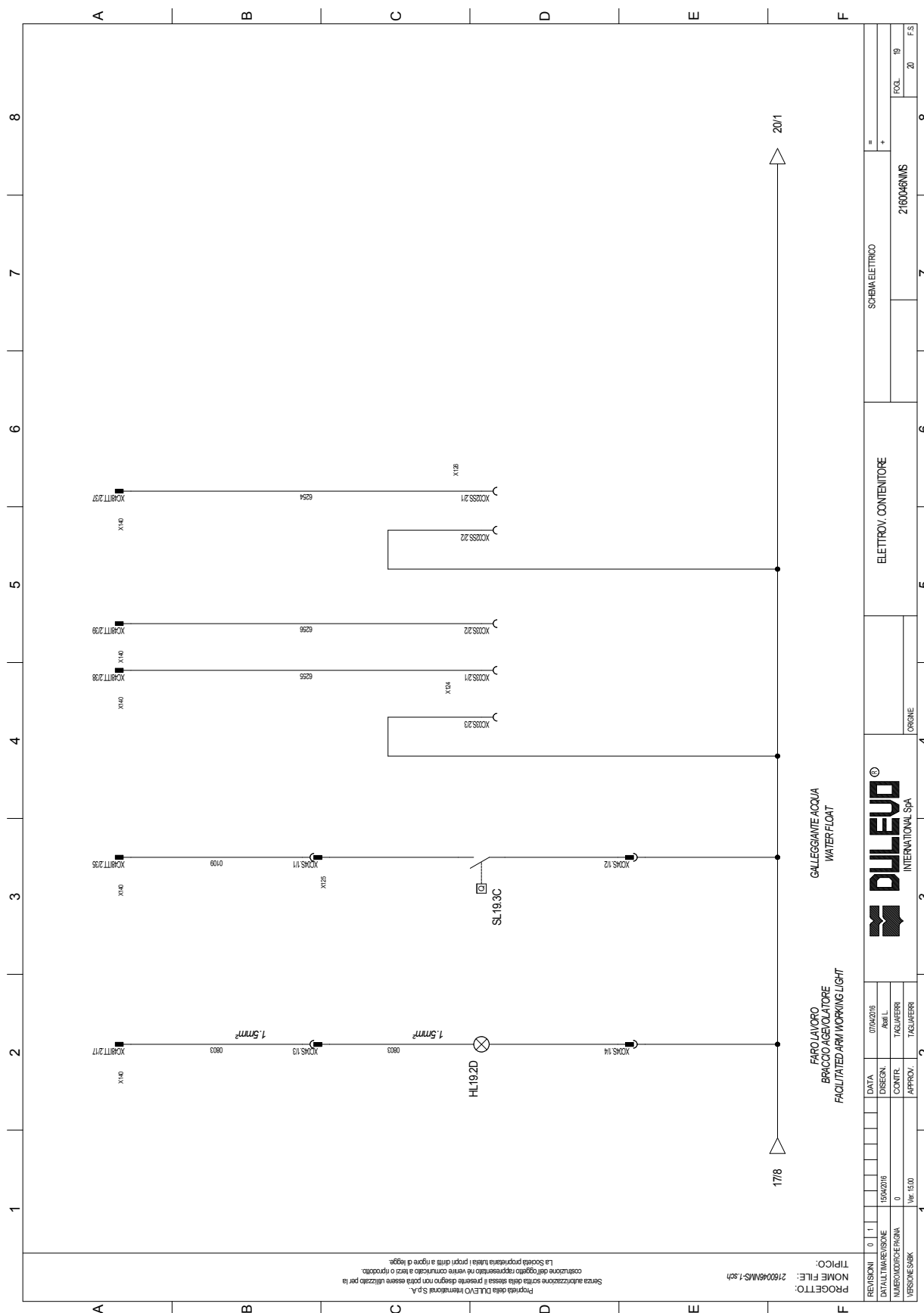
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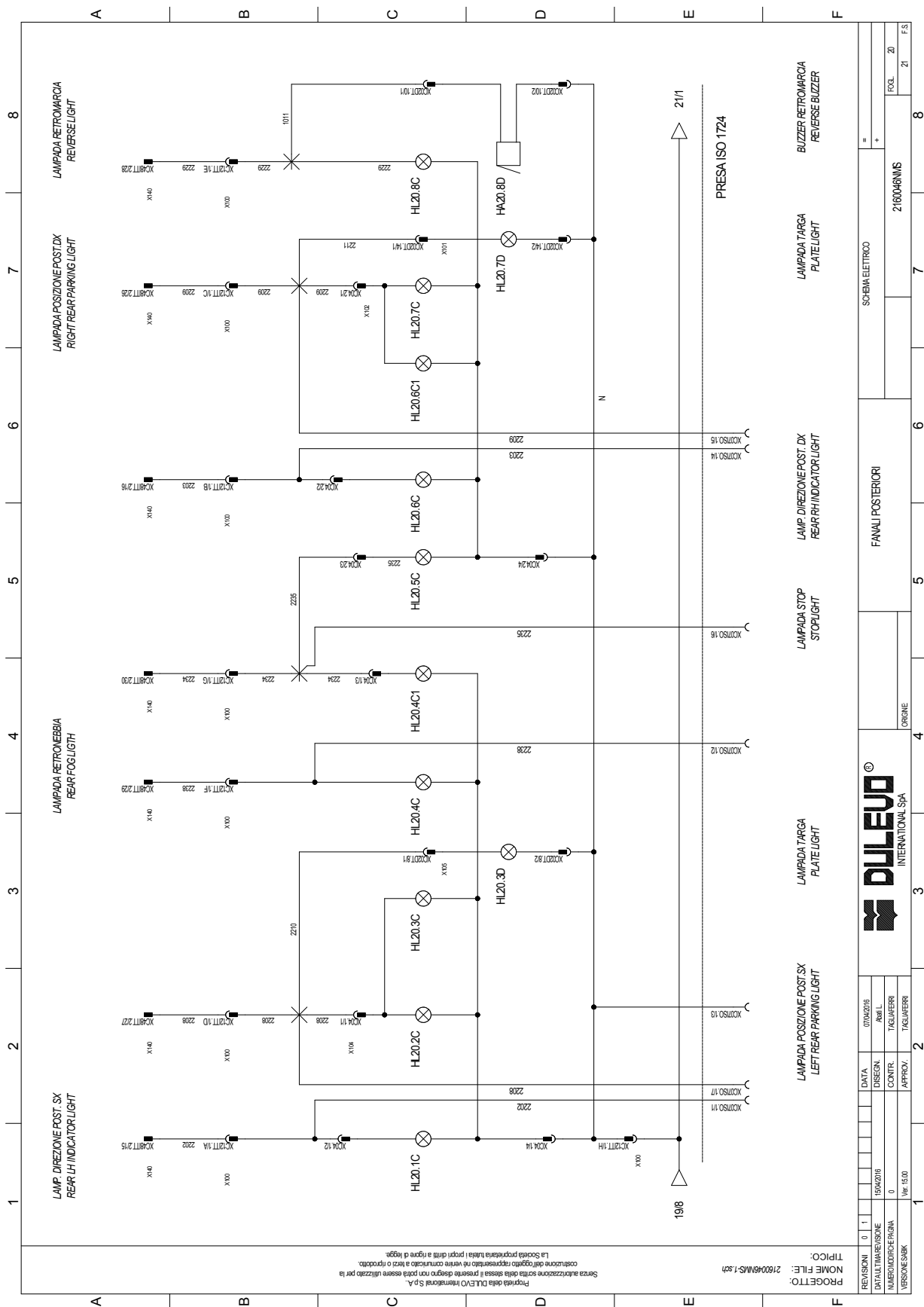




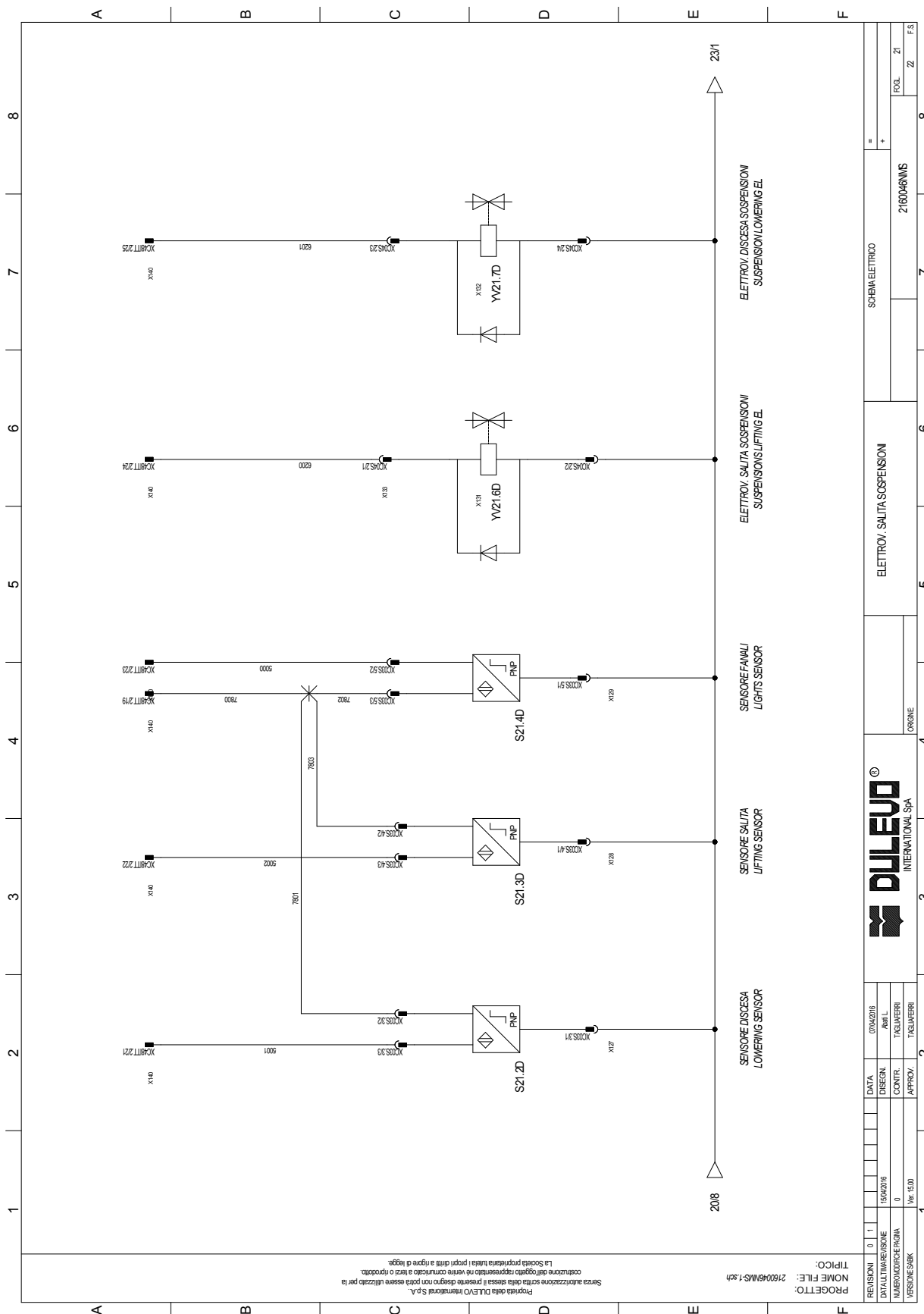




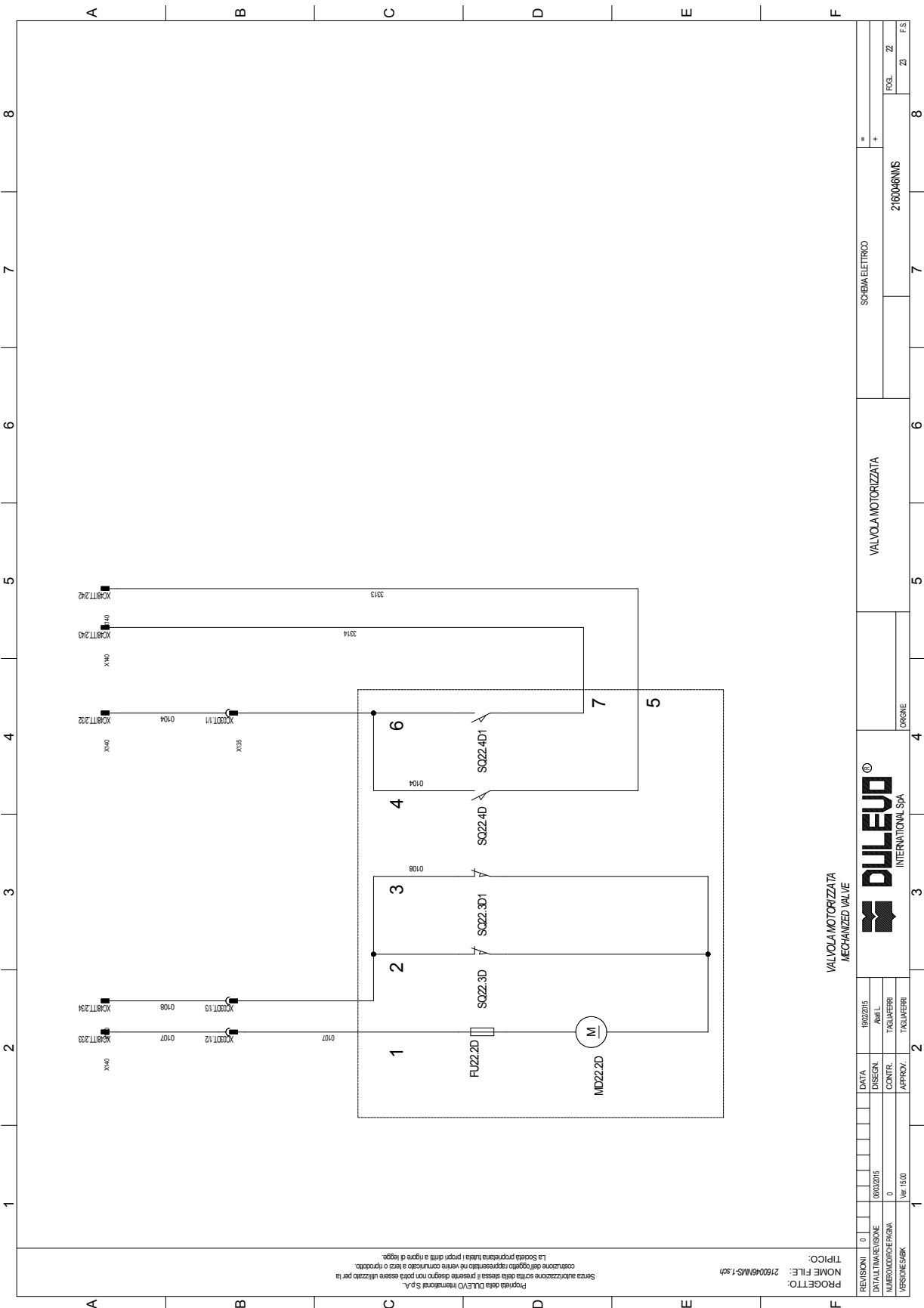


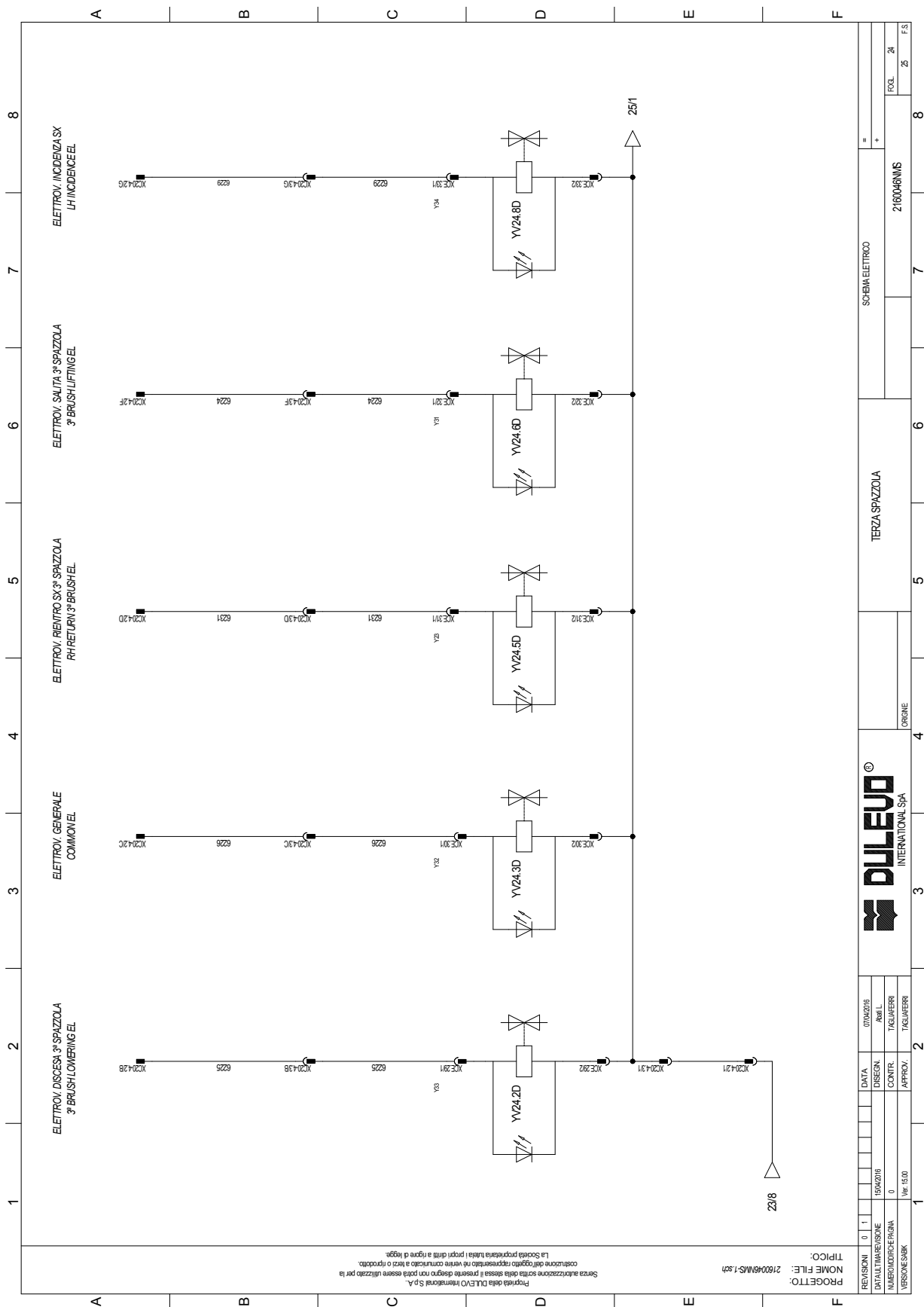


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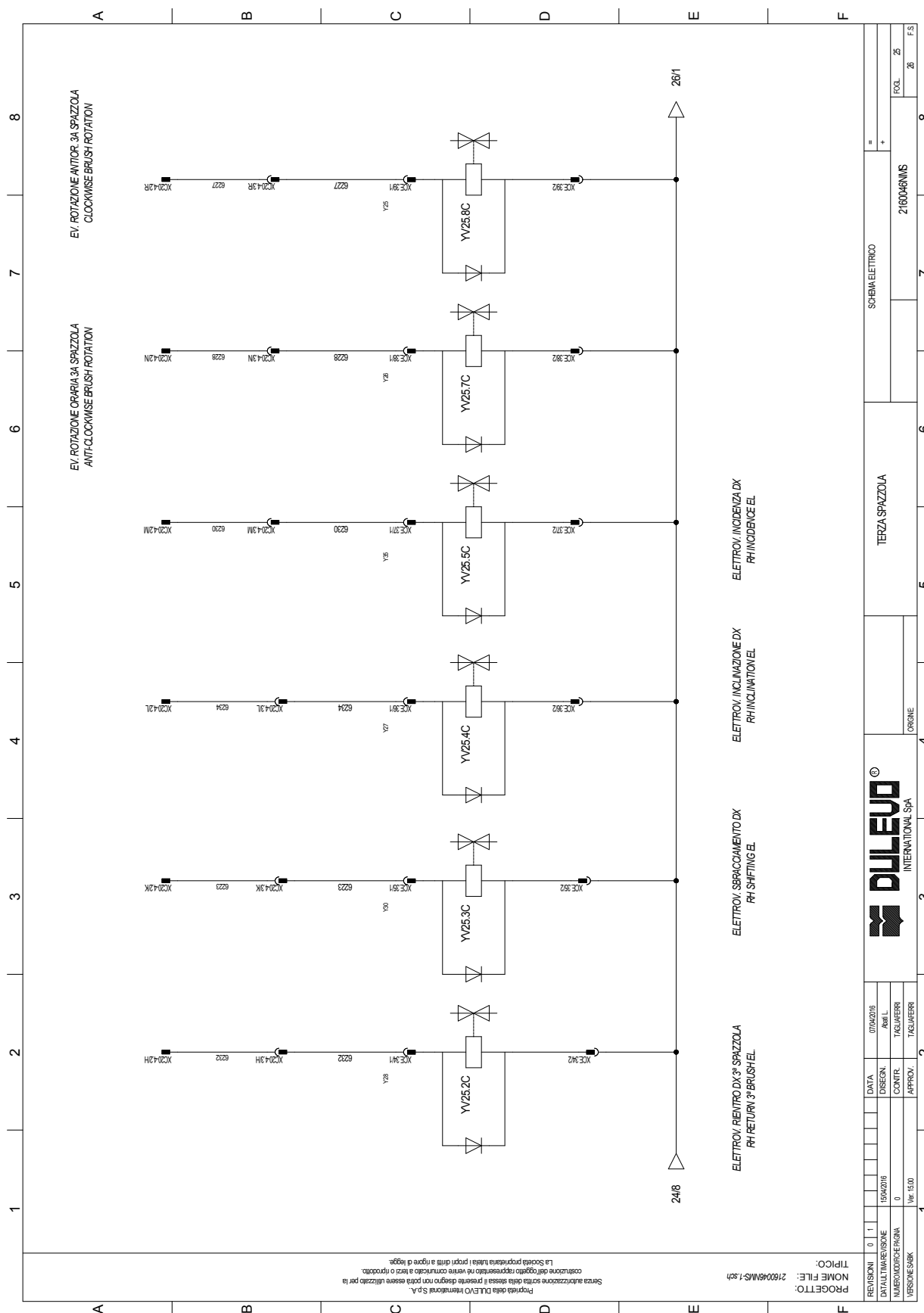
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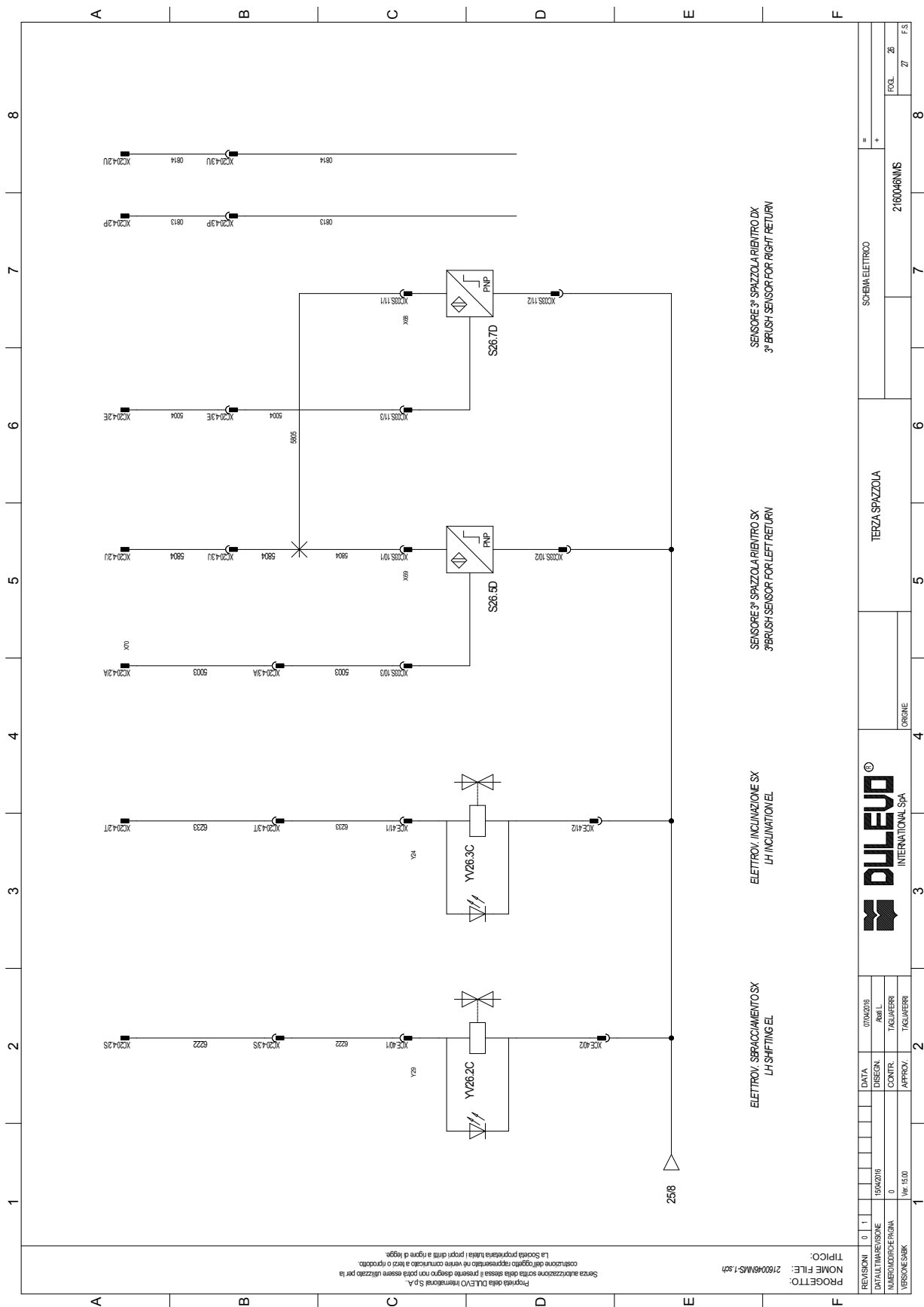
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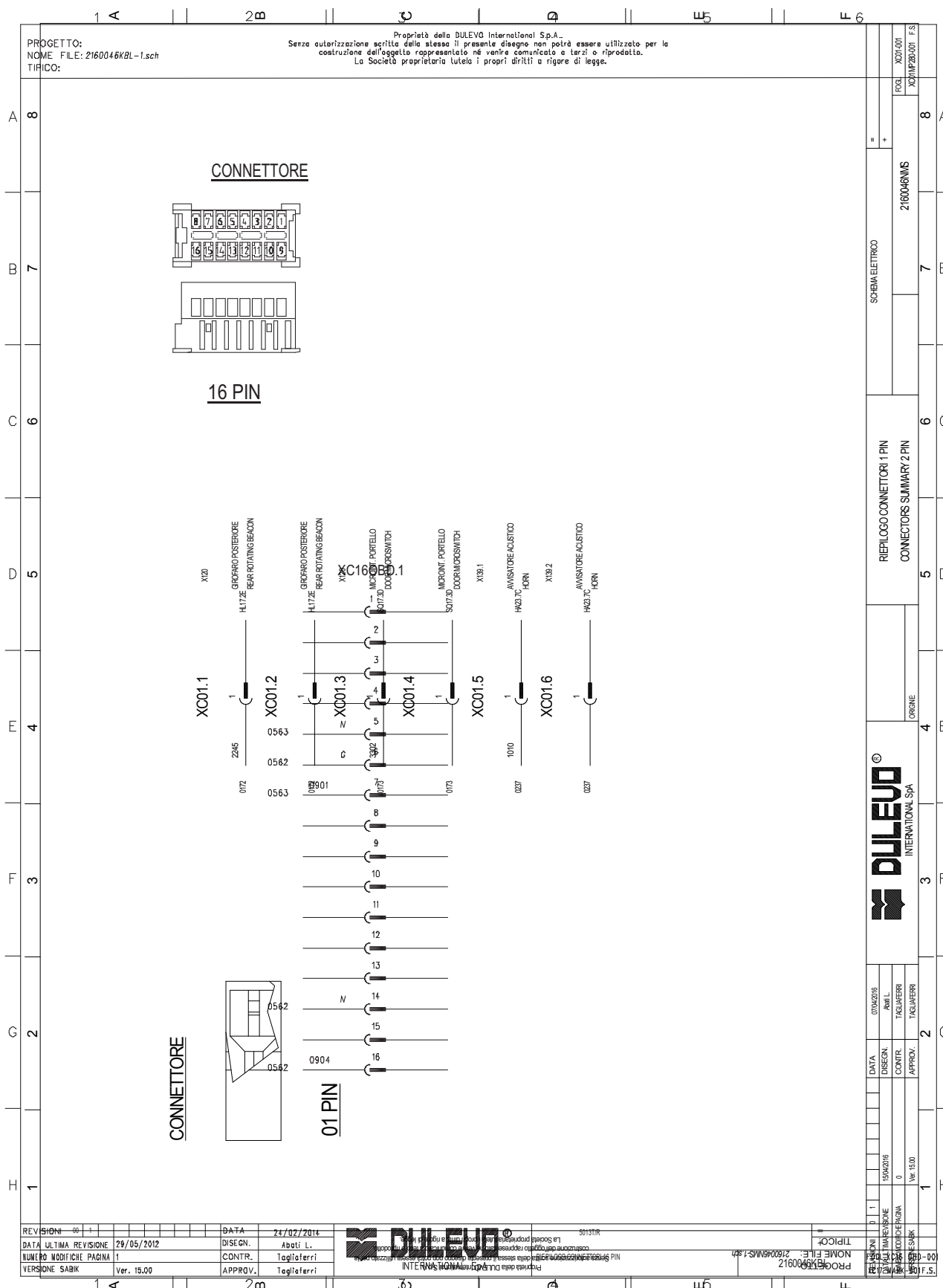
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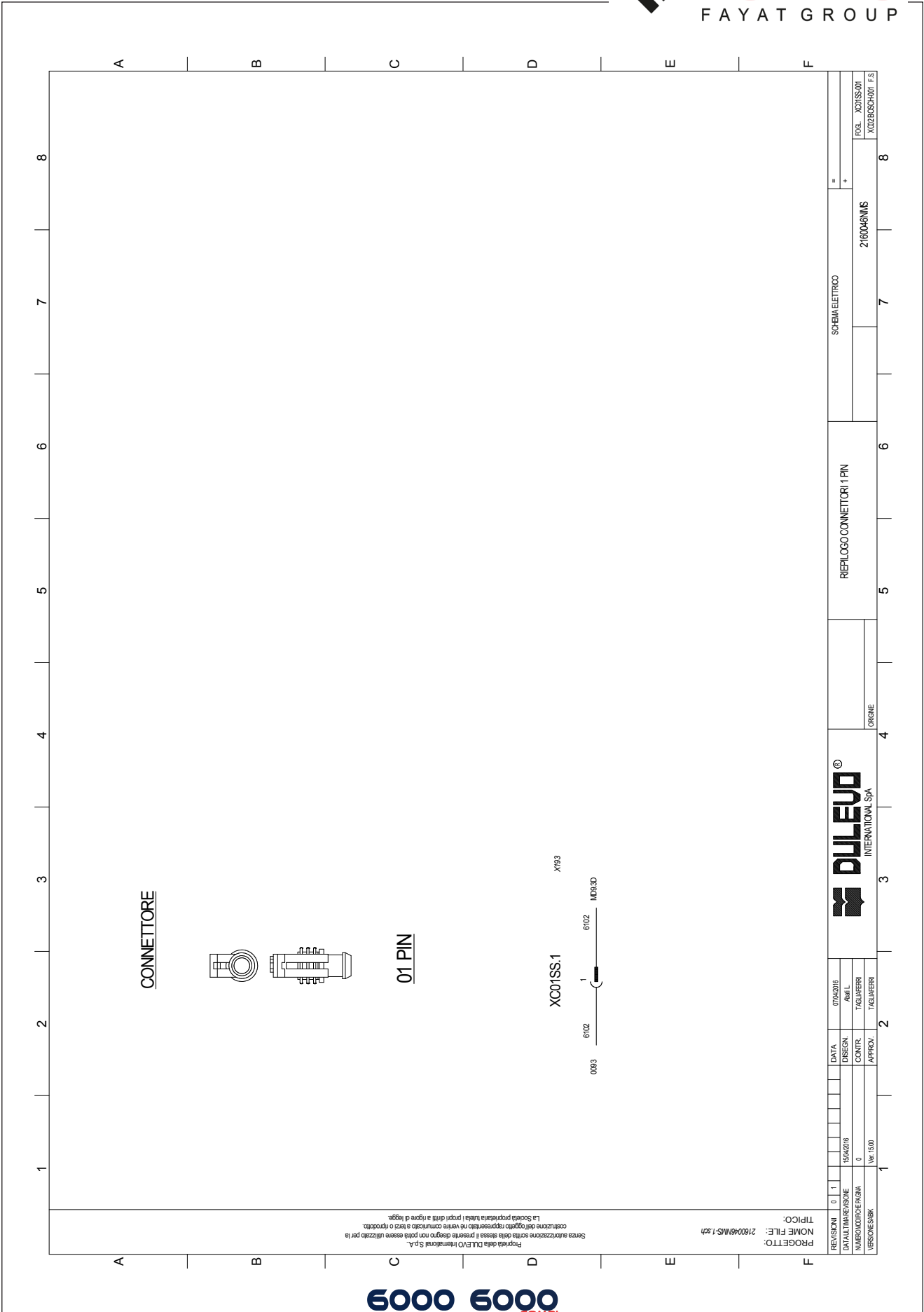
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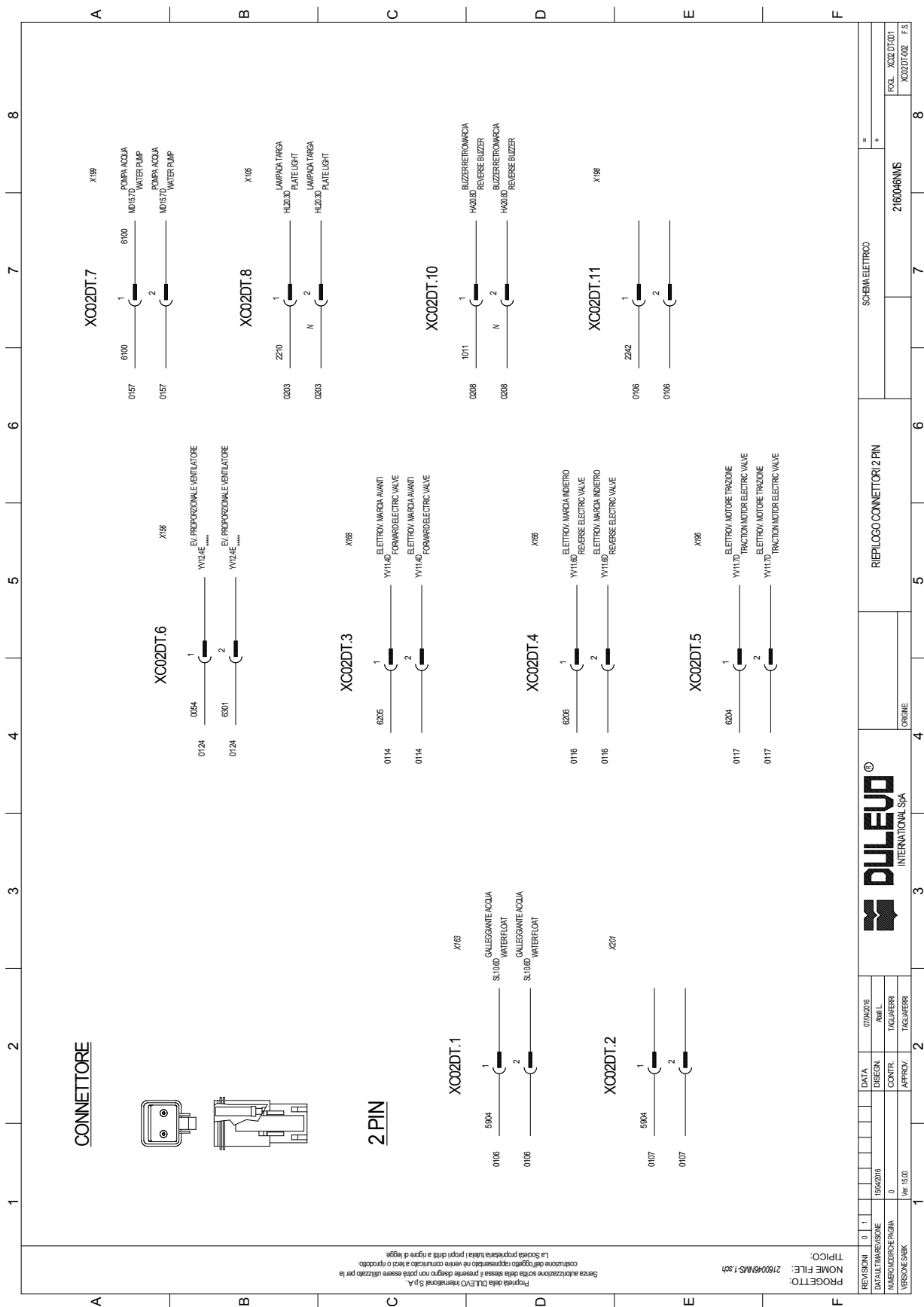
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Progetto della DULEVO International S.p.A. Senza autorizzazione scritta della stessa il presente disegno non potrà essere utilizzato per la costruzione dell'oggetto rappresentato né venire comunicato a terzi o riprodotto. La Società proprietaria tutela i suoi diritti.																													
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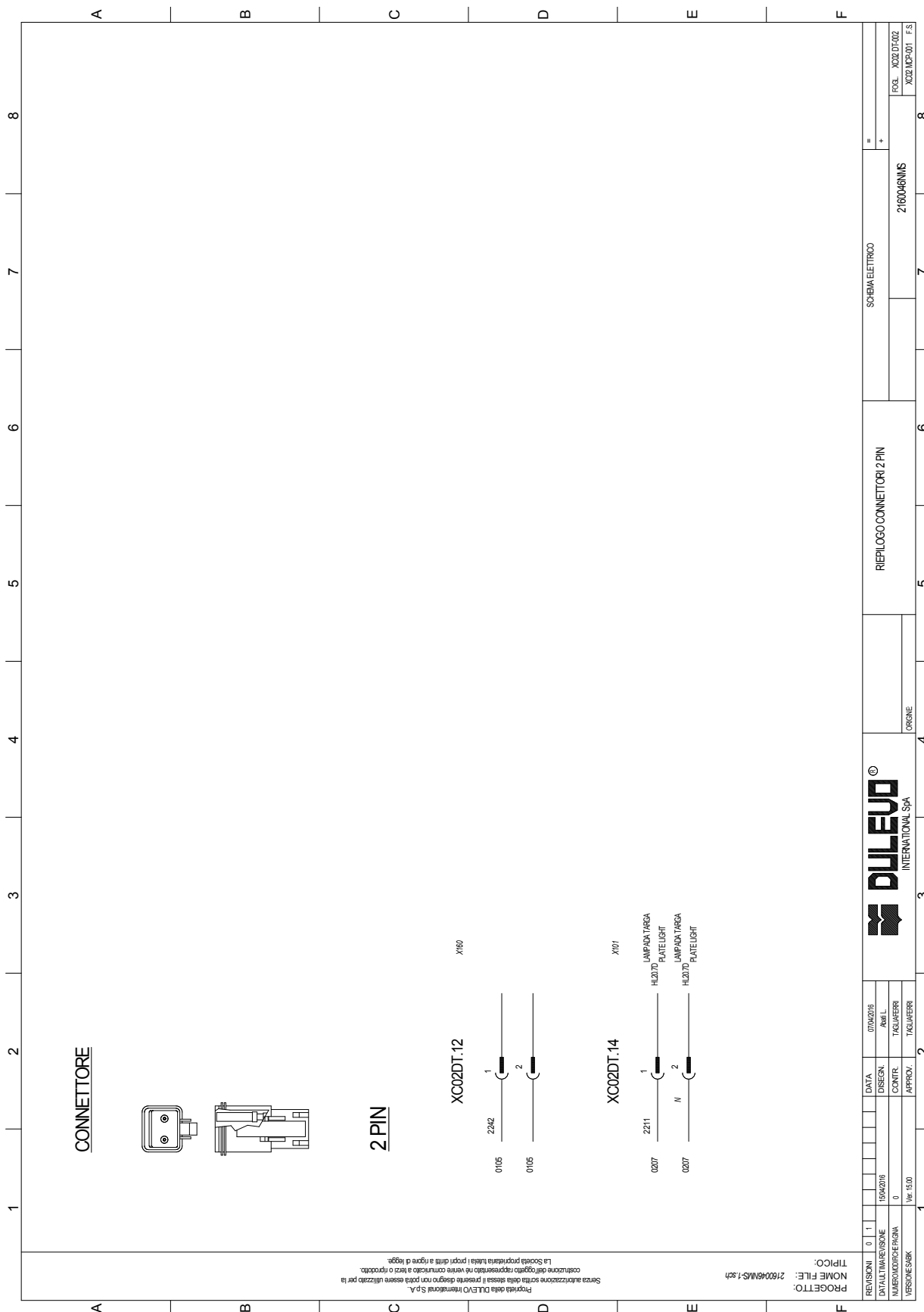
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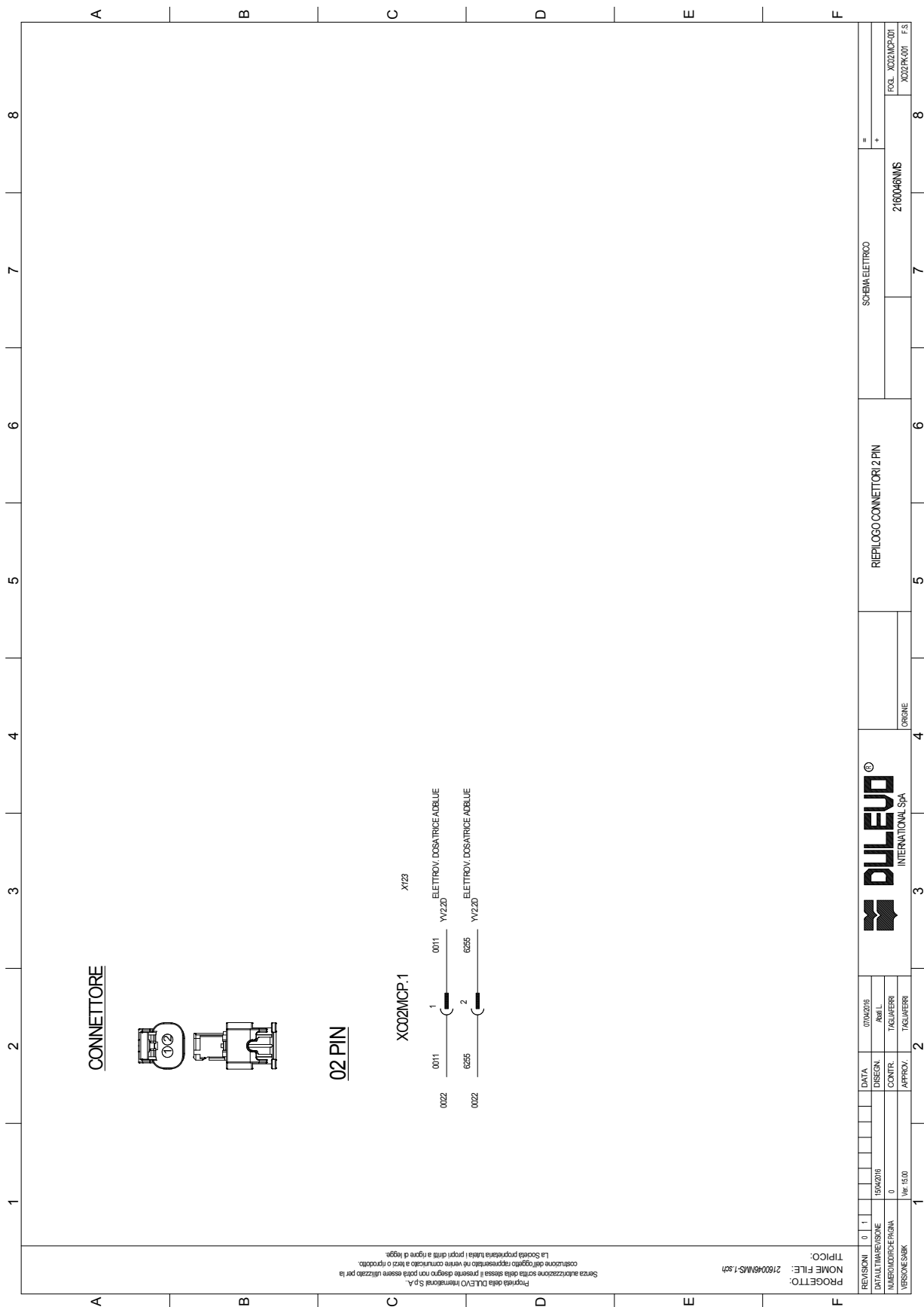


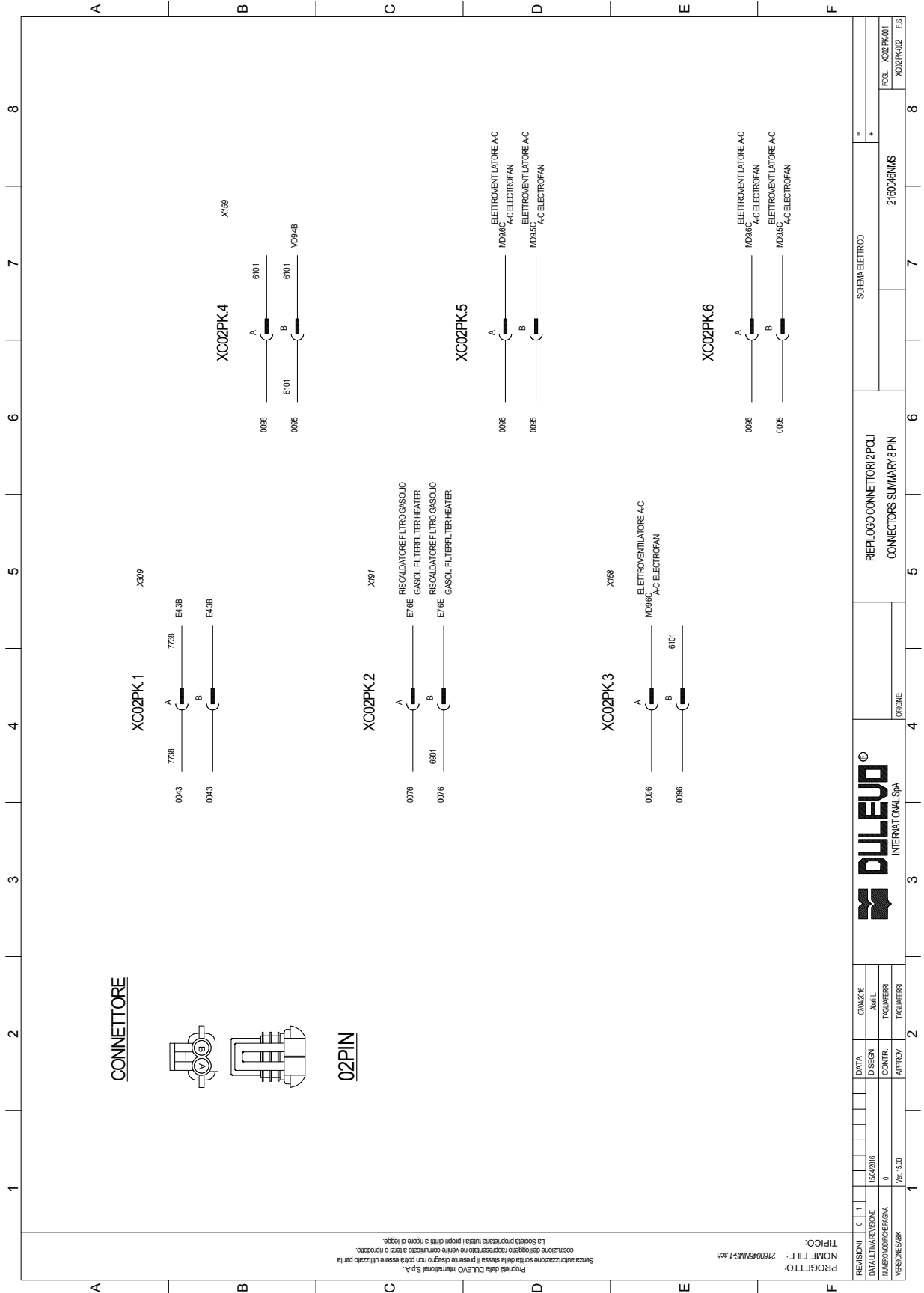


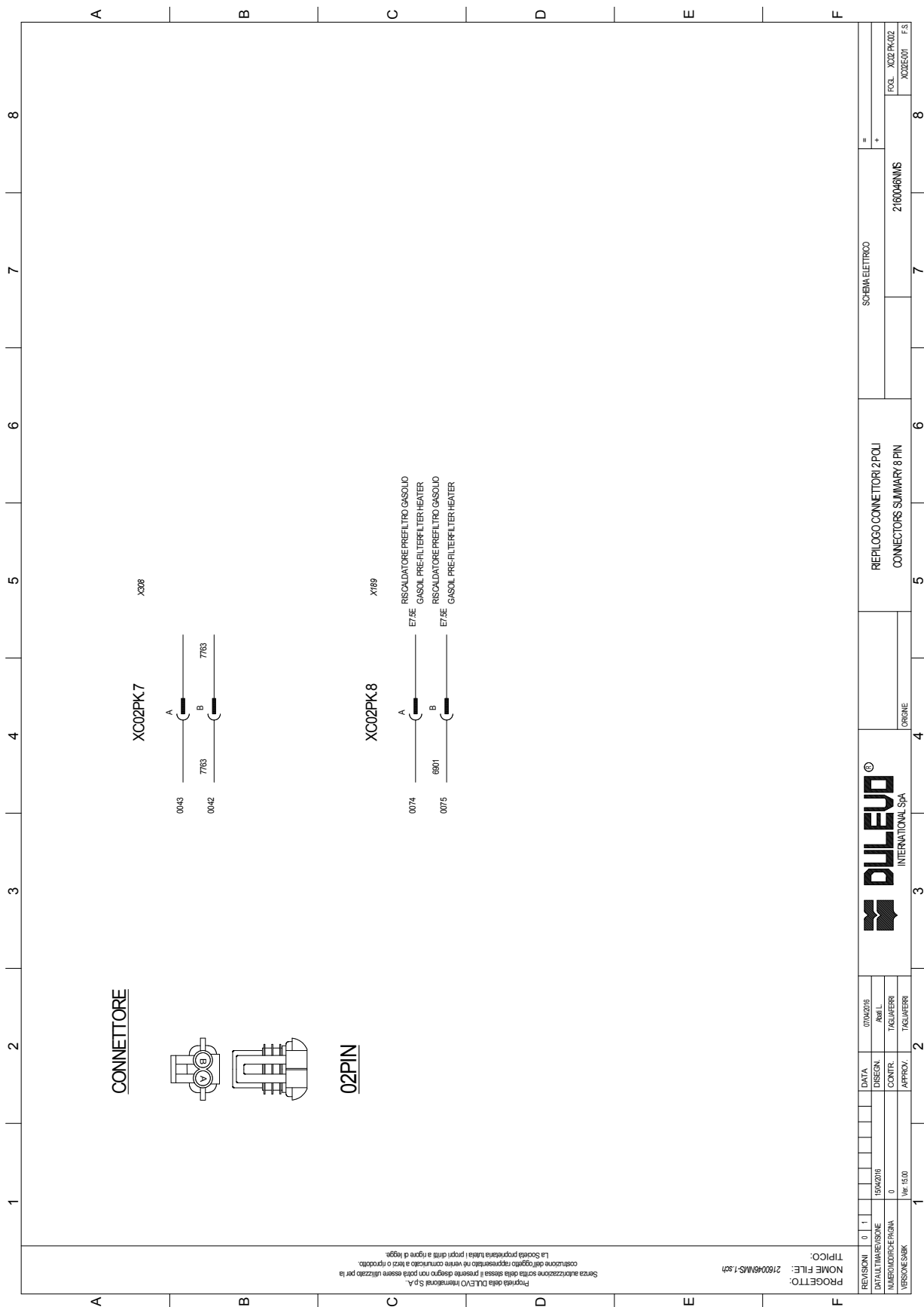


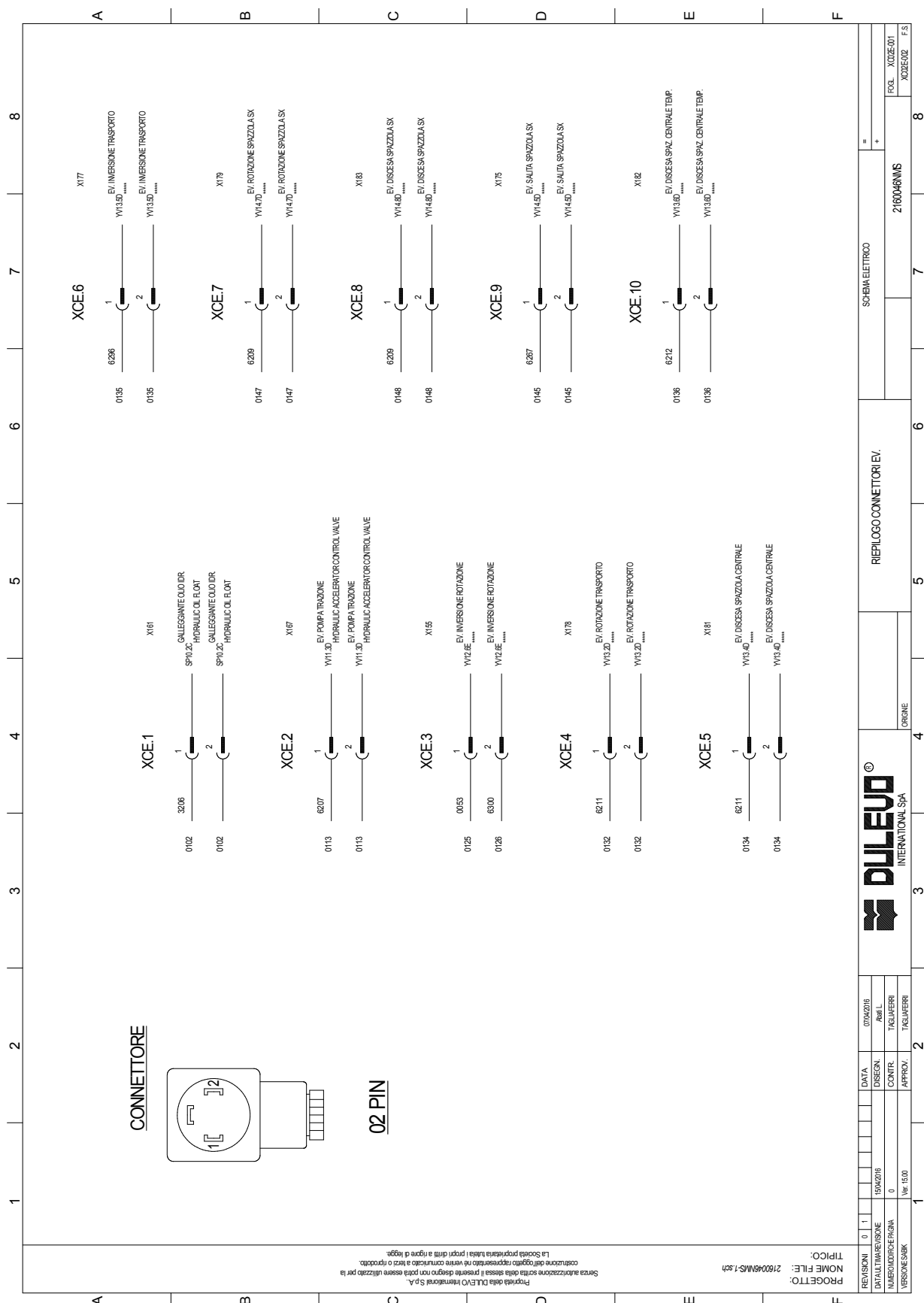


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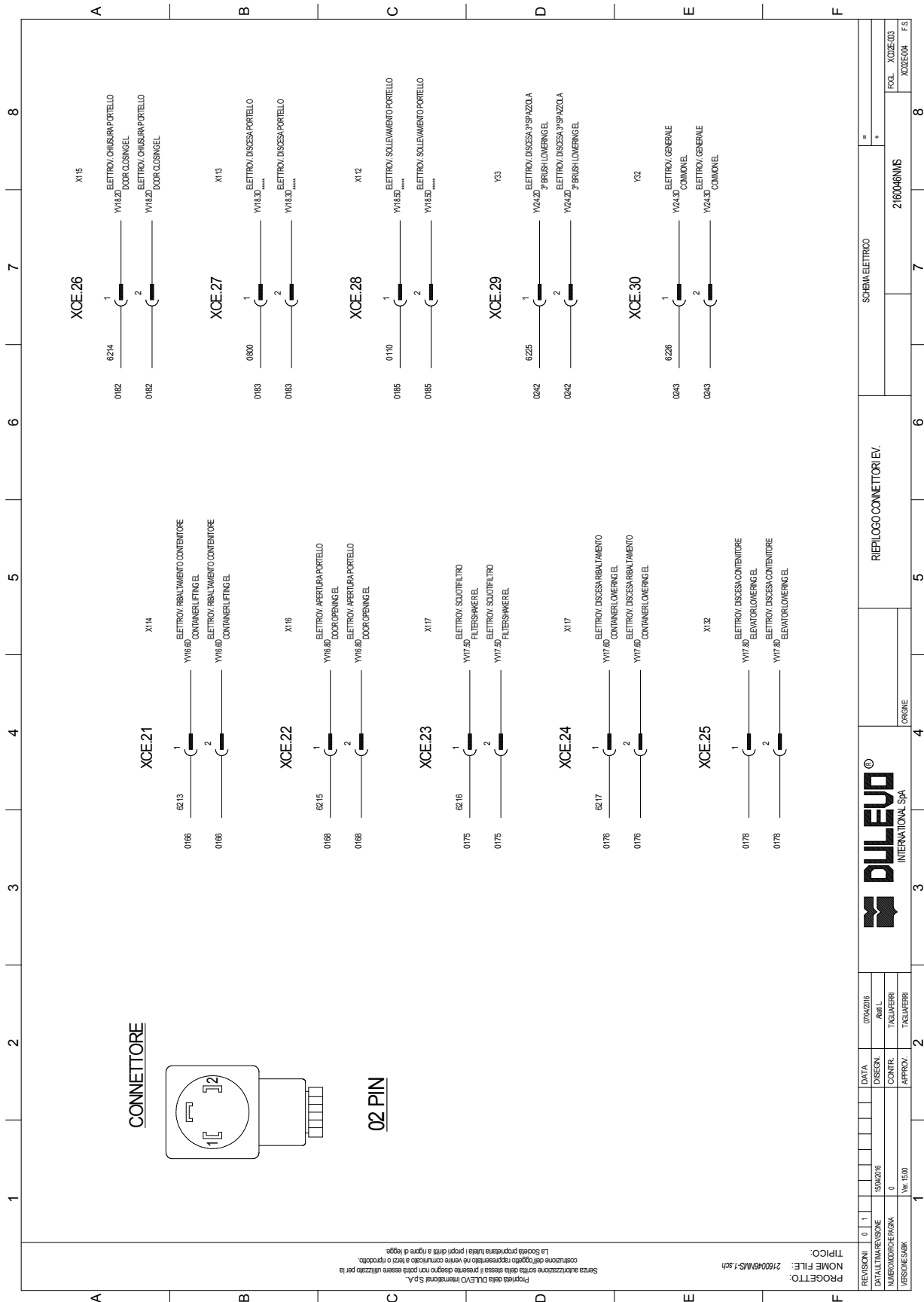
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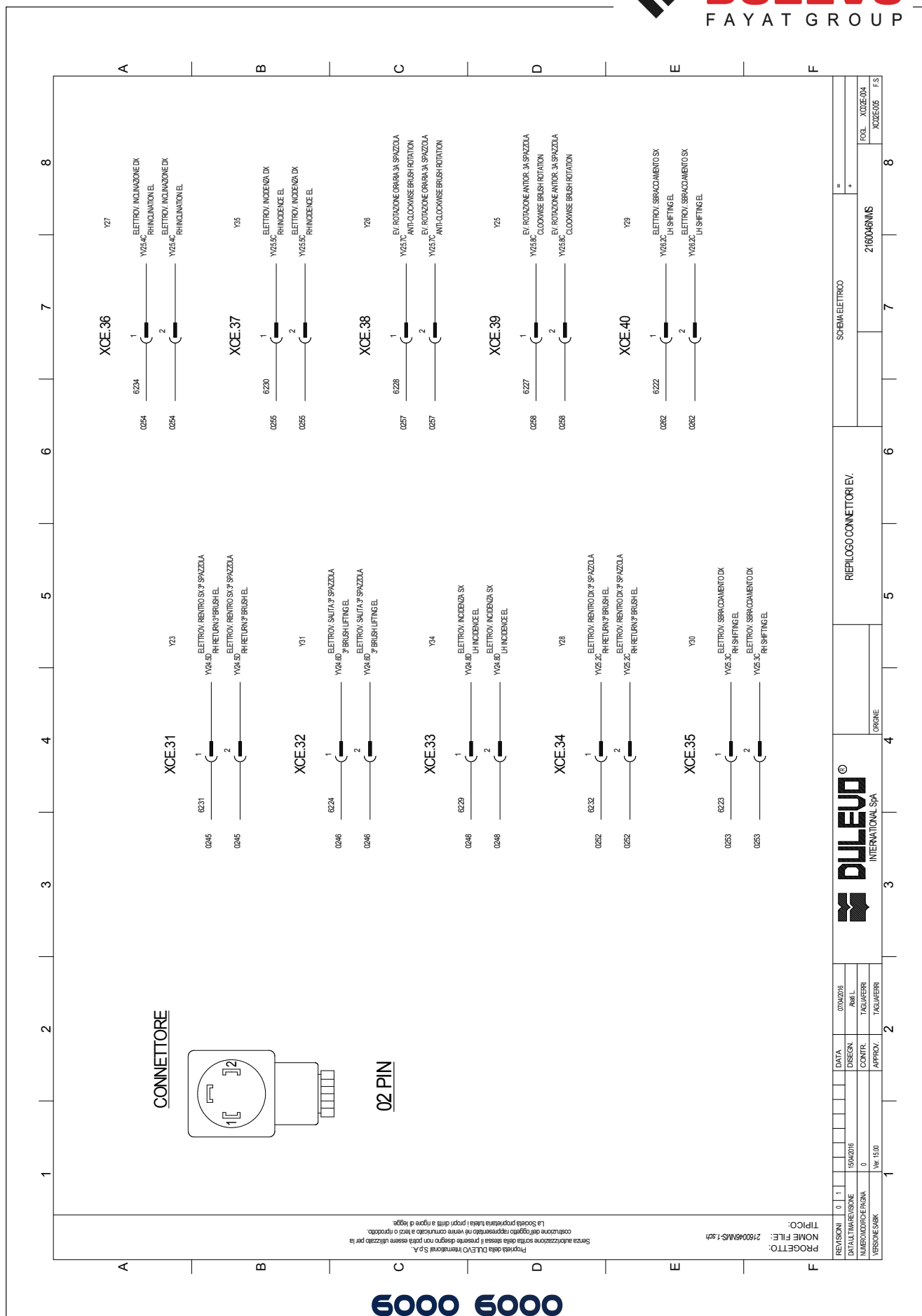
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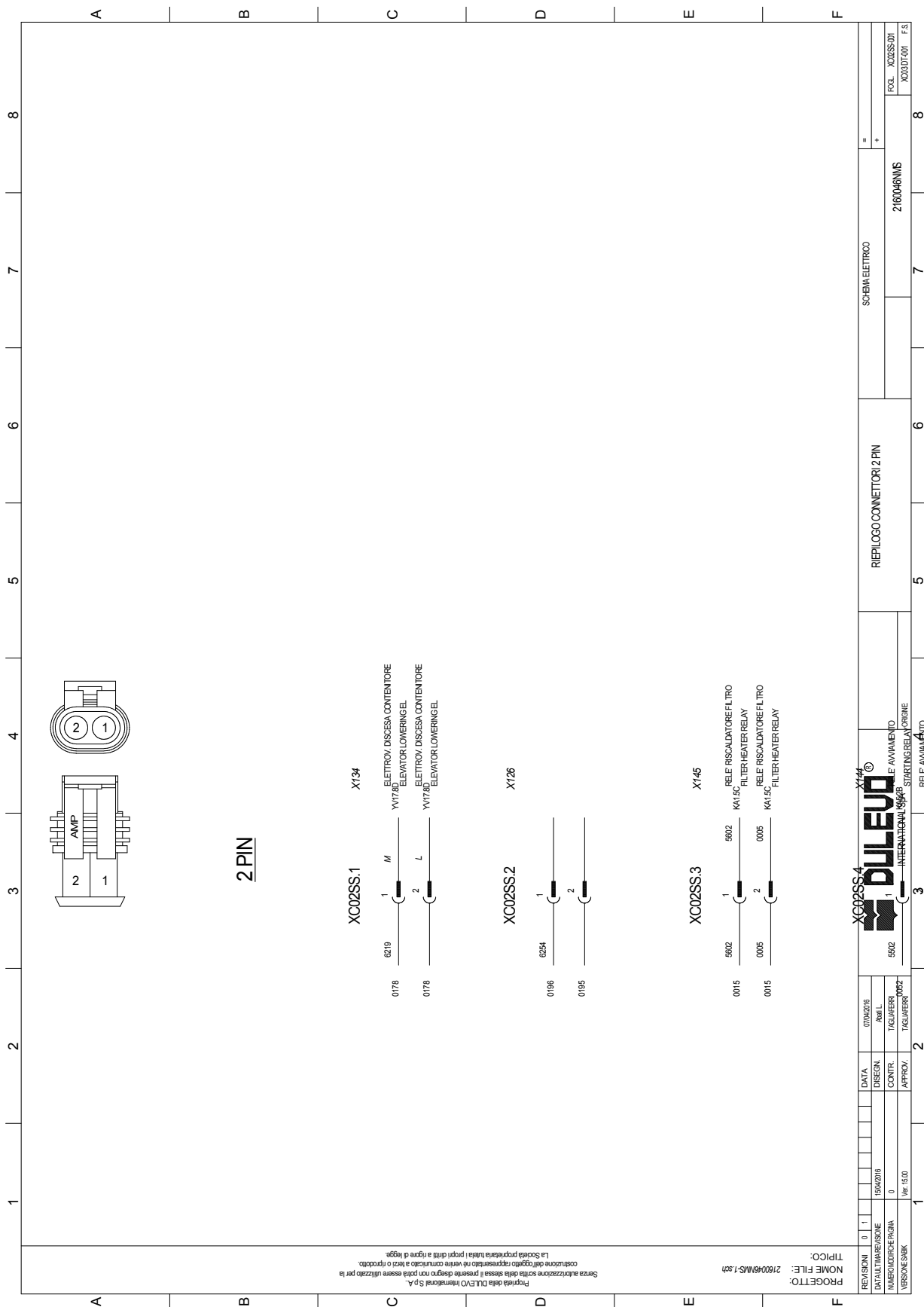
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VERSIONE		XCE.003	

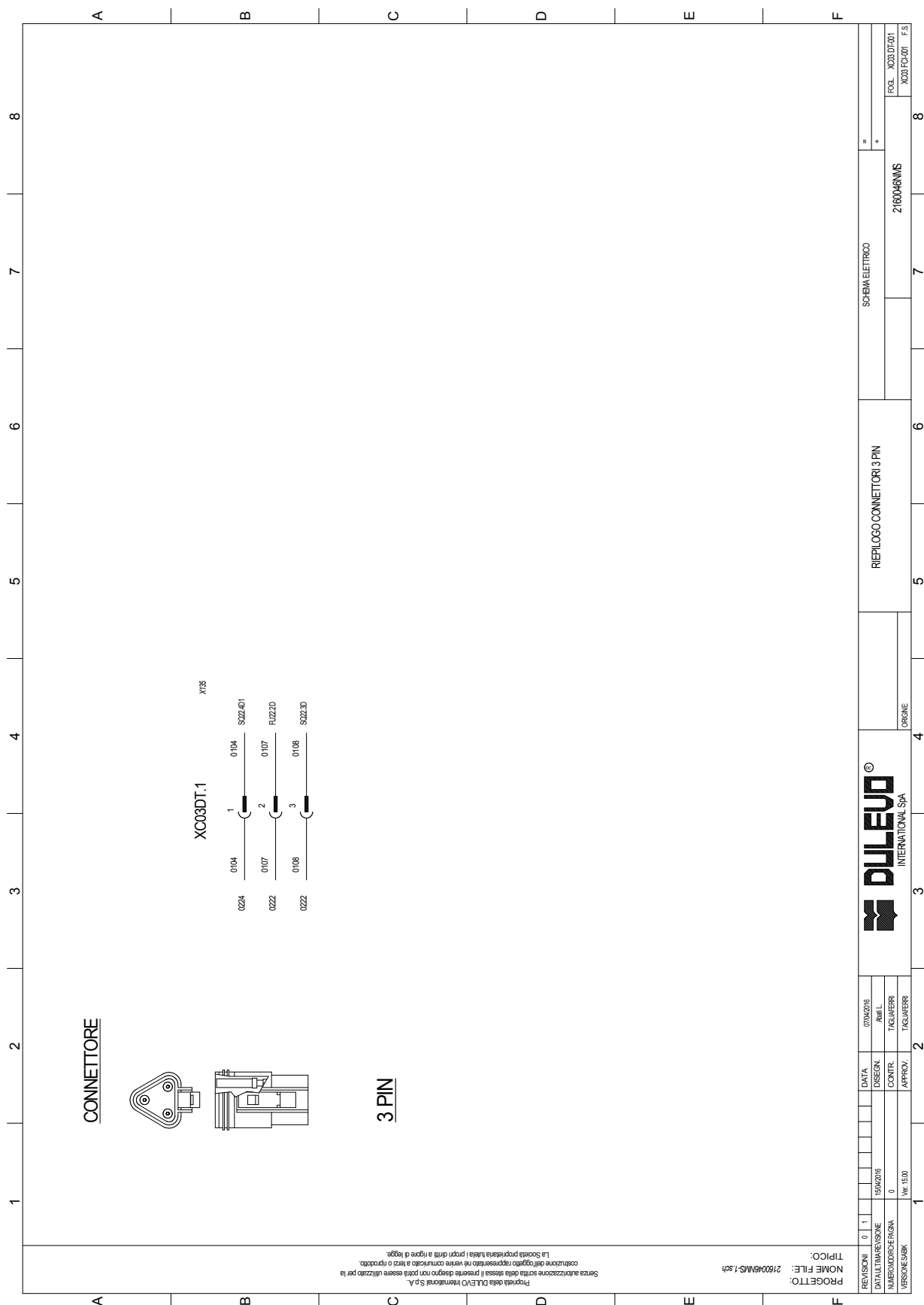
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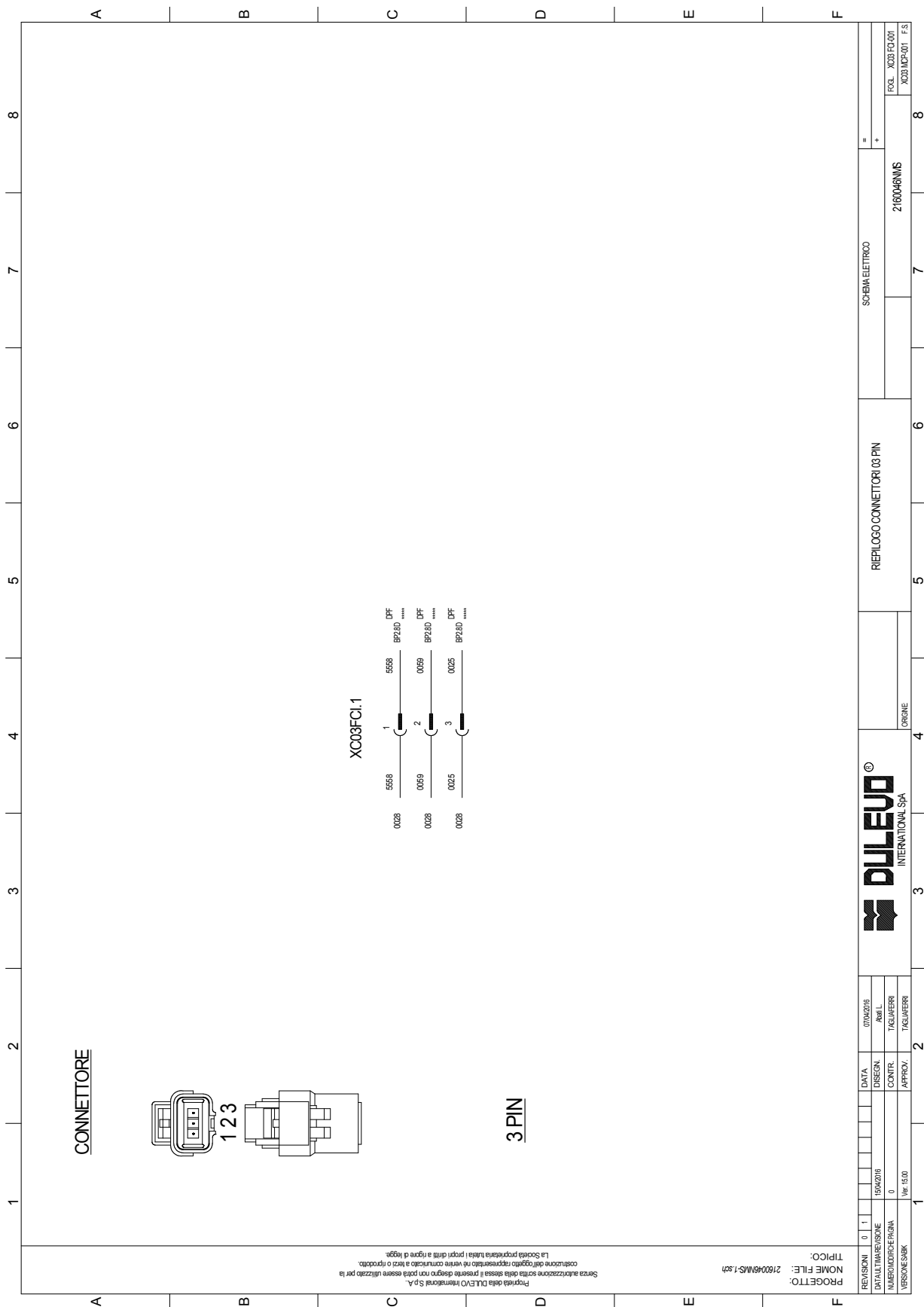
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VERSIONE		XCE.003	

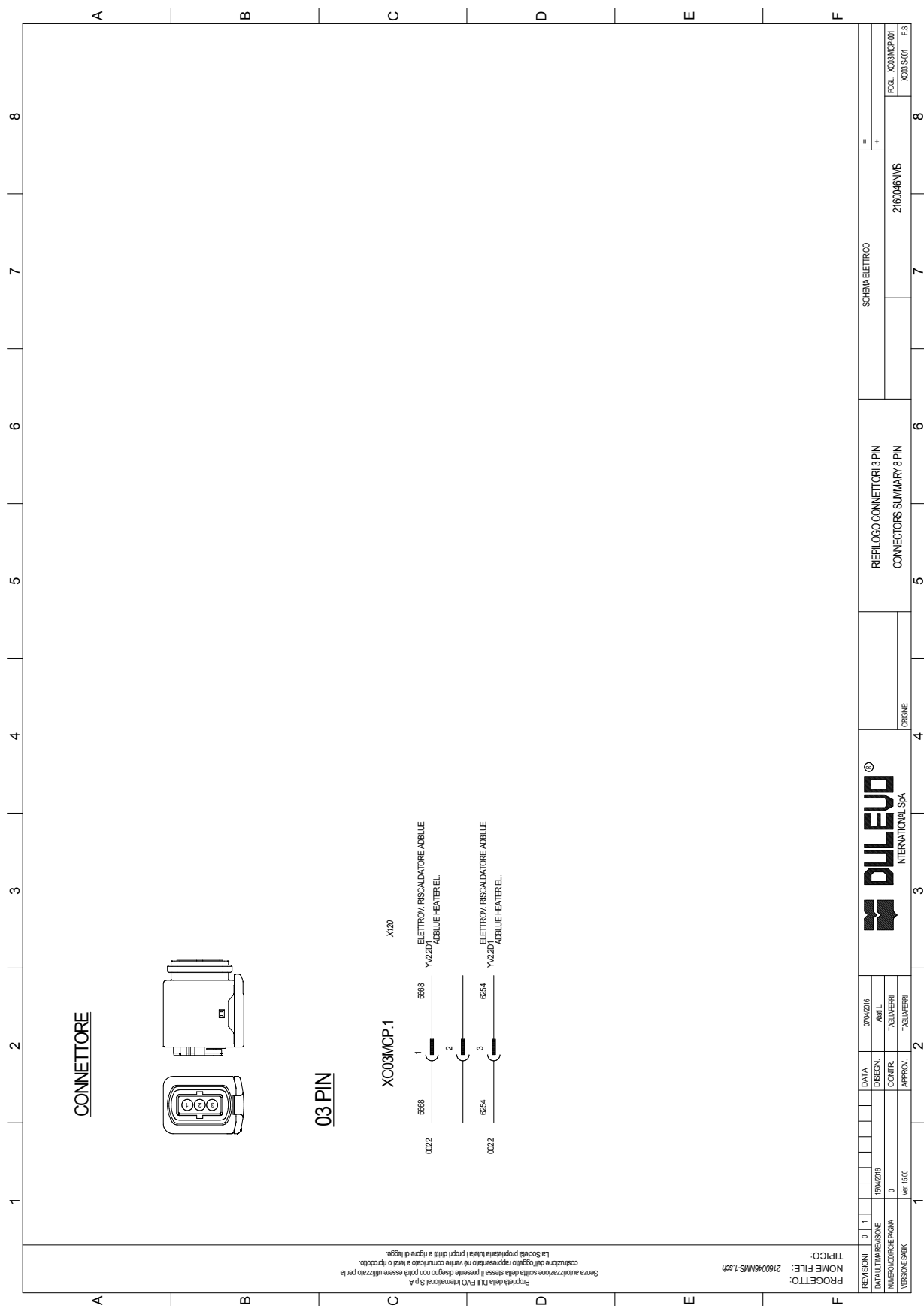














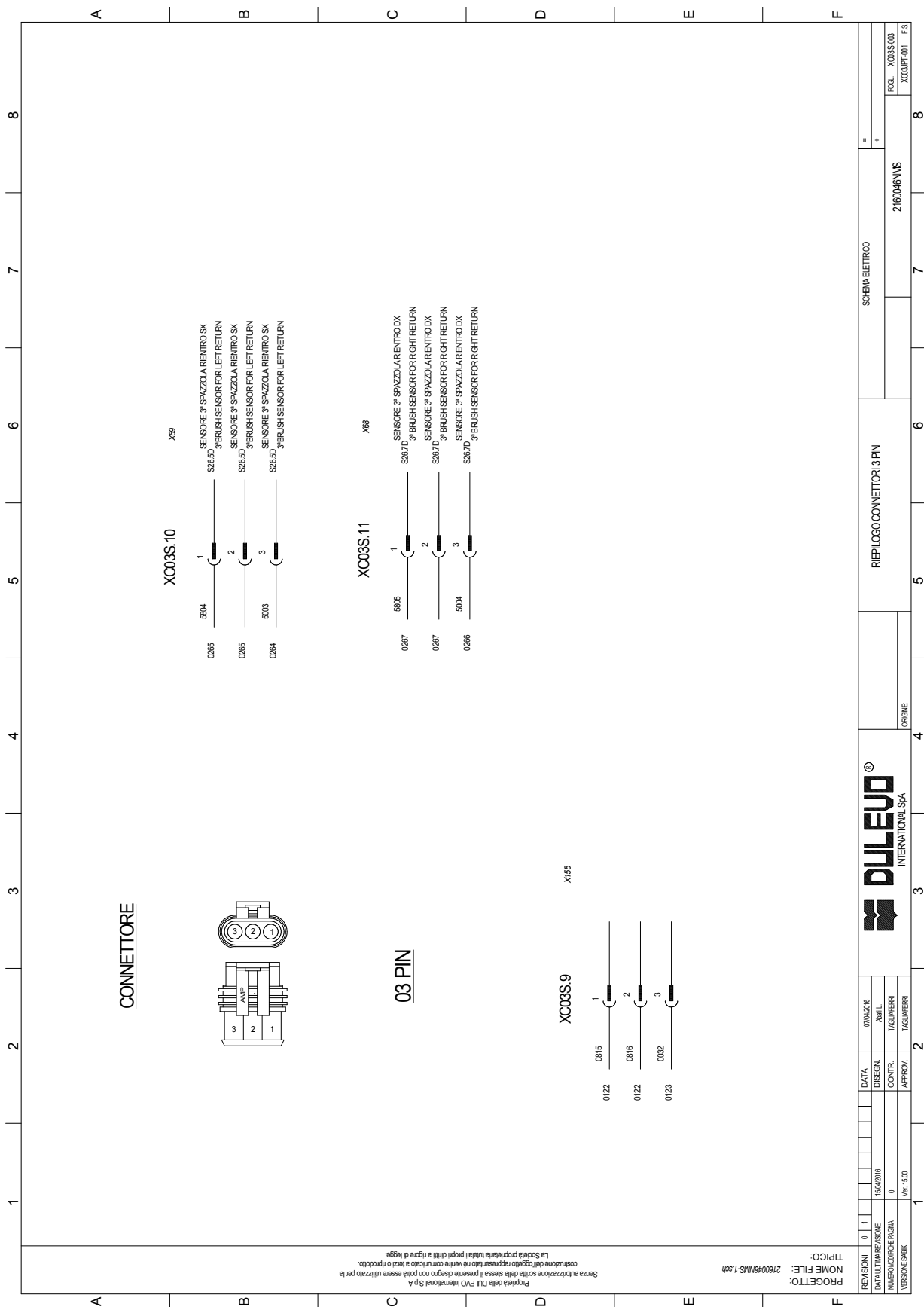
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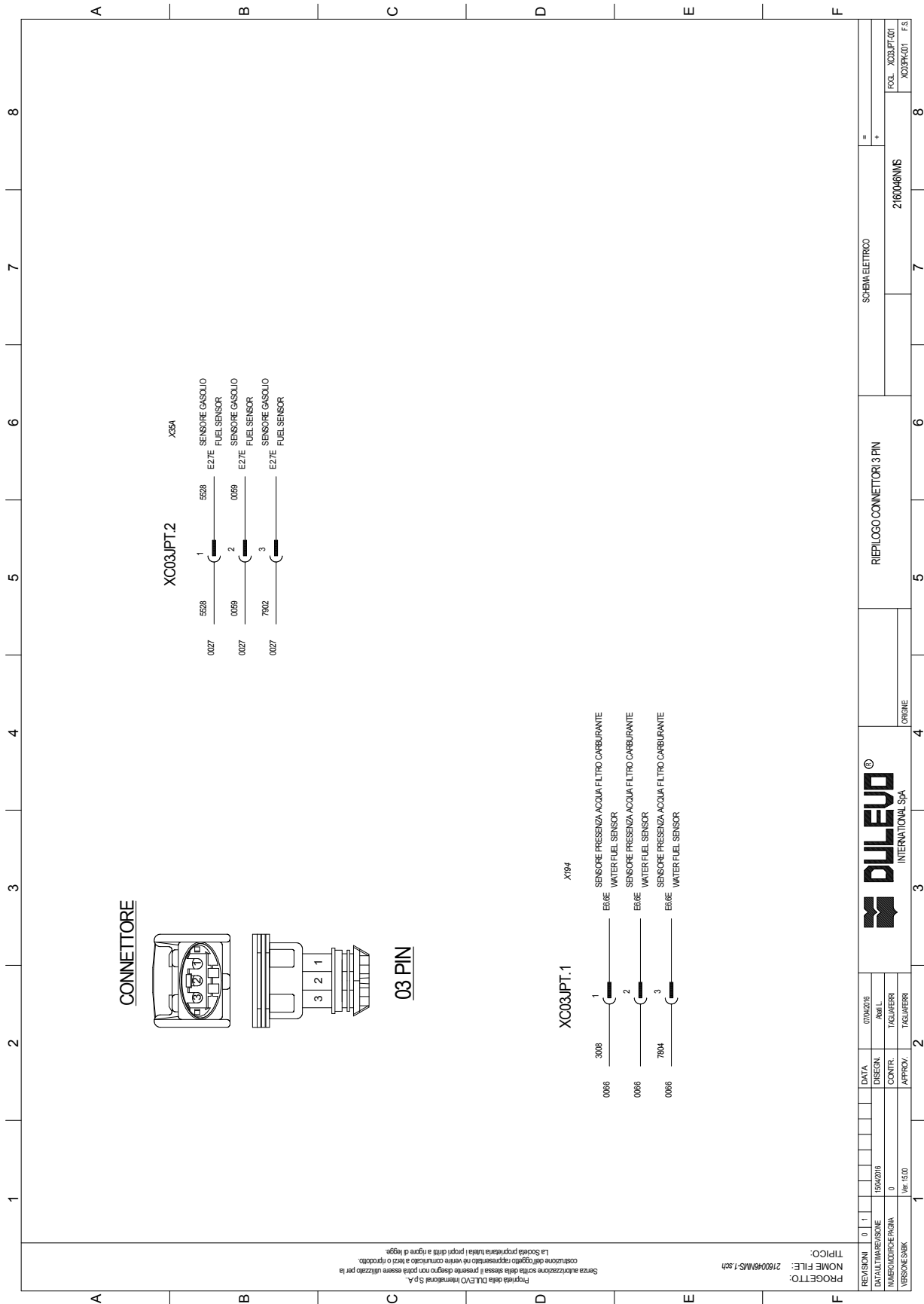
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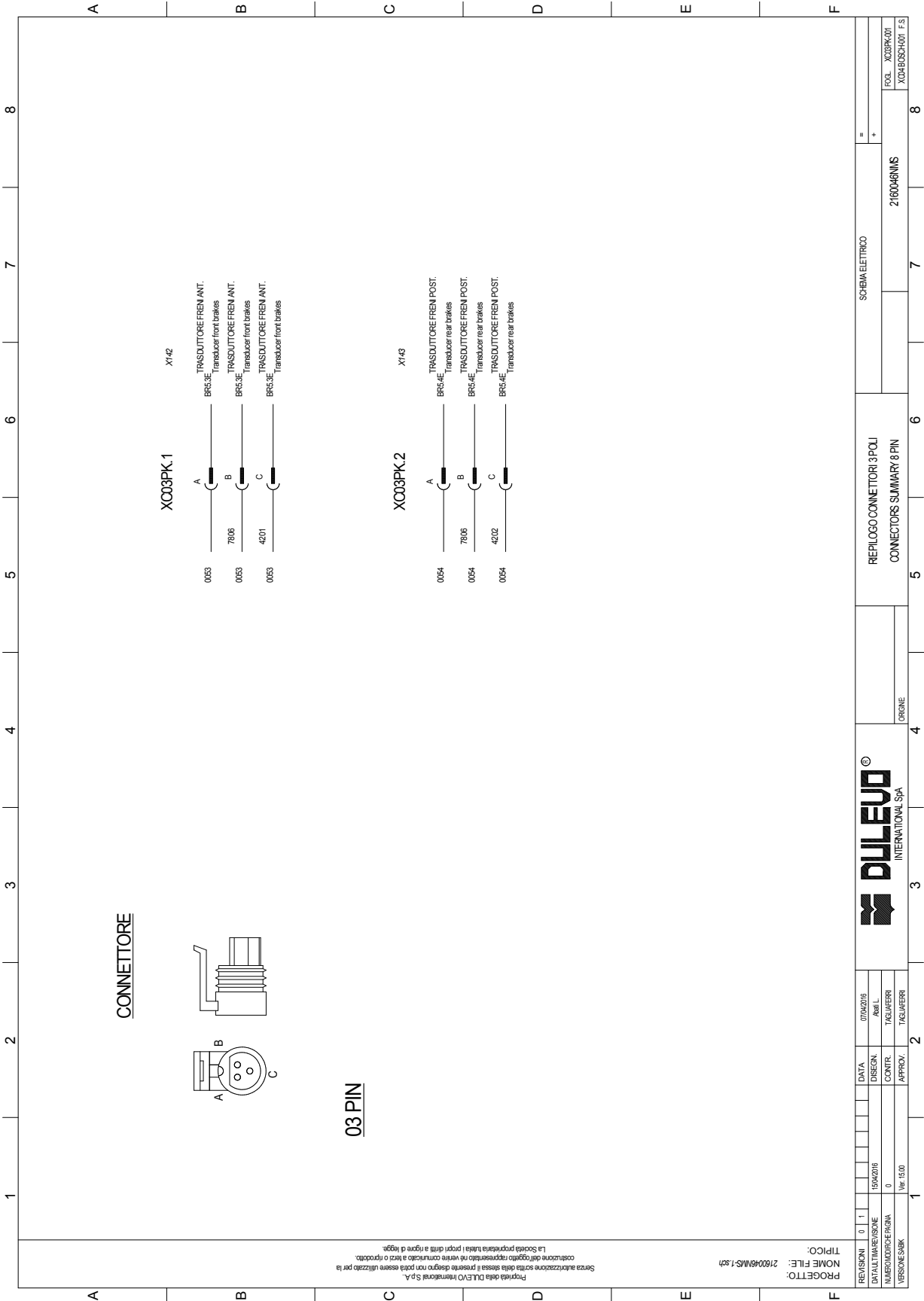
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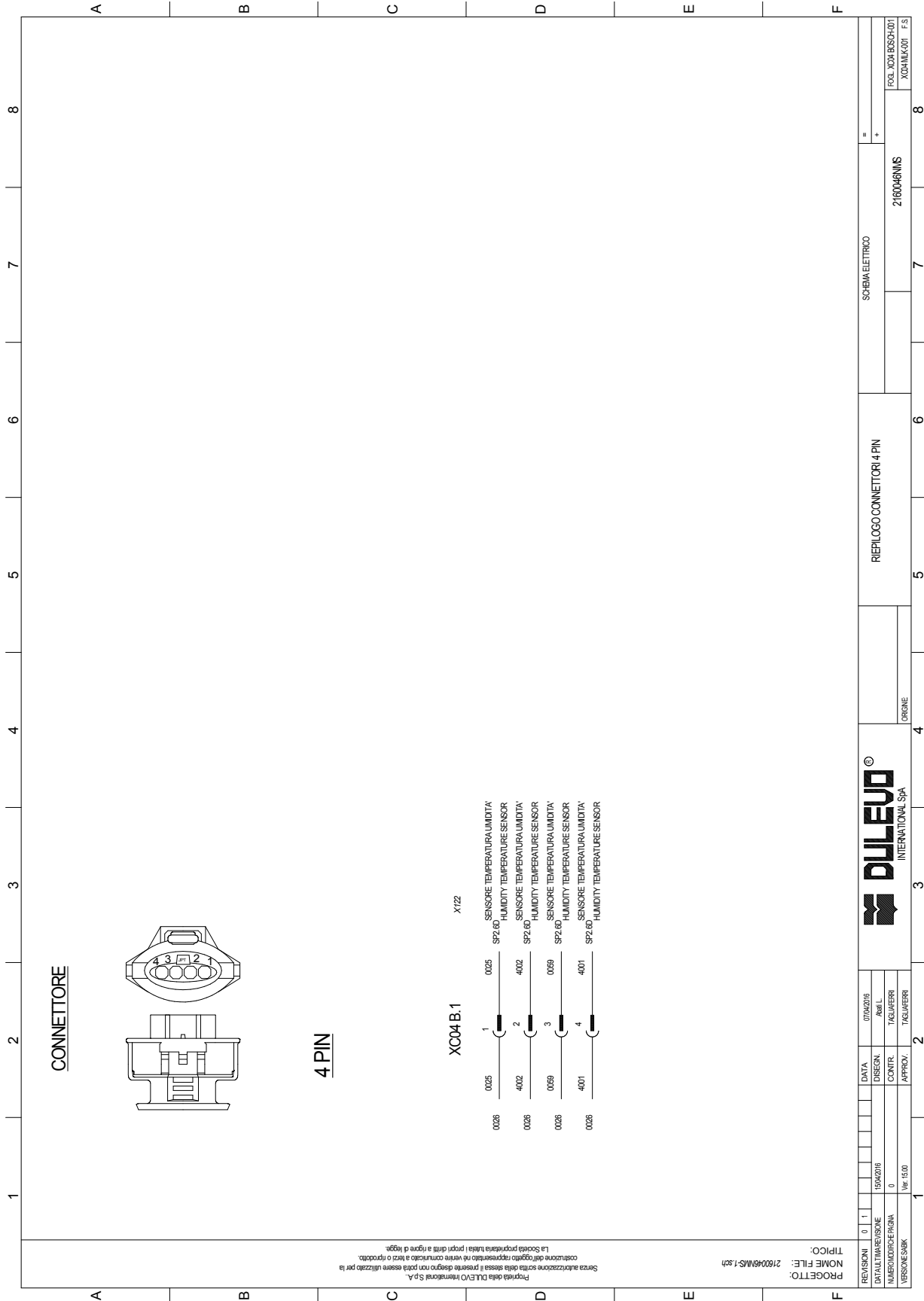
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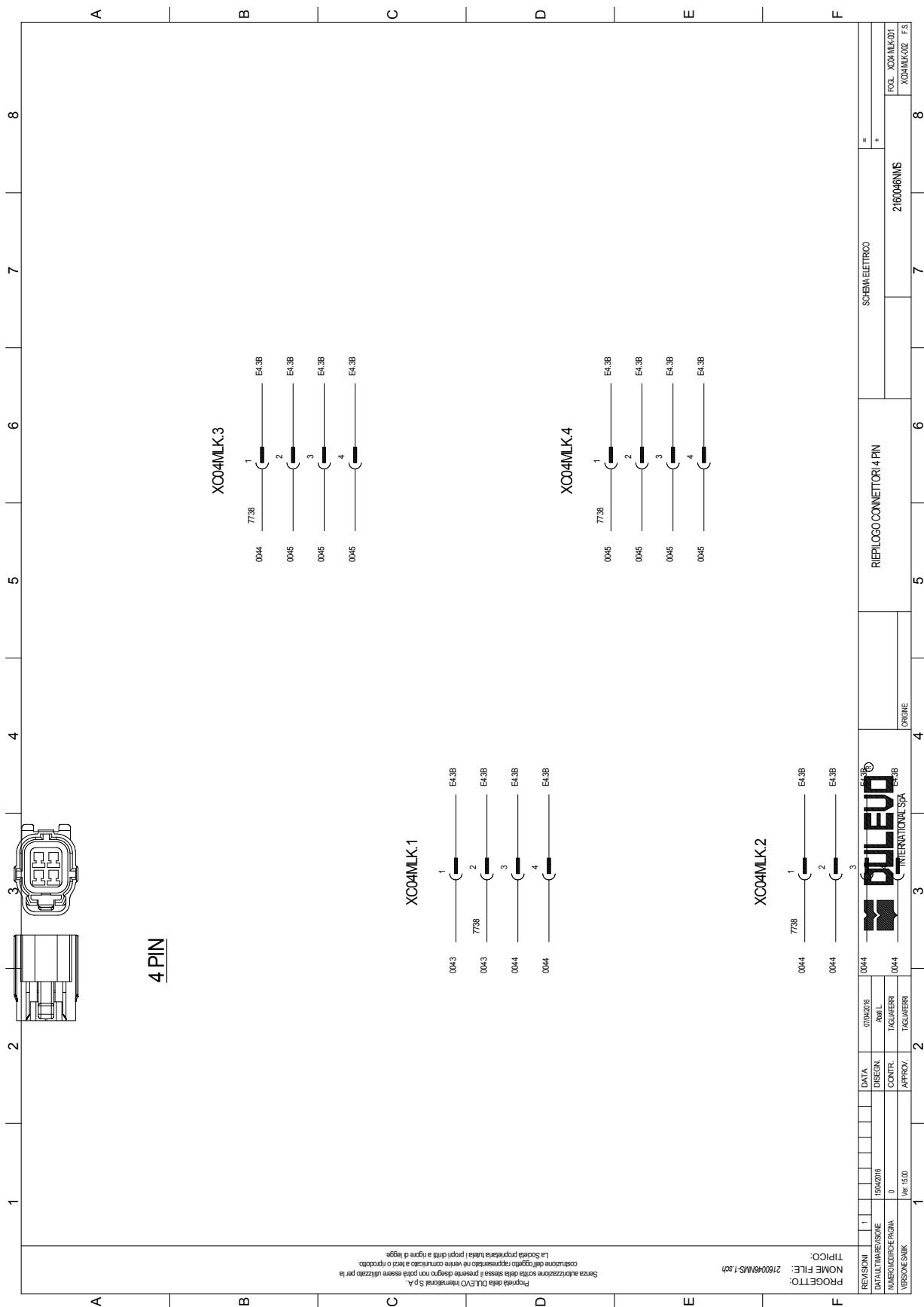
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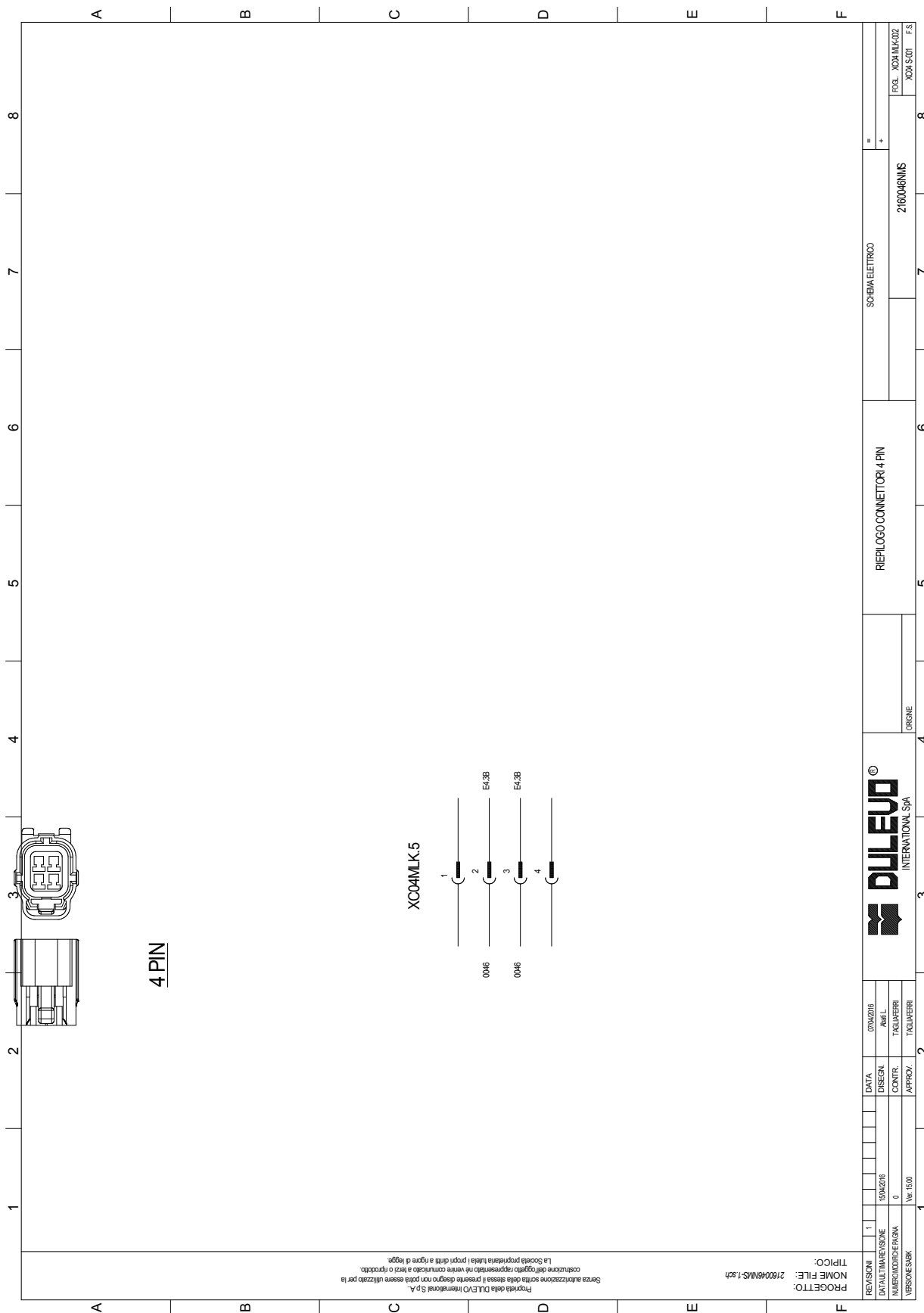






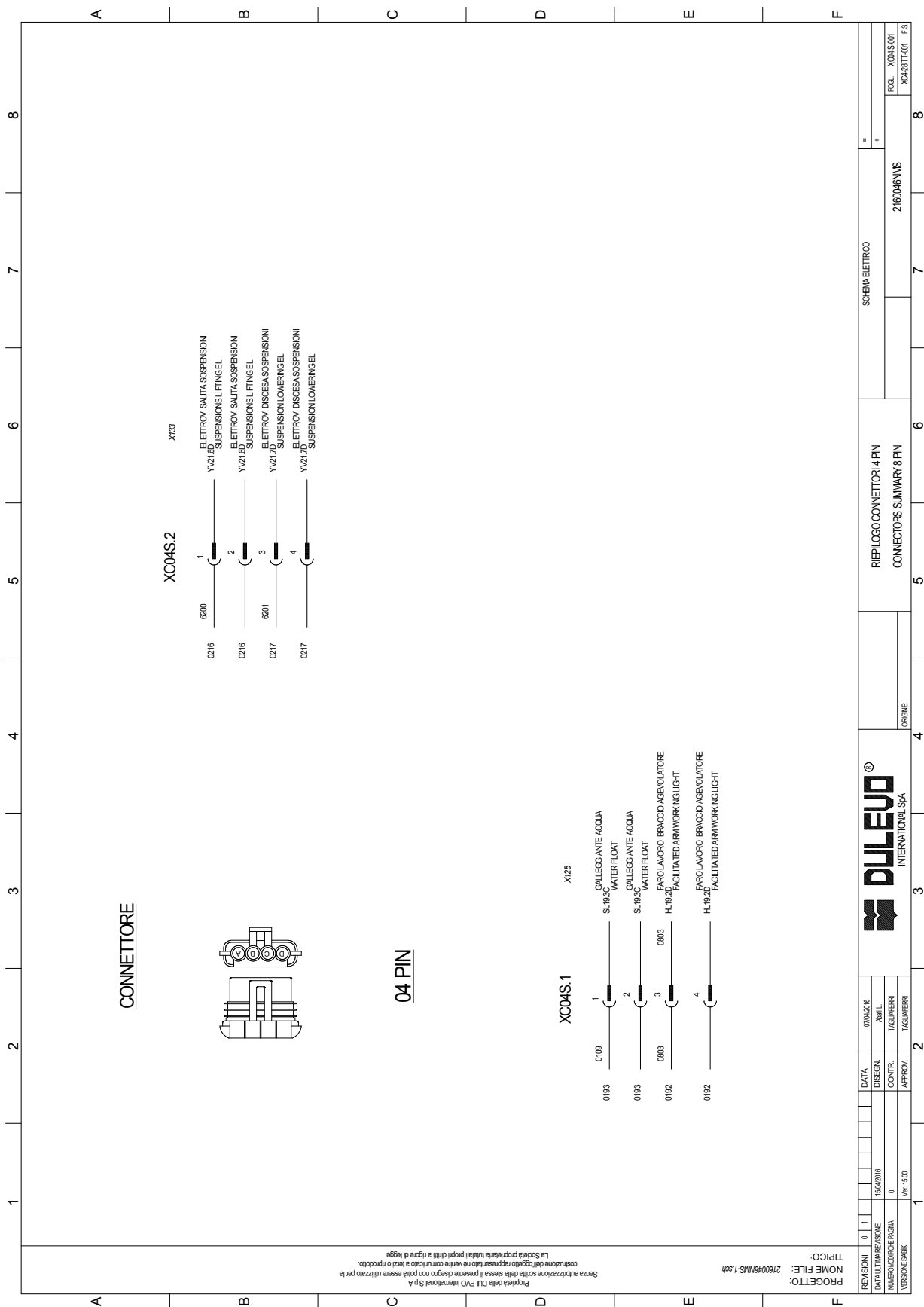


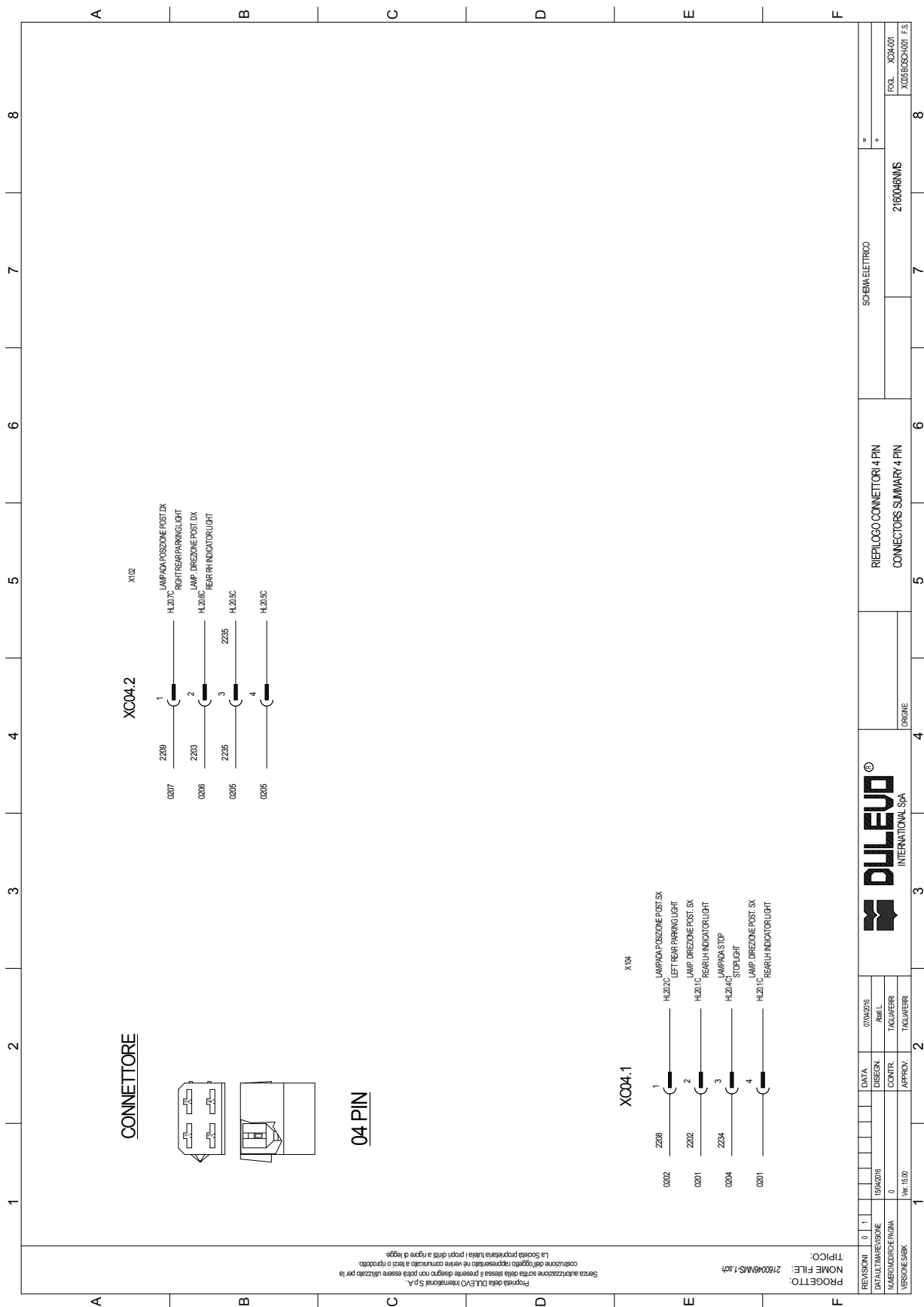


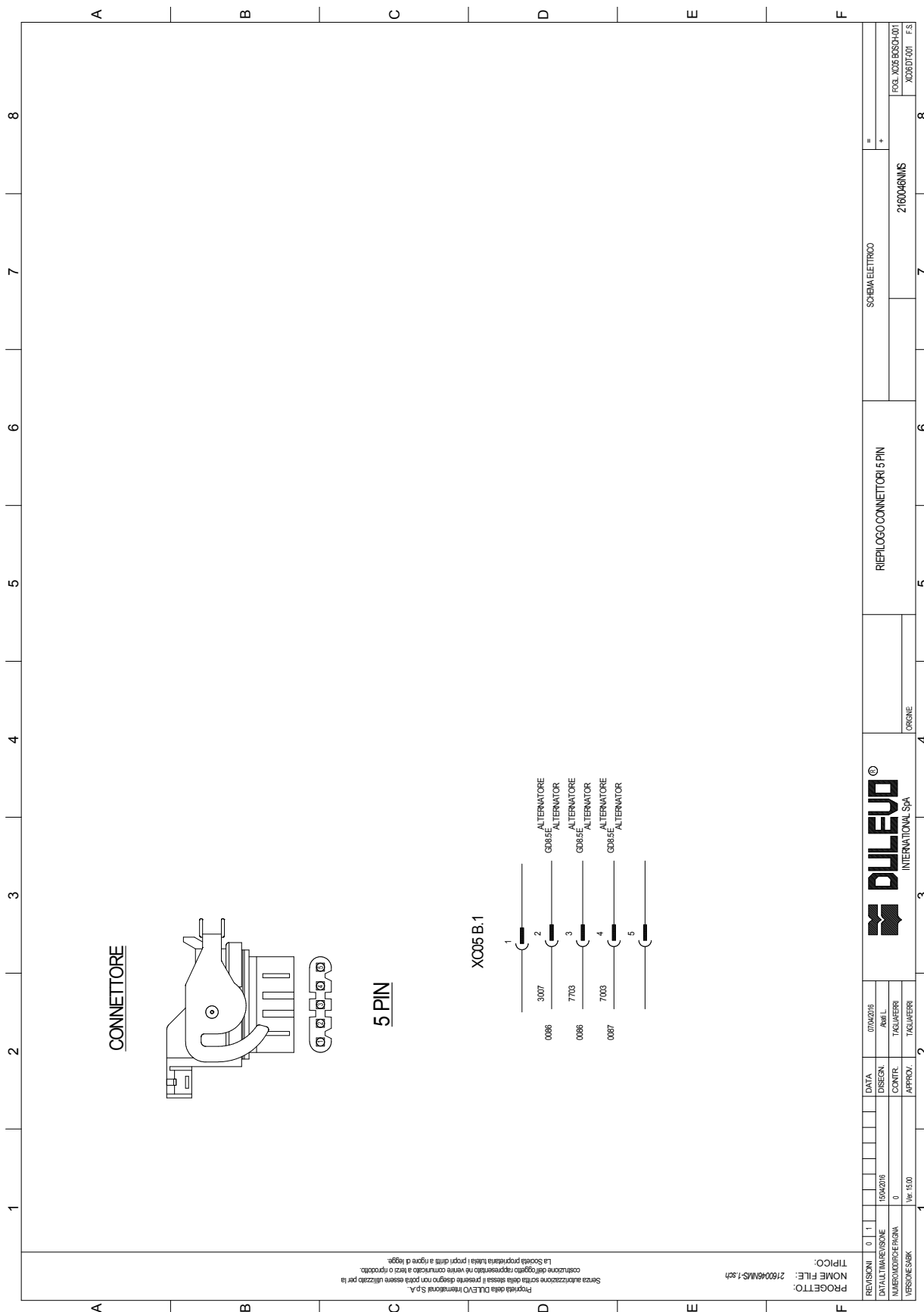


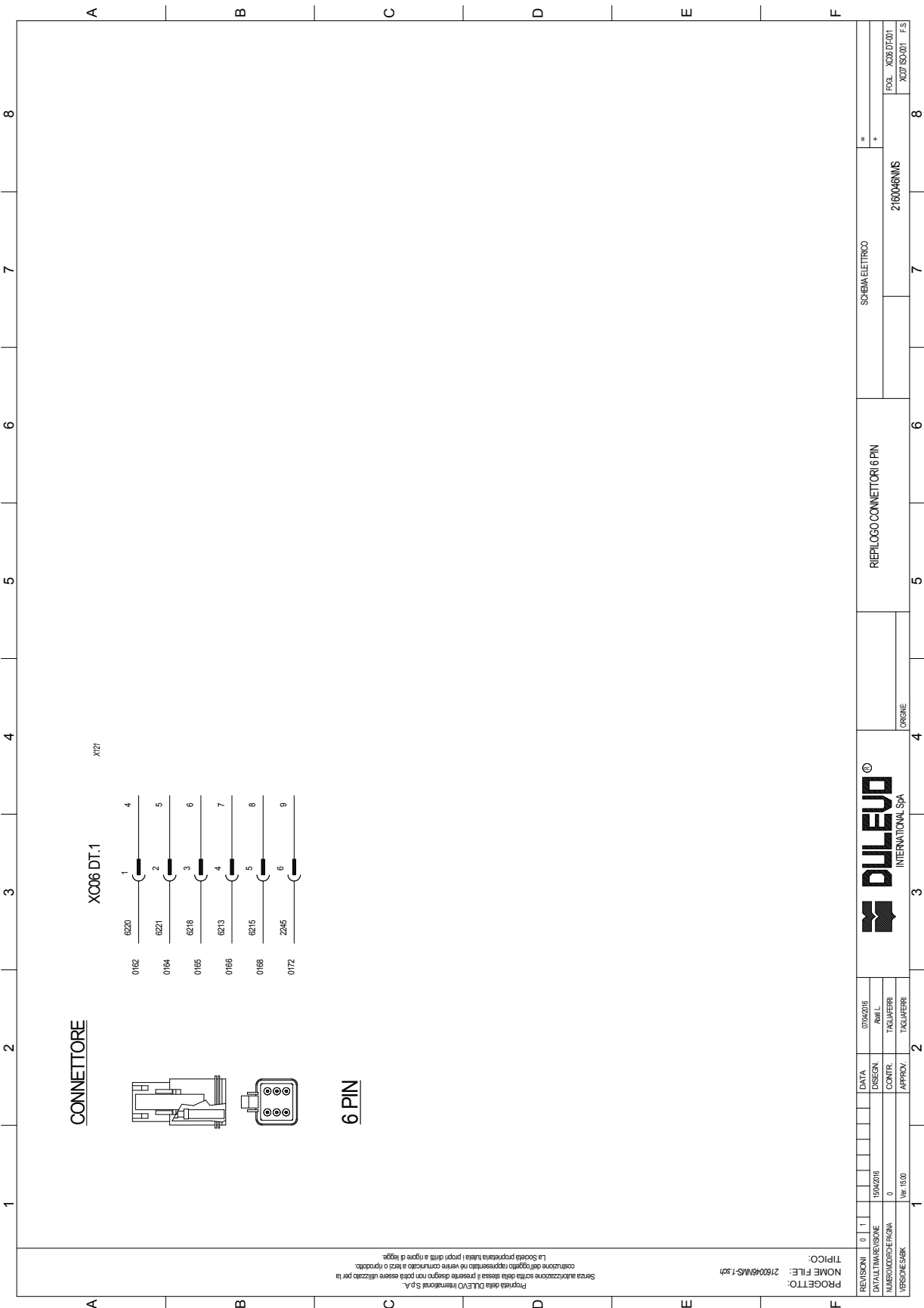
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COMBI











CONNETTORE

7 PIN

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PROGETTO:
2160046NMS.1.sch

TIPO:
XC07ISO.1

REVISIONI
1

DATA
07/04/2016

DATA ULTIMA REVISIONE
15/04/2016

NUMERO DI REVISIONE
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VERSIONE SABC
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DATA
07/04/2016

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APPROV.
TAGLIAFERRI

ORIGINE

RIEPILOGO CONNETTORI 7 PIN

SCHEMA ELETTRICO

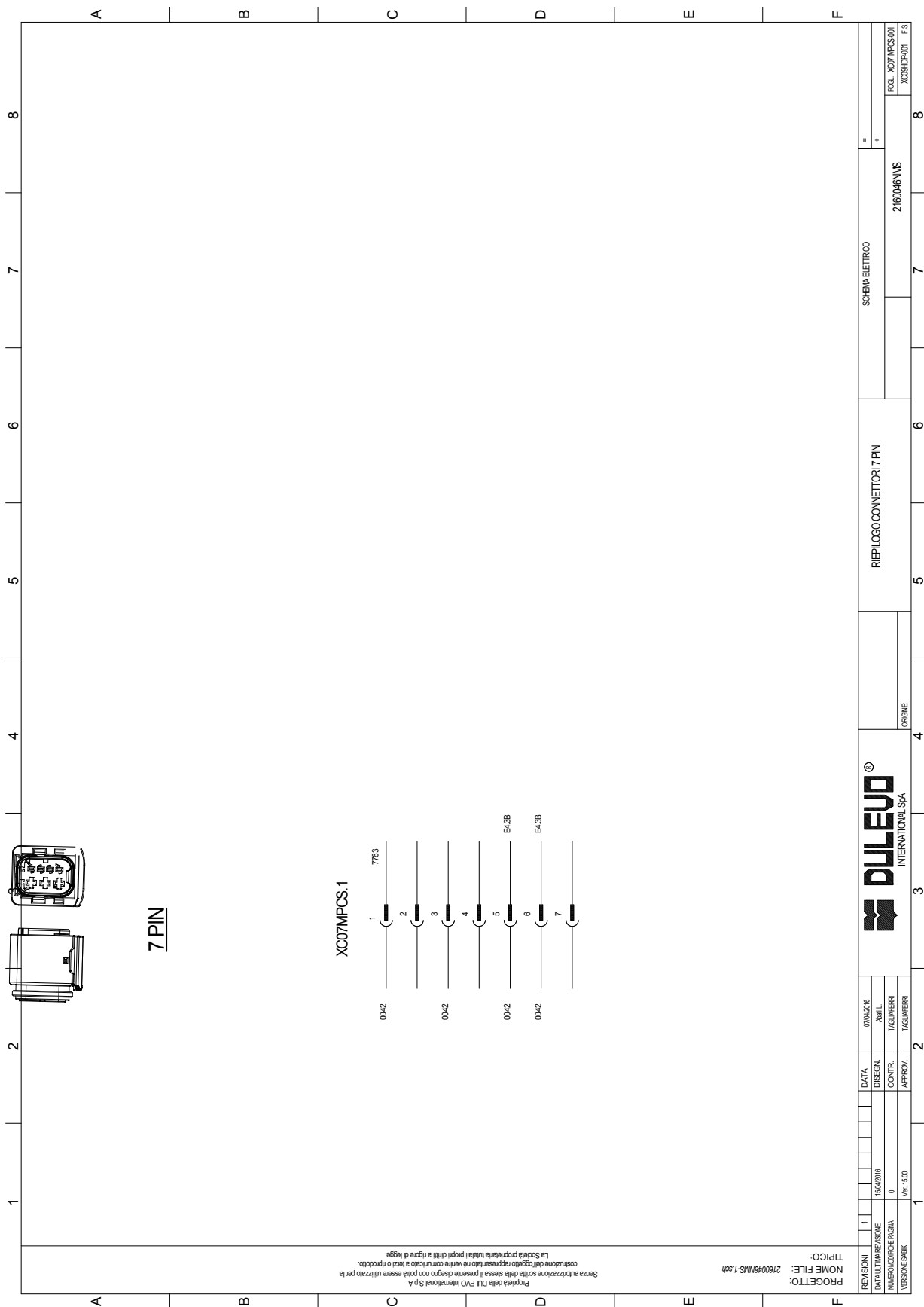
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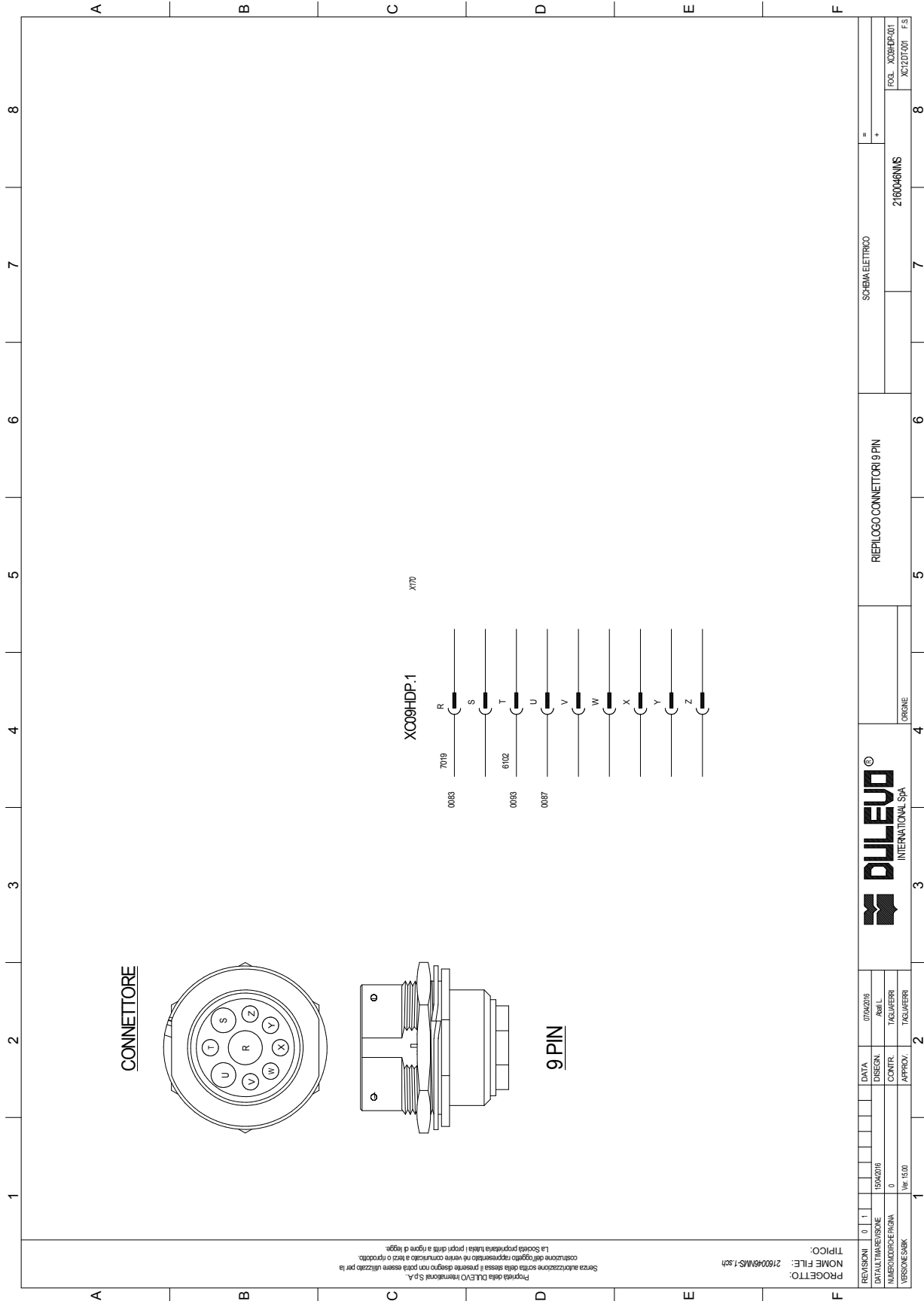
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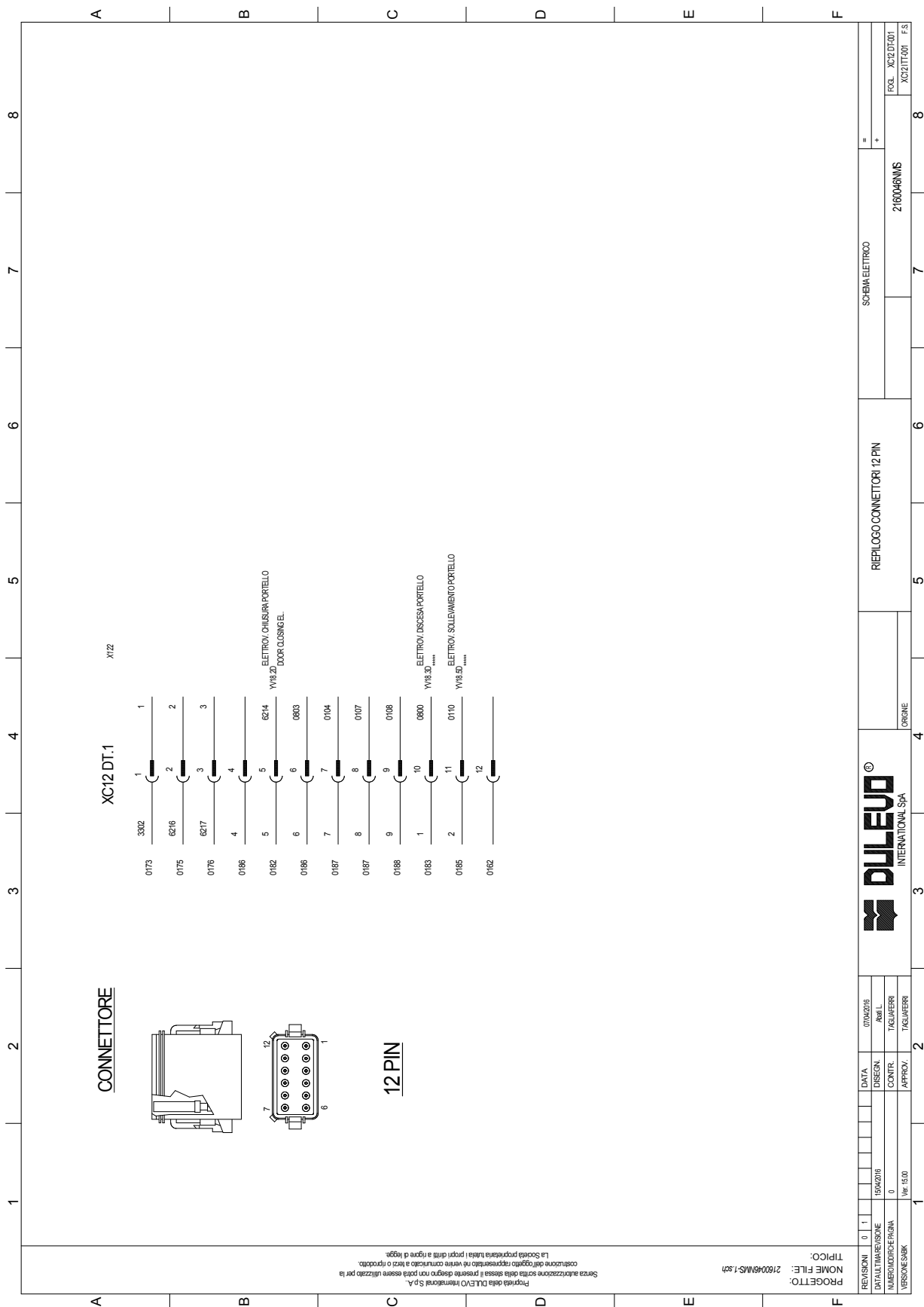
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costruzione dell'oggetto rappresentato né venire comunicato a terzi o riprodotto.
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COMBI



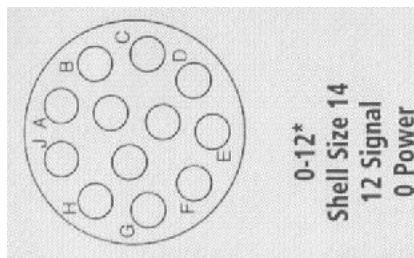


6000 6000
COMBI





CONNETTORE



12 PIN

XC12ITT.1

X100

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0206	2203	B	2203	LAMP DIREZIONE POST. DX H120 1C REAR R INDICATOR LIGHT
0207	2209	C	2209	
0202	2208	D	2208	
0208	2229	E	2229	
0204	2228	F	2228	LAMPADA RETROVIEGIA H120 4C REAR FOOT LIGHT
0204	2234	G	2234	
0201		H	N	LAMP DIREZIONE POST. SX H120 1C REAR L INDICATOR LIGHT
		J		
		K		
		L		
		M		

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PROGETTO:
NOME FILE: 2160048NMS.1.sch
TIPOCO:

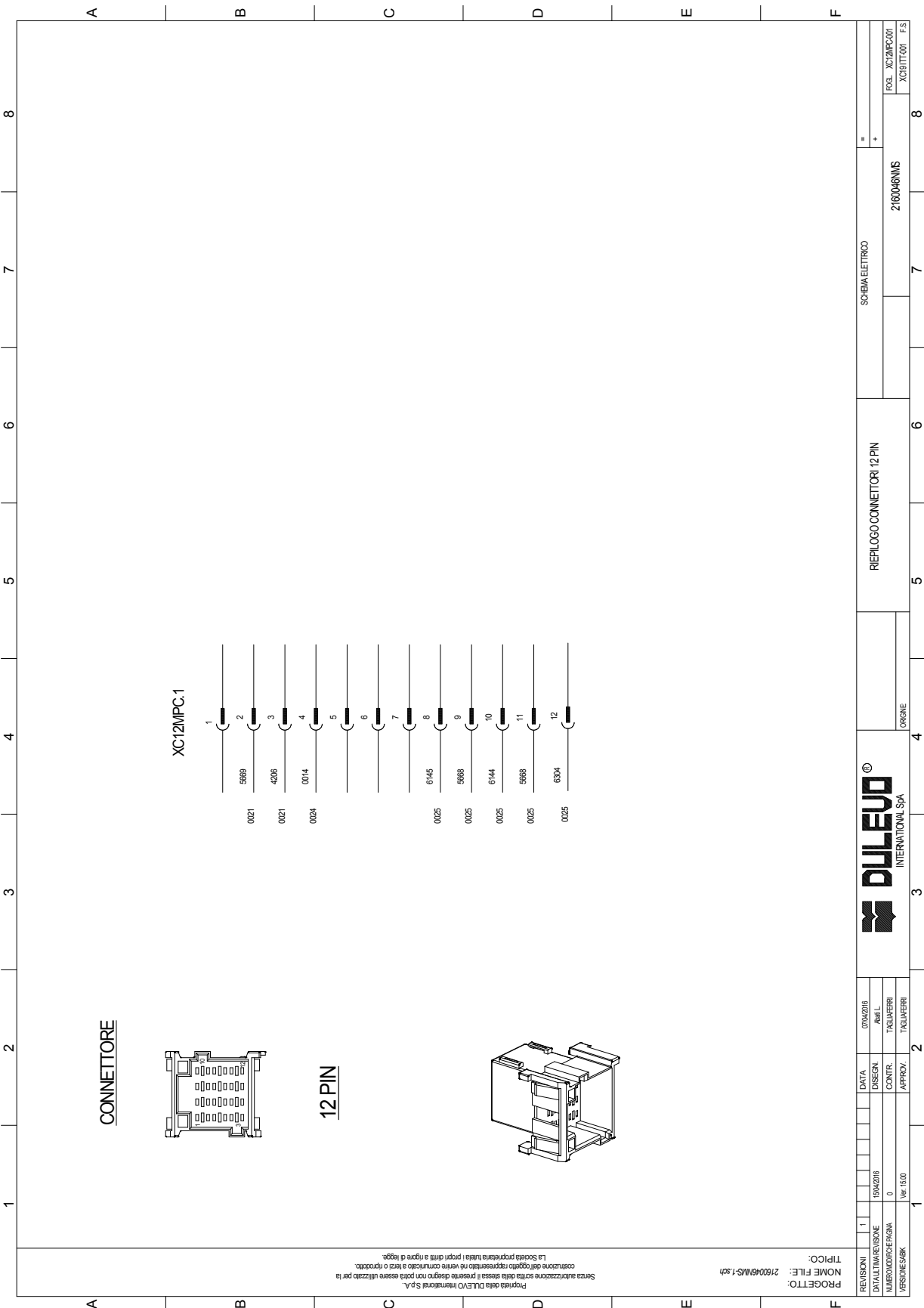
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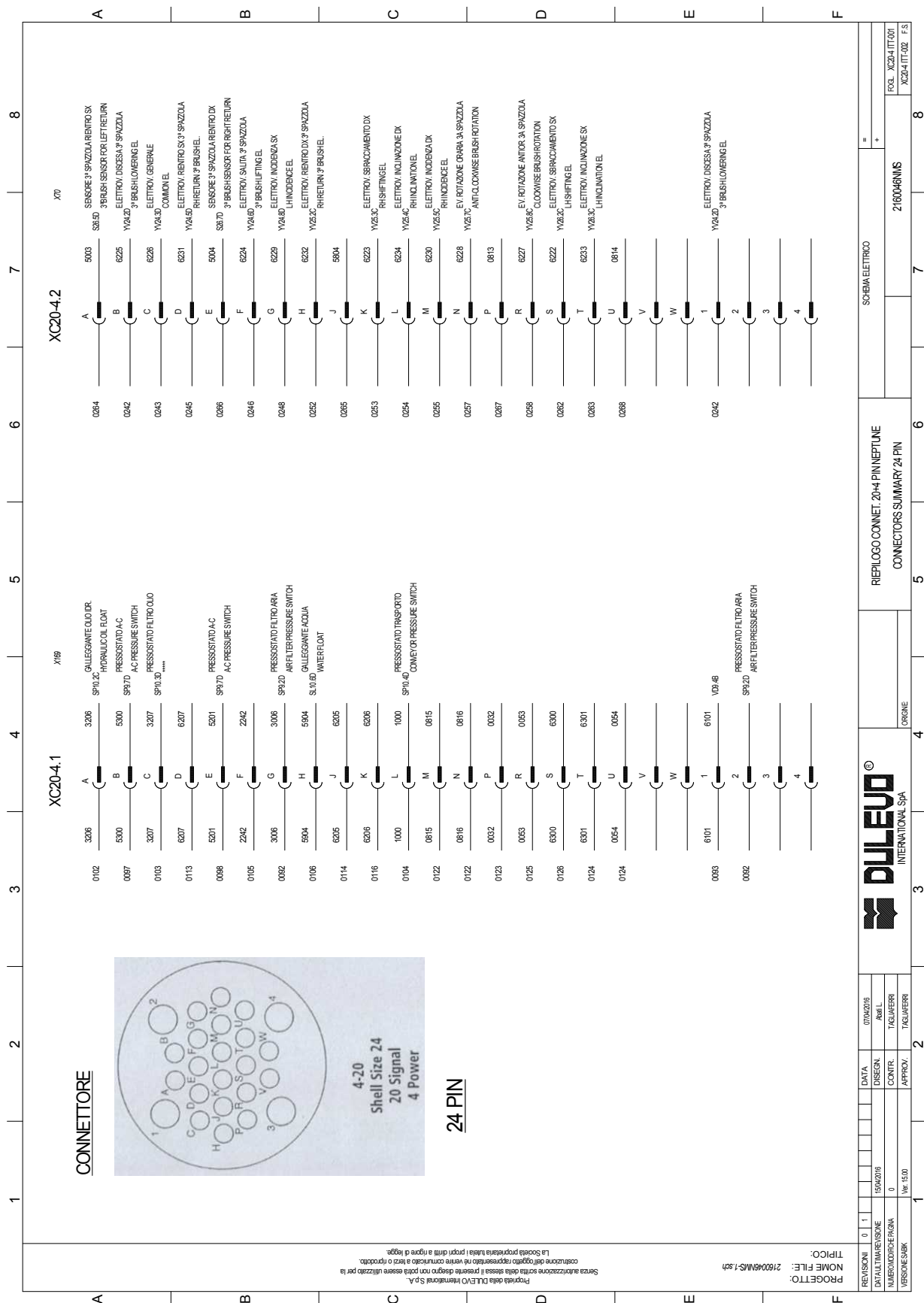


RIPILOGO CONNET. 12 PIN NEPTUNE
CONNECTORS SUMMARY 12 PIN

SCHEMA ELETTRICO
2160048NMS

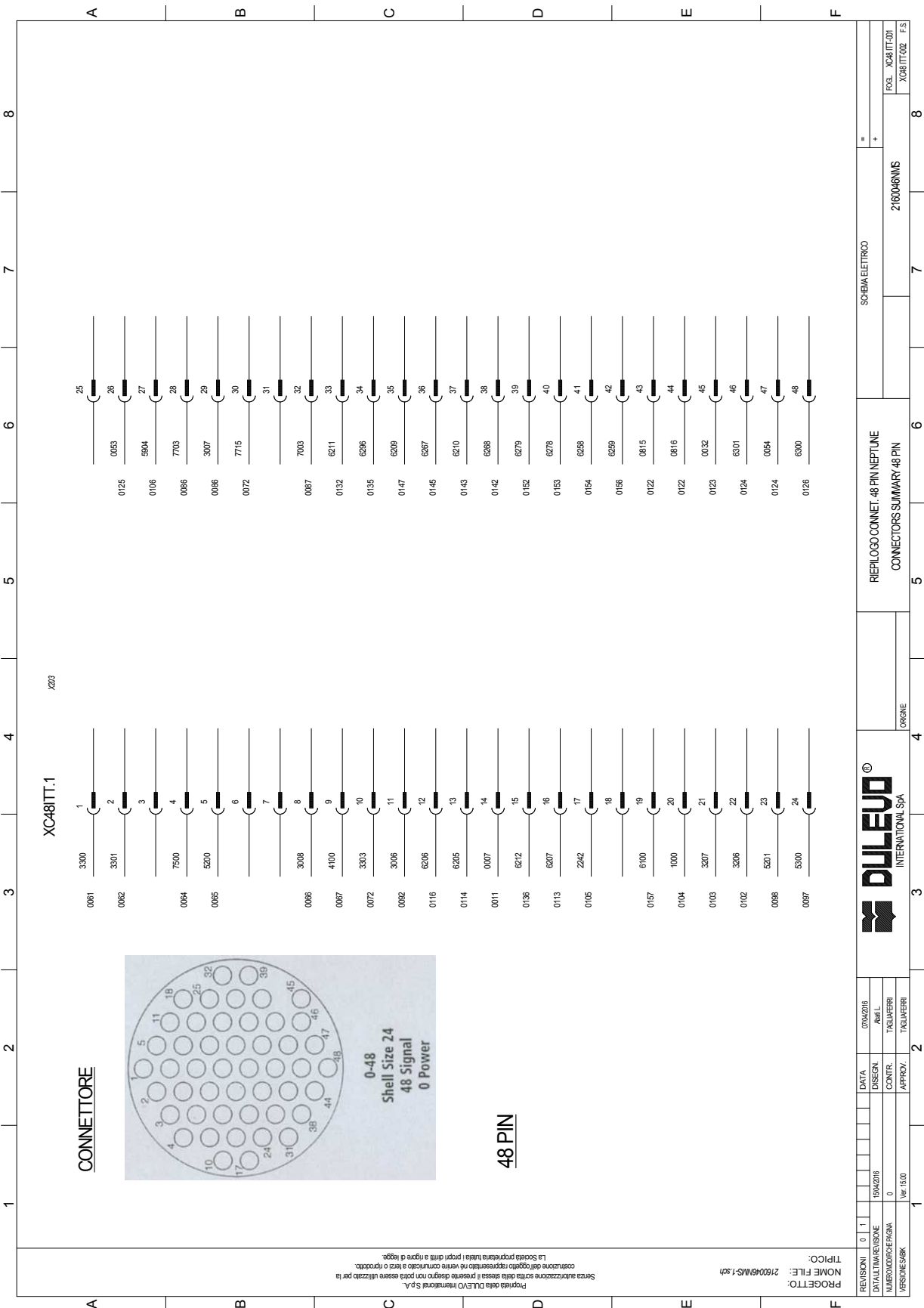
F001 XC12ITT.001
XC12MPC.001 F.S.







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PROGETTO: 216004NIMS-1.sch										TIPICO:		REVISIONI		01		01	
SENZA AUTORIZZAZIONE SCRITTA EMESSA IL PRESENTE DISEGNO NON POTRÀ ESSERE UTILIZZATO PER LA COSTRUZIONE DELL'OGGETTO RAPPRESENTATO NE VENIRÀ COMUNICATO A TERZI O RIPRODOTTO.										DATA		07/04/2016		01		01	
La Società proprietaria tutela i propri diritti a norma di legge.										DISEGN.		07/04/2016		01		01	
Proprietà della DULEVO International S.p.A.										CONTR.		07/04/2016		01		01	
NUMERO DI PAGINE										APPROV.		07/04/2016		01		01	
VERSIONE SABC										APPROV.		07/04/2016		01		01	
DULEVO INTERNATIONAL SPA										APPROV.		07/04/2016		01		01	
RIPROLOGO CONNET. 48 PIN NEPTUNE										APPROV.		07/04/2016		01		01	
CONNECTORS SUMMARY 48 PIN										APPROV.		07/04/2016		01		01	
SCHEMA ELETTRICO										APPROV.		07/04/2016		01		01	
216004NIMS										APPROV.		07/04/2016		01		01	
FOL. XC48 ITT.02										APPROV.		07/04/2016		01		01	
XC48SCH001 F.S										APPROV.		07/04/2016		01		01	

PROGETTO: 216004NIMS-1.sch										TIPICO:		REVISIONI		01		01	
SENZA AUTORIZZAZIONE SCRITTA EMESSA IL PRESENTE DISEGNO NON POTRÀ ESSERE UTILIZZATO PER LA COSTRUZIONE DELL'OGGETTO RAPPRESENTATO NE VENIRÀ COMUNICATO A TERZI O RIPRODOTTO.										DATA		07/04/2016		01		01	
La Società proprietaria tutela i propri diritti a norma di legge.										DISEGN.		07/04/2016		01		01	
Proprietà della DULEVO International S.p.A.										CONTR.		07/04/2016		01		01	
NUMERO DI PAGINE										APPROV.		07/04/2016		01		01	
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RIPROLOGO CONNET. 48 PIN NEPTUNE										APPROV.		07/04/2016		01		01	
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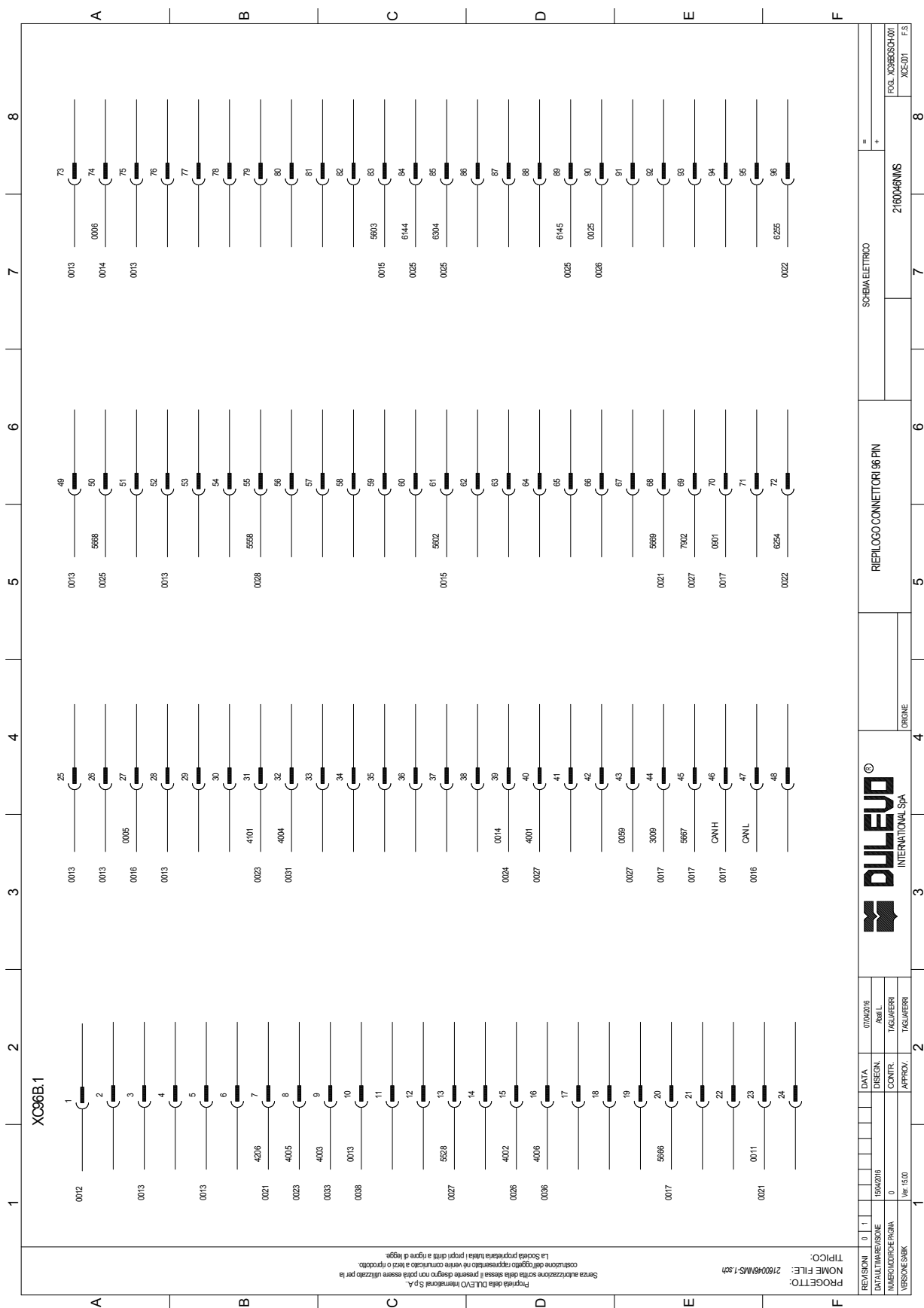
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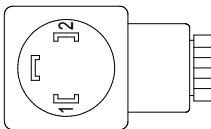
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SENZA AUTORIZZAZIONE SCRITTA DELLA DULEVO INTERNATIONAL S.p.A. IL PRESENTE DISEGNO NON POTRA' ESSERE UTILIZZATO PER LA COSTRUZIONE DELL'OGGETTO RAPPRESENTATO NE' VENIRE COMUNICATO A TERZI O RIPRODOTTO.									
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GALLEGGIANTE OIL									



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8

CONNETTORE

02 PIN

XCE.11

X180

0143 1 6210 EV DISCESA SPAZZOLA DX YH4.3D

0143 2 YH4.3D

XCE.12

X184

0144 1 6210 EV DISCESA ROTAZIONE DX YH4.4D

0144 2 YH4.4D

XCE.13

X178

0142 1 6268 EV SALTATA SPAZZOLA DX YH4.2D

0142 2 YH4.2D

XCE.14

X171

0152 1 6279 EV ACQUA SPAZZOLA SX YH5.2D

0152 2 LEFT BRUSH WATERSOLENIOID VALVE YH5.3D

XCE.15

X172

0153 1 6278 EV ACQUA SPAZZOLA SX YH5.3D

0153 2 LEFT BRUSH WATERSOLENIOID VALVE YH5.3D

XCE.16

X173

0154 1 6258 EV ACQUA SPAZZOLA DX YH5.4D

0154 2 YH5.4D

XCE.17

X174

0156 1 6259 EV ACQUA SPAZZOLA SX YH5.5D

0156 2 YH5.5D

XCE.18

X110

0162 1 6220 ELETTRICI/ASPIRATORE SUCTION PANEL YH6.2D

0162 2 ELETTRICI/ASPIRATORE SUCTION PANEL YH6.2D

XCE.19

X108

0164 1 6221 ELETTRICI/GENERALE COMMONEL YH6.4D

0164 2 ELETTRICI/GENERALE COMMONEL YH6.4D

XCE.20

X119

0165 1 6218 EV SOLEVAMENTO CONTENITORE Hopper lifting YH6.5D

0165 2 EV SOLEVAMENTO CONTENITORE Hopper lifting YH6.5D

A

B

C

D

E

F

A

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TIPO: 2160046NMS.1.sch

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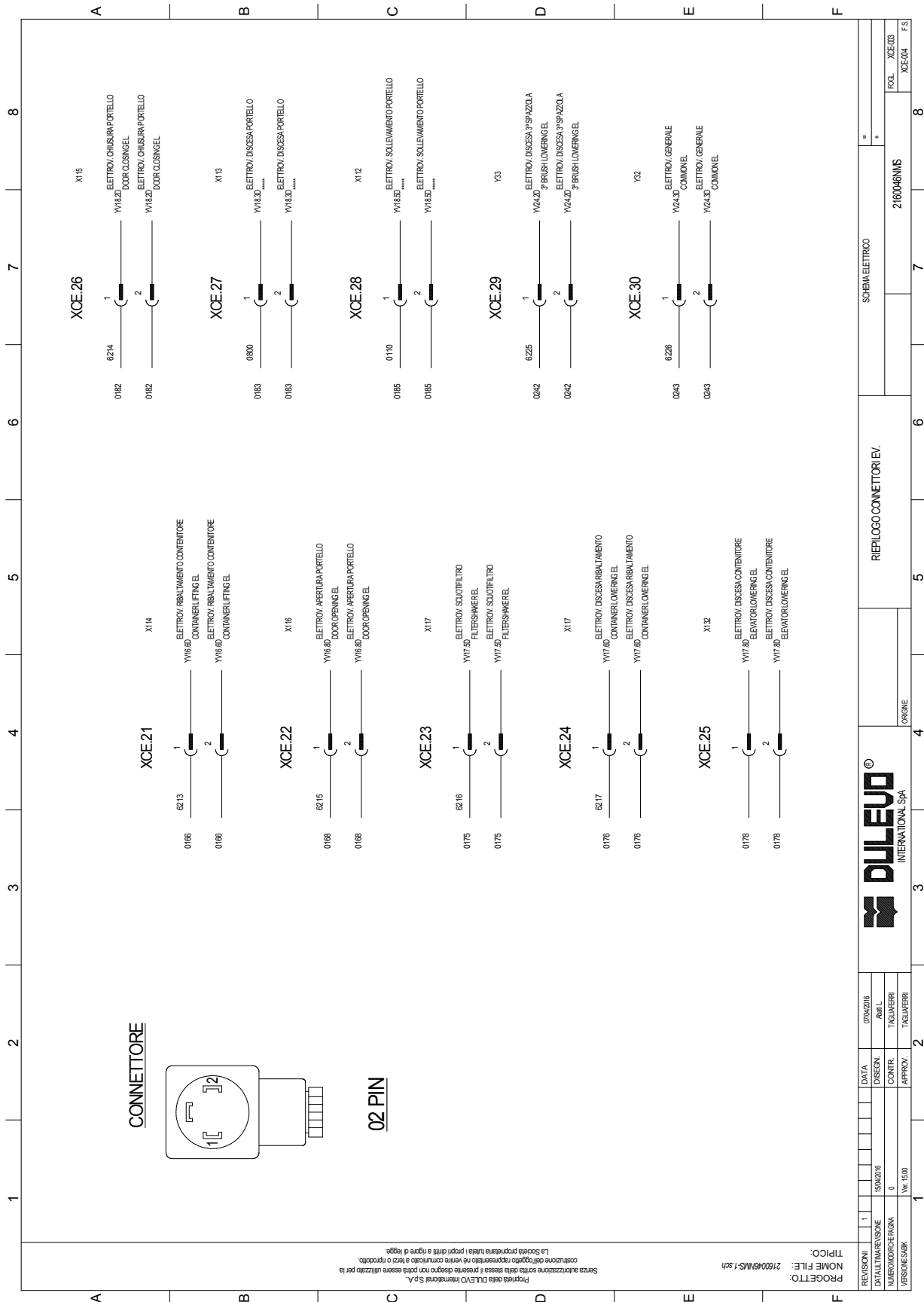
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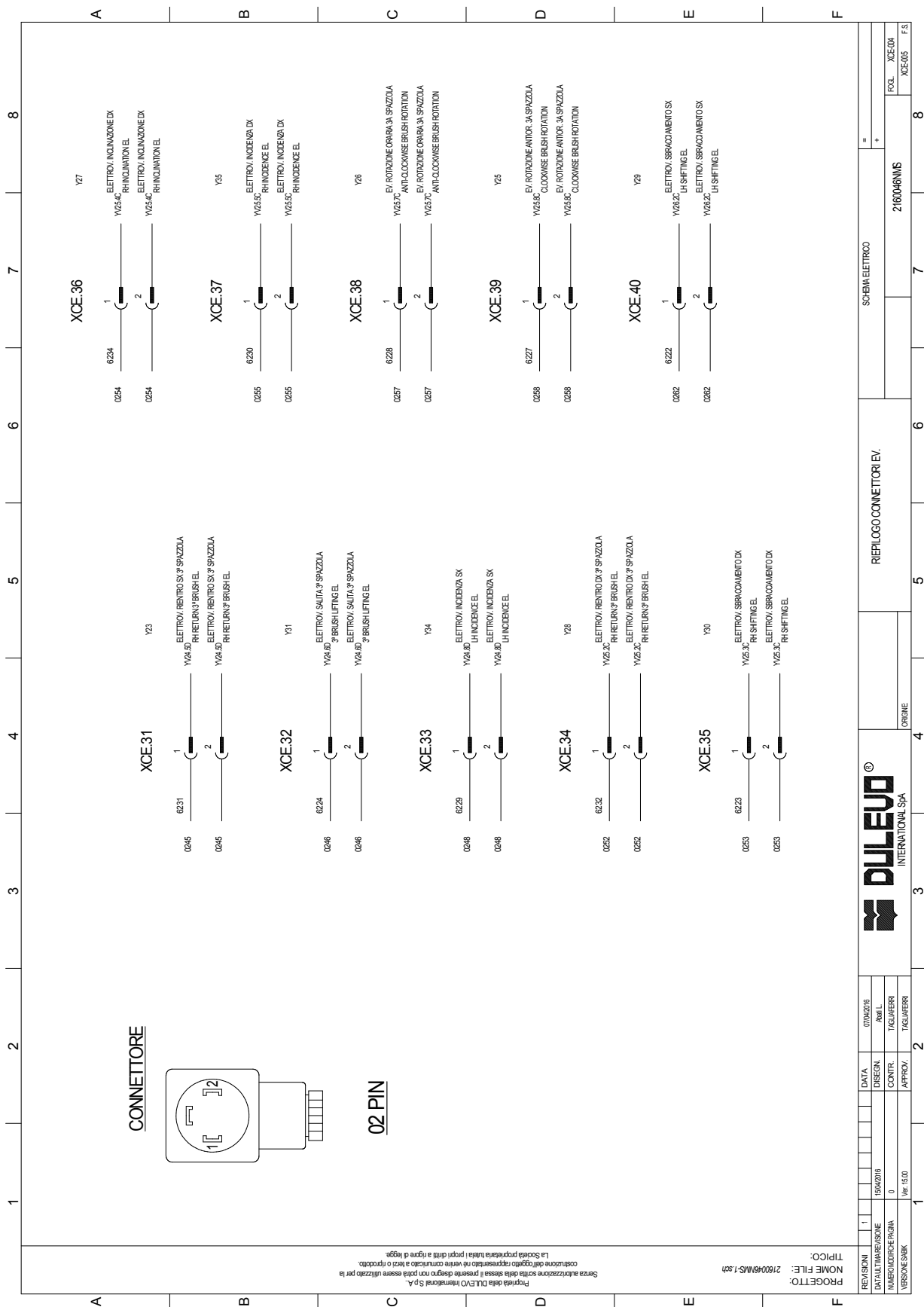
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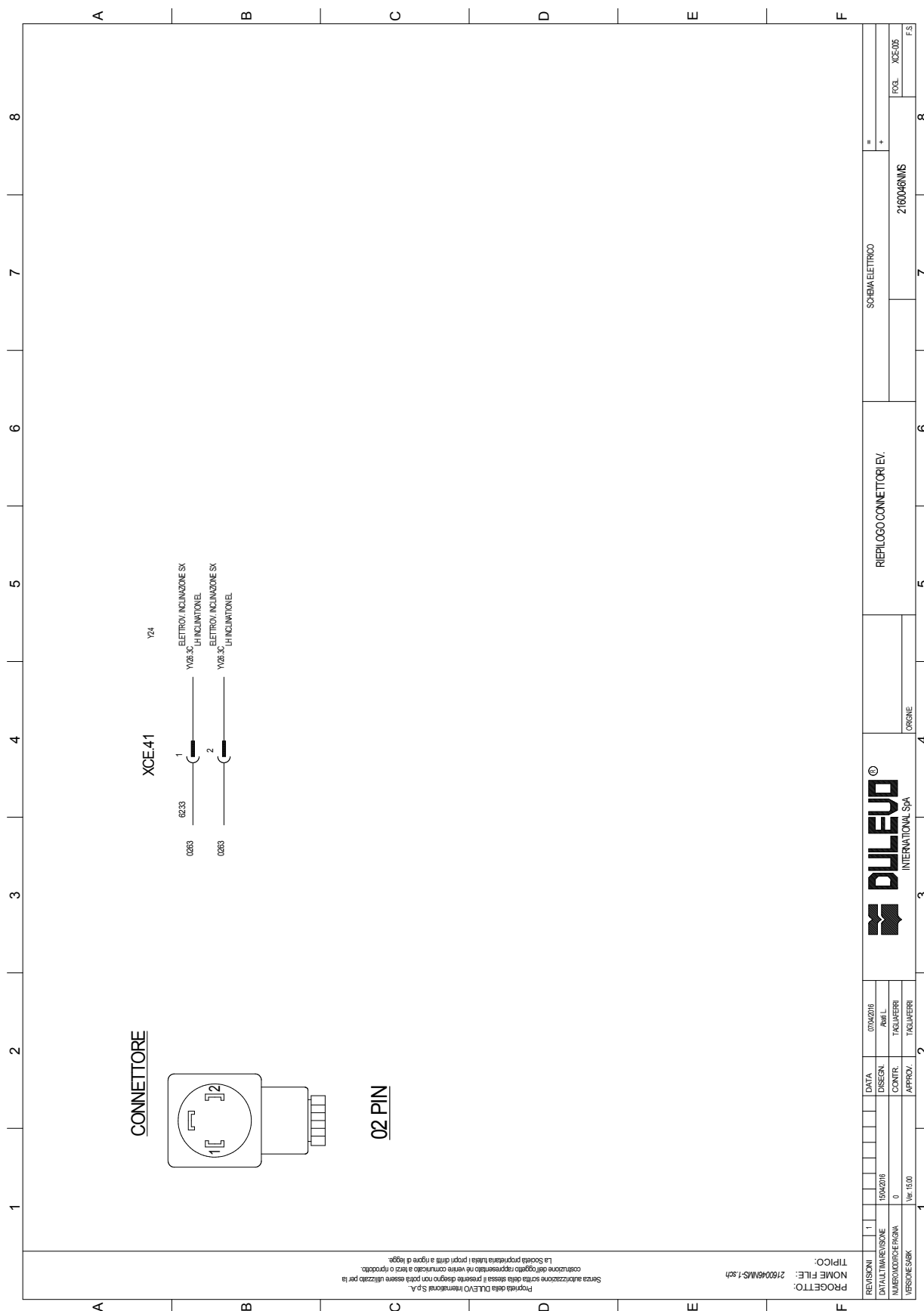
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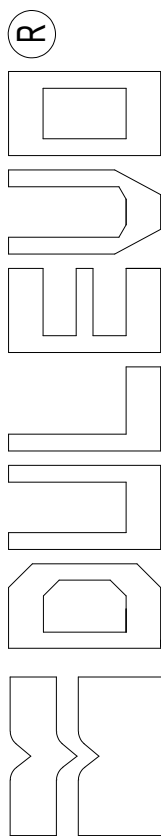
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INTERNATIONAL SpA

33012 FONTANELLO (PARMA) ITALY
VIA GIOVANNINO GUARESCHI N 1
TEL. 0521 827711 FAX. 0521 827797

Schema cabina
Cabin diagram

TABELLA COLORI
COLOUR TABLE

A	AZZURRO - AZURE
B	BIANCO - WHITE
C	ARANCIO - ORANGE
G	GIALLO - YELLOW
H	GRIGIO - GREY
L	BLU - BLUE
M	MARRONE - BROWN
N	NERO - BLACK
R	ROSSO - RED
S	ROSA - PINK
V	VERDE - GREEN
	VIOLA - VIOLET

NOTE: La colorazione dei fili bicolore viene indicata nella composizione delle sigle sopra indicate. Esempio: GV (colore Trasversale) – G-V (colore Longitudinale).
NOTE: The bicoloured wires are indicated with the composition of the above letters.
Example: GV (Transverse colour) – G-V (Longitudinal colour).

[illegible]



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N.ro pagina		Foglio		Descrizione		N.ro pagina		Foglio		Descrizione		N.ro pagina		Foglio	
1 / 34		0		INTESTAZIONE		20 / 34		XC03-001		RIPILOGO CONNETTORI 3 PIN		20 / 34		XC03-001	
2 / 34		0-LP-001		RIPILOGO PAGINE SCHEMA		21 / 34		XC04-001		RIPILOGO CONNETTORI 4 PIN		21 / 34		XC04-001	
3 / 34		1		COMANDO ELETTROVENTILATORE		22 / 34		XC05 ML-001		RIPILOGO CONNETTORI 5 PIN		22 / 34		XC05 ML-001	
4 / 34		2		COMANDO SPECCHI		23 / 34		XC05 MARK-001		RIPILOGO CONNETTORI 5 PIN		23 / 34		XC05 MARK-001	
5 / 34		3		AUTORADIO		24 / 34		XC06 MPC-001		RIPILOGO CONNETTORI 6 PIN		24 / 34		XC06 MPC-001	
6 / 34		4		FARO LAVORO		25 / 34		XC06-001		RIPILOGO CONNETTORI 6 PIN		25 / 34		XC06-001	
7 / 34		5		CENTRALINA FANDRIVE		26 / 34		XC08 ISO A-001		RIPILOGO CONNETTORI 8 PIN		26 / 34		XC08 ISO A-001	
8 / 34		6		MICROINTERRUTTORE SEDILE		27 / 34		XC08 ISO N-001		RIPILOGO CONNETTORI 8 PIN		27 / 34		XC08 ISO N-001	
9 / 34		7		FANALI		28 / 34		XC09 MPC-001		RIPILOGO CONNETTORI 9 PIN		28 / 34		XC09 MPC-001	
10 / 34		8		INDICATORI DI DIREZIONE		29 / 34		XC11-001		RIPILOGO CONNETTORI 11 PIN		29 / 34		XC11-001	
11 / 34		9		RELE SCAMBIO FANALI		30 / 34		XC13 DIN-001		RIPILOGO CONNETTORI 13 PIN		30 / 34		XC13 DIN-001	
12 / 34		10		DISPOSIZIONE COMPONENTI		31 / 34		XC18 MPC-001		RIPILOGO CONNETTORI 18 PIN		31 / 34		XC18 MPC-001	
13 / 34		11		ELETTROVENTILATORE CABINA		32 / 34		XC21 MPC-001		RIPILOGO CONNETTORI 21 PIN		32 / 34		XC21 MPC-001	
14 / 34		XC01-H-001		RIPILOGO CONNETTORI 1 PIN		33 / 34		XC24 JR IM-001		RIPILOGO CONNETTORI 24 PIN		33 / 34		XC24 JR IM-001	
15 / 34		XC02 DT-001		RIPILOGO CONNETTORI 2 PIN		34 / 34		XC35-001		RIPILOGO CONNETTORI 35 PIN		34 / 34		XC35-001	
16 / 34		XC02 S-001		RIPILOGO CONNETTORI 2 PIN											
17 / 34		XC02-001		RIPILOGO CONNETTORI 2 PIN											
18 / 34		XC03 DT-001		RIPILOGO CONNETTORI 3 PIN											
19 / 34		XC03 FB-001		RIPILOGO CONNETTORI 3 PIN											

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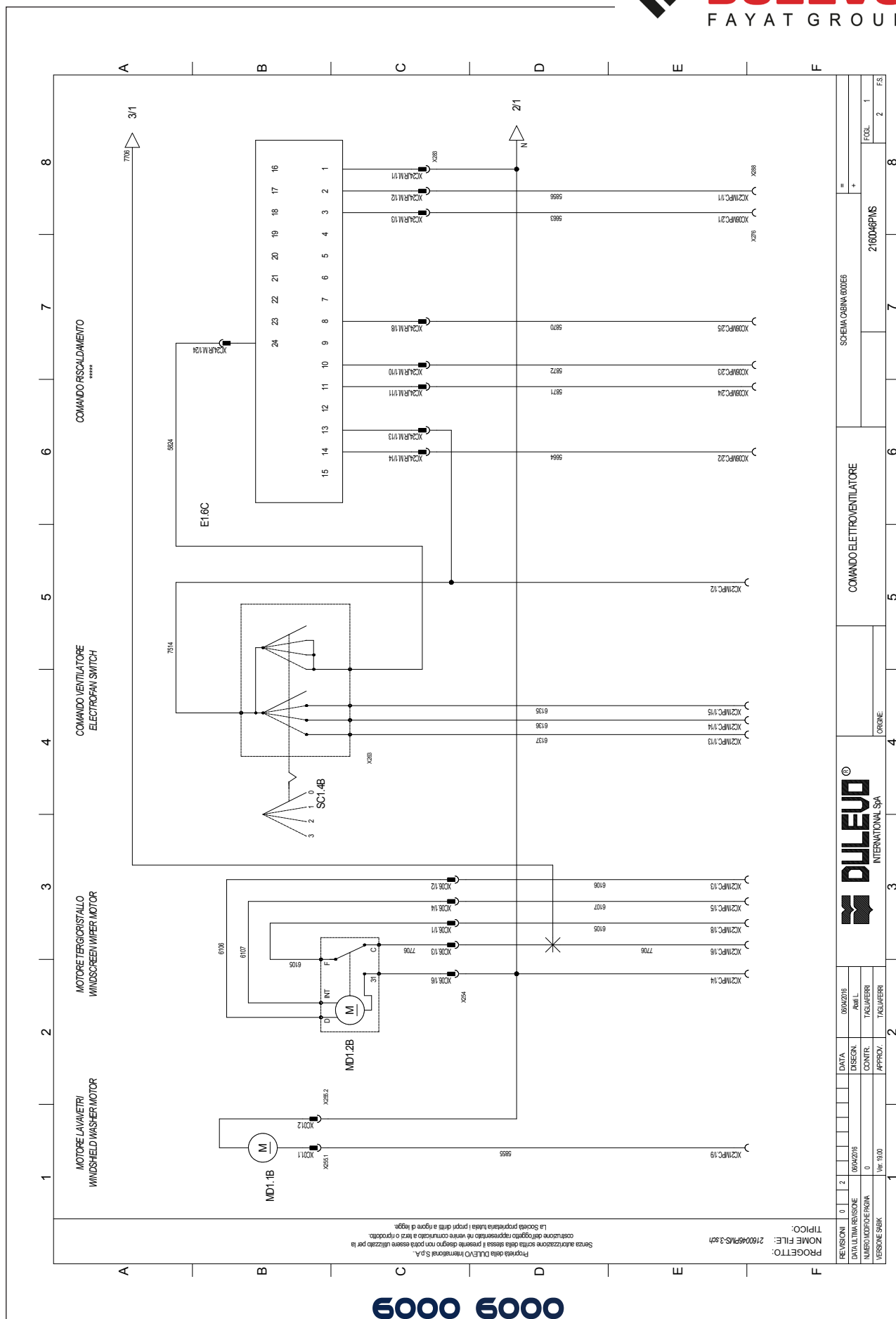
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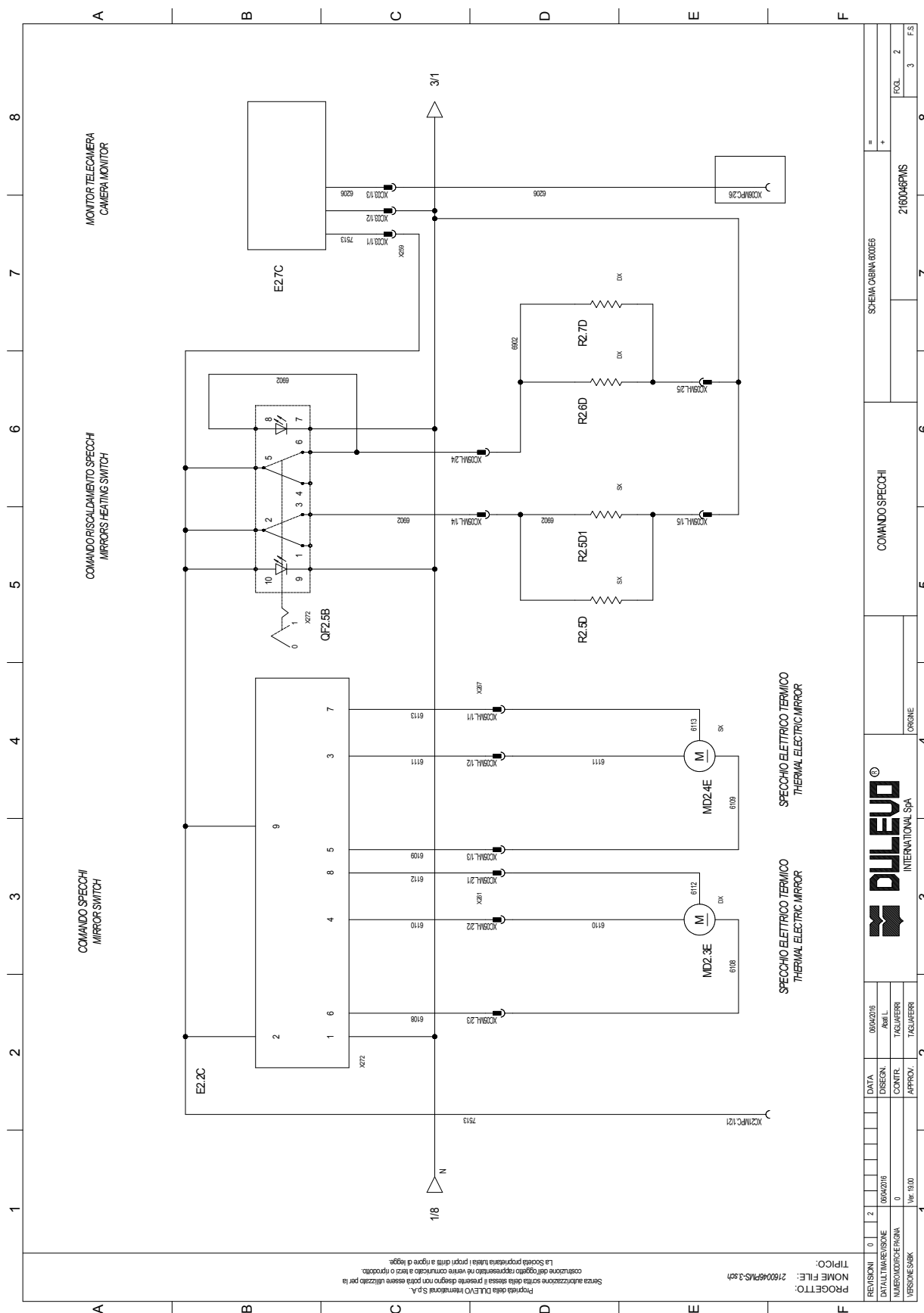
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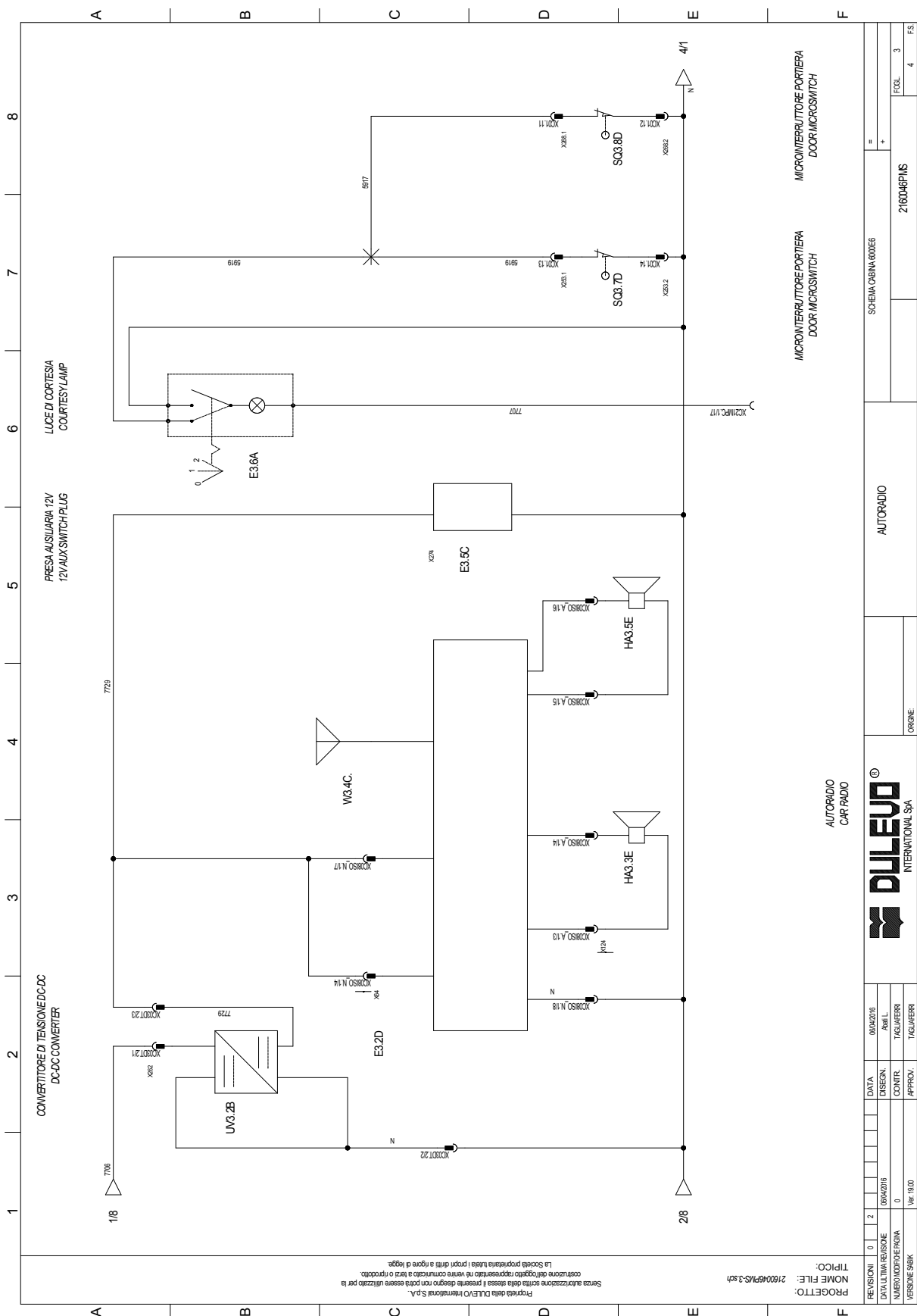
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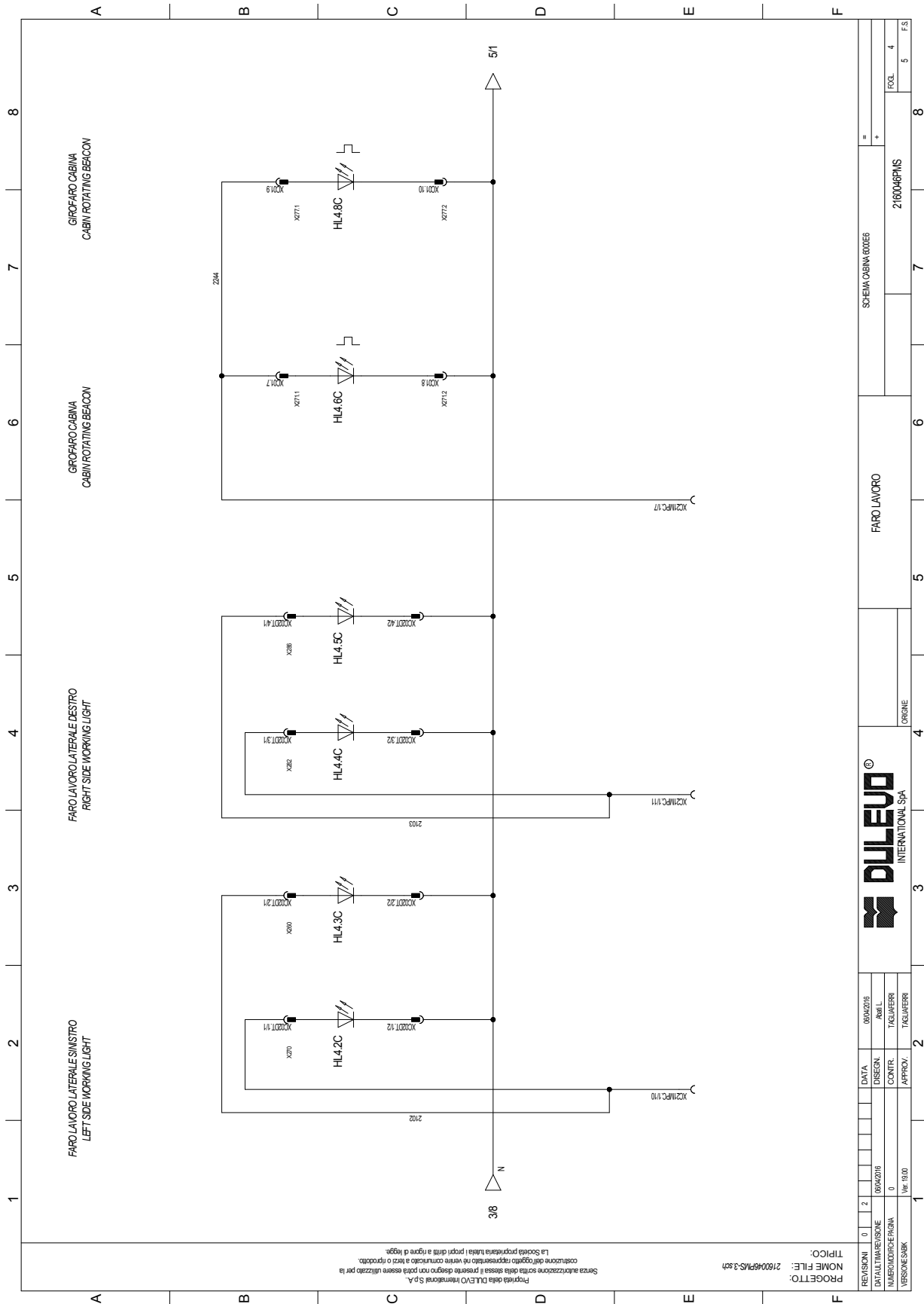
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Senza autorizzazione scritta della stessa il presente disegno non potrà essere utilizzato per la
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RIPILOGO PAGINE SCHEMA
SCHEMA CABINA 000E5
2160046PMS
FOL. 1
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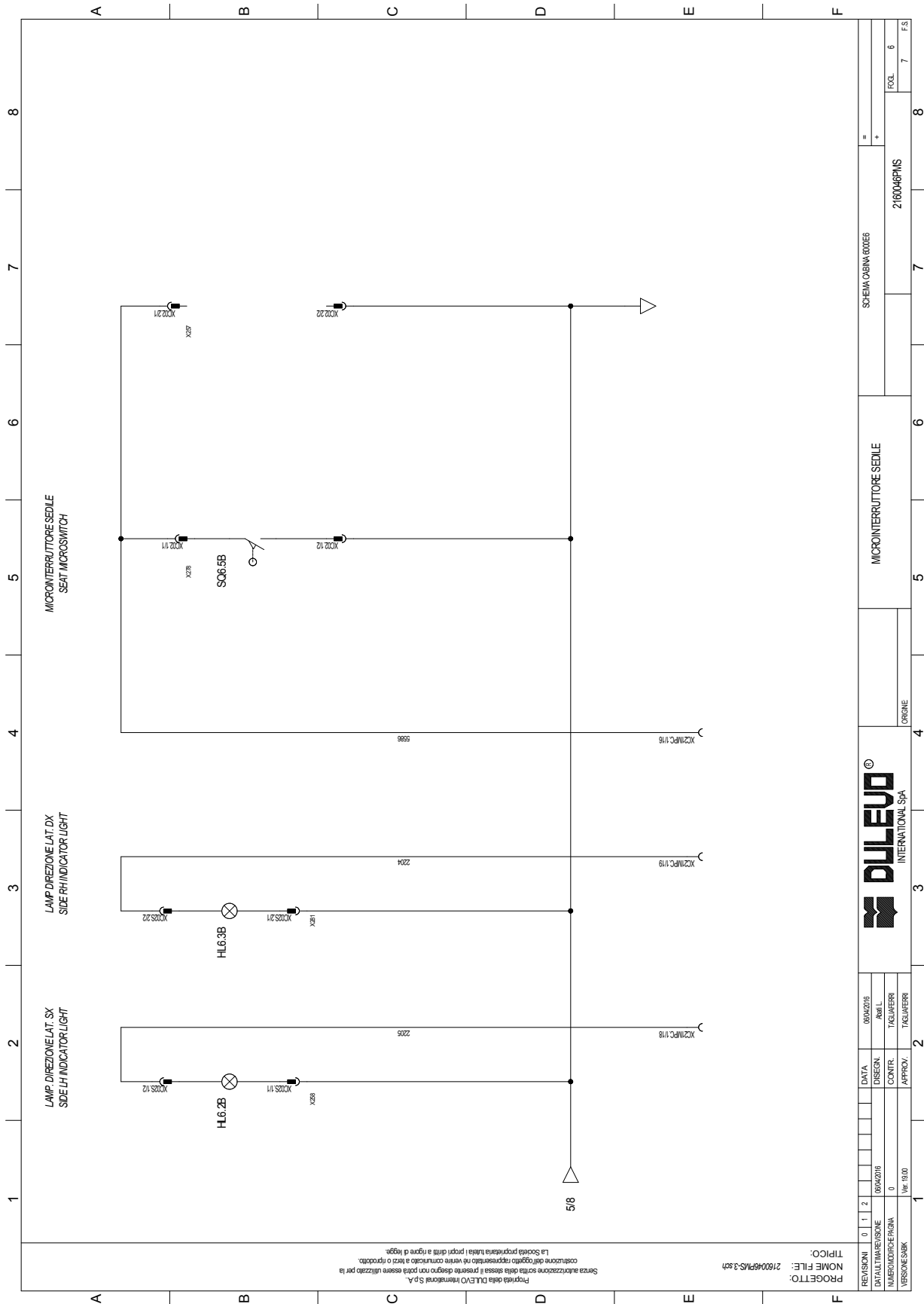




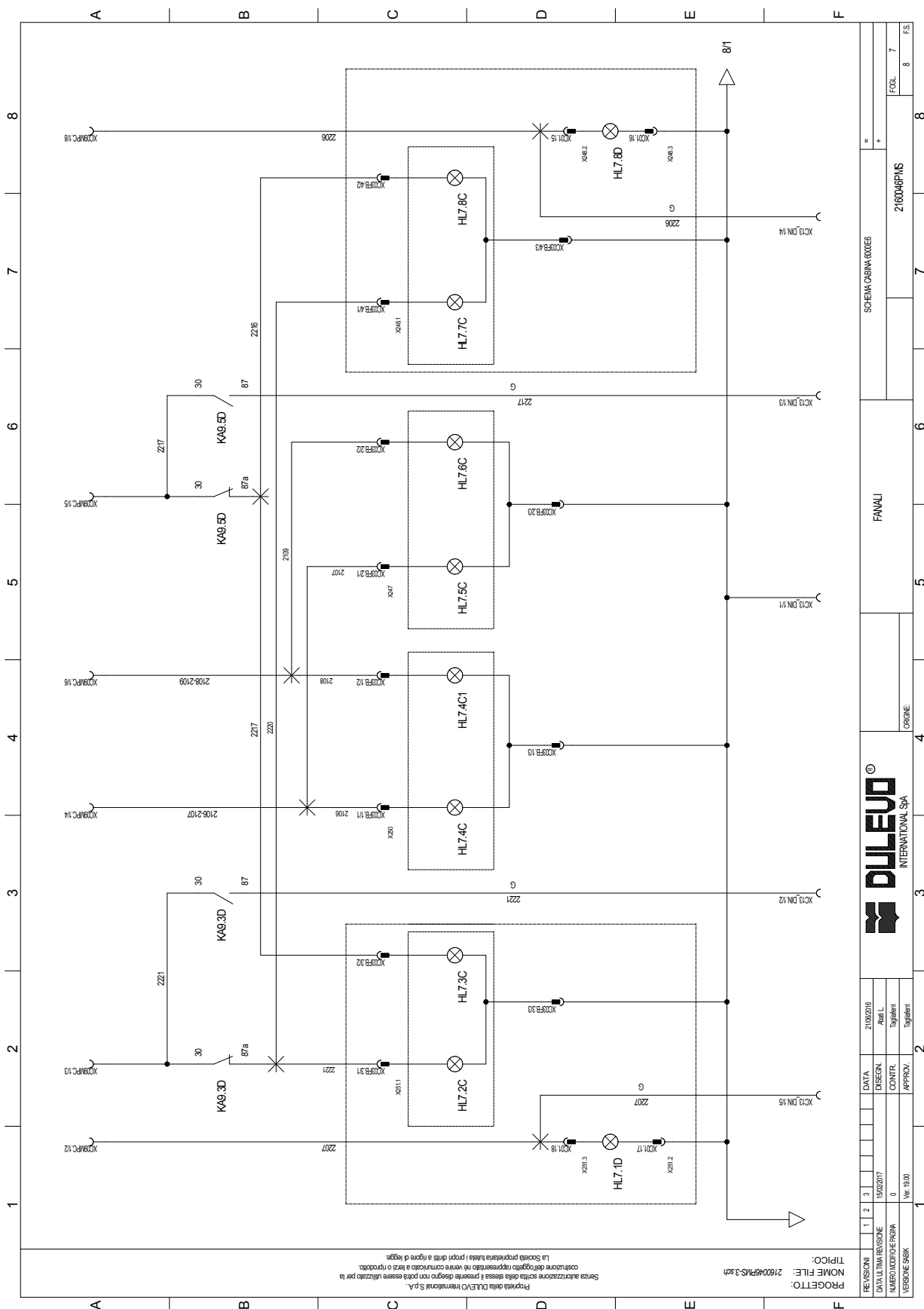


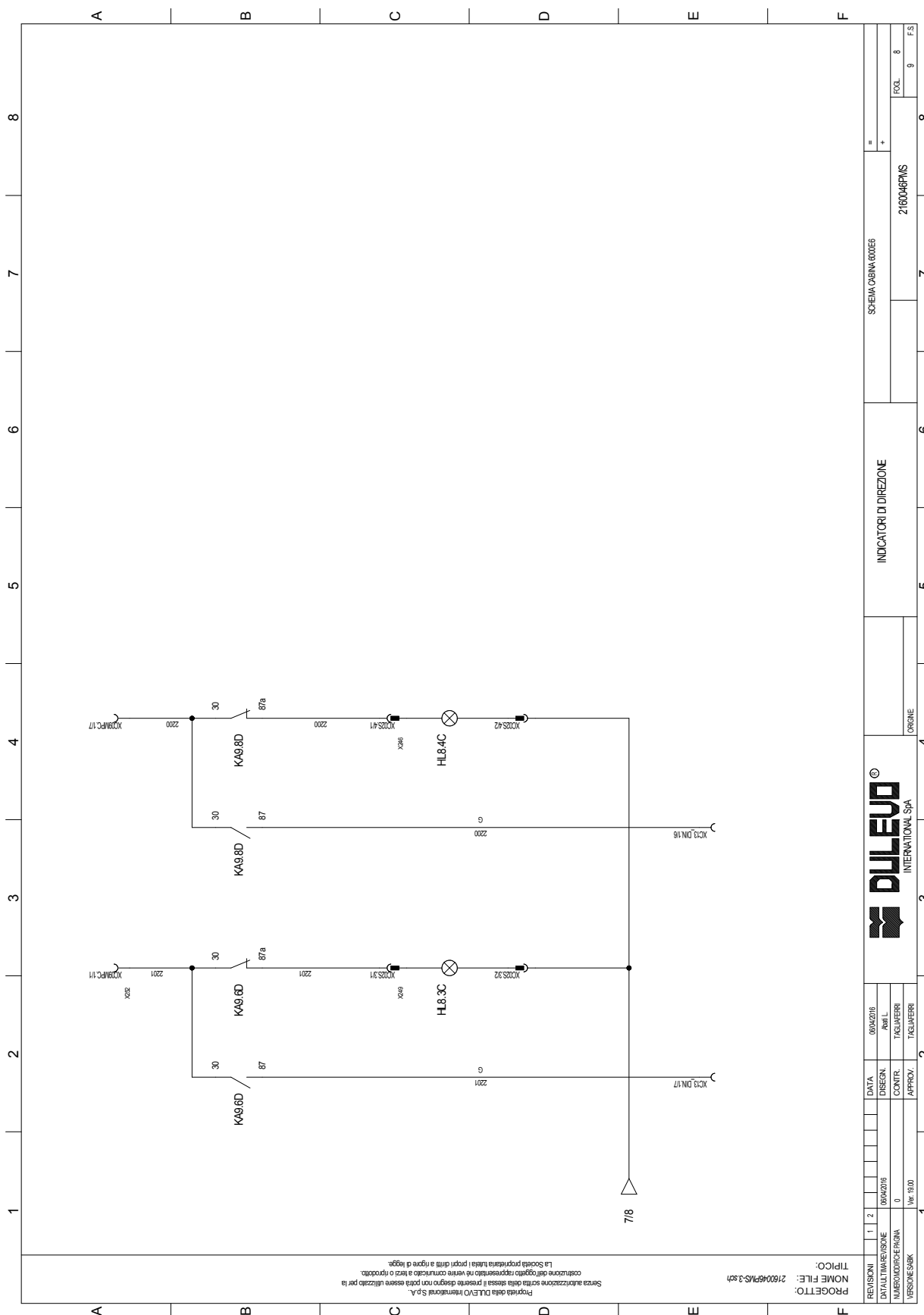


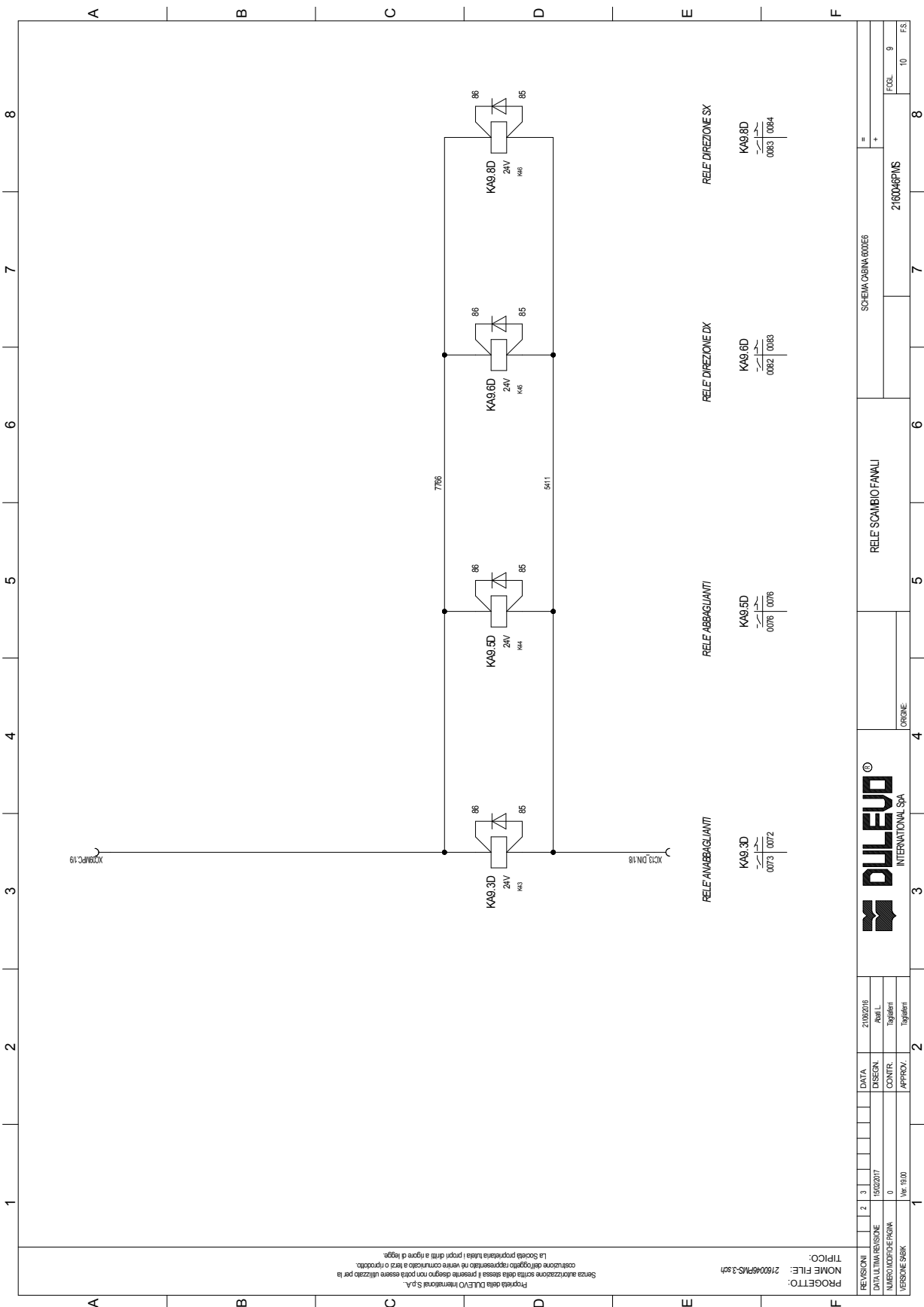
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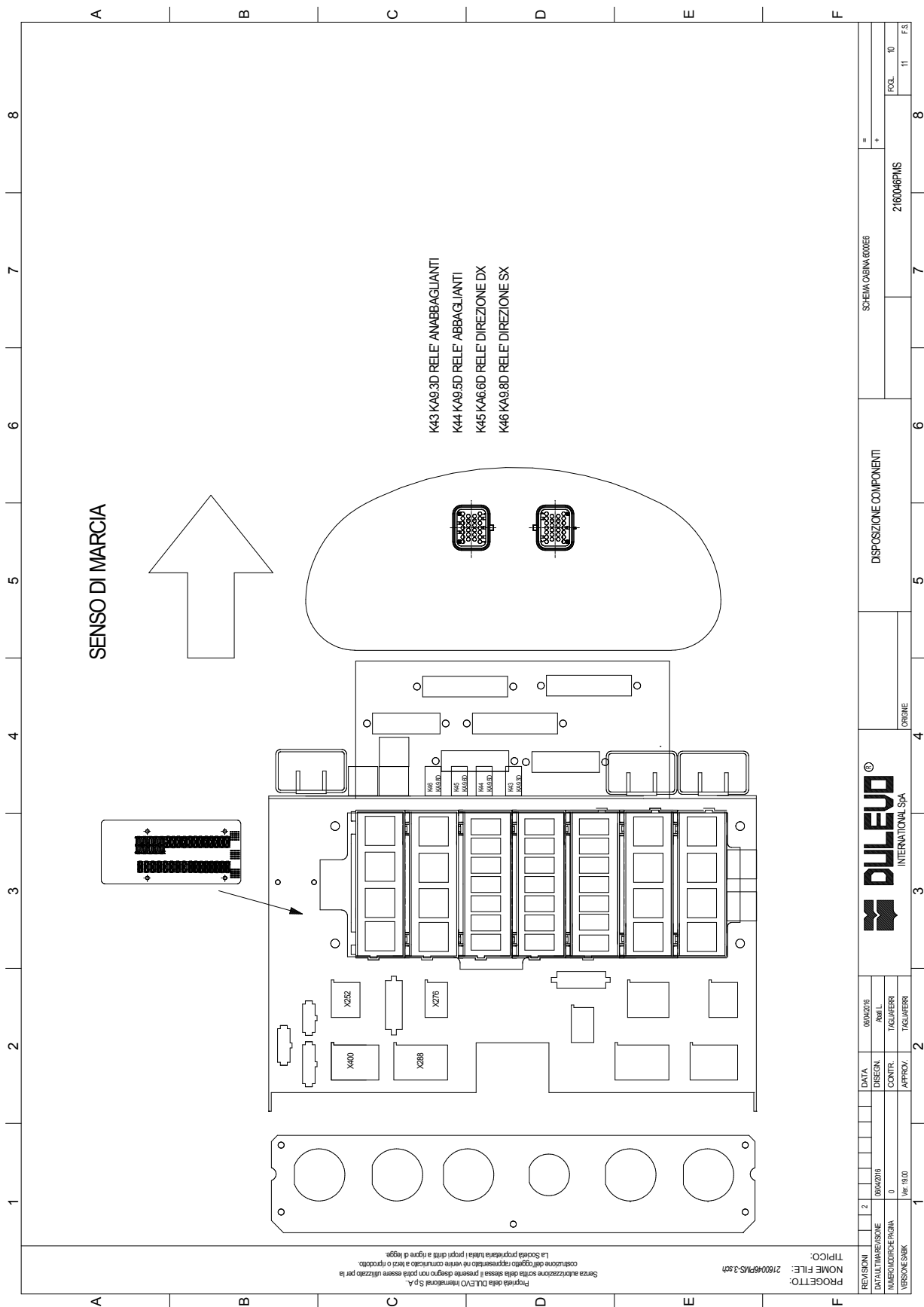


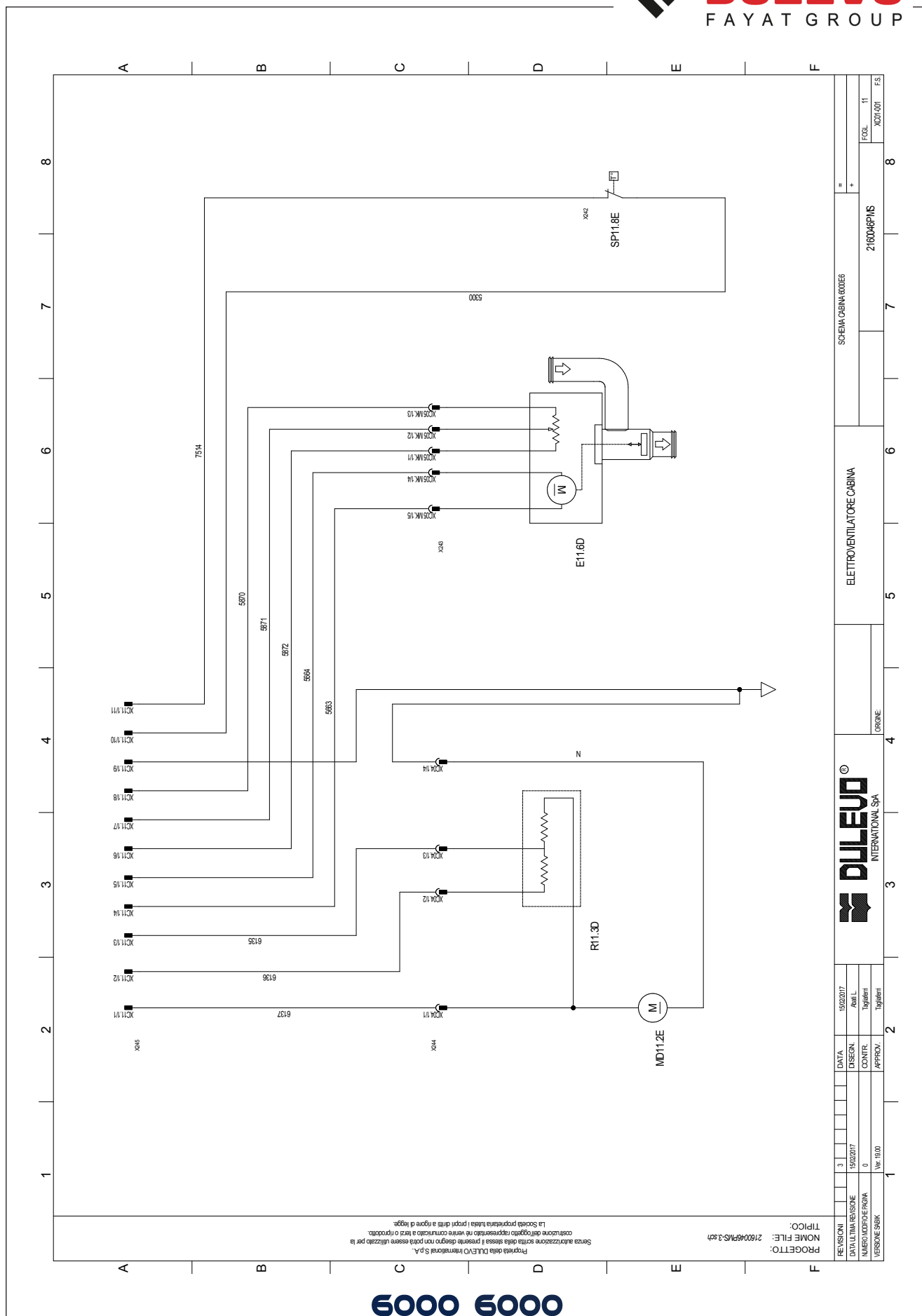
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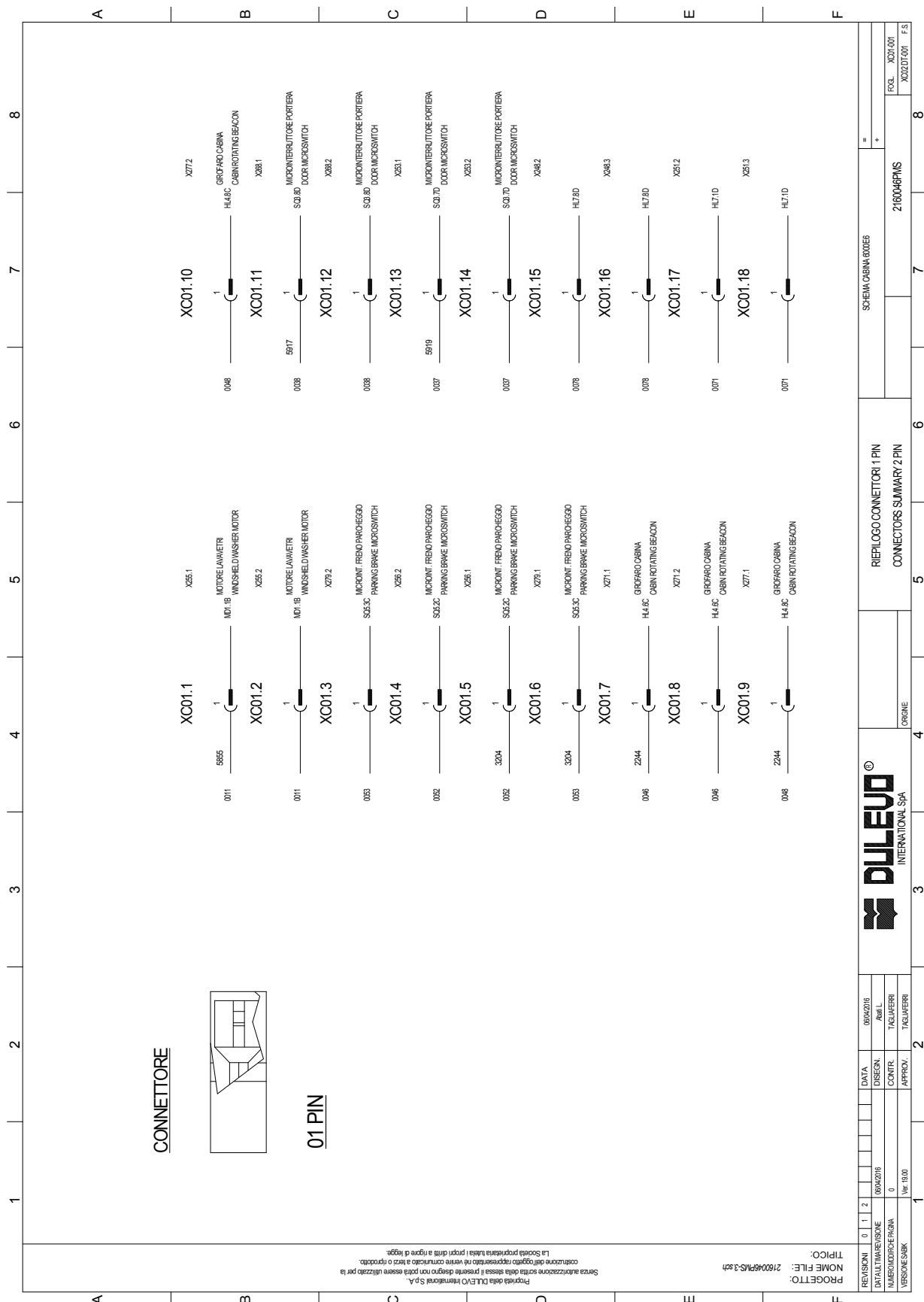


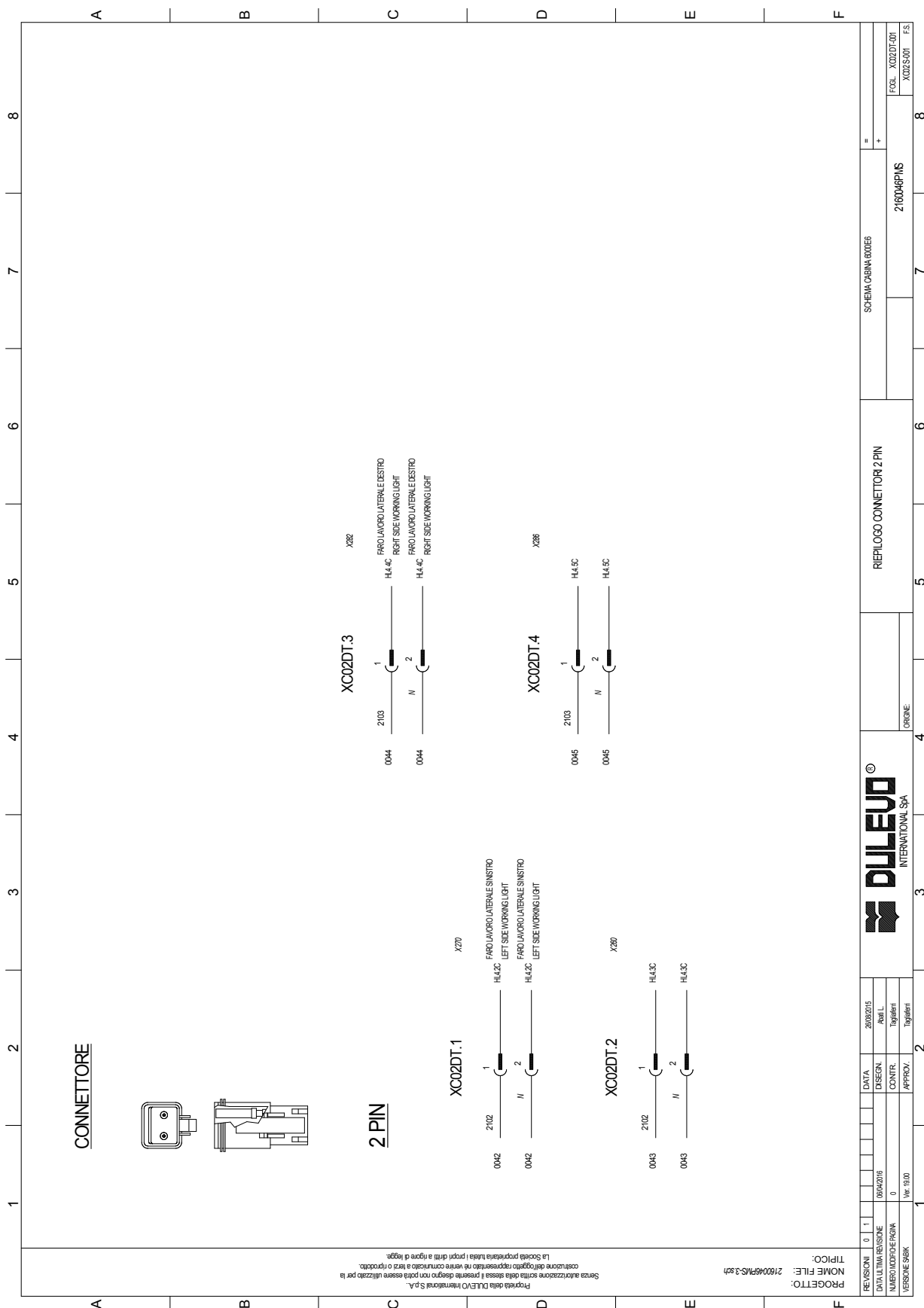


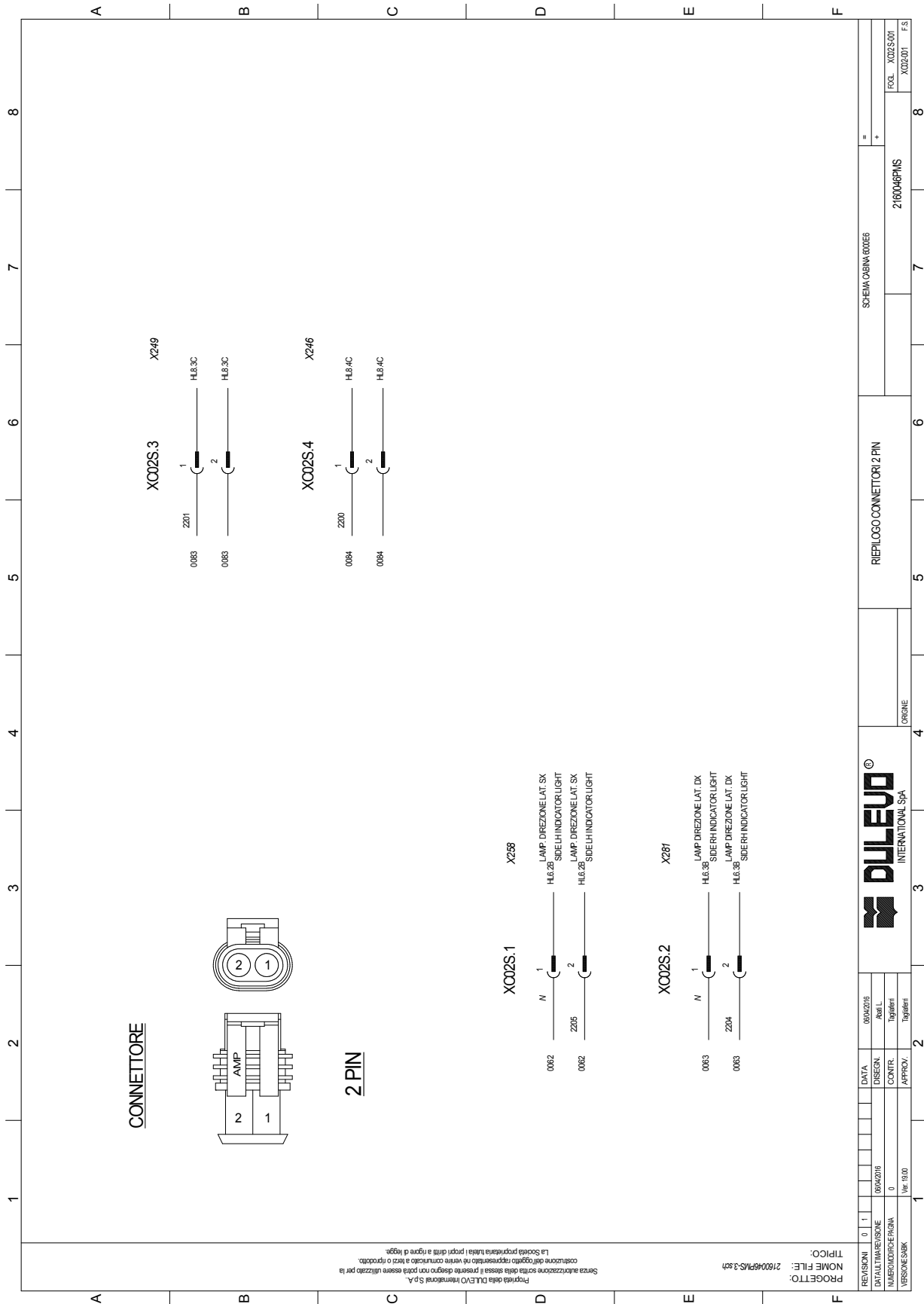


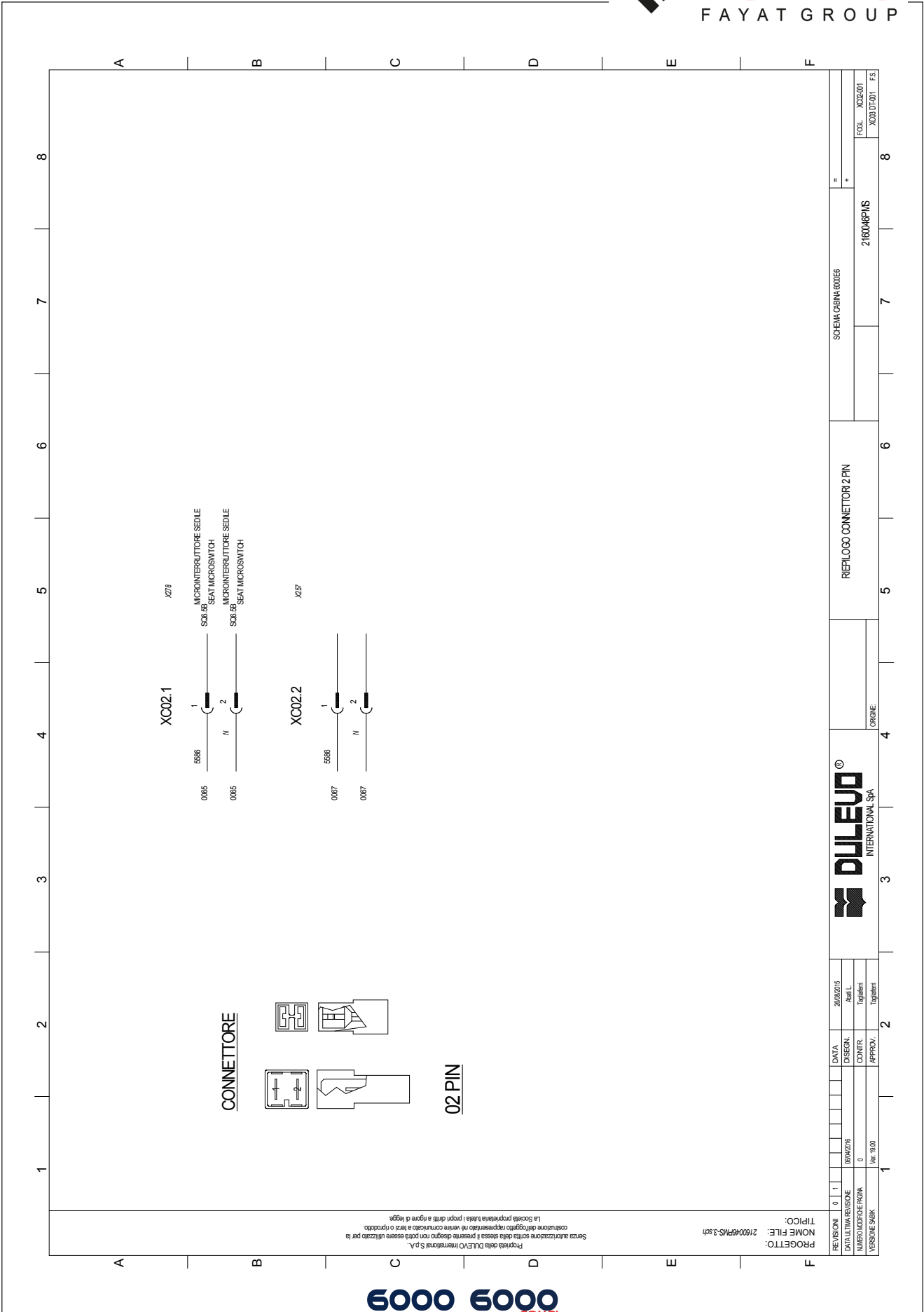


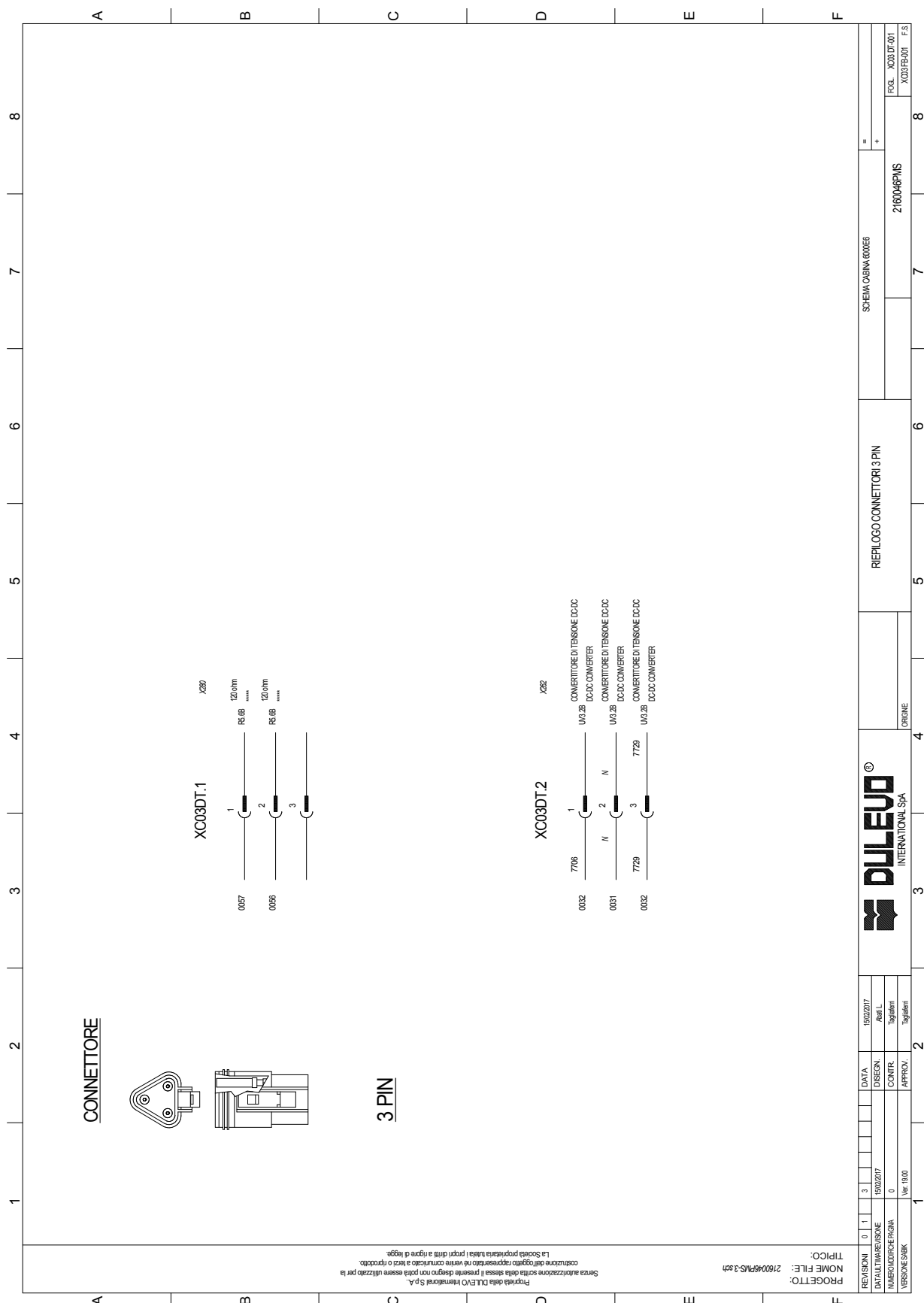


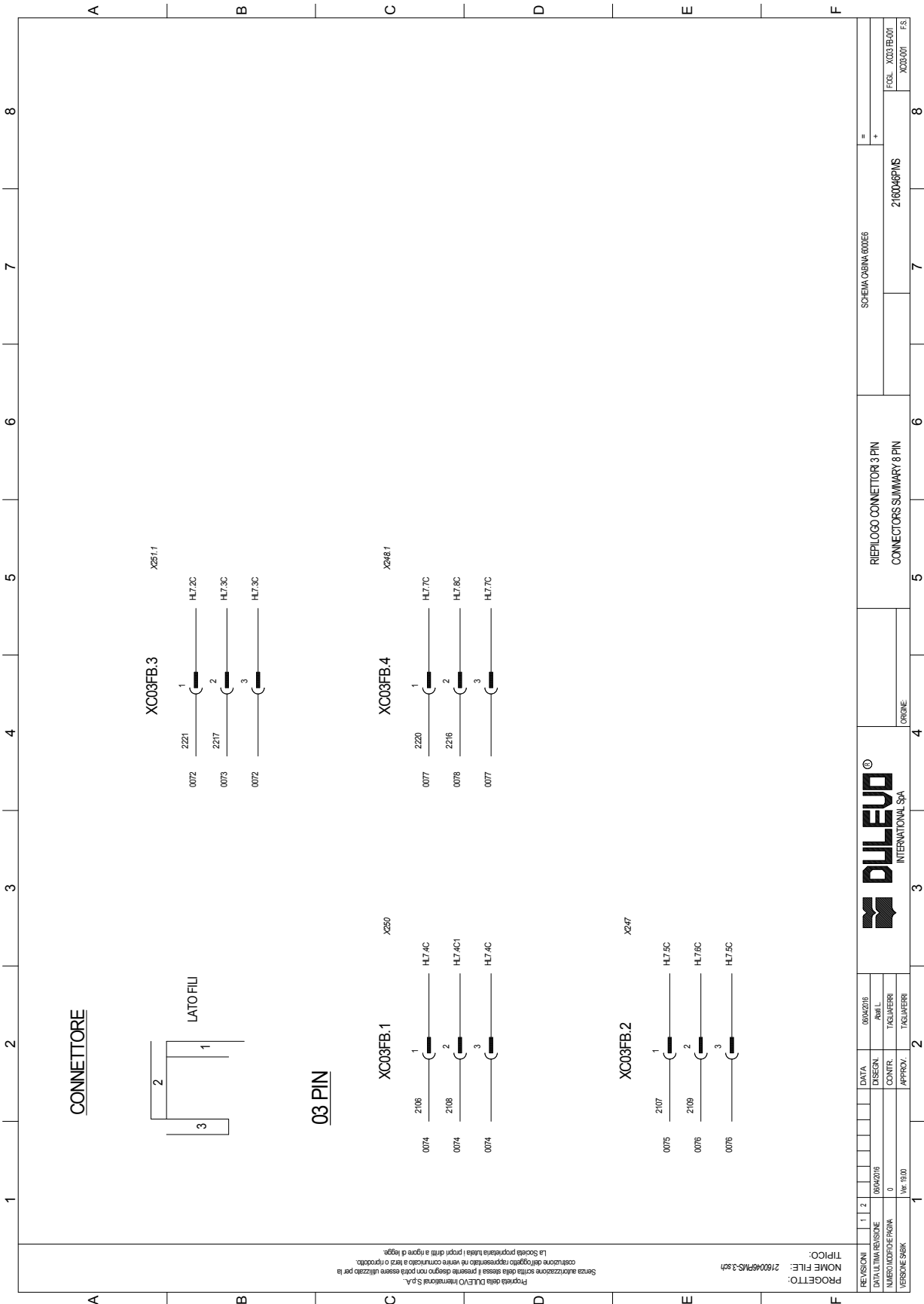


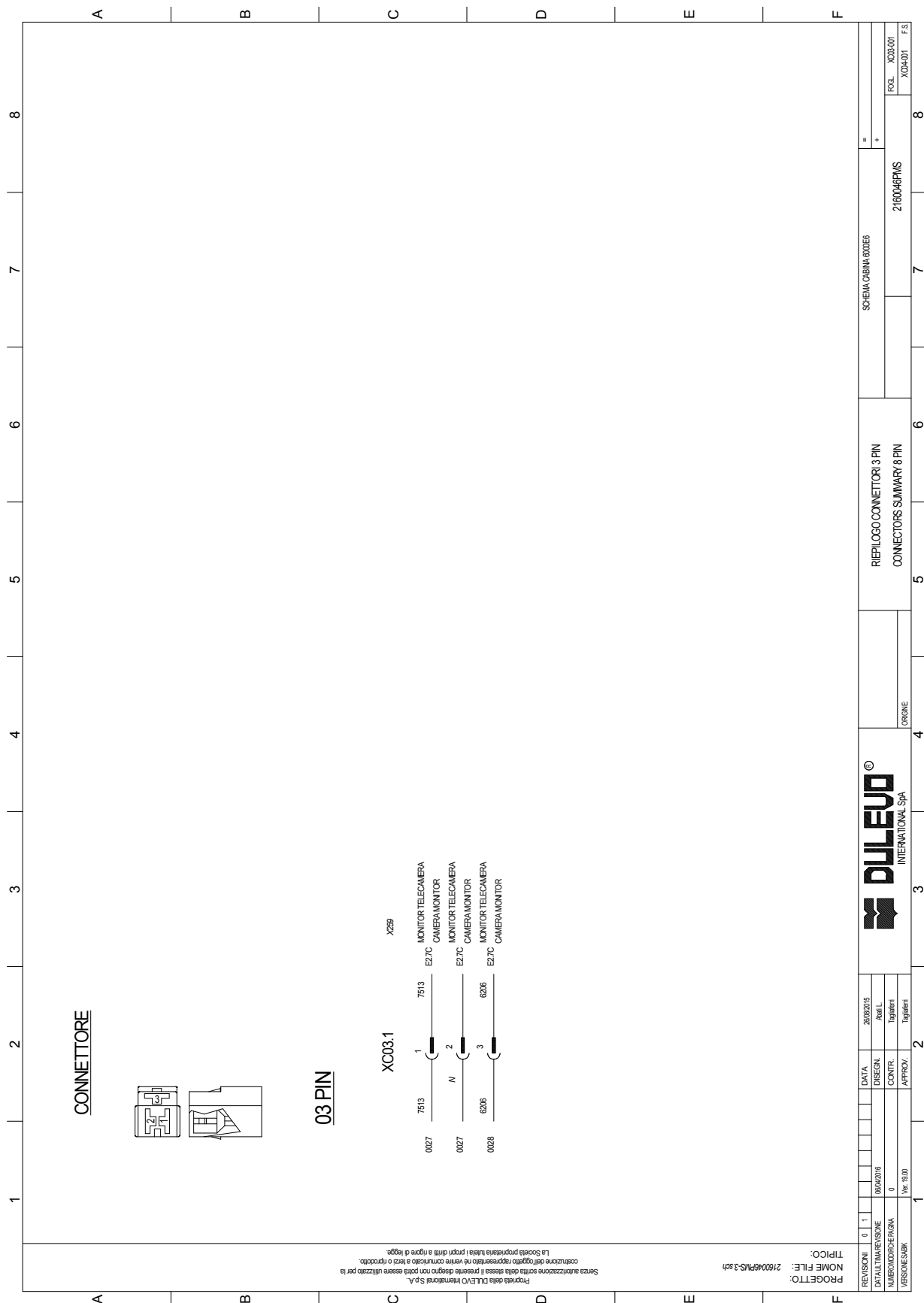


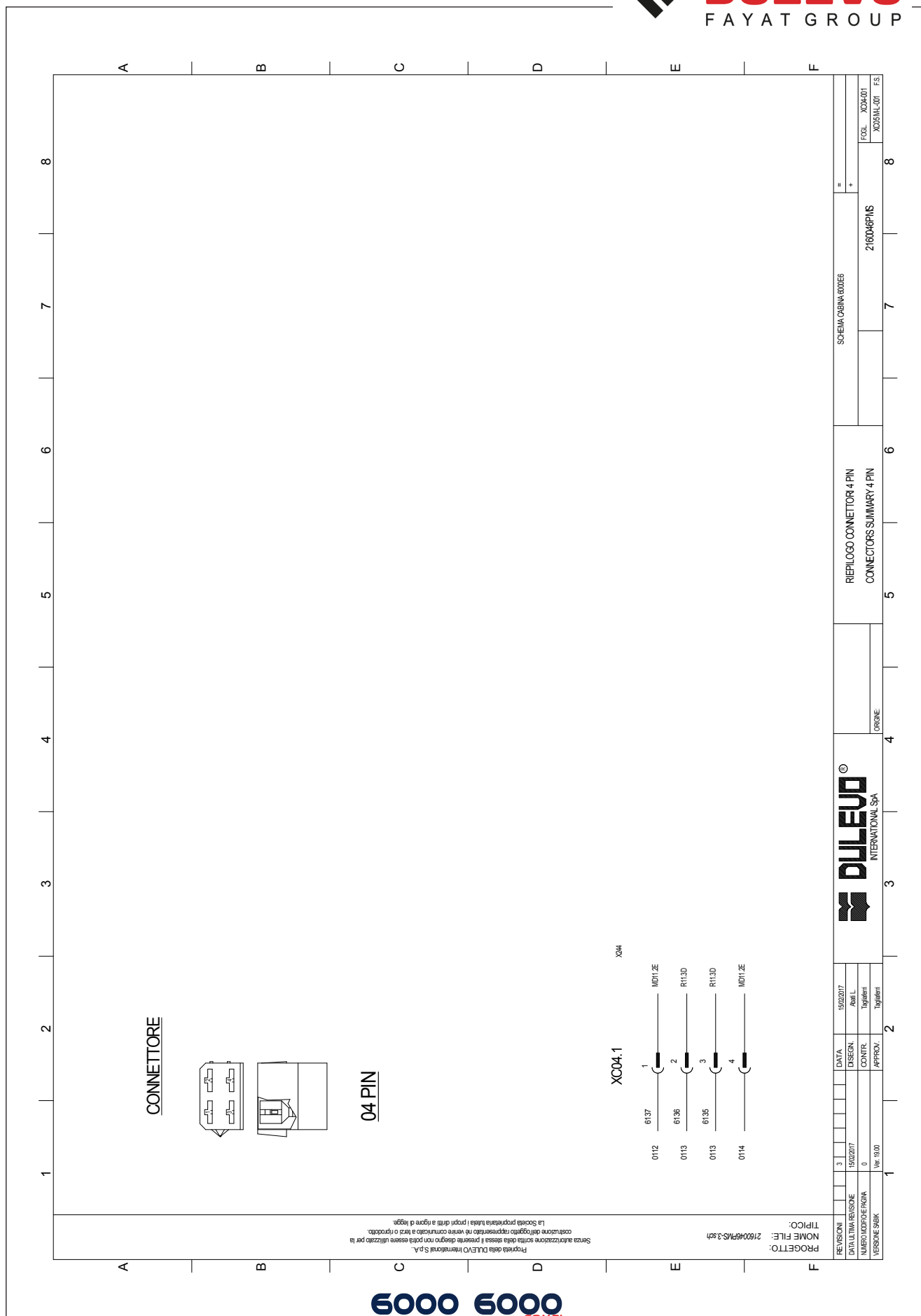


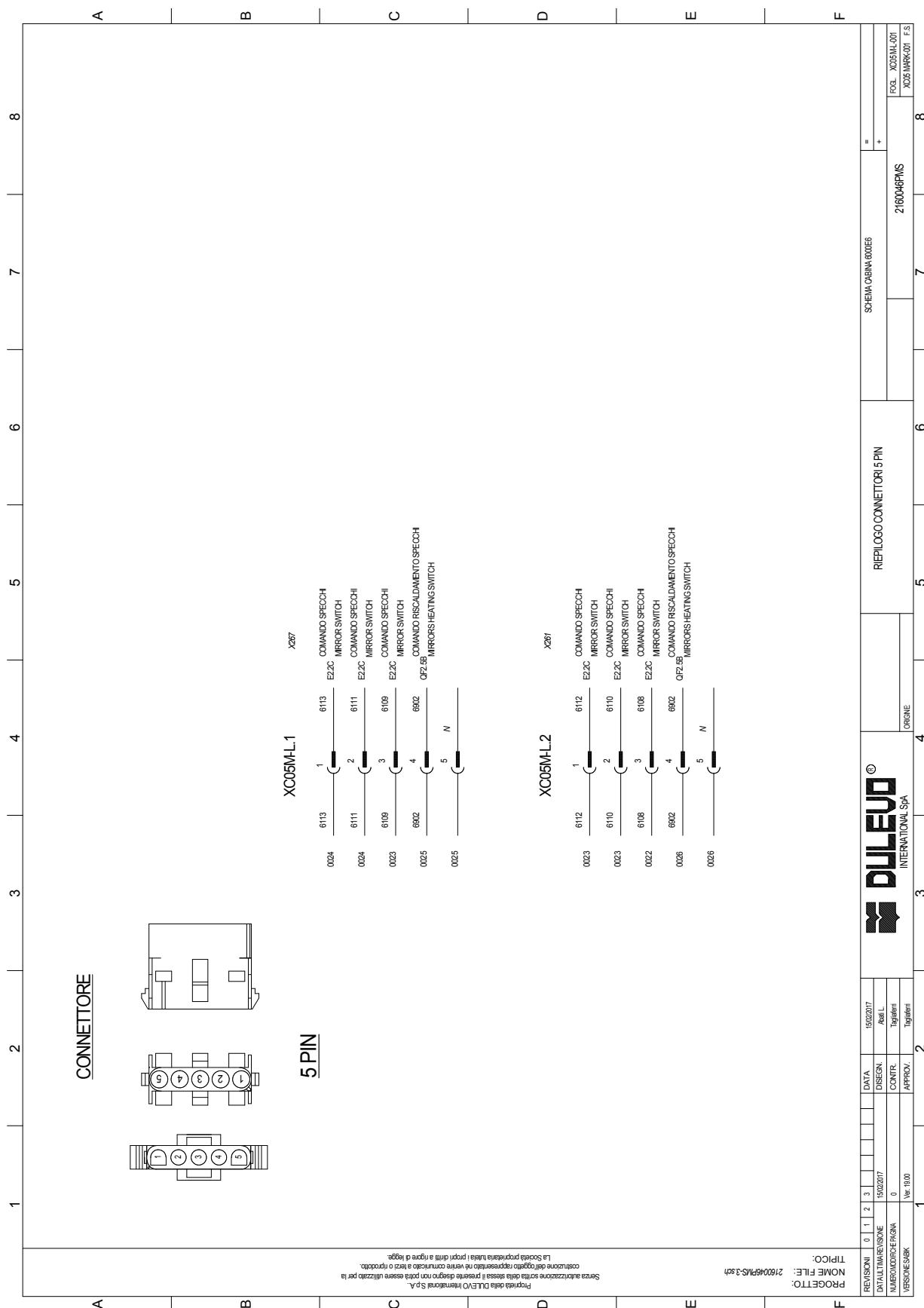


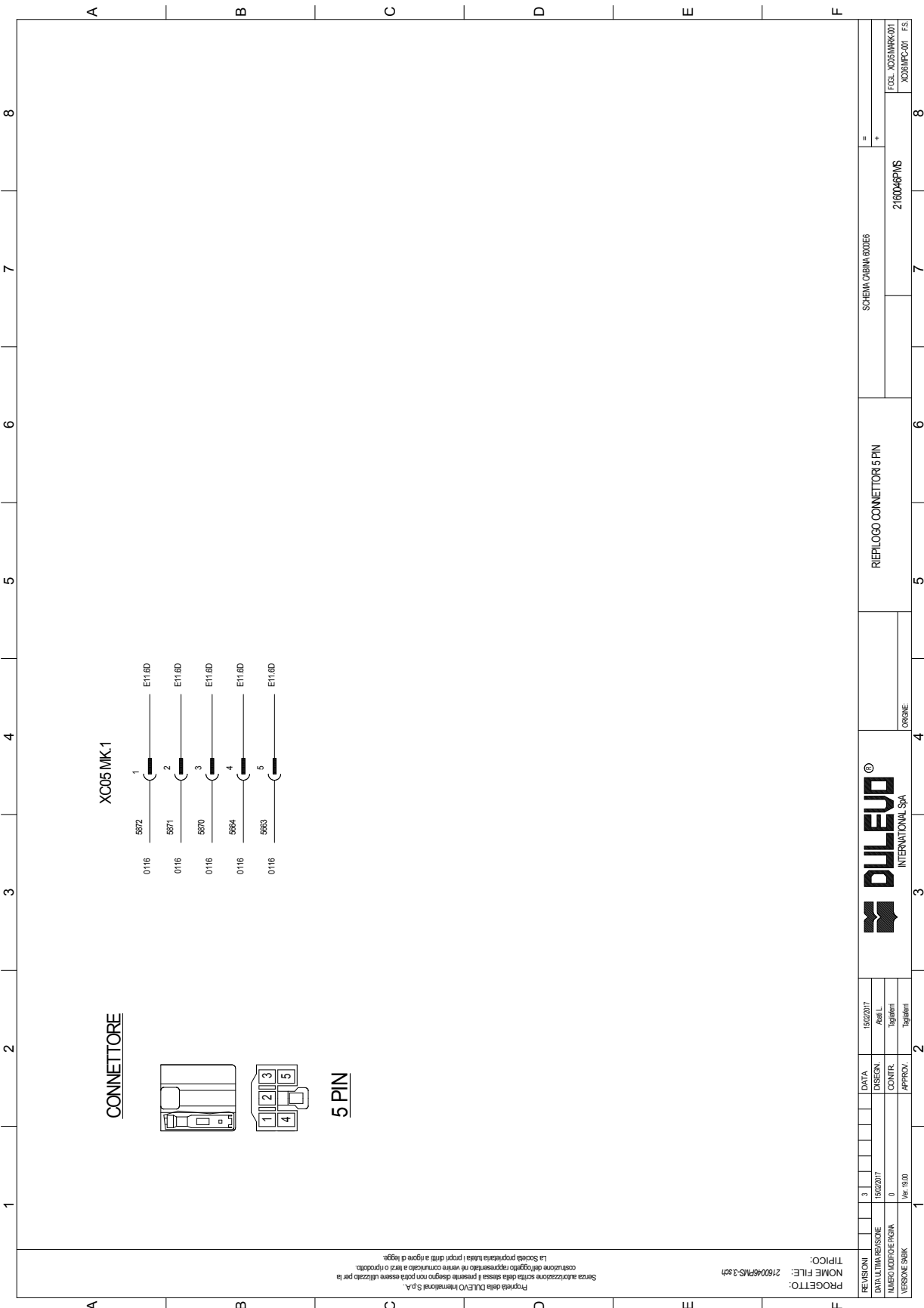


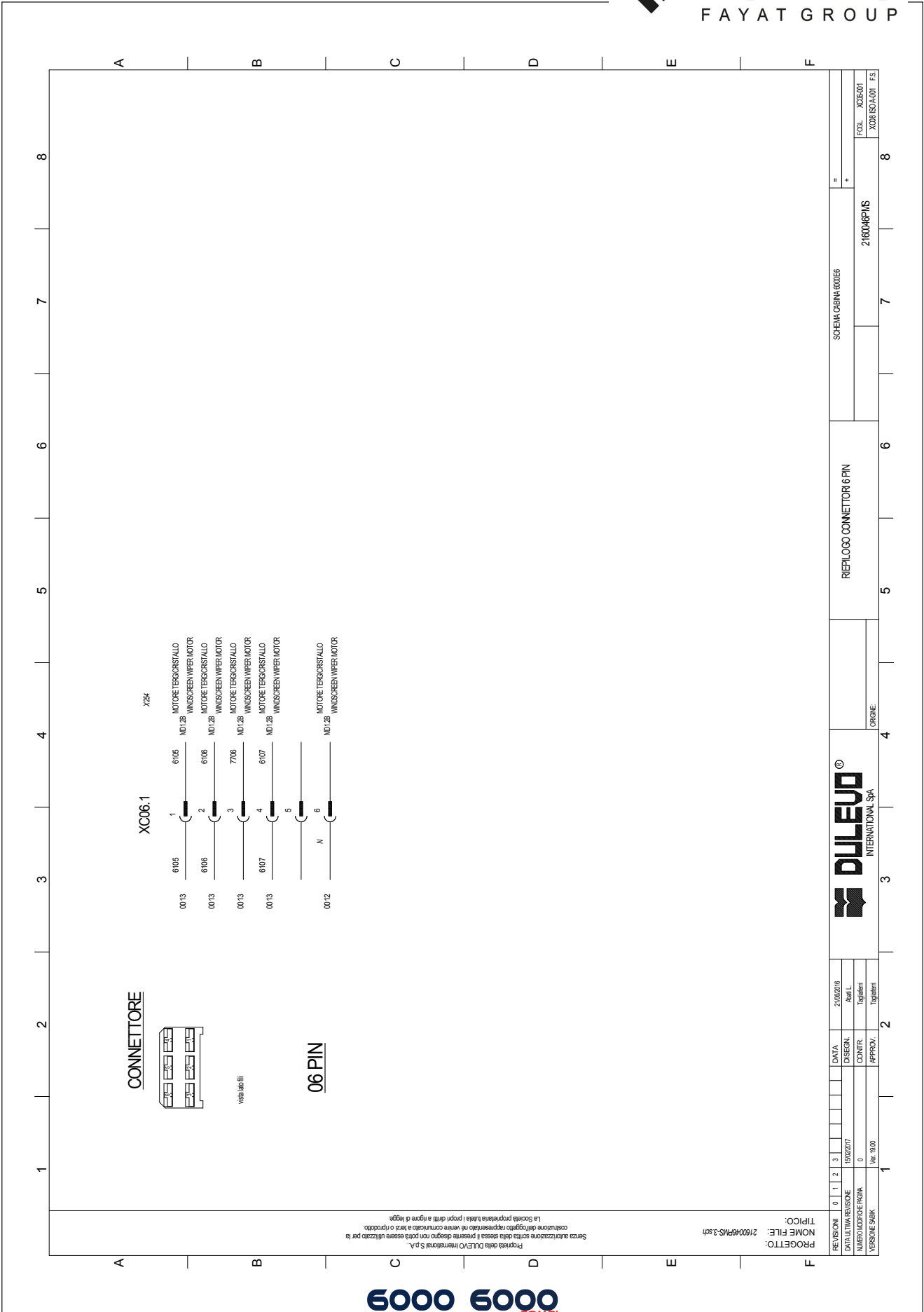


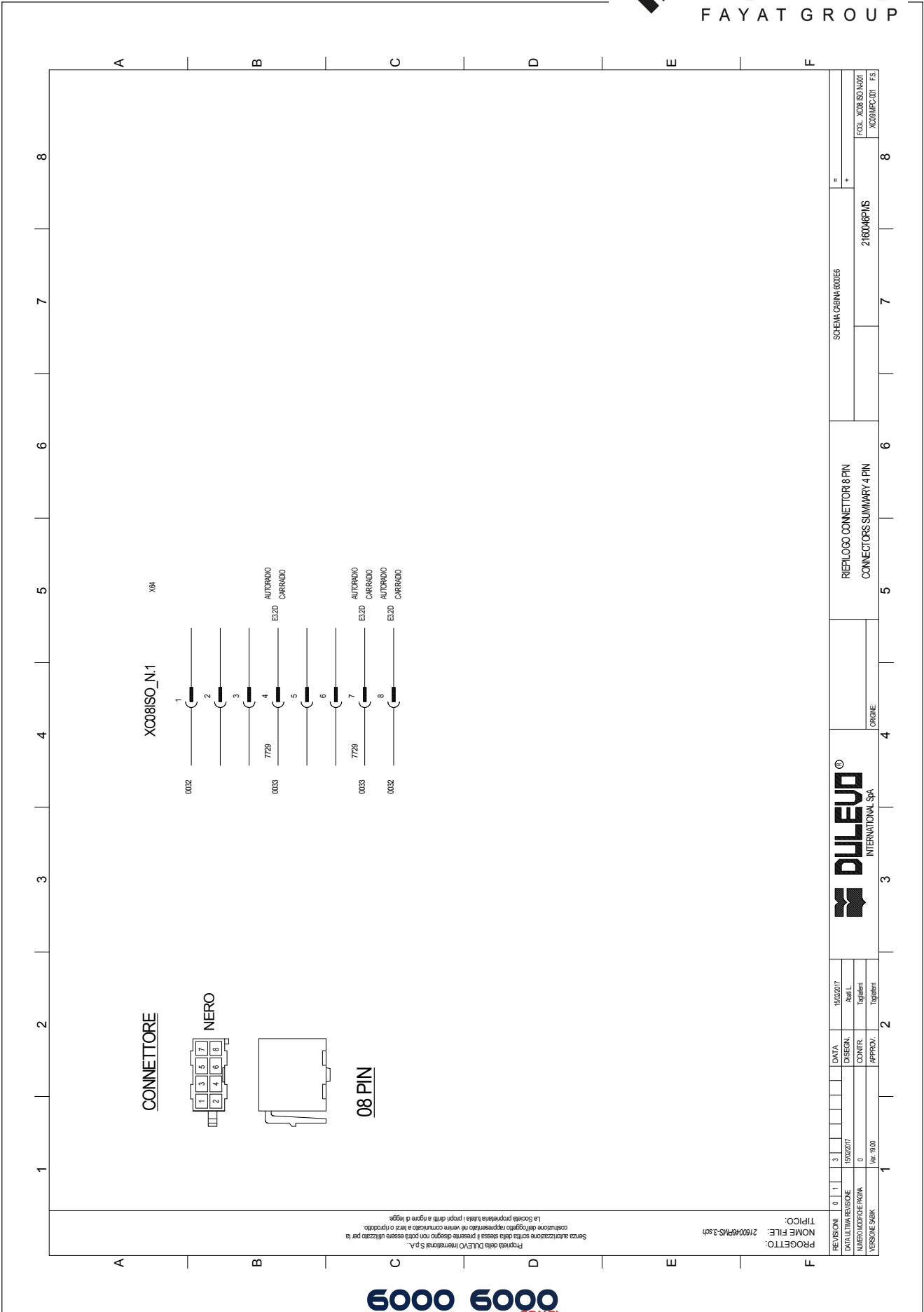


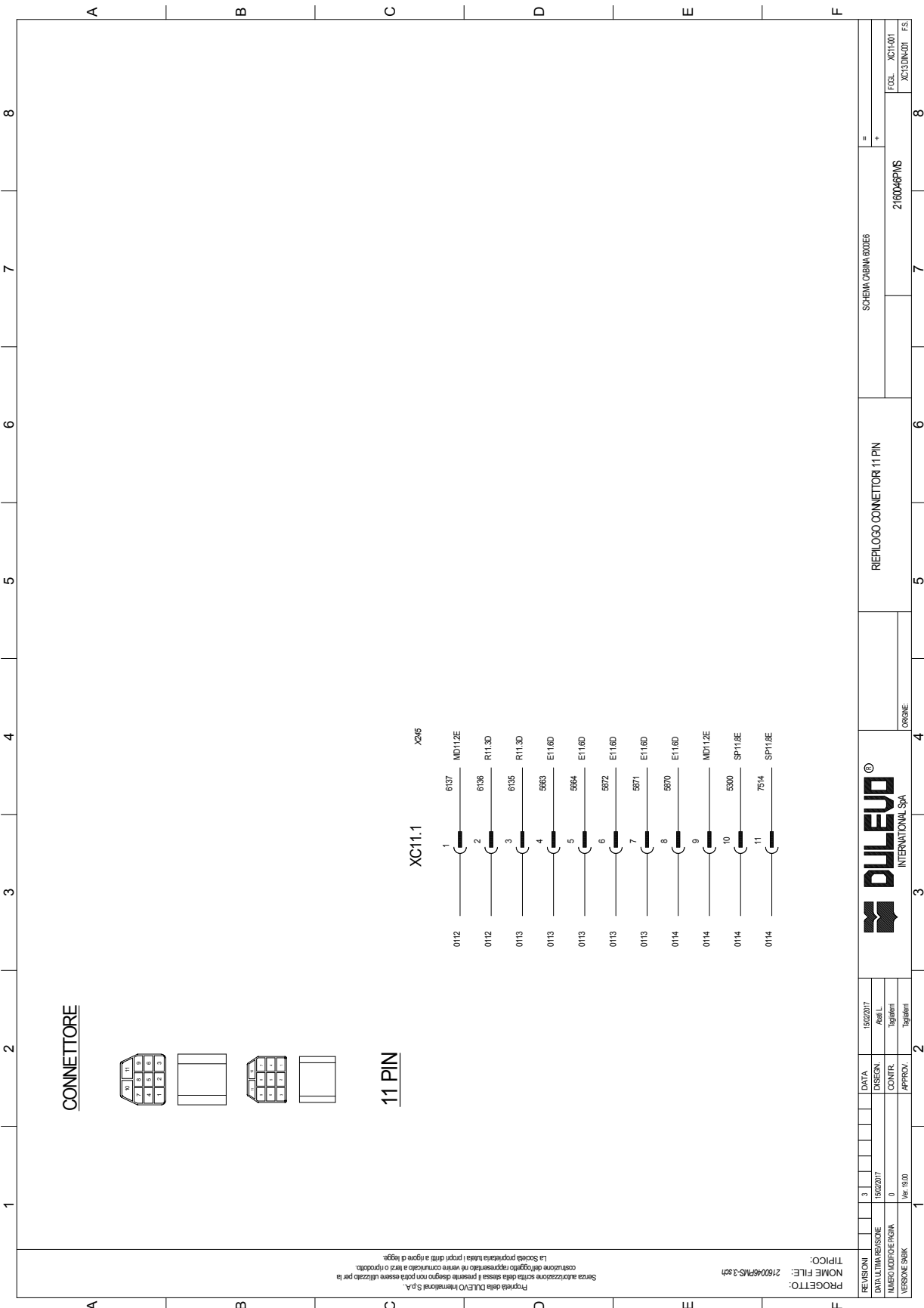


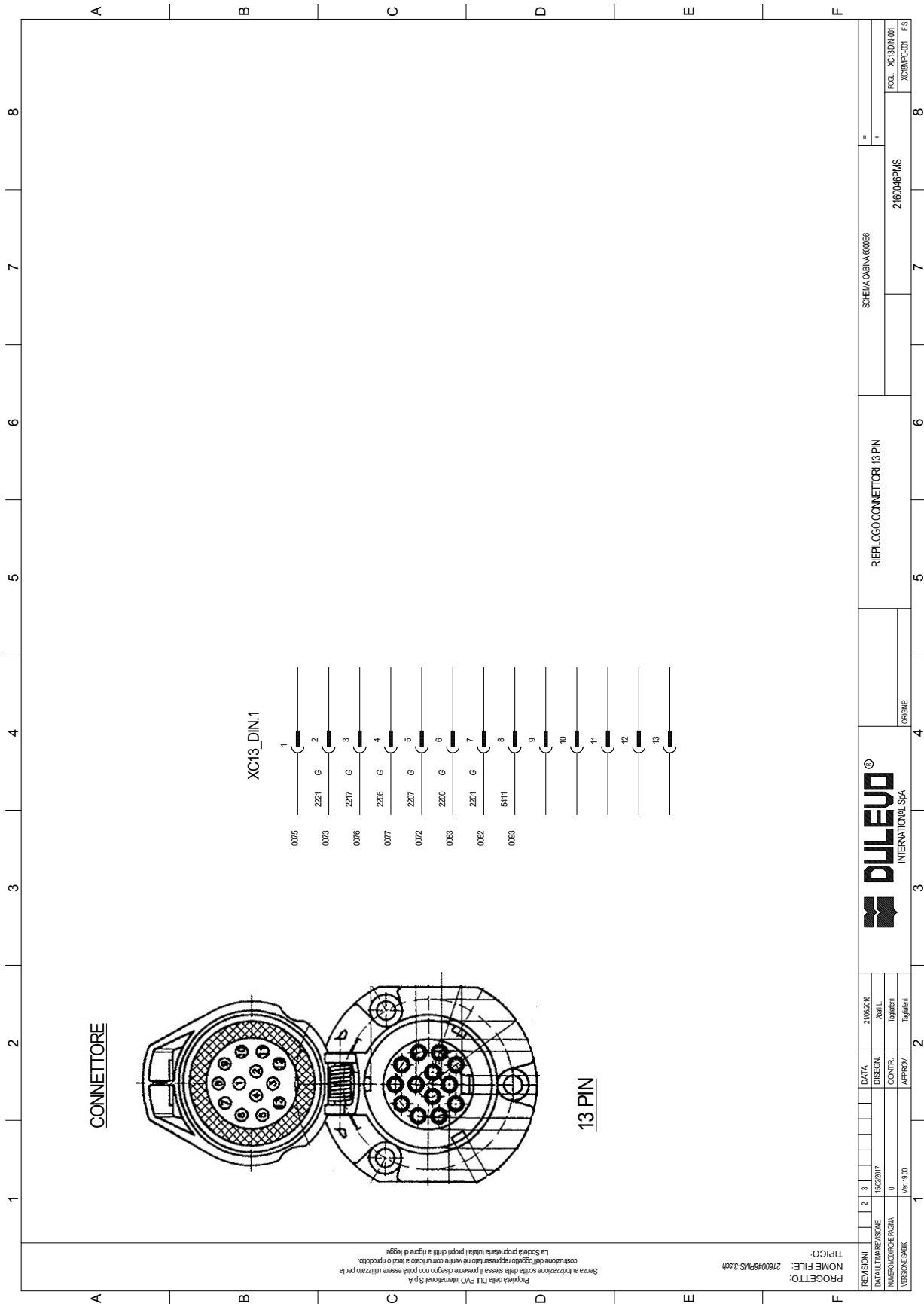












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00/04/2016

NUMERO MODIFICAZIONE

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VERSIONE BASK

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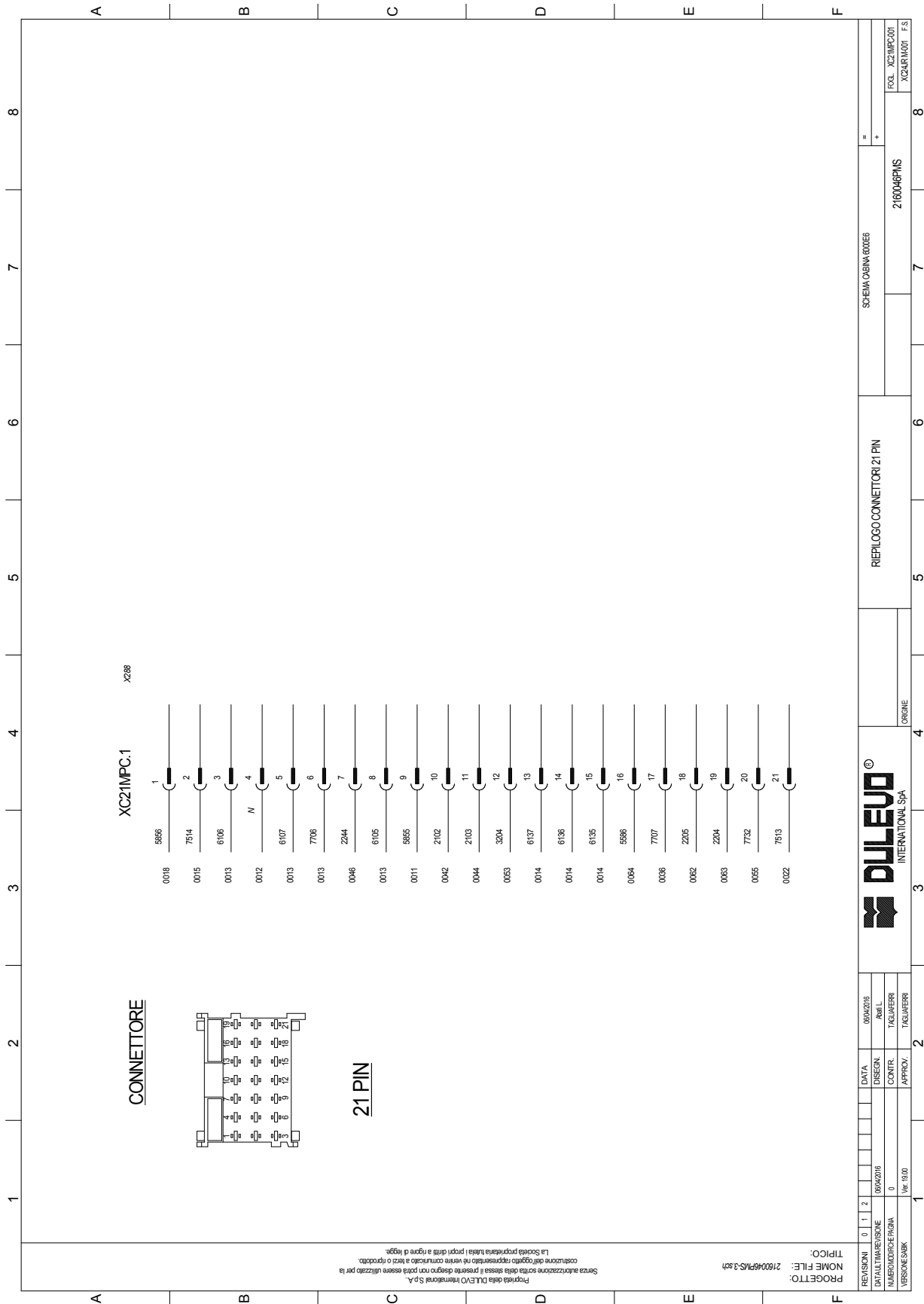
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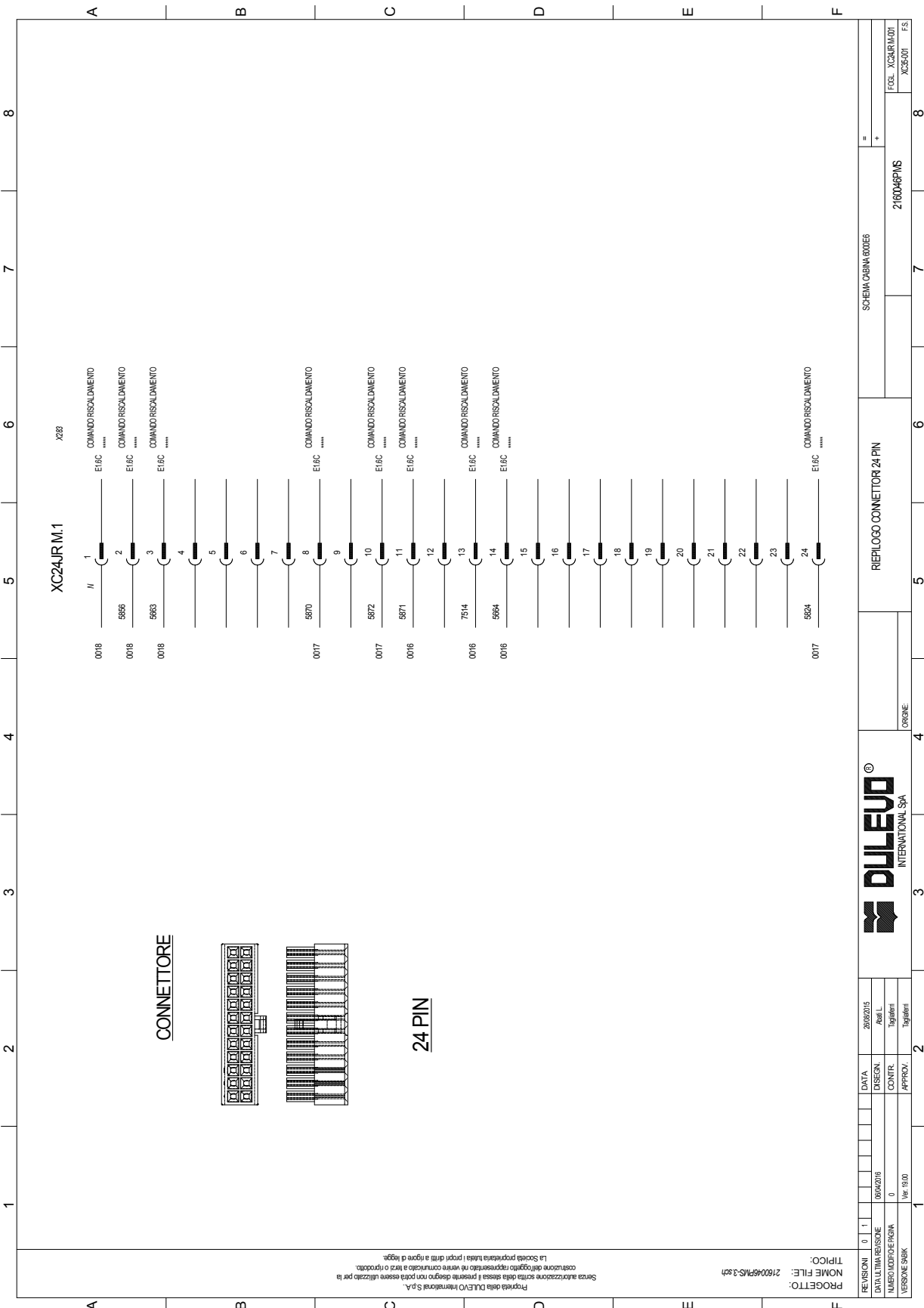
    

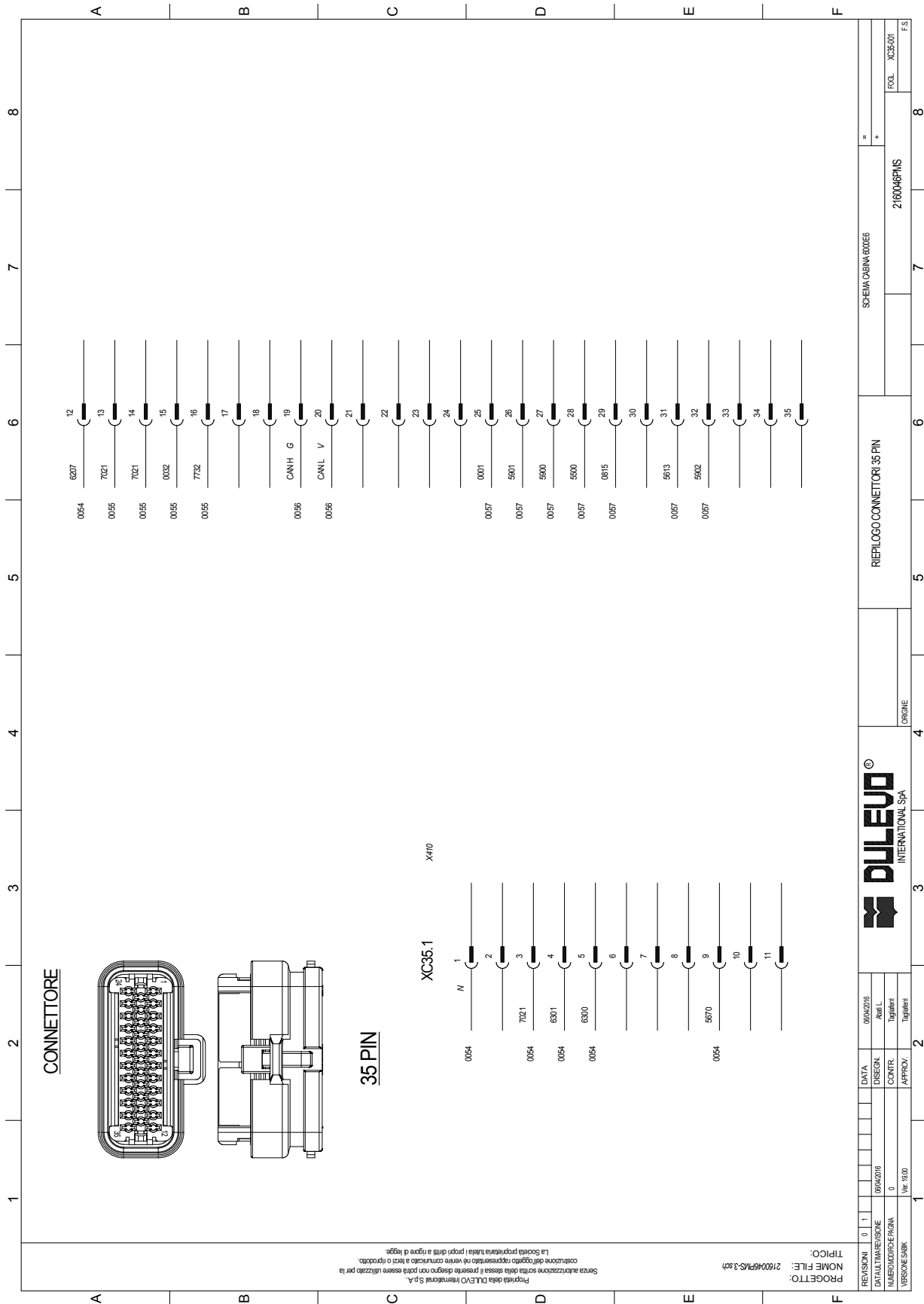
Page 187/212

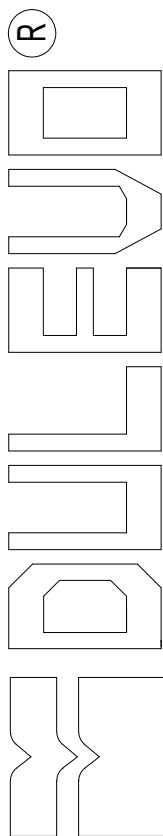
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INTERNATIONAL SpA

33012 FONTANELLO (PARMA) ITALY
VIA GIOVANNINO GUARESCHI N.1
TEL. 0521 827711 FAX. 0521 827797

Schema colonnetta
Steering column diagram

TABELLA COLORI
COLOUR TABLE

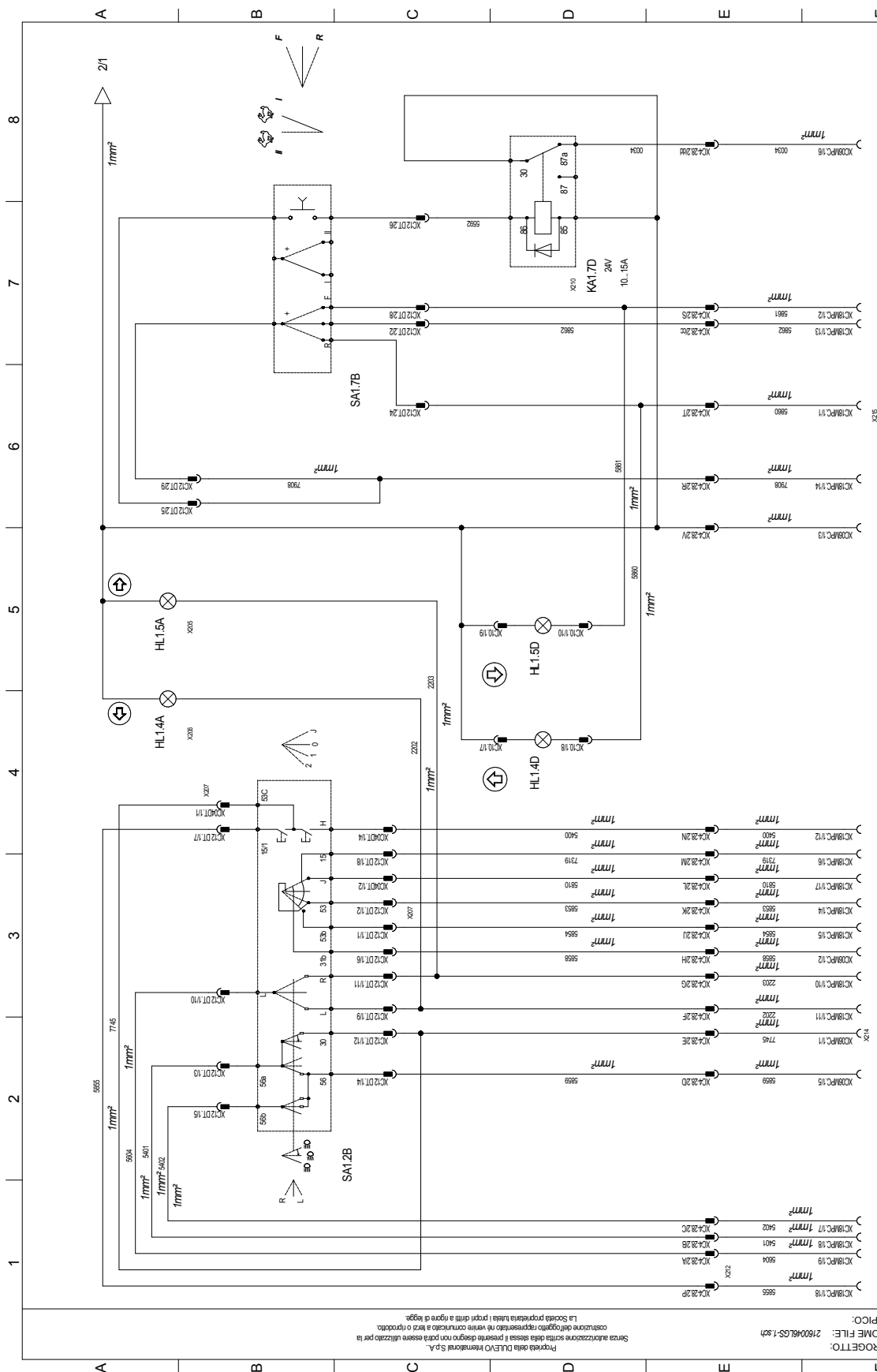
A	AZZURRO - AZURE
B	BIANCO - WHITE
C	ARANCIO - ORANGE
G	GIALLO - YELLOW
H	GRIGIO - GREY
L	BLU - BLUE
M	MARRONE - BROWN
N	NERO - BLACK
R	ROSSO - RED
S	ROSA - PINK
V	VERDE - GREEN
Z	VIOLA - VIOLET

NOTE: La colorazione dei fili / bicolore viene indicata con la composizione delle sigle sopra indicate. Esempio: GV (colore Trasversale) – GV (colore Longitudinale).
NOTE: The bicoloured wires are indicated with the composition of the above letters.
Example: GV (Transverse colour) – GV (Longitudinal colour).

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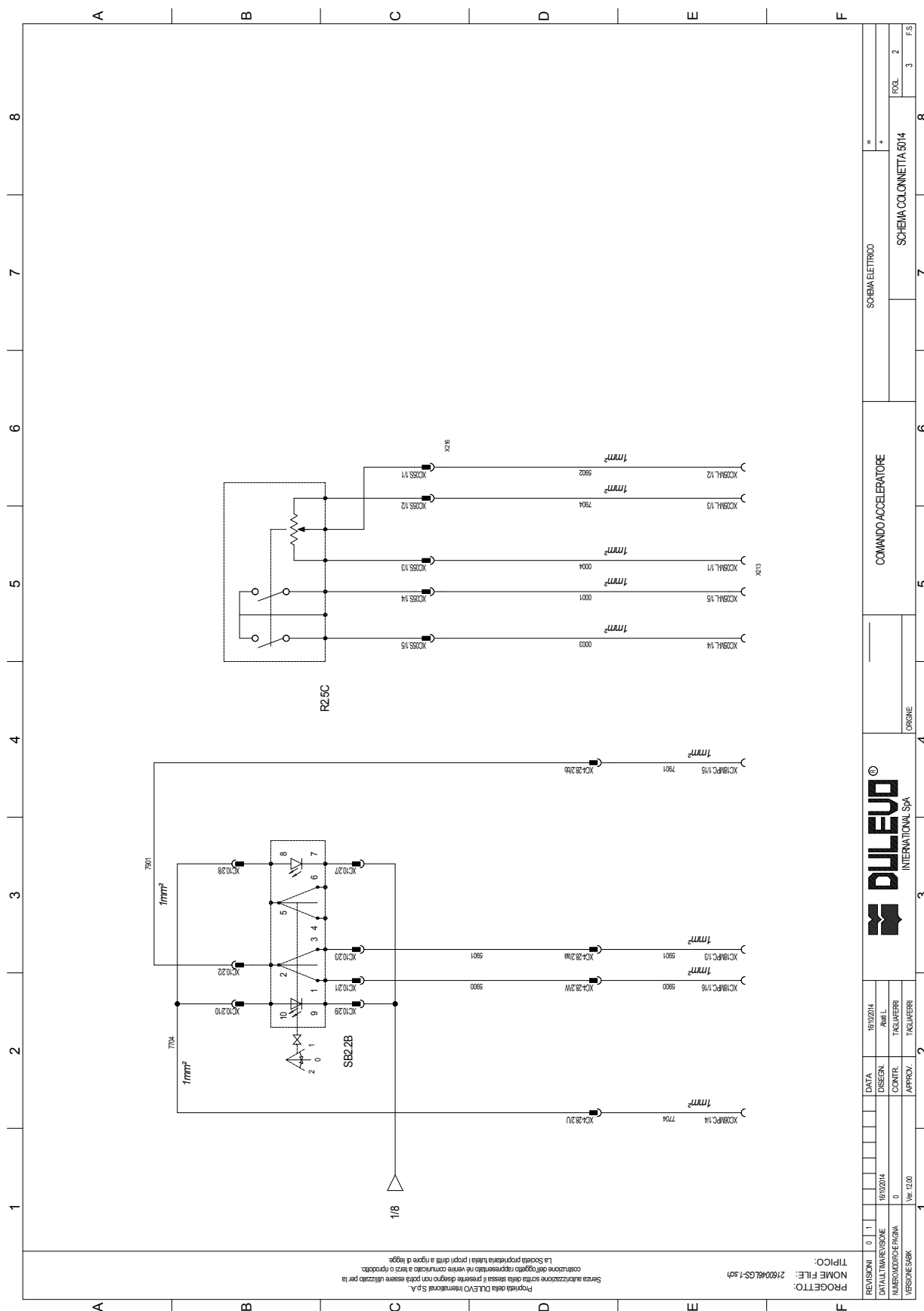


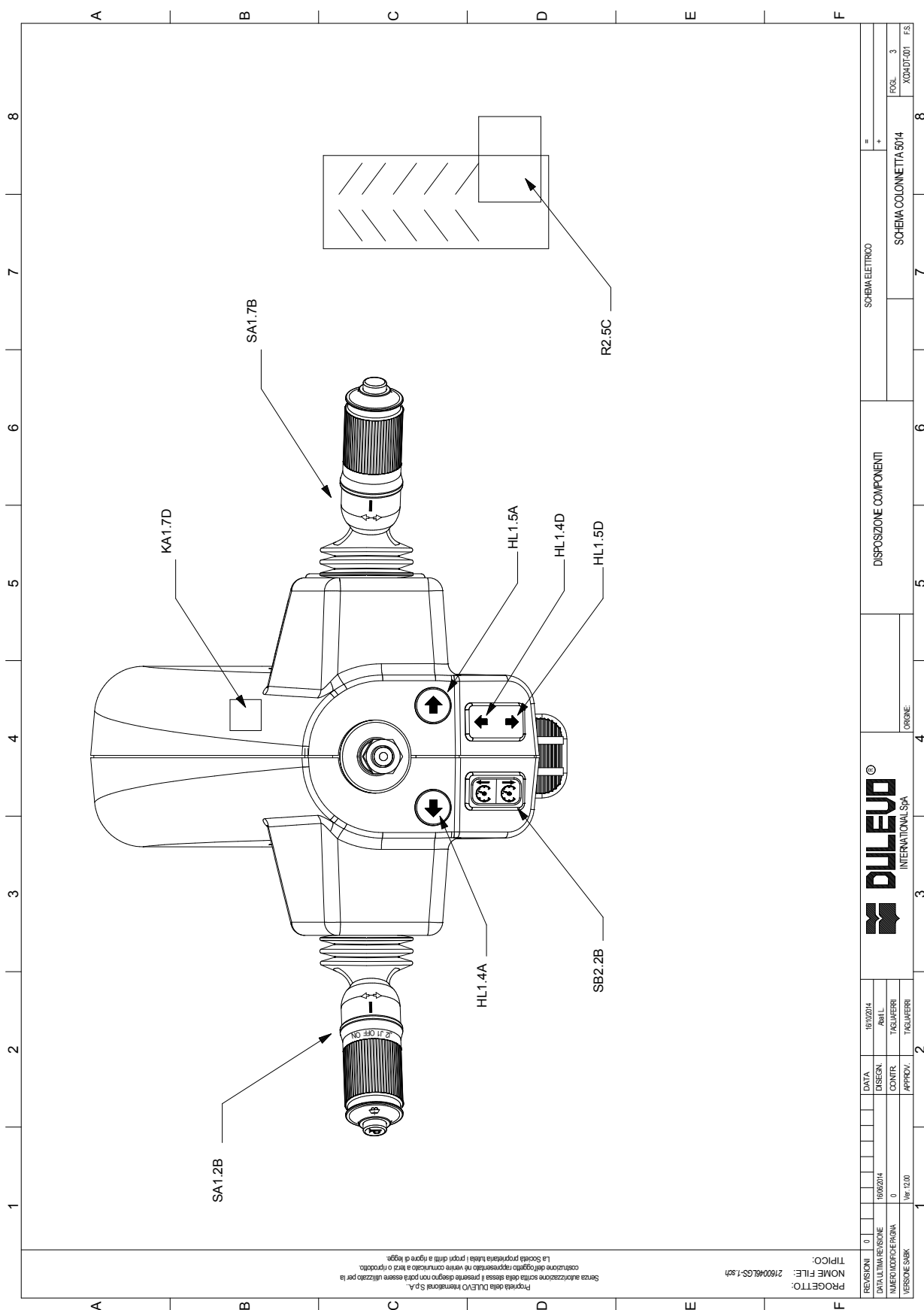
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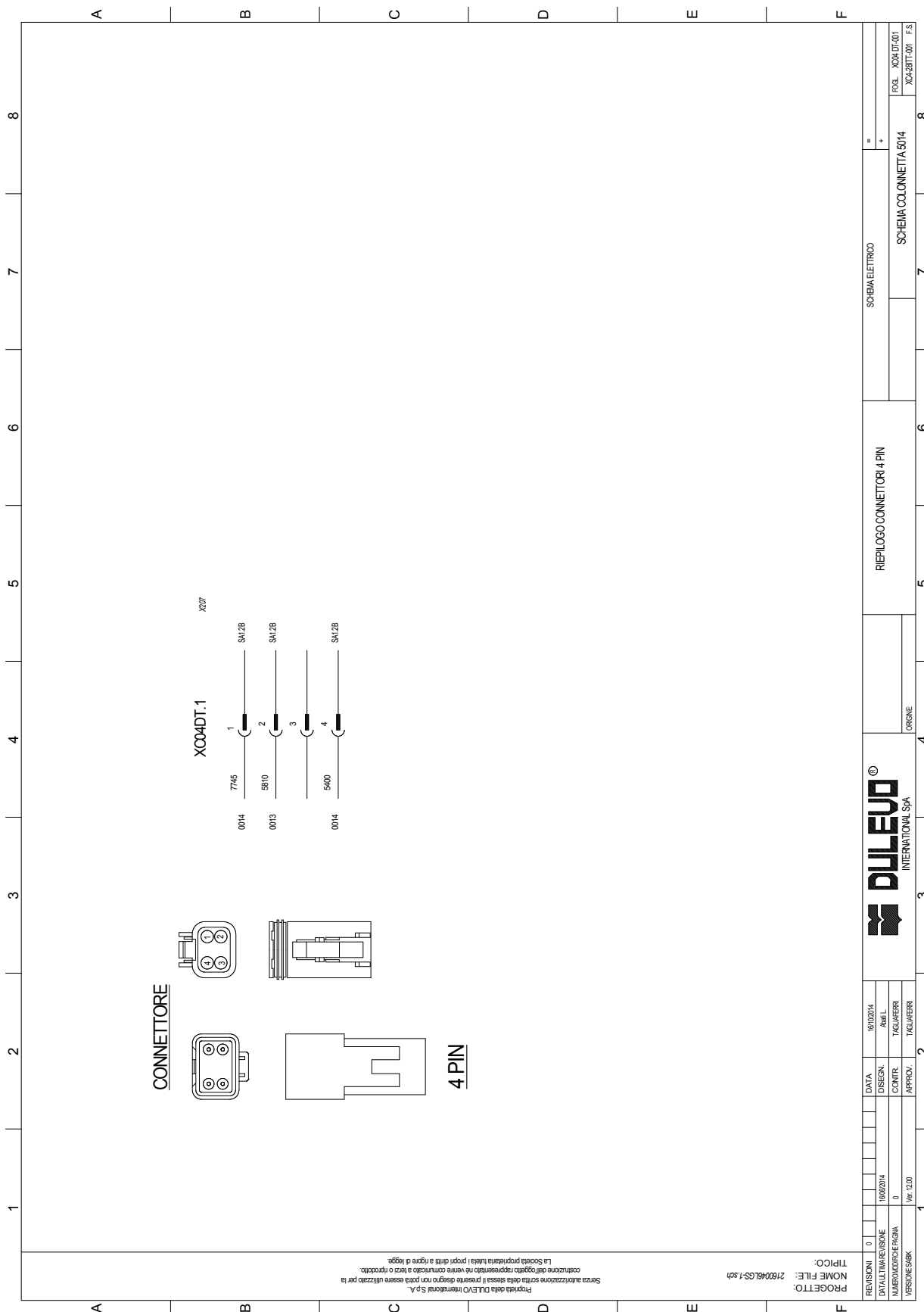
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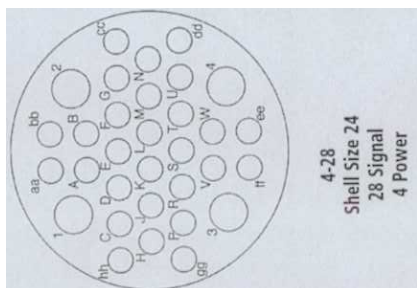
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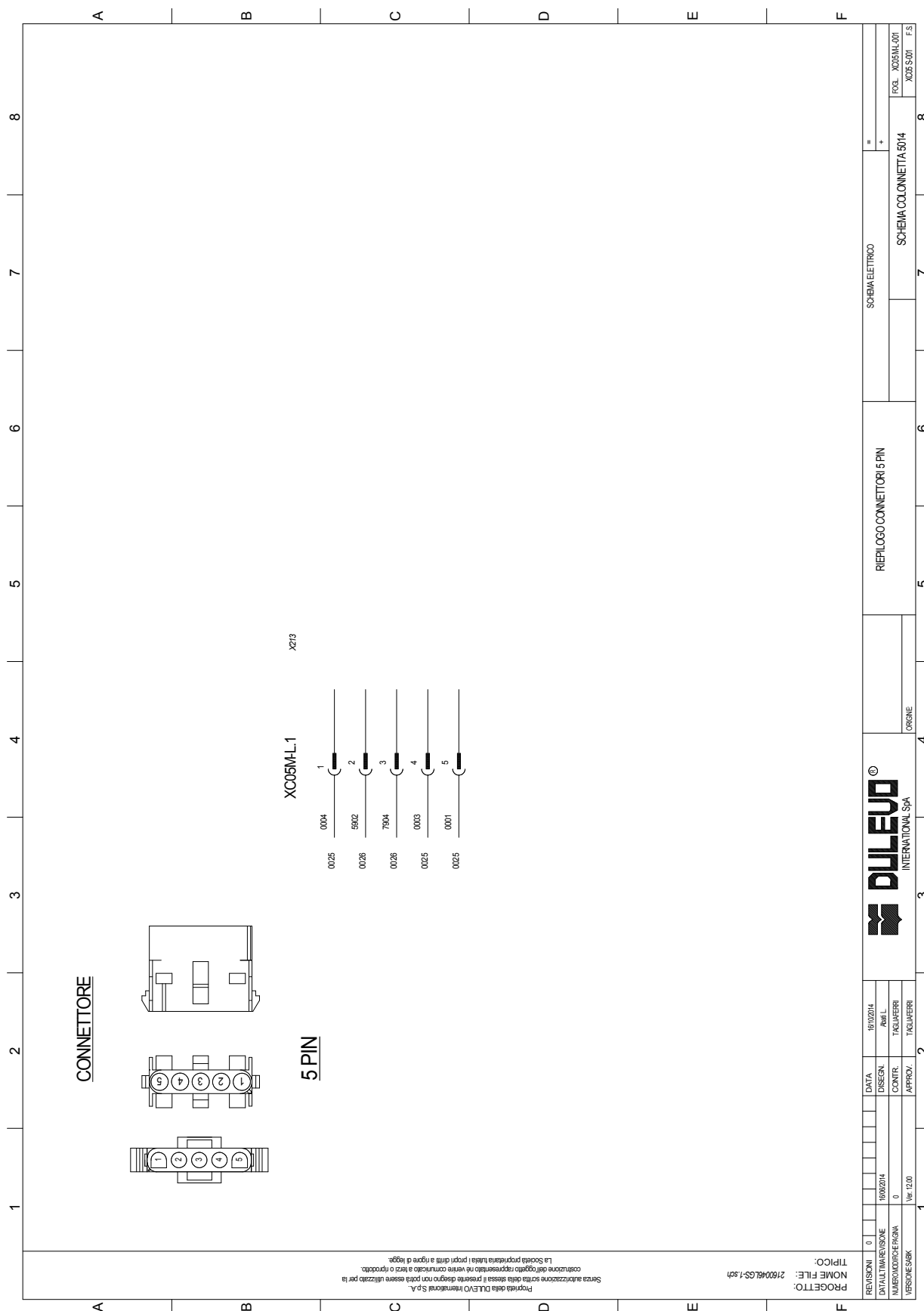


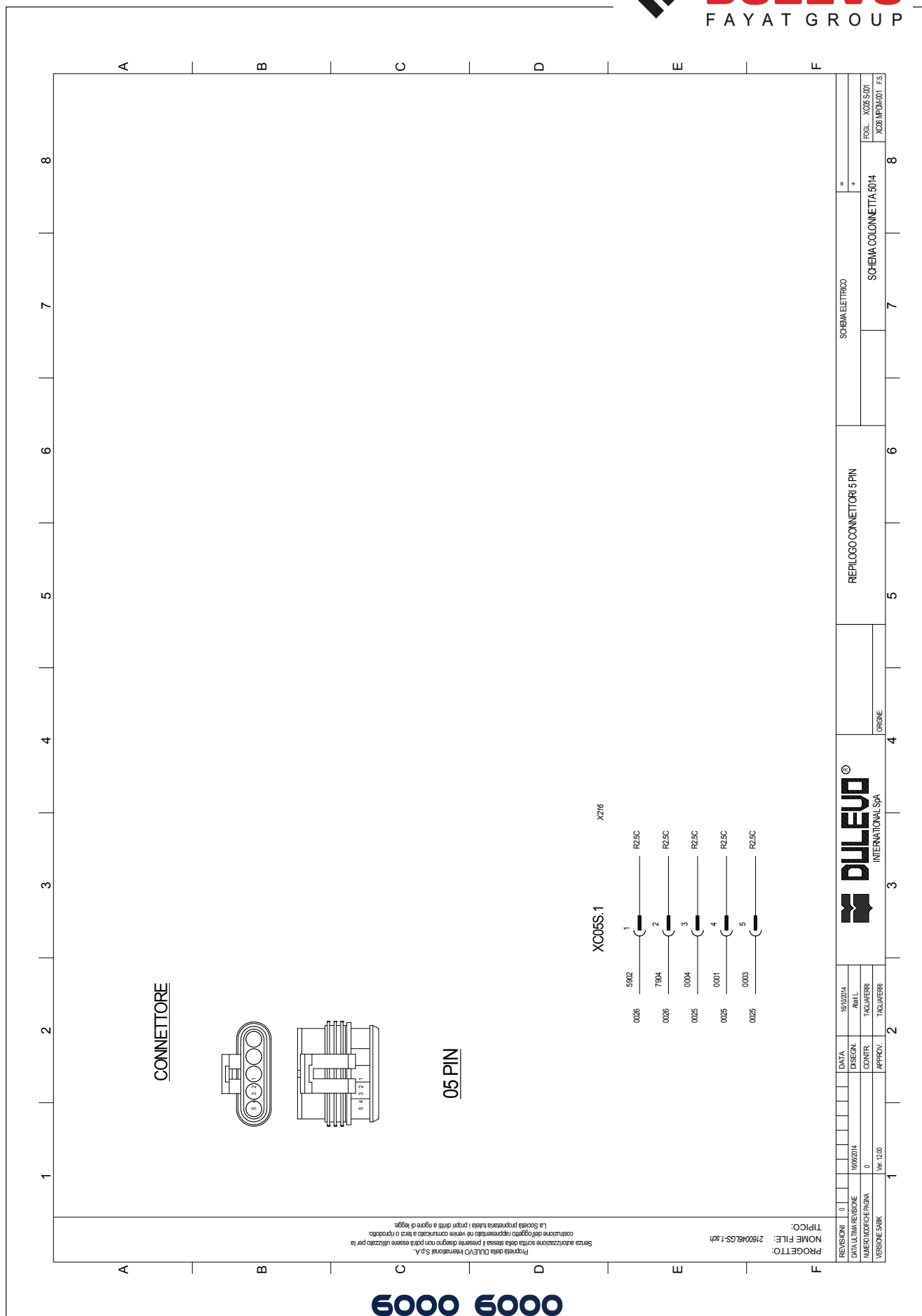
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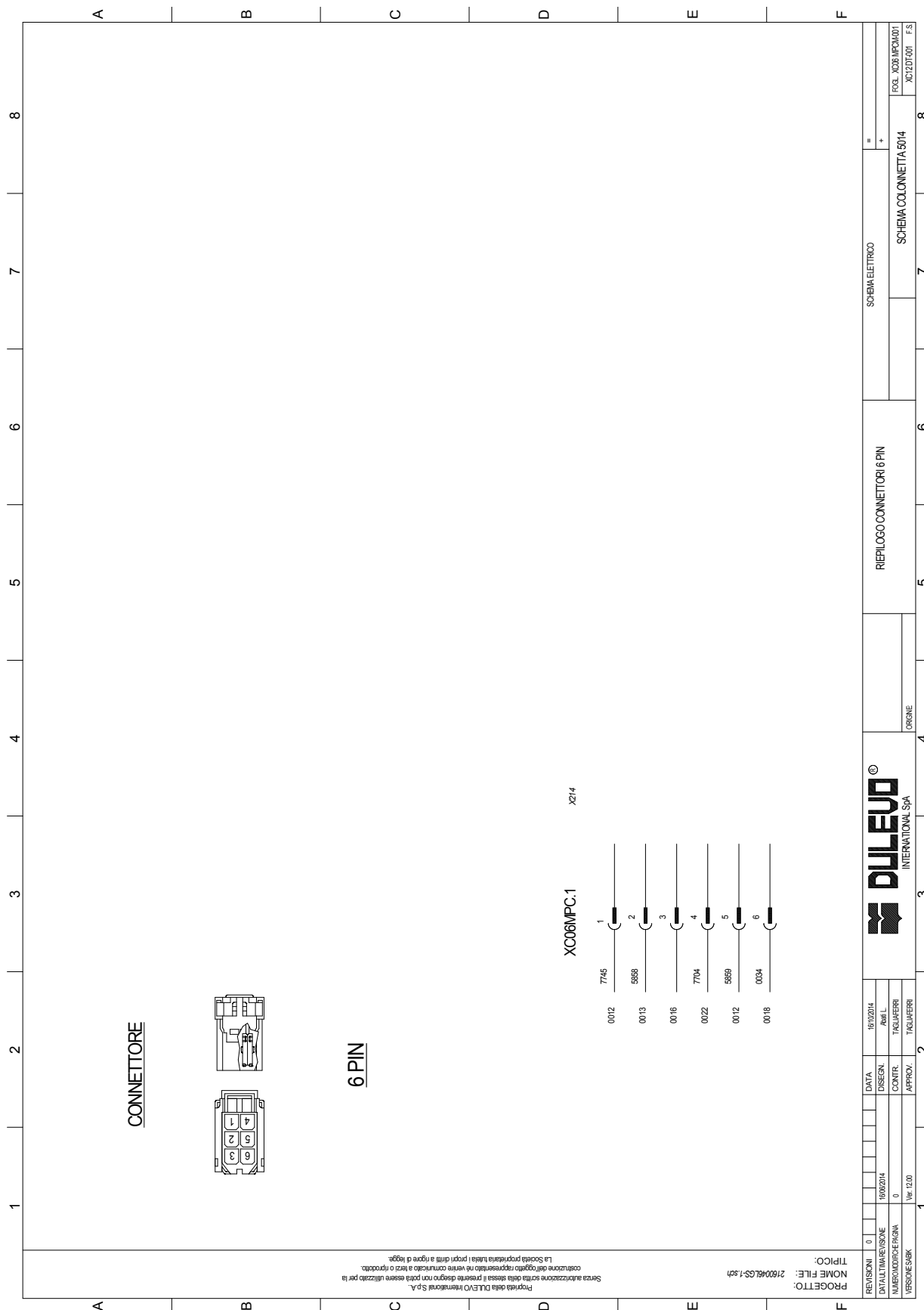
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NOME FILE: 21600046LGS-1.sch
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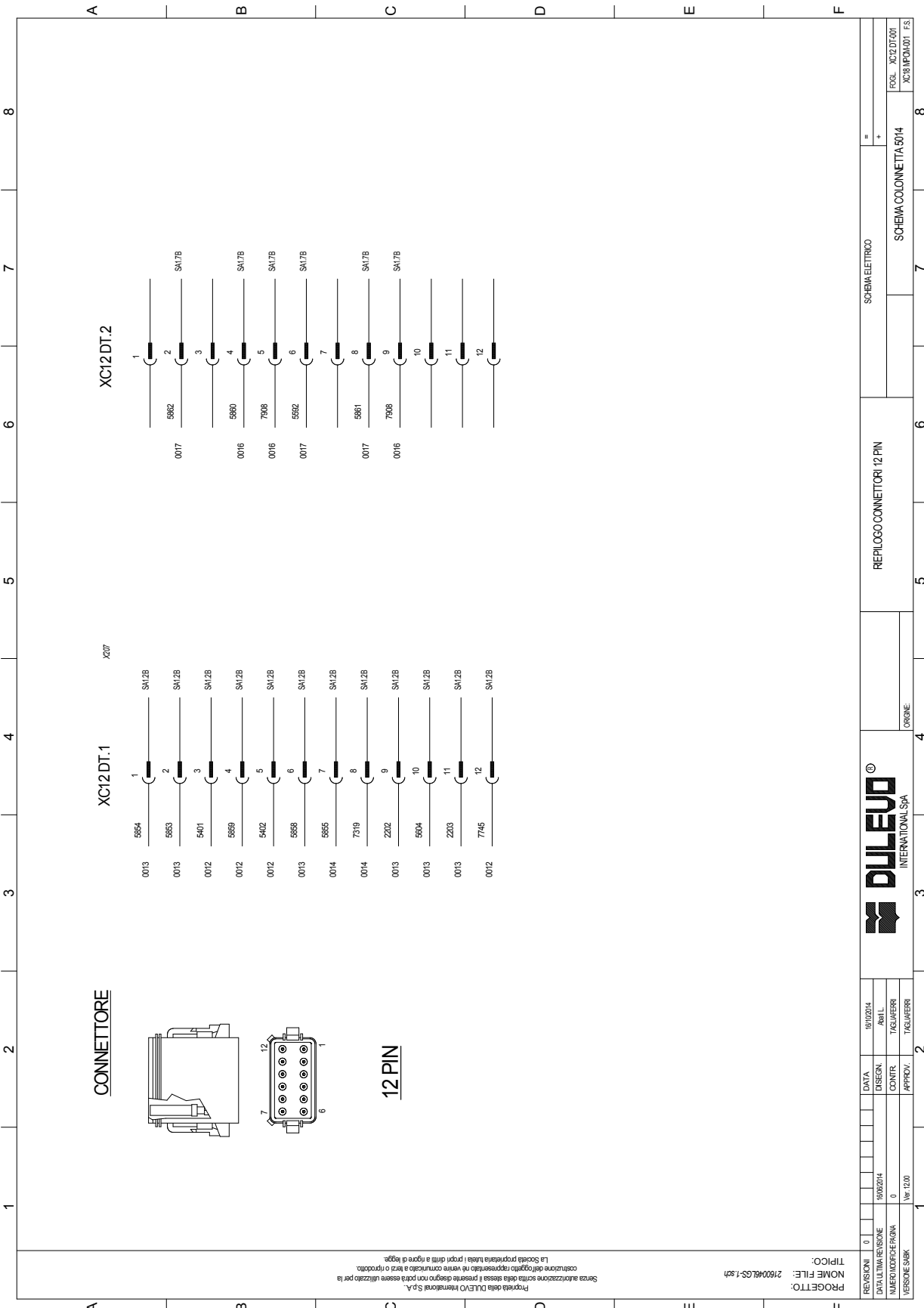


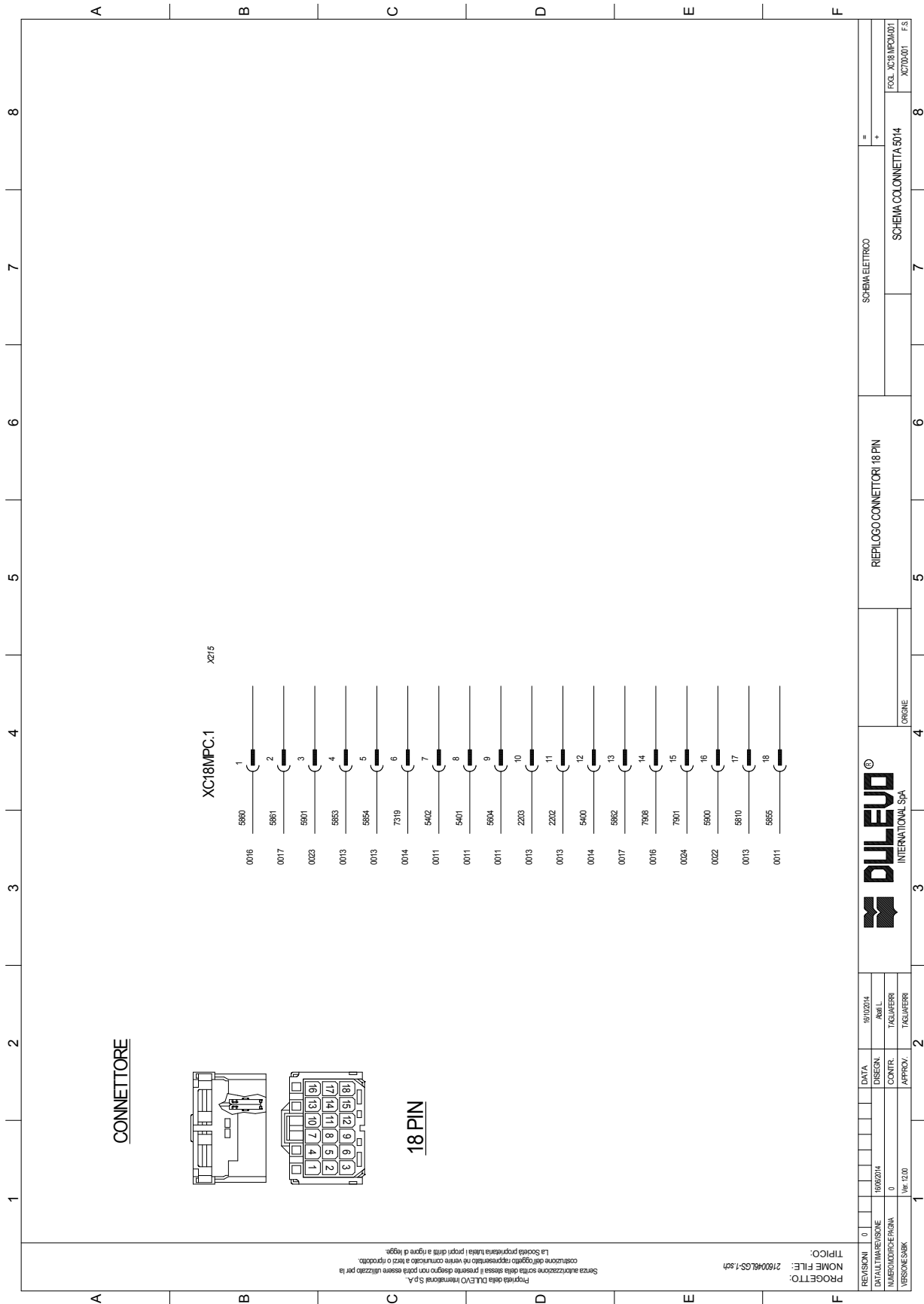


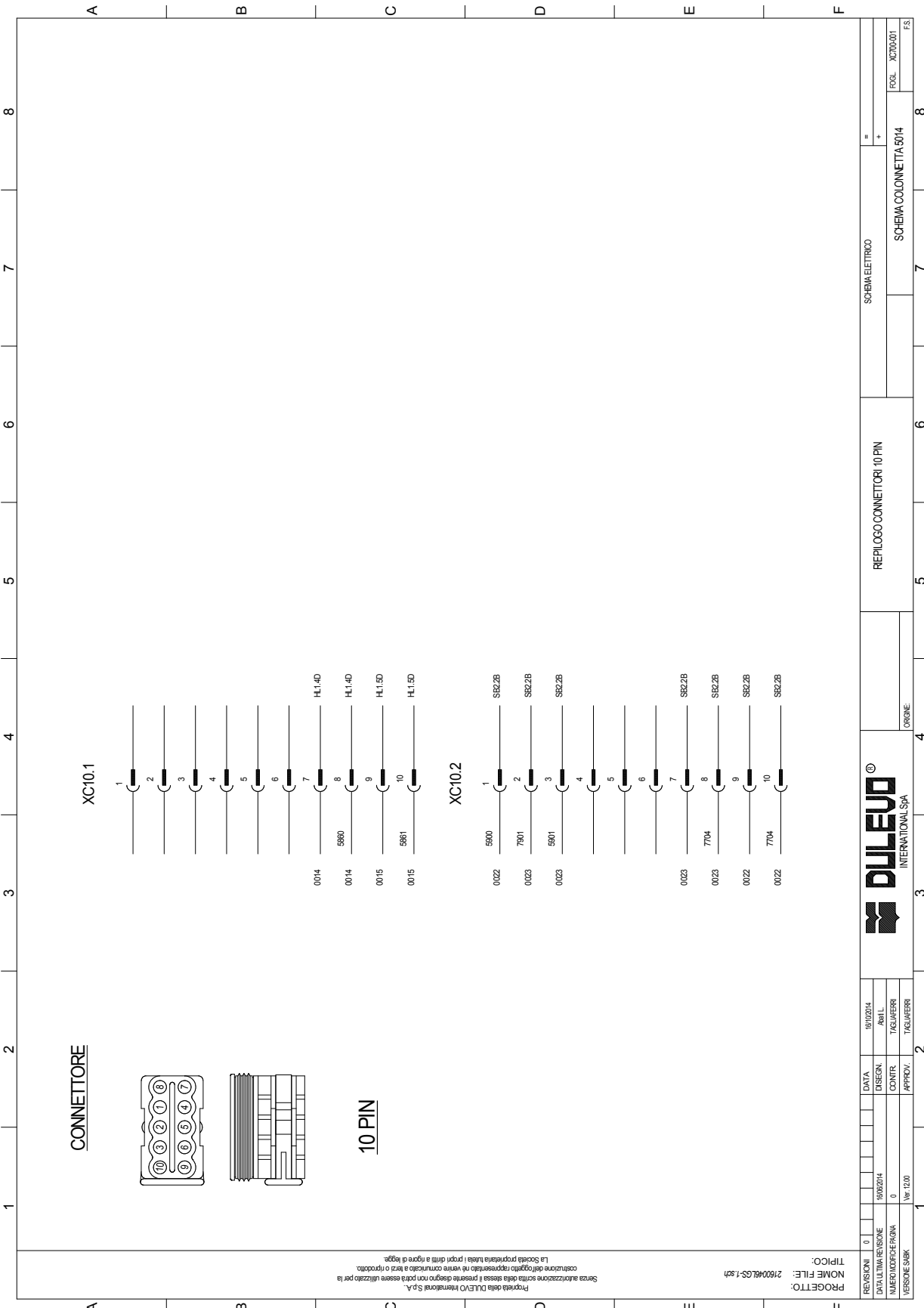
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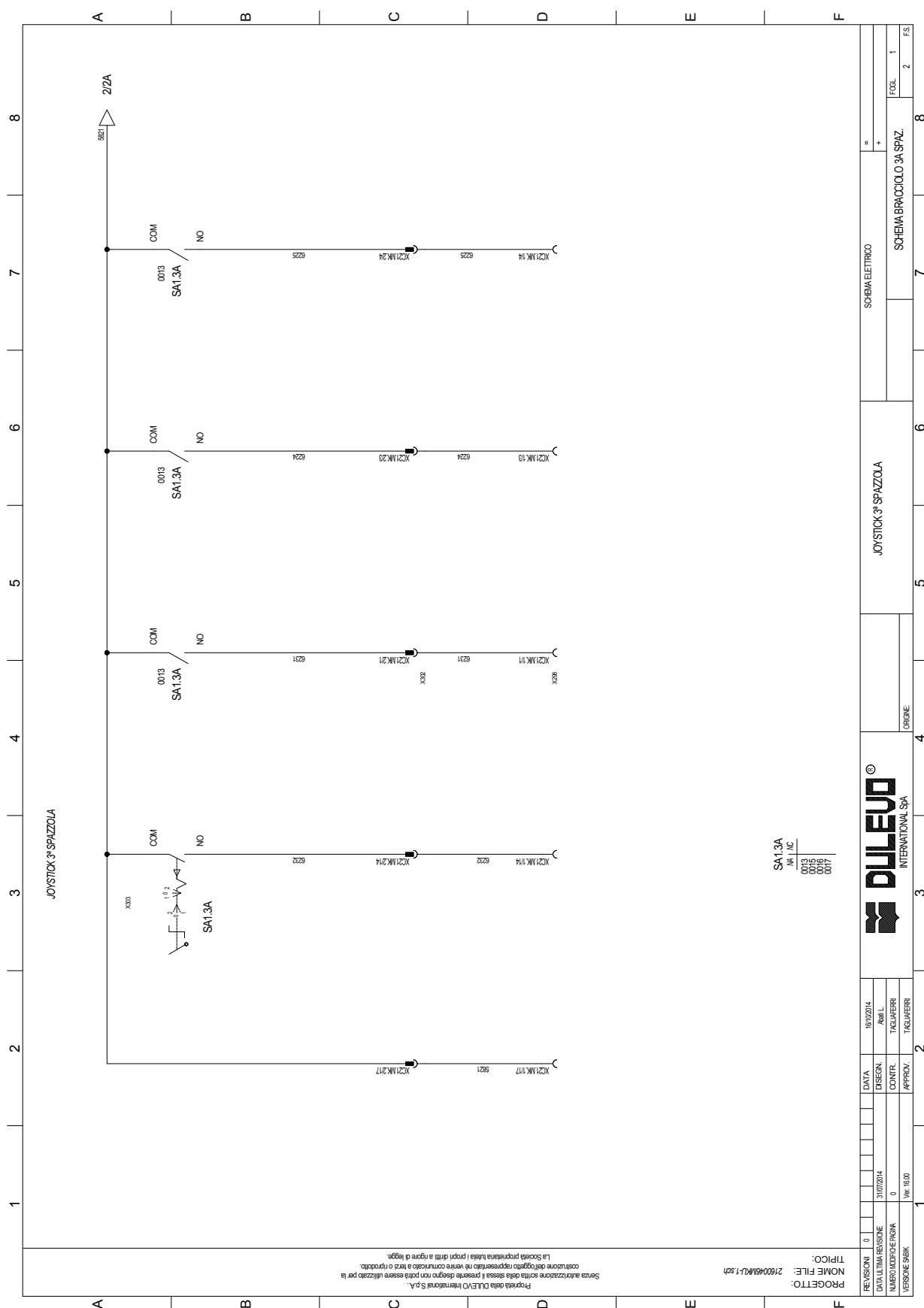


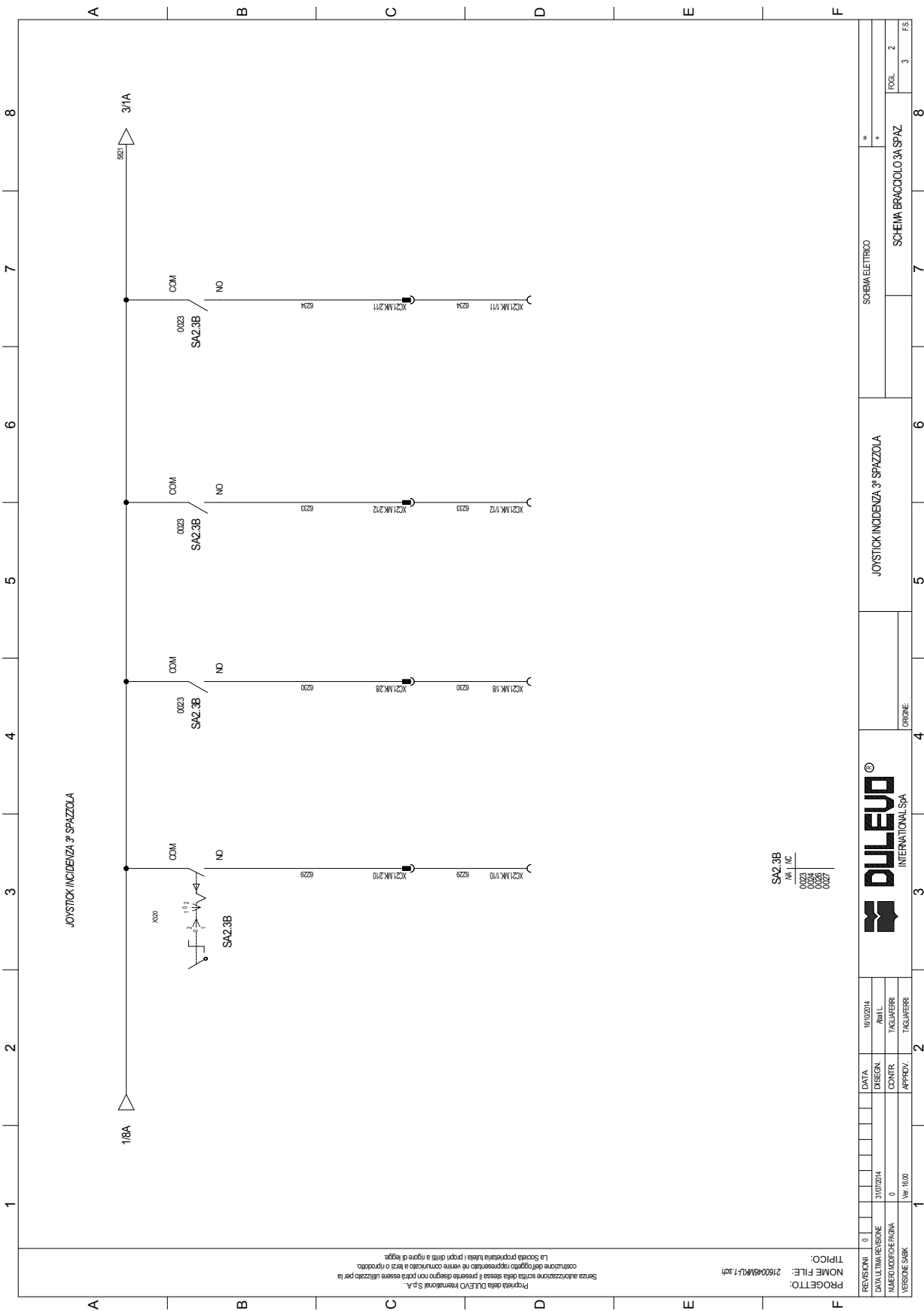


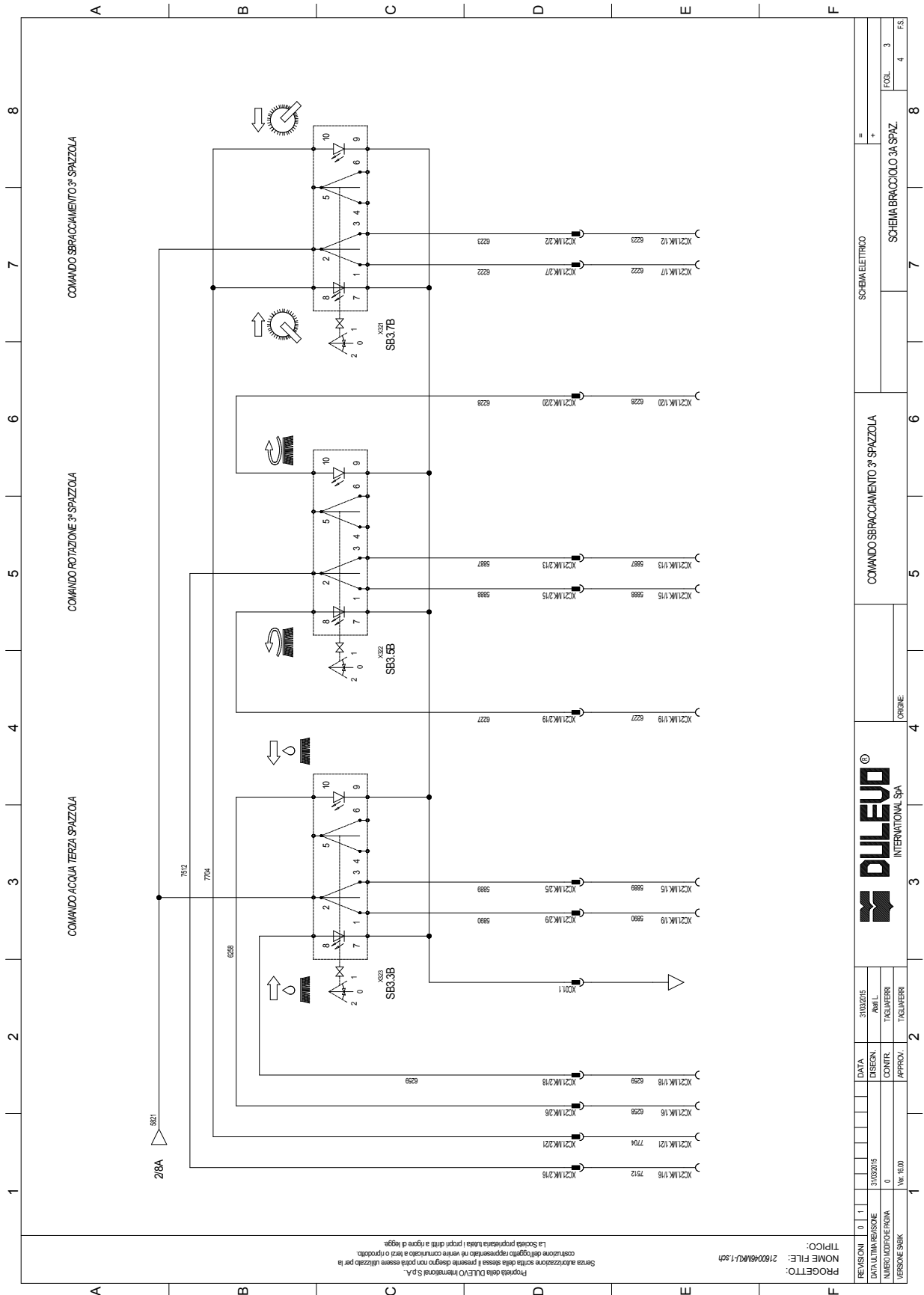


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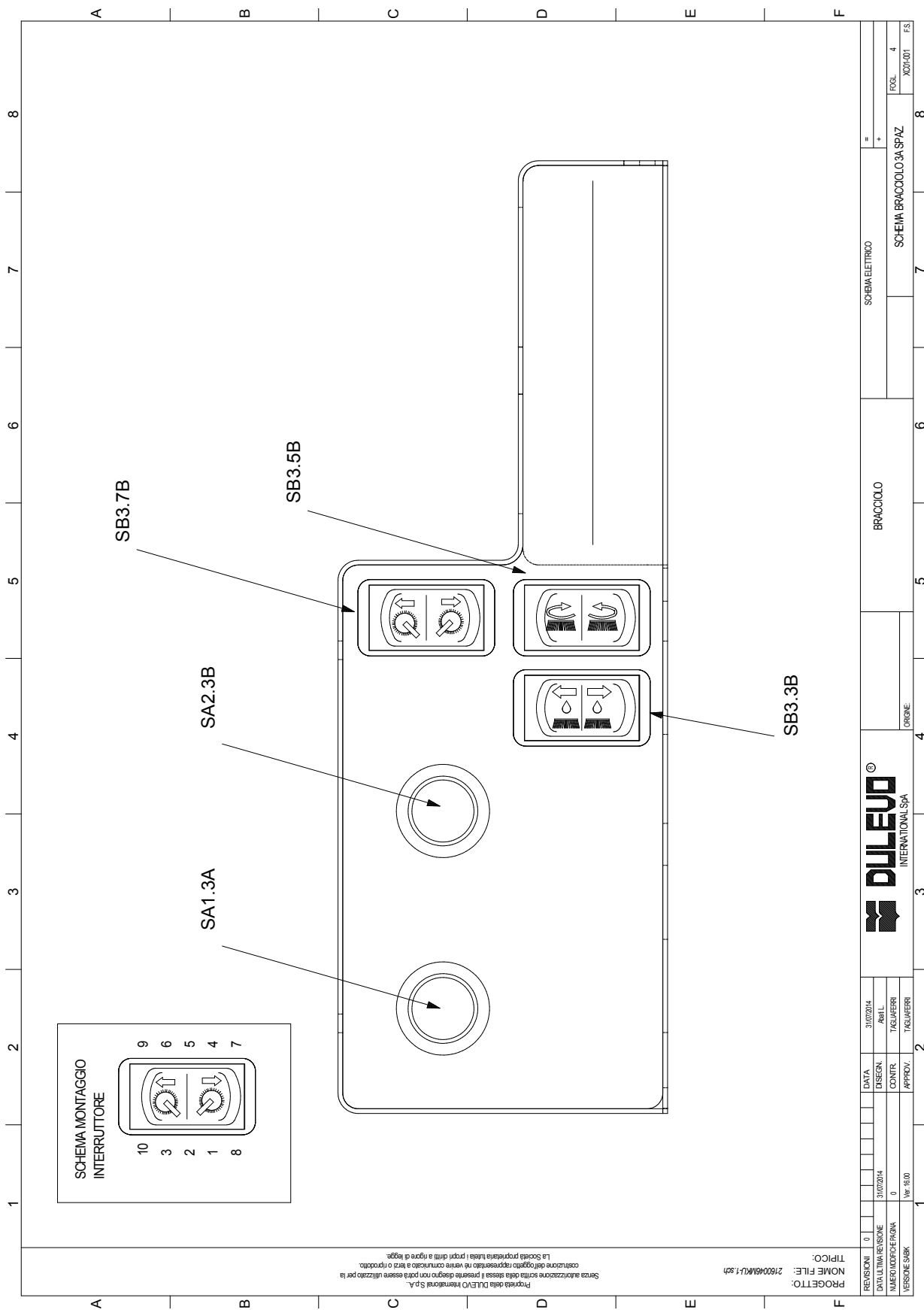




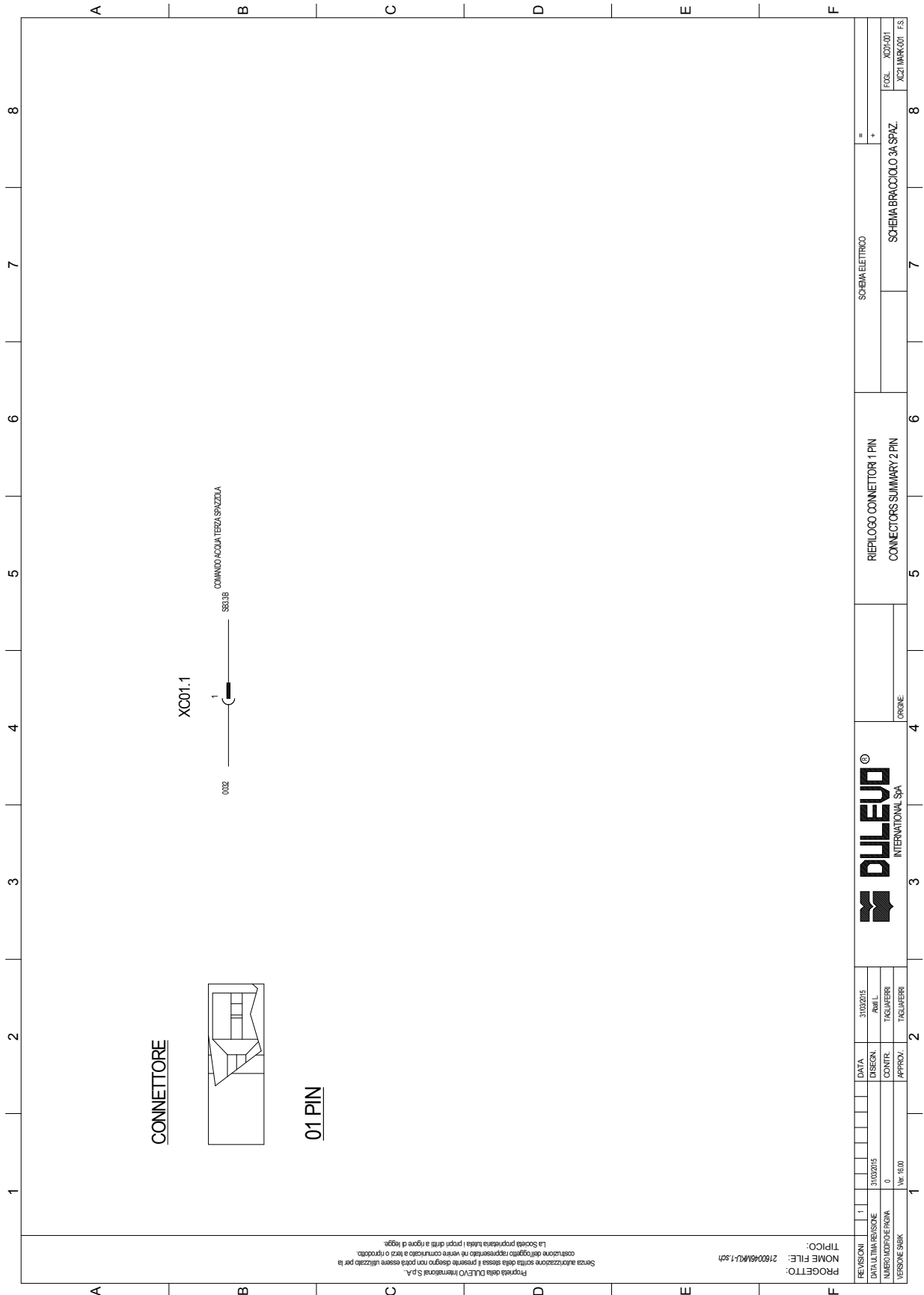


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PROGETTO:
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TIPO:

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CONNECTORS SUMMARY 2 PIN

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CONNETTORE

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TIPO: 216046MK1.24

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NOME FILE:
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AUTORE: ANI L.
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