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1 GENERAL

1.1 Introduction

The ELCONV are compact converters of Greatz Triphase bridge for the running of motors in short circuit up to 1500A, with high levels of precision performance and dynamic response.
The ELCONV are completely digital, in as much as all the functions of control and regulation, till the ignition command of the trysytors, which are managed by the 16 bit micro-controller.

The principal characteristics are:

- 4 quad bi-directional bridge
- Incorporated ultra-rapid fuses
- Incorporated fixed field power-supply or external regulation unit.
- Power Supply of 220 Vac. to 600 Vac.
- Exit until 580 Vdc.
- Frequency 45-65 Hz with automatic adaption.
- Control completely digital.
- 16 Bit Microprocessor.
- Communication serial RS 232 e RS 485.
- Simple and functional programisation.
- Auto-regulation of current loop.
- Sizes from 30 to 1500A.
- Overload 135% for 30'', every 300''.
- Programisation from local keyboard and/or PC.
- Reverse action speed from encoder and dynamo tachometer.
- Reverse action from Resolver (optional).
- Working temperature from 0 to 40 °C.
- Protection IP00.

1.2 Advice:

! ATTENTION
This machinery contains apparatus subject to high voltage.
Not complying to the strict installation procedures, as described in this manual, could cause serious injury to personnel not specifically trained.
Only specifically trained and qualified personnel, qualified according to the current regulations, are able to operate this machinery.
Before installing and using this apparatus, read the manual carefully.
OTO AUTOMATION S.R.L. decline any responsibility for any improper use of the machinery different from that prescribed within this manual.
No modification or operation not prescribed within the manual is allowed without the explicit authorisation from the constructers, and must be carried out only by qualified personnel.
In case of the contrary, the constructer declines every responsibility for possible
consequences, and the machine warranty becomes invalid.
The pre-operational services and installation of the machine is permitted only to qualified personnel.
The security regulations valid for the prevention of injury must be strictly adhered to.
The installation, the cabling, and the opening of the unit and/or converter must be carried out in the absence of voltage.
Position the apparatus in a way that facilitates maintenance, and where there is no danger of interference from moving parts.
Insure that there is always a guaranteed sufficient ventilation to cool the working temperature of the converter.
In case of fire do not use extinguishers containing water.
Avoid the penetration of water or other fluids at the internal of the apparatus.
Any operation at the internal of the apparatus must be carried out in the absence of the power supply.

1.3 Identification information

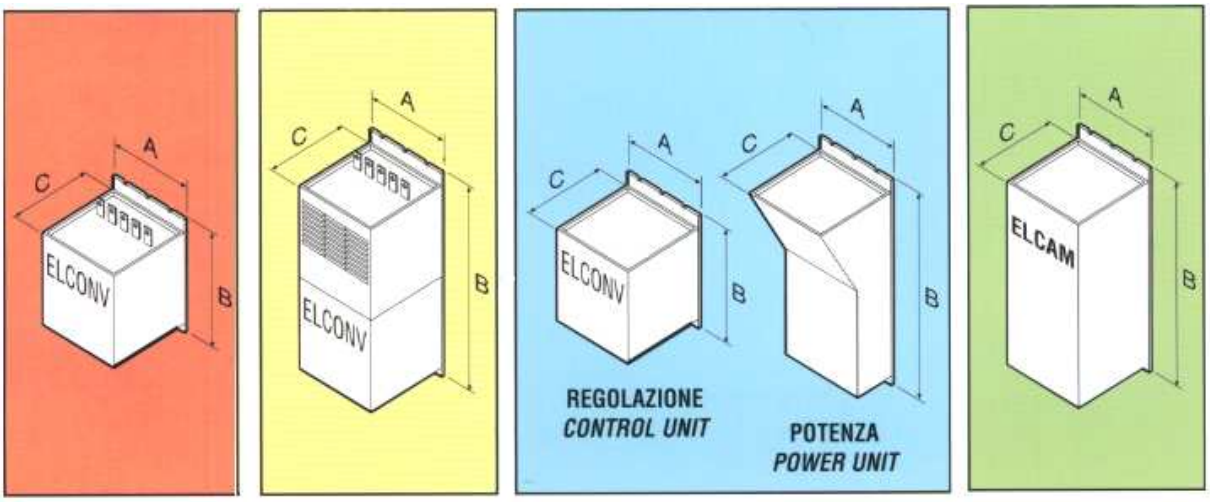
The identification information of the converter ELCONV is as follows:

Converter uni-directional tri-phase	CUT	XXX	X	X	X	X	X
Converter bi-directional tri-phase	CBT						
Nominal Current(A) Size 30/70/110/180/250/350/450/600/ 850/1000/1500		■					
Input Voltage Voltage 400Vac (≤ 415Vac) Voltage 500Vac (≥ 440 ≤ 560Vac) Voltage 600Vac (> 560 ≤ 630Vac)			■				
Supply field Fixed field F De-fluxion DD With Elcam				■			
Supply Field Max Current 24A 2 Max Current 40A 4					■		
Version With rear-action encoder E						■	
Version With local terminal T							■

Example: CBT 70 - 4 - F2 - E - T
Converter Bi-directional Tri-phase I Nom. = 70A Vingr. - 400Vac - Fixed - Exc. max 24A - with rear-action encoder – with keyboard display.

2 Installation

2.1 Dimensions



CBT	30	70	110	180	250	350	450	600	850	1000	1500		ELCAM
											Control	Power	
A	320	320	320	347	347	347	372	372	470	470	320	620	95
B	300	300	380	480	480	480	600	600	740	740	300	1315	265
C	333	333	333	362	362	362	362	362	400	400	333	495	142

2.2 Installation instructions

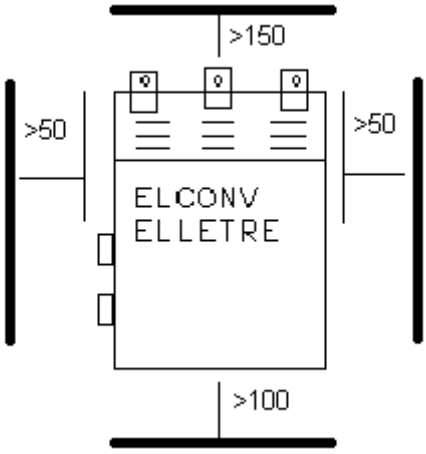
The converter must be installed only in a **vertical** position. The apparatus must not be installed in an oblique or horizontal position, in this way the apparatus is subject to major heat build-up, and this may cause damage. All command elements need to be easily accessed.

The regular function and the life of the converter depend on the room temperature being maintained within a 0℃ - +45℃ range. The temperature should be controlled at frequent intervals.

Air humidity must not be superior to 90% with no condensation formation.

The converter must be installed in a well ventilated and dust-free position. Avoid environmental conditions with dangerous gases. Also abrasive dust, steam, oil spray or salt air may compromise the life of the apparatus.

Other machinery must be at a sufficient distance from the converter operational area, to avoid the possible interference of metallic residue, or electric cables. In no case should the converter be installed close to flammable material.



Minimum distance (mm) needed to guarantee a correct ventilation, taking into account the possible need to enact internal maintenance of the converter.

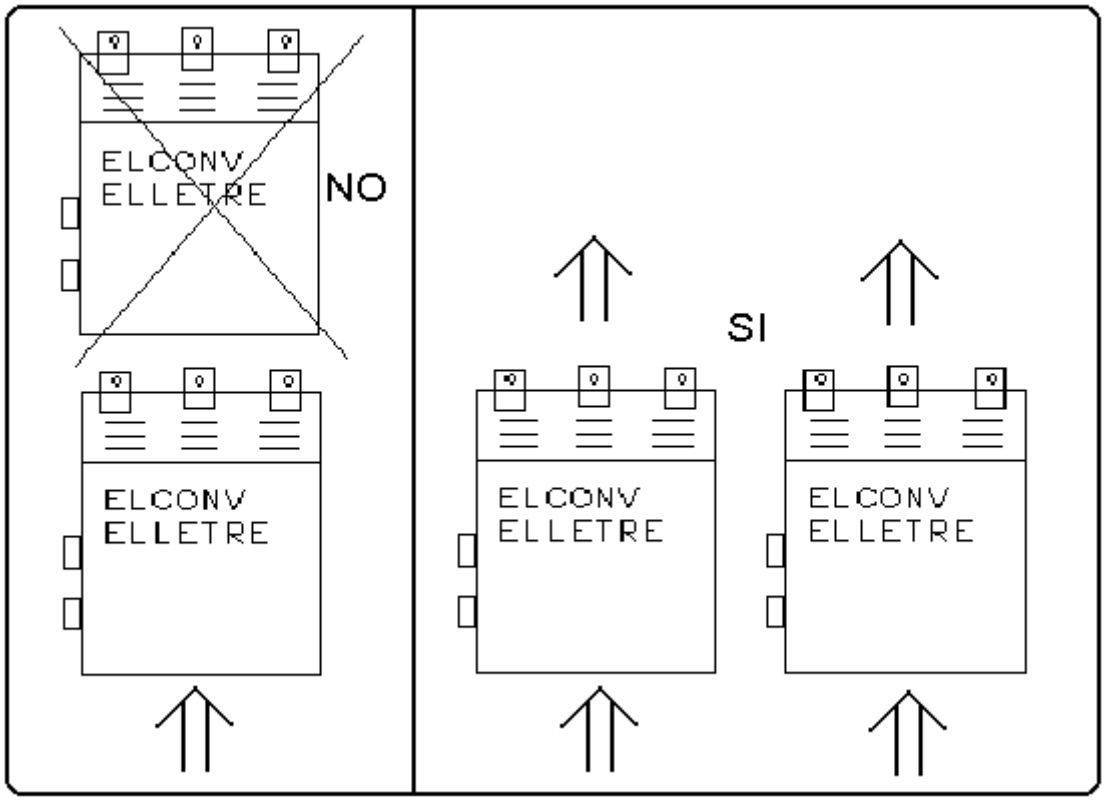
The converter must not be installed in an environment subject to strong vibrations.

If the apparatus in which the converter is set-up on, is of a mobile type, correct and competent systems of anchorage must be present.

If the apparatus has been installed in a closed environment, for example in a closet, take particular attention that the internal temperature does not exceed the environmental temperature advised for the converter (+45℃).

The environment must be ventilated with a sufficient quantity of air to displace the heat generated by the converter and the other components.

A converter must not be installed within the cooling air-flow of another converter, or other units. The ventilators of a converter servoventilated must be installed considering the optimal flow of the cooling air (see figure).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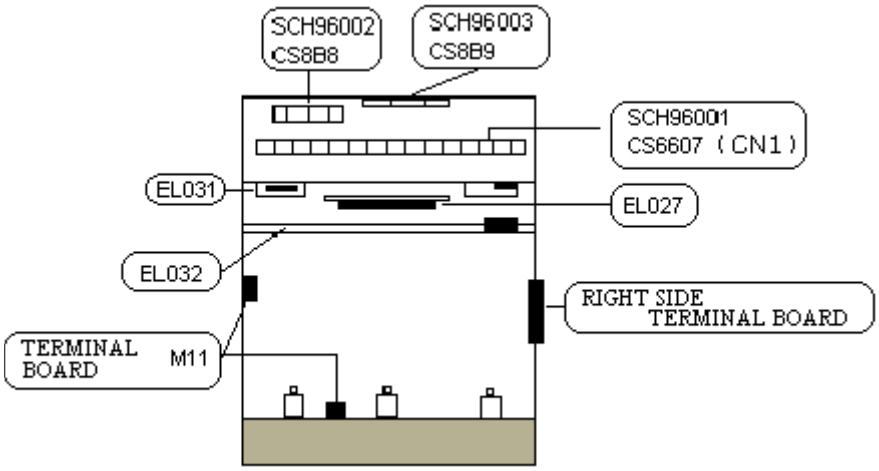
2.3 Position of Control board and Terminal board



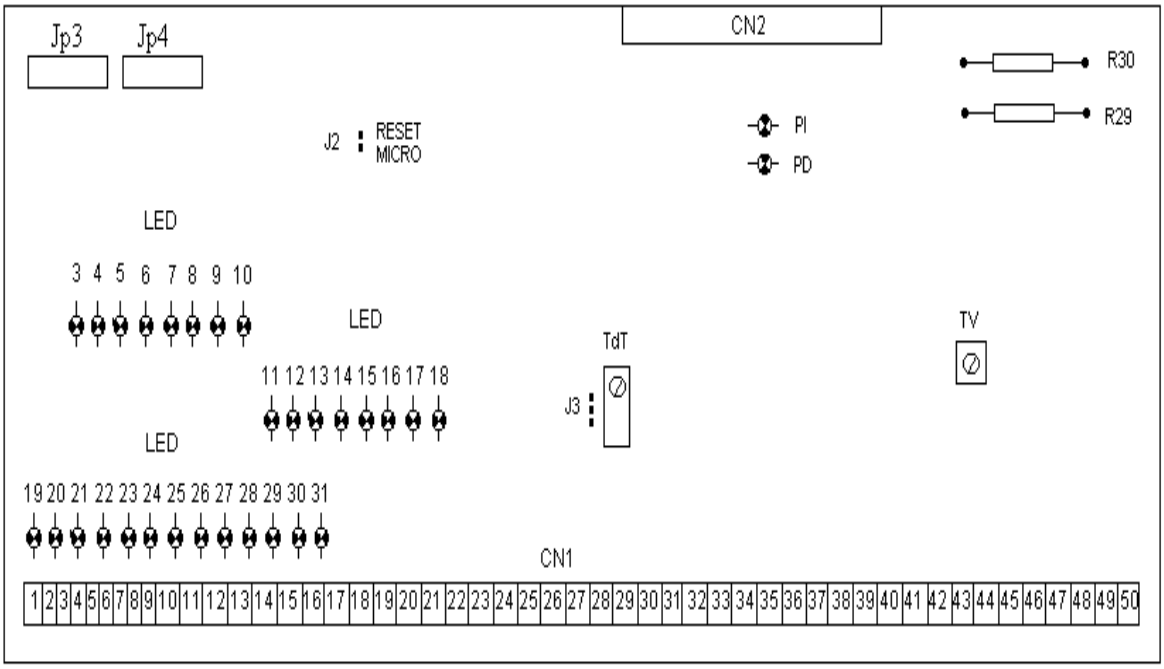
The above layout is valid for all the drives. It needs to be taken into account that the EL027 microprocessor is not mounted on the DD (digitally de-fluxed) drives, which are supplied with the ELCAM control board (supplied separately).
In the above scheme, the EL034 board (RC filter board) is not shown, as the connection is not necessary by the client. It is situated in the internal ventilator compartment for the drive from 180 ÷1000A, for the 30-70-110A & 1500A it is situated under the fuses.
This board develops from the overflow filter and serves to protect the S.C.R. from eventual voltage peaks present on the line.

2.4 Topographic scheme of CS6607 board

(cod. OTO AUTOMATION Sch 96001 and/or Sch96101)

Description:

The CS6607 board is the regulation board of the converter ELCONV, which via the 16 bit microprocessor manages all the functions of the converter.



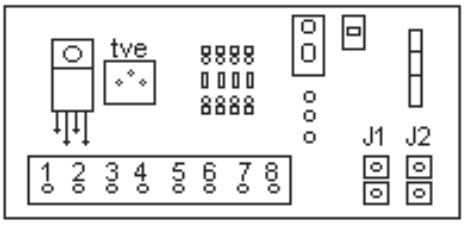
Jp3:	Communication serial port Rs 232 for display keyboard or pc.
Jp4:	Communication serial port Rs 485.
Led PI	Led function signal, Inverse bridge.
Led PD	Led function signal, Direct bridge.
Led 3	Led alarm signal “eprom” – “ram”, board.
Led 11 a 18	Led signal output state.
Led 19 a 31	Led signal input state.
R29//R30	Resistance for the regulation of maximum current.

2.5 Topographic scheme of CS8B8 board

(cod OTO AUTOMATION Sch 96002)

Description:

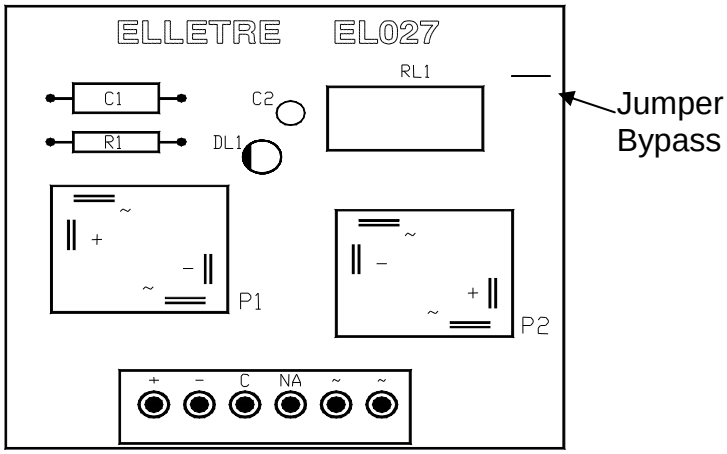
The CS8B8 board is the board that permits the rear-action of the motor controlled in short circuit, via an encoder which can be of the non differential two channel type (A & B), or otherwise differential two channel (A, **A** & B, **B**).



2.6 Topographic scheme of EL 027 board

Description:

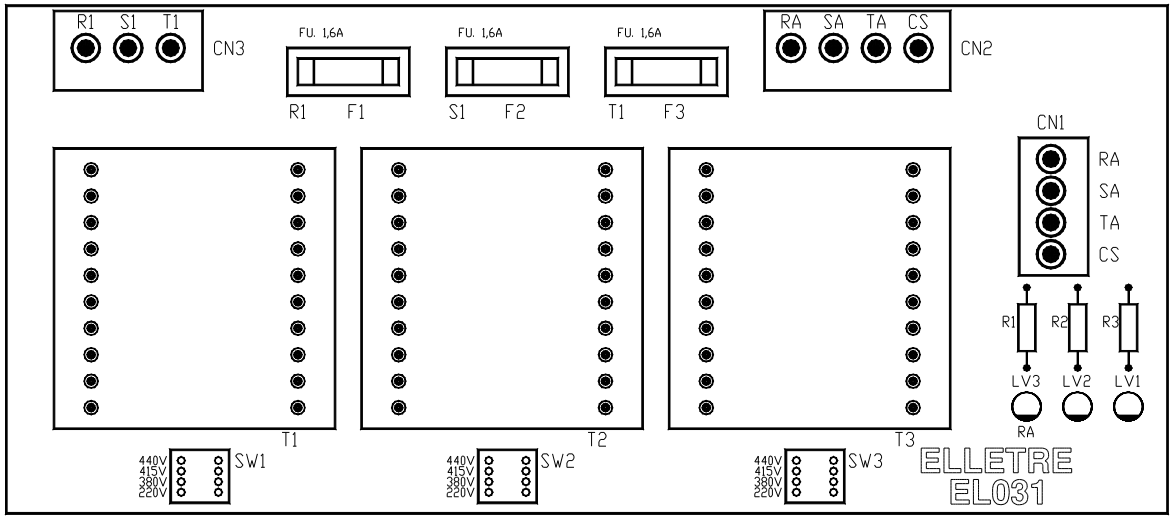
The EL027 is a field supply equipped with a relay for the signalisation of any eventual missing field.



2.7 Topographic scheme of EL031 board

Description:

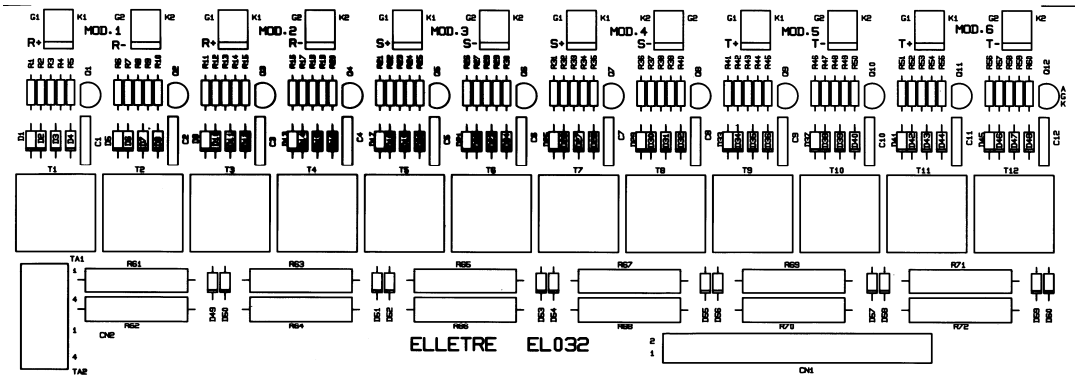
The EL031 board is a board equipped with three monophase transformers, which when connected, transform the tri-phase supply voltage RST (triangle) in Ra Sa Ta Cs (star) to around 11Vac in respect to the star centre; from this the CS6607 board obtains the supply. This board supplies the CS6607 regulation board and is also a synchroniser.



2.8 Topographic scheme of the EL032 board

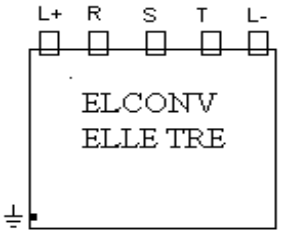
Description:

This board contains the ignition circuits for the tyrystors. It also guarantees the galvanic insulation between the power and the regulation board.

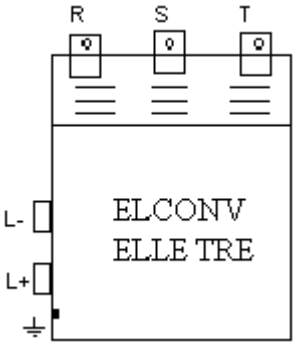


3 Electrical connections:

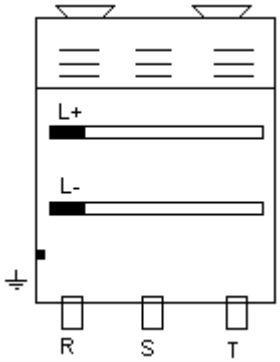
3.1 Connection of the power



Disposition of power terminals for the Elconv CBT 30-70-110A.



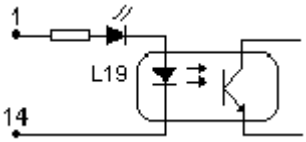
Disposition of power terminals for the Elconv CBT 180-250-350-450-600-850-1000A.



Disposition of power terminals for the Elconv CBT 1500A.
All the connections must be carried out respecting the correct normative.
A limit inductor of voltage peaks (to safe guard the tyrystors) is required for each converter. The connection to the converter must be carried out in a stable manner and with adequate cables for the three phases, RST terminal block and also for the armature L+L- and earth.

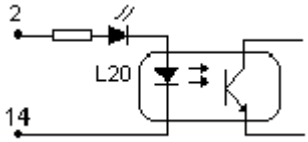
3.2 Terminal Block of regulation board CS6607

Terminal Block 1 – release regulation 24Vdc / 5mA



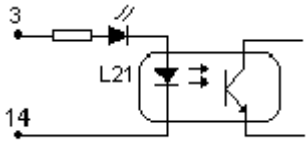
Description of input:
With 24V in input the regulation is released and the drive is started, as long as there are all the permissions. If the drive is in start, and this input is removed, the references are automatically removed and the drive is blocked.

Terminal Block 2 – enable clockwise rotation (CW) 24Vdc / 5mA



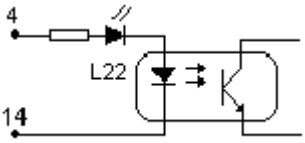
Description of input:
With 24V input, the speed reference entered at terminal blocks 32-33-34 with signal is enabled.

Terminal Block 3 – enable anti-clockwise rotation (CCW) 24Vdc / 5mA



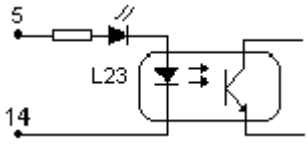
Description of input:
With 24V input, the speed reference entering at terminal blocks 32-33-34 with reverse signal, is enabled .

Terminal Board 4 – Jog cw 24Vdc / 5mA



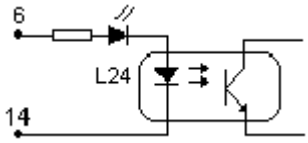
Description of input:
With 24V input, this is used as a speed reference the value set at the parameters.
P3 with its signal (P3 positive, D.T. positive).

Terminal Block 5 – Jog ccw 24Vdc / 5mA



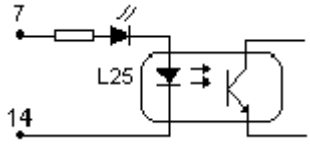
Description of input:
With 24V input, one uses as a speed reference the value set at parameter P4 with reverse signal..

Terminal Block 6 – exclusion ramp 24Vdc / 5mA



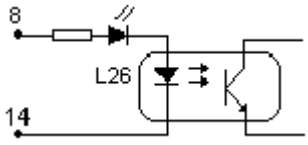
Description of input:
With 24V input the internal ramp is excluded from the drive (parameters from P11 to P18). If the ramp is excluded, the reference speed in input is the same as exit.

Terminal Block 7 – enable IPD 24Vdc / 5mA



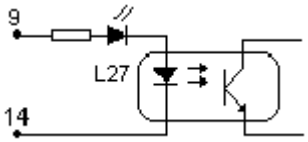
Description of input:
With 24V input, the IPD signal entering at terminal blocks 36-38 is enabled, depending on the function programmed with S7. With IPD enabled, the current is regulated from the external direct bridge with the analogic reference entering in the terminal blocks 36-38. The maximum limit of the current is stabilised by the parameter P29.

Terminal Block 8 – enable IPI 24Vdc / 5mA



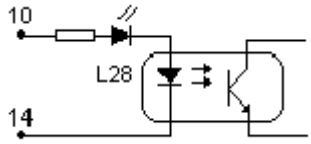
Description of input:
With 24V input, the IPI signal entering at terminal blocks 37-38 is enabled, depending on the function programmed with S7. With IPI enabled it regulates the current of the inverse bridge externally with an analogic reference entering at the terminal blocks 37-38. The maximum limit of the current is stabilised by the parameter P30.

Terminal Block 9 – enable added signal 24Vdc / 5mA



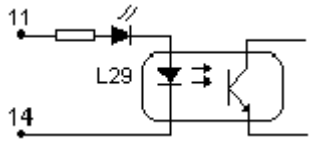
Description of input:
With 24V input, the added signal entering at terminal blocks 35-38 is enabled depending on the function programmed with S4. This signal takes into account the corrective coefficients P5 & P6.
If P5 is equal to 0 there is no signal in V3 (see block scheme of board).

Terminal Block 10 – reset alarms 24Vdc / 5mA



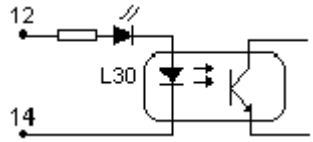
Description of input:
By applying 24V input the alarm memory is reset, if there are no alarms present. The reset is activated only at climb front of entrance signal.

Terminal Block 11 – enable start with delay 24Vdc / 5mA



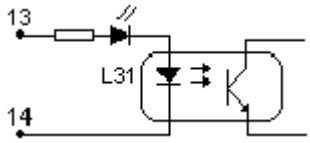
Description of input:
With 24V input, the abilitation of drive start, once waiting time P46 has run.
If input is taken away, the drive is immediately blocked.

Terminal Block 12 – external consent n°1 24Vdc / 5mA



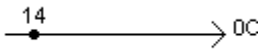
Description of input:
24V is needed for permission to start the driver.
This input is commonly utilised to signal if one or more power fuses have disconnected. If this input is missing, the drive is immediately blocked.

Terminal Block 13 – external consent n°2 24Vdc / 5mA



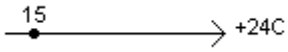
Description of input:
24V is needed for permission to start the driver. This input is utilised to signal missing excitation. If this input is missing, the drive is immediately blocked.

Terminal Block 14 – common negative 0Vdc



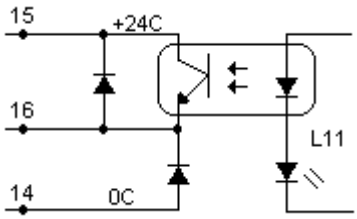
Description of input:
Organises all the common negatives of the digital input and output.

Terminal Block 15 – common positive 24Vdc / 200mA



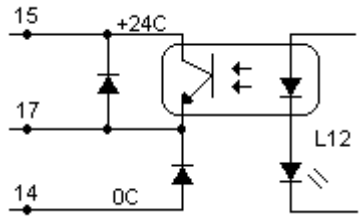
Description of input:
Organises all the common positives of the digital output. Requires a 24V power supply.

Terminal Block 16 – start ready 24Vdc / 80mA



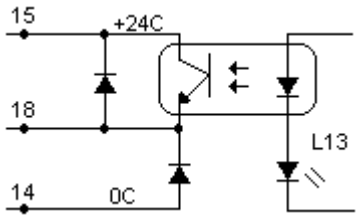
Description of output:
If the drive does not reveal any alarms, it is taken up to 24V, and is able to supply a load up to
80 mA; if any of the alarms are present this function is released.

Terminal Block 17 – ramp end 24Vdc / 40mA



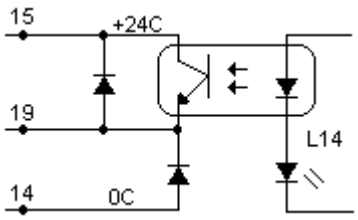
Description of input:
When the drive is in start, and the output becomes equal to that of the input, it is taken up to 24V. With the drive stopped this is taken to zero level.

Terminal Block 18 – start drive or minimum speed 24Vdc / 80mA



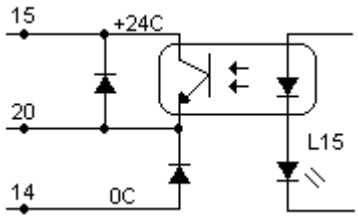
Description of input:
Signals taken to 24V, or drive in start if S6=1, or the minimum speed (set at parameter P47), if S6=0. In arrest it is in any case, at level zero. This output is normally utilised as a peak signal, from the motor, of the minimum speed in arrest phase of the machine. Practically, first the speed reference is removed, the motor decelerates, and at arrival of the minimum speed (S6 =0) the line counter opens. This guarantees the opening of the counter after the motor is stationary, due to this the voltage in “play” is nil. An opening of the counter with the motor-drive in recuperation will cause damage to the protection equipment of the apparatus.

Terminal Block 19 – external protection intervention 24Vdc / 40mA



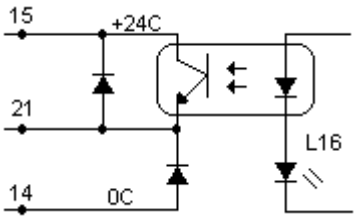
Description of output:
Signals taken to 24V, a lack, even if only transitory, of one of the external consents 1 or 2 (see paragraph 11.1). The drive goes into block and will need to be reset.

Terminal Block 20 – network control and power supply 24Vdc / 40mA



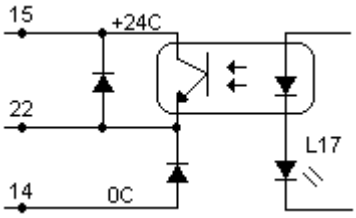
Description of output:
Signals taken to 24V, any alarm relative to the network, (overturned cyclic direction, missing phase, max. voltage tolerance (P49,P50)) and to the internal power supply of the board (see paragraph 11.2).
If drive is blocked , remains memorised.

Terminal Block 21 – current control 24Vdc / 40mA



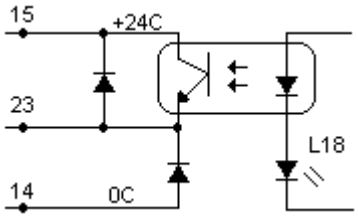
Description of output:
Signals taken to 24V, any alarm relative to the conduction of the converter; such as the maximum instantaneous voltage, etc (see paragraph 11.3). Blocks drive and remains memorised.

Terminal Block 22 – speed control 24Vdc / 40mA



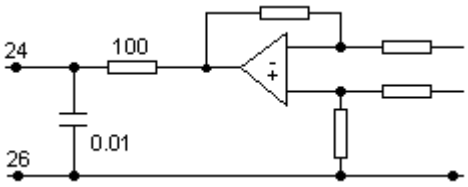
Description of output:
Signals taken to 24V, any alarm relative to the speed such as: missing speed reaction, reaction of inverted speed, excess speed (P51), etc (see paragraph 11.4).
Blocks drive and remains memorised.

Terminal Block 23 – thermal motor and/or drive 24Vdc / 40mA



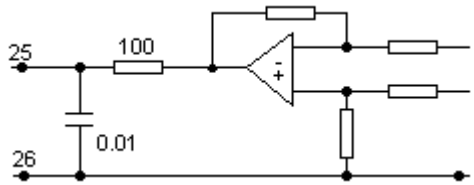
Description of output:
Signals taken to 24V, the superation of the thermal voltage of the motor (parameters P44, P45 & P48) and/or drive (parameters P53, P54 e P55). (See paragraph 11.5)
The calculation is done considering the square of the medium current and is elaborated also with the drive in arrest, as power supply is present.
Once the pre-alarm threshold has been superated, there is only one signal; when the alarm threshold is superated, the drive is blocked.

Terminal Block 24 – analogic exit



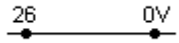
Description of output:
Signal for the control of the ELCAM field regulator board. In the absence of this signal, the ELCAM board will not supply current. (see parag.4).

Terminal Block 25 – programmable analogic exit +/-10V / 2mA



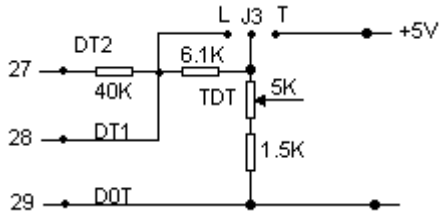
Description of output:
Analogic exit relative to the internal size (See in “Dislpays” – “Internal Quantity” parag. 7) selected via the parameter S1. The value is comprised of between +/- 10V and comes from an operational amplifier with 100 ohm run. *Example* : selecting S1 = 10, it gives the signal +/- 10V proportional to the current request.

Terminal Block 26 – common 0Vdc



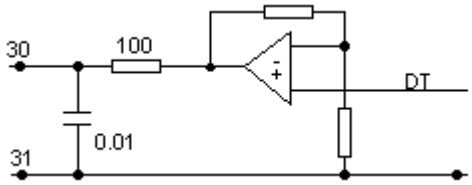
Description of output:
0V of the regulation: gives the return for the analogic exit for the terminal blocks 24-25.

Terminal Blocks 27 - 28 - 29 –dynamo tachometer input



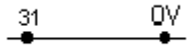
5V < DT1 – 0DT < 40V
40V< DT2 – 0DT < 180V
Description of input:
Depending on the level of voltage of the tachometer dynamo, in relation to the max. speed of the motor, it enters at:
28-29 + J3 in position "L" if V.D.T is comprised of between 5 – 20V,
28-29 + J3 open if V.D.T is comprised of between 10 – 40V,
27-29 + J3 in position "L" if V.D.T is comprised of between 40 – 120V,
27-29 + J3 open if V.D.T is comprised of between 50 – 180V.

Terminal Block 30 – analogic output of speed +/- 10V / 2mA



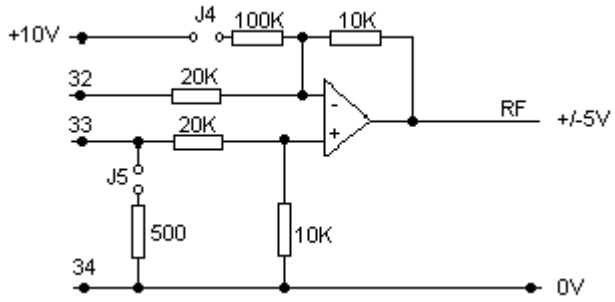
Description of output:
Output standardised by the tachometer dynamo. A signal of +/- 10V is present, proportional to the speed by which, with the maximum speed, gives 10 V. May be needed for a analogic reading, and comes from a operational amplifier with a 100 ohm run.
In case of an encoder, this output visualises the value nil, then it is necessary to utilise the exit 25-26 with S1 = 6.

Terminal Block 31 – common – 0V



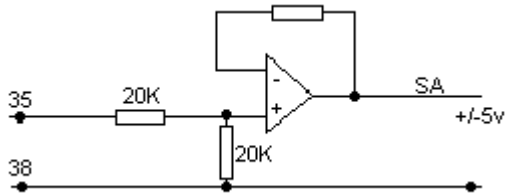
Description of output:
0V of the regulation; gives the return for output 30.

Terminal Block 32 – 33 – 34 input of analogic reference +/-10V 0-20mA



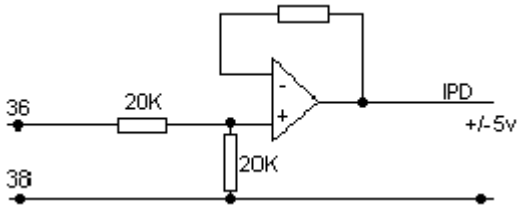
Differential input for the speed reference**:**
The input 33 with 32 at zero and not inverted.
The input 32 with 33 at zero and inverted.
For signals 0-20mA enter between terminal blocks 33 e 34 and close the Jumper J5 whilst 32 is connected to zero.
For signals 4 – 20 mA close also the Jumper J4, the offset needs to be cleared, at take note that the maximum speed is reached with RF=84% and not at 100%. (See parag. 14.3 for the correct link for reference).

Terminal Block 35 – additional signal +/-10V / 0.25A



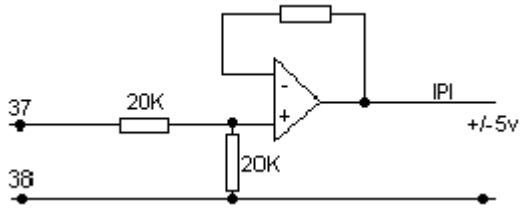
Description of input:
Analogic input for the additional reference signal S.A.
Configurable internally with the parameter S4. (See block scheme parag. 13.2).

Terminal Block 36 – input of signal IPD +/-10V 0.25 mA



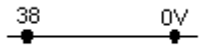
Description of input:
Analogic input for the external control signal of the direct bridge current. This is enabled by taking to 24V the input 7; it is also configurable internally with the parameter S7. (See block scheme at parag. 13.2).

Terminal Block 37 – input signal IPI +/-10V 0.25mA



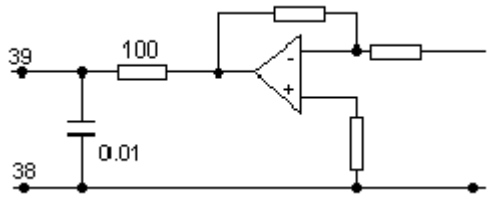
Description of input:
Analogic input for the external control signal of the inverted bridge current. This is enabled by taking to 24V the input 8; it is also configurable internally with the parameter S7. (See block scheme at parag. 13.2).

Terminal Block 38 – common 0V



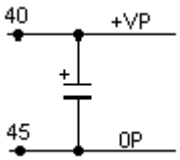
Description of input:
0V of the regulation; is used for the analogic inputs 35 – 36 – 37 and output 39.

Terminal Block 39 – analogic exit of current +/-5V / 2mA



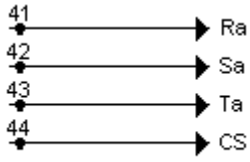
Description of output:
Exit normalised by the current with positive sign for conduction of direct bridge and negative sign for the conduction of the inverted bridge. (+5V P.D.) (-5V P.I.)
It is the operational amplifier with 100 ohm run.

Terminal Block 40 – power-supply not stabilised 24V / 200mA



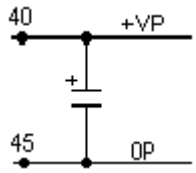
Description of output:
Power-supply not stabilised by the board, by which all the internal power-supply is taken.
May be used for eventual external loading, of which input and output logics with a maximum of 200mA.

Terminal Block 41 – 42 – 43 – 44 – alternate voltage V=3 x 11.2V / 500mA



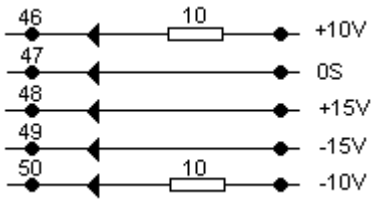
Description of input:
Inputs of synchronism phase and power-supply of the board.
The voltage Ra – Cs must be in phase with the inter-linked RT voltage,
The voltage Sa – Cs must be in phase with the inter-linked SR voltage,
The voltage Ta – Cs must be in phase with the inter-linked TS voltage.
The cyclic direction phase must be respected. (For the exclusion see parag.3.5 e 6.2, parameter S 10).

Terminal Block 45 – common negative 0V



Description of output:
0P common negative of exit at 24 Vdc: power-supply not stabilised, Terminal Block 40.

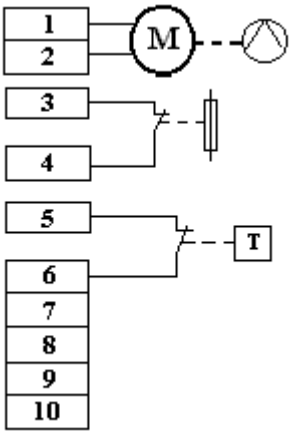
Terminal Block 46 - 47 - 48 - 49 - 50 voltage stabilised and reference



+/- 15V / 25 mA
+/- 10V / 10 mA

Description of output:
Exit of voltage stabilised by the analogic part of the microprocessor board.
Terminal Block 47= 0V
Terminal Block 46= +10V
Terminal Block 50= -10V
Terminal Block 48= +15V
Terminal Block 49= -15V.

3.3 Lateral Terminal Boards M10



3.3.1 Ventilation

With these terminal boards and specifically at terminal boards 1 and 2 the 220Vac power-supply is supplied to the forced ventilation system (not present in sizes 30 – 70A) of the converter ELCONV.

3.3.2 Micro-fuses

At Terminal Block 3 & 4, a N.C. (Normally Closed) contact is available, arriving from the series of micro-switches used to signalise the operation of one or more power fuses.

This contact may be used to operate the “Int. Fus / S.term.” (Fuse intervention or Thermal Probe) alarm drive, if connected. See application scheme at paragraph 14 , at Terminal Block 12 of the regulation board CS6607.

3.3.3 Thermal Probe drive

At Terminal Block 5 & 6, a N.C. (Normally Closed) contact is available, arriving from the thermal probe drive situated in the heat sink. When the temperature in the sink is too high Max 80℃ +/- 3%, this gives the opening of the thermal pad contact. Also in this case, if there is a connection to Terminal Block n°12 of the board, the drive alarm may be employed.

It is advised to organise this externally, as in the case of an intervention of the thermal probe, it is not necessary to block the drive immediately, as is the case with a fuse intervention.

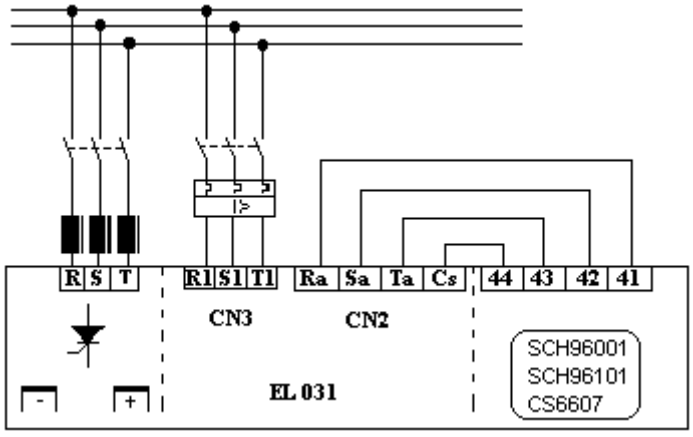
3.4 Terminal Block M11

As is seen in the diagram of paragraph 2.3, this Terminal Block is situated on the heat sink for the 180÷1500A series, whilst for the 30÷110A series, it is mounted on the right side of the carpentary.
At this Terminal Block the voltage of the armature transducer with resistance is present. This Terminal Block is connected as described in the following pages, only if a ELCAM control board is fitted. (See paragraph 4).

3.5 EL031 Board

3.5.1 Description of connection and regulation

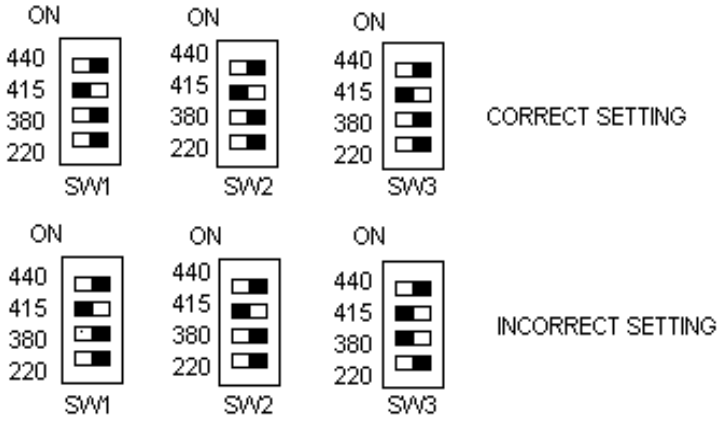
The EL031 board, as specified at paragraph 2.7, allows the regulation of the power supply of the ELCONV converter, and to create the synchronism phase. It is connected as the scheme below illustrates; note that the input power phase R,S,T of the converter are in-line with R1, S1,T1 of the EL031.
The Ra, Sa,Ta & Cs phases of the EL031, at output, must be connected respectively with the Terminal Blocks of the regulation board CS6607 41 , 42, 43 e 44.
If the connections described as above are not respected, the converter will enter in alarm for: “Error cyclic direction” - “Conduction alarm”.
The alarm “Error cyclic direction” is only and exclusively referred to as an incorrect connection of the EL031 and not of the drive input power (R,S,T). With the regulation board CS6607 with Eprom V 3.47 & superior, this alarm may be excluded, making the board independent from the cyclic direction. In any case, the power must be in-line with the regulation. (R-S-T in-line with R1-S1-T1).



The EL031 is equipped with 3 dip switches and 4 channels which allow the selection of the voltage supply utilised: 220, 380, 415 e 440Vac. If this voltage is not available it is possible to utilise an auto-transformer , having the primary in proportion to the input line and the secondary conforming to one of the volts previously mentioned. (A transformer may not be used).

The dip switches SW1 SW2 e SW3 are set **before supplying voltage to the drive.**
Set correctly according to the voltage present between R1, S1, T1 of CN3.
Take care not to position more than one switch in the ON position.

EXAMPLE : VOLTAGE SUPPLY 415Vac



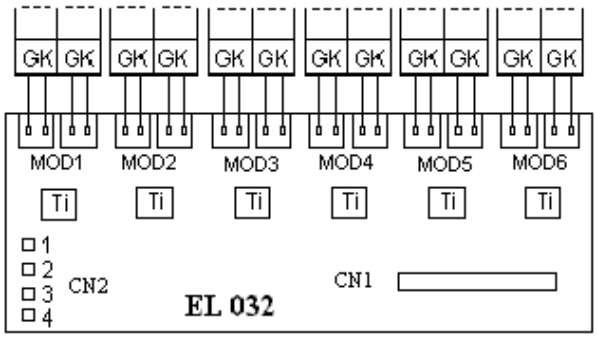
In this case the transformer T3 may burn out within a short time.
The 1,6A fuses are on the secondary of the transformer, and protect them from an eventual short circuit from the CS6607 regulation board.

3.6 EL032

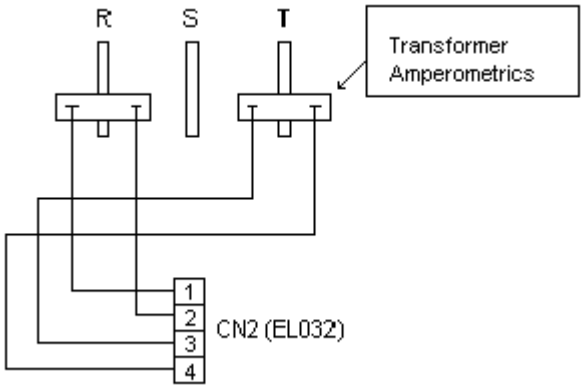
3.7 Board 3.6.1

3.8 Description and connection

The EL032 transforms the impulses arriving from the CS6607 regulation board, and from there transmits to the tyrystors (or S.C.R.) guaranteeing a galvanic isolation.
This board is already connected inside the ELCONV during construction phase, and so it is not necessary for the client to do so; the connections are described anyway in case of malfunctioning or blocking.



At the CN1 connector a flat cable is inserted with 40 channels arriving from the CS6607 regulation board, and must be connected perfectly. Should this not be the case, the ELCONV “alarm conduction” alarm sounds.
At the CN2 connector the T.A. (Transformer Amperometrics) are connected as specified in the following diagram:



At Terminal Block MOD1÷MOD6 the gate (G) and Cathode (K) of each tyrystor.
It must be taken into account that the first module SCR on the right of each converter ELCONV is connected to Terminal Block MOD1 as specified precedently. For the SCR connections refer to the design applied to each module.
In case of missing or connection error to one or more terminals, or Gate inversion with Cathode, module with module, tyrystor with tyrystor; the drive will enter into alarm.
Before starting the drive it is advised to check that all the Terminal Blocks are connected correctly.
WARNING: DANGER - PRESENCE OF HIGH VOLTAGE.

3.7 Field Supply Board EL027

3.7.1 Description and connection

The EL027 is a simple field supplier equipped with a normal mono-phase rectifier bridge, and a circuit for the projection and the signalisation of missing excitations (see paragraph 2.6).
On Terminal Blocks C/ Na there is a contact normally open, which in the presence of the field current, closes.
The Jumper mounted on board is needed to by-pass the alarm “field loss” when it is necessary, in phase of regulation of the driver.
From Terminal Block ~ e ~ arrives the power-supply rating Vac (max 415Vac) of input.
At Terminal Block + e – the motor excitation connection takes place. Take into account there is a voltage present equal to 0,9 Vac.
The maximum current available is 17A with a dissipater mounted on board.
It is important to install protection against short circuits, fuse failure, automatic circuit breakers, etc. (See scheme parag. 14.1).

3.8 Encoder and Feedback board

3.8.1 Description, Connection and Regulation

The board contains a power-supply adjustable via the **Tve** trimmer, which starting from a voltage comprising of between 20 and 30 Volt (Terminal Block 1 & 2) gives permission to obtain an output voltage (Terminal Block 3 e 4) comprised in the field 5 – 18 Volt 300mA maximum to feed the encoder.

Before proceeding with the regulation of the drive, regulate the power-supply voltage of the encoder.

To carry this out, use a tester in Vdc reading, between Terminal Block 3 & 4 and regulate the trimmer Tve until the required voltage to feed the encoder is reached.

The power-supply is of SWITCHING type, so if Va and Ia are the voltage and the current absorbed from the encoder and VI is the supply voltage of the board, the current of
input is:

$$I_I[mA] = \frac{V_A[V] \times I_A[mA]}{V_I[V]} + 15$$

The two output channels of the encoder are taken to the inputs 5 – 6 (channel 1) and 7 – 8 (channel 2) if the encoder has differential exits; otherwise only Terminal Block 6 (channel 1) e 8 (channel 2) if the exits are singular, in which case the passage level 0 1 and ½ go with 10% of hysteresis.

If the outputs are “OPEN COLLECTOR” type it is necessary to predispose the load resistance in the towers (1-2, 3-4, 5-6, 7-8) or for channel N or for channel P; the value of the resistance is calculated knowing the maximum current needed to absorb (generate) Ic with the formula :

$$R[Kohm] = \frac{V_A[V]}{Ic[mA]}$$

The part of the power-supply and the squarer of impulses is galvanically isolated via an opto-isolator from the decodifier which is fed directly from the micro via the JP1 – JP2 connectors, which also give support to the board.

The voltage can be taken from an external supplier or from +24V of the regulation Cs 6607 if the absorbment is compatible.

The frequency of maximum work is given with the relation:

$$frequency[Hz] = \frac{N_I \times N.\max}{60}$$

Where:

Ni = impulses for turn of encoder

N.max = maximum turns every minute of motor

The Jumper J2 closed excludes the reverse-action of the dynamo tachometer, integrated in the CS6607 board, passing to the reverse-action to the encoder; if open, the system works in dynamo tachometer.

To work with the encoder, set the parameter "P20" at the maximum working frequency, so,

$$P20 = \frac{N_I \times N.\max}{60 \times K}$$

Where K = 1 with J1 open = 2 with J1 closed

The work field accepted for "P20" goes from 3000 to 25000 equal to a working frequency of 6000 to 50000 Hz.
By setting the parameter S1 = 6, re-transports to the programmable analogic exit (25, 26) a signal +/- 10V, proportional to the maximum speed of the motor.

N.B.: - Always use the highest frequency possible.

Example 1:

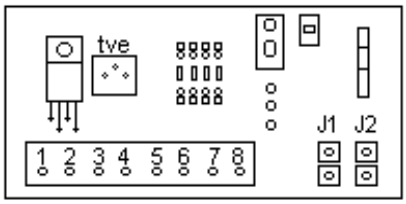
Velocity motor: 2000 rpm Encoder: 720 Imp/turn

From the calculation formula P20 this gives $\frac{720 \times 2000}{60} = 24000$ and as the resulting frequency is inside the working field 3000 to 25000, do not apply the K which will divide the frequency in 2 with the obligation to insert the Jumper J1.("Choose always the highest frequency possible").

Example 2 :

Velocity motor: 2500 rpm Encoder: 720 Imp/turn

From the formula for the calculation of the P20 it gives $\frac{720 \times 2500}{60} = 30000$ and as this value superates the working field, it is necessary to divide this frequency in two, inserting the Jumper J1, so the value to set on P20 will be 15000 with J1 closed.



Terminal Block 1	= +Vin (20 ÷ 30Vdc)
Terminal Block 2 – 3	= 0V
Terminal Block 4	= +V out
Terminal Block 5	= CHA (denied)
Terminal Block 6	= CHA
Terminal Block 7	= CHB (denied)
Terminal Block 8	= CHB

4 Elcam Field Regulator Board (optional)

4.1 Description

The ELCAM is a field regulator which aligned with a ELCONV converter, permits the regulation of the field current in a continual current.
The regulation of the ELCAM is done directly from the display keyboard of the ELCONV converter via the P34, P35 & P37 parameters.
In the auto-regulation phase of the current loop, the regulation board CS6607 organises the field regulator block, and then removes the excitation current without the drive entering into alarm.

4.2 Connection of excitation board to Elconv converter regulation board.

For the correct functioning the following connections are obligatory:

EXCIT BOARD.	REGUL BOARD.
ELCAM (Sch 96006) _____	ELCONV (Sch 96001 e 96101)
Terminal Block M3: 2-1(Pwm1-Pwm1) (PWM1 - 0S)	respectively with Terminal Block M1: 24-26
Terminal Block M3: 6(CIE) (miss. excit.)	respectively with Terminal Block M1: 13
Terminal Block M3: 9-10(+24 - 0VP)	respectively with Terminal Block M1: 40-45 (+24V - OVP) otherwise with 24V external, input is opto-isolated.
Terminal Block M3: 7(P24E)	respectively with Terminal Block M1: 40(24V)otherwise with 24V external, input is opto-isolated.

Practically, at Terminal Block M3: 1-2 takes a signal, similar to a quad wave coming from the CS6607 regulation board, which once modulated, opportunely varies the excitation current and the voltage of the motor armature. The Terminal Block n°6 is the exit of an optoisolator used for the signalisation to the regulation board CS6607 for eventual missing excitations. At Terminal Block 9 – 10 24V is taken to supply the regulation board of the Elcam.
At Terminal Block M3: 5-4 (IE - 0S) there is a filtered signal proportional to the field current with the maximum value of -5V for Iexc.=Iexc. max, where Iexcmax corresponds to the regulation fixed with NP e J2-5; this output has an impedance of 1 Kohm.
Respectively, at Terminal Block M3: 3-4 (Varm. - 0S) exits a filtered signal, proportional to the absolute value of the motor voltage and with a value of -7V when the armature voltage corresponds to the efficient nominal supply voltage of the converter. Also this exit has an impedance of 1 Kohm.

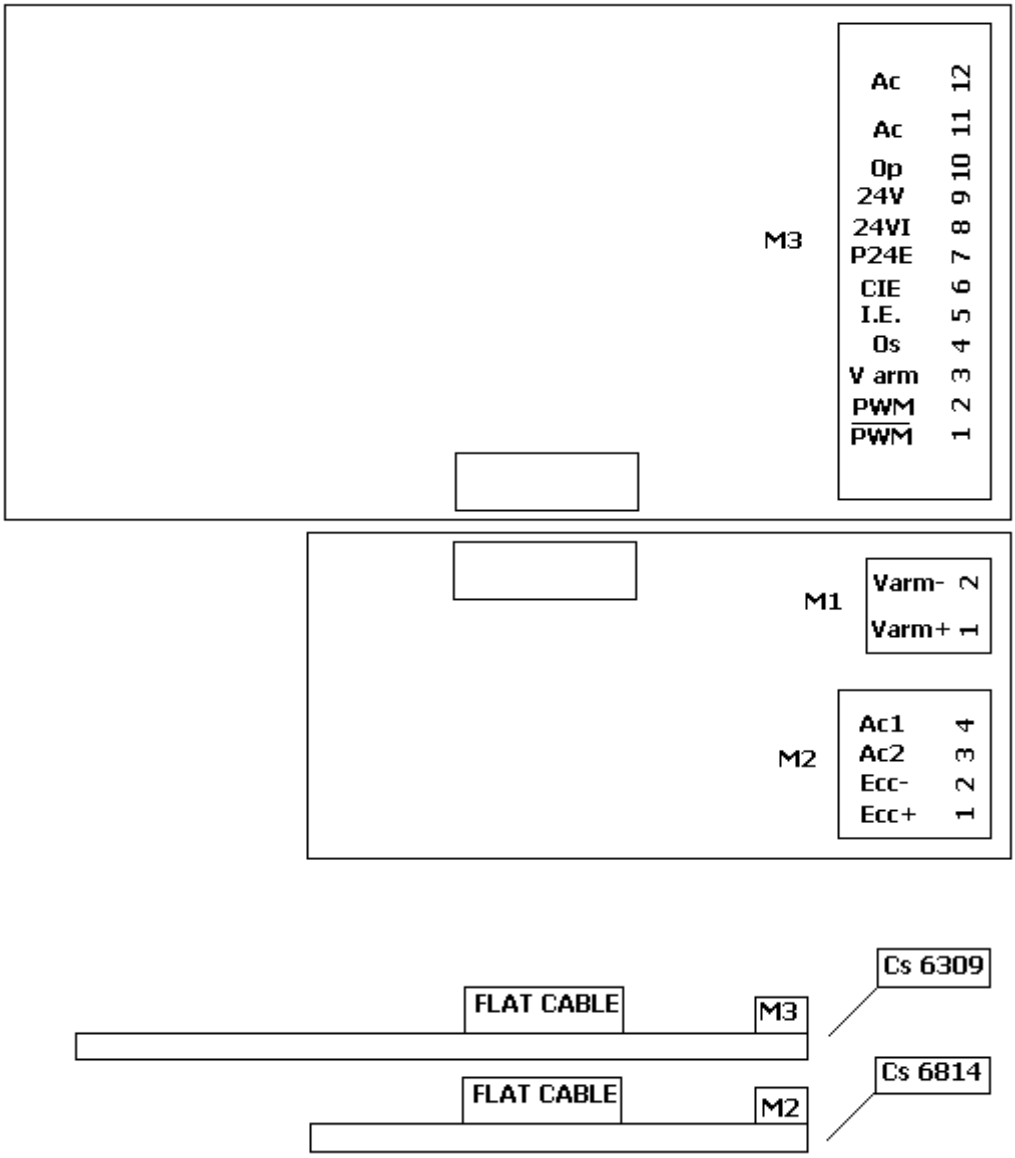
At Terminal Block M2 of the ELCAM and at Terminal Block 3-4 the power supply (AC) is connected to the board. Take note that the max. input voltage is 380 Volt Ac.
At Terminal Block 1-2 of M2, the motor excitation is connected. It is necessary to employ a parallel field connection, at a resistance of 2000 ohm - 50 Watt, for a excitation voltage < 280Volt and of 100 Watt, for a excitation voltage >280 Volt e < o equal to 380 Volt.
In case isn't used the auto-transformer to adjust the supply voltage Vac of the field of the motor, it is necessary to use a resistor calculated in function of the supply voltage Vac.
It must be checked that the EPROM of the regulation board of the converter , and the EPROM of the display keyboard card, have the software version RDVEH, RDVEL V2.10 or higher (for the regulation board CS6607) and TERM 4 V1.5 or higher (for CS8B9 Display Board).
The abilitation of the field is initiated automatically by the regulation board when Jumper J8, of the excitation board, is closed. Or otherwise, when a short circuit takes place
(for example, with a relay) ,of the Terminal Block M3: 8-9.
By opening Terminal Block M3: 8-9, with Jumper J8 open, the field regulation is blocked, and the converter enters into alarm. (See the setting of S9 at paragraph 4.6.2.).

The armature voltage, taken from the internal of the converter via a pre-calculated resistance (see formula for calculus of R1 and R15), is taken to the Terminal Block M1: +VA, -VA of the ELCAM. **NB: The resistance R1, R15 are pre-calculated and mounted directly inside the converter.**The following table demonstrates the formula to show the calculus to find the value and the power.

$$R1 = R15 = \frac{V_{eff} - 63{,}75}{7}[Kohm]$$

Line 380Vac--------120//120//180Kohm = 45 Kohm =R1=R15
Line 415Vac----------100//100Kohm = 50 Kohm =R1=R15
Line 440Vac------- 120//120//470Kohm = 53Kohm =R1=R15
Line 460Vac------120//120//1000Kohm = 56,6Kohm =R1=R15
Line 480Vac----------120//120Kohm = 59,4Kohm =R1=R15
Veff = nominal efficient voltage interlinked with network which supplies the converter.
The max. power dissipated from each resistance (R1 e R15) is given with the following formula :
Pmax = R1x 0,04 [W] con R1 expressed in Kohm.

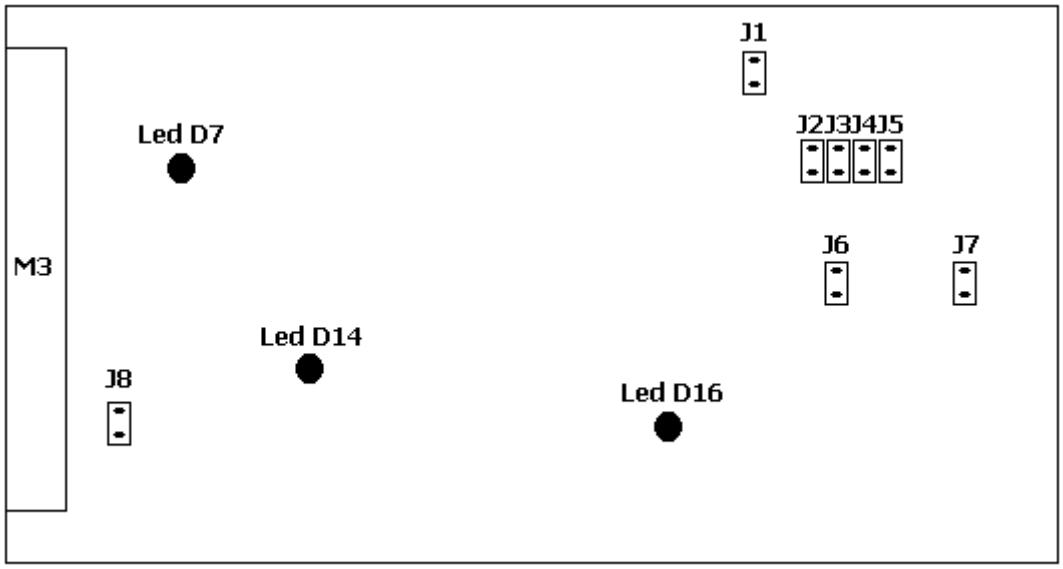
Terminal Block dispositions



4.3 Explanation of leds and Jumpers

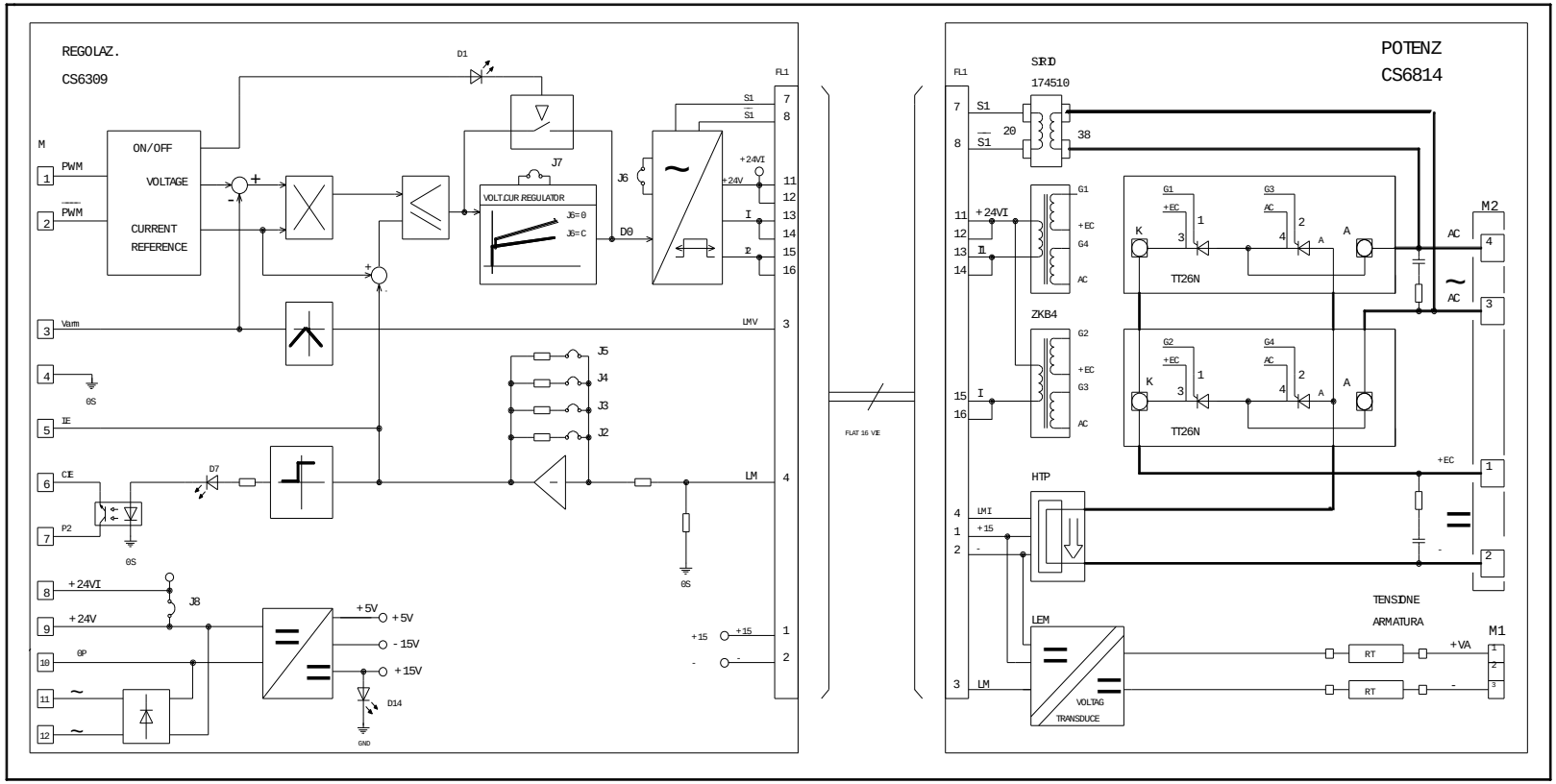
J1	***By-pass missing excitation ON = By pass.***
J2	***Regulation max Iecc.***
J3	***Regulation max Iecc.***
J4	***Regulation max Iecc.***
J5	***Regulation max Iecc.***
J6	***Change current loop gain ON = Low OFF = High.***
J7	***(Always Open).***
J8	***Abilitation Excitation regulation ON = Block Regulation.***

LED D7 Excitation Present signal.
LED D14 Power Supply Voltage Present signal.
LED D16 PWN (M3:1-2) Unblock Regulation Signal.



4.4 Block Scheme of Excitation Elcam Board

ELCAM



4.5 Regulation of Board

The maximum current suppliable is 24 Amp and depends on the number of spires passing through the current transducer, the relation of the same transducer and the of the Jumper with P34 = 100% according to the following table:

J5	J4	J3	J2	Iecc Max (A) for N°spires at current transducer with P34 = 100%. Np: 1(2)	Np:2(4)	Np:3(6)	Np:6(12)
1	1	1	1	24.0	12.0	8	4
0	1	1	1	22.6	11.3	7.5	3.7
1	0	1	1	21.2	10.6	7	3.5
0	0	1	1	19.9	9.9	6.6	3.3
1	1	0	1	18.5	9.2	6.1	3.0
0	1	0	1	17.1	8.5	5.7	2.8
1	0	0	1	15.8	7.9	5.2	2.6
0	0	0	1	14.4	7.2	4.8	2.4
1	1	1	0	13.0	6.5	4.3	2.1
0	1	1	0	11.6	5.8	3.8	1.9
1	0	1	0	10.3	5.1	3.4	1.7
0	0	1	0	8.9	4.4	2.9	1.4
1	1	0	0	7.5	3.7	2.5	1.2
0	1	0	0	6.1	3	2	1
1	0	0	0	4.8	2.4	1.6	0.8
0	0	0	0	3.4	1.7	1.1	0.5

Where: J2,J3,J4 and J5 are equal to 1 with **Jumper Inserted** , it is equal to 0 with **Jumper Open**

Np= Number spires at current transducer with ratio 1000:1

(Np)= Number spires at current transducer with ratio 2000:1

The current transducers used for this board are: TELCOM HTP 25 with a spire ratio of 1000:1 and LEM LA-55P with a spire ratio of 2000:1 and 1000:1.
(Refer to identification plate).

The tables values are arrived at by using this formula:

$$Iecc\max = \frac{1{,}373}{Np} \cdot \left(J2 \cdot 8 + J3 \cdot 4 + J4 \cdot 2 + J5 \cdot 1 + 2{,}47\right) \cdot x = \left(A\right)$$

Where x = 1 for TA 1000:1 e x = 2 per TA 2000:1
J2, J3, J4, J5 = 0 if open; = 1 if closed.

Considering if Jumper J2, J3, J4 and J5 are all in use , the value obtained is projected, and is 17,47; it can be written that:

$$Np = \frac{1.373 \cdot 17.47}{Iecc_{\max}} \cdot X = (A)$$

From the formula, it is read that to obtain 24 Amp in output it is necessary N°1 spire for the transducer with a ratio of 1000:1 and N°2 spire for the transducer with a ratio of 2000:1.
The effective field current is given by the following equation:

$$Iecc\ [A] = Iecc_{\max} \cdot \frac{P34}{100} = [A]$$

P34 is the parameter that permits the regulation of the excitation current once regulated with the spire at the transducer current and Jumpers J2,J3,J4 e J5.
To simplify the Regulation operation of the board, Four different power-supply models with diverse spires in the current transducer:

TA 1000:1	TA 2000:1
1 spire: field use 24A to 6A	2 spires: field use 24A to 6A
2 spires: field use 12A to 3A	4 spires: field use 12A to 3A
3 spires: field use 8A to 2A	6 spires: field use 8A to 2A
6 spires: field use 4A to 0,5A	12 spires: field use 4A to 0,5A

(The current values specified above: 24 to 6, 12 to 3, etc.; are values of Iecc Max possible with that type of board).

Knowing the motor excitation current, it is possible to choose the ELCAM model, and with the assistance of the table (paragraph 4.6), set the Jumper J2 ÷ J5 in a such a way that the excitation current is around 5 ÷ 20% more than the Iecc. nominal max of the motor.
EXAMPLE n°1: Motor with Iecc= 5A / 1.5A respectively with 800 / 1500 n/1'
In this case having a Iecc. Max.of 5A, it is possible to utilise a ELCAM with a field use of 8A÷2A or a board with a field use of 12A÷3A.
Referring to the table (paragraph 4.6) *and considering the board 8A÷2A, insert the Jumpers J4 and J2 in a way to achieve, with P34=100%, a max output current of 5.7A. Alternatively, when using the board 12A÷3A insert the Jumpers J4 and J3 and a Iecc. max of 5.8A with P34=100%.*

*4.5.*1 Regulation Parameters

P25 range from 0 ÷ 100%
P34 range from 30 ÷ 100%
P35 range from 40 ÷ 120%
P37 range from 10 ÷ 100%

Once the hardware regulation is carried out, the parameters may be worked on:

- **P34** (nominal field current). To eventually correct the maximum excitation current, after pre-regulation with the spires at T.A., and with the setting of the Jumper J2 at J5. If P34 = 100%, the field current is equal to the Iecc max, regulated with the Jumper and n° spires on T.A. . If with the P34 fa lls below 70% and with the Jumper J5, J4, J3 and J2 open, it is advised, for reasons of regulator response, to change the number of NP primary spires.
- **P35** (motor voltage in % of P38). To define the voltage of the armature motor defluxion. If P35 = 100%, the motor voltage at defluxion start is equal to that set in P38.
  That is:

$$V_{mot} = \frac{P38}{100} \cdot V_{eff} \cdot \frac{P35}{100} = [V]$$

  were Veff. is the interlinked nominal efficient voltage network which supplies the converter; example :380V,415V,440V,etc.

  So:

$$P35 = \frac{10000 \cdot V_{mot}}{P38 \cdot V_{eff}} = [\%] .$$

- **P37** (relation between max. turns constant pair and max. turns constant power). In this parameter the value in % is set using the following formula:

$$P37 = \frac{\max turns\_const\_pair.}{\max turns\_const\_pow.} \cdot 100 = [\%]$$

with costant power max rpm we mean the motor nominal rpm max.

Once these parameters are set, the start permission may be given, verify that the field value and the voltage is as desired, and eventually adjust the parameters; if the field shows reduced inductive (Tec.≤150ms) or the field current is unstable, close the Jumper J6 which reduces the regulation gain.
Given that with this system it also limits the max. field current of the defluxion zone with the following relation:

$$I_{exc} = Iexc_{max} \cdot P34 \cdot \frac{P37}{|V6|}$$

Where |V6| is the absolute value of the motor speed percentage in V6, it is better to keep P37 at around 5% higher than the initial speed of the de-excitation to take into account an eventual induced reaction, unless the machine is not particularly saturated; in which case the P37 is not increased.
In P36 set the alarm level of maximum voltage in function of P38; this alarm is based on the calculated voltage, and is not read, so to avoid an inevitable imprecision between the two values, this parameter must be higher by 10-20% in respect to the P35, and is adjusted in a way that does not intervene with normal working conditions. **Normally the set Default value is left.**
For a more precise regulation it is sufficient to first place the value higher, and due to this it takes the motor into defluxion zone, it reads V18 (motor voltage %), and puts P36, P36xP38>1,1xV18.
With the P25 it is possible to increase automatically the dynamic gain of the speed regulator to take into account of the pairing diminution, equal to the current, in the constant power zone.
The increase of the gain is achieved using the following formula:

$$G = P23 \cdot \left(\frac{P25 \cdot \frac{|V6|}{P37}}{100} \right)$$

In the zone not defluxed , when |V6| is < P37, the gain is kept at the constant value G= P23.
From the relation written above there is a compensation more or less as the total of the gain variation of the speed loop with P25 = 100%, whilst there is no compensation if P25 = 0; Due to this, if P25 =100%, the same dynamic performance of the speed regulator is achieved, in any working condition.

4.5.2 Missing excitation alarm and Parameter S9

This alarm is activated if at Terminal Block N°13 o f the converter regulation board, +24V is not present when the drive is waiting to insert the field; it is activated directly after the board supply if S9 = 0 or after at the Terminal Block N°11 (I 11) of the converter regulation board a +24V is delivered if S9 = 1.

With I 11=1, at the input in start, passes the "waiting time for counter closure" (P46) which gives permission to the field to take it to a nominal value; if the fields are particularly inductive it is needed to predispose a sufficient time.

(P46 $\geq 2 \times$ T excitation; where T excitation is the constant of the field time 0.5 ÷ 1 s.).

The alarm is delayed by approx. 1s to take into account the assessment of the field itself. If there is no delay, at the moment of the elaboration of the missing field, the current bridge limits or armature bridges are placed at zero and remain there until the field is absent (except in autoRegulation).

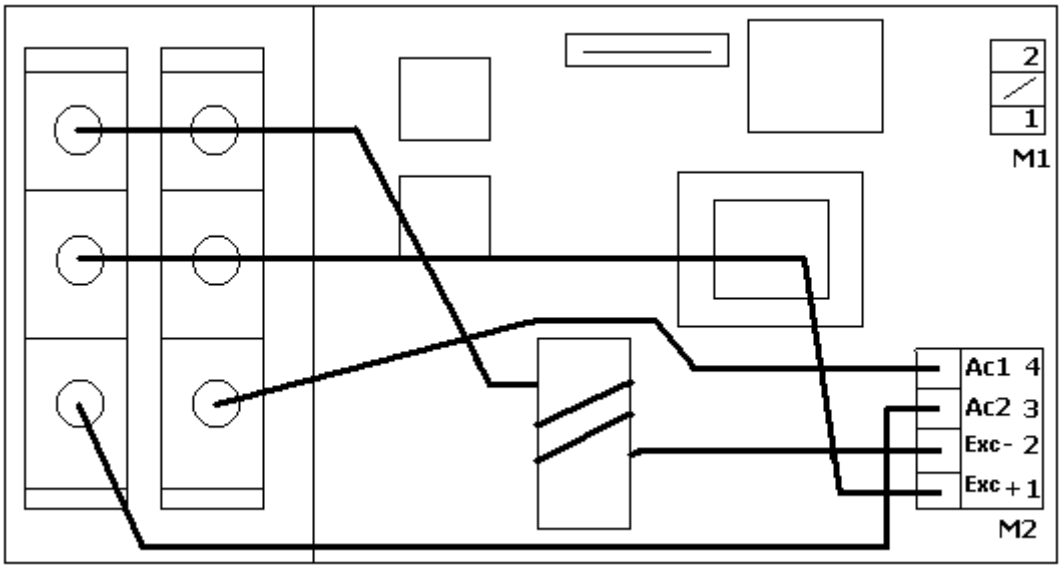
The control level of the field presence in the ELCAM is done by verifying that the effective field current is 0,4 times more than the calculated value for Iexc, with the formula of the previous paragraph, so, if the P37 value is higher than 50-100% in respect to the initial

de-excitation value (P35), if the speed becomes altered, or if the de-excitation voltage (P38) is too low; there is the possibility of an intervention of the missing excitation control, once the voltage regulator reveals an effective current:

$$Iecx.effective < 0.4 \cdot Iexc\max \cdot P34 \cdot \frac{P37}{|V6|}$$

4.6 Modify number of spires on amperometric transformer

Should it be necessary to modify the number of spires of the T.A. of the ELCAM board, a conducter cable is used which is able to carry the maximum excitation current requested. The ELCAM board is able supply a current of maximum 24 Amps. In case of board substitution, verify the spire ratio of the Amperometric Transformer (1000:1 or 2000:1), from this ratio depends the number of spires to wind at T.A. equal to the Iexc.max.(see paragraph 4.6 of this manual).
Attention!!!: respect the winding direction of the spire.



In this case, 3 spires have
been modified

The number of the spires coincides with the number of passes at the internal of the amperometric transducer.

This design represents the CS 6814 board which is found in the lower part of the ELCAM.

4.7 Substitution procedure of the Elcam board

Should the board be substituted, the following points need to be followed:

1) Shut down voltage at control-panel.
2) Verify that the max. current excitation of the replacement board (4A, 8A, 12A, 24A;
   check identification plate found internally or laterally on the container of the ELCAM board), corresponds to that of the replacement board. Jumpers J2, J3, J4 and J5 are inserted in the same position as as the faulty board.
3) If the max. output current is different, it is necessary to rewind the Amperometric Transducer, but take into account the T.A. ratio (1000:1 o 2000:1); refer to paragraph 4.6 and 4.7 of this manual.
4) Regulate the Jumper from J2 to J5, as described in the table paragraph 4.6.
5) Assure that Jumper J1 and J7 are open.
   Open Jumper J6 and insert only if instability of the excitation current is noted.(see paragraph 4.6.1)
6) Assure that Jumper J8 is closed.
7) Connect the replacement ELCAM board as the described in the scheme, connecting a amperometer in series to the field.
8) Turn on the voltage at control panel, release the disengagement regulation of converter (wire connected to Terminal Block n° 1 of the ELCONV regulation board CS 6607) and set parameter S9 = 0
9) Feed the converter, and control at amperometer that the current output corresponds to the max Iexc. , eventually re- regulate parameter P34.
11) Re-set parameter S9 = 1, and if necessary refer to manual for the regulation of the other parameters (P35, P37, P25).
10) Memorise eventual variations of the parameters, saving parameters in eeprom (see parag 5).
11) Shut down voltage at control panel and re-connect the disengagement regulation on Terminal Block n°1 of the CS 6607; previously disconnected at point 9.

The board is now ready to be employed.

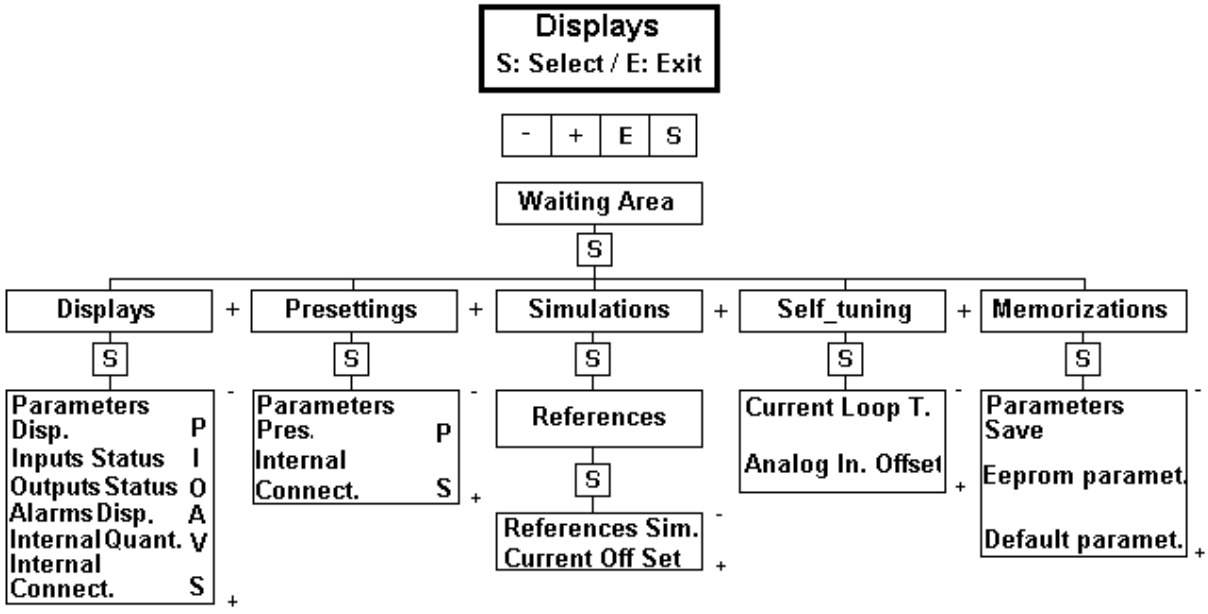
4.7.1 Elcam board adjustment

1) Verify the motor plate values;
2) After Know the maximum field current, verify on the ELCAM board if the waps number and the Jumpers are for the maximum current, with an adjustment higher of the nominal field current.
3) Connect an amperometer in series at the field of the motor, put the parameter S9 = 0, just to adjust exactly the maximum field current with the parameter P34.
4) Put the parameter S9 = 1, because with this the ELCAM generates current only if, DC converter, is in run.
5) Adjust the parameter P35, to fix which is the armature voltage to start the weaking
6) Adjust the parameter P37, to fix which are the RPM to start the weaking
7) Start the DC drive and verify the armature voltage and the field current. The DC motor must start the weaking at the voltage fixed in the parameter P35 and at the RPM fixed in % in the parameter P37. If the field is unstable adjust the Jumper J6 to change the gain.

If the motor doesn't start the weaking correctly,verify the connections on the terminal board M1. If there is no field current, verify the correct connection of the Pwm signal on the terminals 1 and 2 on the terminal board M 3.

5 Operator Display panel CS8B9

DESCRIPTION OF KEYS AND THEIR FUNCTION



5.1 Description of keys and their function

The keys for communication with the Elconv converter are:

+ to increase
- to decrease
E to exit, and return to previous level
S to enter, select and confirm.

As soon as the regulation board of the converter is turned on, the display CS8B9, indicates the software version actually in use, and immediately follows with "Waitting", where an internal quantity is displayed between V06 – V11 – V19.

Example:

% AVERAGE CURRENT
V11 0.0

By pressing the “S” key, communication with the converter is accessed, and the "DISPLAYS" menu appears.
At this point, pressing keys **+** and/or **-** it is possible to pass to other main menus: Preseetings, Simulations, Self-Tuning and Memorizations. Once a menu is chosen, it is possible to enter by pressing the S key, and then rolling the various sub-menus by using the + and/or – keys.
After choosing the sub-menu, it is possible, pressing the S key, to pass to the visualisation of the size or specific parameters; again by using + and/or - .

5.2 Main Menus

The main menus are as follows:

Displays: to view the condition of the inputs and outputs of the converter, to view the alarms, the internal size parameters etc.
Presettings: to modify the P and S parameters.
Simulations: to simulate a speed reference or a current reference.
Self-Tuning: to carry out AutoRegulation of current loop and of the analogic offset.
Memorizations: to memorise the parameters recently modified, to reset the default parameters , or the Eprom's parameters, etc.

5.2.1 Displays

The visualisation menu is made up of the following sub-menus:

Parameters Display: P parameters are displayed.

Input Status: Indicates the state (on, off) of all the inputs from n°1 to n° 11. These inputs correspond to Terminal Block 1-2-3-4-5-6-7-8-9-10-11 of the converter regulation board (CS6607). ON is displayed if the related Terminal Blocks have the 24Vdc disengaged, OFF if the input is 0.

Output Status: Indicates the state (on, off) of all outputs. the output state corresponds to the power employed by the Terminal Blocks 16-17-18-19-20-21-22-23 of the regulation board CS6607. ON if 24Vdc output is present , OFF if output is 0.

Alarms Display: Indicates the intervention of an alarm or alarms. If no alarms are present, "NO ALARMS" "E: EXIT" will appear on the display.
For a list of the alarms, refer to section later in this manual.

Internal Quantity: V01 to V20 size is displayed, and the value employed in that same moment. For a detailed list, refer to list later in this manual.

Internal Connections: Displays the S parameter for the internal configuration of the board. From S01 to S09 for the Cs6607 board with Eprom RDVE up to version V3.15, from S01 to S34 for Eprom version 3.47 and higher.

5.2.2 Presettings

The Settings menu is comprised of:

Parameters Presettings: It is possible to view and modify all the P parameters.

Internal Connections: It is possible to view and modify all the S parameters.

5.2.3 Simulations

The simulation menu is comprised of:

References: Two sizes are present, speed offset E01 and current offset E02. The first enables the creation, inside the board, of a speed offset to utilise as a internal speed reference, so not requiring a external connection. The second creates a current offset, with which it is possible to command the drive with the only current loop.

5.2.4 Self-Tuning

The Autoregulation menu is comprised of :

Current loop tuning: The converter carries out the autoregulation of the constant and of the coefficients of the current loop.

Analogic Input Offset: The converter carries out autoregulation of the analogic input automatically setting the relative parameters. (P56-P57-P58-P59-P60)

5.2.5 Memorisation

The memorisation menu is comprised of the following sub-menus': Save parameters, Reset from eeprom and Default reset. With the P.C., further to these, there are: Reset parameters from disk, Save reset parameters to disk, Saving parameters on disk, Change Password.

Parameters Save: From this menu the saving of the modifiable parameters (P e S) on eeprom, are carried out, which would otherwise be lost at the first shut down of the board.

Eeprom Parameters: With this operation it is possible to return to the previous parameters to the last regulation carried out, if, a saving of these hasn't been carried out on eeprom.

Default Parameters: Gives the possibility to return to the default parameters pre-set by the board constructor.

Reset parameters from disk: This operation is only possible if connected to a PC, and gives the possibility to transfer the parameters, previously saved on a floppy or on a hard disk, from the pc to the drive.

Save parameters to disk: This operation is only possible if connected to a PC, and allows the saving of the parameters on a floppy disk or Hard disk.

Change Password : This operation is only possible if connected to a PC, and gives the possibility to change the access code when entering the Settings, Simulation, Autoregulation and Memorisation Menus.

5.3 Modification of a value

5.3.1 Identification Initials

For the parameters and the sizes present in the various menus, the following initials are used:

“P” = Indicates the parameters present in the menu “Presettings” – “Parameter Presettings”.
“S” = Indicates the parameters which modify the internal connections of the board (Switch internal), present in the nel menù “Presettings” – “Internal Connection ”.
“V” = Indicates all the internal sizes which may be seen in the menu “Displays” – "Vis. Internal Quantity”.

These initials are followed by numbers which identify all the parameters and the size.

5.3.2 How to modify a parameter

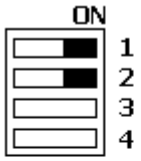
The parameters are modifiable only from the menu “Presettings”. Once the parameter to modify is found (P or S), press the S key until the cursor is under the figure to change, then using the + and/or – keys, the value is increased or decreased. By holding down the key the numbers move quicker.
Once inserted the new number, the E key must be pressed, and then the S key to confirm the change.
Take note that once all the parameters are set it is necessary to save them onto eeprom, to do this, go to the "Memorization” menu, and press the “S” key three times.

5.4 Alarm Signals

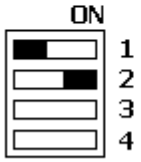
If there is an alarm intervention, whatever position within the menu, a flashing phrase will appear "Alarm On".
At this point **do not** follow reset from the control-panel or control desk, in this way the alarm is cancelled and it is not possible to recieve a diagnosis. Open the "Visualisation " menu and find the sub-menu “Alarms Display”; press S key and then + and/or – to verify if there are more alarms.
Consult the section Alarm Messages.

5.5 Setting of communication language

On the rear of the Display Board CS8B9 (Sch 96003 - Sch 96103) a 4 channel micro-switch is situated for the setting of the language in which the messages and parameters are visualised.



ITALIAN LANGUAGE



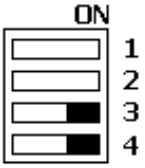
ENGLISH LANGUAGE

This operation is carried before supplying voltage to the board.

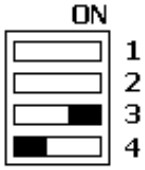
Attention: Switches 3 and 4, found only on version CS6607 V3.47 and higher, with the relative display CS8B9 V2.45 or higher , are used to set the Baud rate for communication between display and regulation board, or between Pc and regulation board. (For the setting refer to following paragraph).

5.6 Setting Baud rate

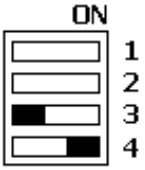
As mentioned in the previous paragraph, on the CS8B9 display board (Sch96103) version Term4 V2.45 or higher, two switches are available (3-4) to set the baud rate for the communication between Pc and/or Display and the regulation board CS6607 V3.47 or superior:
Settings are as follows:



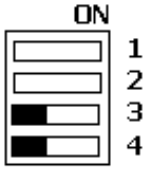
9600 Baud Rate



57600 Baud rate



38400 Baud Rate



115200 Baud Rate

Attention: This setting on the display must be done in union with the setting made at parameter P02 otherwise the converter will enter in communication error.

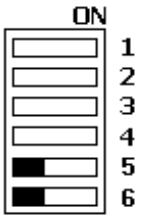
P02 = 0 = 9.600
P02 = 1 = 38.400
P02 = 2 = 57.600
P02 = 3 = 115.200

The setting of the dip – switches must be done with the display off.

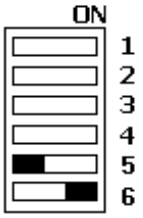
5.7 Dip-switch configuration for display CS8G3

The display keyboard was re-masterized with SMD technology, the microprocessor is already programmed with the software version V3.50 and V13.50, so there are not external eproms. This keyboard is compatible only with the software version V3.50.
It is possible to use it with the software V3.47 but it is no possible to visualize and use the parameters from P71 to P78.
We inform you that in a few time it is possible to have eprom, only for the display with software version V13.50, for the software version V1.41 and V1.52 L3, etc.
After that will be only necessary to install the eprom into the 28 pin supper and open the jumper, now closed, to enable the display to work with the eprom with this software version.
In this way the new display CS8G3 will be compatible with the old software version.
If you open the jumper, without the programmed eprom, the display do not communicate with the regulation card

Setting of communication language

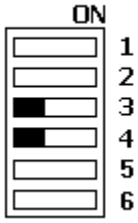


ITALIAN
LANGUAGE

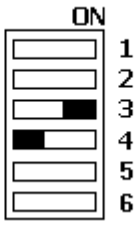


ENGLISH
LANGUAGE

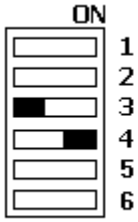
Setting Baud rate



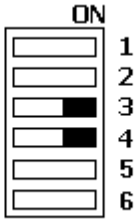
9600 Baud Rate



57600 Baud Rate



38400 Baud Rate



115200 Baud Rate

6 Parameters

The complete functioning of the drive is carried out assigning the right value to each parameter via the user interface (see paragraph 5); but the parameters which the user actually has to modify are almost always a limited number, as the major part of parameters requested are normally default values.
Default values signify the pre-determined value (memorised in the EPROM memory), that the system uses automatically if the user does not insert a value different via the interface.
The parameters are divided into 2 groups:
- Parameters “P”
- Parameters setting internal connection “S”

The parameters displayed with “*” are present only with software V3.47 or higher.

6.1 Parameters “P”

NAME PARAM.	DESCRIPTION	DEFAULT SETTING	POSS.SETT. OFFLINE/ ONLINE
P 01	**Number drive for multi-drop connection.** This parameter stabilises an identification number for the connection between more drives in RS485. Range from 1.0 ÷120.0. The 255 is given after the loading of the default parameters, and this corresponds to no address selected.	255	OFFLINE
P 02 *	Baud rate code. This parameter is used to set the baud rate for the communication between the keyboard and/or the PC and its regulation board. Must be modified in union with the setting of the switches of the display keyboard. Range from 0.0÷3.0 P02 = 0 = 9.600 P02 = 1 = 38.400 P02 = 2 = 57.600 P02 = 3 = 115.200	0.0	OFFLINE
P 03	CW Jog Speed. Set an internal speed reference for the utilisation of the Jog CW of the drive, releasing input 4. Range +/- 100 in % of the maximum speed.	0.0	ONLINE

P 04	**CCW Jog Speed** Set an internal speed reference for the utilisation of the Jog CCW drive, releasing input 5. Range +/- 100 in % of the maximum speed.	0.0	ONLINE
P 05	**Absolute Correction Coefficient added signal.** Stabilises the quantity of added signal to place in the input of speed loop or current loop. P05 = 0 = 0 added signal also with entrance 9 released and with a present reference on 35 – 38. Range +/- 400 in % of the maximum speed.	0.0	ONLINE
P 06	Correction coefficient, proportional to the speed, for the added signal. Stabilises a proportional coefficient to the speed, which summarising at P05, modifies the speed of the added signal. The higher the speed, the higher this coefficient. The entrance reference in the speed regulator assumes a speed non-linear. Range +/- 400 in % of the maximum speed.	0.0	ONLINE
P 07 *	Correction coefficient for speed reference input signal. Stabilises a coefficient which effectuates a correction to the speed reference signal. If P07 = 0 there is no input signal. If RF (reference) = +10V and P07 = -100% RF = -10V. If RF = -10V and P07 = -100% RF = +10V If RF = -10V and P07 = +100% RF = -10V If RF = +2V and P07 = -400% RF = -8V. If P07=+100% the signal RF in input does not undertake any variation. Range +/- 400.0 in % to speed reference.	100	ONLINE
P 08	Correction coefficient IPD signal. Stabilises a corrective coefficient that is multiplied at the IPD signal. The higher P08, the higher the resulting IPD signal with a max of 10V. Example: IPD input equal to +2V P08 = 400% gives a multiplicative factor equal to 4, and so the resulting IPD signal will be equal to 8V.	100	ONLINE

	This coefficient may change the reference sign entering in 36. Functions analogically at P07. Range +/- 400 in % to I maximum		
P 09	Correction coefficient for IPI signal. Stabilises a correction coefficient which is multiplied at IPI signal. The higher P09, the higher the resulting IPI signal, with a max of 10V. Example: IPI in entrance equal to +2V P09= 400% Gives a multiplicative factor equal to 4 times, so the resulting IPI signal will be equal to 8V. This coefficient may change the sign at input signal on 37. Range +/- 400 in % to I maximum.	100	ONLINE
P 10 *	Correction coefficient for the final speed reference (after the ramp). This parameter effectuates a correction the same as parameter P07, but is done on the final reference after the ramp. Range +/- 400.0 in % to speed reference.	100.0	ONLINE
P 11	Acceleration Time CW. Stabilises the ramp acceleration time for the anti-clockwise rotation of the motor. Is expressed in seconds, and the set value is given with a speed reference equal to 10V. Range 0.5 /900.0 sec	10	OFFLINE
P 12	Deceleration Time CW. Stabilises the time of the deceleration ramp for the rotation in anti-clockwise rotation of the motor. Is expressed in seconds, and the set value is given with a speed reference equal to 10V Range 0.5 /900.0 sec	10	OFFLINE
P 13	Initial Rounding Time CW. Stabilises the initial rounding time of the acceleration ramp and deceleration for the clockwise direction of the motor. Range 0.0 /10.0 sec	1	OFFLINE

P 14	Final Rounding Time CW. Stabilises the final rounding time of the acceleration ramp, and deceleration for the clockwise rotation of the motor. Range 0.0 /10.0 sec	1	OFFLINE
P 15	Acceleration Time CCW. Stabilises the time of the acceleration ramp for the anticlockwise rotation of the motor. Expressed in seconds, and the value set is given with the speed reference equal to 10V Range 0.5 /900.0 sec	10	OFFLINE
P 16	Deceleration Time CCW. Stabilises the time of the deceleration ramp for the anti-clockwise rotation of the motor. Expressed in seconds, and the value set is given with the speed reference equal to 10V Range 0.5 /900.0 sec	10	OFFLINE
P 17	Initial Rounding Time CCW. Stabilises the initial rounding time of the acceleration ramp, and deceleration for the anti-clockwise rotation of the motor. Range 0.0 /10.0 sec	1	OFFLINE
P 18	Final Rounding Time CCW. Stabilises the final rounding time of the acceleration ramp, and deceleration for the anti-clockwise rotation of the motor. Range 0.0 /10.0 sec	1	OFFLINE
P 19	Available		
P 20	Maximum Frequency Encoder (/ 2) In this parameter the value, calculated using the formula at paragraph (3.8.1), is set. This corresponds to the working frequency of the encoder, to the required motor speed. With rear-action from dynamo tachometer this parameter does not interfere with the functioning of the converter – motor. Range 3000 ÷ 25000 Hz	10.000	OFFLINE
P 21	Maximum Speed Limit CW. After having set the speed for the rear-action of the dynamo tachometer (trimmer TdT in V6) or for the encoder rear-action (P20), it is possible to limit the speed for the rear-action in clockwise direction via this parameter, which is expressed in % to the maximum speed set (V6 - P20).	100	ONLINE

	Range 0.0 to 100.0 in % to the maximum speed.		
P 22	**Maximum Speed Limit CCW** After having set the speed for the rear-action of the dynamo tachometer (trimmer TdT in V6) or for the encoder rear-action (P20), it is possible to limit the speed for the rear-action in anti-clockwise direction via this parameter, which is expressed in % to the maximum speed set (V6 - P20). Range 0.0 to 100.0 in % to the maximum speed.	100	ONLINE
P 23	Proportional Gain of the Speed Regulator. Stabilises the value of the proportional gain of the speed regulator. The higher this value, the higher the gain. This makes the regulation particularly smooth and trouble-free. Range 1.0 a 100.0	4	ONLINE
P 24	Time of the advance constant of the speed regulator. Stabilises a constant which, expressed in (ms), permits the modification of the integral value of the speed regulator. The integral is given from $\frac{P24}{P23} = ms$ So is equal to P23, P24 is higher, and higher is the integral value. Range 30.0 to 1000.0 ms.	150	ONLINE
P 25	Coefficient Gain Adaptation in the constant power zone. This parameter is relative to the utilisation of the ELCAM excitation board. Return to parag. 4 for explanation. Range from 0.0 to 100.0%	100	ONLINE

P 26	Coefficient for the static fall of the speed regulator. Stabilises a coefficient which creates a fall % on the speed reference. This parameter may be utilised if, after having set P56 and/or P57, it is not possible to stop the motor with the speed reference equal to 0V. Stabilises a pause of insensibility. Range 0.0 from 10.0 in % to the speed reference.	0.0	ONLINE
P 27	Initial Start Value of the Speed Regulator Integral. Stabilises the initial current value of the speed regulator, from the moment the drive is in start. May be useful for starts in counter-braking, or in the presence of unbalanced loads, where it is necessary to place in recuperation phase. Range +/- 100%.	0.0	OFFLINE
P 28	Available		
P 29	Maximum Limit of Direct Bridge Current. Stabilises the maximum current that the drive may supply. Relative to the direct bridge, and is expressed in % to the maximum drive regulated with R29 – R30 (see paragraph 8.1) Range 0.0 to 100.0 in % of the maximum current.	100.0	ONLINE
P 30	Maximum Limit of inverted bridge current. Stabilises the maximum current the drive may supply. Is relative to the inverted bridge, and is expressed in % to the maximum current of the drive regulated with R29 – R30 (see paragraph 8.1) Range 0.0 to 100.0 in % of the maximum current.	100.0	ONLINE
P 31	Nominal Current of the motor. In this parameter the calculated value from the formula at (paragraph 8.3), is expressed in % and is needed by the regulation to calculate the autoregulation parameters of the current loop (P39, P40 e P42). Range 20.0 to 100.0 in % to the max. drive current.	66.6	OFFLINE

P 32	Available		
P 33	Maximum Inclination, Current Variation admitted on motor dI / dt. Stabilises the maximum current variation, theoretically, which can be available within one second. The default value set, should be optimal for the major part of the motors. It is advised that in the presence of motors less inductive and/or strongly resistive it is advised to diminish the value. To understand if the motor is more resistive than inductive refer to parameters P39 and P40. Range 10.0 to 300.0 (In/sec)	150.0	OFFLINE
P 34	Nominal Field Current. This parameter refers to the ELCAM excitation board. For the explanation return to (paragraph 4.6.1.). Range 30.0 to 100.0 in % to the maximum excitation current set with the spires and Jumpers J2, J3, J4, and J5 all inserted.	90	OFFLINE
P 35	Motor Voltage in Power Constant Zone (% di P38). Also this parameter is relative to the ELCAM excitation board. Stabilises the de-fluxation voltage of the motor. Refer to explanation paragraph 4. Range : 40.0 a 120.0 in % di P38.	100.0	OFFLINE
P 36	Maximum Voltage Level permitted at motor (in % P38). Stabilises the maximum limit of armature voltage allowed on motor. Is normally left at Default value. Example: P38 = 105.2 % = armature voltage 400Vdc. Se P36 = 100% = P38 = 400Vdc Se P36 = 120% = P38 +20% = 400Vdc + 20% =480Vdc Range 50.0 to 150.0 in % of P38.	120.0	OFFLINE
P 37	Relation between initial de-excitation turns and maximum turns. This parameter is relative to the ELCAM excitation board. For the explanation and calculation refer to paragraph 4. Range 0.0 to 100.0 in % to max. speed.	100.0	OFFLINE

P 38	Motor Voltage, referred to network and nominal turns. Parameter to set the value calculated with the formula at paragraph 8.3. The motor armature at nominal turns is expressed in %. Range 20.0 to 125.0 in % to the nominal voltage of the network.	105.0	OFFLINE
P 39	Resistive Fall % of motor to the nominal current, referred to the nominal tension. This parameter is automatically modified by following the auto-regulation of the current loop, and expresses the resistive fall on motor R x I. If this value is high, it signifies the subject motor is particularly resistive. Range 2.0 ÷ 40.0 in %.	7.0	OFFLINE
P 40	Time Constant of Armature. This parameter is automatically modified by carrying out the auto-regulation of the current loop, and expresses the time constant of motor armature. practically: $\frac{L}{R}$. The higher this value, the higher the inductance of the motor. Range 3.0 a 200.0 ms.	10.0	OFFLINE
P 41	Coefficient inversely proportional to the current loop gain. Normally left at Default value. If a revision of value is necessary, take into account that, increasing this value, slows the response of the current loop. (For example, for motors less inductive it is suggested to increase P41). Range 2.0 a 100.0	10.0 20.0 con V3.47 e superiori	OFFLINE
P 42	Coefficient Ratio between integral gain and proportional of current loop. Also this parameter is automatically modified during the auto-regulation of the current loop. Expresses a inductance variation of the motor, to a variation of the current. The higher this value to the default value, the higher the inductance variation, the higher the variation will vary the current. Usually the default value of 20, is adjusted only in small increments, assuming values only marginally inferior.	20.0	OFFLINE

	Range 0.0 a 100.0		
P 43	Fall % of line for I=0,82 x In alternate nominal current. This parameter takes into account the voltage fall which could occur on the line which supplies the converter. If the fall % of the line is at 82% of the nominal current of the motor, it is advised to leave the parameter at Default value. Range 2.0 a 20.0 in %.	6.0	OFFLINE
P 44	Thermal Constant Th of motor. This parameter is tightly bound to the P45 and P48 parameters. It stabilises a time for the intervention of the thermal motor pre-alarm (superation of the threshold P45) and for the intervention of the thermal motor alarm (superation of the threshold P48). Expressed in seconds. Range 2.0 a 2400.0 sec.	180.0	OFFLINE
P 45	Thermal Current of Motor for Pre-alarm. In this parameter the value of the motor current, expressed in % in respect to the maximum current of the converter, is loaded. Once this is superated, the alarm time of P44 passes, and the pre-alarm signal at exit 23 of the board (see paragr 3.2) is activated. Normally the corresponding value to the motor nominal current is loaded. Range 20.0 to 100.0 in % to the max. current of the drive.	66.6	OFFLINE
P 46	Waiting Time for Closure Meter (ms). In this parameter a value expressed in ms is loaded, once superated it gives an effective release of the converter regulation, once the entrance 11 and 1 of the board (see paragraph 3.2) are enabled. This time permits the settling of the field current in case of utilisation of the ELCAM board. Range 50.0 a 2000.0 ms.	250.0	OFFLINE
P 47	Regulate Minimum Speed Level. Stabilises the threshold for the signal at exit (18), of the regulation board, at the arrival of minimum speed, if parameter S6 is set at 0. This is normally left at the	1	OFFLINE

	Default value, and is used to arrest the motor after the threshold is reached.0 Range 0.0 to 100.0 in % to the max. speed.		
P 48	Alarm for Thermal Current Motor. In this parameter the current motor value is loaded, expressed in %. In respect to the maximum current of the drive. Once this is superated, the alarm intervention of the ELCONV converter is needed. Normally a value equal to 10 – 15% higher than P45 is set. Range 20.0 to 100.0 in % to the max. current of the drive.	70	OFFLINE
P 49	Max. Voltage Level permitted on network. Stabilises a threshold, expressed in % to the network voltage, once this is superated there is an intervention of the converter alarm: V of network > of P49. The converter refers to the value set at V17. (See paragraph 8.2). Range 105.0 to 130.0 in % to the nominal voltage of network.	115.0	ONLINE
P 50	Minimum Voltage Level permitted on network. Stabilises a threshold, expressed as a % to the network voltage, under which the converter alarm intervention takes place: V of network < of P50. The converter refers to the value set at V17. (See paragraph 8.2). Range 75.0 a 95.0 in % to the nominal voltage of network.	85.0	ONLINE
P 51	**Maximum Speed permitted for Alarm.** Stabilises a threshold expressed as a % to the maximum speed set, once superated it gives the intervention of the converter alarm: Max. speed > P51. Range 0.0 to 115.0 in % to the max. speed For set value > of 112.5% the control is excluded.	110.0	ONLINE
P 52 *	Maximum Delay for late alarms. This parameter was developed for an optional board, which has not entered into production; and so has no effect.	60.0	OFFLINE

P 53	**Permitted Nominal Current Drive for alarm.** With this parameter it is possible to set a threshold, expressed as a % to the maximum drive current. Once superated, will activate the converter alarm: « Drive Over.Alarm ». This alarm can be delayed with the parameters P54 and P55. N.B.: P53 is always set equal to 100% if the requested max. current is the same or inferior to drive cut current. If the current is higher than the drive cut the value is set at an inferior value in respect to the drive cut. *Example:* CBT 250-4-F2- Imax regulation with R29/R30 (see paragraph 8.1) =250A Request = 200A P53 = 100%. CBT 250-4-F2- Imax regulation with R29/R30 =300A (Take into account that each drive may supply a max. current equal to a 35% increase in respect to the cut, for 30'' every 300'') $P53 = \frac{250}{300} \times 100 = 83{,}3\%$ Range 20.0 to 100.0 in % to the max. regulated current with R29/R30.	66.6	OFFLINE
P 54	Thermal Drive Pre-alarm Time (I= 1.5 x In). This parameter takes effect only if P53 has a value inferior to 100% and stabilises the time span the drive may supply a current superior to the value set at P53, before activating the pre-alarm. The time set in seconds at this parameter, is that given if the drive supplied current is equal to 1,5 times the same current of the cut. Example: CBT 250-4-F2- » P54 = 30 sec If I supplied = 1,5 x 250 = 375A P54 = 30 sec with I = 375A If I supplied = 300A is given the intervention with a time of > di 30 sec. Range 10.0 a 200.0 sec.	30	OFFLINE

P 55	Thermal Drive Alarm Time in % of P54. Also this parameter has effect only if P53 < 100 whilst P54 stabilises a threshold for pre-alarm, P55 stabilises a threshold which upon superation gives the alarm intervention: « Thermal Drive ». This is in a % of P54, so if P55 = 100 = P54 (the converter automatically enters into alarm once the conditions shown at P54 are reached). For Default add to P54 approx. 10 sec. Range 100.0 to 400.0 in % of P54.	133.0	OFFLINE
P 56	**Speed Reaction Offset Channel.** With this parameter it is possible to set a value which will compensate any eventual offset to the speed reaction. To adjust this parameter it is necessary to first set the access key in P80. Range +/- 4095.	0.0	OFFLINE
P 57	Speed Reference Offset Channel. With this parameter it is possible to compensate any eventual offset present at speed reference. Range +/- 4095.	0.0	ONLINE
P 58	Correction Signal for Added Signal Offset Channel. With this parameter it is possible to compensate an eventual offset present with the reference, added signal entering at Terminal Block 35. Range +/- 4095.	0.0	OFFLINE
P 59	IPD Signal Offset Channel. With this parameter it is possible to compensate an eventual offset developing on reference, IPD signal entering at Terminal Block 36. Range +/- 4095.	0.0	OFFLINE
P 60	IPI Signal Offset Channel. With this parameter it is possible to compensate an eventual offset developing on reference, IPI signal entering at Terminal Block 37. Range +/- 4095.	0.0	OFFLINE
P 61	Available		
P 62	Available		

P 63	Available		
P 64	Available		
P 65	Available		
P 66	Available		
P 67	Available		
P 68	Available		
P 69	Available		
P 70	Available		
P 71 **Only V3.50**	**Offset couple 1.** This parameter is modified automatically by following autoregulation ; it is advised not to be modified. Expressed in impulses (51Imp. = 1grade)	0.0	OFFLINE
P 72 **Only V3.50**	**Offset couple 2.** This parameter is modified automatically by following autoregulation ; it is advised not to be modified. Expressed in impulses (51Imp. = 1grade)	0.0	OFFLINE
P 73 **Only V3.50**	**Offset couple 3.** This parameter is modified automatically by following autoregulation ; it is advised not to be modified. Expressed in impulses (51Imp. = 1grade)	0.0	OFFLINE
P 74 **Only V3.50**	**Offset couple 4.** This parameter is modified automatically by following autoregulation ; it is advised not to be modified. Expressed in impulses (51Imp. = 1grade)	0.0	OFFLINE
P 75 **Only V3.50**	**Offset couple 5.** This parameter is modified automatically by following autoregulation ; it is advised not to be modified. Expressed in impulses (51Imp. = 1grade)	0.0	OFFLINE
P 76 **Only V3.50**	**Offset couple 6.** This parameter is modified automatically by following autoregulation ; it is advised not to be modified. Expressed in impulses (51Imp. = 1grade)	0.0	OFFLINE
P 77 **Only V3.50**	**Offset synchronism.** This parameter acts as an offset for the couples as described above. It is normally adjusted by a minimal number of degrees.	+153	OFFLINE

	Also this parameter is modified automatically in autoregulation. It is successively checked and eventually modified manually, should it assume a negative value. In this case, it is only necessary to change the sign. - if (+) no modification necessary, - ***if (-) set at (+) and then enter the memorisation menu and save details on eeprom.*** Expressed in impulses (51Imp. = 1grade)		
P 78 **Only V3.50**	**Network Period.** This parameter measures the period of network voltage. It is modified automatically in autoregulation and should not be modified. Expressed in impulses (51Imp. = 1grade)	18432	OFFLINE
P 79	Available		
P 80	Reserved Parameter Access Key. In this parameter a numerical code is set, to access the reserved parameters. The reserved parameters are : P56,P90,P92,P96,P97,P98,P99 e S08. The access key is a pre-set number.		OFFLINE
P 81	**Max. Motor Speed to visualise RPM/1'.** By setting this parameter to the same value as the max. motor speed, it is possible to visualise the speed in absolute value, only if connected with the PC in 485. Range from 0.0 to 3200.0	1500.0	ONLINE
P 82	Value of current limit bridge (A). By setting this parameter at the same value as the converter maximum current, regulated with R29/R30 it is possible to visualise with the PC, the il value of the absorbed current; only if connected in Rs 485. Range from 0.0 to 3200.0	50.0	ONLINE
P 83	Value of nominal voltage of the Veff network. (As parameters P80 and P82, only if it is possible to view network voltage. Range from 0 to 3200.0	380.0	ONLINE
P 84	Available		
P 85	Available		
P 86	Available		
P 87	Available		

P 88	Available		
P 89	Available		
P 90	Conduction Control Level (200 % exclude control) This reserved parameter stabilises a threshold for the intervention of the driver in: « Conduction Alarm ». For a more detailed description refer to alarm messages, Conduction Alarm. (See paragraph 1.1). This value must only be modified by trained personnel. Range from 0.0 to 200.0 % of the max. current.	19.8	OFFLINE
P 91 *	Current Regulator Correction Gain. This parameter allows a correction of current regulator, to compensate the inductance variation in function with the current. This parameter is particularly useful when working with limits or throw, (see S7). If the value requested by current (V10) is different from (V11) average value, this value may be compensated with P91. When working in velocity this must not be touched as it disturbs the dynamics of the regulation. Range : 0.0 a 8.0	0.0	ONLINE
P 92	Offset F.E.M. Correction This reserved parameter is used to compensate eventual offsets of the board, ignition system or voltage fall on the tryrystors. For a detailed explanation refer to paragraph. Range 1.0 to 10.0 %	4.8	OFFLINE
P 93	Current Threshold to control tachometer (100% exclude control) Stabilises a threshold for any eventual lack of rear-action system. (For a more detailed explanation refer to paragraph 11.4) Range 0.0 ÷ 100.0 in %.	2.0	OFFLINE
P 94	Dynamo Tachometer Zero Threshold. Stabilises a threshold for the rear-action system control. (For a more detailed explanation refer to paragraph 11.4) Range 0.0 to 5.0 in %.	2.0	OFFLINE
P 95	F.E.M. Threshold to give DT > Threshold. Stabilises a threshold for a control of any eventual lack of the rear-action system.	2.0	OFFLINE

	(For a more detailed explanation refer to paragraph 11.4) Range 1.0 to 30.0 in %.		
P 96	Peak Value for Max. current (200% exclude control). (Take reference as described at paragraph 11.3). Range 100.0 to 200.0 in % to the I Max.	100.0	OFFLINE
P 97	Ignition Impulse Time in ms. (For a more detailed reference refer to paragraph 10) Range 0.1 to 10.0 ms.	1.6	OFFLINE
P 98	Waiting Time after Inversion. (For a more detailed explanation refer to paragraph 10). Range 1.5 to 30.0 ms.	2.0	OFFLINE
P 99	**Current Equal to Zero Threshold.** (For a more detailed explanation refer to paragraph 10). Range 0.2 to 3.0 %.	0.6	OFFLINE

6.2 Parameters for setting of "S" internal connections

The parameters marked with "*" are present with V3.47 software and higher.

NAME PARAM.	DESCRIPTION	DEFAULT SETTING	POSS. TO SET OFFLINE / ONLINE
S 01	Determines which internal signals are placed at programmable analogic output (25-26). Using this parameter it is possible to choose the internal size, in the form of an analogic signal ± 10 Vdc, at output 25 – 26 (see parag. 3.2). At this parameter the identification number of one of the following sizes is set: V5-V6-V10-V11-V12-V18-V19-V20. Example: If a signal proportional to the max. requested current is required, set S01 = 10 (where 10 corresponds to the identification number of the internal size V10= current request).	18	ONLINE
S 02	Determines the speed regulation configuration. S02 = 0 proportional and integral S02 = 1 proportional only S02 = 2 reference current stage S02 = 3 blocked	0	OFFLINE
S 03	Determines whether Jog CW and Jog CCW are placed before or after the ramp. This parameter takes effect only if the Internal Jog of the Converter is utilised. It stabilises the configuration of the internal reference (P3, P4) of Jog CW & CCW. Take reference to the block scheme of the scheme at parag. 13.2. With S03 = 0, Jog CW & Jog CCW are inserted before the ramp, and so are submitted to the effect of the internal ramp of the converter. With S03 = 1, Jog CW is inserted after the ramp, whilst Jog CCW is inserted before the ramp.	0	OFFLINE

	With S03 = 2, Jog CW is inserted before the ramp, whilst Jog CCW is inserted after. With S03 = 3, Jog CW & Jog CCW will insert after the ramp, and so will not be submitted to the effect of the internal ramp of the converter.		
S 04	**Determines the configuration of added signal SA.** Should the added signal, entering at Terminal Block 35 – 38 be utilised, it is possible to choose if it inserts after the ramp with S04 = 0, before the ramp with S04 = 1 or after the speed stage with S04 = 2. See block scheme at parag. 13.2.	0	OFFLINE
S 05	Determines if the displays are in percentages or absolute value. S05 = 0, displayed as %. S05 = 1, displayed as absolute. Stabilises display type (% or absolute) of internal size, but only if connected with PC – Elconv.	0	OFFLINE
S 06	**Determines the exit configuration of output 18 of regulation board.** With S06 = 0 it works with the minimum speed set at parameter P47 and the output assumes a higher value (24V) after the overtaking of the minimum speed. With S06 = 1 output 18 assumes a higher value (24V) when the drive starts.	1	OFFLINE
S 07	Determines the configuration for the utilisation of external control references of direct bridge current IPD and inverted bridge IPI. With use of the external current limit control input entering at Terminal Block 36 – 38 for IPD and 37 – 38 for IPI, with this parameter it is possible to configure these signals. More precisely : S07 = 0, with I7 and/or I8 enabled it is possibile to work with the external limit IPD and/or IPI.	0	OFFLINE

	S07 = 1, by abilitating input I7 the IPD signal works in addition with eventual current requests which arrive from the speed regulator. By abilitating input I8, the signal IPI may regulate current both from direct bridge and inverted bridge. S07 = 2, abilitating I7 works in throwing phase with PD, abilitating I8 works in limits with PI bridge. S07 = 3, abilitating I7 works in limit with PD and by abilitating I8 works in throw with PI inverted bridge. S07 = 4, abilitating I7 works in throw with PD and abilitating I8 works in throw with PI. It must be in combination with I7, I8. With I7-I8 = 0 works only with internal limits P29 & P30 which take precedence. Working in limits signifies that the current may be limited from 0 to the value set at P29 – P30. Working in throw signifies the possibility to work both in positive and in negative with the same input (36 – 37).		
S 08	Determines converter type. This is reserved parameter and so for any modification it is necessary to first set the P80 parameter access key. Stabilises which of the bridges, direct or inverted, may be utilised. S08 = 0 works both with direct and inverted bridges; bi-directional system. S08 = 1 only direct bridge. S08 = 2 only inverted bridge.	0	OFFLINE
S 09	Abilitation Configuration Signal for ELCAM board control. With this parameter it is possible to stabilise if the field current must be present at the booting of the CS6607 regulation board, with S9 = 0 ; or after the regulation has been released (enable start) with S9 = 1.	0	OFFLINE

	With S9 = 0 the signal which controls the ELCAM board, present at Terminal Blocks 24 - 26, is present soon after having supplied the CS6607 regulation board. With S9 = 1 the signal is present only at the moment of releasing of the regulations (abilitation of delayed start input 11) and in the meantime the signal for missing excitations is not given. The signalisation for missing field is given if, after having supplied and released the regulation board, the field current is missing.		
S 10 *	Alarm exclusion cyclic direction and phase and frequency alarms. With S10 = 0 no exclusion. With S10 = 1 dependence from cyclic direction is excluded. **ATTENTION :** the power must be in phase with regulation (see paragraph 3.5). With S10 = 2 it excludes both the alarm relative to the frequency and missing phase. With S10 = 3 all three are excluded.	0	OFFLINE
S 11 *	Size choice (1) for drive state. By setting at this parameter and at parameters S12, S13, S14, an internal size chosen between V01 and V20, it is possible to display 4 sizes at the same time; only if connected via serial with the PC. Range V01 ÷ V20.	6	ONLINE
S 12 *	Size choice (2) for drive state. Range V01 ÷ V20.	11	ONLINE
S 13*	Size choice (3) for drive state. Range V01 ÷ V20.	5	ONLINE
S 14 *	Size choice (4) for drive state. Range V01 ÷ V20.	10	ONLINE
S 15 *	Validity Multiple Setting. This parameter is modified eventually when the drives are connected in serial line for a multiple set up.	0	ONLINE

	S15 = 0 Setting is invalid. S15 = 1 Setting is valid and so enabled.		
S 16 *	Parameter Choice (1) for Multiple setting. With this parameter it is possible to choose a P parameter from 1 ÷ 99 for the multiple setting. 0 = no parameter. Also in S17 - S18 - S19 it is possible to choose the P parameters from 1 ÷ 99 for multiple setting. Multiple setting signifies that only with a connection with PC via a serial line is it possible to set at the same moment, with a particular address, more parameters together independently of their value. Example: S16 = 29 ⇒ P29 = 40% S17 = 30 ⇒ P30 = 40% S18 = 31 ⇒ P31 = 66% S19 = 38 ⇒ P38 = 105,2% With PC an address is sent to the converter comprising of these 4 parameters, and automatically these parameters are modified at the same time.	0	ONLINE
S 17 *	Parameter choice (2) for multiple setting. Range 1 ÷ 99.	0	ONLINE
S 18 *	Parameter choice (3) for multiple setting. Range 1 ÷ 99.	0	ONLINE
S 19 *	Parameter choice (4) for multiple setting. Range 1 ÷ 99.		
S 20 *	Passive Terminal Exclusion. This parameter can only be changed if connected to a PC. It is used to exclude the visualisation of terminal display to improve the communication on the serial line used by high Baud Rates. S20 = 0 not excluded. S20 = 1 excluded. If with the display it enters in with parameter settings, the display terminals have the precedence and exclude automatically communication via PC.	0	ONLINE

S 21 *	Software start (parallel with X start) By using this parameter it is possible to carry out drive start from the display. This command is parallel with an eventual regulation release. S21 = 0 OFF S21 = 1 ON	0	ONLINE
S 22 *	Abilitation signal CW. This command is parallel with CW release at Terminal Block N° 2 of the ELCONV regulation board. S22 = 0 OFF S22 = 1 ON	0	ONLINE
S23 *	Abilitation signal CCW. This command is parallel with CCW release at Terminal Block N° 3 of the regulation board. S24 = 0 OFF S24 = 1 ON	0	ONLINE
S 24 *	Abilitation signal Jog CW. This command is parallel with Jog CW release at Terminal Block N°4 S24 = 0 OFF S24 = 1 ON	0	ONLINE
S 25 *	Abilitation signal Jog CCW. This command is parallel with Jog CCW release at Terminal Block N°5. S25 = 0 OFF S25 = 1 ON	0	ONLINE
S 26 *	Ramp exclusion. This command is parallel with input N°6 S26 = 0 OFF S26 = 1 ON	0	ONLINE
S 27 *	**Abilitation direct bridge limit.** This command is parallel to the release at Terminal Block N° 7; Abilitation limits direct bridge. S27 = 0 OFF S27 = 1 ON	0	ONLINE
S 28 *	Abilitation inverted bridge limit. This command is parallel to the release at Term. Block N°8. S28 = 0 OFF S28 = 1 ON	0	ONLINE

S 29 *	**Abilitation added signal.** This command is parallel to the release at Term. Block N°9. S29 = 0 OFF S29 = 1 ON	0	ONLINE
S 30 *	**Reset alarms.** This command is parallel to the release at Terminal Block N°10. S30 = 0 OFF S30 = 1 ON	0	ONLINE
S 31 *	**Abilitation of start delay.** This command is in AND-connection with the abilitation start, with delay, at Terminal Block N° 11; if one of the two is missing the drive start is not carried out. S31 = 0 OFF S31 = 1 ON	1	ONLINE
S 32 *	**External alarm n°1.** This parameter can be imagined as a contact in AND-connection with Terminal Block N° 12, consent 1, of the regulation board. If this consent is missing (S32 = 0 otherwise Terminal Block N°12 at low level) the alarm is given : « Missing consent n°1 » otherwise « Intervention Fuses and/or Thermal Probe ». S 32 = 0 OFF S 32 = 1 ON	1	ONLINE
S 33 *	Available		
S 34 *	Consent excitation presence. This parameter allows to give permission for excitation presence taking S34 = 1. It is parallel to external consent, Terminal Block N°13. S 34 = 0 OFF S 34 = 1 ON	0	ONLINE

6.3 Parameter Simulations

As seen at paragraph 5.2.3 a “SIMULATIONS” menu is present, this comprises of only two parameters, E01 & E02.

NAME PARAM.	DESCRIPTION	DEFAULT SETTING	OFFLINE / ONLINE
E 01	OFFSET speed from keyboard. With this parameter it is possible to create a digital signal which simulates an analogic speed reference. It may be needed to turn the motor when a speed reference is not available at the entrances 32-33-34 or otherwise in substitution of external potentiometer. This signal enters directly before the converter ramp, and is expressed in % to the maximum speed and cannot be memorised as a normal parameter. Range +/- 100% in % to the maximum speed.	0.0	ONLINE
E 02	OFFSET of keyboard current. Using this parameter it is possible to have a current request signal. This parameter is active only after the exclusion of the speed regulator (S2=3). As for parameter E01, also E02 cannot be memorised. Range +/- 100%	0.0	ONLINE

7 Displays

As has already been explained at paragraph 5.2.1, in the visualisation menu it is possible to view: the position of the entrances and the exits, the alarms, the position of parameters “S” and of the “P” parameters and the **internal quantity** denominated with the sign “V” followed by an identification number.
The parameters marked with “*” are present only with software V3.47 and higher.

NAME SIZE	DESCRIPTION	MODE OF VISUALISATION	VIEWED AT PROGRAMMABLE ANALOGIC EXIT (25-26)
V 01	External speed reference	(%)	NO
V 02	Added signal input	(%)	NO
V 03	Adaptation added signal	(%)	NO
V 04	Speed reference > ramp	(%)	NO
V 05	Total speed reference	(%)	YES
V 06	Speed feedback	(%)	YES
V 07	Speed reference < ramp	(%)	NO
V 08	Integral part	(%)	NO
V 09	Added signal sum + correction	(%)	NO
V 10	Current request	(%)	YES
V 11	Average value of current	(%)	NO
V 11 *	Current request on correct bridge		YES
V 12	Final limit direct bridge	(%)	NO
V 12 *	Request current on bridge		YES
V 13	Final limit inverted bridge	(%)	NO
V 14	Mains frequency		NO
V 15	IPD signal	(%)	NO
V 16	IPI signal	(%)	NO
V 17	Mains voltage	(%)	NO
V 18	Electro-motor motor strength referred to the network	(%)	YES
V 19	Motor voltage referred to the network	(%)	YES
V 20 *	Speed feedback (average 10 ms)	(%)	YES
V 21 *	Regulation board software version		

For further information consult the block scheme at parag. 13.2.

8 Pre-operational procedure of converter

Before placing under voltage the converter, it is necessary to control that all the connections have been carried out correctly, and confirm to the scheme, after which it is needed to calculate the resistance R29/R30 (see topographic scheme at parag. 2.4) which stabilises the maximum current of the drive.

8.1 Calculate the resistance to determine the max. current:

The resistances stabilise, with a voltage fall of 2,5V, the limit of the maximum current of the converter. (Take note that the drive may supply a current equal to 35% more in respect to its cut for 30 sec., with intervals of 300sec. ; in this case it is important to regulate well the parameter P53, see paragraph 6.1).

EXAMPLE:
Current Limit: 500A T.A. : 400/0.2 (Amperometric Transformer ratio)
The formula to calculate the resistance is as follows:

$$R29 // R30 = \frac{2,5}{500} \times \frac{400}{0,2} = 10 ohm$$

$$Power = \frac{(2,5)^2}{10} = 0,625\ w$$

Where 2,5 the voltage at the resistance heads; standard on all the drives.

From the result of the formula it is seen that to obtain a current limit of 500A it is necessary a resistance of 10 ohm with power of 0.625W.

- At this point it is necessary to open the regulation of the converter, and set the switch of the EL031 board (see paragraph 3.5.1) depending on the voltage which is supplied.
- If a ELCAM field board is not fitted , disconnect the excitations of the motors and by-pass the “Missing Excitations” alarm.
- Remove the regulation release (Terminal Block 1, CS6607 board).
- Supply the regulation board.
- Supply the ventilation system (if present) and **control the functioning.**
- Regulate the power supply voltage of predicted encoder (see paragraph 3.8).
- If an ELCAM field board is present, carry out regulation (see chapter 4).
- Regulate the TV trimmer, and depending on the network voltage, view the value in V17(see previous paragraph).

8.2 Regulation of the internal size V17 “network voltage ” which supplies the converter

Read the network voltage, which supplies the power to the converter, in an accessible point of the board, and then using the formula, use the value to set on the internal size V17.

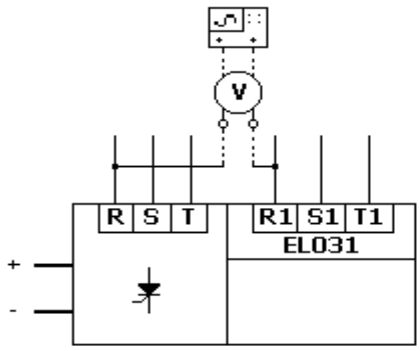
$$V17 = \frac{\text{Network voltage read with Tester}}{\text{Nominal network voltage}} \times 100$$

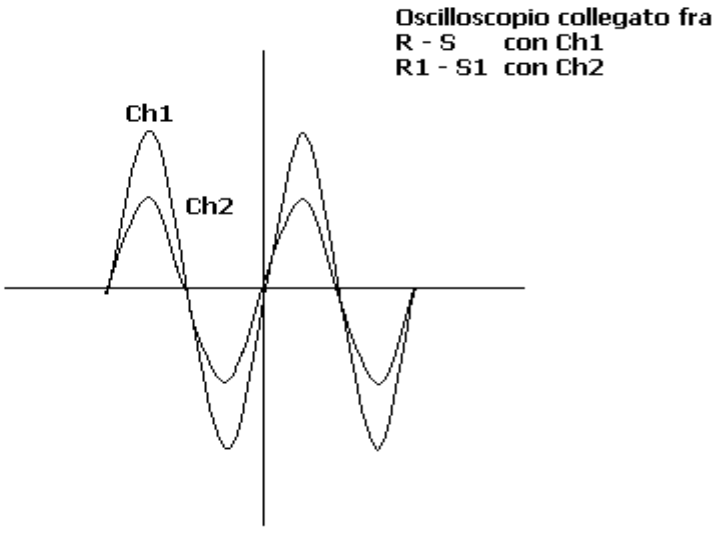
Place in “Visualisations” – “Internal Sizes ” and choose V17; via the TV trimmer (see paragraph 2.4) set the value given from the formula.

- Regulate the internal size V6 for the counter-action of the tachometer dynamo (see parag. 8.6).
- Insure that the converter release (Terminal Block 1) is dis-inserted and place in start.
- Check the synchronism of the power phase R,S,T with the regulation phase (EL031) R1,S1,T1 (see paragraph 3.5.1).

To do this it is possible to utilise an oscilloscope with channels 1 & 2 differentiated, or otherwise an AC tester, which must measure a power difference of almost zero, if R coincides with R1, S with S1 and T with T1.
It is evident in the situation were it is necessary to utilise an auto-transformer to supply the EL031 board (when the nominal network voltage does not coincide with one of the four input voltages available on the EL031) the difference of power between R with R1, S with S1 and T with T1, will obviously be reported to that auto-transformer.

- Carry out the arrest and regulate P31 & P38 (see paragraph 8.3).





8.3 Regulation of parameters P31 and P38

With the operator display panel search for the menu “PRESETTINGS” – “ PARAMETER PRESETTINGS ” and load on parameter P31 the value in a percentage given by the following formula:

$$\textbf{P31} = \frac{\text{Nominal current of armature motor}}{\text{Current limit of converter}} \times 100 .$$

At parameter P38 the percentage value is loaded given from the following formula:

$$\textbf{P38} = \frac{\text{Nominal voltage of armature motor}}{\text{Nominal voltage of network}} \times 100 .$$

For Nominal voltage of network it is intended theoretic (example: 380 Vac, 415 Vac, 440 Vac, etc.).

After having set these parameters it is advised to open the “MEMORIZATION” menu, and save the parameters in eeprom.

- At this point it is possible to carry out the autoregulation of the current loop, which concludes with the automatic saving of the parameters P39, P40, P42.

8.4 Execution of the autoregulation of the current loop

To carry out the autoregulation of the current loop it is necessary to first regulate the parameters P31 and P38, as described above, after which disconnect the regulation release (Terminal Block 1) and disconnect the excitation motor by - passing the “Missing Excitation” alarm. If an ELCAM field board is fitted, this operation is not required, as the regulation board automatically blocks the current supply in autoregulation, (see paragraph 4.1).

- Place drive in start and take the current limit, of the direct bridge, P29 al 20%.

Take note that the autoregulation is always carried out using the only direct bridge and the regulation of parameter P29 is necessary to stabilise the current limit at which the autoregulation is done.

(To carry out autoregulation using the only inverted bridge (P30) it is necessary to open “INTERNAL CONNECTION PRESETTINGS” and set the parameter S08 = 2).

If the direct bridge (P29) is used or the inverted bridge (P30) **only, in autoregulation, are values of less than 20% not accepted,** by setting at, for example the limit at 10% the drive supplies, notwithstanding this fact, a current equal to 20%.

The autoregulation of the current loop should be carried out in approx. three intervals, subdivided between the minimum value accepted (P29 = 20%) and the nominal current of the motor expressed in % in respect to the maximum of the drive.

The autoregulation is carried out at least at the nominal motor current, or otherwise with max. usuable current.

- After having set the limit on P29 or P30, open “Autotune” – “Current loop” page and follow the autoregulation using “S” key (follow on-screen indications).
- If during the autoregulation the system goes into alarm, pass into “Displays” – “Alarms” and take the necessary steps (see paragraph 8.5).
- Once the autoregulation of the current loop has been carried out, the system organises the saving of the parameters P39, P40 and P42; to carry out a manual saving of the information, for security, open “Memorization” menu and save data on eeprom.
- Remember, that by adjusting P31-P38 and P41, after the execution of the final autoregulation, it is necessary to repeat the autoregulation of the current loop to adapt the constants of autoregulation with the new settings. Once the autoregulation is terminated remove the voltage and reset the connections precedently removed.
- Return voltage and regulate the parameters of the converter depending on the motor characteristics and the requested use.

P29- P30 – P23 – P24 - P20	see paragraph 6.1. see paragraph 3.8.1 in case of encoder utilisation.
P25 – P34 – P35 – P37	see chapter 4 concerning the utilisation of the ELCAM field board, if present.
P44 – P45 – P48 motor.	see paragraph 6.1, parameters relative to thermal
P53 – P54 – P55 drives.	see paragraph 6.1, parameters relative to thermal
P11 a P18	see paragraph 6.1, parameters relative to the internal ramp of drive (if utilised).
S01 – S02 – S06 – S09	see paragraph 6.2..

- **<u>During autoregulation of the current loop of the system, only with CS6607 with eprom V3.50, organises on its own the modification of the parameters from P71 to P78; insure that the P77 has the sign (+) if not, modify them (see paragraph 6.1).</u>**
- Carry out autoregulation of the analogic inputs: pass to “Autotune analog inp.” On the “Autotune” menu. Place all the analogic references to zero (speed reference, current reference, added signal, etc.) and follow autoregulation described above. Take into account that to follow the autoregulation of the analogic inputs, it is not required to carry out the converter start, and it is not necessary to remove the motor excitation and the regulation release. However it is extremely important to take the analogic references to zero (potentiometers to zero) as by leaving them mistakenly at, for example, 5V, the converter will consider them as 0 (zero). The operation is concluded with the modification and the automatic saving of parameters P56, P57, P58, P59 and P60.

The Regulation is finished except for minor adjustments to make once in start and at maximum revs..

- Start with a reference at 0V. Revolve the motor controlling the armature voltage and the functioning.
- Re-touch the parameters if necessary.

Attention: after having modified the eventual parameters it is necessary to save them in eeprom. Open Memorisation menu and press the S key three times.

8.5 Typical alarms during the autoregulation phase

NEVER CONTINUE CURRENT

This signifies that the motor is not inductive enough for the current limit set.

It is suggested to raise the converter limit decreasing the resistance R29/R30 which stabilises the maximum current of the drive, and eventually lower the P29 – P30 limits.

Take into consideration that a motor working in these conditions absorbs a current higher than the continuous current, and due to this is submitted to excessive over heating, consequently undermining the function of the machine.

ALARM CONDUCTION

This alarm could indicate: a fault in the tyrystors or of the power, incorrect connections etc. It often intervenes when the start is not followed correctly (closure of the line tele-interupter) or the motor is not connected.

For ulterior information see (paragraph 11.3).

SELFTUNING IMPOSSIBLE

This signifies that the machine is so inductive that it places the system in crisis. This is almost impossible for normal motors, in as much as the system functioning has as a current peak value at the continuous limit, minor than 3% of the current limit. This is equivalent to a motor with a time T>300 MS and with an internal fall percentage of around 4%.

AUTOTUNING MOVING MOTOR

This signifies it is moving during the autoregulation.

<u>Troubleshooting:</u>

Excitation still present (remove), standards too high: the motor could have compensating poles on the statoric circuit (excitation), which partly crossed by the armature current induce a magnetic flow, which places in rotation the motor even if the excitation current is absent. (Mechanically block the motor).

RESISTIVE DROP TOO HIGH

The system will not function if the internal fall percentage of the motor referred to the nominal current superates 40% of the motor voltage or the fall limit superates 50% of the linked voltage crest.

<u>Troubleshooting:</u>

Lower parameter P31 (In / Il) or increase the autoregulation current (P29 higher) and re-do the autoregulation.

8.6 Regulation of the Dynamo Tachometer

Before proceeding to the regulation, it is necessary to know the maximum revolutions of the motor and the resolutions of the dynamo tachometer (D.T.).
Considering a motor having 2000 revs/min., a dynamo tachometer of 60V/1000 revs/min., the supplied voltage must be calculated to the max. motor revolutions. Refer to specific formula below:

$$Vdt = RpmMax \times \frac{60}{1000} = 2000 \times \frac{60}{1000} = 120V$$

Where: **Vdt:** is the voltage of the dynamo tachometer at Max. revs. of the motor.

Rpm Max.: Maximum revs. of motor.

$\frac{60}{1000}$: is the resolution of the dynamo tachometer. Every 1000 revs it supplies 60 Volt.

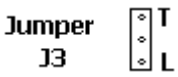
After having calculated the voltage of the dynamo tachometer at maximum nominal revs, compare the values with the table:

8.6.1 Table for the calculation of values in V6

		VALUE OF D.T.		READING IN V6 WITH JUMPER J3 IN POSITION T	
TERMINAL BLOCK	D.T.	L T *------* *	L T * * *	L T * *------*	L T * *------*
27	DT2	40 – 120 V	50 – 180 V	$\frac{3630}{VDT2}$	$\frac{4100}{VDT2}$
28	DT1	5 – 20 V	10 – 40 V	$\frac{500}{VDT1}$	$\frac{867}{VDT1}$
29	0DT	COMMON DYNAMO TACHOMETER			

The value calculated, of the example 120V, re-enters within the interval 50-180V (always choose the interval where a value is approximately half). The dynamo tachometer is connected between Terminal Blocks 27-29 and is applied with the formula:

$\frac{4100}{VDT2}$ is given $\frac{4100}{120} = 34{,}1$

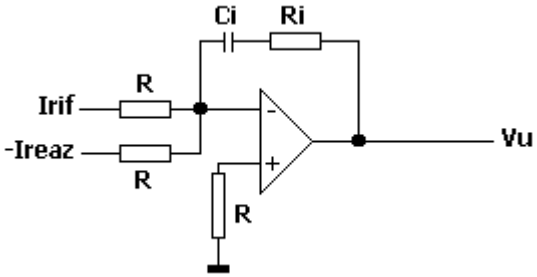


The calculated value , in the examples case 34.1, is set in “Displays” – “Visualisations internal quantity” – “V6”; position the Jumper J3 in Test (see topographic scheme paragraph 2.4) and rotate the TDT trimmer until the V6 value is reached.
At this point, taking reference from table Tab. 8.6.1 the Jumper J3 is left open, and so is not placed in position L.
For the VDT values between 40 & 120 and 5 & 20 the Jumper is positioned between centre and L (see table 8.6.1).
Once the motor is in start, control the maximum speed, and if necessary adjust the TDT trimmer until arrival at the required speed.

9 Explanation with traditional analogic schemes, of the parameter relative to the current loop and speed.

9.1 Current loop

Two parameters exist “P41” and “P42”. Their values are pre-fixed, and based on those values the system in autoregulation fixes the proportional gain and integral. Referring to the traditional scheme:



It can be written: $$\frac{Vu}{Irif.-Ireaz}=\frac{Ri}{R}+\frac{1}{sCR}=\frac{Ri}{R}\left(1+\frac{1}{sCRi}\right)=Kp\left(1+\frac{1}{sCRi}\right)$$

The values of P41 P42 are tied to the equation above, given from the following relation.

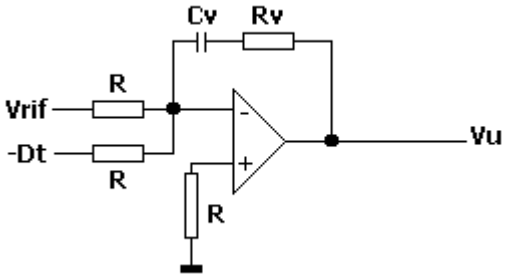
$$P41=\frac{Kautotar}{Kp}$$

$$P42=\frac{Kp}{CRi}=\frac{1}{CR}$$

From this it is seen that to increase P41 is the equivalent to slow the current loop both in the integral gain and the proportional, whilst raising P42 is the equivalent to increasing the integral gain (as reducing the only capacity). The system joins these parameters to the characteristics of the motor calculating Kautotar in autoregulation; it is advised to not touch P41 & P42.

9.2 Speed Loop

Referring to the traditional scheme



It can be written: $\frac{Vu}{VRif - Dt} = \frac{Rv}{R} + \frac{1}{sCvR} = \frac{Rv}{R}\left(1 + \frac{1}{sCvRv}\right) = Kp\left(1 + \frac{1}{sCvRv}\right)$

The two parameters P23 & P24, are connected to the equation above written with relation:
P23 = Kp
P24 = CRv (ms)
From this it is seen that to modify P23 is equivalent to changing the gain of the whole system in a directly proportional manner, whilst increasing P24 is equivalent to slowing the integral gain but increasing the marginal phase.

10 Explanations regarding certain reserved parameters

These are reserved parameters where it is necessary to insert an access code before they may be modified; as it's variations must be done only in extreme necessity and by qualified personnel.

P92 CORRECTION OFFSET F.E.M.:
This is needed to compensate any eventual delays or to the board, or to the ignition system, or in the case of low voltage, the fall of the tyrystors.
For some types of converters the loaded value is more or less the same for all the boards (default value 4,8%).
For the regulation, after having carried out autoregulation of the current loop, place the limits of the maximum current to zero (P29 & P30) place in start with a positive reference, place in the electro-motor power reading "V18" and read the value; if this superates the positive value 2 - 2,5 %, increase P92 until doing so it re-enters the zone, if the read value is negative, decrease P92 which cannot fall below 1%.
For the correction of parameter P92, carry out system arrest, change the value and then re-start and verify V18.
Once the regulation is done the parameters must be saved in EEPROM.

P96 : See description of instantaneous current, too high alarm.

P97 TIME SPAN OF IGNITION IMPULSE:
Fix the time span of impulse train or single impulse, it is expressed in ms and may be shortened to save the absorption on the power supply, it is advised not to go below 1ms and lengthen too much in case the network is extremely deformed. It is advised in any case to not lengthen further than the seventh period.

P98 W AITING TIME AFTER INVERSION:
Fixes the dead time between the conduction of one bridge and another after the current has become zero.
The system gains a further 0.4 – 0.5 ms to the set value.
For systems that do not have any particular dynamical requirements, or with motors particularly inductive, it is advised to increase the value expressed in ms, in respect to the default value 2ms.

P99 CURRENT THRESHOLD EQUIVALENT TO ZERO:
Stabilises the level at which the system considers that the current is practically at zero. Except for interventions of the of the "Current does not zero", it is advised not to change them.

11 Alarm messages

The alarm messages are displayed in “Visualisations - Alarms” menu. All the alarms are formed into six “groups”. Each group is comprised of a series of alarms relative to the same group.
If the drive has an alarm, “Alarms Present” is displayed.
Entering the “Visualisations – Alarm” menu, the display shows, on the first line, the alarm group concerned, and on the second line, the alarm in detail. Should more than one alarm be present, by using the + or - keys, it is possible to view all the messages.
All the alarms are memorised, and once the inconvenience is removed, the drive is needed to be reset to remove the memory.
The alarms are subdivided into the following groups:

- EXTERNAL PROTECTION Led 14
- MAINS & SUPPLY CONTROL Led 15
- CURRENT CONTROL Led 16
- SPEED CONTROL FEEDBACK Led 17
- THERMAL MOTOR DRIVE Led 18
- RAM, EEPROM, BOARD Led 3

The first five groups other than blocking the drive and removing the start consent, have a corresponding hardware exit, to signal the inconvenience (see paragraph 3.2, exit 19 to 23) and a specific led, whilst the last group does not have its own exit, it is limited to the blocking of the drive and to remove the start consent, signalling on LED L3 .
The details of the various alarm are as follows:

11.1 External protections

MISSING CONSENT 1 or INTERVENTION FUSES or THERMAL PROBE DRIVE.	Provokes the immediate block of the drive if, at the relative entrance (Terminal Block12), +24V is not present; it is memorised and is needed to be reset.
FIELD LOS	Feels the presence of the excitations; if the +24V at entrance 13 is missing, the drive enters into block; it is memorised and is needed to be reset.

11.2 Network & Supply control

PHASE R NOT PRESENT	Indicates the inexistence of the R synchronism phase (Ing. 41). Verify the presence of the power supply phases of the EL031. Can also indicate a fault of the regulation board CS 6607.
PHASE S NOT PRESENT	Indicates missing S synchronism phase (Ing. 42), it is also needed to verify if the synchronism transformer supply phases are present (see EL031 board).
PHASE T NOT PRESENT	May indicate missing T synchronism phase (Ing. 43), but must be verified also, if the synchronism transformer supply phases are present (see EL031 board).
MAINS VOLTAGE < MINIMUM	Indicates a lowering, even only transitable, of the value set at parameter P50.
MAINS VOLTAGE > MAXIMUM	Indicates a raising, even only transitable, of the value set at parameter P49.
FREQUENCY< MINIMUM	Indicates that the network frequency has gone below 45Hz, even only for a moment.
FREQUENCY>MAXIMUM	Indicates that the network frequency has superated 65Hz, even only for a moment.
INTERNAL POWER SUPPLY INCORRECT	Indicates a fault at one of the suppliers of the regulation board. See Terminal Block 40-46-47-48-49-50. If the suppliers are all present, substitute CS6607 board.

MOTOR VOLTAGE >MAXIMUM	Indicates a superation of the motor voltage to the value set at parameter P36. The voltage is that calculated by the system and filtered with a filter of 20ms. If it intervenes, a verification of its level (P36) and the level of the nominal tension (P38) are "suitable" with the effective voltage of the motor. If the motor is de-excited, verify the correct functioning of the Elcam voltage regulator.
INCORRECT PHASES ROTATION	Indicates the incorrect cyclic direction of the three phases of supply. Change two of the phases between themselves at the mount of the synchronisation transformer and of the power. Take reference to paragraphs; 3.5 & 3.6 for an eventual exclusion.

11.3 Current control

ISTANTANEOUS CURRENT TOO HIGH or MAX PEAK > P96 (CURRENT PEACK>P96)	Control that the instantaneous current peak is inferior to the maximum level admitted, that the major level between the value that the system is calculating, taking into account the "ripple" of the current, is comprised of between "120% - 199% unlimited" and/or the fixed value of the parameter reserved P96 (default " 120% unlimited"). By suggesting P96=200% the alarm is excluded. If it goes into alarm, verify that none of the tyrystors are in short circuit or under-classed and are not in short circuit on the motor or another problem of the power.
CONDUCTION ALARM	Verify the correct conduction of the converter. The alarm sounds with blockage of the drive, if in the revolution of the 60 conduction possible, 7 or more are missing . The first pair of tyrystors that do not conduct are indicated, even if ther are more than one pair that are not conducting. The control is enabled if the difference between the requested current and the effective current is above the % value shown at P90. The system measures the current peak value and is restarted at every bridge inversion. The control is automatically excluded if P90=200%. In autoregulation phase, if the line counter or the motor armature are open, missing conduction at pair S+ T– appears.

	During the autoregulation of the current loop, the control is done verifying at each ignition, in the discontinuous current stage, there is a corresponding conduction in the tyrystors (crest value higher than P99).
CURRENT WILL NOT ZERO	The converter goes into alarm if, in the inversion phase, the level of zero current is not able to be verified (inferior value at parameter reserved P99, normally set at 0,6%). In the case of alarm which occurs only at current zero and in inversion phase, increase the parameter P99 and if, the alarm continues to sound, substitute the board.
NEVER CONTINUE CURRENT	This is active in autoregulation phase of the current loop, and indicates that the current is close to the bridge limit, and is still discontinuous current; this signifies that the motor is not inductive enough.
SELFTUNING IMPOSSIBLE	Signifies that the ripple of the current is too low to be able to be controlled (this is given when the ripple is inferior to 3% of the current limit) or it is not possible to align the conduction. This may happen only if there is an error of connection between board - power.
RESISTIVE DROP TOO HIGH	The alarm is given if the motor presents a resistance fall > of 40% of the motor voltage of the nominal current (see paragraph 8.5)

11.4 Control speed reaction

NO SPEED FEEDBACK	Verify the presence of the tachometer. The alarm is sounded if, when the Electro-motor force calculated by the motor, is superior to the value set at the reserved parameter “P95” (20% of Default) and/or the current average calculated in that moment is higher than the value set at the reserved parameter “P93” (2% of Default), the signal of the dynamo tachometer has not superated the parameter “P94” value (2% of Default). By setting P93=100% the control is excluded. The control for the superation of signal P94 from the part of the D.T., is followed also in missing current if the F.E.M. superates 20% of the maximum voltage of the converter without the D.T. signal being given (value set at P95). If it intervenes, verify the integrity of the D.T. connection, of the spazzole or the correct mechanical connection of the motor. In the case of a machine with start or arrest in limits, it could happen that the control intervenes unexpectedly. In this case it is

	enough to lengthen the F.E.M. control zone (P95). For machines with steady start, or where the control zone must be “shrunk”, in case of missing tachometer, it may be needed to be agitated on P93, P94, P95, also at the reserved parameter P92 (see reserved parameters). The control is excluded if the speed regulated is blocked (S2=2 otherwiseS2=3). An unexpected intervention may happen also if the autoregulation of the current loop is not effected (error of all parameters).
SPEED FEEDBACK REVERSE	Verifies that the tachometer signal is suitable with the motor voltage signal. If it intervenes, invert the dynamo tachometer connection. The control is excluded if the speed regulator is blocked (S2 = 2 or S2 = 3).
MOTOR OVER SPEED > P51	Intervenes if the tachometer value superates the speed set in “P51” (Default 105%), it is excluded if a value of > 112,5 is set. May intervene if the motor is relieved of its load or subjected to an external couple signal.
AUTOTUNING MOVING MOTOR	Alarm is given if the DT signal is > 2% of the Max. speed set during autoregulation of the current loop. If it intervenes, the motor must be blocked automatically. Verify that the Jumper J3 for the V6 size regulation (for the dynamo tachometer), is not inserted.

11.5 Thermal motor drive

MOTOR THERMAL PREALLARM	Intervenes if the average squared value of the absorbed current (calculated on the medium value of the current of T/6 and then without taking into account the ripple of the same current) superates the value set at “P45” taking into account the thermal constant of the motor “P44”. It does not provoke the arrest of the driver, but takes exit 23 to a higher level; it is not memorised and so the pre-alarm re-enters when the value falls below the threshold.
MOTOR THERMAL ALLARM	Intervenes if the value calculated above, superates P48. It is memorised, and instigates an immediate arrest of the drive, removing start consent; it must be reset. The reset is accepted only if the value calculated falls below P48, due to this, to avoid waiting, the driver needs to be shut down.

THERMAL DRIVE PRE-ALARM	Intervenes if the absorbed current of the drive respects the following formula: $\int (Ia - Ina)^2 \times dt \geq (0,5Ina)^2 \times Tpa$ The value Ina(P53) is the nominal value of the drive; The value Tpa(P54) is the Max. time conceded to the drive to supply 1,5Ina before the pre-alarm enters. Will not provoke the arrest of the drive, but takes exit 23 to a higher level; it is not memorised and so the exit returns to a low level as soon as the calculated value returns to below the threshold.
THERMAL DRIVE ALARM	Intervenes if the value calculated as above, superates the level: $\int (Ia - Ina)^2 dt \geq (0,5Ina)^2 \times Tpa \times P54/100$ Where P54 x Tpa is the max. time conceded for Ia = 1,5Ina before the alarm enters. It is memorised and provokes the drive arrest. The reset is accepted only if the calculated value falls below the limits.

11.6 Ram – Eeprom – Board

EEPROM ERROR	Verifies the capabilities of the system parameters memory. If it intervenes the Default parameters need to be reset, and then memorised. Then, reset the alarm and reset the specific parameters for the DC converter. If it cannot be reset, the board must be substituted.
RAM ERROR	Verifies the integrity of the transit memory. If it intervenes the RAM must be replaced; if the intervention is repeated the board must be replaced.

12 Connector Jp3 & Jp4

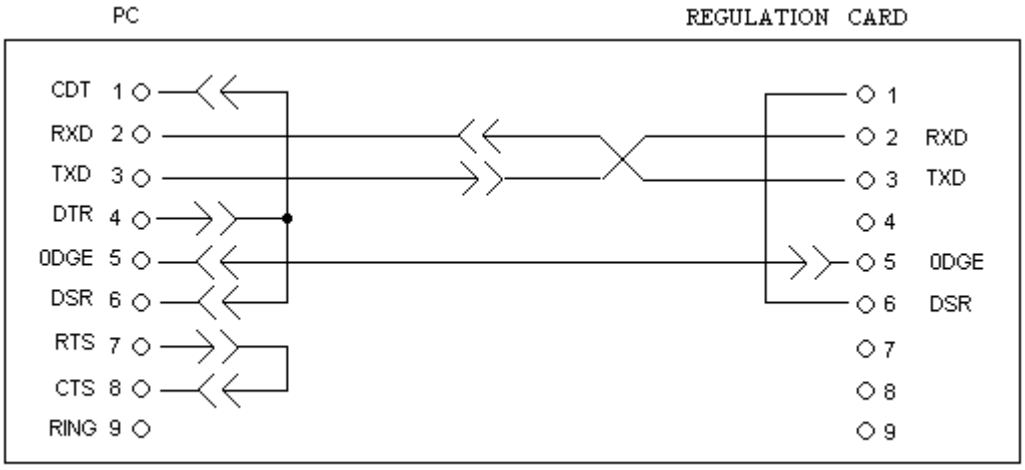
(see parag 2.4 topographic scheme)

On the regulation board their are two, 9 pin connectors for the connection in RS232 RS 485.

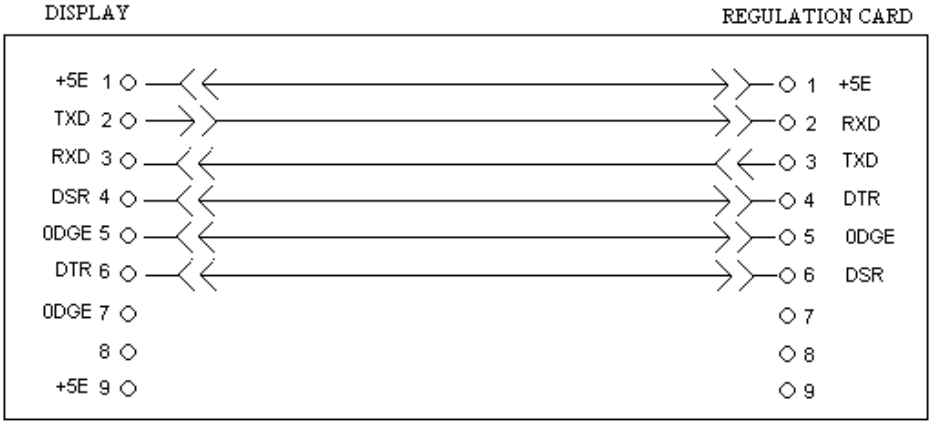
12.1 Connector Jp3

The 9 pin masculine connector (Jp3), is used to connect the display CS8B9 or a PC to program the regulation board.
The input signal and output are compatible with the standard RS-232.
The exits are galvanically isolated in respect to the control circuit.

12.1.1 Connection of serial port RS 232 between pc & board



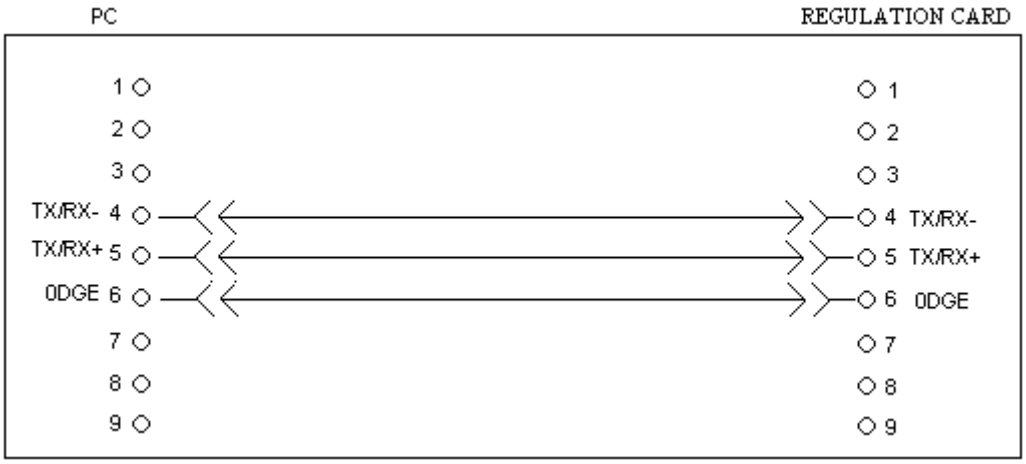
12.1.2 Connection of serial port RS 232 between keyboard and board



12.2 Connector Jp4

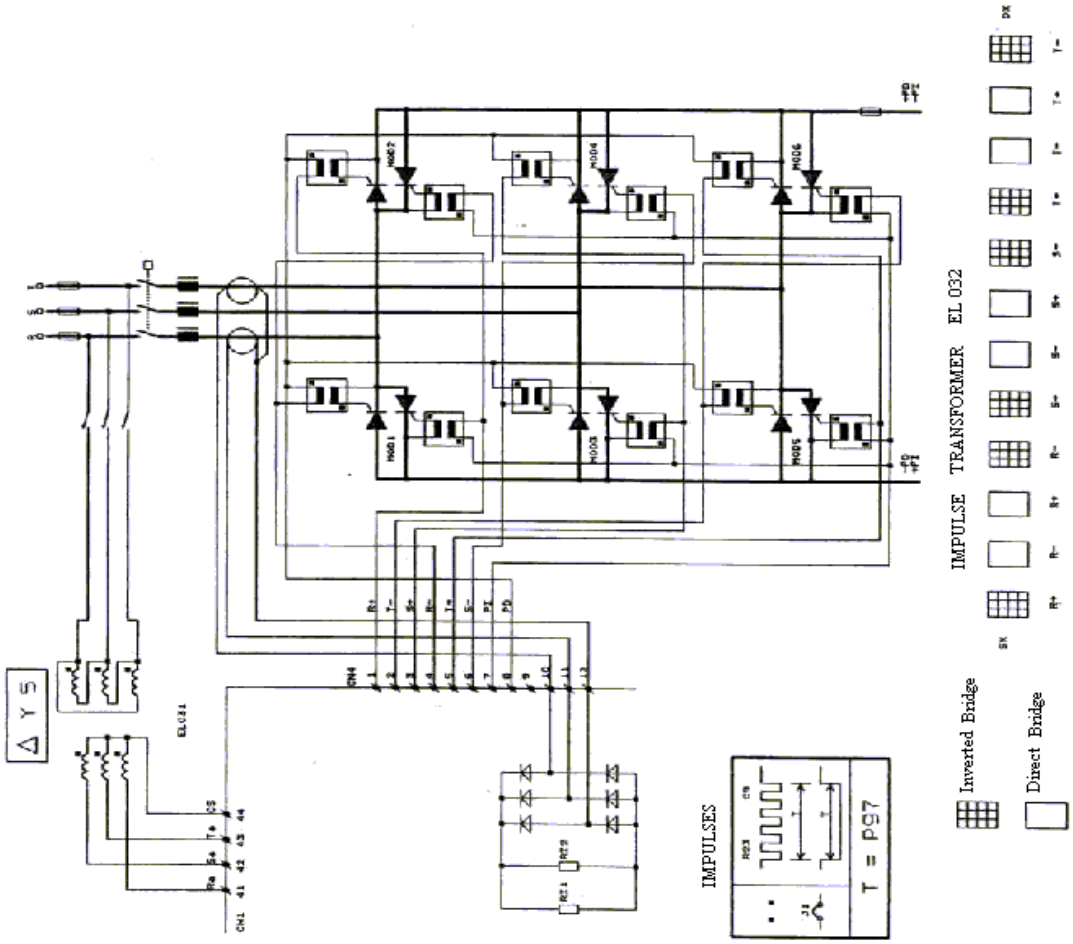
A 9 pin feminine connector which contains a signal relative to the serial port RS232, and the signals relative to a differential port RS-485.
All the signals, including supply, are galvanically isolated in respect to the circuit control.

12.2.1 Connection of the serial port RS 485 between pc and board

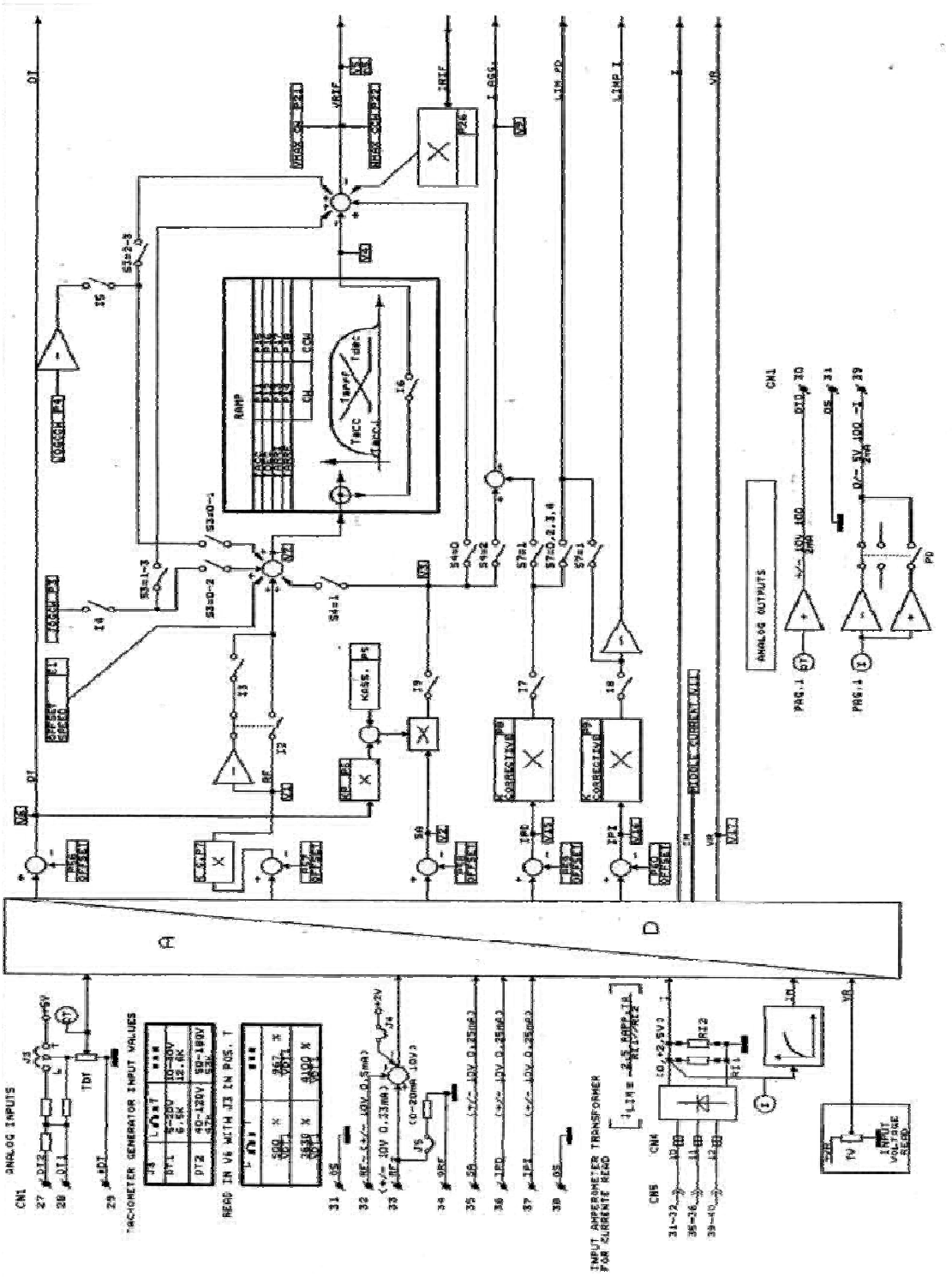


13 Topographic block scheme

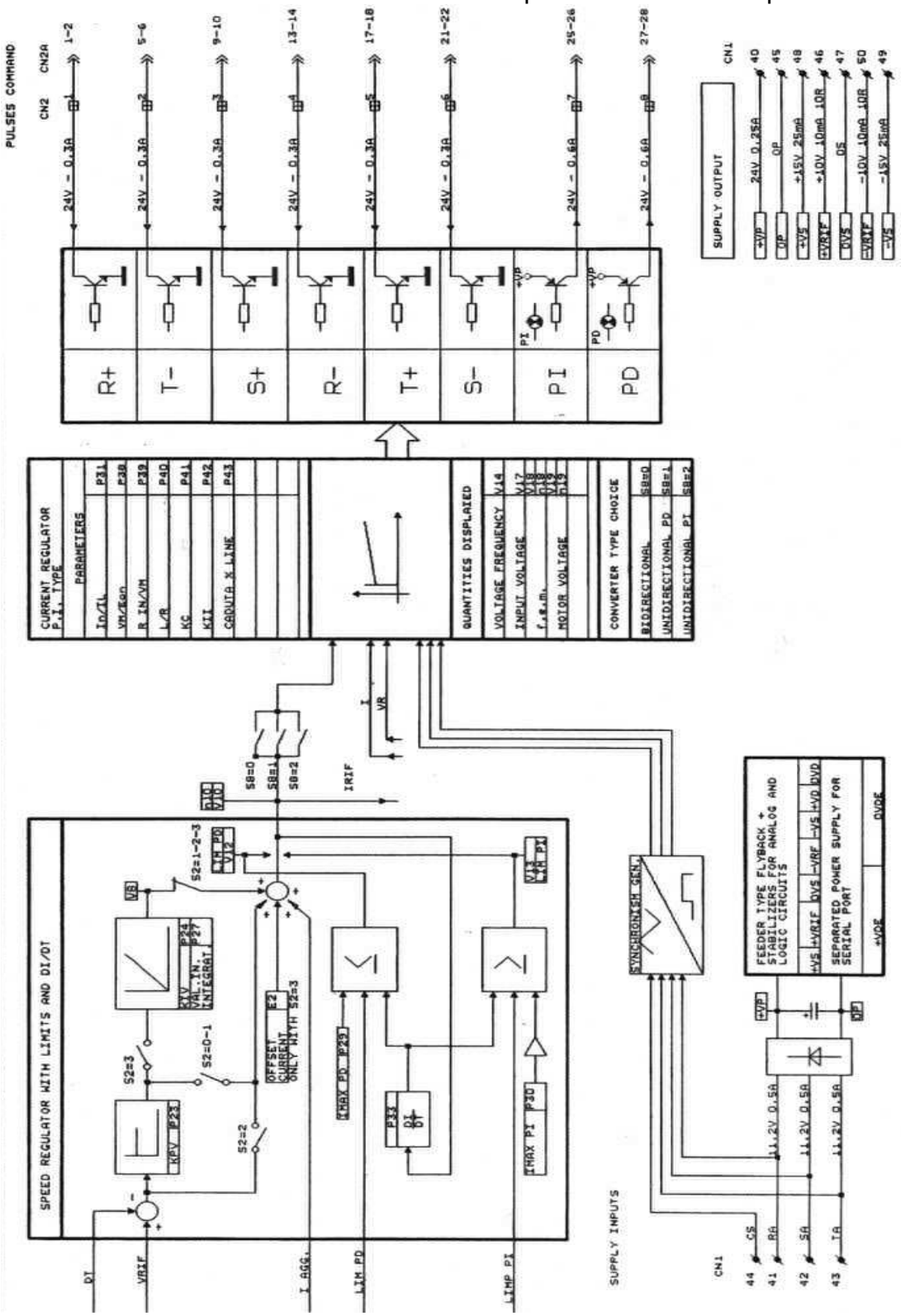
13.1 Power scheme



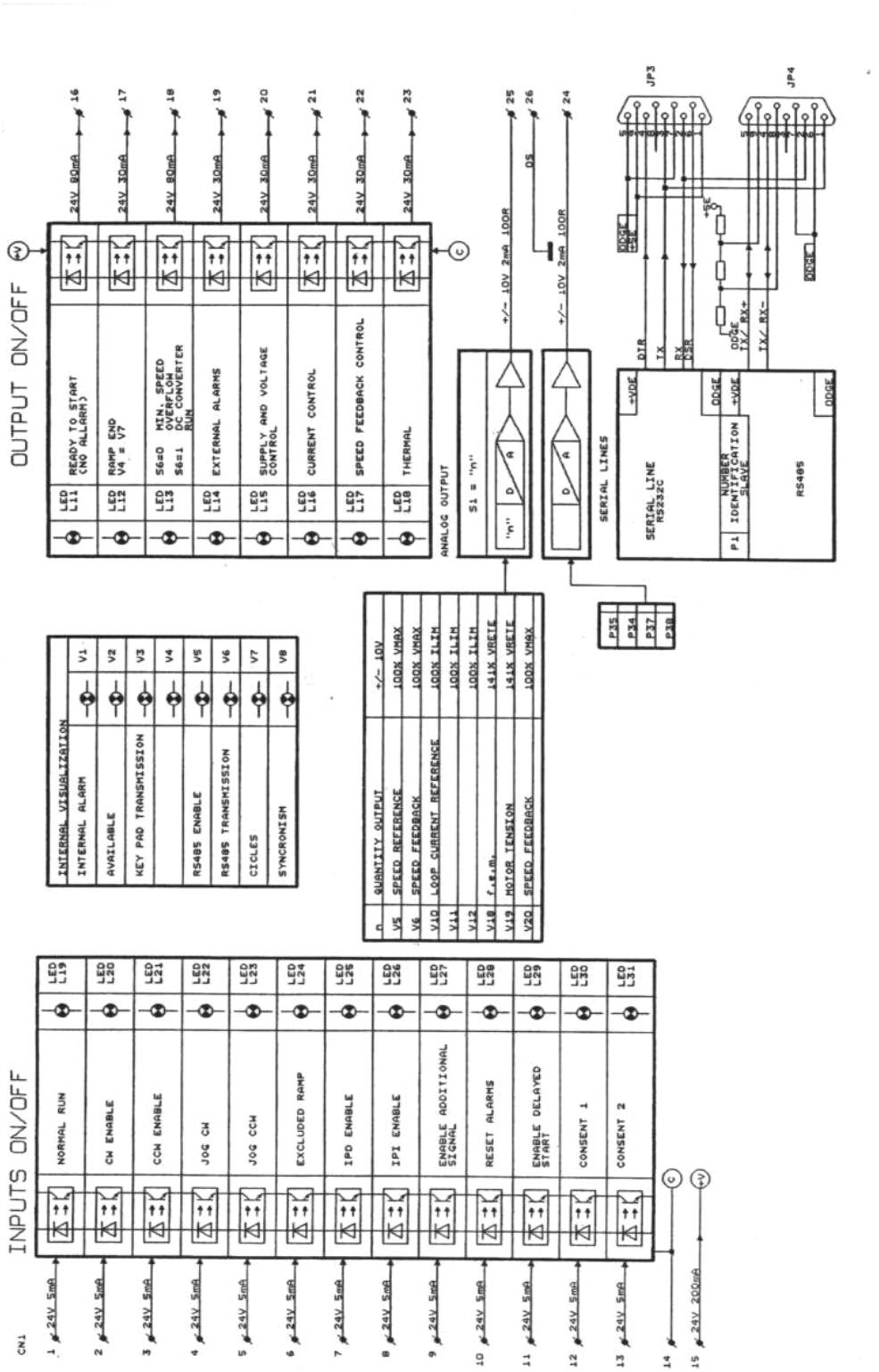
13.2 Block scheme of regulations and reference



12.3 Block scheme of speed and current loop

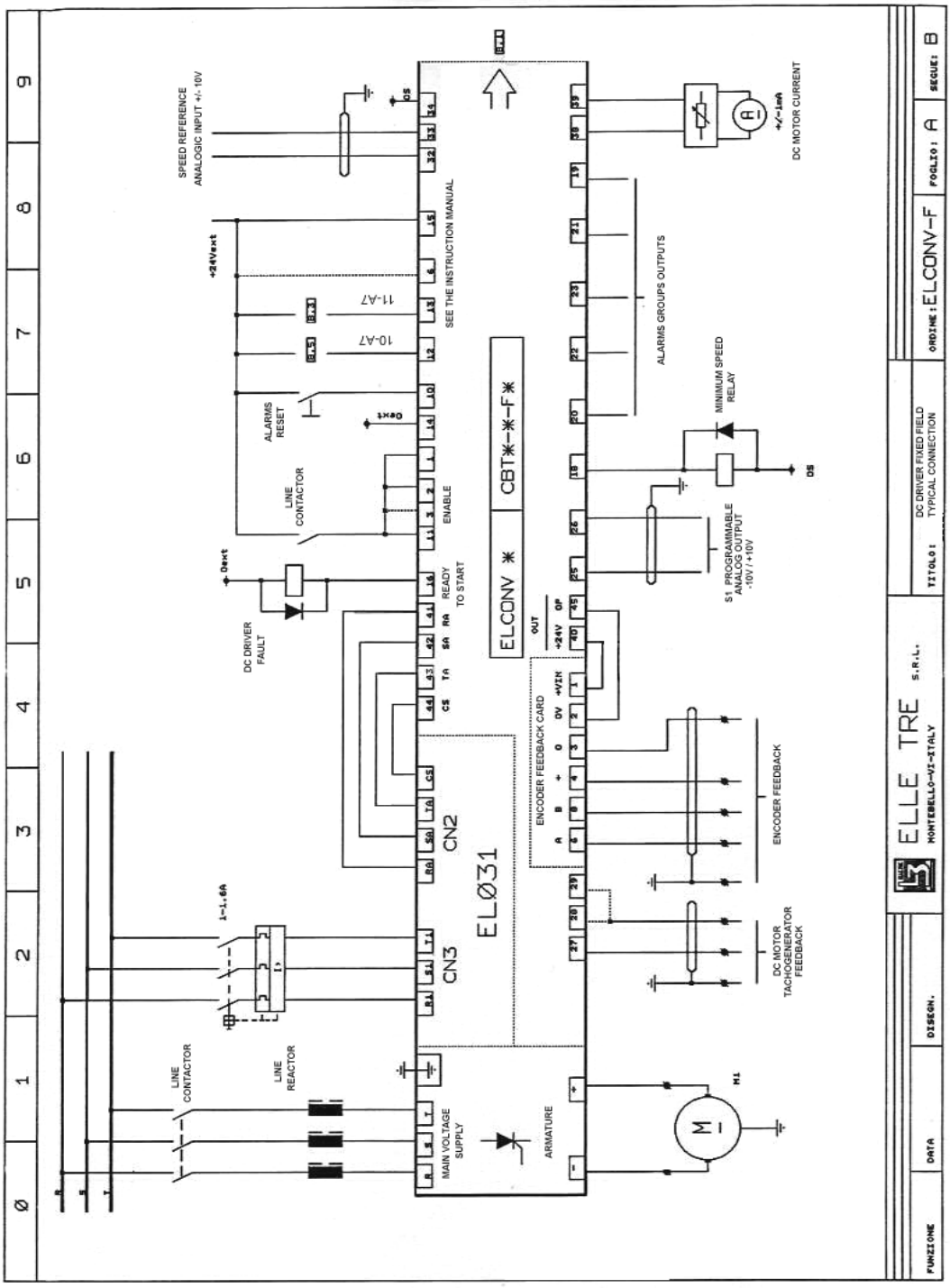


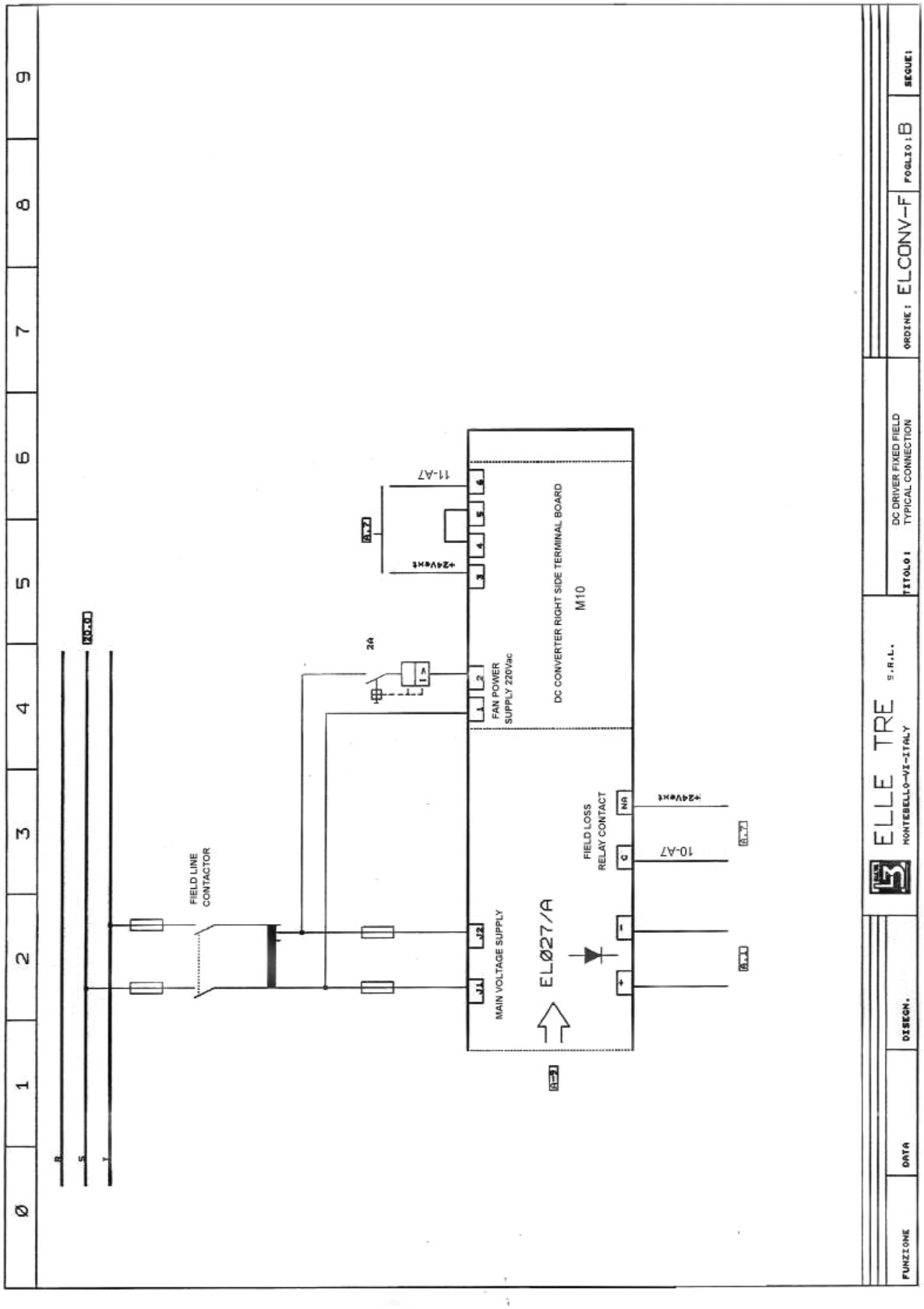
13.4 Summarising block scheme of Entrances & Exits



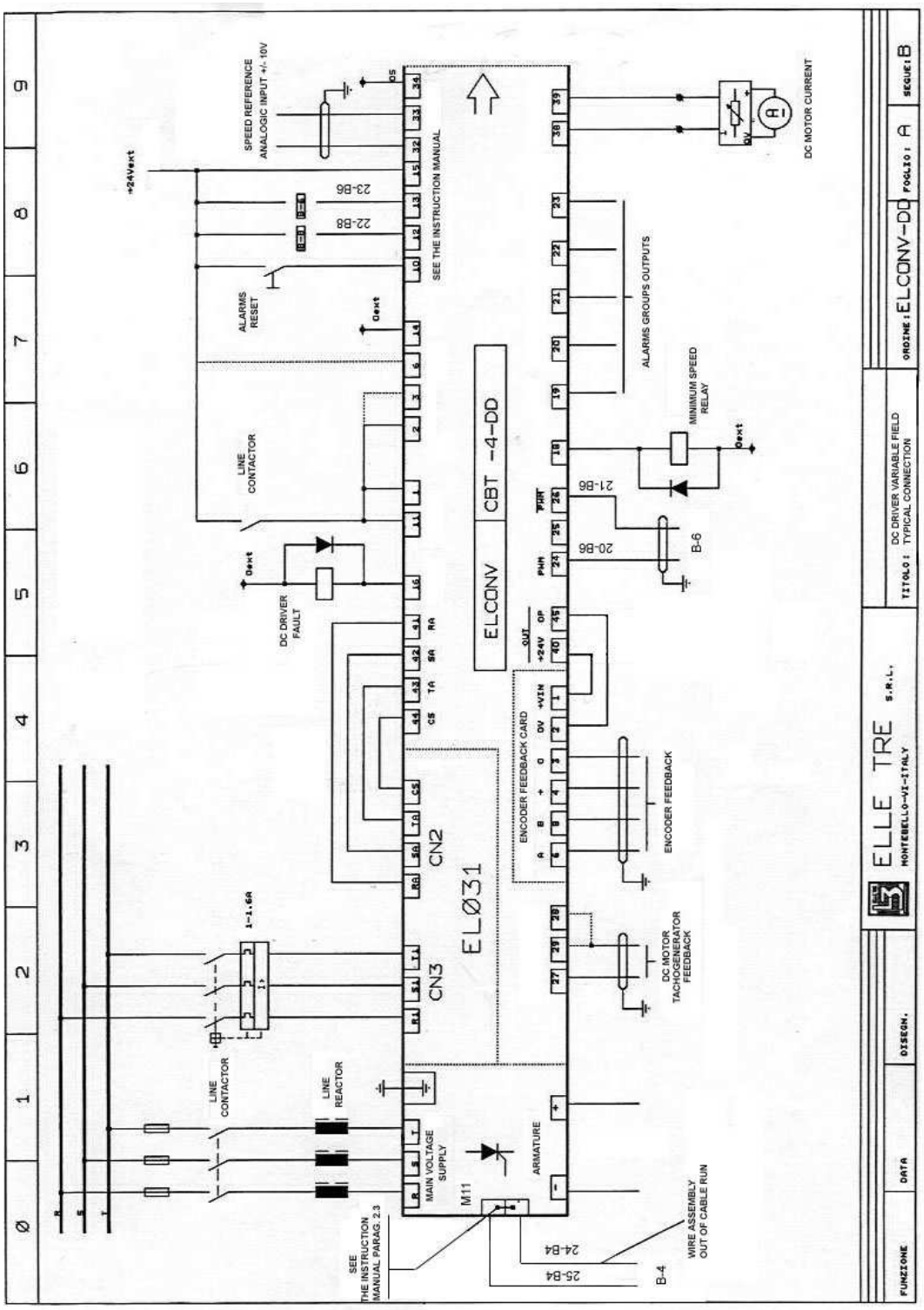
14 Typical schemes of Elconv connection

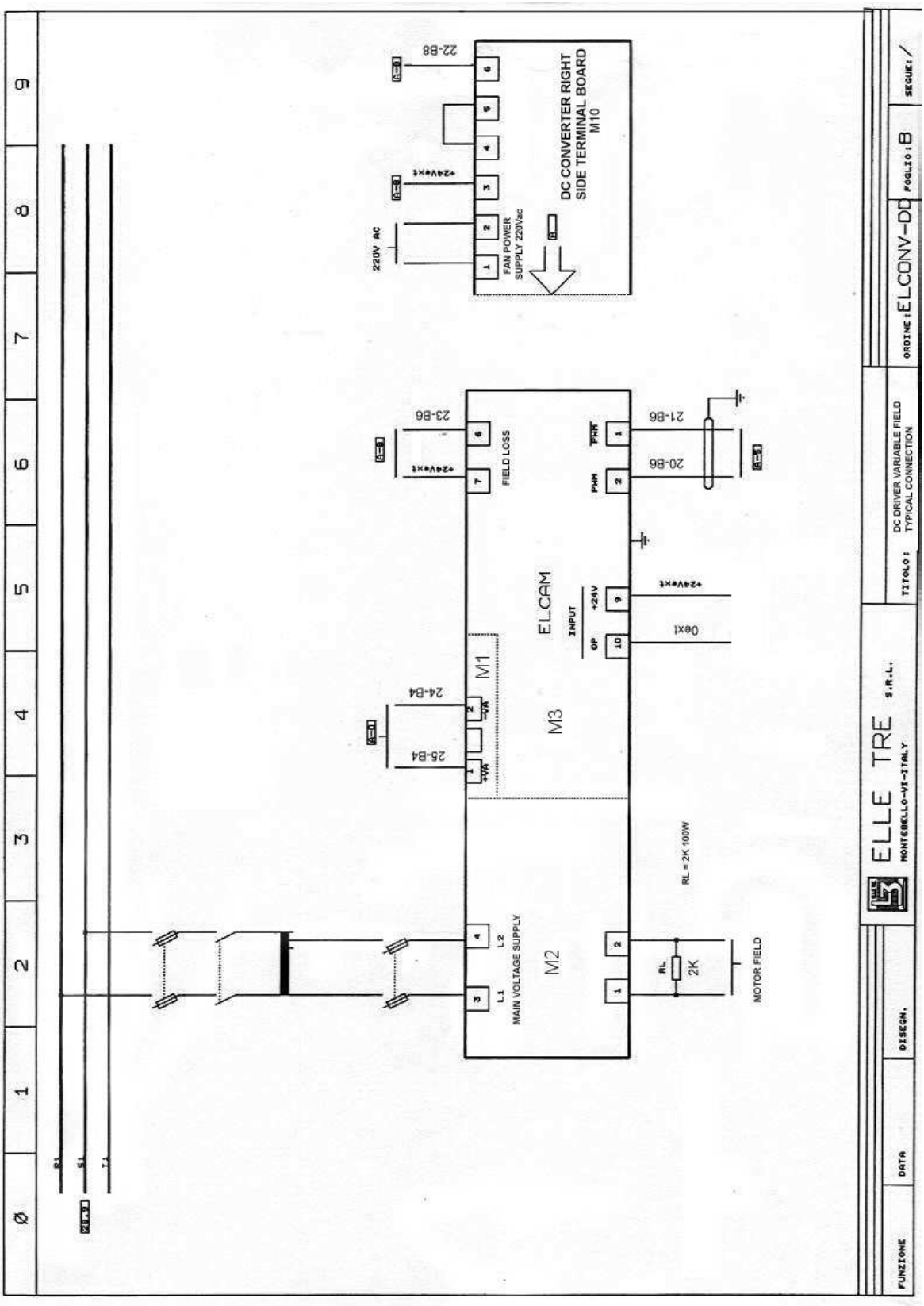
14.1 Typical scheme of connection for fixed CBT




DC DRIVER FIXED FIELD
TYPICAL CONNECTION
ELLE TRE S.R.L.
MONTEBELLO-VI-ITALY
ELCONV-F
FOGLIO: B
SEGUE:
DISEGN.
DATA
FUNZIONE
DC CONVERTER RIGHT SIDE TERMINAL BOARD
M10
FAN POWER SUPPLY 220Vac
FIELD LINE CONTACTOR
MAIN VOLTAGE SUPPLY
FIELD LOSS RELAY CONTACT
EL027/A
11-A7
10-A7
+24VDRIVE

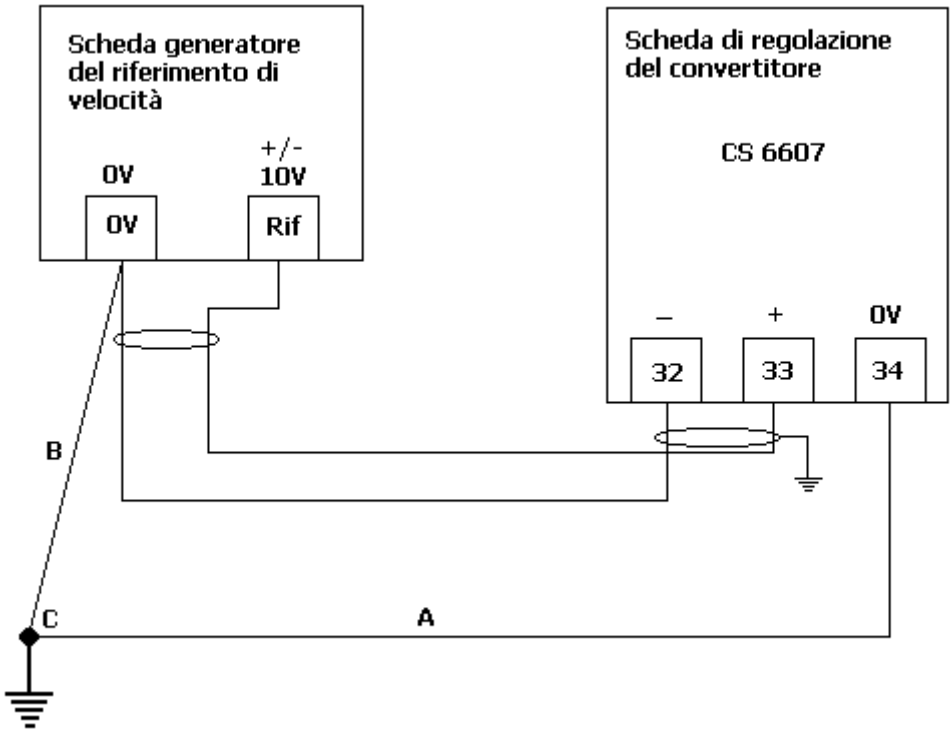
14.2 Typical scheme of connection for digital de-fluxed CBT




DC CONVERTER RIGHT
SIDE TERMINAL BOARD
M10
FAN POWER
SUPPLY 220Vac
220V AC
22-B8
23-B6
21-B6
20-B6
24-B4
25-B4
FIELD LOSS
PWM
INPUT
+24V
0V
ELCAM
M1
M2
M3
RL = 2K 100W
RL
2K
MOTOR FIELD
MAIN VOLTAGE SUPPLY
L1
L2
ELLE TRE S.R.L.
MONTEBELLO-VI-ITALY
DC DRIVER VARIABLE FIELD
TYPICAL CONNECTION
ORDINE: ELCONV-DD
FOGLIO: B
SEGUE:
DISEGN.
DATA
FUNZIONE

14.3 Ideal connection for speed reference

The connection scheme for the speed reference must coincide with those specified below, as they represent the ideal connection for the reduction of disturbances.
In each case it is wise to follow correctly the scheming and the mass earth of the signal cables; also the connection of the zeros'.



The length of cables A & B must be approx. the same, and meet up at point C which is then placed to earth.