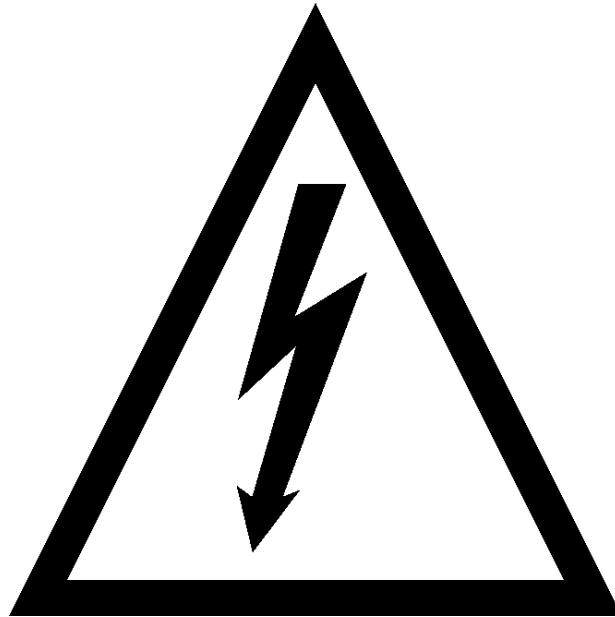


**TECHNICAL FEATURES AND
INSTALLATION INSTRUCTIONS**

DSA 150/300

REVISION				
Code new version	Date	Observations	Compiled	Approved
DSA300-GB-0.1	08/01/10	DSA300 Reference manual		
DSA300-GB-0.2	24/04/13	Update		
DSA300-GB-0.3	16/07/15	Update		
DSA300-GB-0.4	07/05/18	Update		
DSA300-GB-0.5	16/11/18	Update		
DSA300-GB-0.6	20/02/20	Update		



WARNING!

The converters of the DSA300 series are running at high voltages. Even after disconnecting the converter, the capacitor circuits are still under voltage for a short period of time. Therefore, it is absolutely recommended to wait 5 minutes until operating on the inner part of the converter.

The converter is equipped with an inner recovery resistance working at high voltages and high operating temperatures. Do not touch under no circumstances the recovery resistance also after disconnecting the converter.

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GENERALITY

The four quadrant converters of the DSA300 series integrate both the power supply unit and the braking unit and have been realised to exploit the most advanced technology, the final IGBT stage which operates with a PWM switching frequency of 10 KHz.

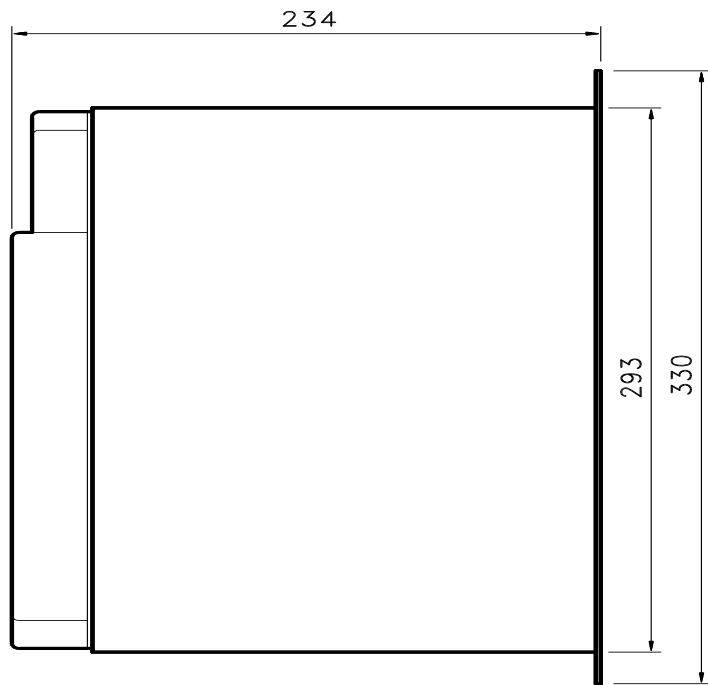
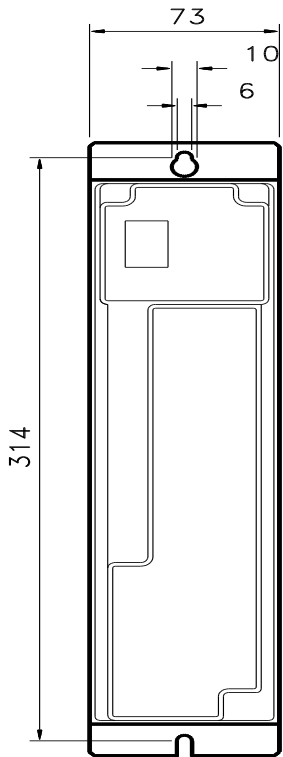
The regulation is realised by the P.W.M. (Pulse Width Modulation) using a particular technology with 2 different signals (instead of the traditionally used single signal) with a phase displacement of 180° for controlling the final power.

The combination of these signals allows to obtain a switching cycle of the final power which reduces the current ripple by 50 % combined with all advantages regarding maintenance and life of the brushes and of the motor.

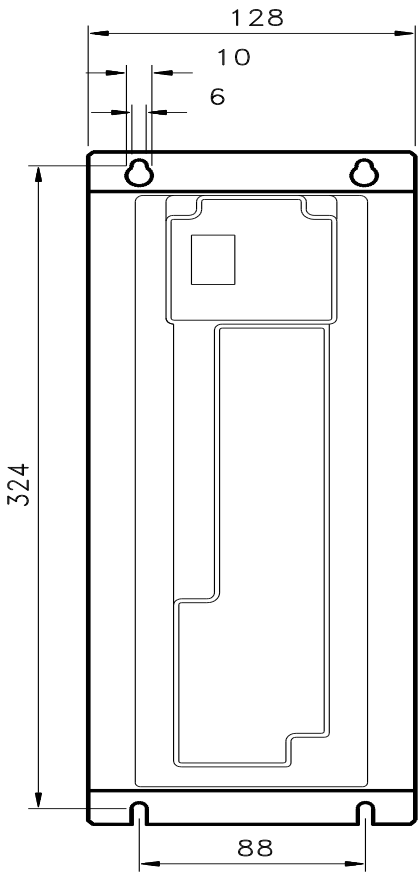
The converters of the DSA300 series are developed for controlling the speed of c.c. motors with permanent magnets both with tachogenerator and armature feedback.

OVERALL DIMENSIONS

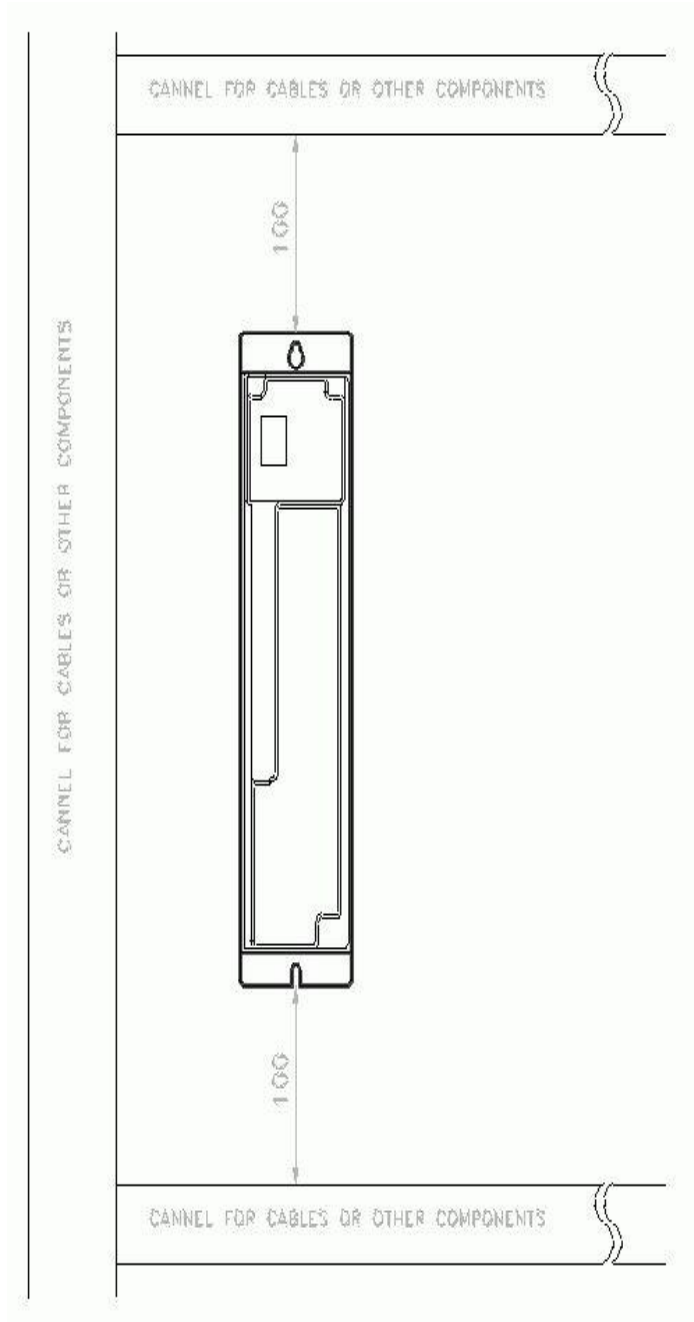
DSA300 10/20 20/40 30/60 40/80



DSA300 60/120



Note: Observe a minimum free distance of 10 cm between converter and surrounding components so as not to hinder the ventilation of the converter.



TECHNICAL FEATURES

Drive sizes

TYPE	SUPPLY	NOMINAL CURRENT	MAX CURRENT FOR 1,5 sec:	V OUT
DSA 150 10A	Three phase / single-phase 25 ÷ 90 Vac ± 10% 50 - 60 Hz.	10A	20A	DSA 150 30÷120 Vcc
DSA 150 20A		20A	40A	
DSA 150 30A		30A	60A	
DSA 150 40A		40A	80A	
DSA 150 60A		60A	120A	
DSA 150 75A		75A	150A	
DSA 300 10A	Three phase / single-phase 90 ÷ 220 Vac ± 10% 50 - 60 Hz.	10A	20A	DSA 300 120÷280Vcc
DSA 300 20A		20A	40A	
DSA 300 30A		30A	60A	
DSA 300 40A		40A	80A	
DSA 300 60A		60A	120A	
DSA 300 75A		75A	150A	

N.B. : For sizes over 20A with single-phase power supply we recommend the additional installation of an external capacitor battery.

GENERAL CHARACTERISTICS

<i>Supply voltage of the DSA 150M:</i>	from single-phase transformer with a secondary voltage of $25V \div 90V_{AC} \pm 10\%$
<i>Supply voltage of the DSA 150:</i>	from three-phase transformer with a secondary voltage of $25V \div 90V_{AC} \pm 10\%$
<i>Supply voltage of the DSA300M:</i>	from single-phase transformer with a secondary voltage of $90V \div 220V_{AC} \pm 10\%$
<i>Supply voltage of the DSA300:</i>	from three-phase transformer with a secondary voltage of $90V \div 220V_{AC} \pm 10\%$
<i>Mains frequency:</i>	50/60 Hz.
<i>Output voltage:</i>	30 / 280 Vdc
<i>Speed loop bandwidth:</i>	> 100 Hz.
<i>PWM switching frequency:</i>	10 KHz
<i>Velocity input reference:</i>	$\pm 10 V_{DC}$ (input impedance 100 Kohm)

Regulation:

- *Fine* velocity tuning with trimmer **P7** on the customising card
- Offset compensation of the velocity signal with trimmer **P1** on the regulation card
- Acceleration ramp gradient adjustable from 0 to 1 sec. with trimmer **P2** on the customising card
- Deceleration ramp gradient adjustable from 0 to 1 sec. with trimmer **P1** on the customising card
- Current limit with trimmer **P4** on the regulation card

Functions:

- Diagnostics on DISPLAY
- Torque programming from the outside by signal from 0 to +10V_{DC}

Inner protections:

- Against short-circuit between motor terminals
- Against short-circuit between motor and towards earth
- Against mains over voltage
- Against mains under voltage
- Against power overheat
- Against excessive energy gain on inner clamp resistance's
- Against breakage or failure of tachogenerator connections

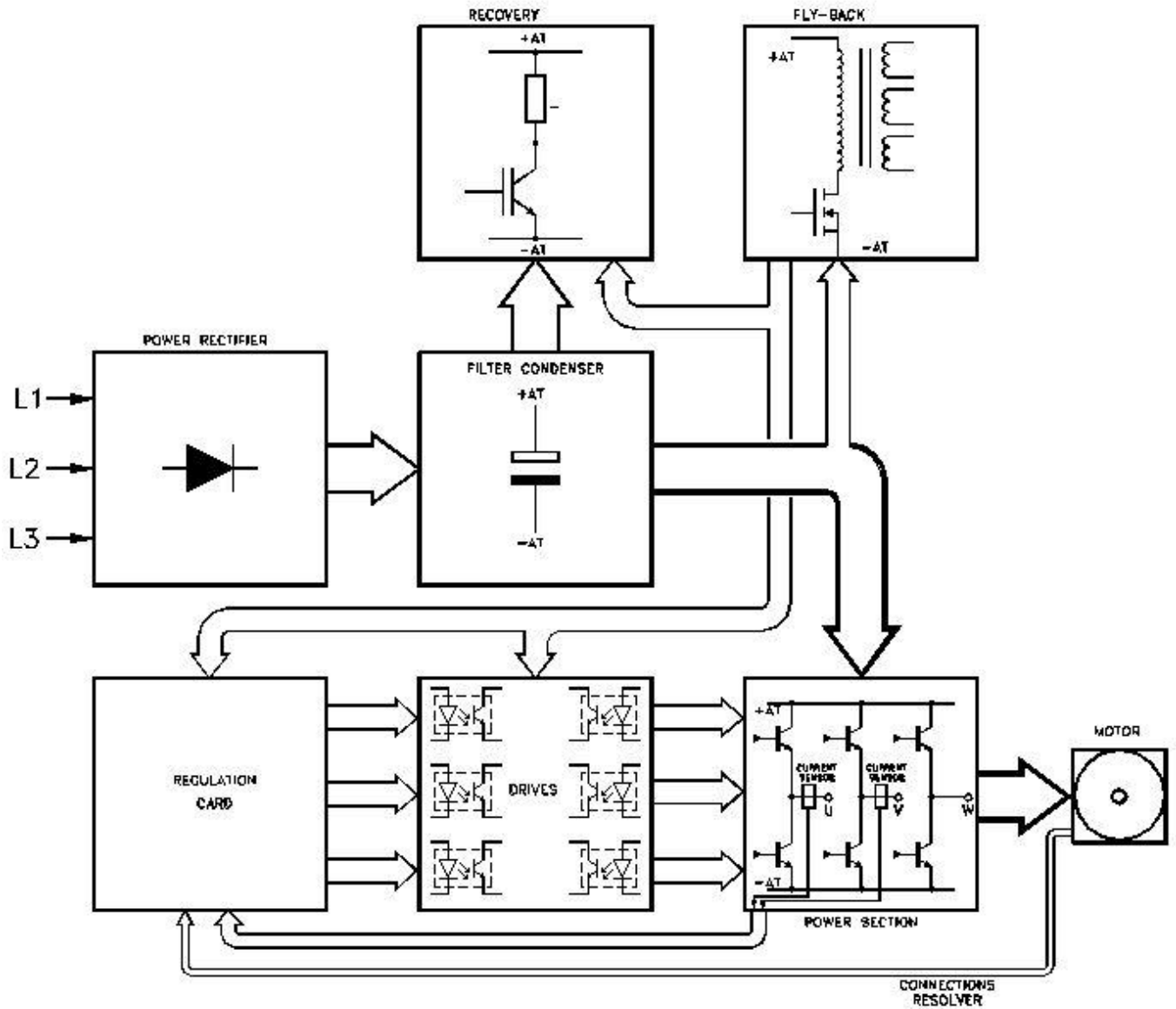
Optional:

- Velocity regulation with armature feedback

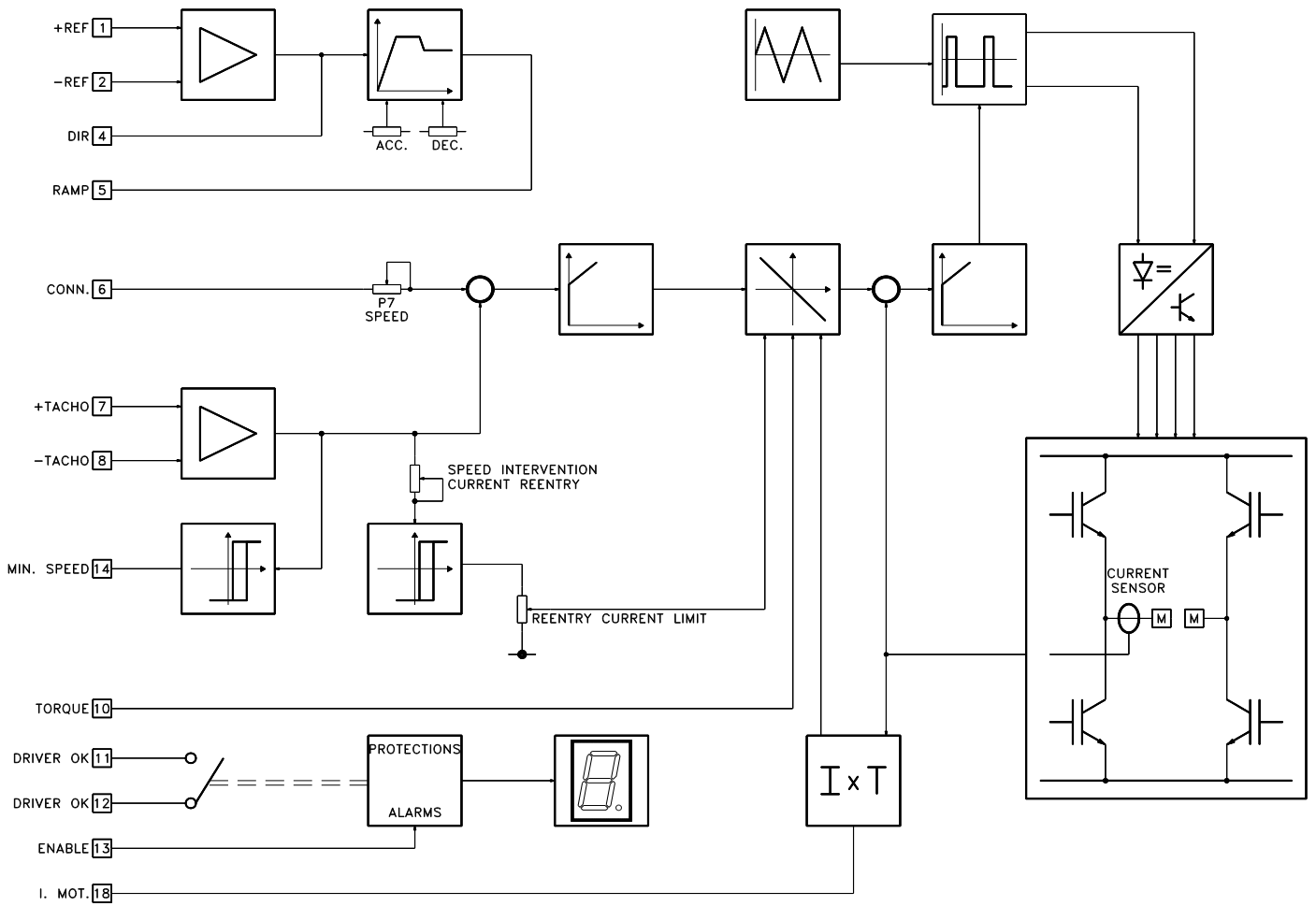
Operation:

<i>Temperature:</i>	from 0 ÷ 40°C
<i>Humidity:</i>	90% max. without condensation
<i>Altitude:</i>	1000 m.
<i>Protection degree:</i>	IP 20

FUNCTIONAL DIAGRAM

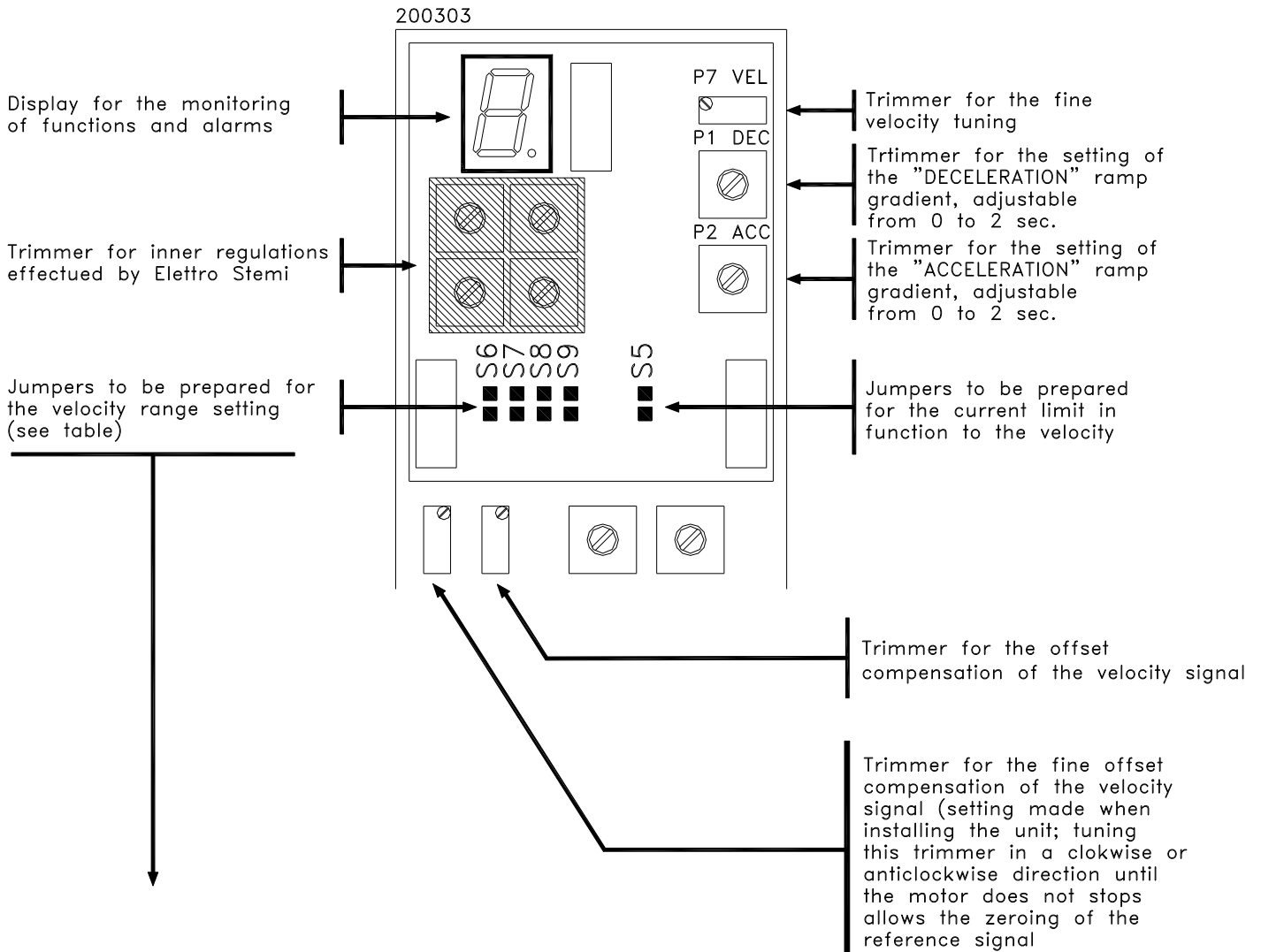


BLOCK DIAGRAM OF THE REGULATION CARD



CUSTOMISING CARD AND SETTINGS

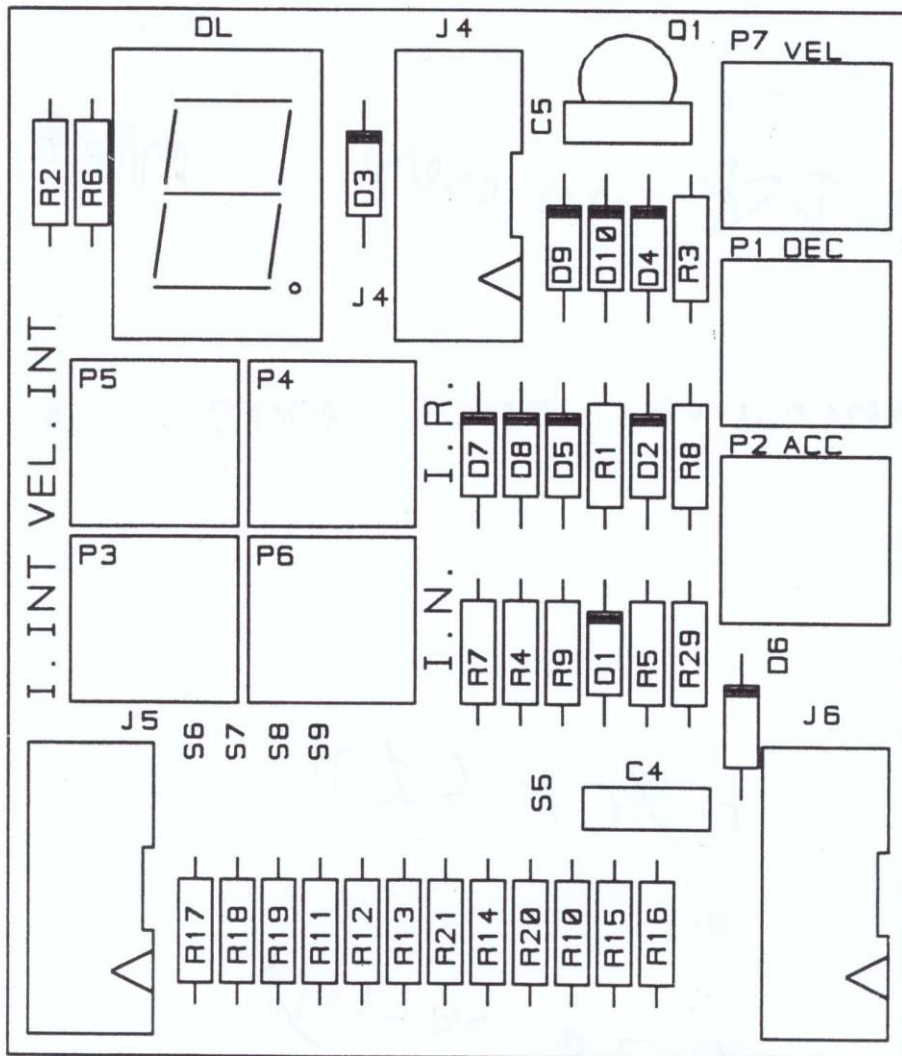
Description of the plug-out customising card and settings



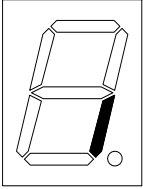
<i>Jumper closed</i>				<i>Range</i>
S6	S7	S8	S9	Tachogenerator voltage
				17.5VDC ÷ 28.5VDC
X				26VDC ÷ 42VDC
X	X			36VDC ÷ 60VDC
X	X	X		51VDC ÷ 84VDC
X	X	X	X	79VDC ÷ 130VDC

SERIGRAPHY CUSTOMIZATION CARD

By removing the resistance R21 from the calibration card 002.0 the voltage range of the can be further lowered

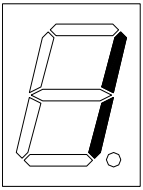


DISPLAY SIGNALS



Segment

Indicates that the unit is supplied with power, however not enabled for operation

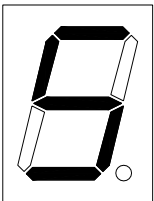


One

Drive enabled for operation

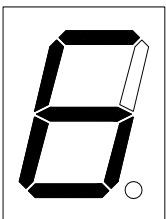
Point

The point lights up when the motor absorbs current superior to its nominal current. This is normal during the acceleration and starting. When the point lights up for more than 2÷3 seconds, the IxT device activates and, on the display, will light up 7 instead of 1



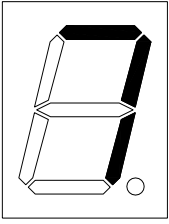
Five

Alarm of the protection device against mains over- and under voltage. Check the R.S.T. power supply. Until the abnormality continues the drive is disabled. Automatic reset is done when the normal operation conditions are achieved

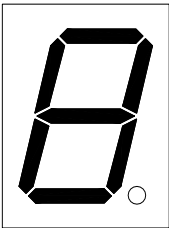


Six

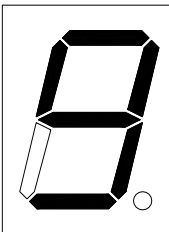
Fault alarm. Short-circuit between the motor connections or of the power unit. Check the insulation of the motor terminals and towards earth (motor housing) by measuring the resistance. The measured value has to be superior to 1 M ohm. During this operation the drive is blocked and can be reset by tuning off from the R.S.T. power supply for at least 5 seconds

**Seven**

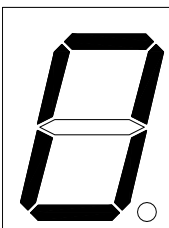
The IxT device is activated. This protection circuit limit the drive current to the fixed nominal current (which corresponds normally to the nominal current of the motor). After 2 seconds this function is disabled and allows the maximum current output of the motor size

**Eight**

Alarm of missing or inverted connections of terminal 7 and 8 of the tachogenerator . During this operation the drive is blocked and can be reset by tuning off from the R.S.T. power supply for at least 5 seconds

**Nine**

Alarm of excessive gain and overheat of the inner braking resistance. The machine cycle or the deceleration ramp timing have to be increased. During this operation the drive is blocked and can be reset by turning off the R.S.T. power supply for at least 5 seconds

**Zero**

Overheat alarm of the power supply. Until the abnormality continues, the drive is disabled. Automatic reset is done when the normal operation temperature is achieved. Check the well functioning of the ventilation. Observe the minimum free distance of at least **10 cm.** of the inferior part when installing the drive

TERMINAL CONNECTIONS


**Table of available INPUT/OUTPUT of the plug-out connector:
Connector X1**

<i>TERMINAL</i>	<i>NAME</i>	<i>TYPE</i>	<i>DESCRIPTION</i>
1	+REF	IN	Non inverting input of the analog reference signal
2	-REF	IN	Inverting input of the analog reference signal
3	GND		0V of the regulation circuits, such as terminal 9
4	DIR	OUT	Output of the differential input stage. It has to be connected to terminal 6 CONN. when the inner ramp circuit is not used. The terminal remains free when the inner ACC/DEC ramps are used
5	RAMP	OUT	Output of the ramp circuit. It has to be connected to terminal 6 CONN. when the inner ramp circuit is used. The terminal remains free when the inner ACC/DEC ramps are used
6	CONN.	IN	Connection terminal for the function mode. When connected to terminal 4 (DIR), the inner ACC/DEC ramp circuits are excluded, when connected to terminal 5 (RAMP) they are enclosed
7	+TACHO	IN	Positive input signal of the tachogenerator
8	-TACHO	IN	Negative input signal of the tachogenerator
9	GND		0V of the regulation circuits, such as terminal 3
10	TORQUE	IN	Input for the signal from 0 to +10V for the external torque regulation (+10V correspond to the peak current of the drive). Do not use this input and let disconnected the terminal when running at the max. available torque
11	DRIVE OK		Output with no voltage applied for the contact of the inner protection relay. During faultless operation, the contact is normally closed. When a protection device is activated, the contact is open (max. 24V, 100 mA)
12	DRIVE OK		Output with no voltage applied for the contact of the inner protection relay. During faultless operation, the contact is normally closed. When a protection device is activated, the contact is open (max. 24V, 100 mA)
13	ENABLE	IN	Input for the 0V or 24VDC enable signal of the drive (without no difference a 0V or a +24V signal can be used)

TERMINAL	NAME	TYPE	DESCRIPTION
14	MIN. SPEED		Output for the 0V/+24V signal with electronic threshold for minimum speed. A 0V signal indicates a motor speed between 0 and 5 % of the maximum fixed speed; a +24V signal indicates that the fixed speed level has been exceeded
15	+10V	OUT	Auxiliary voltage of +10V (max. 2mA)
16	-10V	OUT	Auxiliary voltage of -10V (max. 2mA)
17	+24V	OUT	Auxiliary voltage of +24V (max. 50mA)
18	I. MOT.	OUT	Output for the voltage signal between -2V and +2V proportional to the effective current value of the corresponding motor size (the sign depends on the motor current polarity)

POWER CONNECTIONS

Connector X2

TERMINAL	NAME	TYPE	DESCRIPTION
	-M	OUT	Negative motor connection terminal
	+M	OUT	Positive motor connection terminal
	R	IN	Phase 1 of the secondary of the three-phase autotransformer for the power supply of the converter (220 VAC maximum)
	S	IN	Phase 2 of the secondary of the three-phase autotransformer for the power supply of the converter (220 VAC maximum)
	T	IN	Phase 3 of the secondary of the three-phase autotransformer for the power supply of the converter (220 VAC maximum)
			Connection terminal for grounding

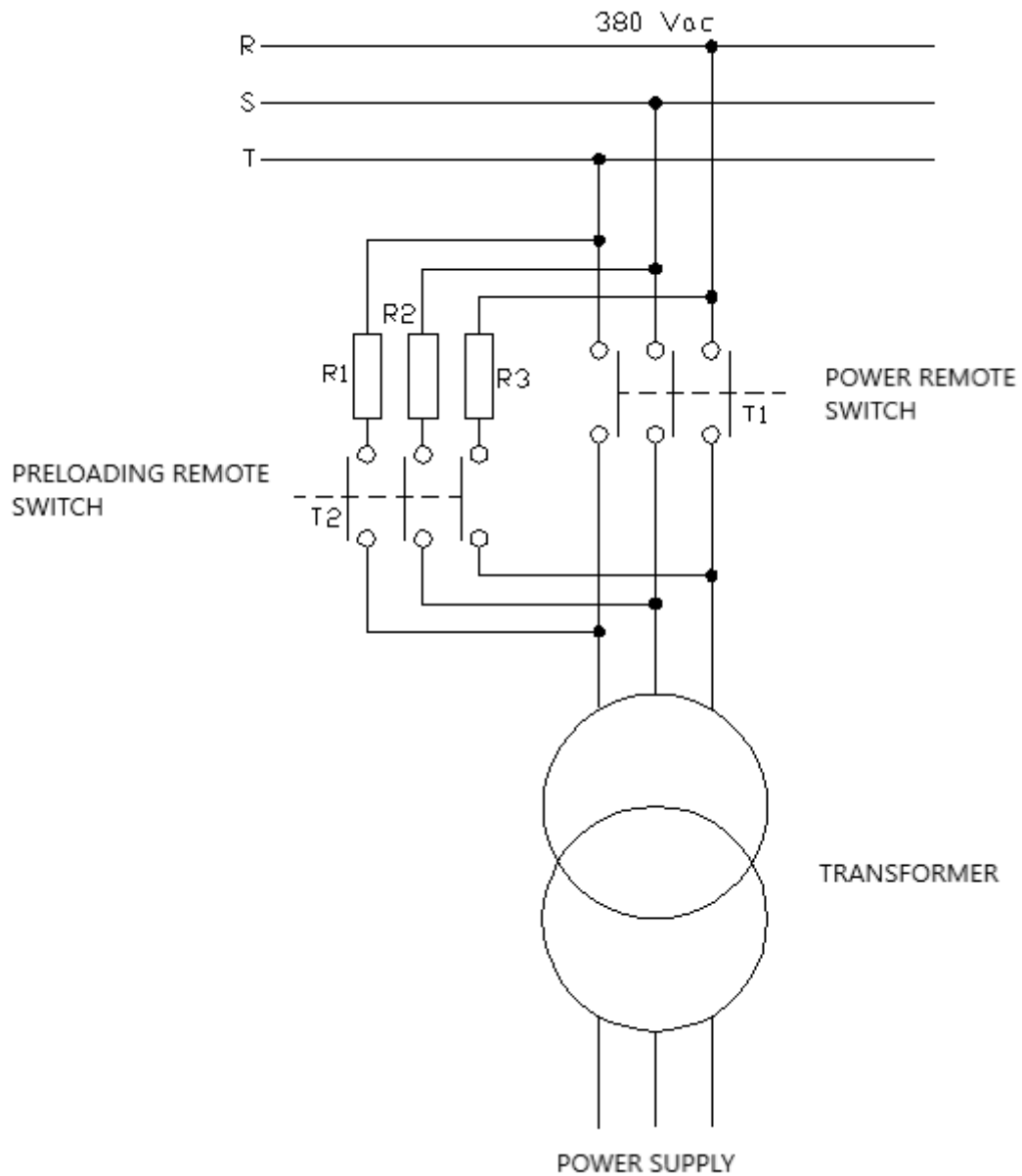
WARNING:

USE SHIELDED CABLE FOR POWER CONNECTIONS AND TACHOGENERATOR

Do not disconnect the motor when the converter is supplied, even by converter disabled. Do not supply the converter during controls and maintenance.

WARNING:

If you use a more then 9KVA transformer / autotransformer, will be necessary to use a soft start circuit as reported in the following scheme:

**Bill of components:**

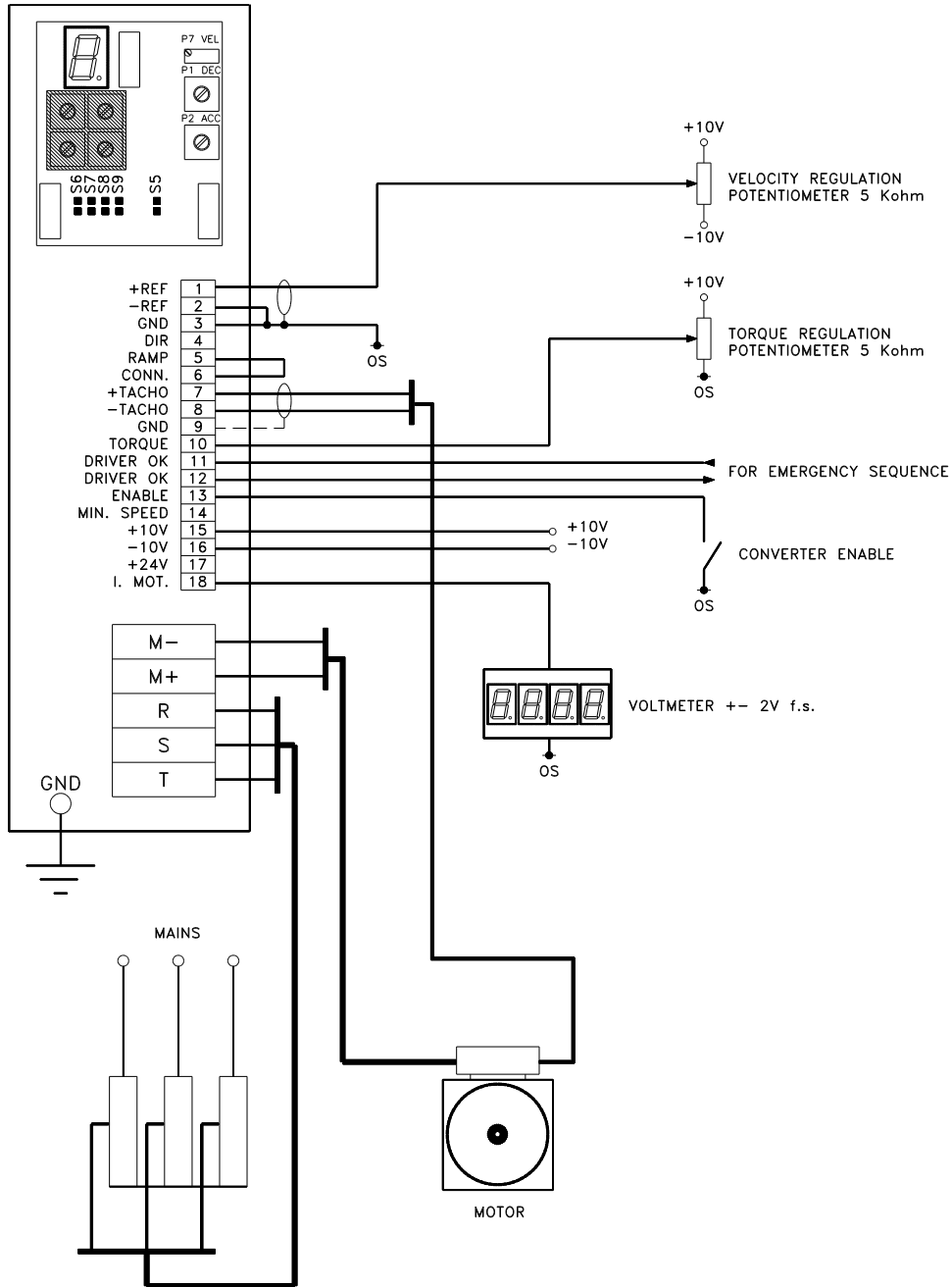
- R1, R2, R3 da 20Ω min. 50W
- T2 25/30 A power contact

Observe the following procedures to start:

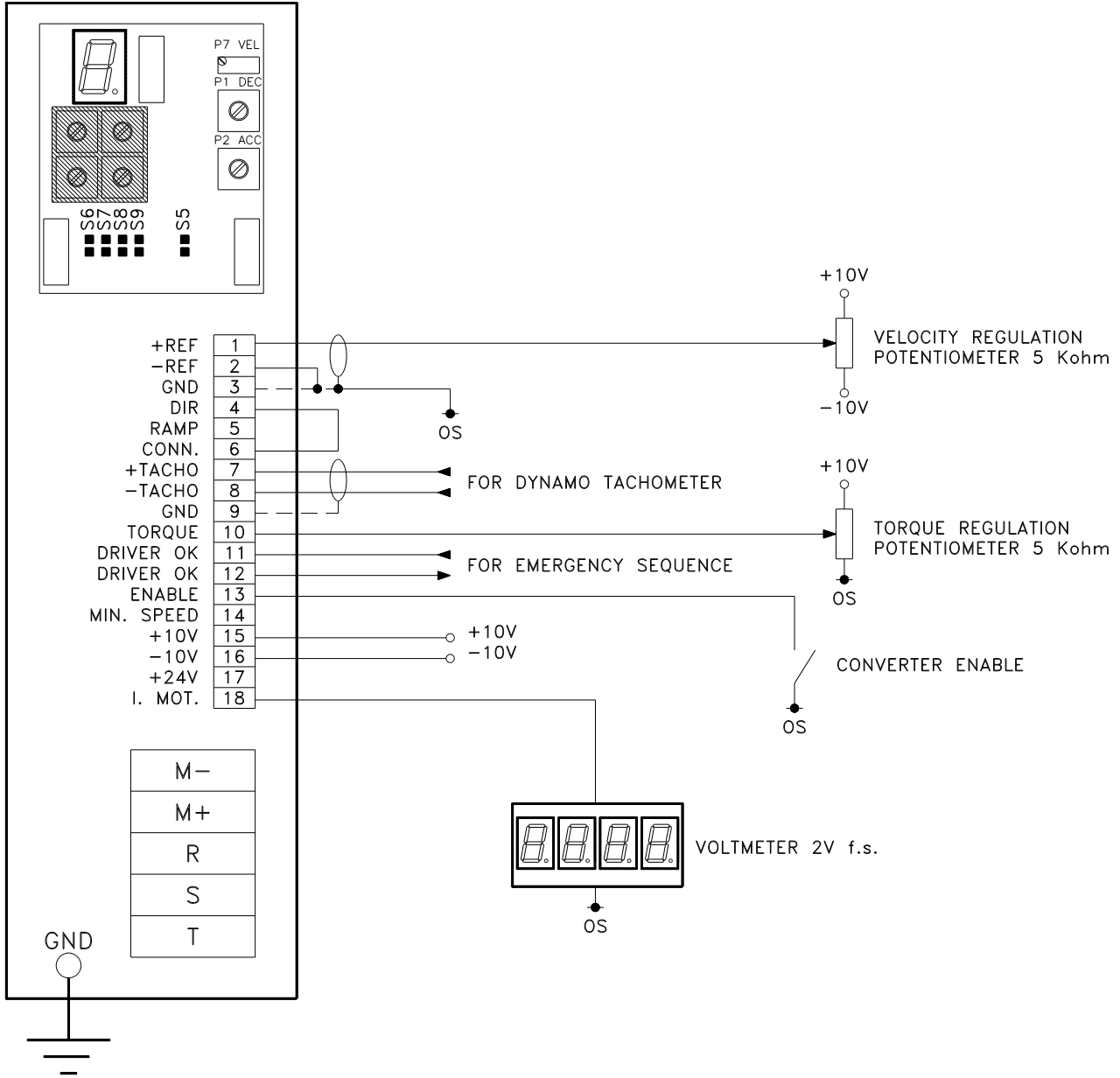
1. Insert T2 while maintaining T1 OFF
2. switch ON T1 after 2/3 seconds

EXAMPLES OF CONNECTIONS

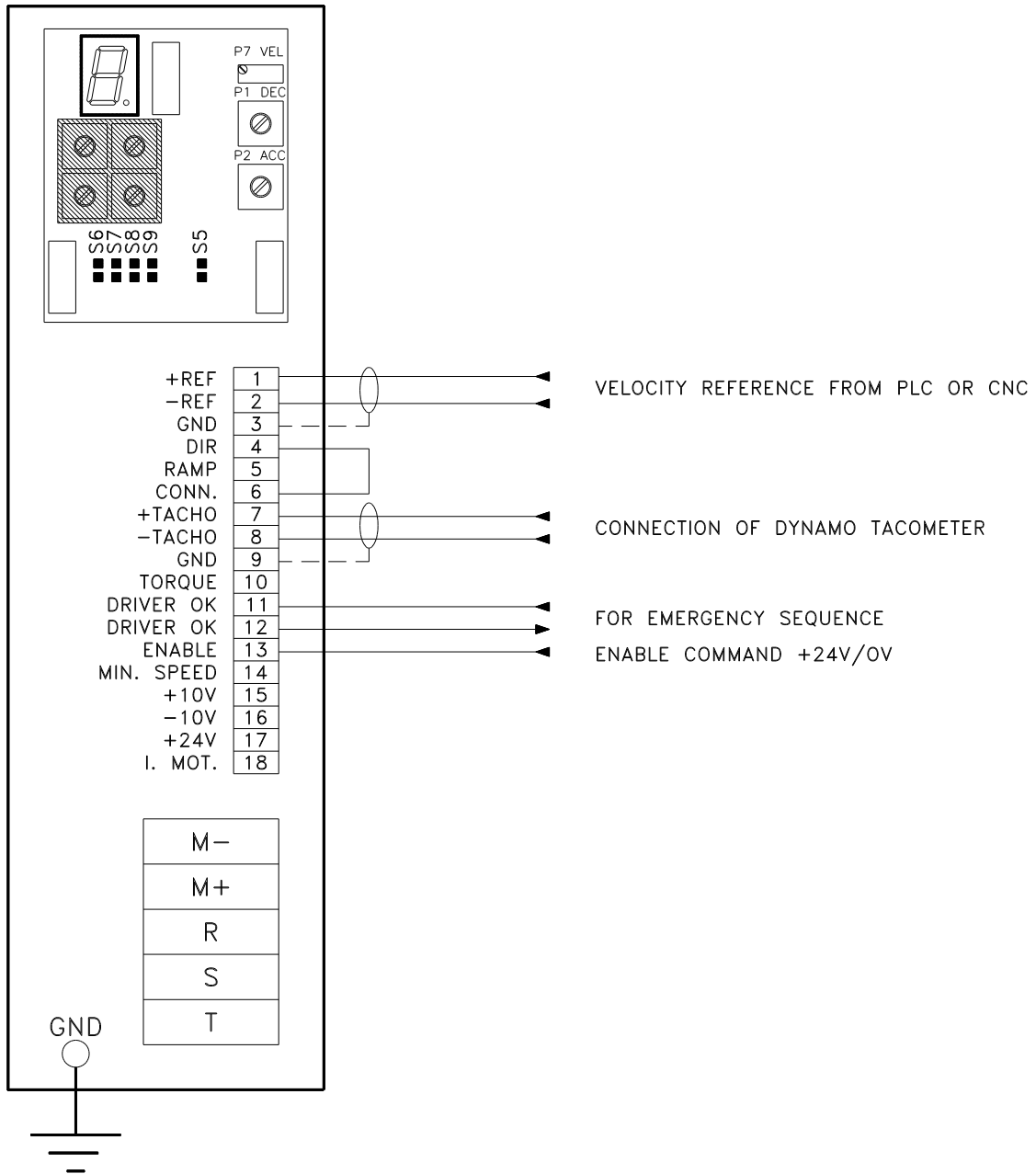
General connections



Connection with potentiometer reference



Connection with PLC or CNC reference



RECOMMENDATIONS FOR THE INSTALLATION AND OPERATION

- To avoid damaging the drive, you must first check the insulation of the motor, which in ohmic value, must be greater than at least 1M Ω , measured between the case and a pole of the engine.
If it is less, try to remove and clean the brushes, which may be overhauled.
- Never insert switch or thermal magnetic circuit breakers, between the drive and the motor. The drive already has a level of thermal protection for the motor and therefore it is not necessary to enter further. The inclusion of these circuit breakers can cause the breaking of the power stage.
- Unpack the DSA300 and verify the integrity of all the single parts
- Connect a potentiometer of **10 K Ω** to the terminals **15** and **16**. Connect the cursor of the potentiometer to terminal **2** and terminal **1** to terminal **3**. With the potentiometer in a central position, the motor stands still; when turning it to the right or to the left, the motor rotates in one or the other direction
- Make a jumper between the terminals **5/6** or **4/6**, depending on if the inner ramp circuit will be used or not
- Prepare a jumper between terminal **13** and **OS** (terminal **9**), or alternatively with terminal **17** (+ **24V**), however without connecting it
- Connect the armature circuit of the motor to the **+M** and **-M** terminals
- Connect the tachogenerator (with a screened cable) to the terminals **7** and **8**, and connect the screen to terminal **9**
- Connect the three-phase power supply inferior to **220 V_{ac}** to the **R.S.T.** terminals
- Supply the DSA300 and check the flash-up of the *segment* on the DISPLAY
- Close the jumper of terminal **13** towards **OS** or **+24 V** and supply with a potentiometer a voltage of at least **100 mV** on the reference input. Now the number **ONE** lights up on the DISPLAY and the motor will start rotating in one direction. If the number **EIGHT** lights up, invert the connection of terminals **7** and **8**

- Tune the maximum velocity by setting the highest possible input reference (highest value) and turn the **P7** trimmer on the customising card to the desired value

- Check the well functioning of the drive and proceed the offset tuning by applying a

0V reference voltage and turning the **P1** trimmer (on the regulation card) until the motor stops rotating

DIAGNOSTICS

Trouble shooting guide

The DISPLAY does not light up

Check the power supply (within the allowed range) on the R.S.T. terminals. If there is no voltage supplied, check the fuses mounted before and after the power transformer.

If the terminals result under voltage but the DSA300 is not enabled, please contact the customer service of ES Technology or the supplier of the drive

The DISPLAY shows "1" however the motor stands still and has no torque

If the display signalizes that the drive is enabled but the motor does not rotate or shows no resistance (the rotor rotates freely), check that the terminal 10 is not occupied, or if used, that there is a sufficient positive voltage towards ground which allows to generate an appropriate torque (see description of terminal 9 TORQUE)

The DISPLAY shows "5" and the motor rotates irregularly

When the display shows the alarm "5" (mains under- or over voltage) during the acceleration period of the motor, probably one of the power supply phases for the DSA300 fails. It is recommended to check the fuses before and/or after the power transformer. If the fuses are in perfect conditions and the three-phase power supply is present on the R,S,T, terminals, please contact the customer service of ES Technology or the supplier of the DRIVE

The DISPLAY shows "6" when starting or during normal operation

If this alarm occurs, cut off immediately the power supply of the DSA300 unit or better of the complete electrical installation and check the motor connections. If the connections result correct, check the condition of the brushes and if the motor is clean and free of carbon residues. (Take note that dirt or carbon dust as a sign of wear of the brushes might cause an insufficient insulation of the motor armature circuit towards ground). In case of malfunction of the motor collector and the brushes, a motor inspection is recommended. If the alarm continues after having carried out the controls without having noticed any abnormality, please contact the customer service of ES Technology or the supplier of the DRIVE

The DISPLAY shows "7" and the motor lose speed

This alarm occurs always after the lighting up of the **point** on the DISPLAY. It signalizes that the motor has absorbed a current superior to its nominal current for more than 3 seconds. When the **IxT** protection is activated, the current output of the drive is reduced by a value inferior to 50 % in consequence of which the current output of the drive decreases. This abnormality can be caused by a hardening of the mechanical motor connections or by a wrong motor dimensioning

The DISPLAY shows "8" and the drive is blocked

This alarm occurs only if the tachogenerator circuit is interrupted or if the tachogenerator has been wrongly connected when installing the unit. In any case, the motor will not be out of control; check the tachogenerator and the corresponding connections

This alarm might also occur if the tachogenerator connection towards the motor is lose or broken

NOTE: A lose tachogenerator connection might cause an irregularly motor rotation varying according to the rotation speed

The DISPLAY shows "9" and the drive is blocked

This alarm protects against excessive gain on the braking circuit. This condition can cause the breakage of the inner recovery resistances of the DRIVE. For a faultless operation, reduce the motor velocity or increase the deceleration ramp period

The DISPLAY shows "0" and the drive is blocked

This alarm protects against overheat of the drive dissipator. Verify that the inner working temperature is inferior to 40°C, that the air shafts of the installation are free, and that the ventilation of the DRIVE is not hindered due to dirt or that the minimum free distance is not observed and therefore a well ventilation is not guaranteed. Also verify the faultless operation of the inner DRIVE fans (if mounted) by controlling if there is an air outflow on the top side and that the fans are not hindered by some small objects which were fallen into. If the alarm continues after having carried out all the controls without having noticed any abnormality, please contact the customer service of ES Technology or the supplier of the DRIVE.

The DISPLAY displays ".1" with the flashing dot with the motor stopped or during movement and the motor vibrates

Act on the gain adjustment trimmer on the regulation board bringing it to minimum (anticlockwise)
Check that the current size of the drive is not much higher than the rated motor current
Check the integrity of the tachogenerator if used
Check for mechanical clearances on the affected axis
If necessary, change the values R16 and C4 on the personalization card (see page 15) to change the speed loop gain. For further information, contact the ES-TECHNOLOGY assistance service

RECOMMENDATION FOR INSTALLATION ACCORDING TO THE EMC STANDARDS

The application standards illustrated here below aim to reduce the interference coming either from the converter or those referred to it.

For the use of converter in EMC environments, it is necessary to use the mains filter, which reduces the converter emission. The filter must be connected observing the connection diagram indicated. (Fig. 1)

For the power supply of the converter a transformer is necessary, the wirings must be performed with screened cables according to the connection diagram (see Fig.1).

The filter, suitably chosen according to the converter size, must be located as near as possible to the converter, but in such a way not to obstruct the ventilation of the same.

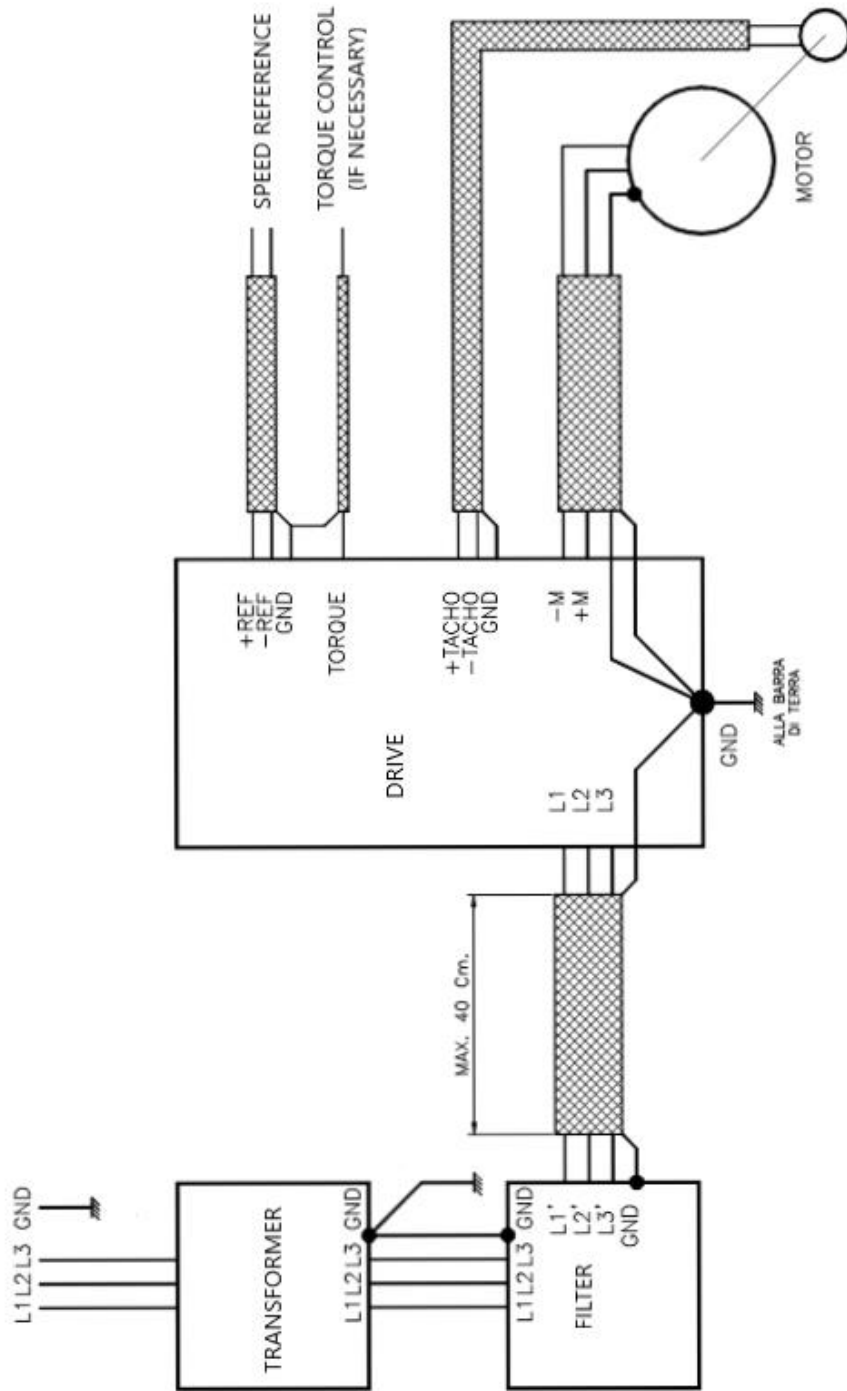
The filter connection to the converter must be performed with a no longer than 40Cm **three-phase screened cable**.

As for the cable upstream the filter, i.e., from the filter to the transformer and from it to the mains, it is not necessary for them to be performed in a screened cable.

Three conductors plus a ground connection also perform the converter connection to the motor in a screened cable. For the cable related to the motor feedback is necessary to use **a three separated screened couple**, to guarantee a low noise on the motor, even in presence of long tracts.

The connections of the speed reference and torque must be performed in a shielded cable.

The remaining control signal e.g., unlocks and signalling does not require the use of a screened cable: it is sufficient that the path is as much as possible separated from the power cables. Here below, it is shown a generically diagram for the connection of a converter, with the indication on the connection of the screened cables in use.



TACHOGENERATOR

NOTES:

All the information included in this USER'S MANUAL can be modified by ES-TECHNOLOGY S.R.L. without notice.

If you will find some mistakes inside the manual, please let us know to make changes in it



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