MANUAL
GTH DRIVER

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Indice

Index pag.1

General Features..... pag.3

Mechanical features
Available sizes
Electrical features
Protections
LEDs
Terminal blocks signal descriptions
Front of the driver
Terminal blocks view

Settings pag.8

External components dimensions ……..... pag.10

Supply transformer
Fuses

Connections pag.11

Potentiometer reference without ramps
Potentiometer reference with ramps
Torque potentiometer
Numerical control speed reference

Fault research pag.15

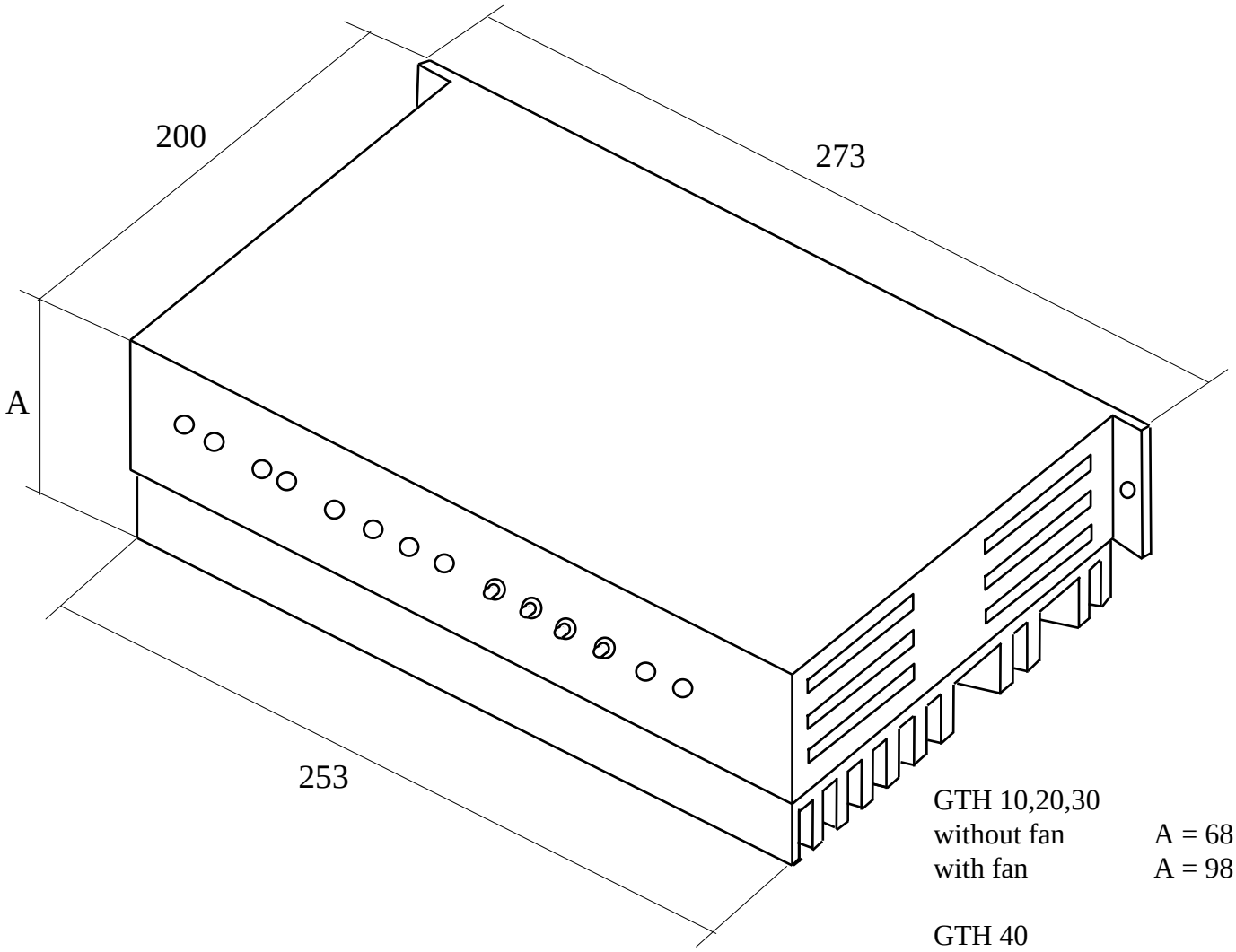
General rules for net disturbs suppression……. pag.16

General features

Mechanical features

Multiple-board driver encased in a metallic cover, fixed to the radiator which has the function of support for the entire structure. The “book” format makes possibile to reduce the size. The driver is designed to be mounted singly with or without fan or in a rack with two or three drivers and common ventilation.
The outputs are made with a 3 poles and a 2 poles terminal block, for the three-phase supply and the motor armature. There is also a 16 poles terminal block for control signals. We report in the figure below the dimensions of the driver.

GTH driver



GTH 10,20,30
without fan A = 68
with fan A = 98

GTH 40
without fan A = 100
with fan A = 130

Available sizes

DRIVER TYPE	Nominal Current	Peak Current	Motor Vdc max	Three-phase Vac supply	EMI Filter
GTH 250 - 10	**10**	**20**	**180**	**150±10%**	**832010V**
GTH 250 - 20	**20**	**40**	**180**	**150±10%**	**832030V**
GTH 250 - 30	**30**	**60**	**180**	**150±10%**	**832030V**
GTH 250 - 40	**40**	**80**	**180**	**150±10%**	**832050V**
GTH 250 - 50	**50**	**100**	**180**	**150±10%**	**832050V**

Electrical features

- Switching driver with "PWM" impulse width modulation, bi-directional, four quadrants, high speed response, made with an IGBT H bridge.
- One three phase power supply 160Vac ±10%.
- Double ring speed and current regulation.
- Speed feedback from tacho dynamo or by request directly from armature voltage.
- Form factor almost equal to one, so it's not necessary to connect a leveling inductance to the motor.
- Control with ±10V analogue signals from numeric control, potentiometer or other signal source
- 20 kHz working frequency (no audible noise).
- Cutting frequency >600 Hz (response time < 16ms).
- Differential analogue speed input.
- Resettable speed offset.
- Input impedance 20Kohm.
- Temperature range from 0° to 40°C.
- Peak current (first peak) twice as high as nominal current for one second.
- Possibility of inserting ramps on speed reference.

Protections

- IGBT fault.
- Internal current supply failure.
- Motor short-circuit.
- Temperature too high.
- Minimum voltage.
- Voltage too high.
- Braking circuit fault or inadequate braking.

The protection is signalled by the lighting of the only red LED S.T. for lack of dynamo signal and temperature too high, by the lighting of both LEDs (S.T. and FAULT) for other protections. The

intervention of a protection is reported externally by the opening of a transistor normally closed located between clamp 14 and the 0V of the signals (which is normally closed signalling “driver OK”).

LEDs

The diagnosis of the driver functions is made using the following LEDs:

- GREEN LED – The driver is properly working, to make the driver supply power it will be necessary to give the driver the consent to operate.
- YELLOW LED – The driver is returning to supply the nominal current after supplying peak current.
- RED LED - FAULT- The driver is blocked, in the meantime there is the lighting of the red S.T. LED, but not for the lack of dynamo signal and temperature too high for which the red S.T. LED is lit (when the red fault LED lights up the green LED turns off).
- RED LED - S.T. - it lights up with the red fault LED and alone for lack of dynamo signal and temperature too high.

Terminal blocks signal description

Control terminal blocks (16 poles)

1. Inverting input of the input differential for the speed reference.
2. Not-inverting input of the input differential for the speed reference.
3. Tacho-dynamo signal
4. 0V tacho-dynamo
5. Negative supply -10V (10mA max)
6. Positive supply +10V (10mA max)
7. Positive supply +10V (10mA max)
8. Input from 0V to 10V for the limitation of the maximum current supplied by the driver (10v=maximum current=current given by the size of the driver).
9. 0V signals
10. 0V signals
11. Enable (to enable the driver you must bring the terminal to a voltage of 24V)
12. Positive supply +24V (20 mA max).
13. OK Driver Output (contact without potential)
14. OK Driver Output (contact without potential)
15. Ramp circuit input.
16. Ramp circuit output

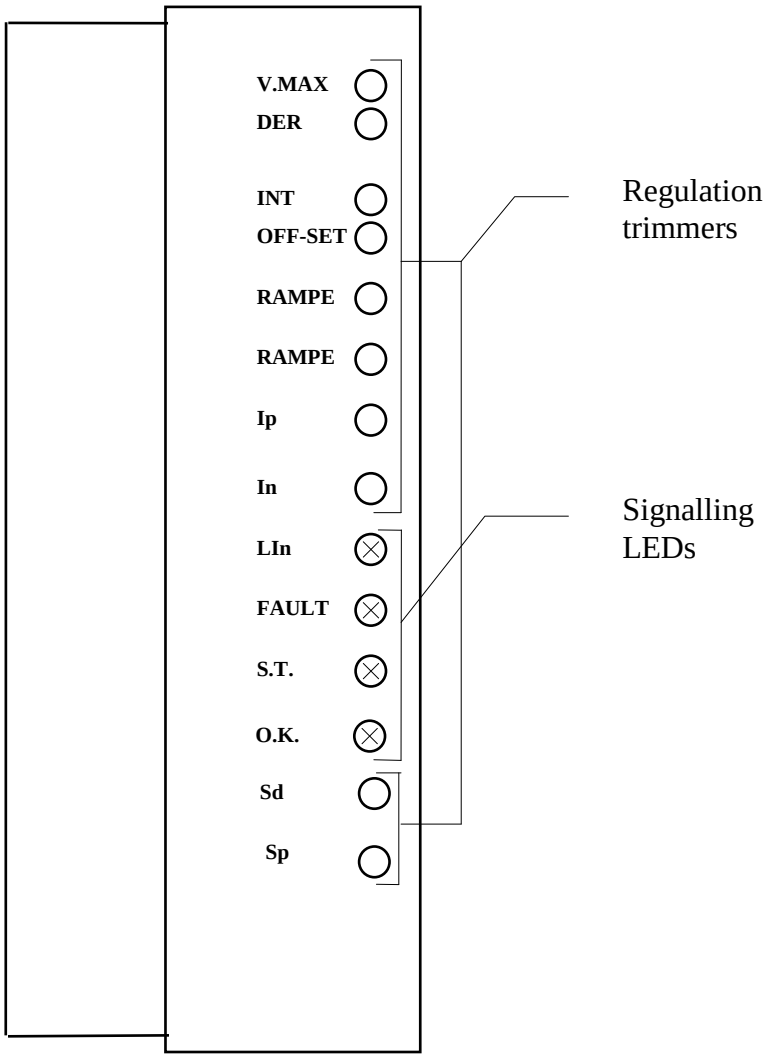
Supply terminal block (3 poles)

R. R phase taken from the transformer secondary winding.
S. S phase taken from the transformer secondary winding.
T. T phase taken from the transformer secondary winding.

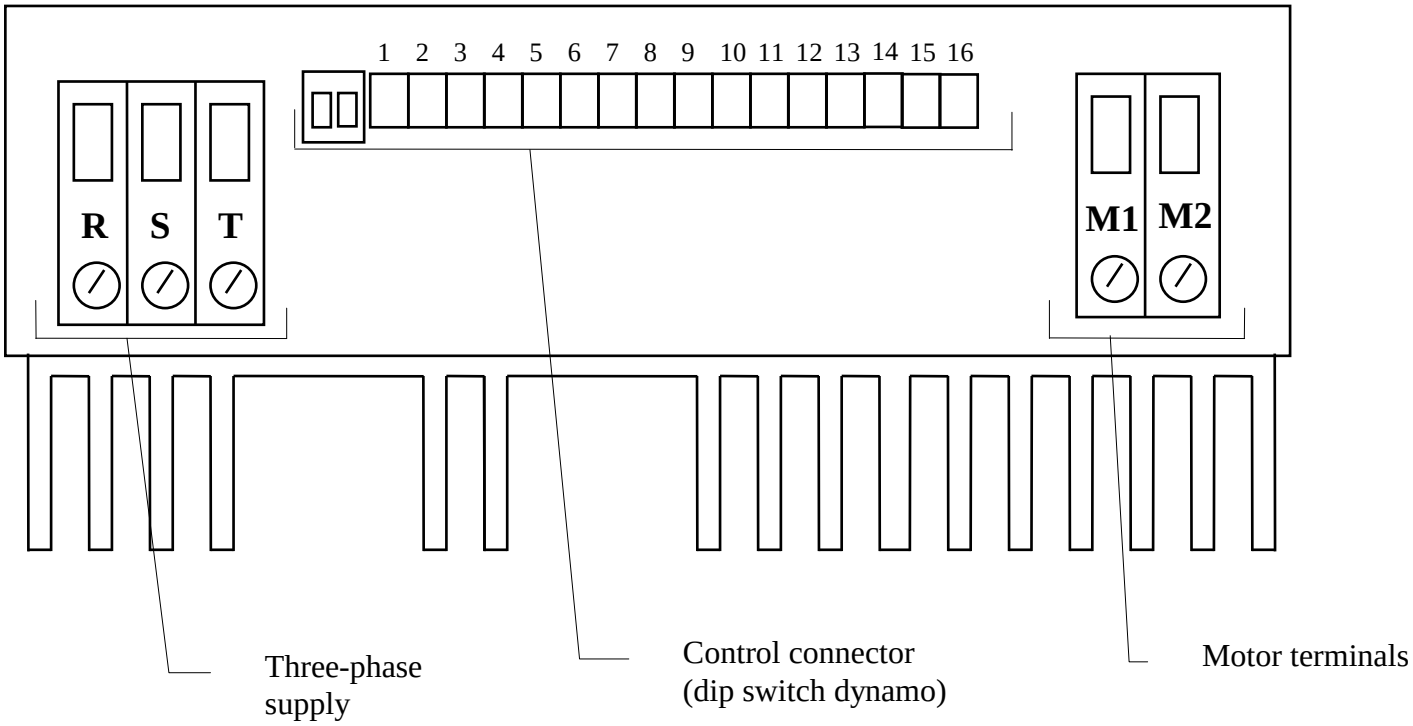
Motor terminal block (2 poles)

1. First motor terminal.
2. Second motor terminal.

Driver front view



Terminal block view



Settings

Trimmers:

V.max.

It regulates the maximum speed of the motor. The maximum speed is obtained by setting the reference to 10V.

Der.

It regulates the gain of the speed ring, together with trimmer Int., and therefore the time of response of the system.

By turning the trimmer Der. clockwise, thereby increasing the gain, you make the driver more reactive to sudden variations of the motor.

It can be employed to reduce overshoot amplitude.

Int.

It is the fundamental trimmer to regulate the gain of the speed ring (derivative and proportional actions), therefore for the regulation of the passing band of the feedbacked system, turning counter-clockwise you increase the system gain and therefore the speed of response, trespassing a certain values determined by the load on the motor the system becomes unstable and a vibration is produced.

The best regulation is the value before the one that makes the system unstable.

Offset

With a speed reference=0 brings the motor speed to zero.

Rampe

The two ramp trimmers regulate the bias of the ramps. They are necessary to prevent the motor from sudden speed variations.

Ip

It regulates the maximum peak current.

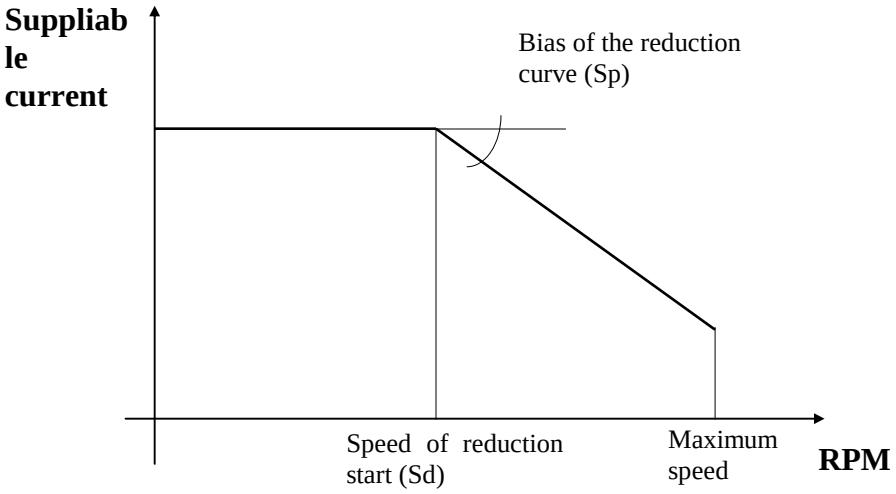
In

It regulates the nominal current of the motor and the maximum value of In is equal to ½ Ip.

Sd

The driver can reduce the current supplied relating to the speed, to reduce the sparkling on the collector which could damage it.

It is possibile to regulate the curve of speed reduction relating to the motor RPM, by using the two trimmers Sd and Sp, Sd regulates the speed value when the regulation start to act and Sp regulates the bias of the reduction curve.

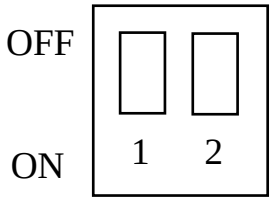


Sp

Regulates the bias of the reduction curve.

Dynamo voltage dip-switch

To set the driver according to the dynamo voltage you must use the dip-switch near the A terminal block and after that for a more precise setting you must use the trimmer Vmax.



Dt max	Microswitch 1	Microswitch 2
60-80V	OFF	OFF
40V	ON	OFF
20V	ON	ON

External components dimensioning

Supply transformer

The primary winding will have a voltage adequate to the supply voltage.
The output voltage from the secondary winding is given by the following formula:

Vac = V motor (nominal) * 0.88

The power of the transformer is given by the following formula:

P = 1.5 * Motor power

To size a transformer that supplies more than one driver, calculate the power for each driver and then sum them.
N.B. The set current on the driver can be 10% more than the nominal current of the motor.

Fuses

Fuses on the supply:

Normal fuses Current = 1.5*driver nominal current

Fuse to protect the motor:

Extra-fast fuses Current = 4 * motor nominal current

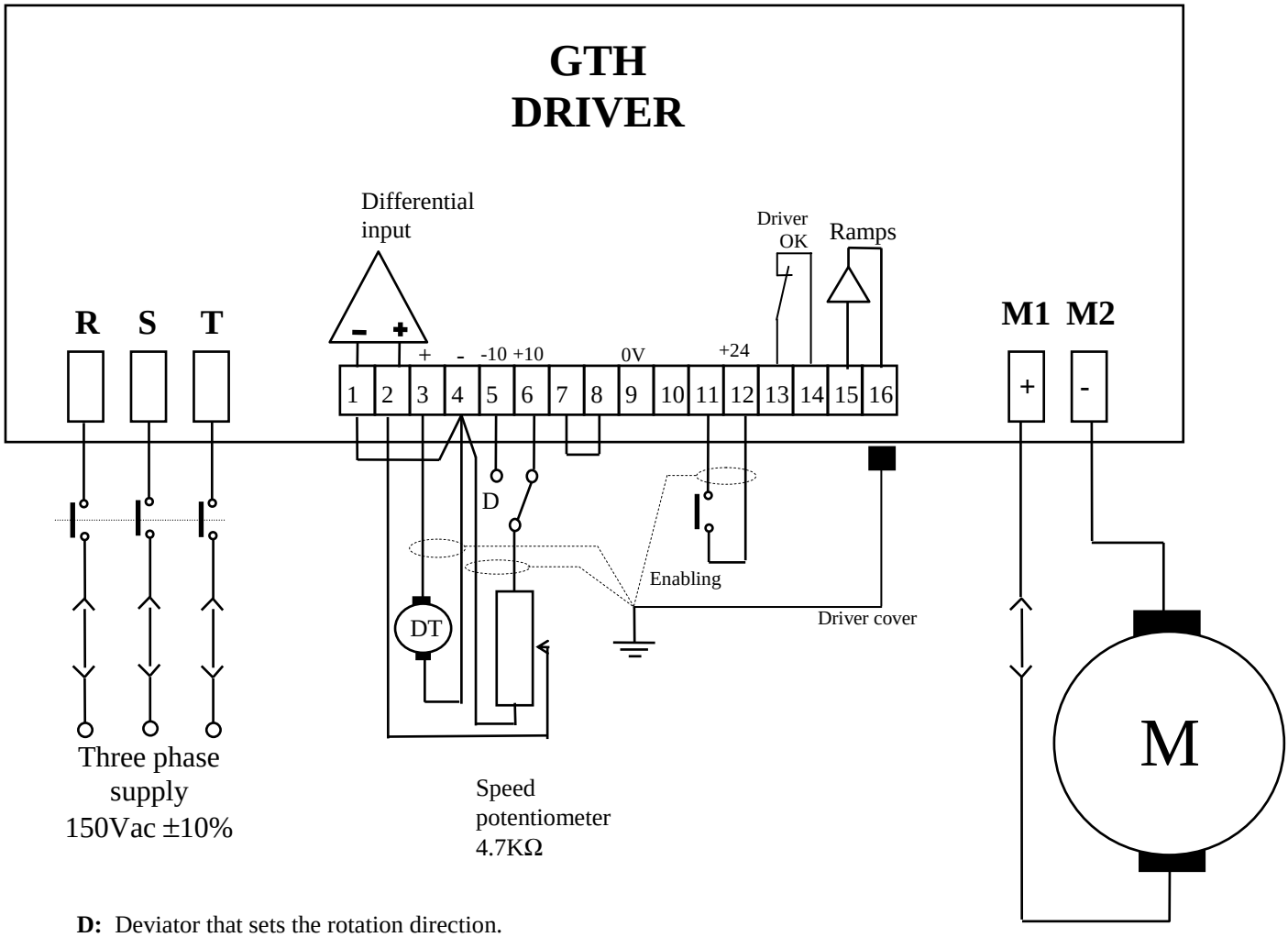
Leveling inductance

A leveling inductance is seldom necessary thanks to the 20 kHz frequency that guarantees a form factor next to one, if you are using a motor with low armature inductance, (as flat rotor Mavilor motors), we suggest to insert a levelling inductance as per the following tab:

Driver size	**Inductance**
10-20A	1.5mH
20-40A	0.7mH
30-60A	0.3mH
40-80A	0.3mH
50-100A	0.15mH

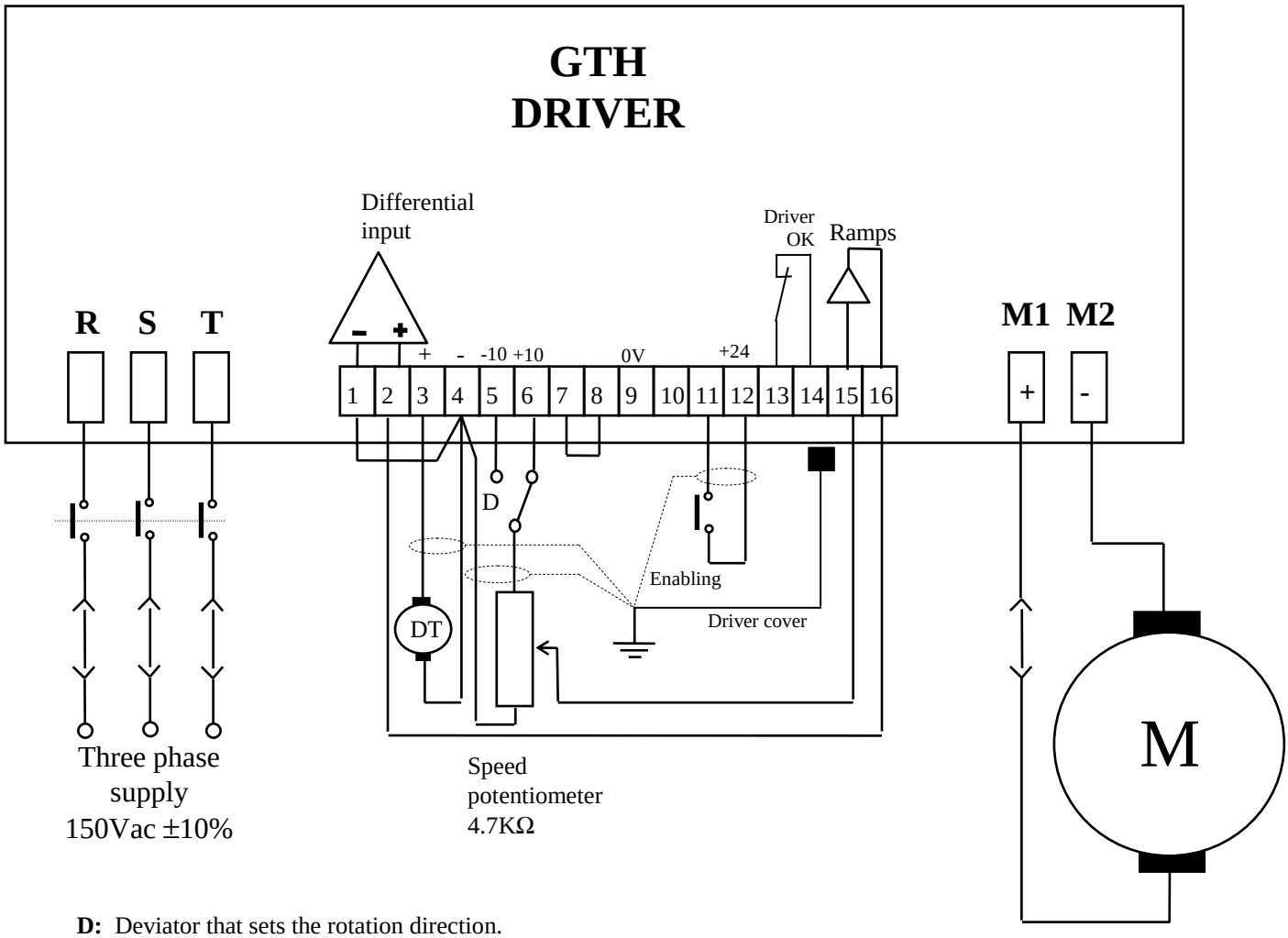
Connections

Wiring with potentiometer reference and off ramps



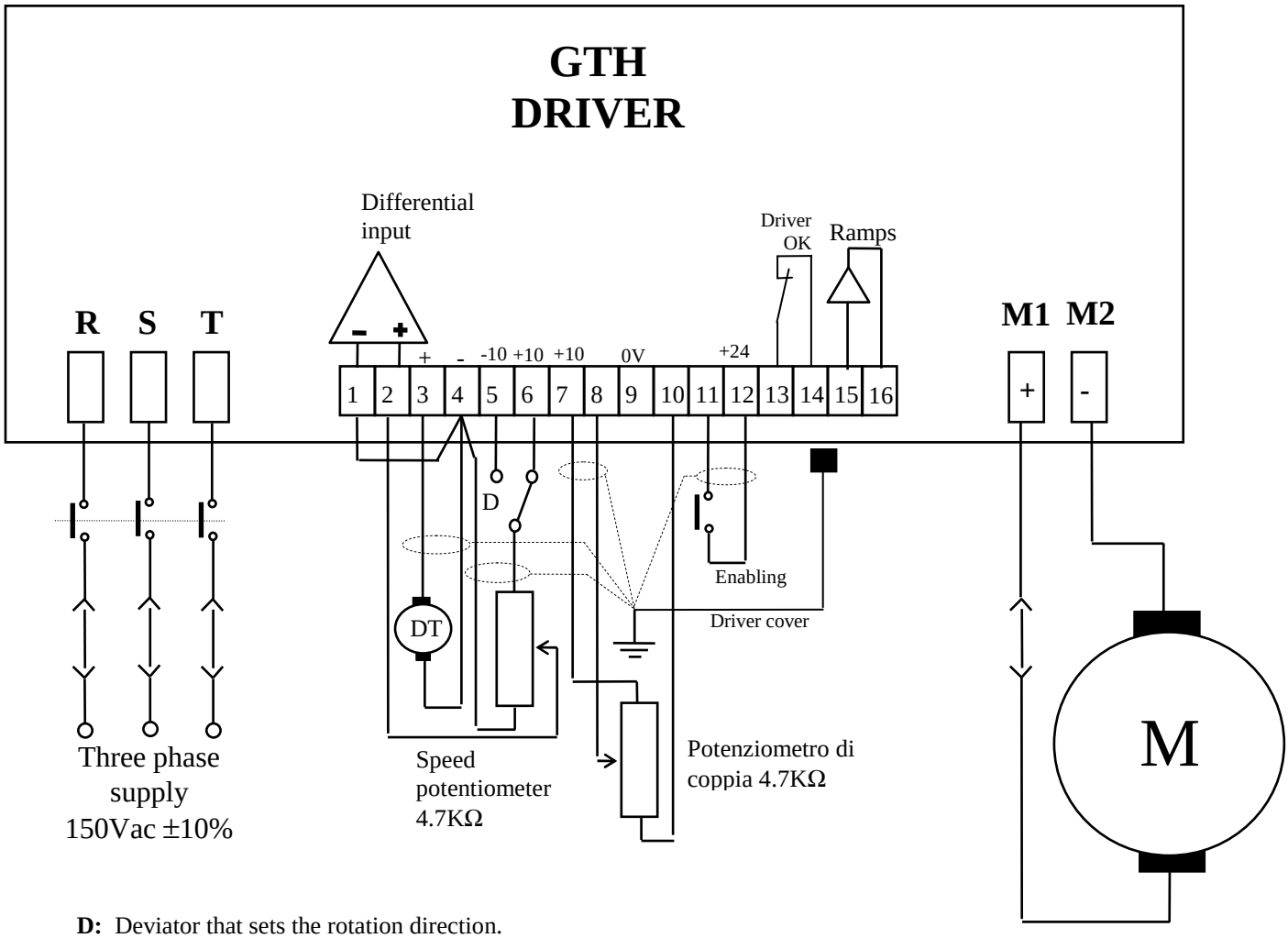
D: Deviator that sets the rotation direction.

Wiring with potentiometer reference and on ramps



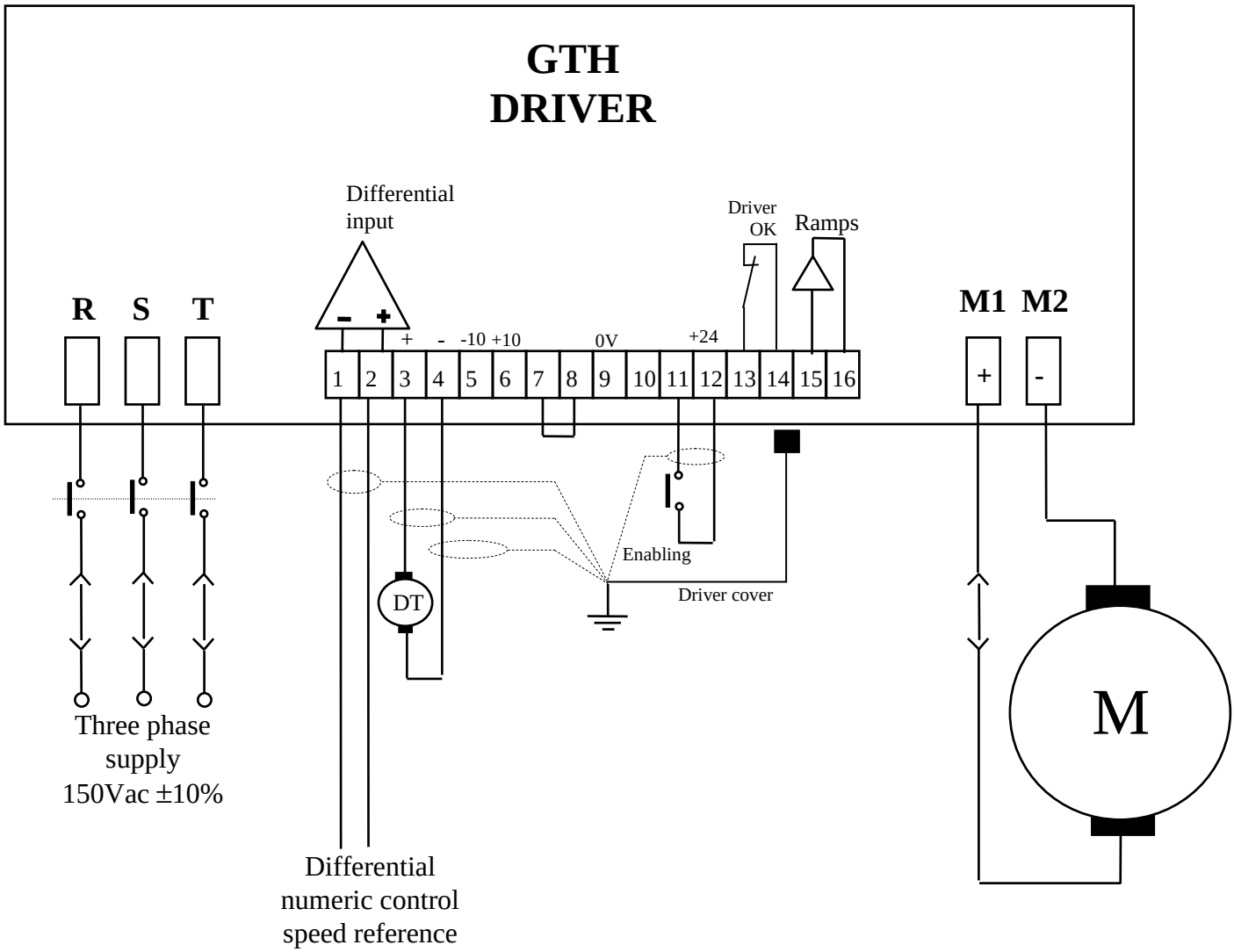
D: Deviator that sets the rotation direction.

Wiring with torque potentiometer



D: Deviator that sets the rotation direction.

Wiring with numeric control reference



Fault research

Fault	Cause	Remedy
• The driver burns the fuses when supplied (*)	• Driver in shortcircuit • Wrong fuses	• Replace the driver • Use fuses with the correct value
• The driver blocks as soon as supplied (both red LEDs lit) before enabling it	• Supply voltage too high	• Lower the supply voltage.
• The driver blocks (both red LEDs lit) as soon as enabled.	• External short circuit • Internal short circuit	• Remove the short circuit • Replace the driver
• The motor blocks (both red LED lit) during swift acceleration or deceleration	• The braking system doesn't work properly • The braking system is not enough compared to the load	• Check the correct connection of the braking resistance • Ask for technical assistance to empower the braking system
• The motor exceeds the maximum speed and there is no control over the speed.	• Connection with the tacho dynamo interrupted or reversed. • The tacho dynamo doesn't work properly	• Check the connections and if necessary reverse them • Check the dinamo
• The driver blocks (S.T. red LED is lit) after a certain time of work and the radiator is hot	• The thermic protection intervened	• Let the driver cool down and look for the cause of heating

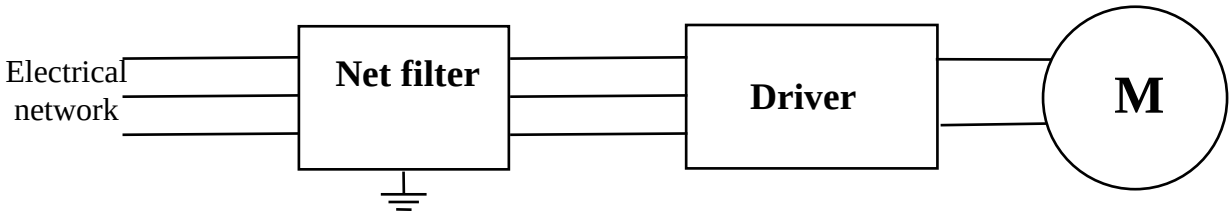
(*) It's absolutely important to use fuses on the supply, otherwise in case of short-circuit there is the risk of fire.

General rules to eliminate network disturbs and EMI (CE certification)

All the electrical equipments that switch inductive loads generate disturbs that can spread electromagnetically (EMI) or via conduction (along the electrical network, on inductive couplings of wires). We supply some rules to eliminate these disturbs.
ATTENTION!!! *The driver you bought has been tested for electromagnetical compatibility and CE certification, anyways to guarantee the electromagnetical compatibility of the whole equipment you have to follow these instructions.*

Net filters utilization

To prevent the generated disturbs from propagating on the electrical networks and from disturbing other connected devices is necessary to use net filters.
To choose a net filter you must pay attention to the type of network it will be connected (single phase or three phase), to the power absorbed by the load and to the power of the filter (single cell or double cell).
It is important to connect the filter near to the driver (not beyond 30 cm of wire), and its metallic cover must be grounded.
In this manual there is written next to each driver size the adequate net filter. If needed net filters can be bought from us.



Shielded cables use

Connection cables are antennas that receive and transmit disturbs; you must use shielded cables both for low-power links (control links) and high-power links (links with the motor).
By doing this you will reduce the noise and the emitted electro-magnetic interference.
Attention! The shield must be grounded only on one end of the cable, you can link it to the mass of the motor which will be grounded as well.

Adequate cables layout

The correct wiring of the panel is fundamental for a good functioning of the entire system and to solve problems of electromagnetical compatibility. Here there are the main rules for the array of the cables.

- Use shielded cable both for control and power links.
- If possibile keep a distance between control and power cables.

- Put the cables into wireways or metal pipes.
- Avoid tangles and crossings, where this is not possible make only 90° crossings.

Grounding

Grounding is fundamental to reduce disturbs; follow this general rules:

- Ground the mass of the driver (0V signal) linking it to all the shields of the control cables.
- Ground all the metallic shells of the system (cover and radiator of the driver, motor shell, etc.) trying to use wide surfaces of contact.
- For the groundings use low-impedance cable even for high frequencies.
- Remove layers of paint or oxide from the surfaces of contact.
- Insert in the usual maintenance program the control of the low-impedance of ground links.

Electric panel example