SERVICE MANUAL

AXOR INDUSTRIES®

ENGLISH

MINISPEED

AXOR
★ INDUSTRIES ★
drives & motors
SINCE
1988
ITALY

CAUTION!

ELECTRICAL AND CONTROL EQUIPMENT CAN BE DANGEROUS IF HANDLED IMPROPERLY.

This manual show mechanical and electrical charateristics about minispeed 60-140-200 series.
It is important, that the installation procedure should be perfomed only by qualified personnel according with local safety rules. Who installs the equipment must follow the technical informations contained in this manual.
For other informations please contact AXOR technicians.

ATTENTION
ELECTRICAL DISCHARGE DANGER

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1.1 Introduction

The minispeed **"MS 60", "MS 140", "MS 200"** series are four quadrant amplifiers, constructed on an european simple pc board.
The output power stage (mosfet or IGBT) is controlled using the PWM technique (20 Khz).
These amplifiers are designed for driving small and medium servomotors where dinamyc performance and fast response are requested.
The speed control is made by tachogenerator ,armature or encoder feedback.
For its supply is requested single phase power supply.
The calibration components are avalaible at removable personality header.
If an amplifier module is replaced,it is important to verify that the new amplifier module is calibrated as the one removed.
This is easily accomplished by simply installing the personality header from the removed amplifier module into the new one.
We can adapt dinamyc costant,respect standard, by new personality header.
For to use various options available on amplifier, we must open or close the solder bridges in “adjustment zone”.
The minispeed amplifier has a “drive ok” green led and a”fault” red avalaible on the frontal of the amplifier.

1.2 Technical specifications

Power supply voltage and rated current for every model.

Model	Power supply (Vdc)
MS 60	**24 - 60 ***
MS 140	**40 - 140 ***
MS 200	**100 - 200 ***

Sizes	Rated Current	Peak Current (A)
2/4	**2**	**4**
4/8	**4**	**8**
8/16	**8**	**16**
10/20	**10**	**20**
14/28	**14**	**28**
20/40	**20**	**40**
25/50	**25**	**50**

- Size avalaible for all models *- Rated current . See derating curves pag 18.*

- Rated current is adjustable between 5% to 100% by Rin.
- Peak current is adjustable between 50% to 100% by Rip.

*** These are values reccomended from factory.**
Min and max voltage values are reported at page 32.

Input reference	Differential +/- 10V (input impedance 20K Ohm)
Drift (referred to differential reference amplifier)	+/- 18 micro V/C° (max)
Drift (referred to differential speed amplifier)	+/- 18 micro V/C° (max)
Input-output demand current	+/- 10V (input impedance 47K)
Enable signal	10 / 30 VDC (input impedance 10K)
Minimum tacho signal at max speed	5V
Output voltage for external use	+10V, -10V (5mA max)
Motor current monitor	+/- 8V (corriepond at peak current)
Operating Temperature	0 / 40 C°
Humidity	80% max (without condensation)
Altitude	0 / 1000 m s.l.d.m.
Weight	510 gr

1.3 Inputs and outputs

The following numeration concerns inputs and outputs about DIN 41612 connector.

Wiring must be done on the terminal boards connections:
on mother board and on rack pc board .(see chapter 3.3 wiring).

1ac ***COMMON ZERO SIGNALS***

2ac ***DRIVE OK (OUTPUT)***
Open collector: max current(100 mA) is protected with zener diode (47 v)
Normally close on.It's

3ac ***DEMAND COMMAND CURRENT (INPUT OUTPUT)*** see page 23
It can use in two modes :
1°Current limitation :
We connect a resistance between pin 2 and pin 3 (zero)
2° Current reference : (torque input)
We apply +/- 10 v signal, it correspond at peak current .
We can use 3 ac pin also as signal representive of the motor current.
Use instrument with impedance greater than 100 k .

4ac ***- 10V*** **(OUTPUT)**
Output voltages for external use - 10 volt (max current 5 mA)

5ac **+10 V (OUTPUT)**
Output voltages for external use +10 volt (max current 5 mA)

6ac ***VELOCITY REFERENCE*** **(INPUT)**
Noninverting differential input +/- 10 volt

7ac ***ENABLE*** **(INPUT)**
Logic signal for amplifier 10/30 vdc

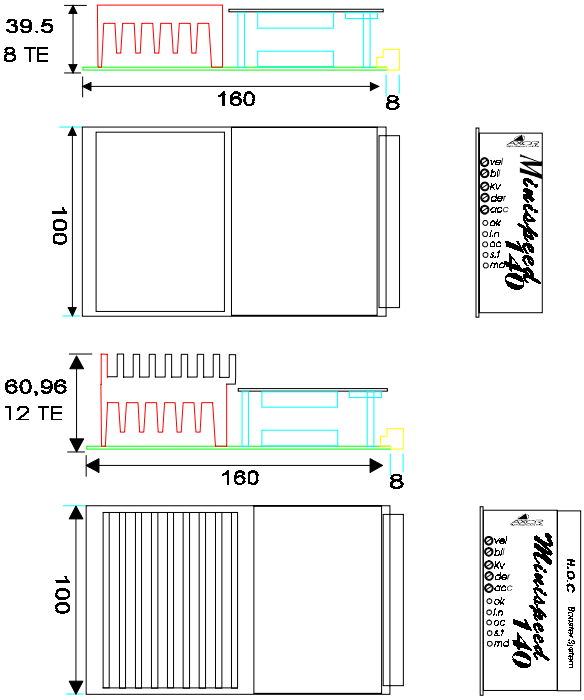
8a ***VELOCITY REFERENCE (INPUT)***
Inverting differential input +/- 10 volt

8c ***COMMON ZERO SIGNALS***

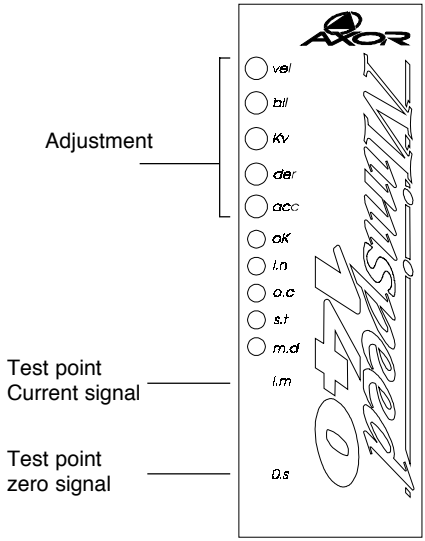
9ac ***TACHOGENERATOR*** **(INPUT)**
Input tachogenerator signal

11 ac	***CURRENT SIGNAL* (OUTPUT)** +/- 8v referred to peak current
14-15-16-17 ac	***POWER SUPPLY + (INPUT)*** Input positive power supply
19-20-21-22 ac	***POWER SUPPLY - (INPUT)*** Input negative power supply
24-25-26-27 ac	***+ M* (OUTPUT)** Connections output to servomotor
29-30-31-32 ac	***- M* (OUTPUT)** Connections output to servomotor

1.4 Overall dimension



2.1 Trimmer adjustment



VEL

The vel trimmer fine tunes the velocity command input sensitivity . It provides a range of +/- 20 % to fine tune the velocity command input sensitivity ;for increase speed turn potentiometer clockwise and in anticlockwise sense for reduce itself.

BAL

Offset calibration. This potentiometer allows offset calibration on the input reference.

Max reference correction +/- 200 mV

KV

The dinamyc response of the motor depends from this trimmer; for increase the gain turn the KV potentiometer in clockwise sense.

DER

Derivative adjustment.Turning the DER trimmer in clockwise the overshoot is reduced.

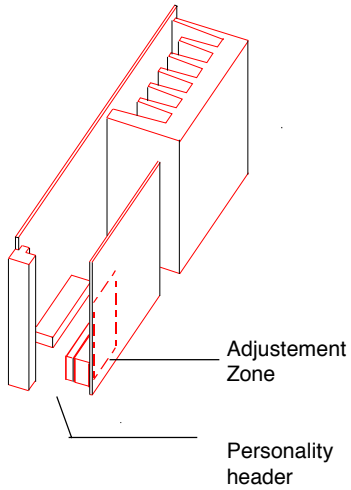
ACC

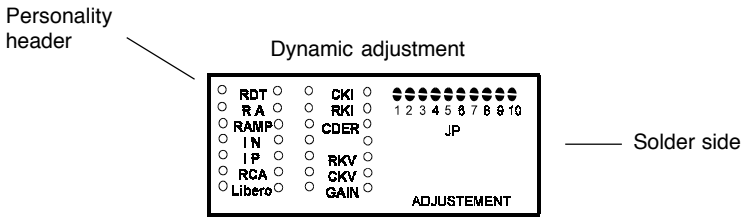
The solder bridges allow insert the acc/dec function.(JP1-JP2-JP8)
With anticlockwise turn(ccw)we increasing acc/dec function between 0.1/1 sec.(correspond 10 v reference)
We can increase or reduce max time of acc/dec opening JP1 solder bridge and inserting a resistance in the personality header.(see chapter 4.3 adjustment)

N.B. Usually,the amplifier,is provided with the ACC/DEC function disabled.

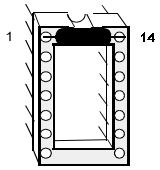
2.2 Personalization

All the amplifier adjustments are present on the 3.005.4 Pc board the adjustment zone.
The amplifier is provided with 7+7 pin header where we mount personality components.
If an amplifier is replaced,it is important to verify that the new amplifier is calibrated as the one removed.
This is easily accomplished by simply installing the personality header from the removed amplifier into the new one and verify the solder bridges.





Adjustment on the personality header

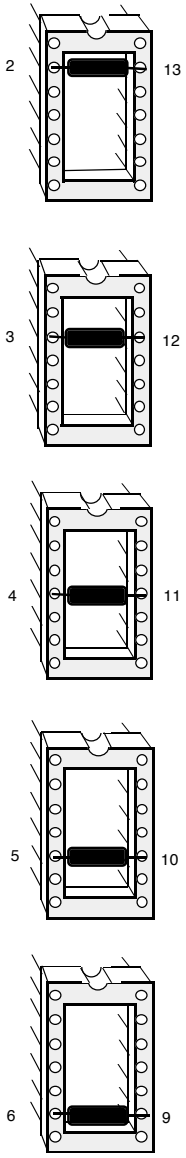


For calculate the correct value see page 26

RDT RESISTANCE pin 1 - 14

If we insert this resistance,we adapt KE tachogenerator costant with input amplifier costant.
If the KE costant is small,we can bridge this resistance.(see velocity calibration chapter 4.3)
The same also if a very low speed is requested.

Adjustment on the personality header



RA RESISTANCE pin 2 - 13

Use this resistance only armature feedback .It permit adaptament at the costant motor tension .For enable the armature feedback close solder bridge JP6(see page 27).

ACC/DEC RESISTANCE pin 3 - 12

It gives ACC/DEC time.When we insert this resistance we must close solder bridges JP1,JP2 and JP8(see page 29).

IN RESISTANCE pin 4 - 11

It gives limitation of the rated current value.(see page 28)

IP RESISTANCE pin 5 - 10

It gives limitation of the peak current value.(see page 29)

RCA RESISTANCE pin 6 - 9

Compensation of the internal motor voltage due to RI resistance of motor.
We insert it when use armature feedback (see page 27),if not inserted we have a speed decreasing from no load to load working.

Dyinamic response calibration

Calibration for qualified personnel

When complete information is supplied to AXOR, the amplifiers are calibrated from the factory for nominal motor performance.
Field calibration may be necessary to optimize motor's performance for a particular applications ,replacing internal costant.
For replacement we insert new value in "ADJUSTMENT ZONE" opening solder bridges expected.(see page 9)

CKI and RKI

They describes respectively capacitor and resistance of the current loop.
For replacement we must open the solder bridge JP3.(disabilitation of standard costant)

C DER

It allows to increase the velocity loop derivative costant.
New value may be composed by 2 capacitor.
We can insert these capacitors in the predisposed space.The obtained capacitor value is the sum of the two.

RKV - CKV

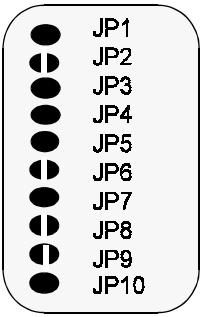
They describe respectively resistance and capacitor of the velocity loop.
For replacement we must open the solder bridge JP4 .(disablilitation of standard costant)

GAIN

It defines the velocity loop static gain.
We can insert new value by solder bridge JP5 opening disabilitation of standard costant.

JP solder bridges

Standard bridges



In the “ADJUSTMENT ZONE” there are ten solder bridges;with these we can enable or disable functions or 3.005.4 circuit sections.

JP1 ,JP2, JP8 They allow obtain different ACC/DEC times. (see chapter 4.3 calibration)

JP3 **Normally closed**. If it is open loop standard costants CKI-RKI are disabled.

JP4 **Normally closed.** If it is open current loop standard costants CKV-RKV are disabled.

JP5 **Normally closed.** If it is open velocity loop static gain is disabled.

JP6 **Normally open .** If it is close the armature feedback is enabled.

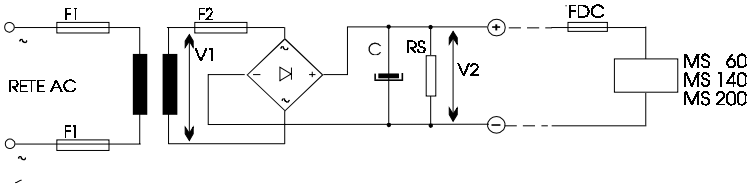
JP7 **Normally closed.** We open this when we wish to drive the amplifier with external current reference.(velocity loop disabled)

JP9 **Normally open.** If it is closed,thermic image IxT circuit activation don’t stop the output transistor and the green led light.(Drive ok)

JP10 **Normally close.I**f it is opened ,lost or reverse tacho circuit activation don’t stop the driver working.
It must be opened when armature feedback is used.

3.1 Power supply dimensioning

Single phase power supply



TRANSFORMER

Voltage:
Primary voltage value is the avalaible voltage on the main secondary voltage to be calculated referrd to motor max line voltage to be used .
Use the following formula:

$$Vac = \frac{Vmotor}{0{,}9 \times 1{,}36}$$

where **V motor = E max + (Ri x In)**

Vmotor= This is voltage between armature motor at max speed and nominal stall torque.

Emax = CEMF at max work speed.(Similar to max voltage of max no load motor speed)

Ri = Armature motor resistance with brushes.

In = Rated current at nominal torque.

Voltage range is reported at page 5.
However,for keep margin, axor advise rated voltage on the secondary winding of the transormer as follows:
(For overvoltage or breaking circuit on capacitors)

44 VAC MAX NOMINAL x MS 60
90 VAC MAX NOMINAL x MS 140
145 VAC MAX NOMINALx MS 200

Dimensioning single phase power supply

Power: nominal transformer power is referred to each motor power sum,on pluriaxes applications.

P (VA) = (Pass M1 + Pass M2 +.....) x 1,25

where

Pabs = Vmotor x In (Pabs M = absorbed motor power)

Usually, if motors don't work together,we can declass the transformer of 30/40%. *If the power of the transformer surplus 7KVA call AXOR.*

FUSES

Fuses dimensioning

$$F\,1° = \frac{P\,(VA)\ \text{transf.}}{V\,(\text{Primary})\ ac} \times 1{,}1$$

fuses on primary slow types

$$F\,2° = \frac{P\,(VA)\ \text{transf.}}{V1\,(\text{secondary})} \times 1{,}1$$

fuses on secondary slow type

FDC	**x MS**	**2/4 =**	**10A**	**super rapid**
	x MS	**4/8 =**	**10A**	**super rapid**
	x MS	**8/16 =**	**10A**	**super rapid**
	x MS	**10/20 =**	**10A**	**super rapid**
	x MS	**14/28 =**	**16A**	**super rapid**
	x MS	**20/40 =**	**20A**	**super rapid**
	x MS	**25/50 =**	**20A**	**super rapid**

Power supply fuses for MS 60,MS 140,MS 200.

Using the interconnections modules ,the fuses are on board.

Power supply dimensioning (single phase)

FILTER CAPACITORS

Rated voltage: 100 VDC per MS 60
200 VDC per MS 140
300 VDC per MS 200

Capacitor: the capacitor, filters the voltage from single phase bridge and recoveries the energy from the motor during the deceleration phase.Capacitor's value,can be obtained with following formula:

$$C\ (mF) = \frac{P\ (VA)\ transf.}{V2} \times 2000$$

(The capacitor must be for switching application)

where:

V2 = Capacitor voltage between positive and negative at no load speed.

NOTE

N.B. If during the deceleration phase green ok led switch-off,voltage between positive and negative is excessive; therefore we must increase the capacitor(parallel) or use the regenerative modules.This modules are reccomended specially with MS 140 and MS 200.

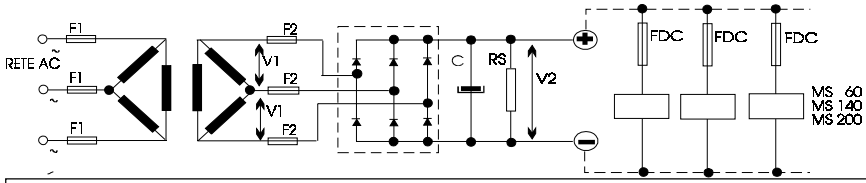
DISCHARGE RESISTANCE

This resistance ,discharge the capacitor also when amplifier is disconnected after power supply switch off.
The value can be calculated with the followig formula :

$$RS\ (Ohm) = \frac{20 \times 1.000.000.}{C\ (mF)}$$

$$P\ (W) = \frac{V2^2}{RS}$$

Dimensioning with three phase power supply



ATTENZIONE: Axor reccomend, to connect the drive at the power net using a transformers with triangle connection in the secondary wiring. If the secondary wiring is star connection, you MUSTN'T connect the neutral to ground.

TRANSFORMER

Voltage: See single phase section same parameters can be used.

Power: See single phasesection same parameters can be used.

FUSES

Fuses dimensioning

$$F\,1° = \frac{P\ (VA)\ transf.}{V\ (primary)\ \ 1{,}73} \times 1{,}1$$

Fuses on primary slow types

$$F\,2° = \frac{P\ (VA)\ transf.}{V1\ (secondary)\ \ 1{,}73} \times 1{,}1$$

Fuses on secondary slow types

FDC	**x MS**	**2/4 =**	**10A**	**super rapid**
	x MS	**4/8 =**	**10A**	**super rapid**
	x MS	**8/16 =**	**10A**	**super rapid**
	x MS	**10/20 =**	**10A**	**super rapid**
	x MS	**14/28 =**	**16A**	**super rapid**
	x MS	**20/40 =**	**20A**	**super rapid**
	x MS	**25/50 =**	**20A**	**super rapid**

Power supply fuses MS 60, MS 140, MS 200

Using the interconnections modules , fuses are on board.

Dimensioning with three phase power supply

FILTERS CAPACITORS

Rated voltage: 100 VDC per MS 60
200 VDC per MS 140
300 VDC per MS 200

Capacitor:the capacitor,filters the voltage from single phase bridge and recoveries the energy from the motor during the deceleration phase.
capacitor's value can be obtained with following formula:

$$C\ (mF) = \frac{P\ (VA)\ transf.}{V2} \times 1000$$

(The capacitor must be for switching application)

where:

V2 = voltage between positive and negative capacitor without load.Multiplicative factor must be 2000 in the foloows cases:
a) Load inertia bigger than motor inertia.
b) Power supply voltage VDC bigger than 50V x MS 60
Power supply voltage VDC bigger than 150V x MS 140
Power supply voltage VDC bigger than 230V x MS 200

NOTE

N.B. If during the deceleration phase, green OK led switch off,voltage between positive and negative is excessive;therefore we must increasing the capacitor or use the regenerative circuit. This modules are recommended specially with MS 140 and MS 200.

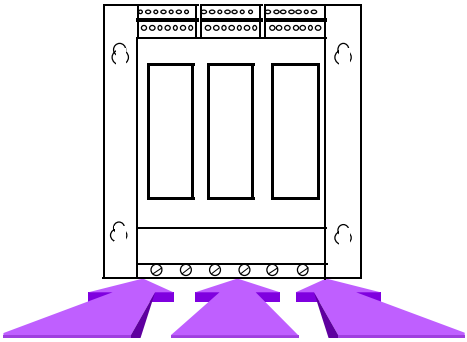
DISCHARGE RESISTANCE

See chapter "single phase power supply".

3.2 Cooling

Minispeed amplifier should be installed to allow a proper heatsink cooling.

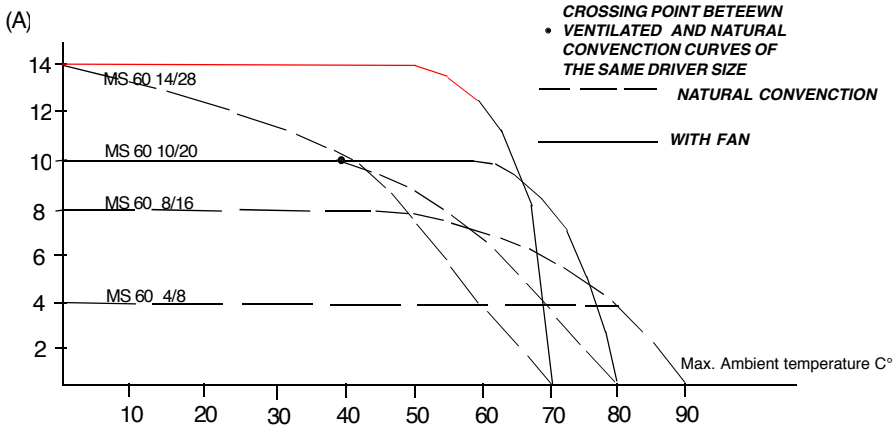
Only position accepted in the equipment is vertical mounting.

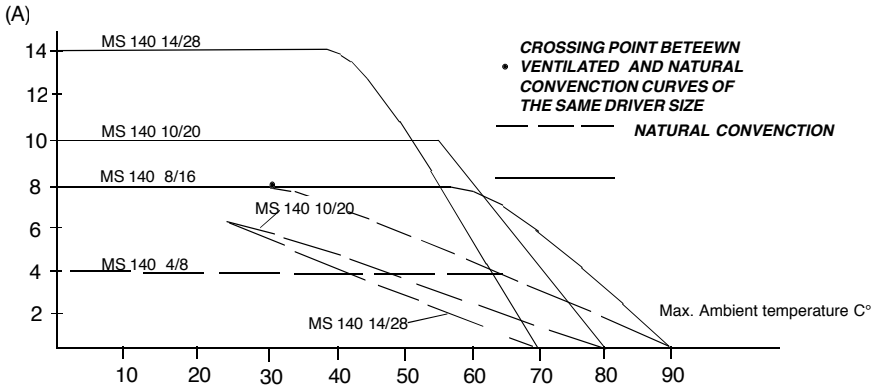


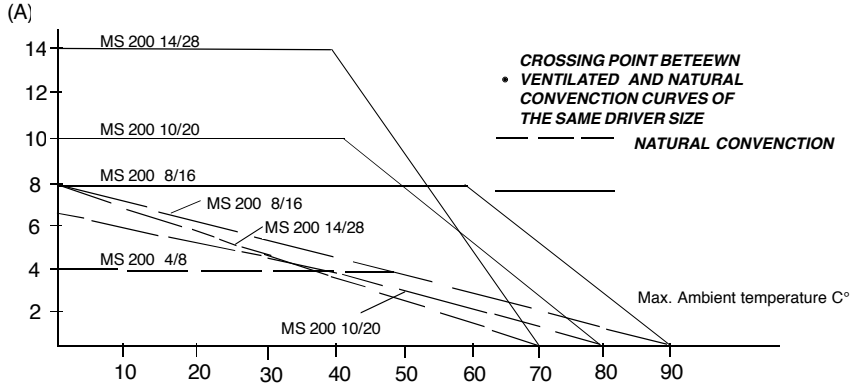
COOLIING

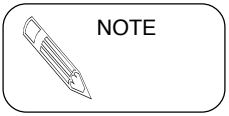
It is important, for proper natural convection cooling, avoid to put other objects above the amplifier.
Using the amplifier in dusty ambient,it is important that the doors of boxes containing electronic equipment be kept closed and air must be filtered avoid the entry of contaminants and conductive particles wich can cause extensive damages.
Every amplifier is provided with a thermoswitch that opens when the temperature exceeds a safe operating level,S.T. protections will be memorized.
The fault can't be reset.We must wait until the heatsink temperature is lower.
If we use intensively the amplifier with high room temperature ambient and quick step we must provide for forced cooling.
NOTE: In case of forced cooling requirement the ventilator it should be installed at the bottom of the amplifier under the relative units.

Derating curves









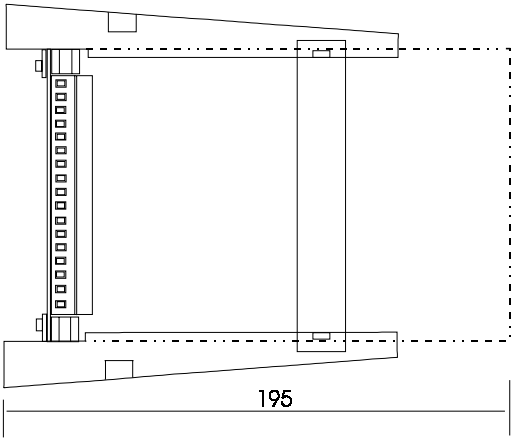
3.3 Wiring

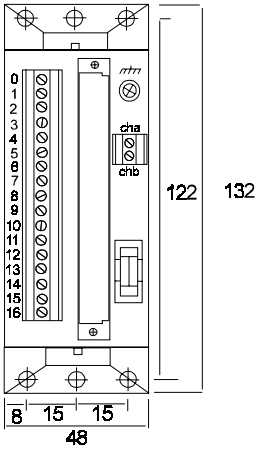
Minispeed amplifier has several wiring connections which must be made in order to ensure the correct operation for reduce interferences.
Use shielded cable for analogue and tacho signal.(For wiring connections see page 20)
Signals cables must be not togheter power wires signals cable output should be own upper side power wiring output twisted togheter should be on lower side.

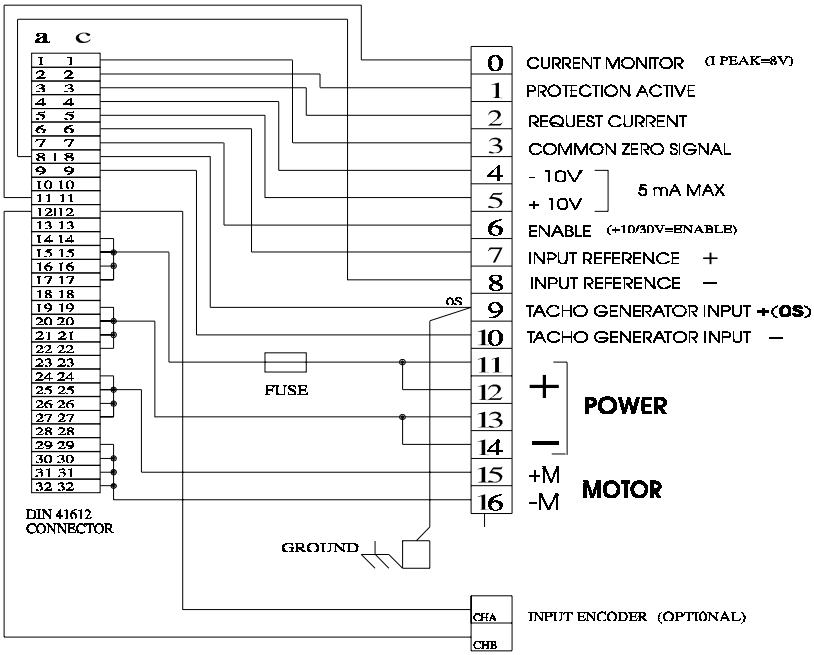
AXOR advise:

0,5 / 1 mm^2 for signal cables, **2** mm^2 for power cables MS 4/8A e 8/16A , **2,5 / 3** mm^2 for power cables MS 10/20A e 14/28A, **4** mm^2 for power cables MS 20/40A and 25/50A.

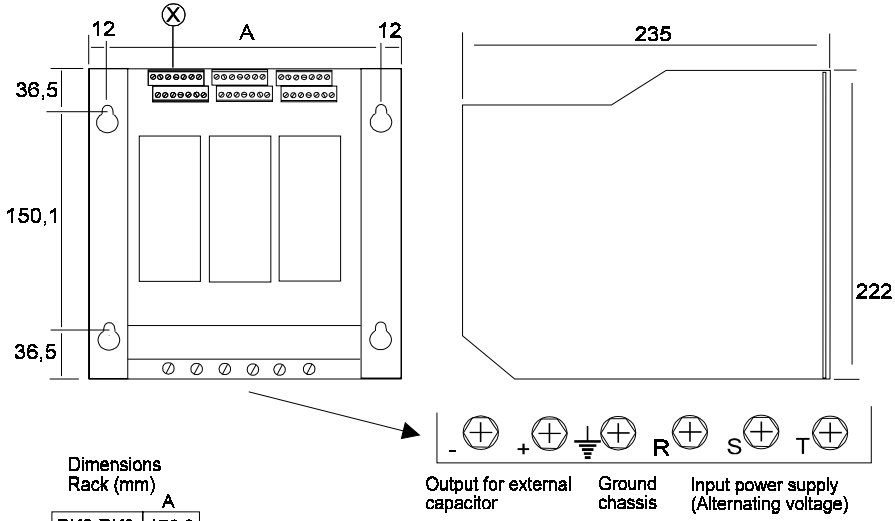
Mother board interconnections





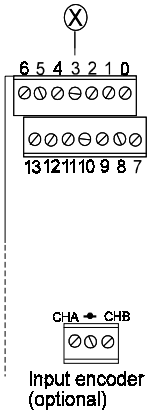


Rack board interconnections



Dimensions Rack (mm)

	A
RK2-RK3	176,2
RK4-RK5	247,5
RK6-RK7	339
RK8-RK9-RK10	461
RK11	501

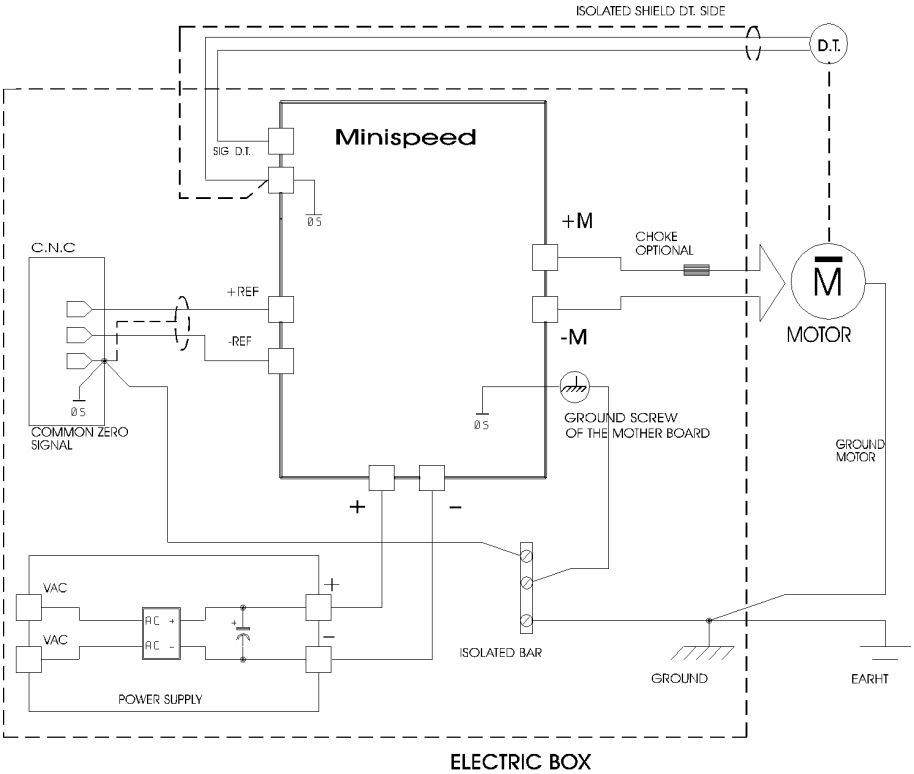


0	Current monitor (i peak=8V)
1	Protection active
2	Request current
3	Common Zero signal
4	- 10V (Max. 5mA)
5	+ 10V (Max. 5mA)
6	Enable
7	Input reference +ref
8	Input reference -ref
9	Tacho generator input -
10	Tacho generator input +
11	+ M (MOTOR)
12	- M (MOTOR)
13	Ground ⏚

Ground cable connections

AXOR advises to connect on an only one isolated bar.
The interconnection screw marked with ⏚ symbol.
With only one wire we connect the isolated bar at the ground of the electric box. From which it will start the ground connection to electrical power net.

Don't make any bridge between the ground of the amplifiers, for avoid closed loop ground interferences.



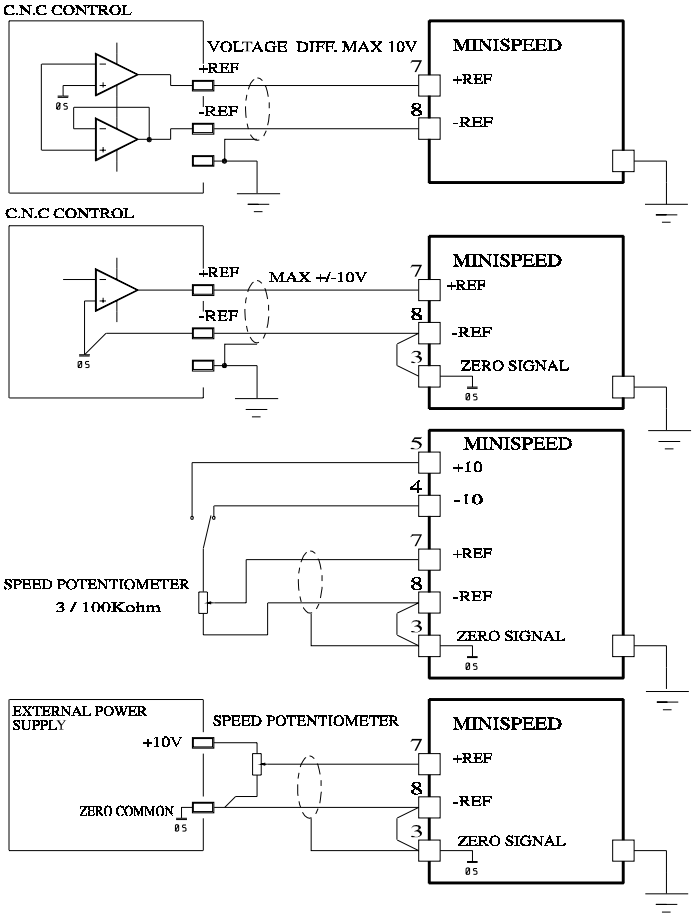
NOTE

ATTENTION!!!
For racks double ground connection is required both pin 13 and ground screw "chassis ground" must be ground connected.

Connections examples

Examples for analogue input connection.

Here we found some examples about input reference.
The numerations are referred to rack and mother board interconnections.
Input reference shield should be connect at ground isolated bar. (see ground connections)



Velocity Control **"C.N.C"** differential mode.

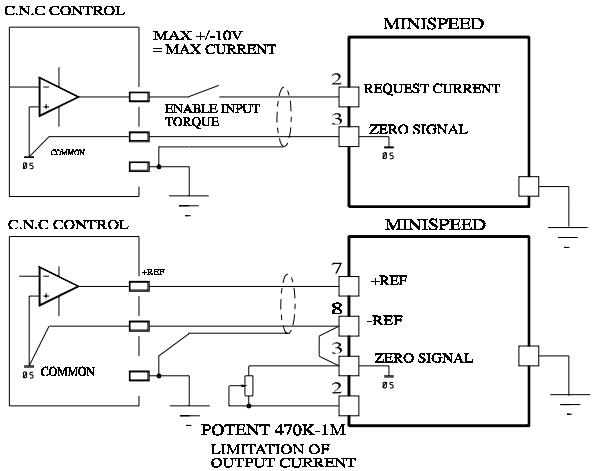
Velocity Control **"C.N.C"** common mode.

Connection of velocity reference input using internal amplifier voltage.

Connection of velocity reference input using external voltage.

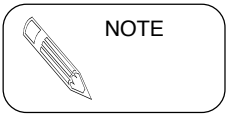
Connections examples

Axor amplifier system has several wiring connections wich must be made in order to ensure a correct operation about input reference.
The numerations are referred on mother board and rack.
Input reference shield should be connected at ground isolated bar (see ground connections). **WARNING:** Do not connected power negative (-) of source at to the ground.



With a “CNC” signal we drive the amplifier in torque mode.
Applying +/- 10 v the amplifier provide peak current.

Applying a resistive load:for example a potentiometer, we can limit the output current .



When current driving is used JP7 solder point must be opened .(see page 12)

4.1 Preliminary checks

The standard amplifier is provided as follows:

- Nominal and peak current agree with amplifier’s size.

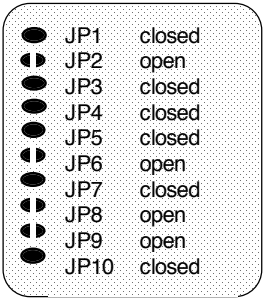
  Ex. MS 10/20 = 20A Peak 10A Nominal

- Tachogenerator feedback

Control the proper value of RDT resistance pin 1/14(see chapter calibrations) on the personality header RDT resistance of 22kohm is mounted for 3000 rpm with 10V/krpm from tacho.

In the amplifier there's a tachogenerator protection that prevent motor runaway.
If we insert a wrong RDT resistance tachogenerator fault don't intervent.
Please verify the correspondance of solder bridge closing point referred to needed function of driver .
These are the solder bridges(see page 10) normally closed and open supplied as standard

Standard solder bridge



Attention at the power supply polarity !!
Verify all screw clamp connections and double check on driver wiring following motor and tacho polarity we will obtain clockwise direction with positive speed reference.

4.2 Starting procedures

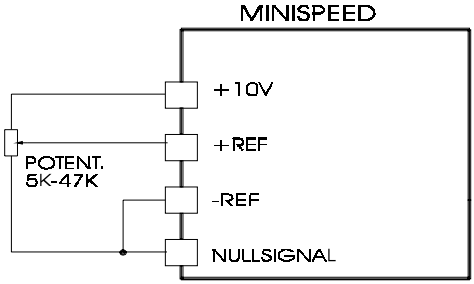
After the preliminary checks we can insert the amplifier on the mother-board
the motor's shaft must be free from the load be ready to stop main supply net if will be necessary after. Disable PWM ON.
Put power on driver.Green light led will be on normally if not on ,please verify with a tester voltage value ;" min or max voltage protection on" .
With analogue input on zero level abilitate PWM on.If motor stays with torque or turns very low,tacho polarity is ok.
If tacho polarity is inverted ,after a little rotation MD protection"tacho loss inverted polarity" is activated and it stops the driver (obviously if also JP 10 bridge is closed).
The alarm is shown with red led light on (not resettable protection)shut power circuit ,reverse tacho cables and start on again.
For further malfunctions,see chapter "fault research".

4.3 Adjustment

MAX TACHOGENERATOR FEEDBACK SIGNAL

NOTES:
for adjustment we need the following instruments:
- Rpm-counter for measure the motor speed , or digital voltmeter for measure tacho signal.
- Potentiometers 5k until 47 kohm.

Axor advise to use a potentiometer when there is not a CNC.
A pot. allows also to reach max speed during tests without too fast accelerations.
ATTENTION: If a cnc is used and the cnc positive direction is inverted respect to the motor positive rotation, we must invert both motor and tacho cables. If not made the cnc when started will give axis position error after started at full speed . Moving manually the machine it is possible to verify that both positive sense(motor and cn) will be on same direction.



Insert RDT resistance between pin 1-14 on the personality header.It can be calculated with the following formula.

$$RDT_{(Kohm)} = \frac{Kdt \times n \times 9{,}7}{1000 \times Vref} - 8$$

RDT value express in k (1/4 w)
Kdt tacho generator costant (express in v/1000rpm)
n max speed express in RPM
Vref max voltage reference

Example:

Kdt =10
n =2500 RPM
Vref=10

$$RDT = \frac{10 \times 3000 \times 9{,}7}{1000 \times 10} - 8 = 21{,}1 \text{ Kohm}$$

We will use RDT= **22 Kohm.**
If the result from formula is zero make a bridge. If the result from formula is negative you must change the tachogenerator with another with an higher kdt.

ADJUSTMENT VELOCITY IN ARMATURE FEEDBACK

Armature voltage can be used as velocity feedback, when motor has not tachogenerator .
The armature feedback system has less precision than a tachogenerator.(range 1/20 and when the motor is stopped it has no torque).
For enable this function close solder bridge JP 6 and open solder bridge JP 10(disable tachogenerator alarm).
Insert RA resistance on the header between pin 2-13 for adapt system at the voltage motor costant.
The value of RA resistance can be calculated using the following formula:

MS 60 $RA_{(k\ ohm)} = 166 \times \frac{Vref}{E - 1{,}4\ Vref}$

MS 140 $RA_{(k\ ohm)} = 159 \times \frac{Vref}{E - 3{,}3\ Vref}$

MS 200 $RA_{(k\ ohm)} = 158 \times \frac{Vref}{E - 5\ Vref}$

$$E = \frac{n \times Ke}{1000}$$

Ke= fcem at 1000 rpm.
Vref = max. Voltage reference
n=max desired speed expressed in rpm

Example:

KE MOTOR=50V **n**=4000 giri/min **Vref**=10V

$$E = \frac{4000 \times 50}{1000} = 200$$

MS 200 $RA_{(k\ ohm)} = 158 \times \frac{10}{200 - 5 \times 10} = \mathbf{10.5}$ Kohm

So the value of the resistance is 10 k.
We will obtain fine speed operating with vel potentiometer on front panel.

Insert RCA resistance between pin 6-9 of the header for compensate internal RI of the motor.
Use the following formula for determining the value.

n = max. speed in rpm.
Ra total resistance (cold).
Ipk peak current of driver size.

$$RCA_{(k\ ohm)} = 0{,}45 \times \frac{n \quad Ke}{Vref\ Ipk\ Ri}$$

Example:

Amplifier 10/20 A , **Ra=**2.5 ohm

$$RCA_{(k\ ohm)} = 0{,}45 \times \frac{4000 \times 50}{10 \times 20 \times 2.5} = 180\ Kohm$$

Use 180 Kohm resistance or a bit higher .

I If after this operation motor is instable,a bigger commercial resistor value must be choosen,changing the previous one.

We recommend to not exceed with the dynamic gain of the velocity loop (kv potentiometer) for avoid control instability.
It is also important the ratio between VDC power supply and V motor for the stability.
Specially for armature feedback avoid reports VDC/V motor greater 1.5.

Example: MS 140 armature feedback,supplied 130v with voltage motor at max speed 40 v.

$$\frac{130}{40} = 3{,}25 \qquad \textit{NO !}$$

OFFSET SPEED CALIBRATION

The amplifier is provided with the offset speed calibration performed for tacho feedback.
If necessary,retouch through bil potentiometer for correct offset.(until +/-200 mv can be compensated on analogue input).When we have zero input reference,turn potentiometer until servomotor is stopped.

When you use amplifier in armature feedback please proceed with the offset calibration as follows:
- Insert RA and RCA resistance calculated (see page 27).
- Insert a voltmeter between Im test point and zero (see page 6) and turn bil trimmer to reach zero voltage respect to tacho mode ,bil trimmer has to be turned more times stop trimmer when motor shaft stops.But no loads are to be applied during this calibration.

RATED CURRENT CALIBRATION

The amplifier is provided with standard calibration.
It correponds at rated current of the size,Rin not mounted.
For reduce itself,insert RIN resistance between 4-11 pin of the personality header.
Typical values are reported below.
Is not suggest to use a lower value than the reported one of 820 ohm.

Taglia/ RIN(Kohm)	-	18	10	8.2	5.6	4.7	3.9	3.3	2.7	2.2	1.8	1.5	1.2	1	0.82
02/04	2	1.9	1.8	1.7	1.6	1.55	1.4	1.3	1.2	1.15	1.1	1	0.9	0.8	0.7
04/08	4	3.7	3.5	3.4	3.2	3.1	3	2.8	2.7	2.5	2.3	2.2	2	1.9	1.7
08/16	8	7.5	7.2	6.8	6.5	6.2	6	5.7	5.4	5	4.6	4.4	4	3.7	3.3
10/20	10	9.3	9	8.5	8	7.7	7.4	7.1	6.7	6.2	5.8	5.4	5	4.6	4.2
14/28	14	13	12.3	12	11.2	11	10.5	10	9.2	8.8	8.1	7.5	7	6.5	6
20/40	20	18.8	18	17.4	16.2	15.8	15	14.5	13.5	12.7	11.9	11	10.2	9.4	8.6
25/50	25	22	21	20.5	19	18.5	17	16	15	14	13	12	11	10	9.5

RATED CURRENT TIME INTERVENTION

Minispeed amplifiers provide peak current for 2 sec.
If nominal current is lower then the current of amplifier,intervention time is lower than 2 sec on the same ratio.

PEAK CURRENT CALIBRATION

If we insert RIP resistance on the personality header between 5-10 pin,we can limit peak current.
Below is reported a table with re-entry current.

Taglia/RIP(Kohm)	-	220	150	100	82	68	56	47	39	33	27	18
02/04	4	3.7	3.6	3.3	3.2	3.1	3	2.8	2.7	2.5	2.3	2
04/08	8	7.3	7.1	6.7	6.4	6.2	5.9	5.6	5.3	5	4.6	4
08/16	16	14.5	14	13.2	12.7	12.2	11.6	11	10.5	9.8	9.2	8
10/20	20	18	17.4	16.3	15.5	15	14.4	13.7	13	12.1	11.4	10
14/28	28	26	25	23.5	22.6	21.8	20.8	19.8	18.7	17.5	16.5	14
20/40	40	37.8	36	34.1	33	31.7	30	28.9	27.1	25.8	23.8	20
25/50	50	46.9	44	41.7	40.3	38.5	36.9	34.9	33	31	28.9	25

ACC/DEC TIME CALIBRATION

JP1	JP2	JP8	FUNCTION	RANGE	NOTES
●	◐	◐	acc/dec off	0 sec.	Standard adjustment
●	●	●	acc/dec on	0,1 / 1 sec.	Adjustable by acc potent.
◐	●	●	acc/dec on	By ramp resistance	Adjustable by acc potent.

Res RAMP	680K	820K	1Mohm	1,5Mohm	2,2Mohm	3,3Mohm
Time	0,2 s - 2,6s	0,3s - 3,2s	0,4s - 3,9s	0,6s - 5,7s	0,8s - 8,6s	1,4s - 13s

DYNAMIC CALIBRATION

Calibration for qualified personnel !

Usually,these calibration,are made from the factory.
If we have very high load inertia (report 3:1 between inertia load and inertia motor) we must modified KV gain “KV”potentiometer and increasing the derivative function “der potentiometer”.
The calibration must be made with load,connected to the motor.
Apply square wave(0,5 hz +/- 1v) at the input reference.
Connect at tachogenerator input an oscilloscope with memory (ground probe must be connected at zero signal).
Then turn the trimmer der in anticlockwise sense.
Before look for safety space during alternative mote.
Apply power to the amplifier and enable it machine will move itself up and down.If possible increase voltage to +/-2volt when the oscilloscope signals on monitor making a comparation with the wave shape on following page and do as suggested.

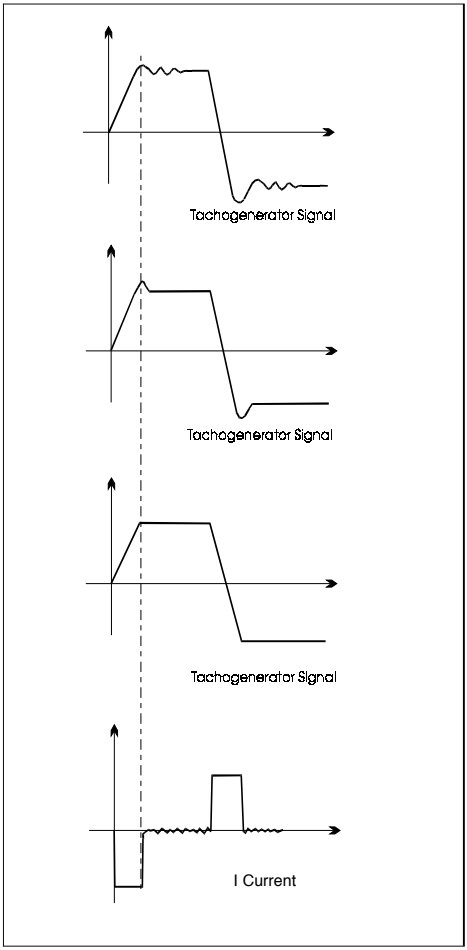
FOLLOW DYNAMIC GAIN

Proportional integral gain low

Increase gain turning in clockwise sense “KV” potentiometer until obtain a response similar as shown.

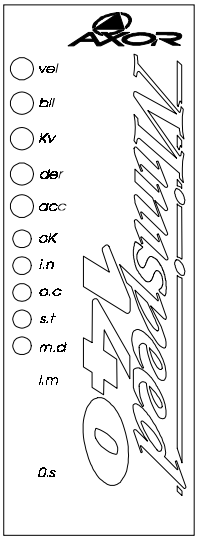
For reduce the overshoot turn in clockwise sense”DER” potentiometer until obtain a response similar as shown.

Attention: Do not exceed with gain,you can cause an useless motor heating the motor’s due to swing following current oscillations.
(TP1-TP2)



5.1 Led's diagnostic

Led's diagnostic



OK LED **(green normally light on)**
This led shows proper functioning of the amplifier.
It switch off when is activated a whatever protections shown also from red led light on.
It switch off when over/under voltage protection is activated.

I.n. LED **(Red normally switch off)**
When this led is lighted protection IxT is activated, limit and max current provided is the rated current.
This “alarm” don’t cause the disabilitation of the amplifier.
The amplifier return automatically to normal work when current consuption goes to a normal value.
If the JP 9 solder bridge is closed is not activated the interdiction of the output transistor and the switching off of the green led (drive ok see page 10)

O.C. LED **(RED normally switch off)**
Alarm of over current fault.
The power switching of the drive is continuosly monitored,and circuit will disable power section if any of the following faults occur:
-Motor armature leads shorter
-Motor armature shorted to ground
-Motor armature shorted to power supply
This fault provoke the memorization of the alarm;can be reset by turning off the main power for several seconds,and then turning it on again.

S.T. LED (**red normally switch off)**
Alarm of over temperature fault.The power switching bridge is provided with a thermoswitch which opens when the temperature exceeds a safe operating level.
This fault provoke the memorization of the alarm.It can’t be reset.We must wait or a lower heatsink temperature and then turning on the main power.

M.D.LED **(Red normally switch off)**
Alarm of loss of tachogenerator signal or tachogenerator signal reverse.
This fault provoke the memorization of the alarm.

5.2 Protection circuit

Minispeed amplifier has protective circuits for safeguard the servomotor and the amplifier too.All protections are annunciated in front of the amplifier.(see page 31)
When a protection goes on it provokes the memorization of the alarm,switch off of the green OK led and disable 2ac pin(interdiction of the transistor=off).
When In red led is on this don't provokes the memorization of the alarm but disable 2ac out (interdiction of the transistor=off),but if JP9 solder bridge is closed.
There are two types of faults:reversable or irreversible.

Reversible protection: The amplifier will enable as soon as the current or voltage returns to on acceptable operating level.

Irreversible protection: The amplifier won't enable.We must switch off the power supply,eliminate the fault cause and start again the amplifier after a minimum amount of time for be sure of complete capacitors discharge.

REVERSIBLE FAULT

Over under voltage Is activated when the power supply come out from the table described below.

MODEL	UNDER VOLTAGE	OVER VOLTAGE
MS 60	20 V	84 V
MS 140	40 V	182 V
MS 200	58 V	275 V

Limit of the current Is activated when the IxT cycle of the amplifier is exceeded.

IRREVERSIBLE FAULT

Temperature (S.T.) The power switching bridge is provided with a termoswitch wich opens when the temperature exceeds a safe operating level.

Short Circuit Is activated when there is a short circuit on the motor.

Broken tacho generator Is activated when tachogenerator is open, short circuited, or reversal,for preventing motor runaway.

5.3 Fault research

1) When we applying power OK green led doesn't light.

Supply voltage not correct	- Control by instrument between +AT and -AT

2) OK green led is light,but servomotor don't start when we enable the amplifier.

Velocity signal isn't present	- Verify input signal

3) When we enable amplifier,OK green led doesn't light and O.C. red led is lighted.

There is a short circuit on motor **Wire or servomotor winding is connect to ground**	- Turn off the main power - Verify the proper wiring - Verify the motor - Disconnect the servomotor and verify its insulation with a tester.

4) When we enable ,the servomotor runaway and **m.d.** red led is lighted.

There isn't present tacho signal **Motor cables or tacho cables are reversal**	- Turn off the main power - Verify with an instrument, the value directly on the amplifier's terminals. - Invert motor or tacho cables

5) With armature feedback,when we enable ***m.d.*** red led is lighted

Solder bridge JP 10 close	- Open solder bridge

6) When we enable the servomotor is stop and ***m.d.*** red light is lighted.

Motor isn't connect	- Verify the presence of connections.

7) When we enable servomotor turn at high speed and ***m.d.*** red led doesn't light

Potentiometer speed calibration isn't correct.	- Verify the proper procedure about "ADJUSTMENT" (see page 26/27).

8) During the deceleration phase OK green led switch off.

Voltage exceed maximum limit	- Verify the capacitor values(see chapter power supply page 34).

9) During the working phase S.T. red led lighted and sevomotor stop.

Happened max temperature thermoswitch	- Room temperature is greater then 40 °C. - There isn't present forced cooling where is required.

Options

Regenerative modules

If during the deceleration phase,green OK led switch off ,we suggest to increase the external capacitor.
When inertia load is elevated ,often external capacitor it's not enough and then we must use the regeneratives modules.

Rack regenerative module (same size of an amplifier)	**SHR 60 / 140 / 200**
Motherboard regenerative module	**SPGR 60 / 140 / 200**

External series inductor

These amplifiers need inductor connected in series to the motor only if the motor has a internal inductance lower then 0,7-0,8 mH.
So we improve form factor and the servomotor don't over heating.

NOTE
IN the electric box,the inductance,must be connected with short wires between amplifier and inductance too.

Accessories

DESCRIPTION	CODE
Single phase bridge 35A-600V	PM 3506
Three phase bridge 25A-800V	PT 2508
Capacitor 10000mF/100V x MS60	C10-100
Capacitor 4700mF/200V x MS140	C47-200
Capacitor filtro 10000mF/200V x MS140	C10-200
Mother board	SPG
Mother board with braking circuit	SPGR
Encoder feedback board	SRE
PWM optional card	PWM
Rack	RK....
Chokes	LX....
Single phase transformer	TM....
Three phase transformer	TT....

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