EASY FD 600

(DIGITAL SERVO AMPLIFIER FOR BRUSHLESS MOTOR)



INSTRUCTION AND USER MANUAL

ELCOM srl
ELETTRONICA INDUSTRIALE
COMO ITALY

All rights reserved.
All information contained herein is for reference purposes only. Information may be changed without prior notice. ELCOM srl shall not be held responsible for errors or damage related to use or incorrect interpretation of instructions described herein. This document cannot be reproduced, entirely or in part, without written consent.

CONTENTS

FOREWORD…...…… 3

LIST OF MODELS……..…… 3

ELECTRICAL SPECIFICATIONS…..……4

PROGRAMMING MODE……...…….4

DYNAMIC EFFICIENCY……6

SAFETY FEATURES……...7

TEST POINTS…..……...8

OPERATING STATUS DISPLAY…….…….9

INSTALLATION……11

CONNECTING TO MAINS…….11

CONNECTING TO MOTOR……12

CONNECTING THE CLAMP RESISTORS……12

CONNECTING THE RESOLVER……13

CONNECTING THE CONTROL DEVICES……..…….13

SETTING THE PARAMETERS……..…….15

ELECTROMAGNETIC COMPATIBILITY (EMC PRESCRIPTION)……..19

DIMENSIONS AND BORING TEMPLATES FOR FIXING…….26

DIGITAL SERVO - AMPLIFIER FOR BRUSHLESS MOTOR

FOREWORD

The **EASY fd 600** is a PWM-modulated JGBT three-phase converter for brushless motors equipped with resolver transducer.
It is fully protected, insulated by a galvanized metal casing and uses the most advanced components to obtain the best results in terms of both performance and reliability.
Connected directly to **400VAC 3-phase mains.**
Internal service power supply, with possible power source from 400VAC 3-phase mains or as a 110/230VAC single-phase option (used to keep encoder emulation alive when power is switched off).
Optimized digital adjustments and settings to make start-up easier.
Parameter programming and setting by keyboard on front panel or by PC serial line RS232.
Front-end connections.
Operating status and/or error displayed on a 5-digit display.
Option:
- Internal EMI filter to reduce mains eddy currents in accordance with EC standards.

List of EASY$_{FD}$ 600 Servo-Amplifier Models :

Model	Power supply	Rated current	Max Current	Dimensions
EASYFD 600 - R04	400 Vac +10/-20%	4 A rms	8 A rms	290 x 63 x 227 (mm)
EASYFD 600 - R08	400 Vac +10/-20%	8 A rms	16 A rms	290 x 63 x 227 (mm)
EASYFD 600 – R12	400 Vac +10/-20%	12 A rms	24 A rms	290 x 73 x 227 (mm)
EASYFD 600 – R16	400 Vac +10/-20%	16 A rms	32 A rms	290 x 73 x 227 (mm)
EASYFD 600 – R20	400 Vac +10/-20%	20 A rms	40 A rms	290 x 108 x 227(mm)
EASYFD 600 – R32	400 Vac +10/-20%	32 A rms	64 A rms	290 x 141 x 227(mm)
EASYFD 600 – R40	400 Vac +10/-20%	40 A rms	80 A rms	290 x 156 x 227(mm)
EASYFD 600 – R50	400 Vac +10/-20%	50 A rms	100 A rms	290 x 156 x 227(mm)
EASYFD 600 – R150	400 Vac +10/-20%	150 A rms	300 A rms	525 x 212 x 327 (mm)
EASYFD 600 – R300	400 Vac +10/-20%	300 A rms	500 A rms	525 x 255 x 327 (mm)

ELECTRICAL SPECIFICATIONS

POWER SUPPLY

Mains voltage	Vac	**400 Vac 3-phase +10% / -20%**
Mains frequency	Hz	**45 to 60 Hz**
Max V bus clamping	Vdc	**730 Vdc (**max internal bus voltage during braking cycle)
Input circuit current rating	A	**4 to 300 A (**according to size of converter used)

TECHNICAL SPECIFICATIONS

Operating temperature	C°	0 to 45 C° (ventilation may be required, depending on converter size)
Continuous current (Stall current)	A	**04 to 300 A (**according to size of converter used)
Max current (peak current)	A	**08 to 500 A (**according to size of converter used)
PWM frequency	kHz	**18 to 5 kHz (**depending on converter size, PWM overmodulation for optimum zero crossing and obtaining high performance current loop)
Max output voltage to motor	Vac	Max 0.96 Vac input line

Vbus overvoltage cut-out	Vdc	**Max 780 Vdc**
Vbus undervoltage cut-out	Vdc	**Min 180 Vdc**
Power dissipated by utilities	W	**11 W**
Power circuit efficiency rating	%	**95 to 97%** **(**depending on size of converter used)
Max temperature of radiator	C°	**85 C°** **(** threshold for overload cut-out)
Resolver excitation frequency	kHz	**12.5 kHz** **(** sinusoidal excitation)
Resolver conversion	Res.	12/ 14 bit resolution, standard **16 bit resolution Optional**
Motor pole selection		**2 / 4 / 6 / 8 / 12** Brushless motor poles
Encoder emulation	I/G	128 to 1024 I/G = 12 Bit resolution 1024 to 4096 I/G = 14 Bit resolution **4096 to 16384 I/G = 16 Bit resolution (Optional.)**
Follow - up error output	Rpm	Circuit indicating follow-up error ref V / Velocity with programmable thresholds (rpm and time) Optoisolator output = **20mA 24VDC (closed when drive OK) Be careful of polarity!!!**
Converter overload cut-out pre-alarm output	C°	Circuit with programmable threshold allowing indication that the safety temperature, set to allow controlled drive switch-off, has been attained. Optoisolator output = **20mA 24VDC (closed when drive OK) Be careful of polarity!!!**
Converter fault output	mA / Vdc	Optoisolator out = **20 mA 24Vdc (closed when drive OK) Be careful of polarity!!!**
Reference input (differential)	V /Kohm	**Analog input = (+/-7,0 to +/-10 V)** Programmable within the range specified. **10 Kohm input impedance**

Input Enable (Optoisolated)	mA / Vdc	Optoisolator input = 20mA, 12 to 24Vdc **5 Kohm input impedance**
Input 1 (Optoisolated)	mA / Vdc	Optoisolator input = 20mA, 12 to 24Vdc **5 Kohm input impedance**
Input 2 (Optoisolated)	mA / Vdc	Optoisolator input = 20mA, 12 to 24Vdc **5 Kohm input impedance**

DYNAMIC EFFICIENCY

Velocity loop pass-band	Hz	**300 Hz**
Current loop pass-band	Hz	**3000 Hz**
Pass-band low-pass filter V reference input	Hz	Two-level setting: - **200 Hz** Velocity mode - **2000 Hz** Current mode
linearity	%	Less than **0.5%**
Max speed tracking rate resolver	rpm	12 bit resolution **……= 15.000 rpm** 14 bit resolution**…….= 3.600 rpm** **(16 bit resolution= 960 rpm Optional.)**

SAFETY FEATURES

- **Overvoltage**
- **Undervoltage**
- **Converter overload cut-out**
- **Motor overload cut-out**
- **Short-circuit between phase/motor phase and to ground**
- **Motor overcurrent**
- **Clamp resistor overcurrent**
- **IxT**
- **Error in resolver connections**

TEST POINTS

The front panel has 5 test points used to display the following values:

- **TP AVERGE……= average current to motor**
- **TP CURR…….....= instantaneous current input to motor**
- **TP VELOC……...…= motor speed**
- **TP REFER……...= V Reference (velocity/torque) applied to converter**
- **TP GND……..…….= signal ground**
-

N.B. Test points (Averg, Current) take a constant voltage/current depending on converter model used, as per table below:

MODEL	TP AVERAGE	TP CURR	TP VELOCITY	TP REFER.
EASYFD 600 – R04	4.5V = **4 Arms**	**400** mV / A	2.33 V/Krpm (**14bit**) 0.58 V/Krpm (**12bit**)	2.10 Vmax @ 10 Vinput
EASYFD 600 – R08	4.5V = **8 Arms**	**300** mV / A	2.33 V/Krpm (**14bit**) 0.58 V/Krpm (**12bit**)	2.10 Vmax @ 10 Vinput
EASYFD 600 – R12	4.5V = **12 Arms**	**200** mV / A	2.33 V/Krpm (**14bit**) 0.58 V/Krpm (**12bit**)	2.10 Vmax @ 10 Vinput
EASYFD 600 – R16	4.5V = **16 Arms**	**100** mV / A	2.33 V/Krpm (**14bit**) 0.58 V/Krpm (**12bit**)	2.10 Vmax @ 10 Vinput
EASYFD 600 – R20	4.5V = **20 Arms**	**100** mV / A	2.33 V/Krpm (**14bit**) 0.58 V/Krpm (**12bit**)	2.10 Vmax @ 10 Vinput
EASYFD 600 – R32	4.5V = **32 Arms**	**82** mV / A	2.33 V/Krpm (**14bit**) 0.58 V/Krpm (**12bit**)	2.10 Vmax @ 10 Vinput
EASYFD 600 – R40	4.5V = **40 Arms**	**60** mV / A	2.33 V/Krpm (**14bit**) 0.58 V/Krpm (**12bit**)	2.10 Vmax @ 10 Vinput
EASYFD 600 – R50	4.5V = **50 Arms**	**50** mV / A	2.33 V/Krpm (**14bit**) 0.58 V/Krpm (**12bit**)	2.10 Vmax @ 10 Vinput
EASYFD 600 – R150	4.5V = **150 Arms**	**15** mV / A	2.33 V/Krpm (**14bit**) 0.58 V/Krpm (**12bit**)	2.10 Vmax @ 10 Vinput
EASYFD 600 – R300	4.5V = **300 Arms**	**10** mV / A	2.33 V/Krpm (**14bit**) 0.58 V/Krpm (**12bit**)	2.10 Vmax @ 10 Vinput

OPERATING STATUS DYSPLAY

The 7-window, 5-digit display on front side shows operating status of converter while showing all programming functions obtained by the three keys.
Under normal working conditions, **disab appears** when converter is disabled and no errors haveoccured.
When the Drive is enabled, **disab disappears** and the display shows **GO** and rotor angle (brushless motor) -one window only is lit (segment's direction of rotation indicates motor's direction of rotation).

Every error (excepting Ixt error) disabled the converter and a FAULT message appears.

On each switch -on, the converter sets on a function (FF - 40) corresponding to the monitoring function; in case of error, the dysplay flashes and shows the error code.

When while using a function other than the monitoring function (FF - 40) the display flashes, this means that an error has occurred. To display this error, select function (FF - 40); every error is stored and dysplayed according to the error codes shown in the table below.

To reset after an error, run through a **disable / enable** cycle.

DISPLAY STATUS

d i s a b	**DISAB** appears when converter **is not enabled** and no errors have occurred
GO. -	**GO.** Appears when converter **is enabled** and no errors have occured; on the right, a hyphen will appear to show motor's direction of rotation.

EE -- 01 (flashing)	**Error: 1 - Undervoltage / Overvoltage.** Check that 400VAC supply voltage falls within tolerance values. Check mains fuses, **clamp resistors** connection and correct value.
EE -- 02 (flashing)	**Error: 2 - Drive/Motor overload cut-out.** Check converter temperature, cabinet ventilation. Check motor temperature, motor overload cut-out connection
EE -- 03 (flashing)	**Error: 3 - IxT safety feature.** Check for corret motor phase connection, motor brake voltage. Check setting of number of motor poles, mechanical friction or crawling.
EE -- 04 (flashing)	**Error: 4 - Resolver error.** Check resolver connections.
EE -- 05 (flashing)	**Error: 5 - Overcurrent.** Check for short-circuits between motor phases and to ground. Check max current setting.
EE – 06 (flashing)	**Error: 6 - Under/Overvoltage and overload cut-out.** Check 400VAC supply voltage and drive/motor temperature. Check mains fuses and motor overload cut-out connection.
EE – 07 (flashing)	**Error: 7 - Under/Overvoltage and resolver error.** Check 400VAC supply voltage and resolver connection **(CN2)** Check mains fuses and resolver connection **(CN2)**
EE – 08 (flashing)	**Error: 8 - Under/Overvoltage and Overcurrent.** Check 400VAC supply voltage and short-circuits between motor phases Check **clamp resistor** connections and short-circuits between motor phases and ground.
EE – 09 (flashing)	**Error: 9 - Overload cut-out and IxT safety feature activated.** Check converter temperature and motor phase connections. Check kinematics, mechanical friction or crawling.
EE -- A (flashing)	**Error: A - Overload cut-out and Overcurrent safety feature activated.** Check converter temperature and cabinet ventilation Check converter temperature and short-circuits between motor phases.
EE -- C (flashing)	**Error: C - Overload cut-out and resolver error.** Check that (resolver) **CN2** connector is plugged in. Check converter temperature and resolver connections.
EE -- E (flashing)	**Error: E - Under/Overvoltage and IxT safety feature activated.** Check 400VAC supply voltage and kinematics. Check mains fuses and mechanical friction or crawling.
EE -- F (flashing)	**Error: F - Simultaneous activation of more than one safety feature.** Simultaneous activation of several safety features.
EE -- H (falshing)	**Error: H -Under/Overvoltage, Ixt e Overcurrent .** Check 400VAC supply voltage, kinematics, motor phases. Check mains fuses, mechanical friction and short circuits between motor phases and ground
EE -- L (flashing)	**Error: L - Under/Overvoltage, Ixt and resolver safety feature.** Check 400VAC supply voltage.
EE -- P (flashing)	**Error: P - IxT safety feature and Overcurrent.** Check motor phase connections and max current. Check kinematics, mechanical friction and crawling, setting max current.

INSTALLATION

WARNING: The instructions given below must be followed carefully when installing an **EASY fd 600** Converter.

Fix the converter to the back plate of the swichboard or cubicle. The radiator must be in an upright position.

Leave a space of at least 20cm below and above the Drive.

When several converters are installed, proceed as follows:

NATURAL VENTILATION :

Leave a gap of at least 5cm between each converter.

FORCED VENTILATION :

In this case the converters can be installed side by side to save space.

GROUNDING :

EASY fd 600 Converters are made from galvanized sheet metal, so it is possible to ground them using either a screw on front panel or the back fixing plate.

N.B.: The converter must be grounded.

CONNECTION TO MAINS:

For connection, please refer to the **WIRING DIAGRAM** (pag. 30)

CAUTION! Be very careful when connecting the unit to 400VAC mains and to motor.

CAUTION! Do not touch or connect wires when they are live or when drive is on: **DANGER!!!**

CAUTION! Switch off power and wait at least 3 minutes (to allow internal capacitors to discharge) before connecting up to mains/motor/clamp resistors.

CAUTION! Do not open the converter: hazardous voltage inside. No fuses but electronic protections only, therefore no (fuse) replacement or repair is necessary or possible.

IF CONVERTER IS OPENED OR TAMPERED WITH, THE GUARANTEE IS VOID.

CONNECTION : 400VAC LINE

Fit series fuses to line as a protection against short-circuits. Use fuses suitable for 600VAC (refer to table in the wiring diagram) . As an alternative, use 3-phase thermal cut-outs.

According to application, a mains filter may be necessary to have system complying with EMC standards.
Some models (EASY fd 600 R32, R40, R50, R150, R300) are equipped with a mains filter; this solution may be convenient for both money-saving and assembly/space rationalization.

A power supply inside converter carries a circuit to limit current when mains power is turned on. Wait about 5/10 seconds between drive switching off and on, so that onrushcurrent protection circuit turns highly efficient.

WIRING TO MOTOR

Motor must be wired as shown in the next figure.
Use a shielded cable, possibly 3-wire + earth + shield.
Shield to be wired to both motor and converter sides (to its front panel screw).
Motor ground wire connection is likewise important, to be connectedto motor terminal and then to drive (to its front panel scew).

WARNING: Motor ground wire to be directly connected to converter then to ground through its body. This to prevent hight-frequency eddy currents from running through grounded cables.

CONNECTION: CLAMP RESISTOR

Connect only when a converter without **internal clamp resistor is used,** or when an external clamp resistor must be fitted, as application causes high machanical inertia when low friction occurs.
Use a twisted or shielded wire, max length 1.5m, to connect.
Wire and fix clamp resistor according to safety standards for 400VAC voltages.

CONNECTING THE RESOLVER (CN2)

CN2 9-pin connector, with casing (flying male)

Use a twisted twin cable (shielded individually + externally)

Pin 1	Motor overload cut-out
Pin 2	N.C.
Pin 3	+ Reference resolver (R1)
Pin 4	+ Sine resolver (S1)
Pin 5	+ Cosine resolver (S2)
Pin 6	Motor overload cut-out
Pin 7	- Reference resolver (R3)
Pin 8	- Sine resolver (S3)
Pin 9	- Cosine resolver (S4)

CONNECTING THE CONTROL DEVICES (CN3)

CN3 26-pin connector, with high-density casing (flying male)

Use a twisted twin cable (shielded individually + externally) for **encoder output**

Pin 1	**FAULT**	Optoisolated output (emitter) 24V 20mA
Pin 2	**+15 V**	50 mA max
Pin 3	**ENABLE**	(range +15V / +24V) High = Enable
Pin 4	**OUT 1 (-)**	Optoisolated output (emitter) follow-up error
Pin 5	**+ VREFERENCE**	+/- 10V max (10Kohm impedance differential)
Pin 6	**+15 V**	50 mA max
Pin 7	**CURRENTLEVEL**	Torque limitation (option)
Pin 8	**INPUT 1 (+)**	Optoisolated input (5Kohm current-limiting resistor incorporated)
Pin 9	**OUT 2 (+)**	Optoisolated output (collector) overtemperature pre-alarm
Pin 10	**FAULT**	Optoisolated output (collector) 24V 20mA
Pin 11	**OUT 1 (+)**	Optoisolated output (collector) follow-up error
Pin 12	**GND**	
Pin 13	**GNDENABLE**	0V Enable input (may be connected to GND)
Pin 14	**GND**	
Pin 15	**- VREFERENCE**	+/- 10V max (10Kohm impedance differential)
Pin 16	**-15V**	50 mA max
Pin 17	**GND**	
Pin 18	**INPUT 2 (+)**	Optoisolated input (5Kohm current-limiting resistor incorporated)
Pin 19	**UA**	Output encoder emulation (RS 422line driver)
Pin 20	**UA**	Output encoder emulation (RS 422line driver)
Pin 21	**UB**	Output encoder emulation (RS 422line driver)
Pin 22	**UB**	Output encoder emulation (RS 422line driver)
Pin 23	**U0**	Output encoder emulation (RS 422line driver)
Pin 24	**U0**	Output encoder emulation (RS 422line driver)
Pin 25	**GND**	
Pin 26	**OUT 2 (-)**	Optoisolated output (emitter) overtemperature pre-alarm

CONNETTING THE PC (SERIALE RS232) (CN1)

CN1 9-pin connector, with casing (flying female)

Use a shielded cable.

Pin 1	
Pin 2	RX (receiver)
Pin 3	TX (transmitter)
Pin 4	
Pin 5	GND
Pin 6	
Pin 7	
Pin 8	
Pin 9	

SETTING THE PARAMETERS

SETTINGS

EASY fd 600 Converter is designed to make parameter setting easier in order to allow user to quickly optimize Servo-amplifier star-up.

N.B.: Max speed depends on set resolver resolution (12-14 bit).

To change the parameters enter the Password, select DD-00 function then, through +/- keys, set digit 1234, then keep SEL button depressed until the Password is acknowledged.
Now settings can be changed.

LIST OF PARAMETER SETTINGS

FF- 00 = **Password**

FF- 01 = **Setting number of motor poles**

FF- 02 = **Setting resolver resolution (12 / 14 bit)**

FF- 03 = **Setting pulses/rev Encoder Emulation**

FF- 04 = **Setting IxT gain**

FF- 05 = **Selecting internal / external V Reference**

FF- 06 = **Setting operation Speed / Torque**

FF- 07 = **Selecting low-pass filter V.Reference**

FF- 08 = **Selecting Current Loop gain**

FF- 09 = **Setting Velocity Loop integrating gain**

FF- 10 = **Selecting Velocity Loop proportional gain**

FF- 11 = **Setting max motor current**

FF- 12 = **Setting motor nominal current**

FF- 13 = **Setting nominal value V.Reference (7,0 – 10,0 V)**

FF- 14 = **Setting motor speed (rpm)**

FF- 15 = **Offset adjustment**

FF- 16 = **Setting the ramp (optional)**

FF- 17 = **Setting follow-up error integration time**

FF- 18 = **Setting rpms for follow-up error**

FF- 19 = **Displaying (8 bit) Velocity reference**

FF- 20 = **Displaying (8 bit) Speed (rpm)**

FF- 21 = **Displaying(8 bit) motor instantaneous current (A)**

FF- 22 = **Displaying (8 bit) motor average current (A)**

FF- 23 = **Displaying (8 bit) Drive temperature (C°)**

FF- 24 = **Displaying converter size**

FF- 25 = **Setting Drive overtemperature threshold pre-alarm**

FF- 26 = **Displaying software version**

FF- 29 = **Selecting operating mode, Wave, fc-fc, Position controller**

FF- 30 = **Setting acceleration time (FF-29) (mS)**

FF- 31 = **Setting speed holding time (FF- 29) (mS)**

FF- 32 = **Setting speed (FF-29) (rpm)**

FF- 33 = **Selecting Start / Stop (FF-29)**

FF- 34 = **Displaying converter series number**

FF- 35 = **Reading parameters, user's auxiliary table**

FF- 36 = **Storing user's auxiliary table**

FF- 37 = **Reading default parameters (factory setting)**

FF- 38 = **Reading operating table parameters**

FF- 39 = **Storing operating table**

FF- 40 = **Monitoring operating status**

MOTOR POLE SETTING

Pole number can be selected as follows: 2, 4, 6, 8, 12 Poles.

ENCODER EMULATION SETTING (12 BIT)

Select 12 / 14 Bit resolution (12 Bit = 15.000 Rpm max, 14 Bit= 3.600 Rpm max)
For speeds **higher than 3.600 rpm,** select **12 bit** resolution.
The following settings can be selected for encoder emulation: **128-256-512-1024 I/g**

ENCODER EMULATION SETTING (14 BIT)

Select 12 / 14 Bit resolution(12 Bit = 15.000 Rpm max, 14 Bit= 3.600 Rpm max)
For speeds **lower than 3.600 rpm,** select **14-bit** resolution.
The following settings can be selected for encoder emulation: **512-1024-2048-4096 I/g**

RAMP TIME SELECTION (OPTIONAL)

An internal ramp circuit can be fitted on request; acceleration/deceleration times can be selected.

REFERENCE SETTING

Internal reference (replacing an external potentiometer, if any) or external V reference (standard) can be selected.

REFERENCE MODE SETTING

Shear frequency of low-pass filter V reference can be set at two levels.
Low -pass and high-pass filters must be set as follows: L.P. filter for speed mode, H.P. filter for torque mode.

VELOCITY LOOP GAIN SETTING

To optimize the dynamic response of the velocity loop, 4 pre-selected gain band levels can be used,

Very low
Low
Middle
High
The gain bans must be set according to the following criteria.

1) An appropriate setting must be used according to higher or lower motor coasting value + load; for low coasting . . . .**Very Low,** for high values ……**High.**

2) Gain can be further adjusted by using the **GAIN** Trimmer**.**

4) After setting max/continuous current values, turn on the converter, apply a small V reference command (+/- 1V), and check **VELOCITY Test Point** with an oscilloscope; if overshooting occurs, increase gain gradually using both gain bands and GAIN Trimmer.

CURRENT LOOP GAIN SETTING

Usually gain is set to **Low;** unless otherwise stated, make sure that it is set at this level as standard configuration.

GAIN IxT SETTING

Two circuit gain levels can be used.
Usually, gain must be set to **LOW**; in applications where a continuous (stall) current of motor is lower than 50% of continuous current for converter size, **HIGH** must be set.

NOMINAL (STALL) CURRENT SETTING

To set the nominal current supplied by converter, check motor rating current.

MAXIMUM CURRENT SETTING

To set maximum current supplied by converter, check motor rating current.

ELECTROMAGNETIC COMPATIBILITY (EMC PRESCRIPTION)

On the basis of tests and measurements carried out, EASY fd 600 converters were found to comply with the following standards:

INDUSTRIAL ENVIRONMENT	EN 50082-2 , EN 50081-2
EN 55011	RADIATED AND DRIVEN EMISSIONS
EN 61000-4	ELECTROSTATIC DISCHARGES
EN 61000-4	HIGH-ENERGY INTERFERENCE
EN 61000-4	BURST
EN 61800-3	POWER CONVERTERS SEMICONDUCTORS
ENV 50204	900MHz ELECTROMAGNETIC FIELD
ENV 50140	ELECTROMAGNETIC FIELDS

LOW VOLTAGE STANDARD.

The appliance must be connected as per these instructions if the unit is to comply with the above standards. Tests were performed with the device connected as shown on page 25.
Where specified, use shilded cables, fit a Siemens B 84143BR EMI filter. Models R32, R40, R50, R150 and R300 come with a built-in EMI filter.

MOTOR + CLAMP RESISTOR CONNECTION (ref. page 25)

Use a shielded cable (cable D) - 3 shielded wires + ground + cable shielding - max length 30m (MOTOR)
Use a shielded cable (cable G) - 2 wires + cable shielding - max length 1.5m (CLAMP RESISTOR)

SIGNAL CONNECTION (ref. page 25)

NOTICE! Connect motor ground to its screw on front panel + cable shielding.

RESOLVER CONNECTION
Use a 3 (single-shielded) twisted pair cable (cable E) + shielding.
Connect shielding to connector casing.

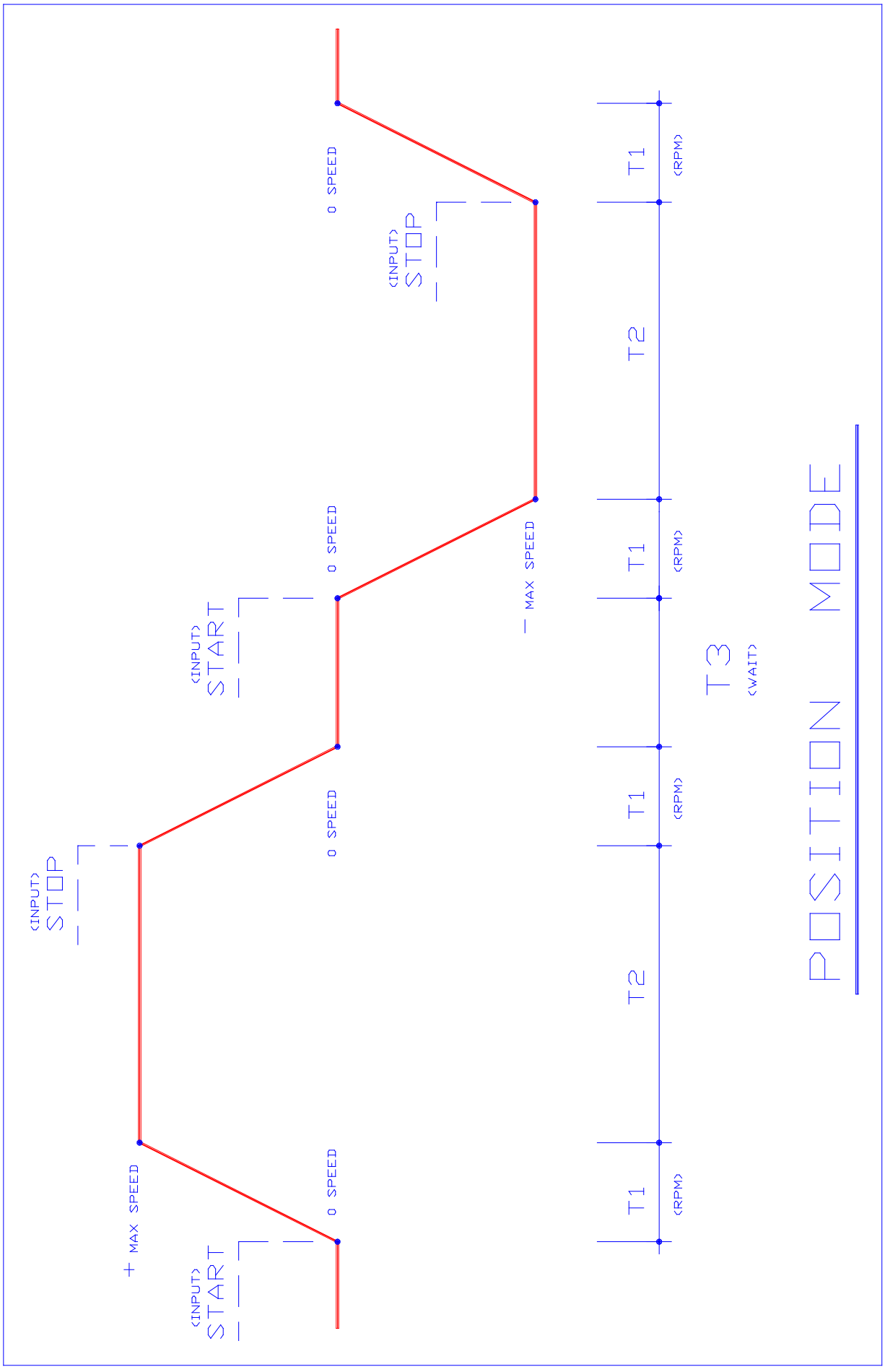
MAINS CONNECTION (Cable B)
1) Using an EMI filter: shielded cable from converter mains input to filter terminals.
2) Using converter's internal EMI filter (Converter models R32, R40, R50) unshielded cable.

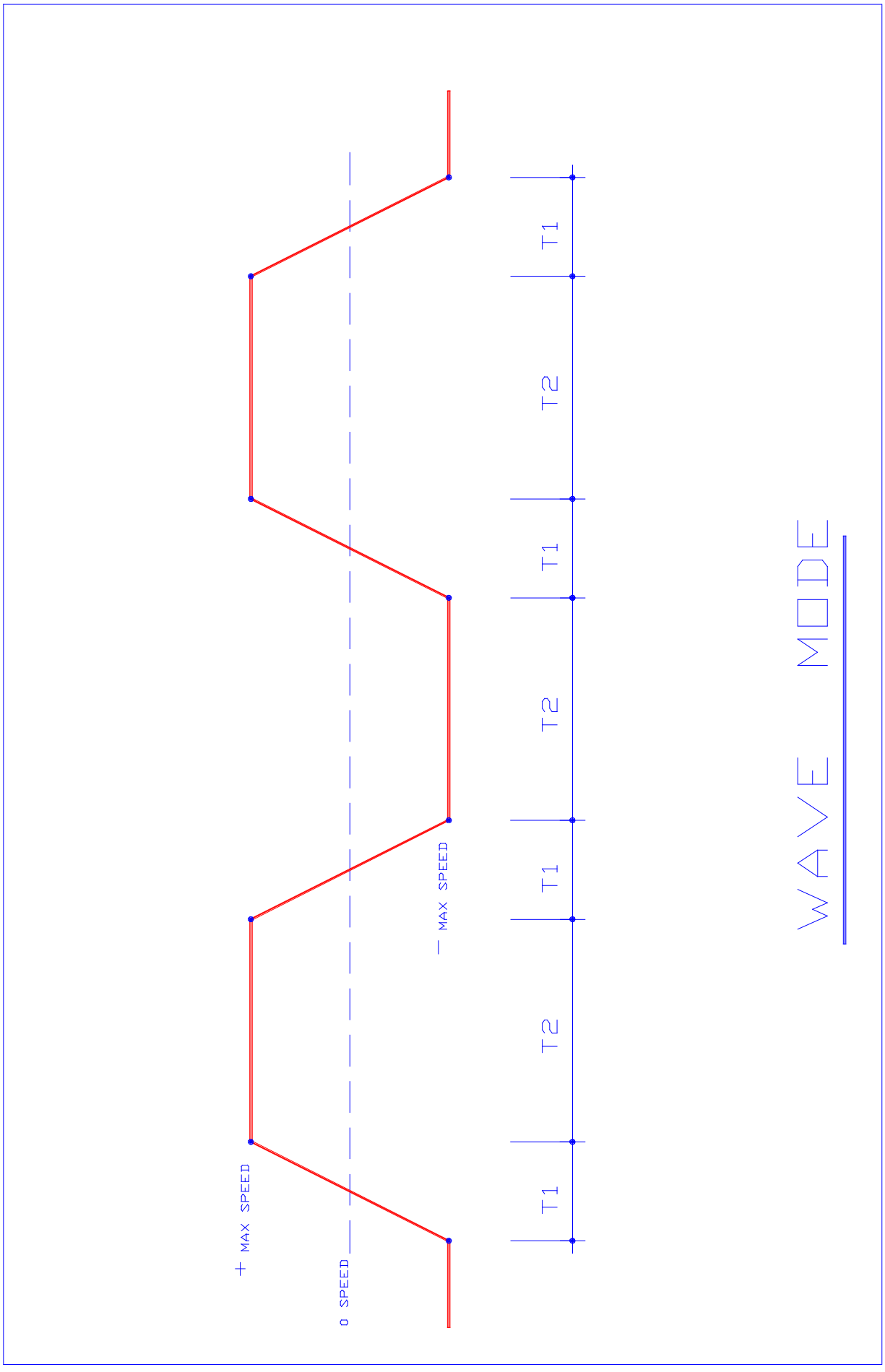
NUMERICAL CONTROL CONNECTION
Use a shielded cable (cable C). Shielding to group all connections.
NOTICE! Connect shielding to both converter and CNC (casing). **GROUND CONVERTER CASING.**

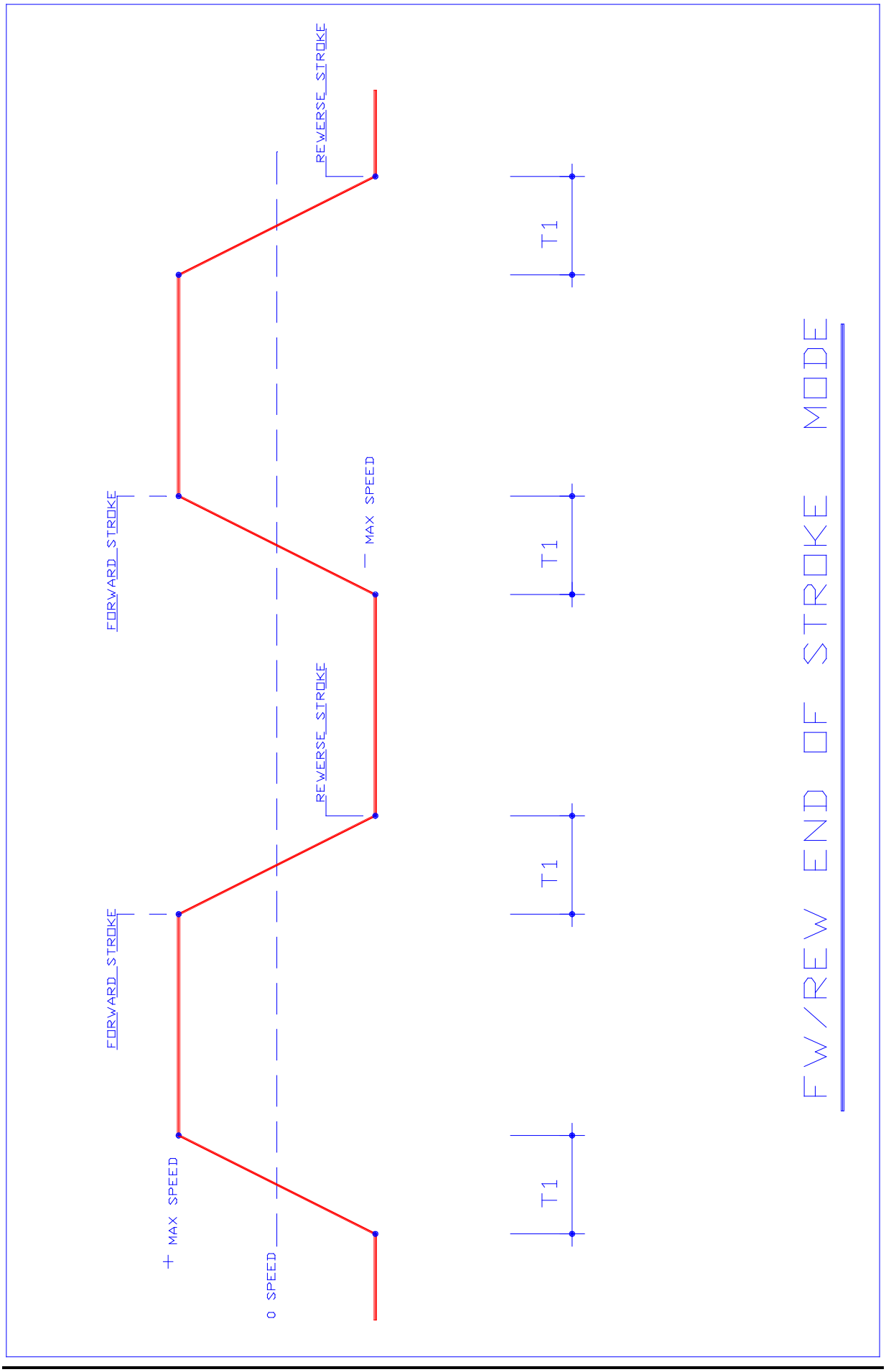
MOTOR + INDUCTANCE

When motors with torque and speeds exceeding 105 rad/sec. are used, a 3-phase inductance (1mH per phase) calculated at a working frequency of 1000Hz - must be mandatorily fitted to drives (R50, R150, R300) and motor.

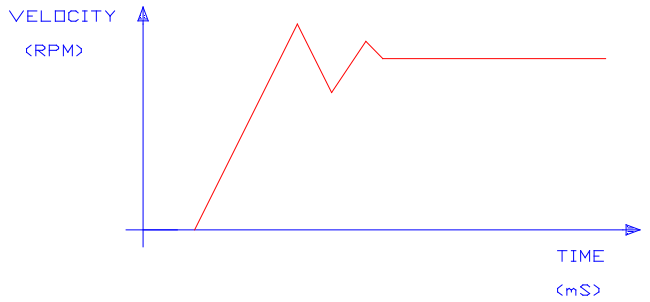
Use of an inductance is also advised when cable lenght from drive to motor exceeds 10 metres.


POSITION MODE
T1
T2
T1
T2
T1
T3
<RPM>
<RPM>
<RPM>
<RPM>
<WAIT>
0 SPEED
0 SPEED
0 SPEED
0 SPEED
+ MAX SPEED
- MAX SPEED
<INPUT>
START
<INPUT>
STOP
<INPUT>
START
<INPUT>
STOP

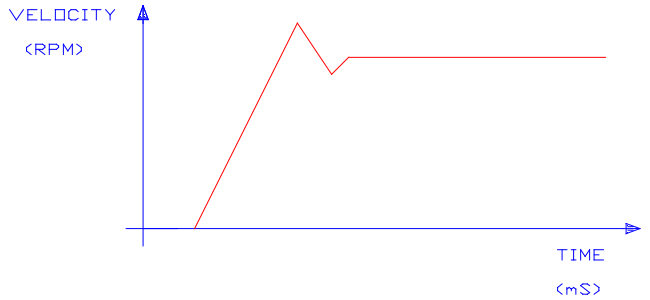

WAVE MODE
T1
T2
T1
T2
T1
T2
T1
- MAX SPEED
0 SPEED
+ MAX SPEED


REWERSE_STROKE
FORWARD_STROKE
- MAX SPEED
REWERSE_STROKE
FORWARD_STROKE
+ MAX SPEED
0 SPEED
T1
T1
T1
T1
F W / R E W E N D O F S T R O K E M O D E

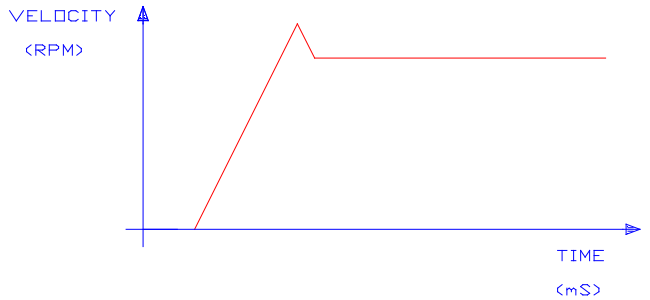
PROPORTIONAL SPEED LOOP GAIN



A

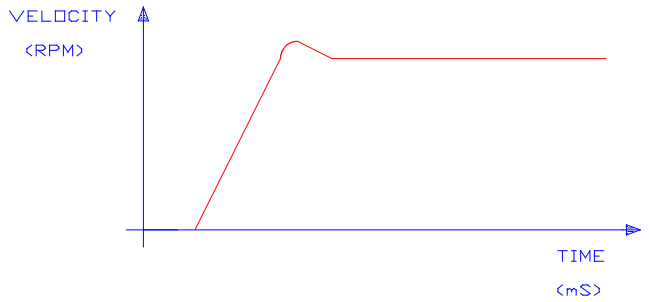


B

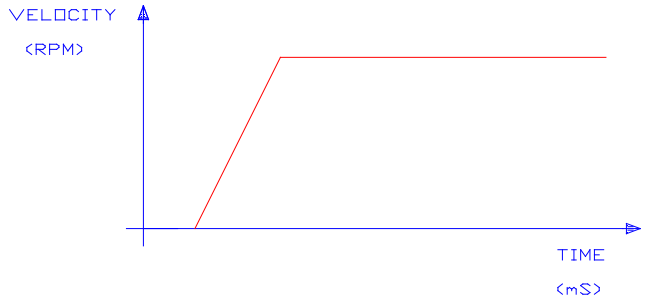


C

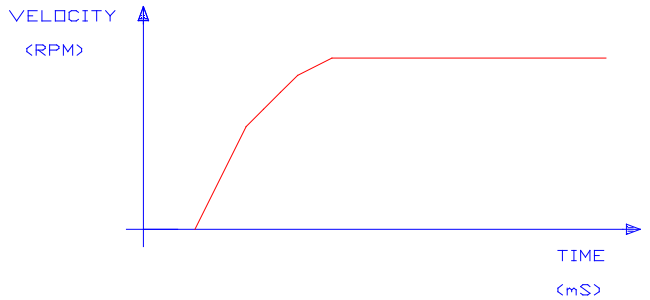
INTEGRAL SPEED LOOP GAIN



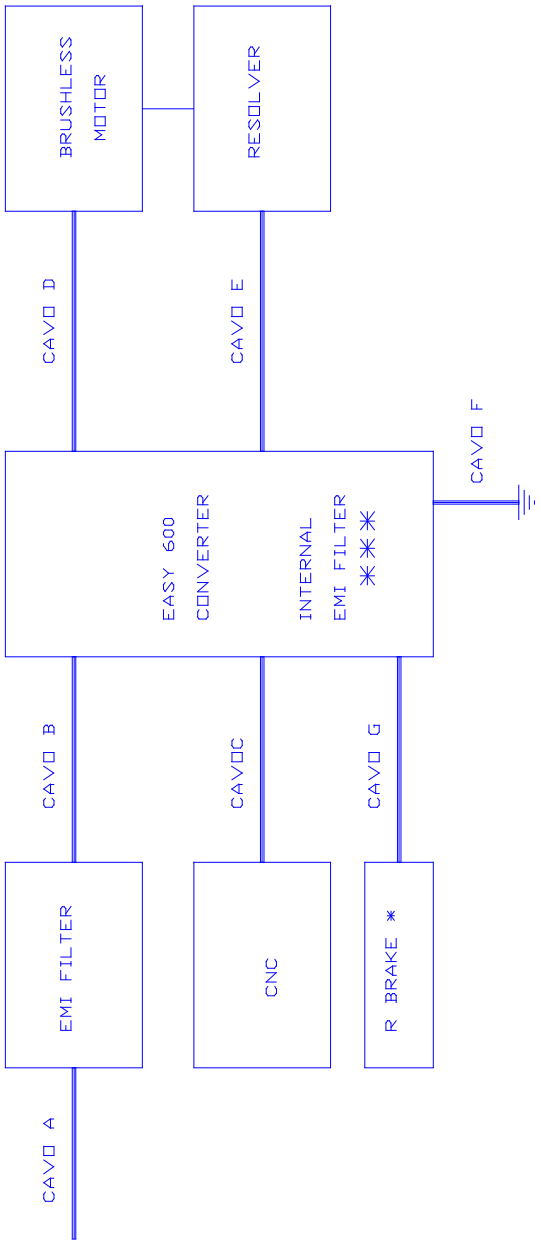
D



E

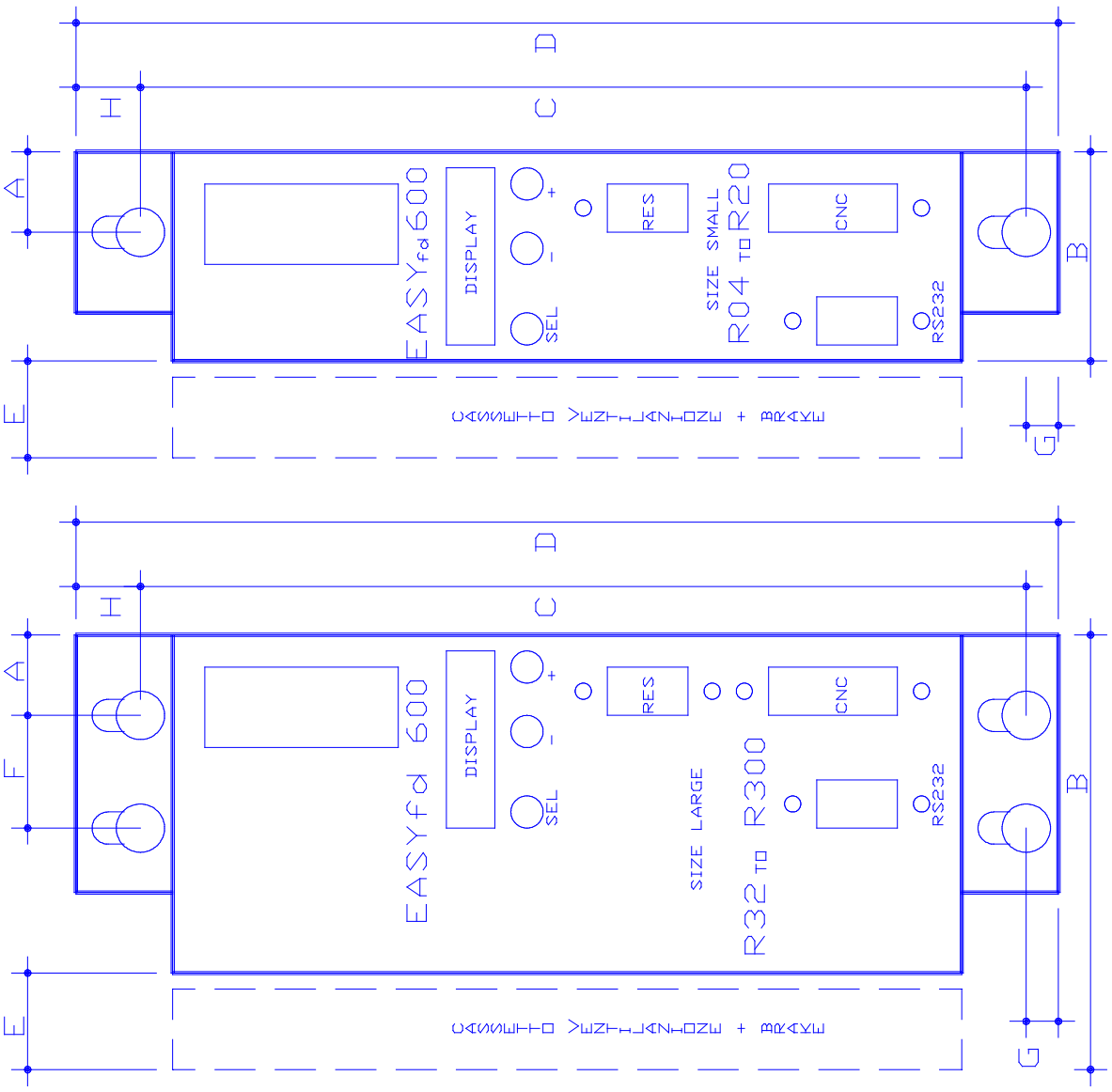


F



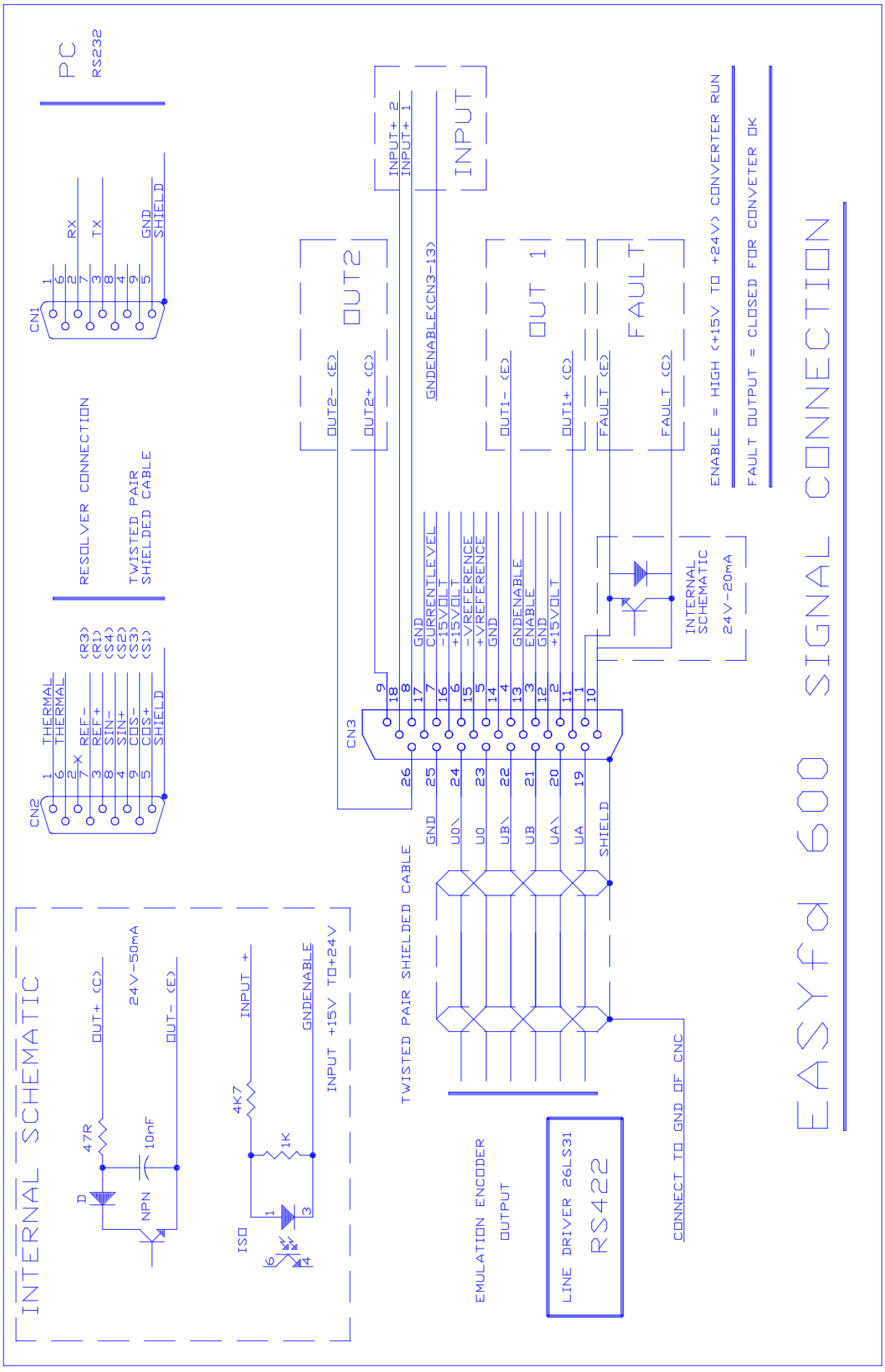
CAVO A	CAVO COLLEGAMENTO DALLA RETE AL FILTRO EMI
CAVO B	CAVO COLLEGAMENTO DAL FILTRO RETE AL CONVERTITORE
CAVO C	CAVO DI COLLEGAMENTO DAL CNC AL CONVERTITORE
CAVO D	CAVO DI COLLEGAMENTO DAL CONVERTITORE AL MOTORE
CAVO E	CAVO DI COLLEGAMENTO DAL CONVERTITORE AL RESOLVER
CAVO F	CAONNESSIONE DI TERRA DELLO CHASSIS (CALZA DI RAME)
CAVO G	CONNESSIONE R BRAKE (ESTERNA)

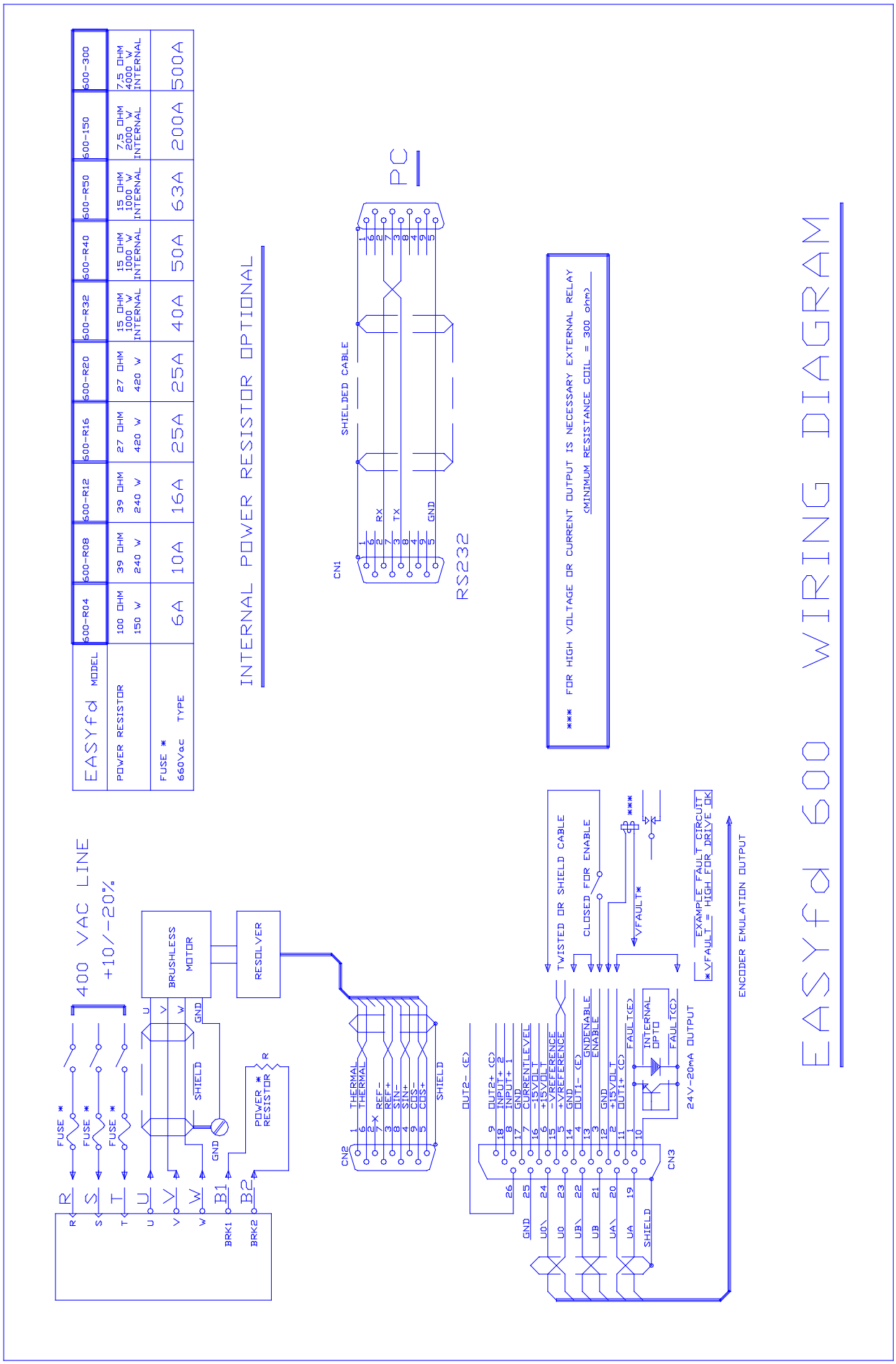
COMPATIBILITA' ELETTROMAGNETICA (EMC)

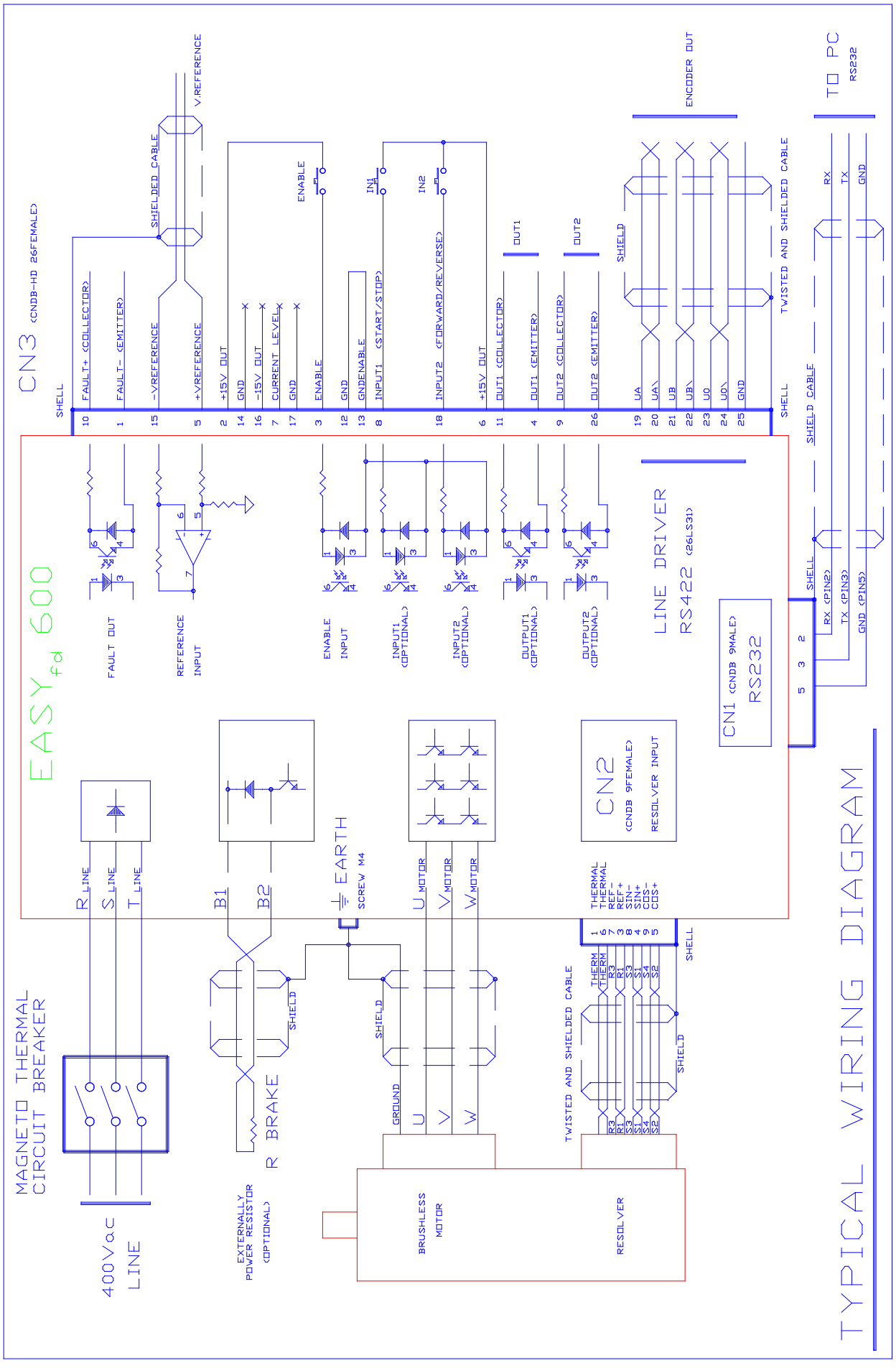


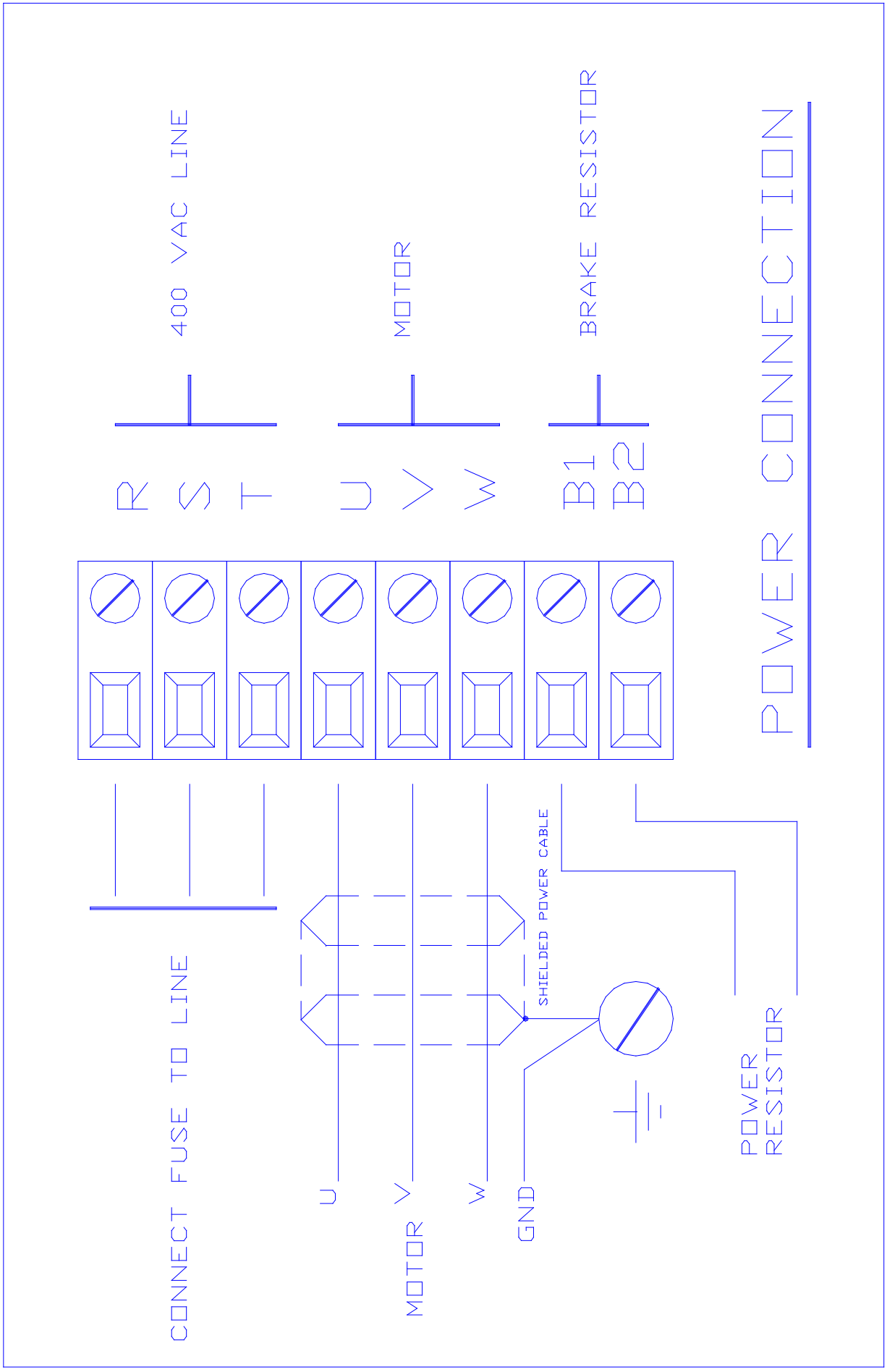
MODELLO	A	B	C	D	E	F	G	H
EASYfd 600 R04	24	63	263	290	35	/	9	18
EASYfd 600 R08	24	63	263	290	35	/	9	18
EASYfd 600 R12	24	73	263	290	35	/	9	18
EASYfd 600 R16	24	73	263	290	35	/	9	18
EASYfd 600 R20	24	108	263	290	35	/	9	18
EASYfd 600 R32	24	141	263	290	35	33	9	18
EASYfd 600 R40	24	156	263	290	35	33	9	18
EASYfd 600 R50	24	156	263	290	35	33	9	18
EASYfd 600 R150	24	212	489	525	40	84	9	18
EASYfd 600 R300	24	255	489	525	40	84	9	18

DIMENSIONI MECCANICHE


EASYfd 600 SIGNAL CONNECTION
PC
RS232
CN1
RX
TX
GND
SHIELD
RESOLVER CONNECTION
TWISTED PAIR
SHIELDED CABLE
CN2
THERMAL
REF-
REF+
SIN-
SIN+
COS-
COS+
SHIELD
<R3>
<R1>
<S4>
<S2>
<S3>
<S1>
OUT2
OUT2- <E>
OUT2+ <C>
INPUT+ 2
INPUT+ 1
INPUT
GNDENABLE(CN3-13)
OUT 1
OUT1- <E>
OUT1+ <C>
FAULT
FAULT <E>
FAULT <C>
ENABLE = HIGH (+15V TO +24V) CONVERTER RUN
FAULT OUTPUT = CLOSED FOR CONVETER OK
CN3
GND
CURRENTLEVEL
-15VOLT
+15VOLT
-VREFERENCE
+VREFERENCE
GND
GNDENABLE
ENABLE
GND
+15VOLT
SHIELD
TWISTED PAIR SHIELDED CABLE
U0\
U0
UB\
UB
UA\
UA
INTERNAL SCHEMATIC
24V-20mA
INTERNAL SCHEMATIC
OUT+ <C>
OUT- <E>
24V-50mA
47R
10nF
D
NPN
INPUT +
GNDENABLE
INPUT +15V TO+24V
4K7
1K
ISO
EMULATION ENCODER
OUTPUT
LINE DRIVER 26LS31
RS422
CONNECT TO GND OF CNC


EASYfd 600 WIRING DIAGRAM
EASYfd MODEL
POWER RESISTOR
FUSE * 660Vac TYPE
600-R04 100 OHM 150 W 6A
600-R08 39 OHM 240 W 10A
600-R12 39 OHM 240 W 16A
600-R16 27 OHM 420 W 25A
600-R20 27 OHM 420 W 25A
600-R32 15 OHM 1000 W INTERNAL 40A
600-R40 15 OHM 1000 W INTERNAL 50A
600-R50 15 OHM 1000 W INTERNAL 63A
600-150 7.5 OHM 2000 W INTERNAL 200A
600-300 7.5 OHM 4000 W INTERNAL 500A
INTERNAL POWER RESISTOR OPTIONAL
SHIELDED CABLE
CN1
RX
TX
GND
RS232
PC
*** FOR HIGH VOLTAGE OR CURRENT OUTPUT IS NECESSARY EXTERNAL RELAY (MINIMUM RESISTANCE COIL = 300 ohm)
400 VAC LINE
+10/-20%
FUSE *
BRUSHLESS MOTOR
RESOLVER
SHIELD
POWER * RESISTOR
THERMAL
REF-
REF+
SIN-
SIN+
COS-
COS+
CN2
OUT2- (E)
OUT2+ (C)
INPUT+ 2
INPUT+ 1
CURRENTLEVEL
+15VOLT
-VREFERENCE
+VREFERENCE
OUT1- (E)
ENABLE
OUT1+ (C)
FAULT(E)
FAULT(C)
INTERNAL OPTO
24V-20mA OUTPUT
TWISTED OR SHIELD CABLE
CLOSED FOR ENABLE
VFAULT*
EXAMPLE FAULT CIRCUIT
*VFAULT = HIGH FOR DRIVE OK
ENCODER EMULATION OUTPUT
CN3


TYPICAL WIRING DIAGRAM
EASY fd 600
CN3 (CNDB-HD 26FEMALE)
SHELL
FAULT+ (COLLECTOR)
FAULT- (EMITTER)
-VREFERENCE
+VREFERENCE
+15V OUT
GND
-15V OUT
CURRENT LEVEL
GND
ENABLE
GND
GNDENABLE
INPUT1 (START/STOP)
INPUT2 (FORWARD/REVERSE)
+15V OUT
OUT1 (COLLECTOR)
OUT1 (EMITTER)
OUT2 (COLLECTOR)
OUT2 (EMITTER)
SHIELD
UA
UA\
UB
UB\
U0
U0\
GND
SHELL
SHIELDED CABLE
VREFERENCE
ENABLE
IN1
IN2
OUT1
OUT2
ENCODER OUT
TWISTED AND SHIELDED CABLE
TO PC
RS232
RX
TX
GND
FAULT OUT
REFERENCE INPUT
ENABLE INPUT
INPUT1 (OPTIONAL)
INPUT2 (OPTIONAL)
OUTPUT1 (OPTIONAL)
OUTPUT2 (OPTIONAL)
LINE DRIVER
RS422 (26LS31)
CN1 (CNDB 9MALE)
RS232
SHELL
5 3 2
RX (PIN2)
TX (PIN3)
GND (PIN5)
SHIELD CABLE
R LINE
S LINE
T LINE
B1
B2
EARTH
SCREW M4
U MOTOR
V MOTOR
W MOTOR
CN2
(CNDB 9FEMALE)
RESOLVER INPUT
THERMAL
THERMAL
REF+
REF-
SIN+
SIN-
COS+
COS-
SHELL
MAGNETO THERMAL
CIRCUIT BREAKER
400Va.c
LINE
EXTERNALLY
POWER RESISTOR
(OPTIONAL)
R BRAKE
SHIELD
GROUND
U
V
W
SHIELD
TWISTED AND SHIELDED CABLE
THERM
THERM
R3
R1
S3
S1
S4
S2
SHIELD
BRUSHLESS
MOTOR
RESOLVER


POWER CONNECTION
400 VAC LINE
MOTOR
BRAKE RESISTOR
R S T
U V W
B1 B2
CONNECT FUSE TO LINE
MOTOR
U
V
W
GND
SHIELDED POWER CABLE
POWER RESISTOR