TRS system

TRS-AX

Documentation

Tecnologie e Prodotti per l'Automazione

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REVISIONS

Revision number	Date	Protocol	Changes and/or changed paragraphs
Rev. 1	20/04/2009		Preliminary
Rev. 2	12/12/2009		Update
Rev. 3	01/03/2010		First official release
Rev. 4	27/05/2010		Update
Rev. 5	16/06/2010		Update of GreenBus specifications
Rev. 6	15/07/2010		Total revision
Rev. 7	01/06/2011		Revision after EMC tests
Rev. 8	16/07/2012		Non-differential correction of technical data and update of encoder wiring.
Rev.9	14/04/2016		Image text modified
Rev.10	21/07/2016		Page 18

CONTENTS

Requirements and production specification of TRS-AX remote module.

1 DESCRIPTION

- Axis control unit
- Configuration of max 4 axes
    - Max. 4 analog axes + 4 digital outputs + 1 input trigger
    - Max. 4 stepper axes + 1 input trigger
- 4 Fast Input
- Incremental encoder management and zero position reference.
- 4 Mb/s GreenBus V4.0 connection with RJ45 connector
- Communication synchronised with the bus cycle time
- Dip switch for module addressing
- Requiring +24Vdc nominal field power supply to activate the outputs.
- Assembly on DIN rails type EN50022 and EN50035
- Dimensions 138x70x23.5 mm

2 TECHNICAL DATA

- Power supply from GreenBus v.4.0
- Control and power supply Led
- CPU 32 bit, 96MHz, 256KB Flash, 96KB RAM
- Connection to unit control on GreenBus v40 bus
- Analog axes:
    - Max. 4 input channels incremental encoders with 0 position reference.
    - Max. 4 analog outputs with 16 bits, +/- 10V, with monitoring process (software diagnosis)
    - Max. 4 digital outputs (general purpose) 0,5 A max.
    - Max. 4 inputs managed in interrupt for setpoint, determination of the positions, limit switch.
    - 1 input trigger
    - Frequency axis control max. 1KHz
- Stepper axes:
    - Possibility to connect max. 4 incremental encoder input channels with zero position reference or control in open loop.
    - Max. 4 stepper outputs (the phase can be selected via software and max 25 KHz frequency), 4 direction outputs.
    - Max. 4 inputs managed in interrupt for setpoint, determination of the positions, limit switch.
    - 1 input trigger
    - Possibility of interpolated movements and control of the trajectory.
- Any combination of analog axes/stepper is accepted. Axis control frequencies max. 1KHz
- Field power supply from outside + 24V.

OUTPUT:

- It supports up to N Output (with N = 4 - configured Stepper axes)
- 0.5 A max current for each output

- Protection of the outputs against overloads and overvoltage (36V)
- Real time monitoring of the outputs (software diagnosis)
- Terminal block for the outputs (connection with AWG24,12) and possibility of wiring directly on the wire axes.
- Field power supply galvanically separated from the power supply of logic circuits.

INPUT

- 1 Input trigger managed in interrupt : it can be enabled via software.
- Threshold level 0 = from 0 to 10 V, 1 = from 18V to 24V.

3 ELECTRICAL FEATURES

3.1 Highest accepted values

Parameter	Condition	Min	Type	Max	Unit
Vcc, Power Supply	by GreenBus	10.8		13.2	V
On Output Current max	VO = 24 Volt DC			1	A
PWM current max	VO = 24 Volt DC			0.1	A
VO Output Power Supply		16		30	V
Temperature		0		65	°C
DAC max output current	w/o short circuit or clamping (per channel)		10	20(*)	mA

(*) Limited from DAC tecnology. Not tested.

3.2 Operating parameters

Parameter	Condition	Min	Typ	Max	Unit
Vcc, Power Supply	by GreenBus		12		V
Iq, Quiescent Current	all off, Vcc=12V		100		mA
Ip, Operating Current	all active outputs, Vcc=12V			300	mA
Voh, output high state voltage	VO=24V, Rl = 10Kohm Cl =50pF	18			V
Vol, output low state voltage	VO=24V, Rl = 10Kohm Cl= 50pF			6	V
On Output Current	VO=24 V	0	--	0.5	A
VO Output Power Supply		18	24	30	V
Operative Temperature		5		60	°C
DAC setting time			10		us
DAC load	Per channel, R		2		KΩ
	Per channel, C			4	nF
On STEP current max	SOX Output			0.1	A
Incremental encoder frequency				4000	KHz
Baud Rate	GreenBus v4.0		4		Mb/s

TRig INT threshold	Vlow (On trans 0->1) VO=24V	0		10	V
	Vhigh (On trans 0->1) VO=24V	18		24	V

4 INSTRUCTIONS

Generally, the values of power supply, temperature and humidity must not exceed the values as indicated in the chapter 3.
You must interface TRS-AX using cables/terminals and everything else, as shown in the following chapters.
The terminal block must be inserted even if it is not cabled.

TRS-AX must be fixed on EN50022 or EN50035 DIN rails by means of the rear spring connection. For coupling and removal, you must work on the connecting tongue with a flat-blade screwdriver, in a way that you can move it back and allow the coupling, or the release from the guide.

Warning! The metal coupling for the DIN rail is electrically connected to the circuit ground of TRS-AX: the connection to earth MUST be provided through this connection (that is the DIN rail must be grounded).

Warning! The GreenBus v4.0 works with 4MHz frequency.
Due to the frequency of the data transmission and to prevent from the effect of possible electromagnetic interferences, we suggest the use of Cat.6 S/STP cables. On the whole the cabling length must be limited.

TRS-AX is an electronic device for general purposes within the environment of the light industry.
It is an A - class product, that, if installed in the home environment, may produce some electromagnetic interferences. So, the final user must take all the precautions needed.

5 SIGNAL LED

5.1 Red led (ST).

It reports the (ST) status of the system and shows different behaviours non attributable to error conditions.

- It blinks, while it waits for the communication and for the TRS-AX to be initialised.
- If TRS-AX is correctly initialised, it finally turns itself off. From now, if it should turns itself on, it only reports an internal error.
- It turns itself on in case of very serious HW fault and it is operating until the problem is removed, followed by other signals from other leds (loss of power supply, disconnection from GreenBus, etc.)
- In case of deadlock (for example, expired watchdog fw, defective power supply on power-up, defective bus on power-up) the led remains on and blinks temporarily. In this case the reported error leads the remote device to a safety block that cannot be removed.

5.2 Yellow (TX) greed (RX) Greenbus led

- They blink synchronously (½ second), if Greenbus is not initialised.
- They blink asynchronously, if GreenBus is initialised and the communication is active.
- They are off, if no communication on GreenBus is available

5.3 POWER green power

- It is off, when a problem arises on any power supply
- It is normally on.

5.4 READY green led

- Start condition: off.
- It is fixed on and, when TRS-AX is connected to GreenBus, initialised, configured and activated.
- It blinks, when TRS-AX is waiting for the initialisation/configuration/activation.
- It may go off in case of some hw problem.

5.5 (AXn) red leds

- They are normally off as long as TRS-AX is not configured.
- They turn on to report a problem on the specified axis. In this case the reported error leads the remote device to a safety block that cannot be removed.

5.6 Out yellow led

It shows the status of the corresponding Output:

- it is on, when the logic status is 1
- it is off, when the logic status is 0

5.7 24Vdc green led

24Vdc power supply is available

- It is on, when it is powered
- it is off, when it is not powered or outside the acceptability range

6 SELF TEST

6.1 System errors

TRS-AX remote device can report conditions of anomalous working or error through the v4.0 GreenBus bus.

TRS-AX produces some system errors listed below:

Code	System error	Description
2049	#N Wrong configuration	#N remote type found is not equal to that provided in the configuration
2050	#N Disconnected	#N remote cannot be reached by the field bus communication any more
2051	#N Reconnected	#N remote now can be reached by the field bus communication, it has not lost the power supply and it has kept the configuration data
2055	#N Initialized	#N remote now can be reached by the field bus communication; however, it has lost the power supply and/or the configuration data; therefore, it has been initialized and configured again
2056	#N Power supply error +24Vcc #D	On #N remote +24V power supply is off or outside of the provided voltage range
2058	#N error output (or axis) #D reading back	On #N remote the #D active and connected output (or axis) failed
2067	Error transmitting the configuration	A communication error or an error during the execution of an #N remote hardware configuration command occurred
2068	#N Internal Error	A Hw or a Fw error inside the #N remote device occurred

#N shows the number of the remote device
#D shows the mentioned device

Herewith a further system error is shown, which does not concern the current remote device, but the field bus. The onset or the presence of this error may explain some further concomitant system errors from the remote devices.

Code	System error	Description
2057	GreenBUS power failed	GreenBus power supply is off or anyway it is outside the acceptability range

Additional information on the system errors are shown in the Albatros help in the chapter about the errors concerning the remote devices.

7 CABLING MAPS

DIP SWITCH

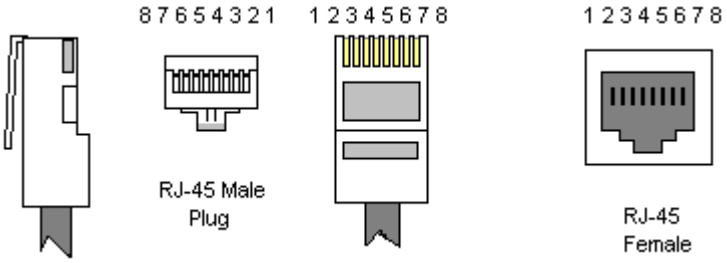
SW	1	2	3	4	5
Receiver N. 1	ON	ON	ON	ON	ON
Receiver N. 2	OFF	ON	ON	ON	ON
Receiver N. 3	ON	OFF	ON	ON	ON
Receiver N. 4	OFF	OFF	ON	ON	ON
Receiver N. 5	ON	ON	OFF	ON	ON
Receiver N. 6	OFF	ON	OFF	ON	ON
Receiver N. 7	ON	OFF	OFF	ON	ON
Receiver N. 8	OFF	OFF	OFF	ON	ON
Receiver N. 9	ON	ON	ON	OFF	ON
Receiver N. 10	OFF	ON	ON	OFF	ON
Receiver N. 11	ON	OFF	ON	OFF	ON
Receiver N. 12	OFF	OFF	ON	OFF	ON
Receiver N. 13	ON	ON	OFF	OFF	ON
Receiver N. 14	OFF	ON	OFF	OFF	ON
Receiver N. 15	ON	OFF	OFF	OFF	ON
Receiver N. 16	OFF	OFF	OFF	OFF	ON

SW	1	2	3	4	5
Receiver N. 17	ON	ON	ON	ON	OFF
Receiver N. 18	OFF	ON	ON	ON	OFF
Receiver N. 19	ON	OFF	ON	ON	OFF
Receiver N. 20	OFF	OFF	ON	ON	OFF
Receiver N. 21	ON	ON	OFF	ON	OFF
Receiver N. 22	OFF	ON	OFF	ON	OFF
Receiver N. 23	ON	OFF	OFF	ON	OFF
Receiver N. 24	OFF	OFF	OFF	ON	OFF
Receiver N. 25	ON	ON	ON	OFF	OFF
Receiver N. 26	OFF	ON	ON	OFF	OFF
Receiver N. 27	ON	OFF	ON	OFF	OFF
Receiver N. 28	OFF	OFF	ON	OFF	OFF
Receiver N. 29	ON	ON	OFF	OFF	OFF
Receiver N. 30	OFF	ON	OFF	OFF	OFF
Receiver N. 31	ON	OFF	OFF	OFF	OFF
Receiver N. 32	OFF	OFF	OFF	OFF	OFF

SW 7	ON	OFF
SW 8	ON	OFF
GBus termination	Last receiver	Last receiver No.

1	**OUT1**		
2	**OUT2**		
3	**OUT3**		
4	**OUT4**		
5	**GROUND**		
6	**TRG**		
7	**24Vdc**		
8	**GND24**		

7.1 GreenBus v4.0



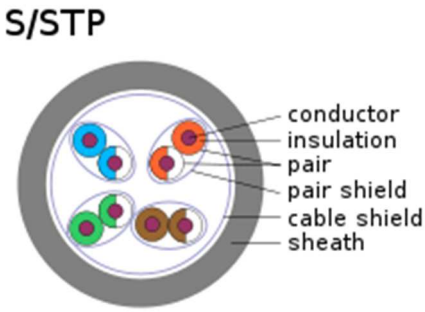
Pin	Name	Function	Notes
1	0 V	GreenBUS Negative power supply	
2	+12 V	GreenBus Power supply (+12Volt ±%5)	Max 1,5A
3	0 V	Negative GreenBUS power supply	
4	TX+	GreenBus Tx (positive signal)	100 Ohm termination
5	TX-	GreenBus Tx (negative signal)	
6	+12 V	GreenBus Power supply (+12Volt ±%5)	Max 1,5°
7	RX+	GreenBus Tx (positive signal)	100 Ohm termination
8	RX-	GreenBus Rx (negative signal)	
Shield	Ground		

This channel, designed by TPA, S.p.A. is able to connect remote devices of a field with a refresh time from 1 to 4 milliseconds. Transmission frequency: 4MHz; throughput: 300 Byte/millisecond.
Communication occurs in Full-Duplex-mode.
Within the communication frame max. 4 TRS-AX device may be available.

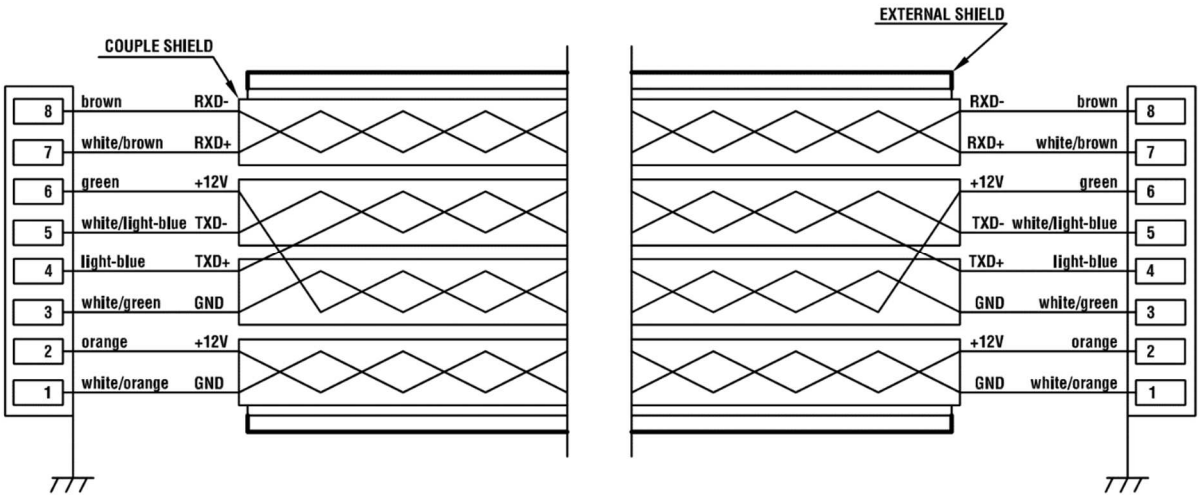
Warning! TX and RX always refer to the transmitter.

7.2 Cabling

GreenBus v4.0 serial channel needs a device-to-device cabling made by Ethernet cables terminated with RJ45 connector. Due to the frequency of the data transmission, to prevent from the effect of possible electromagnetic interferences, we suggest the use of **Cat.6 S/STP** cables. All the wires of S/STP cables are double twisted, individually shielded and have an overall screen.



On the whole the cabling length must be limited.



To reach more devices and reduce the cabling distances you can use the AlbStar device (R1M13 and following models), so that you can count on 4 branches (you will need of course to distribute the remote devices on the lines in order to charge less the more distant remote devices.)
Each branch of the GreenBus v.4.0 channel must be terminated on the last, (the most distant), physically connected remote device; the termination is activated (ON) by the Dip-Switches 7 and 8 on the remote device.

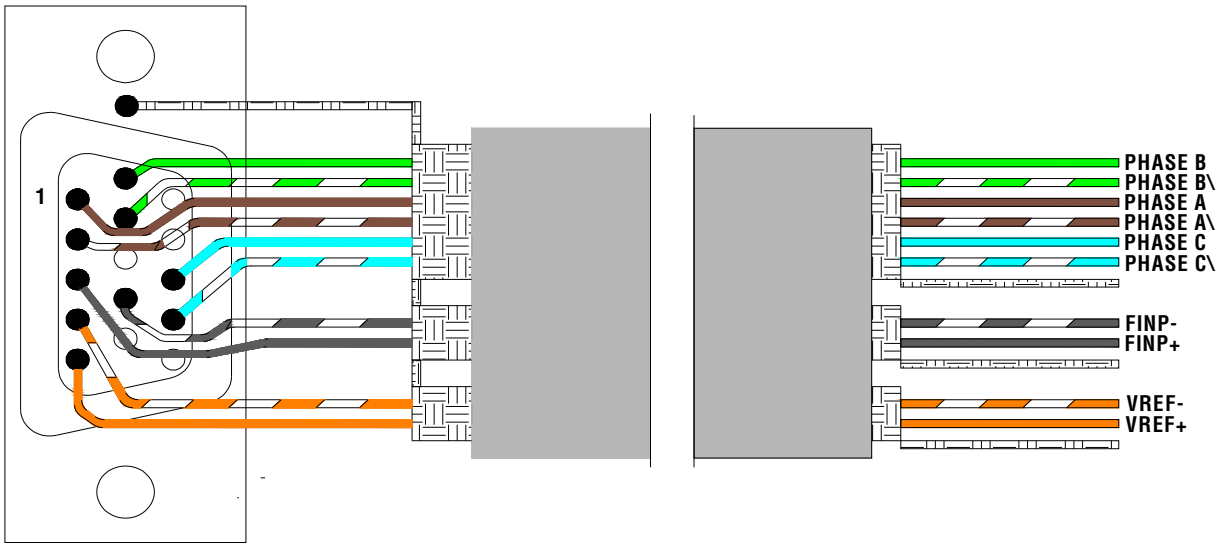
Warning! Without termination the GreenBus v4.0 channel will not work properly and the Cnc Albatros will return a list of communication errors. In the same manner it will happen, if the termination is executed also on other remote devices of the same branch.

Warning! Do not use Ethernet cross-cables (also called "patch cables")

8 CABLES

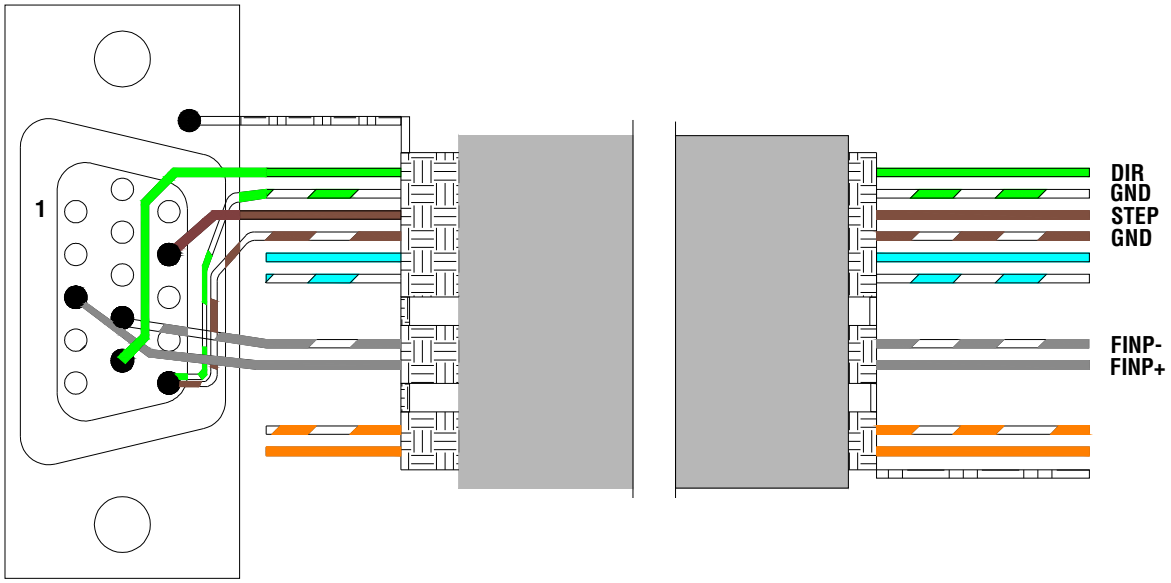
The connector box matches up to the TRS-AX box, the DIN rail anchoring block (metal mass) and to the earthed pin

8.1 Analog axis



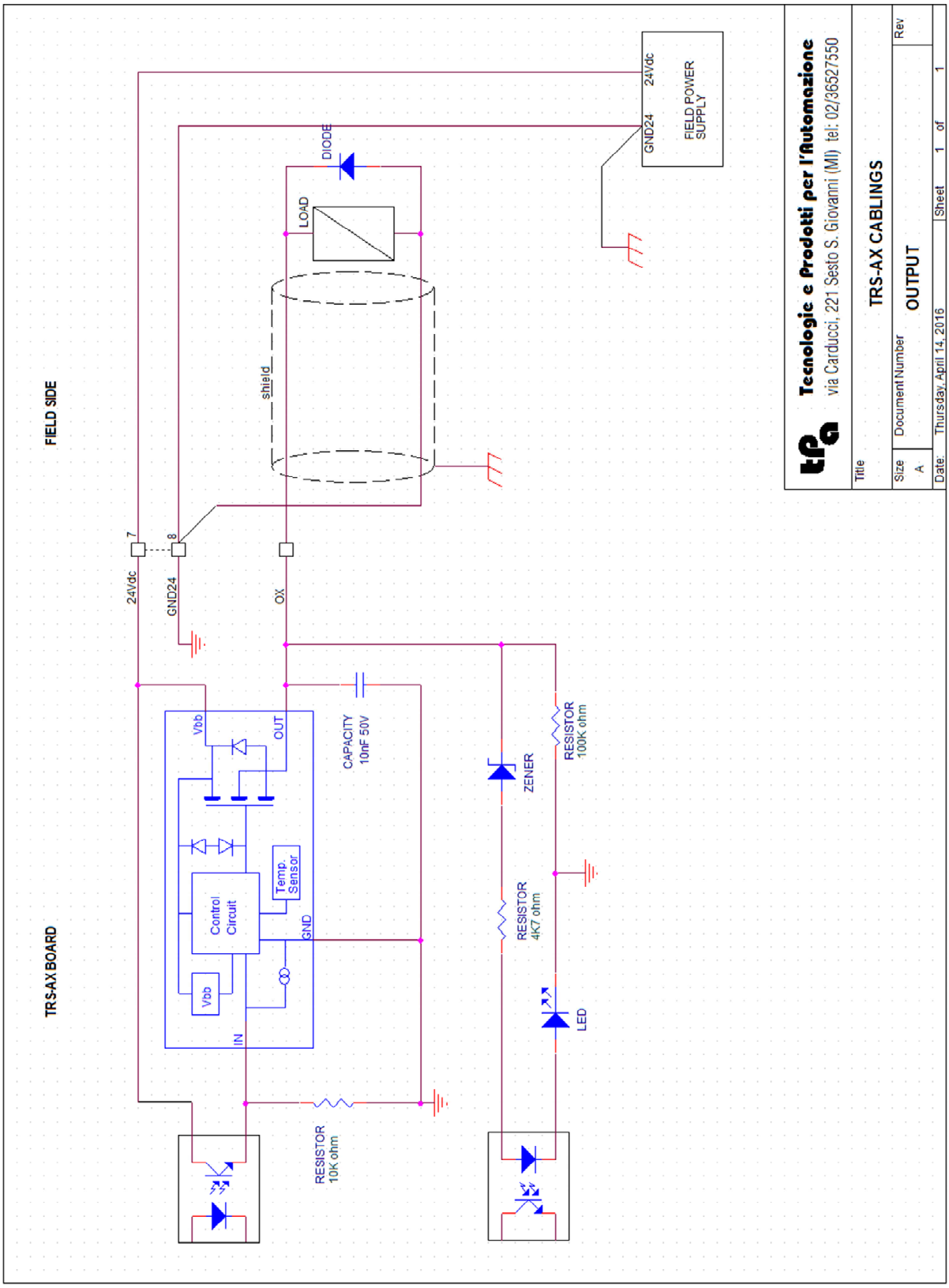
1	PHASE A		
2	PHASE A\		
3	FINP+		
4	VREF-		
5	VREF+		
6	PHASE B		
7	PHASE B\		
8	nc		
9	FINP-		
10	OUT		
11	nc		
12	nc		
13	PHASE C		
14	PHASE C \		
15	GND		

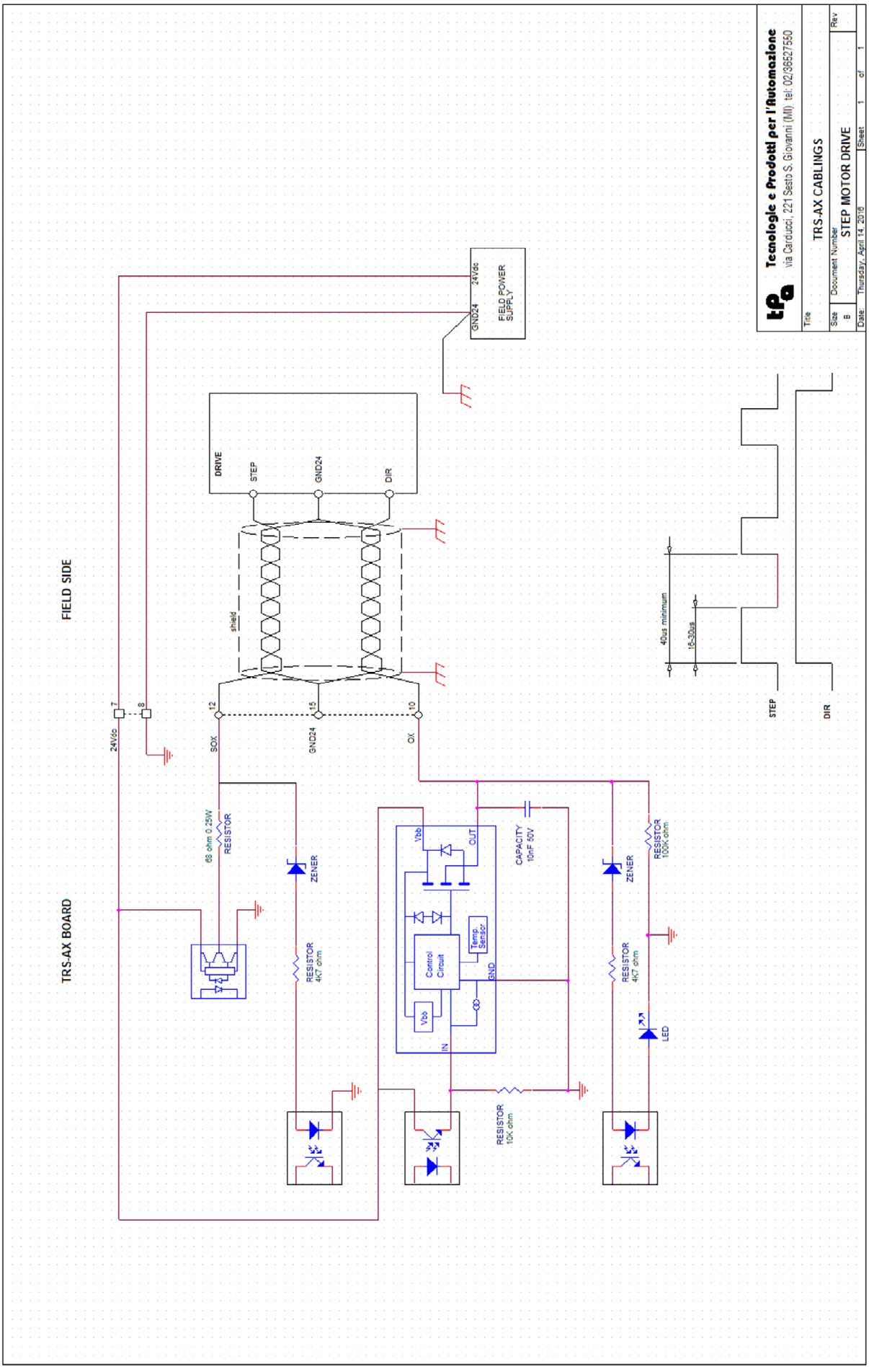
8.2 Step-by-step axis

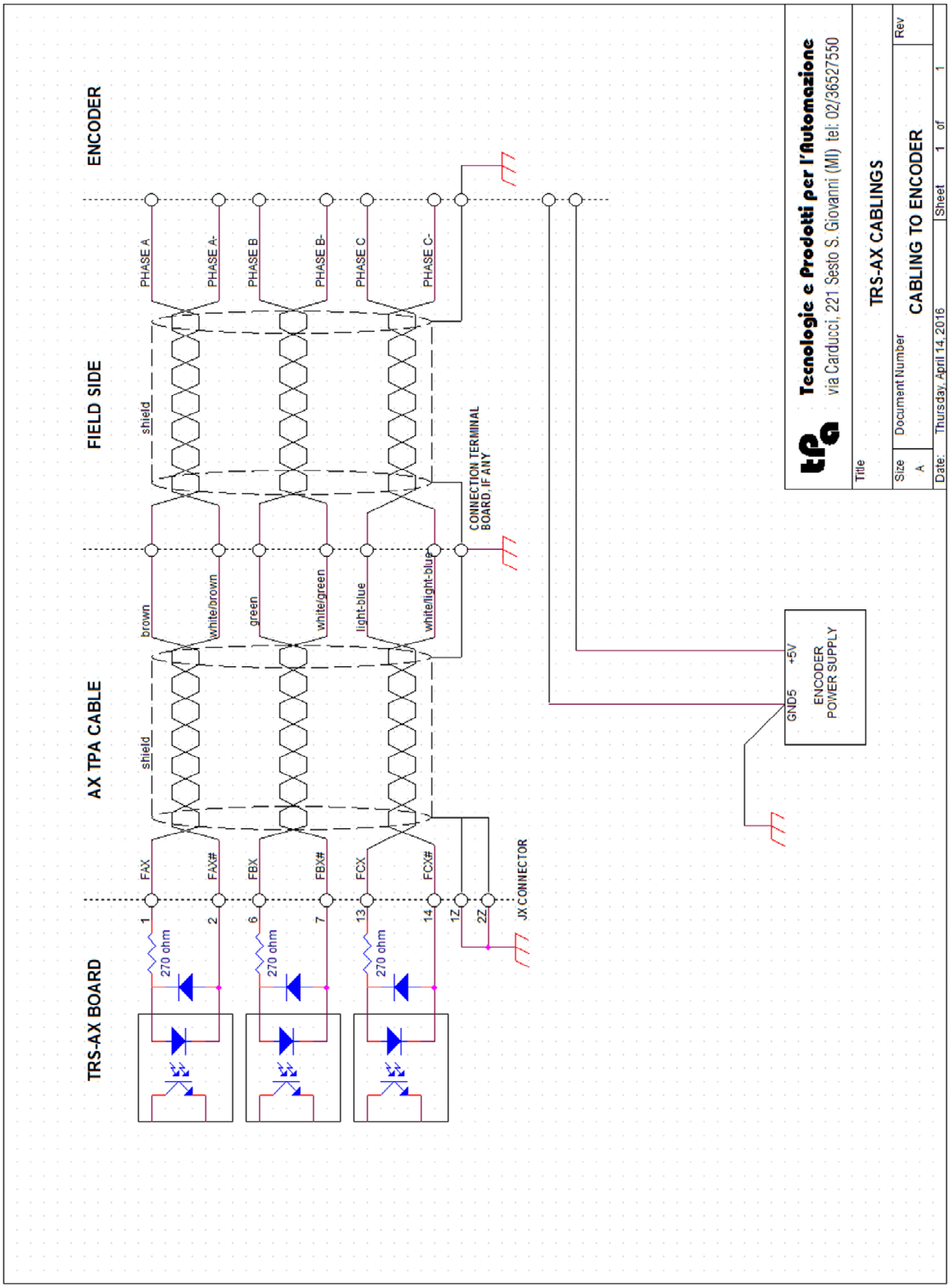


1	Nc		
2	Nc		
3	FINP+		
4	Nc		
5	Nc		
6	Nc		
7	Nc		
8	Nc		
9	FINP-		
10	DIR		
11	Nc		
12	STEP		
13	Nc		
14	Nc		
15	GND		

9 FIELD CONNECTIONS




FIELD SIDE
TRS-AX BOARD
DRIVE
STEP
GND24
DIR
shield
24Vdc
GND24
FIELD POWER SUPPLY
SOX
GND24
OX
68 ohm 0.25W RESISTOR
ZENER
RESISTOR 4K7 ohm
Vbb
OUT
Control Circuit
Temp. Sensor
GND
IN
CAPACITY 10nF 50V
RESISTOR 10K ohm
RESISTOR 100K ohm
LED
40us minimum
16-30us
STEP
DIR
Tecnologie e Prodotti per l'Automazione
via Carducci, 221 Sesto S. Giovanni (MI) tel: 02/36527550
Title
TRS-AX CABLINGS
Size B
Document Number
STEP MOTOR DRIVE
Rev
Date: Thursday, April 14, 2016
Sheet 1 of 1


TRS-AX BOARD
AX TPA CABLE
FIELD SIDE
ENCODER
FAX
FAX#
FBX
FBX#
FCX
FCX#
1Z
2Z
JX CONNECTOR
270 ohm
shield
brown
white/brown
green
white/green
light-blue
white/light-blue
PHASE A
PHASE A-
PHASE B
PHASE B-
PHASE C
PHASE C-
CONNECTION TERMINAL BOARD, IF ANY
GND5
+5V
ENCODER POWER SUPPLY
Tecnologie e Prodotti per l'Automazione
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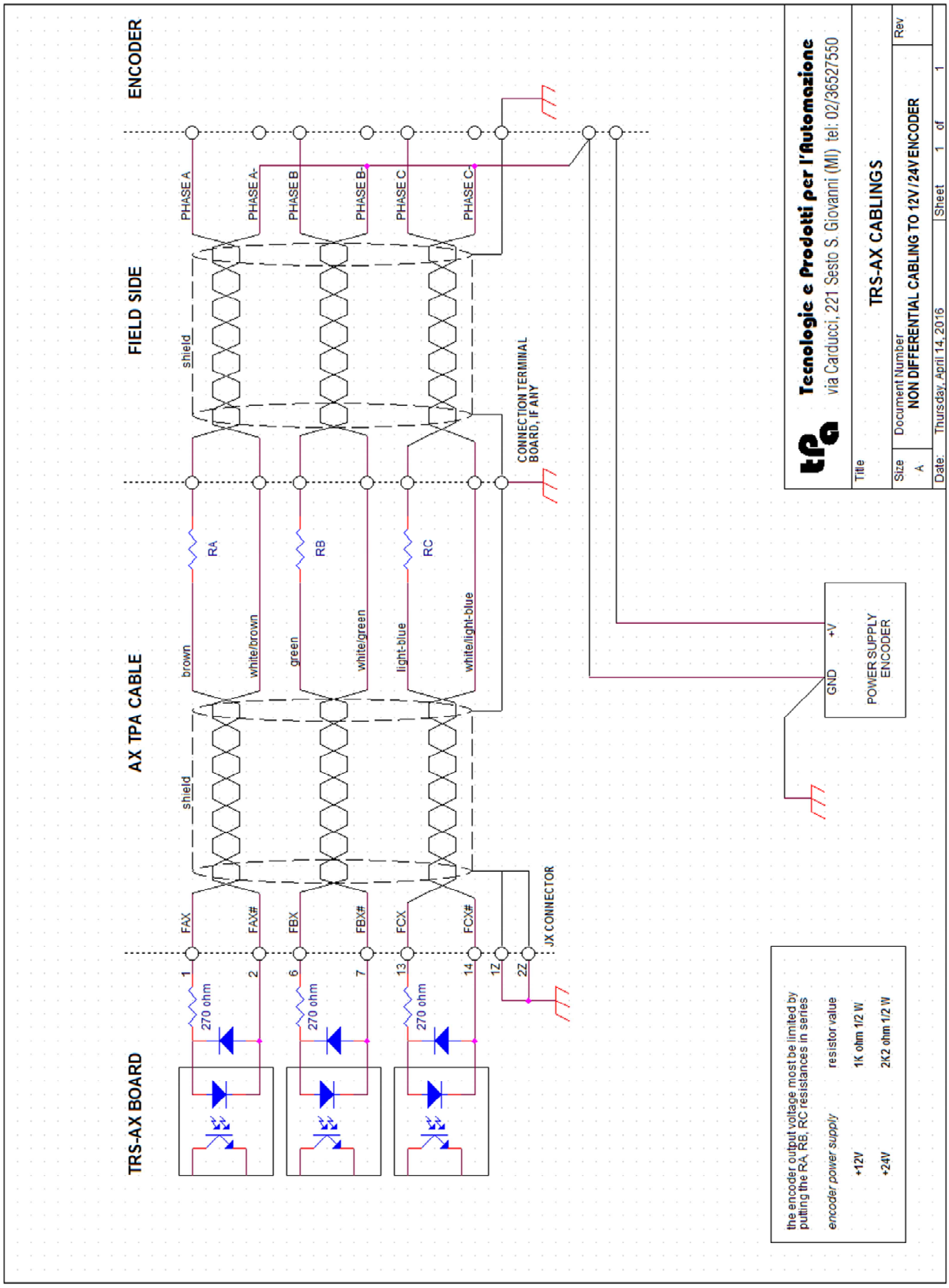
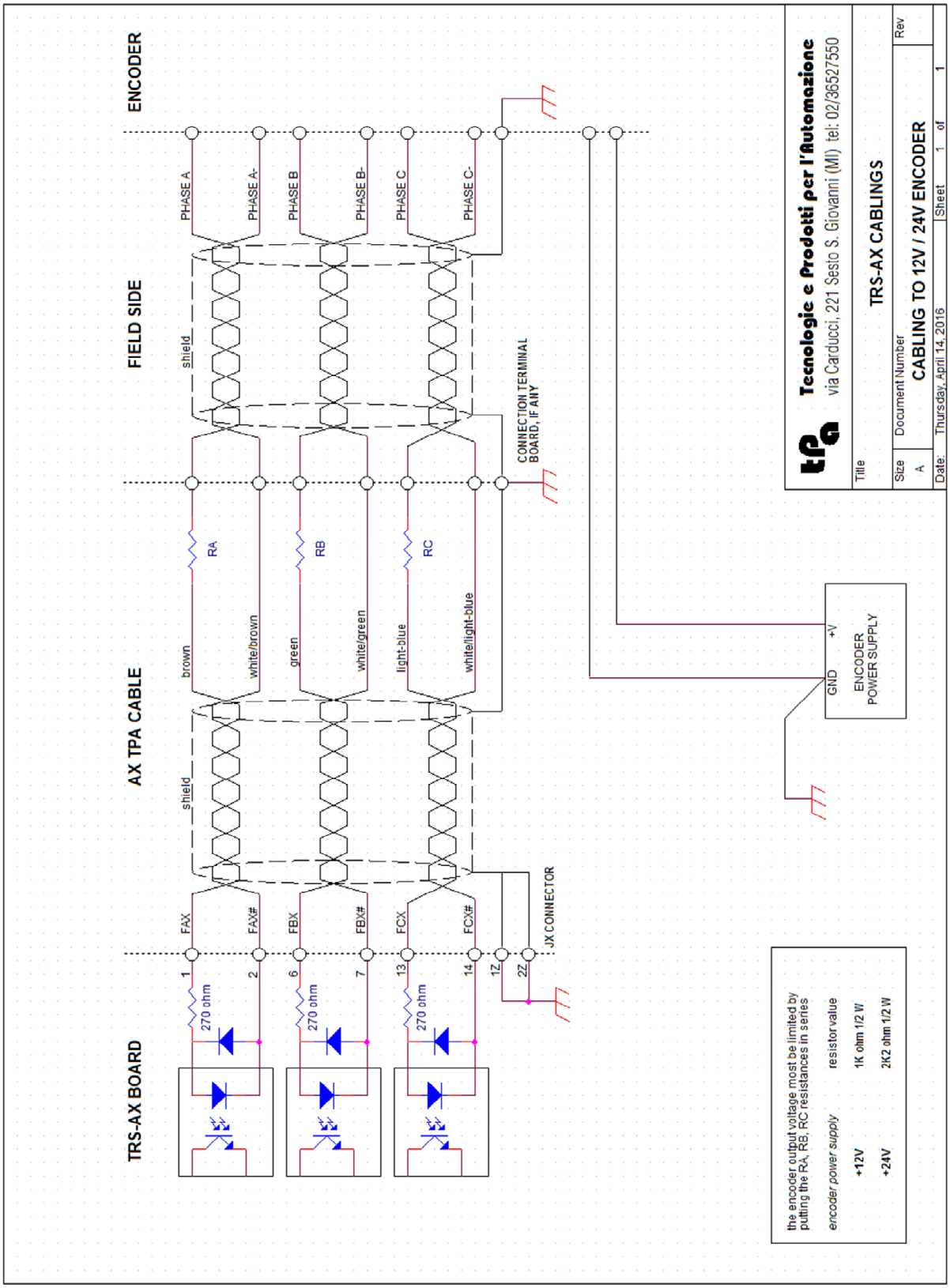
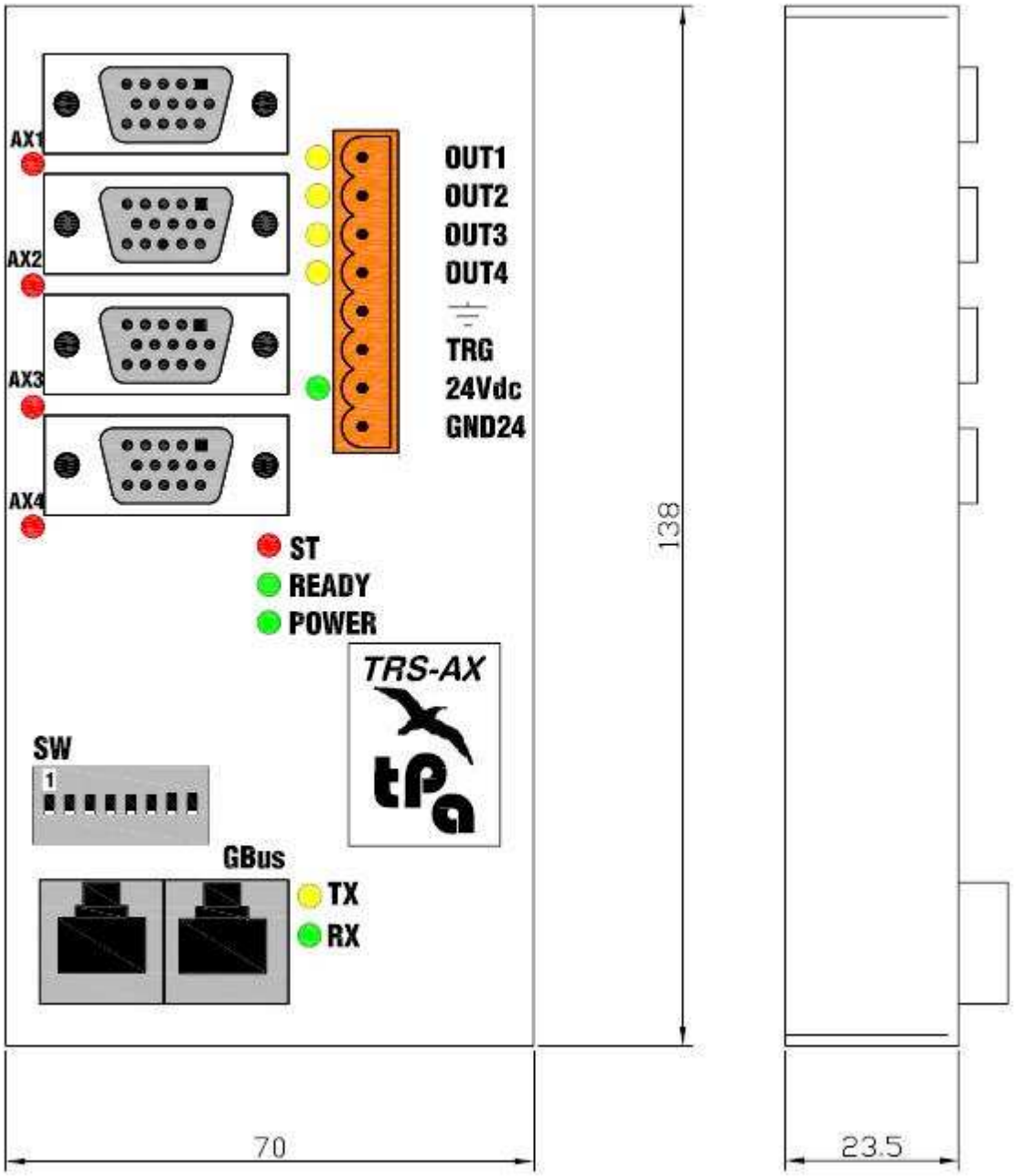
Title
TRS-AX CABLINGS
Size
A
Document Number
CABLING TO ENCODER
Rev
Date: Thursday, April 14, 2016
Sheet 1 of 1



Warning: In some cases you may need to balance the A, B, C channels using 2 equal resistances (half RA, RB, RC) to be installed both on the positive (FAX, FBX, FCX) and on the negative (FAX#, FBX#, FCX#) branches.


ENCODER
FIELD SIDE
AX TPA CABLE
TRS-AX BOARD
PHASE A
PHASE A-
PHASE B
PHASE B-
PHASE C
PHASE C-
shield
RA
RB
RC
brown
white/brown
green
white/green
light-blue
white/light-blue
shield
FAX
FAX#
FBX
FBX#
FCX
FCX#
270 ohm
1
2
6
7
13
14
1Z
2Z
JX CONNECTOR
CONNECTION TERMINAL BOARD, IF ANY
GND
+V
ENCODER POWER SUPPLY
the encoder output voltage most be limited by putting the RA, RB, RC resistances in series
encoder power supply
resistor value
+12V
1K ohm 1/2 W
+24V
2K2 ohm 1/2 W
Tecnologie e Prodotti per l'Automazione
via Carducci, 221 Sesto S. Giovanni (MI) tel: 02/36527550
Title
TRS-AX CABLINGS
Size
A
Document Number
CABLING TO 12V / 24V ENCODER
Rev
Date: Thursday, April 14, 2016
Sheet 1 of 1

10 DIMENSIONS



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