

Quick Start Guide: YROTATE-IT-RX23T

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1.0 Introduction

Welcome to the Renesas Motor Control RX23T reference kit!

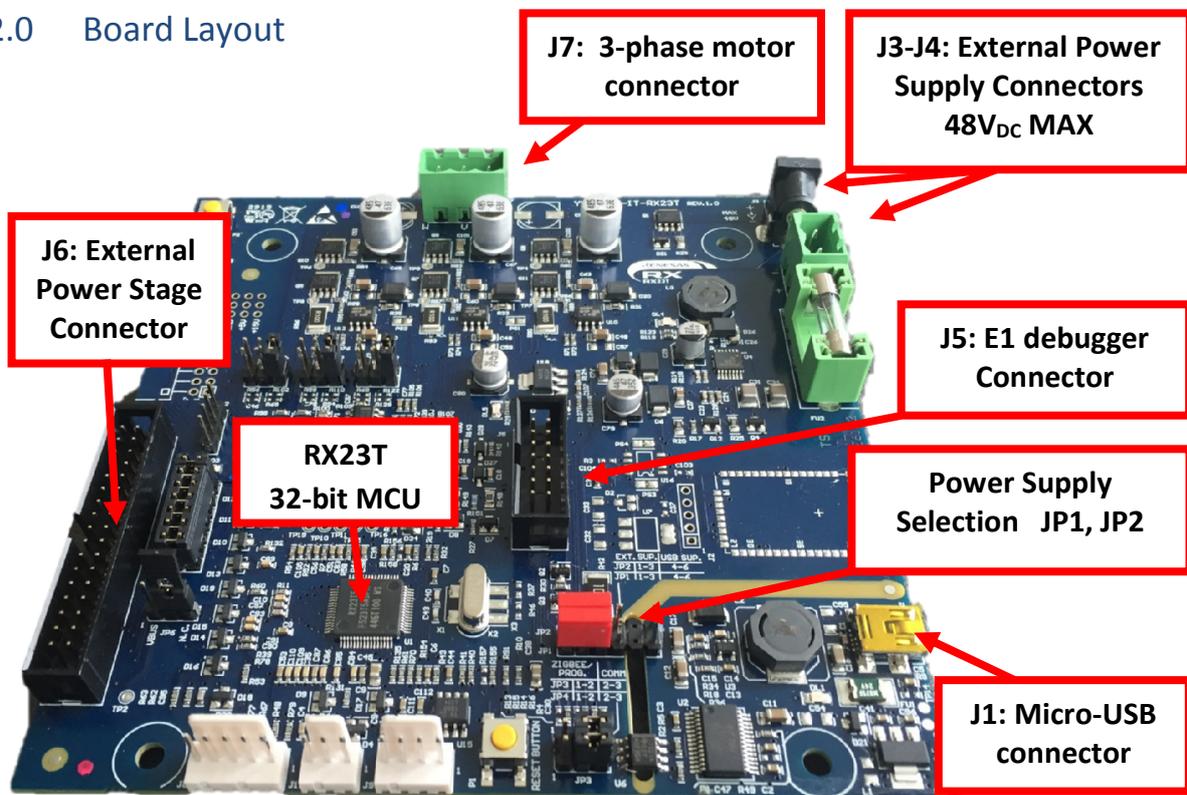
This quick start guide assists the user to connect and use the YROTATE-IT-RX23T motor control kit for the first time. The RX23T microcontroller flash memory is pre-programmed with a motor control project. Please check the contents of the kit using the supplied package contents list and notify your supplier if any are missing.

Please be informed that the most updated documents related to the kit must be downloaded on the following website after a quick registration: www.renesas.eu/motorcontrol

No CD-ROM is provided in the kit.

Note: PLEASE DO NOT CONNECT THE BOARD TO THE HOST PC BEFORE INSTRUCTED

2.0 Board Layout



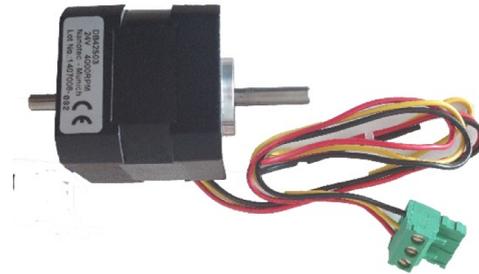
For further board details, please refer to the YROTATE-IT-RX23T User Manual.

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3.0 Initial Board Configuration

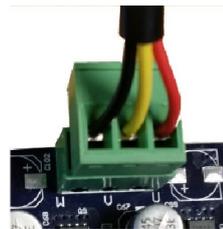
Before connecting the USB cable to the host PC and to the YROTATE-IT-RX23T board please follow the setup procedure as described below.

1. The demonstration 3-phase Permanent Magnet Motor (e.g. PMSM) comes pre-wired with its connector as shown below. The box contains a 3-phase Brushless Motor DB42S03 from Nanotec.
Please refer to the Nanotec website for more details: <http://en.nanotec.com>

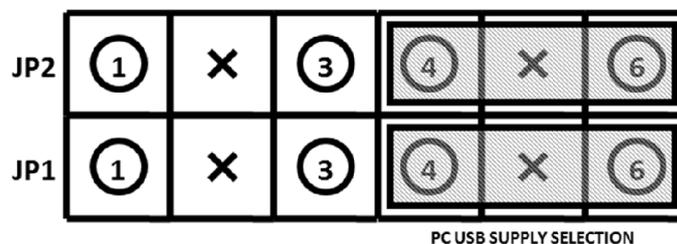


2. Place the PMSM motor connector into the assigned motor connector socket **J7** on the YROTATE-IT-RX23T board.
The motor wires are connected as follows

- a. Red Motor wire to "U" connection
- b. Yellow motor wire to the "V" connection
- c. Black motor wire to the "W" connection



3. There are two ways to supply power to the YROTATE-IT-RX23T board.
 - a. The first is to plug in the USB cable from the PC to supply power directly to the board. In this case the current delivered to the motor is limited by the USB capabilities.
 - b. The second method is to power the board using an external voltage DC source.
 For full details of power supply options please refer to Chapter 3 of the YROTATE-IT-RX23T User Manual.
4. For initial setup of the YROTATE-IT-RX23T kit the first method must be used (USB powered). Ensure that Jumpers **JP1** and **JP2** are correctly configured as described below.



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4.0 PC Graphical User Interface (GUI) Software Installation

The PC GUI supports the 32-bit and 64-bit operating systems:

- Windows 10
- Windows 8.1
- Windows 8
- Windows 7
- Windows Vista

Please download the latest PC GUI software on the website: www.renesas.eu/motorcontrol where after registration, the package to download is the zip filename: "YROTATE-IT-RX23T_PC_GUI_XXXXXX.zip"

Windows™ Vista and 7, 8 users must install the software with administration rights. User may see "User Account Control" dialog box.

If applicable, enter the administrator password and click <OK>. Else, Right Click on the "MCDemoSetupx.x.exe" and select "Run as administrator".

Click on <Install Motor Control Demo> on the installer opening screen and then follow the instructions until reaching the final installer screen and then click <Finish>. At this stage **do not** click on <Start Demo>.



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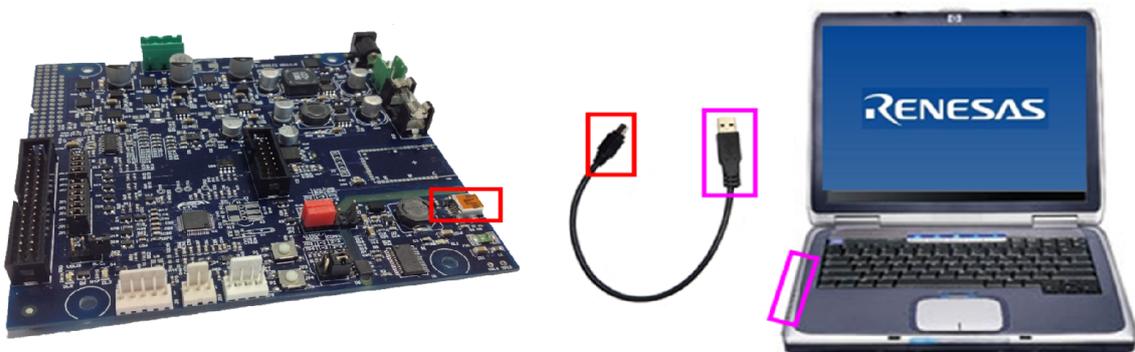
5.0 Installing USB Drivers

The virtual UART drivers are included separately in the zip file “YROTATE-IT-RX23T_PC_GUI_XXXXXX.zip”, located in the folder: ./Drivers/

The RX23T inverter kit is using the FT232R IC from FDTI to convert serial communication to USB. Please refer to the FDTI website to get more information about the device used.

To install the virtual UART drivers of the YROTATE-IT-RX23T, please follow the steps:

1. First connect the USB cable to the host PC and then connect to the YROTATE-IT-RX23T board.



2. The host PC will detect the new hardware and start the driver installation. Follow the Windows instructions, selecting **<NOT THIS TIME>** to the request for an automatic driver search by Windows. Then click on **<SELECT A PATH>** to select the appropriate YROTATE-IT-RX23T drivers in the folder ./Drivers/
3. If the automatic installation fails, the drivers can be manually installed. In the folder ./Drivers/, double click on the file “**CDM v2.12.06 WHQL Certified.exe**” and then follow the installer instructions.

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6.0 Using the Graphical User Interface (GUI)

The GUI is installed during the installation process, and must be run with administration rights. To start the GUI Right-click on the Motor Control Demo Icon in the start menu or on the desktop and **“Run as administrator”**

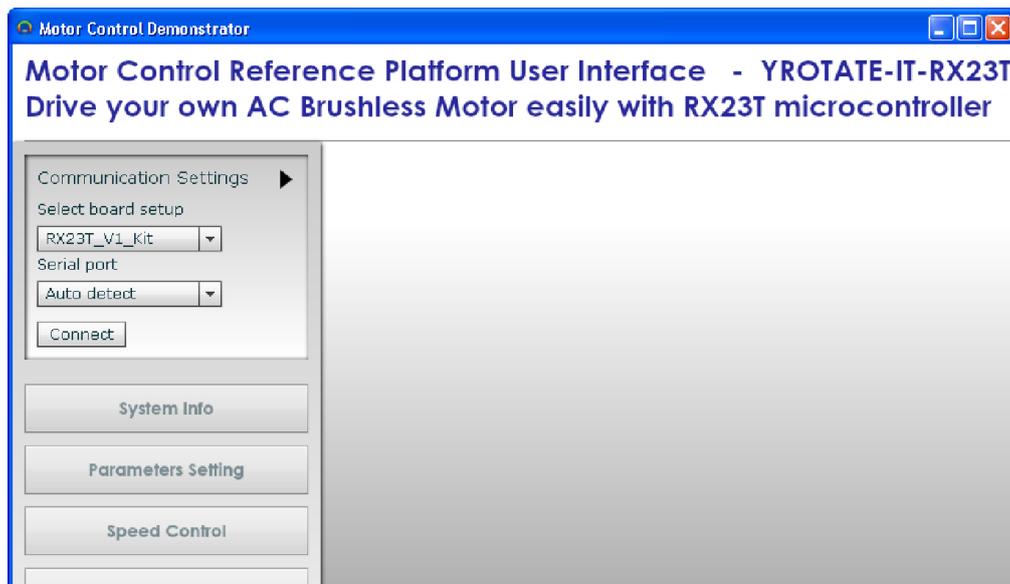


Please note, that for Windows Vista and Windows 7, 8 users, the GUI must be run with administration rights. To automatically set the admin privilege, press the right mouse button over the icon of the GUI, Select **“Properties”**, press the Left mouse button on the **“Compatibility”** tab and Select the Checkbox **“Run this program as an administrator”** under the Privilege Level, and click **<OK>**.

It is recommended that the USB cable should be connected to the PC and the board before opening the GUI as this makes the connection process easier. The GUI can be opened without the board being connected.

Once the GUI is open use the following procedure to connect the GUI to the YROTATE-IT-RX23T board.

- Select the **“Select board setup”** drop down menu bar in the **“Communication Settings”** box in the top left hand corner of the GUI panel.
- Select the **<RX23T_Kit>** option.
- Select the **“Serial port”** drop down box.
- Select the communications port connected to the YROTATE-IT-RX23T board (in this example COM5)
- Click on the **<Connect>** button.

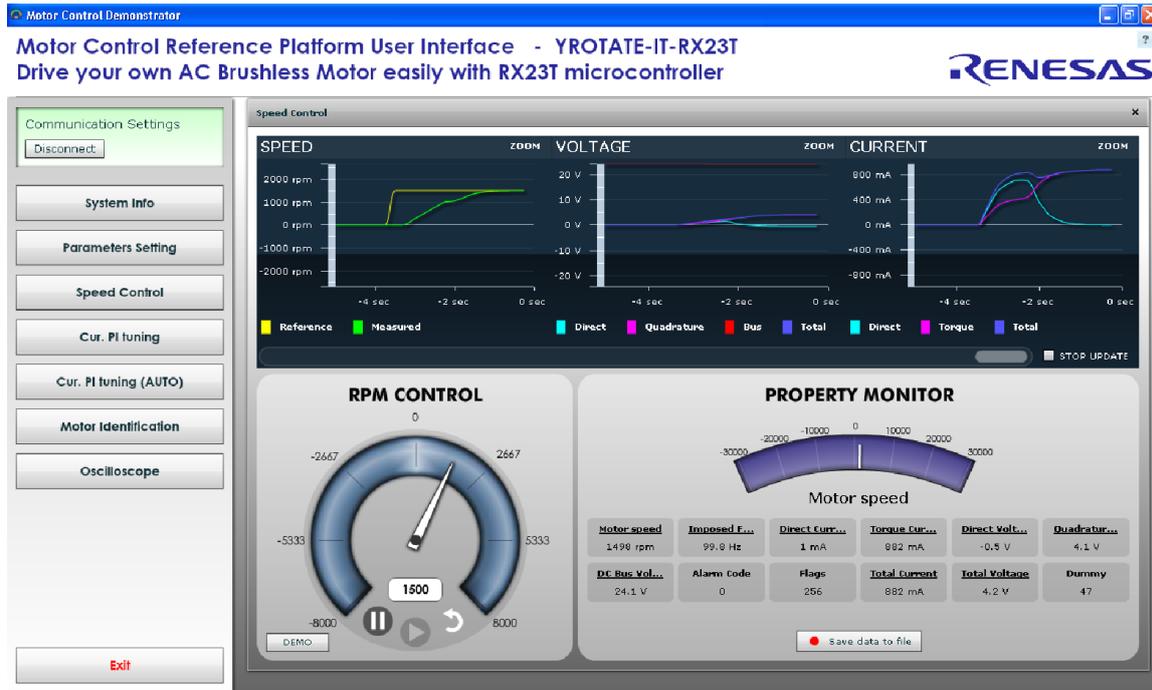


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Once connected the GUI can be used to control the motor manually using the “RPM Control” facility. Here the user can start, stop and set direction and speed of the motor, whilst observing its performance parameters within the system display windows of the GUI.

The GUI can be closed by either clicking on the <Exit> button in the bottom left hand corner or the usual windows close button.

All the facilities of the GUI, including the unique Auto-calibration feature are described in the YROTATE-IT-RX23T User Manual, which can be downloaded on the website: www.renesas.eu/motorcontrol



Speed range limitations

The YROTATE-IT-RX23T kit is able to drive diverse 3-phase Permanent Magnet Motors by using the sensorless vector control algorithm within the given electrical specification of the system.

A **minimum** speed exists which is mandatory to reach in order to run the motor properly using the three shunts current measurement methods.

The delivered Nanotec Motor DB42S03 within the kit, rotates properly from the minimum rotational speed of **600 RPM** up to **3500 RPM** as soon as the supply is established just by the USB connection to the PC.

The current throughout the three shunts at slower rotational speed than 600 RPM is too low by using the USB power supply configuration and cannot be used for the rotor estimation within the control algorithm.

Please Note that the USB power supply of the Board ensures a limited maximum current of up to **500mA** with a total phase current limited to **300mA** at 12Vdc Voltage.

Higher Voltage up to 24Vdc and current up to 1A can be supplied to the Board externally by changing the settings of the Jumper JP1 and JP2, like described in the “Chapter 3.0 Initial Board Configuration”.

The maximum load free rotational speed of the Nanotec motor is up to **6000RPM**.

The motor can reach higher speed up to **8000RPM**, using the implemented flux weakening technic within the control algorithm and higher current.

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7.0 Additional material

After you have completed this quick start procedure, please review documentation that is available on the webpage www.renesas.eu/motorcontrol

The Website contents is the following:

Items	Description of Resources
Auto-tuning Video-Tutorial	Short video explaining how to easily tune any Brushless AC motor in 45 seconds using just the intuitive PC Graphical User Interface
YROTATE-IT-RX23T_PC_GUI_XXXXXX.exe	PC GUI installer package including the drivers and readme file
Embedded Software e ² Studio Source Code CS+ Source Code	Source files for code flashed by default into the Renesas RX23T microcontroller available under e2studio and CS+ (CubeSuite environment) The software source code delivered is Royalty-Free.
Manuals Kit Motor Specifications Renesas Datasheets Tuned Motors Specifications	Relevant documentation for the kit, the 3-phase motor, the RX23T microcontroller, the Renesas MOSFETs and the motors tuned. Languages supported: English, Japanese, Korean, Chinese
Schematics-Gerber-BoM External Power Stages Main low voltage inverter Board	Schematics, Gerber files (Design files, CAD), Bill of Materials for both the main kit and the external power stages (not included as part of the kit)



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8.0 Support

Online technical support and further information is available at the following locations

Motor Control Websites

Europe: www.renesas.eu/motorcontrol
America: www.am.renesas.com/motorcontrol
Japan: www.renesas.com/motorcontrol

General Web Resources

RenesasRulz Forum www.renesasrulz.com
Renesas Interactive Training www.renesasinteractive.com
Renesas YouTube Channel www.youtube.com/user/RenesasPresents
Renesas Europe on Facebook www.facebook.com/RenesasEurope
Renesas Europe on Twitter www.twitter.com/Renesas_Europe

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