Kitagawa Digital Grip Force Analyzer™ App for OSP P200/P300 lathe controls

> itagawa Digital Grip Force Analyzer™ V1.0.1 for 2SP-V60

Connected Grip Force: 0 N at 0 RPM OKUMA

| Home | Machine Parameters | Settings | Diagnostic | About | Reset Sensor |

607.9N at 9077 RPM

> 11 points collected
> Scaling chart
> Test completed

| Automatic test | Manual Test | Set max RPM |

in Kontrol

For OSP P200/P300 controls with API V1.12.1 min.

in Kontrol

1.   Table of Content

2.   Introduction

The application reads the gripping force measured by the ForceCheck Sensor and plots a chart showing the loss of gripping force due to centrifugal force at higher RPM. The application interacts with the OSP Think API and can automatically set a maximum RPM value (chosen by the user) for the current program in execution. The application automatically recognizes the machine and shows different behavior accordingly to the number of spindles and they configuration: left/right spindle or main/sub spindle.

Application capabilities:

- The sensor is automatically discovered by scanning the available communication ports in the CNC. Just insert the USB dongle in a USB port and turn the sensor on.
- Automatic generation of the CNC program for the automated test. The user selects the maximum RPM desired, the interval of RPM to read the grip force value and, for multi spindle machine, which spindle is used.
- The user can customize the machines spindle/spindles information, such as: maximum spindle speed, number of gears and min/max speed for each gear.
- Manual test for recording sensor data at any moment, either by manually running the spindle or by executing any program. The user can choose the sampling interval in seconds.
- Auto start/stop of the sensor reading during the manual test. The application can automatically start collecting data from the sensor once it detects a minimum of 5 RPM. The data collection can stop automatically once the spindle stops spinning for 2 seconds.
- The Grip Force/Rpm chart is interactive. The user can zoom in/out, pan and click on the plotted curve to see the grip force and RPM values in detail. Zooming and panning are activated by keyboard keys and/or mouse.
- The grip force can be shown in three different units: Newton (N), Kilogram Force (kgf), Pound Force (lbf)
- The plotted chart can be automatically saved as Excel file for data collection. The user can choose default name and location of the Excel file.
- The application can automatically modify the part program with the selected maximum RPM.
- The Diagnostic Page shows info about the sensor and allows for sending command to the sensor on-the-fly.

3.   Requirements

The application requires OSP Think API version 1.12.1 or higher and the .NET Framework 4.0 or higher. The application installer will automatically install the .Net framework 4.0 if not already installed.

4.   Installation

4.1   Installing the App

Download the application installer *KitagawaDigitalGripForceAnalyserOSP.exe* from the Okuma App Store (www.myokuma.com). Copy the installer in the CNC and execute it. Follow the installer prompts and the application will be installed and started. Use the Add/Remove Program in the control panel to uninstall it.

The installer creates a new folder *Kitagawa Digital Grip Force Analyzer™ for OSP* in Start/All programs, with links to the application, to the application uninstaller and to the User Manual.

During the installation, the Installer checks of the .NET Framework V4.0 is installed in the CNC and it will automatically install it if needed.

4.2   Installing the USB dongle drivers

Windows XP or 7 may fail to automatically install the driver for the sensor USB dongle. In this case unzip the driver package *CDM v2.12.16 WHQL Certified.zip* on the user document folder in the CNC and follow the instruction in the installation guides:

- *AN_104_FTDI_Drivers_Installation_Guide_for_WindowsXP.pd* for OSP on Windows XP
- *AN_119_FTDI_Drivers_Installation_Guide_for_Windows7.pdf* for OSP on Windows 7

5.   Home page
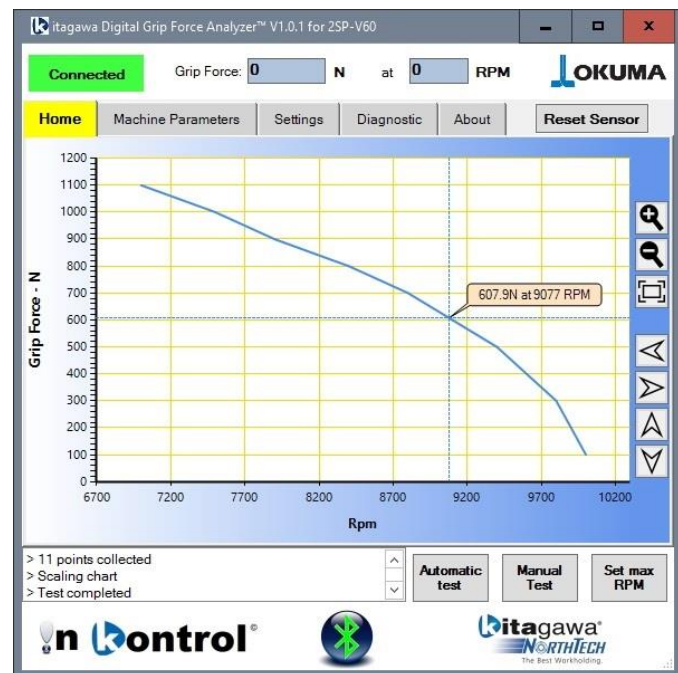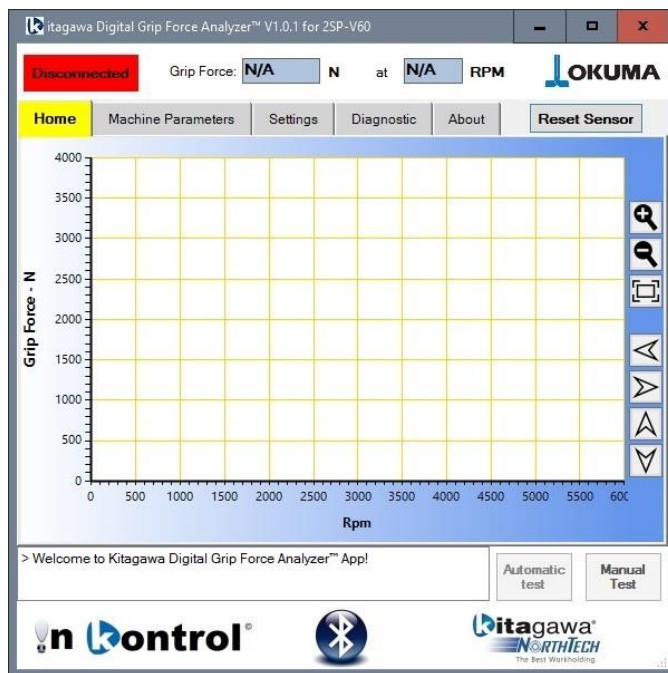
When the application is started for the first time, the chart is empty and the connection with the sensor is not active. The 5 tabs: *Home, Machine Parameters, Settings, Diagnostic* and *About,* are explained in details in the next paragraph. The Automatic Test and Manual Test buttons are enabled only when the application is connected to the sensor.

The connection with the sensor can be initiated by clicking on the Bluetooth orb in the middle of the application at the bottom or on the red *Disconnected* button on the top left corner. Once the sensor is connected, the stylized 'B' shape in the Bluetooth logo becomes green and the *Disconnected* button becomes green showing Connected. Clicking again on the Bluetooth orb or on the Connected button will disconnect the sensor. During the connection phase the Disconnect button changes in Connecting with orange background and the stylized 'B' shape in the Bluetooth orb fades from white to orange and back to white.

The grip force and RPM fields show respectively the real-time force and rpm as measured by the sensor. The grip force unit is shown to the right of the real-time field and on the vertical axis of the chart. The grip force can be displayed in Newton (N), Kilogram-force (kgf) and Pound-force (lbf). The desired unit can be selected in the *Settings* tab.

There are 7 controls on the right side of the chart that can be clicked directly or operated by the keyboard. From the top: *Zoom In (Page Up key), Zoom Out (Page Down key), Fit All (Home key), Pan Left (Arrow Left key), Pan Right (Arrow Right key), Pan Up (Arrow Up key)* and *Pan Down (Arrow Down key)*. Zoom In and Zoom Out can be operated with the mouse wheel. This controls are active only if a chart is displayed.

The chart can be clicked and a balloon will pop up showing the value of grip force and RPM.

The *Reset Sensor* is used to set the sensor zero, once the sensor is connected.
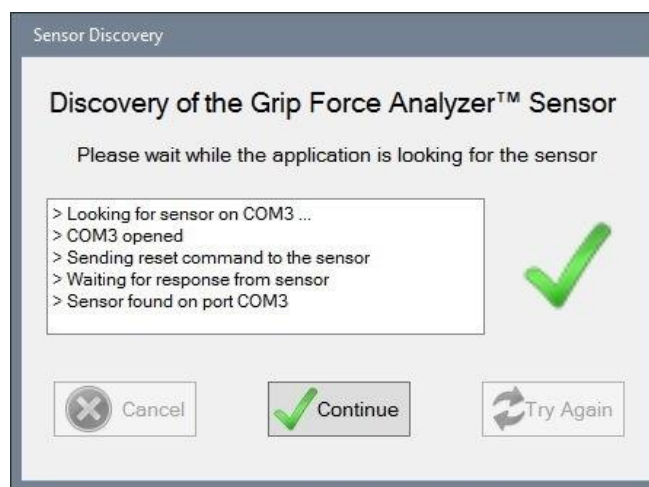
6.   Connecting the sensor

Connecting the sensor requires the sensor to be on and the USB dongle properly working in a USB port of the CNC. On the sensor, the Led should be blinking with a green color meaning that the USB dongle and the sensor are properly connected. Once this step is done, it is possible to activate the communication between the Application and the sensor, by clicking on the Bluetooth orb or on the *Disconnect* button. The very first time the application runs, the Sensor Discovery starts and it looks for the sensor on any serial communication port available in the system.

6.1   Sensor Discovery – Looking for the sensor

The Sensor Discovery scans trough every Serial Communication port trying to find the sensor. On a system with 2 serial ports, it normally takes about 30 seconds. If there are more serial ports, the time will increase accordingly. While the loading animation is running, the Sensor Discovery is working and giving feedback messages.

6.2   Sensor Discovery – Sensor found

Once the sensor is found, the Sensor Discovery shows a big green check mark. Press the *Continue* button and the Sensor Discovery will close and the application will initiate the connection with the sensor.

6.3   Sensor Discovery – Sensor not found

Sometimes, the sensor discovery cannot find the sensor. Make sure the USB dongle is properly plugged in and that the sensor is ON. Press the *Try Again* button to run the Sensor Discovery one more time. If still the Sensor Discovery cannot find the sensor, follow this procedure:

- Turn the sensor off
- Unplug the USB dongle
- Turn the sensor on and wait 5 seconds. The Led should blink in purple color
- Plug the USB dongle back in and wait until the Led on the sensor changes to green color

6.4   Sensor Batteries

The sensor requires three (3) AA size batteries. Once the batteries level get lower the communication between the sensor and the App becomes less reliable. Make sure to remove the batteries from the sensor when not in use to extend the batteries life.

7.   Machine Parameter Page

This page is used to configure the machine spindle parameters. The Right Spindle section is shown only on machines with left and right spindles as for 2SP-V60. Left and Right becomes Main and Sub on machines with opposing spindles as for Multus or LT machines. The application will automatically determine the machine configuration from querying the API. The user must enter the number of gears and the minimum maximum RPM of the spindles, since the Okuma API does not provide these information's. The Automatic Test uses the information in this page to generate the proper test program.

Always remember to press the Save Settings when done, or the spindles data won't be saved.

8.   Settings
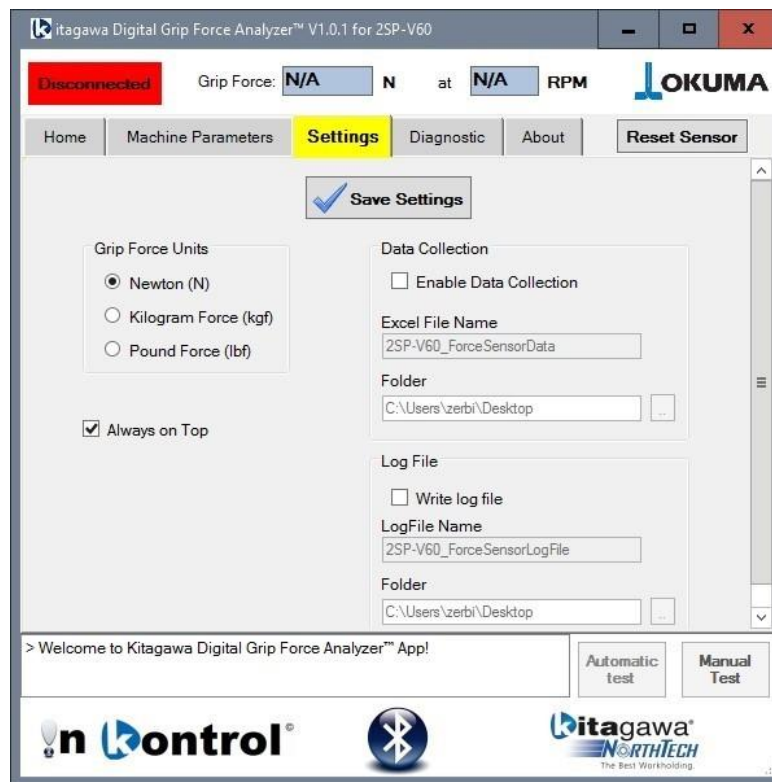
This page allows the user to configure the units of the grip force, Data collection, and event logging.

The data collection consists in an Excel file with the collection of data, information about the test and the chart. It is possible to configure a default location and file name for Excel file. Each time a new test is performed the application will save a new Excel file with the default name plus an incremental number. In this way, there will be a spreadsheet for each test.

If the *Enable Data Collection* is set and data have already been collected, the application will ask the user for a confirmation to save the current set of data.

The log file will be unique and the application will continually add events to

it. The application will log any message shown in the application window.

To choose a default location for the Excel and log file, click on the corresponding '…' button and select a folder. Input the default file names in the respective fields.

The application will make sure that the file names are acceptable per Windows file system naming rules: https://msdn.microsoft.com/en-us/library/windows/desktop/aa365247(v=vs.85).aspx#naming_conventions.

Once done with the setting press the *Save Settings* button to make them effective.

9.   Diagnostic
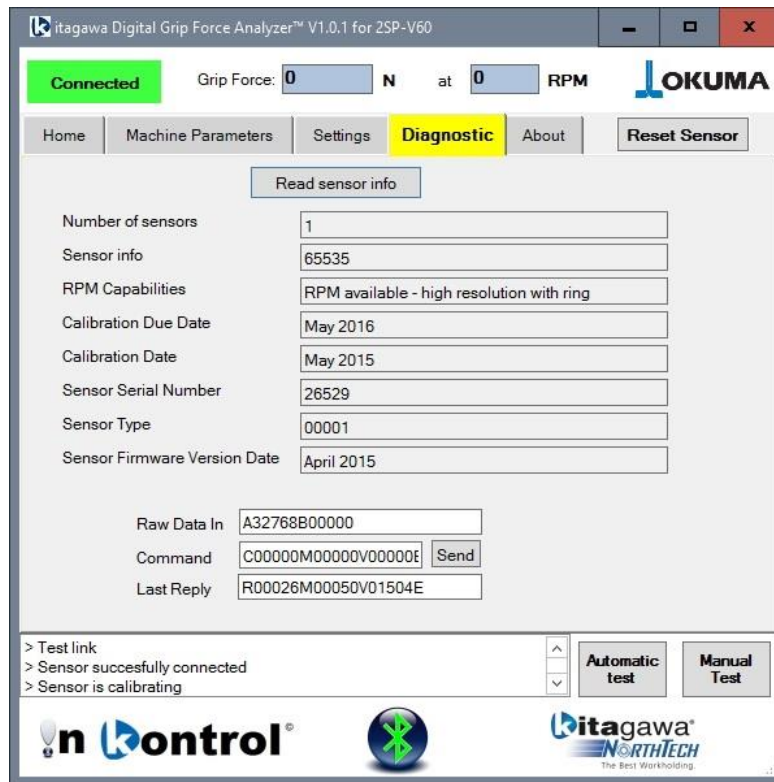
This page is intended for communicating with the sensor, mainly for debugging purposes or for fun!

The *Read Sensor Info* button allows the application to read the internal data in the sensor and fill the info form.

The *Raw Data In* field shows the raw data coming from the sensor, the *Last Reply* field shows the latest answer to a command and, lastly, the *Command* Field and *Send* button allow the user to send command to the sensor.

The sensor documentation provides a list of the available commands and their format.

10.   Automatic test
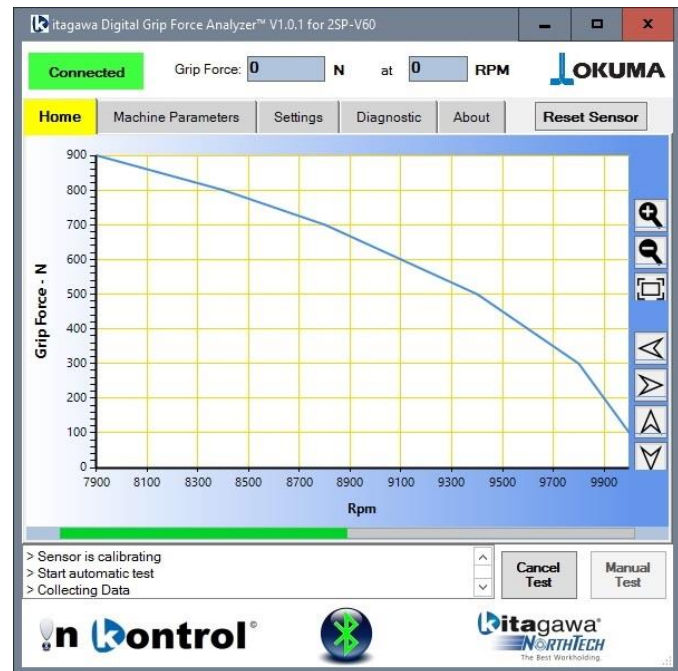
With the Automatic Test the application will create and set for executing a test program that runs the spindle at specified RPM and records the grip force and Rpm at each level. The user sets the maximum RPM accordingly with the part and sets the interval in RPM. For multi spindle machines the user selects in which spindle the sensor is installed: Left/Right spindle for machines like the 2SP-V60 or Main/Sub spindle for opposing spindle machines like Multus or LT. Once the settings are ready, press the *Prepare Program* button and the application will generate the test program named FORCETEST*xxxxxx*.MIN where the *xxxxxx* will be the machine serial number. Once the program has been created, it will be automatically set for execution. Make sure the sensor is properly installed in the spindle and that the machine is ready to start the program. Press the *Start Test* button and then press the machine cycle start. The spindle will start stepping trough the levels, and at each dwell the application will record grip force and RPM. Each value pair is immediately shown on the chart.

11.   Manual Test
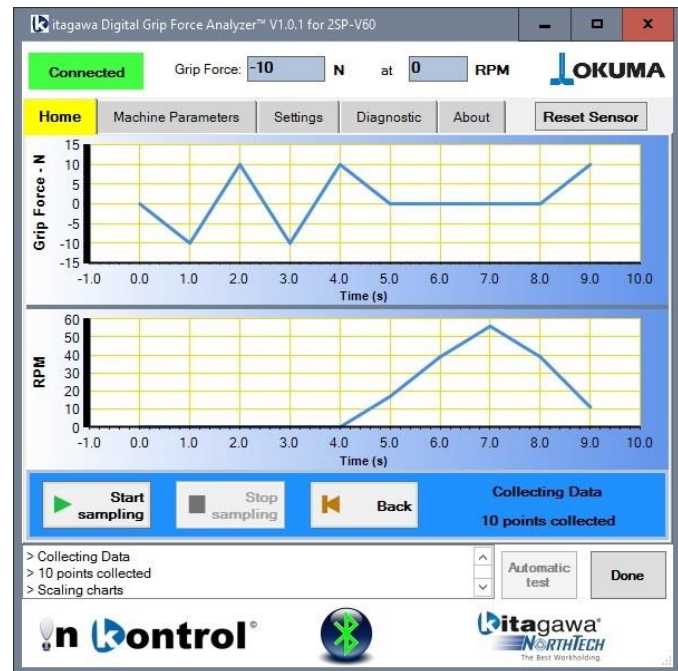
The Manual Test is used to record data on the fly by spinning the spindle manually, either in manual mode with the spindle override or in MDI mode by programming the desired spindle RPM. In the Manual Test mode, the setting needed are the sampling frequency in seconds, and if the application will start and/or stop the sampling automatically. The default sampling frequency is 1 second, meaning that the application will read the grip force and RPM once per second.

With *Start Sampling Automatically* enabled, the application will start sampling automatically once it detects that the sensor is spinning at more than 5 RPM. When *Stop Sampling Automatically* is enabled, the application will stop sampling once the sensor has stopped spinning for more than 2 seconds.

If Start *Sampling Automatically* and *Stop Sampling Automatically* are not enabled, the sampling will start and stop once the respective *Start Sampling* and *Stop Sampling* buttons are pressed.

The application will automatically stop recording once 2000 points have been recorded.

12. Set max RPM
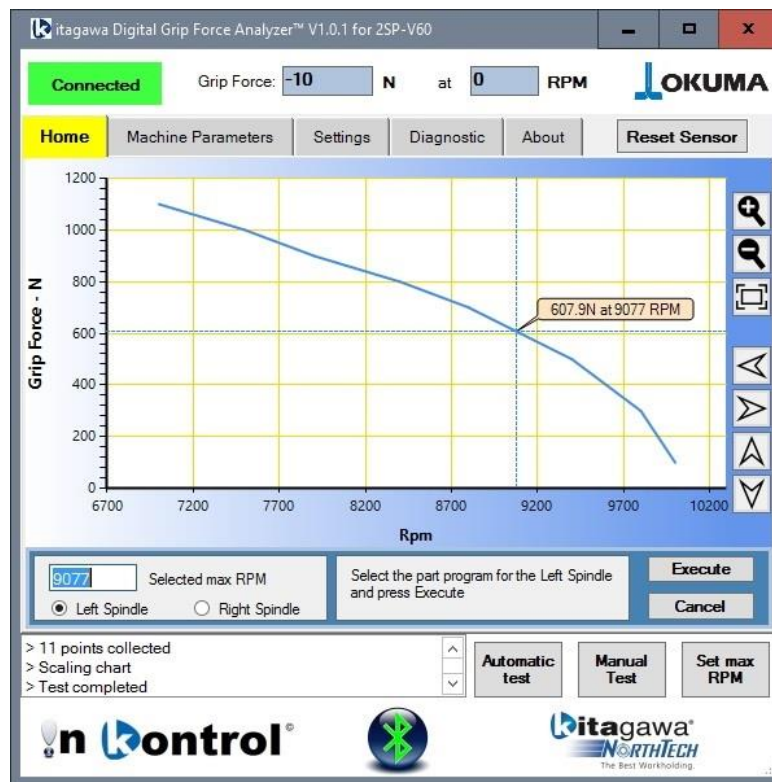
Whit this functionality the application can automatically set the maximum RPM in the user part program, accordingly with the maximum loss of grip force allowed by the user.

The *Set max RPM* button is enabled once there is a chart plotted. Once pressed, the Set max RPM panel is shown. If the chart is clicked, the corresponding RPM are automatically selected in the *Selected max RPM* field. The desired max RPM can be also set manually. For multi spindle machines the user select in which spindle the sensor is installed: Left/Right spindle for machines like the 2SP-V60 or Main/Sub spindle for opposing spindle machines like Multus or LT. The application will pre-select the spindle chosen for the Automatic Test, and the user can change it anytime. Once the maximum RPM desired in the program are set, select the part program to modify and press the *Execute* button to start the process. The application will go through the selected program and it will change any G50 Sxxxx with a spindle speed bigger than the one selected. Any G50 Sxxxx block with spindle speed already less than the selected RPM will be untouched. The application will make a backup copy of the part program (using the same program name but with "BCK" extension) and will insert a comment in the program before any changes of RPM showing what was the original value.

The application properly handles programs for opposing spindle machines, by changing the maximum RPM only for the selected spindle.
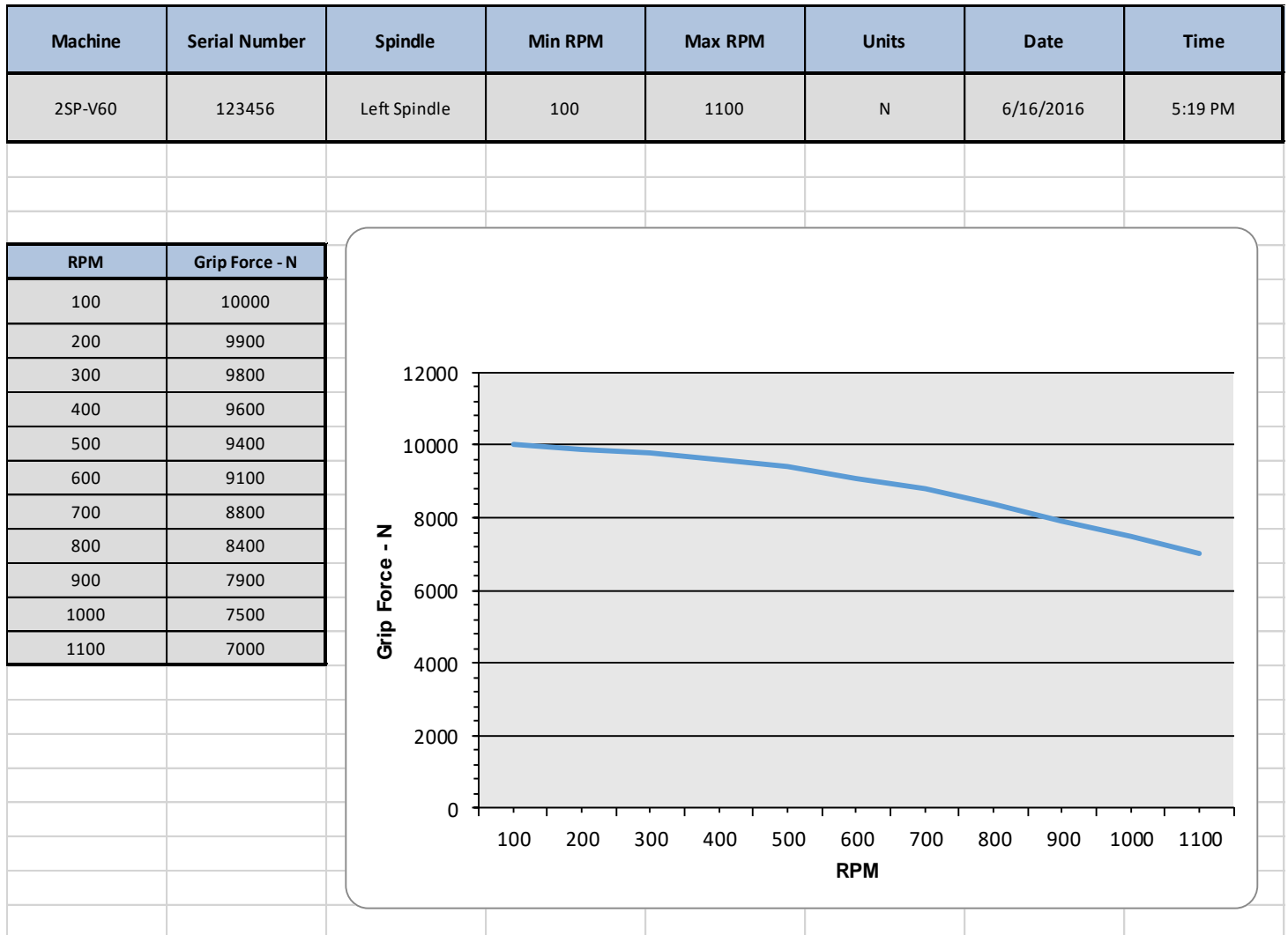
13.   Example of program modified by the Application

This example shows on the left side the original program and on the right side the modified program. The desired selected RPM was 680. The first G50 of S1000 (in yellow) was bigger than the desired 680, so the application changed it to 680 and added the comment right before it. The second G50 of S500 (light blue color) was lower than the desired RPM and the application left it untouched (magenta color).

Original program	Modified program
N12 G50 S1000 G00 X50. Z50. G0 T121212 G97 S600 M03 G0 X5.7 Z.005 M08 G96 S700 G95 G1 X4.0675 F.018 G0 Z.05 X5.406 Z.0067 G1 X5.5704 Z-.219 G0 X5.9468 Z0.1 M09 G97 S200 G00 X50. Z50. M1 N3 G50 S500 G00 X50. Z50. G0 T030303 G97 S492 M03 G96 S700 G0 X4.4589 Z.1039 M08 G1 X4.2269 Z-3.496 F.021 X4.1442 G0 X4.0028 Z-3.4253 Z.1039 X4.759 G1 X4.5271 Z-3.496 X4.2269 G0 Z.1 M09 G97 S200 G00 X50. Z50. M2	(WAS G50 S1000) N12 G50 S680 G00 X50. Z50. G0 T121212 G97 S600 M03 G0 X5.7 Z.005 M08 G96 S700 G95 G1 X4.0675 F.018 G0 Z.05 X5.406 Z.0067 G1 X5.5704 Z-.219 G0 X5.9468 Z0.1 M09 G97 S200 G00 X50. Z50. M1 N3 G50 S500 G00 X50. Z50. G0 T030303 G97 S492 M03 G96 S700 G0 X4.4589 Z.1039 M08 G1 X4.2269 Z-3.496 F.021 X4.1442 G0 X4.0028 Z-3.4253 Z.1039 X4.759 G1 X4.5271 Z-3.496 X4.2269 G0 Z.1 M09 G97 S200 G00 X50. Z50. M2

14.   Data Collection

The application can output an Excel spreadsheet with information about the test, the data collected and the chart. This is an example of output:

Machine	Serial Number	Spindle	Min RPM	Max RPM	Units	Date	Time
2SP-V60	123456	Left Spindle	100	1100	N	6/16/2016	5:19 PM

RPM	Grip Force - N
100	10000
200	9900
300	9800
400	9600
500	9400
600	9100
700	8800
800	8400
900	7900
1000	7500
1100	7000

The Excel file reports the machine model and serial number from the API, min/max RPM, the unit of measurement, and the date and time of the test. Next, there is the table with the collected data and the chart generated from the collected points.

Each time an automatic or manual test is performed the application outputs a new Excel file, using the file name specified in the setting plus an incremental number.

15.   About Page

The *About* page shows the application version and information about the third-party components used in it along with the developer's info.

16.   Settings backup

The application stores the settings in a file named *settings.xml* located in the application folder *D:\ Program File\Kitagawa-NorthTech\Kitagawa Digital Grip Force Analyzer™ for OSP.* If the application needs to be reinstalled and the user wishes to maintain the settings, backup the settings file, install the application and copy the backup settings file in the application folder.

17. Disclaimer

By installing the Kitagawa Digital Grip Force Analyzer™ App for OSP P200/P300 controls:

- The users waive the right to any and all bodily or property claims and or damages resulting from the intentional or unintentional use or misuse of any portion of this product and any associated hardware.

- The users waive the right to any and all technical support for any portion of this product and any associated hardware.