COLIBRI
SPINDLES

High Speed Jet Spindle
SWISS JET

USER MANUAL

CONTENTS

FCC Compliance Statement

This BLE sensor (FCC ID: 2ACJNTJEH-030A) complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Testing confirmed compliance with the limits for a Class A digital device, as defined in FCC Part 15. These limits are designed to provide reasonable protection against harmful interference in a residential environment.
This device generates, uses, and can radiate radio-frequency energy; if not installed and used according to the instructions, it may cause harmful interference to radio or television reception. There is no guarantee that interference will not occur in a particular installation.
If interference does occur—testing by switching the device off and on can help confirm this—the user should consider one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the device and the receiver.
- Connect the device to an outlet on a circuit different from that supplying the receiver.
- Consult the dealer or an experienced radio/TV technician.

This device complies with FCC Rules Part 15:
Operation is subject to two conditions:
1. This device may not cause harmful interference.
2. This device must accept any interference that may be received or that may cause undesired operation.

⚠	**WARNING!** Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1. General

1.1 Safety First

⚠	**Read the Manual** Safety of the operator is a main concern. This equipment is as safe as we are able to make it. Avoid accidents by reading the safety alerts, investing a few seconds of thought and a careful approach to handling equipment. You, the operator, can avoid many accidents by observing the following precautions. Review the safety instructions of the manufacturer, suppler, owner and all organizations responsible for the prevention of accidents.
⚠	**Ensure the Following:** The work area and the area around the CNC machine are free of obstacles. The work area is properly lit. This equipment is operated only by a responsible adult trained in this operation This equipment is not operated by a person under the influence of drugs or alcohol This equipment is not operated by a person with any illness or physical condition that might reduce reflexes or awareness and increase exposure to risk. Before starting any kind of work, install all of the safety devices prescribed by the builder of the machine or power tool.
⚠	**Warning: Rotating Tools, Entanglement Hazard** To avoid risks associated with the use of rotating tools it is strongly recommended to use the utmost caution and concentration when working.
⚠	**Warning: Rotating Tools, Cut or Severe Hazard** Always wear correctly sized gloves that allow the sensitivity necessary to operate the tool correctly and give adequate protection in the event of the blade being touched during use.
⚠	**Warning:** Always use safety glasses or protective screens to protect your eyes.
⚠	Only install tools in perfect condition that are recommended for the material to be worked and that are suitable for the type of machine used. Do not use cracked or deformed tools. Check that the balancing, keying and centering of rotary tools are carried out correctly. Secure the tool correctly using the proper tightening and adjustment devices. Remove all tightening and adjustment devices before use. Check that the tool rotates in the correct direction. Never exceed the limits of a piece of machinery. If its ability to do a job or to do so safely is in question - DON'T TRY IT.

1.2 Statement of Conformity

The SWISS Jet Spindle meets the following standards:

European Standards (CE)
- EMC: EN 301489-1/17
- Radio: EN 300328 V 1.8.1
- Safety: EN 61010-1:2010

American Standards (UL)
- EMC: FCC Part 15 B
- Radio: FCC Part 15 C
- Safety: UL 61010-1

International Standards
- Safety: IEC 61010-1:2010

1.3 Introduction

The SWISS Jet Spindle, is a robust High-Speed Sub-Spindles. It is driven by the CNC machine spindle's coolant-through-flow, at a minimum pressure of 15 bar.
A SWISS Jet Spindle does not require any special installation, aside from mounting onto the machine spindle. It operates as any other standard toolholder in the tool magazine using ATC.

1.4 Case Contents

SWISS Jet Spindle box

Fig. 1: SWISS Jet case contents

1. SWISS JET Spindle
2. High Precision ER8 Nut (preinstalled)
3. ER8 Wrench
4. 9mm Spanner
5. M4 Screws (only included with 97-000-310)

Note: ER8 Collet is not provided by Colibri

Jet Spindle Monitor App (using extra BLE Sensor)

Download on the App Store

GET IT ON Google Play

1.5 Main Features

The SWISS Jet Spindle system uses the machine's existing coolant or cutting fluid supply as a pressurized energy source, rotating a turbine in the range of 35K - 55K RPMs.
It offers an ideal solution for a wide range of semi-finishing and finishing applications such as milling, drilling, thread-milling, engraving, chamfering, deburring, fine radial grinding and more. The Jet Spindle is equipped with real-time wireless RPM transmitting and monitoring; to optimize cutting conditions.

1.5.1 Basic Operation Tables for Spindle Applications

Basic operation table - SWISS Jet

JET SPINDLE OPERATING PARAMETERS						SWISS JET	
HIGH PRESSURE COOLANT (BAR)	15 BAR	20 BAR	25 BAR	35 BAR	45 BAR	Terms of Use	
Min Coolant Supply Diameter [mm]	4.0					**Collet**	ER8 AA/UP
Min flow rate (L/min)	12	14	16	18	20	**Runout**	3 Microns
Rotational spindle speed [RPM]*	30,000	36,000	38,000	46,000	56,000	**Warranty**	1 Year

*** Notes:**

- Rotational spindle speed is based on coolant pressure and flow rate.
- Coolant pressure is measured at the spindle inlet.

Max. Tool Diameter [mm]	Application	P	M	N [Al]	N [Cu]	S [Ti]
	Drilling	2.0		3.0	2.0	
	Profile Milling	3.0	4.0			
	Slot Milling	3.0	4.0		3.0	
	Shoulder Milling	3.0	4.0		6.0	
	Chamfering	6.0				
	Deburring					
	Engraving					

1.5.2 Integrated Coolant Nozzle System

Integrated coolant nozzle system provides direct jet coolant application for fast, powerful cooling and effective chip evacuation.

Fig. 2: Integrated coolant nozzle system

1.5.3 Wireless RPM Mobile App

Fig. 3: Jet Spindle wireless transmitter and Jet Spindle Monitor App

The SWISS Jet Spindle can be used with an extra BLE ("Bluetooth Low Energy") sensor which can automatically connect to the iOS & Android 'Jet Spindle Monitoring" App, allowing real-time monitoring of the rotation speed before machining to check RPM. The wireless transmitter sends RPM data to the mobile device via BLE technology.
The Jet spindle sensor transmitter is powered by a non-rechargeable CR2 lithium battery.

1.5.4 BLE Sensor Transmitter Information

- BLE frequency transmission
- Range up to 10 m
- Internal battery-powered
- Individual ID number for each transmitter unit
- Direct live wireless rotational speed monitoring via Jet Spindle Monitor App

Fig. 4: Jet Spindle with BLE Speed Sensor

1.5.5 Tool Clamping and Shaft Lock

The SWISS Jet Spindle is compatible with ER8 collet chuck. It is recommended to use high-precision ER8 spring collets.
The shaft lock mechanism provides a simple, easy way to change the cutting tool on the SWISS Jet Spindle. For complete tool mounting instructions, see chapter 2.1.4 (page 12).

Fig. 5: SWISS Jet Spindle shaft lock mechanism

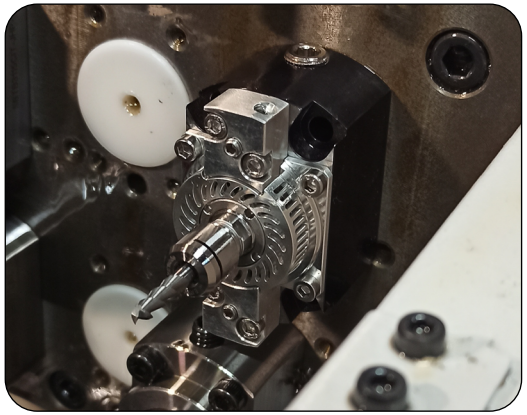
2. Installation

2.1 Using SWISS Jet Spindle

2.1.1 Prerequisites for CNC Machine

1. Coolant flow through the main CNC machine spindle.
2. Min. coolant pressure, at main spindle outlet: 15 bar.
3. Max. coolant pressure, at main spindle outlet: 45 bar.
4. Minimum flow rate: 10 L/min.
5. Filter element: Max. 100 µm.
6. Active mist collector.
7. With emulsion coolant, use an anti-foaming agent additive suitable for emulsion.
8. With oil based coolant, high pressure increases the amount of oil fumes:
   a. Use appropriate means of fire protection and fire extinguishing.
   b. Use anti-dissolution additive suitable for the oil.
9. Max. viscosity 15 mm^2/s.

2.1.2 SWISS Jet Spindle Installation to CNC Machine



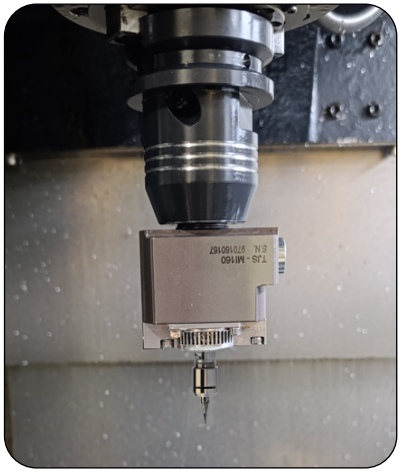


Fig. 6: SWISS Jet Spindle on CNC machine

When the SWISS Jet Spindle is mounted on the machine, the CNC machine spindle should be stationary, except for tool check procedure or Z-offset measurement. In these cases, tool rotation must not exceed 3,000 RPMs to avoid risk of breakage/injury.

To avoid CNC machine spindle rotation during a SWISS Jet Spindle operation, use the correct software M-code to lock the spindle orientation.

For example: “M19” code locks the spindle in a defined angle position.

2.1.3 Tool Prerequisites

SWISS Jet Spindles should be used in applications with tool shank diameters up to 5 mm!

Recommended max. tool diameter - SWISS Jet

Max. Tool Diameter [mm]	Application	P	M	N [Al]	N [Cu]	S [Ti]
	Drilling	2.0		3.0	2.0	
	Profile Milling	3.0	4.0			
	Slot Milling	3.0	4.0		3.0	
	Shoulder Milling	3.0	4.0		6.0	
	Chamfering	6.0				
	Deburring					
	Engraving					

2.1.4 Tool Installation for the SWISS Jet Spindle

When machining at high speeds you must have a high precision spindle that provides the speed, accuracy and power using high-precision nut & collet to optimize dynamic balancing with pinpointed coolant to the cutting edge. **Assures a simple tool change with no setup time and a low runout**.

Tools needed for Tool Clamping

- ER 8 High Precision Nut
- ER 8 High Precision Collet Ø 4.00 mm (5/32") - **Not included in the box!**
- ER 8 Wrench
- 9mm Spanner

Fig. 7: Tools needed for Clamping

How to Clamp a Tool

Assemble the ER 8 AA/UP collet, the cutting tool and ER 8 nut:
Firstly, ensure Jet Spindle cone and collet are thoroughly cleaned.

1. Insert collet and screw on the nut by hand.
2. Align flat sides of the shaft with the positioning slot on the spindle cover.
3. Position 9mm Spanner over the nut. (Raised buttons should fit into the positioning slot underneath.)
4. Slide 9mm Spanner to secure it in place.
5. Insert ER8 Wrench into the slots on the Nut.
6. Turn ER8 Wrench **clockwise** to tighten. (Note: max. 6Nm tightening torque!)

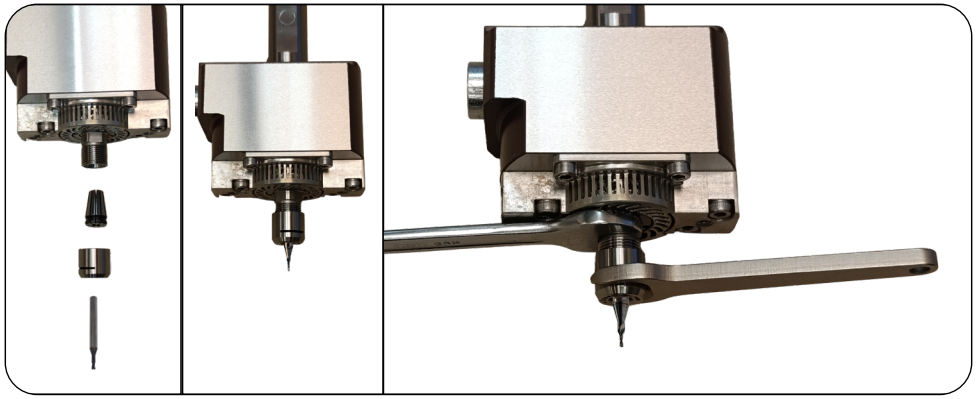


Fig. 8: Steps of tool clamping

How to Remove a Tool

1. Slide the 9mm Spanner to unlock.
2. Insert the ER8 Wrench and turn **counterclockwise** to loosen the nut (this may take a few turns).
3. Keep the shaft lock in the secure position, if you wish to insert a new tool.

Fig. 9: Insert wrench into slots off the nut – turn **counterclockwise**

2.1.5 Tool Clamping and Runout Check (Recommendations)

The SWISS Jet Spindle is designed to perform high speed operations with small diameter cutting tools for very accurate machining.

It is very important to properly perform the instructions related to cutting tool setup, correct clamping procedure and tool runout.

Standard clamping tools, such as ER8 spring collets and standard clamping accessories are used on a SWISS Jet Spindle.

To get a minimum runout value use ER8 SPR...AA or AAA spring collects with exact hole size.

According to ISO 15488, the collet runout tolerances should be checked as shown in the image.

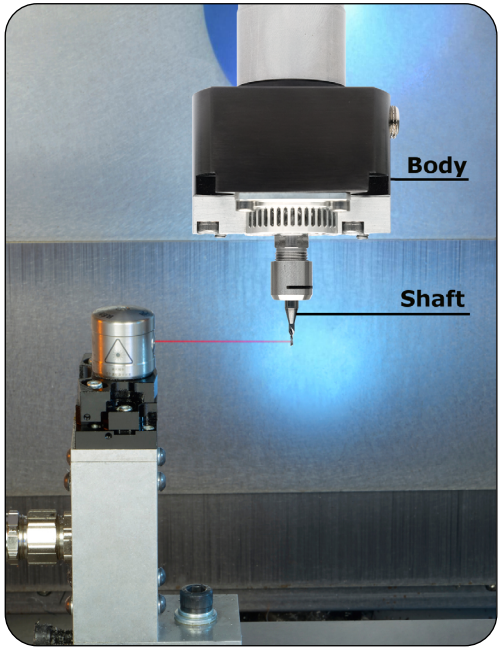


Fig. 10: Optical runout testing

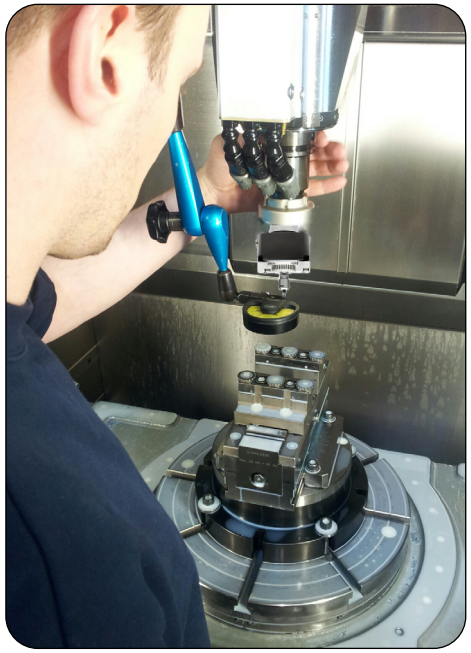


Fig. 11: Manual runout testing

- SWISS Jet Spindle body must remain static.
- Runout Is measured by rotating the shaft manually, or running an air supply through the machine spindle.

2.1.6 Cartridge Replacement for SWISS Jet Spindle

To replace the cartridge there are two steps, first remove the existing cartridge and then install the new cartridge:

Before disassembly remove ER8 Nut and Collet!

1. Losen all the marked screws below.
2. Take everything apart. (Pay attention to the O-rings!)
3. Change the Cartridge.
4. When assemble everything back together make sure:
   - To use Loctite 242 screw locking adhesive.
   - To use the 2 O-rings you got from disassembly.

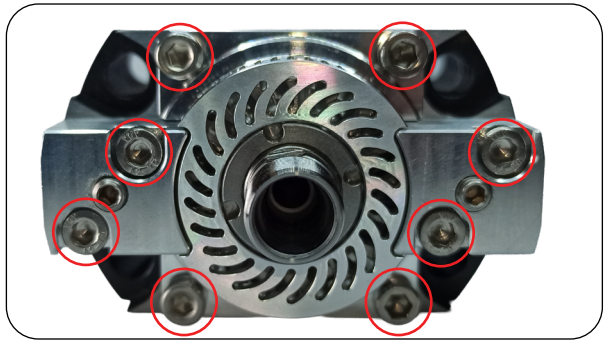


Fig. 12: Marked screws for disassembly

Fig. 13: SWISS JET Spindle Cartridge

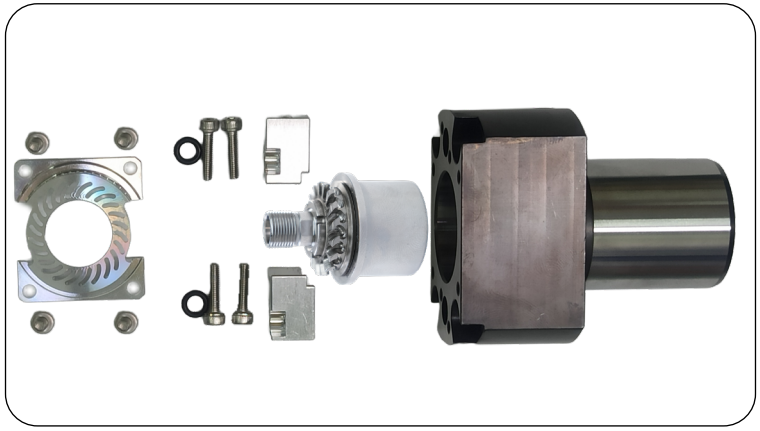


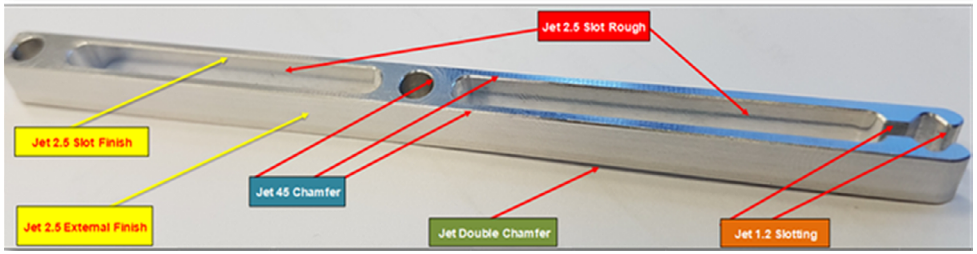
Fig. 14: SWISS JET Spindle taken apart for Cartridge replacement

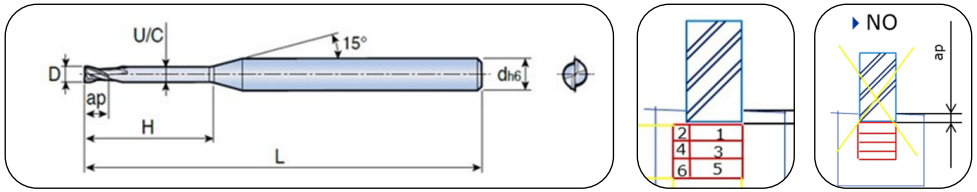
2.1.7 Milling & Drilling with Jet Spindles

Slot Milling Formula

Use a High Speed Slot/Shoulder Milling Strategy as follows:
First step – slot mill with an Ae of 60% of the final slot diameter and an Ap of 30% of end-mill diameter
Second Step – shoulder mill with an Ae of the remaining 40% of final slot diameter and a equivalent Ap of 30% of the end-mill diameter.
Repeat first and second step until you complete the slot.

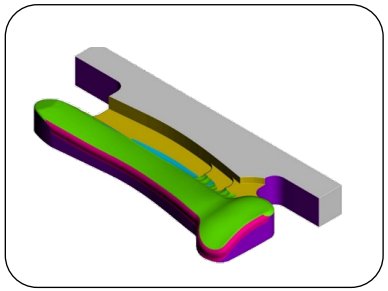
F(z) according to the "Jet Spindles Cutting Conditions Table", classified by: Tool diameter, Material, Speed

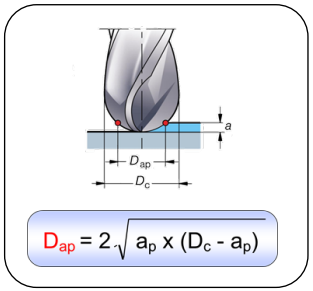




Profile Milling Formula

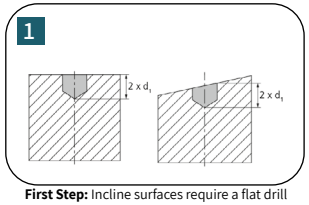
Ball nose geometry and Ap values determined the effective Dap – see equation
Finishing steps cutting conditions are usually correlated:
Ap or Dap = Ae
To achieve better Surface-finish, Ae should be minimum, and Feed will be according to the F(z) "Jet Spindles Cutting Conditions Table" recommendations – Material, Speed, Diameter



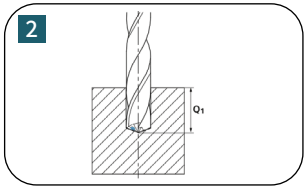


Drilling Formula

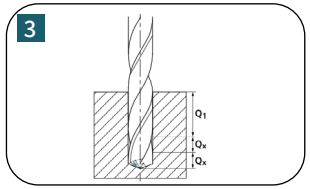
High Speed drill non-ferrous materials with a highly polished spiral tool.
First step – on inclined surfaces preparation with a flat drill or end-mill is mandatory.
Second step – drill until Q1=D according to the F(z) from the "Jet Spindles Operating Data" tables, classified by: Tool diameter, Material, Speed.
Third step - peck drill with Qx = Ap values from the Cutting conditions table. After each peck drill extract to position Q1 for chip evacuation.



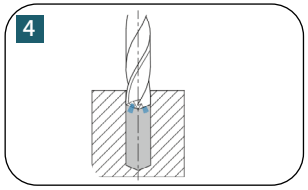
First Step: Incline surfaces require a flat drill



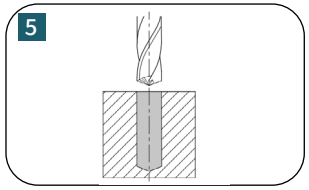
Second Step: Drill until Depth of Q1



Third Step: Pecking steps according to Qx value - extract each time to Q1 to evacuate the chips



Fourth Step: Extract to position 1 x D (Q1) at 500 mm/min or rapid feed. Never extract drill tip from hole



Fith Step: Extract the tip from the hole with vf = 500 mm/min

2.2 Preparations to Measure Speed with BLE Sensor

2.2.1 Battery Installation BLE Speed Sensor

Install battery into the RPM transmitter:

1. Unscrew the 4 battery case cover screws using a hexagonal 2 mm Allen key.
2. Remove the case cover.
3. Make sure the O-ring inside the cover is seated well, and is intact.
4. Insert the CR2 - 3V lithium battery in the correct direction.
5. Replace the battery case cover.
6. Replace the 4 screws to secure the battery case cover.
7. The transmitter is ready for operation.

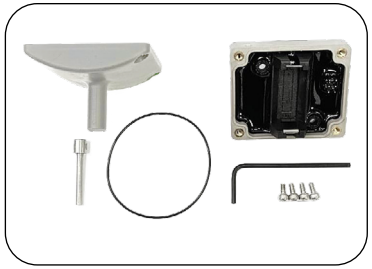


Fig. 15: Battery case opening

2.2.2 Prepare the Magnetic Pin

To measure a speed by the BLE Speed Sensor you need to use the magnetic pin.

Clamp the magnetic pin like any other tool:

1. Insert collet and screw on the nut by hand.
2. Align flat sides of the shaft with the positioning slot on the spindle cover.
3. Position 9mm Spanner over the nut. (Raised buttons should fit into the positioning slot underneath.)
4. Slide 9mm Spanner to secure it in place.
5. Insert ER8 Wrench into the slots on the Nut.
6. Turn ER8 Wrench **clockwise** to tighten. (Note: max. 6Nm tightening torque!)

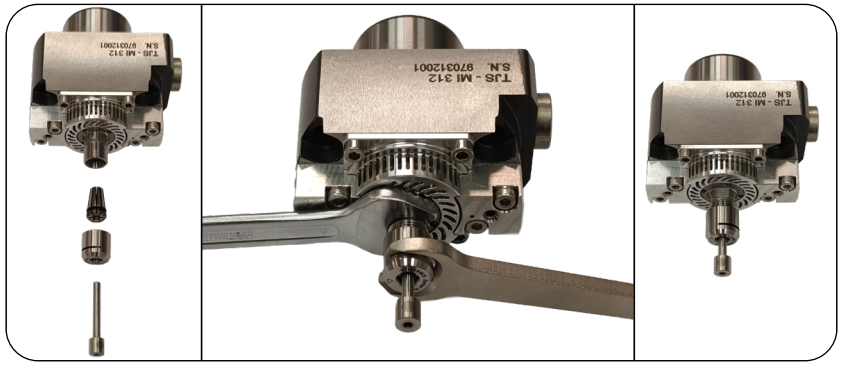


Fig. 16: Insert the magnetic pin for speed measurement

2.2.3 Prepare to Measure Speed on Machine

Clamp the Sensor:

1. Use a DIAL INDICATOR clamp
2. Insert the long shank of the Speed Sensor into the clamp and tighten it
3. Place the sensor 2mm away from the Magnetic Pin

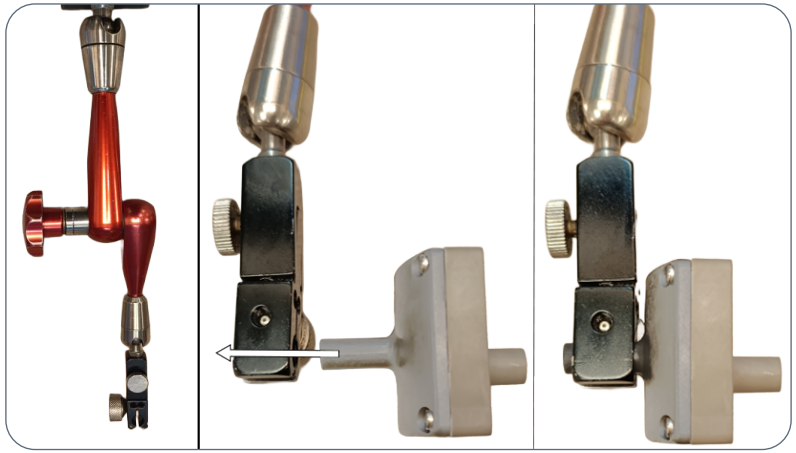


Fig. 17: Insert BLE Speed Sensor into clamp

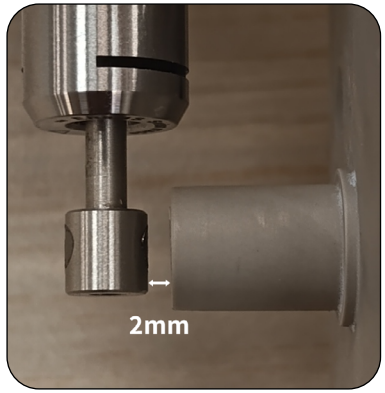


Fig. 18: 2mm Distance from Magnetic Pin to Speed Sensor

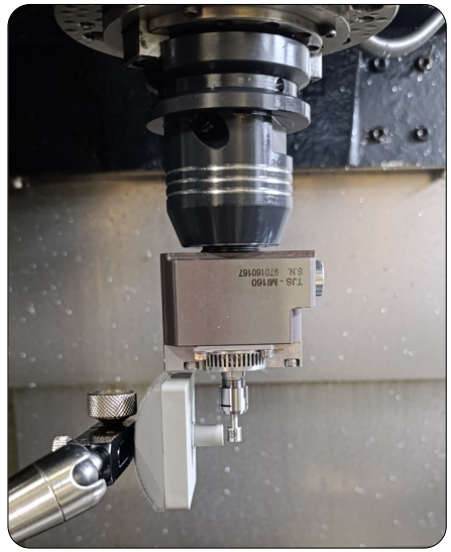


Fig. 19: Speed Sensor and SWISS Jet in machine

2.3 Jet Spindle Monitor App

The BLE Sensor for SWISS Jet Spindle allows for real-time monitoring of the RPM before machining with a Mobile App, available both for iOS and Android.

Use Jet Spindle Monitor across all your Jet Spindle devices, FREE of charge!

2.3.1 Prerequisite for App Installation

Make sure that the following prerequisites are met:

1. iOS or Andriod device
2. Distance from BLE Sensor to mobile device: no more than 10 m.
3. Create space for the mobile device to provide close-up and unobstructed viewing.

2.3.2 Download and Installation of Jet Spindle Monitor App

1. Download and install Jet Spindle Monitor (see methods below)
2. By installing Jet Spindle Monitor, you agree to our Terms & Privacy Policy.
3. Open Jet Spindle Monitor App on Apple or Android devices and start measuring.

iPhone & iPad

IOS

Requires iPhone 10 or newer. Click on the button below or search “Jet Spindle Monitor” on your device or just scan the QR code.

Download on the App Store

Andriod Phone & Device

Google

Requires Andriod 10 or newer. Click on the button below or search “Jet Spindle Monitor” on your device or just scan the QR code.

GET IT ON Google Play

2.2.4 Connect BLE Speed Sensor to Jet Spindle Monitor App

The Jet Spindle Monitoring App and the BLE Speed Sensor must be connected (paired) immediately after inserting transmitter battery.
How to connect the BLE Speed Sensor to the display:

1. Make sure the battery is installed in the BLE Speed Sensor.
2. Make sure your mobile device is ON.
3. The Jet Spindle will appear automatically in the list of connected devices in the App.
4. You have to set the Idle Speed of the Spindle each time you are starting the Spindle again - using the SET button.

Fig. 20: Multiple Spindle connection

2.2.5 App Display Screens

Home Screen

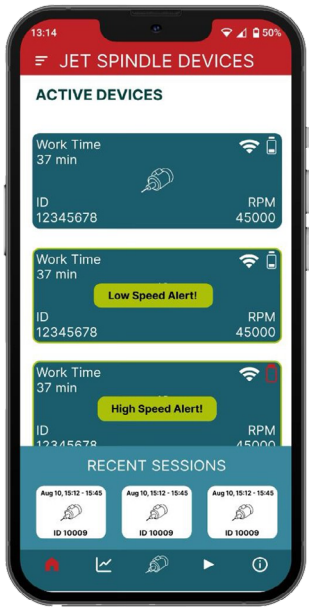


Fig. 21: App - Home Screen

The Jet Spindle Monitor home screen features:

- Tiles for each active device, including:
  - » Device ID
  - » Current work time
  - » RPM of device
  - » Unit bluetooth signal strength
  - » Unit sensor battery level
- Tiles for most recent active devices
- In the footer there are links to:
  - » Real Time RPM graphs for selected active unit
  - » Device List
  - » Video Tutorials
  - » Operating Guide

Real Time RPM

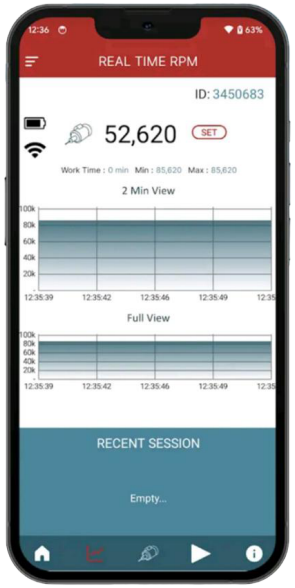


Fig. 22: App - RPM Screen

Detailed screen of selected device:

- Battery (full – empty) indicator icon:
Battery will show as full up to 60% and from 60% until 0% will go down by 10% each time and at 10% full battery icon will blind and be red in color.
- BLE (Bluetooth) signal indicator:
Indicating the strength of signal connection to the selected device.
- SET button to automatically manage 10% RULE.
- First table:
2 Min View Graphic presentation of speed in kRPM of last 2 minutes of activity
- Second table:
Full View Graphic presentation of the kRPM of entire current session

Device List

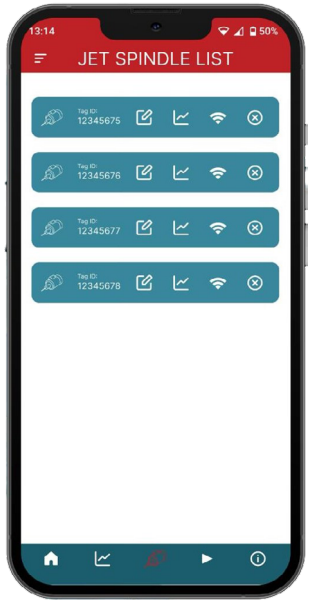


Fig. 23: App - Device List

List of all devices, includes:

- Link to edit devices details
- Link to the device last or current Real Time RPM
- Bluetooth signal strength
- X to delete device from application, until device is active again and will be automatically added to the application.

Edit Device

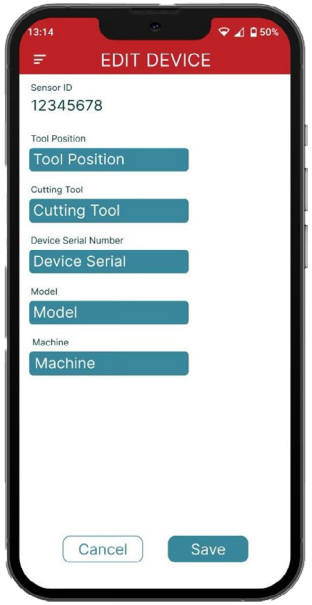


Fig. 24: App - Edit Device

Edit Device screen:

Accessable from the Device List, you can update the following device details:

- Tool position
- Cutting Tool
- Device Serial Number
- Device model
- Machine name

Video Tutorials

Fig. 25: App - Tutorials

Instruction and training videos:

- Link to instruction videos on YouTube to learn how to use the jet spindle and the jet spindle monitoring app.

Operating Guide

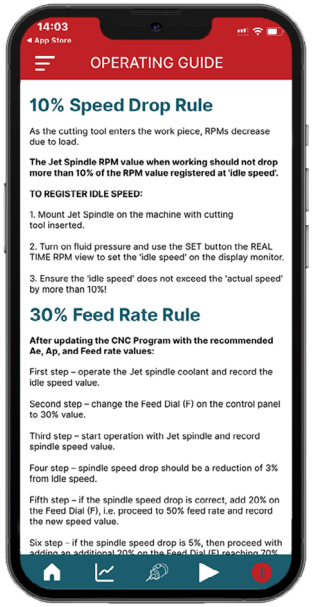


Fig. 26: App - Operating Guide

2 Important rules, you must follow:

- 10% Rule

Set the spindle speed (RPMs) to not less than 10% less than the idle speed, for maximum productivity and product life.

- 30% Rule

Follow the steps of the 30% Rule when setting up the machining on a new process.

2.4 Recommended Cutting Conditions

- Cutting speed may be influenced by material hardness, work piece topography and/or cutting tool geometry. Refer to cutting tool manufacturer's documentation.
- Dramatic fluctuations of RPMS during Jet Spindle operation can indicate problems such as inadequate coolant pressure or a broken cutting tool.

	Material	Process	Cutting Tool dia. (mm)	Pressure (bar)	Speed (rpm)	Ae (mm)	Ap (mm)	Fz (mm/t)
P	SAE 1.2316 (35 HRC)	Drilling (Drill)	0.3	20	36,000	Pecking steps: 0,25-0,5xD Max length of the hole: 3-4xD		0.002
			0.3	30	42,000			0.002
			0.3	40	50,000			0.002
			0.5	20	36,000			0.002
			0.5	30	42,000			0.002
			0.5	40	50,000			0.002
			0.8	20	36,000			0.002
			0.8	30	42,000			0.002
			0.8	40	50,000			0.002
			1.0	20	36,000			0.003
			1.0	30	42,000			0.003
			1.0	40	50,000			0.003
			1.5	20	36,000			0.004
			1.5	30	42,000			0.004
			1.5	40	50,000			0.004
			2.0	20	36,000			0.004
			2.0	30	42,000			0.004
			2.0	40	50,000			0.004
		Profile Milling (Ball-Nose)	0.3	20	36,000	0.03	0.02	0.010
			0.3	30	42,000	0.03	0.02	0.010
			0.3	40	50,000	0.03	0.02	0.010
			0.5	20	36,000	0.05	0.03	0.012
			0.5	30	42,000	0.05	0.03	0.012
			0.5	40	50,000	0.05	0.03	0.012
			1.0	20	36,000	0.10	0.06	0.012
			1.0	30	42,000	0.10	0.06	0.012
			1.0	40	50,000	0.10	0.06	0.012
			1.5	20	36,000	0.15	0.09	0.012
			1.5	30	42,000	0.15	0.09	0.012
			1.5	40	50,000	0.15	0.09	0.012
			2.0	20	36,000	0.20	0.12	0.012
			2.0	30	42,000	0.20	0.12	0.012
			2.0	40	50,000	0.20	0.12	0.012
			2.5	20	36,000	0.25	0.15	0.012
			2.5	30	42,000	0.25	0.15	0.012
			2.5	40	50,000	0.25	0.15	0.012
			3.0	20	36,000	0.30	0.15	0.012
			3.0	30	42,000	0.30	0.15	0.012
			3.0	40	50,000	0.30	0.15	0.012

	Material	Process	Cutting Tool dia. (mm)	Pressure (bar)	Speed (rpm)	Ae (mm)	Ap (mm)	Fz (mm/t)
P	SAE 1.2316 (35 HRC)	Slot Milling (End-Mill)	0.3	20	36,000	0.30	0.03	0.006
			0.3	30	42,000	0.30	0.03	0.006
			0.3	40	50,000	0.30	0.03	0.006
			0.5	20	36,000	0.50	0.05	0.007
			0.5	30	42,000	0.50	0.05	0.007
			0.5	40	50,000	0.50	0.05	0.007
			0.8	20	36,000	0.80	0.08	0.010
			0.8	30	42,000	0.80	0.08	0.010
			0.8	40	50,000	0.80	0.08	0.010
			1.0	20	36,000	1.00	0.10	0.010
			1.0	30	42,000	1.00	0.10	0.010
			1.0	40	50,000	1.00	0.10	0.010
			1.5	20	36,000	1.50	0.12	0.012
			1.5	30	42,000	1.50	0.12	0.012
			1.5	40	50,000	1.50	0.12	0.012
			2.0	20	36,000	2.00	0.15	0.014
			2.0	30	42,000	2.00	0.15	0.014
			2.0	40	50,000	2.00	0.15	0.014
			2.5	20	36,000	2.50	0.18	0.015
			2.5	30	42,000	2.50	0.18	0.015
			2.5	40	50,000	2.50	0.18	0.015
			3.0	20	36,000	3.00	0.20	0.018
			3.0	30	42,000	3.00	0.20	0.018
			3.0	40	50,000	3.00	0.20	0.018
		Shoulder Milling (End-Mill)	0.5	20	36,000	0.03	0.38	0.009
			0.5	30	42,000	0.03	0.38	0.009
			0.5	40	50,000	0.03	0.38	0.010
			1.0	20	36,000	0.05	0.75	0.015
			1.0	30	42,000	0.05	0.75	0.017
			1.0	40	50,000	0.05	0.75	0.018
			2.0	20	36,000	0.08	1.50	0.015
			2.0	30	42,000	0.08	1.50	0.017
			2.0	40	50,000	0.08	1.50	0.018
			3.0	20	36,000	0.10	2.25	0.015
			3.0	30	42,000	0.10	2.25	0.017
			3.0	40	50,000	0.10	2.25	0.018

	Material	Process	Cutting Tool dia. (mm)	Pressure (bar)	Speed (rpm)	Ae (mm)	Ap (mm)	Fz (mm/t)
M	SS 316 (180-250 HB)	Drilling (Drill)	0.5	20	36,000	Pecking steps: 0,25-0,5xD Max length of the hole: 3-4xD		0.002
			0.5	30	42,000			0.002
			0.5	40	50,000			0.002
			0.8	20	36,000			0.002
			0.8	30	42,000			0.002
			0.8	40	50,000			0.002
			1.0	20	36,000			0.002
			1.0	30	42,000			0.002
			1.0	40	50,000			0.002
			1.5	20	36,000			0.003
			1.5	30	42,000			0.003
			1.5	40	50,000			0.003
			2.0	20	36,000			0.004
			2.0	30	42,000			0.004
			2.0	40	50,000			0.004
		Profile Milling (Ball-Nose)	0.5	20	36,000	0.010	0.008	0.006
			0.5	30	42,000	0.010	0.008	0.006
			0.5	40	50,000	0.010	0.008	0.006
			1.0	20	36,000	0.024	0.053	0.006
			1.0	30	42,000	0.024	0.053	0.006
			1.0	40	50,000	0.024	0.053	0.006
			1.5	20	36,000	0.037	0.088	0.006
			1.5	30	42,000	0.037	0.088	0.006
			1.5	40	50,000	0.037	0.088	0.006
			2.0	20	36,000	0.050	0.122	0.006
			2.0	30	42,000	0.050	0.122	0.006
			2.0	40	50,000	0.050	0.122	0.006
			2.5	20	36,000	0.064	0.160	0.006
			2.5	30	42,000	0.064	0.160	0.006
			2.5	40	50,000	0.064	0.160	0.006
			3.0	20	36,000	0.080	0.192	0.006
			3.0	30	42,000	0.080	0.192	0.006
			3.0	40	50,000	0.080	0.192	0.006
			4.0	20	36,000	0.105	0.262	0.006
			4.0	30	42,000	0.105	0.262	0.006
			4.0	40	50,000	0.105	0.262	0.006

	Material	Process	Cutting Tool dia. (mm)	Pressure (bar)	Speed (rpm)	Ae (mm)	Ap (mm)	Fz (mm/t)
M	SS 316 (180-250 HB)	Slot Milling (End-Mill)	0.5	20	36,000	0.50	0.10	0.008
			0.5	30	42,000	0.50	0.10	0.008
			0.5	40	50,000	0.50	0.10	0.009
			0.8	20	36,000	0.80	0.10	0.010
			0.8	30	42,000	0.80	0.10	0.010
			0.8	40	50,000	0.80	0.10	0.010
			1.0	20	36,000	1.00	0.12	0.010
			1.0	30	42,000	1.00	0.12	0.010
			1.0	40	50,000	1.00	0.12	0.010
			1.5	20	36,000	1.50	0.15	0.012
			1.5	30	42,000	1.50	0.15	0.017
			1.5	40	50,000	1.50	0.15	0.018
			2.0	20	36,000	2.00	0.15	0.009
			2.0	30	42,000	2.00	0.15	0.009
			2.0	40	50,000	2.00	0.15	0.009
			2.5	20	36,000	2.50	0.10	0.015
			2.5	30	42,000	2.50	0.10	0.015
			2.5	40	50,000	2.50	0.10	0.016
			3.0	20	36,000	3.00	0.10	0.010
			3.0	30	42,000	3.00	0.10	0.010
			3.0	40	50,000	3.00	0.10	0.010
			4.0	20	36,000	4.00	0.10	0.010
			4.0	30	42,000	4.00	0.10	0.010
			4.0	40	50,000	4.00	0.10	0.010
		Shoulder Milling (End-Mill)	1.0	20	36,000	0.50	0.10	0.014
			1.0	30	42,000	0.50	0.10	0.014
			1.0	40	50,000	0.50	0.10	0.014
			2.0	20	36,000	1.00	0.10	0.015
			2.0	30	42,000	1.00	0.10	0.015
			2.0	40	50,000	1.00	0.10	0.015
			3.0	20	36,000	1.00	0.10	0.015
			3.0	30	42,000	1.00	0.10	0.015
			3.0	40	50,000	1.00	0.10	0.015
			4.0	20	36,000	0.75	0.10	0.009
			4.0	30	42,000	0.75	0.10	0.009
			4.0	40	50,000	0.75	0.10	0.009

	Material	Process	Cutting Tool dia. (mm)	Pressure (bar)	Speed (rpm)	Ae (mm)	Ap (mm)	Fz (mm/t)
N	Al-Si 9% (80-160 HB)	Drilling (Drill)	0.3	20	36,000	Pecking steps: 0,25-0,5xD Max length of the hole: 3-4xD		0.002
			0.3	30	42,000			0.002
			0.3	40	50,000			0.002
			0.5	20	36,000			0.002
			0.5	30	42,000			0.002
			0.5	40	50,000			0.002
			0.8	20	36,000			0.002
			0.8	30	42,000			0.002
			0.8	40	50,000			0.002
			1.0	20	36,000			0.003
			1.0	30	42,000			0.003
			1.0	40	50,000			0.003
			1.5	20	36,000			0.004
			1.5	30	42,000			0.004
			1.5	40	50,000			0.004
			2.0	20	36,000			0.004
			2.0	30	42,000			0.004
			2.0	40	50,000			0.004
			3.0	20	36,000			0.004
			3.0	30	42,000			0.004
			3.0	40	50,000			0.004
		Profile Milling (Ball-Nose)	0.5	20	36,000	0.06	0.05	0.008
			0.5	30	42,000	0.06	0.05	0.008
			0.5	40	50,000	0.07	0.10	0.008
			0.8	20	36,000	0.06	0.05	0.008
			0.8	30	42,000	0.06	0.05	0.008
			0.8	40	50,000	0.07	0.13	0.008
			1.0	20	36,000	0.10	0.08	0.004
			1.0	30	42,000	0.10	0.09	0.004
			1.0	40	50,000	0.11	0.15	0.004
			1.5	20	36,000	0.12	0.09	0.006
			1.5	30	42,000	0.13	0.09	0.006
			1.5	40	50,000	0.15	0.10	0.006
			2.0	20	36,000	0.13	0.05	0.008
			2.0	30	42,000	0.13	0.05	0.008
			2.0	40	50,000	0.17	0.13	0.008
			2.5	20	36,000	0.15	0.10	0.030
			2.5	30	42,000	0.16	0.10	0.030
			2.5	40	50,000	0.25	0.13	0.030
			3.0	20	36,000	0.22	0.08	0.030
			3.0	30	42,000	0.25	0.08	0.030
			3.0	40	50,000	0.25	0.15	0.030
			4.0	20	36,000	0.20	0.08	0.030
			4.0	30	42,000	0.25	0.09	0.030
			4.0	40	50,000	0.27	0.15	0.030

	Material	Process	Cutting Tool dia. (mm)	Pressure (bar)	Speed (rpm)	Ae (mm)	Ap (mm)	Fz (mm/t)
N	Al-Si 9% (80-160 HB)	Slot Milling (End-Mill)	0.5	20	36,000	0.50	0.05	0.007
			0.5	30	42,000	0.50	0.05	0.007
			0.5	40	50,000	0.50	0.05	0.007
			0.8	20	36,000	0.80	0.08	0.008
			0.8	30	42,000	0.80	0.08	0.008
			0.8	40	50,000	0.80	0.08	0.008
			1.0	20	36,000	1.00	0.10	0.018
			1.0	30	42,000	1.00	0.10	0.018
			1.0	40	50,000	1.00	0.10	0.018
			1.5	20	36,000	1.50	0.15	0.020
			1.5	30	42,000	1.50	0.15	0.020
			1.5	40	50,000	1.50	0.15	0.020
			2.0	20	36,000	2.00	0.20	0.022
			2.0	30	42,000	2.00	0.20	0.022
			2.0	40	50,000	2.00	0.20	0.022
			2.5	20	36,000	2.50	0.25	0.025
			2.5	30	42,000	2.50	0.25	0.025
			2.5	40	50,000	2.50	0.25	0.025
			3.0	20	36,000	3.00	0.30	0.025
			3.0	30	42,000	3.00	0.30	0.025
			3.0	40	50,000	3.00	0.30	0.025
			3.5	20	36,000	3.50	0.25	0.025
			3.5	30	42,000	3.50	0.25	0.025
			3.5	40	50,000	3.50	0.25	0.025
			4.0	20	36,000	4.00	0.28	0.025
			4.0	30	42,000	4.00	0.28	0.025
			4.0	40	50,000	4.00	0.28	0.025
		Shoulder Milling (End-Mill)	1.0	20	36,000	0.30	0.10	0.015
			1.0	30	42,000	0.30	0.15	0.017
			1.0	40	50,000	0.30	0.15	0.017
			2.0	20	36,000	0.60	0.10	0.015
			2.0	30	42,000	0.60	0.10	0.015
			2.0	40	50,000	0.60	0.10	0.018
			3.0	20	36,000	0.90	0.10	0.020
			3.0	30	42,000	0.90	0.10	0.020
			3.0	40	50,000	0.90	0.10	0.025
			4.0	20	36,000	1.20	0.10	0.025
			4.0	30	42,000	1.20	0.10	0.025
			4.0	40	50,000	1.20	0.10	0.025

	Material	Process	Cutting Tool dia. (mm)	Pressure (bar)	Speed (rpm)	Ae (mm)	Ap (mm)	Fz (mm/t)
N	Cu alloys (80-200 HB)	Drilling (Drill)	0.5	20	36,000	Pecking steps: 0,25-0,5xD Max length of the hole: 5xD		0.003
			0.5	30	42,000			0.003
			0.5	40	50,000			0.003
			0.8	20	36,000			0.005
			0.8	30	42,000			0.005
			0.8	40	50,000			0.005
			1.0	20	36,000			0.005
			1.0	30	42,000			0.005
			1.0	40	50,000			0.005
			1.5	20	36,000			0.005
			2.0	20	36,000			0.006
		Profile Milling (Ball-Nose)	0.5	20	36,000	0.010	0.008	0.006
			0.5	30	42,000	0.010	0.008	0.006
			0.5	40	50,000	0.010	0.008	0.006
			1.0	20	36,000	0.024	0.053	0.010
			1.5	20	36,000	0.037	0.088	0.010
			2.0	20	36,000	0.050	0.122	0.010
			2.5	20	36,000	0.064	0.160	0.010
			3.0	20	36,000	0.080	0.192	0.005
			4.0	20	36,000	0.105	0.262	0.005
		Slot Milling (End-Mill)	0.5	20	36,000	0.500	0.008	0.004
			0.5	30	42,000	0.500	0.008	0.004
			0.5	40	50,000	0.500	0.008	0.004
			0.8	20	36,000	0.800	0.014	0.006
			0.8	30	42,000	0.800	0.014	0.006
			0.8	40	50,000	0.800	0.014	0.006
			1.0	20	36,000	1.000	0.018	0.008
			1.5	20	36,000	1.500	0.028	0.012
			2.0	20	36,000	2.000	0.038	0.016
			2.5	20	36,000	2.500	0.048	0.019
			3.0	20	36,000	3.000	0.058	0.020
		Shoulder Milling (End-Mill)	1.0	20	36,000	0.080	0.800	0.006
			2.0	20	36,000	0.160	1.600	0.080
			3.0	20	36,000	0.240	2.400	0.008
			4.0	20	36,000	0.320	3.200	0.008
			5.0	20	36,000	0.400	4.000	0.010
			6.0	20	36,000	0.400	4.800	0.010

	Material	Process	Cutting Tool dia. (mm)	Pressure (bar)	Speed (rpm)	Ae (mm)	Ap (mm)	Fz (mm/t)
S	Ti alloys (170-250 HB)	Drilling (Drill)	0.5	20	36,000	Pecking steps: 0,25-0,5xD Max length of the hole: 5xD		0.003
			0.5	30	42,000			0.003
			0.5	40	50,000			0.003
			0.8	20	36,000			0.005
			0.8	30	42,000			0.005
			0.8	40	50,000			0.005
			1.0	20	36,000			0.005
			1.0	30	42,000			0.005
			1.0	40	50,000			0.005
			1.5	20	36,000			0.005
			1.5	30	42,000			0.005
			1.5	40	50,000			0.005
			2.0	20	36,000			0.006
		Profile Milling (Ball-Nose)	0.5	20	36,000	0.010	0.008	0.006
			0.5	30	42,000	0.010	0.008	0.006
			0.5	40	50,000	0.010	0.008	0.006
			1.0	20	36,000	0.024	0.053	0.010
			1.0	30	42,000	0.024	0.053	0.010
			1.0	40	50,000	0.024	0.053	0.010
			1.5	20	36,000	0.037	0.088	0.010
			1.5	30	42,000	0.037	0.088	0.010
			2.0	20	36,000	0.050	0.122	0.010
			2.0	30	42,000	0.050	0.122	0.010
			2.5	20	36,000	0.064	0.160	0.010
			3.0	20	36,000	0.080	0.192	0.005
			4.0	20	36,000	0.105	0.262	0.005
		Slot Milling (End-Mill)	0.5	20	36,000	0.500	0.008	0.004
			0.5	30	42,000	0.500	0.008	0.004
			0.5	40	50,000	0.500	0.008	0.004
			0.8	20	36,000	0.800	0.014	0.006
			0.8	30	42,000	0.800	0.014	0.006
			0.8	40	50,000	0.800	0.014	0.006
			1.0	20	36,000	1.000	0.018	0.008
			1.0	30	42,000	1.000	0.018	0.008
			1.0	40	50,000	1.000	0.018	0.008
			1.5	20	36,000	1.500	0.028	0.012
			1.5	30	42,000	1.500	0.028	0.012
			2.0	20	36,000	2.000	0.038	0.016
			2.5	20	36,000	2.500	0.048	0.019
			2.5	30	42,000	2.500	0.048	0.019
			3.0	20	36,000	3.000	0.058	0.020
		Shoulder Milling (End-Mill)	1.0	20	36,000	0.080	0.800	0.006
			1.0	30	42,000	0.080	0.800	0.006
			1.0	40	50,000	0.080	0.800	0.006
			2.0	20	36,000	0.160	1.600	0.080
			2.0	30	42,000	0.160	1.600	0.080
			3.0	20	36,000	0.240	2.400	0.008
			3.0	30	42,000	0.240	2.400	0.008
			4.0	20	36,000	0.320	3.200	0.008
			5.0	20	36,000	0.400	4.000	0.010
			6.0	20	36,000	0.400	4.800	0.010

3. Maintenance

3.1 Periodic Maintenance

The SWISS Jet Spindle is free from periodic maintenance.

3.2 Battery Change on RPM Transmitter

The battery (CR2 - 3V) in the extra RPM transmitter for the SWISS Jet Spindle, will lose power over time.
To change the battery, please proceed as in chapter 2.2.1 (Installation p.18).

3.3 Recommended Operating Environment

- Temperature range: 15-30° C.
- Max. altitude: 2000 m.

3.4 Steps for Machine Maintenance

To ensure the optimal performance and longevity of your Jet spindle, please follow these professional maintenance guidelines:

- **Removal Prior to Machine Maintenance:** Always **remove the Jet spindle from the machine** before initiating any maintenance procedures on the machine itself.
- **System Flushing Post-Maintenance:** Once machine maintenance is complete, **run the pump for approximately one minute**. This critical step flushes out any residual dirt or debris from the pipes, preventing contamination.
- **Reinstallation:** Only re-install the Jet spindle into the machine **after the pipes have been thoroughly flushed**.

Adhering to these steps will help prevent potential issues and maintain the efficiency of your Jet spindle.

3.5 Spindle Storage

3.5.1 Spindle Pre-Storage

Before storing the SWISS Jet Spindle:

- Clean the SWISS Jet Spindle by air blowing for 10-15 seconds.
- Max. air pressure for cleaning (2 bar/30 psi) – DO NOT EXCEED 50,000 RPM.
- Place the SWISS Jet Spindle back in its case.

3.5.2 Recommended Storage Conditions

The SWISS Jet Spindle should be stored to meet the following conditions:

- Sheltered from possible adverse weather conditions.
- Ideal Storage Temperature Range: 15° C to 27° C.
- Humidity Range: 30% to 60% relative humidity (RH).
-

⚠	**WARNING!** It is strictly prohibited immerse a SWISS Jet Spindle in a fluid bath. Clean external adaptor and ER8 nut using alcohol and treatment with oil. Clean internal shaft using air pressure only.

Any damage caused by one of the above “Warnings” will not be covered by the warranty.

4. Working with a SWISS Jet Spindle

	**WARNING!** Use the utmost caution when working with rotating tools.

The SWISS Jet Spindle enables optimal cutting speed conditions for small diameter, solid carbide tools requiring high RPMs.

The Jet Spindle rotates at its rated speed when idle. When the cutting tool enters the work piece, it is expected that the rotation speed might slow down by several thousand RPM.

For recommended Cutting Tool Parameters, please consult the chapters 2.1 and 2.3.

In order to take advantage of high speed machining, minimize cutting forces and reduce wear, tool diameter should be selected according to the spindle speed (when possible).

- Always select the smallest tool diameter, according to the application requirements.
- Always select cutting tools in grades that are suitable for high speed machining.

4.1 Recalculation of Table Feed for a SWISS Jet Spindle

There are two calculation methods for table feed F [mm / min], with the SWISS Jet Spindle:

- Existing machining process (transition from machining with a machine spindle to a SWISS Jet Spindle).
- New machining process.

4.1.1 Existing Machining Process

The feed per tooth fz remains constant while the table feed F increases in proportion to the SWISS Jet Spindle rotation speed.

The feed per tooth fz should remain constant while the table feed F changes.
Calculate the table feed F [mm/min] according to the following formula:

- F ≈ Ratio x F current
- F - New table feed
- Ratio - Ratio between the machine spindle speed and SWISS Jet Spindle speed, (new speed divided by the current speed).
- F Current - Current table feed with original machine spindle.

Example:
If using a machine spindle at 8,000 rpm, with a table feed of 160 [mm/min], and the SWISS Jet Spindle set to 30,000 rpm, then the new recommended table feed is as follows:

- New table feed = 30,000/8,000 x 160 = 3.75 x 160 = 600 [mm/min].
- In this example, the new table feed should be 600 [mm/min].

4.1.2 New Machining Process

Calculate the table speed, F [mm/min], according to the formula: F = n x z x fz

- Rotation speed – n [rpm] rotation speed for table speed calculation, can be determined only after reading the actual rotation speed obtained when the tool has engaged the material.
- Number of teeth – z.
- Feed per tooth – fz [mm/tooth] , select according to tool vendor's recommendations, taking into consideration the machining material, application and the tool geometry.

Note:
First trial for both machining processes: It is recommended to increase table feed gradually.

5. Troubleshooting

5.1 App Messages

App Messages	Indication	Action Required
No Data Found (IOS), Blank Homescreen (Android)/	Spindle is not in operation/not spinning.	Operate the Spindle with the machines high pressure coolant.
NO SIGNAL		
NO CHART DATA AVAILABLE		
SET	Idle Spindle speed not set.	Press the Set button, while the Spindle is spinning in Idle speed, outside of the material.
Low Speed Alert!	Jet Spindle is rotating to slow, has to handle to much torque.	Check: Jet Spindle, coolant pressure, and cutting parameters.
LOW BATTERY	Battery is low on power.	Replace the battery in the Spindle Speed Sensor.

5.2 Spindle Shaft Does Not Rotate or RPM Not Corresponding to Coolant Pressure

May Result In “Low Speed Alert!” Message.
1. Check coolant pressure in the system.
2. Check spindle inlet is clear.
3. Run coolant through the Jet Spindle for 5 minutes while idle.
4. If issue persists - call for technical assistance.

5.3 Spindle Not Used Within the Past Month

Before working with a SWISS Jet Spindle that has not been recently operated, first assemble it on the CNC machine. Then run coolant through the Jet Spindle for 3 to 5 minutes. Ensure that the Jet Spindle reaches a speed corresponding to the coolant pressure being pumped through it.

6. New Unit Warranty Summary

New SWISS Jet Spindle Warranty Frame
The manufacturer warrants that its Spindles are to be free from defects in material, design and workmanship under proper use. Maintenance and service, for a period commencing from the date of invoice referenced by the Spindle Serial No., is valid for 300 working hours or until 12 months from the date of invoice (whichever comes first).

Warranty Conditions:
- Warranty does not apply to spindles that have been subject to operator/programmer error (i.e. crashed or improper preventative maintenance, installation errors, and/or contamination).
- Warranty does not apply to spindles that have been repaired, or have attempted to be repaired by anyone other than a manufacturer authorized representative.
- Warranty does not apply to worn-out bearings.
- Claim of defect must be issued by returning the spindle in its original packaging accompanied by a written claim form; with an explanation of the malfunction, inclusion of the spindle serial no. and a copy of the product invoice.

The manufacturer’s liability under this warranty shall be limited to the repair of, or replacement of, at the manufacturer’s discretion, any part determined to the manufacturer’s satisfaction to be defective, and which has not been found to have been misused, abused, abnormally used, or damaged by accident or improper maintenance, altered, or carelessly handled.
Upon determination by the manufacturer that a warranty claim is valid, a refurbished or new spindle will be shipped as a replacement, on a no charge bases. All spindles repaired under warranty will remain under the initial warranty timeframe for the balance of the valid warranty period.
Customer shall pay shipping and handling costs for the spindle’s return to the manufacturer’s premises. Return of the repaired or replacement spindles under warranty shall be sent to the customer’s premises only, at the expense of the manufacturer.
The manufacturer reserves the right to choose the method of shipment on all replacement parts supplied under warranty. The customer shall bear all shipping costs related to spindles which are not under warranty.

Warranty shall not apply to:

- Claims or damage resulting from customer or third party repairs or modifications to the product, or other circumstances beyond the manufacturer's control.
- Claims or damage due to non-compliance with recommended installation, operation and maintenance procedures, as specified by the manufacturer, including, without limitation; abuse, neglect, misuse of the product by the customer, its agents, employees or contractor.
- Damage resulting from operation of product not within the working parameters and working environment it was designed for.
- Claims or damage resulting from the use of third party replacement parts.
- Any direct or indirect loss, consequential loss, personal injury or damage to property, loss arising from interruptions or delays in production.
- Claims or damage resulting from buyer's non-compliance with applicable laws, regulations, codes or by-laws, and standard industry practices.

Transfer of Warranty

Spindles are only covered under warranty to the original buyer of the spindle and this warranty is non-transferable to, and may not be enforced by, any third parties, including, but not limited to; subsequent buyers, users or assignees of the spindle.

6.1 Repaired/Refurbished Unit Warranty Summary

Repaired/Refurbished SWISS Jet Spindle Warranty Frame

The manufacturer warrants that its repaired / refurbished Spindles are to be free from defects in material, design and workmanship under proper use. Maintenance and service of repaired or refurbished units are referenced by the Spindle Serial No. and is valid for 200 working hours or until 6 months from the date of invoice (whichever comes first).

Repair and Refurbishment: SWISS Jet Spindle Warranty Frame

A Spindle that has undergone repair by the manufacturer not within the warranty cover terms and/or valid timeframe, shall be entitled to a limited warranty period of 6 months from the invoice date; or 200 working hours (whichever comes first) all warranted repairs must be performed by the manufacturer as the sole certified entity. Using any repair service other than a manufacturer authorized rep, will immediately terminate the warranty; validity, scope and terms.

Performance on refurbished units:

- Runout up to 5 µm
- Balancing level up to 3 mm/s

The repaired / refurbished spindle warranty is subject to the same restrictions and conditional terms as equally applied and specified for the "New SWISS Jet Spindle Warranty Frame".

This warranty document supersedes all and any previous warrant policy information published by the manufacturer, including warranty assurances and conditions stated in the product User Manuals. The manufacturer reserves the right to make changes in products or specifications at any time, without prior notice.

6.2 Activating Warranty Frame

Activate your warranty instantly online by filling out the registration form on the website: **reg.colibri-jet.com**. Or scan the **QR Code** below.
Make sure you have your invoice information on hand.

Registering your product not only activates the warranty but also allows you to receive many important product support features:

- Product ATP
- Online Training & Documentation
- Product Management Interface
- Help & Technical Support Services

6.3 Customer Service After Purchase

After a SWISS Jet Spindle was purchased from an authorized Colibri sales representative: Whenever a malfunction cannot be resolved by the solutions mentioned in the troubleshooting section, you are requested to consult your authorized sales representative for further assistance or instructions.

The unit should not be returned before receiving written approval from your authorized sales representative. The serial number for the unit must be indicated on your claim form (you can find this information on the spindle housing).

We hope this information will be helpful. Our goal is to provide the best possible service to our customers.

PARTNERS

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