CONVENTIONAL MILLING MACHINES

Equipment Identification:

Completed by:

Date:

MACHINE ACTION TOOL

The purpose of this technical sheet is to provide information on the main risk factors associated with conventional milling machines and to propose different ways to control them.

CONVENTIONAL MILLING MACHINE

Components of the conventional milling machine

- 1 Spindle screw
- 2 Control panel
- 3 Spindle
- 4 Cutting tool holder (cone)
- 5 Tool (cutter, etc.)
- 6 Table

Safety features

- A Emergency stop button
- B Plain solid handwheel with retractable handle
- c Handwheel with automatic disengagement
- D Hinged transparent protective screen
- E Manual brake lever





MILLING DIRECTION



Joint Association for Occupational Health and Safety in the Metal, Electrical, Clothing, and Printing Industries

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CONVENTIONAL MILLING MACHINES

HOW TO USE THIS DOCUMENT?

In the manner of an audit:

- Systematically review potential risk factors and identify those that are present.
- For each of the identified risk factors, review the proposed prevention measures to select those that seem most appropriate.

For training purposes:

- Target the instructions within the set of prevention measures.
- Provide the necessary means to comply with the instructions.
- Pass on instructions to workers and ensure their implementation.

CAUTION

This document focuses only on mechanical and electrical risk factors. However, there may be other risk factors when using this machine, including those of a chemical, biological or ergonomic nature.

DESCRIPTION

Conventional (also called manual) vertical head milling machines are machine tools used to machine parts by removing material with a tool called a milling cutter. A milling machine can also perform drilling, tapping, and boring operations. The axis movements are controlled by mechanical, electrical, or other devices, but without the possibility of multiple programmed movements. This technical sheet concerns manual milling machines with continuous mechanized spindle feed rates not exceeding 2 m/min and/or rapid spindle speeds requiring a sustained action not exceeding 5 m/min.

INJURIES



The most common injuries with this machine are cuts, amputation, fractures, crushing and foreign objects, electrification and burns.

RISK FACTORS

#	MECHANICAL	PRESENT? (Yes/No)
1	Contact with the tool or the rotating spindle	
2	Accidentally starting the milling machine during maintenance or repair	
3	Access to hazardous areas created by table movement	
4	Contact with a rotating handwheel	
5	Contact with the elements of the power transmission mechanisms	
6	Contact with sharp edges of the workpiece, chips, or tool when stationary	
7	Falling material or the milling machine	
8	Falling, slipping	
9	Projection of various elements (chuck key, screw, tool fragments, part, chips, etc.)	
9 a)	Projection of the chuck key	
9 b)	Projection of fragments in case of breakage of the tool or projection of its fixing screws	
9 c)	Projection of the part or fragments due to a poorly secured part	
9 d)	Projection of fragments due to wrong cutting parameters	
9 e)	Chip projection and movement	
#	ELECTRIC	

10 Contact with elements usually or accidentally energized



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CONTACT WITH THE TOOL OR THE ROTATING SPINDLE

PREVENTIVE MEASURES	Applied 🖌	Not applicable	n/a	NOTES (responsible / schedule / priority)
TECHNICAL MEASURES				
Install a fixed, adjustable, or interlocked movable transparent protective scre	een in front of th	e cutting area.		
Install a valve for adjusting the cutting fluid flow rate so that it can be a the tool or spindle.	accessed withou	ıt approaching		
Install a brake (manual, electric, etc.) to quickly stop the rotation of the	tool.			
Install an emergency stop button coupled with a brake that stops the spin	dle rotation qui	ckly.		
SAFETY INSTRUCTIONS				
Wait until the tool has stopped rotating completely before performing a such as removing or clamping a workpiece to the table, measuring, rem	ny work near th oving chips, etc	ne tool, 		
Use a brush with long, smooth handle without loops or hooks to remove ch	ips.			
Never approach the rotating tool with gloves or a rag.				
Wear close-fitting clothing and do not wear jewelry.				
Tie back long hair and contain it in a cap.				
Position the spindle axis in relation to the workpiece ("tangent") by usin ("edge finder") or by sticking a piece of paper soaked in fluid on the workpaper shims to check the distance from the cutter to the stock.	ng a positioning orkpiece. Do not	g device t use hand-held		
Never leave the tool or spindle running unattended.				

2 ACCIDENTALLY STARTING THE MILLING MACHINE DURING MAINTENANCE OR REPAIR

PREVENTIVE MEASURES	Applied 🗹 Not applicable 🗔	NOTES (responsible / schedule / priority)
SAFETY INSTRUCTIONS		
 Apply a lockout procedure during maintenance or repair work: Isolate energy sources Lock out the isolation devices Dissipate residual energy Make sure that no start-up is possible. 		

3 ACCESS TO HAZARDOUS AREAS CREATED BY TABLE MOVEMENT

PREVENTIVE MEASURES	Applied 🗹	Not applicable n/a	NOTES (responsible / schedule / priority)
TECHNICAL MEASURES			
Install an easily accessible and clearly identified emergency stop button.			
SAFETY INSTRUCTIONS			
Ensure a minimum clearance of 60 cm (24 in) between the table at its m any other obstacle.	naximum stroke	and	

4 CONTACT WITH A ROTATING HANDWHEEL

PREVENTIVE MEASURES	Applied 🗹	Not applicable n/a	NOTES (responsible/schedule/priority)
TECHNICAL MEASURES			
Install handwheels with automatic disengagement. Otherwise, install pl (without inner spokes) with retractable handles.	ain solid handv	vheels	

Remarks

CONTACT WITH POWER TRANSMISSION ELEMENTS

PREVENTIVE MEASURES	Applied 🖌	Not applicable n/a	NOTES (responsible / schedule / priority)	
TECHNICAL MEASURES				
Install fixed guards to limit access to mechanisms: pulleys, belts, gea	ars, etc.			
⁶ CONTACT WITH SHARP EDGES OF THE WORKPIECE, CHIPS, OR TOOL WHEN STATIONARY				
PREVENTIVE MEASURES	Applied 🗹	Not applicable n/a	NOTES (responsible / schedule / priority)	
PREVENTIVE MEASURES	Applied 🗹	Not applicable 🗔	NOTES (responsible / schedule / priority)	
PREVENTIVE MEASURES SAFETY INSTRUCTIONS Move table as far as possible from cutter while setting up work	Applied 🗹 to avoid hand i	Not applicable 🗔	NOTES (responsible / schedule / priority)	
PREVENTIVE MEASURES SAFETY INSTRUCTIONS Move table as far as possible from cutter while setting up work Perform manipulations with a cloth or cut-resistant gloves.	Applied 🗹	Not applicable 🕡	NOTES (responsible / schedule / priority)	
PREVENTIVE MEASURES SAFETY INSTRUCTIONS Move table as far as possible from cutter while setting up work Perform manipulations with a cloth or cut-resistant gloves. Prefer tightening the elements of the part set-up by pulling towards	Applied 🗹 to avoid hand i ards you.	Not applicable 🛯	NOTES (responsible / schedule / priority)	

Remove the chips with a brush.

7 FALL OF MATERIAL OR THE MACHINE

Applied 🖌	Not applicable ᠬ	NOTES (responsible / schedule / priority)
when the faste	eners	
vy or bulky too	Is as they	
	Applied	Applied Not applicable Not a

8 FALLING, SLIPPING

PREVENTIVE MEASURES	Applied 🖌	Not applicable n/a	NOTES (responsible / schedule / priority)
TECHNICAL MEASURES			
Install a transparent shield (hinged, magnetic, etc.) in front of the or fluids from being thrown onto the floor.	cutting area t	o prevent chips	
Repair and clean the floor: uneven surface, holes, slippery floor, presence	e of chips, etc.		
Install mats with beveled edges.			
INSTALL MATS WITH BEVELED EDGES.			
Minimize cutting fluid flow and pressure. Direct the cutting fluid s	stream to mini	mize splashing. 🗌	

Remarks

5

9 PROJECTION OF VARIOUS ELEMENTS (CHUCK KEY, SCREW, TOOL FRAGMENTS, PART, CHIPS, ETC.)

PREVENTIVE MEASURES	Applied 🖌	Not applicable <u>n/a</u>	NOTES (responsible / schedule / priority)
TECHNICAL MEASURES			
Install a transparent protective screen (hinged, magnetic, etc.) in f	front of the cutti	ng area.	
Orient the milling machine so that projections do not reach adjace	ent workstations	S.	
SAFETY INSTRUCTIONS			
Make sure that there is no object on the table that can be project	cted.		
Wear CSA approved safety glasses with side shields around the millin	ig machine.		
If necessary, wear a CSA approved safety face shield in addition	to protective ey	yewear.	
Wear a long-sleeved, fitted garment.			

9 a) PROJECTION OF THE CHUCK KEY

PREVENTIVE MEASURES	Applied 🗹	Not applicable n/a	NOTES (responsible / schedule / priority)
TECHNICAL MEASURES			
Provide a spring-loaded chuck key to secure the tool to the chuck			
SAFETY INSTRUCTIONS			
Never tighten or loosen the cutting tool through the spindle screw with the motor.	w by rotating t	he spindle	
Make sure the chuck key is off the spindle screw or tool chuck be machine rotation.	fore starting th	ne milling	

9 b) PROJECTION OF FRAGMENTS IN CASE OF BREAKAGE OF THE TOOL OR PROJECTION OF ITS FIXING SCREWS

PREVENTIVE MEASURES	Applied 🗹	Not applicable n/a	NOTES (responsible / schedule / priority)
SAFETY INSTRUCTIONS			
Check that the tool cutting edges are in good condition and that present and well secured to the tool before starting the machine.	all the cutting	inserts are	
Select the shortest possible tool holder (cone) and tool.			
Make sure the tool is securely attached to the tool holder.			
Make sure the tool holder is securely attached to the spindle.			
Use bolts that protrude as little as possible from the assembly.			
Stop the rapid feed at a sufficient distance from the workpiece as	ssembly.		

9 c) PROJECTION OF THE PART OR FRAGMENTS DUE TO A POORLY SECURED PART

PREVENTIVE MEASURES	Applied 🗹	Not applicable n/a	NOTES (responsible / schedule / priority)
SAFETY INSTRUCTIONS			
Make sure the workpiece is securely fastened to the table accord	ling to best pra	ctices.	

Remarks

9 d) PROJECTION OF FRAGMENTS DUE TO WRONG CUTTING PARAMETERS

PREVENTIVE MEASURES

Applied 🗹 Not applicable 🔤

n/a **NOTES** (responsible / schedule / priority)

SAFETY INSTRUCTIONS	
Consult the tool manufacturer's data or other technical data to select the correct combination of cutting parameters (feed rate, depth of cut, cutting speed, and lubrication) based on the material, the type of workpiece set-up and the tool being used.	
Only mill downstream if the milling machine has a back-lash elimination system.	
Check that the tool can be used in the direction of the spindle rotation.	

9 e) CHIP PROJECTION AND MOVEMENT

PREVENTIVE MEASURES	Applied 🖌	Not applicable	n/a	NOTES (responsible / schedule / priority)
SAFETY INSTRUCTIONS				
Use drilling tools equipped with chip breakers. Otherwise, move back an	d forth during	drilling.		
The preferred method for cleaning chips should be the use of a brush. If make sure the pressure stays below 200 kPa (30 psi). Never blow with y to remove them.	compressed air our mouth tow	is needed, ards the chips		

10 CONTACT WITH ELEMENTS USUALLY OR ACCIDENTALLY ENERGIZED

PREVENTIVE MEASURES	Applied 🗹	Not applicable n/a	NOTES (responsible/schedule/priority)
TECHNICAL MEASURES			
Install and identify a circuit breaker near the milling machine.			
SAFETY INSTRUCTIONS			
 Apply a lockout procedure when performing maintenance or repairs: isolate energy sources Lock out the isolation devices Dissipate residual energy Make sure that no start-up is possible. 			
Check the insulation of the power cables and the grounding of the elect machine.	rical circuit of t	he milling	

NEED ASSISTANCE?

Do not hesitate to consult your MultiPrevention consultants if you have any questions about this sheet or about occupational health and safety.

REFERENCES

The proposed preventive measures come in part from the Regulation respecting occupational health and safety (RROHS, r.19), the Quebec Act respecting occupational health and safety (AOHS, S-2.1), as well as the standard EN 13128-01 (2009) *Safety of machine tools - milling machines (including boring machines)*

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