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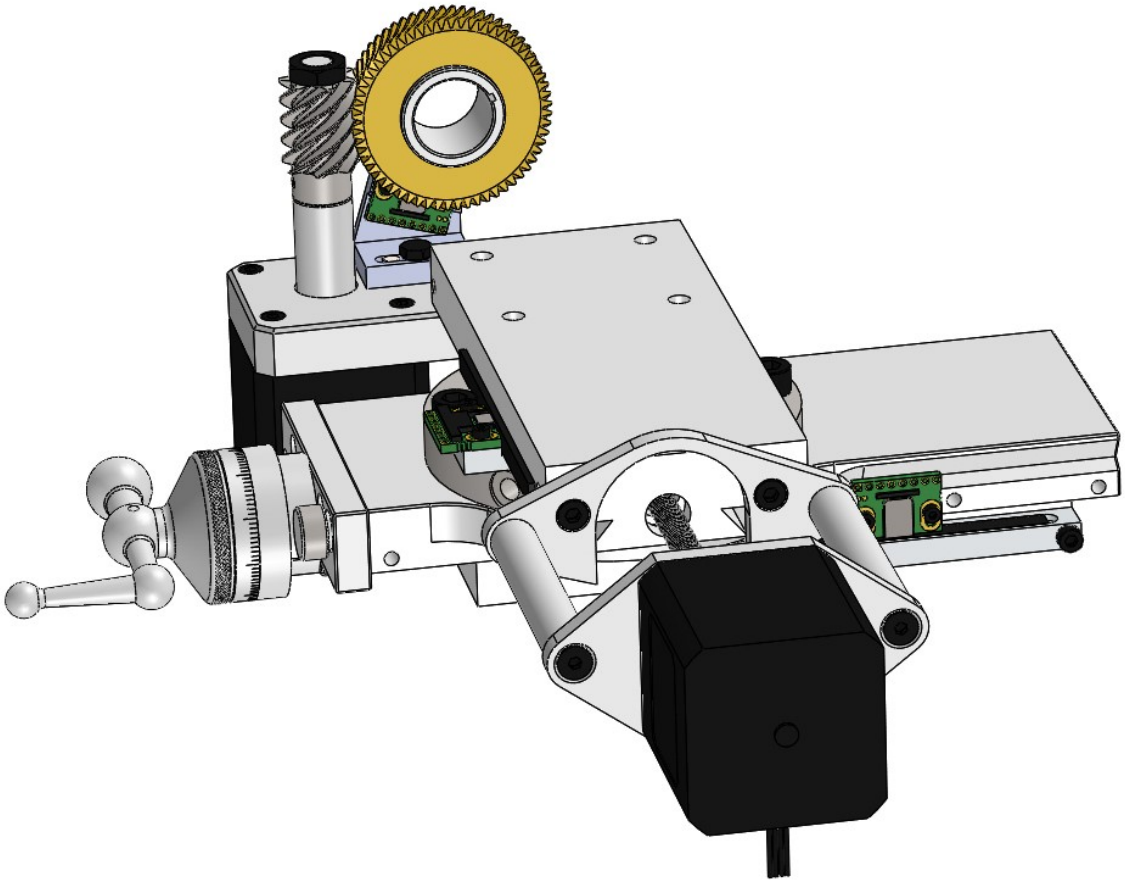


DEFINITION

Developpment of few systems to automatise ans simplify functions on old machines.

The systems need to be installed on different machines so the power of the some components can change.

As I mechanician I will do the custom mechinal parts for integration.

All components must be of industrial quality, comply with European standards and be reliable.
We have tou found components that you can order in your country and that I can order in mine too.

The design of interfaces will be provided.

1: A system called "DRO":

Display and modificate values given by sensors and linear scales, for visual control, on a minimum 10'' touch screen.

Sensor : RLS RL2ICA2D0D00B00 :
https://www.rls.si/eng/rlc2ic-miniature-linear-and-rotary-pcb-level-incremental-magnetic-encoder

Linear scale : RLS MS05DM080A0000 :
https://www.rls.si/eng/ms-scale

Problematics :

- The DRO box will be the control center and user interface panel with screen, control and switches, it have to run 100% autonome with all its necessary elements (like PCB, screen, power supply, …).
- Creating a custom PCB with STM microcontroller.
- The box must be ready to control all other systems :
    - The functions of all others systems must be programmed on the microprocessor.
    - Female plugs on boxes + cables with two male sockets.
    - Preventing possible problems like overheating.
- I need to receive the control box fully wired and working, but not assembled because as a mechanician I will do the integration of components in an aestectics box depending each machine, so, I dont need to receive the control « box ».

2: A system called "Divider": Control of 2 stepper motors to perform various functions.

Functioning :

From the angular zero bridge and the current linear zero point.

1: Stepper motor No. 1 turns to drive a precision screw/nut system to perform a linear advance cycle including advance of a given value then return to the initial position.

2: Stepper motor No. 2 turns to drive a screw and endless wheel system, to perform angular indexing defined by a given number of divisions, applied to a given angular sector, from its current position to the next position.
The angular position is controlled by an sensor (same as the DRO system) and a circular scale and must be adjusted/corrected as necessary before starting a new cycle of linear motion motor #1.

Sensor : RLS RL2ICA2D0D00B00 :
https://www.rls.si/eng/rlc2ic-miniature-linear-and-rotary-pcb-level-incremental-magnetic-encoder
Linear scale : RLS MR040G030_N :
https://www.rls.si/eng/bonded-radial-incremental-magnetic-rings
Stepper motor:
https://www.soprolec.com/shop/m42hs047-moteur-pas-a-pas-0-44-nm-nema-17-2302?category=8#attr=49,50,51,52,57,%2094,53,54,398,56,397,1747,55
Stepper driver :
https://www.soprolec.com/shop/dmd4022-driver-pas-a-pas-numerique-soprolec-40v-2-2a-1850#attr=548,483,484,485,486,487

Problematics :

- The size of the motors can change, depending on wich machine the divider system will be mounted, so the box can evolve but control code and wiring have to still the same.
- Begin to create and fully assemble a box to run Nema 17 0,5N.m motors (smallest configuration possible).
- The box need to include the unique elements necessary for the operation of the Divider system and must have a female plug to be able to be connected to the first box from the outside.

3 : VFD spindle driving : The third box will include a VFD to drive the 2 speeds spindle motor.

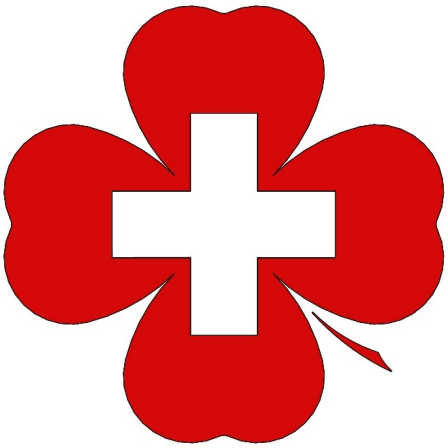
https://www.distrelec.ch/fr/variateur-de-frequence-j1000-2a-400w-380-480v-omron-industrial-automation-jza40p2baa/p/30229065?trackQuery=variateur%20de%20fr%C3%A9quence&pos=175&origPos=5&origPageSize=50&track=true&filterapplied=filter_Manufacturer%3DOmron+Industrial+Automation%26filter_Nombre+de+phases%3D3%26filter_Alimentation+nominale%257E%257EW%3D400&sid=2bf90416da746045c42df4793f5ce4272c196c1b&itemList=search

Probematics :

- The VFD have to be able drive « Dahlander » two speeds motors.
- The box have to display speed and torque regarding motors specs and pulleys stage (by buttons).
- This box must need to be able to work on DRO system AND independently, displaying informations of speed and torque as DRO on screen, on a simple and independant screen.
- The power of VFD will change depending the spindle motor butthe control code will need to fit any VFD, so I choose to stay on Omron brand.
- Begin to create and fully assemble a box to run a 400W VFD (smallest configuration possible).
- The vfd must be controlled by switches and a potentiometer from the main box.
- Some customers will want a VFD that convert the originals 380V motors to 220V but I dont found high industrial quality brands that provide this tyupes of VFD, so in this cas it's will be better to directly change the motor to a 220V and take a 220V VFD.
- This box have to work independetely, and display .

HMI DESIGN :

Loading menu *(company logo)* **:**



On every screen header :

(Logo) EYRAUD Michaël - Mécaniquement vôtre Date Time

SPLASH / MENU SCREEN

Display : Selection by logos *(to draw)* and text : DRO – DIVIDER – MM / REVS – CALCUATOR – SETTINGS


DRO


DIVIDER


MM / REVS


CALCUATOR


SETTINGS

DRO

Display : Number of axis *(values from RL2IC sensors)* – Functions buttons - Spindle motor informations.

Functions : - ZERO : Set value to 0.

- Ø / R : Double value *(Ø = Diameter)* or reset to original *(R = radius)*.

- + / - : Add or subtract a value *(Show kerybord to give a value, apply, select axis)*.

(First push on function button, second push on axis to apply)

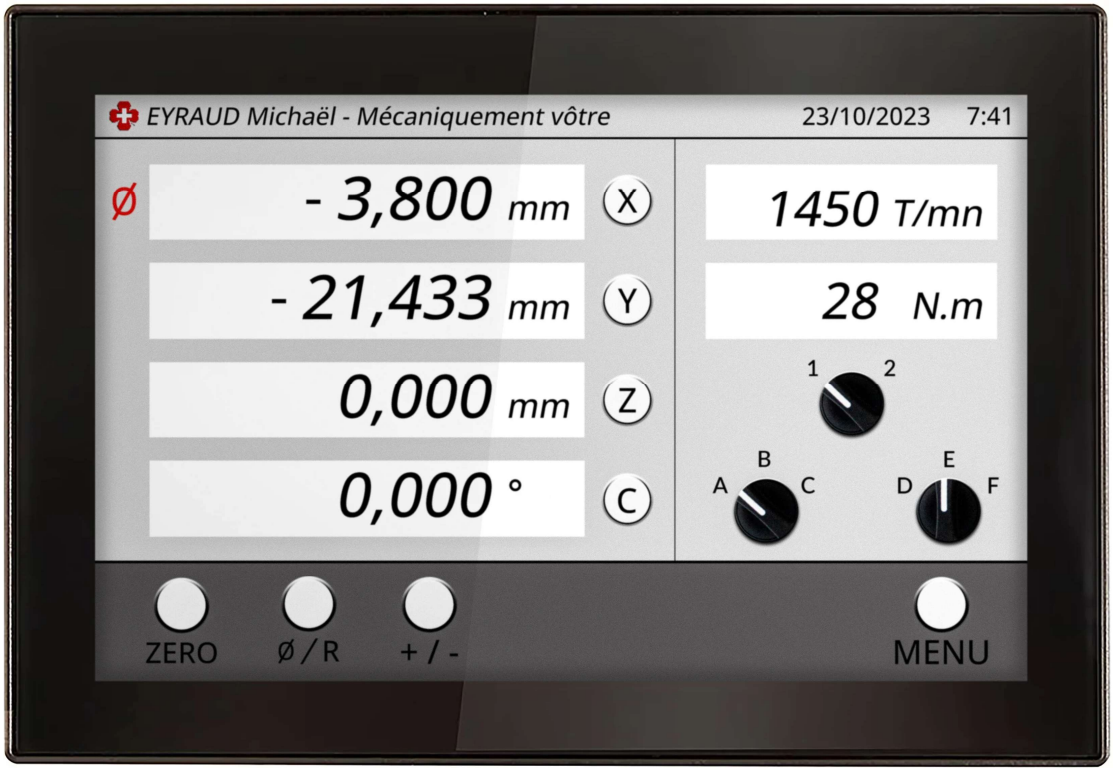
- Spindle speed

(Motor nominal speed x pulley axle 1 ratio x pulley axe 2 ratio x frequency if speed variator)

- Spindle torque :

((9550 x Motor power (W) / Motor nominal speed (Rpm)) x pulley axle 1 inversed ratio x pulley axe 2 inversed ratio x frequency if speed variator, display « low » between 0Hz and 25Hz.)

- Menu



DIVIDER

Display : Various functions to control Nema motors - 3 axis DRO for control.

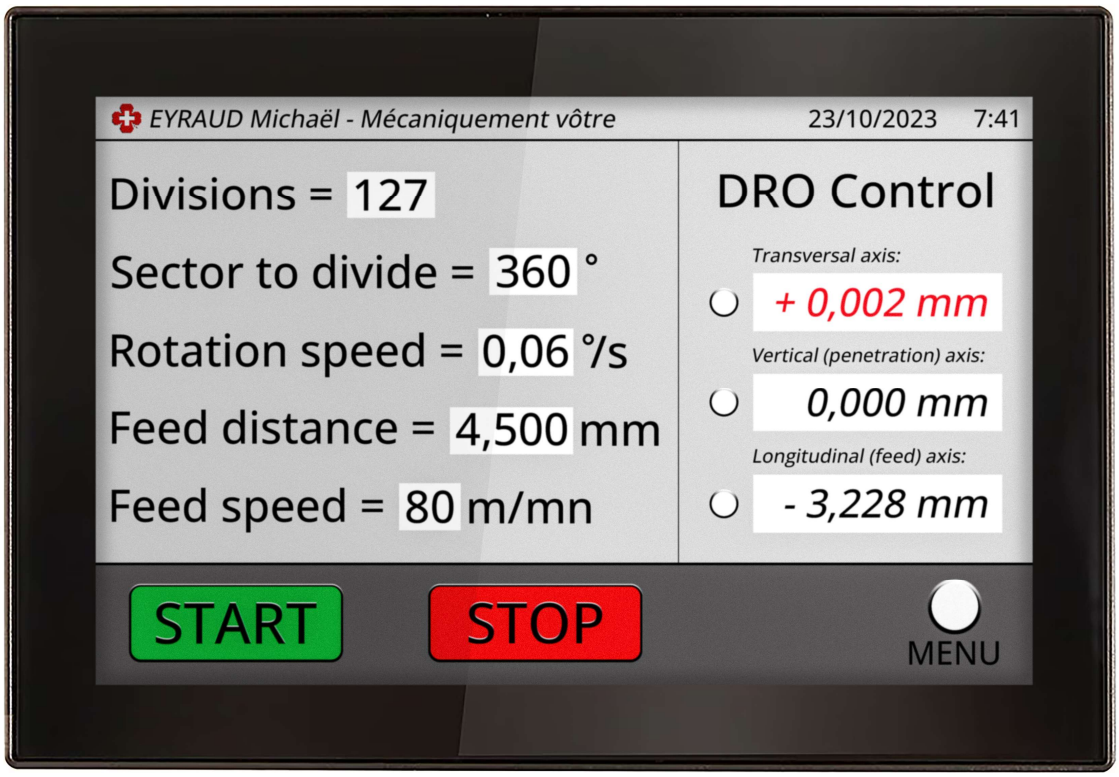
Display values in red when moving after a started cycle.

Functions :

- Set divisions
- Set angular sector to divide
- Set divisions rotation speed
- Set feed distance
- Set feed speed
- Set axis to zero

(Click on a value in a white box, show keyboard, enter value, apply.)

- Start / stop cycle
- Menu



MM / REVS

Display : Various functions to control Nema motors.

Functions :
- Set number of revolutions.
- Set revolutions rotation speed.
- Set feed distance by revolutions.
- Spindle motor informations *(as DRO screen)*.

SETTINGS

Language : English (Default)
Date : 23/10/2023 (entering value)
Time : 7h40 (entering value)
Units : mm / inch
Default opening screen : *Splash* screen *(DRO / Divider / …)*

DRO mode : Enabled / Disabed (to see or not on Splash screen)
Number of axis in DRO mode = (to see on display – X, Y, Z, C – Depending of what is plugged)

DIVIDER mode : Enabled / Disabed (to see or not on Splash screen)
Worm wheel and screw ratio =
Feed screw pitch =

Calculator : Enabled / Disabed (to see or not on Splash screen)

Spindle speed values : Enabled / Disabed (to see or not on DRO and mm/Revs screens).
Spindle motor nominal speed 1 = (ex : 1400) Rpm
Spindle motor nominal speed 2 = (ex : 2800) Rpm
Spindle motor power = (ex : 3) Cv or (ex : 1500) W
Spindle motor voltage = (ex: 380) V
Spindle motor Amp = (ex : 2,4) A
Spindle motor Frequency = (ex : 50) Hz ☐ From variator

Numbers of pulleys axle : X *(example 2)*

Pulleys axle 1, number of stages : 3 *(3 is as example)*
Pulleys axle 1, stage 1 ratio = X mm / X mm *(entering pulleys diameter values, example 40mm / 80mm)*
Pulleys axle 1, stage 2 ratio = X mm / X mm
Pulleys axle 1, stage 2 ratio = X mm / X mm

Pulleys axle 2, number of stages : X (example 3)
Pulleys axle 2, stage 1 ratio = X mm / X mm
Pulleys axle 2, stage 2 ratio = X mm / X mm
Pulleys axle 2, stage 3 ratio = X mm / X mm