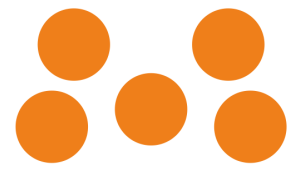


## VC1 USER MANUAL

CNC vice closer kit with robot interface



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<a href="http://www.setuprobotics.com">www.setuprobotics.com</a> • <a href="mailto:info@setuprobotics.com">info@setuprobotics.com</a>	



## Preface

Congratulations with your VC1 vice closer.

The vice closer consist of three main components.

- Spindle tool with compression spring and sliding sensor magnet block.
- Crank arm
- Control unit



The spindle tool is setup in a CNC as any other tool. After a spindle orientation the CNC makes a circular move to open and close the vise. A spring is compressed at closing. A sliding block “remembers” how far the spring was compressed at closing. The CNC moves the sliding block tool on the surface of the control unit to communicate with the robot.

## In the box

- Spindle tool with sliding block.
- Crank arm
- Control unit
- LANG zero fixture

## Important message.



The vice closer are part of a partly completed machinery. A risk assessment is required for each usage.

It is the responsibility of the integrator to make the risk assessment and that all safety requirements and local regulations are complied with.

The CNC machine must have protection against excessive forces and torques via force monitoring or other protection systems.

Only raw parts with thicknesses within the vice closer operating interval can be used.

Protection against Robot and CNC machine interference must be secured using a functional protection door or other systems.

Make sure Spindle tool, Crank arm and control unit are mounted properly.

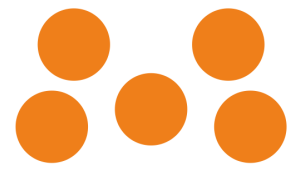
Make sure Crank arm are properly adjusted to the clamping width.

Never use a damaged vice closer.

The vice closer is intended as a tool for closing a LANG vice inside the CNC machine. It is not to be used in potentially explosive environments or in life support applications.

Protect the Vice closer from damaging chemical and physical effects including but not limited to: Corrosive substances, solvents, extreme temperatures, radioactive radiation, extreme magnetic fields, small objects as powder/dirt, extreme mechanical vibrations, electrical currents and discharge.

Avoid touching the electrical connector in coupling.



## Installation

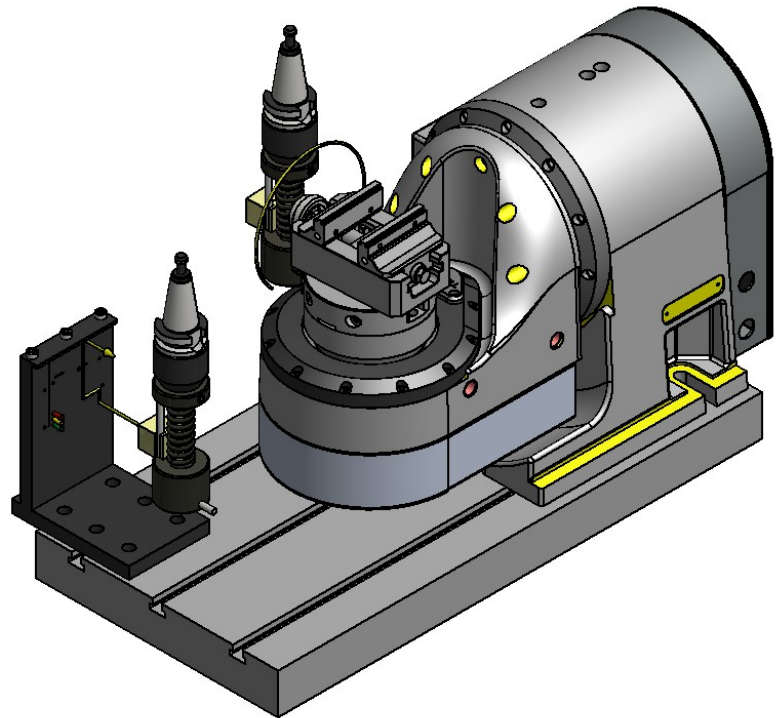
Make a M5 thread, minimum 12mm length in continuation of the hex hole in the LANG spindle. To protect the the tap against the semi hard spindle surface it is recommended to drill off the first 0.5-1mm using a  $\text{\O}5$  drill.

Mount the Crank arm on the LANG vice spindle using the M5x35 center screw.

Mount the Lang vice so the crank arm can rotate  $360^\circ$ . On 5 axis machines make sure vice can rotate without crank arm collides with other parts.

Adjust crank arm so it is horizontal going down when raw part is clamped. (Make this adjustment on every new setup) Parts has to be equal in thickness within 0.15mm

Mount the spindle tool in a  $\text{\O}16$  tool holder and orientate so the  $\text{\O}6$  pin points into crank arm when spindle is orientated for tool change. Make sure top-ring on spindle tool has contact to tool holder so closing forces passes this way.



Mount control unit on CNC table so sliding block on spindle tool points into controller communication surface. The  $\text{\O}3$  magnet in sliding block is detected by controller. Make sure CNC can travel on controllers communication surface.

Connect communication controller to robot I/O using a M12-8 pole code A cable. The cable fits directly the SetupRobotics CNC door controller interfacing to an UR robot.

PIN	Function	Standard cable color
1		White
2	24V	Brown
3		Green
4	Request new raw part from robot PNP	Yellow
5	Vice torque OK, high 1 second PNP	Gray
6	Vice torque error, high 5 seconds PNP	Pink
7	GND	Blue



8	Red
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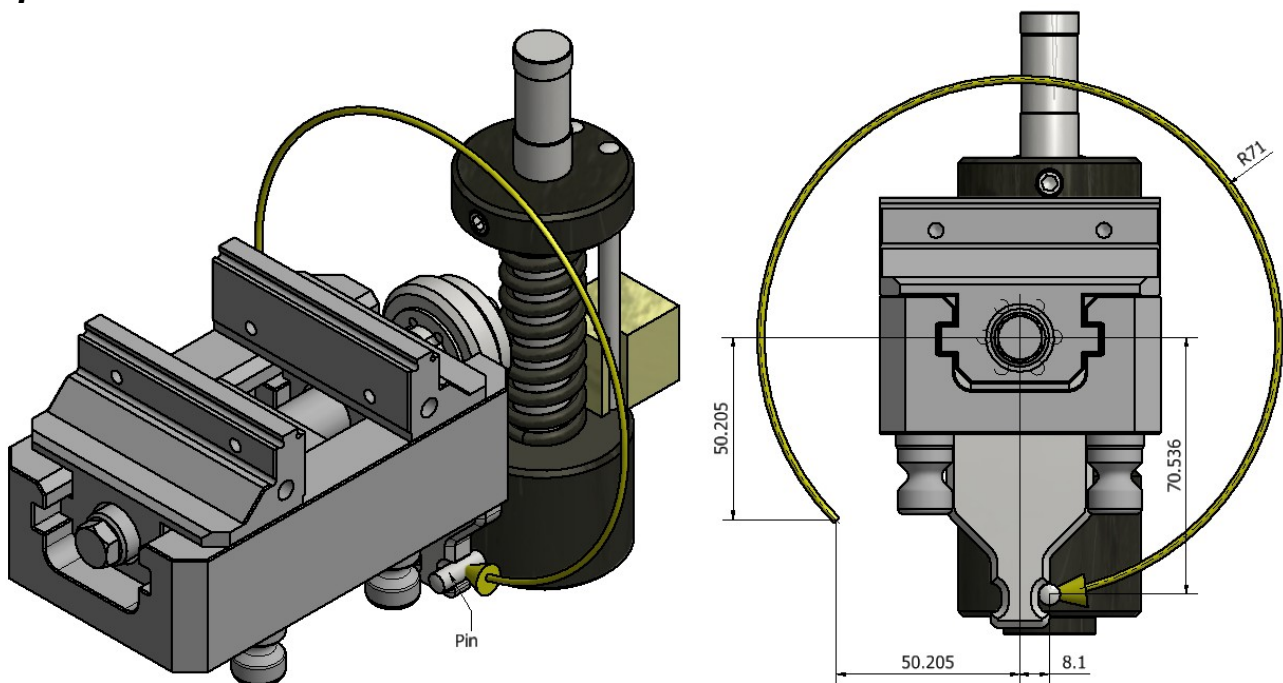


The M12 cable pinout is not compatible with any other use.

## CNC programming

In the current example the LANG vice spindle is pointing Y+ (opposite of typical manual operation).

### Open vise



Below X0 Z0 at spindle center. Z tool compensation at pin center. Y0 when pin in crank.

Initial the crank arm is horizontal but may be hanging down if vice is already open.

A good starting point is to enter vice at X-50.205 Z-50.205.

Travel circular CW to X8.1 Z-70.536 Radius 71

### Sample CNC code:

Y20

X-50.205 Z-50.205.

Y0

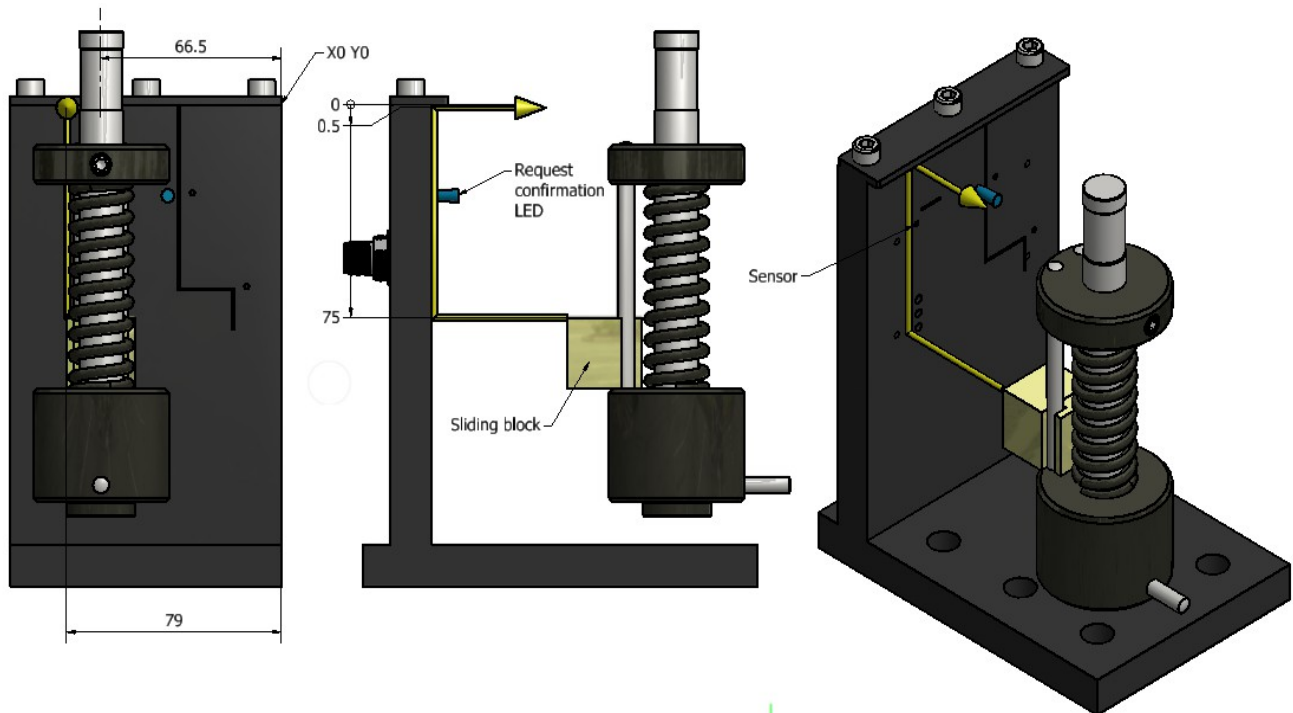
G18 G3 X8.1 Z-70.536 R-71

Y20



## Request new item

Request new item from robot and prepare sliding block for torque check



Below X0 Z0 top right as marked on drawing. Z tool length compensation at sliding block top pushed down to limit as above. Y0 when sliding block has contact to controller surface.

Assume sliding block initially can be at any position. Block magnet has to pass sensor to request new part from robot and slide down ready for torque check subsequent.

## Sample CNC code:

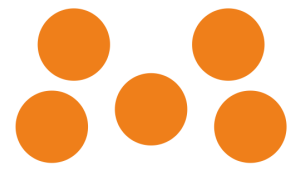
Y-10

Z-75

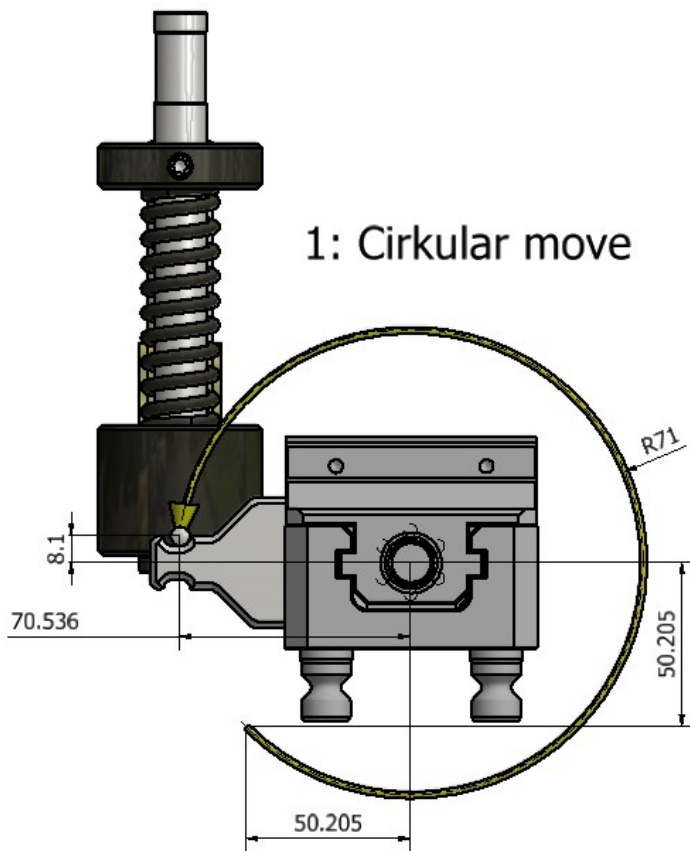
Y-0.5

Z-0.5

Y-10

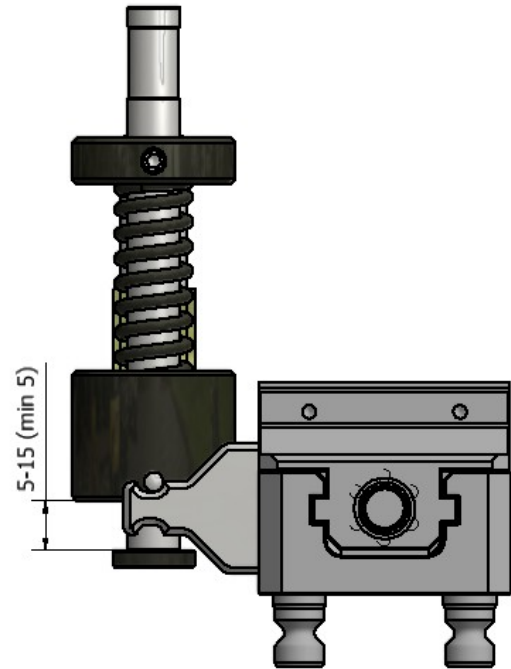


## Close vice



1: Cirkular move

2: linear move  
Spring compression



Below X0 Z0 at spindle center. Z tool compensation at pin center. Y0 when pin in crank.  
Initial the crank arm is hanging down but can be horizontal if already closed by operator.  
A good starting point is to enter vice at X-50.205 Z-50.205.

Travel circular CCW to X-70.536 Z8.1 Radius 71 and then compress spring to required torque.

### Sample CNC code:

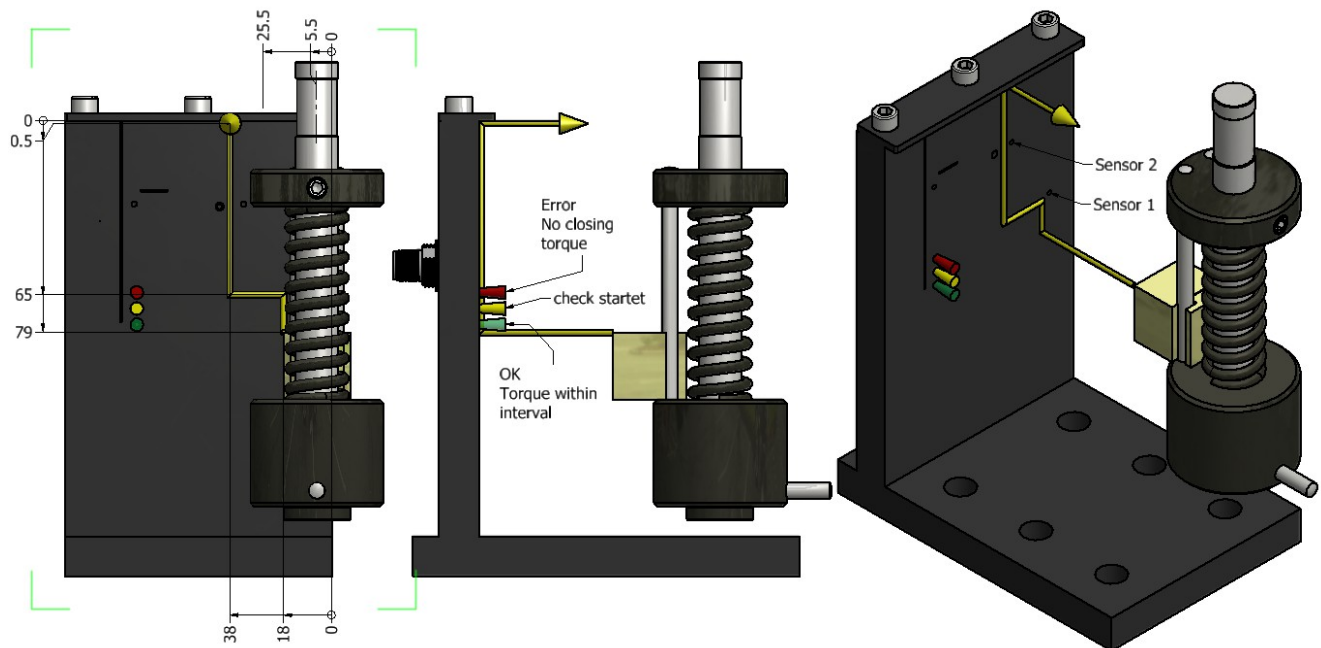
```

Y20
X-50.205 Z-50.205
Y0
G18 G2 X-70.536 Z8.1 R-71
G1 Z-1.9
Z10
Y20
    
```

Stroke [mm]	Light spring 2.75mm wire		Heavy spring 3.25mm wire	
	Force [N]	Torque [Nm]	Force [N]	Torque [Nm]
1	8.5	0.6	17.0	1.2
2	17.0	1.2	34.0	2.4
3	25.5	1.8	51.0	3.6
4	34.0	2.4	68.0	4.8
5	42.5	3.0	85.0	6.0
6	51.0	3.6	102.0	7.2
7	59.5	4.2	119.0	8.4
8	68.0	4.8	136.0	9.7
9	76.5	5.4	153.0	10.9
10	85.0	6.0	170.0	12.1
11	93.5	6.6	187.0	13.3
12	102.0	7.2	204.0	14.5
13	110.5	7.8	221.0	15.7
14	119.0	8.4	238.0	16.9
15	127.5	9.1	255.0	18.1



## Check torque



Below X0 Z0 Y0 and Z tool length compensation as on request new item.

To get correct torque condition controller must see sensor 1 and then sensor 2 withing 5 seconds.

The CNC movement is programmed as bad torque conditioning where sliding block passes below sensor 1.

### Sample CNC code:

Y-10

X-5.5 Z-79

Y-0.5

Z-65

X-25.5

Z-0.5

Y-10

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## EC Declaration of conformity

Manufacturer:

SetupRobotics ApS  
Industrivaenget 6B, Melose  
3320 Skaevinge  
Denmark

Hereby is certified that the following product:

Description:

Vice closer

Type

CNC vice closer

Production year

VC1

Serial No (from)

2018

1

is partly completed machinery according to 2006/42/EC.

The complete machine must be in full compliance with all essential requirements of 2006/42/EC before the vice closer and its connected accessories are put into service. A comprehensive risk assessment must be carried out for each application as part of ensuring that all essential requirements are fulfilled. All essential requirements must be assessed. Instructions and guidance provided in the manual must be followed.

The product is in conformity with the following directives:

2014/30/EU — Electromagnetic Compatibility Directive (EMC)

2011/65/EU — Restriction of the use of certain hazardous substances (RoHS)

2014/35/EU — Low Voltage Directive (LVD)

  
Uffe Safeldt  
COO, CTO  
Hillerød 2018.05.01