

Angle measurement

User interface / Machine parameters

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SAFETY

General Safety



The users must have **Read** and **Understood**, but most of all must Respect the directives described in this manual.

All people coming into contact with the machine on which the numerical control is installed, whatever their function or whatever state the machine is in (assembly, disassembly, start-up, production, maintenance, repairs) must have read and understood the requirements concerning the security and the entirety of the directives of operation described in the manuals delivered with the machine.



The operator must be properly trained to work with the machine on which the numerical control is installed. Improper use of the numerical control can cause heavy damage on equipment and/or injuries to people.

Modification of machine parameters can cause important material damage or lead to irregular product quality.

Do not expose the numerical control to excessive humidity so as to avoid any risk of electrocution and any deterioration of the equipment.



Make sure the numerical control is disconnected from the mains power before carrying out any cleaning. Do not use liquids based on alcohol or ammoniac.

In case of malfunction of the numerical control, call a technician.

Do not expose the numerical control to direct sun rays or any other heat source.

Do not place the numerical control in the neighbourhood of magnetic equipment such as transformers, motors or devices which generate interference (welding machines, etc.)

SIGNS AND ICONS APPEARING IN THIS MANUAL

While using this manual, you will come across the signs and icons represented here below: they are directly related to the safety and security of persons. Carefully follow this advice and inform others about it.

General warning



This warning sign appears in the manual whenever it is necessary to pay attention to rules, instructions or advice. The correct sequence of operations is to be followed in order to avoid damage to the machine.

Symbolizes a serious personnel danger

Information



This warning sign appears in this manual whenever an important information needs to be taken into consideration. Pay attention to this sign and follow the instructions given.

Navigation



This icon appears in this manual to give navigation information, to give the path to the subject treated in the chapter.

GETTING STARTED WITH THE ANGLE MEASUREMENT

Depending on software evolutions and the press brake controlled by the VisiTouch (configuration/capabilities), the present manual may not fully correspond to the VisiTouch that you currently have. However, differences are only minor.



This manual describes all features of VisiTouch 19 software version VisiTouch19_Press_PS_PC_V1.9.6 and above.

In order to use the angle measurement option on the VisiTouch, it is necessary to first install one of the options below:

OFT-AM1	Automatic angle measurement, one station
OFT-AM2	Automatic angle measurement, two stations

A plug-in then needs to be installed on the controller, each different angle measurement system has its own plug-in. Here are below the currently available systems:

Angle measurement system	Manufacturer
Analog angle measurement	Multiple OEMs
Wenglor	Wenglor
DATA-M LaserCheck	data M Engineering GmbH
LazerSafe Iris Plus	Lazer Safe Pty. Ltd.
VC Nano 3D Z - 1	Vision Component GmbH

Springback

In this manual is often used the term Springback.

When a material is bent, it will tend to return to its original shape when the part is released from the pressure and this effect will result in a bend not folded enough. Of course, we are here always talking about air bending. It is therefore necessary to over-bend the angle to achieve the desired angle. For example, to bend a 90° angle, it is necessary depending on the material to reach an 86°- 87° angle before releasing the pressure.

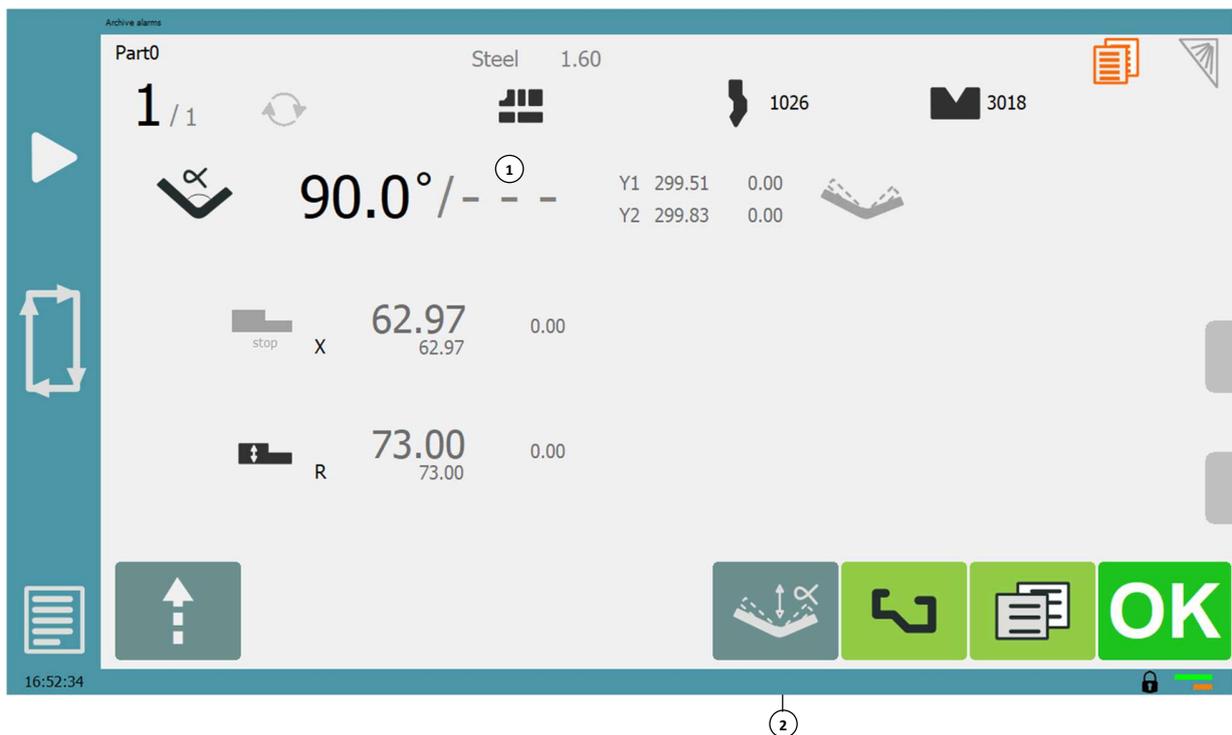
This capacity for the metal sheet to return to its original form is called the springback, it's a variable which will depend on various settings such as the material, the tensile strength, thickness, and the aimed angle.

With an angle measurement system, it is possible to measure the springback effect and automatically calculate a correction in real time to reach the desired angle.

USER INTERFACE

BEND NUMERICAL

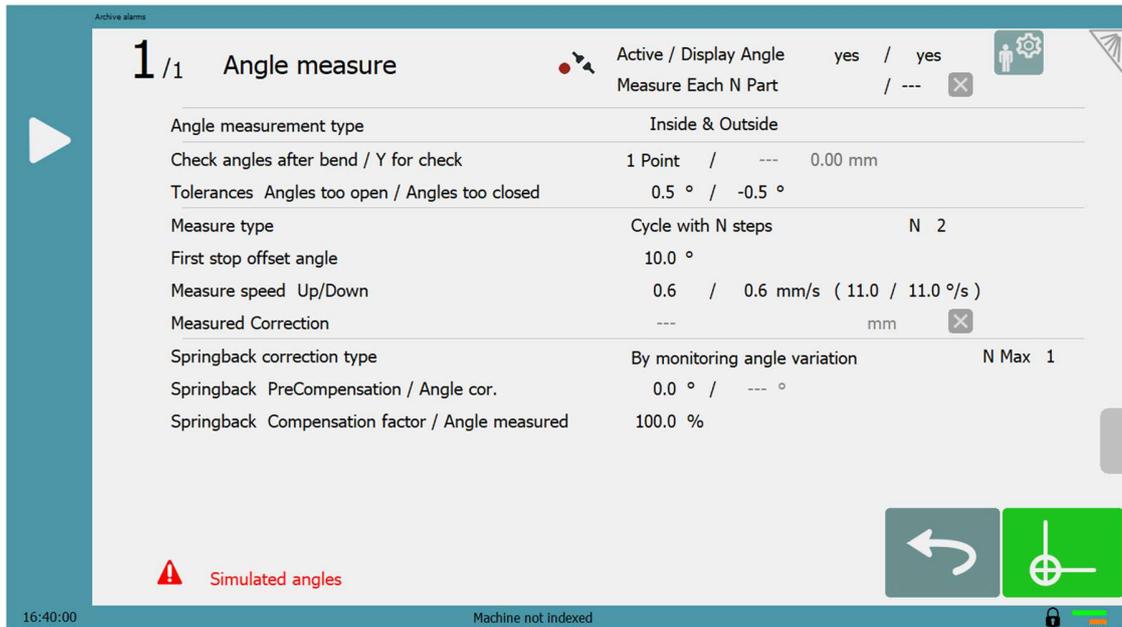
In the bend numerical page, the angle measurement option will appear as below.



1. Real time visualization of the measured angle
2. Angle measurement cycle parameters

ANGLE MEASUREMENT USER PAGE

From the current Bend numerical page:

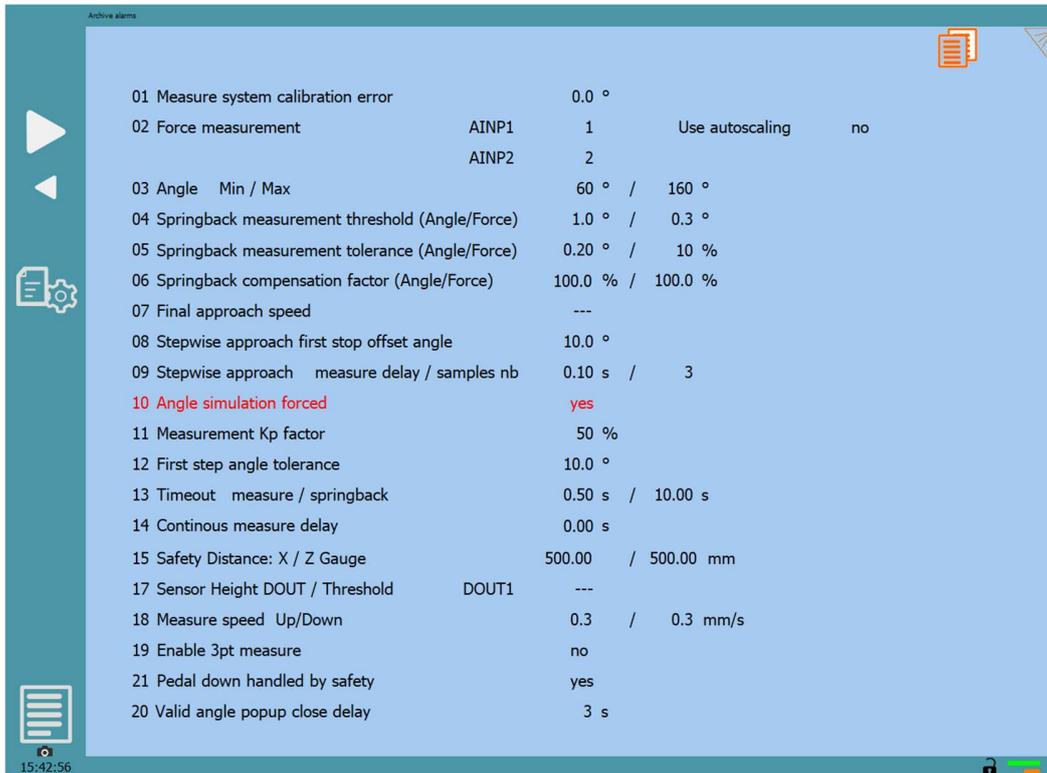


Active	<i>yes / no</i>	Activate / Deactivate the angle measurement
Display angle	<i>yes / no</i>	Displays or hides the measured angle during the bend in the numerical page. Note the value “---” in the bending page shows no current valid angle measured
Measure Each N part	<i>--- / ---</i>	When activated, a springback measurement cycle will be done only each N part. The rest of the bends will be done with similar springback precompensation but no measuring cycle to gain time. The number of parts bent will be shown in grey indicating the next springback measurement cycle.
Angle measurement type	<i>Inside</i>	Inside measured angle for systems such as LazerSafe Iris +
	<i>Outside</i>	Outside measured angle for systems such as LazerSafe Iris +
	<i>Inside & Outside</i>	Average of both inside and outside measured angles
	<i>Front</i>	Front measured angle (side of the user) for angle systems such as DATA-M / Wenglor / VComponent
	<i>Back</i>	Back measured angle (side of the back gauge) for angle systems such as DATA-M / Wenglor / VComponent
	<i>Front & back</i>	Average of both front and back measured angles

Check angle after bend	<i>no / 1 Point / 2 Points</i>	When enabled, will display a pop-up message with the final angle obtained and indicate if it's in the defined tolerances.	
		When Measure type is set to No measurement , the angle check is done at a theoretical point. It's possible to add a correction in [mm] to adapt it.	
Tolerance	<i>Angles too open [°]</i>	Tolerance used to check the angle when it is too open. If the final measured angle is opened more than this tolerance, another springback measuring cycle is performed.	
	<i>Angle too closed [°]</i>	Tolerance used to check the angle when it is too closed. If the angle is too closed, the pop-up message needs to be manually acknowledged as the bend/part is considered scrap.	
Measure type	<i>No measurement</i>	Deactivate the angle measurement cycle for the specified sequence	
	<i>Cycle with N steps</i>	Activate the angle measurement cycle with [N] measuring steps.	
	<i>Continuous measures</i>	Activate the continuous angle measurement. A continuous measure will be done until the measured angle corresponds to the programmed angle, the beam will then go slowly up to measure the springback.	
	<i>Same depth correction as for the bend [...]</i>	During this cycle, the angle and the springback will not be measured. The previous measured springback correction of the selected bend [...] will be applied.	
First stop offset angle	<i>1° to 20°</i>	This parameter will add an offset in degrees on the start of the angle measurement cycle. For example, with an offset of 5° and an angle of 90°, the measure will start at 95°.	
Measure speed Up/Down	<i>1.0 / 1.0</i>	Speed of the beam during the angle measure for up and down movement. To more precisely measure the springback, a low speed up must be set.	
Measured Correction	<i>--- [mm]</i>	Y1/Y2 measured correction after a measurement cycle.	
Springback correction type	<i>No measurement</i>	No measurement will be done.	
	<i>By monitoring angle variation [N Max]</i>	The beam will go to the calculated geometrical bottom dead center (BDC) and will go back up in low speed to detect and measure the metal sheet opening. (springback). If the angle is too open, the beam will then go deeper into the material to compensate the springback. [N Max] defines the maximum number of spring back measurement cycles. The springback measurement cycle will be done again until the measured angle is within the tolerance (Tolerances Angles too open / Angles too closed) or [N Max] has been reached.	
	<i>By measuring the residual force</i>	Uses the strain gauges to measure the springback and detect the sheet opening. (Usually more precise than using camera/lasers)	
	<i>Same springback angle as for bend [...]</i>	Uses the measured springback of a previous bend [...] and does a springback measurement and correction if the angle is out of tolerance.	
Springback PreCompensation	<i>0.0 °</i>	This correction is measured following the springback cycle and it will be directly applied to the BDC for next bends. It can be manually modified.	
Angle cor.	<i>0.0 °</i>	Springback value measured in degrees. Can't be modified.	
		It is possible to erase the calculated values by clicking on the red cross	

MACHINE PARAMETERS

ANGLE MEASURE PAGE

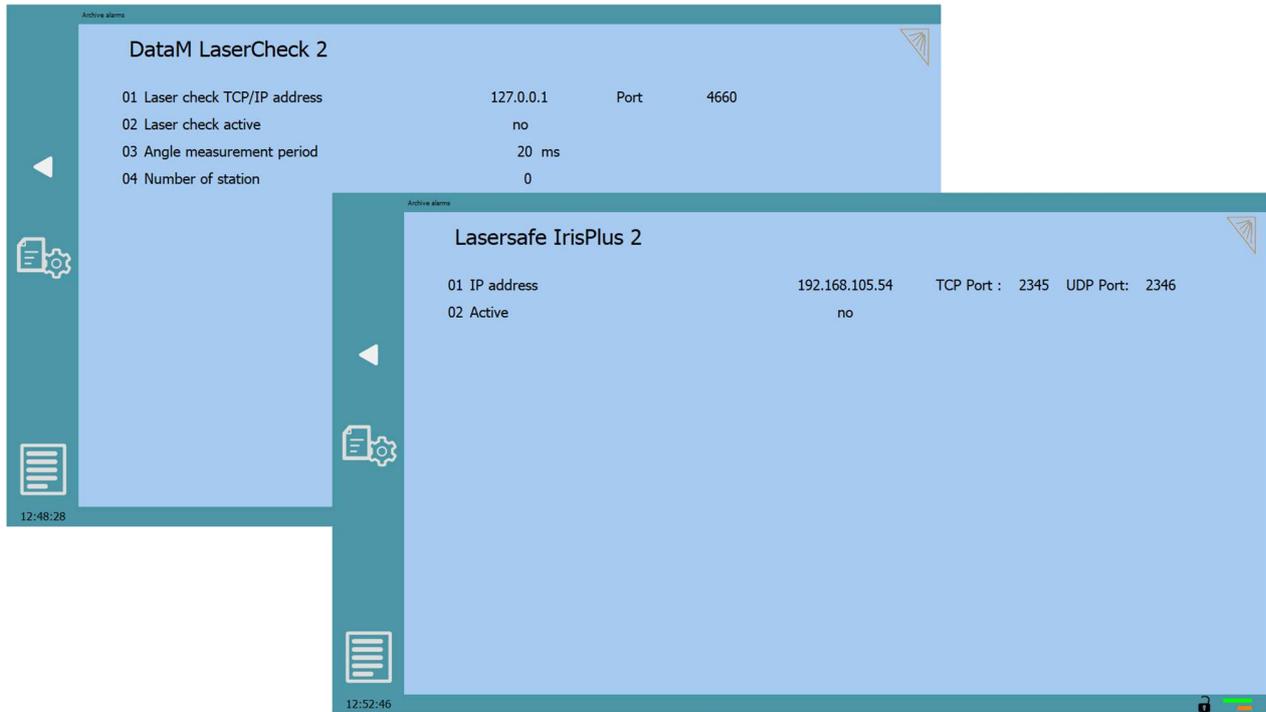


01 Measure system calibration error	0.0 °	Offset applied for each angle measuring cycle to correct an eventual measure error. (normally left at 0°)
02 Force measurement AINP1 / AINP2	1 - 4	Analog inputs of the strain gauge sensors. The inputs need to be mapped in the I/O Config page. Example: AINP1 : 1 = Filtered input 1
Use autoscaling	Yes / no	If the strain gauges have an auto-scaling, it's possible to wire two outputs, one for taring the system when the beam is at TDC and another to indicate the maximum pressure has been reached to adjust the measurement scale. The outputs need to be mapped in the I/O Config page. Note the digital outputs are affiliate with the analog input. Outputs Filtered Input 1 Scale / Filtered Input 1 Tare will be used with analog Filtered input 1 . For more information, read the "force sensor" chapter in the global machine parameter manual.
03 Angle Min / Max	75° / 160°	Set up the limits of the minimum and maximum angles in the program for a cycle with the angle measurement.

04 Springback measurement threshold (Angle/Force)	<i>1.0° / 0.3°</i>	During the up movement of the springback measuring cycle, the detection will only be activated after X degrees to avoid any measuring error.
05 Springback measurement tolerance (Angle/Force)	<i>0.20 ° / 10 %</i>	During the springback detection, (up movement of the beam), the measure will be stopped when it is within this tolerance.
06 Springback compensation factor (Angle/Force)	<i>100%</i>	Factor to add a correction on the springback calculation. 100% = No correction 110% = Amplified springback
07 Final approach speed	<i>mm/s</i>	Maximum speed of the final approach of the steps.
08 Stepwise approach first stop offset angle	<i>5.0°</i>	Value per default of the user parameter First stop offset angle .
09 Stepwise approach measure delay / samples nb	<i>0.00 s / 1</i>	Delay to consider the measure valid / Number of measure samples to calculate the average.
10 Angle simulation forced	<i>yes / no</i>	If set to “Yes”, the measured angle will be simulated internally. (Mostly for the VisiTouch PC offline version). Must be set to “no” on a real machine.
11 Measurement Kp factor	<i>50%</i>	During the angle measuring cycle, the BDC regulation parameters are used. (P20 Bending - Bottom Dead Center). It is possible to lower the proportional gains (Position above/below controller Kp) with this factor to avoid any oscillation.
12 First step angle tolerance	<i>5.0°</i>	Tolerance of the angle for the first measurement, if the angle is out of tolerance, the cycle is stopped.
13 Timeout measure / springback	<i>2.00s / 10.00s</i>	Timeout to stop the cycle during the angle and springback measurement.
14 Continuous measure delay	<i>0.05s</i>	Considered delay during the continuous measure between the real and actual angle received by VisiTouch.
15 Safety Distance: X / Z gauge	<i>500.00 mm / 500.00 mm</i>	Safety position zone of the gauges when the angle measurement sensor is moving to avoid collision. If the gauges are under this position, the gauges will move to it.
16	<i>-</i>	To be defined
17 Sensor Height DOUT / Threshold	<i>DOUT1 / mm</i>	Defines a digital user output that can be used by the angle measuring system to pneumatically move the cameras. The output will be active if the height of the programmed die is bigger than the threshold value. The change applies when pressing on START.
18 Measure speed Up/Down	<i>0.3 mm/s</i>	Default speed Up/Down of the beam during a measurement cycle. Note the lower the speed, the better the sensitivity and springback will be measured.
19 Pedal down handled by safety	<i>yes/no</i>	If the pedal (down order) goes through the safety of the machine, set this parameter to yes . The pop-up message acknowledgment will then be managed only with a timer and not with the pedal.

20 Valid angle popup close delay	3s	Delay before closing the pop-up message of the angle check feature.
---	----	---

COMMUNICATION SETTINGS



01 TCP / IP address	0.0.0.0	IP address of the angle measurement system
02 Active	yes / no	Enable / disable the communication.
03 Angle measurement period	20 ms	Period used to send/receive the measure samples.
04 Number of stations	1-2	Program the number of stations of the angle measurement device.

Windows configuration

For angle measurement systems which use TCP/IP communication, the Cybelec controller needs to be set with a static IP address. Per default, Windows is configured with a dynamic IP on all controllers.

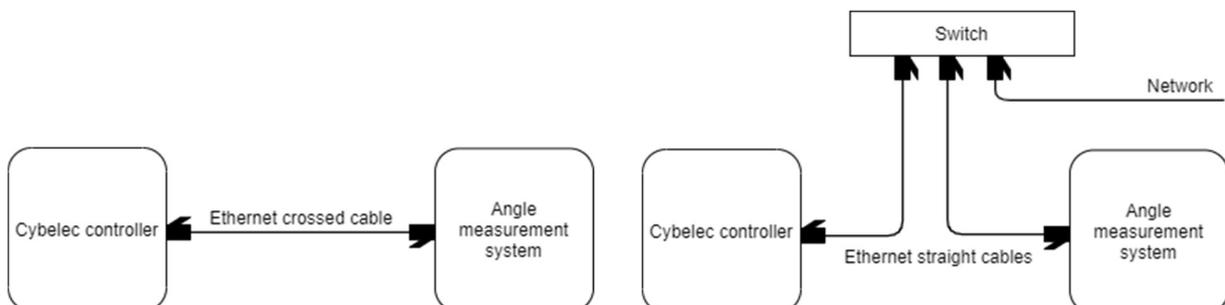
- Open Settings.
- Click on Network & Internet.
- Click on Ethernet.
- Click on the current network connection.
- Under the "IP settings" section, click the Edit button.
- Using the drop-down menu, select the Manual option.
- Turn on the IPv4 toggle switch.
- Set the static IP address.

An exception in the Windows fire wall for the port used by the communication also needs to be configured:

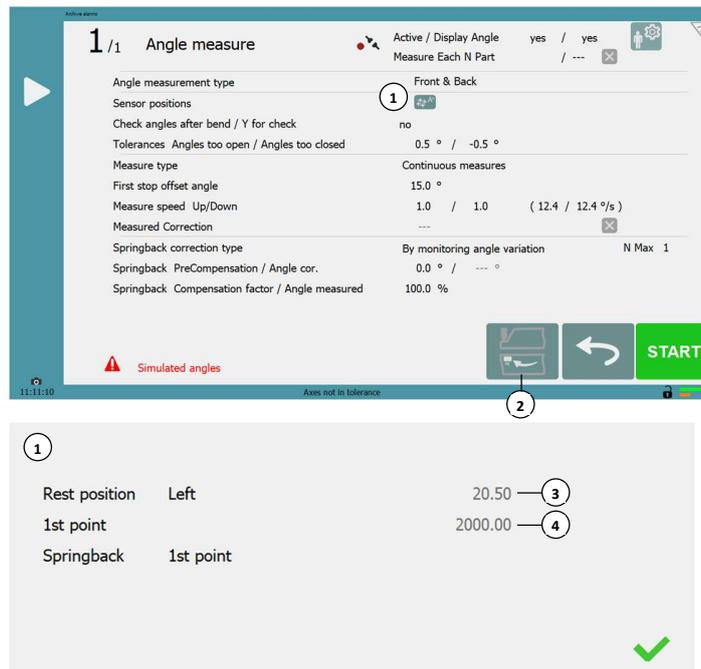
- On the operating system, go to Start > Run and type firewall.cpl. The Windows Firewall window opens.
- Click on the "Advanced Settings" link on the left pane. The Windows Firewall with Advanced security window opens.
- Click on the "Inbound Rules" option.
- On the left panel, click on "New rule".
- Under "Rule Type" select the option "Port" and click next.
- Select "UDP" and "specific local ports" options.
- Key in the port number used by the angle measuring system (per default 2346), click Next.
- Select the option "Allow the connection".
- Click Next, do not change any option here and click Next again.
- Specify a name for this rule, click Finish.

Wiring

There are two possibilities to wire the angle measurement system to the controller. Either wire directly a crossed cable between the controller and the measurement device ethernet ports or use a switch in between, in this case the wires will be straight. In both cases, use a shielded ethernet cable cat6.



Axis management



1. Sensor positions
2. Pressing the button, sends the sensor axis to the parking position.
3. Parking position of the sensors. (can be modified)
4. Measuring position of the sensors for current step, depending on the part position. (can be modified)

Cycle

The controller can manage an electrical axis that will move laterally like a Z axis, this only works for angle measurement with camera stations.

- Before pressing the pedal, the axis is in parking position on the left of the machine.
- When pressing the pedal, the beam goes down to bend until the **first stop offset angle** and then stops.
- The back gauge (X) retracts to a safety distance. (**15 Safety Distance: X / Z gauge**)
- The sensor axis goes to the defined metal sheet position.
- The system defines the sensitivity and then measures the springback.
- The system corrects the springback by bending a second time (and so on, depending on the parameters)
- The data-m axis goes back to parking position
- The beam goes up.

TROUBLE SHOOTING



For troubleshooting reasons, it is possible to open the log of the angle measurement system. During a cycle, the critical steps will be recorded and monitored. This log includes the first approach at the desired angle to calculate the sensitivity in mm/° in N steps or continuous mode. Then it shows the springback measurement cycle in the second part of the log.

```

15:18:59:309 Angle measure monitoring
Last Measured Y: Y1 : 247.535 Cr : 0.000 Y2 : 247.525
Last Measured Angles: Left : 89.933 Center : 0.000 Right : 0.000
Sensitivity: Curr : 0.11330 Calc : 0.14458
000 Type: 1000 SensSum: 0.0000 SensCount: 0 Sens: 0.14458 CurTarAng: 0.000
000 Type: 1000 ActualY1: 248.150 TargetY1: 0.000 AngleL: 91.997 NextY1: 0.000 NextAL: 90.000
000 Type: 1000 ActualY2: 248.150 TargetY2: 0.000 AngleR: 0.000 NextY2: 0.000 NextAR: 0.000
001 Type: 1001 SensSum: 0.0000 SensCount: 0 Sens: 0.14458 CurTarAng: 0.000
001 Type: 1001 ActualY1: 247.925 TargetY1: 0.000 AngleL: 90.090 NextY1: 247.911 NextAL: 2.895
001 Type: 1001 ActualY2: 247.920 TargetY2: 0.000 AngleR: 0.000 NextY2: 247.905 NextAR: 0.000
002 Type: 9999 SensSum: 0.1146 SensCount: 1 Sens: 0.11465 CurTarAng: 89.903
002 Type: 9999 ActualY1: 247.910 TargetY1: 247.915 AngleL: 89.903 NextY1: 0.419 NextAL: 4702.530
002 Type: 9999 ActualY2: 247.910 TargetY2: 247.915 AngleR: 0.000 NextY2: 0.500 NextAR: 0.000
003 Type: 1000 SensSum: 0.1146 SensCount: 1 Sens: 0.11465 CurTarAng: 0.000
003 Type: 1000 ActualY1: 248.370 TargetY1: 247.915 AngleL: 89.903 NextY1: 0.000 NextAL: 86.620
003 Type: 1000 ActualY2: 248.365 TargetY2: 247.915 AngleR: 0.000 NextY2: 0.000 NextAR: 0.000
004 Type: 1001 SensSum: 0.1146 SensCount: 1 Sens: 0.11465 CurTarAng: 0.000
004 Type: 1001 ActualY1: 247.540 TargetY1: 247.915 AngleL: 86.710 NextY1: 247.525 NextAL: 2.895
004 Type: 1001 ActualY2: 247.540 TargetY2: 247.915 AngleR: 0.000 NextY2: 247.525 NextAR: 0.000
005 Type: 9999 SensSum: 0.2266 SensCount: 2 Sens: 0.11330 CurTarAng: 86.503
005 Type: 9999 ActualY1: 247.535 TargetY1: 247.530 AngleL: 86.503 NextY1: 0.419 NextAL: 4702.530
005 Type: 9999 ActualY2: 247.525 TargetY2: 247.535 AngleR: 0.000 NextY2: 0.500 NextAR: 432.000

15:18:59:350 Springback measure monitoring
000- 0000 TargetY: 247.908 ActualY: 247.910 Angle: 89.903 Flag: 1
001- 0100 TargetY: 248.027 ActualY: 248.025 Angle: 90.920 Flag: 1013
002- 0381 TargetY: 248.364 ActualY: 248.365 Angle: 93.300 Flag: 10536
003- 0429 TargetY: 248.364 ActualY: 248.370 Angle: 93.283 Flag: 90003
004- 0432 TargetY: 247.525 ActualY: 247.530 Angle: 86.503 Flag: 1
005- 0533 TargetY: 247.645 ActualY: 247.642 Angle: 87.550 Flag: 1013
006- 0806 TargetY: 247.973 ActualY: 247.965 Angle: 89.940 Flag: 10535
007- 0853 TargetY: 247.973 ActualY: 247.972 Angle: 89.950 Flag: 90003
Angle cor : -3.447 Meas DY1 : 0.009 Meas DY2 : 0.000 Meas DY3 : 0.009 Meas Sens : 0.11330 Depth : -0.442
    
```

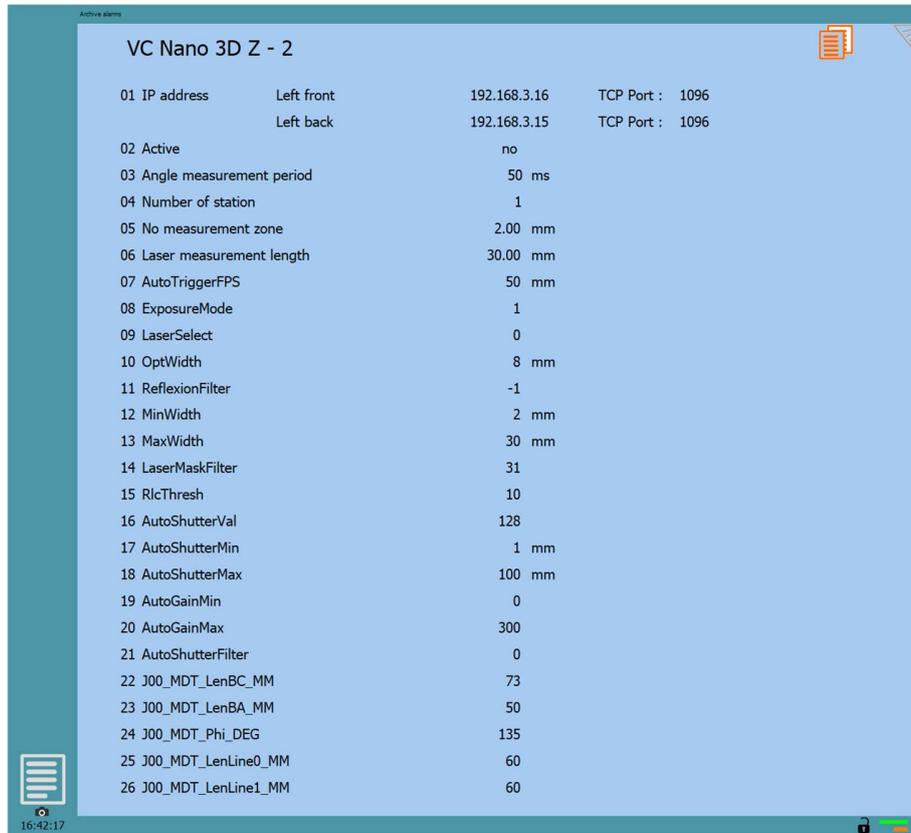
SPECIFICITIES FOR DIFFERENT ANGLE MEASUREMENT BRANDS

LAZERSAFE IRIS PLUS

For LazerSafe IRIS plus system, make sure it is configured as below, you may access the configuration page with the internet browser of the controller:

General			
Network Protocol Configuration	Generic Real-Time (UDP) ▾		
Real-Time Angle Measurement Result Type	Angle Result Type 2 ▾		
CNC TCP/IP Port Number	2345		
Real-Time UDP Port Number	2346		
Initial Machine Length	3.000	m	
Calibration Tool Angles (Acute - Main Tool - Obtuse)	70.00	100.00	140.00 *
Calibration Tool Type	<input type="radio"/> Single Tools <input checked="" type="radio"/> Multi-Tool		

VCOMPONENT – NANO 3D Z -2



01 IP address	<i>0.0.0.0</i>	IP address of the two cameras and TCP Port.
02 Active	<i>yes / no</i>	Enable / disable the communication.
03 Angle measurement period	<i>20 ms</i>	Period used to send/receive the measure samples.
04 Number of stations	<i>1-2</i>	Number of angle measurement stations.
Parameters 05 to 26	-	Refer to VComponent manual for more information about these parameters.

Startup

Once the cameras are mounted, a calibration needs to be done. VComponent provides a tool that needs to be mounted instead of the die. (VK000563 / VC PB-MDT).



Press the buttons **Start Auto detection**, it will enable the laser/camera and start measuring the mounting angle and X – R positions.

VC Nano 3D Z

01 Left front sensor mounting angle	-29.1 °	Start Auto detection	---	
02 Left front sensor mounting X	-109.0 mm		---	
03 Left front sensor mounting R	-44.4 mm		---	
04 Left back sensor mounting angle	29.4 °	Start Auto detection	---	
05 Left back sensor mounting X	108.3 mm		---	
06 Left back sensor mounting R	-48.6 mm		---	

Verify that the measured values (red) are corresponding to the default values on the left. If they are totally different, the camera might have an issue or the measurement mounting setup is not good. Note the mounting angle has to be very accurate as it has a direct influence to the output angle result.

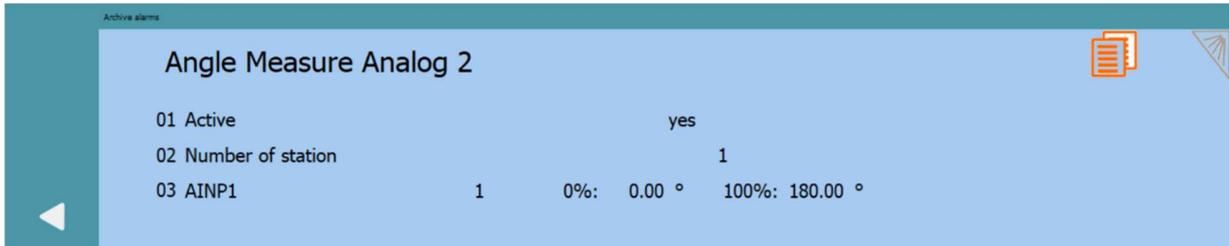
Copy the values by hand.

VC Nano 3D Z

01 Left front sensor mounting angle	-29.1 °	---	Stop auto detect	
02 Left front sensor mounting X	-109.0 mm	---		
03 Left front sensor mounting R	-44.4 mm	---		
04 Left back sensor mounting angle	29.4 °	---	Stop auto detect	
05 Left back sensor mounting X	108.3 mm	---		
06 Left back sensor mounting R	-48.6 mm	---		

For further information, refer to Vision Component manual.

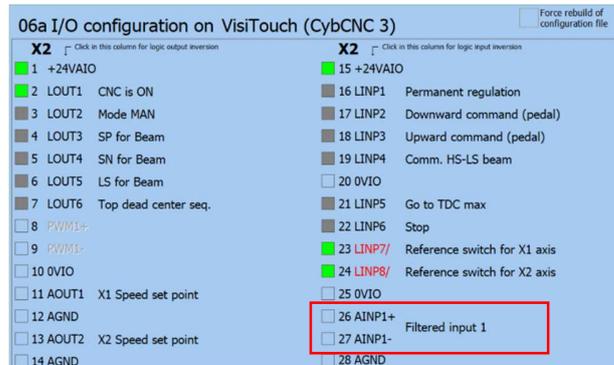
ANGLE MEASUREMENT ANALOG 2



01 Active	yes / no	Enable / disable the communication.
02 Number of stations	1-2	Program the number of stations of the angle measurement device.
03 AINP1	1 -> 4	<p>Analog input used as feedback, it corresponds to the Filtered input 1 -> 4 which can be mapped in the 06a I/O page.</p> <p>Define the angle corresponding to the percentage 0-100% of the analog input. Note the scaling of the input needs to be correctly programmed beforehand. (below)</p>

Mapping

The analog input defined in the [Angle measure Analog 2](#) page, must be mapped in the 06a I/O page.



Scaling

Define the scaling of the analog input. When the range of the sensor or potentiometer is not from 0-10V, the 0% and 100% must be taught to have a better measurement.

