2019 Apr 11

DXL360/S/C V3 Digital Protractor User Guide

2019 Apr 11

Features:

1) DXL360S/C: High accuracy ±0.05°, high resolution 0.01°
   DXL360: ±0.1°, resolution 0.02°, detail check specification
2) Dual and Single axis with user friendly LCD display angle
3) Rechargeable
4) V Shape case for easy to fit at the corner or pipe.
5) 5 Side Magnetic base
6) Audible alarming at settable angle range
7) Any angle measurement *DXL360s/c only
8) USB / Bluetooth to pc connection need adapter for DXL360 and DXL360s/c.

Specifications

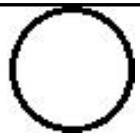
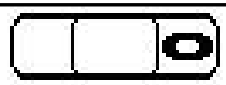
Accuracy:	DXL360S/C: 0 to 20°: ± (0.05°) 20 to 70°: ± (0.1°) 70 to 90°: ± (0.05°) DXL360: 0 to 20°: ± (0.1°) 20 to 70°: ± (0.2°) 70 to 90°: ± (0.1°) *After Calibrated
Measuring range:	Single axis: 360°, Dual axis: ±40°
Resolution:	DXL360S/C: 0.01° DXL360: 0.02°
“Any Angle” Measurement	0.5°

Accuracy *DXL360s/c**:**	
Gyro Rotation Speed *DXL360s/c**:**	<90°/s
Response time:	<0.4 second
Audio sound:	60dB @ 30cm
Zero offset drift angle per °C:	0.0058° (typical)
Operating temperature:	0 to 50°C
Storage temperature:	-10 to 60°C
User Interface:	Mono-color LCD with backlight
Supply Power:	Rechargeable Li-Polymer 3.7V
Charger port:	5V 500mA Mini type-B USB port
Power Consumption:	Standby: 10uA, Operation: 20mA.
Standby Battery Life:	4000 hours
Operating Battery Life:	40 hours
Dimensions (in mm):	70(L) x 70(W) x 23(H)
Magnetic Base:	affix at 4 corners
Magnetic Force:	N48
Weight:	120gram

Button Functions

Button	Function Descriptions	
	Normal Mode	**MENU Mode**
POWER	In normal operation, this button turns the device ON/OFF.	Serves as the escape key at menu mode
ZERO	When pressed, the current reading is set to zero; subsequent measurements are relative to this reading. The LCD will show the  icon to indicate the device is in zero mode. Press and hold for 3 seconds to enable or disable sound. The  icon on LCD will be displaced accordingly. The buzzer alarming could be set at different accuracy level. Refer to section "**Angle Alarming**".	Serves as the upward key for option selection.
HOLD	When pressed, the current value will freeze; the unit icon  flashes to indicate the reading is on hold.	Serves as the downward key at menu mode
SET	Press and hold for 3 seconds to enter MENU mode, for set mode options.	Serves as the Set key.
ANGLE *DXL360S/ C only	Any angle measurement start button. Refer to section "Any Angle" Press and hold for 3 seconds to enter MENU mode, for set mode options.	Serves as the Set key.

LCD Icons Representations

	Battery status indication icons These icons indicate the battery level. There are 3 levels representing empty, half and full.
	In dual-axis mode, the LCD displays the direction of tilt graphically. It will show as E bubble to display the direction of tilt
	Degree mode. Flash when unit is in HOLD mode
	mm/M, the height of one end for 1m long plate.
 *DXL360S/C Only	Gradient % mode. Flash when unit is in HOLD mode
	Sound notification on. Blank as off
	Show this logo as relative value is showing. When the Zero button is pressed, the unit reset current angle to zero.
	Direction of tilt icons, show the tilt angle direction
	Dual-Axis Mode. Both the X and Y axis angle will be showed. Dual axis mode measures inclination up to +-40 degree for each axis before it automatically to single axis mode.
	Single Axis Mode. Measure slope up to +-90 degree. The triangle icon indicates the direction of tilt with respect to the bottom right corner of the unit.

Battery Charging

It has a built in Lithium Ion rechargeable battery. A standard charger is supplied that the input voltage is 110V to 240V AC, 50/60Hz, and the output is 5V DC, 500mA. The charger operating procedure is list below:

1) Plug the Charger into AC socket, the RED indicator on the charger should turned ON,
2) Plug the USB charging cable to the Charger,
3) Insert the other end of the USB cable to the unit,
4) The battery icon on the LCD blinks to indicate charging in process. Upon charging complete, the icon stops blinking.
5) The charging time is approx. 3 hours.

The unit could also be charged by connecting the USB cable to the unit and a computer's USB port. This has the same effect when charging the unit with the provided adaptor.

Note: When the unit is turned OFF, and plug in the USB charge cable, the LCD will no show anything, it is NORMAL. Once the unit is turned ON, the battery icon should flash indicating the unit is in charging mode.

Relative/ Absolute Measurement

Relative Measurement

LCD Icon: 

Absolute Measurement

LCD Icon: **Blank**

Relative and Absolute Mode Switching:

1 Press and release the “ZERO” key to set the relative measurement zero point

2 Press and release the “ZERO” key to cancel the relative zero point and back to absolute measurement mode.

Hold Function

Holding Mode:

LCD Icon blinking: 

Holding function:

1. Press and release the “HOLD” key to activate holding function, digit will freeze.
2. Press and release the “HOLD” key to cancel the holding function.

Auto Power Off

For no movement in 30 minutes, the unit will power off.

Or we can set to never sleep mode at below instruction.

Power auto off setting:

1. Press and hold “SET” / “ANGLE” key and enter MENU mode
2. Select “POWER” by “ZERO” and “HOLD” key, press “SET” key to enter Power mode
3. Scroll “NEVER” or “30MIN” by “ON/OFF” and “HOLD” key
4. Press “SET” key to confirm NEVER or 30MIN (30 minutes) sleep

Restore Factory Setting

When you find that the unit is abnormal, you can restore the unit to factory setting.

All calibration setting will be restored to factory setting.

Not suggest restore to factory setting in normal status, for accuracy drift, please follow **Calibration. After factory set, please redo calibration to ensure the accuracy.*

Restore to factory setting:

1. Press and hold “SET” / “ANGLE” key and enter MENU mode
2. Select “FACTORY SET” by “ZERO” and “HOLD” key, press “SET” key to enter FACTORY SET mode
3. Scroll “YES” or “NO” by “ZERO” and “HOLD” key
4. Press “SET” key to confirm

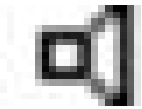
Language Setting:

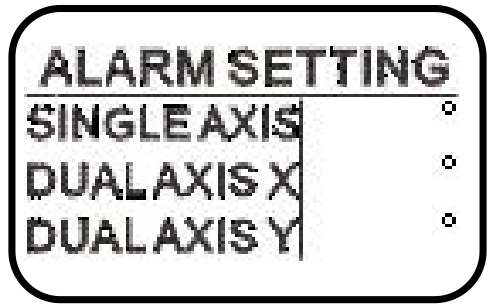
1. Press and hold “SET” / “ANGLE” key and enter MENU mode
2. Select “ENG” to English by “ZERO” and “HOLD” key
3. Press “SET” key to confirm

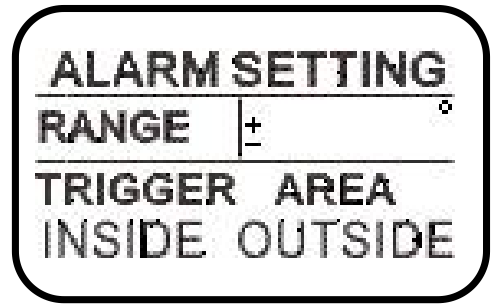
Angle Alarming

Alarming Mode:

LCD Icon:







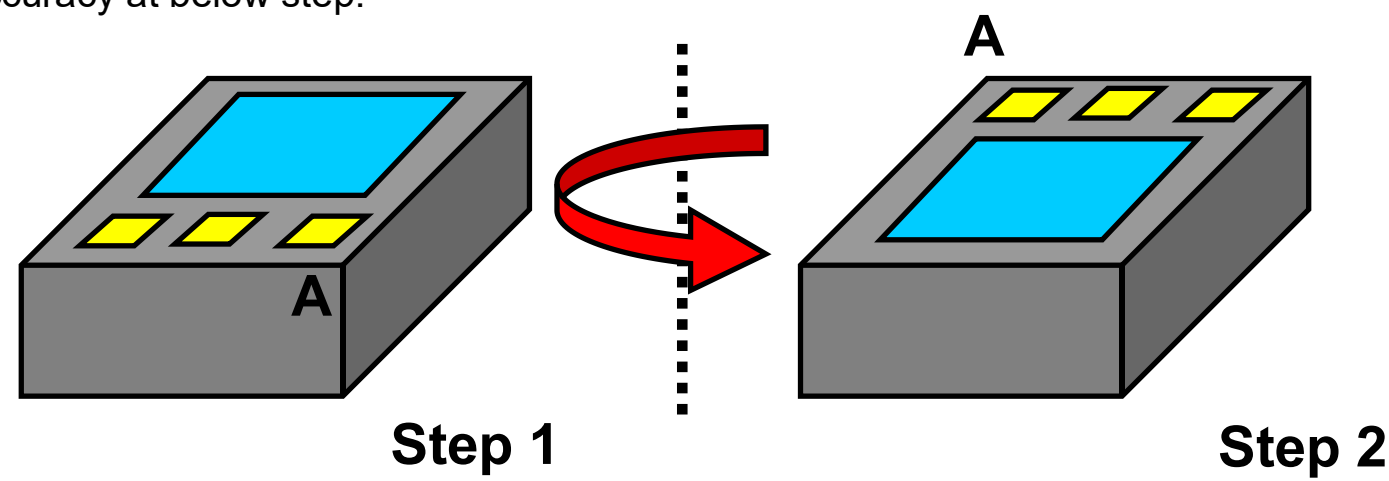
Alarming Angle setting:

1. Press and hold “SET” / “ANGLE” key and enter MENU mode
2. Select “ALARM” by “ZERO” and “HOLD” key, press “SET” or “ANGLE” key to enter Alarm Setting
   Press and hold “ZERO” and “HOLD” key for fast scrolling the digit.
3. Press “SET” or “ANGLE” to enter setting value

SINGLE AXIS	Vertical / Single axis mode alarming angle (Degree)
DUAL AXIS X	Horizontal/ Dual axis mode X axis alarming angle (Degree)
DUAL AXIS Y	Horizontal/ Dual axis mode Y axis alarming angle (Degree)
RANGE	The range (Degree)that will trigger the audible alarming For example: SINGLE. set to 20.00 RANGE set to 01.00 While the unit is in +19° to +21°or -19 ° to -21°, the unit will alarm
TRIGGER AREA	INSIDE or OUTSIDE to set the alarm will alarm in of range or out of range

Calibration

Calibrate the unit, once you found that there is accuracy drift on the unit. You can verify the accuracy at below step:



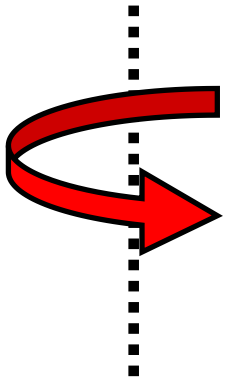
At Step1, you measured X and Y value, X1 and Y1
At Step2, you measured X2 and Y2, in theory X1=-X2, Y1=-Y2.
If the error is too large, you can enter calibration mode to eliminate the error

Accuracy drift is causing by large ambient temperature change (5 to 10 Degree Celsius) or the unit has been dropped.

Calibration Procedure:

Step 1-2: Press and hold the “SET” or “ANGLE” key enter Menu mode. Select “Level CAL. ” mode, press “SET”. Place the unit on a flat table (no need perfect level table)
LCD display “Dual Axis Calibration”, press “SET” and buzzer will beep; wait until the beep sound stop. While the buzzer is beeping keep the unit stable.
Step 3-4: Then rotate the unit 180 degree with the other side against the same place. Press the Set button again, and wait for the beep finished.

Step 1-2



Step 3-4

Step 5-6: LCD display “Single Axis Calibration”. Place the unit horizontal like the picture “STEP 3” and then press “SET”, wait until the beep sound stop.

Step 7-8: Then rotate the unit 180 degree at the same place. Press the “SET” button again, and wait for the beep finished.

Step 5-6

Step 7-8

Step 9-10: LCD display ““Single Axis Calibration”, mention that the ON/OFF Key at upper side, hold on a flat wall. And then press “SET” Key. Wait for the “Beep” sound stop.

Step 11-12: Then rotate the unit 180 degree with the other side against the same place of wall (ON/OFF Key at upper side). Press the Set button again, and wait for the beep finished. Now, the LCD should go back to the selection menu. The calibration is done, by selecting “Return to main page” to go back for normal operation

Wall

Wall

Step 9-10

Step 11-12

ANY ANGLE measurement:

***DXL360S/C only**

Any angle measurement is using gyro technique.
You can measure the angle between two faces, not only in earth gravity direction.

1) Press Angle key at the first face, and then rotate slowly and must keep the rotation axis to another testing face
2) It will then show the angle once you not move the unit.

The rotation axis:


DXL360S
0.01° Resolution
Power
Buzzer
ZERO
Degree
mm/M
%
HOLD
SET
Menu

Any Angle Measurement Method:

Example: Measure angle between two wooden walls is 88.9°

Place at the first position, press Angle

Rotate to final position, keep the rotational axis, LCD show the angle

Calibrate Gyro *DXL360S

1) Place Unit At Flat Table And then Press Set

2) Flip 360 degree in clockwise and then press set
Please rotate slowly to increase the accuracy


DXL360S
0.01° Resolution
<2> FLIP 360 DEGREE
IN CLOCKWISE
AND THEN PRESS SET
Dual Axis Digital Angle Protractor
ZERO
HOLD
ANGLE
SET
Power
Buzzer
Degree
mm/M
%
Menu


DXL360S
0.01° Resolution
<2> FLIP 360 DEGREE
IN CLOCKWISE
AND THEN PRESS SET
Dual Axis Digital Angle Protractor
ZERO
HOLD
ANGLE
SET
Power
Buzzer
Degree
mm/M
%
Menu

3) Place unit at flat table and then press set

4) Flip 360 degree counter clockwise and then press set
Please rotate slowly to increase the accuracy


DXL360S
0.01° Resolution
<4> FLIP 360 DEGREE
COUNTER CLOCKWISE
AND THEN PRESS SET
04.35
Dual Axis Digital Angle Protractor
ZERO
HOLD
ANGLE
SET
Power
Buzzer
Degree
mm/M
Menu


DXL360S
0.01° Resolution
<4> FLIP 360 DEGREE
COUNTER CLOCKWISE
AND THEN PRESS SET
04.35
Dual Axis Digital Angle Protractor
ZERO
HOLD
ANGLE
SET
Power
Buzzer
Degree
mm/M
Menu

PC Communication

It has a PC data logging function.
For DXL360C you can directly plug the USB cable between PC and protractor by a mini USB cable

For DXL360/S You can not directly plug the USB cable between PC to protractor by a general USB cable.
You need to optional purchase the PC adapter SVRS232
You can continue to data logging X and Y inclination data to PC.
Sampling time is around 2 Hz.

Specification:

1) RS232 Com Port 9600 baud rate
2) USB connection (include a RS232 to USB adapter)
3) Format will output ASCII: example for x is 0, Y is -88.88:
   “ X+0000Y-8888”

Detail can visit our website or contact our sales person.

DXL360/S/C V3 数字角度尺使用说明书

产品特点:

1) DXL360S/C: 高精度 ±0.05°, 高分辨率 0.01°
   DXL360: 精度±0.1°, 分辨率 0.02°, 详情参阅说明书。
2) 可测单轴、双轴倾斜角度，大屏 LCD 清晰显示角度。
3) 充电功能
4) 外壳 V 槽设计可以轻松放置在拐角和圆管上。
5) 底面和四周均有磁铁
6) 可对指定角度设定蜂鸣报警
7) 可任意物体之间的角度*只有 DXL360s/c 具有此功能*
8) 通过 USB 可以连接至电脑 *只有 DXL360sc 具有此功能, DXL360/s 需要外接 USB 转接器*

产品规格

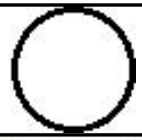
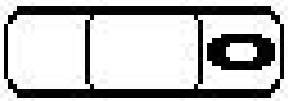
产品精度:	DXL360S/C: 0 至 20°: ± (0.05°) 20 至 70°: ± (0.1°) 70 至 90°: ± (0.05°) DXL360: 0 至 20°: ± (0.1°) 20 至 70°: ± (0.2°) 70 至 90°: ± (0.1°) *校正之后的精度*
测量范围:	单轴: 360°, 双轴: ±40°
分辨率:	DXL360S/C: 0.01° DXL360: 0.02°

任意物体之间角度测量	
精度 *DXL360s/c:	0.5°
陀螺仪旋转速度 *DXL360s/c:	<90° /s
响应时间:	<0.4 秒
蜂鸣音量:	60dB @ 30cm
角度尺零度的时候每° C 角度偏差:	0.0058° (一般状态)
使用温度:	0 至 50° C
储存温度:	-10 至 60° C
用户界面:	背光单色 LCD
供电电源:	充电锂离子电池 3.7V
充电器接口:	5V 500mA Mini B 类型 USB 接口
产品功耗:	待机时: 10uA, 使用时: 20mA.
待机时电池续航时间:	4000 小时
使用时电池续航时间:	40 小时
尺寸 (mm):	70(长) x 70(宽) x 23(高)
磁力座:	设置在四个角上
磁性强度:	N48
重量:	120g

按键功能

按键	功能详解	
	普通模式	菜单模式
POWER	普通操作时，这个按键主要用于开关角度尺.	菜单模式下相当于离开功能。
ZERO	按下按键当前角度将被设置成零；以后的测量将以此为零基准. LCD 上会显示三角图标“ ”，i 提示用户现在处于 ZERO 模式下。 按下并保持 3 秒用于设置或取消蜂鸣功能. LCD 屏幕上显示图标 “ ”。 可以对任意角度设置蜂鸣报警.。 详解查阅 **“角度报警”**.	在菜单模式下当“向上”按键
HOLD	按下此按键后 LCD 会锁定显示按下时角度;屏幕上图标“ ”会闪烁，表示当前角度读数被锁定。	在菜单模式下当“向下”按键
SET *DXL360 专有	按住并保持 3 秒进入菜单模式，设置各项参数。	在菜单模式下当“确定”按键.
ANGLE *DXL360s/c 专有	任意物体间角度测量按键，详解参阅 “任意物体间角度”。 按住并保持 3 秒进入菜单模式，设置各项参数。	在菜单模式下当“确定”按键.

LCD 显示图标说明

	电池状态指示图标： 用于指示当前电池状态。分别指示电池三种状态 没电，一半 ，满电.
	在双轴角度测试模式下，LCD 会显示当前图标模拟角度水泡，演示倾斜方向.
	角度模式. 闪烁时候表示进入锁定角度状态
	mm/M，将角度转换为一米外对应的高度单位是毫米.
 *DXL360S/C	斜度 % 模式. 在 Hold 模式下会闪烁。
	显示时候表示会蜂鸣， 消失表示取消。
	表示当前显示的所有角度是相对的。 当 Zero 按键按下时， 会将当前角度设置为零角度，并依此为水平基准。
	单轴角度测试模式，模拟水泡指示当前角度倾斜方向。
	双轴角度测试模式. X 和 Y 两个方向的角度同时显示. 双轴角度模式测试范围为+-40 度，超过测试范围会自动转换到单轴角度测试模式。

	单轴角度测试模式. 测试倾斜范围为+-90 度。 水泡指示当前角度倾斜的方向，如图表示当前角度是向左边倾斜。

电池充电器

该仪器使用了锂离子充电电池. 充电器标准输入电压 110V 至 240V 交流（AC）, 50/60Hz, 输出电压为 5V 直流 DC, 电流 500mA. 充电器操作步骤如下：

1) 将充电器接入直流插座, 此时红色指示灯会亮。
2) 将 USB 线接入充电器的 USB 接口。
3) 将 USB 线另一端接入角度尺。
4) 角度尺屏幕上的电池图标会闪烁表示正在充电，充电完成后图标会停止闪烁。
5) 充电时间大约为 3 小时。

角度尺也可以通过 USB 线连接至电脑进行充电，这和使用充电器的效果相同。
注意：当角度尺处于关机状态时，将角度尺连接至充电器充电时，LCD 屏幕会亮但不会显示任何东西, 这是正常现象。 只要打开角度尺,屏幕上的电池图标就会闪烁表示当前正在充电。

相对/绝对角度测量

相对角度测量

LCD 图标： 

绝对角度测量

LCD 图标：**空白不显示**

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相对角度模式和绝对角度模式切换方法:

1 按下 “ZERO” 按键设置相对零度进入相对角度测试模式。
2 再次按下 “ZERO” 按键取消相对零度 回到绝对角度测试模式。

角度锁定功能

锁定模式:

LCD 图标这个闪烁： 

角度锁定功能使用方法:

1. 按下“HOLD” 按键进入角度锁定功能，当前角度将锁定一直显示在屏幕上。
2. 再次按下 “HOLD” 按键即可取消角度锁定功能。

自动关机功能

半小时不使用角度尺，角度尺会自动关机。
也可以通过以下操作取消自动关机功能。

自动关机功能设置方法：

1. 长按 “SET”或 “ANGLE” 按键进入菜单模式。
2. 使用”ZERO”和”HOLD”两个按键移动光标选择“电源管理”选项, 按下 “SET”或“ANGLE”按键进入电源设置。
3. 使用 “ZERO” 和 “HOLD” 按键选择“从不” 或“30 分钟”选项。
4. 按下“SET”或 “ANGLE”确认当前选择，是永不关机或者半小时自动关机。

恢复出厂设置

当您使用的角度尺感觉有异常时，可以使用恢复出厂设置对角度尺进行重置。
所有校准设置将全部恢复到出厂时的状态.

正常状态时候不建议恢复出厂设置。 如果是精度漂移,请对角度尺进行* ***校正.* *在恢复出厂设置后， 请重新校正以保证精度正常。.*

恢复出厂设置方法:

1. 长按 “SET”或 “ANGLE” 按键进入菜单模式。
2. 使用”ZERO”和”HOLD”两个按键移动光标选择“工厂设置” 选项，按下 “ANGLE”按键进入恢复出厂设置。
3. 使用 “ZERO” 和 “HOLD” 按键选择“是” 或“否” 。
4. 按下“SET”或 “ANGLE”确认当前选择。

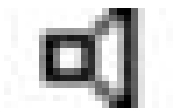
语言设置

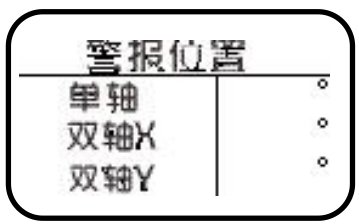
1. 长按 “SET”或 “ANGLE” 按键进入菜单模式。
2. 使用”ZERO”和”HOLD”两个按键移动光标选择“中文” 选项
3. 按下“SET”或 “ANGLE”确认当前选择。

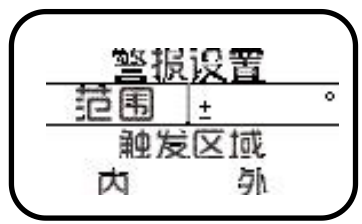
角度报警功能

报警模式:

LCD 图标:







报警角度设置方法:

1. 按住 “SET”/”ANGLE” 按键不要松手进入菜单模式，然后放手。
2. 使用”ZERO”和”HOLD”两个按键移动光标选择“警报设置” 选项，按下 “ANGLE”按键进入报警角度设置。

按住 “ZERO” 或 “HOLD” 按键不放手，可以快速滚动数字。

3. 按下 “SET” 或 “ANGLE” 确定当前设置角度。

单轴	垂直 /单轴角度报警模式（度）
双轴 X	水平双轴角度报警模式 X 轴角（度）
双轴 Y	水平双轴角度报警模式 Y 轴角（度）
范围	触发报警发声范围（度） 例如：单轴设置为 20.00 范围设置为 01.00 当角度尺处于 （ +19° 至 +21°）或（ -19 °至 -21°），角度尺会报警。
触发区域	内 或 外 用于设置是在范围内报警还是在范围外报警

角度尺精度检验

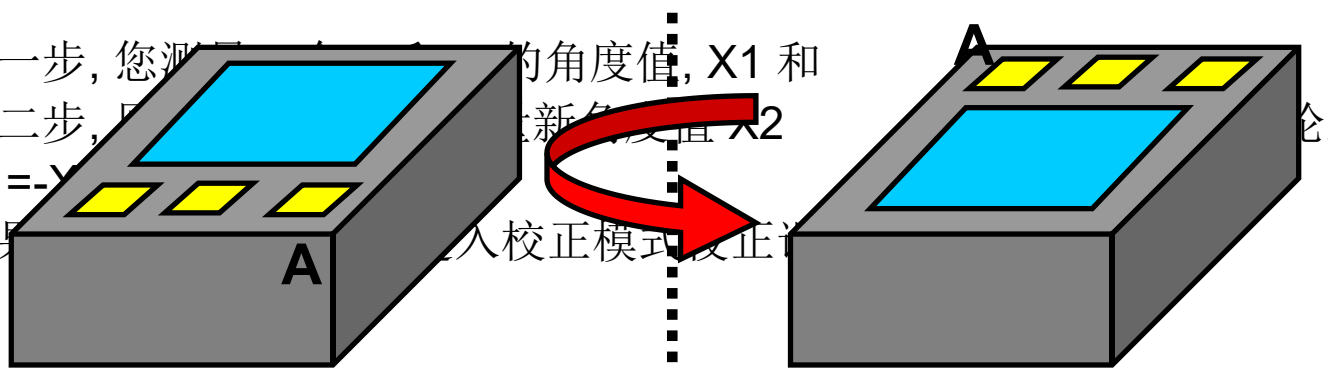
校正角度尺，一旦您发现角度尺的角度有误差时，你可以按如下步骤检验角度尺精度：

第一步, 您测量 [illegible] 的角度值, X1 和

第二步, [illegible] 新角度值 X2 [illegible] 论上应该得到

X1=-X[illegible]

如果 [illegible] 入校正模式校正[illegible]



第一步　　第二步

精度误差可能是由于过大的温度变化造成（5 到 10 摄氏度）或者角度尺被摔过受到大的外力冲击。

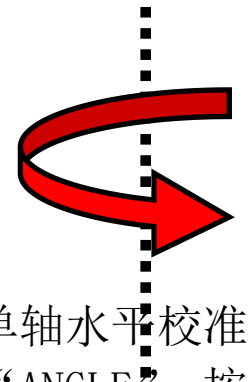
精度校正程序:

步骤 1,2: 长按 “SET”或 “ANGLE” 按键进入菜单模式. 选择“水平校准” 选项, 按 “SET”或 “ANGLE” 按键. 将角度尺放置于一个平整的水平面（只要一个大致水平的平面）

LCD 会显示 “双轴水平校准”, 按 “SET”或 “ANGLE” 按键 此时蜂鸣会响; 等待直到蜂鸣停止发声. 当蜂鸣响的时候请保持水平尺稳定.

步骤 3,4: 然后旋转 180 度放置于相同的位置。再次按 “SET”或 “ANGLE” 按键, 等待直到蜂鸣停止发声。

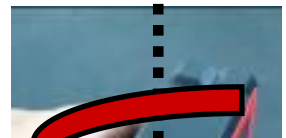
步骤 1,2



步骤 3,4

单轴水平校准”. 步骤三” 。再次按 “SET”或 “ANGLE” 按键, 等待直到蜂鸣停止发声。

步骤 7,8: 以当前状态再次旋转 180 度放置于相同地方. 再次按 “SET”或 “ANGLE” 按键, 等待直到蜂鸣停止发声。



步骤 9, 10：LCD 屏幕显示“单轴水平校准”，开机键朝上垂直放置一个较平的墙面上. 再次按 “SET”或 “ANGLE” 按键，等待直到蜂鸣停止发声。

步骤 11, 12：旋转 180 度依然放置垂直于墙面（此时开机键应依然朝上）. 再次按 “SET”或 “ANGLE” 按键，等待直到蜂鸣停止发声。至此，LCD 屏幕应该回到菜单显示状态。此时表示校准程序完成。然后选择餐单中“返回主页”选项回答正常操作模式。

墙面

步骤 9,10

墙面

步骤 11,12

任意物体间角度测量:

***DXL360S/C 专有**

任意物体间角度测量运用的是陀螺仪技术。

您可以测量两个面之间的角度, 不仅仅在地球重力的方向上。.

1) 在第一个面上按“ANGLE”按键, 慢慢旋转至您需要测量的第二个面上。

2) 当你停止移动时候会显示旋转的角度。

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旋转轴如图:

任意面角度测量：

例如： 测量两个夹角为 88.9°的木墙。

放置在第一面墙,按下 Angle 按键

旋转至测试位置, 保持旋转角度, LCD 显示出角度

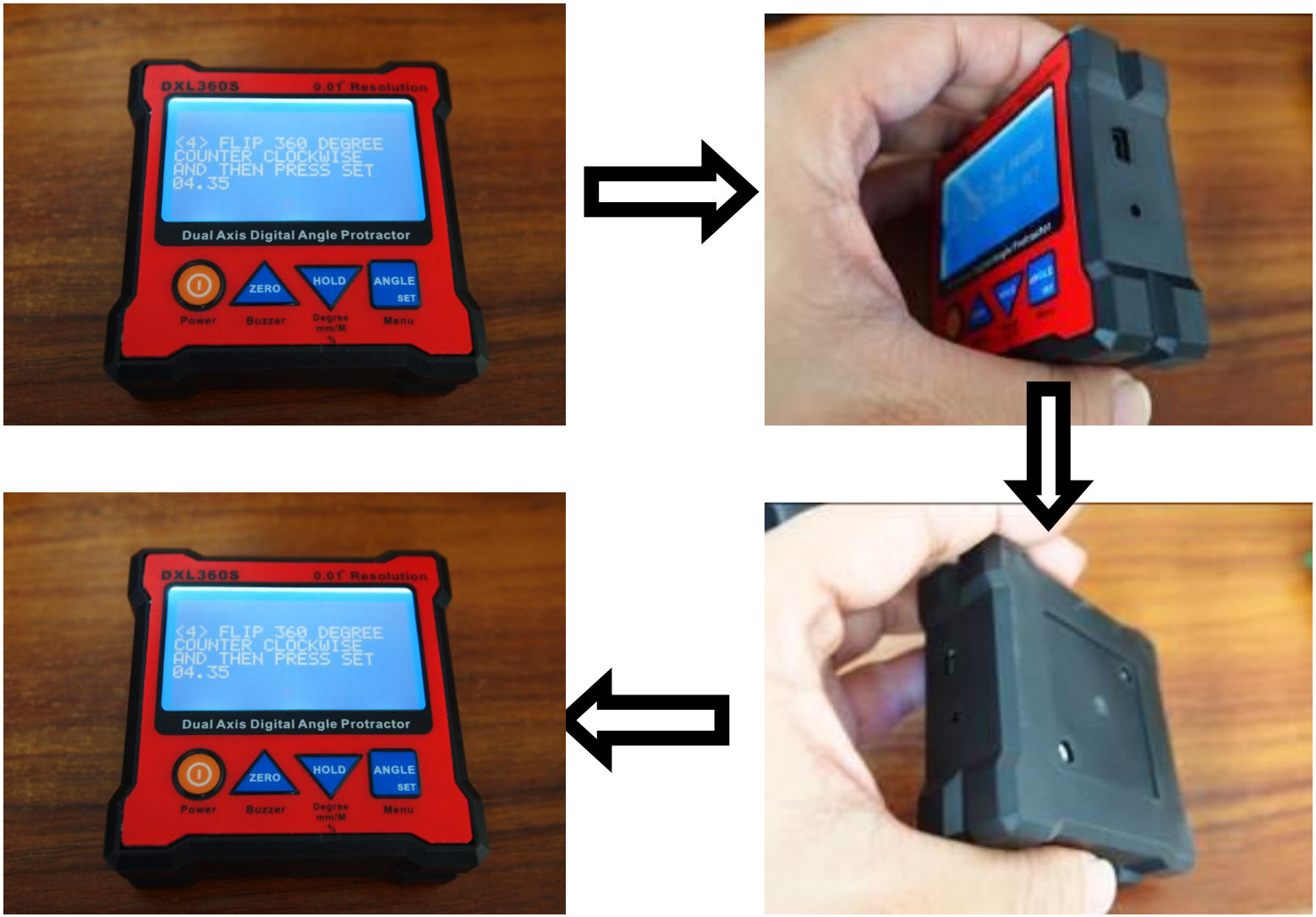
校准陀螺仪 *DXL360S/C

5) 放置于一个较平的平面 然后按 “ANGLE”按键

6） 拿起来慢慢向右旋转 360 度然后按下“ANGLE”按键。请在旋转时候保持慢速以保证精度。

7) 放置于一个较平的平面 然后按 “ANGLE”按键

8) 拿起来慢慢向左旋转 360 度然后按下“ANGLE”按键。请在旋转时候保持慢速以保证精度。



连接至电脑

角度尺具有电脑数据连接功能
DXL360C 您可以通过 Mini USB 接口使用 USB 数据线直接连接至电脑进行数据传输。

DXL360/S 您不可以直接通过 Mini USB 接口使用 USB 数据线直接连接至电脑进行数据传输
您需要购买电脑转接器 SVRS232
您可以持续将 X 和 Y 角度数据发送至 电脑。.
采样速度大约为 2 Hz.

说明：

1. RS232 接口的波特率为 9600
2. USB 连接线 (包含 RS232 转 USB 模块)
3. 输出格式为 ASCII: 例如 X 为 0, Y 为-88.88 传输电脑的格式为”X+0000Y-8888”

详情可登陆我们网站或联系我们销售人员。