HDT
Motors & Digital Drives
TomCat EVO Servosystems
伺服驅動器及馬達系統
Simple Versatile Compact

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20_b: Master 及 Slave 的 PID 參數調整紀錄

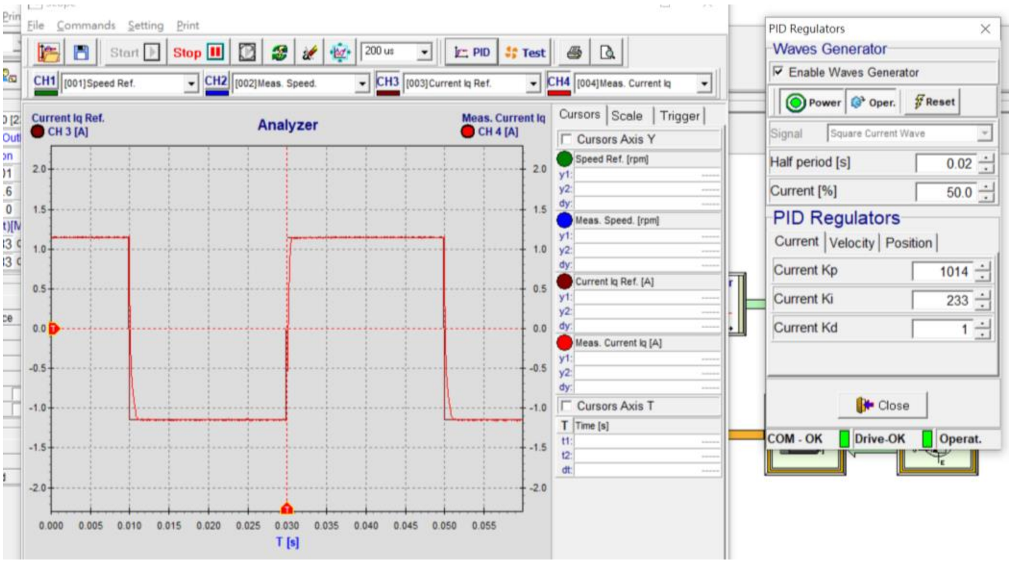
Date: May 21st, 2020

1. TOMCAT 240+400W 馬達展示櫃，無負載．電流環，速度環及位置環測試調件及參數分別如下：
   5/21 第 2 次量測

	上次量測 5/19		這次量測					
測試條件/參數	**Master**	Slave**(未調整)**	M	M	M	M	**M**	
電流環								
Half Period[s]	**0.02**		0.02					
Current[%]	**50**		50					
Kp	**613**	613	1014	1014	1014	1014	**1014**	
Ki	**222**	222	233	233	233	233	**23**	
Kd	**1**	1	1	1	1	1	**1**	
速度環								
Half Period[s]	**0.5**							
Velocity[RPM]	**300**							
Kp	**878**	878	1500	1500	1700	1700	**1700**	
Ki	**18**	18	30	40	50	50	**50**	
Kd	**1**	1	1	1	1	1	**1**	
位置環								
Kp	**1**	1	400	400	400	500	**600**	
Pos. Errors[counts]	**900**	1800 同動時設定值						
Time Errors[ms]	**50**	50						
跑位置，量測跑 180 度位置誤差 counts			**170**	**150**	**130**	**118**	**108**	
PS:	馬達感覺電流聲較大	馬達感覺電流聲較小						

Master 之相關波型及圖形如下所示

第 2 次(本次)


File Commands Setting Print
Start
Stop
200 us
PID
Test
Current Iq Ref.
CH 3 [A]
Analyzer
Meas. Current Iq
CH 4 [A]
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
0.040
0.045
0.050
0.055
T [s]
Cursors
Scale
Trigger
Close
COM - OK
Drive-OK
Operat.
Power
Oper.
Reset

CH1 [001]Speed Ref.
CH2 [002]Meas. Speed
CH3 [003]Current Iq Ref.
CH4 [004]Meas. Current Iq

☐ Cursors Axis Y
Speed Ref. [rpm]
Meas. Speed. [rpm]
Current Iq Ref. [A]
Meas. Current Iq [A]
☐ Cursors Axis T
Time [s]

PID Regulators

Waves Generator

☑ Enable Waves Generator

Signal: Square Current Wave

Half period [s]: 0.02

Current [%]: 50.0

PID Regulators

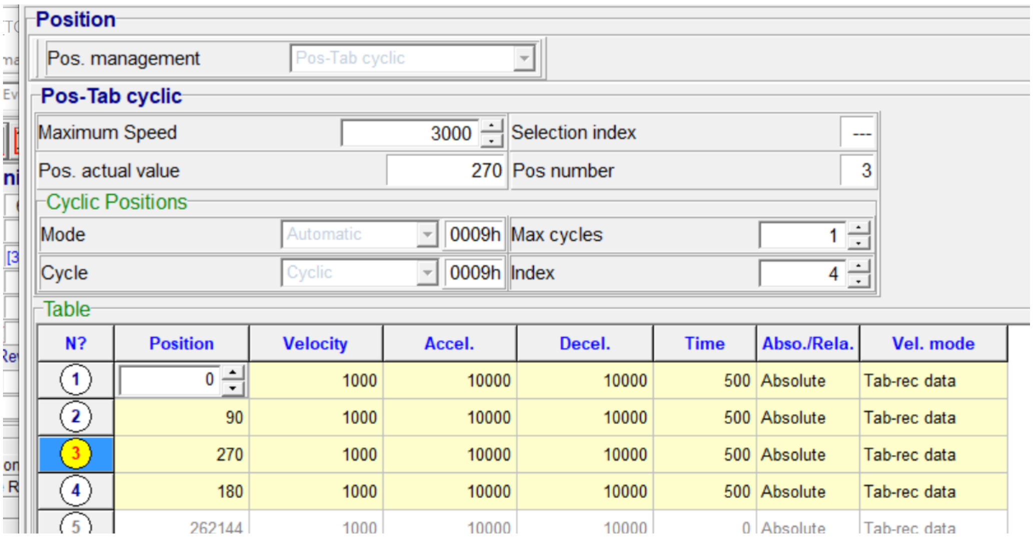
Current | Velocity | Position

Current Kp: 1014

Current Ki: 233

Current Kd: 1

跑位置，量測位置誤差



Position

Pos. management: Pos-Tab cyclic

Pos-Tab cyclic

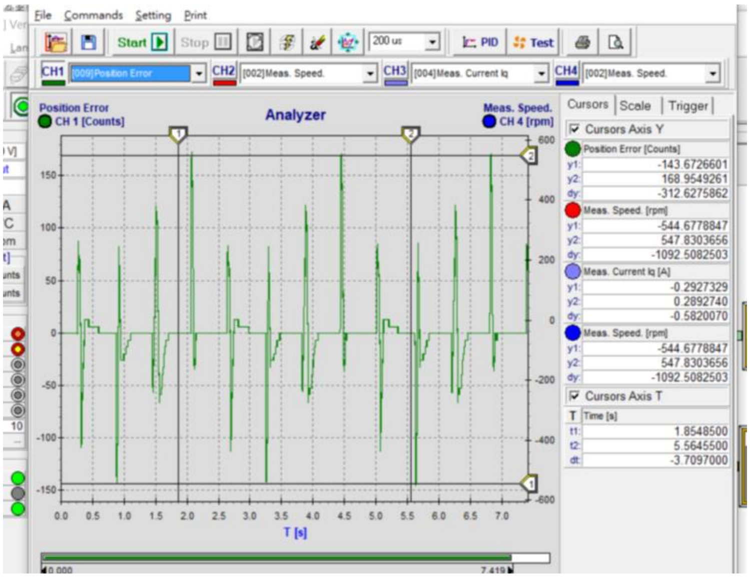
Maximum Speed	3000	Selection index	---
Pos. actual value	270	Pos number	3

Cyclic Positions

Mode	Automatic	0009h	Max cycles	1
Cycle	Cyclic	0009h	Index	4

Table

N?	Position	Velocity	Accel.	Decel.	Time	Abso./Rela.	Vel. mode
1	0	1000	10000	10000	500	Absolute	Tab-rec data
2	90	1000	10000	10000	500	Absolute	Tab-rec data
3	270	1000	10000	10000	500	Absolute	Tab-rec data
4	180	1000	10000	10000	500	Absolute	Tab-rec data
5	262144	1000	10000	10000	0	Absolute	Tab-rec data


File Commands Setting Print
Start
Stop
200 us
PID
Test
Position Error
CH 1 [Counts]
Analyzer
Meas. Speed.
CH 4 [rpm]
150
100
50
0
-50
-100
-150
600
400
200
0
-200
-400
-600
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
T [s]
0.000
7.419
Cursors
Scale
Trigger

CH1 [009]Position Error
CH2 [002]Meas. Speed
CH3 [004]Meas. Current Iq
CH4 [002]Meas. Speed

☑ Cursors Axis Y

Position Error [Counts]
y1: -143.6726601
y2: 168.9549261
dy: -312.6275862

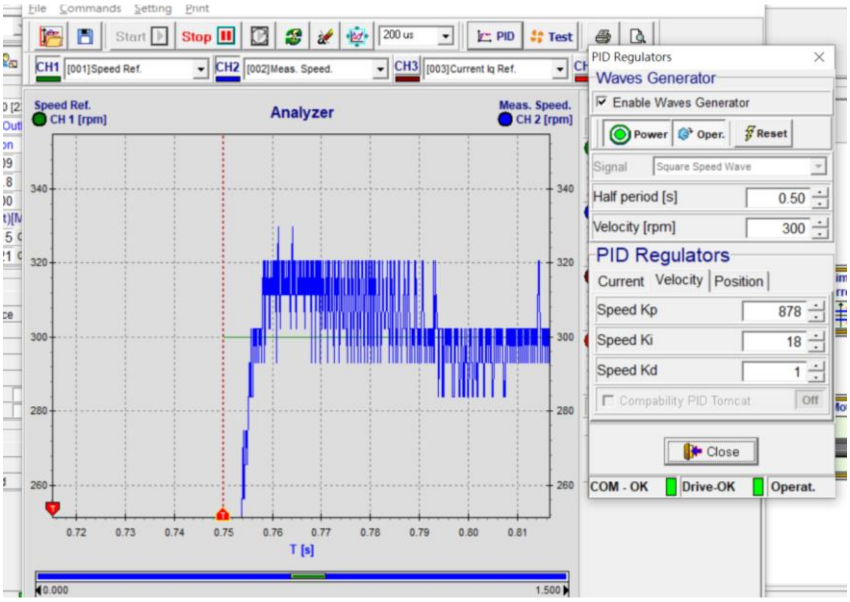
Meas. Speed. [rpm]
y1: -544.6778847
y2: 547.8303656
dy: -1092.5082503

Meas. Current Iq [A]
y1: -0.2927329
y2: 0.2892740
dy: -0.5820070

Meas. Speed. [rpm]
y1: -544.6778847
y2: 547.8303656
dy: -1092.5082503

☑ Cursors Axis T

T Time [s]
t1: 1.8548500
t2: 5.5645500
dt: -3.7097000


File Commands Setting Print
Start Stop
PID Test
Analyzer
Speed Ref.
CH 1 [rpm]
Meas. Speed.
CH 2 [rpm]
340
320
300
280
260
0.72
0.73
0.74
0.75
0.76
0.77
0.78
0.79
0.80
0.81
T [s]
0.000
1.500
Power
Oper.
Reset
Close

200 us

CH1 [001]Speed Ref.

CH2 [002]Meas. Speed.

CH3 [003]Current Iq Ref.

PID Regulators

Waves Generator

☑ Enable Waves Generator

Signal: Square Speed Wave

Half period [s]: 0.50

Velocity [rpm]: 300

PID Regulators

Current | Velocity | Position

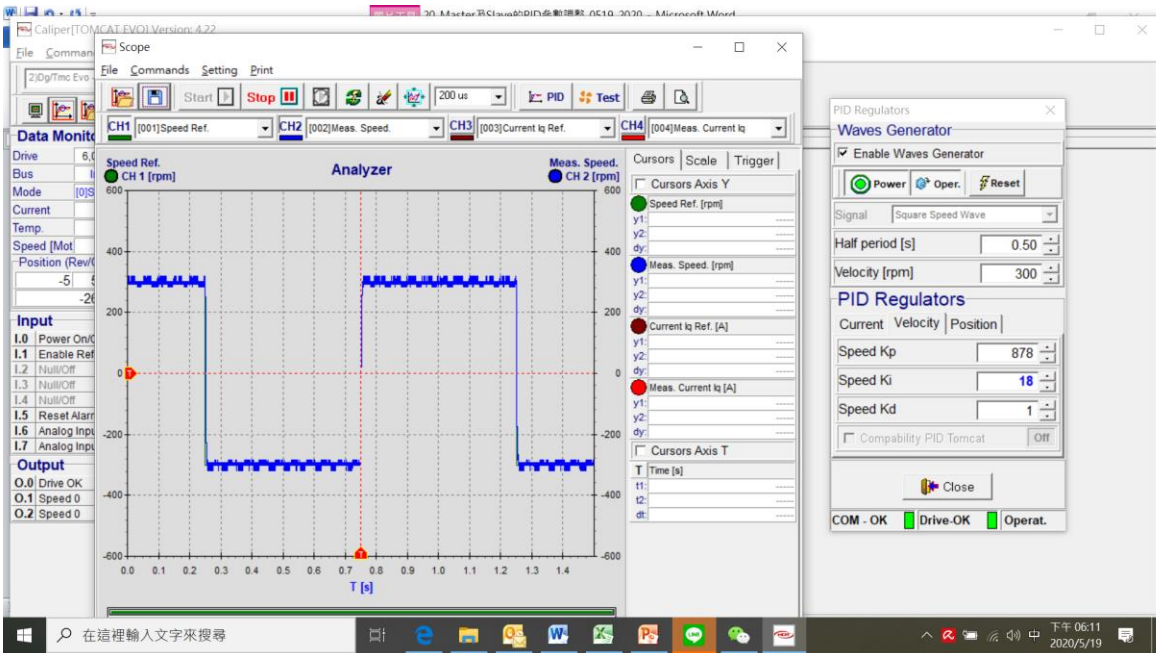
Speed Kp: 878

Speed Ki: 18

Speed Kd: 1

☐ Compability PID Tomcat: Off

COM - OK | Drive-OK | Operat.


Caliper[TOMCAT EVO] Version: 4.22
20_Master及Slave的PID參數調整_0519_2020 - Microsoft Word
Scope
File Commands Setting Print
Start Stop
PID Test
Data Monitor
Drive
Bus
Mode
Current
Temp.
Speed [Mot
Position (Rev/
Input
I.0 Power On/
I.1 Enable Ref
I.2 Null/Off
I.3 Null/Off
I.4 Null/Off
I.5 Reset Alarm
I.6 Analog Inpu
I.7 Analog Inpu
Output
O.0 Drive OK
O.1 Speed 0
O.2 Speed 0
Analyzer
Speed Ref.
CH 1 [rpm]
Meas. Speed.
CH 2 [rpm]
600
400
200
0
-200
-400
-600
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.4
T [s]
Cursors Scale Trigger
Cursors Axis Y
Speed Ref. [rpm]
Meas. Speed. [rpm]
Current Iq Ref. [A]
Meas. Current Iq [A]
Cursors Axis T
Time [s]
Power
Oper.
Reset
Close
在這裡輸入文字來搜尋
下午 06:11
2020/5/19

200 us

CH1 [001]Speed Ref.

CH2 [002]Meas. Speed.

CH3 [003]Current Iq Ref.

CH4 [004]Meas. Current Iq

PID Regulators

Waves Generator

☑ Enable Waves Generator

Signal: Square Speed Wave

Half period [s]: 0.50

Velocity [rpm]: 300

PID Regulators

Current | Velocity | Position

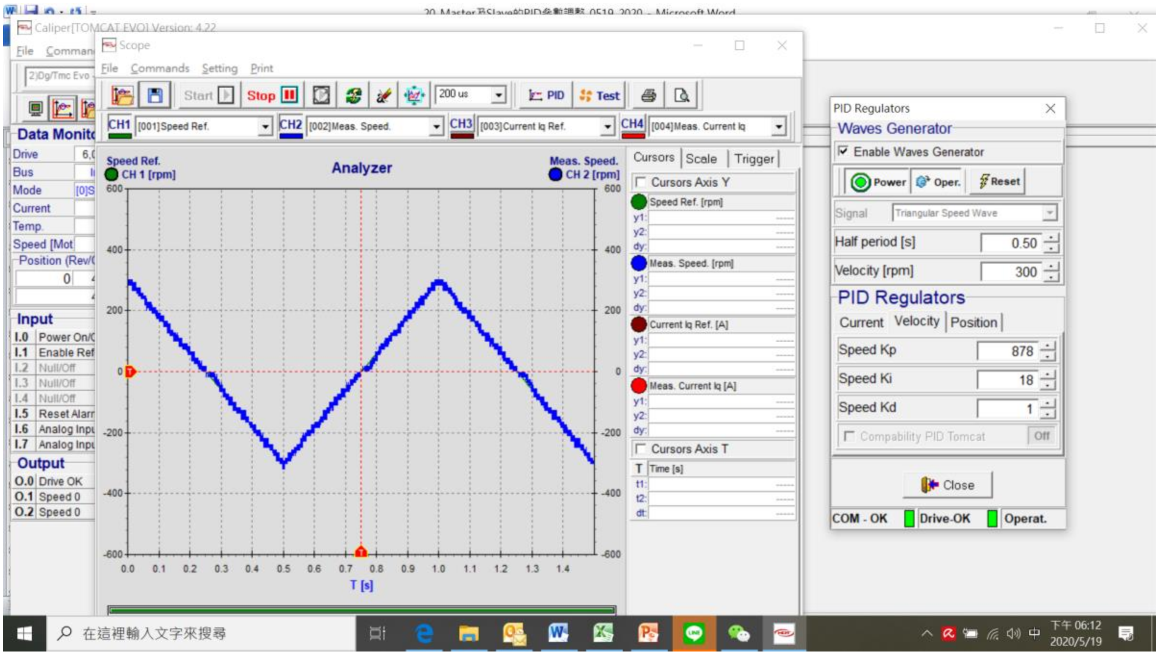
Speed Kp: 878

Speed Ki: 18

Speed Kd: 1

☐ Compability PID Tomcat: Off

COM - OK | Drive-OK | Operat.


Caliper[TOMCAT EVO] Version: 4.22
Scope
File Commands Setting Print
Start Stop PID Test
Analyzer
Speed Ref.
CH 1 [rpm]
Meas. Speed.
CH 2 [rpm]
600
400
200
0
-200
-400
-600
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4
T [s]
Cursors Scale Trigger
Data Monitor
Input
Output
在這裡輸入文字來搜尋
下午 06:12
2020/5/19

200 us

CH1 [001]Speed Ref.
CH2 [002]Meas. Speed.
CH3 [003]Current Iq Ref.
CH4 [004]Meas. Current Iq

PID Regulators

Waves Generator

☑ Enable Waves Generator

Signal: Triangular Speed Wave

Half period [s]: 0.50

Velocity [rpm]: 300

PID Regulators: Current | Velocity | Position

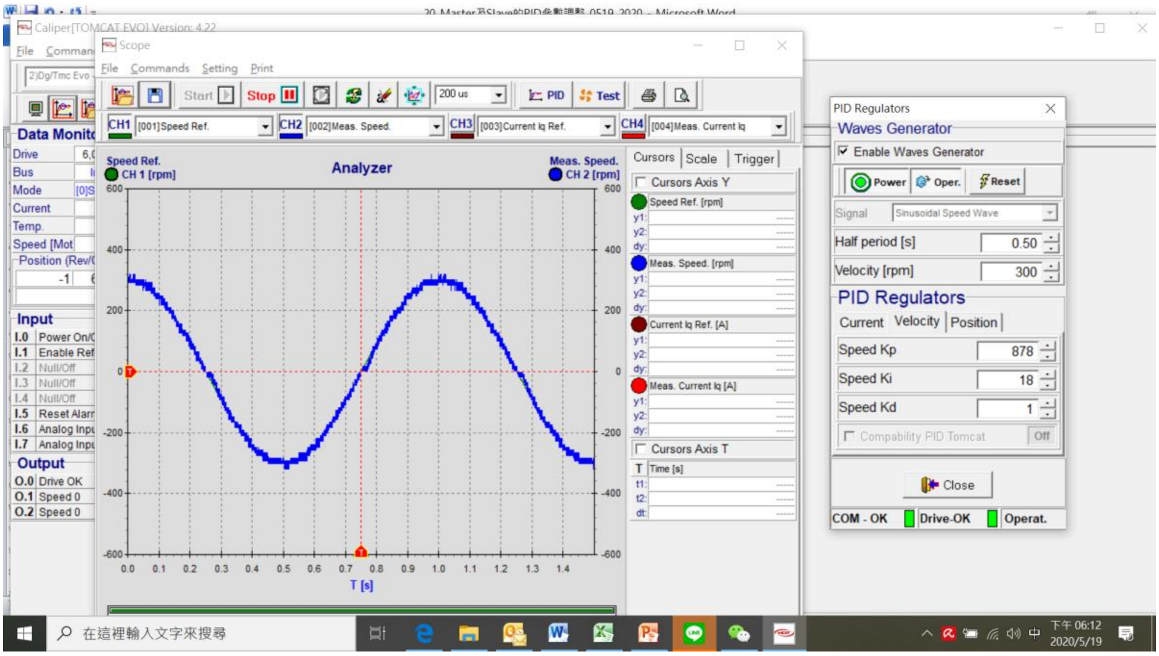
Speed Kp: 878

Speed Ki: 18

Speed Kd: 1

☐ Compability PID Tomcat: Off

COM - OK | Drive-OK | Operat.


Caliper[TOMCAT EVO] Version: 4.22
Scope
File Commands Setting Print
Start Stop PID Test
Analyzer
Speed Ref.
CH 1 [rpm]
Meas. Speed.
CH 2 [rpm]
600
400
200
0
-200
-400
-600
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4
T [s]
Cursors Scale Trigger
Data Monitor
Input
Output
在這裡輸入文字來搜尋
下午 06:12
2020/5/19

200 us

CH1 [001]Speed Ref.
CH2 [002]Meas. Speed.
CH3 [003]Current Iq Ref.
CH4 [004]Meas. Current Iq

PID Regulators

Waves Generator

☑ Enable Waves Generator

Signal: Sinusoidal Speed Wave

Half period [s]: 0.50

Velocity [rpm]: 300

PID Regulators: Current | Velocity | Position

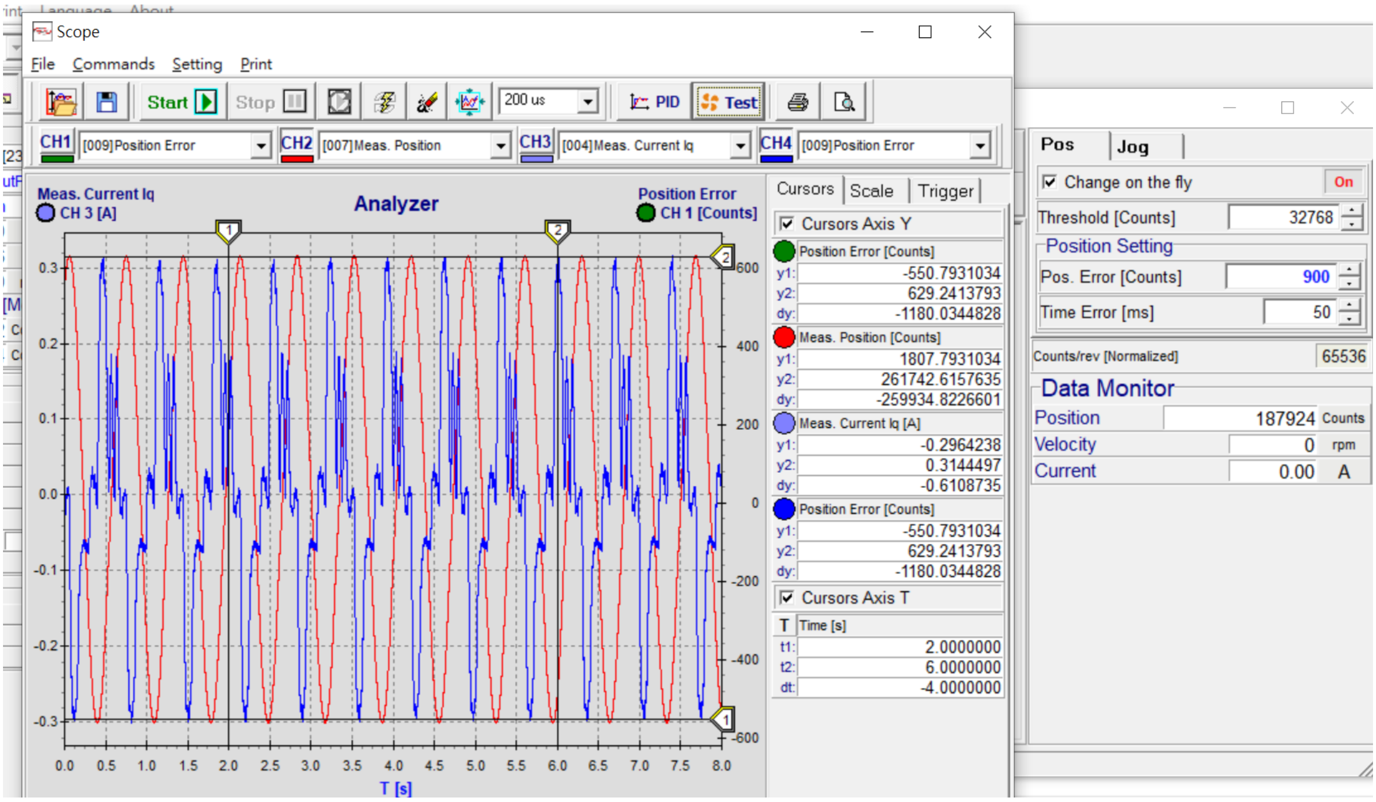
Speed Kp: 878

Speed Ki: 18

Speed Kd: 1

☐ Compability PID Tomcat: Off

COM - OK | Drive-OK | Operat.


Scope
File Commands Setting Print
Start
Stop
PID
Test
Analyzer
Meas. Current Iq
CH 3 [A]
Position Error
CH 1 [Counts]
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
600
400
200
0
-200
-400
-600
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0
T [s]
Cursors
Scale
Trigger
Pos
Jog

200 us

CH1 [009]Position Error

CH2 [007]Meas. Position

CH3 [004]Meas. Current Iq

CH4 [009]Position Error

☑ Cursors Axis Y

Position Error [Counts]
y1: -550.7931034
y2: 629.2413793
dy: -1180.0344828

Meas. Position [Counts]
y1: 1807.7931034
y2: 261742.6157635
dy: -259934.8226601

Meas. Current Iq [A]
y1: -0.2964238
y2: 0.3144497
dy: -0.6108735

Position Error [Counts]
y1: -550.7931034
y2: 629.2413793
dy: -1180.0344828

☑ Cursors Axis T

T Time [s]
t1: 2.0000000
t2: 6.0000000
dt: -4.0000000

☑ Change on the fly On

Threshold [Counts] 32768

Position Setting

Pos. Error [Counts] 900

Time Error [ms] 50

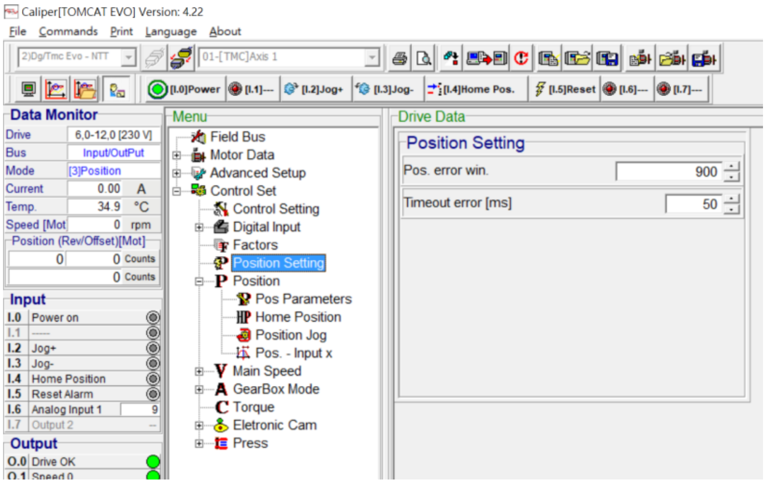
Counts/rev [Normalized] 65536

Data Monitor

Position 187924 Counts

Velocity 0 rpm

Current 0.00 A


Caliper[TOMCAT EVO] Version: 4.22
File Commands Print Language About
[I.0]Power
[I.1]---
[I.2]Jog+
[I.3]Jog-
[I.4]Home Pos.
[I.5]Reset
[I.6]---
[I.7]---
Menu
Field Bus
Motor Data
Advanced Setup
Control Set
Control Setting
Digital Input
Factors
Position Setting
Position
Pos Parameters
Home Position
Position Jog
Pos. - Input x
Main Speed
GearBox Mode
Torque
Eletronic Cam
Press
Drive Data

2)Dg/Tmc Evo - NTT

01-[TMC]Axis 1

Data Monitor

Drive 6,0-12,0 [230 V]

Bus Input/OutPut

Mode [3]Position

Current 0.00 A

Temp. 34.9 °C

Speed [Mot 0 rpm

Position (Rev/Offset)[Mot]

0 0 Counts

0 Counts

Input

I.0 Power on

I.1 -----

I.2 Jog+

I.3 Jog-

I.4 Home Position

I.5 Reset Alarm

I.6 Analog Input 1 9

I.7 Output 2 --

Output

O.0 Drive OK

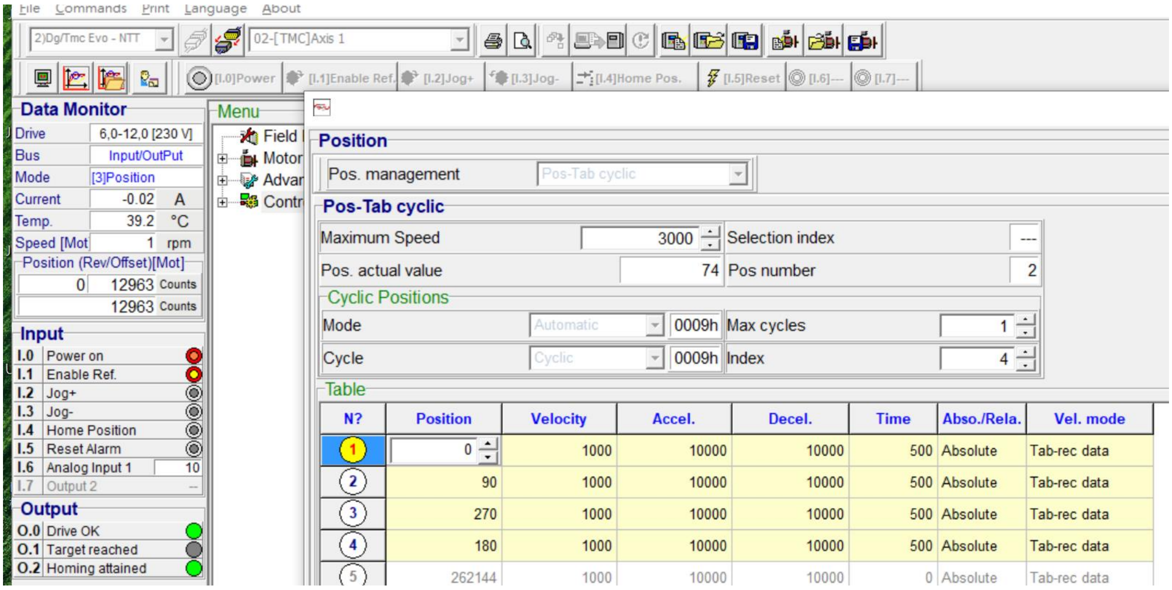
O.1 Speed 0

Position Setting

Pos. error win. 900

Timeout error [ms] 50

PS: 若將 Master 的 ivt 直接 copy 到 Slave, 則會發生 position error 大於 900 counts 的狀況, 將 Slave 的 positon 設為 1600counts, 則下列 Master 的 position table OK. 梯型加減速.


File Commands Print Language About
2)Dg/Tmc Evo - NTT
02-[TMC]Axis 1
[I.0]Power
[I.1]Enable Ref.
[I.2]Jog+
[I.3]Jog-
[I.4]Home Pos.
[I.5]Reset
[I.6]---
[I.7]---
Menu
Field
Motor
Advar
Contr

Data Monitor

Drive 6,0-12,0 [230 V]
Bus Input/OutPut
Mode [3]Position
Current -0.02 A
Temp. 39.2 °C
Speed [Mot] 1 rpm
Position (Rev/Offset)[Mot] 0 12963 Counts
12963 Counts

Input

I.0 Power on ●
I.1 Enable Ref. ●
I.2 Jog+ ○
I.3 Jog- ○
I.4 Home Position ○
I.5 Reset Alarm ○
I.6 Analog Input 1 10
I.7 Output 2

Output

O.0 Drive OK ●
O.1 Target reached ●
O.2 Homing attained ●

Position

Pos. management Pos-Tab cyclic

Pos-Tab cyclic

Maximum Speed 3000
Selection index ---
Pos. actual value 74
Pos number 2

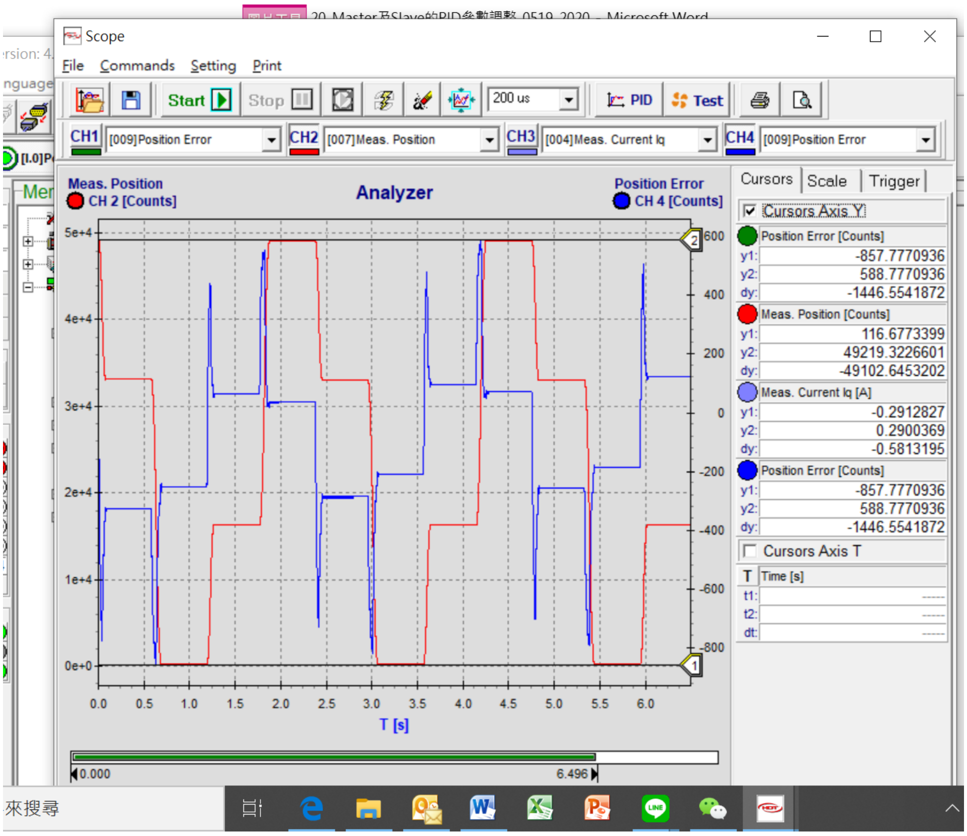
Cyclic Positions

Mode Automatic 0009h
Max cycles 1
Cycle Cyclic 0009h
Index 4

Table

N?	Position	Velocity	Accel.	Decel.	Time	Abso./Rela.	Vel. mode
1	0	1000	10000	10000	500	Absolute	Tab-rec data
2	90	1000	10000	10000	500	Absolute	Tab-rec data
3	270	1000	10000	10000	500	Absolute	Tab-rec data
4	180	1000	10000	10000	500	Absolute	Tab-rec data
5	262144	1000	10000	10000	0	Absolute	Tab-rec data

2. 若只量測 Slave 的 position error, 看出來比同動時小.


20_Master及Slave的PID參數調整_0519_2020 - Microsoft Word
Scope
File Commands Setting Print
Start
Stop
200 us
PID
Test
CH1 [009]Position Error
CH2 [007]Meas. Position
CH3 [004]Meas. Current Iq
CH4 [009]Position Error
Meas. Position
CH 2 [Counts]
Analyzer
Position Error
CH 4 [Counts]
5e+4
4e+4
3e+4
2e+4
1e+4
0e+0
600
400
200
0
-200
-400
-600
-800
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
T [s]
0.000
6.496
Cursors
Scale
Trigger
來搜尋

☑ Cursors Axis Y

Position Error [Counts]
y1: -857.7770936
y2: 588.7770936
dy: -1446.5541872

Meas. Position [Counts]
y1: 116.6773399
y2: 49219.3226601
dy: -49102.6453202

Meas. Current Iq [A]
y1: -0.2912827
y2: 0.2900369
dy: -0.5813195

Position Error [Counts]
y1: -857.7770936
y2: 588.7770936
dy: -1446.5541872

☐ Cursors Axis T

T Time [s]
t1: -----
t2: -----
dt: -----

以下空白

謝謝您的選用

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聯絡人: 范揚昇
手機: 0937583280