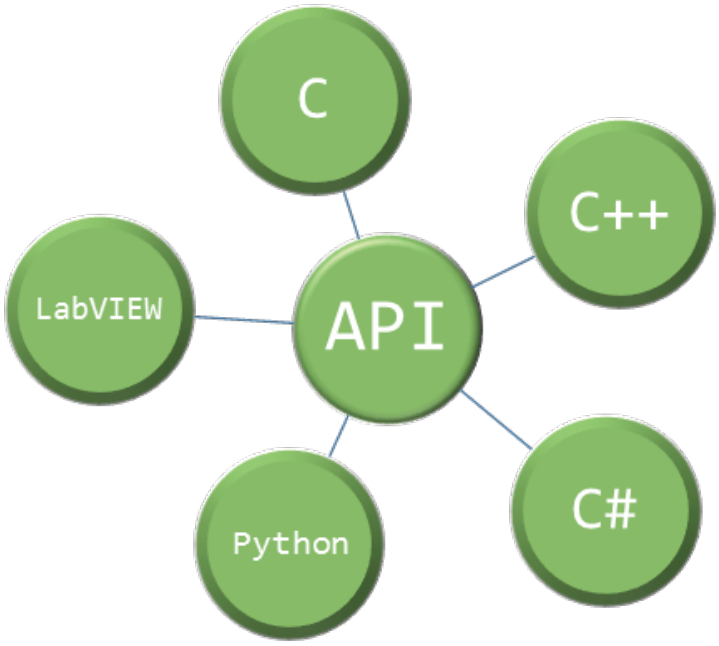
HIWIN® MIKROSYSTEM



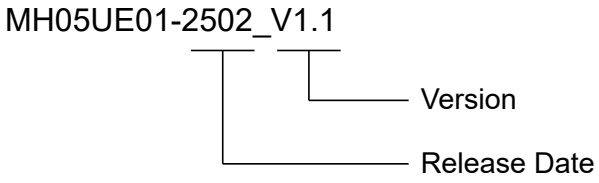
HIMC

API Reference Guide

www.hiwinmikro.tw
MH05UE01-2502_V1.1

Revision History

The version of the guide is also indicated on the bottom of the front cover.



Release Date	Version	Applicable Software Version	Revision Contents
Feb. 28th, 2025	1.1	iA Studio 3.1.0	(1) Add function: ■ Chapter 2 HIMC_IsSystemPreOp HIMC_GetFirmwareDate HIMC_GetFirmwareHash HIMC_GetModelNumber HIMC_GetApiVer ■ Chapter 3 HIMC_GetPosFbComp HIMC_GetBufferMode HIMC_GetCmdNum ■ Chapter 6 HIMC_SetGrpLookAheadPrm HIMC_SetGrpQueueSize ■ Chapter 10 HIMC_SetPT_PosArray HIMC_SetPT_StateArray HIMC_SetPT_StartIndex HIMC_SetPT_EndIndex ■ Chapter 18 HIMC_SetHomedStatus (2) Modify function and data structure: ■ Chapter 2 HIMC_IsSystemOper ■ Chapter 3 HIMC_GetCurrFb - the current feedback HIMC_SetOpMode ■ Chapter 8

Release Date	Version	Applicable Software Version	Revision Contents
			HIMC_SetSlvAORaw HIMC_GetSlvAORaw HIMC_GetSlvAIRaw ■ Chapter 16 HIMC_ReadSDO HIMC_WriteSDO HIMC_ReadPDO HIMC_WritePDO HIMC_FroceWritePDO - parameter type ■ Chapter 20 MotionBufferMode MotionTransitionMode - add parameter (3) Modify/Add function description: ■ Chapter 3 Add CoE variables in Axis variables. ■ Chapter 6 Modify the description of buffer modes and transition modes. Add the look ahead function. ■ Chapter 10 Add the description and procedure of Random PT variables. ■ Chapter 18 Modify the description of homing methods. ■ Chapter 19 Add data structure Data_t. (4) Add error message: Section 17.1.1, Section 17.1.2, Section 17.1.3, Section 21.1
Mar. 15th, 2023	1.0	iA Studio 3.0.0	(1) HIMC supports CoE communication: Add Read/Write SDO and PDO functions. Remove related functions of Get/Set Slave Var and Run PDL. (2) Add chapter/section: ■ Chapter 18 – Homing functions (3) Add function: ■ Chapter 2

Release Date	Version	Applicable Software Version	Revision Contents
			HIMC_IsSystemInit HIMC_GetECATSt HIMC_GetSlvECATSt HIMC_ScanNetwork ■ Chapter 3 HIMC_SetOpMode HIMC_SetBufferMode ■ Chapter 8 HIMC_SetSlvAOHex HIMC_GetSlvAOHex HIMC_GetSlvAIHex ■ Chapter 11 HIMC_SetTouchProbeFunc ■ Chapter 16 HIMC_GetDriveErr (4) Remove related function of Random PT in chapter 10.
Jun. 30th, 2022	0.5	iA Studio 2.0	(1) Add chapter/section: ■ Chapter 8 – AIO Functions (2) Add API: ■ Chapter 2 HIMC_SetEconMode HIMC_IsEconMode ■ Chapter 3 HIMC_MoveTrq HIMC_MovePVT HIMC_IsAcc ■ Chapter 6 HIMC_ArcAngle2D HIMC_SetGrpAngMotionProfile HIMC_GetGrpCoordTrans HIMC_SetGrpCoordTrans HIMC_GetGrpPoseCmd HIMC_GetGrpPoseFb HIMC_CircleRel ■ Chapter 7 HIMC_SetGPIInvert HIMC_SetGPOInvert HIMC_BindEMO HIMC_GetAllGPIInvertSt

Release Date	Version	Applicable Software Version	Revision Contents
			HIMC_GetAllGPOInvertSt ■ Chapter 10 HIMC_SetPT_PosArray HIMC_SetPT_StateArray HIMC_SetPT_StartIndex HIMC_SetPT_EndIndex ■ Chapter 12 HIMC_SetCompAlgType ■ Chapter 14 HIMC_LoadHMPLTask ■ Chapter 15 HIMC_SetHmplMsgEvtCallback (3) Add variable: Section 3.1.1 Section 6.1.1 (4) Add error message: Section 17.1.1, Section 17.1.2, Section 17.1.3
Sep. 15th, 2021	0.4	iA Studio 1.4	(1) Add chapter/section: Section 7.1.1 –GPIO variables (2) Add API: ■ Chapter 2 HIMC_GetFirmwareVer ■ Chapter 3 HIMC_GetVelFb HIMC_GetVelErr HIMC_GetCurrFb HIMC_SetVelScale HIMC_GetVelScale HIMC_SetRollover HIMC_GetRolloverTurns HIMC_IsDriveErr HIMC_IsPosErr ■ Chapter 6 HIMC_JogGroup HIMC_JogGroupAxis HIMC_SetGrpVelScale HIMC_GetGrpVelScale ■ Chapter 11 HIMC_SetupComp3D (3) Add variable:

Release Date	Version	Applicable Software Version	Revision Contents
			Section 3.1.1, Section 6.1.1, Section 15.1.2 (4) Add error message: Section 16.1.1, Section 16.1.2, Section 16.1.3, Section 19.1
Jun. 30th, 2020	0.3	iA Studio 1.3	(1) Add the corresponding function name for C#, LabVIEW and Python. (2) Add appendix: ■ Section 19.1: API error codes (3) Modify API: ■ Section 6.2 HIMC_GroupReset → HIMC_ResetGroup ■ Chapter 17 PosTriggerPar: Remove parameter “polarity” (4) Add API: ■ Section 3.2 HIMC_Halt HIMC_Resume ■ Section 3.3 HIMC_SetAccTime HIMC_SetDecTime HIMC_GetKillDec HIMC_SetKillDec HIMC_IgnorePE ■ Chapter 4 HIMC_GetGearRatio HIMC_IsInGear HIMC_IsGearMaster HIMC_IsGearSlave ■ Chapter 5 HIMC_GetGantryPairID HIMC_IsGantryPair ■ Section 6.2 HIMC_HaltGroup HIMC_ResumeGroup HIMC_ArcCW2D HIMC_ArcCCW2D ■ Section 6.3

Release Date	Version	Applicable Software Version	Revision Contents
			HIMC_GetGrpKin HIMC_GetGrpMaxVel HIMC_SetGrpVel HIMC_GetGrpMaxAcc HIMC_SetGrpAcc HIMC_SetGrpAccTime HIMC_GetGrpMaxDec HIMC_SetGrpDec HIMC_SetGrpDecTime HIMC_GetGrpSMTime HIMC_SetGrpSMTime HIMC_GetGrpCoordSys HIMC_SetGrpCoordSys HIMC_GetGrpBufferMode HIMC_SetGrpBufferMode HIMC_GetGrpTransMode HIMC_SetGrpTransMode HIMC_SetGrpTransPrm HIMC_GetGrpCmdNum ■ Section 6.4 HIMC_IsGrpErrorStop ■ Chapter 11 HIMC_GetCompPos ■ Section 15.3 HIMC_RunSlvPdlFunc HIMC_StopSlvPdlFunc HIMC_IsSlvPdlFuncRunning
Apr. 2nd, 2019	0.2	iA Studio 1.1.3772.0	(1) Modify chapter's arrangement. (2) Add Chapter "Synchronized Motion Functions" and "Filter Functions". (3) Rename API: ■ Section 3.2 HIMC_GetSwPositiveLimitPos → HIMC_GetSWRL HIMC_SetSwPositiveLimitPos → HIMC_SetSWRL HIMC_GetSwNegativeLimitPos → HIMC_GetSWLL HIMC_SetSwNegativeLimitPos → HIMC_SetSWLL

Release Date	Version	Applicable Software Version	Revision Contents
			■ Chapter 13 HIMC_StartHMPLTask → HIMC_StartTask HIMC_StopHMPLTask → HIMC_StopTask (4) Modify API variables: ■ Section 6.1.4 HIMC_LinAbs HIMC_LinRel HIMC_CircAbs ■ Chapter 9 HIMC_SetPosTriggerConfig (5) Add API: ■ Chapter 2 HIMC_ConnectToSimulator HIMC_ConnectToEthernet HIMC_IsSystemOper HIMC_IsSystemPreOp HIMC_IsSystemError HIMC_StopAll HIMC_RescanMoE ■ Section 3.2 HIMC_GetPosOffset HIMC_GetPosOut HIMC_GetVelOut HIMC_GetAccOut HIMC_IgnoreHWL HIMC_IgnoreSWL HIMC_GetAxisNum ■ Section 6.2 HIMC_RemoveAxisFromGrp HIMC_SetGrpKin HIMC_GroupReset ■ Chapter 7 HIMC_ToggleHimcGpo HIMC_ToggleSlaveGpo ■ Chapter 8 HIMC_SetTableValue HIMC_GetTableValue ■ Chapter 11

Release Date	Version	Applicable Software Version	Revision Contents
			HIMC_SetupComp2D ■ Chapter 13 HIMC_StartTaskFunc HIMC_StopAllTask HIMC_IsTaskStop ■ Chapter 15 HIMC_GetSlvVar HIMC_SetSlvVar HIMC_GetSlvSt HIMC_SetSlvSt ■ Chapter 16 HIMC_GetAxisLastErr HIMC_ClearAxisLastErr HIMC_GetGrpLastErr HIMC_ClearGrpLastErr (6) Add Enumeration ■ Chapter 18 ShaperMode
Apr. 17th, 2018	0.1	iA Studio 1.0.2461.0	First edition.

Related Documents

Through related documents, users can quickly understand the positioning of this manual and the correlation between manuals and products. Go to HIWIN MIKROSYSTEM's official website → Download → Manual Overview for details (https://www.hiwinmikro.tw/Downloads/ManualOverview_EN.htm).

Table of Contents

1. Introduction 1-1
   - 1.1 How API works 1-2
   - 1.2 API environment set-up 1-2
     - 1.2.1 C / C++ 1-2
     - 1.2.2 C# 1-2
     - 1.2.3 LabView 1-2
     - 1.2.4 Python 1-2
   - 1.3 Version description 1-3
   - 1.4 Legal disclaimer 1-3

2. HIMC System functions 2-1
   - 2.1 HIMC_ConnectCtrl 2-2
   - 2.2 HIMC_ConnectToSimulator 2-3
   - 2.3 HIMC_ConnectToEthernet 2-4
   - 2.4 HIMC_DisconnectCtrl 2-5
   - 2.5 HIMC_RebootController 2-6
   - 2.6 HIMC_IsSystemInit 2-7
   - 2.7 HIMC_IsSystemOper 2-8
   - 2.8 HIMC_IsSystemPreOp 2-9
   - 2.9 HIMC_IsSystemError 2-10
   - 2.10 HIMC_GetECATSt 2-11
   - 2.11 HIMC_GetSlvECATSt 2-12
   - 2.12 HIMC_DisableAll 2-13
   - 2.13 HIMC_StopAll 2-14
   - 2.14 HIMC_EStop 2-15
   - 2.15 HIMC_GetSlaveNum 2-16
   - 2.16 HIMC_GetFirmwareVer 2-17
   - 2.17 HIMC_GetFirmwareDate 2-18
   - 2.18 HIMC_GetFirmwareHash 2-19
   - 2.19 HIMC_GetModelNumber 2-20
   - 2.20 HIMC_GetApiVer 2-21
   - 2.21 HIMC_ScanNetwork 2-22
   - 2.22 HIMC_SetEconMode 2-23
   - 2.23 HIMC_IsEconMode 2-24

3. Axis functions 3-1
   - 3.1 Overview 3-4
     - 3.1.1 Axis variables 3-7

3.2 Axis motion control 3-11
3.2.1 HIMC_Enable 3-11
3.2.2 HIMC_Disable 3-12
3.2.3 HIMC_Reset 3-13
3.2.4 HIMC_MoveAbs 3-14
3.2.5 HIMC_MoveRel 3-15
3.2.6 HIMC_MoveVel 3-16
3.2.7 HIMC_MoveTrq 3-17
3.2.8 HIMC_Stop 3-18
3.2.9 HIMC_Halt 3-19
3.2.10 HIMC_Resume 3-20
3.3 Axis setting 3-21
3.3.1 HIMC_GetMaxVel 3-21
3.3.2 HIMC_SetVel 3-22
3.3.3 HIMC_GetMaxAcc 3-23
3.3.4 HIMC_SetAcc 3-24
3.3.5 HIMC_SetAccTime 3-25
3.3.6 HIMC_GetMaxDec 3-26
3.3.7 HIMC_SetDec 3-27
3.3.8 HIMC_SetDecTime 3-28
3.3.9 HIMC_GetKillDec 3-29
3.3.10 HIMC_SetKillDec 3-30
3.3.11 HIMC_GetSWRL 3-31
3.3.12 HIMC_SetSWRL 3-32
3.3.13 HIMC_GetSWLL 3-33
3.3.14 HIMC_SetSWLL 3-34
3.3.15 HIMC_GetSMTime 3-35
3.3.16 HIMC_SetSMTime 3-36
3.3.17 HIMC_GetMoveTime 3-37
3.3.18 HIMC_GetSettlingTime 3-38
3.3.19 HIMC_SetPos 3-39
3.3.20 HIMC_GetPosFb 3-40
3.3.21 HIMC_GetPosFbComp 3-41
3.3.22 HIMC_GetPosOffset 3-42
3.3.23 HIMC_GetPosErr 3-43
3.3.24 HIMC_GetVelFb 3-44
3.3.25 HIMC_GetVelErr 3-45
3.3.26 HIMC_GetCurrFb 3-46
3.3.27 HIMC_GetRefPos 3-47
3.3.28 HIMC_GetRefVel 3-48
3.3.29 HIMC_GetRefAcc 3-49

3.3.30 HIMC_GetPosOut 3-50
3.3.31 HIMC_GetVelOut 3-51
3.3.32 HIMC_GetAccOut 3-52
3.3.33 HIMC_IgnoreHWL 3-53
3.3.34 HIMC_IgnoreSWL 3-54
3.3.35 HIMC_IgnorePE 3-55
3.3.36 HIMC_GetAxisNum 3-56
3.3.37 HIMC_SetVelScale 3-57
3.3.38 HIMC_GetVelScale 3-58
3.3.39 HIMC_SetRollover 3-59
3.3.40 HIMC_GetRolloverTurns 3-60
3.3.41 HIMC_SetOpMode 3-61
3.3.42 HIMC_SetBufferMode 3-62
3.3.43 HIMC_GetBufferMode 3-63
3.3.44 HIMC_GetCmdNum 3-64
3.3.45 HIMC_GetMultiAxesFeedbackPos 3-65
3.4 Axis status 3-66
3.4.1 HIMC_IsEnabled 3-66
3.4.2 HIMC_IsMoving 3-67
3.4.3 HIMC_IsInPos 3-68
3.4.4 HIMC_IsErrorStop 3-69
3.4.5 HIMC_IsGantry 3-70
3.4.6 HIMC_IsGrouped 3-71
3.4.7 HIMC_IsSync 3-72
3.4.8 HIMC_IsHWLL 3-73
3.4.9 HIMC_IsHWRL 3-74
3.4.10 HIMC_IsSWLL 3-75
3.4.11 HIMC_IsSWRL 3-76
3.4.12 HIMC_IsDriveErr 3-77
3.4.13 HIMC_IsPosErr 3-78
3.4.14 HIMC_IsCompActive 3-79
3.4.15 HIMC_IsAcc 3-80

4. Synchronized Motion functions 4-1
4.1 Overview 4-2
4.1.1 Synchronized motion variables 4-3
4.2 HIMC_EnableGear 4-4
4.3 HIMC_DisableGear 4-5
4.4 HIMC_GearIn 4-6
4.5 HIMC_GearOut 4-7
4.6 HIMC_GetGearRatio 4-8

4.7 HIMC_IsInGear ... 4-9
4.8 HIMC_IsGearMaster ... 4-10
4.9 HIMC_IsGearSlave ... 4-11

5. Gantry functions ... 5-1
5.1 Overview ... 5-2
5.2 HIMC_EnableGantryPair ... 5-3
5.3 HIMC_DisableGantryPair ... 5-4
5.4 HIMC_GetGantryPairID ... 5-5
5.5 HIMC_IsGantryPair ... 5-6

6. Group functions ... 6-1
6.1 Overview ... 6-3
6.1.1 Group variables ... 6-6
6.1.2 Coordinate systems ... 6-9
6.1.3 Kinematics ... 6-13
6.1.4 Buffer modes ... 6-13
6.1.5 Transition modes ... 6-16
6.2 Group motion control ... 6-18
6.2.1 HIMC_EnableGroup ... 6-18
6.2.2 HIMC_DisableGroup ... 6-19
6.2.3 HIMC_ResetGroup ... 6-20
6.2.4 HIMC_StopGroup ... 6-21
6.2.5 HIMC_HaltGroup ... 6-22
6.2.6 HIMC_ResumeGroup ... 6-23
6.2.7 HIMC_JogGroup ... 6-24
6.2.8 HIMC_JogGroupAxis ... 6-25
6.2.9 HIMC_LineAbs2D ... 6-26
6.2.10 HIMC_LineAbs3D ... 6-27
6.2.11 HIMC_LineRel2D ... 6-28
6.2.12 HIMC_LineRel3D ... 6-29
6.2.13 HIMC_Arc2D ... 6-30
6.2.14 HIMC_ArcCW2D ... 6-32
6.2.15 HIMC_ArcCCW2D ... 6-33
6.2.16 HIMC_ArcAngle2D ... 6-34
6.2.17 HIMC_Circle2D ... 6-36
6.3 Group setting ... 6-38
6.3.1 HIMC_AddAxesToGrp ... 6-38
6.3.2 HIMC_RemoveAxisFromGrp ... 6-39
6.3.3 HIMC_SetupGroup ... 6-40
6.3.4 HIMC_UngrpAllAxes ... 6-41

6.3.5 HIMC_GetGroupID 6-42
6.3.6 HIMC_SetGrpMotionProfile 6-43
6.3.7 HIMC_SetGrpAngMotionProfile 6-45
6.3.8 HIMC_GetGrpKin 6-47
6.3.9 HIMC_SetGrpKin 6-48
6.3.10 HIMC_GetGrpMaxVel 6-49
6.3.11 HIMC_SetGrpVel 6-50
6.3.12 HIMC_GetGrpMaxAcc 6-51
6.3.13 HIMC_SetGrpAcc 6-52
6.3.14 HIMC_SetGrpAccTime 6-53
6.3.15 HIMC_GetGrpMaxDec 6-54
6.3.16 HIMC_SetGrpDec 6-55
6.3.17 HIMC_SetGrpDecTime 6-56
6.3.18 HIMC_GetGrpSMTime 6-57
6.3.19 HIMC_SetGrpSMTime 6-58
6.3.20 HIMC_GetGrpCoordSys 6-59
6.3.21 HIMC_SetGrpCoordSys 6-60
6.3.22 HIMC_GetGrpBufferMode 6-61
6.3.23 HIMC_SetGrpBufferMode 6-62
6.3.24 HIMC_GetGrpTransMode 6-63
6.3.25 HIMC_SetGrpTransMode 6-64
6.3.26 HIMC_SetGrpTransPrm 6-65
6.3.27 HIMC_GetGrpCmdNum 6-67
6.3.28 HIMC_SetGrpVelScale 6-68
6.3.29 HIMC_GetGrpVelScale 6-69
6.3.30 HIMC_GetGrpCoordTrans 6-70
6.3.31 HIMC_SetGrpCoordTrans 6-71
6.3.32 HIMC_GetGrpPoseCmd 6-72
6.3.33 HIMC_GetGrpPoseFb 6-73
6.3.34 HIMC_SetGrpLookAheadPrm 6-74
6.3.35 HIMC_SetGrpQueueSize 6-75
6.4 Group status 6-76
6.4.1 HIMC_IsGrpEnabled 6-76
6.4.2 HIMC_IsGrpMoving 6-77
6.4.3 HIMC_IsGrpInPos 6-78
6.4.4 HIMC_IsGrpErrorStop 6-79
6.5 Advanced group motion control 6-80
6.5.1 HIMC_LineAbs 6-80
6.5.2 HIMC_LineRel 6-82
6.5.3 HIMC_CircleAbs 6-84
6.5.4 HIMC_CircleRel 6-86

7. GPIO functions 7-1
7.1 Overview 7-2
7.1.1 GPIO variables 7-2
7.2 Controller IO setting 7-3
7.2.1 HIMC_SetGPO 7-3
7.2.2 HIMC_ToggleGPO 7-4
7.2.3 HIMC_SetAllGPO 7-5
7.2.4 HIMC_SetGPIInvert 7-6
7.2.5 HIMC_SetGPOInvert 7-7
7.2.6 HIMC_BindEMO 7-8
7.3 Slave IO setting 7-9
7.3.1 HIMC_SetSlvGPO 7-9
7.3.2 HIMC_ToggleSlvGPO 7-10
7.3.3 HIMC_SetSlvAllGPO 7-11
7.4 Controller IO status 7-12
7.4.1 HIMC_GetGPI 7-12
7.4.2 HIMC_GetGPO 7-13
7.4.3 HIMC_GetAllGPI 7-14
7.4.4 HIMC_GetAllGPO 7-15
7.5 Slave IO status 7-16
7.5.1 HIMC_GetSlvGPI 7-16
7.5.2 HIMC_GetSlvGPO 7-18
7.5.3 HIMC_GetSlvAllGPI 7-19
7.5.4 HIMC_GetSlvAllGPO 7-20

8. AIO functions 8-1
8.1 Overview 8-2
8.2 Slave AIO setting 8-3
8.2.1 HIMC_SetSlvAIType 8-3
8.2.2 HIMC_SetSlvAOType 8-4
8.2.3 HIMC_SetSlvAORaw 8-5
8.2.4 HIMC_SetSlvAO 8-6
8.3 Slave AIO status 8-7
8.3.1 HIMC_GetSlvAIType 8-7
8.3.2 HIMC_GetSlvAOType 8-8
8.3.3 HIMC_GetSlvAIRaw 8-9
8.3.4 HIMC_GetSlvAI 8-10
8.3.5 HIMC_GetSlvAORaw 8-11
8.3.6 HIMC_GetSlvAO 8-12
8.4 Slave AO bound to HIMC internal buffer variable 8-13
8.4.1 HIMC_SetSlvAOMonitor 8-13

8.4.2 HIMC_SetSlvAOParam 8-15
8.4.3 HIMC_GetSlvAOScale 8-17
8.4.4 HIMC_GetSlvAOOffset 8-18
8.4.5 HIMC_IsSlvAOBound 8-19

9. User Table functions 9-1
9.1 Overview 9-2
9.2 HIMC_SetUserTable 9-3
9.3 HIMC_GetUserTable 9-4
9.4 HIMC_SetTableValue 9-5
9.5 HIMC_GetTableValue 9-6
9.6 HIMC_SaveUserTable 9-7
9.7 HIMC_LoadUserTable 9-8

10. Position Trigger functions 10-1
10.1 Overview 10-2
10.1.1 PT variables 10-2
10.1.2 Flow of using PT function 10-4
10.2 HIMC_EnablePT 10-6
10.3 HIMC_DisablePT 10-7
10.4 HIMC_IsPTEnabled 10-8
10.5 HIMC_SetPosTriggerConfig 10-9
10.6 HIMC_SetPT_PosArray 10-10
10.7 HIMC_SetPT_StateArray 10-11
10.8 HIMC_SetPT_StartIndex 10-12
10.9 HIMC_SetPT_EndIndex 10-13

11. Touch Probe functions 11-1
11.1 Overview 11-2
11.2 HIMC_EnableTouchProbe 11-3
11.3 HIMC_DisableTouchProbe 11-4
11.4 HIMC_IsTouchProbeEnabled 11-5
11.5 HIMC_IsTouchProbeTriggered 11-6
11.6 HIMC_GetTouchProbePos 11-7
11.7 HIMC_SetTouchProbeFunc 11-8

12. Dynamic Error Compensation functions 12-1
12.1 Overview 12-2
12.2 HIMC_EnableComp 12-4
12.3 HIMC_DisableComp 12-5
12.4 HIMC_SetupComp 12-6

12.5 HIMC_SetupComp2D 12-8
12.6 HIMC_SetupComp3D 12-10
12.7 HIMC_GetCompPos 12-12
12.8 HIMC_SetCompAlgType 12-13

13. Filter functions 13-1
13.1 Overview 13-2
13.2 HIMC_EnableAxisVsf 13-3
13.3 HIMC_DisableAxisVsf 13-4
13.4 HIMC_SetAxisVsf 13-5
13.5 HIMC_EnableAxisInShape 13-7
13.6 HIMC_DisableAxisInShape 13-8
13.7 HIMC_SetAxisInShape 13-9
13.8 HIMC_EnableGrpInShape 13-11
13.9 HIMC_DisableGrpInShape 13-12
13.10 HIMC_SetGrpInShape 13-13

14. HMPL Task functions 14-1
14.1 Overview 14-2
14.2 HIMC_StartTask 14-3
14.3 HIMC_StartTaskFunc 14-4
14.4 HIMC_StopTask 14-5
14.5 HIMC_StopAllTask 14-6
14.6 HIMC_IsTaskStop 14-7
14.7 HIMC_LoadHMPLTask 14-8

15. Callback functions 15-1
15.1 HIMC_SetHmplEvtCallback 15-2
15.2 HIMC_SetErrorCallback 15-3
15.3 HIMC_SetHmplMsgEvtCallback 15-4

16. Variable and Function Operation functions 16-1
16.1 Overview 16-2
16.1.1 Controller variables list 16-3
16.2 Servo drive variable operation 16-7
16.2.1 HIMC_ReadSDO 16-7
16.2.2 HIMC_WriteSDO 16-9
16.2.3 HIMC_ReadPDO 16-10
16.2.4 HIMC_WritePDO 16-11
16.2.5 HIMC_ForceWritePDO 16-12
16.2.6 HIMC_ReleasePDO 16-13

16.3 Controller variable operation 16-14
16.3.1 HIMC_GetVariableByID 16-14
16.3.2 HIMC_SetVariableByID 16-15
16.3.3 HIMC_GetVariableListByID 16-16
16.3.4 HIMC_SetVariableListByID 16-17
16.3.5 HIMC_GetGlobalVariables 16-18
16.3.6 HIMC_SetGlobalVariables 16-19

17. HIMC Error functions 17-1
17.1 Overview 17-2
17.1.1 System error messages 17-3
17.1.2 Axis error massages 17-6
17.1.3 Group error messages 17-9
17.2 HIMC_GetLastError 17-11
17.3 HIMC_GetAxisLastErr 17-12
17.4 HIMC_ClearAxisLastErr 17-13
17.5 HIMC_GetGrpLastErr 17-14
17.6 HIMC_ClearGrpLastErr 17-15
17.7 HIMC_GetDriveErr 17-16
17.8 HIMC_GetErrorInformation 17-17

18. Homing functions 18-1
18.1 Overview 18-2
18.2 HIMC_MoveHome 18-7
18.3 HIMC_SetHomeMethod 18-8
18.4 HIMC_SetHomeSwitchVel 18-9
18.5 HIMC_SetHomeZeroVel 18-10
18.6 HIMC_SetHomeAcc 18-11
18.7 HIMC_SetHomeOffset 18-12
18.8 HIMC_SetHomeTimeout 18-13
18.9 HIMC_IsHomed 18-14
18.10 HIMC_IsHoming 18-15
18.11 HIMC_SetHomedStatus 18-16

19. Data structures 19-1
19.1 ComInfo 19-2
19.2 CoordPosition 19-3
19.3 MotionProfile 19-4
19.4 CenterPosition 19-5
19.5 NormalVector 19-6
19.6 TransPrm 19-7

19.7 PosTriggerPar 19-8
19.8 Data_t 19-9

20. Enumerations 20-1
20.1 ComType 20-2
20.2 CoordSystem 20-3
20.3 MotionBufferMode 20-5
20.4 MotionTransitionMode 20-6
20.5 ShaperMode 20-7

21. Appendix 21-1
21.1 API error codes 21-2

1. Introduction

1. Introduction 1-1
1.1 How API works 1-2
1.2 API environment set-up 1-2
1.2.1 C / C++ 1-2
1.2.2 C# 1-2
1.2.3 LabView 1-2
1.2.4 Python 1-2
1.3 Version description 1-3
1.4 Legal disclaimer 1-3

1.1 How API works

The functions introduced in this reference guide are mainly used in C language. For the corresponding name of other API environment, please refer to the description in each section.

Note:

The unit of motion variables adopted by iA Studio 1.3 (included) and above:

linear motion (mm), rotary motion (deg), time (ms)

The unit of motion variables adopted by iA Studio 1.2 (included) and below:

linear motion (m), rotary motion (rad), time (s)

1.2 API environment set-up

1.2.1 C / C++

1. Go to <installation directory>\examples\API\cpp\vs_project.
2. Execute `copy_required_file.bat`.
3. Open project file `api_example.sln`.

1.2.2 C#

1. Go to <installation directory>\examples\API\c_sharp.
2. Execute `copy_required_file.bat`.
3. Open project file `api_example.sln`.

1.2.3 LabView

1. Go to <installation directory>\examples\API\labview.
2. Execute `copy_required_file.bat`.
3. Open project file `example.lvproj`.

1.2.4 Python

1. Go to <installation directory>\examples\API\python.
2. Execute `copy_required_file.bat`.
3. Directly execute example `python example.py`.

1.3 Version description

When HIMC controller is applied with software version iA Studio 3.0 (included) and above, it supports HIMC controller (product model: MC-XX-XX-01-XX) with CoE communication function, but it is not compatible with HIMC controller (product model: MC-XX-XX-00-XX) with MoE communication function. Users must adopt software version iA Studio 2.X (included) and below when using HIMC controller with MoE communication function.

The unit of motion variables adopted by iA Studio 1.3 (included) and above:
linear motion (mm), rotary motion (deg), time (ms)
The unit of motion variables adopted by iA Studio 1.2 (included) and below:
linear motion (m), rotary motion (rad), time (s)

1.4 Legal disclaimer

Users can adopt or modify any of the sample codes provided in this guide for specific uses. However, the correctness, effectiveness and safety cannot be guaranteed in different application scenarios. Users should take full responsibility for the safety and the effectiveness of the software implementations.

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2. HIMC System functions

2. HIMC System functions 2-1
2.1 HIMC_ConnectCtrl 2-2
2.2 HIMC_ConnectToSimulator 2-3
2.3 HIMC_ConnectToEthernet 2-4
2.4 HIMC_DisconnectCtrl 2-5
2.5 HIMC_RebootController 2-6
2.6 HIMC_IsSystemInit 2-7
2.7 HIMC_IsSystemOper 2-8
2.8 HIMC_IsSystemPreOp 2-9
2.9 HIMC_IsSystemError 2-10
2.10 HIMC_GetECATSt 2-11
2.11 HIMC_GetSlvECATSt 2-12
2.12 HIMC_DisableAll 2-13
2.13 HIMC_StopAll 2-14
2.14 HIMC_EStop 2-15
2.15 HIMC_GetSlaveNum 2-16
2.16 HIMC_GetFirmwareVer 2-17
2.17 HIMC_GetFirmwareDate 2-18
2.18 HIMC_GetFirmwareHash 2-19
2.19 HIMC_GetModelNumber 2-20
2.20 HIMC_GetApiVer 2-21
2.21 HIMC_ScanNetwork 2-22
2.22 HIMC_SetEconMode 2-23
2.23 HIMC_IsEconMode 2-24

2.1 HIMC_ConnectCtrl

Purpose

To connect to the controller.

Syntax

```
int HIMC_ConnectCtrl(
    const ComInfo com_info,
    int *p_ctrl_id
);
```

Parameter

com_info [in] A structure to store the information of the connection.

p_ctrl_id [out] A pointer to the buffer to receive successfully connected controller ID.
Users can use this ID on other API functions to operate this controller.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

It is recommended to use HIMC_ConnectToSimulator or HIMC_ConnectToEthernet to connect to HIMC.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ConnectCtrl
LabVIEW	--
Python	--

2.2 HIMC_ConnectToSimulator

Purpose

To connect to the simulator.

Syntax

```
int HIMC_ConnectToSimulator(
    int *p_ctrl_id
);
```

Parameter

p_ctrl_id [out] A pointer to the buffer to receive successfully connected controller ID.
Users can use this ID on other API functions to operate this controller.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_ConnectToSimulator
LabVIEW	HIMC Connect To Simulator.vi
Python	Declare HimcAPI("Simulator")

2.3 HIMC_ConnectToEthernet

Purpose

To connect to Ethernet.

Syntax

```
int HIMC_ConnectToEthernet(
    const char *ip_address,
    const char *port,
    int *p_ctrl_id
);
```

Parameter

ip_address [in]	The string of IP address.
port [in]	The string of port.
p_ctrl_id [out]	A pointer to the buffer to receive successfully connected controller ID. Users can use this ID on other API functions to operate this controller.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ConnectToEthernet
LabVIEW	HIMC Connect To Ethernet.vi
Python	Declare HimcAPI("Ethernet")

2.4 HIMC_DisconnectCtrl

Purpose

To disconnect from the controller.

Syntax

```
int HIMC_DisconnectCtrl(
    int ctrl_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_DisconnectCtrl
LabVIEW	HIMC Disconnect Ctrl.vi
Python	Disconnect when class is deleted

2.5 HIMC_RebootController

Purpose

To reboot the controller.

Syntax

```
int HIMC_RebootController(
    int ctrl_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_RebootController
LabVIEW	HIMC Reboot Controller.vi
Python	RebootController

2.6 HIMC_IsSystemInit

Purpose

To query whether HIMC system is at “initializing” state.

Syntax

```
int HIMC_IsSystemInit(
    int ctrl_id,
    int *p_is_init
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

p_is_init [out] A pointer to the buffer to receive the “initializing” state of HIMC system.
If HIMC system is at “IsSystemInit” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsSystemInit
LabVIEW	HIMC Is System Init.vi
Python	IsSystemInit

2.7 HIMC_IsSystemOper

Purpose

To query whether HIMC system is at “operation” state. If it is, the motion and PDO related functions can be used.

Syntax

```
int HIMC_IsSystemOper(
    int ctrl_id,
    int *p_is_op
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

p_is_op [out] A pointer to the buffer to receive the state of HIMC system.
If HIMC system is at “System Normal Oper” state and EtherCAT is at “Operation” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0.3
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsSystemOper
LabVIEW	HIMC Is System Oper.vi
Python	IsSystemOper

2.8 HIMC_IsSystemPreOp

Purpose

To query whether HIMC system is at “pre-operation” state. If it is, the communication between HIMC and the slaves is established, but the motion and PDO related functions cannot be used.

Syntax

```
int HIMC_IsSystemPreOp(
    int ctrl_id,
    int *p_is_preop
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

p_is_preop [out] A pointer to the buffer to receive the state of HIMC system.
If HIMC system is at “System Normal Oper” state and EtherCAT is at “Pre-Operation” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0.3
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsSystemPreOp
LabVIEW	HIMC Is System Pre Op.vi
Python	IsSystemPreOp

2.9 HIMC_IsSystemError

Purpose

To query whether HIMC system is at “error” state.

Syntax

```
int HIMC_IsSystemError(
    int ctrl_id,
    int *p_is_error
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

p_is_error [out] A pointer to the buffer to receive the “error” state of HIMC system.
If HIMC system is at “SystemError” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsSystemError
LabVIEW	HIMC Is System Error.vi
Python	IsSystemError

2.10 HIMC_GetECATSt

Purpose

To get EtherCAT State Machine of the controller.

Syntax

```
int HIMC_GetECATSt(
    int ctrl_id,
    int *p_state
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

p_state [out] A pointer to the buffer to recieve EtherCAT State Machine of the controller.
1: Init, 2: Pre-Operation, 4: Safe-Operation, 8: Operation

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

The motion queues of the axes and the axis groups will be cleared.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetECATSt
LabVIEW	HIMC Get ECAT St.vi
Python	GetECATSt

2.11 HIMC_GetSlvECATSt

Purpose

To get EtherCAT State Machine of the slave.

Syntax

```
int HIMC_GetSlvECATSt(
    int ctrl_id,
    int slv_id
    int *p_state
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_id [in]	Slave index.
p_state [out]	A pointer to the buffer to recieve EtherCAT State Machine of the slave. 1: Init, 2: Pre-Operation, 4: Safe-Operation, 8: Operation

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

The motion queues of the axes and the axis groups will be cleared.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetSlvECATSt
LabVIEW	HIMC Get Slv ECAT St.vi
Python	GetSlvECATSt

2.12 HIMC_DisableAll

Purpose

To disable all axes and all axis groups.

Syntax

```
int HIMC_DisableAll(
    int ctrl_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

The motion queues of the axes and the axis groups will be cleared.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_DisableAll
LabVIEW	HIMC Disable All.vi
Python	DisableAll

2.13 HIMC_StopAll

Purpose

To stop all axes and all axis groups with kill deceleration and make them stay at “enable” status.

Syntax

```
int HIMC_StopAll(
    int ctrl_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

The motion queues of the axes and the axis groups will be cleared.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_StopAll
LabVIEW	HIMC Stop All.vi
Python	StopAll

2.14 HIMC_EStop

Purpose

To stop all the execution programs in the controller (including all HMPL tasks) and disable all axes and all axis groups.

Syntax

```
int HIMC_EStop(
    int ctrl_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_EStop
LabVIEW	HIMC E Stop.vi
Python	EStop

2.15 HIMC_GetSlaveNum

Purpose

To get the number of the slaves that are connected to the controller.

Syntax

```
int HIMC_GetSlaveNum(
    int ctrl_id,
    int *p_slv_num
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
p_slv_num [out]	A pointer to the buffer to receive the number of the slaves that are connected to the controller.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetSlaveNum
LabVIEW	HIMC Get Slave Num.vi
Python	GetSlaveNum

2.16 HIMC_GetFirmwareVer

Purpose

To get the firmware version of the controller.

Syntax

```
int HIMC_GetFirmwareVer(
    int ctrl_id,
    char *p_ver_buf
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
p_ver_buf [out]	A pointer to the buffer to receive the returned string of the firmware version.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.4
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetFirmwareVer
LabVIEW	HIMC Get Firmware Ver.vi
Python	GetFirmwareVer

2.17 HIMC_GetFirmwareDate

Purpose

To get the firmware file date of the controller.

Syntax

```
int HIMC_GetFirmwareDate(
    int ctrl_id,
    char *p_date_buf
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
p_date_buf [out]	A pointer to the buffer to receive the returned string of the firmware file date.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetFirmwareDate
LabVIEW	HIMC Get Firmware Date.vi
Python	GetFirmwareDate

2.18 HIMC_GetFirmwareHash

Purpose

To get the firmware hash ID of the controller.

Syntax

```
int HIMC_GetFirmwareHash(
    int ctrl_id,
    uint64_t *p_hash
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
p_hash [out]	A pointer to the buffer to receive the returned firmware hash ID.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetFirmwareHash
LabVIEW	HIMC Get Firmware Hash.vi
Python	GetFirmwareHash

2.19 HIMC_GetModelNumber

Purpose

To get the model number of the controller.

Syntax

```
int HIMC_GetModelNumber(
    int ctrl_id,
    char *p_mod_buf
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
p_mod_buf [out]	A pointer to the buffer to receive the returned string of the model number.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetModelNumber
LabVIEW	HIMC Get Model Number.vi
Python	GetModelNumber

2.20 HIMC_GetApiVer

Purpose

To get the software version of API.

Syntax

```
int HIMC_GetApiVer(
    char *p_ver_buf
);
```

Parameter

p_ver_buf [out] A pointer to the buffer to receive the returned string of API's software version.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetApiVer
LabVIEW	HIMC Get Api Ver.vi
Python	GetApiVer

2.21 HIMC_ScanNetwork

Purpose

To rescan the connection between the controller and the slaves.

Syntax

```
int HIMC_ScanNetwork(
    int ctrl_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ScanNetwork
LabVIEW	HIMC Scan Network.vi
Python	ScanNetwork

2.22 HIMC_SetEconMode

Purpose

To set HIMC API performance mode.

Syntax

```
int HIMC_SetEconMode(
    int ctrl_id,
    bool mode
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

mode [in] HIMC API performance mode.
0: High Performance Mode (default)
1: Econ Mode

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

(1) High Performance Mode has faster HIMC API average response velocity, but its CPU usage is higher than that of Econ Mode.
(2) Econ Mode can reduce CPU usage, but it will increase HIMC API average response time.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetEconMode
LabVIEW	HIMC Set Econ Mode.vi
Python	SetEconMode

2.23 HIMC_IsEconMode

Purpose

To query whether HIMC API performance mode is Econ Mode.

Syntax

```
int HIMC_IsEconMode(
    int ctrl_id
    bool *p_is_econ
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

p_is_econ [in] A pointer to the buffer to receive HIMC API performance mode.
If it is Econ Mode, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 2.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsEconMode
LabVIEW	HIMC Is Econ Mode.vi
Python	IsEconMode

3. Axis functions

3. Axis functions 3-1
3.1 Overview 3-4
3.1.1 Axis variables 3-7
3.2 Axis motion control 3-11
3.2.1 HIMC_Enable 3-11
3.2.2 HIMC_Disable 3-12
3.2.3 HIMC_Reset 3-13
3.2.4 HIMC_MoveAbs 3-14
3.2.5 HIMC_MoveRel 3-15
3.2.6 HIMC_MoveVel 3-16
3.2.7 HIMC_MoveTrq 3-17
3.2.8 HIMC_Stop 3-18
3.2.9 HIMC_Halt 3-19
3.2.10 HIMC_Resume 3-20
3.3 Axis setting 3-21
3.3.1 HIMC_GetMaxVel 3-21
3.3.2 HIMC_SetVel 3-22
3.3.3 HIMC_GetMaxAcc 3-23
3.3.4 HIMC_SetAcc 3-24
3.3.5 HIMC_SetAccTime 3-25
3.3.6 HIMC_GetMaxDec 3-26
3.3.7 HIMC_SetDec 3-27
3.3.8 HIMC_SetDecTime 3-28
3.3.9 HIMC_GetKillDec 3-29
3.3.10 HIMC_SetKillDec 3-30
3.3.11 HIMC_GetSWRL 3-31
3.3.12 HIMC_SetSWRL 3-32
3.3.13 HIMC_GetSWLL 3-33
3.3.14 HIMC_SetSWLL 3-34
3.3.15 HIMC_GetSMTime 3-35
3.3.16 HIMC_SetSMTime 3-36
3.3.17 HIMC_GetMoveTime 3-37
3.3.18 HIMC_GetSettlingTime 3-38
3.3.19 HIMC_SetPos 3-39
3.3.20 HIMC_GetPosFb 3-40
3.3.21 HIMC_GetPosFbComp 3-41

3.3.22 HIMC_GetPosOffset 3-42
3.3.23 HIMC_GetPosErr 3-43
3.3.24 HIMC_GetVelFb 3-44
3.3.25 HIMC_GetVelErr 3-45
3.3.26 HIMC_GetCurrFb 3-46
3.3.27 HIMC_GetRefPos 3-47
3.3.28 HIMC_GetRefVel 3-48
3.3.29 HIMC_GetRefAcc 3-49
3.3.30 HIMC_GetPosOut 3-50
3.3.31 HIMC_GetVelOut 3-51
3.3.32 HIMC_GetAccOut 3-52
3.3.33 HIMC_IgnoreHWL 3-53
3.3.34 HIMC_IgnoreSWL 3-54
3.3.35 HIMC_IgnorePE 3-55
3.3.36 HIMC_GetAxisNum 3-56
3.3.37 HIMC_SetVelScale 3-57
3.3.38 HIMC_GetVelScale 3-58
3.3.39 HIMC_SetRollover 3-59
3.3.40 HIMC_GetRolloverTurns 3-60
3.3.41 HIMC_SetOpMode 3-61
3.3.42 HIMC_SetBufferMode 3-62
3.3.43 HIMC_GetBufferMode 3-63
3.3.44 HIMC_GetCmdNum 3-64
3.3.45 HIMC_GetMultiAxesFeedbackPos 3-65
3.4 Axis status 3-66
3.4.1 HIMC_IsEnabled 3-66
3.4.2 HIMC_IsMoving 3-67
3.4.3 HIMC_IsInPos 3-68
3.4.4 HIMC_IsErrorStop 3-69
3.4.5 HIMC_IsGantry 3-70
3.4.6 HIMC_IsGrouped 3-71
3.4.7 HIMC_IsSync 3-72
3.4.8 HIMC_IsHWLL 3-73
3.4.9 HIMC_IsHWRL 3-74
3.4.10 HIMC_IsSWLL 3-75
3.4.11 HIMC_IsSWRL 3-76
3.4.12 HIMC_IsDriveErr 3-77
3.4.13 HIMC_IsPosErr 3-78

3.4.14 HIMC_IsCompActive 3-79
3.4.15 HIMC_IsAcc 3-80

3.1 Overview

HIMC provides single axis motion commands, including point-to-point (P2P), JOG and synchronized motion. Users can use the related motion functions based on application and requirement. Figure 3.1.1 is the flow diagram of HIMC axis motion control. Reference position will be generated after motion command goes through the built-in profile generator (PG), and the position output for servo drive will be generated after the output reference position adds error compensation value.

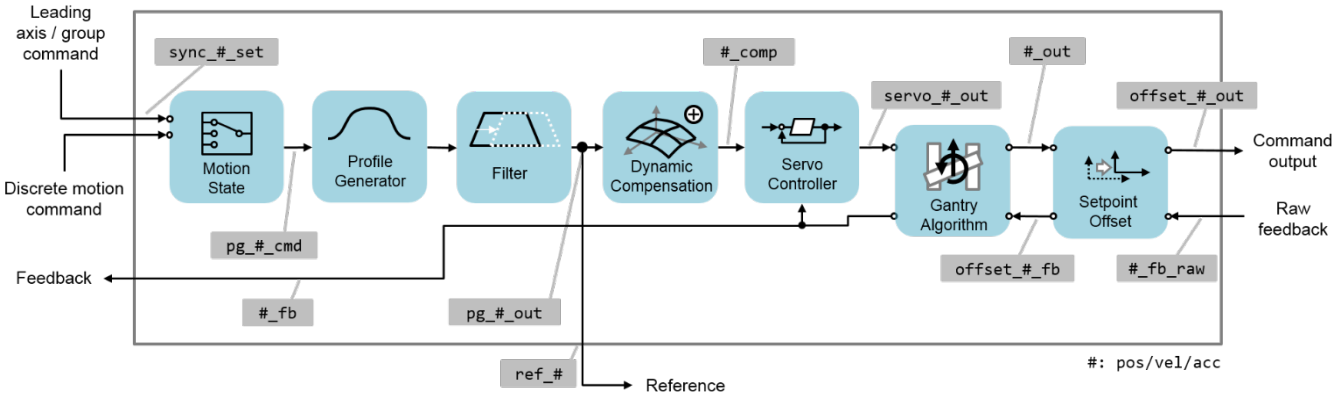

Figure 3.1.1

HIMC's profile generator has built-in S-Curve velocity planning, as Figure 3.1.2 shows. Users can set profile generator's maximum velocity, maximum acceleration, maximum deceleration, and smooth time.

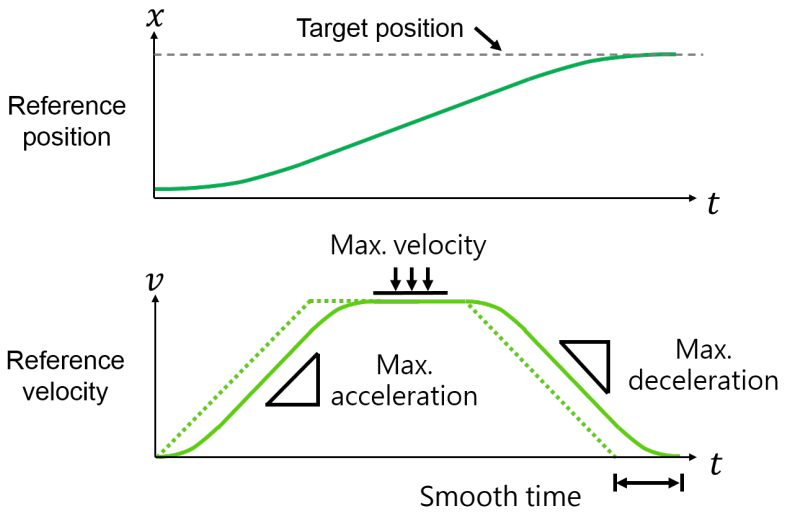

Figure 3.1.2

As Figure 3.1.3 shows, adding smooth time will delay the reference velodity, but it can effectively lower the jerk generated by high acceleration to increase the stability of system. The relationship of jerk, maximum acceleration and smooth time is shown as follows.

Jerk = Maximum acceleration / Smooth time (Ts)

As for total acceleration time, it can be obtained via the following formula.

Total acceleration time (T) = T-Curve acceleration time (Ta) + Smooth time (Ts)

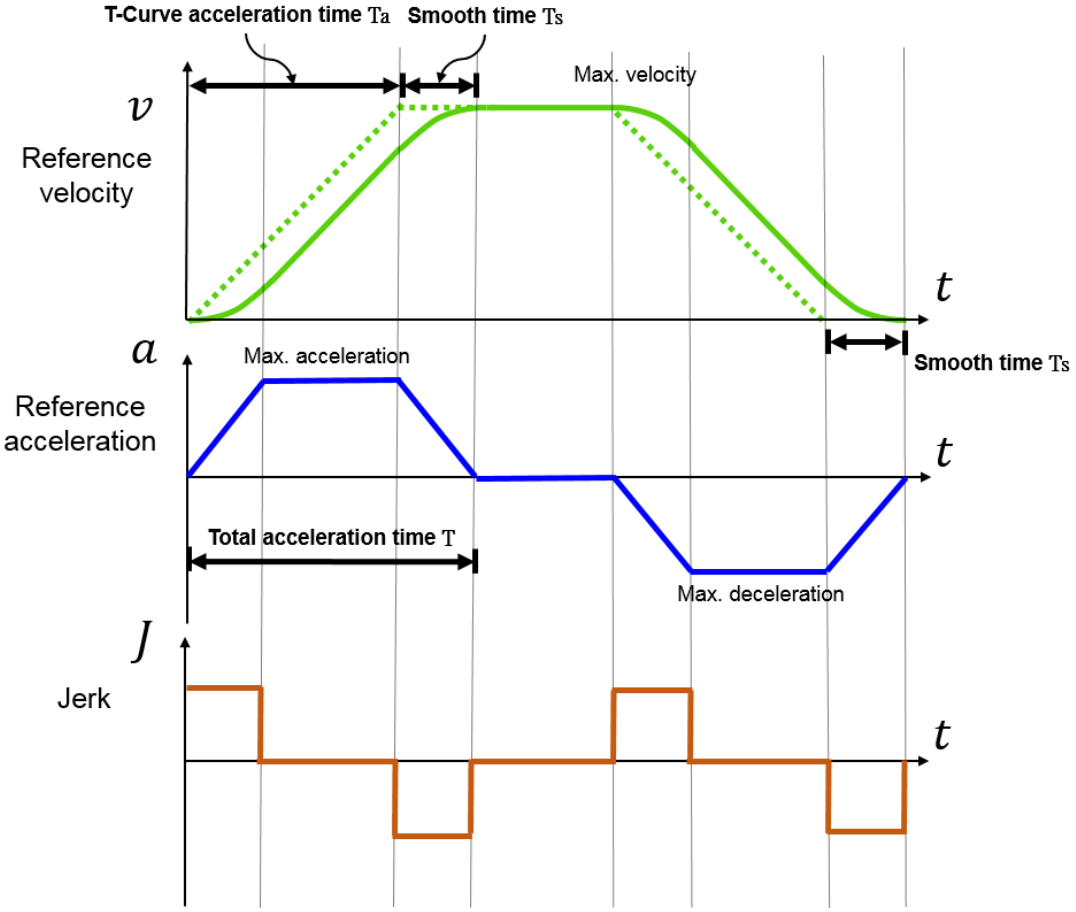

Figure 3.1.3

Besides, HIMC axis motion commands support the change of dynamic target position and velocity planning (On the Fly Modification). During axis motion, users can change axis' target position, maximum velocity, and maximum acceleration / deceleration. HIMC's profile generator will move to the new target position based on the new commands and the motion parameters.

Axis motion status can be divided into “moving” and “in-positiion”, as Figure 3.1.4 shows. Continue to send axis position planning commands in section I, and end it before entering section II. Controller will judge whether the axis is in-position based on the set target radius and debounce time.

If axis feedback position remains in reference position’s target radius after debounce time, axis position will be viewed as in-position. At this time, the status of “axis is in-position” is established inside the controller. However, if axis feedback position exceeds reference position’s target radius during debounce time, the calculation of settling time will be reset. Not until the next time axis feedback position enters target radius will the in-position condition of debounce time be checked.

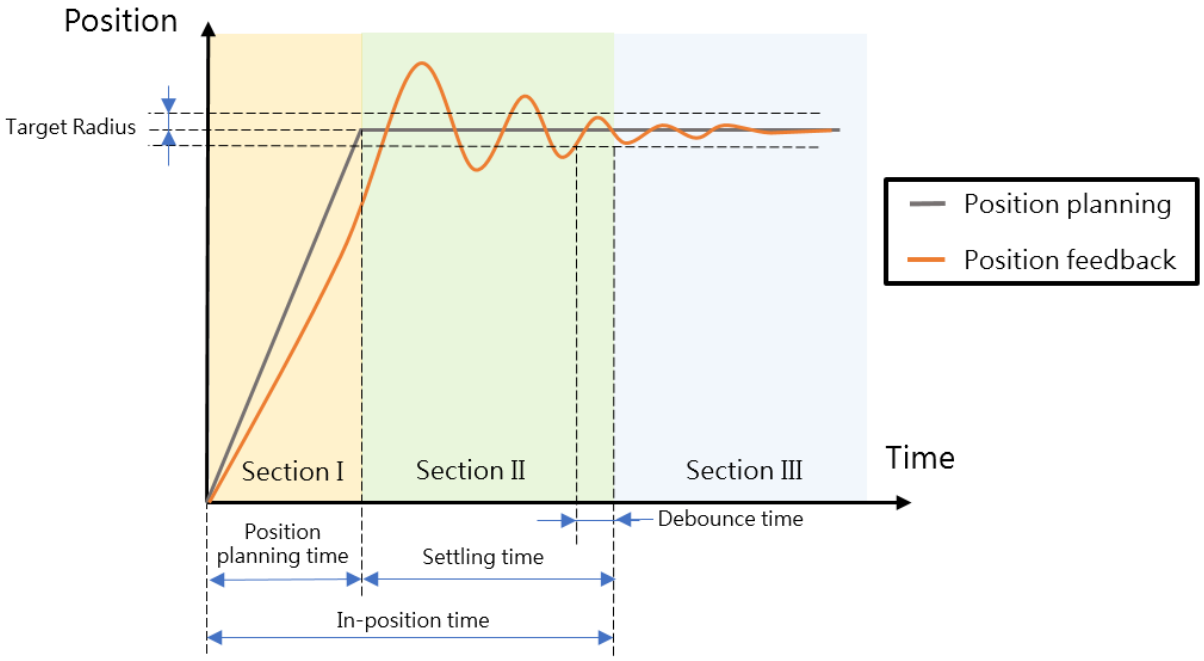

Figure 3.1.4

Refer to Figure 3.1.4, axis motion status is described as follows.

1. Section I: Axis is moving and not in-position.
2. Section II: Axis is not moving but not in-position.
3. Section III: Axis is not moving and in-position.

If the axis is at the “Synchronized” state, axis group or master axis will generate the motion profile for axis motion. Axis itself does not generate the motion profile; instead, it just follows the reference position planned by axis group or master axis.

3.1.1 Axis variables

Axis variables are divided into motion command variables, profile generator variables, status variables, and CoE object variables. Users can select the desired variables via Scope Manager in iA Studio (refer to section 4.8 in “iA Studio User Guide”). Detailed descriptions are shown in Table 3.1.1.1 to Table 3.1.1.6.

Table 3.1.1.1 Motion command variables for axis

Name	Variable	Unit	Description
Sync Position Setpoint	sync_pos_set	mm or deg	Synchronized position set-point. It is the target position to be followed when the axis is in synchronized motion (such as axis group, camming, or gearing operations).
Position Command	pg_pos_cmd	mm or deg	Profile generator position command. It is the target position to be followed when the axis is in discrete motion (point-to-point).
Reference Position	ref_pos	mm or deg	Reference position. It is the position set-point generated from the profile generator according to predefined motion profile.
Reference Velocity	ref_vel	mm/s or deg/s	Reference velocity. It is the velocity set-point generated from the profile generator according to predefined motion profile.
Reference Acceleration	ref_acc	mm/s^2 or deg/s^2	Reference acceleration. It is the acceleration set-point generated from the profile generator according to predefined motion profile.
Position Compensation	pos_comp_set	mm or deg	Position compensation value. It is the output of error map of dynamic error compensation function. If the function is disabled, it will be zero.
Compensated Position	pos_comp	mm or deg	Compensated position command value. It is the sum of reference position and position compensation value.
Position Offset	pos_offset	mm or deg	Position offset. The default value is zero. If users set a new axis position without moving the motor, it will be nonzero.
Position Output	pos_out	mm or deg	Position output. It is the axis position command without position offset.
Velocity Output	vel_out	mm/s or deg/s	Velocity output. It is the axis velocity command without velocity offset.
Acceleration Output	acc_out	mm/s^2 or deg/s^2	Acceleration output. It is the axis acceleration command without acceleration offset.
Offsetted Position Output	offset_pos_out	mm or deg	Position output with offset. It is the final calculated axis position command with position offset. The value will be converted to the unit “count” and be transmitted to the corresponding slave.
Raw Position Feedback	pos_fb_raw	mm or deg	Raw position feedback. It is the encoder feedback read from the slave.
Offsetted Position Feedback	offset_pos_fb	mm or deg	Offsetted position feedback. It is the position feedback with position offset.
Position Feedback	pos_fb	mm or deg	Position feedback. It is in an axis coordinate system.

Name	Variable	Unit	Description
Velocity Feedback	vel_fb	mm/s or deg/s	Velocity feedback. It is in an axis coordinate system.
Position Error	pos_err	mm or deg	Position error. It is the difference between position output and raw position feedback.
Velocity Error	vel_err	mm/s or deg/s	Velocity error. It is the difference between velocity output and raw velocity feedback.
Move Time	movetime	ms	Move time.
Settling Time	settlingtime	ms	Settling time.

Table 3.1.1.2 Profile generator variables for axis

Name	Variable	Unit	Description
Max. Profile Velocity	max_vel	mm/s or deg/s	Maximum profile velocity. Not necessarily reached.
Max. Profile Acceleration	max_acc	mm/s^2 or deg/s^2	Maximum profile acceleration. Not necessarily reached.
Profile Deceleration	max_dec	mm/s^2 or deg/s^2	Maximum profile deceleration. Not necessarily reached.
Smooth Time	sm_factor	ms	Smooth time. Its input range is from 0 to 500. Increasing the value can reduce mechanical vibration during motion, but the total motion time will be affected.

Table 3.1.1.3 Status variables for axis

Name	Variable	Unit	Description
Fault Status	fault_status	N/A	Error status of axis; refer to Table 3.1.1.4 for bit definition.
Motion Status	motion_status	N/A	Motion status of axis; refer to Table 3.1.1.5 for bit definition.

Table 3.1.1.4 Bit definition for axis error status

Bit	Name	Description	Default Response
0	Error Stop	Axis at “error stop” state	N/A
1	Drive fault	Slave drive fault	Controller disables the axis.
2	Position error	Position error exceeds protection limit	Controller disables the axis
3	Hardware right limit	Axis hardware right limit triggered	Controller stops the motion.
4	Hardware left limit	Axis hardware left limit triggered	Controller stops the motion.
5	Software right limit	Axis software right limit triggered	Controller stops the motion.
6	Software left limit	Axis software left limit triggered	Controller stops the motion.

Table 3.1.1.5 Bit definition for axis motion status

Bit	Name	Description	Remark
0	Enabled	The axis is enabled.	N/A
1	Moving	The axis is moving.	Refer to section 3.1.
2	In Position	The axis is in-position.	Refer to section 3.1.
3	Synchronous	The axis is at the “Synchronized” state.	The axis is in an axis group or is the slave axis in synchronized motion.
4	Group	The axis is in an axis group.	Refer to section 6.1.
5	Gantry	The axis is a gantry axis.	Refer to section 5.1.
6	Input Shape	Enable Input Shape filter.	Refer to section 13.1.
7	VSF	Enable VSF filter.	Refer to section 13.1.
8	Gear	The axis is the electronic gear slave axis.	Refer to section 4.1.
9	Cam	The axis is the electronic cam slave axis.	Not supported yet.
10	Accelerating	The axis is accelerating.	Refer to section 3.1.
11	Homed	The axis completes homing.	N/A
12	Homing	The axis is homing.	N/A

Table 3.1.1.6 CoE object variables for axis

Name	Variable	Unit	Description
Power Drive State	power_drive_st	N/A	Power Drive State (PDS).
Controlword	coe_controlword	N/A	Axis control object.
Statusword	coe_statusword	N/A	Axis status object.
Modes of Operation	servo_type	N/A	Written value of axis control modes.
Modes of Operational Display	coe_op_modes_display	N/A	Displayed value of axis control modes.
Target Position	coe_pos_cmd	count	Target position command.
Target Velocity	coe_vel_cmd	count/s	Target velocity command.
Target Torque	coe_trq_cmd	N/A	Target torque command.
Position Actual Value	coe_pos_fb	count	Position feedback value.
Velocity Actual Value	coe_vel_fb	count/s	Velocity feedback value.
Torque Actual Value	coe_trq_fb	N/A	Torque feedback value.
Touch Probe Function	tp_function	N/A	Setting value of Touch Probe function.
Touch Probe Status	tp_status	N/A	Status of Touch Probe function.

Name	Variable	Unit	Description
Touch Probe 1 Positive Value	tp1_positive_edge	count	Position value of Touch Probe 1 positive edge.
Touch Probe 1 Negative Value	tp1_negative_edge	count	Position value of Touch Probe 1 negative edge.
Touch Probe 2 Positive Value	tp2_positive_edge	count	Position value of Touch Probe 2 positive edge.
Touch Probe 2 Negative Value	tp2_negative_edge	count	Position value of Touch Probe 2 negative edge.
Negative Limit Switch	di_bit_HWLL	N/A	Signal of negative limit switch.
Positive Limit Switch	di_bit_HWRL	N/A	Signal of positive limit switch.
Home Switch	di_bit_HOME	N/A	Signal of home switch.

3.2 Axis motion control

3.2.1 HIMC_Enable

Purpose

To enable an axis.

Syntax

```
int HIMC_Enable(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x6040 (Control word) and object 0x6041 (Status word) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_Enable
LabVIEW	HIMC Enable.vi
Python	Enable

3.2.2 HIMC_Disable

Purpose

To disable an axis.

Syntax

```
int HIMC_Disable(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

(1) The motion queue of the axis will be cleared.
(2) Users must configure object 0x6040 (Control word) and object 0x6041 (Status word) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_Disable
LabVIEW	HIMC Disable.vi
Python	Disable

3.2.3 HIMC_Reset

Purpose

To reset an axis when it is at the “error stop” state.

Syntax

```
int HIMC_Reset(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

(1) Operate this function when the axis is in the error stop mode.
(2) Users must configure object 0x6040 (Control word) and object 0x6041 (Status word) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_Reset
LabVIEW	HIMC Reset.vi
Python	Reset

3.2.4 HIMC_MoveAbs

Purpose

To move the axis to an absolute target position.

Syntax

```
int HIMC_MoveAbs(
    int    ctrl_id,
    int    axis_id,
    double pos
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
pos [in]	The value of an absolute target position. Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure the corresponding command as PDO when using this function.

For example, to configure CSP mode as 0x607A (Target position).

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_MoveAbs
LabVIEW	HIMC Move Abs.vi
Python	MoveAbs

3.2.5 HIMC_MoveRel

Purpose

To move the axis by a relative distance.

Syntax

```
int HIMC_MoveRel(
    int    ctrl_id,
    int    axis_id,
    double rel_dist
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

rel_dist [in] The value to a relative distance.
Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure the corresponding command as PDO when using this function.
For example, to configure CSP mode as 0x607A (Target position).

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_MoveRel
LabVIEW	HIMC Move Rel.vi
Python	MoveRel

3.2.6 HIMC_MoveVel

Purpose

To start a never-ending motion at a specific velocity.

Syntax

```
int HIMC_MoveVel(
    int    ctrl_id,
    int    axis_id,
    double vel
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
vel [in]	The value of a specific velocity. It can be either positive or negative to indicate the direction of the motion. Parameter unit: mm/s or deg/s

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure the corresponding command as PDO when using this function.

For example, to configure CSP mode as 0x607A (Target position).

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_MoveVel
LabVIEW	HIMC Move Vel.vi
Python	MoveVel

3.2.7 HIMC_MoveTrq

Purpose

To start a never-ending motion at a specific torque.

Syntax

```
int HIMC_MoveTrq(
    int    ctrl_id,
    int    axis_id,
    double trq_cmd
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

trq_cmd [in] Torque command.
Parameter unit: N-m

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

(1) This function is only applicable to “Profile Torque” mode.
(2) If the torque command is larger than the continuous torque of motor, the motor will move with the value of continuous torque.
(3) Users must configure object 0x6071 (Target torque) as PDO and set the force constant of the motor.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_MoveTrq
LabVIEW	HIMC Move Trq.vi
Python	MoveTrq

3.2.8 HIMC_Stop

Purpose

To stop the motion of an axis.

Syntax

```
int HIMC_Stop(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

The motion queue of the axis will be cleared.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_Stop
LabVIEW	HIMC Stop.vi
Python	Stop

3.2.9 HIMC_Halt

Purpose

To halt the motion of an axis; its velocity will be set as 0.

Syntax

```
int HIMC_Halt(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x6040 (Control word) and object 0x6041 (Status word) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_Halt
LabVIEW	HIMC Halt.vi
Python	Halt

3.2.10 HIMC_Resume

Purpose

To resume the motion of an axis from “halt” status.

Syntax

```
int HIMC_Resume(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x6040 (Control word) and object 0x6041 (Status word) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_Resume
LabVIEW	HIMC Resume.vi
Python	Resume

3.3 Axis setting

3.3.1 HIMC_GetMaxVel

Purpose

To get the maximum profile velocity of an axis.

Syntax

```
int HIMC_GetMaxVel(
    int    ctrl_id,
    int    axis_id,
    double *p_vel
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_vel [out] A pointer to the buffer to receive the maximum profile velocity of an axis.
Parameter unit: mm/s or deg/s

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetMaxVel
LabVIEW	HIMC Get Max Vel.vi
Python	GetMaxVel

3.3.2 HIMC_SetVel

Purpose

To set the maximum profile velocity of an axis.

Syntax

```
int HIMC_SetVel(
    int    ctrl_id,
    int    axis_id,
    double vel
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
vel [in]	The new maximum profile velocity of an axis. Parameter unit: mm/s or deg/s Input range: nonzero positive value

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetVel
LabVIEW	HIMC Set Vel.vi
Python	SetVel

3.3.3 HIMC_GetMaxAcc

Purpose

To get the maximum profile acceleration of an axis.

Syntax

```
int HIMC_GetMaxAcc(
    int    ctrl_id,
    int    axis_id,
    double *p_acc
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained from HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_acc [out] A pointer to the buffer to receive the maximum profile acceleration of an axis.
Parameter unit: mm/s^2 or deg/s^2

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetMaxAcc
LabVIEW	HIMC Get Max Acc.vi
Python	GetMaxAcc

3.3.4 HIMC_SetAcc

Purpose

To set the maximum profile acceleration of an axis.

Syntax

```
int HIMC_SetAcc(
    int    ctrl_id,
    int    axis_id,
    double acc
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

acc [in] The new maximum profile acceleration of an axis.
Parameter unit: mm/s^2 or deg/s^2
Input range: nonzero positive value

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetAcc
LabVIEW	HIMC Set Acc.vi
Python	SetAcc

3.3.5 HIMC_SetAccTime

Purpose

To set the acceleration time of an axis.

Syntax

```
int HIMC_SetAccTime(
    int    ctrl_id,
    int    axis_id,
    double acc_time
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
acc_time [in]	The acceleration time of an axis. Parameter unit: ms Input range: nonzero positive value

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetAccTime
LabVIEW	HIMC Set Acc Time.vi
Python	SetAccTime

3.3.6 HIMC_GetMaxDec

Purpose

To get the maximum profile deceleration of an axis.

Syntax

```
int HIMC_GetMaxDec(
    int    ctrl_id,
    int    axis_id,
    double *p_dec
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_dec [out] A pointer to the buffer to receive the maximum profile deceleration of an axis.
Parameter unit: mm/s^2 or deg/s^2

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetMaxDec
LabVIEW	HIMC Get Max Dec.vi
Python	GetMaxDec

3.3.7 HIMC_SetDec

Purpose

To set the maximum profile deceleration of an axis.

Syntax

```
int HIMC_SetDec(
    int    ctrl_id,
    int    axis_id,
    double dec
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

dec [in] The new maximum profile deceleration of an axis.
Parameter unit: mm/s^2 or deg/s^2
Input range: nonzero positive value

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetDec
LabVIEW	HIMC Set Dec.vi
Python	SetDec

3.3.8 HIMC_SetDecTime

Purpose

To set the deceleration time of an axis.

Syntax

```
int HIMC_SetDecTime(
    int    ctrl_id,
    int    axis_id,
    double dec_time
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

dec_time [in] The deceleration time of an axis.
Parameter unit: ms
Input range: nonzero positive value

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetDecTime
LabVIEW	HIMC Set Dec Time.vi
Python	SetDecTime

3.3.9 HIMC_GetKillDec

Purpose

To get the kill deceleration of an axis.

Syntax

```
int HIMC_GetKillDec(
    int    ctrl_id,
    int    axis_id,
    double *p_kill_dec
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_kill_dec [out] A pointer to the buffer to receive the kill deceleration of an axis.
Parameter unit: mm/s^2 or deg/s^2

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetKillDec
LabVIEW	HIMC Get Kill Dec.vi
Python	GetKillDec

3.3.10 HIMC_SetKillDec

Purpose

To set the kill deceleration of an axis.

Syntax

```
int HIMC_SetKillDec(
    int    ctrl_id,
    int    axis_id,
    double kill_dec
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

kill_dec [in] The new kill deceleration of an axis.
Parameter unit: mm/s^2 or deg/s^2
Input range: nonzero positive value

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetKillDec
LabVIEW	HIMC Set Kill Dec.vi
Python	SetKillDec

3.3.11 HIMC_GetSWRL

Purpose

To get the software right limit position of an axis.

Syntax

```
int HIMC_GetSWRL(
    int    ctrl_id,
    int    axis_id,
    double *p_right_limit_pos
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_right_limit_pos [out]	A pointer to the buffer to receive the software right limit position of an axis. Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetSWRL
LabVIEW	HIMC Get SWRL.vi
Python	GetSWRL

3.3.12 HIMC_SetSWRL

Purpose

To set the software right limit position of an axis.

Syntax

```
int HIMC_SetSWRL(
    int    ctrl_id,
    int    axis_id,
    double right_limit_pos
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
right_limit_pos [in]	The new software right limit position of an axis. Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetSWRL
LabVIEW	HIMC Set SWRL.vi
Python	SetSWRL

3.3.13 HIMC_GetSWLL

Purpose

To get the software left limit position of an axis.

Syntax

```
int HIMC_GetSWLL(
    int    ctrl_id,
    int    axis_id,
    double *p_left_limit_pos
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_left_limit_pos [out]	A pointer to the buffer to receive the software left limit position of an axis. Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetSWLL
LabVIEW	HIMC Get SWLL.vi
Python	GetSWLL

3.3.14 HIMC_SetSWLL

Purpose

To set the software left limit position of an axis.

Syntax

```
int HIMC_SetSWLL(
    int    ctrl_id,
    int    axis_id,
    double left_limit_pos
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
left_limit_pos [in]	The new software left limit position of an axis. Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetSWLL
LabVIEW	HIMC Set SWLL.vi
Python	SetSWLL

3.3.15 HIMC_GetSMTime

Purpose

To get the profile smooth time of an axis.

Syntax

```
int HIMC_GetSMTime(
    int    ctrl_id,
    int    axis_id,
    double *p_smooth_time
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_smooth_time [out]	A pointer to the buffer to receive the profile smooth time of an axis. Parameter unit: ms

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetSMTime
LabVIEW	HIMC Get SM Time.vi
Python	GetSMTime

3.3.16 HIMC_SetSMTime

Purpose

To set the profile smooth time of an axis.

Syntax

```
int HIMC_SetSMTime(
    int    ctrl_id,
    int    axis_id,
    double smooth_time
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
smooth_time [in]	The new profile smooth time of an axis. Parameter unit: ms Input range: 0 ~ 500

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function is not applicable when the axis is moving.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetSMTime
LabVIEW	HIMC Set SM Time.vi
Python	SetSMTime

3.3.17 HIMC_GetMoveTime

Purpose

To get the move time of an axis.

Syntax

```
int HIMC_GetMoveTime(
    int    ctrl_id,
    int    axis_id,
    double *p_move_time
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_move_time [out]	A pointer to the buffer to receive the move time of an axis. Parameter unit: ms

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetMoveTime
LabVIEW	HIMC Get Move Time.vi
Python	GetMoveTime

3.3.18 HIMC_GetSettlingTime

Purpose

To get the settling time of an axis.

Syntax

```
int HIMC_GetSettlingTime(
    int    ctrl_id,
    int    axis_id,
    double *p_settling_time
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_settling_time [out]	A pointer to the buffer to receive the settling time of an axis. Parameter unit: ms

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetSettlingTime
LabVIEW	HIMC Get Settling Time.vi
Python	GetSettlingTime

3.3.19 HIMC_SetPos

Purpose

To set the position of an axis and change home offset.

Syntax

```
int HIMC_SetPos(
    int    ctrl_id,
    int    axis_id,
    double pos
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

pos [in] The value of the axis' current position.
Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function is not applicable when the axis is at the "Synchronized" state, added to an axis group, or at the error state.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetPos
LabVIEW	HIMC Set Pos.vi
Python	SetPos

3.3.20 HIMC_GetPosFb

Purpose

To get the feedback position of an axis.

Syntax

```
int HIMC_GetPosFb(
    int    ctrl_id,
    int    axis_id,
    double *p_pos
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_pos [out] A pointer to the buffer to receive the feedback position of an axis.
Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x6064 (Position actual value) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetPosFb
LabVIEW	HIMC Get Pos Fb.vi
Python	GetPosFb

3.3.21 HIMC_GetPosFbComp

Purpose

To get the feedback position with the position compensation value of an axis.

Syntax

```
int HIMC_GetPosFbComp(
    int    ctrl_id,
    int    axis_id,
    double *p_pos
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_pos [out] A pointer to the buffer to receive the feedback position with the position compensation value of an axis.
Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x6064 (Position actual value) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 3.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetPosFbComp
LabVIEW	HIMC Get Pos Fb Comp.vi
Python	GetPosFbComp

3.3.22 HIMC_GetPosOffset

Purpose

To get the position offset of an axis.

Syntax

```
int HIMC_GetPosOffset(
  int    ctrl_id,
  int    axis_id,
  double *p_pos
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_pos_err [out]	A pointer to the buffer to receive the position error of an axis. Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetPosOffset
LabVIEW	HIMC Get Pos Offset.vi
Python	GetPosOffset

3.3.23 HIMC_GetPosErr

Purpose

To get the position error of an axis.

Syntax

```
int HIMC_GetPosErr(
    int    ctrl_id,
    int    axis_id,
    double *p_pos_err
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_pos_err [out] A pointer to the buffer to receive the position error of an axis.
Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetPosErr
LabVIEW	HIMC Get Pos Err.vi
Python	GetPosErr

3.3.24 HIMC_GetVelFb

Purpose

To get the velocity feedback of an axis.

Syntax

```
int HIMC_GetVelFb(
    int    ctrl_id,
    int    axis_id,
    double *p_vel
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_vel [out] A pointer to the buffer to receive the velocity feedback of an axis.
Parameter unit: mm/s or deg/s

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.4
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetVelFb
LabVIEW	HIMC Get Vel Fb.vi
Python	GetVelFb

3.3.25 HIMC_GetVelErr

Purpose

To get the velocity error of an axis.

Syntax

```
int HIMC_GetVelErr(
    int    ctrl_id,
    int    axis_id,
    double *p_vel_err
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_vel_err [out] A pointer to the buffer to receive the velocity error of an axis.
Parameter unit: mm/s or deg/s

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.4
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetVelErr
LabVIEW	HIMC Get Vel Err.vi
Python	GetVelErr

3.3.26 HIMC_GetCurrFb

Purpose

To get the current feedback of an axis.

Syntax

```
int HIMC_GetCurrFb(
    int    ctrl_id,
    int    axis_id,
    double *p_curr
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_curr [out] A pointer to the buffer to receive the current feedback of an axis.
Parameter unit: amp. (A)

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x6077 (Torque actual value) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 3.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetCurrFb
LabVIEW	HIMC Get Curr Fb.vi
Python	GetCurrFb

3.3.27 HIMC_GetRefPos

Purpose

To get the reference position of an axis.

Syntax

```
int HIMC_GetRefPos(
    int    ctrl_id,
    int    axis_id,
    double *p_pos
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_pos [out] A pointer to the buffer to receive the reference position of an axis.
Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetRefPos
LabVIEW	HIMC Get Ref Pos.vi
Python	GetRefPos

3.3.28 HIMC_GetRefVel

Purpose

To get the reference velocity of an axis.

Syntax

```
int HIMC_GetRefVel(
    int    ctrl_id,
    int    axis_id,
    double *p_vel
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_vel [out]	A pointer to the buffer to receive the reference velocity of an axis. Parameter unit: mm/s or deg/s

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetRefVel
LabVIEW	HIMC Get Ref Vel.vi
Python	GetRefVel

3.3.29 HIMC_GetRefAcc

Purpose

To get the reference acceleration of an axis.

Syntax

```
int HIMC_GetRefAcc(
    int    ctrl_id,
    int    axis_id,
    double *p_acc
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_acc [out] A pointer to the buffer to receive the reference acceleration of an axis.
Parameter unit: mm/s^2 or deg/s^2

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetRefAcc
LabVIEW	HIMC Get Ref Acc.vi
Python	GetRefAcc

3.3.30 HIMC_GetPosOut

Purpose

To get the position command output of an axis sent by the controller to the slave drive.

Syntax

```
int HIMC_GetPosOut(
    int    ctrl_id,
    int    axis_id,
    double *p_pos
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_pos [out] A pointer to the buffer to receive the position command output of an axis.
Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetPosOut
LabVIEW	HIMC Get Pos Out.vi
Python	GetPosOut

3.3.31 HIMC_GetVelOut

Purpose

To get the velocity command output of an axis sent by the controller to the slave drive.

Syntax

```
int HIMC_GetVelOut(
    int    ctrl_id,
    int    axis_id,
    double *p_vel
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_vel [out] A pointer to the buffer to receive the velocity command output of an axis.
Parameter unit: mm/s or deg/s

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetVelOut
LabVIEW	HIMC Get Vel Out.vi
Python	GetVelOut

3.3.32 HIMC_GetAccOut

Purpose

To get the acceleration command output of an axis sent by the controller to the slave drive.

Syntax

```
int HIMC_GetAccOut(
    int    ctrl_id,
    int    axis_id,
    double *p_acc
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_acc [out] A pointer to the buffer to receive the acceleration command output of an axis.
Parameter unit: mm/s^2 or deg/s^2

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetAccOut
LabVIEW	HIMC Get Acc Out.vi
Python	GetAccOut

3.3.33 HIMC_IgnoreHWL

Purpose

To ignore the warning messages of hardware limit protection.

Syntax

```
int HIMC_IgnoreHWL(
    int ctrl_id,
    int axis_id,
    int cmd
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

cmd [in] Set it as “1” to ignore the messages.
Set it as “0” to restore the messages (default).

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IgnoreHWL
LabVIEW	HIMC Ignore HWL.vi
Python	IgnoreHWL

3.3.34 HIMC_IgnoreSWL

Purpose

To ignore the warning messages of software limit protection.

Syntax

```
int HIMC_IgnoreSWL(
    int ctrl_id,
    int axis_id,
    int cmd
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
cmd [in]	Set it as “1” to ignore the messages. Set it as “0” to restore the messages (default).

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IgnoreSWL
LabVIEW	HIMC Ignore SWL.vi
Python	IgnoreSWL

3.3.35 HIMC_IgnorePE

Purpose

To ignore the warning messages of position error limit.

Syntax

```
int HIMC_IgnorePE(
    int ctrl_id,
    int axis_id,
    int cmd
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

cmd [in] Set it as “1” to ignore the messages.
Set it as “0” to restore the messages (default).

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IgnorePE
LabVIEW	HIMC Ignore PE.vi
Python	IgnorePE

3.3.36 HIMC_GetAxisNum

Purpose

To get the number of the axes connected to the controller.

Syntax

```
int HIMC_GetAxisNum(
    int ctrl_id,
    int *num
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
num [out]	A pointer to the buffer to receive the number of the axes connected to the controller.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetAxisNum
LabVIEW	HIMC Get Axis Num.vi
Python	GetAxisNum

3.3.37 HIMC_SetVelScale

Purpose

To set the velocity scale of axis motion.

Syntax

```
int HIMC_SetVelScale(
    int    ctrl_id,
    int    axis_id,
    double vel_scale
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

vel_scale [in] The new velocity scale of axis motion.
Input range: 0 ~ 100

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.4
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetVelScale
LabVIEW	HIMC Set Vel Scale.vi
Python	SetVelScale

3.3.38 HIMC_GetVelScale

Purpose

To get the velocity scale of axis motion.

Syntax

```
int HIMC_GetVelScale(
    int    ctrl_id,
    int    axis_id,
    double *p_vel_scale
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_vel_scale [out]	A pointer to the buffer to receive the velocity scale of axis motion. Its range is from 0 to 100.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.4
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetVelScale
LabVIEW	HIMC Get Vel Scale.vi
Python	GetVelScale

3.3.39 HIMC_SetRollover

Purpose

To set the position rollover value of an axis.

Syntax

```
int HIMC_SetRollover(
    int    ctrl_id,
    int    axis_id,
    double rollover_val
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
rollover_val [in]	The position rollover value of an axis. Parameter unit: mm or deg Input range: zero or positive value.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

(1) If parameter “rollover_val” is set as 0, the function is closed.

(2) This function is applicable only when the axis is disabled.

(3) This function is not applicable when the axis is added to an axis group.

Requirement

Minimum supported version	iA Studio 1.4
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetRollover
LabVIEW	HIMC Set Rollover.vi
Python	SetRollover

3.3.40 HIMC_GetRolloverTurns

Purpose

To get the number of turns when an axis is on rollover mode.

Syntax

```
int HIMC_GetRolloverTurns(
    int ctrl_id,
    int axis_id,
    int *p_turns
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_turns [out] A pointer to the buffer to receive the number of turns when an axis is on rollover mode.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.4
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetRolloverTurns
LabVIEW	HIMC Get Rollover Turns.vi
Python	GetRolloverTurns

3.3.41 HIMC_SetOpMode

Purpose

To set the operational mode of an axis.

Syntax

```
int HIMC_SetOpMode(
    int ctrl_id,
    int axis_id,
    int op_mode
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

op_mode [in] New operational mode of an axis.
Input range: 8(CSP), 9(CSV), 10(CST)

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x6060 (Mode of operation) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetOpMode
LabVIEW	HIMC Set Op Mode.vi
Python	SetOpMode

3.3.42 HIMC_SetBufferMode

Purpose

To set the buffer mode of an axis.

Syntax

```
int HIMC_SetBufferMode(
    int ctrl_id,
    int axis_id,
    int buf_mode
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

buf_mode [in] New buffer mode of an axis.
Input range: 0 (immediate stop mode), 1 (buffer mode)

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetBufferMode
LabVIEW	HIMC Set Buffer Mode.vi
Python	SetBufferMode

3.3.43 HIMC_GetBufferMode

Purpose

To get the buffer mode of an axis.

Syntax

```
int HIMC_GetBufferMode(
    int ctrl_id,
    int axis_id,
    int* buf_mode
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

buf_mode [out] A pointer to the buffer to receive the buffer mode of an axis.
0: immediate stop mode, 1: buffer mode

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetBufferMode
LabVIEW	HIMC Get Buffer Mode.vi
Python	GetBufferMode

3.3.44 HIMC_GetCmdNum

Purpose

To get the number of the buffering command of an axis.

Syntax

```
int HIMC_GetCmdNum(
    int ctrl_id,
    int axis_id,
    int* cmd_num
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

cmd_num [out] A pointer to the buffer to receive the number of the buffering command of an axis.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetCmdNum
LabVIEW	HIMC Get Cmd Num.vi
Python	GetCmdNum

3.3.45 HIMC_GetMultiAxesFeedbackPos

Purpose

To get the feedback position of the list of axes.

Syntax

```
int HIMC_GetMultiAxesFeedbackPos(
    int ctrl_id,
    int *p_axes_id_array,
    int num_of_axes,
    int *p_pos_array
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
p_axes_id_array [in]	A pointer to the buffer to store the list of axes ID.
num_of_axes [in]	Number of axes.
p_pos_array [out]	A pointer to the buffer to receive the feedback position of the list of axes. Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetMultiAxesFeedbackPos
LabVIEW	HIMC Get Multi Axes Feedback Pos.vi
Python	GetMultiAxesFeedbackPos

3.4 Axis status

3.4.1 HIMC_IsEnabled

Purpose

To query the “enable” status of an axis.

Syntax

```
int HIMC_IsEnabled(
    int ctrl_id,
    int axis_id,
    int *p_enabled
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_enabled [out] A pointer to the buffer to receive the enable status of an axis.
If the axis is at the “Enabled” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x6041 (Status word) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsEnabled
LabVIEW	HIMC Is Enabled.vi
Python	IsEnabled

3.4.2 HIMC_IsMoving

Purpose

To query the “moving” status of an axis. If the axis is moving, PG (profile generator) continues outputting new positions.

Syntax

```
int HIMC_IsMoving(
    int ctrl_id,
    int axis_id,
    int *p_is_moving
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_moving [out]	A pointer to the buffer to receive the moving status of an axis. If the axis is at the “Moving” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsMoving
LabVIEW	HIMC Is Moving.vi
Python	IsMoving

3.4.3 HIMC_IsInPos

Purpose

To query the “in-position” status of an axis. If the axis is in-position, the position error is kept within an error window (target radius) for a specific duration (debounce time).

Syntax

```
int HIMC_IsInPos(
    int ctrl_id,
    int axis_id,
    int *p_in_position
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_in_position [out]	A pointer to the buffer to receive the in-position status of an axis. If the axis is at the “InPos” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsInPos
LabVIEW	HIMC Is In Pos.vi
Python	IsInPos

3.4.4 HIMC_IsErrorStop

Purpose

To query whether the axis is at the “error stop” state.

Syntax

```
int HIMC_IsErrorStop(
    int ctrl_id,
    int axis_id,
    int *p_is_errorstop
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_errorstop [out]	A pointer to the buffer to receive the error stop status of an axis. If the axis is at the “ErrorStop” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsErrorStop
LabVIEW	HIMC Is Error Stop.vi
Python	IsErrorStop

3.4.5 HIMC_IsGantry

Purpose

To query whether the axis is at the “gantry” state.

Syntax

```
int HIMC_IsGantry(
    int ctrl_id,
    int axis_id,
    int *p_is_gantry
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_gantry [out]	A pointer to the buffer to receive the gantry status of an axis. If the axis is at the “Gantry” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsGantry
LabVIEW	HIMC Is Gantry.vi
Python	IsGantry

3.4.6 HIMC_IsGrouped

Purpose

To query whether the axis is grouped into an axis group.

Syntax

```
int HIMC_IsGrouped(
    int ctrl_id,
    int axis_id,
    int *p_is_grouped
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_grouped [out]	A pointer to the buffer to receive the grouped status of an axis. If the axis is at the “Grouped” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsGrouped
LabVIEW	HIMC Is Grouped.vi
Python	IsGrouped

3.4.7 HIMC_IsSync

Purpose

To query whether the axis is at the “Synchronized” state.

Syntax

```
int HIMC_IsSync(
    int ctrl_id,
    int axis_id,
    int *p_is_sync
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_sync [out]	A pointer to the buffer to receive the sync status of an axis. If the axis is at the “Sync” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsSync
LabVIEW	HIMC Is Sync.vi
Python	IsSync

3.4.8 HIMC_IsHWLL

Purpose

To query whether the axis reaches the hardware left limit.

Syntax

```
int HIMC_IsHWLL(
    int ctrl_id,
    int axis_id,
    int *p_is_hwll
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_is_hwll [out] A pointer to the buffer to receive the HWLL status of an axis.
If the axis is at the “HWLL” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

When using this function, users must configure object 0x60FD (Digital inputs) as PDO and specify bit 0 as left limit input.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsHWLL
LabVIEW	HIMC Is HWLL.vi
Python	IsHWLL

3.4.9 HIMC_IsHWRL

Purpose

To query whether the axis reaches the hardware right limit.

Syntax

```
int HIMC_IsHWRL(
    int ctrl_id,
    int axis_id,
    int *p_is_hwrl
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_is_hwrl [out] A pointer to the buffer to receive the HWRL status of an axis.
If the axis is at the “HWRL” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

When using this function, users must configure object 0x60FD (Digital inputs) as PDO and specify bit 1 as right limit input.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsHWRL
LabVIEW	HIMC Is HWRL.vi
Python	IsHWRL

3.4.10 HIMC_IsSWLL

Purpose

To query whether the axis reaches the software left limit.

Syntax

```
int HIMC_IsSWLL(
    int ctrl_id,
    int axis_id,
    int *p_is_swll
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_is_swll [out] A pointer to the buffer to receive the SWLL status of an axis.
If the axis is at the “SWLL” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsSWLL
LabVIEW	HIMC Is SWLL.vi
Python	IsSWLL

3.4.11 HIMC_IsSWRL

Purpose

To query whether the axis reaches the software right limit.

Syntax

```
int HIMC_IsSWRL(
    int ctrl_id,
    int axis_id,
    int *p_is_swrl
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_swrl [out]	A pointer to the buffer to receive the SWRL status of an axis. If the axis is at the “SWRL” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsSWRL
LabVIEW	HIMC Is SWRL.vi
Python	IsSWRL

3.4.12 HIMC_IsDriveErr

Purpose

To query whether the axis triggers drive alarms.

Syntax

```
int HIMC_IsDriveErr(
    int ctrl_id,
    int axis_id,
    int *p_is_driveerr
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_driveerr [out]	A pointer to the buffer to receive the DriveErr status of an axis. If the axis is at the “DriveErr” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x6041 (Status word) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 1.4
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsDriveErr
LabVIEW	HIMC Is Drive Err.vi
Python	IsDriveErr

3.4.13 HIMC_IsPosErr

Purpose

To query whether the position error of an axis exceeds the protection limit.

Syntax

```
int HIMC_IsPosErr(
    int ctrl_id,
    int axis_id,
    int *p_is_poserr
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_poserr [out]	A pointer to the buffer to receive the PosErr status of an axis. If the axis is at the “PosErr” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

The error protection limit indicates the position error tolerance of an axis in controller.

Requirement

Minimum supported version	iA Studio 1.4
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsPosErr
LabVIEW	HIMC Is Pos Err.vi
Python	IsPosErr

3.4.14 HIMC_IsCompActive

Purpose

To query whether the compensation function is active.

Syntax

```
int HIMC_IsCompActive(
    int ctrl_id,
    int axis_id,
    int *p_is_compactive
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_compactive [out]	A pointer to the buffer to receive the compensation active status of an axis. If the axis is at the “CompActive” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsCompActive
LabVIEW	HIMC Is Comp Active.vi
Python	IsCompActive

3.4.15 HIMC_IsAcc

Purpose

To query whether the axis is accelerating.

Syntax

```
int HIMC_IsAcc(
    int ctrl_id,
    int axis_id,
    int *p_is_acc
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_is_acc [out] A pointer to the buffer to receive the accelerating status of an axis.
If the axis is at the “Acc” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsAcc
LabVIEW	HIMC Is Acc.vi
Python	IsAcc

4. Synchronized Motion functions

4. Synchronized Motion functions 4-1
4.1 Overview 4-2
4.1.1 Synchronized motion variables 4-3
4.2 HIMC_EnableGear 4-4
4.3 HIMC_DisableGear 4-5
4.4 HIMC_GearIn 4-6
4.5 HIMC_GearOut 4-7
4.6 HIMC_GetGearRatio 4-8
4.7 HIMC_IsInGear 4-9
4.8 HIMC_IsGearMaster 4-10
4.9 HIMC_IsGearSlave 4-11

4.1 Overview

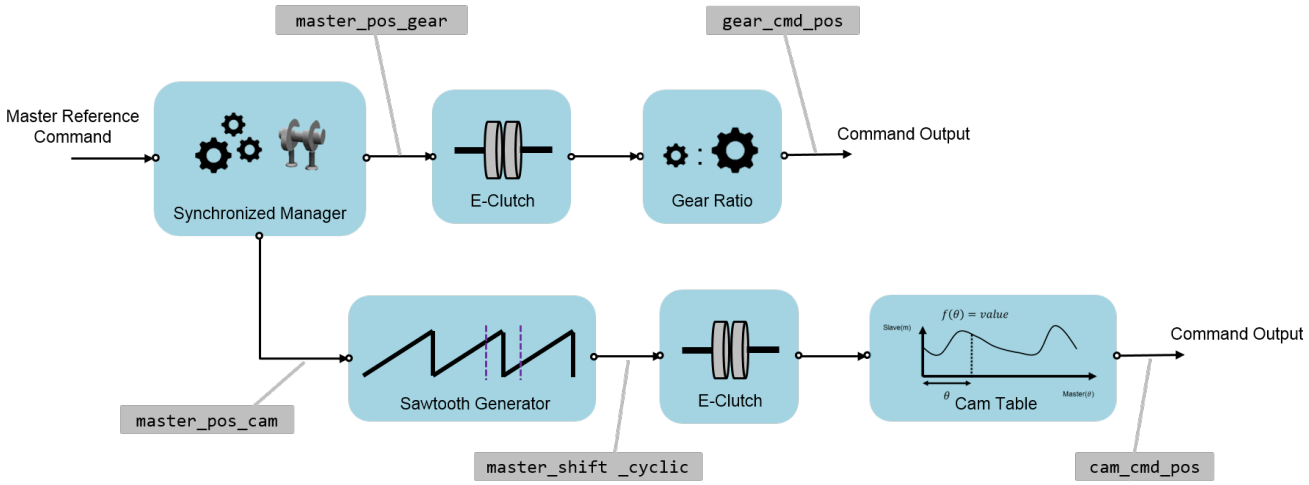

Figure 4.1.1

Users can define synchronized motion between one axis and another. Master axis, a leading axis, will generate position command first, and then slave axis will refer to master axis based on the motion configuration. If master-slave relationship is constant, the motion is electronic gearing. On the other hand, if slave axis needs to follow a pattern, the motion is electronic camming. In Figure 4.1.2, axis 0 acts as master axis, leading axis 1, 2, 3 and 4. Axis 1, 2 and 3 adopt electronic gearing, while axis 4 adopts electronic camming.

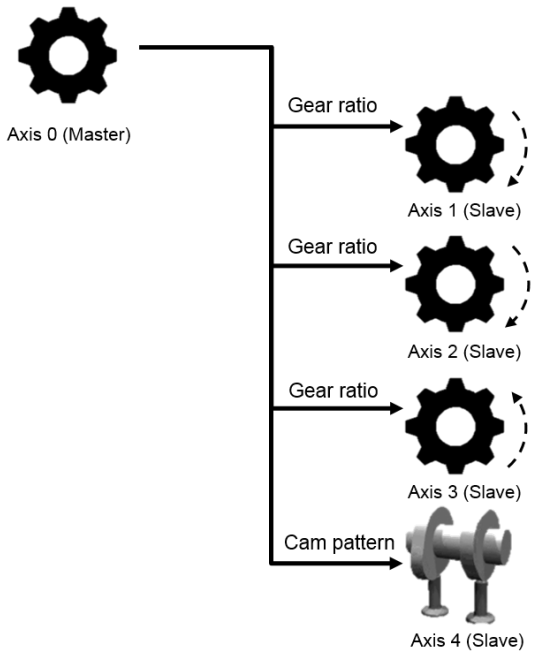

Figure 4.1.2

4.1.1 Synchronized motion variables

Common synchronized motion variables are given in Table 4.1.1.1. Users can select the desired variables via Scope Manager in iA Studio (refer to section 4.8 in “iA Studio User Guide”).

Table 4.1.1.1

Name	Variable	Unit	Description
Raw Master Position	master_pos_gear	mm or deg	Position command of master axis.
Gear Command Position	gear_cmd_pos	mm or deg	Slave axis outputs position command.
Gear Ratio	gear_ratio	mm or deg	Gear ratio.

4.2 HIMC_EnableGear

Purpose

To couple two axes in a master-slave relationship.

Syntax

```
int HIMC_EnableGear(
    int ctrl_id,
    int axis_master_id,
    int axis_slv_id
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_master_id [in]	Master axis index.
axis_slv_id [in]	Slave axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function is applicable only when both axes are enabled.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_EnableGear
LabVIEW	HIMC Enable Gear.vi
Python	EnableGear

4.3 HIMC_DisableGear

Purpose

To uncouple two axes from the master-slave relationship to two independent axes.

Syntax

```
int HIMC_DisableGear(
    int ctrl_id,
    int axis_slv_id
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_slv_id [in]	Slave axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_DisableGear
LabVIEW	HIMC Disable Gear.vi
Python	DisableGear

4.4 HIMC_GearIn

Purpose

To change slave axis' state from disengaged to engaged.

Syntax

```
int HIMC_GearIn(
    int ctrl_id,
    int axis_master_id,
    int axis_slv_id,
    double gear_ratio
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_master_id [in]	Master axis index.
axis_slv_id [in]	Slave axis index.
gear_ratio [in]	Value of gear ratio.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function is applicable only when both axes are enabled.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GearIn
LabVIEW	HIMC Gear In.vi
Python	GearIn

4.5 HIMC_GearOut

Purpose

To change slave axis' state from engaged to disengaged.

Syntax

```
int HIMC_GearOut(
    int ctrl_id,
    int axis_slv_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_slv_id [in] Slave axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GearOut
LabVIEW	HIMC Gear Out.vi
Python	GearOut

4.6 HIMC_GetGearRatio

Purpose

To get the gear ratio of slave axis.

Syntax

```
int HIMC_GetGearRatio(
    int ctrl_id,
    int axis_slv_id,
    double *p_ratio
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_slv_id [in]	Slave axis index.
p_ratio [out]	A pointer to the buffer to receive the gear ratio of slave axis.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGearRatio
LabVIEW	HIMC Get Gear Ratio.vi
Python	GetGearRatio

4.7 HIMC_IsInGear

Purpose

To query whether the slave axis is at the “engaged” state.

Syntax

```
int HIMC_IsInGear(
    int ctrl_id,
    int axis_id,
    int *p_is_in_gear
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_in_gear [out]	A pointer to the buffer to receive the engaged status of slave axis. If the slave axis is at the “InGear” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsInGear
LabVIEW	HIMC Is In Gear.vi
Python	IsInGear

4.8 HIMC_IsGearMaster

Purpose

To query whether the axis is master axis.

Syntax

```
int HIMC_IsGearMaster(
    int ctrl_id,
    int axis_id,
    int *p_is_gear_master
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_gear_master [out]	A pointer to the buffer to receive the status of whether the axis is master axis. If the axis is at the “GearMaster” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsGearMaster
LabVIEW	HIMC Is Gear Master.vi
Python	IsGearMaster

4.9 HIMC_IsGearSlave

Purpose

To query whether the axis is slave axis.

Syntax

```
int HIMC_IsGearSlave(
    int ctrl_id,
    int axis_id,
    int *p_is_gear_slv
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_gear_slv [out]	A pointer to the buffer to receive the status of whether the axis is slave axis. If the axis is at the “GearSlave” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsGearSlave
LabVIEW	HIMC Is Gear Slave.vi
Python	IsGearSlave

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5. Gantry functions

5. Gantry functions 5-1
5.1 Overview 5-2
5.2 HIMC_EnableGantryPair 5-3
5.3 HIMC_DisableGantryPair 5-4
5.4 HIMC_GetGantryPairID 5-5
5.5 HIMC_IsGantryPair 5-6

5.1 Overview

The gantry configuration transforms a pair of right-hand-side (RHS) axis and left-hand-side (LHS) axis into a pair of imaginary linear axis and yaw axis, as Figure 5.1.1 shows. After establishing gantry configuration, users can give RHS axis a linear-axis-direction command to drive both RHS and LHS axes in the same direction, and give LHS axis a rotary motion command of yaw-axis-direction.

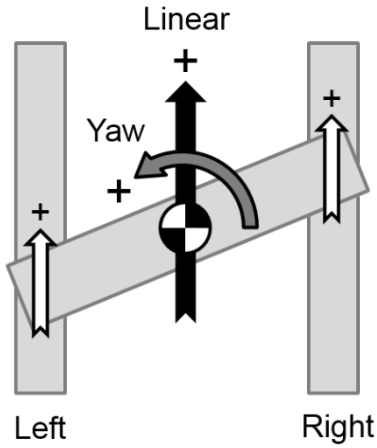


Figure 5.1.1

In gantry configuration, linear axis' and yaw axis' position feedback are defined as follows.

$$Pos_{linear} = \frac{Pos_{RHS} + Pos_{LHS}}{2}; \qquad Pos_{yaw} = \frac{Pos_{RHS} - Pos_{LHS}}{2}$$

Pos_{linear}	: Linear axis' position feedback	Pos_{yaw}	: Yaw axis' position feedback
Pos_{RHS}	: RHS axis' position feedback	Pos_{LHS}	: LHS axis' position feedback

Figure 5.1.2 is a position feedback schematic of linear axis, yaw axis, RHS axis and LHS axis.

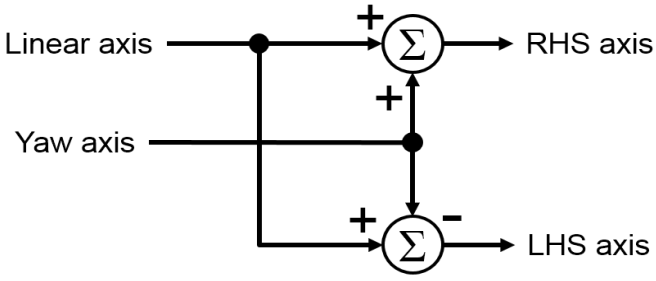


Figure 5.1.2

5.2 HIMC_EnableGantryPair

Purpose

To set up a gantry pair.

Syntax

```
int HIMC_EnableGantryPair(
    int ctrl_id,
    int lhs_axis_id,
    int rhs_axis_id
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
lhs_axis_id [in]	Left-hand-side axis index.
rhs_axis_id [in]	Right-hand-side axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function is applicable only when both axes are disabled.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_EnableGantryPair
LabVIEW	HIMC Enable Gantry Pair.vi
Python	EnableGantryPair

5.3 HIMC_DisableGantryPair

Purpose

To split a gantry pair.

Syntax

```
int HIMC_DisableGantryPair(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Either axis index in a gantry pair.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function is applicable only when both axes are disabled.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_DisableGantryPair
LabVIEW	HIMC Disable Gantry Pair.vi
Python	DisableGantryPair

5.4 HIMC_GetGantryPairID

Purpose

To get the gantry pair ID of any gantry axis.

Syntax

```
int HIMC_GetGantryPairID(
    int ctrl_id,
    int axis_id,
    int *p_id
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Either axis index in a gantry pair.
p_id [out]	A pointer to the buffer to receive the gantry pair ID. If the input axis is not gantry axis, it will be -1.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetGantryPairID
LabVIEW	HIMC Get Gantry Pair ID.vi
Python	GetGantryPairID

5.5 HIMC_IsGantryPair

Purpose

To query whether the two axes are a gantry pair.

Syntax

```
int HIMC_IsGantryPair(
    int ctrl_id,
    int axis_id_1,
    int axis_id_2,
    int *p_is_gantry_pair
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id_1 [in]	Axis index 1.
axis_id_2 [in]	Axis index 2.
p_is_gantry_pair [out]	A pointer to the buffer to receive the status of whether the two axes are a gantry pair. If the two axes are at the “GantryPair” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsGantryPair
LabVIEW	HIMC Is Gantry Pair.vi
Python	IsGantryPair

6. Group functions

6. Group functions 6-1
6.1 Overview 6-3
6.1.1 Group variables 6-6
6.1.2 Coordinate systems 6-9
6.1.3 Kinematics 6-13
6.1.4 Buffer modes 6-13
6.1.5 Transition modes 6-16
6.2 Group motion control 6-18
6.2.1 HIMC_EnableGroup 6-18
6.2.2 HIMC_DisableGroup 6-19
6.2.3 HIMC_ResetGroup 6-20
6.2.4 HIMC_StopGroup 6-21
6.2.5 HIMC_HaltGroup 6-22
6.2.6 HIMC_ResumeGroup 6-23
6.2.7 HIMC_JogGroup 6-24
6.2.8 HIMC_JogGroupAxis 6-25
6.2.9 HIMC_LineAbs2D 6-26
6.2.10 HIMC_LineAbs3D 6-27
6.2.11 HIMC_LineRel2D 6-28
6.2.12 HIMC_LineRel3D 6-29
6.2.13 HIMC_Arc2D 6-30
6.2.14 HIMC_ArcCW2D 6-32
6.2.15 HIMC_ArcCCW2D 6-33
6.2.16 HIMC_ArcAngle2D 6-34
6.2.17 HIMC_Circle2D 6-36
6.3 Group setting 6-38
6.3.1 HIMC_AddAxesToGrp 6-38
6.3.2 HIMC_RemoveAxisFromGrp 6-39
6.3.3 HIMC_SetupGroup 6-40
6.3.4 HIMC_UngrpAllAxes 6-41
6.3.5 HIMC_GetGroupID 6-42
6.3.6 HIMC_SetGrpMotionProfile 6-43
6.3.7 HIMC_SetGrpAngMotionProfile 6-45
6.3.8 HIMC_GetGrpKin 6-47
6.3.9 HIMC_SetGrpKin 6-48
6.3.10 HIMC_GetGrpMaxVel 6-49

6.3.11 HIMC_SetGrpVel ... 6-50
6.3.12 HIMC_GetGrpMaxAcc ... 6-51
6.3.13 HIMC_SetGrpAcc ... 6-52
6.3.14 HIMC_SetGrpAccTime ... 6-53
6.3.15 HIMC_GetGrpMaxDec ... 6-54
6.3.16 HIMC_SetGrpDec ... 6-55
6.3.17 HIMC_SetGrpDecTime ... 6-56
6.3.18 HIMC_GetGrpSMTime ... 6-57
6.3.19 HIMC_SetGrpSMTime ... 6-58
6.3.20 HIMC_GetGrpCoordSys ... 6-59
6.3.21 HIMC_SetGrpCoordSys ... 6-60
6.3.22 HIMC_GetGrpBufferMode ... 6-61
6.3.23 HIMC_SetGrpBufferMode ... 6-62
6.3.24 HIMC_GetGrpTransMode ... 6-63
6.3.25 HIMC_SetGrpTransMode ... 6-64
6.3.26 HIMC_SetGrpTransPrm ... 6-65
6.3.27 HIMC_GetGrpCmdNum ... 6-67
6.3.28 HIMC_SetGrpVelScale ... 6-68
6.3.29 HIMC_GetGrpVelScale ... 6-69
6.3.30 HIMC_GetGrpCoordTrans ... 6-70
6.3.31 HIMC_SetGrpCoordTrans ... 6-71
6.3.32 HIMC_GetGrpPoseCmd ... 6-72
6.3.33 HIMC_GetGrpPoseFb ... 6-73
6.3.34 HIMC_SetGrpLookAheadPrm ... 6-74
6.3.35 HIMC_SetGrpQueueSize ... 6-75
6.4 Group status ... 6-76
6.4.1 HIMC_IsGrpEnabled ... 6-76
6.4.2 HIMC_IsGrpMoving ... 6-77
6.4.3 HIMC_IsGrpInPos ... 6-78
6.4.4 HIMC_IsGrpErrorStop ... 6-79
6.5 Advanced group motion control ... 6-80
6.5.1 HIMC_LineAbs ... 6-80
6.5.2 HIMC_LineRel ... 6-82
6.5.3 HIMC_CircleAbs ... 6-84
6.5.4 HIMC_CircleRel ... 6-86

6.1 Overview

HIMC provides axis group motion commands of multi-axis linear and circular simultaneous interpolation function, including LineAbs2D / 3D, LineRel2D / 3D, Arc2D, Circle2D, etc. Compared with axis motion commands, axis group motion commands ensure the synchronization of each axis in the group. The start time and the stop time of each axis motion are the same, and the controller will adjust the motion velocity of each axis based on the reference velocity given by users. The basic function of HIMC controller supports up to 4 axes for axis group motion commands (product model: MC-XX-XX-XX-00). If there is a need for 5-axis (or above axes') simultaneous machining for axis group motion function, please contact HIWIN Mikrosystem or local distributors for further information.

Figure 6.1.1 is the parameter flow diagram of HIMC axis group motion command. As the position feedback of each axis goes through the calculation of forward kinematics, axis group's position feedback in machine coordinate system (Cartesian Position Feedback) will be obtained. Based on the target command given by users, controller will plan the interpolation command in space (Cartesian Position Command) due to axis group's motion profile (as Figure 6.1.2 shows), and calculate the corresponding position command of each axis with inverse kinematics.

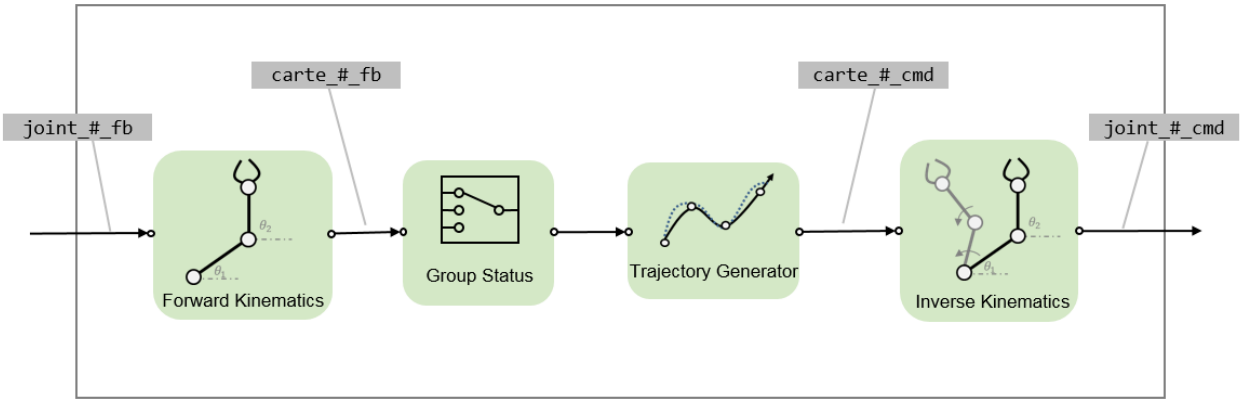


Figure 6.1.1

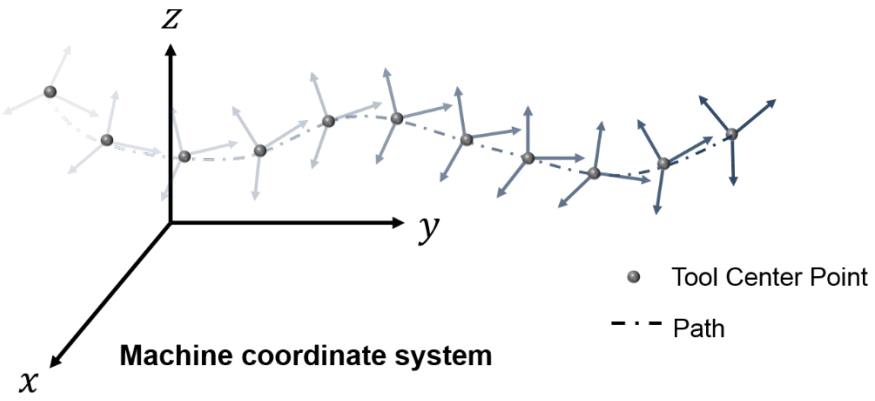


Figure 6.1.2

In axis group motion commands, HIMC will calculate the moving distance of each segment in space. Different from axis motion commands, the velocity planning is planned along axis group's moving direction in space, and the moving direction will change based on the direction of moving command.

Axis group motion commands are similar to axis motion commands (Refer to chapter 3); it also adopts S-Curve velocity planning, as Figure 6.1.3 shows. Axis group motion in space consists of two parts, translation and rotation. Translation command consists of the position commands of XYZ, while rotation command consists of the rotation commands of ABC. With axis group, users can set velocity planning parameters of translation and rotation, including profile generator's maximum velocity, maximum acceleration, maximum deceleration and smooth time.

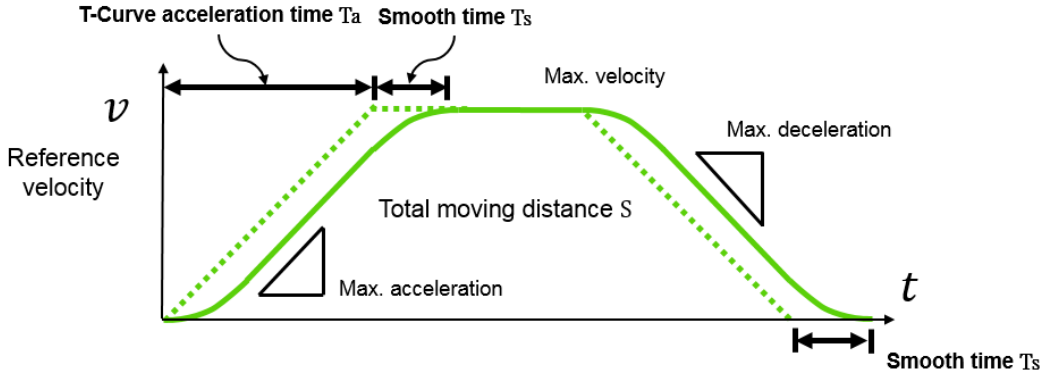


Figure 6.1.3

Each axis group motion command will be viewed as one segment, as Figure 6.1.4 shows. During the motion, based on the translation command and rotation command of each segment as well as the velocity planning parameters set by users, HIMC will calculate the move time of translation command and rotation command. The velocity planning parameters of the longer move time will be viewed as the feed rate of axis group. As for the shorter move time, it will move according to the motion command apportioned by the feed rate command.

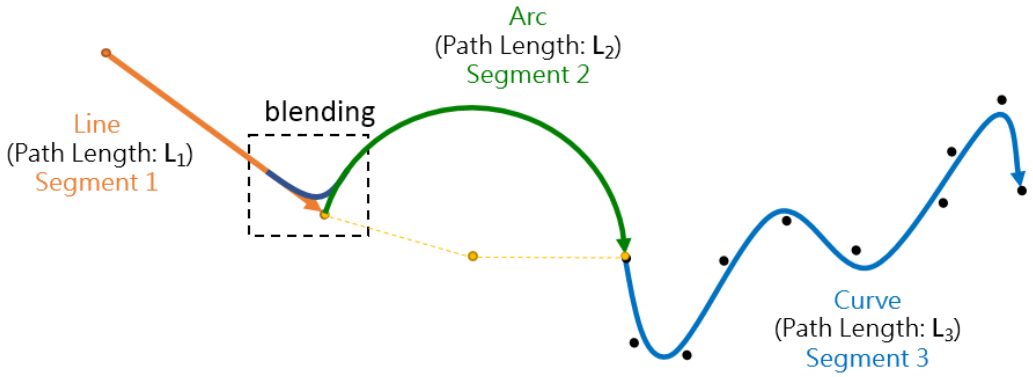


Figure 6.1.4

In HIMC, there is a built-in buffer for axis group commands. The segment of each motion command will be placed in this buffer; up to 512 motion commands can be accepted at the same time. Motion commands larger than this capacity limit will be discarded by the controller, and an error message will be displayed. Between the motion commands of segments, velocity and path will be planned based on the buffer mode and transition mode set by users. The planned velocity and path may change due to the selected mode. Take Figure 6.1.4 as an example, if buffer modes are used to set the velocity handover of each segment, the total length of this axis motion will be "$S = L_1(Line) + L_2(Arc) + L_3(Curve)$". Refer to section 6.1.4 and 6.1.5 for details.

Axis group motion status is similar to axis motion status; it can also be divided into "moving" and "in-positiion". During the motion, there are three phases like Figure 3.1.4 shown, including:

1. Axis group is moving and not in-position.
2. Axis group is not moving but not in-position.
3. Axis group is not moving and in-position.

Unlike axis motion command using target radius and debounce time to check whether the axis is in-position, axis group motion command checks whether all axes in the group are in-position. That is, if the axis group is in-position, all axes in the group are at the "in-position" state.

6.1.1 Group variables

Axis group variables are divided into three categories, motion command variables, profile generator variables and status variables. Users can select the desired variables via Scope Manager in iA Studio (refer to section 4.8 in “iA Studio User Guide”). Detailed descriptions are shown in Table 6.1.1.1 to Table 6.1.1.5.

Table 6.1.1.1 Motion command variables for axis group

Name	Variable	Unit	Description
Cartesian Position Command	carte_pose_cmd	mm or deg	Space position command for axis group in machine coordinated system (MCS). It is an array containing the value of [X Y Z A B C].
Cartesian Velocity Command	carte_vel_cmd	mm/s or deg/s	Space velocity command for axis group in machine coordinated system (MCS). It is an array containing the value of [X Y Z A B C].
Cartesian Position Feedback	carte_pose_fb	mm or deg	Space position feedback for axis group in machine coordinated system (MCS). It is an array containing the value of [X Y Z A B C].
Axis Position Command	joint_pos_cmd	mm or deg	Axis position command for axis group in axis coordinate system (ACS). It is an array.
Axis Velocity Command	joint_vel_cmd	mm/s or deg/s	Axis velocity command for axis group in axis coordinate system (ACS). It is an array.
Axis Acceleration Command	joint_acc_cmd	mm/s^2 or deg/s^2	Axis acceleration command for axis group in axis coordinate system (ACS). It is an array.
Axis Position Feedback	joint_pos_fb	mm or deg	Axis position feedback for axis group in axis coordinate system (ACS). It is an array.
Cartesian Position Error	carte_pose_err	mm or deg	Space position error for axis group in machine coordinated system (MCS). It is an array containing the value of [X Y Z A B C].
Reference Group Position	grp_pg_pos	mm or deg	Reference position for axis group. It is the position set-point generated from the profile generator according to axis group command’s motion profile.
Reference Group Velocity	grp_pg_vel	mm/s or deg/s	Reference velocity for axis group. It is the velocity set-point generated from the profile generator according to axis group command’s motion profile.
Reference Group Acceleration	grp_pg_acc	mm/s^2 or deg/s^2	Reference acceleration for axis group. It is the acceleration set-point generated from the profile generator according to axis group command’s motion profile.

Table 6.1.1.2 Profile generator variables for axis group

Name	Variable	Unit	Description
Group Max. Linear Profile Velocity	grp_lin_vel	mm/s	Maximum linear profile velocity for axis group. Not necessarily reached.
Group Max. Linear Profile Acceleration	grp_lin_acc	mm/s^2	Maximum linear profile acceleration for axis group. Not necessarily reached.
Group Max. Linear Profile Deceleration	grp_lin_dec	mm/s^2	Maximum linear profile deceleration for axis group. Not necessarily reached.
Group Linear Smooth Time	grp_lin_sf	ms	Linear profile smooth time for axis group. Its input range is from 0 to 500. Increasing the value can reduce mechanical vibration during motion, but the total motion time will be affected.
Group Max. Angular Profile Velocity	grp_ang_vel	deg/s	Maximum angular profile velocity for axis group. Not necessarily reached.
Group Max. Angular Profile Acceleration	grp_ang_acc	deg/s^2	Maximum angular profile acceleration for axis group. Not necessarily reached.
Group Max. Angular Profile Deceleration	grp_ang_dec	deg/s^2	Maximum angular profile deceleration for axis group. Not necessarily reached.
Group Angular Smooth Time	grp_ang_sf	ms	Angular profile smooth time for axis group. Its input range is from 0 to 500. Increasing the value can reduce mechanical vibration during motion, but the total motion time will be affected.

Table 6.1.1.3 Status variables for axis group

Name	Variable	Unit	Description
Group Fault Status	grp_fault_status	N/A	Error status of axis group; refer to Table 6.1.1.4 for bit definition.
Group Motion Status	grp_motion_status	N/A	Motion status of axis group; refer to Table 6.1.1.5 for bit definition.

Table 6.1.1.4 Bit definition for axis group error status

Bit	Name	Description	Default Response
0	Error Stop	Axis group at “error stop” state	N/A
1	Axis Fault	Slave drive fault	Controller disables the axis; axis group is out of sync.
2	Software Limit	Axis software limit triggered	Controller stops the motion; axis group is out of sync.

Table 6.1.1.5 Bit definition for axis group motion status

Bit	Name	Description	Remark
0	Enabled	The axis group is enabled.	N/A
1	Moving	The axis group is moving.	N/A
2	In Position	The axis group is in-position.	All the axes in the axis group are in-position.
3	Input Shape	Enable axis group’s Input Shape filter.	Refer to section 13.1.

6.1.2 Coordinate systems

Table 6.1.2.1 shows the definition and description of HIMC's coordinate systems, including Axis Coordinate System (ACS), Machine Coordinate System (MCS), Product Coordinate System (PCS), Workpiece Coordinate System (WCS), Global Coordinate System and Coordinate Offset.

Table 6.1.2.1

HMPL definition	Description
CS_ACS	Axis Coordinate System. It is related to the motion of individual motors.
CS_MCS	Machine Coordinate System. (Sometimes called "World Coordinate System" or "Base Coordinate System") It is a coordinate system with a fixed origin on the machine, and it is linked to ACS via kinematics transformation (refer to section 6.1.3). It has 6 dimensions in total to indicate the position and orientation in space (3 translational, 3 rotational).
CS_PCS	Product Coordinate System (or "Program Coordinate System" in CNC program). It is attached to the product or the workpiece, and it can set coordinate transformation parameters.
CS_WCS# (#=1~15)	Workpiece Coordinate System. It is used to set workpiece zero point, and it provides up to 15 independent workpiece coordinate systems. The default is no offset. It depends on Product Coordinate System, so it can set coordinate transformation parameters.
CS_GLOBAL	Global Coordinate System. It is used to set global zero point, and it can establish the global spatial relationship of each axis group. Not supported yet.
CS_OFFSET	Coordinate Offset. It is used to set temporary zero point. The default is no offset, that is, the coordinate origin of offset is the coordinate origin of machine. It depends on Product Coordinate System, so it can set coordinate transformation parameters.

Figure 6.1.2.1 shows an example of the relationship among ACS, MCS and PCS for a SCARA robot with two rotary axes. ACS and MCS are transformed through forward and inverse kinematics (refer to section 6.1.3). On the other hand, there is a coordinate transformation relationship between MCS and PCS. The position on the coordinate system is obtained through the translation and the rotation of the coordinate.

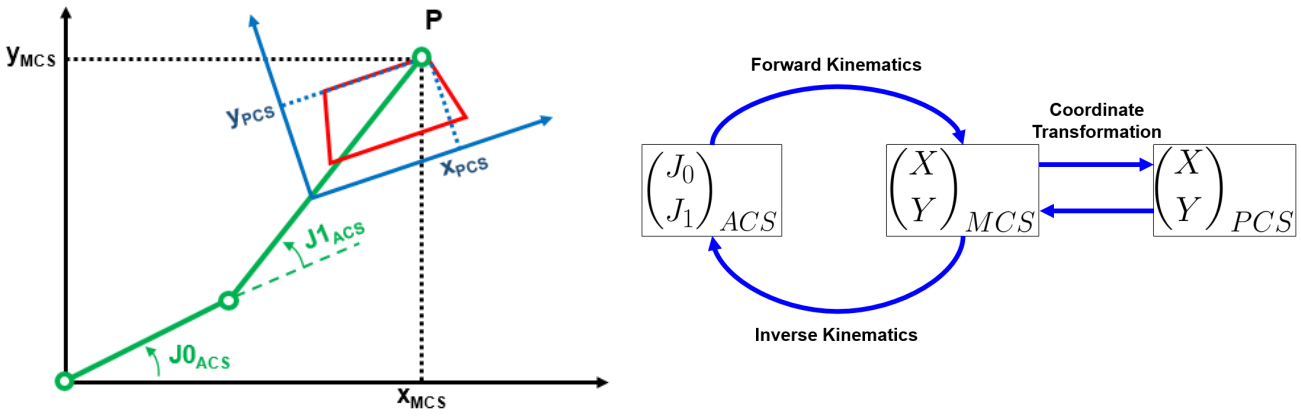


Figure 6.1.2.1

When transforming MCS into PCS, HIMC can set machine's workpiece coordinate (WCS1~15) and coordinate offset (OFFSET) based on requirement. For the setting of coordinate system, 3 translational degrees of freedom (X, Y, Z) and 3 rotational degrees of freedom (A, B, C) are used to indicate the pose in space.

HIMC adopts the "Roll-Pitch-Yaw" rotation convention in fixed angle. As Figure 6.1.2.2 shows, the degree of freedom to rotate along the X axis is **Roll**, angle **A**; the degree of freedom to rotate along the Y axis is **Pitch**, angle **B**; the degree of freedom to rotate along the Z axis is **Yaw**, angle **C**. This rotation convention is the same as using the sequence of ZYX in Tait-Bryan angles to indicate the orientation of object in space, as Figure 6.1.2.3 shows.

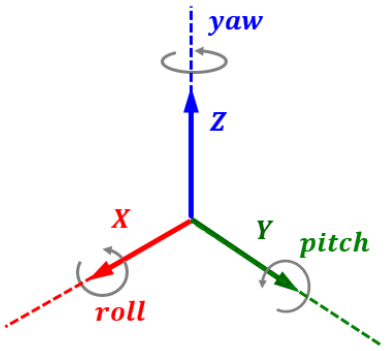


Figure 6.1.2.2

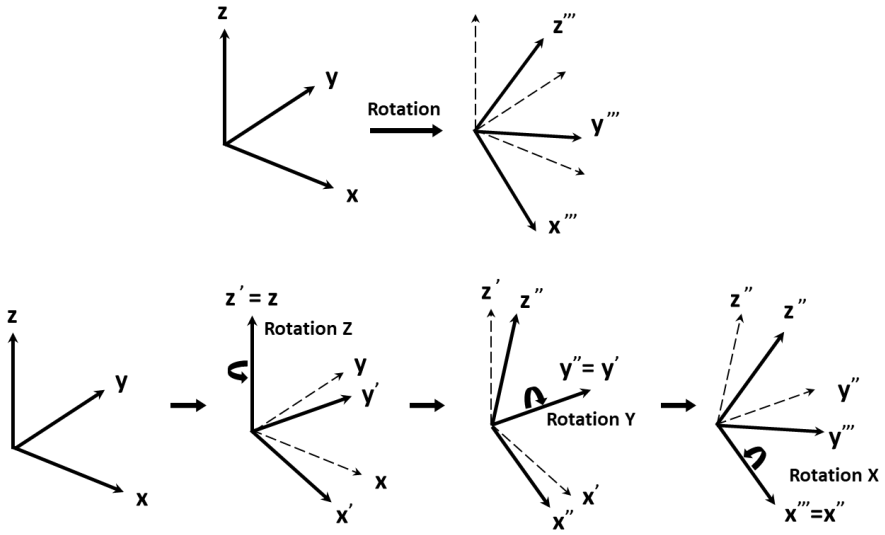


Figure 6.1.2.3

If there is no coordinate offset, the relationship between each WCS and MCS is shown in Figure 6.1.2.4.

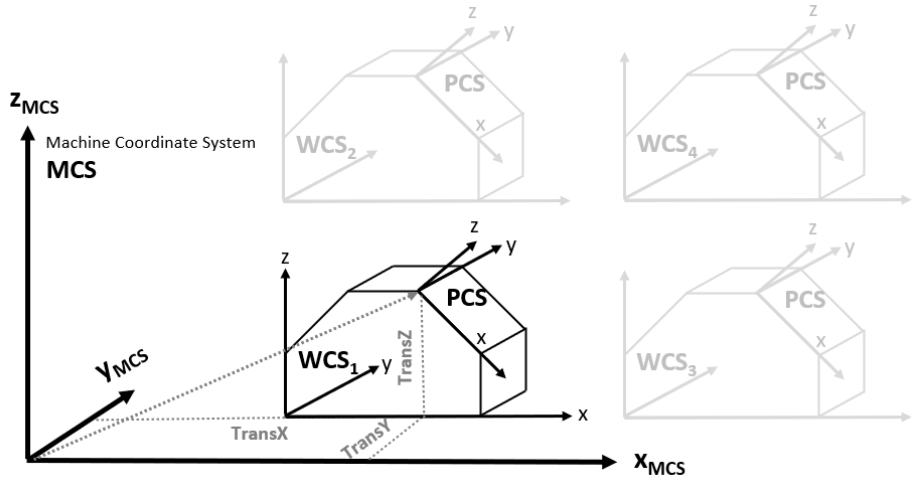


Figure 6.1.2.4

If coordinate offset is added, the relationship between WCS and MCS is shown in Figure 6.1.2.5. The transformation of coordinate offset will be added.

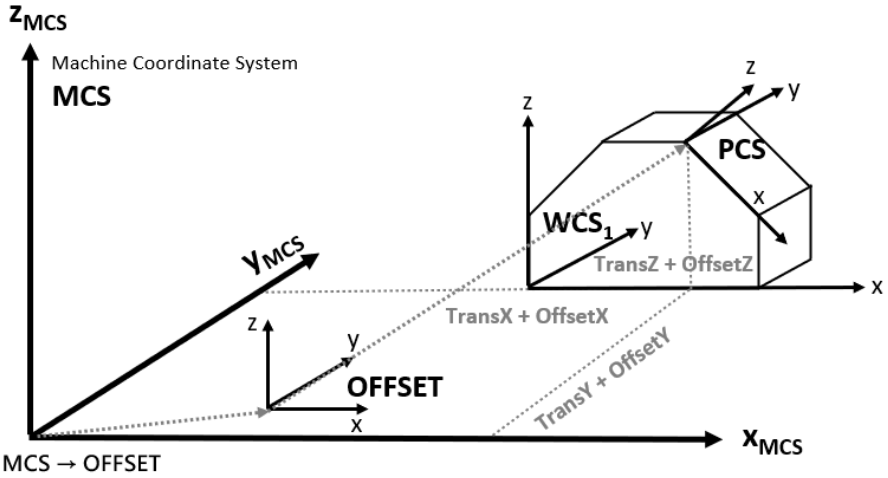


Figure 6.1.2.5

Based on the functions mentioned above, users can define the parameters for coordinate transformation in HIMC and establish the transformation relationship among the coordinate systems. Figure 6.1.2.6 shows the relationship among the coordinate systems. To help users understand easily, the figure only shows the coordinate of XY plane. In actual application, users can set 6 degrees of freedom (X, Y, Z, A, B, C) for coordinate transformation.

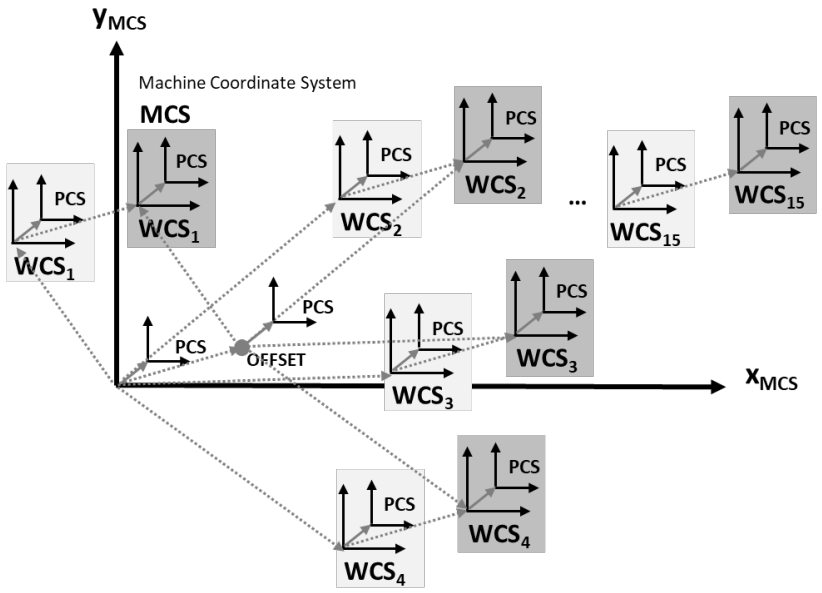


Figure 6.1.2.6

6.1.3 Kinematics

Kinematics mainly deals with the transformation between ACS (Axis Coordinate System) and MCS (Machine Coordinate System). Forward kinematics is the calculation from each axis' position feedback in ACS to the coordinate position of MCS. On the contrary, inverse kinematics is the calculation from coordinate position of MCS to each axis' position in ACS. Table 6.1.3.1 shows the definition of kinematics configuration provided by HIMC.

Table 6.1.3.1

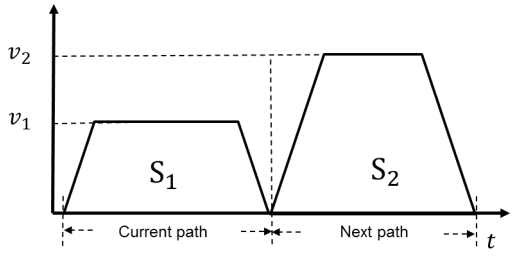
ID	Name	Description
1	Cartesian	Map each axis in the coordinated motion group to X, Y, Z, A, B, C axis of Cartesian coordinate respectively. The maximum allowable number of axes in joint space is 6. (Default for axis group)
2	SCARA	(Not supported)
3	WAFER	(Not supported)
4	6-Axis Articulated Robot	(Not supported)

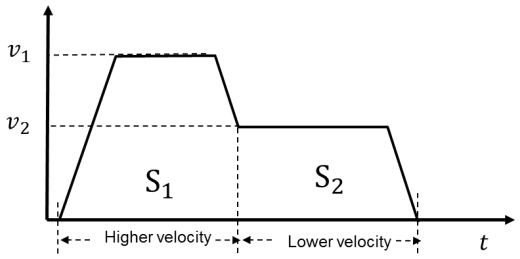
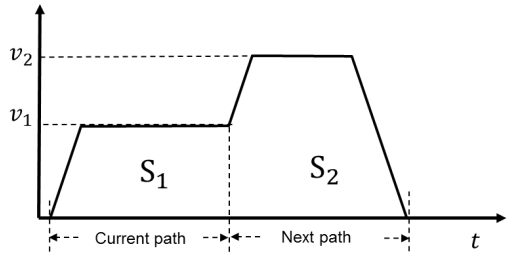
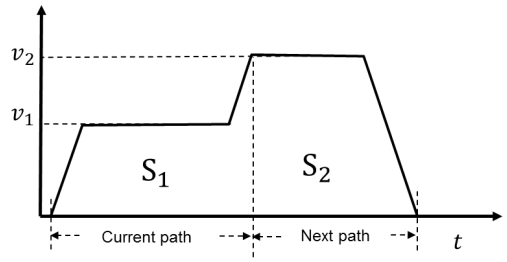
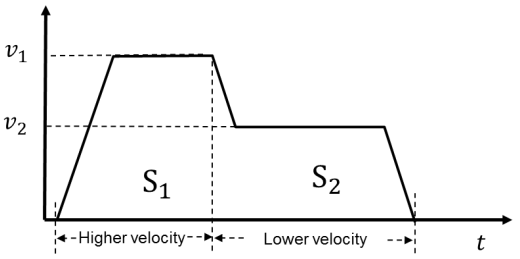
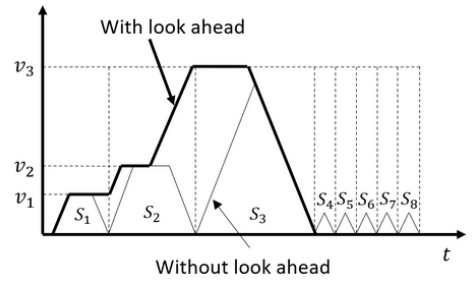
6.1.4 Buffer modes

Buffer mode determines the velocity profile at the end-points of adjacent paths. Users can use this setting to plan the profile velocity of two adjacent paths. Table 6.1.4.1 shows the definition of buffer modes provided by HIMC.

Note: If the axis group does not receive the command of next path before the current path is in-position, the buffer mode function will be ignored.

Table 6.1.4.1

API definition	Description
`kBM_Aborting`	Abort the ongoing motion and immediately start the next one.
`kBM_Buffered`	Start next path after current path is done. 

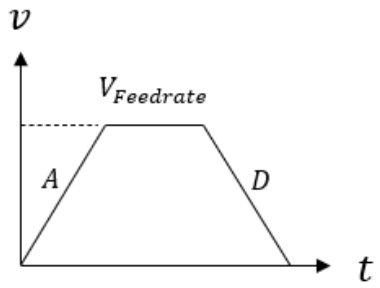
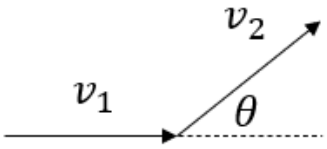
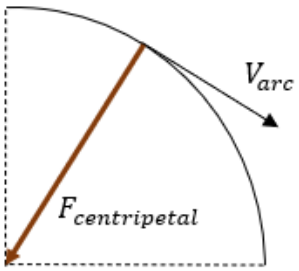
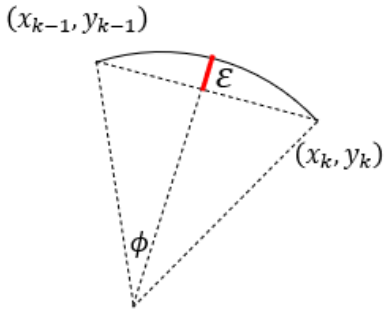
kBM_BlendingLow	The velocity is blended with the lower velocity between the two paths. (Blending) 
kBM_BlendingPrevious	The velocity is blended with current path's velocity. (Blending) 
kBM_BlendingNext	The velocity is blended with next path's velocity. (Blending) 
kBM_BlendingHigh	The velocity is blended with the higher velocity between the two paths. (Blending) 
kBM_LookAhead	The controller determines the velocity based on the moving distance calculated by the look ahead function and the given constraints. 

Look Ahead Motion

The look ahead function is the motion command of the controller in the axis group commands buffer. By looking ahead, it calculates the moving distance of the motion command. Additionally, it carry out the acceleration/deceleration motion for the turning point on the motion path in advance according to the acceleration limit of the mechanism. Table 6.1.4.2 illustrates the velocity parameters calculated by the look ahead motion function during motion:

(a) Feed rate ($V_{Feedrate}$): Velocity conditions for axis group commands.
(b) Corner velocity (V_{corner}): It is calculated based on the limitation of corner acceleration (A_{corner}) set by the user and the angle between the direction of motion. The default limited value for corner acceleration is 5000 mm/s^2.
(c) Arc velocity (V_{arc}): It is calculated based on the limitation of arc acceleration (A_{arc}) set by the user. The default value for arc acceleration is 100 mm/s^2.
(d) Max. chord error velocity (V_{chord}): It is calculated based on the condition of chord error (ε) set by the user. The default value for chord error, which is 0, will not be used.

Table 6.1.4.2

	
(a) Feed rate $V_{Feedrate}$	(b) Corner velocity $V_{corner} = \frac{A_{corner} * \Delta T}{1 - cos\theta}$
	
(c) Arc velocity $V_{arc} = \sqrt{A_{arc} * r}$	(d) Max. chord error velocity $V_{chord} = \frac{2 * r * \phi}{\Delta T}$

When using look ahead motion, the more instructions there are in the command buffer, the more calculation time of the controller's motion core it cost, and an MCK Overload error message may appear. In this case, the error can be eliminated by increasing the communication cycle or reducing the buffer size.

6.1.5 Transition modes

Transition mode determines the type of the transition curve between adjacent paths, as shown in table 6.1.5.1. With this setting, the controller will do the calculation of corner smoothing between the former and the latter motion commands based on the mode and parameter set by users, which will determine the start point and end point of the smooth path and produce the results with its buffer mode and motion profile (refer to table 6.1.5.2). Please note that this planning method will affect the original motion profile.

Table 6.1.5.1

API definition	Description
`KTM_None`	None: Insert no transition curve. (default mode)
`kTM_StartVelocity` (Not supported)	Use velocity parameter as the start velocity of the transition path. This function has not been supported yet.
`kTM_Velocity`	Use velocity parameter as the constant velocity of the transition path.
`kTM_CornerDistance`	Use the distance parameter to set the distance from the start point of the smooth transition path to corner.
`kTM_MaxCornerDeviation`	Use the deviation parameter to determine the maximum deviation between the smooth transition path and the original path.
`kTM_MaxCornerCurvature`	Use the curvature parameter to determine the maximum curvature value of the transition path.

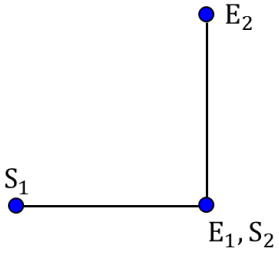
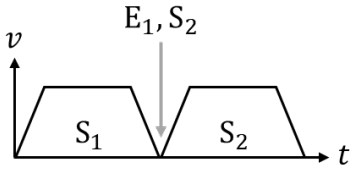
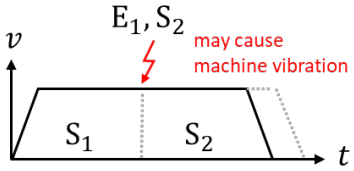
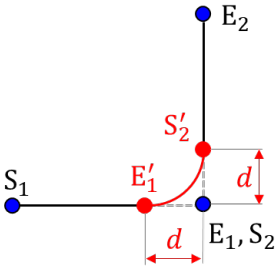
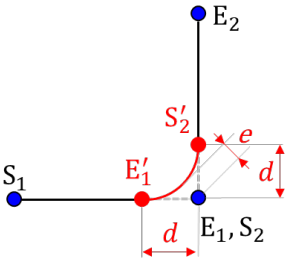
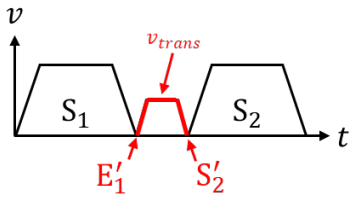
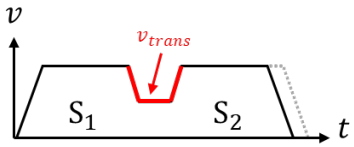
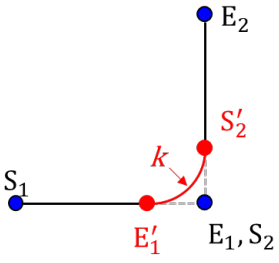
Note:

(1) If the trim range calculated by transition mode exceeds the length of any segment, the function of transition mode between the segments will be ignored.

(2) Refer to section 6.3.26 for the setting of transition mode's parameters.

(3) The behavior of `kTM_Velocity` and `kTM_CornerDistance` are the same.

Table 6.1.5.2 Buffer modes and transition modes

Transition modes	Trajectory of TCP	Speed of TCP	
		kBM_Buffered	Others
kTM_None			
kTM_StartVelocity kTM_CornerDistance	 d = trans_dis		
kTM_MaxCornerDeviation	 d = trans_dis e = trans_dev	 v_{trans} = trans_vel	 v_{trans} = trans_vel
kTM_MaxCornerCurvature	 k = trans_curv		

6.2 Group motion control

6.2.1 HIMC_EnableGroup

Purpose

To enable an axis group.

Syntax

```
int HIMC_EnableGroup(
    int ctrl_id,
    int group_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

All the axes in the group should be enabled before executing this function.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_EnableGroup
LabVIEW	HIMC Enable Group.vi
Python	EnableGroup

6.2.2 HIMC_DisableGroup

Purpose

To disable an axis group.

Syntax

```
int HIMC_DisableGroup(
    int ctrl_id,
    int group_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_DisableGroup
LabVIEW	HIMC Disable Group.vi
Python	DisableGroup

6.2.3 HIMC_ResetGroup

Purpose

To change an axis group's state from "Group Error Stop" to "Group Standby".

Syntax

```
int HIMC_ResetGroup(
    int ctrl_id,
    int group_id
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function can only be used after all errors have been cleared.

Requirement

Minimum supported version	iA Studio 1.3
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_ResetGroup
LabVIEW	HIMC Reset Group.vi
Python	ResetGroup

6.2.4 HIMC_StopGroup

Purpose

To stop the motion of an axis group.

Syntax

```
int HIMC_StopGroup(
    int ctrl_id,
    int group_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

The motion queue of the axis group will be cleared.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_StopGroup
LabVIEW	HIMC Stop Group.vi
Python	StopGroup

6.2.5 HIMC_HaltGroup

Purpose

To halt the motion of an axis group; its velocity will be set as 0.

Syntax

```
int HIMC_HaltGroup(
    int ctrl_id,
    int group_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

If the axis group is not in-position, it will keep moving.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_HaltGroup
LabVIEW	HIMC Halt Group.vi
Python	HaltGroup

6.2.6 HIMC_ResumeGroup

Purpose

To resume the motion of an axis group from “halt” status.

Syntax

```
int HIMC_ResumeGroup(
    int ctrl_id,
    int group_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ResumeGroup
LabVIEW	HIMC Resume Group.vi
Python	ResumeGroup

6.2.7 HIMC_JogGroup

Purpose

To make an axis group start a never-ending motion at a specific velocity in the designated direction of machine coordinate system.

Syntax

```
int HIMC_JogGroup(
    int    ctrl_id,
    int    group_id,
    int    carte_dir,
    double jog_vel
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

carte_dir [in] The direction of motion in the machine coordinate system.
The number 0 ~ 5 orderly repersents 6-DOF {X, Y, Z, A, B, C} in the machine coordinate system.

jog_vel [in] The value of a specific velocity.
Its positive / negative value represents the same / reverse direction movement of the direction of motion.
Parameter unit: mm/s or deg/s

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.4
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_JogGroup
LabVIEW	HIMC Jog Group.vi
Python	JogGroup

6.2.8 HIMC_JogGroupAxis

Purpose

To make the specific axis in an axis group start a never-ending motion at a specific velocity in the axis coordinate system.

Syntax

```
int HIMC_JogGroupAxis(
    int    ctrl_id,
    int    group_id,
    int    grp_axis,
    double jog_vel
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

grp_axis [in] Axis index in the axis group.
The number 0 ~ 8 orderly repersents the sequence that each axis is added to the axis group.

jog_vel [in] The value of a specific velocity.
Its positive / negative value represents the same / reverse direction movement of the direction of motion.
Parameter unit: mm/s or deg/s

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.4
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_JogGroupAxis
LabVIEW	HIMC Jog Group Axis.vi
Python	JogGroupAxis

6.2.9 HIMC_LineAbs2D

Purpose

To command an interpolated, two-dimensional linear movement on an axis group toward an absolute target position in the machine coordinate system.

Syntax

```
int HIMC_LineAbs2D(
    int    ctrl_id,
    int    group_id,
    double end_x,
    double end_y
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
end_x [in]	The value of the absolute target position in X coordinate.
end_y [in]	The value of the absolute target position in Y coordinate.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_LineAbs2D
LabVIEW	HIMC Line Abs2D.vi
Python	LineAbs2D

6.2.10 HIMC_LineAbs3D

Purpose

To command an interpolated, three-dimensional linear movement on an axis group toward an absolute target position in the machine coordinate system.

Syntax

```
int HIMC_LineAbs3D(
    int    ctrl_id,
    int    group_id,
    double end_x,
    double end_y,
    double end_z
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
end_x [in]	The value of the absolute target position in X coordinate.
end_y [in]	The value of the absolute target position in Y coordinate.
end_z [in]	The value of the absolute target position in Z coordinate.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_LineAbs3D
LabVIEW	HIMC Line Abs3D.vi
Python	LineAbs3D

6.2.11 HIMC_LineRel2D

Purpose

To command an interpolated, two-dimensional linear movement on an axis group toward a relative position in the machine coordinate system.

Syntax

```
int HIMC_LineRel2D(
    int    ctrl_id,
    int    group_id,
    double distance_x,
    double distance_y
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
distance_x [in]	The value of the relative distance in X coordinate.
distance_y [in]	The value of the relative distance in Y coordinate.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_LineRel2D
LabVIEW	HIMC Line Rel2D.vi
Python	LineRel2D

6.2.12 HIMC_LineRel3D

Purpose

To command an interpolated, three-dimensional linear movement on an axis group toward a relative position in the machine coordinate system.

Syntax

```
int HIMC_LineRel3D(
    int    ctrl_id,
    int    group_id,
    double distance_x,
    double distance_y,
    double distance_z
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
distance_x [in]	The value of the relative distance in X coordinate.
distance_y [in]	The value of the relative distance in Y coordinate.
distance_z [in]	The value of the relative distance in Z coordinate.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_LineRel3D
LabVIEW	HIMC Line Rel3D.vi
Python	LineRel3D

6.2.13 HIMC_Arc2D

Purpose

To command an interpolated, two-dimensional circular movement on an axis group toward an absolute target position in the machine coordinate system.

Syntax

```
int HIMC_Arc2D(
    int    ctrl_id,
    int    group_id,
    double border_x,
    double border_y,
    double end_x,
    double end_y
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
border_x [in]	The value of the absolute border position in X coordinate.
border_y [in]	The value of the absolute border position in Y coordinate.
end_x [in]	The value of the absolute end position in X coordinate.
end_y [in]	The value of the absolute end position in Y coordinate.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

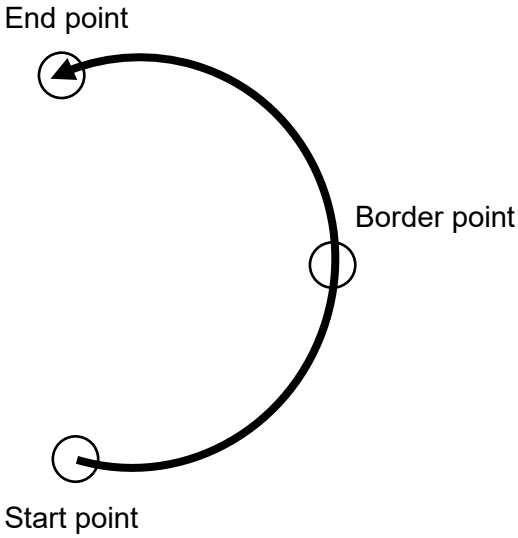
C#	HIMC_Arc2D
LabVIEW	HIMC Arc2D.vi
Python	Arc2D

Advantage

Users can specify the border point (the farthest point in the movement), and make sure that the machine can reach it.

Disadvange

It is restricted to the angle < 2π in a single command.



6.2.14 HIMC_ArcCW2D

Purpose

To command an interpolated, two-dimensional circular movement on an axis group toward an absolute target position in the machine coordinate system clockwise.

Syntax

```
int HIMC_ArcCW2D(
    int    ctrl_id,
    int    group_id,
    double center_x,
    double center_y,
    double end_x,
    double end_y
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
center_x [in]	The value of the absolute center position in X coordinate.
center_y [in]	The value of the absolute center position in Y coordinate.
end_x [in]	The value of the absolute end position in X coordinate.
end_y [in]	The value of the absolute end position in Y coordinate.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ArcCW2D
LabVIEW	HIMC ArcCW2D.vi
Python	ArcCW2D

6.2.15 HIMC_ArcCCW2D

Purpose

To command an interpolated, two-dimensional circular movement on an axis group toward an absolute target position in the machine coordinate system counterclockwise.

Syntax

```
int HIMC_ArcCCW2D(
    int    ctrl_id,
    int    group_id,
    double center_x,
    double center_y,
    double end_x,
    double end_y
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
center_x [in]	The value of the absolute center position in X coordinate.
center_y [in]	The value of the absolute center position in Y coordinate.
end_x [in]	The value of the absolute end position in X coordinate.
end_y [in]	The value of the absolute end position in Y coordinate.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ArcCCW2D
LabVIEW	HIMC ArcCCW2D.vi
Python	ArcCCW2D

6.2.16 HIMC_ArcAngle2D

Purpose

To command an interpolated, two-dimensional circular movement on an axis group toward an absolute target position in the machine coordinate system based on the given angle.

Syntax

```
int HIMC_ArcAngle2D(
    int    ctrl_id,
    int    group_id,
    double center_x,
    double center_y,
    double angle
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
center_x [in]	The value of the absolute center position in X coordinate.
center_y [in]	The value of the absolute center position in Y coordinate.
angle [in]	The angle that start point and end point relative to the absolute center position. It determines the direction and the rotation angle of circular movement. Parameter unit: deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Parameter “angle” represents the direction of circular trajectory’s rotation.

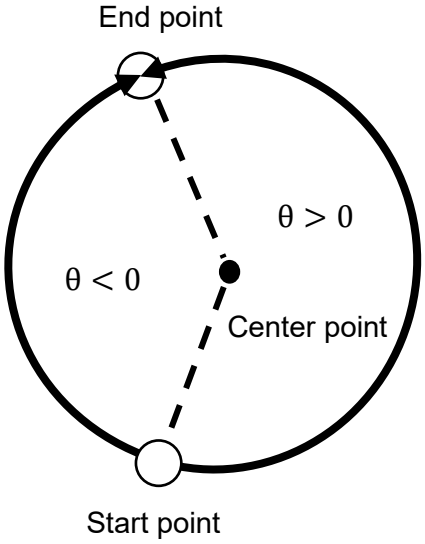
If “angle” > 0, move counterclockwise; if “angle” < 0, move clockwise.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ArcAngle2D
LabVIEW	HIMC Arc Angle2D.vi
Python	ArcAngle2D



The value of θ determines the direction of circular movement.

$\theta > 0$: move counterclockwise

$\theta < 0$: move clockwise

6.2.17 HIMC_Circle2D

Purpose

To command an interpolated, two-dimensional circular movement on an axis group toward an absolute target position in the machine coordinate system.

Syntax

```
int HIMC_Circle2D(
    int    ctrl_id,
    int    group_id,
    double center_x,
    double center_y,
    double end_x,
    double end_y,
    int    turns
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
center_x [in]	The value of the absolute center position in X coordinate.
center_y [in]	The value of the absolute center position in Y coordinate.
end_x [in]	The value of the absolute end position in X coordinate.
end_y [in]	The value of the absolute end position in Y coordinate.
turns [in]	Number of turns of circular path relative to the start point. It determines the direction and the total angle of circular path.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

(1) Parameter “turns” represents the direction of circular trajectory’s rotation.
If “turns” >= 0, move counterclockwise; if “turns” < 0, move clockwise.

(2) When ||turns|| <= 1, the total moving angle of circular trajectory is < 360°.
If the total moving angle of circular trajectory is >= 360° (that is, one turn, or more than one turn), ||turns|| must be >= 2.

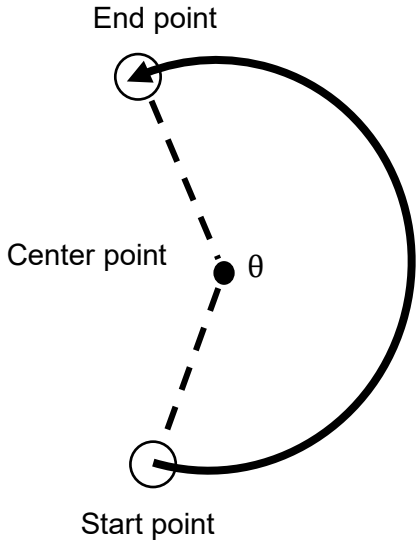
(3) The behavior of “turns = 0” and that of “turns =1” are the same when using this function.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_Circle2D
LabVIEW	HIMC Circle2D.vi
Python	Circle2D



Advantage

No restriction to angles.

Disadvantage

Users cannot specify the border point (the farthest point in the movement). Therefore, the machine may not reach the border point.

The value of turns determines the direction of circular movement. ※ $\text{angle} = \theta + \text{turns} \times 360$

$\text{turns} \geq 0$ indicates C.C.W. direction, while $\text{turns} < 0$ indicates C.W. direction. Note that the movement of $\text{turns} = 0$ is the same as that of $\text{turns} = 1$. The following table takes $\theta = 210°$ for example.

Turns	Calculation	Angle (Degree)
-2	$210 - 2 \times 360°$	$-510°$
-1	$210 - 1 \times 360°$	$-150°$
0	$210 + 0 \times 360°$	$210°$
1	$210 + 0 \times 360°$	$210°$
2	$210 + 1 \times 360°$	$570°$

6.3 Group setting

6.3.1 HIMC_AddAxesToGrp

Purpose

To add axes to an axis group with a specific sequence.

Syntax

```
int HIMC_AddAxesToGrp(
    int ctrl_id,
    int group_id,
    int num_of_axes,
    int *p_axis_list,
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
num_of_axes [in]	Number of axes to be added to an axis group. (Maximum: 9)
p_axis_list [in]	A pointer to the buffer to store the sequence list of axes ID.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_AddAxesToGrp
LabVIEW	HIMC Add Axes To Grp.vi
Python	AddAxesToGrp

6.3.2 HIMC_RemoveAxisFromGrp

Purpose

To remove the last axis from an axis group.

Syntax

```
int HIMC_RemoveAxisFromGrp(
    int ctrl_id,
    int group_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_RemoveAxisFromGrp
LabVIEW	HIMC Remove Axis From Grp.vi
Python	RemoveAxisFromGrp

6.3.3 HIMC_SetupGroup

Purpose

To set up an axis group with a specific sequence.

Syntax

```
int HIMC_SetupGroup(
    int ctrl_id,
    int group_id,
    int num_of_axes,
    int *p_axis_list,
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
num_of_axes [in]	Number of axes. (Maximum: 9)
p_axis_list [in]	A pointer to the buffer to store the sequence list of axes ID.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetupGroup
LabVIEW	HIMC Setup Group.vi
Python	SetupGroup

6.3.4 HIMC_UngrpAllAxes

Purpose

To ungroup and disable an axis group.

Syntax

```
int HIMC_UngrpAllAxes(
    int ctrl_id,
    int group_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_UngrpAllAxes
LabVIEW	HIMC Ungrp All Axes.vi
Python	UngrpAllAxes

6.3.5 HIMC_GetGroupID

Purpose

To get the axis group ID to which the axis belongs.

Syntax

```
int HIMC_GetGroupID(
    int ctrl_id,
    int axis_id,
    int *p_group_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_group_id [out] A pointer to the buffer to receive the axis group ID to which the axis belongs.
If the value is -1, it indicates that the axis does not belong to any axis group.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGroupID
LabVIEW	HIMC Get Group ID.vi
Python	GetGroupID

6.3.6 HIMC_SetGrpMotionProfile

Purpose

To set TCP linear motion parameters for an axis group.

Syntax

```
int HIMC_SetGrpMotionProfile(
    int    ctrl_id,
    int    group_id,
    double max_velocity,
    double max_acceleration,
    double max_deceleration,
    double smooth_time
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
max_velocity [in]	The maximum linear profile velocity for an axis group. Parameter unit: mm/s Input range: 0 ~ 5000
max_acceleration [in]	The maximum linear profile acceleration for an axis group. Parameter unit: mm/s^2 Input range: >0 ~ 50000 (acceleration cannot be 0)
max_deceleration [in]	The maximum linear profile deceleration for an axis group. Parameter unit: mm/s^2 Input range: >0 ~ 50000 (deceleration cannot be 0)
smooth_time [in]	The linear profile smooth time for an axis group. Parameter unit: ms Input range: 0 ~ 500

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

The default value of linear group motion profile is **[100, 500, 500, 50]** for velocity, acceleration, deceleration, and smooth time respectively.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetGrpMotionProfile
LabVIEW	HIMC Set Grp Motion Profile.vi
Python	SetGrpMotionProfile

6.3.7 HIMC_SetGrpAngMotionProfile

Purpose

To set TCP angular motion parameters for an axis group.

Syntax

```
int HIMC_SetGrpAngMotionProfile(
    int    ctrl_id,
    int    group_id,
    double max_velocity,
    double max_acceleration,
    double max_deceleration,
    double smooth_time
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
max_velocity [in]	The maximum angular profile velocity for an axis group. Parameter unit: deg/s Input range: 0 ~ 7200
max_acceleration [in]	The maximum angular profile acceleration for an axis group. Parameter unit: deg/s^2 Input range: >0 ~ 72000 (acceleration cannot be 0)
max_deceleration [in]	The maximum angular profile deceleration for an axis group. Parameter unit: deg/s^2 Input range: >0 ~ 72000 (deceleration cannot be 0)
smooth_time [in]	The angular profile smooth time for an axis group. Parameter unit: ms Input range: 0 ~ 500

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

The default value of angular group motion profile is **[360, 1800, 1800, 50]** for velocity, acceleration, deceleration, and smooth time respectively.

Requirement

Minimum supported version	iA Studio 2.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetGrpAngMotionProfile
LabVIEW	HIMC Set Grp Ang Motion Profile.vi
Python	SetGrpAngMotionProfile

6.3.8 HIMC_GetGrpKin

Purpose

To get the kinematics type of an axis group.

Syntax

```
int HIMC_GetGrpKin(
    int ctrl_id,
    int group_id,
    int *p_grp_kin
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
p_grp_kin [out]	A pointer to the buffer to receive the kinematics type of an axis group.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetGrpKin
LabVIEW	HIMC Get Grp Kin.vi
Python	GetGrpKin

6.3.9 HIMC_SetGrpKin

Purpose

To set the kinematics type of an axis group.

Syntax

```
int HIMC_SetGrpKin(
    int ctrl_id,
    int group_id,
    int kin_type
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

kin_type [in] The new kinematics type of an axis group. **Refer to section 6.1.3 for details.**

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpKin
LabVIEW	HIMC Set Grp Kin.vi
Python	SetGrpKin

6.3.10 HIMC_GetGrpMaxVel

Purpose

To get the maximum profile velocity of an axis group.

Syntax

```
int HIMC_GetGrpMaxVel(
    int    ctrl_id,
    int    group_id,
    double *p_grp_vel
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

p_grp_vel [out] A pointer to the buffer to receive the maximum profile velocity of an axis group.
Parameter unit: mm/s or deg/s

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGrpMaxVel
LabVIEW	HIMC Get Grp Max Vel.vi
Python	GetGrpMaxVel

6.3.11 HIMC_SetGrpVel

Purpose

To set the maximum profile velocity of an axis group.

Syntax

```
int HIMC_SetGrpVel(
    int    ctrl_id,
    int    group_id,
    double vel
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
vel [in]	The new maximum profile velocity of an axis group. Parameter unit: mm/s or deg/s Input range: 0 ~ 5000

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpVel
LabVIEW	HIMC Set Grp Vel.vi
Python	SetGrpVel

6.3.12 HIMC_GetGrpMaxAcc

Purpose

To get the maximum profile acceleration of an axis group.

Syntax

```
int HIMC_GetGrpMaxAcc(
    int    ctrl_id,
    int    group_id,
    double *p_grp_acc
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

p_grp_acc [out] A pointer to the buffer to receive the maximum profile acceleration of an axis group.
Parameter unit: mm/s^2 or deg/s^2

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGrpMaxAcc
LabVIEW	HIMC Get Grp Max Acc.vi
Python	GetGrpMaxAcc

6.3.13 HIMC_SetGrpAcc

Purpose

To set the maximum profile acceleration of an axis group.

Syntax

```
int HIMC_SetGrpAcc(
    int    ctrl_id,
    int    group_id,
    double acc
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

acc [in] The new maximum profile acceleration of an axis group.
Parameter unit: mm/s^2 or deg/s^2
Input range: >0 ~ 50000 (acceleration cannot be 0)

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpAcc
LabVIEW	HIMC Set Grp Acc.vi
Python	SetGrpAcc

6.3.14 HIMC_SetGrpAccTime

Purpose

To set the acceleration time of an axis group.

Syntax

```
int HIMC_SetGrpAccTime(
    int    ctrl_id,
    int    group_id,
    double acc_time
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

acc_time [in] The acceleration time of an axis group.
Parameter unit: ms
Input range: nonzero positive value

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpAccTime
LabVIEW	HIMC Set Grp Acc Time.vi
Python	SetGrpAccTime

6.3.15 HIMC_GetGrpMaxDec

Purpose

To get the maximum profile deceleration of an axis group.

Syntax

```
int HIMC_GetGrpMaxDec(
    int    ctrl_id,
    int    group_id,
    double *p_grp_dec
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

p_grp_dec [out] A pointer to the buffer to receive the maximum profile deceleration of an axis group.
Parameter unit: mm/s^2 or deg/s^2

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGrpMaxDec
LabVIEW	HIMC Get Grp Max Dec.vi
Python	GetGrpMaxDec

6.3.16 HIMC_SetGrpDec

Purpose

To set the maximum profile deceleration of an axis group.

Syntax

```
int HIMC_SetGrpDec(
    int    ctrl_id,
    int    group_id,
    double dec
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

dec [in] The new maximum profile deceleration of an axis group.
Parameter unit: mm/s^2 or deg/s^2
Input range: >0 ~ 50000 (deceleration cannot be 0)

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpDec
LabVIEW	HIMC Set Grp Dec.vi
Python	SetGrpDec

6.3.17 HIMC_SetGrpDecTime

Purpose

To set the deceleration time of an axis group.

Syntax

```
int HIMC_SetGrpDecTime(
    int    ctrl_id,
    int    group_id,
    double dec_time
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

dec_time [in] The deceleration time of an axis group.
Parameter unit: ms
Input range: nonzero positive value

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpDecTime
LabVIEW	HIMC Set Grp Dec Time.vi
Python	SetGrpDecTime

6.3.18 HIMC_GetGrpSMTime

Purpose

To get the profile smooth time of an axis group.

Syntax

```
int HIMC_GetGrpSMTime(
    int    ctrl_id,
    int    group_id,
    double *p_grp_smooth_time
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
p_grp_smooth_time [out]	A pointer to the buffer to receive the profile smooth time of an axis group. Parameter unit: ms

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGrpSMTime
LabVIEW	HIMC Get Grp SM Time.vi
Python	GetGrpSMTime

6.3.19 HIMC_SetGrpSMTime

Purpose

To set the profile smooth time of an axis group.

Syntax

```
int HIMC_SetGrpSMTime(
    int    ctrl_id,
    int    group_id,
    double smooth_time
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

smooth_time [in] The new profile smooth time of an axis group.
Parameter unit: ms
Input range: 0 ~ 500

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpSMTime
LabVIEW	HIMC Set Grp SM Time.vi
Python	SetGrpSMTime

6.3.20 HIMC_GetGrpCoordSys

Purpose

To get the coordinate system of an axis group.

Syntax

```
int HIMC_GetGrpCoordSys(
    int ctrl_id,
    int group_id,
    int *p_grp_coord_sys
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
p_grp_coord_sys [out]	A pointer to the buffer to receive the coordinate system of an axis group.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetGrpCoordSys
LabVIEW	HIMC Get Coord Sys.vi
Python	GetGrpCoordSys

6.3.21 HIMC_SetGrpCoordSys

Purpose

To set the coordinate system of an axis group.

Syntax

```
int HIMC_SetGrpCoordSys(
    int ctrl_id,
    int group_id,
    int coord_sys
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

coord_sys [in] The new coordinate system of an axis group. **Refer to section 6.1.2 for details.**
Example: 1. kCoord_MCS
2. kCoord_WCS1 | kCoord_PCS
3. kCoord_OFFSET | kCoord_WCS2 | kCoord_PCS

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpCoordSys
LabVIEW	HIMC Set Grp Coord Sys.vi
Python	SetGrpCoordSys

6.3.22 HIMC_GetGrpBufferMode

Purpose

To get the buffer mode of an axis group.

Syntax

```
int HIMC_GetGrpBufferMode(
    int ctrl_id,
    int group_id,
    int *p_grp_buffer_mode
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
p_grp_buffer_mode [out]	A pointer to the buffer to receive the buffer mode of an axis group.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGrpBufferMode
LabVIEW	HIMC Get Buffer Mode.vi
Python	GetGrpBufferMode

6.3.23 HIMC_SetGrpBufferMode

Purpose

To set the buffer mode of an axis group.

Syntax

```
int HIMC_SetGrpBufferMode(
    int ctrl_id,
    int group_id,
    int buffer_mode
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

buffer_mode [in] The new buffer mode of an axis group. **Refer to section 6.1.4 for details.**
Input range: 0 ~ 5

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpBufferMode
LabVIEW	HIMC Set Grp Buffer Mode.vi
Python	SetGrpBufferMode

6.3.24 HIMC_GetGrpTransMode

Purpose

To get the transition mode of an axis group.

Syntax

```
int HIMC_GetGrpTransMode(
    int ctrl_id,
    int group_id,
    int *p_grp_trans_mode
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
p_grp_trans_mode [out]	A pointer to the buffer to receive the transition mode of an axis group.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGrpTransMode
LabVIEW	HIMC Get Trans Mode.vi
Python	GetGrpTransMode

6.3.25 HIMC_SetGrpTransMode

Purpose

To set the transition mode of an axis group.

Syntax

```
int HIMC_SetGrpTransMode(
    int ctrl_id,
    int group_id,
    int trans_mode
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

trans_mode [in] The new transition mode of an axis group. **Refer to section 6.1.5 for details.**
Input range: 0 ~ 4

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpTransMode
LabVIEW	HIMC Set Grp Trans Mode.vi
Python	SetGrpTransMode

6.3.26 HIMC_SetGrpTransPrm

Purpose

To set the transition mode's parameters of an axis group.

Syntax

```
int HIMC_SetGrpTransPrm(
    int    ctrl_id,
    int    group_id,
    double trans_vel,
    double trans_dis
    double trans_dev,
    double trans_curv
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

trans_vel [in] The new transition mode's velocity parameter of an axis group.
Refer to section 6.1.5 for details.

trans_dis [in] The new transition mode's distance parameter of an axis group.
Refer to section 6.1.5 for details.

trans_dev [in] The new transition mode's maximum deviation parameter of an axis group.
Refer to section 6.1.5 for details.

trans_curv [in] The new transition mode's maximum curvature parameter of an axis group.
Refer to section 6.1.5 for details.

Table 6.3.26.1 Setting range for transition parameter

Transition parameter	Unit	Max.	Min.
`trans_vel`	mm/s	< 5000	> 0
`trans_dis`	mm	< [len_{min}] = MIN([len_{S1}],[len_{S2}])	> 0
`trans_dev`	mm	< [trans_dis] $\times \frac{1}{2} cos[\frac{\theta}{2}]$ **Note: θ is corner angle**	> 0
`trans_curv`	mm^{-1}	< 10^7	> $\frac{6 \times \sin([\theta])}{[len_{min}]\sqrt{2-2\cos([\theta])}^3}$

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetGrpTransPrm
LabVIEW	HIMC Set Grp Trans Prm.vi
Python	SetGrpTransPrm

6.3.27 HIMC_GetGrpCmdNum

Purpose

To get the number of commands of an axis group in the command buffer.

Syntax

```
int HIMC_GetGrpCmdNum(
    int ctrl_id,
    int group_id,
    int *p_grp_cmd_num
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
p_grp_cmd_num [out]	A pointer to the buffer to receive the number of commands of an axis group in the command buffer.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGrpCmdNum
LabVIEW	HIMC Get Grp Cmd Num.vi
Python	GetGrpCmdNum

6.3.28 HIMC_SetGrpVelScale

Purpose

To set the velocity scale of axis group motion.

Syntax

```
int HIMC_SetGrpVelScale(
    int    ctrl_id,
    int    group_id,
    double vel_scale
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

vel_scale [in] The new velocity scale of axis group motion.
Input range: 0 ~ 100

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.4
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpVelScale
LabVIEW	HIMC Set Grp Vel Scale.vi
Python	SetGrpVelScale

6.3.29 HIMC_GetGrpVelScale

Purpose

To get the velocity scale of axis group motion.

Syntax

```
int HIMC_GetGrpVelScale(
    int    ctrl_id,
    int    group_id,
    double *p_grp_vel_scale
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
p_grp_vel_scale [out]	A pointer to the buffer to receive the velocity scale of axis group motion. Its range is from 0 to 100.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.4
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGrpVelScale
LabVIEW	HIMC Get Grp Vel Scale.vi
Python	GetGrpVelScale

6.3.30 HIMC_GetGrpCoordTrans

Purpose

To get the transformation parameters of axis group's coordinate system.

Syntax

```
int HIMC_GetGrpCoordTrans(
    int    ctrl_id,
    int    group_id,
    int    coord_sys,
    double *trans_param
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

coord_sys [in] Coordinate system.
Refer to section 20.2 CoordSystem for details.

trans_param [out] A pointer to a six-element array which contains the transformation parameters in 6-DOF {X, Y, Z, A, B, C}.
Parameter unit: mm for X, Y, Z; deg for A, B, C

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGrpCoordTrans
LabVIEW	HIMC Get Grp Coord Trans.vi
Python	GetGrpCoordTrans

6.3.31 HIMC_SetGrpCoordTrans

Purpose

To set the transformation parameters of axis group's coordinate system.

Syntax

```
int HIMC_SetGrpCoordTrans(
    int    ctrl_id,
    int    group_id,
    int    coord_sys,
    double *trans_param
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
coord_sys [in]	Coordinate system. **Refer to section 20.2 CoordSystem for details.**
trans_param [in]	A pointer to a six-element array which contains the transformation parameters in 6-DOF {X, Y, Z, A, B, C}. Parameter unit: mm for X, Y, Z; deg for A, B, C

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpCoordTrans
LabVIEW	HIMC Set Grp Coord Trans.vi
Python	SetGrpCoordTrans

6.3.32 HIMC_GetGrpPoseCmd

Purpose

To get the pose command of axis group's coordinate system.

Syntax

```
int HIMC_GetGrpPoseCmd(
    int    ctrl_id,
    int    group_id,
    int    coord_sys,
    double *pose_cmd
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
coord_sys [in]	Coordinate system. **Refer to section 20.2 CoordSystem for details.**
pose_cmd [out]	A pointer to a six-element array which contains the pose command in 6-DOF {X, Y, Z, A, B, C}. Parameter unit: mm for X, Y, Z; deg for A, B, C

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGrpPoseCmd
LabVIEW	HIMC Get Grp Pose Cmd.vi
Python	GetGrpPoseCmd

6.3.33 HIMC_GetGrpPoseFb

Purpose

To get the pose feedback of axis group's coordinate system.

Syntax

```
int HIMC_GetGrpPoseFb(
    int    ctrl_id,
    int    group_id,
    int    coord_sys,
    double *pose_fb
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
coord_sys [in]	Coordinate system. **Refer to section 20.2 CoordSystem for details.**
pose_fb [out]	A pointer to a six-element array which contains the pose feedback in 6-DOF {X, Y, Z, A, B, C}. Parameter unit: mm for X, Y, Z; deg for A, B, C

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGrpPoseFb
LabVIEW	HIMC Get Grp Pose Fb.vi
Python	GetGrpPoseFb

6.3.34 HIMC_SetGrpLookAheadPrm

Purpose

To set the motion parameter of axis group's look ahead function.

Syntax

```
int HIMC_SetGrpLookAheadPrm(
    int    ctrl_id,
    int    group_id,
    int    prm_id,
    double value
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
prm_id [in]	Parameter of look ahead function. 0: Max. corner acceleration, 1: Max. arc acceleration, 2: Max. chord error
value [in]	Parameter setting value of look ahead function.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpLookAheadPrm
LabVIEW	HIMC Set Grp Look Ahead Prm.vi
Python	SetGrpLookAheadPrm

6.3.35 HIMC_SetGrpQueueSize

Purpose

To set the buffer size of axis group command.

Syntax

```
int HIMC_SetGrpQueueSize(
    int ctrl_id,
    int group_id,
    int queue_size
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
queue_size [in]	The buffer size of axis group command. If the input value is n, the size of the buffer is 2^n. Input range: 0 ~ 10

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGrpQueueSize
LabVIEW	HIMC Set Grp Queue Size.vi
Python	SetGrpQueueSize

6.4 Group status

6.4.1 HIMC_IsGrpEnabled

Purpose

To query the “enable” status of an axis group.

Syntax

```
int HIMC_IsGrpEnabled(
    int ctrl_id,
    int group_id,
    int *p_is_grp_enabled
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
p_is_grp_enabled [out]	A pointer to the buffer to receive the enable status of an axis group. If the axis group is at the “GrpEnabled” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsGrpEnabled
LabVIEW	HIMC Is Grp Enabled.vi
Python	IsGrpEnabled

6.4.2 HIMC_IsGrpMoving

Purpose

To query the “moving” status of an axis group. If the axis group is moving, PG (profile generator) continues outputting new positions.

Syntax

```
int HIMC_IsGrpMoving(
    int ctrl_id,
    int group_id,
    int *p_is_grp_moving
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
p_is_grp_moving [out]	A pointer to the buffer to receive the moving status of an axis group. If the axis group is at the “GrpMoving” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsGrpMoving
LabVIEW	HIMC Is Grp Moving.vi
Python	IsGrpMoving

6.4.3 HIMC_IsGrpInPos

Purpose

To query the “in-position” status of an axis group. If the axis group is in-position, all axes in the group are in-position.

Syntax

```
int HIMC_IsGrpInPos(
    int ctrl_id,
    int group_id,
    int *p_is_grp_inpos
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
p_is_grp_inpos [out]	A pointer to the buffer to receive the in-position status of an axis group. If the axis group is at the “GrpInPos” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsGrpInPos
LabVIEW	HIMC Is Grp In Pos.vi
Python	IsGrpInPos

6.4.4 HIMC_IsGrpErrorStop

Purpose

To query whether the axis group is at the “error stop” state.

Syntax

```
int HIMC_IsGrpErrorStop(
    int ctrl_id,
    int group_id,
    int *p_is_grp_errorstop
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
p_is_grp_errorstop [out]	A pointer to the buffer to receive the error stop status of an axis group. If the axis group is at the “GrpErrorStop” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsGrpErrorStop
LabVIEW	HIMC Is Grp Error Stop.vi
Python	IsGrpErrorStop

6.5 Advanced group motion control

6.5.1 HIMC_LineAbs

Purpose

To command an interpolated linear movement on an axis group toward an absolute position in the specific coordinate system.

Syntax

```
int HIMC_LineAbs(
    int ctrl_id,
    int group_id,
    CoordPosition *target_pos,
    MotionProfile *motion_profile,
    CoordSystem coord_sys,
    MotionBufferMode buff_mode,
    MotionTransitionMode trans_mode,
    TransPrm *trans_prm
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
target_pos [in]	A pointer to the buffer to store the 6-DOF target position of the tool center point (end-effector). Parameter unit: mm for X, Y, Z; deg for A, B, C **Refer to section 19.2 CoordPosition for details.**
motion_profile [in]	A pointer to the buffer to store motion profile settings of the tool center point (end-effector). **Refer to section 19.3 MotionProfile for details.**
coord_sys [in]	Specify the applicable coordinate system. **Refer to section 20.2 CoordSystem for details.**
buff_mode [in]	Specify the buffer mode. **Refer to section 20.3 MotionBufferMode for details.**

trans_mode [in] Specify the transition mode.
Refer to section 20.4 MotionTransitionMode for details.

trans_prm [in] Specify the pointer for transition mode's parameters.
Refer to section 19.6 TransPrm for details.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_LineAbs
LabVIEW	HIMC Line Abs.vi
Python	LineAbs

6.5.2 HIMC_LineRel

Purpose

To command an interpolated linear movement on an axis group toward a relative position in the specific coordinate system.

Syntax

```
int HIMC_LineRel(
    int ctrl_id,
    int group_id,
    CoordPosition *relative_dist,
    MotionProfile *motion_profile,
    CoordSystem coord_sys,
    MotionBufferMode buff_mode,
    MotionTransitionMode trans_mode,
    TransPrm *trans_prm
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
relative_dist [in]	A pointer to the buffer to store the relative distance for 6-DOF of the tool center point (end-effector). Parameter unit: mm for X, Y, Z; deg for A, B, C **Refer to section 19.2 CoordPositionfor details.**
motion_profile [in]	A pointer to the buffer to store motion profile settings of the tool center point (end-effector). **Refer to section 19.3 MotionProfile for details.**
coord_sys [in]	Specify the applicable coordinate system. **Refer to section 20.2 CoordSystem for details.**
buff_mode [in]	Specify the buffer mode. **Refer to section 20.3 MotionBufferMode for details.**
trans_mode [in]	Specify the transition mode. **Refer to section 20.4 MotionTransitionMode for details.**

trans_prm [in] Specify the pointer for transition mode's parameters.

Refer to section 19.6 TransPrm for details.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_LineRel
LabVIEW	HIMC Line Rel.vi
Python	LineRel

6.5.3 HIMC_CircleAbs

Purpose

To command an interpolated circular movement on an axis group toward an absolute position in the specific coordinate system.

Syntax

```
int HIMC_CircleAbs(
    int ctrl_id,
    int group_id,
    CenterPosition *center_pos,
    NormalVector *normal_vector,
    int turns,
    CoordPosition *target_pos,
    MotionProfile *motion_profile,
    CoordSystem coord_sys,
    MotionBufferMode buff_mode,
    MotionTransitionMode trans_mode,
    TransPrm *trans_prm
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
center_pos [in]	A pointer to the buffer to store the position of center point. Parameter unit: mm **Refer to section 19.4 CenterPosition for details.**
normal_vector [in]	A pointer to the buffer to store normal vector of circle. **Refer to section 19.5 NormalVector for details.**
turns [in]	Number of turns of circular path relative to the start point. It determines the direction and the total angle of circular path.
target_pos [in]	A pointer to the buffer to store the 6-DOF target position of the tool center point (end-effector). Parameter unit: mm for X, Y, Z; deg for A, B, C **Refer to section 19.2 CoordPosition for details.**

motion_profile [in] A pointer to the buffer to store motion profile settings of the tool center point (end-effector).
Refer to section 19.3 MotionProfile for details.

coord_sys [in] Specify the applicable coordinate system.
Refer to section 20.2 CoordSystem for details.

buff_mode [in] Specify the buffer mode.
Refer to section 20.3 MotionBufferMode for details.

trans_mode [in] Specify the transition mode.
Refer to section 20.4 MotionTransitionMode for details.

trans_prm [in] Specify the pointer for transition mode's parameters.
Refer to section 19.6 TransPrm for details.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_CircleAbs
LabVIEW	HIMC Circle Abs.vi
Python	CircleAbs

6.5.4 HIMC_CircleRel

Purpose

To command an interpolated circular movement on an axis group toward a relative position in the specific coordinate system.

Syntax

```
int HIMC_CircleRel(
    int ctrl_id,
    int group_id,
    CenterPosition *center_pos,
    NormalVector *normal_vector,
    int turns,
    CoordPosition *relative_dist,
    MotionProfile *motion_profile,
    CoordSystem coord_sys,
    MotionBufferMode buff_mode,
    MotionTransitionMode trans_mode,
    TransPrm *trans_prm
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
center_pos [in]	A pointer to the buffer to store the position of center point. Parameter unit: mm **Refer to section 19.4 CenterPosition for details.**
normal_vector [in]	A pointer to the buffer to store normal vector of circle. **Refer to section 19.5 NormalVector for details.**
turns [in]	Number of turns of circular path relative to the start point. It determines the direction and the total angle of circular path.
relative_dist [in]	A pointer to the buffer to store the relative distance for 6-DOF of the tool center point (end-effector). Parameter unit: mm for X, Y, Z; deg for A, B, C **Refer to section 19.2 CoordPosition for details.**

motion_profile [in] A pointer to the buffer to store motion profile settings of the tool center point (end-effector).
Refer to section 19.3 MotionProfile for details.

coord_sys [in] Specify the applicable coordinate system.
Refer to section 20.2 CoordSystem for details.

buff_mode [in] Specify the buffer mode.
Refer to section 20.3 MotionBufferMode for details.

trans_mode [in] Specify the transition mode.
Refer to section 20.4 MotionTransitionMode for details.

trans_prm [in] Specify the pointer for transition mode's parameters.
Refer to section 19.6 TransPrm for details.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_CircleRel
LabVIEW	HIMC Circle Rel.vi
Python	CircleRel

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7. GPIO functions

7. GPIO functions 7-1
7.1 Overview 7-2
7.1.1 GPIO variables 7-2
7.2 Controller IO setting 7-3
7.2.1 HIMC_SetGPO 7-3
7.2.2 HIMC_ToggleGPO 7-4
7.2.3 HIMC_SetAllGPO 7-5
7.2.4 HIMC_SetGPIInvert 7-6
7.2.5 HIMC_SetGPOInvert 7-7
7.2.6 HIMC_BindEMO 7-8
7.3 Slave IO setting 7-9
7.3.1 HIMC_SetSlvGPO 7-9
7.3.2 HIMC_ToggleSlvGPO 7-10
7.3.3 HIMC_SetSlvAllGPO 7-11
7.4 Controller IO status 7-12
7.4.1 HIMC_GetGPI 7-12
7.4.2 HIMC_GetGPO 7-13
7.4.3 HIMC_GetAllGPI 7-14
7.4.4 HIMC_GetAllGPO 7-15
7.5 Slave IO status 7-16
7.5.1 HIMC_GetSlvGPI 7-16
7.5.2 HIMC_GetSlvGPO 7-18
7.5.3 HIMC_GetSlvAllGPI 7-19
7.5.4 HIMC_GetSlvAllGPO 7-20

7.1 Overview

HIMC provides 8 sets of general purpose input / output (GPIO) pins; the hardware delay time is within 1ms and the power is 24V. The slave device can connect to the controller via CoE communication and update its IO status. The number of IO depends on the slave device. With the functions provided in this chapter, such as “SetGPO” and “SetSlvGPO”, users can set the signal of output pin respectively for HIMC and slave. Besides, users can query the signal status of input / output pin. With iA Studio’s function module “Digital IO” (refer to section 4.4 in “iA Studio User Guide”), users can observe and set HIMC’s and slave’s input / output status.

HIMC’s digital input “I8” is E-stop signal (refer to section 3.3 in “HIMC Installation Guide”), which will be triggered when receiving rising-edge signal. At this time, all axes will be disabled and all HMPL tasks will be stopped.

Note: After rising-edge signal is triggered, users can re-enable the axes or re-execute HMPL tasks.

7.1.1 GPIO variables

Users can select the desired controller’s general purpose input/output system variables via Scope Manager in iA Studio (refer to section 4.8 in “iA Studio User Guide”). Detailed descriptions are shown in Table 7.1.1.1.

Table 7.1.1.1 Controller’s general purpose input / output variables

Name	Variable	Unit	Description
HIMC GPO	himc_gpo_bits	N/A	State of controller’s general purpose output pin.
HIMC GPI	himc_gpi_bits	N/A	State of controller’s general purpose input pin.

7.2 Controller IO setting

7.2.1 HIMC_SetGPO

Purpose

To set the state of the controller's general purpose output.

Syntax

```
int HIMC_SetGPO(
    int  ctrl_id,
    int  gpo_idx,
    char state
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
gpo_idx [in]	General purpose output index.
state [in]	The state to be set.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGPO
LabVIEW	HIMC Set GPO.vi
Python	SetGPO

7.2.2 HIMC_ToggleGPO

Purpose

To toggle the state of the controller's general purpose output.

Syntax

```
int HIMC_ToggleGPO(
    int ctrl_id,
    int gpo_idx
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

gpo_idx [in] General purpose output index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ToggleGPO
LabVIEW	HIMC Toggle GPO.vi
Python	ToggleGPO

7.2.3 HIMC_SetAllGPO

Purpose

To set the states of the controller's multiple general purpose outputs.

Syntax

```
int HIMC_SetAllGPO(
    int ctrl_id,
    int all_gpo_state
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
all_gpo_state [in]	State value of all general purpose outputs.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetAllGPO
LabVIEW	HIMC Set All GPO.vi
Python	SetAllGPO

7.2.4 HIMC_SetGPIInvert

Purpose

To set the invert state of the controller's general purpose input.

Syntax

```
int HIMC_SetGPIInvert(
    int  ctrl_id,
    int  gpi_idx,
    char invert
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
gpi_idx [in]	General purpose input index.
invert [in]	The invert state to be set.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 2.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetGPIInvert
LabVIEW	HIMC Set GPI Invert.vi
Python	SetGPIInvert

7.2.5 HIMC_SetGPOInvert

Purpose

To set the invert state of the controller's general purpose output.

Syntax

```
int HIMC_SetGPOInvert(
    int  ctrl_id,
    int  gpo_idx,
    char invert
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

gpo_idx [in] General purpose output index.

invert [in] The invert state to be set.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetGPOInvert
LabVIEW	HIMC Set GPO Invert.vi
Python	SetGPOInvert

7.2.6 HIMC_BindEMO

Purpose

To set the general purpose input pin to be bound to E-Stop.

Syntax

```
int HIMC_BindEMO(
    int ctrl_id,
    int gpi_idx
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

gpi_idx [in] General purpose input index. The default value is 8.
If it is set as 0, all general purpose input pins are not bound to E-Stop.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_BindEMO
LabVIEW	HIMC Bind EMO.vi
Python	BindEMO

7.3 Slave IO setting

7.3.1 HIMC_SetSlvGPO

Purpose

To set the state of the slave's general purpose output.

Syntax

```
int HIMC_SetSlvGPO(
    int ctrl_id,
    int slv_slot_id,
    int gpo_idx,
    int on_off
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
gpo_idx [in]	General purpose output index.
on_off [in]	The state to be set.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Digital output object as PDO when using this function.

For example, to set 0x60FE (Digital outputs) of the servo drive as PDO.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetSlvGPO
LabVIEW	HIMC Set Slv GPO.vi
Python	SetSlvGPO

7.3.2 HIMC_ToggleSlvGPO

Purpose

To toggle the state of the slave's general purpose output.

Syntax

```
int HIMC_ToggleSlvGPO(
    int ctrl_id,
    int slv_slot_id,
    int gpo_idx
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
gpo_idx [in]	General purpose output index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Digital output object as PDO when using this function.

For example, to set 0x60FE (Digital outputs) of the servo drive as PDO.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ToggleSlvGPO
LabVIEW	HIMC Toggle Slv GPO.vi
Python	ToggleSlvGPO

7.3.3 HIMC_SetSlvAllGPO

Purpose

To set the states of the slave's multiple general purpose outputs.

Syntax

```
int HIMC_SetSlvAllGPO(
    int ctrl_id,
    int slv_slot_id,
    int all_gpo_state
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
all_gpo_state [in]	State value of all general purpose outputs.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Digital output object as PDO when using this function.

For example, to set 0x60FE (Digital outputs) of the servo drive as PDO.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetSlvAllGPO
LabVIEW	HIMC Set Slv All GPO.vi
Python	SetSlvAllGPO

7.4 Controller IO status

7.4.1 HIMC_GetGPI

Purpose

To get the state of the controller's general purpose input.

Syntax

```
int HIMC_GetGPI(
    int   ctrl_id,
    int   gpi_idx,
    char *p_state
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

gpi_idx [in] General purpose input index.

p_state [out] A pointer to the buffer to receive the state of the specific input.
If the input is at the "on" state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGPI
LabVIEW	HIMC Get GPI.vi
Python	GetGPI

7.4.2 HIMC_GetGPO

Purpose

To get the state of the controller's general purpose output.

Syntax

```
int HIMC_GetGPO(
    int   ctrl_id,
    int   gpo_idx,
    char *p_state
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

gpo_idx [in] General purpose output index.

p_state [out] A pointer to the buffer to receive the state of the specific output.
If the output is at the "on" state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetGPO
LabVIEW	HIMC Get GPO.vi
Python	GetGPO

7.4.3 HIMC_GetAllGPI

Purpose

To get the states of the controller's multiple general purpose inputs.

Syntax

```
int HIMC_GetAllGPI(
    int  ctrl_id,
    int *p_state
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
p_state [out]	A pointer to the buffer to receive the state of the controller's general purpose input.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetAllGPI
LabVIEW	HIMC Get All GPI.vi
Python	GetAllGPI

7.4.4 HIMC_GetAllGPO

Purpose

To get the states of the controller's multiple general purpose outputs.

Syntax

```
int HIMC_GetAllGPO(
    int  ctrl_id,
    int *p_state
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
p_state [out]	A pointer to the buffer to receive the state of the controller's general purpose output.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetAllGPO
LabVIEW	HIMC Get All GPO.vi
Python	GetAllGPO

7.5 Slave IO status

7.5.1 HIMC_GetSlvGPI

Purpose

To get the state of the slave's general purpose input.

Syntax

```
int HIMC_GetSlvGPI(
    int  ctrl_id,
    int  slv_slot_id,
    int  gpi_idx,
    int *p_state
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
gpi_idx [in]	General purpose input index.
p_state [out]	A pointer to the buffer to receive the state of the specific input. If the input is at the "on" state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Digital input object as PDO when using this function.

For example, to set 0x60FE (Digital inputs) of the servo drive as PDO.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetSlvGPI
LabVIEW	HIMC Get Slv GPI.vi
Python	GetSlvGPI

7.5.2 HIMC_GetSlvGPO

Purpose

To get the state of the slave's general purpose output.

Syntax

```
int HIMC_GetSlvGPO(
    int  ctrl_id,
    int  slv_slot_id,
    int  gpo_idx,
    int *p_state
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
gpo_idx [in]	General purpose output index.
p_state [out]	A pointer to the buffer to receive the state of the specific output. If the output is at the "on" state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Digital output object as PDO when using this function.

For example, to set 0x60FE (Digital outputs) of the servo drive as PDO.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetSlvGPO
LabVIEW	HIMC Get Slv GPO.vi
Python	GetSlvGPO

7.5.3 HIMC_GetSlvAllGPI

Purpose

To query all general purpose input states of the slave.

Syntax

```
int HIMC_GetSlvAllGPI(
    int ctrl_id,
    int slv_slot_id,
    int *p_state
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
p_state [out]	A pointer to the buffer to receive all general purpose input states of the slave. If the 1st and the 4th GPI pins are TRUE, the return value will be 9.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Digital input object as PDO when using this function.

For example, to set 0x60FD (Digital inputs) of the servo drive as PDO.

Requirement

Minimum supported version	iA Studio 3.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetSlvAllGPI
LabVIEW	HIMC Get Slv All GPI.vi
Python	GetSlvAllGPI

7.5.4 HIMC_GetSlvAllGPO

Purpose

To query all general purpose output states of the slave.

Syntax

```
int HIMC_GetSlvAllGPO(
    int ctrl_id,
    int slv_slot_id,
    int *p_state
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
p_state [out]	A pointer to the buffer to receive the state of the specific output. If the 2nd and the 3rd GPO pins are TRUE, the return value will be 6.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Digital output object as PDO when using this function.

For example, to set 0x60FE (Digital outputs) of the servo drive as PDO.

Requirement

Minimum supported version	iA Studio 3.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetSlvAllGPO
LabVIEW	HIMC Get Slv All GPO.vi
Python	GetSlvAllGPO

8. AIO functions

8. AIO functions 8-1
8.1 Overview 8-2
8.2 Slave AIO setting 8-3
8.2.1 HIMC_SetSlvAIType 8-3
8.2.2 HIMC_SetSlvAOType 8-4
8.2.3 HIMC_SetSlvAORaw 8-5
8.2.4 HIMC_SetSlvAO 8-6
8.3 Slave AIO status 8-7
8.3.1 HIMC_GetSlvAIType 8-7
8.3.2 HIMC_GetSlvAOType 8-8
8.3.3 HIMC_GetSlvAIRaw 8-9
8.3.4 HIMC_GetSlvAI 8-10
8.3.5 HIMC_GetSlvAORaw 8-11
8.3.6 HIMC_GetSlvAO 8-12
8.4 Slave AO bound to HIMC internal buffer variable 8-13
8.4.1 HIMC_SetSlvAOMonitor 8-13
8.4.2 HIMC_SetSlvAOParam 8-15
8.4.3 HIMC_GetSlvAOScale 8-17
8.4.4 HIMC_GetSlvAOOffset 8-18
8.4.5 HIMC_IsSlvAOBound 8-19

8.1 Overview

With AIO functions, slaves with analog input (AI) or analog output (AO) function can read and set the related parameters. Among them, HMPL provides users with the setting of specifying conversion type between digital and analog. Detailed specifications are shown in Table 8.1.

Table 8.1.1 Definition of analog data conversion type

<table>
<tr><th>Conversion type</th><th>Conversion description</th><th>Specification</th><th>Remark</th></tr>
<tr><td>kDAC_NONE</td><td>N/A</td><td>Use only Raw function to operate this conversion.</td><td>-</td></tr>
<tr><td>kDAC_N10_P10</td><td>-10~10</td><td>Convert raw analog value to -10~10.</td><td rowspan="4">Common in analog voltage module</td></tr>
<tr><td>kDAC_P0_P10</td><td>0~10</td><td>Convert raw analog value to 0~10.</td></tr>
<tr><td>kDAC_N5_P5</td><td>-5~5</td><td>Convert raw analog value to -5~5.</td></tr>
<tr><td>kDAC_P0_P5</td><td>0~5</td><td>Convert raw analog value to 0~5.</td></tr>
<tr><td>kDAC_P0_P20</td><td>0~20</td><td>Convert raw analog value to 0~20.</td><td rowspan="3">Common in analog current module</td></tr>
<tr><td>kDAC_P4_P20</td><td>4~20</td><td>Convert raw analog value to 4~20.</td></tr>
<tr><td>kDAC_N20_P20</td><td>-20~20</td><td>Convert raw analog value to -20~20.</td></tr>
<tr><td>kDAC_SIGNED</td><td>High bit defines whether the sign is positive or negative.</td><td>Signed conversion.
Take a 16 bit ±10V analog device as an example, when setting kDAC_N10_P10, the conversion table is shown as follows:
<table>
<tr><th>Raw value</th><th>Conversion value</th></tr>
<tr><td>65535</td><td>10</td></tr>
<tr><td>49152</td><td>5</td></tr>
<tr><td>32768</td><td>0</td></tr>
<tr><td>16384</td><td>-5</td></tr>
<tr><td>0</td><td>-10</td></tr>
</table>
When setting kDAC_SIGNED | kDAC_N10_P10, the conversion table is shown as follows:
<table>
<tr><th>Raw value</th><th>Conversion value</th></tr>
<tr><td>32767</td><td>10</td></tr>
<tr><td>16384</td><td>5</td></tr>
<tr><td>0</td><td>0</td></tr>
<tr><td>-16384</td><td>-5</td></tr>
<tr><td>-32768</td><td>-10</td></tr>
</table></td><td>Refer to the user manual of subdevice for conversion method.</td></tr>
</table>

8.2 Slave AIO setting

8.2.1 HIMC_SetSlvAIType

Purpose

To set the conversion type of the slave's analog input value.

Syntax

```
int HIMC_SetSlvAIType(
    int ctrl_id,
    int slv_slot_id,
    int ai_idx,
    int range_type
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

slv_slot_id [in] Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.

Ai idx [in] Analog input channel.

range_type [in] Analog data conversion type. **Refer to Table 8.1 for details.**

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetSlvAOType
LabVIEW	HIMC Set Slv AO Type.vi
Python	SetSlvAOType

8.2.2 HIMC_SetSlvAOType

Purpose

To set the conversion type of the slave's analog output value.

Syntax

```
int HIMC_SetSlvAOType(
    int ctrl_id,
    int slv_slot_id,
    int ao_idx,
    int range_type
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
ai idx [in]	Analog output channel.
range_type [in]	Analog data conversion type. **Refer to Table 8.1 for details.**

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetSlvAOType
LabVIEW	HIMC Set Slv AO Type.vi
Python	SetSlvAOType

8.2.3 HIMC_SetSlvAORaw

Purpose

To set the analog output raw value of the slave.

Syntax

```
int HIMC_SetSlvAORaw(
    int ctrl_id,
    int slv_slot_id,
    int ao_idx,
    int ao_raw_val
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and its Slot ID. Slot ID could be ignored if there is no slot on the slave.
ao_idx [in]	Analog output channel.
ao_raw_val [in]	Analog output raw value.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Analog output object as PDO when using this function.

Requirement

Minimum supported version	iA Studio 3.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetSlvAORaw
LabVIEW	HIMC Set Slv AO Raw.vi
Python	SetSlvAORaw

8.2.4 HIMC_SetSlvAO

Purpose

To set the analog output value of the slave.

Syntax

```
int HIMC_SetSlvAO(
    int ctrl_id,
    int slv_slot_id,
    int ao_idx,
    double ao_val
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and its Slot ID. Slot ID could be ignored if there is no slot on the slave.
ao_idx [in]	Analog output channel.
ao_val [in]	Analog output value.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Analog output object as PDO and set the conversion type when using this function.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetSlvAO
LabVIEW	HIMC Set Slv AO.vi
Python	SetSlvAO

8.3 Slave AIO status

8.3.1 HIMC_GetSlvAIType

Purpose

To get the analog input type of the slave.

Syntax

```
int HIMC_GetSlvAIType(
    int ctrl_id,
    int slv_slot_id,
    int ai_idx,
    int *p_ai_type
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and its Slot ID. Slot ID could be ignored if there is no slot on the slave.
ai_idx [in]	Analog input channel.
p_ai_type [out]	A pointer to the buffer to receive the analog input type of the slave. **Refer to Table 8.1 for details.**

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetSlvAIType
LabVIEW	HIMC Get Slv AI Type.vi
Python	GetSlvAIType

8.3.2 HIMC_GetSlvAOType

Purpose

To get the analog input type of the slave.

Syntax

```
int HIMC_GetSlvAOType(
    int ctrl_id,
    int slv_slot_id,
    int ao_idx,
    int *p_ao_type
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

slv_slot_id [in] Slave ID and its Slot ID. Slot ID could be ignored if there is no slot on the slave.

ao_idx [in] Analog output channel.

p_ao_type [out] A pointer to the buffer to receive the analog output type of the slave.
Refer to Table 8.1 for details.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetSlvAOType
LabVIEW	HIMC Get Slv AO Type.vi
Python	GetSlvAOType

8.3.3 HIMC_GetSlvAIRaw

Purpose

To get the analog input raw value of the slave.

Syntax

```
int HIMC_GetSlvAIRaw(
    int ctrl_id,
    int slv_slot_id,
    int ai_idx,
    int *p_ai_raw_val
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
ai_idx [in]	Analog input channel.
p_ai_raw_val [out]	A pointer to the buffer to receive the analog input raw value.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Analog input object as PDO when using this function.

Requirement

Minimum supported version	iA Studio 3.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetSlvAIRaw
LabVIEW	HIMC Get Slv AI Raw.vi
Python	GetSlvAIRaw

8.3.4 HIMC_GetSlvAI

Purpose

To get the analog input of the slave.

Syntax

```
int HIMC_GetSlvAI(
    int ctrl_id,
    int slv_slot_id,
    int ai_idx,
    double *p_ai_val
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
ai_idx [in]	Analog input channel.
p_ai_val [out]	A pointer to the buffer to receive the analog input value.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Analog input object as PDO and set the conversion type when using this function.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetSlvAI
LabVIEW	HIMC Get Slv AI.vi
Python	GetSlvAI

8.3.5 HIMC_GetSlvAORaw

Purpose

To get the analog output raw value of the slave.

Syntax

```
int HIMC_GetSlvAORaw(
    int ctrl_id,
    int slv_slot_id,
    int ao_idx,
    int *p_ao_raw_val
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
ao_idx [in]	Analog output channel.
p_ao_raw_val [out]	A pointer to the buffer to receive the analog output raw value.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Analog output object as PDO when using this function.

Requirement

Minimum supported version	iA Studio 3.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetSlvAORaw
LabVIEW	HIMC Get Slv AO Raw.vi
Python	GetSlvAORaw

8.3.6 HIMC_GetSlvAO

Purpose

To get the analog output value of the slave.

Syntax

```
int HIMC_GetSlvAO(
    int ctrl_id,
    int slv_slot_id,
    int ao_idx,
    double *p_ao_val
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
ao_idx [in]	Analog output channel.
p_ao_val [out]	A pointer to the buffer to receive the analog output value.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Analog output object as PDO and set the conversion type when using this function.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetSlvAO
LabVIEW	HIMC Get Slv AO.vi
Python	GetSlvAO

8.4 Slave AO bound to HIMC internal buffer variable

8.4.1 HIMC_SetSlvAOMonitor

Purpose

To set the controller variable to be bound to analog output.

Syntax

```
int HIMC_SetSlvAOMonitor(
    int ctrl_id,
    int slv_slot_id,
    int ao_idx,
    int var_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

slv_slot_id [in] Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.

ao_idx [in] Analog output channel.

var_id [in] Controller variable and axis ID.
The following tables show the definition of controller variable and axis ID.
Refer to section 16.1.2 for more controller variables.
Example: HMPL_AXIS_0 | HMPL_REF_VEL

Controller variable	Definition	Controller variable	Definition
HMPL_REF_POS	Reference position of axis	HMPL_POS_FB	Position feedback of axis
HMPL_REF_VEL	Reference velocity of axis	HMPL_VEL_FB	Velocity feedback of axis
HMPL_REF_ACC	Reference acceleration of axis	HMPL_ACC_FB	Acceleration feedback of axis
		HMPL_CUR_FB	Current feedback of axis

Axis ID	Definition
HMPL_AXIS_0	Axis 0
HMPL_AXIS_1	Axis 1
…	…
HMPL_AXIS_15	Axis 15

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure Analog output object as PDO and set the conversion type when using this function.

Requirement

Minimum supported version	iA Studio 2.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetSlvAOMonitor
LabVIEW	HIMC Set Slv AO Monitor.vi
Python	SetSlvAOMonitor

8.4.2 HIMC_SetSlvAOParam

Purpose

To set the slave's analog output bound to controller variable.

Syntax

```
int HIMC_SetSlvAOParam(
    int ctrl_id,
    int slv_slot_id,
    int ao_idx,
    int ao_en_bind,
    double ao_scale,
    double ao_offset
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
ao_idx [in]	Analog output channel.
ao_en_bind [in]	0: The function of analog output bound to controller variable is OFF (default) 1: The function of analog output bound to controller variable is ON
ao_scale [in]	Scale of analog output and controller variable.
ao_offset [in]	Offset of analog output and controller variable.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 2.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetSlvAOParam
LabVIEW	HIMC Set Slv AO Param.vi
Python	SetSlvAOParam

8.4.3 HIMC_GetSlvAOScale

Purpose

To set scale of analog output and controller variable.

Syntax

```
int HIMC_SetSlvAOScale(
    int ctrl_id,
    int slv_slot_id,
    int ao_idx,
    double *p_ao_scale
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
ao_idx [in]	Analog output channel.
p_ao_scale [in]	A pointer to the buffer to receive scale of analog output and controller variable.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetSlvAOScale
LabVIEW	HIMC Set Slv AO Scale.vi
Python	SetSlvAOScale

8.4.4 HIMC_GetSlvAOOffset

Purpose

To get the slave's offset of analog output and controller variable.

Syntax

```
int HIMC_SetSlvAOOffset(
    int ctrl_id,
    int slv_slot_id,
    int ao_idx,
    double *p_ao_offset
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
ao_idx [in]	Analog output channel.
p_ao_offset [in]	A pointer to the buffer to receive offset of analog output and controller variable.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetSlvAOOffset
LabVIEW	HIMC Get Slv AO Offset.vi
Python	GetSlvAOOffset

8.4.5 HIMC_IsSlvAOBound

Purpose

To query whether the slave's analog output is bound to controller variable.

Syntax

```
int HIMC_IsSlvAOBound(
    int ctrl_id,
    int slv_slot_id,
    int ao_idx,
    int *p_is_bound
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_slot_id [in]	Slave ID and Slot ID. If there is no slot on the slave, Slot ID can be ignored.
ao_idx [in]	Analog output channel.
p_ao_bound [in]	A pointer to the buffer to receive whether the slave's analog output is bound to controller variable.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetSlvAOBound
LabVIEW	HIMC Get Slv AO Bound.vi
Python	GetSlvAO Bound

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9. User Table functions

9. User Table functions 9-1
9.1 Overview 9-2
9.2 HIMC_SetUserTable 9-3
9.3 HIMC_GetUserTable 9-4
9.4 HIMC_SetTableValue 9-5
9.5 HIMC_GetTableValue 9-6
9.6 HIMC_SaveUserTable 9-7
9.7 HIMC_LoadUserTable 9-8

9.1 Overview

HIMC provides users with free memory space, which can store up to 512,000 double-type variable data (500K Bytes). With the functions provided in this chapter, users can access memory space. The written values will be stored to controller's random access memory (RAM). With function "HIMC_SaveUserTable", User Table's data in memory space will be saved to HIMC's hard disk space. After HIMC is power cycled, with function "HIMC_LoadUserTable", the stored data will be copied to User Table's memory space again.

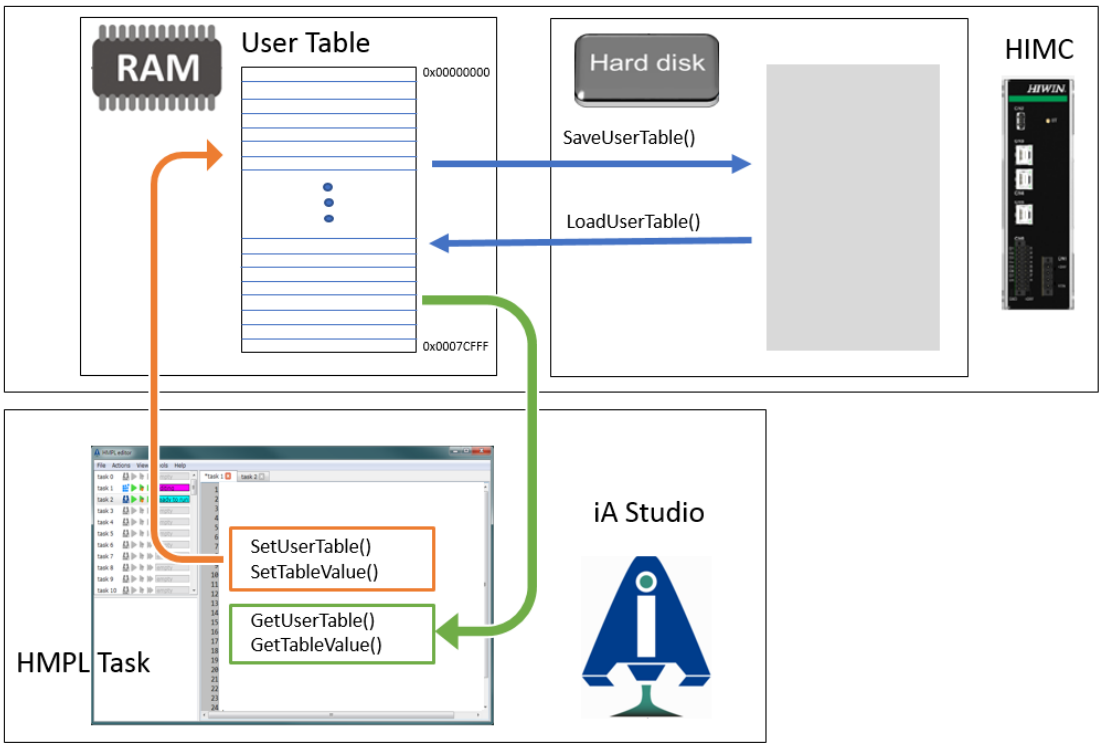

Figure 9.1.1

Note: Users can access User Table's variable values via Table Viewer in iA Studio (refer to section 4.11 in "iA Studio User Guide"), including loading and saving to HIMC's memory and hard disk.

Attention:
The error map used by dynamic error compensation functions is stored in User Table's memory space. When enabling dynamic error compensation, users should ensure the access to other User Table values will not affect the built error compensation values.

9.2 HIMC_SetUserTable

Purpose

To set user table data to the controller.

Syntax

```
int HIMC_SetUserTable(
    int    ctrl_id,
    double *p_user_table_data,
    int    start_idx,
    int    number_of_doubles_to_write
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
p_user_table_data [in]	A pointer to the buffer to write the data to user table.
start_idx [in]	Start index of user table.
number_of_doubles_to_write [in]	Number of user table to be written.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetUserTable
LabVIEW	HIMC Set User Table.vi
Python	SetUserTable

9.3 HIMC_GetUserTable

Purpose

To get user table data from the controller.

Syntax

```
int HIMC_GetUserTable(
    int    ctrl_id,
    double *p_user_table_data,
    int    start_idx,
    int    number_of_doubles_to_read
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
p_user_table_data [out]	A pointer to the buffer to receive the data from user table.
start_idx [in]	Start index of user table.
number_of_doubles_to_read [in]	Number of user table to be read.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetUserTable
LabVIEW	HIMC Get User Table.vi
Python	GetUserTable

9.4 HIMC_SetTableValue

Purpose

To write data to the specific index of user table.

Syntax

```
int HIMC_SetTableValue(
    int    ctrl_id,
    int    index,
    double value
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
index [in]	Index of user table.
value [in]	Input data.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetTableValue
LabVIEW	HIMC Set Table Value.vi
Python	SetTableValue

9.5 HIMC_GetTableValue

Purpose

To get data from the specific index of user table.

Syntax

```
int HIMC_GetTableValue(
    int    ctrl_id,
    int    index,
    double *value
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
index [in]	Index of user table.
value [out]	A pointer to the buffer to receive the data.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetTableValue
LabVIEW	HIMC Get Table Value.vi
Python	GetTableValue

9.6 HIMC_SaveUserTable

Purpose

Store user table data in RAM to permanent memory.

Syntax

```
int HIMC_SaveUserTable(
    int ctrl_id,
    int start_idx,
    int num_data
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
start_idx [in]	Start index of user table.
num_data [in]	Number of elements to be stored.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SaveUserTable
LabVIEW	HIMC Save User Table.vi
Python	SaveUserTable

9.7 HIMC_LoadUserTable

Purpose

Load user table data from permanent memory to RAM.

Syntax

```
int HIMC_LoadUserTable(
    int ctrl_id,
    int start_idx,
    int num_data
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
start_idx [in]	Start index of user table.
num_data [in]	Number of elements to be stored.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_LoadUserTable
LabVIEW	HIMC Load User Table.vi
Python	LoadUserTable

10. Position Trigger functions

10. Position Trigger functions 10-1
10.1 Overview 10-2
10.1.1 PT variables 10-2
10.1.2 Flow of using PT function 10-4
10.2 HIMC_EnablePT 10-6
10.3 HIMC_DisablePT 10-7
10.4 HIMC_IsPTEnabled 10-8
10.5 HIMC_SetPosTriggerConfig 10-9
10.6 HIMC_SetPT_PosArray 10-10
10.7 HIMC_SetPT_StateArray 10-11
10.8 HIMC_SetPT_StartIndex 10-12
10.9 HIMC_SetPT_EndIndex 10-13

10.1 Overview

HIMC position trigger function can only be used with HIWIN MIKROSYSTEM servo drive. With HMPL commands, users can operate PT (position trigger) related functions. Before operating PT related functions, please consult HIWIN MIKROSYSTEM or local distributors for compatible drives.

Note:

These are the requirements for using HIWIN MIKROSYSTEM servo drives with PT related functions:

(1) Must be a digital encoder (2) Must complete drive homing procedure first.

10.1.1 PT variables

PT related functions are operated based on the variables listed in Table 10.1.1.1.

Table 10.1.1.1

Name	Type	Unit	Description
status	int	true/false	Status of PT function, which indicates whether PT is still functioning.
start position	double	mm or deg	Start position of PT function. PT output signal train starts at this point.
end position	double	mm or deg	End position of PT function. No more PT output signal is sent out after this point.
interval	double	mm or deg	Position interval between consecutive PT outputs.
pulse width	int	ns	The width of each PT output signal. For E1 series servo drive, the range is from 20 ns to 80,000 ns, with the minimum increment of 20 ns. For example, 20, 40, ... 80,000 ns.
position array	double	mm or deg	Trigger position of random interval PT function.
status array	int	high/low	Status output of random interval PT function.
start index	int	-	Start index of random interval PT function.
end index	int	-	End index of random interval PT function.

In Figure 10.1.1.1, the polarity is set to be “active high”.

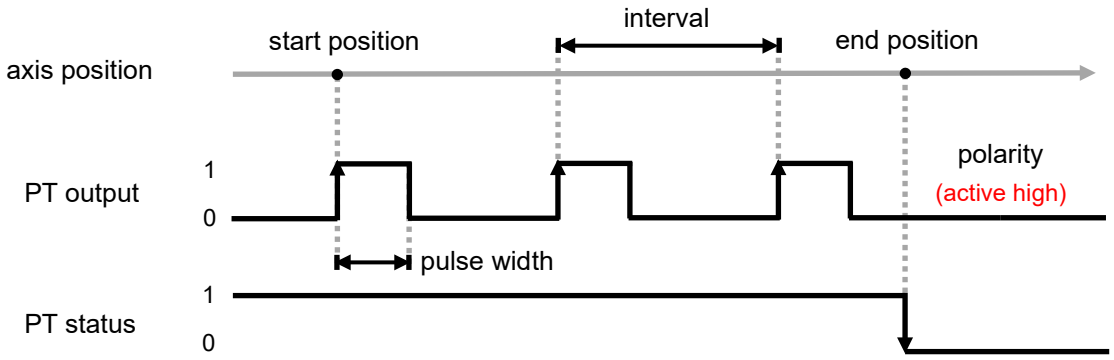

Figure 10.1.1.1

In Figure 10.1.1.2, the polarity is set to be “active low”.

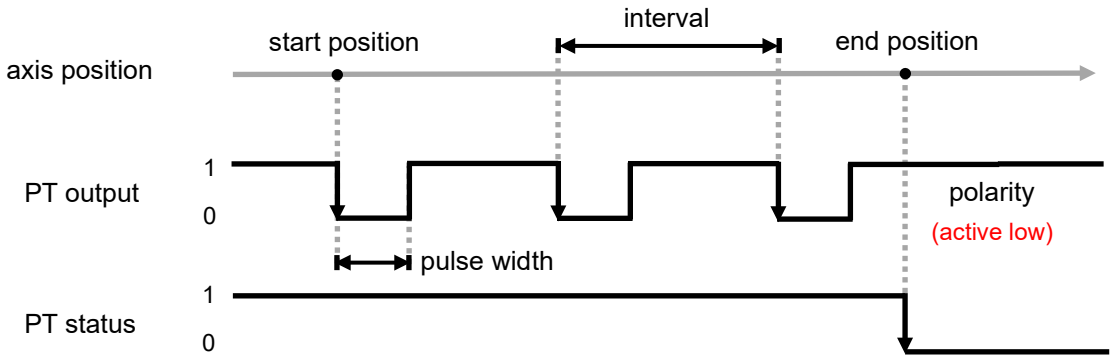

Figure 10.1.1.2

Limitation:

The interval of PT function and the velocity of axis must fit in the formula “Velocity < Interval x Position sampling rate”. If the interval is set as 100 um and the position sampling rate is 16 K, the velocity must be less than 1600 mm/s.

Note: To adjust PT function’s output polarity (active high / low), go to servo drive’s HMI for setting. After saving the setting, power cycle servo drive to make the output polarity be effective.

10.1.2 Flow of using PT function

◆ Fixed interval PT function

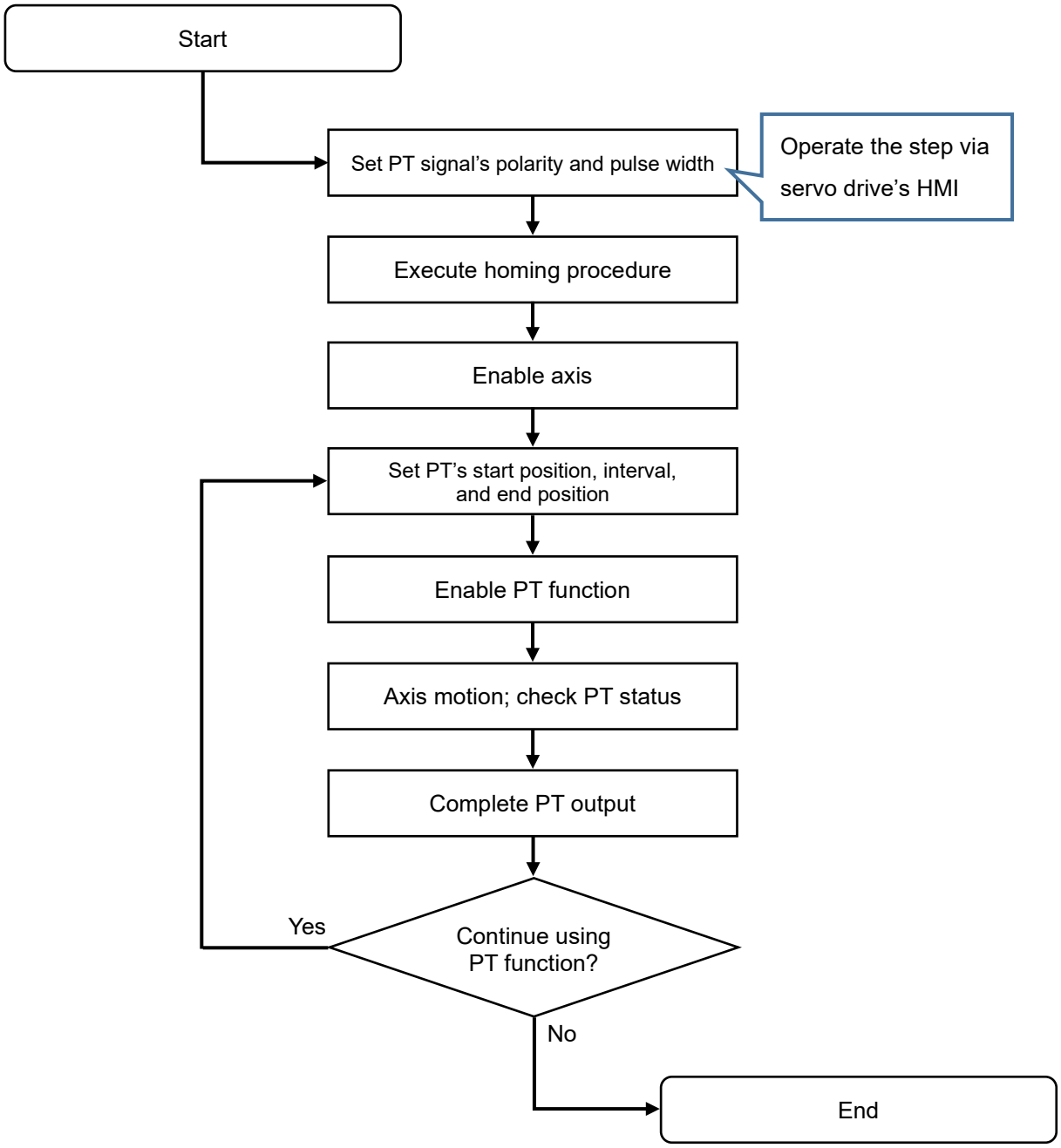

Figure 10.1.2.1

◆ Random interval PT function

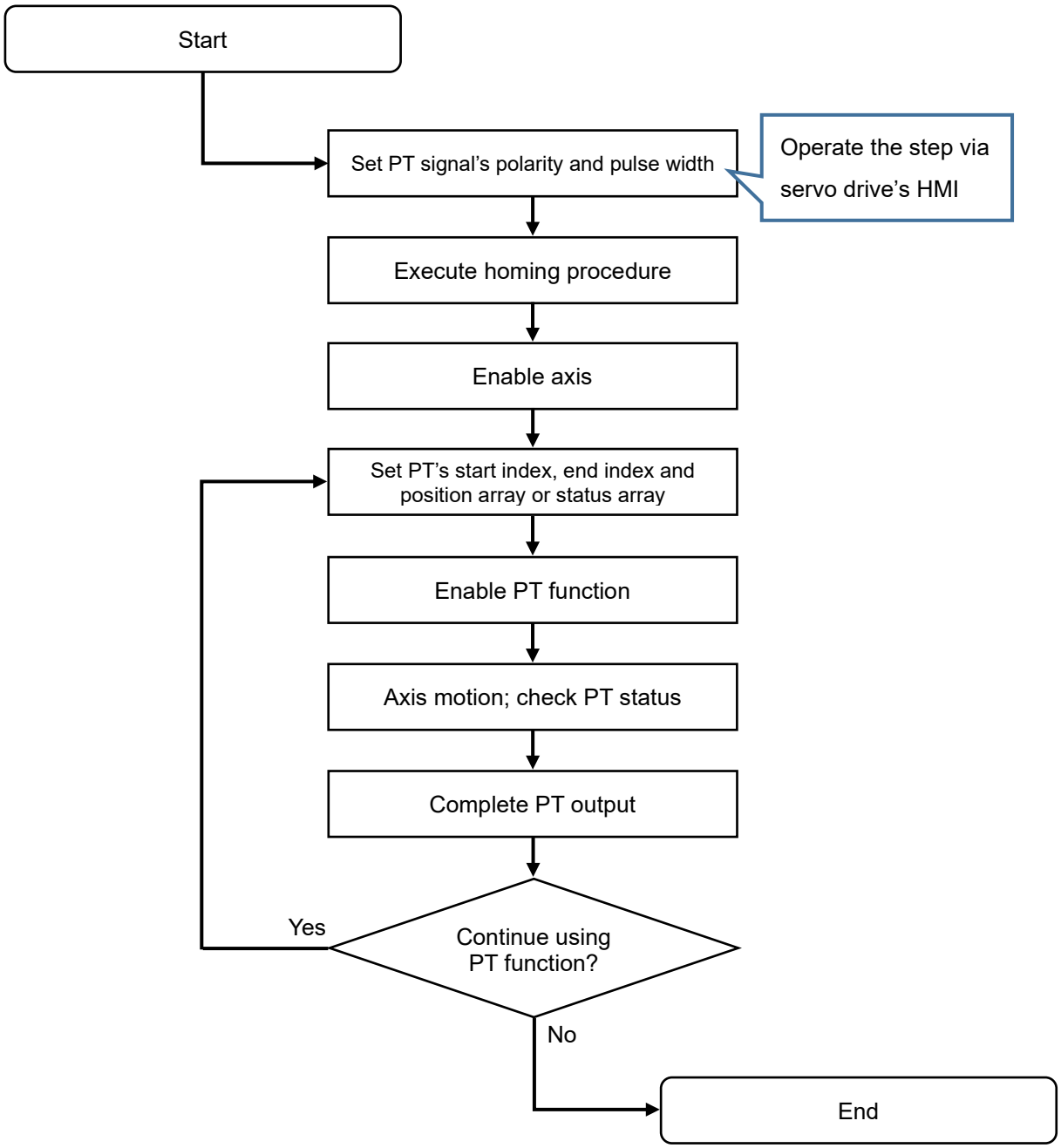

Figure 10.1.2.2

10.2 HIMC_EnablePT

Purpose

To enable the position trigger function of an axis.

Syntax

```
int HIMC_EnablePT(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_EnablePT
LabVIEW	HIMC Enable PT.vi
Python	EnablePT

10.3 HIMC_DisablePT

Purpose

To disable the position trigger function of an axis.

Syntax

```
int HIMC_DisablePT(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_DisablePT
LabVIEW	HIMC Disable PT.vi
Python	DisablePT

10.4 HIMC_IsPTEnabled

Purpose

To query whether the position trigger function is enabled.

Syntax

```
int HIMC_IsPTEnabled(
    int ctrl_id,
    int axis_id,
    int *p_is_pt_enabled
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_pt_enabled [out]	A pointer to the buffer to receive the position trigger enabled state. If the axis is at the “PT Enabled” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsPTEnabled
LabVIEW	HIMC Is PT Enabled.vi
Python	IsPTEnabled

10.5 HIMC_SetPosTriggerConfig

Purpose

To set the position trigger configuration to an axis.

Syntax

```
int HIMC_SetPosTriggerConfig(
    int ctrl_id,
    int axis_id,
    PosTriggerPar *pos_trigger_par
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
pos_trigger_par [in]	A pointer to the buffer which contains position trigger configuration set to an axis.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetPosTriggerConfig
LabVIEW	HIMC Set Pos Trigger Config.vi
Python	SetPosTriggerConfig

10.6 HIMC_SetPT_PosArray

Purpose

To set random position trigger function's trigger positions.

Syntax

```
int HIMC_SetPT_PosArray(
    int    ctrl_id,
    int    axis_id,
    int    index,
    double trigger_pos
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
index [in]	Trigger position's index.
trigger_pos [in]	An array which contains several trigger positions. Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetPT_PosArray
LabVIEW	HIMC Set PT Pos Array.vi
Python	SetPT_PosArray

10.7 HIMC_SetPT_StateArray

Purpose

To set random position trigger function's status outputs.

Syntax

```
int HIMC_SetPT_StateArray(
    int ctrl_id,
    int axis_id,
    int index,
    int state
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
index [in]	Status output's index.
state [in]	An array which contains several status outputs.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetPT_StateArray
LabVIEW	HIMC Set PT State Array.vi
Python	SetPT_StateArray

10.8 HIMC_SetPT_StartIndex

Purpose

To set random position trigger function's start index.

Syntax

```
int HIMC_SetPT_StartIndex(
    int ctrl_id,
    int axis_id,
    int index
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
index [in]	Start index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetPT_StartIndex
LabVIEW	HIMC Set PT Start Index.vi
Python	SetPT_StartIndex

10.9 HIMC_SetPT_EndIndex

Purpose

To set random position trigger function's end index.

Syntax

```
int HIMC_SetPT_EndIndex(
    int ctrl_id,
    int axis_id,
    int index
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
index [in]	End index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetPT_EndIndex
LabVIEW	HIMC Set PT End Index.vi
Python	SetPT_EndIndex

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11. Touch Probe functions

11. Touch Probe functions 11-1
11.1 Overview 11-2
11.2 HIMC_EnableTouchProbe 11-3
11.3 HIMC_DisableTouchProbe 11-4
11.4 HIMC_IsTouchProbeEnabled 11-5
11.5 HIMC_IsTouchProbeTriggered 11-6
11.6 HIMC_GetTouchProbePos 11-7
11.7 HIMC_SetTouchProbeFunc 11-8

11.1 Overview

Touch probe function is a latch function, used in homing procedure (applicable to AC motor, direct drive motor and linear motor). It captures encoder's position feedback value with the edge triggering of encoder input signal. As Figure 11.1.1 shows, when the servo drive passes by its encoder index signal, touch probe function will be triggered, and the position of the index signal will be recorded. With touch probe function, users can query the controller whether touch probe function is triggered, and the controller can get the position of the index signal recorded by latch.

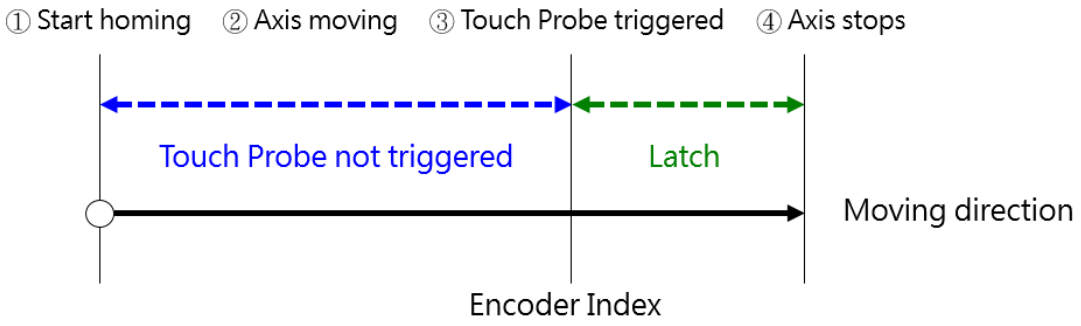

Figure 11.1.1

11.2 HIMC_EnableTouchProbe

Purpose

To enable the touch probe function of an axis.

Syntax

```
int HIMC_EnableTouchProbe(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x60B8 (Touch probe function) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_EnableTouchProbe
LabVIEW	HIMC Enable Touch Probe.vi
Python	EnableTouchProbe

11.3 HIMC_DisableTouchProbe

Purpose

To disable the touch probe function of an axis.

Syntax

```
int HIMC_DisableTouchProbe(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x60B8 (Touch probe function) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_DisableTouchProbe
LabVIEW	HIMC Disable Touch Probe.vi
Python	DisableTouchProbe

11.4 HIMC_IsTouchProbeEnabled

Purpose

To query whether the touch probe function is enabled.

Syntax

```
int HIMC_IsTouchProbeEnabled(
    int ctrl_id,
    int axis_id,
    int *p_is_probe_enabled
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_probe_enabled [out]	A pointer to the buffer to receive the touch probe enabled state. If the axis is at the “Touch Probe Enabled” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x60B9 (Touch probe status) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsTouchProbeEnabled
LabVIEW	HIMC Is Touch Probe Enabled.vi
Python	IsTouchProbeEnabled

11.5 HIMC_IsTouchProbeTriggered

Purpose

To query whether the touch probe is triggered.

Syntax

```
int HIMC_IsTouchProbeTriggered(
    int ctrl_id,
    int axis_id,
    int *p_is_probe_triggered
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_is_probe_triggered [out]	A pointer to the buffer to receive the touch probe triggered state. If the axis is at the “Touch Probe Triggered” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x60B9 (Touch probe status) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsTouchProbeTriggered
LabVIEW	HIMC Is Touch Probe Triggered.vi
Python	IsTouchProbeTriggered

11.6 HIMC_GetTouchProbePos

Purpose

To get the touch probe position of an axis.

Syntax

```
int HIMC_GetTouchProbePos(
    int    ctrl_id,
    int    axis_id,
    double *p_get_probe_pos
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
p_get_probe_pos [out]	A pointer to the buffer to receive the touch probe position of an axis. Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure the corresponding Touch probe object as PDO when using this function such as 0x60BA (Touch probe 1 positive edge).

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetTouchProbePos
LabVIEW	HIMC Get Touch Probe Pos.vi
Python	GetTouchProbePos

11.7 HIMC_SetTouchProbeFunc

Purpose

To set touch probe function.

Syntax

```
int HIMC_SetTouchProbeFunc(
    int ctrl_id,
    int axis_id,
    int tp_source,
    int cont_trigger,
    int detect_edge
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
tp_source [in]	Touch probe source. Input range: 0 (touch probe1, default), 1 (touch probe 2)
cont_trigger [in]	Touch probe trigger mode. Input range: 0 (single trigger, default), 1 (continuous trigger)
detect_edge [in]	Touch probe source. Input range: 0 (rising-edge detection, default), 1 (falling-edge detection)

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetTouchProbeFunc
LabVIEW	HIMC Set Touch Probe Func.vi
Python	SetTouchProbeFunc

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12. Dynamic Error Compensation functions

12. Dynamic Error Compensation functions 12-1
12.1 Overview 12-2
12.2 HIMC_EnableComp 12-4
12.3 HIMC_DisableComp 12-5
12.4 HIMC_SetupComp 12-6
12.5 HIMC_SetupComp2D 12-8
12.6 HIMC_SetupComp3D 12-10
12.7 HIMC_GetCompPos 12-12
12.8 HIMC_SetCompAlgType 12-13

12.1 Overview

HIMC provides dynamic 1D / 2D / 3D error compensation function. Based on related error mearsurement and calculation results, users can establish an error map and do the setting on HIMC. The setting parameters include the compensated axis, reference axis, interval of map points, base of map points, number of map points and compensation value of each map point. As for the setting of compensation value, the memory space of HIMC User Table will be used and the first ID position of error map will be provided to User Table.

Note:

(1) Refer to chapter 9 for the usage and the description of User Table.

(2) Before enabling dynamic error compensation, axis must complete homing to fix the coordinate positions of compensated axis and reference axis.

Users can choose the same axis to be both compensated axis and reference axis, or choose multiple different axes to be the reference axes of the compensated axis. For example, the compensated axis is Z axis, and the reference axes are X axis and Y axis. The compensation value of the compensated axis will change according to the moving position of the reference axis. During axis motion, the established error map will calculate the compensation command value between map points with linear interpolation, so that the compensation value can keep continuous. When the position of the axis exceeds the range established by error map, HIMC will take the nearest map point's compensation value to be its compensation command, as Figure 12.1.1 shows.

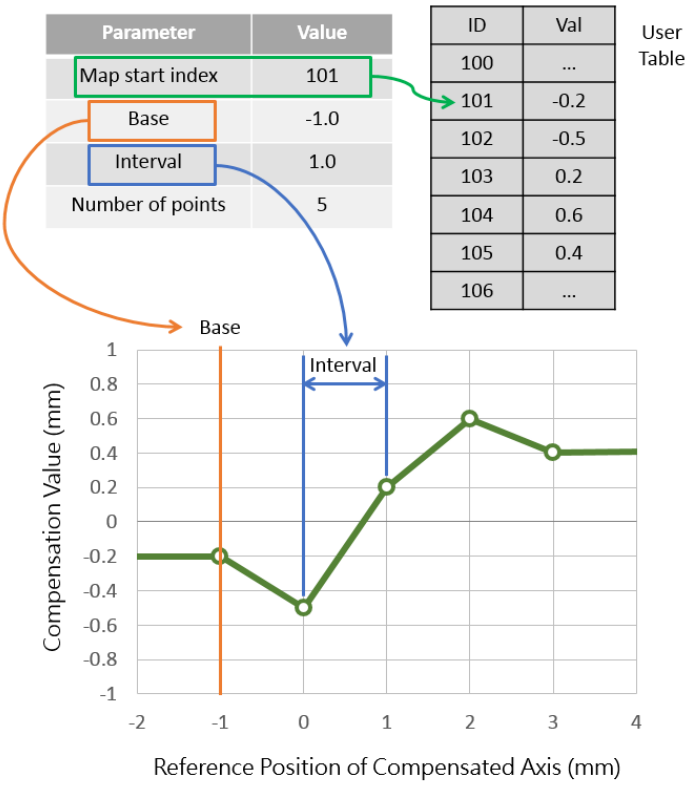

Figure 12.1.1

After enabling dynamic error compensation, in controller's axis control command, the output reference position will add the displacement to be compensated to eliminate the known measured error. As Figure 3.1.1 shows, the relationship can be described as:

Reference position + Position compensation = Position output

After enablilng dynamic error compensation, users can observe variables via Scope Manager in iA Studio.

- Compensation value: Axis → Motion Variable → Position Compensation
- Reference position (without compensation): Axis → Motion Variable → Reference Position
- Reference position (with compensation): Axis → Motion Variable → Position Output

Limit:

In HIMC, compensation command does not go through the profile generator, and the maximum compensation value preset by the controller is 1 mm. If the compensation value is larger than 1 mm, the system will display an error message to remind users.

When enabling dynamic error compensation, the reference coordinate to be compensated must be fixed. Therefore, users cannot change the home offset of the axis.

12.2 HIMC_EnableComp

Purpose

To enable the dynamic error compensation of an axis.

Syntax

```
int HIMC_EnableComp(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function is not applicable when the axis is enabled.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_EnableComp
LabVIEW	HIMC Enable Comp.vi
Python	EnableComp

12.3 HIMC_DisableComp

Purpose

To disable the dynamic error compensation of an axis.

Syntax

```
int HIMC_DisableComp(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

(1) The reference position of the axis will be reset as current feedback.
(2) This function is not applicable when the axis is enabled.
(3) The setting of the dynamic error compensation will be cleared.
To enable the dynamic error compensation again, users need to reset the setting.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_DisableComp
LabVIEW	HIMC Disable Comp.vi
Python	DisableComp

12.4 HIMC_SetupComp

Purpose

To set up one-dimensional dynamic error compensation of an axis.

Syntax

```
int HIMC_SetupComp(
    int    ctrl_id,
    int    axis_id,
    int    start_idx,
    double base_val,
    double interval,
    int    num_pt,
    int    ref_axis_id
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
start_idx [in]	Start index of map point in the user table.
base_val [in]	Base value (the smallest value of map input) Parameter unit: mm or deg
interval [in]	Constant interval between adjacent map points. Parameter unit: mm or deg
num_pt [in]	Number of map points.
ref_axis_id [in]	Index of reference axis.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetupComp
LabVIEW	HIMC Setup Comp.vi
Python	SetupComp

12.5 HIMC_SetupComp2D

Purpose

To set up two-dimensional dynamic error compensation of an axis.

Syntax

```
int HIMC_SetupComp2D(
    int    ctrl_id,
    int    axis_id,
    int    start_idx,
    double *base_val,
    double *interval,
    int    *num_pt,
    int    *ref_axis_id
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
start_idx [in]	Start index of map point in the user table.
base_val [in]	A pointer to a two-element array which contains each dimension's base value (the smallest value of map input). Parameter unit: mm or deg
interval [in]	A pointer to a two-element array which contains each dimension's constant interval between adjacent map points. Parameter unit: mm or deg
num_pt [in]	A pointer to a two-element array which contains each dimension's number of map points.
ref_axis_id [in]	A pointer to a two-element array which contains each dimension's index of reference axis.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetupComp2D
LabVIEW	HIMC Setup Comp2D.vi
Python	SetupComp2D

12.6 HIMC_SetupComp3D

Purpose

To set up three-dimensional dynamic error compensation of an axis.

Syntax

```
int HIMC_SetupComp3D(
    int    ctrl_id,
    int    axis_id,
    int    start_idx,
    double *base_val,
    double *interval,
    int    *num_pt,
    int    *ref_axis_id
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
start_idx [in]	Start index of map point in the user table.
base_val [in]	A pointer to a three-element array which contains each dimension's base value (the smallest value of map input). Parameter unit: mm or deg
interval [in]	A pointer to a three-element array which contains each dimension's constant interval between adjacent map points. Parameter unit: mm or deg
num_pt [in]	A pointer to a three-element array which contains each dimension's number of map points.
ref_axis_id [in]	A pointer to a three-element array which contains each dimension's index of reference axis.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.4
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetupComp3D
LabVIEW	HIMC Setup Comp3D.vi
Python	SetupComp3D

12.7 HIMC_GetCompPos

Purpose

To get the error compensation value of an axis sent from the controller to the servo drive.

Syntax

```
int HIMC_GetCompPos(
    int     ctrl_id,
    int     group_id,
    double *p_comp_pos
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
p_comp_pos [out]	A pointer to the buffer to receive the error compensation value of an axis.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.3
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetCompPos
LabVIEW	HIMC Get Comp Pos.vi
Python	GetCompPos

12.8 HIMC_SetCompAlgType

Purpose

To set the interpolation method of dynamic error compensation of an axis.

Syntax

```
int HIMC_SetCompAlgType(
    int ctrl_id,
    int axis_id,
    int alg_type
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

alg_type [in] The interpolation method of dynamic error compensation.
0: first-order linear interpolation (defualt)
1: three-order spline interpolation

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Three-dimensional dynamic error compensation does not support three-order spline interpolation.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetCompAlgType
LabVIEW	HIMC Set Comp Alg Type.vi
Python	SetCompAlgType

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13. Filter functions

13. Filter functions 13-1
13.1 Overview 13-2
13.2 HIMC_EnableAxisVsf 13-3
13.3 HIMC_DisableAxisVsf 13-4
13.4 HIMC_SetAxisVsf 13-5
13.5 HIMC_EnableAxisInShape 13-7
13.6 HIMC_DisableAxisInShape 13-8
13.7 HIMC_SetAxisInShape 13-9
13.8 HIMC_EnableGrpInShape 13-11
13.9 HIMC_DisableGrpInShape 13-12
13.10 HIMC_SetGrpInShape 13-13

13.1 Overview

Filter functions are used to revise profile generator's position command. Currently, HMPL provides three kinds of filters, smooth time, vibration suppression filter (VSF), and input shaping filter (InShape).

Smooth time makes the motor accelerate smoothly to achieve smooth movement, while VSF and InShape suppresses the vibration of the motor (especially when the load of the mechanism is cantilever) during the movement. By tuning "frequency" and "damping ratio", the effect of vibration suppression can be achieved.

VSF and InShape cannot be used at the same time, but either of them can be used with smooth time.

Besides, when it comes to coordinated motion, Axis InShape function is useless. Users must adopt Group InShape function to suppress the vibration.

Note: Using filters will increase move time and decrease debounce time.

13.2 HIMC_EnableAxisVsf

Purpose

To enable VSF filter of an axis.

Syntax

```
int HIMC_EnableAxisVsf(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function is not applicable when the motor is moving. Otherwise, the motor will generate an unexpected vibration.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_EnableAxisVsf
LabVIEW	HIMC Enable Axis Vsf.vi
Python	EnableAxisVsf

13.3 HIMC_DisableAxisVsf

Purpose

To disable VSF filter of an axis.

Syntax

```
int HIMC_DisableAxisVsf(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_DisableAxisVsf
LabVIEW	HIMC Disable Axis Vsf.vi
Python	DisableAxisVsf

13.4 HIMC_SetAxisVsf

Purpose

To set VSF filter's parameters of an axis.

Syntax

```
int HIMC_SetAxisVsf(
    int ctrl_id,
    int axis_id,
    double frequency,
    double damping_ratio
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
frequency [in]	System frequency. Parameter unit: Hz Input range: 0.1 ~ 200
damping_ratio [in]	Damping ratio. Input range: 0.7 ~ 1.5 (**1.0** is recommended)

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function is not applicable when the motor is moving. Otherwise, the motor will generate an unexpected vibration.

Requirement

Minimum supported version	iA Studio 1.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetAxisVsf
LabVIEW	HIMC Set Axis Vsf.vi
Python	SetAxisVsf

13.5 HIMC_EnableAxisInShape

Purpose

To enable InShape filter of an axis.

Syntax

```
int HIMC_EnableAxisInShape(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function is not applicable when the motor is moving. Otherwise, the motor will generate an unexpected vibration.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_EnableAxisInshape
LabVIEW	HIMC Enable Axis In Shape.vi
Python	EnableAxisInShape

13.6 HIMC_DisableAxisInShape

Purpose

To disable InShape filter of an axis.

Syntax

```
int HIMC_DisableAxisInShape(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_DisableAxisInshape
LabVIEW	HIMC Disable Axis In Shape.vi
Python	DisableAxisInShape

13.7 HIMC_SetAxisInShape

Purpose

To set InShape filter's parameters of an axis.

Syntax

```
int HIMC_SetAxisInShape(
    int ctrl_id,
    int axis_id,
    double frequency,
    double damping_ratio,
    ShaperMode shaper_type
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
frequency [in]	System frequency. Parameter unit: Hz Input range: 3.0 ~ 300
damping_ratio [in]	Damping ratio. Input range: 0.0 ~ 0.3
shaper_type [in]	There are two shaper types, **Shaper_Normal** and **Shaper_Robust**. Shaper_Robust is more robust than Shaper_Normal, but Shaper_Normal is strong enough to suppress vibration.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

(1) This function is not applicable when the motor is moving. Otherwise, the motor will generate an unexpected vibration.

(2) The default value for frequency and damping ratio is 5.5Hz and 0.03 respectively.

Requirement

Minimum supported version	iA Studio 1.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetAxisInshape
LabVIEW	HIMC Set Axis In Shape.vi
Python	SetAxisInShape

13.8 HIMC_EnableGrpInShape

Purpose

To enable InShape filter of an axis group.

Syntax

```
int HIMC_EnableGrpInShape(
    int ctrl_id,
    int group_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function is not applicable when the motor is moving. Otherwise, the motor will generate an unexpected vibration.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_EnableGrpInShape
LabVIEW	HIMC Enable Grp In Shape.vi
Python	EnableGrpInShape

13.9 HIMC_DisableGrpInShape

Purpose

To disable InShape filter of an axis group.

Syntax

```
int HIMC_DisableGrpInShape(
    int ctrl_id,
    int group_id
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_DisableGrpInShape
LabVIEW	HIMC Disable Grp In Shape.vi
Python	DisableGrpInShape

13.10 HIMC_SetGrpInShape

Purpose

To set InShape filter's parameters of an axis group.

Syntax

```
int HIMC_SetGrpInShape(
    int ctrl_id,
    int group_id,
    double frequency,
    double damping_ratio,
    ShaperMode shaper_type
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
group_id [in]	Axis group index.
frequency [in]	System frequency. Parameter unit: Hz Input range: 3.0 ~ 300
damping_ratio [in]	Damping ratio. Input range: 0.0 ~ 0.3
shaper_type [in]	There are two shaper types, **Shaper_Normal** and **Shaper_Robust**. Shaper_Robust is more robust than Shaper_Normal, but Shaper_Normal is strong enough to suppress vibration.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

(1) This function is not applicable when the motor is moving. Otherwise, the motor will generate an unexpected vibration.

(2) The default value for frequency and damping ratio is 5.5Hz and 0.03 respectively.

Requirement

Minimum supported version	iA Studio 1.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetGrpInShape
LabVIEW	HIMC Set Grp In Shape.vi
Python	SetGrpInShape

14. HMPL Task functions

14. HMPL Task functions 14-1
14.1 Overview 14-2
14.2 HIMC_StartTask 14-3
14.3 HIMC_StartTaskFunc 14-4
14.4 HIMC_StopTask 14-5
14.5 HIMC_StopAllTask 14-6
14.6 HIMC_IsTaskStop 14-7
14.7 HIMC_LoadHMPLTask 14-8

14.1 Overview

HIMC has 64 built-in HMPL tasks for users to practice motion profile commands based on application. In any HMPL task, users can start or stop other HMPL tasks with HMPL task function. When a HMPL task is being executed, users cannot ask it to be re-executed; instead, users should wait until the execution of the task is done and the task enters “stop” status. However, users can query whether the HMPL task is currently being executed, and control the order of multiple HMPL tasks for the application accordingly.

14.2 HIMC_StartTask

Purpose

To start the execution of a HMPL task.

Syntax

```
int HIMC_StartTask(
    int ctrl_id,
    int task_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

task_id [in] HMPL task ID.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_StartTask
LabVIEW	HIMC Start Task.vi
Python	StartTask

14.3 HIMC_StartTaskFunc

Purpose

To start the execution of a function in a HMPL task.

Syntax

```
int HIMC_StartTaskFunc(
    int ctrl_id,
    int task_id,
    char *func_name
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

task_id [in] HMPL task ID.

func_name [in] A pointer to the buffer to store the function name in the HMPL task.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_StartTaskFunc
LabVIEW	HIMC Start Task Func.vi
Python	StartTaskFunc

14.4 HIMC_StopTask

Purpose

To stop the execution of a HMPL task.

Syntax

```
int HIMC_StopTask(
    int ctrl_id,
    int task_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

task_id [in] HMPL task ID.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_StopTask
LabVIEW	HIMC Stop Task.vi
Python	StopTask

14.5 HIMC_StopAllTask

Purpose

To stop the execution of all HMPL tasks (the caller included).

Syntax

```
int HIMC_StopAllTask(
    int ctrl_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_StopAllTask
LabVIEW	HIMC Stop All Task.vi
Python	StopAllTask

14.6 HIMC_IsTaskStop

Purpose

To query whether the execution of a HMPL task is stopped.

Syntax

```
int HIMC_IsTaskStop(
    int ctrl_id,
    int task_id,
    int *isStop
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

task_id [in] HMPL task ID.

isStop [out] A pointer to the buffer to receive the status of the HMPL task.
If the HMPL task is at the “TaskStop” state, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_IsTaskStop
LabVIEW	HIMC Is Task Stop.vi
Python	IsTaskStop

14.7 HIMC_LoadHMPLTask

Purpose

To load HMPL file to the controller.

Syntax

```
int HIMC_LoadHMPLTask(
    int ctrl_id,
    int task_id,
    const char *file_name
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

task_id [in] HMPL task ID.

file_name [in] A pointer to the buffer to store the HMPL file path to be loaded.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

This function must be used with the executable file “HMPL_compiler.exe” in “iA_Studio” folder. Copy the executable file and place it in the “bin\Debug” and “bin\Release” folder of the user-developed program.

Requirement

Minimum supported version	iA Studio 2.0
Executable	HMPL_compiler.exe
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_LoadHMPLTask
LabVIEW	HIMC Load HMPL Task.vi
Python	LoadHMPLTask

15. Callback functions

15. Callback functions 15-1
15.1 HIMC_SetHmpIEvtCallback 15-2
15.2 HIMC_SetErrorCallback 15-3
15.3 HIMC_SetHmpIMsgEvtCallback 15-4

15.1 HIMC_SetHmplEvtCallback

Purpose

To register a callback function to capture the event sent by HMPL task.

Syntax

```
int HIMC_SetHmplEvtCallback(
    int ctrl_id,
    HMPLEventCBFuncPtr hmpl_event_cb_func_ptr
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
hmpl_event_cb_func_ptr [in]	A pointer to callback function. The prototype of the function is “void func(int arg)”.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetHmplEvtCallback
LabVIEW	--
Python	SetHmplEvtCallback

15.2 HIMC_SetErrorCallback

Purpose

To register a callback function to capture the error ID sent by the controller.

Syntax

```
int HIMC_SetErrorCallback(
    int ctrl_id,
    HimcErrorCBFuncPtr himc_error_cb_func_ptr
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
himc_error_cb_func_ptr [in]	A pointer to callback function. The prototype of the function is “void func(int arg)”.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Refer ro chapter 5 in “iA Studio User Guide” for error ID.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetErrorCallback
LabVIEW	--
Python	SetErrorCallback

15.3 HIMC_SetHmplMsgEvtCallback

Purpose

To register a callback function to capture the string message sent by HMPL task.

Syntax

```
int HIMC_SetHmplMsgEvtCallback(
    int ctrl_id,
    HMPLMsgEventCBFuncPtr hmpl_msg_cb_func_ptr
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
hmpl_msg_cb_func_ptr [in]	A pointer to callback function. The prototype of the function is “void func(const char *text)”.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

The maximum length of the string message is 128 characters.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetHmplMsgEvtCallback
LabVIEW	--
Python	SetHmplMsgEvtCallback

16. Variable and Function Operation functions

16. Variable and Function Operation functions 16-1
16.1 Overview 16-2
16.1.1 Controller variables list 16-3
16.2 Servo drive variable operation 16-7
16.2.1 HIMC_ReadSDO 16-7
16.2.2 HIMC_WriteSDO 16-9
16.2.3 HIMC_ReadPDO 16-10
16.2.4 HIMC_WritePDO 16-11
16.2.5 HIMC_ForceWritePDO 16-12
16.2.6 HIMC_ReleasePDO 16-13
16.3 Controller variable operation 16-14
16.3.1 HIMC_GetVariableByID 16-14
16.3.2 HIMC_SetVariableByID 16-15
16.3.3 HIMC_GetVariableListByID 16-16
16.3.4 HIMC_SetVariableListByID 16-17
16.3.5 HIMC_GetGlobalVariables 16-18
16.3.6 HIMC_SetGlobalVariables 16-19

16.1 Overview

HIMC provides users with variable operation functions for servo drive and controller. For servo drive's variable operation, servo drive Object Dictionary index must be given to access its value, and data exchange must be performed via CoE communication. As for controller's variable operation, specific variable's addressing ID must be given based on controller's variable ID list for the access. The definition of parameters of controller is given in section 16.1.1.

Attention:
If there is no requirement for specific purposes, it is recommended for users to access relevant system variables with relevant HMI and functions. When using variable operation functions, users should ensure the safety of accessing variables and entering values.

16.1.1 Controller variables list

HIMC takes 32 bits as controller variable's addressing ID. Its type is 0x□□□□□□□□, where "0x" indicates the value is in hexadecimal system. With variable operation functions, users can access system variables, axis variables and axis group variables provided by HIMC. The rule of addressing ID is explained as follows:

1. The 1st and 2nd value of addressing ID indicates "category of controller variable". 0x00□□□□□□ belongs to system variable; 0x83□□□□□□ belongs to axis variable; 0x82□□□□□□ belongs to axis group variable.

2. The 3rd and 4th value of addressing ID indicates "axis ID or axis group ID". For example, axis variable 0x8302□□□□ is a variable storing axis index 02, while axis group variable 0x8201□□□□ is a variable storing axis group index 01.

3. The 5th to 8th value of addressing ID indicates "addressing location of controller's system, axis or axis group variable". Refer to Table 16.1.1.1 to Table 16.1.1.3 for parameters list and description.

Table 16.1.1.1

System Variables		
Addressing ID	Variable Name	Description
0x0000012c	HCV_ID_fclk	System execution clock (increase 1 count per 250 us)
0x0000012e	HCV_ID_timeInMs	System execution time (ms)
0x000007d0	HCV_ID_user_table	double[512000] array variable that users can freely use
0x00002328	HCV_ID_ltest0	int variable that users can freely use
0x00002329	HCV_ID_ltest1	int variable that users can freely use
0x0000232a	HCV_ID_ltest2	int variable that users can freely use
0x0000232b	HCV_ID_ltest3	int variable that users can freely use
0x0000232c	HCV_ID_ltest4	int variable that users can freely use
0x0000232d	HCV_ID_ltest5	int variable that users can freely use
0x0000232e	HCV_ID_ltest6	int variable that users can freely use
0x0000232f	HCV_ID_ltest7	int variable that users can freely use
0x00002330	HCV_ID_ltest8	int variable that users can freely use
0x00002331	HCV_ID_ltest9	int variable that users can freely use
0x0000235a	HCV_ID_dtest0	double variable that users can freely use
0x0000235b	HCV_ID_dtest1	double variable that users can freely use
0x0000235c	HCV_ID_dtest2	double variable that users can freely use
0x0000235d	HCV_ID_dtest3	double variable that users can freely use
0x0000235e	HCV_ID_dtest4	double variable that users can freely use
0x0000235f	HCV_ID_dtest5	double variable that users can freely use
0x00002360	HCV_ID_dtest6	double variable that users can freely use
0x00002361	HCV_ID_dtest7	double variable that users can freely use

System Variables		
Addressing ID	Variable Name	Description
0x00002362	HCV_ID_dtest8	double variable that users can freely use
0x00002363	HCV_ID_dtest9	double variable that users can freely use
0x0000238c	HCV_ID_mtest	double[10] array variable that users can freely use

Table 16.1.1.2

Axis Variables		
Addressing ID	Variable Name	Description
0x83□□0015	HCV_ID_motion_type	Motion type
0x83□□0033	HCV_ID_pos_tr	In-position convergence radius
0x83□□0034	HCV_ID_pos_tr_t	In-position settling time
0x83□□0065	HCV_ID_sw_RL	Software right limit
0x83□□0066	HCV_ID_sw_LL	Software left limit
0x83□□0067	HCV_ID_vel_lim	Maximum velocity limit
0x83□□0068	HCV_ID_acc_lim	Maximum acceleration limit
0x83□□0069	HCV_ID_dec_lim	Maximum deceleration limit
0x83□□0079	HCV_ID_max_pos_err	Position error limit
0x83□□007a	HCV_ID_max_comp_lim	Position compensation limit
0x83□□00a0	HCV_ID_home_status	Homing state
0x83□□00a1	HCV_ID_home_method	Homing method
0x83□□00a2	HCV_ID_home_fast_vel	Fast homing velocity
0x83□□00a3	HCV_ID_home_slow_vel	Slow homing velocity
0x83□□00a4	HCV_ID_home_timeout	Homing delay time
0x83□□00a5	HCV_ID_home_acc	Homing acceleration
0x83□□00a6	HCV_ID_home_offset	Homing position offset
0x83□□00d3	HCV_ID_max_vel	Target velocity
0x83□□00d4	HCV_ID_max_acc	Target acceleration
0x83□□00d5	HCV_ID_max_dec	Target deceleration
0x83□□00d7	HCV_ID_sm_factor	Smooth time
0x83□□00db	HCV_ID_vel_scale	Velocity scale (0~100)
0x83□□00dd	HCV_ID_p2p_del	P2P motion waiting time
0x83□□00de	HCV_ID_p2p_pos1	P2P position 1
0x83□□00df	HCV_ID_p2p_pos2	P2P position 2
0x83□□00e0	HCV_ID_p2p_repeat	Repeat P2P motion
0x83□□00e1	HCV_ID_rlt_dist	Relative move distance
0x83□□00e2	HCV_ID_en_motionManager	Motion axis selection of Motion Manager
0x83□□00e3	HCV_ID_acc_time	Acceleration time
0x83□□00e4	HCV_ID_dec_time	Deceleration time
0x83□□00e9	HCV_ID_map_io_type	Error compensation type

Axis Variables		
Addressing ID	Variable Name	Description
0x83□□0117	HCV_ID_rollover_turns	Rollover turns
0x83□□0119	HCV_ID_rollover_val	Rollover value
0x83□□0193	HCV_ID_gant_pair	Gantry pair ID of gantry configuration
0x83□□01f7	HCV_ID_en_delay	Time out for axis enabling
0x83□□01ff	HCV_ID_fb_ratio_pos	Servo drive position resolution; length unit (denominator)
0x83□□0200	HCV_ID_fb_ratio_cnt	Servo drive position resolution; unit: count (numerator)
0x83□□0209	HCV_ID_fb_curr_ratio_curr	Servo drive current resolution; current unit (denominator)
0x83□□020a	HCV_ID_fb_curr_ratio_cnt	Servo drive current resolution; unit: count (numerator)
0x83□□0213	HCV_ID_rotor_inertia	Rotor intertia ratio of the motor
0x83□□0214	HCV_ID_force_constant	Torque constant of the motor
0x83□□0263	HCV_ID_last_err	Axis error code
0x83□□03c2	HCV_ID_gear_ratio	Gear ratio

Note: Symbols □□ will be the axis ID in hexadecimal format. For example, 01 stands for axis index 01; 0f stands for axis index 15.

Table 16.1.1.3

Axis Group Variables		
Addressing ID	Variable Name	Description
0x82□□0002	HCV_ID_grp_num_axis	Number of axes for axis group
0x82□□00c9	HCV_ID_grp_lin_vel_lim	Velocity limit for axis group’s linear motion
0x82□□00ca	HCV_ID_grp_lin_acc_lim	Acceleration limit for axis group’s linear motion
0x82□□00cb	HCV_ID_grp_lin_dec_lim	Deceleration limit for axis group’s linear motion
0x82□□00d4	HCV_ID_grp_ang_vel_lim	Velocity limit for axis group’s rotary motion
0x82□□00d5	HCV_ID_grp_ang_acc_lim	Acceleration limit for axis group’s rotary motion
0x82□□00d6	HCV_ID_grp_ang_dec_lim	Deceleration limit for axis group’s rotary motion
0x82□□00d0	HCV_ID_grp_lin_vel	Target velocity for axis group
0x82□□00d1	HCV_ID_grp_lin_acc	Target acceleration for axis group
0x82□□00d2	HCV_ID_grp_lin_dec	Target deceleration for axis group
0x82□□00d3	HCV_ID_grp_lin_sf	Smooth time for axis group
0x82□□00f0	HCV_ID_grp_lin_acc_time	Target acceleration time for axis group
0x82□□00f1	HCV_ID_grp_lin_dec_time	Target deceleration time for axis group
0x82□□00e7	HCV_ID_grp_ang_vel	Target velocity for axis group’s rotary motion
0x82□□00e8	HCV_ID_grp_ang_acc	Target acceleration for axis group’s rotary motion
0x82□□00e9	HCV_ID_grp_ang_dec	Target deceleration for axis group’s rotary motion
0x82□□00ea	HCV_ID_grp_ang_sf	Smooth time for axis group’s rotary motion
0x82□□00eb	HCV_ID_grp_ang_acc_time	Target acceleration time for axis group’s rotary motion

Axis Group Variables		
Addressing ID	Variable Name	Description
0x82□□00ec	HCV_ID_grp_ang_dec_time	Target deceleration time for axis group's rotary motion
0x82□□00e4	HCV_ID_grp_coord_sys	Coordinate system for axis group
0x82□□00e5	HCV_ID_grp_buffer_mode	Buffer mode for axis group
0x82□□00e6	HCV_ID_grp_trans_mode	Transition mode for axis group
0x82□□00e7	HCV_ID_grp_trans_vel	Transition velocity for axis group
0x82□□00e8	HCV_ID_grp_trans_dis	Tramsition distance for axis group
0x82□□00f6	HCV_ID_grp_trans_dev	Tramsition deviation for axis group
0x82□□00f7	HCV_ID_grp_trans_curvature	Tramsition curvature for axis group
0x82□□00eb	HCV_ID_grp_vel_scale	Velocity scale (0~100) for axis group
0x82□□00da	HCV_ID_grp_shaper_fr	InShape filter's frequency for axis group
0x82□□00db	HCV_ID_grp_shaper_xi	InShape filter's damping ratio for axis group
0x82□□038f	HCV_ID_grp_last_err	Axis group error code

Note: Symbols □□ will be the axis group ID in hexadecimal format. For example, 01 stands for axis group index 01; 0f stands for axis group index 15.

16.2 Servo drive variable operation

16.2.1 HIMC_ReadSDO

Purpose

To read the object value of the slave through SDO.

Syntax

```
int HIMC_ReadSDO(
    int ctrl_id,
    int slv_id,
    int obj_index,
    int obj_subindex,
    int size_bytes,
    int64_t *value
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_id [in]	Slave index.
obj_index [in]	Index of the slave object.
obj_subindex [in]	Subindex of the slave object.
obj_subindex [in]	Byte length of the slave object.
value [out]	A pointer to the buffer to store the read object value.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ReadSDO
LabVIEW	HIMC Read SDO.vi
Python	ReadSDO

16.2.2 HIMC_WriteSDO

Purpose

To write the object value of the slave through SDO.

Syntax

```
int HIMC_WriteSDO(
    int ctrl_id,
    int slv_id,
    int obj_index,
    int obj_subindex,
    int size_bytes,
    int64_t value
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_id [in]	Slave index.
obj_index [in]	Index of the slave object.
obj_subindex [in]	Subindex of the slave object.
size_bytes [in]	Byte length of the slave object.
value [in]	The object value to be written.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_Write SDO.vi
LabVIEW	HIMC Write SDO.vi
Python	WriteSDO

16.2.3 HIMC_ReadPDO

Purpose

To read PDO object value of the slave through PDO.

Syntax

```
int HIMC_ReadPDO(
    int ctrl_id,
    int slv_id,
    int obj_index,
    int obj_subindex,
    int64_t *value
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_id [in]	Slave index.
obj_index [in]	Index of the slave object.
obj_subindex [in]	Subindex of the slave object.
value [out]	A pointer to the buffer to store the read object value.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_ReadPDO
LabVIEW	HIMC Read PDO.vis
Python	ReadPDO

16.2.4 HIMC_WritePDO

Purpose

To write PDO object value of the slave through PDO.

Syntax

```
int HIMC_WritePDO(
    int ctrl_id,
    int slv_id,
    int obj_index,
    int obj_subindex,
    int64_t value
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_id [in]	Slave index.
obj_index [in]	Index of the slave object.
obj_subindex [in]	Subindex of the slave object.
value [in]	The object value to be written.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_WritePDO
LabVIEW	HIMC Write PDO.vi
Python	WritePDO

16.2.5 HIMC_ForceWritePDO

Purpose

To force write PDO object of the slave through PDO.

Syntax

```
int HIMC_ForceWritePDO(
    int ctrl_id,
    int slv_id,
    int obj_index,
    int obj_subindex,
    int64_t value
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_id [in]	Slave index.
obj_index [in]	Index of the slave object.
obj_subindex [in]	Subindex of the slave object.
value [in]	The object value to be written.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ForceWritePDO
LabVIEW	HIMC Force Write PDO.vi
Python	ForceWritePDO

16.2.6 HIMC_ReleasePDO

Purpose

To release force written PDO object and use it with HIMC_ForceWritePDO.

Syntax

```
int HIMC_ReleasePDO(
    int ctrl_id,
    int slv_id,
    int obj_index,
    int obj_subindex
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
slv_id [in]	Slave index.
obj_index [in]	Index of the slave object.
obj_subindex [in]	Subindex of the slave object.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_ReleasePDO
LabVIEW	HIMC Release PDO.vi
Python	ReleasePDO

16.3 Controller variable operation

16.3.1 HIMC_GetVariableByID

Purpose

To get the variable value of the controller by ID.

Syntax

```
int HIMC_GetVariableByID(
    int    ctrl_id,
    int    var_id,
    double *p_val
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

var_id [in] HIMC controller variable ID.
Refer to section 16.1.1 for the definition.

p_val [out] A pointer to the buffer to receive the value of the variable.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetVariableByID
LabVIEW	HIMC Get Variable By ID.vi
Python	GetVariableByID

16.3.2 HIMC_SetVariableByID

Purpose

To set the variable value of the controller by ID.

Syntax

```
int HIMC_SetVariableByID(
    int    ctrl_id,
    int    var_id,
    double val
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

var_id [in] HIMC controller variable ID.
Refer to section 16.1.1 for the definition.

val [in] The new value of the variable.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetVariableByID
LabVIEW	HIMC Set Variable By ID.vi
Python	SetVariableByID

16.3.3 HIMC_GetVariableListByID

Purpose

To get values of list variables of the controller by ID.

Syntax

```
int HIMC_GetVariableListByID(
    int    ctrl_id,
    int    *p_var_id,
    int    num,
    double *p_val
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

p_var_id [in] A pointer to the buffer to store the HIMC controller variable IDs of list variables.
Refer to section 16.1.1 for the definition.

num [in] Number of variables.

p_val [out] A pointer to the buffer to receive the values of list variables.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetVariableListByID
LabVIEW	HIMC Get Variable List By ID.vi
Python	GetVariableListByID

16.3.4 HIMC_SetVariableListByID

Purpose

To set values to list variables of the controller by ID.

Syntax

```
int HIMC_SetVariableListByID(
    int    ctrl_id,
    int    *p_var_id,
    int    num,
    double *p_val
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

p_var_id [in] A pointer to the buffer to store the HIMC controller variable IDs of list variables.
Refer to section 16.1.1 for the definition.

num [in] Number of variables.

p_val [in] A pointer to the buffer to store the new values of list variables.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetVariableListByID
LabVIEW	HIMC Set Variable List By ID.vi
Python	SetVariableListByID

16.3.5 HIMC_GetGlobalVariables

Purpose

To get values of list global variables of the controller.

Syntax

```
int HIMC_GetGlobalVariables(
    int    ctrl_id,
    char   **pp_var_name_array,
    int    length,
    double *p_output_array
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
pp_var_name_array [in]	A pointer to the buffer to store the names of list global variables.
length [in]	Number of global variables.
p_output_array [out]	A pointer to the buffer to receive the values of list global variables.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Executable	`HMPL_compiler.exe`
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetGlobalVariables
LabVIEW	HIMC Get Global Variables.vi
Python	GetGlobalVariables

16.3.6 HIMC_SetGlobalVariables

Purpose

To set values to list global variables of the controller.

Syntax

```
int HIMC_SetGlobalVariables(
    int    ctrl_id,
    char   **pp_var_name_array,
    int    length,
    double *p_input_array
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
pp_var_name_array [in]	A pointer to the buffer to store the names of list global variables.
length [in]	Number of global variables.
p_input_array [in]	A pointer to the buffer to store the new values of list global variables.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Executable	`HMPL_compiler.exe`
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetGlobalVariables
LabVIEW	HIMC Get Global Variables.vi
Python	GetGlobalVariables

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17. HIMC Error functions

17. HIMC Error functions 17-1
17.1 Overview 17-2
17.1.1 System error messages 17-3
17.1.2 Axis error massages 17-6
17.1.3 Group error messages 17-9
17.2 HIMC_GetLastError 17-11
17.3 HIMC_GetAxisLastErr 17-12
17.4 HIMC_ClearAxisLastErr 17-13
17.5 HIMC_GetGrpLastErr 17-14
17.6 HIMC_ClearGrpLastErr 17-15
17.7 HIMC_GetDriveErr 17-16
17.8 HIMC_GetErrorInformation 17-17

17.1 Overview

HIMC offers 32-bit error codes to represent the related error messages. With the functions provided in this chapter, users can get or clear the error code of system, axis and axis group. (The error codes, names and descriptions of each category are listed in section 17.1.1 to 17.1.3.) The type of error code is 0x□□□□□□□□, where “0x” indicates the value is in hexadecimal system. Its rule is the same as that of controller variable addressing ID, which is explained as follows:

1. The 1st and 2nd value of error code indicates “category of controller variable”. 0x00□□□□□□ belongs to system variable; 0x83□□□□□□ belongs to axis variable; 0x82□□□□□□ belongs to axis group variable.
2. The 3rd and 4th value of error code indicates “axis ID or axis group ID”. For example, axis variable 0x8302□□□□ is a variable storing axis index 02, while axis group variable 0x8201□□□□ is a variable storing axis group index 01.
3. The 5th to 8th value of error code indicates “variable ID”. Refer to section 17.1.1 to 17.1.3 for details.

Note: Since the return value of function is in decimal system, users must convert it to hexadecimal system by themselves to get the correct error code.

17.1.1 System error messages

Table 17.1.1.1

System Error Codes		
Error Code	Error Name	Description
0x00000001	eERR_HCV_ID_NOT_FOUND	The variable ID was not found.
0x00000002	eERR_DATA_EXCEEDED	The requested data is out of range.
0x00000003	eERR_HCV_IS_READ_ONLY	Read-only parameter.
0x00000004	eERR_HCV_VALUE_OUT_OF_RANGE	The input value is out of range.
0x00000050	eERR_EWM_CALLBACK_BUSY	The EWM callback function is busy.
0x00000064	eERR_EMERGENCY_STOP	Emergency stop activated. Disable all axes and stop all tasks.
0x00000107	eERR_NOT_VALID_TASKID	The task ID is invalid.
0x00000108	eERR_TASK_IS_RUNNING	The task is already running.
0x00000109	eERR_FUNC_NOT_IN_TASK	The function was not found in task.
0x0000010a	eERR_TASK_EMPTY	The task is empty.
0x0000010b	eERR_TASK_NOT_RUNNING	The task is not running.
0x0000012c	eERR_NIC_INIT_TOUT	The network port of fieldbus is not ready.
0x0000012d	eERR_HARDWARE_MISMATCH	The hardware is unrecognized.
0x0000012e	eERR_SLAVE_NUM_MISMATCH	The number of slaves is different from configuration.
0x00000130	eERR_INVALID_MCK_CNFG	The configuration of motion kernel is invalid.
0x00000138	eERR_HIMC_LOAD_CONFIG_FAIL	Load configuration from SSD failed. Please save it again.
0x00000139	eERR_HIMC_SAVE_CONFIG_FAIL	Store configuration to HIMC failed. Please save it again.
0x0000013a	eERR_HIMC_SAVE_CONFIG_COPY_FAIL	Store configuration to HIMC failed. Cannot save file into SAVE folder.
0x0000013c	eERR_ETHERCAT_LICENSE_MISMATCH	EtherCAT license mismatch.
0x000001f4	eERR_ISR_NOT_STABLE	The period of interrupt is not stable.
0x000041f4	eWRN_ISR_NOT_STABLE	The period of interrupt is not stable early warning.
0x000001f5	eERR_MCK_OVERLOAD	The motion kernel is overloaded.
0x000001f6	eERR_ISR_OVERLOAD	The CPU is overloaded.
0x00001388	eERR_HMPL_INVALID_ARG	The arguments are invalid in HMPL.
0x00001389	eERR_HMPL_INVALID_PTR	The pointer is invalid in HMPL.
0x0000138a	eERR_HMPL_STACK_OVERFLOW	Stack overflow in HMPL.
0x0000138b	eERR_HMPL_ILLEGAL_MEM_OP	The operation of memory is illegal in HMPL.
0x0000138c	eERR_HMPL_MOTION_NOT_READY	Motion function should be called in synchronized state.
0x0000138d	eERR_HMPL_STR_TOO_LONG	String length is out of range.
0x0000138e	eERR_HMPL_INVALID_STR_FORMAT	String format is invalid.
0x0000138f	eERR_HMPL_ARG_OUT_OF_RANGE	The argument is out of range.
0x00001392	eERR_HMPL_ASCII_AGENT_RUNNING	ASCII agent is already running. Multiple ASCII agents cannot be run at the same time.
0x0000139c	eERR_HMPL_CANNOT_RUN_IN_DEBUG	The function cannot run in debug mode.
0x000013a6	eERR_HMPL_TOO_MANY_BRK_POINT	There are too many break points in the task.
0x000013ec	eERR_HMPL_MUTEX_LOCK_TWICE	Cannot lock the same mutex twice in the same task.

System Error Codes		
Error Code	Error Name	Description
0x00001450	eERR_HMPL_INVALID_SYS_TIME_MEMORY	Buffer too small, minimum size must be 30 Byte.
0x00001451	eERR_HMPL_NOT_SUPPORTED	This HMPL function not supported for this platform.
0x00001452	eERR_HMPL_CLIENT_NOT_CONNECTED	Cannot send as client disconnected.
0x000014b4	eERR_HMPL_NOT_IN_OP_MODE	The function only can run in OP mode.
0x0000176f	eERR_HMPL_INTERNAL_ERROR	HMPL internal error.
0x00001770	eERR_HMPL_EXEC_FAILED	HMPL function execution failed.
0x00001771	eERR_HMPL_ASM_LOAD_FAILED	HMPL compilation failed, assembly file empty or not generated.
0x00001772	eERR_HMPL_STARTTASK_TIMEOUT	HMPL StartTask function timeout.
0x00001773	eERR_HMPL_STOPTASK_TIMEOUT	HMPL StopTask function timeout.
0x000017d4	eERR_ASCII_CONNECT_TIMEOUT	ASCII client connection timeout.
0x000017d5	eERR_ASCII_CONNECT_FAILED	ASCII client connection failed. Please check ip and port.
0x000017d6	eERR_ASCII_MULTI_CONNECTING	Multiple ASCII clients connecting at the same time.
0x000017d7	eERR_ASCII_MULTI_DISCONNECTING	Multiple ASCII clients disconnecting at the same time.
0x000017d8	eERR_ASCII_DISCONNECT_TIMEOUT	ASCII client disconnection timeout.
0x000017de	eERR_ASCII_RECV_TIMEOUT	ASCII client receive timeout. Please try again later.
0x000017df	eERR_ASCII_RECV_FAIL	ASCII client receive failed. Please check if the connection is still alive.
0x000017e0	eERR_ASCII_MULTI_RECVING	Multiple ASCII clients receiving at the same time.
0x000017e8	eERR_ASCII_SEND_TIMEOUT	ASCII client send timeout. Please try again later.
0x000017e9	eERR_ASCII_SEND_FAIL	ASCII client send failed. Please check if the connection is still alive.
0x000017ea	eERR_ASCII_MULTI_SENDING	Multiple ASCII clients sending at the same time.
0x00001838	eERR_MODBUS_CONNECT_TIMEOUT	Modbus client connection timeout.
0x00001839	eERR_MODBUS_CONNECT_FAILED	Modbus client connection failed. Please check ip.
0x0000183a	eERR_MODBUS_MULTI_CONNECTING	Multiple Modbus clients connecting at the same time.
0x0000183b	eERR_MODBUS_MULTI_DISCONNECTING	Multiple Modbus clients disconnecting at the same time.
0x0000183c	eERR_MODBUS_DISCONNECT_TIMEOUT	Modbus client disconnection timeout.
0x0000183d	eERR_MODBUS_DATALENGTH_ERR	Modbus client's read/write data number exceeds the limitation.
0x0000183e	eERR_MODBUS_SOCKET_BUSY	Modbus client deals with two or more commands at the same time.
0x0000183f	eERR_MODBUS_JOB_TIMEOUT	Modbus client job execution timeout. Please try again later.
0x00001840	eERR_MODBUS_JOB_FAIL	Modbus client job execution failed. Please check if the connection is still alive.
0x0000b037	eMSG_HIMC_SET_DEFAULT	Set controller to factory default.
0x0000b038	eMSG_HIMC_REBOOT	Reboot controller.
0x0000b039	eMSG_HIMC_BOOT	Controller power is on.
0x0000b03a	eMSG_HIMC_INFO	Controller information.
0x0000b03b	eMSG_HIMC_STORE_CONFIG	Store configuration.

System Error Codes		
Error Code	Error Name	Description
0x0000b03e	eMSG_API_MAIN_ID_CHANGE_GET	API access privilege has changed by get.
0x0000b03f	eMSG_API_MAIN_ID_CHANGE_RELEASE	API access privilege has changed by release.
0x0000b2c8	eMSG_START_HMI_SCOPE	Start HMI scope.
0x0000b2c9	eMSG_STOP_HMI_SCOPE	Stop HMI scope.
0x00003fff	eERR_SYS_LOG	This error is sent from system.
0x00007fff	eWRN_SYS_LOG	This warning is sent from system.
0x0000bfff	eMSG_SYS_LOG	This message is sent from system.
0x0000ffff	eDBG_SYS_LOG	This debug information is sent from system.

17.1.2 Axis error massages

The following error codes appear due to an error or invalid operation in an axis. Symbols □□ will be the axis ID in hexadecimal format. For example, 01 stands for axis index 01; 0f stands for axis index 15.

Table 17.1.2.1

Axis Error Codes		
Error Code	Error Name	Description
0x83□□000a	eERR_AXIS_CMD_UNKOWN	The command name is unknown.
0x83□□001e	eERR_AXIS_CMD_QUEUE_FULL	Axis command queue is full.
0x83□□0064	eERR_AXIS_CMD_INVALID_STATE	The axis is unable to execute the command in current motion state.
0x83□□006e	eERR_AXIS_CMD_INVALID_ENABLED	The command is not allowed while enabled.
0x83□□0078	eERR_AXIS_CMD_INVALID_DISABLED	The command is not allowed while disabled.
0x83□□0082	eERR_AXIS_CMD_INVALID_MOVING	The axis is unable to execute the command while moving.
0x83□□008c	eERR_AXIS_CMD_INVALID_STOPPING	The command is invalid when axis stops moving.
0x83□□0096	eERR_AXIS_CMD_INVALID_ERROR_STATE	The command is invalid when axis is in ErrorStop state.
0x83□□00a0	eERR_AXIS_CMD_INVALID_IN_SYNC	The command is invalid when axis is in synchronized motion state.
0x83□□00aa	eERR_AXIS_CMD_INVALID_GEAR_MASTER	The command is invalid when axis is the gear master axis.
0x83□□00b4	eERR_AXIS_CMD_INVALID_PP_MODE	The command is invalid when axis is in PP mode.
0x83□□00be	eERR_AXIS_CMD_INVALID_MAP_SWITCHING	The command is invalid when axis is switching the compensation map.
0x83□□00c8	eERR_AXIS_CMD_INVALID_INPUTSHAPING_ENABLED	The axis is unable to execute the command when position command shaping function is activated.
0x83□□00d2	eERR_AXIS_CMD_INVALID_COMP_ENABLED	The axis is unable to execute the command when dynamic compensation is enabled.
0x83□□00dc	eERR_AXIS_CMD_INVALID_GANTRY_MODE	The axis is unable to execute the command in gantry mode.
0x83□□00e6	eERR_AXIS_CMD_INVALID_GROUPED	The command is not allowed when axis is in an axis group.
0x83□□00f0	eERR_AXIS_CMD_INVALID_CONTROL_MODE	The command is invalid in current control mode.
0x83□□00fa	eERR_AXIS_CMD_INVALID_OP_MODE	The operational mode is invalid.
0x83□□0104	eERR_AXIS_CMD_INVALID_BUFFER_MODE	The axis buffer mode is invalid.
0x83□□0105	eERR_AXIS_CMD_INVALID_SETBUFFERMODE	The command is not allowed when axis has any unfinished command.
0x83□□010e	eERR_AXIS_CMD_INVALID_TP_ENABLED	The command is not allowed when touch probe is enabled.
0x83□□012c	eERR_AXIS_CMD_INVALID_PARAMETER	The parameter of axis command is invalid.
0x83□□0136	eERR_AXIS_CMD_INVALID_POS	Axis target position is out of allowable range.
0x83□□0140	eERR_AXIS_CMD_INVALID_VEL	Axis velocity setting is out of allowable range.
0x83□□014a	eERR_AXIS_CMD_INVALID_ACC	Axis acceleration setting is out of allowable range.
0x83□□0154	eERR_AXIS_CMD_INVALID_DEC	Axis deceleration setting is out of allowable range.
0x83□□015e	eERR_AXIS_CMD_INVALID_JERK	Axis jerk setting is out of allowable range.

Axis Error Codes		
Error Code	Error Name	Description
0x83□□0168	eERR_AXIS_CMD_INVALID_SM_TIME	Axis smooth time setting is out of allowable range.
0x83□□0172	eERR_AXIS_CMD_INVALID_KILL_DEC	Axis kill deceleration setting is out of allowable range.
0x83□□017c	eERR_AXIS_CMD_INVALID_VEL_SCALE	Axis velocity scale setting is out of allowable range.
0x83□□0190	eERR_AXIS_COMP_NOT_CNFG	Axis dynamic compensation settings have not been configured properly.
0x83□□01c2	eERR_AXIS_CMD_INVALID_MASTER_SLAVE_CONNECTION	Master-slave relationship setting is invalid.
0x83□□01cc	eERR_AXIS_CMD_INVALID_SLAVE_ID	Slave ID setting is invalid.
0x83□□01d6	eERR_AXIS_CMD_INVALID_GEAR_RATIO	The gear ratio setting of slave axis is out of allowable range.
0x83□□01f4	eERR_AXIS_CMD_INVALID_ROLLOVER_POS	Invalid axis rollover position, should be a positive value.
0x83□□01fe	eERR_AXIS_CMD_INVALID_ROLLOVER_PP_MODE	Rollover is not supported in Profile Position mode. Please reset rollover value to 0 before switching to Profile Position mode.
0x83□□0208	eERR_AXIS_CMD_INVALID_FORCECONST_TRQMODE	Invalid force constant for torque mode. Please set the correct force constant first.
0x83□□0258	eERR_AXIS_CMD_INVALID_NO_SPECIFIC_PDO	PDO must have specific CoE object to execute command.
0x83□□03f2	eERR_AXIS_DRIVE_FAULT	The drive has reported a fault. Please check the corresponding error message in the drive.
0x83□□03fc	eERR_AXIS_DRIVE_ABNORMAL_DISABLE	The drive is abnormally disabled.
0x83□□0406	eERR_AXIS_DRIVE_ENABLE_TOUT	It took too long to enable the drive.
0x83□□0407	eERR_AXIS_DRIVE_ENABLE_TOUT_RMT	It took too long to enable the drive. Please check access setting in the drive.
0x83□□0410	eERR_AXIS_DRIVE_CLEAR_ERROR_TOUT	It took too long to clear drive error.
0x83□□041a	eERR_AXIS_DRIVE_DISABLE_TOUT	It took too long to disable the drive.
0x83□□0424	eERR_AXIS_DRIVE_HOME_TOUT	It took too long to home the axis.
0x83□□042e	eERR_AXIS_DRIVE_HOME_FAILED	Axis homing error. Please check error code from drive.
0x83□□0456	eERR_AXIS_VEL_LIMIT	The reference velocity has exceeded the velocity limit.
0x83□□4456	eWRN_AXIS_VEL_LIMIT	The reference velocity has exceeded the velocity limit, velocity is clipped.
0x83□□0460	eERR_AXIS_ACC_LIMIT	The reference acceleration has exceeded the acceleration limit.
0x83□□046a	eERR_AXIS_CURR_LIMIT	The current command has exceeded the current limit.
0x83□□0474	eERR_AXIS_DAMPINGRATIO_LIMIT	The damping ratio setting of axes is out of allowable range.
0x83□□047e	eERR_AXIS_FREQUENCY_LIMIT	The frequency setting of axis is out of allowable range.
0x83□□07da	eERR_AXIS_SWRL	Axis reference position reached right software limit.
0x83□□07e4	eERR_AXIS_SWLL	Axis reference position reached left software limit.
0x83□□07ee	eERR_AXIS_HWRL	Axis right hardware limit signal triggered.
0x83□□07f8	eERR_AXIS_HWLL	Axis left hardware limit signal triggered.
0x83□□0802	eERR_AXIS_COMP_LIMIT	Axis compensation position has exceeded maximum compensation limit.

Axis Error Codes		
Error Code	Error Name	Description
0x83□□083e	eERR_AXIS_PERR	Axis position error has exceeded the protection limit. Please first check if there is any mechanical interference for motor motion.
0x83□□0848	eERR_AXIS_VERR	Axis velocity error has exceeded the protection limit. Please first check if there is any mechanical interference for motor motion.
0x83□□08a2	eERR_AXIS_PVT_MOTION_VEL_LIMIT	Velocity of axis PVT motion has exceeded the protection limit. Please first check if the given parameters are valid.
0x83□□08ac	eERR_AXIS_PVT_MOTION_ACC_LIMIT	Acceleration of axis PVT motion has exceeded the protection limit. Please first check if the given parameters are valid.
0x83□□08b6	eERR_AXIS_PVT_MOTION_INVALID_TIME	Time sequence of axis PVT motion is invalid. Please first check if the given parameters are valid.
0x83□□0bb8	eERR_AXIS_CTRL_ERR	Axis internal control error.
0x83□□0fa0	eERR_AXIS_CMD_GEAR_DISABLED	Gear command is not allowed while gear is disabled.
0x83□□0fa1	eERR_AXIS_CMD_INVALID_AXIS_IN_CAM	Gear command is invalid when axis is in cam.
0x83□□1388	eERR_CAM_CMD_INVALID_ENGAGE_WINDOW	Cam engage window is out of allowable range.
0x83□□1389	eERR_CAM_CMD_INVALID_ENGAGE_POSITION	Cam engage position is out of cam table domain.
0x83□□138a	eERR_CAM_CMD_INVALID_MASTER_SCALE_FACTOR	Cam master scale factor is out of allowable range.
0x83□□138b	eERR_CAM_CMD_INVALID_CAM_SCALE_FACTOR	Cam scale factor is out of allowable range.
0x83□□138c	eERR_CAM_CMD_INVALID_CAMTABLE_ID	Cam table ID is out of allowable range.
0x83□□138d	eERR_CAM_CMD_INVALID_DISENGAGE_WINDOW	Cam disengage window is out of allowable range.
0x83□□138e	eERR_CAM_CMD_INVALID_DISENGAGE_POSITION	Cam disengage position is out of allowable range.
0x83□□138f	eERR_CAM_CMD_INVALID_OPERATION_IN_ENGAGED_STATE	Cam command is invalid in engage state.
0x83□□1390	eERR_CAM_CMD_INVALID_START_MODE	Cam start mode does not correspond to a valid enumeration value.
0x83□□1391	eERR_CAM_CMD_INVALID_MOVE_MODE	Cam move mode does not correspond to a valid enumeration value.
0x83□□1392	eERR_CAM_ENGAGED_FAILED	CamMaster may pass through the engage window because engage window is too small.
0x83□□1393	eERR_CAM_CMD_NOTINUSE	End of profile mode is not in use right now
0x83□□1394	eERR_CAM_CMD_CAM_DISABLED	Cam command is not allowed while cam is disabled.
0x83□□1395	eERR_CAM_CMD_INVALID_AXIS_NOT_INCAM	Cam command is invalid when axis is not in cam.
0x83□□1396	eERR_CAM_CMD_INVALID_AXIS_NOT_IN_DISENGAGED	Cam command is invalid when axis is not in disengaged.
0x83□□1397	eERR_CAM_CMD_INVALID_AXIS_IN_GEAR	Cam command is invalid when axis is in gear.

17.1.3 Group error messages

The following error codes appear due to an error or invalid operation in an axis group. Symbols □□ will be the axis group ID in hexadecimal format. For example, 01 stands for axis group index 01; 0f stands for axis group index 15.

Table 17.1.3.1

Axis Group Error Codes		
Error Code	Error Name	Description
0x82□□000a	eERR_CRD_CMD_UNKNOWN	The axis group command is unknown.
0x82□□0014	eERR_CRD_CMD_REACH_MAX_NUM_AXIS	The axis group reaches its maximum number of axes.
0x82□□001e	eERR_CRD_CMD_INVALID_KIN_SETTING	The kinematics type setting is invalid.
0x82□□001f	eERR_CRD_CMD_INVALID_SPECIFIC_KIN	The command is invalid when axis group is in specific kinematics type.
0x82□□0028	eERR_CRD_CMD_AXIS_DUPLICATED	Could not add the axis since it is already in the group.
0x82□□0032	eERR_CRD_CMD_GRP_SIZE_EMPTY	The axis group is empty.
0x82□□003c	eERR_CRD_CMD_GRP_SIZE_FULL	The axis group is full and cannot hold any more axis.
0x82□□0046	eERR_CRD_CMD_INVALID_MOVING	The command is invalid while the axis group is moving.
0x82□□0050	eERR_CRD_CMD_INVALID_DISABLED	The command is invalid while the axis group is disabled.
0x82□□005a	eERR_CRD_CMD_INVALID_INPUTSHAPING_PARAMETER_INCOMPLETE	The parameters of axis group inshape function is incomplete.
0x82□□006e	eERR_CRD_CMD_INVALID_STATE	The axis group is unable to execute the command in current motion state.
0x82□□0078	eERR_CRD_CMD_QUEUE_FULL	Please wait till the last command is done.
0x82□□0082	eERR_CRD_CMD_GRP_AXIS_INVALID	The group axis is invalid.
0x82□□008c	eERR_CRD_CMD_QUEUE_IS_NOT_EMPTY	The command queue is not empty.
0x82□□0096	eERR_CRD_CMD_INVALID_QUEUE_SIZE	The size of command queue is invalid.
0x82□□00d2	eERR_CRD_CMD_INVALID_POS	The axis group target position or orientation is out of allowable range.
0x82□□00dc	eERR_CRD_CMD_INVALID_LIN_VEL	The linear velocity setting of axis group is out of allowable range.
0x82□□00e6	eERR_CRD_CMD_INVALID_LIN_ACC	The linear acceleration setting of axis group is out of allowable range.
0x82□□00f0	eERR_CRD_CMD_INVALID_LIN_DEC	The linear deceleration setting of axis group is out of allowable range.
0x82□□00fa	eERR_CRD_CMD_INVALID_LIN_JERK	The linear jerk setting of axis group is out of allowable range.
0x82□□0104	eERR_CRD_CMD_INVALID_LIN_SM_TIME	The linear smooth time setting of axis group is out of allowable range.
0x82□□010e	eERR_CRD_CMD_INVALID_DAMPINGRATIO	The damping ratio setting of axis group is out of allowable range.
0x82□□0118	eERR CRD_CMD_INVALID_FREQUENCY	The frequency setting of axis group is out of allowable range.
0x82□□0140	eERR_CRD_CMD_INVALID_ANG_VEL	The angular velocity setting of axis group is out of allowable range.
0x82□□014a	eERR_CRD_CMD_INVALID_ANG_ACC	The angular acceleration setting of axis group is out of allowable range.
0x82□□0154	eERR_CRD_CMD_INVALID_ANG_DEC	The angular deceleration setting of axis group is out of allowable range.

Axis Group Error Codes		
Error Code	Error Name	Description
0x82□□015e	eERR_CRD_CMD_INVALID_ANG_JERK	The angular jerk setting of axis group is out of allowable range.
0x82□□0168	eERR_CRD_CMD_INVALID_ANG_SM_TIME	The angular smooth time setting of axis group is out of allowable range.
0x82□□0190	eERR_CRD_CMD_INVALID_VEL_SCALE	The velocity scale of axis group is out of allowable range.
0x82□□019a	eERR_CRD_CMD_INVALID_TRANS_VEL	The transition velocity of axis group is invalid.
0x82□□01a4	eERR_CRD_CMD_INVALID_TRANS_DIS	The transition distance of axis group is invalid.
0x82□□01a5	eERR_CRD_CMD_INVALID_TRANS_DEV	The transition deviation of axis group is invalid.
0x82□□01a6	eERR_CRD_CMD_INVALID_TRANS_CURVE	The transition curvature of axis group is invalid.
0x82□□01b8	eERR_CRD_CMD_TRANS_MODE_UNKNOWN	The path transition mode name is unknown.
0x82□□01c2	eERR_CRD_CMD_COORD_SYS_UNKNOWN	The coordinate system is unknow.
0x82□□01cc	eERR_CRD_CMD_BLEND_MODE_UNKNOWN	The path blending mode name is unknown.
0x82□□01fe	eERR_CRD_CMD_LIN_INVALID_PARAM	The parameters are invalid for linear path planning.
0x82□□0262	eERR_CRD_CMD_CIRC_INVALID_PARAM	The parameters are invalid for circular path planning.
0x82□□026c	eERR_CRD_CMD_CIRC_INVALID_CENTER	The center position of circular path is too close to start / end point.
0x82□□0276	eERR_CRD_CMD_CIRC_ANGLE_SMALL	The central angle of circular path is too small.
0x82□□0280	eERR_CRD_CMD_CIRC_INVALID_RADIUS	The radius of circular path is invalid.
0x82□□028a	eERR_CRD_CMD_CIRC_INVALID_COORD	The coordinate system of circular path is invalid.
0x82□□02c6	eERR_CRD_CMD_BEZIER_INVALID_PARAM	The parameters are invalid for Bezier curve path planning.
0x82□□02d0	eERR_CRD_CMD_BSPLINE_INVALID_PARAM	The parameters are invalid for BSpline curve path planning.
0x82□□02da	eERR_CRD_CMD_CURVE_INVALID_STARTPOS	The start position is invalid for curve path planning.
0x82□□02e4	eERR_CRD_CMD_COORD_INVALID_PARAM	The parameters are invalid for coordinate transformation.
0x82□□02ee	eERR_CRD_CMD_NURBS_INVALID_PARAM	The parameters are invalid for NURBS curve path planning.
0x82□□02f8	eERR_CRD_CMD_LOOKAHEAD_INVALID_PARAM	The parameters are invalid for look ahead motion.
0x82□□03f2	eERR_CRD_AXIS_ABNORMALLY_DISABLED	One or more axes in the axis group are abnormally disabled.
0x82□□03fc	eERR_CRD_AXIS_SWL	One of the axes in axis group touches software limit.

17.2 HIMC_GetLastError

Purpose

To get the latest error code of the controller.

Syntax

```
int HIMC_GetLastError(
    int ctrl_id,
    int *p_error_code
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
p_error_ code [out]	A pointer to the buffer to receive the latest error code of the controller. **Refer to section 17.1.1 for the definition.**

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetLastError
LabVIEW	HIMC Get Last Error.vi
Python	GetLastError

17.3 HIMC_GetAxisLastErr

Purpose

To get the lastest error code of an axis.

Syntax

```
int HIMC_GetAxisLastErr(
    int ctrl_id,
    int axis_id,
    int *err_code
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

err_code [out] A pointer to the buffer to receive the lastest error code of an axis.
Refer to section 17.1.2 for the definition.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetAxisLastErr
LabVIEW	HIMC Get Axis Last Err.vi
Python	GetAxisLastErr

17.4 HIMC_ClearAxisLastErr

Purpose

To clear the lastest error code of an axis.

Syntax

```
int HIMC_ClearAxisLastErr(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ClearAxisLastErr
LabVIEW	HIMC Clear Axis Last Err.vi
Python	ClearAxisLastErr

17.5 HIMC_GetGrpLastErr

Purpose

To get the lastest error code of an axis group.

Syntax

```
int HIMC_GetGrpLastErr(
    int ctrl_id,
    int group_id,
    int *err_code
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

err_code [out] A pointer to the buffer to receive the lastest error code of an axis group.
Refer to section 17.1.3 for the definition.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ClearAxisLastErr
LabVIEW	HIMC Clear Axis Last Err.vi
Python	ClearAxisLastErr

17.6 HIMC_ClearGrpLastErr

Purpose

To clear the lastest error code of an axis group.

Syntax

```
int HIMC_ClearGrpLastErr(
    int ctrl_id,
    int group_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

group_id [in] Axis group index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_ClearGrpLastErr
LabVIEW	HIMC Clear Grp Last Err.vi
Python	ClearGrpLastErr

17.7 HIMC_GetDriveErr

Purpose

To get the error code of a drive.

Syntax

```
int HIMC_GetDriveErr(
    int ctrl_id,
    int axis_id,
    int *err_code
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis Index.

err_code [in] A pointer to the buffer to receive the error code of a drive.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x603F (Error code) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_GetDriveErr
LabVIEW	HIMC Get Drive Err.vi
Python	GetDriveErr

17.8 HIMC_GetErrorInformation

Purpose

To get the information of a given error ID.

Syntax

```
int HIMC_GetErrorInfomation(
    int error_id,
    char *p_name,
    int name_buff_len,
    int *p_name_actual_len,
    char *p_description,
    int description_buff_len,
    int *p_description_actual_len
);
```

Parameter

error_id [in]	Specify an error ID.
p_name [out]	A pointer to the buffer to receive the error name of the given error ID.
name_buff_len [in]	Specify the buffer's maximum number of the characters to receive the error name.
p_name_actual_len [out]	A pointer to the buffer to receive the error name's actual number of the characters. (Exclude the terminating null character.)
p_description [out]	A pointer to the buffer to receive the error description of the given error ID.
description_buff_len [in]	Specify the buffer's maximum number of the characters to receive the error description.
p_description_actual_len [out]	A pointer to the buffer to receive the error description's actual number of the characters. (Exclude the terminating null character.)

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 0.23
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_GetErrorInformation
LabVIEW	HIMC Get Error Information.vi
Python	GetErrorInformation

18. Homing functions

18. Homing functions 18-1
18.1 Overview 18-2
18.2 HIMC_MoveHome 18-7
18.3 HIMC_SetHomeMethod 18-8
18.4 HIMC_SetHomeSwitchVel 18-9
18.5 HIMC_SetHomeZeroVel 18-10
18.6 HIMC_SetHomeAcc 18-11
18.7 HIMC_SetHomeOffset 18-12
18.8 HIMC_SetHomeTimeout 18-13
18.9 HIMC_IsHomed 18-14
18.10 HIMC_IsHoming 18-15
18.11 HIMC_SetHomedStatus 18-16

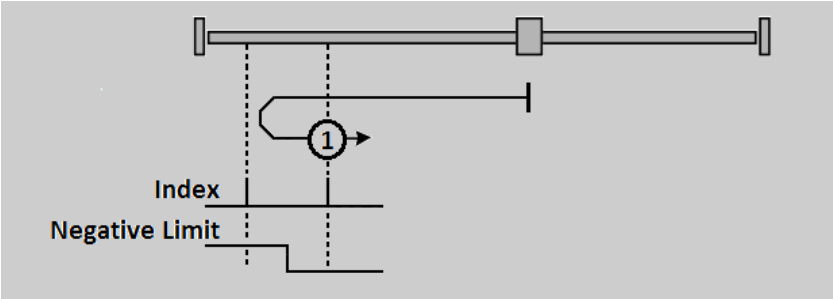
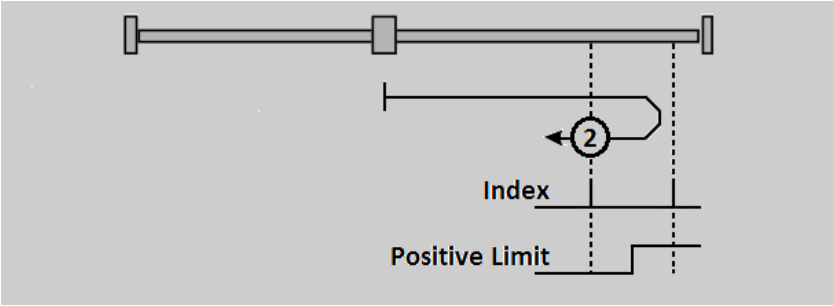
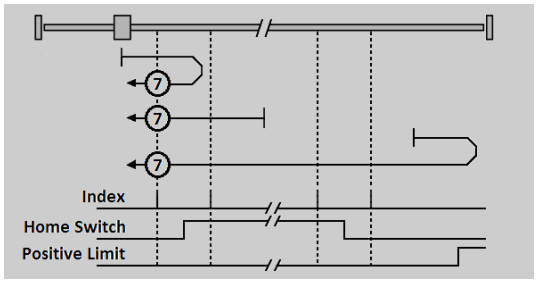
18.1 Overview

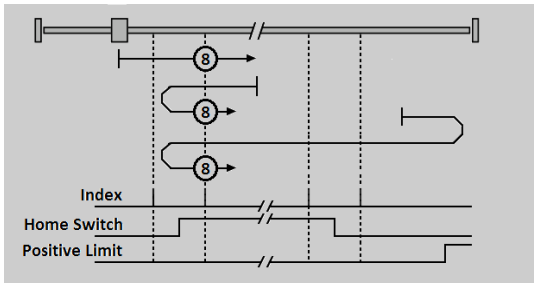
HIMC supports CiA 402 homing mode, which allows users to set the homing method of each axis based on stage configuration. The homing methods defined by CiA 402 homing mode are listed in Table 18.1.1, and the detailed diagrams and descriptions are shown in Table 18.1.2.

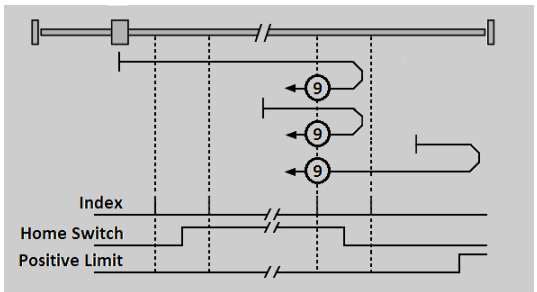
Table 18.1.1

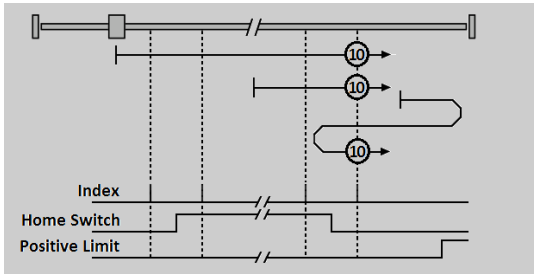
Homing method	Description
1	Homing on negative limit switch and index pulse
2	Homing on positive limit switch and index pulse
7~10	Homing on home switch and index pulse – positive initial direction
11~14	Homing on home switch and index pulse – negative initial direction
17	Homing on negative limit switch
18	Homing on positive limit switch
23~26	Homing on home switch – positive initial direction
27~30	Homing on home switch – negative initial direction
33~34	Homing on index pulse
37	Homing on current position

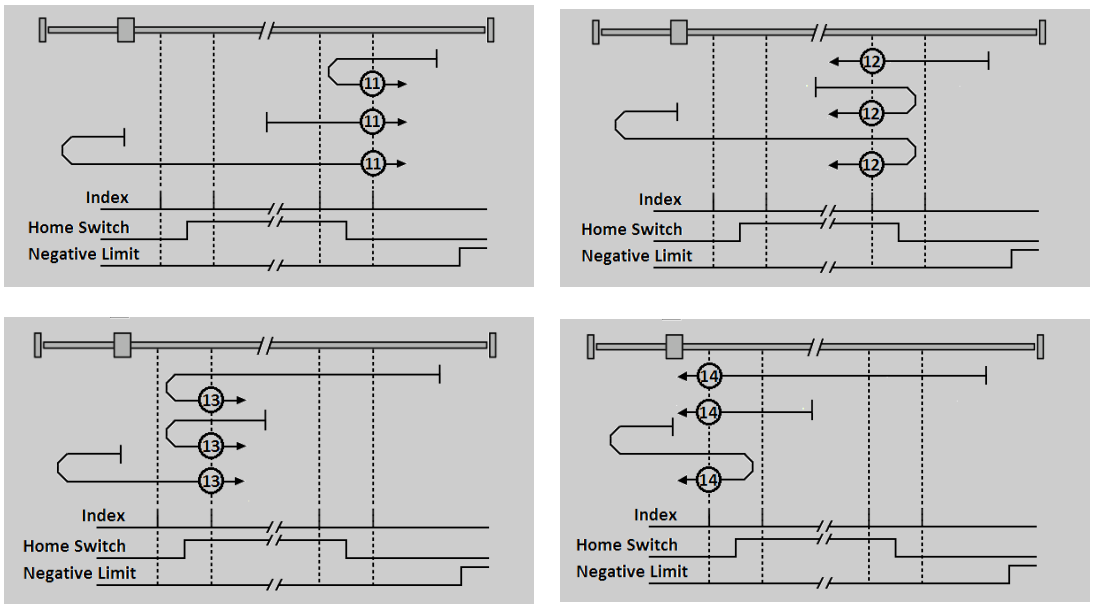
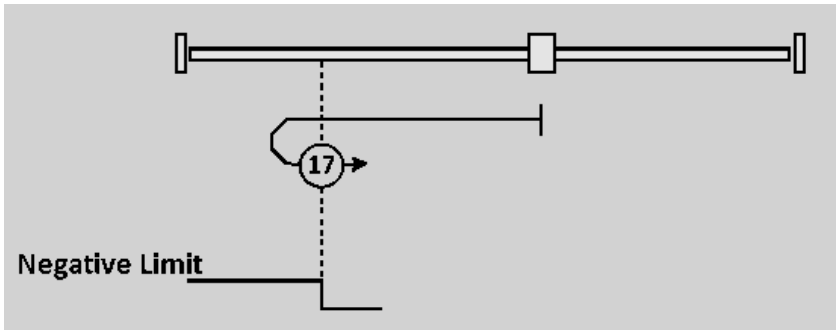
Table 18.1.2

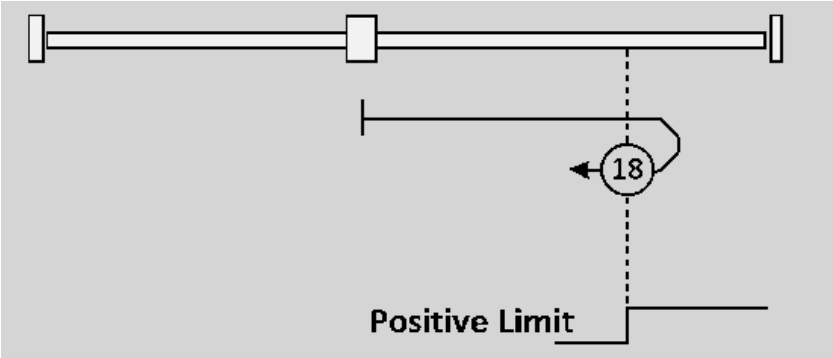
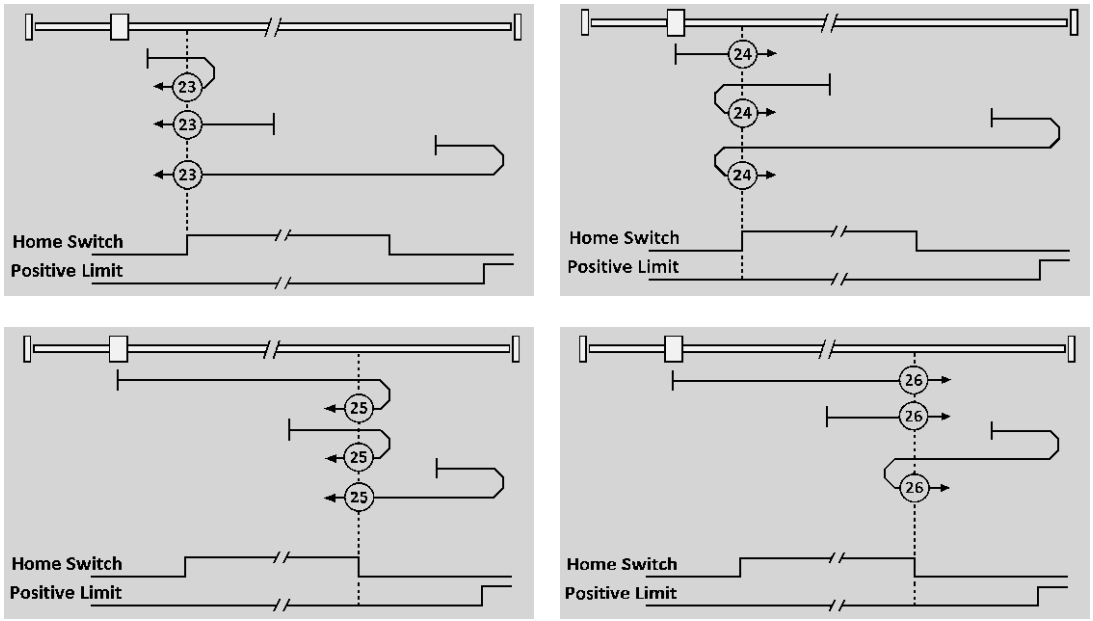
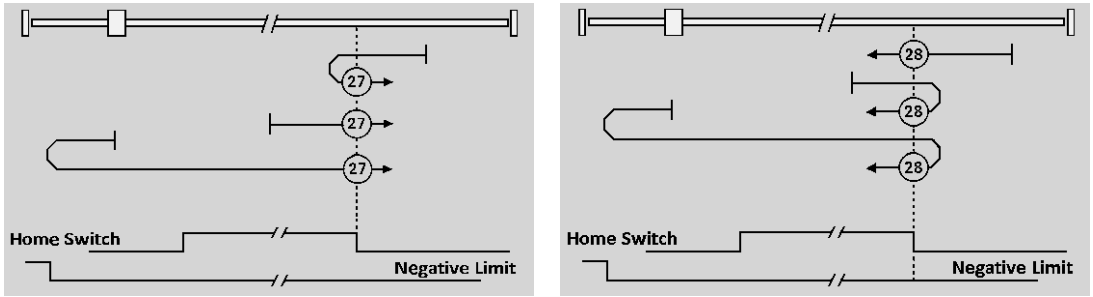
<table>
<tr><th>Homing Method</th><th>Homing procedure</th></tr>
<tr><td rowspan="2">1</td><td> 
</td></tr>
<tr><td>If the negative limit switch is inactive, the initial direction of the movement is leftward. The home position is at the first index pulse to the right of the position where the negative limit switch becomes inactive. If the negative limit is not assigned, homing will fail.</td></tr>
<tr><td rowspan="2">2</td><td> 
</td></tr>
<tr><td>If the positive limit switch is inactive, the initial direction of the movement is rightward. The home position is at the first index pulse to the left of the position where the positive limit switch becomes inactive. If the positive limit is not assigned, homing will fail.</td></tr>
<tr><td>7~10</td><td> 

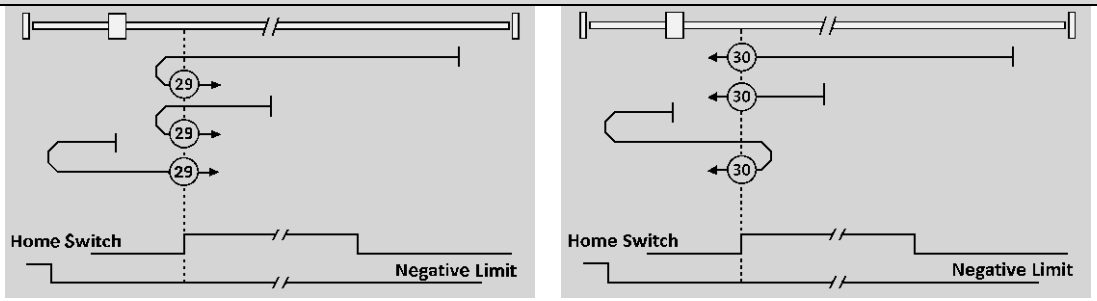
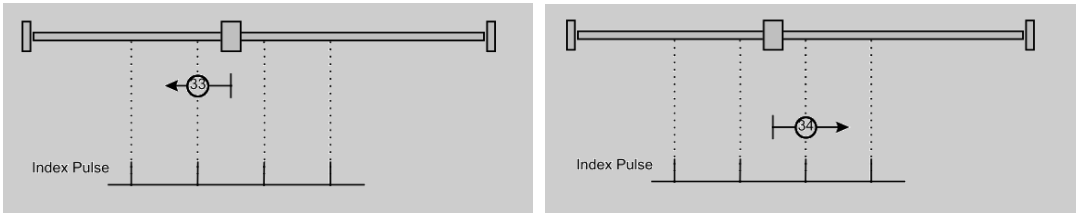
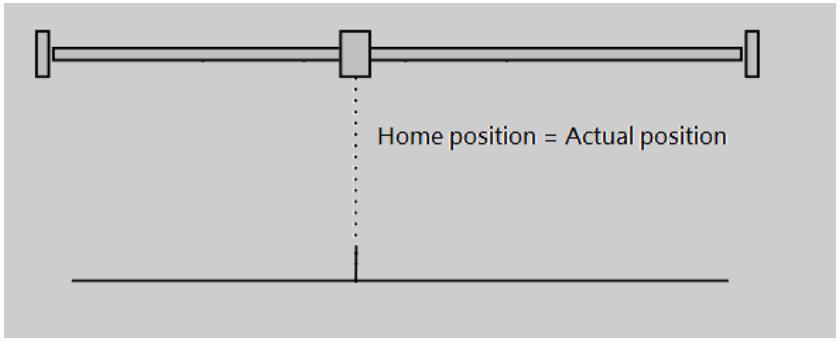





</td></tr>
</table>

<table>
<tr><th>Homing Method</th><th>Homing procedure</th></tr>
<tr><td></td><td>The initial direction of the movement depends on the home switch edge being sought. If the home switch is active at the beginning, the initial direction of method 7 and 8 is negative. The initial direction of all other cases is positive.
If the home switch and the positive limit are not assigned, homing will fail.</td></tr>
<tr><td rowspan="2">11~14</td><td> 
</td></tr>
<tr><td>The initial direction of the movement depends on the home switch edge being sought. If the home switch is active at the beginning, the initial direction of method 11 and 12 is positive. The initial direction of all other cases is negative.
If the home switch and the negative limit are not assigned, homing will fail.</td></tr>
<tr><td rowspan="2">17</td><td> 
</td></tr>
<tr><td>If the negative limit switch is inactive, the initial direction of the movement is leftward. The home position is at the right of the position where the negative limit switch becomes inactive.
If the negative limit is not assigned, homing will fail.</td></tr>
</table>

<table>
<tr><th>Homing Method</th><th>Homing procedure</th></tr>
<tr><td rowspan="2">18</td><td> 
</td></tr>
<tr><td>If the positive limit switch is inactive, the initial direction of the movement is rightward. The home position is at the left of the position where the positive limit switch becomes inactive.
If the positive limit is not assigned, homing will fail.</td></tr>
<tr><td rowspan="2">23~26</td><td> 
</td></tr>
<tr><td>The initial direction of the movement depends on the home switch edge being sought. If the home switch is active at the beginning, the initial direction of method 23 and 24 is negative. The initial direction of all other cases is positive.
If the home switch and the positive limit are not assigned, homing will fail.</td></tr>
<tr><td rowspan="2">27~30</td><td> 
</td></tr>
<tr><td></td></tr>
</table>

<table>
<tr><th>Homing Method</th><th>Homing procedure</th></tr>
<tr><td rowspan="2"></td><td> 
</td></tr>
<tr><td>The initial direction of the movement depends on the home switch edge being sought. If the home switch is active at the beginning, the initial direction of method 27 and 28 is positive. The initial direction of all other cases is negative.
If the home switch and the negative limit are not assigned, homing will fail.</td></tr>
<tr><td rowspan="2">33~34</td><td> 
</td></tr>
<tr><td>The direction of homing is negative (33) or positive (34) respectively. The home position is at the index pulse found in the selected direction.</td></tr>
<tr><td rowspan="2">37</td><td> 
</td></tr>
<tr><td>Current position of the motor is defined as the home position. In this method, the drive does not need to be in Operation enabled state. Objects are initialized as follows.

6062h (position demand value) = 6064h (position actual value) = 607Ch (home offset)
6063h (position actual internal value) = 60FCh (position demand internal value) = 0</td></tr>
</table>

Note: Homing procedure does not support simulator.

18.2 HIMC_MoveHome

Purpose

To execute homing procedure of an axis.

Syntax

```
int HIMC_MoveHome(
    int ctrl_id,
    int axis_id
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Remark

Users must configure object 0x6060 (Mode of operation) and object 0x6061 (Mode of operation display) as PDO when using this function.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_MoveHome
LabVIEW	HIMC Move Home.vi
Python	MoveHome

18.3 HIMC_SetHomeMethod

Purpose

To set the homing method of homing procedure.

Syntax

```
int HIMC_SetHomeMethod(
    int ctrl_id,
    int axis_id,
    int method
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
method [in]	Homing method, refer to Table 18.1.1 and Table 18.1.2 for details. The default value is 33.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetHomeMethod
LabVIEW	HIMC Set Home Method.vi
Python	SetHomeMethod

18.4 HIMC_SetHomeSwitchVel

Purpose

To set fast homing velocity of homing procedure.

Syntax

```
int HIMC_SetHomeSwitchVel(
    int    ctrl_id,
    int    axis_id,
    double fast_vel
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
fast_vel [in]	Fast homing velocity, the default value is 20. Parameter unit: mm/s or deg/s

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetHomeSwitchVel
LabVIEW	HIMC Set Home Switch Vel.vi
Python	SetHomeSwitchVel

18.5 HIMC_SetHomeZeroVel

Purpose

To set slow homing velocity of homing procedure.

Syntax

```
int HIMC_SetHomeZeroVel(
    int    ctrl_id,
    int    axis_id,
    double slow_vel
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
slow_vel [in]	Slow homing velocity, the default value is 5. Parameter unit: mm/s or deg/s

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetHomeZeroVel
LabVIEW	HIMC Set Home Zero Vel.vi
Python	SetHomeZeroVel

18.6 HIMC_SetHomeAcc

Purpose

To set homing acceleration of homing procedure.

Syntax

```
int HIMC_SetHomeAcc(
    int    ctrl_id,
    int    axis_id,
    double acc
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
acc [in]	Homing acceleration, the default value is 2000. Parameter unit: mm/s^2 or deg/s^2

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetHomeAcc
LabVIEW	HIMC Set Home Acc.vi
Python	SetHomeAcc

18.7 HIMC_SetHomeOffset

Purpose

To set the home offset of homing procedure.

Syntax

```
int HIMC_SetHomeOffset(
    int    ctrl_id,
    int    axis_id,
    double offset
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
offset [in]	Home offset. The default value is 0. Parameter unit: mm or deg

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetHomeOffset
LabVIEW	HIMC Set Home Offset.vi
Python	SetHomeOffset

18.8 HIMC_SetHomeTimeout

Purpose

To set the timeout of homing procedure.

Syntax

```
int HIMC_SetHomeTimeout(
    int ctrl_id,
    int axis_id,
    int timeout
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
timeout [in]	Timeout. The default value is 120,000. Parameter unit: ms

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	HIMC_SetHomeTimeout
LabVIEW	HIMC Set Home Timeout.vi
Python	SetHomeTimeout

18.9 HIMC_IsHomed

Purpose

To query whether the axis has completed homing procedure.

Syntax

```
int HIMC_IsHomed(
    int ctrl_id,
    int axis_id,
    int *p_is_homed
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_is_homed [out] A pointer to the buffer to receive whether the axis has completed homing procedure.
If the axis has completed homing procedure, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsHomed
LabVIEW	HIMC Is Homed.vi
Python	IsHomed

18.10 HIMC_IsHoming

Purpose

To query whether the axis is operating homing procedure.

Syntax

```
int HIMC_IsHoming(
    int ctrl_id,
    int axis_id,
    int *p_is_homing
);
```

Parameter

ctrl_id [in] A controller ID for HIWIN Motion Controller.
It must be obtained by calling HIMC_ConnectCtrl.

axis_id [in] Axis index.

p_is_homing [out] A pointer to the buffer to receive whether the axis is operating homing procedure.
If the axis is operating homing procedure, the value will be 1. Otherwise, it will be 0.

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_IsHoming
LabVIEW	HIMC Is Homing.vi
Python	IsHoming

18.11 HIMC_SetHomedStatus

Purpose

To set the homing status of an axis.

Syntax

```
int HIMC_SetHomedStatus(
    int ctrl_id,
    int axis_id,
    int is_homed
);
```

Parameter

ctrl_id [in]	A controller ID for HIWIN Motion Controller. It must be obtained by calling HIMC_ConnectCtrl.
axis_id [in]	Axis index.
is_homed [in]	Set it as “1” to indicate that homing is completed. Set it as “0” to indicate that homing is not completed (default).

Return value

It will return an **int** value **0** if the function succeeds, a **nonzero** value if the function fails.

Requirement

Minimum supported version	iA Studio 3.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	HIMC_SetHomedStatus
LabVIEW	-
Python	-

19. Data structures

19. Data structures 19-1
19.1 ComInfo 19-2
19.2 CoordPosition 19-3
19.3 MotionProfile 19-4
19.4 CenterPosition 19-5
19.5 NormalVector 19-6
19.6 TransPrm 19-7
19.7 PosTriggerPar 19-8
19.8 Data_t 19-9

19.1 ComInfo

Purpose

It defines the connection type and its information.

Syntax

```
typedef struct {
    ComType type;
    struct {
        char ip[20];
        char port[12];
    } TCP_IP;

    struct {
        char com_port_name[80];
        int  baud_rate;
    } RS232;

    struct {
        char autoExecExe;
    } Simulator;
} ComInfo;
```

Member

ComType	Connection type.
TCP_IP	A structure which includes network connecting parameter, ip and port.
RS232	A structure which includes RS232 connecting parameter, com port name and baud rate.
Simulator	A structure which includes Simulator connecting parameter and autoExecExe.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	ComInfo
LabVIEW	--
Python	ComInfo

19.2 CoordPosition

Purpose

It defines the positions or distances of the coordinate motion.

Syntax

```
typedef struct {
    double x_pos;
    double y_pos;
    double z_pos;
    double a_pos;
    double b_pos;
    double c_pos;
} CoordPosition, *PCoordPosition;
```

Member

x_pos	Linear position X of the end-point. Unit: mm
y_pos	Linear position Y of the end-point. Unit: mm
z_pos	Linear position Z of the end-point. Unit: mm
a_pos	Orientation angle A of the end-point. Unit: deg
b_pos	Orientation angle B of the end-point. Unit: deg
c_pos	Orientation angle C of the end-point. Unit: deg

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	CoordPosition
LabVIEW	--
Python	CoordPosition

19.3 MotionProfile

Purpose

It defines the motion profile settings.

Syntax

```
typedef struct {
    double max_vel;
    double max_acc;
    double max_dec;
    double smooth_time;
} MotionProfile, *PMotionProfile;
```

Member

max_vel — The maximum tangential velocity of linear motion.
Unit: mm/s or deg/s
Range: 0 ~ 5000

max_acc — The maximum tangential acceleration of linear motion.
Unit: mm/s^2 or deg/s^2
Range: >0 ~ 50000 (acceleration cannot be 0)

max_dec — The maximum tangential deceleration of linear motion.
Unit: mm/s^2 or deg/s^2
Range: >0 ~ 50000 (deceleration cannot be 0)

smooth_time — Smooth time of linear motion.
Unit: ms
Range: 0 ~ 500

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	MotionProfile
LabVIEW	--
Python	MotionProfile

19.4 CenterPosition

Purpose

It defines the center position settings.

Syntax

```
typedef struct {
    double x_pos;
    double y_pos;
    double z_pos;
} CenterPosition, *PCenterPosition;
```

Member

x_pos	Position of X axis. Unit: mm
y_pos	Position of Y axis. Unit: mm
z_pos	Position of Z axis. Unit: mm

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	CenterPosition
LabVIEW	--
Python	CenterPosition

19.5 NormalVector

Purpose

It defines the normal vector settings.

Syntax

```
typedef struct {
    double x_vector;
    double y_vector;
    double z_vector;
} NormalVector, *PNormalVector;
```

Member

x_vector X direction vector.

y_vector Y direction vector.

z_vector Z direction vector.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	NormalVector
LabVIEW	--
Python	NormalVector

19.6 TransPrm

Purpose

It defines the position trigger settings.

Syntax

```
typedef struct {
    double trans_vel,
    double trans_dis,
    double trans_dev;
    double trans_curv;
} TransPrm, *PTransPrm;
```

Member

trans_vel — The new transition mode's velocity parameter of an axis group.
Unit: mm/s

trans_dis — The new transition mode's distance parameter of an axis group.
Unit: mm

trans_dev — The new transition mode's maximum deviation parameter of an axis group.
Unit: mm

trans_curv — The new transition mode's maximum curvature parameter of an axis group.
Unit: mm^{-1}

Requirement

Minimum supported version	iA Studio 3.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	TransPrm
LabVIEW	--
Python	TransPrm

19.7 PosTriggerPar

Purpose

It defines the position trigger settings.

Syntax

```
typedef struct {
    double start_pos;
    double end_pos;
    double interval;
    int pulse_width;
} PosTriggerPar, *PPosTriggerPar;
```

Member

start_pos Start position of PT function.
Unit: mm or deg

end_pos End position of PT function.
Unit: mm or deg

interval Position interval between consecutive PT outputs.
Unit: mm or deg

pulse_width The width of each PT output signal.
Unit: ns

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	PosTriggerPar
LabVIEW	--
Python	PosTriggerPar

19.8 Data_t

Purpose

It defines the value type of CoE object.

Syntax

```
typedef union {
    unsigned char bytes[65];
    unsigned char uint8_;
    unsigned short uint16_;
    unsigned int uint32_;
    unsigned uint64_t uint64_;
    signed char int8_;
    short int16_;
    int int32_;
    int64_t int64_;
    float float_;
    double double_;
} Data_t;
```

Member

bytes	Value type is string. **(Note: not supported in C#)**
uint8_	Value type is unsigned char.
uint16_	Value type is unsigned short integer.
uint32_	Value type is unsigned integer.
uint64_	Value type is unsigned long integer.
int8_	Value type is char.
int16_	Value type is short integer.
int32_	Value type is integer.
int64_	Value type is long integer.
float_	Value type is float.
double_	Value type is double.

Requirement

Minimum supported version	iA Studio 3.1
Header	`HIMC_API.h`
Library	`HIMC_API.lib`
DLL	`HIMC_API.dll`

Corresponding name of other API environment

C#	Data_t
LabVIEW	--
Python	Data_t

20. Enumerations

20. Enumerations 20-1
20.1 ComType 20-2
20.2 CoordSystem 20-3
20.3 MotionBufferMode 20-5
20.4 MotionTransitionMode 20-6
20.5 ShaperMode 20-7

20.1 ComType

Definition

Connection type enumeration

Syntax

```
typedef enum {
    COM_TYPE_TCPIP,
    COM_TYPE_RS232,
    COM_TYPE_SIMULATOR
} ComType;
```

Member

COM_TYPE_TCPIP	The connection type is TCPIP.
COM_TYPE_RS232	The connection type is RS232.
COM_TYPE_SIMULATOR	The connection type is simulator.

Requirement

Minimum supported version	iA Studio 0.23
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	ComType
LabVIEW	--
Python	ComType

20.2 CoordSystem

Definition

Coordinate systems

Syntax

```
typedef enum {
    kCoord_ACS = 0,
    kCoord_MCS = 1,
    kCoord_PCS = 2,
    kCoord_GLOBAL = 3,
    kCoord_WCS1 = 1 << 8,
    kCoord_WCS2 = 2 << 8,
    kCoord_WCS3 = 3 << 8,
    kCoord_WCS4 = 4 << 8,
    kCoord_WCS5 = 5 << 8,
    kCoord_WCS6 = 6 << 8,
    kCoord_WCS7 = 7 << 8,
    kCoord_WCS8 = 8 << 8,
    kCoord_WCS9 = 9 << 8,
    kCoord_WCS10 = 10 << 8,
    kCoord_WCS11 = 11 << 8,
    kCoord_WCS12 = 12 << 8,
    kCoord_WCS13 = 13 << 8,
    kCoord_WCS14 = 14 << 8,
    kCoord_WCS15 = 15 << 8,
    kCoord_OFFSET = 1 << 15
} CoordSystem;
```

Description

Refer to section 6.1.2.

Requirement

Minimum supported version	iA Studio 2.0
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	CoordSystem
LabVIEW	--
Python	CoordSystem

20.3 MotionBufferMode

Definition

Buffer modes between adjacent coordinate motion segments

Syntax

```
typedef enum {
    kBM_Aborting = 0,
    kBM_Buffered = 1,
    kBM_BlendingLow = 2,
    kBM_BlendingPrevious = 3,
    kBM_BlendingNext = 4,
    kBM_BlendingHigh = 5,
    kBM_LookAhead = 6
} MotionBufferMode;
```

Description

Refer to section 6.1.4.

Requirement

Minimum supported version	iA Studio 3.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	MotionBufferMode
LabVIEW	--
Python	MotionBufferMode

20.4 MotionTransitionMode

Definition

Transition modes between adjacent coordinate motion segments

Syntax

```
typedef enum {
    kTM_NONE = 0,
    kTM_StartVelocity = 1,
    kTM_ConstantVelocity = 2,
    kTM_CornerDistance = 3,
    kTM_MaxCornerDeviation = 4,
    kTM_PLCOpenReserved_05 = 5,
    kTM_PLCOpenReserved_06 = 6,
    kTM_PLCOpenReserved_07 = 7,
    kTM_PLCOpenReserved_08 = 8,
    kTM_PLCOpenReserved_09 = 9,
    kTM_PLCOpenReserved_10 = 10,
    kTM_MaxCornerCurvature = 11
} MotionTransitionMode;
```

Description

Refer to section 6.1.5.

Requirement

Minimum supported version	iA Studio 3.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	MotionTransitionMode
LabVIEW	--
Python	MotionTransitionMode

20.5 ShaperMode

Definition

Filter modes of input shaping filter (InShape)

Syntax

```
typedef enum {
    Shaper_Normal = 0,
    Shaper_Robust
} ShaperMode;
```

Member

Shaper_Normal	Normal input shaping filter.
Shaper_Robust	Robust input shaping filter.

Requirement

Minimum supported version	iA Studio 1.1
Header	HIMC_API.h
Library	HIMC_API.lib
DLL	HIMC_API.dll

Corresponding name of other API environment

C#	ShaperMode
LabVIEW	--
Python	ShaperMode

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21. Appendix

21. Appendix 21-1
21.1 API error codes 21-2

21.1 API error codes

The following error codes appear when accessing the controller by API.

Table 21.1.1

API Error Codes		
Error Code	Error Name	Description
0x01000000	eERR_API_COMM_ERR	An error occurred when communicating with the controller.
0x0100000a	eERR_API_CONNECT_FAIL	Cannot connect to controller.
0x01000014	eERR_API_TOUT	This operation returned because the time-out period expired.
0x0100001e	eERR_API_ACCESS_REJECT	The request was rejected.
0x01000028	eERR_API_FIFO_MISMATCH	Fatal API error.
0x01000032	eERR_API_FIFO_FULL	The network is busy.
0x0100003c	eERR_API_HIMC_NOT_READY	The HIMC is not ready.
0x01000046	eERR_API_PROTOCOL_MISMATCH	Fatal API error.
0x01000050	eERR_API_INPUT_ARG_ERR	The arguments are invalid.
0x0100005a	eERR_API_NOT_SUPPORT	The API is not supported for this version.
0x01000064	eERR_API_BUSY	The API is busy.
0x0100006e	eERR_API_FILE_TRANS_FAIL	The file transmission failed.
0x01000073	eERR_API_ZIP_CORRUPT	The ZIP file was corrupted.
0x01000078	eERR_API_ID_NOT_FOUND	The connection ID was not found, maybe not connected yet.
0x01000082	eERR_API_SLV_DB_NOT_READY	The slaves are not ready.
0x0100008c	eERR_API_SLV_ID_INVALID	The slave ID is invalid.
0x01000096	eERR_API_INVALID_VAR_ID	The variable ID is invalid.
0x010000a0	eERR_API_VAR_VAL_OUT_OF_RANGE	The value is out of range.
0x010000a5	eERR_API_VAR_IS_READ_ONLY	The variable is read only.
0x010000aa	eERR_API_FS_ACCESS_DENIED	Unable to access file system, please check your permission.
0x010000b4	eERR_API_TASK_ID_INVALID	The task ID is invalid.
0x010000be	eERR_API_TASK_EMPTY	The task is empty.
0x010000c3	eERR_API_TASK_FUNC_NOT_FOUND	Cannot find the function.
0x010000c8	eERR_API_TASK_NOT_RUNNING	The task is not running.
0x010000d2	eERR_API_TASK_IS_RUNNING	The task is already running.
0x010000d7	eERR_API_TOO_MANY_BRK_POINT	There are too many break points in the task.
0x010000dc	eERR_API_INVALID_ERROR_ID	The error ID is invalid.
0x010000e6	eERR_API_INSUFFICIENT_BUFFER	Insufficient buffer.
0x010000f0	eERR_API_STR_TOO_LONG	String length is out of range.
0x010000fa	eERR_API_HIMC_VERSION_MISMATCH	The API is not compatible with this controller version.
0x010003e8	eERR_API_MOTION_ERROR	Motion control error. Please check error log.
0x010087d0	eMSG_API_PACKET_SYS_CALL	System call message from packet.
0x010047da	eWRN_API_PACKET_BUSY	API data packet in high usage.
0x010047e4	eWRN_API_PACKET_INVALID_SYS_CALL_ID	System call id is invalid.
0x01008bb8	eMSG_API_CONNECT	API client connected.

API Error Codes		
Error Code	Error Name	Description
0x01008bb9	eMSG_API_DISCONNECT	API client disconnect.
0x01008bba	eMSG_API_VERSION	API client version.
0x0100270f	eERR_API_FATAL	Fatal API error.
0x01003fff	eERR_API_LOG	This error is sent from API.
0x01007fff	eWRN_API_LOG	This warning is sent from API.
0x0100bfff	eMSG_API_LOG	This message is sent from API.
0x0100ffff	eDBG_API_LOG	This debug information is sent from API.