Subset of the

Technical Specification
PLCopen - Technical Committee 2 – Task Force

Function blocks for motion control

Version 1.0

Appendix A :

Compliance Procedure and Compliance List

Appendix A. <u>Compliance Procedure and Compliance List</u>

Listed in this Appendix are the requirements for the compliance statement from the supplier of the Motion Control Function Blocks. The compliance statement consists of two main groups: supported datatypes (see Appendix A 2 Supported Datatypes) and supported Function Blocks, in combination with the applicable inputs and outputs (see Appendix A 3 Overview of the Function Blocks and its paragraphs). The supplier has to fill out the tables for the used datatypes and Function Blocks, according to their product, committing their support to the specification.

By submitting these tables to PLCopen, and after approval by PLCopen, the list will be published on the PLCopen website, www.plcopen.org , as well as a shortform overview, as specified in Appendix A 2 Supported Datatypes and Appendix A 3 Overview of the Function Blocks here below.

In addition to this approval, the supplier gets access and usage rights of the PLCopen Motion Control logo, as described in chapter Appendix A 4 The PLCopen Motion Control Logo and Its Usage.

Datatypes

The data type REAL listed in the Function Blocks and parameters (e.g. for velocity, acceleration, distance, etc.) may be exchanged to SINT, INT, DINT or LREAL without to be seen as incompliant to this standard, as long as they are consistent for the whole set of Function Blocks and parameters.

Implementation allows to extend data types as long as the basic data type is kept. For example: WORD may be changed to DWORD, but not to REAL.

Function Blocks and Inputs and Outputs

An implementation which claims compliance with this PLCopen specification shall offer a set of Function Blocks for motion control, meaning one or more, with at least the **basic** input and output variables, marked as "**B**" in the tables. These inputs and outputs have to be supported to be compliant.
For higher-level systems and future extensions any subset of the **extended** input and output variables, marked as "**E**" in the tables can be implemented.
Vendor specific additions are marked with "**V**", and can be listed as such in the supplier documentation.

- **Basic** input/output variables are mandatory	Marked in the tables with the letter "**B**"
- **Extended** input /output variables are optional	Marked in the tables with the letter "**E**"
- **Vendor Specific** additions	Marked in the vendor's compliance documentation with "**V**"

Appendix A 1.   Statement of Supplier

Supplier name	KW-Software GmbH
Supplier address	Lagesche Strasse 32
City	32657 Lemgo
Country	Germany
Telephone	+49 (0)5261-9373-0
Fax	+49 (0)5261-9373-26
Email address	info@kw-software.com
Product Name	ProConOS Win RT MC
Product version	V 3.3
Release date	10.10.2003

I herewith state that the following tables as filled out and submitted do match our product as well as the accompanying user manual, as stated above.

Name of representation (person):
Michael Petig

Date of signature (dd/mm/yyyy):
12/11/2003

Signature:

Appendix A 2.   Supported Datatypes

Defined datatypes with MC library:	Supported	If not supported, which datatype used
BOOL	Yes	
INT	Yes	
WORD	Yes	
REAL	Yes	
ENUM	No	

Table 1: Supported datatypes

Within the specification the following derived datatypes are defined. Which structure is used in this system:

Derived datatypes:	Where used	Supported	Which structure
Axis_Ref	Nearly all FBs	Yes	WORD
MC_Direction (extended)	MC_MoveAbsolute MC_MoveVelocity	No	

MC_TP_REF	MC_PositionProfile	Yes	TYPE MC_TP_REF STRUCT
			        delta_time : LREAL
			        position : LREAL
			        interpolation : BYTE
			        END_STRUCT
			END_TYPE

MC_TV_REF	MC_VelocityProfile	Yes	TYPE MC_TV_REF STRUCT
			        delta_time : LREAL
			        velocity : LREAL
			        interpolation : BYTE
			        END_STRUCT
			END_TYPE

MC_TA_REF	MC_AccelerationProfile	Yes	TYPE MC_TV_REF STRUCT
			        delta_time : LREAL
			        acceleration : LREAL
			        interpolation : BYTE
			        END_STRUCT
			END_TYPE

MC_CAM_REF	MC_CamTableSelect	Yes	TYPE MC_CAM_REF STRUCT
			        NoOfRows :UDINT
			        pArray :DWORD
			        END_STRUCT
			END_TYPE
			
			TYPE MC_CAM_POS STRUCT
			        MasterPos :LREAL
			        SlavePos :LREAL
			        Interpolation :BYTE
			        END_STRUCT
			END_TYPE
			pArray is a Pointer to the table of the following type:
			        ARRAY[1..n] of MC_CAM_POS

MC_CAM_ID (extended)	MC_CamTableSelect MC_CamIn	Yes	WORD
MC_StartMode (extended)	MC_CamIn	No	

Table 2: Supported derived datatypes

Appendix A 3. Overview of the Function Blocks

Single Axis Function Blocks	Supported Yes / No	Comments (<= 48 char.)
MC_MoveAbsolute	Yes	
MC_MoveRelative	Yes	
MC_MoveAdditive	Yes	
MC_MoveSuperimposed	Yes	
MC_MoveVelocity	Yes	
MC_Home	Yes	
MC_Stop	Yes	
MC_Power	Yes	
MC_ReadStatus	Yes	
MC_ReadAxisError	Yes	
MC_Reset	Yes	
MC_ReadParameter	Yes	
MC_ReadBoolParameter	Yes	
MC_WriteParameter	Yes	
MC_WriteBoolParameter	Yes	
MC_ReadActualPosition	Yes	
MC_PositionProfile	Yes	
MC_VelocityProfile	Yes	
MC_AccelerationProfile	Yes	
Multi-Axis Function Blocks	**Supported Yes / No**	**Comments (<= 48 char.)**
MC_CamTableSelect	Yes	
MC_CamIn	Yes	
MC_CamOut	Yes	
MC_GearIn	Yes	
MC_GearOut	Yes	
MC_Phasing	Yes	

Table 3: Short overview of the Function Blocks

Appendix A 6.1 MoveAbsolute

If Supported	**MC_MoveAbsolute**	Sup.Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Execute	Yes	
B	Position	Yes	
E	Velocity	Yes	
E	Acceleration	Yes	
E	Deceleration	Yes	
E	Jerk	Yes	
E	Direction	Yes	
V	Merge	Yes	0 = IMMEDIATELY (FB will be aborted by other FB) 1 = BLENDING (FB will start Motion when active FB on same axis is done)
VAR_OUTPUT			
B	Done	Yes	
E	CommandAborted	Yes	
B	Error	Yes	
E	ErrorID	Yes	
V	Active	Yes	FB is active

Appendix A 6.2 MoveRelative

If Supported	MC_MoveRelative	Supported Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Execute	Yes	
B	Distance	Yes	
E	Velocity	Yes	
E	Acceleration	Yes	
E	Deceleration	Yes	
E	Jerk	Yes	
V	Merge	Yes	0 = IMMEDIATELY (FB will be aborted by other FB) 1 = BLENDING (FB will start Motion when active FB on same axis is done)
VAR_OUTPUT			
B	Done	Yes	
E	CommandAborted	Yes	
B	Error	Yes	
E	ErrorID	Yes	
V	Active	Yes	FB is active

Appendix A 6.3 MoveAdditive

If Supported	**MC_MoveAdditive**	Suported Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Execute	Yes	
B	Distance	Yes	
E	Velocity	Yes	
E	Acceleration	Yes	

E	Deceleration	Yes	
E	Jerk	Yes	
V	Merge	Yes	0 = IMMEDIATELY (FB will be aborted by other FB) 1 = BLENDING (FB will start Motion when active FB on same axis is done)
VAR_OUTPUT			
B	Done	Yes	
E	CommandAborted	Yes	
B	Error	Yes	
E	ErrorID	Yes	
V	Active	Yes	FB is active

Appendix A 6.4 MoveSuperimposed

If Supported	MC_MoveSuperimposed	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Execute	Yes	
B	Distance	Yes	
E	VelocityDiff	Yes	
E	Acceleration	Yes	
E	Deceleration	Yes	
E	Jerk	Yes	
VAR_OUTPUT			
B	Done	Yes	
B	Busy	Yes	
E	CommandAborted	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.5 MoveVelocity

If Supported	MC_MoveVelocity	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Execute	Yes	
E	Velocity	Yes	
E	Acceleration	Yes	
E	Deceleration	Yes	
E	Jerk	Yes	
E	Direction	Yes	
VAR_OUTPUT			
B	InVelocity	Yes	
E	CommandAborted	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.6 Home

If Supported	MC_Home	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Execute	Yes	
B	Position	Yes	
VAR_OUTPUT			
B	Done	Yes	
E	CommandAborted	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.7 Stop

If Supported	MC_Stop	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Execute	Yes	
E	Deceleration	Yes	
E	Jerk	Yes	
V	StopSpecification	Yes	0 = ALL_AXIS_MOTION; 1 = SUPERIMPOSED; 2 = PHASING ALL_AXIS_MOTION - All Motions of the axis are stopped SUPERIMPOSED - Only superimposed Motion of axis is stopped PHASING - Only phasing Motion of axis is stopped
VAR_OUTPUT			
B	Done	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.8 Power

If Supported	MC_Power	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Enable	Yes	
E	Enable_Positive	No	
E	Enable_Negative	No	
VAR_OUTPUT			
B	Status	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.9 ReadStatus

If Supported	MC_ReadStatus	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Enable	Yes	
VAR_OUTPUT			
B	Done	Yes	
B	Error	Yes	
E	ErrorID	Yes	
B	Errorstop	Yes	
B	Stopping	Yes	
B	StandStill	Yes	
B	DiscreteMotion	Yes	
B	ContinuousMotion	Yes	
E	SynchronizedMotion	Yes	
E	Homing	Yes	
V	SuperImposedMotion	Yes	Superimposed motion of axis is active
E	ConstantVelocity	Yes	
E	Accelerating	Yes	
E	Decelerating	Yes	

Appendix A 6.10 ReadAxisError

If Supported	MC_ReadAxisError	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
	Enable	Yes	
VAR_OUTPUT			
B	Done	Yes	
B	Error	Yes	
B	ErrorID	Yes	
V	ErrorCategory	Yes	Error category: 1 – minor local failure 2 – major loal failure 3 – minor global failure 4 – major global failure 5 – fatal failure
V	ErrorModule	Yes	Vendor-specific drive

Appendix A 6.11 Reset

If Supported	MC_Reset	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Execute	Yes	
VAR_OUTPUT			
B	Done	Yes	
B	Error	Yes	
B	ErrorID	Yes	

Appendix A 6.12 ReadParameter

If Supported	MC_ReadParameter	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Enable	Yes	
B	ParameterNumber	Yes	
VAR_OUTPUT			
B	Done	Yes	
B	Error	Yes	
E	ErrorID	Yes	
B	Value	Yes	

Appendix A 6.13 ReadBoolParameter

If Supported	MC_ReadBoolParameter	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Enable	Yes	
B	ParameterNumber	Yes	
VAR_OUTPUT			
B	Done	Yes	
B	Error	Yes	
E	ErrorID	Yes	
B	Value	Yes	

Name	B/E	R/W	Supp. Y/N	Comments
CommandedPosition	B	R	Yes	
SWLimitPos	E	R/W	Yes	
SWLimitNeg	E	R/W	Yes	
EnableLimitPos	E	R/W	Yes	
EnableLimitNeg	E	R/W	Yes	
EnablePosLagMonitoring	E	R/W	Yes	
MaxPositionLag	E	R/W	Yes	
MaxVelocitySystem	E	R	No	
MaxVelocityAppl	B	R/W	Yes	
ActualVelocity	B	R	Yes	
CommandedVelocity	B	R	Yes	
MaxAccelerationSystem	E	R	No	
MaxAccelerationAppl	E	R/W	Yes	
MaxDecelerationSystem	E	R	No	
MaxDecelerationAppl	E	R/W	Yes	
MaxJerk	E	R/W	Yes	

Table 4: Parameters for ReadParameter and WriteParameter

Appendix A 6.14 WriteParameter

If Supported	MC_WriteParameter	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Execute	Yes	
B	ParameterNumber	Yes	
B	Value	Yes	
VAR_OUTPUT			
B	Done	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.15 WriteBoolParameter

If Supported	MC_WriteBoolParameter	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Execute	Yes	
B	ParameterNumber	Yes	
B	Value	Yes	
VAR_OUTPUT			
B	Done	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.16 ReadActualPosition

If Supported	MC_ReadActualPositio n	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
VAR_INPUT			
B	Enable	Yes	
VAR_OUTPUT			
B	Done	Yes	
B	Error	Yes	
E	ErrorID	Yes	
B	Position	Yes	

Appendix A 6.17 PositionProfile

If Supported	MC_PositionProfile	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
B	TimePosition	Yes	
VAR_INPUT			
B	Execute	Yes	
B	ArraySize	Yes	
E	Scale	Yes	
E	Offset	Yes	
VAR_OUTPUT			
B	Done	Yes	
E	CommandAborted	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.18 VelocityProfile

If Supported	**MC_VelocityProfile**	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
B	MC_TimeVelocity	Yes	
VAR_INPUT			
B	Execute	Yes	
B	ArraySize	Yes	
E	Scale	Yes	
E	Offset	Yes	
VAR_OUTPUT			
B	Done	Yes	
E	CommandAborted	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.19 AccelerationProfile

If Supported	**MC_AccelerationProfile**	Sup. Y/N	Comments
VAR_IN_OUT			
B	Axis	Yes	
B	MC_TimeAcceleration	Yes	
VAR_INPUT			
B	Execute	Yes	
B	ArraySize	Yes	
E	Scale	Yes	
E	Offset	Yes	
VAR_OUTPUT			
B	Done	Yes	
E	CommandAborted	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.20 CamTableSelect

If Supported	**MC_CamTableSelect**	Sup. Y/N	Comments
VAR_IN_OUT			
B	Master	Yes	
B	Slave	Yes	
B	CamTable	Yes	
VAR_INPUT			
B	Execute	Yes	
E	Periodic	Yes	
E	MasterAbsolute	Yes	
E	SlaveAbsolute	Yes	
VAR_OUTPUT			
B	Done	Yes	
B	Error	Yes	
E	ErrorID	Yes	
E	CamTableID	Yes	

Appendix A 6.21 CamIn

If Supported	MC_CamIn	Sup. Y/N	Comments
VAR_IN_OUT			
B	Master	Yes	
B	Slave	Yes	
VAR_INPUT			
B	Execute	Yes	
E	MasterOffset	Yes	
E	SlaveOffset	Yes	
E	MasterScaling	Yes	
E	SlaveScaling	Yes	
E	StartMode	Yes	
V	CouplingMode	Yes	0 = COUPLING_MODE_ERROR; 1 = COUPLING_MODE_SUPERIMPOSED;
V	CouplingDistance	Yes	Maximum distance between actual position and the coupling position of the slave axis
E	CamTableID	Yes	
VAR_OUTPUT			
B	InSync	Yes	
E	CommandAborted	Yes	
B	Error	Yes	
E	ErrorID	Yes	
E	EndOfProfile	Yes	

Appendix A 6.22 CamOut

If Supported	MC_CamOut	Sup. Y/N	Comments
VAR_IN_OUT			
B	Slave	Yes	
VAR_INPUT			
B	Execute	Yes	
VAR_OUTPUT			
B	Done	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.23 GearIn

If Supported	MC_GearIn	Sup. Y/N	Comments
VAR_IN_OUT			
B	Master	Yes	
B	Slave	Yes	
VAR_INPUT			
B	Execute	Yes	
B	RatioNumerator	Yes	
B	RatioDenominator	Yes	
E	Acceleration	Yes	
E	Deceleration	Yes	
E	Jerk	Yes	
VAR_OUTPUT			
B	InGear	Yes	
E	CommandAborted	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.24 GearOut

If Supported	MC_GearOut	Sup. Y/N	Comments
VAR_IN_OUT			
B	Slave	Yes	
VAR_INPUT			
B	Execute	Yes	
VAR_OUTPUT			
B	Done	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 6.25 Phasing

If Supported	MC_Phasing	Sup. Y/N	Comments
VAR_IN_OUT			
B	Master	Yes	
B	Slave	Yes	
VAR_INPUT			
B	Execute	Yes	
B	PhaseShift	Yes	
E	Velocity	Yes	
E	Acceleration	Yes	
E	Deceleration	Yes	
E	Jerk	Yes	
VAR_OUTPUT			
B	Done	Yes	
E	CommandAborted	Yes	
B	Error	Yes	
E	ErrorID	Yes	

Appendix A 4. The PLCopen Motion Control Logo and Its Usage

For quick identification of compliant products, PLCopen has developed a logo for the motion control Function Blocks:

Figure 1: The PLCopen Motion Control Logo

This motion control logo is owned and trademarked by PLCopen.

In order to use this logo free-of-charge, the relevant company has to fulfill all the following requirements:
1. the company has to be a voting member of PLCopen;
2. the company has to comply to the existing specification, as specified by the PLCopen Task Force Motion Control, and as published by PLCopen, and of which this statement is a part;
3. this compliance is done in written form by the company to PLCopen, clearly stating the applicable software package and the supporting elements of all the specified tables, as specified in the document itself;
4. in case of non-fulfillment, which has to be decided by PLCopen, the company will receive a statement on this from PLCopen in written form. The company will have a one month period to either adopt their software package in such a way that it complies, represented by the issuing of a new compliance statement, or remove all reference to the specification, including the use of the logo, from all their specification, be it technical or promotional material;
5. the logo has to be used as is - meaning the full logo. it may be altered in size as long as the original scale and color setting is kept.
6. the logo has to be used in the context of Motion Control.