

MSD Servo Drive

Specification



Analog Input/Output
Option Card

Description of
Basic Functionality

MSD Analog Input-Output Option Card

Id. no.: CB59508-001, Rev. 1.1

Date: 06/2013

Applicable as from firmware version:

The English version is the original of this specification

Technical alterations reserved

The contents of our documentation have been compiled with greatest care and in compliance with our present status of information.

Nevertheless we would like to point that this document cannot always be updated parallel to the technical further development of our products.

Information and specifications may be changed at any time. For information on the latest version please refer to drives-support@moog.com.

Audience

This document does not replace the MSD Servo Drive Operation Manual. Please be sure to observe the information contained in the “For your safety”, “Intended use” and “Responsibility” sections of the Operation Manual (Id no.: CA65642-001). For information on installation, setup and commissioning, and details of the warranted technical characteristics of the MSD Servo Drive series, refer to the additional documentation (Operation Manual, User Manual, etc.).

This document provides information about how to connect and how to set-up the analogue I/O option card functions.

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Referenced Documents

Document	Title	Document No. (English)	Document No. (German)
[APP]	Moog MSD Servo Drive Application Manual	CA65643-001	CA65643-002
[MDA]	Moog DRIVEADMINISTRATOR 5 User Manual	CA79186-001	CA79186-002
[OPM]	Moog MSD Servo Drive Operation Manual	CA65642-001	CA65642-002

1 Availability


This function is available for the following MSD Servo Drive devices:

Series	Model	Hardware version	Firmware Version
MSD Servo Drive Single-Axis System	G392-xxx-x7x-xxx G395-xxx-x7x-xxx	From Rev. C	From 123.xx-xx
MSD Servo Drive Multi-Axis System	G393-xxx-x7x-xxx G397-xxx-x7x-xxx	From Rev. C	From 123.xx-xx

2 Interface description

2.1 Technical data and pin assignment

The following table describes the technical data of the analog inputs and outputs on the option card.

Figure	Pin	Description
	1	Analog input – IEA02+
	2	Analog input – IEA02-
	3	Analog input – IEA03+
	4	Analog input – IEA03-
	5	Analog output – OEA02+
	6	n/c
	7	Analog output – OEA03+
	8	Analog output – OEA03-
	9	Supply voltage*
	10	GND
	11	n/c
	12	n/c
	13	n/c
	14	n/c
	15	Analog output – OEA02-

*10 V power supply (for example can be used to power a force sensor)

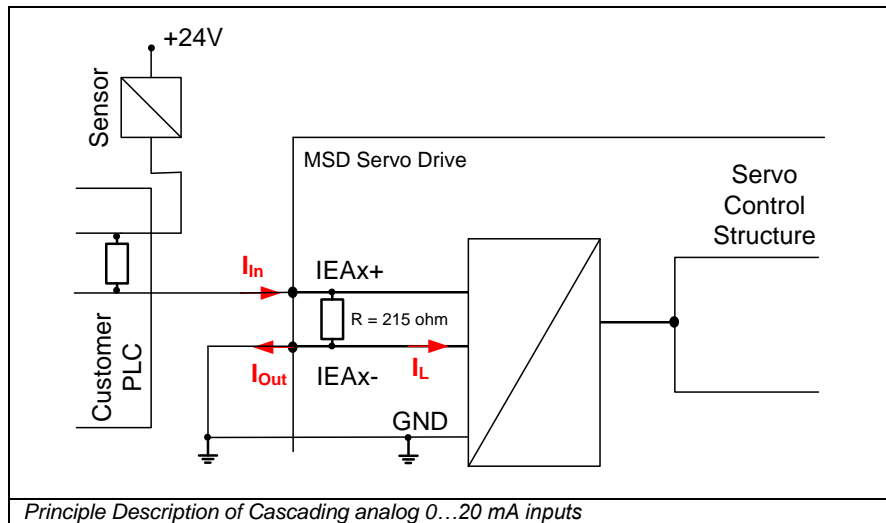
3 Configuration Analog Inputs

3.1 Cascading of analog inputs

Current inputs allow the possibility of cascading several inputs in a series connection. By doing so, the signal from a single sensor can be read by multiple devices at the same time. On the MSD Servo Drive current inputs are available on both the option card and the drive's control card, but with two important differences. Firstly, the ADC on the option card is a 16 Bit converter as opposed to 12 Bit on the control card. Secondly, with AIs on the option card it's possible to select via software whether the inputs are voltage or current whereas on the control card this is not possible, the user needs to decide beforehand whether to order a drive with voltage or current input.

This correct operation depends on the leakage currents of the used analog input circuits. The analog inputs on the MSD Servo Drive control card are as follows: $I_{in} - I_{out} < 50 \mu A$. For a correct operation it is recommended to place the analog inputs of the MSD Servo Drives at the end of the connection cascade.

The following principle circuit figure shows how the cascading has to be done for correct operation.



3.2 Analog Inputs

For this function the selections for the two channels have been increased to fulfil the extra needs of the 0...20 mA inputs. To be able to specify reference set points for the control via the two analog inputs IEA02 and IEA03 or just process them for further use in the MSD PLC or the programming interface, the following function selectors have to be set accordingly.

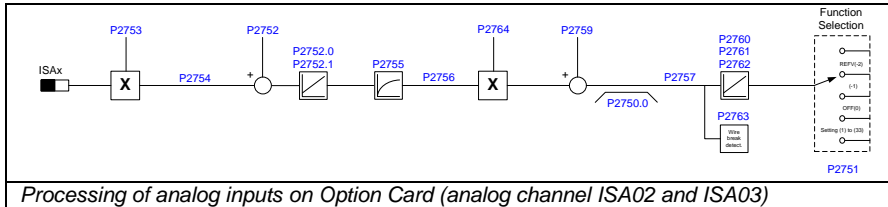
Setting of analog input IEA02/03:

P 2751.0, **P 2751.1** must each be set to REV(-2) for analog command to the internal servo loops or to (-1) for just processing them for use in the MSD PLC or the programming interface. The functions usable in analog mode are indicated by a (-) mark.

Parameter	Parameter name / Settings	Designation in MDA5	Function
P2751	AIO_IN_FS	Function of analog input IEA02/03	Function of the analog input
	REFV(-2)	Analog command	The analog reference can be passed on to the control
	(-1)	Processing analog input	The analog input is just processed without being transferred to the control – parameters are available for further use in MSD PLC or programming interface
P0165	MPRO_REF_SEL	Motion profile selection	Reference selector
	ANA0/1	Via analog channel IEA02/03	Selection of the analog reference source – needs only be set to this value in case of setting REFV(-2). Otherwise this parameter needs to be set to the mating value of the command source (e.g. fieldbus)
P2750.0	TOPT_AIO_Type	Analog current/voltage input switch	Mode selector of analog input for voltage or current mode
	0		Voltage mode +/-10 V
	1		Current mode 0 ... 20 mA

Depending on the parameterized control mode (**P 0300 CON_CfgCon**), a speed or a torque can be set as the reference by setting above parameters accordingly. Otherwise the inputs can be set also in that way so that the inputs are only processed and then are then available for the MSD PLC, the programming interface or also just transmitted to a superimposed PLC via fieldbus.

Structure



Processing of analog inputs on Option Card (analog channel ISA02 and ISA03)

Parameter List

Parameter	Parameter name / Settings	Designation in MDA5	Function
P2750	TOPT_AIO_IO_Type	Extended analog inputs/outputs: current/voltage switch	Input selector (+/- 10 V = 0, 0...20 mA = 1)
0	IEA02/03	Analog current/voltage input switch	Value for input IEA02/03
P2751	TOPT_AIO_IN_FS	Extended analog inputs: Function selector	Function selector IEA02/03 see MSD Application Manual
0	IEA02	Input function	Function selector IAE02
1	IEA03	Input function	Function selector IAE03
P2752.0...3	TOPT_AIO_IN_CAL	Extended analog inputs: AD	Calibration values for

		values calibration	analog inputs
P2753	TOPT_AIO_IN_ScopeGain	Extended analog inputs: scope gains	Scopegains for IEA02/03
0	IEA02	Scope gain	Scope gain IEA02
1	IEA02	Scope gain	Scope gain IEA03
P2754	TOPT_AIO_IN_Raw	Extended analog inputs: Raw values	Raw values of IEA02/03
0	IEA02	Raw ADC Value	Raw value of IEA02
1	IEA03	Raw ADC Value	Raw value of IEA03
P2755	TOPT_AIO_IN_Filt	Extended analog inputs: Filter time constants	Filter time constants for IEA02/03
0	IEA02	Filter time constant	Filter time constant IEA02
1	IEA03	Filter time constant	Filter time constant IEA03
P2756	TOPT_AIO_IN_Val_Norm	Extended analog inputs: Values (filt, norm)	IEA02/03 values filtered, norm.
0	IEA02	Filtered, normalized value	
1	IEA03	Filtered, normalized value	
P2757	TOPT_AIO_IN_Val_Comp	Extended analog inputs: Values (filt, norm, comp)	IEA02/03 values filtered, normalized, compensated
0	IEA02	Compensated, Filtered, normalized value	
1	IEA03	Compensated, Filtered, normalized value	
P2758	TOPT_AIO_IN_Val_Scaled	Extended analog inputs: Values	IEA02/03 values filtered,

		(filt, norm, comp, scaled)	normalized, compensated, scaled
0	IEA02	Compensated, Filtered, normalized value	
1	IEA03	Compensated, Filtered, normalized value	
P2759	TOPT_AIO_IN_Offset	Extended analog inputs: Offset	Offset for IEA02/03
0	IEA02	Voltage/Current offset	Voltage/current offset for IEA02
1	IEA03	Voltage/Current offset	Voltage/current offset for IEA03
P2760	TOPT_AIO_IN_Scale_ThUpper	Extended analog inputs: upper scaling limits	Upper scaling limits for IEA02/03
0	IEA02	Upper scaling threshold	Upper scaling threshold for IEA02
1	IEA03	Upper scaling threshold	Upper scaling threshold for IEA03
P2761	TOPT_AIO_IN_Scale_ThLower	Extended analog inputs: lower scaling limits	lower scaling limits for IEA02/03
0	IEA02	Lower scaling threshold	lower scaling threshold for IEA02
1	IEA03	Lower scaling threshold	lower scaling threshold for IEA03
P2762	TOPT_AIO_IN_Scale_ThZero	Extended analog inputs: Zero scaling threshold	Zero scaling threshold for IEA02/03
0	IEA02	Zero scaling threshold	Zero scaling threshold for IEA02
1	IEA03	Zero scaling threshold	Zero scaling threshold for IEA03

P2763	TOPT_AIO_IN_WireBrk_Th	Extended analog inputs: Wire break threshold	Wire break threshold for IEA02/03
0	IEA02	Wire break detection threshold	Wire break detection threshold for IEA02
1	IEA03	Wire break detection threshold	Wire break detection threshold for IEA03
P2764	TOPT_AIO_IN_Gain	Extended analog inputs: Gain scaling	Gain scaling for IEA02/03
0	IEA02	Gain scaling	Gain scaling for IEA02
1	IEA03	Gain scaling	Gain scaling for IEA03

scope parameters

Name	Number	description
IEA02_Val_F	5770	IEA02: input value filtered, normalized
IEA03_Val_F	5771	IEA03: input value filtered, normalized
IEA02_Val_FC	5772	IEA02: input value filtered, normalized, compensated
IEA03_Val_FC	5773	IEA02: input value filtered, normalized, compensated
IEA02_Val_FCS	5774	IEA02: input value filtered, normalized, compensated, scaled
IEA03_Val_FCS	5775	IEA03: input value filtered, normalized, compensated
IEA02_RawVal	5776	IEA02: raw data ADC
IEA03_RawVal	5777	IEA03: raw data ADC

After a new calibration value is entered, an initialization of the drive must be performed. This can be done by saving everything in the drive and perform a re-start.

As a last step it is possible to check via **parameter 2757** Sub0 for IEA02 and Sub 1 for IEA03 the actual input value. As here the value 0 is applied to the input, these parameters should show also the value 0.

For the second calibration point it is necessary to apply either 20 mA or +10 V to the analog inputs, depending on the used function. In that case it is necessary to enter into **parameter 2757**, Sub1 for IEA02 or **parameter 2757**, Sub3 for IEA03 the mating calibration value so that **parameters 2757**, Sub0 and Sub1 are showing the value 1 as a maximum value. Also here it is necessary to perform a re-initialization after the calibration value has been changed.

3.3 Calibration of Analog Inputs

With the calibration parameters **P2752** SubID 0 to 3 it is possible to adjust the minimum and maximum level of the analog input. The calibration has to be redone after a change of type selector, parameter **P2750** SubID 0.

If the analog inputs are used as voltage inputs, it is possible to define negative calibration values. When using the analog inputs as current inputs it is not possible to set negative calibration values.

For the calibration it is necessary to be able to apply currents in the range of 0 to 20 mA for the current inputs. For the voltage inputs it is necessary to be able to apply voltages for 0 and +10 V to the inputs.

As a first step it is necessary to do the calibration for the lower limit (either 0 mA or 0 V, depending on the selected input functionality). In **parameter 2752**, Subindex 0 the calibration value for input IEA02 is entered while in **parameter 2752**, Subindex 3 the value for input IEA03 is entered. The values shall be entered in the range of $2^{15} = 32768$.

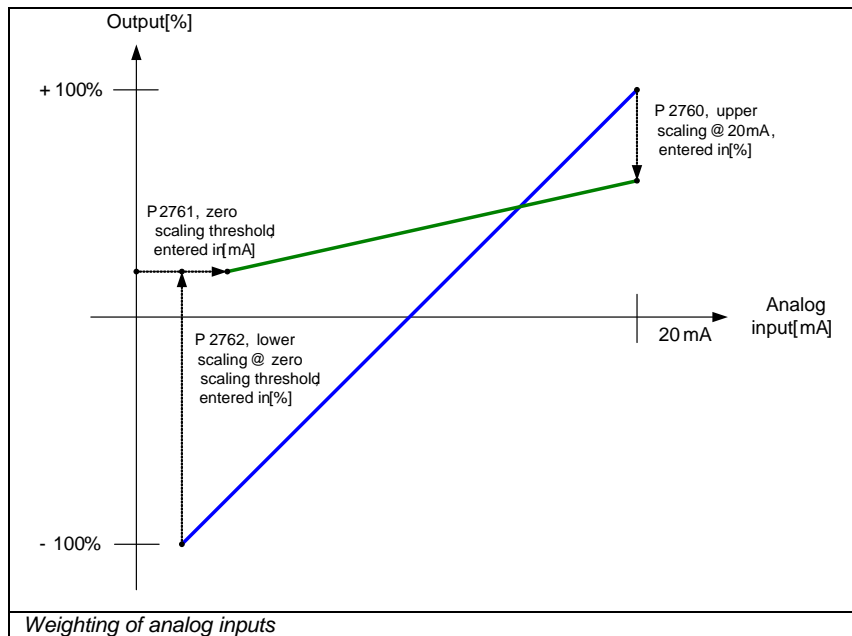
3.4 Weighting

It is possible to change the weighting of the two analog inputs. With the six parameters **P2760 (0/1)**, **P2761 (0/1)** and **P2762 (0/1)** the input weighting can be set. The Sub-indexes 0 are valid for analog input ISA02 while the Sub-indexes 1 are valid for analog input ISA03

Reasons for the need of changing the weighting can be:

- Change the weighting to meet the limiting range: 4...20 mA -> 0...100% (e.g. Torque limiting, sensor scaling,...)
- Change the weighting to meet the speed / position loop command range: 4...20 mA -> +/- 100% (e.g. reference scaling)

The following illustration shows how the weighting function works.



The following table gives a description about the weighting parameters

Parameter	Parameter name / Settings	Designation in MDA5	Function
P2760	TOPT_AIO_IN_Scale_ThUpper	Upper scaling threshold	Defining the output value in [%] @ 20 mA
0	ANA0		Value for input ISA02
1	ANA1		Value for input ISA03
P2761	TOPT_AIO_IN_Scale_ThLower	Zero scaling threshold	Defining the input value of the lower zero threshold in [mA]
0	ANA0		Value for input ISA02
1	ANA1		Value for input ISA03
P2762	TOPT_AIO_IN_Scale_ThZero	Lower scaling threshold	Defining the output value in [%] @ lower zero threshold
0	ANA0		Value for input ISA02
1	ANA1		Value for input ISA03

3.5 Wire break detection

For the 4...20 mA analog inputs, a wire break detection has been implemented. Via a parameter it is possible to define the signal level which sets the drive to error mode and performs an error reaction on demand. There are separate parameters available – one for each analog input (**parameter P2763 (0/1)**).

Parameter	Parameter name / Settings	Designation in MDA5	Function
P2763	CON_ANA_WireBrk_Th	Wire break threshold	Defining the detection level for the wire break condition
0	ANA0		Value for input ISA00
1	ANA1		Value for input ISA01

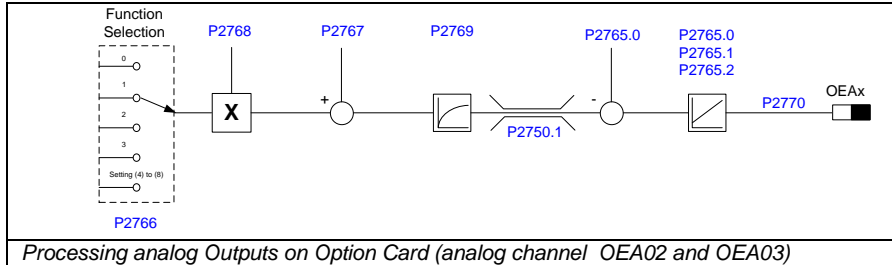
The failure reaction for this error detection is set via **parameter P0030**, Subindex 52. The following table gives an overview about the available failure reactions which can be set for the wire break error detection on an analog input.

Parameter	Parameter name / Settings	Designation in MDA5	Function
P0030, Sub 52	Error Reactions	Programmable reaction in case of a failure	Error Reaction
(0)	Ignore	Ignore error	The error is ignored
(1)	Specific1	Notify error, reaction is forced by internal PLC function block	A specific error reaction can be programmed via PLC.
(2)	Specific2	Notify error, reaction is forced by external control unit	Error reaction external
(3)	FaultReactionOption Code	Notify error, reaction as given by fault	The error reaction is based on the value set in object 605Eh "Fault reaction option

		reaction option code	code"
(4)	ServoStop	Notify error, execute quick stop and wait for restart of control	Quick stop, waiting for restart of control
(5)	ServoStopAndLock	Notify error, execute quick stop and wait for restart of control	Quick stop, block power stage, secure against switching on
(6)	ServoHalt	Notify error, disable power stage	Block power stage

Parameter	Parameter name / Settings	Designation in MDA5	Function
P0030, Sub 52	Error Reactions	Programmable reaction in case of a failure	Error Reaction
(7)	ServoHaltAndLock	Notify error, block power stage, protect against restart	Block power stage, block enable
(8)	WaitERSAndReset	Notify error, block power stage and reset only via switching off/on control voltage (24 V)	Block power stage, reset only by switching the 24 V control voltage off and back on

4 Analog Outputs



P2768	AIO_OUT_Scale		Scale factors for analog outputs
0	OEA02	Scale factor	Scale factor for OEA02
1	OEA03	Scale factor	Scale factor for OEA03
P2769	AIO_OUT_Filter		Filter time for analog outputs
0	OEA02	Filter time	Filter time OEA02
1	OEA03	Filter time	Filter time OEA03
P2770	AIO_OUT_Values		Values of analog outputs at DAC
0	OEA02	Value DAC	Value of OEA02 at DAC
1	OEA03	Value DAC	Value of OEA03 at DAC

NOTE: It is possible to output an arbitrary value to the analog output from the internal PLC or via field bus by setting **P2766** to 4 and by writing the desired value directly in **P2770**.

Parameter	Parameter name / Settings	Designation in MDA5	Function
P2750	AIO_IO_Type	Analog current/voltage output switch	Output selector (+/-10V = 0, 0...20 mA = 1)
1	OEA02/03		Value for input ISA02
P2765.0...5			Calibration Parameters for OEA02/03
P2766	TOPT_AIO_OUT_FS	Extended analog outputs: Function Selector	Function selector for analog outputs.
0	OEA02	Output function	OFF(0) = No function NACT(1) = actual speed TACT(2) = actual torque IRMS(3) = actual rms current PARA(4) = output value in P2770 ACTPOS(5) = actual position VDC(6) = actual DCbus voltage ACTPOS_MODULO(7) = actual modulo position
1	OEA03	Output function	
P2767	AIO_OUT_Offset	User-Offset	Defining the output value in [%] @ lower zero threshold
0	OEA02	Current offset	Offset for OEA02
1	OEA03	Current offset	Offset for OEA03

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