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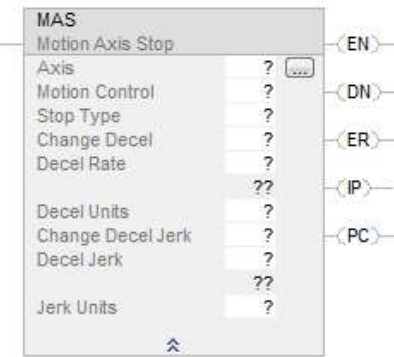
Motion Axis Stop (MAS)

This information applies to the CompactLogix 5370, ControlLogix 5570, Compact GuardLogix 5370, GuardLogix 5570, Compact GuardLogix 5380, CompactLogix 5380, CompactLogix 5480, ControlLogix 5580, and GuardLogix 5580 controllers. Controller differences are noted where applicable.

Use the Motion Axis Stop (MAS) instruction to stop a specific motion process on an axis or to stop the axis completely.

Available Languages

Ladder Diagram



Function Block

This instruction is not available for function block.

Structured Text

MAS(Axis,MotionControl,StopType,ChangeDecel,DecelRate,DecelUnits,ChangeDecelJerk,DecelJerk,Jerk Units)

Operands

Ladder Diagram

Operand	Type	Type	Format	Description	
	CompactLogix 5370, Compact GuardLogix 5370, Compact GuardLogix 5380, CompactLogix 5380, CompactLogix 5480	ControlLogix 5570, GuardLogix 5570, ControlLogix 5580, and GuardLogix 5580 controllers			
Axis	AXIS_CIP_DRIVE AXIS_VIRTUAL	AXIS_CIP_DRIVE AXIS_VIRTUAL AXIS_GENERIC AXIS_GENERIC_DRIVE AXIS_SERVO AXIS_SERVO_DRIVE Tip: AXIS_GENERIC is supported by the ControlLogix 5570 and the GuardLogix 5570 controllers only.	Tag	Name of the axis.	
Motion Control	MOTION_INSTRUCTION		Tag	Control tag for the instruction.	
Stop Type	DINT		Immediate	To Stop	Choose this Stop Type

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[Master Driven Axis Control \(MDAC\)](#)

[Motion Axis Gear \(MAG\)](#)

[MAG Flow Chart \(True\)](#)

All motion in process for this axis.	<div>All = 0</div> <div>With this selection, the instruction stops all motion on an axis. The stops takes any coordinated motion on the axis into account when it computes the Decel rate and stops that component of the coordinated motion. The other axes components of the coordinated motion are unaffected and continue.</div> <div>If this instruction stops a Motion Drive Start (MDS) instruction, the Direct Control Feature is disabled and the affected axis is decelerated to a stop using the instruction parameters.</div>
Only a certain type of motion but leave other motion processes running.	Choose the type of motion that you want to stop:
	Jog = 1
	Move = 2
	Gear = 3
	Home = 4
	Tune = 5
	Test = 6

[Motion Axis Home \(MAH\)](#)

[MAH Flow Chart \(True\)](#)

[Motion Axis Jog.\(MAJ\)](#)

[Motion Axis Move \(MAM\)](#)

[Motion Axis Position Cam \(MAPC\)](#)

[MAPC Flow Chart \(True\)](#)

[Motion Axis Stop \(MAS\)](#)

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					Time Cam = 7
					Position Cam = 8
					Master Offset Move = 9
					Direct Control = 10 ⁽¹⁾
					The axis could still be moving when the MAS instruction is complete.
Change Decel	DINT		Immediate	If you want to	Then Choose
				Use the Maximum Deceleration rate of the axis.	No = 0
				Specify the deceleration rate.	Yes = 1
Decel Rate	REAL		Immediate or Tag	Important: The axis could overshoot its target position if you reduce the deceleration while a move is in process. Deceleration rate of the axis. The instruction uses this value only if Change Decel is Yes.	
Decel Units	DINT		Immediate	Which units do you want to use for the Decel Rate? <ul style="list-style-type: none">Units per sec² (0)% of Maximum (1)	
Change Decel Jerk	DINT		Immediate	If you want to	Then Choose
				Use the Maximum Deceleration Jerk rate of the axis.	No (0)
				Program the deceleration jerk rate.	Yes (1)
Decel Jerk	REAL		Immediate or Tag	Important: The axis could overshoot its target position if you reduce the	

Jerk Units	DINT		Immediate	<p>deceleration jerk while a move is in process.</p> <p>You must always enter a value for the Decel Jerk operand. This instruction only uses the value if the Profile is configured as S-curve.</p> <p>Decel Jerk is the deceleration jerk rate of the axis.</p> <p>Use these values to get started.</p> <p>Decel Jerk = 100 (% of Time)</p> <p>0 = Units per sec³</p> <p>1 = % of Maximum</p> <p>2 = % of Time (use this value to get started)</p>
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(1) When the MAS instruction is used to with either an All or DirectVelocityControlStatus Command Stop Type, the selection also clears the MDS In Process (.IP) bit, and clears the Axis DirectVelocityControlStatus bit in the Motion Status attribute

Structured Text

This Operand	Has These Options Which You	
	Enter as Text	Or Enter as a Number
Stop Type	all jog move gear home tune test timecam positioncam masteroffsetmove directcontrol	0 1 2 3 4 5 6 7 8 9 10
Change Decel	no yes	0 1
Decel Units	Units per sec ² %ofmaximum	0 1
Change Decel Jerk	no yes	0 1

Decel Jerk	no enumeration	<p>You must always enter a value for the Decel Jerk operand. This instruction only uses the value if the Profile is configured as S-curve.</p> <p>Decel Jerk is the deceleration jerk rate of the axis.</p> <p>Use this value to get started.</p> <p>Decel Jerk = 100 % of Time (2)</p>
Jerk Units	unitspersec ³	0
	% of Maximum	1
	% of Time	2

See Structured Text Syntax for more information on the syntax of expressions within structured text.

MOTION_INSTRUCTION Structure

To See If	Check To See If This Bit Is Set To	Data Type	Notes
A false-to-true transition caused the instruction to execute.	EN	BOOL	The EN bit stays set until the process is complete and the rung goes false.
The stop was successfully initiated.	DN	BOOL	
An error happened.	ER	BOOL	
The axis is stopping.	IP	BOOL	Any of these actions end the MAS instruction and clear the IP bit: <ul style="list-style-type: none">The axis is stoppedAnother MAS instruction supersedes this MAS instructionShutdown commandFault Action
The axis is stopped.	PC	BOOL	The PC bit stays set until the rung makes a false-to-true transition.

Description

Use the MAS instruction when you want a decelerated stop for any controlled motion in process for the axis. The instruction stops the motion without disabling the servo loop. A trapezoidal profile is always used for MAS with Stop Type=ALL for the deceleration regardless of the programmed profile type. Use the instruction to:

- stop a specific motion process such as jogging, moving, or gearing
- stop the axis completely
- abort a test or tune process initiated by a Motion Run Hookup Diagnostics (MRHD) instruction or Motion Run Axis Tuning (MRAT) instruction.

If the Stop Type is	Then the MAS Instruction Uses This Profile
Jog	Same type of profile as the Motion Axis Jog (MAJ) instruction that started the jog.
Move	Same type of profile as the Motion Axis Move (MAM) instruction that started the move.
None of the above	Trapezoidal.

When MAS (Stop Type = All) is used on any axis associated with a coordinate system and a coordinated motion instruction is running on it, Coordinate system’s maximum deceleration is used to stop remaining axes. If the coordinate system contains orientation axes, Coordinate system’s Orientation maximum deceleration is used for stopping remaining Rx, Ry or Rz axes.

Example

Suppose you use a Motion Axis Jog (MAJ) instruction with an S-curve profile to start a jog. Then you use an MAS instruction with a Stop Type of Jog to stop the jog. In that case, the MAS instruction uses an S-curve profile to stop the jog.

Programming Guidelines



Risk of Velocity and/or End Position Overshoot

If you change move parameters dynamically by any method, that is by changing move dynamics [Motion Change Dynamics (MCD) instruction or Motion Coordinated Change Dynamics (MCCD)] or by starting a new instruction before the last one has completed, be aware of the risk of velocity and/or end position overshoot.

A Trapezoidal velocity profile can overshoot if maximum deceleration is decreased while the move is decelerating or is close to the deceleration point.

An S-curve velocity profile can overshoot if:

- Maximum deceleration is decreased while the move is decelerating or close to the deceleration point; or
- Maximum acceleration jerk is decreased and the axis is accelerating. Keep in mind, however, that jerk can be changed indirectly if it is specified in % of time.
For more information, see Troubleshooting Axis Motion.

Guidelines	Details	
In ladder diagram, toggle the rung condition each time you want to execute the instruction.	This is a transitional instruction: <ul style="list-style-type: none">• In ladder diagram, toggle the rung-condition-in from cleared to set each time you want to execute the instruction.	
In structured text, condition the instruction so that it only executes on a transition.	In structured text, instructions execute each time they are scanned. <ul style="list-style-type: none">• Condition the instruction so that it only executes on a transition. Use either of these methods:• Qualifier of an SFC action• Structured text construct For more information, see Structured Text Syntax.	
Choose whether to stop all motion or only a specific type of motion.	If You Want to Stop	Then Choose This Stop Type
	All motion in process for this axis.	All The instruction uses a trapezoidal profile and stops the axis.
	Stop only a certain type of motion but leave other motion processes running.	The type of motion that you want to stop The axis could still be moving when the MAS instruction is complete. The instruction uses an S-curve profile to stop the axis only if: <ul style="list-style-type: none">• The Stop Type is Jog or Move, and• The jog or move used an S-curve profile.

	Example: Suppose your axis is executing both a jog and a move at the same time. And suppose you want to stop only the jog but leave the move running. In that case, choose a Stop Type of Jog.
To stop gearing or camming, select the slave axis.	To stop a gearing or position camming process, enter the slave axis to turn off the specific process and stop the axis. If the master axis is a servo axis, you can stop the master axis which in turn stops the slave without disabling the gearing or position camming. Tip: If the Master axis is moved manually while the Master axis was in a disabled state, the actual position of the slave axis continues to track the Master's position, regardless whether the MasterReference of the MAPC instruction is set to Actual or Command.
To stop a Master Offset move, enter the slave axis but use master units.	To stop an Absolute or Incremental Master Offset move: <ul style="list-style-type: none">• For Axis, enter the slave axis.• For Deceleration and Jerk, enter the values and units for the master axis.
Be careful if the instruction changes motion parameters.	When you execute an MAS instruction, the axis uses the new deceleration and jerk rates for the motion that’s already in process. This can cause an axis to overshoot its speed, overshoot its end position, or reverse direction. S-curve profiles are more sensitive to parameter changes. For more information, see <i>Troubleshoot Axis Motion</i> .
Use the jerk operands for S-curve profiles.	Use the jerk operands when <ul style="list-style-type: none">• The Stop Type is Jog or Move.• The jog or move uses an S-curve profile. Under those conditions, the instruction uses an S-curve profile to stop the axis. The instruction uses a constant deceleration rate for all other types of stops. You must fill in the jerk operands regardless of the type of stop.
Use % of Time for the easiest programming and tuning of jerk.	For an easy way to program and tune jerk, enter it as a % of the acceleration or deceleration time. For more information, see <i>Tune an S-curve Profile</i> .

Master Driven Speed Control (MDSC) and the MAS Instruction

If the MAS is executed (goes IP) on the Slave Axis in Master Driven Mode, the MDSC link is immediately broken. The Slave always stops in Time Driven Mode, regardless if the active mode is Time Driven or Master Driven.

Stop Type for MAS

The behavior of the MAS instruction depends on the Stop Type parameter:

- Time CAM, stop type moves, and jogs - When you invoke an MAS with Stop Type = Time Cam on an axis that is running in Master Driven Mode, the axis terminates Master Driven Mode, changes to Time Driven Mode, and stops as specified.
- Master Offset Move - When you invoke an MAS with Stop Type = Master Offset Move on an axis that is running in Master Driven Mode and controlling a Position Cam, the offset axis terminates Master Driven Mode, changes to Time Driven Mode, and stops at the specified deceleration and deceleration jerk.
- All - When you invoke an MAS with Stop Type = All, the MDSC link is broken immediately. All motion planners on the specified axis terminate Master Driven Mode and axes are stopped at the specified deceleration and deceleration jerk in Time Driven Mode.

If the axes are involved in any coordinated motion (in Master Driven Mode), then the axes break from the coordinate motion planner and the other axes in the coordinate system continue. The IP bit is cleared on the Master Driven Axis Control (MDAC).

Note that MAS ALL on the Master axis does not break the MDSC link. For all other stop types in which you execute an MAS instruction on an axis that is being controlled in Master Driven Mode, the motion planner terminates Master Driven Mode on the requested axis for the requested Stop Type, changes to

Time Driven Mode, and stops at the specified deceleration and deceleration jerk in Time Driven Mode. Other stop types do not clear the IP bit on the MDAC.

The AC bit of the MDAC instruction resets when the axis is stopped.

MAS All reset the IP bit of the MDAC. Other stop types do not reset the IP bit.

Note that if a stop is issued very close to the programmed endpoint, the actual stop may be beyond the programmed endpoint, especially if run in Master Driven Mode.

The status bit CalculatedDataAvailable in an active motion instruction status word for an MAS instruction resets when an MAS is executed (goes IP). The CalculatedData is not recomputed.

Affects Math Status Flags

No

Major/Minor Faults

None specific to this instruction. See Common Attributes for operand related faults.

Execution

Ladder Diagram

Condition/State	Action Taken
Prescan	The .EN, .DN, .ER, and .IP bits are cleared to false.
Rung-condition-in is false	The .EN bit is cleared to false if the .DN or .ER bit is true.
Rung-condition-in is true	The .EN bit is set to true and the instruction executes.
Postscan	N/A

Structured Text

Condition/State	Action Taken
Prescan	See Prescan in Ladder Diagram table
Normal execution	See Rung-condition-in is false, followed by rung is true in the Ladder Diagram table.
Postscan	See Postscan in Ladder Diagram table.

Error Codes

See Motion Error Codes (.ERR).

Extended Error Codes

Use Extended Error Codes (.EXERR) for more instructions about an error. See Motion Error Codes (.ERR).

If ERR is	And EXERR is	Then	
		Cause	Corrective Action
13	Varies	An operand is outside its range.	<div>The EXERR is the number of the operand that is out of range. The first operand is 0.</div> <div>For example, if EXERR = 4, then check the Decel Rate.</div>

			EXERR	MAS Operand
			0	Axis
			1	Motion Control
			2	Stop Type
			3	Change Decel
			4	Decel Rate

MAS Changes to Single Axis Status Bits

Motion Status Bits

If the Stop Type Is	Then		
NOT All	The instruction clears the Motion Status bit for the motion process that you stopped.		
All	The instruction clears all Motion Status bits.		
	Bit Name	State	Meaning
	MoveStatus	FALSE	Axis is not Moving.
	JogStatus	FALSE	Axis is not Jogging.
	GearingStatus	FALSE	Axis is not Gearing.
	HomingStatus	FALSE	Axis is not Homing.
	StoppingStatus	TRUE	Axis is Stopping.
	PositionCamStatus	FALSE	Axis is not Position Camming.
	TimeCamStatus	FALSE	Axis is not Time Camming.
	PositionCamPendingStatus	FALSE	Axis does not have a Position Cam Pending.
	TimeCamPendingStatus	FALSE	Axis does not have a Time Cam Pending.
	GearingLockStatus	FALSE	Axis is not in a Gear Locked condition.
	PositionCamLockStatus	FALSE	Axis is not in a Cam Locked condition.
	DirectVelocityControlStatus	FALSE	Axis is not under Direct Velocity Control.
	DirectTorqueControlStatus	FALSE	Axis is not under Direct Torque Control.

See also

- [Troubleshoot Axis Motion](#)
- [Structured Text Syntax](#)
- [Motion Error Codes \(.ERR\)](#)
- [Motion Move Instructions](#)

[Common Attributes](#)

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