Gen IV Controller

Assignable I/O Instructions

AIMCO

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1. Assignable I/O

The Gen IV controller supports assignable I/O.

Buses: The controller is divided up into buses. Each bus has a set of inputs and a set of outputs. Currently the controller supports the following buses.

Bus Number	Bus
1	Physical I/O
2	Fieldbus (Anybus module) I/O
3	Modbus TCP
4	Ethernet/IP

All assignments have a bus, element, and bit configuration to define its location in the system. The bus value needs to be set from the list above. The element and bit define the location in the bus. The first element on the bus is 0 and goes up the last legal element for the given bus. The bits in each element is referenced from 0(LSB) to 31(MSB).

Inputs

All input assignments have a Bus, Element, and Bit configuration to define its location in the system. Along with the basic configuration many also have other configuration(s) that allow its behavior to be modified to suit the application.

	Supported Feature						Controllers					
	Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset	iEC	iAC	iPC	iBC	iBC-Z	iCC
Do Nothing	√	√	√				√	√	√	√	√	√
Start	√	√	√	√			√					
Stop	√	√	√	√			√	√	√	√		√
Reverse	√	√	√	√			√					
Disable	√	√	√	√			√	√	√			√
Reset Job	√	√	√	√			√	√	√	√	√	√
Select PSet	√	√	√		√	√	√	√	√	√		√
Select Job	√	√	√		√	√	√	√	√	√	√	√
Select Job Sequence	√	√	√		√	√	√	√	√	√	√	√
Disable Assembly	√	√	√	√			√					
Set ID	√	√	√		√		√	√	√	√	√	√
Set ID (word swap)	√	√	√		√		√	√	√	√	√	√
Set Date/Time	√	√	√		√		√	√	√	√	√	√
Set Date/Time (word swap)	√	√	√		√		√	√	√	√	√	√
Verify PSet	√	√	√		√	√	√	√	√	√	√	√
Clear Results	√	√	√	√			√	√	√	√	√	√
Log Change	√	√	√		√	√	√	√	√	√	√	√
Decrement Batch	√	√	√	√			√	√	√	√	√	√
Increment Batch	√	√	√	√			√	√	√	√	√	√
Click Wrench	√	√	√	√			√	√	√	√	√	√
Click Wrench NOK	√	√	√	√			√	√	√	√	√	√
Bypass Stops	√	√	√	√			√	√	√	√	√	√
Verify Job Sequence	√	√	√		√	√	√	√	√	√	√	√
ASCII ID	√	√					√	√	√	√	√	√
Abort Job	√	√	√	√			√	√	√	√		√
Remote Start	√	√	√	√			√					
Remove Lock on Reject	√	√	√	√			√	√	√	√		√
Dual Start Interlocked	√	√	√	√			√					
Decrement Job	√	√	√	√			√	√	√	√	√	√
Increment Job	√	√	√	√			√	√	√	√	√	√
Decrement PSet	√	√	√	√			√	√	√	√	√	√
Increment PSet	√	√	√	√			√	√	√	√	√	√
Decrement Job Sequence	√	√	√	√			√	√	√	√	√	√
Increment Job Sequence	√	√	√	√			√	√	√	√	√	√
Set Tool Home Position	√	√	√	√			√					

Polarity

When the polarity is set to N.O. the input is considered active high (24vdc for physical inputs and logic 1 for all network type buses). When the polarity is set to N.C. the input is considered active low (0vdc for physical inputs and logic 0 for all network type buses).

Width and Offset

For multiple bit inputs (for example "Select PSet") the width variable defines the number of bits the assignment will read for its input. This allows the input size to be restricted to a few bits saving space for other assignments.

The offset variable allows a fixed value to be added to the read value.

For example to use bits 4 & 5 of the physical inputs to select parameter sets 1-4 the assignment would look like…

Select PSet		
Bus	1	For the physical bus
Element	0	For the first element on the bus
Bit	4	For the starting bit location
Width	2	To span the two bits 4 & 5
Offset	1	Adding 1 to the read input value so we get… Binary 00 = 1 Binary 01 = 2 Binary 10 = 3 Binary 11 = 4

Input Assignments

Do Nothing	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√			

The "Do Nothing" assignment will run do nothing if it is active or inactive.

Start	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Start" assignment will run the tool while the input is active. Start is available for the Physical I/O bus only.

Stop	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Stop" assignment will stop the tool if it is running and prevent it from being started.

Reverse	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Reverse" will put the controller in disassembly mode while the input is active.

Disable	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Disable" will disable the tool while the input is active. It will not stop a fastening cycle that is progress.

Reset Job	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

On the transition of inactive to active the "Reset Job" assignment will reset the active job.

Select PSet	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√		√	√

The "Select PSET" input will select the parameter set according to the input value. Uses the width parameter to define the number of input bits read. The minimum width is 1 and the maximum is 8. After the input is read, the offset parameter will be added to the value to get the actual parameter set number. Selecting an invalid parameter set number will disable the tool.

Select Job	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√		√	√

The "Select Job" input will select the job number according to the input value. Uses the width parameter to define the number of input bits read. The minimum width is 1 and the maximum is 8. After the input is read, the offset parameter will be added to the value to get the actual job number. Selecting an invalid job number will disable the tool.

Select Job Sequence	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√		√	√

The "Select Job Sequence" input will select the job sequence number according to the input value. Uses the width parameter to define the number of input bits read. The minimum width is 1 and the maximum is 8. After the input is read, the offset parameter will be added to the value to get the actual job sequence number. Selecting an invalid job sequence number or a sequence that is already complete will disable the tool.

Disable Assembly	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Disable Assembly" assignment will disable the tool in the assembly direction. It will not disable the tool in disassembly or tube nut homing. It will not stop a fastening cycle that is progress.

Set ID	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√		√	

The "Set ID" assignment will set the ID to an integer value of the input value. The width can be set from 1 to 32 bits. The input value will read as an integer value and an ASCII string with leading zeros will be produced and passed to the ID recognition system. The length of the string is based on the width of the assignment. The string will always be sized to accommodate the maximum value of the input. For example a width setting of 16 can have an integer value of 0-65535 so the produced ID would be "00000" to "65535" (always five character long).

Width setting	Length of ID string	ID value
1 - 3	1	"0" – "n"
4 - 6	2	"00" – "nn"
7 - 9	3	"000" – "nnn"
10 - 13	4	"0000" – "nnnn"
14 - 16	5	"00000" – "nnnnn"
17 – 19	6	"000000" – "nnnnnn"
20 – 23	7	"0000000" – "nnnnnnn"
24 – 26	8	"00000000" – "nnnnnnnn"
27 – 29	9	"000000000" – "nnnnnnnnn"
30 - 32	10	"0000000000" – "nnnnnnnnnn"

Set ID (word swap	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√		√	

The "Set ID (word swap)" assignment is the same as the "Set ID" assignment except the high and low words (16bit) are swapped prior to evaluation. This is to correct the mixed endianness of some PLC. See the "Set ID" for behavior.

Set Date/ Time	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√		√	

The "Set Date/Time" assignment will set the date and time of the controller. The width can be set from 1 to 32 bits but should always be set to 32 to get the correct results. The input value will be read as the number of seconds since 00:00:00 January 1, 1970 (POSIX time or Epoch time). If the input value changes and it is non-zero, the date and time of the controller will be set to the new value.

Set Date/ Time (word swap)	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√		√	

The "Set Date/Time (word swap)" assignment is the same as the "Set Date/Time" assignment except the high and low words (16bit) are swapped prior to evaluation. This is to correct the mixed endianness of some PLC. See the "Set Date/Time" for behavior.

Verify PSet	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√		√	√

The "Verify PSET" input will compare the current parameter set to the input value. Uses the width parameter to define the number of input bits read. The minimum width is 1 and the maximum is 8. After the input is read, the offset parameter will be added to the value to get the actual parameter set number. If the parameter set input value does not match the current parameter of the controller the tool will be disabled.

Clear Results	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Clear Results" assignment will clear the latest results outputs (Ok, Nok, etc.) on the same bus.

Log Change	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√		√	√

The "Log Change" assignment will add entries to the controller event log when the input changes.

Decrement Batch	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Decrement Batch" assignment will remove the latest OK rundown from the current running JOB. This will cause the JOB count to be reduced by one.

Increment Batch	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Increment Batch" assignment will insert a manual rundown into the current sequence of the current JOB. This will cause the JOB count to increment by one.

Click Wrench	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Click Wrench" assignment is the same as "Increment Batch" with the addition of a programmable torque value.

Click Wrench NOK	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Click Wrench NOK" assignment is the same as "Click Wrench," but the inserted manual rundown always reports a torque of 0.

Bypass Stops	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Bypass Stops" assignment removes most stop conditions, allowing the tool to be ran in an override type condition. Hardware faults, stop and disable inputs are not removed.

Verify Job Sequence	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√		√	√

The "Verify Job Sequence" input will compare the current Job sequence to the input value. Uses the width parameter to define the number of input bits read. The minimum width is 1 and the maximum is 8. After the input is read, the offset parameter will be added to the value to get the actual Job sequence number. If the Job sequence input value does not match the current Job sequence of the controller the tool will be disabled.

ASCII ID	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√				

The "ASCII ID" assignment will set the ID to the of the input (ASCII) value. This assignment consumes the entire element so the Bit is not used. It also has a length parameter to set the length of the input in bytes. The input value will be passed directly to the ID recognition system.

Abort Job	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Abort Job" assignment aborts the job and disables the tool. A job reset is required to enable the tool for the next job.

Remote Start	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Remote Start" assignment will run the tool while the input is active. Remote Start is available for non-physical I/O buses.

Remove Lock on Reject	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Remove Lock on Reject" assignment unlocks the tool if locked on reject, re-enabling the tool.

Dual Start Interlocked	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Dual Start Interlocked" assignment will run the tool if the interlock conditions are met. Dual Start Interlock is available for the Physical IO bus only. The Dual Start Interlocked input works in combination with the Physical input assigned to the 'Start' input. The Dual Start Interlocked is only available for iEC controllers.

Setup
- Only 1 Start Input and 1 Dual Start Interlocked Input should be assigned.
- Controller->Tool Setup –> Start Input Configuration:
  - The Start Input Source Must be set to 'Start From IO'.
  - Latching throttle is disabled for Dual Interlocked Start.

Dual Start Interlocked - Operation
- The tool will not run unless both inputs are activated within two seconds of each other.
- If the two second timer times out, both inputs must be deactivated to reset the timer.
- If either input is deactivated the tool stops.
- To restart the tool, both inputs must be deactivated then reactivated within two seconds of each other.

Tubenut Tool Homing Exceptions for Dual Start Interlocked functionality
- If controller's tubenut homing configuration is set to RELEASE:
  - Deactivating either, or both, of the inputs will initiate the homing sequence.
  - Homing will continue until sequence is complete.
- If controller's tubenut homing configuration is set to RELEASE AND REPRESS:
  - Deactivating either of the inputs, then activating both inputs will initiate the homing sequence.
  - Homing will continue while both inputs are active.
  - If either input is deactivated, before homing is complete, the tool will stop, and homing will pause until both inputs are reactivated.
  - To restart tool, after homing is complete, both inputs must be deactivated, then reactivated within two seconds of each other.

Decrement Job	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Decrement Job" assignment will decrement the Job Number, selecting the last job if decrementing past the first one.

Increment Job	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Increment Job" assignment will increment the Job Number, selecting the first job if incrementing past the last one.

Decrement PSet	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Decrement PSet" assignment will decrement the PSet Number, selecting the last PSet if decrementing past the first one.

Increment PSet	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Increment PSet" assignment will increment the PSet Number, selecting the first PSet if incrementing past the last one.

Decrement Job Sequence	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Decrement Job Sequence" assignment will decrement the Job sequence, selecting the last job sequence if decrementing past the first one.

Increment Job Sequence	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Increment Job Sequence" assignment will increment the Job sequence, selecting the first job if incrementing past the last one.

Set Tool Home Position	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Width	Offset
	√	√	√	√		

The "Set Tool Home Position" assignment will set the home position to the tool's current angular location. This can be used in conjunction with the Homing stage to bring the tool's output back to the home position.

Outputs

All output assignments have a Bus, Element, and Bit configuration to define its location in the system. Along with the basic configuration many also have other configuration(s) that allow its behavior to be modified to suit the application.

	Supported Feature											Controller					
	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode Normal, Timed, Flashed	Time	Width	Offset	Input Bus	Input Element	Input Bit	iEC	iAC	iPC	iBC	iBC-Z	iCC
Ok	√	√	√	√	√							√	√	√	√	√	√
Nok	√	√	√	√	√							√	√	√	√	√	√
Torque Ok	√	√	√	√	√							√	√	√	√	√	√
Torque Nok	√	√	√	√	√							√	√	√	√	√	√
Low Torque	√	√	√	√	√							√	√	√	√	√	√
High Torque	√	√	√	√	√							√	√	√	√	√	√
Angle Ok	√	√	√	√	√							√	√	√	√	√	√
Angle Nok	√	√	√	√	√							√	√	√	√	√	√
Low Angle	√	√	√	√	√							√	√	√	√	√	√
High Angle	√	√	√	√	√							√	√	√	√	√	√
Fastening Complete	√	√	√	√	√							√	√	√	√	√	√
In Cycle	√	√	√	√	√							√	√	√			√
Fastening Aborted	√	√	√	√	√							√	√	√	√	√	√
Fastening Stopped	√	√	√	√	√							√	√	√	√	√	√
Batch Complete	√	√	√	√	√							√	√	√	√	√	√
Job Complete	√	√	√	√	√							√	√	√	√	√	√
Error	√	√	√	√	√							√	√	√	√	√	√
Tool Start Switch	√	√	√	√	√							√					
Tool Push to Start Switch	√	√	√	√	√							√					
Tool MFB	√	√	√	√	√							√					
Tool Enabled	√	√	√	√	√							√	√	√	√	√	√
Tool Running	√	√	√	√	√							√	√				
Service Indicator	√	√	√	√	√							√	√	√		√	√
ToolsNet Connected	√	√	√	√	√							√	√	√	√	√	√
Open Protocol Connected	√	√	√	√	√							√	√	√	√	√	√
PFCS Connected	√	√	√	√	√							√	√	√	√	√	√
Running PSet Number	√	√	√				√	√				√	√	√	√	√	√
Running Job Number	√	√	√				√	√				√	√	√	√	√	√
External Controlled	√	√	√						√	√	√	√	√	√	√	√	√
Tool In CCW	√	√	√	√	√							√					
Tool In CW	√	√	√	√	√							√					
Torque	√	√	√				√					√	√	√	√	√	√
Torque (x10)	√	√	√				√					√	√	√	√	√	√
Torque (x100)	√	√	√				√					√	√	√	√	√	√
Angle	√	√	√				√					√	√	√	√		√
Rundown Saved to FTP Server	√	√	√				√					√	√	√	√	√	√
Fastener Removed	√	√	√	√	√							√	√	√			√
Spindle Ok	√	√	√	√	√							√					
Spindle NOk	√	√	√	√	√							√					
Spindle Fastening Complete	√	√	√	√	√							√					
Pulses	√	√	√				√						√	√		√	√
Pulses High	√	√	√	√	√								√	√		√	√
Pulses Low	√	√	√	√	√								√	√		√	√
Pulses NOk	√	√	√	√	√								√	√		√	√
Pulses Ok	√	√	√	√	√								√	√		√	√
ON	√	√	√	√	√							√		√	√	√	√
Job Aborted	√	√	√	√	√							√	√	√	√		√
Tool In Use	√	√	√	√		√						√	√	√	√	√	√
Barcode Scanned	√	√	√	√								√	√	√	√	√	√
Start Trigger Active	√	√	√	√								√					
Tubenut Home	√	√	√	√	√							√					

Polarity

When the polarity is set to N.O. the output will be high when it is active (24vdc for physical outputs and logic 1 for all network type buses). When the polarity is set to N.C. the output will be low for active (0vdc for physical inputs and logic 0 for all network type buses).

Mode

Normal

In the "Normal" mode, the output will track the state of the assignment (while still observing the polarity setting). If the polarity is set N.O. and the assignment has an active output the output will be on and stay on till the assignment goes to inactive.
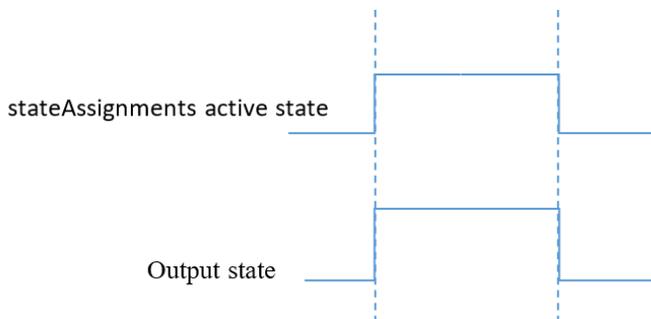

Figure 1: Normal Mode

Timed

In the "Timed" mode, the output will come on when the assignments state goes active and go off based on the time value or the assignment state going inactive (while still observing the polarity setting).
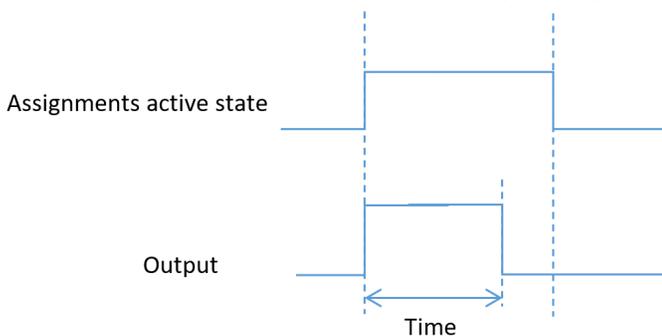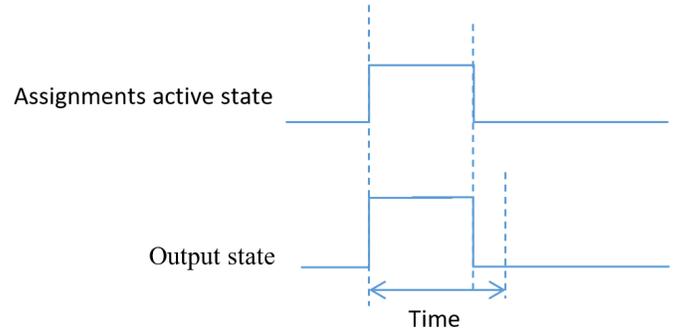

Figure 2 Timed Mode

Figure 3: Timed Mode (assignment deactivates before time expires)

Flash

In the "flash" mode, the output will flash at the time rate while the assignments state is active (while still observing the polarity setting).
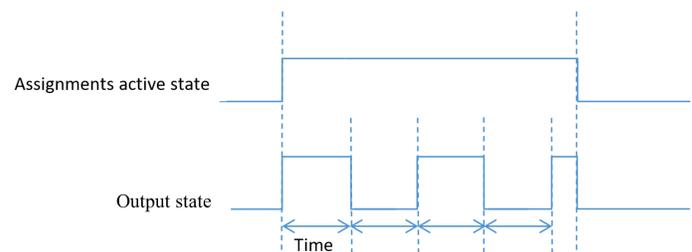
Figure 3 Flash Mode

Width and Offset

For multiple bit outputs (for example "Running PSet Number") the width variable defines the number of bits the assignment will output. This allows the output size to be restricted to a few bits saving space for other assignments.

The offset variable allows a fixed value to be added to the value before it is output.

For example to use bits 4 & 5 of the physical outputs to indicate the selected parameter set number 1-4 as binary 0-3 the assignment would look like...

Running PSet Number		
Bus	1	For the physical bus
Element	0	For the first element on the bus
Bit	4	For the starting bit location
Width	2	To span the two bits 4 & 5
Offset	-1	Adding -1 to the read input value so we get... 1 = Binary 00 2 = Binary 01 3 = Binary 10 4 = Binary 11

Output Assignments

OK	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Ok" output assignment will go active at the completion of an acceptable fastening. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Nok	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Nok" output assignment will go active at the completion of an unacceptable fastening. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Torque Ok	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Torque Ok" output assignment will go active at the completion of a fastening that has an acceptable torque value. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Torque Nok	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Torque Nok" output assignment will go active at the completion of a fastening that has an unacceptable torque value. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Low Torque	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Low Torque" output assignment will go active at the completion of a fastening that has a low torque results. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

High Torque	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "High Torque" output assignment will go active at the completion of a fastening that has a high torque results. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Angle Ok	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Angle Ok" output assignment will go active at the completion of a fastening that has an acceptable angle results. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Angle Nok	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Angle Nok" output assignment will go active at the completion of a fastening that has an unacceptable angle results. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Low Angle	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Low Angle" output assignment will go active at the completion of a fastening that has a low angle results. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

High Angle	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "High Angle" output assignment will go active at the completion of a fastening that has high angle results. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Fastening Complete	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Fastening Complete" output assignment will go active at the completion of a fastening. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

In Cycle	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "In Cycle" output assignment will go active at the start of the fastening cycle (the torque exceeds the threshold value). It will go inactive when the fastening cycle ends.

Fastening Aborted	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Fastening Aborted" output assignment will go active at the completion of a fastening that was aborted by the system. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Fastening Stopped	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Fastening Stopped" output assignment will go active at the completion of a fastening that was stopped by the user. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Batch Complete	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Batch Complete" output assignment will go active at the completion of a fastening that satisfies the bolt count of a Job sequence. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or the job is reset.

Job Complete	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Job Complete" output assignment will go active at the completion of a fastening that satisfies all the sequences. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or the job is reset.

Error	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Error" output assignment will be active while the controller has an error.

Tool Start Switch	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Tool Start Switch" output assignment will reflect the state of the tools start lever.

Tool Push to Start Switch	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Tool Push to Start Switch" output assignment will reflect the state of the tools push to start switch.

Tool MFB	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Tool MFB" output assignment will reflect the state of the tools multifunction button.

Tool Enabled	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Tool Enabled" output assignment will be active if the tool is enabled.

Tool Running	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Tool Running" output assignment will be active while the tool is running.

Service Indicator	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Service Indicator" output assignment will be active if the system is in need of service.

ToolsNet Connected	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "ToolsNet Connected" output assignment will be active if the controller has an active connection to a ToolsNet server.

Open Protocol Connected	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Open Protocol Connected" output assignment will be active if the controller has an active Open protocol connection.

PFCS Connected	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "PFCS Connected" output assignment will be active if the controller has an active PFCS connection.

Running PSet Number	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√				√	√			

The "Running PSet Number" output assignment will output the current PSet number.

Running Job Number	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√				√	√			

The "Running Job Number" output assignment will output the current Job number.

External Controlled	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√						√	√	√

The "External Controlled" output assignment will reflect the state of an input. Use the "Input Bus, "Input Element", and "Input Bit" to specify the input to reflect.

Tool in CCW	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Tool In CCW" output assignment will be active if the tool is put into disassembly mode and inactive if the tool is in assembly mode.

Tool in CW	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Tool In CW" output assignment will be active when the is in assembly mode and inactive if the tool is put into disassembly mode.

Torque	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√				√				

If Stage Default is selected, the "Torque" output assignment will output the final torque value of the most recent rundown. If a specific Stage is selected, the "Torque" output assignment will output the final torque value of the selected stage. In both cases, the value will be cleared to 0 at the start of a new fastening cycle or a Job reset. At the end of the fastening cycle the final torque will be truncated to an integer and output.

Torque (x10)	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√					√			

If Stage Default is selected, the "Torque (x10)" output assignment will output the final torque value of the most recent rundown. If a specific Stage is selected, the "Torque (x10)" output assignment will output the final torque value of the selected stage. In both cases, the value will be cleared to 0 at the start of a new fastening cycle or a Job reset. At the end of the fastening cycle the final torque will be multiplied by 10, truncated to an integer and output.

Torque (x100)	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√					√			

If Stage Default is selected, the "Torque (x100)" output assignment will output the final torque value of the most recent rundown. If a specific Stage is selected, the "Torque (x100)" output assignment will output the final torque value of the selected stage. In both cases, the value will be cleared to 0 at the start of a new fastening cycle or a Job reset. At the end of the fastening cycle the final torque will be multiplied by 100, truncated to an integer and output.

Angle	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√					√			

If Stage Default is selected, the "Angle" output assignment will output the final angle value of the most recent rundown. If a specific Stage is selected, the "Angle" output assignment will output the final angle value of the selected stage. In both cases, the value will be cleared to 0 at the start of a new fastening cycle or a Job reset.

Rundown Saved to FTP Server	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√					√			

The "Rundown Saved to FTP Server" output assignment will output the ID of the last rundown that was saved to the FTP server.

Fastener Removed	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Fastener Removed" output assignment will go active when a fastener is removed by the operator. The controller must be configured to report disassembly for this output to work. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Spindle OK	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Spindle Ok" output assignment will go active at the completion of multi-spindle fastening if all spindles have an OK. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Spindle NOk	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Spindle NOk" output assignment will go active at the completion of multi-spindle fastening if one or more of the spindles have an NOK. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Spindle Fastening Complete	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Spindle Fastening Complete" output assignment will go active at the completion of multi-spindle fastening. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Pulses	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√				√				

The "Pulses" output assignment will output the pulse count value of the most recent rundown. The value will be cleared to 0 at the start of a new fastening cycle or a Job reset.

Pulses High	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Pulses High" output assignment will go active at the completion of a fastening that has an pulse count that exceeds the high limit. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Pulses Low	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Pulses Low" output assignment will go active at the completion of a fastening that has an pulse count that falls below the low limit. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Pulses NOk	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Pulses Ok" output assignment will go active at the completion of a fastening that has an acceptable pulse count. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Pulses Ok	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Pulses NOk" output assignment will go active at the completion of a fastening that has an unacceptable pulse count. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

ON	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "ON" output assignment will be active when the controller is powered up and remains active until power down.

Job Aborted	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The "Job Aborted" output assignment will go active if a Job is aborted. It will go inactive when the job is reset.

Tool In Use	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√			√				

The "Tool In Use" output assignment will go active when the trigger is pressed, whereupon a timer will restart. It will go inactive when the specified time is reached without becoming active in between.

Barcode Scanned	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√							

The "Barcode Scanned" output assignment will go active when a barcode is scanned. The ID # (1-4) will activate the corresponding bit, if it is covered by the number of bits configured. The maximum size is 4 bits. All bits will go inactive when a tool reaches the InCycle threshold of a rundown or when they are reset.

Start Trigger Active	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√							

The 'Start Trigger Active' assignment will reflect the state of the active Start Input configured to run the tool.

Possible Start Inputs include:

- Start from IO
  - Start
  - Dual Start Interlocked
- Start from Tool Buttons
  - Lever and/or PTS
  - Dual Levers Interlocked
- Start from Master Tool
- Start from Remote Start
- Latched Throttle

Start Trigger Active is available for the iEC Controller Only.

Tubenut Home	Bus	Element	Bit 0-32	Polarity N.O./N.C.	Mode: Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
	√	√	√	√	√						

The 'Tubenut Home' assignment will go active if a Tubenut Tool is in the home position.