Power and Thermal Management Status Attributes

These are the power and thermal management status related attributes associated with a Motion Control Axis.

Motor Overload Protection Method

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Get/GSV	T	USINT	-	-	-	Enumeration: 0 = Thermal Model 1 = I^2T Overload

The Motor Overload Protection Method attribute is an enumerated value indicates what motor overload protection method is being used by the CIP Motion device.

Thermal Model motor overload protection applies the measured motor current to an internal motor thermal model to detect a motor overload condition.

I^2T Overload motor overload protection applies an I^2T calculation once the motor current exceeds the product of the Motor Overload Limit and the Motor Rated Continuous Current that indicates a motor overload condition.

Inverter Overload Protection Method

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional-BD	Get/GSV	T	USINT	-	-	-	Enumeration: 0 = Thermal Model 1 = I^2T Overload

This enumerated value indicates what inverter overload protection method is being used by the CIP Motion device.

Thermal Model inverter overload protection applies the measured motor current to an internal inverter thermal model to detect an inverter overload condition.

I^2T Overload inverter overload protection applies an I^2T calculation once the inverter current exceeds the product of the Inverter Overload Limit and the Inverter Rated Continuous Current that indicates an inverter overload condition.

Converter Overload Protection Method

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional-BD	Get/GSV	T	USINT	-	-	-	Enumeration: 0 = Thermal Model 1 = I^2T Overload

This enumerated value indicates what converter overload protection method is being used by the CIP Motion device.

Thermal Model converter overload protection applies the measured converter current to an internal converter thermal model to detect a converter overload condition.

I^2T Overload converter overload protection applies an I^2T calculation once the converter current exceeds the converter overload current limit that indicates a converter overload condition.

Bus Regulator Overload Protection Method

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional-BD	Get/GSV	T	USINT	-	-	-	Enumeration: 0 = Thermal Model 1 = I^2T Overload

This enumerated value indicates what bus regulator overload protection method is being used by the CIP Motion device.

Thermal Model converter overload protection applies the measured bus regulator current to an internal bus regulator thermal model to detect a bus regulator overload condition.

I^2T Overload bus regulator overload protection applies an I^2T calculation once the bus regulator current exceeds the factory set bus regulator overload current limit that indicates a bus regulator overload condition.

Motor Capacity

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Required - D	Get/GSV	T	REAL	-	-	-	% Motor Rated

The Motor Capacity attribute is the real-time estimate of the continuous rated motor thermal capacity utilized during operation based on the motor thermal model. A value of 100% would indicate that the motor is being used at 100% of rated capacity as determined by the continuous current rating of the motor.

If the drive device applies I^2T overload protection rather than thermal model based overload protection, the Motor Capacity value is zero until the motor current exceeds the product of the Motor Overload Limit and the Motor Rated Continuous Current. Once in an overload condition the Motor Capacity increases from 0 according to the I^2T calculation. A value of 100% in this case indicates that the drive has used up 100% of the motor's I^2T overload capacity.

The motor overload protection method applied by the drive device is indicated by the Motor Overload Protection Method attribute.

Inverter Capacity

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Required - D	Get/GSV	T	REAL	-	-	-	% Inverter Rated

The Inverter Capacity attribute is the real-time estimate of the continuous rated inverter thermal capacity utilized during operation based on the inverter thermal model. A value of 100% would indicate that the inverter is being used at 100% of rated capacity as determined by the continuous current rating of the inverter. If the drive device applies I^2T overload protection rather than thermal model based overload protection, the Inverter

Capacity value is zero until the inverter current exceeds the product of the factory set

Inverter Overload Limit and the continuous current rating of the inverter. Once in an overload condition the Inverter Capacity increases from 0 according to the I^2T calculation. A value of 100% in this case indicates that the drive has used up 100% of the inverter's I^2T overload capacity.

The inverter overload protection method applied by the drive device is indicated by the Inverter Overload Protection Method attribute.

Converter Capacity

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Get/GSV	T	REAL	-	-	-	% Converter Rated

The Converter Capacity attribute is the real-time estimate of the continuous rated converter thermal capacity utilized during operation based on the converter thermal model. A value of 100% would indicate that the converter is being used at 100% of rated capacity as determined by the continuous current rating of the converter.

If the CIP Motion device applies I^2T overload protection rather than thermal model based overload protection, the Converter Capacity value is zero until the converter current exceeds its factory set overload current rating. Once in an overload condition the Converter Capacity increases from 0 according to the I^2T calculation. A value of 100% in this case indicates that the converter has used up 100% of its I^2T overload capacity.

The converter overload protection method applied by the device is indicated by the Converter Overload Protection Method attribute.

Bus Regulator Capacity

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - BD	Get/GSV	T	REAL	-	-	-	% Regulator Rated

The Bus Regulator Capacity attribute is the real-time estimate of the continuous rated bus regulator thermal capacity utilized during operation based on the bus regulator thermal model. A value of 100% would indicate that the bus regulator is being used at 100% of rated capacity as determined by the continuous current rating of the bus regulator.

If the CIP Motion device applies I^2T overload protection rather than thermal model based overload protection, the Bus Regulator Capacity value is zero until the bus regulator current exceeds its factory set overload current rating. Once in an overload condition the Bus Regulator Capacity increases from 0 according to the I^2T calculation. A value of 100% in this case indicates that the bus regulator has used up 100% of its I^2T overload capacity.

The bus regulator overload protection method applied by the device is indicated by the Bus Regulator Overload Protection Method attribute.

Converter Temperature

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - B	Get/GSV	T	REAL	-	-	-	Degrees C

The Converter Temperature attribute is the measured temperature of the power block in the power structured of the converter.

Converter Temperature Capacity

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - B	Get/GSV	T	REAL	-	-	-	%

The Converter Temperature Capacity attribute is power block temperature of the converter. It is a percentage of the maximum operational temperature range of the power block. A 100% value indicates the converter power block is at 100% of the rated temperature range.

Define Converter Overtemperature Capacity as:

% = (T-Tmin)(Tmax-Tmin)

Where,

T=Power block temperature

Tmin-=Minimum rated power block temperature

Tmax=Maximum rated power block temperature

Converter Heatsink Temperature

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - G	Get/GSV	T	REAL	-	-	-	Degrees C

The Converter Heatsink Temperature Capacity attribute is the power structure heatsink temperature of the converter. It is a percentage of the maximum operational temperature range of the converter heatsink. A 100% value indicates the heatsink of the converter is 100% of the rated temperature range.

Define Converter Heatsink Overtemperature Capacity as:

% = (T-Tmin)(Tmax-Tmin)

Where,

T = Heatsink temperature

Tmin = Minimum rated heatsink temperature

Tmax = Maximum rated heatsink temperature

Converter Heatsink Temperature Capacity

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - B	Get/GSV	T	REAL	-	-	-	Degrees C

The Converter Heatsink Temperature Capacity attribute is the converter power structure heatsink temperature as a percentage of maximum operational temperature range of the heatsink of the converter. A 100% value indicates the converter heatsink is 100% of the rated temperature range.

Define Converter Heatsink Overtemperature Capacity as:

% = (T-Tmin)/(Tmax-Tmin)

Where,

T=Heatsink temperature

Tmin = Minimum rated heatsink temperature

Tmax=Maximum rated heatsink temperature

AC Line 1 Capacity

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - G	Get/GSV	T	REAL	-	-	-	% Converter Rated

The AC Line Capacity is the real-time estimate of the continuous rated converter thermal capacity for AC Line (Phase R) utilized during operation based on the converter thermal model. A 100% value indicates the converter components on Line 1 use 100% of the rated thermal capacity for this phase.

If the CIP Motion device applies I^2T overload protection instead of thermal model based overload protection, the AC Line 1 Capacity value remains zero until the converter current exceeds its factory set overload current rating.

Once in an overload condition, the AC Line 1 Capacity increases from 0 according to the I^2T calculation. A 100% value indicates the converter has used 100% of its I^2T overload capacity for this phase.

The converter overload protection method applied by the device is indicated by the Converter Overload Protection Method attribute.

AC Line 2 Capacity

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - G	Get/GSV	T	REAL	-	-	-	% Converter Rated

The AC Line 2 Capacity attribute is a real-time estimate of the continuous rated converter thermal capacity for AC Line 2 (Phase S) utilized during operation based on the converter thermal model. A 100% value indicates the converter components on Line 2 are used at 100% of the rated thermal capacity for this phase.

If the CIP Motion device applies to I^2T overload protection rather than thermal-model based overload protection, the AC Line 2 Capacity value is zero until the converter current exceeds its factory set overload current rating. Once in an overload condition, the AC Line 2 Capacity increases from 0 according to the I^2T calculation.

A 100% value indicates the converter used up 100% of the I2T overload capacity for this phase.

The converter overload protection method applied by the device is indicated by the Converter Overload Protection Method attribute.

AC Line 3 Capacity

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - G	Get/GSV	T	REAL	-	-	-	% Converter Rated

The AC Line 2 Capacity attribute is a real-time estimate of the continuous rated converter thermal capacity for AC Line 3 (Phase T) utilized during operation based on the converter thermal model. A 100% value indicates the converter components on Line 3 are used at 100% of the rated thermal capacity for this phase.

If the CIP Motion device applies to I^2T overload protection rather than thermal-model based overload protection, the AC Line 3 Capacity value is zero until the converter current exceeds its factory set overload current rating. Once in an overload condition, the AC Line 3 Capacity increases from 0 according to the I^2T calculation.

▷ Select/Limit Instructions
▷ Sequential Function Chart (SFC) Instructions
▷ Statistical Instructions
▷ Safety Instructions
▷ Studio 5000 Logix Designer Glossary

A 100% value indicates the converter used up 100% of the I2T overload capacity for this phase.

The converter overload protection method applied by the device is indicated by the Converter Overload Protection Method attribute.

Converter Overload Limit

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - G	Get/GSV	T	REAL	-	-	-	% Converter Rated

The Converter Overload Limit attribute is a factory-set maximum limit for Converter Capacity. Exceeding the limit triggers the selected Converter Overload action. If the drive applies an I^2T converter overload protection method, then exceeding the specified Converter Overload Limit results in an overload condition and activates I2T overload protection. While the converter is overloaded, the Converter Capacity attribute value increases, indicating how much of the converters available I2T overload capacity is utilized. When Converter Capacity reaches 100% of its rated capacity, the drive can trigger a Converter Overload Action. When employing an overload protection method based on a converter thermal model, the

Converter Capacity attribute value represents how much of the converter's rated thermal capacity, associated with the converter thermal model, has been utilized. Once the Converter Capacity value exceeds the Converter Overload Limit, the drive can optionally trigger a predetermined Converter Overload Action.

The Converter Overload Limit can also be used by the drive to determine the absolute thermal capacity limit of the converter, i.e. the Converter Thermal Overload Factory Limit, which if exceeded, generates an Converter Thermal Overload FL exception. The configured Converter Overload Limit also applies to Converter L1, L2, and L3 Capacity, any of which are exceeded also results in a Converter Thermal Overload FL exception.

Motor Overload Action

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - D	Set/GSV	T	USINT	-	-	-	% Converter Rated

Selects the device's response to a motor overload condition based on an I2T or motor thermal model based overload protection method. When a motor thermal model is employed, the motor overload condition occurs when the motor thermal model indicates that the Motor Capacity has exceeded the

Motor Overload Limit. In the case of the I2T overload protection method, the motor overload condition occurs when the motor current, in percent of rated continuous motor current, exceeds the Motor Overload Limit.

The Motor Overload Action provides opportunities to mitigate the overload condition without stopping operation. Motor Overload Action functionality is independent of the motor overload exception action functionality.

No explicit action is taken by the device in the overload condition if None is the selected overload action. Selecting the Current Foldback action, however, results in a reduction of motor current in proportion to the percentage difference between Motor Capacity and the Motor Overload Limit, or in the case of the I2T overload protection method, in proportion to the difference between the motor current, in percent of rated continuous motor current, and the Motor Overload Limit.

Inverter Overload Action

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - D	Set/GSV	T	USINT	0	-	-	Enumeration: 0 = None (R) 1 = Current Foldback (O) 2-127 = (reserved) 128-255 = (vendor specific

Selects the device response to an inverter overload alarm condition based on an I2T or inverter thermal model-based overload protection method. When employing an inverter thermal model, the inverter overload alarm condition occurs when the inverter thermal model indicates the Inverter Capacity is exceeding the Inverter Overload Limit.

For the I2T overload protection method, the inverter overload condition occurs when the inverter current exceeds the Inverter Overload Limit. The inverter current is measured in percent of rated continuous inverter current.

The Inverter Overload Action enables mitigating the overload condition without stopping operation. Inverter Overload Action functionality is independent of the motor overload exception action functionality. Also generate an overload alarm condition by exceeding the limits of the device power block thermal model that includes switching losses that depend on the PWM Frequency. Also generate an overload alarm condition by exceeding the limits of the device power block thermal model that includes switching losses that have a dependency.

The device in the overload condition takes no action if None is the overload action. Selecting the Current Foldback action reduces the inverter current in proportion to the percentage difference between Inverter Capacity and the Inverter. Overload Limit, or in the case of the I2T overload protection method, in proportion to the difference between the inverter current, in percent of rated continuous inverter current, and the Inverter Overload Limit.

If an inverter overload condition occurs due to the power block thermal model, two additional overload actions can be applied. Selecting Reduce PWM Rate can be used to reduce heat generated by switching losses in the inverter power structure. When PWM – Foldback is selected the device first reduces the PWM rate and then, if necessary, reduces the Inverter Thermal Current Limit.

Converter Overload Action

Usage	Access	T	Data Type	Default	Min	Max	Semantics of Values
Optional - G	Set/SSV	T	USINT	0	-	-	Enumeration: 0 = None (R) 1 = Current Foldback (O) 2-127 = (reserved) 128-255 = (vendor specific

Selects the device's response to a converter overload condition based on an I2T or converter thermal model-based overload protection method. When a converter thermal model is employed, the converter overload condition occurs when the converter thermal

model indicates that theConverter Capacity has exceeded the Converter Overload Limit.

In the case of the I2T overload protection method, the converter overload condition occurs when the converter current, in percent of rated continuous converter current, exceeds the Converter Overload Limit.

The Converter Overload Action provides opportunities to mitigate the overload condition without stopping operation. Converter Overload Action functionality is independent of the converter overload exception action functionality. An overload alarm condition can also be generated by exceeding the limits of the device's power block thermal model that includes switching losses that have a dependency on the PWM Frequency. No explicit action is taken by the device in the overload condition if None is the selected overload action. Selecting the Current Foldback action, however, results in a reduction of the converter current in proportion to the percentage difference between Converter Capacity and the Converter Overload Limit, or in the case of the I2T overload protection method, in proportion to the difference between the converter current, in percent of rated continuous converter current, and the Converter Overload Limit. In addition to the configured Converter Overload Action being triggered by a Converter Overload condition, the configured Converter Overload Action can also be triggered by Converter L1, L2, or L3 Overload conditions.

See also

Power and Thermal Management Configuration Attributes