

1. 1 F23 Basic Function Parameter Group

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.00	Tension control mode selection	0 : Disable (EM600 Standard functions) 1: Closed loop speed mode 2: Open loop torque mode 3: Closed-loop torque mode 4: Constant linear velocity mode 5~10: Not Used		0	○

F23. 00=0: Disable

Standard EM600 General Purpose High Performance Vector Control Inverter.

F23. 00=1: Closed loop speed mode

Closed loop speed mode, By the tension position or actual tension feedback constitutes a closed-loop regulation, by changing the motor speed to achieve the effect of indirect control tension. Extra tension pendulum, tension can determine the weight, Or direct tension feedback, through the pendulum position or tension feedback to adjust the motor speed, to achieve tension control. Closed loop speed mode, The main frequency given by the coil diameter calculation in real-time assignment to the parameter F00.07, You should select the auxiliary frequency source process PID reference (F00.05 = 10), The PID output frequency is determined by the F24.07 function code with respect to the frequency source selection. Such as dual-frequency drawing machine, straight wire drawing machine. Drive mode of inverter is not limited to VVF, SVC or FVC.

F23. 00=2: Open loop torque mode

No tension position or tension feedback, the tension required by the material is controlled by controlling the output torque of the motor. Torque is the product of tension and roll radius, So need to calculate the diameter of reel in real time, due to the existence of static friction and dynamic friction, to maintain the tension control accuracy, the inverter must automatically compensate for static friction and dynamic friction and high-speed friction, frictional torque is given relative to the inverter torque, winding is positive compensation, unwinding is negative compensation. Because the friction is to prevent the motor rotation, winding is forward, so positive compensation; roll for the reverse, so the negative compensation. Another traction machine in the acceleration and deceleration process, in order to maintain a constant tension, the need for automatic inertia compensation. When accelerating, the inertia compensation torque is given to the inverter

F23.00=3: Closed-loop torque mode

The standard torque is obtained from the tension and coil diameter calculation, tension closed-loop feedback, closed-loop control fine-tuning motor output torque to achieve a constant tension control. Applicable to the occasion of higher tension accuracy requirements. As the tension has been closed, therefore, can not consider the dynamic and static friction compensation and inertia torque compensation, closed-loop tension feedback fine-tuning to achieve. The drive is in FVC drive mode.

F23.00=4: Constant linear velocity mode

In the winding machine or dyeing and finishing machine and other equipment, only winding and unwinding two motors, reciprocating winding or dyeing and finishing. In order to ensure the effect of winding dyeing and finishing, requires a constant line speed. Winding or unwinding work in the speed mode, with the corresponding work in tension mode. The inverter of speed mode automatically changes the output frequency according to the change of winding diameter. Two inverters for DC bus energy-saving operation.

Constant linear velocity mode work in the absence of traction speed, torque combination of unwinding and rewinding. When the retracting / rewinding switch terminal $X_i = 92$ is active, the current winding terminal is active, and the unwinding mode is switched to the unwinding mode. When the unwinding / rewinding terminal $X_i = 92$ is active, the current unwinding mode is active and the current terminal is valid, it switches to the winding mode.



1. In order to improve the control performance, the vector control mode needs to carry on the motor parameter self-study before the movement, obtains the correct motor parameter;
2. Vector control mode, the inverter can only be equipped with a motor, and the motor capacity and the inverter capacity should not be too large difference, otherwise it may result in decreased control performance or the system can not work properly.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.01	Coiling mode	0: roll-up 1: roll-back		0	○

F23.01=0: roll-up

The interver is in roll-up.

F23.01=1: roll-back

The interver is in roll-up.



Unwinding and rewinding selection can be selected by F23.01 function code,

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F23.03	Unwinding upper limit frequency	0.00~F _{max}	Hz	1.00	●
F23.04	Winding/Unwinding Upper Limit Frequency Analog Channel Selection	Bit: Winding upper limit frequency analog channel selection 0: Winding upper limit frequency 1: AI1* Winding upper limit frequency 2: AI2* Winding upper limit frequency 3: AI3* Winding upper limit frequency Ten bits: Unwinding upper limit frequency analog channel selection 0: Unwinding upper limit frequency 1: AI1* Unwinding upper limit frequency 2: AI2* Unwinding upper limit frequency 3: AI3* Unwinding upper limit frequency		00	○

F23.02=0: Winding upper limit frequency

As the winding inverter, the upper limit frequency of its work is the maximum frequency of winding operation, this operating frequency is limited by F00.16 maximum frequency at the same time.

F23.03=1: Unwinding upper limit frequency

As the unwinding inverter, the upper limit frequency of its work is the maximum frequency of winding operation, this operating frequency is limited by F00.16 maximum frequency at the same time

F23.04 : Winding/ Unwinding upper limit frequency analog channel selection

The upper limit frequency for the winding or unwinding operation of the inverter is limited by the analog input. Commonly used with the torque mode torque winding or unwinding the upper frequency limit source to prevent winding or unwinding material in the case of the inverter drive speed.



Torque mode When the upper limit frequency of the unwinding and unwinding volume is limited by an external analog input, the open-loop torque cutoff detection fault should be masked to the inactive state (F24.18 = 0).

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
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Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.06	Tension Given Way	0: Digital tension setting 1: AI1 2: AI2 3: AI3 4: PULSE 5: Communication tension setting		0	○

F23.06=0: Digital tension setting **F23.07**

F23.06=1: AI1

F23.06=2: AI2

F23.06=3: AI3

Tension given of torque control by the AI1 ~ AI3 (percentage) multiplied by F23.08 decision.

F23.06=4: PULSE (High frequency pulse input)

Tension given of torque control by the HDI(percentage) multiplied by F23.08 decision.

F23.06=5: Communication tension setting

The tension reference is given as 7019H, given as a percentage of tension, in the range of 0.00% to 100.00%; the value of the actual tension setpoint is 7019H multiplied by the value of F23.08.



0.01N

In addition to the digital tension setting, the tension reference is accurate to

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.08	Tension Given Max	0~30000	N	0	○

F23.08 For the maximum tension setting, the tension is limited by this value. Normally the maximum tension setting is divided by the initial radius of the roll after multiplying the rated torque of the motor by the gear ratio i (F23.05).

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.09	Tension Taper Input	0: Digital tension taper 1: AI1			

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F23.09=2: AI2

F23.09=3: AI3

F23.09=4: PULSE((High frequency pulse input))

Analog, high-frequency pulse input tension taper input percentage, can be relative to hundred percent (set function code parameter F23.13 = 0), can also be relative to the value of digital tension taper F23.12 (set function code F23.13 = 1).

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.10	Tension Taper Input Mode	0: Curve taper 1: Linear taper		0	○
F23.11	Linear Taper Mode	0: Single- section linear taper 1: Multi - section linear taper		0	○

The following variables are defined: F0 tension reference, eg when F23.06 = 0, F0 is the F23.07 reference

K is the tension taper value, for example, when F23.09 = 0, K is the value of F23.12
DC tension taper compensation

D0 initial winding diameter

F23.10 = 0 Curve Taper:

$$F = F_0 \left[1 - K \left(1 - \frac{D_0 + D_c}{D + D_c} \right) \right] = F_0 \left(1 - K \frac{D - D_0}{D + D_c} \right)$$

F23.10 = 1 Linear taper:

Linear taper: can be divided into single-and multi-section linear taper, selected by the function code F23.11.

F23.11 =0 Single- section linear taper:

$$F = F_0 \left(1 - K \frac{D - D_0}{1000\text{mm}} \right)$$

F23.11 =1 Multi - section linear taper:

Multi-section linear taper is set by the function codes F23.14 ~ F23.20 to form the segmental taper curve. See F23.14 ~ F23.20 for the function code description.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.14	Tension taper compensation	0 to 10000	mm	1	●
F23.15	Tension taper	D0 ~ tension taper diameter 2	mm	9998	●

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paragraph 2 by the tension taper 2 set, 3 by the tension taper 3 set. The following variables are defined:

K0 is the tension taper value, for example, when F23.09 = 0, K0 is the value of F23.12

K1 is the value of the first tension taper F23.16 tension taper 1

K2 is the value of the second tension taper F23.18 tension taper 1

K3 is the value of the first tension taper F23.20 tension taper 1

F0 tension reference, for example, when F23.06 = 0, F0 is F23.07 given value

F1 Tension Tension First reference value of curve tension is calculated as follows

F2 Tension Tension The reference value of the first curve tension is given by the following formula

F3 Tension Tension The reference value of the first curve tension is given by the following formula

DC tension taper compensation

D0 initial winding diameter

Tension Taper Roll Diameter

D2 tension taper diameter 2

D3 tension taper diameter 3

D Current live volume value

Dmax Maximum winding diameter

Para 0: $D_0 \leq D \leq D_1$

$$F = F_0 \left(1 - K_0 \frac{D - D_0}{1000\text{mm}} \right)$$

$$F_1 = F_0 \left(1 - K_0 \frac{D_1 - D_0}{1000\text{mm}} \right)$$

Para 1: $D_1 \leq D \leq D_2$

$$F = F_1 \left(1 - K_1 \frac{D - D_1}{1000\text{mm}} \right)$$

$$F_2 = F_1 \left(1 - K_1 \frac{D_2 - D_1}{1000\text{mm}} \right)$$

Para 2: $D_2 \leq D \leq D_3$

$$F = F_2 \left(1 - K_2 \frac{D - D_2}{1000\text{mm}} \right)$$

$$F_3 = F_2 \left(1 - K_2 \frac{D_3 - D_2}{1000\text{mm}} \right)$$

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Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.21	Static friction torque compensation	0.00~100.00	%	0	●
F23.22	Dynamic friction torque compensation	0.00~100.00	%	0	●
F23.23	High - speed friction torque compensation	0.00~100.00	%	0	●
F23.24	Static friction frequency threshold	0.00~50.00	Hz	1.00	●
F23.25	Dynamic friction frequency threshold	0.00~50.00	Hz	5.00	●
F23.26	High - speed friction frequency threshold	0.00~50.00	Hz	40.00	●

Friction compensation using four compensation range, the size can be self-learning can also be adjusted in accordance with the needs of debugging equipment to adjust. Because of the difference in equipment, such as reducer, belt drive, chain drive friction compensation caused by the difference, it is recommended to set the scene through debugging. The method is as follows (EM600 drive standard model operation, drive mode is in the speed sensor vector control FVC):

- (1) The static friction torque compensation is determined, and the torque reference is gradually increased from 0.00% until the drum is able to rotate at a lower frequency (static friction frequency threshold) then the motor stalled, can continue to run after the release of rotation. At this time is the static friction torque compensation torque;
- (2) dynamic high-speed friction torque compensation to determine the method, based on (1), slowly increase the torque given, When the current frequency can be raised to the dynamic friction frequency threshold and the high-speed friction frequency threshold respectively, the current torque reference value is the current dynamic and high-speed friction torque compensation value.

The static and dynamic friction torque compensation is applied to F23.00 = 2 open-loop torque mode, and the static and dynamic friction torque is compensated to the inverter torque reference. When the output frequency is less than or equal to the static friction frequency threshold value F23.24, the static friction value Is the value of F23.21. When the output frequency is between the static friction frequency threshold and the dynamic friction frequency threshold, the friction torque compensation is linearly interpolated between the static and dynamic friction torque compensation values. When the output frequency is higher than the high-speed friction frequency threshold, the friction compensation torque is compensated by the friction torque compensation and the high-speed friction torque compensation. When the output frequency is above the high-speed friction frequency

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Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.27	Static and dynamic friction self-learning	0: Disable 1: Enable		0	○

Static friction torque, dynamic friction torque, high-speed friction torque self-learning, self-learning in torque mode, F23.27 = 1, press RUN key, self-learning, F23.27 Automatically cleared. Note that the tension reference is cleared before self-learning.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.28	Mechanical inertia	0~600.00	Kg.m ²	0	●
F23.29	Material inertia	0~600.00	Kg.m ²	0	●

F23.28 Mechanical inertia:

Mechanical inertia includes the motor spindle, the physical inertia of the empty reel

F23.29 Material inertia:

The material inertia is the physical inertia of the material itself when it is full. In the process of unwinding and rewinding, the inertia of the system changes in real time along with the diameter of the coil. The current inertia compensation torque is calculated according to the current inertia and the change rate of the linear acceleration of the reel.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.30	Material density	0~60000	Kg/m ³	1	●
F23.31	Width of material	0~10000	mm	1000	●
F23.32	Inertia self - learning torque	10.00~70.00	%	20	○
F23.33	Self - learning torque	10.00~70.00	%	40	○
F23.34	Self - learning of mechanical inertia	0: No learning 1: Self-learning		0	○
F23.35	Material inertia self - learning	0: No learning 1: Self-learning		0	○

F23.30 Material inerial

The density of the material is the density of the material, in Kg / m³

F23.31 Material Width

The width of the material is used to calculate the inertia of the full-roll material, and the width of the spool, In the wire winding, the known wire diameter, the calculation of the

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1, run, the mechanical inertia self-learning, self-learning is completed, F23.24 automatically cleared. F23.25 is set to 1, run, the material inertia self-learning, self-learning is completed, F23.25 automatically cleared. In the inertia self-learning, you need to set the inertia self-learning torque 0 and the inertia self-learning torque 1 to accelerate from 0 Hz to 40.00 Hz in self-learning torque 0 or self-learning torque 1 to calculate the change from 5 Hz to 35 Hz Rate, usually smaller load conditions, acceleration time is only 30ms or so, the error is large, it is recommended to use the calculation method, or set their own inertia compensation value.

Self-learning principle is as follows: Torque mode of the upper limit frequency of 40Hz to self-learning torque 0 to calculate the rate of change from 5Hz to 35Hz; and then reduced to 0 speed, and then to self-learning torque 1 to calculate the 5Hz to 35Hz changes rate, respectively, the mechanical inertia, the system inertia. The material inertia is equal to the system inertia minus the mechanical inertia.

$$J_s = \frac{1}{2\pi} \cdot i^2 \cdot p \cdot \frac{T_{DG1} - T_{DG0}}{\frac{dF_1}{dt} - \frac{dF_0}{dt}}$$

Where i is the mechanical transmission ratio, p is the number of pole pairs of the motor, TDG1 inertia self-learning torque 1, TDG0 inertia self-learning torque 0

$\left(\frac{dF_1}{dt}\right)$ Self-learning torque 1, speed from 5Hz to 35Hz rate of change in the rate of change.

$\left(\frac{dF_0}{dt}\right)$ Self-learning torque 0, speed from 5Hz to 35Hz rate of change in the rate of change.



The inertia of the material can be learned by itself or can be set by itself, and the inertia of the material can be learned by itself or set by itself, and the material inertia will be recalculated once any value of material density and material width is changed. The mechanical inertia and the material inertia are subject to the last modification.

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Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.36	Volume Diameter Calculation Mode Selection	0: Linear velocity calculation 1: PG pulse thickness accumulation method 2: Terminal pulse thickness accumulation method 3: High-speed pulse thickness accumulation method 4: AI1 5: AI2 6: AI3 7: Open-loop vector thickness accumulation method		0	○

F23.36=0 Line speed calculation method:

Line speed Coil diameter calculation principle is through the external input line speed value, according to the current line speed and the current motor speed to calculate the feedback diameter.

F23.36=1 PG pulse thickness accumulation method :

Calculate the current winding diameter for the feedback pulses of the speed sensor vector control PG card. Through the PG card can locate the number of revolutions of the drum rotation, for the strip, roll every turn, roll diameter change 2 times the thickness of the material; For wire, the number of turns per revolution per roll, the volume diameter of 2 times the wire diameter.

F23.36=2 Terminal pulse thickness accumulation method:

Terminal pulse thickness accumulation method is controlled by the external terminal signal, when the drum rotation, the external input DI terminal no ring pulse number (F23.51) falling edge of the pulse signal. In this case, you only need to set the terminal function to 89: terminal pulse.

F23.36=3 High-speed pulse thickness accumulation method:

High-speed pulse thickness accumulation method is controlled by the external terminal of the rotary signal, and the terminal pulse thickness accumulation method is different, the

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terminal pulse, high frequency pulse, etc. According to the inverter output frequency calculation of volume diameter changes. In actual application, it is recommended to set the volume calculation interval time F23.57 to 0 to reduce the calculation error.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.37	Roll Diameter Maximum	1~10000	mm	1200	○

F23.37 Roll Diameter Maximum:

The maximum diameter of the winding diameter refers to the maximum winding diameter of rewinding or unwinding, winding volume diameter, unwinding volume diameter, the current volume diameter can not exceed this value.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.38	Initial Coil Diameter of Winding 0	1~10000	mm	80	○
F23.39	Initial Coil Diameter of Winding 1	1~10000	mm	100	○
F23.40	Initial Coil Diameter of Winding 2	1~10000	mm	120	○
F23.41	Initial Coil Diameter of Winding 3	1~10000	mm	150	○

F23.38~F23.41 Initial Coil Diameter of Winding Selection:

Initial Coil Diameter of Winding, Xj, Xj input terminal function selection Use the initial volume diameter 0 ~ 3 (the default initial volume diameter 0):

- 81:Initial coil diameter of winding terminal 1, enable terminal is 1, disable terminal is 0
- 82:Initial coil diameter of winding terminal 2, enable terminal is 1, disable terminal is 0

Initial coil diameter of winding terminal 1 (X _i =81)	Initial coil diameter of winding terminal 2 (X _i =82)	Initial Coil Diameter of Winding
0	0	Initial Coil Diameter of Winding 1
0	1	Initial Coil Diameter of Winding 2
1	0	Initial Coil Diameter of Winding 3
1	1	Initial Coil Diameter of Winding 3

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	of Winding 2				
F23.45	Initial Coil Diameter of Winding 3	1~10000	mm	600	○

F23.42~F23.45 Initial Coil Diameter of Unwinding Selection:

Initial Coil Diameter of Unwinding, X_j , X_j input terminal function selection Use the initial volume diameter 0 ~ 3 (the default initial volume diameter 0):

83:Initial coil diameter of winding terminal 1, enable terminal is 1, disable terminal is 0

84:Initial coil diameter of winding terminal 2, enable terminal is 1, disable terminal is 0

Initial coil diameter of unwinding terminal 1 ($X_i=83$)	Initial coil diameter of unwinding terminal 2 ($X_j=84$)	Initial Coil Diameter of Unwinding
0	0	Initial Coil Diameter of Unwinding 0
0	1	Initial Coil Diameter of Unwinding 1
1	0	Initial Coil Diameter of Unwinding 2
1	1	Initial Coil Diameter of Unwinding 3

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.46	Material Type	0: Strip 1: Wire		0	○

F23.46 =0 Strip:

Material type for the strip, the drum rotation, the coil diameter changes twice the material thickness;

F23.46 =1 Wire:

The material type is wire, which changes twice the thickness of the material after the number of turns per revolution (monitoring parameter F23.52).

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.47	Strip Thickness / Wire Diameter 0	0.001~65.535	mm	0.100	○
F23.48	Strip Thickness / Wire Diameter 1	0.001~65.535	mm	0.100	○

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Input terminal function selection Strip thickness / wire diameter 0 to 3 (default strip thickness / wire diameter 0):

85: Strip thickness and wire diameter terminal 1,enable terminal is 1,disable terminal is 0

86: Strip thickness and wire diameter terminal 2,enable terminal is 1,disable terminal is 0

Strip thickness / Wire diameter terminal 1 (X _i =85)	Strip thickness / Wire diameter terminal 2 (X _j =86)	Strip thickness / Wire diameter
0	0	Strip thickness / Wire diameter 0
0	1	Strip thickness / Wire diameter 1
1	0	Strip thickness / Wire diameter2
1	1	Strip thickness / Wire diameter3

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.51	DI Terminal Pulses Per Revolution	1~10000		1	○

F23. 51 DI Terminal Pulses Per Revolution

Volume calculation method When the terminal pulse thickness accumulation method (F23.36 = 2) is selected, the number of pulses received by the inverter divided by the number of pulses per revolution of the DI terminal is equal to the number of revolutions of the drum. Variety.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.52	Number of Turns Per Layer	1~10000		1	X

F23. 52 Number of Turns Per Layer

The number of turns per layer is the monitoring parameter, when the material type is strip, the number of turns per layer is 1; when the material type is wire, the number of turns per layer is equal to the width of the wheel (F23.31 material width) diameter.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.53	Minimum Linear Velocity of Coil Diameter	0.1~6500.0	m/min	200	○

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Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.54	Coil Diameter Calculation Monotonic Selection	0: Increase or decrease (monotonically invalid) 1: Winding can only increase, release volume can only be reduced (monotonically effective)		1	○

F23.54 =0 Coil Diameter Increase or Decrease

Regardless of the winding diameter calculation method, the winding diameter calculation value can be increased during the winding or unwinding process and can be reduced.

F23.54 =1 Winding can only increase, Unwinding can only decrease

Volume diameter calculation follows the monotonous, winding, the volume diameter can only increase, release volume diameter can only be reduced.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.55	Coil Diameter Change Rate Limit	0.00: Not limited 0.01~9.00: 0.01~9.00mm/times		0.00	○

F23.55 Coil Diameter Change Rate Limit

In order to prevent this from happening, it is possible to restrict the rate of change of the diameter of the coil. The diameter of the coil is calculated every interval of the winding diameter. Time (F23.57) after the calculation once, twice the calculated result is higher than the set value, according to the value of F23.55 interval F23.57 time change. When F23.55 volume diameter change rate limit value is 0.00, there is no restriction on the diameter change.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.56	Coil Diameter Reset Selection	0: Can not reset 1: Reset 2: Shutdown and reset		0	○

F23.56 =0 Can not reset

During the running of the system, including the inverter is in the parameter setting state, even if the Xi input terminal function coil diameter reset is valid, the winding diameter can not be reset;

F23.56=1 Reset

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Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.57	Coil Diameter Calculation Interval Time	0.00~100.00	S	1.00	○
F23.58	Coil Diameter Calculation Filter Time	0.00~100.00	S	3.00	●

F23. 57 Coil Diameter Calculation Interval Time

Coil diameter calculation interval time refers to the interval between two coil diameter calculation. For the material, the volume diameter is not real-time changes, especially in terms of wire, the general roll to turn a lot of circle diameter after the change, it is not required real-time calculation of volume diameter. The average winding diameter calculation interval is slightly shorter than the actual winding diameter change time.

F23.58 Coil Diameter Calculation Filter Time

Coil diameter calculation results filter processing, filter out the interference results.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.59	Real-time Coil Diameter	1~10000	mm	XXXX	X

F23. 59 Real-time Coil Diameter

The real-time coil diameter value is monitored.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.60	Set the Coil Diameter to the Upper Limit	1~10000	mm	1000	○
F23.61	Set the Coil Diameter to the Lower Limit	1~10000	mm	200	○

F23. 60 ~F23. 61 Set the Coil Diameter to the Upper/Lower Limit

When the real-time coil diameter is greater than or equal to the set coil diameter reaches the upper limit (F23.60) Or when the real-time winding diameter is less than or equal to the set winding diameter reaching the lower limit value (F23.61). The output

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Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.62	State of Initial Winding Diameter is Reached	0: Not Reached 1: Reached		0	○

F23.63 =0 State of Initial Winding Diameter is Not Reached

State of initial winding diameter is not reached after the system is powered off, the current volume diameter is the value of the real-time volume before power off.

F23.63 =1 State of Initial Winding Diameter is Reached

State of initial winding diameter is reached after the system is powered off again, the current coil diameter is the initial winding diameter before power failure.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.63	Linear Speed Input Mode	0: Zero Linear Speed 1: AI1 2: AI2 3: AI3 4:High-speed PULSE Pulse 5: Communication 6: Maximum Linear Velocity		1	○

F23.63 =0 Zero Linear Speed

Zero linear speed is Line speed input is invalid

F23.63= 1/2 /3 The linear Speed Input Is Via the Analog Input

The analog input percentage multiplied by the maximum line speed (F23.64) is the current line speed.

F23.63= 4 High-speed PULSE Pulse

High-speed PULSE pulses are input via the X7 terminal, with 100% corresponding to the maximum line speed (F23.64).

F23.63= 5 Communication

Communication given address 7007H, directly given the line speed value, the range is 0.0 ~ 3000.0 m / min.

F23. 64 Maximum Linear Velocity

Analog input, high-speed PULSE pulse input reference value. The maximum linear velocity does not exceed this parameter.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.65	Linear Speed Actual Value	0.0~3000.0	m/min	XXXX	X

F23. 65 Linear Speed Actual Value: Real-time monitoring of current line speed values.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.66	Winding pre-drive frequency gain	50.00~200.00	%	105	○
F23.67	Unwinding pre-drive frequency gain	50.00~200.00	%	95	○
F23.68	Pre-drive control delay	0.00~10.00	S	1.00	○

Pre-drive is the process of non-stop machine for volume, due to changes in volume diameter, material line speed and tension corresponding to maintain the previous state. Torque mode, in order to quickly establish the tension, speed mode, the reference frequency multiplied by the pre-drive gain, torque mode, rolling up and down the winding, Torque mode The reference frequency is multiplied by the pre-drive gain; the unwinding is reversed. In short, when changing the volume, the speed mode, the inverter torque limit, torque mode, the speed of the inverter limit.

Pre-drive (including pre-drive control delay time) is valid, coil diameter reset and PID pause, coil diameter stop calculation.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.69	Tension Torque Given	0.00~600.00	%	XXXX	X

Tension is given by the taper processing, torque compensation or PID closed-loop adjustment of the actual torque setpoint, calculated to 0.01% (tension acceleration and deceleration change running display).

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.70	Taper Post Tension Calculation	0.00~600.00	%	XXXX	X

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In the calculation of inertia compensation torque, due to the acceleration and deceleration time of the system caused by a large linear acceleration error, so the calculation of inertia compensation to increase the line speed acquisition interval, interval time to collect once, after multiple acquisitions to calculate the average line Acceleration.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F23.72	Line Acceleration Monitoring Value	-99.99~99.99	m/s ²	XXXX	X

In the acceleration and deceleration of the system, the calculated value of the linear acceleration is monitored in real time, and the linear acceleration is zero when the linear velocity is constant.

1. 2 F24 Tension Closed Loop Control Parameters

PID function part reference EM600 high performance vector control frequency changer F09 group PID function explanation.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.00	Closed Loop Speed Mode Given Source	0: Pendulum Position 1: Given Tension 2: AI1 3: AI2 4: AI3		0	○

F24.00 =0 Closed Loop Speed Mode Gives the Pendulum Position

Pendulum position corresponding to the upper and lower limits of analog signal 0 ~ 10V, pendulum position given, according to the feedback adjustment of the current position remained unchanged. Closed loop speed mode (F23.00 = 1) Given the position of the pendulum lever, the PID regulator input is formed with the feedback signal, and the output frequency of the inverter is adjusted to ensure the tension on the material is constant. Closed-loop torque mode (F23.00 = 3), and the amount of feedback constitutes a PID regulator to adjust the inverter output torque to ensure constant tension on the material.

F24.00 =1 Closed Loop Speed Mode Gives the Given Tension

The given torque is given as the reference value of the PID controller after the given tension is processed by the taper after the coil diameter is calculated. The value is changed with the change of the winding diameter. Smile adjustment is ensured on this basis to ensure a higher Tension control accuracy.

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Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.01	Pendulum Position Given	0.00~10.00	V	5.00	●

F24.01 Pendulum position setting When the closed-loop speed mode is selected, it is given the specific value of the pendulum position reference (F24.00).

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.02	Position / Tension Reference Acceleration Time	0.00~60.00	S	8.00	●
F24.03	Position / Tension Reference Deceleration Time	0.00~60.00	S	1.00	●

F24.02 Position / Tension Reference Acceleration Time

F24.03 Position / Tension Reference Deceleration Time

In the closed-loop speed mode, open loop torque mode, closed-loop torque mode, the position / tension reference acceleration time is the time required for the position or tension reference percentage to rise from 0.00% to 100.00%; position / tension reference deceleration time Refers to the time required for a given position or tension to decrease from 100.00% to 0.00%.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.04	Pendulum / Tension Initial Position	0: Pendulum / Tension Feedback Position 1: 0.00 V Position / Tension		0	○

F24.04=0 Pendulum / Tension Initial Position

Speed PID operation, the given position is equal to the feedback position, to avoid the PID operation is valid, the error is not zero swing pendulum generated during the pre-drive, the pole position is equal to the feedback position feedback.

F24.04=1 0.00 V Position / Tension

Speed PID operation, pre-drive period, the given position is equal to zero initial position, PID operation, according to the current feedback position and zero initial position for PID adjustment operation.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.05		0: All			

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Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.06	PID Regulation	0: Positive Role 1: Gative Effect		0	○

The process PID action mode is decided by the setting of function code F24.06 and the input function "44: PID forward / reverse switching"

PID Positive And Negative Effects

F24.06	44:PID Positive / Negative Switching	Mode of Effect	Description
0	0	Positive Deviation Is Positive, The Output Is Also Positive	Positive Deviation Is Positive, The Output Is Also Positive
0	1	The Reaction Deviation Is Positive, The Output Is Negative	The Reaction Deviation Is Positive, The Output Is Negative
1	0	The Reaction Deviation Is Positive, The Output Is Negative	The Reaction Deviation Is Positive, The Output Is Negative
1	1	Positive Deviation Is Positive, The Output Is Also Positive	Positive Deviation Is Positive, The Output Is Also Positive

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.07	PID Regulator Output Relative Value	0: Maximum frequency 1: Reference frequency reference		0	○

F24.07 = 0 PID Regulator Output mximum frequency

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		Description			y
F24.08	PID Output Adjustment Range	0.00~100.00	%	20.00	●

F24.08 PID Output Adjustment Range

PID output limit, the entire process PID module output range (-F24.08, F24.08), the actual adjustment results in this range, the border output.

F24.09	PID Parameter Auto-tuning	0: Only the first set of PID parameters is used 1: According to the volume diameter adjustment 2: According to the output frequency adjustment 3: According to the line speed adjustment 4 : Error		0	○
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F24.09 =0 PID Parameter Auto-tuning use the first parameters only

PID parameter adjustment only with the first group of PID parameters F24.10 ~ F24.12

F24.09 =1 PID Parameter Auto-tuning according to the coil diameter adjustment

According to the volume diameter self-adjustment is the current volume diameter for the initial volume diameter using the first group of PID parameters, the current volume diameter for the maximum volume diameter when using the second group of PID parameters. Current volume diameter in the initial volume diameter and the maximum diameter range PID parameters Linear interpolation.

F24.09 =1 PID parameter auto-tuning is based on the output frequency adjustment

According to the output frequency adjustment refers to the current frequency of 0.00Hz Use the first group of PID parameters, the current frequency is the maximum frequency using the second group of PID parameters. Current frequency 0.00Hz frequency and maximum frequency range of the PID parameter linear interpolation.

F24.09 =1 PID parameter auto-tuning is based on line speed adjustment

The first group of PID parameters is used when the line speed is 0 m / min and the second group of PID parameters is used when the line speed is the maximum line speed. The current line speed is at 0 m / min line speed and maximum line Linear Interpolation of PID Parameter

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percentage and the feedback percentage is less than or equal to F24.17 and greater than or equal to F24.16.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.10	Proportional Gain	0.00~100.00		20.00	●
F24.11	Integration Time	0.00~30.00	S	2.00	●
F24.12	Differential Time	0.000~30.000	mS	0.000	●
F24.13	Proportional Gain	0.00~100.00		20.00	●
F24.14	Integration Time	0.00~30.00	S	2.00	●
F24.15	Differential Time	0.000~30.000	mS	0.000	●
F24.16	PID1 Switching Point	0.00~100.00	%	20.00	●
F24.17	PID2switching Point	0.00~100.00	%	80.00	●

To meet the complex field, the process PID module introduces two sets of PID parameters, according to the function set (F24.09) to switch between the two sets of parameters or linear interpolation values.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.18	Open Loop Torque Cut - Off Detection	0: Does not automatically detect broken material 1: Automatic detection of broken material		0	○
F24.19	Material Detection Minimum Line Speed	0.0~ Maximum linear velocity	M/min	100.0	●
F24.20	Material Detection Delay Time	0.01~30.00	S	2.00	●

F24.18 = 0 open-loop torque cut-off detection does not automatically detect material, that is, open-loop torque cut off material E43 fault is shielded.

F24.18 = 1 Open-loop torque is automatically detected, and the current line speed must be greater than F24.19 Minimum cut-off line speed is valid. And when the material cut-off detection condition is satisfied for F24.20, the inverter reports fault E43.

Open-loop torque broken material detection basis (to distinguish between unwinding volume):

Winding: winding speed reached the winding upper frequency; line speed, output frequency calculation volume diameter continued to decrease

Unwinding: Unwinding speed reaches the unwinding upper limit frequency; linear velocity, output frequency calculation The coil diameter continues to increase or negative

Function	Name of Function Code	Parameter Description	Un	Defa	Prope
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	Detection				
F24.24	PID Break Detection Limit	0.00~10.00	V	9.50	●
F24.25	PID Broken Material Detection Delay Time	0.01~30.00	S	0.10	●

F24.21 = 0 Closed-loop torque cut-off detection does not automatically detect the material cut off, that is, the closed-loop torque cut-off E21 fault is masked.

F24.21 = 1 Closed-loop torque cut-off detection is automatically detected. During the PID start material cut-off detection delay (F24.22), the PID adjustment is stable and the pendulum is off the material cut-off position. When the material cut-off detection condition is satisfied and the PID fault detection delay time (F24.25) is satisfied, the inverter reports a fault E21.

Closed-loop torque cut-off detection basis: When the feedback from the upper limit feedback (F24.24) or lower limit feedback (F24.23) position, once again reached the upper limit or lower limit feedback position, then that material.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.26	PID Differential Limiting	0.00~100.00	%	5.00	●

PID controller in differential (D) component can not be greater than the PID differential limiting value (F24.26), so as to avoid a moment of bias is too large, the output is also great, resulting in system oscillation. Set this value can be a good suppression of the impact of sudden interference on the system.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.27	PID Deviation Limit	0.00~100.00	%	0.00	●

When the deviation between the PID reference quantity and the feedback value is less than or equal to the deviation limit (F24.27), the PID stops the adjustment operation. In this way, given a small deviation from the feedback when the output frequency stability, for some closed-loop control is very effective.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.28	PID Integral Separation Threshold	0.00~100.00	%	5.00	●

In order to carry on the PID adjustment quicker and better, sometimes need not to use the integral regulation temporarily, namely carries on the PD or P adjustment only. For this reason, EM610 series inverter unique integral separation function - when the PID reference quantity and feedback quantity deviation is greater than the PID integral separation threshold (F24.28), the integral separation is effective, that is, PID regulator integral (I) adjustment time out.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
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Code					
F24.30	Material Interruption Fault Detection	Bit: E43 0: Deceleration stop 1: Freewheel stop 2: Continue running at the upper limit Ten: E21 0: Deceleration stop 1: Freewheel stop 2: Continue running at the upper limit		00	○

F24.30 Torque Off Fault Action Selects the open-loop torque cut-off detection fault (E43) and the closed-loop torque cut-off detection fault, if the material cut-off condition is met, you can choose to perform deceleration stop or freewheel stop or continue operation. Note that if you continue to run after the shutdown will be reported broken material failure.

Function Code	Name of Function Code	Parameter Description	Unit	Default	Property
F24.31	Closed Loop Speed Mode PID Start Output Range Limit	0.00~20.00(0.00%: Not limited)	%	0.00	○

F24.31 Closed Loop Speed Mode PID Start Output Range Limit

When PID input deviation is large, the PID output, integral term and differential term are limited when the system starts, so that when the PID is started, the speed will be smoothed smoothly when the linear speed is less than 0.5m / min. When PID input deviation is close, When the feedback deviation is less than 5.00%, the system can quickly reach the steady state by using the normal PID regulation parameter and without limiting processing.