CHV Series Vector Control Inverter Options

Operating Instructions for Tension Control Card

1. Model and Specifications

1.1 Model Description

The model of tension card is CHV00ZL. CHV series inverter can conduct constant tension control of winding/unwinding when set tension card. Meantime, the tension card provides RS485 physical communication mode for user to conduct communication control.

1.2 Schematic Diagram of Appearance

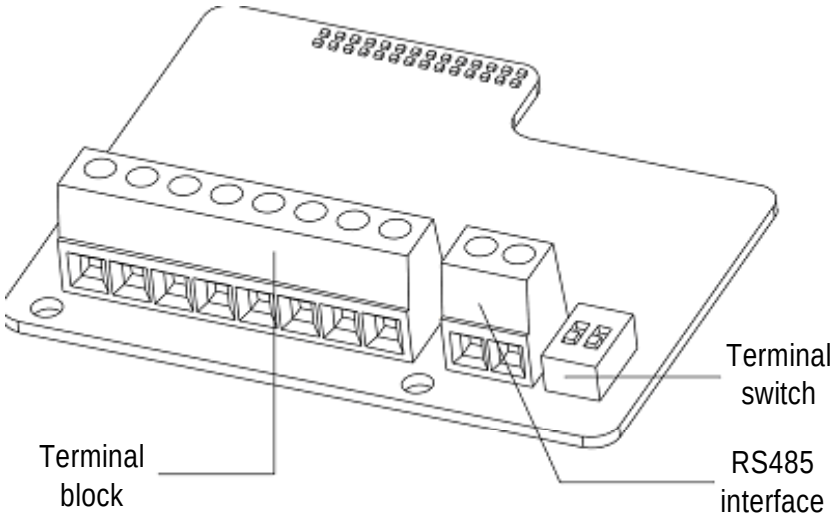

Figure 1.1 Diagram of Tension Card.

1.3 Schematic Diagram of Installation

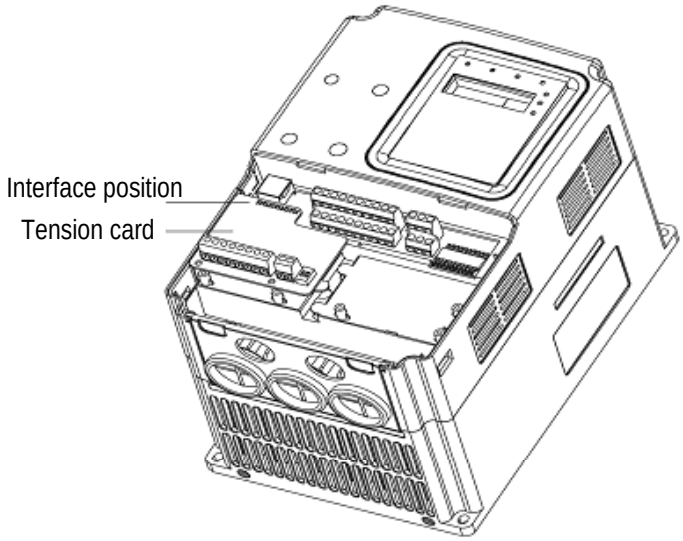

Figure 1.2 Installation of Tension Card.

2. Terminals of Tension Card

Terminal No.	Usage and Description
S6~S8	Digital input terminal: forming optical coupling isolation input with PW COM Input voltage range: 9~30V Input impedance: 3.3KΩ
HDI2	High-speed pulse or digital input, forming optical coupling isolation input with PW and COM Pulse input frequency range: 0~50KHz Input voltage range: 9~30V Input impedance: 1.1KΩ
COM	Common terminal of +24V or external power supply
AI3	Analog input, voltage range: -10V~10V Input impedance: 10KΩ
AI4	Analog input: voltage (0~10V)/current (0~20mA), optional through J1; Input impedance: 10KΩ (voltage input)/250Ω (current input)
RS485+,RS485-	RS485 serial communications

3. Jumpers

Jumper	Description
J1	Voltage (0~10V)/current (0~20mA) input switching jumper Short-circuiting of 1(V) and 2 (GND) generates voltage input; short-circuiting of 2 (GND) and 3 (I) generates current input.
S1	RS485 communication port terminator setting selection; If the DIP switch is set to ON, the terminator is enabled; if the DIP switch is set to OFF, the terminator is disabled. If the RS485 communication port is located at the end of the RS485 communication network cable, a terminator is needed.

4. Schematic Diagram of Terminal

S6	S7	S8	HDI2	COM	AI3	AI4	GND	RS485+	RS485-

5. CHV Tension Control Functions

5.1 Preface

In many industrial production fields, need to apply accurate tension control to maintain constant output tension of drive equipment and improve product quality. For example, paper making, paper processing, printing, printing and dyeing, packaging, cables, optical cables, adhesive tape manufacture, textile, leather, metal foil material processing and so on. In the winding/unwinding process in these industries, it is necessary to maintain constant tension in winding/unwinding (wires and strip materials).

5.2 Product Description

The CHV tension control card is attached to the CHV series high-performance vector inverters. In the functional algorithm, a special tension control module is added, to implement functions of tension control inverter occasions such as center-oriented winding/unwinding and intermediate section control. The combination of tension control card with CHV series high-performance vector inverters can completely replace torque motors, DC motors and tension controllers to independently form a tension control system. Compared with the traditional control scheme with the use of tension controller and inverter, this solution can make the system features simpler structure, lower cost, more convenient maintenance and more stable control.

The tension control system is a professional system. Please read the operating instructions carefully before use.

5.3 Detailed Description of Functional Parameters

Note: To browse and modify the following functional codes, user should apply tension control card.

Function Code	Name	Description	Setting Range	Default Value
PF.00	Tension control mode	0: Disabled (common speed control) 1: Tension-free feedback torque control 2: Tension feedback torque control 3: Tension feedback speed control	0~3	0

0: Disabled.

That is common inverter function, capable of implementing speed and torque control.

1: Tension-free feedback torque control: tension open-loop control mode.

The torque control tension output from the control motor is constant.

The torque command of inverter is calculated according to the set tension and the reel winding diameter (obtained by the winding diameter calculation module).

The calculation expression is: **T = (F×D) / (2×i)**

Where: T inverter output torque command;

F tension setting command;

D rotating diameter of the reel winding;

I mechanical drive ratio.

The inverter can achieve more stable tension control effect in torque control mode. In this mode, no tension feedback unit is needed, but the inverter must operate in the PG vector control mode, and speed measuring coder and PG card (option) should be configured.

Note: If the torque mode is used for tension control, the influence of rotational inertia during acceleration/deceleration should be noticed.

2: Tension feedback torque control

Tension feedback close-loop adjustment is added on the tension-free feedback torque control. The feedback tension signal of tension detection unit and the tension settings form PID close-loop adjustment, to adjust the output torque command of inverter. This scheme can improve the tension control accuracy to a great extent. Likewise, the inverter also needs to operate in the PG vector control mode, and a speed measuring coder and a PG card (option) should be configured.

Note: In the tension feedback torque control mode, PID module is the PID (two groups) in the tension control functional code, and is unrelated to the PID parameter group in the universal inverter functions. The tension set by user is the setting value of PID, and the feedback channel can be determined by PF.51. For other details, refer to Operating Instructions for CHV Series Vector Inverter.

3: Tension feedback speed control

The rotational speed of motor is adjusted to implement a constant tension.

Firstly, calculate the synchronous match frequency command according to the linear speed of strip (wire) material and the winding diameter of reel, then use the tension signal of tension detection unit and the tension setting value to form a PID close-loop, and finally adjust the frequency command of inverter.

The calculation equation for the synchronous match frequency command is as follows:

$$f = (V \times N \times i)/((\pi \times D)$$

Where, f current match frequency of inverter;

V linear speed of material;

N Pole pairs of motor;

I mechanical drive ratio;

D winding diameter of reel.

The linear speed of material is obtained by linear speed-detection module, and the winding diameter is obtained by winding diameter calculation module. To ensure accurate synchronous match frequency command can reduce the PID adjustment, so that the system can be more stable. In other words, the correctness of linear speed detection is very important.

Functional Code	Name	Description	Setting Range	Default Value
PF.01	Winding/unwinding mode	0: Winding mode 1: Unwinding mode	0~1	0

0: Winding mode. With the operation of system, the winding diameter of reel will get larger and larger.

1: Unwinding mode. With the operation of system, the winding diameter of reel will get smaller and smaller.

Note: The modification of this function code can implement online switching in winding/unwinding mode or through the terminal.

Functional Code	Name	Description	Setting Range	Default Value
PF.02	Operating frequency upper limit source selection	0: P0.08 1: AI1 setting 2:AI2 setting 3:AI3 setting 4: AI4 setting 5: HDI1 setting 6: HDI2 setting 7: remote communication setting	0~7	0
PF.03	Operating frequency upper limit setting deviation	0/0% ~ 50.0% (maximum frequency)	0/0% ~ 50.0%	0.0%

The meaning of upper limit frequency is the same as that in the universal inverter.

The upper limit frequency can be adjusted randomly according to the technologic requirement, which can efficiently prevent the occurrence of overdrive during system operation. The user can set the upper limit frequency according to the actual needing. For the function of upper limit frequency in torque control, please refer to the detailed description of functions P3.12, P3.13, and P3.14 in Operating Instructions for CHV Series Vector Inverter.

For all settings of the upper limit frequency, we refer to the percentage of maximum frequency, corresponding to the maximum frequency at 100%.

Operating frequency upper limit setting offset: Add offset on the basis of the upper limit frequency to meet the special production process requirement.

Functional Code	Name	Description	Setting Range	Default Value
PF.04	Maximum tension	0~30000N	0~30000	30000N

It refers to the output maximum tension that the motor driven by inverter. Note that it is in units of Newton: N.

This functional code serves as the tension setting reference. All settings corresponding to 100%

is the maximum tension. When the user debugs the tension control system, pay special attention to the setting of appropriate maximum tension value. If the maximum tension value is not set properly, the tension control effect will be affected.

Functional Code	Name	Description	Setting Range	Default Value
PF.05	Tension setting source selection	0: PF.06 setting 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: AI4 setting 5: HDI1 setting 6: HDI2 setting 7: remote communication setting	0~7	0
PF.06	Tension digital setting	0~PF.04	0~PF.04	0

Tension setting source selection: that is tension setting channel. Similar to the frequency setting, the 100% setting of individual channels corresponds to the maximum tension.

Note: In the mode of tension feedback torque control or tension feedback speed control, the system will automatically regard the tension setting value as PID setting value by default, so the user does not need make additional setting.

Functional Code	Name	Description	Setting Range	Default Value
PF.07	Zero-speed tension offset	0.0~50.0%	0.0~ 50.0%	0.0%
PF.08	Zero-speed match frequency threshold	0/0% ~ 50.0% (maximum frequency)	0.0~ 50.0%	10.0%

Zero-speed tension offset: When the tension control system detects that the system is in zero-speed state, the inverter will automatically add a zero-speed tension offset to the current tension value to tighten the winding/unwinding system and prevent system wire/strip loosening caused by too small tension at zero speed.

Zero-speed match frequency threshold: If the current match frequency calculated according to the linear speed and the current winding diameter is less than the threshold, the system will regard that the current winding/unwinding is operating at zero speed, and the zero-speed tension offset will take effect.

Functional Code	Name	Description	Setting Range	Default Value
PF.09	Tension taper coefficient selection	0: PF.10 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: AI4 setting	0~7	0

		5: HDI1 setting 6: HDI2 setting 7: remote communication setting		
PF.10	Tension taper coefficient	0.0~100.0%	0.0%~ 100.0%	1.0%

Tension taper coefficient: To meet the requirement that the tension decreases with the increasing of winding diameter, and implement the tight inside but loose outside of winding roller to protection the coiled material.

Note: The tension taper coefficient is only valid for winding.

Its calculation expression is as follows:

$$F = F0 \times [1-K \times (1-D0/D)]$$

Where, F: actual output tension;

F0: set tension;

K: taper coefficient;

D0: Initial value of winding diameter;

D: current winding diameter value.

The relationship among the parameters is as follows:

Figure 5.1 Schematic Diagram of Tension Taper.

Functional Code	Name	Description	Setting Range	Default Value
PF.11	Mechanical drive ratio	0.01~300.00	0.01~300.00	1.00

Mechanical drive ratio = gearbox input value/gearbox output value;

Note: Input the correct mechanical drive ratio; otherwise, the system cannot operate normally.

Functional Code	Name	Description	Setting Range	Default Value
PF.12	Maximum winding diameter	0.001~10.000m	0.001~10.000	1.000m

It refers to the maximum diameter of rotation axis during tension control.

This functional code is used to gather the reference object of current winding diameter. The 100% setting value is the maximum winding diameter. When the user debugs the tension control system, pay special attention to the setting of appropriate maximum winding diameter. If the maximum winding diameter is not set properly, the calculation of winding diameter will be affected, and finally the tension control effect will be affected.

Functional Code	Name	Description	Setting Range	Default Value
PF.13	Original winding diameter source selection	0: PF.14~ PF.17 setting 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: AI4 setting 5:HDI1 setting 6: HDI2 setting 7: Remote communication setting	0~7	0
PF.14	Winding diameter	0.001~PF.12	0.001~ PF.12	0.001m
PF.15	Original winding diameter 1	0.001~PF.12	0.001~ PF.12	0.001m
PF.16	Original winding diameter 2	0.001~PF.12	0.001~ PF.12	0.001m
PF.17	Original winding diameter 3	0.001~PF.12	0.001~ PF.12	0.001m

The original winding diameter refers to the diameter of empty roller, which can be reset through terminal. This value will be used upon winding change and pre-drive. Meanwhile, different initial winding diameters can be selected through the terminal.

Functional Code	Name	Description	Setting Range	Default Value
PF.18	Winding diameter calculation method selection	0: Linear speed method 1: AI1 measurement 2: AI2 measurement 3: AI3 measurement 4: AI4 measurement 5: HDI1 measurement 6: HDI2 measurement 7: strip material thickness accumulation 8: Wire thickness accumulation	0~8	0

This functional code is used to select the calculation method of winding diameter. In tension

control system, the calculation of winding diameter is very important. Only after accurate winding diameter is obtained, high-accuracy tension control can be conducted.

0: Linear speed method.

After the current winding/unwinding linear speed of external device is obtained, the current winding/unwinding diameter can be calculated.

The calculation expression is as follows: **$D = (i \times N \times V)/(\pi \times f)$**

Where, i: mechanical drive ratio;

N: pole pairs of motor;

V: linear speed;

f: current match frequency.

1~6: method for gathering winding diameter

Use the analog input or high-speed pulse form to express the current winding diameter. The 100% setting corresponds to the maximum winding diameter.

7: Strip thickness accumulation

According to the thickness of strip material (PF.28), calculate the winding diameter in accumulated integration mode.

The calculation expression is as follows: **$D = D0+2\times n\times d$**

Where, D0: initial winding diameter;

n: number of winding/unwinding turns;

d: average thickness of strip material.

8: Wire thickness accumulation

According to the thickness of the wire (PF.28), calculate the winding diameter in accumulated integration mode.

The calculation expression is as follows: **$D = D0+2\times d\times(n/N)$**

Where, D0: initial winding diameter;

d: average thickness of wire;

n: number of winding/unwinding turns;

N: number of turns every layer.

Functional Code	Name	Description	Setting Range	Default Value
PF.19	Winding diameter filter time	0.0~100.0s	0.0~100.0	0.0s

It refers to the filter time for winding diameter calculation, used to determine the sensitivity of winding diameter calculation. To prevent misoperation caused by calculation disturbance, set the parameter to higher value, and the anti-disturbance performance can be enhanced but decrease the sensitivity.

Functional Code	Name	Description	Setting Range	Default Value
PF.20	Setting arrival winding diameter	0.001~PF.12	~	0.001m

If the winding diameter reaches this value, inverter will output a signal (collector open circuit or relay output) to the peripheral device.

Functional Code	Name	Description	Setting Range	Default Value
PF.21	Actual winding diameter	0.001~PF.12		

This functional code can be used to monitor the current winding diameter, but cannot be changed.

Functional Code	Name	Description	Setting Range	Default Value
PF.22	Maximum linear speed	0.1~4000.0m/Min	0.1~4000.0	1.0m/Min

It refers to the maximum linear speed during tension control.

This functional code is used to gather the reference object of current linear speed. The 100% setting value is the maximum linear speed. When the user debugs the tension control system, pay special attention to the setting of appropriate maximum linear speed. If the maximum linear speed is not set properly, the calculation of linear speed will be affected, and finally the tension control effect will be affected.

Functional Code	Name	Description	Setting Range	Default Value
PF.23	Linear speed input source	0: No input 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: AI4 setting 5: HDI1 setting 6: HDI2 setting 7: remote communication setting	0~7	0

This functional code is used to select linear speed collection mode and channel. The 100% setting value corresponds to the maximum linear speed.

Functional Code	Name	Description	Setting Range	Default Value
PF.24	Minimum linear speed	0.1~PF.22	0.1~PF.22	0.1m/Min

When the system operates at lower speed, the linear speed of material and the output frequency of inverter are lower, and a smaller detection error will cause greater error in winding diameter calculation, so it is necessary to set the minimum linear speed. If the linear speed of material is lower than this value, the calculation of winding diameter will stop, and the current winding diameter will keep unchanged. This value should be set to be lower than the normal operation speed, compliance with the process requirement as reference.

Functional Code	Name	Description	Setting Range	Default Value
PF.25	Actual linear speed	0.1~PF.22		

This functional code can be used to monitor the current operation linear speed, but the functional code cannot be changed.

Functional Code	Name	Description	Setting Range	Default Value
PF.26	Maximum thickness of coiled material	0.01~200.00mm	0.01~200.00	100.00mm
PF.27	Coiled material thickness setting source selection	0: PF.28 setting 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: AI4 setting 5: HDI1 setting 6: HDI2 setting 7: remote communication setting	0~7	0
PF.28	Coiled material thickness	0.01~100.00mm	0.01~100.00	0.01mm
PF.29	Number of pulses per turn	1~30000	1~30000	1
PF.30	Number of turns per layer	1~30000	1~30000	1

For details, refer to the description of “the winding diameter calculation in the mode of strip material thickness accumulation and wire thickness accumulation” in functional code PF.18.

Functional Code	Name	Description	Setting Range	Default Value
PF.31	Reserved function			
PF.32	Reserved function			

Reserved function

Functional Code	Name	Description	Setting Range	Default Value
PF.33	System inertial compensation system	0.1~100.0% (corresponding to rated torque of motor)	0.1%~100.0%	0.1%
PF.34	Material density	0~30000Kg/m^3	0~30000	0 Kg/m^3
PF.35	Material width	0~60.000m	0~60.000	0.000m

If “free-tension feedback torque control or tension feedback torque control is selected for tension

control, the inverter operates in the torque control mode. During system acceleration/deceleration, additional torque should be provided to overcome the rotational inertia of entire system. If no compensation is made, the tension will be too small when acceleration in winding, and too great in deceleration, while the tension is too great when acceleration in unwinding, and too small when deceleration.

The rotational inertia of entire system is divided into two parts:

1) Rotational inertia of mechanical system: includes the rotational inertia of motor, gearbox and rotation axis etc. The rotational inertia of mechanical system is fixed, but is not regular. When debugging, the user can set the system inertia compensation coefficient to overcome the deviation caused by rotational inertia of mechanical system.

2) Rotational inertia of material on the reel: it varies with the winding diameter. The rotational inertia compensation module will automatically calculate the torque compensation according to the winding diameter. The user needs to set the material density and the width of rotation axis to overcome the deviation caused by material inertia.

Functional Code	Name	Description	Setting Range	Default Value
PF.36	Static friction compensation coefficient	0.0% ~ 100.0% (corresponding to the maximum tension)	0.0~ 100.0%	0.0%
PF.37	Slide friction compensation coefficient	0.0% ~ 100.0% (corresponding to the maximum tension)	0.0~ 100.0%	0.0%

Static friction compensation coefficient: refers to the tension to be compensated additionally to overcome the static friction when the tension control system starts.

Slide friction compensation coefficient: refers to the tension to be compensated additionally to overcome the slide friction in the tension control system.

Functional Code	Name	Description	Setting Range	Default Value
PF.38	Material breaking automatic detection function selection	0: Disabled; 1: enabled;	0~1	0
PF.39	Minimum linear speed of material breaking automatic detection	0.1~1000.0 m/Min	0.1~1000.0	0.1 m/Min
PF.40	Material breaking automatic detection error range	0.1~50.0%	0.1~50.0%	0.1%
PF.41	Material breaking automatic detection judgment delay time	0.1~60.0s	0.1~60.0	0.1s

Material breaking detection is conducted according to the abnormal change of winding diameter. If the winding diameter changes to a smaller value continuously when winding, or if the winding

diameter changes to a larger value continuously when unwinding, it can be regarded that strip (wire) breaking occurs. The winding diameter is calculated by linear speed. No matter which winding diameter calculation is used, the winding diameter calculation module has been calculating the winding diameter at linear speed. If the linear speed calculation is not selected for the calculation of winding diameter, the linear speed calculation of winding diameter is only used for strip breaking detection. If strip breaking detection function is selected, an accurate linear speed input should be provided.

Linear speed signal detection error may cause minor abnormal winding diameter change in the calculation result, which may lead to a false alarm. Therefore, it is necessary to adjust the strip breaking detection sensitivity. The strip breaking detection module is configured with three functional codes: minimum linear speed of material breaking automatic detection, material breaking automatic detection error range and material breaking automatic detection judgment delay time. The system will conduct material breaking protection only when all the above three conditions are satisfied and when the material breaking automatic detection function is enabled.

Functional Code	Name	Description	Setting Range	Default Value
PF.42	Proportional Gain (Kp1)	0.00~100.00	0.00~100.00	0.10
PF.43	Integral time (Ti1)	0.01~10.00s	0.01~10.00	0.10
PF.44	Differential time (Td1)	0.00~10.00s	0.00~10.00	0.00
PF.45	Proportional Gain (Kp2)	0.00~100.00	0.00~100.00	0.10
PF.46	Integral time (Ti2)	0.01~10.00s	0.01~10.00	0.10
PF.47	Differential time (Td2)	0.00~10.00s	0.00~10.00	0.00
PF.48	Sample period	0.01~100.00s	0.01~100.00	0.50s
PF.49	Deviation limit	0.0~100.0%	0.0~100.0	0.0%
PF.50	Output buffer time	0.00~10.00s	0.00~10.00	0.00s

For details, refer to the description of PID control in Operating Instructions of CHV Series Vector Inverter.

Functional Code	Name	Description	Setting Range	Default Value
PF.51	Tension feedback source selection	0: AI1 tension feedback setting 1: AI2 tension feedback setting 2: AI3 tension feedback setting 3: AI4 tension feedback setting 4: HDI1 tension feedback setting 5: HDI2 tension feedback setting 6: Remote communication setting	0~6	0

This functional code is used to determine the tension feedback channel selection, serving as PID feedback source for “tension feedback torque control” and “tension feedback speed control”.

Functional Code	Name	Description	Setting Range	Default Value
PF.52	PID parameter automatic adjustment basis	0: PID2 disabled 1: Adjusted by winding diameter 2: Adjusted by operating frequency 3: Adjusted by linear speed	0~3	0

The tension control system is configured with two sets of PID parameters, which can select adjustment by winding diameter, frequency or linear speed. This can achieve better control effect. The change curve of PID parameters is as follows:

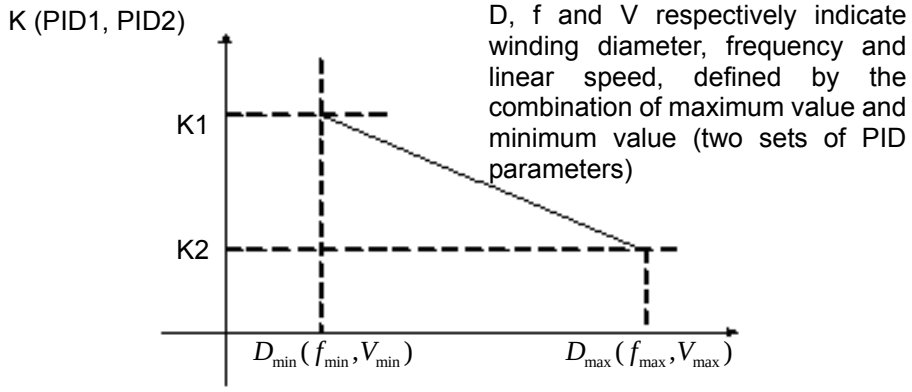

Figure 5.2 Parameter Change Curve.

Functional Code	Name	Description	Setting Range	Default Value
PF.53	Tension feedback PID adjustment frequency selection	0: Corresponding to the current match frequency 1: Corresponding to the maximum frequency	0~1	0

In the tension feedback speed control mode, the parameter can be selected by speed reference object adjusted by PID. Then it is added to the current match frequency to form the output frequency of inverter, to achieve the purpose of adjusting the match frequency.

Functional Code	Name	Description	Setting Range	Default Value
PF.54~PF.99	Reserved function	0~65535	0~65535	65535

Reserved function

Note: Please refer to Operating Instructions of CHV Series Vector Inverter.

5.4 List of Control Functions of Tension Card (for IDs, Refer to the Operation Instructions)

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
PF.00	Tension control mode	0:Disabled (common speed control) 1:Tension-free feedback torque control 2:Tension feedback torque control 3:Tension feedback speed control	0~3	0	◎	Tension mode	334
PF.01	Winding/ unwinding mode	0: Winding mode; 1:unwinding mode	0~1	0	O	Winding/ Unwinding mode	335
PF.02	Operating frequency upper limit source selection	0: P0.08 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: AI4 setting 5: HDI1 setting 6: HDI1 setting 7:Remote communication setting	0~7	0	◎	Upper frequency limit source	336
PF.03	Operating frequency upper limit setting deviation	0/0% ~ 50.0% (maximum frequency)	0.0~ 50.0%	0.0%	◎	Upper frequency limit offset	337
PF.04	Maximum tension	0~30000N	0~ 30000	30000 N	◎	Maximum tension	338
PF.05	Tension setting source selection	0: PF.06 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: AI4 setting 5: HDI1 setting 6: HDI2 setting 7:Remote communication setting	0~7	0	◎	Tension setting source	339
PF.06	Tension digital setting	0~PF.04	0~ PF.04	0N	O	Tension digital setting	340
PF.07	Zero-speed tension offset	0.0~50.0%	0.0~ 50.0%	0.0%	O	Zero-speed tension setting	341

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
PF.08	Zero-speed match frequency threshold	0/0% ~50.0% (maximum frequency)	0.0~ 50.0%	10.0%	O	Match frequency threshold	342
PF.09	Tension taper coefficient selection	0: PF.10 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: AI4 setting 5: HDI1 setting 6: HDI2 setting 7:Remote communication setting	0~7	0	◎	Taper coefficient selection	343
PF.10	Tension taper coefficient	0.0~100.0%	0.0~ 100.0%	1.0%	O	Taper coefficient	344
PF.11	Mechanical drive ratio	0.01~300.00	0.01~ 300.00	1.00	O	Mechanical drive ratio	345
Winding Diameter Calculation							
PF.12	Maximum winding diameter	0.001~10.000m	0.001~ 10.000	1.000m	◎	Maximum winding diameter	346
PF.13	Original winding diameter source selection	0: PF.14~ PF.17 setting 1: AI1setting 2: AI2 setting 3: AI3 setting 4: AI4 setting 5: HDI1 setting 6: HDI2 setting 7:Remote communication setting	0~7	0	◎	Original winding diameter selection	347
PF.14	Reel diameter	0.001~PF.12	0.001~ PF.12	0.001m	◎	Reel diameter	348
PF.15	Original winding diameter 1	0.001~PF.12	0.001~ PF.12	0.001m	O	Original diameter 1	349
PF.16	Original winding diameter 2	0.001~PF.12	0.001~ PF.12	0.001m	O	Original diameter 2	350
PF.17	Original winding diameter 3	0.001~PF.12	0.001~ PF.12	0.001m	O	Original diameter 3	351
PF.18	Winding diameter	0:Linear speed method. 1:AI1 measurement	0~8	0	◎	Winding diameter	352

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
	calculation method selection	2:AI2 measurement 3:AI3 measurement 4:AI4 measurement 5:HDI1 measurement 6:HDI2 measurement 7:Strip thickness accumulation 8: Wire thickness accumulation				calculation	
PF.19	Winding diameter filter time	0.0~100.0s	0.0~100.0	0.0s	O	Winding diameter filter	353
PF.20	Setting arrival winding diameter	0.001~PF.12	0.001~PF.14	0.001m	O	Winding diameter arrival	354
PF.21	Actual winding diameter	0.001~PF.12			●	Actual winding diameter	355
Winding Diameter Calculation in Linear Speed Method							
PF.22	Maximum linear speed	0.1~4000.0m/Min	0.1~4000.0	1.0m/Min	O	Maximum linear speed	356
PF.23	Linear speed input source	0:No input 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: AI4 setting 5: HDI1 setting 6: HDI2 setting 7:Remote communication setting	0~7	0	O	Linear speed source	357
PF.24	Maximum linear speed	0.1~PF.22	0.1~PF.22	0.1m/Min	O	Maximum linear speed	358
PF.25	Actual linear speed	0.1~PF.22			●	Actual linear speed	359
Winding Diameter Calculation in Thickness Accumulation Method							
PF.26	Maximum thickness of coiled material	0.01~200.00mm	0.01~200.00	100.00 mm	O	Maximum thickness	360

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
PF.27	Coiled material thickness setting source selection	0: PF.28 setting 1: AI1 setting 2: AI2 setting 3: AI3 setting 4:AI4 setting 5: HDI1 setting 6: HDI2 setting 7:Remote communication setting	0~7	0	O	Thickness setting selection	361
PF.28	Coiled material thickness	0.01~100.00mm	0.01~ 100.00	0.01 mm	O	Coiled material thickness	362
PF.29	Number of pulses per turn	1~30000	1~ 30000	1	O	Number of pulses per turn	363
PF.30	Number of turns per layer	1~30000	1~ 30000	1	O	Number of turns per layer	364
Rotational Inertia Compensation							
PF.31	Reserved function				O	Reserved function	365
PF.32	Reserved function				O	Reserved function	366
PF.33	System inertia compensation system	0.1~100.0% (corresponding to rated torque of motor)	0.1~ 100.0%	0.1%	O	Inertia compensation coefficient	367
PF.34	Material density	0~30000Kg/m^3	0~ 30000	0 Kg/m^3	O	Material density	368
PF.35	Material width	0~60.000m	0~ 60.000	0.000m	O	Material width	369
PF.36	Static friction compensation coefficient	0.0% ~ 100.0% (relative maximum tension)	0.0~ 100.0%	0.0%	◎	Static friction coefficient	370
PF.37	Slide friction compensation coefficient	0.0% ~ 100.0% (relative maximum tension)	0.0~ 100.0%	0.0%	◎	Slide friction coefficient	371
Material breaking detection							
PF.38	Material exhaustion automatic detection function selection	0: Disabled 1: Enabled	0~1	0	◎	Material breaking detection	372

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
PF.39	Minimum linear speed of material exhaustion automatic detection	0.1~1000.0m/Min	0.1~1000.0	0.1 m/Min	◎	Material breaking linear speed	373
PF.40	Material exhaustion automatic detection error range	0.1~50.0%	0.1~50.0%	0.1%	◎	Material breaking error	374
PF.41	Material exhaustion automatic detection judgment delay time	0.1~60.0s	0.1~60.0	0.1s	◎	Material breaking delay	375
Two sets of PID1 Parameters							
PF.42	Proportional Gain (Kp1)	0.00~100.00	0.00~100.00	0.10	O	Proportional gain 1	376
PF.43	Integral time (Ti1)	0.01~10.00s	0.01~10.00	0.10	O	Integral time 1	377
PF.44	Differential time (Td1)	0.00~10.00s	0.00~10.00	0.00	O	Differential time 1	378
PF.45	Proportional Gain (Kp2)	0.00~100.00	0.00~100.00	0.10	O	Proportional gain 2	379
PF.46	Integral time (Ti2)	0.01~10.00s	0.01~10.00	0.10	O	Integral time 2	380
PF.47	Differential time (Td2)	0.00~10.00s	0.00~10.00	0.00	O	Differential time 2	381
PF.48	Sample period	0.01~100.00s	0.01~100.00	0.50s	O	Sample period	382
PF.49	Deviation limit	0.0~100.0%	0.0~100.0	0.0%	O	PID deviation limit	383
PF.50	Output buffer time	0.00~10.00s	0.00~10.00	0.00s	O	PID buffer time	384
PF.51	Tension feedback source selection	0: AI1 tension feedback setting 1: AI2 tension feedback setting	0~6	0	◎	Tension feedback source	385

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
		2: AI3 tension feedback setting 3: AI4 tension feedback setting 4: HDI1 tension feedback setting 5: HDI2 tension feedback setting 6: Remote communication setting					
PF.52	PID parameter automatic adjustment basis	0: PID2 disabled 1: Adjusted by winding diameter 2: Adjusted by operating frequency 3: Adjusted by linear speed	0~3	0	O	Adjustment basis	386
PF.53	Tension feedback PID adjustment frequency selection	0: Corresponding to the current match frequency 1: Corresponding to the maximum frequency	0~1	0	O	PID adjustment value selection	387
Reserved Function							
PF.54~ PF.99	Reserved function	0~65535	0~ 65535	65535	O		388
Supplement to CHV Functions							
P5.02	S1 terminal function selection	32: Winding diameter reset 33: Original winding diameter selection terminal 1 34: Original winding diameter selection terminal 2 35: Pre-drive signal 36: Winding/unwinding switching 37:Winding diameter calculation stop 38~47: Reserved	0~47	0	◎		
P5.03	S2 terminal function selection		0~47	0	◎		
P5.04	S3 terminal function selection		0~47	0	◎		
P5.05	S4 terminal function selection		0~47	0	◎		
P5.06	S5 terminal function selection		0~47	0	◎		

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
P5.07	HDI1 terminal function selection		0~47	0	◎		
P5.08	HDI2 terminal function selection		0~47	0	◎		
P5.09	S6 terminal function selection		0~47	0	◎		
P5.10	S7 terminal function selection		0~47	0	◎		
P5.11	S8 terminal function selection		0~47	0	◎		
P5.35	HDI1 high-speed pulse input function selection	0: Setting input 1: Counter input 2: Length count input 3: Turn calculation pulse input 4: Reserved	0~4	0	◎		
P5.36	HDI2 high-speed pulse input function selection		0~4	0	◎		

6. For the communication function part of RS485, refer to Operating Instructions for CHV Series Inverter Communication Card.