Campro Precision Machinery Co., Ltd.

凱柏精密機械股份有限公司

OPERATION MANUAL

VERTICAL MACHINING CENTER

HEIDENHAIN CNC iTNC530 HSCI Series

地　址　：臺灣省台中市南屯區 408 精科一路 12 號
ADDRESS ：No.12, JINGKE 1ST RD., NANTUN, TAICHUNG 408, TAIWAN
電　話 TEL　：886-4-23500501
傳　真 FAX　：886-4-23500213

料號: BK07-530HSCI-PA01A

COMPATIBLE PRODUCT：

MACHINE MODEL	CNC CONTROLLER
CPV-550	**HEIDENHAIN** **iTNC530 HSCI SERIES**
CPV-750	
CPV-900	
CPV-1100	
CPV-1300	
CPV-850B	
CPV-1100B	
CPV-1200B	
CPV-1400B	
CPV-1600B	
CQV-900	
CQV-1100	
CQV-1300	

Chapter 1 Operation Description

1.1 Safety Instructions

(1) This manual explains how to operate the CNC vertical machining center.

(2) Before operating this machine, read the CNC controller manuals carefully to confirm the safety operation of the CNC system.

(3) Before operating this machine, read every manual carefully, you have to only understand this system completely and you can operate this machine after acquainting with the safety operation step, you may avoid the personnel to hurt or the machine equipment damage.

(4) This machine provides many safety designs to avoid the personnel hurts or the equipment damage. But operator can't depend on these safety devices completely, and you must know the manual content, and fully understanding special note before operating the machine, you can just insure the safety.

(5) This operation manual not applied the content yet, the operation is impossible.

(6) This machine is the high accuracy technology product that machine and electric unite as one, the environment of the machine perimeter, the maintenance and operation periodically and the operator level is influenced the life of this product.

(7) This operating manual writing is according to suppose your machine has all function of the operation. Before operating machine, please confirm the function of the machine can use.

1.2 Operation Precaution

A. Check before turning on the machine:

(1) Check every the operation door or the maintenance door whether they have closed?

(2) Check the safety cover of the machine whether it protect integrity?

(3) Check electric case door whether it have closed?

(4) Check the oil every unit whether enough?

(5) Check the coolant whether enough?

(6) Check the pressure whether enough?

(7) Check the power supply voltage whether exactitude? (This machine it uses the voltage AC380~415V)

(8) If have the in addition transformer, check the power supply wiring whether exactitude?

B. Check after turning on the machine:

(1) First the feed axis returns reference position.

(2) The spindle and feed axis revolve 10-20 minutes with 1/2 or 1/3 of limit speed under the auto mode, check it active whether normal?

C. Check before the calibrate tool and test running on the Machine:

(1) The work piece install whether it is definite and appropriate?

(2) Do the tool clamp? While you run the spindle, the tool select and the tool change, it should operation door close, by insure the safety.

(3) You should check the spindle tool number and the tool whether same after the tool change completing?

D. Check before the operation machine:

(1) Check the work coordination initial value whether exactitude?

(2) Check the tool offset whether exactitude?

(3) Check the program whether exactitude? Particularly note plus or minus sign and decimal point.

(4) The program establishes the process condition whether the exactitude and safety?

(5) While writing the program, you should select the appropriate program according to the performance of the machine, CNC controller system of the machine and the limit conditions.

(6) The machine progress work before the cutting physically, let the machine run no-load revolved, check the program, the tool offset, the coordination setting… whether it is the accurate?

E. Try cutting the note:

(1) While trying cutting, you should start the single block function, the cutting feed override button regulate to the slower speed, then the speed rises slowly, it prevent bumps the machine because the process program error.

(2) After try cutting, the modify program check the decimal point, plus or minus sign.

(3) In any manufacturing process because changing the tool, molding or

modification programs need the test run program first and the program confirm without error after, execute the program.

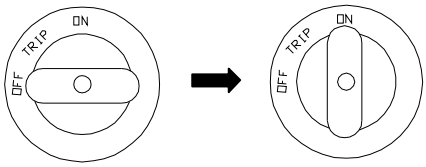
F. Notice in the operation:

(1) While meeting an emergency state, you should press the emergency stop switch immediately and it make machine stopped right away.

(2) While restarting the program, you should check cursor whether it in the place of the program beginning.

Chapter 2 Turn On and Turn Off The Machine

2.1 Turn On Process：

(1) Press the [**Emergency Stop**] button on the operation panel.	
(2) Switch on the main power supply： 1. Turn the main power switch from "OFF" place to "ON" place in clockwise direction. 2. The TNC power supply and the other equipments of machine power supply are turned on at the same time. 3. When the TNC is starting, it will show a series of dialog automatically.	
(3) After TNC memory test, a message "**Power interrupted**" will display. Press the [**CE**] key to clear this message.	**"Power interrupted"** 
(4) Later, the PLC program is compiled automatically.	**"Translate PLC program"**
(5) Guard test： 1. After "translate PLC program", a message "**10 Machine guard is open**" will appear. 2. Open and close the front guard door once, this message will disappear automatically.	**"10 Machine guard is open"**

(6) TNC power on： 1. A message "**Relay ext. dc voltage missing**" will appear if the message "**10 Machine guard is open**" disappears. 2. Close the right guard & the left guard of machine. 3. Pull the [**Emergency Stop**] button to rise. 4. Keep press the [**Power On**] key till the [**Power On**] key light on. (During the TNC power on, the [**Power On**] key will flash once and light on again) 5. If the TNC power on is successful, the "**Relay ext. dc voltage missing**" will disappear automatically and the [**Power On**] key is bright.	**"Relay ext. dc voltage missing"**  

↓

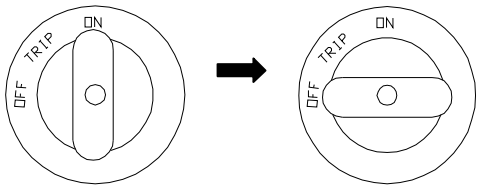
(7) Reference point return： 1. A message "**Traverse reference points**" will appear after "**TNC power on**" successfully. 2. Press the [**START**] button, then x, y, z axes will make reference return automatically in following sequence : Z→Y→X	**"Traverse reference points"** 

↓

Complete.

2.2 **Turn Off Process:**

※ **To prevent data being lost at switch-off, you need to shut down the TNC as follows :**

(1) Press the [**Emergency stop**] button on the machine operating panel.	
(2) Select the "Manual operating mode".	
(3) Select "Power off function" : 1. Select the [power off] soft key to shut down. 2. Confirm again with the [YES] soft key. 3. When the TNC displays the message "**The machine switch off automatically …….**", you can switch off the main power supply.	 [**YES**]
(3) Switch off the main power supply : Turn the main power switch from "ON" place to "OFF" place in counter clockwise direction.	

Complete.

2.3 Lock The Main Power Switch Process :

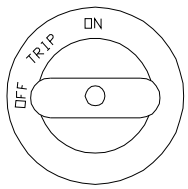
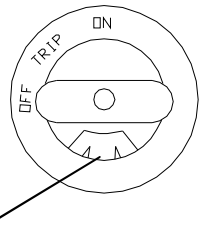
A. Caution :

(1) The main power switch can be locked only the handle at the OFF position.

(2) The key lock size is “Φ4~5mm”.

(3) Three key locks can be installed at most.

B. Install process (FUJI type)

(1) Make sure the main power switch handle at the “OFF” position.	
(2) Install the key lock on the main power switch. (Refer right figure)	 LOCK POSITION

Complete.

Chapter 3 Control Panel Description

3.1 Operator's panel layout

A. Machine operating panel :

3.2 The keys instruction of machine operating panel :

(1) TNC power on key

1. This key can start the TNC voltage on in emergency stop released.
2. When switch on the main power, after the TNC starting procedure ready and the emergency stop button unlocked, keep press this key, the TNC voltage will be turned on if power on successful.
3. The hiding lamp is lighted after power on successfully.

(2) Emergency stop button

1. The function of this button is used for when take place the emergency condition, press this button can make the machine overall action stopped, all the power supplies of motors were cut off.
2. Machine conditions in emergency stop state:
   a. Feed axes stop travel.
   b. The spindle stop revolves.
   c. Tool selecting or tool changing is stopped.
   d. The motors of coolant, chip conveyor, chip flushing, oil cooler, hydraulic and CTS ...etc. are stopped.
   e. The screen displays emergency stop message.
   f. The red alarm lamp is bright.
3. Release emergency stop method :

   Pull this button up and TNC power on, press the “CE” key to clear the emergency stop message, but note the following items :

   a. Be sure all emergency stop conditions are removal.
   b. If the emergency stop button was pushed during tool selecting, please refer the missing tool troubleshooting procedure of troubleshooting manual to troubleshoot.
   c. If the emergency stop button was pushed during tool changing, please refer the arm troubleshooting procedure(arm type) or ATC troubleshooting procedure(carrousel type) of troubleshooting manual to troubleshoot.

(3) NC start key

1. This key can start the process program in automatic operation mode.
2. Under "Manual operation mode" or "Electronic hand wheel mode", the M/T code can be executed with this key.
3. When the tool exchange arm was stick, enter "HELP function" and use this key to troubleshoot.
4. The hiding lamp of NC start key will light and the green alarm lamp will active if cycle start is successful and the program goes running.

(4) NC stop key

1. This key can stop the process program execution.
2. During the program runs (the NC start key bright), press this key, the process program will stop run.
3. After the process program stop run, the NC stop lamp is bright and the NC start lamp become dark.
4. Press the NC start key again and the process program will be restarted.

(5) Axis direction key

A. Under the "Manual operation mode" or the "Electronic hand wheel mode", the axis direction key can control the axis to move.
   1. X'+, Y'+, Z+, IV+ : While pressing these keys, the feed axis travels toward the "positive" direction.
   2. X'-, Y'-, Z-, IV- : While pressing these keys, the feed axis travels toward the "negative" direction.
   3. The speed of axis travels depended on the "Jog override" rotary switch.

(6) Rapid traverse key

1. This key can let the feed axis travel with rapid speed.
2. When press the axis direction key and this key together, the axis travels speed will change to rapid speed immediately.

(7) Retract axis key

1. This key can release the over travel condition when X, Y or Z axis moves over the axis hardware limit.
2. When axis moves over the axis hardware limit, it will display the over travel caution message and generate emergency stop state, it seems like to press the emergency stop button.
4. First, press this key, then press the TNC power on key to let the TNC ready.
5. Use axis direction key to retract axis from hardware limit position.

(8) Spindle start key

1. This key can start the spindle rotation in C.W direction under "Manual operation mode" or "Electronic hand wheel mode ".
2. The spindle speed is S code command an earlier generation.
3. The spindle speed override can regulate spindle speed.

(9) Spindle stop key

1. This key can stop the spindle under "Manual operation mode" or "Electronic hand wheel mode ".
2. When this key was pressed, however the spindle start key was pressed or not at the same time, the spindle is stopped.

(10) Tool change key

1. This key is used to exchange the tool from the spindle with hand under "Manual operation mode" or "Electronic hand wheel mode ".
2. When press this key, the screen will display "39 Tool unclamping, please !" massage and the guard door unlock.

(11) Tool unlock/lock key

1. This key can control the tool unclamp/clamp of spindle.
2. When press the "tool change" key and the guard door is opened, press this key once, the spindle will tool unclamp and the screen display "42 Close guard -> TC quit !" massage.
3. Press this key one more time, the spindle will tool clamp and the "42 Close guard -> TC quit !" massage will disappear.

(12) Spindle jog C.W key

1. Keep press this key, the spindle will rotate with fixed slow speed in C.W direction under "Manual operation mode" or "Electronic hand wheel mode ".

(13) Spindle jog C.C.W key

1. Keep press this key, the spindle will rotate with fixed slow speed in C.C.W direction under "Manual operation mode" or "Electronic hand wheel mode ".

(14) Coolant key

1. This key can control the coolant on/off.
2. Before let the coolant on, the spindle must rotate first.
3. When the spindle is running, press this key once, the coolant will be sprayed immediately.
4. Press this key again, the coolant will be stop sprayed.

(15) Work-piece blow key

1. This key can control the work-piece blow on/off.
2. When press this key once, the work-piece blow on.
3. Press this key again, the work-piece blow off.

(16) Work light key

1. This key can control the work light on/off.
2. When press this key once, the work light will bright.
3. Press this key again, the work light will become dark.
4. This key will auto be started during the TNC translate PLC program has done after switching on the main power.

(17) Chip conveyor forward key

1. This key can control the chip conveyor move forward to remove the chips.
2. When press this key once, the chip conveyor starts move forward.
3. Press this key again, the chip conveyor will stop.

(18) Chip conveyor reverse key

1. This key can control the chip conveyor moves backward while the chip conveyor stops.
2. Keep press this key, the chip conveyor continue moves backward.
3. Release this key, the chip conveyor will become stop.

(19) Unlock door key

1. This key is used to unlock the guard door.
2. When press this key under the machine stop condition, the guard door will be unlocked and the screen displays message “10 Machine guard is open !”, then the door can be opened.
3. When the guard door unlocked, if you want to let the guard door lock, you must open the door and close it again, it can let the guard door lock automatically.
4. The guard door can’t be unlocked under the following conditions :
   (1) The program is running. (The NC start lamp is bright)
   (2) The spindle is revolving.
   (3) The magazine is running for selecting tool.
   (4) The arm is running for changing tool.

---

(20) FN1 key (Chip flushing)

1. This key can control the chip flushing on/off.
2. When press this key once, the chip flushing on.
3. Press this key again, the chip flushing off.

---

(21) FN2 key (Spindle coolant ring spray)

1. This key can control the spindle coolant ring spray on/off.
2. When press this key once, the spindle coolant ring spray on.
3. Press this key again, the spindle coolant ring spray off.

---

(22) FN3 key (spare)

---

(23) Electronic Hand-wheel

1. This electronic hand-wheel can operate the feed axis movement and control the feed axis +/- direction.
2. The hand-wheel is valid only in the "Electronic Hand wheel mode".
3. Before turning the hand-wheel, you should select the axis and the feed magnification first.
4. Press the axis key on the electronic hand-wheel to select the feed axis.
5. Press the magnification key on the electronic hand-wheel to select the feed magnification.
6. When turn the hand-wheel in C.W direction, the axis moves for "+" direction.
7. When turn the hand-wheel in C.C.W direction, the axis moves for "-" direction.
8. When the front guard door was opened, the drive will be disabled, so before you want to move axis, you must press these two permissive buttons on the electronic hand-wheel to enable drive. In CE specification, the maintenance key should be switched to “1” position at the same time, it will display message “75 Special mode”.

(24) Maintenance key

1. This key is used for CE specification.
2. When this key switch to “1” position, the electrical cabinet can be opened and the main power switch not be tripped, and the chip flushing can be used when the side guard door was opened and generate an emergency stop state.

(25) Permissive button

1. This key is used for CE specification.
2. When open the front guard door and the maintenance key switch to “1” position, press this key will display message “75 Special mode”, it means “maintenance mode” valid.
3. Some “HELP” functions which dangerous and may hurt person are not allowed to execute when the front guard door was opened, in this time, you should use one hand to press this key to let “maintenance mode” become valid and use the other hand to press “START” key to process the “HELP” function.(two hand control)

Chapter 4 M, S Code Description

4.1 M code Description:

4.1.1 Use : M code is wrote in program mainly, it is used to control some device or the program's action in the machine. For example: the M03 is a spindle CW.

4.1.2 Note : M code definition is by machinery plant, so each definition of machinery plant would be some to allow different, so while using, please read this table and select to use the M code of the function.

4.1.3 M code list:

【Arm type, Carrousel type】

NO.	Function Description	○ : **Standard** ☆ : **Option**
M00	Program stop	○
M01	Program conditional stop	○
M02	END program	○
M03	Spindle right CW on	○
M04	Spindle left CCW on	○
M05	Spindle off	○
M06		○
M07	CTS on	☆
M08	Coolant on	○
M09	Coolant / CTS off	○
M10		
M11		

NO.	Function Description	○ : Standard ☆ : Option
M12		
M13	Spindle right CW + Coolant on	○
M14	Spindle left CCW + Coolant on	○
M15	Chip flushing on	○
M16	Chip flushing off	○
M17		
M18	Spindle reference	○
M19	Spindle orientation	○
M20	Spindle orientation CYCLE 13	○
M21		
M22		
M23		
M24		
M25		
M26		
M27		
M28		
M29		

NO.	Function Description	○ : Standard ☆ : Option
M30	END program	○
M31	Working without M3/M4	○
M32	Working area monitoring off	○
M33		
M34		
M35	Work-piece air blow on	○
M36	Work-piece air blow off	○
M37		
M38		
M39		
M40		
M41		
M42		
M43		
M44	The 4th axis unclamp	☆
M45	The 5th axis unclamp	☆
M46		
M47		

NO.	Function Description	○ : Standard ☆ : Option
M48		
M49		
M50	Chip conveyor forward off	☆
M51	Chip conveyor forward on	☆
M52		
M53		
M54		
M55		
M56		
M57		
M58		
M59		
M60		
M61		
M62		
M63		
M64	The 4th axis clamp	☆
M65	The 5th axis clamp	☆

NO.	Function Description	○ : Standard ☆ : Option
M66		
M67		
M68		
M69		
M70		
M71	Axis limit 1	○
M72	Axis limit 2	○
M73	Axis limit 3	○
M74		
M75		
M76		
M77		
M78		
M79		
M80	Work-piece count reset	○
M81	Work-piece count plus one	○
M82	Tool torque monitoring off	○
M83	Tool torque monitoring on	○

NO.	Function Description	○ : Standard ☆ : Option
M84		
M85		
M86		
M87		
M88		
M89		
M90		
M91		
M92		
M93		
M94		
M95		
M96		
M97		
M98		
M99		

4.2 S Code Description :

4.2.1 Purpose:

The S code is an instruction that is used to control the spindle speed.

4.2.2 For example:

The S1000 represents the 1000 rpm of spindle speed.