CHV Series Vector Control Inverter Options

Operating Instructions for Water Supply Card

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1. Model and Specifications

1.1 Model Description

The model of “water supply card” is CHV00GS. With water supply card, CHV series inverters can provide constant-pressure water supply. This also can implement the settings and automatic switching logic of variable frequency pumps, power frequency pumps, dormant pumps and dredge pumps. Meanwhile it can implement such functions as multi-step water supply, dormant control, dredge control, periodic pump change and faulty variable frequency judgment.

1.2 Schematic Diagram of Appearance

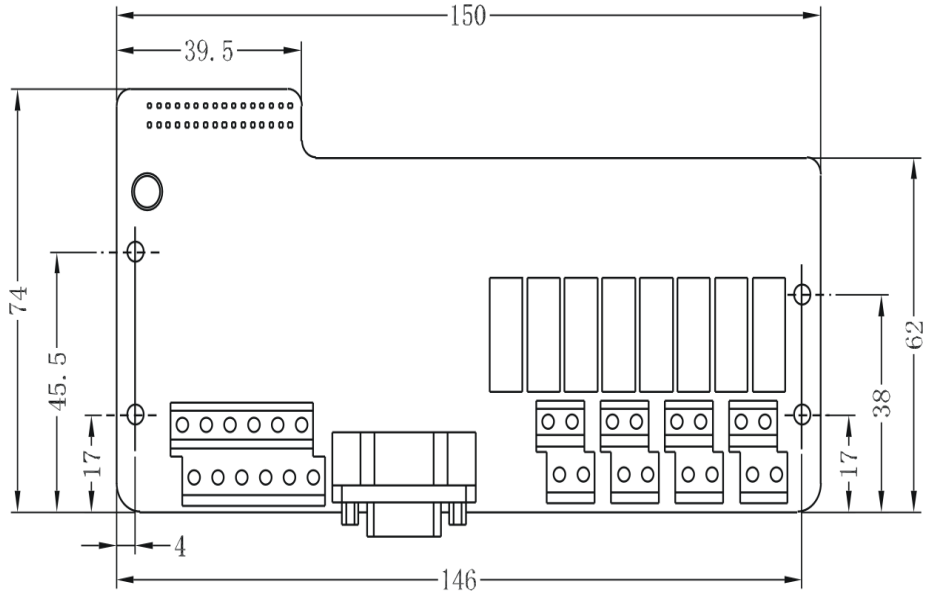


Figure 1.1 Appearance of Water Supply Card.

1.3 Schematic Diagram of Installation

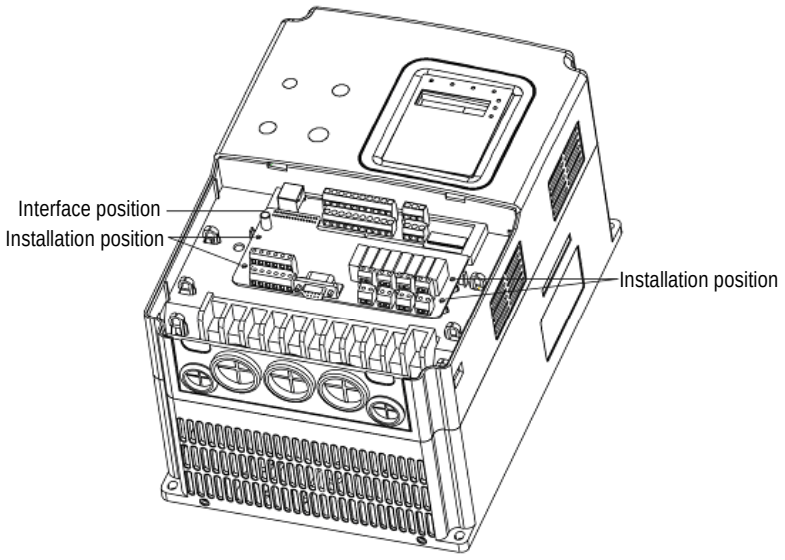
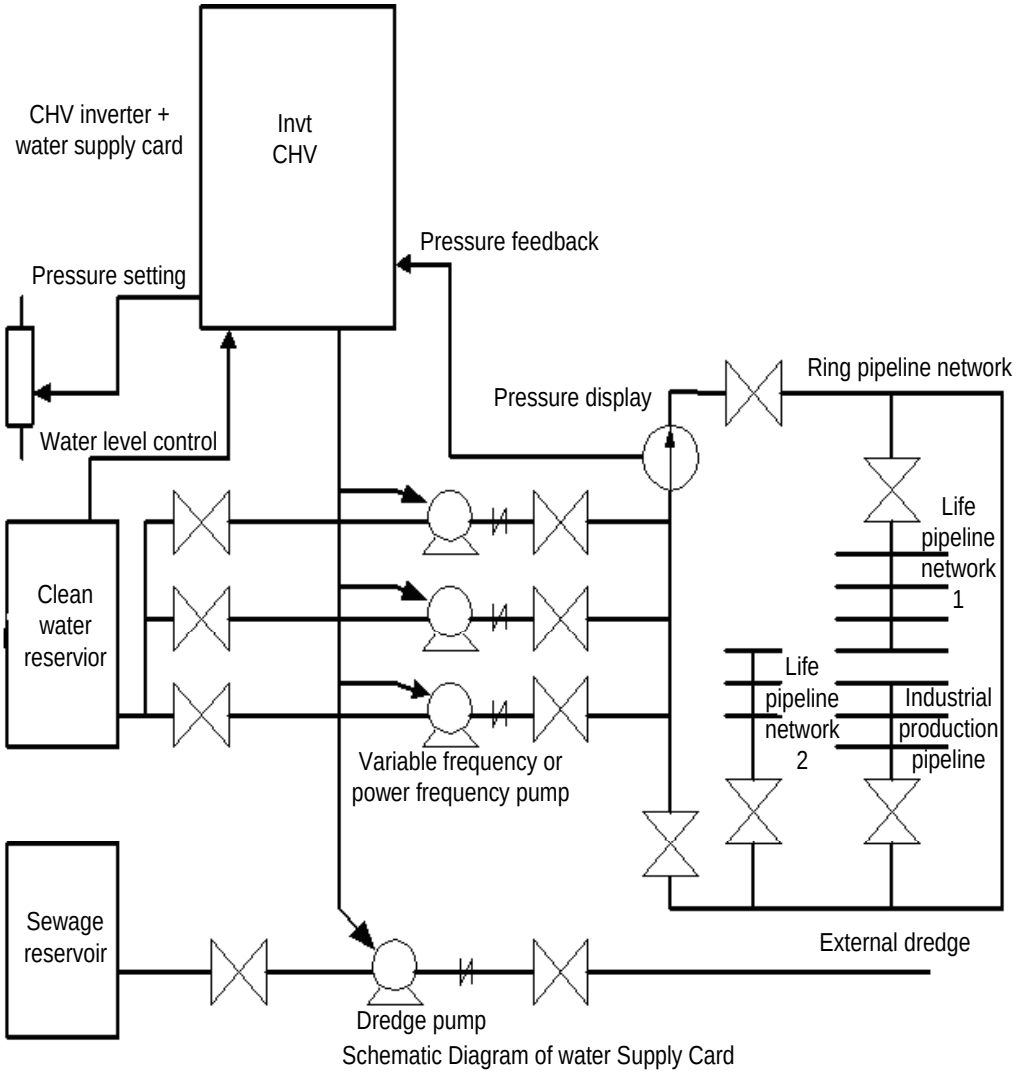


Figure 1.2 Installation of Water Supply Card.

2. Features of Water Supply Card

1) Having multiple features of CHV high-performance inverters of INVT, such as password protection, which can limit unauthorized personnel to change parameters randomly and its normal operation will not be affected.
2) Supporting pressure setting in eight-segments time every day: the given pressure can vary with the time.
3) Dormant pump control function: the card can make the system enter dormant operation status and control dedicated small dormant pumps, such as parameter setting for enabling dormancy awaking, to awake the power and variable frequency pumps to conduct normal operation.
4) Small-flow stop and energy-saving: if the water consumption is lower, PID will be adjusted in its tolerance range. When PID is adjusted to the positive type, if the given flow is less than the feedback flow and meanwhile is greater than the tolerance range, the pump will stop.
5) Periodic alternate control: this function can efficiently prevent rusting of pumps and meanwhile avoid the operation of one pump all along. Condition: the power of alternate pumps should be equivalent.
6) Dredge pump control: capable of controlling the water level of sewage reservoir.
7) Liquid level detection and control of water inlet reservoir: capable of detecting the liquid level of clean water reservoir and automatically controlling the given pressure of pump.
8) Over-pressure/under-pressure alarm of pipelines: The water supply card provides the selection of a delayed over-pressure/under-pressure output terminal.
9) The water supply card can access the rated current parameters of motors of seven pumps, and provide the overcurrent and overload protection of currently-operating variable frequency pumps.
10) Recording of faulty pumps: The water supply card can automatically record faulty pumps. To clear the record, use fault clearing archives.

3. Block Diagram of Water Supply Card



Schematic Diagram of water Supply Card

4. Terminals of Water Supply Card

Terminal Name	Terminal Purpose and Description
S6~S8	Digital input terminal: forming optical coupling isolation input with PW and COM Input voltage range: 9~30V Input impedance: 3.3KΩ
COM	Common terminal of +24V or external power supply
Y2	Output terminal of open-circuit collector, its corresponding common terminal is CME2 External voltage range: 0~24V Output current range: 0~50mA
CME2	Common terminal of open-circuit collector output
AI3	Analog input, voltage range: -10V~10V Input impedance: 10KΩ
AI4	Analog input: voltage (0~10V)/current (0~20mA), optional through J2; Input impedance: 10KΩ (voltage input)/250Ω (current input)

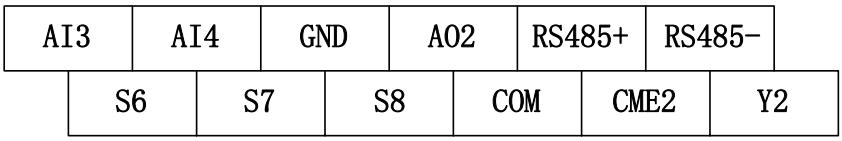
GND	Analog input signal ground
RT1~RT8 (A, B)	Eight relay outputs (normally ON contacts) Contact capacity: AC250V/5A
AO2	Analog output terminal: optional voltage or current output through jumper J3; Output range: voltage (0~10)/current (0~20mA)
RS485+, RS485-	RS485 serial communications, optional through J4;
D9 bus connector	Standard RS232 serial communications, optional through J4;

5. Jumpers

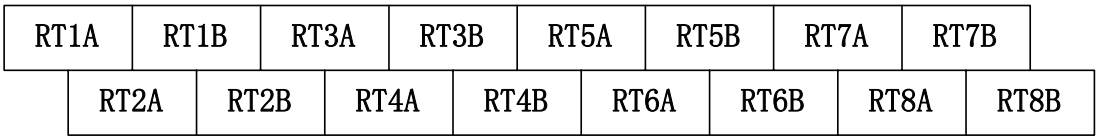
Jumper Name	Description
J2	Voltage (0~10V)/current (0~20mA) input switching jumper Short-circuiting of 1 (W) and 2 (GND) indicates the voltage input; Short-circuiting of 2 (GND) and 3 (I) indicates the current input;
J3	Voltage (0~10V)/current (0~20mA) output switching jumper Short-circuiting of 1 (W) and 2 (GND) indicates the voltage output; Short-circuiting of 2 (GND) and 3 (I) indicates the current output;
J4	RS485/RS232 input/output selection jumper Short-circuiting of 1 and 2 indicates communications through RS232 port Short-circuiting of 2 and 3 indicates communications through RS485 port

6. Schematic Diagram of Terminal Sequence

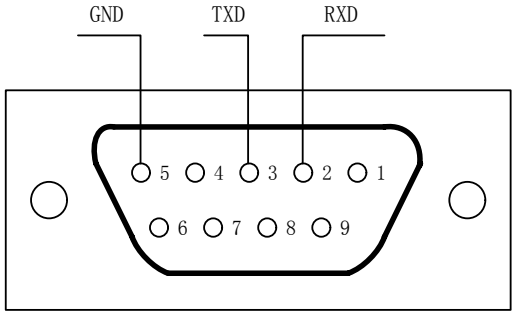
6.1 Sequence Schematic Diagram of Functional Terminals



6.2 Sequence Schematic Diagram of Relay Output Terminals



6.3 Schematic Diagram of Standard RS232 Serial Wiring Terminals



7. Control Functions of CHV Water Supply Card

7.1 Preface

In the field that needs constant pressure liquid supply, the water supply card can be used for accurate constant pressure control to maintain a constant pressure in pipes. For example, water supply of waterworks, pressurizing system in water supply stations, spray irrigation systems, and tall buildings such as residential communities, hotels and restaurants, industrial constant pressure water supply systems, sewage treatment systems and pressurizing systems for oil transfer pipes and so on.

7.2 Product Description

CHV water supply card is based on the CHV series high-performance vector inverters, and is added with a dedicated constant pressure water supply control module to implement constant liquid pressure of pipes. The combination of CHV water supply card and CHV series high-performance vector inverters is equivalent to a professional constant pressure water supply system. Compared with the traditional constant pressure water supply controller, it features simpler system, lower cost, more convenient maintenance and more stable control.

The water supply card control system is a professional system. Before using the water supply card, please carefully read the detailed description of following functional parameters.

7.3 Detailed Description of Functional Parameters

Note: To browse and modify the following functional codes, user should have a dedicated water supply control card.

PF.00	Water Supply Mode Selection		Default Value	0
	Setting Range	0	Invalid	
		1	Universal water supply mode	
		2	Reserved	

This parameter is used for user to select the water supply mode.

0: Invalid

The water supply card is invalid.

1: Universal water supply mode

Applicable to a common constant pressure water supply system, for example, constant pressure water supply for life and production, public water supply system and sewage treatment system;

In addition, this mode can also be selected for other similar systems, such as constant pressure oil supply systems and constant pressure ventilation systems.

2: Reserved

This functional parameter is reserved for future function extension.

PF.01	Water Supply Pressure Setting Source Selection		Default Value	0
	Setting Range	0	Digital Setting	
		1	AI1 setting	
		2	AI2 setting	
		3	AI3 setting	
		4	AI4 setting	
		5	HDI1 setting	
		6	Remote communication setting	
		7	Periodic water supply setting	

Given pressure setting for constant pressure system:

0: Digital Setting

PF.02 keyboard is used to set the pressure.

1: AI1 setting

2: AI2 setting

3: AI3 setting

4: AI4 setting

Pressure is given by the analog input. This pressure setting is the same as analog input in the A-frequency command selection on a universal inverter. The only difference is the setting input is pressure.

5: HDI1 setting

Pressure is set by high-speed pulse input at the terminal. This pressure setting is the same as high-speed pulse setting in the A-frequency command selection on a universal inverter. The only difference is that the setting input is pressure.

6: Remote communication setting

The pressure is given by the communication mode of PC. For details, refer to ModBus Communication Protocol of CHV Series Inverters.

7: Periodic water supply setting

The pressure is given by multi-stages pressure setting: set by PF.47~PF.64.

The target values of above-mentioned pressures are relative values. The setting 100% corresponds to 100% of the feedback pressure.

The system makes operation according to the relative values (0~100%) all the time.

PF.02	Digital Setting of Water Supply Pressure		Default Value	0.0%
	Setting Range	0.0%~100.0%		

The pressure is given by the keyboard. 100% corresponds to 100% of the feedback pressure.

PF.03	Pressure Feedback Source Selection		Default Value	0
	Setting Range	0	AI1 setting	
		1	AI2 setting	
		2	AI3 setting	
		3	AI4 setting	
		4	HDI1 setting	
		5	Remote communication feedback setting	

This parameter is used to select the feedback pressure channel. This selection is the same as the water supply power setting source selection.

Note: The pressure setting source selection should not be repeated with the pressure feedback source selection; otherwise, the water supply card cannot control effectively.

PF.04	Pressure Regulation Type Selection		Default Value	0
	Setting Range	0	Positive pressure regulation type	
		1	Negative pressure regulation type	

- Positive pressure regulation type: if the feedback pressure is greater than the given pressure, the output frequency of inverter should be decreased so that the control pressure can reach balance.
- Negative pressure regulation type: if the feedback pressure is greater than the given pressure, the output frequency of inverter should be increased so that the control pressure can reach balance.

PF.05	Proportional Gain (Kp)		Default Value	0.10
	Setting Range	0.00~100.00		
PF.06	Integral time (Ti)		Default Value	0.10
	Setting Range	0.01~10.00s		
PF.07	Derivative time (Td)		Default value	0.00
	Setting Range	0.00~10.00		

- Proportional gain (Kp): determines the regulation strength of entire pressure regulator. The greater the P value, the higher the regulation strength is. If the parameter value is 100, it indicates that when the deviation of feedback pressure from the given pressure is 100%, the regulation amplitude of output frequency command by pressure regulator is the maximum frequency (ignoring the integral action and derivative action).
- Integral time (Ti): Determines speed at which the pressure regulator conducts integral regulation of the deviation of feedback pressure from the given pressure. Integral time means that when the deviation of feedback pressure from the given pressure is 100%, the adjustment value of integral regulator (ignoring the proportional action and derivative action) reaches the maximum pressure after continuous adjustment. The shorter the integral time, the higher the regulation strength.
- Derivative time (Td): Determines strength at which the pressure regulator adjusts the change

rate of the deviation of feedback pressure from the given pressure. The derivative time means that if the feedback pressure changes 100% in the period of time, the adjustment value of derivative regulator reaches the maximum pressure (ignoring the proportional action and integral action). The longer the derivative time, the higher the regulation strength is.

The pressure regulator is a PID regulator. The functions of its individual parts are different. For details, refer to the description of PID Control in Operating Instructions for CHV Series Vector Inverters.

PF.08	Sample Period (T)		Default Value	0.50s
	Setting Range	0.01~100.00s		

Sample period (T): refers to the sample period of feedback value. The regulator will make operation once every sample period. The greater the sample period, the slower the response is.

PF.09	Deviation Limit		Default Value	0.0%
	Setting Range	0.0~100.0%		

Deviation limit of pressure regulator: refers to the maximum permitted deviation for output value of the pressure regulator relative to the given pressure closed-loop value. As shown in the following figure, within the deviation limit, the pressure regulator will stop regulation. Reasonably set the accuracy and stability of the pressure system to be regulated by this functional code.

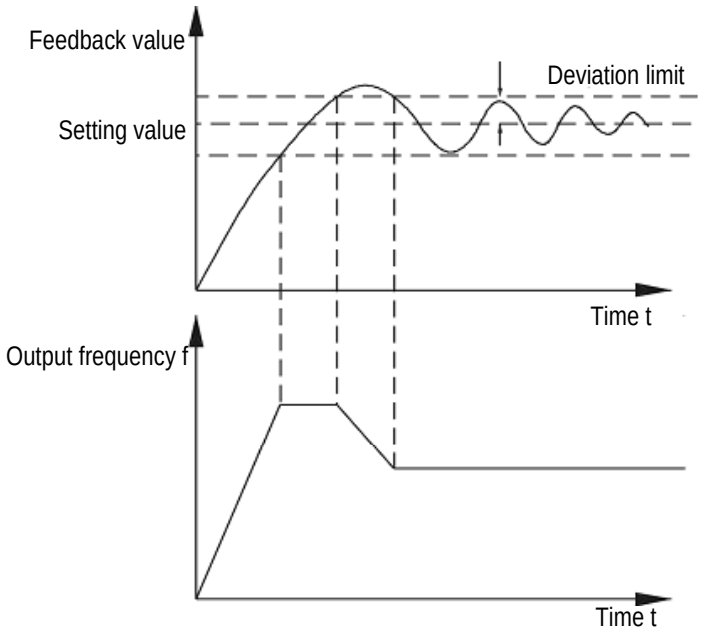


Figure 7.1 Relationship between Deviation Limit and Output Frequency.

PF.10	Output Buffer Time		Default Value	0.00s
	Setting Range	0.00~10.00s		

Pressure output buffer time: Frequency signals output by the pressure regulator are filtered to

prevent the influence of frequently-hopping disturbance signals on the system. However, if the filter time is too long, the regulation sensitivity will be affected.

PF.11	Pump A type selection	Default Value	0
PF.12	Pump B type selection	Default Value	0
PF.13	Pump C type selection	Default Value	0
PF.14	Pump D type selection	Default Value	0
PF.15	Pump E type selection	Default Value	0
PF.16	Pump F type selection	Default Value	0
PF.17	Pump G type selection	Default Value	0

	Setting Range	0	Pump invalid
		1	Variable frequency control pump
		2	Power frequency control pump
		3	Dedicated dormant pump
		4	Dedicated dredge pump

0: Pump invalid

The corresponding pump is not installed or does not participate in system operation.

1: Variable frequency control pump

The corresponding pump adopts variable-frequency start. If the pump switchover conditions are not satisfied, the pump serves as the variable regulation pump of entire constant pressure water supply system. The inverter controls the operation and automatically regulates the rotation speed of pump according to the actual pressure of system, to maintain the constant system pressure. If the switchover conditions are satisfied, the pump will switch to the power frequency operation or exit operation according to the switching mode setting.

2: Power frequency pump

The corresponding pump can only operate in power frequency mode. If the capacity of power grid is sufficient and also the pump power is lower than 15KW, can apply the direct start at full pressure. If the pump power is 18.5KW or above, it is recommended that the mode of start at decreased pressure can be used (such as star-triangle decreased pressure start, self-coupling decreased pressure start, soft start and so on) to reduce the impact upon the power grid system and the pipelines.

3: Dormant pump

The corresponding pump serves as the small dormant pump of system. If the system reaches the set dormant conditions, enters dormant operation, and automatically enter or awake dormancy according to the set dormant pressure and deviation limit.

4: Dredge pump

The corresponding pump serves as the dredge pump of system. The precondition for setting dredge pump is that the system should be configured with a sewage reservoir water level sensor, which is correctly connected to the inverter. The inverter automatically starts or stops the dredge pump

according to the water level of sewage reservoir.

Note 1: The dormant pump is valid only in the dormant water supply mode.

Note 2: The dredge pump and dormant pump can only operate in the power frequency mode.

PF.18	Rated current of pump A	Default value	0.1A
PF.19	Rated current of pump B	Default value	0.1A
PF.20	Rated current of pump C	Default value	0.1A
PF.21	Rated current of pump D	Default value	0.1A
PF.22	Rated current of pump E	Default value	0.1A
PF.23	Rated current of pump F	Default value	0.1A
PF.24	Rated current of pump G	Default value	0.1A
	Setting Range	0.1~1000.0A	

The above parameters are provided for user to set the rated current of individual motors. Please make setting according to the nameplate of motors. These parameters will affect the motor overload protection of inverter.

PF.25	RT1 output function selection	Default value	0
PF.26	RT2 output function selection	Default value	0
PF.27	RT3 output function selection	Default value	0
PF.28	RT4 output function selection	Default value	0
PF.29	RT5 output function selection	Default value	0
PF.30	RT6 output function selection	Default value	0
PF.31	RT7 output function selection	Default value	0
PF.32	RT8 output function selection	Default value	0

	Setting range	0	No function
		1	Connecting pump A for variable frequency control
		2	Connecting pump A for power frequency control
		3	Connecting pump B for variable frequency control
		4	Connecting pump B for power frequency control
		5	Connecting pump C for variable frequency control
		6	Connecting pump C for power frequency control
		7	Connecting pump D for variable frequency control
		8	Connecting pump D for power frequency control
		9	Connecting pump E for variable frequency control
		10	Connecting pump E for power frequency control
		11	Connecting pump F for variable frequency control
		12	Connecting pump F for power frequency control
		13	Connecting pump G for variable frequency control
		14	Connecting pump G for power frequency control

The above parameters are used to set output function of the relay of water supply card. The parameters have the following meanings:

Setting Value	Function	Description
0	No function	Invalid terminal
1	Connecting pump A for variable frequency control	Setting control signals for each pump: The variable frequency pump needs two control signals (variable frequency control and power frequency control), while The power frequency pump, dredge pump and dormant pump need one control signal, and furthermore, only one power frequency control signal can be set.
2	Connecting pump A for power frequency control	
3	Connecting pump B for variable frequency control	
4	Connecting pump B for power frequency control	
5	Connecting pump C for variable frequency control	
6	Connecting pump C for power frequency control	
7	Connecting pump D for variable frequency control	
8	Connecting pump D for power frequency control	
9	Connecting pump E for variable frequency control	
10	Connecting pump E for power frequency control	
11	Connecting pump F for variable frequency control	
12	Connecting pump F for variable frequency control	
13	Connecting pump G for variable frequency control	
14	Connecting pump G for power frequency control	

PF.33	Pressure tolerance for adding pump		Default value	10.0%
	Setting range	0.0~30.0%		
PF.34	Operating frequency for adding pump		Default value	50.00Hz
	Setting range	0.00~P0.08		
PF.35	Delay time for adding pump		Default value	5S
	Setting range	0~3600s		
PF.36	Switching frequency of variable frequency pump		Default value	50.00Hz
	Setting range	0.0~P0.08		

The above four groups of parameters are used for setting the necessary conditions of adding a pump:

1) If the next switching pump is power frequency pump and also when the current variable frequency pump reaches PF.34, or if the next switching pump is variable frequency pump and also when the current variable frequency pump reaches PF.36, and furthermore, if the feedback pressure < setting pressure – pressure tolerance value, and continues for the delay time set by PF.35, the pump-adding conditions are satisfied, and pump can be added.

2) The pressure tolerance 100% is the percentage relative to 100% of feedback pressure.

3) Operating frequency for PF.34 pump-adding: If no variable pump is available, and the next power frequency pump is to be added, and furthermore, when the current variable frequency pump reaches the operating frequency for pump adding, the power frequency pump can be added. If the pump is reduced, the variable frequency pump should reach this frequency to prevent pressure jumping of the pipelines.

4) Switching frequency for PF.36 variable frequency pump: After the pump-adding conditions are satisfied, if the next pump to be put into operation is the variable frequency pump, the current variable frequency pump should be switched to operate at the power frequency. Because the time delay (PF.42, PF.43) is needed from cutting off the variable frequency contactor to closing the power frequency contactor. In order to minimize the pressure fall of pipelines, firstly increase the speed of variable frequency pump to a higher rotation speed, stop the output of inverter, and then switch back to power frequency after the trip time and close time of the contactor.

PF.37	Deceleration time of variable frequency pump in case a power frequency pump is added		Default value	10.0S
	Setting range	0.0~100.0s		

When the pump adding conditions are satisfied, if the next switching pump is power frequency pump, after the switching power frequency pump is put into operation, the current variable frequency pump will firstly decelerate its speed to the lower frequency limit from the PF.34 frequency according to the set deceleration time, and then conduct pressure PID operation. This function can smoothen sudden pressure rise of pipelines caused by sudden adding power frequency pump.

PF.38	Pressure tolerance for reducing pump		Default value	10.0%
	Setting range	0.0~30.0%		
PF.39	Operating frequency for reducing pump		Default value	5.00Hz
	Setting range	P0.09~PF.34		
PF.40	Delay time for reducing pump		Default value	5S
	Setting range	0~3600s		

The above four groups of parameters are used for setting the necessary conditions when reducing pump:

1) When the variable frequency pump reaches the PF.39 operating frequency of reducing pump, and if the feedback pressure > set pressure + pressure tolerance value, and continues for the delay time set by PF.40, the conditions for reducing pump are satisfied.

2) The pressure tolerance 100% is the percentage relative to 100% of feedback pressure.

3) PF.39 operating frequency for reducing pump: if the power frequency pump is still operating, and meanwhile the current variable frequency pump reaches the operating frequency for pump reducing and also the pump reducing delay time is reached, the power frequency pump will be reduced. If the power frequency pump is added, the variable frequency pump should reach this frequency to prevent pressure jumping of pipelines.

PF.41	Acceleration time of variable frequency pump when pump reducing		Default value	10.0S
	Setting range	0.0~100.0s		

If the pump reducing conditions are satisfied, after the power frequency pump is cut off, the current variable frequency pump firstly accelerates from the lower limit frequency to the PF.34 operating

frequency of pump adding according to the set acceleration time, and then implement pressure PID operation. This function can smoothen sudden pressure rise of pipelines caused by sudden reducing of power frequency pump.

PF.42	Contactor close time		Default value	0.5S
PF.43	Contactor trip time		Default value	0.5S
	Setting range	0.1~9.9s		

During pump switching, the above parameters should be set with consideration of following factors: considering the mechanical delay of contactor close/trip, and more important, considering power frequency switching failure caused by remanence when the variable frequency pump switches to power frequency operation.

1) Contact close time refers to the time from the sending of the contactor close command to start output of inverter before the inverter starts the next variable frequency pump, with consideration of the mechanical delay of contactor.

2) Contactor trip time refers to the time from sending of the free stop command by inverter (meanwhile sending inverter contactor trip command) to the sending of power frequency contact close command. If the power is above 45KW, and the pump needs to switch from variable frequency operation to power frequency operation, this time can efficiently reduce the switching current and improve the successful switching rate.

PF.44	Switch period of power frequency pump		Default value	0h
	Setting range	0~65535h		

This parameter is used to set the periodic alternate period of power frequency pump.

If the parameter is set to be 0, the function is disabled, and the system will conduct switching according to the normal “firstly start firstly stop” principle.

If the parameter is not set to be 0, the periodic alternation of power frequency pump is enabled, and the set value is the switching period.

Please appropriately select the function when the capacity of individual power frequency pumps (except dredge pump and dormant pump) is basically the same.

If the system has two or more power frequency pumps,. All power frequency pumps (except dredge pump and dormant pump) will participate in the alternation. If the system has only one power frequency pump, no alternation is needed.

PF.45	Switch period of variable frequency pump		Default value	0h
	Setting range	0~65535h		

The setting of this parameter is similar to that of periodic alternation of power frequency pump. Refer to PF.45.

PF.46	Switching frequency in manual soft start		Default value	50.00HZ
	Setting range	0~P0.08		

This parameter is used to set the operating frequency of inverter before being switched to power frequency when the manual soft start is used.

PF.47	Current moment		Default value	
	Setting range	00.00~23.59		

When entering and modifying the time parameter, after pressing **<ENT>**, the user can set the time. The time meaning of the parameter is as follows:

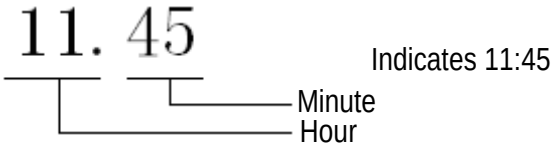


Figure 7.2 Time Display Meaning.

This time is the reference for multi-stages pressure setting moments. This time parameter is being updated at any moment.

If you enter this parameter, but do not modify the parameter, you may use it as a time table. The time will be updated every minute.

If the input or format error occurs when change time, the time will not be updated and confirmed.

PF.48	Current moment		Default value	1
	Setting range	1~8		

This parameter is used to enable pressure stages. By default, only T1 moment is enabled, that is, .twenty-four hours in the whole day are set for one pressure stage. If multi-stages are selected and enabled, it indicates that the pressure stages are pressure settings during the time segments from 00:00 to 24:00. The settings will be repeated everyday to give the pressure.

PF.49	T1 start moment		Default value	00.00
PF.51	T2 start moment		Default value	00.00
PF.53	T3 start moment		Default value	00.00
PF.55	T4 start moment		Default value	00.00
PF.57	T5 start moment		Default value	00.00
PF.59	T6 start moment		Default value	00.00
PF.61	T7 start moment		Default value	00.00
PF.63	T8 start moment		Default value	00.00
	Setting range	00.00~23.59 (but T1<T2<…..<T8)		

PF.50	Pressure in time segment T1	Default value	0.0%
PF.52	Pressure in time segment T2	Default value	0.0%
PF.54	Pressure in time segment T3	Default value	0.0%
PF.56	Pressure in time segment T4	Default value	0.0%
PF.58	Pressure in time segment T5	Default value	0.0%
PF.60	Pressure in time segment T6	Default value	0.0%
PF.62	Pressure in time segment T7	Default value	0.0%
PF.64	Pressure in time segment T8	Default value	0.0%
	Setting range	0.0~100.0%	

The above parameters are used for setting time segments and the corresponding pressures in case of multi-stages pressure water supply.

1) Time setting principle: T1≤T2≤T3≤T4≤T5≤T6≤T7≤T8.

2) Time segment T1 refers to the period from T1 start moment to T2 start moment; T2 time segment refers to the period from T2 start moment to T3 start moment, the rest may be decuced by analogy. T8 time segment refers to the period from T8 start moment to T1 start moment.

3) If the start moment of one time segment is the same as the end time of previous time segment, the time segment is invalid, and will be combined with the previous time segment into the same time segment.

4) If T1=T2=T3=T4=T5=T6=T7=T8, there is only one time segment everyday.

PF.65	Dormant time segment selection	Default value	0
	Setting range	0~255	

This parameter is used to set the time segment for dormant operation.

0: no dormant function; The dormant function is invalid, and no dormant operation will be taken.

1~255: dormant pressure stage selection, select the dormant pressure given-stage from eight time segments (T1~T8), serving as the dormant pressure stage. Pressure dormancy in multiple time segments (in binary notation) can be implemented. The setting is as follows:

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Time segment T8	Time segment T7	Time segment T6	Time segment T5	Time segment T4	Time segment T3	Time segment T2	Time segment T1

PF.66	Dormant pressure tolerance	Default value	10.0%
	Setting range	0.0~30.0%	
PF.67	Adding/reducing pump delay for dormancy	Default value	5S
	Setting range	0~3600S	
PF.68	Dormancy awake enable	Default value	0
	Setting range	0	Disabled
		1	Enabled

This parameter is used to set the start/stop conditions and awake enable during inverter dormancy.

1) If the dormant pump is operating, the feedback pressure > dormant setting pressure + PF.66, and meanwhile continues for the delay time set by PF.67, the dormant pump stops.

2) If the dormant pump is operating, the feedback pressure < dormant setting pressure - PF.66, and meanwhile continues for the delay time set by PF.67, and furthermore, if the awake function is enabled (PF.68=1), the variable frequency pump starts; if the awake function is disabled (PF.68=0), the variable frequency pump will not start but maintain the dormant operation.

3) If the dormant pump is awaken, the feedback pressure > dormant setting pressure + PF.66, and meanwhile continues for the delay time set by PF.67, the variable frequency pump will be stopped firstly.

4) If the dormant pump has already stopped (in this case the dormant pump also stops), the feedback pressure < dormant setting pressure - PF.66, and meanwhile continues for the delay time set in PF.67, the dormant pump will be restarted.

5) Operating status diagram of dormant pipeline network pressure is in the following figure.

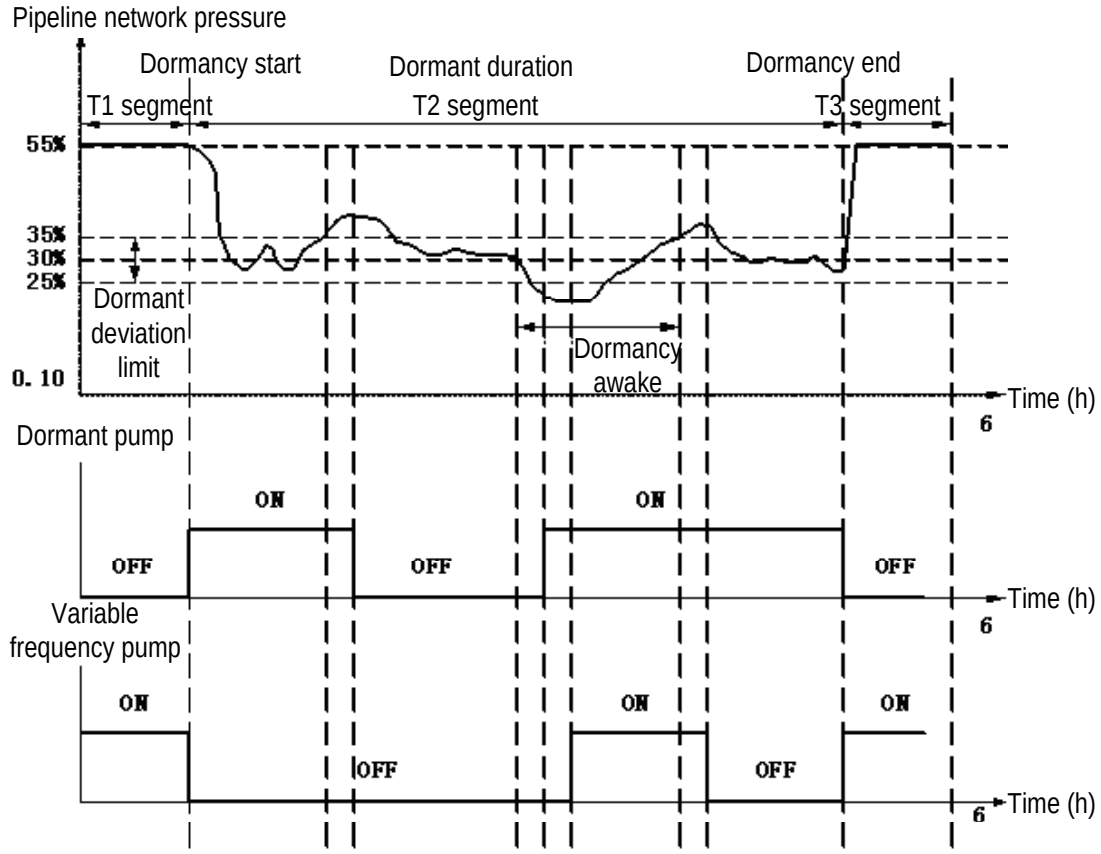


Figure 7.3 Operational Diagram of Dormant Pump and Variable Frequency Pump in Dormant Status.

Note:

T1 pressure setting: PF.49=55%

Dormant time segment selection: PF.65=2

Dormant pressure setting: PF.51=30%

Dormant pressure tolerance: PF.66=5%

Dormancy awake enable: PF.68=1

PF.69	Over-pressure protection value		Default value	90.0%
	Setting range	0.0~100.0%		
PF.70	Over-pressure delay time		Default value	500S
	Setting range	0~3600S		
PF.71	Under-pressure protection value		Default value	10.0%
	Setting range	0.0~100.0%		
PF.72	Under-pressure delay time		Default value	500S
	Setting range	0~3600S		

The above parameters are used to set the over-pressure/under-pressure pressure and over-pressure/under-pressure judgment time.

If the pipeline network pressure reaches the maximum pressure set by PF.69 and also continues for the delay time set by PF.70, the system will give an over-pressure alarm. After the alarm is given, if the pressure is lower than the over-pressure protection value, it will take PF.70 delay time to clear the alarm. The under-pressure judgment is similar to the over-pressure judgment.

PF.73	Water level signal input selection of water inlet reservoir		Default value	0
	Setting range	0	No input (no liquid level control)	
		1	Input by digital input terminal	
		2	Input by analog input terminal	

The above parameter is used to set whether to conduct water level signal control for the water inlet reservoir or not.

0: No input: No water level signal control of the water inlet reservoir will be conducted.

1: Input by digital input terminal: The water level signal of water inlet reservoir is input by the digital input terminal to control the water level.

2: Input by analog input terminal: The water level signal input of water inlet reservoir is selected by PF.74, and the water level signal boundary is determined by PF.75~PF.77 to control the water level.

Water level control mode:

1) If the water level of water inlet reservoir changes from high to low and meanwhile if the water level is higher than the lower water level limit, the system will operate according to the normal set pressure. If the water level is lower than the lower water level limit but higher than the shortage water level limit, the system will operate according to the abnormal backup pressure (PF.78). If the water level is lower than the shortage water level, the system will stop all operations.

2) If the water level of water inlet reservoir changes from high to low, before the water level is lower than the lower water level limit, the system does not operate (all pumps stop). If the water level

is higher than the lower water level limit but lower than the upper water level limit, the system will operate according to the abnormal backup pressure (PF.78). After the water level is higher than the upper water level, the system will recover normal pressure operation.

PF.74	Water level signal analog input channel selection		Default value	0
	Setting range	0	Analog AI1 input	
		1	Analog AI2 input	
		2	Analog AI3 input	
		3	Analog AI4 input	
		4	High-speed pulse HDI1 input	
		5	Remote communication input	

The above parameter is used to select the water signal analog input. This selection is the same as the selection of water supply pressure setting source.

PF.75	Upper water level limit of water inlet reservoir		Default value	50%
	Setting range	0~100%		
PF.76	Lower water level limit of water inlet reservoir		Default value	30.0%
	Setting range	0~PF.75		
PF.77	Water level of water inlet reservoir upon water shortage		Default value	10%
	Setting range	0~PF.76		

The above parameters are used to set the analog water level.

The pressure percentage is the percentage relative to the feedback pressure of water reservoir.

PF.78	Abnormal backup pressure		Default value	0.0%
	Setting range	0~1000.0%		

It can be known from the above-mentioned that, if the abnormal backup pressure state is enabled, in order to prevent the speed of water inlet pipeline from being lower than the speed of water outlet pipeline such that the water level of water reservoir drops too quickly or even the phenomenon of empty pumping of pump appears, the backup pressure should be used for operation.

PF.79	Faulty pump record		Default value	0
	Setting range	0~127 (pumps corresponding their respective bits)		

In constant pressure water supply mode, if one variable frequency pump fails, the inverter will automatically make record for the pump (accordingly, BIT=1), If PF.80 fault handling is set to be 1, set the type of corresponding pump to “disabled”, and the inverter will automatically make the faulty pump exit system operation and the pump will never participate in the switching logic.

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Reserved	Pump 7	Pump 6	Pump 5	Pump 4	Pump 3	Pump 2	Pump 1

For example, if PF.79=35D=00100011B, it indicates pumps 1, 2 and 6 have failed.

PF.80	Fault handling		Default value	0
	Setting range	0	Breakdown of the entire system	
		1	The inverter switches to the next variable frequency pump. If no variable frequency pump is available, power frequency control will be applied.	
		2	Reserved	

The above parameter is used for subsequent handling after fault.

0: the entire system breaks down. If the variable frequency pump fails, the entire system will break down. The system will not clear the pump settings. Please manually set the motor to “disabled” at the terminal.

1: The inverter switches to the next variable frequency pump. If no variable frequency pump is available, power frequency control will be applied. If variable frequency operation fails, the motor stops running, and the system will automatically start the next variable frequency pump. If no variable frequency pump is available, the power frequency pump will be loaded.

2: reserved. This function is reserved.

PF.81~PF.99	Reserved function		Default value	65535
	Setting range	0~65535		

Reserved function

Supplement of CHV Functions

P5.02	S1 terminal function selection			Default value	0
P5.03	S2 terminal function selection			Default value	0
P5.04	S3 terminal function selection			Default value	0
P5.05	S4 terminal function selection			Default value	0
P5.06	S5 terminal function selection			Default value	0
P5.07	HDI1 terminal function selection			Default value	0
P5.09	S6 terminal function selection			Default value	0
P5.10	S7 terminal function selection			Default value	0
P5.11	S8 terminal function selection			Default value	0
	Setting range	32	Manual soft start debugging		
		33	Manual round-robin command		
		34	Manual soft start of motor A		
		35	Manual soft start of motor B		
		36	Manual soft start of motor C		
		37	Manual soft start of motor D		
		38	Manual soft start of motor E		
		39	Manual soft start of motor F		
		40	Manual soft start of motor G		

		41	Motor A disabled
		42	Motor B disabled
		43	Motor C disabled
		44	Motor D disabled
		45	Motor E disabled
		46	Motor F disabled
		47	Motor G disabled
		48	Upper water level limit of water inlet reservoir
		49	Lower water level limit of water inlet reservoir
		50	Water level of water inlet reservoir upon water shortage
		51	Upper water level limit of sewage reservoir
		52	Lower water level limit of sewage reservoir
		53~55	Reserved

The above parameters are supplements to the functions of CHV input terminals.

32: Manual soft start debugging enable terminal, the user can use it to enable the whole manual soft start debugging process. To ensure debugging safety, this terminal should be set for manual soft start of each motor, and furthermore, the state of the terminal should be set to be 1 (short-connected with terminal COM).

33: Based on the equipment maintenance needs, this function can be used for manual in-process inspection. After this terminal is set and enabled, the inverter enters the in-process inspection state. Its in-process inspection process is similar to the switch of variable frequency pumps.

34~40: used to respectively manually designate variable frequency motors needing soft start, for use with the manual soft start debugging enable terminal.

If the manual soft start enable terminal and the manual soft start command of corresponding motor are enabled at the same time, the motor starts soft start by the inverter, and after reaching the switching frequency set by PF.46, it switches to power frequency operation. If manual soft start commands of several motors are enabled at the same time, the inverter will conduct soft start and switching in turn according to the close sequence of individual terminals.

41~47: Used to manually exit a motor needing repair or a faulty motor. If this command is enabled, the corresponding motor will not participate in the switching logic of system. This function is used to exit the corresponding motor by force when equipment overhaul or fault, to improve the switching efficiency of system.

48~50: Water level signal input of water inlet reservoir. If the water level of water inlet reservoir changes from high to low and meanwhile if the water level is higher than the lower water level limit, the system will operate according to the normal set pressure. If the water level is lower than the lower water level limit but higher than the water level of water shortage, the system will operate according to the abnormal backup pressure. If the water level is lower than the shortage water level, the system will stop all operations (all pumps stop). If the water level of water inlet reservoir changes from low to high, when

the water level is lower than the lower water level limit, the system does not operate (all pumps stop). If the water level is lower than the lower water level limit but higher than the upper water level limit, the system will operate according to the abnormal backup pressure. After the water level is higher than the lower water level, the system will recover normal pressure operation.

51~52: Water level signal input of water inlet reservoir. If the water level of sewage reservoir is higher than the upper water level limit, the dredge pump is put into operation; if the water level is lower than the lower water level limit, the dredge pump stops operation.

53~55: Reserved function

P6.01	Y1 output selection		Default value	0
P6.02	Y2 output selection		Default value	0
P6.03	HDO open-circuit collector output selection		Default value	0
P6.04	Relay 1 output selection		Default value	0
P6.05	Relay 2 output selection		Default value	0
	Setting range	20	Over-pressure indication	
		21	Under-pressure indication	
		22	Dormant operation indication	
		23	Backup pressure operation indication	
		24	Water shortage indication of water reservoir	
		25	Faulty pump indication	
		26~31	Reserved	

The above parameters are supplements to functions of CHV output terminals.

20: If the pipeline network pressure reaches or exceeds the PF.69 over-pressure protection value and continues for the over-pressure delay time set by PF.70, the signal will be enabled.

21: If the pipeline network pressure reaches or lower than the PF.71 under-pressure protection value and continues for the under-pressure delay time set by PF.72, the signal will be enabled.

22: In dormant operation state, the dormant operation indication signal will be enabled.

23: If the system reaches the backup pressure operation conditions (for details, refer to the water level signal input function), the system will operate according to the backup pressure, and this signal is enabled.

24: If the water level of water inlet reservoir is lower than the shortage water level, the signal will be enabled.

25: If PF.79 is not zero (faulty pump appears), the signal will be enabled.

Note:

Please refer to Operating Instructions for CHV Series Vector Inverters.

7.4 List of Control Functions of Water Supply Card

(For related IDs, refer to the operating instructions)

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
PF.00	Water supply mode selection	0: Disabled 1: Universal water supply mode 2: Reserved	0~2	0	◎	Water supply mode	334
PF.01	Water supply pressure setting source selection	0: Digital Setting (PF.02) 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: AI4 setting 5: HDI1 setting 6: Remote communication setting 7: Periodic water supply setting	0~7	0	◎	Water supply pressure setting source selection	335
PF.02	Digital setting of water supply pressure	0.0~100.0%	0.0~100.0	0.0%	O	pressure setting	336
PF.03	Pressure feedback source selection	0: AI1 feedback setting 1: AI2 feedback setting 2: AI3 feedback setting 3: AI4 feedback setting 4: HDI1 feedback setting 5: Remote communication feedback setting	0~5	0	◎	Feedback source selection	337
PF.04	Pressure regulation type selection	0: Positive pressure regulation type 1: Negative pressure regulation type	0~1	0	◎	Pressure regulation selection	338
PF.05	Proportional gain (Kp)	0.00~100.00	0.00~100.00	0.10	O	Proportional gain	339
PF.06	Integral time (Ti)	0.01~10.00s	0.01~10.00	0.10	O	Integral time (Ti)	340
PF.07	Differential time (Td)	0.00~10.00s	0.00~10.00	0.00	O	Differential time	341
PF.08	Sample period	0.01~100.00s	0.01~100.00	0.50s	O	Sample period	342
PF.09	Deviation limit	0.0~100.0%	0.0~100.0	0.0%	O	Deviation limit	343

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
PF.10	Output buffer time	0.00~10.00s	0.00~10.00	0.00s	O	Buffer time	344
Pump Type Selection							
PF.11	Pump A type selection	0: Pump invalid 1: Variable frequency control pump 2: Power frequency control pump 3: Dedicated dormant pump 4: Dedicated dredge pump	0~4	0	◎	Pump A selection	345
PF.12	Pump B type selection			0	◎	Pump B selection	346
PF.13	Pump C type selection			0	◎	Pump C selection	347
PF.14	Pump D type selection			0	◎	Pump D selection	348
PF.15	Pump E type selection			0	◎	Pump E selection	349
PF.16	Pump F type selection			0	◎	Pump F selection	350
PF.17	Pump G type selection			0	◎	Pump G selection	350
PF.18	Rated current of pump A	0.1~1000.0A	0.1~1000.0	0.1A	◎	Rated current of pump A	352
PF.19	Rated current of pump B	0.1~1000.0A	0.1~1000.0	0.1A	◎	Rated current of pump B	353
PF.20	Rated current of pump C	0.1~1000.0A	0.1~1000.0	0.1A	◎	Rated current of pump C	354
PF.21	Rated current of pump D	0.1~1000.0A	0.1~1000.0	0.1A	◎	Rated current of pump D	355
PF.22	Rated current of pump E	0.1~1000.0A	0.1~1000.0	0.1A	◎	Rated current of pump E	356
PF.23	Rated current of pump F	0.1~1000.0A	0.1~1000.0	0.1A	◎	Rated current of pump F	357
PF.24	Rated current of pump G	0.1~1000.0A	0.1~1000.0	0.1A	◎	Rated current of pump G	358
Relay Output Definition							

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
PF.25	RT1 output function selection	0: No function 1: Connecting pump A for variable frequency control 2: Connecting pump A for power frequency control 3: Connecting pump B for variable frequency control 4: Connecting pump B for power frequency control 5: Connecting pump C for variable frequency control 6: Connecting pump C for power frequency control 7: Connecting pump D for variable frequency control 8: Connecting pump D for power frequency control 9: Connecting pump E for variable frequency control 10: Connecting pump E for power frequency control 11: Connecting pump F for variable frequency control 12: Connecting pump F for variable frequency control 13: Connecting pump G for variable frequency control 14: Connecting pump G for power frequency control	0~14	0	◎	RT1 selection	359
PF.26	RT2 output function selection			0	◎	RT2 selection	360
PF.27	RT3 output function selection			0	◎	RT3 selection	361
PF.28	RT2 output function selection			0	◎	RT4 selection	362
PF.29	RT5 output function selection			0	◎	RT5 selection	363
PF.30	RT6 output function selection			0	◎	RT6 selection	364
PF.31	RT7 output function selection			0	◎	RT7 selection	365
PF.32	RT8 output function selection			0	◎	RT8 selection	366
Pump Adding/Reduction Operation							
PF.33	Pressure	0.0~30.0%	0.0~	10.0%	O	Pump	367

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
	tolerance for adding pump		30.0			adding tolerance	
PF.34	Operating frequency for adding pump	0.00 Hz~P0.08	0.00~ P0.08	50.00Hz	O	Pump adding frequency	368
PF.35	Delay time for adding pump	0~3600s	0~3600	5s	O	Pump adding delay	369
PF.36	Switching frequency of variable frequency pump	0~upper frequency limit (P0.08)	0~P0.0 8	50.00Hz	O	Switching frequency	370
PF.37	Deceleration time of variable frequency pump in case a power frequency pump is added	0.0~100.0s	0.0~ 100.0	10.0s	O	Deceleratio n time of variable frequency pump	371
PF.38	Pressure tolerance for reducing pump	0.0~30.0%	0.0~ 30.0	10.0%	O	Pump reduction tolerance	372
PF.39	Operating frequency for reducing pump	Lower frequency limitP0.09~PF.34	P0.09~ PF.34	5.00 Hz	O	Pump reduction frequency	373
PF.40	Delay time for reducing pump	0~3600s	0~3600	5s	O	Pump reduction delay	374
PF.41	Acceleration time of variable frequency pump upon pump reducing	0.0~100.0s	0.0~ 100.0	10.0s	O	Accelerati on time of variable frequency pump	375
PF.42	Contactor close time	0.1~9.9s	0.1~9.9	0.5s	O	Close delay	376
PF.43	Contactor trip time	0.1~9.9s	0.1~9.9	0.5s	O	Trip delay	377
PF.44	Switch period of power	0~65535h (0: Disabled)	0~ 65535	0 h	◎	Switch period of	378

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
	frequency pump					power frequency pump	
PF.45	Switch period of variable frequency pump	0~65535h (0: Disabled)	0~65535	0 h	◎	Switch period of variable frequency pump	379
PF.46	Switching frequency in manual soft start	0~upper frequency limit (P0.08)	0~P0.08	50.00Hz	◎	Switching frequency in manual soft start	380
Multi-stages Pressure Setting							
PF.47	Current moment	00.00~23.59	00.00~23.59		O	Current moment	381
PF.48	Selection of pressure steps	1~8	1~8	1	O	Pressure steps	382
PF.49	T1 start moment	00.00~23.59	00.00~23.59	00.00	O	T1 start moment	383
PF.50	Pressure in time segment T1	0.0~100.0%	0.0~100.0	0.0%	O	Pressure in time segment T1	384
PF.51	T2 start moment	PF.49~23.59	PF.49~23.59	00.00	O	T2 start moment	385
PF.52	Pressure in time segment T2	0.0~100.0%	0.0~100.0	0.0%	O	Pressure in time segment T2	386
PF.53	T3 start moment	PF.51~23.59	PF.51~23.59	00.00	O	T3 start moment	387
PF.54	Pressure in time segment T3	0.0~100.0%	0.0~100.0	0.0%	O	Pressure in time segment T3	388
PF.55	T4 start moment	PF.53~23.59	PF.53~23.59	00.00	O	T4 start moment	389
PF.56	Pressure in time segment T4	0.0~100.0%	0.0~100.0	0.0%	O	Pressure in time segment T4	390
PF.57	T5 start moment	PF.55~23.59	PF.55~23.59	00.00	O	T5 start moment	391
PF.58	Pressure in time segment	0.0~100.0%	0.0~100.0	0.0%	O	Pressure in time	392

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
	T5					segment T5	
PF.59	T6 start moment	PF.57~23.59	PF.57~ 23.59	00.00	O	T6 start moment	393
PF.60	Pressure in time segment T6	0.0~100.0%	0.0~ 100.0	0.0%	O	Pressure in time segment T6	394
PF.61	T7 start moment	PF.59~23.59	PF.59~ 23.59	00.00	O	T7 start moment	395
PF.62	Pressure in time segment T7	0.0~100.0%	0.0~ 100.0	0.0%	O	Pressure in time segment T7	396
PF.63	T8 start moment	PF.61~23.59	PF.61~ 23.59	00.00	O	T8 start moment	397
PF.64	Pressure in time segment T8	0.0~100.0%	0.0~100 .0	0.0%	O	Pressure in time segment T8	398
Dormant Control							
PF.65	Dormant time segment selection	0: No dormant function1~255	0~255	0	O	Dormant mode	399
PF.66	Dormant pressure tolerance	0.0~30.0%	0.0~ 30.0	10.0%	O	Dormant tolerance	400
PF.67	Adding/reducing pump delay for dormancy	0~3600s	0~3600	5s	O	Dormant delay	401
PF.68	Dormancy awake enable	0: disabled 1: enabled	0~1	0	◎	Dormancy awake	402
Fault and Protection							
PF.69	Over-pressure protection value	0.0~100.0%	0.0~ 100.0	90.0%	O	Maximum pressure	403
PF.70	Over-pressure delay time	0~3600s	0~3600	500s	O	Over-pressure delay	404
PF.71	Under-pressure protection value	0.0~100.0%	0.0~ 100.0	10.0%	O	Minimum pressure	405
PF.72	Under-pressure delay time	0~3600s	0~3600	500s	O	Under-pressure	405

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
						delay	
PF.73	Water level signal input selection of water inlet reservoir	0: No input (no liquid level control) 1: Input by digital input terminal 2: Input by analog input terminal	0~2	0	◎	Water level signal input selection	407
PF.74	Water level signal analog input channel selection	0: Analog AI1 input 1: Analog AI2 input 2: Analog AI3 input 3: Analog AI4 input 4: High-speed pulse HDI1 input 5: Remote communication input	0~5	0	◎	Water level signal analog input channel selection	408
PF.75	Upper water level limit of water inlet reservoir	0~100%	0~100 %	50%	O	Upper water level limit	409
PF.76	Lower water level limit of water inlet reservoir	0~ PF.75	0~ PF.75	30%	O	Lower water level limit	410
PF.77	Water level of water inlet reservoir upon water shortage	0~ PF.76	0~ PF.76	10%	O	Shortage water level	411
PF.78	Abnormal backup pressure	0~100.0%	0~ 100.0%	0.0%	O	Backup pressure	412
PF.79	Faulty pump record	0~127 (pumps corresponding their respective bits)	0~127		•	Faulty pump record	413
PF.80	Fault handling	0: Breakdown of the entire system 1: The inverter switches to the next variable frequency pump. If no variable frequency pump is available, power frequency control will be applied. 2: Reserved	0~2	0	◎	Fault handling	414

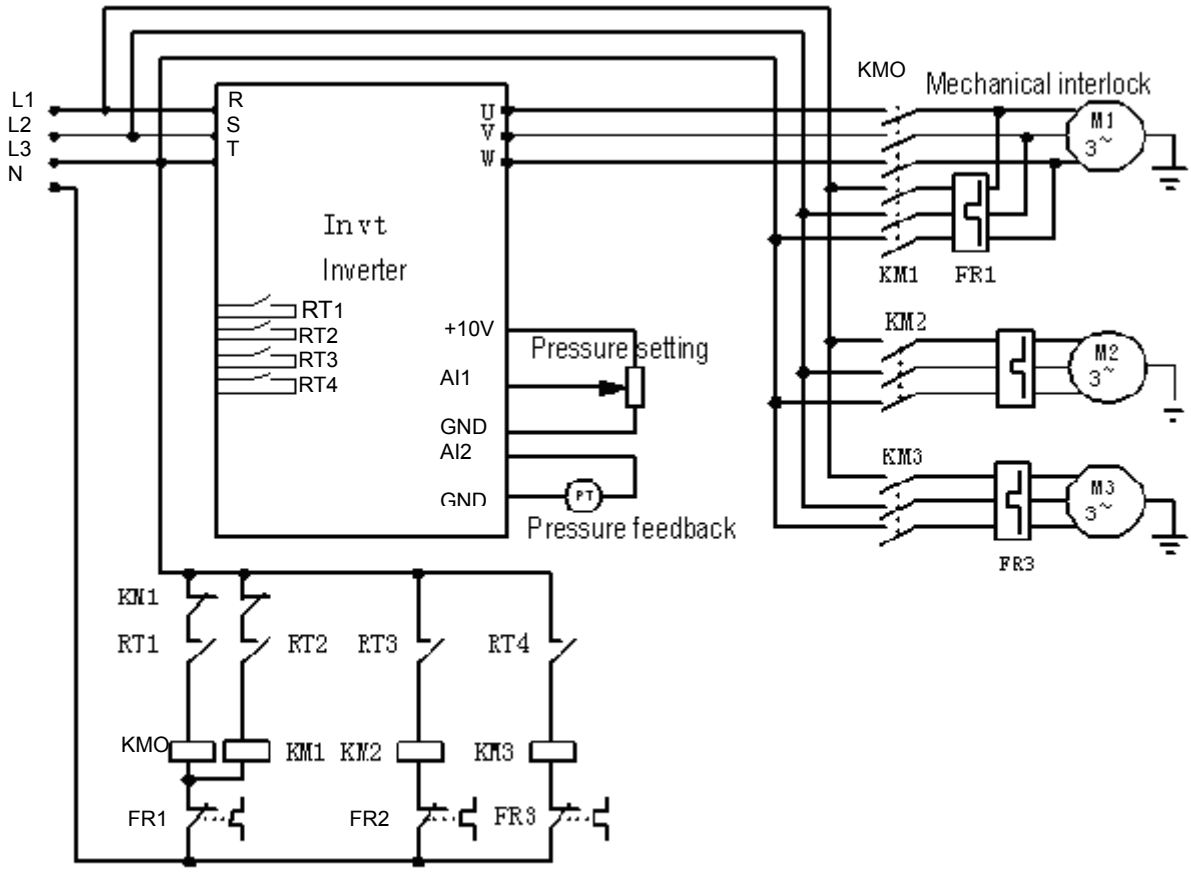
Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
PF.81~ PF.99	Reserved function	0~65535	0~ 65535	65535	O	Reserved function	415~ 433
Supplement to CHV Functions							
P5.02	S1 terminal function selection	32: Manual soft start debugging 33: Manual round-robin command 34: Manual soft start of motor A 35: Manual soft start of motor B 36: Manual soft start of motor C 37: Manual soft start of motor D 38: Manual soft start of motor E 39: Manual soft start of motor F 40: Manual soft start of motor G 41: Motor A disabled 42: Motor B disabled 43: Motor C disabled 44: Motor D disabled 45: Motor E disabled 46: Motor F disabled 47: Motor G disabled 48: Upper water level limit of water inlet reservoir 49: Lower water level limit of water inlet reservoir 50: Water level of water inlet reservoir upon water shortage 51: Upper water level limit of sewage reservoir 52: Lower water level limit of sewage reservoir 53~55: Reserved	0~55	0	◎		77
P5.03	S2 terminal function selection			0	◎		78
P5.04	S3 terminal function selection			0	◎		79
P5.05	S4 terminal function selection			0	◎		80
P5.06	S5 terminal function selection			0	◎		81
P5.07	HDI1 terminal function selection			0	◎		82
P5.09	S6 terminal function selection			0	◎		84
P5.10	S7 terminal function selection			0	◎		85
P5.11	S8 terminal function selection			0	◎		86

Functional Code	Name	Detailed Parameter Description	Setting Range	Default Value	Change	LCD Display	Serial No.
P6.01	Y1 output selection	20: Over-pressure indication 21: Under-pressure indication 22: Dormant Operation indication 23: Backup pressure operation indication 24: Water shortage indication of water reservoir 25: Faulty pump indication 26~31: Reserved	0~25	0	O		123
P6.02	Y2 output selection			0	O		124
P6.03	HDO open-circuit collector output selection			0	O		125
P6.04	Relay 1 output selection			0	O		126
P6.05	Relay 2 output selection			0	O		127

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

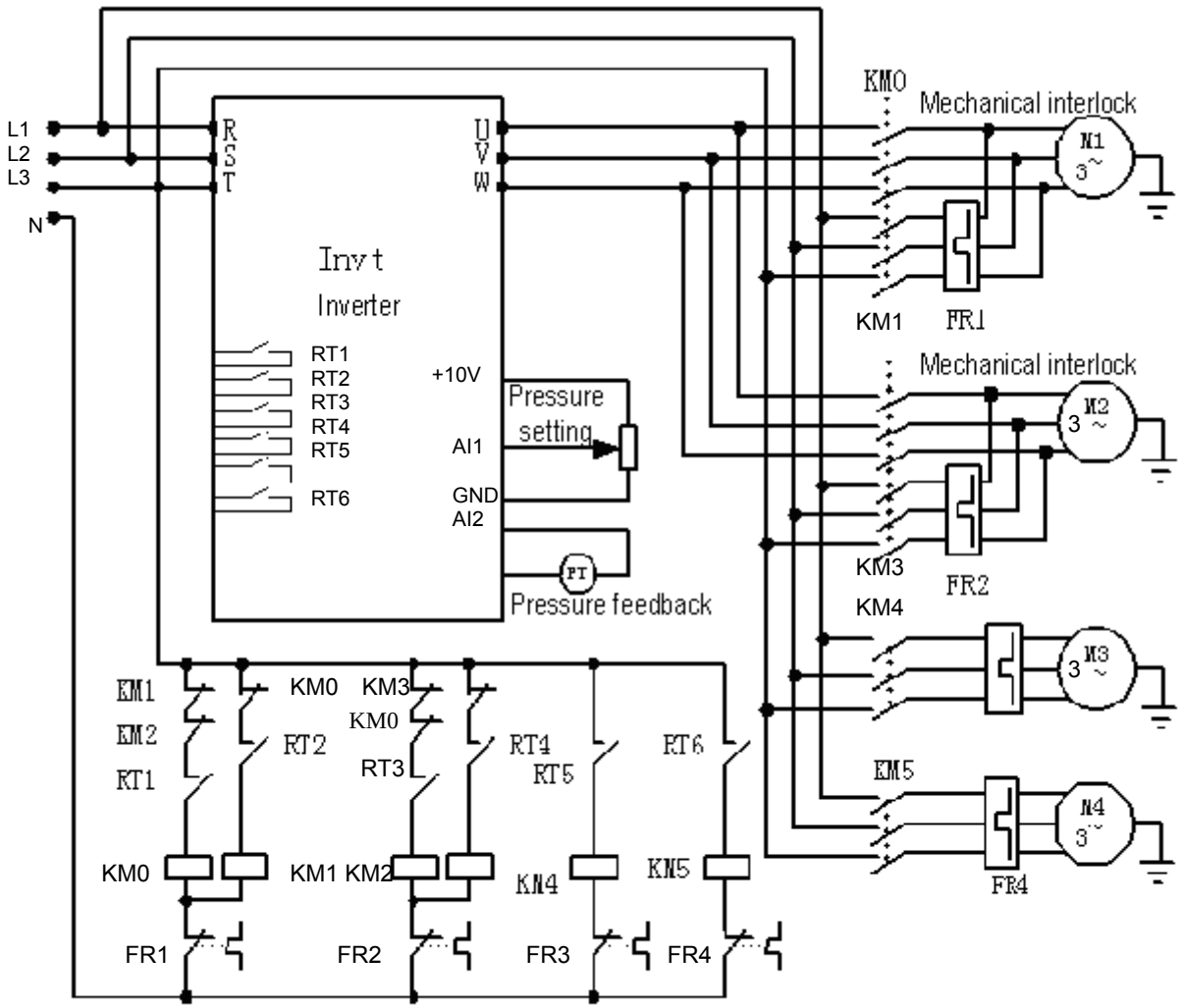
9. Typical Application and Electric Wiring Diagram

1: If one variable frequency pump is used:



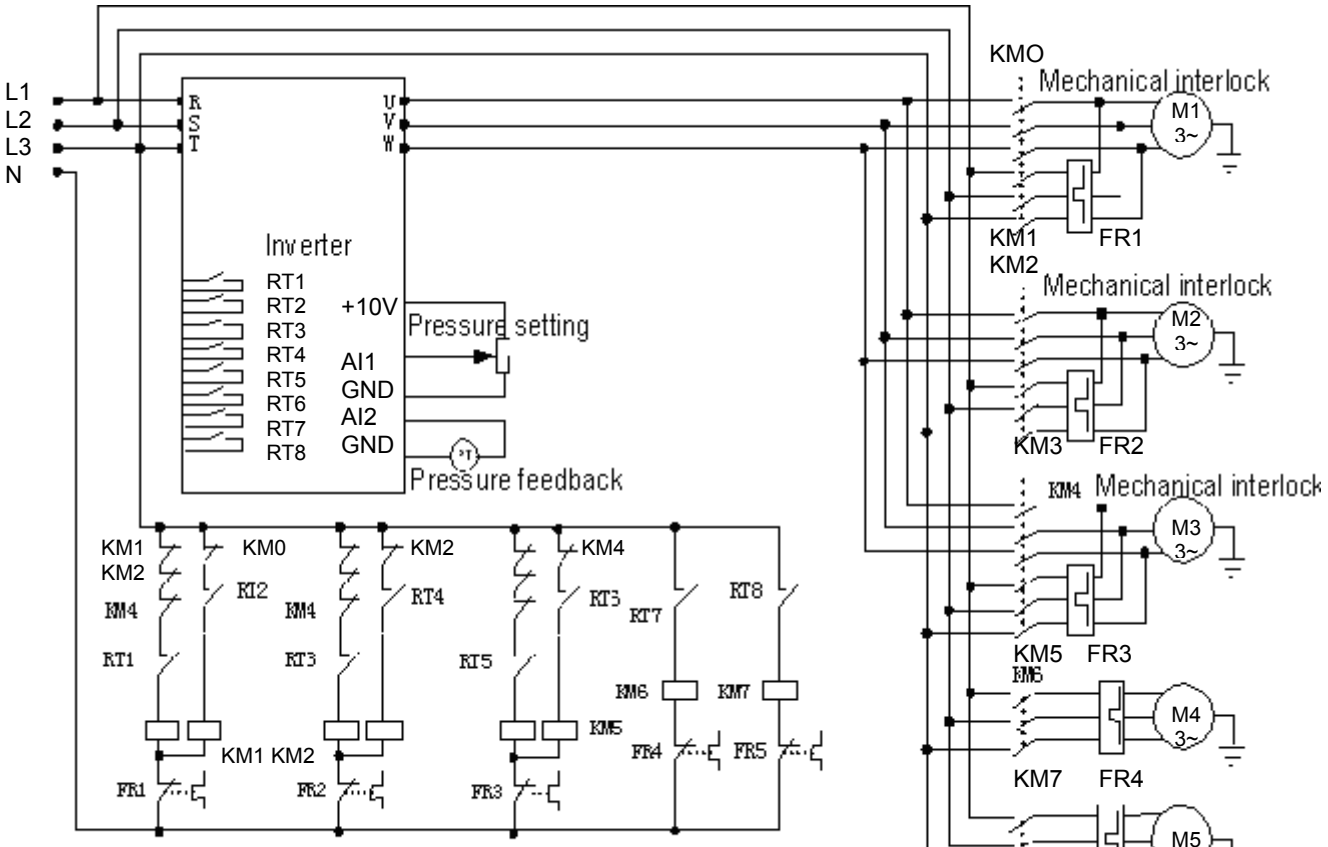
Wiring diagram for the connection of water supply card to one variable frequency pump and multiple power frequency pumps

2: If two variable frequency pumps are used:



Wiring diagram for the connection of water supply card to two variable frequency pumps and multiple power frequency pumps

3: If three variable frequency pumps are used:



Wiring diagram for the connection of water supply card to three variable frequency pumps and multiple power frequency pumps