INSTRUCTION MANUAL
使用說明書

TECO INVERTER

220V Class 1Ø 0.5~3HP
0.4~2.2KW

220V Class 3Ø 0.5~40HP
0.4~30 KW

440V Class 3Ø 1~75HP
0.75~55 KW

TECO CVP PUMP

恆壓泵浦專用機
For constant-pressure pump

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Preface

0.1 Preface

To extend the performance of the product and ensure your safety, please read this manual thoroughly before using the inverter. Should there be any problem in using the product and can not be solved with the information provided in the manual, contact your nearest Teco's distributor or our sales representatives who will be willing to help you. Please keep using Teco's products in the future.

※ Precautions

The inverter is an electrical electronic product. For your safety, there are symbols such as "Danger", "Caution" in this manual to remind you to pay attention to safety instructions on handling, installing, operating, and checking the inverter. Be sure to follow the instructions for highest safety.

Danger	Indicates a potential hazard could cause death or serious personal injury if misused.
⚠ Caution	Indicates that the inverter or the mechanical system might be damaged if misused.

Danger
● Do not touch any circuit boards or components if the charging indicator is still lit after turned the power off. ● Do not wire when the inverter is electrified. Do not check parts and signals on circuit boards during the inverter operation. ● Do not disassemble the inverter and modify internal wires, circuits and parts. Ground the ground terminal of the inverter properly. As for 200V class ground to 100 Ω or below, 400v class ground to 10Ω or below.

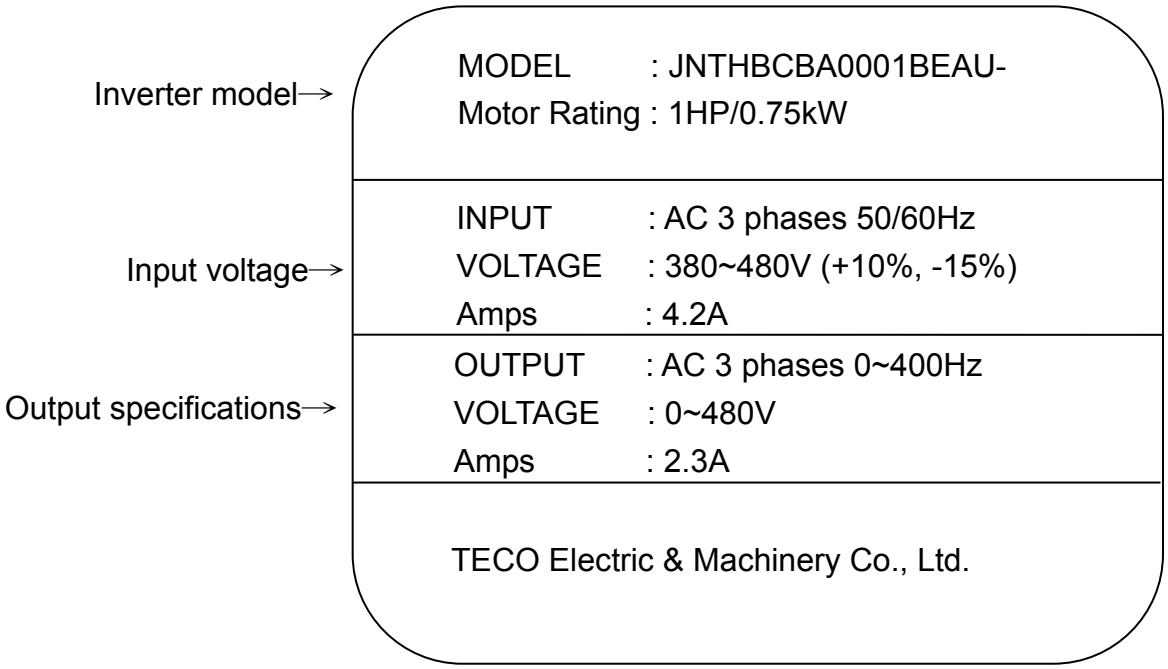
⚠ Caution
● Do not perform a voltage test on parts inside the inverter. High voltage will easily destroy these semiconductor parts. ● Do not connect T1 (U), T2 (V), and T3 (W) terminals of the inverter to AC power supply. ● CMOS ICs on the inverter's main board are susceptible to static electricity. Do not touch the main circuit board

※Products Inspection

TECO's inverters are all passed the function test before delivery. Please check the followings when you received and unpacked the inverter:

- The model and capacity of the inverter are the same as those specified in your purchase order.
- Check where there are any damages caused by transportation. Please do not apply the power, and do contact Teco's sales representatives if any of the above problems happened.

Chapter 1 Definition of Model



JNTH BC BA 0001 AC A U F

Series:

Keypad Panel
BC : LED
BG : LCD
BL : BLIND

Enclosure :
BA : IP00 or IP20
BB : NEMA1

Horsepower :
R500 : 0.5 HP
0001 : 1.0 HP
0002 : 2.0 HP
0003 : 3.0 HP
0005 : 5.0 HP
7R50 : 7.5 HP
0010 : 10 HP
0015 : 15 HP
0020 : 20 HP
0025 : 25 HP
0030 : 30 HP
0040 : 40 HP
0050 : 50 HP
0060 : 60 HP
0075 : 75 HP

Power supply
AC: Single phase 220V
BC: Three phase 220V
BE: Three phase 440V

UL Approval :
U : YES

Noise Filter :
- : None
F : Built-in

A: CVP Series
Constant-pressure
pump type inverter

Chapter 2 Safety Precautions

2.1 Operation Precaution

2.1.1 Before Power ON

⚠ Caution
The line voltage applied must comply with the inverter's specified input voltage.

Danger
Make sure the main circuit connections are correct. L1(L), L2 and L3(N) are power-input terminals and must not be mistaken for T1, T2 and T3. Otherwise, the inverter might be damaged.

⚠ Caution
• To avoid the front cover from disengaging, do not pull the cover during handling for the heat sink should be fallen off. Accident falling down will damage the inverter or injure to person, which should be avoided. • To avoid the risk of fire, do not install the inverter on a flammable object. Install it on nonflammable object such as metal. • If several inverters are placed in the same control panel, add extra heat sink to keep the temperature below 40 degree C to avoid overheat or fire. • When removing or installing the operator, turn OFF the power first, and manipulate the operator following the instruction of the diagram to avoid operator error or no display caused by bad contact.

Warning
This is a product of the restricted sales distribution class according to IEC 61800-3. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

⚠ Caution
To ensure the safety of peripheral devices, it is strongly command to install a fast acting fuse in the input side especially for higher output system. Regarding the specification of fast acting fuse, please refer to P7.

2.1.2 During Power ON

Danger

Do not plug or unplug the connectors on the inverter when electrified to avoid the control panel damage resulting from erratic transition voltage surge due to contact bounce.

2.1.3 Before Operation

Caution

The inverter will flash the power voltage 5 seconds when applying power.

2.1.4 During Operation

Danger

Do not engage or disengage the motor during operation. Otherwise, the over-current will cause the inverter to disconnect or the main circuit to burn.

Danger

- To avoid electric shock, do not take the front cover off during electrifying
- The motor will restart automatically after stop when auto-restart function is on. In this case, do not get close to the machine.
- Note: The stop switch is different from the usage of the emergency stop switch. It must be set first to be effective.

Caution

- Do not touch heat-generating components such as heat sink and braking resistor.
- The inverter can drive the motor running from low speed to high speed. Verify the allowable capacities range of the motor and the mechanism.
- Note the settings related to the braking reactor.
- Do not check signals on circuit boards while the inverter is running.

Caution

It is after 5 minutes that disassembling or checking the components could be performed as power supply OFF and the indicator turned off.

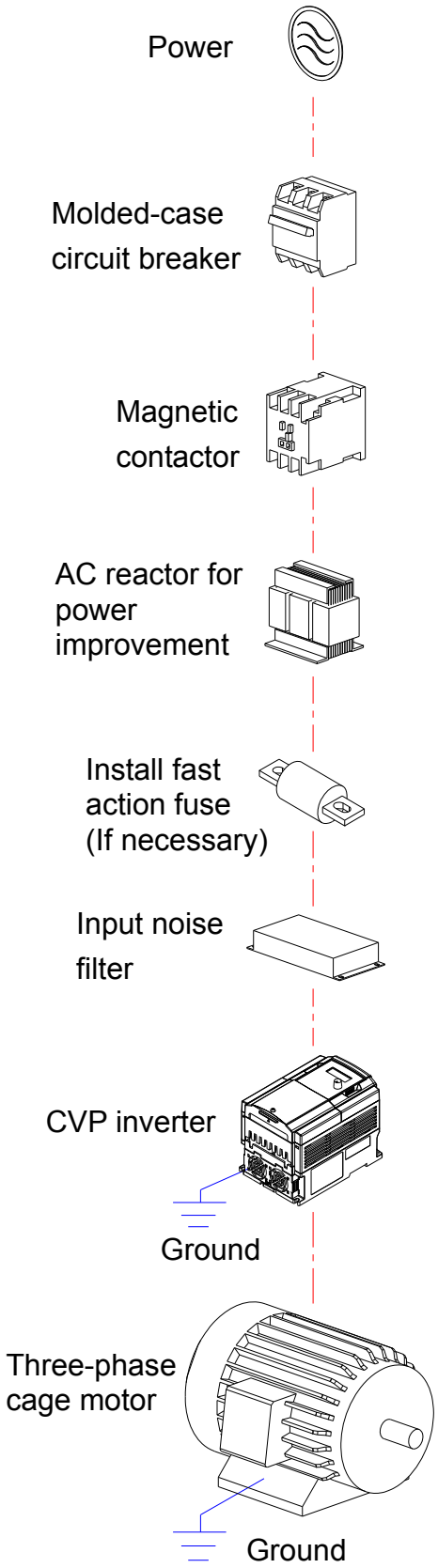
2.1.5 During Maintenance

⚠ Caution
The inverter should be used in a non-condensed environment with temperature from –10 degree C to +40 degree C and relative humidity of 95% non-condense.

⚠ Caution
When the inverter top cover has removed, it can be used in a non-condensed environment with temperature from –10 degree C to +50 degree C and relative humidity of 95%, but the environment should be free from water and metal dust.

Chapter 3 Notice for wiring

3.1 Precautions for Peripheral Applications



Power supply:

- Make sure the voltage applied is correct to avoid damaging the inverter.
- A molded-case circuit breaker must be installed between the AC source and the inverter

Molded-case circuit breaker:

- Use a molded-case circuit breaker that conforms to the rated voltage and current of the inverter to control the power ON/OFF and protect the inverter.
- Do not use the inverter as the switch for run/stop switch.

Leakage breaker:

- Install a leakage breaker to prevent error operation caused by electric leakage and to protect operators
- Setting current should be 200mA or above and the operating time at 0.1 second or longer to prevent malfunction.

Magnetic contactor:

- Normal operations do not need a magnetic contactor. But a contactor has to be installed in primary side when performing functions such as external control and auto restart after power failure, or when using brake controller.
- Do not use the magnetic contactor as the run/stop switch of the inverter.

AC reactor for power improvement:

- When inverters below 200V/400V 15KW are supplied with high capacity (above 600KVA) power source or an AC reactor can be connected to improve the power performance.

Install fast action fuse (If necessary):

- To ensure the safety of peripheral devices, please install the fast action fuse. Regarding the specification, please refer to P7.

Input noise filter:

- A filter must be installed when there are inductive load around the inverter

Inverter:

- Input power terminals L1, L2, and L3 can be used in any sequence regardless of phases.
- Output terminals T1, T2, and T3 are connected to U, V, and W terminals of the motor. If the motor is reversed while the inverter is forward, just swap any two terminals of T1, T2, and T3.
- To avoid damaging the inverter, do not connect the input terminals T1, T2, and T3 to AC power.
- Connect the ground terminal properly. 200 V series: class 3 grounding, <100Ω; 400 V series : <10Ω.

3.2 Fuse types:

Drive input fuses are required to disconnect the drive from power in the event of a component failure in the drive's power circuitry. The drive's electronic protection circuitry is designed to clear drive output short circuits and ground faults without blowing the drive input fuses. Table below shows the recommended input fuse ratings for CVP inverter. For effective protection use fuses with current-limit function, non delay type, also consider the applicable national and international regulations for short circuit and over current protection.

For UL type approval consider the following fuse types RK5, CC or T.

For non UL type approval consider gG and aR type fuses.

gG:- (Overload and Short circuit protection)

aR ultra rapid (Short circuit protection only), suitable for protection of Power semiconductors.

TECO Molded case circuit breakers can be used in Place of the input fuse, consider the necessity of back up fuse to provide correct protection according to the applicable national and international regulations. Consult with your fuse suppliers if in doubt.

	JNTHBCBA-	HP	KW	KVA	100% CONT Output AMPS (A)	Max.RK5 FUSE Rating(A)	Max.CC or T FUSE Rating(A)
220V class(1φ)	R500AC	0.5	0.4	1.2	3.1	10	20
	0001AC	1	0.75	1.7	4.5	15	30
	0002AC	2	1.5	2.9	7.5	20	40
	0003AC	3	2.2	4.0	10.5	25	50
220V class(3φ)	R500BC	0.5	0.4	1.2	3.1	8	10
	0001BC	1	0.75	1.7	4.5	12	15
	0002BC	2	1.5	2.9	7.5	15	20
	0003BC	3	2.2	4.0	10.5	20	30
	0005BC	5	3.7	6.7	17.5	30	50
	7R50BC	7.5	5.5	9.9	26	50	60
	0010BC	10	7.5	13.3	35	60	70
	0015BC	15	11.0	20.6	48	80	100
	0020BC	20	15.0	27.4	64	100	125
	0025BC	25	18.5	34.0	80	125	150
	0030BC	30	22.0	41.0	96	160	200
	0040BC	40	30.0	54.0	130	200	250
440V class(3φ)	0001BE	1	0.75	1.7	2.3	6	10
	0002BE	2	1.5	2.9	3.8	10	15
	0003BE	3	2.2	4.0	5.2	10	20
	0005BE	5	3.7	6.7	8.8	20	30
	7R50BE	7.5	5.5	9.9	13	25	35
	0010BE	10	7.5	13.3	17.5	30	50
	0015BE	15	11.0	20.6	25	50	60
	0020BE	20	15.0	27.4	32	60	70
	0025BE	25	18.5	34.0	40	70	80
	0030BE	30	22.0	41.0	48	80	100
	0040BE	40	30.0	54.0	64	100	125
	0050BE	50	37.0	68.0	80	125	150
	0060BE	60	45.0	82.0	96	150	200
	0075BE	75	55.0	110.0	128	200	250

*Fuse ratings are based upon 300V fuses for 230V inverter, and 500V for 460V inverters

※Notice

- To avoid shock hazards, do not touch any electrical component when the power is applied or just after five minutes the power plug is unplugged. The other action should be performed after the charge indicator went off.
- Do not perform wiring on the inverter while it is still electrified. Disregard of this notice could cause serious injure or death to persons.

※This product is designed to use in Pollution Degree 2 environment or equivalent environments.

3.3 Inflammable materials

A. Screwdriver torque:

Wiring with a screwdriver or other tools and follow the torque listed below:

Securing torque			
Horsepower	Power source	Nominal torque for TM1 terminal	
0.5/1/2(3φ)	200-240V	0.59/0.08 (LBS-FT / KG-M)	7.10/8.20 (LBS-IN/KG-CM)
1/ 2	380-480V		
2(1φ)/3/5/7.5/10	200-240V	1.5/0.21 (LBS-FT/KG-M)	18.00/20.28 (LBS-IN/KG-CM)
3/ 5/ 7.5/ 10/15	380-480V		
15/20/25	200-240V	1.84/0.3 (LBS-FT / KG-M)	22.1/30 (LBS-IN/KG-CM)
20/25/30	380-480V		
30/40	200-240V	4.42/0.66 (LBS-FT/KG-M)	53.1/66 (LBS-IN/KG-CM)
40/50/60/75	380-480V		

B. Power wires:

Power wires are connecting to L1, L2, L3, T1, T2, T3, P, BR and P1. Choose wires in accordance with the following criteria:

(1) Use copper wires only. Deciding diameters of wires should be based on rating working at 105 degree C.
(2) For rating voltage of wires, the minimum voltage of 230VAC type is 300V, and 460VAC type is 600V.
(3) For safety reason, the power wires should be fixed by type terminal.

C. Control wires:

Control wires are wires connecting to TM2 control terminal. Choose the wire in accordance with the following criteria:

(1) Use copper wires only. Deciding diameters of wires should be based on rating working at 105 degree C.
(2) For rating voltage of wires, the minimum voltage of 230VAC type is 300V, and 460VAC type is 600V.
(3) To avoid noise interference, do not route the control wires in the same conduit with power wires and motor wires.

D. Nominal electrical specifications of the terminals Block:

The following list is nominal values of TM1:

Horsepower	Power source	Volts	Amps
0.5/1/ 2(3φ)	200-240V	600	15A
1/ 2	380-480V		
2(1φ)/3/5/ 7.5/ 10	200-240V		40A
3/ 5/ 7.5/ 10/15	380-480V		
15/20/25	200-240V		80A
20/25/30	380-480V		60A
30	200-240V		100A
40/50	380-480V		
40	200-240V		150A
60/75	380-480V		

Note: Nominal values of input and output signals (TM2) – follow the specifications of class 2 wiring.

3.4 Specifications

Single phase, 200-240V model

JNTHBCBA□□□□ACAU(F)	R500	0001	0002	0003
Horsepower(HP)	0.5	1	2	3
Suitable Motor Capacity(KW)	0.4	0.75	1.5	2.2
Rated Output Current(A)	3.1	4.5	7.5	10.5
Rated Capacity(KVA)	1.2	1.7	2.9	4.0
Max. Input Voltage	Single Phase: 200~240V +10% -15%，50/60H_Z ± 5%			
Max. Output Voltage	Three Phases: 0~240V			
Input Current(A)	8.5	12	16	23.9
Net Weight(KG)	1.2(1.3)	1.2(1.3)	1.5(1.8)	1.9(2.3)
Allowable momentary power loss time (second)	1.0	1.0	2.0	2.0

Three phases, 200 – 240V model

JNTHBCBA□□□□BCAU	R500	0001	0002	0003	0005	7R50	0010	0015	0020	0025	0030	0040
Horsepower(HP)	0.5	1	2	3	5	7.5	10	15	20	25	30	40
Suitable Motor Capacity(KW)	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30
Rated Output Current(A)	3.1	4.5	7.5	10.5	17.5	26	35	48	64	80	96	130
Rated Capacity(KVA)	1.2	1.7	2.9	4.0	6.7	9.9	13.3	20.6	27.4	34	41	54
Max. Input Voltage	Three Voltage: 200~240V +10% -15%，50/60H_Z ± 5%											
Max. Output Voltage	Three Voltage: 0~240V											
Input Current(A)	4.5	6.5	11	12.5	20.5	33	42	57	70	85	108	138
Net Weight(KG)	1.2	1.2	1.2	1.75	1.9	5.6	5.6	15	15	15	33	34
Allowable momentary power loss time (second)	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

Three phases, 380 – 480V model

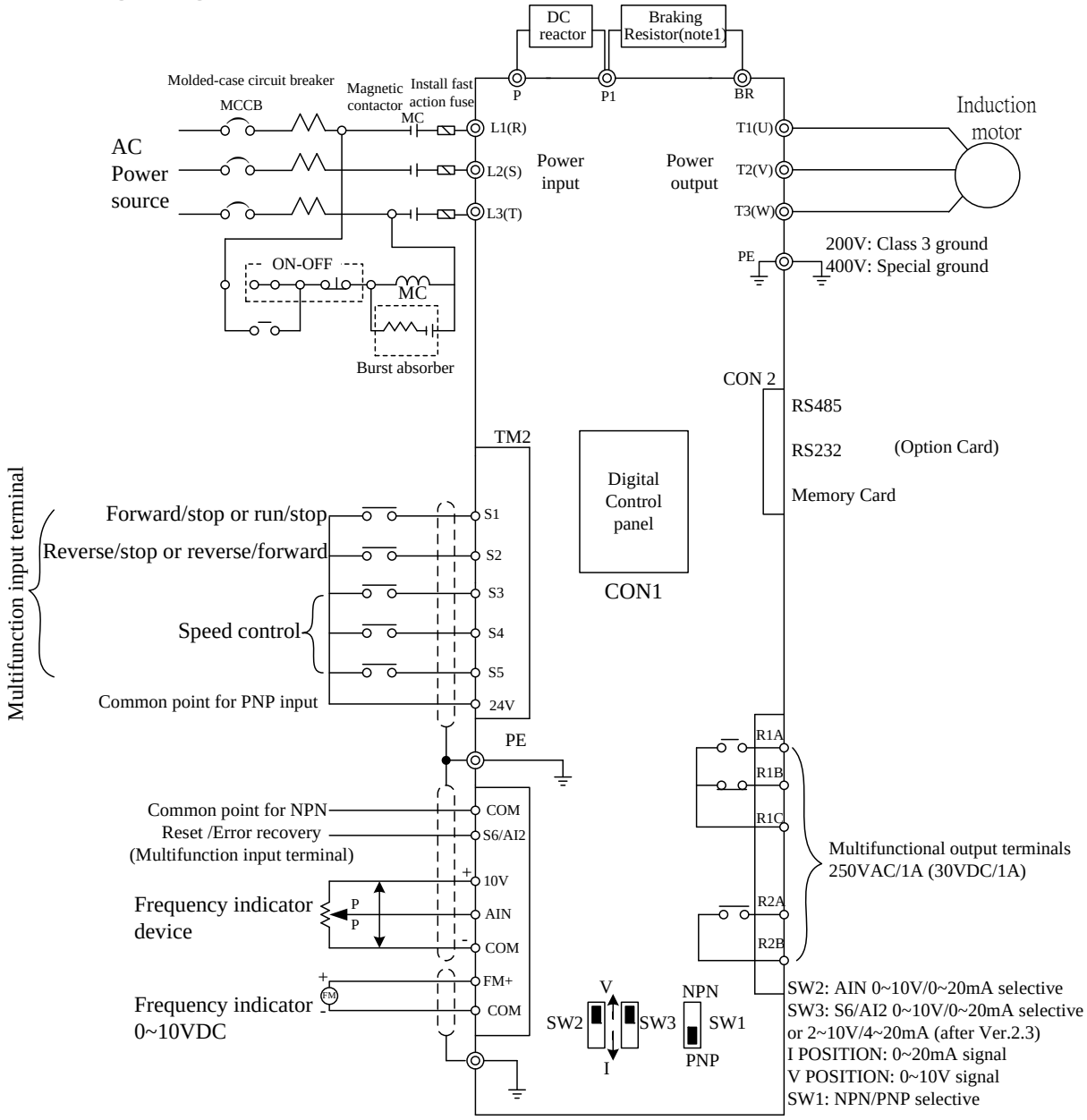
JNTHBCBA□□□□BEAU(F)	0001	0002	0003	0005	7R50	0010	0015	0020	0025	0030	0040	0050	0060	0075
Horsepower(HP)	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75
Suitable Motor Capacity(KW)	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Rated Output Current(A)	2.3	3.8	5.2	8.8	13.0	17.5	25	32	40	48	64	80	96	128
Rated Capacity(KVA)	1.7	2.9	4.0	6.7	9.9	13.3	19.1	27.4	34	41	54	68	82	110
Max. Input Voltage	Three Voltage:380~480V +10% -15%， 50/60H_Z ± 5%													
Max. Output Voltage	Three Voltage: 0~480V													
Input Current(A)	4.2	5.6	7.3	11.6	17	23	31	38	48	56	75	92	112	142
Net Weight(KG)	1.2 (1.3)	1.2 (1.3)	1.8 (2.2)	1.8 (2.2)	5.6 (6.6)	5.6 (6.6)	5.6 (6.6)	15	15	15	33	33	50	50
Allowable momentary power loss time (second)	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

NOTE1: DC Reactor is built-in for 30hp above in 200V class series.

NOTE2: DC Reactor is built-in for 40hp above in 400V class series.

3.5 Wiring Diagram CVP Series Inverter

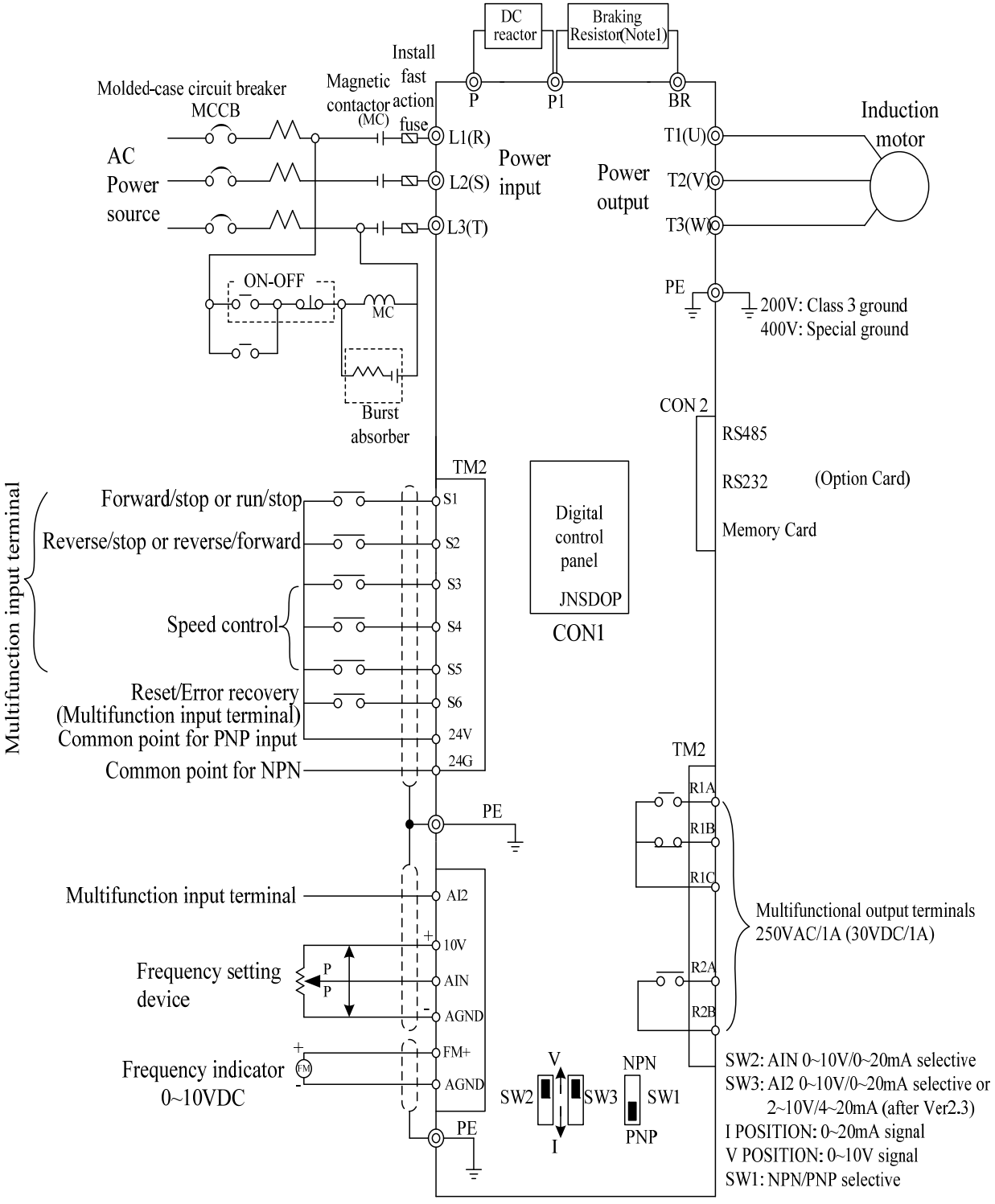
Wiring diagram I:



Note 1: Please refer to description of main circuit terminals (P1, BR) and specification of braking resistor for value selection.

Note 2: Above wiring diagram refers for 0.4~1.5KW at 220V and 0.75~1.5KW at 440V.

Wiring diagram II:

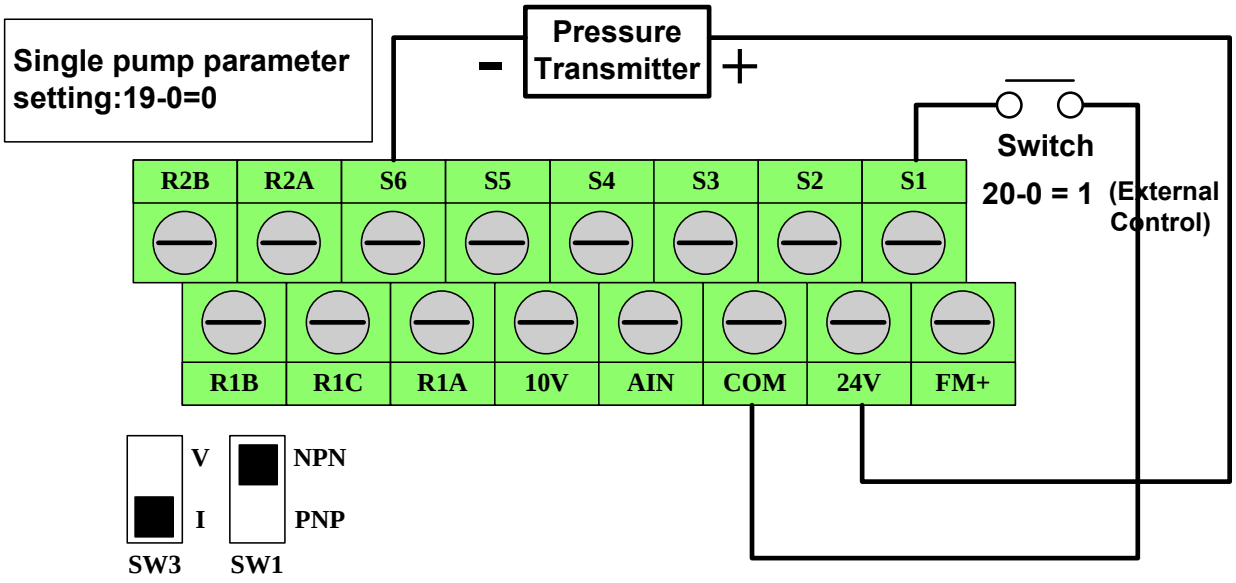


Note 1: Please refer to description of main circuit terminals (P1, BR) and specification of braking resistor for value selection.

Note 2: Above wiring diagram refers for 2.2~30KW at 220V and 2.2~55KW at 440V.

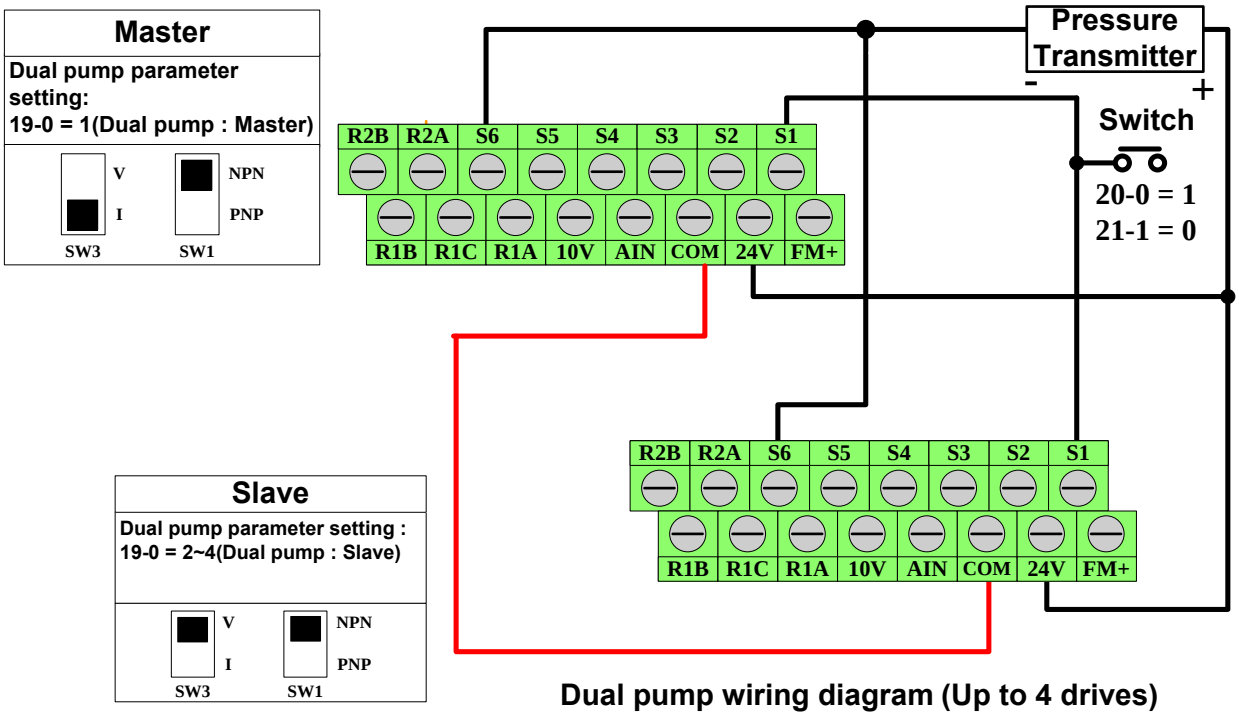
3.6 Pump Wiring Diagram of Control Board

1. Single pump wiring diagram. (I)



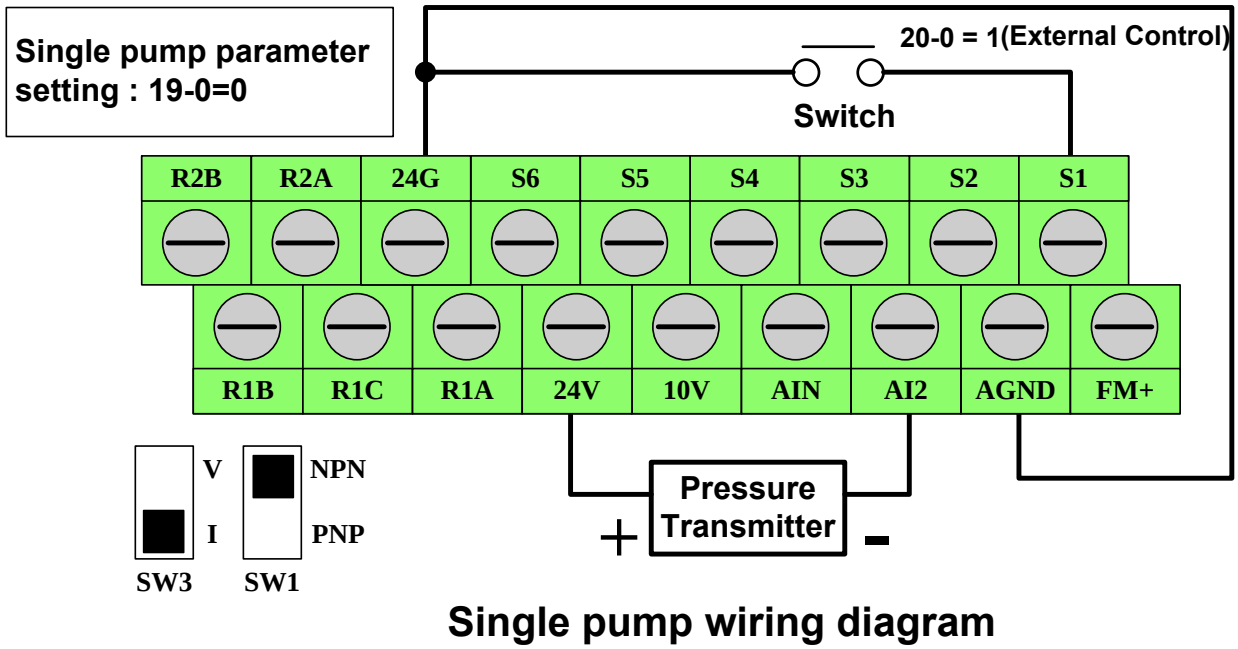
Single pump wiring diagram

2. Dual pump wiring diagram. (I)



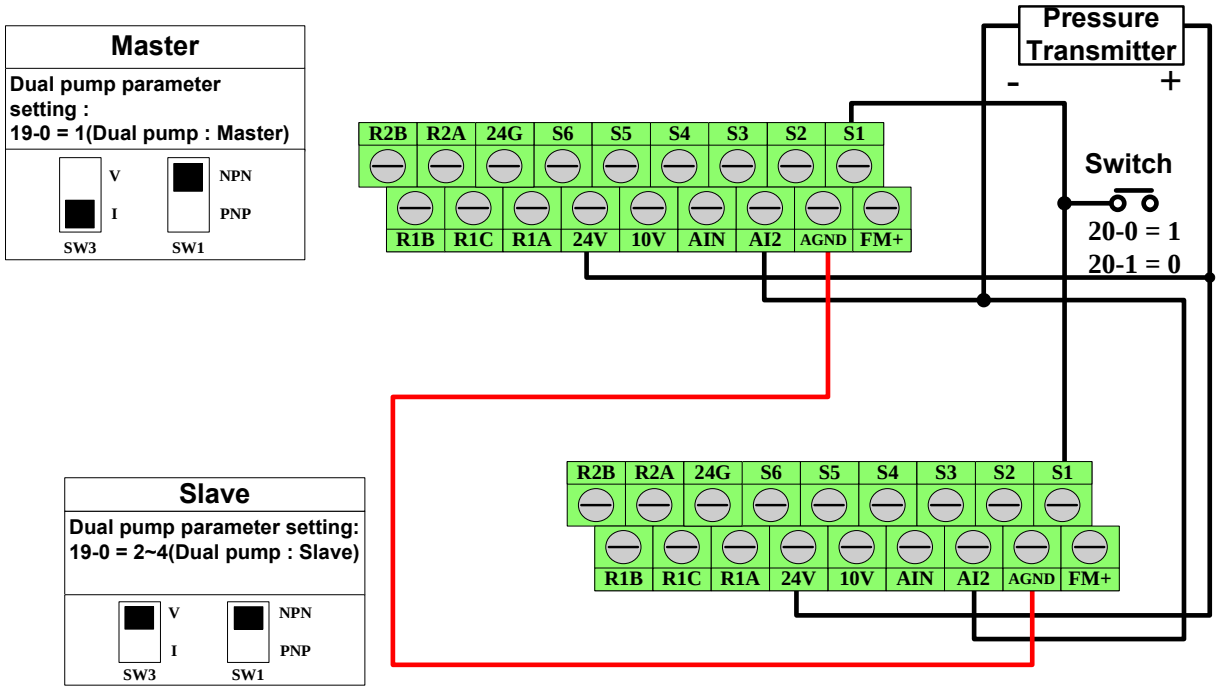
Dual pump wiring diagram (Up to 4 drives)

3. Single pump wiring diagram. (II)



Single pump wiring diagram

4. Dual pump wiring diagram. (II)



Dual pump wiring diagram (Up to 4 drives)

3.7 Description of Terminals Troubleshooting Inverter

Descriptions of main circuit terminals

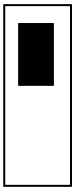
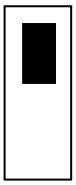
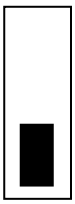
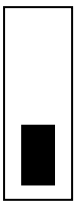
<table>
<tr><th>Symbol</th><th colspan="3">Description</th></tr>
<tr><td>R / L1 (L)</td><td colspan="3" rowspan="3">Main power input Single-phase: L/N
Three-phase: L1/L2/L3</td></tr>
<tr><td>S / L2</td></tr>
<tr><td>T / L3 (N)</td></tr>
<tr><td>P1</td><td colspan="2" rowspan="2">Braking resistor or connecting terminal: Used in cases where the inverter frequently disconnects due to large load inertia or short deceleration time (refer to specifications of braking resistor)</td><td rowspan="2">For
220V:0.5~10HP,
440V:1~15HP</td></tr>
<tr><td>BR</td></tr>
<tr><td>P1/ P</td><td colspan="2">DC reactor connecting terminals</td></tr>
<tr><td>B1/P</td><td rowspan="2">●B1/P- ⊖: DC power supply input
B1/P-B2: External braking resistor
For 220V: 15~20HP and 440V: 20HP</td><td colspan="2">-</td></tr>
<tr><td>B2</td><td colspan="2" rowspan="2">● ⊕- ⊖: DC power supply input or
External braking unit.
For 220V: 25~40HP and 440V: 25~75HP</td></tr>
<tr><td>⊖</td><td rowspan="2">-</td></tr>
<tr><td>⊕</td></tr>
<tr><td>U / T1</td><td colspan="3" rowspan="3">Inverter outputs</td></tr>
<tr><td>V / T2</td></tr>
<tr><td>W / T3</td></tr>
</table>

- Do not remove the P-P1 jumper if there is no DC reactor connected.

Descriptions of CVP control circuit terminals

<table>
<tr><th>Symbol</th><th colspan="3">Description</th></tr>
<tr><td>R2A</td><td colspan="2" rowspan="2">Multifunctional terminal – Normal open</td><td rowspan="4">Contact rated capacity:
(250VAC/1A or 30VDC/1A)</td></tr>
<tr><td>R2B</td></tr>
<tr><td>R1C</td><td>Common contact</td><td rowspan="3">Multifunctional output terminals</td></tr>
<tr><td>R1B</td><td>Normal close contact</td></tr>
<tr><td>R1A</td><td>Normal open contact</td></tr>
<tr><td>10V</td><td colspan="3">Frequency knob (VR) power source terminal (pin 3)</td></tr>
<tr><td>AIN</td><td colspan="3">Analog frequency signal input terminal or multifunction input terminals S7 (H level:>8V, L level:<2V, PNP only)</td></tr>
<tr><td>24V</td><td colspan="3">Common contact for S1~S5 (S6, S7) in PNP (Source) input. Shift to PNP position (refer to wiring diagram) of SW1 when used PNP input</td></tr>
<tr><td>COM
24G
AGND</td><td colspan="3">1. Common contact and analog input /output signal for S1~S5 in NPN (Sink) input.
Shift to NPN position (refer to wiring diagram I) of SW1 when used NPN input.
2. AGND for AIN, AI2 and FM+ (analog input /output signal) & 24G for S1~S6 (digital input /output signal in NPN (Sink) input). Shift to NPN position (refer to wiring diagram II) of SW1 when used NPN input.</td></tr>
<tr><td>FM+</td><td colspan="3">The positive analog output for multifunction, the signal for output terminal is 0-10VDC (below 2mA).</td></tr>
<tr><td>S1</td><td colspan="3" rowspan="5">Multifunctional input terminals</td></tr>
<tr><td>S2</td></tr>
<tr><td>S3</td></tr>
<tr><td>S4</td></tr>
<tr><td>S5</td></tr>
<tr><td>S6</td><td colspan="3">1. Multifunction input terminals (Digital terminal H level:>8V, L level:<2V, PNP only) or analog input terminal AI2(0~10Vdc/4~20mA)
2. The V2.9 version (contains) above the edition, S6 only is the Multi-function input terminal use, AI2 have replaced S6 to take analog input use. (Above wiring diagram refers for 2.2~30KW at 220V and 2.2~55KW at 440V only.)</td></tr>
</table>

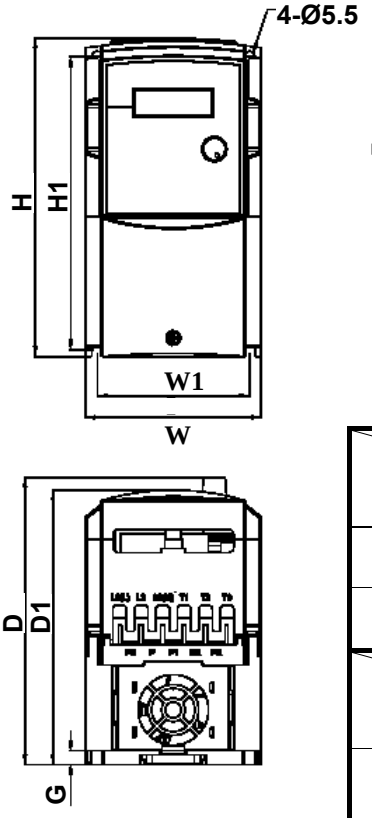
Descriptions of SW function

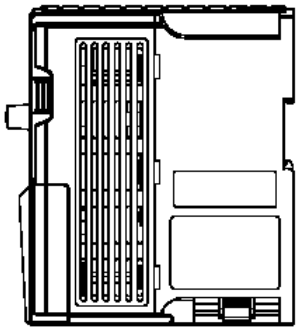
SW2/SW3	Type of external signal	Remarks	SW1	Type of external signal	Remarks
	0~10VDC analog signal	Factory setting is voltage input		NPN (SINK) input	
	0~20mA analog signal			PNP (SOURCE) input	Factory default

3.8 Outline Dimensions

(1) Frame1: Single phase JNTHBCBA __ AC: R500, 0001
Three phase JNTHBCBA __ BC/BE: R500, 0001, 0002

(2) Frame2: Single phase JNTHBCBA __ AC: 0002, 0003
Three phase JNTHBCBA __ BC/BE: 0003, 0005





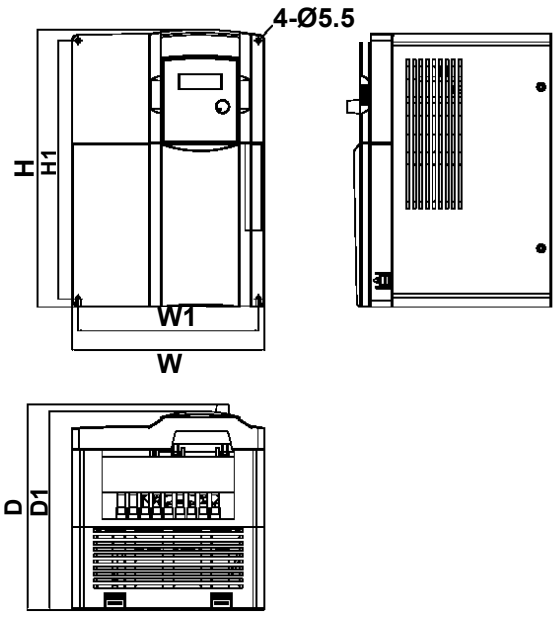
Unit: mm / inch

LENGTH / MODEL	H	H1	W	W1
Frame 1	163/6.4	150/5.9	90/3.5	78/3.1
Frame 2	187.1/7.4	170.5/6.7	128/5.0	114.6/4.5
LENGTH / MODEL	**D**	**D1**	**G**	
Frame 1	147/5.8	141/5.6	7/0.3	
Frame 2	148/5.8	142.1/5.6	7/0.3	

(3) Frame3:

Three phase JNTHBCBA __ BC: 7R50, 0010

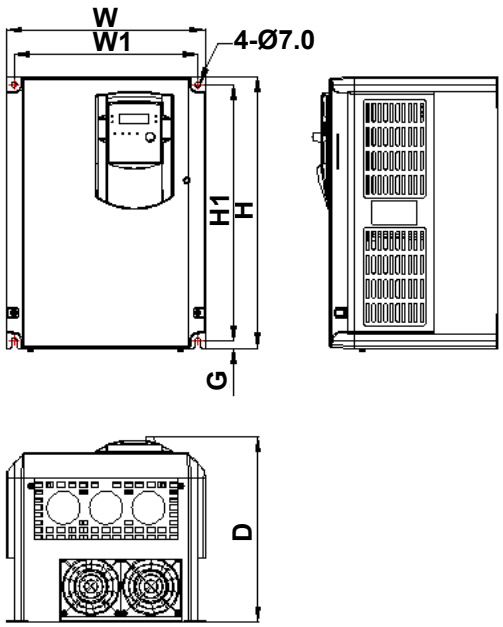
JNTHBCBA __ BE: 7R50, 0010, 0015



(4) Frame4:

Three phase JNTHBCBB __ BC: 0015, 0020, 0025

JNTHBCBB __ BE: 0020, 0025, 0030



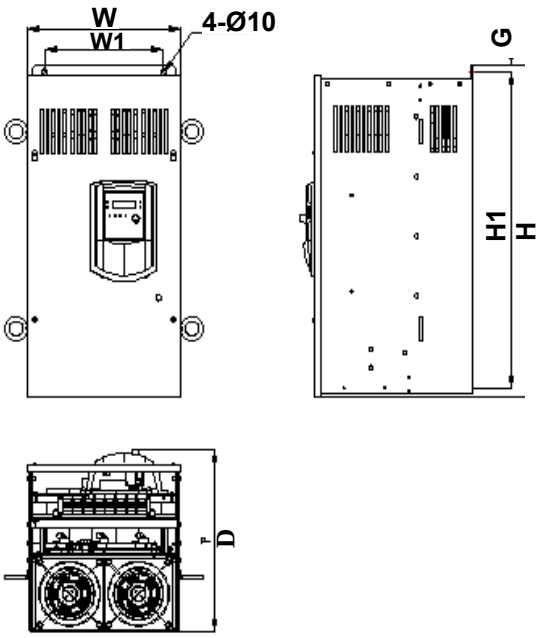
(5) Frame5:

Three phase JNTHBCBA __ BC: 0030, 0040

JNTHBCBA __ BE: 0040, 0050

(6) Frame6:

Three phase JNTHBCBA __ BE: 0060, 0075



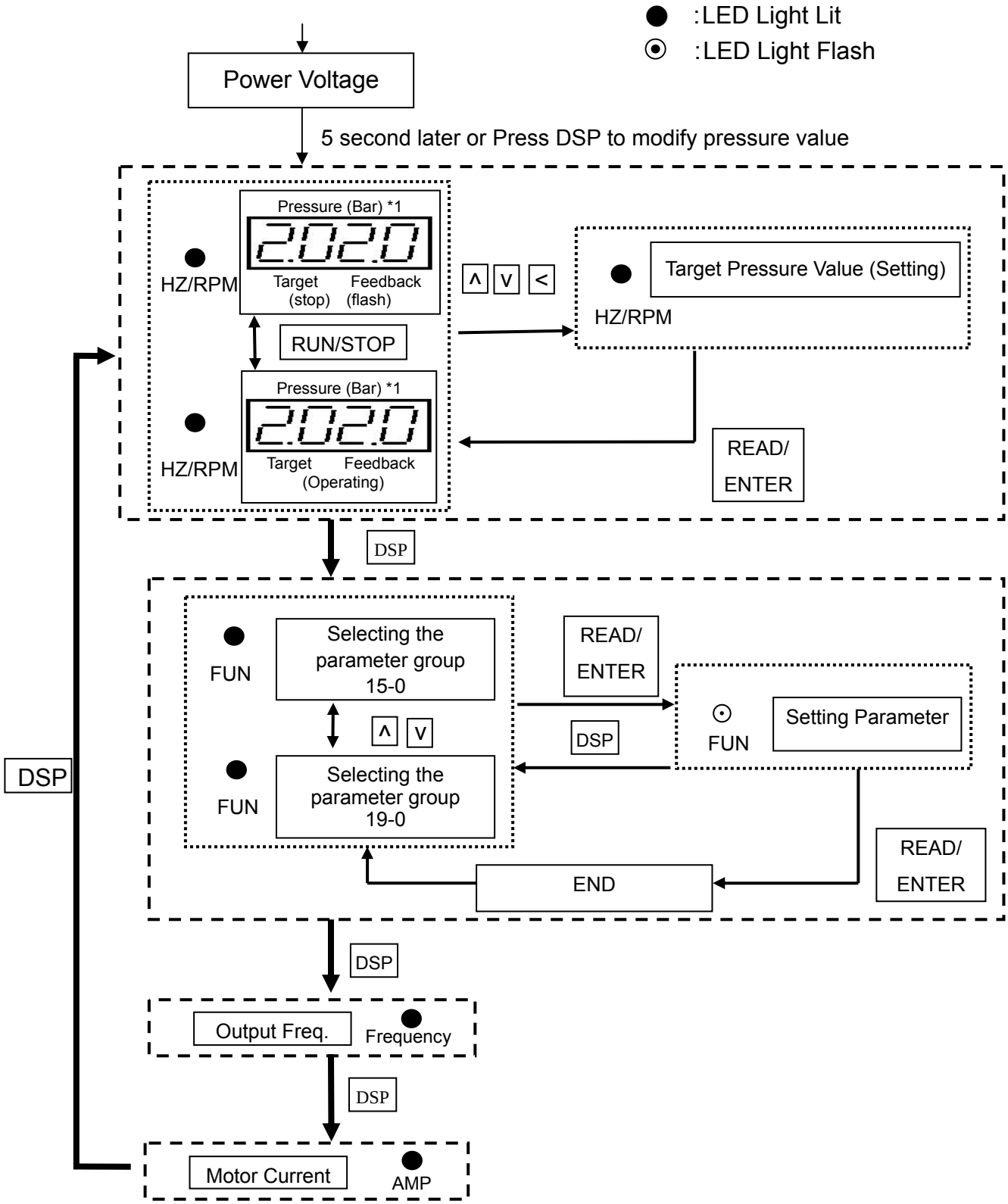
(Open Chassis Type－IP00)

Unit: mm / inch

LENGTH / MODEL	H	H1	W	W1	D	D1	G
Frame3	260/ 10.2	244/ 9.6	186/ 7.3	173/ 6.8	195/ 7.7	188/ 7.4	
Frame4	360/ 14.2	340/ 13.4	265/ 10.4	245/ 9.6	248/ 9.8		10/ 0.4
Frame5	553/ 21.8	530/ 20.9	269/ 10.6	210/ 8.3	304/ 12		10/ 0.4
Frame6	653/ 25.7	630/ 24.8	308/ 12.1	250/ 9.8	309/ 12.1		10/ 0.4

Chapter 4 Software Index

4.1 Operation Instruction of the Keypad



***1 : Dual pressure display is changed in software version b1.18 or later.**

4.2 Programmable Functions List

Parameter Group No.	Description
15-	Drive Status and Function Reset
16-	Operation Parameters
17-	PID Control Parameters
18-	System Protect Parameters
19-	Dual Pumps Parameters
20-	Multifunction Input/ Output Parameter Group

15-Group Drive Status and Function Reset

Function Code No.	Description	Range (unit) /Code	Factory Setting	Communication Address	Remarks
15-0	Drive Horsepower Code	---	---	134 or (0x86)	*3
15-1	Software Version	---	---	135 or(0x87)	*3
15-2	Fault Jog (Last 3 Faults)	---	---	136 or(0x88)	*3
15-3	Accumulated Operation Time(Hours)	0 - 9999	---	139 or(0x8B)	*3
15-4	Accumulated Operation Time(Hours X 10000)	0 - 27	---	140 or(0x8C)	*3
15-5	Accumulated Operation Time Mode	0: Time Under Power 1: Run Mode Time Only	0000	141 or (0x8D)	*3
15-6	Reset Parameter	1110: Reset for 50 Hz Motor Operation 1111: Reset for 60 Hz Motor Operation	0000	142 or (0x8E)	*1
15-7	Parameter locking password	0000 ~ 0999	0	228 or (0xE4)	*4
15-8	Copy Unit	0000: Disable 0001: Inverter to Copy Unit 0002: Copy Unit to Inverter 0003: Verify	0	42 or (0x2A)	*3
15-9	Display of Pressure Setting	0000: Setting and Feedback 0001: Only Setting 0002: Only Feedback	0	198 or (0xC6)	*4

16-Group Operation Parameters

Function Code No.	Description	Range (unit) /Code	Factory Setting	Communication Address	Remarks
16-0	Frequency Upper Limit (Hz)	0.01 – 400.00 (Hz)	60.00 (Hz)	24 or (0x18)	*1
16-1	Frequency Lower Limit (Hz)	0.00 – 400.00 (Hz)	00.00 (Hz)	25 or (0x19)	*1
16-2	Acceleration Time	0.1 – 3600.0 (sec)	5.00 (sec)	26 or (0x1A)	
16-3	Deceleration Time	0.1 – 3600.0 (sec)	5.00 (sec)	27 or (0x1B)	
16-4	Sleep Deceleration Time	0.1 – 3600.0 (sec)	3.00 (sec)	31 or (0x1F)	*3
16-5	Sleep Frequency	0.00 - 400.00 (Hz)	35.00 (Hz)	155 or (0x9B)	*3
16-6	Period of Water Used Detection	0.0 – 200.0 (sec)	20.0 (sec)	190 or (0xBE)	*3
16-7	Acceleration Time of Water Used Detection	0.1 - 3600.0 (sec)	12.0 (sec)	191 or (0xBF)	*3
16-8	Pressure Range of Water Used Detection	0.00 - 2.50 (Bar)	0.10 (Bar)	193 or (0xC1)	*3
16-9	HiP/LoP/1BrE Protection Auto Restart Time	0 - 200 (min)	20 (min)	192 or (0xC0)	*3
16-A	Direction of water usage	0 : Upward 1 : Downward	1	244 or (0xF4)	*1 *5
16-B	Deceleration time of water usage detection	0.1 – 3600.0 (sec)	40.0 (sec)	245 or (0xF5)	*5

17-Group PID Control parameters

Function Code No.	Description	Range (unit) /Code	Factory Setting	Communication Address	Remarks
17-0	Proportional Gain (P)	0.0 – 10.0	1.0	111 or (0x6F)	
17-1	Integration Time (I)	0.0–100.0 (sec)	1.0 (sec)	112 or (0x70)	
17-2	Differentiation Time (D)	0.00 – 10.00 (sec)	0.00 (sec)	113 or (0x71)	
17-3	Output Filter Time (O)	0.0 – 2.5 (sec)	0.0 (sec)	116 or (0x74)	
17-4	Feedback Signal Offset(F)	0.00 – 10.00	1.00	110 or (0x6E)	
17-5	Feedback Signal Type(F)	0000 : 0~10V 0001 : 4~20mA	1	123 or (0x7B)	*1*2
17-6	Feedback Signal Scan Time(F)	1 – 100 (base on 4ms)	5 (20ms of 5*4ms)	75 or (0x4B)	
17-7	Liquid Leakage Detection Time	0.0 - 10.0 (sec)	0.0 (sec)	177 or (0xB1)	*3
17-8	Change Level within Detection Time	0.01 - 2.50 (Bar)	0.10 (Bar)	178 or (0xB2)	*3
17-9	Restart Level for Liquid Leakage Detection	0.01 - 2.50 (Bar)	0.50 (Bar)	179 or (0xB3)	*3

18-Group System Protect parameters

Function Code No.	Description	Range (unit) /Code	Factory Setting	Communication Address	Remarks
18-0	Target Pressure Value	0.10 - 25.50 (Bar)	2.00 (Bar)	168 or (0xA8)	*3
18-1	Max. Pressure limit	0.10 - 25.50 (Bar)	5.00 (Bar)	166 or (0xA6)	*3
18-2	Min. Pressure limit	0.10 - 25.50 (Bar)	0.50 (Bar)	167 or (0xA5)	*3
18-3	High Pressure Alarm Time	0.0 - 600.0 (sec)	10.0 (sec)	169 or (0xA9)	
18-4	High Pressure Stop Time	0.0 - 600.0 (sec)	20.0 (sec)	170 or (0xAA)	
18-5	Low Pressure Alarm Time	0.0 - 600.0 (sec)	10.0 (sec)	171 or (0xAB)	
18-6	Low Pressure Stop Time	0.0 - 600.0 (sec)	20.0 (sec)	195 or (0xC3)	
18-7	Sleep Delay Time	0.0 - 120.0 (sec)	0.0 (sec)	162 or (0xA2)	*3
18-8	Sleep Tolerance Range	0.00 – 5.00 (Bar)	0.50 (Bar)	165 or (0xA5)	*3
18-9	HiP/LoP/1BrE Protection Auto Restart Times	0 ~ 999	999	199 or (0xC7)	*4
18-A	Pressure losing prevention level (%)	0 - 100 (rate)	0 (rate)	229 or (0xE5)	*5
18-B	Detection time of pressure losing	0.0 – 25.0 (sec)	0.0 (sec)	239 or (0xEF)	*5
18-C	Forced operating frequency	0.0 – 200.0 (Hz)	0.0 (Hz)	240 or (0xF0)	*5

19-Group Dual Pumps Parameters

Function Code No.	Description	Range (unit) /Code	Factory Setting	Communication Address	Remarks
19-0	Single/Dual Pump and Master/Slave Selection	0 : Single 1 : Dual – Master 2 : Dual – Slave 1 3 : Dual – Slave 2 4 : Dual – Slave 3	0	172 or (0xAC)	*3
19-1	Max. Pressure of Pressure Transmitter	0.10 – 25.50 (Bar)	10.00 (Bar)	173 or (0xAD)	*3
19-2	Dual pump synchronal setting	0 : Disable 1 : Target Pressure Value & Run/Stop 2 : Only Target Pressure Value 3 : Only Run/Stop	0	243 or (0xF3)	*5
19-3	Auto Shift Time	0 – 240 (Hour)	1 (Hour)	175 or (0xAF)	
19-4	Launch Delay Time (Slave Unit)	0 – 30.0 (Sec)	10.0 (Sec)	176 or (0xB0)	
19-5	AI2 (S6)Gain(%)	0 – 200 (%)	100 (%)	76 or (0x4C)	
19-6	Start Frequency for Slave Pump Running (100% = 16-0)	0 - 100 (%)	0 (%)	196 or(0xC4)	*3
19-7	Start Frequency for Slave Pump Stopping (100% = 16-0)	0 - 100 (%)	0 (%)	197 or(0xC5)	*3

20-Group 多機能輸入輸出參數群

Function Code No.	Description	Range (unit) /Code	Factory Setting	Communication Address	Remarks
20-0	Run command source	0 : Keypad 1 : External Terminal	0	9 or (0x09)	
20-1	Terminal S1 Function	0 : Forward 1 : E.S. terminal A 2 : Base block (b.b.) 3 : RESET command 4 : Control signal switch 5 : Communication control signal switch 6 : PID function disable 7 : Forced operating frequency	0	53 or (0x35)	
20-2	Terminal S2 Function		6	54 or (0x36)	
20-3	Terminal S3 Function		7	55 or (0x37)	
20-4	Terminal S4 Function		3	56 or (0x38)	
20-5	Terminal S5 Function		1	57 or (0x39)	
20-6	RELAY1(R1C,R1B,R1A terminals in TM2)	0 : Run 1 : Fault terminal 2 : Auto restart 3 : Momentary power loss 4 : E.S. 5 : Free run stop 6 : Motor overload protection 7 : Inverter overload protection 8 : High/Low pressure alarm 9 : Power On 10 : PID feedback signal offline 11 : Over torque detect	0	79 or (0x4F)	
20-7	RELAY2(R2B,R2A terminals in TM2)		8	80 or (0x50)	
20-8	Source of bias target pressure	0 : Disable 1 : AIN 2 : VR(15-6 password is a must)	0	241 or (0xF1)	
20-9	Range of bias target pressure	0.0 – 10.00	2.00	242 or (0xF2)	
20-A	Multifunction analog output selection	0 : Output Frequency 1 : Frequency command 2 : Output voltage 3 : DC voltage 4 : Output circuit 5 : PID feedback signal		77 or (0x4D)	*1

Function Code No.	Description	Range (unit) /Code	Factory Setting	Communication Address	Remarks
20-B	Gain control of multifunction analog output	0 - 200	100	78 or (0x4E)	*1

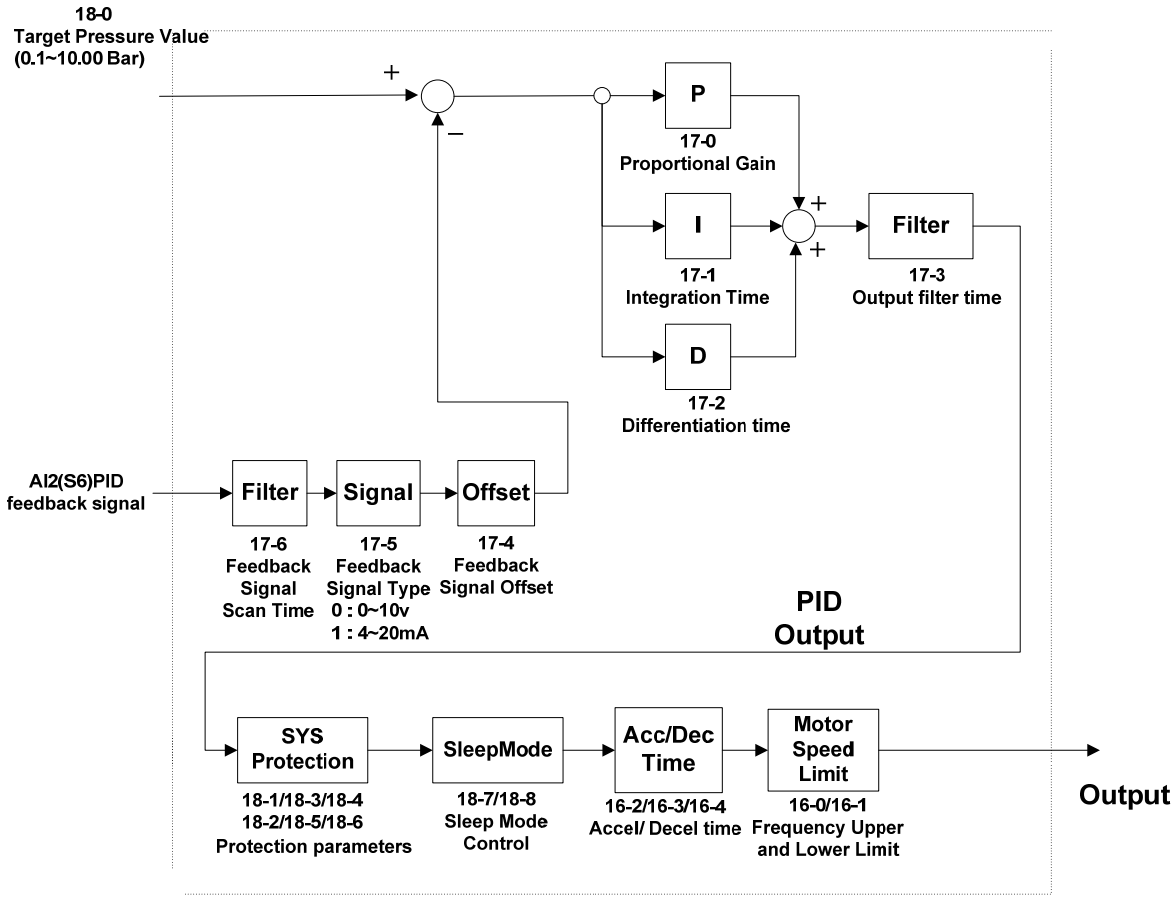
Notes: *1 Modify parameter when inverter status is "STOP", can not change while inverter status is "Run".

***2 Require to adjust position of SW3 of Control Board.**

***3 The new parameter is added or modified in software version b1.2 or later.**

***4 Available in Software version 1.4 or later.**

***5 Available in Software version 1.5 or later.**



PID Process Diagram

(1):15-0 Drive Horsepower Code

15-0	Inverter Model	
2P5	JNTHBCBA	R500AC / BC
201		0001AC / BC
202		0002AC / BC
203		0003AC / BC
205		0005BC
208		7R50BC
210		0010BC
215		0015BC
220		0020BC
225		0025BC
230		0030BC
240		0040BC

15-0	Inverter Model	
401	JNTHBCBA	0001BE
402		0002BE
403		0003BE
405		0005BE
408		7R50BE
410		0010BE
415		0015BE
420		0020BE
425		0025BE
430		0030BE
440		0040BE
450		0050BE
460		0060BE
475		0075BE

(2):15-1 Software Version

(3):15-2 Fault Jog (Latest 3 times)

1. When the inverter doesn't work normally, the former fault log stored in 2.xxx will be moved to 3.xxx, and the fault log in 1.xxx moved to 2.xxx. The present fault will be stored in 1.xxx. The fault stored in 3.xxx is the earliest one of the three, while the one 1.xxxx is the latest.
2. In 15-2, the fault 1.xxxx will be displayed at first, press▲, you can read 2.xxx→3.xxx→1.xxx, whereas▼, the order is 3.xxx→2.xxx→1.xxx→3.xxx.
3. In 15-2, the three fault log will be cleared when the reset key is pressed. The log content will changed to 1.---, 2.---, 3.---.
4. Ex. If the fault log content is '1.OCC' which indicates the latest fault is OC-C.

(4):15-3: Accumulated Operation Time 1 (Hours) 0 – 9999
15-4: Accumulated Operation Time 2 (Hours X 10000) 0 - 27
15-5: Accumulated Operation Time Mode 0000: Power on time
0001: Operation time

1. When the operation time 1 is set to 9999, the operation time 2 will be add by 1 at next hour, meanwhile, the value of operation time 1 will be cleared to 0000.
2. Description of operation time selection:

Preset value	Description
0	Power on, count the accumulated time.
1	Inverter operation, count the accumulated operation time.

(5): 15-6 Reset the factory setting 1110: Reset the 50Hz factory setting
1111: Reset the 60Hz factory setting

(6):15-7 Parameter locking password 0000~0999

Establish the password procedure:

15-7 = 888 (establish the password command) →15-7 = establish the password (establish the password that the customer appoints) → Completion

Unlock the parameter:

When the parameter is locked, only 15-7 can be used, if want to unlock the parameter, input the primitive password of establishing on 15-7, other parameters can make an modification after unlocking.

Remove the password by force:

When forget the primitive password that establishes, remove the settlement of the primitive password with this procedure, when need to do the password to lock, please operate it in accordance with above-mentioned "Establish the password procedure".
15-7 = 123 (remove the password command 1) → 15-7 = 999 (remove the password command 2) → The original password has already been removed.

Note:

1. When inverter needs to establish a new password, please input the primitive password first to unlock parameter, can just use “Establish the password procedure” to establish the new password.
2. If the inverter has password of establishing, the inverter will lock the parameter automatically after power on.
3. Please avoid the value of 15-7 to use 123, 888, 999, 000.

(7):15-8 Copy Unit 0000: Disable
0001: Inverter to Copy Unit
0002: Copy Unit to Inverter
0003: Verify

1.) 15-8=0000**:** Disable.

2.) 15-8=0001**:** Copy the inverter parameters to module.

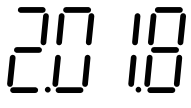
3.) 15-8=0002**:** Copy the module parameters to inverter.

4.) 15-8=0003**:** Copy the parameters to inverter or module to mutually verify the parameters.

Note: The copy function is available for the models with same capacity.

(8):15-9 Display of Pressure Setting	0000: Setting and Feedback 0001: Only Setting 0002: Only Feedback

1.) 15-9=0000: Display setting and feedback pressure value on keypad.

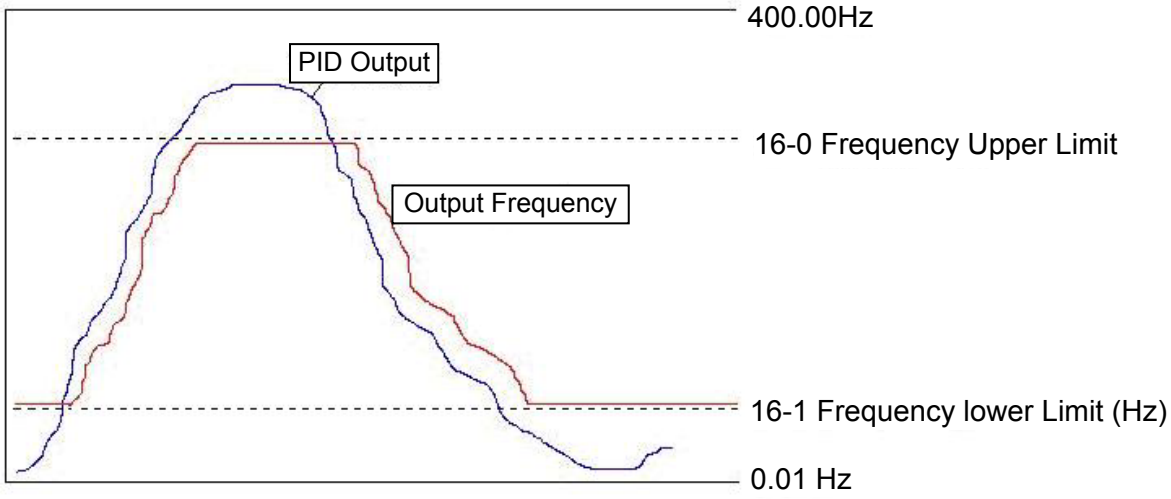


The 1st and 2nd segment is setting pressure value, and 3rd and 4th segment is feedback pressure value.

2.) 15-9=0001: Only display setting pressure value.

3.) 15-9=0002: Only display feedback pressure value.

(9):16-0 Frequency Upper limit 0.01 – 400.00 Hz 16-1 Frequency Lower limit 0.00 – 400.00 Hz



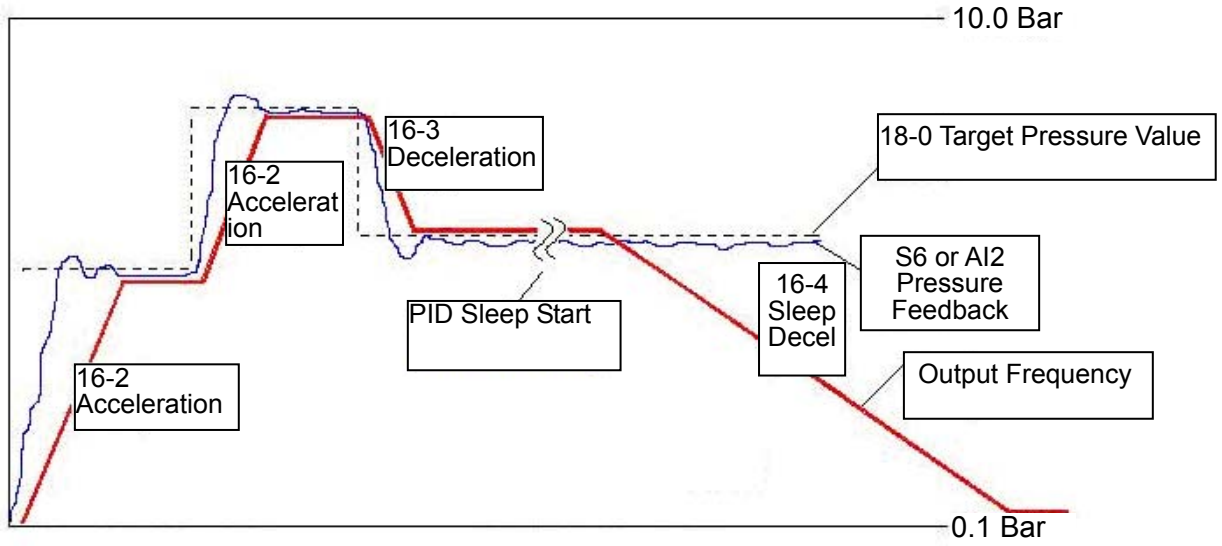
Operation example:

Confine output frequency in the certain range.

Set a frequency lower limit could increase response time and reduce vibration of pump.

Set a frequency upper limit could avoid motor operate above rate speed.

(10):16-2 Acceleration time 0.1 – 3600.0 sec
16-3 Deceleration time 0.1 – 3600.0 sec
16-4 Sleep deceleration time 0.1 – 3600.0 sec



When ｜(18-0 Target Pressure Value) – (S6 or AI2 Pressure Feedback) ｜ < 18-8 Sleep Tolerance Range, and Output Frequency is less than 16-5 Sleep Frequency, and the time is longer than 18-7 Sleep delay time, PID Sleep starts.
When inverter sleep mode starts, deceleration time depends on setting value of 16-4.
Acceleration and deceleration is controlled by parameters 16-2 and 16-3 when using PID control.

(11):16-5 Sleep Frequency 0.00 – 400.00 Hz

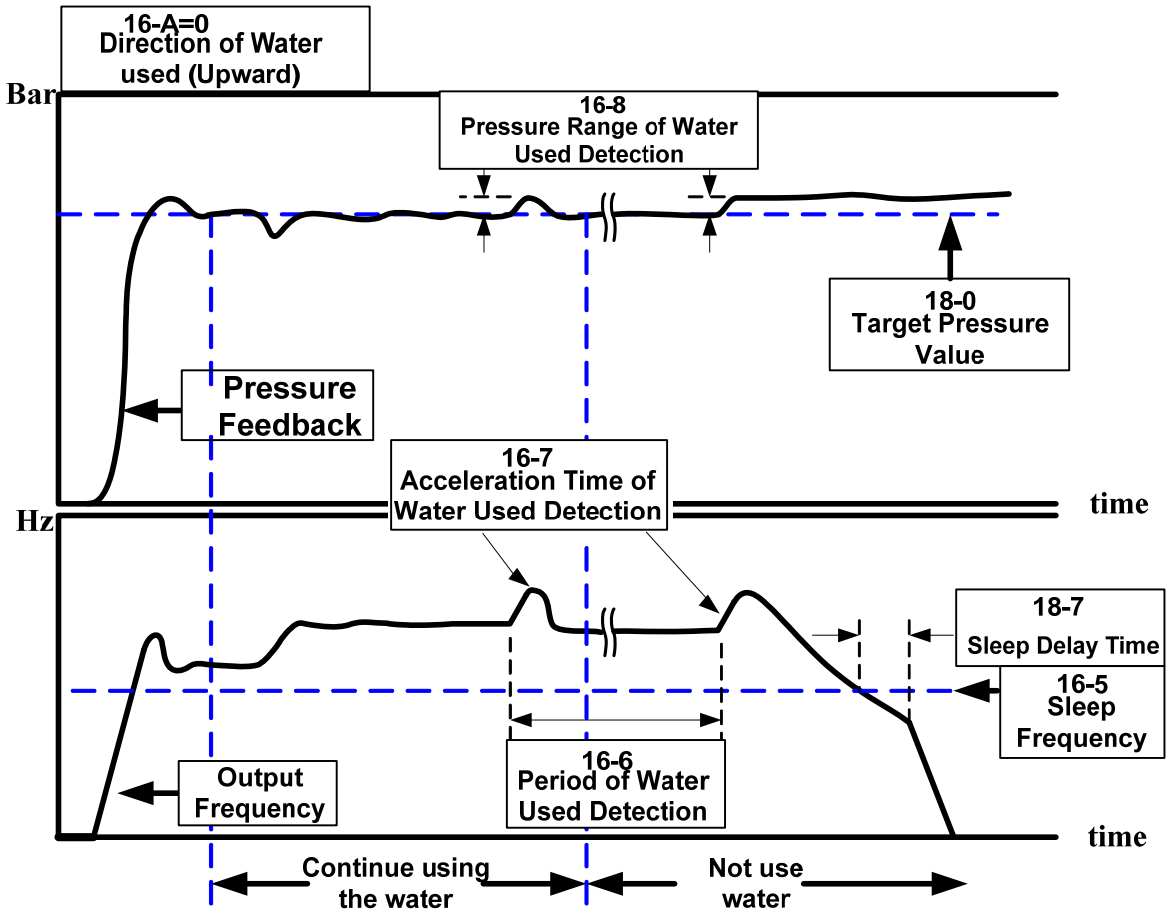
16-6 Period of Water Used Detection 0.0 – 200.0 sec

16-7 Acceleration Time of Water Used Detection 0.1 – 3600.0 sec

16-8 Pressure Range of Water Used Detection 0.00 – 2.50 Bar

16-A Direction of water usage 0 : Upward 1 : Downward

16-B Deceleration time of water usage detection 0.1 – 3600.0 (sec)

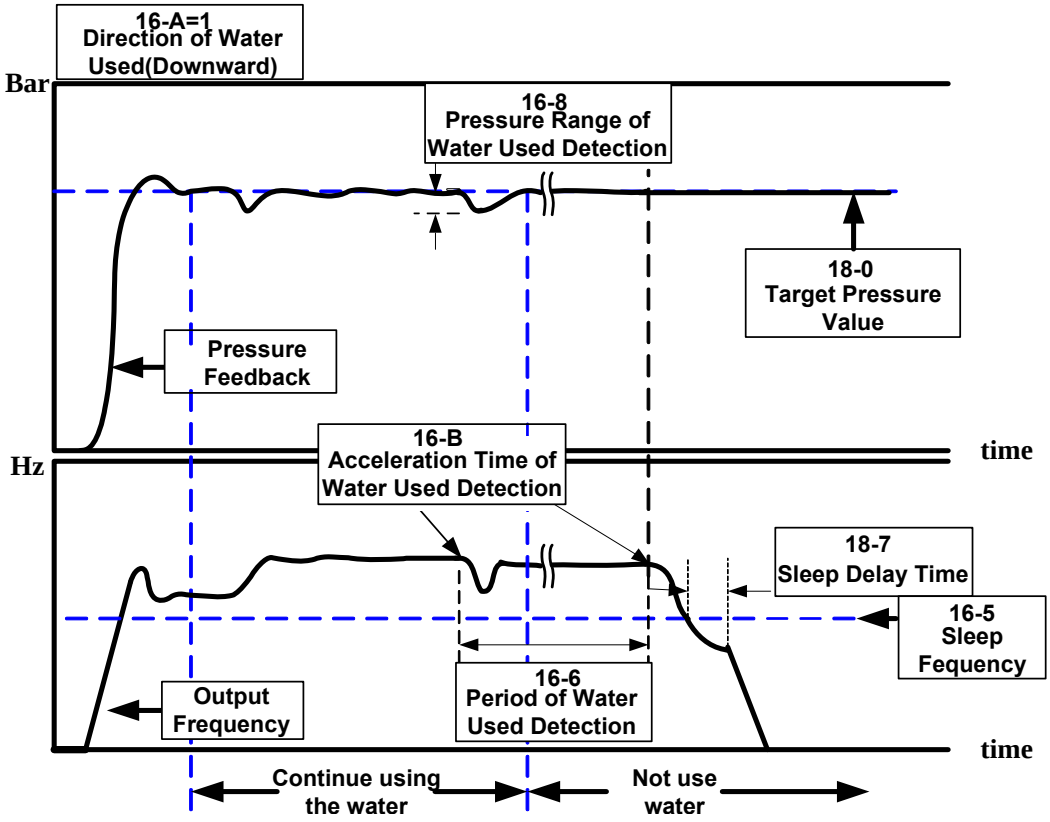


★16-6 = 0.0 (sec) : Disable water used detection.

★When this function is operated, it can reduce the time that pump get into sleep mode effectively.

★When using water frequently, we suggest that set 16-6 (Cycle of water usage detection) longer to reduce detection times, this would be helpful for lessening unstable pressure which cause by water usage detection function.

★When upward water usage detection is operating, the pressure will slightly increase, if users do care about the situation, we suggest you can adjust 16-8 (Pressure range of water usage detection) lower. In other hand, it will extend the time of getting to sleep when we are not using water or using small amount of water.



★16-6 = 0.0 (sec) : Disable water used detection.

★When this function is operated, it can reduce the time that pump get into sleep mode effectively.

★When using water frequently, we suggest that set 16-6 (Cycle of water usage detection) longer to reduce detection times, this would be helpful for reducing unstable pressure cause by water usage detection function.

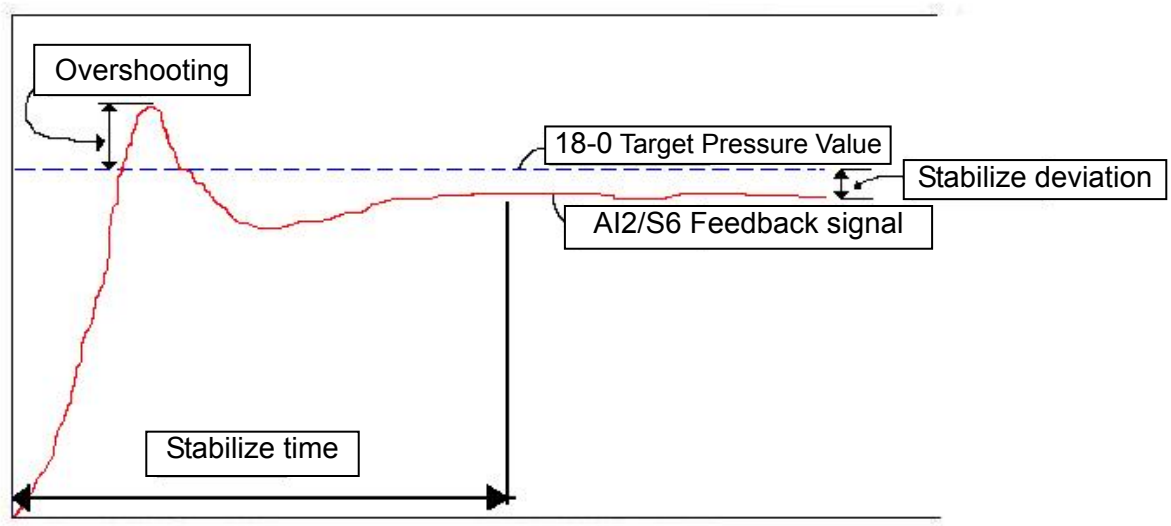
★When downward water usage detection is operating; the frequency will decrease according to 16-B (Deceleration time of water usage detection). In the condition of using water, the pressure will decrease and then the frequency will rise to reach the original setting pressure, it is judge by pressure feedback is lower than 18-0 (working pressure) – 16-8(Pressure range of water usage detection). If the condition is small amount or not using water, the operating frequency will decrease continuously. The detecting process will cause the pressure slightly unstable in a very short time. So 16-8(Pressure range of water usage detection) must be adjusted appropriately. In the decreasing process, if small amount of leakage cause the pressure lower than 18-0 (working pressure) – 16-8(Pressure range of water usage detection) before it reach the sleeping frequency, the frequency will rise again.

	Advantage	Disadvantage
Direction of Water Used (Upward)	1. Keep the actual pressure always higher than command pressure in the operating process, especially for strict and precise applications.	1. If the lift is too high which cause the operating frequency higher than usual even if little water usage or not using water. The efficiency of upward water usage detection won't be as good as we expect. 2. When multi pump operate in parallel, the slave is hard to get into sleep.
Direction of Water Used (Downward)	1. Get into sleep more efficient in only small amount water usage or not using water situation. 2. When multi pumps operate in parallel, the drives have more efficient to control the operating drive quantity and output frequency in downward water usage detection. 3. The operating order is master, slave1, slave 2, slave 3, and the sleeping order is slave 3, slave 2 ,slave 3, the master and slave will exchange after Auto Shift Time ,it also helps the product life.	1. It could cause pressure shock wave if we didn't adjust (16-8) Pressure range of water usage detection and (16-B) Deceleration time of water usage detection appropriately.

(12):16-9 HiP/LoP/1BrE Protection Auto Restart Time 0 – 200 min

- 16-9 = 0(min): Disable auto restart function.
- When Hi-p or Lo-p protection happens, the pump will stop. It will auto restart after 16-9 auto restart time.
- When 1BrE is occurred during dual pump operation and the message will disappear after 16-9 auto restart time. When 1BrE is reset, it is never occurred again, until Master and Slave unit change states. (Reference dual pump parameter)

(13):17-0 Proportional Gain (P) 0.0 – 10.0 rate
17-1 Integration Time (I) 0.0 – 100.0 sec
17-2 Differentiation Time (D) 0.00 – 10.00 sec

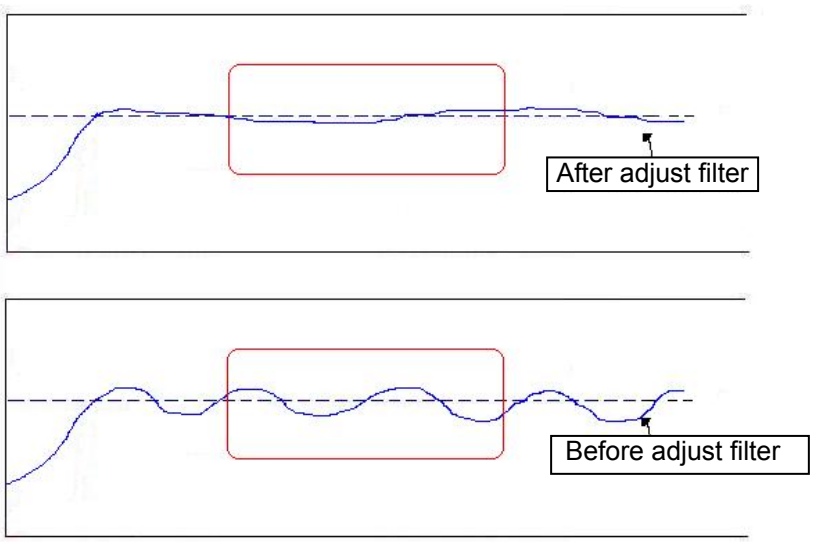


PID Parameter Adjustment Guide:

PID Parameters	Increase Setting Value	Decrease Setting Value	Main Feature
Proportional Gain (P)	(G) Increase response time (B) Might cause pump vibration	(G) Reduce vibration (B) Slow down response	Increase stabilize time
Integration Time (I)	(G) Smooth output frequency (B) Slow down response	(G) Fast response (B) Change rapidly of output frequency.	For smooth feedback variations
Differentiation Time (D)	(G) Avoid overshooting (B) System unstable or motor vibration	(G) System stable (B) Overshooting easily	Respond to system rapid variations

Notes: PID parameters can be changed during the inverter is running.
Notes: (G) means good, (B) means bad.

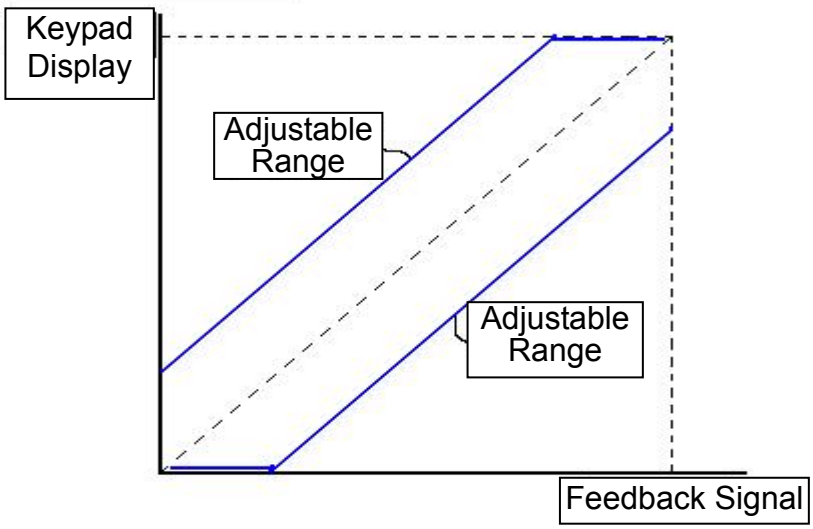
(14):17-3 Output Filter Time (O) 0.0 – 2.5 sec



Smooth the PWM output by increase filter time setting.
Setting a bigger filter time will get a slower system response time.

(15):17-4 Feedback Signal (F) Offset 0.00 – 10.00 rate
17-5 Signal Type 0000 : 0 ~10V 0001 : 4 ~ 20mA
17-6 Feedback Signal Scan Time 1 – 100 (base on 4ms)

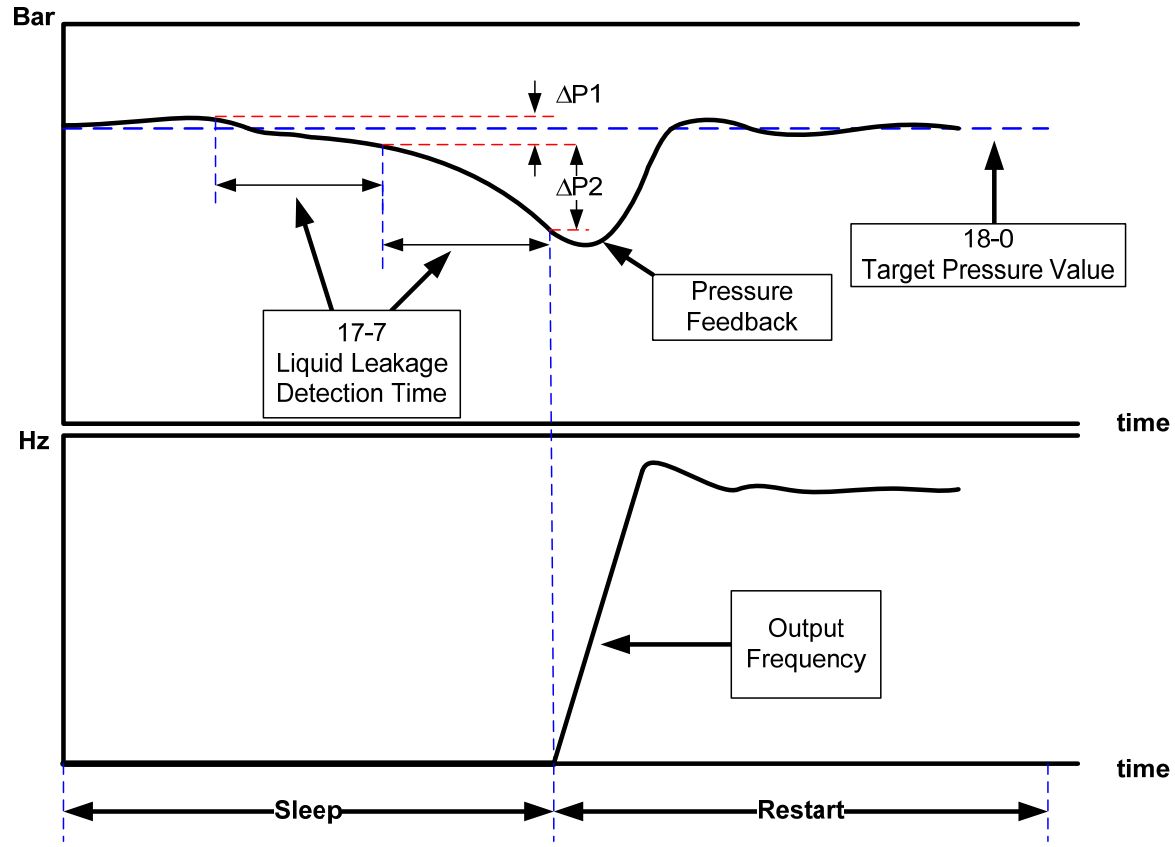
17-4 Feedback Signal Offset(F): Gradual adjust to specific value
Example: When the feedback signal were not the same as keypad display, adjust this parameter to reduce the bias.



17-5 Feedback Signal Type(F): select a signal type depends on the pressure sensor specification for the voltage type 0 ~ 10V and current type 4 ~ 20mA.
17-6 Feedback Signal Scan Time(F) setting range 1 ~100 : To set a Scan Time for feedback signal, increasing the setting will get slower response.
Example: Set 17-6 to 5, it will automatically multiply 4ms derive a 20ms scan time. Every 20ms, inverter detect feedback signal once.

(16) 17-7 Liquid Leakage Detection Time 0.0 – 10.0 sec
17-8 Change Level within Detection Time 0.01 - 2.50 Bar
17-9 Restart Level for Liquid Leakage Detection 0.01 - 2.50 Bar

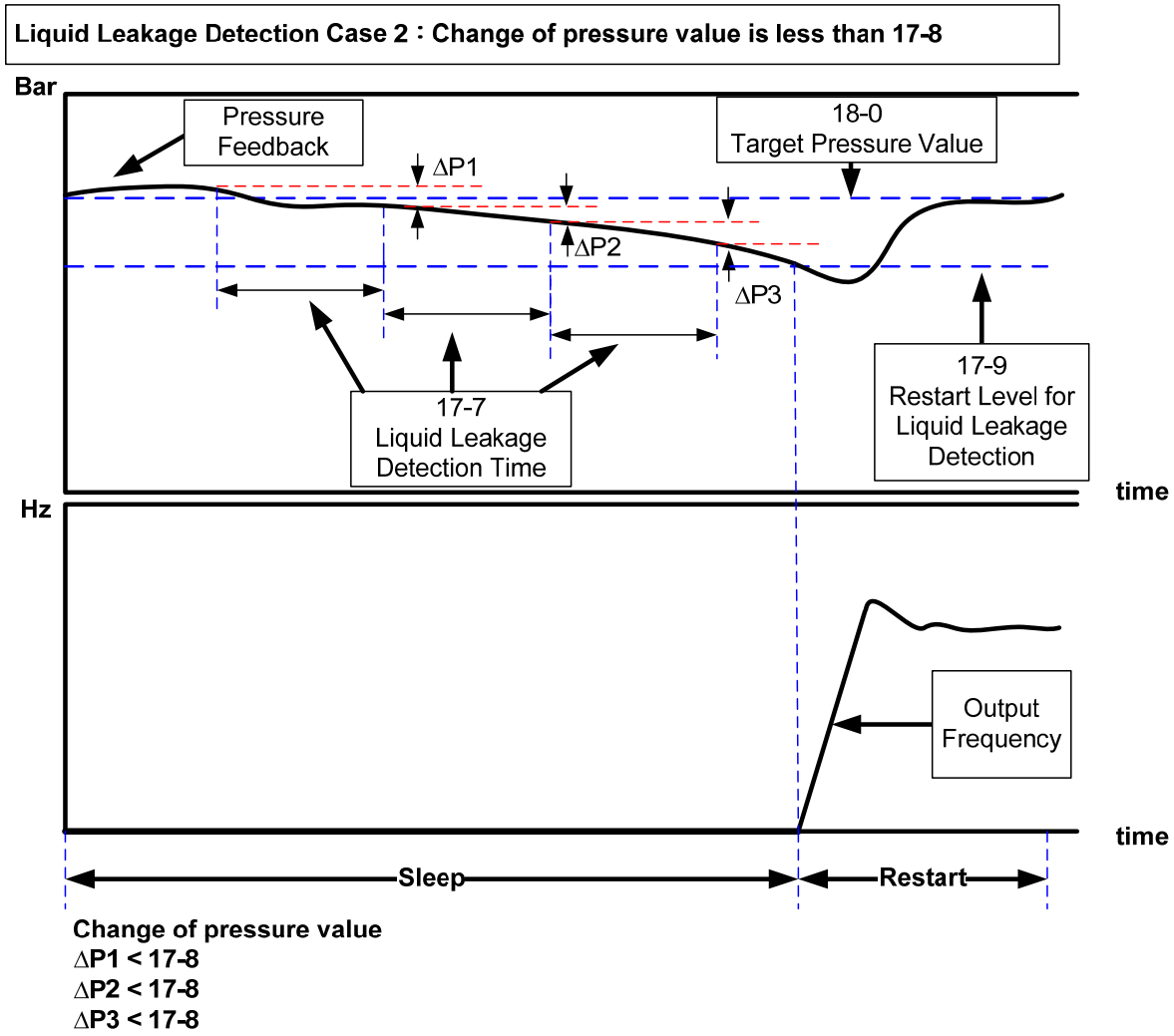
Liquid Leakage Detection Case 1：Change of pressure value is over than 17-8



Change of pressure value
ΔP1 < 17-8
ΔP2 > 17-8

✸17-7 = 0.0(sec) : Disable Liquid Leakage Detection.

✸When pump is sleeping, the pressure value maybe decrease due to the liquid leakage, if the change of pressure value is higher than 17-8, the pump will start again.



✸17-7 = 0.0(sec) : Disable Liquid Leakage Detection.

✸When pump is sleeping, the pressure value maybe decrease because liquid leakage, if the change of pressure value is lower than 17-8 during every 17-7 detection time, the pump will keep in sleep mode, until the pressure value is higher than the setting of 17-9 (restart level).

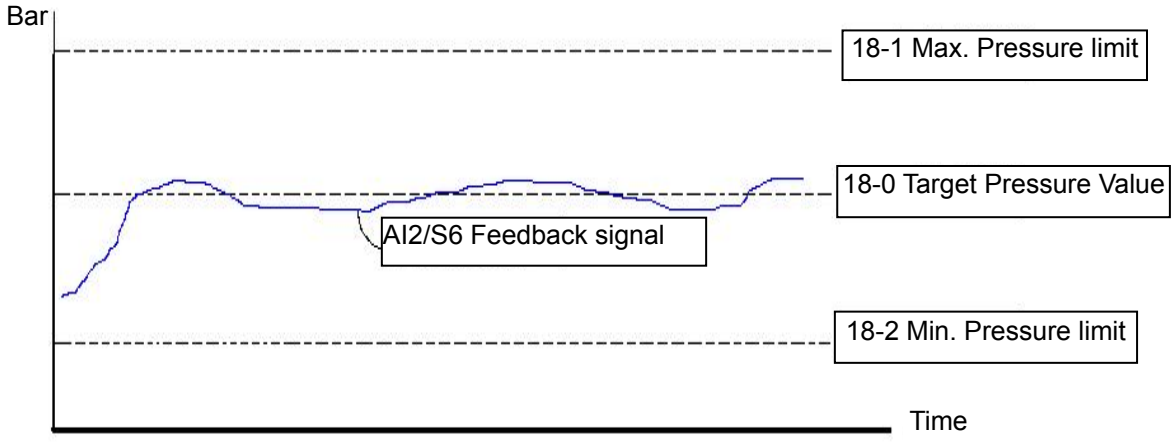
✸Setting the value of 17-7/17-8/17-9 properly can improve the pump restart condition due to the liquid leakage.

✸Water leakage detection function only enable in single pump application.

(17):18-0 Target Pressure Value 0.10 – 25.50Bar

18-1 Max. Pressure limit 0.10 – 25.50 Bar

18-2 Min. Pressure limit 0.10 – 25.50 Bar

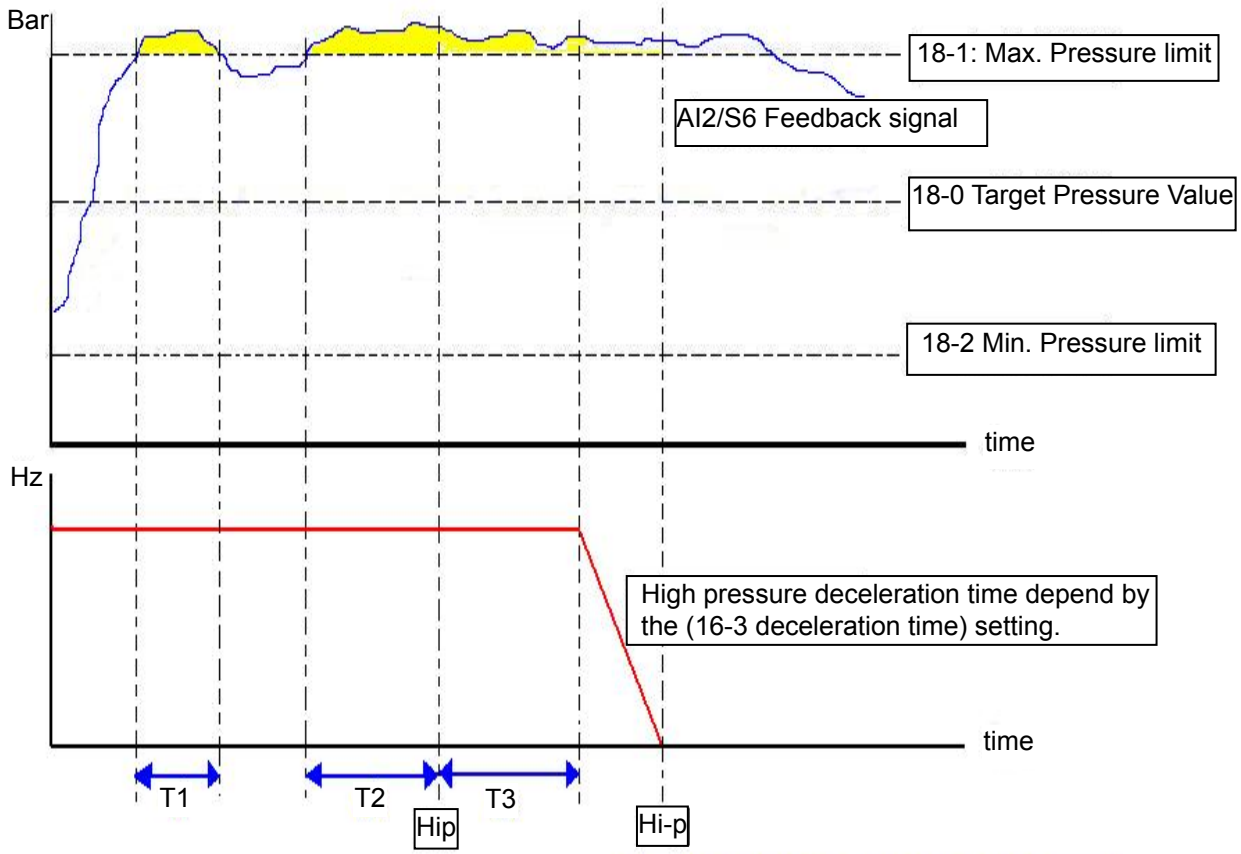


When using PID control, system pressure will intervene (18-1 Max. Pressure limit) and (18-2 Min. Pressure limit).

(18):18-0 Target Pressure Value 0.10 – 25.50Bar

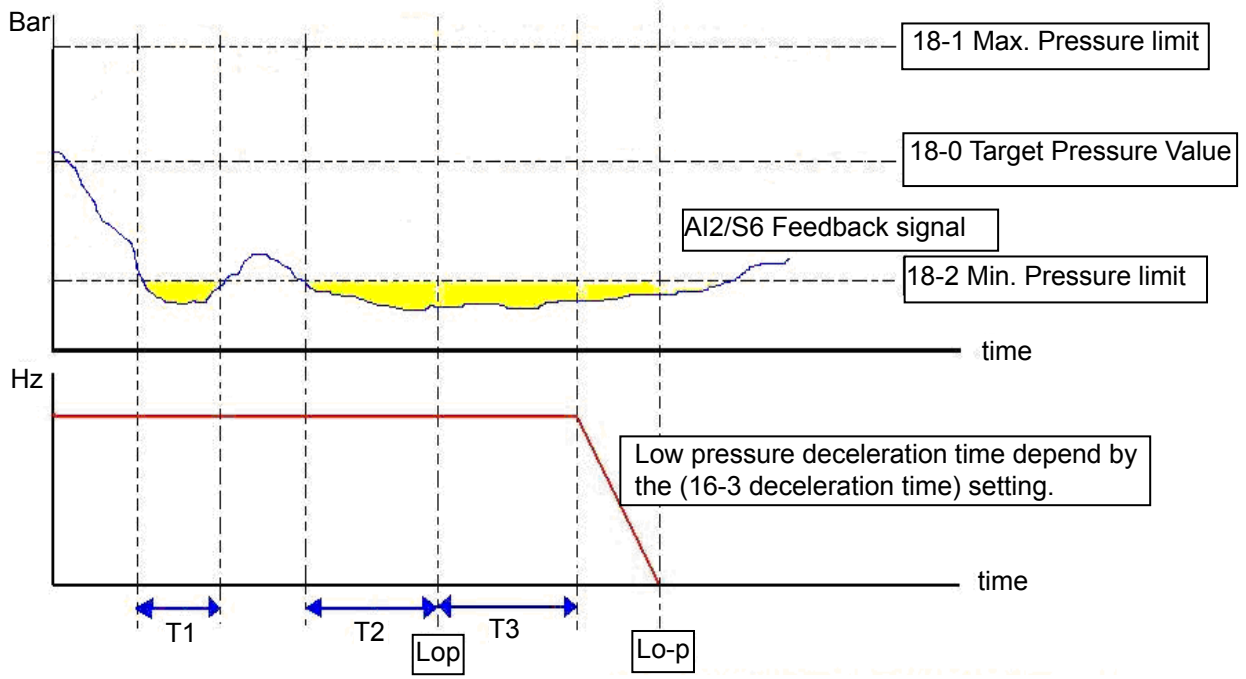
18-3 High pressure alarm time 0.0 – 600.0 sec

18-4 High pressure stop time 0.0 – 600.0 sec



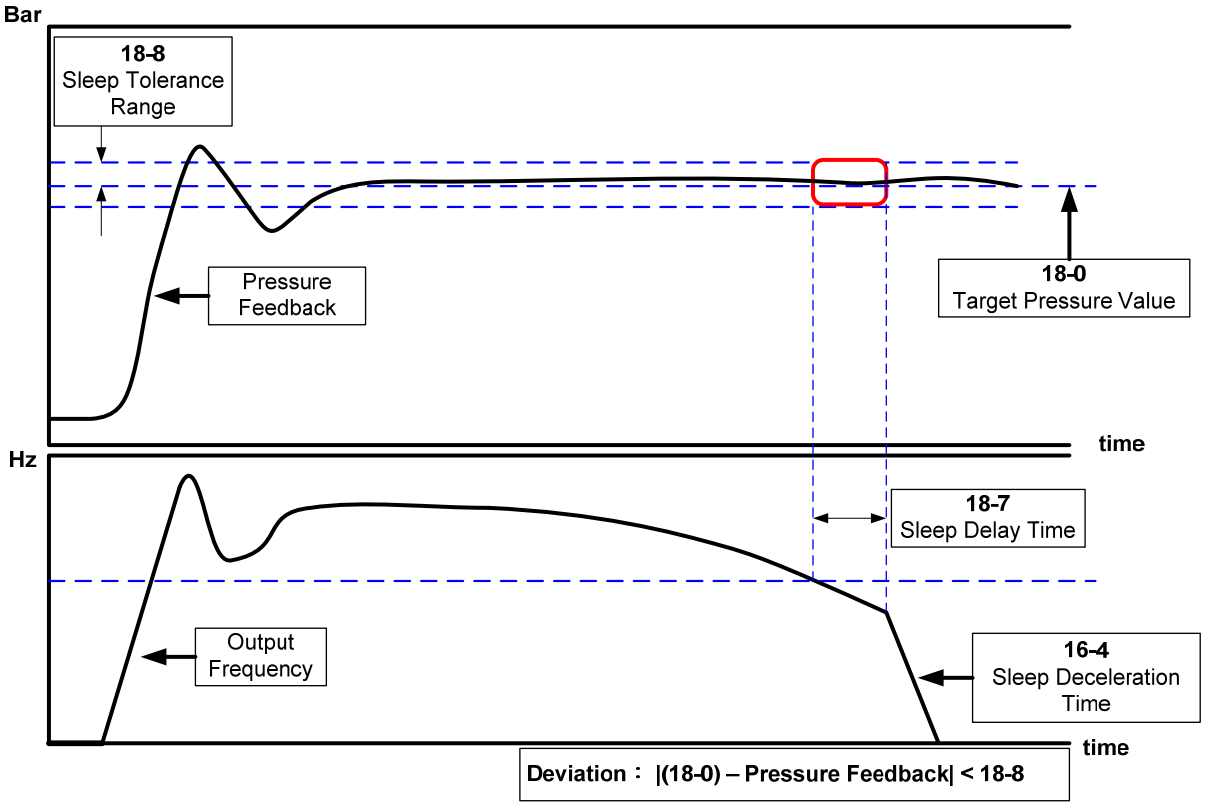
T1 < (18-3 High Pressure Alarm Time), the Hip accumulate time will be reset after T1.
T2 = (18-3 High Pressure Alarm Time), Counting high pressure time again and keypad blink Hip.
T3 = (18-4 High Pressure Stop Time), keypad blink Hi-p and deceleration to stop.

(19):18-5 Low pressure alarm time 0.0 – 600.0 sec
18-6 Time ow pressure stop time 0.0 – 600.0 sec



T1 < (18-5 Low Pressure Alarm Time); the Lop accumulate time will be reset after T1.
T2 = (18-5 Low Pressure Alarm Time); Counting low pressure time again and keypad blink Lop.
T3 = (18-6 Low Pressure Stop Time); keypad blink Lo-p and deceleration to stop.

(20):18-7 Sleep Delay Time 0.0 – 120.0 sec
18-8 Sleep Tolerance Range 0.00 – 5.00 Bar



Notes: Sleep function can save energy when pressure reached target pressure value.

(21):18-9 HiP/LoP/1BrE Protection Auto Restart Times 0 – 999

1.) 18-9=0: Amount of auto restart is infinite.

2.) 18-9=1~999: When amount of auto restart is over 18-9 setting, then inverter never restart, until re-power-on or using reset function.

(22): 18-A Pressure losing prevention level (%) 0 – 100 rate
18-B Detection time of pressure losing 0.0 – 25.0 (sec)

1.) When 18-A = 0: Disable.
2.) When 18-A > 0: If Pressure feedback is less than **(**Pressure setting (18-0) x Pressure losing prevention level (18-A)**)** and exceed the detection time (18-B), the pump will stop and show “PbL”

(23): 18-C Forced operating frequency 0.00 – 200.0 (Hz)

When S1~S5 any DI setting = 6(PID disable), pump will not operate according to PID function, then set another DI = 7(Forced operating frequency), now the pump will operate depending on 18-C (Forced operating frequency), and pump stops if remove the DI(S1~S5=7). This function is use for when pressure sensor is offline or breakdown.

(24):19-0 Single/Dual Pump and Master/Slave Selection 0000: Single
0001: Dual – Master
0002: Dual – Slave 1
0003: Dual – Slave 2
0004: Dual – Slave 3

19-2 Dual pump synchronal setting 0: Disable
1: Target Pressure Value & Run/Stop
2: Only Target Pressure Value
3: Only Run/Stop

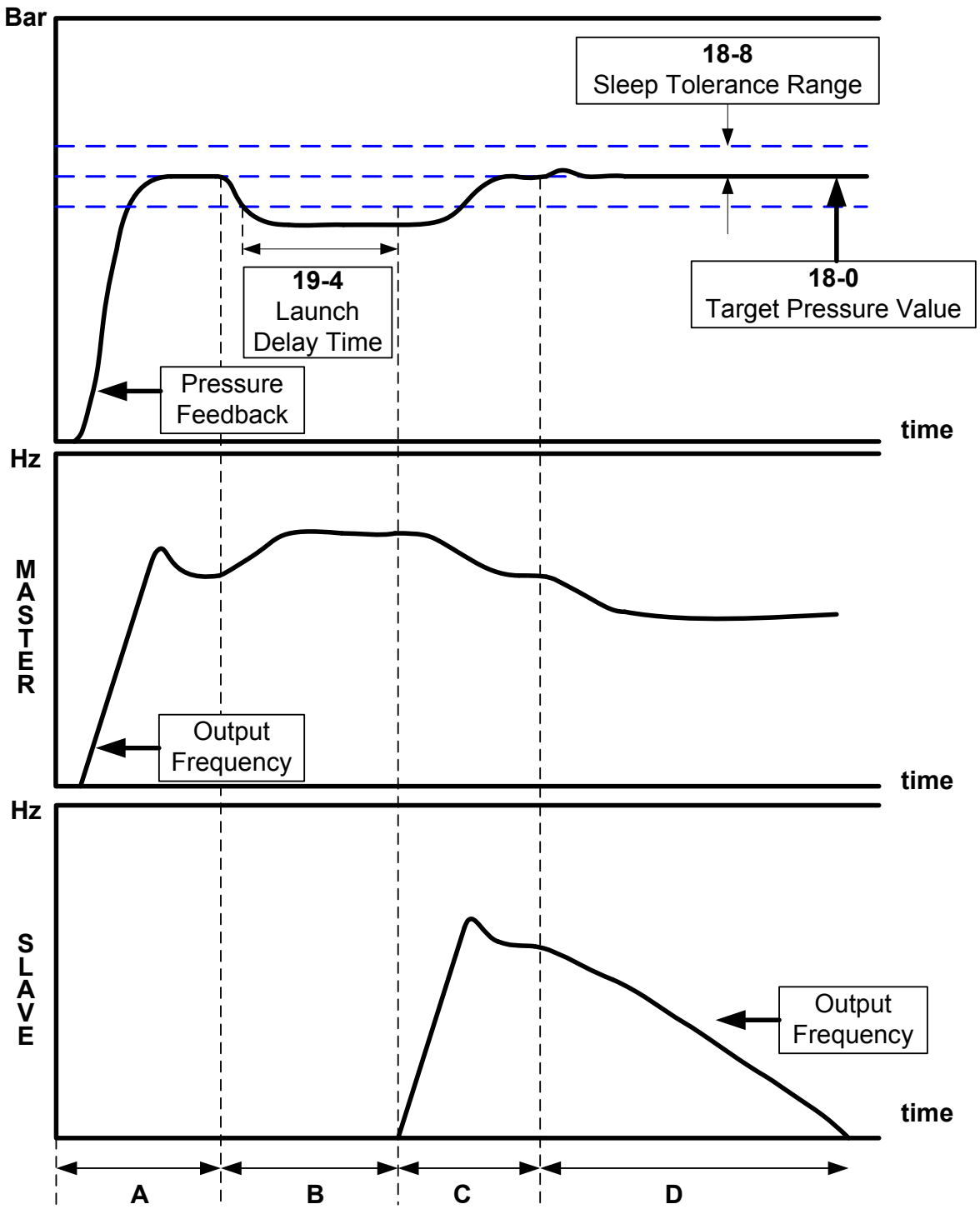
19-3 Auto Shift Time 0 – 240 hour

19-4 Launch Delay Time (Slave Unit) 0 – 30.0 sec

19-0 Single/Dual Pump and Master/Slave Selection,

0000: Single 0001: Dual – Master 0002: Dual – Slave

When select dual pump control method (19-0=1, 2), set one inverter 19-0 to “1” another to “2”.



A : When dual pump operate, Master start and Slave(1~3) is standing by, then system is operating in the constant pressure.

B : When water usage become larger, then the output frequency of Master will increase. If the feedback pressure does not reach setting range of 18-8(Sleep Tolerance Pressure) and 19-4(Launch Delay Time) is not finished, Slave is still standing by.

C : When 19-4 is finished, Master request Slave to operate simultaneously to keep constant pressure. If water usage reduced, the output frequency will decrease.

D : When the water usage become less, through Water Usage Detection, and the output frequency will decrease again, when the water usage reduce to only 1 drive can afford (means still can keep constant pressure), then the output frequency of Slave will decrease again and get into sleeping mode.(More detail about Slave sleeping conditions please refer 19-6 and 19-7). Now, only the Master is operating.

19-3 Auto Shift Time

Mater and Slave unit will exchange the status after the setting time of 19-3, thereby Master will operate as Slave and Slave operate as Master. The S1 can be a switch to start or stop operation.

19-4 Launch Delay Time (Slave Unit)

When the feedback signal is lower than 18-8, Master will start immediately. If the feedback signal is still lower than 18-8 and over 19-4, the Slave will operate.

1.When using dual pump 19-0≠0, the two drives parameter 19-0 cannot be set as 1 or 2 for both, and modifying 19-5=200 and 17-4 is needed which helps to make sure the feedback signal of the two drive is the same

(25):19-1 Max. Pressure of Pressure Transmitter 0.10 – 25.50 Bar

According to the specification of pressure transmitter to set pump system pressure base.

(26):19-5 AI2 (S6)Gain(%) adjustment 0 – 200 %

The dual pump operation AI2 (S6) Gain is 200% and 17- 4 Feedback Signal Offset should be the same for both Master and Slave drives.

(27):19-6 Start Frequency for Slave Pump Running 0 – 100 % (100% = 16-0)
19-7 Start Frequency for Slave Pump Stopping 0 – 100 % (100% = 16-0)

19-6 = 0% : Disable.

19-7 = 0% : Disable.

When dual pump is operation and Master is running, as the pressure is lower than (18-0 – 18-8), the Slave will restart by follow condition:

1.19-6 = 0%: Disable restart frequency condition
After the setting time of 19-4, Master request Slave to start.

2.19-6 = 1 ~ 100%: Enable restart frequency condition
When the output frequency of Master is over than 19-6(%) × 16-0, and after the setting time of 19-4, then Master request Slave to start.

When Master and Slave are running, the Slave will stop by follow condition:

1.19-7 = 0%: Disable stop frequency condition
When output frequency of Slave is less then 16-5 Sleep Frequency, and persist time is bigger than 18-7 Sleep delay time, then Slave will get into sleep mode.

2.19-7 = 1 ~ 100%: Enable stop frequency condition

When the output frequency of Master is over than 19-7(%) × 16-0, and 19-4 is finished, or output frequency of Slave is less then 16-5 Sleep Frequency, and persist time is bigger than 18-7 Sleep delay time, then Slave will get into sleep mode.

Note: The 19-6/19-7 setting values of Master and Slave must be the same.

(28): 20-0 Run command source	0 : Keypad 1 : External Terminal

1.) 20-00 = 0 inverter is controlled by keypad.

2.) 20-00 = 1 When inverter is controlled by external terminal, the stop button on keypad still enable for emergency stop.

(29): 20-1~20-5	S1~S5 Terminal Function 0 : Forward 1 : E.S. terminal A 2 : Base Block (b.b.) 3 : RESET command 4 : Control signal switch 5 : Communication control signal switch 6 : PID function disable 7 : Forced operating frequency

1.) S1-S5 on TM2 are multi-function input terminals which can be set to the above 7 functions.

2.) 20-01~05 Function descriptions:

A. 20-01~05 = 0 Forward run

When forward command is on, motor will operate, when command is off, motor will not operate.

B. 20-01~05 = 1 E.S. terminal A

When external E.S. is on, the drive will decelerate depend on the Deceleration Time, and blink E.S. after stops. Please remove the E.S. signal before turn the switch from off to on on (20-00=1) or press Run (20-00=0), then the drive will operate from the starting frequency.

C. 20-01~05 = 2 Free run stop(Base block)

When Base block is on, the drive will block the PWM immediately and blink "b.b." on screen. After Base block command is removed, the drive will restart by Speed search automatically.

D. 20-01~05 = 3 RESET command

When terminal is on, reset the drive; off, does not work.

E. 20-01~05 = 4 Control signal switch

External control terminal off: operating signal is controlled by 20-00

External control terminal on: operating signal is controlled by Keypad display.

F. 20-01~05 = 5 Communication control signal switch reserve.

G. 20-01~05 = 6 PID function disable

When on, the PID function is disable, drive doesn't concern about the sensor feedback, in the same time, output frequency= 0.

H. 20-01~05 = 7 Forced operating frequency

This function is match with PID disable function to start the forced operating frequency. More detail please refer to 18-C.

(30)：20-6~7 Multifunction output terminal:

20-6 : RELAY1(R1C, R1B, R1A terminal inTM2)

20-7 : RELAY2(R2B, R2A terminal inTM2)

0: Run
1: Auto restart
2: Auto restart
3: Momentary power loss
4: E.S.
5: Free run stop
6: Motor overload
7: Inverter overload protection
8: High/Low pressure alarm
9: Power On
10: PID feedback signal offline
11: Over torque detection

(31)：20-8 Source of bias target pressure

0 : Disable
1 : AIN
2 : VR(15-6 password is a must)

20-9 Range of bias target pressure 0.0 – 10.00

1.) 20-8 = 0 : Disable

2.) 20-8 = 1 : Voltage command is given by TM2 AIN, the target pressure cannot be set from keypad now, target pressure will adjust according to 20-9 setting range and AIN voltage, and it is based on 5V, it decreases (by ration) according to the AIN voltage if it is lower than 5V, it will increase (by ration) if higher.

EX : 18-0 (Pressure setting) = 5.0 (Bar)

20-9 (Range of bias target pressure) = 3.0 (Bar)

If AIN input voltage 8V ➔ Target Pressure = 5 + ((8V-5V) / 5) x 3(Bar) = 6.8(Bar)

If AIN input voltage3V ➔ Target Pressure = 5 + ((3V-5V) / 5) x 3(Bar) = 3.8(Bar)

✸ **Target pressure still limit by 18-1(Max. pressure limit), 18-2(Min. pressure limit).**

Control of multifunction analog output

(32)：20-A Multifunction analog output selection:

0: Output Frequency

1: Frequency command

2: Output voltage

3: DC voltage

4: Output circuit

5: PID feedback signal

20-B Gain control of multifunction analog output = 0~200%

Multifunction analog output terminal (TM2) is a 0~10Vdc analog output, it is selectable as 20-A, and when external voltage meter or peripheral equipment has an error, 20-B is use for adjust it.

Chapter 5 Troubleshooting and Maintenance

5.1 Error display and remedy

5.1.1 Errors which can not be recovered manually

	Display	Error	Cause	Remedy
	CPF	Program problem	External noise interference	Connect a parallel RC burst absorber across the magnetizing coil of the magnetic contactor that causes interference
	EPR	EEPROM problem	Faulty EEPROM	Replace EEPROM
@	-OV-	Voltage too high during stop	Detection circuit malfunction	Send the inverter back for repairing
@	-LV-	Voltage too low during stop	1. Power voltage too low 2. Restraining resistor or fuse burnt out. 3. Detection circuit malfunctions	1. Check if the power voltage was correct or not 2. Replace the restraining resistor or the fuse 3. Send the inverter back for repairing
@	-OH-	The inverter is overheated during stop	1. Detection circuit malfunctions 2. Ambient temperature too high or bad ventilation	1. Send the inverter back for repairing 2. Improve ventilation conditions
	CTER	Current Sensor detecting error	Current sensor error or circuit malfunctions	Send the inverter back for repairing

Note： “@” the Failure contact does not function.

5.1.2 Errors which can be recovered manually and automatically

Display	Error	Cause	Remedy
OC-S	Over current at start	1. the motor wind and enclosure short circuit 2. the motor contacts and earth short circuit 3. the IGBT module ruined	1. inspect the motor 2. inspect the wire 3. replace the transistor module
OC-D	Over-current at deceleration	The preset deceleration time is too short.	Set a longer deceleration time
OC-A	Over-current at acceleration	1. Acceleration time too short 2. The capacity of the motor higher than the capacity of the inverter 3. Short circuit between the motor coil and the shell 4. Short circuit between motor wiring and earth 5. IGBT module damaged	1. Set a longer acceleration time 2. Replace a inverter with the same capacity as that of the motor 3. Check the motor 4. Check the wiring 5. Replace the IGBT module
OC-C	Over-current at fixed speed	1. Transient load change 2. Transient power change	Increase the capacity of the inverter
OV-C	Voltage too high during operation/ deceleration	1. Deceleration time setting too short or large load inertia 2. Power voltage varies widely	1. Set a longer deceleration time 2. Add a brake resistor or brake module 3. Add a reactor at the power input side 4. Increase inverter capacity
Err4	Illegal interrupt of CPU	Outside noise interference	Send back to repair if it happens many times
OVSP	Over speed during operating	1. Moter load too big or Inverter capacity too small 2. The Current detect circuit fault	1. Increase acceleration / deceleration time (16-2/16-3) 2.Send back to Teco
LoP	Low Pressure Alarm	Pressure lower than min. pressure limit, low pressure persist time greater than low pressure alarm time setting	1. Decrease setting value of min. pressure limit 2. Check pressure meter
Hip	Low Pressure Stop	Pressure lower than min. pressure limit, low pressure persist time greater than low pressure stop time setting	1.Decrease setting value of min. pressure limit 2. Check pressure meter
Lo-P	High Pressure Alarm	Pressure higher than max. pressure limit, High pressure persist time greater than high pressure alarm time setting.	1. Increase setting value of max. pressure limit 2. Check pressure meter
Hi-p	High Pressure Stop	Pressure higher than max. pressure limit, High pressure persist time greater than high pressure stop time setting.	1. Increase setting value of max. pressure limit 2. Check pressure meter

Display	Error	Cause	Remedy
PbL	**Pressure Loss Stop**	When feedback pressure is lower than 18-A (Pressure losing ratio) and longer then pressure losing detection time.	1. Decrease the value of min. pressure limit 2. Check pressure meter

5.1.3 Errors which can be recovered manually but not automatically

Display	Error	Cause	Remedy
OC	Over-current during stop	1. Detection circuit malfunctions 2. Bad connection for CT signal cable	1. Check the noise between Power line and motor line 2. Send the inverter back for repairing
OL1	Motor overload	Heavy load	Increase the motor capacity
OL2	Inverter overload	Heavy Load	Increase the inverter capacity
OL3	Over torque	Heavy Load	Increase the inverter capacity
LV-C	Voltage too low during operation	1. Power voltage too low 2. Power voltage varies widely 3. Main Circuit Relay error	1. Improve power quality 2. Set a longer acceleration time 3. Increase inverter capacitor Add a reactor at the power input side Send the inverter back for repairing
OH-C	Heatsink temperature too High during operation	1. Heavy load 2. Ambient temperature too high or bad ventilation	1. Check if there are any problems with the load 2. Increase inverter capacity 3. Improve ventilation conditions

5.1.4 Special conditions

Display	Error	Description
STP0	Zero speed stop	Happened when preset frequency <0.1Hz
PDER	PID feedback loss	PID feedback loss detect
1BrE	Inverter mal-function	When one unit show " 1BrE " error the other unit can operate continuously.

5.1.5 Operation errors

Display	Error	Cause	Remedy
Err1	Key operation error	Attempt to modify the parameter can not be modified during operation (refer to the parameter list).	Modify the parameter while STOP

5.2 General troubleshooting

Status	Checking point	Remedy
Motor can not run	Is power applied to L1(L), L2, and L3(N) terminals (is the charging indicator lit)?	• Is the power applied? • Turn the power OFF and then ON again. • Make sure the power voltage is correct. • Make sure screws are secured firmly.
	Are there voltage across the output terminal T1, T2, and T3?	• Turn the power OFF and then ON again.
	Is overload causing the motor blocked?	• Reduce the load to let the motor running.
	Are there any abnormalities in the inverter?	• See error descriptions to check wiring and correct if necessary.
	Is forward or reverse running command issued?	
	Has analog frequency signal been input?	• Is analog frequency input signal wiring correct? • Is voltage of frequency input correct?
	Is operation mode setting correct?	• Operate operations through the digital panel.
Motor runs inversely	Are wiring for output terminals T1, T2, and T3 correct?	• Wiring must match U, V, and W terminals of the motor.
	Are wiring for forward and reverse signals correct?	• Check wiring are correct if necessary.
The motor speed can not be regulated.	Are wiring for analog frequency inputs correct?	• Check wiring are correct if necessary.
	Is the setting of operation mode correct?	• Check the operation mode of the operator.
	Is the load too heavy?	• Reduce the load.
Motor running speed too high or too low	Are specifications of the motor (poles, voltage…) correct?	• Confirm the motor's specifications.
	Is the gear ratio correct?	• Confirm the gear ratio.
	Is the setting of the highest output frequency correct?	• Confirm the highest output frequency.
Motor speed varies unusually	Is the load too heavy?	• Reduce the load.
	Does the load vary largely?	• Minimize the variation of the load. • Increase capacities of the inverter and the motor.
	Is the input power lack of phase?	• Add an AC reactor at the power input side if using single-phase power. • Check wiring if using three-phase power.

Appendix

The definition of Pressure:

$$P = \frac{F}{A} \qquad \text{or} \qquad P = \frac{dF}{dA}$$

Where:

p is the pressure,
F is the normal force,
A is the area.

Non-SI measures such as *pound per square inch* (psi) and *bar* are used in parts of the world Conversion between Kg/Cm^2 and P.S.I are list as below formula:

1 Kg/Cm^2 = 14.22 P.S.I or 1P.S.I = 0.07 Kg/Cm^2

1 Bar = 1 00 kPa = 1.02 Kg/Cm^2 = 14.5 P.S.I

Conversion of the Pressure unit						
MPa	**KPa**	**Bar**	**Kg/cm^2**	**P.S.I**	**atm**	**mHg**
1	1000	10	10.2	145	9.87	7.5
0.001	1	0.01	0.011	0.145	9.87×10^{-3}	7.5×10^{-1}
0.1	100	1	1.02	14.5	0.987	0.75
0.09807	98.07	0.981	1	14.22	0.968	0.736
0.00689	6.89	0.069	0.07	1	0.068	0.052
0.101	1.01×10^2	1.013	1.033	14.7	1	0.76
0.133	1.33×10^2	1.33	1.36	19.3	1.32	1

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