



Pump Solution H100+

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- **Global technical service network**

Appendix. LSE Products

LS Group is a conglomerate based in South Korea. It spun off from LG Group in 2003. LS is leading in the field of electric power, automation, machinery, materials and energy.



LS Group

<u>EMPLOYEES</u>	12,700
<u>AFFILIATES</u>	48
<u>SALES</u>	22.9 B USD
<u>TOTAL ASSET</u>	22.9 B USD



<u>EMPLOYEES</u>	3,500
<u>SALES</u>	1.9 B USD
<u>OPERATION INCOME</u>	150 M USD

* Financial figures in 2019

LS ELECTRIC (LSE) is the pioneer of electric power systems, automation, and the green energy industry in South Korea.

Company Name	LS ELECTRIC CO., LTD.
Founded	1974
Employees	3,500
Total Assets	2,170(In millions of USD, 2019)
Headquarters	LS Tower, LS-ro 127, Dongan-gu, Anyang-si, Gyeonggi-do, Korea
Seoul office	LS Yongsan Tower, Hangang-daero 92, Yongsan-gu, Seoul, Korea
Plants	4 in Korea, 2 in China and 1 in Vietnam

Global Manufacturing Footprint

Global manufacturing footprints and top-notch R&D centers allows LS ELECTRIC to produce global top level products with unparalleled cost competitiveness



- #### R&D centers, South Korea
- ☞ Convergence Technology R&D Center
 - ☞ Electro Technology R&D Center
 - ☞ Automation R&D Center
 - ☞ Power Testing & Technology Institute



| Global expansion through more than 20 overseas branches and subsidiaries



Overseas Subsidiaries

Chicago(USA), Tokyo(Japan), Dubai(U.A.E), Hanoi(Vietnam), Wuxi/Dalian(China), Amsterdam(Netherlands)

Overseas Branches

Irvine(USA), Moscow(Russia), Istanbul(Turkey), Tokyo(Japan), Bangkok(Thailand), Hochiminh(Vietnam), Jakarta(Indonesia) Shanghai/Beijing/Guangzhou/Qingdao/Chengdu/Shenyang/Jinan(China)

Presence Internationally

77 Countries

2015~

Value Management

Opening up the future of smart energy

- 2020.03 Changed the company name to LS ELECTRIC
- 2020.02 Selected as a Top 100 Global Innovator for ninth consecutive year
- 2018.12 Take over ESS unit of North America's ESS leader Parker-Hannifin
- 2017.03 Named one of the world's top 100 businesses in patent applications in Europe (European Patent Office)
- 2016.04 Acquired the MW ESS PCS North America UL certification for the first time in the world

Awarded the Korea National Quality Grand Award 2013.11
(39th National Quality Competition)

Completed Busan HVDC factory 2011.10

Established Europe's Amsterdam subsidiary 2009.10

2008~2014

Growth and Innovation

Takeoff as a global leader

- 2007.11 Awarded the Best Korean Company Award for the first time
- 2006.11 Awarded the Korea National Quality Grand Award (32nd National Quality Competition)
- 2003.11 Spun off into LS Corporate Group
- 2000.08 Power Testing & Technology Institute(PT&T) accredited as a Testing and Calibration Laboratory
- 1997.06 Established Vietnam's Hanoi subsidiary

1996~2007

Era of Challenge

Became the leader in the Korean power and automation sectors

Changed the company name to LG Industrial Systems 1995.02

Changed the company name to Goldstar Industrial Systems Co., Ltd. 1987.03

Established Lucky Packing Co., Ltd. 1974.07

1974~1995

Era of Beginning

Pioneered the power and automation industries in Korea

Pump Solution | New Firmware for Pumps

New Additions of H100+

Nothing else required to achieve better and more efficient pump control and operations by using H100 pump driven features.

Improved Process Control

- Lead-Lag
- PI Auxiliary (Suction/Level/Vacuum) Control
- Flow monitoring
- Differential Level Detection

Improved User friendliness

- Improved Hand-Off-Auto Keypad
- Power-on run for Keypad command

New Firmware



H100+

Improved PID Control

- Enhanced PID responsiveness
- Sleep Mode & Method
- PID Input Limit, I-Limit, PID ACC/DEC Time
- Simplify PID group
- Wake-up method (Absolute, Deviation)
- Sleep Off Mode

Additional Pump Protection Functions

- No-Flow Control
- Over-cycling protection
- Low/High feedback Detection
- Setpoint Timeout
- Current Limit
- Backspin Timer
- Pump Minimum Speed

Pump Solution | New Firmware for Pumps

New Additions of H100+

New Additions of H100+



Functions of H100

<i>No-Flow Control</i>
<i>Flow monitoring</i>
<i>PI Auxiliary (Suction/Level/Vacuum) Control</i>
<i>Over-cycling protection</i>
<i>Differential Level Detection</i>
<i>Low/High feedback Detection</i>
<i>Setpoint Timeout</i>
<i>Current Limit</i>
<i>Thrust Bearing Control</i>
<i>Pump Minimum Speed</i>
<i>Improved Hand-Off-Auto Keypad</i>
<i>Power-on run for Keypad command</i>
<i>Lead-Lag</i>
<i>Enhanced PID responsiveness</i>
<i>Sleep Mode & Method (Frequency, Feedback, Current)</i>
<i>PID Input Limit, Integral Limit, PID ACC/DEC Time</i>
<i>Simplify PID group</i>
<i>Wake-up method (Absolute, Deviation)</i>
<i>Sleep Off Mode</i>
<i>Backspin Timer</i>
Deleted External PID
Deleted Payback Counter
Deleted M2 Group

<i>Soft Fill Operation</i>
<i>Dec Valve Ramp</i>
<i>Multi Motor Control</i>
<i>Scheduling (Time Event: Real Time Clock)</i>
<i>Flow Compensation</i>
<i>Power-on Resume</i>
<i>Sleep Boost</i>
<i>Lubrication Control</i>
<i>Damper Control</i>
<i>Detection of Pipe Broken</i>
<i>Level Detection</i>
<i>Pre-Heat</i>
<i>Under Load Protection</i>
<i>Pump Clean</i>
<i>Load Tuning</i>
<i>Fire Mode</i>

Pump Solution | Product

H100+

● H100+ hardware features

Wall mounting types



3-phase 240V 1HP~25HP
3-phase 480V 1HP~800HP

● Enhanced coated circuit boards

- Electronic components are coated in conformance to IEC 60721-3-3, class 3C2, as standard.



● Fieldbus network support

- Built-in communication protocols based on RS485 (Variants):
 - . Modbus RTU, BACnet MS/TP, Metasys N2, LS Bus
- Wide range of communication options (Variants):
 - . Lonworks, Ethernet/IP, Modbus TCP, RAPIenet+, BACnet IP

● Drive capacity (Normal Duty)

- 200V Class, Three-phase, 0.75~18.5kW(5~69A)
- 400V Class, Three-phase, 0.75~500kW(2.5~962A)

● Overload capacity

- 120% for 60sec. (0.75~90kW)
- 110% for 60sec. (110~500kW)

● Input voltage range

- 200~240V, Three-phase (-15%/+10%): 0.75~90kW
- 380~480V, Three-phase (-15%/+10%): 0.75~90kW
- 380~500V, Three-phase (-15%/+10%): 110~500kW

● Control method

- V/f

● Output frequency

- 0~400Hz

● Carrier frequency

- 1~15kHz(0.75~90kW), 1~5kHz(110~355kW), 1~4kHz(400~500kW)

● Protection degree

- Standard: IP20/IP00, Optional: NEMA1

● Options

- Extension I/O, Flange mounting

● Global compliance (Variants)

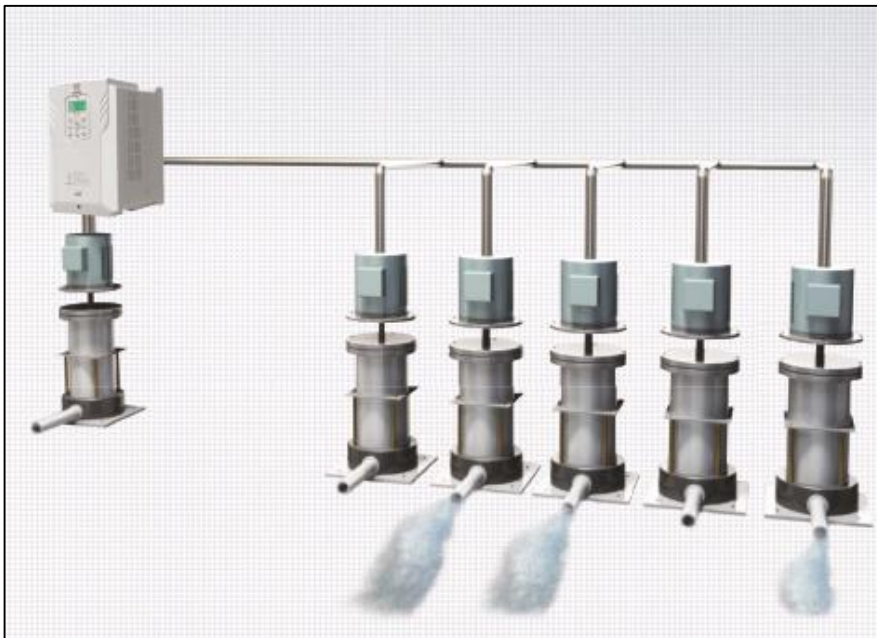
<p>International standards</p>	<p>Marine standards</p>	<p>HVAC standards for USA</p>

Pump Solution | VFD features

New Features for Pumps

● **Multi Motor Control (MMC)**

- Multi Motor Control(MMC) : Method for single drive to control multiple motors. Utilized to evenly distribute motor use and extend lifespan. Saves energy with constant PID control.
- MMC is used when a single drive is used to control multiple motors in pump systems. The H100 can control 1 main motor and 5 auxiliary motors and can be extended up to 8 motors.



[MMC]

● **Lead Lag**

- Lead Lag: Full redundant multiple motor control using multiple drives to control multiple pumps. Maximizes motor lifetime and has highest PID accuracy without using any external devices.

Category	Features	
Single Drive / Multi Pump Control (MMC)	Aux Exchange Mode	
	Main Exchange Mode	
	Regular Bypass Mode	
	Regular Bypass with feedback value	
	Aux PID compensation	
Multi Drive / Multi Pump Control (Lead Lag)	Follow Lead (Multi-PID)	
	Fixed Lag (Multi-Master)	
	Alternation Mode	First In First Out
		First In Last Out
		Operation Time Based
		Forced Alternation Timer (Lead Swap)
	Macro Data-share	
	Interlock	
	Jockey Pump Mode	
	Lost Feedback	
8 Steps of PID Setpoint, Stage/DeStage Speed, Sleep & Wake-up Level		
Various Types of PID Unit + Custom PID Unit		

Pump Solution

VFD features

New Features for Pumps

● Lead-Lag

This mode is also called as “Master-Follower”, “Lead-Lag Loadshare”.

The system can be configured without using a controller such as PLC. Instead the drives are connected via communications. In this system, if a failure occurs to the master drive, the next drive assumes the master role. Pump operation and order can be setup to alternate based on operation time, FILO, or FIFO.



Main features

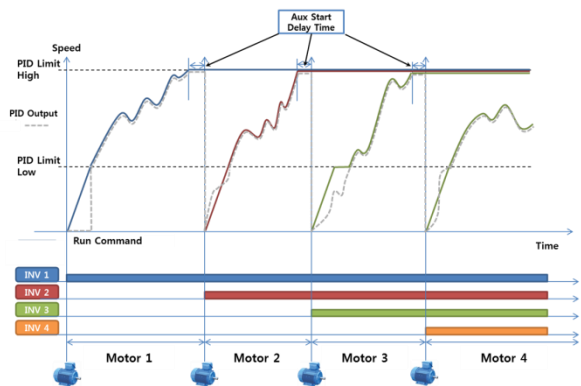
- Fixed Lag
- Follow Lead
- Jockey Pump
- Interlock
- Alternation Mode (Operation Time Based, ...)

Pump Solution | VFD features

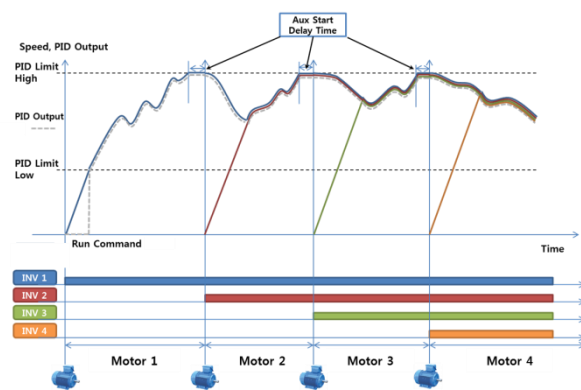
New Features for Pumps

● Lead Lag – PID Operation Method

- Based on PID control
- 2 Modes – Fixed Lag, Follow Lead



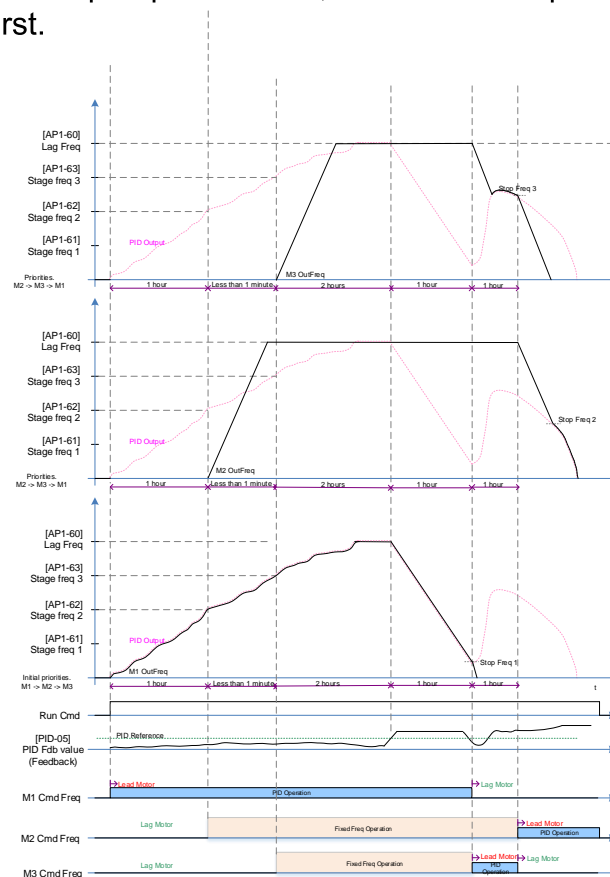
[Multi Master / Fixed Lag]



[Multi Follower / Follow Lead]

● Lead Lag – Operation Time Order

- 3 Modes – FIFO, FILO, Operation Time Order
- Operation Time Order - VFDs will calculate the time and make the least operated pump to run first, and the most operated pump to turn off first.



[Multi Follower / Follow Lead]

Pump Solution | VFD features

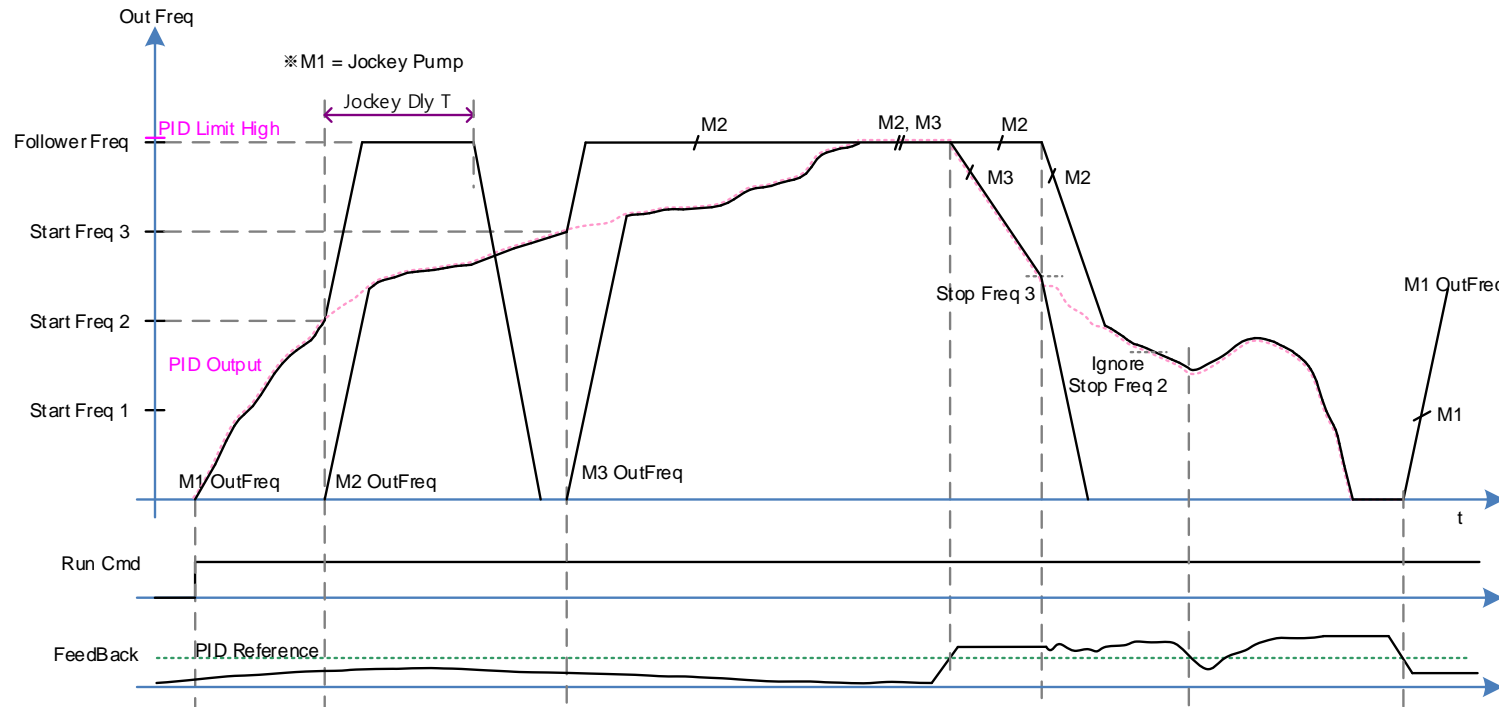
New Features for Pumps

• Lead Lag – Time Alternation

- Lead lag can be set for time alternation based on operation time.
- Time alternation can be used to make sure all pumps rotate operation periodically to share lifetime and prevent a specific pump from wearing faster.

• Lead Lag – Jockey Pump

- Jockey pump is a typically a small pump which operates when there is small water demands before turning on a larger booster pump.
- This feature is used to save energy and reduce stress from booster pumps when the demand is small.



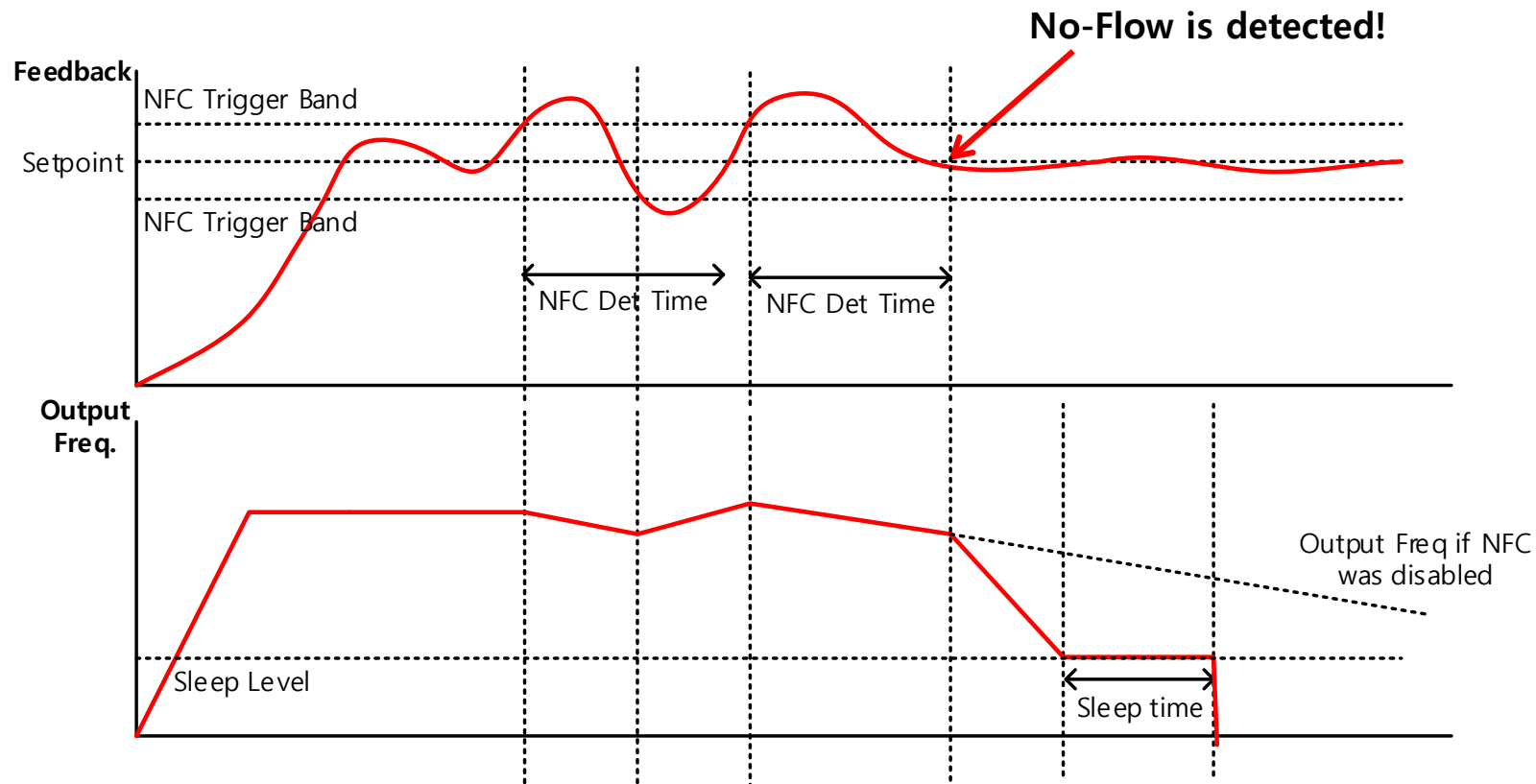
[Jockey Pump @ Fixed Lag]

Pump Solution | VFD features

New Features for Pumps

● No-Flow Control

A no flow condition, sometimes called “Deadhead”, could happen when all valves are closed. During no flow conditions, the pressure does not change even if VFD changes the output frequency. The No-Flow Control function puts the pump to sleep when a no flow condition is detected. This works by controlling output frequency and monitoring the change of the feedback value.



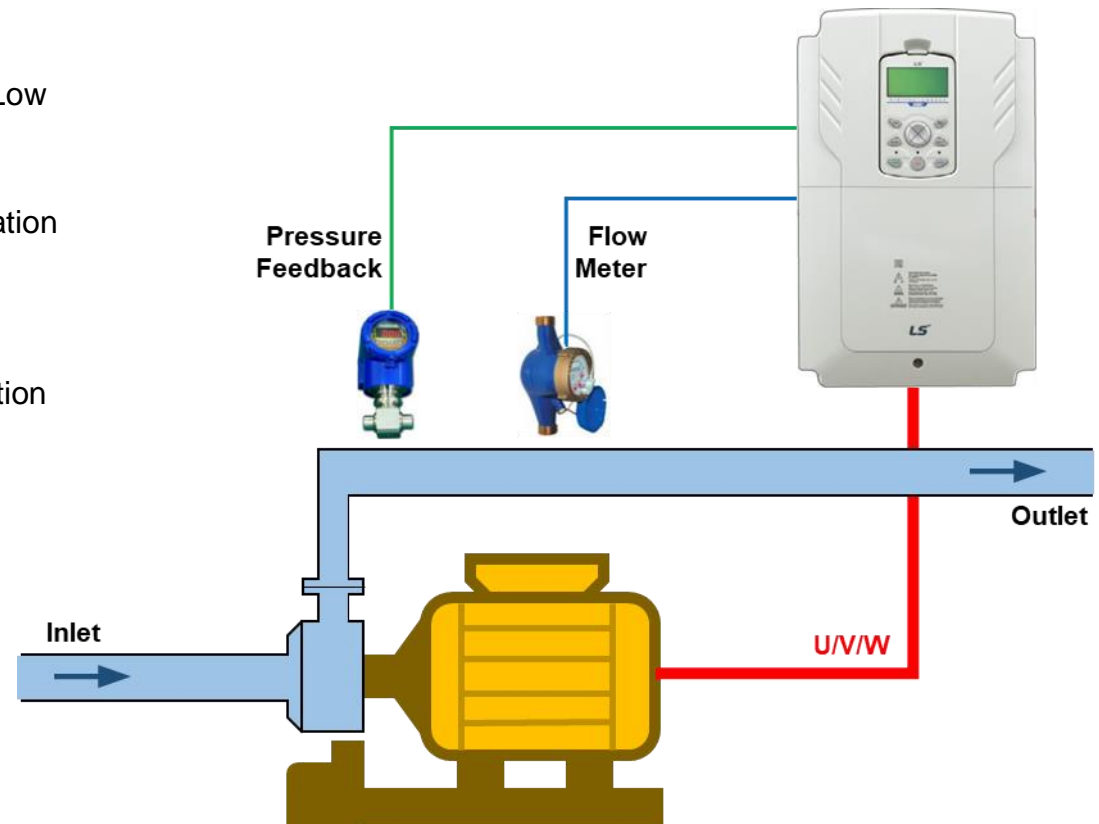
Pump Solution | VFD features

New Features for Pumps

● Flow Monitoring

Flow meters are becoming very popular in pumping systems due to regulations and limitations to how much water can be pumped out of rivers, streams, and aquifers. The drive can use a flowmeter's feedback to do the following:

- ① Displays Flow rate of the flow meter (Pulse or Analog)
- ② Triggers Digital output / warning / trip by detecting High / Low flow rate
- ③ Saves Accumulation of flow (Flow integrated amount)
- ④ Triggers Digital output / warning / trip when total accumulation (Flow integrated amount) is greater than setpoint value
- ⑤ Provides a method to convert the inverter to sleep mode according to low or no flow conditions
- ⑥ When the flow rate reaches the high or low limit, PI operation can reduce the system pressure by reducing the speed.



Pump Solution | VFD features

New Features for Pumps

● PI Auxiliary Control

PI Auxiliary Control allows the drive to control pressure when the PI Aux Level is satisfied. This function allows the H100 to monitor suction pressure at the inlet of the pump and control the output frequency accordingly.

● Suction Control

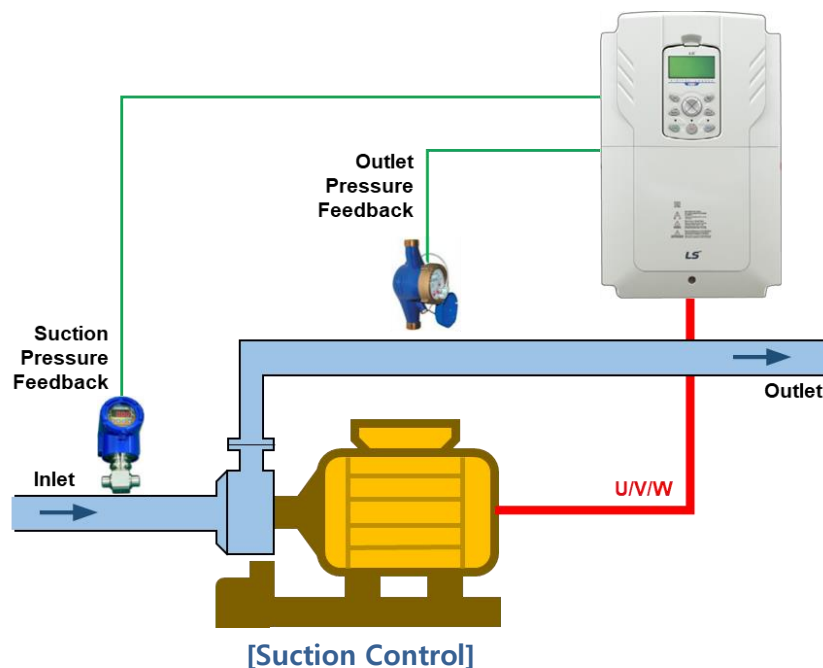
- This function allows VFD to control the outlet pressure of the pump when the inlet (suction) pressure is appropriate.

● Water Level Control

- This function allows VFD to control the outlet pressure of the pump when the water level of the well is appropriate.

● Vacuum Control

- This function allows VFD to control outlet pressure of the pump when the vacuum amount at the inlet is not too high.



● Example: Suction control

① PI Aux Setpoint \geq PI Aux Sleep Level

Aux PID output changes the output speed by comparing PID output

② PI Aux Setpoint $<$ PI Aux Sleep Level

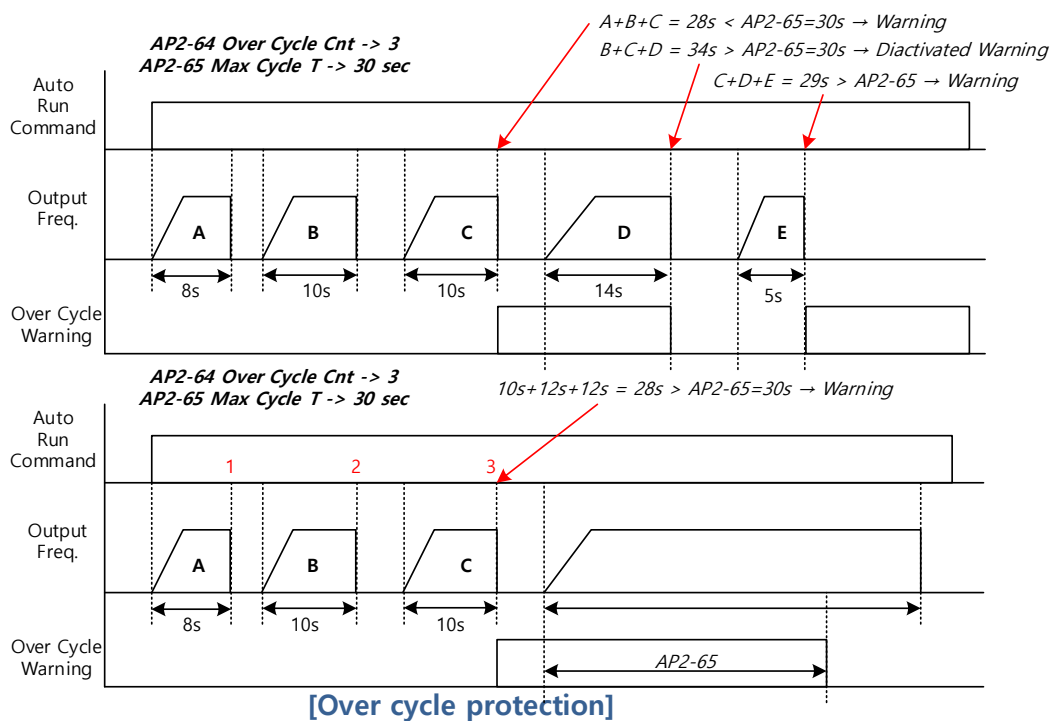
Only Primary PID output affects the speed and sleep is operated based on PI Aux feedback value

Pump Solution | VFD features

New Features for Pumps

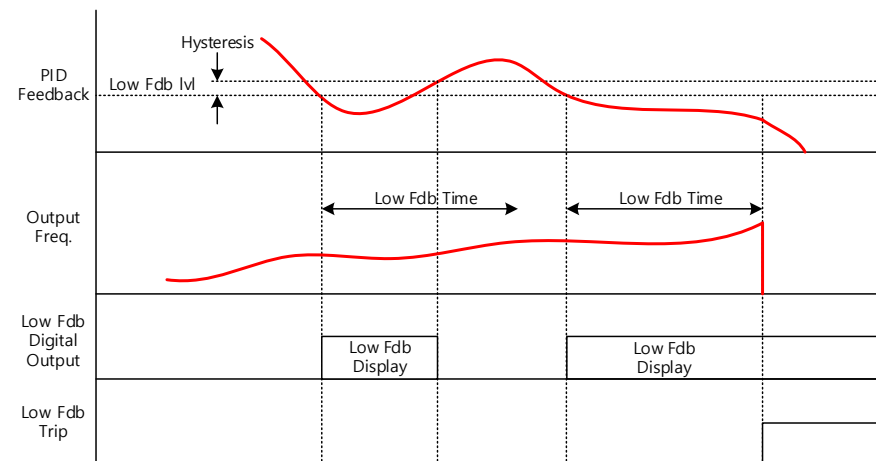
Over cycle Protection

- One cycle refers to when the VFD switches from the normal operation of Auto mode to the Sleep mode. Over cycle protection is a function to prevent frequent sleep/wake-up cycling by counting the number of cycles.

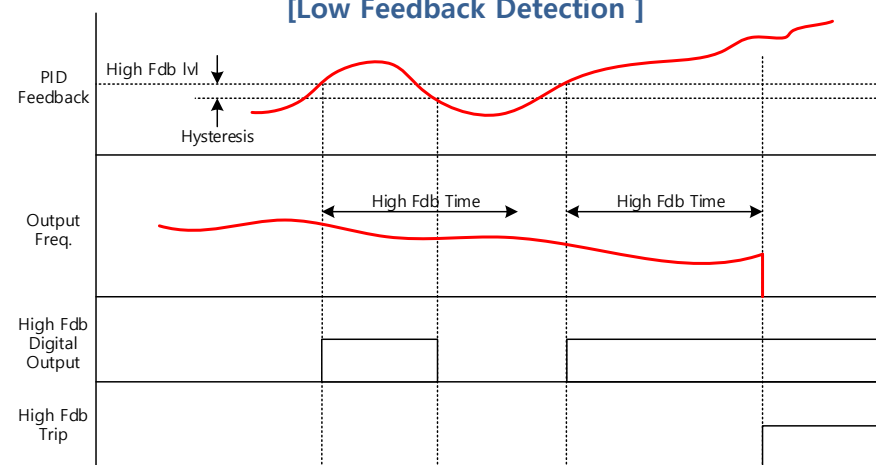


Low / High Feedback Detection

- Generates Warning, Trip, or Digital Output by detecting Low / High level set in PID feedback



[Low Feedback Detection]



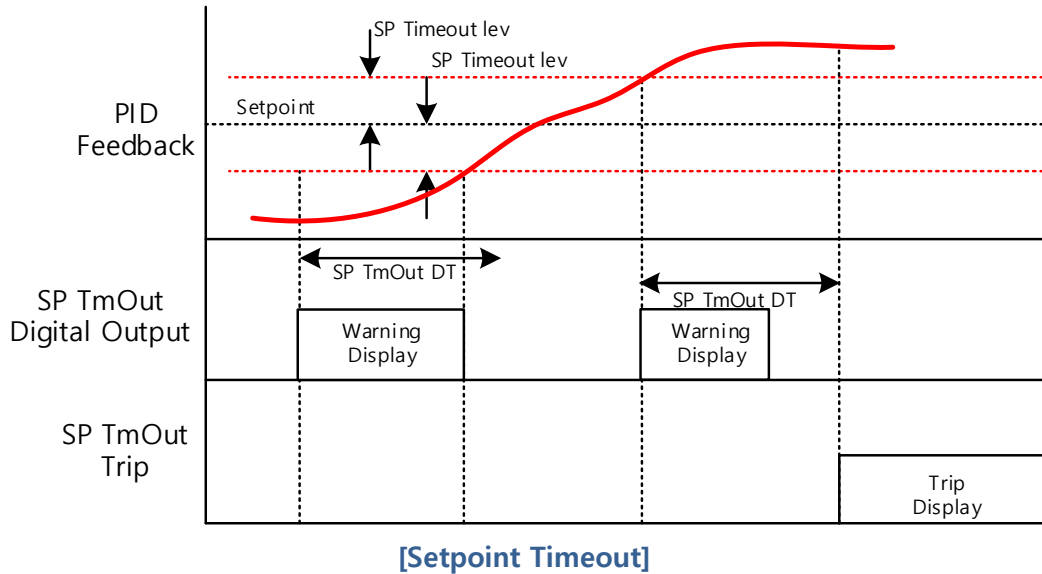
[High Feedback Detection]

Pump Solution | VFD features

New Features for Pumps

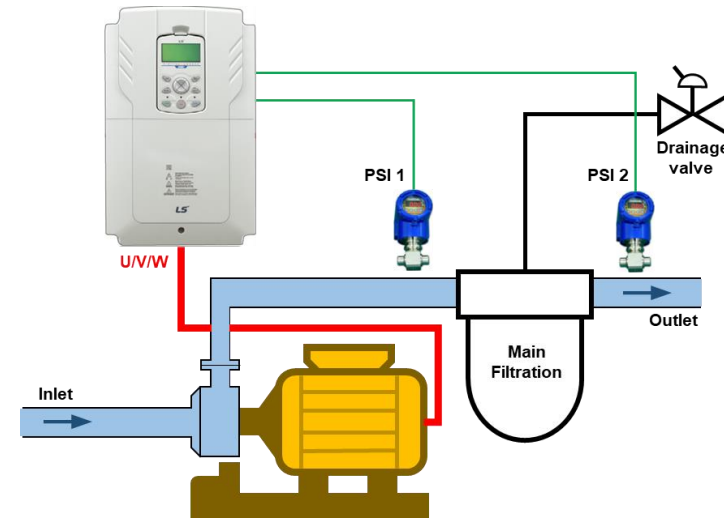
• Setpoint Timeout

- This function triggers a Warning or Trip, when the difference between feedback and setpoint is greater than set value.
- Setpoint Timeout could occur during a blockage of the impeller, pump over-cycling, or a broken pipe condition.

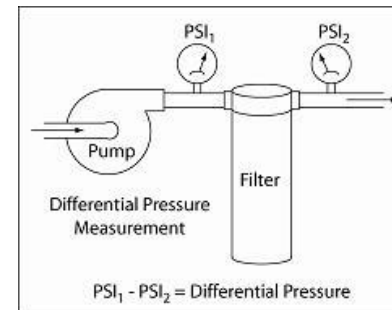


• Differential Level Detection

- The difference between two feedbacks is monitored and measured for backflush operation



- Differential Level Detection function detects the deviation of PID feedback and secondary pressure feedback and operates a digital output/ Warning/ Trip accordingly.



Pump Solution | VFD features

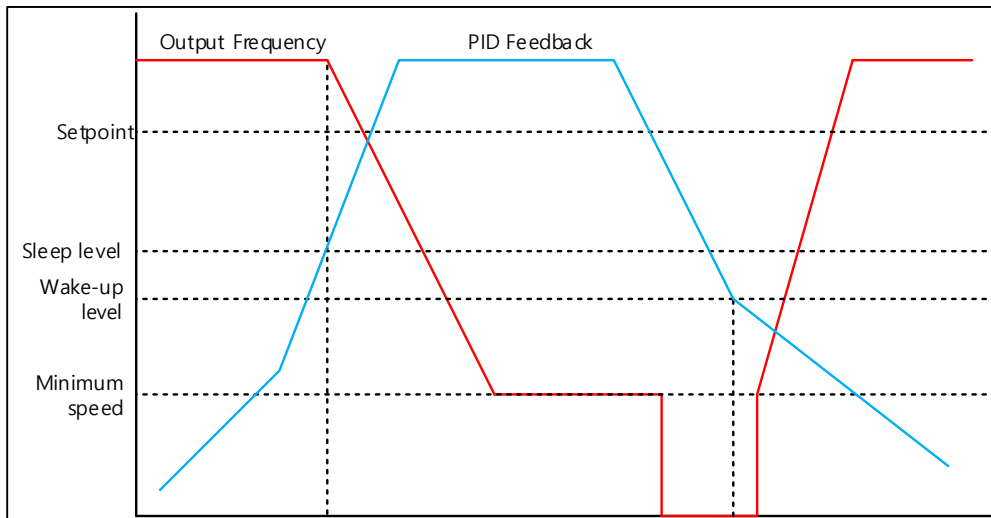
New Features for Pumps

• Selectable Sleep Level Type

• The following sleep level types can be selected:

- ① Frequency
- ② Output Current
- ③ PID Feedback Value
- ④ RPM
- ⑤ Flow Rate

※ *only Frequency is available on the standard H100 firmware*

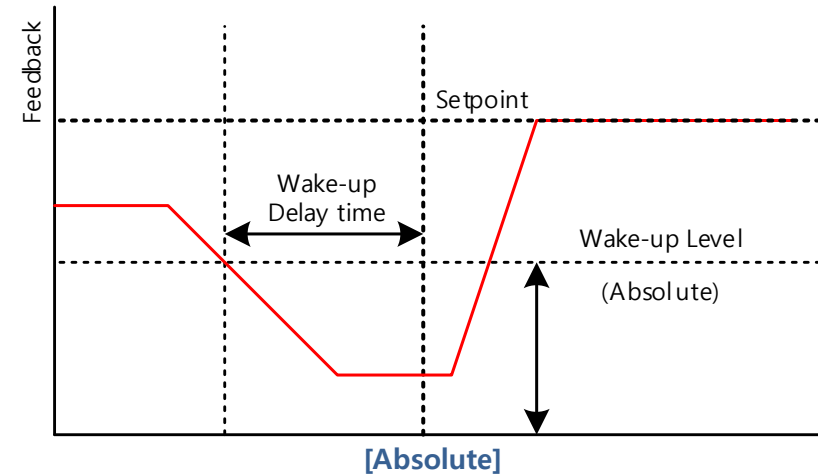


[Sleep level – Feedback (Direct Acting)]

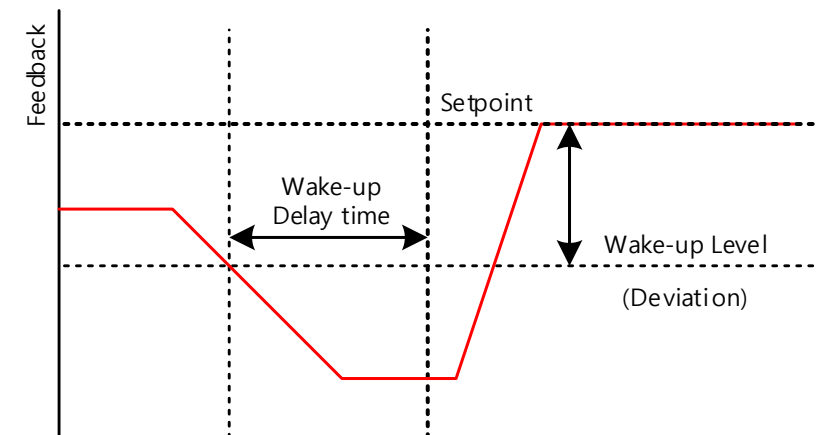
• Selectable Wake-up level

• Absolute or Deviation can be selected for the Wake-up level

※ *only Deviation is available on the standard H100 firmware*



[Absolute]



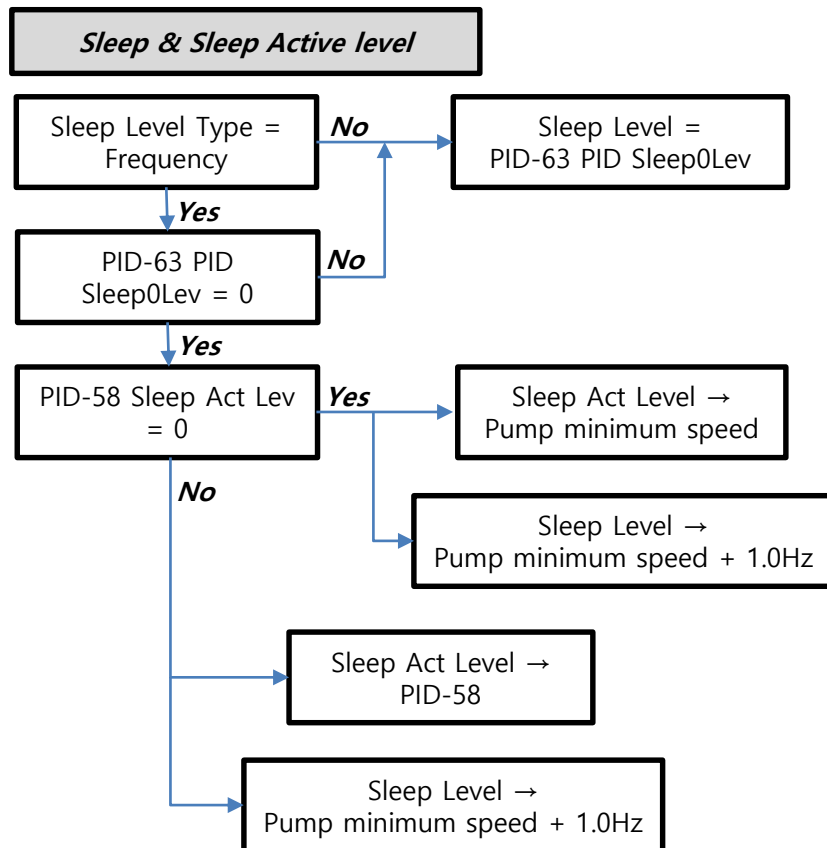
[Deviation]

Pump Solution | VFD features

New Features for Pumps

● **Sleep Activate Level**

- Frequency monitoring for Sleep Activate Level starts only when output frequency is greater than Sleep Activate Level.
- Without having to separately set a Sleep level & Activate level, it is automatically set on a basis of Minimum frequency.



● **Sleep Off Mode**

- When Sleep Off Mode is activated, VFD is turned to Off status after entering into Sleep during PID operation. At this status, wake-up is not operated at the wake-up level, but only by pushing on Auto key.
- This function can be used when Wake-up is not to be operated based on the pressure feedback value.
- It is requested for some submersible pumps.

Pump Solution | VFD features

New Features for Pumps

● **Functions for more stable PID operation**

• **PID Accel/Decel Time**

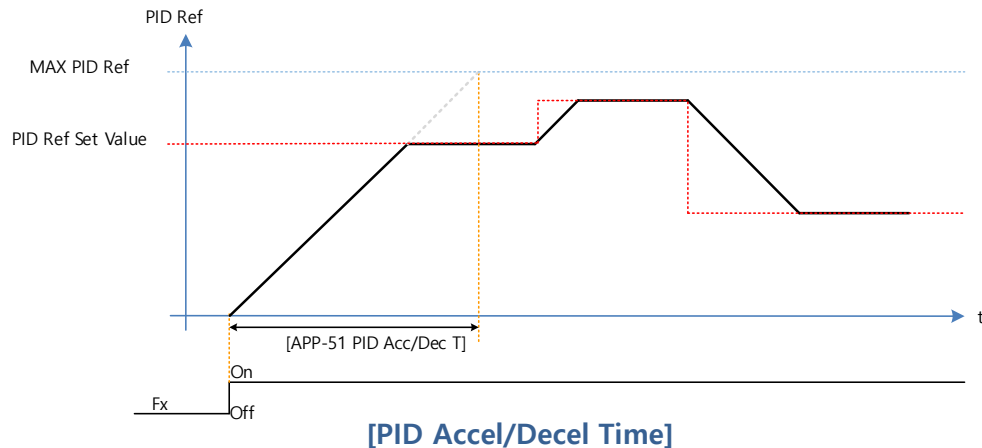
- Acceleration / Deceleration time for PID Setpoint
- This function helps to prevent hunting, overshoot, or undershoot.

• **PID Input Limit**

- Input limit of PID controller

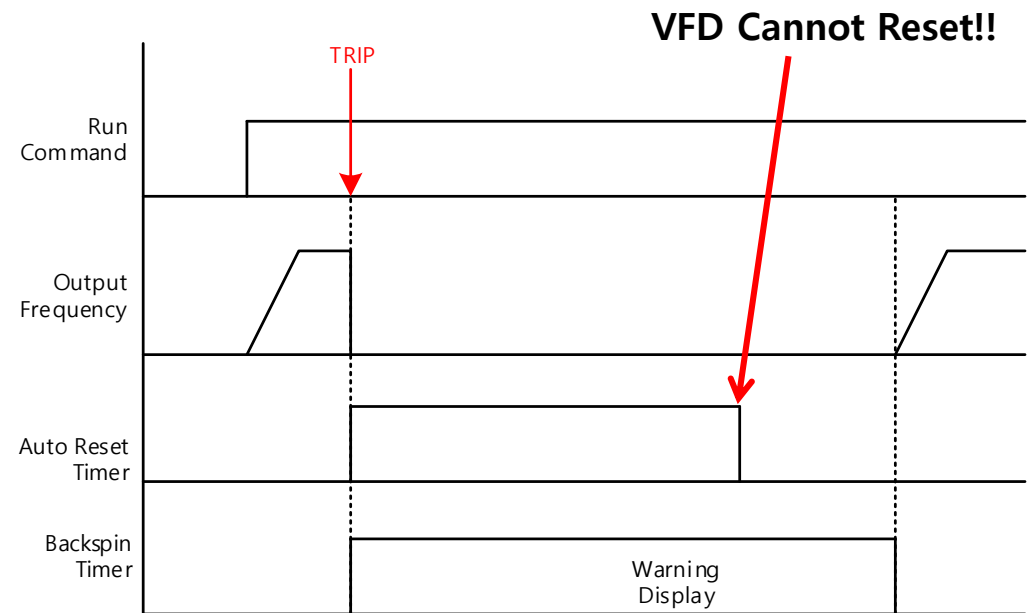
• **PID Integral Limit**

- Output limit of I controller among PID controllers. Prevents integral windup!



● **Backspin Timer**

- This function prevents starting for a specified time after stopping or a trip. This prevents pump damage when there is a backspinning condition.



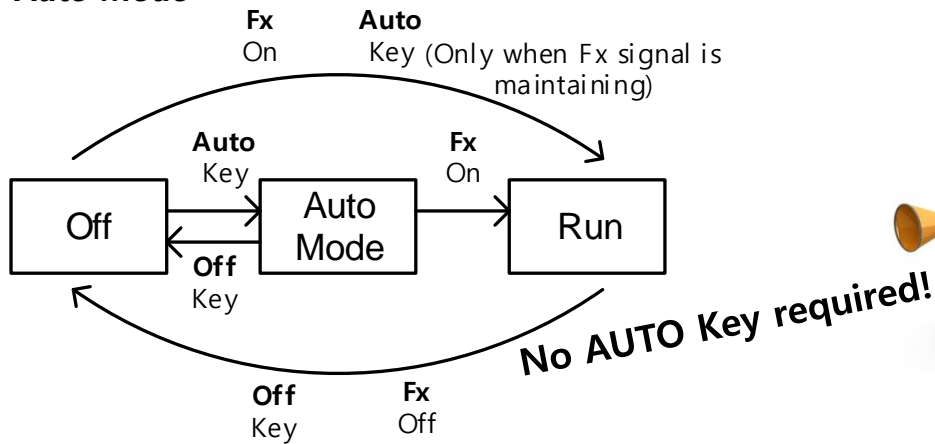
Pump Solution | VFD features

New Features for Pumps

● **Enhanced HAND-OFF-AUTO keypad (1/2)**

• **Auto Mode Selection**

- Run operation without the need to go into Auto Mode is allowed
- ※ *Standard H100 Firmware can operate only after switching to Auto Mode*



• **Added Hand operation by digital input**

- Enhanced user convenience in configuring Hand-Off-Auto by using a remote switch or contact point for hand operation via digital input
- ※ *Not available in standard H100 firmware*

• **Added “Off Key Enable” to HOA Lock**

- Added “OFF Key Enable”
- Default value is Hand/Auto Key locked except the Off key
- ※ *All HOA keys are locked during operation in standard H100 Firmware*

• **Added “Hand Key Selection”**

- Hand key selection parameter is added for safety reason.

Code	Name	Parameter setting
DRV-05	KPD H.O.A Lock	0: Locked 1: During Run 2: OFF Key Enable 3: Unlocked
DRV-08	AUTO Mode Selection	0: Enabled 1: Disabled
DRV-24	Hand Key Selection	0: None 1: Disabled

[New parameters]

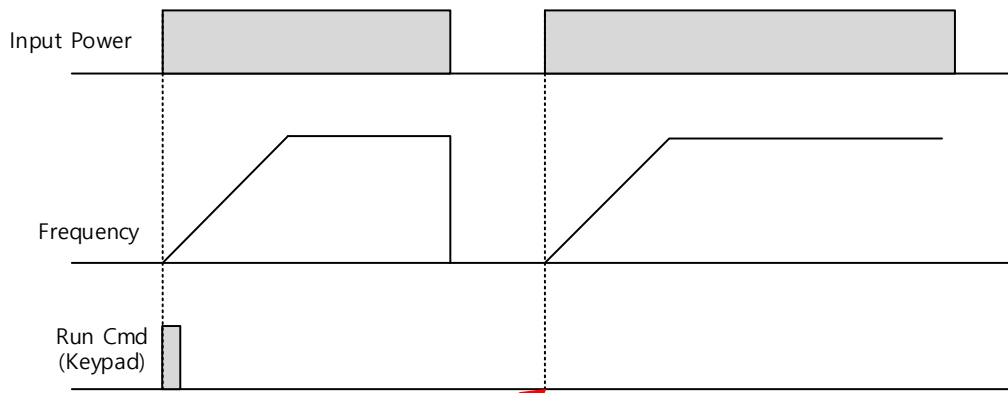
Pump Solution | VFD features

New Features for Pumps

• **Enhanced HAND-OFF-AUTO keypad (2/2)**

• **Keypad Power on Run**

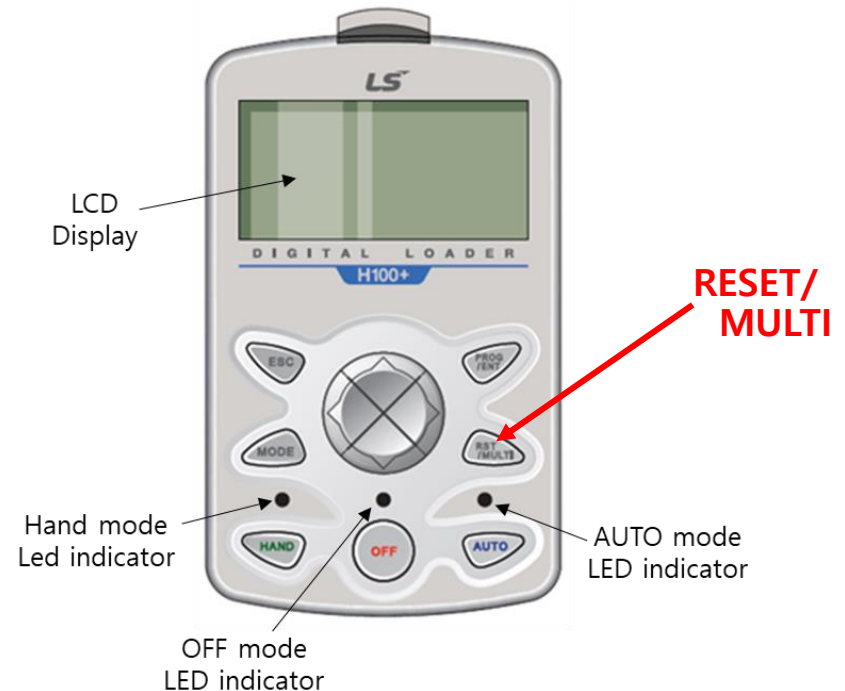
- A Keypad power-on run function can be setup to continue operation after powering up based on the run command set by the keypad (Hand / Auto)



No need to press the AUTO key again!

• **Added RESET function to Multi Key**

- H100 LCD keypad doesn't have a RESET key. This can be inconvenient when the customer operates the VFD by the keypad.
- The RESET feature has been added to the multi function key, this is the factory default value.

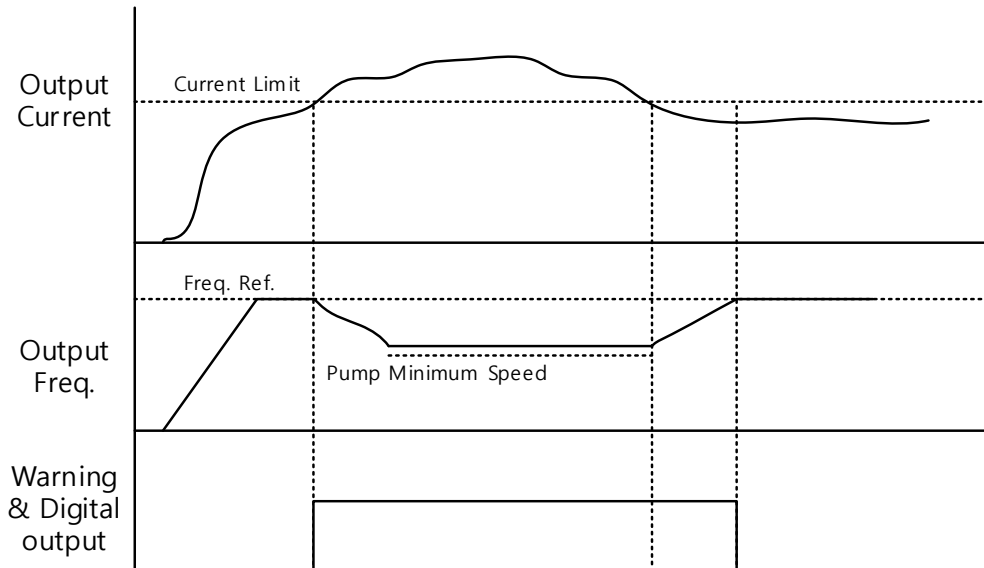


Pump Solution | VFD features

New Features for Pumps

● Hard Current Limit

- The Current Limit function prevents tripping by reducing output speed as the motor current increases and approaches and overload condition.
- PI control is used to monitor the current level and maintain the output frequency above minimum speed to prevent entering into sleep.



● Pump Minimum Speed

- Pump Minimum Speed parameter added.
- Enhanced user convenience for Minimum Limit setting
- Minimum Limit operates based on the greatest value of following:
 - ① AP2 40 Thrust Frequency
 - ② PID 56 Pump Minimum Speed
 - ③ ADV 25 Freq Limit Lo

Code	Name	Description
PID 56	Pump Min Speed	Minimum frequency that the drive will run at. Applies to both Auto and Hand modes

Pump Solution | VFD features

New Features for Pumps

● PID Access Level

- The Default value only allows access to the basic parameters in the PID group. The rest are hidden.
- When set to “Advanced” all parameters are shown.

PID 2 PID Access Lev - Basic

PID 2 PID Access Lev - Advanced

Code	Parameter Name	Code	Parameter Name	Code	Parameter Name
PID 0	Jump Code	PID 34	PID D-Time 2	PID 68	PID WakeUp1 DT
PID 1	PID Sel	PID 35	PID Out Mode	PID 69	PID WakeUp1Lev
PID 2	PID Access Lev	PID 36	PID Out Inv	PID 70	PID Sleep 2 DT
PID 3	PID Output	PID 37	PID Out Scale	PID 71	PID Sleep2Lev
PID 4	Setpoint Value	PID 38	PID InputLimit	PID 72	PID WakeUp2 DT
PID 5	Fdb Monitor	PID 39	PID I Limit	PID 73	PID WakeUp2Lev
PID 6	Err Monitor	PID 40	PID Step SP 1	PID 74	PID Sleep 3 DT
PID 10	PID SP 1 Src	PID 41	PID Step SP 2	PID 75	PID Sleep3Lev
PID 11	PID SP 1 Set	PID 42	PID Step SP 3	PID 76	PID WakeUp3 DT
PID 12	PID SP1 AuxSrc	PID 43	PID Step SP 4	PID 77	PID WakeUp3Lev
PID 13	PID SP1 AuxMod	PID 44	PID Step SP 5	PID 78	PID Sleep 4 DT
PID 14	PID SP1 Aux G	PID 45	PID Step SP 6	PID 79	PID Sleep4Lev
PID 15	PID SP 2 Src	PID 46	PID Step SP 7	PID 80	PID WakeUp4 DT
PID 16	PID SP 2 Set	PID 50	PID Unit Sel	PID 81	PID WakeUp4Lev
PID 17	PID SP2 AuxSrc	PID 51	PID Unit Scale	PID 82	PID Sleep 5 DT
PID 18	PID SP2 AuxMod	PID 52	PID Unit 0%	PID 83	PID Sleep5Lev
PID 19	PID SP2 Aux G	PID 53	PID Unit 100%	PID 84	PID WakeUp5 DT
PID 20	PID Fdb Source	PID 54	RampPIRefAtRun	PID 85	PID WakeUp5Lev
PID 21	PID Fdb AuxSrc	PID 55	PID Acc/Dec Tm	PID 86	PID Sleep 6 DT
PID 22	PID Fdb AuxMod	PID 56	Pump Min Speed	PID 87	PID Sleep6Lev
PID 23	PID Fdb Aux G	PID 57	WakeUpLev type	PID 88	PID WakeUp6 DT
PID 24	PID Fdb Band	PID 58	Sleep Act Lev	PID 89	PID WakeUp6Lev
PID 25	PID P-Gain 1	PID 59	Sleep Lev Type	PID 90	PID Sleep 7 DT
PID 26	PID I-Time 1	PID 60	Sleep Bst Set	PID 91	PID Sleep7Lev
PID 27	PID D-Time 1	PID 61	Sleep Bst Freq	PID 92	PID WakeUp7 DT
PID 28	PID FF-Gain	PID 62	PID Sleep 0 DT	PID 93	PID WakeUp7Lev
PID 29	PID Out LPF	PID 63	PID Sleep0Lev	PID 95	Sleep Off Mode
PID 30	PID Limit Hi	PID 64	PID WakeUp0 DT		
PID 31	PID Limit Lo	PID 65	PID WakeUp0Lev		
PID 32	PID P-Gain 2	PID 66	PID Sleep 1 DT		
PID 33	PID I-Time 2	PID 67	PID Sleep1Lev		

Code	Parameter Name
PID 0	Jump Code
PID 1	PID Sel
PID 2	PID Access Lev
PID 3	PID Output
PID 4	PID Ref Value
PID 5	PID Fdb Value
PID 6	PID Err Value
PID 10	PID Ref 1 Src
PID 11	PID Ref 1 Set
PID 20	PID Fdb Source
PID 25	PID P-Gain 1
PID 26	PID I-Time 1
PID 27	PID D-Time 1
PID 36	PID Out Inv
PID 50	PID Unit Sel
PID 51	PID Unit Scale
PID 52	PID Unit 0%
PID 53	PID Unit 100%
PID 56	Pump Min Speed
PID 57	WakeUpLev type
PID 58	Sleep Act Lev
PID 59	Sleep Lev Type
PID 62	PID Sleep 0 DT
PID 63	PID Sleep0Freq
PID 64	PID WakeUp0 DT
PID 65	PID WakeUp0Dev

● Added “Pump Trip” to Digital Output

- “Pump Trip” is added as a multi-functional digital output selection which closes when any of Low Feedback, High Feedback, SetPnt Timeout, Pump Over Cycle Trip occurs.

Code	Name	Description
OUT 31~36	Relay 1~5, Q1	53. Pump Trip

● Added “Loss of Prime” display

- When Current, Power, Torque condition is selected in Level Detection function, to monitor Loss Of Prime (or Dry well) condition, keypad displays “Loss Of Prime”

Pump Solution | VFD features

Existing functions

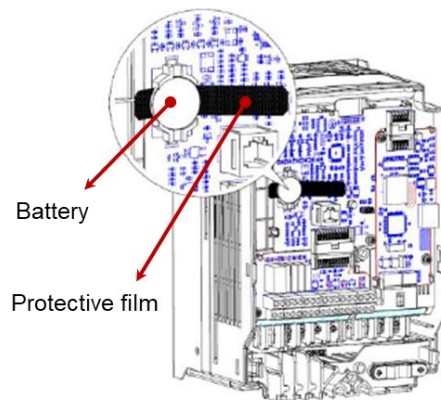
● Real-Time Clock

- A battery operated RTC allows time and date stamping for events and supports calendar-based functions like timer controls for 30 different operations included starting and stopping without the need for external controls.



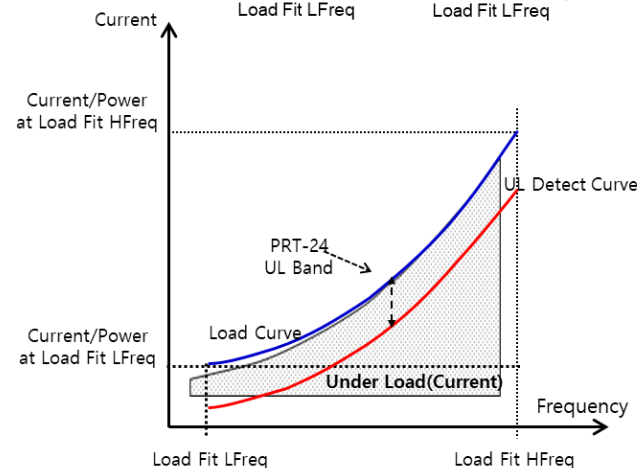
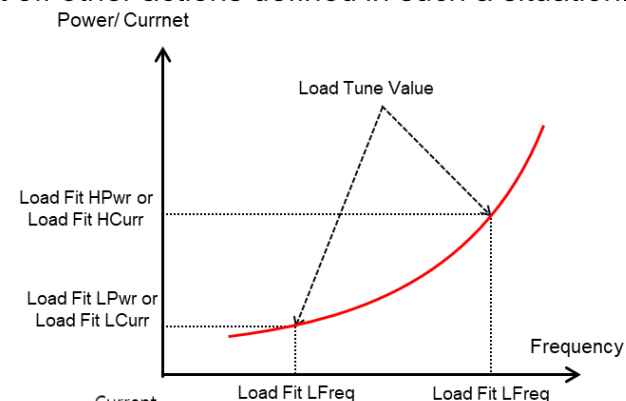
- 4 time period modules (Weekly)
- 8 exception date modules (Day)
- 8 time event modules
- 30 functions available (Fx, Rx, Step Freq, PID, etc.)

- Day Light Savings available (Start/End date setting)
- 3 types of date displays available (EU / USA / ASIA)



● Underload Protection & Load tune

- This feature makes it possible to detect no-flow conditions when the system has been closed off via mechanical valves or other restrictions. Monitoring speed and power, the drive will establish a curve to describe the power at no flow and provide a warning or set off other actions defined in such a situation.

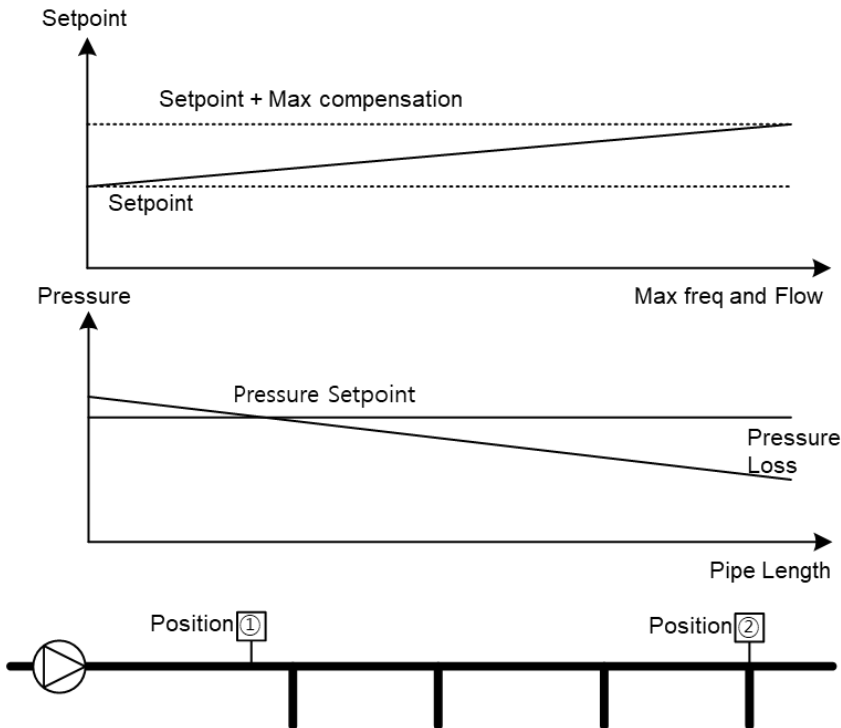


Pump Solution | VFD features

Existing functions

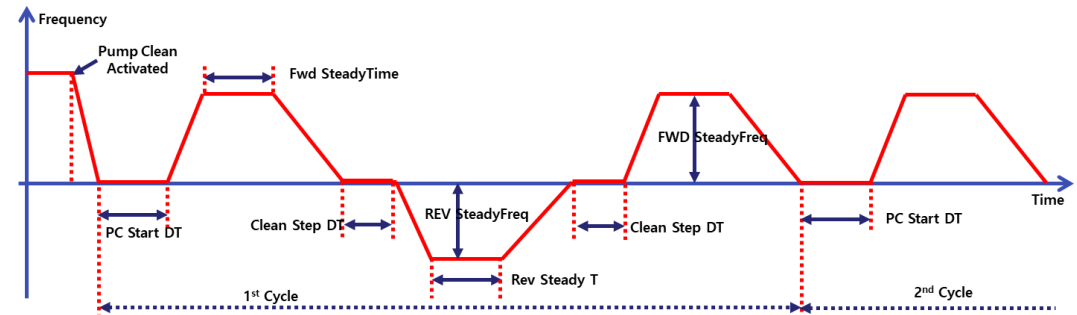
● Flow Compensation

- In a system with longer pipe length, pressure loss in the pipe occurs and the loss increases as the flow rate increases. The pressure sensor installed near the pump (①) allows the inverter to maintain a constant pressure at this position, but the pressure drops in proportion to the flow rate toward the end of the pipe (②). In order to compensate for this loss, this function compensates the pressure loss by increasing value of the PID reference.



● Pump Clean(Deragging feature)

- When enabled, the drive can sense when a pump is clogged and will enter washing mode by reversing the pump spin to ensure a clear path for the water. As a preventative maintenance function, the drive can be set up to reverse the pump at set intervals for regular self-maintenance.

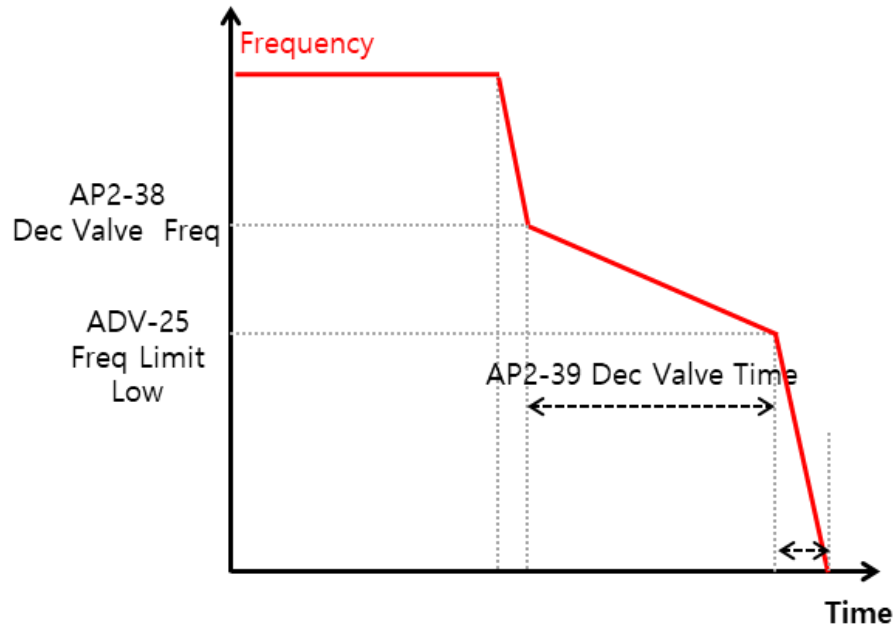


Pump Solution | VFD features

Existing functions

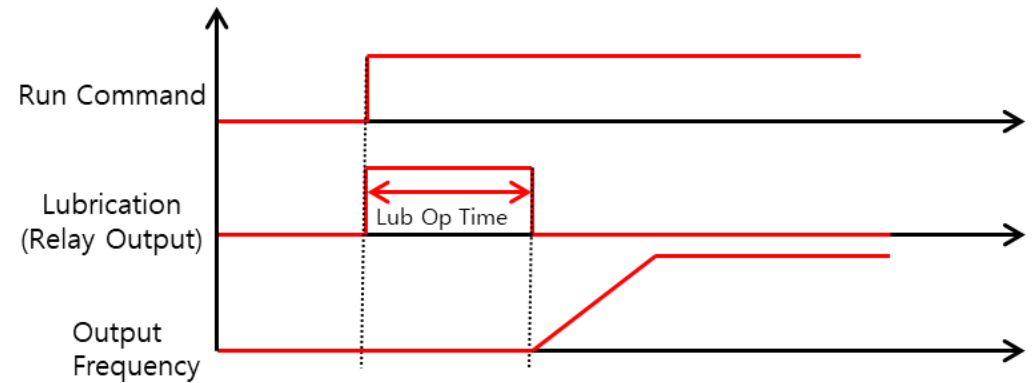
• Dec Valve Ramp(Check Valve Ramp)

- The check valve ramp prevents water hammering when stopping the pump, by ensuring slow pump speed ramp down just as the check valve ball is almost shut.



• Lubrication

- Some machines require lubrication of their mechanical parts before and during operation to prevent damage and reduce wear. During lubrication, certain equipment must remain active, for example exhaust fans. To achieve this, the Pre Lube feature supports a signal to an external device to perform a specific action for a user-defined time period.

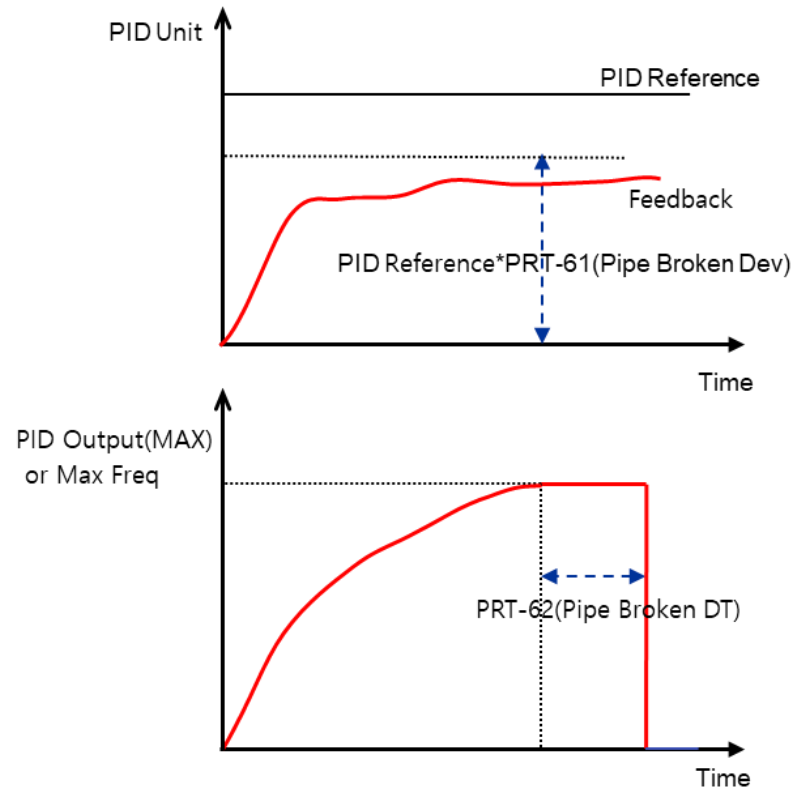


Pump Solution | VFD features

Existing functions

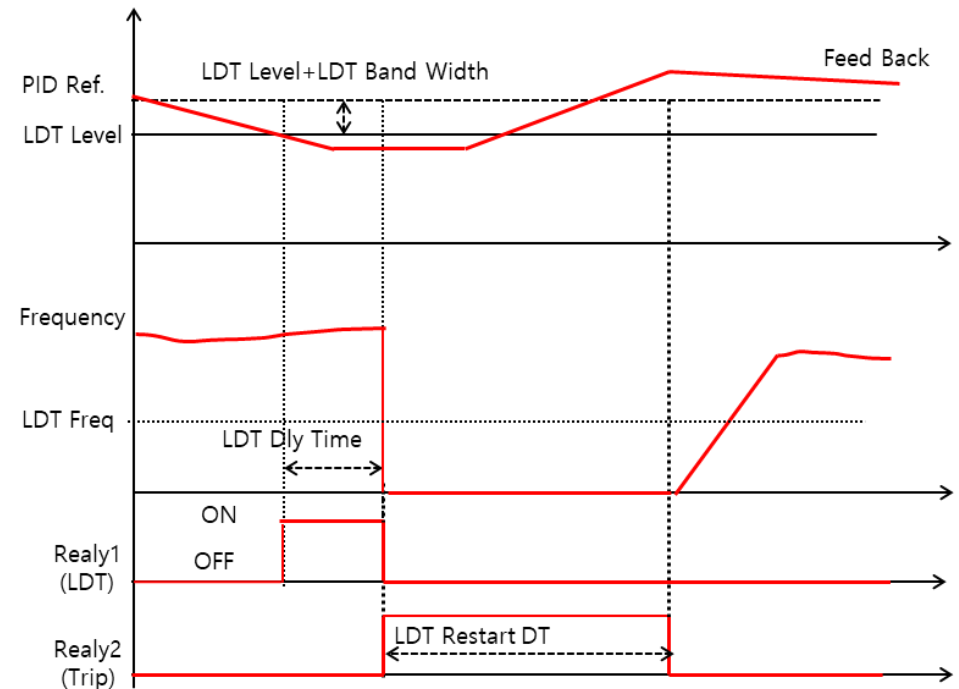
● Pipe Broken Detection

- The Pipe Broken feature triggers a warning or trip when the pipe has been damaged.
- Pipe Broken is detected when the Pipe Broken Deviation level is reached and the feedback does not reach the setpoint at full PID Output.



● Level Detection

- This function is useful to detect an abnormal operation condition such as well-dry, clogging of the filter, broken blade, etc while monitoring one of the 12 sources. This is very similar to other protection functions such as Under Load protection and Pump clean when selecting output current or kW/HP power from the sources.



Pump Solution | HMI Solution for Pump

User Friendly – Operation with HMI

Pump controlling interface embedded in HMI for easy & remote control and key features (HOA, Parameter Settings, Trend Monitoring and Wizard) also available through HMI

Option 1.

- To operate a drive with a inbuilt LCD keypad



Option 2.

- To operate a drive with an additional graphic panel (HMI)





Appendix.

Products

Pump Solution

Appendix: HMI Line-up

● **iXP2 Series (Premium)**



- Aluminum body (Front IP66/NEMA4X)
- Explosion proof: IECEx, ATEX, KCs
- Capacitive touchscreen
- High resolution 1024x768 (TFT LCD)
- Easy-to-use Multi-touch, gesture, dual screen, portrait mode.
- Multi connected with 1Gbits 2ch.

High functioning, user friendly and robust choice

		15" [38Cm]	12.1" [31Cm]	10.4" [26Cm]	8.4" [21Cm]
iXP2 Series	Premium				
		iXP2-1500 TFT 16,777,216 colors XGA [1024 X 768]	iXP2-1200 TFT 16,777,216 colors XGA [1024 X 768]	iXP2-1000 TFT 16,777,216 colors XGA [1024 X 768]	iXP2-0800 TFT 16,777,216 colors SVGA [800 X 600]

● **eXP2 Series (Standard)**



- Fully Compatible With eXP
- Improved project downloading speed, screen switching speed, booting time, and graphic rendering compared to eXP.
- Enhanced Product Reliability (LCD Backlight Lifespan, Non Battery Type NVRAM)
- Variety of Interfaces and Functions

Effective Control and Monitoring Solution Cost-Efficient

		10.2" [25.9Cm]	7" [17.7Cm]	5.6" [14.2Cm]	4.3" [10.9Cm]
eXP2 Series	Standard				
		eXP2-100 ^{*4} TFT 16.7M Colors WSVGA [1024 X 600]	eXP2-070 ^{*4} TFT 16.7M Colors WVGA [800x480]	eXP2-050 ^{*4} TFT 262,144 Colors VGA [680x480]	eXP2-040 ^{*4} TFT 16.7M Colors VGA [480x272]

LEADING SOLUTION
THANK YOU