

## HYDRO BOOSTER Variable Speed Control System

The EBARA Hydro Booster system consists of two or more EVM pumps coupled in parallel and mounted on a common baseplate, integrally provided with a Ebara Hydro Controller electrical cabinet and all the necessary common pipe work and fittings. All EBARA Hydro Booster system is factory assembled and tested, pre-set according to customer requirement. It is ready-to-connect at site. Scope of supply including O&M manual.

Fully assembled and certified Hydro Booster set type UN generally consist of multiple pumps arranged in parallel, mounted on a common baseframe, pipework complete with EBARA micro computer controller unit, frequency inverters, pressure transmitter and complete with all internal electrical wiring.

**EBARA Hydro Booster system type UN is a variable speed control booster system utilising advance and proven microcomputer namely EBARA Hydro Controller unit to provide constant pressure to suit your system requirement.**

### APPLICATIONS

- General water supply i.e school, hotels, hospitals, high-rise buildings, etc.;
- Industrial water supply;
- Irrigation system for garden, parks, golf courses, etc.



## HYDRO BOOSTER Variable Speed Control System

### **Pumps**

2 or more EBARA pumps are arranged for parallel operation. All parts contact with liquid are of stainless steel.

### **Baseframe & Common Pipework**

Galvanized pipework enable easy connection to all commonly used pipe fittings. The pipework is sized suitable for maximum hydraulic unit capacity. Check valve and suitable gate valves are fitted for optimal system operation.

### **Diaphragm Pressure Tank**

A pre-charged diaphragm tank is fitted to the discharge pipe with a compatible Butyl-rubber diaphragm. Generally this tank serves basic functions of supplying water at a very low flow and minimising effect of water hammering.

### **Pressure Transmitter**

1 - 5V to transmit control signals to the EBARA Hydro Booster Controller, located at the discharge side.

### **Frequency Converter**

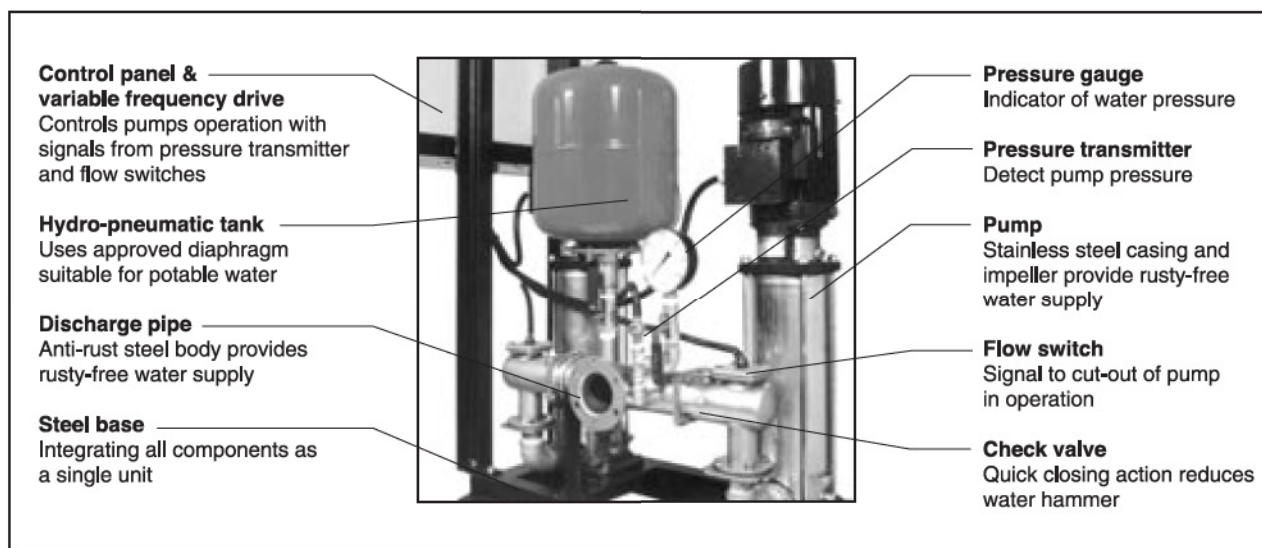
Constant water pressure is achieved due to variable speed drive make possible by the use of frequency converters. To ensure highly reliable EBARA system, each pump is equip with frequency converter unit, thus ensure optimal operation of pumping system.

### **Flow Switch**

Flow switch is used to enhance system operation by receiving signal to cut-out pump operation during low-flow or no-flow condition. Thus can be used as dry-running protection device.

### **Ebara Controller**

This micro-processor controller unit is fitted to the Hydro Booster Control Panel to control variable speed pumping operation. It provides 'One-touch' operating possibility to interpret various signals from pressure transmitter and flow switch, thereby enhance constant pressure system operation. In addition, it provides various advance operative functions that maintain constant pressure and trouble-free water supply system.



## HYDRO BOOSTER Variable Speed Control System - Features / Benefits

### 1. Advance energy saving system

This unit is operating on variable speed drive control incorporated with logic control system. Thus save energy for most demanding conditions.

### 2. Constant pressure water supply

The variable speed pumping system would ensure constant water pressure for the furthest point with pipe friction loss compensation capability.

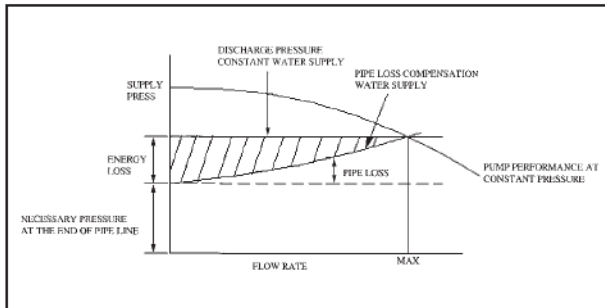


Fig. Pipe Friction Loss Compensation Operation

### 3. Highly reliable inverters being used

Individual frequency inverters are provided for each pump, thus reduces emergency risk with automatic change over and back-up system. During pump or inverter failure, second pump will start automatically and back-up operation to ensure continues water supply.



Fig. Custom Design Control Panel

### 4. User-friendly operation

Ebara unique controller permits easy access and displays most data in the front panel. The controller is a microcomputer board with LCD operation adjustment and instant information display.

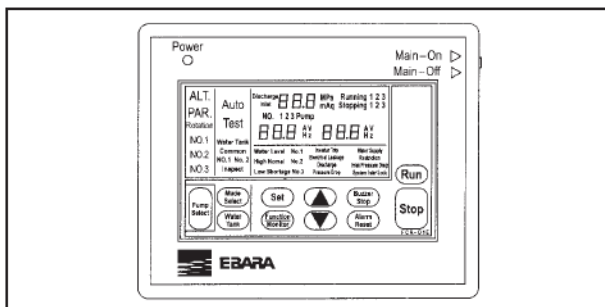


Fig. Ebara Proven - Designed Controller

### 5. Cyclic operation

During continuous operation, if the pump continuously run over 6 hours, second pump will start run parallel and then changeover to new one. This would ensure even operating hours for multiple pumping system; thus prolong life spend of pumps.

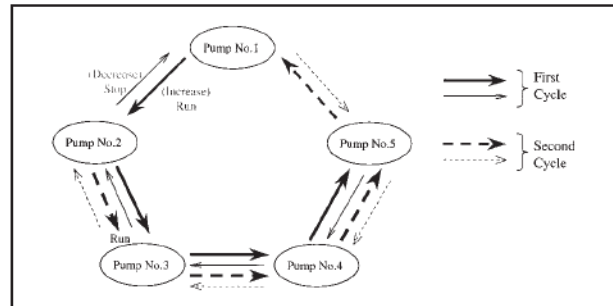


Fig. Cyclic Operating System

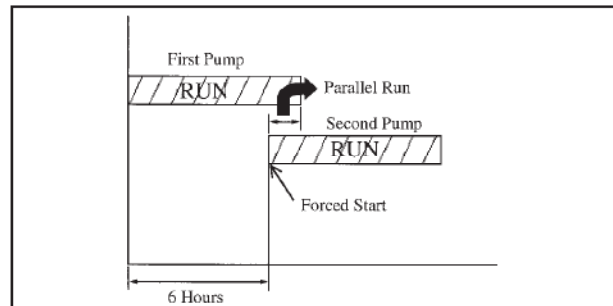


Fig. Forced Cyclic Operation

### 6. APNC & APR System

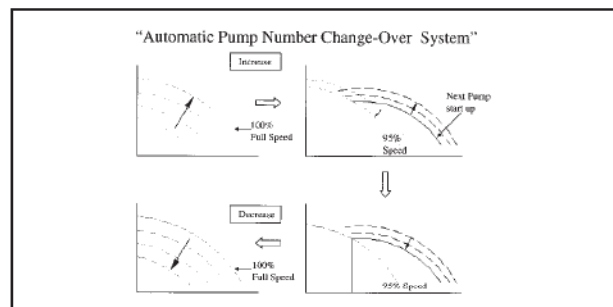


Fig. APNC - Automatic Pump Number Charge-Over System

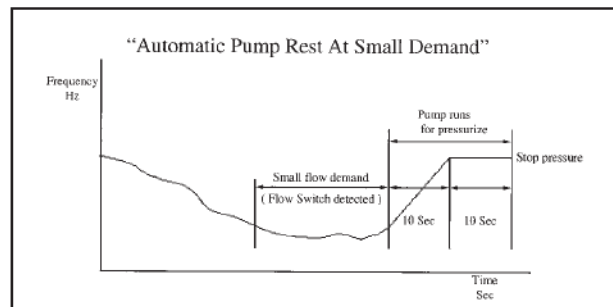
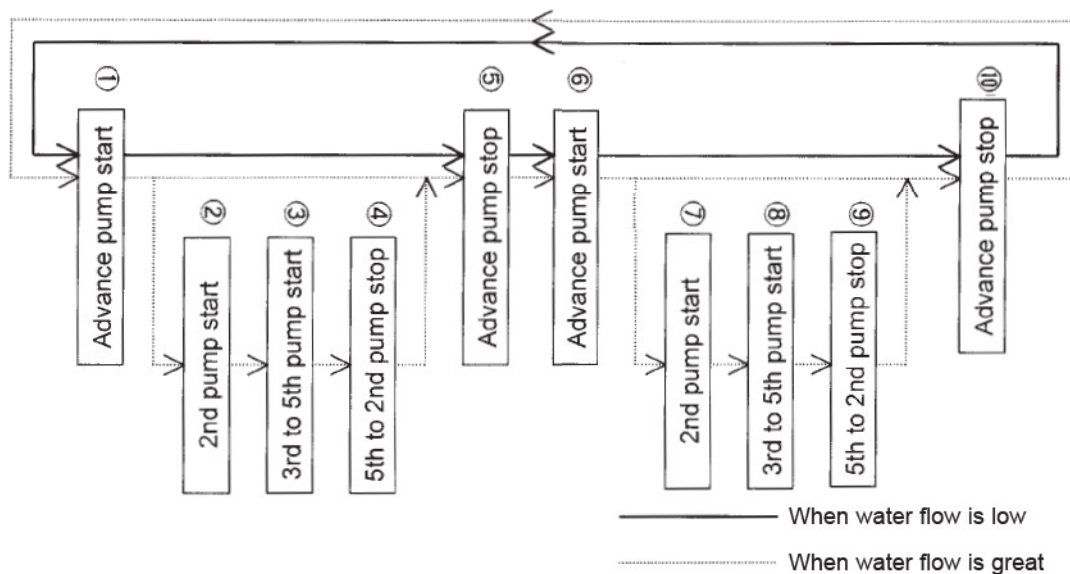


Fig. APR - Automatic Pump Rest At Small Demand

## HYDRO BOOSTER Variable Speed Control System - Operation method



### A. When water flow is low

- ① If water is used, the inner pressure of the pipes drops, triggering the pressure sensor, and advance pump (Ex: No.1) starts up.
- ⑤ If water stops being used, the flow switch is triggered, and advance pump (Ex: No. 1) stops after the required time has elapsed. At this time, the advance pump rotates. (Ex: The advance pump changes from No. 1 to No. 2.)
- ⑥ If water is used again, the inner pressure of the pipes drops, triggering the pressure sensor, and advance pump (Ex: No. 2) starts up.
- ⑩ If water stops being used, the flow switch is triggered, and advance pump (Ex: No. 2) stops after the required time has elapsed. At this time, the advance pump rotates. (Ex: The advance pump changes from No. 2 to No. 3.) In the same way, the advance pump rotates in order from No. 3 to No. 4, No. 4 to No. 5, and No. 5 to No. 1, while steps ①, ⑤, ⑥, and ⑩ are repeated in order.

### B. When water flow is great

- ① If water is used, the inner pressure of the pipes drops, triggering the pressure sensor, and advance pump (Ex: No.1) starts up.
- ② If the flow continues to increase, the rotational speed of advance pump reaches maximum and 2nd pump (Ex: No. 2) starts up.
- ③ As the volume of water used increases in order, the delayed pumps start in order from the 3rd (Ex: No. 3) to the 4th (Ex: No. 4), to the 5th (Ex: No. 5), to a maximum of 5 pumps.
- ④ If the volume of water used decreases, the flow switch is triggered and the delayed pumps shut down in order, eventually leaving only the advance pump operational.
- ⑤ If water stops being used, the flow switch is triggered, and advance pump stops after the required time has elapsed. At this time, the advance pump rotates. (Ex: The advance pump changes from No. 1 to No. 2.)
- ⑥ If water is used again, the inner pressure of the pipes drops, triggering the pressure sensor, and 2nd pump (Ex: No. 2) starts up.
- ⑦ If the flow continues to increase, the rotational speed of advance pump (Ex: No. 2) reaches maximum and 2nd pump (Ex: No. 3) starts up.
- ⑧ As the volume of water used increases in order, the delayed pumps start in order from the 3rd (Ex: No. 4) to the 4th (Ex: No. 5), to the 5th (Ex: No. 1), to a maximum of 5 pumps.
- ⑨ If the volume of water used decreases, the flow switch is triggered and the delayed pumps shut down in order, eventually leaving only the advance pump operational.
- ⑩ If water stops being used, the flow switch is triggered, and advance pump (Ex: No. 2) stops after the required time has elapsed. At this time, the advance pump rotates. (Ex: The advance pump changes from No. 2 to No. 3.) In the same way, the advance pump rotates in order from No. 3 to No. 4, No. 4 to No. 5, and No. 5 to No. 1, while steps ① - ⑩ are repeated in order.

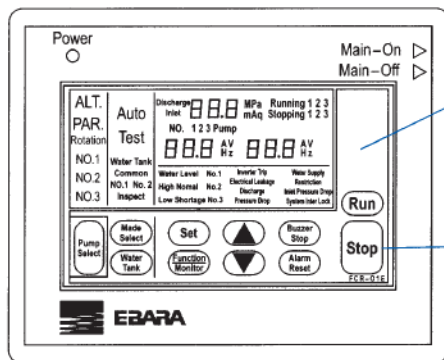


## HYDRO BOOSTER Variable Speed Control System - Controller

The heart of the system is the EBARA controller unit, which is user-friendly and permit 'One-touch' operation. It controls the sequence of pump operation with signals input from the pressure transmitter and/or flow switch in Auto & Alternate mode. This user-friendly controller unit operates compatible with other electrical components to ensure smooth function of booster system.

EBARA controller unit generally provides the below 'one-touch' functioning features:

- |  |                                   |
|--|-----------------------------------|
| 1 x Power on indicating light                        | 1 x Buzzer stop switch            |
| 1 x Power selector switch (ALT/PAR/Rotation/Plto P5) | 1 x Alarm reset switch            |
| 1 x Mode selector switch (Auto/ Test)                | 1 x Run switch                    |
| 1 x Power main on off switch                         | 1 x Stop switch                   |
| 1 x Set switch                                       | 1 x LCD System parameter displays |
| 1 x Function / Monitor switch                        |                                   |



**System parameters display:**  
 Operation mode  
 Pump no. in operation  
 Output frequency & discharge  
 Water tank & Fault type

**Operation pushbuttons:**  
 Run or stop  
 Pump, mode & water tank select  
 Parameters set & function monitor  
 Buzzer stop & alarm reset

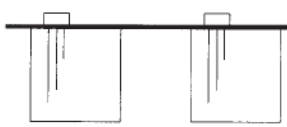
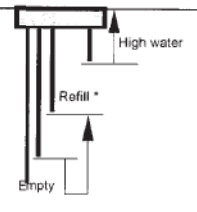
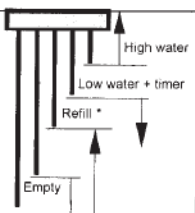
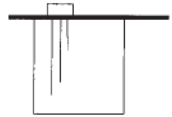
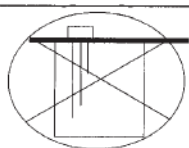
Rotation - No.1 - No.2 - No.3 indicates that the item displayed changes, in rotation, each time the button is pushed.  
 No.5 - No.4

Operation	Function
Pump Select	Rotation - No.1 - No.2 - No.3 No.5 - No.4 Changes the operation method. Method cannot be changed during operation.
Mode Select	Auto - Test Changes between auto and test operation. Method cannot be changed during operation.
Water Tank	Common - No.1 - No.2 Used when a dual tank type receiving tank is used.
Function Monitor	(No. 1, Hz, A) - (No. 2, Hz, A) - (No. 3, Hz, A) V - (No. 5, Hz, A) - (No. 4, Hz, A) * Switches displayed item, in rotation, among pump No.1, pump No.2, pump No.3, pump No.4, pump No.5, and power supply voltage. *
Set	Switches to the setting mode Used for setting codes.
▲ ▼	In test mode: Set the frequency for manual operation. In setting mode: Increase/decrease code No. or set values.
Buzzer Stop	Stops sounding of buzzer For turning the buzzer OFF when an alarm has occurred. Buzzer turns off automatically after 2 minutes if this button is not pushed.
Alarm Reset	Clears alarm, and stops buzzer For resetting inverter relay trip and discharge pressure drop alarms.
Run	Starts the pumps Runs the pumps in auto or test operation.
Stop	Stops the pumps Stops the pumps in auto or test operation.

\* Displayed for 5-pump units.  
 For 3- and 4-pump units, pumps No. 4 - No. 5 or pump No. 5 are not displayed.

## HYDRO BOOSTER Variable Speed Control System - Unique Feature

### Unique Feature- Receiving (Water) tank

Code P05		Code P06 and Code P07	
Code P05 = 2 		4P electrode Code P06 = 0 Code P07 = 0 	5P electrode Code P06 = 1 Code P07 = 0 
Code P05 = 1 			
Code P05 = 0 		Code P06 = 0 Code P07 = 0	

Note 1. \* Short circuit E12-E15, E22-E25 (when using the dual tank system) with the jumper cable (included).

2. Water reduction is detected by timer control. Therefore, the empty display may be triggered during the period when the suction amount is greater than the volume of water flowing into the water tank.

## PROTECTION FEATURES

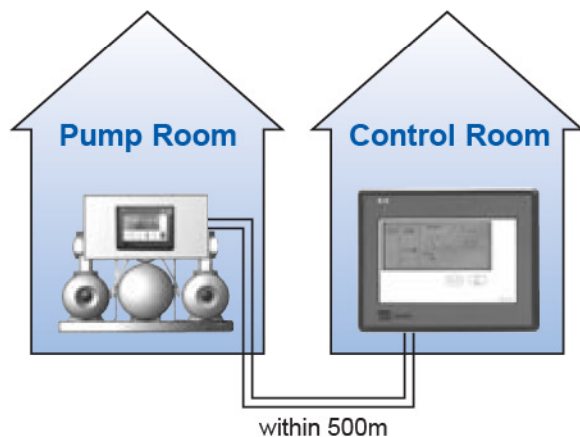
Automatic back up system ensure smooth and continuous pumping operation during the below malfunction:

- electrical leakage,
- discharge pressure drop, and
- inverter tripped

Freezes pump Operation when Low Water level at suction tank. Fault Display for below:

- suction tank water level
- system interlock
- electrical leakage
- inverter trip
- low discharge pressure

## REMOTE MONITORING FEATURE



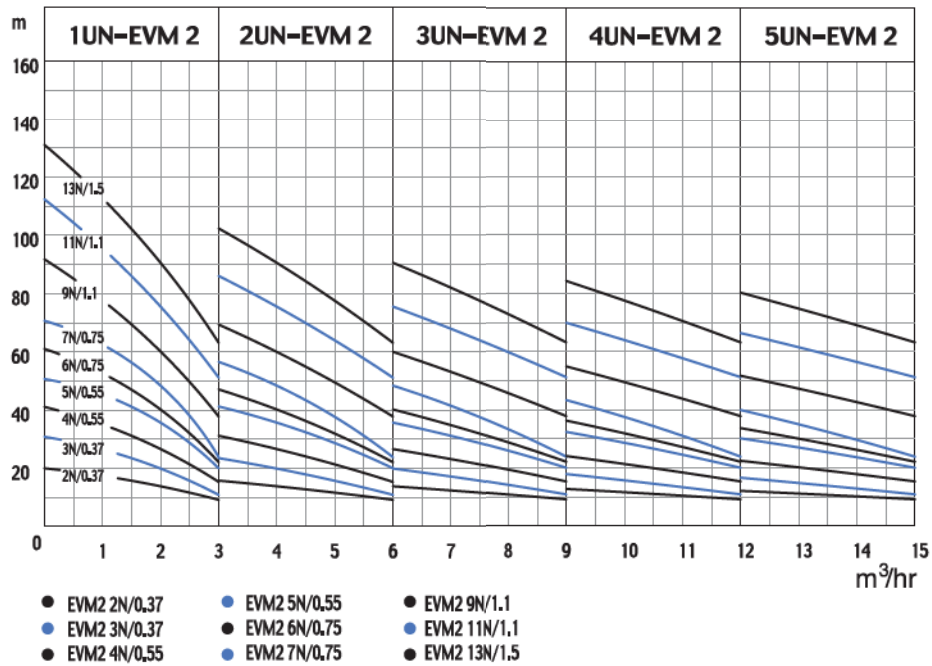
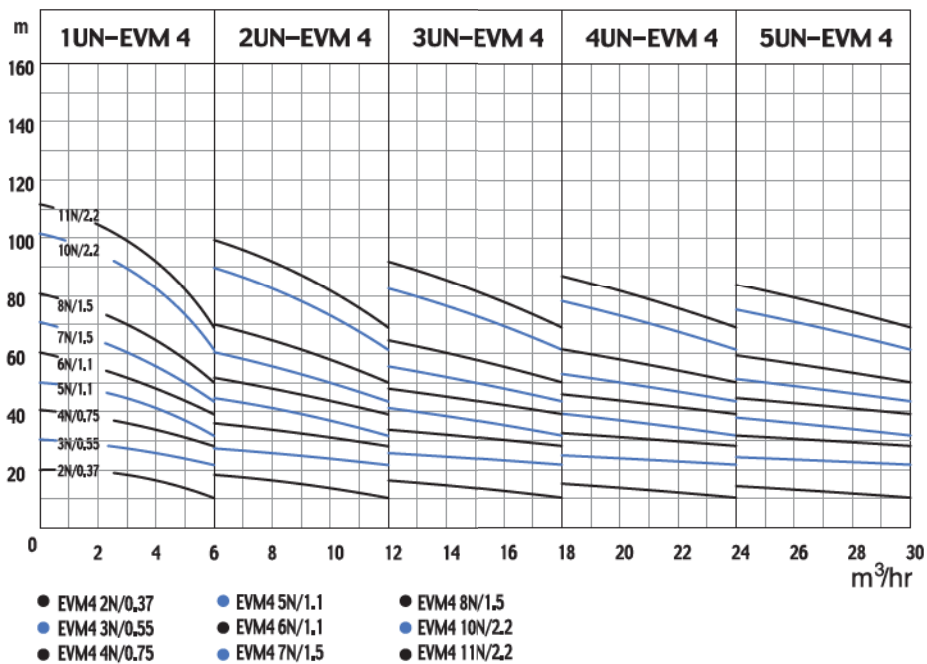
The same operation conditions of the pumping system can be observe and monitor at remote station with only 2 wire connection. No additional electrical supply is required. Buzzer is provided, and distance within 500 m is permissible.

### Display Items:

- 1) Normal display
  - Digital : Discharge pressure, Pump Operation Hz (each pump), Operation current (each pump), Voltage.
  - Others : Electrical source (LED Display), Operation mode (Auto, Test, No. of Pump) System interlock.
- 2) Fault Display
  - Discharge pressure drop (each pump),
  - Inverter fault (each pump),
  - Water level (over-flow, insufficient, shortage conditions).

**SPECIFICATIONS FOR VARIABLE SPEED PRESSURE BOOSTER UNIT**

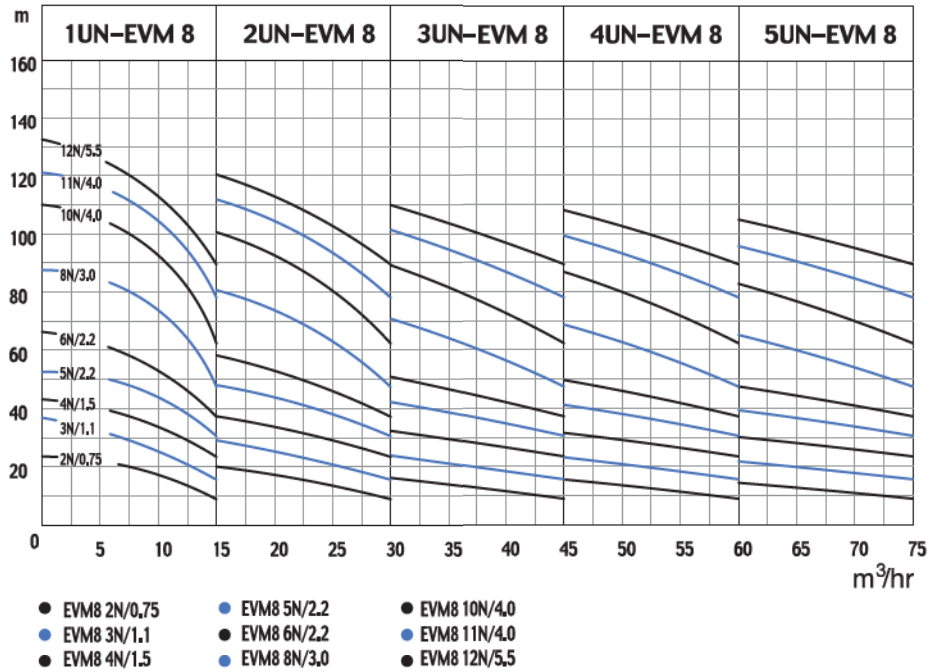
Item		Standard	Optional
Operation system	Pump speed	Inverter variable speed control drive	
	Pressure control	Constant pressure with system loss compensation	
	Number of pump control	Single alternate, Parallel alternate, Up to 5 pumps cyclic Pumps rest at small flow rate	
Installation area		Indoor	Outdoor
Pump		Ambient temperature Up to 40°C	Weather-proof available
Power source		Vertical multistage Pump: Model EVM	3M, CDX and other Ebara model
Pressure tank		Three phase, 380/400/415 V, 50 Hz	
		Pre-Air charged	
		Type	
		Capacity	Over 18L
		Max. working pressure	up to 20 bar
Pressure sensor		3 Wire for DC 12V	
		Output Voltage 1 - 5V	
Control panel & Controller		Inverter (each pump), Control panel (Remote type) Main circuit breaker, Main control CPU board Interface board, Pilot light, Isolator, Voltage detection board Control circuit noise filter, Electric leakage relay	Water level board, Main circuit noise filter
		Electric thermal device, controlled by microcomputer	
Protection		Discharge pressure {digital display}	
Display Items		Pump operation current {digital display}	
		Voltage {digital display}	
		Pump operation frequency {digital display}	
		Power {red LED}	
		Operation condition {running pump}	
		Operation mode {Automatic or manual}	
		Storage tank selection {Tank 1 or 2}	
		Storage tank water level condition {normal}	
		System interlock	
		Failure : Shortage or full of storage tank	
		Low discharge pressure	
		Inverter trip	
External output signal (No voltage, normal open contact)		Pump running	
		Pump failure	
		Storage tank condition {Full, low, shortage}	
External input signal (No voltage, normal open contact)		System interlock {on.off}	

**SELECTION GUIDE**
**EVM 2**

**EVM 4**


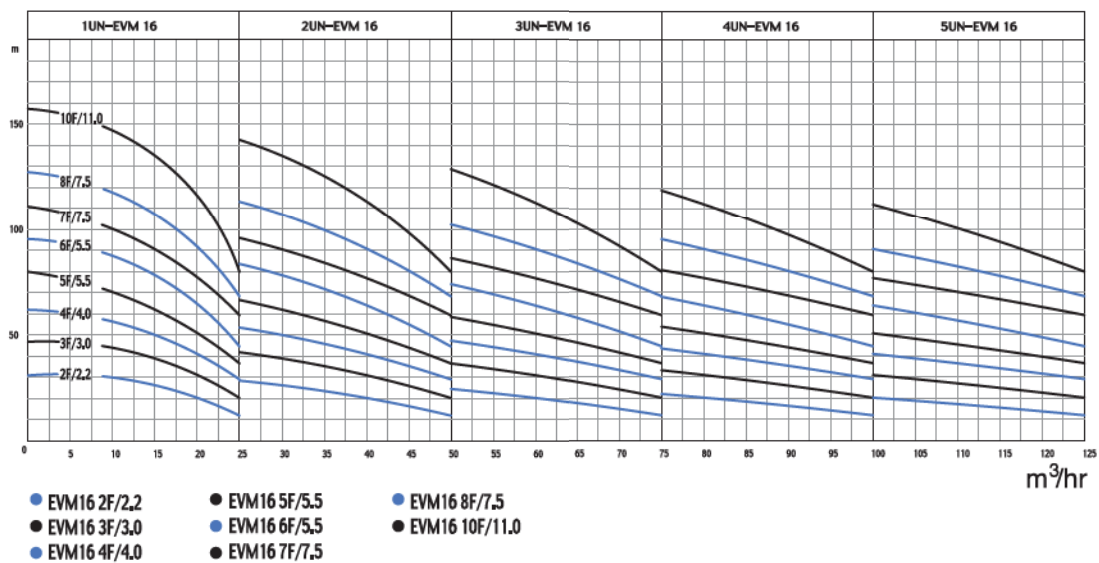


SELECTION GUIDE

EVM 8

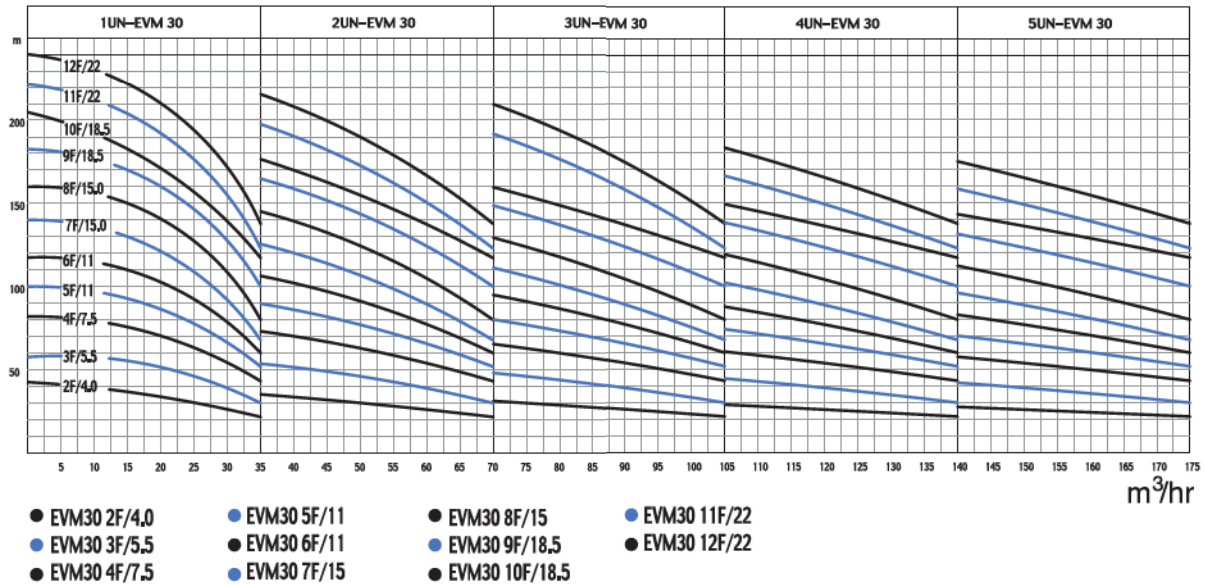


EVM 16

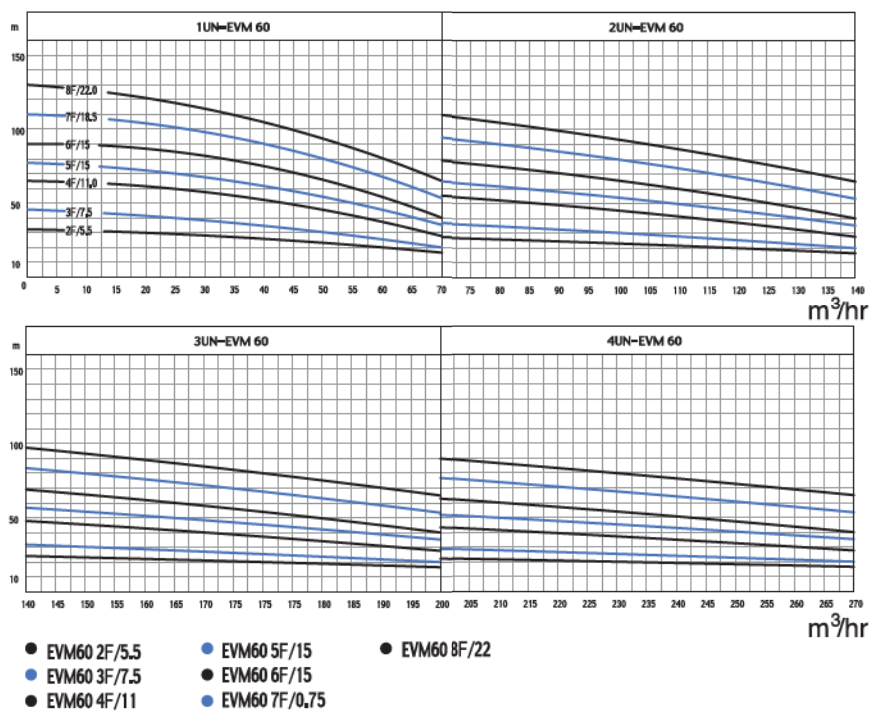


SELECTION GUIDE

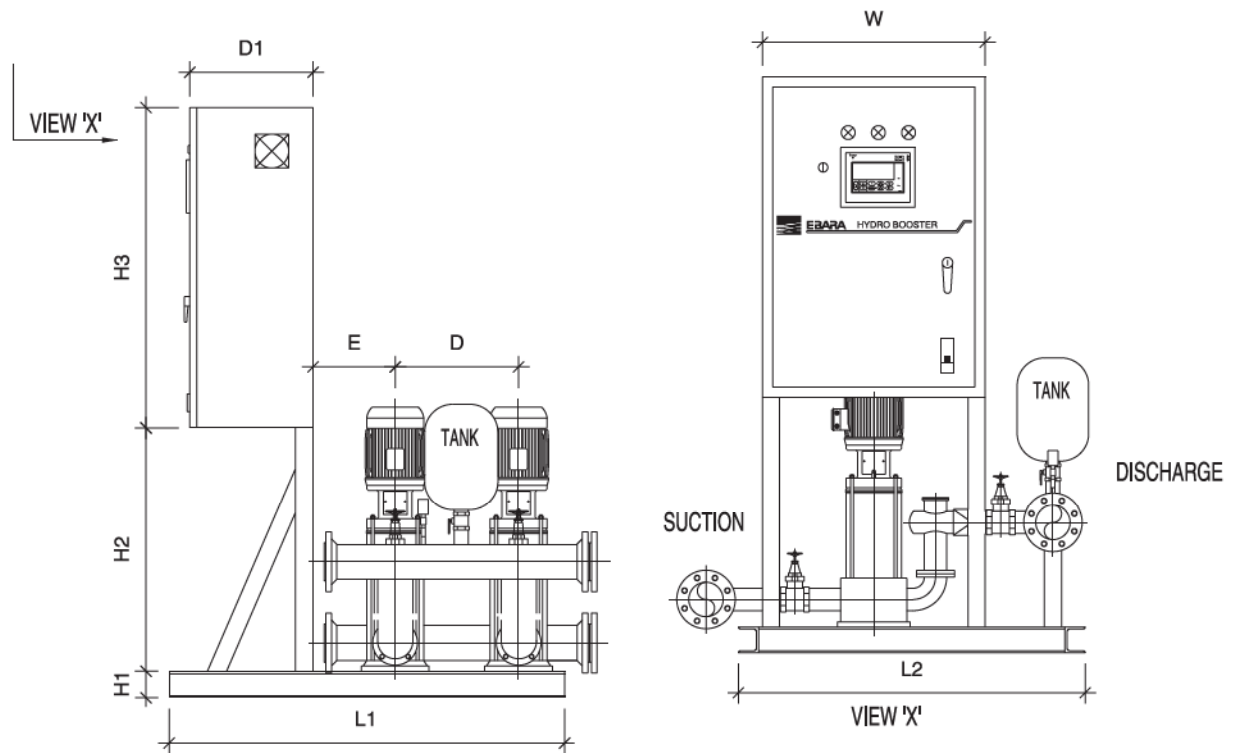
EVM 30



EVM 60

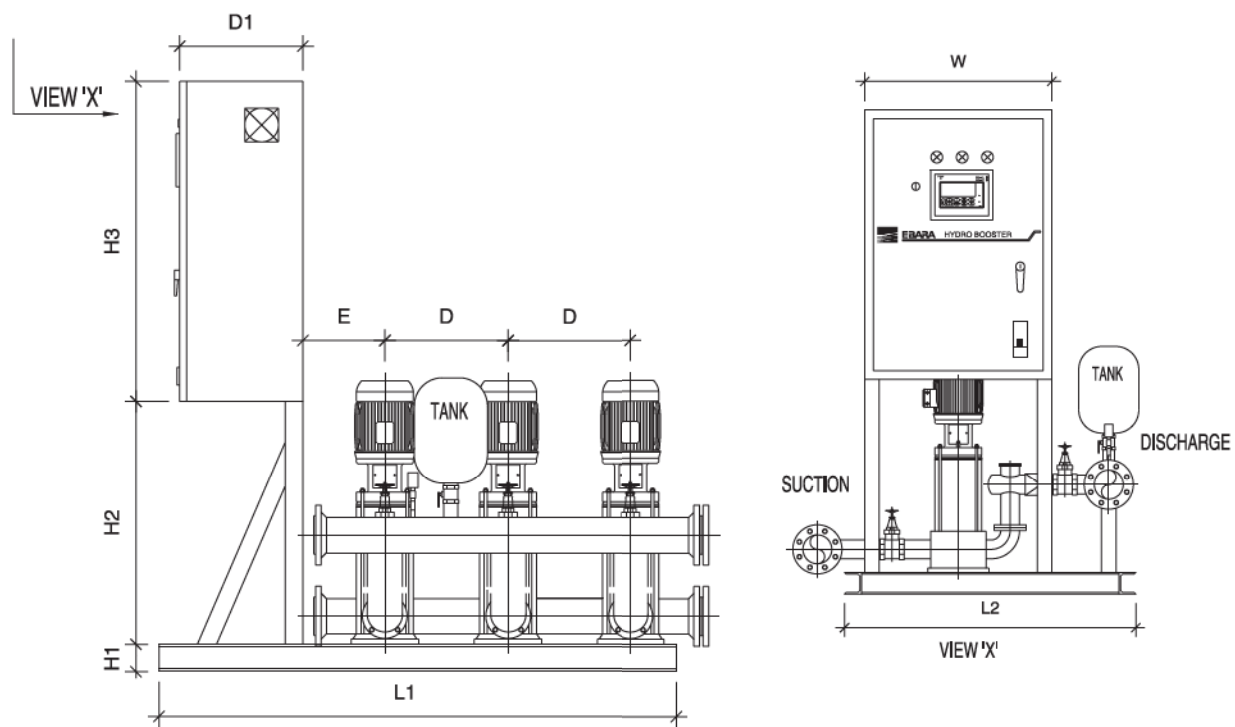


\*Larger System available upon request. Please contact EBARA for details.

**DIMENSIONAL DRAWING (2UN)**


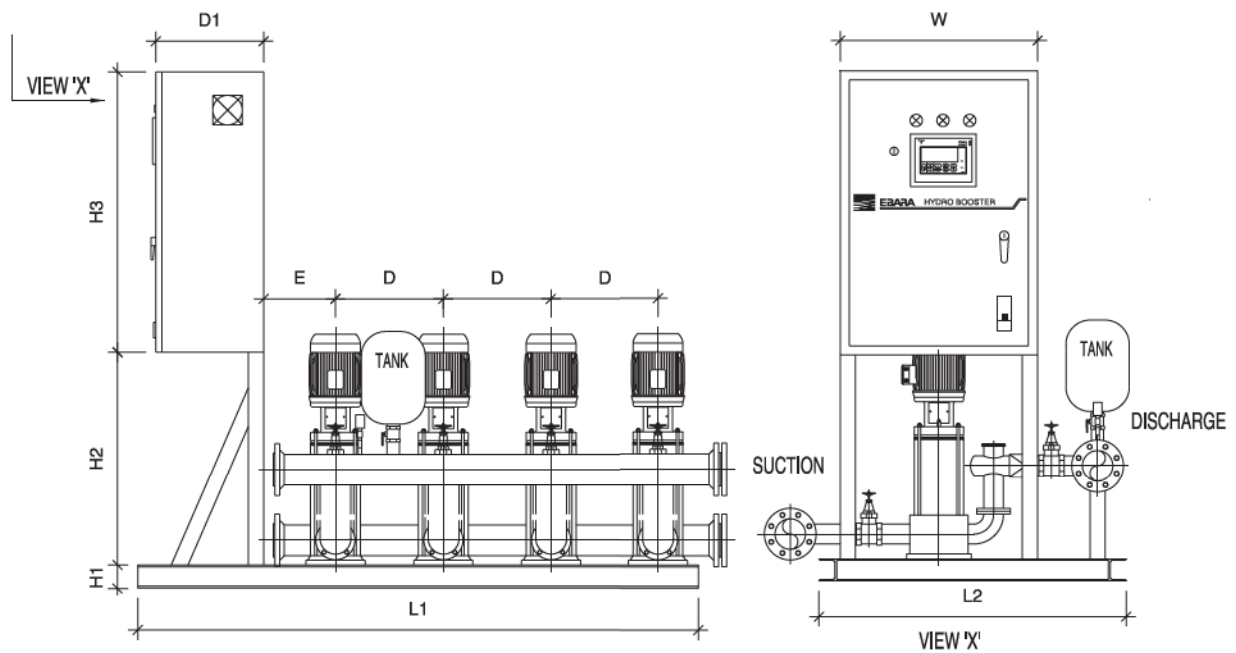
DIMENSION MODEL	H1 mm	H2 mm	H3 mm	D1 mm	W mm	L1 mm	L2 mm	D mm	E mm	TANK LITER	SUCTION MANIFOLD mm	DISCHARGE MANIFOLD mm
2UN-EVM 2	75	725	800	250	600	1030	780	350	180	18	50	50
2UN-EVM 4	75	725	800	250	600	1030	780	350	180	18	50	50
2UN-EVM 8	100	725	800	250	600	1100	910	390	210	24	65	65
2UN-EVM 16	100	725	800	250	600	1245	910	440	305	24	80	80
2UN-EVM 30	100	725	800	250	600	1755	910	440	305	100	100	100
2UN-EVM 60	100	725	800	250	600	1865	1100	550	305	100	150	150

\*\*FOR REFERENCE ONLY : ALL DIMENSION ARE SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

**DIMENSIONAL DRAWING (3UN)**


MODEL \ DIMENSION	H1 mm	H2 mm	H3 mm	D1 mm	W mm	L1 mm	L2 mm	D mm	E mm	TANK LITER	SUCTION MANIFOLD mm	DISCHARGE MANIFOLD mm
3UN-EVM 2	100	625	900	250	700	1380	780	350	180	18	50	50
3UN-EVM 4	100	625	900	250	700	1380	780	350	180	18	50	50
3UN-EVM 8	100	625	900	250	700	1490	910	390	210	24	65	65
3UN-EVM 16	150	625	900	250	700	1685	910	440	305	24	100	100
3UN-EVM 30	150	625	900	250	700	2195	910	440	305	100	150	150
3UN-EVM 60	150	625	900	250	700	2415	1100	550	305	100	150	150

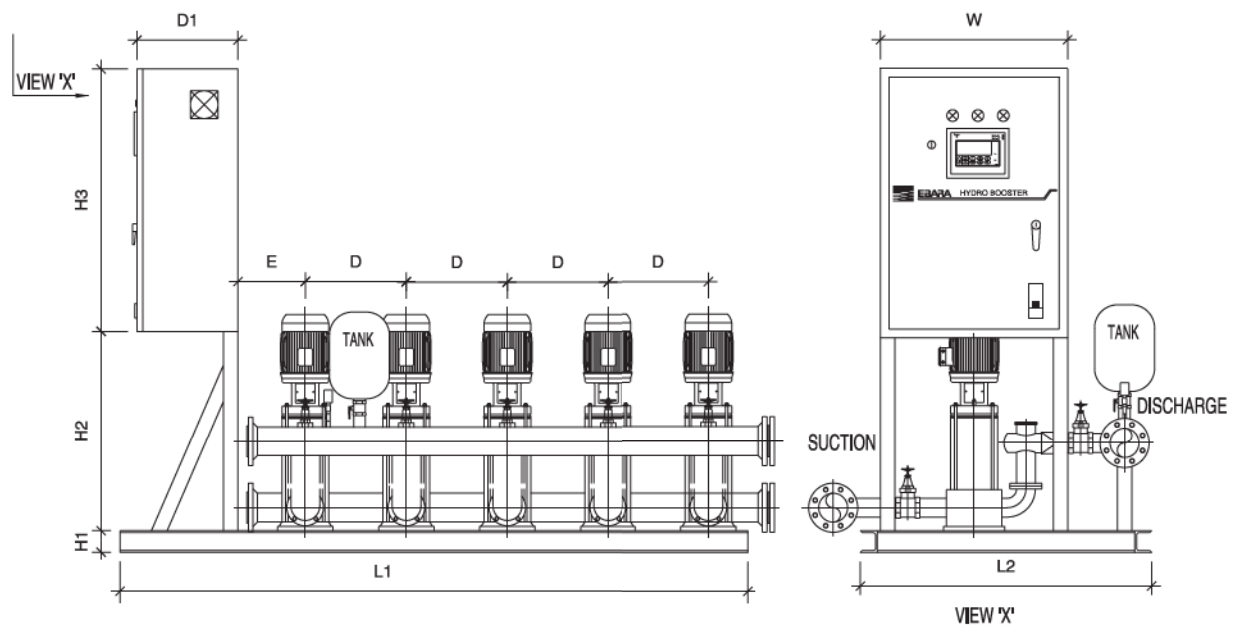
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**DIMENSIONAL DRAWING (4UN)**


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4UN-EVM 2	100	625	900	250	700	1730	780	350	180	18	65	65
4UN-EVM 4	100	625	900	250	700	1730	780	350	180	18	65	65
4UN-EVM 8	150	625	900	250	700	1880	910	390	210	24	80	80
4UN-EVM 16	150	625	900	250	700	2125	910	440	305	24	100	100
4UN-EVM 30	150	625	900	250	700	2635	910	440	305	100	150	150
4UN-EVM 60	150	625	900	250	700	2965	1100	550	305	100	200	200

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**DIMENSIONAL DRAWING (5UN)**


MODEL \ DIMENSION	H1 mm	H2 mm	H3 mm	D1 mm	W mm	L1 mm	L2 mm	D mm	E mm	TANK LITER	SUCTION MANIFOLD mm	DISCHARGE MANIFOLD mm
5UN-EVM 2	150	500	1100	250	800	2080	780	350	180	18	80	80
5UN-EVM 4	150	500	1100	250	800	2080	780	350	180	18	80	80
5UN-EVM 8	150	500	1100	250	800	2270	910	390	210	24	100	100
5UN-EVM 16	150	500	1100	250	800	2565	910	440	305	24	150	150
5UN-EVM 30	150	500	1100	250	800	3075	910	440	305	100	200	200
5UN-EVM 60	150	500	1100	250	800	3515	1100	550	305	100	200	200

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