

EBARA VARIABLE SPEED and CONSTANT PRESSURE BOOSTER 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 includes instruction 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 microcomputer controller unit, frequency inverters, pressure sensor 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 schools, hotels, hospitals, high-rise buildings, etc.
- Industrial water supply
- Irrigation system for garden, parks, golf courses, etc.
- All booster pump station

Pumps

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

Baseframe & Common Pipe work

Galvanized pipe work 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 Sensor

1-5V to transmit control type signals to the EBARA Hydro Booster Controller, located at the discharge side or/suction side (depend on systems offered).

Frequency Converter

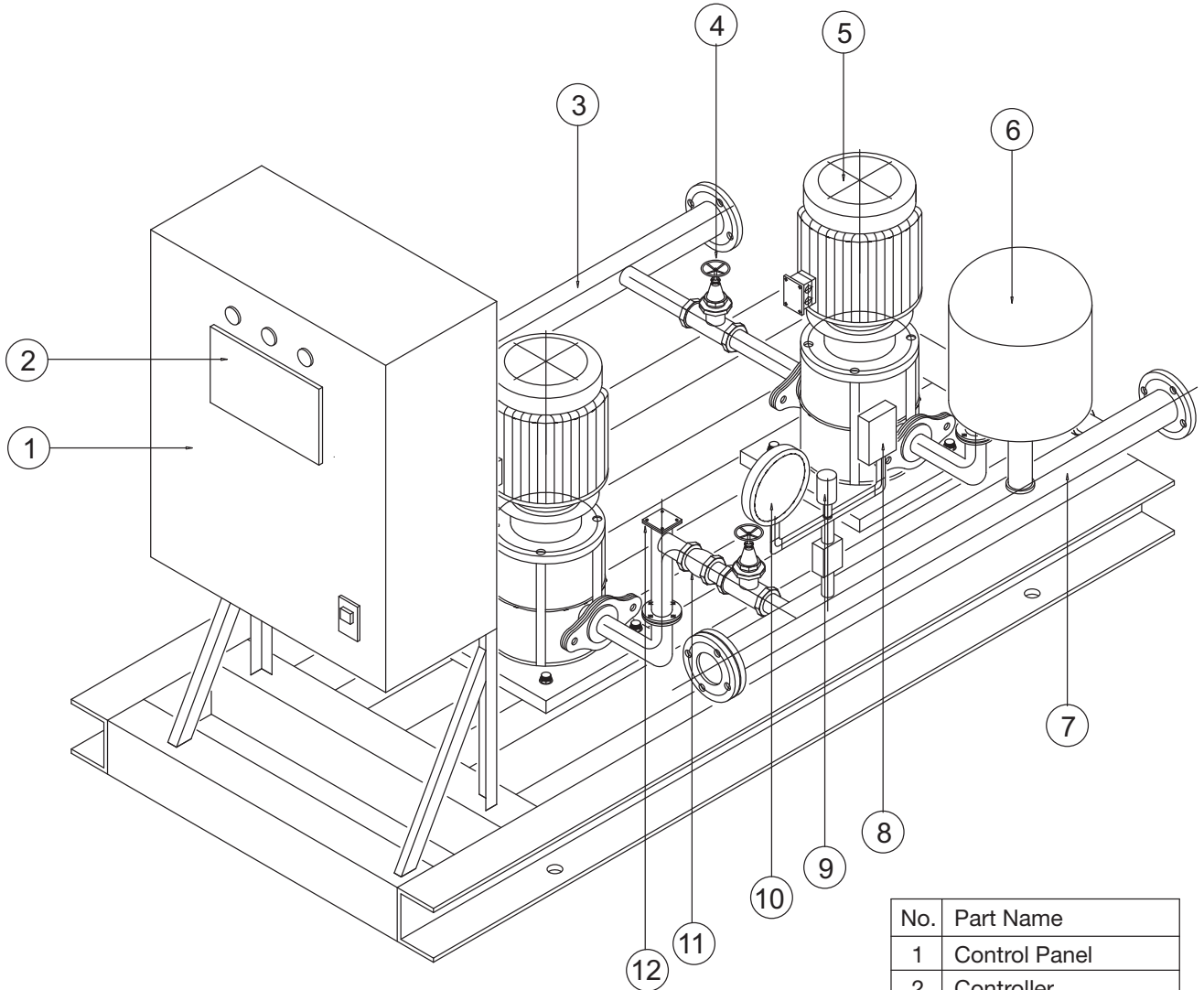
Constant water pressure is achieved due to variable speed drive made possible by the use of frequency converters. To ensure highly reliable EBARA system, each pump is equipped with frequency converter unit, thus ensure optimal operation of pumping system.

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.

ISOMETRIC DRAWING


No.	Part Name
1	Control Panel
2	Controller
3	Suction Manifold
4	Gate Valve
5	Pump
6	Expansion Tank
7	Discharge Manifold
8	Pressure Switch
9	Pressure Transmitter
10	Pressure Gauge
11	Check Valve
12	Flow Switch

EBARA VARIABLE SPEED BOOSTER SYSTEM

Major Components & Functions

EBARA Controller System parameters display:

Operation mode
Pump no. in operation
Output frequency & discharge
Water tank & Fault type

Operation push buttons:

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

Pressure Switch
System auto backup operation.



Pressure Gauge
Indicator of system pressure.



Hydro Tank
Ensure accurate pressure reading.



EBARA Pressure Sensor
Detect pump pressure.



Check Valve
Quick closing action reduces water hammer.



EBARA Vertical Multi-Stage Pump

EBARA Vertical multi-stage pump utilising quality stainless steel casing and impellers to ensure reliable pumping operation.

All pumps are tested according to specifications; thus ensure long operating life.



High efficiency hydraulic design.

EBARA owned R&D has resulted in the newly developed hydraulic parts for EVM, particularly impellers and intermediate casing that provide high efficiency operation.

Flow Switch

Provide signal to cut-out pump during no-flow operation



EBARA Custom Design Electrical Control Panel

Ensure trouble-free operation at all time. Specially design for Malaysian weather.



EBARA VARIABLE SPEED BOOSTER SYSTEM

1. Advance energy saving system

This unit is operating on variable speed drive control incorporated with logic control system. Thus saving 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.

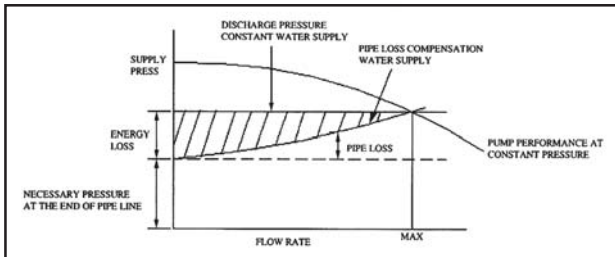


Fig. Pipe Friction Loss Compensation Operation

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 water supply continues.

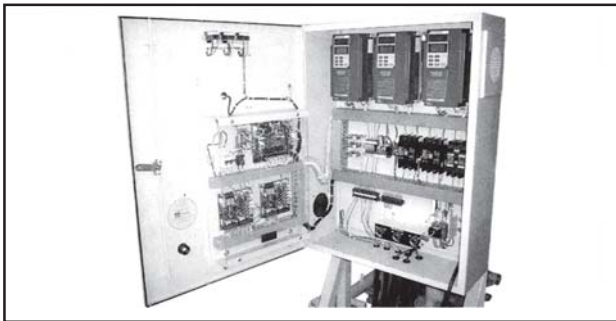


Fig. Custom Design Control Panel

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.

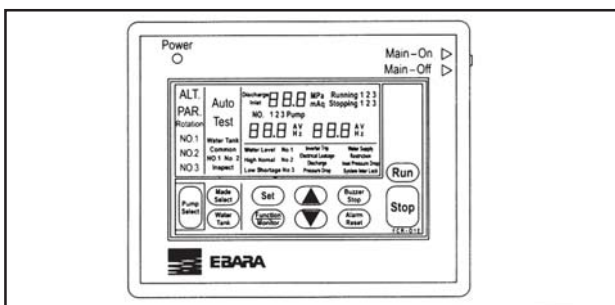


Fig. Ebara Proven - Designed Controller

5. Cyclic & forced cyclic operation

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

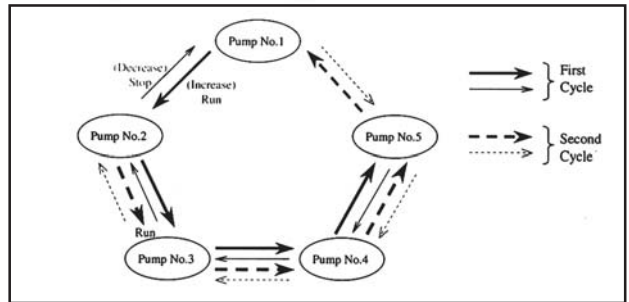


Fig. Cyclic Operating System

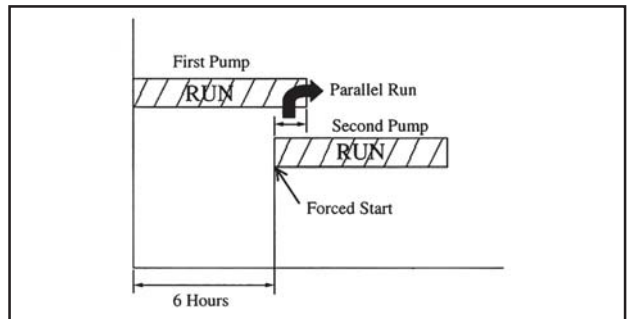


Fig. Forced Cyclic Operation

6. APNC & APR System

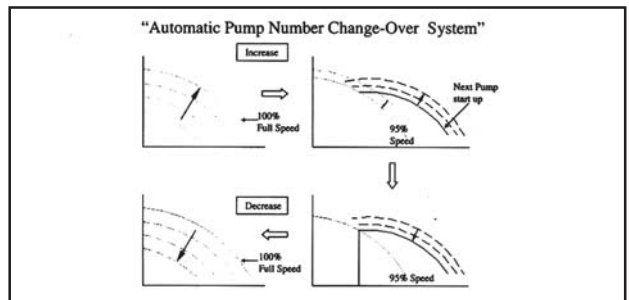


Fig. APNC - Automatic Pump Number Charge-Over System

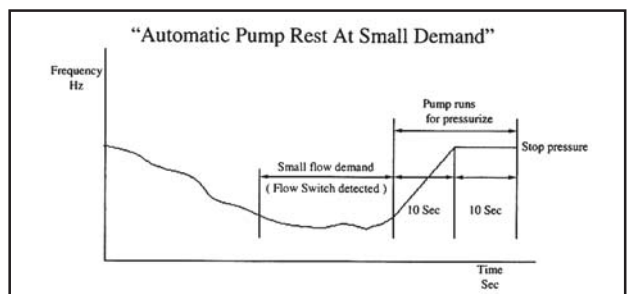
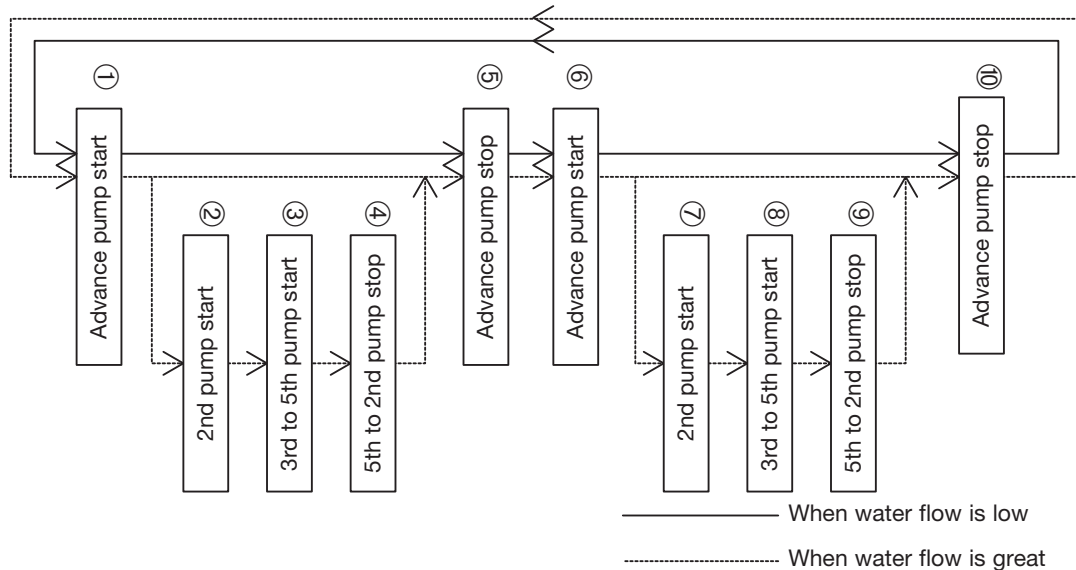


Fig. APR - Automatic Pump Rest At Small Demand

EBARA VARIABLE SPEED BOOSTER SYSTEM - OPERATION METHOD



A. When water flow is low

- ① If water is used, the inner pressure of the pipes drop, 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

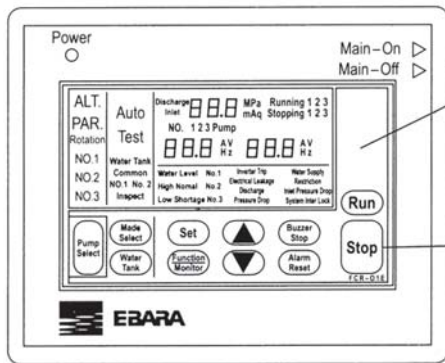
- ① If water is used, the inner pressure of the pipes drop, triggering the pressure sensor, and advance pump (Ex: No.1) starts up.
- ② If the flow continues to increase, the rotational speed of advance pump reaches maximum and 2nd pump (Ex: No. 2) starts up.
- ③ As the volume of water used increases in order, the delayed pumps starts 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 (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 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.

EBARA VARIABLE SPEED BOOSTER SYSTEM - CONTROLLER

The heart of the system is the EBARA controller unit, which is user-friendly and permits 'One-touch' operation. It controls the sequence of pump operation with signals input from the pressure sensor 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 Power selector switch (ALT/PAR/Rotation/P1 to P5)
- 1 x Mode selector switch (Auto/Test)
- 1 x Power main on off switch
- 1 x Set switch
- 1 x Function / Monitor switch
- 1 x Buzzer stop switch
- 1 x Alarm reset switch
- 1 x Run switch
- 1 x Stop switch
- 1 x LCD System parameter displays



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


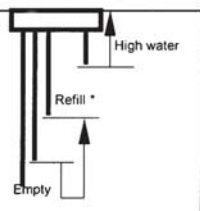
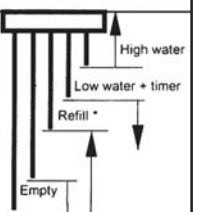


Rotation - No.1 - No.2 - No.3 indicates that the item displayed changes, in rotation, No.5 - No.4 each time the button is pushed.

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.

EBARA VARIABLE SPEED BOOSTER SYSTEM - UNIQUE FEATURE

Unique Feature- Receiving (Water) tank

Code P05	Code P06 and Code P07	
<p>Code P05 = 2</p> 	<p>4P electrode</p> <p>Code P06 = 0 Code P07 = 0</p> 	<p>5P electrode</p> <p>Code P06 = 1 Code P07 = 0</p> 
<p>Code P05 = 1</p> 	<p>Code P06 = 0 Code P07 = 0</p>	
<p>Code P05 = 0</p> 	<p>Code P06 = 0 Code P07 = 0</p>	

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,
- inverter tripped

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

- suction tank water level
- system interlock
- electrical leakage
- low discharge pressure. *Option (IN-LINE BOOSTING mode)

REMOTE MONITORING FEATURES

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

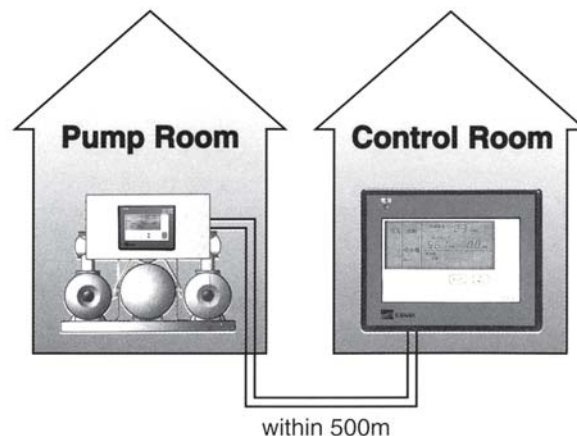
Display Items:

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).



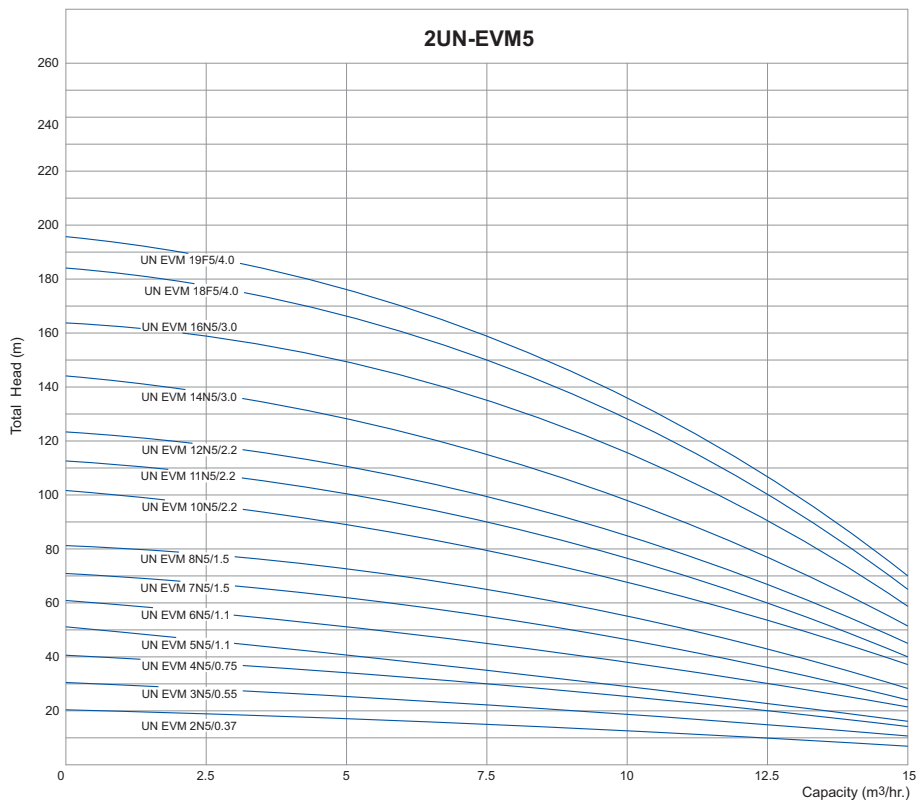
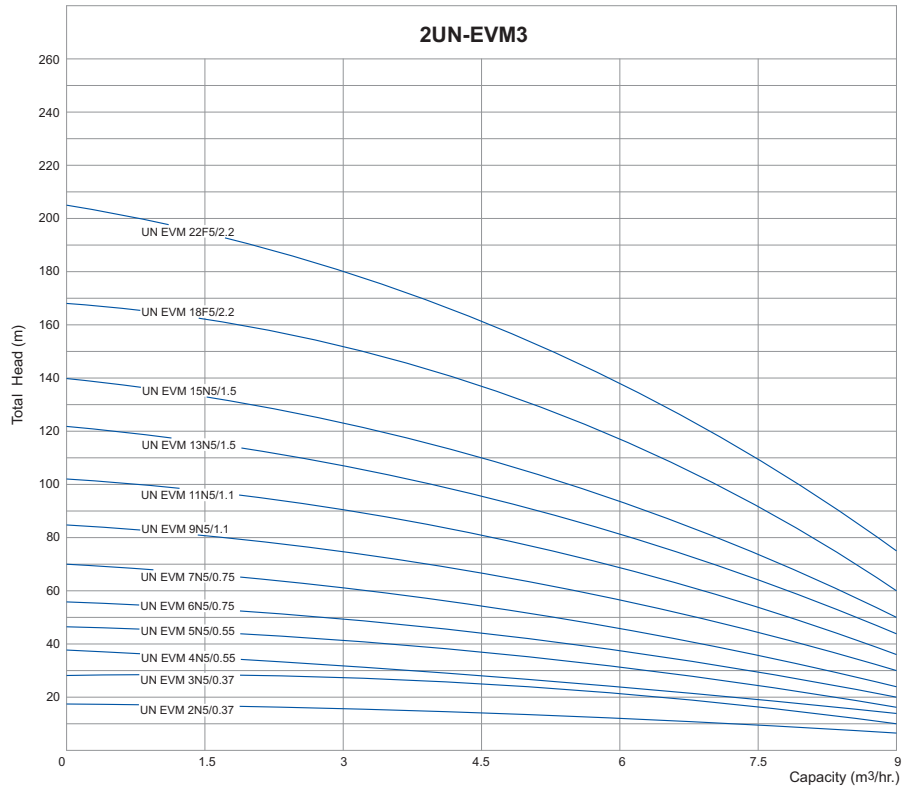
SPECIFICATIONS FOR VARIABLE SPEED PRESSURE BOOSTER UNIT

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
		Ambient temperature Up to 40°C	Weather-proof available
		Vertical multistage Pump: Model EVM	3M, CDX and other EBARA model
Power source	Three phase, 380/400/415 V, 50 Hz		
Pressure tank	Type	Pre-charged Diaphragm	
	Capacity	18L	Over 18L
	Max. working pressure	10 bar	Up to 20 bar
Pressure sensor		3 Wire for DC 12V Output Voltage 1 - 5V	
Control panel & Controller	Main components	Inverter (each pump), Control panel (Remote type)	Water level board, Main supply noise filter Surge protector
		Main circuit breaker, Main control CPU board	
		Interface board, Pilot light, Isolator, Voltage detection board	
		Control circuit noise filter, Electric leakage breaker	
		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. *Option: IN-LINE BOOSTING mode 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}	

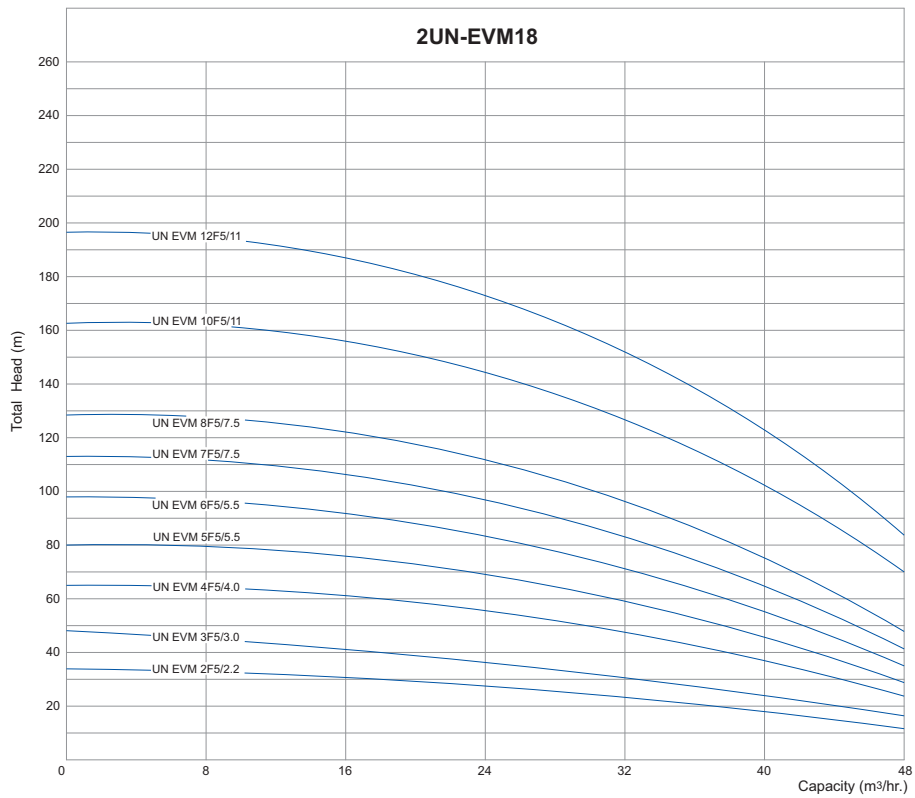
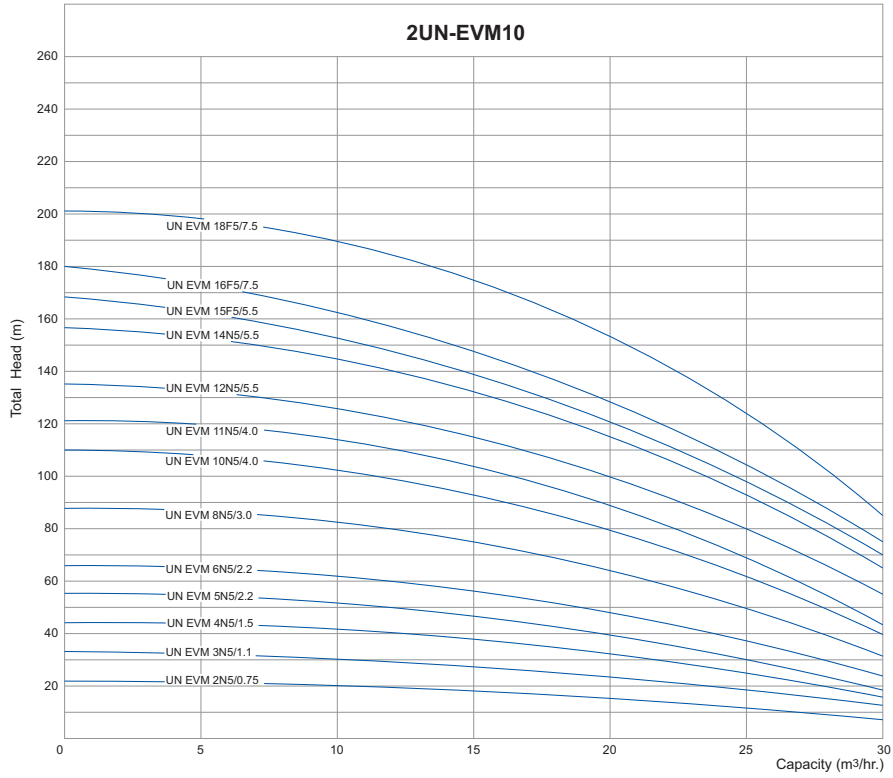
CUSTOM BUILT HYDRO BOOSTER SYSTEM (available upon request)

Applications	Product Options	Features / Benefits
<p>Inline boosting system specially design for:</p> <ul style="list-style-type: none"> • automatic water supply system. • water supply distribution. 	 <p style="text-align: right;"><i>UN-IB</i></p>	<ul style="list-style-type: none"> • consistent pressure. • no suction tank required i.e: direct boosting from suction pipe. • flexible usage i.e. capable of integrating with existing. pumping system with minimal modification works.
<ul style="list-style-type: none"> • automatic booster system for housing estate, hospitals, condominium and high-rise building. 	 <p style="text-align: right;"><i>UN-GB</i></p>	<ul style="list-style-type: none"> • consistent pressure. • reduce storage tank size. • empties water effectively to process and utilities etc.
<ul style="list-style-type: none"> • golf course irrigation. 	 <p style="text-align: right;"><i>UN-GC</i></p>	<ul style="list-style-type: none"> • automatic irrigation of required capacity and pressure setting. • economical design. • economy set.
<ul style="list-style-type: none"> • general boosting for factories, plant and booster station. 	 <p style="text-align: right;"><i>UN-SP</i></p>	<ul style="list-style-type: none"> • automatic boosting system for large-scale water supply. • ensure constant pressure. • maintenance free operation.

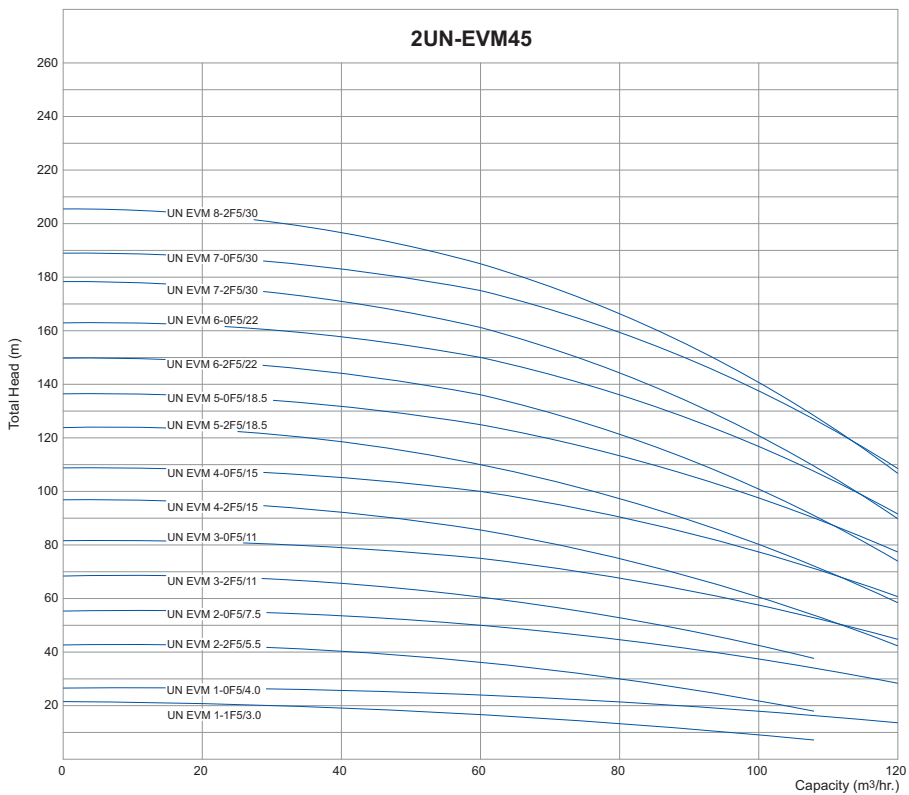
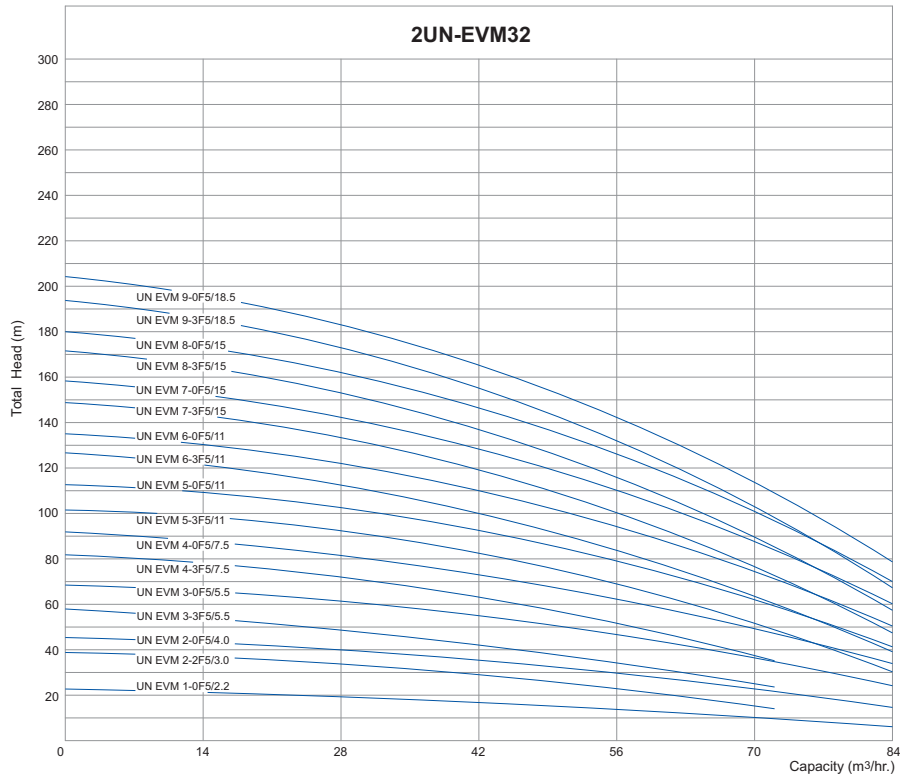
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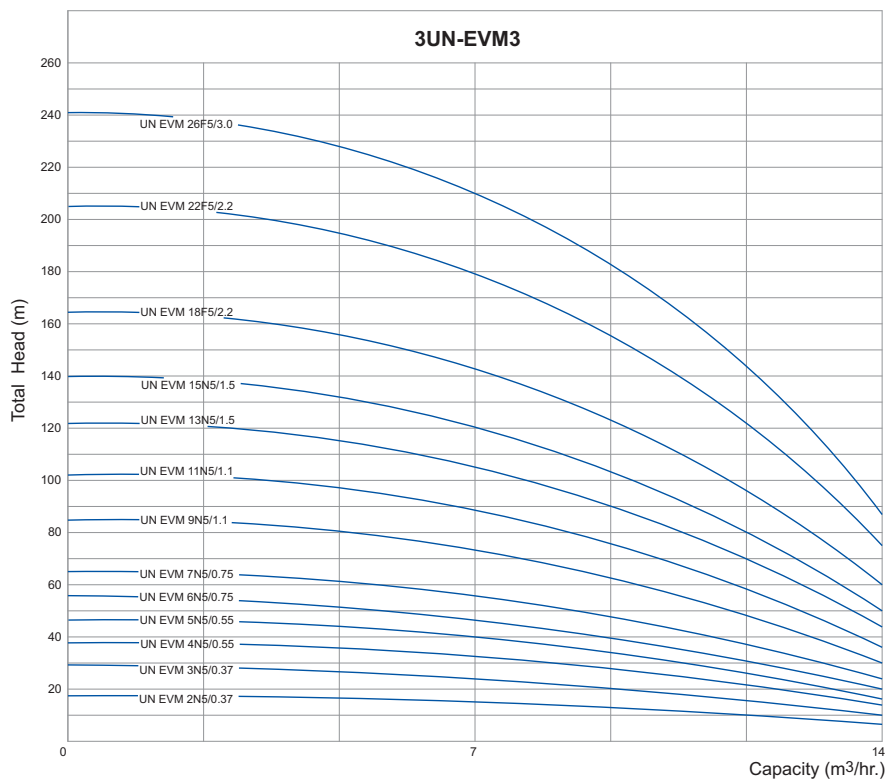
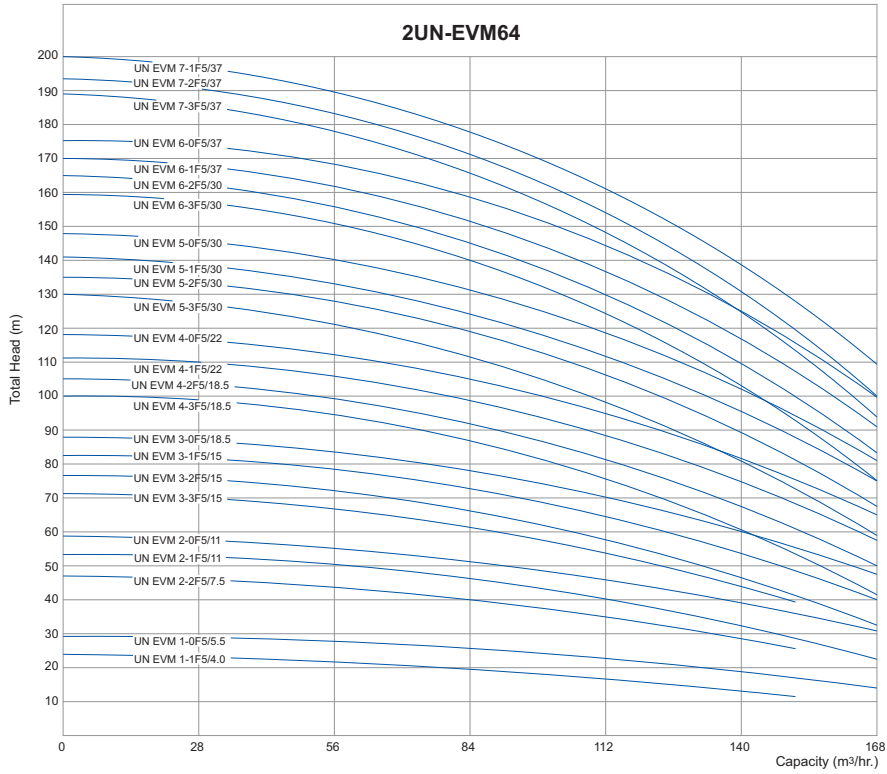
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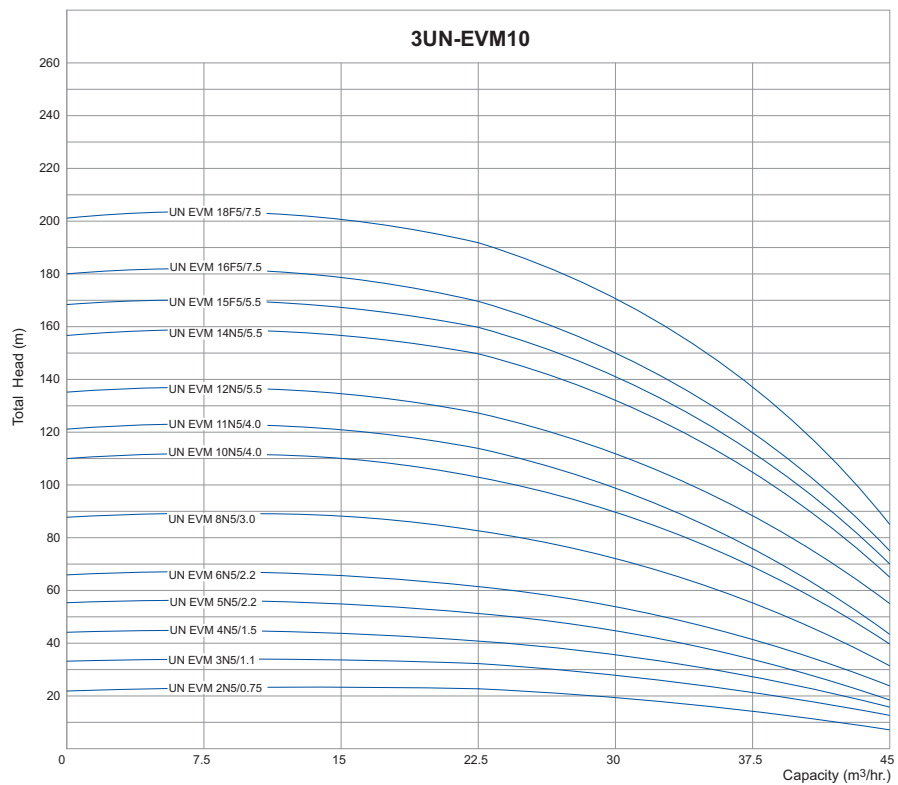
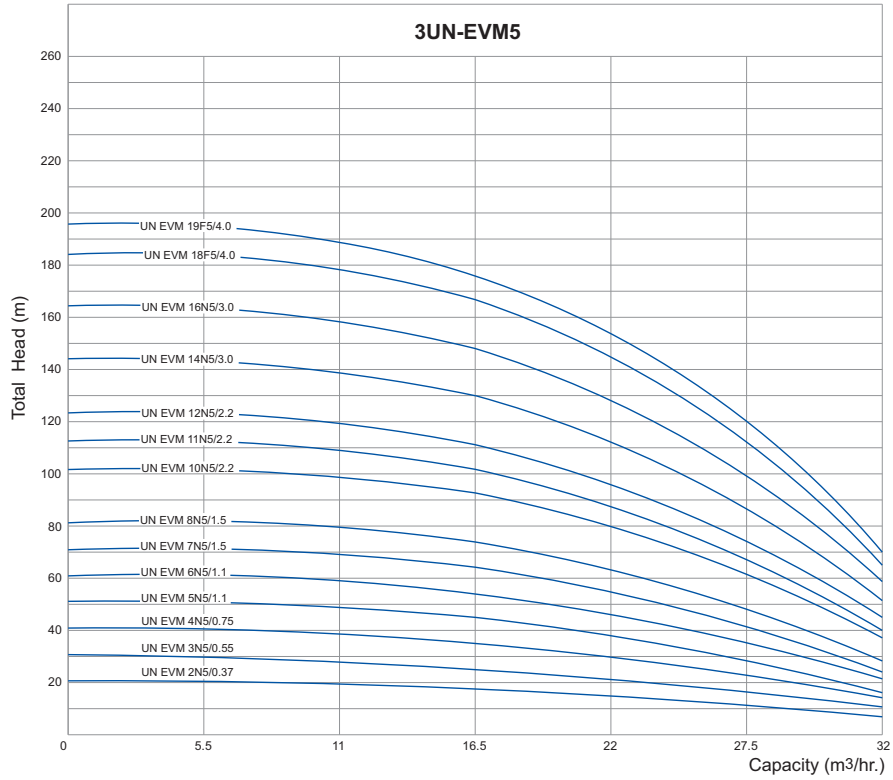
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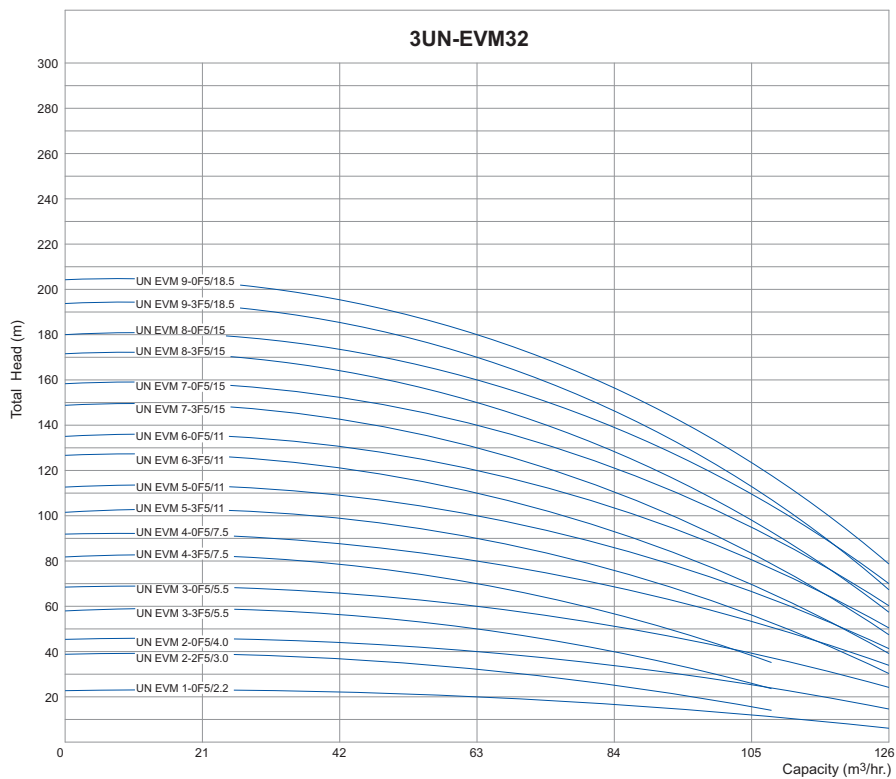
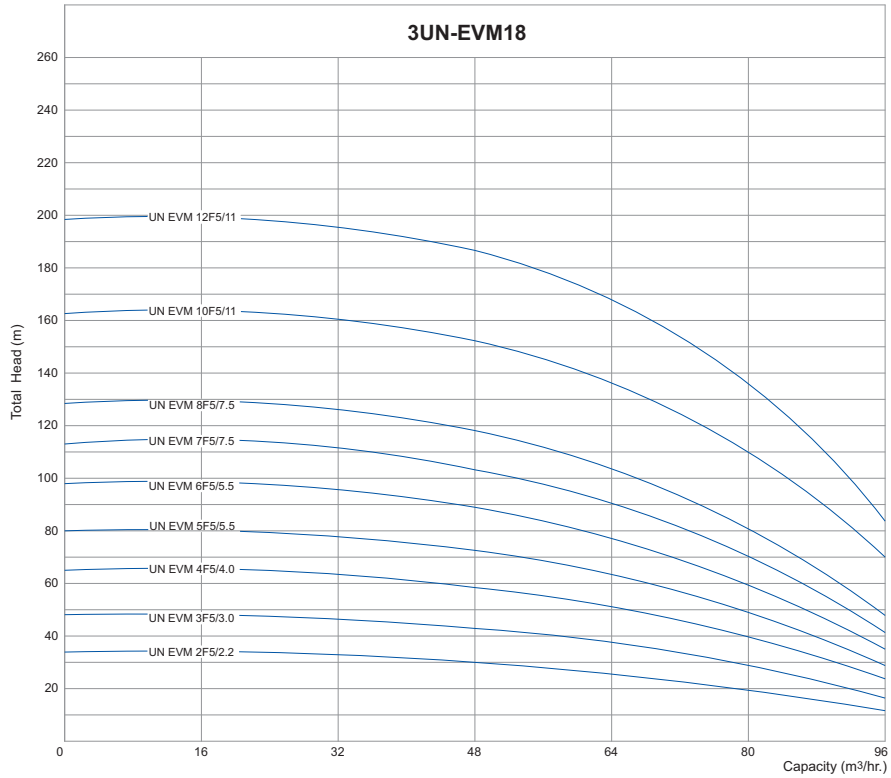
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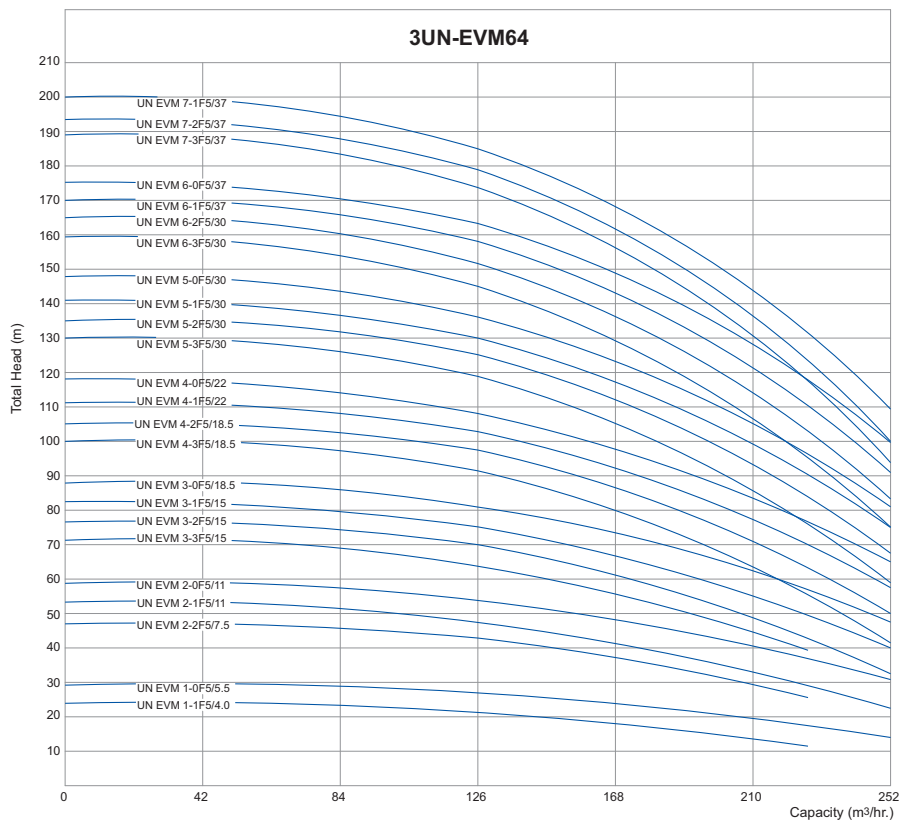
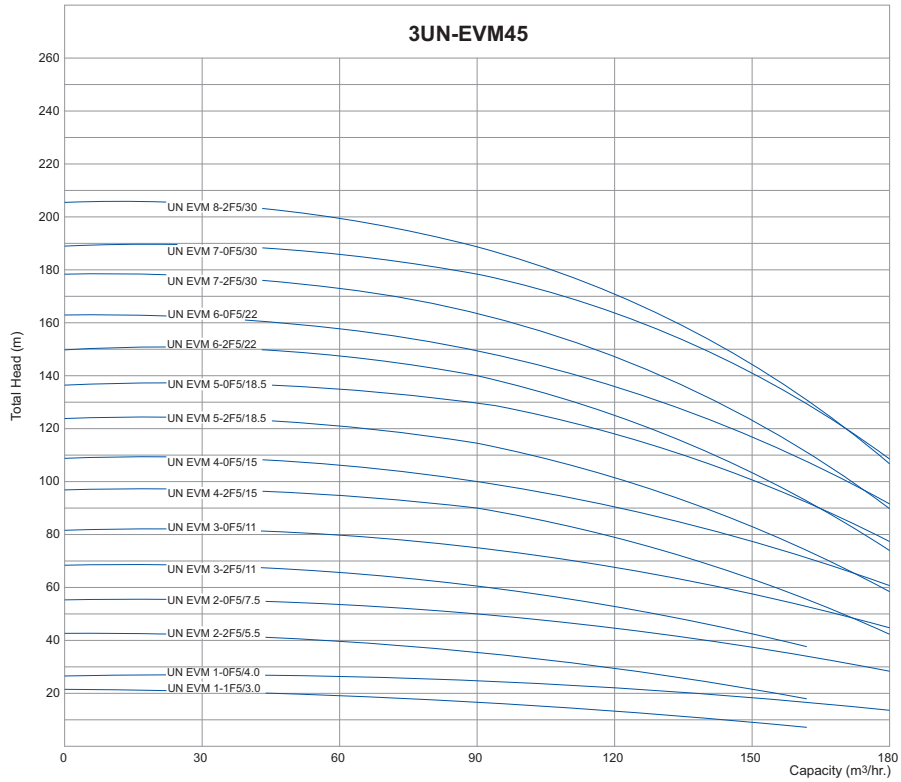
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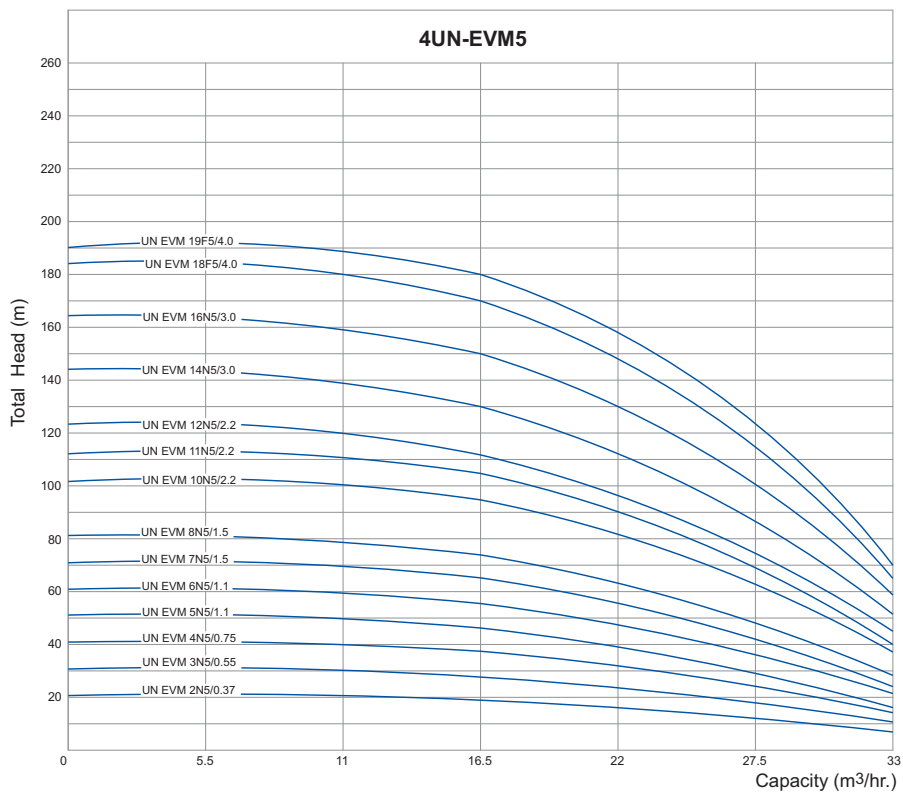
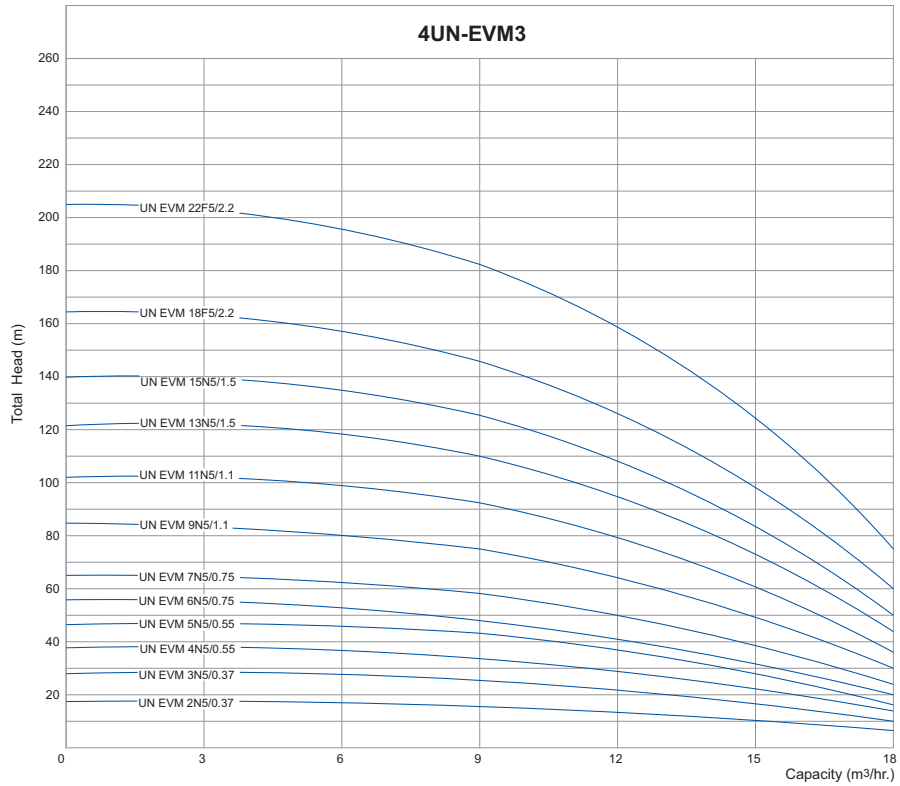
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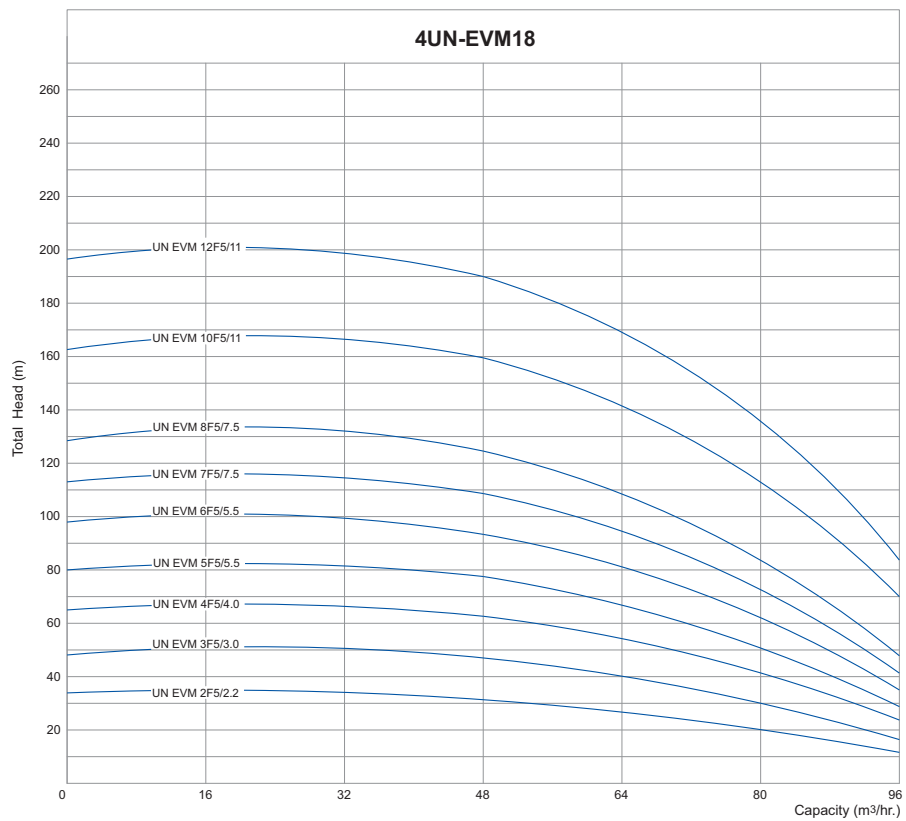
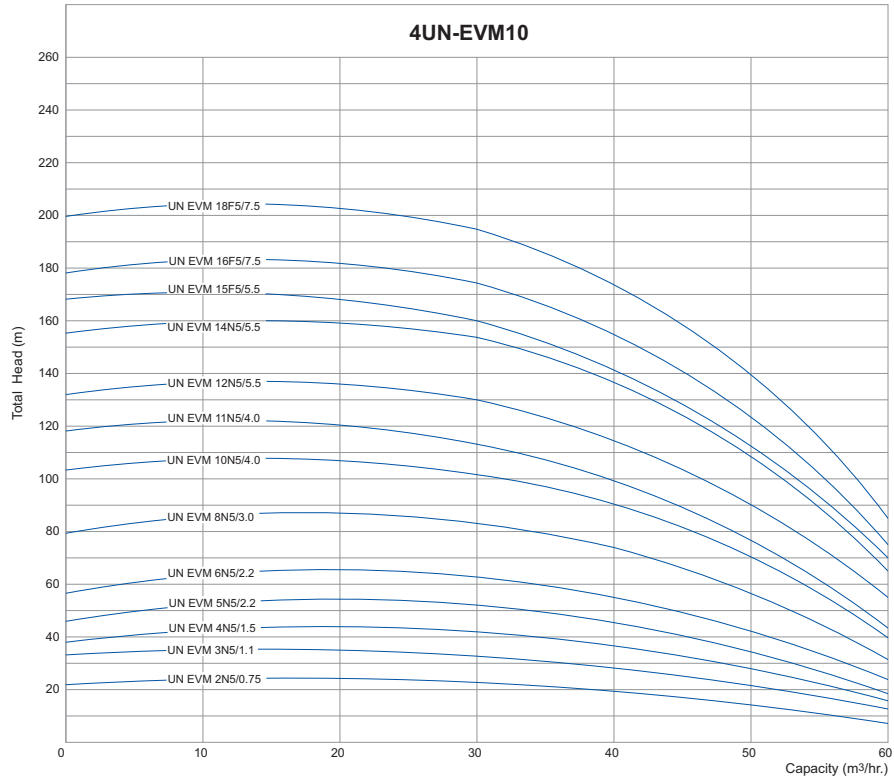
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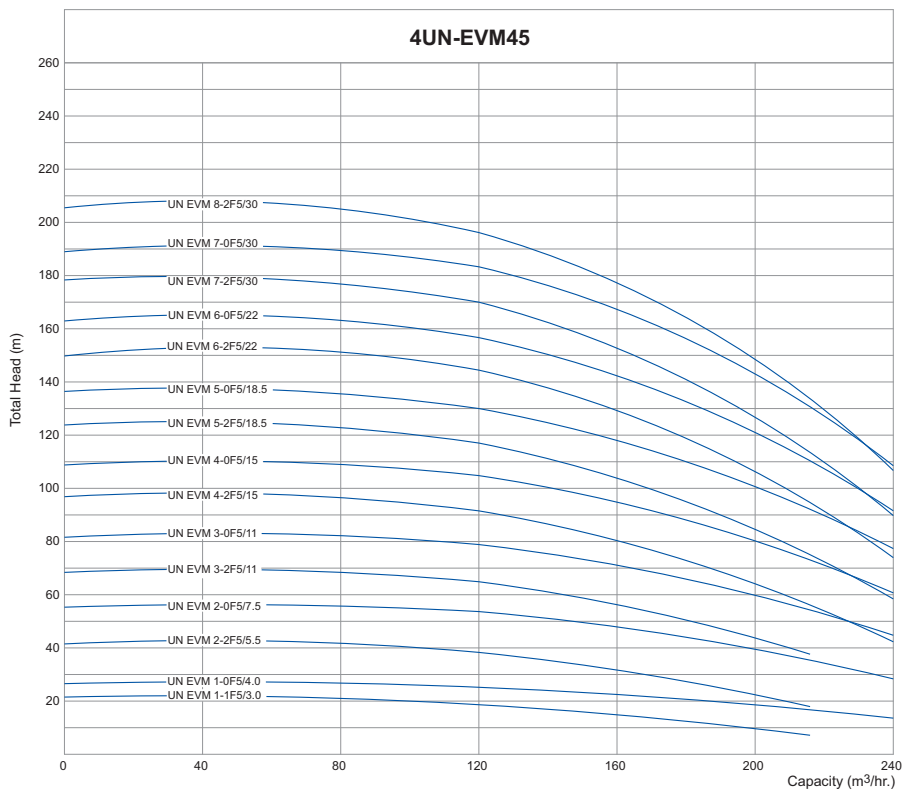
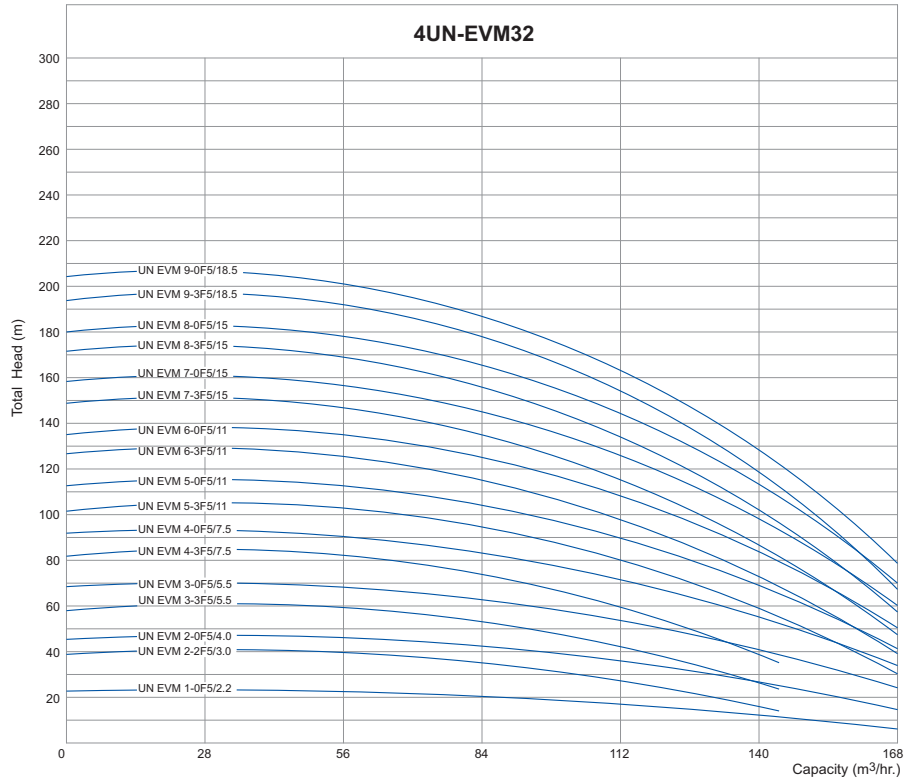
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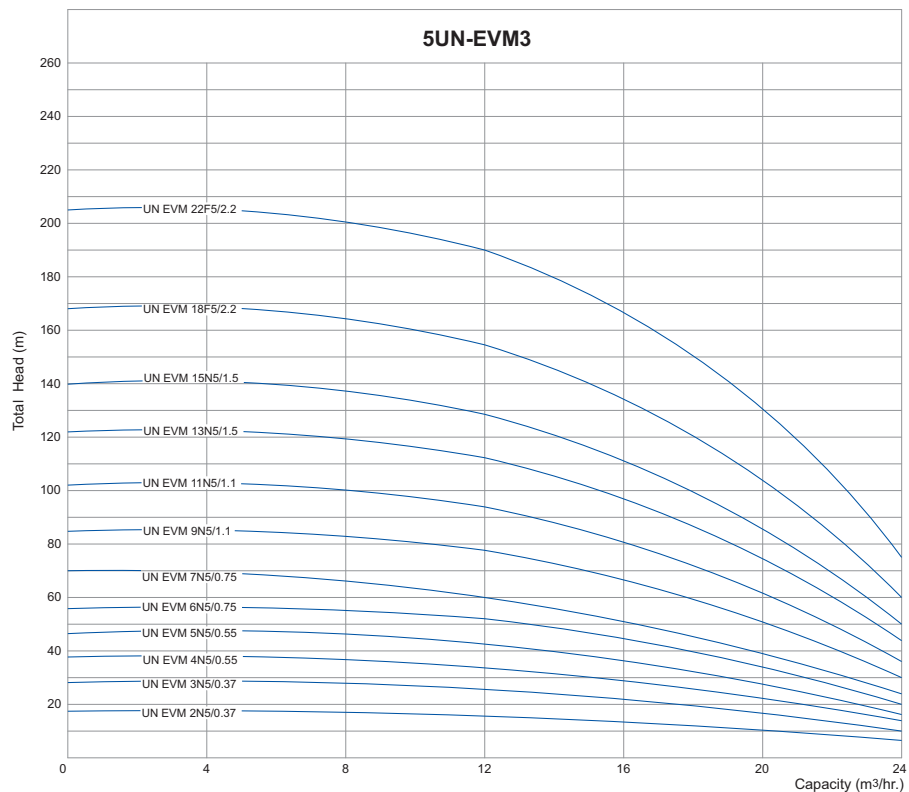
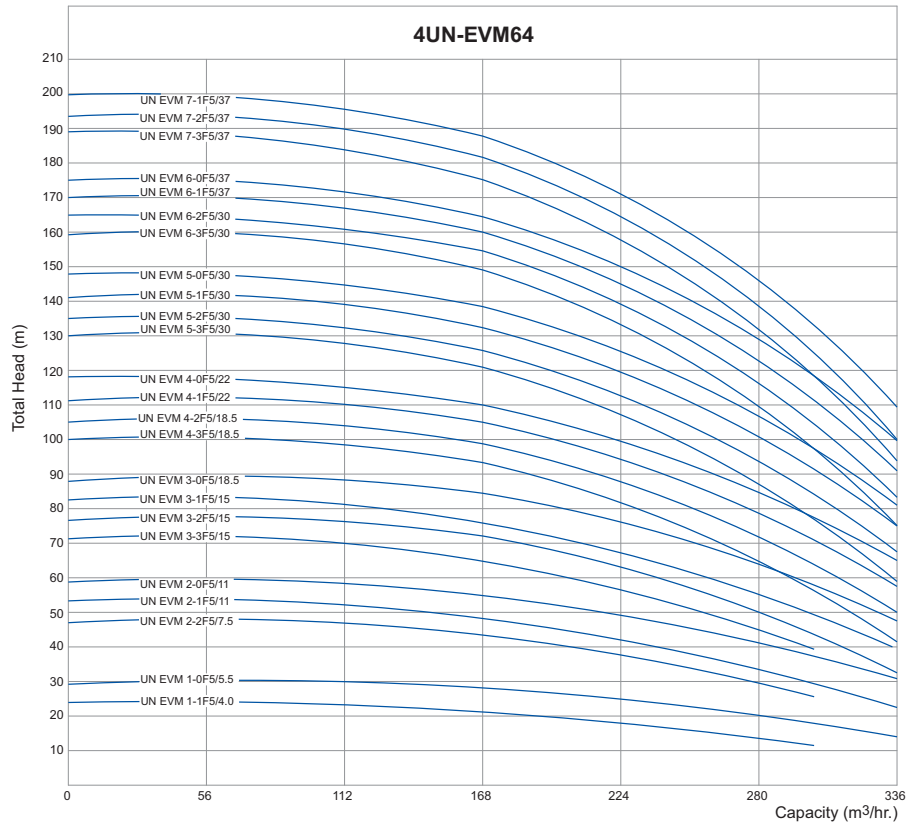
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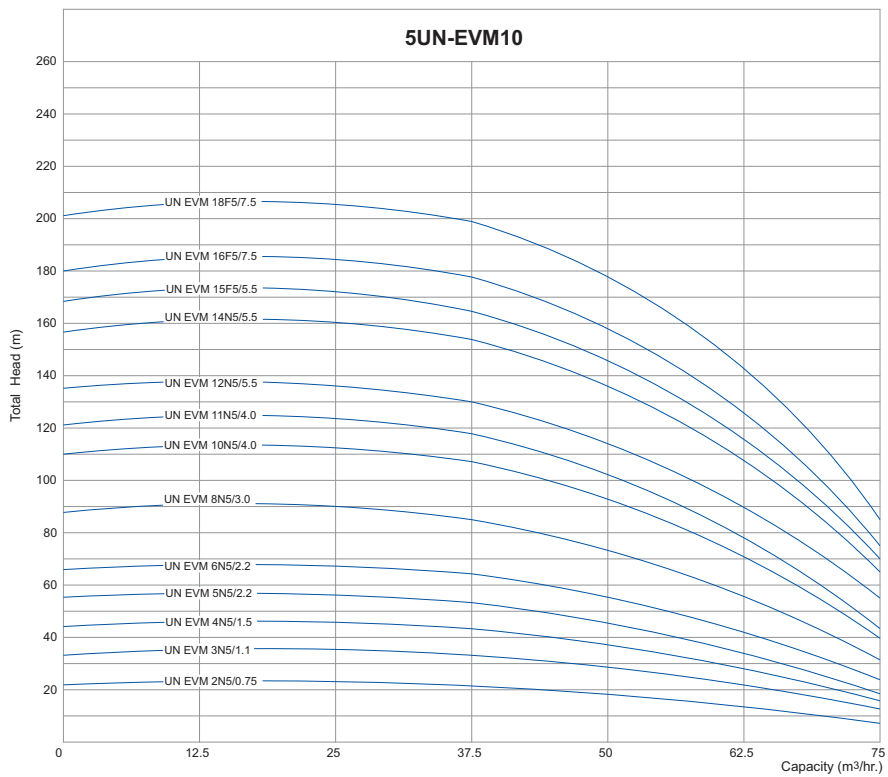
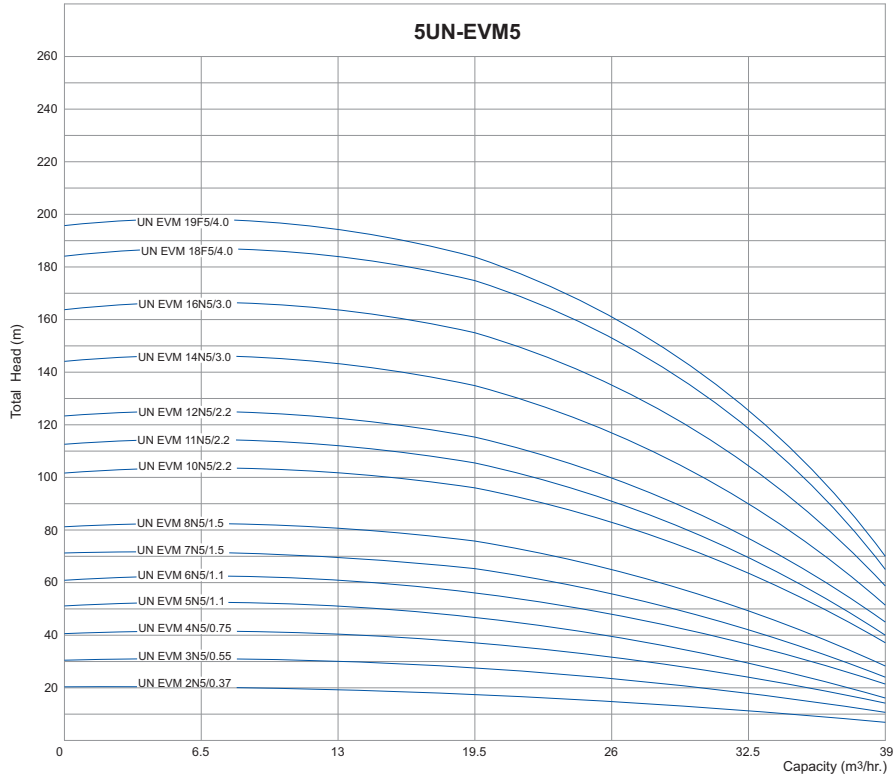
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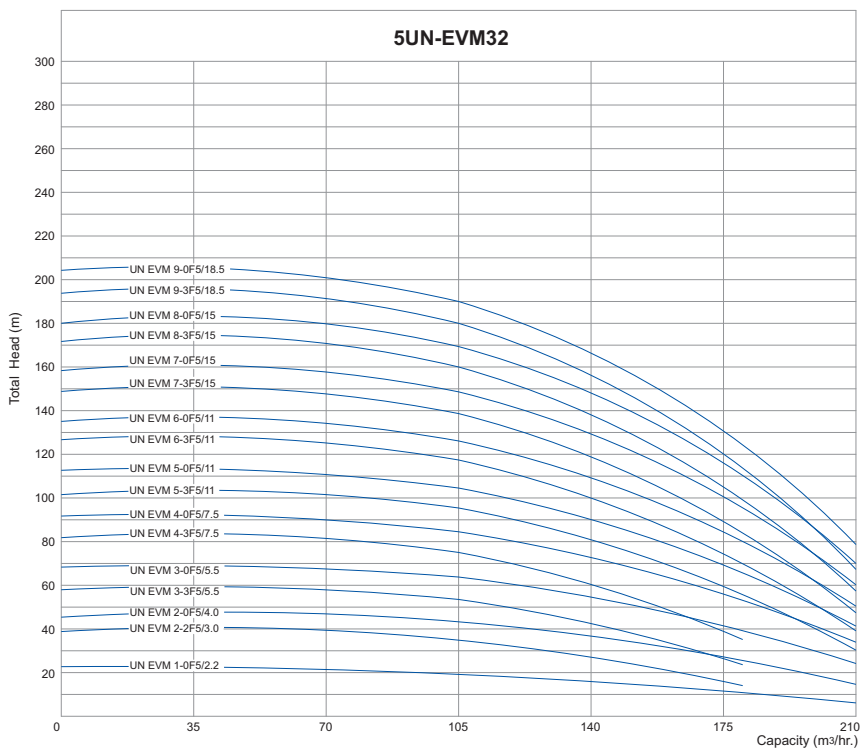
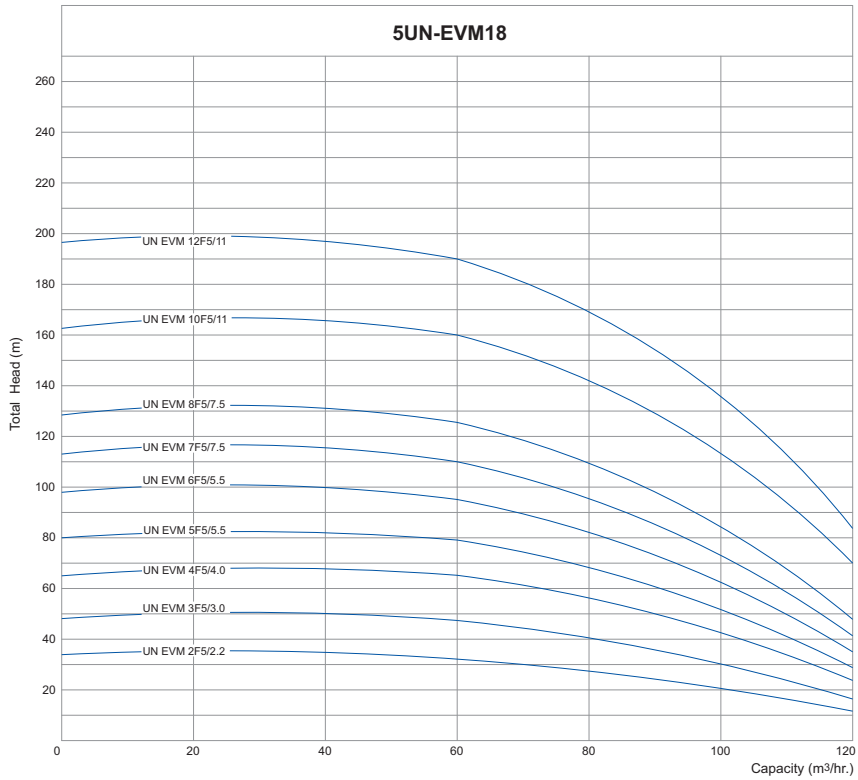
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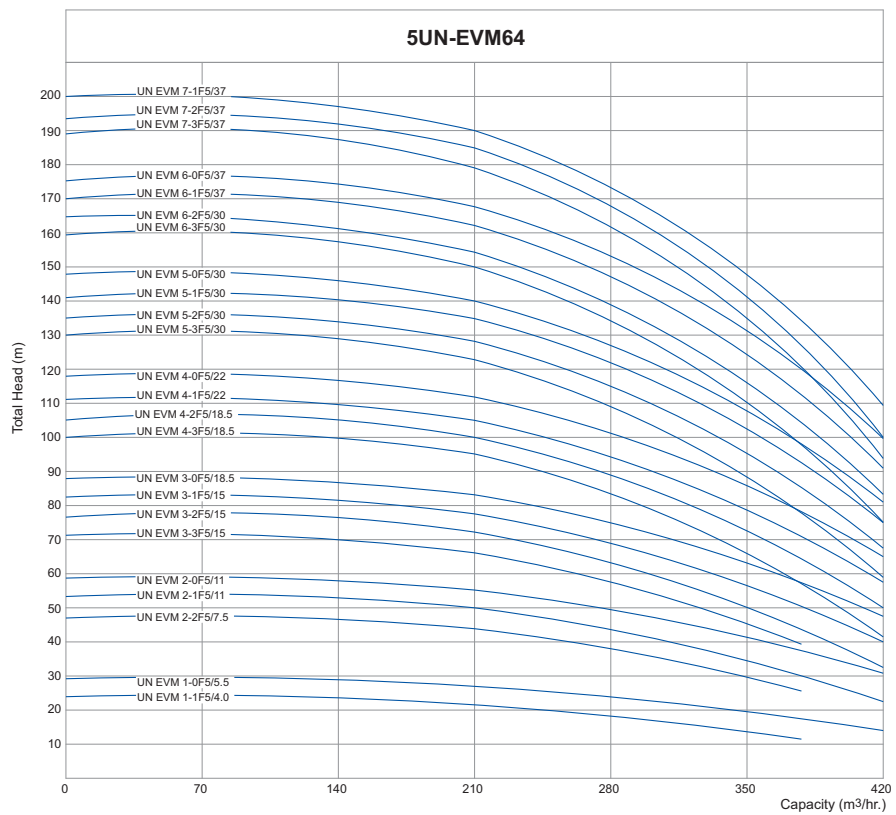
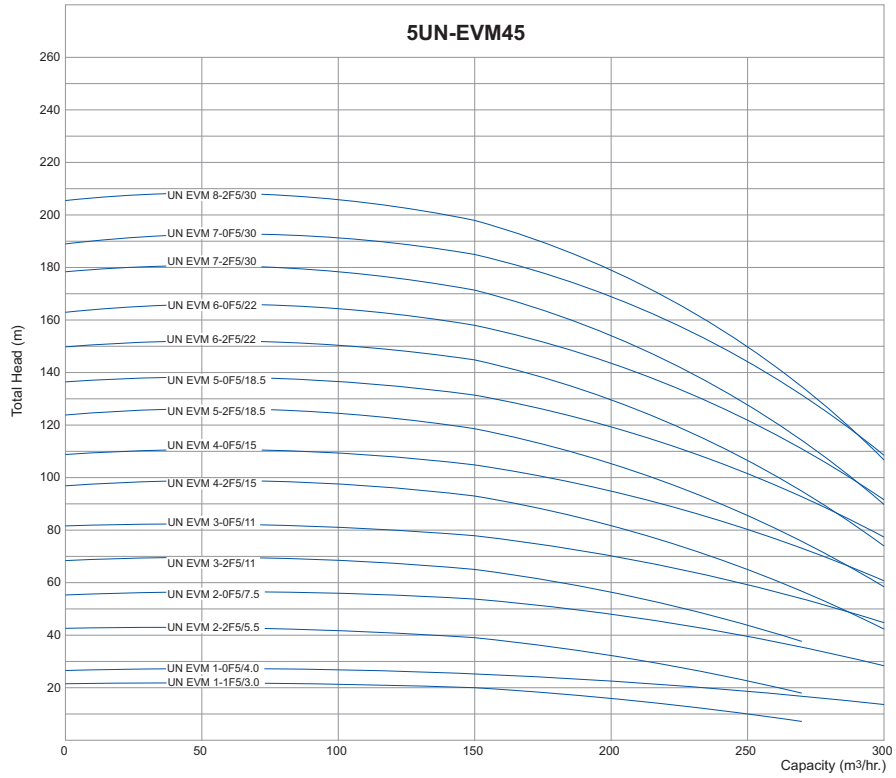
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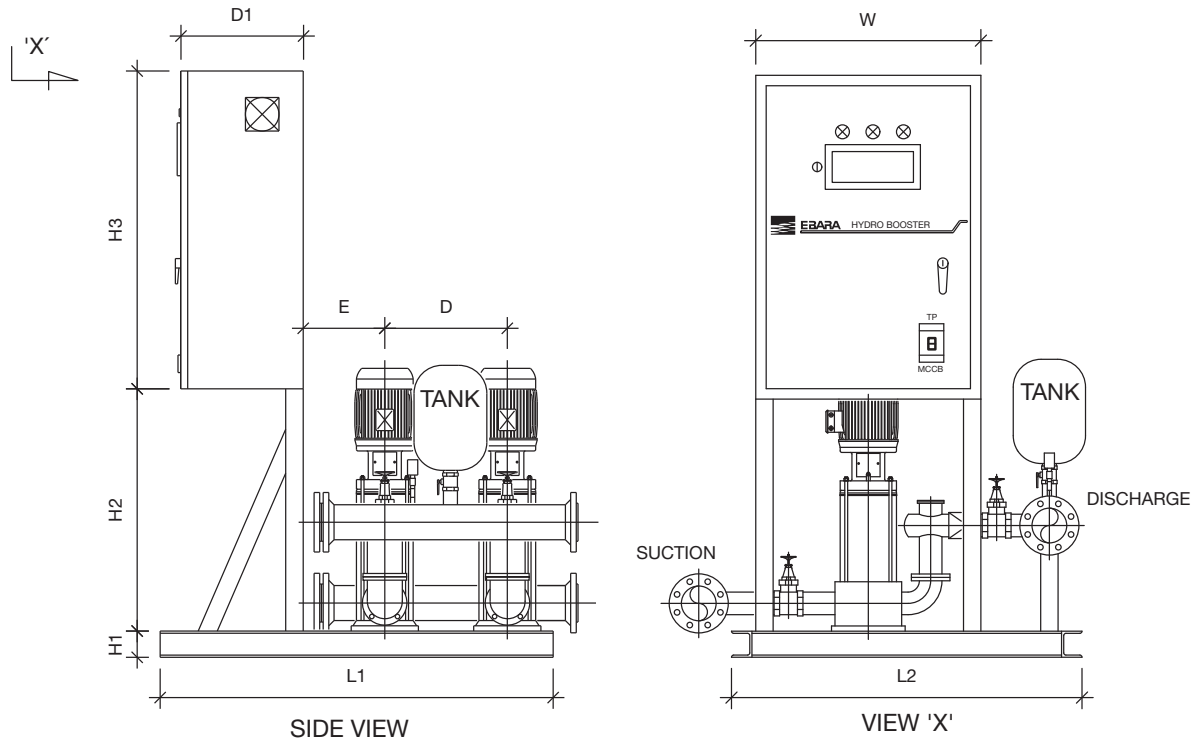
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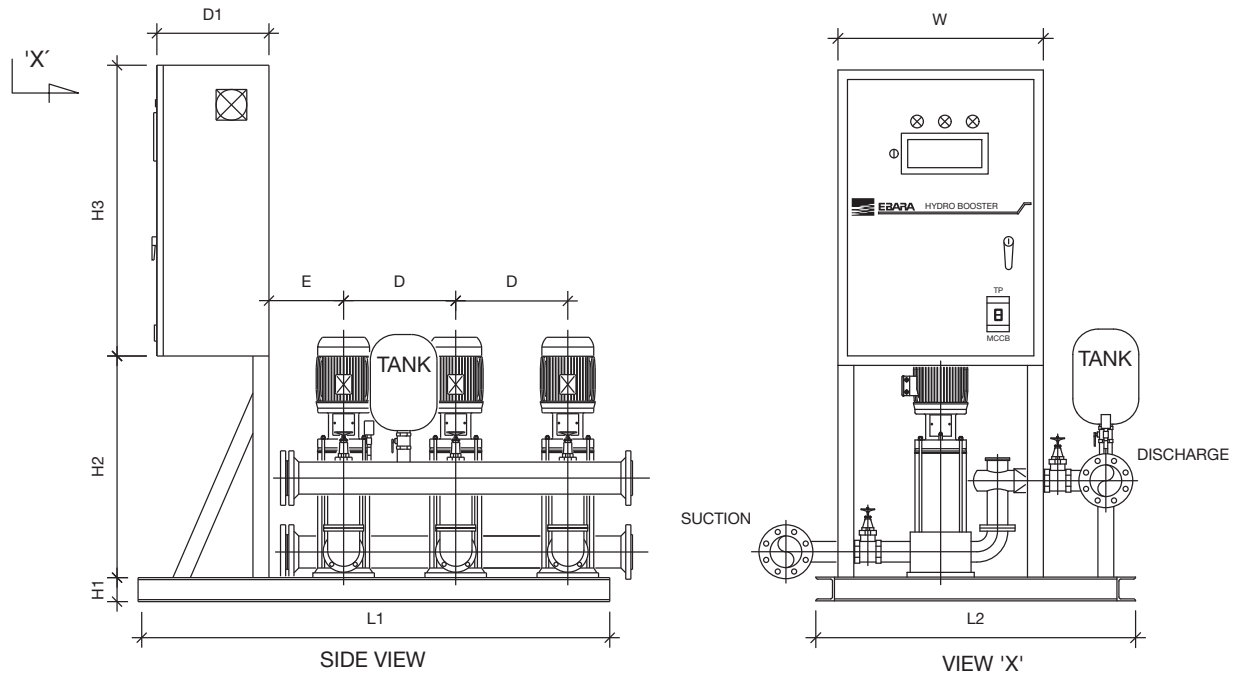


DIMENSIONAL DRAWING (2UN)



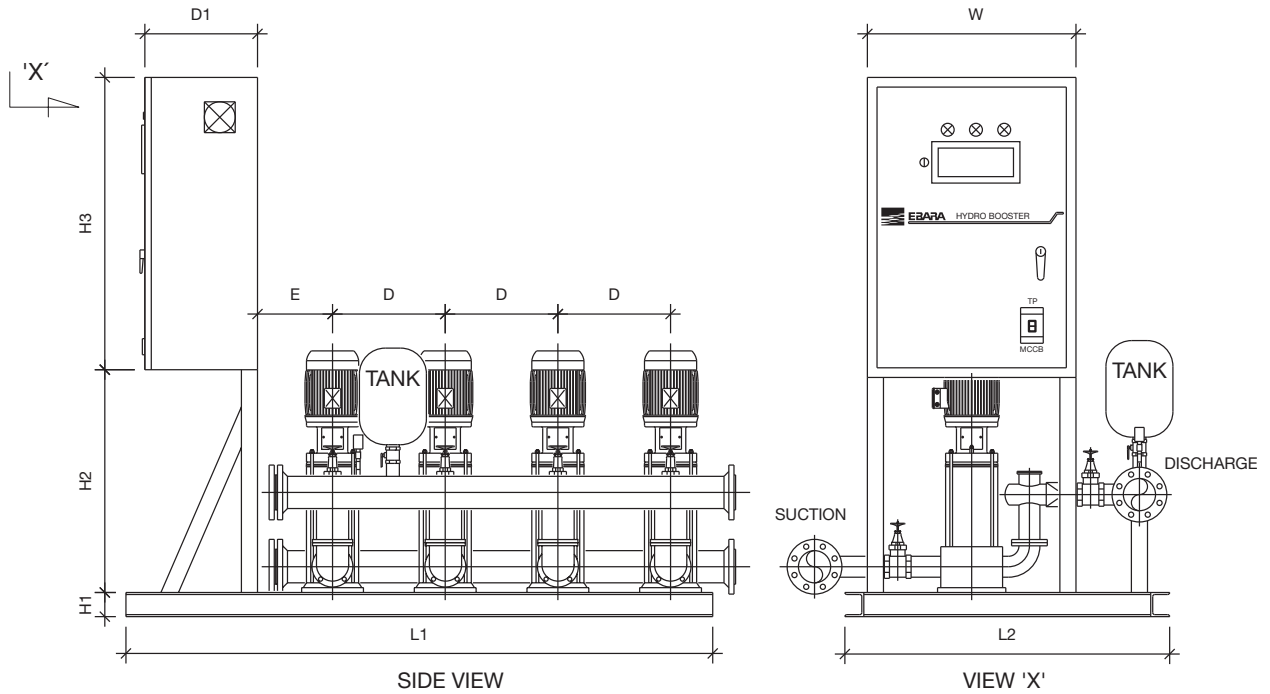
DIMENSION MODEL	DIMENSION												
	H1 mm	H2 mm	H3 mm	D1 mm	W mm	L1 mm	L2 mm	D mm	E mm	TANK LITER	SUCTION MANIFOLD mm	DISCHARGE MANIFOLD mm	PIPE CONNECTION
2UN-EVM 3	75	725	800	250	600	1030	780	350	180	18	50	50	NPT
2UN-EVM 5	75	725	800	250	600	1030	780	350	180	18	50	50	NPT
2UN-EVM 10	100	725	800	250	600	1100	910	390	210	24	65	65	NPT
2UN-EVM 18	100	725	800	250	600	1245	910	440	305	24	80	80	FLANGE
2UN-EVM 32	100	725	800	250	600	1755	910	440	305	100	100	100	FLANGE
2UN-EVM 45	100	725	800	250	600	1865	1200	550	305	100	150	150	FLANGE
2UN-EVM 64	100	725	800	250	600	1865	1200	550	305	100	150	150	FLANGE

DIMENSIONAL DRAWING (3UN)



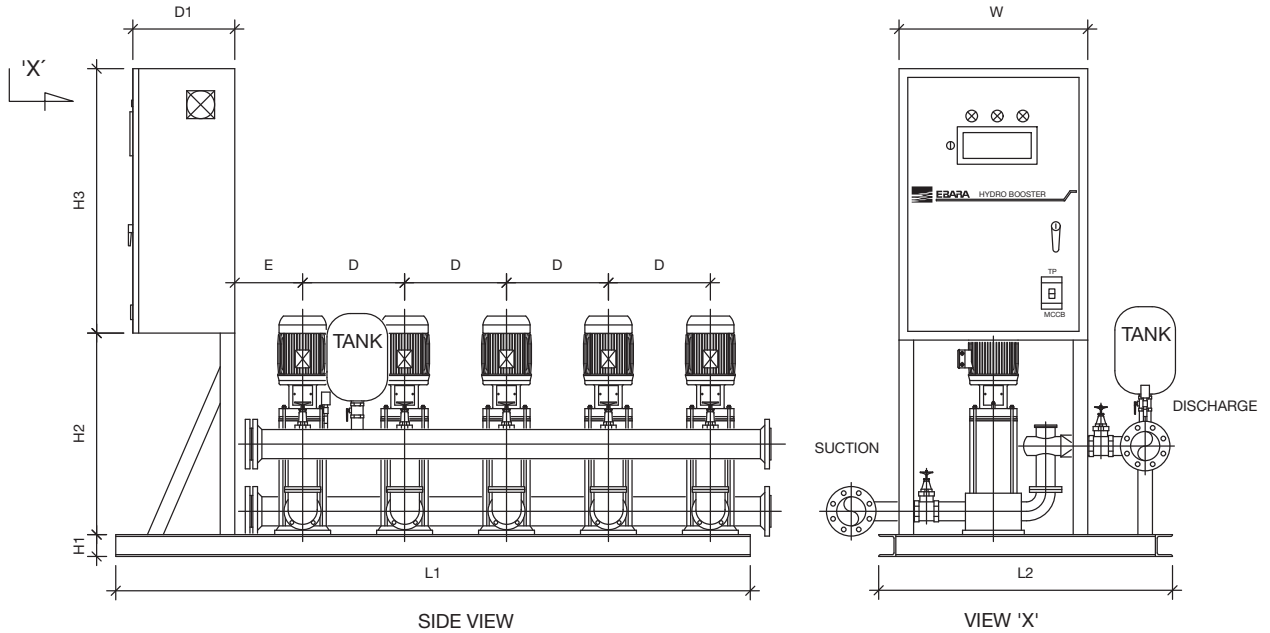
DIMENSION MODEL	H1 mm	H2 mm	H3 mm	D1 mm	W mm	L1 mm	L2 mm	D mm	E mm	TANK LITER	SUCTION MANIFOLD mm	DISCHARGE MANIFOLD mm	PIPE CONNECTION
3UN-EVM 3	100	625	900	250	700	1380	780	350	180	18	50	50	NPT
3UN-EVM 5	100	625	900	250	700	1380	780	350	180	18	50	50	NPT
3UN-EVM 10	100	625	900	250	700	1490	910	390	210	24	65	65	NPT
3UN-EVM 18	150	625	900	250	700	1685	910	440	305	24	100	100	FLANGE
3UN-EVM 32	150	625	900	250	700	2195	910	440	305	100	150	150	FLANGE
3UN-EVM 45	150	625	900	250	700	2415	1200	550	305	100	150	150	FLANGE
3UN-EVM 64	150	625	900	250	700	2415	1200	550	305	100	150	150	FLANGE

DIMENSIONAL DRAWING (4UN)



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	PIPE CONNECTION
4UN-EVM 3	100	625	900	250	700	1730	780	350	180	18	65	65	NPT
4UN-EVM 5	100	625	900	250	700	1730	780	350	180	18	65	65	NPT
4UN-EVM 10	150	625	900	250	700	1880	910	390	210	24	80	80	FLANGE
4UN-EVM 18	150	625	900	250	700	2125	910	440	305	24	100	100	FLANGE
4UN-EVM 32	150	625	900	250	700	2635	910	440	305	100	150	150	FLANGE
4UN-EVM 45	150	625	900	250	700	2965	1200	550	305	100	200	200	FLANGE
4UN-EVM 64	150	625	900	250	700	2965	1200	550	305	100	200	200	FLANGE

DIMENSIONAL DRAWING (5UN)



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	PIPE CONNECTION
5UN-EVM 3	150	500	1100	250	800	2080	780	350	180	18	80	80	FLANGE
5UN-EVM 5	150	500	1100	250	800	2080	780	350	180	18	80	80	FLANGE
5UN-EVM 10	150	500	1100	250	800	2270	910	390	210	24	100	100	FLANGE
5UN-EVM 18	150	500	1100	250	800	2565	910	440	305	24	150	150	FLANGE
5UN-EVM 32	150	500	1100	250	800	3075	910	440	305	100	200	200	FLANGE
5UN-EVM 45	150	500	1100	250	800	3515	1200	550	305	100	200	200	FLANGE
5UN-EVM 64	150	500	1100	250	800	3515	1200	550	305	100	200	200	FLANGE