Technical Specifications

Monsoon IQ

BOOST YOUR PUMP SET'S IQ

proudly australian since 1934

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CONTENTS

1. PRODUCT INFORMATION

1.1 APPLICATIONS

The Monsoon IQ system has many different applications for different purposes, such as pressure boosting and water transfer. The appropriate applications are as follows;

- Golf courses,
- Race courses,
- Stadiums and sports field irrigation /water supply
- Hotels
- Hospitals
- High rise residential apartments
- High rise commercial buildings
- Shopping centres
- Low rise buildings
- Cold Water Boosting
- Rainwater harvesting
- Aged Care facilities
- Municipal Water Supply
- Dust Suppression
- Agricultural systems
- Dairy
- Horticulture
- Irrigation
- Stock Watering
- Industrial water supply
- Mining civil services

1.2 BENEFITS

The Monsoon IQ booster pump system is a fully integrated package, which allows for greater control of a variable speed drive pumpset. The large screen with touch interface is intuitive to operate, making vital data and key information easy to read. The user interface communicates with the variable speed drives to sustain a desired output pressure by varying the speed and consequent output from each pump.

The system consists of a parallel pumpset, pump controllers, a touch screen, a wireless modem and the necessary mechanical fittings. It is suitable for 6 pumps of any type and the unique electronic – hydraulic control ensures each pump operates at its maximum performance level by allocating optimal power to each pump.

Ease of Use

The Monsoon IQ system has been specifically designed from the ground up based on user feedback. The system is intuitive and simple to use. The touchscreen uses a simple interactive logic to assist you with optimising your system. The Monsoon IQ cloud allows users to extend the usability of the system even further. The cloud allows for easier diagnosis and Davey to assist you as if we were there in person.

Connectivity

The Davey Monsoon IQ system comes ready to connect to the Monsoon IQ cloud. We provide the system already configured and ready to connect with a 3G antenna and 3 metre lead for easy installation. All you need is 3G phone reception. (Alternatively, with help from Davey, you can use a local network with internet access). The system is also provided with easy connection points for SCADA and BMS connection. The Monsoon IQ Cloud allows you to remotely control, optimise and monitor your system easily from any device that is connected to the internet.

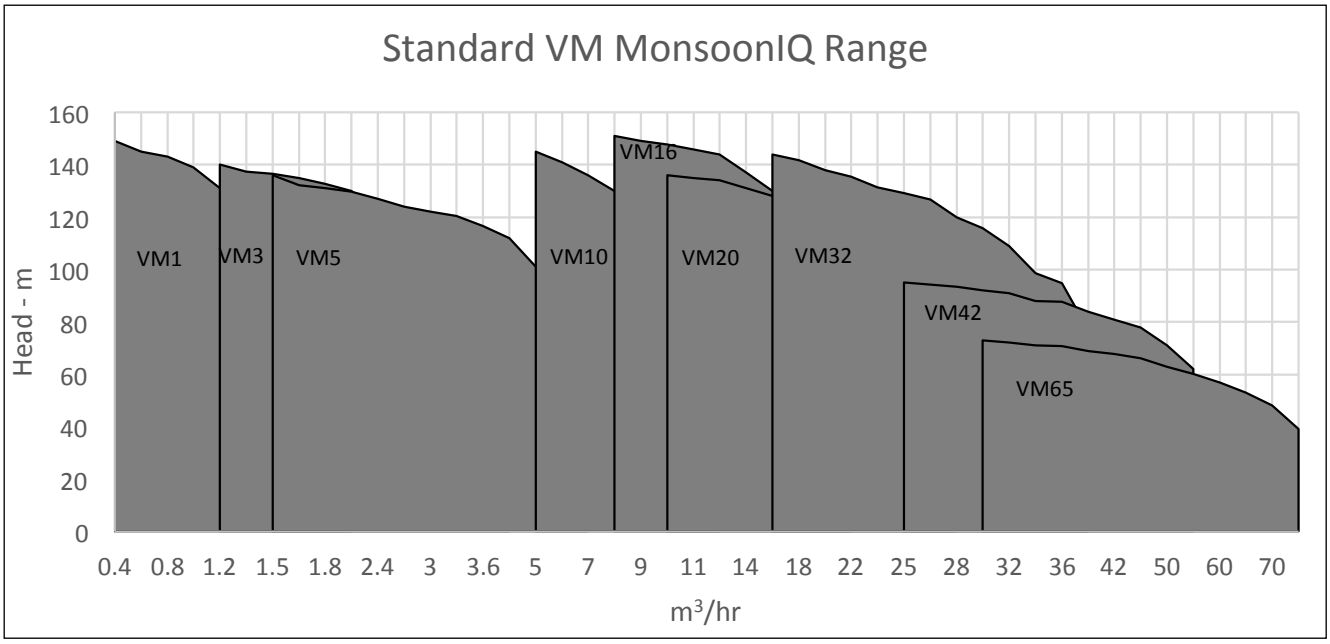
Tailored Solutions

At Davey Water Products, we believe in making the system right for you, because we understand no two jobs are the same. You need the optimum solution that is suited to you. We have a large range of options to allow the Monsoon IQ to be customised to your needs.

2. PRODUCT DATA

2.1 PERFORMANCE RANGE

The Monsoon IQ system has many different applications for different purposes, such as pressure boosting and water transfer. The appropriate applications are as follows;



2.2 TYPE KEY

The type key is what we use to describe the system you have purchased. It is the system, we use to describe when we quote and invoice your product. It allows you to match what you have and to effectively communicate with Davey Water Products, should you have any questions. There are many options available for customisation at Davey. The type key does not capture them all, but it certainly captures most.

Refer to Type Key diagram on next page →

Type key: 3 | MIQ | V- | VM10-10 | V1- | A- | A- | A- | FHQ

Number of Main Pumps

Name

System type
V: All pumps VSD
RBP: RainbankPro
X: Customized system type

Pump Type

Voltage code
V1 = 3x 415V, N, PE, 50 Hz
V2 = 3 x 415V, PE, 50 Hz

Design
A:
Systems with the IQ Cabinet and IP 54 drives mounted on the same base frame as the pumps.
B:
Systems with the IQ Cabinet and IP 54 drives on designed and prepared for independent Wall mount with 5 metres of cable
C:
Systems with the IQ control cabinet and IP54 drives on its own base prepared for floor mounting. Provided with 5 metres of cable.
D:
Systems with IQ Controller and drives enclosed in one cabinet prepared for floor mounting with 5 metres of cable.
X:
Customized Cabinet combination

Starting method
A:ALL VSD

Material Combination
A:
Stainless steel manifold and base frame and standard valves
B:
Stainless steel manifold, base frames and watermark valves
C:
Stainless steel manifold and galvanised steel base frame and standard valves
D:
Stainless steel manifold and galvanised steel base frame and watermark valves
X:
Customized material combination

Options
A: Standard Hydraulic
B: Non-standard Diaphragm Tank
C: Redundant primary sensor
D: Suction Transducer
E: Instant Power loss notification by SMS
F: Jacking pump
G: NRV on discharge
H: 316 Stainless Steel Manifold
I: Bypass Connection
J: Spacer on Non-return Valve
K: Victaulic connections on Offtakes
L: Lightening protection
M: Custom Base
N: 1 Free position
O: Additional Dry run protection
P: High Pressure System
Q:Oversized Manifold
X: Customised beyond options listed
Z: More than 4 options

2.3 OPERATIONAL CONDITIONS

The system is designed as standard to be able to operate to a maximum 16 bar but higher pressure systems are available on request. The standard system is designed 0 to 95% Relative humidity and for a system supply of 3 x 400V ~AC (with neutral) ±10%. (Australian and New Zealand Standard 3 phase power supply. AS/NZS 3000:2007)

Ambient Temperature for standard system

0 to +40 °C (higher rating available on request)

Ingress Protection and Protection from the Environment

The system is rated to IP44 standard and is designed to be mounted indoors in a well-ventilated space. Should you require a higher rating or require the system to be mounted outside, please contact/consult Davey for customisation options.

3. CONSTRUCTION

3.1 PUMPS

CONSTRUCTION MATERIALS	
PART	MATERIAL
Pump attachment base	Cast Iron
Suction and Discharge pump casing	304 stainless steel
Motor support lantern	Cast Iron
Impellers	304 stainless steel
Stages (Casing)	304 stainless steel
Outer Sleeve	304 stainless steel
Pump Shaft	316L stainless steel
Intermediate Bearing	Tungsten carbide
Mechanical Seal	Silicon Carbide/Carbon/EPDM
“O” rings (casing)	EPDM
Plugs (drainage and priming)	316L stainless steel
Impeller Neck Rings	Teflon

Table 1 – CONSTRUCTION MATERIALS

NOTE 1 – 304 stainless steel, (Z6 CN 18.9) and 316L stainless steel (Z2 CND 17.12) are recommended materials that are highly resistant to corrosion. Suitable for pumping clean, clear non-viscous liquids, containing no fibres or solids. Maximum sand/silica concentration is 40 grams/m3.

NOTE 2 – Special versions of the pump are available on request. (such as 316 stainless pump components, different intermediate bearings, different mechanical seals and Viton “O”rings)

3.2 MOTORS

The standard Davey motors are totally enclosed fan cooled (TEFC) and are IE2 and MEPs approved for standard efficiency. (Specialised motors, such as different brands, efficiency ratings and certifications are available on request).

3.3 MECHANICAL SEAL

The mechanical seal on the VM pumps are a cartridge type mechanical seal for easy servicing. The Elastomers are EPDM rubber and the Seal faces are Silicon Carbide and Carbon. The carbon face assists with lubrication in the event of accidental dry running.

In the Davey ISOspec end suction range the mechanical seals are a high quality John Crane type 2100 mechanical seal. The Elastomers as standard are Nitrile and the seal faces are carbon and ceramic. The carbon assists with reducing damage in accidental dry running situations.

3.4 VARIABLE SPEED DRIVE

The Variable Speed Drives (VSD) are a Vacon® 100 Flow low voltage AC Frequency Converter. Supply Voltage for the drive can be between 3 x 380 to 500 V in 50 or 60Hz. However, for the purposes of the other equipment used in a standard Monsoon IQ system, we require the supply voltage to be maintained at 3 x 400V ± 10%. They are IP54 rated and have integrated DC choke and EMC filters. They can operate in an environment with relative humidity up to 95% (that is non-condensing and non-corrosive) and in ambient temperatures between -10°C to +50°C; however, above 40°C the drives must be derated. Please contact Davey for assistance if intended operation and design is above 40°C. The Vacon® VSD uses film capacitors for a long life span and has an efficiency above 97%. The standard display is a removable interchangeable display for easy servicing and has a 9 parameter quick display as a standard feature. Under normal circumstances there will be no requirement for the user to make any adjustments to the individual pump controllers, as parameters in these units are factory set. Any adjustments to the system operation can be undertaken via the Monsoon IQ controller touch screen.

4. SYSTEM COMPONENTS

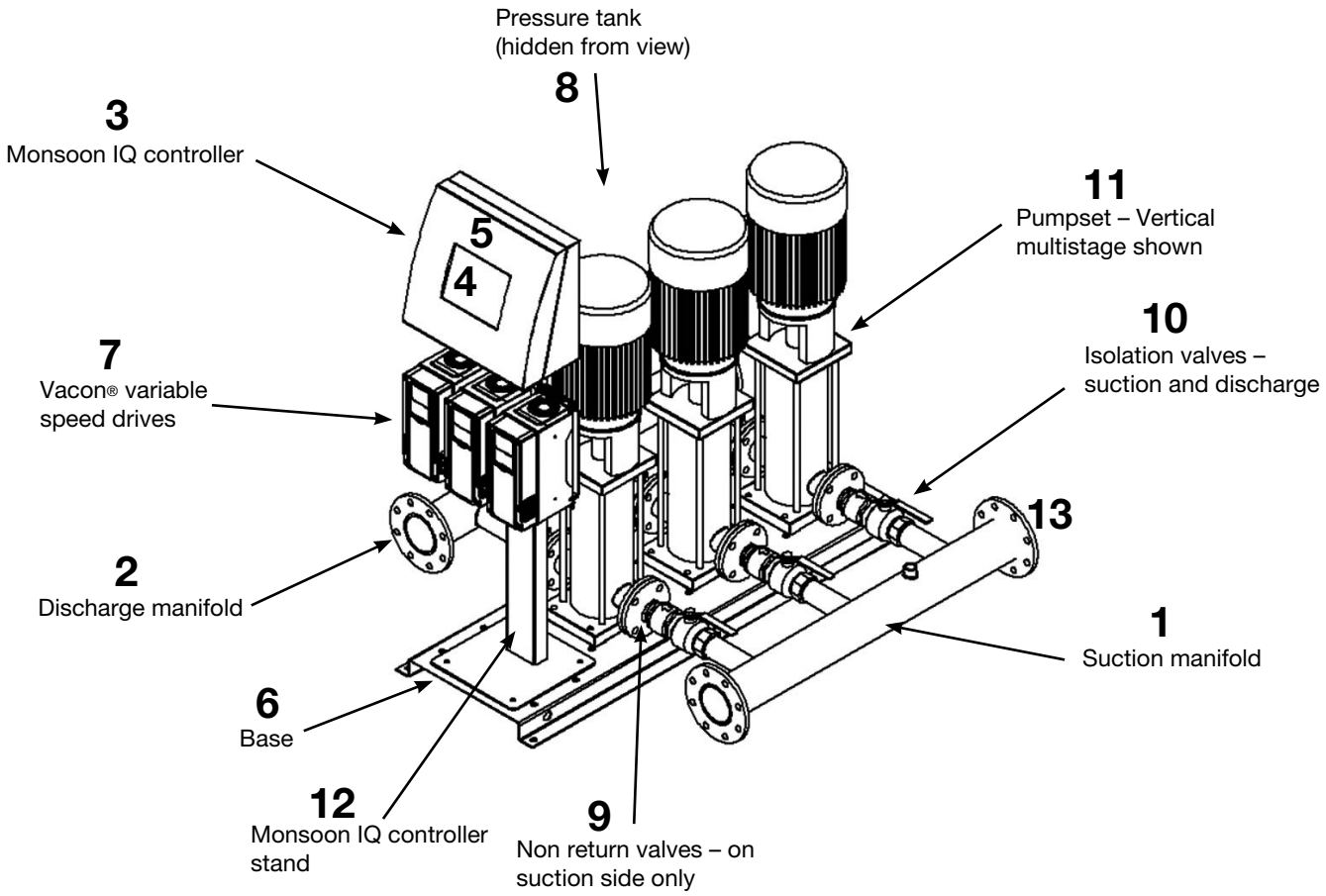


Figure 1 – CONSTRUCTION MATERIALS

No.	DESCRIPTION	SPECIFICATION
1&2	Suction & Discharge manifold	Standard manifolds are an electro polished type 304 stainless steel fabrication. They are TIG welded by qualified welders. Each off take is laser cut, scalloped and joined to ensure optimum hydraulic performance.
3	Monsoon IQ Controller	The Monsoon IQ Controller is a Davey manufactured enclosure from powder coated zinc anneal sheet to IP55 standard
4	Touch screen interface	Our standard touch screen has been specially sealed and tested to achieve the required high IP rating of the Monsoon IQ controller. The TFT touchscreen is 10.1” and has a screen resolution on 1920x1200. The touchscreen is also equipped with its own 7300mAh battery to allow an independence from the other system components.

continued overleaf...

5	CN Module (inside IQ controller)	The CN Module is our very own on board PCB that allows all the many features of the system to be available to the end user. It facilitates the communication between the drives, the Monsoon IQ Cloud and the touch screen. It is equipped with its own 1GB of Ram and 8GB of Storage, a 3G modem and 6 GigE ports.
6	Base	Standard bases are supplied in galvanised steel. Smaller size units have bases formed from steel plate while larger units have fully welded channel construction. Larger bases have lifting eyelets as standard.
7	Variable speed drives	Vacon® 100 Flow AC Frequency Converter. (See 3.4)
8	Pressure tanks	Type & size dependant on flow variability but should be 16 bar rated unless system is low pressure. (see Pressure Tank section 14)
9	Non return valves	All valves are brass – poppet style with a nylon stem/disc and spring up to 50mm diameter. Above 50mm valves are wafer style with stainless steel disc and nitrile elastomers.
10	Isolating valves	Ball valves are stainless steel up to 50mm. Above 50mm isolation valves are Australian made butterfly valves with stainless steel disc, triple shaft seal and ductile iron body. All valves are sized to suit flow & manifold.
11	Pumps	Models to suit pump selection (See 3.1, 3.2, 3.3 & 3.4)
12	Monsoon IQ controller stand	Mild steel RHS welded to a MS steel base (Epoxy coated)
13	Manifold flanges	All manifold connection points are either AS 2129 Table E or British Standard Pipe (BSP) thread as standard. Other flange types are available on request.

Table 2 – SYSTEM COMPONENT DESCRIPTIONS

5. PRODUCT INFORMATION

5.1 CONTROL SYSTEM OVERVIEW

The Monsoon IQ is designed to automatically cater for varying demand in a water supply system by maintaining a set pressure regardless of the flow requirements (up to the maximum capacity of the pumpset). Once the desired pressure has been set (set point pressure) the Monsoon IQ will ramp up the pump/s until the desired pressure is reached. The variable speed drive will then control the speed of all the active pumps to maintain that set point pressure to allow for maximum system optimization. The process can be illustrated by Figure 2 below. Explanation of terms in Table 3 follows.

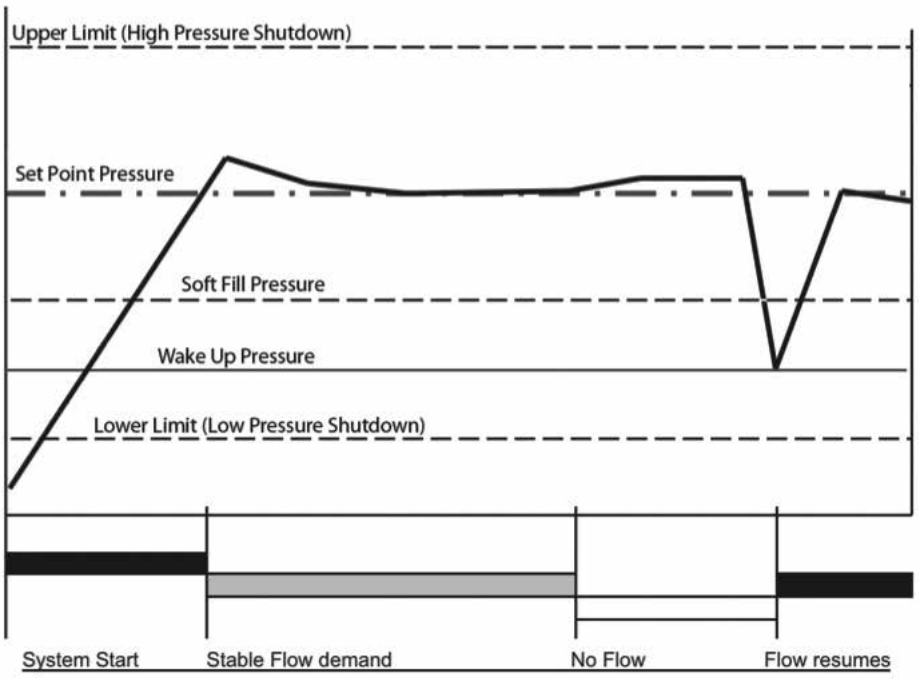


Figure 1 – CONSTRUCTION MATERIALS

TERMINOLOGY	MEANING
Upper limit	The pressure at which the system will shut down due to the pressure being too high (alarm triggered)
Lower limit	The pressure at which the system will shut down due to pressure being too low (alarm triggered)
Set point pressure	The pressure at which the system has been selected to operate and aims to maintain
Wake up pressure	If the pressure falls to this level, the system will automatically restart a pump (jockey pump if fitted - or one of the main pumps) to bring the pressure back up to the set point
Soft fill pressure	This pressure can be selected to allow slow filling of the pipelines (in most cases on initial commissioning but can occur during a normal startup, if very low pressure is detected)

Table 3 – EXPLANATION OF TERMS

6. PRODUCT INFORMATION

6.1 MECHANICAL INSTALLATION REQUIREMENTS

1. Install in a room with adequate ventilation
2. Unit should be bolted on solid even surface of adequate size & weight
3. 1 metre clearance required on one side of pumpset
4. Install overhead gantry or allow 0.5 metres clearance on opposing side
5. Pipework must be adequately supported and not stress manifolds
6. Install pipework to avoid airlocks. The pipework should also sized adequately to facilitate correct NPSHa for the pumpset and be hydraulically correct on both suction and discharge.
7. If vibration damping is required also fit springs, inertia bases and expansion joints to ensure full isolation. The right damping varies from installation to installation meaning that the appropriate supplier should always be consulted to ensure correct reductions.

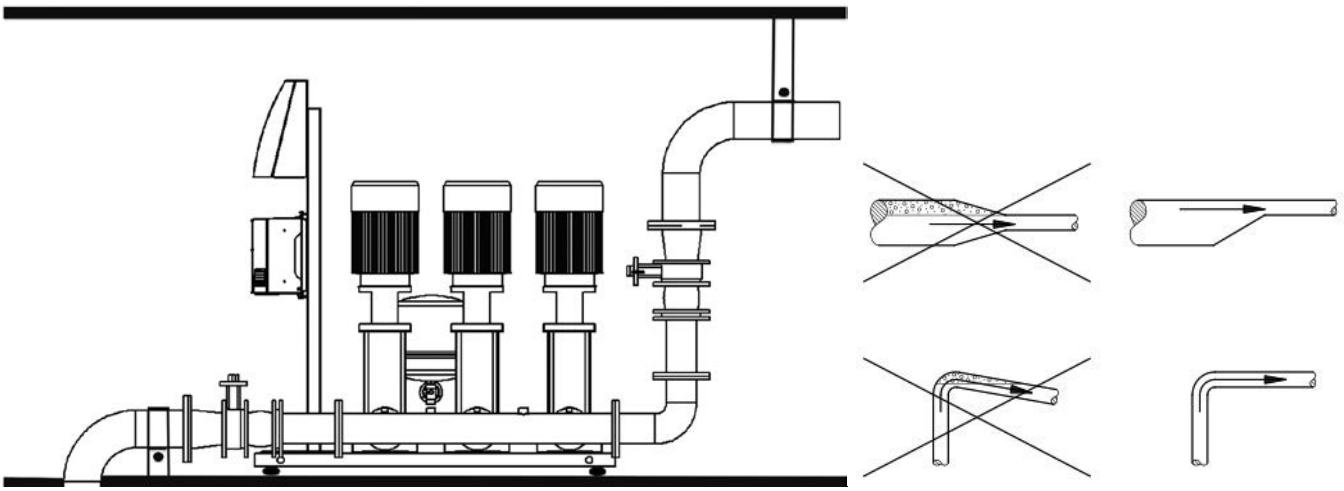


Figure 3 – TYPICAL INSTALLATION & PIPEWORK / SUPPORT REQUIREMENTS

6.2 ELECTRICAL INSTALLATION REQUIREMENTS

The unit comes pre – wired with mains isolation switch. Also required –

1. A suitable circuit breaker capable of handling the total pump & controller load to protect the supply cable to the Monsoon IQ in accordance with local regulations.
2. Connections as required for remote start & digital inputs/outputs as required (optional)
3. Any switchgear used for connection to the Monsoon IQ on the mains side of the IQ system should be rated to handle DC current. This will prevent nuisance tripping from the variable speed drives -- the drives can cause a current in the protective earthing conductor. Use a residual current – operated device (RDC) or a residual current – operated monitoring device (RCM) to give protection against a direct or indirect contact. Use a Type B RCD or RCM device on the mains side of the drive
4. Consideration needs to be given to harmonics if the system is generator driven. Consult your generator supplier.

7. ELECTRICAL DATA FOR “ADD ON” FEATURES

7.1 FLOW SWITCH

A flow switch can be installed in addition to the normal pressure transducer to assist protection against loss of prime, pipe blockages or any other situation which could cause unintended lack of flow in the system. This switch must be installed as per the manufacturers recommendations.

Flow switch specifications – No time delay with Normally Open contact for 24V DC operation. Time delays are available on the Monsoon IQ controller.

7.2 REMOTE START

A remote STOP/START feature is available for users who need integration into an irrigation system, Scada or BMS systems. The integration allows users to have other means of automation to start and stop the system on demand.

7.3 RAINBANK

A rainwater harvesting feature known as Davey RainBank® is available. This can only be ordered as a complete system from Davey. The complete system comes with the appropriate solenoid and float switch pre-wired. To install this option, the supplied float switch is installed in the actual rainwater tank. The solenoid valve will automatically switch between mains water and rainwater but referencing rainwater when available.

8. ONLINE SUBSCRIPTION

An Online subscription service is available for the Monsoon IQ. While this is an option, it is highly recommended because of the opportunity it provides for the end user to be in control, manage and optimise the system installation at all times (providing there is internet service available) regardless of their location.

8.1 INFORMATION VIA THE DAVEY MONSOON IQ CLOUD

The Davey Monsoon IQ cloud subscription service allows the user to log on, interrogate, operate and optimise their system/s via the inbuilt modem. The service allows you:

1. To analyse in detail your pumps and system performance, (There is no historical limit on data of your pumps, you can access data right back to when you first installed it - many years of data if required.)
2. Export this data for use in third party analytical software (Including Microsoft Excel)
3. Fully control your pumps remotely, including settings adjustment and detailed system monitoring of over a hundred parameters.
4. Set alerts based on many variables, to alert you by email or mobile text of specific system actions or faults.
5. Give remote access to many users and adjust their access levels accordingly.
6. Generate quick overview visual reports for easy system review and assessment
7. Access logged events and messages from multiple sites from a single logon.
8. Easily diagnose remotely problem sites, with quick filter mechanisms for multi-site users
9. Allow Davey to easily and remotely assist, because Davey can see your system on-line and assist with the analytics, which will minimise downtime.
10. Allow Davey to remotely update software on request in consultation with the end user.
11. Facilitate part replacement, because Davey can look inspect your system in consultation with you remotely.
12. Future proof yourself to enable upgrades to future Davey Monsoon IQ cloud service offerings

To access the Davey Monsoon IQ cloud remotely, you will need your own internet connected device. This can be a touchscreen interface, smart phone, laptop, desktop or any web browser enabled device connected to the internet. If your remote device has a touchscreen interface (i.e. an iPad tablet with a sim card) the user can tap on the screen as usual, and if the remote device is a desktop computer connected to the internet, the same result can be achieved by clicking on the desired icon.

Browsers supported by Monsoon IQ cloud are Chrome, Safari, Microsoft Edge and Firefox (including Mozilla). We recommend using Chrome, updated to the latest version for optimal use.

Internet Explorer is not supported and not recommended.

9. OPTIONAL EXTRAS

Table 4 below provides a list of all the optional extras available with the Monsoon IQ. For some installations Davey may suggest various items on this list are necessary because of the system size and characteristics.

OPTIONAL EQUIPMENT	BENEFITS
Redundant primary sensor	In high risk installations, it may be necessary to incorporate the ability to easily swap between the primary transducer to a standby transducer, to minimise possibility of no control reference signal.
Suction sensor	The suction sensor is an additional pressure transducer fitted to the suction manifold. This option allows for superior system optimisation and analysis. It also allows the ability for additional protection if required. The suction sensor also allows for a better real time analysis of pumpset efficiency.
Flow Sensor	Flow sensors are available to allow you to gain real time analysis into your system performance. In most cases the pumpset represents a central point to a reticulation system. This makes it an excellent point to monitor and assess flow rates. It is important to consider flow, in order to get a true sensor of system efficiency, hydraulic power consumption and water use. There are two ranges of flow sensors available. The economical option that is temperature based to give you a rough indication or the premium option where accuracy counts. The premium option is an electro-magnetic flow meter.
High Gain Antenna	Higher gain options of 3G antennas are available to assist in areas of poor reception.
Level transducer	Level transducers are available if you require monitoring of the water source level.
Instant power loss notification by SMS	This is a feature which is available in the optional on online subscription service. Automatic notification occurs whenever the system is shut down or started. An email notification is also sent if an address is setup on line.
Jockey pump	A jockey pump can be included as one of the maximum of six pumps in the pumpset. The purpose of this smaller jockey pump is to maintain system setpoint pressure while the main pumps are “asleep” (i.e there is no flow demand in the system) thus eliminating the need to start and stop one of the larger pumps intermittently. They are generally used to assist the “maintenance pressure” of a reticulation network.
Non return valves	Non return valves are installed on the suction side of the pumps as standard. However, this can be changed if requested to be installed as an option on the discharge side also. NOTE – be aware that in some conditions non return valves on the suction side can affect NPSH requirements. Please consult Davey if any there are any concerns.
Stainless steel manifolds	Optional type 316 stainless steel electro polished manifolds are available in lieu of the standard type 304 stainless manifolds for better corrosion resistance.
Oversize manifolds	Depending on flowrates in the system or customer specifications, it may be helpful to reduce friction losses by enlarging the size of the suction and discharge manifolds. Larger pipe manifolds are available on request to suit your particular requirements.

Bypass connection	For installations than need to keep the water supply connected to the downstream services when pump maintenance is necessary, bypass valves can be supplied as part of the system to allow the Monsoon IQ to be disconnected from the supply, while still allowing waterflow.
Spacer for non return valves	A spacer between the non-return valve and the pump can greatly assist maintenance of both the pump and non-return valve. It allows for the removal of one with minimal disturbance of the other. A standard system often has the non-return valve installed directly against the pump flange.
Victaulic connections	The Monsoon IQ can be manufactured with Victaulic connections in lieu of the standard connections on our manifolds. For pump units in confined spaces or with associated pipework that is rigidly mounted this feature can make removal of the unit much easier. Use on off-takes also allows for greater movement during maintenance, which greatly assists general maintenance tasks, such as valve inspection and pump inspection.
Lightening protection	Suppression devices can be included in the electronic circuitry to guard against surges and spikes in the power supply brought about by lightning strikes on the external grid.
Heavy duty base	As required Davey can manufacture special heavy duty bases from welded channel and include pipe support brackets to fully stabilize the suction and discharge manifolds.
Custom handling features	Our standard crates are not designed for independent crane lifting. Depending on the size and model of the unit, it may have lifting eyelets welded on the channel steel base – in this case it is permissible to lift the unit by slinging through these eyelets, taking all the necessary precautions to ensure correct balance and prevention of damage to the pumps and pipework etc. However alternate lifting or shifting options can be designed by Davey as required.
Rain covers	For installations that are exposed to the elements, rain covers can be supplied along with other protection as required to ensure the key components of the Monsoon IQ are protected from rain, sun light and heat.
Electrical Component weather rating upgrade	An upgrade to IP66 drives and all-weather upgrades of the electrical enclosure in the system is available for additional weather protection.
High pressure system	The standard Monsoon IQ is rated 16 bar. However a system capable of a higher rating can be engineered if necessary.
Custom gauges	Gauges to customer preference and specification can be supplied in lieu of the normal gauges supplied.
Master suction & Discharge valves	It is very often necessary to fully isolate a pumping system from the suction line or discharge line (or both). Davey can supply the appropriate valves to suit the installation. This benefits the installer by increasing the ease of installation.
Extra documentation	Specific additional documentation pertaining to a customer order can be supplied together with the comprehensive Installation & Operation manual.

Table 3 – EXPLANATION OF TERMS

10. SIZING OF A PUMP INSTALLATION

10.1 UNDERSTANDING MULTIPUMP CURVES

FIGURE 4 below represents the curve for a standard multipump system.

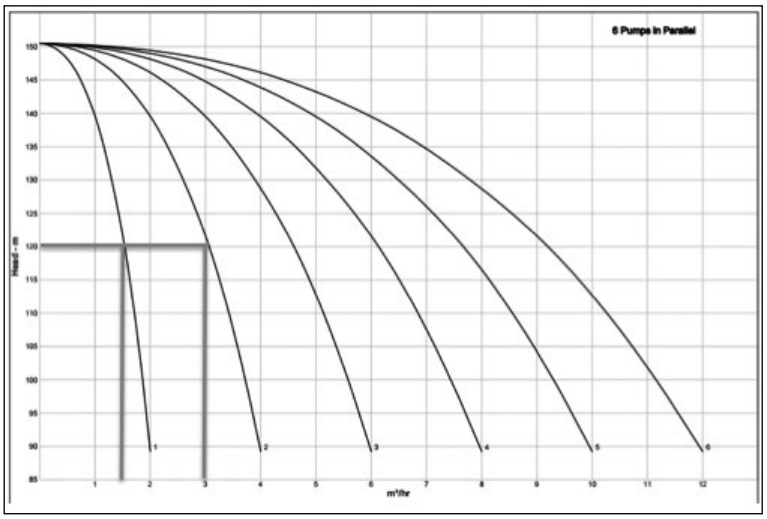


Figure 4 – TYPICAL MULTIPUMP CURVE FOR 6 PUMPS IN PARALLEL

The curve shows six pumps of the (of the same size running at 2900 rpm) connected in parallel. The left hand vertical axis shows the head in metres and the horizontal axis shows the flow in cubic metres per hour (m3/hr). The effect of multiple pumps connected in parallel running at the same speed can be seen in FIGURE 44. In this example, if one pump is operating at the required head of 120m, the flow rate is approximately 1.5 m3/hr. If a second pump is switched in, running at the same speed, the head remains the same but the flow rate doubles to 3 m3/hr and so on.

THE MONSOON IQ

The Monsoon IQ caters for systems that need to operate at a constant pressure (head) but have varying flow requirements. It is important to understand how the Monsoon IQ functions with more than one pump operating in the demand cycle. If flow demand increases to a level above the first pump capacity, a slight drop in pressure will trigger the “staging” (starting) of the next pump. Once both pumps are operating, the system will adjust the frequency (speed) of both VFDs so the two pumps are sharing the demand equally. If demand increases again the same process applies for three pumps. Thus if we have a set point pressure of 1020 metres, once the flow is stable, all pumps will share the load equally and supply equal flow. Shown below in Figure 5 (blue curve) is a system operating at a setpoint of 1020 meters in which each pump is supplying 0.9one m^3/hr and the system is producing a total flow rate of 2.7(total demand of three m^(3/)hr at 100 metres.

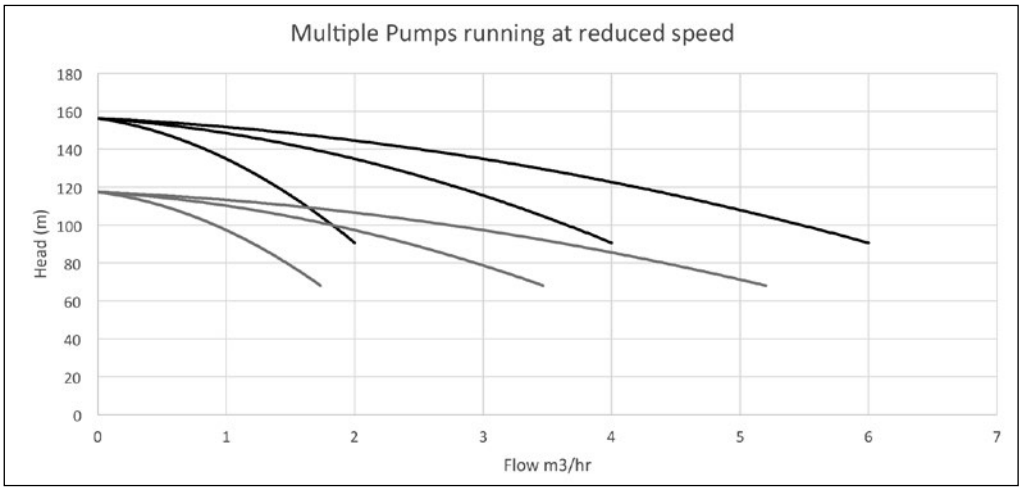


Figure 5 – 3 PUMPS RUNNING AT REDUCED SPEED

10.2 READING PUMP CURVES

Figure 6 below is a typical VM multistage curve for a VM5 pump (a pump which has between 5 and 22 stages). While understanding how to select a system it is very important to understand a single pump curve.

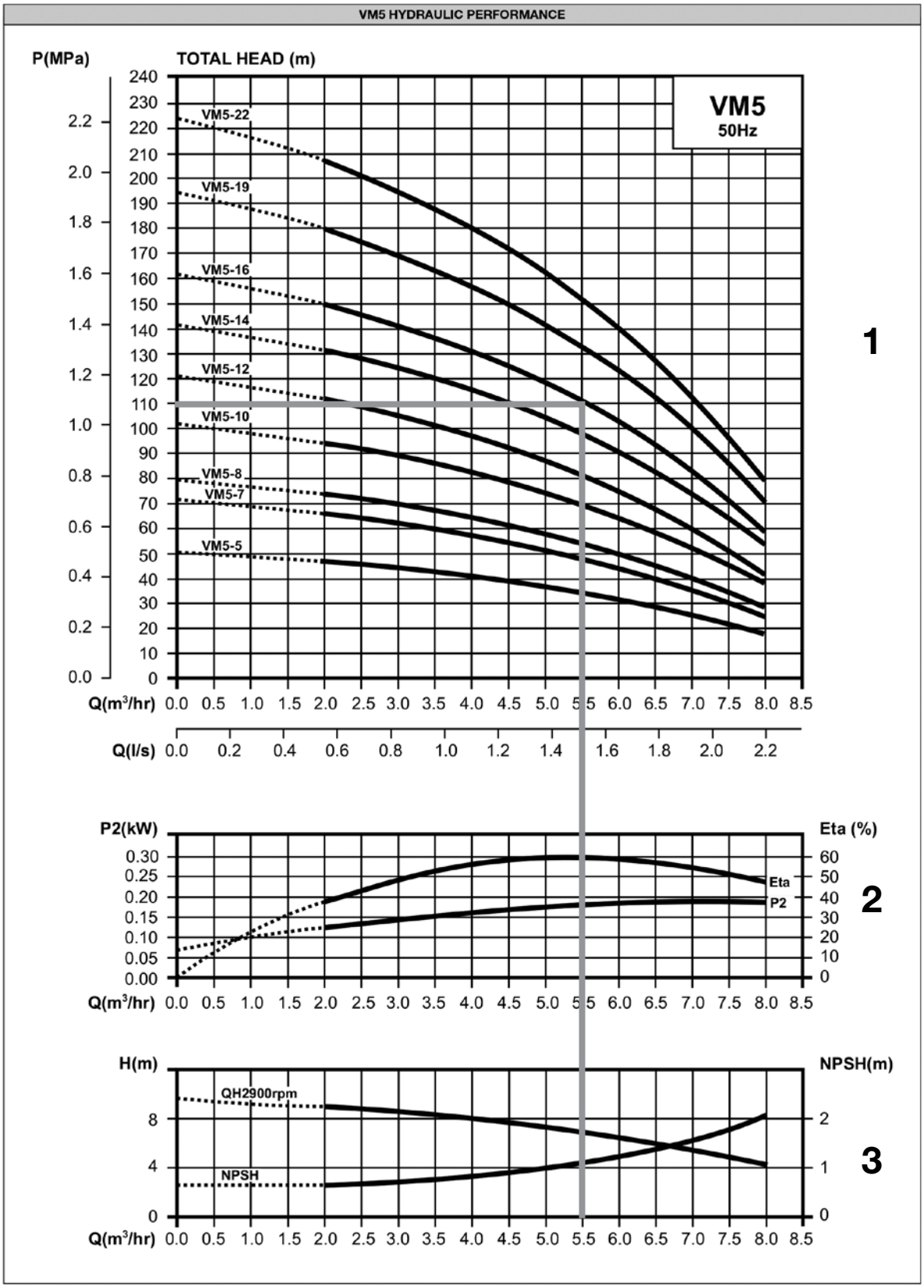


Figure 6 – VM5 MULTISTAGE CURVE

All three individual sets of curves provide pieces of vital information required when selecting a pump, and while they are separate entities, they should be read in conjunction with one another at the same flow rate–

CURVE 1 – QH curve (Flow and Head)
The LH vertical axis shows the head in metres and megapascals while the horizontal axis shows the flow in cubic metres per hour and litres/sec.

CURVE 2 – Eta and P_2 curve (Efficiency and Power)
This chart again shows the flow on the horizontal axis but the vertical axis is graduated in efficiency on the RH vertical and power per stage on the LH side. Note that most pumps show the hydraulic power consumed for the complete pump but in the case of Davey vertical multistage pumps the power is per full size impeller stage.

CURVE 3 – NPSHr and QH per stage curve.
In this case, the horizontal axis shows the flow while the vertical axis shows the minimum NPSHr (Net Positive Suction Head required) on the RH side and head in metres on the RH side. The NPSHr curve represents the minimum NPSHr below which failure may occur for the given flow. The other curve is the head /quantity curve for each pump stage.

10.3 NPSH (NET POSITIVE SUCTION HEAD)

Understanding Net Positive Suction Head is vital to ensuring correct operation and that cavitation does not occur. When considering NPSH, the published individual pump NPSHr (Net Positive Suction Head required) curve should always be consulted. When assessing this information, it is always wise to use a safety margin for your calculations because the published NPSHr represents the area known by the manufacturer to potentially cause cavitation. The published NPSH value represents the inlet head required at the eye of the pump impeller in absolute terms (relative to a vacuum) by the pump in order to operate correctly (as per AS2417:2001). Davey recommends a safety margin of at least 1 metre but the safety margin used will depend on personal preference and you should consider likelihood and consequence on a case-by-case basis. Further consideration should always be given to checking the NPSHr value of the selected pump at the highest possible flow your system can achieve.

To calculate the maximum suction lift available “H” in metres and to properly consider NPSH for an installation the following formula can be used –

$H = P_b \times 10.2 – NPSHr – H_f - H_v - H_s$ (See Figure 7 below)

Where

P_b = Barametric pressure in bar (set at 1 bar for the purpose of calculation)

NPSHr – Net Positive Suction Head required in meters from the pump curves

H_f = Friction loss in suction pipe and fittings up to the pumps.

H_v = Vapour pressure in meters head

H_s = Safety margin of at least 1 metre is recommended in paragraph 1 above

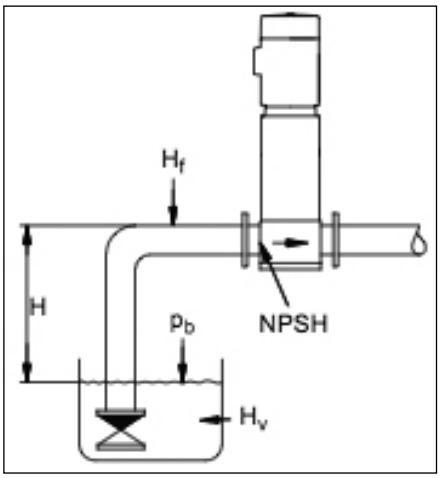


Figure 7 – MAXIMUM SUCTION LIFT ILLUSTRATION

10.4 SIZING THE PUMP SYSTEM

10.4.1 If you have the duty points?

In many situations it is common that consultants, engineers or experienced end users will have worked out a rough requirement for the varying water supply demands. In these cases, the challenge is to consider the demands (flow & pressure) and then make a booster system recommendation. As a guide, the minimum information required for a selection in this case would be;

- The maximum flow rate and pressure requirement from the pumpset (maximum duty point)
- The minimum flow rate and pressure requirement (minimum duty point)
- The required pump configuration regarding how many pumps are to share the load (duty pumps) and the number of standby pumps required. (Normally it would assumed that the standby pump is to be the same size as the duty pumps, for ease of replacement and simplicity)
- The power supply information (maximum amps available and voltage)
- The suction conditions and water source conditions
- Any advanced selection information such as applicable tender specifications, control specifications, SCADA/BMS requirements, sensor and custom function considerations.

From this information, you can generally select a pumpset. This is done in the simplest form by firstly looking at the number of duty pumps required and the maximum duty point. The selection can be done in two ways; either by dividing the maximum flow by the number of duty pumps to reach a maximum individual pump duty point or by using the multi-pump charts below to make a selection. Bearing in mind that the curves do not take into account the fittings/valve losses on the pumpset and the pumps are variable speed, selection should result in the duty point being underneath the pump curve and typically somewhere between the best efficiency point and the right hand side of the curve. This will give you the best chance of taking advantage of the variable speed control to ensure optimised sizing over a range of duty points and demands.

Once you have a selection, you then need to check that a single pump will be able to achieve the minimum flow. (For a VM pump that is a minimum of 10% of the flow rate from the best efficiency point, but you should consult with Davey if this minimum allowable flow is not known. Always remember the minimum flow does not represent the best practice working range - it represents the minimum flow at which the pump will operate under normal conditions without damaging itself.

Here is an example selection.

Step 1. The information.

- Maximum duty point 20 m^3/hr at 70 metres head
- Minimum duty point is 2 m^3/hr at 70 metres head
- Duty/Duty/Standby pumpset is required. (Two duty pumps and 1 standby pump).
- Power supply is 3 x 415V AC, and there is no known power limitation.
- Suction pressure/water supply is a 500,000L tank beside the pumpset.
- There are no known advanced selection parameters required.

20 m^3/hr divided by 2 (2 duty pumps) equals 10 m^3/hr. The single pump duty is 10 m^3/hr at 70 metres. A selection by the multi pump chart would look like figure 8 overleaf.

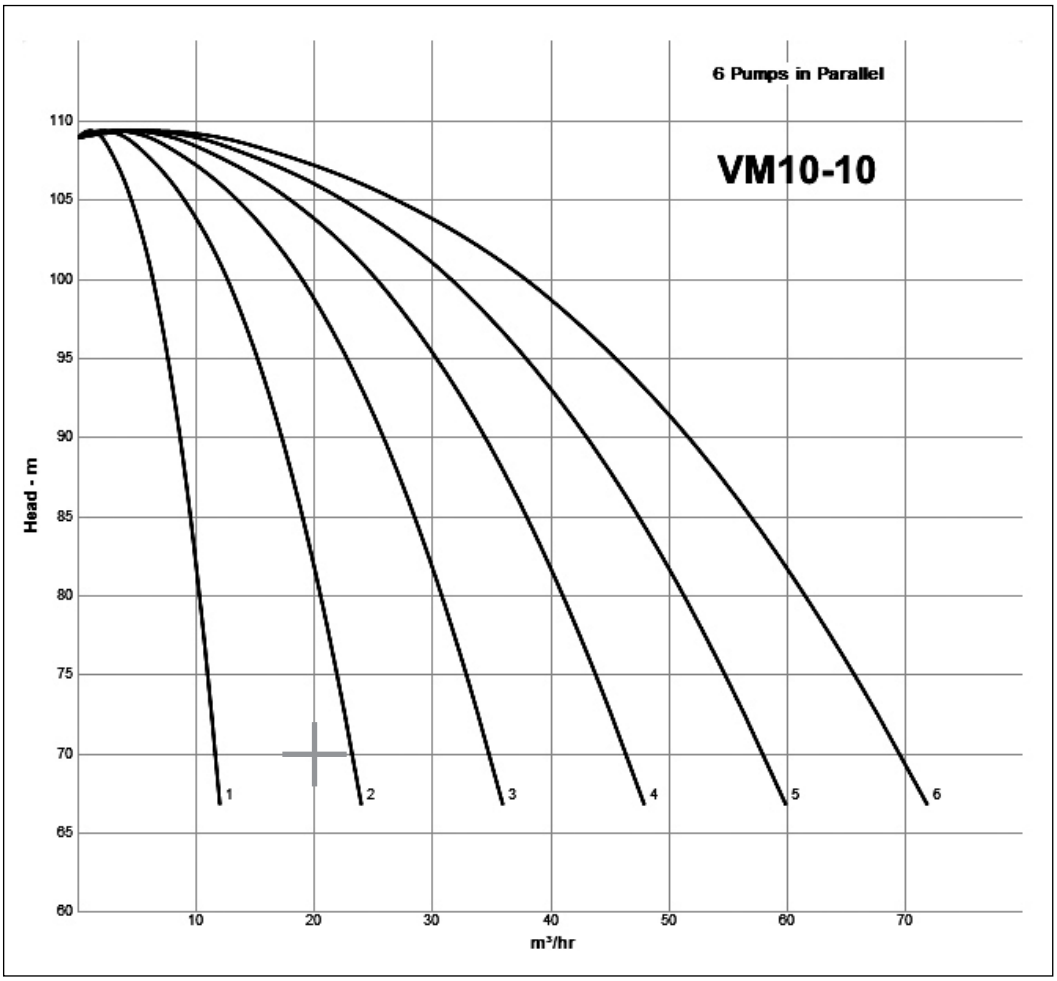


Figure 8 – PUMP SELECTION EXAMPLE FROM MULTI-PUMP CHART

Even though you may have selected the pump from the multi-pump charts, it is still good practice to assess the individual pump performance separately based on the published pump data information. In the case mentioned in FIGURE 8, by looking at the Davey VM Databook it can be seen that the selection has a NPSH of 1.2 metres at the maximum duty point and the minimum flow specification is above the selected pump minimum flow of 10%. Using the NPSH calculations from section 10.3, it can also be seen that there is a maximum suction lift available of 6 metres (approx.). Considering this case uses a flooded suction water source, the actual application design pressure available is in excess of the calculated suction lift figure, thus making the pump selection acceptable.

In this case, allowing for the standby pump, we would end up with a three-pump booster system of 3 x VM10-10 pumps. (i.e. using the type key it could be a 3MIQ V-VM10-10 V1-A-A-A-A system).

10.4.2 If you don't have the duty points (Calculating duty points and number of pumps).

There are many methods to calculate booster pumpset duty points and required number of pumps. Some are listed in international standards and some relate to industry best practice. There are a number of considerations. Firstly, there is a load profile, which considers how much flow and pressure variation is actually required in terms of percentage use. Secondly, there is consideration of the rate of change and how that will affect the pumps. Thirdly, there are risks and consequences to consider which directly relate to the amount of redundancy required. The best way to determine the relevant duty points is to consult an experienced specialised consulting engineer, however, for rough guides there are many sizing principles publically available including using AS/NZS 3500.1:2015 for loading units and probable simultaneous demand use. (Table 3.2.1 and 3.2.4). Other methods include adding up the various duty points of a system and considering the amount of time as a percentage that each duty point will be operating (load profile). The load profile is then considered against the various options of "duty" pumps. To assess this properly, the probable rate of change and duration of operation should also be considered.

10.4.3 AS/NZS 3500.1:2015

The Australian standard for water services for plumbing and drainage is AS/NZS 3500.1:2015. This standard refers both to requirements for dwellings for probable simultaneous demand and also for loading units. It should be noted that these standards are meant for standard domestic dwellings and do not apply to other users. i.e. hospitals, hotels, resorts, commercial and industrial buildings. By considering the fixtures present for each dwelling, the standard can be used to translate these fixtures into loading units. The total loading units are then used to consider a maximum duty point. However, it is important to note if there is any other additional flow rate requirements, such as fire service demands or building demands (such as any HVAC requirements), these need to be considered separately. This standard calls for a maximum pressure within a building not to exceed 500 kpa and the minimum available pressure in a fixture to be 50 kpa at the specified flow rate in the standard. The Water supply code of Australia published by the Water Services Association of Australia (WSA 03:2011) has a much more detailed description on booster selection. This standard discusses many factors including recommended minimum desirable static and service pressures.

10.4.4 Other considerations.

There are many things to consider while selecting booster pumps but there are two primary reasons that booster pumpsets are considered.

A. Redundancy in order to reduce risk. Having a standby pump is one of the primary reasons for selecting a booster set.

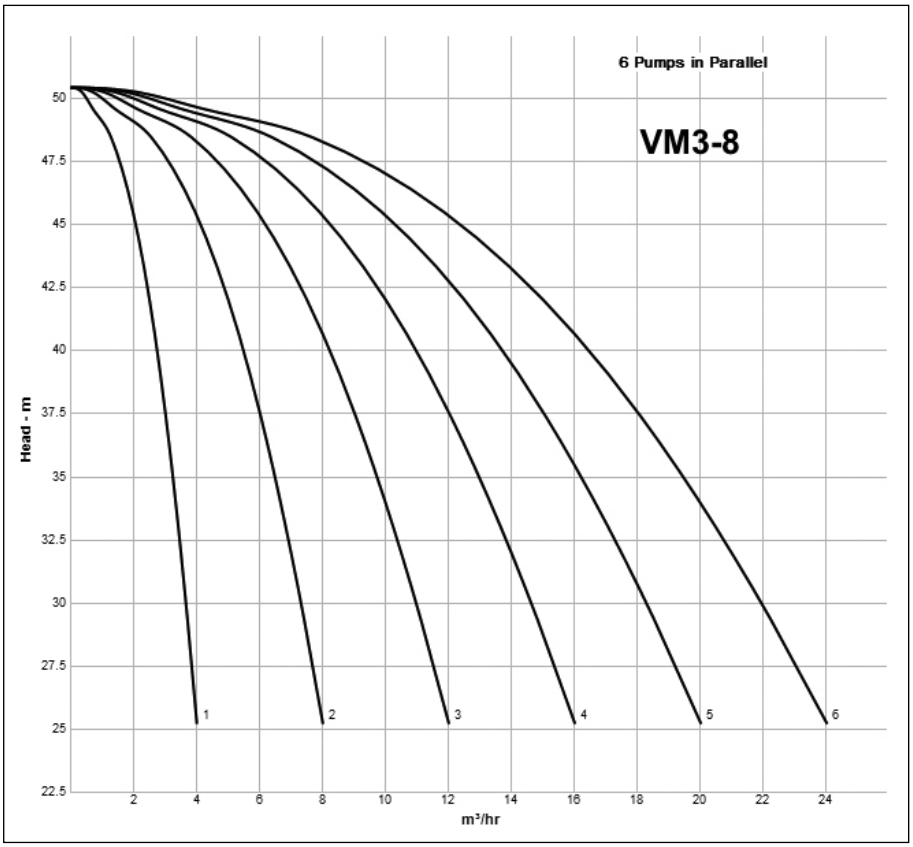
B. Greater variation in allowable flow rates and optimisation of efficiency.

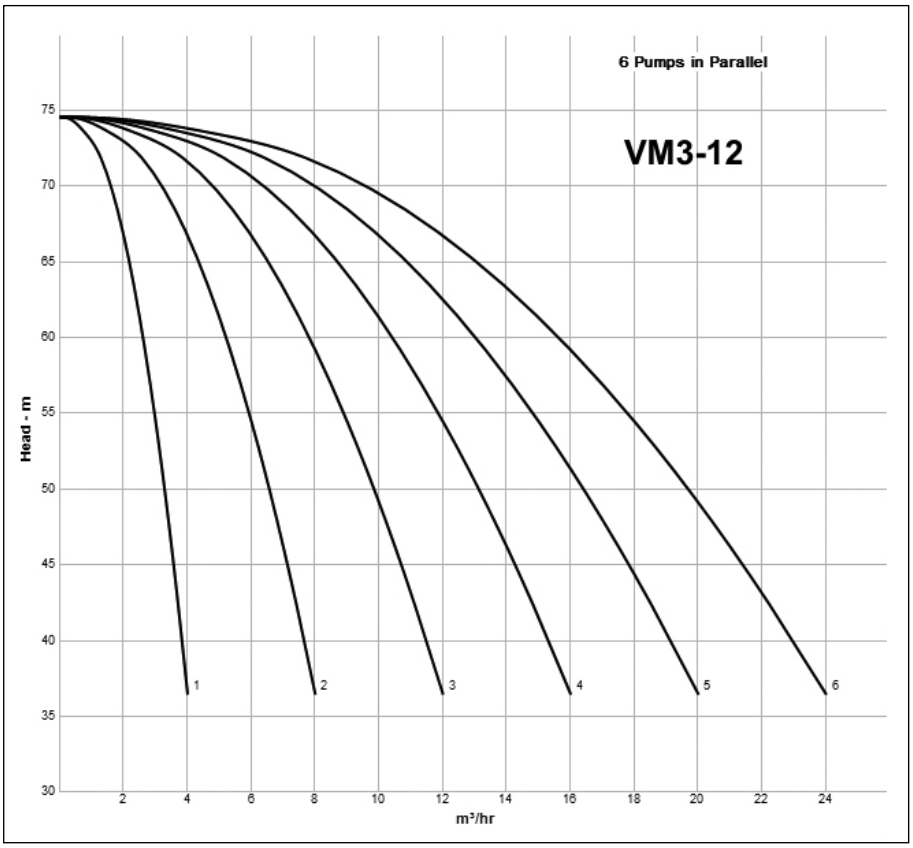
While these are the primary considerations, there are also other considerations that will dictate the preferred selection.

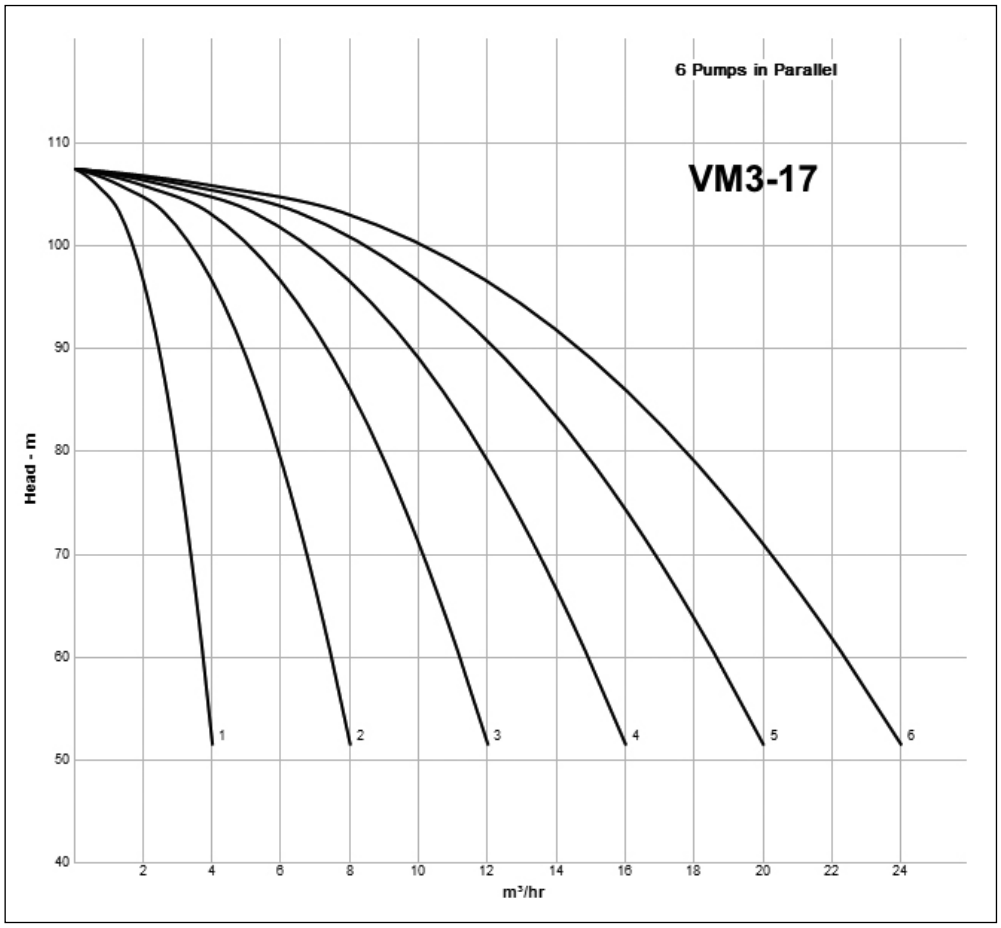
- Allowable Footprint size. (Often the size of the area available for the booster pump can dictate the selection)
- Possible worse case scenarios and their effects on the users.
- Pipework and system pressure ratings. (Best practice is to not select a pumpset that can potentially generate more pressure than the pressure rating of the system components.
- Effects of other system components on the pumpset
- Maximum power supply available
- Minimum NPSH requirements
- Friction losses and the impact of system valves and fittings
- Effect of height differences

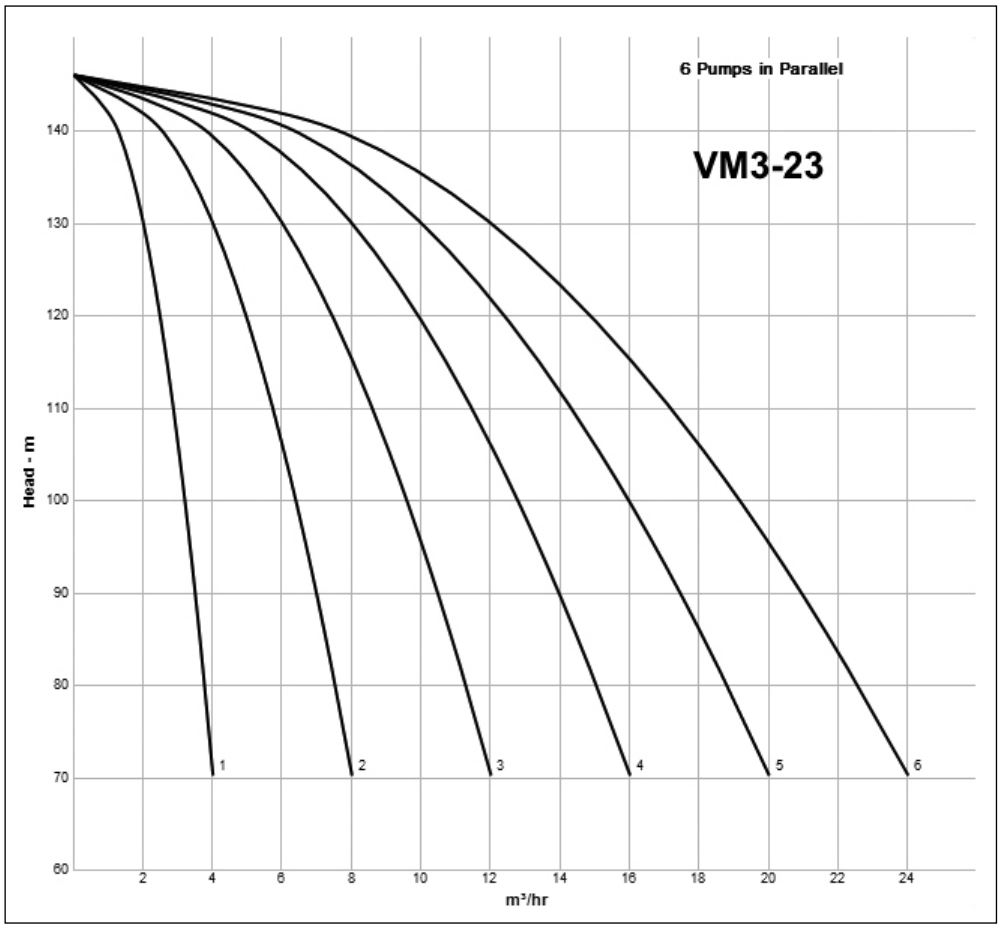
12. PUMP CHARTS

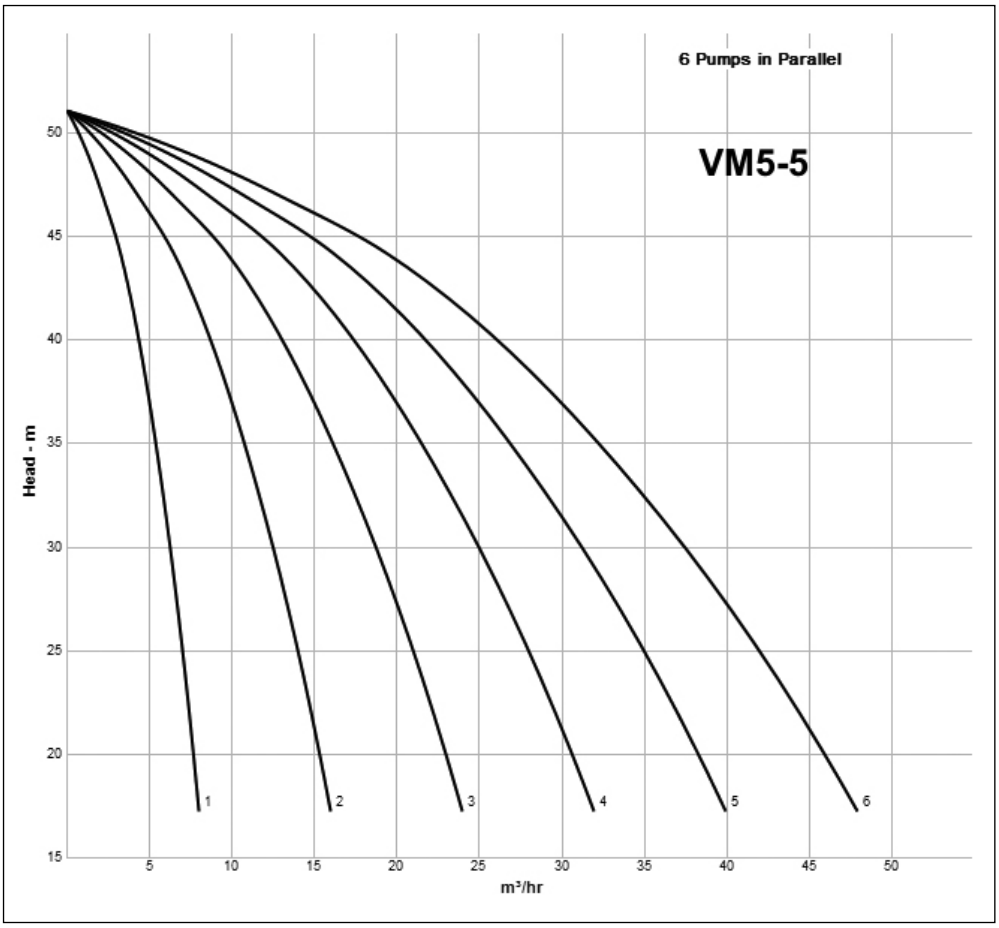
The charts below show Davey VM pumps connected in parallel to facilitate easy selection of a suitable booster system. They do not represent all pumps available, the complete range being much larger than published in this document. Please contact Davey, should you need information on a booster outside the range published here. All charts represent the performance of VM pumps according to AS2417:2001 Annex A tolerance and do not include losses for fittings or valves.

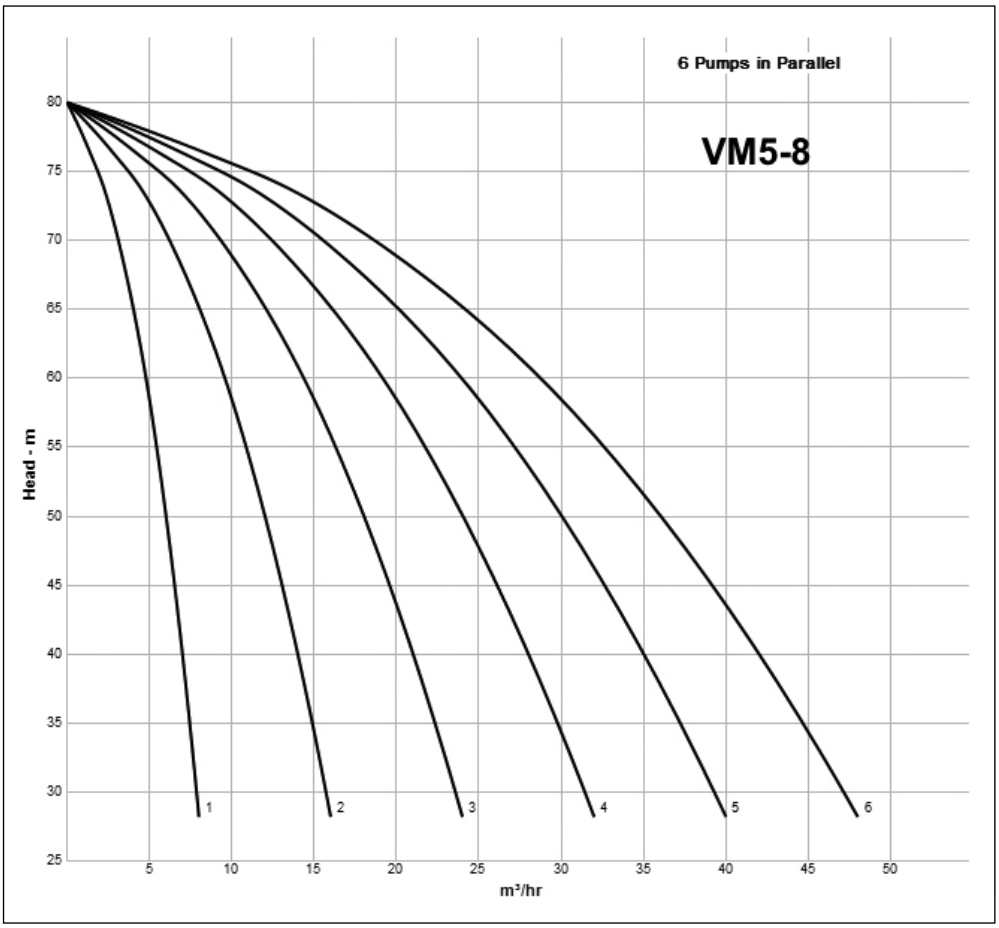


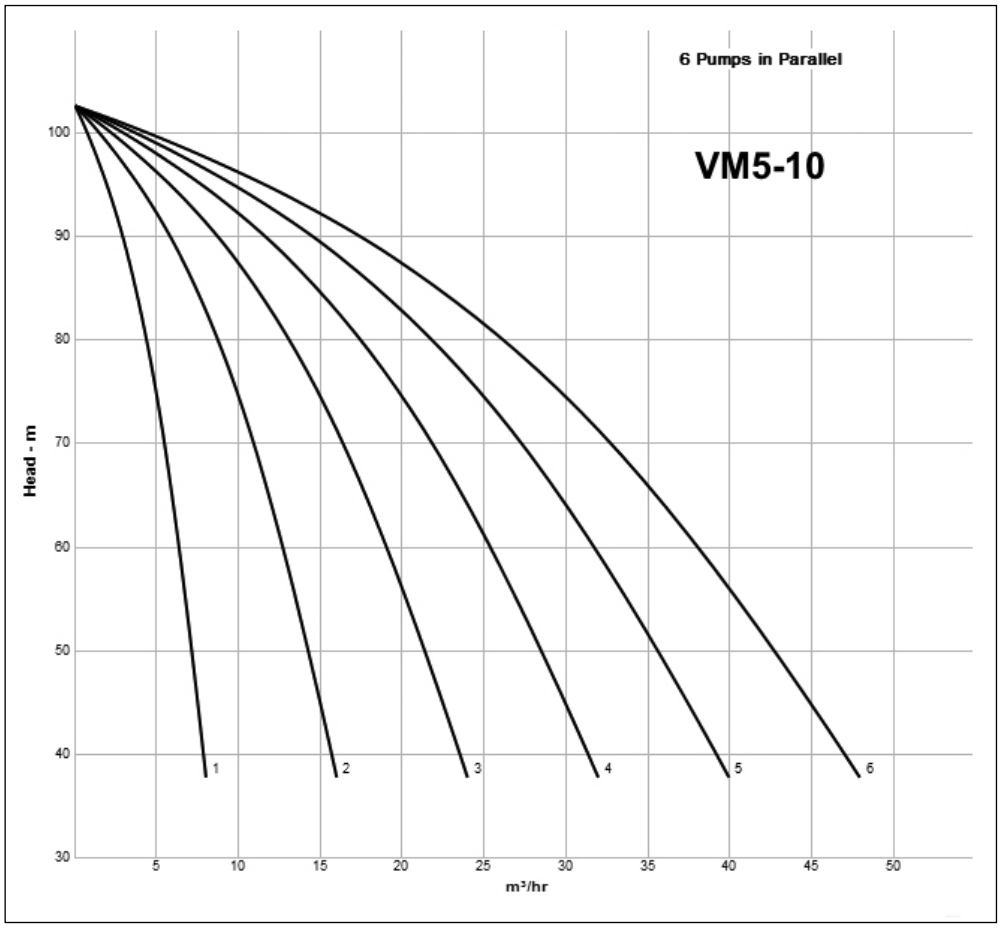


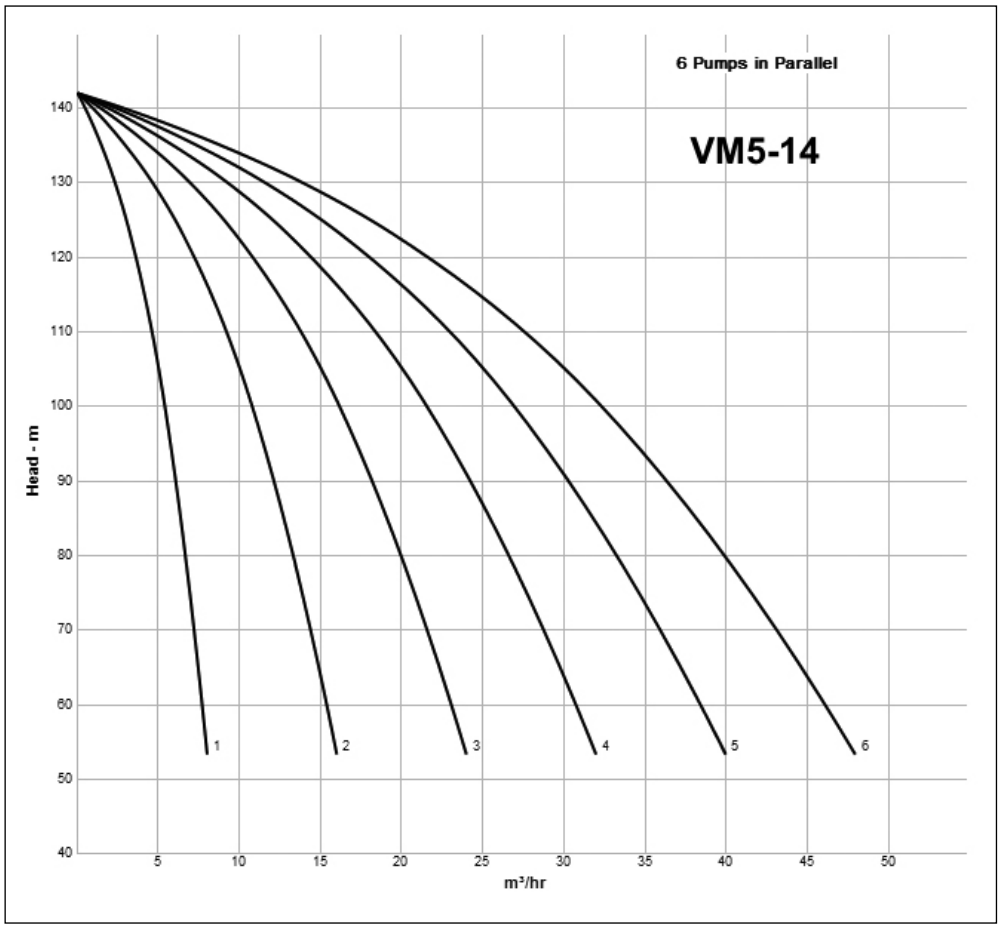

6 Pumps in Parallel
VM3-17
Head - m
m³/hr
110
100
90
80
70
60
50
40
2
4
6
8
10
12
14
16
18
20
22
24
1
2
3
4
5
6

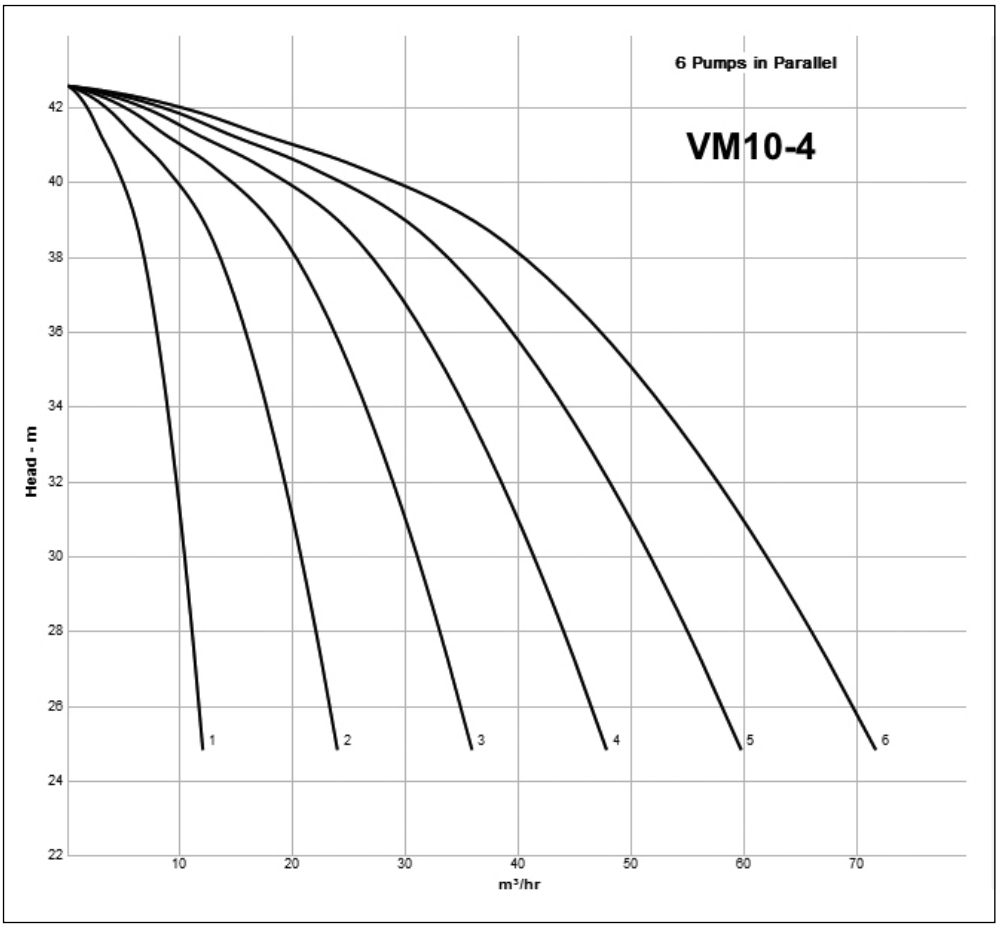

6 Pumps in Parallel
VM3-23
Head - m
m³/hr
140
130
120
110
100
90
80
70
60
2
4
6
8
10
12
14
16
18
20
22
24
1
2
3
4
5
6

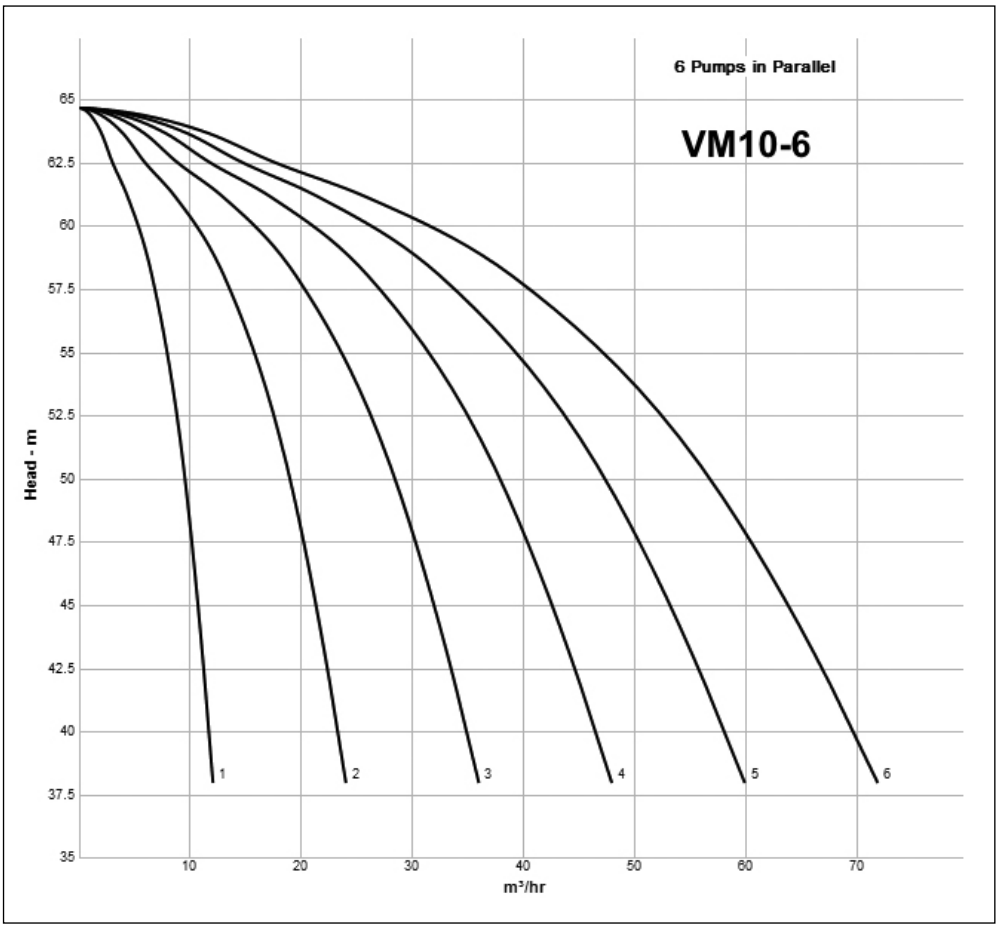

6 Pumps in Parallel
VM5-5
Head - m
m³/hr
50
45
40
35
30
25
20
15
5
10
15
20
25
30
35
40
45
50
1
2
3
4
5
6

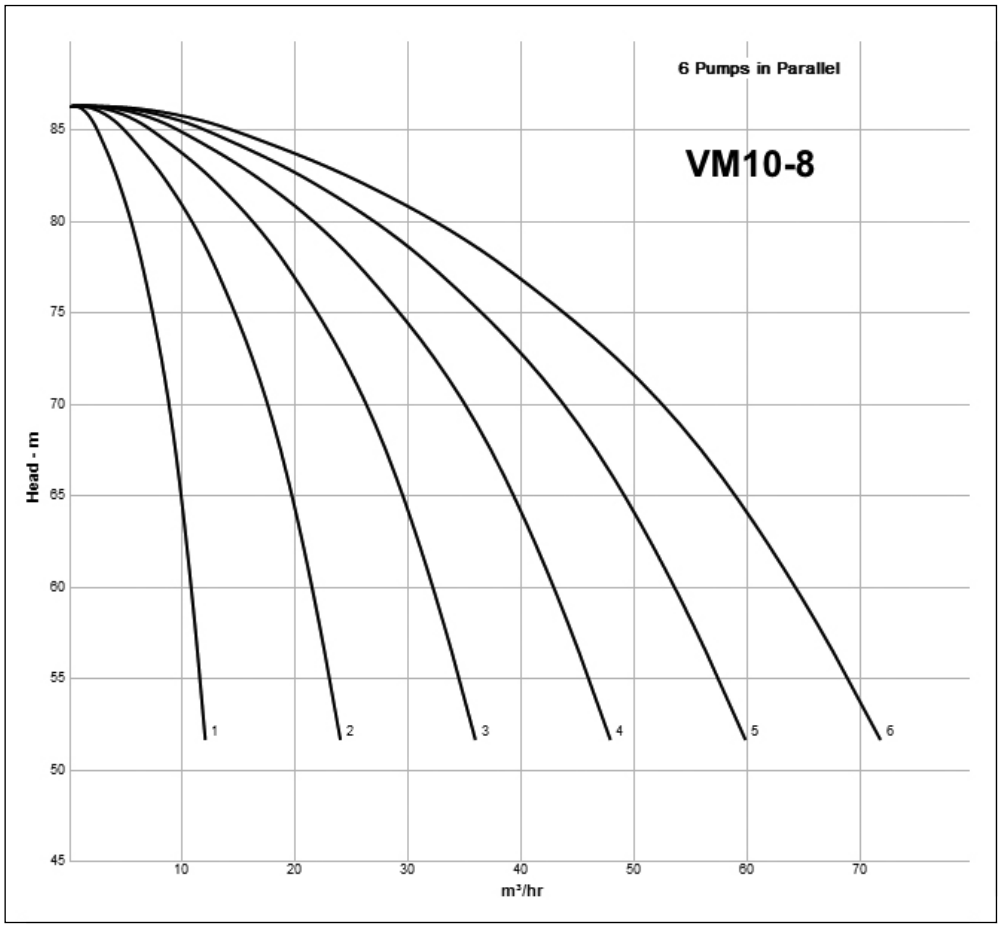

6 Pumps in Parallel
VM5-8
Head - m
m³/hr
80
75
70
65
60
55
50
45
40
35
30
25
5
10
15
20
25
30
35
40
45
50
1
2
3
4
5
6

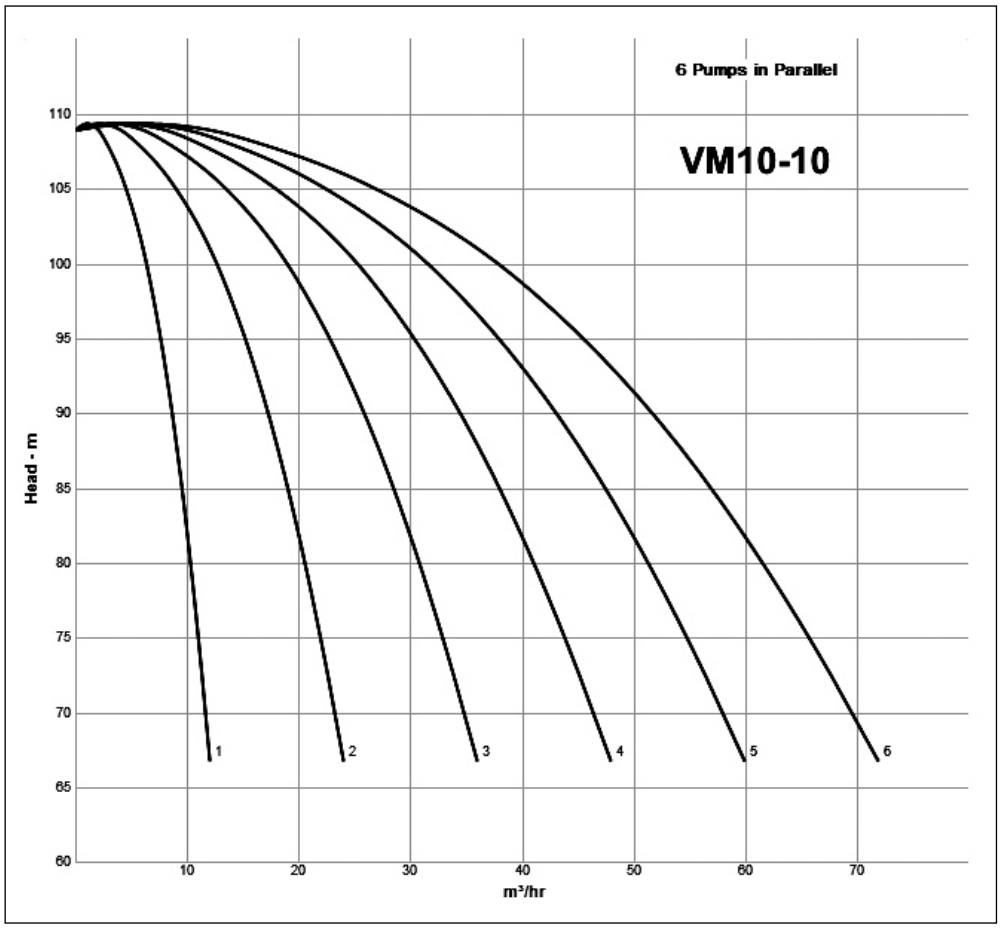

6 Pumps in Parallel
VM5-10
Head - m
100
90
80
70
60
50
40
30
5
10
15
20
25
30
35
40
45
50
m³/hr
1
2
3
4
5
6

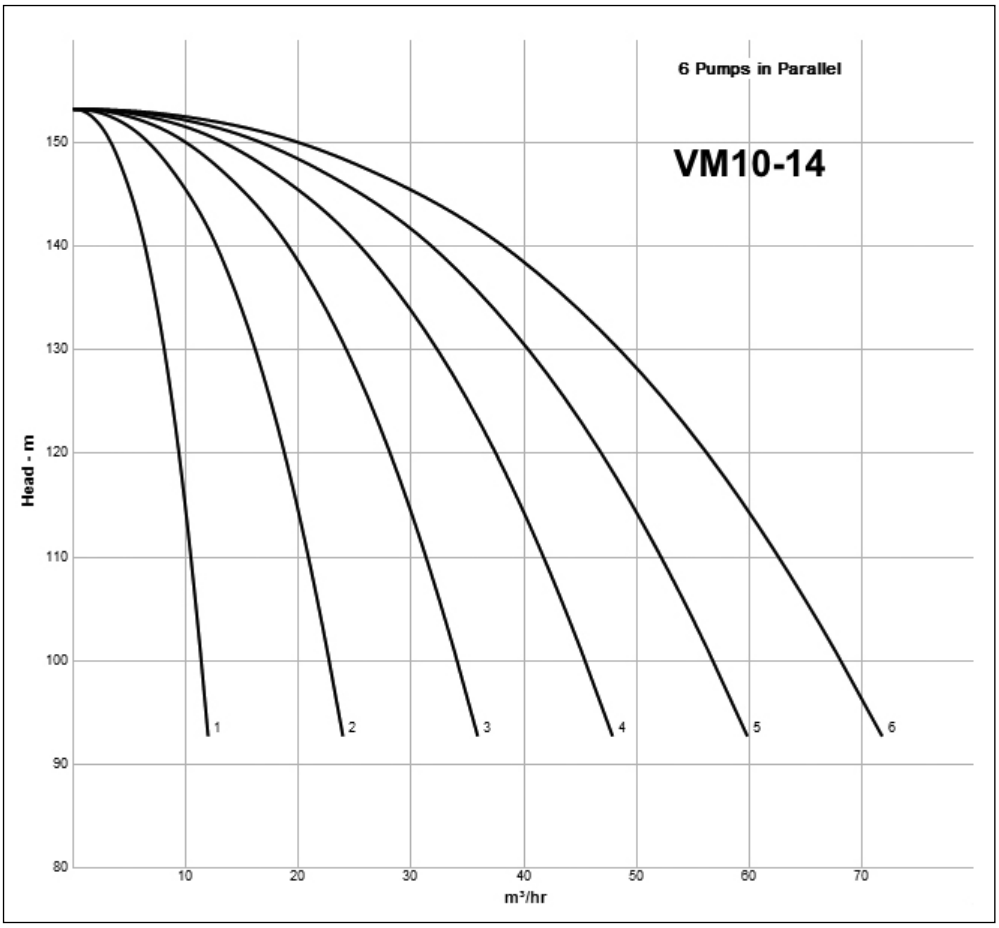

6 Pumps in Parallel
VM5-14
Head - m
140
130
120
110
100
90
80
70
60
50
40
5
10
15
20
25
30
35
40
45
50
m³/hr
1
2
3
4
5
6

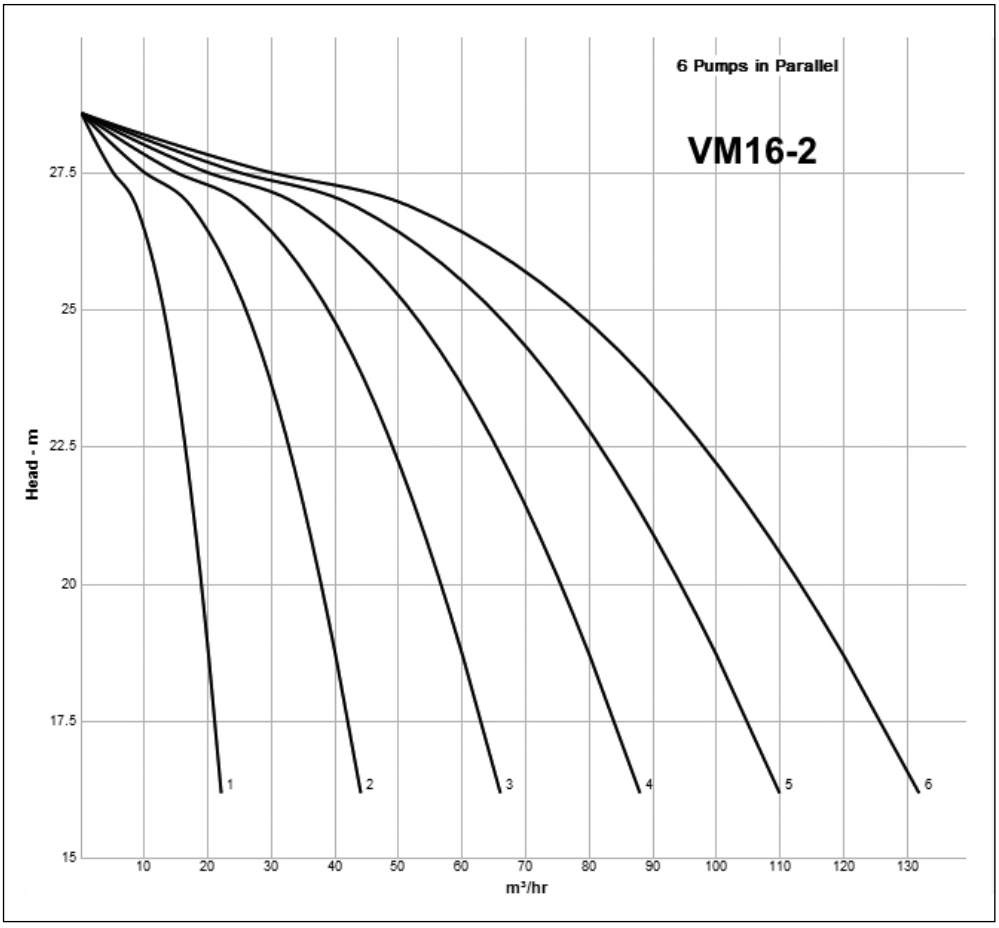

6 Pumps in Parallel
VM10-4
Head - m
42
40
38
36
34
32
30
28
26
24
22
10
20
30
40
50
60
70
m³/hr
1
2
3
4
5
6

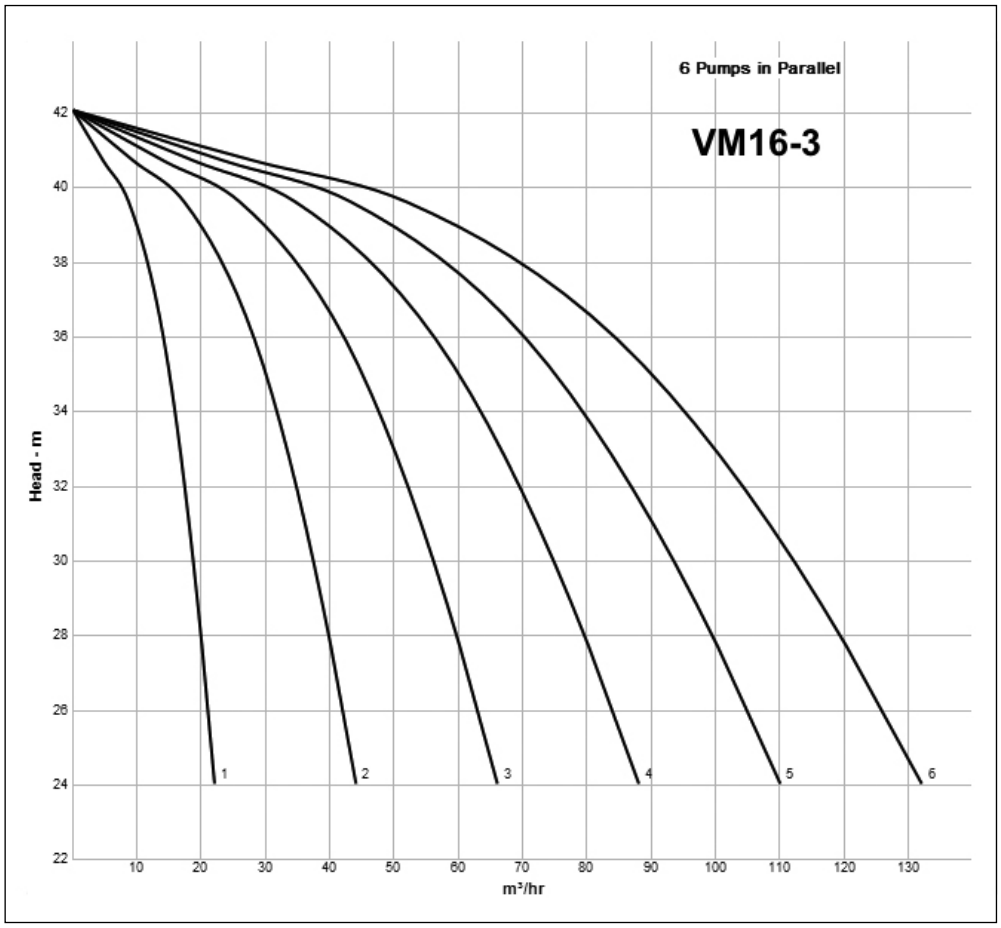

6 Pumps in Parallel
VM10-6
Head - m
65
62.5
60
57.5
55
52.5
50
47.5
45
42.5
40
37.5
35
10
20
30
40
50
60
70
m³/hr
1
2
3
4
5
6

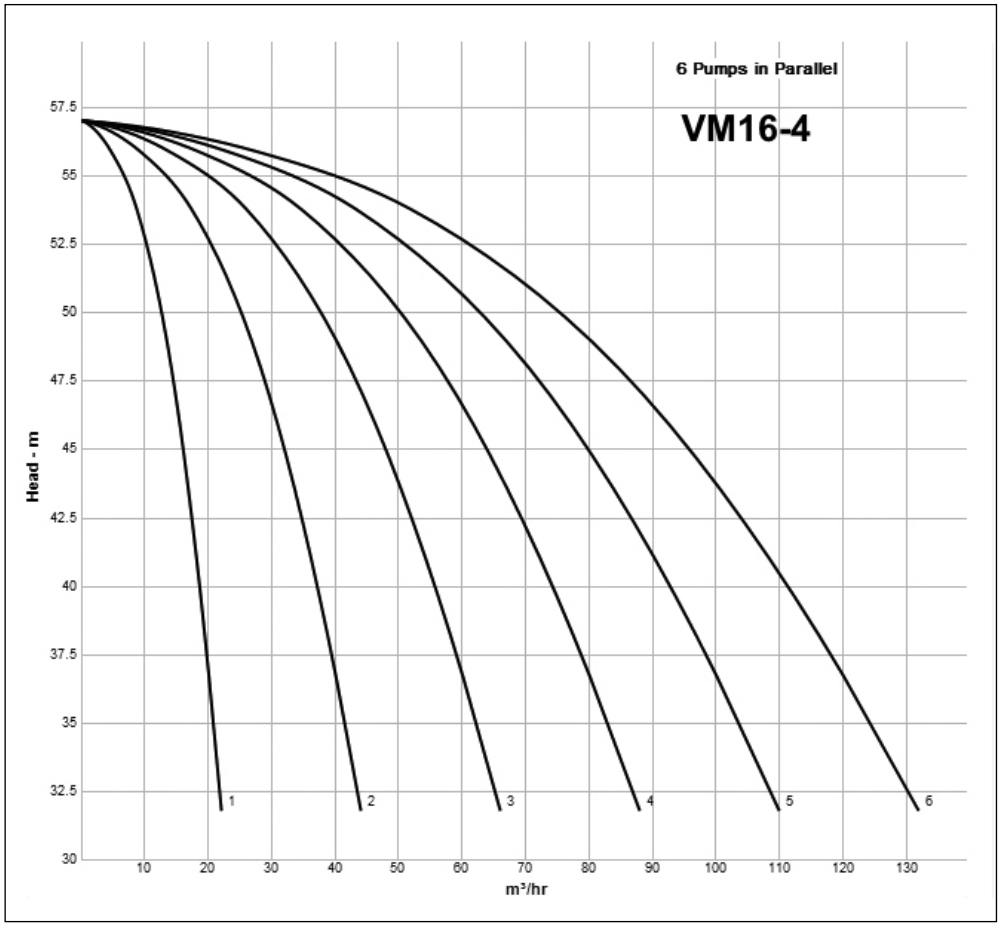

6 Pumps in Parallel
VM10-8
Head - m
85
80
75
70
65
60
55
50
45
10
20
30
40
50
60
70
m³/hr
1
2
3
4
5
6

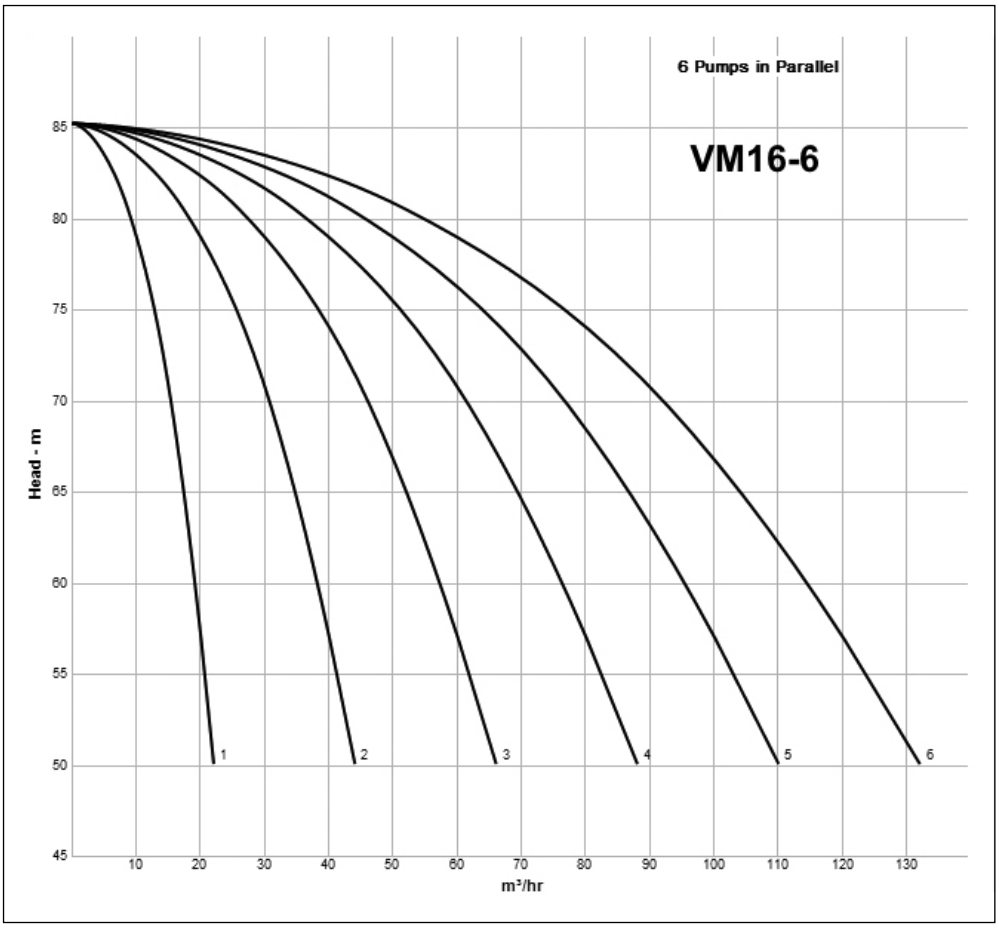

6 Pumps in Parallel
VM10-10
Head - m
110
105
100
95
90
85
80
75
70
65
60
10
20
30
40
50
60
70
m³/hr
1
2
3
4
5
6

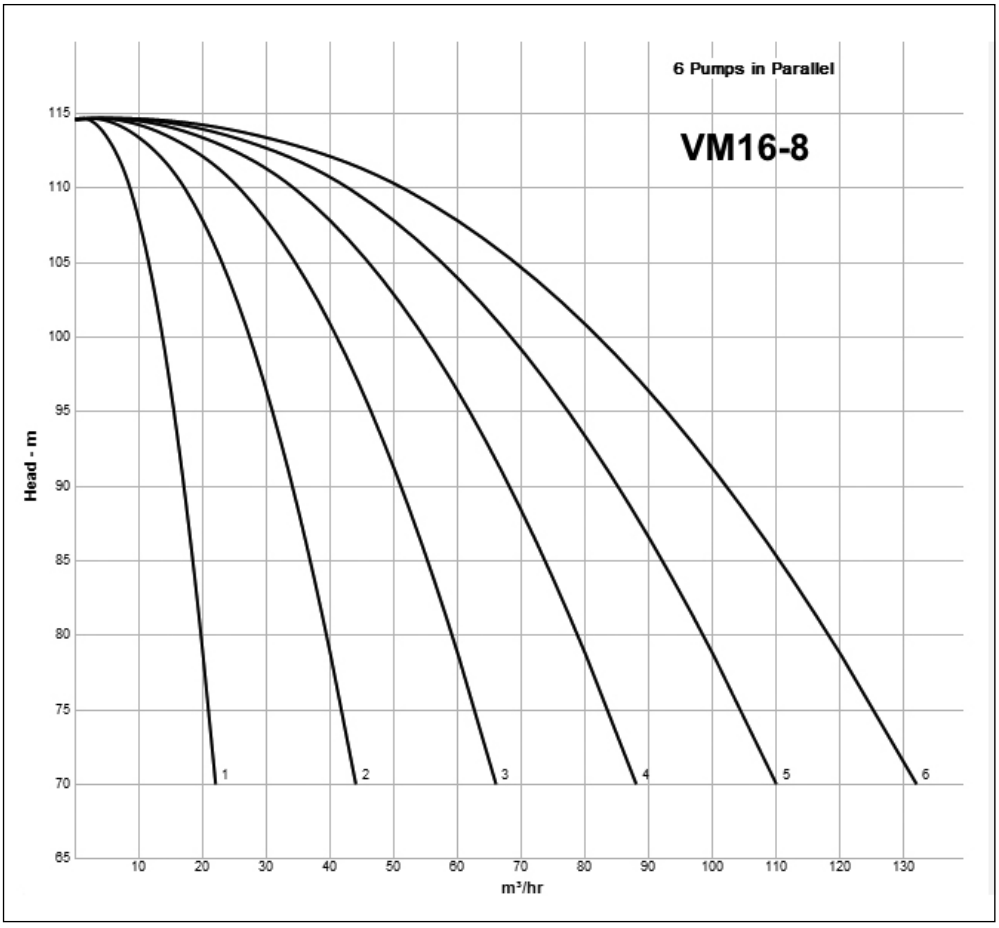

6 Pumps in Parallel
VM10-14
Head - m
150
140
130
120
110
100
90
80
10
20
30
40
50
60
70
m³/hr
1
2
3
4
5
6

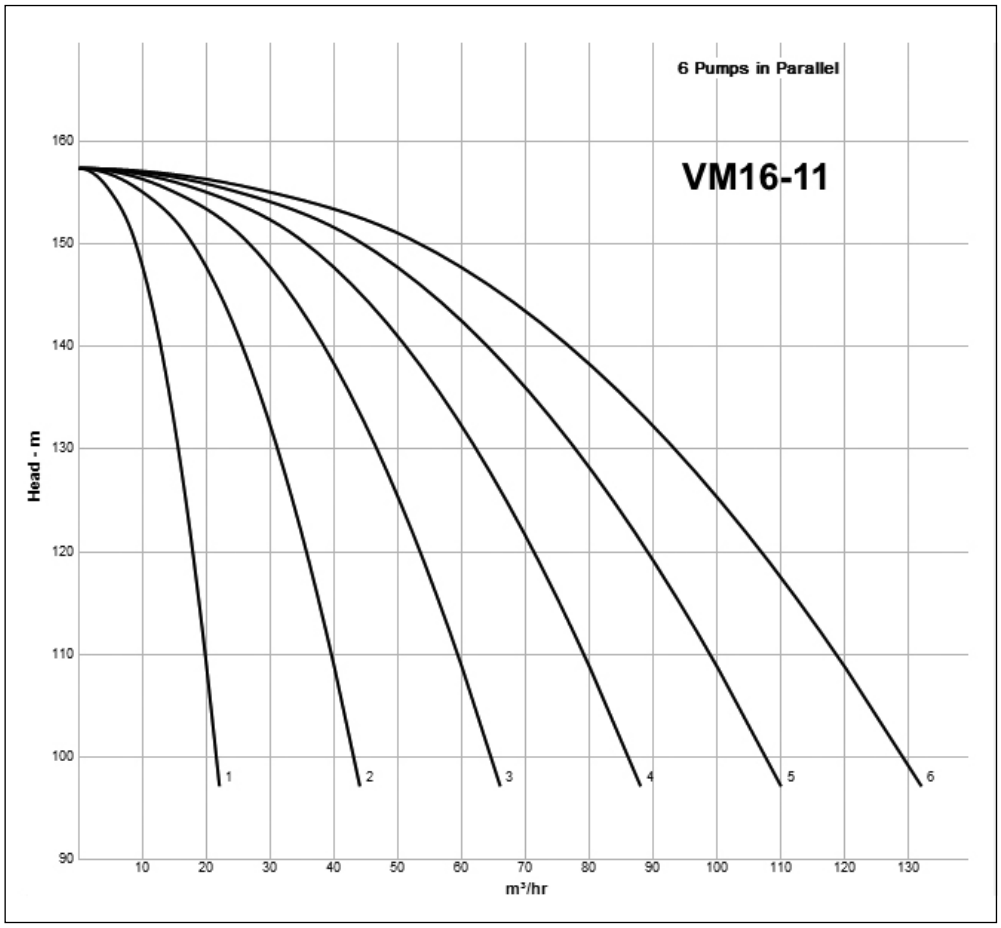

6 Pumps in Parallel
VM16-2
Head - m
27.5
25
22.5
20
17.5
15
10
20
30
40
50
60
70
80
90
100
110
120
130
m³/hr
1
2
3
4
5
6

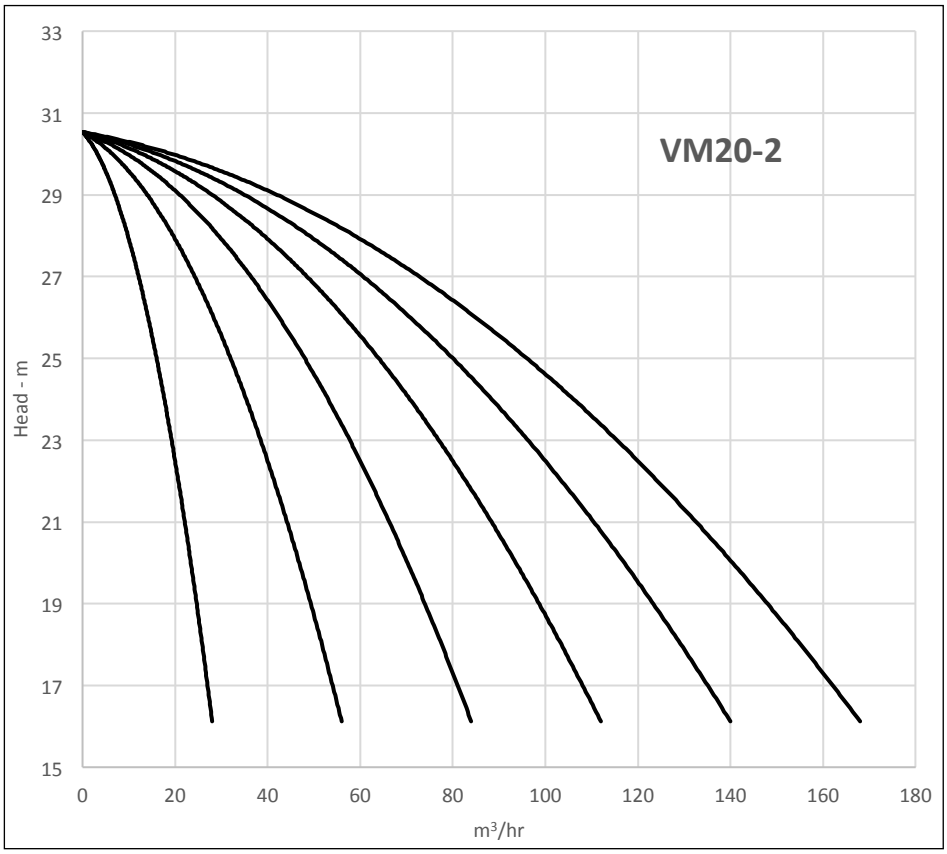

6 Pumps in Parallel
VM16-3
Head - m
42
40
38
36
34
32
30
28
26
24
22
10
20
30
40
50
60
70
80
90
100
110
120
130
m³/hr
1
2
3
4
5
6

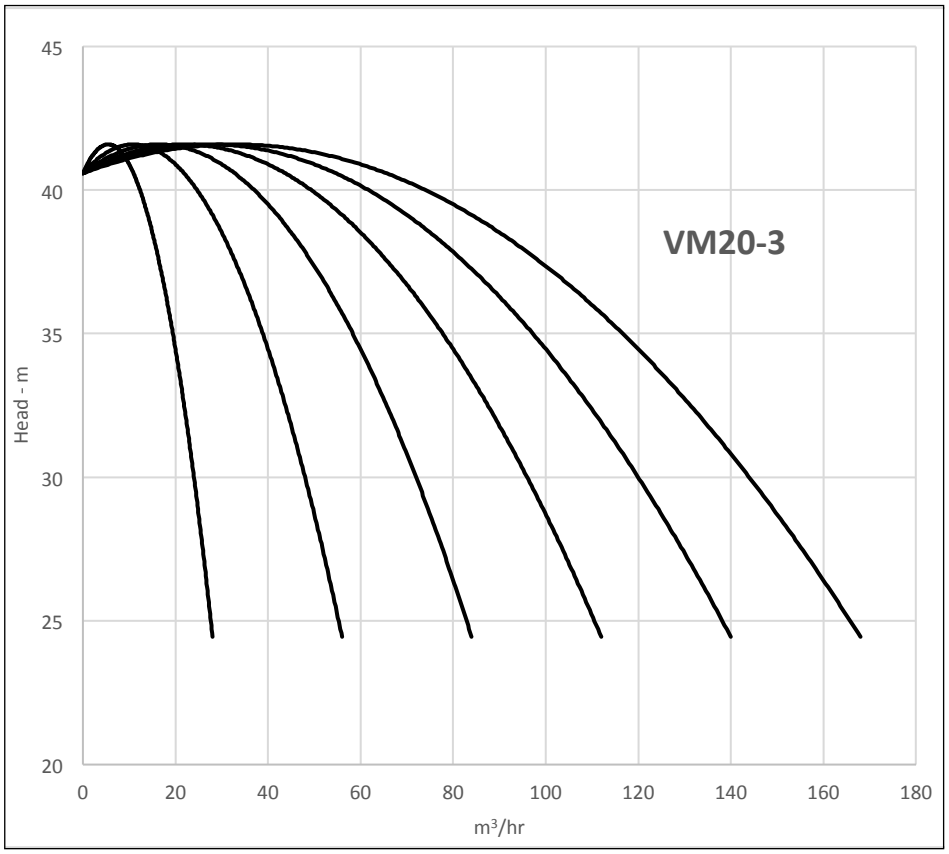

6 Pumps in Parallel
VM16-4
Head - m
57.5
55
52.5
50
47.5
45
42.5
40
37.5
35
32.5
30
10
20
30
40
50
60
70
80
90
100
110
120
130
m³/hr
1
2
3
4
5
6

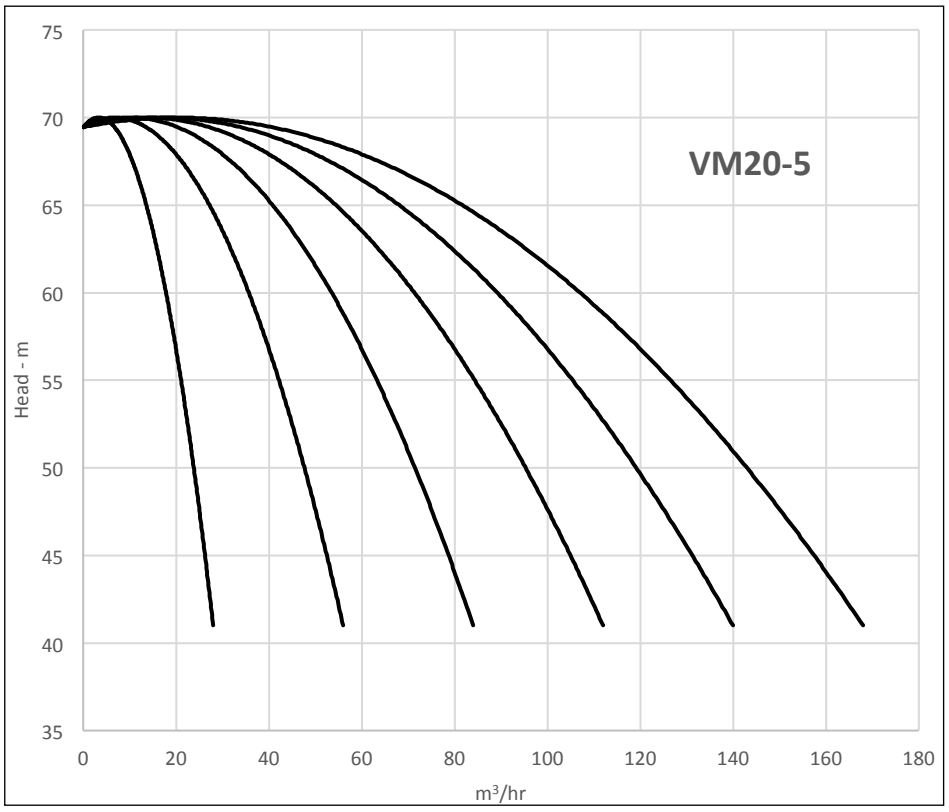

6 Pumps in Parallel
VM16-6
Head - m
85
80
75
70
65
60
55
50
45
10
20
30
40
50
60
70
80
90
100
110
120
130
m³/hr
1
2
3
4
5
6

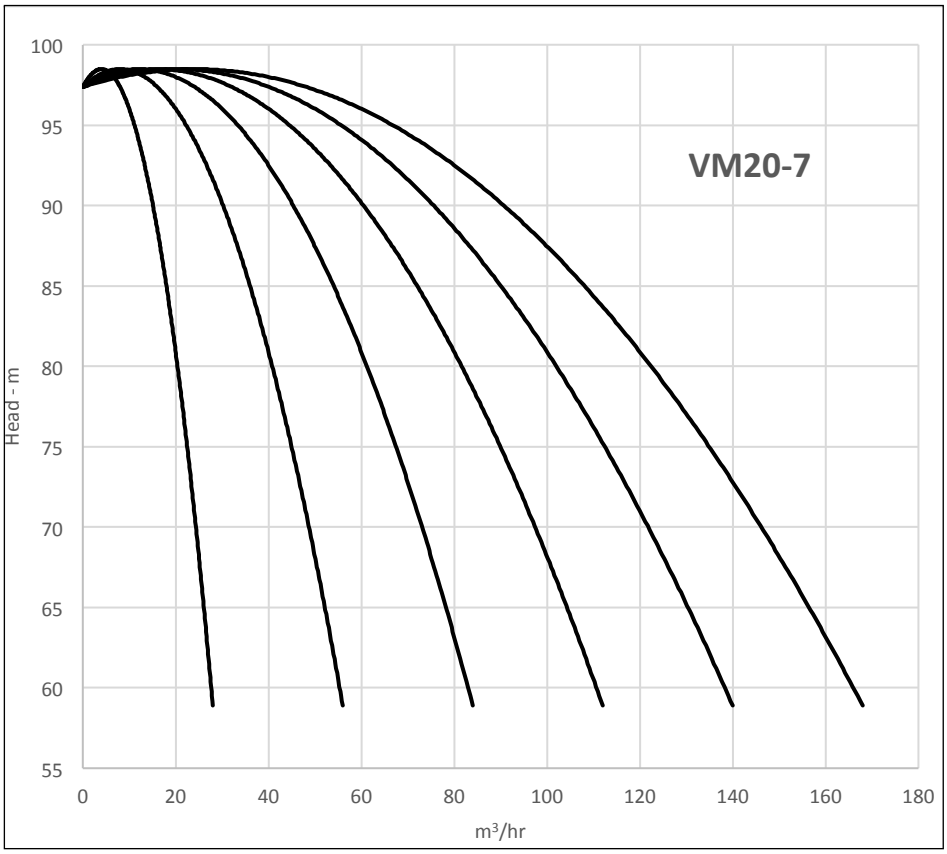

6 Pumps in Parallel
VM16-8
Head - m
115
110
105
100
95
90
85
80
75
70
65
10
20
30
40
50
60
70
80
90
100
110
120
130
m³/hr
1
2
3
4
5
6

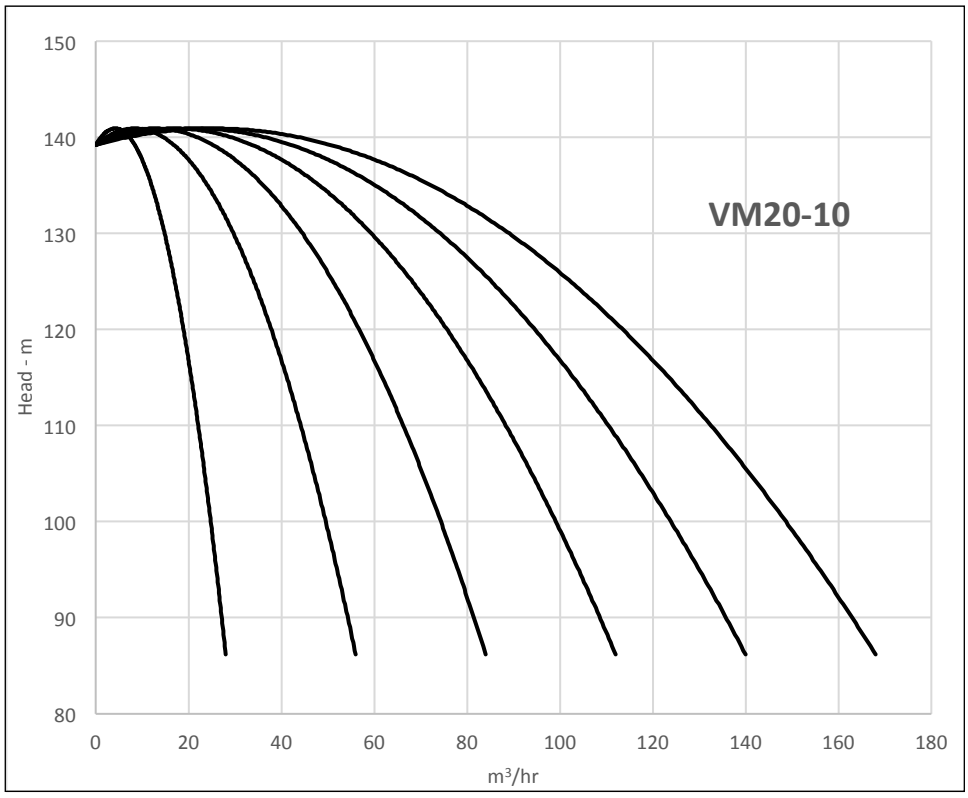

6 Pumps in Parallel
VM16-11
Head - m
160
150
140
130
120
110
100
90
10
20
30
40
50
60
70
80
90
100
110
120
130
m³/hr
1
2
3
4
5
6

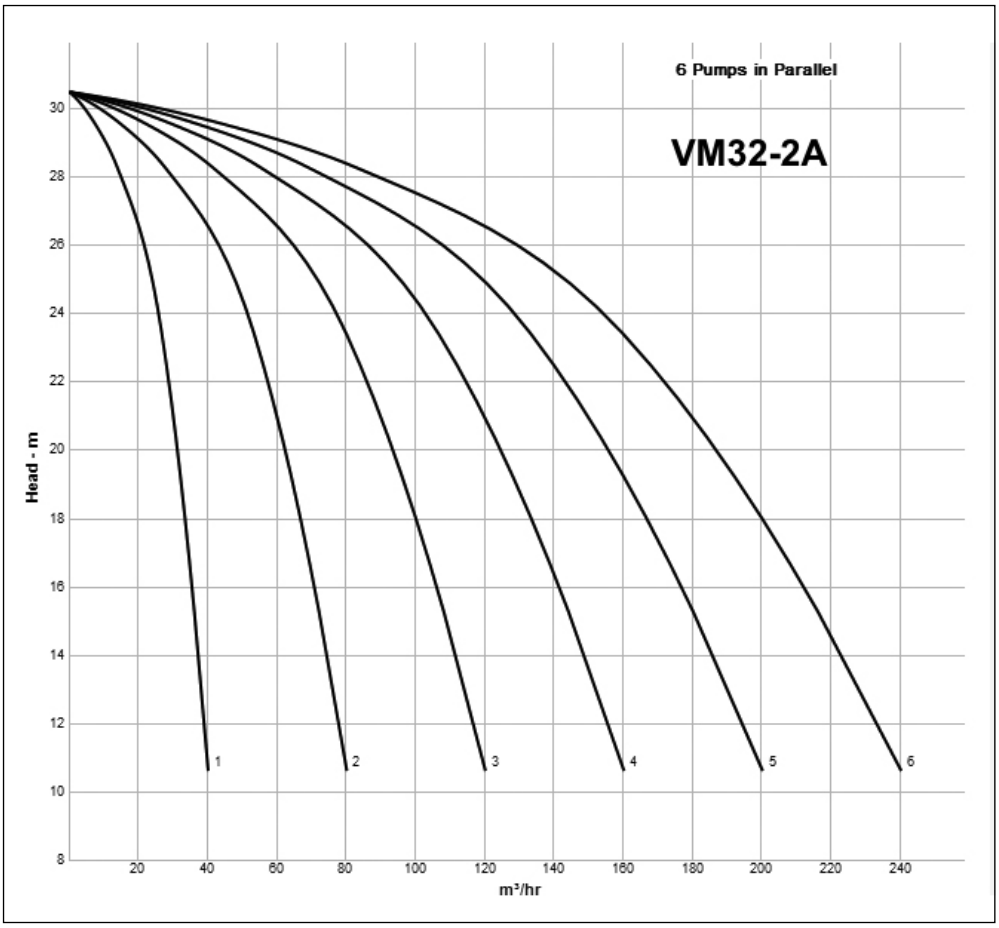

VM20-2
Head - m
33
31
29
27
25
23
21
19
17
15
0
20
40
60
80
100
120
140
160
180
m³/hr


VM20-3
Head - m
45
40
35
30
25
20
0
20
40
60
80
100
120
140
160
180
m³/hr


VM20-5
Head - m
75
70
65
60
55
50
45
40
35
0
20
40
60
80
100
120
140
160
180
m³/hr

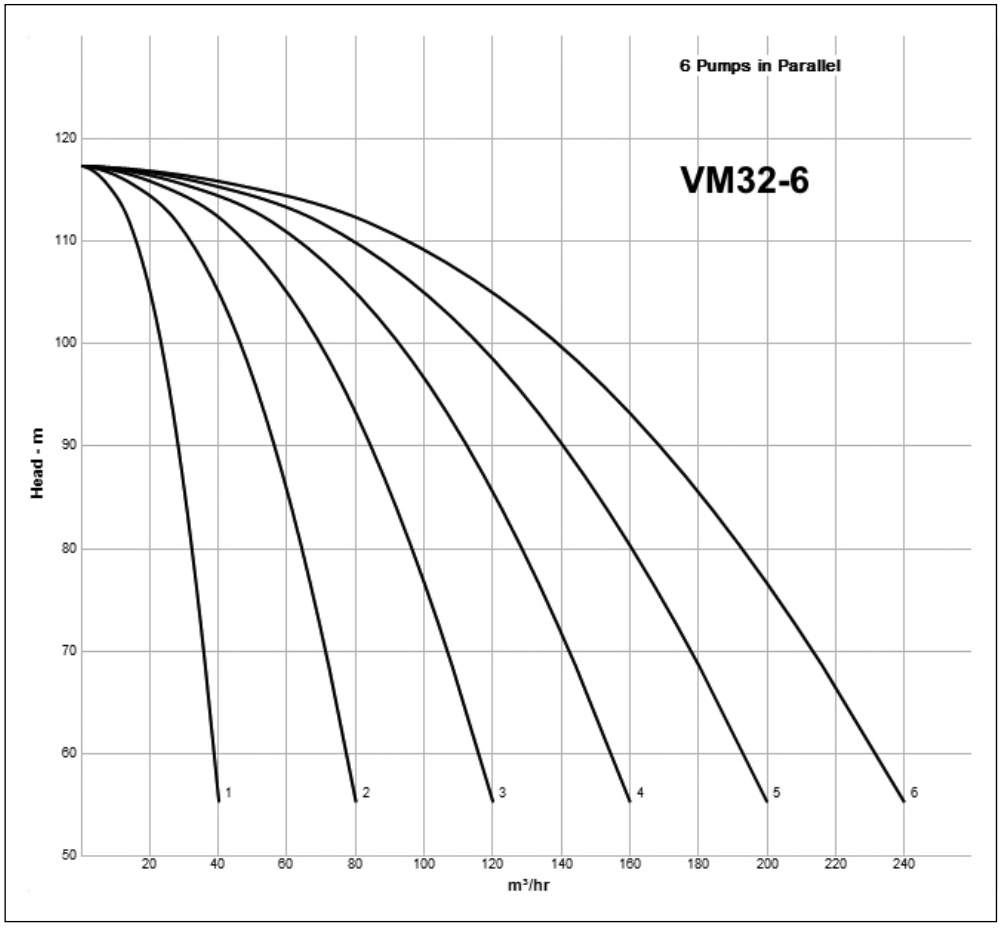

VM20-7
Head - m
100
95
90
85
80
75
70
65
60
55
0
20
40
60
80
100
120
140
160
180
m³/hr

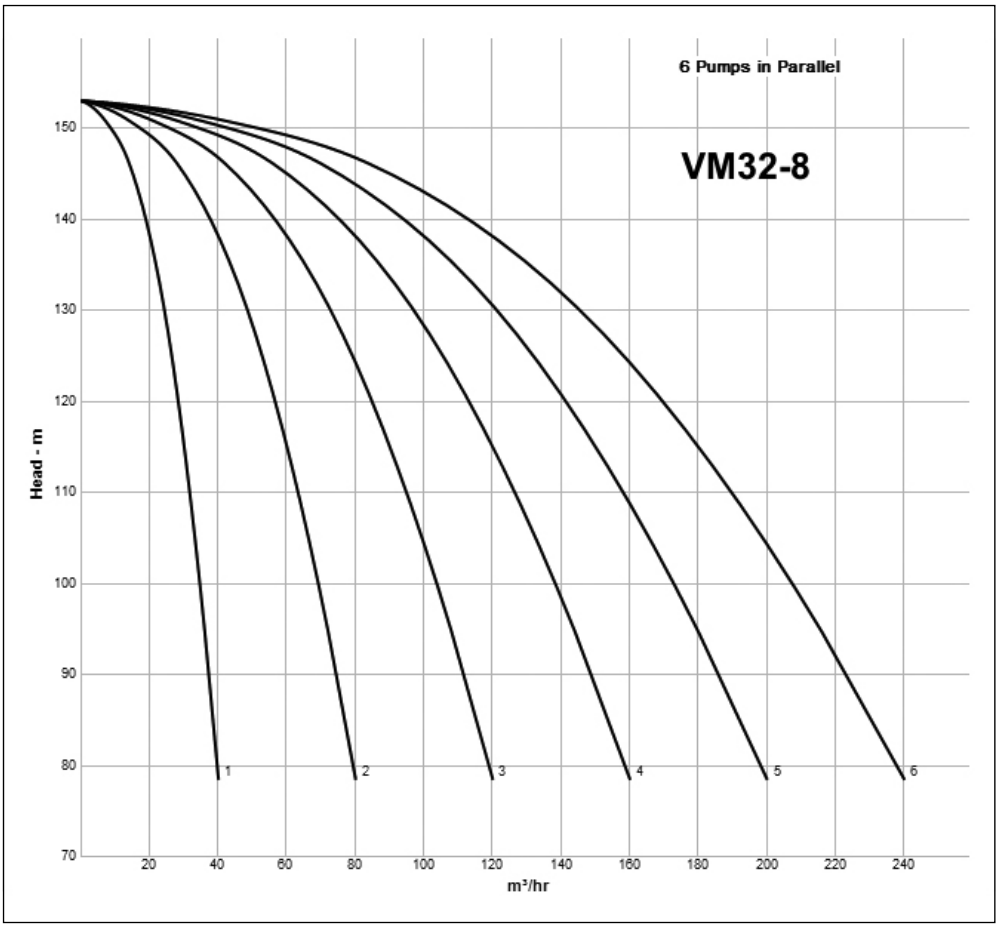

VM20-10
Head - m
150
140
130
120
110
100
90
80
0
20
40
60
80
100
120
140
160
180
m³/hr

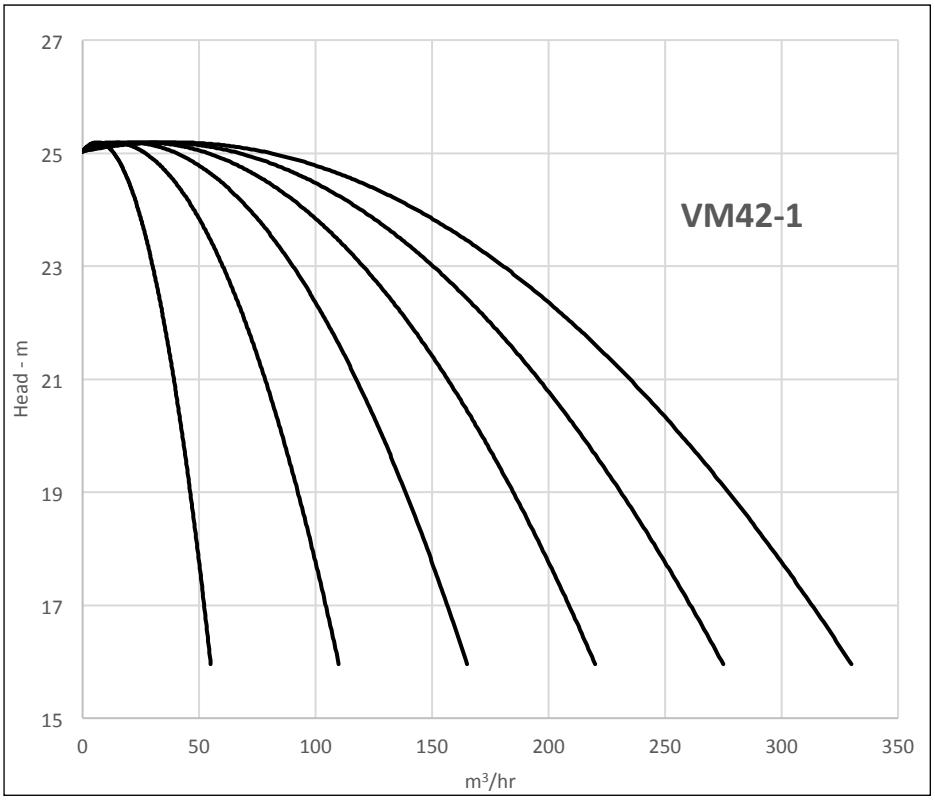

6 Pumps in Parallel
VM32-2A
Head - m
m³/hr
30
28
26
24
22
20
18
16
14
12
10
8
20
40
60
80
100
120
140
160
180
200
220
240
1
2
3
4
5
6

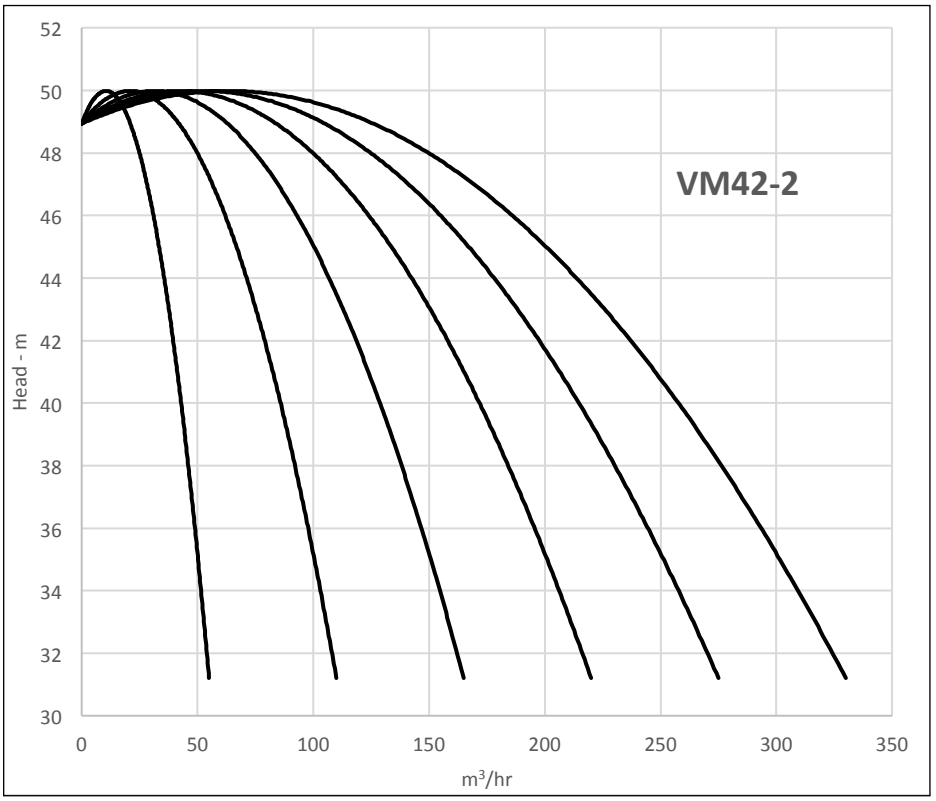

6 Pumps in Parallel
VM32-3
Head - m
m³/hr
55
50
45
40
35
30
25
20
20
40
60
80
100
120
140
160
180
200
220
240
1
2
3
4
5
6

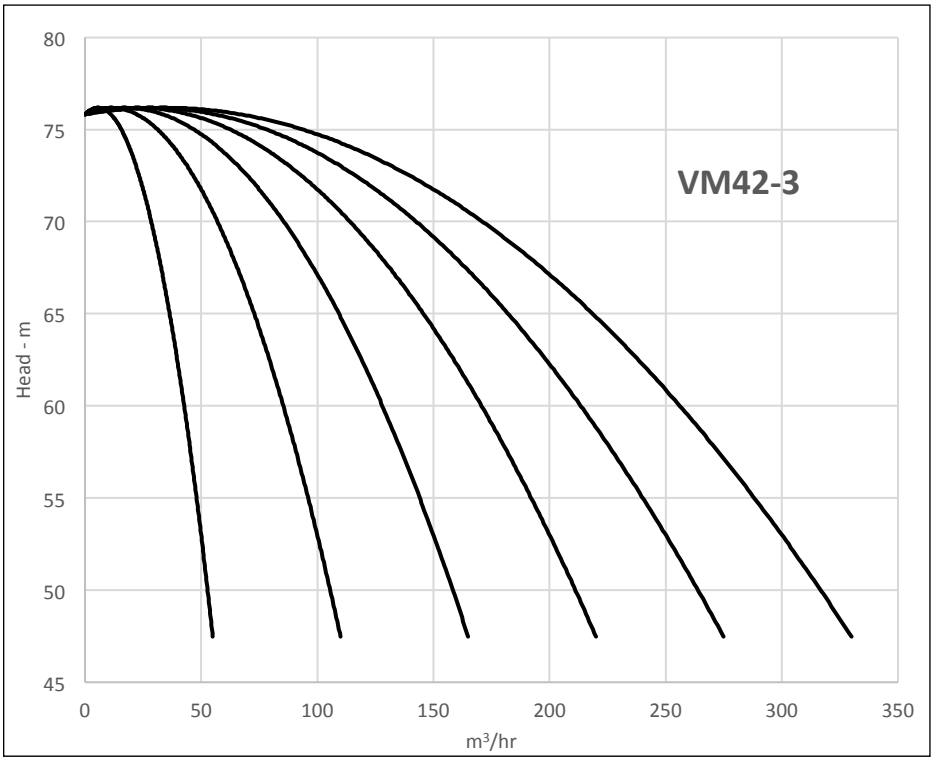

6 Pumps in Parallel
VM32-4
Head - m
75
70
65
60
55
50
45
40
35
30
20
40
60
80
100
120
140
160
180
200
220
240
m³/hr
1
2
3
4
5
6

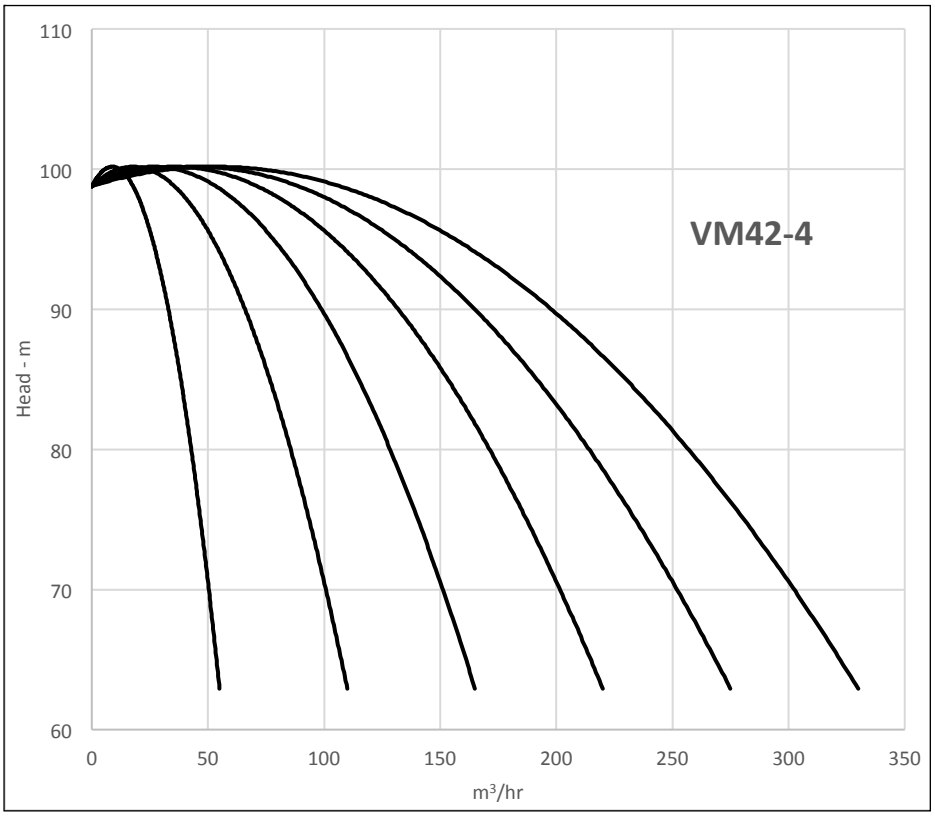

6 Pumps in Parallel
VM32-6
Head - m
120
110
100
90
80
70
60
50
20
40
60
80
100
120
140
160
180
200
220
240
m³/hr
1
2
3
4
5
6


6 Pumps in Parallel
VM32-8
Head - m
150
140
130
120
110
100
90
80
70
20
40
60
80
100
120
140
160
180
200
220
240
m³/hr
1
2
3
4
5
6


VM42-1
Head - m
27
25
23
21
19
17
15
0
50
100
150
200
250
300
350
m³/hr

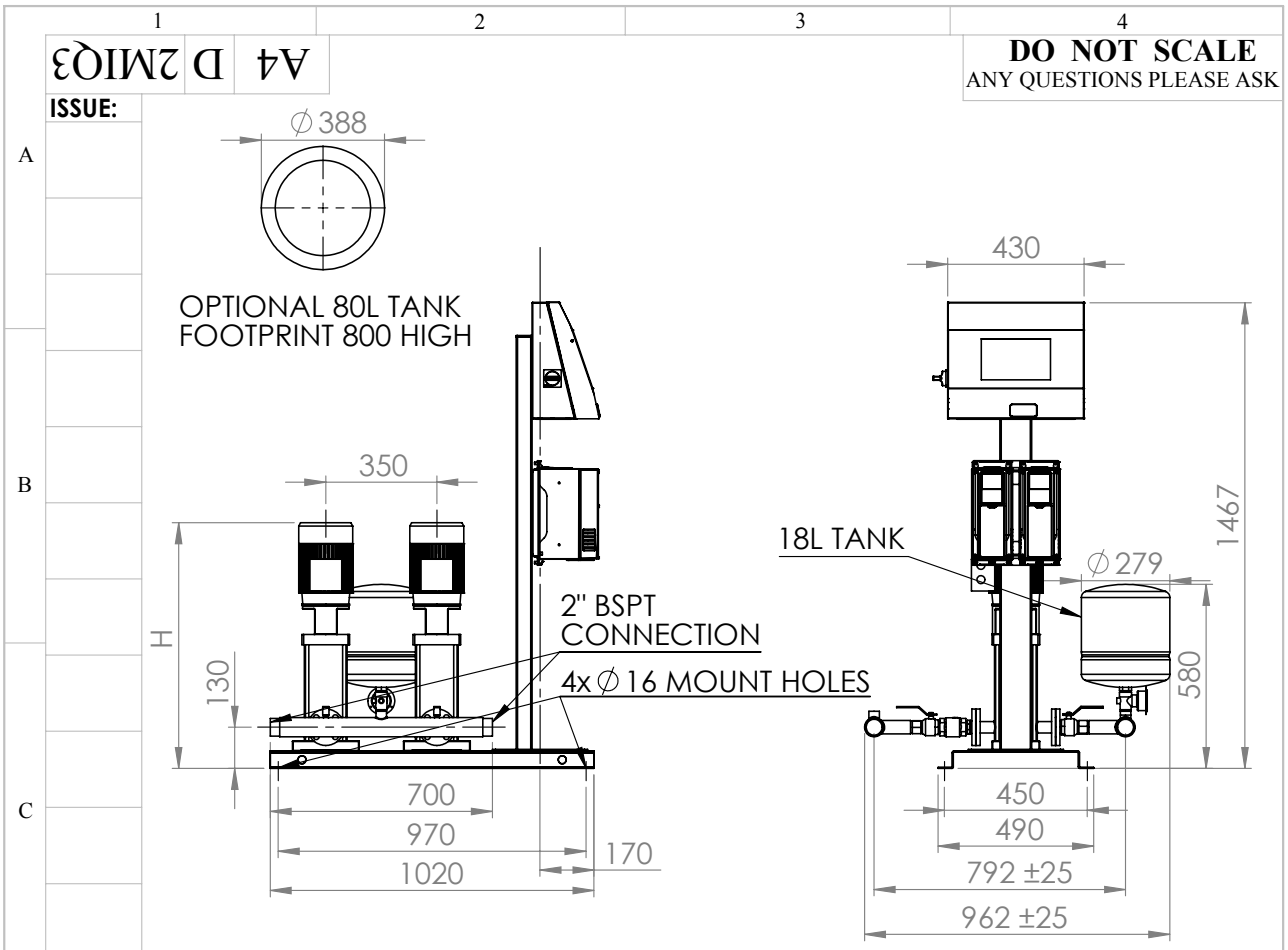

VM42-2
Head - m
52
50
48
46
44
42
40
38
36
34
32
30
0
50
100
150
200
250
300
350
m³/hr


VM42-3
Head - m
80
75
70
65
60
55
50
45
0
50
100
150
200
250
300
350
m³/hr


VM42-4
Head - m
110
100
90
80
70
60
0
50
100
150
200
250
300
350
m³/hr

13. TECHNICAL DATA

13.1 DIMENSIONAL INFORMATION



Part Number	Motor kW	Voltage V	Drive	H
2MIQ3-8/3	0.75	3x380-415	3.4A-MR4	633
2MIQ3-12/3	1.1	3x380-415	3.4A-MR4	705
2MIQ3-17/3	1.5	3x380-415	4.8A-MR4	857
2MIQ3-23/3	2.2	3x380-415	5.6A-MR4	965

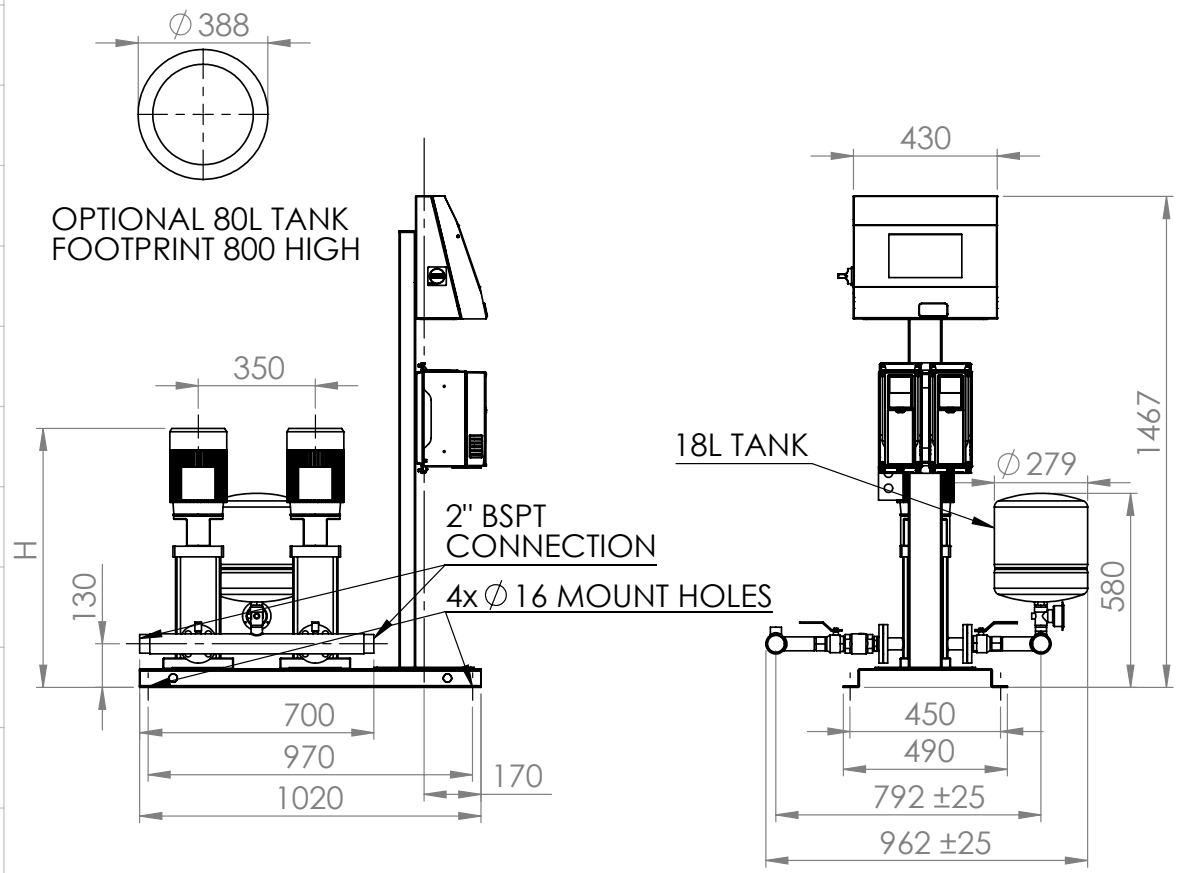
NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	DATE:	DAVEY WATER PRODUCTS PTY.LTD. A.B.N. 18 066 327 517 A.C.N. 066 327 517	THIRD ANGLE PROJECTION	
ANGULAR: ±1°	DRAWN:		MATERIAL:	
LINEAR: ±10	CHECKED:	TITLE: MONSOON IQ 2xVM3		
	SCALE:1:20	© Copyright Davey Products Pty Ltd 2001	A4 D 2MIQ3 1	

A4 D 2MIQ5

DO NOT SCALE
ANY QUESTIONS PLEASE ASK

ISSUE:



Part Number	Motor kW	Voltage V	Drive	H
2MIQ5-5/3	1.1	3x380-415	3.4A-MR4	624
2MIQ5-8/3	1.5	3x380-415	4.8A-MR4	767
2MIQ5-10/3	2.2	3x380-415	5.6A-MR4	821
2MIQ5-14/3	3.0	3x380-415	8A-MR4	962

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	*DATE:*	DAVEY WATER PRODUCTS PTY.LTD.	*THIRD ANGLE PROJECTION*	
ANGULAR: ±1°	*DRAWN:*	A.B.N. 18 066 327 517 A.C.N. 066 327 517	*MATERIAL:*	
LINEAR: ±10	*CHECKED:*	*TITLE:* MONSOON IQ 2xVM5		
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A4 D 2MIQ10

DO NOT SCALE
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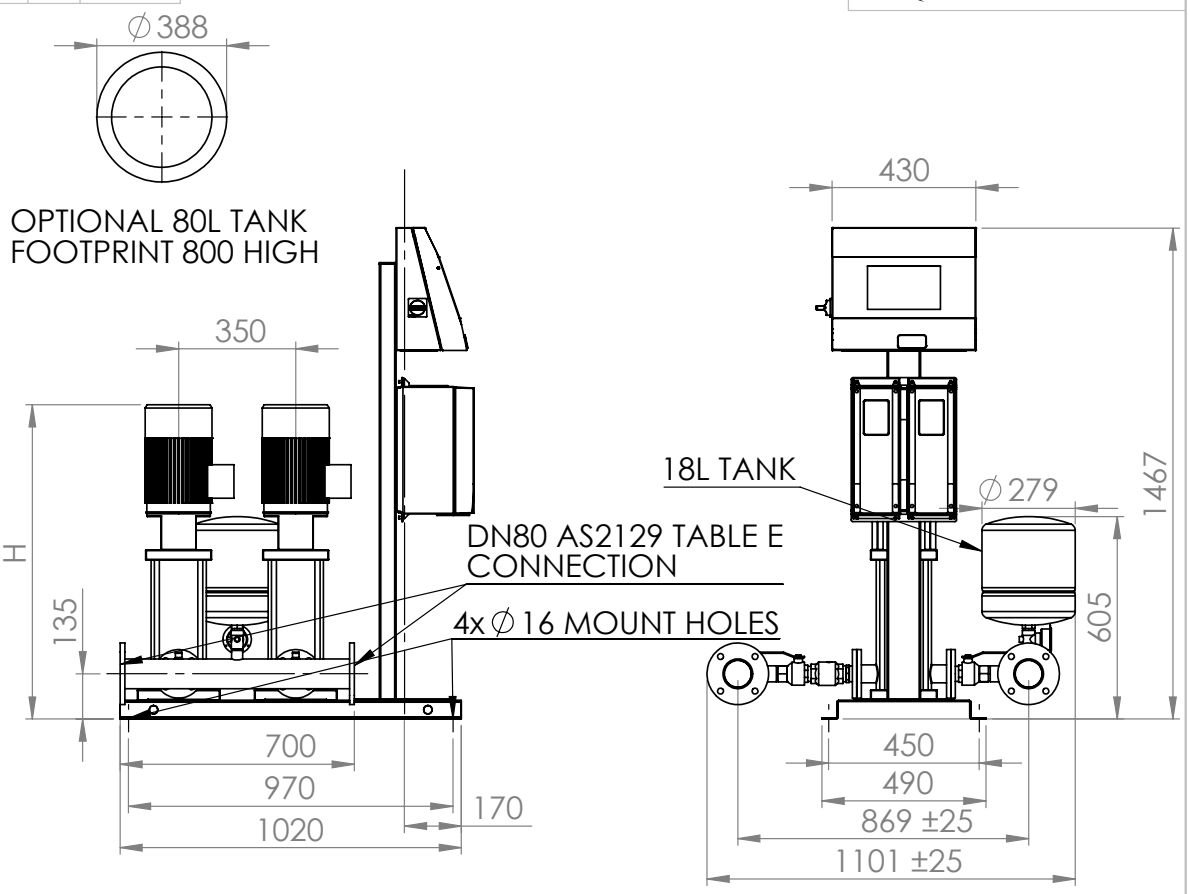
ISSUE:



Part Number	Motor kW	Voltage V	Drive	H
2MIQ10-4/3	1.5	3x380-415	4.8A-MR4	765
2MIQ10-6/3	2.2	3x380-415	5.6A-MR4	825
2MIQ10-8/3	3.0	3x380-415	8A-MR4	920
2MIQ10-10/3	4.0	3x380-415	9.6A-MR4	1000
2MIQ10-14/3	5.5	3x380-415	12A-MR4	1235

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	*DATE:*	DAVEY WATER PRODUCTS PTY.LTD. A.B.N. 18 066 327 517 A.C.N. 066 327 517	*THIRD ANGLE PROJECTION*
ANGULAR: ±1°	*DRAWN:*		*MATERIAL:*
LINEAR: ±10	*CHECKED:*	*TITLE:* MONSOON IQ 2xVM10	
	SCALE:1:20	© Copyright Davey Products Pty Ltd 2001	A4 D 2MIQ10 1

A4 D 2MIQ16

DO NOT SCALE
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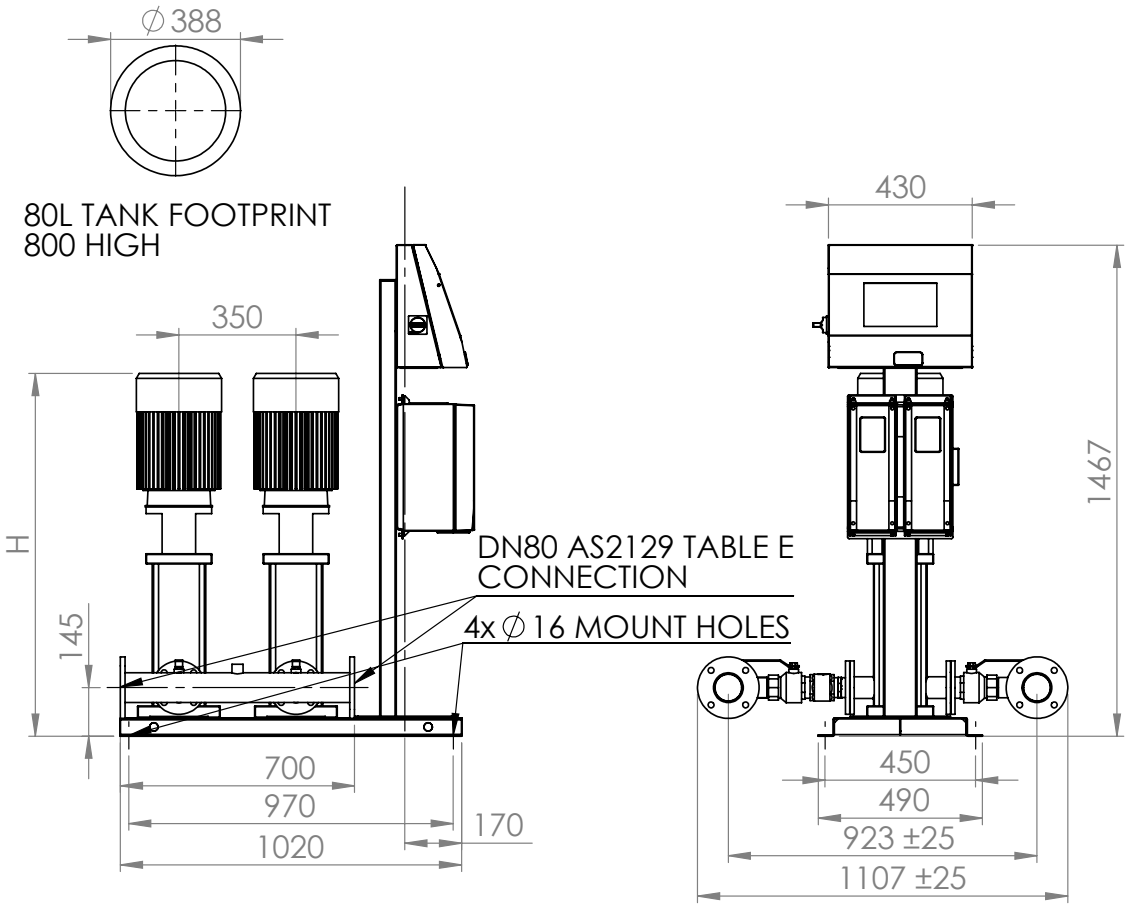

Part Number	Motor kW	Voltage V	Drive	H
2MIQ16-2/3	2.2	3x380-415	5.6A-MR4	745
2MIQ16-3/3	3.0	3x380-415	8A-MR4	825
2MIQ16-4/3	4.0	3x380-415	9.6A-MR4	890
2MIQ16-6/3	5.5	3x380-415	12A-MR4	1095
2MIQ16-8/3	7.5	3x380-415	16A-MR5	1185
2MIQ16-11/3	11.0	3x380-415	23A-MR5	1410

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	*DATE:*	DAVEY WATER PRODUCTS PTY.LTD.	*THIRD ANGLE PROJECTION*	
ANGULAR: ±1°	*DRAWN:*	A.B.N. 18 066 327 517 A.C.N. 066 327 517	*MATERIAL:*	
LINEAR: ±10	*CHECKED:*	*TITLE:* MONSOON IQ 2xVM16		
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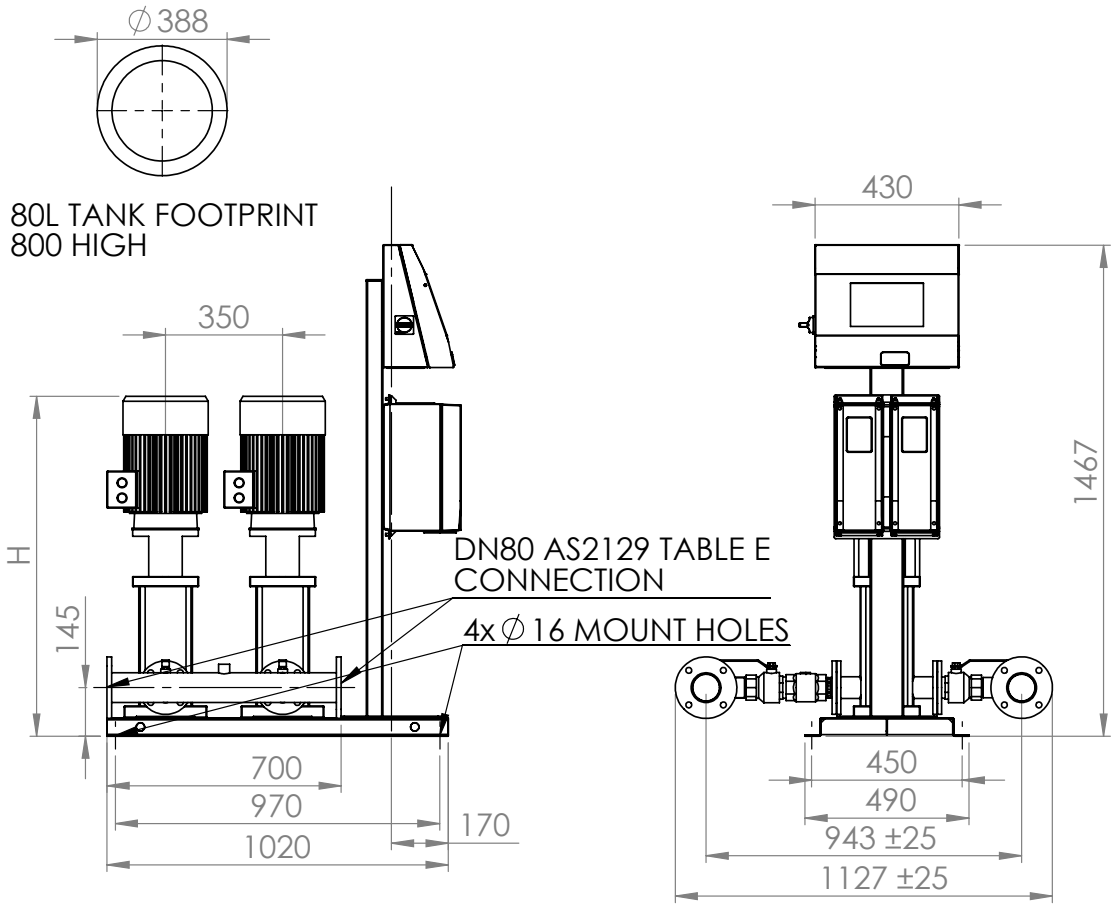
A4 D 2MIQ20

DO NOT SCALE
ANY QUESTIONS PLEASE ASK

ISSUE:



Part Number	Motor kW	Voltage V	Drive	H
2MIQ20-2/3	2.2	3x380-415	5.6A-MR4	742
2MIQ20-3/3	4.0	3x380-415	9.6A-MR4	862
2MIQ20-5/3	5.5	3x380-415	12A-MR4	1007
2MIQ20-7/3	7.5	3x380-415	16A-MR5	1097
2MIQ20-10/3	11.0	3x380-415	23A-MR5	1430

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	DATE:	DAVEY WATER PRODUCTS PTY.LTD.	THIRD ANGLE PROJECTION
ANGULAR: ±1°	DRAWN:	A.B.N. 18 066 327 517 A.C.N. 066 327 517	MATERIAL:
LINEAR: ±10	CHECKED:	TITLE: MONSOON IQ 2xVM20	
	SCALE:1:20	© Copyright Davey Products Pty Ltd 2001	A4 D 2MIQ20 1

A4 D 2MIQ32

DO NOT SCALE
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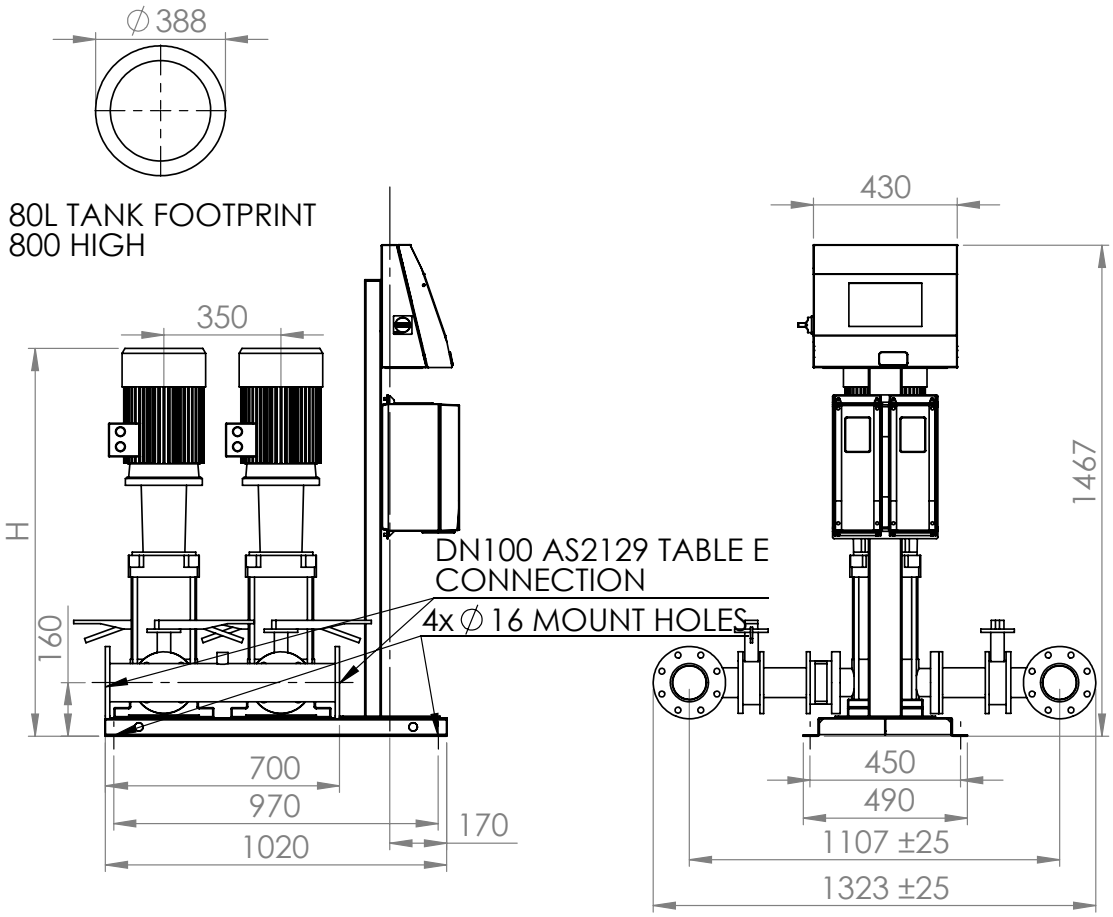

Part Number	Motor kW	Voltage V	Drive	H
2MIQ32-2A/3	3	3x380-415	8A-MR4	825
2MIQ32-3/3	5.5	3x380-415	12A-MR4	1130
2MIQ32-4/3	7.5	3x380-415	16A-MR5	1200
2MIQ32-6/3	11	3x380-415	23A-MR5	1505
2MIQ32-8/3	15	3x380-415	31A-MR5	1645

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	*DATE:*	DAVEY WATER PRODUCTS PTY.LTD.	*THIRD ANGLE PROJECTION*	
ANGULAR: ±1°	*DRAWN:*	A.B.N. 18 066 327 517 A.C.N. 066 327 517	*MATERIAL:*	
LINEAR: ±10	*CHECKED:*	*TITLE:* MONSOON IQ 2xVM32		
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A4 D 2MIQ42

DO NOT SCALE
ANY QUESTIONS PLEASE ASK

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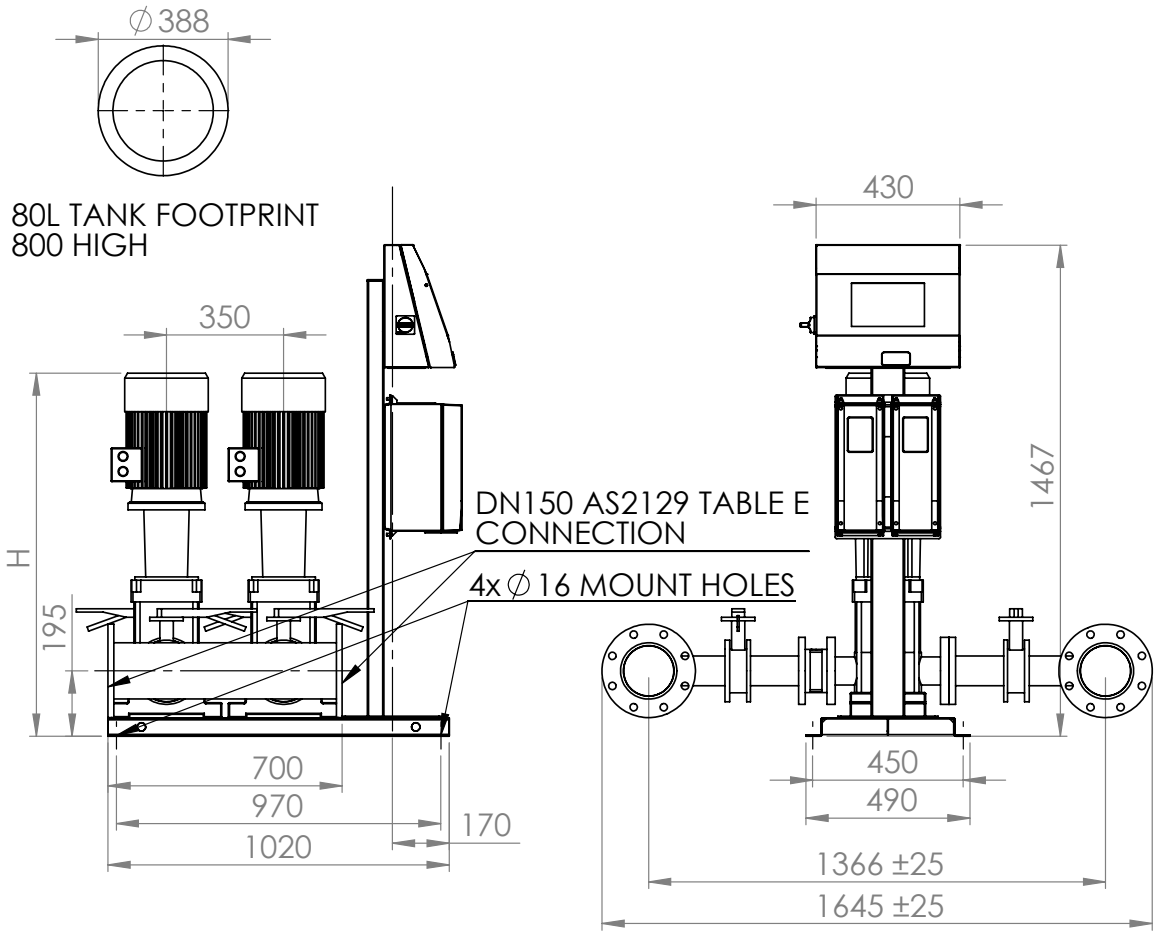

Part Number	Motor kW	Voltage V	Drive	H
2MIQ42-2/3	7.5	3x380-415	16A-MR5	1086
2MIQ42-3/3	11	3x380-415	23A-MR5	1381
2MIQ42-4/3	15	3x380-415	31A-MR5	1461

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	DATE:	DAVEY WATER PRODUCTS PTY.LTD. A.B.N. 18 066 327 517 A.C.N. 066 327 517	THIRD ANGLE PROJECTION
ANGULAR: ±1°	DRAWN:	TITLE: MONSOON IQ 2xVM42	MATERIAL:
LINEAR: ±10	CHECKED:		
	SCALE:1:20	© Copyright Davey Products Pty Ltd 2001	A4 D 2MIQ42 1

A4 D 3MIQ3

DO NOT SCALE
ANY QUESTIONS PLEASE ASK

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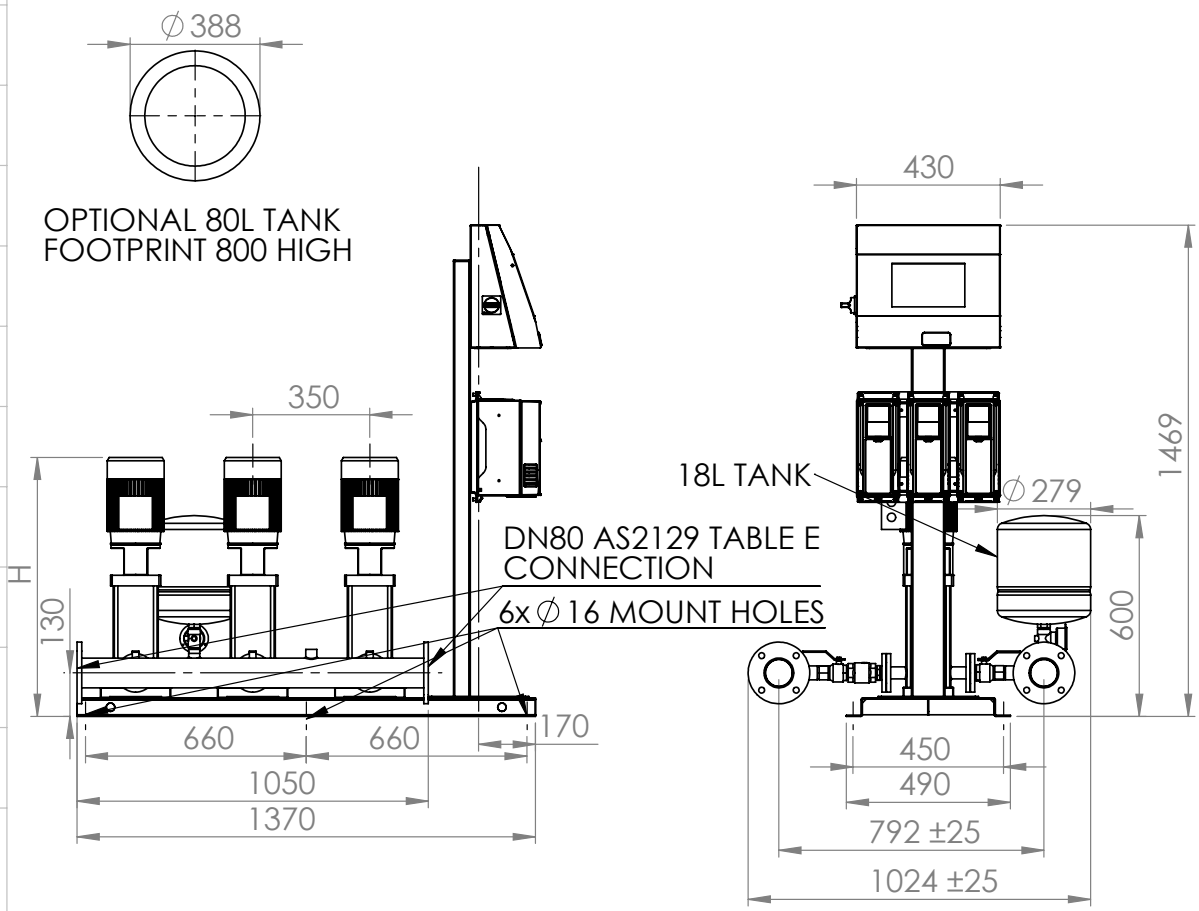

Part Number	Motor kW	Voltage V	Drive	H
3MIQ3-8/3	0.75	3x380-415	3.4A-MR4	633
3MIQ3-12/3	1.1	3x380-415	3.4A-MR4	705
3MIQ3-17/3	1.5	3x380-415	4.8A-MR4	857
3MIQ3-23/3	2.2	3x380-415	5.6A-MR4	965

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	*DATE:*	DAVEY WATER PRODUCTS PTY.LTD. A.B.N. 18 066 327 517 A.C.N. 066 327 517	*THIRD ANGLE PROJECTION*	
ANGULAR: ±1°	*DRAWN:*	*TITLE:* MONSOON IQ 3xVM3	*MATERIAL:*	
LINEAR: ±10	*CHECKED:*			
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A4 D 3MIQ5

DO NOT SCALE
ANY QUESTIONS PLEASE ASK

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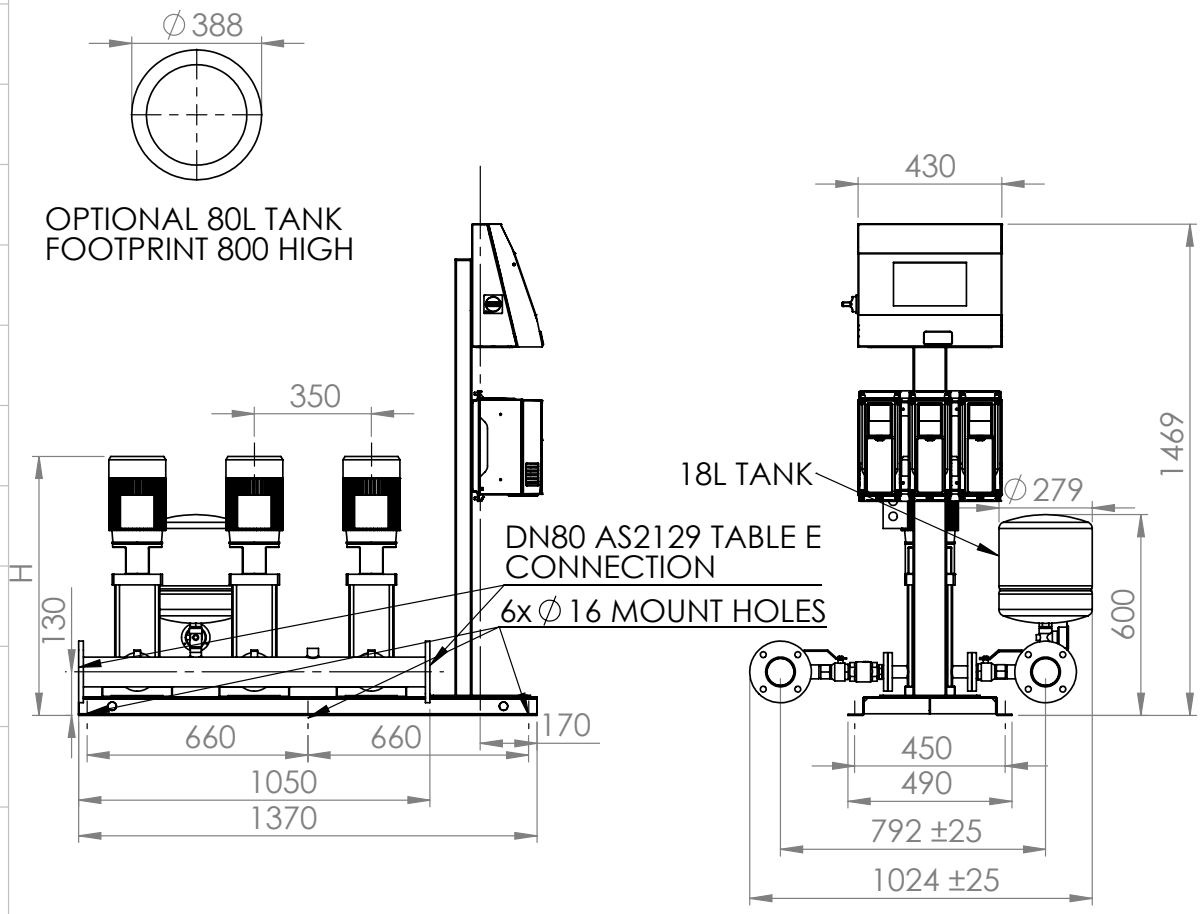

Part Number	Motor kW	Voltage V	Drive	H
3MIQ5-5/3	1.1	3x380-415	3.4A-MR4	624
3MIQ5-8/3	1.5	3x380-415	4.8A-MR4	767
3MIQ5-10/3	2.2	3x380-415	5.6A-MR4	821
3MIQ5-14/3	3.0	3x380-415	8A-MR4	962

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	*DATE:*	DAVEY WATER PRODUCTS PTY.LTD.	*THIRD ANGLE PROJECTION*
ANGULAR: ±1°	*DRAWN:*	A.B.N. 18 066 327 517 A.C.N. 066 327 517	*MATERIAL:*
LINEAR: ±10	*CHECKED:*	*TITLE:* MONSOON IQ 3xVM5	
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A4 D 3MIQ10

DO NOT SCALE
ANY QUESTIONS PLEASE ASK

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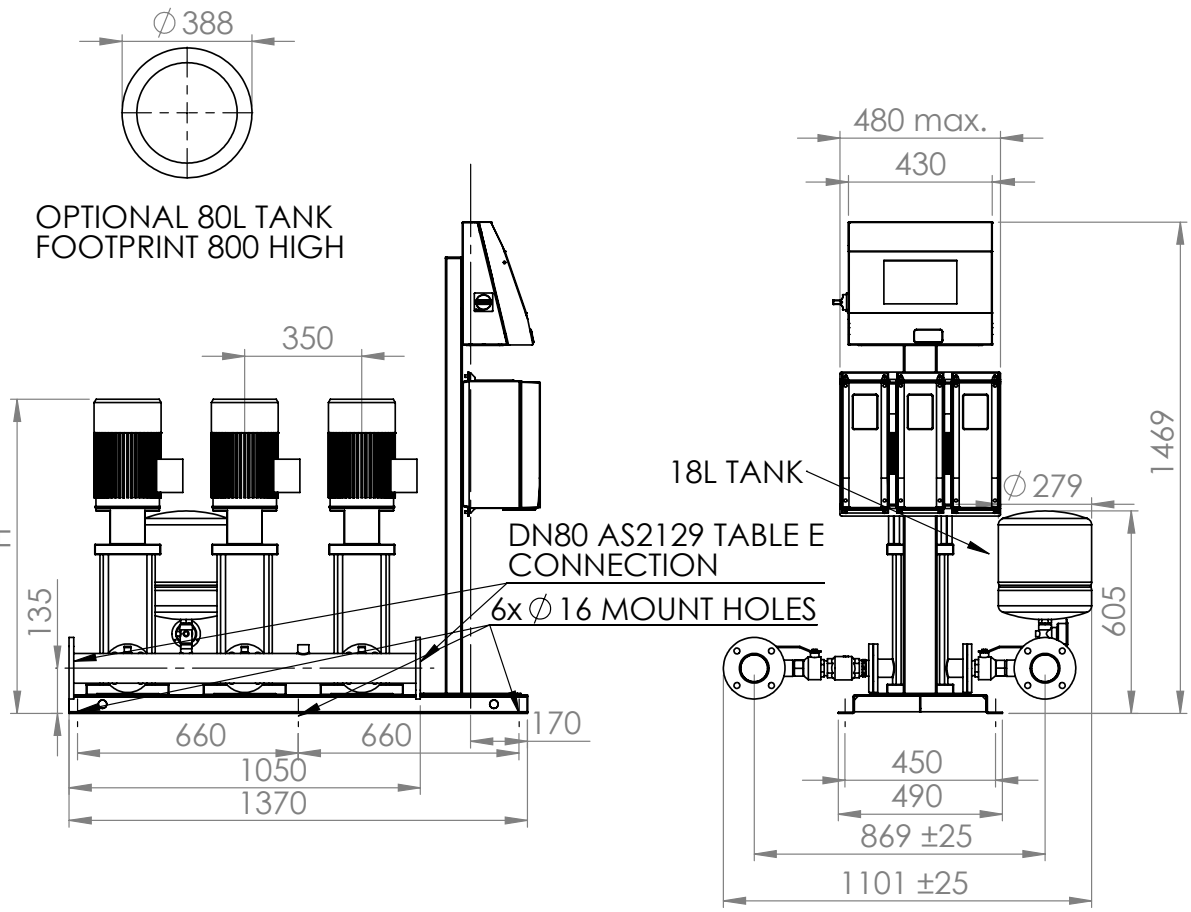

Part Number	Motor kW	Voltage V	Drive	H
3MIQ10-4/3	1.5	3x380-415	4.8A-MR4	765
3MIQ10-6/3	2.2	3x380-415	5.6A-MR4	825
3MIQ10-8/3	3.0	3x380-415	8A-MR4	920
3MIQ10-10/3	4.0	3x380-415	9.6A-MR4	1000
3MIQ10-14/3	5.5	3x380-415	12A-MR4	1235

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	*DATE:*	DAVEY WATER PRODUCTS PTY.LTD.	*THIRD ANGLE PROJECTION*	
ANGULAR: ±1°	*DRAWN:*	A.B.N. 18 066 327 517 A.C.N. 066 327 517	*MATERIAL:*	
LINEAR: ±10	*CHECKED:*	*TITLE:* MONSOON IQ 3xVM10		
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A4 D 3MIQ16

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ANY QUESTIONS PLEASE ASK

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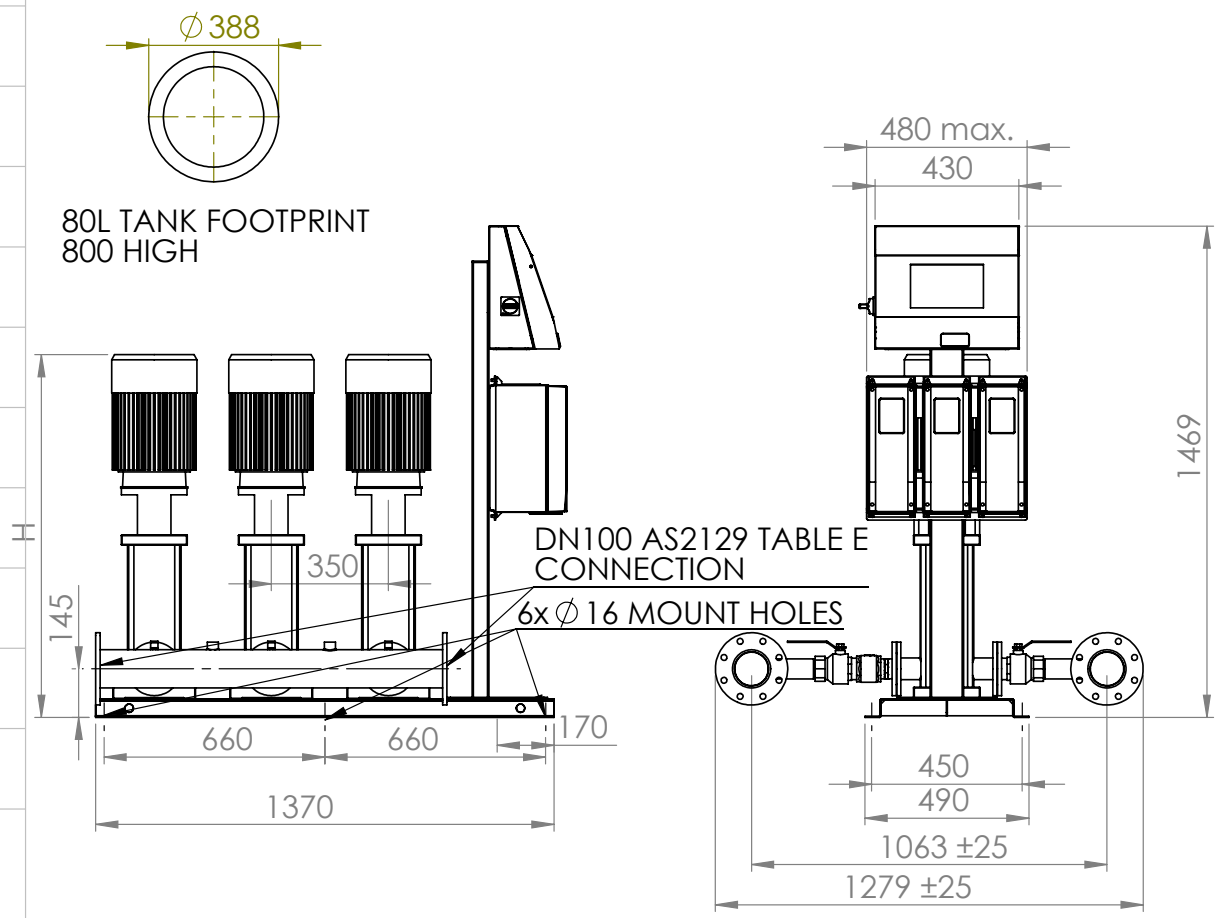

Part Number	Motor kW	Voltage V	Drive	H
3MIQ16-2/3	2.2	3x380-415	5.6A-MR4	745
3MIQ16-3/3	3.0	3x380-415	8A-MR4	825
3MIQ16-4/3	4.0	3x380-415	9.6A-MR4	890
3MIQ16-6/3	5.5	3x380-415	12A-MR4	1095
3MIQ16-8/3	7.5	3x380-415	16A-MR5	1185
3MIQ16-11/3	11.0	3x380-415	23A-MR5	1410

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	DATE:	DAVEY WATER PRODUCTS PTY.LTD.	THIRD ANGLE PROJECTION
ANGULAR: ±1°	DRAWN:	A.B.N. 18 066 327 517 A.C.N. 066 327 517	MATERIAL:
LINEAR: ±10	CHECKED:	TITLE: MONSOON IQ 3xVM16	
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A4 D 3MIQ20

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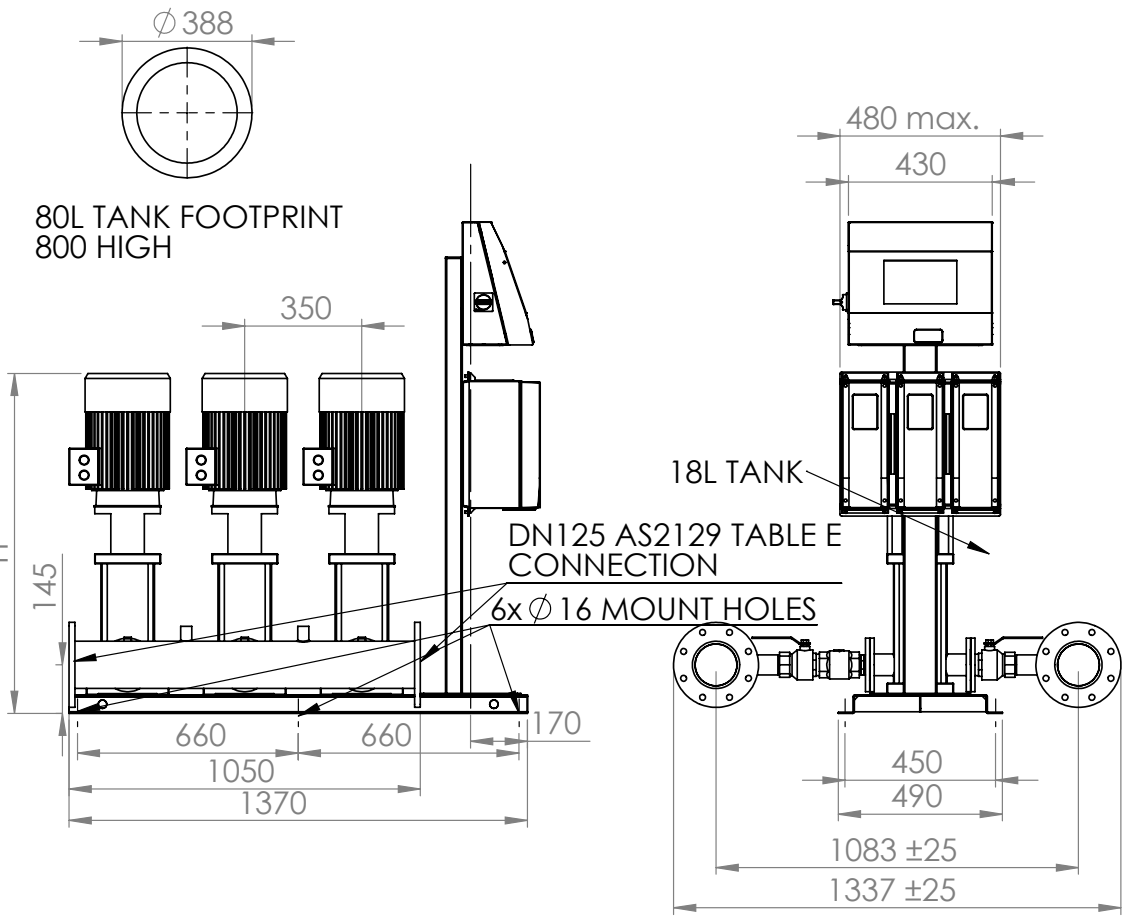
ISSUE:



Part Number	Motor kW	Voltage V	Drive	H
3MIQ20-2/3	2.2	3x380-415	5.6A-MR4	742
3MIQ20-3/3	4.0	3x380-415	9.6A-MR4	862
3MIQ20-5/3	5.5	3x380-415	12A-MR4	1007
3MIQ20-7/3	7.5	3x380-415	16A-MR5	1097
3MIQ20-10/3	11.0	3x380-415	23A-MR5	1430

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	*DATE:*	DAVEY WATER PRODUCTS PTY.LTD. A.B.N. 18 066 327 517 A.C.N. 066 327 517	*THIRD ANGLE PROJECTION*	
ANGULAR: ±1°	*DRAWN:*	*TITLE:* MONSOON IQ 3xVM20	*MATERIAL:*	
LINEAR: ±10	*CHECKED:*			
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A4 D 3MIQ32

DO NOT SCALE
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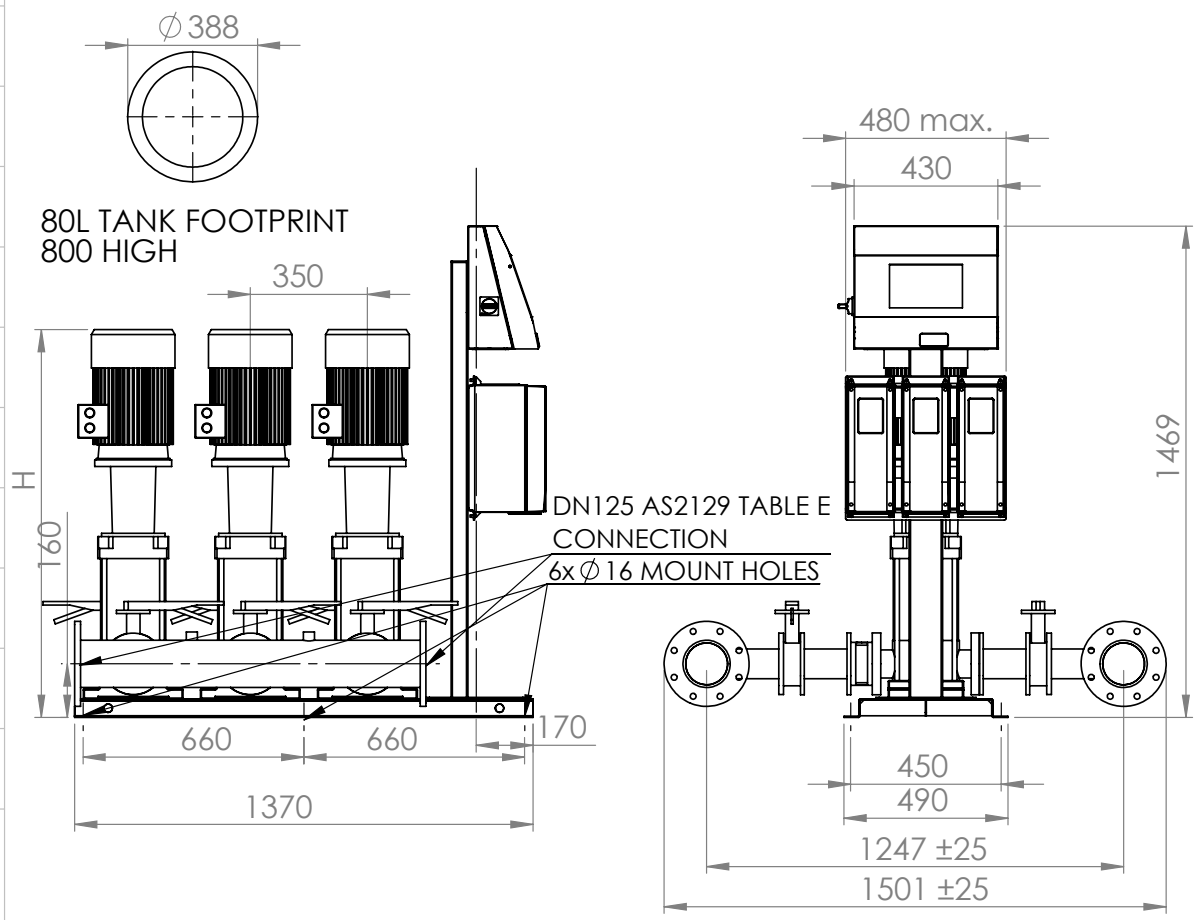
ISSUE:



Part Number	Motor kW	Voltage V	Drive	H
3MIQ32-2A/3	3	3x380-415	8A-MR4	825
3MIQ32-3/3	5.5	3x380-415	12A-MR4	1130
3MIQ32-4/3	7.5	3x380-415	16A-MR5	1200
3MIQ32-6/3	11	3x380-415	23A-MR5	1505

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	DATE:	DAVEY WATER PRODUCTS PTY.LTD.	THIRD ANGLE PROJECTION
ANGULAR: ±1°	DRAWN:	A.B.N. 18 066 327 517 A.C.N. 066 327 517	MATERIAL:
LINEAR: ±10	CHECKED:	TITLE: MONSOON IQ 3xVM16	
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A4 D 3MIQ42

DO NOT SCALE
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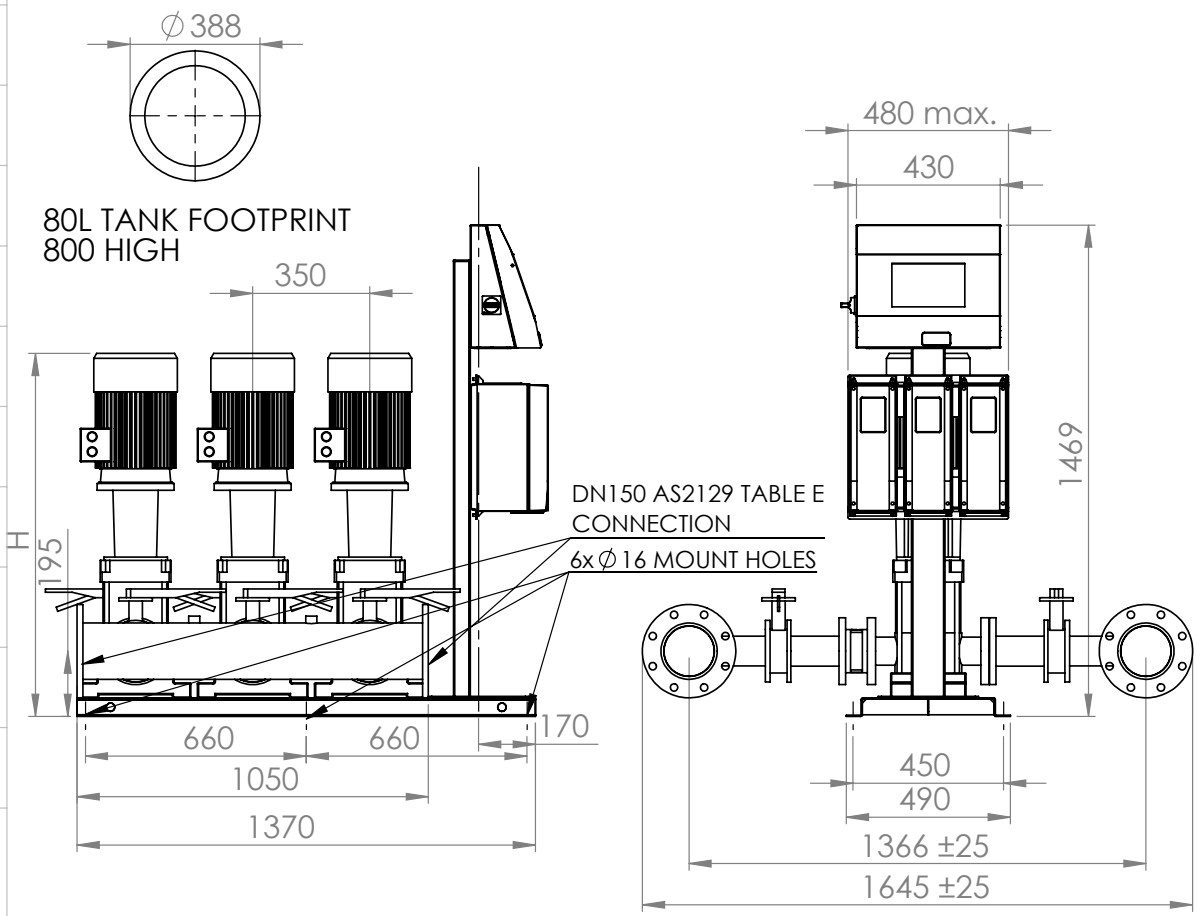
ISSUE:



Part Number	Motor kW	Voltage V	Drive	H
3MIQ42-2/3	7.5	3x380-415	16A-MR5	1086
3MIQ42-3/3	11	3x380-415	23A-MR5	1381

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. CONTROL STAND CAN BE ROTATED 90°
3. SYSTEM PRESSURE RATING: 16BAR
4. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	*DATE:*	DAVEY WATER PRODUCTS PTY.LTD. A.B.N. 18 066 327 517 A.C.N. 066 327 517	*THIRD ANGLE PROJECTION*	
ANGULAR: ±1°	*DRAWN:*	*TITLE:* MONSOON IQ 3xVM42	*MATERIAL:*	
LINEAR: ±10	*CHECKED:*			
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A4 D 4MIQ3

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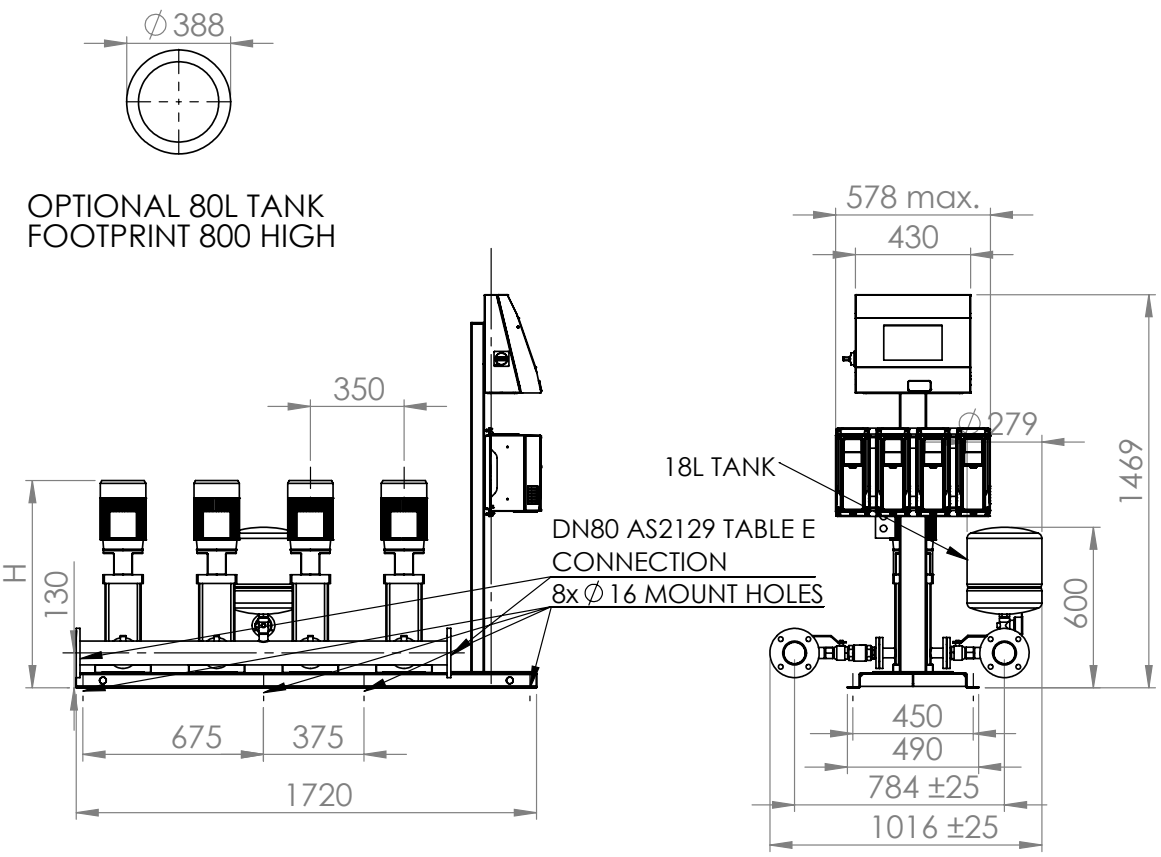
ISSUE:



Part Number	Motor kW	Voltage V	Drive	H
4MIQ3-8/3	0.75	3x380-415	3.4A-MR4	633
4MIQ3-12/3	1.1	3x380-415	3.4A-MR4	705
4MIQ3-17/3	1.5	3x380-415	4.8A-MR4	857
4MIQ3-23/3	2.2	3x380-415	5.6A-MR4	965

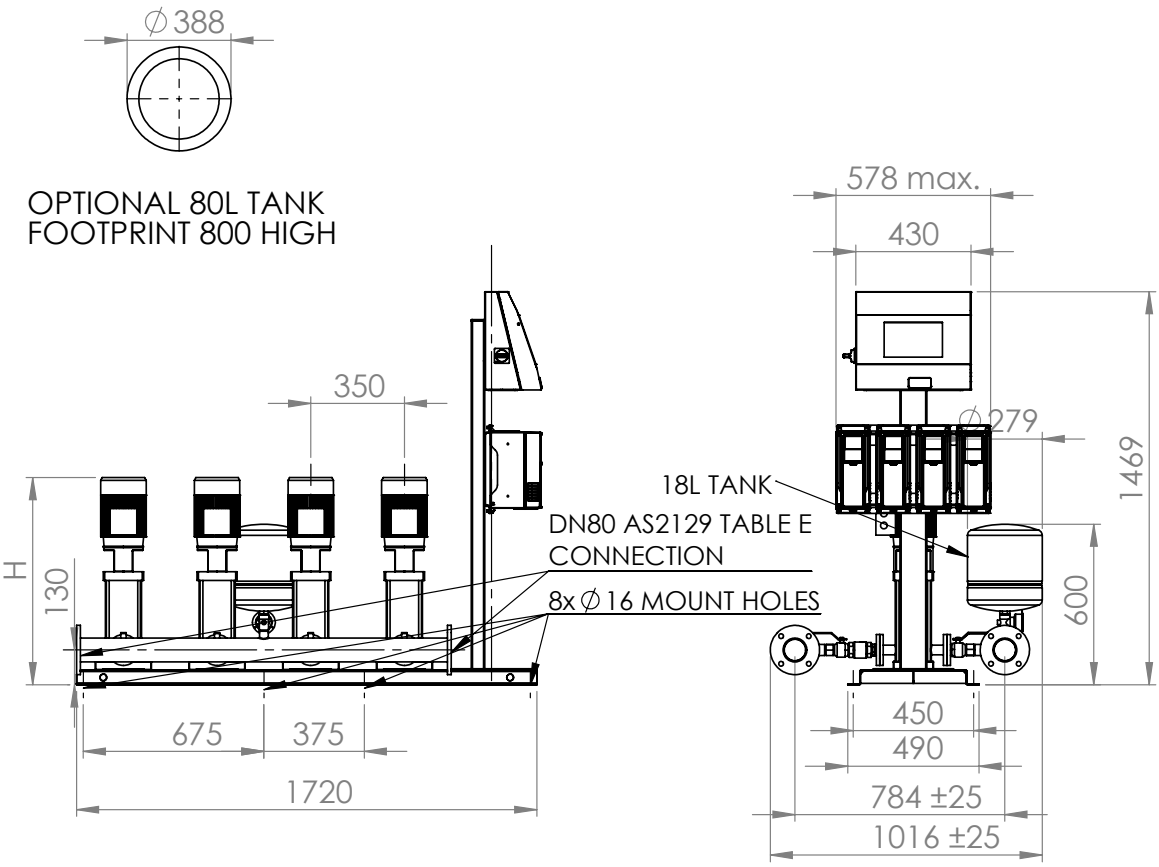
NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. SYSTEM PRESSURE RATING: 16BAR
3. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	DATE:	DAVEY WATER PRODUCTS PTY.LTD.	THIRD ANGLE PROJECTION
ANGULAR: ±1°	DRAWN:	A.B.N. 18 066 327 517 A.C.N. 066 327 517	MATERIAL:
LINEAR: ±10	CHECKED:	TITLE: MONSOON IQ 4xVM3	
	SCALE:1:25	© Copyright Davey Products Pty Ltd 2001	A4 D 4MIQ3 1

A4 D 4MIQ5

DO NOT SCALE
ANY QUESTIONS PLEASE ASK

ISSUE:



Part Number	Motor kW	Voltage V	Drive	H
4MIQ5-5/3	1.1	3x380-415	3.4A-MR4	624
4MIQ5-8/3	1.5	3x380-415	4.8A-MR4	767
4MIQ5-10/3	2.2	3x380-415	5.6A-MR4	821
4MIQ5-14/3	3.0	3x380-415	8A-MR4	962

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. SYSTEM PRESSURE RATING: 16BAR
3. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	DATE:	DAVEY WATER PRODUCTS PTY.LTD.	THIRD ANGLE PROJECTION	
ANGULAR: ±1°	DRAWN:	A.B.N. 18 066 327 517 A.C.N. 066 327 517	MATERIAL:	
LINEAR: ±10	CHECKED:	TITLE: MONSOON IQ 4xVM5		
	SCALE:1:25	© Copyright Davey Products Pty Ltd 2001	A4 D 4MIQ5 1	

A4 D 4MIQ10

DO NOT SCALE
ANY QUESTIONS PLEASE ASK

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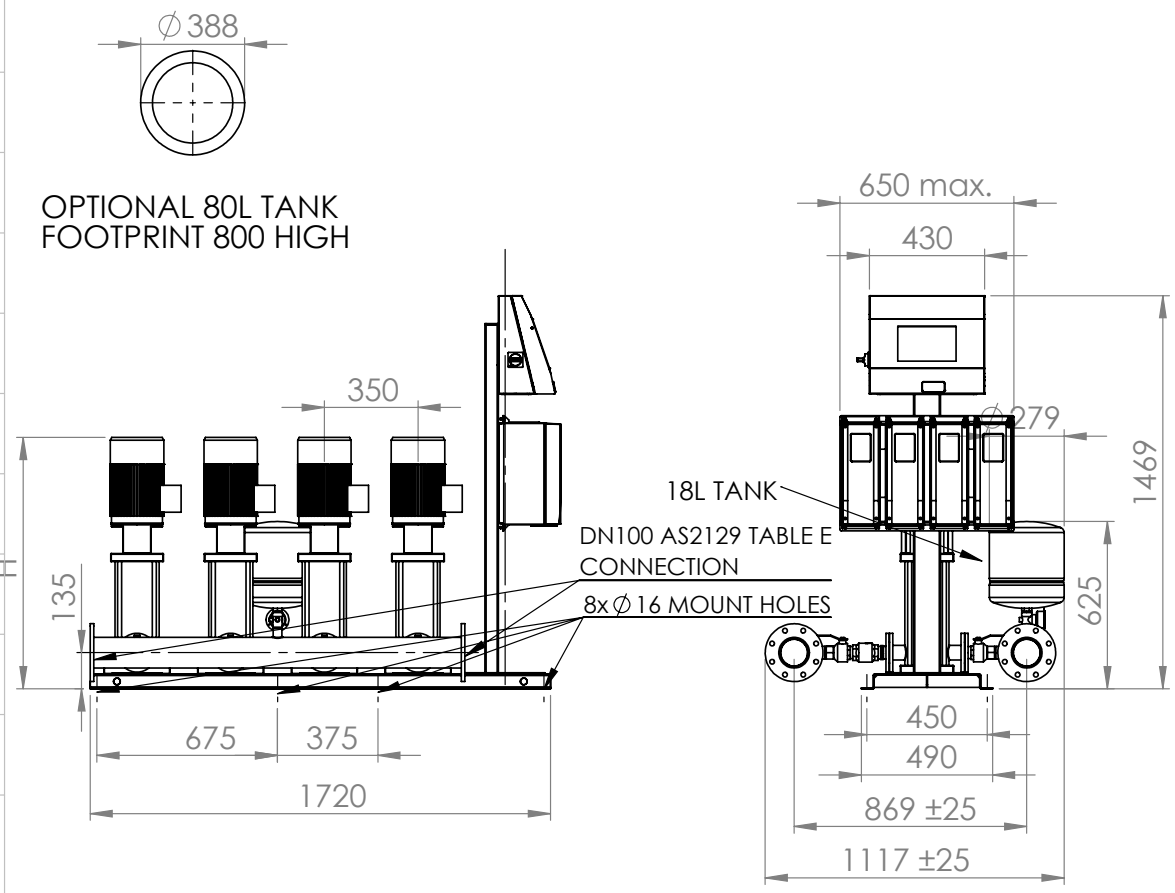

Part Number	Motor kW	Voltage V	Drive	H
4MIQ10-4/3	1.5	3x380-415	4.8A-MR4	765
4MIQ10-6/3	2.2	3x380-415	5.6A-MR4	825
4MIQ10-8/3	3.0	3x380-415	8A-MR4	920
4MIQ10-10/3	4.0	3x380-415	9.6A-MR4	1000
4MIQ10-14/3	5.5	3x380-415	12A-MR4	1235

NOTE:
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2. SYSTEM PRESSURE RATING: 16BAR
3. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	DATE:	DAVEY WATER PRODUCTS PTY.LTD.	THIRD ANGLE PROJECTION
ANGULAR: ±1°	DRAWN:	A.B.N. 18 066 327 517 A.C.N. 066 327 517	MATERIAL:
LINEAR: ±10	CHECKED:	TITLE: MONSOON IQ 4xVM10	
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A4 D 4MIQ16

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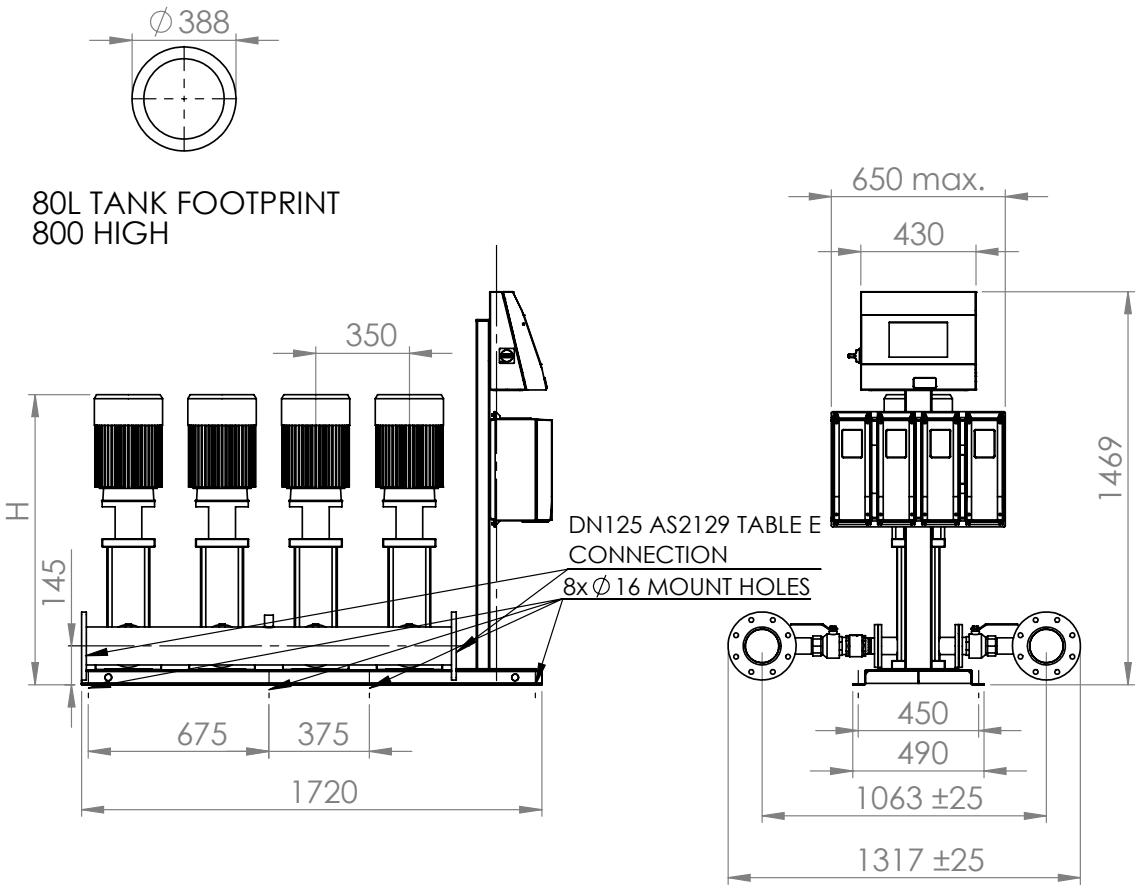
ISSUE:



Part Number	Motor kW	Voltage V	Drive	H
4MIQ16-2/3	2.2	3x380-415	5.6A-MR4	745
4MIQ16-3/3	3.0	3x380-415	8A-MR4	825
4MIQ16-4/3	4.0	3x380-415	9.6A-MR4	890
4MIQ16-6/3	5.5	3x380-415	12A-MR4	1095
4MIQ16-8/3	7.5	3x380-415	16A-MR5	1185

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. SYSTEM PRESSURE RATING: 16BAR
3. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	DATE:	DAVEY WATER PRODUCTS PTY.LTD. A.B.N. 18 066 327 517 A.C.N. 066 327 517	THIRD ANGLE PROJECTION	
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A4 D 4MIQ20

DO NOT SCALE
ANY QUESTIONS PLEASE ASK

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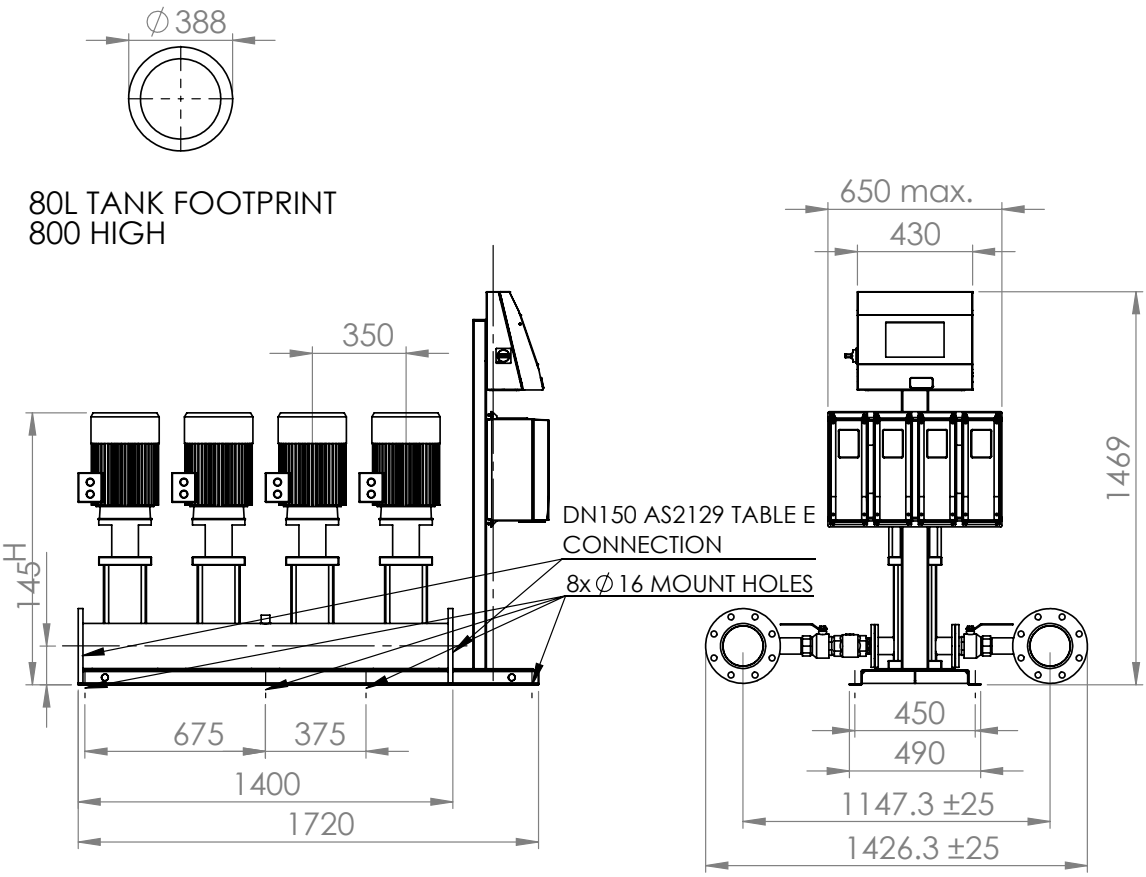

Part Number	Motor kW	Voltage V	Drive	H
4MIQ20-2/3	2.2	3x380-415	5.6A-MR4	742
4MIQ20-3/3	4.0	3x380-415	9.6A-MR4	862
4MIQ20-5/3	5.5	3x380-415	12A-MR4	1007
4MIQ20-7/3	7.5	3x380-415	16A-MR5	1097

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. SYSTEM PRESSURE RATING: 16BAR
3. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	DATE:	DAVEY WATER PRODUCTS PTY.LTD.	THIRD ANGLE PROJECTION
ANGULAR: ±1°	DRAWN:	A.B.N. 18 066 327 517 A.C.N. 066 327 517	MATERIAL:
LINEAR: ±10	CHECKED:	TITLE: MONSOON IQ 4xVM20	
	SCALE:1:25	© Copyright Davey Products Pty Ltd 2001	A4 D 4MIQ20 1

A4 D 4MIQ32

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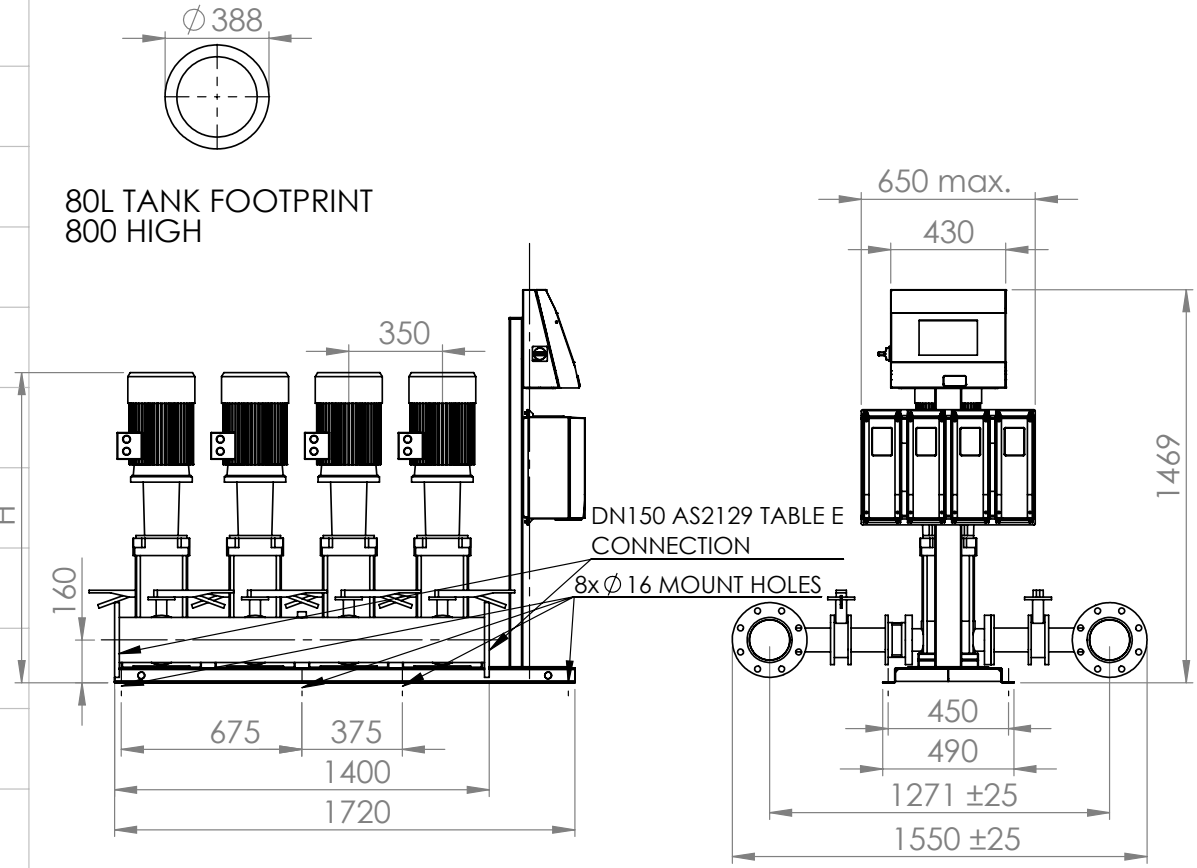
ISSUE:



Part Number	Motor kW	Voltage V	Drive	H
4MIQ32-2A/3	3	3x380-415	8A-MR4	825
4MIQ32-3/3	5.5	3x380-415	12A-MR4	1130
4MIQ32-4/3	7.5	3x380-415	16A-MR5	1200

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. SYSTEM PRESSURE RATING: 16BAR
3. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	DATE:	DAVEY WATER PRODUCTS PTY.LTD. A.B.N. 18 066 327 517 A.C.N. 066 327 517	THIRD ANGLE PROJECTION	
ANGULAR: ±1°	DRAWN:	TITLE: MONSOON IQ 4xVM32	MATERIAL:	
LINEAR: ±10	CHECKED:			
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A4 D 4MIQ42

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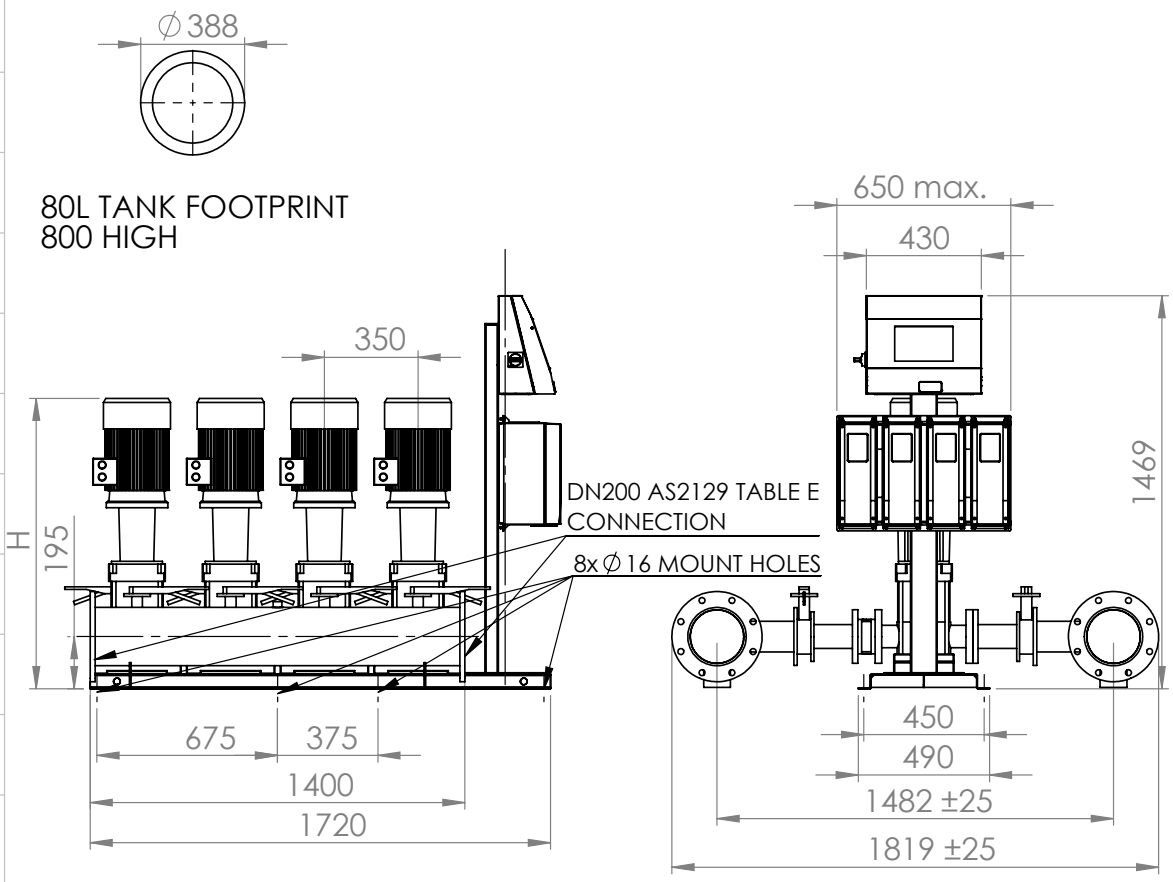
ISSUE:



Part Number	Motor kW	Voltage V	Drive	H
4MIQ42-2/3	7.5	3x380-415	16A-MR5	1086

NOTE:
1. DRAWING SHOWN AS REPRESENTATION ONLY
2. SYSTEM PRESSURE RATING: 16BAR
3. ALL DIMENSIONS IN MILLIMETERS

UNSPECIFIED TOLERANCES:	DATE:	DAVEY WATER PRODUCTS PTY.LTD. A.B.N. 18 066 327 517 A.C.N. 066 327 517	THIRD ANGLE PROJECTION
ANGULAR: ±1°	DRAWN:	TITLE: MONSOON IQ 4xVM42	MATERIAL:
LINEAR: ±10	CHECKED:		
	SCALE:1:25	© Copyright Davey Products Pty Ltd 2001	A4 D 4MIQ42 1

13.2 ELECTRICAL INFORMATION

The information in the table below shows a guide for circuit breaker allowance for complete system with the intention to assist with cable sizing. This information is not a substitute for best practice or local regulations. Please consult the appropriate local authorities to ensure information is correct and applies. The information provided is meant to assist as a rough guide only. If further information is required, please contact Davey.

The circuit breaker allowance shows a guide for a switchboard circuit breaker size for the power supply to the Monsoon IQ (if this is the only device on the nominated circuit). This must always be checked when installed by the relevant suitable qualified person.

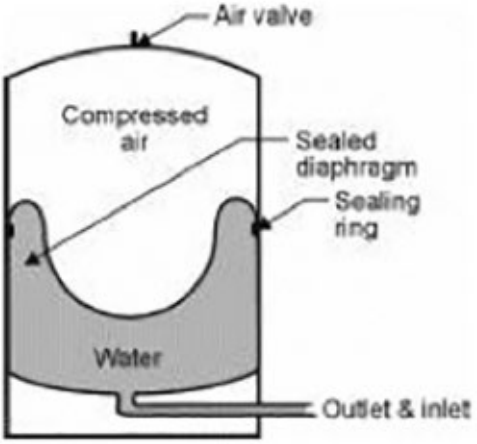
The Generator allowance shows the amount of amps to discuss with your generator supplier. It is not intended as the amount to select the suitable generator but it is theoretically the maximum amount of amps the system can consume (IS 2s). Please consult your generator supplier and consider the harmonics from the Vacon drives in order to select a suitable generator.

Supply Main Circuit Breaker and Generator Allowance Guide

Motor	VSD	VSD Specifications		Circuit Breaker Guide Per Pump	1 Pump		2 Pump		3 Pump		4 Pump	
kW Rating	kW Rating	Maximum Current	Allowance for Generator Current (150%)		Circuit breaker for mains supply allowance	Generator allowance	Circuit breaker for mains supply allowance	Generator allowance	Circuit breaker for mains supply allowance	Generator allowance	Circuit breaker for mains supply allowance	Generator allowance
0.55 kW	1.1 kW	3.4 A	5.1 A	4 A	6 A	7.1 A	10 A	12.2 A	16 A	17.3 A	20 A	22.4 A
0.75 kW	1.1 kW	3.4 A	5.1 A	4 A	6 A	7.1 A	10 A	12.2 A	16 A	17.3 A	20 A	22.4 A
1.1 kW	1.1 kW	3.4 A	5.1 A	4 A	6 A	7.1 A	10 A	12.2 A	16 A	17.3 A	20 A	22.4 A
1.5 kW	1.5 kW	4.8 A	7.2 A	6 A	10 A	9.2 A	16 A	16.4 A	20 A	23.6 A	32 A	30.8 A
2.2 kW	2.2 kW	5.6 A	8.4 A	6 A	10 A	10.4 A	16 A	18.8 A	20 A	27.2 A	32 A	35.6 A
3.0 kW	3.0 kW	8 A	12 A	10 A	16 A	14 A	25 A	26 A	32 A	38 A	50 A	50 A
4.0 kW	4.0 kW	9.6 A	14.4 A	10 A	16 A	16.4 A	25 A	30.8 A	32 A	45.2 A	50 A	59.6 A
5.5 kW	5.5 kW	12 A	18 A	16 A	20 A	20 A	40 A	38 A	50 A	56 A	80 A	74 A
7.5 kW	7.5 kW	16 A	24 A	16 A	20 A	26 A	40 A	50 A	50 A	74 A	80 A	98 A
11.0 kW	11.0 kW	23 A	34.5 A	25 A	32 A	36.5 A	63 A	71 A	80 A	105.5 A	–	–
15.0 kW	15.0 kW	31 A	46.5 A	32 A	40 A	48.5 A	80 A	95 A	–	–	–	–

14. PRESSURE TANKS

14.1 PRESSURE TANK REQUIREMENTS



A pressure tank is fitted to all complete Monsoon IQ systems. Its purpose is twofold –

- To provide supplemental pressure in the system to reduce the cycle time of the pump starts
- To reduce effects of any water hammer in the system

The Monsoon IQ is a high pressure booster system rated to 16 bar as standard and as such must be fitted with a 16 bar Supercell pressure tank -- either a 24018PHP16 (18 L capacity) or a 24080PHP16 (80 L capacity). The table below provides the tank minimum requirements if Davey VM vertical multistage pumps make up the pumpset.

PUMP MODEL	PRESSURE TANK FITTED	PART NUMBER
VM1	1 off -16 Bar 18 litre Supercell Tank	24018PHP16
VM3	1 off -16 Bar 18 litre Supercell Tank	24018PHP16
VM5	1 off - 16 Bar 18 litre Supercell Tank	24018PHP16
VM10	1 off -16 Bar 18 litre Supercell Tank	24018PHP16
VM16	1 off - 16 Bar 80 litre Supercell Tank	24080PHP16
VM32	1 off - 16 Bar 80 litre Supercell Tank	24080PHP16
VM65	2 off - 16 Bar 80 litre Supercell Tank	24080PHP16
VM90	2 off - 16 Bar 80 litre Supercell Tank	24080PHP16

The above recommendations are the minimum requirement for normal application. Adding extra pressure tanks will always assist in smoother operation of the pumpset and may be required if you have a fast reacting system.

14.2 RAPIDLY CHANGING (UNPREDICTABLE FLOW) DEMANDS

Caution

The requirements for pressure tanks described above are the minimum standards to make the Davey Monsoon IQ operate correctly under common circumstances. However there are many circumstances, due to the hydraulic nature of each connection, where a greater volume of pressure tanks is required. This section does not include an exhaustive description of all situations and each case should be considered on its own merits.

Should you have a system that can rapidly change to full flow, the Monsoon IQ system has a minimum response time to these rapid changes in flow demand. This time is 10 seconds for pump 1 and then 12 seconds for each subsequent pump. If the surrounding pipework can handle the sudden change in velocity, a larger pressure tank (or tanks) may be necessary to buffer the response time. In this case the pressure tank minimum sizing should be calculated using Boyles law as illustrated below –

EXAMPLE

Say the maximum predicted sudden change from sleep mode is to a flow rate of 5 l/s.

Assuming pump 1 can handle the increase in flow, the minimum response time for this pump is 10 seconds.

Therefore the draw off to cover the pump response time is 10 x 2.5 l/s = 25 litres

Thus we need the pressure tank to cover that demand until the pump can respond.

The formula to determine the pressure tank requirement is –

$$V = \frac{(Ppc+100)\times C}{Pci+100} - \frac{(Ppc+100)\times C}{Pco+100}$$ where

Ppc = the pressure tank charge pressure in kPa = say 360 kPa

Pci = the nominated Wake Up pressure in kPa = say 400 kPa

Pco = the Setpoint in kPa = say 600 kPa

V = draw off required to cover pump response time

C = tank capacity required

Therefore $25 = \frac{(360+100)\times C}{(400+100)} - \frac{(360+100)\times C}{(600+100)}$

$$25 = \frac{460C}{500} - \frac{460C}{700}$$

$$25 = 0.92C - 0.66C$$

$$25 = 0.26C$$

Therefore required tank capacity $C = \frac{25}{0.26}$ = 96 litres. (96 litres should be rounded up to the tank size or sizes that are available to suit. In this case, it would be a Davey 100 litre tank if maximum pressure was under 10 bar)

This calculation does not allow for the take up from the pumpset during the ramp up but if we discount this, it allows for an appropriate buffer.

15. VARIANT BOOSTER SYSTEMS

15.1 WATER TREATMENT BOOSTER

A package solution is available for water treatment applications. This package comes complete with filters, UV sterilization and the necessary equipment to make this a complete unit for the end user. Please consult Davey with your design requirements.

15.2 END SUCTION PUMP BOOSTER

A package is available to suit an end suction configuration. This comes complete with the necessary flanges and connecting pipework to make this a desirable package for the end user. Please consult Davey with details of your design requirements.

16. COMMISSIONING

The Monsoon IQ has many technical features and while it may be tempting to commission a new system without specialist input, there are a number of reasons why signing a commissioning agreement with Davey is a better idea.

During Commissioning, all aspects of the pump installation are thoroughly checked so that at start-up, the customer can be assured that the system will be running at absolute peak performance right from the start, and that it has been installed correctly in every detail.

Time and money spent on downtime, while having the system performance analysed and corrected, can be saved by carrying out proper commissioning. Correct commissioning also ensures that the system is running as energy-efficiently as possible, which means energy savings for the end user. Commissioning services can be used for virtually all Monsoon IQ installation and application types.

Customer benefits

- Peace of mind in the knowledge that system performs optimally, that parts will not wear out due to incorrect installation, and that system and pumps are fully compatible
- Greatly reduce risk of unexpected site problems
- Customer understanding of what can go wrong and what to do when it happens
- Minimised down time due to mechanical and electrical checks
- Optimised settings and running according to local site conditions
- Comprehensive training for users (Management level and product supervision level)
- Required maintenance and maintenance training
- Points of contact for assistance
- Maintenance planning

Failure to do this may result in incorrect system operation, reduced energy savings & in some instances damage to equipment.

17. SPECIFY DAVEY

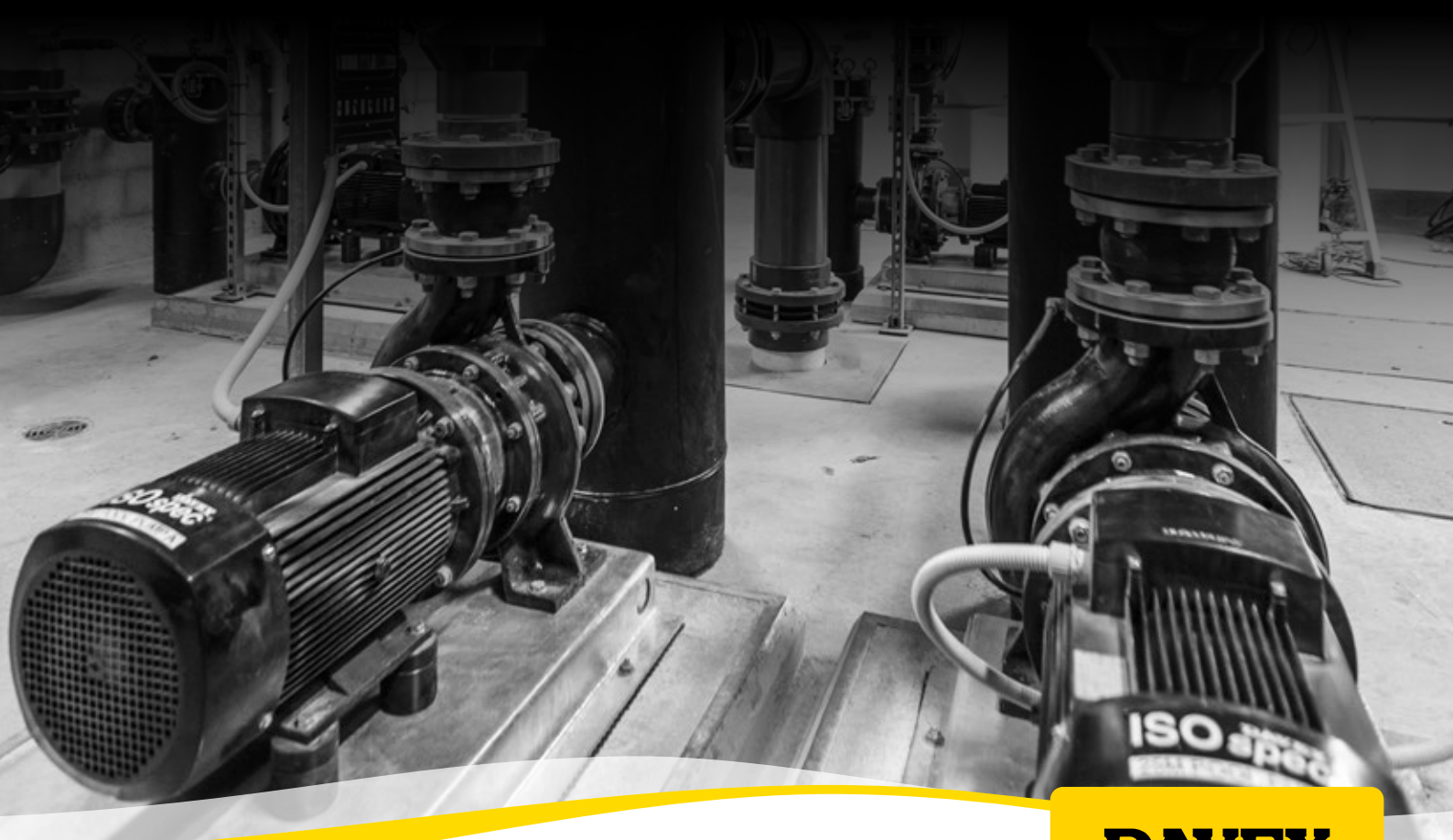
If you are a consultant, engineer, designer, planner or project manager and you need assistance with writing specification text for your feasibility studies, projects, expressions of interest and tenders documents, we have a specialised team ready to assist. We can also assist you with hydraulic design of the project in relation to the Davey products and offer assistance/recommendations based on our extensive experience.

18. FURTHER INFORMATION

Davey Pumps have extensive information on line at www.davey.com.au regarding this and other products which customers can research for themselves. However if there are any issues which you are unsure of, or need further information on, do not hesitate to contact Davey Water Products Pty Ltd.

Notes

Monsoon IQ



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