GRUNDFOS
PRODUCT GUIDE

BoosterpaQ®

Grundfos CR-Booster systems
60 Hz

BE > THINK > INNOVATE >

GRUNDFOS

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Mission

- to successfully develop, produce, and sell high quality pumps and pumping systems worldwide, contributing to a better quality of life and healthier environment

GBJ - Bjerringbro, Denmark

GMU - Fresno, California

GPU - Olathe, Kansas

GMX - Monterrey, Mexico

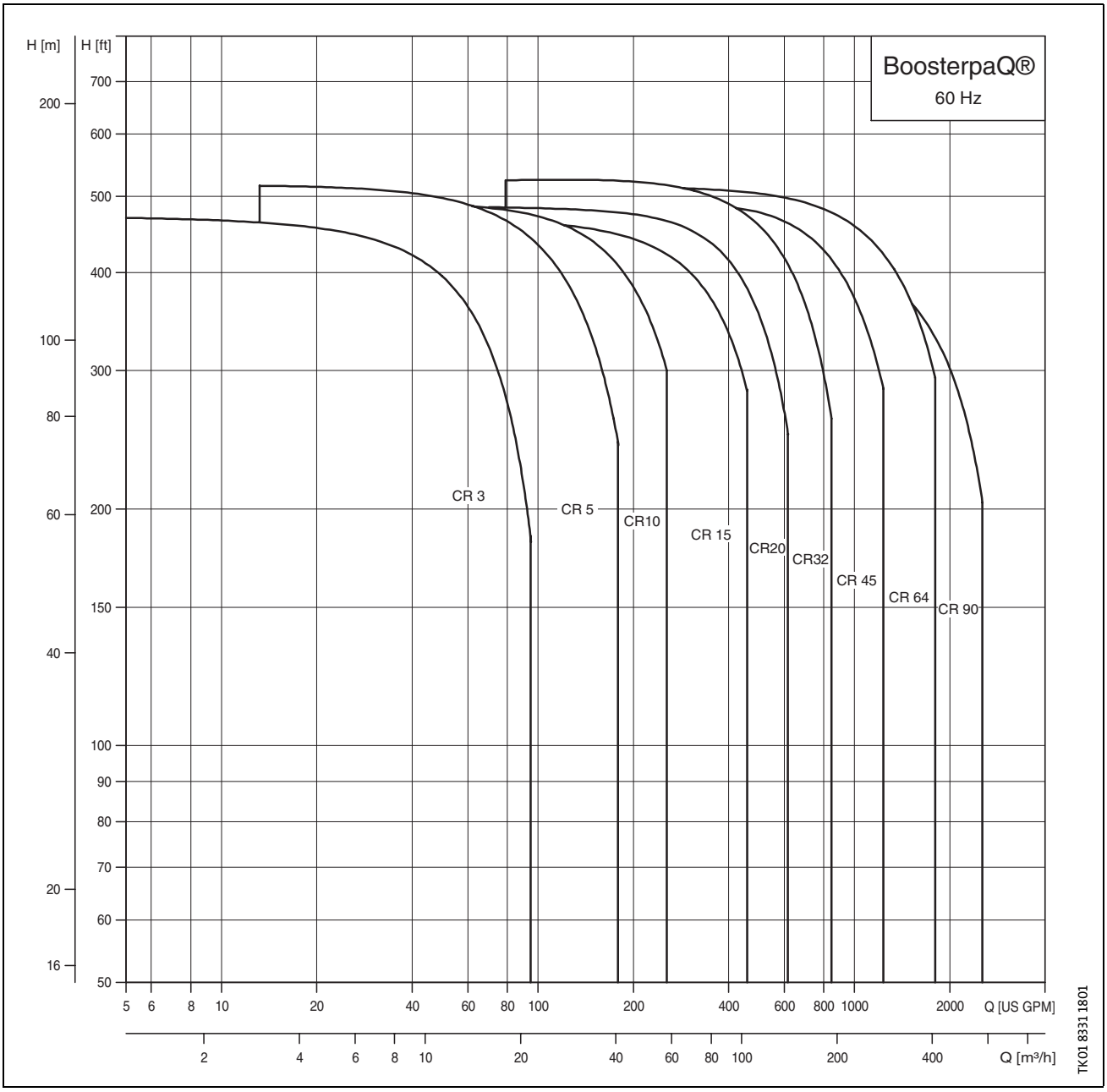
GPA - Allentown, Pennsylvania

GCA - Oakville, Ontario

- One of the 3 largest pump companies in the world
- World headquarters in Denmark
- North American headquarters in Kansas City - Manufacturing in Fresno, California
- 60 companies in 40 countries
- More than 10 million pumps produced annually worldwide
- North American companies operating in USA, Canada and Mexico
- Continuous reinvestment in growth and development enables the company to

  BE responsible, **THINK** ahead, and **INNOVATE**

Performance range

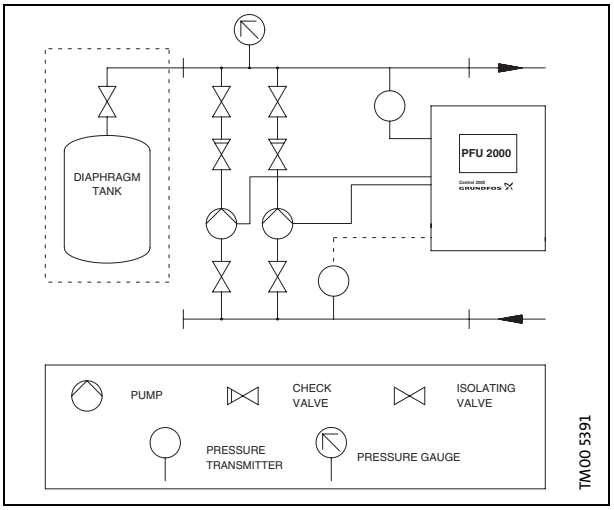


BoosterpaQ

The Grundfos BoosterpaQ consists of 2 - 4 CR(E) pumps coupled in parallel and mounted on a common base frame provided with all the necessary fittings and a Grundfos Control 2000 cabinet.

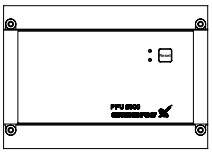
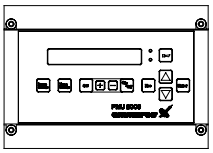
BoosterpaQs with up to 8 pumps are available on request.

When delivered, the Grundfos BoosterpaQ is factory tested and programmed according to the customer's specifications, ready for operation.



Control 2000

A Grundfos Control 2000 control cabinet holds a **PFU 2000** (**P**ump **F**unctional **U**nit **2000**) electronic control unit. The Grundfos Control 2000 may also be supplied with a **PMU 2000** (**P**ump **M**anagement **U**nit **2000**) for advanced control.

 TM00 2721 1302	PFU 2000 **Simple operation**
 TM00 7023 1302	PMU 2000 **Advanced operation** Enables regular optimization of operating conditions and read-out of operating data.

Functions

Control 2000 offers the following functions:

- Automatic **cascade control** of pumps
- Automatic **changeover between pumps** in operation (ensures the same number of operating hours for all pumps)
- **Stop function** when operating at low flow (increases the efficiency when operating at low flow)
- **Manual operation** (enables testing of individual pumps)
- Various **setpoint influences**:

  – friction-loss compensation (decreasing pressure with decreasing flow)*

  – setpoint adjustment via external signals (temperature, time, level and flow)*
- Various **digital remote-control functions**:

  – start/stop of system

  – reduced operation (limits the max. number of pumps in operation)*

  – 2-point control of the setpoint (enables control of the setpoint by means of 2-point contact)*

  – 3-point control of the setpoint (enables control of the setpoint by means of 3-point contact)*

  – emergency flow operation (aids in firefighting)*
- **Pump and system monitoring functions**:

  – high and low system pressure shutdown*

  – inlet pressure measurement*

  – motor protection

  – Grundfos BUS communication*
- **Display, alarm and signal functions:**

  – 2 x 24 character LCD display*

  – signal lights for operating and fault indication (green and red light-emitting diodes)

  – potential-free changeover contacts for operating and fault signals
- Clock program*

  – up to 10 different setpoints per 24 hour period

* Setting can be changed only when PMU 2000 is connected.

Application and need

Abundant water is the key to progress and comfort. A booster system should be planned the right way whether used for water supply, industrial purposes or irrigation. The purpose is to optimize operating costs and achieve a high degree of comfort.

The starting point when planning a booster system is need. Every supply area has its own consumption pattern.

The Grundfos BoosterpaQ can be used for many different purposes. A number of typical examples are shown below.

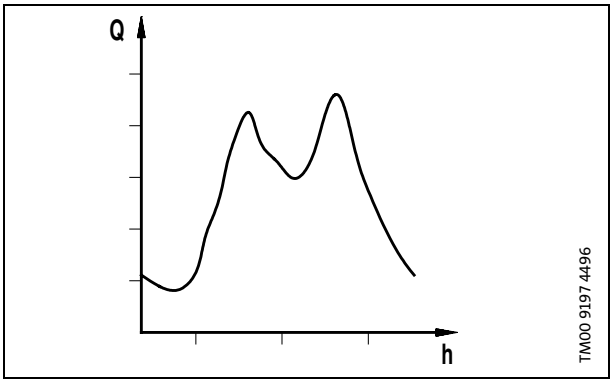
Water supply

Access to the right quantity of clean water at the right time is the key to a healthy life. The term **water supply** covers:

- waterworks, pressure boosting in distribution circuits
- housing tracts, schools, hotels, hospitals, etc.

Studies of the water consumption in a typical waterworks have revealed large differences in the daily water consumption pattern. Consumption is characterized by:

- sudden variations between min. and max. flow
- variation taking place over long periods
- constant pressure.



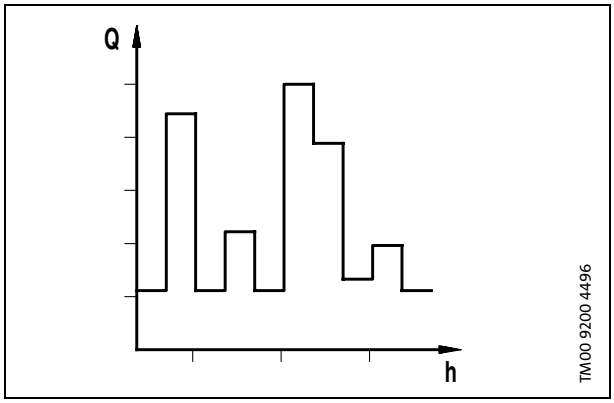
Industry

In a number of processes water plays a vital role. The industrial consumption pattern varies with the type of industry. Many manufacturing processes consist of a cycle requiring constant pressure even where large and very quick flow variations are concerned. Among others, **industrial** pressure boosting and liquid transfer comprises:

- the food industry
- the textile industry
- the petrochemical industry
- the pharmaceutical industry

In general, consumption is characterized by:

- large variations from minimum load to peak load
- sudden variations
- constant pressure



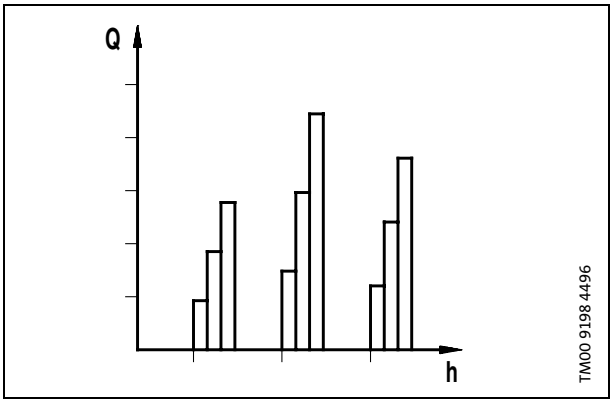
Irrigation

In order to maintain recreational areas used for specific purposes it may be necessary to irrigate. The term **irrigation** covers:

- gardening
- parks
- sports grounds etc.

A typical irrigation application could be a golf course. When the irrigation system is started, consumption depends on the number of sprinklers activated. A typical **irrigation system** is characterized by:

- irrigation zones
- variable, but known consumption
- system divided into pressure zones



General data

Type key

Example	BoosterpaQ	ME	2	CRE 15-5	PMU	3 x 460 V, 60 Hz

Type range

Subgroups:
MS - MF - ME - MES

Number of pumps: 2 - 4

Pump type

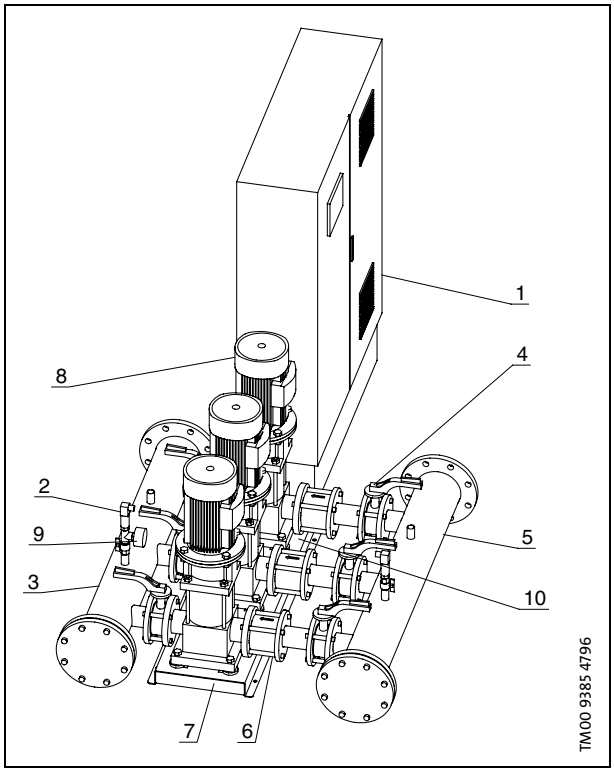
Control 2000 control panel:
PMU: PMU 2000
PFU: PFU 2000

Supply voltage, frequency

Construction

The following is standard on all BoosterpaQ systems.

Pos.	Designation	Qty.
1	Control 2000	1
2	Pressure transmitter (discharge)	1
3	Discharge manifold (stainless steel)	1
4	Isolating valve	2 per pump
5	Suction manifold (stainless steel)	1
6	Check valve	1 per pump
7	Base frame (stainless steel)	1
8	CR(E) pump	2 - 4
9	Pressure gauge	2
10	Nameplate	1



System configuration

BoosterpaQ consists of three main groups:

- BoosterpaQ S
- BoosterpaQ F
- BoosterpaQ E

The main groups are divided into subgroups as shown in the table below.

Maingroup	Subgroup	Description of pumps			
		Number of pumps	Number of speed controlled pumps	Mode of operation	Comments
BoosterpaQ S (Start/stop)	**MS**	2 - 4		Constant speed operation (start/stop).	
BoosterpaQ F (Variable speed)	**MF**	2 - 4	1	Speed control via variable frequency drive mounted in control cabinet.	Variable frequency drive control rotates among all pumps in the system.
			All other pumps	Constant speed operation (start/stop).	
BoosterpaQ E (Variable speed)	**ME**	2 - 4	All	Speed control via variable frequency drive integrated in the motor.	All pumps in operation run at the same speed.
	MES	2 - 4	1	Speed control via variable frequency drive integrated in the motor.	
			All other pumps	Constant speed operation (start/stop).	

Abbreviations:

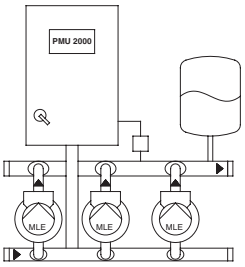
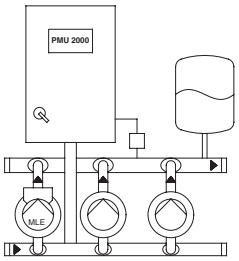
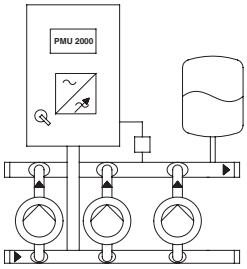
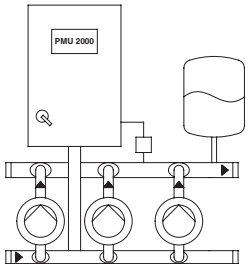
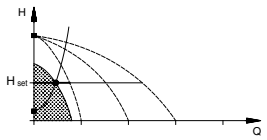
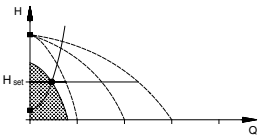
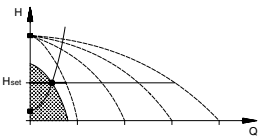
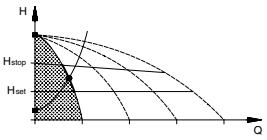
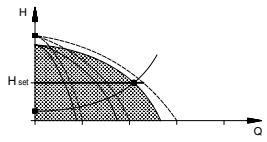
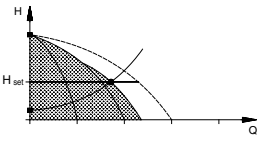
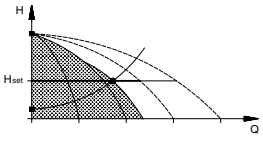
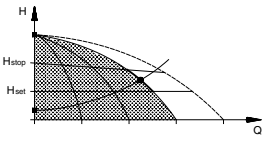
M: Control 2000 features a Microprocessor for the control of all functions.

S: Some or all of the pumps in the system are Constant Speed operated (start/stop).

F: Control 2000 features a variable frequency drive for the control of some of the pumps in the system.

E: Some or all of the pumps in the system are fitted with MLE motors with frequency converters integrated in the motors.

Overview of functions

Variable speed			Start/stop
Grundfos BoosterpaQ ME	**Grundfos BoosterpaQ MES**	**Grundfos BoosterpaQ MF**	**Grundfos BoosterpaQ MS**
 TM00 7983 2296	 TM00 7985 2296	 TM00 2680 0294	 TM00 2674 0294
One pump in operation.	One pump with MLE motor in operation.	One pump in operation via variable frequency drive.	One pump in operation.
 TM00 7995 2296	 TM00 7993 2296	 TM00 2757 0294	 TM00 2749 0294
Three pumps in operation.	One pump with MLE motor and two mains-operated pumps in operation.	One pump in operation via variable frequency drive and two pumps mains operated.	Three pumps in operation.
 TM00 7996 2296	 TM00 7998 2296	 TM00 2759 0294	 TM00 2751 0294
• Maintains constant pressure through continuous adjustment of the speed of the operating pumps. • The system performance is adjusted to the demand through cutting in/out of pumps and parallel speed control of the pumps in operation. • Pump changeover is automatic and depends on load, time and fault.	• Maintains constant pressure through continuous adjustment of the speed of one variable speed pump. The other pumps (fixed speed) are cut in/out according to demand, providing performance corresponding to the consumption. • The pump (MLE motor) will always start first. • Pump changeover is automatic and depends on load, time and fault.	• Maintains constant pressure through continuous adjustment of the speed of one pump. The other pumps (fixed speed) are cut in/out as required. • The variable frequency-controlled pump is always started first. • Pump changeover is automatic and depends on load, time and fault. • All pumps are controlled by the variable frequency drive alternately.	• Maintains an almost constant pressure by cutting the pumps in or out as required. • Pump changeover is automatic and depends on load, time and fault.

System overview

System	ME	MES	MF	MS
Range				
Number of pumps	2-4	2-4	2-6	2-6
Mechanical				
In-line pipe routing	●	●	●	●
AISI 316 stainless steel manifold	●	●	●	●
AISI 304 stainless steel base frame	●	●	●	●
232 psi [16 bar] standard maximum ouput, 362 psi [25 bar] optional (reduced by pressure transducer, gauge, and tank limits)	●	●	●	●
Control				
NEMA 3R			●	
NEMA 4	●	●		●
PFU 2000 (simple operation)	●	●	●	●
PMU 2000 (Advanced Control)	●	●	●	●
Pump alteration	●	●	●	●
Constant pressure	●	●	●	
Friction loss compensation	●	●	●	
Dry running protection	●	●	●	●
External variable frequency drive			●	
Integrated variable frequency drive (MLE motor)	●	●		
Application (recommended models)				
Water supply	●	●	●	●
Industry	●	●	●	
Irrigation	●	●	●	●
Approvals*	cUL	cUL	cUL	cUL

* All control panels are UL listed to US and Candian safety standards and all motors are UL/cUL recognized. BoosterpaQs are certified and listed by UL for conformance to US and Candadian safety standards.

General information

When selecting a BoosterpaQ it is important to ensure:

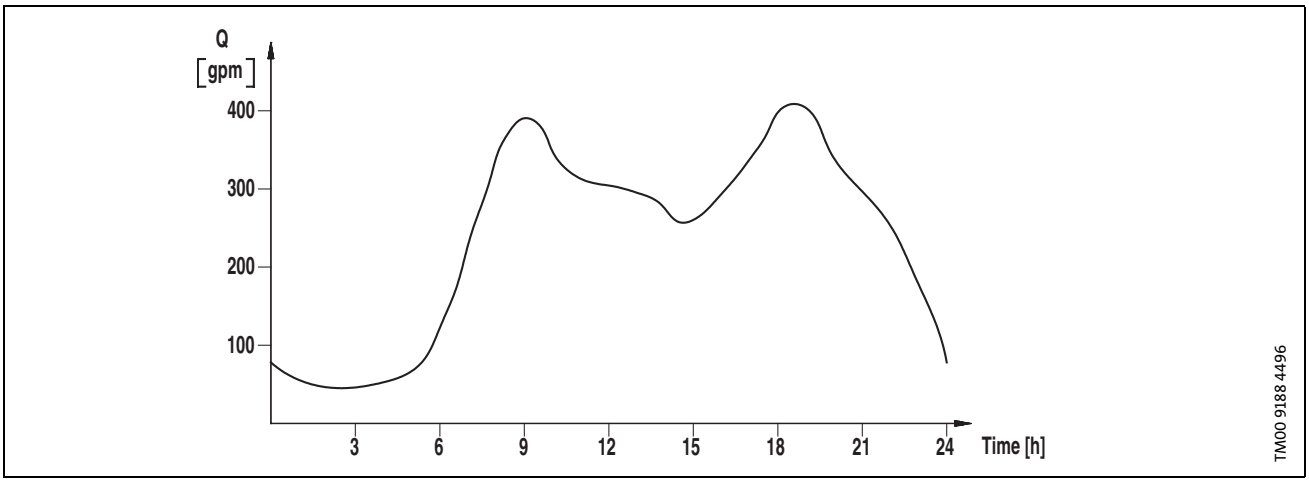
- that the capacity of the BoosterpaQ can meet the highest possible demand both in terms of flow and pressure.
- that the BoosterpaQ is not oversized.
  This is important in relation to the installation and operating costs. If required, capacity can always be enhanced at a later stage by adding one or more pumps connected in parallel.

Consumption pattern

The consumption pattern can be illustrated in many ways:

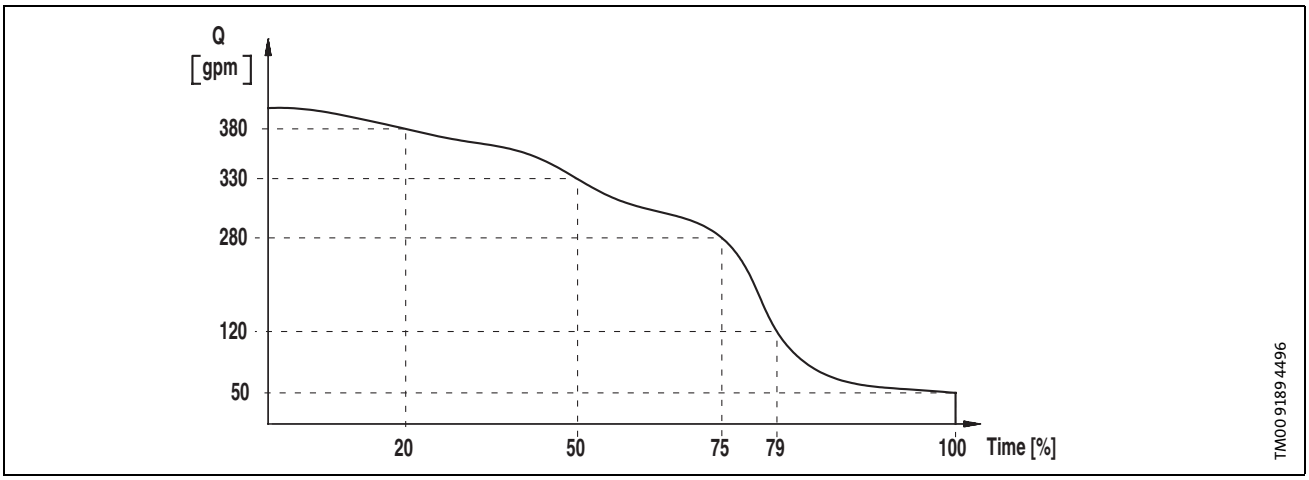
24-hour profile

A 24-hour profile shows the consumption at different times of the day:



Duty-time profile

Based on the 24-hour profile, a duty-time profile is worked out.
This profile is used to give an overview of how long the system is in duty at a specific flow.



This example shows the following:

- 100% of the time: flow ≥ 50 gpm
- 79% of the time: flow > 120 gpm
- 75% of the time: flow > 280 gpm
- 50% of the time: flow > 330 gpm
- 20% of the time: flow ≥ 380 gpm

System selection

When sizing the system, the following should be considered:

1). The consumption pattern to be met by the BoosterpaQ, including

– how much does consumption vary

– how suddenly does consumption vary

2). The distribution of consumption over time.

3). The type of BoosterpaQ to be selected. The selection should be based upon the consumption pattern. The following types are available:

– MS, MF, ME, MES.
See page 14.

4). The system size to be selected (pump performance and number of pumps). The selection of system size should be based upon the consumption pattern, considering the following aspects:

– efficiency

– NPSHA

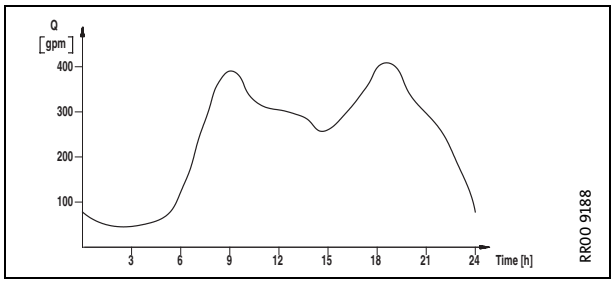
– are stand-by pumps required?
See page 15.

5). The diaphragm tank to be selected.
See page 16.

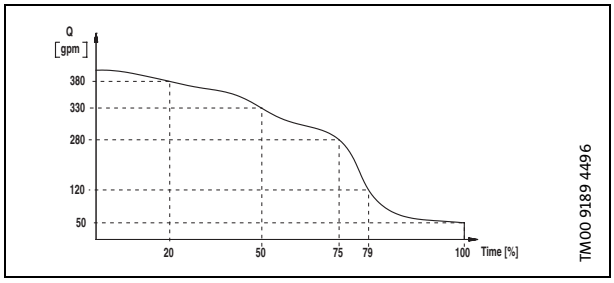
6). The dry-running protection to be selected.
See page 16.

7). Is friction-loss compensation required?
See page 16.

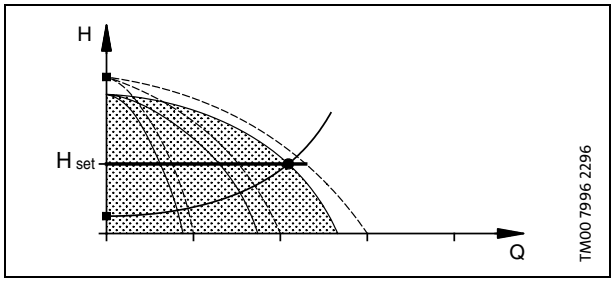
1. Consumption pattern



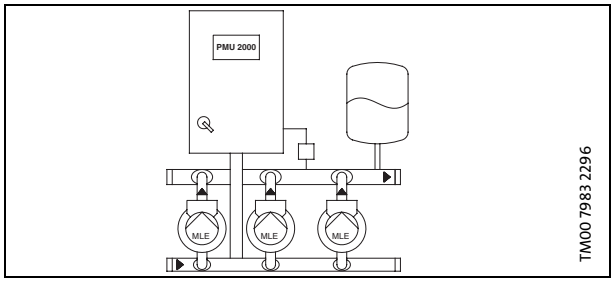
2. Duty-time profile



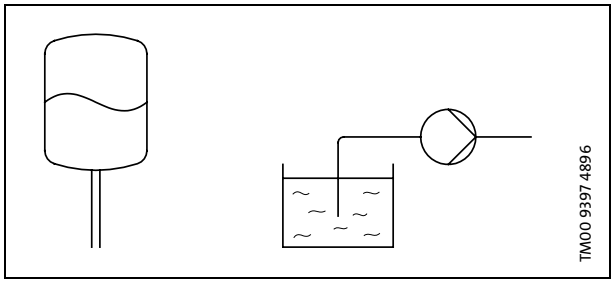
3. System/control type



4. System size



5. Accessories

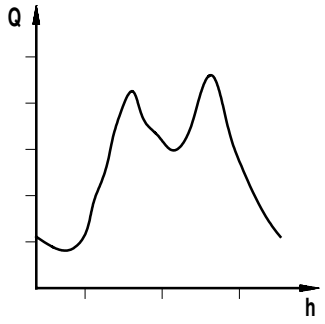
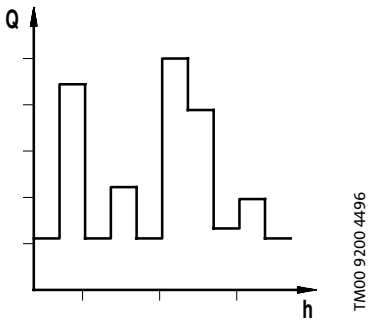
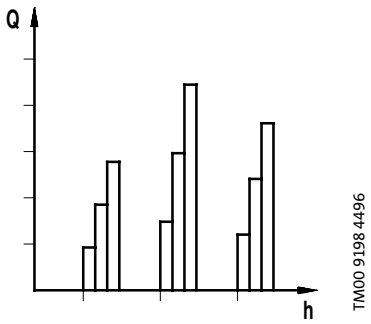
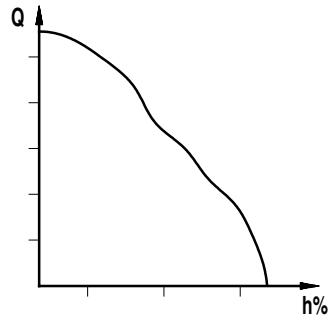
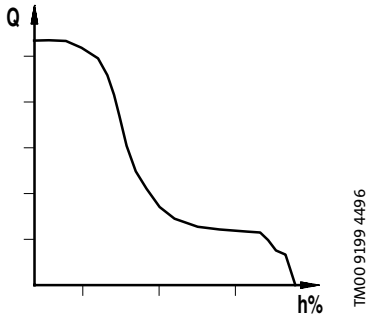
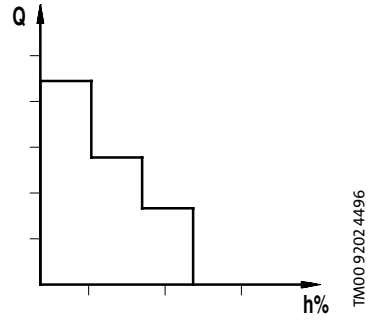


Type of BoosterpaQ

The BoosterpaQ type should be selected on the basis of the consumption pattern, i.e. the 24-hour and duty-time profiles.

If the consumption is highly variable and optimum comfort is required, pumps with continuous variable speed control should be used.

Examples of different consumption patterns and their 24-hour and duty-time profiles:

	Water supply	Industry	Irrigation
24-hour profile			
	Flow: High degree of variation. Pressure: Constant.	Flow: High and sudden variation. Pressure: Constant.	Flow: Constant and known. Pressure: Constant.
Duty-time profile			
	As shown, consumption is highly variable. Control with continuous variable speed control of the pumps is recommended. Recommended system types: MF, ME, MES.	As shown, consumption is highly variable and sudden. A control with continuous variable speed control of the pumps is recommended. Recommended system types: MF, ME, MES.	As shown, variations in consumption are regular yet known. Simple control is recommended. Recommended system types: MS, (MF, ME, MES).

System size

Pump size:

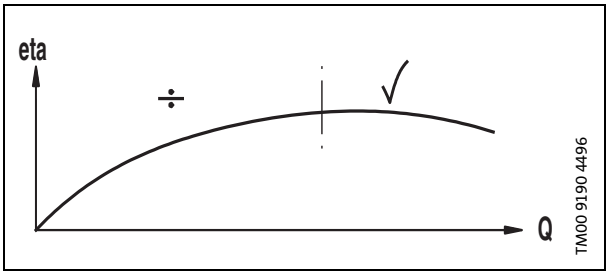
As previously explained, the system should be capable of meeting the highest possible demand. But as the highest demand will often occur for a short part of the duty cycle, it is necessary to select a type of pump which can meet the varying demand throughout the duty period.

It is not recommended to select a pump whose performance is lower than the lowest possible consumption. Nor is it recommended to select a pump type whose performance is higher than the highest possible consumption.

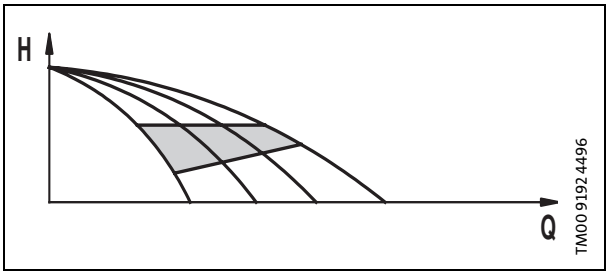
Efficiency:

In order to achieve the optimum operating economy attempts should be made to select the pumps on the basis of optimum efficiency, i.e. the pumps should, as far as possible, operate within their nominal operating ranges.

Since booster systems are sized on the basis of the highest possible consumption, meaning it will always be regulated down, it is necessary to select the pumps at a demand that is to the right of the Best Efficiency Point (BEP). This will ensure a high level of efficiency when consumption drops.

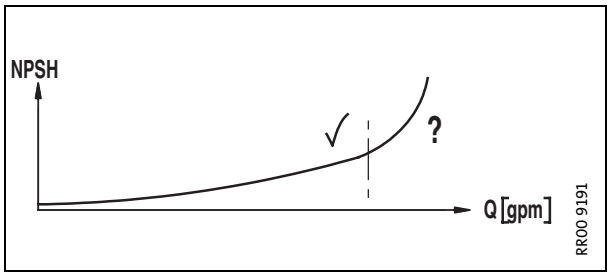


The optimum efficiency is ensured by selecting a duty point within the hatched area.



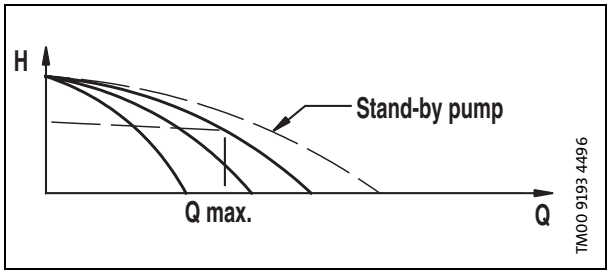
NPSH:

In order to avoid cavitation never select a pump whose duty point lies too far to the right on the NPSH curve. Always check the NPSH values of the pumps at the highest possible consumption (see the pump performance curve).

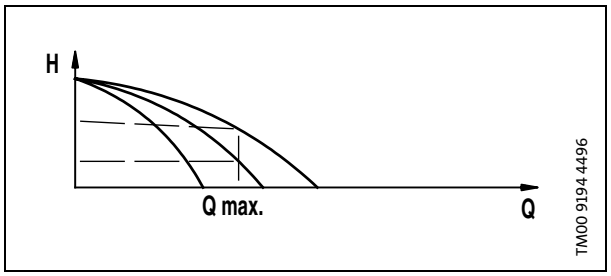


Stand-by pump:

To most customers reliable water supply is a major factor. Quite often it is not acceptable if the system does not maintain its maximum flow even during pump repairs or breakdown. In order to prevent any disruption of the supply in such a situation, the system should be supplied with a stand-by pump.



If it is acceptable that the system does not produce the desired pressure but an adequate flow during pump repair and breakdown, a stand-by pump may in certain circumstances not be required.



Diaphragm tank

Most systems require the use of a diaphragm tank.

The diaphragm tank may be selected on the basis of the below table:

Recommended Diaphragm Tank Size (gallons)				
Pump Type	**ME**	**MES**	**MF**	**MS**
CR(E) 3	4.4	4.4	4.4	20
CR(E) 5	4.4	4.4	4.4	34
CR(E) 10	10.3	10.3	10.3	62
CR(E) 15	34	34	34	211
CR(E) 20	44	44	44	317
CR(E) 32	44	44	44	317
CR(E) 45	86	86	86	528
CR(E) 64	132	132	132	1056
CR90			132	1056

For MS systems the size of the diaphragm tank can also be calculated by means of the following formula:

$$V = \frac{Q \times 15 \times (14.5 + p_{set} + On/off_{band})}{n_{max} \times On/off_{band} \times k} \times \frac{1}{k}$$

V = Tank volume [gallons]

Q = nominal flow for the smallest pump in the system (gpm)

On/off_{band} = Difference between setpoint and stop pressure [psi]

p_{set} = Setpoint [psi]

k = 0.9, constant for diaphragm tank pre-charge pressure

n_{max} = Max. number of starts/stops per hour.

Dry-running protection

Dry-running protection must always be installed on the suction side of the system.

The following types of dry run protection are available on BoosterpaQs:

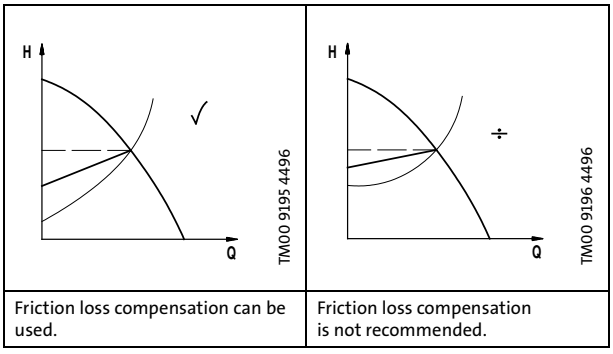
- Pressure Transducer (4-20mA)
- Liquid Level Switch (Ultrasonic)

Other types of dry run protection can be field connected to the BoosterpaQ. The BoosterpaQ can be configured to accept an analog input (e.g. 4-20mA) or a digital input (NO or NC) signal for dry run protection.

Water supply systems that can have suction pressure variations that go below 0 psig (e.g. storage tanks) should have a Liquid Level sensing type of dry run protection.

Friction loss compensation

Friction loss compensation often improves the economy of the system. The system characteristic determines whether friction loss compensation can be used or not.



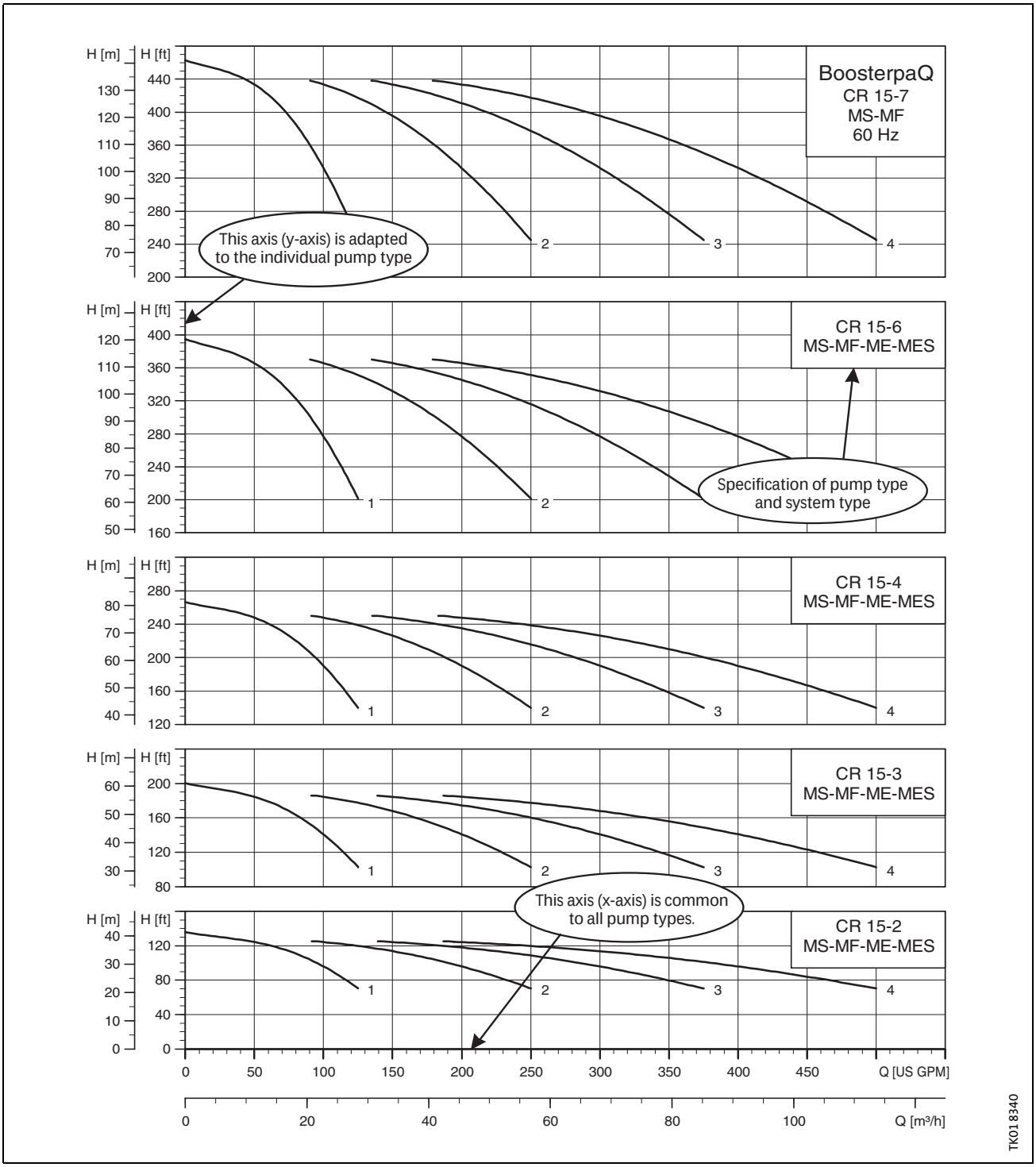
Friction loss compensation can be used.

Friction loss compensation is not recommended.

Understanding the curve charts

The curves should be read as follows:

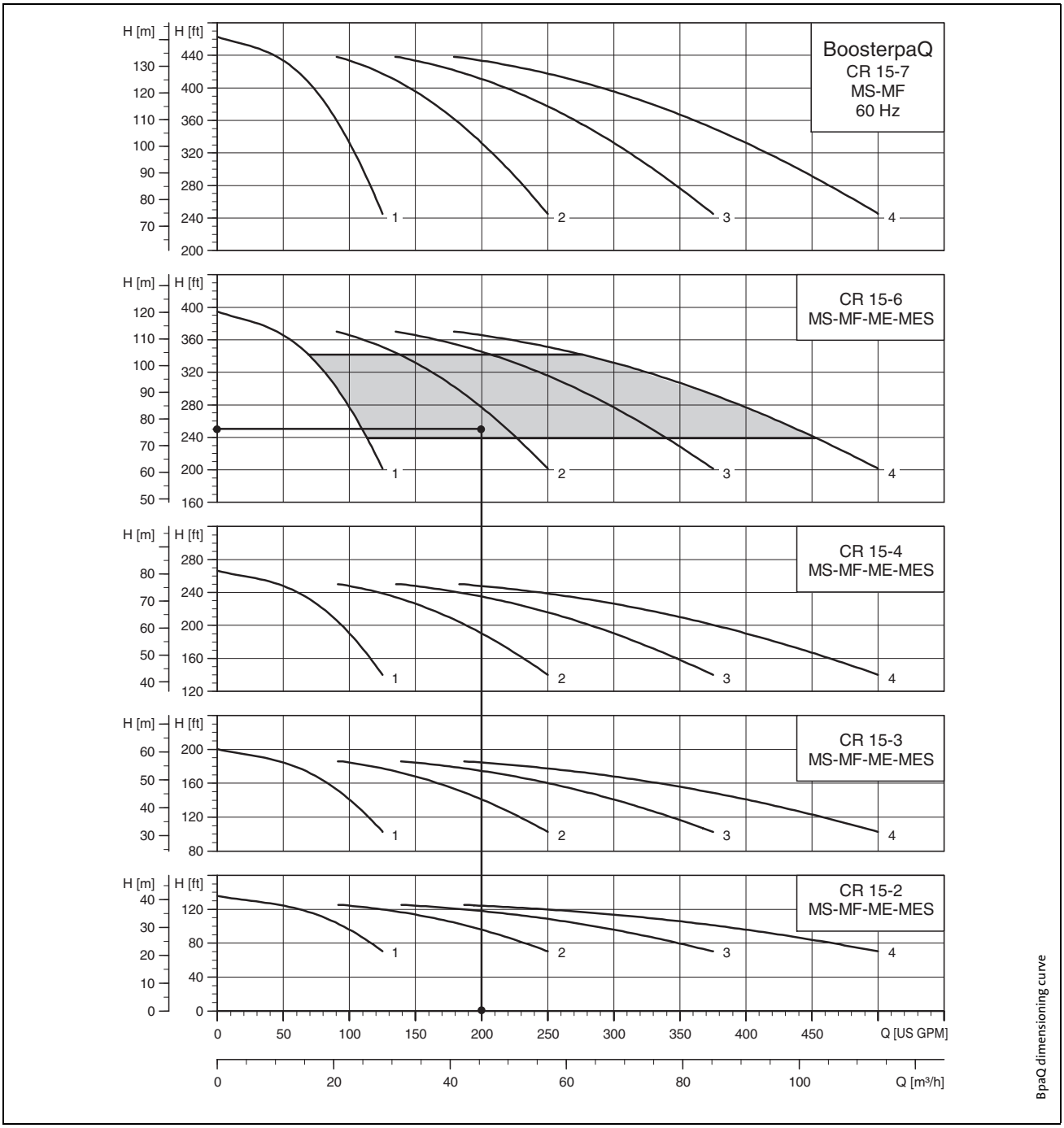
The x-axis, giving the flow (Q) in gpm, is common to all the curves, whereas the y-axis, giving the head (H) in feet, has been adapted to the individual pump type.



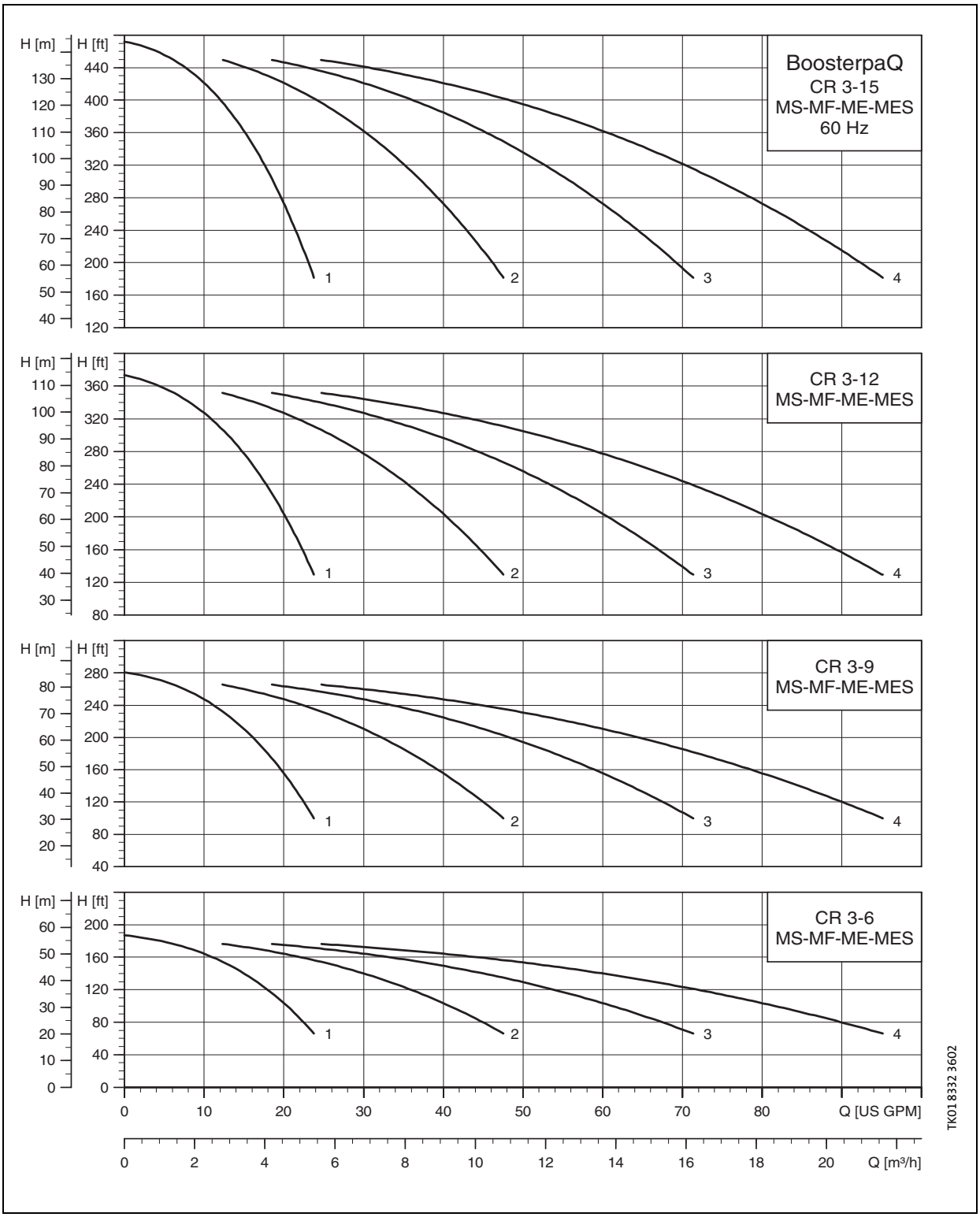
Example: How to select a system

- A head of 250 feet is required.
  The pump type best meeting this specification is found by means of the y-axis (e.g. CR 15-6). Draw a rightward, horizontal line from the head required.
- A flow of 200 gpm is required.
  Now draw an upward, vertical line from the specified flow. The intersection point of the two lines gives the number of pumps required for the system (2 CR 15-6).

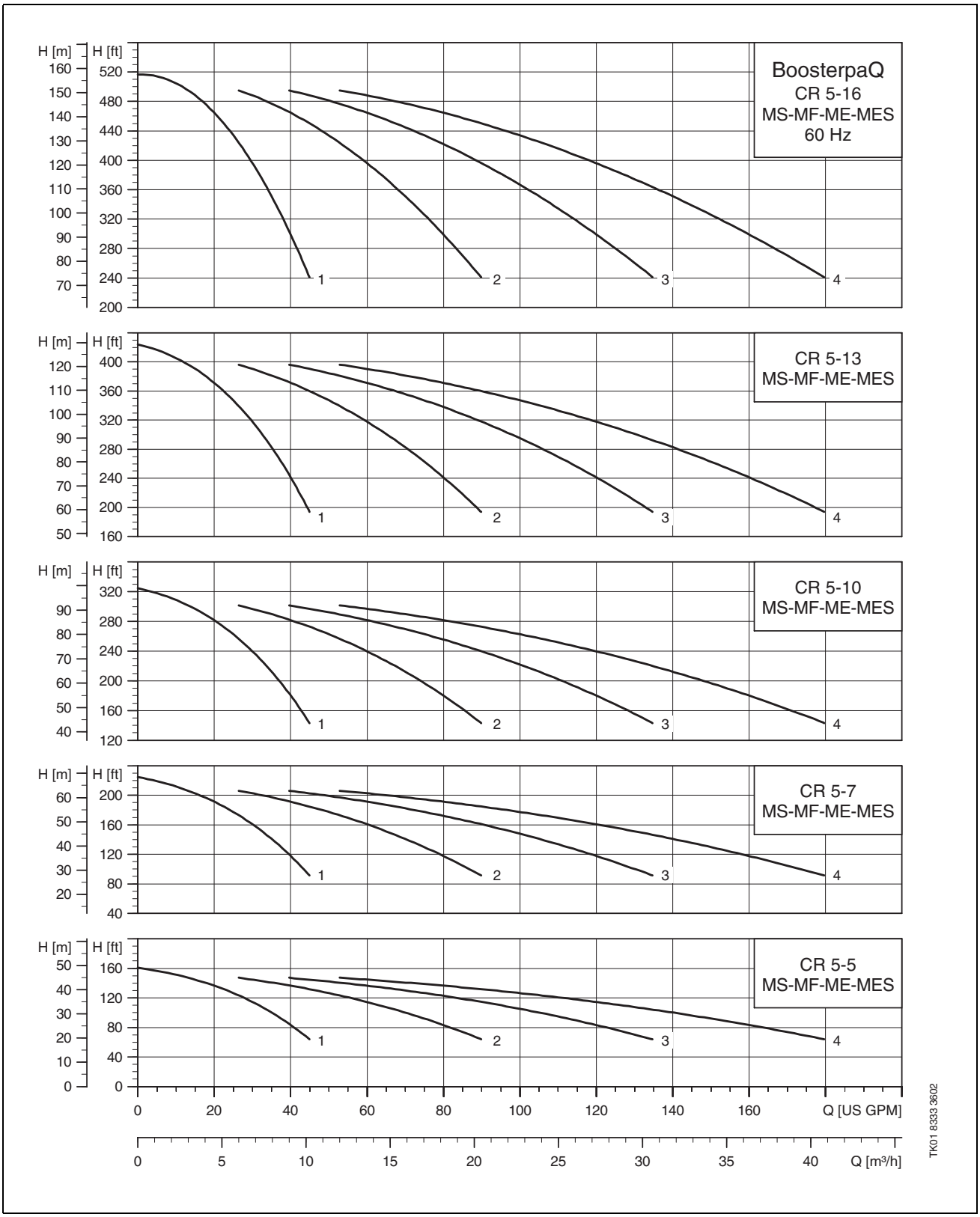
Only systems whose operating ranges lie within the shaded area of the example should be selected.



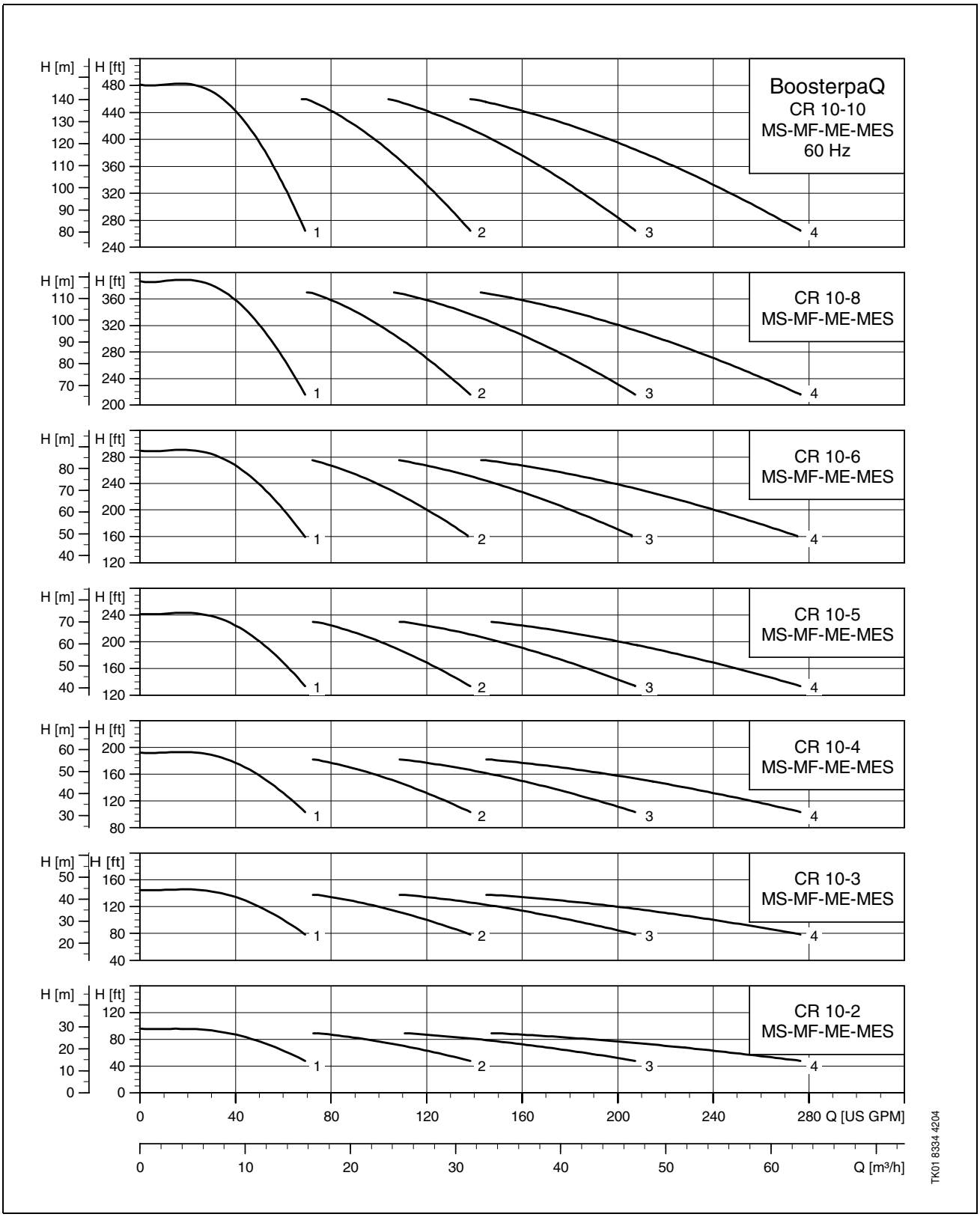
Performance curves



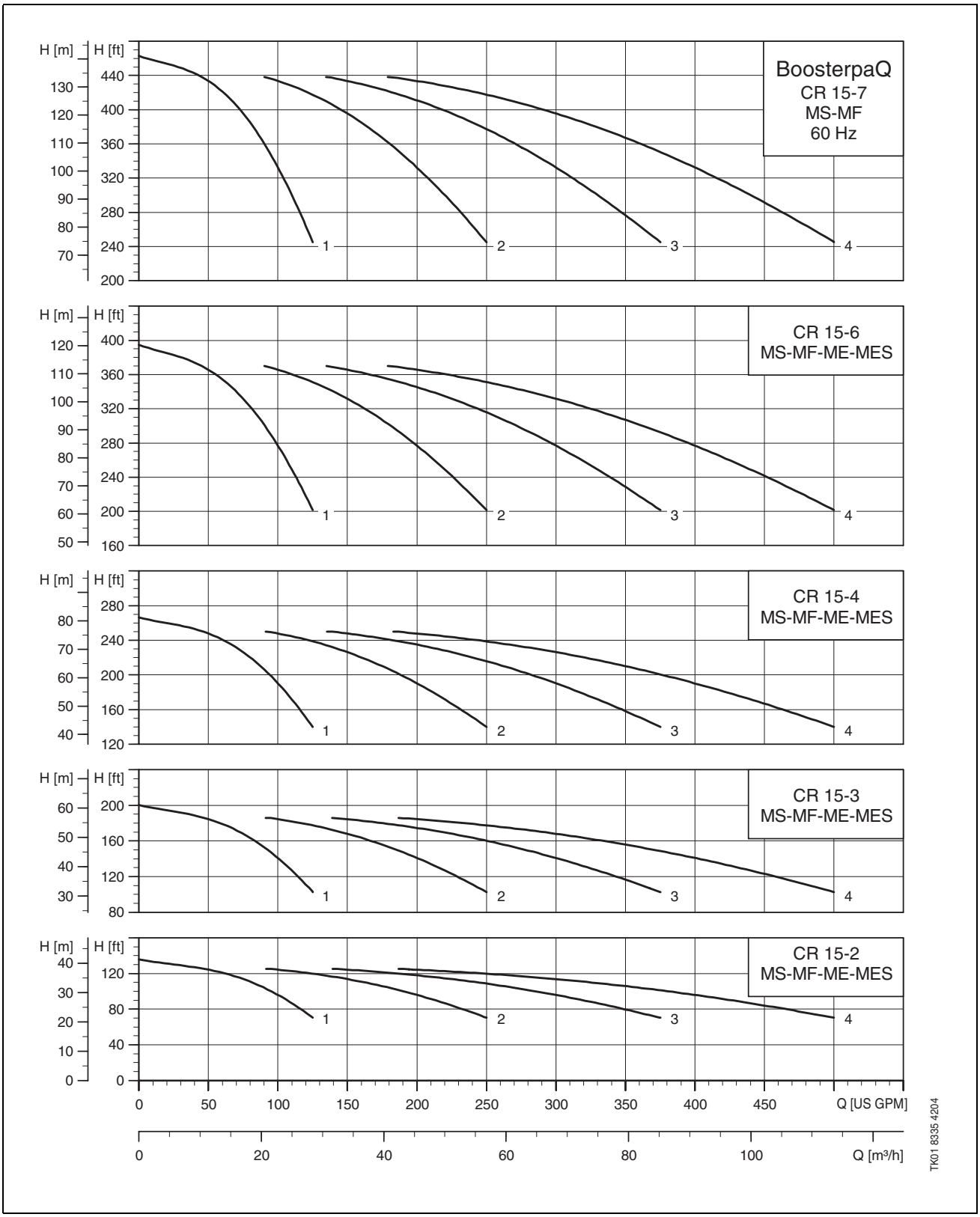
Performance curves



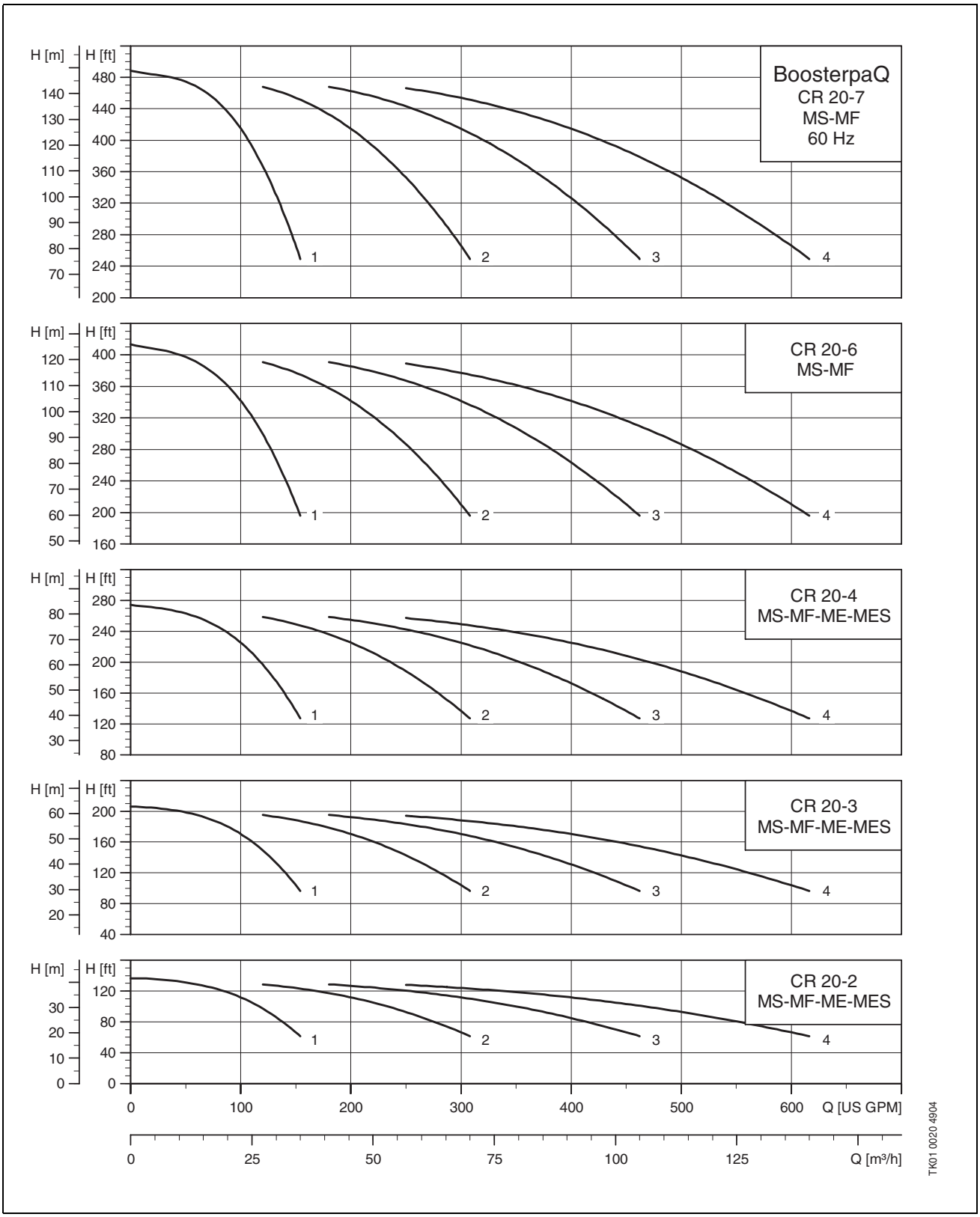
Performance curves



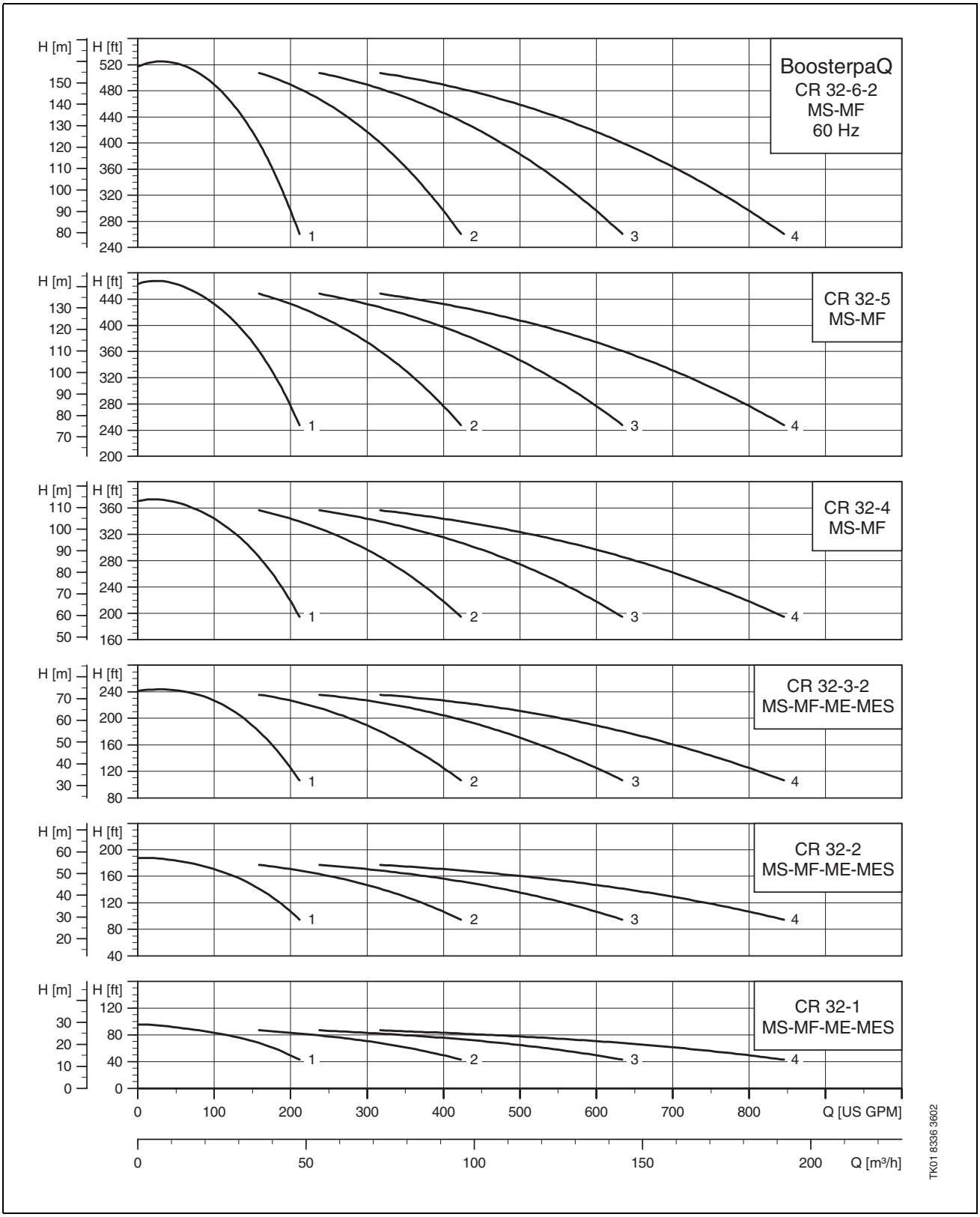
Performance curves



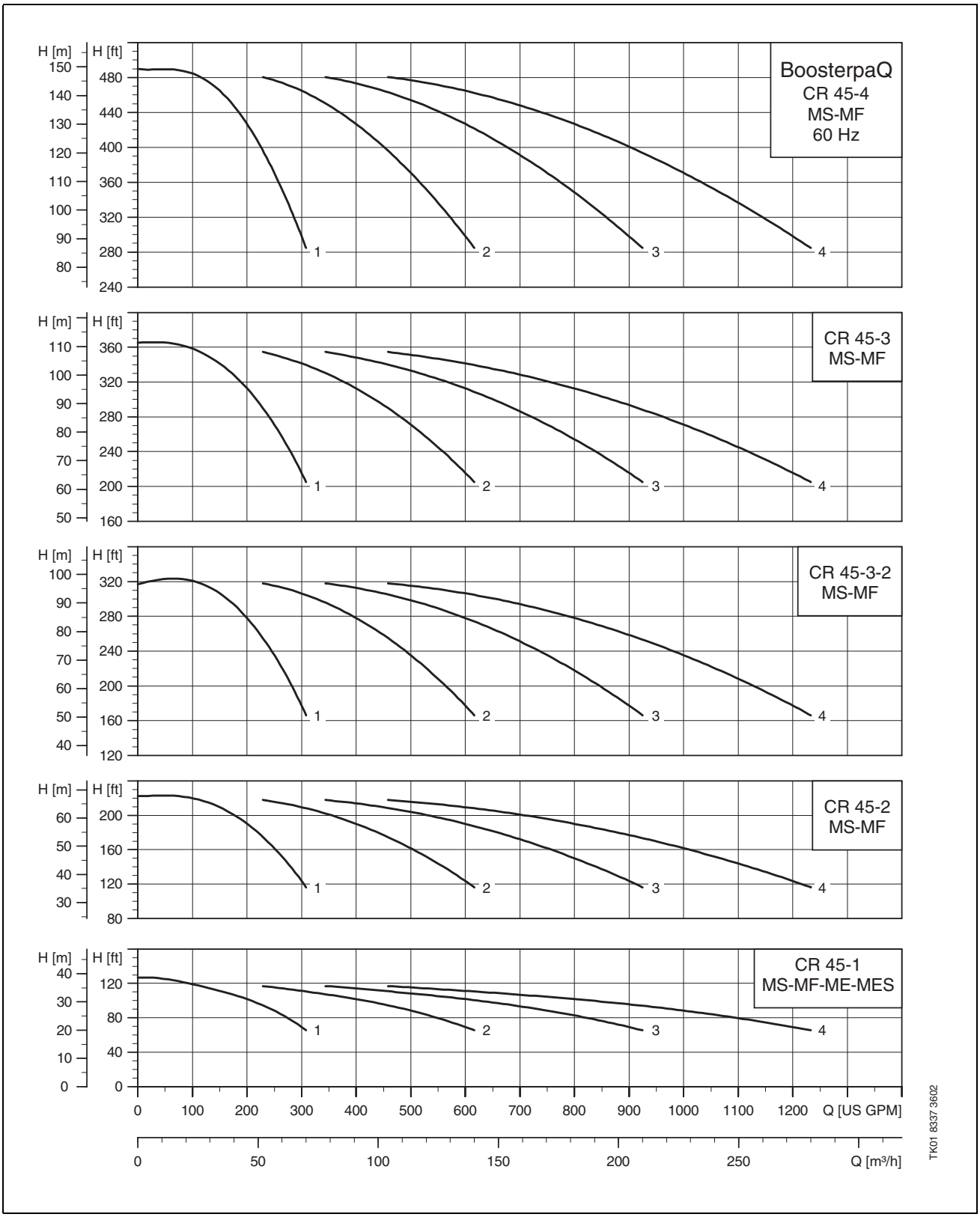
Performance curves



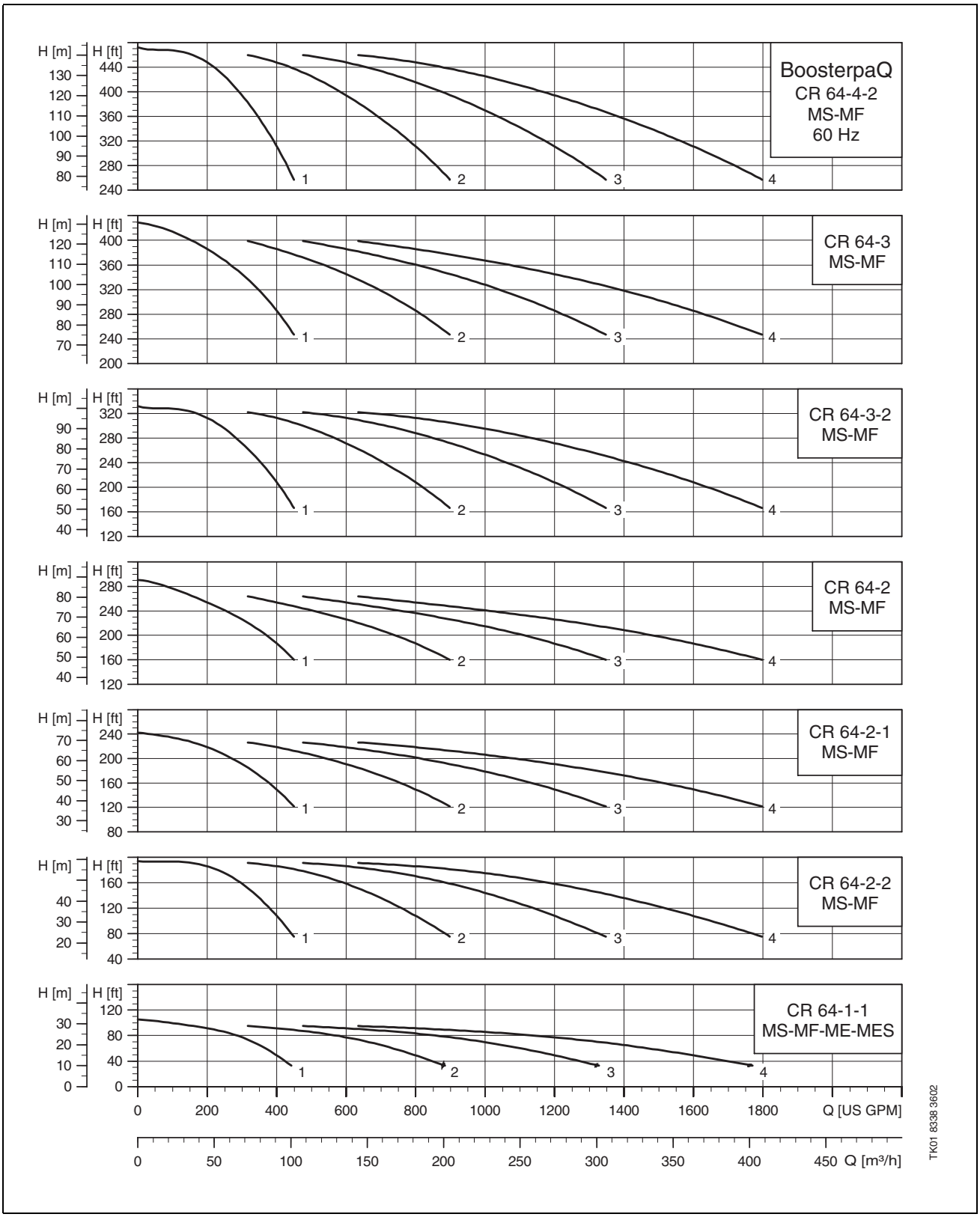
Performance curves



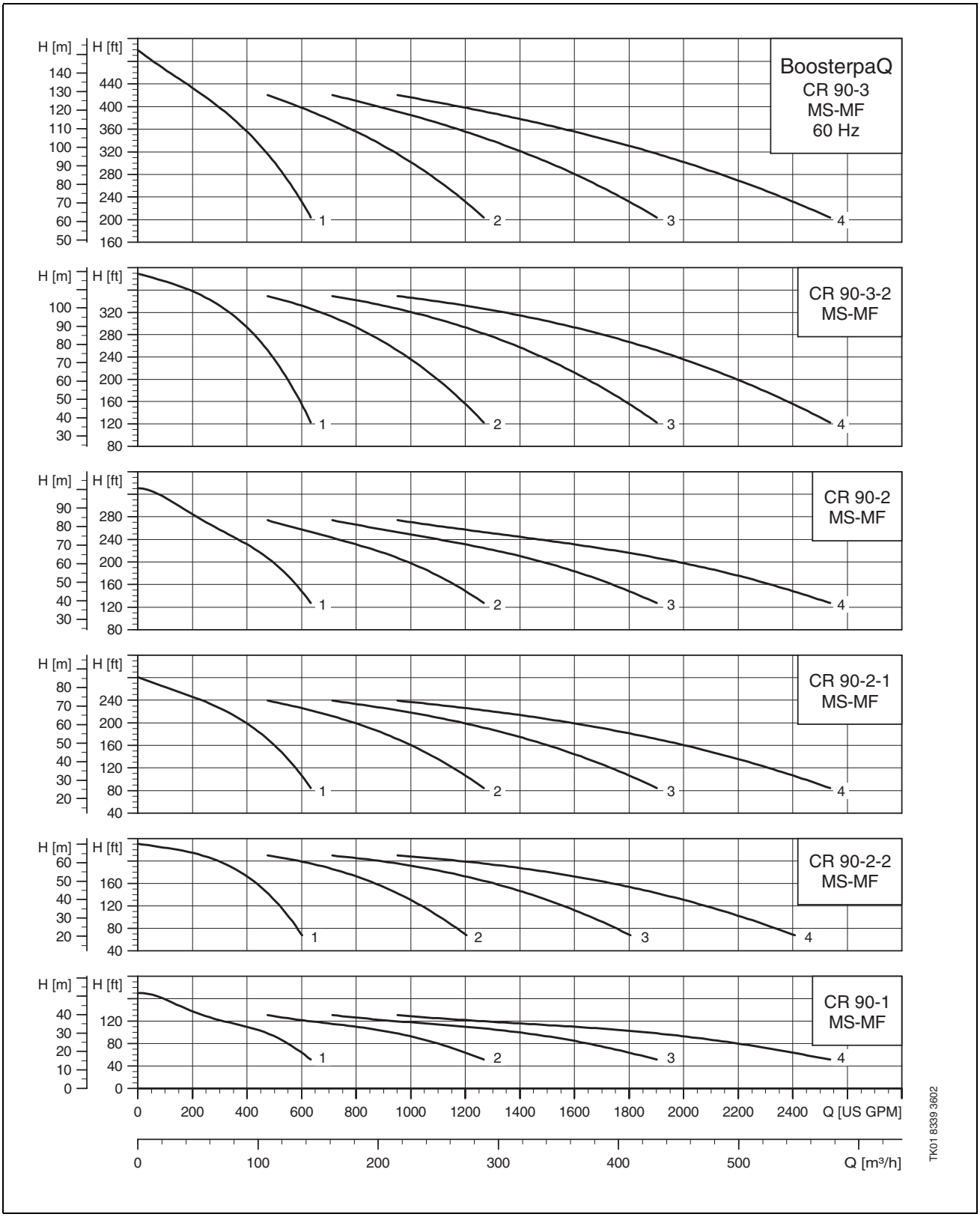
Performance curves

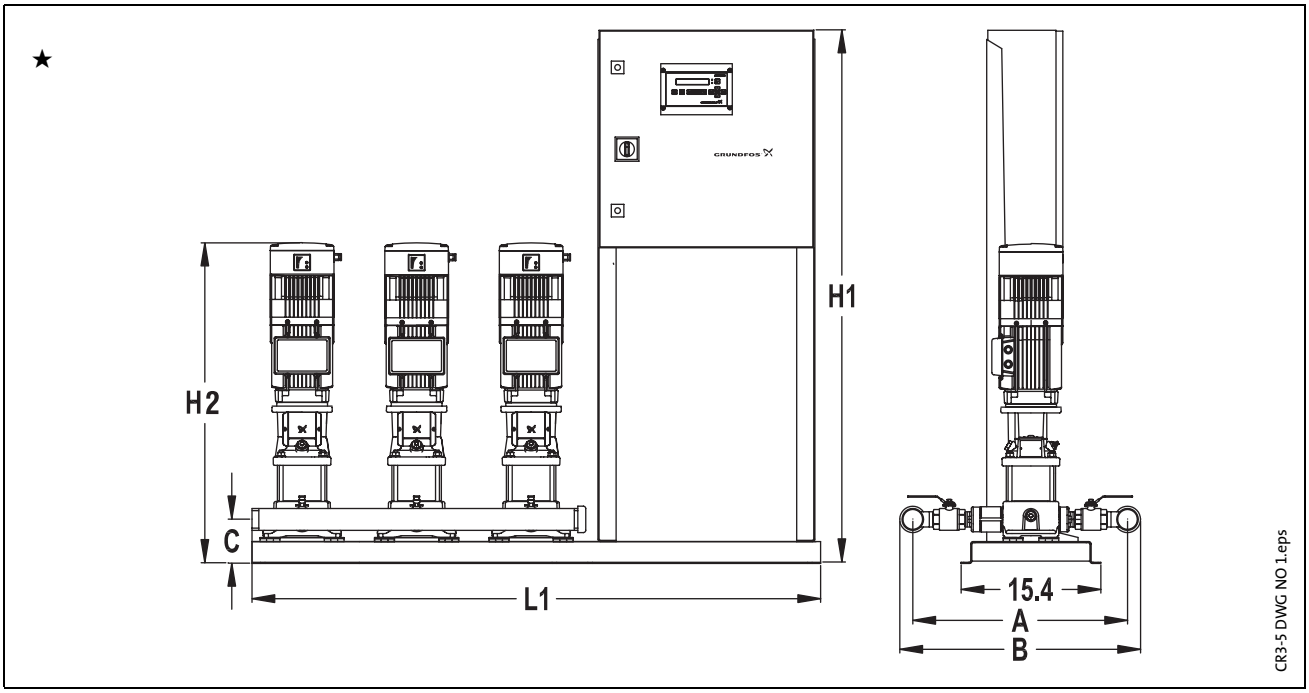


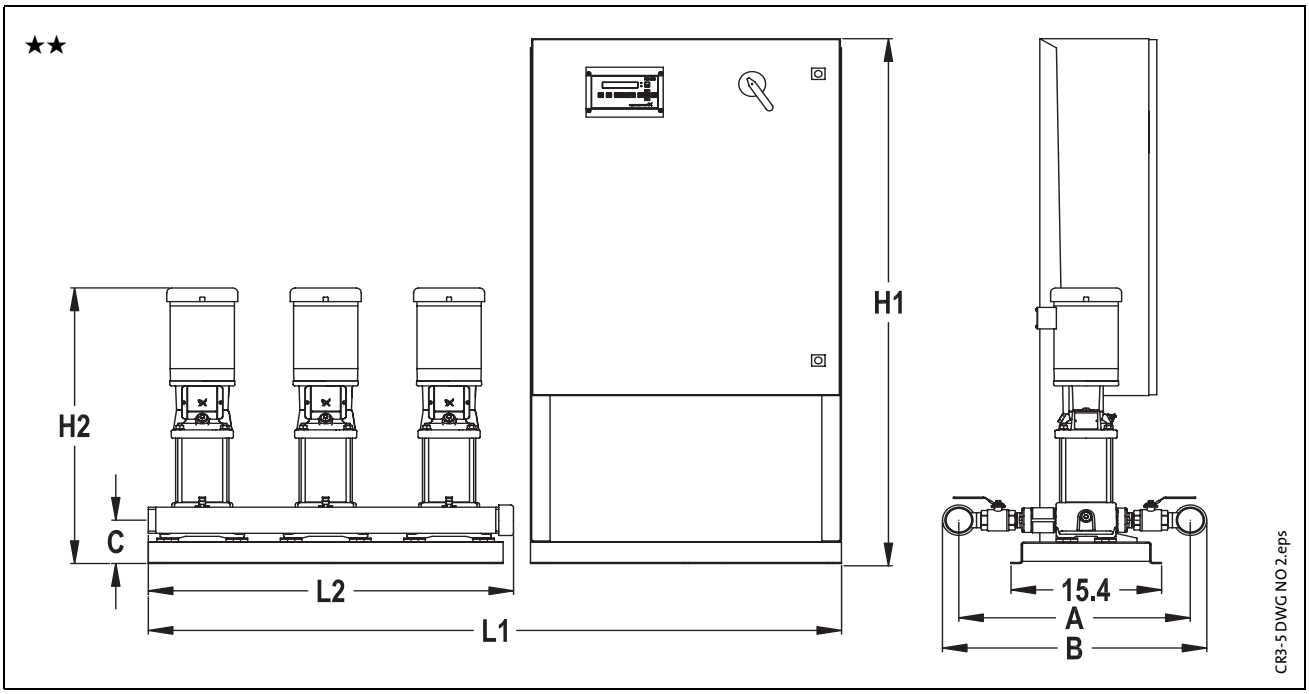
Performance curves



Performance curves







1. Dimensions subject to change without notice.
2. Not for construction; certified drawings available on request.

For information about ★and ★★ please see weights and dimensions.

Weights and dimensions

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	ME						MES					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR(E) 3-6	1	2" NPT	23.6	26.5	4.8	33.4	57.9	49.2		309	★	33.4	57.9	49.2		303	★
	CR(E) 3-9	1 1/2					35.6	57.9	49.2		324	★	35.6	57.9	49.2		322	★
	CR(E) 3-12	2					37.7	57.9	49.2		346	★	37.7	57.9	49.2		329	★
	CR(E) 3-15	3		23.9	26.8	5.8	41.4	57.9	49.2		364	★	41.4	57.9	49.2		355	★
3	CR(E) 3-6	1	2" NPT	25.7	28.6	4.8	33.4	57.9	61.8		446	★	33.4	57.9	61.8		434	★
	CR(E) 3-9	1 1/2					35.6	57.9	61.8		510	★	35.6	57.9	61.8		506	★
	CR(E) 3-12	2					37.7	57.9	61.8		539	★	37.7	57.9	61.8		521	★
	CR(E) 3-15	3		26.0	28.9	5.8	41.4	57.9	61.8		565	★	41.4	57.9	61.8		547	★
4	CR(E) 3-6	1	2.5" NPT	25.7	29.3	4.8	33.4	57.9	74.4		617	★	33.4	57.9	74.4		577	★
	CR(E) 3-9	1 1/2					35.6	57.9	74.4		681	★	35.6	57.9	74.4		641	★
	CR(E) 3-12	2					37.7	57.9	74.4		710	★	37.7	57.9	74.4		659	★
	CR(E) 3-15	3		26.0	29.6	5.8	41.4	57.9	74.4		747	★	41.4	57.9	74.4		720	★

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	MF						MS					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR 3-6	1	2" NPT	23.6	26.5	4.8	25.2	57.9	49.2		403	★	25.2	57.9	49.2		297	★
	CR 3-9	1 1/2					28.8	57.9	49.2		419	★	28.8	57.9	49.2		320	★
	CR 3-12	2					30.5	57.9	49.2		456	★	30.5	57.9	49.2		330	★
	CR 3-15	3		23.9	26.8	5.8	36.0	57.9	49.2		477	★	36.0	57.9	49.2		346	★
3	CR 3-6	1	2" NPT	25.7	28.6	4.8	25.2	57.9	61.8		541	★	25.2	57.9	61.8		428	★
	CR 3-9	1 1/2					28.8	57.9	61.8		567	★	28.8	57.9	61.8		504	★
	CR 3-12	2					30.5	57.9	61.8		623	★	30.5	57.9	61.8		519	★
	CR 3-15	3		26.0	28.9	5.8	36.0	57.9	68.9	37.2	652	★★	36.0	57.9	61.8		538	★
4	CR 3-6	1	2.5" NPT	25.7	29.3	4.8	25.2	57.9	81.5	50.3	670	★★	25.2	57.9	81.5		525	★
	CR 3-9	1 1/2					28.8	57.9	81.5	50.3	702	★★	28.8	57.9	81.5		570	★
	CR 3-12	2					30.5	57.9	81.5	50.3	778	★★	30.5	57.9	81.5		642	★
	CR 3-15	3		26.0	29.6	5.8	36.0	57.9	81.5	50.3	815	★★	36.0	57.9	81.5		711	★

All dimensions are for 3 x 460V systems. Dimensions may vary for other voltages.

Weights and dimensions are based on 460V, 3 phase ODP motors (MES, MS, MF).

Dimensions may vary with panel options and system voltage.

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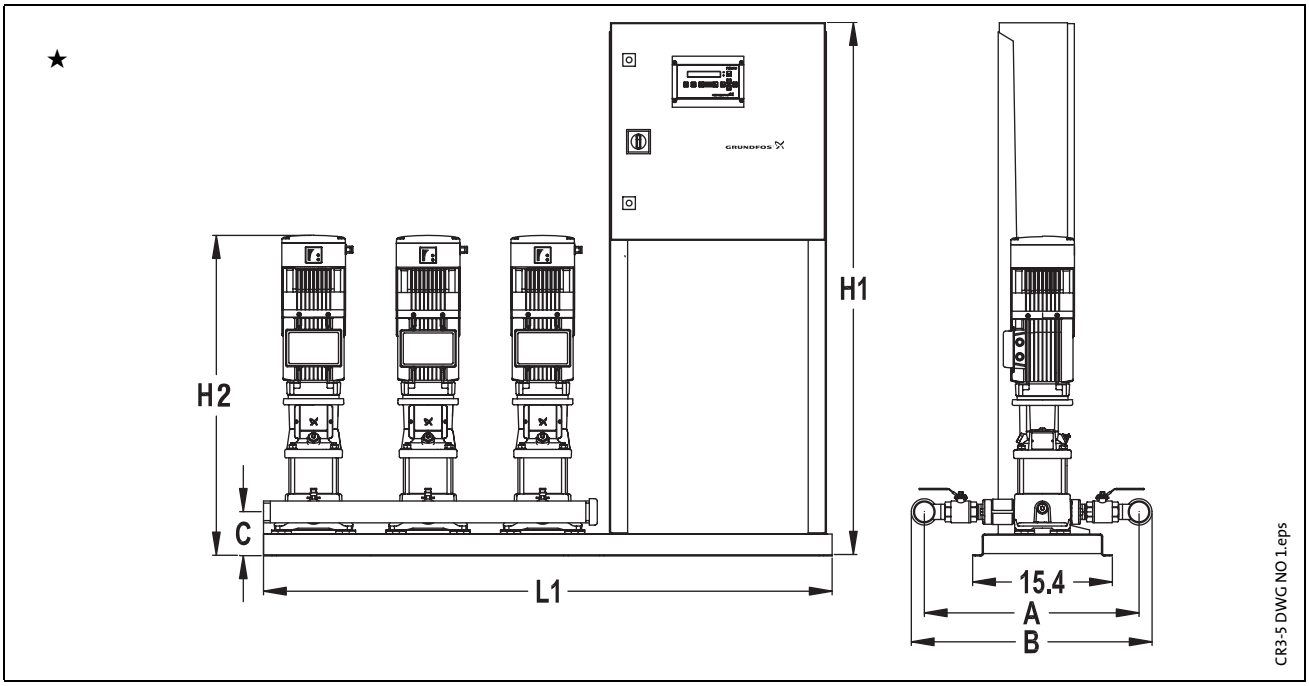

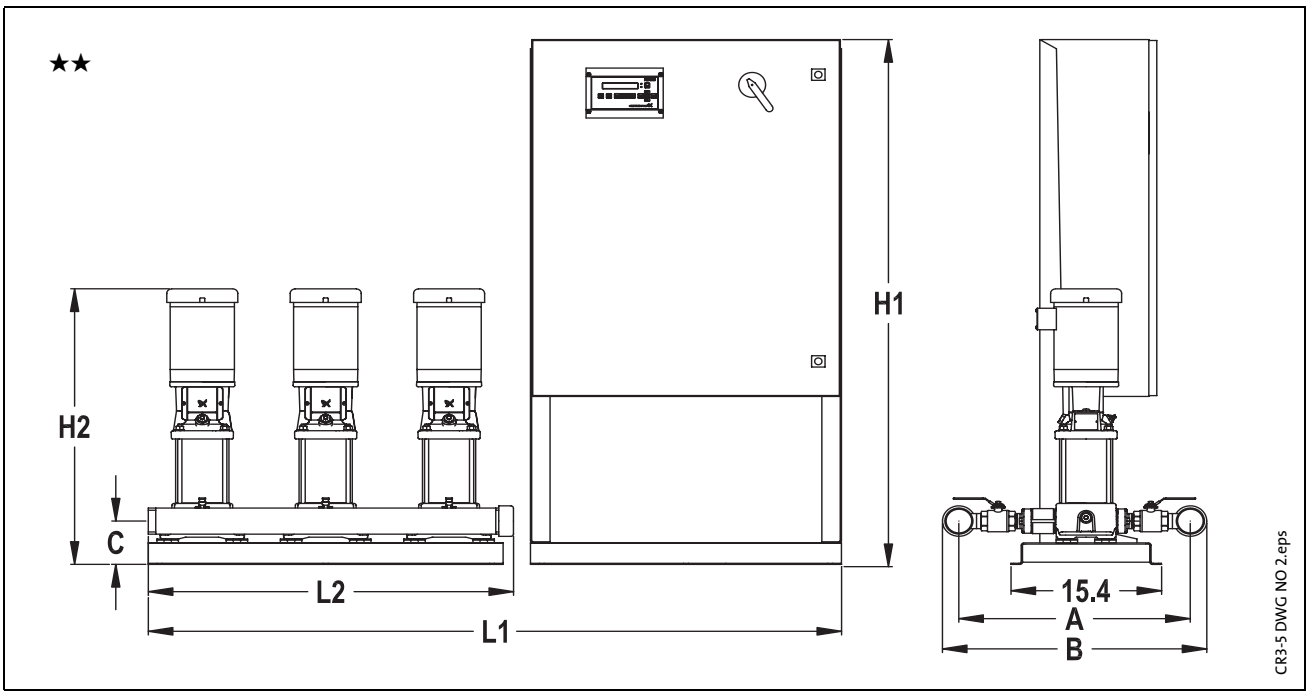

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Weights and dimensions

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	ME						MES					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR(E) 5-5	1 1/2	2" NPT	23.6	26.5	4.8	34.5	57.9	49.2		320	★	34.5	57.9	49.2		318	★
	CR(E) 5-7	2					36.6	57.9	49.2		341	★	36.6	57.9	49.2		324	★
	CR(E) 5-10	3					41.4	57.9	49.2		367	★	41.4	57.9	49.2		358	★
	CR(E) 5-13	5		23.9	26.8	5.8	48.0	57.9	49.2		409	★	48.0	57.9	49.2		389	★
	CR(E) 5-16	5					51.2	57.9	49.2		423	★	51.2	57.9	49.2		403	★
3	CR(E) 5-5	1 1/2	2.5" NPT	25.7	29.3	4.8	34.5	57.9	61.8		501	★	34.5	57.9	61.8		499	★
	CR(E) 5-7	2					36.6	57.9	61.8		528	★	36.6	57.9	61.8		494	★
	CR(E) 5-10	3					41.4	57.9	61.8		570	★	41.4	57.9	61.8		552	★
	CR(E) 5-13	5		26.0	29.6	5.8	48.0	57.9	61.8		634	★	48.0	57.9	61.8		594	★
	CR(E) 5-16	5					51.2	57.9	61.8		655.	★	51.2	57.9	61.8		615	★
4	CR(E) 5-5		3" NPT	25.7	29.7	4.8												
	CR(E) 5-7	2					36.6	57.9	74.4		697	★	36.6	57.9	74.4		646	★
	CR(E) 5-10	3					41.4	57.9	74.4		752	★	41.4	57.9	74.4		725	★
	CR(E) 5-13	5		26.0	30.0	5.8	48.0	57.9	74.4		837	★	48.0	57.9	74.4		777	★
	CR(E) 5-16	5					51.2	57.9	74.4		865	★	51.2	57.9	74.4		805	★

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	MF						MS					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR 5-5	1 1/2	2" NPT	23.6	26.5	4.8	27.8	57.9	49.2		417	★	27.8	57.9	49.2		316	★
	CR 5-7	2					29.9	57.9	49.2		451	★	29.9	57.9	49.2		307	★
	CR 5-10	3					35.9	57.9	49.2		477	★	35.9	57.9	49.2		349	★
	CR 5-13	5		23.9	26.8	5.8	40.6	57.9	49.2		522	★	40.6	57.9	49.2		369	★
	CR 5-16	5					43.9	57.9	49.2		536	★	43.9	57.9	49.2		383	★
3	CR 5-5	1 1/2	2.5" NPT	25.7	29.3	4.8	27.8	57.9	61.8		562	★	27.8	57.9	61.8		495	★
	CR 5-7	2					29.9	57.9	61.8		615	★	29.9	57.9	61.8		477	★
	CR 5-10	3					35.9	57.9	68.9	37.7	654	★★	35.9	57.9	61.8		543	★
	CR 5-13	5		26.0	29.6	5.8	40.6	57.9	68.9	37.7	720	★★	40.6	57.9	61.8		574	★
	CR 5-16	5					43.9	57.9	68.9	37.7	741	★★	43.9	57.9	61.8		595	★
4	CR 5-5	1 1/2	3" NPT	25.7	29.7	4.8	27.8	57.9	81.5	49.3	694	★★	27.8	57.9	81.5		589	★
	CR 5-7	2					29.4	57.9	81.5	49.3	766	★★	29.9	57.9	81.5		629	★
	CR 5-10	3					35.9	57.9	81.5	49.3	821	★★	35.9	57.9	81.5	49.3	716	★★
	CR 5-13	5		26.0	30.0	5.8	40.6	57.9	81.5	49.3	906	★★	40.6	57.9	81.5	49.3	757	★★
	CR 5-16	5					43.9	57.9	81.5	49.3	930	★★	43.9	57.9	81.5	49.3	781	★★

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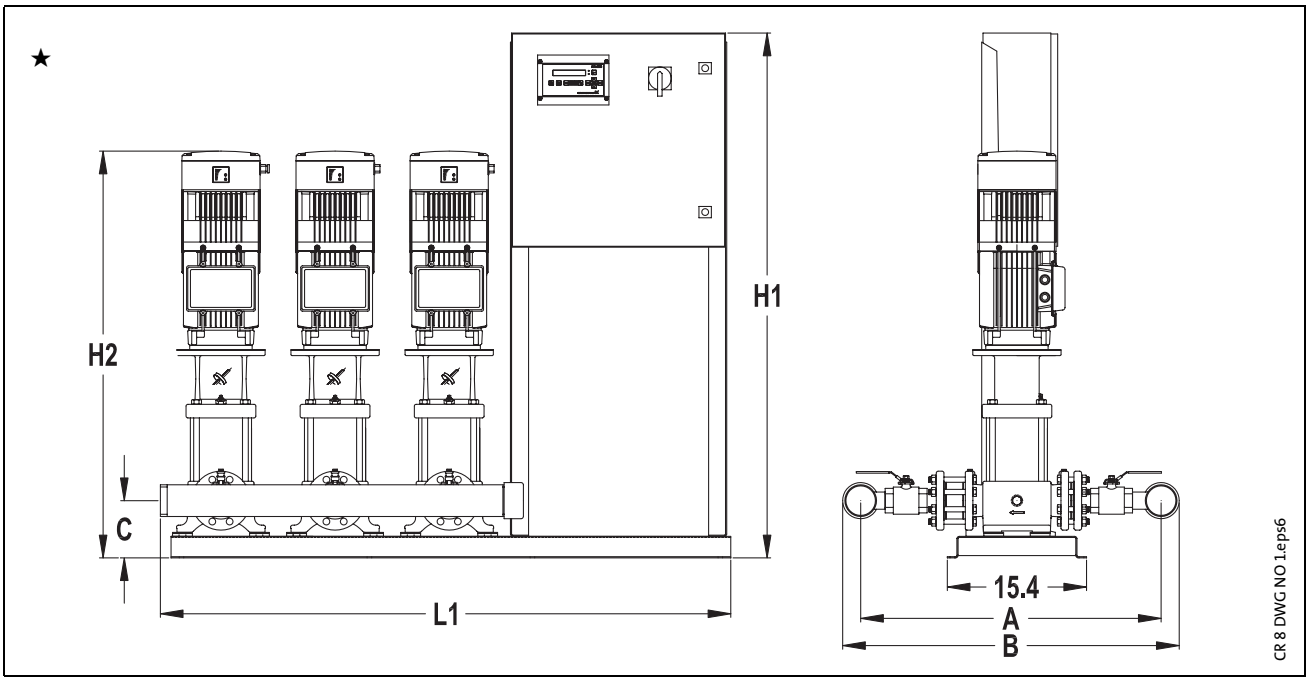

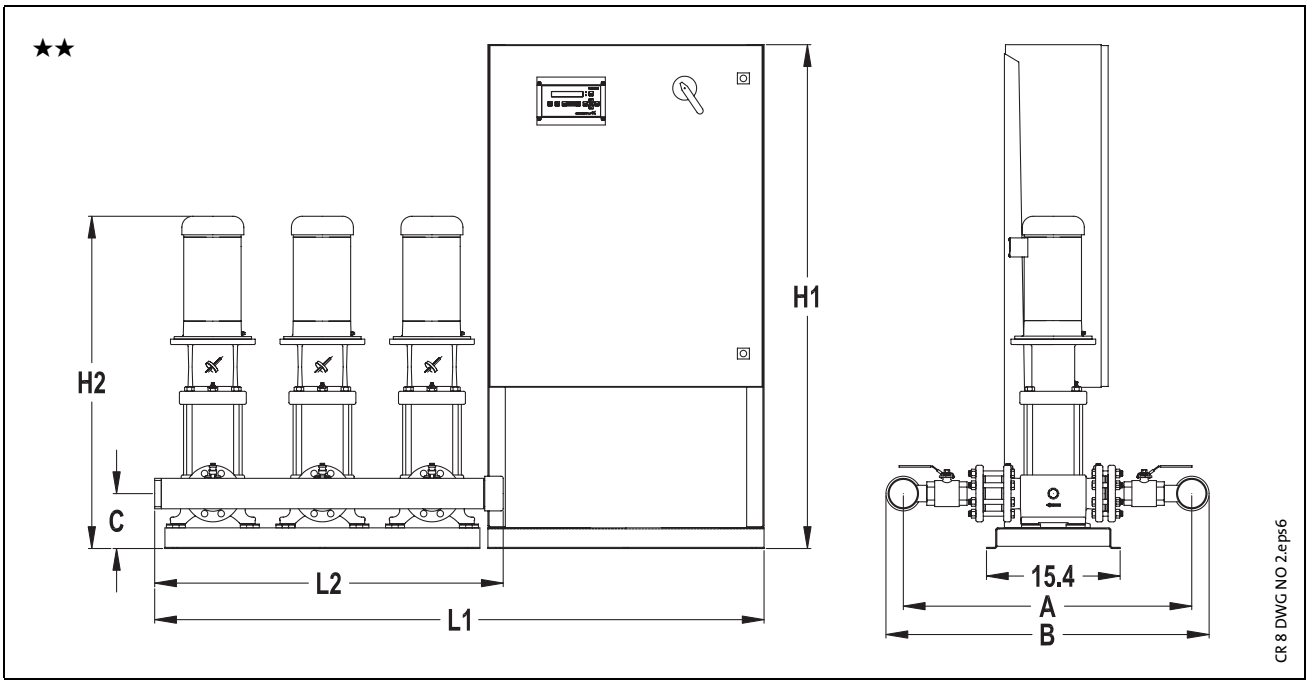

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Weights and dimensions

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	ME						MES					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR(E) 10-2	1 1/2	2.5" NPT	33.0	36.5	6.3	35.5	57.9	50.4		340	★	35.5	57.9	50.4		338	★
	CR(E) 10-3	3					38.0	57.9	50.4		385	★	38.0	57.9	50.4		376	★
	CR(E) 10-4	3					39.3	57.9	50.4		389	★	39.3	57.9	50.4		380	★
	CR(E) 10-5	5					44.3	57.9	50.4		438	★	44.3	57.9	50.4		418	★
	CR(E) 10-6	5					45.4	57.9	50.4		442	★	45.4	57.9	50.4		422	★
	CR(E) 10-8	7 1/2					48.1	57.9	50.4		491	★	48.1	57.9	50.4		471	★
	CR(E) 10-10	7 1/2					50.5	57.9	50.4		502	★	50.5	57.9	50.4		482	★
3	CR(E) 10-2	1 1/2	3" NPT	33.0	37.0	6.3	35.5	57.9	63.0		512	★	35.5	57.9	63.0		508	★
	CR(E) 10-3	3					38.0	57.9	63.0		591	★	38.0	57.9	63.0		573	★
	CR(E) 10-4	3					39.3	57.9	63.0		597	★	39.3	57.9	63.0		579	★
	CR(E) 10-5	5					44.3	57.9	63.0		671	★	44.3	57.9	63.0		631	★
	CR(E) 10-6	5					45.4	57.9	63.0		677	★	45.4	57.9	63.0		637	★
	CR(E) 10-8	7 1/2					48.1	57.9	63.0		752	★	48.1	57.9	63.0		712	★
	CR(E) 10-10	7 1/2					50.5	57.9	63.0		766	★	50.5	57.9	63.0		726	★
4	CR(E) 10-2	1 1/2	4" ANSI	33.0	42.0	6.3	35.5	57.9	75.6		724	★	35.5	57.9	75.6		718	★
	CR(E) 10-3	3					38.0	57.9	75.6		826	★	38.0	57.9	75.6		799	★
	CR(E) 10-4	3					39.3	57.9	75.6		835	★	39.3	57.9	75.6		808	★
	CR(E) 10-5	5					44.3	57.9	75.6		937	★	44.3	57.9	75.6		877	★
	CR(E) 10-6	5					45.4	57.9	75.6		946	★	45.4	57.9	75.6		886	★
	CR(E) 10-8	7 1/2					48.1	57.9	75.6		1043	★	48.1	57.9	75.6		983	★
	CR(E) 10-10	7 1/2					50.5	57.9	75.6		1053	★	50.5	57.9	75.6		993	★

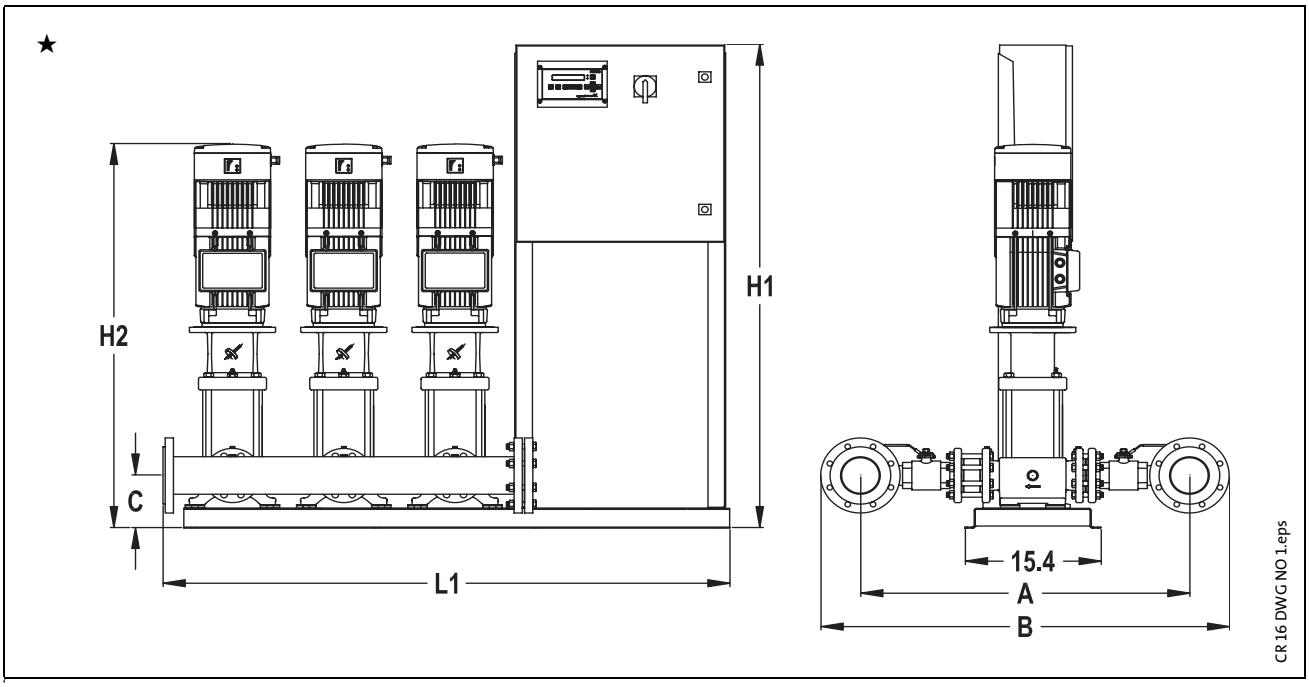
No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	MF						MS					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR 10-2	1 1/2	2.5" NPT	33.0	36.5	6.3	28.8	57.9	50.4		446	★	28.8	57.9	50.4		336	★
	CR 10-3	3					28.9	57.9	50.4		499	★	28.9	57.9	50.4		367	★
	CR 10-4	3					33.8	57.9	50.4		499	★	33.8	57.9	50.4		371	★
	CR 10-5	5					34.6	57.9	50.4		551	★	34.6	57.9	50.4		398	★
	CR 10-6	5					37.7	57.9	50.4		551	★	37.7	57.9	50.4		402	★
	CR 10-8	7 1/2					40.7	57.9	50.4		646	★	40.7	57.9	50.4		451	★
	CR 10-10	7 1/2					43.1	57.9	50.4		710	★	43.1	57.9	50.4		462	★
3	CR 10-2	1 1/2	3" NPT	33.0	37.0	6.3	28.8	57.9	62.6		599	★	28.8	57.9	62.6		506	★
	CR 10-3	3					28.9	57.9	62.6		678	★	28.9	57.9	62.6		564	★
	CR 10-4	3					33.8	57.9	62.6		678	★	33.8	57.9	62.6		570	★
	CR 10-5	5					34.6	57.9	62.6		757	★	34.6	57.9	62.6		611	★
	CR 10-6	5					37.7	57.9	62.6		757	★	37.7	57.9	62.6		617	★
	CR 10-8	7 1/2					40.7	57.9	62.6		871	★	40.7	57.9	62.6		692	★
	CR 10-10	7 1/2					43.1	57.9	62.6		963	★	43.1	57.9	62.6		706	★
4	CR 10-2	1 1/2	4" ANSI	33.0	42.0	6.3	28.8	57.9	82.7	52.2	784	★★	28.8	57.9	82.7		710	★
	CR 10-3	3					28.9	57.9	82.7	52.2	892	★★	28.9	57.9	82.7		790	★
	CR 10-4	3					33.8	57.9	82.7	52.2	892	★★	33.8	57.9	82.7		799	★
	CR 10-5	5					34.6	57.9	82.7	52.2	997	★★	34.6	57.9	82.7		857	★
	CR10-6	5					37.7	57.9	82.7	52.2	997	★★	37.7	57.9	82.7		866	★
	CR 10-8	7 1/2					40.7	57.9	82.7	52.2	1124	★★	40.7	57.9	82.7	52.2	963	★★
	CR 10-10	7 1/2					43.1	57.9	82.7	52.2	1243	★★	43.1	57.9	82.7	52.2	973	★★

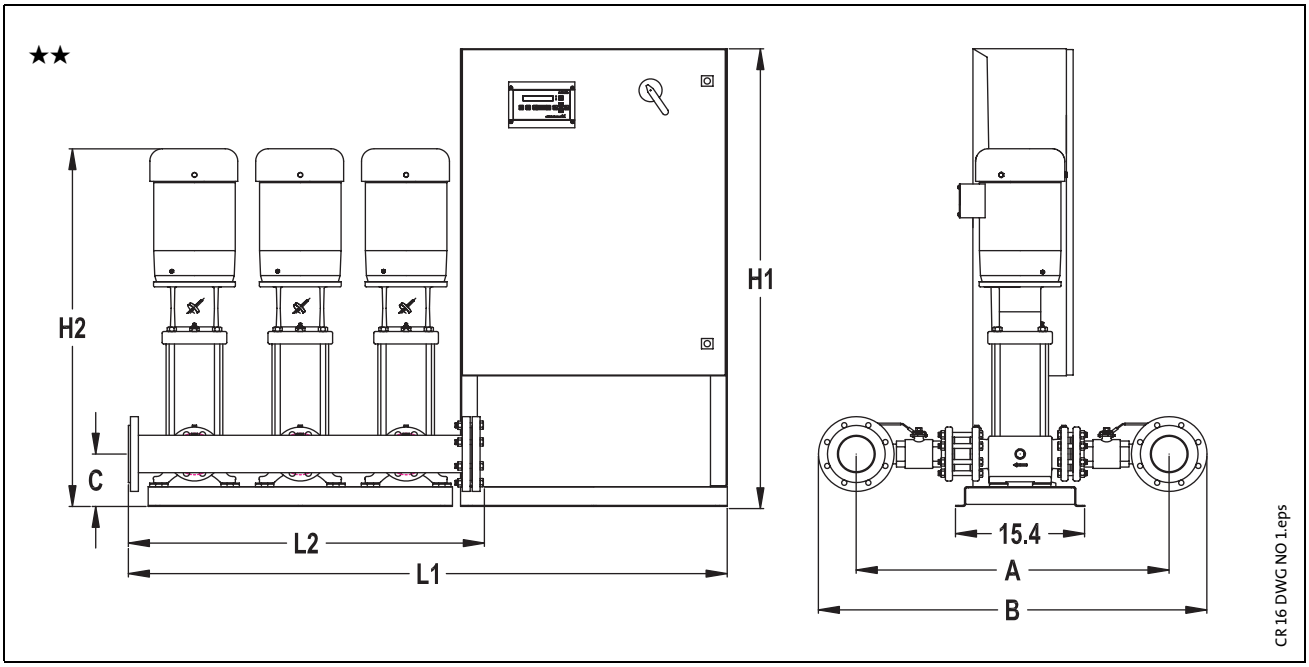
All dimensions are for 3 x 460V systems. Dimensions may vary for other voltages.

Weights and dimensions are based on 460V, 3 phase ODP motors (MES, MS, MF).

Dimensions may vary with panel options and system voltage.

Dimensions not for construction unless certified; certified drawings available upon request.





1. Dimensions subject to change without notice.
2. Not for construction; certified drawings available on request.
3. For information about ★and ★★ please see weights and dimensions.

Weights and dimensions

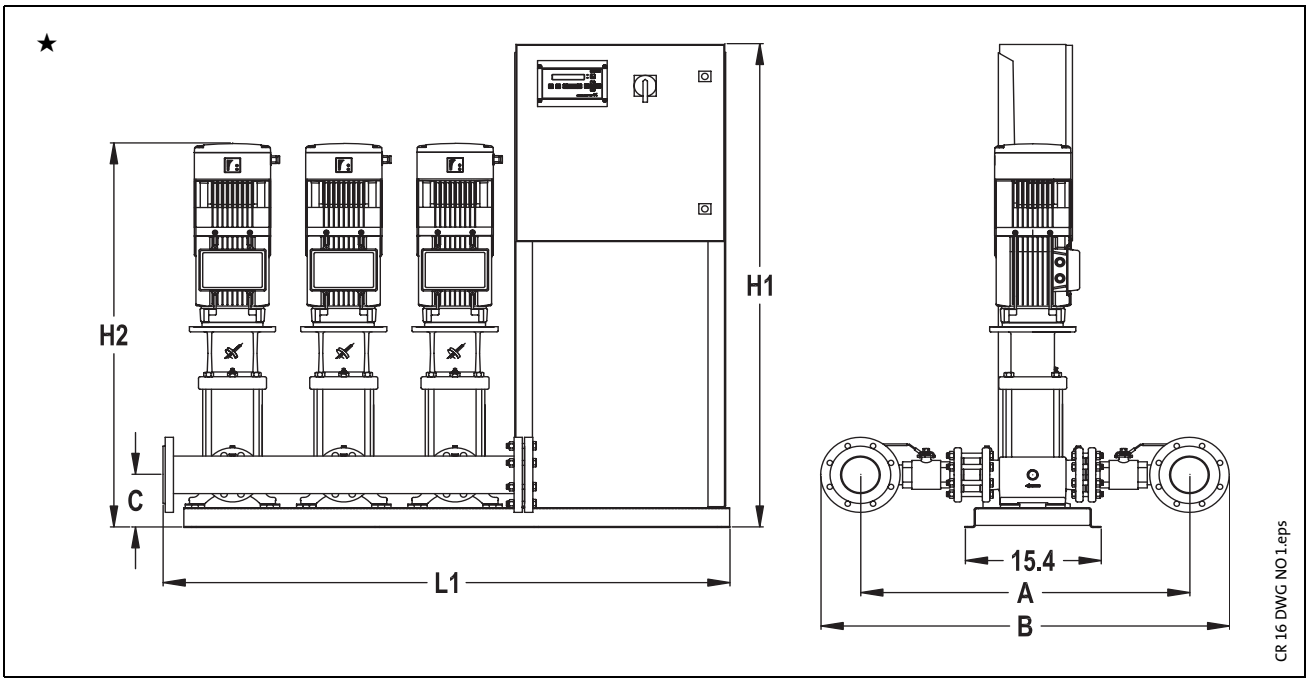
No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	ME						MES					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR(E) 15-2	5	4" ANSI	35.6	44.6	6.3	41.6	57.9	51.6		573	★	41.6	57.9	51.6		553	★
	CR(E) 15-3	5					43.3	57.9	51.6		644	★	43.3	57.9	51.6		624	★
	CR(E) 15-4	7 1/2					45.9	57.9	51.6		652	★	45.9	57.9	51.6		632	★
	CR(E) 15-6	10					49.4	57.9	51.6		726	★	49.4	57.9	51.6		710	★
3	CR(E) 15-2	5	4" ANSI	35.6	44.6	6.3	41.6	57.9	64.2		890	★	41.6	57.9	64.2		810	★
	CR(E) 15-3	5					43.3	57.9	64.2		1061	★	43.3	57.9	64.2		981	★
	CR(E) 15-4	7 1/2					45.9	57.9	64.2		1073	★	45.9	57.9	64.2		993	★
	CR(E) 15-6	10					49.4	57.9	64.2		1175	★	49.4	57.9	64.2		1143	★
4	CR(E) 15-2	5	6" ANSI	35.6	46.6	6.3	41.6	57.9	76.4		1130	★	41.6	57.9	76.4		1070	★
	CR(E) 15-3	5					43.3	57.9	76.4		1243	★	43.3	57.9	76.4		1183	★
	CR(E) 15-4	7 1/2					45.9	57.9	76.4		1259	★	45.9	57.9	76.4		1199	★
	CR(E) 15-6	10					49.4	57.9	76.4		1399	★	49.4	57.9	76.4		1351	★

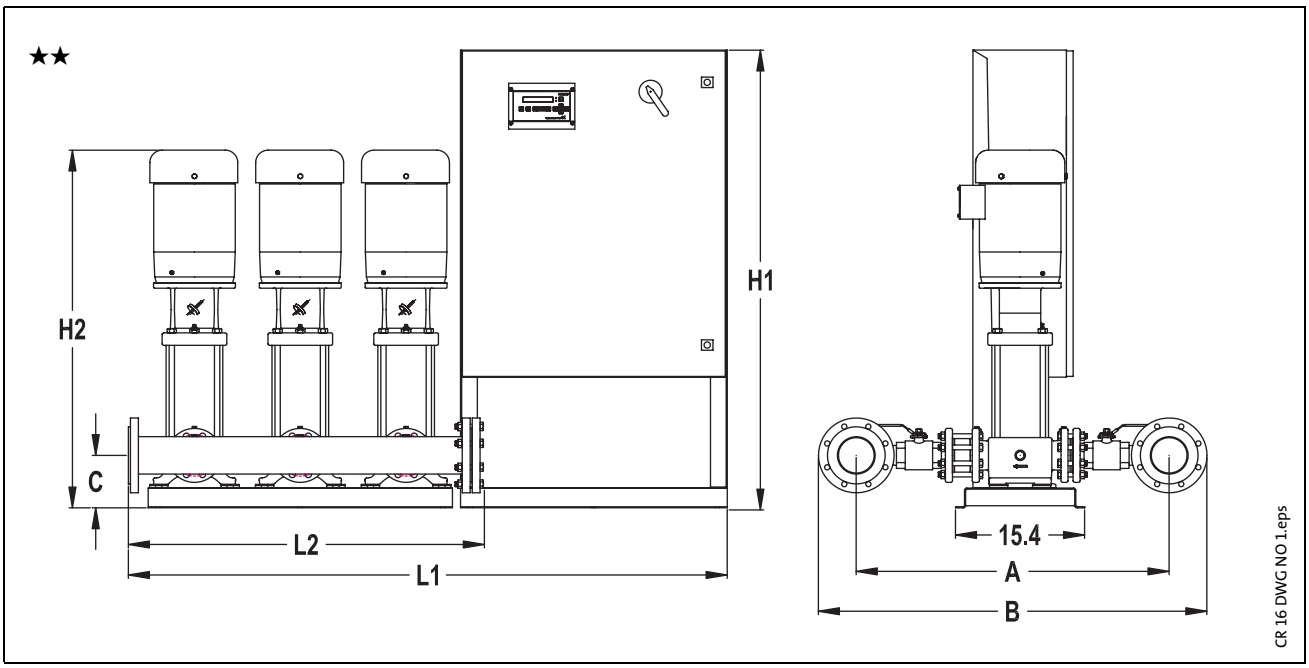
No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	MF						MS					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR 15-2	5	4" ANSI	35.6	44.6	6.3	34.2	57.9	51.6		728	★	34.2	57.9	51.6		533	★
	CR 15-3	5					35.4	57.9	51.6		834	★	35.4	57.9	51.6		604	★
	CR 15-4	7 1/2					38.2	57.9	51.6		842	★	38.2	57.9	51.6		612	★
	CR 15-6	10					41.9	57.9	51.6		892	★	41.9	57.9	51.6		694	★
	CR 15-7	15					45.0	57.9	58.7	29.8	1306	★★	45.0	57.9	51.6		929	★
3	CR 15-2	5	4" ANSI	35.6	44.6	6.3	34.2	57.9	71.3	42.3	1013	★★	34.2	57.9	64.2		830	★
	CR 15-3	5					35.4	57.9	71.3	42.3	1172	★★	35.4	57.9	64.2		1001	★
	CR 15-4	7 1/2					38.2	57.9	71.3	42.3	1184	★★	38.2	57.9	64.2		1013	★
	CR 15-6	10					41.9	57.9	71.3	42.3	1251	★★	41.9	57.9	64.2		1127	★
	CR 15-7	15					45.0	57.9	71.3	42.3	1824	★★	45.0	57.9	64.2	42.3	1423	★★
4	CR 15-2	5	6" ANSI	35.6	46.6	6.3	34.2	57.9	83.9	55.0	1230	★★	34.2	57.9	83.9	55.0	1050	★★
	CR 15-3	5					35.4	57.9	83.9	55.0	1441	★★	35.4	57.9	83.9	55.0	1163	★★
	CR 15-4	7 1/2					38.2	57.9	83.9	55.0	1457	★★	38.2	57.9	83.9	55.0	1179	★★
	CR 15-6	10					41.9	57.9	83.9	55.0	1694	★★	41.9	57.9	83.9	55.0	1335	★★
	CR 15-7	15					45.0	57.9	83.9	55.0	2228	★★	45.0	57.9	83.9	55.0	1882	★★

Weights and dimensions are based on 460V, 3 phase ODP motors (MES, MS, MF).

Dimensions may vary with panel options and system voltage.

Dimensions not for construction unless certified; certified drawings available upon request.





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Weights and dimensions

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	ME						MES					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR(E) 20-2	5	4" ANSI	36.3	45.3	6.3	42.1	57.9	51.5		571	★	42.1	57.9	51.5		551	★
	CR(E) 20-3	7 1/2					44.2	57.9	51.5		653	★	44.2	57.9	51.5		633	★
	CR(E) 20-4	10					45.8	57.9	51.5		677	★	45.8	57.9	51.5		659	★
3	CR(E) 20-2	5	4" ANSI	36.3	45.3	6.3	42.1	57.9	64.1		887	★	42.1	57.9	64.1		807	★
	CR(E) 20-3	7 1/2					44.2	57.9	64.1		1075	★	44.2	57.9	64.1		995	★
	CR(E) 20-4	10					45.8	57.9	64.1		1110	★	45.8	57.9	64.1		1034	★
4	CR(E) 20-2	5	6" ANSI	36.3	47.3	6.3	42.1	57.9	76.8		1126	★	42.1	57.9	76.8		1066	★
	CR(E) 20-3	7 1/2					44.2	57.9	76.8		1261	★	44.2	57.9	76.8		1201	★
	CR(E) 20-4	10					45.8	57.9	76.8		1308	★	45.8	57.9	76.8		1254	★

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	MF						MS					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR 20-2	5	4" ANSI	36.3	45.3	6.3	34.2	57.9	51.5		726	★	34.2	57.9	51.5		531	★
	CR 20-3	7 1/2					36.5	57.9	51.5		843	★	36.5	57.9	51.5		613	★
	CR 20-4	10					38.4	57.9	51.5		871	★	38.4	57.9	51.5		641	★
	CR 20-5	15					43.4	55.1	58.7	29.3	969	★★	43.4	55.1	51.5		771	★
	CR 20-6	15					45.3	55.1	58.7	29.3	1325	★★	45.3	55.1	51.5		948	★
3	CR 20-2	5	4" ANSI	36.3	45.3	6.3	34.2	57.9	71.3	41.9	1010	★★	34.2	57.9	71.3		827	★
	CR 20-3	7 1/2					36.5	57.9	71.3	41.9	1186	★★	36.5	57.9	71.3		1015	★
	CR 20-4	10					38.4	57.9	71.3	41.9	1227	★★	38.4	57.9	71.3		1056	★
	CR 20-5	15					43.4	55.1	71.3	41.9	1366	★★	43.4	55.1	71.3	41.9	1242	★★
	CR 20-6	15					45.3	55.1	71.3	41.9	1853	★★	45.3	55.1	71.3	41.9	1452	★★
4	CR 20-2	5	6" ANSI	36.3	47.3	6.3	34.2	57.9	84.0	54.5	1226	★★	34.2	57.9	84.0	54.5	1046	★★
	CR 20-3	7 1/2					36.5	57.9	84.0	54.5	1459	★★	36.5	57.9	84.0	54.5	1181	★★
	CR 20-4	10					38.4	57.9	84.0	54.5	1514	★★	38.4	57.9	84.0	54.5	1236	★★
	CR 20-5	15					43.4	57.9	84.0	54.5	1847	★★	43.4	57.9	84.0	54.5	1488	★★
	CR 20-6	15					45.3	57.9	84.0	54.5	2226	★★	45.3	57.9	84.0	54.5	1919	★★

Weights and dimensions are based on 460V, 3 phase ODP motors (MES, MS, MF).

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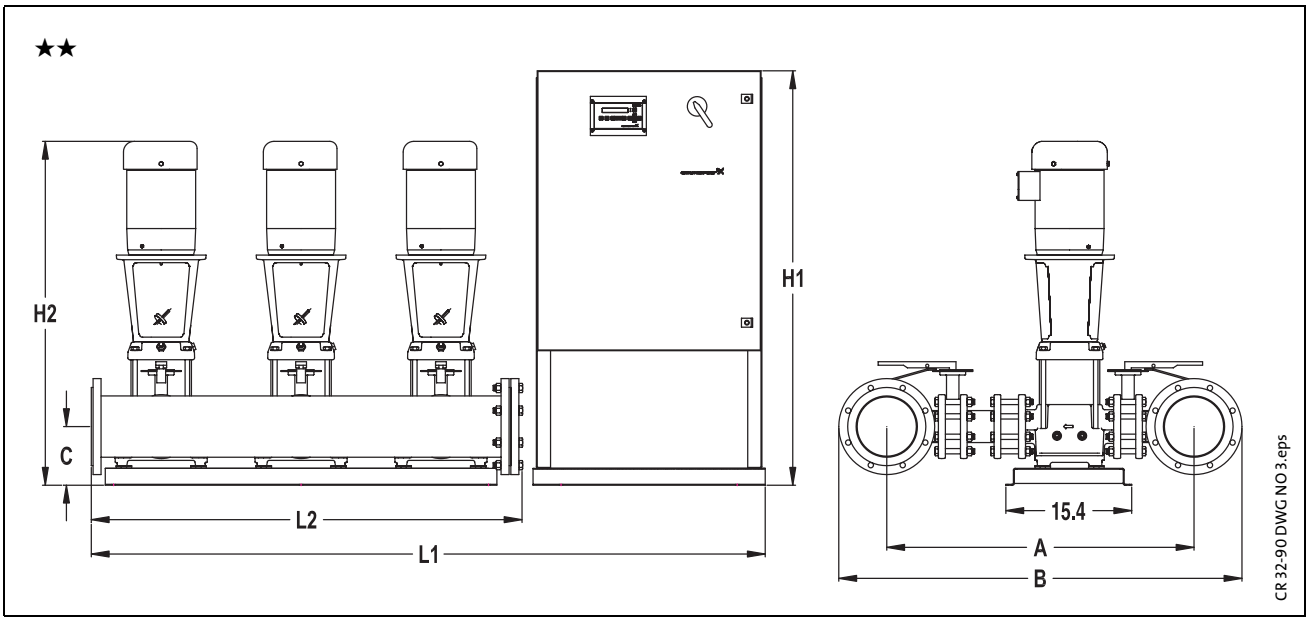

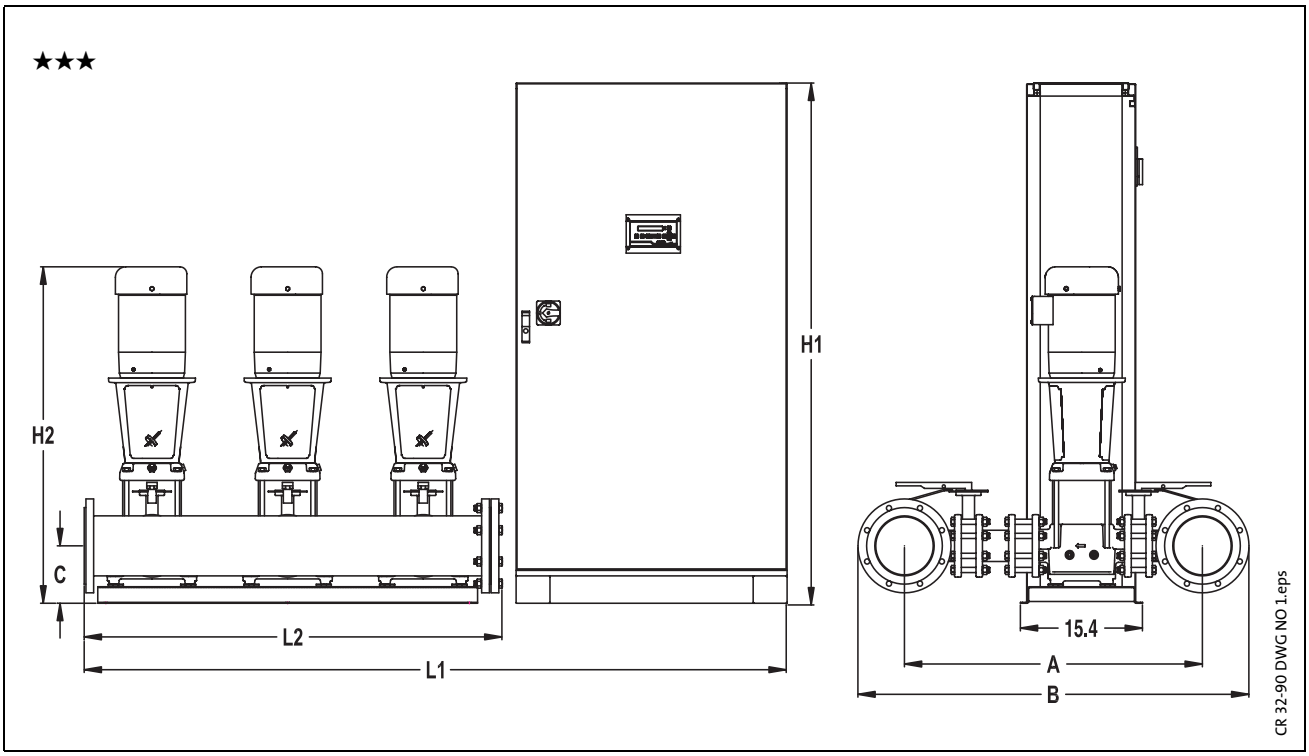

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Weights and dimensions

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	ME						MES					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR(E) 32-1	5	4" ANSI	38.8	47.8	6.9	44.2	58.3	65.1	40.8	879	★	44.2	57.9	65.1	40.8	859	★
	CR(E) 32-2	7 1/2					47.5	58.3	65.1	40.8	958	★	47.5	57.9	65.1	40.8	938	★
	CR(E) 32-3-2	10					50.2	58.3	65.1	40.8	995	★	50.2	57.9	65.1	40.8	979	★
3	CR(E) 32-1	5	6" ANSI	38.8	49.8	6.9	44.2	58.3	84.9	60.5	1286	★	44.2	57.9	84.9	60.5	1246	★
	CR(E) 32-2	7 1/2					47.5	58.3	84.9	60.5	1404	★	47.5	57.9	84.9	60.5	1364	★
	CR(E) 32-3-2	10					50.2	58.3	84.9	60.5	1463	★	50.2	57.9	84.9	60.5	1431	★
4	CR(E) 32-1	5	6" ANSI	38.8	49.8	6.9	44.2	58.3	104.6	80.3	1658	★	44.2	57.9	104.6	80.3	1598	★
	CR(E) 32-2	7 1/2					47.5	58.3	104.6	80.3	1819	★	47.5	57.9	104.6	80.3	1759	★
	CR(E) 32-3-2	10					50.2	58.3	104.6	80.3	1890	★	50.2	57.9	104.6	80.3	1874	★

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	MF						MS					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR 32-1	5	4" ANSI	38.8	47.8	6.9	36.9	58.3	73.0	40.8	1005	★★	36.9	57.9	73.0	40.8	839	★★
	CR 32-2	7 1/2					40.1	58.3	73.0	40.8	1053	★★	40.1	57.9	73.0	40.8	918	★★
	CR 32-3-2	10					43.8	58.3	73.0	40.8	1100	★★	43.8	57.9	73.0	40.8	963	★★
	CR 32-4	15					51.4	58.3	73.0	40.8	1557	★★	51.4	57.9	73.0	40.8	1219	★★
	CR 32-5	20					56.2	58.3	73.0	40.8	1760	★★	56.2	57.9	73.0	40.8	1417	★★
	CR 32-6-2	25					61.8	58.3	73.0	40.8	1839	★★	61.8	57.9	73.0	40.8	1495	★★
3	CR 32-1	5	6" ANSI	38.8	49.8	6.9	36.9	58.3	92.8	60.5	1452	★★	36.9	57.9	92.8	60.5	1226	★★
	CR 32-2	7 1/2					40.1	58.3	92.8	60.5	1523	★★	40.1	57.9	92.8	60.5	1344	★★
	CR 32-3-2	10					43.8	58.3	92.8	60.5	1586	★★	43.8	57.9	92.8	60.5	1415	★★
	CR 32-4	15					51.4	58.3	92.8	60.5	2212	★★	51.4	57.9	92.8	60.5	1871	★★
	CR 32-5	20					56.2	58.3	92.8	60.5	2518	★★	56.2	57.9	92.8	60.5	2170	★★
	CR 32-6-2	25					61.8	58.3	92.8	60.5	2636	★★	61.8	57.9	92.8	60.5	2272	★★
4	CR 32-1	5	6" ANSI	38.8	49.8	6.9	36.9	58.3	111.2	80.3	1813	★★	36.9	57.9	111.2	80.3	1578	★★
	CR 32-2	7 1/2					40.1	58.3	111.2	80.3	1908	★★	40.1	57.9	111.2	80.3	1739	★★
	CR 32-3-2	10					43.8	58.3	111.2	80.3	2141	★★	43.8	57.9	111.2	80.3	1826	★★
	CR 32-4	15					51.4	58.3	111.2	80.3	2743	★★	51.4	57.9	111.2	80.3	2402	★★
	CR 32-5	20					57.3	58.3	111.2	80.3	3149	★★★	56.2	57.9	111.2	80.3	2795	★★
	CR 32-6-2	25					61.8	58.3	111.2	80.3	3306	★★★	61.8	57.9	111.2	80.3	2931	★★

Weights and dimensions are based on 460V, 3 phase ODP motors (MES, MS, MF).

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Dimensions not for construction unless certified; certified drawings available upon request.

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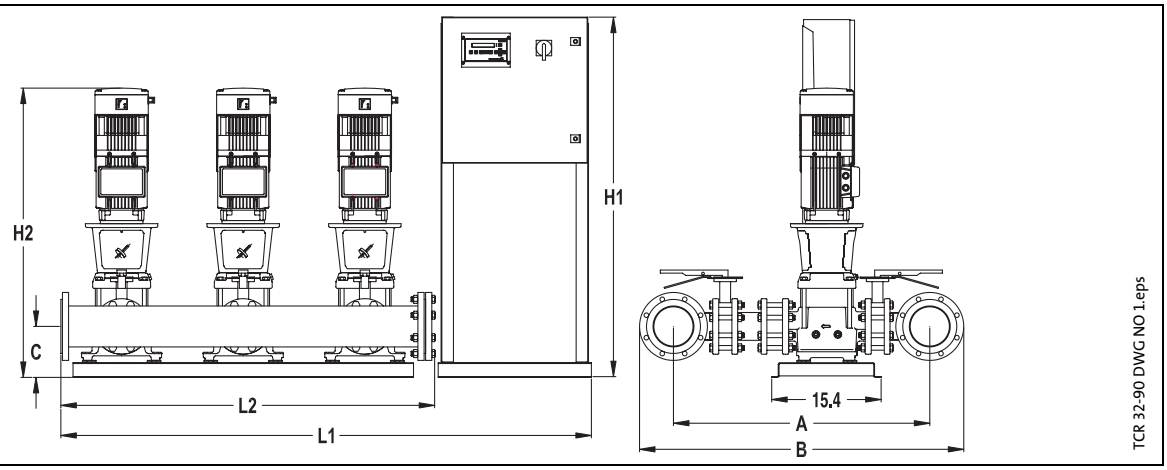
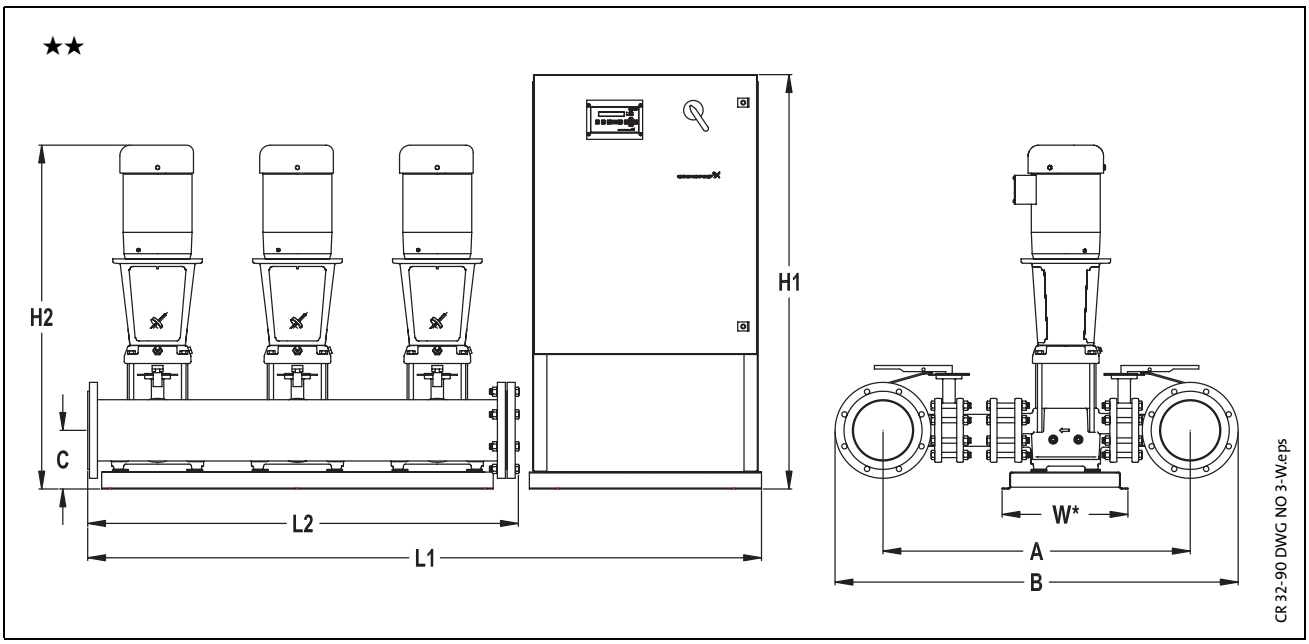
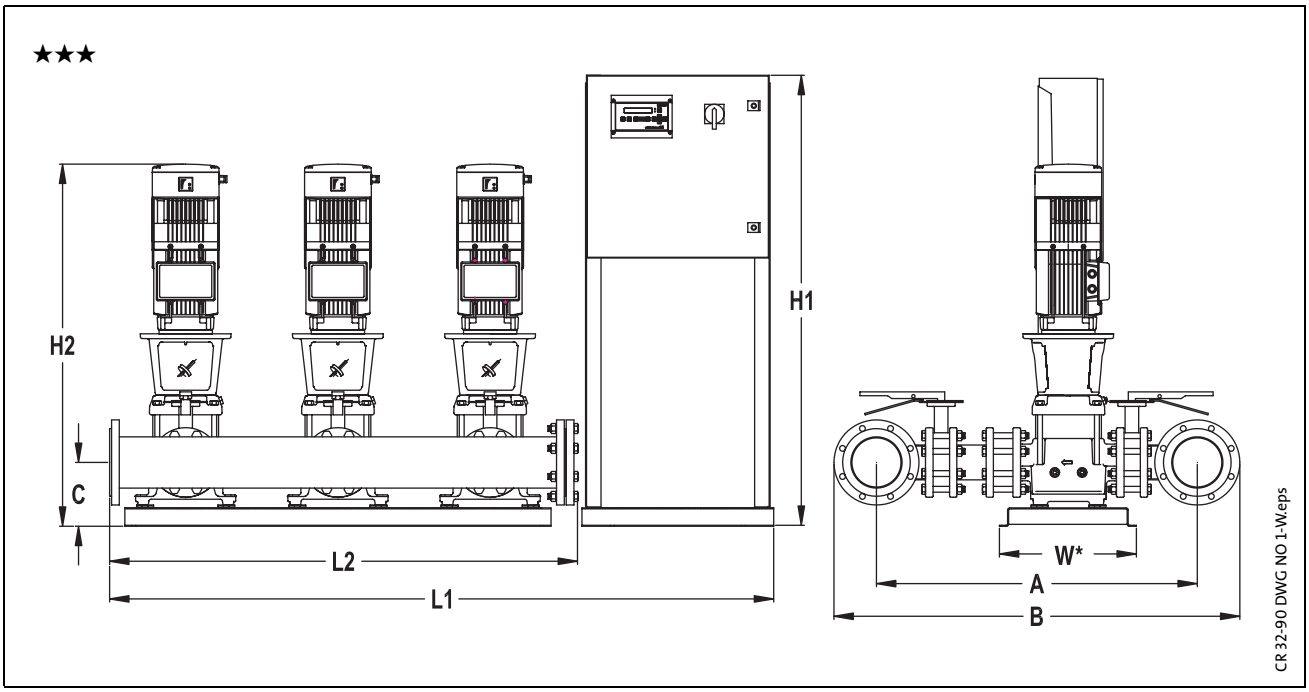






1. Dimensions subject to change without notice.
2. Not for construction; certified drawings available on request.

For information about ★and ★★ please see weights and dimensions.

* W = 15.4 inches (2 & 3 pumps) or 17.7 inches (4 pumps)

Weights and dimensions

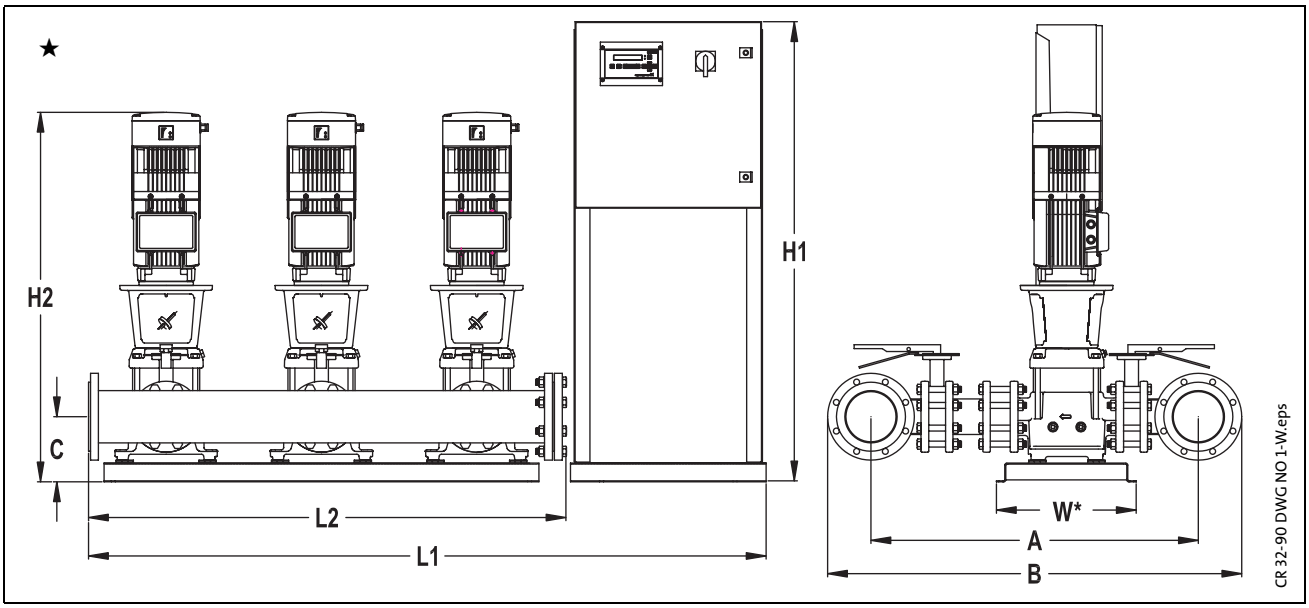
No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	ME						MES					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR(E) 45-1	7 1/2	6” ANSI	40.7	51.7	8.2	46.7	58.3	65.1	40.8	1064	★	46.7	58.3	65.1	40.8	1044	★
3	CR(E) 45-1	7 1/2	6” ANSI	40.7	51.7	8.2	46.7	58.3	84.9	60.5	1544	★	46.7	58.3	84.9	60.5	1504	★
4	CR(E) 45-1	7 1/2	8” ANSI	42.8	56.3	9.8	48.1	58.3	104.6	80.3	2001	★	48.1	58.3	104.6	80.3	1941	★

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	MF						MS					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR 45-1	7 1/2	6” ANSI	40.7	51.7	8.2	39.3	58.3	73.0	40.8	1159	★★	39.3	58.3	73.0	40.8	1024	★★
	CR 45-2	15					48.4	58.3	73.0	40.8	1623	★★	48.4	58.3	73.0	40.8	1066	★★
	CR 45-3-2	20					53.5	58.3	73.0	40.8	1829	★★	53.5	58.3	73.0	40.8	1486	★★
	CR 45-3	25					56.4	58.3	73.0	40.8	1929	★★	56.4	58.3	73.0	40.8	1655	★★
	CR 45-4	30					58.3	55.2	73.0	40.8	2303	★★★	58.3	55.2	73.0	40.8	1765	★★
3	CR 45-1	7 1/2	6” ANSI	40.7	51.7	8.2	39.3	58.3	92.8	60.5	1660	★★	39.3	58.3	92.8	60.5	1484	★★
	CR 45-2	15					48.4	58.3	92.8	60.5	2296	★★	48.4	58.3	92.8	60.5	1956	★★
	CR 45-3-2	20					53.5	58.3	92.8	60.5	2603	★★	53.5	58.3	92.8	60.5	2254	★★
	CR 45-3	25					56.4	58.3	92.8	60.5	2867	★★	56.4	58.3	92.8	60.5	2376	★★
	CR 45-4	30					58.3	58.3	92.8	60.5	3428	★★★	58.3	58.3	92.8	60.5	2541	★★
4	CR 45-1	7 1/2	8” ANSI	42.8	56.3	9.8	39.3	58.3	111.2	80.3	2090	★★	39.3	58.3	111.2	80.3	1921	★★
	CR 45-2	15					48.4	58.3	111.2	80.3	2848	★★	48.4	58.3	111.2	80.3	2510	★★
	CR 45-3-2	20					53.5	58.3	111.2	80.3	3255	★★★	53.5	58.3	111.2	80.3	2904	★★
	CR 45-3	25					57.9	58.3	111.2	80.3	3561	★★★	57.9	58.3	111.2	80.3	3065	★★
	CR 45-4	30					60.1	58.3	111.2	80.3	4307	★★★	60.1	58.3	111.2	80.3	3285	★★

Weights and dimensions are based on 460V, 3 phase ODP motors (MES, MS, MF).

Dimensions may vary with panel options and system voltage.

Dimensions not for construction unless certified; certified drawings available upon request.



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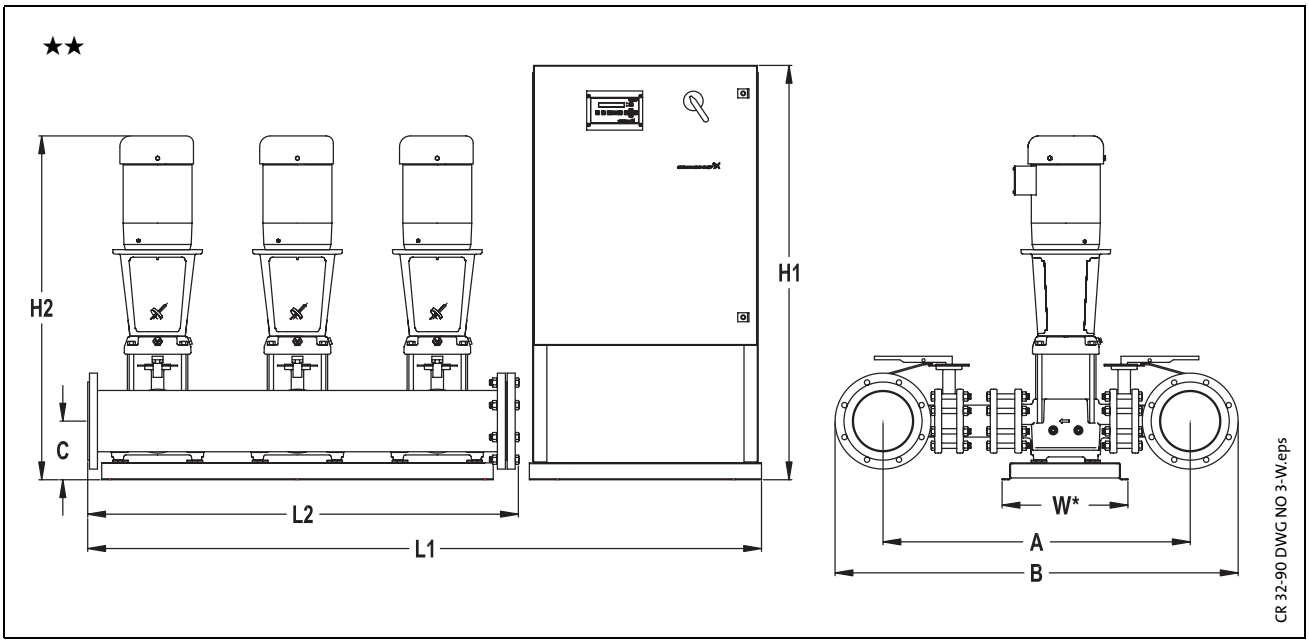

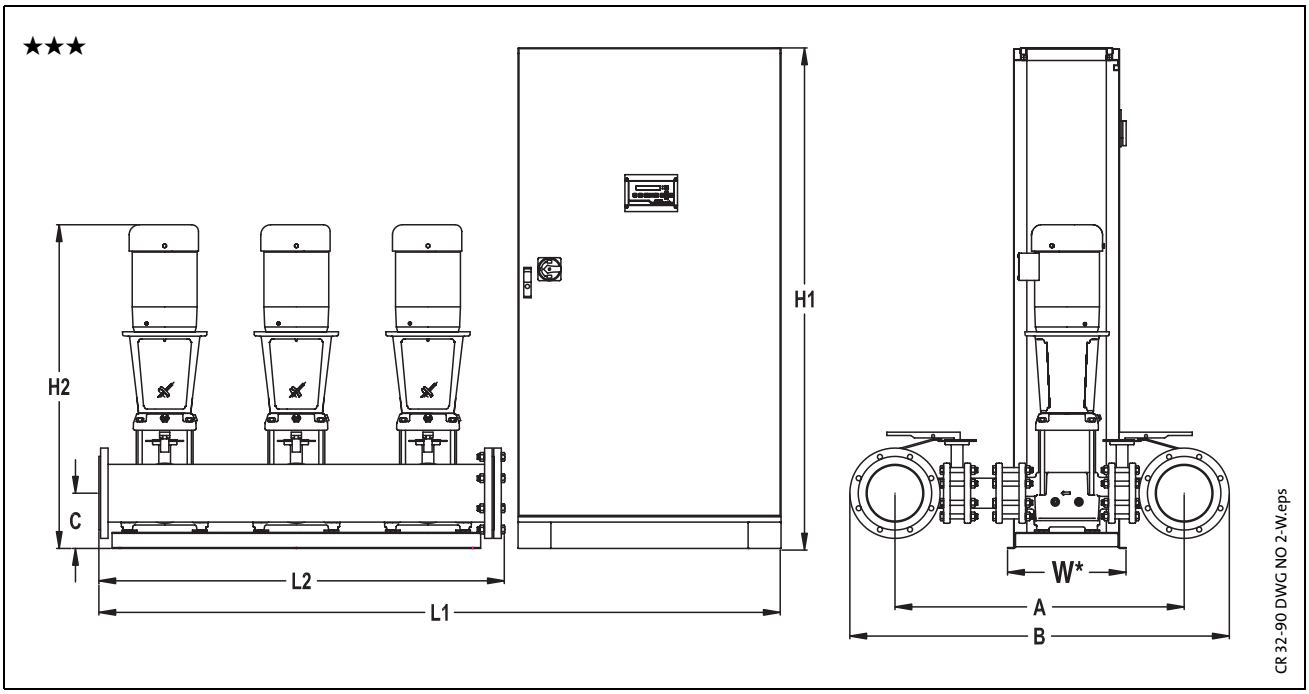

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For information about ★and ★★ please see weights and dimensions.

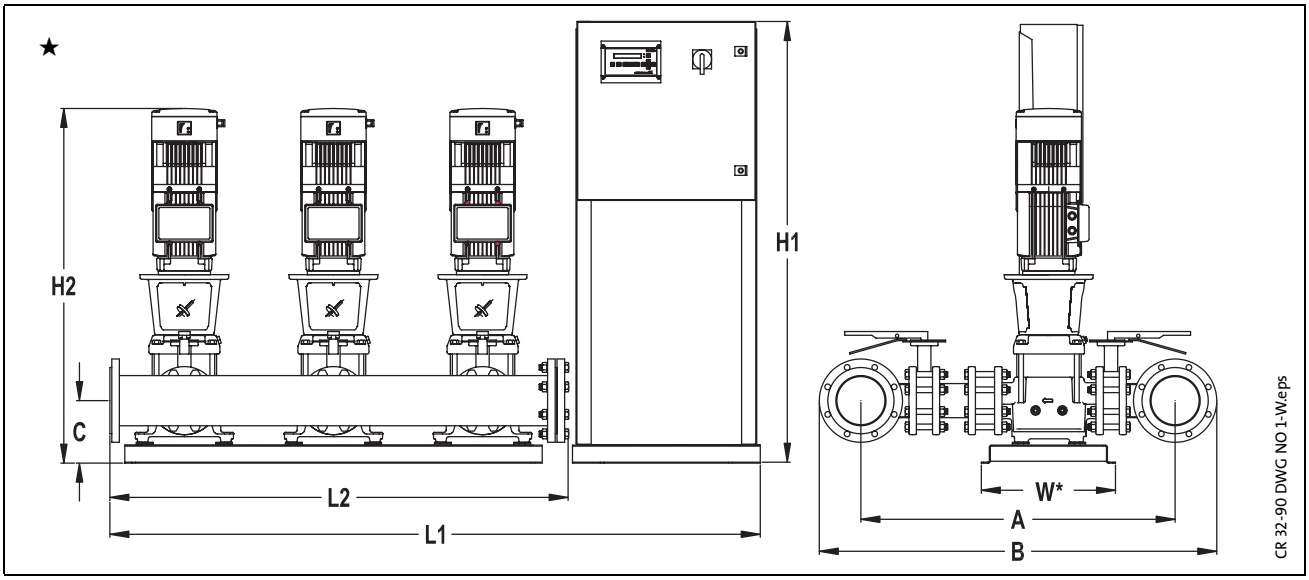
* W = 15.4 inches (2 & 3 pumps) or 17.7 inches (4 pumps)

Weights and dimensions

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	ME						MES					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR(E) 64-1-1	7.5	6" ANSI	42.6	53.6	8.3	46.8	58.3	65.1	40.8	1072	★	46.8	58.3	65.1	40.8	1052	★
3	CR(E) 64-1-1	7.5	8" ANSI	43.1	56.6	9.8	48.4	58.3	84.9	60.5	1555	★	48.4	58.3	84.9	60.5	1515	★
4	CR(E) 64-1-1	7.5	10" ANSI	47.7	63.7	12.2	50.8	58.3	104.6	80.3	2017	★	50.8	58.3	104.6	80.3	1957	★

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	MF						MS					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR 64-1-1	7 1/2	6" ANSI	42.6	53.6	8.2	39.4	58.3	73.0	40.8	1166	★★	39.4	58.3	73.0	40.8	1032	★★
	CR 64-2-2	15					48.7	58.3	73.0	40.8	1631	★★	48.7	58.3	73.0	40.8	1296	★★
	CR 64-2-1	20					50.7	58.3	73.0	40.8	1842	★★	50.7	58.3	73.0	40.8	1499	★★
	CR 64-2	25					53.6	58.3	73.0	40.8	1937	★★	53.6	58.3	73.0	40.8	1663	★★
	CR 64-3-2	30					55.6	55.2	73.0	40.8	2228	★★★	55.6	55.2	73.0	40.8	1951	★★
	CR 64-3	40					56.8	55.2	73.0	40.8	2851	★★★	56.8	55.2	73.0	40.8	2492	★★
3	CR 64-1-1	7 1/2	8" ANSI	43.1	56.6	9.8	40.9	58.3	92.8	60.5	1671	★★	40.9	58.3	92.8	60.5	1495	★★
	CR 64-2-2	15					50.2	58.3	92.8	60.5	2307	★★	50.2	58.3	92.8	60.5	1966	★★
	CR 64-2-1	20					52.3	58.3	92.8	60.5	2621	★★	52.3	58.3	92.8	60.5	2273	★★
	CR 64-2	25					55.1	55.2	92.8	60.5	2877	★★	55.1	55.2	92.8	60.5	2386	★★
	CR 64-3-2	30					57.1	55.2	92.8	60.5	3305	★★★	57.1	55.2	92.8	60.5	2816	★★
	CR 64-3	40					58.3	55.2	92.8	60.5	4255	★★★	58.3	55.2	92.8	60.5	3587	★★
4	CR 64-1-1	7 1/2	10" ANSI	47.7	63.7	12.2	43.2	58.3	111.2	80.3	2106	★★	43.2	58.3	111.2	80.3	1957	★★
	CR 64-2-2	15					52.5	58.3	111.2	80.3	2864	★★	52.5	58.3	111.2	80.3	2526	★★
	CR 64-2-1	20					54.7	58.3	111.2	80.3	3281	★★★	54.7	58.3	111.2	80.3	2930	★★
	CR 64-2	25					57.6	55.2	111.2	80.3	3577	★★★	57.6	55.2	111.2	80.3	3080	★★
	CR 64-3-2	30					59.7	55.2	111.2	80.3	4155	★★★	59.7	55.2	111.2	80.3	3656	★★
	CR 64-3	40					61.1	55.2	111.2	80.3	5536	★★★	61.1	55.2	111.2	80.3	4657	★★

Weights and dimensions are based on 460V, 3 phase ODP motors (MES, MS, MF).
Dimensions may vary with panel options and system voltage.
Dimensions not for construction unless certified; certified drawings available upon request.



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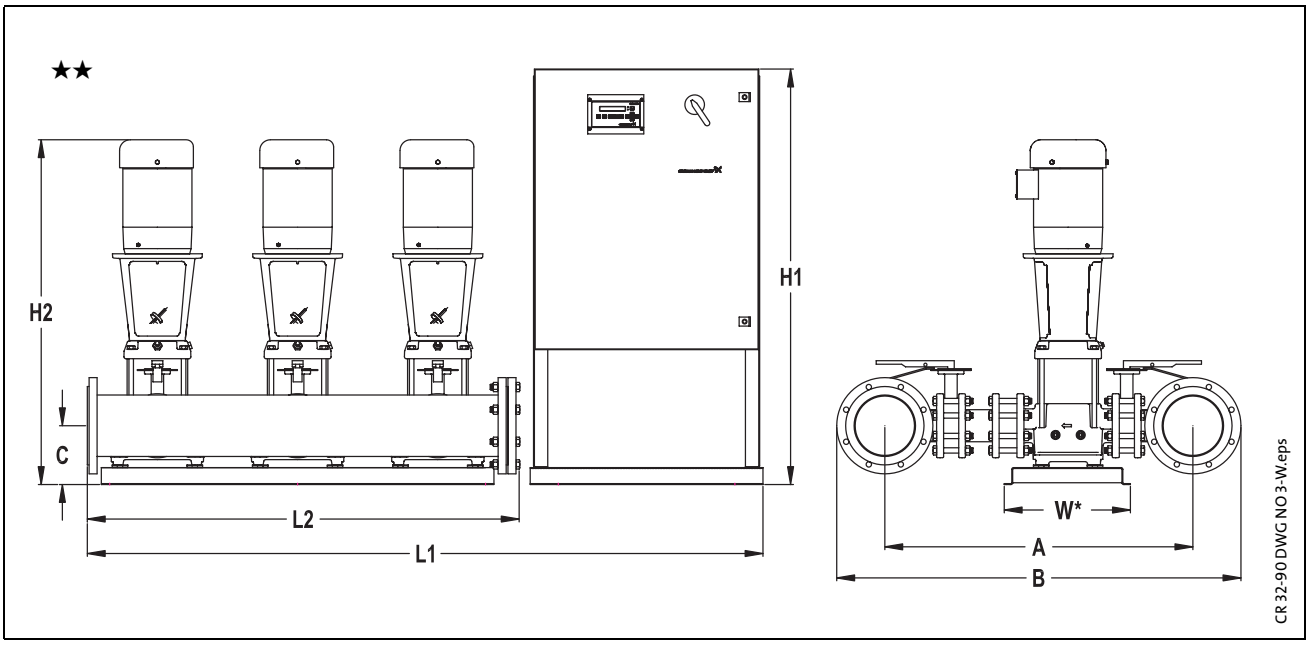

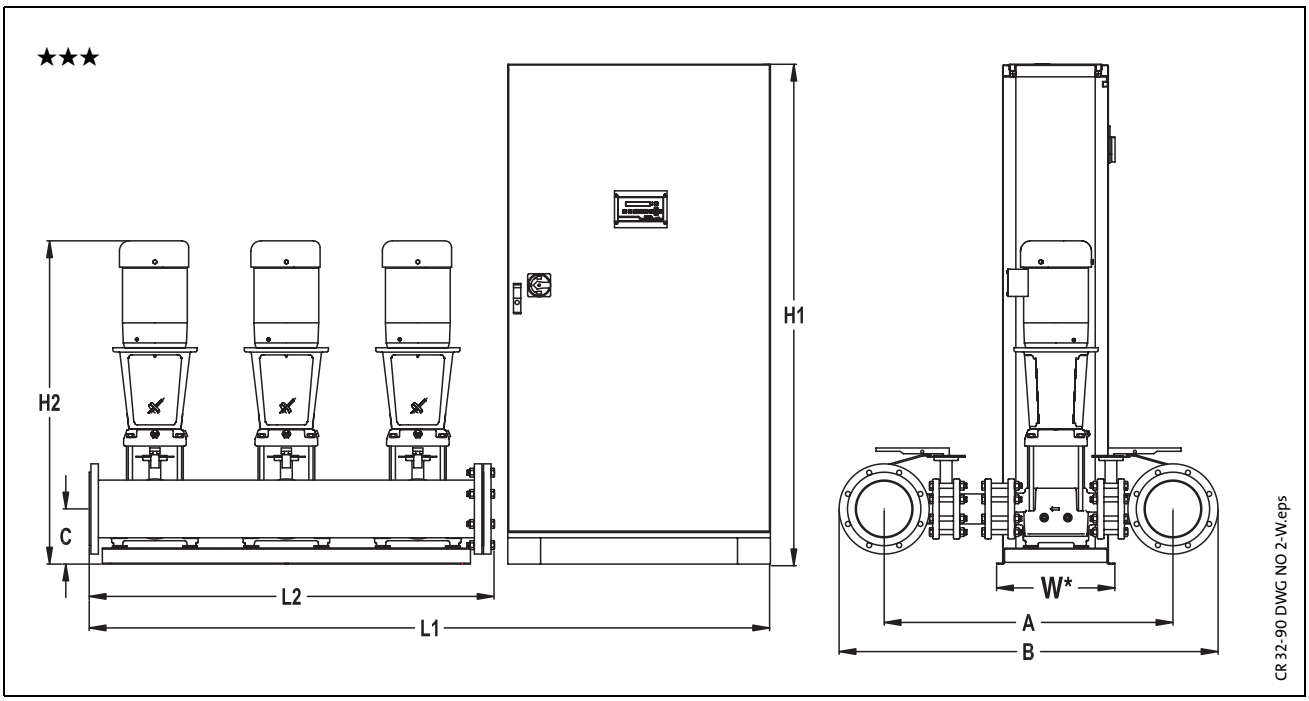

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For information about ★and ★★ please see weights and dimensions.

* W = 15.4 inches (2 & 3 pumps) or 17.7 inches (4 pumps)

Weights and dimensions

No. of pumps	Pump Type	Motor output [hp]	Connection size	A [in]	B [in]	C [in]	MF						MS					
							H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG	H2 [in]	H1 [in]	L1 [in]	L2 [in]	Shipping Weight [lb]	DWG
2	CR 90-1	15	6" ANSI	44.1	55.1	8.3	45.5	58.3	73.0	40.8	1689	★★	45.5	58.3	65.1	40.8	1354	★★
	CR 90-2-2	25					54.2	58.3	73.0	40.8	1974	★★	54.2	58.3	73.0	40.8	1700	★★
	CR 90-2-1	30					53.3	55.2	73.0	40.8	2265	★★★	53.3	58.3	73.0	40.8	1987	★★
	CR 90-2	40					54.5	55.2	73.0	40.8	2868	★★★	54.5	58.3	73.0	40.8	2509	★★
	CR 90-3-2	40					58.2	55.2	73.0	40.8	2888	★★★	58.2	58.3	73.0	40.8	2529	★★
	CR 90-3	50					62.3	78.0	79.5	40.8	3072	★★★	62.3	58.3	73.0	40.8	2713	★★
3	CR 90-1	15	8" ANSI	44.1	57.6	9.8	47.0	57.9	92.8	60.5	2399	★★	47.0	58.3	92.8	60.5	2059	★★
	CR 90-2-2	25					55.5	57.9	92.8	60.5	2938	★★	55.5	58.3	92.8	60.5	2447	★★
	CR 90-2-1	30					54.4	55.2	92.8	60.5	3366	★★★	54.4	58.3	92.8	60.5	2877	★★
	CR 90-2	40					56.0	55.2	92.8	60.5	4286	★★★	56.0	58.3	92.8	60.5	3618	★★
	CR 90-3-2	40					59.6	55.2	92.8	60.5	4316	★★★	59.6	58.3	92.8	60.5	3648	★★
	CR 90-3	50					62.3	78.0	99.3	60.5	4592	★★★	62.3	58.3	92.8	60.5	3924	★★
4	CR 90-1	15	10" ANSI	48.6	64.6	12.2	49.5	57.9	111.2	80.3	2983	★★	49.5	58.3	111.2	80.3	2647	★★
	CR 90-2-2	25					58.1	57.9	111.2	80.3	3653	★★★	58.1	58.3	111.2	80.3	3160	★★
	CR 90-2-1	30					57.1	55.2	111.2	80.3	4231	★★★	57.1	58.3	111.2	80.3	3735	★★
	CR 90-2	40					58.5	55.2	111.2	80.3	5572	★★★	58.5	58.3	111.2	80.3	4693	★★
	CR 90-3-2	40					62.1	55.2	111.2	80.3	5612	★★★	62.1	58.3	111.2	80.3	4733	★★
	CR 90-3	50					62.3	78.0	118.1	80.3	5981	★★★	62.3	58.3	111.2	80.3	5101	★★

Weights and dimensions are based on 460V, 3 phase ODP motors (MS, MF).

Dimensions may vary with panel options and system voltage.

Dimensions not for construction unless certified; certified drawings available upon request.

Electrical data

No. of Pumps	Motor output [hp]	Maximum System Amps											
		MS			MF			ME			MES		
		1x230V	3x230V	3x460V	3x208V	3x230V	3x460V	1x230V	3x230V	3x460V	1x230V	3x230V	3x460V
2	1	15.0	7.2	3.6	7.6	7.2	4.8	10.4	10.4	4.8	12.7	8.8	4.2
	1.5	19.4	10.0	5.0	10.8	10.0	6.1	15.0	15.0	6.1	17.2	12.5	5.6
	2	27.6	12.8	6.4	13.4	12.8	7.8	27.6	12.4	7.8	27.6	12.6	7.1
	3	33.4	18.0	9.0	19.0	18.0	10.9	28.6	22.8	10.9	31.0	20.4	10.0
	5	57.4	27.2	13.6	29.4	27.2	16.0	39.2	33.4	16.0	48.3	30.3	14.8
	7.5	82.0	40.0	20.0	42.0	40.0	24.0	64.6	49.8	24.0	73.3	44.9	22.0
	10	103.4	56.0	28.0	60.0	56.0	29.2	96.8	64.2	29.2	100.1	60.1	28.6
	15		82.0	41.0	86.0	82.0							
	20		110.0	55.0		110.0							
	25			67.0									
	30			80.0									
	40			110.0									
	50			134.0									
3	1	22.5	10.8	5.4	11.4	10.8	7.2	15.6	15.6	7.2	20.2	12.4	6.0
	1.5	29.1	15.0	7.5	16.2	15.0	9.2	22.5	22.5	9.2	26.9	17.5	8.1
	2	41.4	19.2	9.6	20.1	19.2	11.7	41.4	18.6	11.7	41.4	19.0	10.3
	3	50.1	27.0	13.5	28.5	27.0	16.4	42.9	34.2	16.4	47.7	29.4	14.5
	5	86.1	40.8	20.4	44.1	40.8	24.0	58.8	50.1	24.0	77.0	43.9	21.6
	7.5	123.0	60.0	30.0	63.0	60.0	36.0	96.9	74.7	36.0	114.3	64.9	32.0
	10	155.1	84.0	42.0	90.0	84.0	43.8		96.3	43.8		88.1	42.6
	15		123.0	61.5	129.0	123.0							
	20		165.0	82.5		165.0							
	25			100.5									
	30			120.0									
	40			165.0									
	50			201.0									
4	1	30.0	14.4	7.2	15.2	14.4	9.6	20.8	20.8	9.6	27.7	16.0	7.8
	1.5	38.8	20.0	10.0	21.6	20.0	12.2	30.0	30.0	12.2	36.6	22.5	10.6
	2	55.2	25.6	12.8	26.8	25.6	15.6	55.2	24.8	15.6	55.2	25.4	13.5
	3	66.8	36.0	18.0	38.0	36.0	21.8	57.2	45.6	21.8	64.4	38.4	19.0
	5	114.8	54.4	27.2	58.8	54.4	32.0	78.4	66.8	32.0	105.7	57.5	28.4
	7.5	164.0	80.0	40.0	84.0	80.0	48.0	129.2	99.6	48.0	155.3	84.9	42.0
	10	206.8	112.0	56.0	120.0	112.0	58.4	193.6	128.4	58.4		116.1	56.6
	15		164.0	82.0	172.0	164.0							
	20		220.0	110.0		220.0							
	25			134.0									
	30			160.0									
	40			220.0									
	50			268.0									

1. Maximum system amps reflect panels with no options.
2. For 208V (single and three phase) systems the maximum system amps will be slightly higher than 230V systems.
3. All values based on ODP motors.

Dimensions and weights

The previous pages state dimensions and weights for BoosterpaQ.

Please note that the dimensions stated may vary and that all systems are supplied without vibration dampers.

The standard configuration is with the control panel to the right with the suction manifold in front. Other panel/manifold configurations are available on request.

Larger BoosterpaQs come with the control cabinet on a separate base frame (304 SS) or as a stand-alone cabinet.

Construction

BoosterpaQs are built up on a common stainless steel base frame (304 SS). The pumps are fixed to the base frame by means of bolts. The control cabinet is fixed to the base frame by means of a stainless steel stand (304 SS).

A discharge manifold of stainless steel (316 or 316 Ti SS) is mounted on the discharge side of the pumps. An isolation valve and check valve are mounted between the discharge manifold and the individual pumps. The check valve may be mounted on the suction side on request. BoosterpaQs that will be installed in suction lift configuration will have the check valves mounted on the suction side of the pumps.

A suction manifold of stainless steel (316 or 316 Ti) is mounted on the suction side of the pumps. An isolation valve is mounted between the suction manifold and the individual pumps.

The Control 2000 control cabinet is fitted with all the necessary components. All BoosterpaQ MF control cabinets are fitted with a fan to remove surplus heat generated by the variable frequency drive.

Operating conditions

Liquid temperature: + 32° F to +176° F [0°C to +80 °C].

Ambient temperature: +32° F to +104° F [0°C to +40 °C].

Consult factory for conditions outside of this range.

Operating pressure

The operating pressure depends on the pressure transmitter, but the standard maximum is 230 psi [16 bar]. The max. operating pressure may also be limited by the diaphragm tank installed.

Consult factory for higher operating pressures.

Installation

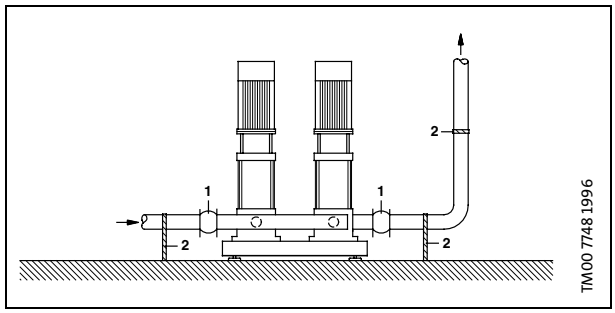
A BoosterpaQ must be installed in a well ventilated room to ensure sufficient cooling for pumps and the control cabinet.

The BoosterpaQ should be placed with a 3 ft. clearance in front and on the two sides for start-up and service access.

Mechanical installation

The pipes connected to the BoosterpaQ must be of adequate size. To avoid resonance, expansion joints should be fitted both in the discharge and suction pipes. The pipes are to be connected to the manifolds of the system. Either end can be used.

It is always advisable to fit supports both on the suction and discharge side. The systems should be positioned on an even and solid surface, e.g. a concrete floor or foundation. If the BoosterpaQ is not fitted with vibration dampers, it must be bolted to the floor or foundation.



1. Expansion joints (not supplied with BoosterpaQ).
2. Pipe supports (not supplied with BoosterpaQ).

Electrical connection

60 Hz standard voltage:

1 x 208, 230 V ± 10 %

3 x 208, 230, 460, 575 V ± 10 %

Starting method:

Direct-on-line starting

Dry-running protection

Dry-running protection must always be installed on the suction side of the system.
The following types of dry run protection are available with each BoosterpaQ.

- Pressure Transducer (4-20mA)
- Liquid Level Switch

Other types of dry run protection can be connected to the BoosterpaQ. The BoosterpaQ can be configured to accept an analog input (e.g. 4-20mA) or a digital input (NO or NC) signal for dry run protection.

Water supply systems that can have suction pressure variations that go below 0 psig (e.g. storage tanks, suction lift applications) should have a Liquid Level sensing type of dry run protection.

Diaphragm tank

In most systems a diaphragm tank must be installed on the discharge side of the system. See page 16 for recommended size.

Pressure sustaining valve (PSV)

(Recommended for MF type systems)

The fitting of a PSV valve prevents system damage due to excessive pressure in case of variable frequency drive failure or improper operation.

PMU 2000

PMU 2000 enables regular optimization of operation and read-out of operating data.

Emergency operation switch

The emergency operation switch enables emergency operation if fault occurs in the control panel. There is one switch per pump. If any one of the switches is turned to the emergency position the PFU and variable frequency drive will be disabled and that pump will run full speed.

Safety disconnect switch

To enable pump/motor repair without disturbing system operation of other pumps.

Phase failure protection

A phase monitor relay mounted in the control panel that protects against high/low voltage, voltage imbalance and loss of phase.

Lightning protection

A lightning arrestor is mounted in the control panel to aid in the protection against a lightning strike.

Voltmeter

A voltmeter indicates the incoming voltage between individual phases.

Description	Mounting
Voltmeter (with change-over switch)	In door of Control 2000

Ammeter

An ammeter indicates the current (Amps) for a single phase.

Pump run lights

The operating light for a pump is illuminated when that pump is in operation. MF systems have two run lights per pump; one indicates VFD operation and the other indicates across-the-line operation (full speed).

System fault light

This light is illuminated when there is a system fault. Three types are available:

- Dial indicator on the panel door
- Dome Light on top of panel
- Remote Dome Light for mounting some distance from the control panel

Pump fault lights

The fault light for a pump is illuminated when that pump is in fault.

Audible system fault alarm

The alarm is sounded when there is a system fault. There are two types:

- 80 db(A)
- 100 db(A)

Panel illumination light

A work light mounted inside the control panel. Two types are available:

- Work light powered by 115V supplied by the panel
- Work light powered by a separate 115V power supply brought to the control panel

Extra documentation

In addition to the documentation supplied with the system, the following extra set of documentation may be supplied:

- Installation and Operating instructions
- Wiring diagram,
- List of Programming Parameters (PMU, VFD etc)

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Subject to alterations.

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