

Series HSC³ Split Case Pumps Technical Brochure

BX-520E

 **Bell & Gossett**
a xylem brand

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Useful Pump Formulas

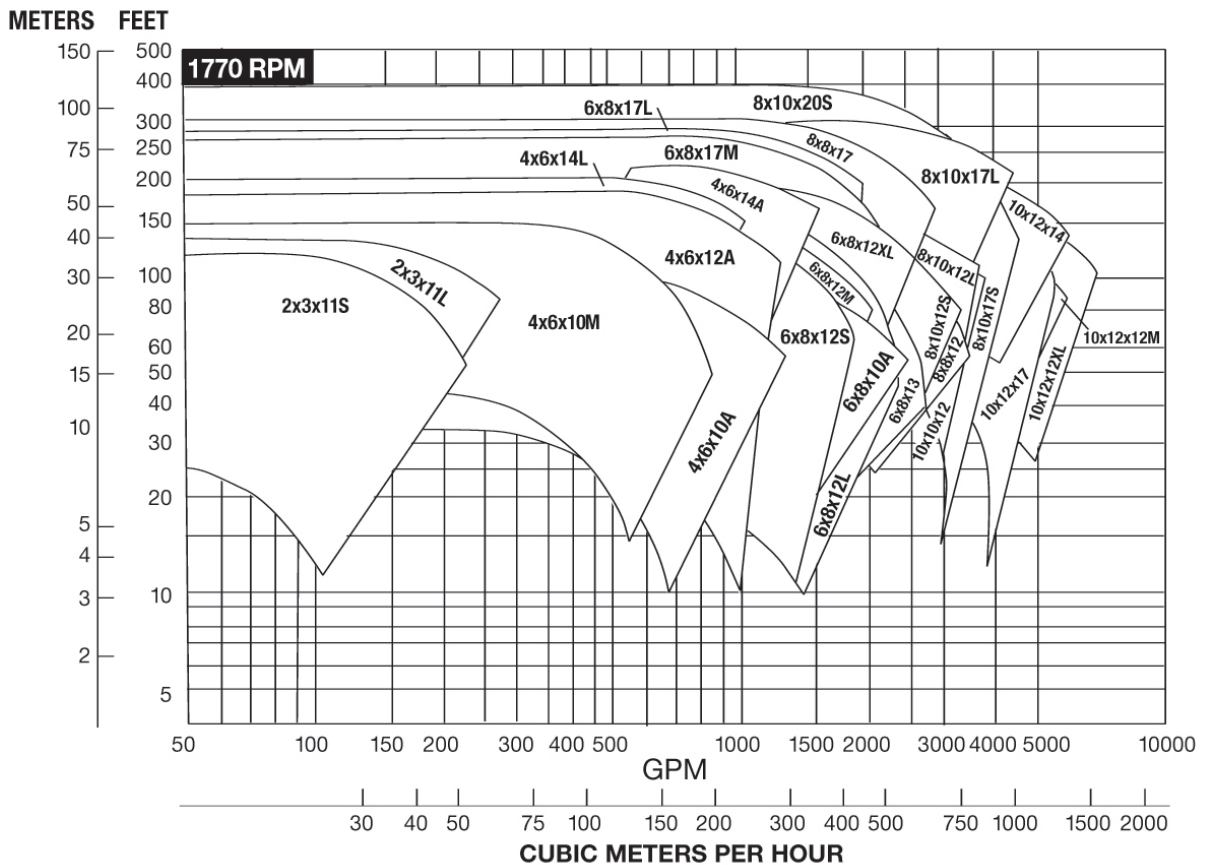
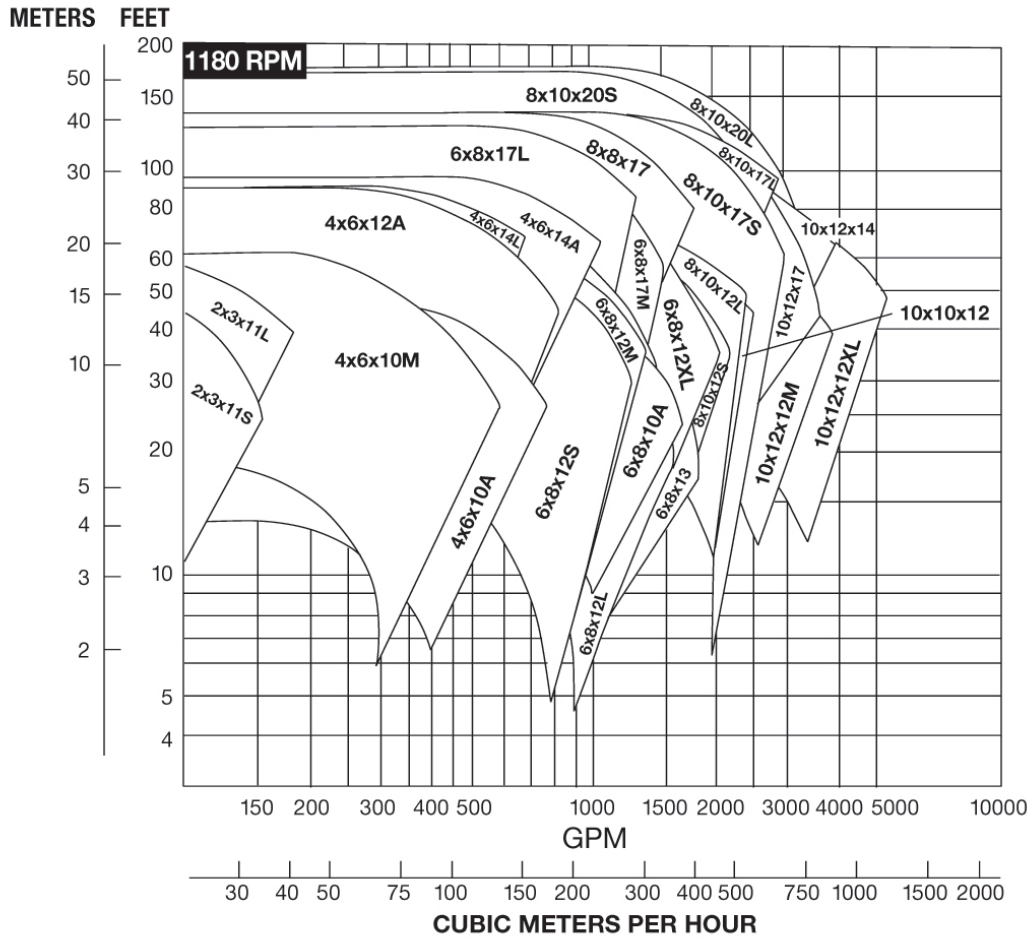
| | | |
|----------------------------|---|--|
| Pressure (PSI) | = | $\frac{\text{Head (Feet)} \times \text{Specific Gravity}}{2.31}$ |
| Head (Feet) | = | $\frac{\text{Pressure (PSI)} \times 2.31}{\text{Specific Gravity}}$ |
| Vacuum (Inches of Mercury) | = | Dynamic Suction Lift (Feet) x .883 x Specific Gravity |
| Horsepower (Brake) | = | $\frac{\text{GPM} \times \text{Head (Feet)} \times \text{Specific Gravity}}{3960 \times \text{Pump Efficiency}}$ |
| Horsepower (Water) | = | $\frac{\text{GPM} \times \text{Head (Feet)} \times \text{Specific Gravity}}{3960}$ |
| Efficiency (Pump) | = | $\frac{\text{Horsepower (Water)}}{\text{Horsepower (Brake)}} \times 100 \text{ Per Cent}$ |
| NPSH (Available) | = | Positive Factors – Negative Factors |

Affinity Laws: Effect of change of speed or impeller diameter on centrifugal pumps.

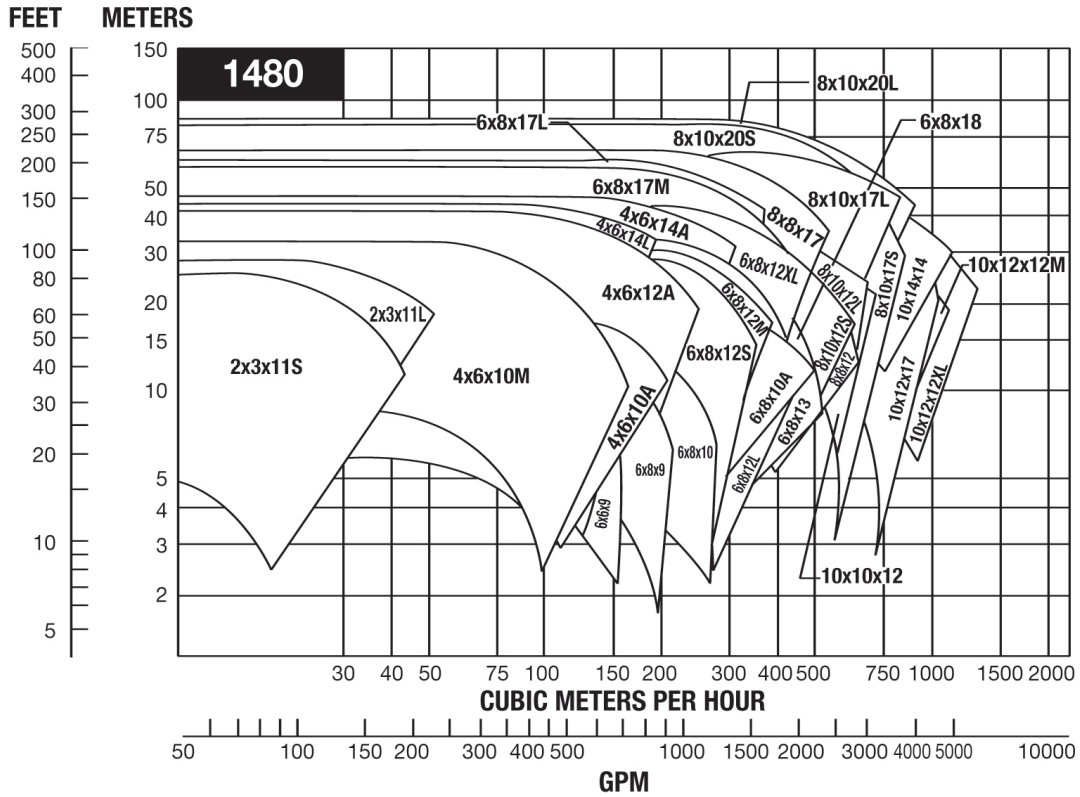
| | GPM Capacity | Ft. Head | BHP |
|--------------------------|---------------------------------|--|--|
| Impeller Diameter Change | $Q_2 = \frac{D_2}{D_1} Q_1$ | $H_2 = \left(\frac{D_2}{D_1}\right)^2 H_1$ | $P_2 = \left(\frac{D_2}{D_1}\right)^3 P_1$ |
| Speed Change | $Q_2 = \frac{RPM_2}{RPM_1} Q_1$ | $H_2 = \left(\frac{RPM_2}{RPM_1}\right)^2 H_1$ | $P_2 = \left(\frac{RPM_2}{RPM_1}\right)^3 P_1$ |

Where Q = GPM, H = Head, P = BHP, D = Impeller Dia., RPM = Pump Speed

60 Cycle Performance Curves - Series HSC³

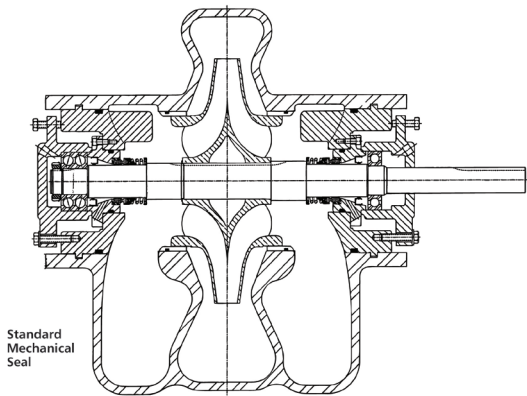


50 Cycle Performance Curves - Series HSC³



Series HSC3 Materials of Construction

Mechanical Seals Mounted on Shaft



| PART NAME | MATERIAL |
|---------------------------------|------------------------------------|
| | Cast Iron, Bronze Fitted |
| Casing Assembly | Cast Iron (ASTM A48 Class 35A) |
| Casing Joint Gasket (Suction) | Paper (Vellumoid 505) |
| Casing Joint Gasket (Discharge) | Paper (Vellumoid 505) |
| Casing Ring | Bronze (ASTM B584-932) |
| Shaft | 416 Stn. Stl. |
| Bearing Housing | Cast Iron (ASTM A48 Class 30A) |
| Bearing Housing | Cast Iron (ASTM A48 Class 30A) |
| Bearing (Inboard) Ball | Steel |
| Bearing (Outboard) Ball | Steel |
| Stuffing Box (Mechanical Seal) | Cast Iron (ASTM A48 Class 30A) |
| Lip Seal (Bearing) | Rubber (BUNA "N") |
| Mechanical Seal | Stn. Stl., Rubber, Carbon, Ceramic |
| Capscrew (Bearing Housing) | Steel, Grade 2 |
| Pipe Plugs (Bearing Housing) | Steel |
| Key, Impeller | Stn., Stl. (ANSI 416) |
| Key, Coupling | Steel |
| "O" Ring (Casing Ring) | Rubber (Buna "N") |
| "O" Ring (Cover Plate) | Rubber (Buna "N") |
| Retaining Ring (Impeller) | Steel |
| Ring Retaining (Bearing) | Steel |
| End Cap | Steel |
| Spirol Pin (Casing Ring) | 304 SS |
| Impeller | Bronze (ASTM B584/876) |

Mechanical Seal Data

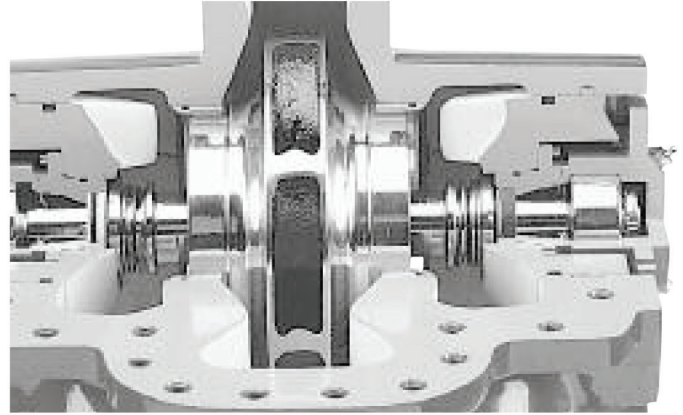
Standard Construction:

- 175 PSIG (12 BAR) Maximum Working Pressure
- *100 PSIG (7 BAR) Maximum Suction Pressure
125#FF ANSI FLANGE (ANSI A21.10, AWWA C110 & ANSI B16.1 class 125)
- Type 21, Buna/Carbon-Ceramic, *100 psig (7 BAR) maximum suction pressure, from -20 to 225°F (-29 to 107°C)
- Optional Seals:
Type 21, EPR/Carbon-Ceramic, *100 psig (7 BAR) maximum suction pressure, from -20 to 250°F (-29 to 121°C)
Type 21, EPR/Carbon-Tungsten Carbide, *100 psig (7 BAR) maximum suction pressure, from -20 to 250°F (-29 to 121°C)

Internally Self-Flushing Seal:

The HSC³ features internally self-flushing mechanical seals. This innovative design, an industry standard, insures maximum seal life lubrication, heat dissipation and debris removal – all without vulnerable, external flush lines and filter kits that can clog and

result in seal failure. With the Bell & Gossett internally self-flushing seal design, as much as 25% of the total pump flow continuously flushes the seal faces compared to only a few GPM for conventional stuffing box mounted mechanical seals. Seals remain cooler and unwanted debris is flushed away from the mechanical seal faces resulting in longer mechanical seal life.



L/D Ratio Comparison

The L/D ratio measures the comparable shaft stiffness factor between two pumps where “L” equals the distance between the inboard and outboard bearings and “D” represents the shaft diameter at the impeller. The lower the ratio, the stiffer the shaft. Excessive shaft deflection will shorten mechanical seal life, sub-

ject the shaft to fatigue stress, that could result in shaft failure and increase the bearing load with a corresponding reduction in bearing life. As calculated in the table below, the HSC³ has a L/D ratio that is significantly below a traditional horizontal split case pump.

| PUMP SIZE | SERIES HSC ³ | | | TYPICAL HORIZONTAL SPLIT CASE PUMPS | | |
|------------|---|------------------------------|-----|---|------------------------------|------|
| | L= SPAN BETWEEN BEARING TO BEARING (CENTER) | D= DIAMETER THROUGH IMPELLER | L/D | L= SPAN BETWEEN BEARING TO BEARING (CENTER) | D= DIAMETER THROUGH IMPELLER | L/D |
| 2x3x11S | 11.03 | 1.689 | 6.5 | 20.90 | 1.689 | 12.4 |
| 2x3x11L | 11.03 | 1.689 | 6.5 | 20.90 | 1.689 | 12.4 |
| 4x6x10A | 14.56 | 1.939 | 7.5 | 25.25 | 1.939 | 13.0 |
| 4x6x12A | 12.53 | 1.689 | 7.4 | 22.90 | 1.689 | 13.6 |
| 4x6x14A | 12.53 | 1.689 | 7.4 | 22.90 | 1.989 | 13.0 |
| 6x8x10A | 18.25 | 1.939 | 9.4 | 29.57 | 2.439 | 12.1 |
| 6x8x12S | 12.53 | 1.689 | 7.4 | 22.90 | 1.689 | 13.6 |
| 6x8x12M | 14.56 | 1.939 | 7.5 | 25.25 | 1.939 | 13.0 |
| 6x8x12L | 12.53 | 1.689 | 7.4 | 22.90 | 1.689 | 13.6 |
| 6x8x12XL | 12.53 | 1.689 | 7.4 | 22.90 | 1.689 | 13.6 |
| 6x8x13 | 16.16 | 1.939 | 8.3 | 27.25 | 1.939 | 14.1 |
| 6x8x17M | 16.16 | 1.939 | 8.3 | 27.25 | 1.939 | 14.1 |
| 6x8x17L | 16.16 | 1.939 | 8.3 | 27.25 | 1.939 | 14.1 |
| 8x8x12 | 16.16 | 1.939 | 8.3 | 27.25 | 1.939 | 14.1 |
| 8x8x17 | 18.59 | 2.439 | 7.6 | 29.90 | 2.439 | 12.3 |
| 8x10x12S | 18.59 | 2.439 | 7.6 | 29.90 | 2.439 | 12.3 |
| 8x10x12L | 18.59 | 2.439 | 7.6 | 29.90 | 2.439 | 12.3 |
| 8x10x17S | 18.59 | 2.439 | 7.6 | 29.90 | 2.439 | 12.3 |
| 8x10x17L | 18.59 | 2.439 | 7.6 | 29.90 | 2.439 | 12.3 |
| 8x10x20S | 18.59 | 2.439 | 7.6 | 29.90 | 2.439 | 12.3 |
| 8x10x20L | 18.59 | 2.439 | 7.6 | 29.90 | 2.439 | 12.3 |
| 10x10x12 | 21.59 | 2.439 | 8.9 | 32.90 | 2.439 | 13.5 |
| 10x12x12M | 21.59 | 2.439 | 8.9 | 32.90 | 2.439 | 13.5 |
| 10x12x12XL | 21.59 | 2.439 | 8.9 | 32.90 | 2.439 | 13.5 |
| 10x12x14 | 18.59 | 2.439 | 7.6 | 29.90 | 2.439 | 12.3 |
| 10x12x17 | 18.59 | 2.439 | 7.6 | 29.90 | 2.439 | 12.3 |

Bell & Gossett Engineering Specification for Series HSC³ Base Mounted Double-Suction Pumps

DOUBLE SUCTION, HORIZONTAL SPLIT CASE PUMPS (BASE MOUNTED):

A. Manufacturer:

Contractor shall furnish and install new double suction horizontal split case pumps for chilled water and hot water heating systems as indicated on the drawings. Pumps shall be model HSC or HSCS as manufactured by **Bell & Gossett** under base bid. Equivalent units as manufactured by Taco or Armstrong may be submitted as deduct alternates. Pumps shall meet types, sizes, capacities, and characteristics as scheduled on the Equipment Schedule drawings.

B. Double Suction Horizontal Split Case Pump (Base Mounted):

1. The pumps shall be long coupled, base mounted, single stage, double suction, horizontally split case design, in cast iron bronze fitted construction specifically designed and guaranteed for quiet operation. Suitable standard operations at 225°F (107°C) and 175 psig (12 BAR) working pressure. Working pressures shall not be de-rated at temperatures up to 250°F (121°C). The pump internals shall be capable of being serviced without disturbing the upper casing half and system piping.
 2. A bearing housing shall supply support for a pair of heavy-duty regreaseable ball bearings. An inboard single row bearing will absorb thermal expansive forces while an outboard double row bearing will be clamped in place to absorb both radial and thrust loads and keep the rotating element in proper axial alignment. Bearings shall be replaceable without disturbing the system piping, the upper casing half, and shall be regreaseable without removal of the bearings from the bearing housing.
 3. The impeller shaft shall be a solid 416 stainless steel shaft.
 4. Pump shall be equipped with a pair of internally flushed mechanical seal assemblies in direct contact with the pump shaft. Seal assemblies shall be Type 21 having a stainless steel housing, Buna bellows and seat gasket, stainless steel spring, and be of a carbon-ceramic design with the carbon face rotating against a stationary ceramic face.
 5. Impeller shall be of the enclosed double suction type made of bronze, both hydraulically and dynamically balanced to ANSI/HI 1.1-1.5-1994, section 1.4.6.1.3.1, figure 1.106, balance grade G6.3 keyed to the shaft and fixed in the axial position.
 6. A flexible type coupling, capable of absorbing torsional vibration, shall be employed between the pump and motor. On variable speed applications the coupler sleeve should be constructed of an EPDM material to maximize performance life.
 7. The coupling shall be shielded by a dual rated ANSI B15.1, Section 8 AND OSHA 1910.219 compliant coupling guard and contain viewing windows for inspection of the coupling.
 8. Pump volute shall be of a cast iron (rated for 175 psig [12 BAR] Max WP) axially-split design with flanges (175 psig [12 BAR] drilled for 125# ANSI companion flanges) and mounting feet integral cast into the bottom half of the casing. Suction and discharge flanges shall be on a common centerline in both the horizontal and vertical planes, and the volute shall include Bronze Casing Wear Rings, priming port, gauge ports at nozzles, and vent and drain ports. The upper half casing shall be capable of being removed without disturbing piping connections or electrical motor connections.
9. Pump seal flushing shall be internal within the pump casing and shall flush the seal at a rate equal to 25% of the total pump flow.
 10. Motors shall meet scheduled horsepower, speed, voltage, and enclosure design. Pump and motors shall be factory aligned, and shall be realigned after installation by the manufacturer's representative. Motors shall be non-overloading at any point on the pump curve and shall meet NEMA specifications and conform to the standards outlined in EISA 2007.
 11. Base plate shall be of structural steel or fabricated steel channel with fully enclosed sides and ends, and securely welded cross members. The grouting area shall be fully open. The combined pump and motor base plate shall be sufficiently stiff as to limit the susceptibility of vibration. The minimum base plate stiffness shall conform to ANSI/HI 1.3.4-1997 for *Horizontal Baseplate Design* standards.
 12. Base shall be capable of being field grouting.
 13. Pump rotation shall be righthand or lefthand as viewed from the pump end.
 14. Pump manufacturer shall be ISO-9001 certified.
 15. The seismic capability of the pump shall allow it to withstand a horizontal load of 0.5g, excluding piping and/or fasteners used to anchor the pump to mounting pads or to the floor, without adversely affecting pump operation.
 16. Each pump shall be factory hydrostatically tested per Hydraulic Institute standards and name-plated before shipment. It shall then be thoroughly cleaned and painted with at least one coat of high-grade paint prior to shipment.

C. Accessories:

1. Where noted on schedule pumps shall be provided with internal bronze pump wear rings, special shaft materials, or special spacer couplers.
2. Where noted on schedule either balanced or unbalanced seals of EPR Carbon/Ceramic seals, EPR Tungsten/Carbide seal, or packing gland material should be used in lieu of the standard seal.
3. Where noted on schedule pumping equipment may require one or all of the following tests: Certified Lab tests (unwitnessed), Hydraulic Institute Level B tests, or Witnessed Tests.

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- 1) The tissue in plants that brings water upward from the roots;
- 2) a leading global water technology company.

We're 12,700 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

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