



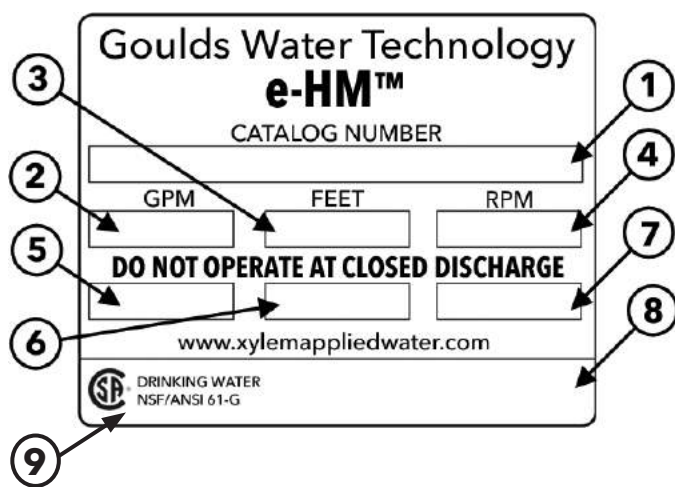
e-HMTM 60 Hz TECHNICAL MANUAL

THREADED HORIZONTAL MULTISTAGE CENTRIFUGAL ELECTRIC PUMPS

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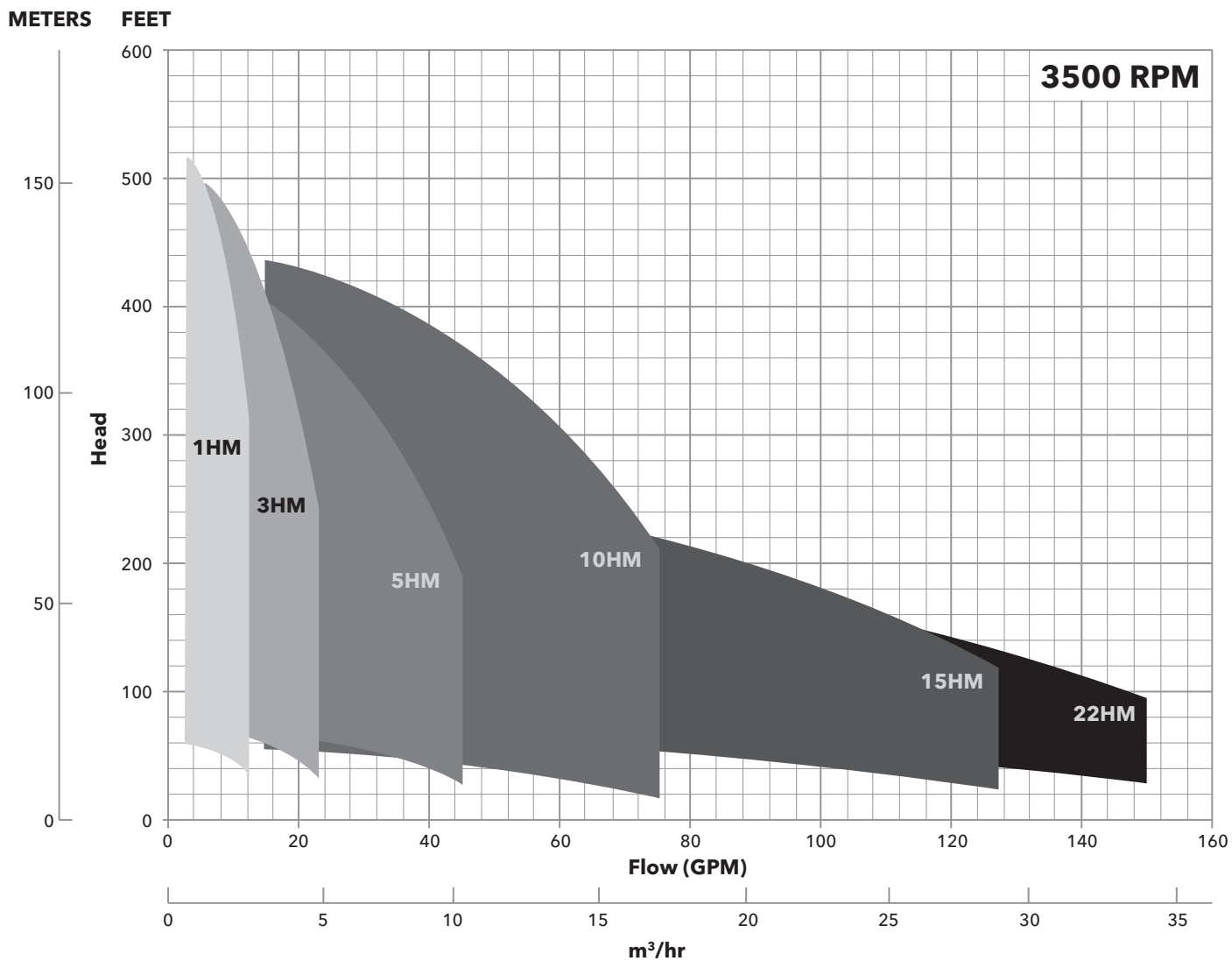
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e-HM RATING PLATE



| | |
|---|--|
| 1 | Goulds Water Technology Catalog Number |
| 2 | Capacity Range |
| 3 | TDH Range |
| 4 | Rated Speed |
| 5 | Rated Horsepower |
| 6 | Maximum Operating Pressure |
| 7 | Maximum Fluid Temperature |
| 8 | Pump Serial Number |
| 9 | Certifications Where Applicable |

e-HM™ Series Hydraulic Coverage Curve



e-HM™ SERIES Applications, Benefits and Industry

Whether you're in the market for industry specific applications, building services, or residential applications, the e-HM is designed to meet your water needs. Customizable options mean you get exactly the right pump for your application, exactly when you need it.

APPLICATIONS

Designed with compactness in mind, the e-HM is ideal for applications where a smaller footprint is needed. Ideal for use in pressure boosting and water supply systems, industrial washing and cleaning, water treatment, or circulation of hot and cold liquids in cooling and conditioning systems. The broad coverage and range of applications make this pump an ideal solution in industry, building services and residential applications.

BENEFITS

Reliability: The e-HM series was designed to withstand heavy-duty applications in Industry. Made of 316 stainless steel and construction incorporating a 20% increase in the pump body thickness, ensures enhanced durability and reliability.

Versatility: Offering two different mechanical configurations, 7 mechanical seal options, high-efficiency motors, and surface treatment options such as electropolishing and passivation, make the e-HM suitable for multiple applications.

Performances: The e-HM series provides best-in-class efficiency and is up to 72% efficient. Compared to similar pumps in the market, the e-HM offers a potential of 30% in energy savings versus the competition.

Global Platform: Assembled in different factories around the world, the e-HM can offer easier accessibility due to its proximity to our customers. Beyond our commitment to reduce the carbon footprint of e-HM, this global platform offers the same design which is available everywhere using the same quality processes.

FEATURES

- Wide range of performances with 6 sizes, flow up to 127 gpm, heads up to 525 feet
- Maximum working pressure up to 230 psi (16 bar)
- Premium efficient, UL Recognized (cURus) motor
- 90% of the range has the same suction height (3.54") for easy installation or system upgrades



Commercial Water

e-HM™ SERIES GENERAL INTRODUCTION

Our newly redesigned horizontal multi-stage high pressure centrifugal pump offers outstanding efficiencies. The high-efficiency motor coupled with an innovative hydraulic design, NPT threaded inlet and outlet connections, and broad coverage provides flexible options for a variety of applications. Whether you're in the market for industry specific applications, building services, or residential applications, the e-HM is designed to meet your water needs.

Pump Design

The e-HM is a close-coupled horizontal multi-stage design with NPT threaded inlet and outlet connections, and a TEFC equivalent high-efficiency motors. The pump incorporates an innovative hydraulic design that provides the highest efficiency in the market today.

The e-HM is available in two configurations:

Compact Design

Sizes 1HM, 3HM, and 5HM

- 1HM and 3HM up to 6 stages
- 5HM up to 5 stages

Sleeve Design

Sizes 1HM, 3HM, 5HM, 10HM, 15HM and 22HM

- 1HM & 3HM start at 7 stages
- 5HM starts at 6 stages

The compact design is made of one single piece of fabricated stainless steel for the pump body which is directly connected to the motor flange. The sleeve design is made of an external stainless steel TIG welded sleeve, and incorporates a separate suction housing. All available in 316 stainless steel construction consisting of a 20% increase in pump body thickness for enhanced durability and reliability.

Motor

The e-HM series incorporates a UL Recognized (cURus) premium efficiency, inverter design motor for additional energy savings and versatility. The standard motor enclosure is a TEFC (IP55) design which can be paired with Goulds Water Technology variable speed drives such as the Hydrovar.

EISA Compliance

Xylem conforms to the requirements of the Energy Independence and Security Act (EISA) of 2007. Under the Energy Independence and Security Act of 2007 (EISA), covered motors that are manufactured or imported for distribution in commerce in the United States on or after December 19, 2010, must comply with the applicable EISA energy conservation standards. EISA-covered motors include general purpose electric motors (subtype I), general purpose electric motors (subtype II), fire pump motors, and NEMA Design B general purpose electric motors, which are manufactured alone or as a component of another piece of equipment. The standards are found in sections 431.25(c)-(f) of Title 10 of the Code of Federal Regulations, Part 431 (10 CFR Part 431).



e-HM™ SERIES GENERAL CHARACTERISTICS

| 1HM, 3HM | | | |
|------------|-----|-----------|-----|
| 2-6 Stages | | 7+ stages | |
| t (F) | PSI | t (F) | PSI |
| -20 | 147 | -20 | 235 |
| 248 | 147 | 248 | 235 |
| 248 | 147 | 248 | 235 |
| 248 | 147 | | |
| 248 | 147 | 194 | 235 |
| | | 194 | 235 |
| 194 | 147 | | |

| 5HM | | | |
|------------|-----|-----------|-----|
| 2-5 Stages | | 7+ stages | |
| t (F) | PSI | t (F) | PSI |
| -20 | 147 | -20 | 235 |
| 248 | 147 | 248 | 235 |
| 248 | 147 | 248 | 235 |
| 248 | 147 | | |
| 248 | 147 | 194 | 235 |
| | | 194 | 235 |
| 194 | 147 | | |

| 10HM, 15HM, 22HM | |
|------------------|-----|
| All Stages | |
| t (F) | PSI |
| -20 | 235 |
| 248 | 235 |
| 248 | 235 |
| | |
| 194 | 235 |
| 194 | 235 |
| 194 | 0 |

ELECTRIC PUMP NOISE

| POWER | NOISE |
|-------|--------|
| HP | LpA dB |
| 0.75 | 55 |
| 1 | 55 |
| 1.5 | 60 |
| 2 | 60 |
| 3 | 60 |
| 4 | 60 |
| 5.5 | 60 |
| 7.5 | 60 |

The table shows the mean sound pressure (Lp) measured as per Curve A (Standard ISO 1680). Noise values were measured with the 50 Hz motor running idle with a tolerance of 3 dB (A).

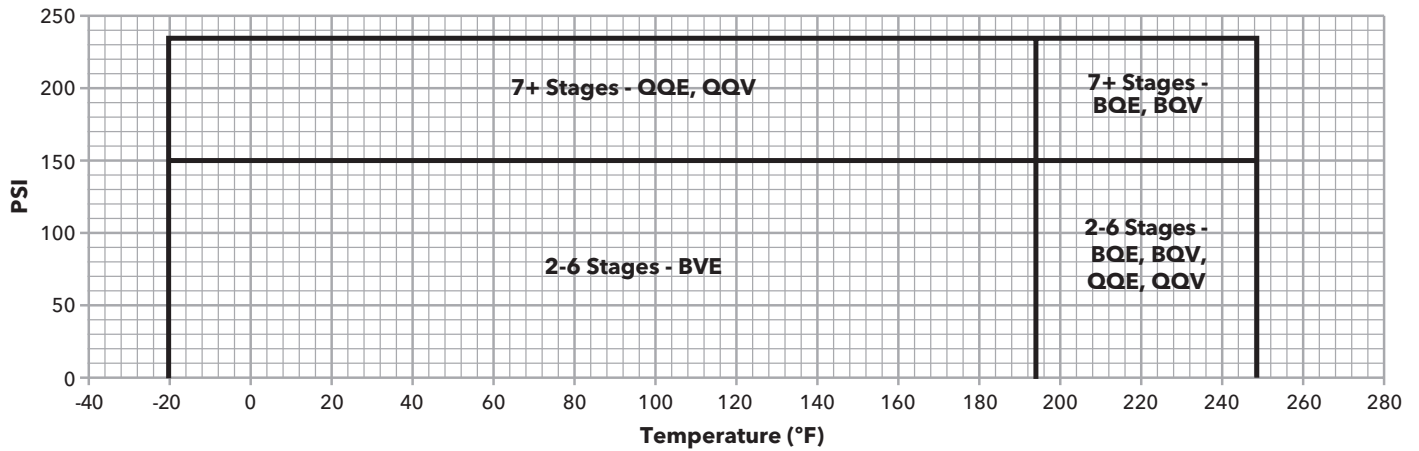
STORAGE AND TRANSPORT TEMPERATURE

-40°C to +60°C

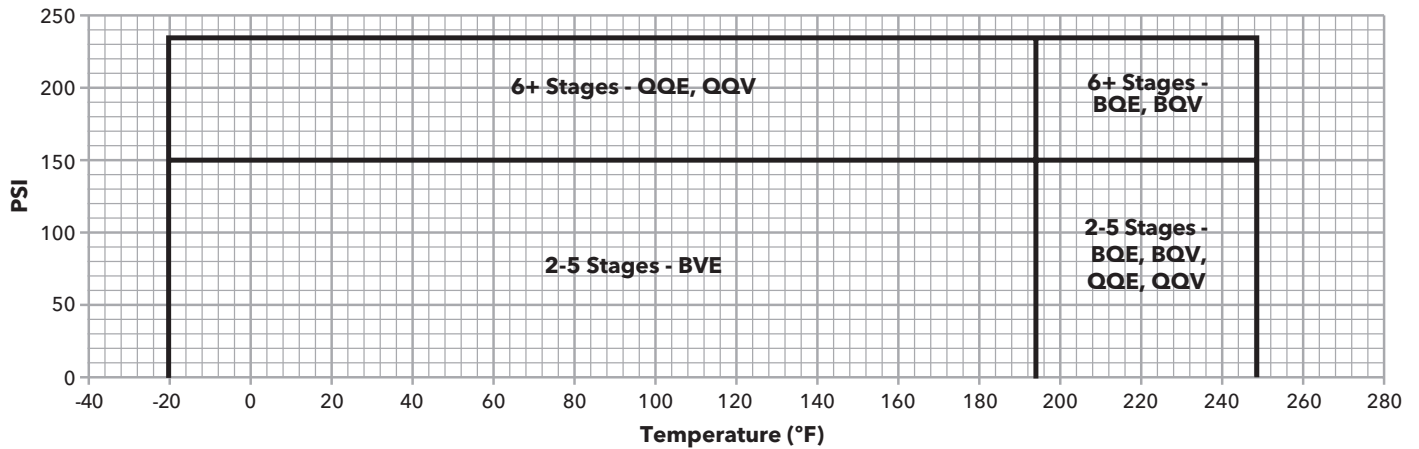
NEMA MG-1 TABLE 12-12 FL EFFICIENCIES FOR 60 HZ NEMA PREMIUM

| HP | 2-POLE | Lowara | 2-POLE |
|----|--------|----------------|--------|
| 1 | 77 | Lowara SM IE3 | 83.4 |
| 1½ | 84 | | 85.6 |
| 2 | 85.5 | | 87.2 |
| 3 | 86.5 | | 87.7 |
| 5 | 88.5 | | 91.0 |
| 7½ | 89.5 | | 90.5 |
| 10 | 90.2 | | 90.8 |
| 15 | 91 | Lowara PLM IE3 | 92.4 |
| 20 | 91 | | 93.4 |
| 25 | 91.7 | | 93.5 |
| 30 | 91.7 | | 93.4 |
| 40 | 92.4 | | |

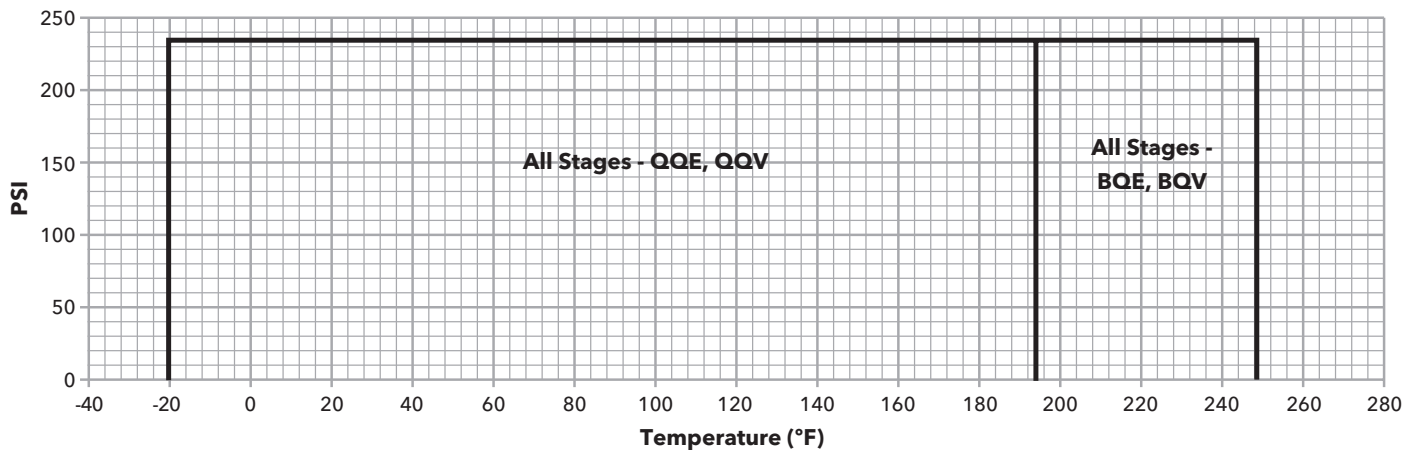
1HM, 3HM PRESSURE AND TEMPERATURE LIMITS



5HM PRESSURE AND TEMPERATURE LIMITS



10HM, 15HM, 22HM PRESSURE AND TEMPERATURE LIMITS



e-HM™ SERIES

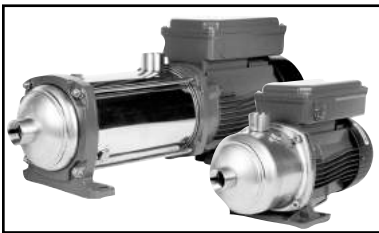
**High efficiency
horizontal
multistage pump**

MARKETS

BUILDING SERVICES.
INDUSTRY.

APPLICATIONS

Pressure boosting and water supply systems.
Washing and cleaning industry including vehicles washing.
Circulation of hot and cold liquids (like water, water and glycol) for heating, cooling and conditioning systems.
Water treatment applications.
Handling of moderately aggressive liquids.
Food and beverage industries.



SPECIFICATIONS

Pump

- Flow rate: up to 127 GPM
- Heads: up to 525 feet
- Designs:
 - Compact - one piece pump body
 - 1HM and 3HM, sizes up to 6 stages
 - 5HM, sizes up to 5 stages
 - Sleeve - Sleeve and separate suction housing
 - 1HM and 3HM, 7 stages and above
 - 5 HM, 6 stages and above
 - All 10HM, 15HM, and 22HM sizes
- Connections: NPT threaded suction and discharge
- Temperature of the pumped liquid: -20°F to 248°F (-30°C to 120°C)
- Ambient Temperature:
 - Standard Offering: -15°C to 40°C
 - Available Options: Single Phase: -15°C to 45°C
 - Three Phase: -15°C to 50°C
- Maximum Operating Pressure:
 - Compact pump designs - 145 PSI
 - Sleeve pump designs - 230 PSI

Motor

- Premium Efficiency
- TEFC (IP 55) design
- cURus*
- 3500 RPM
- Class F insulation
- Standard voltage:
 - Single Phase: 115 or 230V, 60 Hz - built in auto reset overload protection
 - Three Phase: 208-230/460V, 50 or 60 Hz; or 575V, 60 Hz

* cURus applies to 60 Hz frequency

e-HM™ SERIES GENERAL CHARACTERISTICS



Compact



Sleeve

| HM Series | 1HM | 3HM | 5HM | 10HM | 15HM | 22HM |
|-------------------------------|--|---------|-------------|-----------------|-------------|-------------|
| Nominal Flow (GPM) | 10 | 16 | 33 | 56 | 90 | 100 |
| Flow Range (GPM) | 3 - 12 | 5-23 | 10 - 45 | 15 - 75 | 25 - 127 | 30 - 150 |
| Number of Stages | 2 - 18 | 2 - 14 | 2 - 12 | 1 - 8 | 1 - 4 | 1 - 3 |
| Maximum Head (Ft) | 520 | 500 | 430 | 450 | 275 | 217 |
| Maximum Working Pressure | 145 psi - Compact pumps 230 psi - Sleeve pumps | | | | | |
| Temperature Range (°F) | -20°F to 248°F (-30°C to 120°C) | | | | | |
| Maximum Pump Efficiency (%) | 51 | 60 | 70 | 70 | 70 | 68 |
| HP Range | 3/4 - 2 | 3/4 - 3 | 3/4 - 4 | 1 - 7 1/2 | 2 - 7 1/2 | 3 - 7 1/2 |
| Piping Connections (NPT) | 1" x 1" | 1" x 1" | 1 1/4" x 1" | 1 1/2" x 1 1/4" | 2" x 1 1/2" | 2" x 1 1/2" |

OPTIONAL FEATURES:

- Special Voltages
- 50 Hz Frequency
- Suitable for use with VFDs (ABII, SPD, Hydrovar, CPC and IPC)

e-HM PRODUCT LINE NUMBERING SYSTEM FOR 1 - 22HM PUMPS

The various versions of the e-HM line are identified by a product code number on the pump label. This number is also the catalog number for the pump. The meaning of each digit in the product code number is shown below.

Note: Not all combinations are possible.

Example Product Code

15 HM 04 N 55 T 6P BQE H

Special Configuration

H = Single Phase pump label 45°C ambient
= Three Phase pump label 50°C ambient

Seal Material

BQE = Carbon-SilCar-EPDM (standard)
BQV = Carbon-SilCar-Viton
QQE = SilCar-SilCar-EPDM
QQV = SilCar-SilCar-Viton
BVE = Carbon-Ceramic-EPDM
QQK = SilCar-SilCar-Kalrez
BQK = Carbon-SilCar-Kalrez

Hz - Phase - Voltage

6F = 60 - 1 - 230V
6B = 60 - 1 - 115V
6P = 60 - 3 - 208-230/460V; 50 - 3 - 220-240/380-415V*
6Z = 60 - 3 - 575V
5H = 50 - 1 - 220-240V
5D = 50 - 1 - 110-120V

Phase

M = 1 PH T = 3 PH

HP Rating

05 = .75 hp 22 = 3 hp
07 = 1 hp 30 = 4 hp
11 = 1.5 hp 40 = 5.5 hp
15 = 2 hp 55 = 7.5 hp

Pump Construction

N = 316 Stainless Steel

Total Number of Stages

Product Line

HM = Stainless Horizontal Multi-stage

Nominal Flow

1 = 5 GPM 10 = 56 GPM
3 = 16 GPM 15 = 90 GPM
5 = 33 GPM 22 = 100 GPM

* For CE compliant 50 Hz motors, please contact the factory

MODEL 1, 3, 5 HM..N SERIES - MAJOR COMPONENTS

(COMPACT DESIGN)

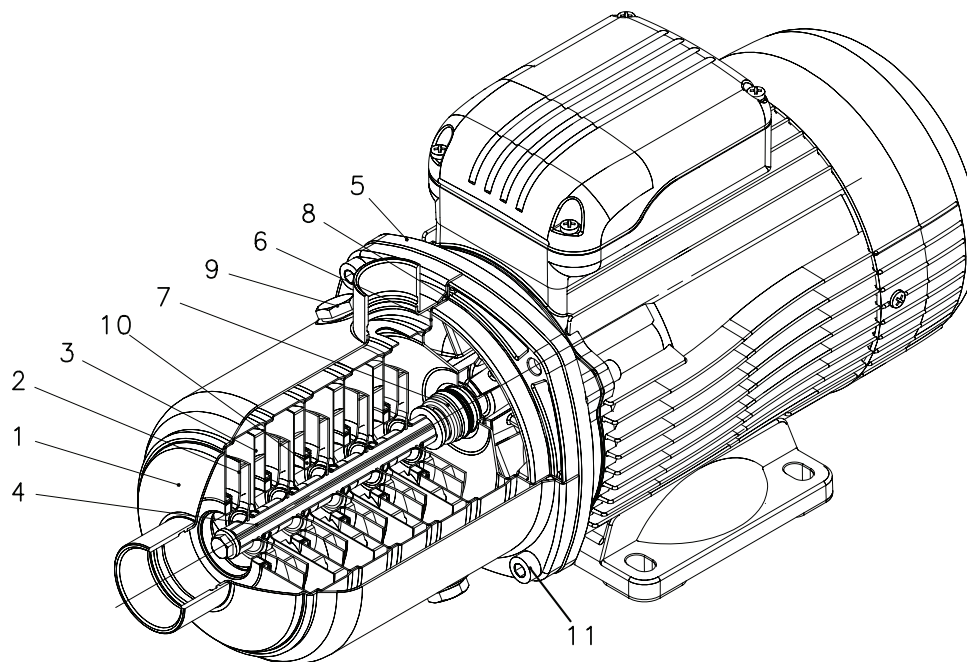


TABLE OF MATERIALS HM..N SERIES

| REFERENCE NUMBER | NAME | MATERIAL | REFERENCE STANDARDS | |
|------------------|--------------------|-------------------------|---------------------|-------------------------------------|
| | | | USA | EUROPE |
| 1 | Pump body | Stainless steel | AISI 316L | EN 10088-1-X2CrNiMo17-12-2 (1.4404) |
| 2 | Impeller | Stainless steel | AISI 316L | EN 10088-1-X2CrNiMo17-12-2 (1.4404) |
| 3 | Diffuser | Stainless steel | AISI 316L | EN 10088-1-X2CrNiMo17-12-2 (1.4404) |
| 4 | Shaft | Stainless steel | AISI 316 | EN 10088-1-X5CrNiMo17-12-2 (1.4401) |
| 5 | Adapter | Aluminium | - | EN 1706-AC-AISI11Cu2 (Fe) (AC46100) |
| 6 | Seal housing | Stainless steel | AISI 316L | EN 10088-1-X2CrNiMo17-12-2 (1.4404) |
| 7 | Mechanical seal | Ceramic / Carbon / EPDM | | |
| 8 | Elastomers | EPDM | | |
| 9 | Fill / drain plugs | Stainless steel | AISI 316 | EN 10088-1-X5CrNiMo17-12-2 (1.4401) |
| 10 | Wear ring | Technopolymer (PPS) | | |
| 11 | Bolts and screws | Stainless steel | AISI 304 | EN 10088-1-X5CrNi18-10 (1.4301) |

MODEL 1, 3, 5, 10, 15, 22 HM..N SERIES - MAJOR COMPONENTS

(SLEEVE DESIGN)

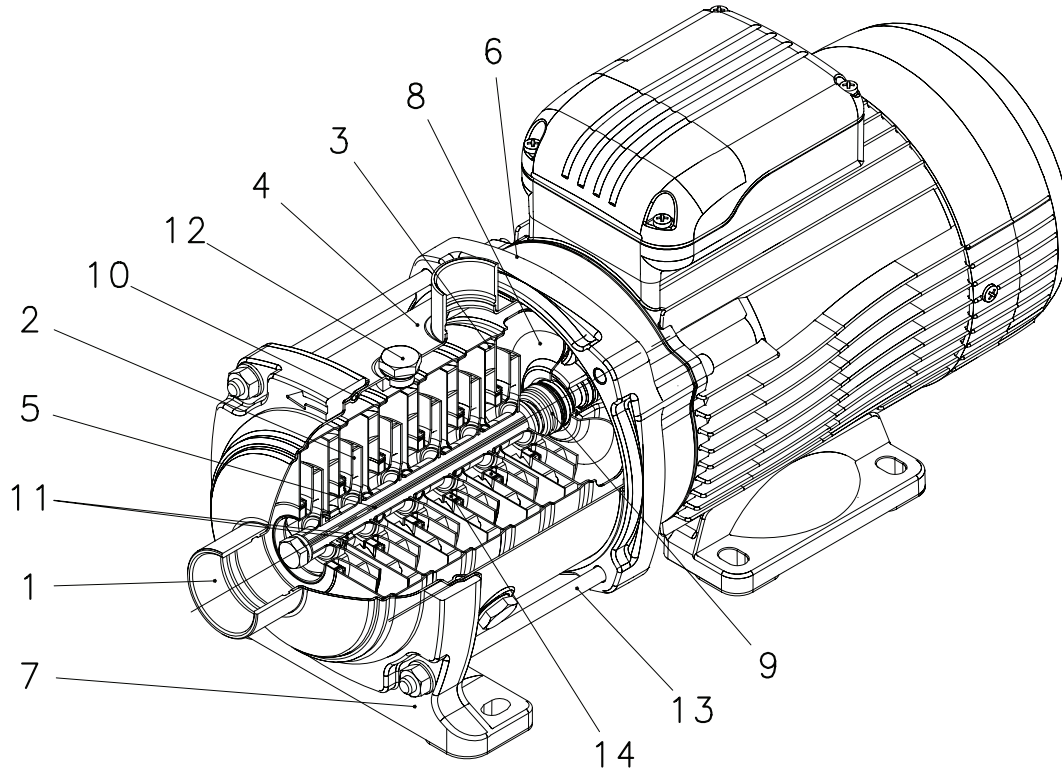
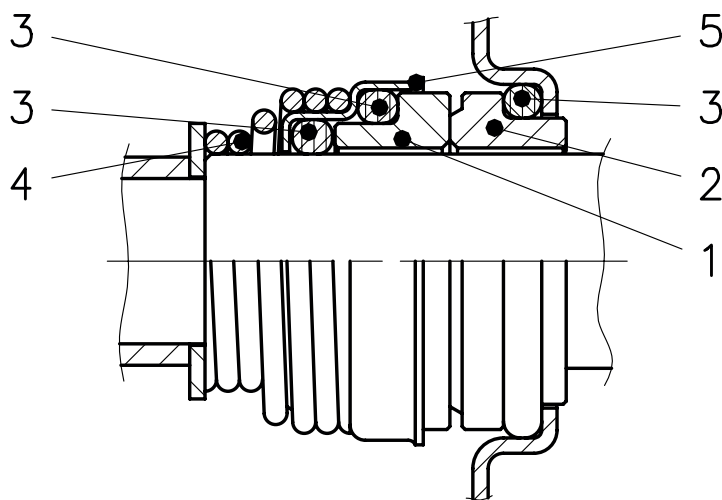


TABLE OF MATERIALS HM..N SERIES

| REFERENCE NUMBER | NAME | MATERIAL | REFERENCE STANDARDS | |
|------------------|---------------------------|---|---------------------|-------------------------------------|
| | | | USA | EUROPE |
| 1 | Head | Stainless steel | AISI 316L | EN 10088-1-X2CrNiMo17-12-2 (1.4404) |
| 2 | Impeller | Stainless steel | AISI 316L | EN 10088-1-X2CrNiMo17-12-2 (1.4404) |
| 3 | Diffuser and upper spacer | Stainless steel | AISI 316L | EN 10088-1-X2CrNiMo17-12-2 (1.4404) |
| 4 | Outer sleeve | Stainless steel | AISI 316L | EN 10088-1-X2CrNiMo17-12-2 (1.4404) |
| 5 | Shaft | Stainless steel | AISI 316 | EN 10088-1-X5CrNiMo17-12-2 (1.4401) |
| 6 | Adapter | Aluminium | - | EN 1706-AC-AISI11Cu2 (Fe) (AC46100) |
| 7 | Ring with foot | Aluminium | - | EN 1706-AC-AISI11Cu2 (Fe) (AC46100) |
| 8 | Seal housing | Stainless steel | AISI 316L | EN 10088-1-X2CrNiMo17-12-2 (1.4404) |
| 9 | Mechanical seal | Ceramic / Carbon / EPDM (PN10) - Silicon Carbide/Carbon/EPDM (PN16) | | |
| 10 | Elastomers | EPDM | | |
| 11 | Shaft sleeve and bushing | Tungsten carbide | | |
| 12 | Fill / drain plugs | Stainless steel | AISI 316L | EN 10088-1-X5CrNiMo17-12-2 (1.4401) |
| 13 | Tie rods | Stainless steel | AISI 431 | EN 10088-1-X17CrNi16-2 (1.4057) |
| 14 | Wear ring | Technopolymer (PPS) | | |

e-HM™ SERIES MECHANICAL SEALS



LIST OF MATERIALS

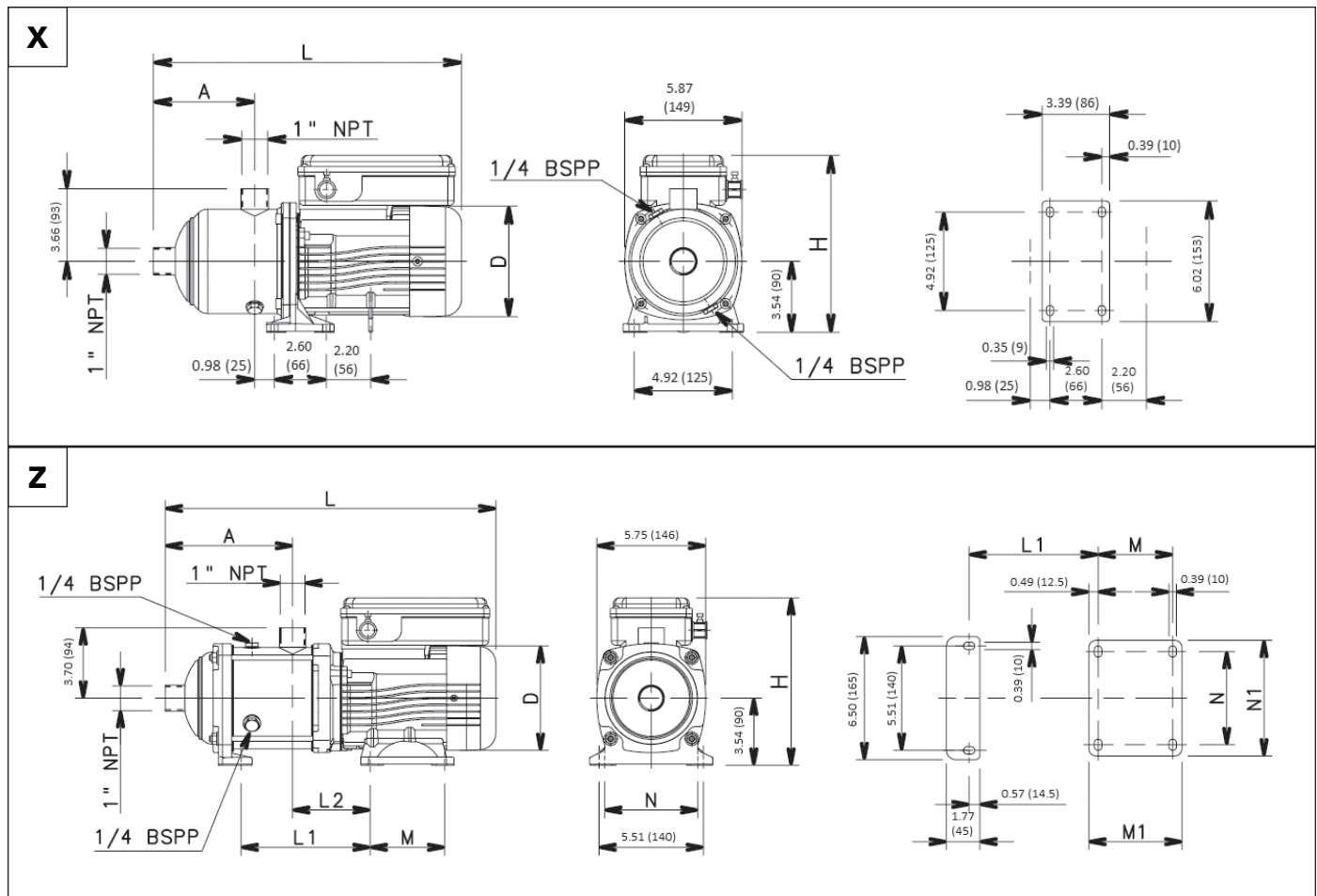
| Components | Part Number | | | |
|------------|-----------------|-----------------|----------------|------------|
| | 1 | 2 | 3 | 4 and 5 |
| | Rotory Face | Stationary Face | Elastomers | Hardware |
| Materials | B - Carbon | | E - EPDM (EPR) | All 316 SS |
| | Q - Sil Carbide | | V - Viton | |
| | V - Ceramic | | | |

PRESSURE AND TEMPERATURES LIMITS

| Seal Code | 1HM, 3HM | | 5HM | | 10HM, 15HM, 22HM |
|-----------|----------------|----------------|----------------|----------------|------------------|
| | 2-6 Stages | 7+ Stages | 2-5 Stages | 6+ Stages | All Stages |
| BQE | 147PSI at 248F | 235PSI at 248F | 147PSI at 248F | 235PSI at 248F | 235PSI at 248F |
| BQV | 147PSI at 248F | 235PSI at 248F | 147PSI at 248F | 235PSI at 248F | 235PSI at 248F |
| QQE | 147PSI at 248F | 235PSI at 194F | 147PSI at 248F | 235PSI at 194F | 235PSI at 194F |
| QQV | 147PSI at 248F | 235PSI at 194F | 147PSI at 248F | 235PSI at 194F | 235PSI at 194F |
| BVE | 147PSI at 194F | Not Available | 147PSI at 194F | Not Available | Not Available |

Commercial Water

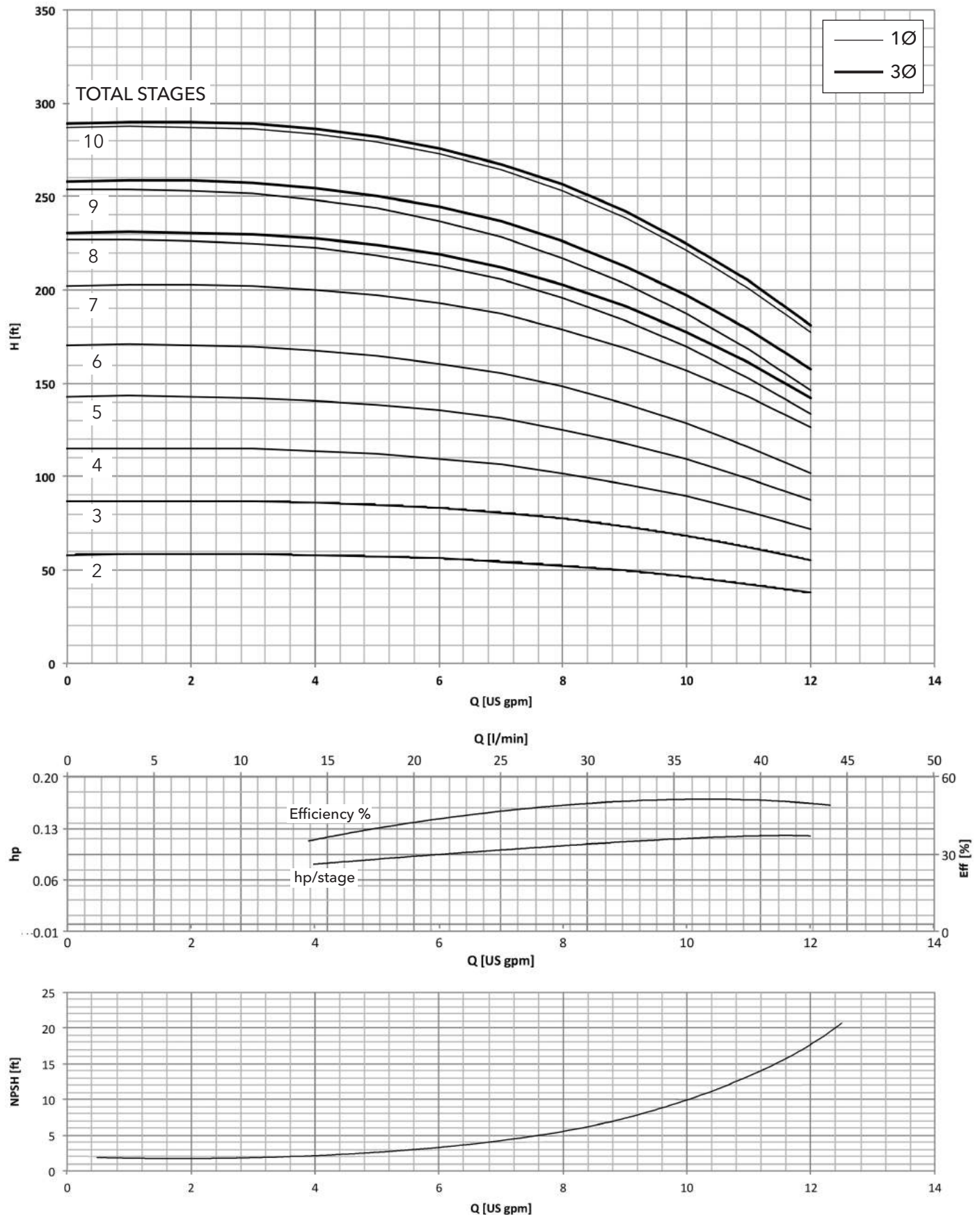
1HM..N SERIES, (2 TO 10 STAGES) DIMENSIONS AND WEIGHTS AT 60 HZ, 3500 RPM



| Pump Size Stages | Phase | DWG No. | Motor | | Dimensions (in) | | | | | | | | | | Max. Working Pressure (PSI) | Weight (lbs) |
|------------------|--------------|---------|-------|------------|-----------------|------|------|-------|------|------|------|------|------|------|-----------------------------|--------------|
| | | | HP | Frame Size | A | D | H | L | L1 | L2 | M | M1 | N | N1 | | |
| 1HM02 | SINGLE PHASE | X | 0.75 | 71 | 3.43 | 5.51 | 8.86 | 13.78 | - | - | - | - | - | - | 147 | 18 |
| 1HM03 | | | 0.75 | 71 | 3.43 | 5.51 | 8.86 | 13.78 | - | - | - | - | - | - | 147 | 18 |
| 1HM04 | | | 0.75 | 71 | 4.21 | 5.51 | 8.86 | 14.57 | - | - | - | - | - | - | 147 | 20 |
| 1HM05 | | | 0.75 | 71 | 5.00 | 5.51 | 8.86 | 15.35 | - | - | - | - | - | - | 147 | 20 |
| 1HM06 | | | 0.75 | 71 | 5.79 | 5.51 | 8.86 | 16.14 | - | - | - | - | - | - | 147 | 20 |
| 1HM07 | SINGLE PHASE | Z | 1 | 71 | 5.94 | 5.51 | 8.86 | 16.69 | 6.02 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 24 |
| 1HM08 | | | 1 | 71 | 6.73 | 5.51 | 8.86 | 17.48 | 6.81 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 26 |
| 1HM09 | | | 1 | 71 | 7.52 | 5.51 | 8.86 | 18.27 | 7.60 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 26 |
| 1HM10 | | | 1.5 | 80 | 8.31 | 6.10 | 9.13 | 20.79 | 8.39 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 35 |

| | | | | | | | | | | | | | | | | |
|-------|-------------|---|------|----|------|------|------|-------|------|------|------|------|------|------|-----|----|
| 1HM02 | THREE PHASE | X | 0.75 | 71 | 3.43 | 5.51 | 8.86 | 13.78 | - | - | - | - | - | - | 147 | 18 |
| 1HM03 | | | 0.75 | 71 | 3.43 | 5.51 | 8.86 | 13.78 | - | - | - | - | - | - | 147 | 18 |
| 1HM04 | | | 0.75 | 71 | 4.21 | 5.51 | 8.86 | 14.57 | - | - | - | - | - | - | 147 | 20 |
| 1HM05 | | | 0.75 | 71 | 5.00 | 5.51 | 8.86 | 15.35 | - | - | - | - | - | - | 147 | 20 |
| 1HM06 | | | 0.75 | 71 | 5.79 | 5.51 | 8.86 | 16.14 | - | - | - | - | - | - | 147 | 20 |
| 1HM07 | THREE PHASE | Z | 1 | 71 | 5.94 | 6.10 | 9.13 | 18.43 | 6.02 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 31 |
| 1HM08 | | | 1 | 71 | 6.73 | 6.10 | 9.13 | 19.21 | 6.81 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 33 |
| 1HM09 | | | 1 | 71 | 7.52 | 6.10 | 9.13 | 20.00 | 7.60 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 33 |
| 1HM10 | | | 1.5 | 80 | 8.31 | 6.10 | 9.13 | 20.79 | 8.39 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 35 |

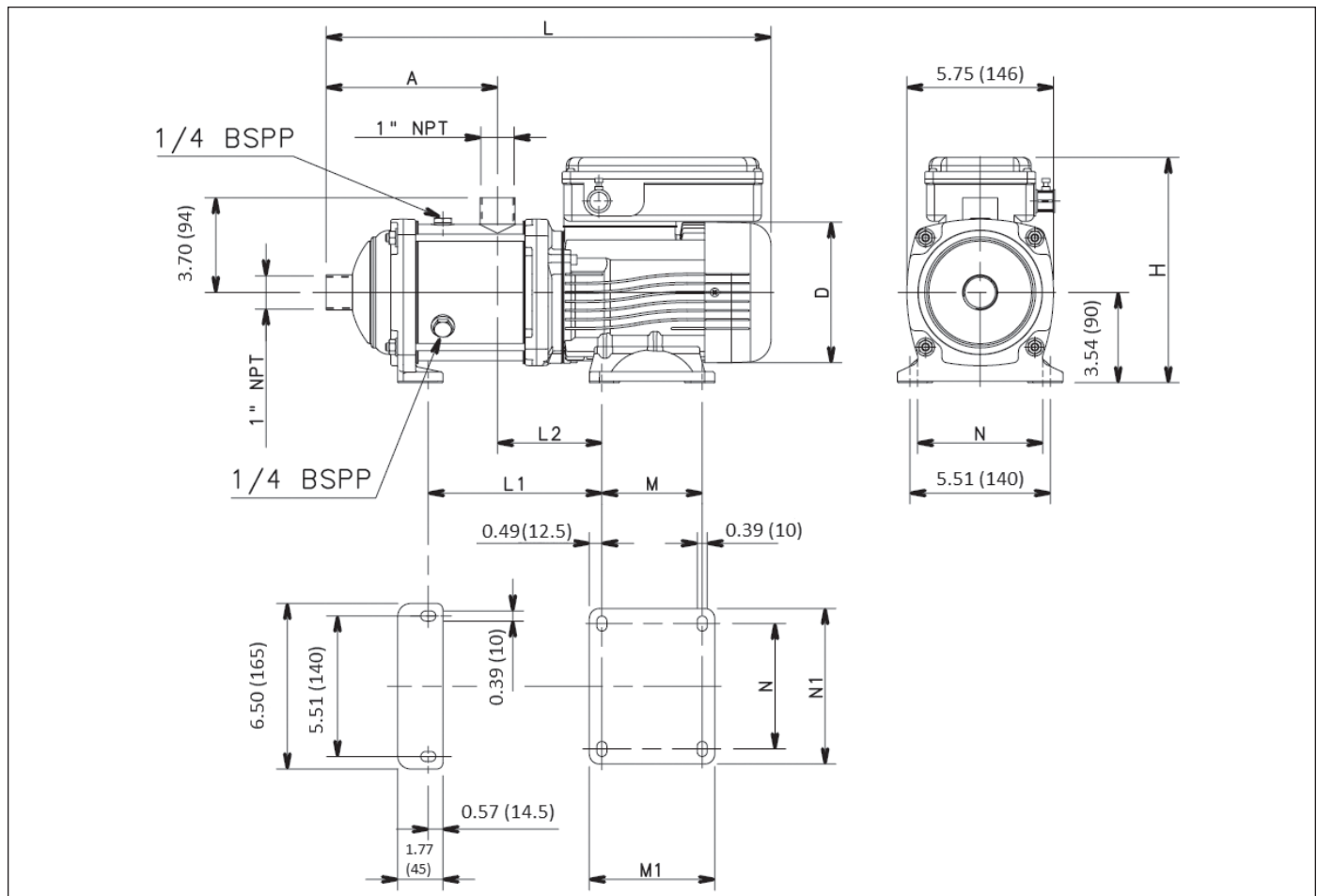
1HM..N SERIES, (2 TO 10 STAGES) OPERATING CHARACTERISTICS AT 60 HZ, 3500 RPM



MINIMUM FLOW RATE: 3 GPM

Commercial Water

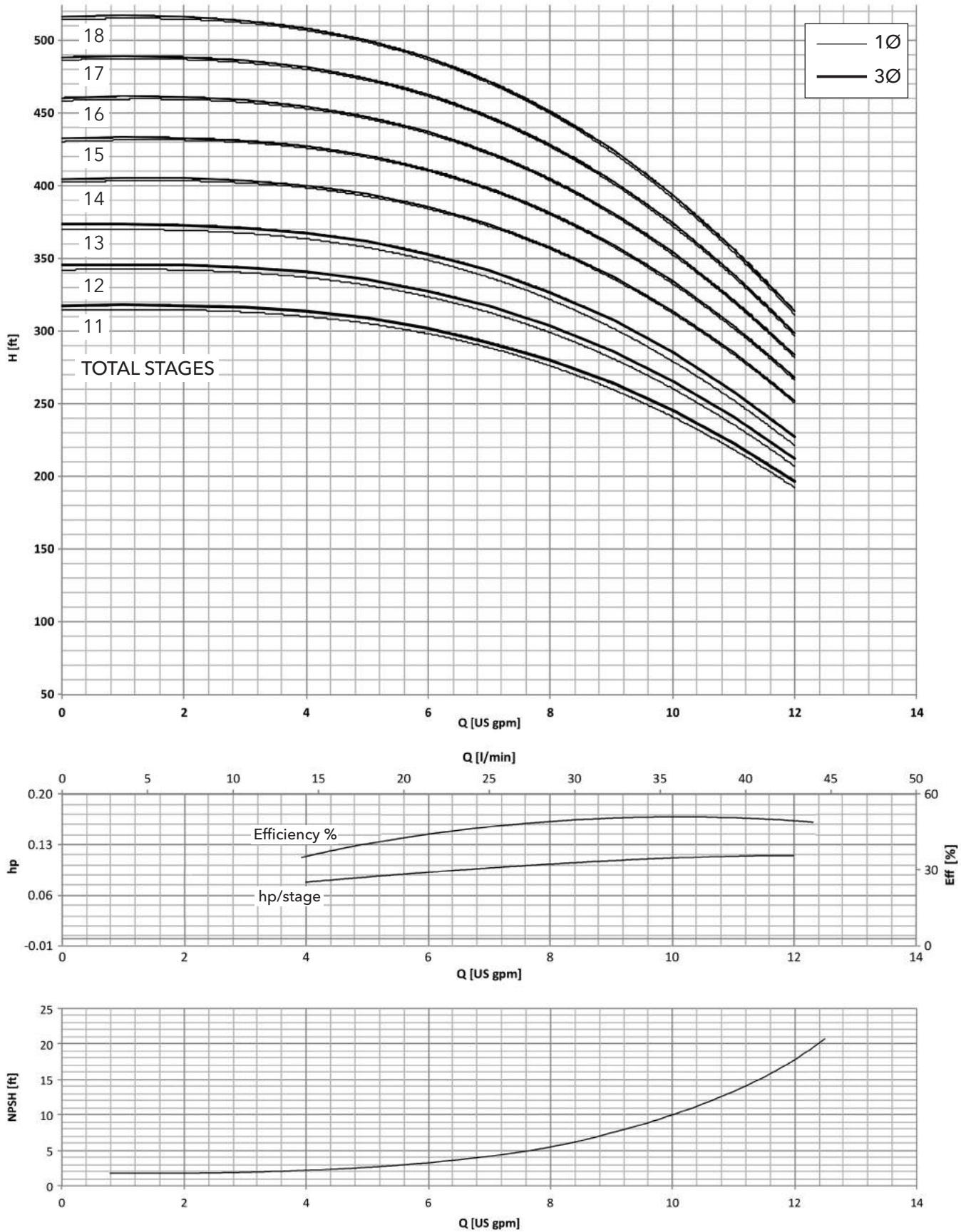
1HM..N SERIES, (11 TO 18 STAGES) DIMENSIONS AND WEIGHTS AT 60 HZ, 3500 RPM



| Pump Size Stages | Phase | Motor | | Dimensions (in) | | | | | | | | | | Max. Working Pressure (PSI) | Weight (lbs) |
|------------------|--------------|-------|------------|-----------------|------|------|-------|-------|------|------|------|------|------|-----------------------------|--------------|
| | | HP | Frame Size | A | D | H | L | L1 | L2 | M | M1 | N | N1 | | |
| 1HM11 | SINGLE PHASE | 1.5 | 80 | 9.09 | 6.10 | 9.13 | 21.57 | 9.17 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 37 |
| 1HM12 | | 1.5 | 80 | 9.88 | 6.10 | 9.13 | 22.36 | 9.96 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 37 |
| 1HM13 | | 1.5 | 80 | 10.67 | 6.10 | 9.13 | 23.15 | 10.75 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 37 |
| 1HM14 | | 2 | 80 | 11.46 | 6.10 | 9.13 | 23.94 | 11.54 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 42 |
| 1HM15 | | 2 | 80 | 12.24 | 6.10 | 9.13 | 24.72 | 12.32 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 42 |
| 1HM16 | | 2 | 80 | 13.03 | 6.10 | 9.13 | 25.51 | 13.11 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 42 |
| 1HM17 | | 2 | 80 | 13.82 | 6.10 | 9.13 | 26.30 | 13.90 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 44 |
| 1HM18 | | 2 | 80 | 14.61 | 6.10 | 9.13 | 27.09 | 14.69 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 44 |

| | | | | | | | | | | | | | | | |
|-------|-------------|-----|----|-------|------|------|-------|-------|------|------|------|------|------|-----|----|
| 1HM11 | THREE PHASE | 1.5 | 80 | 9.09 | 6.10 | 9.13 | 21.57 | 9.17 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 37 |
| 1HM12 | | 1.5 | 80 | 9.88 | 6.10 | 9.13 | 22.36 | 9.96 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 37 |
| 1HM13 | | 1.5 | 80 | 10.67 | 6.10 | 9.13 | 23.15 | 10.75 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 37 |
| 1HM14 | | 2 | 80 | 11.46 | 6.10 | 9.13 | 23.94 | 11.54 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 42 |
| 1HM15 | | 2 | 80 | 12.24 | 6.10 | 9.13 | 24.72 | 12.32 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 42 |
| 1HM16 | | 2 | 80 | 13.03 | 6.10 | 9.13 | 25.51 | 13.11 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 42 |
| 1HM17 | | 2 | 80 | 13.82 | 6.10 | 9.13 | 26.30 | 13.90 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 44 |
| 1HM18 | | 2 | 80 | 14.61 | 6.10 | 9.13 | 27.09 | 14.69 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 44 |

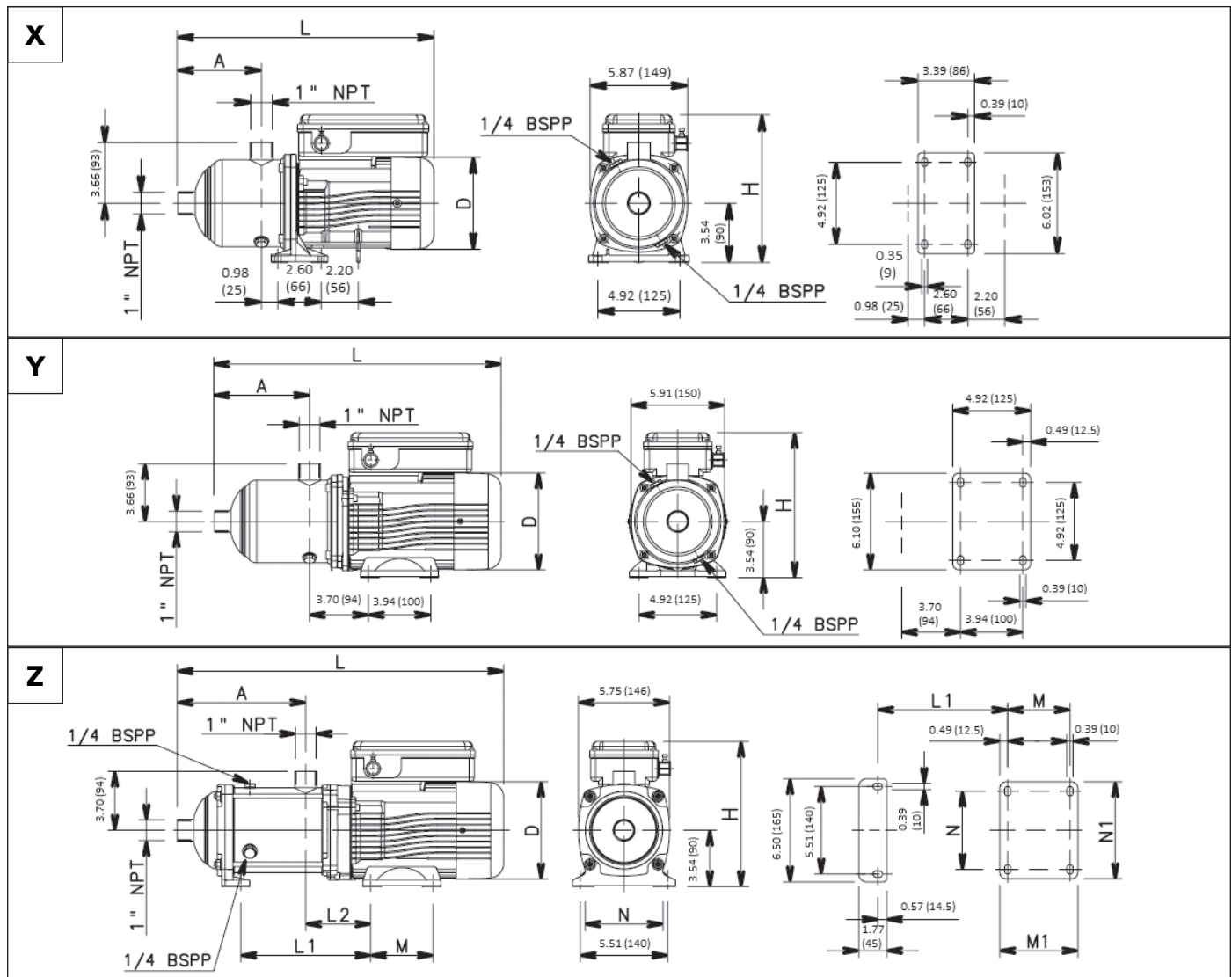
1HM..N SERIES, (11 TO 18 STAGES) OPERATING CHARACTERISTICS AT 60 HZ, 3500 RPM



MINIMUM FLOW RATE: 3 GPM

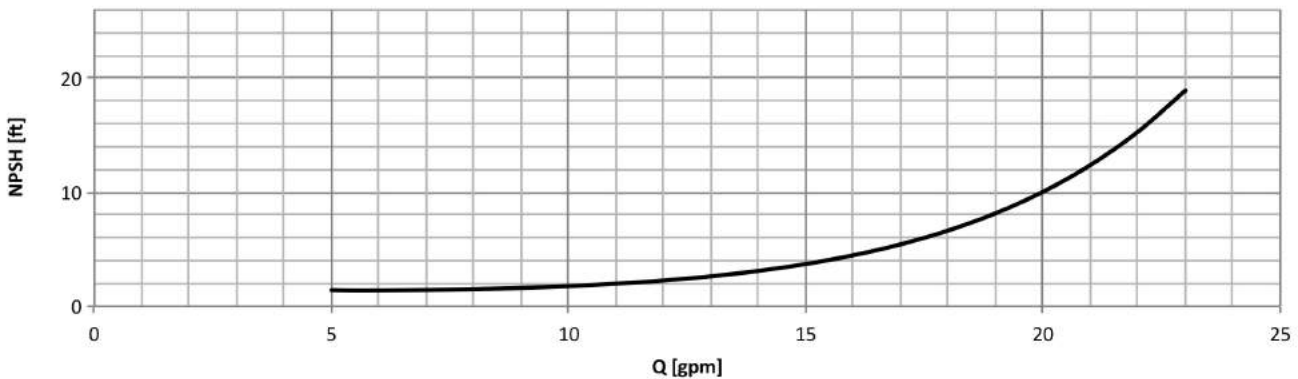
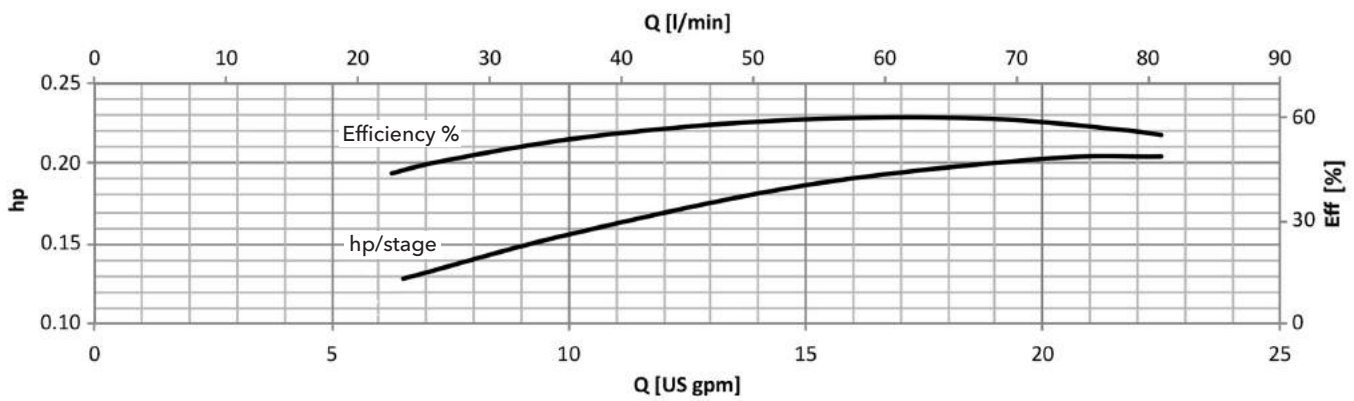
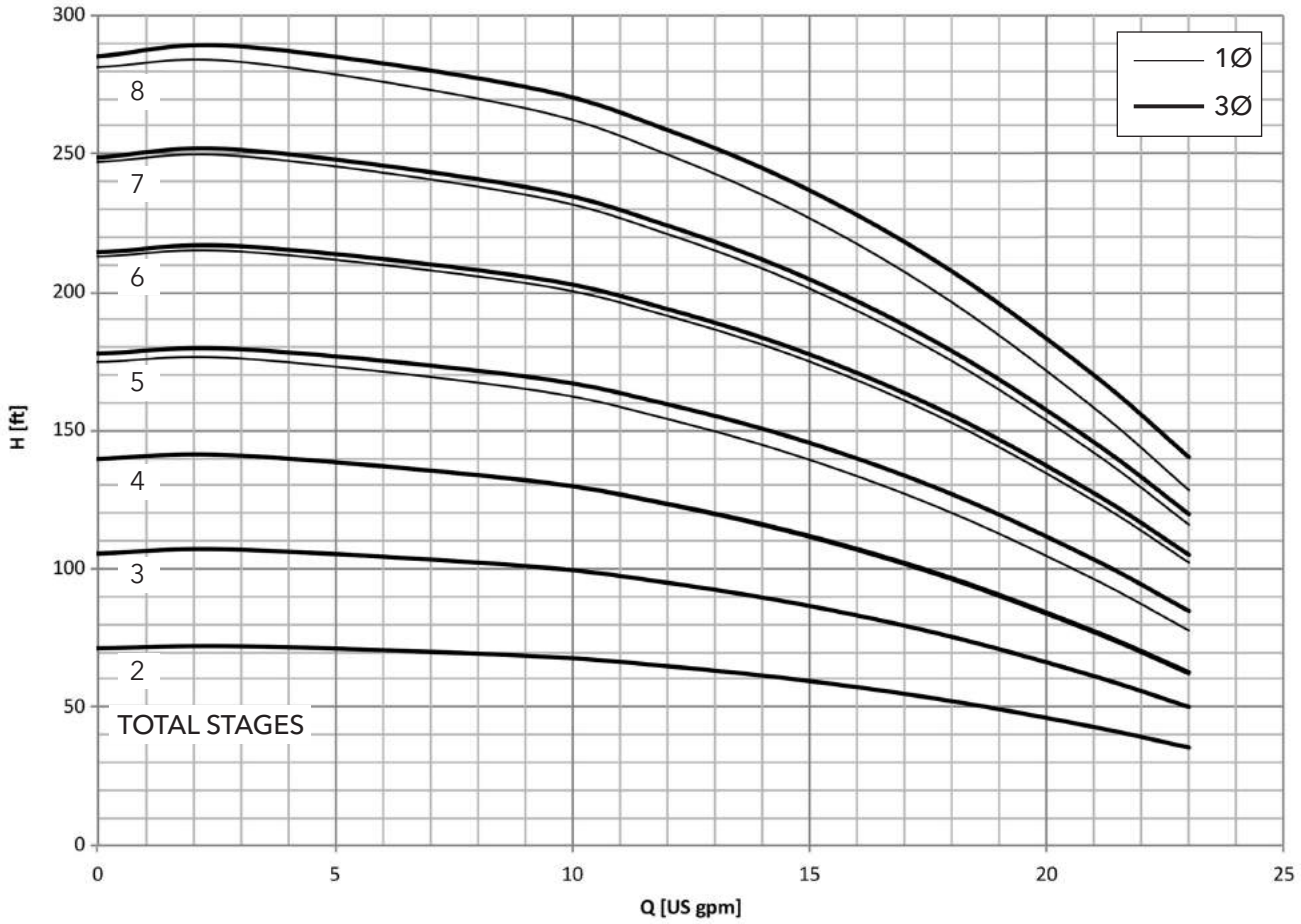
Commercial Water

3HM..N SERIES, (2 TO 8 STAGES) DIMENSIONS AND WEIGHTS AT 60 HZ, 3500 RPM



| Pump Size Stages | Phase | DWG No. | Motor | | Dimensions (in) | | | | | | | | | | Max. Working Pressure (PSI) | Weight (lbs) |
|------------------|--------------|-------------|-------|------------|-----------------|------|------|-------|-------|------|------|------|------|------|-----------------------------|--------------|
| | | | HP | Frame Size | A | D | H | L | L1 | L2 | M | M1 | N | N1 | | |
| 3HM02 | SINGLE PHASE | X | 0.75 | 71 | 3.43 | 5.51 | 8.86 | 13.78 | - | - | - | - | - | - | 147 | 18 |
| 3HM03 | | | 0.75 | 71 | 3.43 | 5.51 | 8.86 | 13.78 | - | - | - | - | - | - | 147 | 18 |
| 3HM04 | | | 0.75 | 71 | 4.21 | 5.51 | 8.86 | 14.57 | - | - | - | - | - | - | 147 | 20 |
| 3HM05 | | | 1 | 71 | 5.00 | 5.51 | 9.13 | 16.85 | - | - | - | - | - | - | 147 | 22 |
| 3HM06 | | Y | 1.5 | 80 | 5.79 | 5.94 | 9.13 | 17.64 | - | - | - | - | - | - | 147 | 31 |
| 3HM07 | | Z | 1.5 | 80 | 5.94 | 5.94 | 9.13 | 18.43 | 6.02 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 33 |
| 3HM08 | | | 1.5 | 80 | 6.73 | 5.94 | 9.13 | 19.21 | 6.81 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 35 |
| 3HM02 | | THREE PHASE | X | 0.75 | 71 | 3.43 | 5.51 | 8.86 | 13.78 | - | - | - | - | - | - | 147 |
| 3HM03 | 0.75 | | | 71 | 3.43 | 5.51 | 8.86 | 13.78 | - | - | - | - | - | - | 147 | 18 |
| 3HM04 | 0.75 | | | 71 | 4.21 | 5.51 | 8.86 | 14.57 | - | - | - | - | - | - | 147 | 20 |
| 3HM05 | Y | | 1 | 80 | 5.00 | 5.51 | 9.13 | 16.85 | - | - | - | - | - | - | 147 | 29 |
| 3HM06 | | | 1.5 | 80 | 5.79 | 5.94 | 9.13 | 17.64 | - | - | - | - | - | - | 147 | 31 |
| 3HM07 | Z | | 1.5 | 80 | 5.94 | 5.94 | 9.13 | 18.43 | 6.02 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 33 |
| 3HM08 | | | 2 | 80 | 6.73 | 5.94 | 9.13 | 19.21 | 6.81 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 37 |

3HM..N SERIES, (2 TO 8 STAGES) OPERATING CHARACTERISTICS AT 60 HZ, 3500 RPM

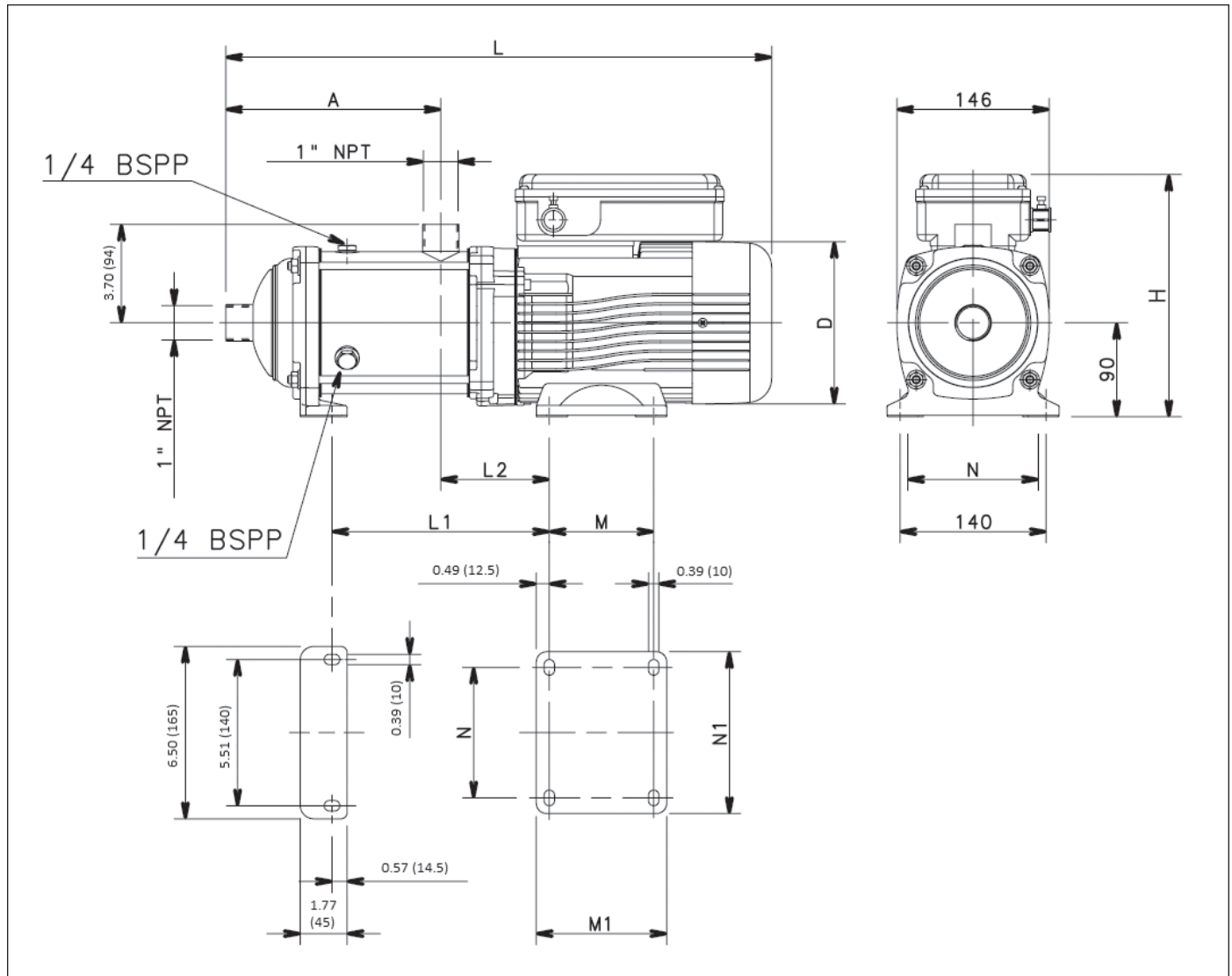


MINIMUM FLOW RATE: 5 GPM

Commercial Water

3HM..N SERIES, (9 TO 14 STAGES)

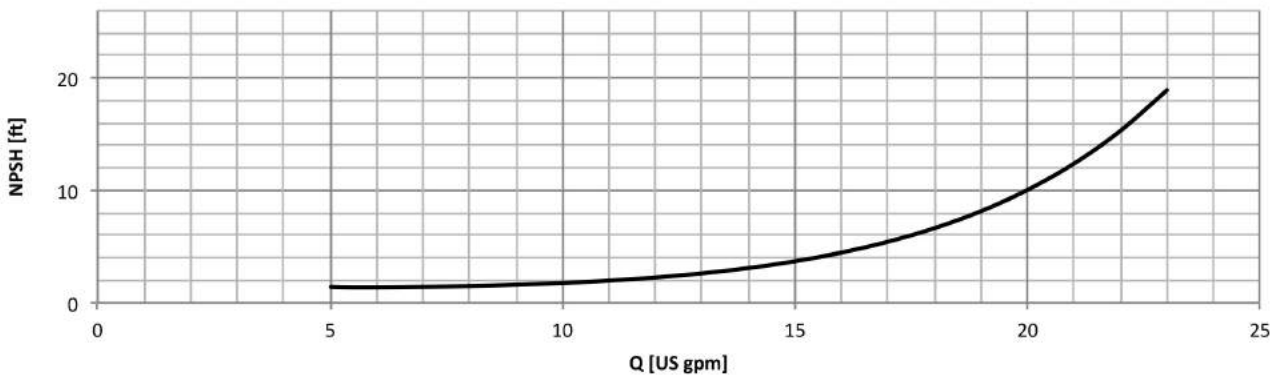
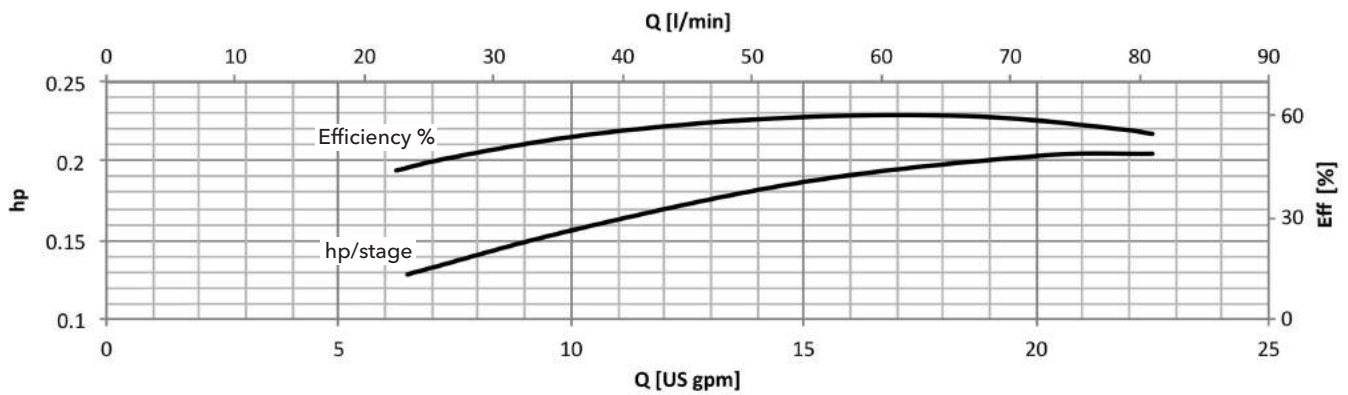
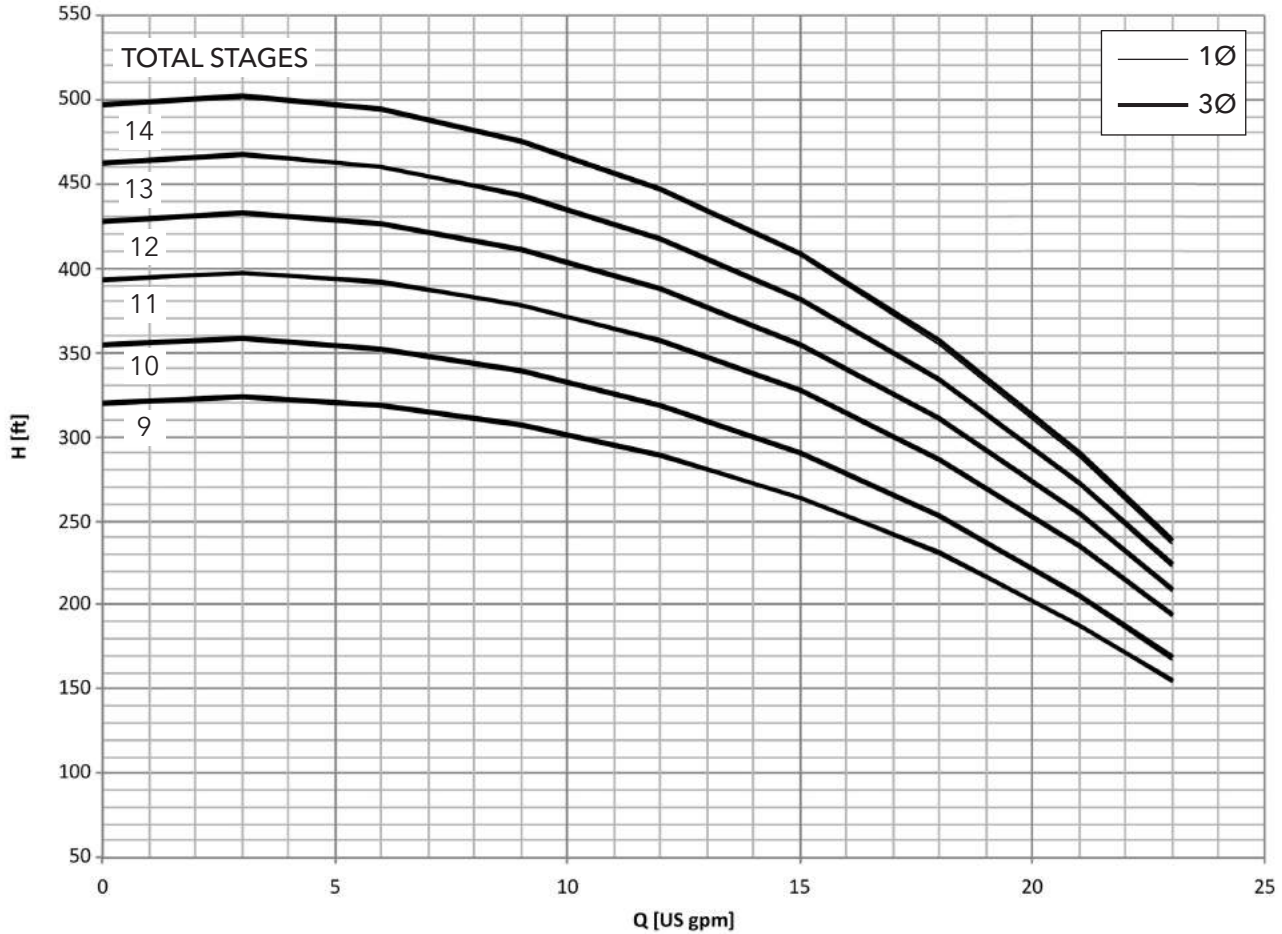
DIMENSIONS AND WEIGHTS AT 60 HZ, 3500 RPM



| Pump Size Stages | Phase | Motor | | Dimensions (in) | | | | | | | | | | Max. Working Pressure (PSI) | Weight (lbs) |
|------------------|--------------|-------|------------|-----------------|------|------|-------|------|------|------|------|------|------|-----------------------------|--------------|
| | | HP | Frame Size | A | D | H | L | L1 | L2 | M | M1 | N | N1 | | |
| 3HM09 | SINGLE PHASE | 2 | 80 | 7.52 | 6.10 | 9.13 | 20.00 | 7.60 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 37 |
| 3HM10 | | 2 | 80 | 8.31 | 6.10 | 9.13 | 20.79 | 8.39 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 37 |

| | | | | | | | | | | | | | | | |
|-------|-------------|---|----|-------|------|------|-------|-------|------|------|------|------|------|-----|----|
| 3HM09 | THREE PHASE | 2 | 80 | 7.52 | 6.10 | 9.13 | 20.00 | 7.60 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 37 |
| 3HM10 | | 2 | 80 | 8.31 | 6.10 | 9.13 | 20.79 | 8.39 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 37 |
| 3HM11 | | 3 | 90 | 9.09 | 6.85 | 9.13 | 23.58 | 10.08 | 5.00 | 4.92 | 5.91 | 5.51 | 6.46 | 235 | 51 |
| 3HM12 | | 3 | 90 | 9.88 | 6.85 | 9.13 | 24.37 | 10.87 | 5.00 | 4.92 | 5.91 | 5.51 | 6.46 | 235 | 51 |
| 3HM13 | | 3 | 90 | 10.67 | 6.85 | 9.13 | 25.16 | 11.65 | 5.00 | 4.92 | 5.91 | 5.51 | 6.46 | 235 | 51 |
| 3HM14 | | 3 | 90 | 11.46 | 6.85 | 9.13 | 25.94 | 12.44 | 5.00 | 4.92 | 5.91 | 5.51 | 6.46 | 235 | 53 |

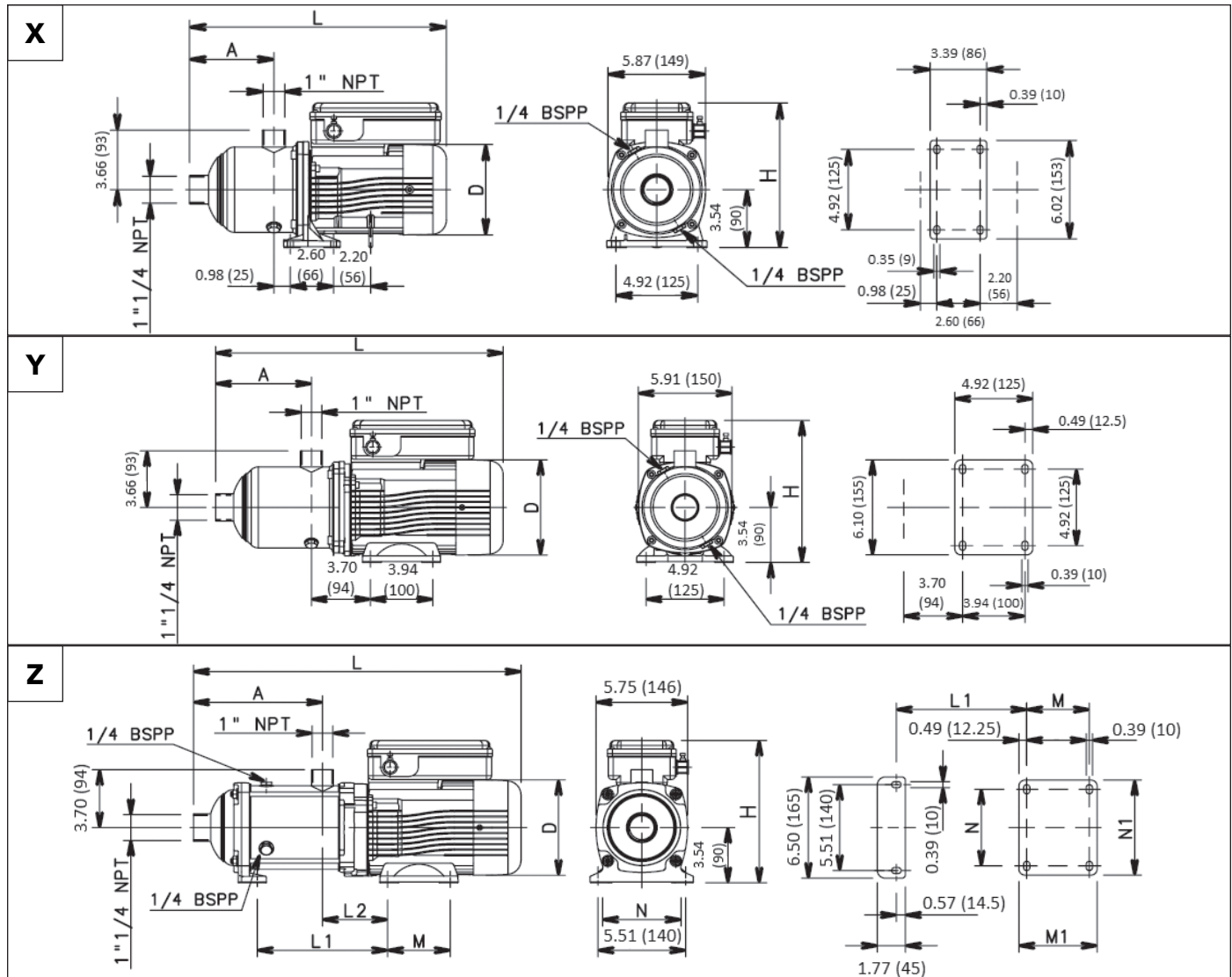
3HM..N SERIES, (9 TO 14 STAGES) OPERATING CHARACTERISTICS AT 60 HZ, 3500 RPM



MINIMUM FLOW RATE: 5 GPM

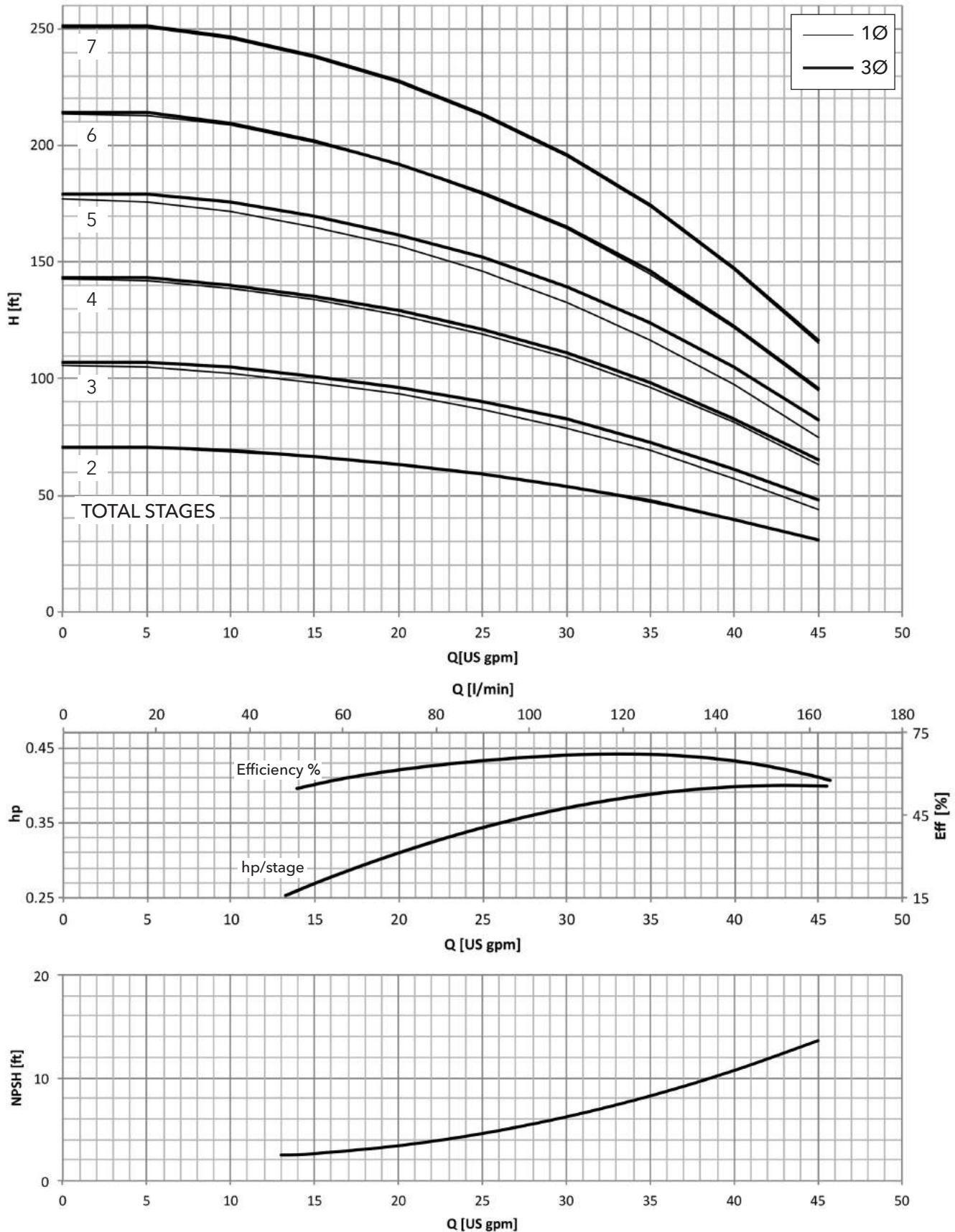
Commercial Water

5HM..N SERIES, (2 TO 7 STAGES) DIMENSIONS AND WEIGHTS AT 60 HZ, 3500 RPM



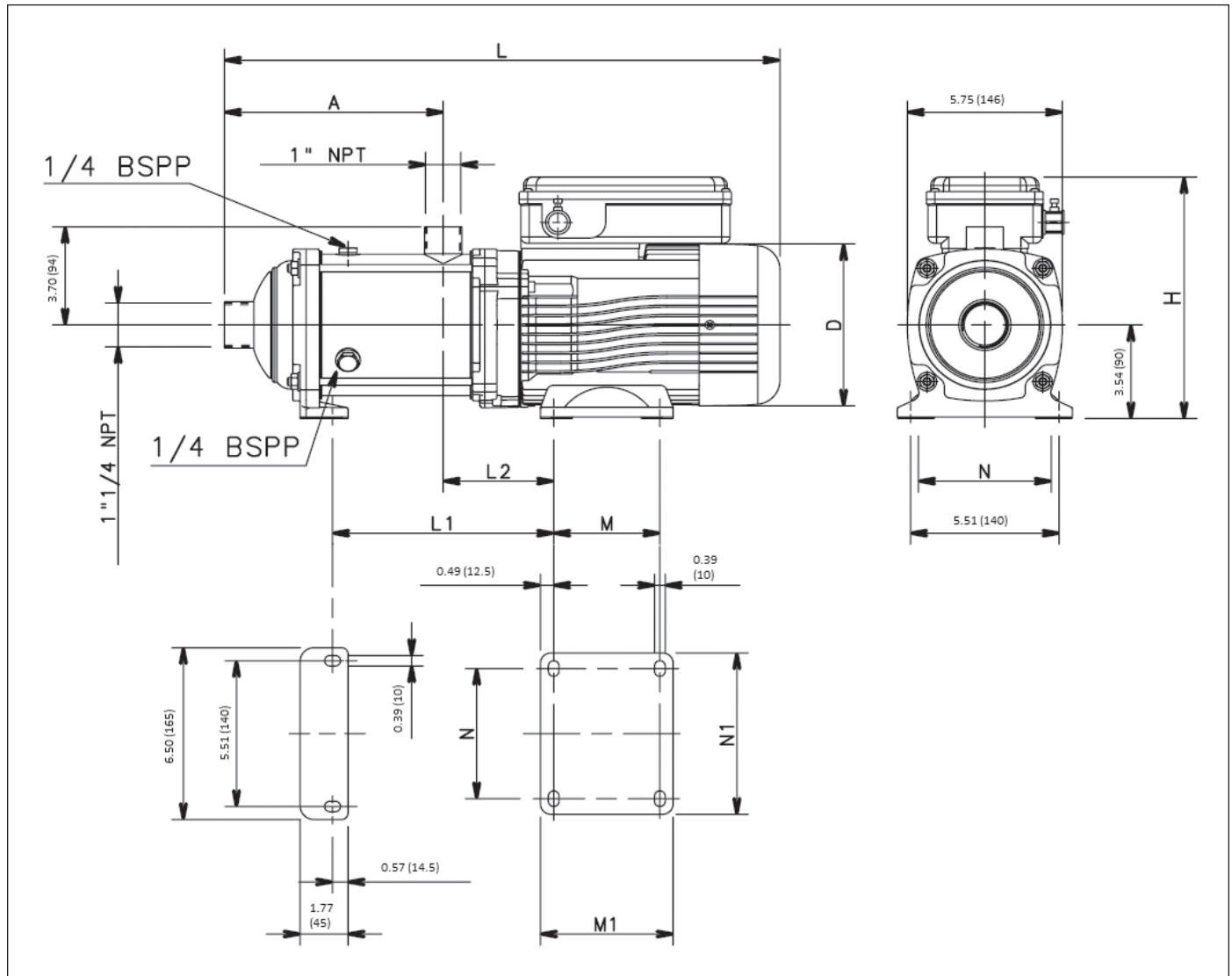
| Pump Size Stages | Phase | DWG No. | Motor | | Dimensions (in) | | | | | | | | | | Max. Working Pressure (PSI) | Weight (lbs) |
|------------------|--------------|-------------|-------|------------|-----------------|------|------|-------|-------|------|------|------|------|------|-----------------------------|--------------|
| | | | HP | Frame Size | A | D | H | L | L1 | L2 | M | M1 | N | N1 | | |
| 5HM02 | SINGLE PHASE | X | 0.75 | 71 | 4.09 | 5.51 | 8.86 | 14.45 | - | - | - | - | - | - | 147 | 18 |
| 5HM03 | | | 1 | 71 | 4.09 | 5.51 | 8.86 | 14.45 | - | - | - | - | - | - | 147 | 20 |
| 5HM04 | | Y | 1.5 | 80 | 5.08 | 6.10 | 9.13 | 16.93 | - | - | - | - | - | - | 147 | 31 |
| 5HM05 | | | 1.5 | 80 | 6.06 | 6.10 | 9.13 | 17.91 | - | - | - | - | - | - | 147 | 31 |
| 5HM06 | | Z | 2 | 80 | 6.22 | 6.10 | 9.13 | 18.70 | 6.22 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 36 |
| 5HM02 | | THREE PHASE | X | 0.75 | 71 | 4.09 | 5.51 | 8.86 | 14.45 | - | - | - | - | - | - | 147 |
| 5HM03 | 1 | | | 80 | 4.09 | 6.10 | 9.13 | 15.94 | - | - | - | - | - | - | 147 | 27 |
| 5HM04 | Y | | 1.5 | 80 | 5.08 | 6.10 | 9.13 | 16.93 | - | - | - | - | - | - | 147 | 31 |
| 5HM05 | | | 2 | 80 | 6.06 | 6.10 | 9.13 | 17.91 | - | - | - | - | - | - | 147 | 34 |
| 5HM06 | Z | | 2 | 80 | 6.22 | 6.10 | 9.13 | 18.70 | 6.22 | 4.09 | 3.94 | 4.92 | 4.92 | 6.10 | 235 | 36 |
| 5HM07 | | | 3 | 90 | 7.20 | 6.85 | 9.13 | 21.89 | 8.11 | 5.00 | 4.92 | 5.91 | 5.51 | 6.46 | 235 | 49 |

5HM..N SERIES, (2 TO 7 STAGES) OPERATING CHARACTERISTICS AT 60 HZ, 3500 RPM



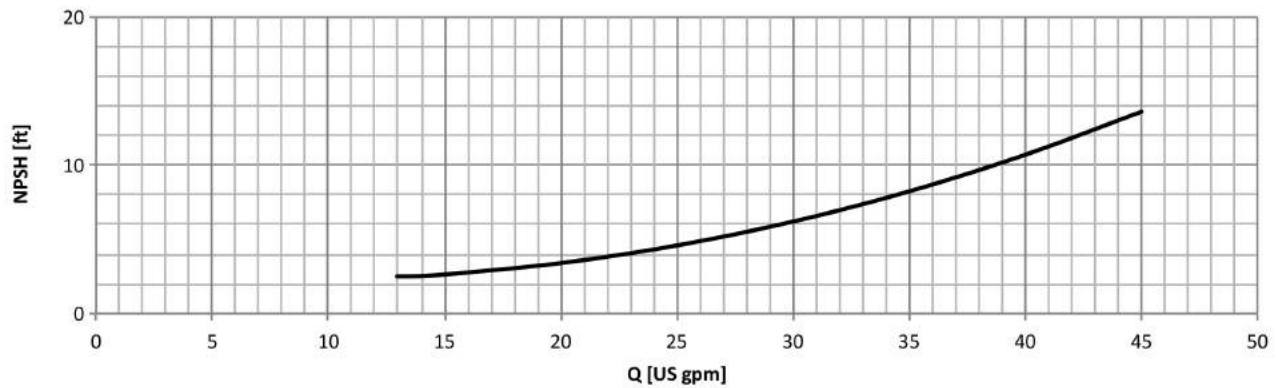
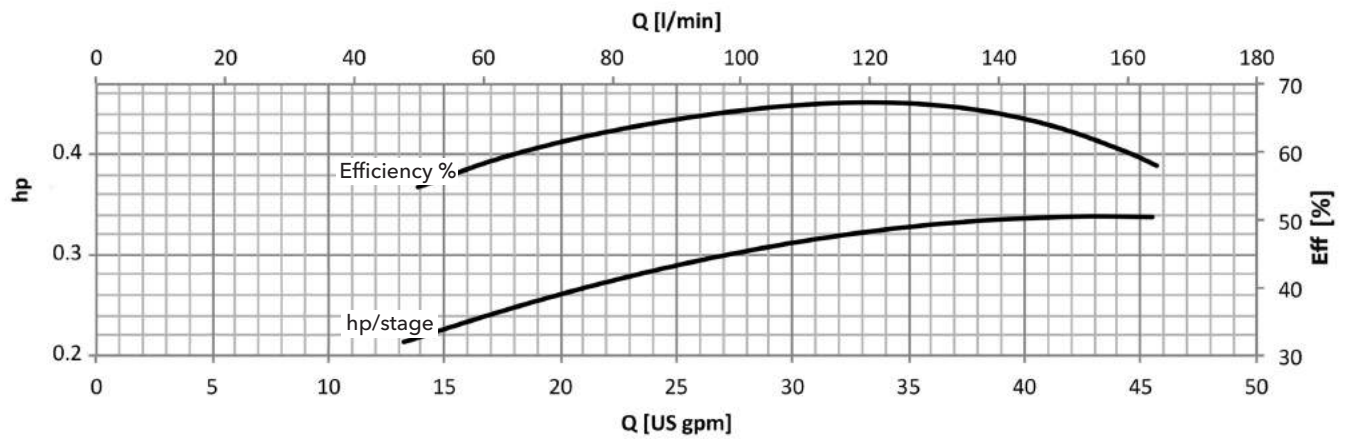
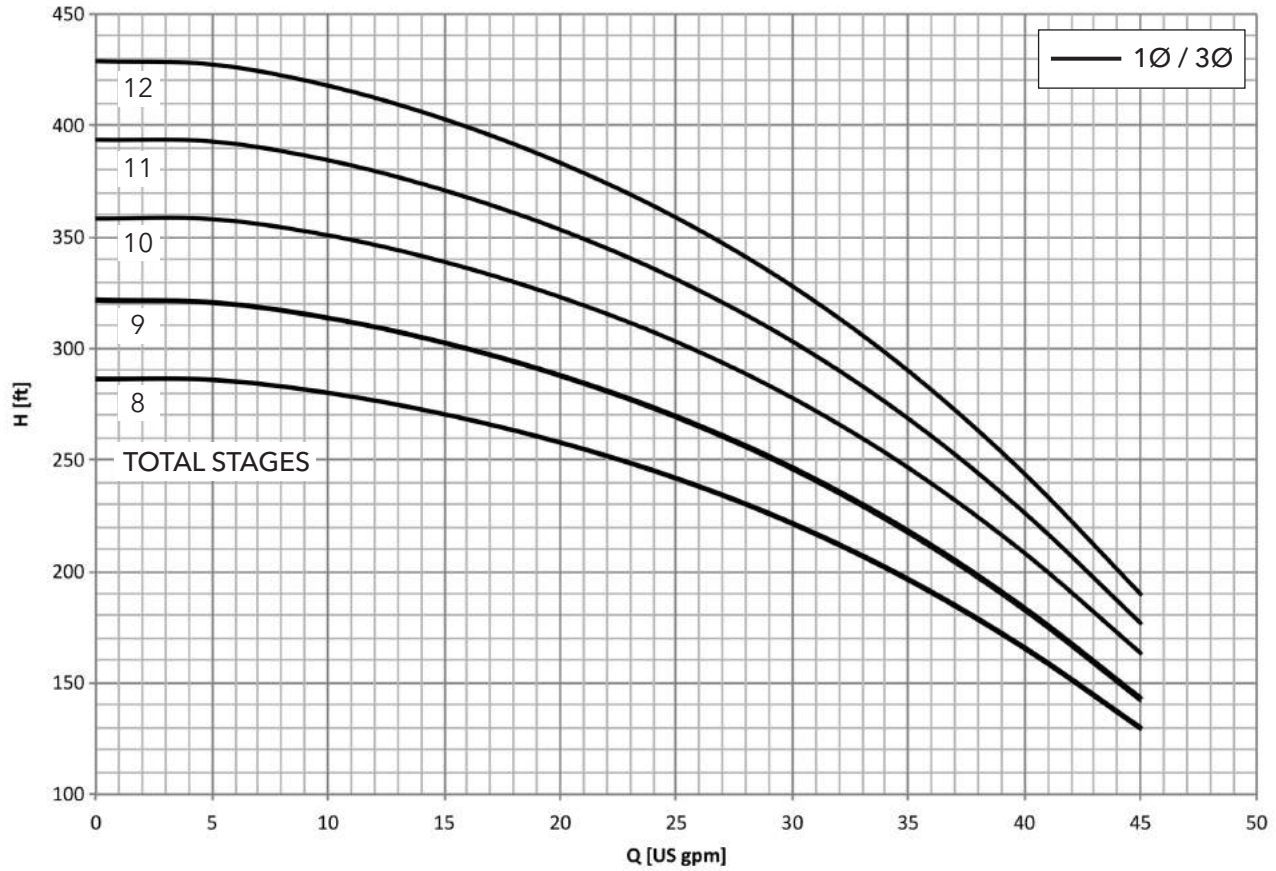
MINIMUM FLOW RATE: 10 GPM

5HM..N SERIES, (8 TO 12 STAGES) DIMENSIONS AND WEIGHTS AT 60 HZ, 3500 RPM



| Pump Size Stages | Phase | Motor | | Dimensions (in) | | | | | | | | | | Max. Working Pressure (PSI) | Weight (lbs) |
|------------------|-------------|-------|------------|-----------------|------|------|-------|-------|------|------|------|------|------|-----------------------------|--------------|
| | | HP | Frame Size | A | D | H | L | L1 | L2 | M | M1 | N | N1 | | |
| 5HM08 | THREE PHASE | 3 | 90 | 8.19 | 6.85 | 9.13 | 22.87 | 9.09 | 5.00 | 4.92 | 5.91 | 5.51 | 6.46 | 235 | 49 |
| 5HM09 | | 3 | 90 | 9.17 | 6.85 | 9.13 | 23.86 | 10.08 | 5.00 | 4.92 | 5.91 | 5.51 | 6.46 | 235 | 51 |
| 5HM10 | | 4 | 90 | 10.16 | 6.85 | 9.13 | 24.84 | 11.06 | 5.00 | 4.92 | 5.91 | 5.51 | 6.46 | 235 | 58 |
| 5HM11 | | 4 | 90 | 11.14 | 6.85 | 9.13 | 25.83 | 12.05 | 5.00 | 4.92 | 5.91 | 5.51 | 6.46 | 235 | 60 |
| 5HM12 | | 4 | 90 | 12.13 | 6.85 | 9.13 | 26.81 | 13.03 | 5.00 | 4.92 | 5.91 | 5.51 | 6.46 | 235 | 60 |

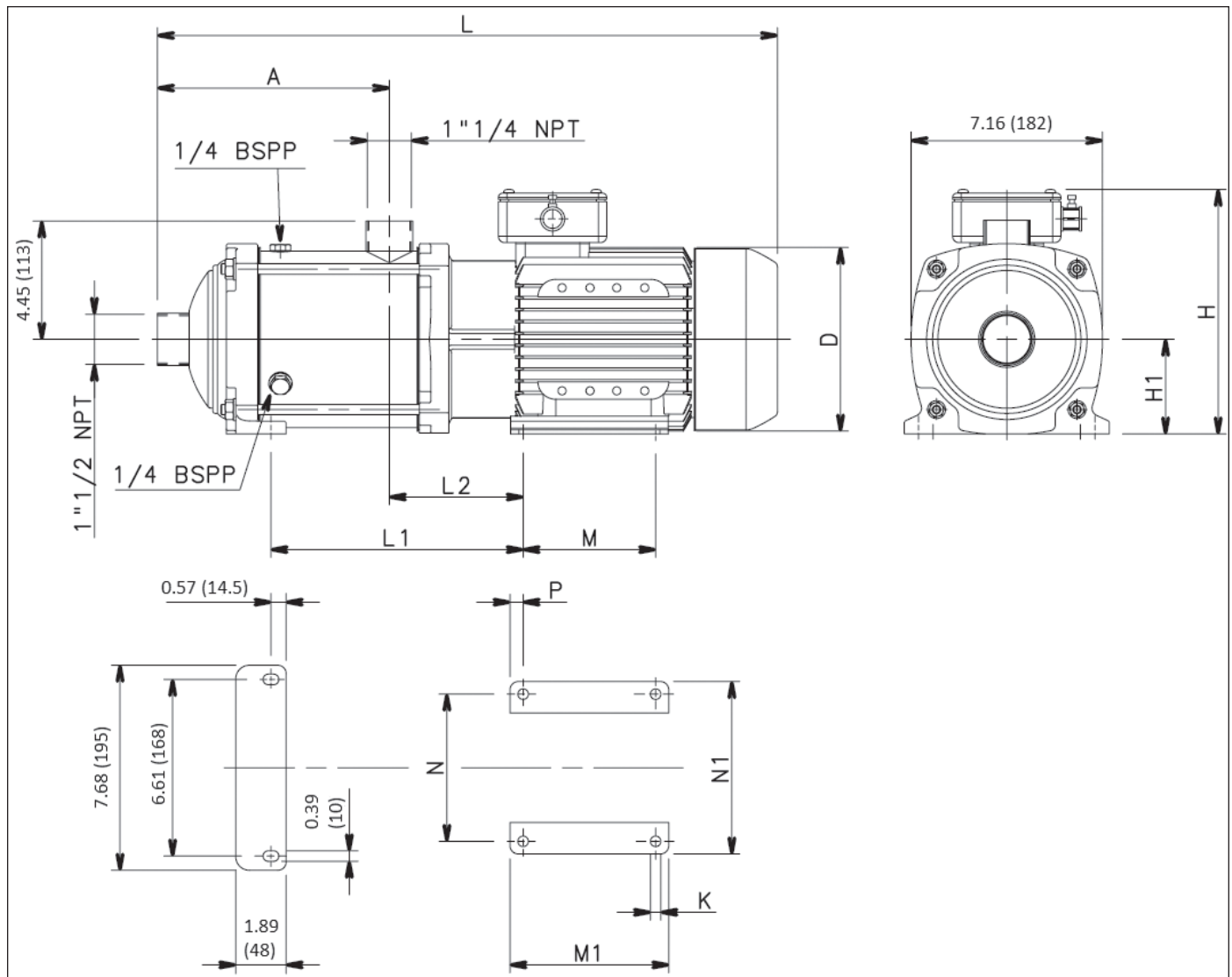
5HM..N SERIES, (8 TO 12 STAGES) OPERATING CHARACTERISTICS AT 60 HZ, 3500 RPM



MINIMUM FLOW RATE: 10 GPM

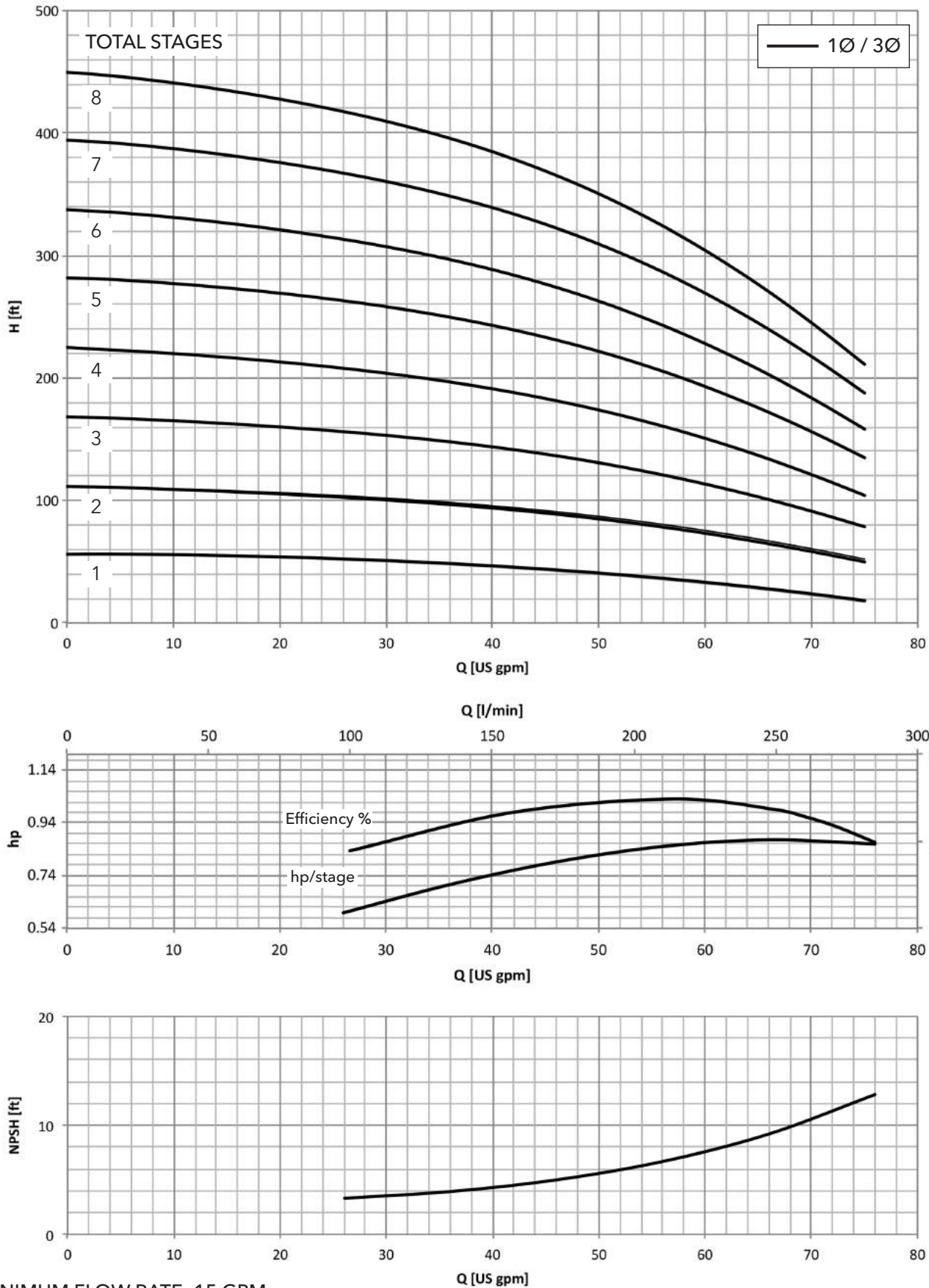
Commercial Water

10HM..N SERIES, (1 TO 8 STAGES) DIMENSIONS AND WEIGHTS AT 60 HZ, 3500 RPM



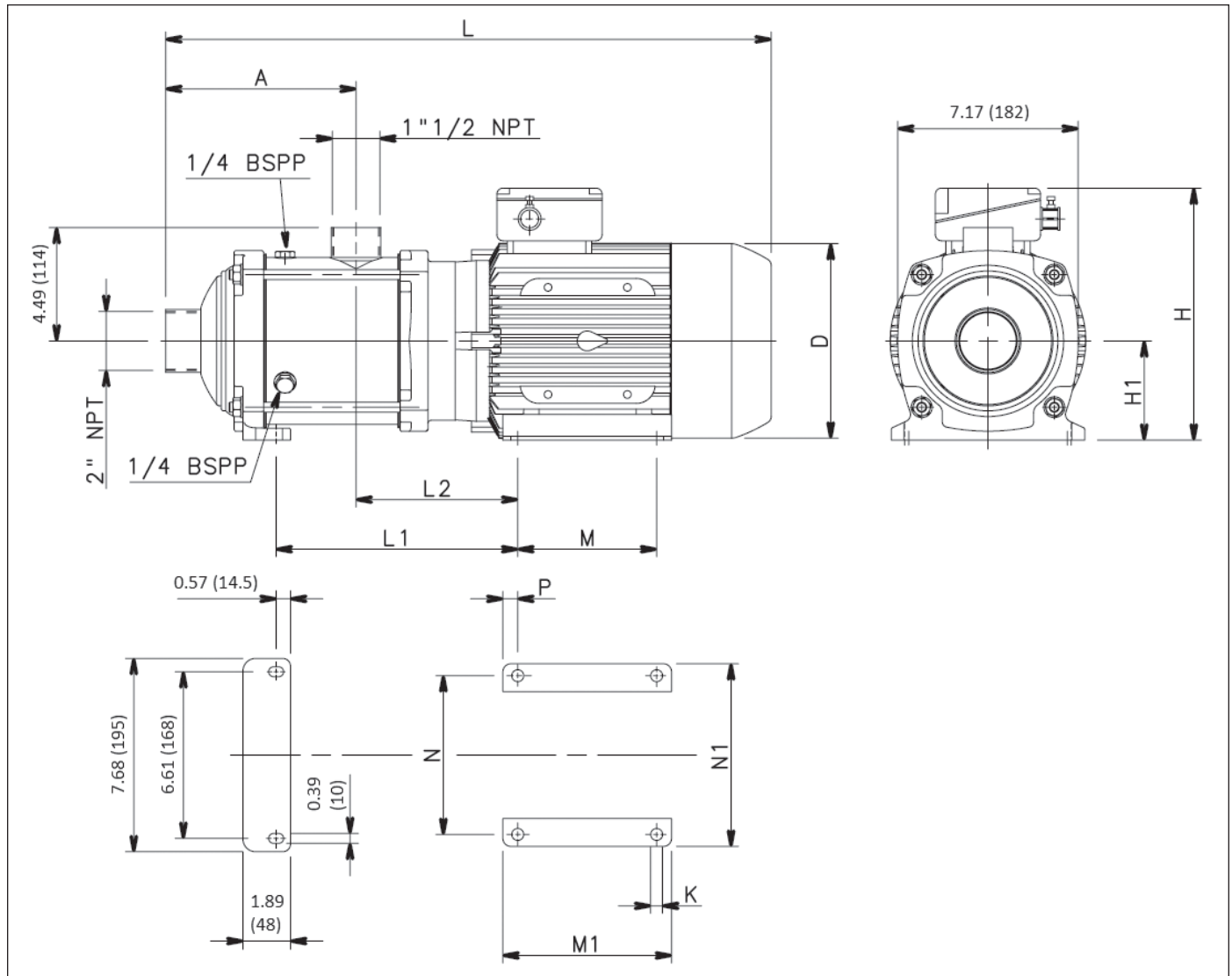
| Pump Size Stages | Phase | Motor | | Dimensions (in) | | | | | | | | | | | | | Max. Working Pressure (PSI) | Weight (lbs) |
|------------------|--------------|-------|------------|-----------------|------|-------|------|-------|-------|------|------|------|------|------|------|------|-----------------------------|--------------|
| | | HP | Frame Size | A | D | H | H1 | L | L1 | L2 | M | M1 | N | N1 | P | K | | |
| 10HM01 | SINGLE PHASE | 1.5 | 80 | 4.92 | 6.1 | 9.13 | 3.54 | 17.44 | 4.8 | 4.13 | 3.94 | 4.92 | 4.92 | 6.1 | 0.49 | 0.39 | 235 | 36 |
| 10HM02 | | 2 | 80 | 4.92 | 6.1 | 9.13 | 3.54 | 17.44 | 4.8 | 4.13 | 3.94 | 4.92 | 4.92 | 6.1 | 0.49 | 0.39 | 235 | 38 |
| 10HM01 | THREE PHASE | 1 | 80 | 4.92 | 6.1 | 9.13 | 3.54 | 17.44 | 4.8 | 4.13 | 3.94 | 4.92 | 4.92 | 6.1 | 0.49 | 0.39 | 235 | 34 |
| 10HM02 | | 2 | 80 | 4.92 | 6.1 | 9.13 | 3.54 | 17.4 | 4.8 | 4.13 | 3.94 | 4.92 | 4.92 | 6.1 | 0.49 | 0.39 | 235 | 38 |
| 10HM03 | | 3 | 90 | 4.92 | 6.85 | 9.13 | 3.54 | 19.45 | 5.67 | 5.04 | 4.92 | 5.91 | 5.51 | 6.46 | 0.49 | 0.39 | 235 | 51 |
| 10HM04 | | 4 | 90 | 6.18 | 6.85 | 9.13 | 3.54 | 20.71 | 6.93 | 5.04 | 4.92 | 5.91 | 5.51 | 6.46 | 0.49 | 0.39 | 235 | 60 |
| 10HM05 | | 5.5 | 100 | 7.44 | 7.76 | 10 | 3.94 | 23.31 | 8.98 | 5.79 | 5.51 | 6.69 | 6.3 | 7.24 | 0.59 | 0.47 | 235 | 75 |
| 10HM06 | | 5.5 | 100 | 8.7 | 7.76 | 10 | 3.94 | 24.57 | 10.24 | 5.79 | 5.51 | 6.69 | 6.3 | 7.24 | 0.59 | 0.47 | 235 | 78 |
| 10HM07 | | 7.5 | 112 | 9.96 | 8.43 | 11.02 | 4.41 | 27.17 | 11.77 | 6.06 | 5.51 | 6.69 | 7.48 | 8.62 | 0.59 | 0.47 | 235 | 95 |
| 10HM08 | | 7.5 | 112 | 11.22 | 8.43 | 11.02 | 4.41 | 28.43 | 13.03 | 6.06 | 5.51 | 6.69 | 7.48 | 8.62 | 0.59 | 0.47 | 235 | 98 |

10HM..N SERIES, (1 TO 8 STAGES) OPERATING CHARACTERISTICS AT 60 HZ, 3500 RPM



MINIMUM FLOW RATE: 15 GPM

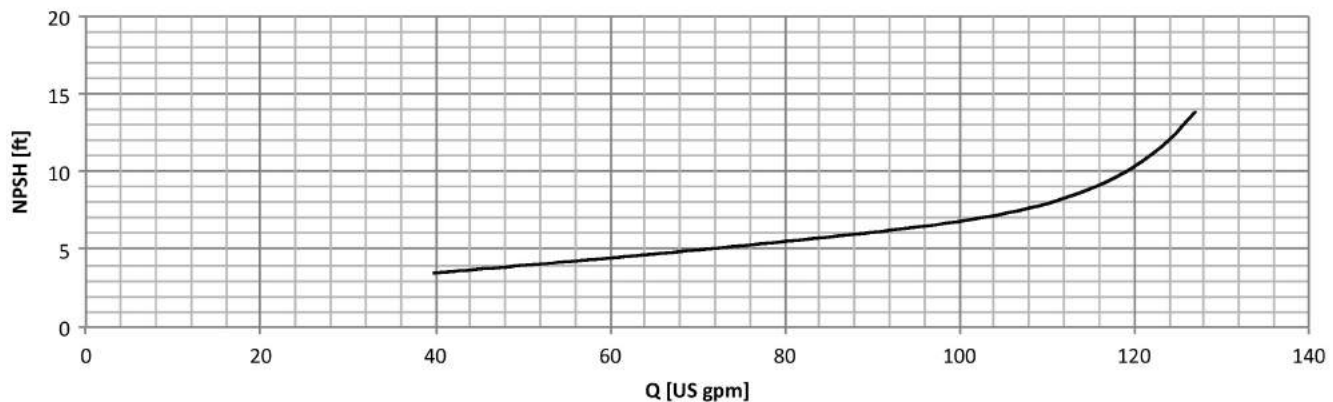
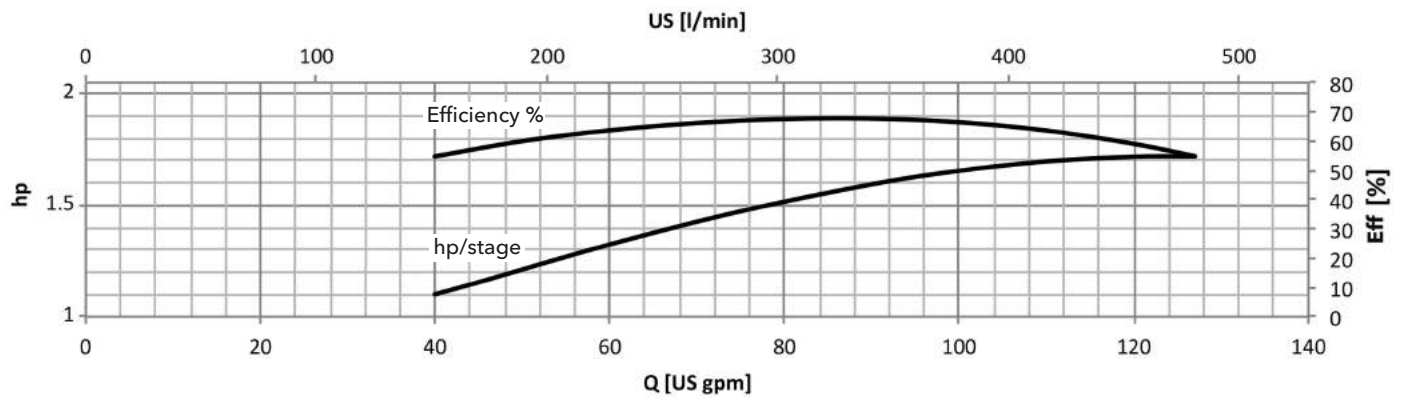
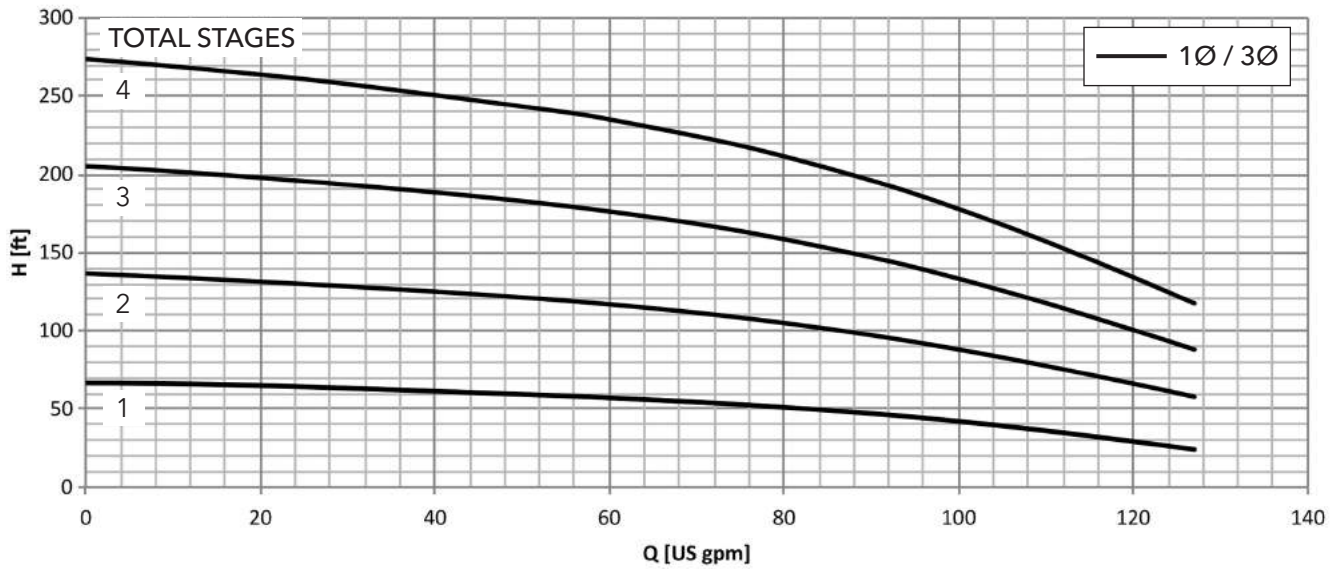
15HM..N SERIES, (1 TO 4 STAGES) DIMENSIONS AND WEIGHTS AT 60 HZ, 3500 RPM



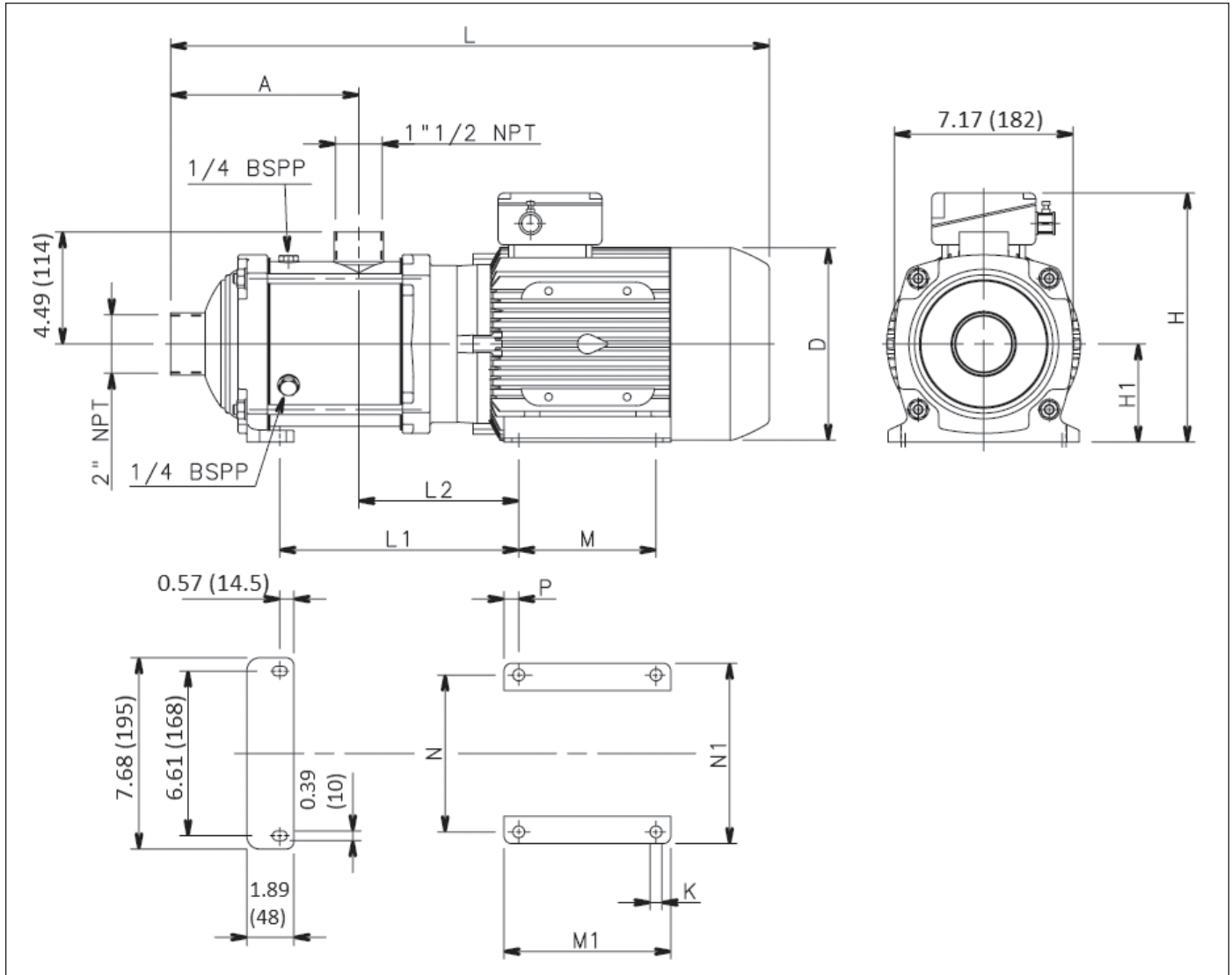
| Pump Size Stages | Phase | Motor | | Dimensions (in) | | | | | | | | | | | | | | Max. Working Pressure (PSI) | Weight (lbs) |
|------------------|--------------|-------|------------|-----------------|------|------|------|-------|------|------|------|------|------|------|------|------|-----|-----------------------------|--------------|
| | | HP | Frame Size | A | D | H | H1 | L | L1 | L2 | M | M1 | N | N1 | P | K | | | |
| 15HM01 | SINGLE PHASE | 2 | 80 | 5.67 | 6.10 | 9.13 | 3.54 | 18.82 | 6.06 | 4.76 | 3.94 | 4.92 | 4.92 | 6.10 | 0.49 | 0.39 | 235 | 38 | |

| | | | | | | | | | | | | | | | | | | |
|--------|-------------|-----|-----|------|------|-------|------|-------|------|------|------|------|------|------|------|------|-----|----|
| 15HM01 | THREE PHASE | 2 | 80 | 5.67 | 6.10 | 9.13 | 3.54 | 18.82 | 6.06 | 4.76 | 3.94 | 4.92 | 4.92 | 6.10 | 0.49 | 0.39 | 235 | 38 |
| 15HM02 | | 4 | 90 | 5.67 | 6.85 | 9.13 | 3.54 | 20.87 | 6.93 | 5.67 | 4.92 | 5.91 | 5.51 | 6.46 | 0.49 | 0.39 | 235 | 58 |
| 15HM03 | | 5.5 | 100 | 5.67 | 7.76 | 10.00 | 3.94 | 22.17 | 7.72 | 6.42 | 5.51 | 6.69 | 6.30 | 7.24 | 0.59 | 0.47 | 235 | 71 |
| 15HM04 | | 7.5 | 112 | 7.56 | 8.43 | 11.02 | 4.41 | 25.39 | 9.88 | 6.69 | 5.51 | 6.69 | 7.48 | 8.62 | 0.59 | 0.47 | 235 | 89 |

15HM..N SERIES, (1 TO 4 STAGES) OPERATING CHARACTERISTICS AT 60 HZ, 3500 RPM

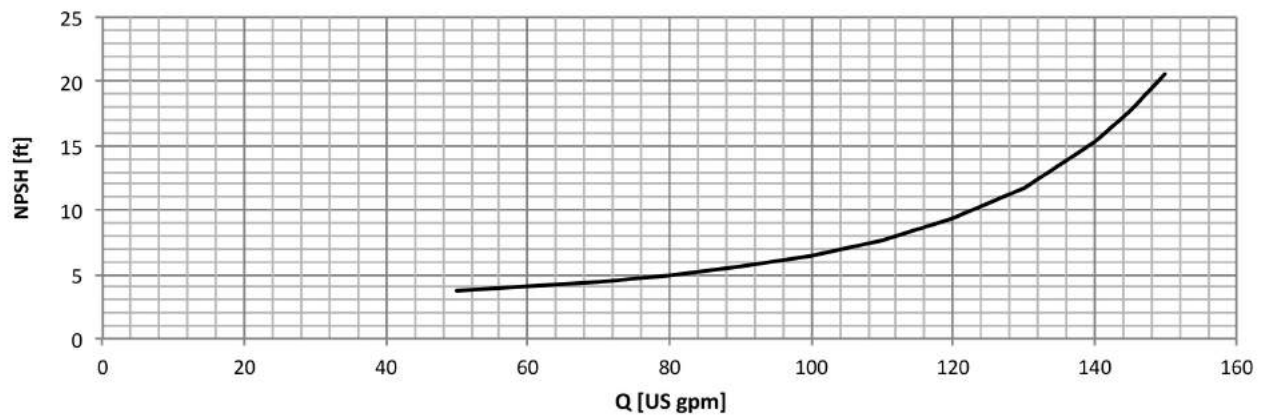
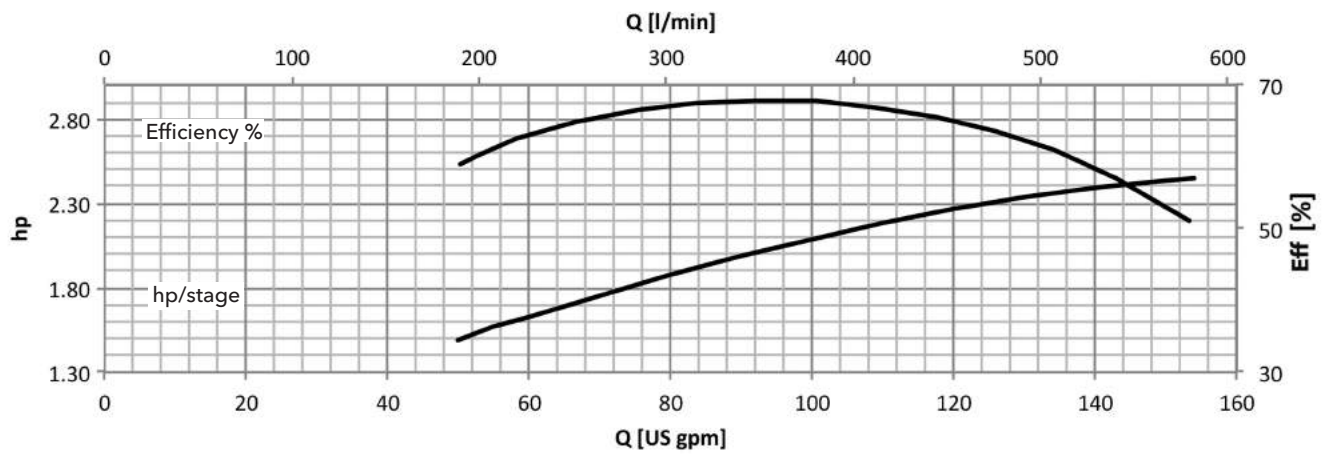
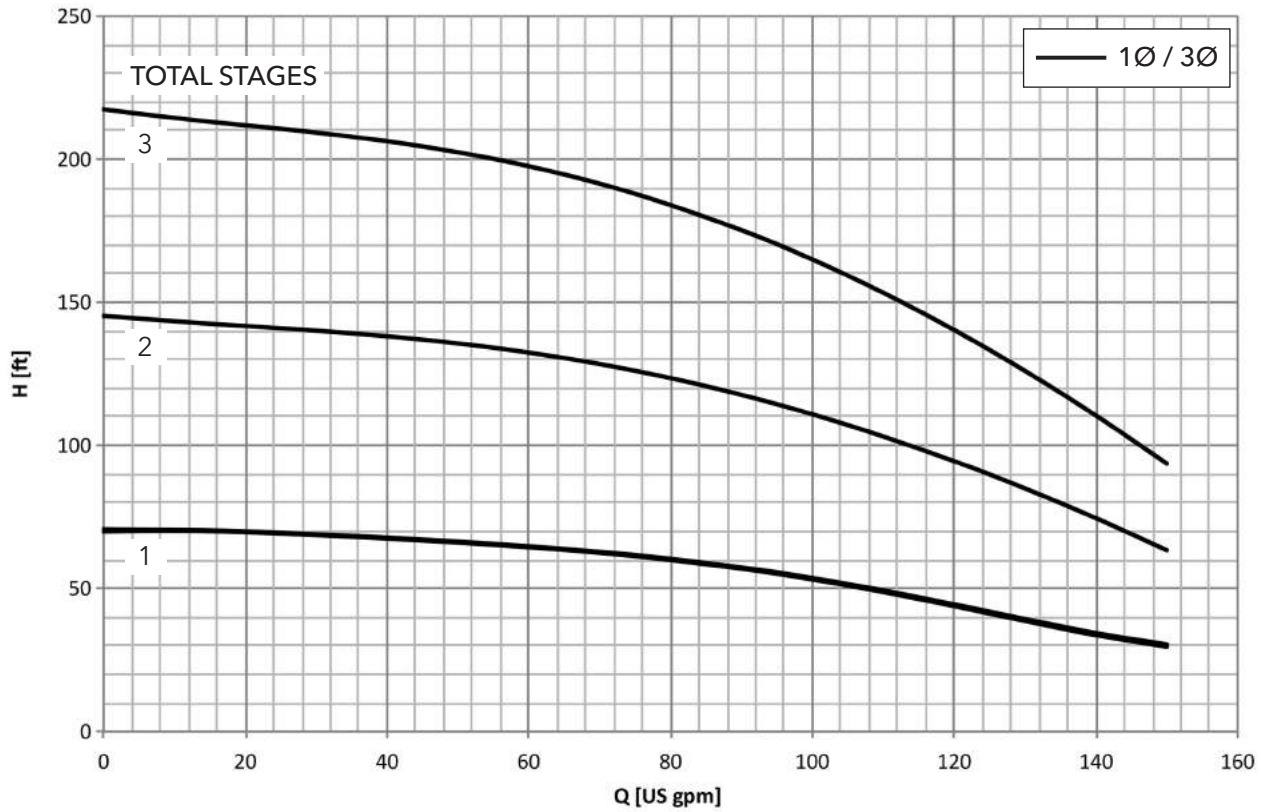


22HM..N SERIES, (1 TO 3 STAGES) DIMENSIONS AND WEIGHTS AT 60 HZ, 3500 RPM



| Pump Size Stages | Phase | Motor | | Dimensions (in) | | | | | | | | | | | | | Max. Working Pressure (PSI) | Weight (lbs) |
|------------------|-------------|-------|------------|-----------------|------|-------|------|-------|------|------|------|------|------|------|------|------|-----------------------------|--------------|
| | | HP | Frame Size | A | D | H | H1 | L | L1 | L2 | M | M1 | N | N1 | P | K | | |
| 22HM01 | THREE PHASE | 3 | 90 | 5.67 | 6.85 | 9.13 | 3.54 | 20.83 | 6.93 | 5.67 | 4.92 | 5.91 | 5.51 | 6.46 | 0.49 | 0.39 | 235 | 49 |
| 22HM02 | | 5.5 | 100 | 5.67 | 7.76 | 10.00 | 3.94 | 22.17 | 7.72 | 6.42 | 5.51 | 6.69 | 6.30 | 7.24 | 0.59 | 0.47 | 235 | 71 |
| 22HM03 | | 7.5 | 112 | 5.67 | 8.43 | 11.02 | 4.41 | 23.50 | 7.99 | 6.69 | 5.51 | 6.69 | 7.48 | 8.62 | 0.59 | 0.47 | 235 | 86 |

22HM..N SERIES, (1 TO 3 STAGES) OPERATING CHARACTERISTICS AT 60 HZ, 3500 RPM



MINIMUM FLOW RATE: 30 GPM

TECHNICAL DATA - WATER PROPERTY CHART

| Temp °F | Temp °C | Specific Volume (Cubic ft/lb) | Specific Gravity | | | Weight (lb/cubic ft) | Vapor Pressure (psi Abs) |
|---------|---------|----------------------------------|------------------|--------|--------|-------------------------|-----------------------------|
| | | | @ 39.2°F | @ 60°F | @ 68°F | | |
| 32 | 0.0 | 0.01602 | 1.000 | 1.001 | 1.002 | 62.42 | 0.088 |
| 35 | 1.7 | 0.01602 | 1.000 | 1.001 | 1.002 | 62.42 | 0.100 |
| 40 | 4.4 | 0.01602 | 1.000 | 1.001 | 1.002 | 62.42 | 0.122 |
| 50 | 10.0 | 0.01603 | 0.999 | 1.001 | 1.002 | 62.38 | 0.178 |
| 60 | 15.6 | 0.01604 | 0.999 | 1.000 | 1.001 | 62.34 | 0.256 |
| 70 | 21.1 | 0.01606 | 0.998 | 0.999 | 1.000 | 62.27 | 0.363 |
| 80 | 26.7 | 0.01608 | 0.996 | 0.998 | 0.999 | 62.19 | 0.507 |
| 90 | 32.2 | 0.0161 | 0.995 | 0.996 | 0.997 | 62.11 | 0.698 |
| 100 | 37.8 | 0.01613 | 0.993 | 0.994 | 0.995 | 62.00 | 0.949 |
| 120 | 48.9 | 0.0162 | 0.989 | 0.990 | 0.991 | 61.73 | 1.692 |
| 140 | 60.0 | 0.01629 | 0.983 | 0.985 | 0.986 | 61.39 | 2.889 |
| 160 | 71.1 | 0.01639 | 0.977 | 0.979 | 0.979 | 61.01 | 4.741 |
| 180 | 82.2 | 0.01651 | 0.970 | 0.972 | 0.973 | 60.57 | 7.510 |
| 200 | 93.3 | 0.01663 | 0.963 | 0.964 | 0.966 | 60.13 | 11.526 |
| 212 | 100.0 | 0.01672 | 0.958 | 0.959 | 0.960 | 59.81 | 14.696 |
| 220 | 104.4 | 0.01677 | 0.955 | 0.956 | 0.957 | 59.63 | 17.186 |
| 240 | 115.6 | 0.01692 | 0.947 | 0.948 | 0.949 | 59.10 | 24.97 |
| 260 | 126.7 | 0.01709 | 0.938 | 0.939 | 0.940 | 58.51 | 35.43 |
| 280 | 137.8 | 0.01726 | 0.928 | 0.929 | 0.930 | 58.00 | 49.20 |
| 300 | 148.9 | 0.01745 | 0.918 | 0.919 | 0.920 | 57.31 | 67.01 |
| 320 | 160.0 | 0.01756 | 0.908 | 0.909 | 0.910 | 56.66 | 89.66 |
| 340 | 171.1 | 0.01787 | 0.896 | 0.898 | 0.899 | 55.96 | 118.01 |
| 360 | 182.2 | 0.01811 | 0.885 | 0.886 | 0.887 | 55.22 | 153.04 |
| 380 | 193.3 | 0.01836 | 0.873 | 0.874 | 0.875 | 54.47 | 195.77 |
| 400 | 204.4 | 0.01864 | 0.859 | 0.860 | 0.862 | 53.65 | 247.31 |
| 420 | 215.6 | 0.01894 | 0.846 | 0.847 | 0.848 | 52.80 | 308.83 |
| 440 | 226.7 | 0.01926 | 0.832 | 0.833 | 0.834 | 51.92 | 381.59 |
| 460 | 237.8 | 0.0196 | 0.817 | 0.818 | 0.819 | 51.02 | 466.9 |
| 480 | 248.9 | 0.02 | 0.801 | 0.802 | 0.803 | 50.00 | 566.1 |
| 500 | 260.0 | 0.0204 | 0.785 | 0.786 | 0.787 | 49.02 | 680.8 |
| 520 | 271.1 | 0.0209 | 0.765 | 0.766 | 0.767 | 47.85 | 812.4 |
| 540 | 282.2 | 0.0215 | 0.746 | 0.747 | 0.748 | 46.51 | 962.5 |
| 560 | 293.3 | 0.0221 | 0.726 | 0.727 | 0.728 | 45.30 | 1133.1 |
| 580 | 304.4 | 0.0228 | 0.703 | 0.704 | 0.704 | 43.90 | 1325.8 |
| 600 | 315.6 | 0.0236 | 0.678 | 0.679 | 0.680 | 42.30 | 1542.9 |
| 620 | 326.7 | 0.0247 | 0.649 | 0.650 | 0.650 | 40.50 | 1786.6 |
| 640 | 337.8 | 0.026 | 0.617 | 0.618 | 0.618 | 38.50 | 2059.7 |
| 660 | 348.9 | 0.0278 | 0.577 | 0.577 | 0.578 | 36.00 | 2365.4 |
| 680 | 360.0 | 0.0305 | 0.525 | 0.526 | 0.527 | 32.80 | 2708.1 |
| 700 | 371.1 | 0.0369 | 0.434 | 0.435 | 0.435 | 27.10 | 3093.7 |

TECHNICAL DATA - NPSH

NPSH

The minimum operating values that can be reached at the pump suction end are limited by the onset of cavitation.

Cavitation is the formation of vapor-filled cavities within liquids where the pressure is locally reduced to a critical value, or where the local pressure is equal to, or just below the vapor pressure of the liquid.

The vapor-filled cavities flow with the current and when they reach a higher pressure area the vapor contained in the cavities condenses. The cavities collide, generating pressure waves that are transmitted to the walls. These, being subjected to stress cycles, gradually become deformed and yield due to fatigue. This phenomenon, characterized by a metallic noise produced by the hammering on the pipe walls, is called incipient cavitation.

The damage caused by cavitation may be magnified by electrochemical corrosion and a local rise in temperature due to the plastic deformation of the walls. The materials that offer the highest resistance to heat and corrosion are alloy steels, especially austenitic steel. The conditions that trigger cavitation may be assessed by calculating the total net suction head, referred to in technical literature with the acronym NPSH (Net Positive Suction Head).

The NPSH represents the total energy (expressed in feet) of the liquid measured at suction under conditions of incipient cavitation, excluding the vapor pressure (expressed in feet) that the liquid has at the pump inlet.

To find the static height (h_z) at which to install the machine under safe conditions, the following formula must be verified:

$$h_p + h_z \geq (\text{NPSHr} + 2 \text{ ft}) + h_f + h_{pv}$$

where:

- h_p** is the absolute pressure applied to the free liquid surface in the suction tank, expressed in feet of liquid; h_p is the quotient between the barometric pressure and the specific weight of the liquid.
- h_z** is the suction lift between the pump axis and the free liquid surface in the suction tank, expressed in feet; h_z is negative when the liquid level is lower than the pump axis.
- h_f** is the flow resistance in the suction line and its accessories, such as: fittings, foot valve, gate valve, elbows, etc.
- h_{pv}** is the vapor pressure of the liquid at the operating temperature, expressed in feet of the liquid. h_{pv} is the quotient between the Pv vapor pressure and the liquid's specific weight.

0.5 is the safety factor.

The maximum possible suction head for installation depends on the value of the atmospheric pressure (i.e. the elevation above sea level at which the pump is installed) and the temperature of the liquid.

To help the user, with reference to water temperature (40°F) and to the elevation above sea level, the following tables show the drop in hydraulic pressure head in relation to the elevation above sea level, and the suction loss in relation to temperature.

| | | | | | | | |
|-------------------------------|-----|-----|-----|------|------|------|------|
| Water Temperature (°F) | 68 | 104 | 140 | 176 | 194 | 230 | 248 |
| Suction Loss (ft) | -.7 | 2.3 | 6.6 | 16.4 | 24.3 | 50.5 | 70.5 |

| | | | | | | |
|---------------------------------------|------|------|------|------|------|------|
| Elevation Above Sea Level (ft) | 1600 | 3300 | 4900 | 6500 | 8200 | 9800 |
| Suction Loss (ft) | 1.8 | 3.6 | 5.4 | 7.2 | 9.0 | 10.8 |

To reduce it to a minimum, especially in cases of high suction head (over 13 - 16 feet) or within the operating limits with high flow rates, we recommend using a suction line having a larger diameter than that of the pump's suction port. It is always a good idea to position the pump as close as possible to the liquid to be pumped.

TECHNICAL DATA - COMPATABILITY CHART FOR MATERIALS IN CONTACT WITH MOST COMMONLY USED LIQUIDS

| Liquid | Concentration (%) | Temperature Min/Max °F | Specific Weight (lb/in ³) | 1HM - 22HM | Recommended Seal | Elastomers |
|--------------------------------------|-------------------|------------------------|---------------------------------------|------------|------------------|------------|
| | | | | 316 | | |
| Water | 100 | 23/248 | | • | QBEGG | E |
| Deionized, demineralized | 100 | -13/230 | | • | QBEGG | E |
| Water and oil emulsion | any | 23/194 | | • | QBVG | V |
| Acetic acid (•) | 80 | 14/158 | .038 | • | QBEGG | E |
| Citric acid | 5 | 14/158 | .056 | • | QBEGG | E |
| Hydrochloric acid | 2 | 23/77 | .043 | • | QQVGG | V |
| Phosphoric acid | 10 | 23/86 | .048 | • | QBEGG | E |
| Nitric acid (•) | 50 | 23/86 | .053 | • | QQVGG | V |
| Sulphuric acid (•) | 2 | 14/77 | .066 | • | QBVG | V |
| Tannic acid | 20 | 32/122 | | • | QBEGG | E |
| Tartaric acid | 50 | 14/77 | .063 | • | QQVGG | V |
| Uric acid | 80 | 14/176 | .068 | • | QBEGG | E |
| Benzoic acid | 70 | 32/158 | .047 | • | QBVG | V |
| Boric acid | Saturated | 14/194 | .052 | • | QQVGG | V |
| Formic acid (•) | 5 | 5/77 | .044 | • | QBEGG | E |
| Ethyl alcohol (•) | 100 | 23/104 | .029 | • | QBEGG | E |
| Methyl alcohol (•) | 100 | 23/104 | .029 | • | QBEGG | E |
| Propyl alcohol (•) | 100 | 23/176 | .029 | • | QBEGG | E |
| Butyl alcohol | 100 | 23/176 | .030 | • | QBVG | V |
| Denatured alcohol (•) | 100 | 23/158 | .030 | • | QBEGG | E |
| Ammonia in water (•) | 25 | -4/122 | .038 | • | QBEGG | E |
| Chloroform | | 14/86 | .053 | • | QBVG | V |
| Caustic soda | 25 | 32/158 | .077 | • | QQEGG | E |
| Water, detergents, Cleaning products | | 23/176 | | • | QQVGG | V |
| | | 23/212 | | • | QQVGG | V |
| Diesel oil (•) | 100 | 32/176 | .033 | • | QBVG | V |
| Kerosene (•) | 100 | 32/176 | | • | QBVG | V |
| Fuel oil (•) | | 32/194 | .027 | • | QBVG | V |
| Glycerine | 100 | 68/194 | .046 | • | QBEGG | E |
| Sodium Hypochlorite | 1 | 14/77 | | • | QQVGG | V |
| Phosphates/polyphosphates | | 23/194 | | • | QQVGG | V |
| Sodium nitrate | Saturated | 14/176 | .081 | • | QBEGG | E |
| Cutting fluid | 100 | 23/230 | .033 | • | QBVG | V |
| Peanut oil (•) | 100 | 23/230 | .034 | • | QBEGG | E |
| Colza oil (•) | 100 | 23/230 | .034 | • | QBEGG | E |
| Linseed oil (•) | 100 | 23/230 | .034 | • | QBEGG | E |
| Coconut oil (•) | 100 | -4/194 | .033 | • | QBEGG | E |
| Soybean oil (•) | 100 | 32/194 | | • | QBEGG | E |
| Diathermic oil | 100 | 23/230 | .033 | • | QBVG | V |
| Hydraulic oil | 100 | 23/230 | | • | QBVG | V |
| Mineral oil | 100 | 23/230 | .034 | • | QBVG | V |
| Sodium sulfate | 15 | 14/104 | .094 | • | QQEGG | E |
| Aluminum sulfate | 30 | 23/122 | .097 | • | QQEGG | E |
| Ammonium sulfate | 10 | 14/140 | .064 | • | QQEGG | E |
| Iron sulfate | 10 | 23/86 | .076 | • | QBEGG | E |
| Copper sulfate | 20 | 32/86 | .082 | • | QQVGG | V |
| Trichloroethylene | | 14/104 | .053 | • | QBVG | V |
| Perchloroethylene | | 14/86 | .057 | • | QBVG | V |

Legend

Q = Silicon carbide B = Carbon E = EPDM V = Viton G = AISI 316 (spring, metal components)

(•) A special version may be necessary for this fluid. For additional information, please contact our sales network.

Xylem |'zīləm|

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

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services, and agricultural settings. With its October 2016 acquisition of Sensus, Xylem added smart metering, network technologies and advanced data analytics for water, gas and electric utilities to its portfolio of solutions. 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 with a strong focus on developing comprehensive, sustainable solutions.

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