# standard end-suction centrifugal pumps

## type D-1000

### D-1020/D-1021/D-1022

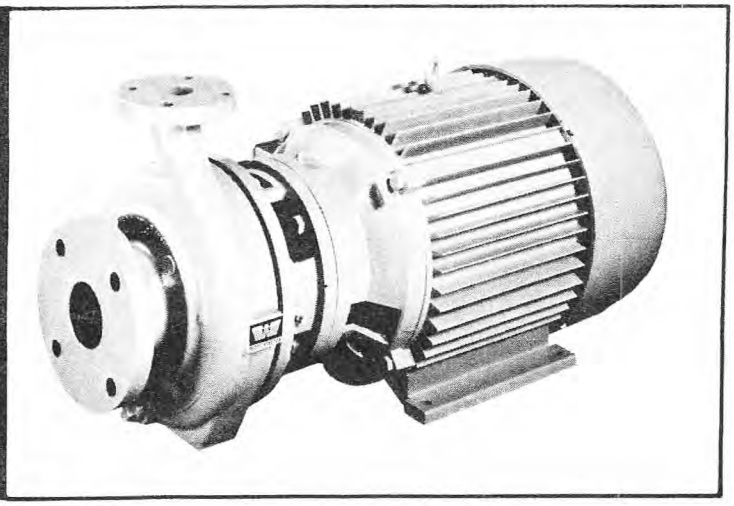
STAINLESS STEEL FITTINGS

INDUCER OPTION

STANDARDIZED MOTORS

CLOSED IMPELLERS

FLANGED CONNECTIONS



**Worthington's close-coupled pump line**

For many years Worthington has been the unrivaled leader in the manufacture and sales of the best close-coupled pumps on the market. Now, we have bettered the best with our D-Line. The D-Line possesses all of the best features of our Monobloc line plus many new advance design features that modern pump technology has made possible in recent years.

The D-Line with centerline discharge and self-venting casing, offers the following advance-design benefits without additional cost.

**Three models for greater application flexibility Standardized motors for immediate delivery**

The D-Line Monobloc pumps use completely standardized motors for best possible availability. A JM extension motor specifically designed for a mechanical seal pump is used on the D-1020 models. The D-1020 seal cover design offers the advantage of more copious seal flushing. It is less costly and requires no external piping nor glands, avoiding the possibility of cocking seal faces by uneven bolting of glands. A JP extension motor, designed for packing or mechanical seals is used on the D-1021 models. This pump includes a convertible stuffing box cover capable of using soft packing or a variety of mechanical seals.

The D-1022 pump uses a JP motor and comes equipped with a seal cover similar to the D-1020 model, offering all the benefits of the mechanical seal-only design in either iron or stainless-steel construction.

**Standardized non-corrosive stainless steel fittings— for longer life on ductile iron pumps**

All internal parts are made of stainless steel—the impeller, the shaft sleeve, the impeller mounting screw and the washer. The stainless steel shaft sleeve precludes the necessity of replacing the entire motor shaft should the surface under the seal begin to wear, another significant Worthington money-saving feature.

Stainless steel pumps also are designed with all stainless liquid end materials including a shaft sleeve.

**Closed, scalloped impeller—for maximum efficiency**

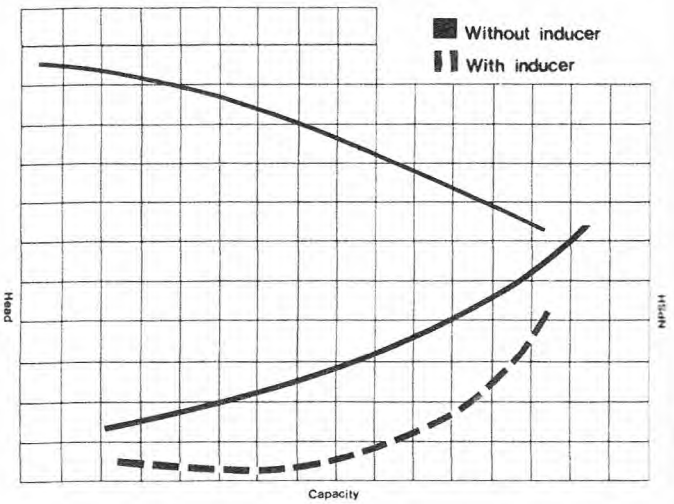
The stainless steel scalloped impeller is hydraulically balanced for greatest efficiency throughout the entire operating range. This unique impeller is keyed to the shaft and fastened by a stainless steel screw, a far superior design to the threaded-on impellers when transmitting torque.

**Inducer (optional)—for solving NPSH problems and improving performance**

Many years of Worthington pump technology have gone into the D-Line inducer to provide you with a significant and economical pump problem solver. It is offered as a standard D-Line option! The inducer significantly reduces the required NPSH of a given pump over most of the normal operating range. This affords you the opportunities of lowering inlet pressures, better tank arrangements, higher suction lifts and higher speeds. And it can be added at a later date without disturbing pump system of basic pump configuration.

**Mechanical seals selected for superior service and long life**

The standard seals are superior designs specifically suited to the services intended. In general duty applications Crane Type 1 and Type 21 are used. For chemical and process applications Crane Type 9 and Durametalic ROTT seals are standard. For abrasive or toxic fluids Durametalic Double CRO and Crane Double Type 9 are offered. These have been selected as the best possible seals to compliment the D-Line pumps for their ruggedness and dependability.




Typical performance curves show effect of inducer on NPSH

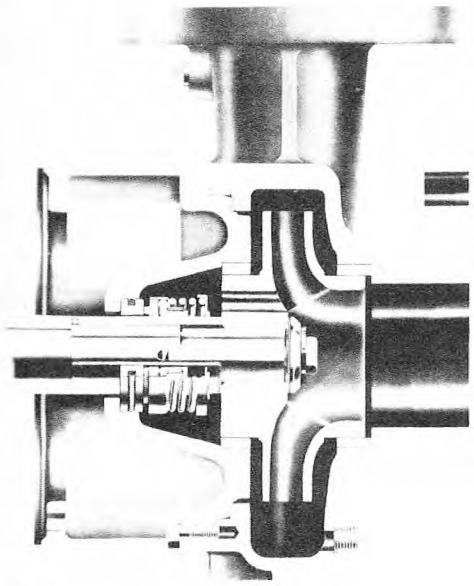
# standard end-suction centrifugal pumps

# type D-1000

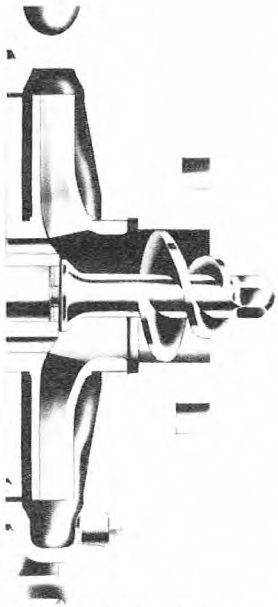
## Type D-1020/D-1021/D-1022 pumps – flanged connections

**CAPABILITY:** to 1300 gpm; 600 feet, 300° F
**AVAILABILITY:** sizes 1" to 4"; 22 liquid ends

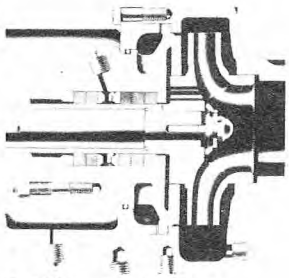
4



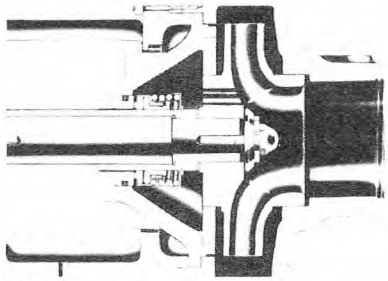
D-1020



Optional inducer



D-1021—packed box



D-1022

### STANDARD FEATURES

- Stainless steel fittings
- Closed, scalloped impeller
- Inducer (optional)
- Centerline connections
- Mechanical seal or packed box
- Standard motor
- Standard sleeve construction on iron pumps

### MATERIALS OF CONSTRUCTION

NOTE: Model D-1020 is rated as cast iron only. Materials for D-1020 are as listed for ductile iron pump (except for integral stuffing box cover).

| PART | MATERIAL | |
|---|---|---|
| | Ductile iron pump | 316 stainless steel pump |
| Casing | ductile iron | 316 stainless steel |
| Casing wear ring | 316 stainless steel | none |
| Casing gasket | Durabla | Durabla |
| Impeller | 316 stainless steel | 316 stainless steel |
| Wearplate (open impeller) | 316 stainless steel | 316 stainless steel |
| Shaft sleeve | 416 stainless steel | 316 stainless steel |
| Adapter | cast iron | cast iron |
| Adapter w/integral stuffing box cover (D-1020) | cast iron | |
| Mechanical seal cover (D-1022) | ductile iron | 316 stainless steel |
| Stuffing box cover (D-1021) | ductile iron | 316 stainless steel |
| Packing (D-1021) | white asbestos | blue asbestos |

# standard end-suction centrifugal pumps

## type D-1000

TYPICAL SPECIFICATION SHEET
**WORTHINGTON**

Single–Stage, End Suction, Vertically Split Case
Close–Coupled Centrifugal Pumps
Type D–1021 and D–1022

### GENERAL

Furnish and install as indicated in plans and specifications __(quantity)__ Worthington or Equal Model (*D–1021) (*D–1022) centrifugal pumps for __(Type)__ service. Pumps are to be (*Ductile Iron with 316 stainless steel internals) (*All 316 stainless steel), and are to be close-coupled to a standard NEMA C-face motor driver.

### OPERATING CONDITIONS

Each pump shall be capable of delivering _____ GPM of __(liquid)__ against _____ feet total head. Net positive suction head available to the top of the pump foundation will be _____ feet. The characteristics of the liquid to be pumped are as follows:

Liquid handled----------
Temperature----------
Specific Gravity----------
Nature of Solids Present----------
Percentage of Solids by Weight----------
Viscosity of Liquid at Pumping Temperature----------
(Add any additional facts concerning the nature of the liquid which might effect pump construction or application.)

### CONSTRUCTION DETAILS

The construction features shall be:

1.) The casing of the pump shall be of (*Ductile Iron) (*316 S.S.) material and shall be equipped with 150 lb flat faced flanges for inlet and outlet connections. Casing shall be end suction with top centerline discharge and shall permit disassembly from the rear without disturbing suction and discharge piping. A 316 SS casing wearing ring shall be furnished on Ductile Iron pumps.

2.) The impeller shall be of the enclosed type statically balanced, and shall be of 316 S.S. material. The impeller shall be hydraulically balanced by use of balance ports and rear wearing ring joints. Impeller shall be keyed to the shaft and held securely in place by a 316 stainless steel impeller screw and lockwasher.

3.) Pumps shall be equipped with a stainless steel shaft sleeve which is securely keyed to the shaft. The surface of the sleeve shall be finished to 32 micro inches. Sealing gaskets shall be provided to prevent leakage of the fluid pumped. The sleeve shall extend through and beyond the stuffing box area.

4.) a. *D–1021 Pump shall be packed box with asbestos packing, teflon seal cage and (*steel) (*316 Stainless Steel) split gland. Stuffing box shall include water cooling jacket for use where required. The stuffing box shall incorporate an external connection through which sealing liquid may be provided to the seal cage. Pump construction shall permit conversion from packed stuffing box to mechanical seal without special machining.

b. *D–1022 Pump shall be furnished with rugged mechanical seal with a flexible O-ring mounted seat.

5.) Motor shall be of standard NEMA C-face design with JP shaft extension.

6.) A suction inducer shall be furnished if required to decrease the NPSH required of the pump. When furnished, inducer shall be of 316 Stainless Steel material.

*Use whichever phrase applies.

# standard end-suction centrifugal pumps

# type D-1000



D-1011 AND D-1012 BEARING FRAME DATA

| Frame Size | SHAFT DIAMETER | | | | O.D. of Sleeve (1) | Size of Keyway at Coupling | Impeller Overhang | Bearing Span | SKF BEARING SYMBOLS | |
|---|---|---|---|---|---|---|---|---|---|---|
| | At Impeller | Under Sleeve | Between Bearings | At Coupling | | | | | Line | Thrust (2) |
| 1 | 7/8 | 7/8 | 1.56 | 7/8 | 1-1/8 | 3/16 x 3/32 | 6-3/8 | 4-3/8 | 6206 | 6206 NR |
| 2 | 7/8 | 1-1/8 | 1.56 | 1 | 1-3/8 | 1/4 x 1/8 | 7-1/16 | 6 | 6307 | 6307 NR |
| 3 | 1-1/8 | 1-1/2 | 2.18 | 1-1/8 | 1-3/4 | 1/4 x 1/8 | 7-1/2 | 7 | 6309 | 6309 NR |
| 4 | 1-5/8 | 1-3/4 | 2.60 | 1-3/4 | 2-1/8 | 3/8 x 3/16 | 8-1/2 | 8-1/2 | 6311 | 6311 NR |
| 5 | 2 | 2-1/2 | 3.29 | 2-3/8 | 2-3/4 | 1/2 x 1/4 | 9-7/8 | 9-7/8 | 6314 | 6314 NR |

D-1011 AND D-1021
STUFFING BOX DATA

| FRAME SIZE | | Bore Dia. | Depth of Box | O.D. of Sleeve (1) | Packing Size | No. Rings | Gland Stud Dia. |
|---|---|---|---|---|---|---|---|
| D-1011 | D-1021 | | | | | | |
| 1 | - | 1-3/4 | 2.05 | 1-1/8 | 1/4 x 5/16 | 5 | 3/8 |
| 2 | 143-184 JP | 2 | 2.32 | 1-3/8 | 5/16 x 5/16 | 5 | 3/8 |
| 3 | 213-326 JP | 2-1/2 | 2.83 | 1-3/4 | 3/8 x 3/8 | 5 | 1/2 |
| 4 | - | 2-7/8 | 2.83 | 2-1/8 | 3/8 x 3/8 | 5 | 1/2 |
| 5 | - | 3-3/4 | 3.78 | 2-3/4 | 1/2 x 1/2 | 5 | 5/8 |

D-1020, D-1021, AND D-1022
SHAFT AND SHAFT SLEEVE DIMENSIONS

| Pump Model | Motor Frame | SHAFT DIAMETER | | O.D. of Sleeve |
|---|---|---|---|---|
| | | At Impeller | Under Sleeve | |
| D-1020 | 143-215 JM | 7/8 | 1 | 1-3/8 |
| | 254-326 JM | 1-1/4 | 1-3/8 | 1-3/4 |
| D-1021 and D-1022 | 143-184 JP | 7/8 | 1 | 1-3/8 |
| | 213-326 JP | 1-1/4 | 1-3/8 | 1-3/4 |

(1) O.D. of shaft on solid shaft pumps.
(2) Optional double row bearing symbols are respectively for frames 1-5, 7206 BYG, 7307 BYG, 7309 BYG, 7311 BYG, and 7314 BYG.
All dimensions are in inches.

# standard end-suction centrifugal pumps

## type D-1000

PUMP DATA

| Pump Size | Size Suction | Size Discharge | Maximum Working Pressure | Hydrostatic Test Pressure | Casing Thickness (In.) | Corrosion Allowance (In.) | Wearing Ring Diametric Clearance (In.) |
|---|---|---|---|---|---|---|---|
| 1-1/2 x 1 x 6 | 1-1/2 | 1 | All | All | .30 | All | .018-.024 |
| 1-1/2 x 1 x 8 | 1-1/2 | 1 | | | .28 | | .018-.024 |
| 2 x 1 x 10 | 2 | 1 | | | .35 | | .018-.024 |
| 3 x 1-1/2 x 5 | 3 | 1-1/2 | | | .25 | | .018-.024 |
| 3 x 1-1/2 x 6 | 3 | 1-1/2 | | | .30 | | .018-.024 |
| 3 x 1-1/2 x 8 | 3 | 1-1/2 | | | .30 | | .018-.024 |
| 3 x 1-1/2 x 10 | 3 | 1-1/2 | | | .35 | | .018-.024 |
| 3 x 1-1/2 x 13 | 3 | 1-1/2 | | | .55 | | .018-.024 |
| 3 x 2 x 5 | 3 | 2 | | | .25 | | .018-.024 |
| 3 x 2 x 6 | 3 | 2 | | | .30 | | .018-.024 |
| 3 x 2 x 8 | 3 | 2 | | | .30 | | .018-.024 |
| 3 x 2 x 10 | 3 | 2 | 275 PSI | 415 PSI | .35 | 1/8 In. | .018-.024 |
| 3 x 2 x 13 | 3 | 2 | | | .55 | | .018-.024 |
| 3 x 3 x 4 | 3 | 3 | | | .25 | | .018-.022 |
| 4 x 3 x 5 | 4 | 3 | | | .30 | | .021-.027 |
| 4 x 3 x 6 | 4 | 3 | | | .35 | | .021-.027 |
| 4 x 3 x 8 | 4 | 3 | | | .35 | | .021-.027 |
| 4 x 3 x 10 | 4 | 3 | | | .35 | | .021-.027 |
| 4 x 3 x 13 | 4 | 3 | | | .55 | | .021-.027 |
| 6 x 4 x 6 | 6 | 4 | | | .38 | | .021-.025 |
| 6 x 4 x 8 | 6 | 4 | | | .38 | | .021-.025 |
| 6 x 4 x 10 | 6 | 4 | | | .47 | | .021-.027 |
| 6 x 4 x 11 | 6 | 4 | | | .51 | | .021-.027 |
| 6 x 4 x 13 | 6 | 4 | | | .51 | | .021-.027 |
| 8 x 6 x 11 | 8 | 6 | | | .51 | | .024-.030 |
| 8 x 6 x 13 | 8 | 6 | | | .51 | | .024-.030 |
| 8 x 6 x 15 | 8 | 6 | | | .51 | | .024-.030 |
| 10 x 8 x 13 | 10 | 8 | | | .56 | | .027-.033 |
| 10 x 8 x 15 | 10 | 8 | | | .56 | | .027-.033 |

All dimensions are in inches.

Casing thicknesses are based on drawings and subject to foundry tolerances.

# standard end-suction centrifugal pumps

## type D-1000

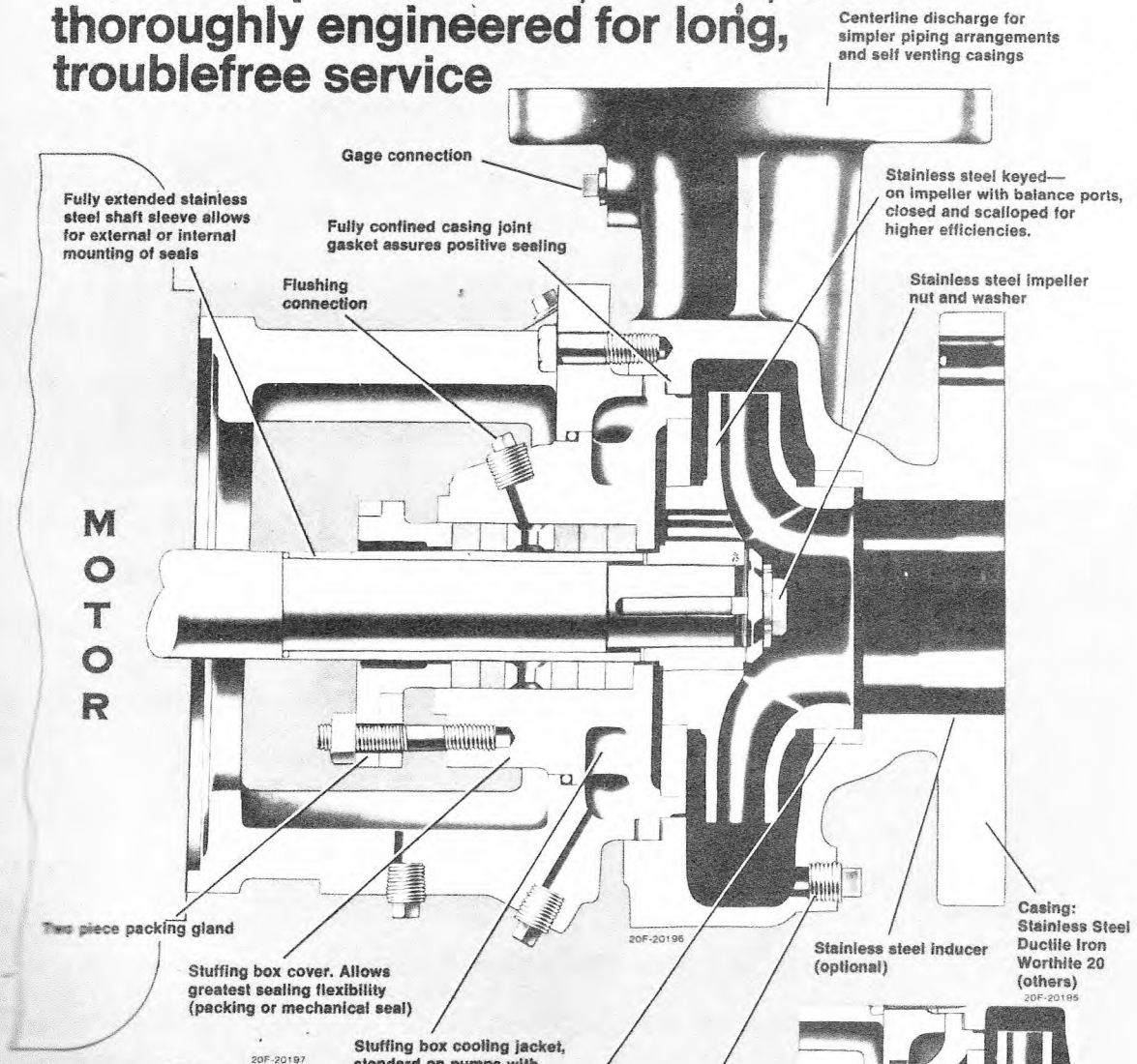


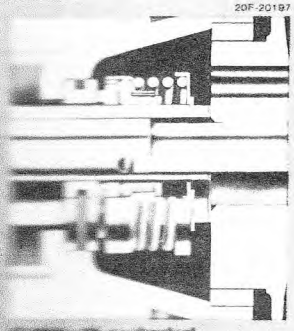
D-1000 IMPELLER DATA

| Pump Size | Min. Dia. (In.) | Max. Dia. (In.) | Eye Area ($In.^2$) | Max. Dia. Solids (In.) | No. Vanes | $WR^2$ ($Lb.-In.^2$) |
|---|---|---|---|---|---|---|
| 1-1/2 x 1 x 6 | 5.3 | 6.5 | 3.40 | .38 | 5 | 25 |
| 1-1/2 x 1 x 8 | 6.8 | 8.0 | 3.40 | .31 | 5 | 60 |
| 2 x 1 x 10 | 8.3 | 9.9 | 4.91 | .44 | 6 | 168 |
| 3 x 1-1/2 x 5 | 4.4 | 5.2 | 4.91 | .42 | 6 | 18 |
| 3 x 1-1/2 x 6 | 5.3 | 6.5 | 5.31 | .42 | 6 | 28 |
| 3 x 1-1/2 x 8 | 6.8 | 8.0 | 4.91 | .44 | 6 | 58 |
| 3 x 1-1/2 x 10 | 8.3 | 9.9 | 4.91 | .44 | 6 | 168 |
| 3 x 1-1/2 x 13 | 10.5 | 12.6 | 7.07 | .55 | 5 | 195 |
| 3 x 2 x 5 | 4.4 | 5.2 | 6.51 | .50 | 6 | 20 |
| 3 x 2 x 6 | 5.3 | 6.5 | 6.88 | .59 | 5 | 36 |
| 3 x 2 x 8 | 6.8 | 8.0 | 7.07 | .59 | 5 | 65 |
| 3 x 2 x 10 | 8.3 | 9.9 | 7.07 | .59 | 5 | 150 |
| 3 x 2 x 13 | 10.5 | 12.6 | 7.07 | .70 | 5 | 225 |
| 3 x 3 x 4 | 3.4 | 4.2 | 5.60 | .38 | 7 | 10 |
| 4 x 3 x 5 | 4.4 | 5.2 | 9.62 | .42 | 6 | 24 |
| 4 x 3 x 6 | 5.3 | 6.5 | 9.62 | .53 | 6 | 44 |
| 4 x 3 x 8 | 6.8 | 8.0 | 9.95 | .63 | 6 | 80 |
| 4 x 3 x 10 | 8.3 | 9.9 | 9.62 | .63 | 6 | 165 |
| 4 x 3 x 13 | 10.5 | 12.6 | 10.80 | .90 | 6 | 295 |
| 6 x 4 x 6 | 5.3 | 6.5 | 17.71 | .62 | 7 | 67 |
| 6 x 4 x 8 | 6.8 | 8.0 | 19.63 | .63 | 6 | 140 |
| 6 x 4 x 10 | 8.3 | 9.9 | 19.63 | .55 | 7 | 200 |
| 6 x 4 x 11 | 8.3 | 9.9 | 19.60 | .80 | 7 | 260 |
| 6 x 4 x 13 | 10.5 | 12.6 | 19.65 | .88 | 7 | 460 |
| 8 x 6 x 11 | 8.3 | 9.9 | 35.1 | .50 | 7 | 700 |
| 8 x 6 x 13 | 10.5 | 12.6 | 39.6 | 1.06 | 7 | 920 |
| 8 x 6 x 15 | 13.0 | 15.6 | 40.8 | 1.15 | 6 | 1490 |
| 10 x 8 x 13 | 10.5 | 12.6 | 65.5 | .60 | 6 | 1300 |
| 10 x 8 x 15 | 13.0 | 15.6 | 71.3 | 1.26 | 6 | 2000 |

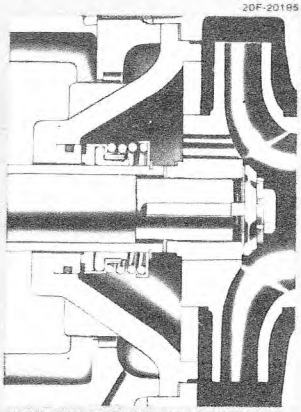
# standard end-suction centrifugal pumps type D-1000

## Close-coupled D-1020/D-1021/D-1022 thoroughly engineered for long, troublefree service




Model D-1021 with packed stuffing box



Model D-1022 with mechanical seal cover and John Crane Type 21 mechanical seal.

# standard end-suction centrifugal pumps

# type D-1000

STANDARD MATERIALS OF CONSTRUCTION

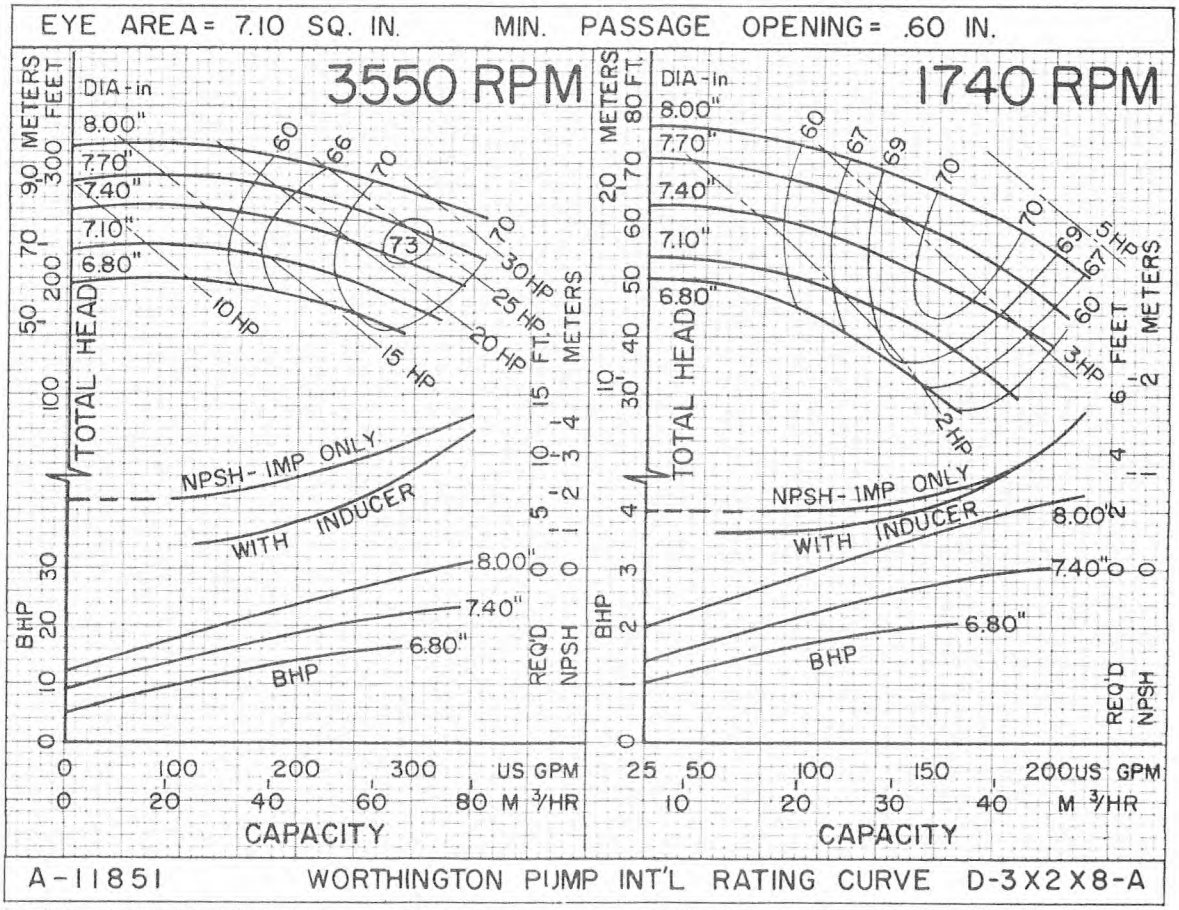
| PART | DUCTILE IRON | 316 SS | WORTHITE 20 |
|---|---|---|---|
| Casing | Ductile Iron | 316 SS | Worthite 20 |
| Casing Wear Ring | 316 SS | None | None |
| Casing Gasket | Durabla | Durabla | Durabla |
| Casing Cap Screws | Steel | 316 SS | 316 SS |
| Casing Foot | Cast Iron | Cast Iron | Cast Iron |
| Impeller | 316 SS | 316 SS | Worthite 20 |
| Impeller Nut | 316 SS | 316 SS | Worthite 20 |
| Impeller Lockwasher | 316 SS | 316 SS | Worthite 20 |
| Imp. Lockwasher Gasket | Durabla | Durabla | Durabla |
| Adapter and Adapter Support | Cast Iron | Cast Iron | Cast Iron |
| Adapter/St. Box Ring | 316 SS (1) (2) | 316 SS | Worthite 20 |
| Mech. Seal/St. Box Cover | Ductile Iron (2) | 316 SS | Worthite 20 |
| Shaft Sleeve | 416 SS | None | None |
| Bearing Frame | Cast Iron | Cast Iron | Cast Iron |
| Shaft | Steel | 316 SS | Worthite 20 |
| D-1011, D-1021 | | | |
| Packing | White Asbestos | Blue Asbestos | Blue Asbestos |
| Gland | Steel Split Gland | 316 SS Split Gland | Worthite 20 Flush Gland |
| Studs and Nuts | 316 SS | 316 SS | Worthite 20 |
| D-1020, D-1012, D-1022 | | | |
| Mech. Seal | Type 21 BP-171 | Type 9 QP-1C1 | Type 9 QP-1C1 |
| D-1020, D-1021, D-1022 | | | |
| Impeller Screw | 316 SS | 316 SS | — |
| Shaft Sleeve | 416 SS | 316 SS | — |
| Motor Shaft | Steel | Steel | — |
| Optional Construction | | | |
| Inducer | 316 SS | 316 SS | Worthite 20 |
| Casing Gasket | Teflon | Teflon | Teflon |
| Shaft | 316 SS | — | — |
| Shaft Sleeve | 17% Chr. Hd. | 316 SS | Worthite 20 |
| Flush Gland (D-1011, D-1021) | Worthite 20 | Worthite 20 | — |
| Open Impeller & Wear Plate | 316 SS | 316 SS | Worthite 20 |

(1) Adapter ring on D-1020 pumps is cast iron.
(2) Adapter and mechanical seal cover on D-1020 pumps are integral and are cast iron.

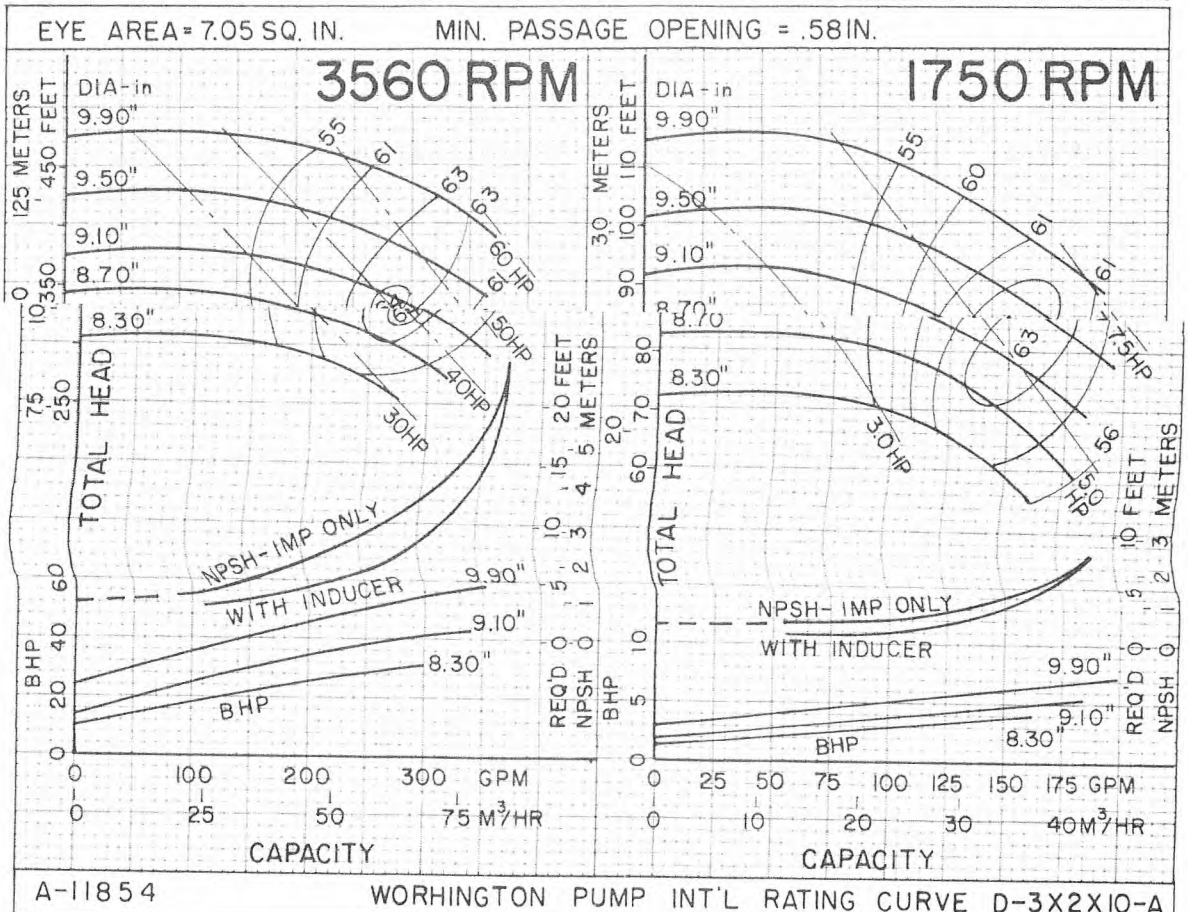
# standard end-suction centrifugal pumps

## type D-1000






A-11851 WORTHINGTON PUMP INT'L RATING CURVE D-3X2X8-A




A-11854 WORHINGTON PUMP INT'L RATING CURVE D-3X2X10-A

THELCO CUTAWAY DRAWING OF WORTHINGTON® PUMP MODEL D-1022 MOTOR MOUNTED.

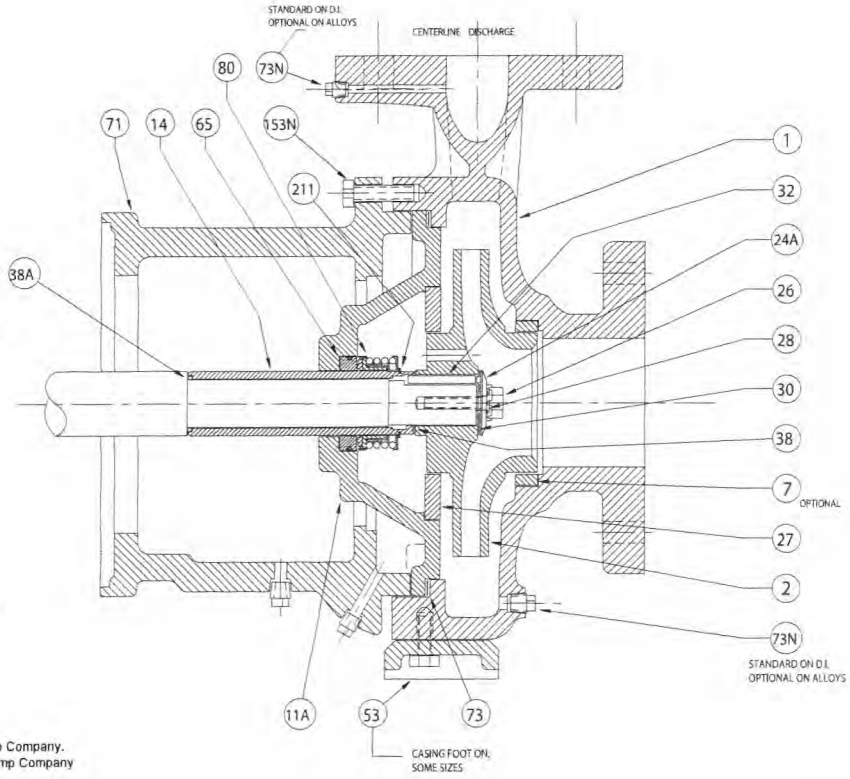
Thelco Corporation Englewood, CO. USA
www.thelco.com



D-1020 Pump Sizes
1-1/2 X 1 X 6
1-1/2 X 1 X 8
2 X 1 X 10
3 X 1-1/2 X 5
3 X 1-1/2 X 6
3 X 1-1/2 X 8
3 X 1-1/2 X 10
3 X 1-1/2 X 13
3 X 2 X 5
3 X 2 X 6
3 X 2 X 8
3 X 2 X 10
3 X 2 X 13
3 X 3 X 4
4 X 3 X 5
4 X 3 X 6
4 X 3 X 8
4 X 3 10
4 X 3 X 13
6 X 4 X 6
6 X 4 X 8
6 X 4 X 10

JP Frame Motor
C-Face

Note: Adapter and Cover are Seperate Pieces.






## REFERENCE NUMBERS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | CASING | 26 | BOLT, IMPELLER | 38 | GASKET, SHAFT SLEEVE | 73 | GASKET, CASING |
| 2 | IMPELLER | 27 | RING, ADAPTER COVER | 38A | O-RING, SHAFT SLEEVE | 73N | PIPE PLUG, CASING |
| 7 | RING, CASING (OPTIONAL) | 28 | GASKET, IMPELLER BOLT | 53 | CASING FOOT WITH CAP SCREWS | 80 | ROTOR, MECHANICAL SEAL |
| 11A | MECHANICAL SEAL COVER | 30 | GSKT, IMPELLER LOCK WASHER | 65 | SEAT, MECHANICAL SEAL | 211 | RETAINING RING, MECH SEAL |
| 14 | SLEEVE, SHAFT | 32 | KEY, IMPELLER | 71 | ADAPTER | 153N | CAP SCREW, CASING |
| 24A | LOCK WASHER, IMPELLER | | | | | | |