GO WITH WHO YOU KNOW

With our vast network of locations around the world, Twin Disc offers you unprecedented global sales and service support. We can put engineering and service expertise on location virtually anywhere. We’ll work with you on your particular application and product to ensure optimum results.

We’re more than just a name you know, Twin Disc is a name you can trust.

IMPORTANT NOTICE: Twin Disc, Incorporated reminds users of these products that their safe operation depends on use in compliance with engineering information provided in this catalog. Users are also reminded that safe operation depends on proper installation, operation and routine maintenance and inspection under prevailing conditions. It is the responsibility of users (and not Twin Disc, Incorporated) to provide and install guards or safety devices which may be required by recognized safety standards or by the Occupational Safety and Health Act of 1970 and its subsequent provisions.

TWIN DISC, INCORPORATED       RACINE, WISCONSIN 53403, U.S.A.       262-638-4000/262-638-4481 (FAX)       WWW.TWINDISC.COM

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MECHANICAL POWER TAKE-OFFS
TWIN DISC SETS THE STANDARD IN POWER TAKE-OFFS

Power take-offs (PTOs) are used as a standard method for transmitting the power of engines in a great variety of industrial applications such as air compressors, agricultural machinery, crushers, road building machinery, cranes, shovels, pump drives and oil field service. A power take-off consists of a complete clutch assembly with shaft and bearings mounted in a cast-iron housing for easy engine installation.

Twin Disc offers power take-offs for all industrial engines. The IBF line is designed especially for today's high inertia applications and presently is offered in two- and three-clutch plate construction. This multiple-plate, ventilated design assures ample cooling area to withstand heat, and with solid friction plates, these PTOs can effectively handle the stress of higher engine speeds. The IBF units feature oil lubricated tapered roller bearings that extend lubrication intervals.

An extra margin of strength
Actual design torque capacity of the clutches used in Twin Disc power take-offs is in excess of the horsepower rating listed. This permits Twin Disc power take-offs in proper adjustment to withstand temporary torque overloads. Rated torque can be transmitted while moderately slipping during short periods without permanent damage.

Specifications
- Suitable for Duty Class II industrial applications with internal combustion engines up to 1667 horsepower and with standard SAE flywheel housing dimensions from No. 6 through No. 00.
- Contain clutches ranging in size from one plate 6\("\) to one plate 14\("\); in two-plate size from 11\("\) to 18\("\); and three-plate size from 11\("\) to 21\("\).
- Standard sealed pilot ball or roller bearings eliminate the lubrication requirement and shaft raille-drilling normally encountered with standard pilot bearings. Also available as options: ball bearing throw-out collars and finger springs.
- Horsepower and torque capacities listed can be increased by the use of sintered-iron clutch plates, which are available as optional equipment in the 8\("\) through 21\("\) sizes.
- All bearings, shafts and other parts are designed with liberal safety factors to maximize life under normal operating conditions.*

Note: All dimensions given in inches unless noted.

*To avoid overstressing the shaft and bearings, use the allowable side-pull load data in this bulletin, and calculate the side load. The resultant value should be less than the corresponding maximum value listed for each power take-off. In questionable cases, consult the Twin Disc Application Department, Twin Disc, Incorporated, Racine, Wisconsin.

SPECIAL POWER TAKE-OFFS

Special power take-offs are available from Twin Disc. These include the innovative straddle bearing concept and a limited-attendance PTO that contains a positive throw-out collar clearance mechanism and extended lubrication intervals.

For original equipment manufacturers, Twin Disc can design other special power take-offs to meet individual requirements when sufficient volume is indicated. Design variations can range from minor changes to entirely new concepts.

Straddle Bearing Power Take-Offs
- SP & PO Models
- High side-load applications
- No pilot bearing
- 14\("\) & 18\("\) flywheel connection
- SAE #0 & SAE #1 Input Housing
- 180\(^\circ\) sheave housing rotatable by 90\(^\circ\) increments

Limited-Attendance Power Take-Offs
- Modified SP & C Models
- Special grease on main bearings
- Sealed pilot bearings
- Lubrication interval can be extended to 6 months
- Positive clearance mechanism to reduce collar wear
- SAE #0 through SAE #6 Input Housing
- 6\("\) through 14\("\) flywheel connection

In-line Power Take-Offs
- SP, IB, & CA Models
- Bearings designed for in-line only duty
- Sealed pilot bearings
- Lubrication interval can be extended to 6 months
- SAE #0 & SAE #1 Input Housing
- 180\(^\circ\) sheave housing rotatable by 90\(^\circ\) increments

Spring Loaded Power Take-Offs
- RL Models
- Self-adjusting spring-loaded clutch
- Ideal for high frequency engagements
- Single- and double-friction plates
- 11\," 13\," 14\(") flywheel connection
- SAE #1 through SAE #4 Input Housing

Rubber Block Drive Power Take-Offs
- RBD Models
- Absorbs torsional activity
- Single row 11\(") rubber blocks
- Double row 14\(") rubber blocks
- SAE #0 through SAE #2 Input Housing

Pump Mount Power Take-Offs
- BDP & BDSP Models
- Single SAE pad on output of PTO
- SAE “A” through SAE “O” pads available
- SAE #1 through SAE #4 Input Housing
- 11.5\(") flywheel connection
- Optional keyed stub shaft input for remote mount applications
HOW TO CHOOSE THE APPROPRIATE PTO

Several factors must be considered in the selection process in addition to duty service, such as:

- **Speed Limits**
- **Side-Load Limits**
- **Clutch Torque Limits**

The selections are usually dry clutch disconnect type applications where engagements are infrequent and are at low (idle) input speed. Once engaged operation continues for one hour or more, engaging the clutch at higher input speed will reduce component life. Refer to the following duty classifications and examples.

### Application Data*

- **SAE Housing**
- **SAE Flywheel Size**
- **Number of Engagements**
- **Sheave Pitch Diameter**
- **Pilot Bearing Diameter**

*refer to attached PTO data sheet located in back cover

### Determine duty classification (page 5)

#### PTO Selection Procedure

1. Calculate NET Input Power or Torque to PTO

2. Calculate imposed side-load utilizing the following formula:

   \[
   L = \frac{126,000 \times HP \times F \times LF}{N \times D}
   \]

   - \( L \) = Actual Applied Load (lbs)
   - \( N \) = Shaft Speed (rpm)
   - \( D \) = Sheave Pitch Diameter (in)
   - \( F \) = Load Factor
     - 1.0 for Chain/Gear Drive
     - 1.5 for Timing Belts
     - 2.5 for All V Belts
     - 3.5 for Flat Belts
   - \( LF \) = 2.1 for reciprocating compressors and other Severe Shock Drives and 1.8 for Large Inertia Type Drives (crushers, chippers, planers, etc.)

3. Use the following data and compare to the PTO rating and allowable side-load tables:

   - 190 hp NET to clutch
   - SAE 11.5" flywheel
   - SAE #2 housing

The SP311P has a Class III rating of 250 hp and max speed rating of 3,000 rpm with nodular iron drive rings. The application requires 190 hp into the clutch @ 2,000 rpm, which are within the limits of the SP311P.

The side-load required for the application is 2,302 lbs at an “X” dimension of 4”. The side-load capacity of the SP311P at an “X” dimension of 4” for any rpm is 2,750 lbs. The application side-load of 2,302 lbs @ 4” is within the capacity of the SP311P.

**THE SP311P IS ACCEPTABLE FOR THIS APPLICATION AND IS AVAILABLE WITH A 72MM PILOT BEARING.**

### PTO SIZING EXAMPLE – Select the proper Twin Disc PTO for this application

A disconnect PTO is required to drive a rotary screw compressor which is a Duty Class II application. The prime mover is a diesel engine rated for 200 hp @ 2,000 rpm. The engine has a SAE #2 flywheel housing and SAE 11.5" flywheel with a 22 mm pilot bearing bore. The sheave pitch diameter mounted to the PTO shaft will be 13” and “V” belts are used for power transmission. The centerline of the load imposed “X” dimension will be 4”. Assume 5% parasitic losses from the engine for this specific application.

1. Determine the NET horsepower to the clutch (assume 5% parasitic losses.)

   \[
   200 \text{ hp gross} \times 0.95 = 190 \text{ hp NET}
   \]

2. Calculate the imposed side-load utilizing the following formula:

   \[
   L = \frac{126,000 \times 190 \times 1.5 \times 2.1}{2,000 \times 13}
   \]

   \( L = 2,302 \text{ lbs} \)

3. Use the PTO rating table on page 6 and the side-load tables on pages 7-8 with the following information:

   - 190 hp NET to clutch
   - SAE 11.5" flywheel
   - SAE #2 housing

The SP311P has a Class III rating of 247 hp and max speed rating of 3,000 rpm with nodular iron drive rings. The application requires 190 hp into the clutch @ 2,000 rpm, which are within the limits of the SP311P.

The side-load required for the application is 2,302 lbs at an “X” dimension of 4”. The side-load capacity of the SP311P at an “X” dimension of 4” for any rpm is 2,750 lbs. The application side-load of 2,302 lbs @ 4” is within the capacity of the SP311P.

**THE SP311P IS ACCEPTABLE FOR THIS APPLICATION AND IS AVAILABLE WITH A 72MM PILOT BEARING.**
**SELECTION GUIDE TO DUTY CLASSIFICATION**

**CLASS I (Disconnect)**
1. Pumps – centrifugal
2. Hydraulic pumps (without pre-charge)
3. Feeders – disc type
4. Agitators – pure liquids
5. Irrigation pumps

**CLASS II (Light Duty)**
1. Cookers – cereal
2. Elevators – bucket, uniformly loaded all types
3. Kettles – brew
4. Line shafts – light duty
5. Machines, general – all types with uniform loads, non-reversing
6. Row thresher
7. Generators (non-welding)

**CLASS III (Normal Duty)**
1. Agitators – solid or semi-solid
2. Batchers – textile
3. Blowers and fans – centrifugal and lobe
4. Bottling machines
5. Compressors – all centrifugal, screw
6. Elevators – bucket, non-uniformly loaded or fed
7. Feeders – apron, belt, screw or vane
8. Filling machines – can type
9. Mixers – continuous
10. Pumps – two or more cylinders
11. Conveyors – uniformly loaded
12. Dredge pumps (allow for shock loading)
13. Locomotive railroad shuffles

**CLASS IV (Heavy Duty)**
1. Cranes and hoists – working clutch
2. Crushers – ore and stone
3. Choppers – wood hub grinders
4. Drums – banking *
5. Compressors – lobe rotary plus 3 or more cylinder reciprocating type
6. Rurtles – cushion pulley and bar-type
7. Machines – impact load types *
8. Mills – ball-type
9. Paper mill machinery – except calendars and dries
10. Presses – brick and clay
11. Mud pumps
12. Road planers

**CLASS V (Extreme Heavy Duty)**
**DUTY CLASS V REQUIRES FACTORY REVIEW**
1. Compressors – one and two cylinder reciprocating
2. Calendars and dries – paper mill
3. Mills – hammer-type
4. Shakers – reciprocating-type
5. Automobile shredders

For reciprocating compressors and applications where high torsonals can be experienced, a flexible coupling may be mounted between clutch and flywheel.

* Beware of Operator Misuse

**Duty Class II:** The clutch is used for disconnecting the power from the load. When engaging, no harm is done that the clutch shows no temperature increase at the pressure plate outer surface. Use maximum input torque from the Class II Table, disregard horsepower. The mechanism is operated one or more times before disconnecting.

Examples: Engagement of clutches with the driven equipment having WR2 less than that of the clutch and whose torque demand curve is similar to that of a centrifugal pump.

**Duty Class III:** The clutch is used primarily for disconnect, but does more work during engagement than in Duty Class I. The clutch will engage within two seconds, never heat the pressure plate more than 50ºF (28ºC) above ambient, and once engaged is operated for one or more hours before disconnecting. The maximum horsepower which the clutch can absorb is given in Class II Table.

Examples: Power shovels, radial clutches, generators, line shafts and similar light duty drives.

**Duty Class IV:** The clutch will engage within three seconds, never heat the pressure plate more than 100ºF (56ºC) above ambient, and once engaged is operated for one or more hours before disconnecting. The maximum horsepower which the clutch can absorb is given in Class III Table.

Examples: Engine PTO starting average loads, and clutches whose starting load is up to 1.4 times the running load. Brushes, fans, screw compressors, conveyors and similar normal duty drives.

**Duty Class V:** The clutch will engage within four seconds, never heat the pressure plate more than 150ºF (83ºC) above ambient, and once engaged is operated for one or more hours before disconnecting. The maximum horsepower which the clutch can absorb is given in Class IV Table.

Examples: Engine PTO starting heavy loads such as rock crushers, mud pumps, and other large heavy duty drives.

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Clutch Maximum HP Rating (See note 2)</th>
<th>Solid Plate</th>
<th>Maximum Safe Operating Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>Clutch</td>
<td>0-150</td>
</tr>
<tr>
<td>Class II</td>
<td>Clutch</td>
<td>0-250</td>
</tr>
<tr>
<td>Class III</td>
<td>Clutch</td>
<td>0-500</td>
</tr>
<tr>
<td>Class IV</td>
<td>Clutch</td>
<td>0-1000</td>
</tr>
<tr>
<td>Class V</td>
<td>Clutch</td>
<td>0-2000</td>
</tr>
</tbody>
</table>

**NOTES:**
1. NA (Not available), NR (Not recommended).
3. Sintered iron clutch plates with ventilated-type center plates are available in 3", 4", 6", 8", 10", 12", 14", 16", 18", 20", 22", 24", 26", 28", 30", 32" sizes. These plates should not be used in applications where torsonals or vibrations are present. Consult Twin Disc General Products Application Department, Racine, WI.
4. Composed clutches and power engaged PTO assemblies require separate factory review for warranty to apply.
5. Nonradial trim.

**GENERAL INFORMATION NOTES**
1. Capscocks to mount PTO and driving ring to prime mover are not Twin Disc supplied.
2. Installation of support plate to PTO housing requires bearing carrier capscocks be properly retarked to prevent damage. Refer to applicable Care and Operation service manual.
3. Clutch maximum input torque values in specification chart is for properly adjusted clutch assemblies. Refer to applicable Care and Operation service manual.

**IMPORTANT NOTICE:** Disregarding system torsonal compatibility could cause damage to components in the drive train resulting in loss of mobility or power transmission for which the drive is intended. All minimum system incompatibility could result in unwanted noise and vibration at low speeds.

The responsibility for ensuring that the torsonal compatibility of the system is satisfactory rests with the assembler of the drive and driven equipment. Torsional vibration analysis can be made by the engine builder, independent consultants and others. Twin Disc is prepared to assist in finding solutions to potential torsional problems that relate to the power take-off, pump mount PTO or rubber block drive.
ALLOWABLE SIDE-PULL LOADS FOR STANDARD POWER TAKE-OFFS

<table>
<thead>
<tr>
<th>PTO MODEL AND DRAWING NUMBERS</th>
<th>RPM</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
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</thead>
<tbody>
<tr>
<td>CX-108P X0317 (M141A)</td>
<td>1000</td>
<td>730</td>
<td>585</td>
<td>490</td>
<td>420</td>
<td>350</td>
<td>280</td>
<td>210</td>
<td>140</td>
<td>70</td>
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<tr>
<td>1500</td>
<td>750</td>
<td>590</td>
<td>490</td>
<td>420</td>
<td>350</td>
<td>280</td>
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<td>425</td>
<td>355</td>
<td>285</td>
<td>215</td>
<td>145</td>
<td>75</td>
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</tr>
<tr>
<td>2500</td>
<td>790</td>
<td>600</td>
<td>500</td>
<td>430</td>
<td>360</td>
<td>290</td>
<td>220</td>
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<td>3000</td>
<td>810</td>
<td>605</td>
<td>505</td>
<td>435</td>
<td>365</td>
<td>295</td>
<td>225</td>
<td>155</td>
<td>85</td>
<td></td>
</tr>
</tbody>
</table>

The following general formula should be used for determining the actual applied load.

\[ F = \frac{L \times D}{N} \]

WHERE:

- \( L \) = Actual Applied Load (lbs)
- \( N \) = Shaft Speed (RPM)
- \( D \) = Pitch Diameter (in) of Sheave, etc.
- \( F \) = Load Factor

1.0 for Chain or Gear Drive
2.5 for All V Belts
3.5 for Flat Belts
3.5 for Reciprocating Compressors and other Severe Shock Drives and 1.8 for Large inertia Type Drive (crushers, chippers, planers).

Compound drives and power engaged power take-off applications must have written factory review.

_____

NOTES: Allowable side pull given are for standard PTOS as shown page 3. Deviations will require adjustment to the allowable side pull limits.
STANDARD POWER TAKE-OFFS

Dimensions of Twin Disc industrial PTOs with drive ring and overcenter clutch conform to the recommendations of SAE J621 (latest revision) unless noted.

**DIMENSIONAL DATA (all dimensions in inches unless noted)**

<table>
<thead>
<tr>
<th>PTO Model Number</th>
<th>Drawing/Assembly Number</th>
<th>D</th>
<th>F Diameter +.003 (in.)</th>
<th>E</th>
<th>G Diameter</th>
<th>B Clutch Diameter</th>
<th>C (in. Feature B)</th>
<th>R</th>
<th>H Diameter (in. Feature H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB-1105P</td>
<td>X0017</td>
<td>5.96</td>
<td>1.436</td>
<td>2.00</td>
<td>3/16 x 1/8</td>
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<td>2.63</td>
<td>0.88</td>
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<td>CB-1115P</td>
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<td>3/16 x 1/8</td>
<td>8.50</td>
<td>2.63</td>
<td>0.88</td>
<td>4.50</td>
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<td>5.50</td>
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<td>11.00</td>
<td>3.04</td>
<td>3.75</td>
<td>5.75</td>
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<td>SP-111P</td>
<td>X0019</td>
<td>8.13</td>
<td>5.50</td>
<td>11.38</td>
<td>3.04</td>
<td>3.75</td>
<td>5.75</td>
<td>2.8364 - 72</td>
<td></td>
</tr>
<tr>
<td>SP-113P</td>
<td>X0025</td>
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<td>2.250</td>
<td>5.50</td>
<td>3/16 x 1/8</td>
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<td>3/16 x 1/8</td>
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<td>3.04</td>
<td>3.75</td>
<td>5.75</td>
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<td>11.38</td>
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<tr>
<td>SP-215P</td>
<td>X0031</td>
<td>14.00</td>
<td>1.750</td>
<td>12.38</td>
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<td>8.00</td>
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<td>3.500</td>
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<td>1.75</td>
<td>14.00</td>
<td>3.04</td>
<td>3.38</td>
<td>7.80</td>
</tr>
</tbody>
</table>

**FOOTNOTE 8**

Footnote 8

1 Dimensions shown is for No. 4 and No. 6 Housings. 2.07” for No. 5.

2 Dimensions shown is for No. 1, No. 2 and No. 3 housings. 2.18” for No. 4.

3 Furnished with spherical roller main bearings. +.000 V - .0005 

4 Standard roller bearing. 2.25” OD on SAE Std. for 11”. 3JC clutch.

5 Flange of flywheel housing in bottom of pilot bore in flywheel.

**FOOTNOTE B**

Support plate mounting to fit 350° pilot, REF. 1”. SEE IMPORTANT NOTICE.

**APPLICATIONS**

1 A support plate for one-plate 14” and smaller PTOs (except SP-211P) is not required.

2 A support plate for three-plate 11” and three-plate 14” PTOs is required in side-load applications and is recommended for in-line applications.

3 A support plate for 18” and larger PTOs is required in both side-load and in-line applications.

NOTE: PTO models with OP designation have oil-lubricated main bearings. All other models have grease-lubricated main bearings.

**IMPORTANT NOTICE**

1 USE A CERTIFIED PRINT FOR INSTALLATION
## DYNAMICALLY-BALANCED DRIVING RINGS

Dimensions of Twin Disc industrial PTOs with drive ring and overcenter clutch conform to the recommendations of SAE J621 (latest revision) unless noted.

### DIMENSIONAL DATA (all dimensions in inches unless noted)

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Driving Ring Drawing Number</th>
<th>Drawing Number</th>
<th>Type Ring</th>
<th>A Diameter +.000 -.005</th>
<th>B B.C.</th>
<th>Nominal Pitch Diameter</th>
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</table>

**Use a Certified Print for Installation**

Correct and proper installation is very important. Procedures are described in Care and Operation Manuals and Tech Talk Service Letters 71-1, 71-2, 73-2 and 77-5. Copies are available upon request.

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1. Nodular Iron Driving Ring
2. SAE Grade 8 Attachment Capscrews Required
# PTO Application Data Sheet

**Type and Model of Machine**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>RPM</th>
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</thead>
<tbody>
<tr>
<td>SAE Flywheel Size</td>
<td>SAE Flywheel Housing Size</td>
<td></td>
</tr>
</tbody>
</table>

**Prime Mover**

- **Rated HP**: 
- **Max. Intermittent HP**: 
- **Peak Torque LB FT**: 
- **Flywheel Pilot Bearing**: 

**Notes**

**Application Details**

- **Net Input HP to Clutch**: HP @ RPM
- **Maximum Torque to Clutch**: LB FT
- **Peak Torque to Clutch**: LB FT
- **Max. Safe RPM Published by Twin Disc for Unit Recommended**: RPM
- **Back Drive Possible this Installation?**: RPM

**Other Information**

**Twin Disc** has the best ways to transform power into productivity. Our wide range of power transmission products and nearly a century of applications make OEM “engineering in” or aftermarket replacement easy and economical. Plus, all Twin Disc products offer renowned reliability, low operating costs and a global support network of distributors and service dealers. For more information, visit [twindisc.com/productsupport](http://twindisc.com/productsupport). For assistance regarding a specific application, please contact [sales@twindisc.com](mailto:sales@twindisc.com).

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**More Productivity. More Reliability. And a World of Product Support.**

**Twin Disc** has the best ways to transform power into productivity. Our wide range of power transmission products and nearly a century of applications make OEM “engineering in” or aftermarket replacement easy and economical. Plus, all Twin Disc products offer renowned reliability, low operating costs and a global support network of distributors and service dealers. For more information, visit [twindisc.com/productsupport](http://twindisc.com/productsupport). For assistance regarding a specific application, please contact [sales@twindisc.com](mailto:sales@twindisc.com).

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**Notes**