

APPLICATION CONSIDERATIONS

The proper selection and application of power transmission products and components, including the related area of product safety, is the responsibility of the customer. Operating and performance requirements and potential associated issues will vary appreciably depending upon the use and application of such products and components. The scope of the technical and application information included in this publication is necessarily limited. Unusual operating environments and conditions, lubrication requirements, loading supports, and other factors can materially affect the application and operating results of the products and components and the customer should carefully review its requirements. Any technical advice or review furnished by Feinnord Maschinen GmbH and its affiliates with respect to the use of products and components is given in good faith and without charge, and Feinnord assumes no obligation or liability for the advice given, or results obtained, all such advice and review being given and accepted at customer's risk.

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FEINNORD



RESILIENT COUPLING B SERIES



RESILIENT COUPLING



A flexible coupling must perform two tasks: transmit torque from driving to driven shaft and accommodate shaft misalignments—angular, offset and axial. However, many applications require a third function. These applications involve severe torque fluctuations, starting and stopping of high inertia machinery, shock and impact loading and certain other types of torsional vibration problems characteristic of reciprocating equipment. This third function is to provide the proper degree of resilience and damping.

Resilience is the capacity of the coupling to assume relatively large torsional deflections under torque. That is what the B series coupling is. Coupling supplies a means to attenuate and dampen torsional shock loading and vibration while accommodating misalignment.

Advantages of the Feinnord Resilient Coupling

- *Eliminates the need for lubrication*
- *Transmits very high torque and cushions system shock*
- *Easy to assemble and install*
- *Operates in wet, gritty, hot and other tough conditions*
- *Can increase drive train and gear component life*
- *Low maintenance requirements*

B series couplings employ three principal components: an outer sleeve, an inner flex hub, both made of metal, and resilient drive blocks. When assembled, the flex hub and sleeve form cavities into which specially designed elastomer blocks are placed. The elastomer blocks are incompressible but the pockets allow block deformation under torque. The cavities are completely filled only under conditions of extreme overload and the coupling thus combines high load carrying capability with resilience. This provides smooth power transmission, day after day, year after year, without ever requiring lubrication.



Superior Service Life

The elastomer block materials (several different block compounds are available) are the key to the B series coupling's ability to provide consistent torque transmission with long service life. No other coupling will duplicate its performance and longevity. Block life is long, usually five years or more, but the blocks are easy to replace if useful service life has been reached. Replacing the blocks makes the coupling virtually as good as new.

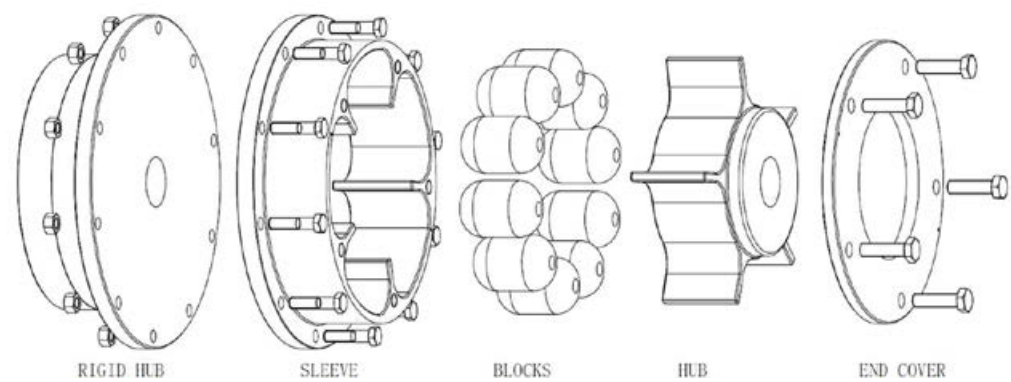
Block Material

Type BWB and BCB blocks are supplied in various compounds (natural, nitrile, and SBR high damping rubber) and various hardnesses (40 through 80 Shore 'A' hardness). Since these couplings are designed for engineered applications, the correct block compound and hardness is generally defined by a detailed torsional analysis, or by user experience. Special compounds are also available for specific properties such as high temperature or oil resistant characteristics.

Fail-Safe Design

The interlocking design of the hub and sleeve blades provide a coupling design that is inherently fail-safe. In the unlikely event that the blocks should suffer a complete failure, the coupling will continue to transmit torque through metal-to-metal contact of the interlocking blades until the equipment can be shut down and the blocks replaced.

1. COMPONENTS



2. SELECTION

① The type of B series coupling is selected based on the application and any specific requirements (torsional stiffness, damping, etc.) stated by the customer. Each type of coupling has specific torsional properties and should be selected accordingly.

Prime Mover		CB	WB
Electric Motors	Crane Drives		✓
	Bow Thruster	✓	✓
	Reduction Gears		✓
	Feed Rolls		✓
	Fans		✓
	Manipulators		✓
Synchronous & Variable Frequency Motors	Centrifugal Compressor	✓	✓
	Speed Increaseers		✓
	Mill Pinions		✓
	Kiln Drives		✓
	Drushers		✓
	ID & FD Fans		✓
Diesel Engines	Generator Sets	✓	
	Fire Pumps	✓	
	Torque Convertors	✓	
	Marine Gears	✓	✓
	Dynamometers	✓	
	Drill Rigs	✓	✓
	Main Propulsion	✓	✓
	Bow or Stern Thruster	✓	✓

②SELECTION PROCEDURE

The use of type BCB or BWB will usually be determined by one or more of the following criteria:

- If a torsional analysis of the system is made, the analysis will indicate whether to use type BWB or BCB, the rubber block hardness and compound, and where the coupling should be located in the drive.
- If a system torsional analysis is not going to be made, follow the guidelines given below:
 - i. Diesel Engine Drives:
Consult Engineering.
 - ii. Electric Motor Drives:
If there is a direct drive (no gearing) and the electric motor is the source of torsional shock or vibration, use a BWB coupling mounted on the motor shaft and driven shaft. If a BCB coupling is more readily available, it can be used.
- Speed Reducer:
If there is a speed reducer involved and the source of torsional shock or vibration is from the driven machine, then usually a BWB coupling should be mounted in the low speed shafting. If the drive arrangement precludes this, use a BCB coupling in the high speed (motor) shafting.
- Speed Increaser:
If there is a speed increaser involved and the source of torsional shock or vibration is from the high speed machine, use a BWB coupling in the high speed shafting or, if this is not possible, use a BCB in the low speed (motor) shafting.

③The choice of rubber block hardness and compound is determined from experience. General guidelines are:

- Steel Mill Drives - natural or nitrile rubber, 60 durometer.
- Grinding Mills, Ball Mills - Nitrile or high damping rubber, 60 or 70 durometer.
- Synchronous Motors & AC Variable Frequency Motors – high damping rubber, 60 or 70 durometer.
- Diesel Engine Drives - natural rubber, 50 or 60 durometer.

Determine Coupling Size

There are two basic methods for selection of proper coupling size:

Method 1

When application PEAK, CONTINUOUS, AND VIBRATORY TORQUE LEVELS ARE KNOWN based on a system torsional analysis, select the smallest B series coupling type BCB or BWB, that has peak, continuous, and vibratory torque capacities exceeding those of the application.

Method 2

When application torques are NOT KNOWN, service factors must be used to make a selection. (If application peak, continuous and vibratory torques are established later, the selection based on method 2 should be confirmed by method 1).

- a) Determine PRIME MOVER FACTOR from Table on Page 7.
 - b) Determine DRIVEN MACHINE FACTOR from Table on Page 7.
 - c) Add these two factors together to obtain the TOTAL SYSTEM FACTOR.
- NOTE: For BCB couplings, the total system service factor must be at least 3.0.
- d) Calculate the requirement of the application torque as follows:
 $T(Nm)=9550 \times Power(KW) / Speed(rpm)$
 - e) Refer to peak ratings for the type of B series coupling coupling selected from Tables 1 or 2 and select a coupling sized equal to or larger than the calculated requirements.

Selection Example:

A centrifugal compressor is driven by a 1702 KW synchronous motor at 1800 rpm.
Prime Mover Factor = 1
Driven Machine Factor = 2
For a Total System Factor (TSF) of 3.0
Therefore: $T=9550 \times 1702 \times 3 / 1800=27090$ Nm
The application requires a coupling with a rating of at least 27090 Nm. Since a type BWB is suggested for a Synchronous motor drive, a size BWB38 rated at 37285 Nm is the correct choice

Bore Capacity

Note the bore or shaft requirements of the application and compare to the maximum bore columns on page 9 or 10 to confirm coupling size selection. Increase the coupling size if its bores are too small for the application.

Operating Speed & Balancing Requirements

The maximum operating speeds for the selected coupling must not exceed speeds shown in the tables. Type BCB couplings Sizes 5 through 30 will require component balancing when operating speeds exceed.
Consideration must be given to dynamically balancing all Type BWB couplings and Size 35 or larger B series coupling Type BCB couplings when operating speeds exceed 2/3 of the catalog maximum speed, shown in Tables 1 & 2.

Limited End Float

Type BWB and BCB couplings can be furnished to limited end float (L.E.F.) requirements. Limited end float is usually required when the electric motor is of the sleeve bearing type and is furnished as standard by Feinnord for electric motors rated at 368KW and higher.

Spacer Type & Floating Shaft Couplings

For accurate and concentric location of the flex hubs and floating member at certain operating speeds, centering bushings may be required. Please contact Feinnord for details. Maximum allowable misalignment for Floating shaft and Spacer couplings, at speeds up to 500 RPM, is 1/2° at each end. For speeds above 500 RPM calculate the limits of misalignment as follows:

$$Misalignment\ Limit = 0.5^{\circ} \times \sqrt{\frac{500}{Operating\ RPM}}$$

[If more information or assistance is needed to select a B series coupling please contact FEINNORD.](#)

Rubber Block Life

The rubber drive block operating life should be at least five years...provided the coupling is selected, installed and operated (in terms of steady torque, peak torque, vibratory torque and misalignment) in accordance with criteria stated by FEINNORD.

Coupling Damping

Coupling damping is provided by the Type BCB & BWB couplings through the high energy absorption characteristics of the elastomer drive blocks. The Type SBR compound is suggested when large amounts of damping are required.

The amount of damping provided by the coupling can be calculated by the following formula:

$$C = \frac{K}{Mw}$$

where
C=coupling specific damping N.m.sec/rad
K=coupling torsional stiffness N.m./rad
w=torsional vibration frequency rad./sec.
M=coupling dynamic magnifier non-dimensional

Coupling dynamic magnifiers relative to rubber compound and durometer are as follows :

Natural Rubber		Nitrile		SBR High Damping	
Shore Hardness	Dynamic Magnifier	Shore Hardness	Dynamic Magnifier	Shore Hardness	Dynamic Magnifier
50	12	50	10	50	4
60	9	60	7	60	3.5
70	7	70	5.5	70	3
80	5	80	4.5	80	3
Typical application Diesel Drives		Typical application Grinding Mill Drives		Typical application Synchronous Motor Drives	

Service Factors

Prime Movers:

Smooth Torque Turbines & Turbines & Electric Motors	0	4 cylinders	2
Synchronous Motors & Variable Frequency AC Motors	1	1, 2, 3, & 5 cylinders	3
Diesel Engines- 6 or more cylinders	1		

Driven Movers:

Agitators	2	Cranes - Cross Traverse	3	Machine Tools	2
Autogenous Grinding Mills	2.5	Cranes - Long Travel	3	Manipulators	4
Ball Mills	2.5	Crushers - Cane	3	Pumps - Centrifugal	2
Banbury Mixers	3	Crushers - Rock, Ore	4	Pumps - Dredge	2
Bar Mills	3	Disintegrators	2.5	Pumps - Rotary or Gear	2
Bar Reeling Machine	2.5	Drawbench (Tube Mill)	3.5	Pumps - Ram	3
Bar Straightening Machine	3.5	Dynamometers	2	Pumps - Reciprocating	3
Blooming Mills	4	Edger Drives	4	Paddle Wheels	3
Blower - Lobe or Vane	2	Exhausters	2	Planers - Reversing	2.5
Cement Mills	2.5	Fans - Centrifugal	2	Propellers - Marine	2
Cold Mills	3	Fans - Mine Ventilating	2.5	Pulp Grinders	3.5
Compressors - Axial Screw (air)	2	Feed Rolls - Reversing	8	Pulverizers	2
Compressors - Centrifugal	2	Feed Rolls - Unidirectional	3	Pusher Drive	3
Compressors - Rotary, Lobe	2	Fluid Mixers	2	Runout Tables	2.5
Compressors - Reciprocating	4	Forging Machine - Belt Driven	2	Rod Mills	2.5
Compressors- Quadruple or Radial	2	Forging Machine - Direct Drive	2	Sawing Machines	2
Conveyors - Belt, Chain, Screw	2	Hoists	3	Shearing Machines	3
Conveyors - Bucket	2	Hot Strip Mills	4	Slabbing Mills	4
Cranes - Main & Auxiliary Hoist	3	Kiln Drive	3	Tube Mill	3.5
Welding Generators	2.2	For Driven Machine Types Not Listed		Heavy Shock	3-4
Winch and Capstans	2	Use the Following Guidelines:		NOTE (1) - BCB Coupling Total System Service Factor must be 3 minimum .	
Winder	3	Low Shock	2-2.5		
Wire Mills	2	Medium Shock	2.5-3		

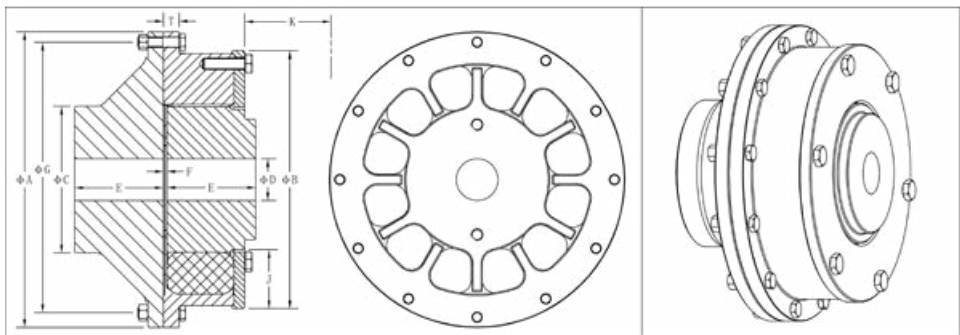
g) Allowable Misalignment

BWB				BCB			
SIZE	AXIAL	OFFSET	ANGULAR	SIZE	AXIAL	OFFSET	ANGULAR
15	0.8	0.5	0.5	5	0.6	0.4	0.5
20	0.8	0.5	0.5	10	0.6	0.4	0.5
25	0.9	0.6	0.5	15	0.8	0.5	0.5
30	0.9	0.6	0.5	20	0.8	0.5	0.5
32	1.1	0.6	0.5	25	0.8	0.5	0.5
38	1.3	0.9	0.5	30	0.8	0.5	0.5
40	1.3	0.9	0.5	35	0.8	0.5	0.5
42	1.3	0.9	0.5	40	1.1	0.8	0.5
45	1.5	1.0	0.5	45	1.1	0.8	0.5
50	1.5	1.0	0.5	50	1.1	0.8	0.5
55	1.5	1.0	0.5	55	1.1	0.8	0.5
60	1.5	1.0	0.5	60	1.5	1.0	0.5
62	1.5	1.0	0.5	65	1.5	1.0	0.5
65	1.5	1.0	0.5	70	2.0	1.3	0.5
75	1.5	1.0	0.5	75	2.3	1.5	0.5
80	1.5	1.0	0.5	80	2.3	1.5	0.5
85	2.3	1.5	0.5				
90	3.2	2.0	0.5				
95	3.2	2.0	0.5				
100	3.2	2.0	0.5				

- Tables show allowable simultaneous misalignment limits for speeds up to 500 RPM.
- Angular misalignment values based on shaft centerlines intersecting at the vertical centerline of rubber blocks.
- Calculation of radial and angular misalignment limits for speeds exceeding 500 RPM

$$NEW\ LIMIT = TABULATED\ VALUE \times \sqrt{\frac{500}{OPERATING\ RPM}}$$

- Normal installations should be aligned initially as accurately as possible, generally within 25% of the tabulated values.



Series BWB should be specified for severe impact or reversing conditions where use of a coupling with moderately high degree of torsional stiffness (a lower degree of angular displacement, varying from 1° to 2° or more) to provide high shock absorbing capacity is required. The high torques at the moment of impact, as well as their possible amplifications at other locations in the drive, usually dictate the use of the Wedge Block B series coupling. The block tends to fill the cavity and the larger driving areas of contact between block and blade will support severe overloads.

table 1

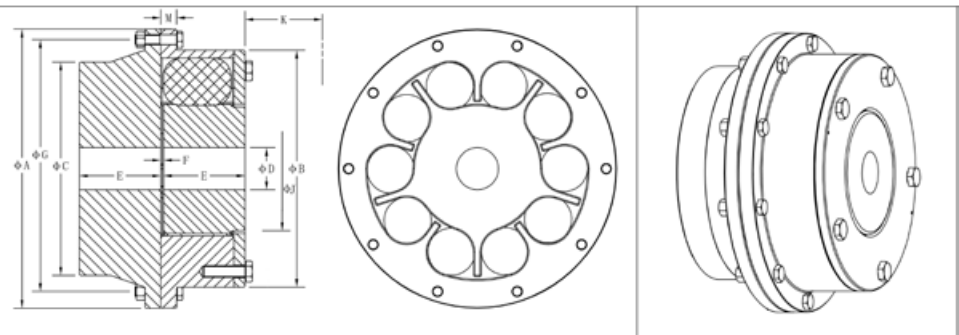
SIZE	Peak Torque Nm	Vibratory Torque Nm (1)	Max Speed RPM (2)	Qty Of Cavs	Qty of Blocks (3)	A	B	C	D of Flex Hub (4)	E	F	G	K (5)	J	T	Inertia J Kgm2 (6)	Weight Kg (6)
15	2825	350	4470	12	12	260	214	114	76	70	3	238	73	108	19	0.17	26
20	5197	655	3700	12	12	295	252	148	89	89	3	276	86	133	19	0.35	45
25	9943	1243	3250	12	12	359	306	178	108	108	4	333	130	146	19	0.85	77
30	14349	1808	2700	12	12	416	362	206	127	121	4	391	130	203	19	1.69	118
32	23727	2938	2660	12	12	438	384	216	133	125	5	413	178	203	19	2.26	136
38	37285	4632	2210	14	14	527	457	254	175	141	6	495	178	260	22	5.54	229
40	56493	7005	2030	16	16	575	505	305	200	156	6	543	203	308	22	8.63	305
42	84739	10621	1840	16	32	632	549	313	216	194	6	594	254	333	29	15.7	453
45	114115	14236	1710	16	32	683	587	356	232	213	13	638	159	359	29	22.3	570
50	152530	19207	1560	18	36	746	651	375	273	222	13	702	165	422	29	33.0	721
55	187555	23727	1470	18	36	791	679	406	286	248	13	740	184	445	29	46.0	899
60	273424	33896	1320	20	40	883	775	456	333	267	13	832	197	521	29	79.8	1240
62	378500	47454	1200	20	40	972	854	508	381	318	13	914	232	594	37	139	1796
65	583003	72875	1100	22	44	1060	927	578	406	375	19	997	273	641	38	226	2498
75	813492	101687	1020	24	48	1137	1003	641	448	406	19	1073	302	705	38	334	3209
80	1073358	134452	880	24	72	1327	1168	732	540	425	19	1251	314	851	51	749	4867
85	1932044	241788	750	28	84	1556	1365	895	635	508	19	1467	362	1003	57	1730	8137
90	3197476	399967	580	32	96	2019	1778	1016	864	610	25	1905	362	1384	70	5273	14678
95	4779266	597691	580	32	160	2019	1778	1138	864	724	44	1905	540	1384	70	6757	19377
100	6383653	797674	580	32	192	2019	1778	1302	864	889	114	1905	714	1384	70	8756	25383

(1) Vibratory torque values tabulated relate to vibration frequencies up to 500 vib/min. for higher frequencies, coupling vibratory torque capacity is derated on the following basis:

$$T_F = T \sqrt{\frac{500}{F}}$$

where, T_F vibratory torque capacity at frequency F (vib./min.); T vibration torque from table (Nm) F frequency (vib./min.) at which torque capacity is required

- (2) Max. speeds based on ductile iron. Greater speeds allowed for forged steel.
- (3) Quantity of blocks employed is shown in Tables No.1 and 2.
- (4) A reduction in maximum bore is required for limited end float couplings, please consult Feinnord.
- (5) Space needed for block removal.
- (6) Weight and moments of inertia values are based on ductile iron hubs and sleeves, and steel forged rigids and end rings.



The B series coupling Type BCB should be used when resonant vibration conditions, inherent in reciprocating drives, dictate the use of a coupling with very low torsional stiffness (or high degree of angular displacement, approaching 6° or 7° at peak torque), permitting a large windup in relation to the vibratory torque. In the Cylindrical Block B series coupling, there is more space in the cavity or pocket into which the block may deflect under load, producing the high resiliency desired. Even greater resiliency or windup, approaching 14°, can often be achieved with the Type BCB to meet specific applications merely by assembling two couplings in tandem.

table 2

SIZE	Peak Torque Nm	Vibratory Torque Nm (1)	Max Speed RPM (2)	Qty of Cavs	Qty of Blocks (3)	A	B	C	D of Flex Hub (4)	E	F	G	K (5)	J	M	Inertia J Kgm2 (6)	Weight Kg (6)
5	498	62	6900	10	10	168	127	121	44	55	2	149	70	67	19	0.03	12
10	854	107	5900	10	10	197	156	146	54	61	2	178	76	82	19	0.07	18
15	1566	195	4800	10	10	241	200	171	67	67	3	222	83	101	19	0.15	28
20	2847	356	4100	10	10	283	241	197	81	83	3	264	108	124	19	0.35	47
25	4983	623	3600	10	10	337	286	257	97	98	3	311	121	149	19	0.85	82
30	8542	1068	3000	10	10	400	346	273	117	116	3	375	146	183	19	1.75	126
35	15660	1958	2400	10	10	486	419	254	143	143	3	454	184	223	22	3.86	191
40	28472	3559	1950	10	10	597	514	305	175	173	5	559	222	270	29	10.6	335
45	42708	5339	1760	10	10	664	581	356	198	200	5	625	260	308	29	17.8	471
50	56944	7118	1600	10	10	737	645	387	219	213	5	692	279	355	29	30.5	650
55	85417	10677	1400	10	10	838	737	448	251	243	5	787	324	392	35	59.6	972
60	113889	13954	1265	10	10	921	800	489	276	273	6	864	356	427	37	94.8	1298
65	156597	19580	1150	10	10	1016	892	549	308	302	6	953	400	475	44	157	1781
70	213542	26698	1110	12	24	1054	914	610	337	354	8	991	248	534	44	211	2308
75	284722	35590	1030	12	24	1130	1000	660	375	398	10	1067	279	582	44	320	2981
80	427083	53385	960	16	32	1219	1057	752	429	457	10	1143	330	702	51	469	3994

(1) Vibratory torque values tabulated relate to vibration frequencies up to 500 vib/min. for higher frequencies, coupling vibratory torque capacity is derated on the following basis:

$$T_F = T \sqrt{\frac{500}{F}}$$

where, T_F vibratory torque capacity at frequency F; T vibration torque from table F frequency at which torque capacity is required

- (2) Max. speeds based on ductile iron. Greater speeds allowed for forged steel.
- (3) Quantity of blocks employed is shown in Tables No.1 and 2.
- (4) A reduction in maximum bore is required for limited end float couplings, please consult Feinnord.
- (5) Space needed for block removal.
- (6) Weight and moments of inertia values are based on ductile iron hubs and sleeves, and steel forged rigids and end rings.

APPENDIX

a) General Application Data for Selection and Design

Customer _____

Contact Name _____

Type of Mill _____

Email _____

Date _____

Inquiry No _____

No. of Units _____

Phone _____

No. of Pages _____

Motor Power _____

Motor RPM _____

Required Service Factor _____

Operating RPM _____

Reducer Ratio _____

Normal Operating Torque _____

DBSE(*) minimum _____

DBSE(*) maximum _____

Operating angle _____

Diameter Limitations _____

Operating Offset _____

No Load Angle _____

No Load Offset _____

Horizontal Application _____

Vertical Application _____

Drive End Bore (DxL)(**) _____

Drive End Keyway _____

Driven End Bore (DxL)(**) _____

Driven End Keyway _____

* DBSE: Distance Between Shaft Ends.

** DxL: Diameter x Length

Comments or special conditions such as: ambient temperature, atmospheric, etc.:

Note: if bolting to existing drive and driven flanges, please specify flange diameter, pilot diameter, bolt circle, number of bolts and bolt size

CAUTION: This product will be selected based on the information supplied to Feinnord by the purchaser. Complete and accurate information will help to minimize errors and misapplications. Further, it is the responsibility of the purchaser to assure the interface connection between couplings and connected equipment (flanges, bolting, keys, hydraulic fits, etc.), and capable of handling anticipated loads. Feinnord will not be responsible for errors due to inaccurate or incomplete information supplied to Feinnord.

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