
MECHANICAL POWER TRANSMISSION

Raptor coupling (metric)

DODGE[®]



A better choice has arrived

Coupling maintenance and reliability should not monopolize your maintenance team. The Dodge® Raptor elastomeric coupling eliminates these concerns.

The Raptor's easy to assemble, patented split natural rubber element significantly decreases total costs of ownership and extends driven equipment life. Built for drop-in interchangeability, the Raptor features an innovative design offering easier installation, reduced maintenance, and improved reliability in a wide range of new and existing applications.

Metric version catalog

For imperial version, see Catalog 9AKK2017-106583



*Not actual size

WAFRATOR
EMMO

MADE IN THE U.S.A.

DO

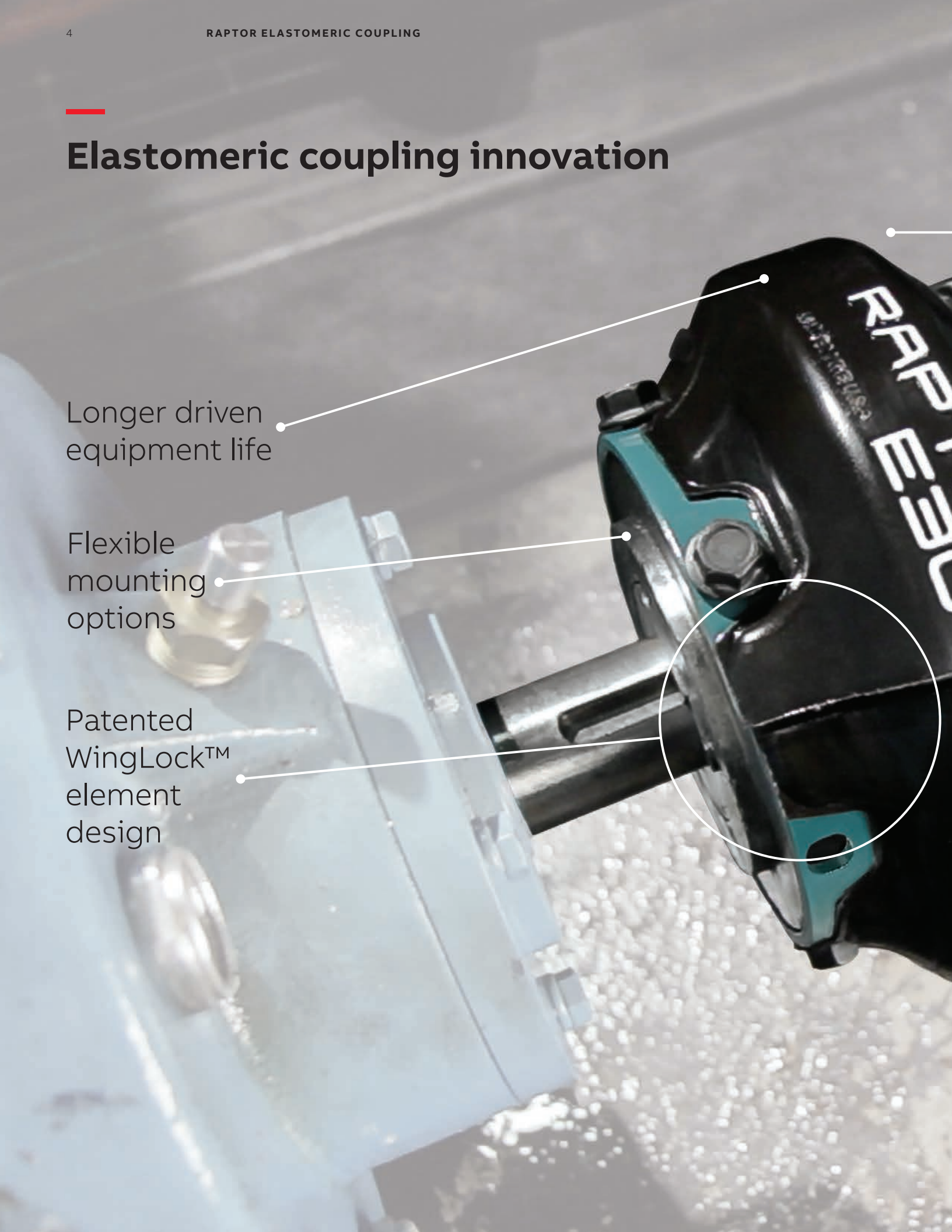


Elastomeric coupling innovation

Longer driven
equipment life

Flexible
mounting
options

Patented
WingLock™
element
design





Drop-in
interchangeability

Easier
installation

Designed and developed at Dodge

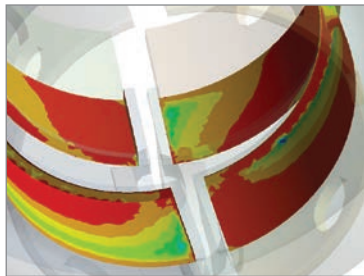
Patented WingLock™ element design

The Dodge Raptor utilizes a patented finite-element optimized winged elastomeric element design. This WingLock technology increases surface area in the most critical regions of the element, resulting in higher bond strength, improved fatigue resistance, and longer life versus competitive designs.

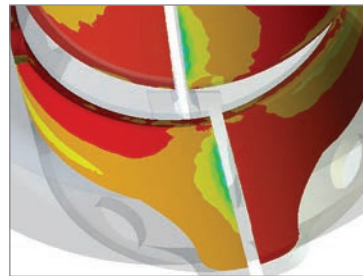


- 01 Pressure at bond without WingLock technology
- 02 Pressure at bond with WingLock technology
- 03 Average life, Dodge Raptor versus competitors.

Dodge Raptor patented WingLock technology

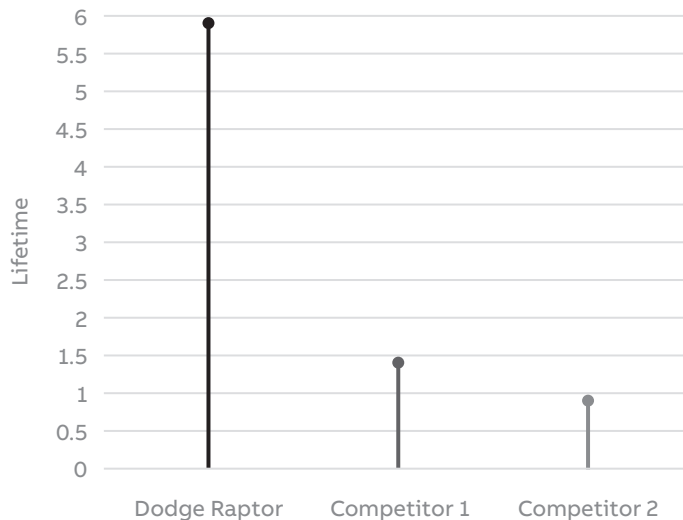


01



02

03 Documented performance

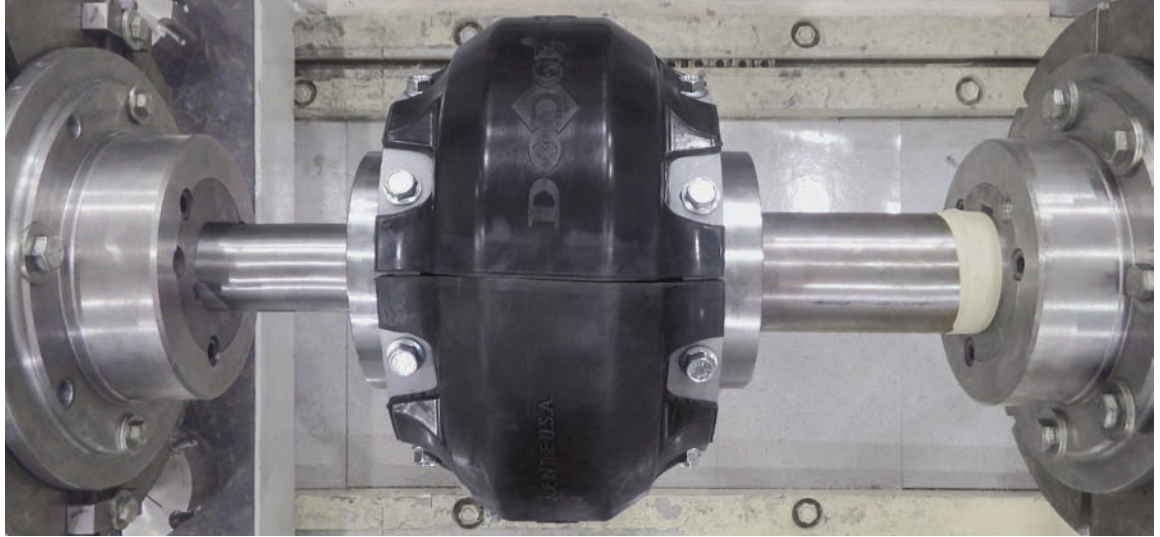


Comparative benchmark testing confirms the performance improvements associated with Raptor's WingLock element design. Even under worst-case misalignment and torque conditions, testing results show that Raptor lasts six times longer than the closest competitor.

Results based on accelerated life testing at 1.5x cataloged torque, while subject to 4° angular misalignment and 4.8mm parallel misalignment.

Tested tough

Engineers from Dodge's Advanced Development Laboratory designed and tested the Raptor to perform under the most extreme conditions. This includes successfully passing the rigorous DIN 740 (reverse cyclic loading) coupling test standard – not once, not twice, but ten times for a single coupling.



Easy to interchange

Designed to be a drop-in interchange, the Raptor meets or exceeds torque, bore, and speed ratings for these styles of commonly used couplings. All Raptor components can be used in existing applications without any modifications. This allows current users of these styles to immediately realize the benefit of longer driven equipment life and improved reliability by switching to the Raptor.

	Coupling size														
Dodge Raptor	E2M	E3M	E4M	E5M	E10M	E20M	E30M	E40M	E50M	E60M	E70M	E80M	E100M	E120M	E140M
Rexnord Omega	E2M	E3M	E4M	E5M	E10M	E20M	E30M	E40M	E50M	E60M	E70M	E80M	E100M	E120M	E140M
TB Wood's Dura-Flex	WE2M	WE3M	WE4M	WE5M	WE10M	WE20M	WE30M	WE40M	WE50M	WE60M	WE70M	WE80M	-	-	-

Industry leading 5-year warranty

With over 100 years of coupling manufacturing experience, Dodge has a history of providing reliable coupling solutions in a wide range of industries and applications. Raptor couplings carry an industry leading 5-year limited warranty, even when used with competitors' components.



Longer driven equipment life and improved reliability

Superior natural rubber element

Leveraging over 50 years of Dodge's natural rubber expertise, the Raptor features a natural rubber flexible element that offers a number of performance benefits when compared to competitive urethane designs.

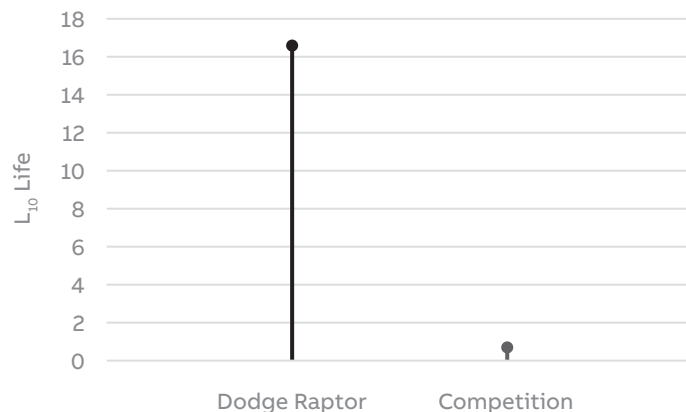
- Static conductive for grounding redundancy, allowing current to safely pass through the natural rubber element, preventing the possibility of arcing during operation
- Exceptional resistance to hydrolysis, for improved performance in humid environments
- Superior thermal conductivity and ability to dissipate heat and hysteresis build up



Lower stiffness, longer driven equipment life

Because the Raptor element uses a natural rubber compound, it is significantly more flexible than urethane designs. Natural rubber yields an element with approximately 50% lower torsional and bending stiffness, resulting in longer life for all types of connected driven equipment – including motors, pumps, compressors and gearboxes.

- Reduced bearing loads yield over 15 times increase in L_{10} bearing life connected equipment
- Less vibration transmission to connected equipment
- Better shock damping capabilities



Results based on tested bending stiffness values applied to a motor and centrifugal pump arrangement with 4° angular misalignment.

-
01 Connected
equipment L_{10} life,
Dodge Raptor versus
competition

-
01

Industry leading misalignment capabilities

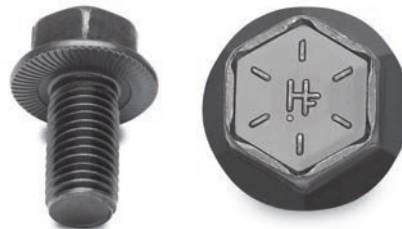
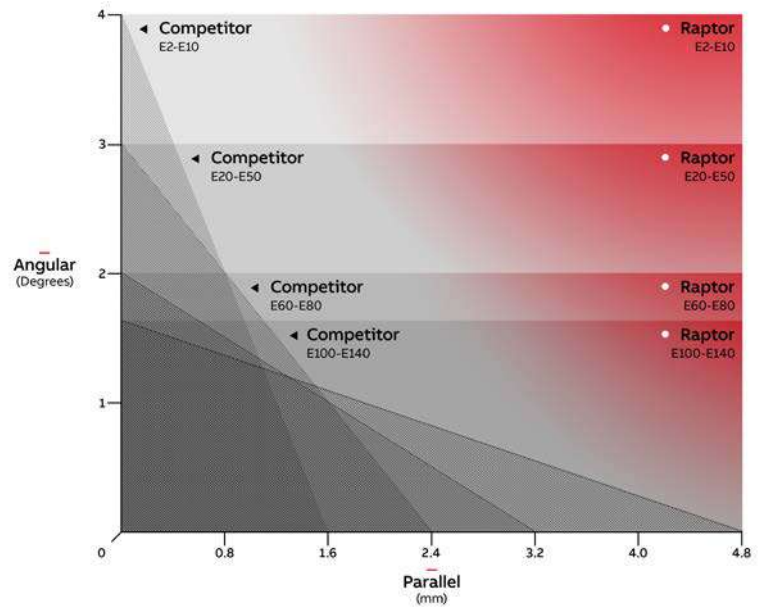
Over time foundations settle, vibration occurs, and some level of misalignment may occur. While competitive urethane couplings can handle pure angular or parallel misalignment, their capabilities are greatly diminished in applications with combined angular and parallel misalignment. Unfortunately for the competition, combined misalignment is reality.

When an elastomeric coupling is misaligned during operation, cyclic stresses are created, generating heat in a phenomenon known as hysteresis. The Raptor's natural rubber element has superior heat dissipating capabilities versus competitive urethane elements. Additionally, the Raptor has a lower angular stiffness, allowing it to be more forgiving in misaligned conditions. These two features combined allow the Dodge Raptor to offer industry leading misalignment capabilities.

The Raptor provides accommodation of shaft misalignment during installation, operation, and replacement better than competitive urethane elements.

Attention to every detail

Dodge highly engineered every aspect of the Raptor for performance, including specification of high-strength ISO Class 10.9 flanged head cap screws. This robust hardware gives a 40% increase in proof strength versus competitor's standard head Grade 5 fasteners. Serrations under the flanged head and a thread locking patch help to resist loosening and minimize the potential for stripping. This attention to detail provides a more reliable connection between elastomeric element and shaft hubs.



Dodge Grade 8 (ISO Grade 10.9 equivalent) serrated flanged-head cap screw (shown without Nylok patch)



Competitor Grade 5 (ISO Grade 8.8 equivalent) hex-head cap screw

Easier installation and reduced maintenance

Improved features, easier installation

The Dodge Raptor has everything needed for easier installations and reduced maintenance costs.

- Split element for easy replacement without moving and re-aligning connected equipment
- Slotted clamp ring holes offer 187% extra mounting hardware clearance versus competitor's circular through holes.
- Approximately 50% lower torsional stiffness makes the element significantly easier to manipulate by hand during installation
- Maintenance free non-lubricated natural rubber element for trouble-free operation



Raptor's slotted clamp rings offer more clearance at the bolt holes, for an easier installation than competitive designs.

Easy as 1-2-3

Installation for Dodge Raptor couplings are quick and easy. The Raptor's horizontally split element doesn't require locking shafts during installation, meaning a faster installation, requiring fewer tools and eliminating shaft damage. Simply fasten the shaft hubs, install the element, and tighten the hardware.

-
- 01
- Step 1
- Install hubs
-
- 02
- Step 2
- Set spacing
-
- 03
- Step 3
- Install element



01



02



03

Suited for any application

A practical solution to spacer couplings

The innovation behind the Raptor coupling also extends to applications requiring additional space between shaft ends.

- One spacer element fits all standard ISO and ANSI spacer lengths
- Spacer elements can be replaced with standard close-coupled elements, resulting in lower replacement costs and reduced inventory
- Eliminates the need for high-speed rings, resulting in easier installation, while also reducing purchase costs and inventory requirements
- Offered in half-spacer or full-spacer design



Armored elements for extra protection from harsh environments

Raptor elements are available with an optional Armored Element. This allows users to benefit from the increased performance and longer driven equipment life of standard Raptor elements, while providing an added layer of protection from ozone, petroleum oils, and some chemical environments. Raptor Armored Elements exceed ASTM 1149-07 rubber deterioration standards, as determined through third-party testing.



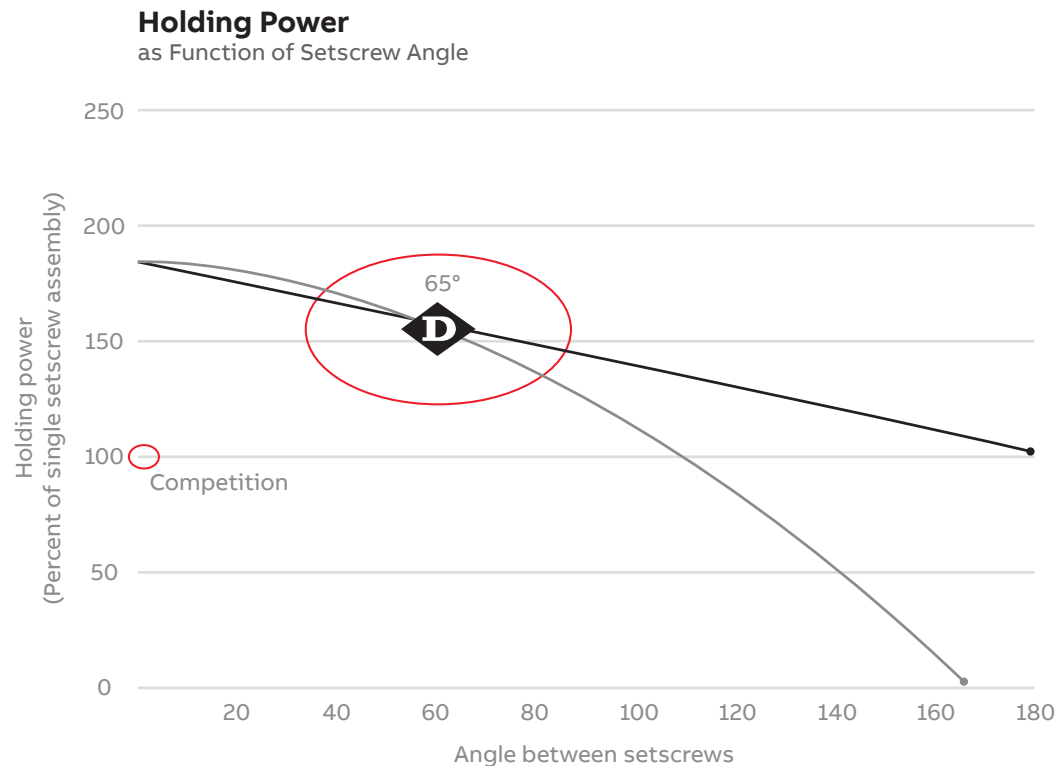
Shaft hubs

Flexible mounting options for any application

- Available in a wide range of shaft attachment methods, including finished bore and Taper-Lock® bushed options.
- Suited for any application, hubs are reversible to accommodate a wide range of shaft gaps
- Interchangeable hubs are used for both close-coupled and spacer designs for reduced inventory

Finished bore

- Setscrew locking mechanism ensures a quick, easy installation
- Two setscrews at a 65° angle optimizes radial and torsional holding power, resulting in a 75% holding power increase versus competitive designs using one setscrew





Taper-Lock bushed

- Reduced maintenance time and costs
- Easy installation and removal
- Minimal shaft damage
- Clean, compact design
- Dodge original design, an industry standard for over 50 years
- Conforms with MPTA-B9i-2013 Taper-Lock bushing standard
- Combine with Dodge Integral Key bushings for added value and convenience



Third-party ATEX certified

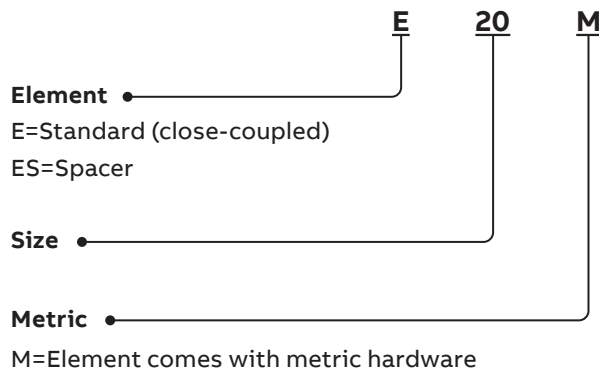
When it comes to applications in hazardous environments, there's no reason for customers to assume any risk by using a product which is self-certified. That's why all Raptor couplings are third-party ATEX certified for worry-free use in hazardous environments. All required product markings and documentation are included with each coupling at no additional charge. When it comes to hazardous environments, you can trust Dodge.

How to order

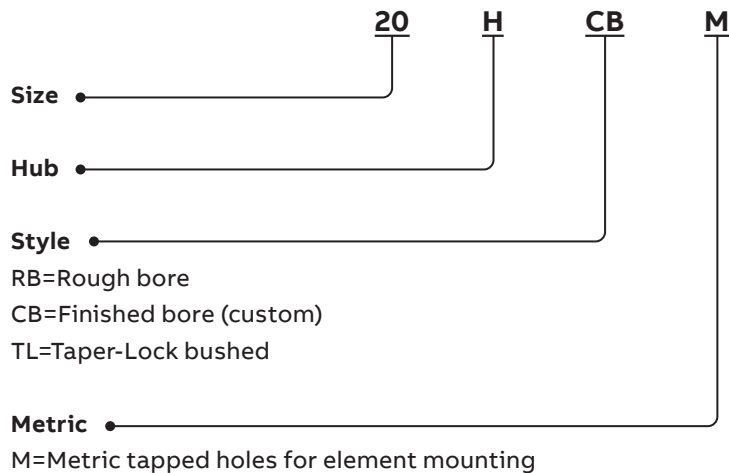
A complete Raptor coupling assembly consists of one element (standard or spacer) and two shaft hubs (finished bore and Taper-Lock). If Taper-Lock shaft hubs are selected, bushings must also be selected for the desired shaft size.

Nomenclature:

Elements:



Hubs:



Engineering

Selection methods

Torque method:

Step 1:

Obtain required S.F. (service factor) from Table 1 on pages 16 and 17.

Step 2:

Determine torque required for application.

$$\text{Torque (Nm)} = \frac{9550 \times \text{motor kW} \times \text{S.F.}}{\text{Coupling RPM}}$$

Step 3:

From rating tables, find a rating equal to or greater than the torque. Note coupling size from left hand column.

Step 4:

Check maximum RPM capability.

Step 5:

Check maximum bore capacity. If maximum bore is exceeded, move to larger size with adequate bore. Be sure maximum RPM of coupling is not exceeded.

Notes:

1. If system peak torque is known and is non-reversing, start at step 3. If system peak torque is known and reversing, multiply by 2.0 and start at step 3.
2. If ambient temperature of the application is above 82°C, a high temperature adjustment must be made to the system service factor. See page 34 for high temperature adjustment factors.
3. If spring set motor brake is used, and brake kW is greater than prime mover, use brake kW in place of motor kW.

kW/100 method:

Step 1:

Obtain required S.F. (service factor) from service factor tables on pages 16 and 17.

Step 2:

Determine the application kW per 100 RPM:

$$\text{kW} / 100 \text{ RPM} = \frac{\text{Motor kW} \times 100 \times \text{S.F.}}{\text{Coupling RPM}}$$

Step 3:

From rating tables, find a rating equal to or greater than kW design. Note to or greater than the kW/100 RPM. Note coupling size from left hand column.

Step 4:

Check maximum RPM capability.

Step 5:

Check maximum bore capacity. If maximum bore is exceeded, move to larger size with adequate bore. Be sure maximum RPM of coupling is not exceeded.

Engineering

Service Factor Table 1

Application (read footnotes)	Factor Δ Raptor
Agitators	
Paddle or propeller (vert. or horiz.)	1.00
Screw	1.00
Blowers	
Centrifugal	1.00
Lobe	1.50
Vane	1.00
Brewing & distilling	
Bottling machinery, brew kettle	1.00
Cooker (continuous duty)	1.00
Mash tub	1.00
Scale hopper-frequent starting peaks	1.50
Can filling machine	1.00
Car dumper	1.50
Car puller	1.50
Clarifier	1.00
Classifier	1.00
Clay-working machines	
Brick press, briquette mach., clay working mach., pug mill	1.50
Compressors	
Centrifugal	1.00
Screw	2.50
Reciprocating, lobe	◆
Conveyors	
Apron, assembly, belt, chain, flight, oven	1.00
Reciprocating	2.50
Screw	1.00
Cranes and hoists	
Main hoist-medium duty	1.50
Main hoist-heavy duty	2.00
Skip hoist, travel motion, trolley	1.50
Motion, slope	1.50
Crushers	
Cane	2.00
Gyratory	2.50
Dredges	
Cable reel, screen drive, stacker	1.50
Conveyor	1.50
Cutter head drive, jig drive	2.50
Pump, utility winch	1.50
Dynamometer	1.00
Elevators	
Bucket, freight	2.00
Exciter	1.00

Application (read footnotes)	Factor Δ Raptor
Fans	
Centrifugal	1.00
Cooling tower	2.00
Heavy duty (forced draft)	1.50
Induced draft	1.50
Light	1.00
Propeller indoor	1.50
Food industry	
Beet slicer	1.50
Cereal cooker	1.00
Dough mixer, meat grinder	1.50
Generators	
Even load	1.00
Hoist or railway service	1.50
Welder load	2.00
Grizzly	2.00
Kiln	2.00
Laundry machines	
Tumbler washer	2.00
Line shafts	
Driving processing machinery	1.00
Light	1.00
Lumber industry	
Band resaw	1.50
Circular resaw	1.50
Edger head rig, hog, log haul	2.00
Planer	1.50
Rolls non-reversing	1.50
Rolls reversing	2.00
Sawdust conveyor	1.00
Slab conveyor	1.50
Sorting table	1.50
Machine tools	
Auxiliary	1.00
Main drive	1.50
Notching press, planer (reversing), plate planer, punch press	1.50
Traverse	1.00
Metal forming machines	
Draw bench, carriage, main drive, extruder	2.00
Wire drawing, flattening machine	2.00
Mills rotary type	
Ball or pebble direct or	2.50
On LS shaft gear reducer	2.50
On HS shaft gear reducer	2.00
Dryer and cooler	1.50
Rod or tube direct or	2.50
On LS shaft gear reducer	2.50
On HS shaft gear reducer	2.00
Tumbling barrel	1.50

Application (read footnotes)	Factor Δ Raptor
Mixers	
Concrete (continuous or intermittent)	1.50
Muller-Simpson type	1.50
Oil industry	
Chiller	1.00
Oil well pumping (not over 150% peak torque)	2.00
Paraffin filter press	1.50
Paper mills	
Agitator	1.00
Barking drum	2.50
Beater and pulper	1.50
Bleacher	1.00
Calender	2.00
Chipper	3.00
Couch cylinder dryer	1.50
Felt stretcher	1.00
Fourdrinier	1.50
Jordan	2.00
Press	2.00
Pulp grinder	2.00
Stock chest	1.50
Stock pump	
Reciprocating	2.00
Suction roll	2.00
Winder	1.50
Paraffin filter press	1.50
Printing press	1.50
Propeller marine	1.50
Pullers	
Barge hall	2.50
Pulverizers	
Hog	2.00
Roller	1.50
Hammermill	◆
Pumps	
Centrifugal	1.00
Descaling gear type	1.50
Oil well pumping (not over 150% peak torque)	2.00
Rotary - other than gear	1.50
Reciprocating	◆

	Factor Δ
Application (read footnotes)	Raptor
Rubber industry	1.50
Banbury mixer	1.50
Calender	2.00
Cracker mixing mill plasticator	2.50
Refiner, sheeter	2.00
Tire-building machine	2.00
Tire and tube press opener based on peak torque	1.00
Tuber and strainer	1.50
Warming mill	2.00
Washer	2.50
Screens	
Air washing	1.00
Coal and sand rotary	1.50
Vibrating	2.50
Water	1.00
Sewage disposal equipment	1.00
Shovel	2.00
Shredder	1.50
Steel industry	
Cold mills	
Coiler up or down	1.50
Strip, temper	2.00

	Factor Δ
Application (read footnotes)	Raptor
Steel industry (continued)	
Hot mills	
Coiler up or down	1.50
Edger drive	1.50
Feed roll blooming	3.00
Roughing mill delivery	3.00
Non-reversing, sheet strip	3.00
Rod mill	2.50
Soaking pit cover drive lift	3.00
Soaking pit cover drive travel	3.00
Rollout table (non-reversing)	2.00
Rollout table (reversing)	3.50
Steering gear	1.00
Stoker	
Textile mills	
Batcher	1.00
“Calender, card machine, D can”	1.50
Dyeing machine	1.00
Loom	1.50
Mangel, napper, soaper	1.00
Spinner, tenter frame	1.50
Windlass	1.50
Woodworking machines	1.00

System service factor calculation

To determine the system service factor, the driver service factor adder (Table 1A) must be added to the driven service factor (Table 1). Example: Determine the system service factor for a Raptor coupling used to couple a barking drum and a six-cylinder diesel engine.

$$\text{Driven S.F.} + \text{Driver S.F. Adder} = \text{System S.F.}$$

$$2.5 + 0.5 = 3.0$$

Δ The service factors listed are intended only as a general guide. Where substantial shock occurs or starting and stopping is frequent as on some creep drives and on some reversing drives or where the power source is an internal combustion engine with less than four cylinders - consult Dodge. Where torsional vibrations occur as in, for example, internal combustion engine or reciprocating compressor or pump applications, check the coupling stiffness for the possible development of damaging large- amplitude vibrations. A complete system torsional analysis may be necessary.

♦ Consult Dodge for selection assistance

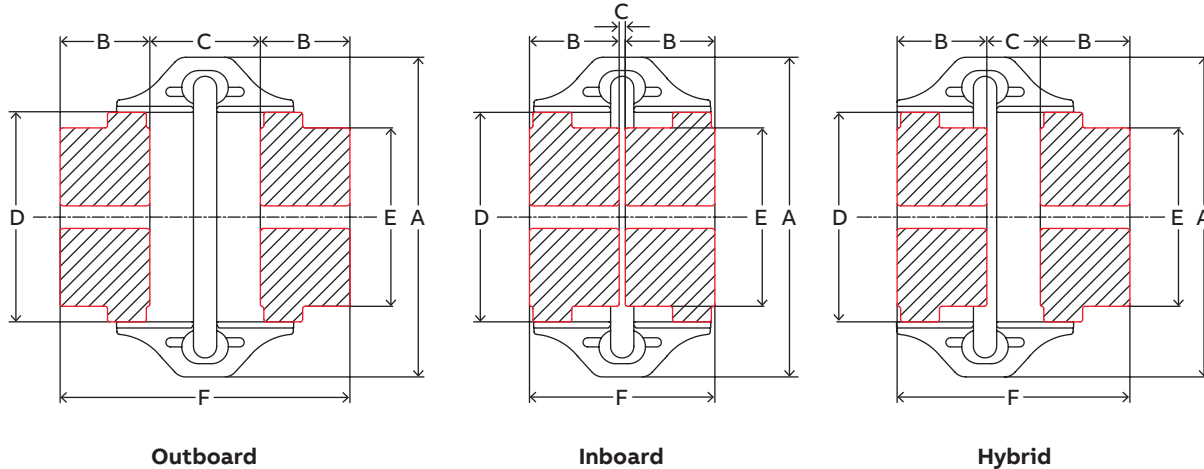
Table 1A - driver service factor adders ♦

Type of coupling	Electric motor std. torque	High torque motors	Turbines	Reciprocating engine number of cylinders				
				12 or more	8 to 11	6 to 7	4 to 5	Less than 4
Raptor	0.00	0.00	0.00	0.00	0.50	0.50	0.50	♦

♦ Consult Dodge for selection assistance

Ratings & dimensions

Close-coupled - finished bore



Coupling size	Min. bore	Max. bore ⁽¹⁾	kW/100	Max torque (Nm)	Max. RPM	A	B	C ⁽⁴⁾			D	E	F ⁽⁴⁾			Weight ⁽²⁾ (kg)
								Outboard	Inboard	Hybrid			Outboard	Inboard	Hybrid	
E2M	-	28	.23	22	6,600	89	24	48	34	41	47	42	96	82	89	0.6
E3M	-	34	.43	42	6,600	102	38	34	20	27	59	51	110	96	103	1.1
E4M	-	42	.65	63	6,600	116	43	34	11	22	66	60	119	96	108	1.5
E5M	-	48	1.09	105	6,600	137	44	47	20	33	80	71	136	109	122	2.5
E10M	-	55	1.72	165	6,600	162	48	47	13	30	93	84	142	109	126	3.5
E20M	-	60	2.72	261	6,600	184	52	68	6	37	114	102	172	110	141	5.8
E30M	-	75	4.32	413	5,800	210	59	76	1	38	138	117	193	118	156	8.9
E40M	-	85	6.51	622	5,000	241	64	84	11	47	168	146	211	138	174	15.2
E50M	-	90	9.06	865	4,200	279	70	99	2	51	207	156	239	142	191	23.1
E60M	-	105	14.8	1,413	3,800	318	83	108	13	60	222	165	273	178	225	32.3
E70M	-	120	26.2	2,501	3,600	356	92	122	13	68	235	178	306	197	252	37.2
E80M	-	155	46.7	4,463	2,000	406	124	170	19	94	286	241	417	267	342	76.8
E100M	63	171	101	9,613	1,900	533	140	96	45	70	359	267	375	324	350	114.6
E120M	75	190	201	19,226	1,800	635	152	125	57	91	448	299	429	362	396	190.2
E140M	85	228	402	38,453	1,500	762	178	128	77	102	530	381	483	432	458	269.2

(1) Consult page 29 for larger bore capacities with shallow keys.

(2) Weight of complete coupling in kilograms

(3) All dimensions in millimeters.

(4) Hubs are reversible and will accommodate different shaft spacing requirements

Close-coupled metric element assemblies

Size	Standard (natural rubber)	Armored elements	Replacement hardware ⁽¹⁾
E2M	015973	017141	017008
E3M	015974	017142	
E4M	015975	017143	017009
E5M	015976	017144	
E10M	015977	017145	017181
E20M	015978	017146	017010
E30M	015979	017147	
E40M	015980	017148	017011

Size	Standard (natural rubber)	Armored elements	Replacement hardware ⁽¹⁾
E50M	015981	017149	017011
E60M	015982	017150	
E70M	015983	017151	017012
E80M	015984	017152	
E100M	015985	017153	017013
E120M	015986	017154	017014
E140M	015987	017155	017015

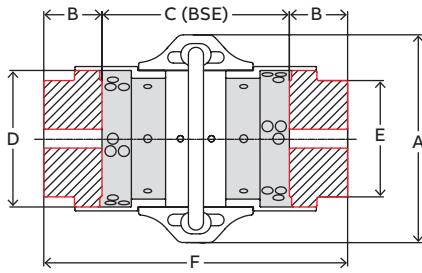
(1) Element assemblies include metric hardware.

(2) Raptor elements are also available with imperial hardware. This requires use of shaft hubs tapped for imperial hardware. Reference Couplings Catalog (9AKK2017-106583) or contact Dodge for more information.

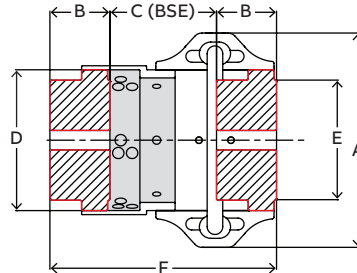
(3) Complete coupling consist of one Element and two bored hubs.

Ratings & dimensions

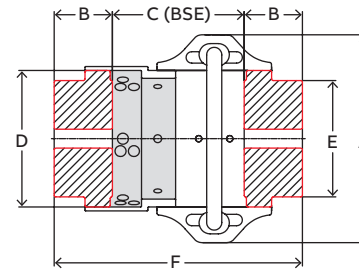
Spacer - finished bore



Full spacer - outboard



Half spacer - hybrid



Half spacer - outboard

Coupling size	Min. bore	Max. bore ⁽¹⁾	kW/100	Max rated torque (Nm)	Max. RPM	A	B	D	E	Weight ⁽²⁾ (kg)
ES2M	-	28	0.23	22	6600	89	24	47	42	0.8
ES3M	-	34	0.44	42	6600	102	38	59	51	1.7
ES4M	-	40	0.66	63	6600	116	43	66	60	2.3
ES5M	-	48	1.10	105	6600	137	44	80	71	3.5
ES10M	-	55	1.73	165	6600	162	48	93	84	4.7
ES20M	-	60	2.73	261	4800	184	52	114	102	7.9
ES30M	-	75	4.32	413	4200	210	59	138	117	12.2
ES40M	-	85	6.51	622	3600	241	64	168	146	19.8
ES50M	-	90	9.06	865	3100	279	70	207	156	29
ES60M	-	105	14.8	1413	2800	318	83	222	165	43
ES70M	-	120	26.2	2501	2600	356	92	235	178	48.2
ES80M	-	155	46.7	4463	1800	406	124	286	241	94.1

(1) Consult page 29 for larger bore capacities with shallow keys.

(2) Weight of complete coupling at maximum bore with four spacer extensions

(3) All dimensions in millimeters

Finished bore spacer length options

Coupling size	Standard (natural rubber) element part number		Armored element part number		C (BSE) ⁽⁴⁾⁽⁵⁾						F ⁽⁴⁾⁽⁵⁾	
	Full spacer	Half spacer	Full spacer	Half spacer	Half spacer		Full spacer		Half spacer		Full spacer	
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
ES2M	017076	017194	017168	017230	64	77	89	105	111	124	137	152
ES3M	017077	017195	017169	017231	54	87	89	140	131	163	165	216
ES4M	017078	017196	017170	017232	50	87	89	140	135	173	175	226
ES5M	017079	017197	017171	017233	54	94	89	140	143	182	178	229
ES10M	017080	017198	017172	017234	51	94	89	140	147	189	184	235
ES20M	017081	017199	017173	017235	60	132	115	197	165	237	220	301
ES30M	017082	017200	017174	017236	57	138	113	200	174	255	230	317
ES40M	017083	017201	017175	017237	64	139	128	194	191	266	255	321
ES50M	017084	017202	017176	017238	75	161	146	222	214	300	286	361
ES60M	017085	017203	017177	017239	80	188	162	267	245	353	327	432
ES70M	017086	017204	017178	017240	85	198	178	274	269	382	362	458
ES80M	017087	017205	017179	017241	103	287	228	403	350	534	478	651

(1) Element assemblies include metric hardware.

(2) Table shows actual spacer lengths.

(3) All calculations based off of outboard hubs.

(4) Hubs are reversible and will accommodate different shaft spacing requirements

(5) Consult factory for minimum shaft spacing

(6) Complete Spacer coupling consist of one Element and two bored hubs.

Hub part numbers

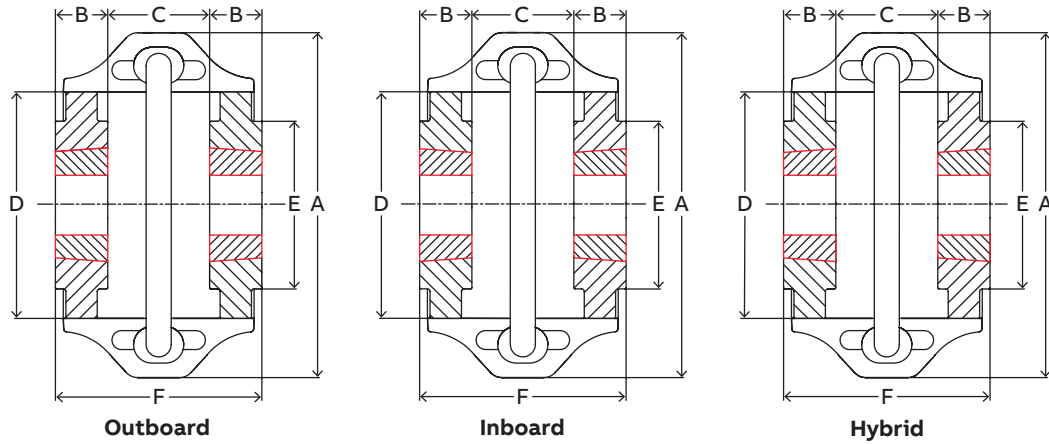
Finished bore - metric bores

Bore (mm)	Coupling size														
	2HCBM	3HCBM	4HCBM	5HCBM	10HCBM	20HCBM	30HCBM	40HCBM	50HCBM	60HCBM	70HCBM	80HCBM	100HCBM	120HCBM	140HCBM
Reborable	015249	015250	015251	015252	015253	015254	015255	015256	015257	015258	015259	015260	015261	015262	015263
11	016850	016861	016875	016892	016912	-	-	-	-	-	-	-	-	-	-
12	016851	016862	016876	016894	016913	-	-	-	-	-	-	-	-	-	-
14	016852	016863	016877	016895	016914	-	-	-	-	-	-	-	-	-	-
16	016853	016864	016878	016896	016915	-	-	-	-	-	-	-	-	-	-
17	016854	016865	016879	016897	016916	-	-	-	-	-	-	-	-	-	-
18	016855	016866	016880	016898	016917	-	-	-	-	-	-	-	-	-	-
19	016856	016867	016881	016899	016918	016934	016952	016974	-	-	-	-	-	-	-
20	016857	016868	016882	016900	016919	016935	016953	016975	-	-	-	-	-	-	-
22	016858	016869	016883	016901	016920	016936	016954	016976	-	-	-	-	-	-	-
24	016859	016870	016884	016902	016921	016937	016955	016977	-	-	-	-	-	-	-
25	016860	016871	016885	016903	016922	016938	016956	016978	-	-	-	-	-	-	-
28	-	016872	016886	016904	016923	016939	016957	016979	019820	019841	-	-	-	-	-
30	-	016873	016887	016905	016924	016940	016958	016980	019821	019842	-	-	-	-	-
32	-	016874	016888	016906	016925	016941	016959	016981	019822	019843	-	-	-	-	-
35	-	-	016889	016907	016927	016942	016960	016982	019823	019844	019864	-	-	-	-
38	-	-	016890	016908	016928	016943	016961	016983	019824	019845	019865	-	-	-	-
40	-	-	016891	016909	016929	016944	016962	016984	019825	019846	019866	019886	-	-	-
42	-	-	-	016910	016930	016945	016963	016985	019826	019847	019867	019887	-	-	-
45	-	-	-	016911	016931	016946	016964	016986	019827	019848	019868	019888	-	-	-
48	-	-	-	-	016932	016947	016965	016987	019828	019849	019869	019889	-	-	-
50	-	-	-	-	016933	016948	016966	016988	019829	019850	019870	019890	-	-	-
55	-	-	-	-	-	016949	016967	016989	019830	019851	019871	019891	-	-	-
56	-	-	-	-	-	016950	016968	016990	019831	019852	019872	019892	-	-	-
60	-	-	-	-	-	016951	016969	016991	019832	019853	019873	019893	-	-	-
63	-	-	-	-	-	-	016970	016992	019833	019854	019874	019894	019911	-	-
65	-	-	-	-	-	-	016971	016993	019834	019855	019875	019895	019912	-	-
70	-	-	-	-	-	-	016972	016994	019835	019856	019876	019896	019913	-	-
71	-	-	-	-	-	-	016973	016995	019836	019857	019877	019897	019914	-	-
75	-	-	-	-	-	-	-	016996	019837	019858	019878	019898	019915	019931	-
80	-	-	-	-	-	-	-	016997	019838	019859	019879	019899	019916	019932	-
85	-	-	-	-	-	-	-	016998	019839	019860	019880	019900	019917	019933	019948
90	-	-	-	-	-	-	-	-	019840	019861	019881	019901	019918	019934	019949
95	-	-	-	-	-	-	-	-	-	019862	019882	019902	019919	019935	019950
100	-	-	-	-	-	-	-	-	-	019863	019883	019903	019920	019936	019951
105	-	-	-	-	-	-	-	-	-	-	019884	019904	019921	019937	019952
110	-	-	-	-	-	-	-	-	-	-	019885	019905	019922	019938	019953
120	-	-	-	-	-	-	-	-	-	-	-	019906	019924	019939	019954
125	-	-	-	-	-	-	-	-	-	-	-	019907	019925	019940	019955
130	-	-	-	-	-	-	-	-	-	-	-	019908	019926	019941	019956
140	-	-	-	-	-	-	-	-	-	-	-	019909	019927	019942	019957
150	-	-	-	-	-	-	-	-	-	-	-	019910	019928	019943	019958
160	-	-	-	-	-	-	-	-	-	-	-	-	019929	019944	019959
170	-	-	-	-	-	-	-	-	-	-	-	-	019930	019945	019960
180	-	-	-	-	-	-	-	-	-	-	-	-	019966	019946	019961
190	-	-	-	-	-	-	-	-	-	-	-	-	-	019947	019962
200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	019963
210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	019964
220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	019965

- Listed shaft hubs are tapped for metric hardware, and intended for use with metric element assemblies. Shaft hubs and element assemblies are also available for use with imperial hardware. Reference International Catalog (9AKK107387) or contact Dodge for more information.
- Unless otherwise specified, finished bores for E2-E60 are transitional fit and sizes E70-E80 are interference fit per ISO R775. See pages 29-33 for details.

Ratings & dimensions

Close-coupled - Taper-Lock bushed



Coupling size	Bushing size	Max. bore ⁽¹⁾	kW/100	Max torque (Nm) ⁽²⁾	Max. RPM	A	B	C			D	E	F			Weight ⁽⁵⁾ (kg)
								Outboard	Inboard	Hybrid			Outboard	Inboard	Hybrid	
E3M	1008	25	0.44	42	6600	102	22	43	42	43	59	51	87	87	87	1.0
E4M	1008	25	0.66	63	6600	116	22	43	42	43	66	57	87	87	87	1.3
E5M	1210	32	1.10	105	6600	137	22	55	55	55	80	71	100	100	100	2.2
E10M	1610	42	1.73	165	6600	162	25	52	52	52	93	84	103	103	103	2.9
E20M	1610	42	2.73	261	6,600	184	25	64	63	63	114	89	114	114	114	4.2
E30M	2012	50	4.32	413	5,800	210	32	65	65	65	138	102	129	129	129	6.7
E40M	2517	65	6.51	622	5,000	241	44	60	60	60	168	118	149	149	149	10.8
E50M	2517	65	9.06	865	4,200	279	44	76	76	76	207	125	165	165	165	15.9
E60M	3020	80	14.8	1413	3,800	318	51	84	84	84	222	146	186	186	186	24.3
E70M	3535	95	26.2	2501	3,600	356	89	60	60	60	235	165	238	238	238	35.2
E80M	4040	105	46.7	4463	2,000	406	102	95	95	95	286	197	298	298	298	58.5
E100M	4535	125	101	9613	1,900	533	89	153	90	122	359	267	331	268	300	115.2
E120M	5040	127	149	14236 ⁽²⁾	1,800	635	102	172	105	138	448	299	375	308	341	194.1
E140M	7060	180	402	38453	1,500	762	152	177	76	126	530	381	482	380	431	323.4

(1) All maximum bore dimensions are based off of shallow keys

(2) Maximum torque is limited by maximum bushing rated torque

(3) Space required to install bushing with shortened hex key

(4) Space required to remove bushing with shortened hex key

(5) Weight of complete coupling including the bushing at maximum bore

(6) All dimensions in millimeters

Taper-Lock bushed part numbers

Coupling size	TL hub	Bushing size	Standard (natural rubber) element	Armored elements	Replacement hardware ⁽¹⁾
3HTLM	015207	1008		015974	017142
4HTLM	015208	1008		015975	017143
5HTLM	015209	1210		015976	017144
10HTLM	015210	1610		015977	017145
20HTLM	015211	1610		015978	017146
30HTLM	015212	2012		015979	017147
40HTLM	015213	2517		015980	017148
50HTLM	015214	2517		015981	017149
60HTLM	015215	3020		015982	017150
70HTLM	015216	3535		015983	017151
80HTLM	015217	4040		015984	017152
100HTLM	015218	4535		015985	017153
120HTLM	015219	5040		015986	017154
140HTLM	015220	7060		015987	017155

(1) Element assemblies include metric hardware.

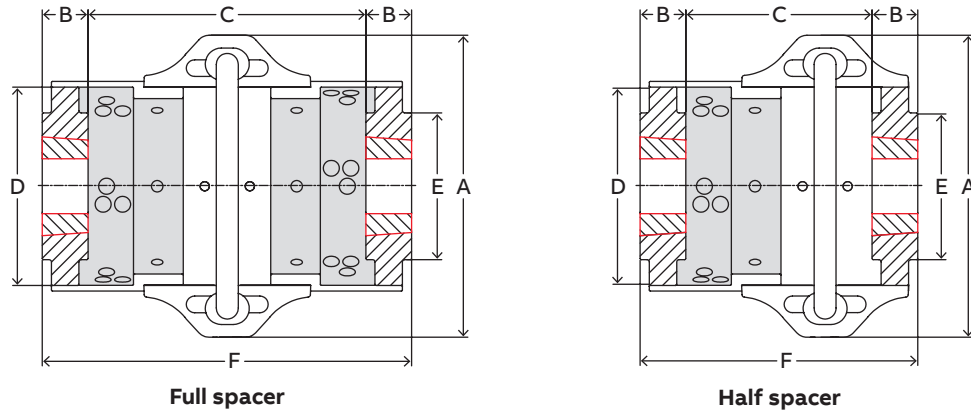
(2) All TL hubs machined for BSW thread

(3) Raptor elements are also available with imperial hardware. This requires use of shaft hubs tapped for imperial hardware. Reference Couplings Catalog (9AKK2017-106583) or contact Dodge for more information.

(4) Complete coupling consist of one Element, 2 hubs and 2 Bushings.

Ratings & dimensions

Spacer - Taper-Lock bushed



Coupling size	Bushing size	Max bore ⁽¹⁾	kW/100	Max rated torque (Nm)	Max. RPM	A	B	D	E	Weight ⁽²⁾ (kg)
ES3M	1008	25	0.44	42	6600	102	22	59	51	1.6
ES4M	1008	25	0.66	63	6600	116	22	66	60	2.1
ES5M	1210	32	1.10	105	6600	137	22	80	71	3.3
ES10M	1610	42	1.73	165	6600	162	25	93	84	4.2
ES20M	1610	42	2.73	261	4800	184	25	114	102	6.3
ES30M	2012	50	4.32	413	4200	210	32	138	117	9.9
ES40M	2517	65	6.51	622	3600	241	44	168	146	15.4
ES50M	2517	65	9.06	865	3100	279	44	207	156	21.9
ES60M	3020	80	14.8	1413	2800	318	51	222	165	35
ES70M	3535	95	26.2	2501	2600	356	89	235	178	46.3
ES80M	4040	105	46.7	4463	1800	406	102	286	241	75.7

(1) Maximum bores may require use of shallow key and/or steel bushings. Consult the Dodge for bushing requirements.

(2) Weight of complete coupling at maximum bore with four spacer extensions and bushings at maximum bore

(3) All dimensions in millimeters

Taper-Lock bushed spacer length options

Coupling size	Standard (natural rubber)		Armored elements		C (BSE)				F			
	Element part number		part number		Half spacer		Full spacer		Half spacer		Full spacer	
	Full spacer	Half spacer	Full spacer	Half spacer	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
ES3M	017077	017195	017169	017231	70	96	98	149	115	140	142	193
ES4M	017078	017196	017170	017232	70	96	98	149	115	140	142	193
ES5M	017079	017197	017171	017233	76	102	98	149	121	147	142	193
ES10M	017080	017198	017172	017234	73	99	95	146	124	150	145	196
ES20M	017081	017199	017173	017235	90	128	116	193	141	179	167	243
ES30M	017082	017200	017174	017236	89	127	113	189	153	191	177	253
ES40M	017083	017201	017175	017237	89	116	117	171	178	204	205	260
ES50M	017084	017202	017176	017238	105	137	134	198	194	226	223	287
ES60M	017085	017203	017177	017239	119	164	154	244	220	266	255	345
ES70M	017086	017204	017178	017240	99	137	137	213	276	314	314	391
ES80M	017087	017205	017179	017241	146	212	196	329	349	416	399	532

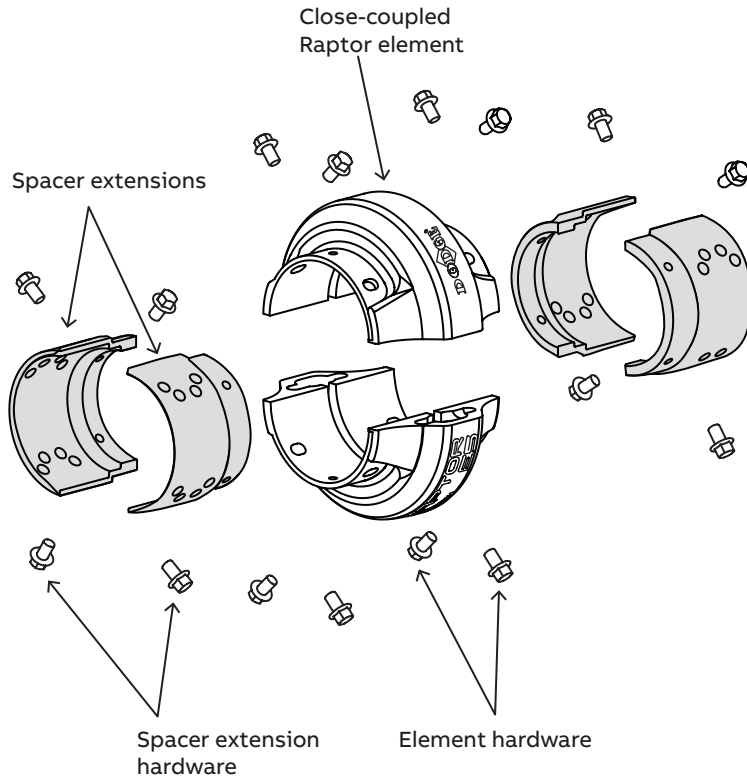
(1) Element assemblies include metric hardware.

(2) Table shows actual spacer lengths.

(3) Taper-Lock Spacers couplings use TL hubs on previous page

(4) Complete TL Spacer coupling consist of one Spacer Element, 2 TL hubs and 2 Bushings

Spacer element component details



Raptor spacer element component part numbers

Coupling size	Complete spacer element assemblies		Replacement components				
	Standard (natural rubber) elements		Close-coupled elements ^{(1) (2)}		Spacer extension kit ^{(3) (4)}	Replacement hardware	
	Full spacer	Half spacer	Standard (natural rubber)	Armored elements			
E2M	017076	017194	015973	017141	017052	017008	
E3M	017077	017195	015974	017142	017053		
E4M	017078	017196	015975	017143	017054	017009	
E5M	017079	017197	015976	017144	017055		
E10M	017080	017198	015977	017145	017056	017181	
E20M	017081	017199	015978	017146	017057		
E30M	017082	017200	015979	017147	017058	017010	
E40M	017083	017201	015980	017148	017059		
E50M	017084	017202	015981	017149	017060	017011	
E60M	017085	017203	015982	017150	017061		
E70M	017086	017204	015983	017151	017062	017012	
E80M	017087	017205	015984	017152	017063		

(1) For replacement on existing Raptor half or full spacer couplings, purchase only close-coupled element if spacer extensions remain on shaft hubs

(2) For replacement on existing Raptor half or full spacer couplings, purchase close-coupled element and one set of replacement hardware if spacer extensions have been removed from shaft hubs

(3) To convert an existing close-coupled Raptor element into a half spacer element, purchase one spacer extension kit

(4) To convert an existing close-coupled Raptor element into a full spacer element, purchase two spacer extension kits

Engineering

ISO R775 metric bore and keyway fits

Nominal shaft diameter (mm)	Shaft diameter		Clearance fit				Transitional fit				Interference fit				Keyway				
	Min.	Max.	Hub bore		Fit		Hub bore		Fit		Hub bore		Fit		Nominal	Width .D10		Scribe height	
			F7	H7	F7	H7	F7	H7	M6	M6	Width X Height	Min	Max	Min		Max			
	j6		F7		H7		M6				Width X Height								
	+0.008 / 12.008	-0.003 / 11.997	+0.016 / 12.016	+0.034 / 12.034	+0.008 / 0.008	+0.037 / 0.037	0.000 / 12.000	+0.018 / 12.018	-0.008 / -0.008	+0.021 / 0.021	-0.015 / 11.985	-0.004 / 11.996	-0.023 / -0.023	-0.001 / -0.001	4 X 1.8	4.03	4.078	13.8	13.9
14	14.008	13.997	14.016	14.034	1.008	1.037	14.000	14.018	-0.008	0.021	13.985	13.996	-0.023	-0.001	5 X 2.3	5.03	5.078	16.3	16.4
16	16.008	15.997	16.016	16.034	2.008	2.037	16.000	16.018	-0.008	0.021	15.985	15.996	-0.023	-0.001	5 X 2.3	5.03	5.078	18.3	18.4
18	18.008	17.997	18.016	18.034	3.008	3.037	18.000	18.018	-0.008	0.021	17.985	17.996	-0.023	-0.001	6 X 2.8	6.03	6.078	20.8	20.9
>18	j6		F7		H7		M6												
	+0.009 / 19.009	-0.004 / 18.996	+0.02 / 19.02	+0.041 / 19.041	+0.011 / 0.011	+0.045 / 0.045	0.000 / 19.000	+0.021 / 19.021	-0.009 / -0.009	+0.025 / 0.025	-0.017 / 18.983	-0.004 / 18.996	-0.026 / -0.026	0.000 / 0.000	6 X 2.8	6.03	6.078	21.8	21.9
19	19.009	18.996	19.02	19.041	0.011	0.045	19.000	19.021	-0.009	0.025	18.983	18.996	-0.026	0.000	6 X 2.8	6.03	6.078	22.8	22.9
20	20.009	19.996	20.02	20.041	0.011	0.045	20.000	20.021	-0.009	0.025	19.983	19.996	-0.026	0.000	6 X 2.8	6.03	6.078	23.8	23.9
22	22.009	21.996	22.02	22.041	0.011	0.045	22.000	22.021	-0.009	0.025	21.983	21.996	-0.026	0.000	6 X 2.8	6.03	6.078	24.8	24.9
24	24.009	23.996	24.02	24.041	0.011	0.045	24.000	24.021	-0.009	0.025	23.983	23.996	-0.026	0.000	8 X 3.3	8.04	8.098	27.3	27.5
25	25.009	24.996	25.02	25.041	0.011	0.045	25.000	25.021	-0.009	0.025	24.983	24.996	-0.026	0.000	8 X 3.3	8.04	8.098	28.3	28.5
28	28.009	27.996	28.02	28.041	0.011	0.045	28.000	28.021	-0.009	0.025	27.983	27.996	-0.026	0.000	8 X 3.3	8.04	8.098	31.3	31.5
30	30.009	29.996	30.02	30.041	0.011	0.045	30.000	30.021	-0.009	0.025	29.983	29.996	-0.026	0.000	8 X 3.3	8.04	8.098	33.3	33.5
>30	k6		F7		H7		K6												
	+0.018 / 32.018	+0.002 / 32.002	+0.025 / 32.025	+0.050 / 32.050	+0.007 / 0.007	+0.048 / 0.048	0.000 / 32.000	+0.025 / 32.025	-0.018 / -0.018	+0.023 / 0.023	-0.013 / 31.987	+0.003 / 32.003	-0.031 / -0.031	+0.001 / 0.001	10 X 3.3	10.04	10.098	35.3	35.5
32	32.018	32.002	32.025	32.050	0.007	0.048	32.000	32.025	-0.018	0.023	31.987	32.003	-0.031	0.001	10 X 3.3	10.04	10.098	38.3	38.5
35	35.018	35.002	35.025	35.050	0.007	0.048	35.000	35.025	-0.018	0.023	34.987	35.003	-0.031	0.001	10 X 3.3	10.04	10.098	41.3	41.5
38	38.018	38.002	38.025	38.050	0.007	0.048	38.000	38.025	-0.018	0.023	37.987	38.003	-0.031	0.001	10 X 3.3	10.04	10.098	44.3	44.5
40	40.018	40.002	40.025	40.050	0.007	0.048	40.000	40.025	-0.018	0.023	39.987	40.003	-0.031	0.001	12 X 3.3	12.05	12.12	43.3	43.5
42	42.018	42.002	42.025	42.050	0.007	0.048	42.000	42.025	-0.018	0.023	41.987	42.003	-0.031	0.001	12 X 3.3	12.05	12.12	45.3	45.5
45	45.018	45.002	45.025	45.050	0.007	0.048	45.000	45.025	-0.018	0.023	44.987	45.003	-0.031	0.001	14 X 3.8	14.05	14.12	48.8	49
48	48.018	48.002	48.025	48.050	0.007	0.048	48.000	48.025	-0.018	0.023	47.987	48.003	-0.031	0.001	14 X 3.8	14.05	14.12	51.8	52
50	50.018	50.002	50.025	50.050	0.007	0.048	50.000	50.025	-0.018	0.023	49.987	50.003	-0.031	0.001	14 X 3.8	14.05	14.12	53.8	54
>50	m6		F7		H7		K7												
	+0.030 / 55.030	+0.011 / 55.011	+0.030 / 55.030	+0.060 / 55.060	0 / 0.000	+0.049 / 0.049	0.000 / 55.000	+0.030 / 55.030	-0.030 / -0.030	+0.019 / 0.019	-0.021 / 54.979	+0.009 / 55.009	-0.051 / -0.051	-0.002 / -0.002	16 X 4.3	16.05	16.12	59.3	59.5
55	55.030	55.011	55.030	55.060	0.000	0.049	55.000	55.030	-0.030	0.019	54.979	55.009	-0.051	-0.002	16 X 4.3	16.05	16.12	60.3	60.5
56	56.030	56.011	56.030	56.060	0.000	0.049	56.000	56.030	-0.030	0.019	55.979	56.009	-0.051	-0.002	18 X 4.4	18.05	18.12	64.4	64.6
60	60.030	60.011	60.030	60.060	0.000	0.049	60.000	60.030	-0.030	0.019	59.979	60.009	-0.051	-0.002	18 X 4.4	18.05	18.12	67.4	67.6
63	63.030	63.011	63.030	63.060	0.000	0.049	63.000	63.030	-0.030	0.019	62.979	63.009	-0.051	-0.002	18 X 4.4	18.05	18.12	67.4	67.6
65	65.030	65.011	65.030	65.060	0.000	0.049	65.000	65.030	-0.030	0.019	64.979	65.009	-0.051	-0.002	18 X 4.4	18.05	18.12	69.4	69.6
70	70.030	70.011	70.030	70.060	0.000	0.049	70.000	70.030	-0.030	0.019	69.979	70.009	-0.051	-0.002	20 X 4.9	20.065	20.149	74.9	75.1
71	71.030	71.011	71.030	71.060	0.000	0.049	71.000	71.030	-0.030	0.019	70.979	71.009	-0.051	-0.002	20 X 4.9	20.065	20.149	75.9	76.1
75	75.030	75.011	75.030	75.060	0.000	0.049	75.000	75.030	-0.030	0.019	74.979	75.009	-0.051	-0.002	20 X 4.9	20.065	20.149	79.9	80.1
80	80.030	80.011	80.030	80.060	0.000	0.049	80.000	80.030	-0.030	0.019	79.979	80.009	-0.051	-0.002	22 X 5.4	22.065	22.149	85.4	85.6
>80	m6		F7		H7		M7												
	+0.035 / 85.035	+0.013 / 85.013	+0.036 / 85.036	+0.071 / 85.071	+0.001 / 0.001	+0.058 / 0.058	0.000 / 85.000	+0.035 / 85.035	-0.035 / -0.035	+0.022 / 0.022	-0.035 / 84.965	0.000 / 85.000	-0.070 / -0.070	-0.013 / -0.013	22 X 5.4	22.065	22.149	90.4	90.6
85	85.035	85.013	85.036	85.071	0.001	0.058	85.000	85.035	-0.035	0.022	84.965	85.000	-0.070	-0.013	22 X 5.4	22.065	22.149	90.4	90.6
90	90.035	90.013	90.036	90.071	0.001	0.058	90.000	90.035	-0.035	0.022	89.965	90.000	-0.070	-0.013	25 X 5.4	25.065	25.149	95.4	95.6
95	95.035	95.013	95.036	95.071	0.001	0.058	95.000	95.035	-0.035	0.022	94.965	95.000	-0.070	-0.013	25 X 5.4	25.065	25.149	100.4	100.6
100	100.035	100.013	100.036	100.071	0.001	0.058	100.000	100.035	-0.035	0.022	99.965	100.000	-0.070	-0.013	28 X 6.4	28.065	28.149	106.4	106.6
>100	m6		F7		H7		P7												
	+0.035 / 110.035	+0.013 / 110.013	+0.036 / 110.036	+0.071 / 110.071	+0.001 / 0.001	+0.058 / 0.058	0.000 / 110.000	+0.035 / 110.035	-0.035 / -0.035	+0.022 / 0.022	-0.059 / 109.979	-0.024 / 109.976	-0.094 / -0.094	-0.037 / -0.037	28 X 6.4	28.065	28.149	116.4	116.6
110	110.035	110.013	110.036	110.071	0.001	0.058	110.000	110.035	-0.035	0.022	109.979	109.976	-0.094	-0.037	28 X 6.4	28.065	28.149	116.4	116.6
120	120.035	120.013	120.036	120.071	0.001	0.058	120.000	120.035	-0.035	0.022	119.941	119.976	-0.094	-0.037	32 X 7.4	32.08	32.18	127.4	127.6
>120	m6		F7		H7		P7												
	+0.040 / 125.040	+0.015 / 125.015	+0.043 / 125.043	+0.083 / 125.083	+0.003 / 0.003	+0.068 / 0.068	0.000 / 125.000	+0.040 / 125.040	-0.040 / -0.040	+0.025 / 0.025	-0.068 / 124.932	-0.028 / 124.972	-0.108 / -0.108	-0.043 / -0.043	32 X 7.4	32.08	32.18	132.4	132.6
125	125.040	125.015	125.043	125.083	0.003	0.068	125.000	125.040	-0.040	0.025	124.932	124.972	-0.108	-0.043	32 X 7.4	32.08	32.18	132.4	132.6
130	130.040	130.015	130.043	130.083	0.003	0.068	130.000	130.040	-0.040	0.025	129.932	129.972	-0.108	-0.043	32 X 7.4	32.08	32.18	137.4	137.6
140	140.040	140.015	140.043	140.083	0.003	0.068	140.000	140.040	-0.040	0.025	139.932	139.972	-0.108	-0.043	36 X 8.4	36.08	36.18	148.4	148.7
150	150.040	150.015	150.043	150.083	0.003	0.068	150.000	150.040	-0.040	0.025	149.932	149.972	-0.108	-0.043	36 X 8.4	36.08	36.18	158.4	158.7
160	160.040	160.015	160.043	160.083	0.003	0.068	160.												

Engineering

Temperature ratings

Element type	Minimum	Maximum ⁽¹⁾
Standard element	-43°C	105°C
Armored element	-43°C	105°C

(1) Reference high temperature adjustment factors for applications in excess of 80°C

High temperature adjustment factors

Temperature range	Adjustment
82°C - 93°C	+ 0.75
94°C - 105°C	+ 1.0

High temperature adjustment factors are only to be added to the standard system service factors as needed. High temperature service factors are not included in the standard application service factor in order to prevent oversizing coupling selections.

Bore ranges

Coupling size	Finished bore			Taper-Lock	
	Minimum bore	Max. bore ⁽¹⁾	Bushing size	Minimum bore	Max. bore ⁽²⁾
E2M	-	28	-	-	-
E3M	-	35	1008	14	25
E4M	-	42	1008	14	25
E5M	-	48	1210	14	32
E10M	-	54	1610	14	35
E20M	-	60	1610	14	42
E30M	-	73	2012	14	50
E40M	-	85	2517	14	65
E50M	-	92	2517	14	65
E60M	-	101	3020	24	80
E70M	-	114	3535	32	95
E80M	-	152	4040	40	105
E100M	63	171	4535	55	125
E120M	75	190	5040	70	127
E140M	85	228	7060	125	180

(1) Larger bore capacities available. Contact Dodge Engineering for additional details.

(2) With steel Dodge bushings and/or shallow keyway

Torsional stiffness

Size	Static torsional stiffness (Nm/degree)
E2M	153
E3M	213
E4M	306
E5M	645
E10M	758
E20M	798
E30M	1828
E40M	2925
E50M	5205
E60M	9166
E70M	12337
E80M	18612
E100M	29779
E120M	47646
E140M	76235

• Values are shown for an ambient temperature of 24°C

• Values are nominal and may vary by +/- 20%

• Torsional stiffness values are for both the standard Natural Rubber and Armored Element

Elastomer chemical compatibility

Substance	Natural rubber		Substance	Armored element	
	Natural rubber	Armored element		Natural rubber	Armored element
Acetic acids	2	3	Hydrobromic acid (40%)	1	2
Acetic anhydride	2	3	Kerosene	3	2
Alcohols, monohydric	2	nd	Lacquers	3	3
Ammonia anhydrous	3	2	Lead sulfamate	2	nd
ASTM A oils	3	1	Mineral oil	3	1
Animal fast	3	2	Naphtha	3	2
Benzene	3	3	Nickel chloride	1	3
Carbonic acid	3	3	Nitric acid (10%)	1	3
Calcium bisulfite	2	nd	Ozone	3	1
Chloracetone	2	3	Petroleum (<250°F)	3	2
Chloroacetic acid	2	3	Potassium dichromate	2	1
Copper sulphate	2	1	Salt water	1	2
Corn oil	2	1	Silicone oils	1	1
Diesel oil	3	2	Sulfuric acid (con.)	3	3
Fuel oil	3	2	Vinegar	2	3
Gasoline	2	2	Zinc sulfate	2	2

Ratings: 1 - Minor effect 2 - Moderate effect 3 - Severe effect nd - No data

Additional information

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