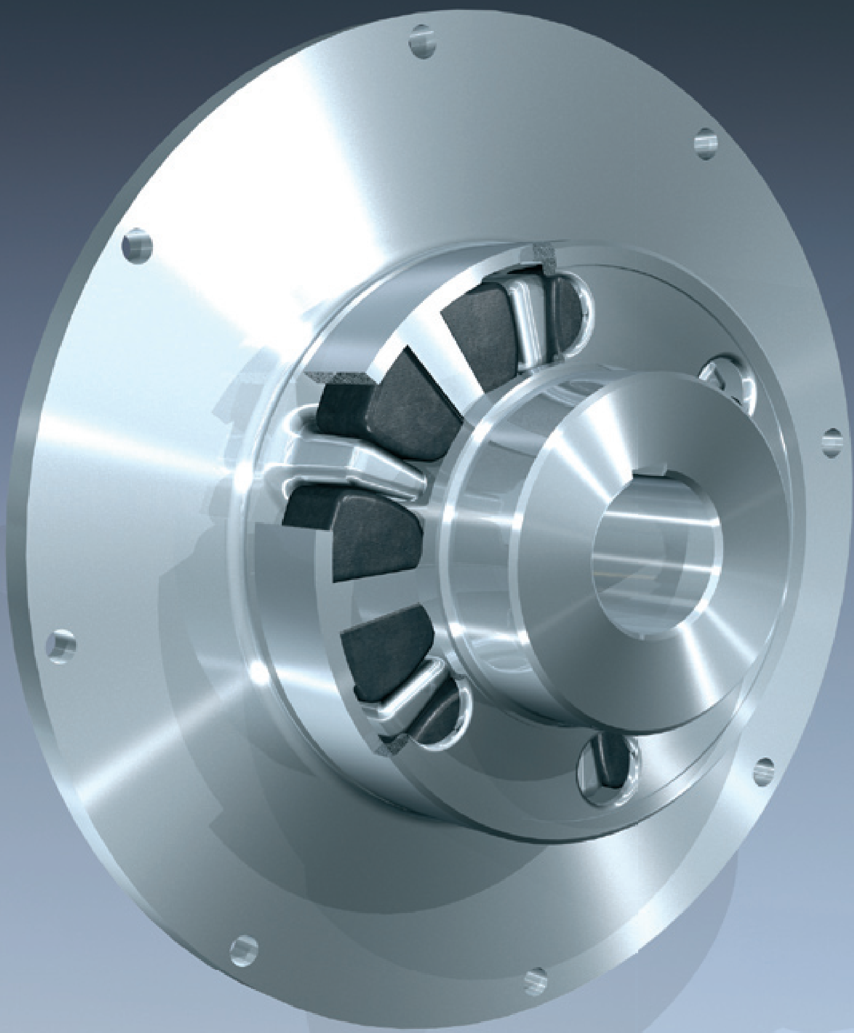
CENTAFLEX®-D

Flexible Flange Couplings
Elastische Flanschkupplungen



Catalog CF-D-10-04

Power Transmission
Leading by innovation

CENTAFLEX series D

The CENTAFLEX coupling series D are very reliable, well proven couplings for generator sets, centrifugal pumpsets and other similar drives.

Within a few short years, these couplings have gained a considerable portion of the market and with **more than 50.000 units in operation**, they belong amongst the top ranking couplings for the gen-set market.

This range was purposely designed for Diesel driven generator and similar drives. The couplings are simple and robust in design following the well-proven design principles of the claw coupling with purely compression stressed rubber elements.

In the development of the series D coupling, particular importance was attached to the following criteria:

a) Generous dimensioning of the rubber elements to ensure very low specific stress

b) Slim configuration of the claws by attention to the material selection and by careful generation of their shape to allow a long elastic length of the rubber elements. This permits relatively large angles of twist of 3°-5° at nominal torque (depending on size).

The resulting characteristics provide a range of couplings with relatively low torsional stiffness. The critical rotational speeds (resonances) of the drive, even when the engine has few cylinders, are usually placed below the operation speed of the drive. By using elements of various shorehardnesses it is possible to further adjust the resonance speed and torque characteristics so that a good torsional vibration situation is generally achieved with commercial engines and generators.

The couplings are designed as standard to mount direct to SAE standard flywheels, but in addition special designs for non-standard flywheels are readily available.

Important areas of application:

The CENTAFLEX Series D is a coupling of medium stiffness (torsional angle at rated torque of about 3-5°), which is usually used for drives with overcritical operation, i.e. the working speeds are above the main resonance speed. The secondary inertia, therefore, should not be too small and working speed should not be too low.

Such conditions are normally provided in drives for gensets, pumping sets, blowers etc.

The coupling is suitable for flange mounted and non-flange mounted sets (please see allowable misalignment, page 4).

If the set is not flange-mounted, then the engine should not be placed on flexible mounts, because these get a permanent set as time passes and this results in greater misalignment. In this case, we recommend mounting both the engine and driven unit rigidly on a common frame and installing this frame on flexible mounts.

Important characteristics and advantages:

* simple, robust, safe in operation, compact, non-lubricated, fail safe
* generously dimensioned, low stress, rubber in compression elements, air cooled
* carefully tuned torsional stiffness to provide favourable torsional vibration characteristics, available with different shorehardness elements, progressive stiffness curve
* dampens vibrations and shocks, accepts axial, radial and angular misalignments
* simple installation, even with flange mounted driven units since the couplings are "blind fitting"
* widely variable design for all standard and non-standard fitting dimensions
* competitively priced and readily available from stock.

Design components

The flange part (item 1) is dimensioned to correspond to the most common flywheel dimensions to comply with SAE standard J620. In addition, there are numerous special designs for non-standard flywheels.
Due to the special manufacturing methods employed, it is possible to virtually make any flywheel connection economical.
The hub (item 2) on the output or driven side, is manufactured in two lengths, except sizes 425 and 560.
With the short hub, the coupling mounting dimensions correspond to DIN 6281 (fitting dimensions for generators and reciprocating engines).
The long hub is intended for other non-standard mounting dimensions. By shortening the long hub, it will of course be possible to achieve any intermediate mounting dimension.

Design sizes

The CENTAFLEX series D couplings comprise six design sizes for nominal torques from 250 to 40.000 Nm. This range will in practice cater for all Diesel engines from 3 cylinders upwards to include ratings up to 5.000 kW (approx. 6800 HP) at 1500 rpm.

Materials :

Rubber Elements:
Standard design: NBR
Special synthetic rubber compound to provide oil resistant, abrasion resistant elements.
Allowable temperatures
-25 up to +90°C
-50° with special material
Temperature factor: see diagram on page 7
Shorehardnesses: 50, 60 and 75 Shore A, dependant upon torsional stiffness required.
Special qualities of rubber elements can be provided where sufficient quantities are envisaged.

Flange (item 1)
Steel or similar material of 400 N/mm² approximate tensile strength.

Hub (item 2)
Nodular cast iron (GGG50) in Meehanite Quality SF 500.

Alternative couplings :

As an alternative to the series D couplings, we also have our CENTAMAX range of highly flexible couplings.

Both these ranges allow difficult applications such as misfiring or flikker-free light to be correctly engineered. Furthermore, the **CENTAMAX** couplings are free of backlash and provide overload protection.

The basic difference: the CENTAFLEX series D has a progressive stiffness characteristic, whereas CENTAMAX has a linear one.

The CENTAMAX series covers the range from small 1-cylinder engines up to engines with many cylinders and about 6000 kW capacity (catalogue CM).

For small Diesel engines with 1 or 2 cylinders (and some 3 cylinder engines) we recommend our original well-proven **CENTAFLEX series A** highly flexible couplings (catalogue CF-A). We supply complete coupling kits for such engines with, in some cases, additional flywheel masses in order to ensure proper control of torsional vibrations and flicker-free light.

We thus offer a comprehensive range of couplings for generator drives from small single cylinder engines of flow power up to engines rated at 2.500 kW.

Furthermore we have the broad experience and know-how for application engineering and calculation of torsional vibrations with our own computer program.

It will be worth your while to talk to the CENTA engineers. Our "know how" guarantees advice, based on field experience, that will provide couplings which are completely satisfactory in service.

CENTA

CENTAFLEX series D coupling selection for diesel engine driven generator drives

We have prepared selection charts for CENTAFLEX-D couplings to suit engines from the following manufacturers amongst others:

Caterpillar
Cummins
DAF
Daimler Benz
Fiat Aifo
Ford
GM Detroit Diesel
Hatz
KHD - Deutz
MAN
MWM
Perkins Rolls Royce
Saab Scania
Volvo Penta
VW

These charts contain, amongst other details, the engine type, engine flywheel number, coupling size and shorehardness, minimum and maximum limiting values Jgmin and Jgmax for mass moment of inertia of generators.

Where the mass moment of inertia of the generator to be driven is within the limits of J, the drive is satisfactory with regard to torsional vibration, and there is no need for individual torsional vibration calculation calculations to be made (disregarding engine drive with intermittently operating cylinders).

By a simple comparison of figures therefore, engineers are able to quickly ascertain whether or not the torsional vibration situation is correct. A perfect torsional vibration situation is the most important condition for smooth operation and long service life of any flexible coupling. It is therefore, in your interest to make this easy check (or allow us to do so) for each individual case.

Selection

For other applications and for generators whose mass moment of inertia is outside the stated limits, we request that full details of the proposed drives are sent to us. We can then carry out, free of charge, a torsional vibration calculation with the aid of our computer. The design of the CENTAFLEX series D couplings is such that we can frequently carry out a simple modification to the standard coupling to procedure a satisfactory drive installation.

NOTE: Older technical literature frequently quotes the value GD^2 (Kpm^2) for inertia in place of the new inertia unit $J(kgm^2)$.

$$J = m \cdot r^2 = m \cdot \frac{D^2}{4} = \frac{GD^2}{4} (kgm^2)$$

i.e. the numerical value of GD^2 (Kpm^2) should be divided by 4 in order to obtain the numerical values of $J(kgm^2)$.

Should you wish to design the coupling yourself, then it is important to follow the procedure given in standard DIN 740 sheet 2. The low design stress induced in the rubber elements permit the engine torque to closely match the nominal torque rating of the coupling, but in general a minimum operation factor of 1,5 should be used.

Where:

$T_{KN} \geq T_M \times 1,5$

T_{KN} = nominal torque of the coupling

T_M = Maximum torque of the engine

All necessary coupling data for torsional vibration calculations is stated in this catalogue.

Balancing

If nothing else has been agreed, the couplings are normally balanced as follows:

All flanges 1 of size 350 with dimensions according to SAE 14 (466,7∅) and larger.

All hubs 2 of sizes 350 and 425 if delivered with finished bore and keyway.

We dynamically balance in one plane with quality Q6,3 for 1800 rpm.

Classification

The couplings can be supplied in accordance with the requirements of the leading classification societies. However, if this is required, it must be specified at the time of the initial enquiry and when ordered.

The couplings have general type approval from the following societies. Please ask for details.

Bureau Veritas
Det Norske Veritas
Germanischer Lloyd
Lloyds Register of Shipping
RINA

For couplings which are to be classified, we need the following data:

Name of society
Main or auxiliary drive
Technical data of the engine
Technical data of the generator
Shipowner
Name of the shipyard
Shipyard no.

Misalignment

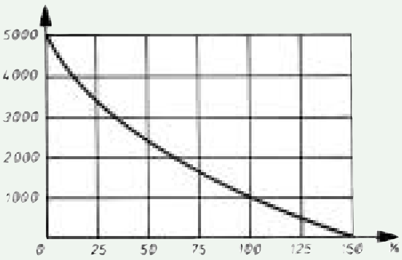
The couplings can accommodate the following maximum misalignment:

angular: 1 degree
radial : 0.5 mm
axial : $\pm^{2}_{1}$

These values for angular and radial misalignment are based on 1000 rpm. For other speeds convert according to the following diagram.

Since radial and angular misalignment causes relative movement each revolution, it is advisable to have the best possible alignment especially on higher speed installations to ensure long coupling life and smooth running.

Permissible angular and radial misalignment is dependant upon the speed when utilising the nominal torque capacity.



CENTAFLEX series D technical data

CENTAFLEX D size	Shore-hardness Shore A	nominal torque T_{KN} (Nm)	maximum torque T_{Kmax} (Nm)	continuous vibr.torque ± T_{KW} (Nm) at 10 Hz	Dynamic torsional stiffness * C_{Tdyn} x 10^3 Nm/rad at 0,25 T_{KN}	0,50 T_{KN}	0,75 T_{KN}	1,00 T_{KN}	maximum speed n n_{max} (min^{-1})
160	50	280	1000	140	2,8	4,8	7,5	11,5	6200
	60	400	1400	200	4,2	6,8	11,4	18,0	
	75	600	1800	300	8,0	13,5	22,5	33,0	
198	50	560	2000	280	6,5	11,0	19,0	29,0	5000
	60	800	2800	400	10,0	16,0	25,0	38,0	
	75	1200	3600	600	18,0	30,0	45,0	64,0	
220	50	1250	3750	750	19,0	32,0	47,0	64,0	4500
	60	1600	5600	800	28,0	43,0	62,0	86,0	
	75	2500	7500	1250	44,0	64,0	88,0	120,0	
275	50	2500	7500	1500	34,0	58,0	92,0	135,0	3600
	60	3200	11200	1600	55,0	95,0	145,0	220,0	
	75	5000	15000	2500	90,0	150,0	255,0	400,0	
350	50	5000	20000	3000	100,0	145,0	205,0	280,0	2800
	60	6400	22400	3200	160,0	220,0	315,0	435,0	
	75	10000	30000	5000	260,0	390,0	560,0	750,0	
425	50	10000	40000	6000	150,0	220,0	320,0	430,0	2300
	60	12800	44800	6400	260,0	380,0	520,0	680,0	
	75	20000	60000	10000	400,0	640,0	950,0	12000,0	
560	50	20000	60000	12000					2000
	60	25600	89600	12800	on request				
	75	40000	120000	20000					

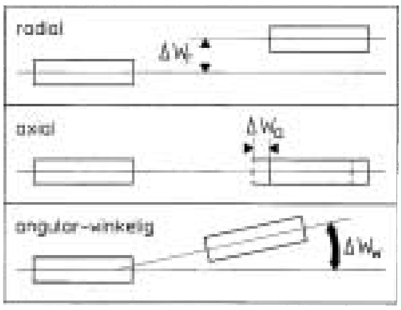
In order to tune the torsional vibration situation, various shorehardnesses are available, which will result in different transmittable torque values.

Element markings:
50 Shore: black with yellow dot
60 Shore: black
75 Shore: black with red dot

Technical data according DIN 740-2
* variablevalue because or progressive characteristic

The above mentioned technical data refers only to the couplings as such. No guarantee is offered or intended that, for example, the bolts attaching the flywheel flange onto the flywheel can always transmit these torques, especially when relatively small flanges are used. In these cases additional or larger bolts and / or dowel pins must be provided. If there are several SAE flange fittings provided in the flywheel, the largest one should be preferred. It is the responsibility of the customer to check this point as well as other points such as the dimensions of shafts and keys, or any other connection to the coupling.

Misalignment



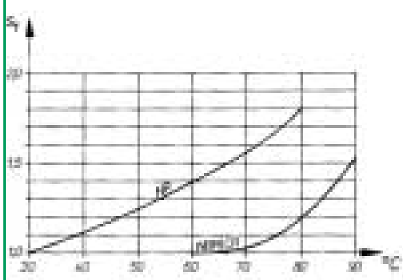
Frequency faktor S_f

f in Hz	£ 10	> 10
S_f	1	$\sqrt{\frac{f}{10}}$

Resonance factor V_R
Relative damping ψ

Perbunan (NBR)		
Shore	V_R	ψ
50-60	7,5	0,84
70	6,5	0,97

Temperature factor S_t



NR natural rubber
NBR Perbunan, Nitrile
CR Chloroprene, Neoprene

Standard types for generators to DIN 6281 - Flanges to SAE J620

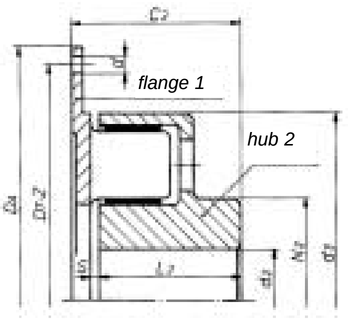
CENTAFLEX D size	SAE J620	DIN 6281 generator size	C3	L2	d2 min.	d2 max.	N2	d3	S ± 1	d4 +3	T +3	weight kg	mass moment of inertia J kgm² Primary	mass moment of inertia J kgm² Secondary	Order code
160	10”	A	73	55	--	60	90	160	4	--	--	8,7	0,0621	0,0098	CF-D-160-*-10- 73-**
160	11½”	A	59	55	--	60	90	160	4	300	10	11,2	0,0724	0,0098	CF-D-160-*-11- 59-**
198	10”	A	73	58	--	70	115	198	4	225	2	13,1	0,0681	0,0257	CF-D-198-*-10- 73-**
198	10”	BCD	121	106	--	75	115	198	4	225	2	15,3	0,0681	0,0295	CF-D-198-*-10-121-**
198	11½”	BCD	107	82	--	75	115	198	4	--	--	16,4	0,1251	0,0272	CF-D-198-*-11-107-**
198	14”	BCD	93	82	--	75	115	198	4	345	6	24,4	0,3716	0,0272	CF-D-198-*-14- 93-**
220	11½”	BCD	107	82	--	80	124	220	4	--	--	19,8	0,1328	0,0498	CF-D-220-*-11-107-**
220	14”	BCD	93	82	--	80	124	220	4	345	6	26	0,3746	0,0498	CF-D-220-*-14- 93-**
275	11½”	BCDE	107	82	--	95	145	275	4	--	--	29,5	0,1743	0,1384	CF-D-275-*-11-107-**
275	14”	BCDE	93	82	--	95	145	275	4	345	6	28,6	0,4044	0,1384	CF-D-275-*-14- 93-**
275	16”	EF	83	82	--	95	145	275	4	450	15	41,8	0,6850	0,1384	CF-D-275-*-16- 83-**
350	11½”	EF	107	90	65	120	192	350	4	--	--	47,0	0,2377	0,4371	CF-D-350-*-11-107-**
350	14”	EF	93	90	65	120	192	350	4	396	15	55,5	0,6640	0,4371	CF-D-350-*-14- 93-**
350	16”	EF	83	90	65	120	192	350	4	450	25	59,0	0,7455	0,4371	CF-D-350-*-16- 83-**

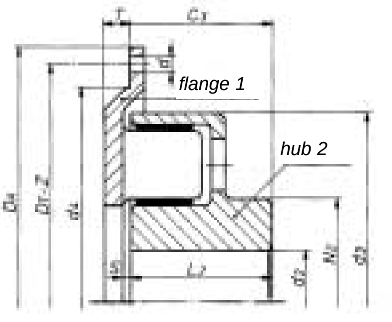
Standard types, different from DIN 6281 - Flanges to SAE J620

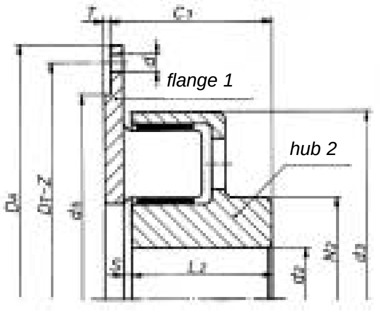
CENTAFLEX D size	SAE J620	C3	L2	d2 min.	d2 max.	N2	d3	S ± 1	d4 +3	T +3	weight kg	mass moment of moment J kgm² Primary	mass moment of moment J kgm² Secondary	Order code
160	8”	73	55	--	60	90	160	4	--	--	7,2	0,0319	0,0098	CF-D-160-*-8-73-**
160	8”	110	92	--	60	90	160	4	--	--	8,8	0,0319	0,0112	CF-D-160-*-8-110-**
160	10”	110	92	--	60	90	160	4	--	--	10,3	0,0621	0,0112	CF-D-160-*-10-110-**
160	11½”	96	92	--	60	90	160	4	300	10	12,8	0,0724	0,0112	CF-D-160-*-11-96-**
198	10”	97	82	--	75	115	198	4	225	2	14,1	0,0681	0,0272	CF-D-198-*-10-97-**
198	11½”	131	106	--	75	115	198	4	--	--	17,6	0,1251	0,0295	CF-D-198-*-11-131-**
198	14”	117	106	--	75	115	198	4	345	6	25,6	0,3716	0,0295	CF-D-198-*-14-117-**
220	11½”	147	122	--	85	124	220	4	--	--	22,0	0,1328	0,0545	CF-D-220-*-11-147-**
220	14”	133	122	--	85	124	220	4	345	6	29,9	0,3746	0,0545	CF-D-220-*-14-133-**
275	11½”	167	142	--	100	145	275	4	--	--	35,2	0,1743	0,1550	CF-D-275-*-11-167-**
275	14”	153	142	--	100	145	275	4	345	6	34,4	0,4044	0,1550	CF-D-275-*-14-153-**
275	16”	143	142	--	100	145	275	4	450	15	47,6	0,6850	0,1550	CF-D-275-*-16-143-**
350	11½”	167	150	65	130	192	350	4	--	--	57,0	0,2377	0,4910	CF-D-350-*-11-167-**
350	14”	153	150	65	130	192	350	4	396	15	65,5	0,6640	0,4910	CF-D-350-*-14-153-**
350	16”	143	150	65	130	192	350	4	450	25	69,0	0,7455	0,4910	CF-D-350-*-16-143-**
350	18”	120	90	65	120	192	350	4	--	--	67,0	1,5006	0,4371	CF-D-350-*-18-120-**
350	18”	180	150	65	130	192	350	4	--	--	77,0	1,5006	0,4910	CF-D-350-*-18-180-**
425	16”	210	180	85	155	240	425	5	427	10	112,7	1,1523	1,3104	CF-D-425-*-16-210-**
425	18”	210	180	85	155	240	425	5	427	10	115,6	1,3678	1,3104	CF-D-425-*-18-210-**
425	21”	214	180	85	155	240	425	5	427	10	129,6	2,5506	1,3104	CF-D-425-*-21-214-**
425	24”	214	180	85	155	240	425	5	427	10	135,9	3,3279	1,3104	CF-D-425-*-24-214-**
560	24”	290	240	120	220	330	560	6	550	20	275,5	6,0572	5,0808	CF-D-560-*-24-290-**

* indicate shorehardness here
** state finished bore dia d_2 here.

Dimensions







Special types, flanges different from SAE J620

CENTA FLEX D size	Motor	d2 min.	d2 max.	N2	d3	S ± 1	d5	T	DA	C3	L2	weight kg	Mass moment of inertia J kgm² Primary	Secondary	Order code
160	VW068.2/5	--	60	90	160	4	--	--	253	72	55	7,23	0,0297	0,0098	CF-D-160-*-VW068-72-**
			65							109	92	8,83	0,0297	0,0112	CF-D-160-*-VW068-109-**
160	VW075.1	--	60	90	160	4	--	--	266	72	55	7,60	0,0361	0,0095	CF-D-160-*-VW075-72-**
			65							109	92	9,20	0,0361	0,0112	CF-D-160-*-VW075-109-**
160	DB 616	--	60	90	160	4	--	--	265	72	55	7,57	0,0355	0,0098	CF-D-160-*-DB616-72-**
			65							109	92	9,17	0,0355	0,0112	CF-D-160-*-DB616-109-**
160	DB 617	--	60	90	160	4	--	--	253	72	55	7,23	0,0298	0,0098	CF-D-160-*-DB617-72-**
			65							109	92	8,83	0,0298	0,0112	CF-D-160-*-DB617-109-**
160	Perkins	--	60	90	160	4	--	--	308	73	55	8,94	0,0561	0,0098	CF-D-160-*-308-73-**
			65							110	92	10,54	0,0561	0,0112	CF-D-160-*-308-110-**
160	Ford	--	60	90	160	4	155,6	4	360	73	55	12,79	0,1552	0,0098	CF-D-160-*-155,6-73-**
			65							110	92	14,39	0,1552	0,0112	CF-D-160-*-155,6-110-**
198	Perkins	--	75	115	198	4	--	--	308	104	82	13,94	0,0645	0,0272	CF-D-198-*-308-104-**
			80							128	106	14,94	0,0645	0,0295	CF-D-198-*-308-128-**
198	Ford	--	75	115	198	4	155,6	4	360	106	82	17,84	0,1932	0,0272	CF-D-198-*-155,6-106-**
			80							130	106	18,83	0,1932	0,0295	CF-D-198-*-155,6-130-**
220	Perkins	--	80	124	220	4	260	4	310	103	82	15,28	0,0906	0,0498	CF-D-220-*-260-103-**
			85							143	122	17,48	0,0906	0,0545	CF-D-220-*-260-143-**
220	Ford	--	80	124	220	4	155,6	4	360	106	82	18,53	0,2062	0,0498	CF-D-220-*-155,6-106-**
			85							146	122	20,73	0,2062	0,0545	CF-D-220-*-155,6-146-**

If you do not find the required coupling, please ask us. There are myn further special types.

Dimensions to SAE J620

SAE J 620	D_A	D_T	Z	d
6½”	215,9	200,0	6x60°	9
7½”	241,3	222,3	8x45°	9
8”	263,5	244,5	6x60°	11
10”	314,3	295,3	8x45°	11
11½”	352,4	333,4	8x45°	11
14”	466,7	438,2	8x45°	13
16”	517,5	489,0	8x45°	13
18”	571,5	542,9	6x60°	17
21”	673,1	641,4	12x30°	17
24”	733,4	692,2	12x30°	19

Order code

CF - D - 160 - 75 - 10 - 73 - 48

- 48: Finished bore (state with order)
- 73: Overall length (dimension “C_3”)
- 10: SAE Flange size (or other significant Ø)
- 75: Shorehardness of rubber element
- 160: Size (outer diameter of hub 2)
- D: Series
- CF: CENTAFLEX (product name)

Where no details are provided, hubs will be supplied pilot bored and without slot. All data, dimensions and information in this catalog are given without guarantee. Amendments and improve-ments may be made without notice. This technical document has legal protection.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CENTA Antriebe is also represented in:
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