Fluid couplings

Hydrodynamic power transmission according to the Föttinger principle

Morskate®

A smart product for diverse applications

In general, typical applications for fluid couplings may be found where acceleration of large masses is required (e. g. conveyer belts, centrifuges), and start-up must be gentle. Fluid couplings limit starting torque and hence relieve the engine as the motor can start under low load conditions. Due to the limitation of the starting torque, the engine can reach 80-85 % of its speed within a few seconds. As the starting torque is limited by the fluid coupling, and the motor starts almost load-free, start-up current is low (Fig. 1).
In the case of overload, slip increases and motor and driven machine are protected as torque transmission via fluid coupling decreases.

Another benefit of fluid couplings is that almost no wear occurs since torque is transmitted via a fluid.
KTR offers various types of constant-fill fluid couplings in order to serve a wide range of application areas.

ATEX

KTR is actively associated with governing associations, for instance with the introduction of the ATEX product standard 94/9/EC, well known as ATEX 95. The standard defines the use of products in hazardous areas. We are here to support you, to make sure that you adhere to every safety standard and to advise you of the necessary markings.

Please consult with our technical sales engineers or your local KTR office.

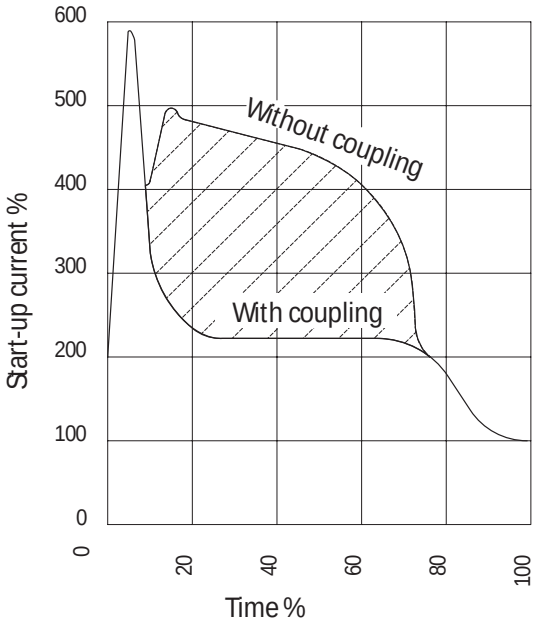


Fig. 1: Absorbed start-up current with and without fluid coupling

Hydrodynamic couplings

The operating principle of hydrodynamic couplings is based on the Föttinger principle: as opposed to the direct working principle, where, for instance, power is transmitted via mechanical couplings, hydrodynamic couplings transmit power by means of a fluid. Since torque transmission is realized via a fluid there is almost no wear in comparison to the direct working principle.

Inner drive

Figure 3 depicts a fluid coupling at standstill, during start-up and at nominal operation. During start-up the input shaft (driving side) mechanically transfers torque to the inner wheel (impeller) of the fluid coupling. Mechanical energy is converted to kinetic energy which in turn gradually accelerates the outer wheel (runner). Torque transmission from outer wheel to driven machine takes place mechanically. Due to the gradual transmission of torque by means of the hydrodynamic coupling, motors can basically start unloaded. Slippage of the coupling initially amounts to 100 % then steadily decreases as torque transmission increases, allowing for a soft start-up. An even softer start-up can be realized by fitting fluid couplings with delay chambers (Fig. 2).

Before start-up fluid rests in both the working circuit and the delay chamber. After run-up of the motor, the entire fluid gradually flows into the working circuit, thus providing for an even slower and softer start-up.

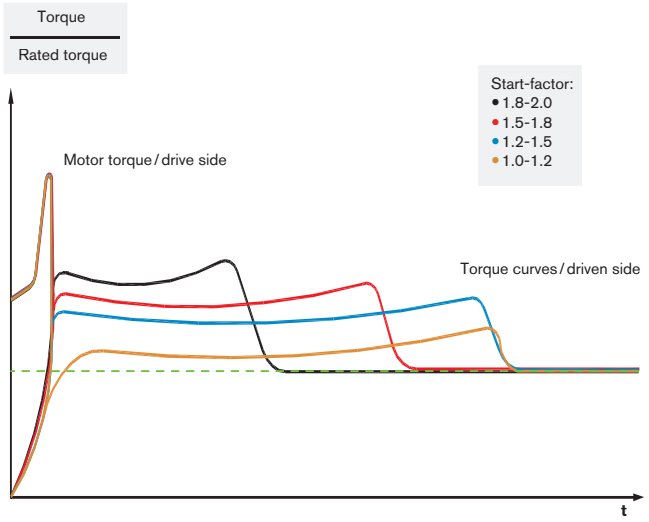


Fig. 2: Torque curves of fluid coupling with no delay chambers and delay chambers of varying sizes

Outer drive

The driving end mechanically transfers torque to the outer wheel. Mechanical energy is converted to kinetic energy which in turn gradually accelerates the outer wheel (runner). Torque transmission from outer wheel to driven machine takes place mechanically.

Slip at nominal speed

The slip of hydrodynamic couplings at nominal speed varies depending on coupling size and oil filling level.

Stand-still **Start-up** **Nominal operation**

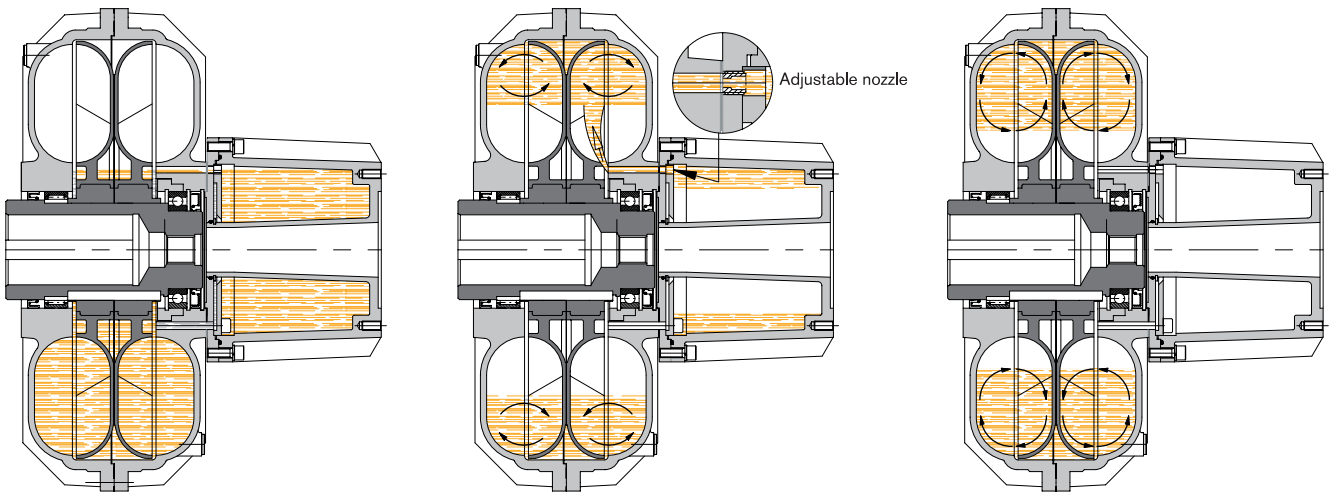


Fig. 3: Working principle of fluid

Hydrodynamic couplings at a glance

KTR offers an extensive range of fluid couplings for standard IEC motors and NEMA motors. Different requirements and fluid coupling types as well as designs entail and necessitate varying performance data:

- We can cover differing power ranges depending on speed and type of hydraulic coupling
- Fluid couplings may be supplied for vertical assembly
- Starting torque may be limited to 100 % - 200 % of nominal motor torque

Further, KTR can supply various types:

- Depending on required starting torque single, double and enlarged delay chambers may be supplied.
- Fluid coupling with pulley
- Inner or outer drive
- Fluid couplings that provide for mechanical lock-up at nominal speed thus preventing slippage

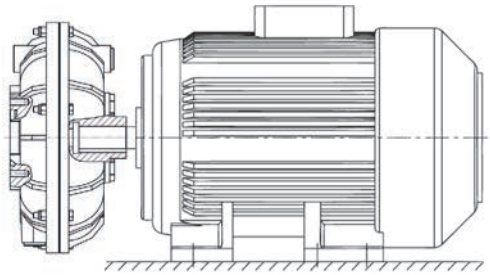
Complementary KTR-products

Our fluid couplings may be complemented with our flexible, gear-type and torsionally stiff couplings. Examples are given below:

- **ROTEX®, ROTEX® type CF**
- **REVOLEX®**
- **POLY-NORM®**
- **GEARex®**

If long distances need to be bridged, KTR's coupling RADEX®-N type NANA, with composite spacer, is recommended. KTR can also provide brake discs/drums if required as well as disc brakes (hydraulically and spring applied).

IEC - motors - selection

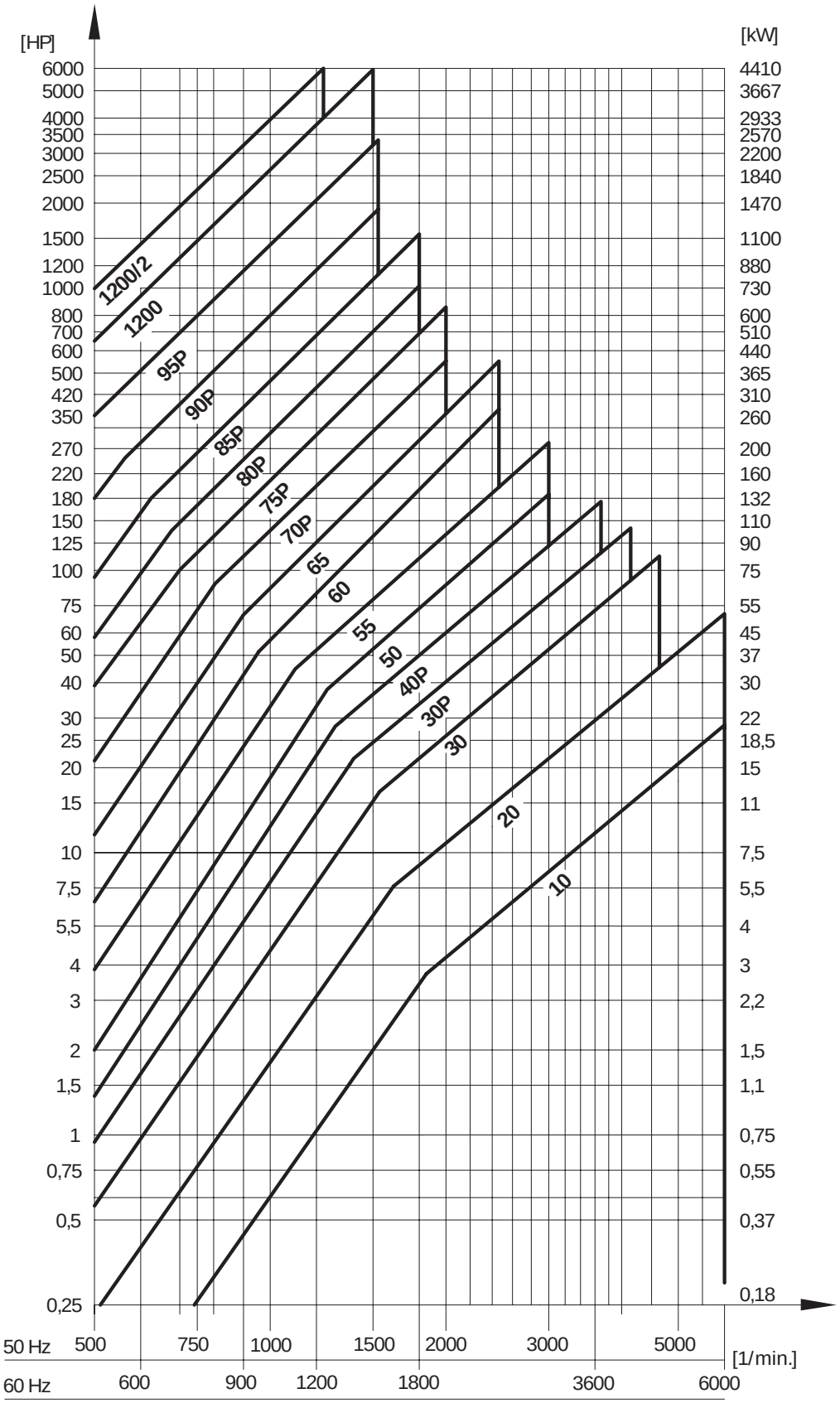


Fluid couplings for IEC - motors [1)]

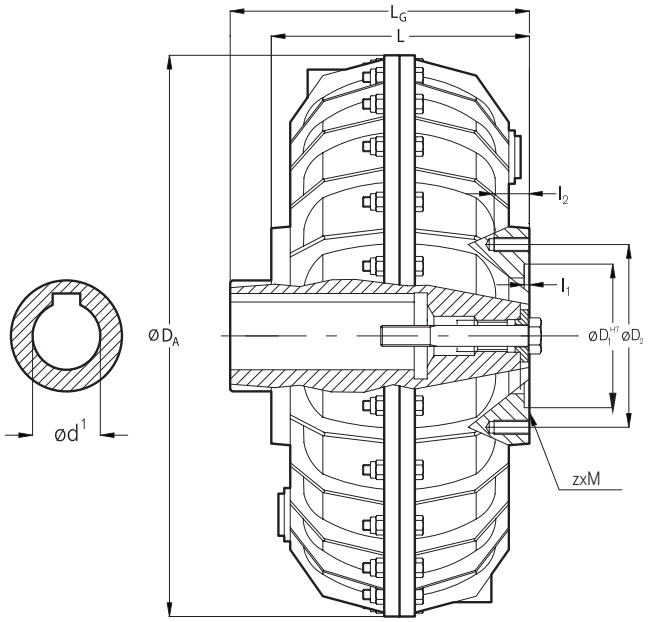
Motors			Motor speed 50 Hz												Motor speed 60 Hz					
			8-pole			6-pole			4-pole			2-pole			6-pole			4-pole		
			750 1/min			1000 1/min			1500 1/min			3000 1/min			1200 1/min			1800 1/min		
Size	Shaft end dxl [mm]		kW	HP	Coupling	kW	HP	Coupling	kW	HP	Coupling	kW	HP	Coupling	kW	HP	Coupling	kW	HP	Coupling
71	14x30					0,25	0,33		0,25	0,33		0,37	0,5		0,25	0,33		0,25	0,35	
								10	0,37	0,5		0,55	0,75					0,37	0,5	
80	19x40					0,37	0,5		0,55	0,75	10	0,75	1		0,37	0,5	10	0,55	0,75	
						0,55	0,75		0,75	1		1,1	1,5	10	0,55	0,75		0,75	1	10
90S	24x50					0,75	1	20	1,1	1,5		1,5	2		0,75	1		1,1	1,5	
90L			0,55	0,75	20	1,1	1,5		1,5	2		2,2	3		1,1	1,5		1,5	2	
100L	28x60		1,1	1,5	30	1,5	2	30	2,2	3	20	3	4		1,5	2	20	2,2	3	
									3	4								3	4	
112M			1,5	2		2,2	3		4	5,5		4	5,5		2,2	3		4	5,5	20
132S	38x80		2,2	3	30P	3	4	30P	5,5	7,5	30	5,5	7,5		3	4	30	5,5	7,5	
												7,5	10							
132M			3	4	40P	4	5,5		7,5	10		5,5	7,5	20	4	5,5		7,5	10	
						5,5	7,5					7,5	10		5,5	7,5				
160M	42x110		4	5,5	50	7,5	10	40P	11	15	30P	11	15		7,5	10	30P	11	15	30
												15	20							
160L			7,5	10	55	11	15	50	15	20		18,5	25		11	15		15	20	
180M	48x110		11	15		15	20		18,5	25	40P	22	30	30	15	20	40P	18,5	25	30P
180L									22	30					15	20		22	30	
200L	55x110		15	20	60	18,5	25	55	30	40	50	30	40		18,5	25	50	30	40	40P
						22	30					37	50		22	30				
225S	55x110	60x140	18,5	25		30	40		37	50		45	60	30P				37	50	50
225M			22	30	65			60	45	60	55	45	60		30	40	55	45	60	
250M	60x140	65x140	30	40		37	50	65	55	75		55	75	40P	37	50		55	75	55
280S		75x140	37	50	70P	45	60		75	100	60	75	100		45	60	60	75	100	
280M			45	60		55	75	70P	90	125		90	125	50	55	75		90	125	60
315S	65x140		55	75	75P	75	100		110	150	65	110	150		75	100	65	110	150	
		80x170	75	100		90	125	75P	132	180		132	180		90	125		132	180	65
315M			90	125		110	150		160	220	70P	160	220	55	110	150	70P	160	220	
			110	150	80P	132	180		200	270					132	180		200	270	
355S	75x140	95x170	132	180		160	220	80P	250	340					160	220		250	340	70P
					85P						75P						75P			
355M			160	220		200	270	85P	315	430					200	270		315	430	75P
			200	270	90P	250	340								250	340	80P			
Non standard motors			330	450	90P	370	500	85P	510	700	80P				310	420	80P	440	600	75P
			600	800	95P	600	800	90P	810	1100	85P				440	600	85P	700	950	80P
			1000	1360	1200	1000	1360	95P	1300	1740	90P				800	1100	90P	1000	1360	85P
			1550	2100	1200/2	2000	2720	1200	2300	3100	95P				1380	1880	95P			
						3200	4350	1200/2	3850	5250	1200				2580	3500	1200			
															4200	5710	1200/2			

[1)] Fluid couplings available for NEMA - motors

Selection diagram



Type K



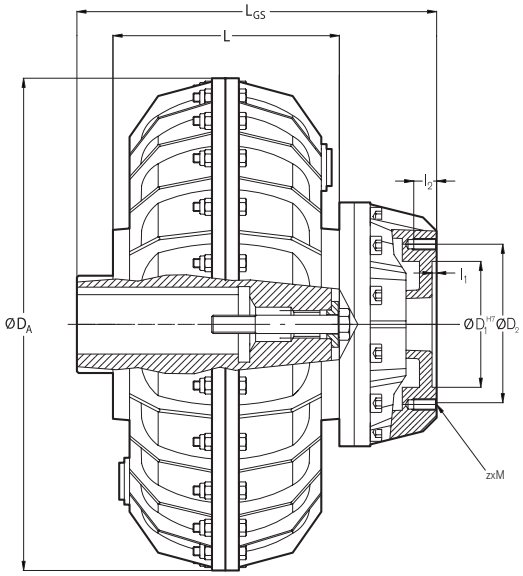
- Basic version of constant fill couplings
- Consists of pump and turbine wheel, outer shell
- Starting factor: 1.8-2
- Inner and outer drive possible:
- The coupling is usually mounted on the motor shaft (inner drive). Outer drive on request (coupling is mounted on gearbox shaft).
- Flexible couplings are used to compensate for misalignments

Technical data

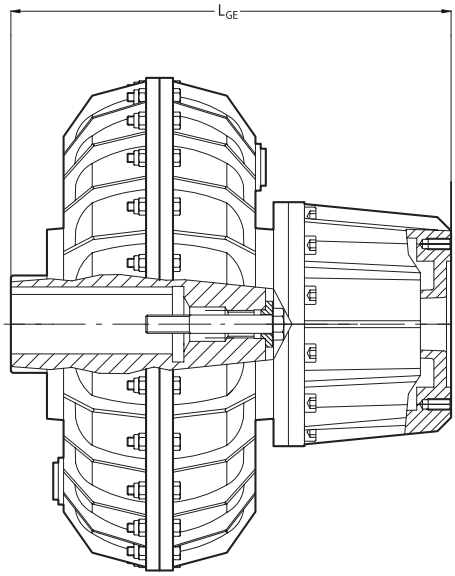
Size	Dimensions [mm]								
	Basic coupling								
	max. finish bore Ød[1]	D_A	L	L_G	D_1 H7	l_1	D_2	zxM	l_2
10	24	193	88	98	47	4	60	6x M6	12
	28			114		2			9
20	28	230	115	125	62	4	78	6x M8	16
	38			135	52				14
30	42	290	150	162	75	4	100	8x M8	16
	48			190	72				
	55			219	72				
30P	42	327	150	162	75	4	100	8x M8	16
	48			190	72				
	55			219	72				
40P	55	338	183	198	100	4	125	8x M10	22
	60				90				20
50	65	430	154	179	110	4,5	140	8x M10	22
55	65	430	196	211	110	4,5	140	8x M10	22
	75			210					
60	75	520	172	192	125	8	160	8x M10	22
	80			222					
65	80	520	220	240	125	8	160	8x M10	22
70P	90	640	190	240	150	4	195	8x M16	30
	100			280					
75P	90	640	245	265	150	4	195	8x M16	30
	100			280					
80P	110	810	226	270	160	5	230	8x M18	28
	125			286					
85P	125	810	300	340	160	5	230	8x M18	28
	135								
90P	130	1000	344	364	445	5	506	16x M20	32
	140			464					
95P	130	1000	466	479	445	5	506	16x M20	32
	140			586					
1200	max. 190	1300	425	462	220	7	310	16x M20	36

[1] Finish bore acc. to ISO fit H7, feather keyway acc. to DIN 6885 sheet 1 - JS9
Finish bore Ø ≤32: H7; Finish bore Ø ≥33: G7
Finish bore length: min. 2xd; max. 2,5xd

Type K with small and enlarged delay chamber



Fluid couplings: small delay chamber



Fluid couplings: enlarged delay chamber

- The basic type “K” is fitted with a delay chamber. The delay chamber is flange-mounted to the outer wheel of the hydrodynamic coupling.
- Start-up factor: 1.5-1.8 (small delay chamber)
- Start-up factor: 1.2-1.5 (enlarged delay chamber)
- Due to the reduced start-up factor even smoother and longer start-ups of the driven machine are enabled.
- Inner and outer drive possible
- Flexible couplings allow for compensation of misalignments

Technical data

Dimensions [mm]

Basic coupling									Small delay chamber	Enlarged delay chamber
Size	max. finish bore Ød[1]	D_A	L	D_1 H7	l_1	D_2	zxM	l_2	L_{GS}	L_{GE}
	42			75					217	257
30	48	290	150	72	4	100	8x M8	16	245	285
	55			72					274	314
	42			75					217	257
30P	48	327	150	72	4	100	8x M8	16	245	285
	55			72					274	314
40P	60	338	183	90	4	125	8x M10	20	256	328
50	65	430	154	110	4,5	140	8x M10	22	259	334
55	65	430	196	110	4,5	140	8x M10	22	291	366
	75								290	365
60	75	520	172	125	8	160	8x M10	22	282	362
	80								312	392
65	80	520	220	125	8	160	8x M10	22	330	410
70P	90	640	190	150	4	195	8x M16	30	350	465
	100								390	505
75P	90	640	245	150	4	195	8x M16	30	375	490
	100								390	505
80P	110	810	226	160	5	230	8x M18	28	388	488
	125								404	504
85P	125	810	300	160	5	230	8x M18	28	458	558
	135									
90P	130	1000	344	445	5	506	16x M20	32	424	504
	140								524	604
95P	130	1000	466	445	5	506	16x M20	32	599	679
	140								706	786

[1] Finish bore acc. to ISO fit H7, feather keyway acc. to DIN 6885 sheet 1- JS9
Finish bore Ø ≤32: H7; Finish bore Ø ≥33: G7
Finish bore length: min. 2xD; max. 2,5xD

Any questions? Please contact us.

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