"GIFLEX®" GE-T COUPLINGS with FLEXIBLE SPIDER

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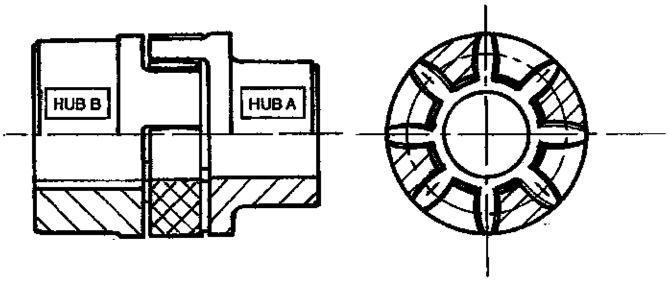
TORSIONAL FLEXIBLE COUPLINGS PRECISE EXECUTION



INTRODUCTION

Flexible torsion couplings, which are connecting devices between rotating shafts, are designed to ensure shock-free torque transmission and to compensate minor alignment deviations in operation between the shafts in industrial use.
The GE-T range of flexible couplings ensures this level of performance and also provides excellent quality thanks to the machining accuracy and the choice of the materials used.
The general level of reliability provided by the GE-T couplings is ensured by a satisfactory useful working life of the couplings.

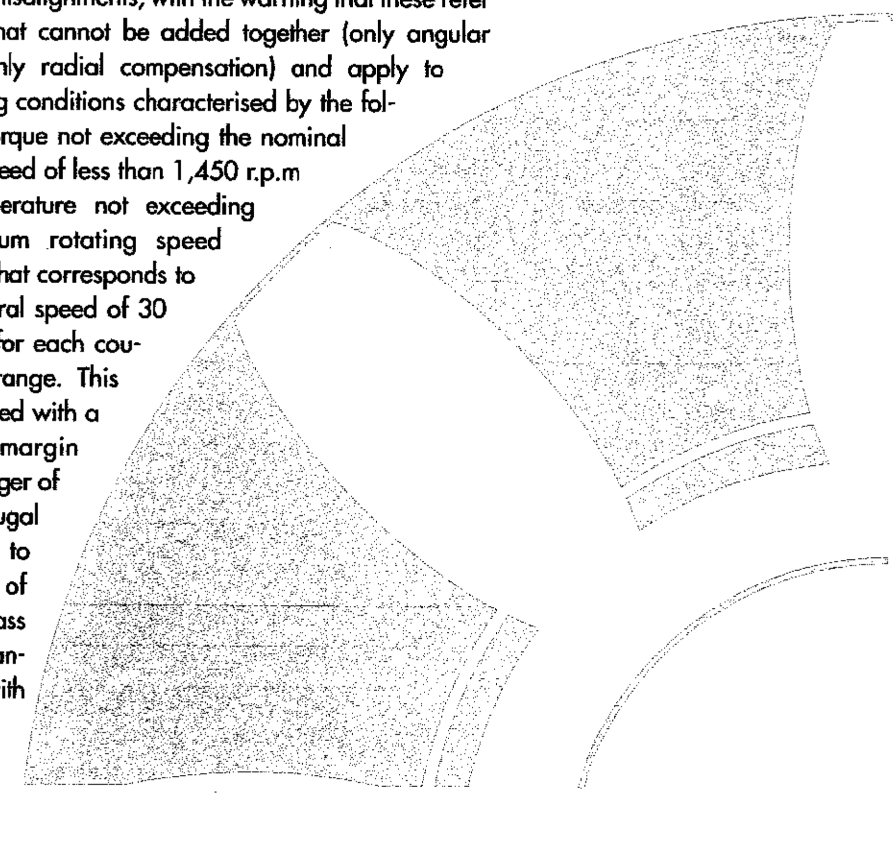
GENERAL

The GE-T range of flexible couplings represents torsionally flexible, mechanical couplings capable of transmitting a twisting moment proportional to the flexible yield of the intermediate component.
The couplings must also be capable of effectively absorbing possible torsional vibrations due to the load or self-induced, to attenuate impacts and torque peaks during the start-up phase and to compensate minor angular and parallel misalignments between the shafts, however ensuring an acceptable useful working life.
These features and more in general the performance required from the coupling depend almost exclusively on the quality of the intermediate component. The choice of the material used to manufacture the coupling is therefore fundamental. The curve that expresses the flexible characteristic of the intermediate component must have a progressive trend (yielding at low torque values and remaining rigid at higher torque values) to ensure operation without jerks at start-up and with a limited torsional yield at steady state conditions.
It is essential for the intermediate component to have a certain flexible hysteresis, proportional to the required absorbing effect that ensures the coupling

can efficiently absorb possible torsional oscillations. Furthermore, the useful working life of the coupling depends on the flexible yield of the material comprising the intermediary component. The physical characteristics as described above are frequently in contrast with each other and compared with other basic mechanical and technological parameters. The performance of the intermediary component therefore cannot be adapted to the variety of operating conditions when only one type of material is used and therefore the materials adopted for the flexible ring gear must be differentiated. A selected thermoplastic elastomer is selected to meet medium level needs in the basic execution. This refers to an elastomer with medium rigidity, characterised by an optimum internal dampening effect, resistant to ageing, to fatigue, to abrasion, as well as hydrolysis and to the principal chemical agents with special reference to oils and ozone. Operating temperatures lying between −40°C and +125°C with brief peaks of up to 150°C are permitted in the case of couplings in the base execution. Alternative mixes capable of meeting every practical need have been designed and are available on request for use in extremely demanding operating conditions, or for needs that exceed average requirements.

OPERATING AND ASSEMBLY CONDITIONS

Operation of the flexible torsion couplings, such as the GE-T type or similar couplings is characterised by a proportional feature between the twisting torque and the torsion angle and by the ability to compensate limited angular and radial misalignments.
Key features of equal importance, but which are more difficult to interpret are represented by the absorbing factor and the natural frequency or resonance. To qualify its couplings, **CHIARAVALLI Trasmissioni spa** declares permitted twisting torque values correlated to well defined torsion angle values, which has the limiting value of 5° corresponding to the maximum torque value. This provides a valid guide for the progressive characteristic of the flexible curve. The maximum permitted values are shown in the case of the angular and radial misalignments, with the warning that these refer to extreme values that cannot be added together (only angular compensation or only radial compensation) and apply to "standard" operating conditions characterised by the following: operating torque not exceeding the nominal torque, a rotating speed of less than 1,450 r.p.m and coupling temperature not exceeding 40°C. The maximum rotating speed expressed in r.p.m. that corresponds to a maximum peripheral speed of 30 m/sec. is indicated for each coupling of the GE-T range. This speed can be achieved with a sufficient safety margin compared to the danger of failure due to centrifugal force stress thanks to the characteristics of the material used. Class G 2.5 dynamic balancing in compliance with



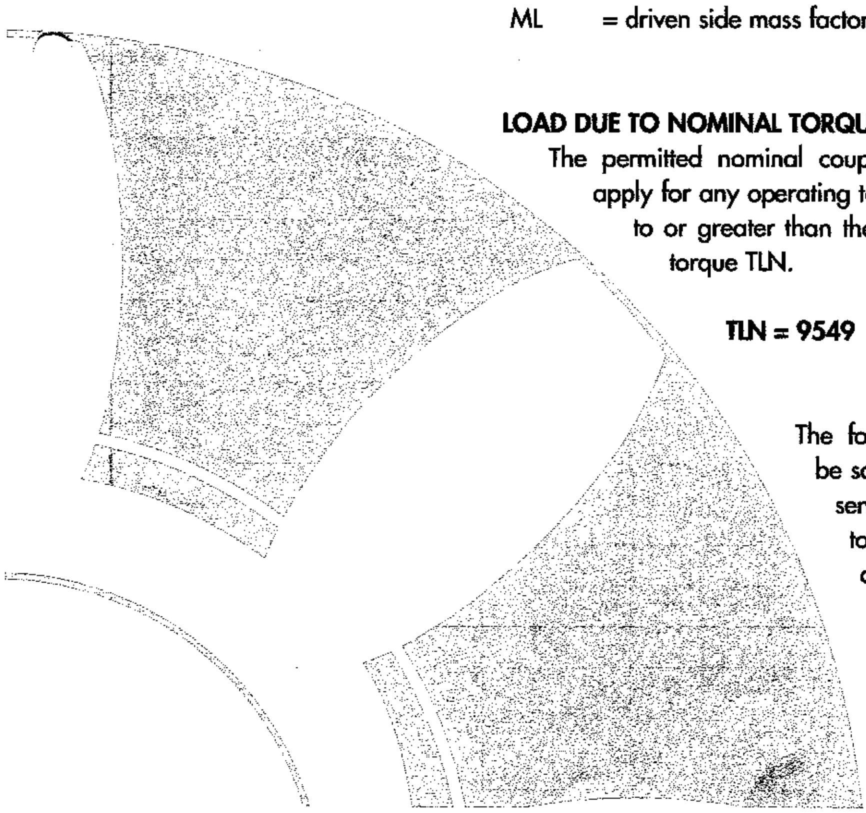
ISO 1940 is recommended despite the fact that the half-couplings are fully machined on both external surfaces, if the actual operating speed exceeds 2.800 r.p.m.

COUPLING SELECTION AND SIZING CRITERIA

Couplings are sized on the basis of the physical laws of mechanics and the resistance of the materials and also complies with the provisions established in the DIN 740 standards Sheet 2.
The coupling is selected on the basis of the criteria, which establishes that the maximum permitted stress is never exceeded even in the most demanding operating conditions. It follows that the nominal torque declared for the coupling must be compared with a reference torque that takes into account the overloads due to the way the load is exerted and the operating conditions. The reference torque is obtained by multiplying the operating torque by a series of multiplying factors depending on the nature of the load or on the ambient temperature conditions.

Symbols:
- TKN = coupling maximum torque (Nm)
- TK max = coupling maximum torque (Nm)
- TKw = torque with coupling inversion (Nm)
- TLN = driven side operating torque (Nm)
- TLs = driven side static torque (Nm)
- TAs = motor side static torque (Nm)
- Ts = plant static torque (Nm)
- PLn = driven side operating power (kW)
- nLn = driven side rotating speed (r.p.m.)
- St = temperature factor

- SA = motor side impact factor
- SL = driven side impact factor
- Sz = start-up factor
- MA = control side mass factor $\frac{JL}{JA+JL}$
- ML = driven side mass factor $\frac{JA}{JA+JL}$



LOAD DUE TO NOMINAL TORQUE

The permitted nominal coupling torque TKN must apply for any operating temperature value equal to or greater than the driven side operating torque TLN.

$$TLN = 9549 \frac{(PLn)}{nLn} \quad [Nm]$$

The following condition must be satisfied, where St represents the temperature factor, to take into account overloads due to the operating temperature for the coupling.

TKN = > TLN * St

START-UP LOAD

The drive motor delivers a drive torque during the start-up transient period, which is a multiple of the nominal torque and depends on the way the masses are distributed. A similar situation occurs in the braking phase therefore, these two phases are characterised by torque impacts that have an intensity which depends on the distribution of the masses on the drive side MA and on the driven side ML, as well as the frequency of the number of start-ups on which the start-up factor Sz depends. The static torques for the drive side and the driven side are expressed by the following relationships:

- **drive side** **TS = TAS *MA *SA**
- **driven side** **TS = TLS *MM *SL**

MA and ML are assumed to be equal to 1, to a first approximation, and if the distribution of the masses is unknown. The SA factor can be assumed as being equal to the relationship between the start-up torque and the nominal torque in the case of drives based on an electric motor.

LOAD CAUSED BY TORQUE IMPACTS

The permitted nominal coupling torque TKN max must be equal to or greater than the start-up torque increased by the temperature factor and by St and by the start-up factor Sz for any operating temperature value.

TKN max > TS *St *Sz

Consult the CHIARAVALLI Trasmissioni Technical Department for operating conditions that foresee periodic variations or torque inversions, as well as alternate torsional stresses.

INDICATIVE VALUES FOR ADJUSTMENT FACTORS:

NAME	SYMBOL	DEFINITION				
Temperature Factor	St.	St. °C	1 -30 +30	1.2 +40	1.4 +80	1.8 +120
Start-up Factor	Sz.	Number of start-ups per hour				
		Start-up/hr. Sz.	100 1	200 1.2	400 1.4	800 1.6
Impact Factor	SA/SL		SA/SL			
		Minor start-up impacts	1.5			
		Medium start-up impacts	1.8			
		Major start-up impacts	2.2			

SERVICE FACTORS

LOAD CONDITION	OPERATING CONDITIONS	TYPE OF DRIVE: Electric motor	TYPE OF DRIVE: Diesel engine
UNIFORM	Regular operation without impacts or overloads	1.25	1.5
LIGHT	Regular operation with minor and infrequent impacts and overloads	1.50	2.0
MEDIUM	Irregular operation with medium overloads for a short duration and frequent but moderate impacts	2.0	2.5
HEAVY	Markedly irregular operation with very frequent impacts and overloads and of major intensity.	2.5	3.0

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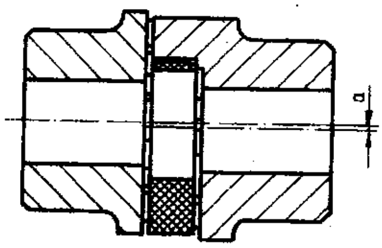
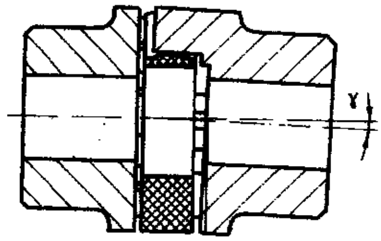
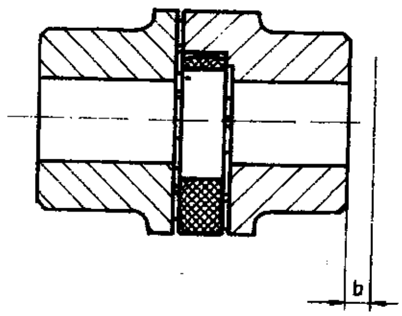


Radially displaced shafts



Angularly displaced shafts



Axially displaced shafts

94 SHORE A BLACK SPIDER THERMOPLASTIC RUBBER

TECHNICAL DATA (G 25 CAST IRON HUBS)

TYPE	Max. R.p.m.	Torsion Angle		Toothed Star	Twisting Moment			Torsional Rigidity (kNm/rad)				Axial displacement	Maximum misalignment	
	No. (min⁻¹)	TKN	TKmax	Hardness	TKN Norm.	MAX TKmax	TKW with Inversion	1.0 TKN	0.75 TKN	0.5 TKN	0.25 TKN	b m m	Radial b mm	Angular γ°
19/24	14000			94	10	20	2.6	0.68	0.57	0.44	0.28	1.2	0.2	1.2°
24/32	10600			94	35	70	9	2.19	1.82	1.40	0.90	1.4	0.2	0.9°
28/38	8500			94	95	190	25	5.20	4.31	3.32	2.12	1.5	0.25	0.9°
38/45	7100			94	190	380	49	10.00	8.30	6.39	4.08	1.8	0.28	1.0°
42/55	6000	3.0°	5°	94	265	530	69	17.00	14.11	10.86	6.94	2.0	0.32	1.0°
48/60	5600			94	310	620	81	20.00	16.59	12.77	8.16	2.1	0.36	1.1°
55/70	4750			94	410	820	105	21.99	18.25	14.05	8.98	2.2	0.38	1.1°
65/75	4250			94	625	1250	163	28.20	23.39	18.01	11.51	2.6	0.42	1.2°
75/90	3550			94	975	1950	254	67.99	56.41	43.44	27.75	3.0	0.48	1.2°
90/100	2800			94	2400	4800	624	110.0	91.26	70.27	44.89	3.4	0.50	1.2°

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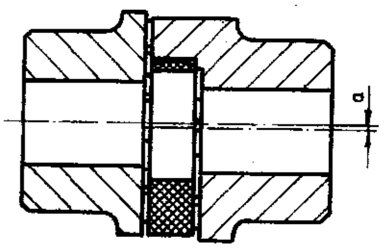
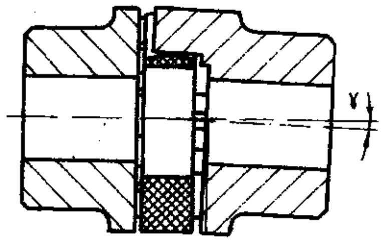
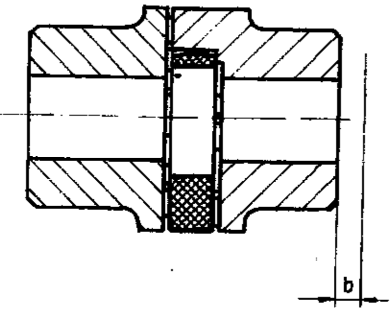


Radially displaced shafts



Angularly displaced shafts



Axially displaced shafts

96 SHORE A RED SPIDER THERMOPLASTIC RUBBER
96 SHORE A YELLOW SPIDER POLYURETHANE

TECHNICAL DATA (G 25 CAST IRON HUBS)

TYPE	Max. R.p.m.	Torsion Angle		Toothed Star	Twisting Moment			Torsional Rigidity (kNm/rad)					Axial displacement	Maximum misalignment	
	n. (min⁻¹)	TKN	TKmax	Hardness	TKN Norm.	MAX TKmax	TKW with Inversion	1.0 TKN	0.75 TKN	0.5 TKN	0.25 TKN		b mm	Radial b mm	Angular γ°
19/24	14000			96	17	34	4.4	1.09	0.90	0.68	0.42		1.2	0.2	1.2°
24/32	10600			96	60	120	16	3.70	3.04	2.31	1.44		1.4	0.2	0.9°
28/38	8500			96	160	320	42	9.5	7.80	5.92	3.68		1.5	0.25	0.9°
38/45	7100			96	325	650	85	29.0	23.8	18.06	11.24		1.8	0.28	1.0°
42/55	6000	3.0°	5°	96	450	900	117	40.5	33.24	25.21	15.70		2.0	0.32	1.0°
48/60	5600			96	525	1050	137	48.56	39.86	30.23	18.82		2.1	0.36	1.1°
55/70	4750			96	625	1250	163	52.78	43.32	32.86	20.46		2.2	0.38	1.1°
65/75	4250			95	640	1280	166	57.5	47.19	35.80	22.29		2.6	0.42	1.2°
75/90	3550			95	1465	2930	381	150.0	123.12	93.39	58.14		3.0	0.48	1.2°
90/100	2800			95	3600	7200	936	250.0	205.19	155.65	96.90		3.4	0.50	1.2°