

DESENHO TÉCNICO MECÂNICO I (SEM0564)

AULA 9 - ELEMENTOS DE MÁQUINA

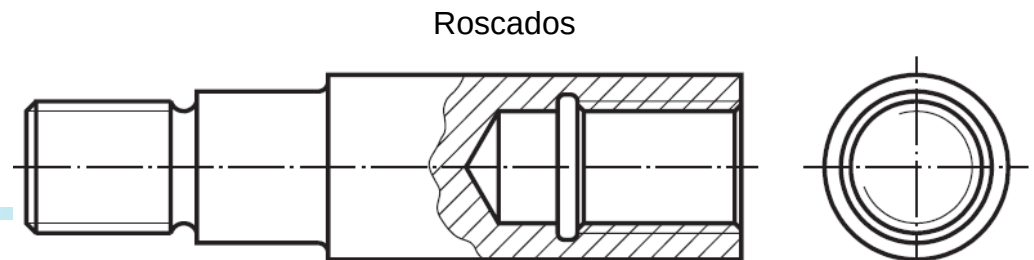
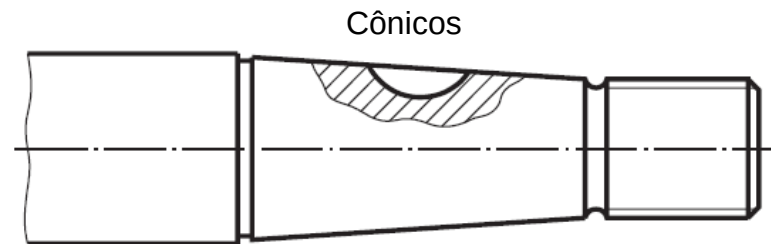
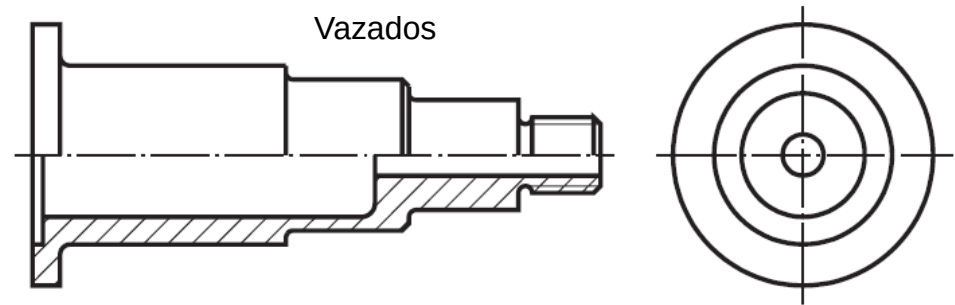
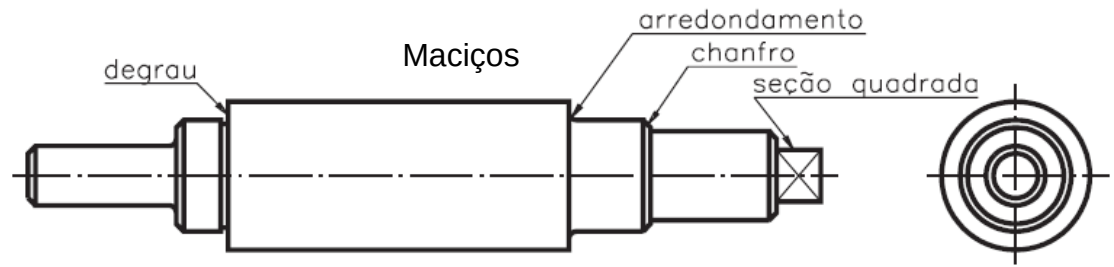
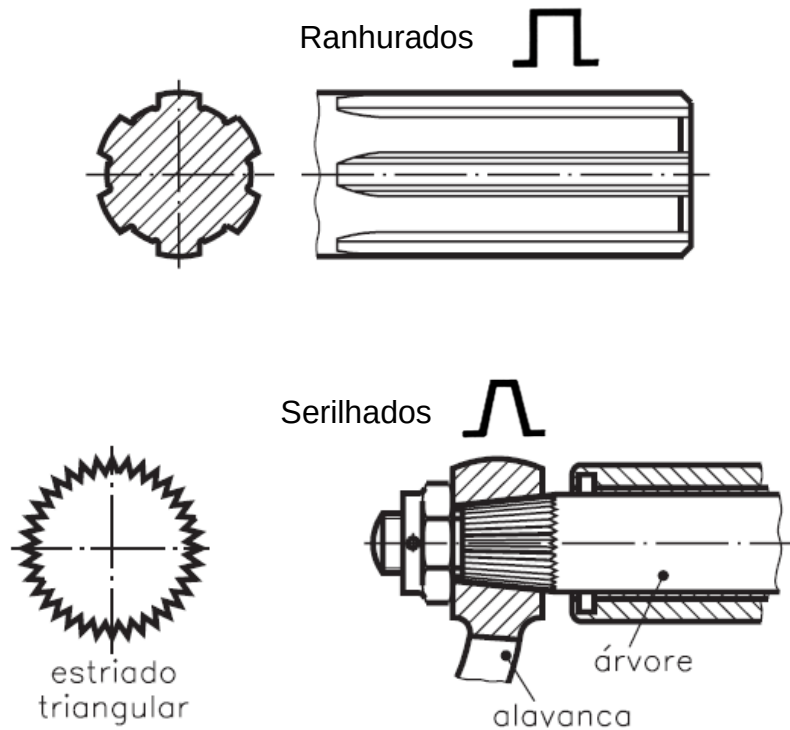
(TRANSMISSÃO)



Notas de Aulas v.2018

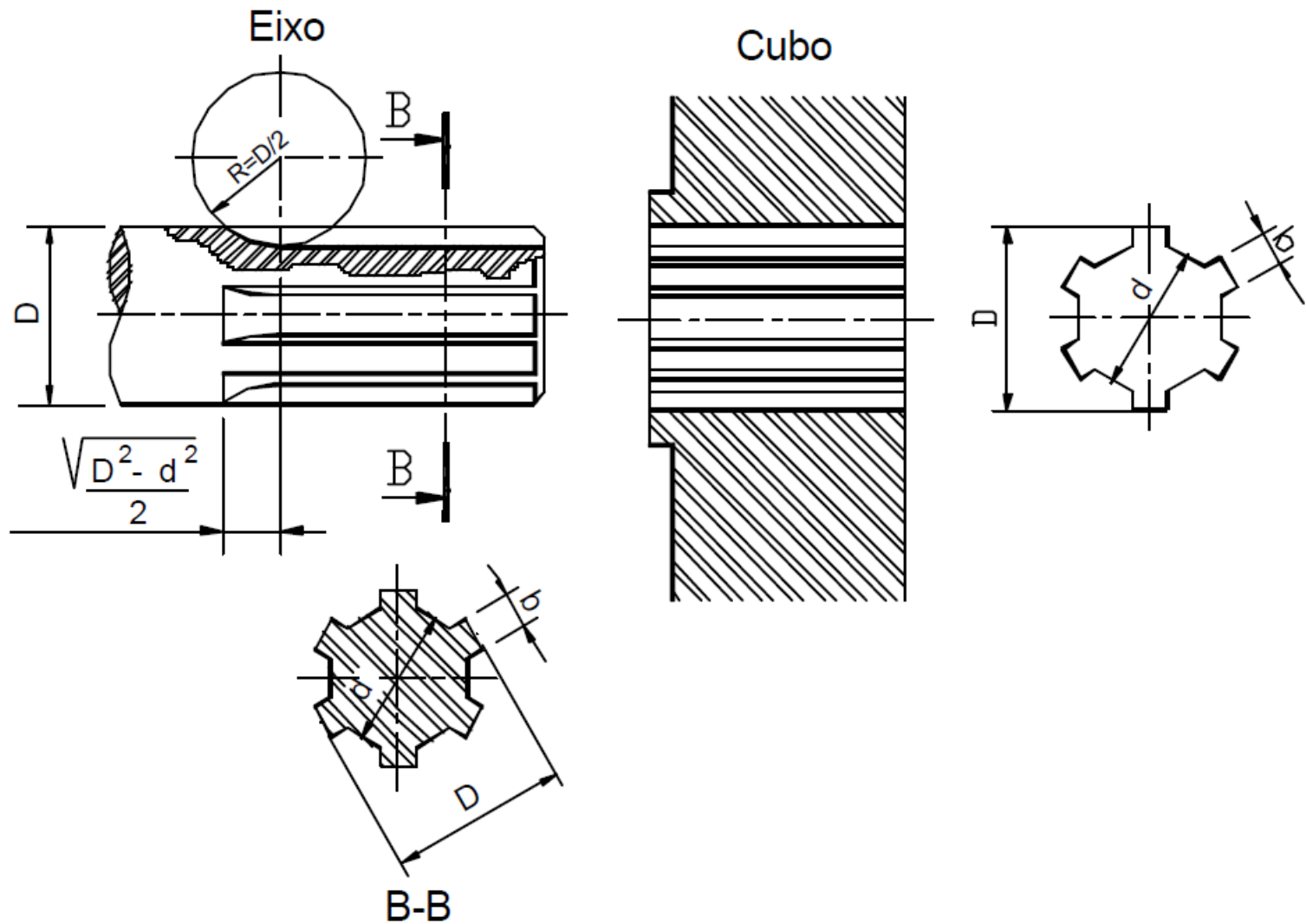
ELEMENTOS DE TRANSMISSÃO

EIXOS



ELEMENTOS DE TRANSMISSÃO

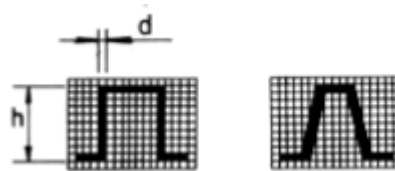
EIXOS



ELEMENTOS DE TRANSMISSÃO

EIXOS

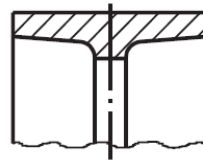
Diâmetro de referência	Diâmetro do eixo	Largura da canaleta	Número de canaletas	Diâmetro do eixo	Largura da canaleta	Número de canaletas
d	D	b	Z	D	b	Z
11	14	4	4	14	3	6
13	16	5	4	16	3,5	6
16	20	6	4	20	4	6
18	22	7	4	22	5	6
21	25	8	4	25	5	6
23	26	6	6	28	6	6
26	30	6	6	32	6	6
28	32	7	6	34	7	8
32	36	6	8	38	6	8
36	40	7	8	42	7	8
42	46	8	8	48	8	8
46	50	9	8	54	9	8
52	58	10	8	60	10	8
56	62	10	8	65	10	8
62	68	12	8	72	12	10
72	78	12	10	82	12	10
82	88	12	10	92	12	10
92	98	14	10	102	14	10
102	108	16	10	112	16	10
112	120	18	10	125	18	10



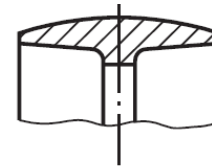
Dimensões [mm]						
Altura do símbolo, dos algarismos e letras, h	3,5	5	7	10	14	20
Espessura da linha para símbolos e letra, d	0,35	0,5	0,7	1	1,4	2

ELEMENTOS DE TRANSMISSÃO

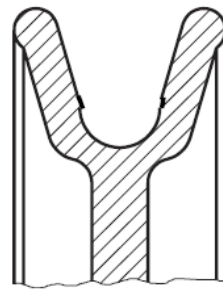
POLIAS



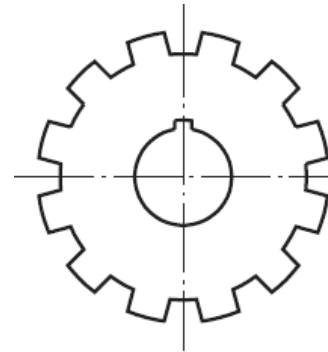
polia plana



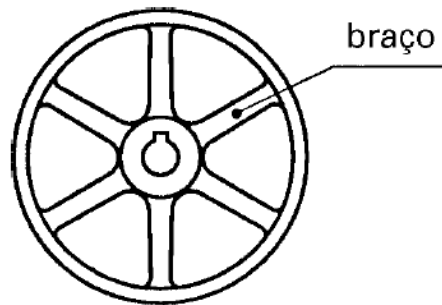
polia abaulada



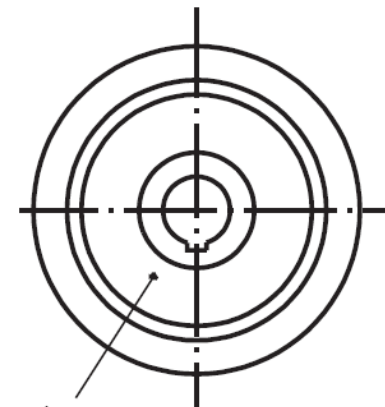
polia para correia e
cabo de aço redondos



polia para correia
dentada



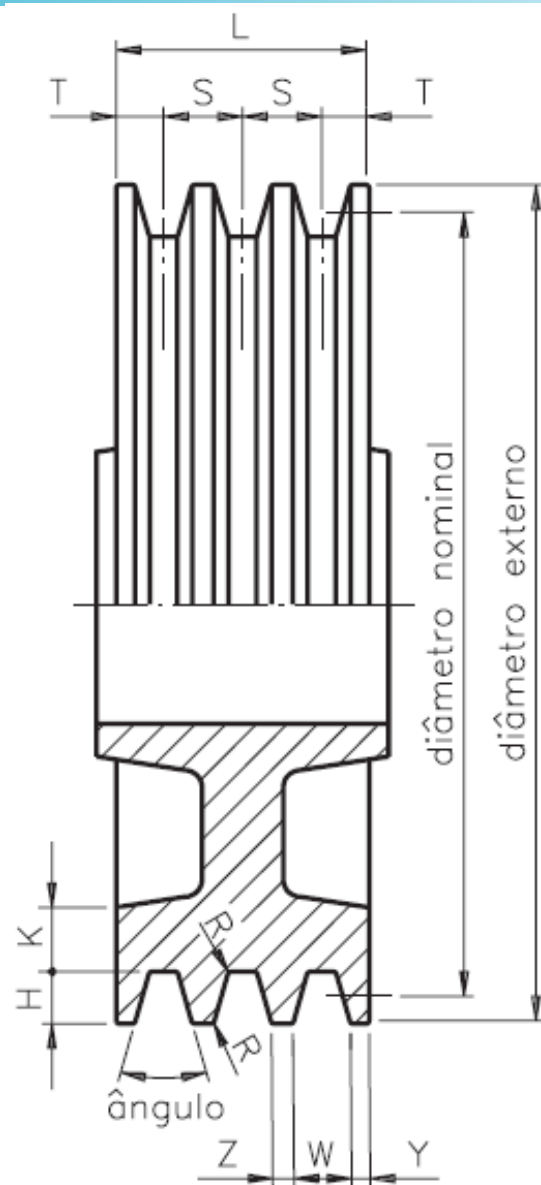
braço



disco

ELEMENTOS DE TRANSMISSÃO

POLIAS



ELEMENTOS DE TRANSMISSÃO

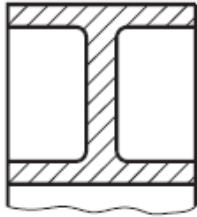
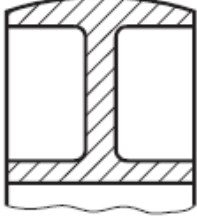
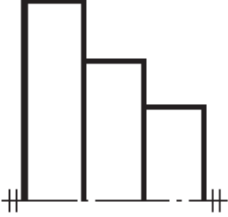
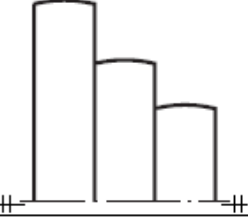
POLIAS

Perfil	Ângulo do canal		t	s	w	y	z	h	k	x	R ⁴
	Diâmetro externo (mm)	Graus									
A	de 75 a 170 acima de 170	34° 38°	9,5	15	13	3	2	13	5	5	1
B	de 130 a 240 acima de 240	34° 38°	11,5	19	17	3	2	17	6,5	6,25	1
C	de 200 a 350 acima de 350	34° 38°	15,25	25,5	22,5	4	3	22	9,5	8,25	1,5
D	de 300 a 450 acima de 450	36° 38°	22	36,5	32	6	4,5	28	12,5	11	1,5
E	de 485 a 630 acima de 630	36° 38°	27,25	44,5	38,5	8	6	33	16	13	1,5

Largura $L = 2 t + s (n-1)$
 n = número de canais

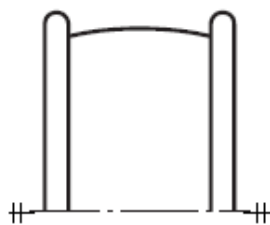
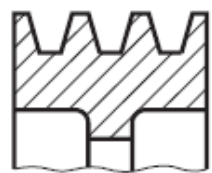
ELEMENTOS DE TRANSMISSÃO

POLIAS

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		polia de aro abaulado
		polia escalonada de aro plano
		polia escalonada de aro abaulado

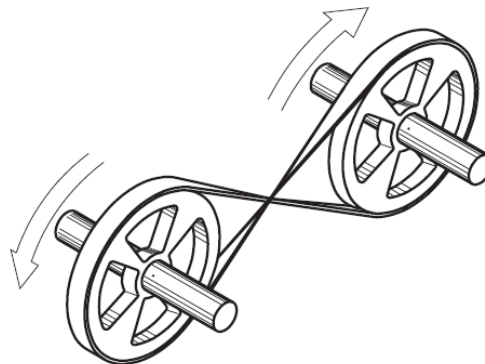
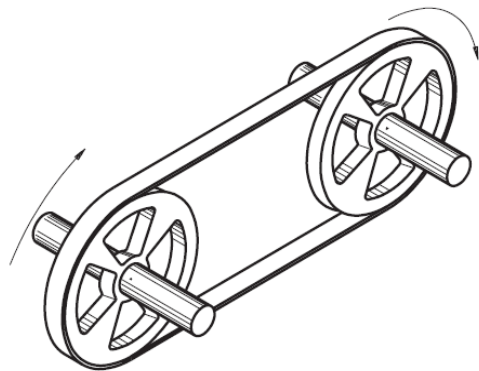
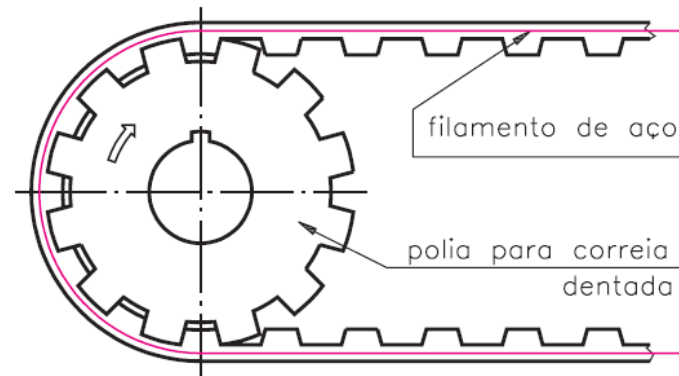
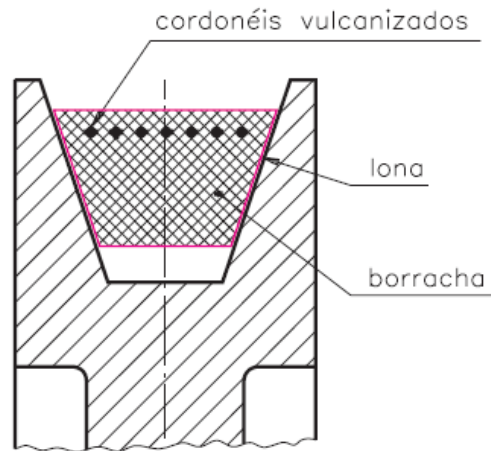
ELEMENTOS DE TRANSMISSÃO

POLIAS

		polia com guia
		polia em "V" simples
		polia em "V" múltipla

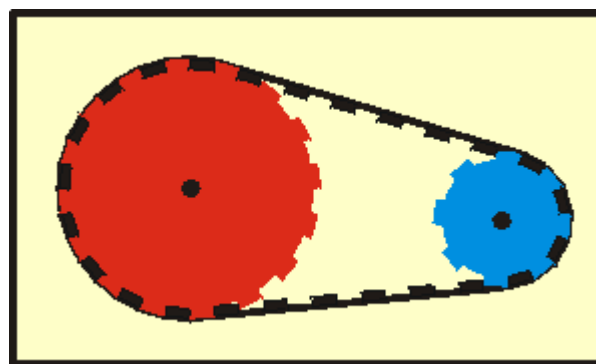
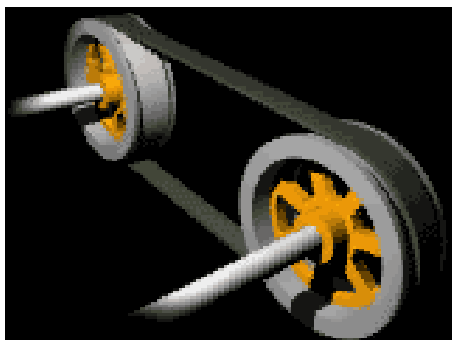
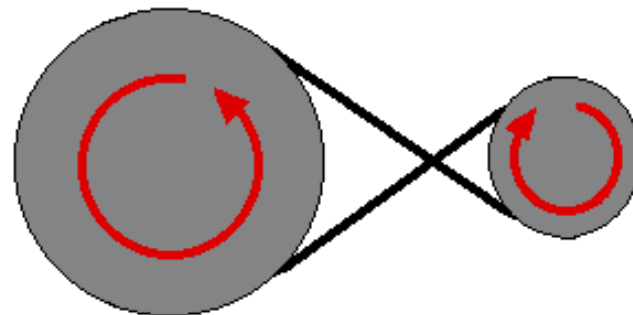
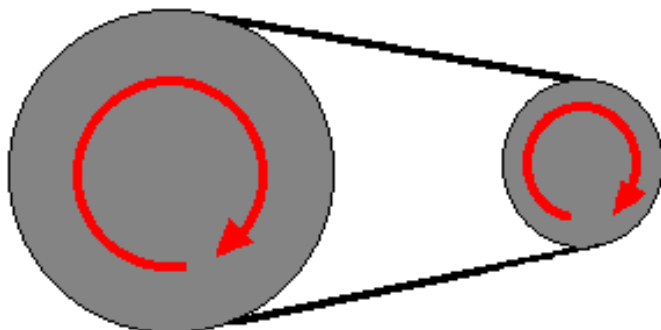
ELEMENTOS DE TRANSMISSÃO

CORREIAS

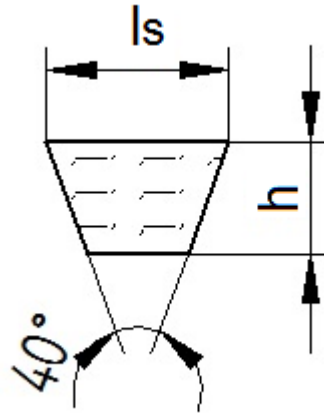


ELEMENTOS DE TRANSMISSÃO

CORREIAS



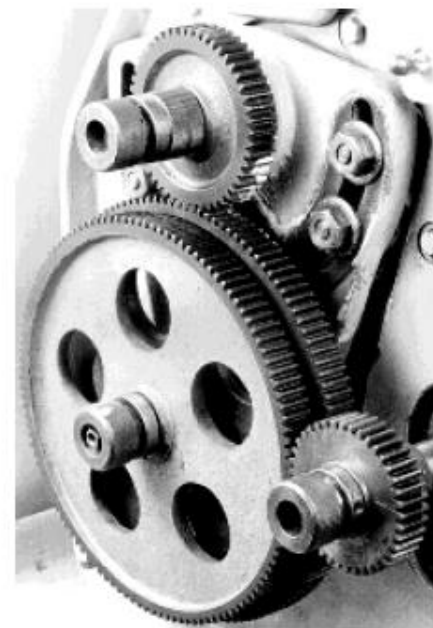
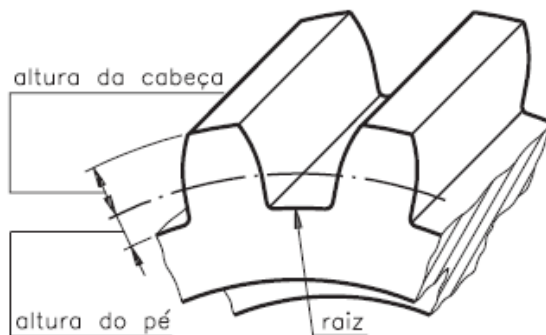
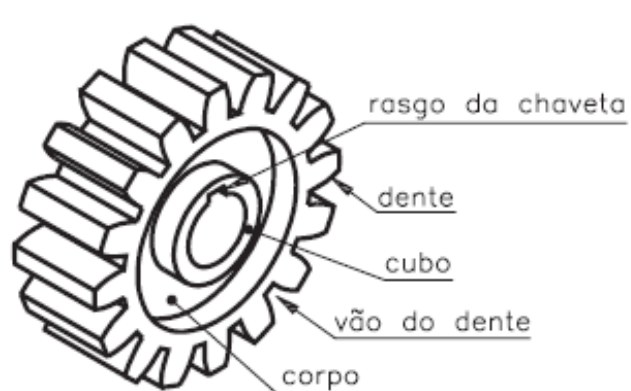
ELEMENTOS DE TRANSMISSÃO CORREIAS



Seção		Largura superior (ls) (mm)	Altura (h) (mm)	Ângulo (°)
Designação	Largura primitiva (mm)			
A	11	13	8	40 ± 1
B	14	17	11	40 ± 1
C	19	22	14	40 ± 1
D	27	32	19	40 ± 1

ELEMENTOS DE TRANSMISSÃO

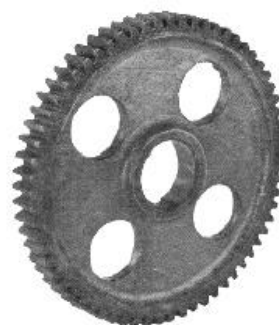
ENGRENAGENS



corpo em forma de disco
com furo central



corpo em forma de disco
com cubo e furo central



corpo com 4 furos,
cubo e furo central



corpo com braços,
cubo e furo central

ELEMENTOS DE TRANSMISSÃO

ENGRENAGENS

Engrenagens Cilíndricas

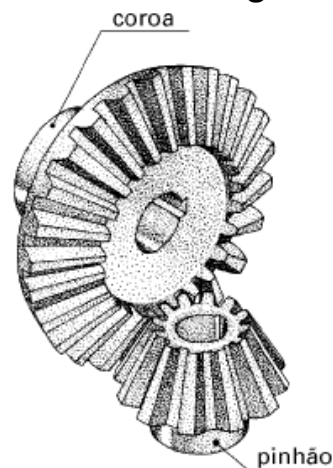


Dente Reto



Dente Helicoidal

Engrenagens Cônicas

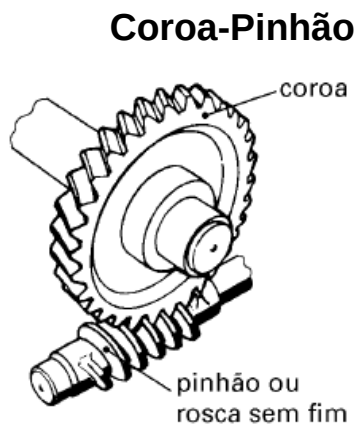


Dente Reto

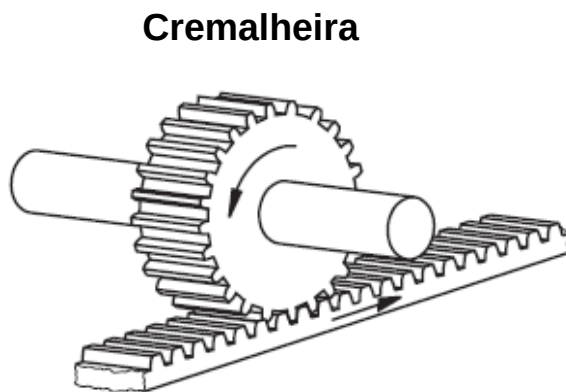


Dente Helicoidal

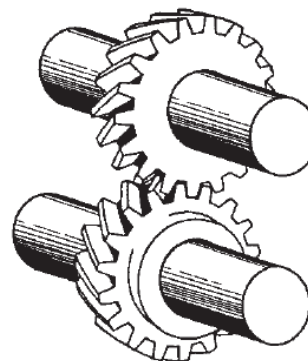
Montagens



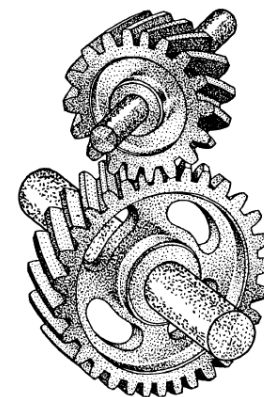
Coroa-Pinhão



Cremalheira



Eixos Paralelos



Eixos Reversos

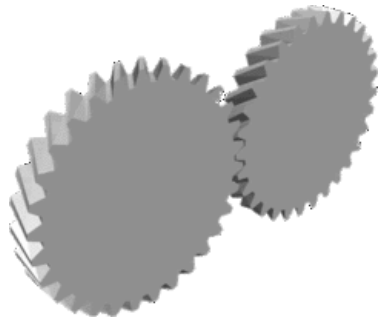
ELEMENTOS DE TRANSMISSÃO

ENGRENAGENS

Engrenagens Cilíndricas

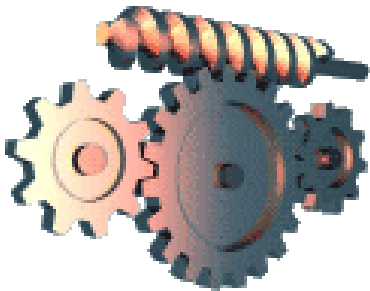


Dente Reto

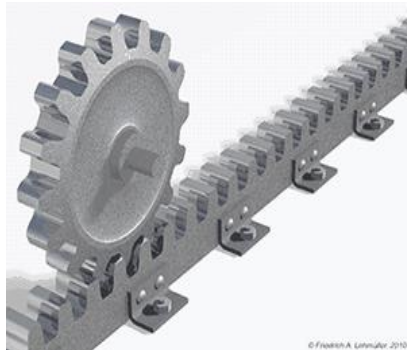


Dente Helicoidal

Coroa-Pinhão

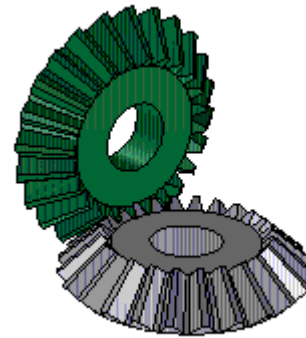


Cremalheira



© Friedrich A. Lottner 2010

Engrenagens Cônicas

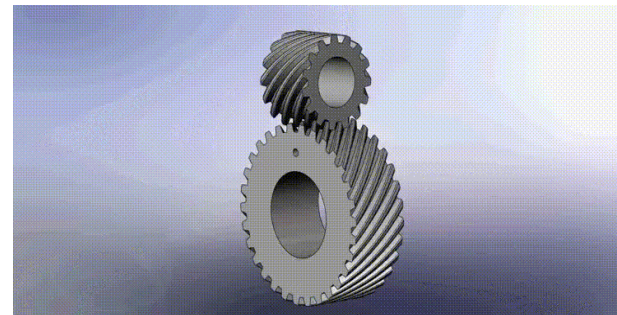


Dente Reto



Dente Helicoidal

Montagens



ELEMENTOS DE TRANSMISSÃO

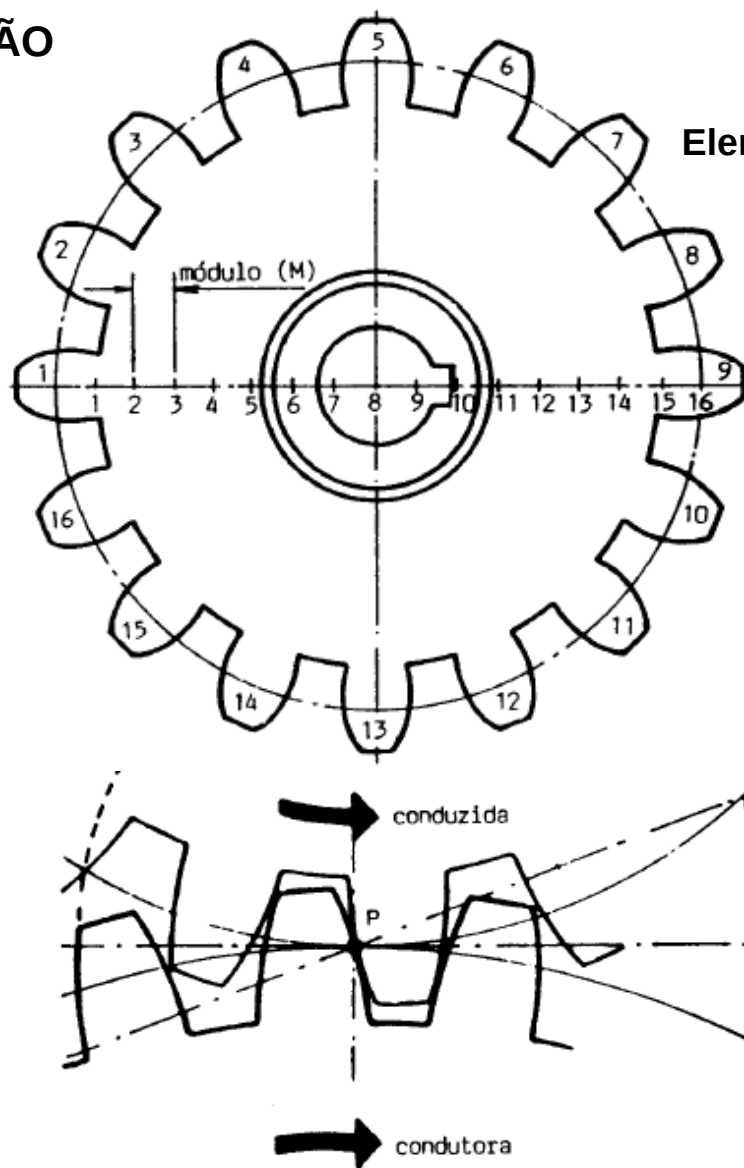
ENGRENAGENS - Simbologia

Sistema de dentes	Símbolo
Helicoidal à direita	
Helicoidal à esquerda	
Dupla helicoidal (espinha de peixe)	 
Espiral	 

ELEMENTOS DE TRANSMISSÃO

ENGRENAGENS

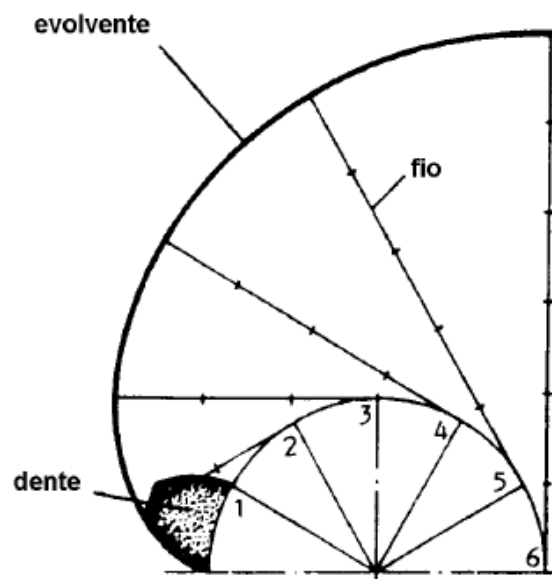
Elementos de uma engrenagem



número de dentes (Z) = 16

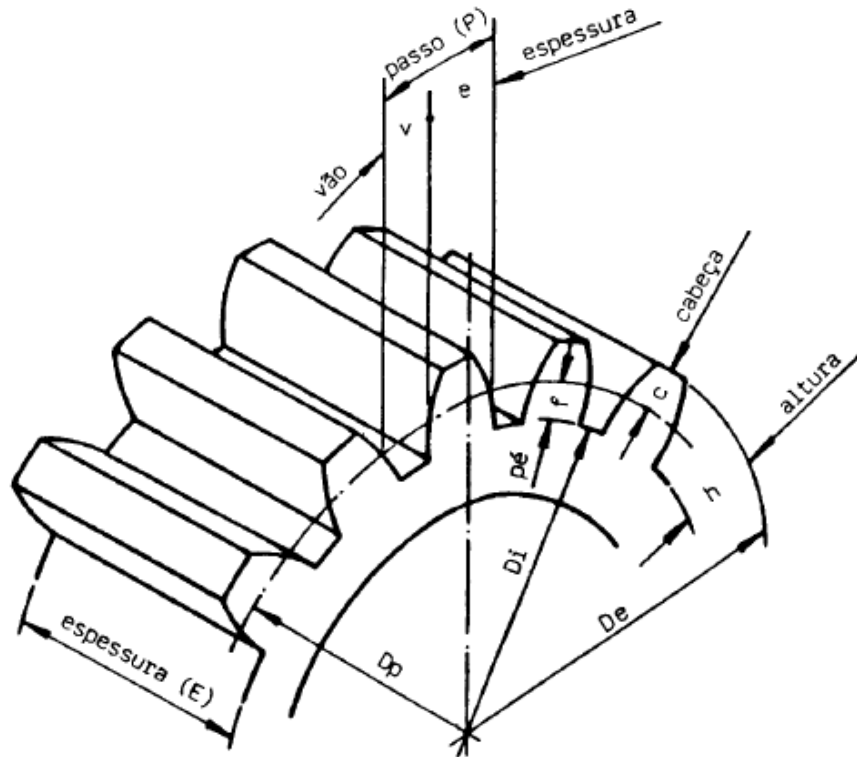
$$\text{Módulo (M)} = \frac{D_p}{Z} \text{ ou } \frac{P}{\pi}$$

Perfil do dente



ELEMENTOS DE TRANSMISSÃO

ENGRENAGENS



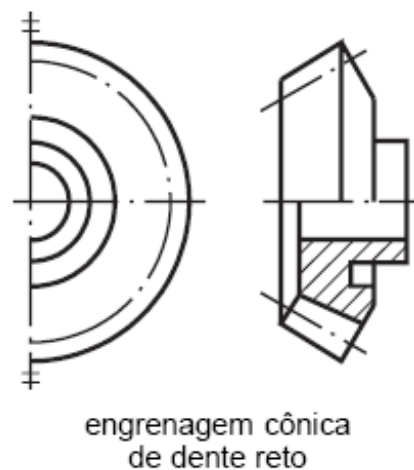
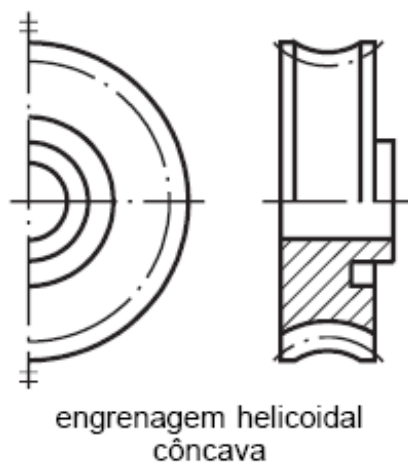
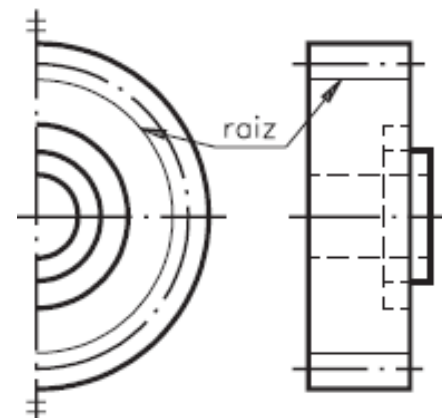
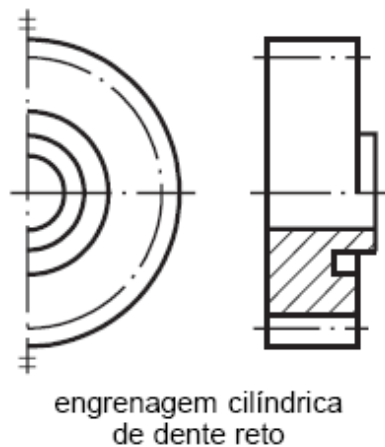
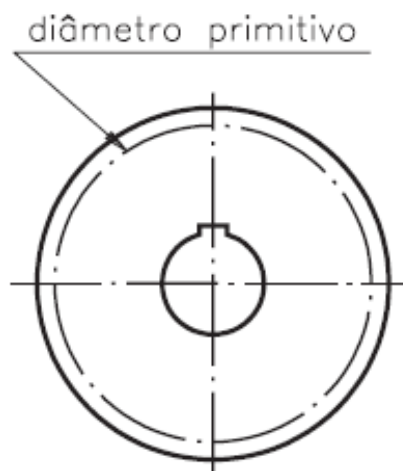
Formulações

- **(De)** Diâmetro externo
É o diâmetro máximo da engrenagem $De = m (z + 2)$.
- **(Di)** Diâmetro interno
É o diâmetro menor da engrenagem.
- **(Dp)** Diâmetro primitivo
É o diâmetro intermediário entre De e Di . Seu cálculo exato é $Dp = De - 2m$.
- **(C)** Cabeça do dente
É a parte do dente que fica entre Dp e De .
- **(f)** Pé do dente
É a parte do dente que fica entre Dp e Di .
- **(h)** Altura do dente
É a altura total do dente $\frac{De - Di}{2}$ ou $h = 2,166 \cdot m$.
- **(e)** Espessura de dente
É a distância entre os dois pontos extremos de um dente, medida à altura do Dp .
- **(V)** Vão do dente
É o espaço entre dois dentes consecutivos. Não é a mesma medida de e .
- **(P)** Passo
Medida que corresponde a distância entre dois dentes consecutivos, medida à altura do Dp .

ELEMENTOS DE TRANSMISSÃO

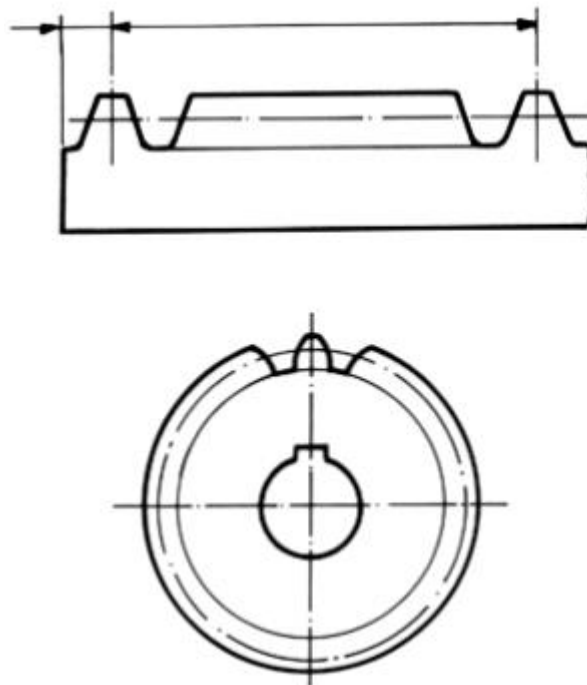
ENGRENAGENS

Representação Gráfica



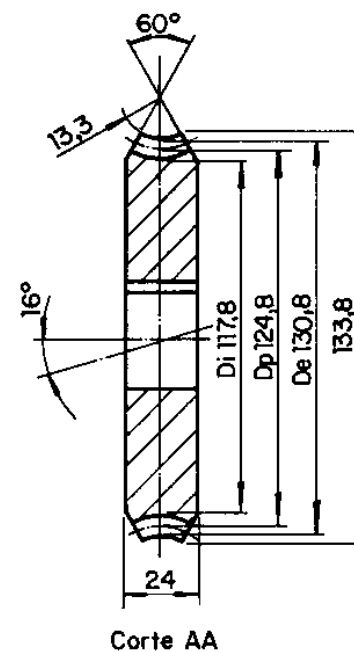
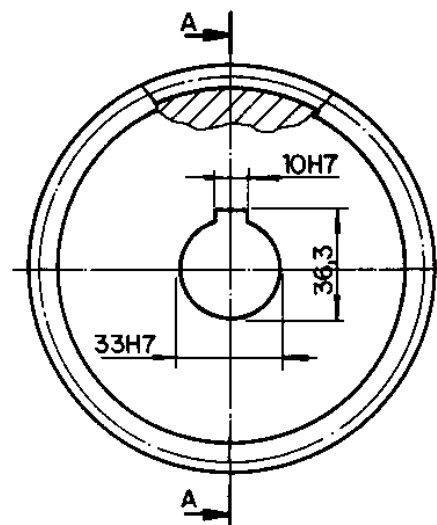
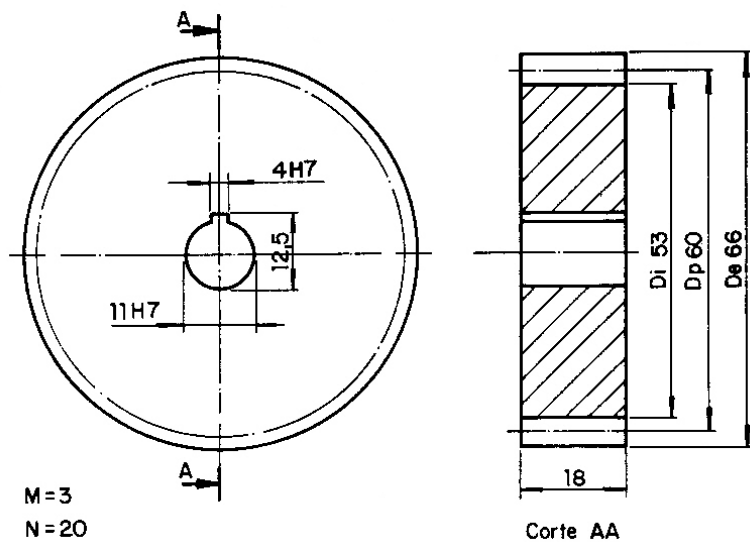
ELEMENTOS DE TRANSMISSÃO

ENGRENAGENS



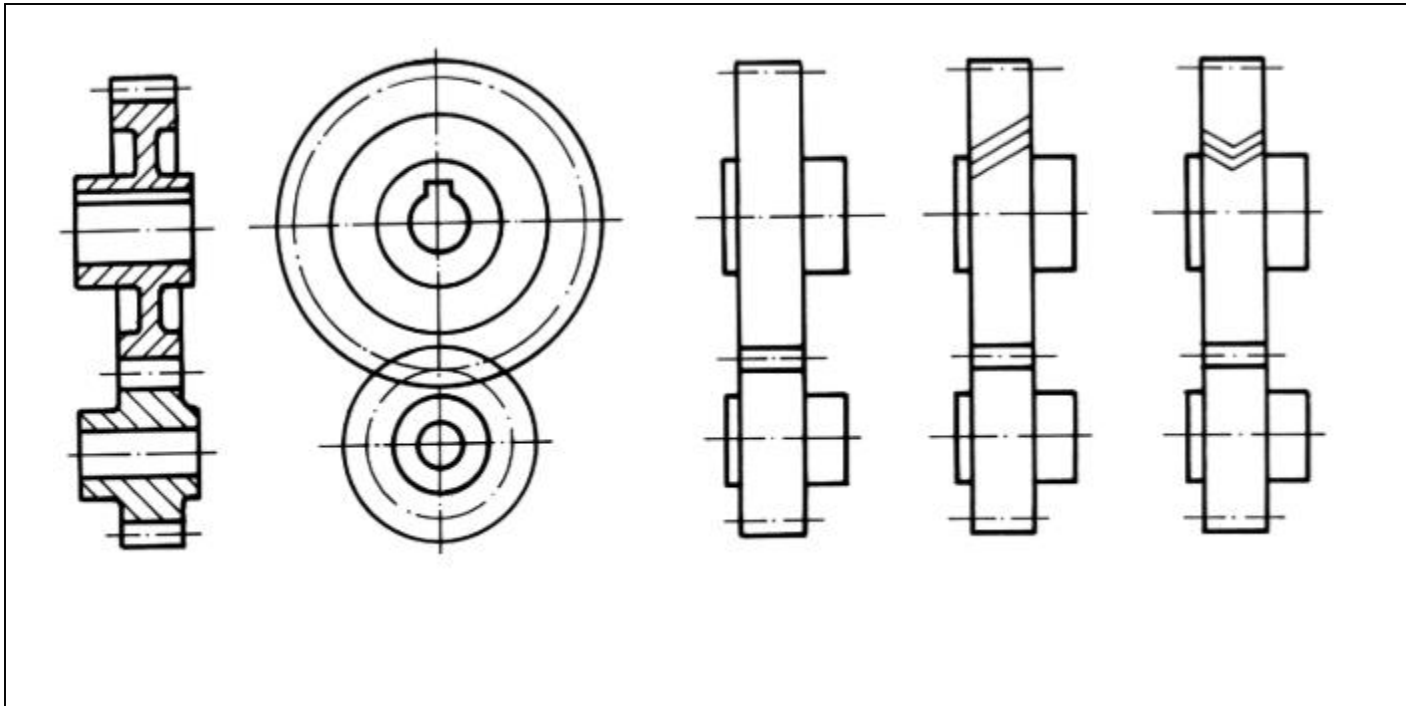
ELEMENTOS DE TRANSMISSÃO

ENGRENAGENS



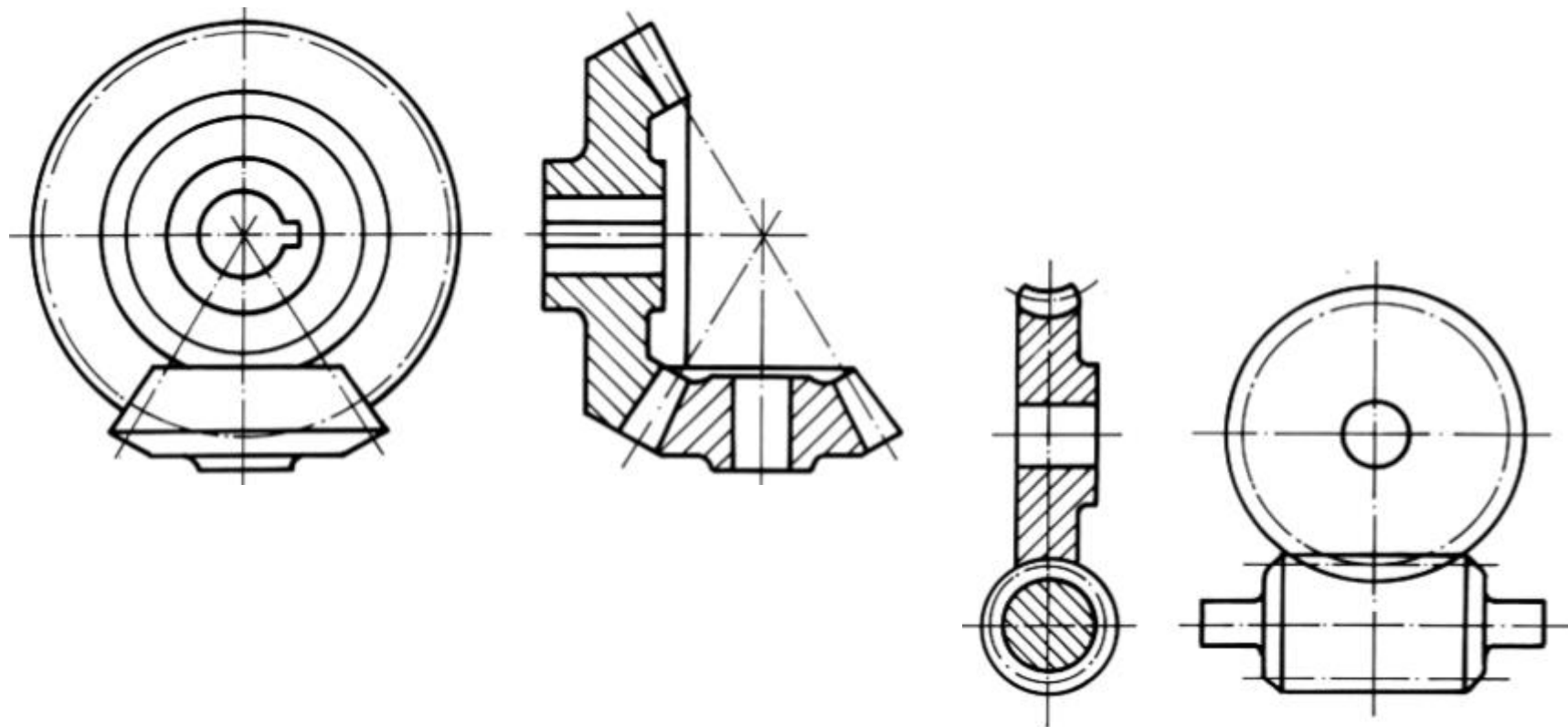
ELEMENTOS DE TRANSMISSÃO

ENGRENAGENS

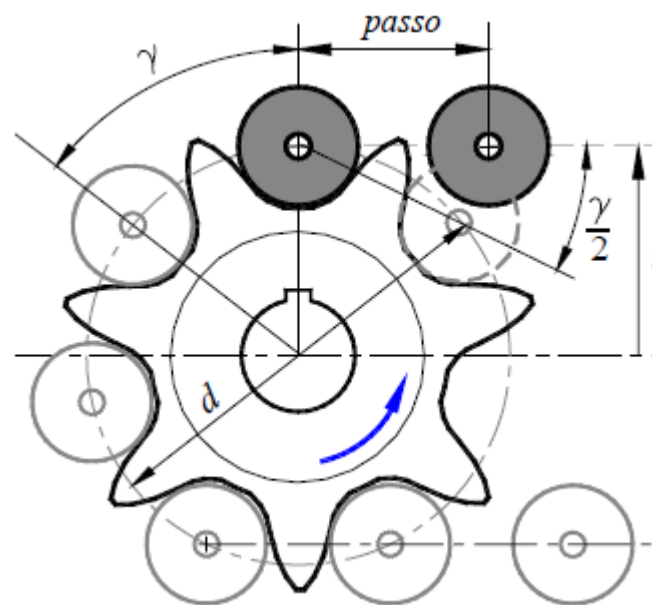


ELEMENTOS DE TRANSMISSÃO

ENGRENAGENS



Engrenagem corrente



$$\gamma = \frac{2\pi}{z} = \frac{360}{z}$$

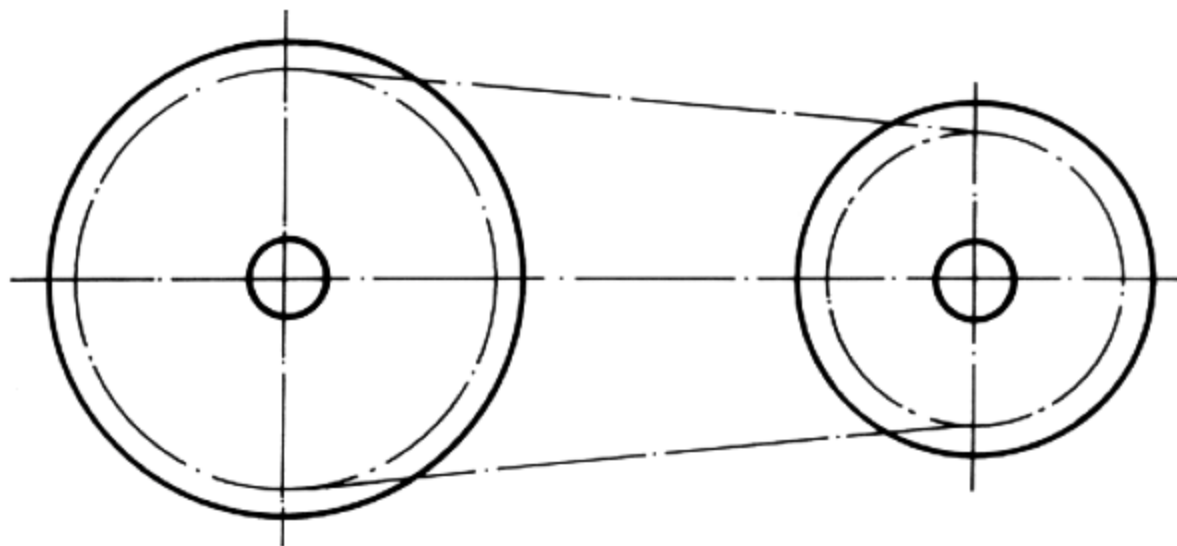
γ – ângulo articulação

z – número de dentes

d – diâmetro primitivo



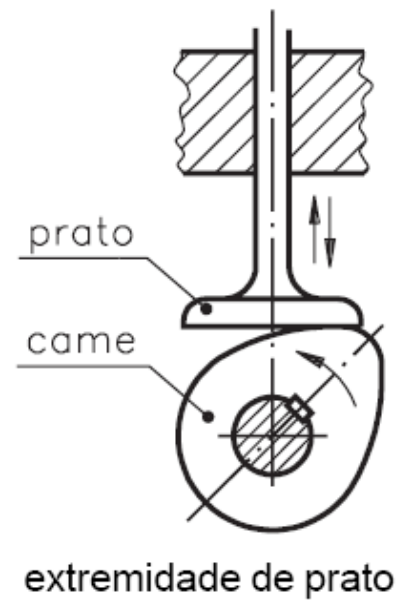
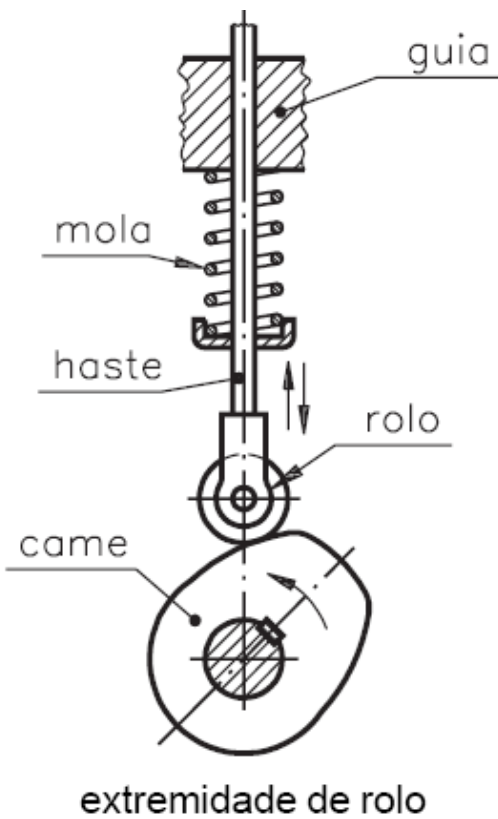
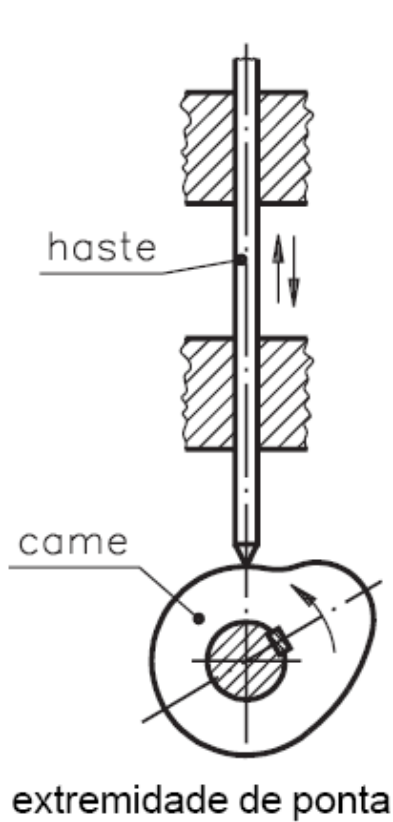
Engrenagem corrente



ELEMENTOS DE TRANSMISSÃO

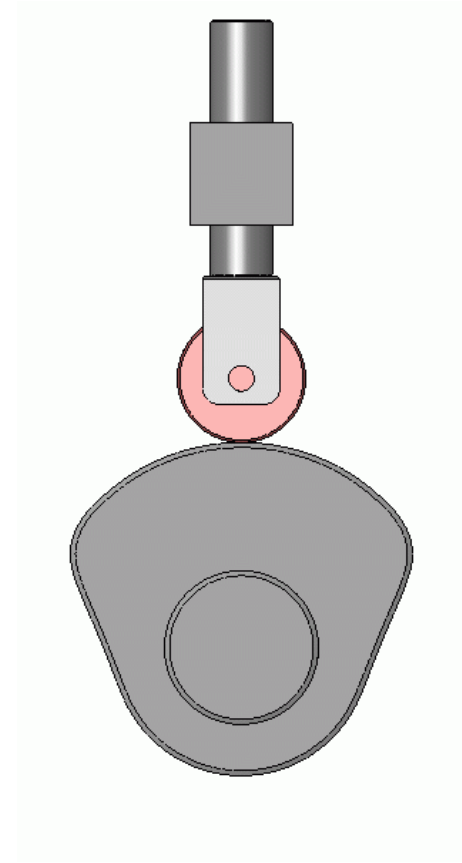
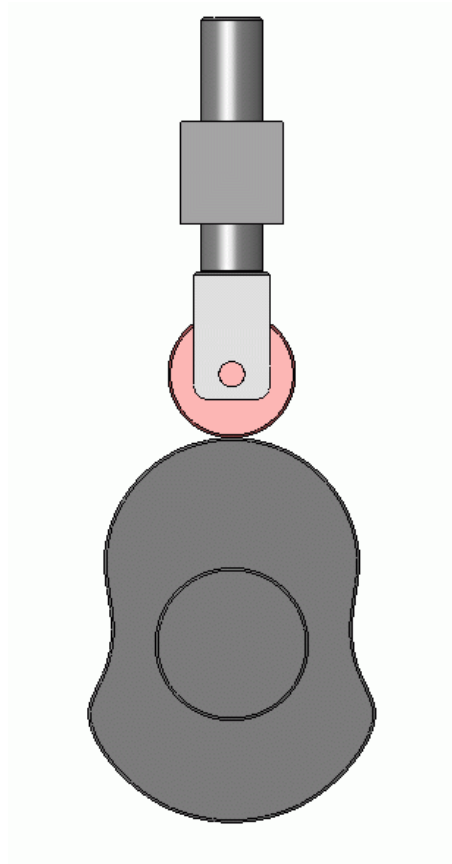
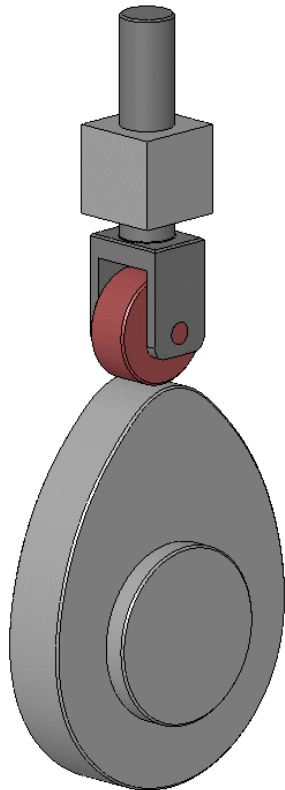
CAMES

Came de Disco



ELEMENTOS DE TRANSMISSÃO

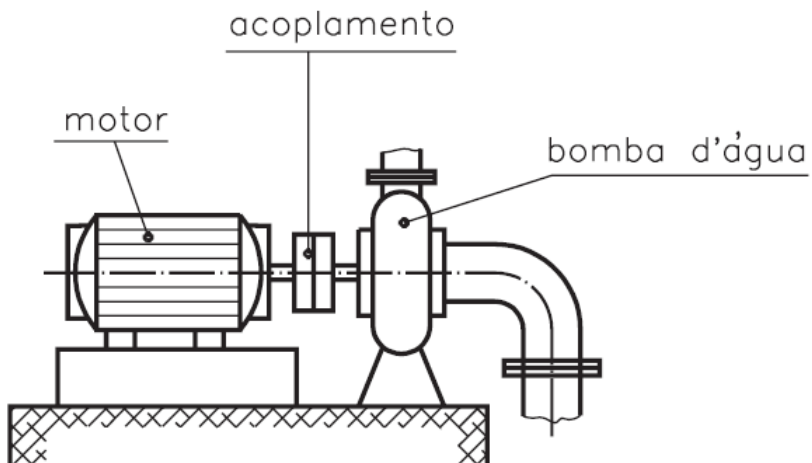
CAMES



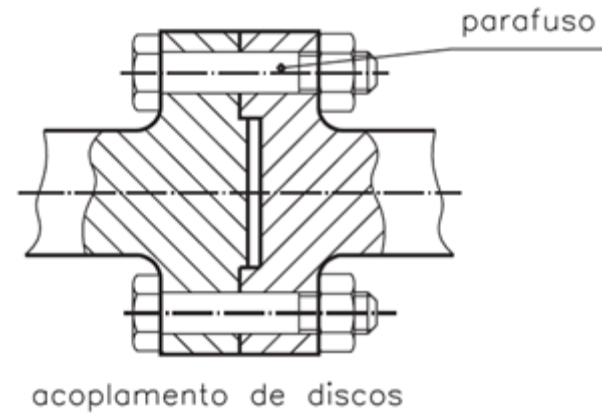
ELEMENTOS DE TRANSMISSÃO

ACOPLAMENTOS

Exemplo de Aplicação



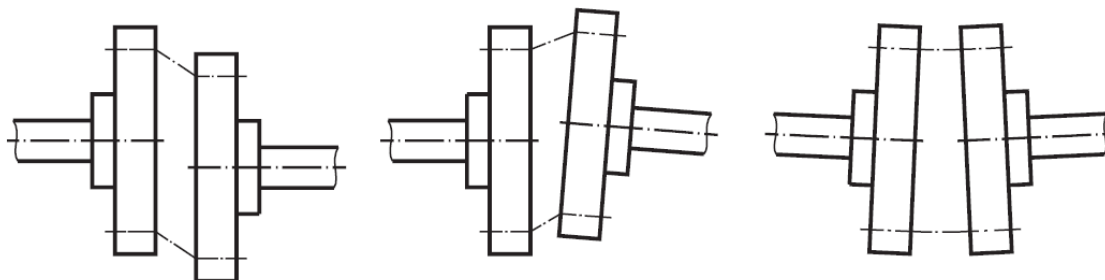
Acoplamentos Fixos



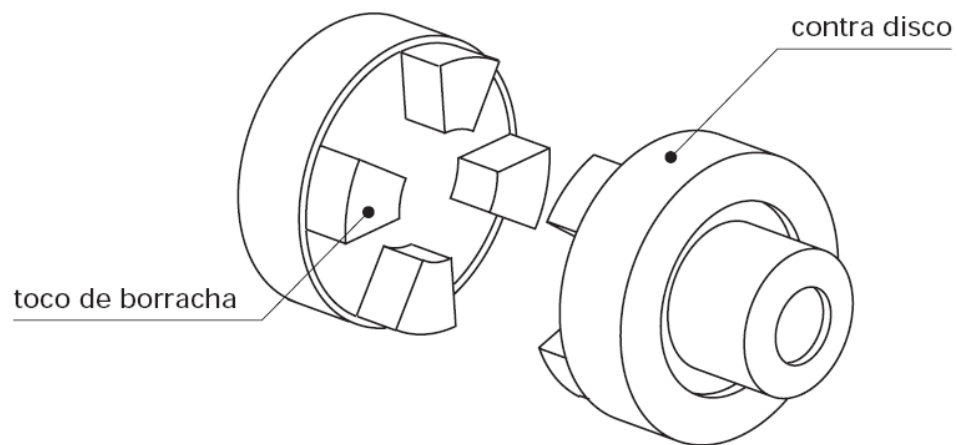
ELEMENTOS DE TRANSMISSÃO

ACOPLAMENTOS

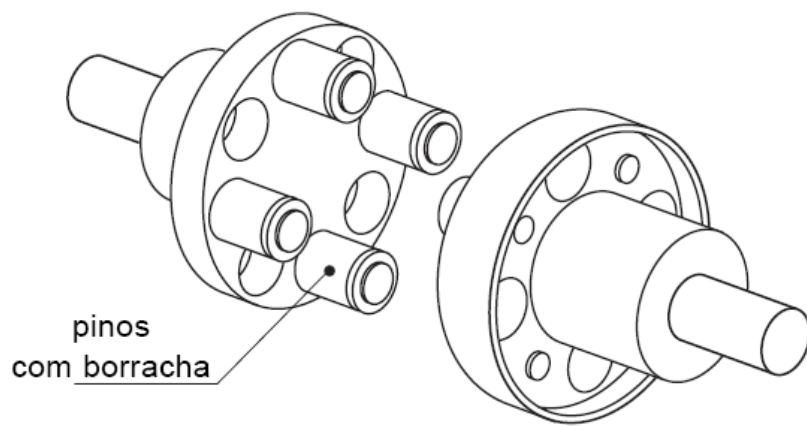
Acoplamentos Elásticos



De garras

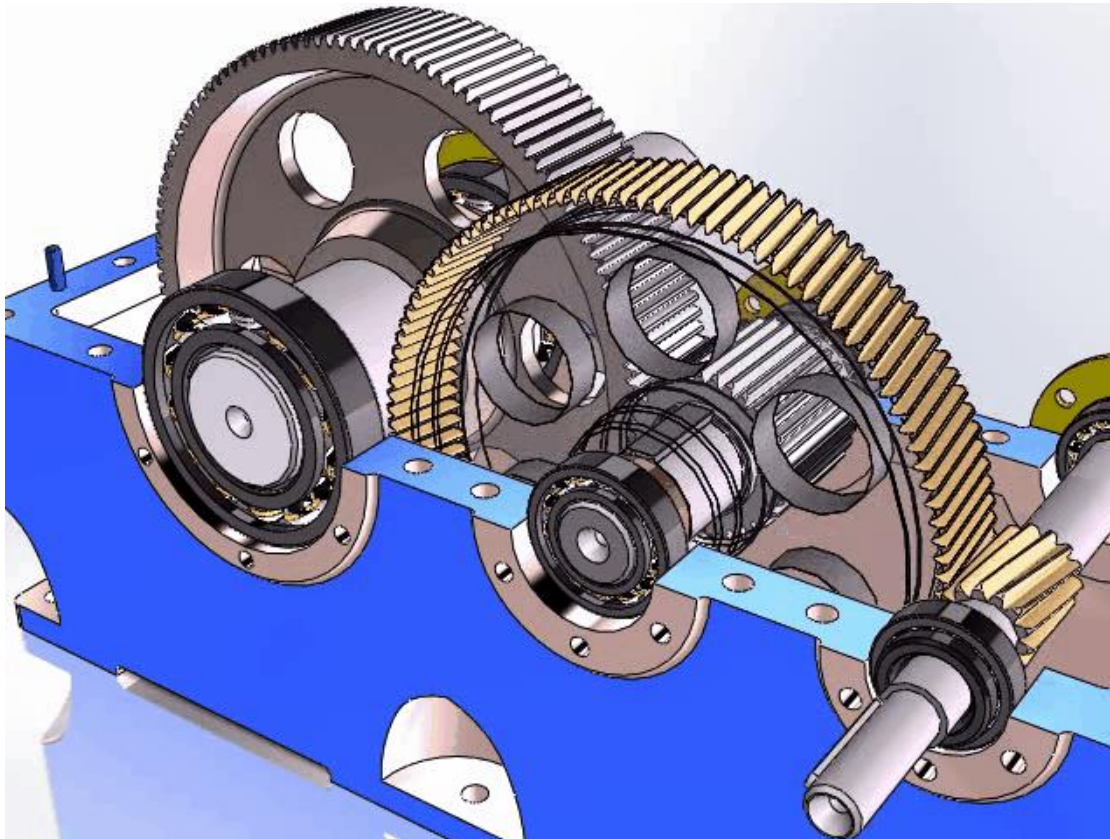


De pinos



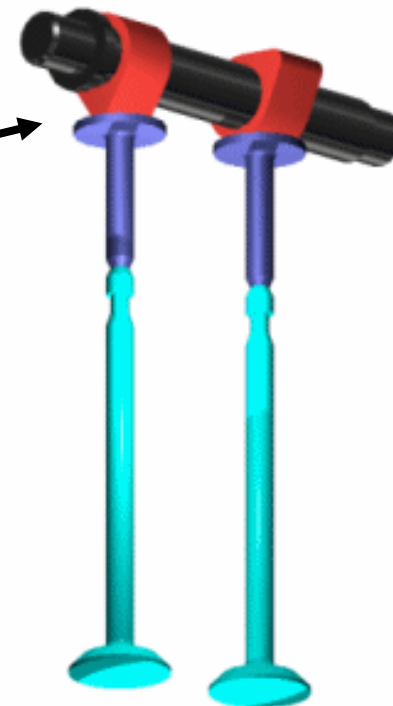
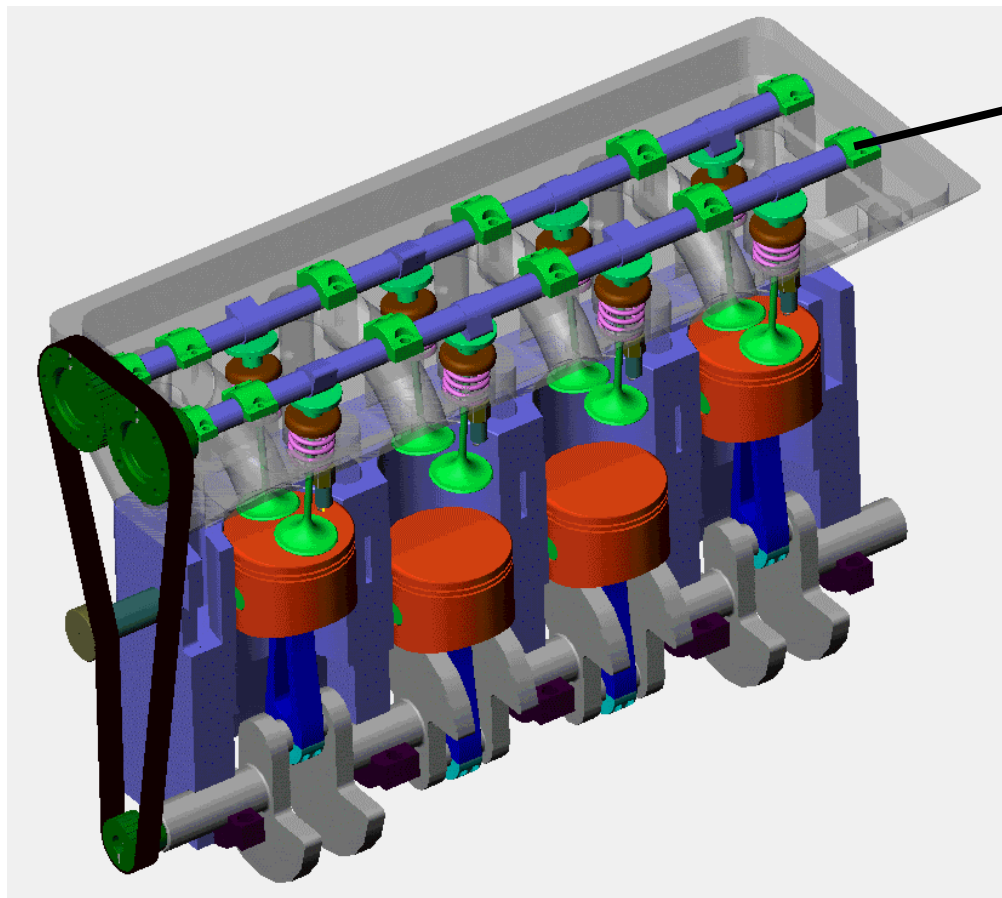
ELEMENTOS DE TRANSMISSÃO

EXEMPLOS

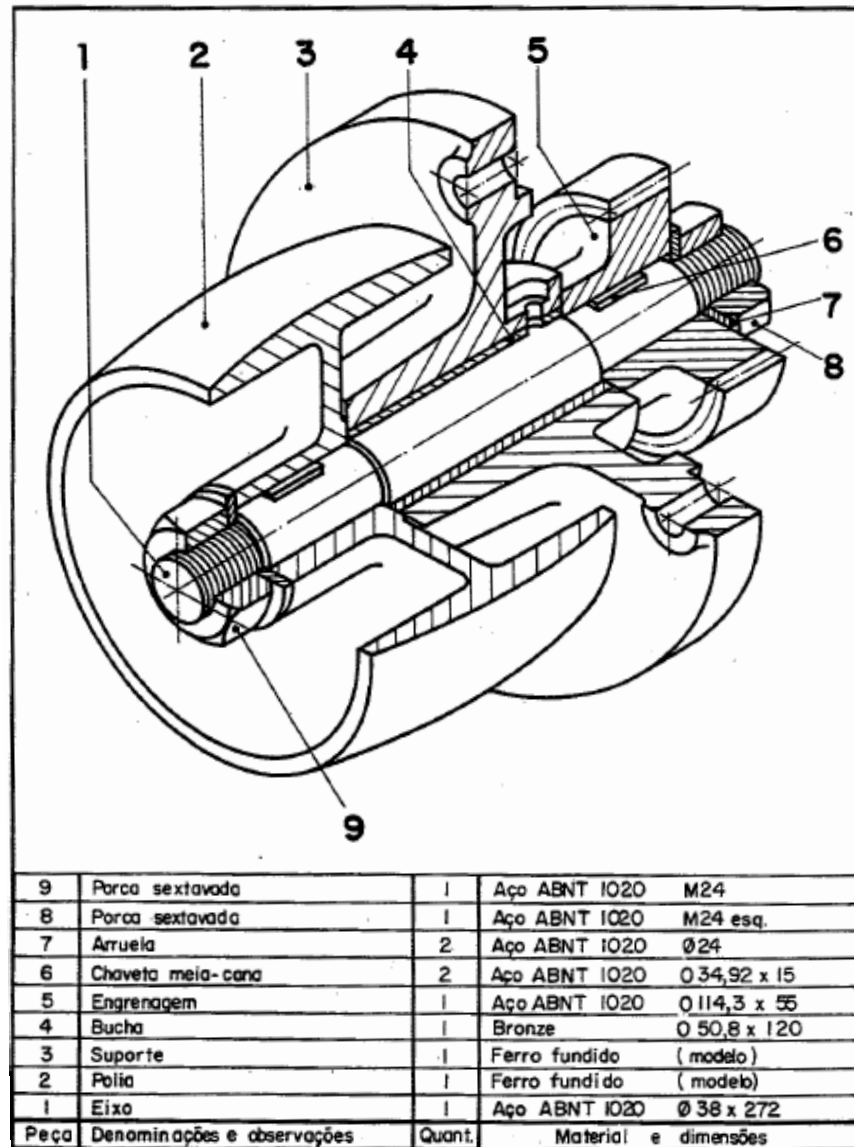


ELEMENTOS DE TRANSMISSÃO

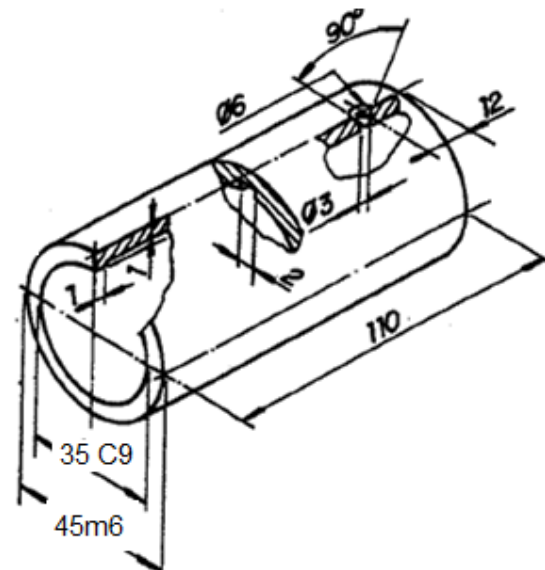
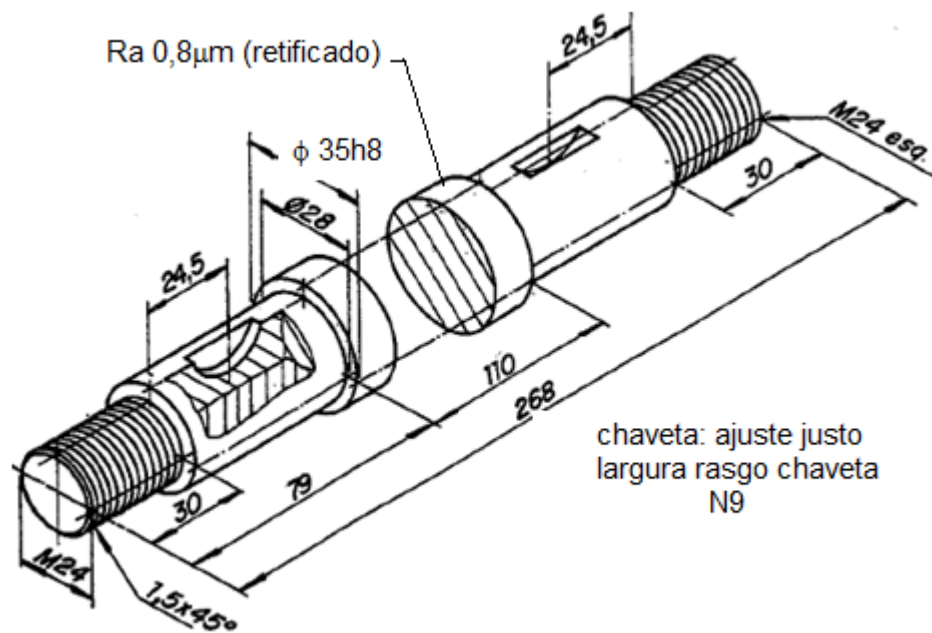
EXEMPLOS



Exercício – Fazer o desenho definitivo dos componentes e do conjunto.



Fonte: Apostila Desenho Mecânico, v9. Projeção ortogonal. Convênio SENAI/São Paulo



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