JAQUET
PRODUCT INFO

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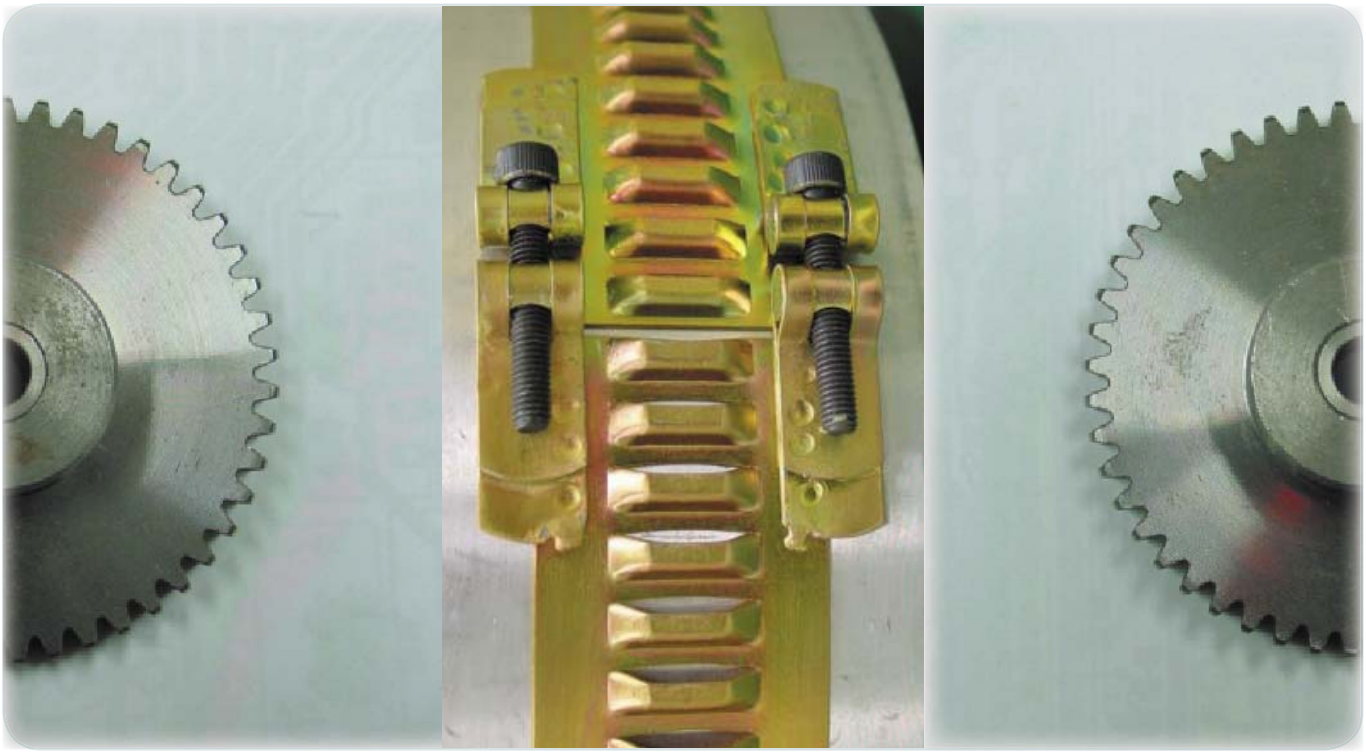
TECHNOLOGY GROUP

Pole wheels and pole bands



POLE WHEELS AND POLE BANDS

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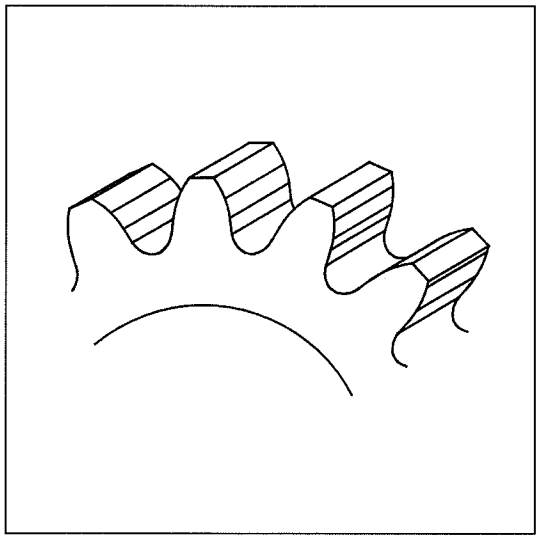
IN CHARGE OF SPEED

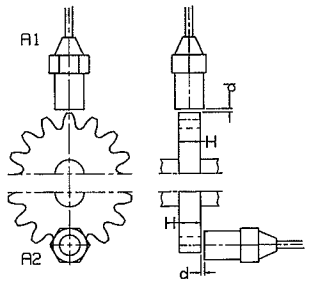


GENERAL

A pole wheel on the target shaft is required when using contactless sensors to generate a signal. Often an existing gear wheel can be used but where none is present a special gear, slotted or holed disk would be added.

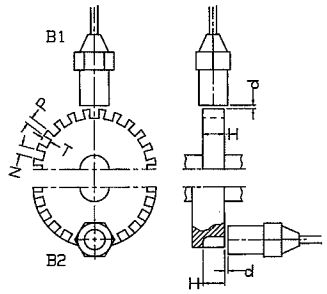
Where the shaft is very large a cost effective alternative is to add a pole band (see following section).

Other existing parts such as clutches, flanges or shafts, to which slots, holes or pegs can be added may also be suitable as the pole wheel. See notes on pole wheel geometry.



Toothed wheel with involute gear form

A1 radial sensing:	Module	1 ... 8
	B (often)	≥6 mm
A2 axial sensing:	Module	4 ... 8
	B	≥4 mm

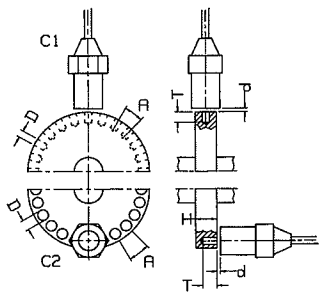


Slotted wheels

P = 0.5 ... 1.0 ... 1.3 - times slot width N

N = 3 ... 6 ... 20 mm
= 0.8 ... 1.0 ... 2.0 - times pole width P

B1 radial sensing:	T (often)	≥4 mm
	B (often)	≥6 mm
B2 axial sensing:	T (often)	≥4 mm
	B (often)	≥6 mm



Wheels with holes

A = 1.5 ... 2.0 ... 2.3 - times hole diameter D

D = 4 ... 6 ... 20 mm
= 0.8 ... 1.0 ... 2.0 - times bridge width

T = (often) ≥4 mm

Pole wheel sensing

This is usually via radially mounted sensors (occasionally via axial mounting). All mounting and operational tolerances should be taken into account when determining the sensor/pole wheel air gap. In the case of axial mounting the often considerable axial shaft play should be allowed for.

To maintain a relatively constant mark:space ratio of the sensor output signal during rotation of the pole wheel, the pole wheel/sensor air gap should be kept as small as possible.

Material

Sensors that operate on the principle of changes to the magnetic flux require a pole wheel out of ferro-magnetic material (iron, steel, castings). Stainless steel and plating with 8 % CrNi are not suitable.

For certain applications (e.g. in turbochargers or for sensing with a large air gap) pole wheels having permanent magnets can be used. HF sensors require a pole wheel out of any metallic material.

Target geometry

For optimum signal generation, pole wheels having an involute gear form should ideally be used, or alternatively slotted or holed disks. Stamped sections (pole bands), bolts and screw heads are also possibilities. It must however be ensured, that the air gap between the part and the sensor remains the same. For optimum sensing the following is recommended:

- Run out and float to be kept to a minimum (< 0.2 mm or < 20% of the air gap).
- Holes or slots to be within the dimensions and gaps shown in the adjacent drawings (recommended values underlined).
- Holes (slots) to be within the limits shown in the adjacent drawings or corresponding to the tooth height for the gear module specified.

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Geometric relationships with disk pole wheels

The following relationships are valid for involute gear wheels:

Pitch circumference
Uo [mm] = π • do [mm]

with

pitch p [mm]
defined as = Tooth centre spacing on the pitch diameter

and pole count = Z

then

Pitch circumference
Uo [mm] = Z • p [mm]

Pitch diameter
do [mm] = Z • p [mm] / π

with

module [mm]
defined as = p / π

then

Pitch diameter
do [mm] = Z • module [mm]

For optimum power transmission in a gearbox, the pitch diameter for standard gear wheels having involute gear form is:

Outer diameter
dk [mm] = pitch diameter + 2 • module [mm]
= (Z + 2) • module [mm]

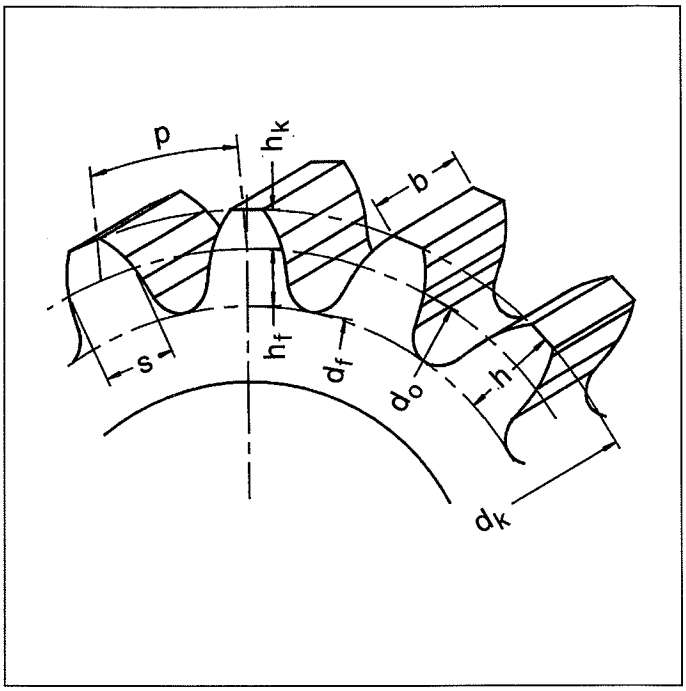
hence:

module [mm] = dk / (Z + 2)

Extract from DIN 780, standard module series:

... 0.3; 0.35; 0.4; 0.5; 0.6; 0.7; 0.8; 0.9; 1.0; 1.25; 1.5; 1.75; 2.0; 2.25; 2.5; 2.75; 3.0; 3.25; 3.5; 3.75; 4.0; 4.5; 5.0; 6.0; 7.0; 8.0 ...

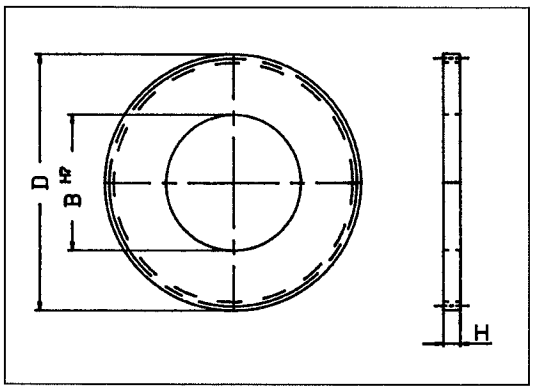
Pitch (inch) = (Z + 2) / dk (inch)
= (Z + 2) • 25.4 / dk [mm]
= 25.4 / module [mm]



do = pitch diameter
dk = outer diameter
df = tooth base diameter
p = pitch
Z = number of poles or teeth
m = module
h = tooth height
hf = tooth base
hk = tooth height
b = tooth width
s = tooth thickness

The following geometric relationships are valid for gear wheels:

$$m = \frac{t}{\pi} = \frac{do}{Z} = \frac{dk}{Z+2}$$



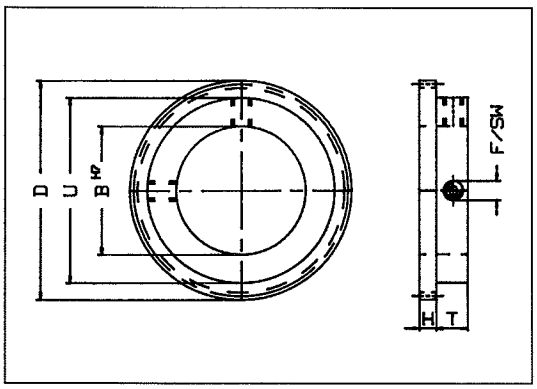
One piece pole wheels without boss, Series FTP 520

P = Number of teeth
M = Module
D = External diameter
H = Tooth width
B_N = Standard bore (H7 tolerance)
B... = Special bore range

Dimensions in mm.

Typ	Part Nr.	P	M	D	H	B_N	B...	[kg]
FTP 521/30	306F-61549	30	1	32	10	10	10... 20	on request
FTP 521/60	306F-61550	60	1	62	10	10	10... 45	0.20
FTP 521/120	306F-61551	120	1	122	10	10	10...100	0.90
FTP 521/180	306F-61552	180	1	182	10	10	10...150	on request
FTP 521/240	306F-61553	240	1	242	10	10	10...200	on request
FTP 522/15	306F-61554	15	2	34	15	15	15... 20	0.06
FTP 522/30	306F-61555	30	2	64	15	15	15... 45	0.30
FTP 522/60	306F-61556	60	2	124	15	15	15...100	1.30
FTP 522/90	306F-61557	90	2	184	15	15	15...150	3.00
FTP 522/120	306F-61558	120	2	244	15	15	15...200	5.20
FTP524/15	306F-61559	15	4	68	20	20	20... 40	on request
FTP524/30	306F-61560	30	4	128	20	20	20... 90	on request
FTP524/45	306F-61561	45	4	188	20	20	20...145	on request
FTP524/60	306F-61562	60	4	248	20	20	20...200	on request

Extra fixing holes on request.



One piece pole wheels with boss, Series FTP 530

P = Number of teeth
M = Module
D = External diameter
H = Tooth width
U = Boss diameter
T = Boss width
B_N = Standard bore (H7 tolerance)
B... = Special bore range
F = Thread
SW = Allen key size for the fixing screw

Dimensions in mm.

Typ	Part Nr.	P	M	D	H	U	T	B_N	B...	F	SW	[kg]
FTP 531/30	306G-61563	30	1	32	10	24	10	10	10... 16	M3	1.5	on request
FTP 531/60	306G-61564	60	1	62	10	48	15	10	10... 36	M5	2.5	0.40
FTP 531/120	306G-61565	120	1	122	10	108	20	10	10... 88	M8	4.0	2.30
FTP 531/180	306G-61566	180	1	182	10	168	25	10	10...140	M10	5.0	on request
FTP 531/240	306G-61567	240	1	242	10	228	30	10	10...190	M12	6.0	on request
FTP 532/15	306G-61568	15	2	34	15	24	10	15	15... 16	M3	1.5	0.08
FTP 532/30	306G-61569	30	2	64	15	48	15	15	15... 36	M5	2.5	0.50
FTP 532/60	306G-61570	60	2	124	15	108	20	15	15... 88	M8	4.0	2.70
FTP 532/90	306G-61571	90	2	184	15	168	25	15	15...140	M10	5.0	7.20
FTP 532/120	306G-61572	120	2	244	15	228	30	15	15...190	M12	6.0	14.60
FTP 534/15	306G-61573	15	4	68	20	48	15	20	20... 36	M5	2.5	on request
FTP 534/30	306G-61574	30	4	128	20	108	20	20	20... 88	M8	4.0	on request
FTP 534/45	306G-61575	45	4	188	20	168	25	20	20...140	M10	5.0	on request
FTP 534/60	306G-61576	60	4	248	20	228	30	20	20...190	M12	6.0	on request

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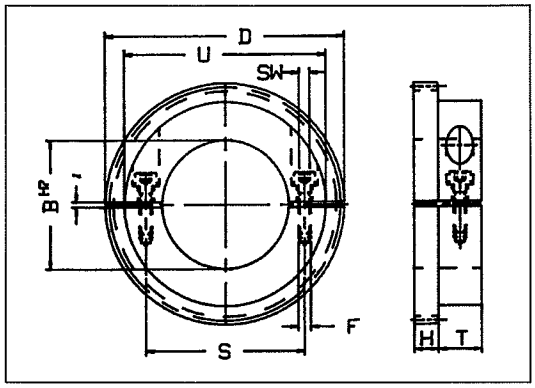
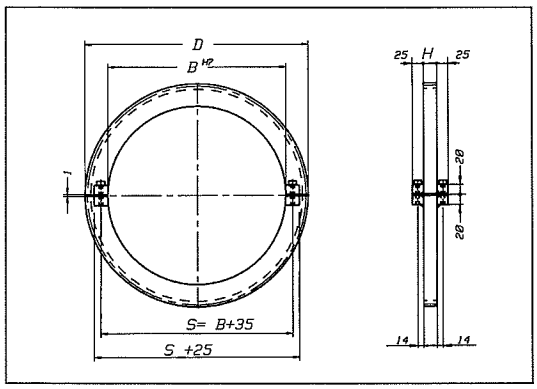
Two piece pole wheels with boss, Series FTP 540

P = Number of teeth
M = Module
D = External diameter
H = Tooth width
U = Boss diameter
T = Boss width
B...= Special bore range
F = Thread
SW= Allen key size for the fixing screw



Typ	Part Nr.	P	M	D	H	U	T	B...	F	SW	[kg]
FTP 541/120	306H-61579	120	1	122	10	108	20	10...70	M8	6	on request
FTP 541/180	306H-61580	180	1	182	10	168	25	10...120	M10		on request
FTP 541/240	306H-61581	240	1	242	10	228	30	10...170	M12	10	on request
FTP 542/60	306H-61582	60	2	124	15	108	20	15...70	M8	6	2.7
FTP 542/90	306H-61583	90	2	184	15	168	25	15...120	M10	8	7.2
FTP 542/120	306H-61584	120	2	244	15	228	30	15...170	M12	10	14.6
FTP 544/30	306H-61585	30	4	128	20	108	20	20...70	M8	6	3.1
FTP 544/45	306H-61586	45	4	188	20	168	25	20...120	M10	8	8.1
FTP 544/60	306H-61587	60	4	248	20	228	30	20...170	M12	10	16.4

Two piece pole wheels with flange, Series FTP 540



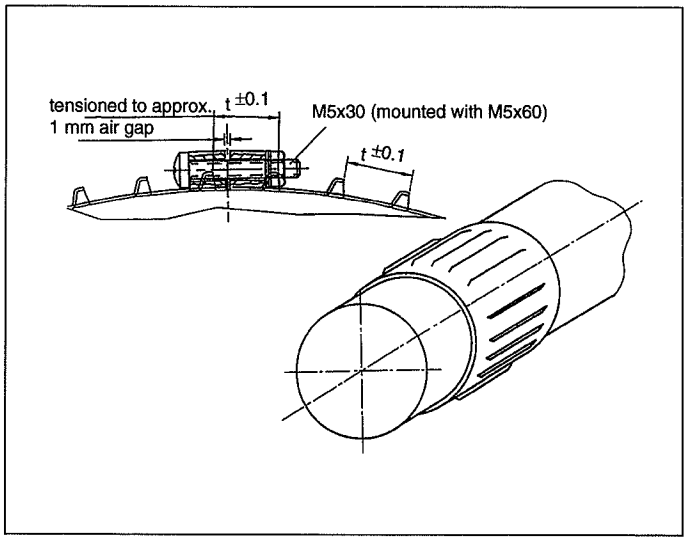
Type	Part Nr.	Module
FTP 540/Flange type	306N-63972	1.0
FTP 540/Flange type	306N-63973	2.0
FTP 540/Flange type	306N-63974	3.0
FTP 540/Flange type	306N-63975	4.0
FTP 540/Flange type	306N-63976	2.5
FTP 540/Flange type	306N-63977	5.0

Order details

Model number,
exact shaft diameter.

Other dimensions

on request.



Pole band to shaft

Where a contact less sensor is to be used to generate a signal from a very large shaft, a pole band strapped to the shaft is a proven approach. It is also a cost effective alternative to using a very large pole wheel.

Sensing

This is always via a radially mounted sensor. All mounting and operational tolerances must be allowed for when determining the air gap, in particular the often considerable end float with large shafts.

To maintain a constant signal ratio during one revolution of the shaft the air gap should be kept to a minimum.

Material

The pole bands offered here are made from ferro-magnetic material (Steel band Ust 1304-m).

Target geometry

Optimum signal generation is achieved when the pole band has humps, slots or stamped bar sections. It is necessary for the sensor to raised section air gap to remain constant during one revolution. To maintain the tension in the band it is produced so that its length and the section spacing is slightly smaller than the circumference of the shaft. The shaft outside diameter must therefore be specified exactly when ordering.

For optimum sensing the following is recommended:

- Run out and float to be kept to a minimum (< 20% of the width of the raised section).
- Sensor to be mounted over the middle of the raised sections.
- The pole band must sit securely on the shaft and over the whole circumference.
- When the pole band is screwed tight the pole pitch and spacing conform to the specified spacing exactly.

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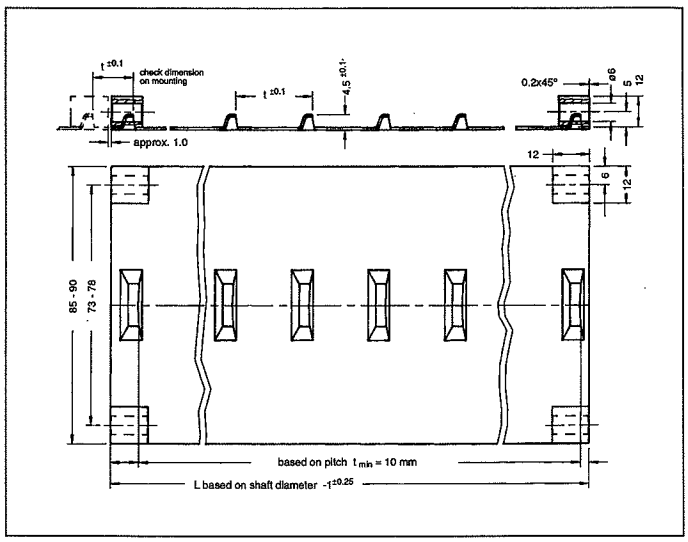
Pole bands series FTP 552

Pole band module > 3
with stamped bar sections

for shafts > 600 mm o.d.

Part. Nr. 306J-72683
Old Type 306J-72491

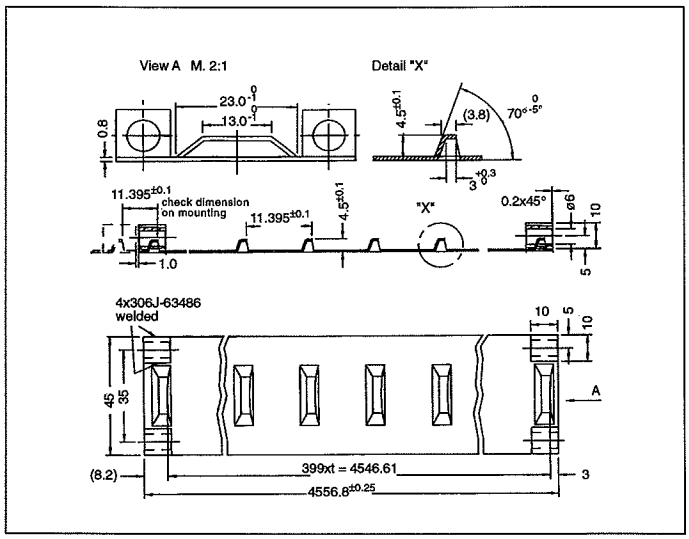


Pole bands series FTP 551

Pole band module > 3
with humps

for shafts > 200 mm o.d.
and with limited space.

Part. Nr. 306L-72492

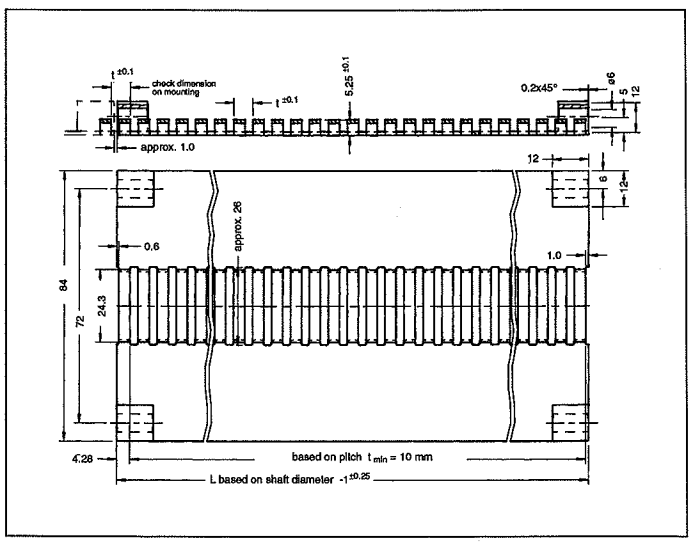


Pole bands series FTP 553

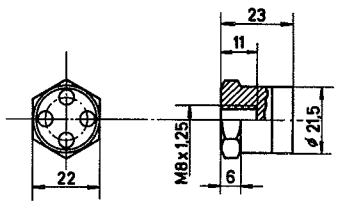
Pole band module > 2
with stamped bar sections

for shafts > 200 mm o.d.
(Creep detector).

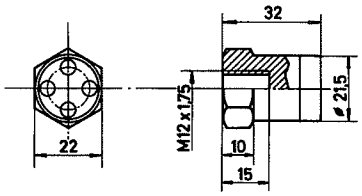
Part. Nr. 306M-72726



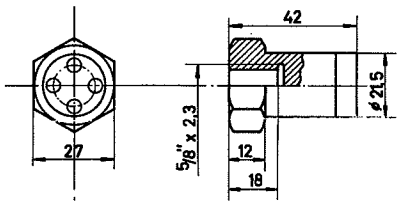
FTP 511/M8



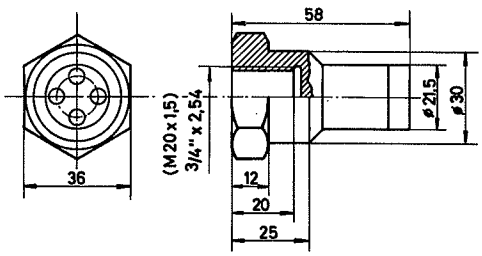
FTP 511/M12



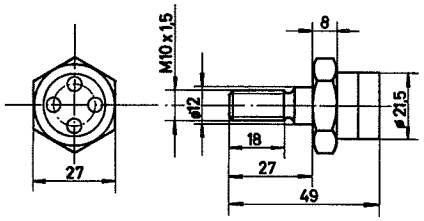
FTP 511/W58



FTP 511/W34,
FTP 511/M20



FTP 511/B10



Pole wheels
Series FTP 511

Material

Black anodised anticorodal
FTP 511/B10 only – stainless steel

Arrangement and number of poles

4 at face

Mounting

Coaxially screwed to turbocharger shaft

Speed range

Lowest: 0...9000 rpm
Highest: 0...60000 rpm

Type	Part-Nr.	Thread	Weight [g]
FTP 511/M8	306A-71570	M8x1.25	23
FTP 511/M12	306A-71571	M12x1.75	27
FTP 511/W58	306A-71572	5/8"x2.3	43
FTP 511/W34	306A-71573	3/4"x2.54	81
FTP 511/M20	306A-71575	M20x1.5	81
FTP 511/B10	306A-71574	M10x1.5	84

Turbocharger model	Notes	Pole wheel	Sensor
RR150, 180, 212	TC with filter silencer or air intake reduction	—	FTG 232 A od.S
VTC 214, 254, 304	TC with filter silencer or air intake reduction	—	FTG 232 A or S
VTC 214, 254, 304	—	—	FTG 233 A or S
VTR 160	Bearing WE, WF Bearing WE, WP	FTP 511/M12 —	FTG 103 FTG 233 A or S
VTR 161	Bearing WP Bearing WE	— —	FTG 233 A or S FTG 233 A or S
VTR 200	Bearing WE Bearing WE, WP	FTP 511/W58 —	FTG 103 FTG 233 A or S
VTR 201	Bearing WP	—	FTG 233 A or S
VTR 250	Bearing WE, WF Bearing WE, WP	FTP511/W34 —	FTG 103 FTG 233 A or S
VTR 251	Bearing WP	—	FTG 233 A or S
VTR 320	Bearing WE, GF Bearing WF Bearing WF G2F Bearing WE, WP	FTP 511/W34 FTP 511/W34 FTP 511/W34 —	FTG 103 FTG 103 FTG 104 FTG 233 A or S
VTR 321	Bearing WP	—	FTG 233 A or S
VTR 400	Bearing WE,WZ, WF, GF Bearing WE, WF, G2F	FTP 511/M8 FTP 511/M8	FTG 103 FTG 104
VTR 401	Bearing WZ, WF, G2F	FTP 511/M8	FTG 104
VTR 500	Bearing WE, WZ, WF, GF, GF1 Bearing WZ, WZ6, WF, G2F	FTP 511/M8 FTP 511/M8	FTG 103 FTG 104
VTR 501	Bearing WZ, WZ5, WZ6, WF, G2F	FTP 511/M8	FTG 104
VTR 630	Bearing WE, WZ, WF, GF, GF1 Bearing WF, G2F	FTP 511/M12 FTP 511/M12	FTG 103 FTG 104
VTR 631	Bearing WE,WZ, WZ5, WF, GF1 Bearing WF, G2F	FTP 511/M12 FTP 511/M12	FTG 103 FTG 104
VTR 750	Bearing WE,WZ, WF, GF Bearing WZ5, WZ6, WF, G2F	FTP 511/M12 FTP 511/M12	FTG 103 FTG 104
VTR 751	Bearing WZ Bearing WZ5, WZ6, WF, G2F	FTP 511/M12 FTP 511/M12	FTG 103 FTG 104
VTR 900	Bearing GF	FTP 511/B10	FTG 104
VTR 184, 214, 254, 304, 354	—	—	FTG 233 A or S
VTR 304, 354	PE2, LS2	FTP 511/M8	FTG 104
VTR 454, 564	—	FTP 511/M8	FTG 104
VTR 714	—	FTP 511/M12	FTG 104