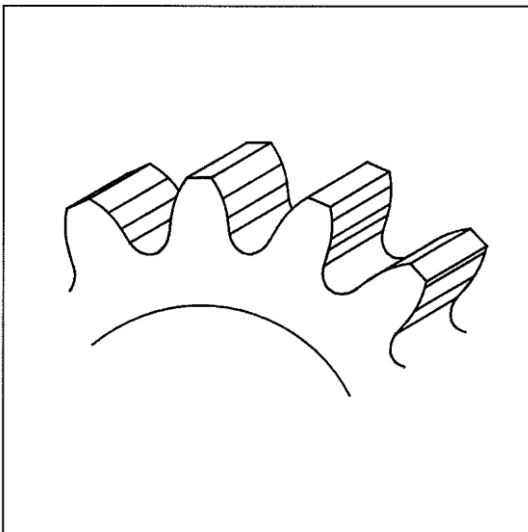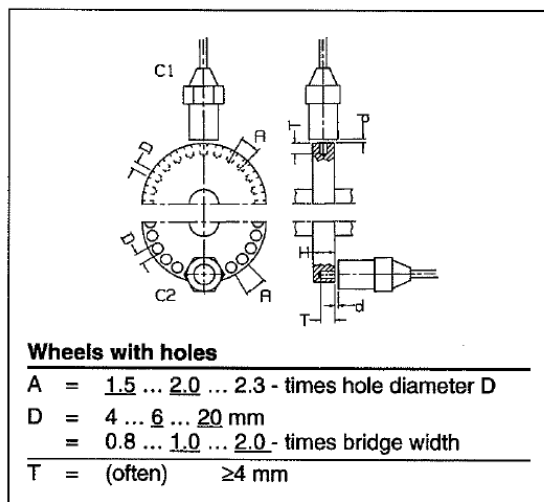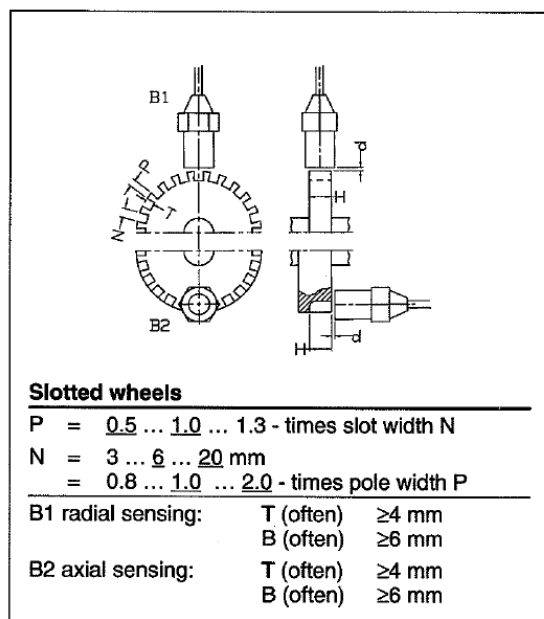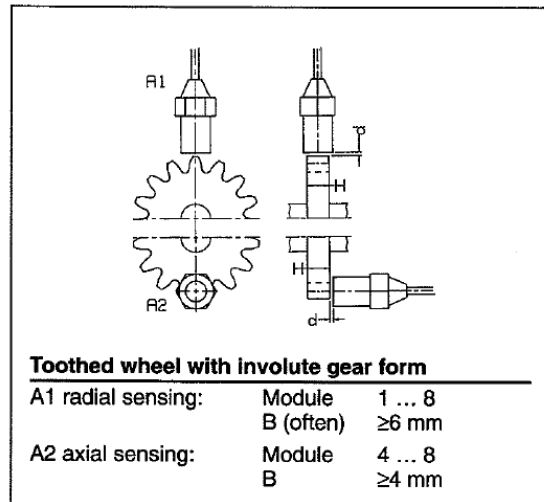# POLE WHEELS

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 Sen sing 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.

Geometries 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 center 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]
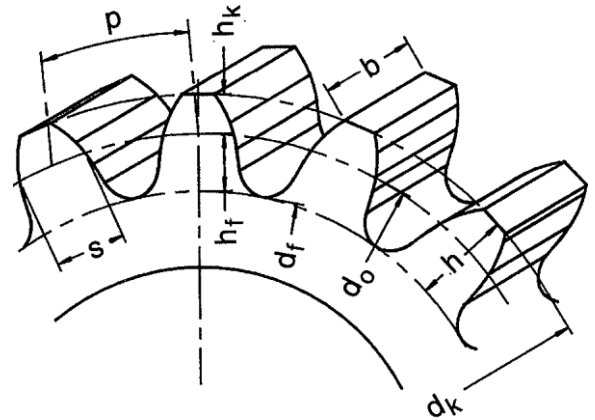
hence:

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:

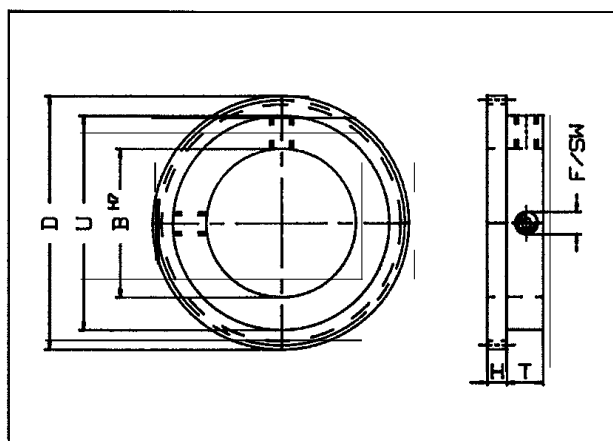$$m = \frac{t}{\pi} = \frac{do}{Z} = \frac{dk}{Z+2}$$

One piece pole wheels without boss, Series FTP 520
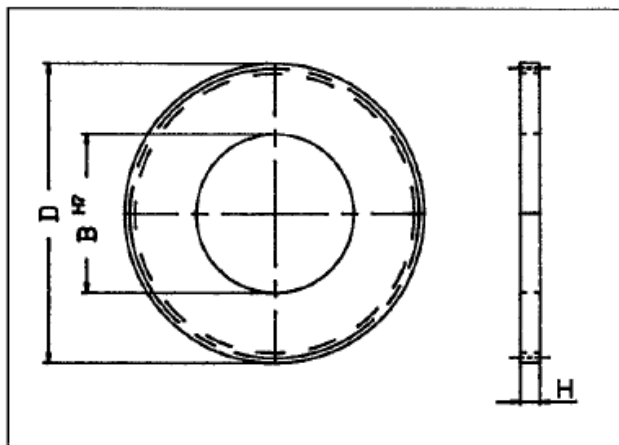
P — Number of teeth

M — Module

D — External diameter

H — Tooth width

B_N = Standard bare (H7 tolerance)

B… = Special bare 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 522190	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 bare (H7 tolerance)

B... = Special bare range

F = Thread

SW = Allen key size for the fixing screw

Dimensions in mm.

Type	Part. Nr.	P	M	D	H	U	T	B$_N$	8..	F		SW[kg]
FTP 531/30	306G-61563	30	1	32	10	24	10	10	10... 16	M3	1.5	on request
FTP531/60	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-6156B	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 532190	306G-61571	90	2	184	15	168	25	15	15...140	M10	5.0	7.20
FTP532/120	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
FTP534/30	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

Two-piece pole wheels with boss, Series FTP 540

P... =   Number of teeth

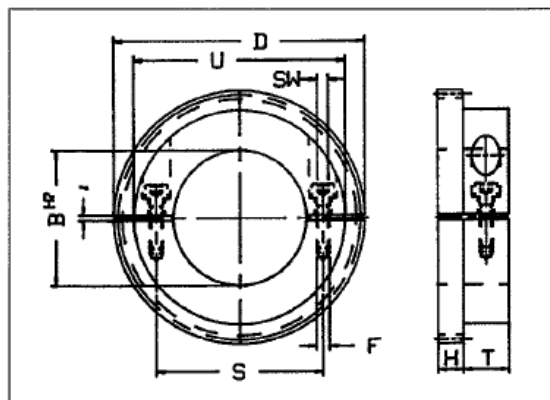M... =   Module

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

Type	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	10	on request
FTP 541/240	306H-61581	240	1	242	10	228	30	10...170	M12		on request
FTP542/60	306H-61582	60	2	124	15	108	20	15 ...70	M8	6	2.7
FTP542/90	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 544130	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	.1
FTP 544/60	306H-61587	60	4	248	20	228	30	20 ...170	M12	10	16.4

Two-piece pole wheels with flange,

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
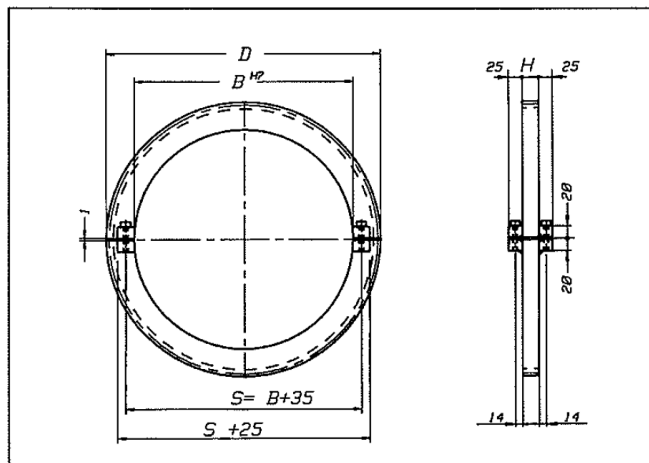
Order details

Model number,
exact shaft diameter.

Other dimensions
on request

010-62127688 82057633

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