



VARDEX Industrial Solutions

# GEAR MILLING

For Gear, Spline & Rack Manufacturing



METRIC

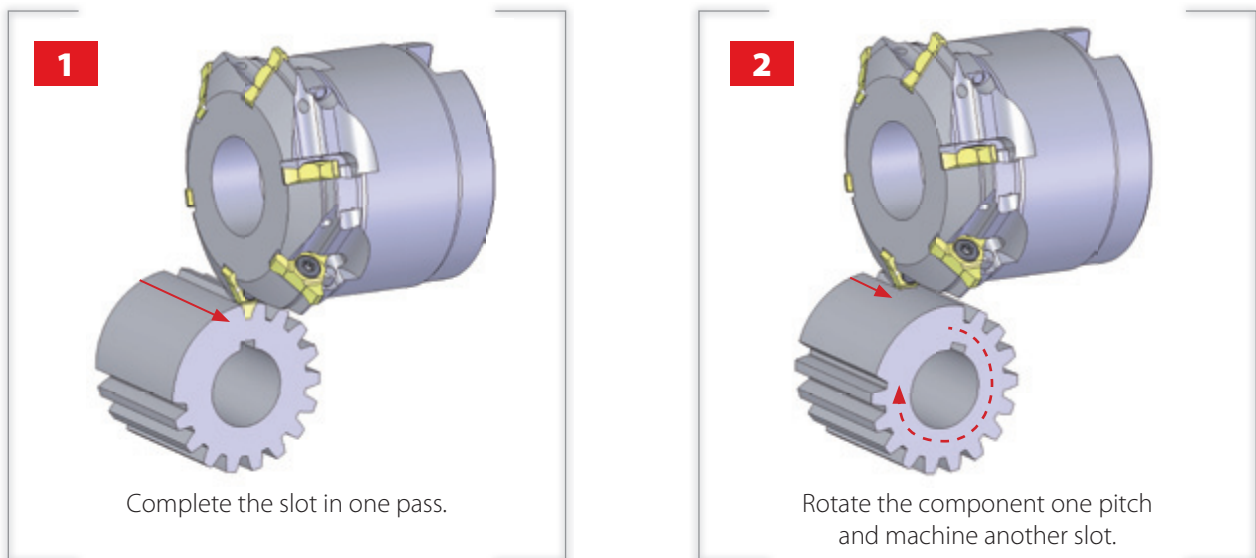
# GEAR MILLING

## Advanced Technologies for Gear, Spline and Rack Manufacturing

VARDEX presents an original and innovative solution for the gear milling industry, offering a competitive alternative to the traditional Hob system. Gear manufacturers can now mill external splines, external cylindrical gears, sprockets and racks as well as many additional gear applications with VARDEX gear milling tools.

### VARDEX GEAR MILLING Concept

- Milling tools with multi-flute indexable carbide inserts.
- Tailor-made inserts and holders designed per customer application. The inserts have the exact required profile shape (evolvent, involute or any other profile) which is transferred onto the component.



### VarDEX System Advantages:

- **Super Fast** - At least 50% less machining cycle compared to any other method:
  - Carbide inserts - High cutting speed
  - Full profile per pass - One pass per slot
- **Long Tool Life** - Tough sub-micron substrate insert coating
- **Machining** - Simple set-up and use on standard 3.5 axis CNC milling machine
- **Economical** - Absolute Price/Performance advantage over existing technology
- **High Precision** - Gears up to Class 7 according to DIN 3962 or Class 11 according to ANSI 390.03
  - Involute Splines according to DIN 5480 or ANSI B92.1
  - Straight sided Splines according to ISO 14-1982
- **Accuracy** - No need for additional machining
- **Cutting Edges** - Up to 3 cutting edges per insert for extended tool life
- **Quality** - High surface finish

## Major Applications

### GEAR



The VARDEX Gear milling tools are suitable for machining both straight and helical teeth covering modules from 0.2-6.0mm or DP 128.0-4.0.



### SPLINE



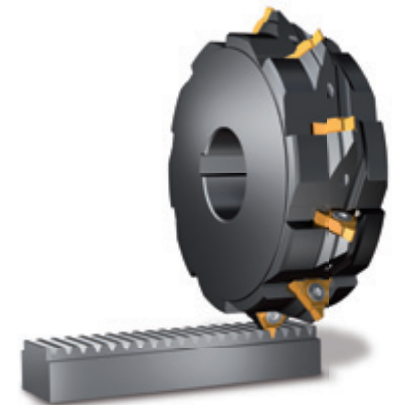
The VARDEX Spline milling tools are suitable for machining both involute or straight-sided profiles, covering modules from 0.5-6.0mm or DP 48/96 - 4/8.



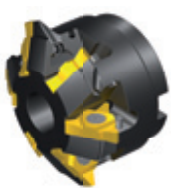
### RACK



The VARDEX rack milling tools are suitable for covering modules from 0.2-6.0mm or DP 128.0-4.0.



Gears, Splines and Racks can be machined with either Shell Mills, End Mills or Disc Mills.



Shell Mill



End Mill



Disc Mill

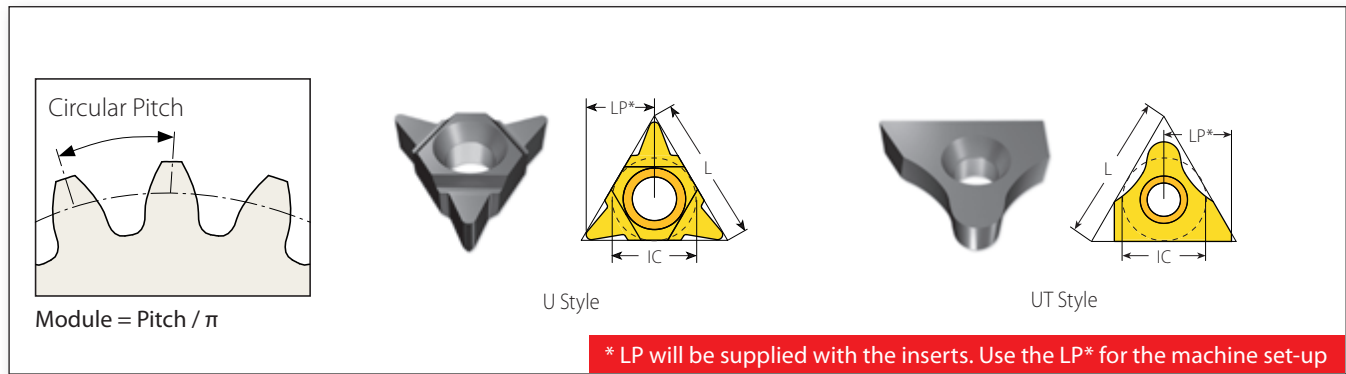


U Style  
3 Cutting Edges



UT Style  
1 Cutting Edge

# Gear Milling Insert



## The VARDEX Concept

The detailed table below describes the VARDEX gear milling machining concept.

According to the required customer application, VARDEX will design and supply unique inserts to suit a **specific and single module / DP** as well as the exact number of teeth used on the component.

Example:

For producing 2 gears with modules of 1.5 and 2, two separate IC 3/8" inserts are needed.

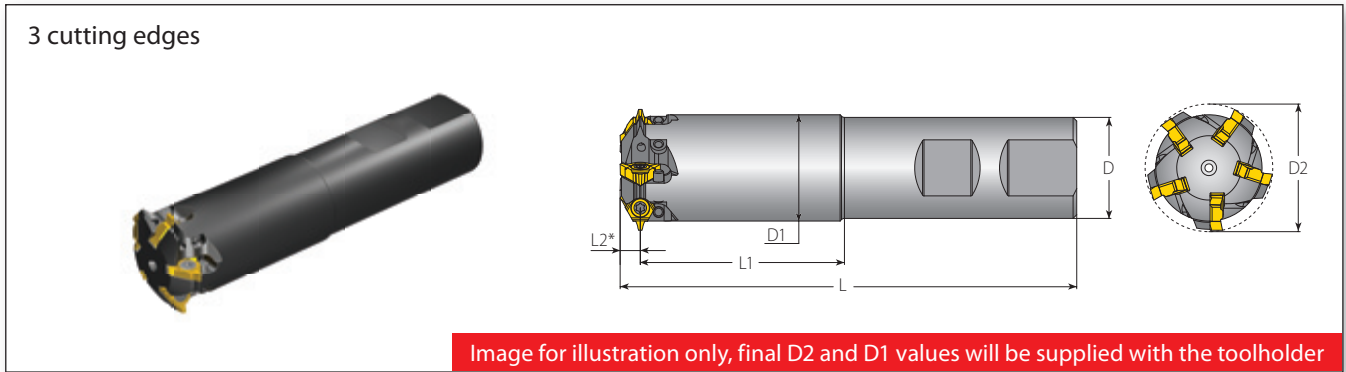
## Inserts for Gear, Spline and Rack

All inserts are tailor-made according to the customer's application



Gear Range		Spline Range		Rack Range		Insert			Toolholder	
Module	Diametrical Pitch	Module	Diametrical Pitch	Module	Diametrical Pitch	IC	L mm	Cutting Edge	Required Tool	See Pages
0.2-1.0	26-128	0.5-1.25	48/96; 40/80; 32/64; 24/48	0.2-1.0	26-128	1/4"U	11	3	GME5S 25W32-50-2U 215/... GMD12S D85-22-2U 215/...	5, 9
1.0-1.5	17-26	1.5-2.0	20/40; 16/32	1.0-1.5	17-26	3/8"U	16	3	GME5S 32W36-80-3U 215/... GMS6S D42-16-3U 215/... GMS7S D48-22-3U 215/... GMD12S D90-22-3U 215/...	5, 6, 9
1.75-2.0	13-16	2.0-3.0	12/24; 10/20; 8/16	1.75-2.0	13-16	1/2"U	22	3	GMS7S D70-27-4U 215/...	7
3.0-3.5	8.5-9	4.0-5.0	6/12; 5/10	3.0-3.5	8.5-9	1/2"UT	22	1	GMS6S D85-27-4UT 215/...	7
2.25-2.75	9.5-12	3.0-4.0	8/16; 6/12	2.25-2.75	9.5-12	5/8"U	27	3	GMS6S D80-27-5U 215/...	8
3.5-6	4-7	5.0-6.0	5/10; 4/8	3.5-6	4-7	5/8"UT	27	1	GMS5S D80-27-5UT 215/...	8

Ordering Code Example: 3UEM1.5GMVBX 210/...

## Toolholder - Weldon Shank for IC 1/4"U

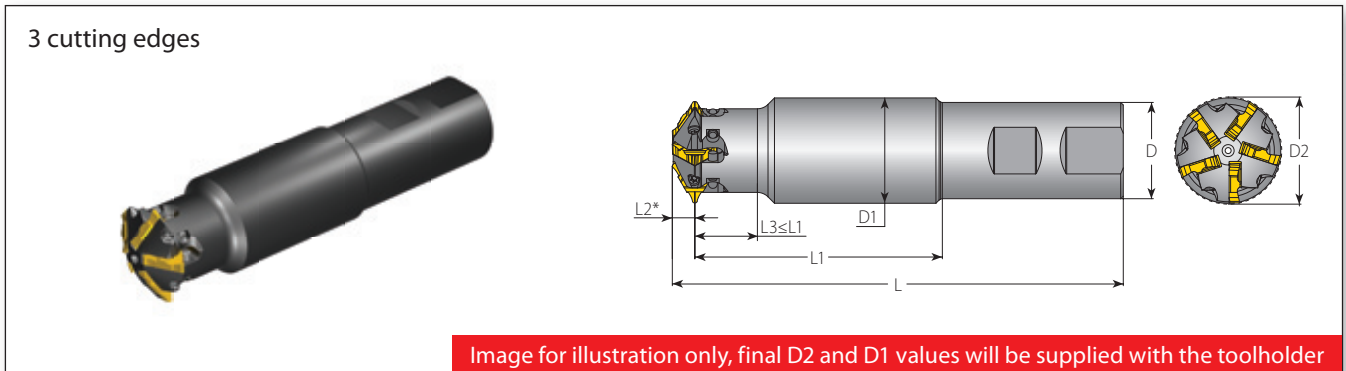


### For Gear, Rack and Spline


Insert Size	Cutting Edges	Ordering Code	Dimensions (mm)							No. of Flutes	Spare Parts	
			L	L1	*L2 (ref)	D	D1 (max)	D2 (ref)	Z			
IC	3											
1/4U	3	GME5S 25W32-50-2U 215/...	113	51	4.8	25	31	32	5	SN2T	HK2T	

\* The L2 value is only for reference, for machine set-up use LP (see page 4).

## Toolholder - Weldon Shank for IC 3/8"U



### For Gear, Rack and Spline

Insert Size	Cutting Edges	Ordering Code	Dimensions (mm)							No. of Flutes	Spare Parts	
			L	L1	*L2 (ref)	L3	D	D1 (max)	D2 (ref)		Z	
IC	3											
3/8U	3	GME5S 32W36-80-3U 215/...	150	81	7.1	≤81	32	35	36	5	SR3FIP8	KIP8

\* The L2 value is only for reference, for machine set-up use LP (see page 4).

## Toolholder - Shell Mill for IC 3/8"U

3 cutting edges

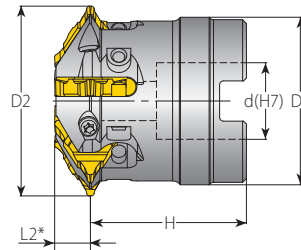


Image for illustration only, final D2 and D1 values will be supplied with the toolholder

### For Gear, Rack and Spline

#### Spare Parts

Insert Size	Cutting Edges	Ordering Code	Dimensions (mm)							No. of Flutes	Spare Parts			
			D1 (max)	D2 (ref)	d(H7)	H	L2 (ref)	Z	Insert Screw		Torx+ Key	Holder Screw	Holder Screwdriver	
IC	3	GMS6S D42-16-3U 215/...	40	42	16	40	7.5	6	SR3FIP8	KIP8	SA5T-C5(M8x1.25x28)	TK5T		

\*The L2 value is only for reference, for machine set-up use LP (see page 4).

## Toolholder - Shell Mill for IC 3/8"U

3 cutting edges

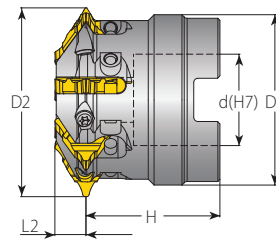


Image for illustration only, final D2 and D1 values will be supplied with the toolholder

### For Gear, Rack and Spline

#### Spare Parts

Insert Size	Cutting Edges	Ordering Code	Dimensions (mm)							No. of Flutes	Spare Parts		
			D1 (max)	D2 (ref)	d(H7)	H	*L2 (ref)	Z	Insert Screw		Torx+ Key	Holder Screw	
IC	3	GMS7S D48-22-3U 215/...	45	48	22	40	7.5	7	SR3FIP8	KIP8	M10x35x1.5		

\*The L2 value is only for reference, for machine set-up use LP (see page 4).

## Toolholder – Shell Mill for IC 1/2"U

3 cutting edges

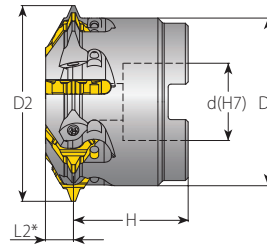
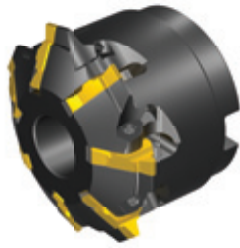


Image for illustration only, final D2 and D1 values will be supplied with the toolholder

### For Gear, Rack and Spline

Insert Size	Cutting Edges	Ordering Code	Dimensions (mm)							No. of Flutes	Spare Parts		
			D1 (max)	D2 (ref)	d(H7)	H	L2 (ref)	Z	Insert Screw		Torx+ Key	Holder Screw	
IC	3	GMS7S D70-27-4U 215/...	68	70	27	50	10	7	SR3FIP8	KIP8	M12x40x1.75		

\*The L2 value is only for reference, for machine set-up use LP (see page 4).

## Toolholder – Shell Mill for IC 1/2" UT

1 cutting edge

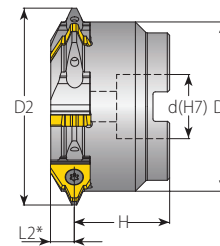
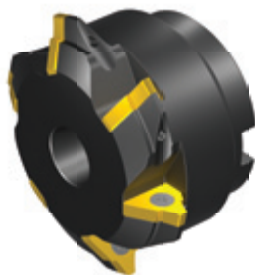


Image for illustration only, final D2 and D1 values will be supplied with the toolholder

### For Gear, Rack and Spline

Insert Size	Cutting Edges	Ordering Code	Dimensions (mm)							No. of Flutes	Spare Parts		
			D1 (max)	D2 (ref)	d(H7)	H	*L2 (ref)	Z	Insert Screw		Torx Key	Holder Screw	
IC	1	GMS6S D85-27-4UT 215/...	83	85	27	50	10.2	6	SN4T	HK4T	M12x40x1.75		

\*The L2 value is only for reference, for machine set-up use LP (see page 4).

## Toolholder - Shell Mill for IC 5/8"U

3 cutting edges

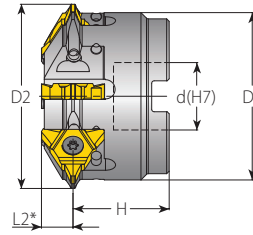
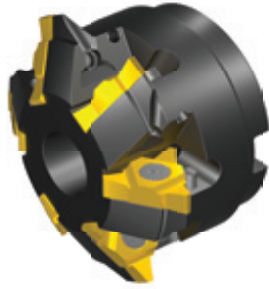


Image for illustration only, final D2 and D1 values will be supplied with the toolholder

### For Gear, Rack and Spline

#### Spare Parts

Insert Size	Cutting Edges	Ordering Code	Dimensions (mm)							No. of Flutes	Insert Screw	Torx Key	Holder Screw
			D1 (max)	D2 (ref)	d(H7)	H	*L2 (ref)	Z					
IC	3	GMS6S D80-27-5U 215/...	78	80	27	50	13	6	SN5TM	HK5T	M12x40x1.75		

\*The L2 value is only for reference, for machine set-up use LP (see page 4).

## Toolholder – Shell Mill for IC 5/8"UT

1 cutting edge

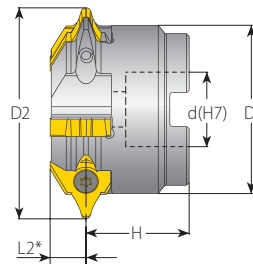
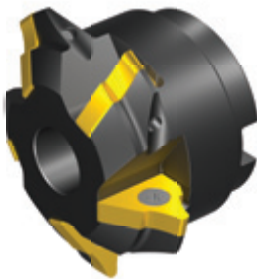


Image for illustration only, final D2 and D1 values will be supplied with the toolholder

### For Gear, Rack and Spline

#### Spare Parts

Insert Size	Cutting Edges	Ordering Code	Dimensions (mm)							No. of Flutes	Insert Screw	Torx Key	Holder Screw
			D1 (max)	D2 (ref)	d(H7)	H	*L2 (ref)	Z					
IC	1	GMS5S D80-27-5UT 215/...	78	80	27	50	13	5	SN5TM	HK5T	M12x40x1.75		



\*The L2 value is only for reference, for machine set-up use LP (see page 4).

## Gear Milling Toolholder - Disk Mill for IC 1/4"U

3 cutting edges

Image for illustration only, final D2 and D1 values will be supplied with the toolholder

### For Gear, Rack and Spline

Insert Size	Cutting Edges	Ordering Code	Dimensions (mm)							No. of Flutes	Spare Parts	
			D1 (max)	D2 (ref)	d(H6)	H	L	L2 (ref)	Z			
IC											Insert Screw	Torx Key
1/4"U	3	GMD12S D85-22-2U 215/...	83	85	22	12.5	25	5	12		SN2T	HK2T



\* The L2 value is only for reference, for machine set-up use LP (see page 4).

## Gear Milling Toolholder – Disc Mill for IC 3/8"U

3 cutting edges

Image for illustration only, final D2 and D1 values will be supplied with the toolholder

### For Gear, Rack and Spline

Insert Size	Cutting Edges	Ordering Code	Dimensions (mm)							No. of Flutes	Spare Parts	
			D1 (max)	D2 (ref)	d(H6)	H	L	L2 (ref)	Z			
IC											Insert Screw	Torx+ Key
3/8U	3	GMD12S D90-22-3U 215/...	88	90	22	12.5	25	7.6	12		SR3FIP8	KIP8

\* The L2 value is only for reference, for machine set-up use LP (see page 4).

## Recommended Grades, Cutting Speeds Vc [m/min] and Feed f [mm/tooth]

Material Group	Vardex No.	Material	Hardness Brinell HB	Vc [mm/min]		Feed f [mm/tooth]
				VBX		
<b>P</b> Steel	1	Unalloyed steel	Low carbon (C=0.1-0.25%)	125	100-210	0.20-0.32
	2		Medium carbon (C=0.25-0.55%)	150	100-180	0.20-0.32
	3		High Carbon (C=0.55-0.85%)	170	100-170	0.15-0.23
	4	Low alloy steel (alloying elements ≤5%)	Non hardened	180	60-90	0.17-0.28
	5		Hardened	275	80-150	0.15-0.28
	6		Hardened	350	70-140	0.15-0.25
	7	High alloy steel (alloying elements >5%)	Annealed	200	60-130	0.15-0.22
	8		Hardened	325	70-110	0.13-0.21
	9	Cast steel	Low alloy (alloying elements <5%)	200	100-170	0.15-0.22
	10		High alloy (alloying elements >5%)	225	70-120	0.12-0.22
<b>M</b> Stainless Steel	11	Stainless steel Ferritic	Non hardened	200	100-170	0.15-0.22
	12		Hardened	330	100-170	0.16-0.23
	13	Stainless steel Austenitic	Austenitic	180	70-140	0.15-0.25
	14		Super Austenitic	200	70-140	0.12-0.20
	15	Stainless steel Cast Ferritic	Non hardened	200	70-140	0.16-0.24
	16		Hardened	330	70-140	0.12-0.20
	17	Stainless steel Cast austenitic	Austenitic	200	70-120	0.15-0.22
	18		Hardened	330	70-120	0.12-0.20
<b>K</b> Cast Iron	28	Malleable Cast iron	Ferritic (short chips)	130	60-130	0.16-0.24
	29		Pearlitic (long chips)	230	60-120	0.15-0.22
	30	Grey cast iron	Low tensile strength	180	60-130	0.15-0.22
	31		High tensile strength	260	60-100	0.15-0.22
	32	Nodular SG iron	Ferritic	160	60-125	0.10-0.20
	33		Pearlitic	260	50-90	0.15-0.22
<b>N(K)</b> Non-Ferrous Metals	34	Aluminium alloys Wrought	Non aging	60	100-250	0.30-0.50
	35		Aged	100	100-180	0.28-0.50
	36	Aluminium alloys	Cast	75	150-400	0.28-0.50
	37		Cast & aged	90	150-280	0.25-0.40
	38	Aluminium alloys	Cast Si 13-22%	130	80-150	0.28-0.50
	39	Copper and Copper alloys	Brass	90	120-210	0.30-0.50
	40		Bronze and non leaded copper	100	120-210	0.28-0.50
<b>S(M)</b> Heat Resistant Material	19	High temperature alloys	Annealed (Iron based )	200	20-45	0.09-0.15
	20		Aged (Iron based)	280	20-30	0.07-0.13
	21		Annealed (Nickel or Cobalt based)	250	15-20	0.08-0.15
	22		Aged (Nickel or Cobalt based)	350	10-15	0.08-0.15
	23	Titanium alloys	Pure 99.5 Ti	400Rm	70-140	0.07-0.13
	24		α+β alloys	1050Rm	20-50	0.07-0.13
<b>H(K)</b> Hardened Material	25	Extra hard steel	Hardened & tempered	45-50HRc	15-45	0.05-0.12
	26			51-60HRc	15-40	0.05-0.12

### Grades

Grade	Application
<b>VBX</b>	TiCN coated carbide grade. Excellent grade for <b>general use</b> .

Other grades are available upon request.

U Style



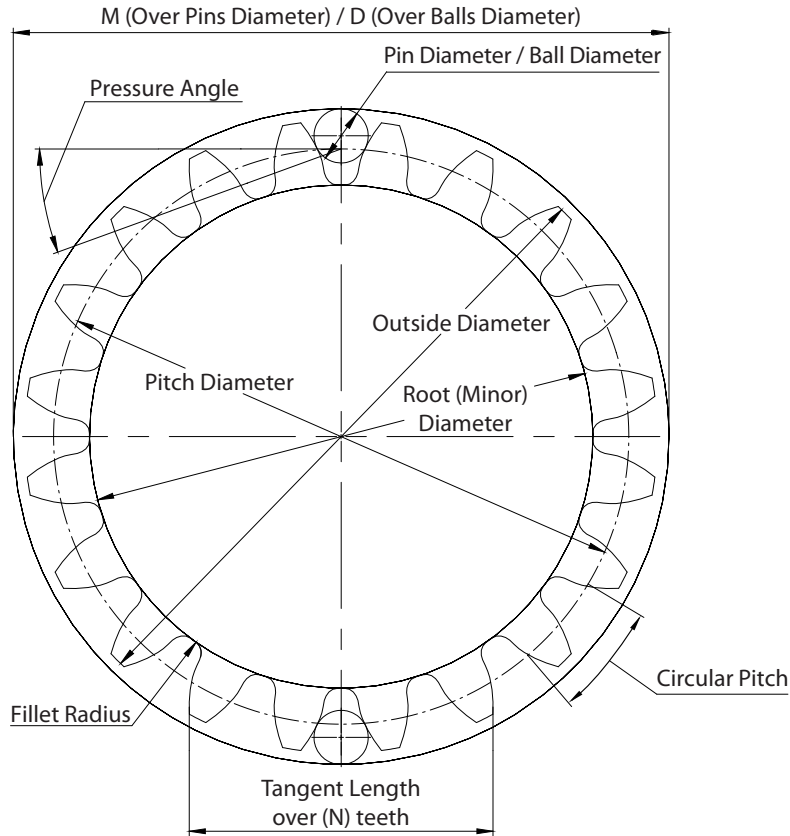
UT Style



# Price Quotation Form

The VARDEX design is based on your application. Please complete the **Required Dimensions** below and together with the component drawing (if available) send to your local VARDEX distributor.

## Gear Dimensions



## Required Dimensions

Dimensions		Required Information
1	Material to be Machined	
2	Number of Teeth	
3	Circular Pitch / Normal Module (mm)	
4	Pressure Angle	
5	Helix Angle	
6	Direction of Helix: RH/LH	
7	Outside Diameter	____ +/- ____
8	Root (Minor) Diameter	____ +/- ____
9	Fillet Radius	
10	Class of Accuracy (finishing only)	
11	Grinding Stock (roughing/semi finishing only)	
12	Teeth Measurement: Dimensions over two pins "M" or balls "D"	

**Note:** For Splines, lines 8, 9, 10 and 12 can be filled in with the Spline standard.

**GEAR MILLING**

For Gear, Spline & Rack Manufacturing



**VARDEX**

Advanced Threading Solutions

