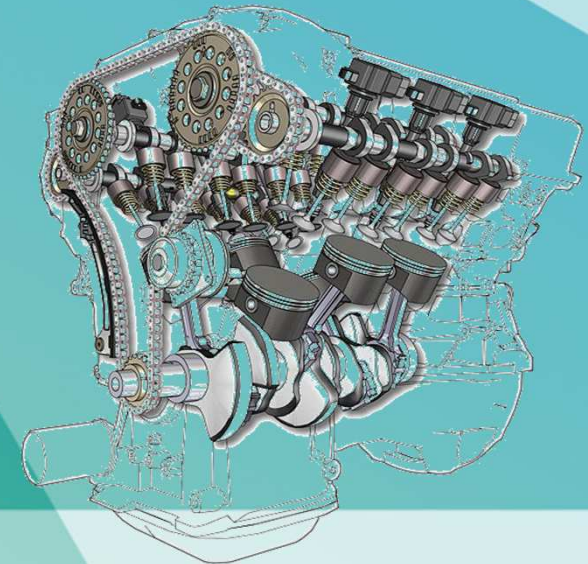




# Quindos / Romer sales argumentation

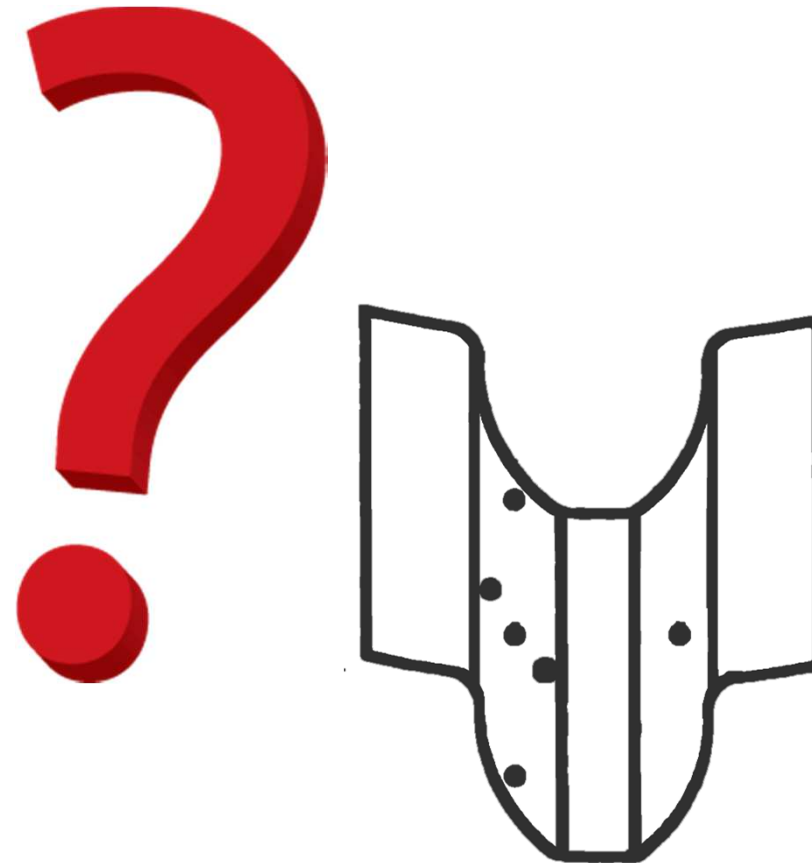
21.12.2012



Hexagon Metrology PTS GmbH  
PowerTrain Solutions

# Application – Unknown gear

PowerTrain Solutions





How to measure an unknown gear  
with only 4 instructions  
in less than 5 minutes

# Measuring program

## PowerTrain Solutions

- **Only 4 instructions to measure a very complex part**

! Elements to build the coordinate system

MEPLA (NAM=PLA(1), CSY=REFR\$CSY, ITY=GSS, DEL=Y)

MECIR (NAM=CIR(1), CSY=REFR\$CSY, DEL=Y)

! Build a coordinate system

BLDCSY (NAM=CSY(1), TYP=CAR, SPA=PLA(1), SDR=+Z, PDR=+X, XZE=CIR(1), YZE=CIR(1), ZZE=PLA(1))

!

! Measurement of an unknown gear

GEARXY (PRI=TT)

- **QUINDOS makes it possible !**

## Element to build a coordinate system

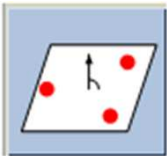
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# Element to build a coordinate system

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- **Instruction 1**



### Measure plane

Element

Calculate nominal element from nominal points (CAD - manual pre-alignment)

Coordinate system

Mode

Measure  Evaluate

Calculate

Calculation type

Bestfit (Gauss)

Minimum

Calculation control :

Create the constrained element ?

Message/Image/Sound

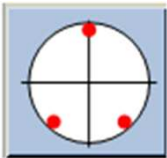
Delete first?

Points  Evaluations

# Element to build a coordinate system

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- **Instruction 2**



### Measure circle

Element

Calculate nominal element from nominal points

Coordinate system

Mode

Measure  Evaluate

Calculate

Projection into

Calculation type

Bestfit (Gauss)

Minimum (Chebyshev)

MaxInscribed

MinCircumscribed  MinCirc./Arc

Message/Image/Sound

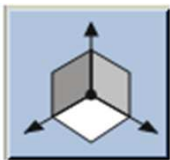
Delete first?

Points  Evaluations

# build a coordinate system

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- **Instruction 3**



### Build coordinate system

New coordinate system

CSY(1) ▼

Create CAD coord.system

Create coordinate system in LDB and NDB

Create coordinate system in NDB database only

Create coordinate system in LDB database only

Type of coordinate system

cartesian     cylindric

spheric

---

Spatial Alignment

Element	Axis
PLA(1) <span style="float: right;">▼</span>	+Z <span style="float: right;">▼</span>

---

Planar Alignment

Element	Axis
<span style="border: 1px solid gray; padding: 2px;"> </span> <span style="float: right;">▼</span>	+X <span style="float: right;">▼</span>

---

Origin

X CIR(1) ▼

Y CIR(1) ▼

Z PLA(1) ▼

---

Copy co-ordinate system

  ▼



# Measure unknown gear (GEARXY)

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- **Instruction 4**



## Unknown gear

UVS result element (without index)

Output device

Screen
  Printer
  File

# Unknown gear nominal data

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**QUINDOS** Unknown gear - nominal data

**Gear parameters**

Number of teeth:   Probe

Tip circle diameter:   Probe

Root circle diameter:   Probe

Tooth width:   Probe

**Gear parameters (nominal data)**

Helix angle on pitch circle:

Pitch circle diameter:

Base circle diameter:

Base helix angle:

Addendum modification factor:

**Gearing type**

Gear:  External  Internal


Flank direction:  Straight  Helical

**Module/pressure angle**

fix normal module

fix preassure angle

normal pressure angle:



**Crowning**

Crowning of profile [mm/inch]: left  right

Crowning of helix [mm/inch]: left  right

## Probe in the middle of 3 left or right flanks

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### **PROBINGS IN THE MIDDLE OF 3 LEFT OR 3 RIGHT FLANKS**

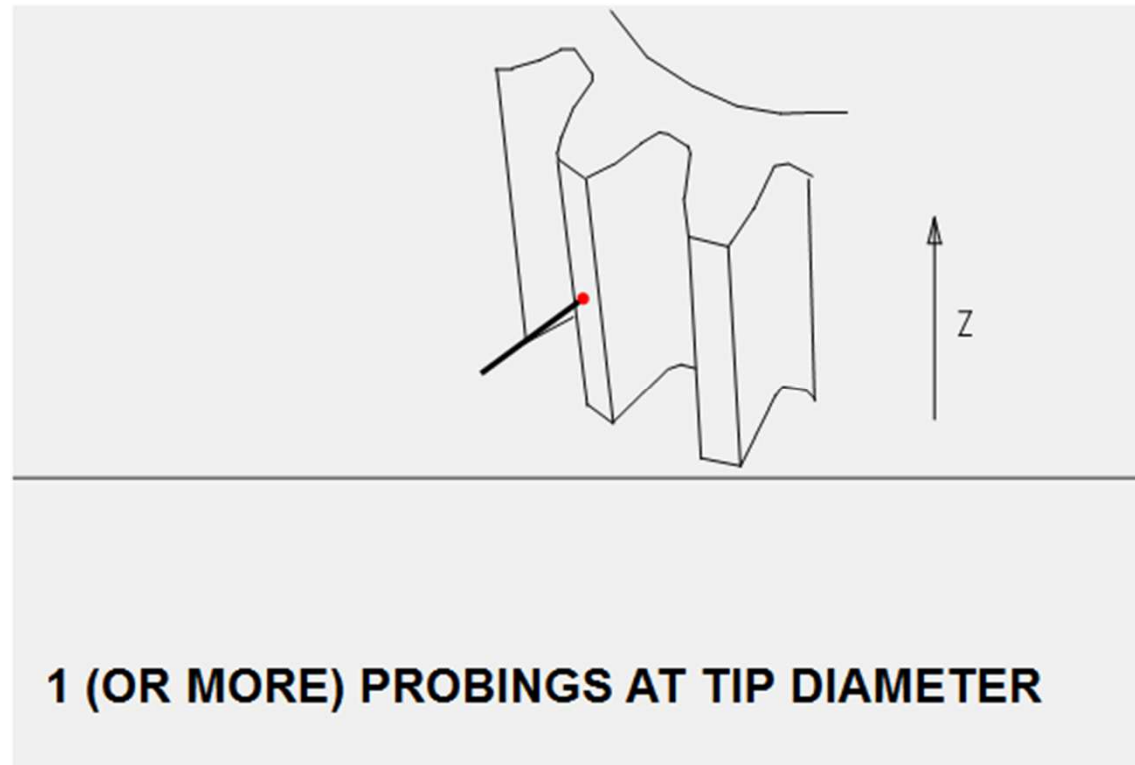
**==> TOOTH 1, TOOTH 2, TOOTH N (WITH CLPS !!)**

**GREATER DISTANCE BETWEEN 2 AND N IN CASE OF LARGE NUMBERS**

**(NO. OF TEETH LESS THAN 40: TOOTH 1 AND 2 IS SUFFICIENT)**

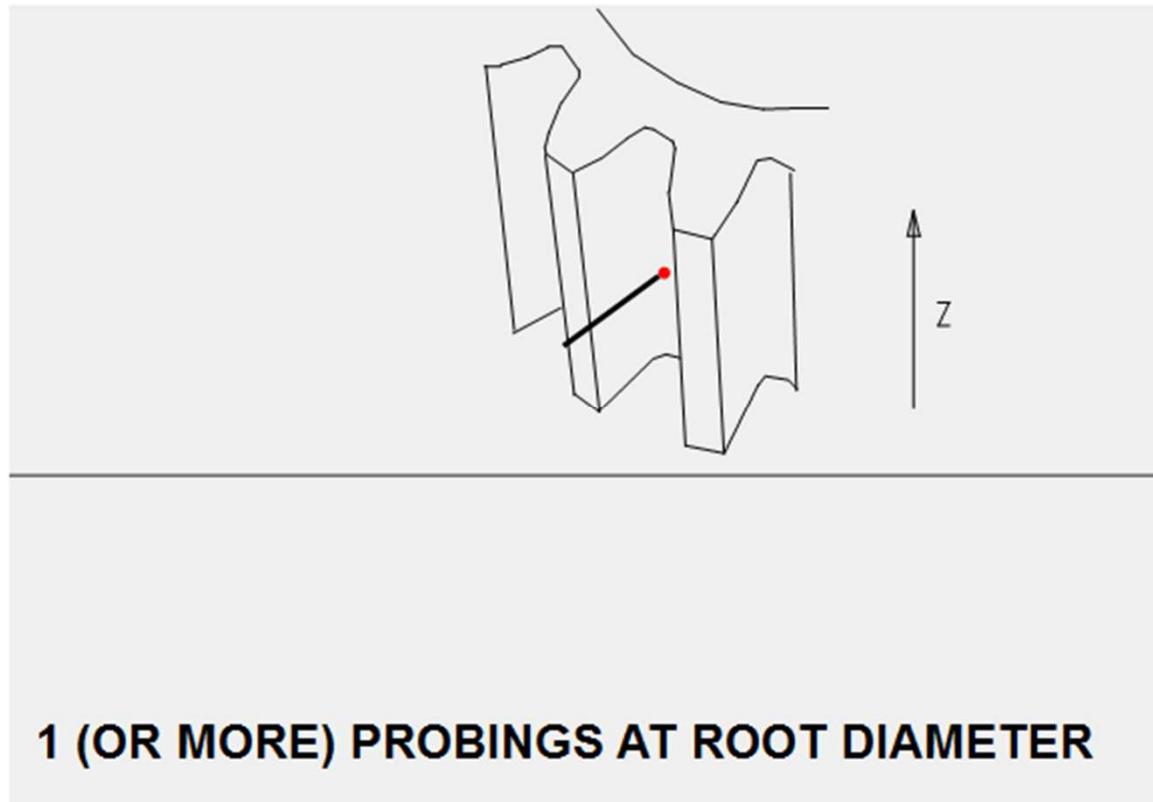
## Probe at the tip diameter

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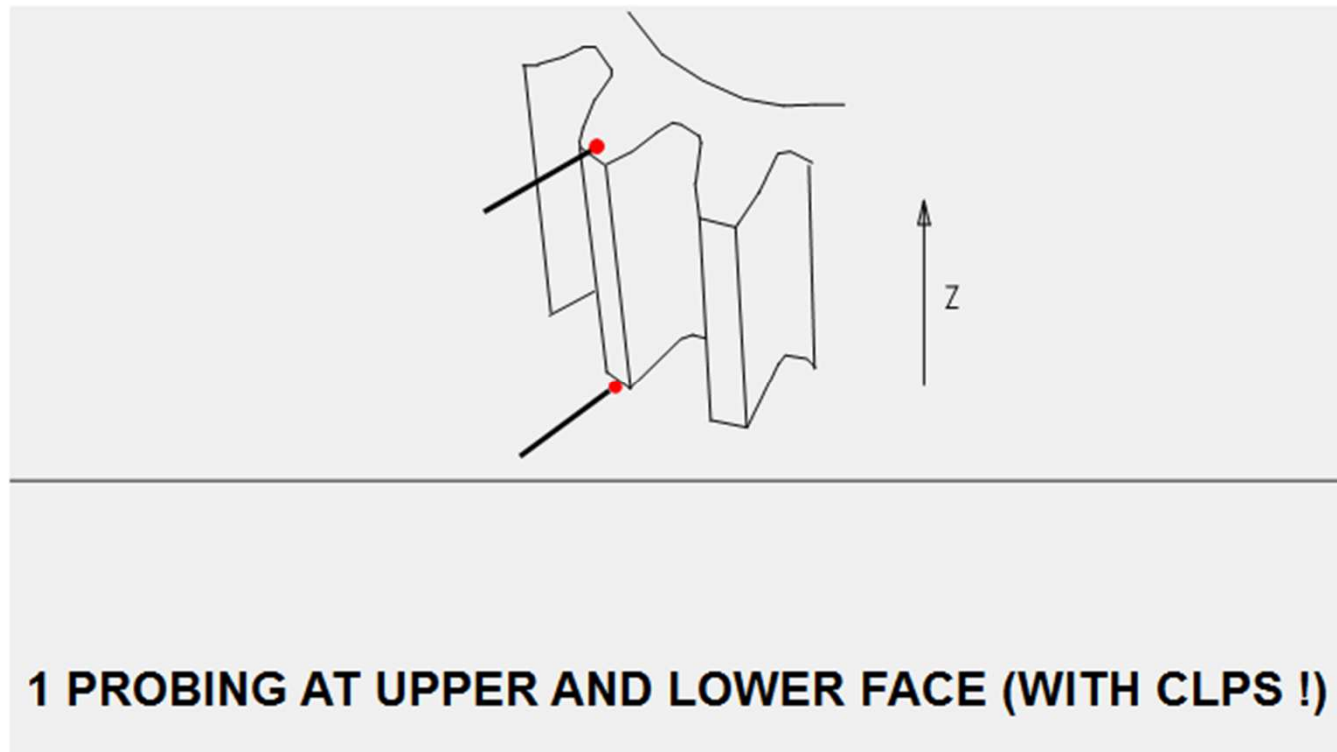
## Probe at the root diameter

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# Probe tooth height

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# First results

## PowerTrain Solutions

**QUINDOS** Unknown gear - nominal data

**Gear parameters**

Number of teeth:   Probe

Tip circle diameter:   Probe

Root circle diameter:   Probe

Tooth width:   Probe

**Gear parameters (nominal data)**

Helix angle on pitch circle:

Pitch circle diameter:

Base circle diameter:

Base helix angle:

Addendum modification factor:

**Gearing type**

Gear:  External  Internal


Flank direction:  Straight  Helical

**Module/pressure angle**

fix normal module

fix pressure angle

normal pressure angle:



**Crowing**

Crowing of profile [mm/inch]: left  right

Crowing of helix [mm/inch]: left  right

# Measurement strategy

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**QUINDOS**
Measurement strategy

Probing strategy

Single points    Scanning


Method with single points

Probing of points

Number of points to probe

6

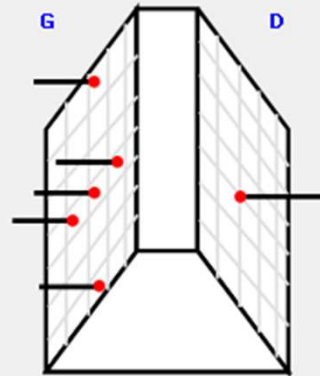
- 6 = 5+1 : Helix 3D, crowning, factor x
- 5 : Helix 3D, crowning
- 4 = 3+1 : Profile 2D, crowning, factor x
- 3 : Profile 2D, crowning





# Helix, crowning & factor x

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**5 PROBINGS AT RIGHT FLANK, 1 PROBING AT LEFT FLANK**

**OR**

**5 PROBINGS AT LEFT FLANK, 1 PROBING AT RIGHT FLANK**

**(ORDER OF THE 5 POINTS ARBITRARY)**

# Get the parameters of the gear

## PowerTrain Solutions

PARAMETER	INPUT (*=FIX)	ACTUAL	DEVIATION
Number of teeth	22.0000	(21.998)	
external/internal	external		
Hand of lead	left	left	
Base circle diameter	0.0000	107.5728	107.5728
Base helix angle	0.0000	-19.7911	19.7911
Normal module (mm)	0.0000	4.8961	4.8961
Norm. Diam. Pitch (Inch)	0.0000	5.1878	5.1878
Normal pressure angle	20.0000 **	20.0000	0.0000
Helix angle	0.0000	-21.1199	21.1199
Pitch circle diameter	0.0000	115.4713	115.4713
Outside diameter	131.2203		
Root diameter	107.3049		
Face width	27.6536		
Addendum modif. coeff.	0.0000	0.5252	0.5252
Crowning of profile (L/R)	0/ 0	0.0087/ 0	
Crowning of helix (L/R)	0/ 0	0.0135/ 0	

# Quindos Unknown Gear

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## QUINDOS

- MTW-510-BAS-001 QUINDOS7 Basic for scanning CMM's
- MTW-510-GXY-001 Unknown Gear (cylindrical gears, straight or helical)

