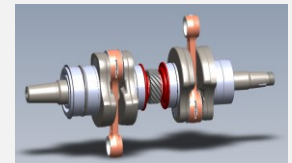
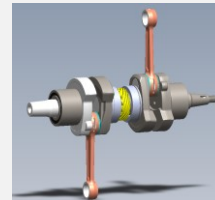
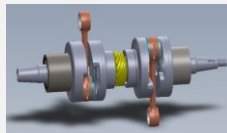


Beyond your conventional wisdom in crankshaft making!



Beyond Global Co., Ltd



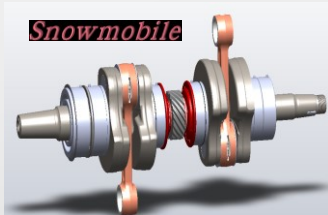
Crankshaft Products



Motorcycles & scooters



All Terrain Vehicles (ATV/UTV)



Snowmobile



Personal Water Craft

Our advantages

- Leveraging the new technology.
 - Expertise in crankshaft design and implementation.
 - Experienced in crankshaft assembly.
 - In-house forging and heat treatment.
 - Superb rod development.
 - Thorough and solid methodology from development, testing, to production.
-

Leveraging the new technology

- 3D scanning for reverse engineering.
 - Funneling 2D and 3D drawings to tool development.
 - CAD/CAM integration for NC programming
 - 3D simulation in native CAD software for idea exploration and forward thinking.
 - Sprocket/spline profile rendering via 3D scanning.
 - Sprocket/spline profile verification via 3D scanning comparison of OEM and sample parts.
-

Leveraging new technology – 3D scanning

A 3D scanning



Expertise in crankshaft design and implementation

- Innovative tool design for mold sharing.
 - Flexible base tool for expansive add-on.
 - Application of jigs for machining and inspection.
 - Adjustable fixtures for variety of stroke lengths, if applicable.
-

Experienced in crankshaft assembly

- Axial clearances and tolerance optimization.
 - Material adoption for heat treatment optimization.
 - Truing excellence via self tuning in-process specs control.
-

In-house forging and heat treatment

- Shortened forging tool development cycle.
 - Reduction of blank movements.
 - Flexible MOQ and production lead-time.
 - Cost reduction.
-

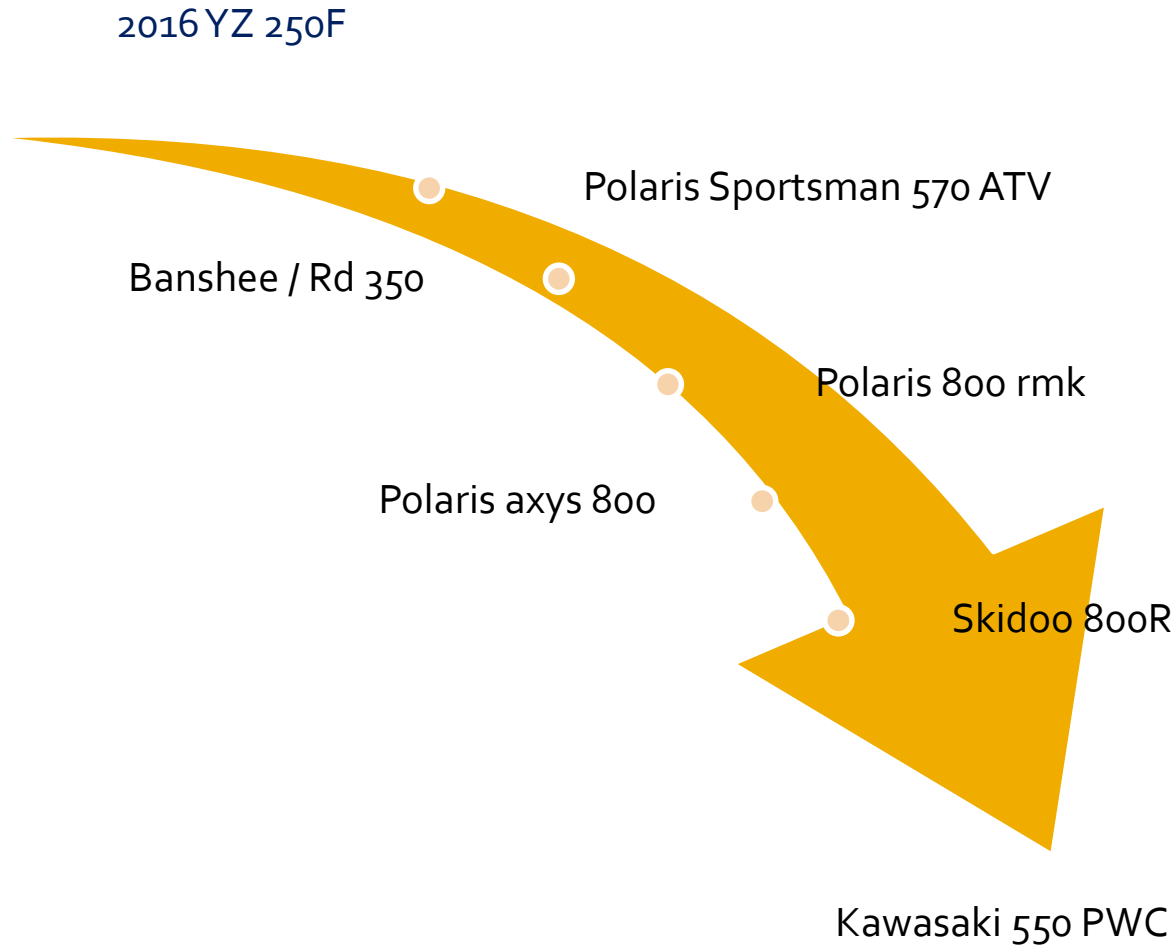
Superb rod development

- Material in SAE 8620.
 - PEEK coating needle bearing for abrasion resistance.
 - Integrated design for durability.
 - Enhanced finishing for marketability (optional).
-

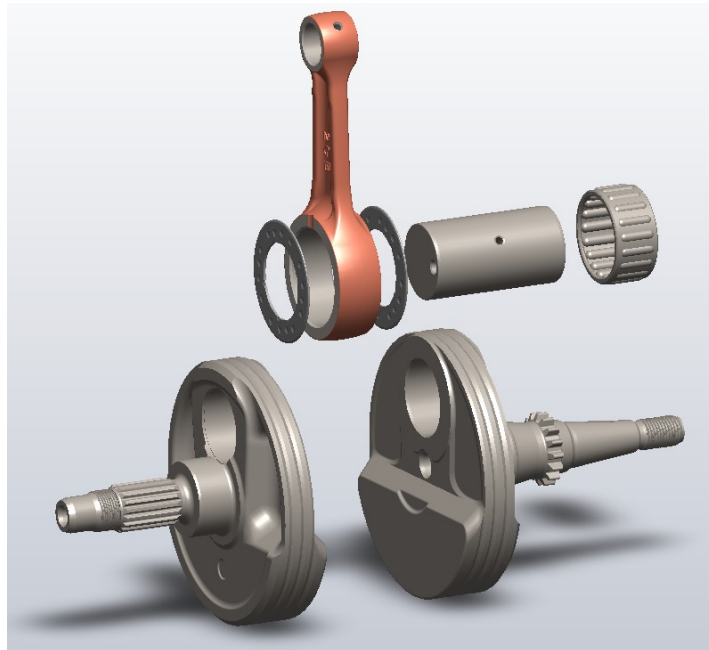
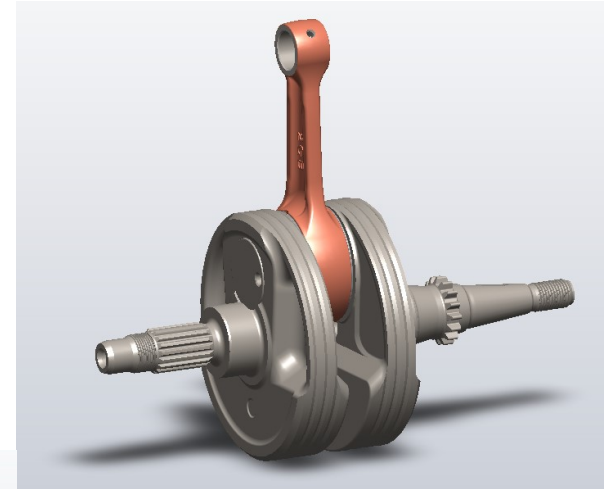
Thorough and solid methodology

- Matching parts fitting and test run.
 - Crankcase fitting test (100% if required).
 - Customer field testing feedback and fine-tuning.
 - EC (Engineering Change) follow-through and drawing revision.
 - Implementation of improvements in production.
-

Feature Presentation



Yamaha 2016 YZ 250F



Reverse engineering using 3D scanning tasks

Scope of reverse engineering for crankshaft/web
Project: Yamaha YZ 250F 2016 by Beyond Global
Revised: August 17, 2018

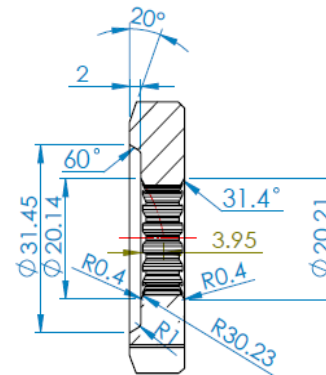
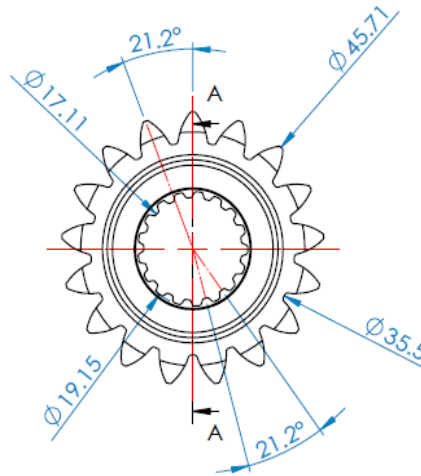
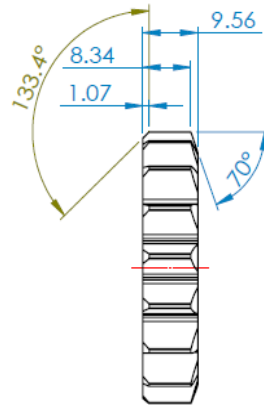
seq.	Description / task	Parts/drawing	QTY	Work Days	Remark
1	3D scanning	PTO web	1	0.5	setup & scanning, charged by per incident.
		Mag Web	1	0.5	
		Gear (sprocket)	1	0.5	
		Subtotal ==>		1.5	
2	3D file processing and conversion to 2D	Critical specs checking on and verification on sample parts.	1	2	Adopting inspection equipment for key/critical dimensions checking and verification.
		PTO web	1	1	Charge by day
		Mag Web	1	1	
		Gear	1	1	
		Subtotal ==>		5	
3	2D detailed specs and tolerances marking.	PTO web	1	1.5	Charge by day
		Mag Web	1	1.5	
		Gear (sprocket)	1	1.5	
		Timing gear	1	1.5	
		Crankshaft assembly	1	0.5	
		Other component	1	1	
		Subtotal ==>		7.5	
4	Final preparation	Specs proof-checking and overall paperwork and files in required formats.	1	2.5	Charge by day
Grand total ==>				17	

- Note:
1. Day indicated is # of work days.
 2. Engineering software platform by customer will be followed.
 3. Scopes/parts may be adjusted based on the plan required.
 4. If drawing files for components such as rod kits or certain parts are already available, please supply them to be used in 3D formation.

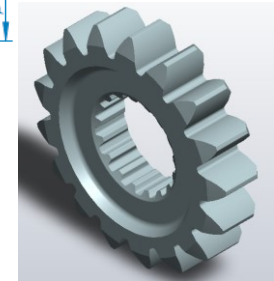
Yamaha 2016 YZ 250F

Spline - timing gear

Spline Data 鏈齒齒形數據	
Tooth Count 齒數	17
Module 模數	2.406
Major Dia 齒頂圓徑	45.71
Minor Dia 齒底圓徑	35.5
Base Circle Dia 基圓直徑	35.78
Chain Pitch 鏈條節徑	-----
Pitch Dia* 節圓直徑	25.4840.9
Pitch Angle* 齒形夾角	26.7°
Circular Pitch* 節圓節徑	7.56
Base Circle Pitch* 基圓節徑	-----
MOP 跨銷直徑	46.12
Gauge Pin Dia 跨銷針外徑	4



Section A-A
Scale 1:1



Spline Data 直齒齒形數據	
Type 類型	Flat root side fit
Module 模數	1
No. of Teeth 齒數	17
Pressure Angle 壓力角	20.7°
Major Dia 齒頂圓徑	19.15
Minor Dia 齒底圓徑	117.11
MOP 跨銷直徑	15.05
Gauge Pin Dia 跨銷針外徑	2

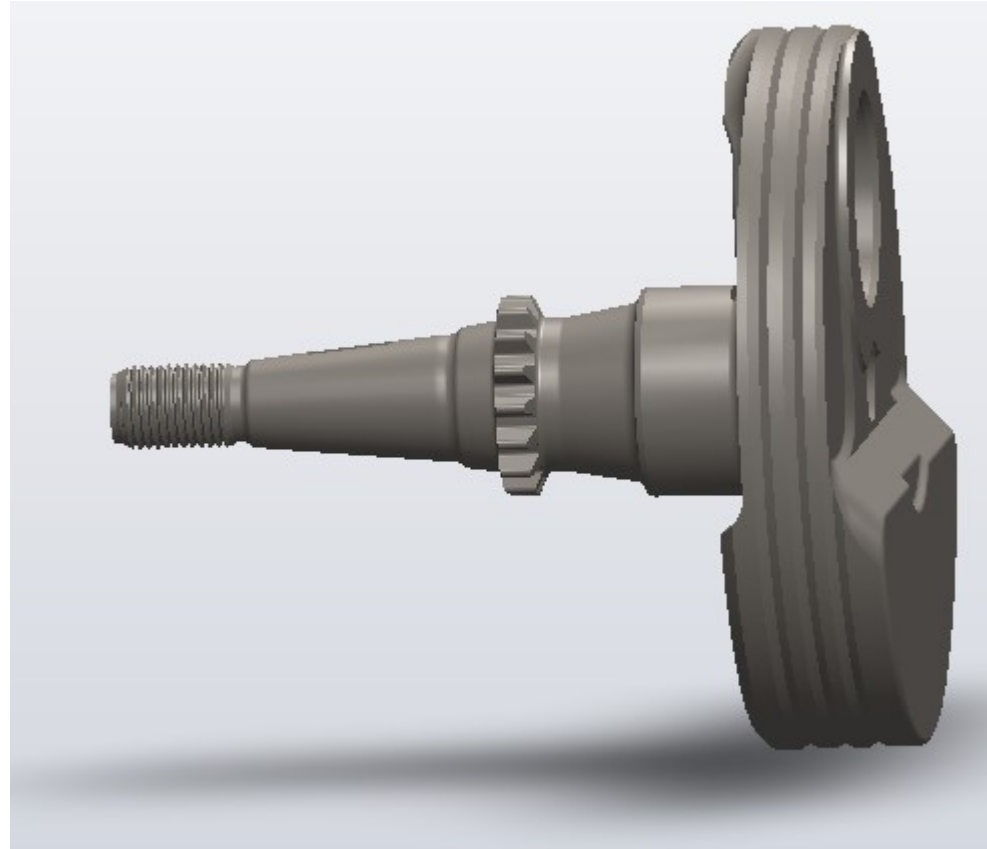
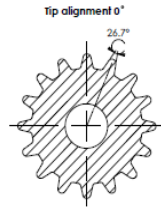
Heat treatment specification

1. Dashed line areas to be Induction harden to surface hardness HRC57-62
2. Harden layer is 0.7-12mm (finished part)
3. Part need to be quenched and tempered to HRC 25-40 (core hardness)

Yamaha 2016 YZ 250F

Sprocket - MAG

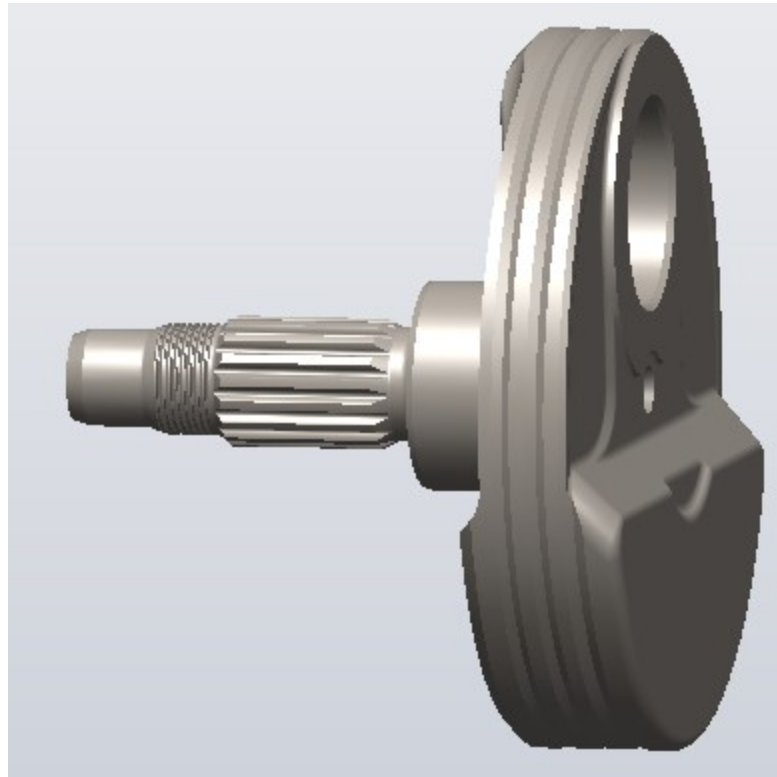
Sprocket Data 鏈齒齒形數據	
Tooth Count 齒數	16
Module 模數	1.59
Major Dia 齒頂圓徑	28.67
Minor Dia 齒底圓徑	23.0
Base Circle Dia 基圓直徑	24.75
Chain Pitch 鏈條節徑	6.35
Pitch Dia* 節圓直徑	25.48
Pitch Angle* 齒形夾角	26.7°
Circular Pitch* 節圓節徑	5.00
Base Circle Pitch* 基圓節徑	4.87
MOP 跨銷直徑	32.33
Gauge Pin Dia 跨銷針外徑	4.0



Yamaha 2016 YZ 250F

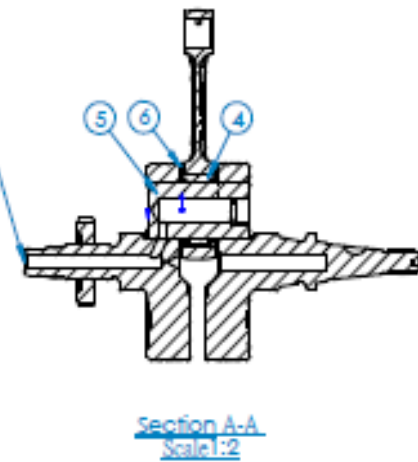
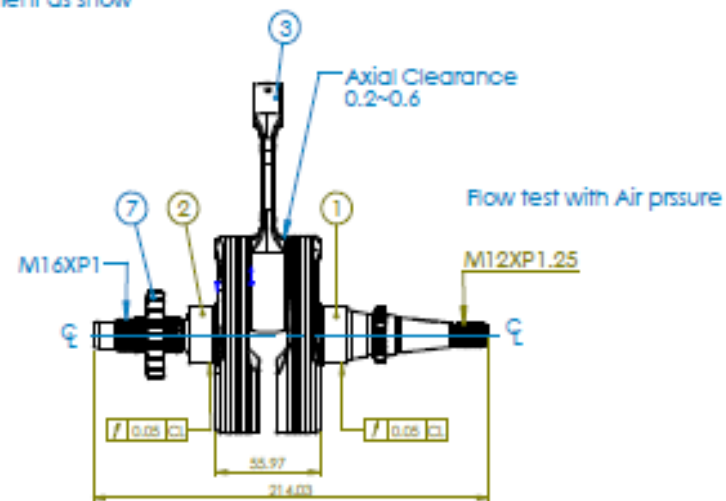
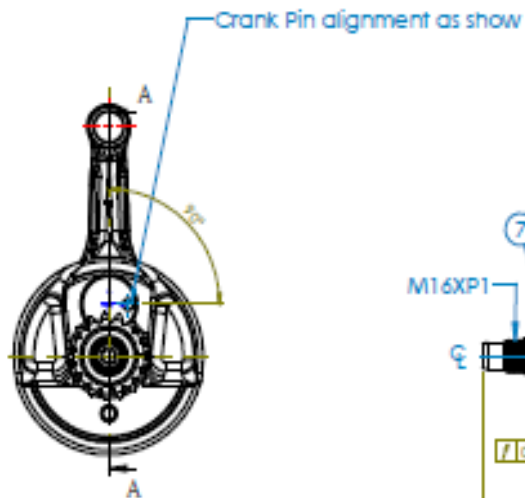
Spline - PTO

Spline Data 直齒齒形數據	
Type 類型	Flat root side fit
Module 模數	0.99
No. of Teeth 齒數	17
Pressure Angle 壓力角	20.7°
Major Dia 齒頂圓徑	18.76
Minor Dia 齒底圓徑	16.46
MOP 跨銷直徑	21.14
Gauge Pin Dia 跨銷針外徑	2.00



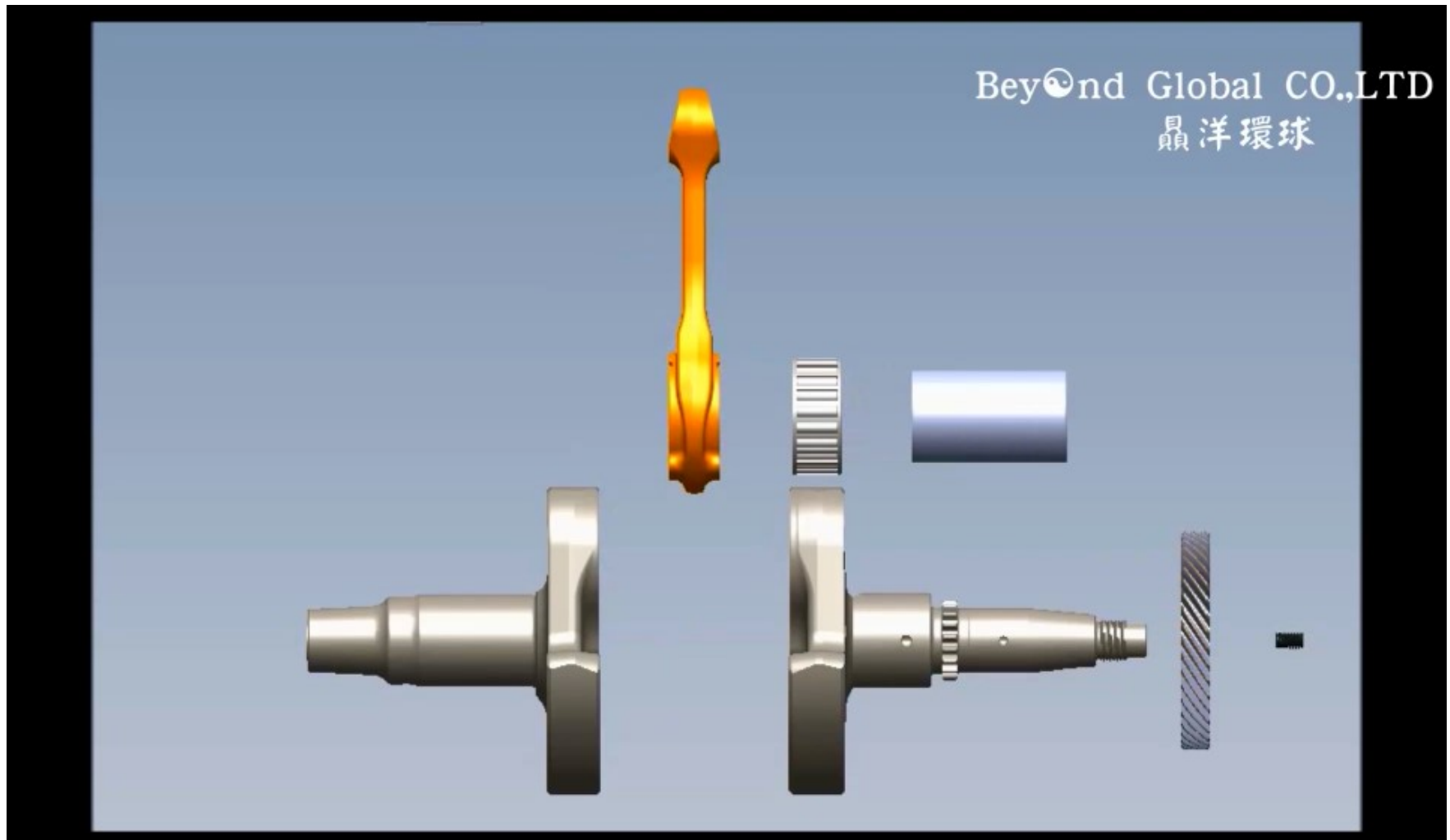
Yamaha 2016 YZ 250F

Crankshaft assembly

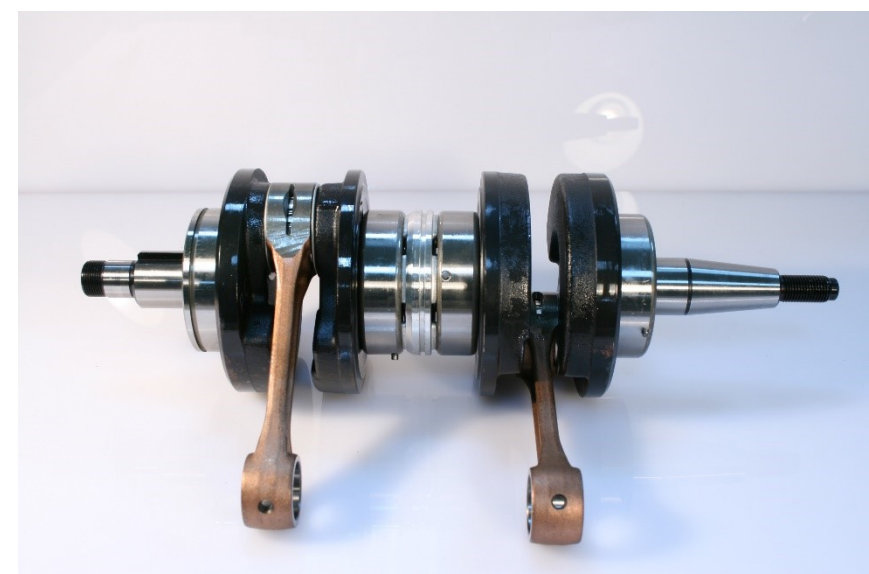


Polaris Sportsman 570 Crankshaft

3D demo



Yes, the Banshees

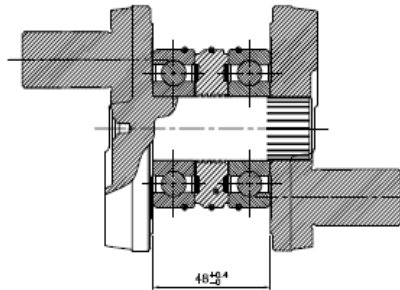


Our specials about Banshee

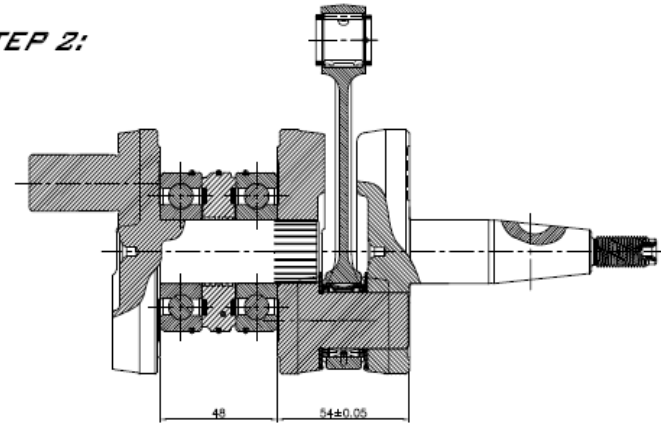
- **Customization is our key strength:**
 - **Billet machining, if required.**
 - **Desired finishing**
 - **Preferred ball bearings**
 - **Welding, with or without**
- **A variety of stroke lengths:**
 - 54, 58, 59, 61, and 64mm**
- **Low MOQ.**
- **Competitive pricing.**
- **Also available for RD 350 version.**

Banshee assembly

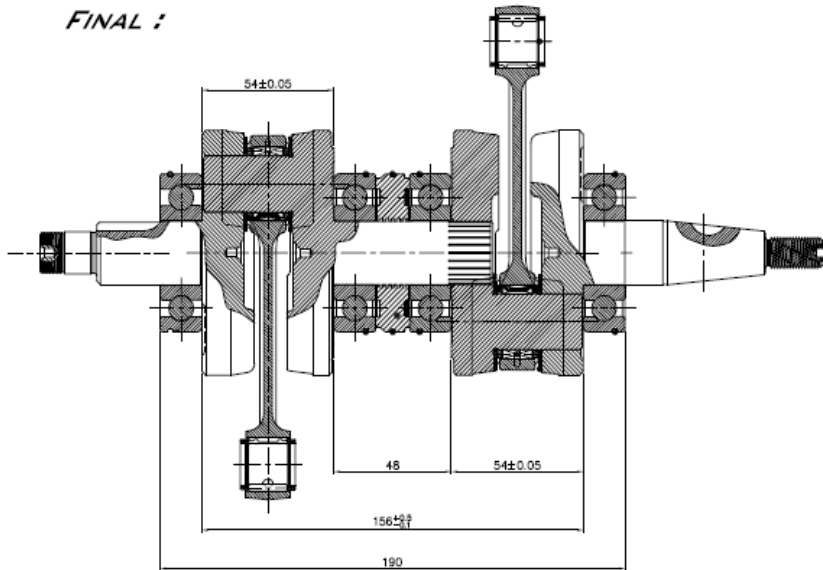
STEP 1:



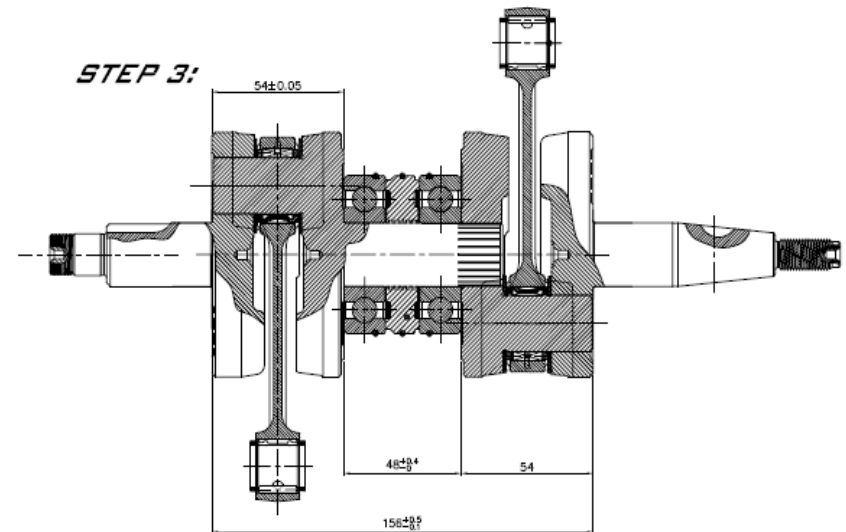
STEP 2:



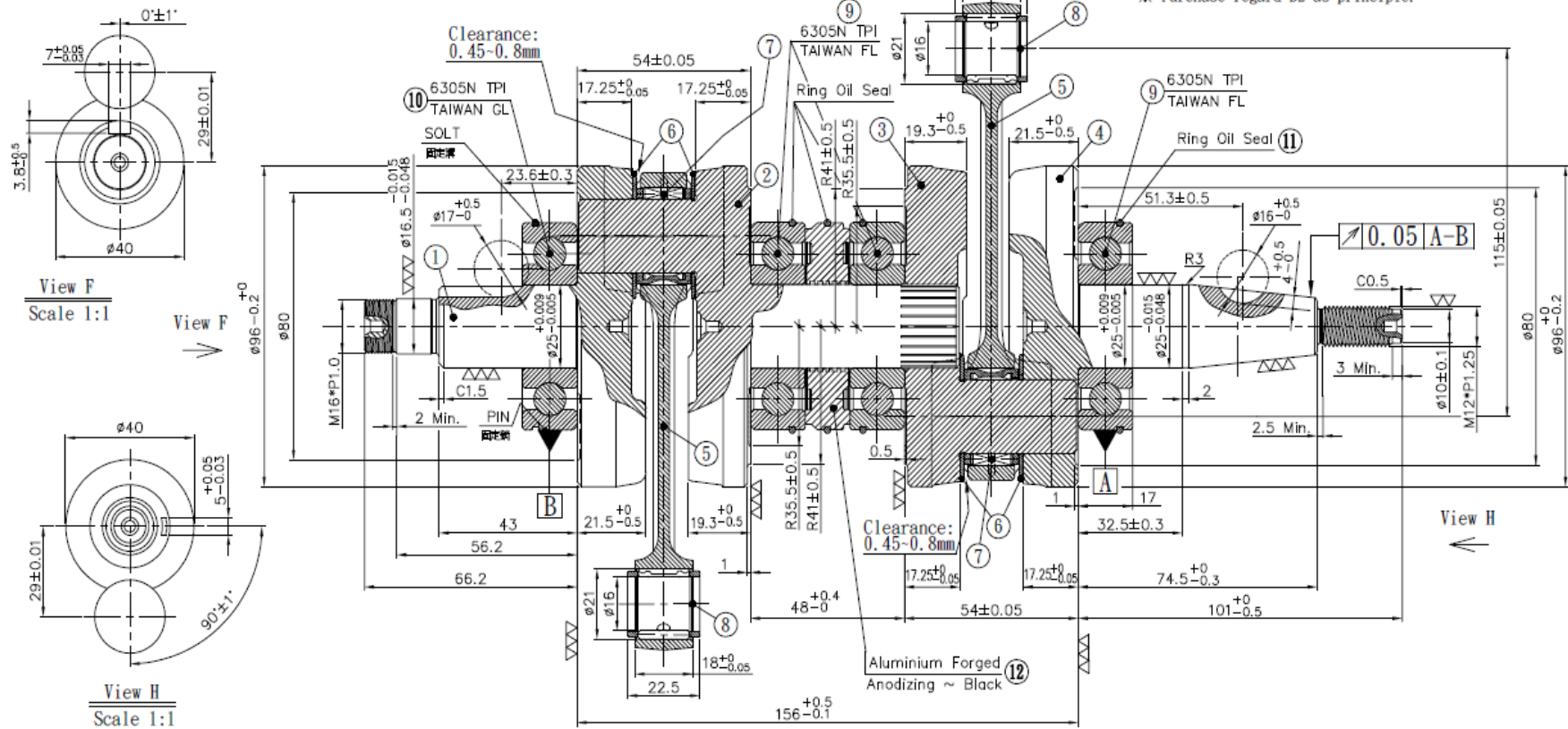
FINAL :



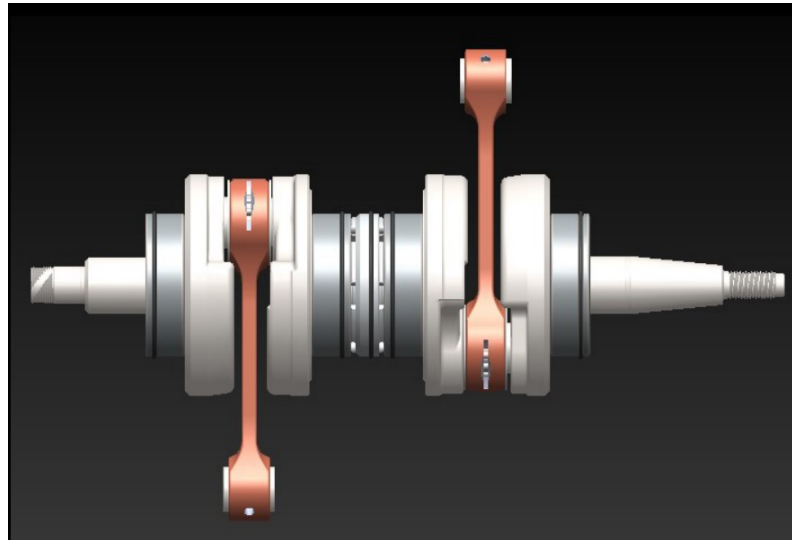
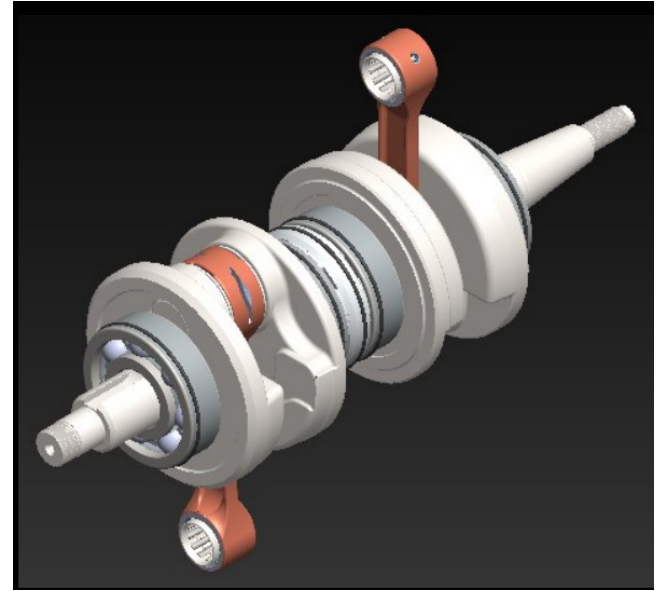
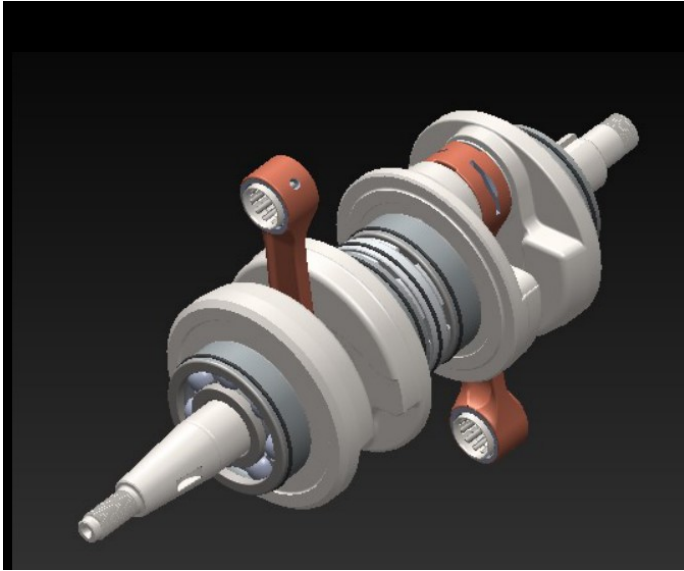
STEP 3:



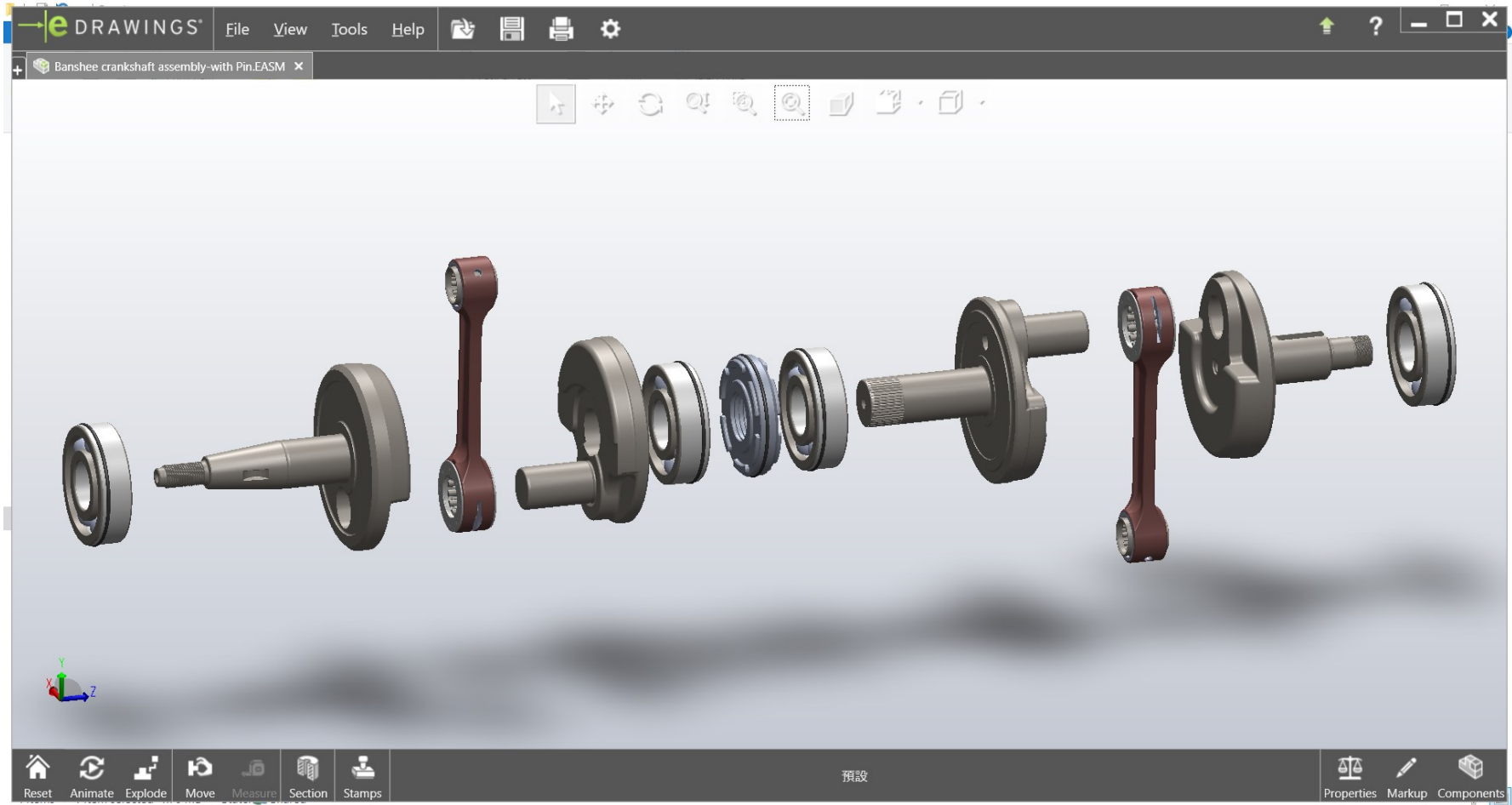
※ Radial Clearance:0.025~0.037mm.
※ Purchase regard B2 as principle.



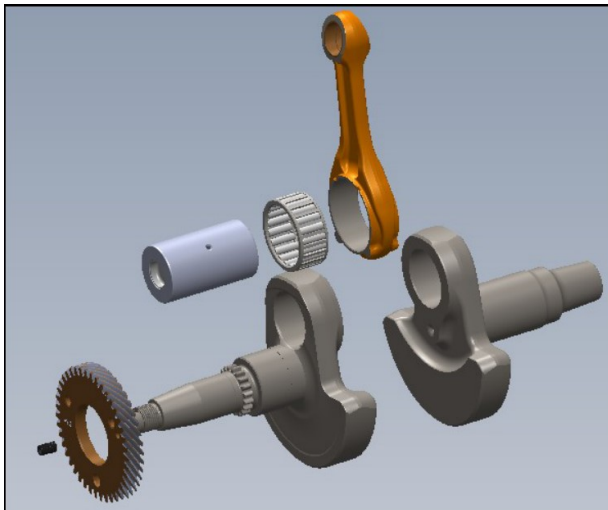
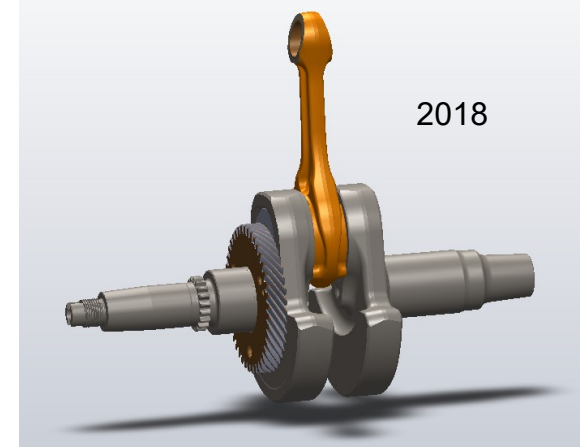
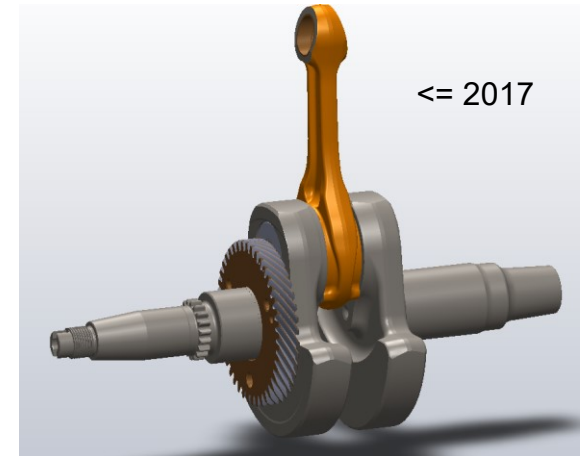
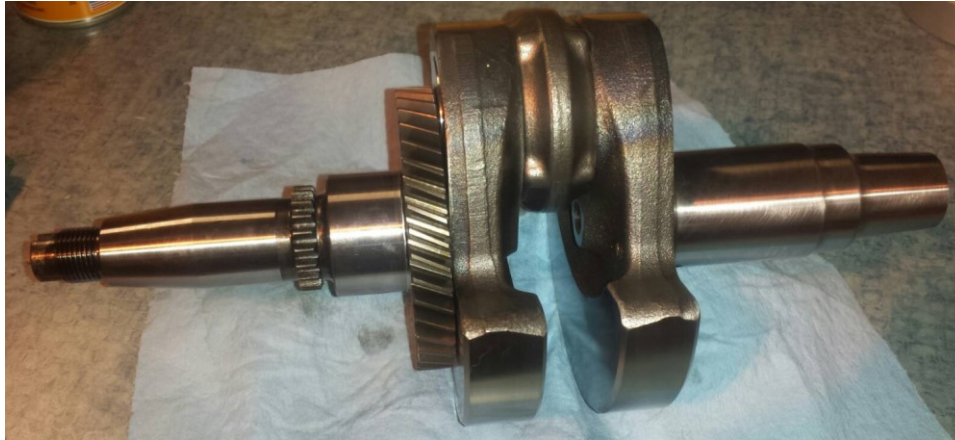
Banshee 3Ds



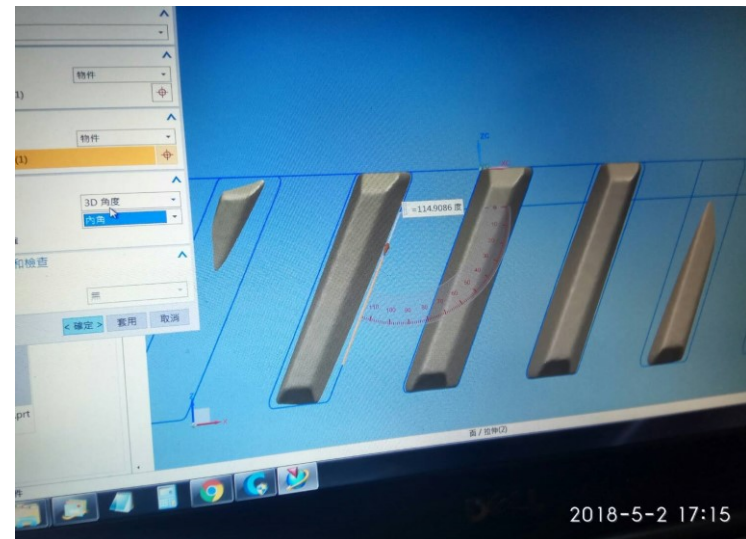
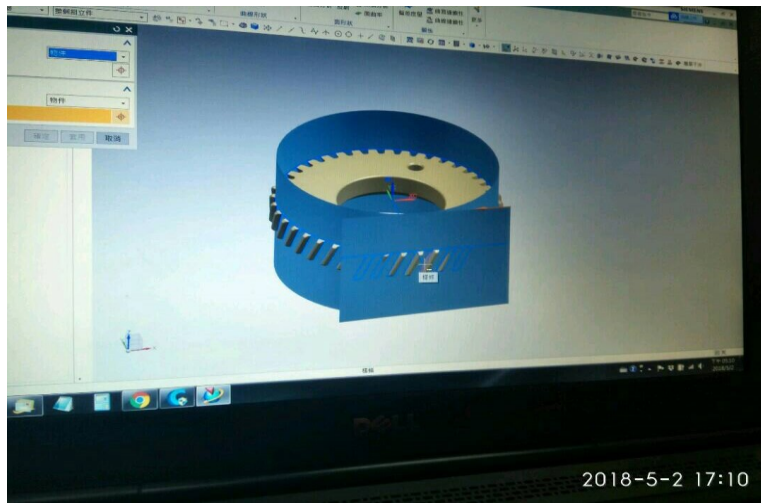
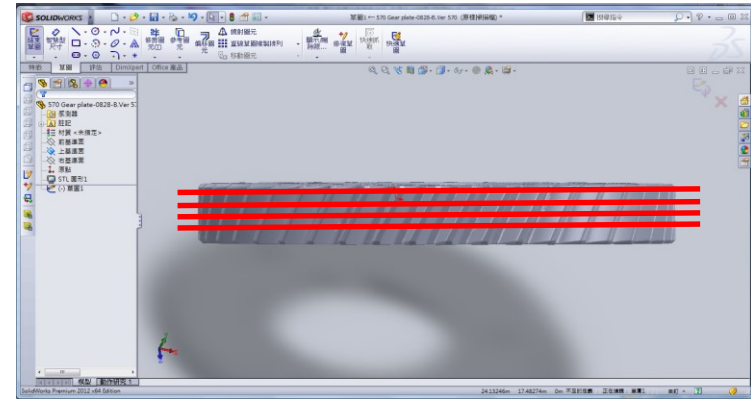
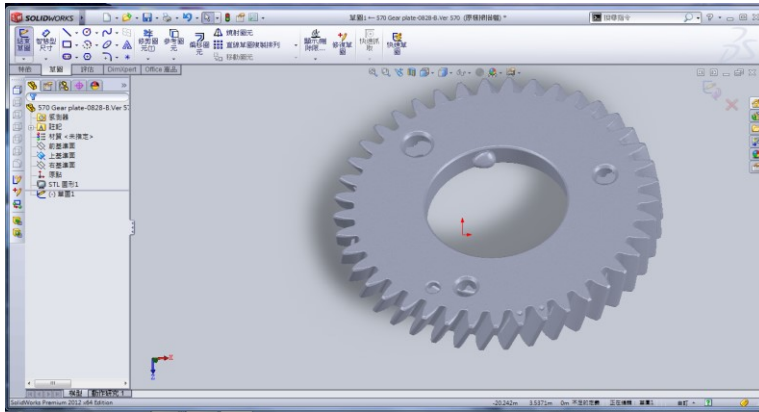
3D and explosion chart



Polaris Sportsman 570 Crankshaft



Sportsman 570 gear profile rendering





OEM versus sample comparison full report

QUALIFY

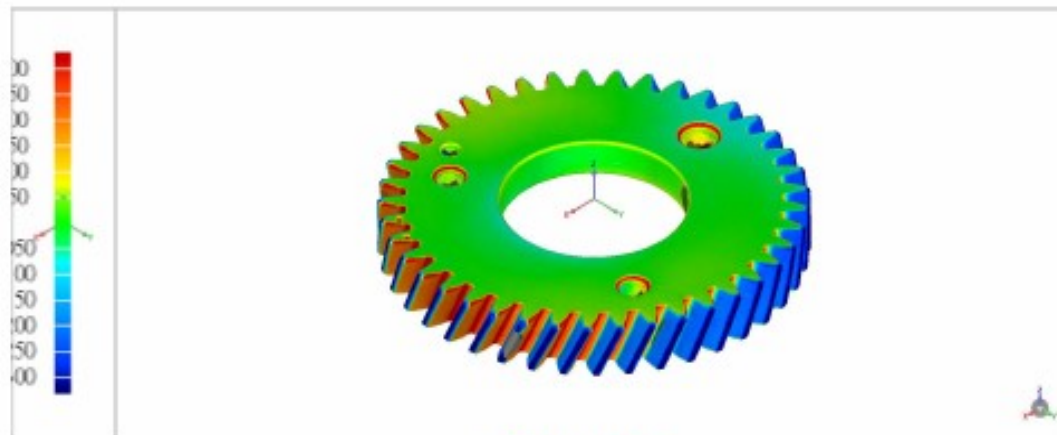
日期: 10/24/2018, 8:57 pm

Date of the report

比對 Comparison

檢測日期: 10/24/2018 Test date

生成日期: 10/24/2018, 8:57 pm Report generated



作者: A Author

客戶名稱: B Customer

參考模型: 0828-gear-2 Parts

測試模型: 1023-gear Test module

OEM versus sample comparison full report

QUALIFY

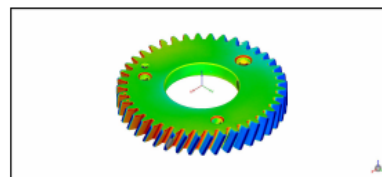
日期: 10/24/2018, 8:57 pm

3D比較 結果 3D comparison results

參考模組	Reference module	0828-gear-2
測試模組	Test module	1023-gear
		models\export.pro
數據點的數量	# of data points	843476
離外圓點	# of outside arc points	1204

公差類型	Tolerance type	3D偏差	3D deviation
單位	Unit	mm	
最大臨界值	Maximum limit	0.300	
最大公差值	Top tolerance	0.050	
最小公差值	Low tolerance	-0.050	
最小臨界值	Minimum limit	-0.300	

偏差	Deviation	
Max. Upper Deviation		3.877
Max. Lower Deviation		-3.907
平均偏差	Average deviation	0.128 / -0.133
標準偏差	Standard deviation	0.192



偏差分布 Deviation distribution

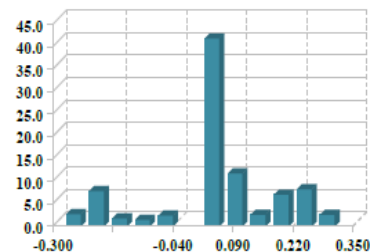
>=Min	<=Max	# 點	%
-0.300	-0.250	17110	2.859
-0.250	-0.200	50179	7.798
-0.200	-0.150	11057	1.718
-0.150	-0.100	9270	1.441
-0.100	-0.050	15186	2.300
-0.050	0.000	289191	41.834
0.000	0.100	75457	11.728
0.100	0.150	16477	2.561
0.150	0.200	44992	6.992
0.200	0.250	53186	8.285
0.250	0.300	18360	2.542

超出最大臨界值	Maximum threshold	42258	6.567
超出最小臨界值	Minimum threshold	22753	3.538

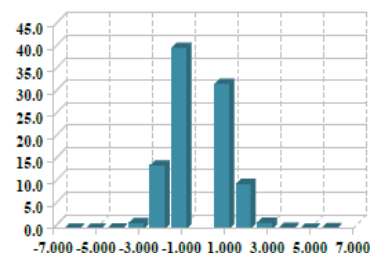
標準偏差 Standard deviation

分布(+/-)	# 點	%
-6 * 標準偏差	213	0.033
-5 * 標準偏差	137	0.021
-4 * 標準偏差	391	0.061
-3 * 標準偏差	8401	1.306
-2 * 標準偏差	90985	14.140
-1 * 標準偏差	259604	40.344
1 * 標準偏差	207880	32.306
2 * 標準偏差	64302	9.993
3 * 標準偏差	9059	1.408
4 * 標準偏差	1336	0.208
5 * 標準偏差	260	0.040
6 * 標準偏差	908	0.141

偏差分布



標準偏差



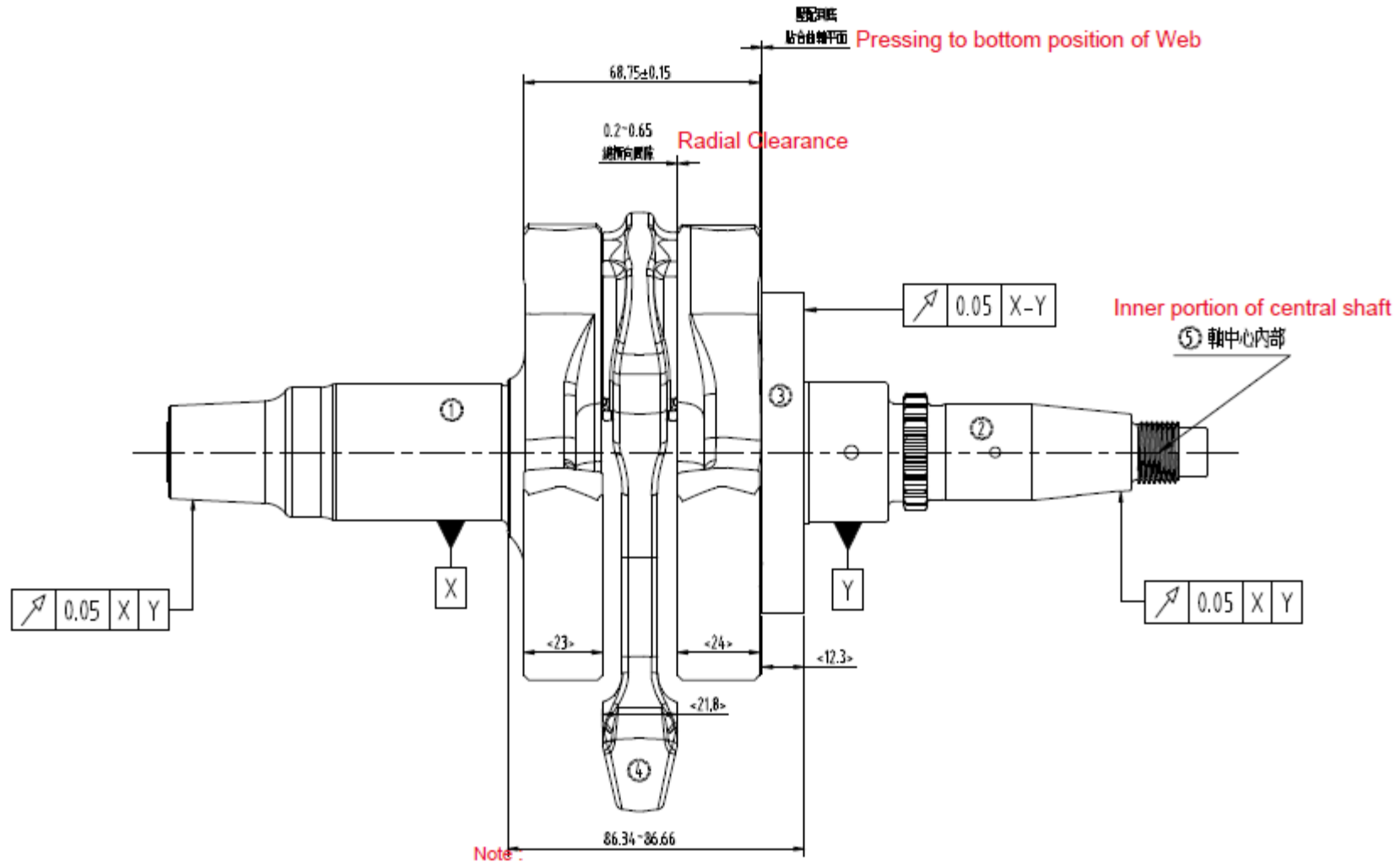
Polaris Sportsman 570 Crankshaft gear comparison summary

Sportsman 570 齒盤樣件與原廠件 A & B版 齒形尺寸差異比對 Gear comparison

Dimension	BYG sample	Ver.A	Ver.B	BYG vs Ver.A	BYG vs Ver.B
Tip Diameter 齒頂徑	93.96	94.37	94.67	-0.41	-0.71
Root Diameter 齒底徑	82.8	82.16	82.34	0.64	0.46
Tooth height 齒高	5.58	6.11	6.17	-0.53	-0.59
螺旋角	24.71 °	24.50 °	24.78 °	0.21 °	-0.07 °
Pn 齒直角節距	6.17	6.26	6.20	-0.09	-0.02
Pt 軸直角節距	6.80	6.89	6.82	-0.09	-0.02
齒頂寬度	3.11	2.85	3.16	0.26	-0.05
齒高	5.58	6.11	6.17	-0.53	-0.59
壓力角	兩齒形輪廓線重疊，故為相同角度				
模數	兩齒形輪廓線(齒寬)重疊，故為相同模數				

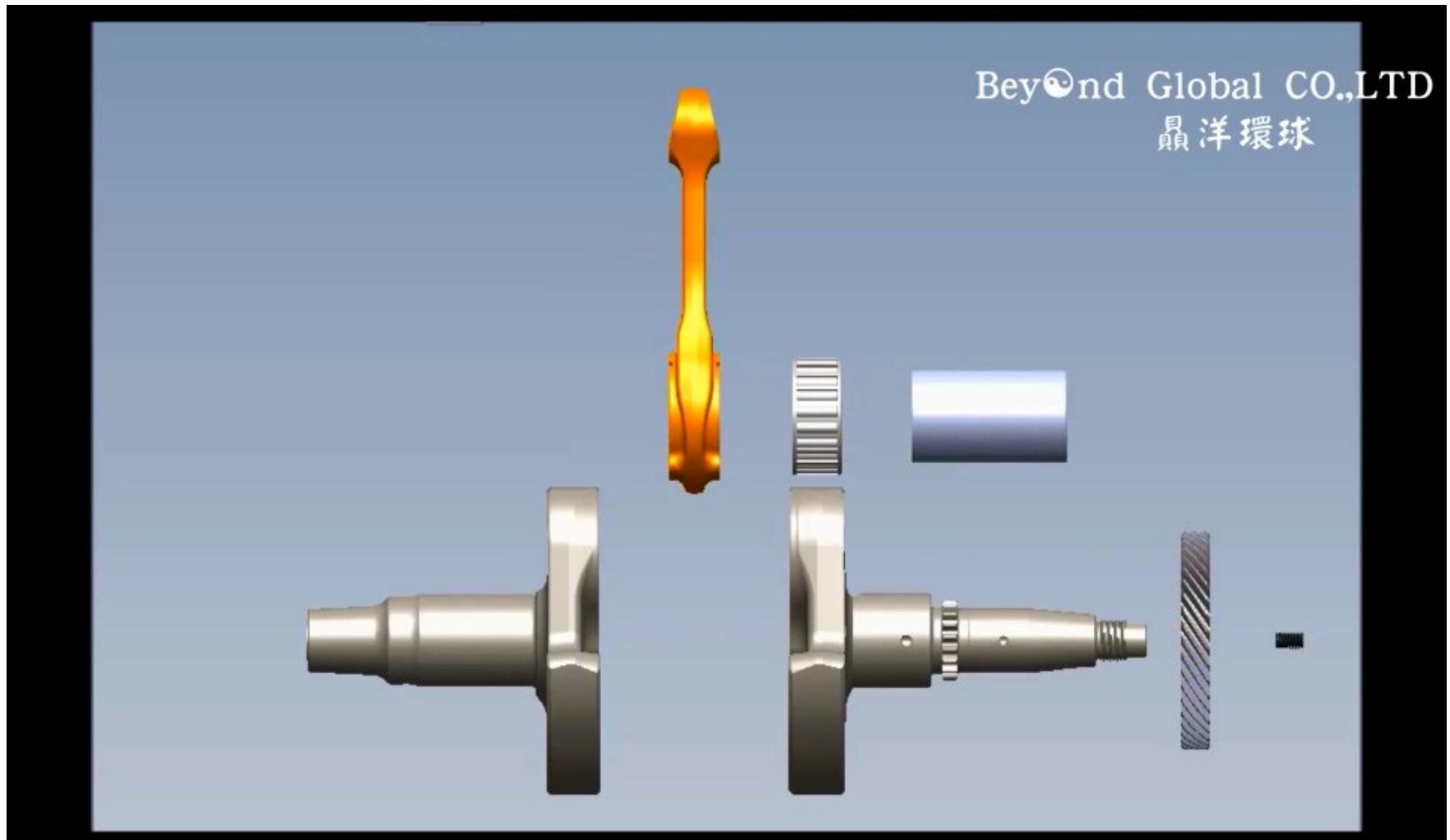
Polaris Sportsman 570

Crankshaft assembly

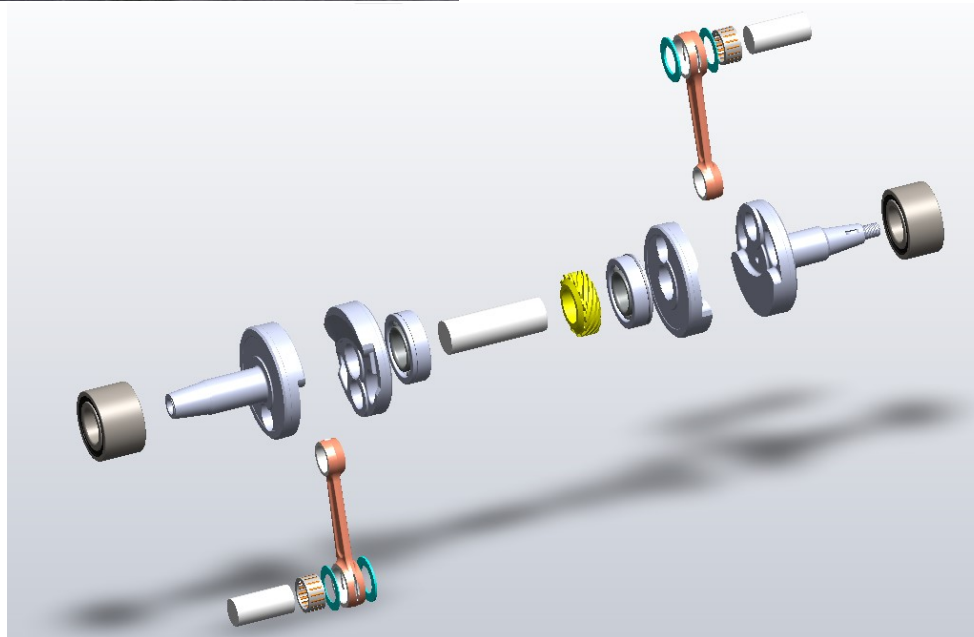
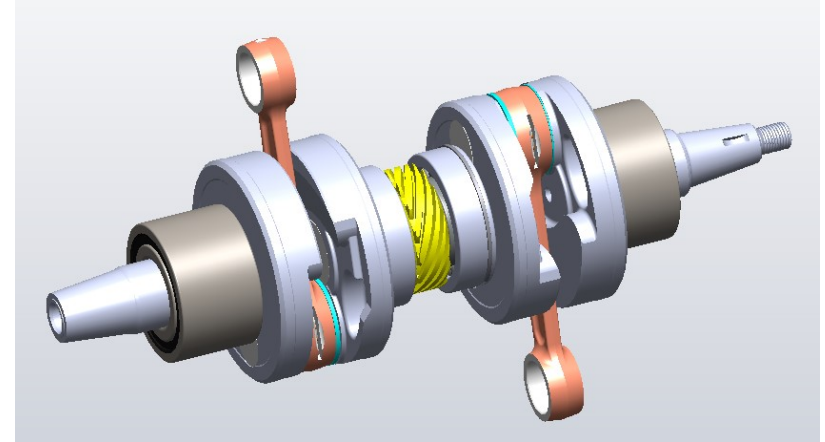


Polaris Sportsman 570 Crankshaft

3D demo



Polaris 800 RMK Crankshaft



Polaris 800 rmk drive gear profile comparison

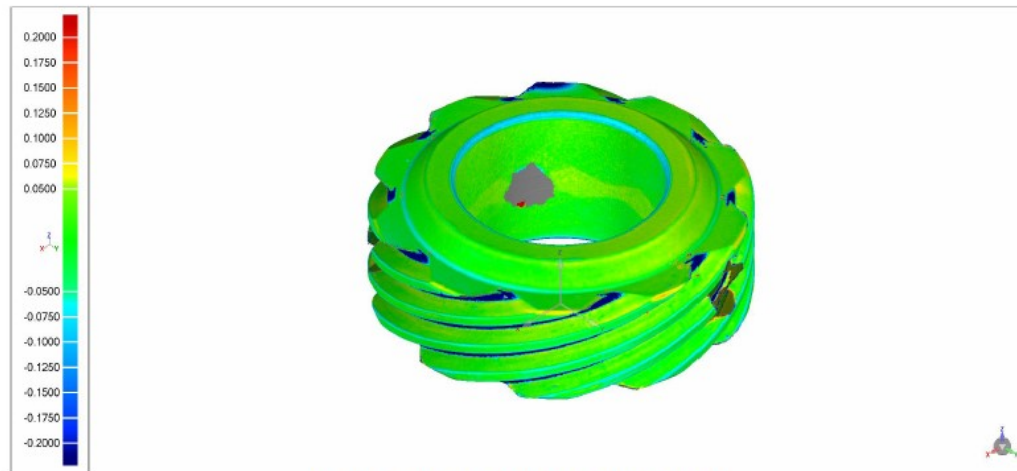
geomagic
QUALIFY

日期: 11/14/2018, 6:25 pm

Geomagic Qualify 報告

Date of report

檢測日期: 11/14/2018 Testing date
生成日期: 11/14/2018, 6:25 pm



作者: PJ-CAD01:PJ-CAD01-NB

客戶名稱: Geomagic, Inc.

參考模型: 1029-gear Reference module (OEM)

測試模型: 1113--gear Test module (CV Tech sample)

Polaris 800 rmk drive gear comparison

QUALIFY

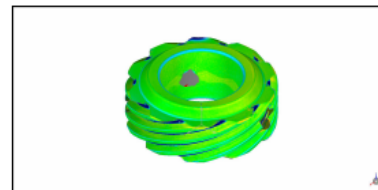
日期: 11/14/2018, 6:25 pm

3D比較 結果 3D comparison

參考模型	OEM	1029-gear
測試模型	CV Tech	1113-gear
數據庫的數量	#of datum	535121
# 體外點數	# of datum outside	819

公差類型	Allowance type	3D 偏差
單位	Unit	mm
最大臨界值	Max Threshold	0.2000
最大公差值	Max bottom limit	0.0500
最小公差值	Minimum Threshold	-0.0500
最小臨界值	Minimum bottom limit	-0.2000

標準	Deviation	
Max. Upper Deviation		3.1202
Max. Lower Deviation		-3.1930
平均偏差	Average deviation	0.0326 / -0.2929
標準偏差	Standard deviation	0.3545

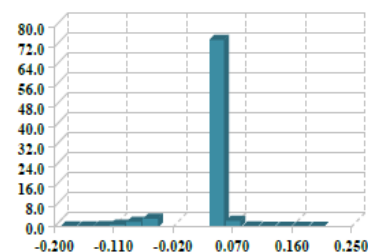


偏差分布 Deviation distribution

>=Min	<=Max	# 點	%
-0.2000	-0.1750	1287	0.2405
-0.1750	-0.1500	1347	0.2517
-0.1500	-0.1250	2287	0.4274
-0.1250	-0.1000	5071	0.9476
-0.1000	-0.0750	11245	2.1014
-0.0750	-0.0500	17818	3.3297
-0.0500	0.0500	401247	74.8825
0.0500	0.0750	13455	2.5144
0.0750	0.1000	1489	0.2745
0.1000	0.1250	400	0.0747
0.1250	0.1500	262	0.0490
0.1500	0.1750	120	0.0224
0.1750	0.2000	117	0.0219

指出最大偏差值	3198	0.5898
指出最小偏差值	75840	14.1725

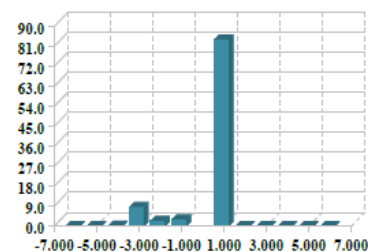
偏差分布



標準偏差 Standard deviation

分布(+/-)	# 點	# of datum	%
-6 * 標準偏差	1037		0.1938
-5 * 標準偏差	883		0.1650
-4 * 標準偏差	1485		0.2775
-3 * 標準偏差	47031		8.7889
-2 * 標準偏差	13623		2.5458
-1 * 標準偏差	17052		3.1866
1 * 標準偏差	450969		84.2742
2 * 標準偏差	1108		0.2071
3 * 標準偏差	761		0.1422
4 * 標準偏差	537		0.1004
5 * 標準偏差	326		0.0609
6 * 標準偏差	309		0.0577

標準偏差



Polaris 800 bronze gear profile comparison

Polaris 800 Alu-Brass Gear parameter List

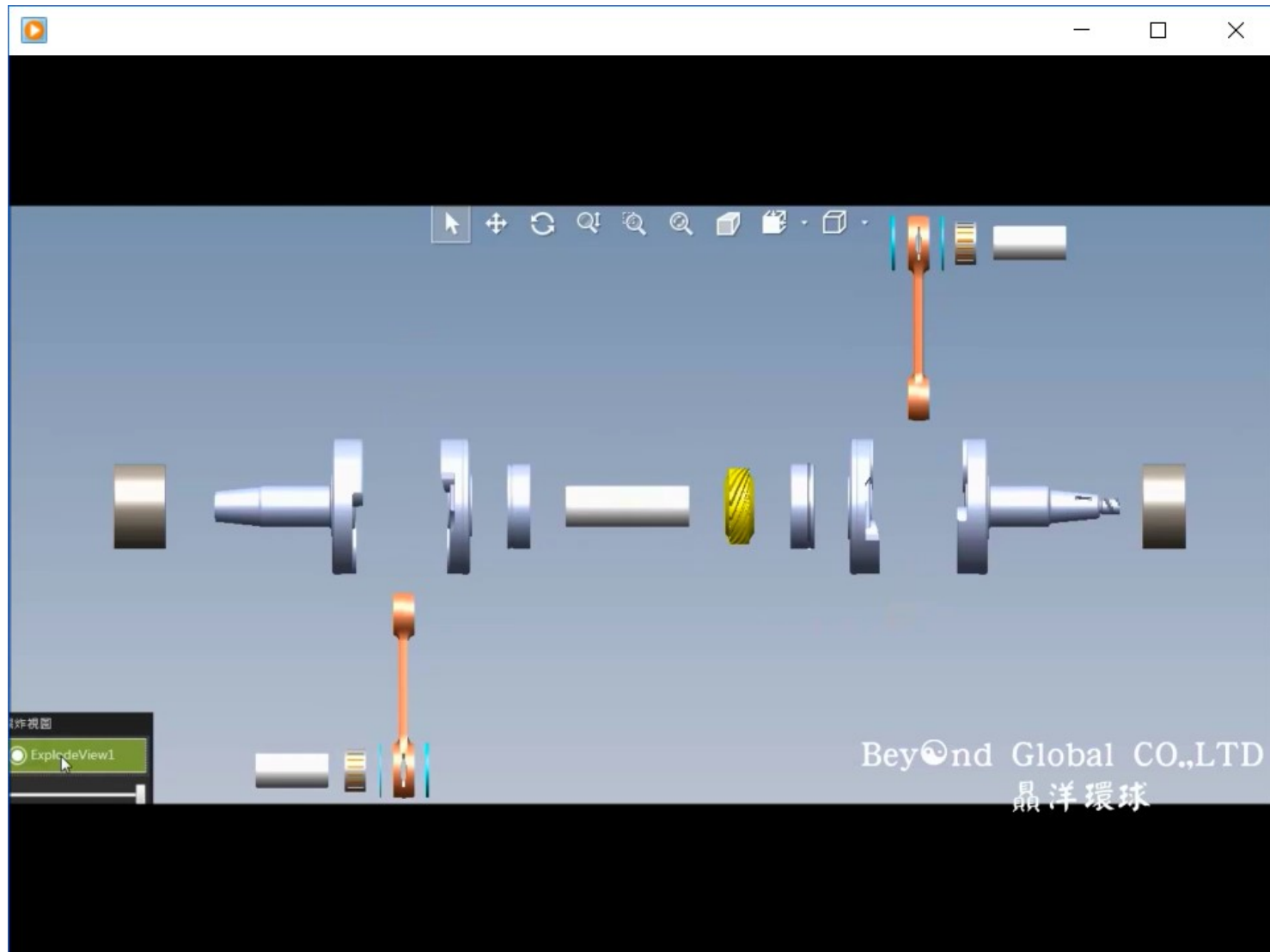
10 T 銅齒參數 僅供參考

Item	OEM 掃描 3D scanning	樣品 (sample) (原廠提供的數據)	Sample 樣品 3D掃描 (11/14)
齒數 z Number of Tooth	10	10	10
模數 m Tip Diameter	1.646	未提供 (na)	1.65
齒頂(冠)圓直徑 D_a Tip Diameter	63.80	63.696	63.80
齒底(根)圓直徑 D_f Root Diameter	57.06	57.00	54.7
全齒深(齒高) h Tooth Depth	3.37	3.35	4.55
壓力角 α_n Helix Angle	21.1 °	20.0 °	20.9 °
螺旋角 β Helix Angle	74.07 °	74.2629 °	74.0 °
螺旋方向 Helical Hand	Right (右)	Right (右)	Right
中心孔內徑 Central hole I.D	35.00	34.975	35.00
總厚度 Total Thickness	24.12	24.225	24.20
齒部範圍厚度 Thickness	17.00	17.02	17.00
齒直角節距 P_n	5.17	未提供 (na)	5.18
軸直角節距 P_t	18.00	15.36	18.78
斜角 Angel	135.0 °	135.0 °	135.0 °
跨銷徑 MOW	-----	32.741	-----

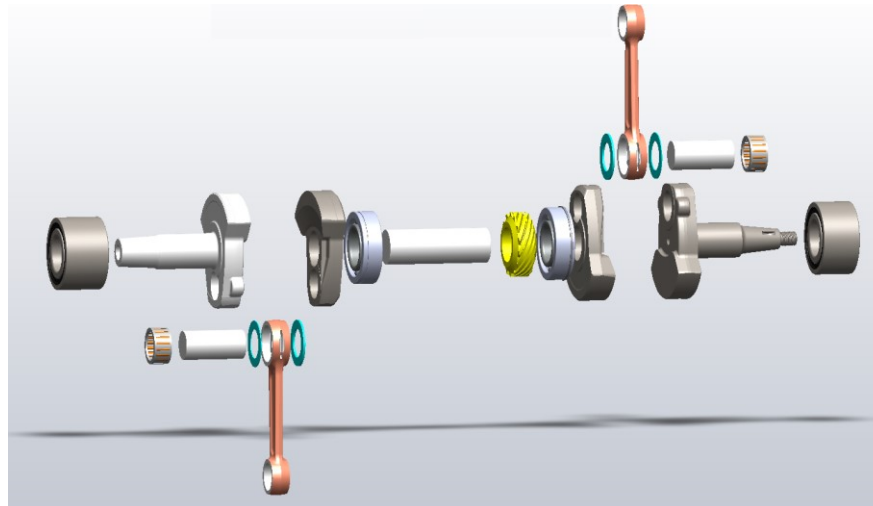
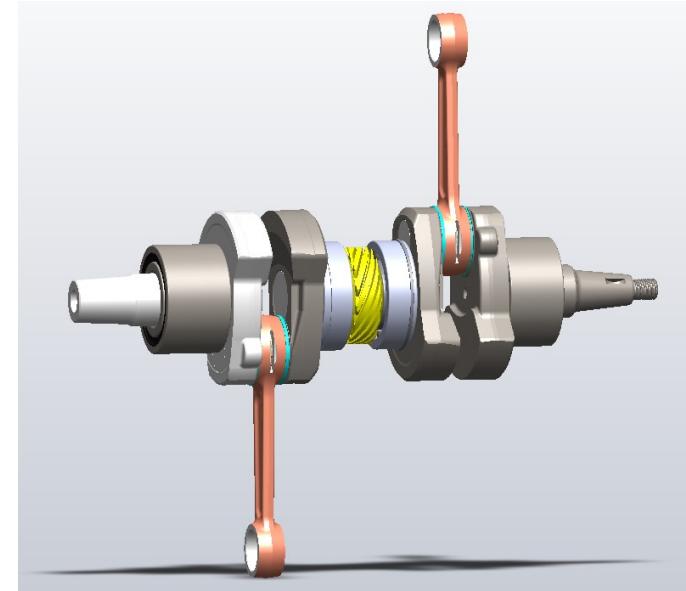
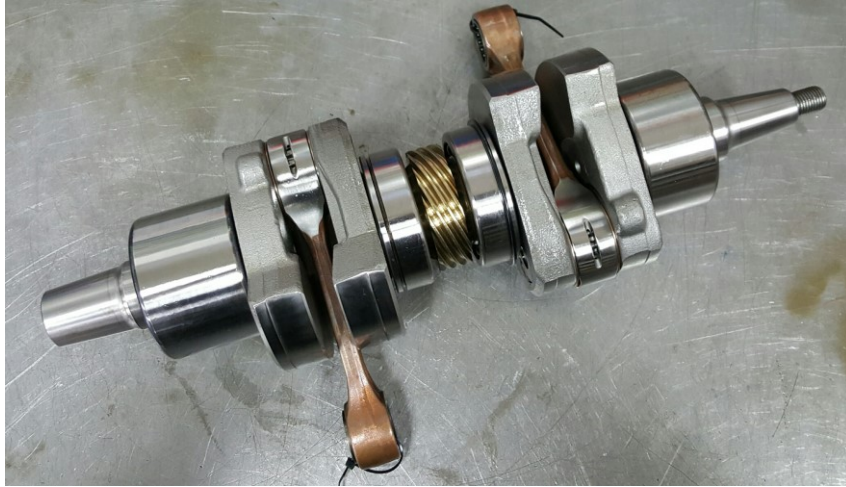


Polaris 800 RMK Crankshaft

3D demo

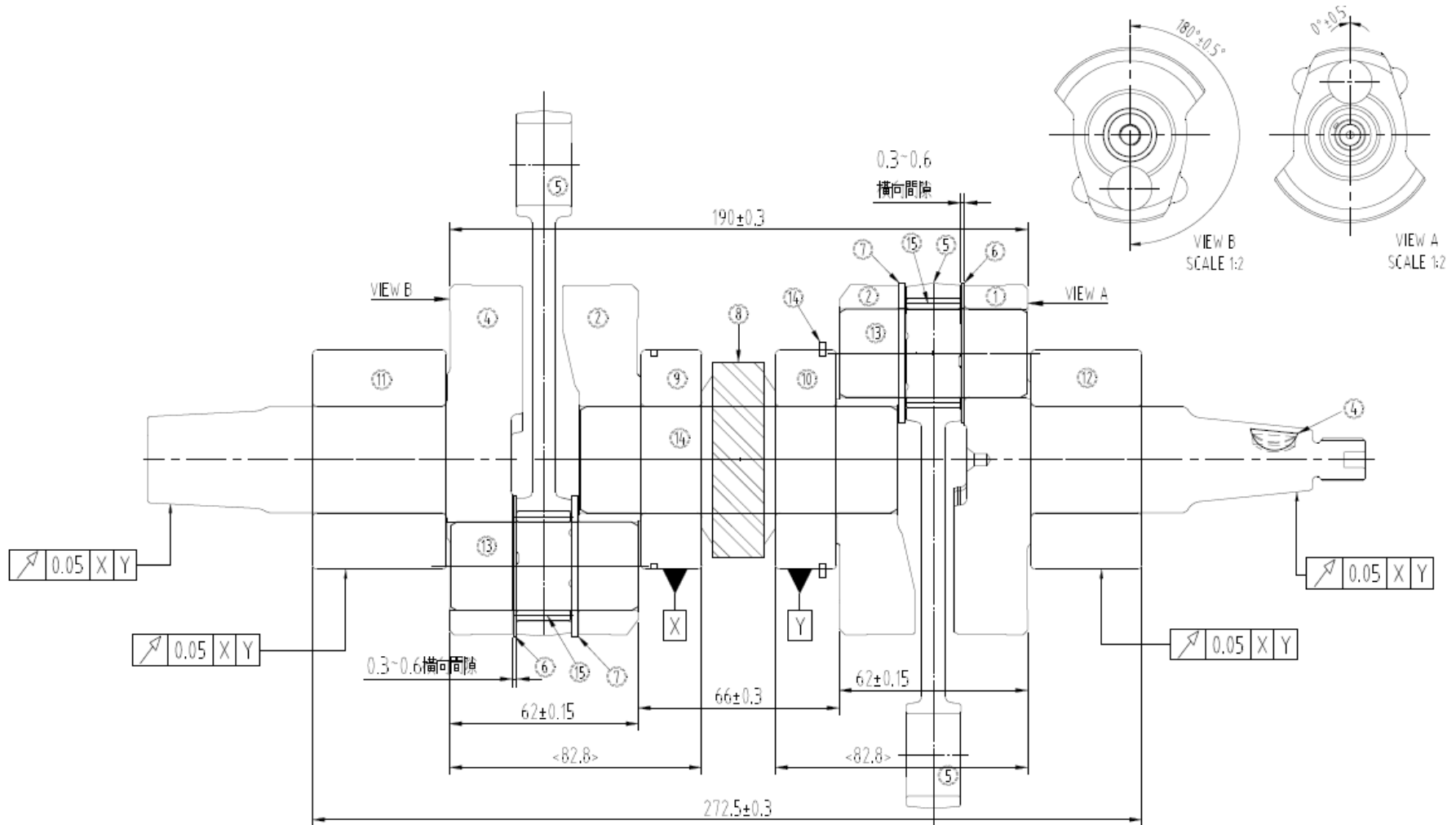


Polaris axys 800 Crankshaft



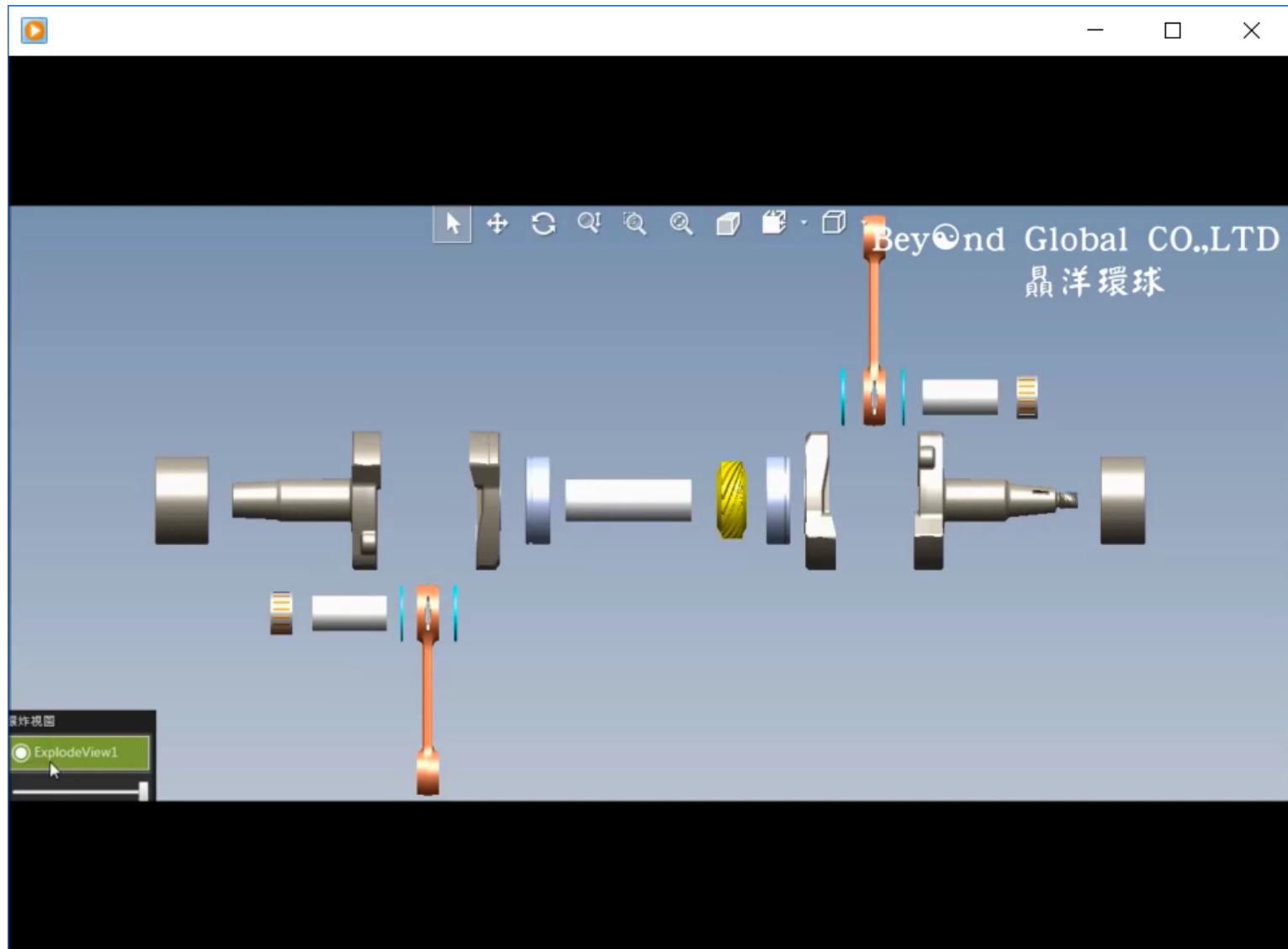
Polaris axys 800

Crankshaft assembly



Polaris axys 800 Crankshaft

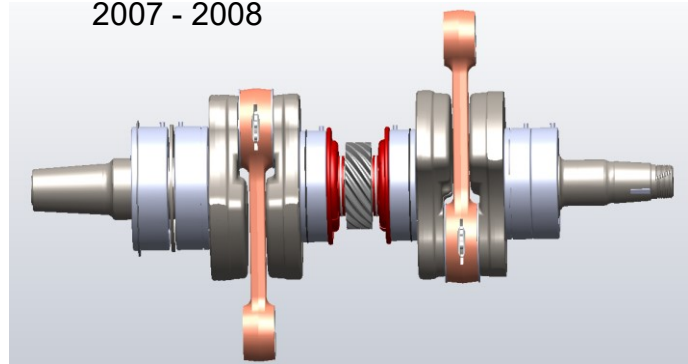
3D demo



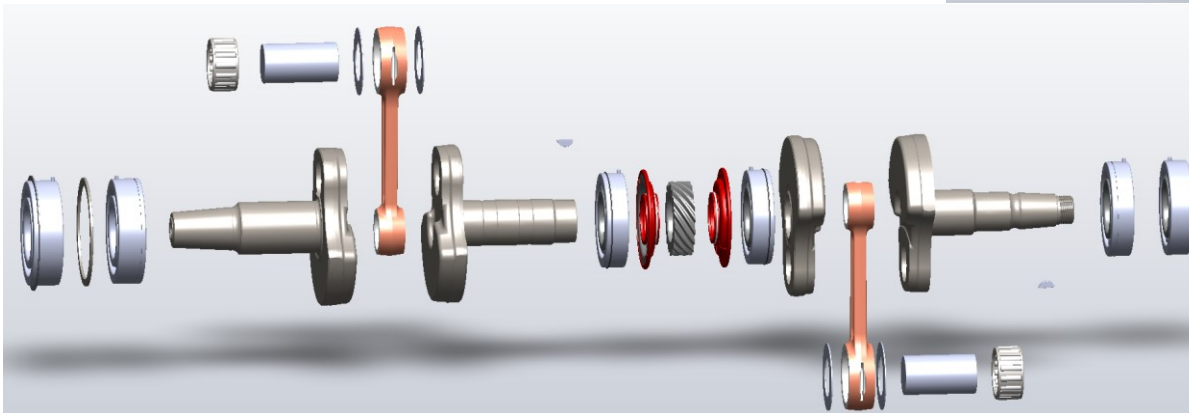
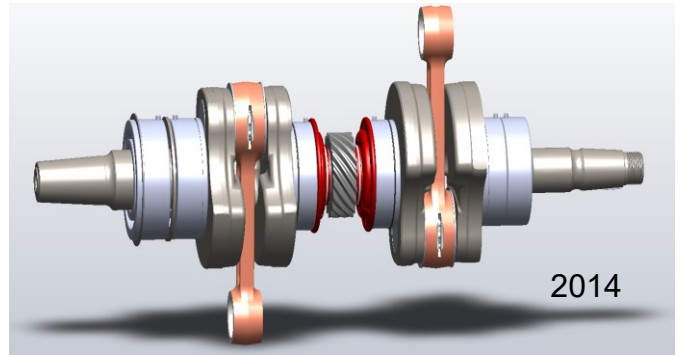
Skidoo 800R Crankshaft



2007 - 2008

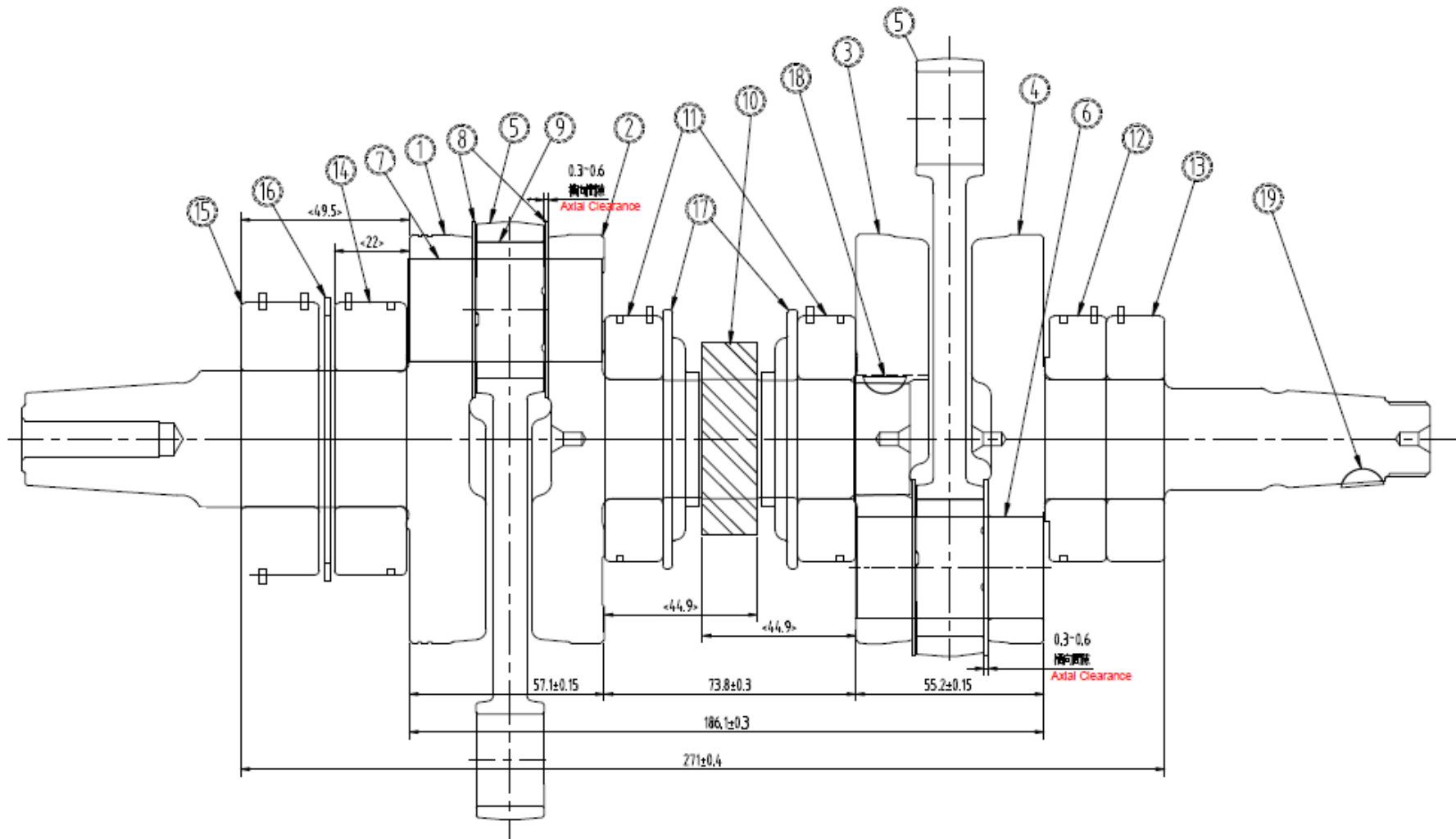


2014



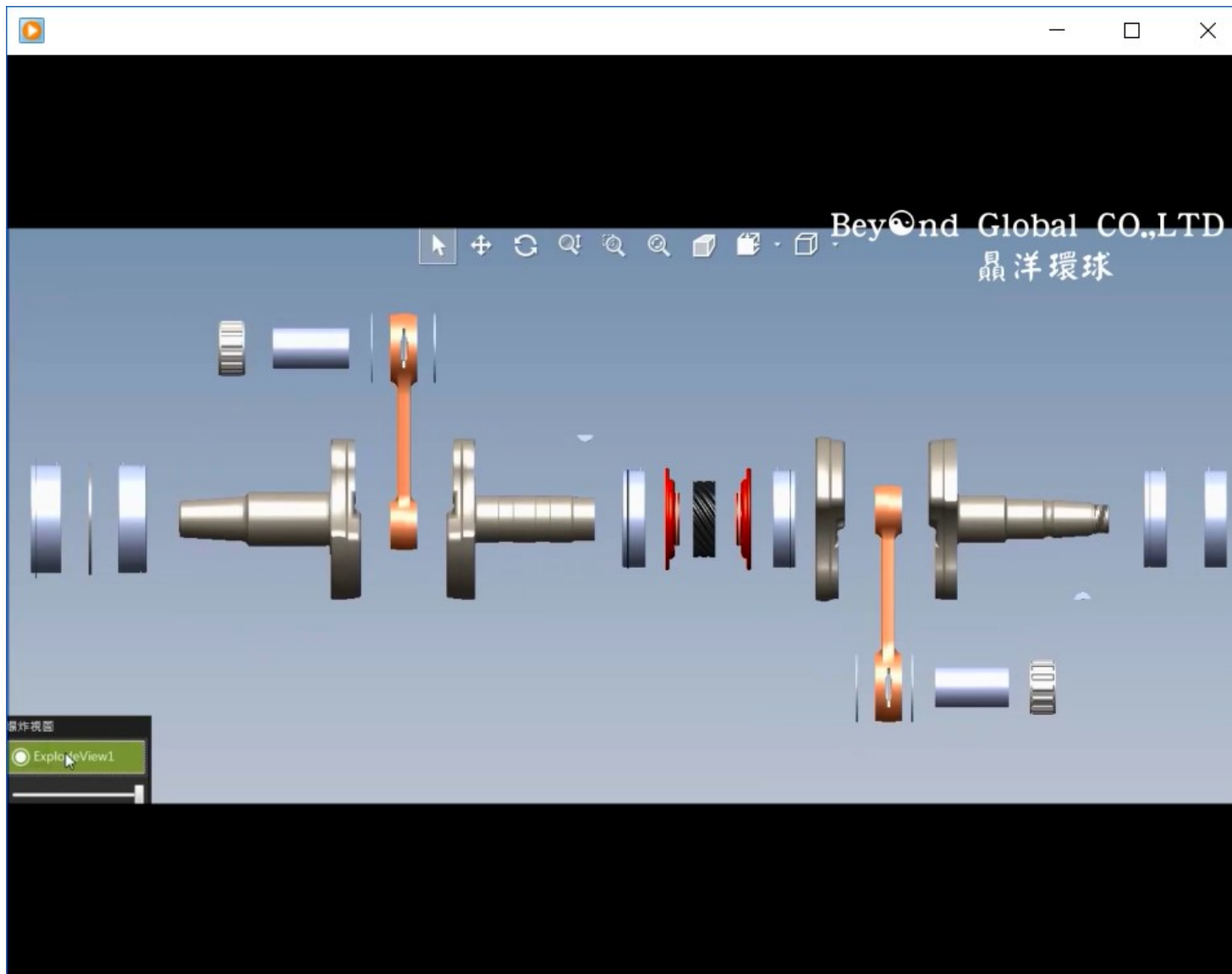
Skidoo 800R

Crankshaft assembly

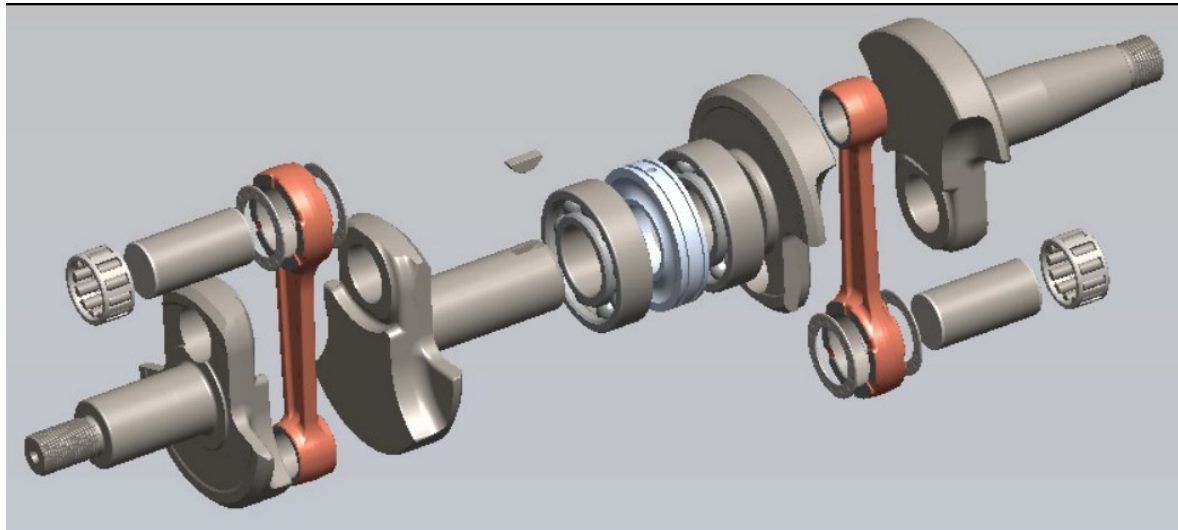
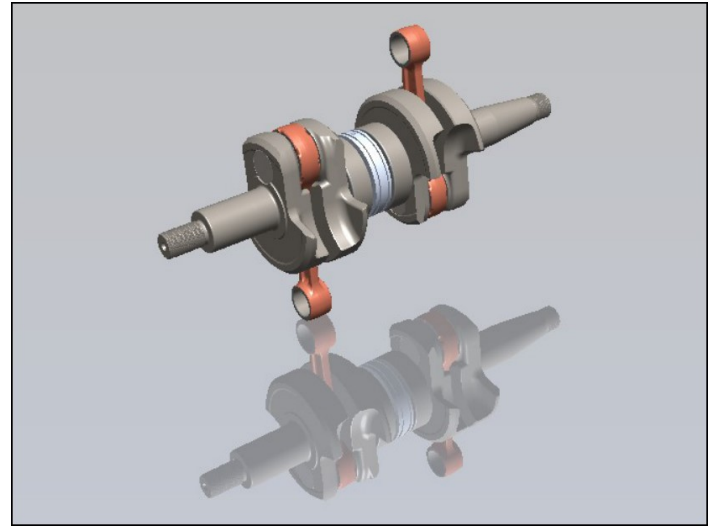
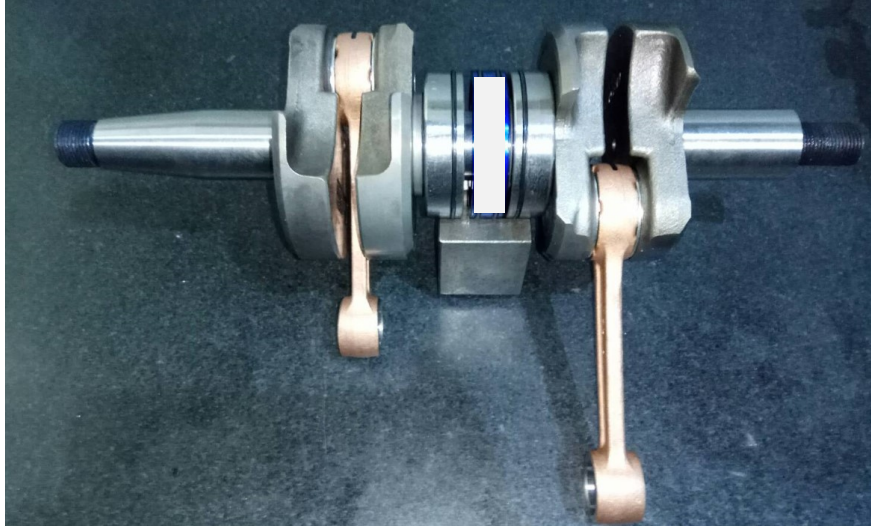


Skidoo 800R Crankshaft

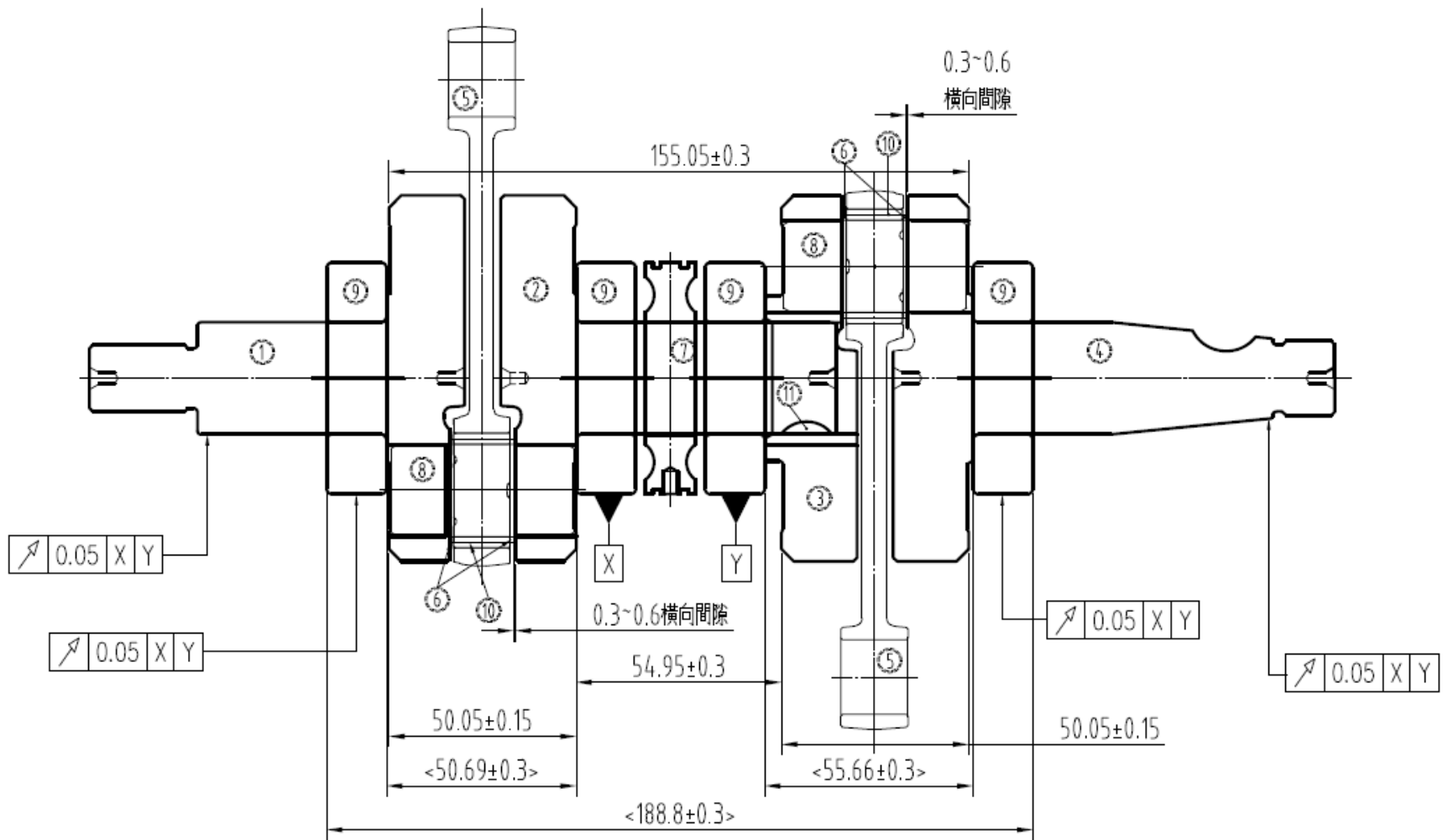
3D demo



Kawasaki 550 PWC Crankshaft

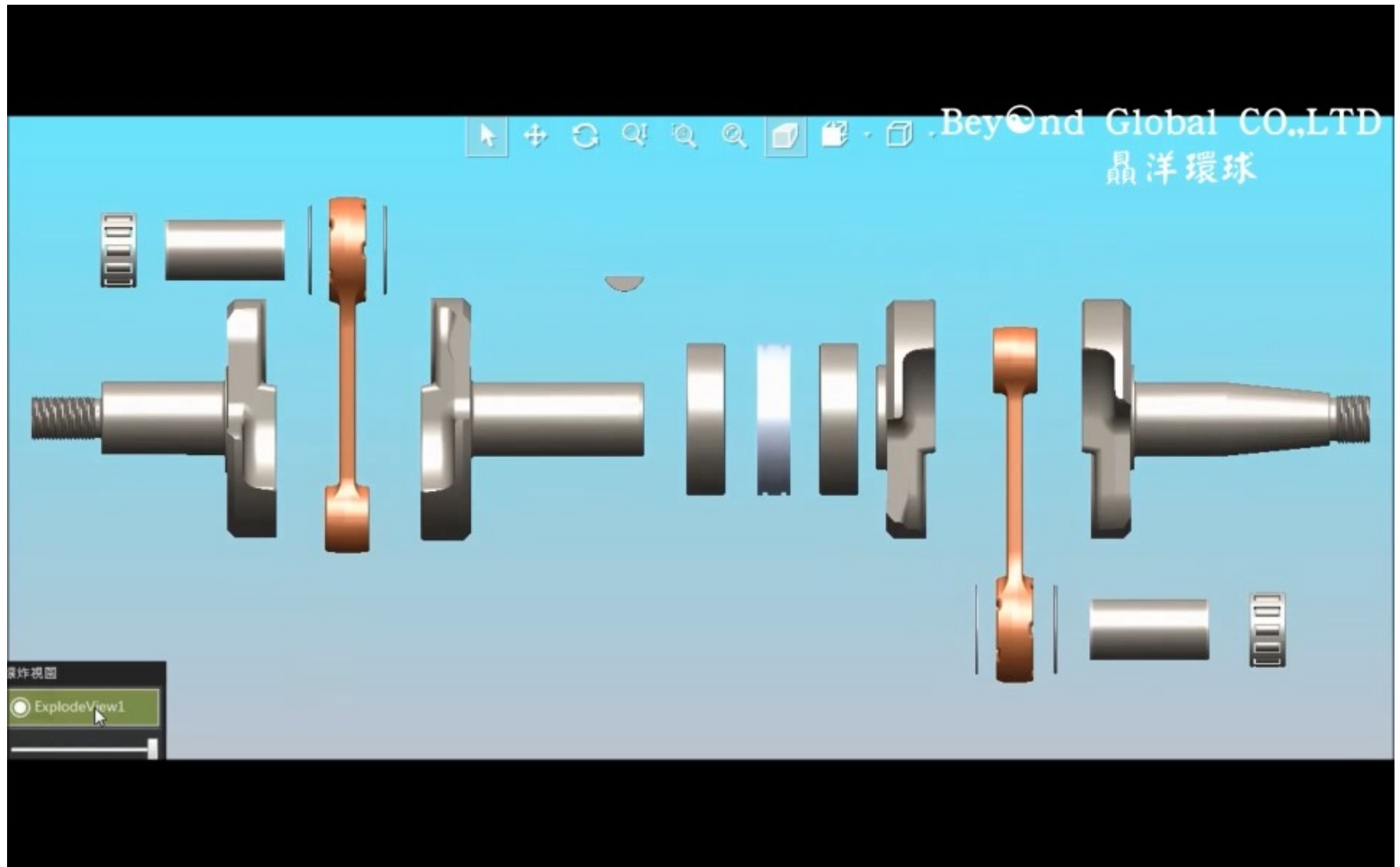


Kawasaki 550 PWC Crankshaft assembly

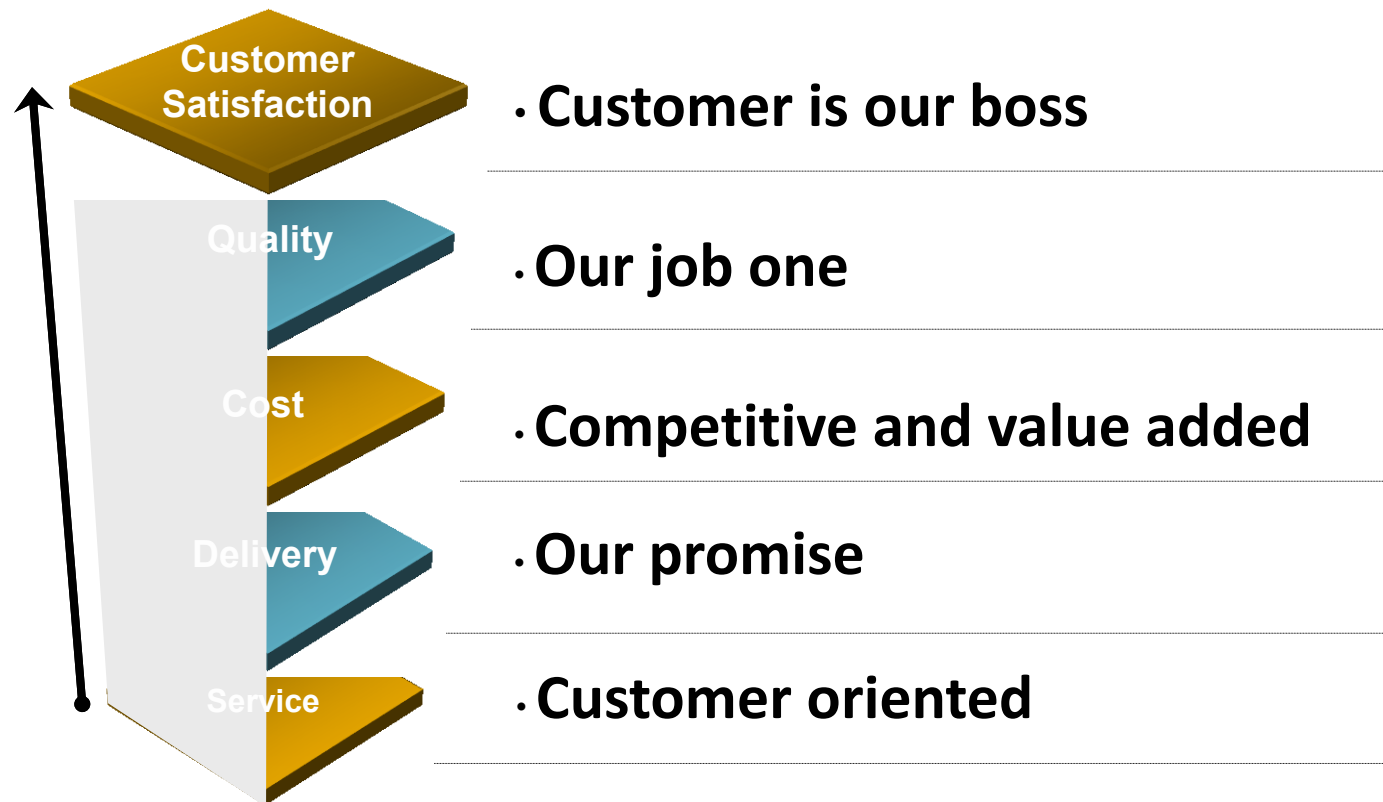


Kawasaki 550 PWC Crankshaft

3D demo



Our commitment



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