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ENGINE BLUEPRINTING KIT

P/N 11137

The T&D Machine Products' Engine Blueprinter Kit is a multi-function measurement tool set, designed to measure the components that are difficult to measure accurately or that require special tools. By combining different components, other uses are possible beyond those described here.

Included are instructions for measuring:

- CRANKSHAFT STROKE
- PISTON DECK CLEARANCE
- PISTON COMPRESSION HEIGHT
- CRANK TO BLOCK DECK
- PUSHROD LENGTH
- CONNECTING ROD LENGTH
- CAM LIFT

CAUTION: Be aware of the mounting ear on the back of the dial indicator and avoid binding against the slotted bar or other accessories.

Before beginning use of any tool combination, remember that the calibration of each set-up is the most critical part. DO NOT bend the gauges or damage the ground ends.

Make sure to check parts/hardware inventory when you receive your T&D Engine Blueprinting Kit

PARTS LIST

- | | | | |
|-----|---------------------------------|-----|--------------------------|
| (1) | 1" Dial Indicator | (2) | 0.500 Round Gauges |
| (1) | 3.500 Gauge | (1) | 5.500 Gauge |
| (1) | 7.500 Gauge | (1) | 9.500 Gauge |
| (1) | Bridge Top (A) | (2) | Short Bridge Legs (C) |
| (2) | Long Bridge legs (B) | (1) | Flat Calibration Bar (D) |
| (1) | "L" Shaped Indicator Holder (E) | (1) | Slotted Bar Assembly |

HARDWARE

(1)	Allen Wrench	(6)	1/4-20 x 5/8 Allen Bolts
(2)	1/4-20 x 3/4 Allen Bolts	(1)	1/2 x 1 1/2 Bolt
(1)	7/16 x 1 1/2 Bolt	(1)	1/2 Washer
(1)	7/16 Washer	(1)	Indicator Foot
(1)	0.300 Indicator Tip	(1)	0.820 Extension
(1)	0.950 Extension	(1)	1.700 Extension

CHECKING CRANKSHAFT STROKE

Use the bridge marked "A" and the long bridge legs marked "B" installed in the holes that allow the legs to rest on the main journals. Install the indicator and the 0.950 in. long extension. Calibrate the indicator using the flat calibration bar marked "D" and the two 0.500 tall round gauges. Strokes of 2.00 to 3.00" will usually use one 0.500 tall round gauge and longer strokes will use the short tip (0.300) and both of the round gauges stacked on top of each other.

Place the calibrated assembly on the crank (legs on the mains, indicator on the rod journal). Slide the assembly across the mains until the highest reading is obtained and then rock the assembly on the mains until you get the absolute highest reading. Add the round gauge dimensions to the indicator reading. Multiply that number by 2. Measure the rod and main journal diameters. Subtract the rod journal diameter from the main journal diameter and add this number to the indicator reading (indicator + step x 2). This is your stroke.

EXAMPLE:	Indicator	0.948							
	Step	0.500			Main	2.500			
	X 2	<u>1.448</u>			- Rod	<u>2.100</u>			
=	2.896		+		0.400		=	3.296	

PISTON DECK CLEARANCE

Use the bridge top marked "A" and either the short or long bridge legs marked "B" or "C" in the appropriate attaching holes. Any indicator tip can be used. Use the flat calibration bar marked "D" to zero in the indicator. For some applications you may need the round gauges (0.500/1.000).

PISTON COMPRESSION HEIGHT

Use the "L" shaped indicator holder marked "E" and the indicator with the necessary length extension. To calibrate, use the flat calibration bar and the round gauges. (Use the 0.300 long tip and the 0.500 tall gauge for 0.500" to 1.500" and the 0.950 long extension and both of the 0.500 round gauges for 1" to 2") With the gauge on the bar, hold the "L" bracket on top of the gauge and set the indicator height so that the indicator reads 1.000". With the wrist pin partially extended from the pin hole, hold the indicator

bracket flat on the deck portion of the piston top and the indicator tip on the wrist pin. Move the indicator and bracket until the highest reading is obtained. Add 1/2 the pin diameter to this reading. This is your compression height.

CRANK TO DECK AND BLOCK SQUARENESS

Assemble the "L" shaped indicator holder in the correct groove of the slotted bar assembly.

Groove #1 is for 9.5" to 10.5"

Groove #2 is for 8.5" to 9.5"

Groove #3 is for 7.5" to 8.5"

Groove #4 is for 6.5" to 7.5"

We will assume that you are measuring a deck of approximately 7.45". Install the "L" shaped indicator holder into the #4 groove. Install the indicator with the short (0.300) tip in the hole closest to the bar. The indicator must be angled to clear the tab, do not tighten. Lay the assembly on the bench or lightly hold in a vice. Fit the 7.500" gauge between the indicator tip and the dowel as squarely as possible and raise or lower the indicator to read 1" (+/- 0.020). Snug the clamp screw, re-insert the gauge and zero the indicator.

The readings obtained from this set-up will be 6.500 plus the indicator reading since you set-up the indicator at its full travel of 1". The next groove up uses the same 7.500 gauge but is set and 0.0" and all measurements will be 7.5 plus the indicator reading. The same rules apply for all grooves and gauges.

Now slip the assembly either down the bore or over the end of the block while lifting the indicator shaft up. Rest the dowel in the main bearing saddle and indicator tip on the deck. The bar can make contact with the cylinder wall to help align the assembly. Move the assembly in all directions until the lowest reading is obtained. For true crank to deck dimension, add 1/2 the block main bore diameter, gauge length and indicator reading. Checking all corners of the block will indicate squareness of the crank to deck.

PUSHROD LENGTH

Calibrate the same as "crank to deck" but use the indicator foot in place of the tip or extension. Lay the assembly on the bench or clamp lightly in a vice. Position the pushrod between the indicator foot and dowel and move the upper and lower ends around until the highest reading is obtained. This is the measured length or the length after the oil holes are drilled. The gauge length is the length before drilling and will be about 0.025" longer. Adjustable pushrods without oil holes will produce gauge length dimensions.

CAM FUNCTIONS

Use the "L" shaped indicator holder and any appropriate indicator tip or extensions. With the cylinder head off, you can use the 1/2 or 7/16 bolt and washer provided to attach the bracket to the block. The indicator extension will seat in the tappet, moving the indicator when the tappet moves.

CONNECTING ROD LENGTH

Many combinations of the basic components are possible for checking rod length. The main components are the slotted bar assembly, the "L" shaped indicator holder and dial indicator. The holder slot, tip extension and gauge are all chosen to match the particular rod. If the rod bolts are in the rods, you may want to use the outer (furthest from the bar) mounting hole. Calibrate the assembly using the appropriate gauge.

The rod cap must be removed. Slide the wrist pin hole over the dowel on the bar assembly while lifting the indicator tip to clear the crankshaft end of the rod. Holding the assembly with the bar vertical will allow the rod to center on the dowel. Rock the crankshaft end from side to side until the lowest reading is obtained.

To calculate rod length using the previously obtained information:

$$\begin{aligned} & 1/2 \text{ pin hole diameter} \\ + & 1/2 \text{ crank hole diameter} \\ + & \text{Indicator length (including gauge length)} \\ = & \text{Rod length} \end{aligned}$$

Once the first rod is measured, all others in the set can be measured as just plus or minus the first rod's indicator reading. Piston and rods can now be mixed to get more equal overall lengths.