CHECKING AND ADJUSTMENT OF THE EXHAUST CAM FOR TWO STROKE MAN B&W MC ENGINES

For checking of the exhaust cam lead, we should know the **engine specific LIFTING HEIGHT** value which can be find in Maintenance manual Section 908-5.1 and/or in operation manual engine Shop test result which second one to be preferred.
This value somehow to be closed to 14,00 mm for 70MC, 12,00 mm for 60MC, 10,00 mm for 50MC and smaller bore.

Above given values are for reference only and engine specific values from shop test results to be taken into account.

For typical checking of the exhaust cam roller:

1. Stop the engine and close the starting air.
2. Stop the lubrication oil pump.
3. Remove the exhaust valve hydraulic pipe.
4. Bring the NO:1 cylinder to TDC. Measure the crankshaft position with pin gauge and confirm NO:1 cylinder exactly at TDC. (Recommended). Measure the camshaft position by pin gauge and confirm camshaft is in correct position. You should read 0 degrees on the turning wheel.

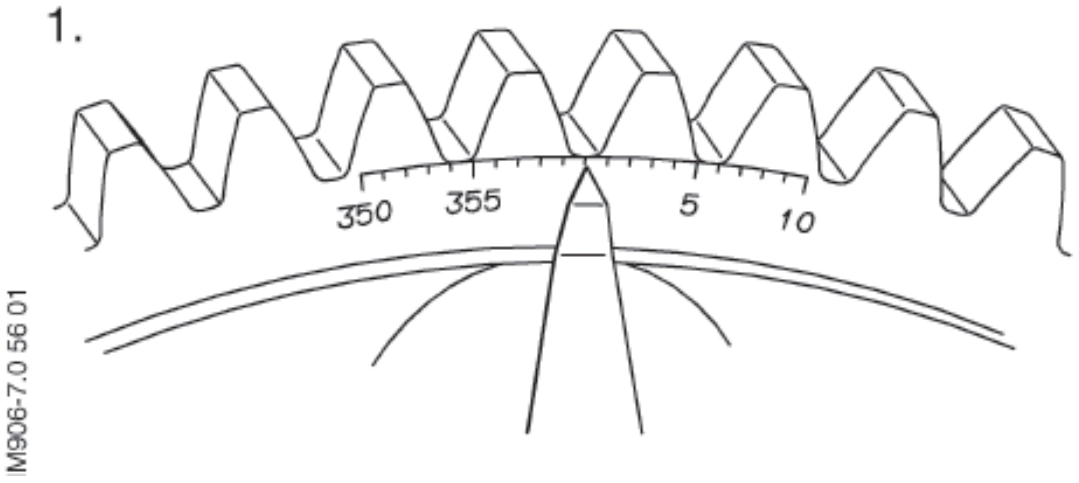
5. Measure the height of the exhaust roller.
6. Turn the engine **AHEAD** direction until the roller is lifted to indicated value in the shop test or maintenance manual. (For example, 12 mm).
7. Read and note the new angle indicated on the turning wheel. (For example, 113.70 deg). This is the value of the angle, which exhaust cam turned from TDC to reach to **lifting height** which called **A**
8. Turn the engine until lifting height value became to same lifting height, which is 12,00 mm in our example. (Due to shape of the cam, measured value will be increased for a while and will start to decrease to previous measurement).
9. When same value 12,00 mm obtained, read and note the angle indicated on the turning wheel. (For example, 258,30 deg) This is the value of angle, which exhaust cam turned from TDC to reach lifting height during **decreasing cycle** which called **B**
10. Theoretical middle point of the cam 180°
11. A+B=360°
12. (A+B)/2=180°
13. Difference of (A+B)/2 value from the 180° indicate us **exhaust cam Lead angle**…
14. This value to be compared with shop test value.

In our example:
A=113,70° B=258,30°
(A+B)/2= 186… 180-186= -6° exhaust cam lead angle…

Same procedures to be repeated for remained cylinder.

EXHAUST ROLLER OIL CYLINDER

EXHAUST ROLLER AT DISMANTLED CONDITION(FOR REFERENCE ONLY) MEASUREMENT CAN BE TAKEN ON THE TOP OF THE PISTON WITHOUT REMOVING OIL CYLINDER AND ROLLER



READ AND NOTE THE ANGLE ON THE TURNING WHEEL (NO:1 CYL AT TDC AT ILLUSTRATION)

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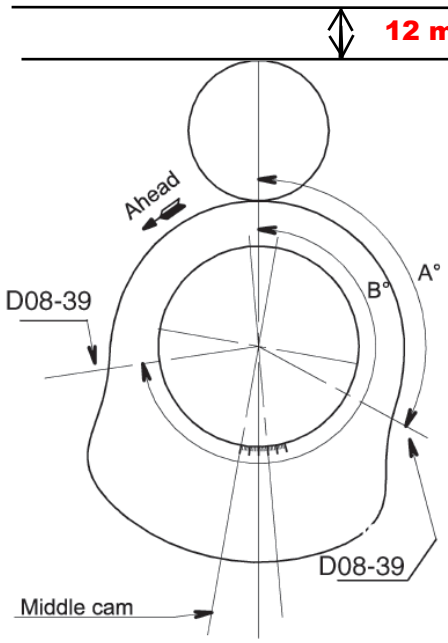


Fig.1 Subject cylinder at TDC

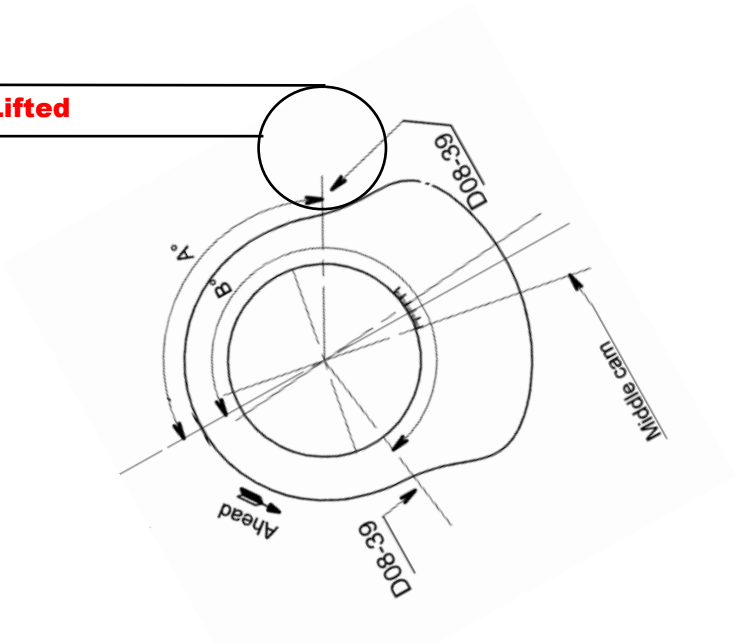


Fig.2 Exhaust cam has turned A degree until roller has lifted to determined value(113,70 deg and 12,00 mm in our example) .

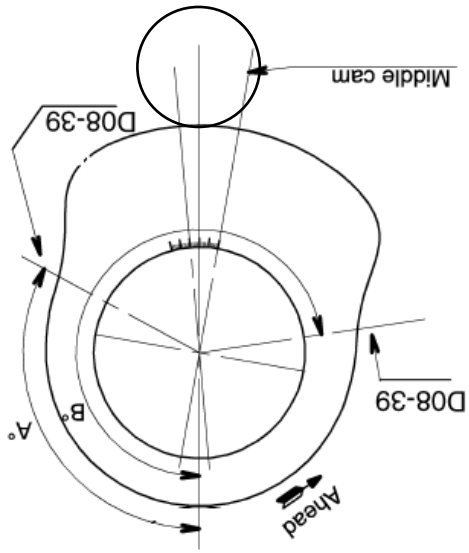


Fig.3 Exhaust cam further turned. Roller at highest point.

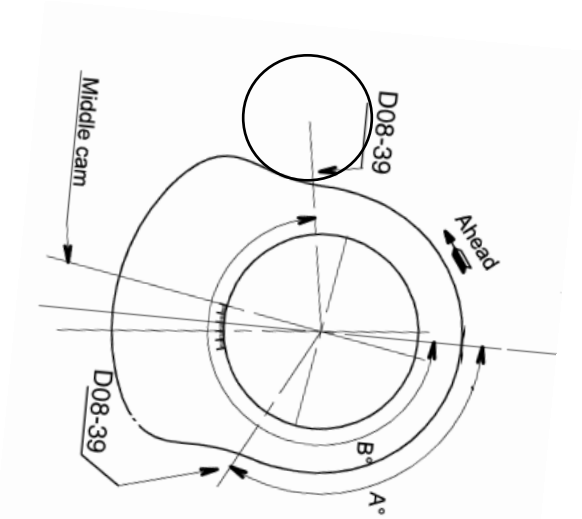


Fig.4 Exhaust cam turned total B degrees (258,30 deg.in our example) and same roller height (12 mm) with Fig.2 obtained.

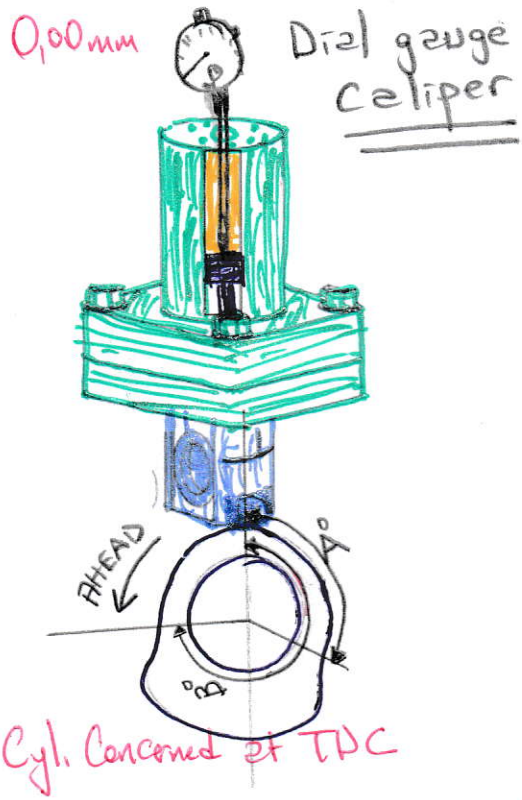


Fig.1 Cyl. Concerned at TDC

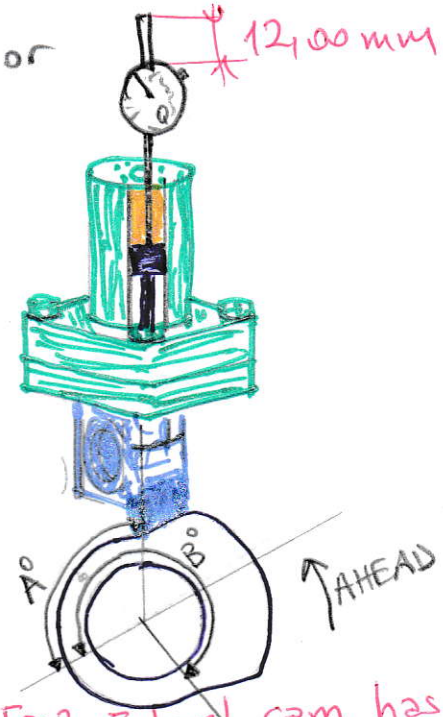


Fig.2 Exhaust cam has turned A° degree, until roller has lifted to determined value (113,70 deg and 12,00 mm in our example)

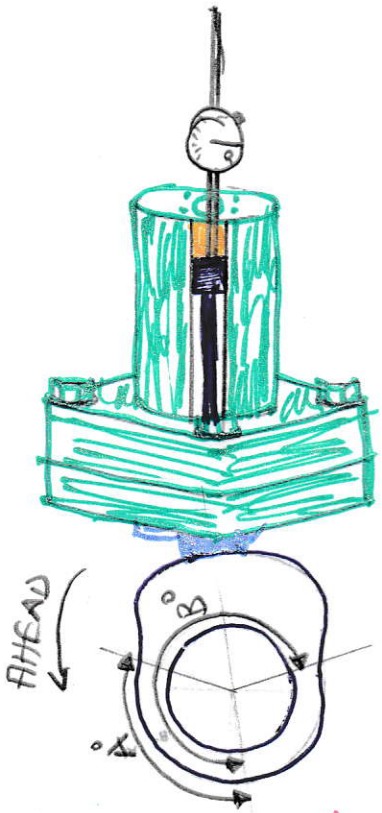


Fig.3 Exhaust cam further turned. Roller at highest point.

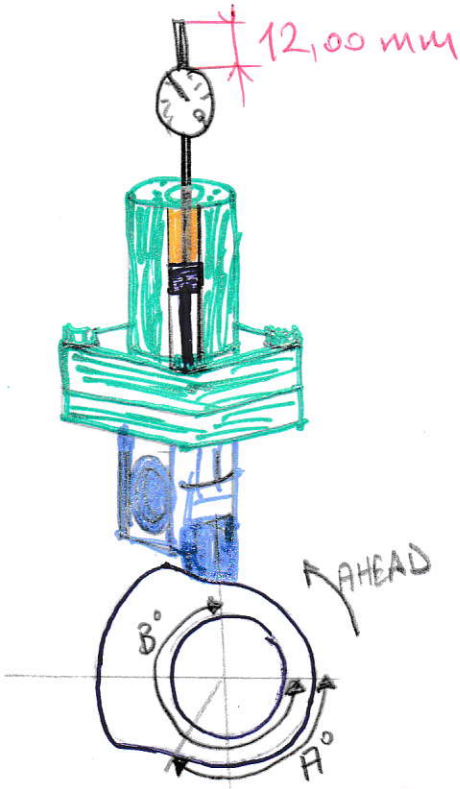


Fig.4. Exhaust cam has turned B° degrees (258,30° in our example) and same roller height (12,00mm) with Fig.2 obtained.

FIRING ORDER :	1-5-3-4-2-6	C/S Type	Casting	Forging
		C/S Angle	Regular	Irregular

(A : 113.7 ° => 12mm)

1. Exhaust Cam Lead (Advance Angle) (B : 258.3 ° => 12mm) (Design : -6 °)

CYLINDER No. / CHECK POINT	1	2	3	4	5	6						
Measured A Timing (Ahead)	113.70	353.70	233.70	293.70	173.70	53.70						
Measured B Timing (Astern)	258.30	138.30	18.30	78.30	318.30	198.30						
Lead Angle	-6	-6	-6	-6	-6	-6						

Above table shows shop test inspection report for same engine(60MC). As can be seen, difference between A and B is same for all cylinder, i.e. 258,3-113,7= 114,6 deg for NO:1 cyl and 126,3(360-233,70) +18,3= 114,6 deg for NO:3 cylinder.

1. Exhaust Cam Lead (Advance Angle)

Cylinder NO.	1	2	3	4	5	6	7	8	9	10	11	12	1
Measured Timing(Ahead)	-3.85	-3.80	-4.15	-3.85	-4.10	-4.00	BLANK						

* Angle A : 114.1 ° * Lift : 14.0 mm

* Angle B : 253.9 ° * Lift : 14.0 mm

Above inspection report shows another engine's(70MC) record. This table they do not indicated all A and B value for all cylinder, but they give only A and B value for NO:1 cylinder. Same values for other cylinders to be calculated based on firing order.

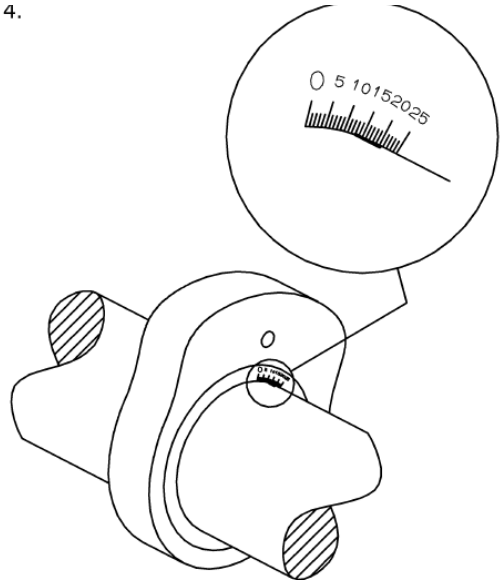
Description \ Cylinder No.			Design	1	2	3	4	5	6	7	8
Crank shaft T.D.C			— (Deg.)	0	102.9	257.1	205.7	154.3	308.6	51.4	
Exhaust valve (Roller guide lift 10mm)	Open (After T.)		115.6 (Deg.)	115.6	115.6	115.6	115.6	115.6	115.6	115.6	
	Shut (After T.)		246.4 (Deg.)	246.2	246.2	246.2	246.2	246.2	246.2	246.2	
Starting air distributor	Ahead	Open (After T.)	5 (Deg.)	4.0	3.4	3.9	3.8	3	3.4	4.6	
		Shut (After T.)	95 (Deg.)	92	92.1	93.9	94.3	93.7	93.0	91.6	
	Astern	Open (After T.)	5 (Deg.)	5	6.9	5.1	5.2	6.3	4.6	6.4	
		Shut (After T.)	95 (Deg.)	95	95.9	96.1	96.7	95.3	95.6	94.4	
F.O.Pump top lift			8.25 (mm)	8.26	8.2	8.26	8.29	8.25	8.24	8.2	
F.O.Pump shim height			— (mm)	2.5	2.5	2	2.5	2	1.5	2.5	

Firing Order :1-7-2-5-4-3-6

Another inspection report belongs to 35MC engine. Kindly note number of cylinders changed, which to be considered for firing order and TDC calculation for all cylinders

REMARK: The cam lead angle can be checked visually by reading directly the scale position of the exhaust cam over the marking scratch on the camshaft. For this check **position of the camshaft to be confirmed by pin gauge.**

4.



Several incidents reported that some or all the exhaust or fuel cams lost their correct position due to roller damages. In that case, cams in questions to be adjusted back to correct position.

Recommendation:

1. One of the common reason of the roller damages is malfunction of the reversing system. In case the reversing is not complete or doesn't take place, forces acting on the roller guide and reversing arm is so high that it can cause such damage to the components. Adjustment of the reversing arms to be checked during overhaul of the roller. Please see service letter SL1988-243 in line with maintenance manual related section in Plate no 909.
2. Another possible reason of the roller damages is water leakages to roller sections. In case no effective sealing between roller housing and engine frame, and excessive water leak from cooling jackets with blocked drains, it is possible to water enter to roller housing and brake the oil film which result stuck of the roller. Therefor it is very important to keep engine free from any leakages and make sure drain holes not blocked by foreign materials.
3. Roller overhaul and inspection should not be skipped and to be completed together with fuel pump overhauls. Crack tests will inform you in advance if any crack developed on the rollers which will cause damage in due course. Loose guide blocks also will cause misalignment and damage of the roller. Please see service letter SL1997-345 for more info.
4. Our experience shows that in some cases, it is overlooked to order seal & O-rings set for roller housings and umbrella seals, resulting cancelling roller overhaul and inspection, which should be done together with fuel pump overhaul during drydocks. Therefore, we recommend keep full set seal and O-ring for the roller and umbrella seal system on board.
5. We also recommend keeping below spares on board to prevent operational time losses.
    a. 1 pc two halves exhaust cam.
    b. 1 pc two halves roller cam
    c. 1 set fuel pump roller
    d. 1 set exhaust cam roller
    e. 1 pc fuel roller housing
    f. 1 pc exhaust roller housing
    g. 1 pc spring for fuel and exhaust roller

Remark: If you want to check fuel pump lead along with exhaust cam lead, make sure fuel pump roller is at ahead position. How to change roller position, please visit our web page www.oktotr.com

If you have any question or service request, please reach us through info@oktotr.com