FIXTHIS.COM

F5DFL413A*A001 / F5DFL413A*A002 / F5DFL413B*A006 / F5DFL413C*A003 / F5DFL413D*A003 / F5DFL413D*A004 / F5HFL413A*A001 / F5HFL413B*A001 / F5HFL413B*A002 / F5HFL413C*A001

Tier 4a

Engine

SERVICE MANUAL

Part number 84496807
1st edition English
April 2012

CASE CONSTRUCTION

Contents

INTRODUCTION

Engine 10

Engine and crankcase 10.001
Cylinder heads 10.101
Pan and covers 10.102
Crankshaft and flywheel 10.103
Connecting rods and pistons 10.105
Valve drive and gears 10.106
Fuel filters 10.206
Fuel injection system 10.218
Turbocharger and lines 10.250
Intake and exhaust manifolds and muffler 10.254
Engine lubrication system 10.304
Engine cooling system 10.400
Oil cooler and lines 10.408
Fan and drive 10.414
Exhaust Gas Recirculation (EGR) exhaust treatment 10.501

Electrical systems 55

Engine cooling system 55.012
Engine oil system 55.013
Engine intake and exhaust system 55.014
Engine control system 55.015
Engine starting system 55.201
Cold start aid 55.202
Alternator 55.301

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Safety rules

Personal safety



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible death or injury.

Throughout this manual and on machine decals, you will find the signal words DANGER, WARNING, and CAUTION followed by special instructions. These precautions are intended for the personal safety of you and those working with you.

Read and understand all the safety messages in this manual before you operate or service the machine.

⚠ DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury. The color associated with DANGER is RED.

⚠ WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. The color associated with WARNING is ORANGE.

⚠ CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. The color associated with CAUTION is YELLOW.

FAILURE TO FOLLOW DANGER, WARNING, AND CAUTION MESSAGES COULD RESULT IN DEATH OR SERIOUS INJURY.

Machine safety

NOTICE: *Notice indicates a situation which, if not avoided, could result in machine or property damage. The color associated with Notice is BLUE.*

Throughout this manual you will find the signal word Notice followed by special instructions to prevent machine or property damage. The word Notice is used to address practices not related to personal safety.

Information

NOTE: *Note indicates additional information which clarifies steps, procedures, or other information in this manual.*

Throughout this manual you will find the word Note followed by additional information about a step, procedure, or other information in the manual. The word Note is not intended to address personal safety or property damage.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Torque - Minimum tightening torques for normal assembly

METRIC NON-FLANGED HARDWARE

NOM. SIZE	CLASS 8.8 BOLT and CLASS 8 NUT		CLASS 10.9 BOLT and CLASS 10 NUT		LOCKNUT CL.8 W/CL8.8 BOLT	LOCKNUT CL.10 W/CL10.9 BOLT
	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr		
M4	2.2 N·m (19 lb in)	2.9 N·m (26 lb in)	3.2 N·m (28 lb in)	4.2 N·m (37 lb in)	2 N·m (18 lb in)	2.9 N·m (26 lb in)
M5	4.5 N·m (40 lb in)	5.9 N·m (52 lb in)	6.4 N·m (57 lb in)	8.5 N·m (75 lb in)	4 N·m (36 lb in)	5.8 N·m (51 lb in)
M6	7.5 N·m (66 lb in)	10 N·m (89 lb in)	11 N·m (96 lb in)	15 N·m (128 lb in)	6.8 N·m (60 lb in)	10 N·m (89 lb in)
M8	18 N·m (163 lb in)	25 N·m (217 lb in)	26 N·m (234 lb in)	35 N·m (311 lb in)	17 N·m (151 lb in)	24 N·m (212 lb in)
M10	37 N·m (27 lb ft)	49 N·m (36 lb ft)	52 N·m (38 lb ft)	70 N·m (51 lb ft)	33 N·m (25 lb ft)	48 N·m (35 lb ft)
M12	64 N·m (47 lb ft)	85 N·m (63 lb ft)	91 N·m (67 lb ft)	121 N·m (90 lb ft)	58 N·m (43 lb ft)	83 N·m (61 lb ft)
M16	158 N·m (116 lb ft)	210 N·m (155 lb ft)	225 N·m (166 lb ft)	301 N·m (222 lb ft)	143 N·m (106 lb ft)	205 N·m (151 lb ft)
M20	319 N·m (235 lb ft)	425 N·m (313 lb ft)	440 N·m (325 lb ft)	587 N·m (433 lb ft)	290 N·m (214 lb ft)	400 N·m (295 lb ft)
M24	551 N·m (410 lb ft)	735 N·m (500 lb ft)	762 N·m (560 lb ft)	1016 N·m (750 lb ft)	501 N·m (370 lb ft)	693 N·m (510 lb ft)

NOTE: *M4 through M8 hardware torque specifications are shown in pound-inches. M10 through M24 hardware torque specifications are shown in pound-feet.*

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

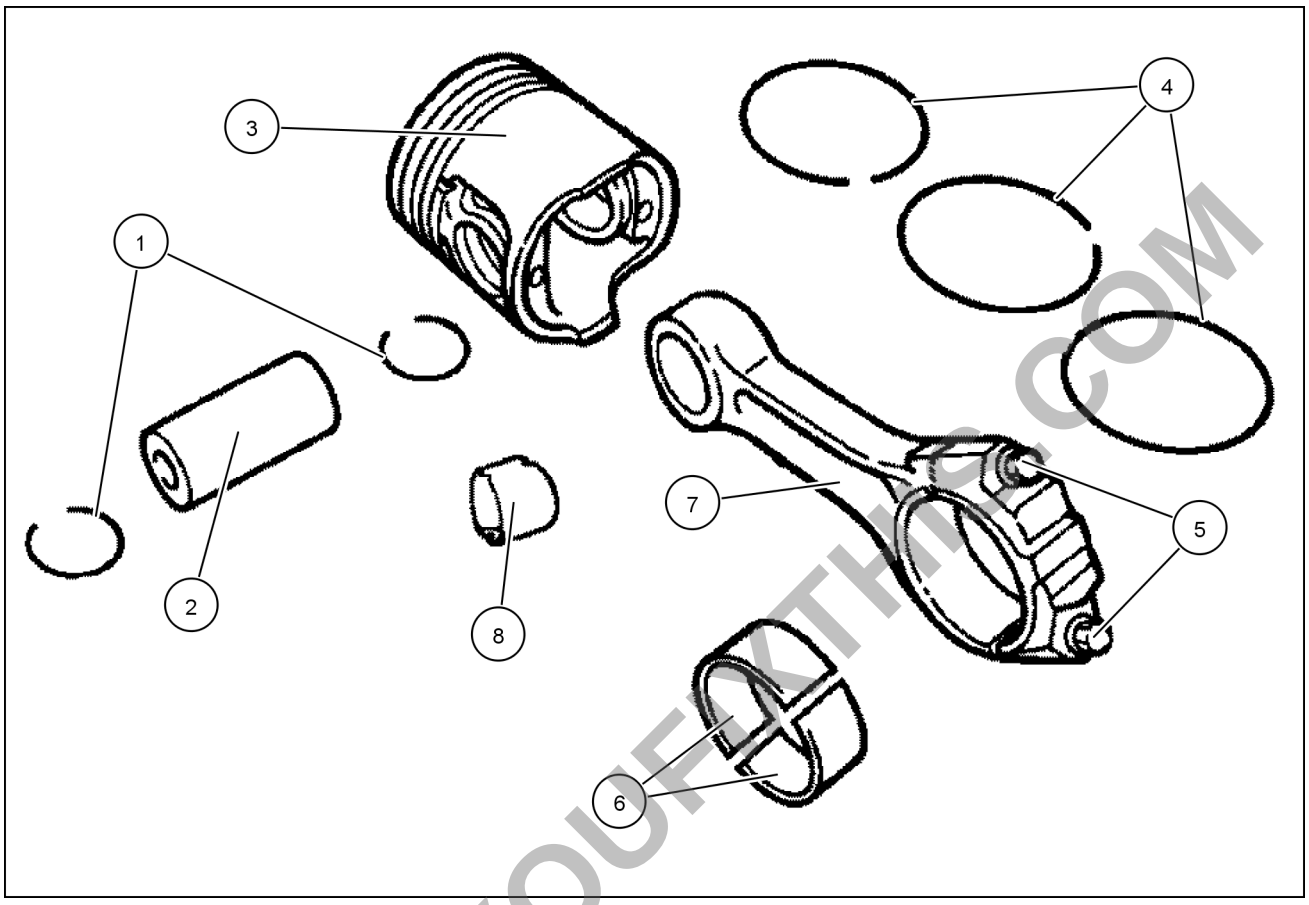
Engine - Service limits

Timing	
Intake	
- Start before Top Dead Center (TDC)	**19 °**
- End after Bottom Dead Center (BDC)	**37 °**
Exhaust	
- Start before BDC	**61 °**
- End after TDC	**21 °**
Fuel system	
Injection Type	Bosch CP4.1
Nozzle type	Bosch CRI2.2
Injection sequence	1 - 3 - 4 - 2
Cylinder block and piston	
Cylinder bore	**99.000 - 99.020 mm** (**3.8976 - 3.8984 in**)
Pistons	
- Outside diameter	**98.908 - 98.918 mm** (**3.8940 - 3.8944 in**)
- Pin bore	**36.003 - 36.009 mm** (**1.4174 - 1.4177 in**)
Clearance between cylinder bore and piston	**0.082 - 0.112 mm** (**0.0032 - 0.0044 in**)
Piston protrusion	**-0.22 - 0.07 mm** (**-0.0087 - 0.0028 in**)
Piston pin	**35.990 - 35.996 mm** (**1.4169 - 1.4172 in**)
Clearance between piston pin and bore	**0.004 - 0.019 mm** (**0.0002 - 0.0007 in**)
Piston ring lands	
- Top	**2.21 mm** (**0.0870 in**)
- Middle	**2.050 - 2.070 mm** (**0.0807 - 0.0815 in**)
- Bottom	**2.540 - 2.560 mm** (**0.1000 - 0.1008 in**)
Piston rings	
- Top	**2.068 - 2.097 mm** (**0.0814 - 0.0826 in**)
- Middle	**1.970 - 1.990 mm** (**0.0776 - 0.0783 in**)
- Bottom	**2.470 - 2.490 mm** (**0.0972 - 0.0980 in**)
Clearance between Rings and Lands	
- Top	**0.06 - 0.100 mm** (**0.0024 - 0.0039 in**)
- Middle	**0.06 - 0.100 mm** (**0.0024 - 0.0039 in**)
- Bottom	**0.05 - 0.09 mm** (**0.0020 - 0.0035 in**)
Piston ring end gap	
- Top	**0.20 - 0.35 mm** (**0.0079 - 0.0138 in**)
- Middle	**0.60 - 0.80 mm** (**0.0236 - 0.0315 in**)
- Bottom	**0.30 - 0.60 mm** (**0.0118 - 0.0236 in**)
Camshaft bore inside diameter	
- 1	**59.222 - 59.248 mm** (**2.3316 - 2.3326 in**)
- 2-3-4	**50.069 - 50.119 mm** (**1.9712 - 1.9732 in**)
- 5	**40.069 - 40.119 mm** (**1.5775 - 1.5795 in**)
Camshaft Journals	
- 1	**53.995 - 54.045 mm** (**2.1258 - 2.1278 in**)
- 2-3-4	**49.975 - 50.025 mm** (**1.9675 - 1.9695 in**)
- 5	**39.975 - 40.025 mm** (**1.5738 - 1.5758 in**)
Clearance between cam bearings and journals	**0.038 - 0.162 mm** (**0.0015 - 0.0064 in**)
Cam lift	
- Intake	**6.213 mm** (**0.2446 in**)
- Exhaust	**5.5105 mm** (**0.2169 in**)
Tappets	
- Housing	**15.000 - 15.018 mm** (**0.5906 - 0.5913 in**)
- Tappet (Upper and Lower)	**15.924 - 15.954 mm** (**0.6269 - 0.6281 in**)
- Tappet (Middle)	**15.960 - 15.975 mm** (**0.6283 - 0.6289 in**)
Clearance between tappets and housing	**0.03 - 0.068 mm** (**0.0012 - 0.0027 in**)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Connecting rod and piston - Exploded view



73092848A 1

(1) Snap ring
(2) Pin
(3) Piston
(4) Piston rings
(5) Bolts
(6) Half bearings
(7) Connecting rod
(8) Bushing

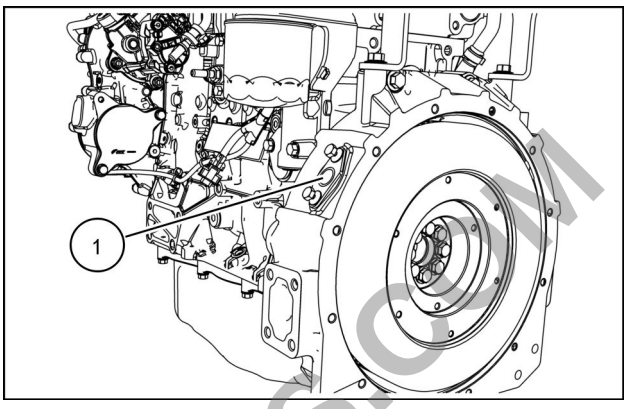
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Engine - Service instruction - Finding Top Dead Center (TDC)

For engines with access to the timing hole in the flywheel housing

1. Fit the tool **380000150** through the case **(1)** and into the port on the flywheel, as shown.
2. Using the tool **380000988 (1)** rotate the flywheel until the notch **(2)** is visible in the inspection hole and cylinder one is at TDC.

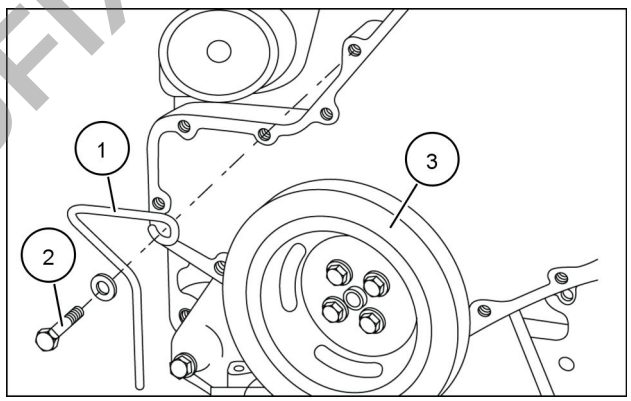


NHVM12ENG0004AA 1

For engines without access to the timing hole in the flywheel housing

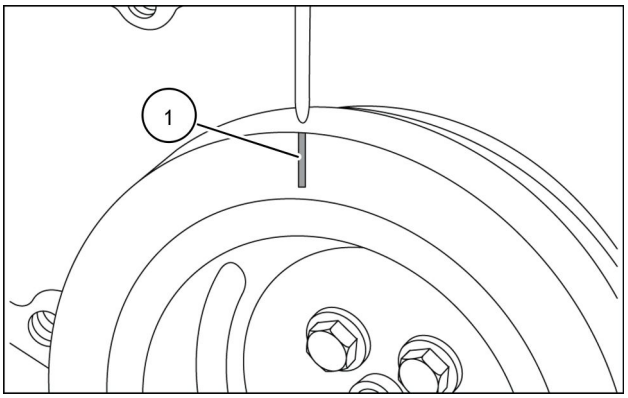
NOTE: *Prior to performing this procedure, ensure that the engine is near cylinder one TDC on the compression stroke by verifying that both push rods or rocker arm assemblies on number one cylinder are loose. If both push rods or rocker arms are tight, rotate the engine one full revolution on the crankshaft, in the direction of normal operation, and re check the push rods or rocker arm assemblies.*

1. Fabricate a wire pointer **(1)** as shown and attach it to a front cover bolt **(2)** that is located close to the vibration damper **(3)**. Position the pointer approximately **1.6 mm** (**0.0625 in**) from the damper.
2. Rotate the engine in the direction of normal operation.
3. Pry down on the cylinder number one intake valve and insert a **6.35 mm** (**0.25 in**) spacer between the valve stem and rocker arm tip to hold the valve open.



93110987 2

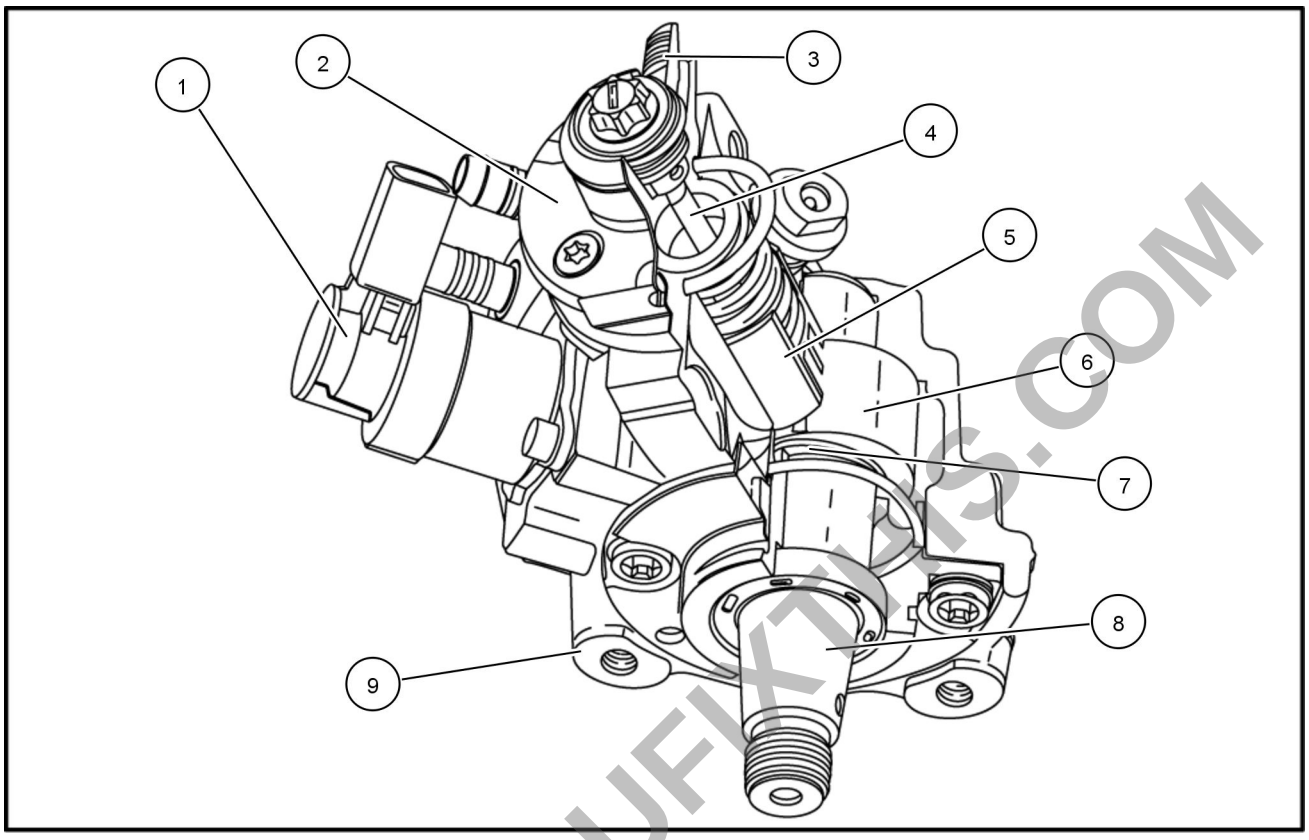
4. Slowly rotate the engine to TDC by hand until the piston contacts the valve and stops rotation. Make a reference mark **(1)** on the damper at the pointer.
5. Rotate the engine counter clockwise as viewed from the front.
6. Remove the spacer.
7. Rotate the engine clockwise approximately **90 °** past TDC.
8. Pry down on cylinder number one intake valve and again insert the spacer between the valve stem and rocker arm tip to hold the valve open.



93110988 3

Download full manual at youfixthis.com
PREVIEW - YOUFIXTHIS.COM

Injection pump - Overview



83116822 1

(1) Metering unit
(2) Cylinder head
(3) High pressure port to rail
(4) Plunger
(5) Bucket tappet
(6) Roller
(7) Double cam
(8) Drive shaft
(9) Pump flange

The Bosch CP4.1 high pressure injection pump is a single radial-piston pump which is capable of producing pressures up to **200,000 kPa** (**29,008 psi**).

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Contents

INTRODUCTION

Foreword - Ecology and the environment 3
Safety rules 4
Basic instructions - Important notice regarding equipment servicing 5
Basic instructions - Shop and assembly 6
Torque - Minimum tightening torques for normal assembly 8

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Engine - 10

Crankshaft and flywheel - 103

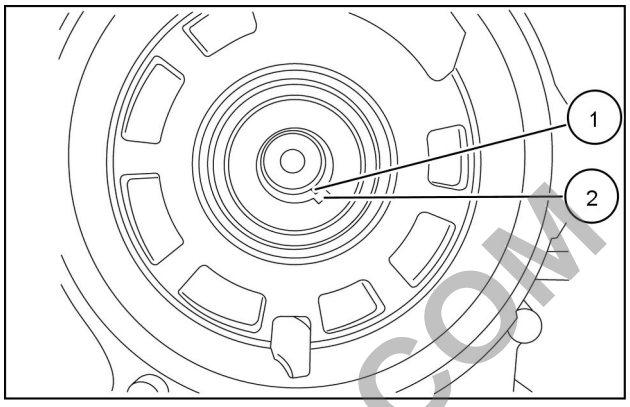
F5DFL413A*A001 , F5DFL413A*A002 , F5DFL413B*A006 , F5DFL413C*A003 , F5DFL413D*A003 , F5DFL413D*A004 , F5HFL413A*A001 , F5HFL413B*A001 , F5HFL413B*A002 , F5HFL413C*A001

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

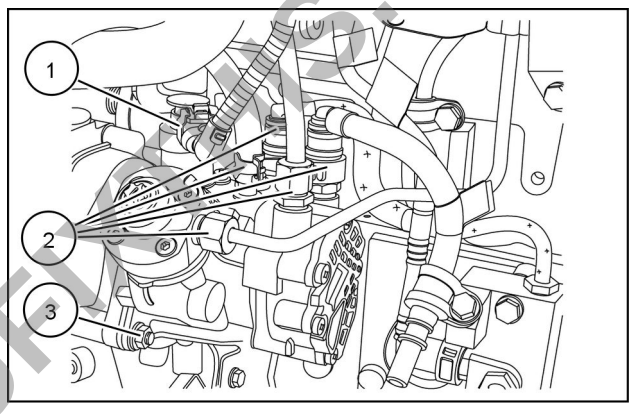
Injection pump - Install

1. Install the pump on the gear housing while aligning the pump shaft key **(1)** with the slot in the gear **(2)**.



83119820 1

2. Torque the nuts **(3)** to **25 N·m** (**18 lb ft**).
3. Connect the fuel lines **(2)**.
4. Connect the fuel metering valve connector **(1)**.
5. Install the blowby recirculation system. Refer to **Blowby re-circulation system - Install (10.304)** for the proper procedure.

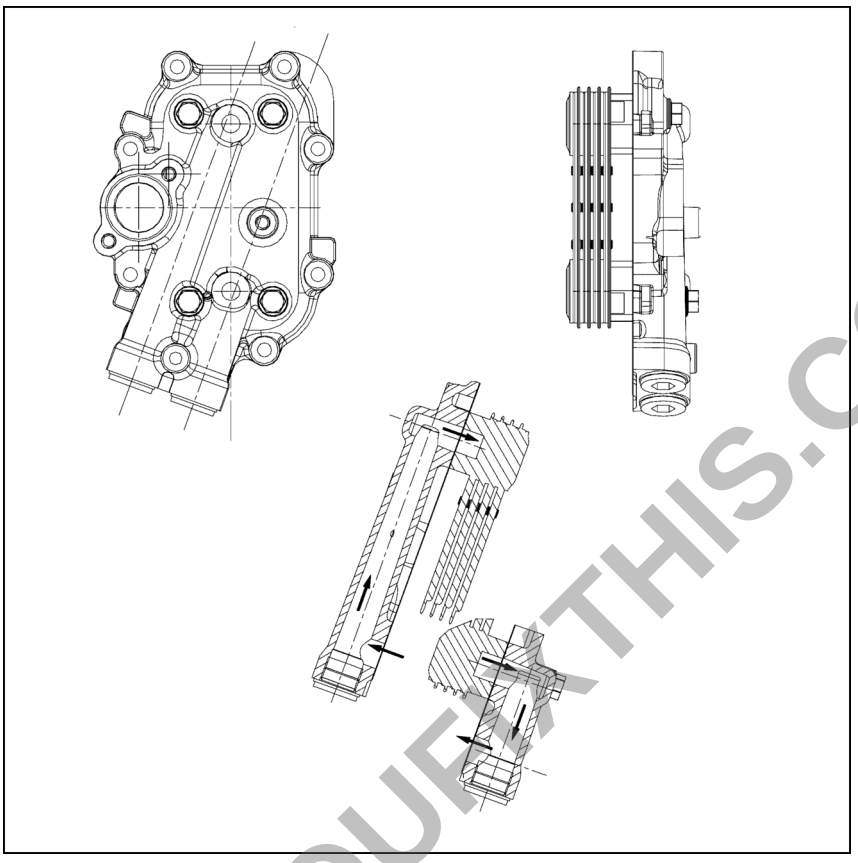


83119800 2

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Engine oil cooler - Overview



73092745 1

The oil cooler circulates engine oil through cooling plates that sit in a coolant passage on the right hand side of the engine. This process transfers heat from the engine oil to the engine coolant.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

PREVIEW ONLY

You're viewing 12 of 236 pages

The full manual includes:

- All 236 pages, complete
- Searchable PDF (find any keyword)
- No watermarks
- Instant download
- Print-ready quality

GET FULL MANUAL NOW

Fpt F5DFL413A*A001, F5DFL413A*A002, F5DFL413B*A006, F5DFL413C*A003, F5DFL413D*A003, F5DFL413D*A004, F5HFL413A*A001, F5HFL413B*A001, F5HFL413B*A002, F5HFL413C*A001 Service Manual



Scan or click anywhere
youfixthis.com

Click anywhere on this page to get the full manual