

Kubota Installation Instructions

CARB/EPA certified Tier 4f engines:

D1803-CR-TIE4B-KEA-1 (1J497-10000)
D1803-CR-TIE4B-KEA-2 (1J497-20000)
D1803-CR-TIE4BG-KEA-1 (1J478-10000)
V2403-CR-TIE4B-KEA-1 (1J498-10000)
V2403-CR-TIE4B-KEA-2 (1J498-20000)
V2403-CR-TIE4BG-KEA-1 (1J488-10000)

The instructions in this document supersede any other previous instructions provided by Kubota.



Kubota Emission-Related Installation Instructions

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Important Notice

EMISSION-RELATED INSTALLATION INSTRUCTIONS

These instructions are provided for the final engine assemblers (FEA) who must ensure the engine, exhaust system (After Treatment Device: ATD), intake system (Air flow sensor), engine control system etc, are installed correctly in the engine's certified configuration. The emission related parts which FEA prepare (for example the exhaust tail pipe or wire harness and controls) must be designed to function throughout the useful life of the component without any failure.

Failing to follow these instructions when installing a certified engine in a piece of nonroad equipment violates federal law (40 CFR 1068.105(b)), and is subject to fines or other penalties as described in the Clean Air Act.



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Objective Items

1. Exhaust System

Kubota supplies a certified diesel oxidation catalyst (DOC) assembly. FEA must use the Kubota supplied certified exhaust after treatment and assemble the exhaust system parts according to the instructions. No other exhaust after treatment is certified for use with these KEA standard engine models. Therefore, no other exhaust after treatment can be used.

2. Intake System

These Tier 4 common rail engines utilize a mass air flow (MAF) sensor to control the EGR flow rate. The air cleaner location and piping layout must be installed according to these installation instructions to maintain proper performance of the MAF sensor output. Also, to prevent decreases of engine output performance and to maintain emission compliance, intake resistance and charge air cooler performance must be kept within certain criteria.

3. Fuel System

In order to maintain the common rail fuel injection pump performance and durability the pressure and temperature of the fuel must be checked during the application review.

4. Engine Control System (Engine Control Unit (ECU))

The Engine Control Unit (ECU) is considered an emission control device. It is critical to ensure that the ECU is installed correctly and that the requirements and specifications are checked during the application review. The electrical signal must be within Kubota specification. Otherwise, engine and emission performance cannot be guaranteed.

5. Engine Control System (Engine Control Unit (ECU), Wire Harness, Operator Display Panel)

The wire harness is also considered an emission control device. It is critical to ensure that the wire harness is installed correctly and that the requirements and specifications are checked during the application review. The electrical signals must be within Kubota specification. Otherwise, engine and emission performance cannot be guaranteed.



Objective Items

6. Certification Labels

Kubota installs the certification label on the cylinder head cover. If the final engine assembler installs the engine in a way that makes the engine's emission control information label hard to read during normal engine maintenance, the final engine assembler must place a duplicate label on the equipment, as described in 40 CFR 1068.105.

7. Application Review Requirements

Distributor is responsible for completing full application review for standard engine to ensure quality engine installation. The application review should be completed according to Kubota's application review standards and application manual requirements.



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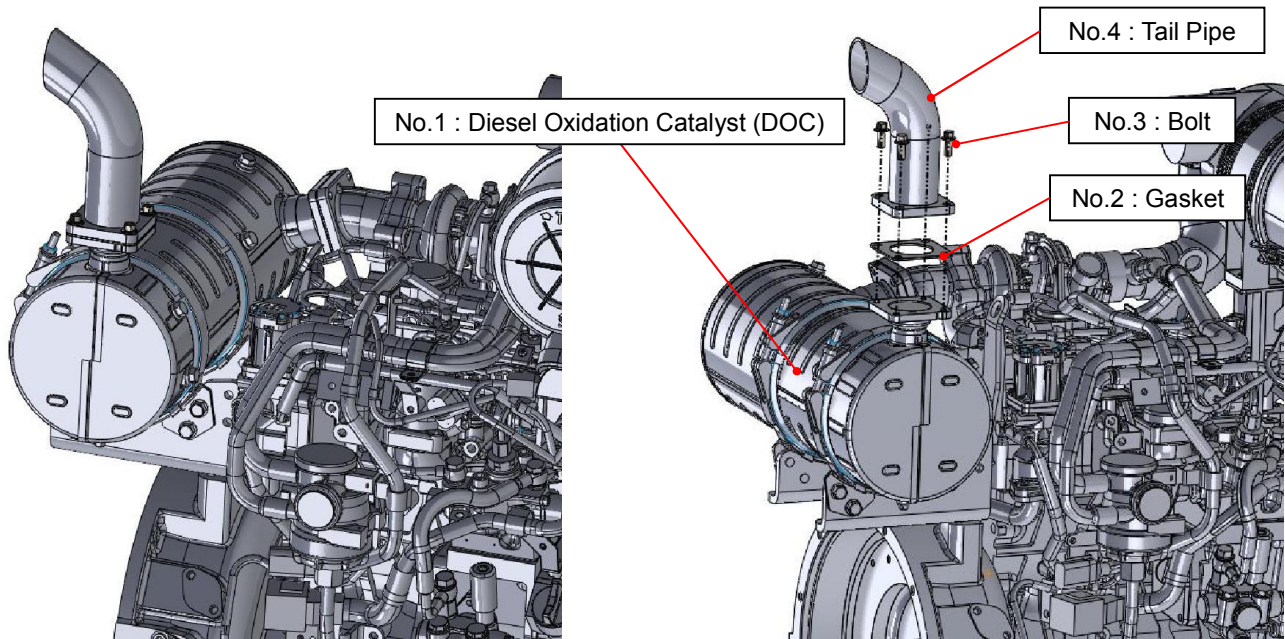
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1. Exhaust System

1-1. Exhaust System Supply

1-1-1. Exhaust System Supply for KEA Standard CRS-DOC Engines

Exhaust system means the layout of all parts from the exhaust manifold to the exhaust exit.
An example of exhaust system is shown below.



1. Exhaust System

Kubota supplies the following parts as shown below, these parts must be used in the exhaust system.
FEA supplied parts must meet the installation instruction requirements.

No.	Part Name	FEA	Kubota supplied	KBT Part No.	Q'ty	Engine Model	Remarks
1	Diesel Oxidation Catalyst		○	1J497- 1810△	1	D1803- CR- TIE4	Engine Code: 1J497- 10000 , 1J478- 10000
				1J807- 1810△	1	D1803- CR- TIE4	Engine Code: 1J497- 20000
				1J808- 1810△	1	V2403- CR- TIE4	All V2403- CR- TIE4 Models
2	Gasket		○	17326- 1223△	1	All 03 Series	Qty: 1 Gasket supplied with engine. Qty: 3 Gaskets are required for remote DOC installation. (See page 12- 13 for remote DOC installation details)
3	Bolt	○		-	4		M8 x 1.25mm ISO 8.8
4	Tail Pipe	○		-	-		Meet the back pressure and flange requirements.

Note: Part numbers / assemblies for item #1, Diesel Oxidation Catalyst, vary based on the base engine.



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1. Exhaust System

1-2. Exhaust System Layout

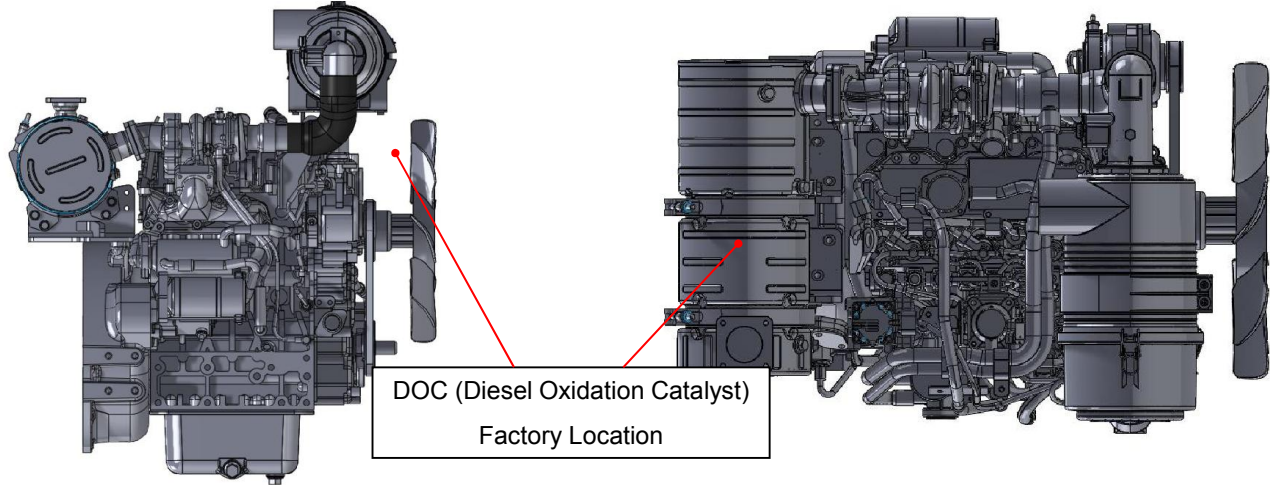
DOC (Diesel Oxidation Catalyst) Installation for KEA CRS-DOC Standard Engines

Incorrect DOC installation will cause emission non-compliance and/or damage to the DOC.

1-2-1. DOC Installation Options:

- A. **Standard DOC Installation Position:** The DOC is installed onto the top side of the flywheel housing at the Kubota production facility as the standard configuration. Kubota recommends to keep the DOC in this factory location.
- B. **DOC Outlet Angle:** Changing the DOC outlet angle is acceptable. See following pages.
- C. **Remote Mount DOC:** Certain applications will require for the DOC to be relocated. See following pages.

It is critical to follow the instructions outlined in this installation manual to guarantee emission compliance.



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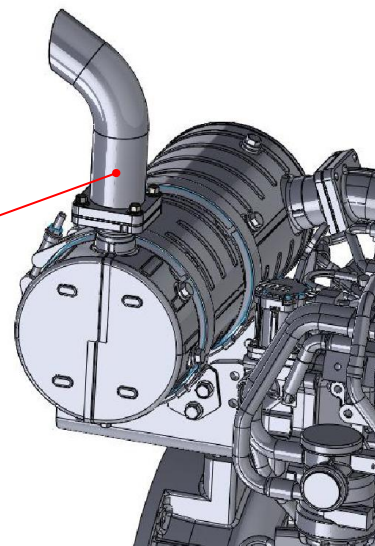
1. Exhaust System

1-2-1.A Factory Mounted Installation Position (DOC): Exhaust Back Pressure Check

Back pressure of exhaust tail pipe at full load, rated speed condition must be according to table below.
Measurement point of back pressure of exhaust system is within 1" (25.4 mm) of the DOC outlet.

Engine Model	10 Digit Code	Maximum Back Pressure	Remarks
D1803- CR- TIE4B- KEA- 1	1J497- 10000	50 mm Hg	Industrial
D1803- CR- TIE4B- KEA- 2	1J497- 20000	50 mm Hg	Industrial
D1803- CR- TIE4BG- KEA- 1	1J478- 10000	40 mm Hg	BG
V2403- CR- TIE4B- KEA- 1	1J498- 10000	50 mm Hg	Industrial
V2403- CR- TIE4B- KEA- 2	1J498- 20000	50 mm Hg	Industrial
V2403- CR- TIE4BG- KEA- 1	1J488- 10000	40 mm Hg	BG

Back Pressure Measurement
Location



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1. Exhaust System

1-2-1.B DOC Outlet Angle Adjustment Procedure (Option)

1. Kubota recommends to keep the DOC outlet angle in the standard position, but certain applications will require adjustment.
2. Adjusting the DOC outlet angle is acceptable to meet the installation requirements of the machine.
 - Installation instructions must be carefully followed to ensure emission compliance.
 - Angle adjustment must be completed only 1 time (to minimize risk of clamp breakage).
 - Angle adjustment must be completed before customers run the engine (to minimize risk of clamp deterioration due to heat).

Procedure:

STEP 1: Loosen DOC band clamp at DOC outlet position and remove DOC outlet portion.

STEP 2: Replace gasket with new parts. Refer to illustrated parts list for gasket P/N.

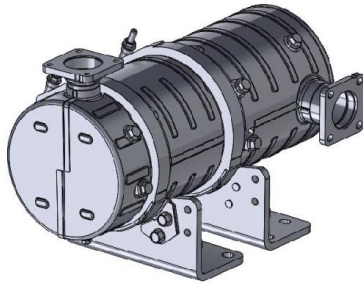
STEP 3: Orient the DOC outlet to the desired angle (similar to image to the right).

STEP 4: Tighten Band clamp nut to 16-20 Nm.

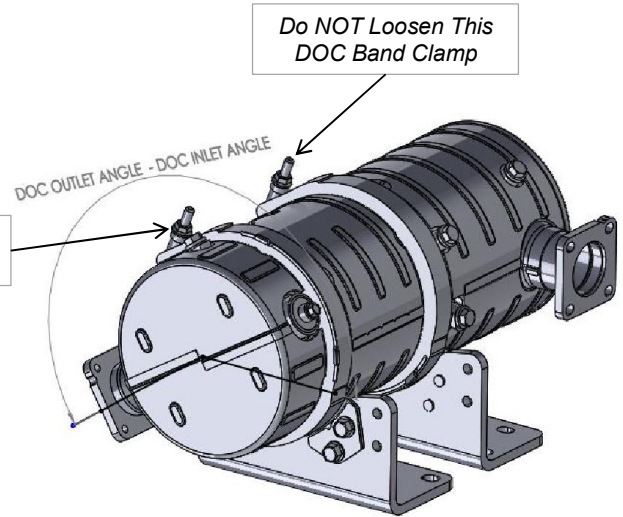
STEP 5: Start engine and confirm that there are no exhaust leaks.

Note 1: It is NOT allowed to adjust the DOC inlet portion of the DOC.
Only the DOC outlet position can be adjusted.

Note 2: Any exhaust gas leakage or failures due to incorrect modification is not covered under standard/emissions warranty.



STANDARD DOC CONFIGURATION



ADJUSTED DOC OUTLET ANGLE

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1. Exhaust System

1-2-1.C Remote Mounting the DOC (Option)

Remote DOC Installation Option

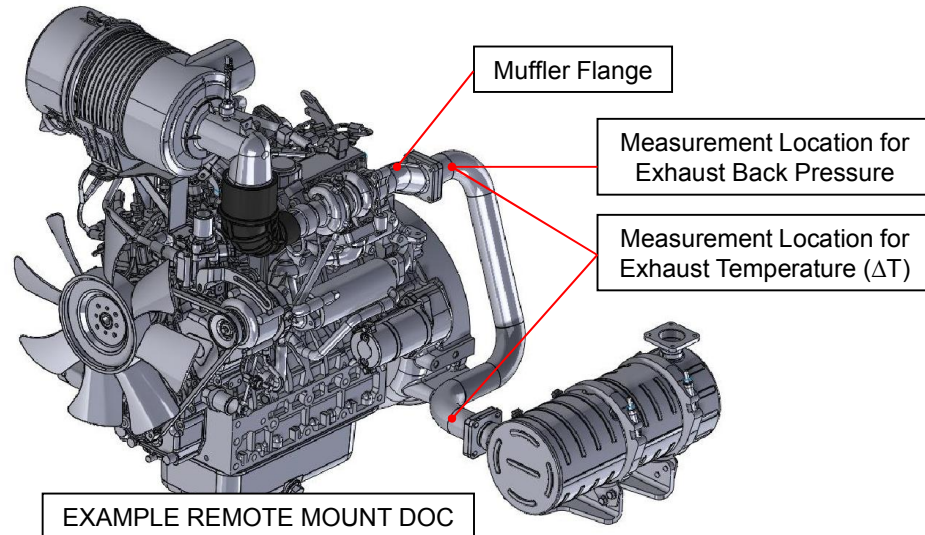
Certain applications will require for the DOC to be relocated. See below installation criteria.

1. Exhaust Backpressure Requirement:

A. The maximum allowable exhaust back pressure for the complete exhaust system measured at the muffler flange outlet must be less than 113 mmHg. The back pressure must be measured at the rated speed full load condition.

2. Exhaust Temperature Drop Requirement:

A. The maximum allowable temperature drop across the intermediate exhaust pipe must be less than 25 deg. C at the rated speed full load condition. Exhaust pipe insulation may be required and is recommended to meet this requirement.



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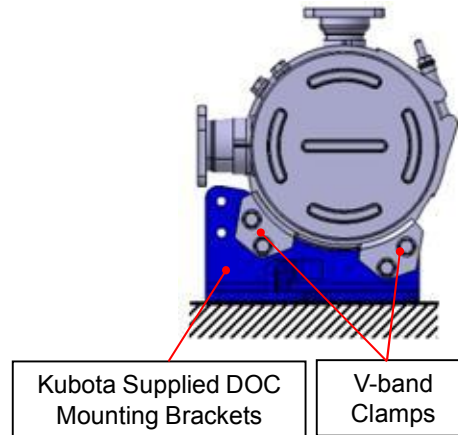
1. Exhaust System

1-2-1.C Remote Mounting the DOC (Option)

Remote DOC Installation Option Continued...

3. Other Installation Requirements for Remotely Installed DOC

- A. Intermediate pipe for remote DOC (from turbo-out to DOC-inlet) must include a flexible portion.
- B. The muffler flange must not be removed from the engine. The intermediate exhaust pipe must connect to the outlet of the muffler flange.
- C. The intermediate exhaust pipe and flexible coupling must not leak exhaust gases during operation.
- D. New muffler flange outlet gasket, DOC inlet gasket, studs, and nuts on muffler flange outlet are required when DOC is removed from engine for remote installation. Refer to the illustrated parts list for the correct replacement part numbers.
- E. Tightening torque for the muffler flange outlet and DOC inlet M8 fasteners is 24-27 N·m.
- F. Relocated DOC needs to be mounted without excessive strain/load on V-band clamps.
- G. It is strongly recommended to use the Kubota supplied DOC mounting brackets (shown below in blue).
- H. DOC inclination angle must follow the required installation angles defined in the next page.



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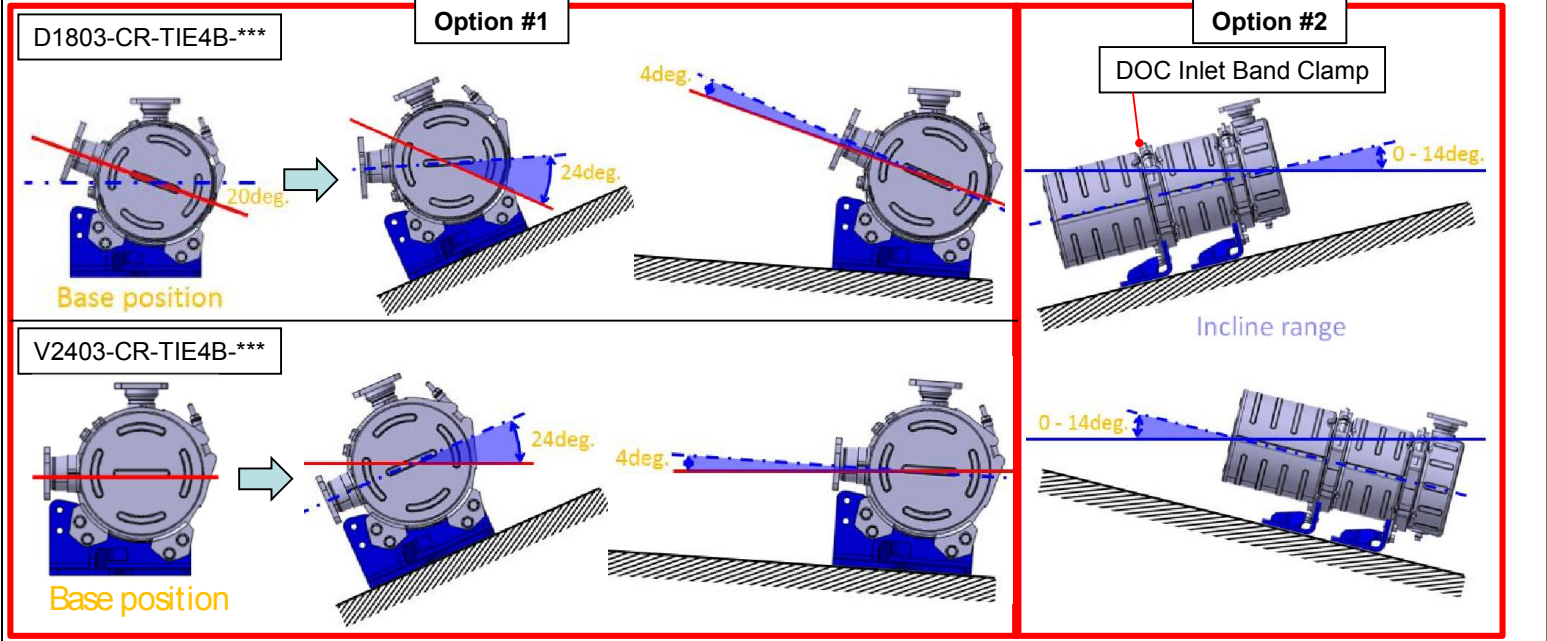
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1. Exhaust System

1-2-1.C Remote Mounting the DOC (Option)

4. Other Installation Requirements for Remotely Installed DOC

- A. DOC inclination angle must be installed according to the angles defined below.
- B. The DOC inlet band clamp cannot be loosened or modified in any way.
- C. The DOC can only be inclined according to option #1 or option #2, not the combination.
 - I. Option #1: Rotate the DOC about the DOC centerline axis.
 - i. Please note the required installation angle limits below (viewed from DOC inlet side)
 - II. Option #2: Incline the DOC up to +/-14 deg.



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1. Exhaust System

1-3 DOC (Diesel Oxidation Catalyst) Installation Criteria {Applies for engine mounted or remote mounted DOC}

1. DOC vibration:

- Acceleration/Displacement must not exceed the limits prescribed in the application review form.
- Vibration must be checked during the application review.

2. The DOC shall not support mounting loads from adjacent or mated components (tail pipe/intermediate pipe):

- Check DOC tail pipe vibration during application review to ensure it will not damage the DOC during long term operation.
- Intermediate exhaust pipe for remote mount DOC may require support brackets.

3. Please note that the DOC skin temperature can reach about 250° C:

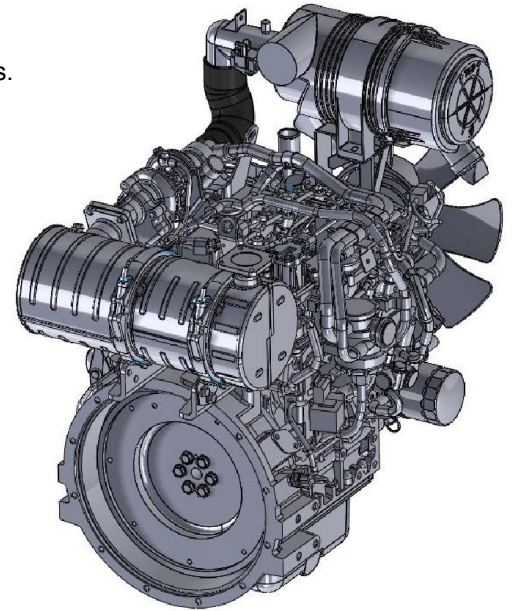
- Check surrounding component temperatures during the application review.

4. OEM Tail Pipe Requirements:

- FEA supplied bolts:
 - Flange bolts: M8 x 1.25, strength classification is ISO 8.8
 - Tightening torque; 24-27 N·m
- Tail Pipe Flange:
 - Flange thickness is 8mm or more.
 - Flatness of the flange face is maximum 0.1mm.
 - Surface finish of the flange face is 3.2Ra.

5. Intermediate Exhaust Pipe Vibration: for remote mounted DOC

- Acceleration/Displacement must not exceed the limits prescribed in the application review form.
- Vibration must be checked during the application review.



1. Exhaust System

1-4. Other Notice

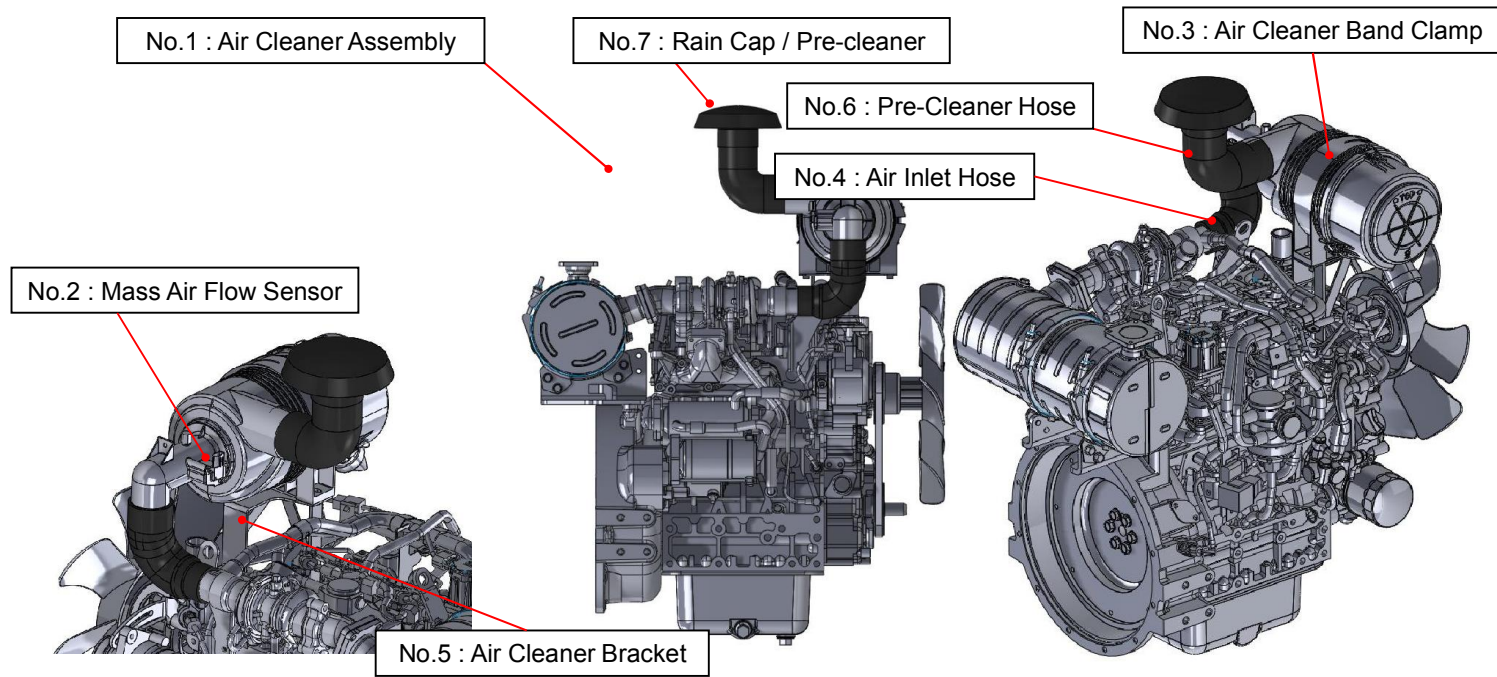
1. The exhaust system will be very hot, so to protect electrical parts such as the starter, the alternator, fuel system parts, wiring, etc. around the exhaust system and for the safety of operators, FEA should install heat shields or insulating blankets as necessary. It is acceptable to wrap the DOC if necessary. However, heat shield must not be welded to the DOC. The temperature of these surrounding components must be confirmed during the application review and must be within the prescribed limits shown in the application review form.
2. Confirm that water does not enter the exhaust system from the tail pipe outlet in all operating conditions. If water entry is possible, install a rain cover or similar device.



2. Intake System

2-1. Intake System Scope of Supply for KEA Standard CRS-DOC Engines

Intake system means the layout of all parts from the air inlet / pre-cleaner hose to the intake manifold or turbo charger.
An example of an intake system with the KEA Standard CRS-DOC engine is shown below.



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2. Intake System

Kubota supplies the following parts as shown below, these parts **MUST** be used in the intake system.

No.	Part Name	FEA	Kubota supplied	KBT Part No.	Q'ty	Engine Model	Remarks
1	Air Cleaner Assembly		○	1J497-1101△	1	D1803-CR-TIE4B-KEA-1	7" Non-Rotatable A/C (S/N: <7HU****)
				1E690-1101△	1		7" Rotatable A/C (S/N: >7HU****)
				1J497-1101△	1	D1803-CR-TIE4B-KEA-2	7" Non-Rotatable A/C (S/N: <7HU****)
				1E690-1101△	1		7" Rotatable A/C (S/N: >7HU****)
				1J497-1100△	1	D1803-CR-TIE4BG-KEA-1	7" Non-Rotatable A/C (All S/N's)
				1J498-1101△	1	V2403-CR-TIE4B-KEA-1	8" Non-Rotatable A/C (S/N: <7HU****)
				1E691-1101△	1		8" Rotatable A/C (S/N: >7HU****)
				1J498-1101△	1	V2403-CR-TIE4B-KEA-2	8" Non-Rotatable A/C (S/N: <7HU****)
				1E691-1101△	1		8" Rotatable A/C (S/N: >7HU****)
1J456-1100△	1	V2403-CR-TIE4BG-KEA-1	7" Non-Rotatable A/C (All S/N's)				
2	Mass Air Flow Sensor		○	1J520-1070△	1	All 03 Series	comes pre-assembled into air cleaner body
3	Air Cleaner Band Clamp		○	1E441-1125△	1	D1803-CR-TIE4B-KEA-1	for 7" A/C
				1E441-1125△	1	D1803-CR-TIE4B-KEA-2	for 7" A/C
				1E441-1125△	1	D1803-CR-TIE4BG-KEA-1	for 7" A/C
				(Integrated Type)	1	V2403-CR-TIE4B-KEA-1,2	for 8" Non-Rotatable A/C (S/N: <7HU****)
				1J498-1125△	1	V2403-CR-TIE4B-KEA-1,2	for 8" Rotatable A/C (S/N: >7HU****)
1E441-1125△	1	V2403-CR-TIE4BG-KEA-1	for 7" A/C				
4	Air Inlet Hose		○	1J497-1164△	1	D1803-CR-TIE4B	KEA-1, KEA-2, and KEA-1 (BG)
				1J498-1164△	1	V2403-CR-TIE4B-KEA-1	
				1J498-1164△	1	V2403-CR-TIE4B-KEA-2	
				1J456-1164△	1	V2403-CR-TIE4BG-KEA-1	
5	Air Cleaner Bracket		○	1J456-1157△	1	All 03 Series	
6	Pre-Cleaner Hose	○		-	-		Meet the intake resistance requirements.
7	Rain Cap	○		-	-		
8	Extension Pipe	○		-	1	All 03 Series	
9	Rubber Coupling		○	1J419-1162△	1	D1803-CR-TIE4B-KEA	Supplied with engine S/N: >7HU****
				1E691-1162△		V2403-CR-TIE4B-KEA	



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2. Intake System

2-2. Standard Intake System Layout

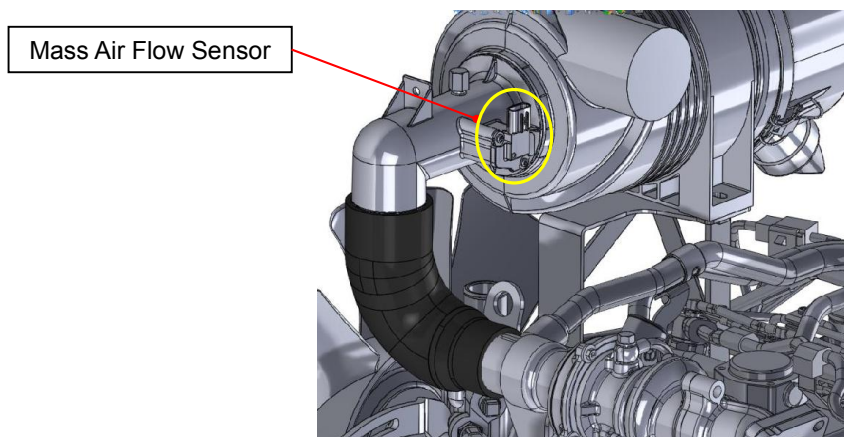
2-2-1. Air Intake System Layout for KEA CRS-DOC Standard Engines

Incorrect air intake system layout will cause emission non-compliance.

Air Intake System layout must comply with the following.

1. To maintain emissions compliance

These Tier 4 common rail engines utilize a mass air flow (MAF) sensor to control the EGR flow rate. The air cleaner location and piping layout must be installed according to these installation instructions to maintain proper performance of the MAF sensor output. The next pages in this section illustrate the correct installation location for each air intake system.



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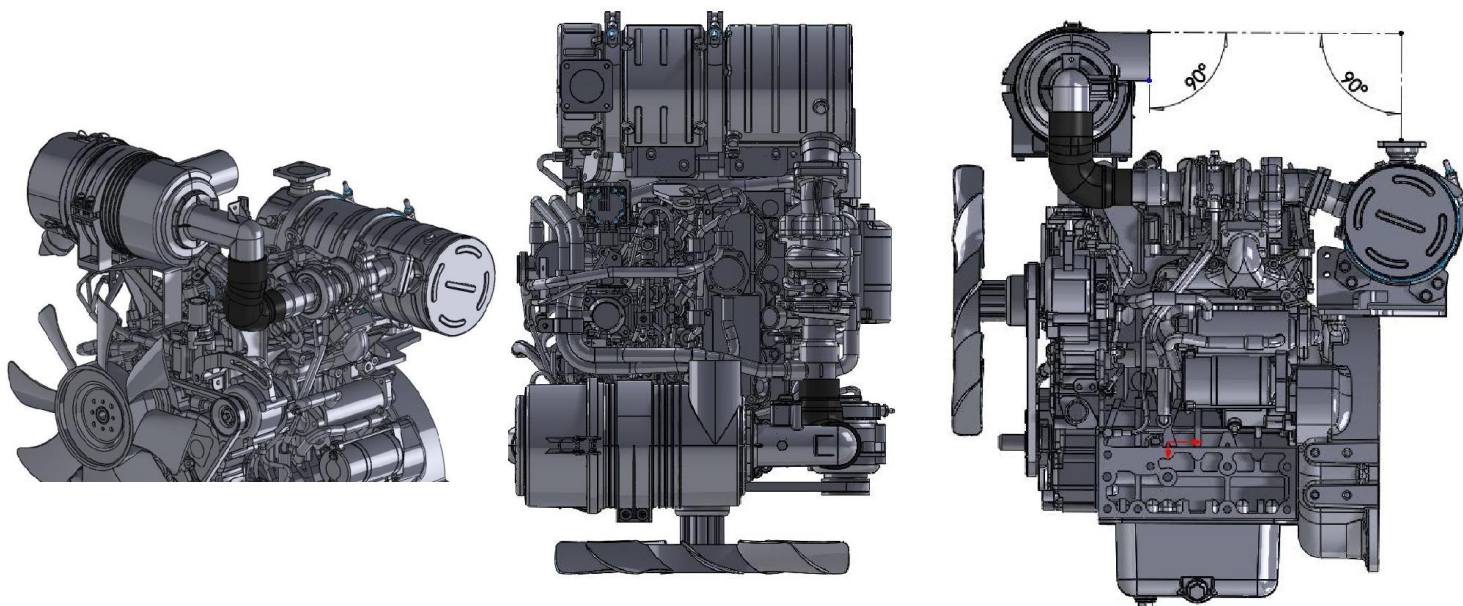
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2. Intake System

2-2. Standard Intake System Layout

2-2-2. Standard Air Intake System Layout for D1803-CR-TIE4B-KEA-1 and D1803-CR-TIE4B-KEA-2 Models

Incorrect air intake system layout will cause emission non-compliance.
The standard air intake system layout is illustrated below.



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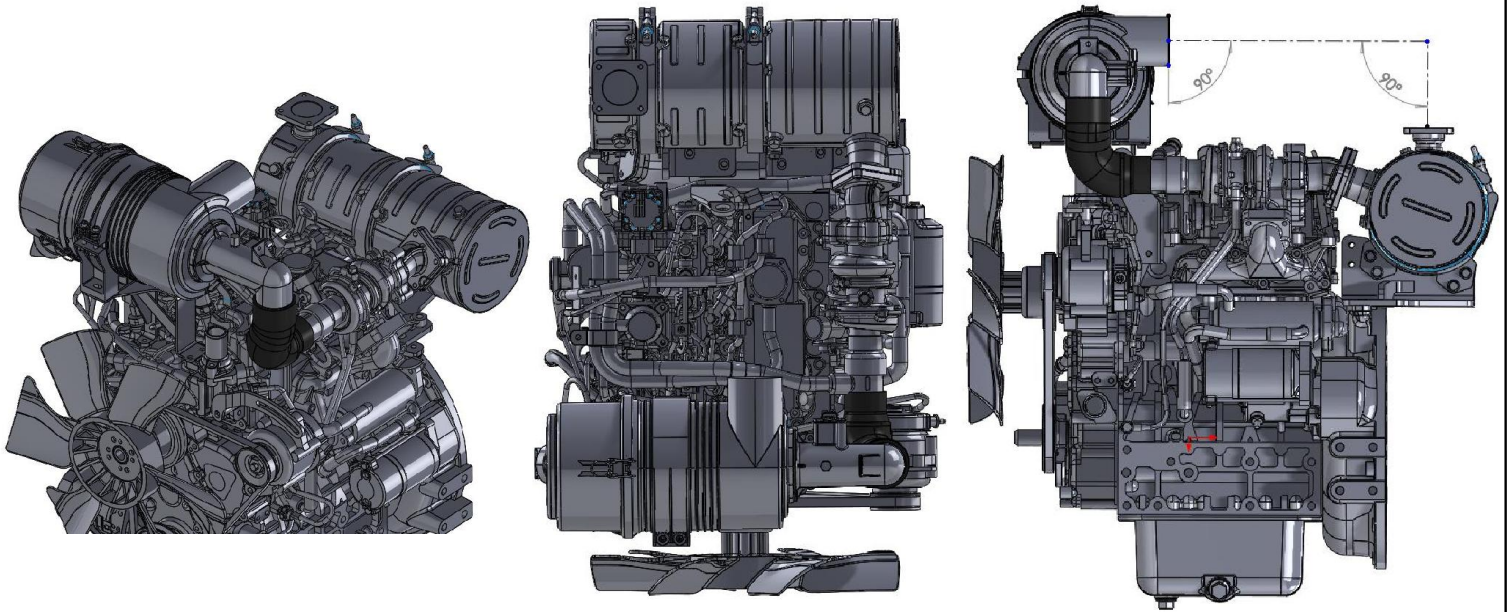
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2. Intake System

2-2. Standard Intake System Layout

2-2-3. Standard Air Intake System Layout for D1803-CR-TIE4BG-KEA-1

Incorrect air intake system layout will cause emission non-compliance.
The standard air intake system layout is illustrated below.



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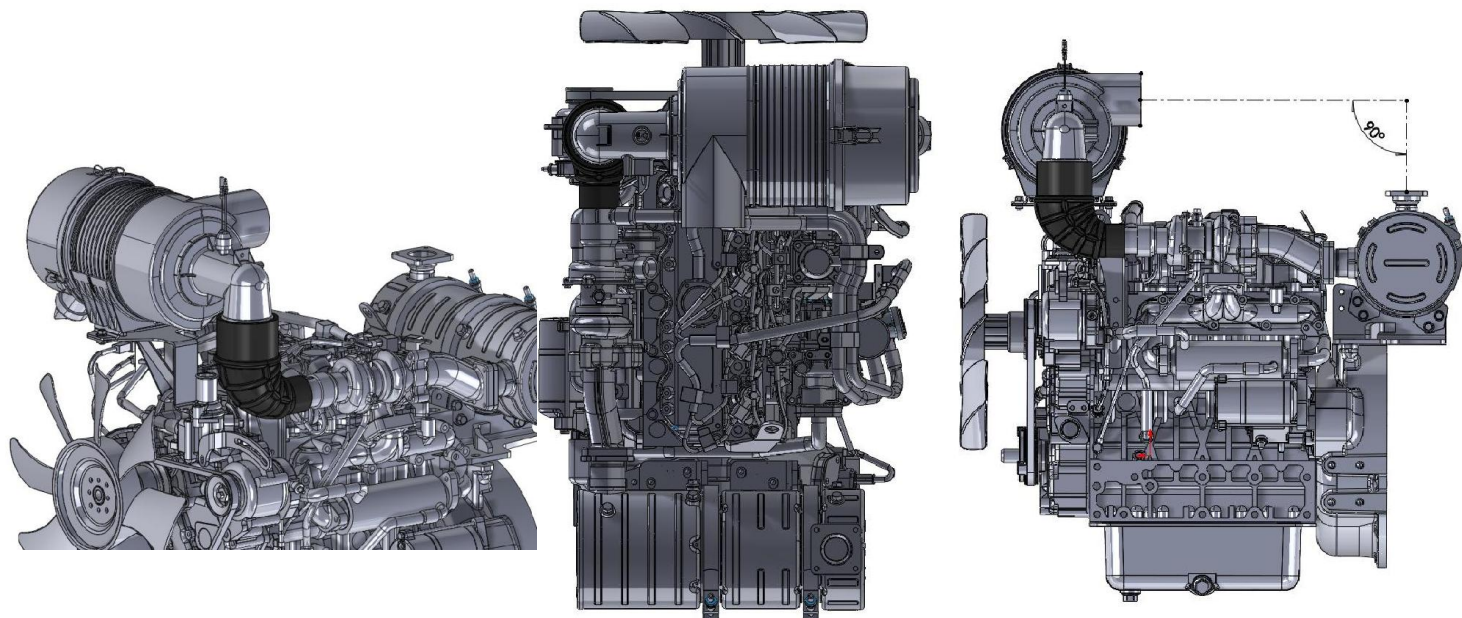
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2. Intake System

2-2. Standard Intake System Layout

2-2-4. Standard Air Intake System Layout for V2403-CR-TIE4B-KEA-1 and V2403-CR-TIE4B-KEA-2 Models

Incorrect air intake system layout will cause emission non-compliance.
The standard air intake system layout is illustrated below.



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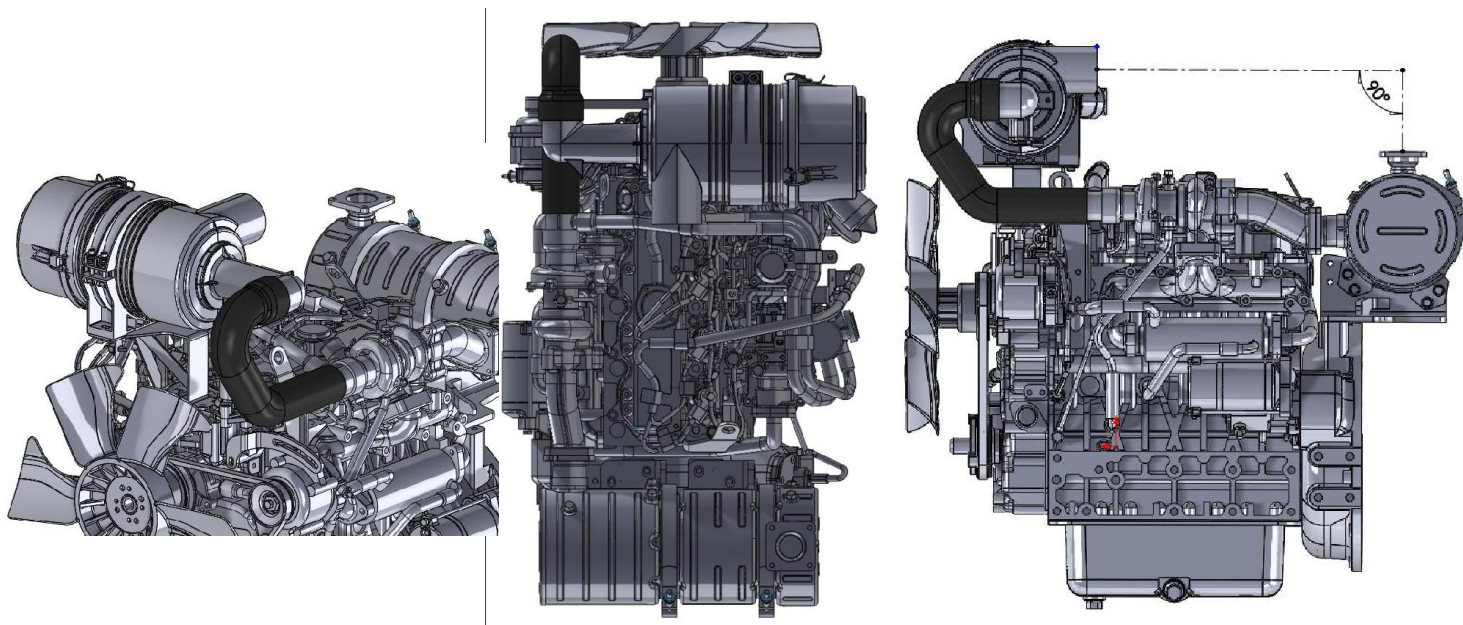
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2. Intake System

2-2. Standard Intake System Layout

2-2-5. Standard Air Intake System Layout for V2403-CR-TIE4BG-KEA-1

Incorrect air intake system layout will cause emission non-compliance.
The standard air intake system layout is illustrated below.



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2. Intake System

2-3 Intake System Flexibility Eligibility

In some cases the standard intake system layout may not fit within the OEM's engine compartment due to interference or serviceability concerns. Kubota has added the intake system flexibility options to certain engine models to overcome these installation challenges.

The *intake system flexibility* is only allowed on certain engine models and serial numbers. Please refer to the list in the below table to see if the intake system options are eligible for the engine being installed into the OEM equipment.

ENGINE MODEL	10 DIGIT CODE	INTAKE SYSTEM FLEXIBILITY OPTIONS	SERIAL NUMBER BREAK:
D1803-CR-TIE4BG-KEA-1	1J478-10000	NOT AVAILABLE	FLEXIBILITY NOT AVAILABLE
V2403-CR-TIE4BG-KEA-1	1J488-10000	NOT AVAILABLE	FLEXIBILITY NOT AVAILABLE
D1803-CR-TIE4B-KEA-1	1J497-10000	AVAILABLE	>7HU**** (Produced from Oct. 2017)
D1803-CR-TIE4B-KEA-2	1J497-20000	AVAILABLE	>7HU**** (Produced from Oct. 2017)
V2403-CR-TIE4B-KEA-1	1J498-10000	AVAILABLE	>7HU**** (Produced from Oct. 2017)
V2403-CR-TIE4B-KEA-2	1J498-20000	AVAILABLE	>7HU**** (Produced from Oct. 2017)

Intake systems on engines **MUST NOT** be modified from the standard layout defined in the previous pages if the flexibility is not available in the above table.

*See the next slides for flexibility option definitions and limitations.



2. Intake System

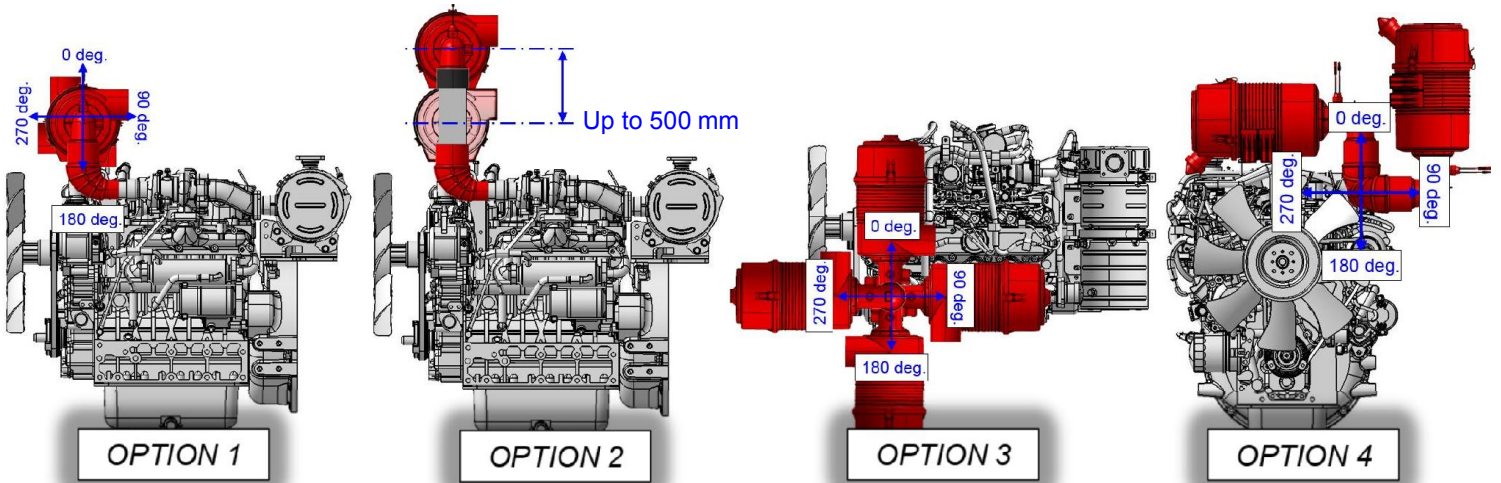
2-4 Intake System Flexibility Options

2-4-1. Air Intake System Flexibility Option Introduction

For engines eligible for intake system flexibility the following options are available.

- Option #1: Rotate the air cleaner inlet relative to the air cleaner body axis.
- Option #2: Extend the air cleaner position by installing an extension pipe (OEM procured).
- Option #3: Rotate the air cleaner relative to the air cleaner outlet axis.
- Option #4: Rotate the air cleaner relative to the turbo charger inlet axis.

Multiple combinations of option #1, 2, 3, and 4 are acceptable. See examples of a few variations on the next page.



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2. Intake System

2-4 Intake System Flexibility Options

2-4-2. Examples of Air Intake System Flexibility Combinations

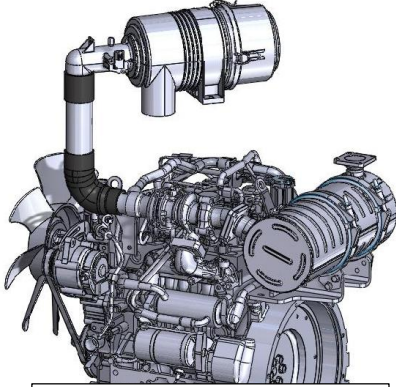
Multiple combinations of option #1, 2, 3, and 4 are acceptable. Some examples of intake system installations are shown below. Any combination of option #1, 2, 3, and 4 is available except for limitations shown on the following pages.

Option #1: Rotate the air cleaner inlet relative to the air cleaner body axis.

Option #2: Extend the air cleaner position by installing an extension pipe (OEM procured).

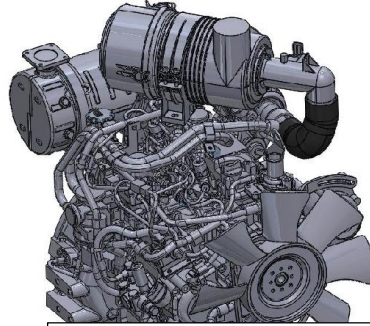
Option #3: Rotate the air cleaner relative to the air cleaner outlet axis.

Option #4: Rotate the air cleaner relative to the turbo charger inlet axis.



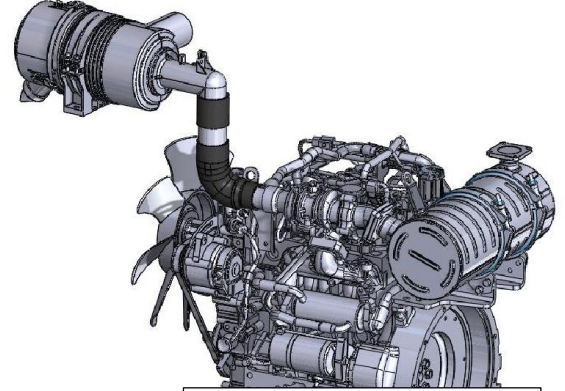
Option #1: 180 deg.
Option #2: 200 mm extension
Option #3: 40 deg.
Option #4: 0 deg.

EXAMPLE 1



Option #1: 0 deg.
Option #2: No extension
Option #3: 50 deg.
Option #4: 0 deg.

EXAMPLE 2



Option #1: 90 deg.
Option #2: 100 mm extension
Option #3: 285 deg.
Option #4: 0 deg.

EXAMPLE 3



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2. Intake System

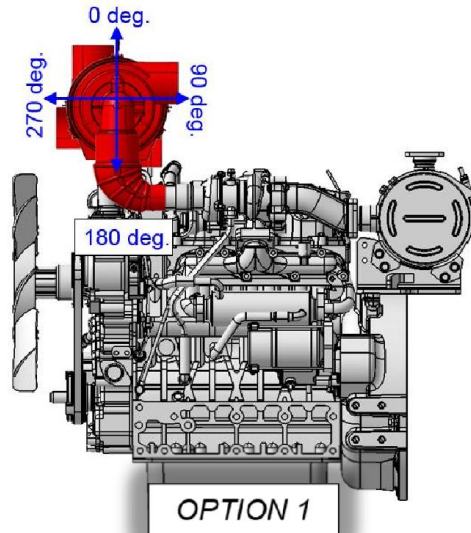
2-4 Intake System Flexibility Options

2-4-3. Air Intake System Flexibility Option #1

See below for installation notes and limitations for option #1.

Option #1: Rotate the air cleaner inlet relative to the air cleaner body axis.

The air cleaner that is provided for the standard KEA engines with intake system flexibility has a rotatable inlet. It is acceptable to adjust the air cleaner inlet to **any** angle (0-360 deg.) as illustrated below except for the limitations outlined in the following pages.



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2-4 Intake System Flexibility Options

2. Intake System

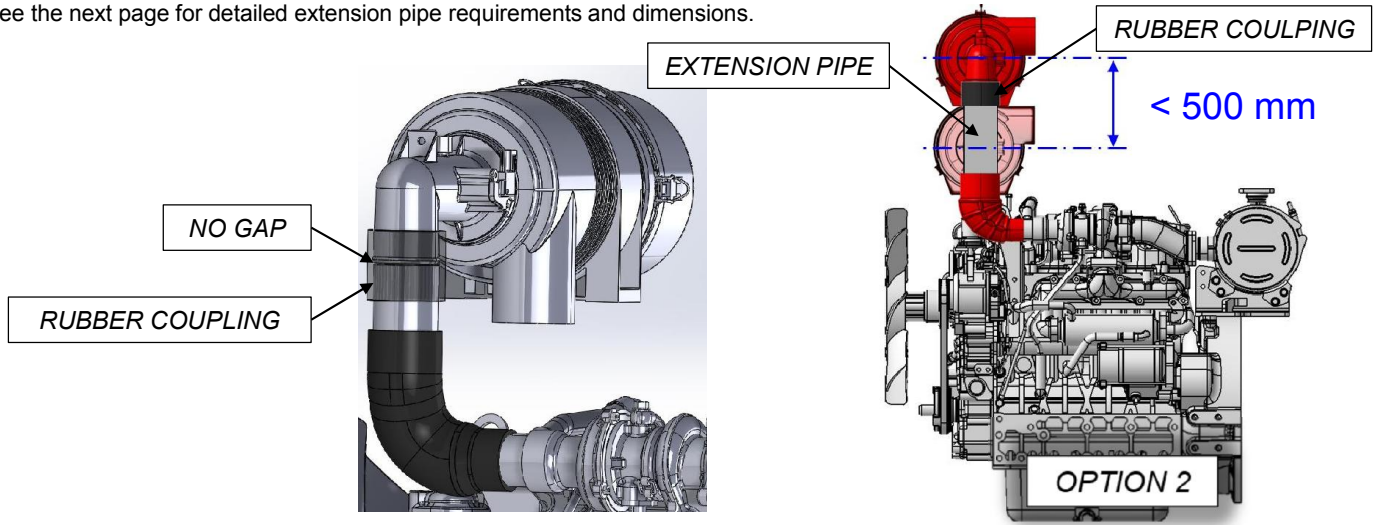
2-4-4. Air Intake System Flexibility Option #2

See below for installation notes and limitations for option #2.

Option #2: Extend the air cleaner position as illustrated below except for the limitations outlined in the following pages.

The extension pipe must be OEM procured and it must comply with the below requirements:

- The OEM must use the rubber coupling which is supplied by Kubota.
- The rubber coupling must fit tightly on the air cleaner and extension pipe in order to avoid dust in the intake system.
- The OEM must install a hose clamp on each end of the rubber coupling to avoid dust in the intake system.
- No gap is allowed between the extension pipe and air cleaner outlet. (See image below)
- "Flexibility" engines include an air cleaner with a rotatable outlet. There is possibility that the air cleaner outlet could rotate due to the extension pipe weight, vibration, etc. It is the responsibility of the OEM to evaluate if the air cleaner extension pipe requires support. The OEM must be able to guarantee that the extension pipe installation angle follows the design intent angle throughout the life of the machine.
- See the next page for detailed extension pipe requirements and dimensions.



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2-4 Intake System Flexibility Options

2. Intake System

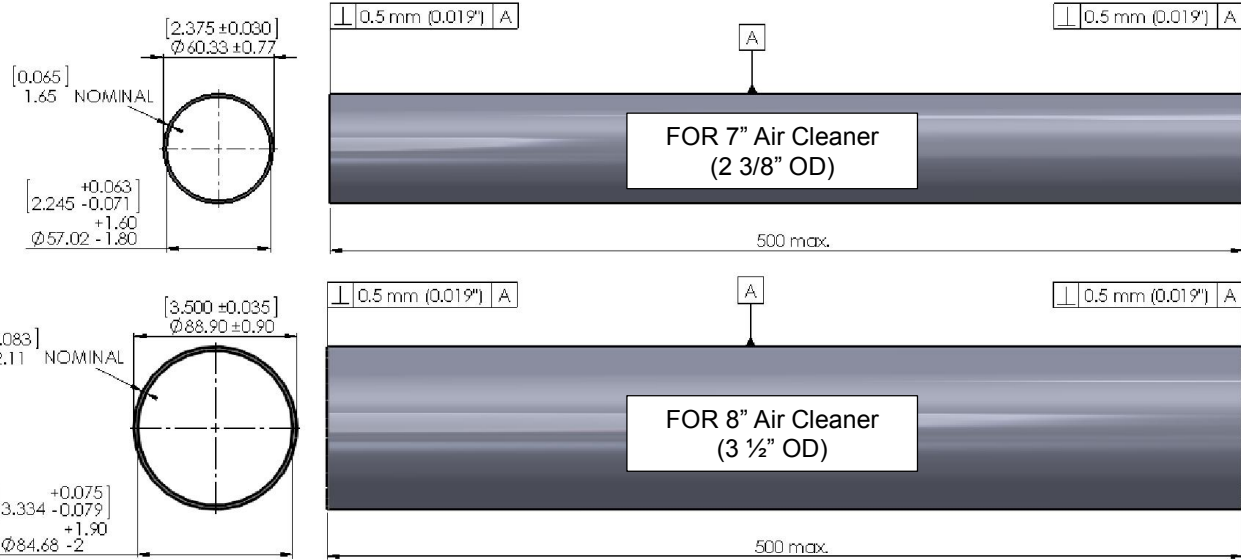
2-4-4. Air Intake System Flexibility Option #2

Installation notes and limitations for option #2 continued...

Option #2: Extend the air cleaner position as illustrated below except for the limitations outlined in the following pages.

Extension Pipe Requirements and Dimensions :

- G. The pipe must be clean and de-burred prior to installation.
- H. The pipe must be seamless stainless steel or aluminum (resistant to corrosion).
- I. The pipe must fall within the dimensions outlined in the below drawing.
- J. Pipe spec must follow ASTM A511, ASTM A519, or similar standards.



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2. Intake System

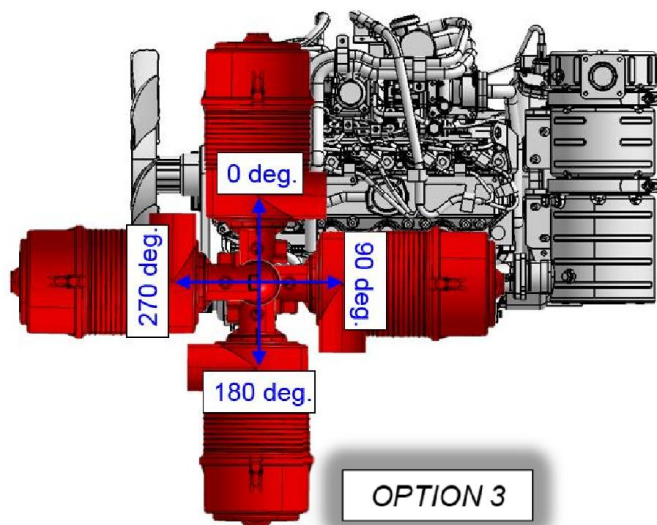
2-4 Intake System Flexibility Options

2-4-5. Air Intake System Flexibility Option #3

See below for installation notes and limitations for option #3.

Option #3: Rotate the air cleaner relative to the air cleaner outlet axis.

It is acceptable to adjust the air cleaner installation to **any** angle (0-360 degree) illustrated below except for the limitations outlined in the following pages.



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2. Intake System

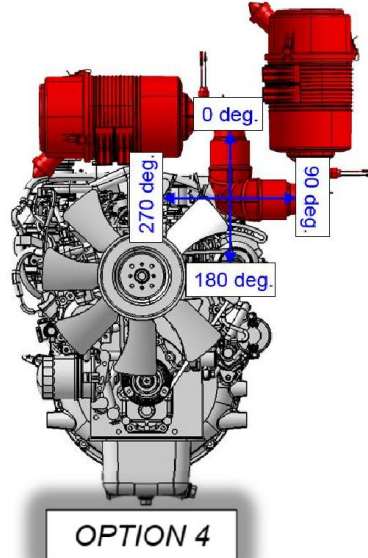
2-4 Intake System Flexibility Options

2-4-6. Air Intake System Flexibility Option #4

See below for installation notes and limitations for option #4.

Option #4: Rotate the air cleaner relative to the turbo charger inlet axis.

It is acceptable to adjust the air cleaner installation to exactly 90 degrees as illustrated below. Other angles besides 90 degree are not permitted. Also, see other limitations outlined in the following pages for option #4.



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2. Intake System

2-5 Intake System Flexibility Limitations

2-5-1. Air Intake System Flexibility Limitations

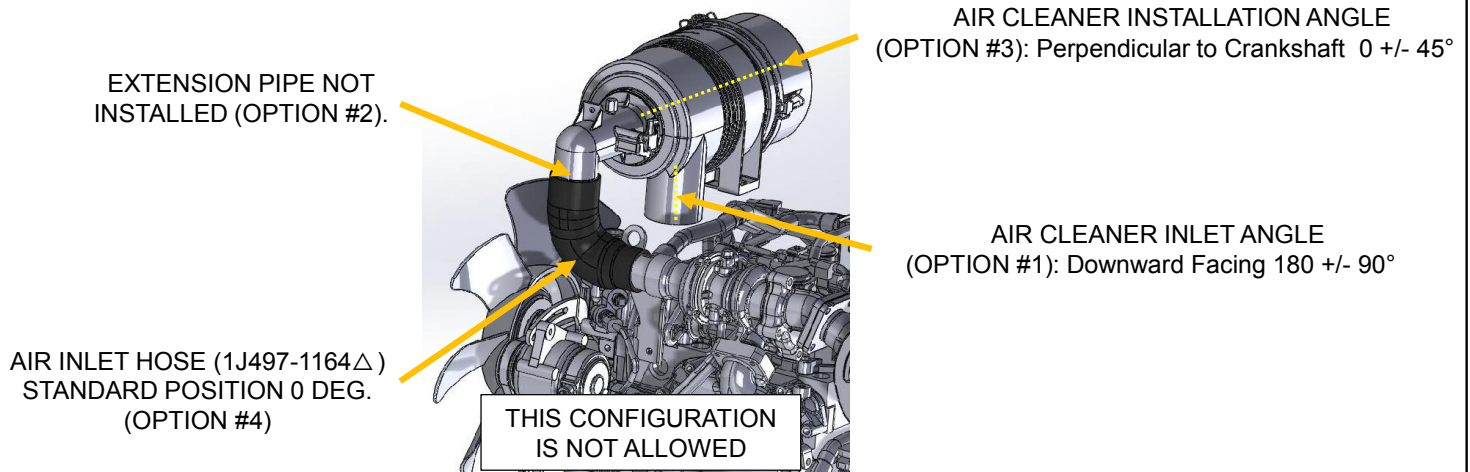
See below for installation limitations for the following engines:

D1803-CR-TIE4B-KEA-1 (1J497-10000)

D1803-CR-TIE4B-KEA-2 (1J497-20000)

See below for air cleaner installation locations that are **NOT acceptable**. These installations cause the mass air flow sensor to fall outside of the acceptable sensor performance range.

Configuration NOT acceptable for D1803-CR-TIE4B-KEA-1, D1803-CR-TIE4B-KEA-2



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2. Intake System

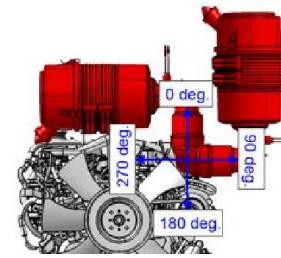
2-5 Intake System Flexibility Limitations

2-5-2. Air Intake System Flexibility Limitations

See below for installation limitations for the following engines:

D1803-CR-TIE4B-KEA-1 (1J497-10000)

D1803-CR-TIE4B-KEA-2 (1J497-20000)



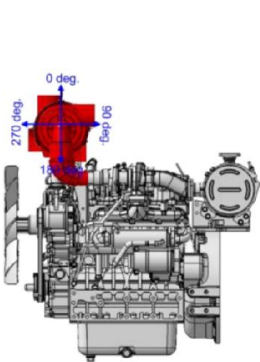
Inlet Hose Angle
(Option #4)

If the air inlet hose is rotated 90 deg. about the turbo charger axis (option #4), the following air cleaner installation combinations **ARE acceptable**:

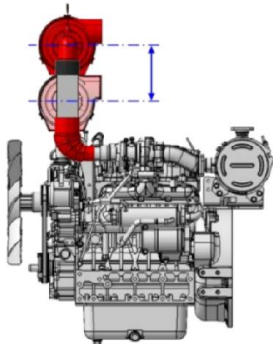
A. The exact combination of AC Inlet, AC Angle, and Heights in this table can be used as specified.

B. Any other combination not listed in this table is not permitted.

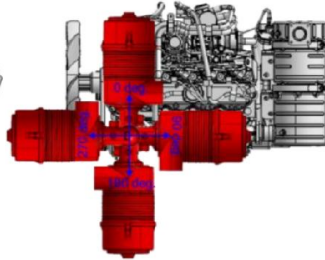
Acceptable Combinations for D1803-CR-TIE4B-KEA-1, D1803-CR-TIE4B-KEA-2



AC Inlet
(Option #1)



Height
(Option #2)



AC Angle
(Option #3)

AC Inlet	AC Angle	Height
90	90	Standard (0 mm Extension)
0	180	Standard (0 mm Extension)
90	180	Standard (0 mm Extension)
0	270	Standard (0 mm Extension)
90	270	Standard (0 mm Extension)
0	90	Extension = 250 mm Fixed Length
90	90	Extension = 500 mm Fixed Length
0	180	Extension = 500 mm Fixed Length
270	270	Extension = 500 mm Fixed Length



2. Intake System

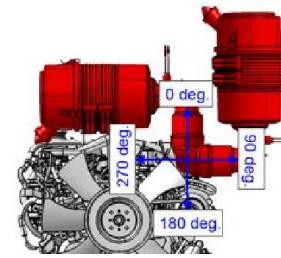
2-5 Intake System Flexibility Limitations

2-5-3. Air Intake System Flexibility Limitations

See below for installation limitations for the following engines:

V2403-CR-TIE4B-KEA-1 (1J498-10000)

V2403-CR-TIE4B-KEA-2 (1J498-20000)



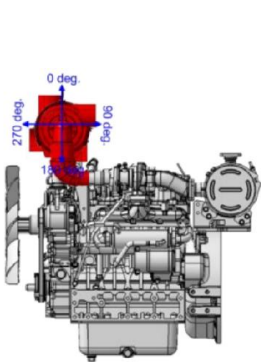
Inlet Hose Angle
(Option #4)

If the air inlet hose is rotated 90 deg. about the turbo charger axis (option #4), the following air cleaner installation combinations **ARE acceptable**:

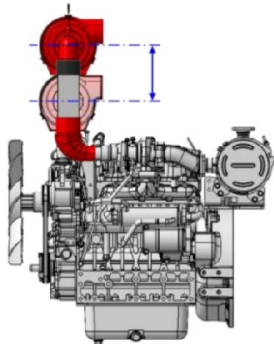
A. The exact combination of AC Inlet, AC Angle, and Heights in this table can be used as specified.

B. Any other combination not listed in this table is not permitted.

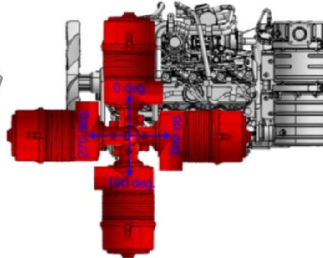
Acceptable Combinations for V2403-CR-TIE4B-KEA-1, V2403-CR-TIE4B-KEA-2



AC Inlet
(Option #1)



Height
(Option #2)



AC Angle
(Option #3)

AC Inlet	AC Angle	Inlet Hose Angle	Height
0	90	90	Standard (0 mm Extension)
180	90	90	Standard (0 mm Extension)
180	180	90	Standard (0 mm Extension)
0	270	90	Standard (0 mm Extension)
180	90	90	Extension = 250 mm Fixed Length
0	180	90	Extension = 250 mm Fixed Length
180	90	90	Extension = 500 mm Fixed Length



2. Intake System

2-6 Intake System Installation

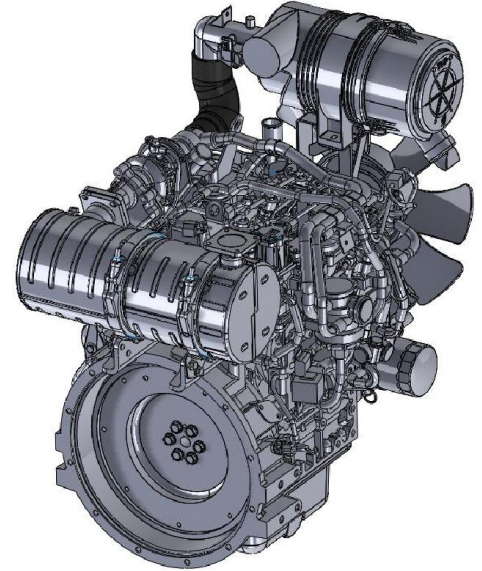
1. Air cleaner vibration:
 - Acceleration/Displacement must not exceed the limits prescribed in the application review form.
 - Vibration must be checked during the application review.

2. Air intake temperature should be checked during the application review:
 - The air inlet temperature should not be more than 5 deg. C higher than ambient temperature, otherwise engine performance will be reduced.
 - If the temperature is high a pre-cleaner hose can be added to the air cleaner to help reduce inlet temperature.

3. Environment:
 - It is critical that water does not enter the intake system.
 - Add a pre-cleaner hose and/or rain cap as necessary.
 - The dust evacuation valve must point downward to prevent water from entering the air cleaner.

4. Pre-Cleaner Hose Requirements:
 - FEA supplied pre-cleaner hose:
 - Thickness \geq 6 mm (for rubber molded hoses)
 - The inner surface of the pipe should be smooth.

5. Air Cleaner Bracket:
 - The OEM is responsible to prepare the air cleaner mounting bracket if the air cleaner is moved from the standard position (intake system flexibility).

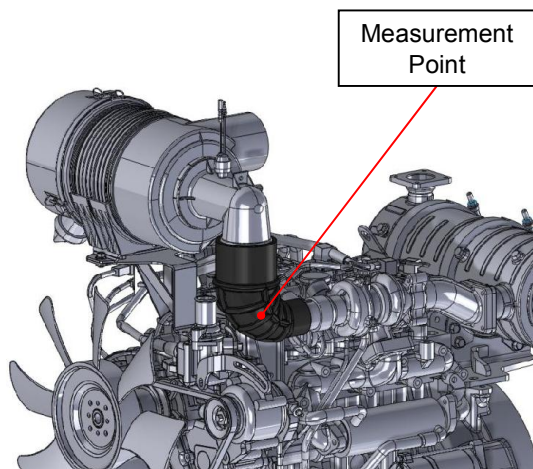


2. Intake System

2-7. Intake Resistance

To prevent decreases of engine output performance and to maintain emission compliance, the total intake system restriction must be less than the following limits. If a pre-cleaner hose, rain cap, or any other modification from the standard intake system configuration is changed the intake restriction **MUST** be checked during the application review with the final intake system configuration.

- Measurement point of intake resistance is between the air cleaner and the inlet of the turbo charger.
 - Measure as close as possible to the compressor inlet.
- Measure intake restriction at rated speed, full load.



Engine Model	Intake Resistance	
	Initial limit w/ clean filter (mmH ₂ O)	Limit w/ dirty filter (mmH ₂ O)
D1803- CR- TIE4B- KEA- 1	400	630
D1803- CR- TIE4B- KEA- 2	400	630
D1803- CR- TIE4BG- KEA- 1	250	500
V2403- CR- TIE4B- KEA- 1	400	630
V2403- CR- TIE4B- KEA- 2	400	630
V2403- CR- TIE4BG- KEA- 1	250	500



2. Intake System

2-8. Charge Air Cooler Installation Requirements

The Kubota 03-CRS DOC engines require a charge air cooler. To prevent decreases of engine output performance and to maintain emission compliance, the charge air cooler must meet the following criteria. The charge air cooler pressure drop and temperature drop **MUST** be checked during the application review.

1. Maximum allowable pressure drop from turbo charger outlet to intake manifold inlet = <10 kPa
2. Maximum allowable temperature at intake manifold inlet = < Ambient + 25° C

Note: Measure charge air cooler pressure drop and intake manifold temperature at rated speed, full load.



3. Fuel System

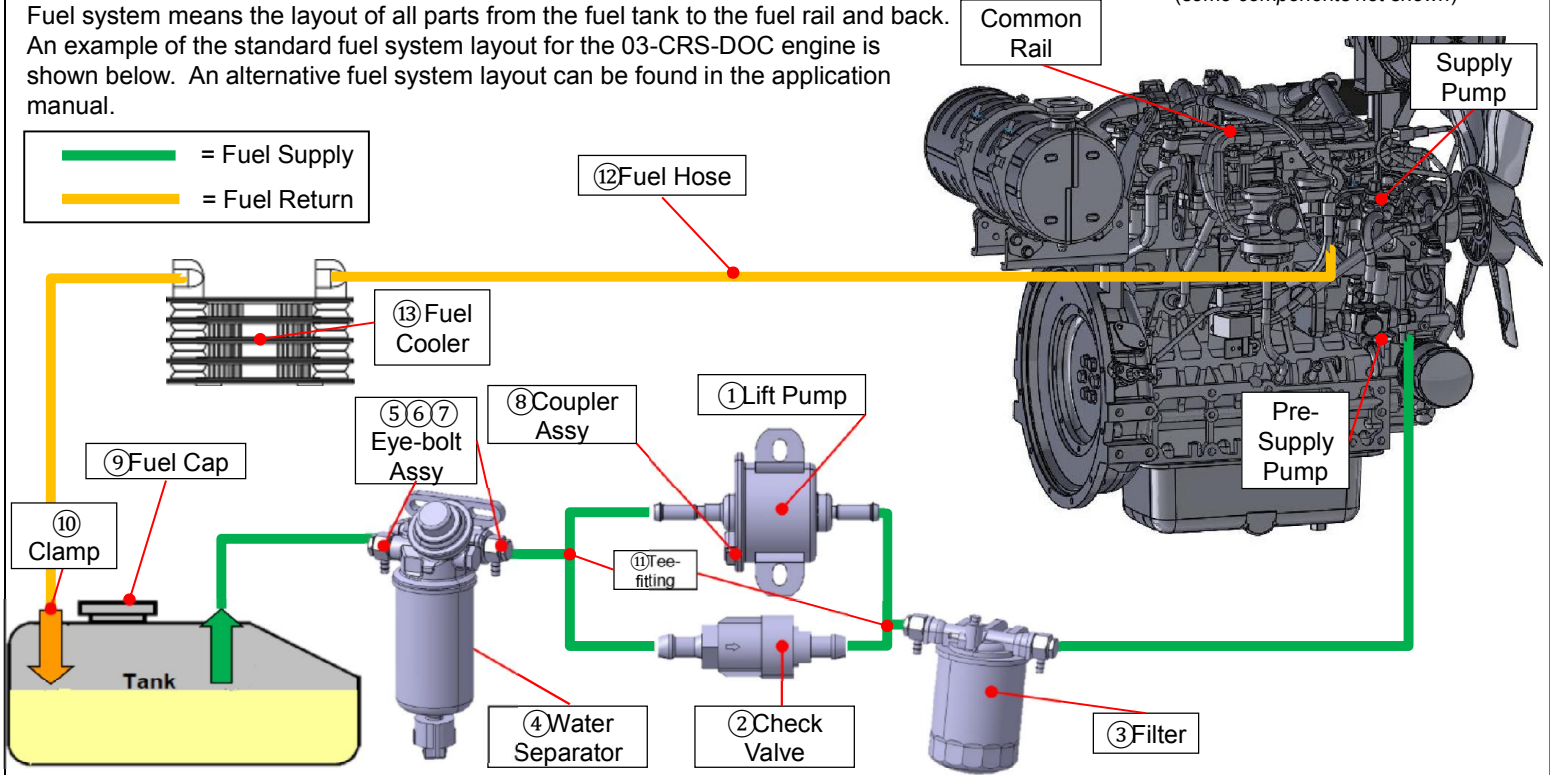
3-1. Fuel System Supply

3-1-1. Fuel System Supply for KEA Standard CRS-DOC Engines

Fuel system means the layout of all parts from the fuel tank to the fuel rail and back. An example of the standard fuel system layout for the 03-CRS-DOC engine is shown below. An alternative fuel system layout can be found in the application manual.

Engine: V2403-CR-TIE4

(some components not shown)



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3. Fuel System

Kubota has the parts shown in the previous drawing and recommends that these parts be used in the fuel system.
FEA supplied parts must meet the installation instruction requirements.

No.	Part Name	FEA	Kubota Supplied	KBT Part No.	Q'ty	Engine Model	Remarks
1	Pump, Electric Lift		○	1G639-5203△	1	All 03 Series	
2	Valve, Check		○	1G911-4246△	1	All 03 Series	
3	Fuel Filter Assembly		○	1J456-4301△	1	All 03 Series	2800 cm ² filtration area
4	Water Separator Assembly		○	1J430-4335△	1	All 03 Series	Comes with Water In Fuel sensor installed
5	Joint, Bolt		○	16541-9579△	4	All 03 Series	M14x1.5 thread, used for inlet/ outlet of Separator and Filter
6	Joint, Eye		○	15401-9569△	4	All 03 Series	Used for inlet/ outlet of Separator and Filter
7	Washer, Packing		○	17105-3368△	8	All 03 Series	Used for inlet/ outlet of Separator and Filter
8	Coupler Assy, Electrical		○	19838-6583△	1	All 03 Series	Electrical connector for electric lift pump
9	Fuel Cap	○		-	1	All 03 Series	
10	Clamp, hose	○		-	18	All 03 Series	for 8mm ID fuel hose
11	Tee fitting, 8mm ID	○		-	2	All 03 Series	for 8mm ID fuel hose, one after Separator, one before Filter
12	Hose, Fuel	○		-	-	All 03 Series	8mm ID fuel hose, rated for fuel per SAE 30R9
13	Cooler, Fuel	○		-	-	All 03 Series	Fuel cooler may be added to keep temperature < 75° C



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3. Fuel System

3-2. Fuel System Layout

3-2-1. Fuel System Layout for KEA CRS-DOC Standard Engines

Incorrect fuel system layout may cause decreased engine performance and/or fuel system durability issues. Fuel System layout must comply with the following:

1. To maintain emissions compliance

These Tier 4 common rail engines utilize computer-controlled fuel injection. The Pre-Supply and Supply pump are mounted to the engine and must remain in this configuration. The fuel supply lines, return hoses, and other loose components must be installed according to the guidelines shown on the following pages.

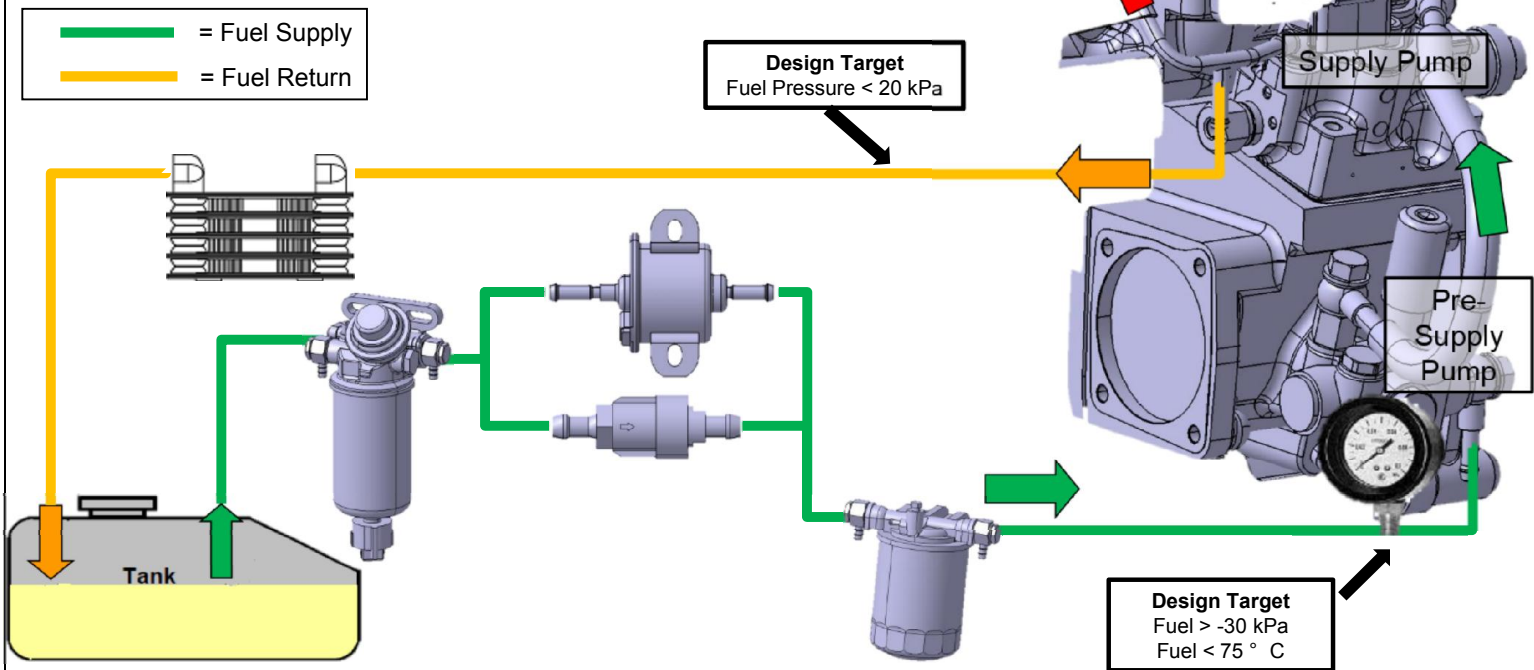


3. Fuel System

3-3. Fuel Line

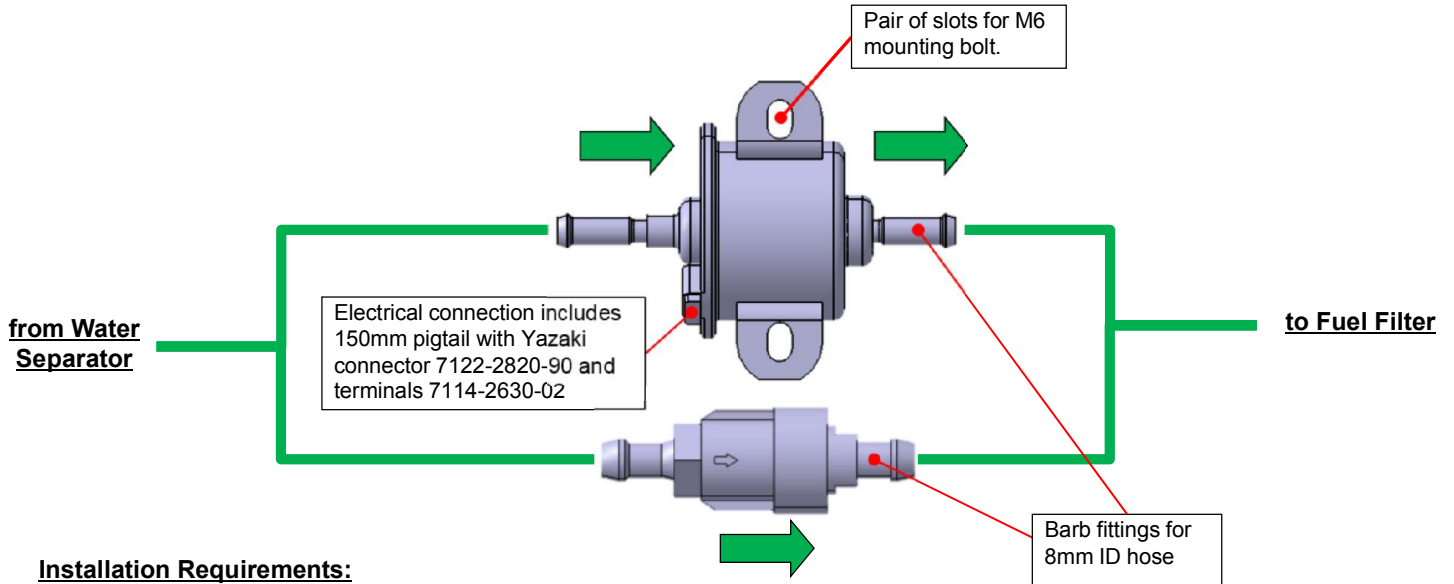
3-3-1. Fuel Hose Measurement for KEA CRS-DOC Standard Engines

Fuel pressure and temperature measurements are taken during the Application Review. Please note the expected values and measurement locations.



3. Fuel System

3-4. Fuel Pump and Check Valve



Installation Requirements:

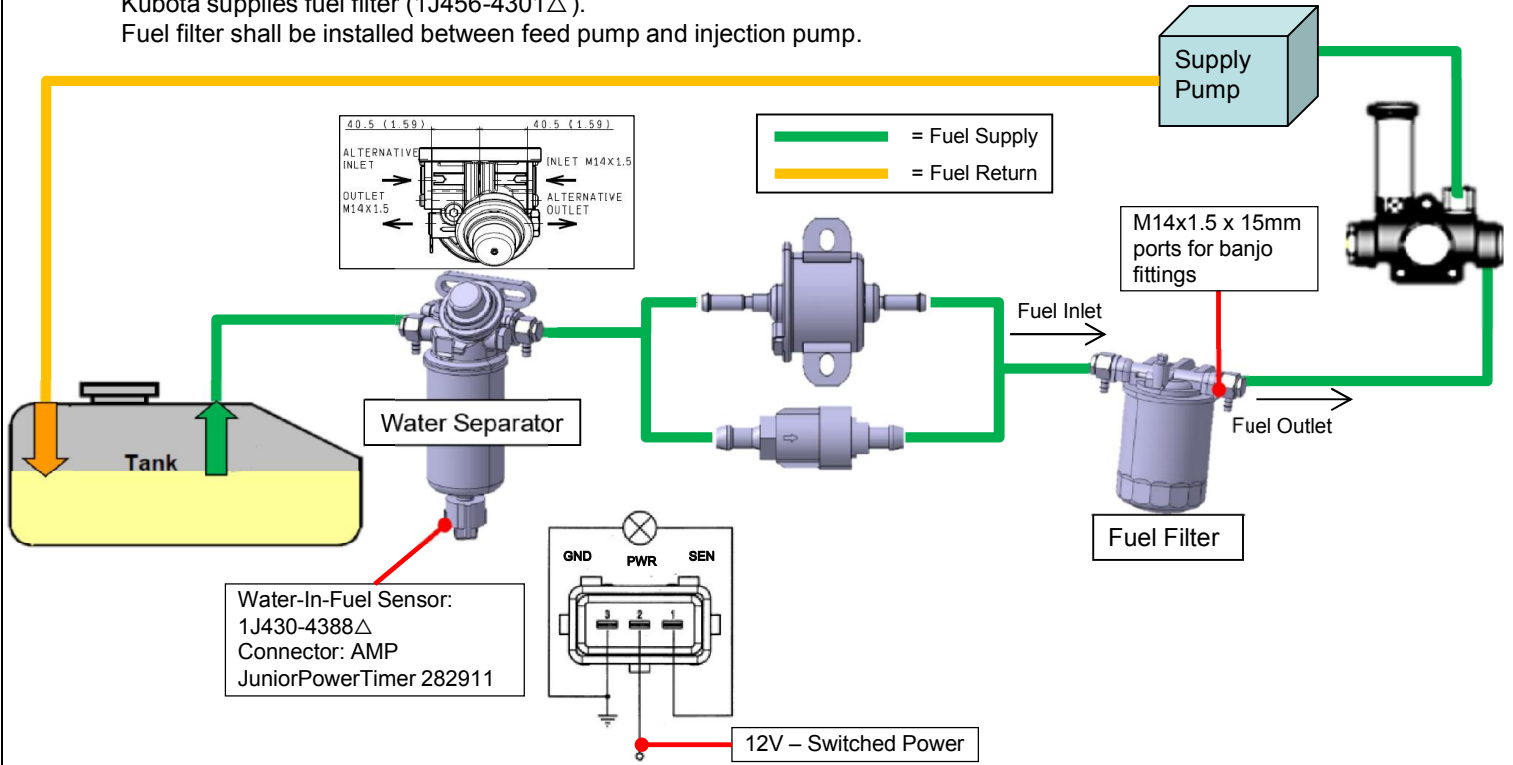
1. Maximum vibration levels not to exceed 3G.
2. Pump can be mounted in horizontal or vertical orientation.
4. Do not mount Pump in high temperature environments which can create cavitation or vapor lock conditions.



3. Fuel System

3-5. Fuel Filter and Water Separator

Kubota supplies fuel filter (1J456-4301△).
 Fuel filter shall be installed between feed pump and injection pump.



3. Fuel System

3-6 Fuel System Installation

1. Vibration must be checked during the application review:
 - Fuel Pump acceleration must not exceed 2 G's continuous at any condition.
 - Fuel Pump displacement must not exceed 0.5mm continuous at any condition.
 - Fuel Filter acceleration must not exceed 5 G's continuous at any condition.
 - Fuel Filter displacement must not exceed 0.7mm continuous at any condition.

2. Fuel temperature should be checked during the application review:
 - The temperature should not be more than 75° C.

3. Installation/orientation of Components:
 - Water separator and fuel filter should be mounted with the filter oriented vertically.
 - Feed pump and check valve can be mounted vertically or horizontally.

4. Environment:
 - It is critical that water content in fuel does not exceed 0.14%.
 - It is critical that Bio content does not exceed 5% ASTM D6751, EN 14214 (7%; EU EN 590: 2009)
 - It is strongly recommended to not use zinc coated fuel tank or components.

5. Fuel component Requirements:
 - FEA-sourced Supply/Return hose:
 - Hose I.D. = 8mm nominal
 - Supply pressure > -30 kPa @ the supply pump
 - Temperature < 75 ° C @ the supply pump
 - Return pressure < 20 kPa @ the tank
 - Fuel Filter:
 - Filtration ≥ 98.7% at 3-5µm (per ISO 19438)



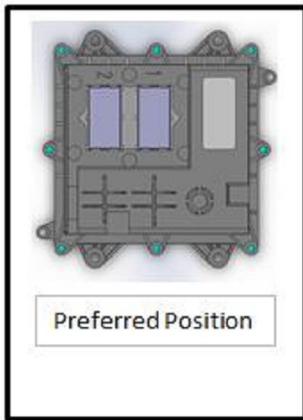
4. Engine Control Unit (ECU)

1. Operational Specifications

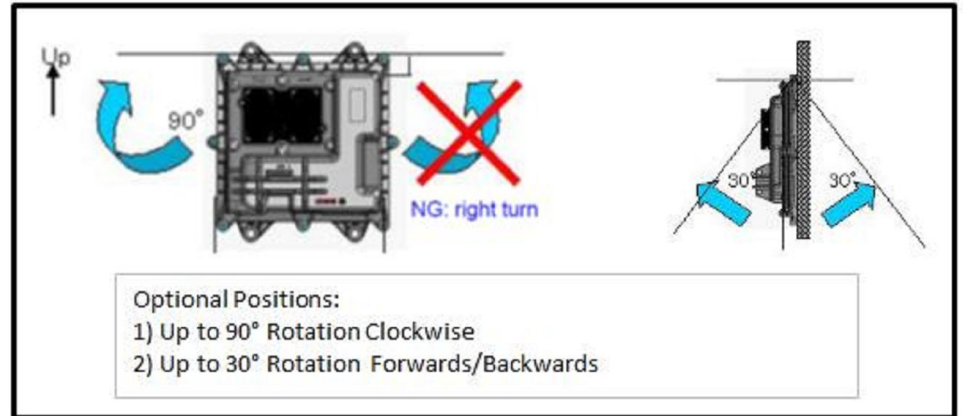
- 1-1. Operating voltage : 8 to 16 VDC.
- 1-2. Max. Vibration : 5G
- 1-3. Normal operating temperature : -30 to 105° C
- 1-4. Water Proof : IP69K

2. Installation Notes

- 2-1. The ECU must be mounted on the equipment chassis. Engine mounted ECU's are not approved for warranty.
- 2-2. The ECU temperature must be checked during the application review.
- 2-3. The ECU vibration levels must be checked during the application review.
- 2-4. The ECU must be mounted within the installation angles shown below:



OR



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