

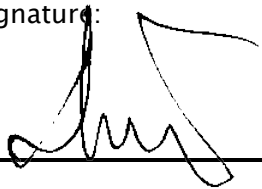

	Power plant installation definition Viper SD-4 LSA	Doc-Nr: TOM-TC-01-C1-010
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		Date: 23.FEB 2016
EASA.21J.ELA	RE: PROJECT N. 0010021022-001 - VIPER SD-4	Page: 1 of 29

Viper SD-4 LSA

Power plant installation definition


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Amendments

Issue	Reason	Date
A	Initial issue	18. DEC 2015
B	Added stainless safety wire description	7.JAN 2016
C	Refferences chapter revised General section updated Chapter 3 added Manifold pressure and fuel flow sensor relocation definition	23.FEB 2016

References

- /1/ SD4-A-6-001-N-1#3 Power plant unit
- /2/ INSTALLATION MANUAL FOR ROTAX ENGINE TYPE 912 SERIES
- /3/ TAC0-24 Power plant photos
- /4/ TOM-TC-01-DDP-9005_A Fire sleeves
- /5/ TOM-TC-01-DDP-4003_B Fuel, Oil and Coolant hoses
- /6/ TOM-TC-01-DDP-4009_A Gascolator
- /7/ TOM-TC-01-DDP-4010_B Electric fuel pump
- /8/ TOM-TC-01-DDP-4014_A Water thermometer
- /9/ TOM-TC-01-DDP-4015_A Oil thermometer
- /10/ TOM-TC-01-DDP-4016_A Air filter
- /11/ TOM-TC-01-DDP-4017_A Hot air hose
- /12/ TOM-TC-01-DDP-4018_A Drain fuel hose
- /13/ TOM-TC-01-DDP-4019_A Cold air hose
- /14/ TOM-TC-01-DDP-4020_A Fuel check valve
- /15/ TOM-TC-01-DDP-8013_A Airbox filter holder
- /16/ TOM-TC-01-DDP-8014_A Airbox chamber

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1 General

The purpose of this document is to define and describe the overall installation of ROTAX 912 series engine to the Viper SD-4 LSA airplane. It further describes the means of how the power plant installation is attached to each other. This includes definition of cable/hose/wire attachments and spots of those attachments. Spots are shown on representative Figures.

2 Bundling definition

The bundling used to fix single power plant installation is defined in Table 1. Tie-wraps are used to bundle the oil, fuel and coolant hoses and electricity wires. When the Bowden cables that operates airbox conduit flaps, cold air intake conduit flap, carburettors, are set to their position a 0.5mm thick stainless safety wire is used at their ends to secure them from unintended rotation. A 0.8 mm stainless safety wire is used to secure exhaust tubes joints from unintended movement caused by vibration and from rotation (Figure 10). It is used to secure return oil line from engine to oil tank (Figure 12) and more spots defined on Figure 9 and Figure 13.

Table 1 Bundling types

Bundling	Type	Part No.
Plastic locking tie-wrap	PLT1.5I-M69	8000-0161
	PLT2I-M69	8000-0022
	PLT1M-M69	8000-0010
Stainless safety wire	ø0,5 mm	1800-0082
	ø0,8 mm	1800-0080

2.1 Tie-wraps



Figure 1: Tie-wrap

Manufacturer:

PANDUIT
United States
18900 Panduit Drive
Tinley Park, IL 60487

Supplier of tie-wraps:

SVK Elektronik s.r.o.
Slavětínská 142
190 14 Praha 9 Klánovice

Table 2 PLT1.5I-M69 locking tie definition (8000-0161)

Material	Flame Retardant Nylon 6.6
Color	Ivory
Cross Section	Intermediate
Locking Style	Locking
Min. Loop Tensile Strength Lbs. (N)	40 (178)
Continuous Use Temperature Range	-76° (-60°) - 212° (100°)
Plenum-Rated	No
Tool	GTS, GTSL, GS2B, PTS, PPTS, STS2
Length In (mm)	5.6 (142)
Thickness In (mm)	0.044 (1.1)
Bundle Diameter Range In. (mm)	0.06 (1.5) - 1.38 (35)
CE Compliant	Yes
CSA Certified	Yes
UL 62275 Compliant (Type 1, 11)	Yes
UL Listed (File #E56854)	No
UL Recognized (File #E56854)	Yes
Application	General
Installation Temperature	-4°F (-20°C) - 32°F (0°C)
Operating Temperature	-76°F (-60°C) - 212°F (100°C)
Part Features	One-piece locking wedge for consistent performance and reliability. Low thread force and high loop tensile strength.
Thickness (mm)	1.1
UV Resistant	No
Width In (mm)	0.142 (3.6)
RoHS Compliancy Status	Compliant

Table 3 PLT2I-M69 locking tie definition (8000-0022)

Material	Flame Retardant Nylon 6.6
Color	Ivory
Cross Section	Intermediate
Length (In.)	8.0
Length (mm)	203
Locking Style	Locking
Width (In.)	0.142
Width (mm)	3.6
Min. Loop Tensile Strength Lbs. (N)	40 (178)
Continuous Use Temperature Range	-76° (-60°) - 212° (100°)
Plenum-Rated	No
Tool	GTS, GTSL, GS2B, PTS, PPTS, STS2
Length In (mm)	8.0 (203)
Thickness In (mm)	0.045 (1.1)
Bundle Diameter Range In. (mm)	0.06 (1.5) - 2.00 (51)
CE Compliant	Yes
CSA Certified	Yes
UL 62275 Compliant (Type 1, 11)	Yes
UL Listed (File #E56854)	No
UL Recognized (File #E56854)	Yes
Installation Temperature	-4°F (-20°C) - 32°F (0°C)
Operating Temperature	-76°F (-60°C) - 212°F (100°C)
Part Features	One-piece locking wedge for consistent performance and reliability. Low thread force and high loop tensile strength.
RoHS Compliancy Status	Compliant

Table 4 PLT1M-M69 locking tie definition (8000-0010)

Material	Flame Retardant Nylon 6.6
Color	Ivory
Cross Section	Miniature
Length (In.)	3.9
Length (mm)	99
Locking Style	Locking
Width (In.)	0.098
Width (mm)	2.5
Min. Loop Tensile Strength Lbs. (N)	18 (80)
Continuous Use Temperature Range	-76° (-60°) - 212° (100°)
Plenum-Rated	No
Tool	GTS, GTSL, GS2B, PTS, PPTS, STS2
Length In (mm)	3.9 (99)
Thickness In (mm)	0.043 (1.1)
Bundle Diameter Range In. (mm)	0.06 (1.5) - 0.87 (22)
CE Compliant	Yes
CSA Certified	Yes
Mil. Std. Part Number	—
UL 62275 Compliant (Type 1, 11)	Yes
UL 62275 Compliant (Type 2, 21)	—
UL Listed (File #E56854)	No
UL Recognized (File #E56854)	Yes
Installation Temperature	-4°F (-20°C) - 32°F (0°C)
Operating Temperature	-76°F (-60°C) - 212°F (100°C)
Part Features	One-piece locking wedge for consistent performance and reliability. Low thread force and high loop tensile strength.
RoHS Compliance Status	Compliant

2.2 Safety wire



Figure 2: Stainless safety wire

Manufacturer:

AERO LOGISTICS s.r.o.
Trieda 1. mája 35
052 05, Spišská Nová Ves
Slovakia

Meeting regulation: MS 209 95-C and ASTMA 580

3 Power plant installation

For ROTAX 912 series to the Viper SD-4 fuselage installation please refer to drawing No. SD4-A-6-001-N-1 revision 3 and to TOM-TC-01-SM-08_B Bolted joints procedure. This document serves to provide a clearer picture of how the power plant hoses and wires should be guided and attached by different means.

4 Spots

This chapter defines which power plan installation is attached to which installation. Figures are used to define the bundling position. Table 5 serves as guidance for attached Figures to help to define each line and attachment.

Table 5: Description of power plant installation

Pos.	Description
1	fuel line from gascolator to fuel vacuum pump /5/
2	oil line from oil to oil reservoir /5/
3	fuel line to fuel pressure sensor /5/
4	fuel restrictor line /5/
5	fuel line from fuel flow sensor to carburettors /5/
6	draining of carburettor float chamber
7	oil line to oil thermometer /5/
8	carburettor suction compensation line
9	oil expansion reservoir draining line
10	oil line from oil cooler /5/
11	oil line from oil thermometer to oil pump /5/
12	oil line from oil thermometer to oil cooler /5/
13	fuel line from fuel vacuum pump to fuel pressure and fuel flow sensors and to restrictor line
14	oil reservoir draining line
15	fuel line bypass /5//7/
16	warm air distribution line /11/
17	warm air intake line /11/
18	hot engine oil to oil reservoir line /5/
19	drip tray gasket and airbox draining line
20	fuel line to carburettors /5/
21	coolant from cooler
22	spark plug line
23	power line for right carburettor
24	vacuum fuel pump draining line /12/
25	oil line from oil cooler
26	oil line to oil cooler
27	cold air intake lane /13/
28	water from cylinder head to water cooler /5/
29	cylinder head cooling line /5/

Pos.	Description
30	manifold pressure sensor line
31	Airbox mixing chamber conduit flap Bowden cable
32	Airbox air filter /10/
33	left carburettor Bowden cable
34	exhaust tubes connection (spring type secured with safety wire)
35	exhaust tubes joint connection (spring type secured with safety wire)
36	exhaust tubes connection counter-rotation safety wire
37	airbox scout (warm air intake)
38	water thermostat
39	fuel line to LHS carburettor

4.1 Power plant installation

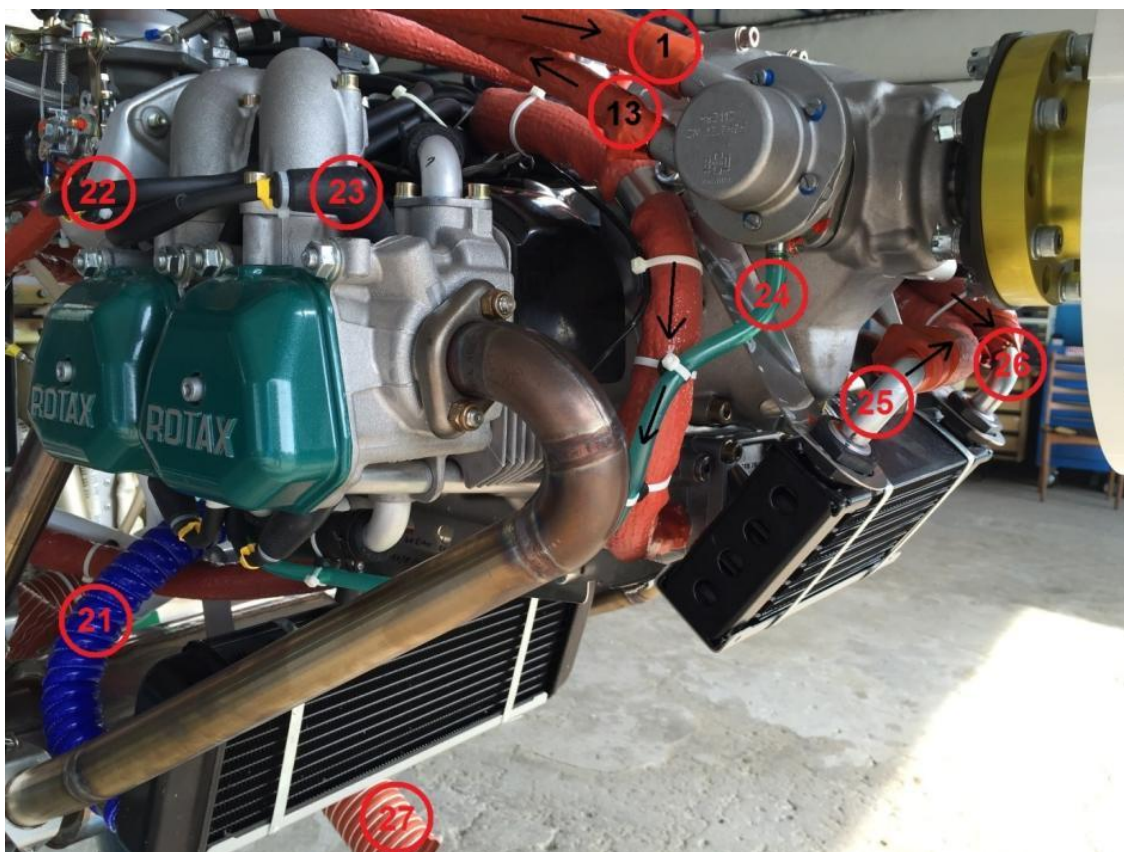


Figure 3: Viper SD-4 LSA Power plant installation

Table 6: Figure 3 guidance

Pos.	Description
1	fuel line from gascolator to fuel vacuum pump
13	fuel line from fuel vacuum pump to fuel pressure and fuel flow sensors and to restrictor line
21	coolant from cooler
22	spark plug line
23	power line for right carburettor
24	vacuum fuel pump draining line
25	oil line from oil cooler
26	oil line to oil cooler
27	cold air intake lane

Figure 3 describes front right side of the Viper SD-4 LSA power plant installation. On the most right hand side there is a propellers hub. Right after propellers hub there is an engine reduction gearbox. Bellow that is oil cooler. The oil flow comes from left line and exits via right line.

On the engine gearbox there is a fuel vacuum pump which is drained to the aft part of the engine compartment via green draining line attached by several plastic locking tie-wraps.

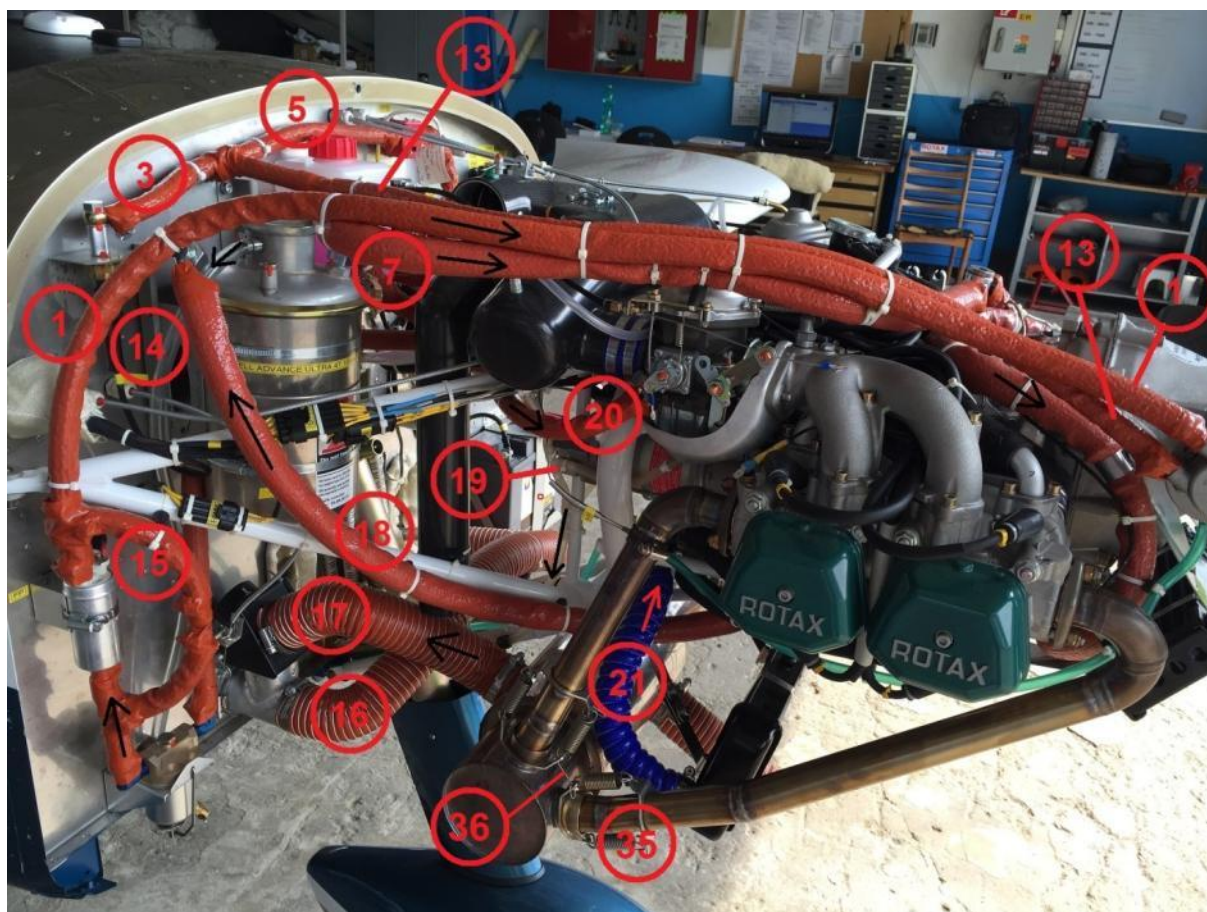


Figure 4: Viper SD-4 LSA Power plant installation

Table 7: Figure 4 guidance

Pos.	Description
1	fuel line from gascolator to fuel vacuum pump
3	fuel line to fuel pressure sensor
5	fuel line from fuel flow sensor to carburettors
7	oil line to oil thermometer
13	fuel line from fuel vacuum pump to fuel pressure and fuel flow sensors and to restrictor line
14	oil reservoir draining line
15	fuel line bypass
16	warm air distribution line
17	warm air intake line
18	hot engine oil to oil reservoir line
19	drip tray gasket and airbox draining line
20	fuel line to carburettors
21	coolant from cooler
36	0.8mm safety stainless wire application

As seen on Figure 4 most of the fuel lines are attached by plastic locking tie-wraps. Fuel lines are covered by orange fire-proof sleeves /4/ ended up with fire-proof sealing tape.

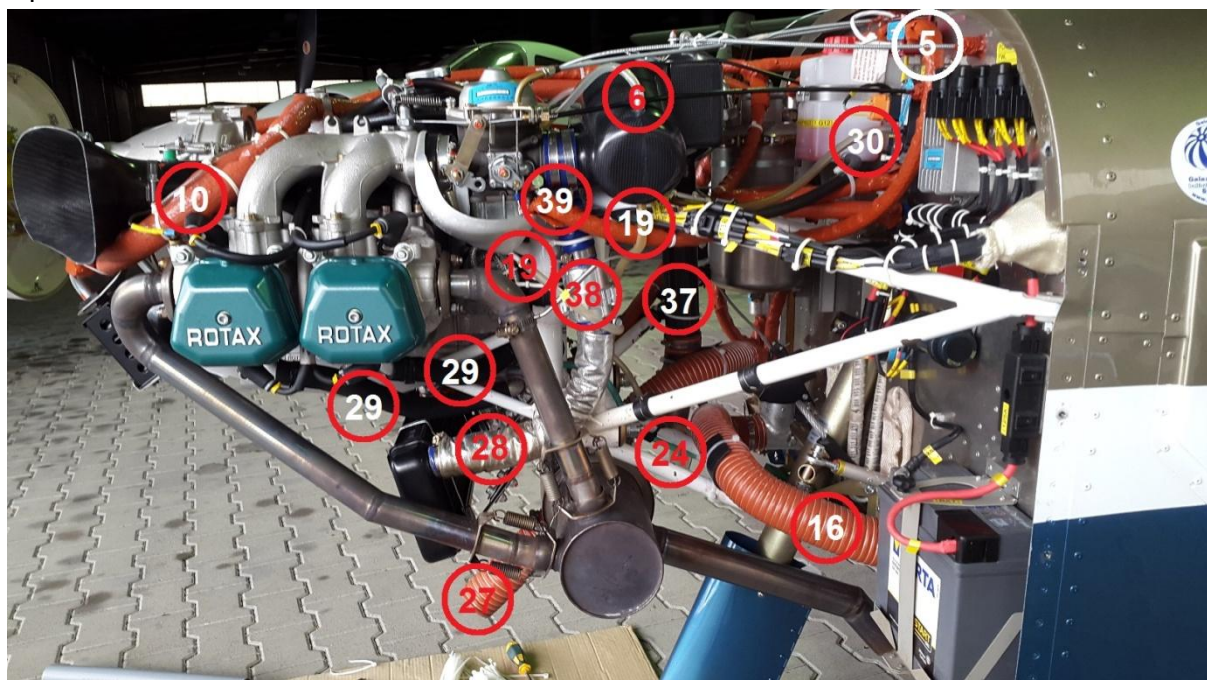


Figure 5: Viper SD-4 LSA Power plant installation

Pos.	Description
5	fuel line from fuel flow sensor to carburetors
6	draining of carburettor float chamber
10	Oil line from oil cooler
16	warm air distribution line
17	warm air intake line
19	drip tray gasket and airbox draining line
24	vacuum fuel pump draining line
27	cold air intake
28	water from cylinder head to water cooler
29	cylinder head cooling line
30	manifold pressure sensor line
38	water thermostat
39	fuel line to LHS carburettor



Figure 6: SD-4 LSA power plant installation

Pos.	Description
1	fuel line from gascolator to fuel vacuum pump
2	oil line from oil to oil reservoir
3	fuel line to fuel pressure sensor
4	fuel restrictor line
5	fuel line from fuel flow sensor to carburettors
6	draining of carburettor float chamber
7	oil line to oil thermometer
8	carburettor suction compensation line
9	oil expansion reservoir draining line
10	oil line from oil cooler
11	oil line from oil thermometer to oil pump
12	oil line from oil thermometer to oil cooler
31	Airbox mixing chamber conduit flap Bowden cable
32	Airbox air filter
33	left carburettor Bowden cable

Note

Fuel flow pressure (5) and manifold pressure position (not visible on this Figure) not conforming to the Type Definition. For correct installation definition please refer to Figure 26.

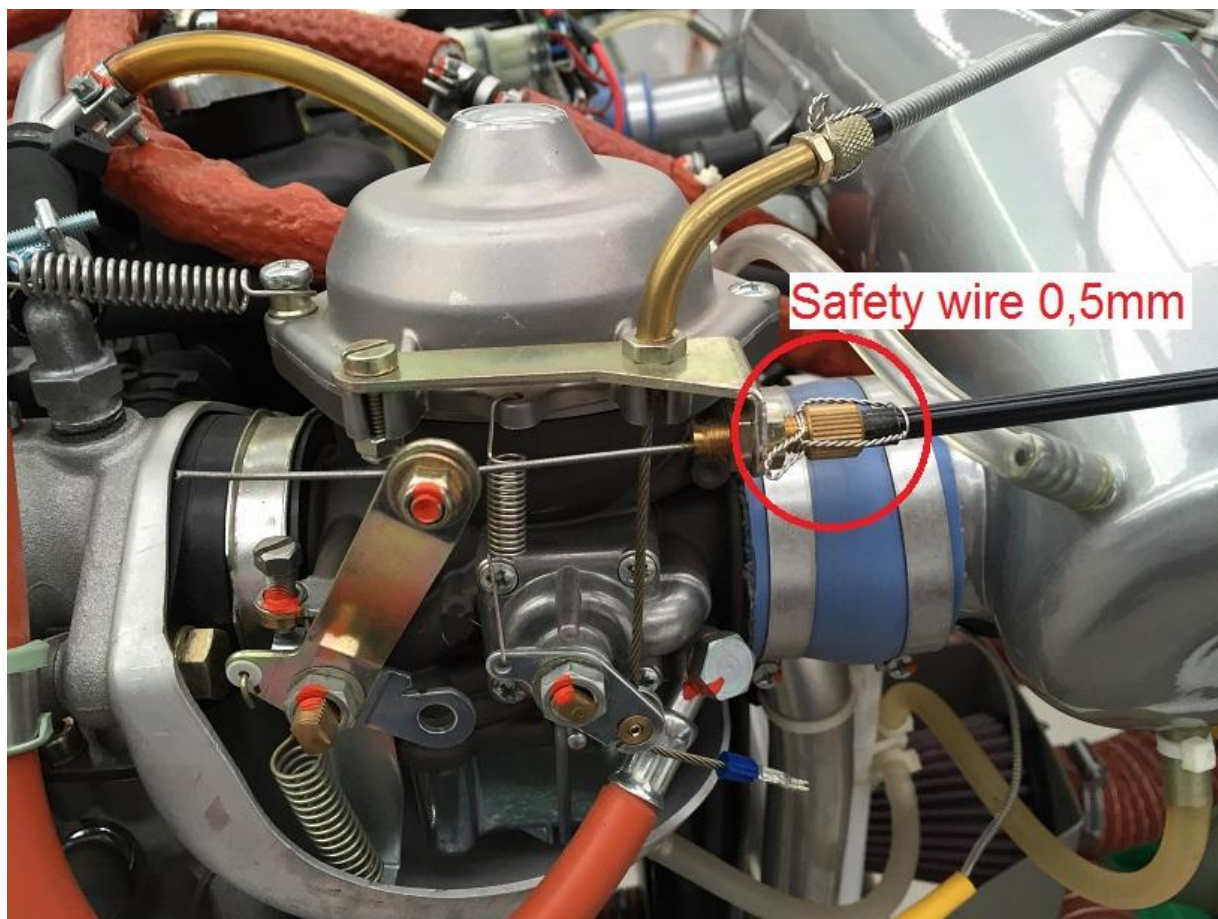


Figure 7: Stainless safety wire application

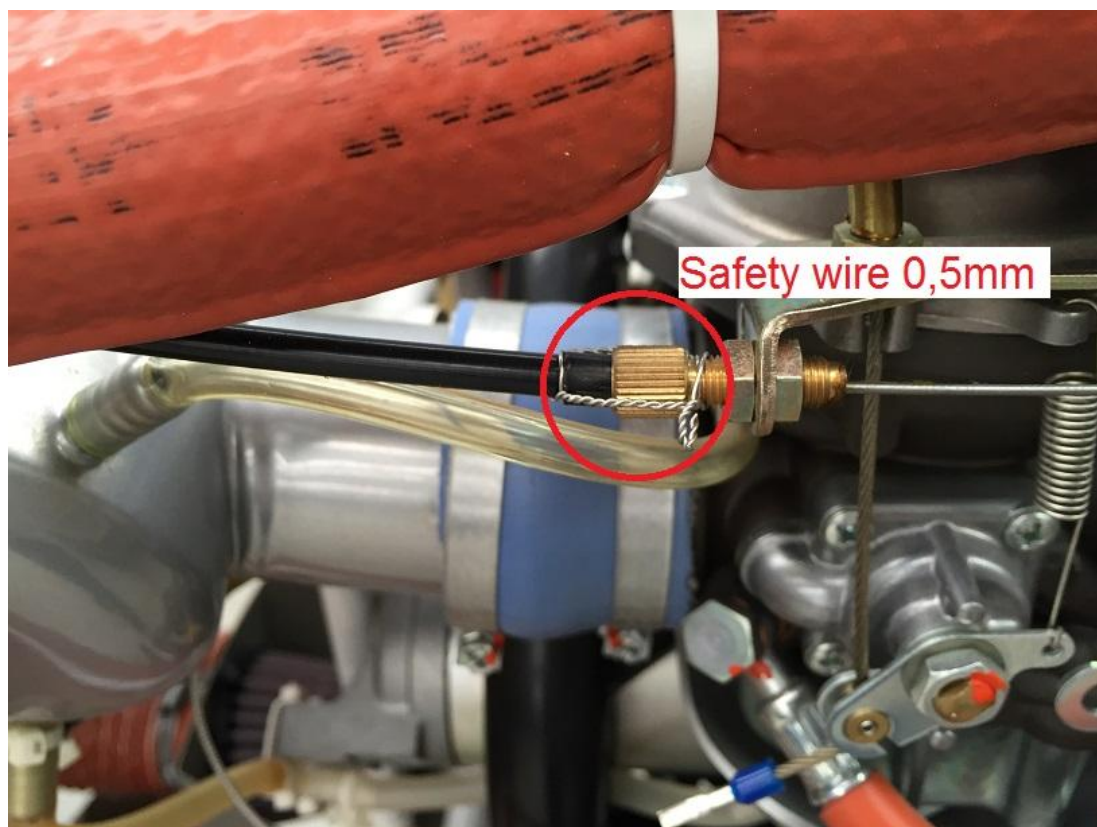


Figure 8: Stainless safety wire application



Figure 9: Stainless safety wire application



Figure 10: Exhaust tubes connection secured by 0,8mm stainless wire

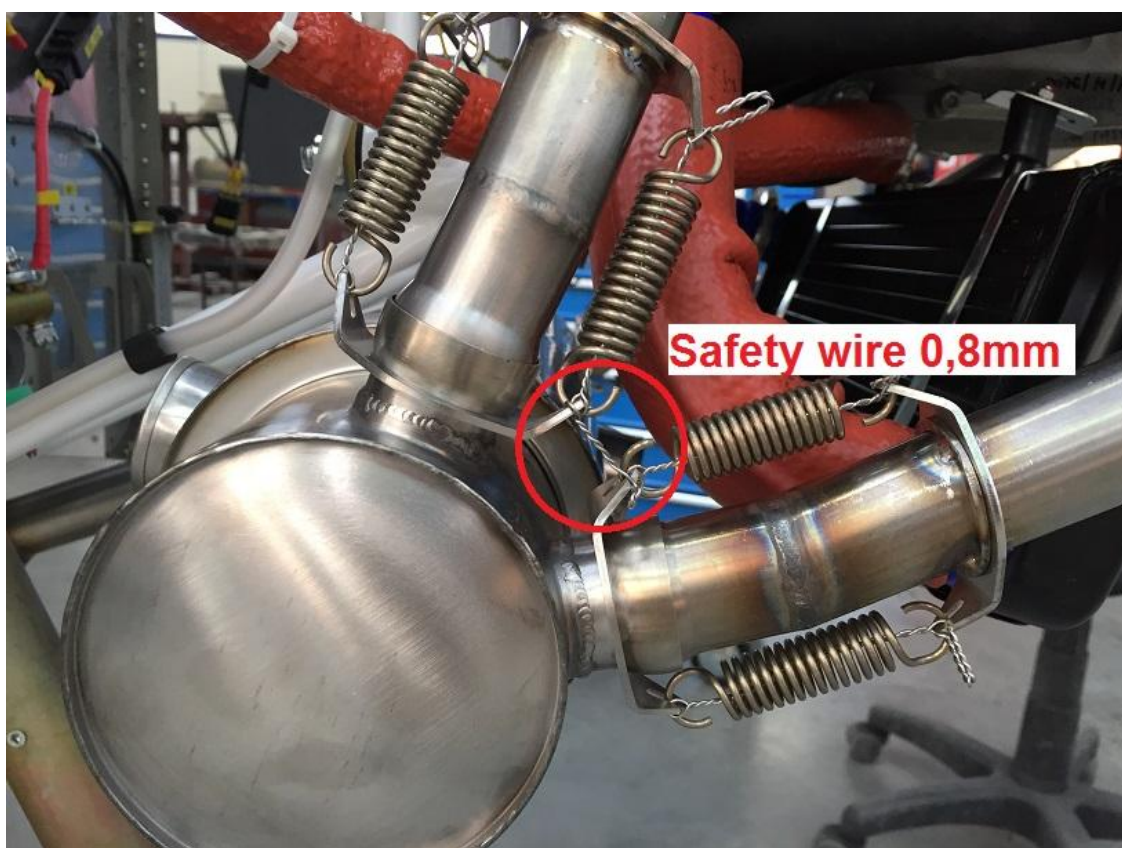


Figure 11: Exhaust tubes anti rotation attachment



Figure 12: Oil line return line



Figure 13: Stainless safety wire application

Appendix

This appendix contains overall and close-up look pictures of power plant unit hoses, cables, wires.

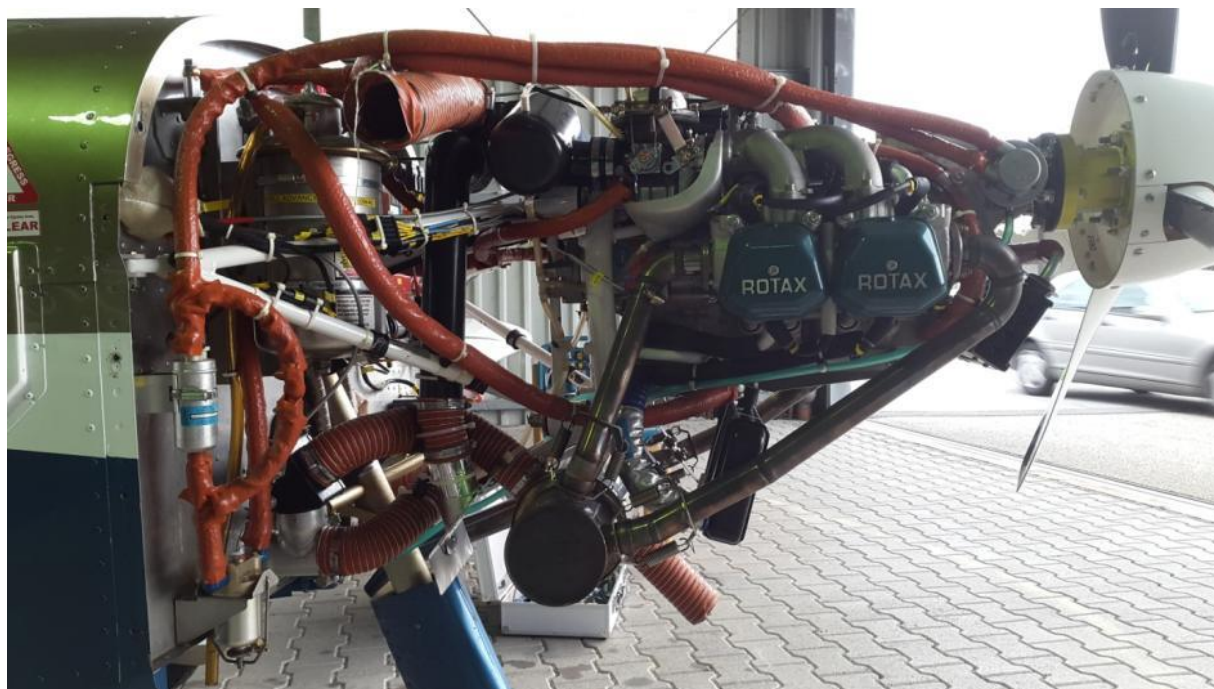


Figure 14: right side

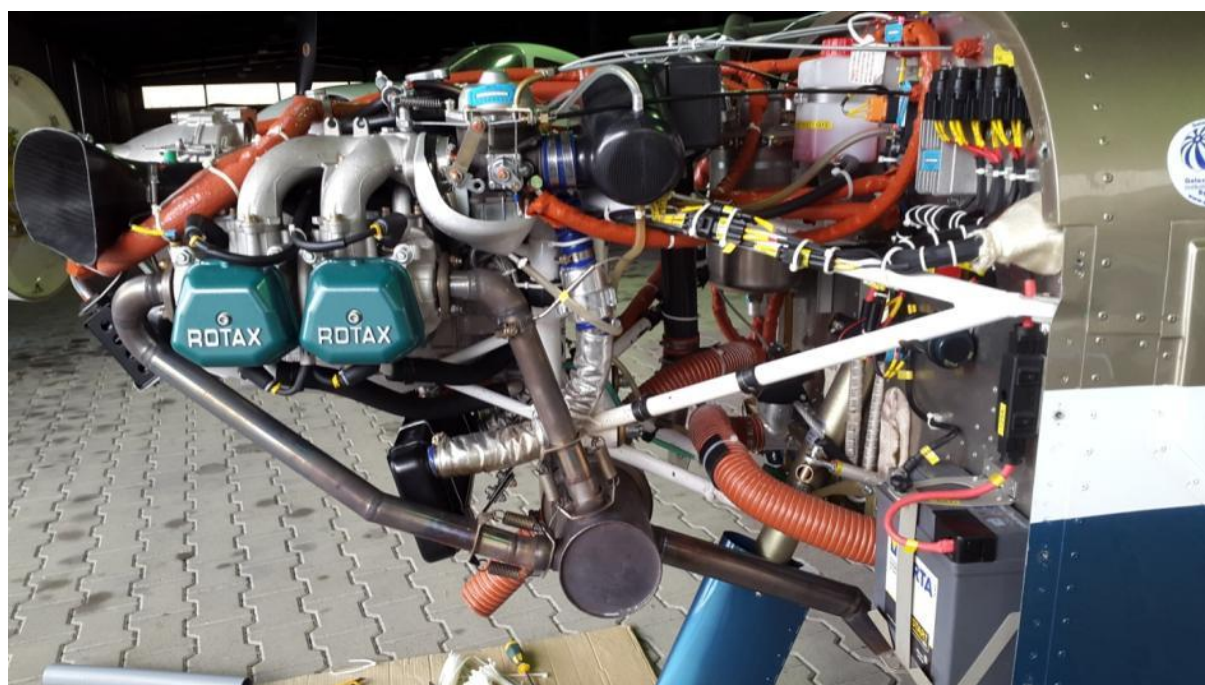


Figure 15: left side

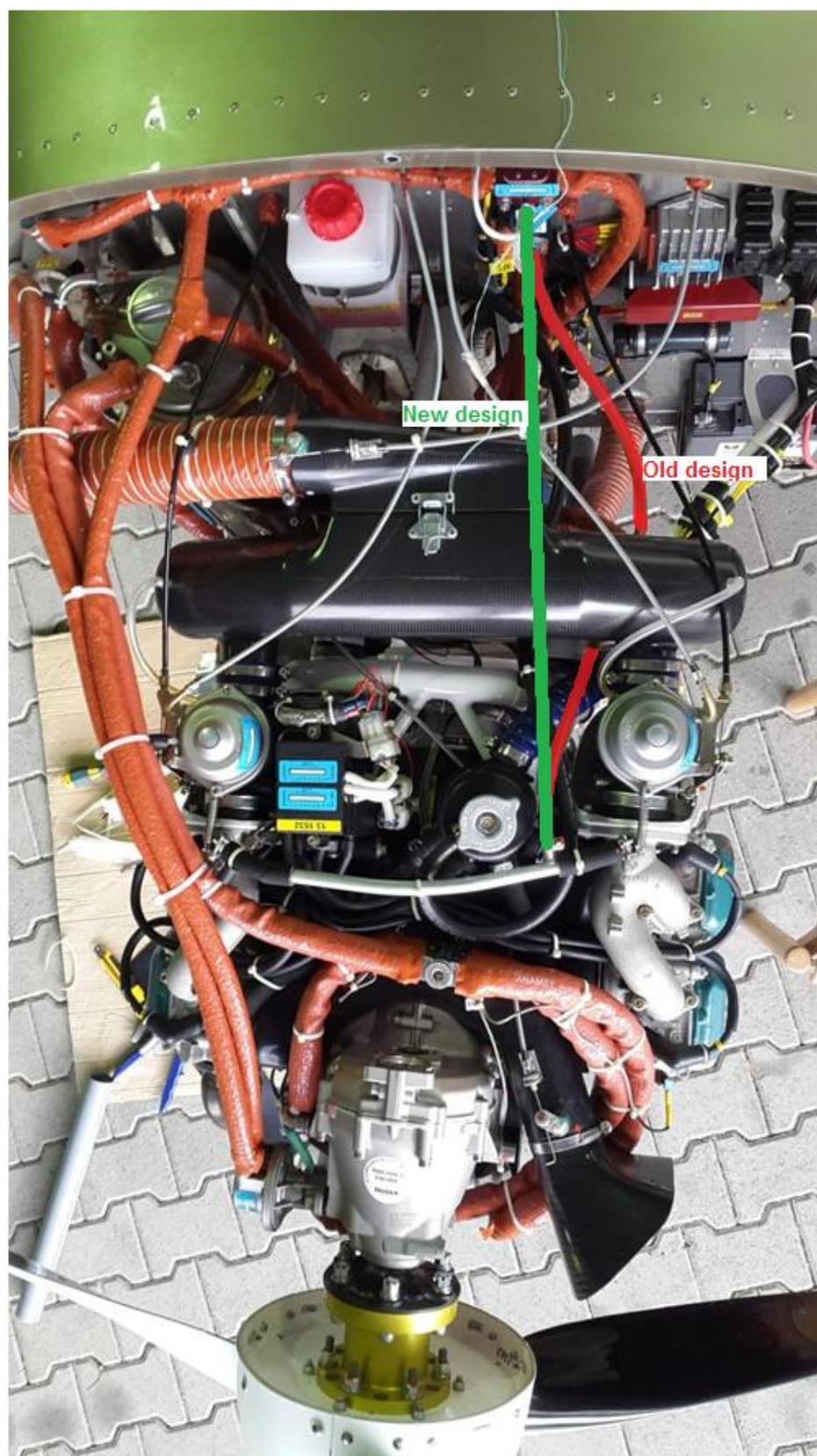


Figure 16: Top view

Manifold pressure line not according to TD (red colour). TD marked with green colour (see Figure 26).



Figure 17: front look



Figure 18: reduction gearbox



Figure 19: left side closer look



Figure 20: left side firewall top part



Figure 21: left side firewall – bottom part

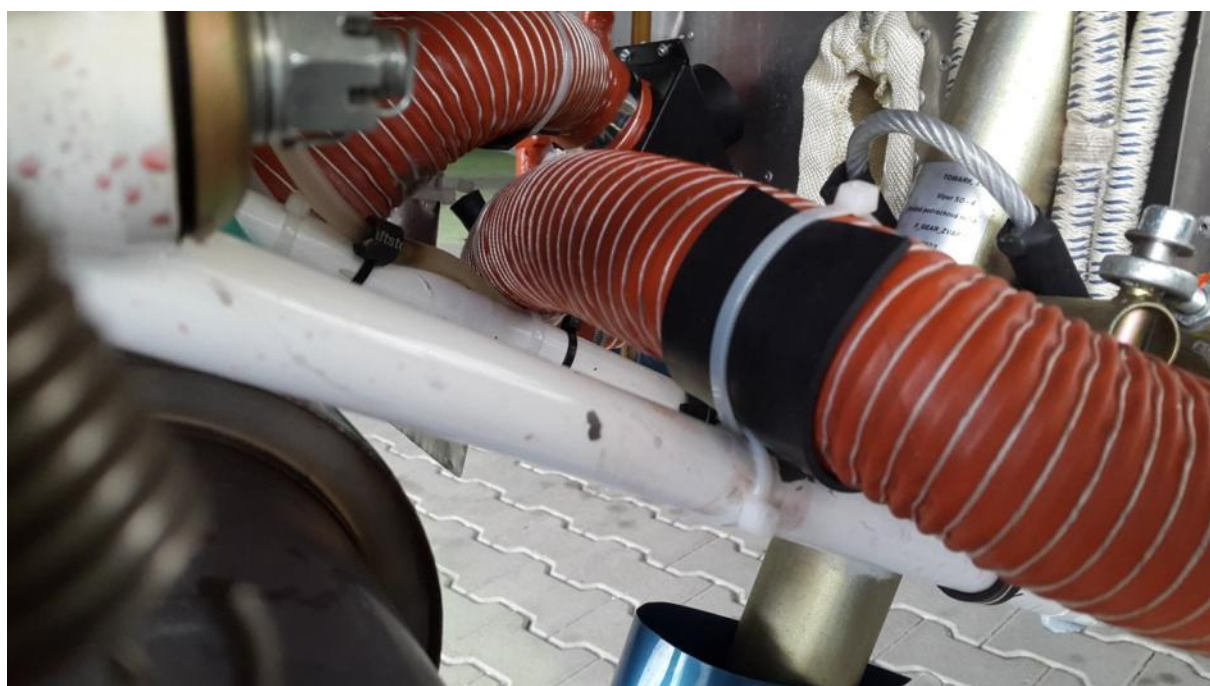


Figure 22: cabin heat distribution hose

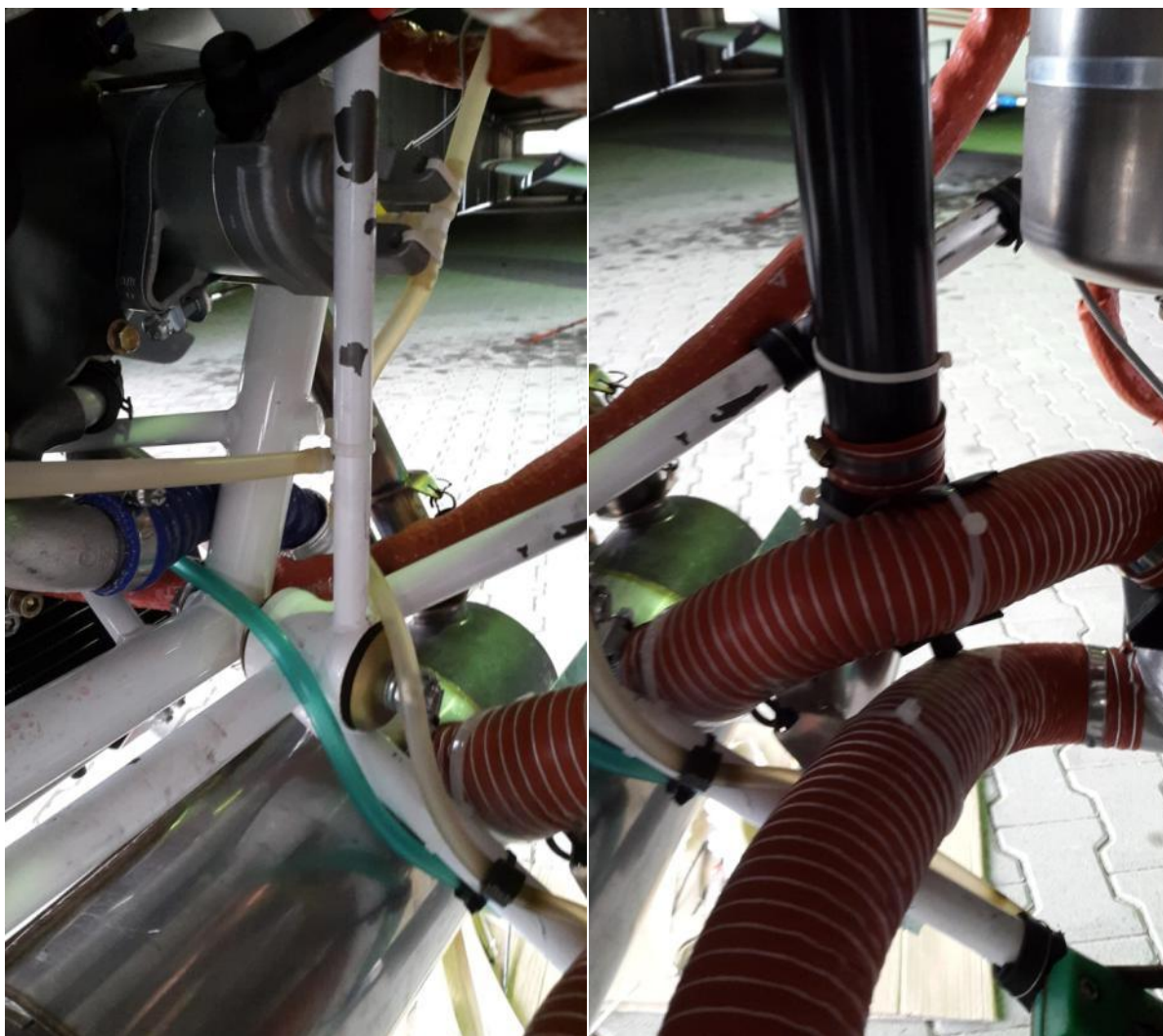


Figure 23: Left (fuel pump draining + airbox draining) Right (airbox warm air intake)



Figure 24: Left (firewall right side overall look) Right (electric fuel pump closer look)



Figure 25: firewall top part overall look

Fuel flow sensor and fuel pressure sensor not in line with TD. Fuel flow sensor and manifold pressure sensor should be installed according to SD4-A-6-001-N-1#1 (Figure 26).

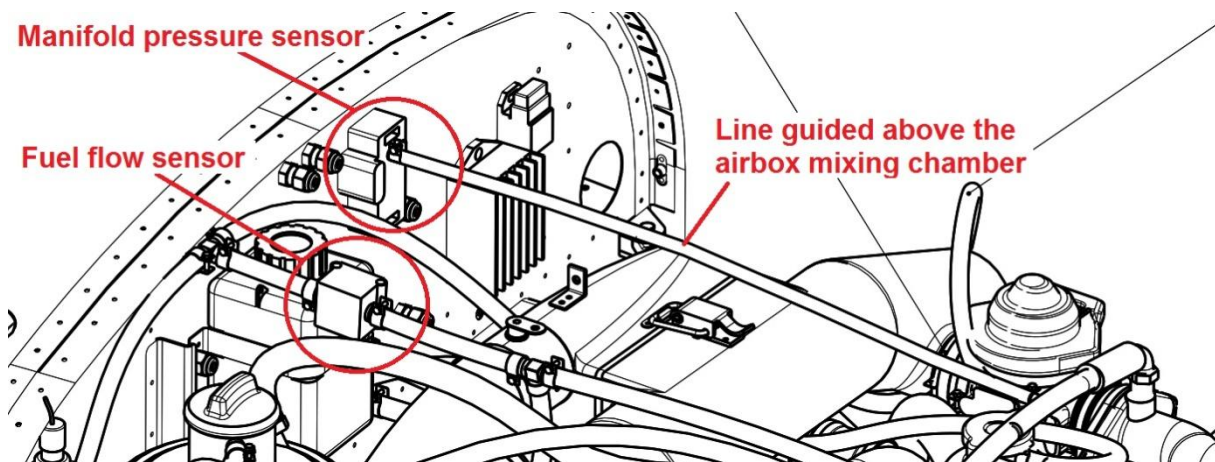


Figure 26: Type design definition of correct manifold pressure sensor and fuel flow sensor

Fuel flow sensor attached by a 2 (M66) plastic tie wraps to the oil line.

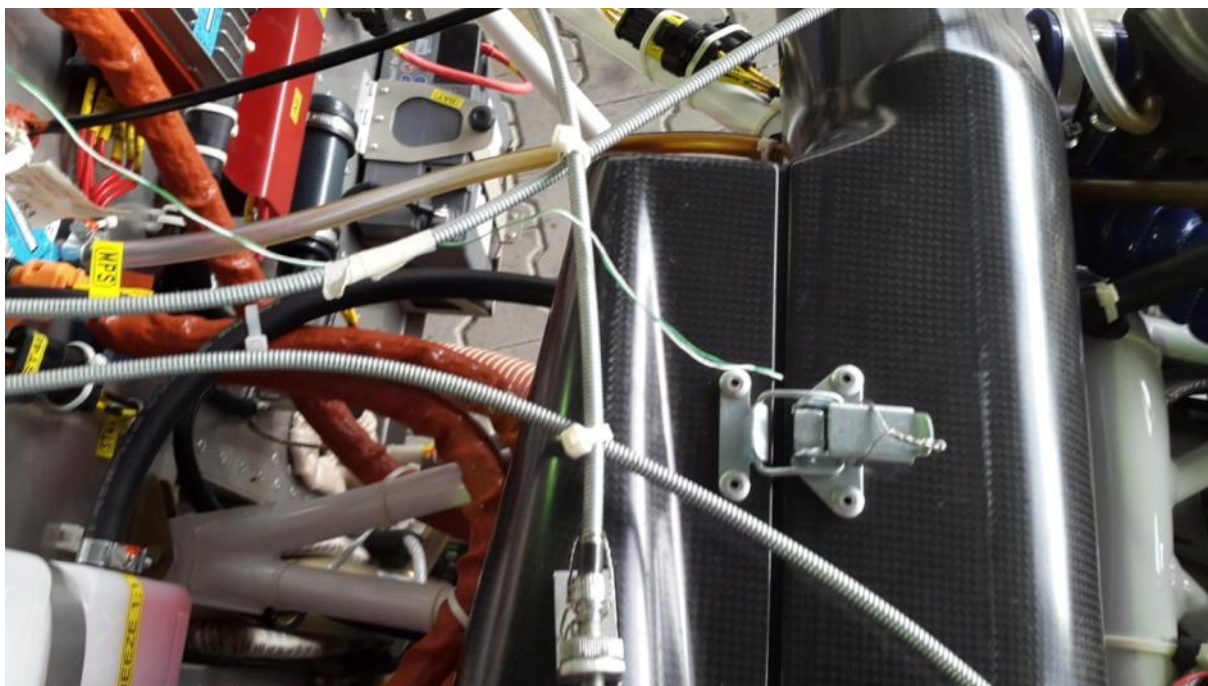


Figure 27: airbox + control cables (green/white electric cable inserted to the airbox NOT PART of TD)



Figure 28: Engine suspension frame and power plant guidance



Figure 29: Water thermostat installation