Plug integration procedure

Twardowsky 2 propulsion

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1. **Introdution**In this document, the process of integration of plug assembly will be presented and described. This procedure should be performed with caution and without usage of excessive forces on utilized components. Instructions relating to the integration of seals should be followed with particular care. As the plug system has been designed and developed according to two separate configurations differing by type of injector, the procedures for integrating the two will be presented. Here we can distinguish between two separate assemblies:

- swirl injector assembly

- the showerhead assembly

1. **Swirl injector assembly procedure**Basic tools needed for integration: 20 flat spanner, teflon grease, screwdriver, large seger pliers.

Before integration, the components should be cleaned with isopropyl alcohol and the integration station should be prepared by spreading stretch film on the tabletop.

|  |  |  |
| --- | --- | --- |
| **Part number** | **Part name** | **Quantity** |
| TWR.2A.4.03.02.003 | Adaptive plate | 1 |
| TWR.2A.4.03.02.004 | Swirl element | 8 |
| TWR.2A.4.03.02.007 | Igniter nozzle | 1 |
| TWR.2A.4.03.02.008 | Igniter body | 1 |
| TWR.2A.4.03.02.001/  TWR.2A.4.03.02.002 | Plug/ Test plug | 1 |

Table 1. List of components

|  |  |  |  |
| --- | --- | --- | --- |
| **Norm** | **Name** | **Size** | **Quantity** |
| DIN 7991 | Countersunk screws | M3x16 | 8 |
| Acc. to manufacturer (material AISI 316/VITON) | Met-gum stainless steel washer | M16 | 8 |
| - | Oring NBR/VITON | 96x2,5 | 1 |
| - | Oring NBR/VITON | 23,52x1,78 | 1 |
| - | Flat washer NBR/VITON | Acc. to dimensions of the flange connection | 1 |
| DIN 472 | Seger inner ring | W108 | 1 |

Table 2. List of standardised components

Obraz zawierający ziemia, brudne, w pomieszczeniu, opuszczone

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Fig 1. Components required for integration

Prepare 8 pieces of swirl injector parts together with 8 pieces of flat rubber-metal washers for M16 threads.

Obraz zawierający wyroby z metalu, w pomieszczeniu, dźwignia

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Fig 2. Swirl injector with metal-gum washers

Teflon grease should be applied to the metal-gum washers and swirl injector threads.

Obraz zawierający wyroby z metalu, Część samochodowa, Sprzęt domowy, metal

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Fig 3. Metal-gum washers put on swirl injectors

Screw the swirl injectors thus prepared into the adaptive plate.

Obraz zawierający wyroby z metalu, Część samochodowa, orzech, metal

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Fig 4. Swirl injectors integrated into the adaptive plate

Prepare the 96x2.5 NBR oring. Do this by coating it with a thin layer of teflon grease. Put a similar amount of grease on the groove under the oring beforehand. Then apply the oring to the outer groove of the adapter plate.

Obraz zawierający metal, srebro, ziemia, w pomieszczeniu

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Fig 5. Oring applied to the adapter plate

Screw the igniter nozzle into the igniter body.

Obraz zawierający cylinder, srebro, Część samochodowa, stal

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Fig 6. Igniter nozzle integrated into the igniter body

Prepare the 23.52x1.78 VITON oring. Also coat the o-ring with teflon grease, as well as the groove on its outer surface. Then apply the oring to the groove.

Then apply a flat washer to the flange connection coated with teflon grease.

Obraz zawierający krąg, Część samochodowa, ziemia

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Fig 7. Flat rubber washer for flange connection

Then insert the igniter body into the corresponding center hole in the adaptor plate.

Obraz zawierający w pomieszczeniu, srebro, ziemia

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Fig 8. Ignition assembly integrated into the adaptor plate

Screw in 8 M3x16 screws, fixing the igniter with the adapter plate by flange connection. The screws should be screwed in around the perimeter in a "star" order, first tentatively without bringing the cones into contact, and then screwed all the way in.

Obraz zawierający Część samochodowa, osoba, narzędzie, paznokieć

Opis wygenerowany automatycznie

Fig 9. Integrated flange connection to the adapter plate

Then slide the thus integrated ignition-injection system into the plug body. Particular care must be taken to ensure the concentricity of the system with the plug during this step.

Obraz zawierający osoba, dłoń, podłoga, srebro

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Fig 10. Axial insertion process of the adaptor plate assembly into the plug

In the case of resistant insertion of the component, an axisymmetric piece of metal with an orifice and a surface protection in the form of a flat rubber sheet should be provided. A piece of rubber sheet and a corresponding piece of metal higher than the protruding part of the ignitor assembly should then be placed on the surface of the adaptor plate to protect the surface of the components.

Obraz zawierający narzędzie, osoba, Obróbka metali, w pomieszczeniu

Opis wygenerowany automatycznie

Fig 11. Proposed accessories for integration in case of problems in the insertion process

Obraz zawierający osoba, Obróbka metali, rzemieślnik, narzędzie

Opis wygenerowany automatycznie

Fig 11. Proposed process of integration in case of problems in the insertion process

If still unsuccessful, use a screw press as desired to apply a less destructive force introduced linearly rather than percussively. Slide the plate into the plug until the entire groove for the seger ring is exposed.

The seger ring should then be inserted using seger pliers and applied in the groove locking the plate in one position.

Obraz zawierający osoba, nożyczki, w pomieszczeniu, zlew

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Fig 12. Application process for the seger ring fastening the adaptive plate

During disintegration, use a long stick or aluminium rod when pulling out the adaptor plate. Place a rubber washer on the surface of the ignitor body on the 1" hydraulic inlet side of the plug. Then rest the stick or rod against the washer and then use a rubber mallet or line press.

Obraz zawierający osoba, ubrania, srebro, w pomieszczeniu

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Fig 13. Disintegration process

1. **Showerhead injector assembly procedure**

|  |  |  |
| --- | --- | --- |
| **Part number** | **Part name** | **Quantity** |
| TWR.2A.4.03.02.006 | Showerhead injector | 1 |
| TWR.2A.4.03.02.007 | Igniter nozzle | 1 |
| TWR.2A.4.03.02.008 | Igniter body | 1 |
| TWR.2A.4.03.02.001/  TWR.2A.4.03.02.002 | Plug/ Test plug | 1 |

Table 3. List of components

|  |  |  |  |
| --- | --- | --- | --- |
| **Norm** | **Name** | **Size** | **Quantity** |
| DIN 7991 | Countersunk screws | M3x16 | 8 |
| - | Oring NBR/VITON | 96x2,5 | 1 |
| - | Oring NBR/VITON | 23,52x1,78 | 1 |
| - | Flat washer NBR/VITON | Acc. to dimensions of the flange connection | 1 |
| DIN 472 | Seger inner ring | W108 | 1 |

Table 4. List of standarised components

For the integration of the showerhead injector into the plug system, the procedure is similar to that for the integration of the swirl injector assembly. The only thing to ignore here is the step of screwing in the swirl injector components and special care must be taken during integration not to load the area around the through-holes in the showerhead plate in order to reduce the risk of damage to the component.

Obraz zawierający krąg, w pomieszczeniu, podłoga, ziemia

Opis wygenerowany automatycznieFig 14. Oring applied to the showerhead plate

**4. Revision**

|  |  |  |
| --- | --- | --- |
| **No.** | **Person responsible** | **Date** |
| 1 | Bartosz Hyży | 2023-12-02 |
|  |  |  |