

RUSSIAN FEDERATION  
MINISTRY OF TRANSPORT OF THE RUSSIAN FEDERATION  
FEDERAL AIR TRANSPORT AGENCY

**AIRWORTHINESS DIRECTIVE**

March 14, 2024

No. 2024-53-D-03

Scope: D-136 type and series 1 D-136 engines

State of Design: Russian Federation

The corrective actions set out in this Airworthiness Directive are mandatory. No operator may operate an aircraft covered by this Airworthiness Directive in any way other than in accordance with the requirements of this Directive.

In connection with the aviation accident on July 10, 2023 with the Mi-26T RA - 06028 helicopter, associated with the shutdown of the D-136 engine No. 2251363001047 in flight due to fatigue failure of the drive spur gear of the upper horizontal shaft 136.06.00.102-01 and the fuel supply stop, for maintaining the airworthiness of D-136, series 1 D-136 engines in order to ensure the flight safety of the fleet of civil aviation Mi-26T helicopters of the Russian Federation and on the basis of the Technical decision of the Federal State Unitary Enterprise GosNII GA No. 7.TRZ.136.4.8-23/538 Revision No. 01 dated February 15, 2024 (hereinafter referred to as the Technical decision),

**IT IS PROPOSED THAT:**

1. Organizations operating and maintaining D-136 and series 1 D-136 engines, within 60 calendar days or 50 operating hours from the commencement date of this Airworthiness Directive (whichever comes first), perform the work specified in clauses 4.1 and 4.2 of the Technical decision.

Perform the work specified in clause 4.3 of the Technical decision on newly installed helicopter D-136 and series 1 D-136 engines.


2. The Airworthiness Directive comes into force on March 20, 2024.

**Appendix:** Technical decision No. 7.TRZ.136.4.8-23/538 Revision No. 01 dated February 15, 2024 (13 sheets).

Deputy Director of the  
Federal Air Transport  
Agency

A.A. Dobryakov

П. П.

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**Introduction of corrective actions in order to avoid destruction of the upper horizontal shaft (UHS) 136.06.00.102-01 of D-136 engines in Mi-26T helicopters registered in the State Register of Civil Aircraft of the Russian Federation**

**No. 7.TRZ.136.4.8-23/538**


**Revision No. 01**

		<b>APPROVED</b> by Chief Structural Engineer of the Federal State Unitary Enterprise GosNII GA (GosNII GA Scientific Center for Continuing Airworthiness of Aircraft, SC CAA) M.S. Gromov February 15, 2024		
<b>TECHNICAL DECISION</b>		Introduction of corrective actions in order to avoid destruction of the upper horizontal shaft (UHS) 136.06.00.102-01 of D-136 engines in Mi-26T helicopters registered in the State Register of Civil Aircraft of the Russian Federation		
		No. 7.TRZ. 136.4.8-23/538		
		Revision No. 01		
<b>AERONAUTICAL PRODUCT TYPE</b>		D-136 engine		
		all modifications		
<b>Stages</b>	<b>Job title</b>	<b>Full name</b>	<b>Signature</b>	<b>Date</b>
Originated by	Head of Department No. 156	Uvaev S.F.		Feb. 12, 2024
Checked by	Deputy Head of Department No. 156	Yurin S.P.		Feb. 12, 2024
Agreed by	Head of Service - Expert of Service No. 155	Arepyev K.A.		Feb. 15, 2024

	<b>Introduction of corrective actions in order to avoid destruction of the upper horizontal shaft (UHS) 136.06.00.102-01 of D-136 engines in Mi-26T helicopters registered in the State Register of Civil Aircraft of the Russian Federation</b>	<b>No. 7.TRZ.136.4.8-23/538</b>	<b>Revision No. 01</b>
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## 1. Abbreviations, terms, definitions

### 1.1 Abbreviations

UHS – upper horizontal shaft

DSG – drive spur gear

TSN – time since new

SLO – since last overhaul

OM 1360000000-01-81 – Series 1 D-136 engine. Overhaul manual 1360000000-01-81 OM. Intermediate housing. (Part 1).

DD – design documentation

MM – D-136 engine maintenance manual.


### 1.2 Terms and Definitions

Bulletin is a document containing information about changes in the type design of aeronautical products with technological instructions for introducing these changes into the design of specific aircraft copies.

Airworthiness Directive is a document issued by the Authorized State Authority and containing mandatory information on continuing airworthiness of aircraft, aircraft engines, propellers and components.

Non-compliance is failure to comply with a requirement.

Major parts are parts whose destruction or implications of destruction can lead to dangerous consequences.

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## 2. Information on the scope of the Technical decision

The Technical decision “Introduction of corrective actions in order to avoid destruction of the upper horizontal shaft (UHS) 136.06.00.102-01 of D-136 engines in Mi-26T helicopters registered in the State Register of Civil Aircraft of the Russian Federation” was developed in accordance with the requirements of the following documents:

- clause 21.10 of subpart A of the Federal Aviation Regulations “Certification of aeronautical products, design organizations and manufacturers. Part 21”:
- Organization standard “Development of technical decisions for issuing an airworthiness directive”, STO 01132732 of SC CAA-31-2023, applicable to D-136 engines of all modifications of Mi-26T helicopters registered in the State Register of Civil Aircraft of the Russian Federation;
- Conclusion based on the results of special study No. 10291-I/103 dated September 8, 2023 for the UHS 136.06.00.102-01 and the driven bevel gear 136.06.00.084 of the gearbox (upper box-shaped boss) of the D-136 engine No. 2251363001047 from the Mi-26T RA-06028 helicopter, conducted in connection with the incident that occurred on July 10, 2023 (uncommanded engine shut-down);
- Series 1 D-136 engine. Overhaul manual 1360000000-01-81 OM. Intermediate housing. (Part 1);
- D-136 engine. Bulletin No. 136.04.170.1935-BR dated August 18, 2004 “Clarification of the OM text in connection with structural modifications and improved maintainability of repairs aimed at increasing engine reliability.”
- Engine D-136. Bulletin No. D-136-GD001-BE-G dated June 22, 2022 “Informing aviation enterprises, operators and maintenance organizations about the sequence of works to increase the resource performance of D-136 engines operated on Mi-26 helicopters registered in State Register of Civil Aircraft of the Russian Federation.”

**Applicable to D-136 engines installed or to be installed on Mi-26T helicopters registered in the State Register of Civil Aircraft of the Russian Federation.**



**Introduction of corrective actions in order to avoid destruction of the upper horizontal shaft (UHS) 136.06.00.102-01 of D-136 engines in Mi-26T helicopters registered in the State Register of Civil Aircraft of the Russian Federation**

**No. 7.TRZ.136.4.8-23/538**

**Revision No. 01**

### **3. Rationale for the need to develop the Directive**

On July 10, 2023, in horizontal level flight, an uncommanded shut-down of the left engine D-136 No. 2251363001047 occurred on the Mi-26T helicopter RA-06028 of UTair-Helicopter Services JSC. The health assessment of the UHS drive components revealed it had been caused by a fatigue failure of the DSG made together with the UHS 136.06.00.102-01. The destruction, the mechanism of which is described in detail in Conclusion No. 10291-I/103 of the Russian Aviation Register, occurred along the hub surface, leading to a disruption of the kinematic connection of the drive with unit 934 (pump unit), and as a consequence, to the loss of fuel supply to the engine.

The crack growth period was at least 45 cycles (start - shut-down) of the engine. The operating TSN of the engine was 2952 hours/2552 cycles, including 458 hours/210 SLO cycles. Due to the fact that the UHS 136.06.00.102-01 was not replaced during repairs of the engine D-136 No. 2251363001047, its operating TSN is equal to the TSN of the engine, i.e., 2952 hours/2552 cycles. The last overhaul was performed on December 17, 2021 at the Aramil branch of UEC-Service JSC.

In accordance with the Conclusion of the Russian Aviation Register No. 10291-I/103, the fatigue failure of the UHS 136.06.00 102-01 with the actual thickness of the DSG hub surface equal to 2.14 mm (per requirements according to the drawing  $2\pm 0.2$  mm) occurred due to the limiting fatigue state reached by the component.

According to the DD (assembly drawings 136.06.00.160 SB; 136.06.00.160-02 SB and its specifications), the UHS 136.06.00.102-01 (136.06.00.102-02) is a component included in the assembly 136.06.00.160, the modification of which was made by Motor Sich JSC (the manufacturer). OM 1360000000-01-81 states that, in overhauls, if there are positive results of the inspection, the UHS 136.06.00.102-01 remains part of the enhanced assembly 136.06.00.160-02 SB.

Thus, the assembly unit of the UHS 136.06.00.160, marked by the manufacturer as an enhanced one (136.06.00.160-02), is not covered by Bulletin No. 136.04.170.1935-BR dated August 18, 2004 (mandatory replacement of the assembly unit 136.06.00.160-01 with 136.06.00.160-02).



Thus, the enhanced assembly unit 136.06.00.160-02, as in the case with the D-136 engine No. 2251363001047, may include non-enhanced UHSs 136.06.00.102-01, the operating TSN of which, as noted in the Conclusion No. 10291-I/103 of the Russian Aviation Register, can be up to 2952 hours/2552 cycles when they reach the limiting fatigue state in terms of the material.

#### **4. Corrective actions**

##### **Actions mandatory for operators**


4.1. In order to prevent incidents similar to those described in Section 3 of this Technical decision, organizations operating and maintaining Mi-26T helicopters registered in the State Register of Civil Aircraft of the Russian Federation must, **within 60 calendar days or 50 hours of engine operating time from the commencement date of this AD (whichever comes first)**, determine the modification and operating TSN in hours and cycles for UHSs 136.06.00.102 included in the assembly units 136.06.00.160, both on engines installed on the helicopter and stored according to the procedure described in Appendix 1.

4.2. Measure thickness **S** of the hub surface for the UHS 136.06.00.102 as described in Appendix No. 2. Send the measurement results to the GosNII GA SC CAA.

**If the obtained value  $S < 6$  mm, suspend operating the engine until the UHS is replaced with an enhanced modification 136.06.00.102-02 or 136.06.00.102-03.**

**NOTE.** Regarding the UHS replacement, contact the Aramil branch of UEC-Service JSC. After replacing the UHS with the enhanced modification 136.06.00.102-02, continue operating the engine in accordance with the OM within the established resource performance and service life of the engine and its components, with respect to the requirements of Bulletin No. D-136-GD001-BE-G dated June 22, 2022. Make an entry on the UHS replacement in section 13 "Maintenance log".

**If  $S \geq 6$  mm**, continue operating the engine in accordance with the OM within the established resource performance and service life of the engine and its components.

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4.3. After the commencement date of this AD under this Technical decision, **it is prohibited to:**

- install engines newly received by the aviation enterprise on a helicopter without first performing work to determine the modification, operating TSN and thickness **S** of the hub surface for its UHS 136.06.00.102 (Appendices 1 and 2);

- operate engines without recording the modification, operating TSN and monitoring the thickness of the hub surface for their UHSs 136.06.00.102 in section 13 “Maintenance log” of the appropriate forms;

- operate engines comprising UHSs 136.06.00.102 with a hub surface thickness **S < 6 mm.**



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## 5. Appendices

### Appendix 1.

**Procedure for determining the modification and operating TSN for UHSs 136.06.00.102 included in assembly units 136.06.00.160.**

#### **ATTENTION!**

When performing works, the safety measures set out in section 72.00.02 of the OM must be met.

**To prevent foreign objects from entering into the main drive cavity (Fig. 1), the workplace must contain only the tools and parts necessary to perform the planned operation.**

1. Remove the hoisting eye 186 in the following order:

- using a 10 mm socket wrench, unscrew the fastening nuts 145 (Fig. 1) of the hoisting eye 186;
- carefully remove the hoisting eye, paying special attention to the integrity of the O-ring 109;
- using backlight, inspect the UHS 136.06.00.102. This inspection may produce two possible cases as a result: the presence or absence of compensation holes in the hub surface of the UHS 136.06.00.102-02.

**NOTE. The presence of compensation holes in the UHS hub surface (shown by arrows in Fig. 2) indicates that this is a reinforced UHS 136.06.00.102-02.**

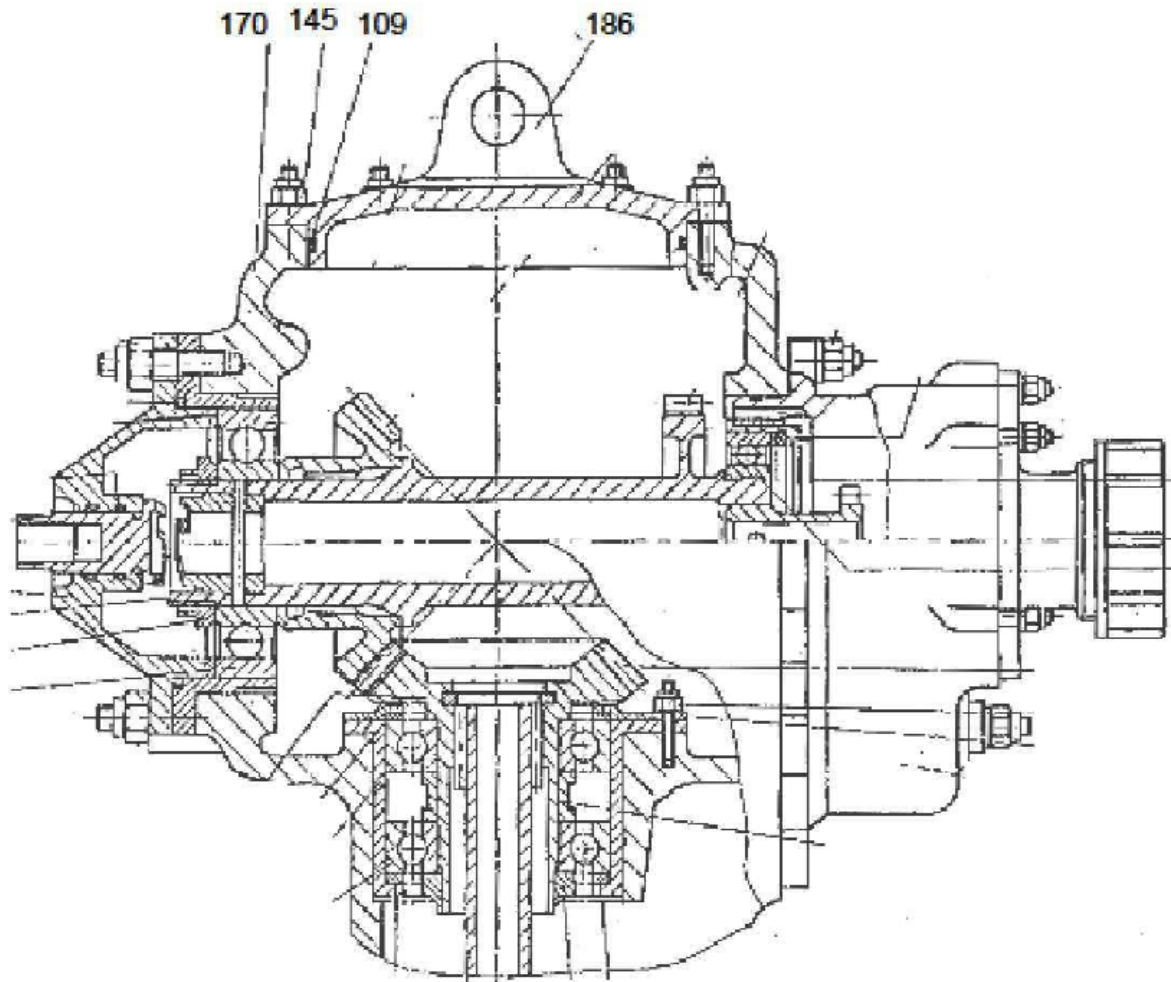
2. If compensation holes are present in the UHS hub surface, it is necessary to:

2.1. Determine and record the operating TSN for the UHS 136.06.00.102-02 in section 10 “Operation records” of the engine log. To do this:

2.2. According to section 15 “Repair” of the engine log, determine whether the UHS 136.06.00.102 was replaced during a major overhaul of the engine. If there are no records on replacement, the operating time of the UHS 136.06.00.102-02 shall be considered equal to the operating TSN of the engine. Otherwise, the operating TSN **A** of the UHS 136.06.00.102-02 is determined by the formula:

$$\mathbf{A=B+C, \text{ where}}$$

B is the operating time of the engine after the overhaul involving the UHS replacement.  
C is the UHS operating time before its installation on the engine.



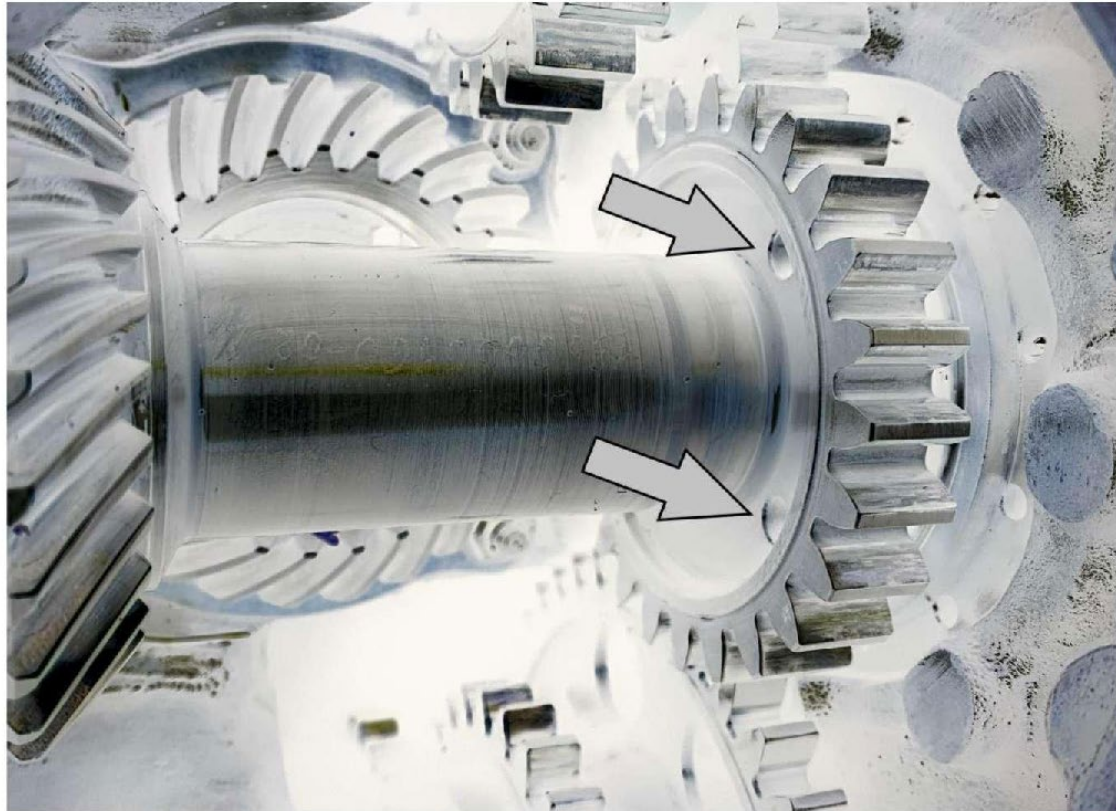
**Fig. 1.** Drive of the upper horizontal shaft

**NOTE.** If, for whatever reason, it is impossible to determine the operating time of the UHS136.06.00.102 from the engine log, it is necessary to send a request for data on the operating time of the UHS 136.06.00.102 to the aircraft repair company that performed the repair(s).

3. Observing the safety measures set out in section 72.00.02 of the OM, install the hoisting eye 186 (Fig. 1) on the flange of the intermediate housing 170 (Fig. 1) in the following order:


- using a magnifying glass  $\times 10$ , check the condition of the O-ring 109 (Fig. 1). Cracks, abrasions and deformations are not allowed.

- apply ALKM-1 paste to the surface of the flange of the intermediate housing 170 and the hoisting eye 186. Application of sealant U-4-21 is allowed;



**Fig. 2.** Upper horizontal shaft 136.06.00.102-02

- carefully place the O-ring 109 on the hoisting eye 186, avoiding its twisting;
- using backlight, make sure that there are no foreign objects in the main drive cavity;
- install the hoisting eye 186 on the flange of the main drive housing. When installing O-ring 109 (Fig. 1), carefully control the alignment of the holes in O-ring 109 with the studs on the flange of the main drive housing. Foreign particles must not adhere to the O-ring 109; delamination of the material of the ring 109 and misalignment of the holes with the corresponding studs of the flange of the main drive housing 170 are not allowed;

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- use a torque wrench U5353-0107 to secure the hoisting eye 186 with the nuts 145 (Fig. 1). The tightening torque of the nuts shall be 0.8 - 1.0 kgf-m.

4. In section 13 of the engine log, make a record of the work (operations) performed. Example entry: "Works were completed in accordance with the AD No.        dated        . An enhanced UHS 136.06.00.102-02 was installed with an operating time of ....hours/....cycles."

5. Continue operating the engine in accordance with its OM within the limits of resource performance and service life established for the engine and its components.

6. If there are no compensation holes in the UHS hub surface:

6.1. Determine and record the operating TSN of the UHS 136.06.00.102 in section 10 "Operation records" of the engine log; to do this, according to section 15 "Repair" of the engine log, find out whether the UHS 136.06.00.102 was replaced during a major overhaul of the engine. In the absence of records on replacement, the operating time of the UHS 136.06.00.102-02 shall be considered equal to the operating TSN of the engine. Otherwise, the operating TSN of the UHS 136.06.00.102-02 shall be equal to the engine operating time **A** and shall be determined by the formula:

$$A=B+C, \text{ where}$$

B is the operating time of the engine after the overhaul involving the UHS replacement.

C is the UHS operating time before its installation on the engine.

## Appendix 2. Procedure for measuring the thickness of the hub surface of the UHS 136.06.00.102 spur gear.

### ATTENTION!

When performing works, the safety measures set out in section 72.00.02 of the OM must be met.

**To prevent foreign objects from entering into the main drive cavity, the workplace must contain only the tools and parts necessary to perform the planned operation.**

1. Remove the hoisting eye 186 (Fig. 1) in the following order:

- using a 10 mm socket wrench, unscrew the fastening nuts 145 (Fig. 1, Appendix 1) of the hoisting eye 1 (Fig. 3);
  - carefully remove the hoisting eye, paying special attention to the integrity of the O-ring 109.
2. Using a depth gauge, measure the distance (h) from the wall of the hub surface to the end of the spur gear (Fig. 4).

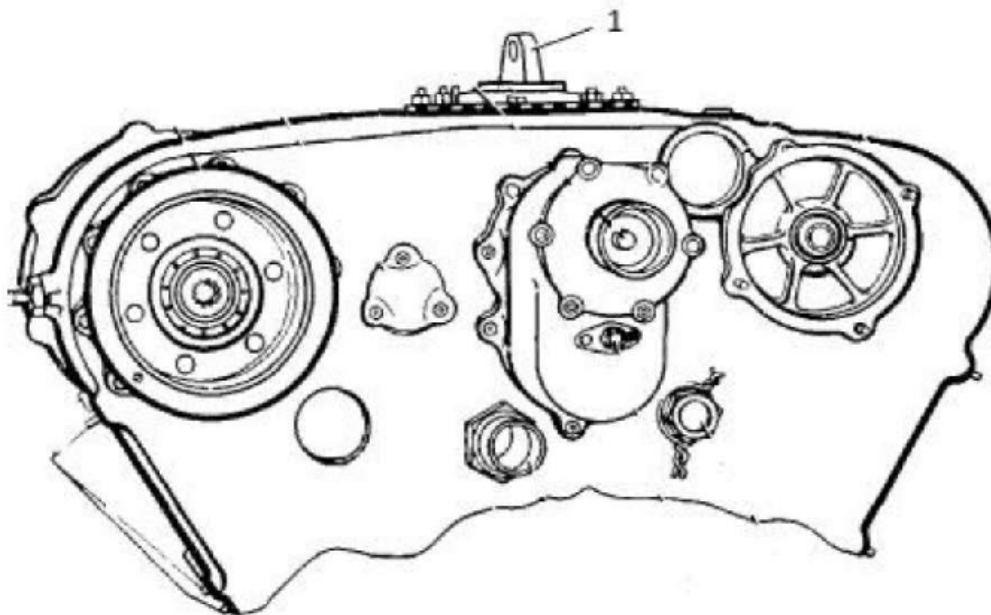


Fig. 3. Location of the hoisting eye on the upper box-shaped boss

3. Determine the thickness of the hub surface (S) using the formula:

$$S = (7 - h) \times 2$$

Record the resulting value in section 13 of the engine log.

Example entry: Thickness of the UHS hub surface is .... mm.

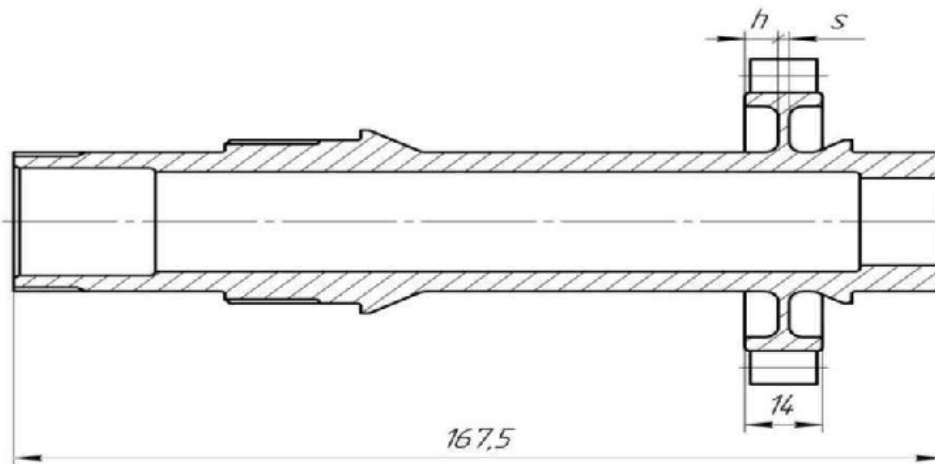


Fig. 4. UHS 136.06.00.102

**NOTE.** Measurements can be taken with a depth gauge having the following specification: Length  $\leq 65$  mm. Width  $\leq 40$  mm. Measuring range of 0...25 mm. Measurement step of 0.1 mm. Accuracy of  $\pm 0.1$  mm.

4. Observing the safety measures set out in section 72.00.02 of the OM, install the hoisting eye 186 (Fig. 1) on the flange of the intermediate housing 170 (Fig. 1) in the following order:

- using a magnifying glass  $\times 10$ , check the condition of the O-ring 109 (Fig. 1). Cracks, abrasions and deformations are not allowed.

- apply ALKM-1 paste to the surface of the flange of the intermediate housing 170 and the hoisting eye 186. Application of sealant U-4-21 is allowed;

- carefully place the O-ring 109 on the hoisting eye 186, avoiding its twisting;

- using backlight, make sure that there are no foreign objects in the main drive cavity;

- install the hoisting eye 186 on the flange of the main drive housing. When installing O-ring 109 (Fig. 1), carefully control the alignment of the holes in O-ring 109 with the studs on the flange of the main drive housing. Foreign particles must not adhere to the O-ring 109; delamination of the material of the ring 109 and misalignment of the holes with the corresponding studs of the flange of the main drive housing 170 are not allowed;

- use a torque wrench U5353-0107 to secure the hoisting eye 186 with the nuts 145 (Appendix 1, Fig. 1). The tightening torque of the nuts shall be 0.8 - 1.0 kgf-m.