

621.5 + 621.89 + 621.179

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Методика бесконтактного измерения температуры поверхности трения вращающегося диска

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 11.05.2019, 25.06.2019

« ... ».
 0,32 ... 80 , 40 , : HRC 54, Ra
 0 - 24 000 / (« »)
 7 , 10 ... (I),
 — (2).
 I, 2
 2 %
 ; ; ; ; ;

Methods for contactless measurement of the temperature of the friction surface of a rotating disk

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The method of experimental determination of the temperature of the friction surface of the steel disk by non-contact method using infrared thermometers is developed. The implementation of the method performed on an experimental stand to determine the tribological and thermal characteristics of self-lubricating friction couples under the scheme "finger-disc". The steel disk has a diameter of 80 mm, made of steel 40X, friction surface parameters: HRC 54, Ra 0.32 microns. The range of frequencies of disk rotation is 0 - 24 000 rpm. Sample ("finger") is made of self-lubricating material with dimensions: diameter 7 mm, length 10 mm. To measure the temperature in the friction zone, two pyrometric sensors are used, one of which is directed exactly to the friction track of the steel disk (ICT 1), the second – to the blackened surface adjacent to the friction track (ICT 2). The temperature control of the friction surface is carried out according to the readings of the infrared thermometer ICT 1, and ICT 2 is necessary to determine the radiation coefficient on the friction track according to the appropriate algorithm. Temperature measurement on the friction track is implemented with a rotating disk, which allows to take into account the uneven thickness of the transfer film. The measurement sys-

tem of the stand allows to determine the load-speed and tribological characteristics of a friction pair, as well as the surface temperature of the disk and the sample. The measured parameters are displayed on the personal computer in the form of trends over time. The proposed method, which provides a measurement error of no more than 2%, has been tested on various materials, including metal films, polymer composite and ceramic materials.

Keywords: experimental technique; friction without lubrication; transfer film; temperature; pyrometer; radiation coefficient.

... ; n—
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 , - λ.
 , - с
 , -
 [- , -
 , 1-9]. , -
 -
 (1)

определяется и
 сней и уравнению:
 [10], $\epsilon_{\text{эф}}(\lambda, T_p) = \frac{T_p^n - T_A^n}{T_D^n - T_A^n}$, (3)
 , -
 , ; T —
 [11]. =1, ; T —

[12;13].
 [16] = 0,95.
 [13].

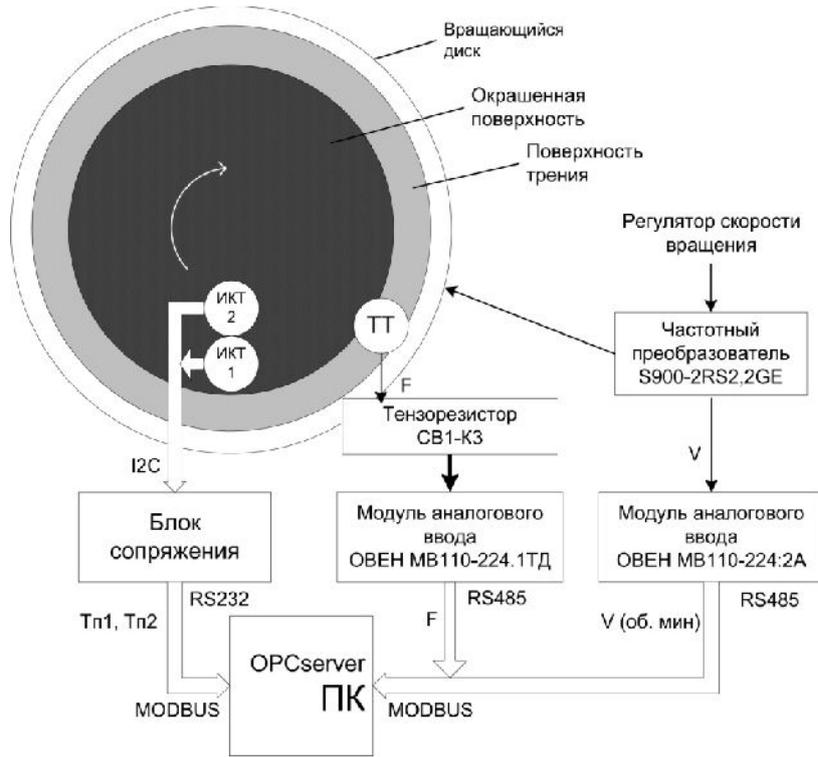
[14], [17].
 r ,
 ()
 и (r ,
) :
 ϵ (как T) = $\frac{r_{ок}(\lambda, T)}{r_{АЧТ}(\lambda, T)}$. (1)
 « — », — .2.

80
 HRC 54
 Ra 0,32.
 S900-2RS2.2GE
 0÷24000 / ,
 80 / .

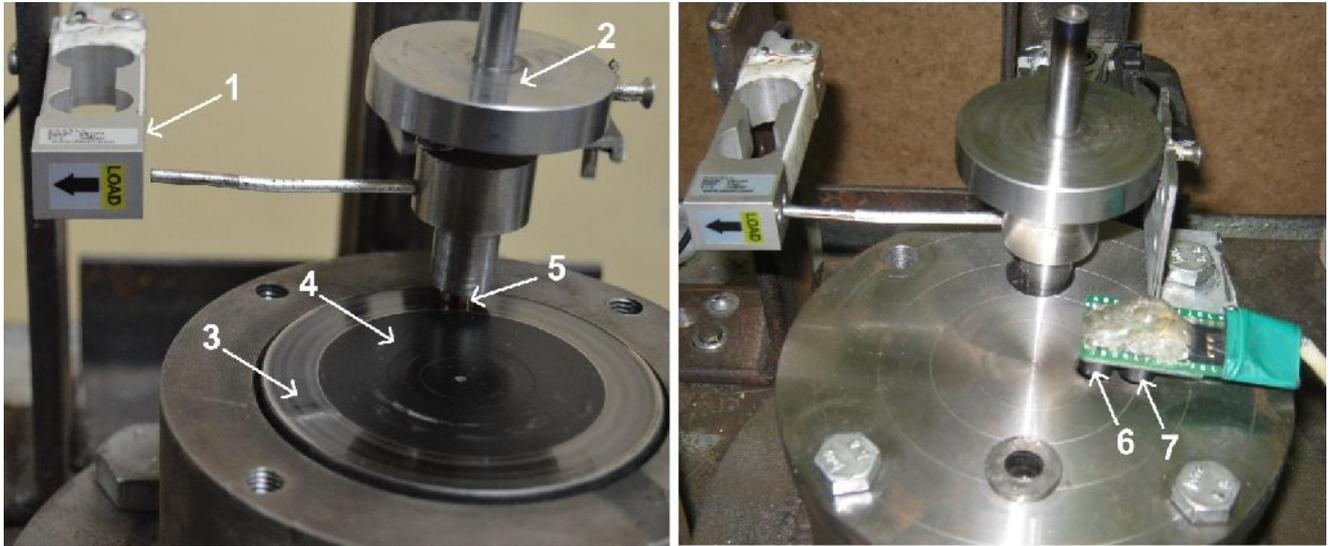
$\epsilon = 0.01...0.05$

ичного излучения
 сения определяется [15]:
 $|\Delta T| = \frac{1}{n} \cdot [1 - (\frac{T_0}{T})^n] \cdot |\frac{\Delta \epsilon}{\epsilon}| \cdot T$, (2)

MLX90614-ACF
 , K; T₀—
 , K; ε— λ = 5,5–14
 ; ε—



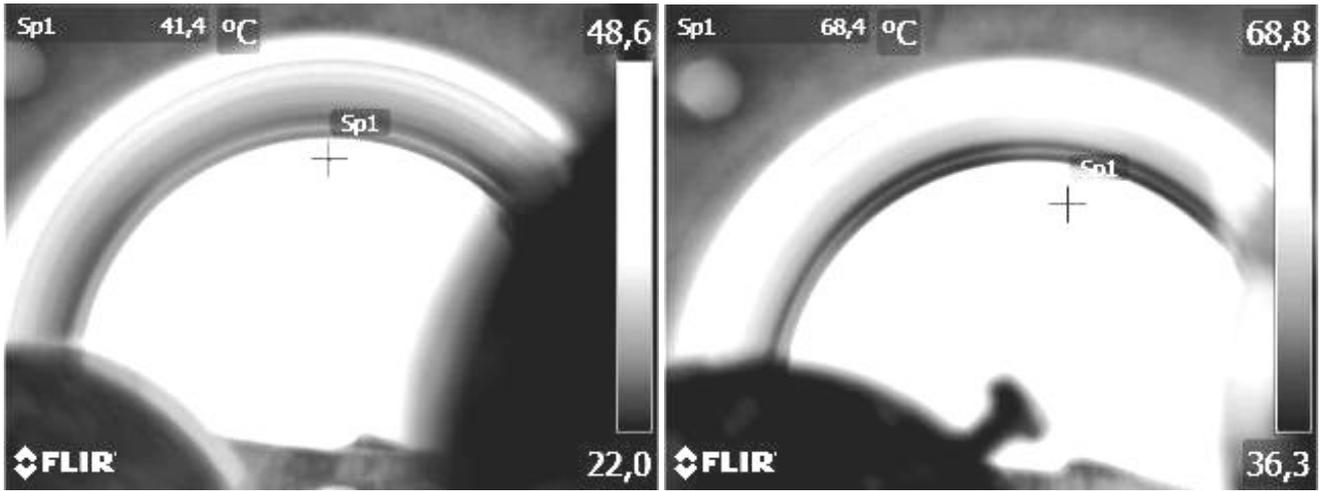
1. — : — ; — MLX90614-ACF; —



2. — ; 1— ; 2— ; 3— ; 4— ; 5— ; 6— 2; 7— 1

(. 1)

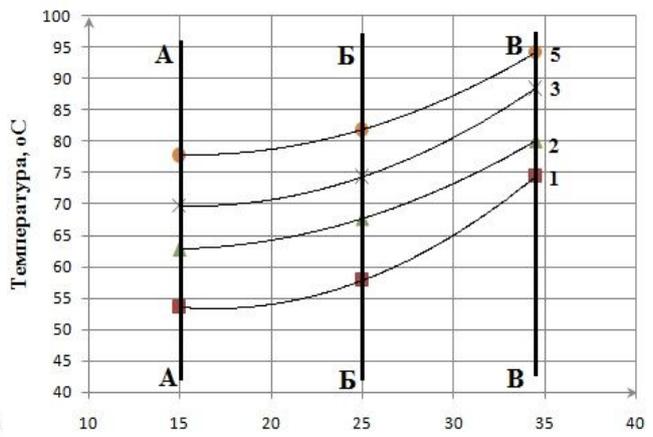
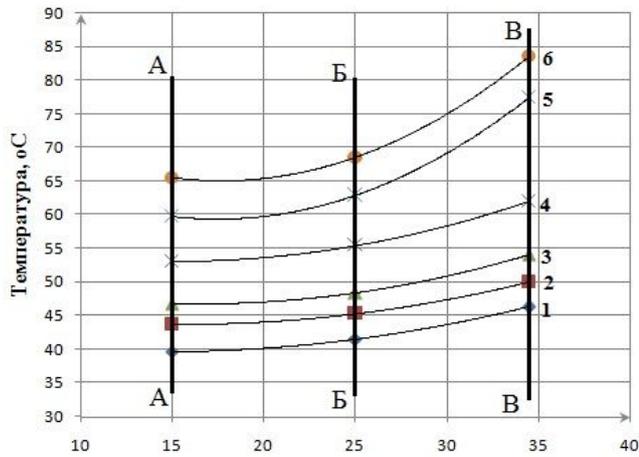
. 1. FLIRE60 (. 3).



.3.

: -10 / , 3,2 ; -60 / , 3,2

-
 =0,49±0.01 (— -1500- 5). [16] , -
 , -
 , (20%), -
 (153-34.0-
 20.363-99)



. 4.

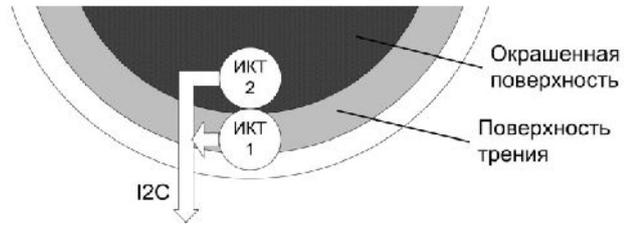
1 -10 / ; 2 -20 / ; 3 -30 / ; 4 -40 / ; 5 -50 / ; 6 -60 / ; - - : - 3,2 ; - 6,5 ; - 2; - 1; -

(. 4) - 2.

1.

.5.

1. —
2. —
(.5).



.5.

3. —
4. —
=1) (2 = 0,95). 1.

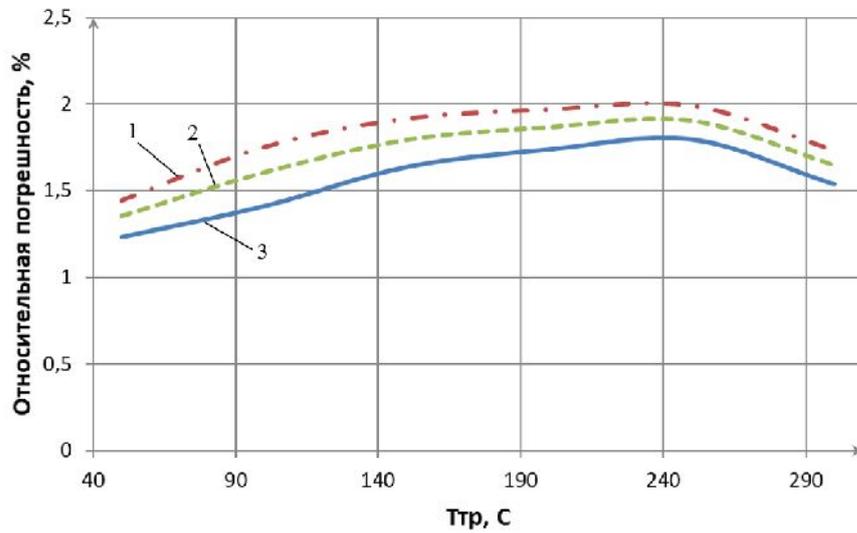
5.

$$d/dt = d/dt$$

MLX90614

(3).

.6.



.6.

1 — =0,34 (TiN); 2 — =0,39 (-3); 3 — =0,49 (-1500 5)

(MLX90614),

2 %.

0,17,

— 0,97 (0,39 0,49.),

— 0,95,

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