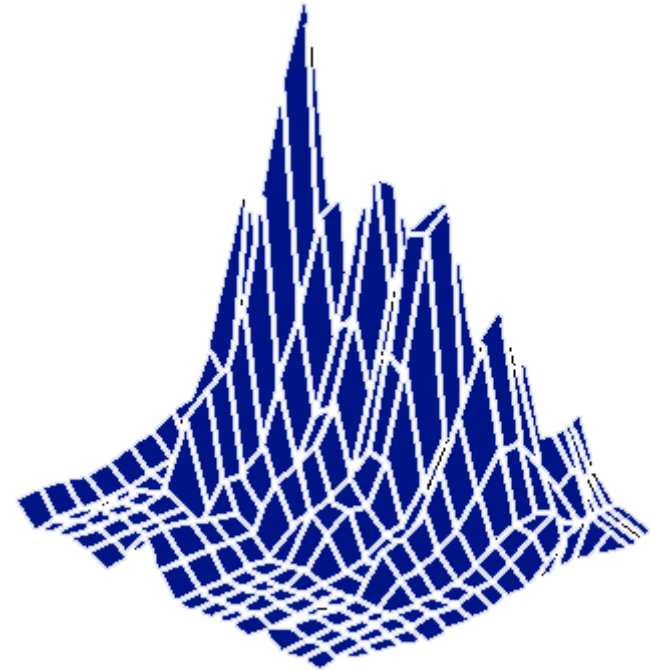


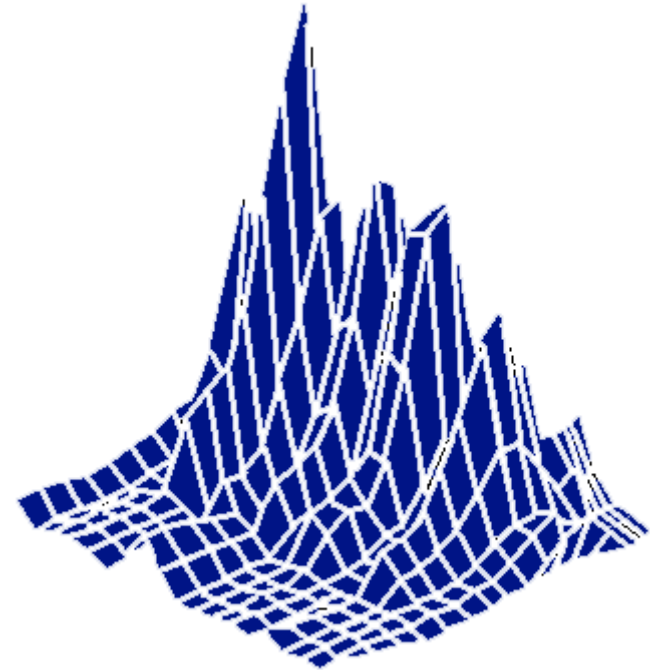
Greetings from

Korto Cavitation Services Luxembourg

www.korto.com



Korto Monitoring Systems



Korto's approach

Multidimensional algorithm, based on the full usage of observable data on all dimensions of the monitored processes.

**Simple, high-quality hardware from the best suppliers.
Special proprietary multidimensional software.**

Not pre-defined, one-size-fits-all systems, but systems tailored to the unit-specific or plant-specific issues in question.

Multidimensionality implies:

Suitable sampling of all the quantities in space, time, instantaneous rotor position, process frequency, and the domain of state-variables.

True multidimensional processing of such data, using direct and hidden interrelationships among the data.

Optimizing the monitoring algorithm based on secondary data yielded by such a procedure.

Work plan

- **First, perform a diagnostic test on the unit.**
- **Use the test results and the operators' insights to define the list of quantities to be monitored; optimize the selection, number, and location of sensors.**
- **Adapt the multidimensional algorithm to the unit.**

Result

- **A cost-effective monitoring system**
- **High reliability of monitoring**
- **High sensitivity to deterioration effects**

The functionality of such a simple system can surpass that of a system based on complex hardware and a costly collection of specialized software subsystems, which is a configuration being commonly offered on the world market.

Configuration

The Korto monitoring system consists of

- sensors,**
- an industrial computer as the controller with**
- an analog-to-digital conversion card, and**
- the multidimensional software.**

No additional analog units are needed. This reduces costs, simplifies maintenance, and permits easy reconfiguration of the system.

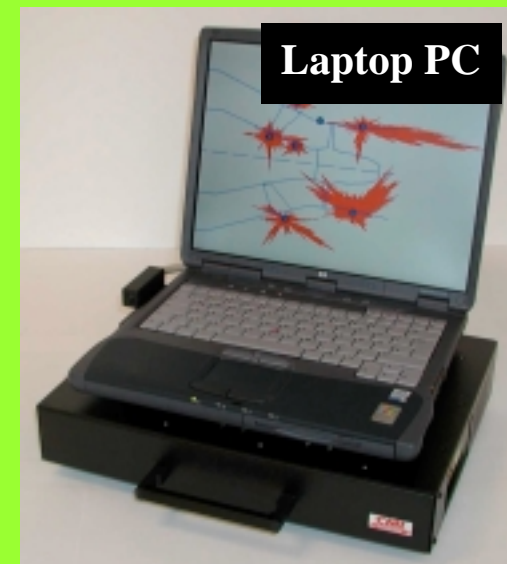
Platforms



No peripherals; data used through the plant network



Data observed directly on the wall



Several units controlled by a single portable PC

Organisation of monitoring

Korto delivers:

- Multidimensional general monitoring systems for hydropower units**
- Multidimensional cavitation monitoring systems**

Connections

A Korto cavitation monitoring system can be designed as

- an autonomous system,**
- an independent system connected to the plant network and/or the general plant monitoring system,**
- a subsystem of the general plant monitoring system.**

An example

In the following, a small multidimensional general monitoring system, incorporating cavitation, attached to a 40 MW bulb unit, is illustrated.

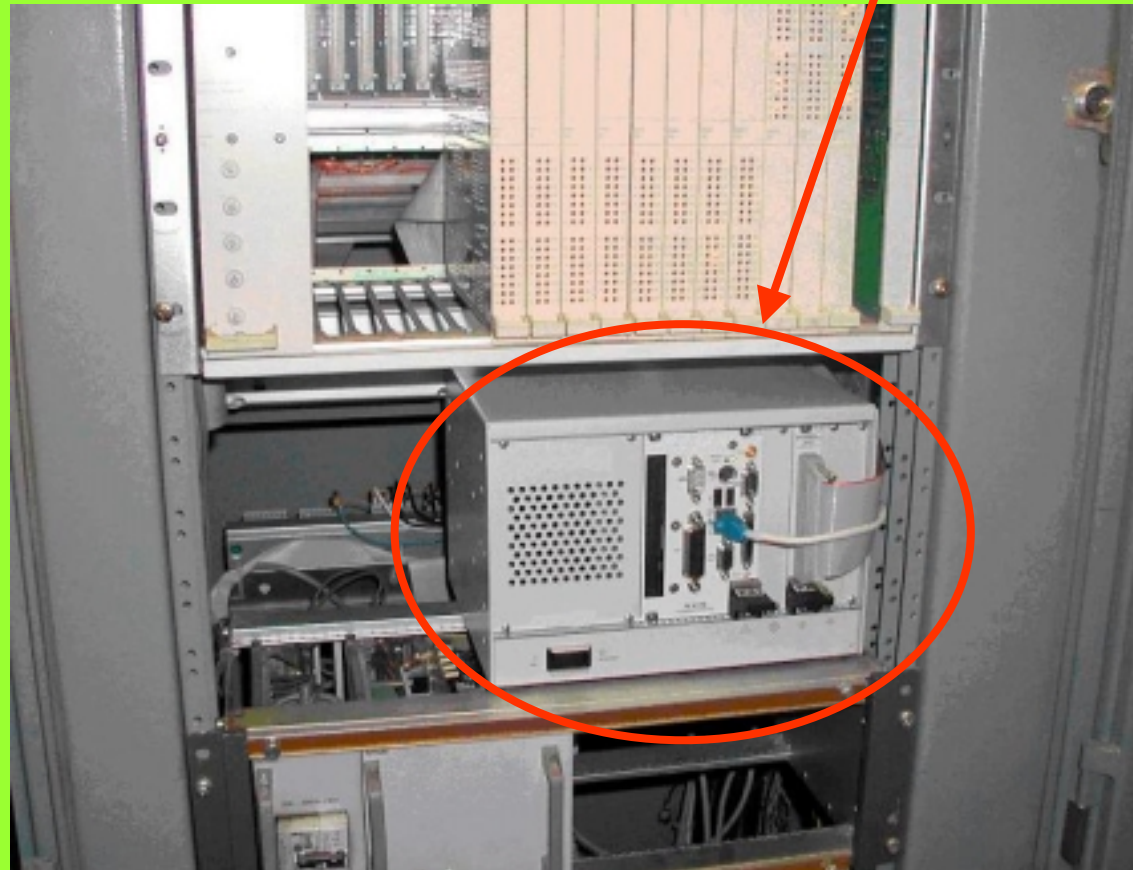
**The user has chosen the platform:
a heavy-duty PC with PXI technology,
no peripherals, man-machine interface via the
plant-chain network. Presentation: all important
data are shown in the basic window and
remaining data are shown in additional windows.**

Most signals are taken from the existing control system. Some of the added sensors, such as the cavitation sensor (above), are easily replaceable. Some of them, such as the air-gap and magnetic flux sensors (below), cannot be dismantled.

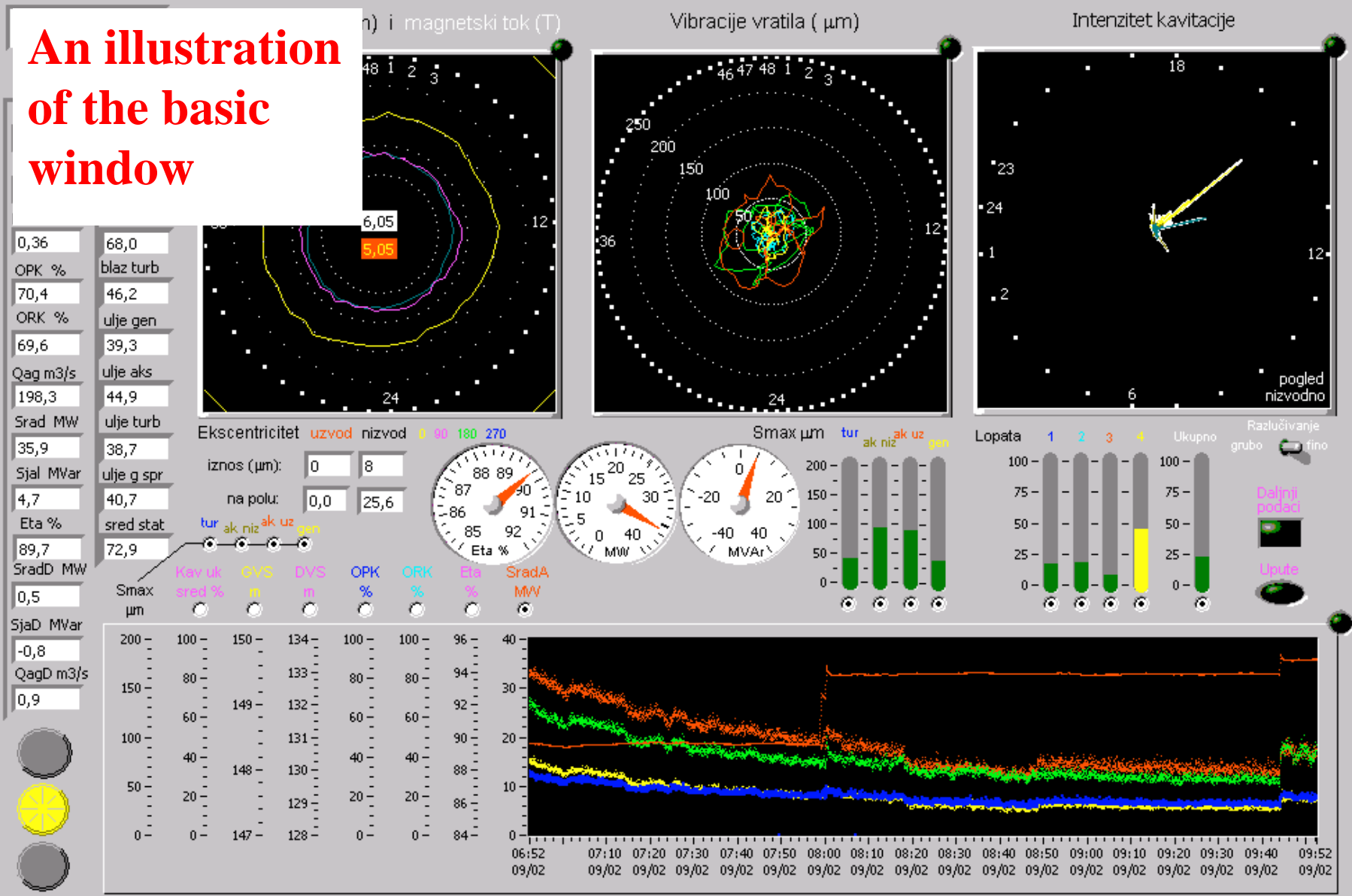


Very little space is needed for signal connections and the **controller**. The controller can be installed in a free corner of the control system or anywhere else. In the configuration chosen, it is passive, with no peripherals.

A large quantity of high-frequency cavitation data and other raw data is reduced in the controller to a small-size set of scalar and vector data published on the network; alarms are also generated here.



An illustration of the basic window



English or a local language (as is the case here) is used.

HED Ag A

Režim Temperatura

GVS m blaz gen

149,25 46,0

DVS m blaz aks uz

129,65 53,5

Pad ul r m blaz ak niz

0,36 68,0

OPK % blaz turb

70,4 46,2

ORK % ulje gen

69,6 39,3

Qag m3/s ulje aks

198,3 44,9

Srad MW ulje turb

35,9 38,7

Sjal MVar ulje g spr

4,7 40,7

Eta %

89,7

SradD MW

0,5

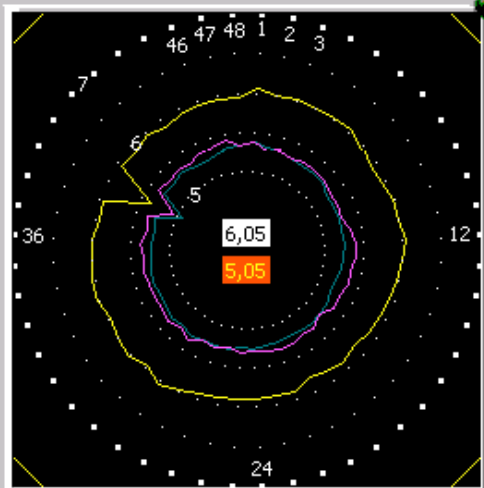
SjaD MVar

-0,8

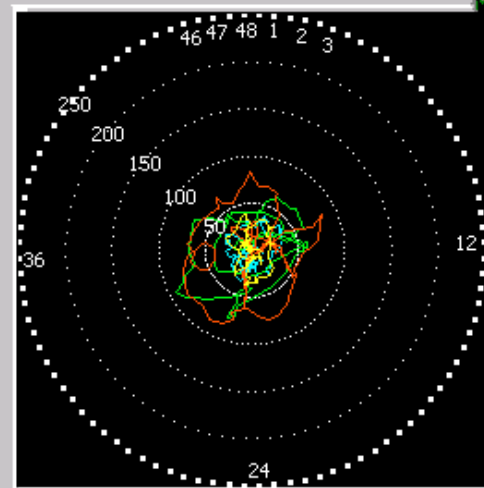
QagD m3/s

0,9

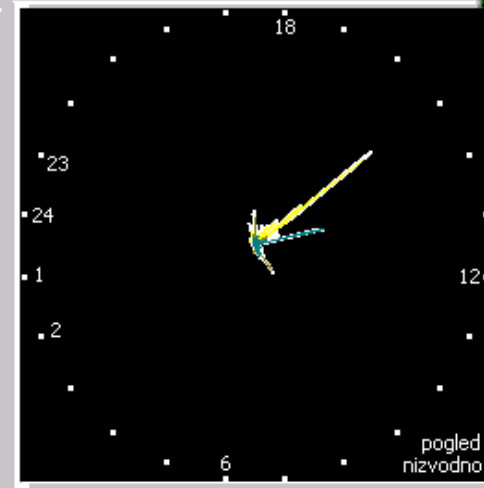
Zračni raspored (mm) i magnetski tok (T)



Vibracije vratila (µm)



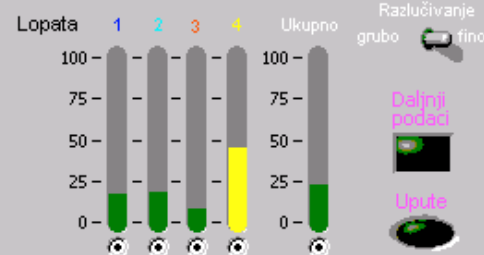
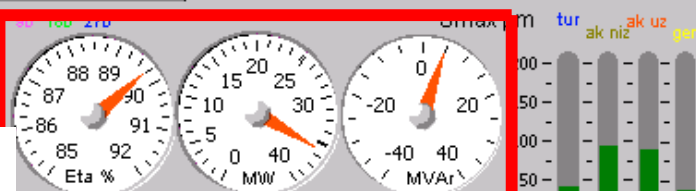
Intenzitet kavitacije



Ekscentricitet uzvod nizvod

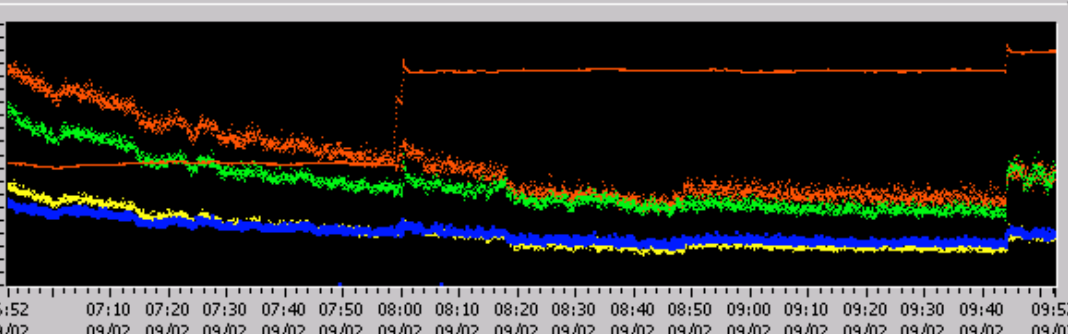
iznos (µm): 0 8

na polu: 0,0 25,6



Operation parameters

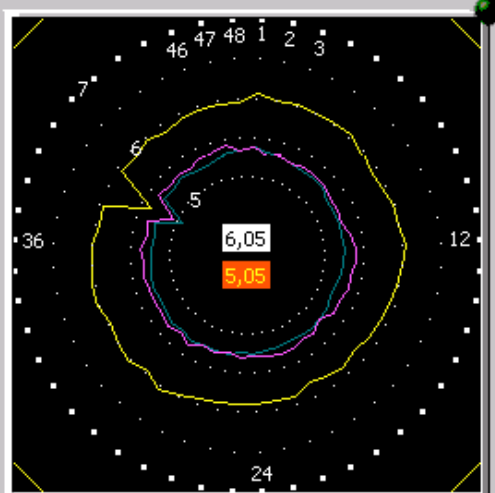
Smax µm	med %	m	m	%	%	%	MVV
200	100	150	134	100	100	96	40
150	80	133	80	80	80	94	30
100	60	149	132	60	60	92	20
50	40	148	130	40	40	88	10
0	20	129	20	20	20	86	0
0	0	147	128	0	0	84	0



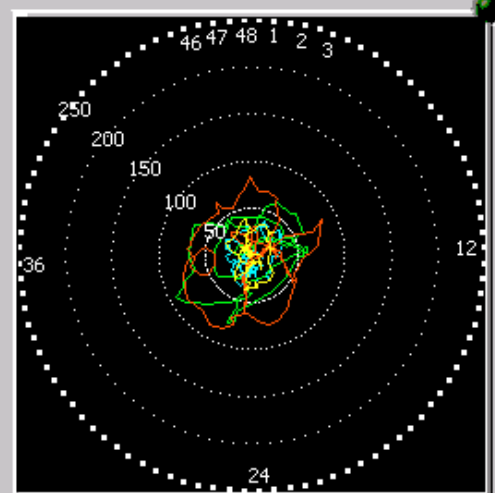
HED Ag A

Režim	Temperatura
GVS m	blaz gen
149,25	46,0
DVS m	blaz aks uz
129,65	53,5
Pad ul r m	blaz ak niz
0,36	68,0
OPK %	blaz turb
70,4	46,2
ORK %	ulje gen
69,6	39,3
Qag m3/s	ulje aks
198,3	44,9
Srad MW	ulje turb
35,9	38,7
Sjal MVar	ulje g spr
4,7	40,7
Eta %	sred stat
89,7	72,9
SradD MVar	
0,5	
SjaD MVar	
-0,8	
QagD m3/s	
0,9	

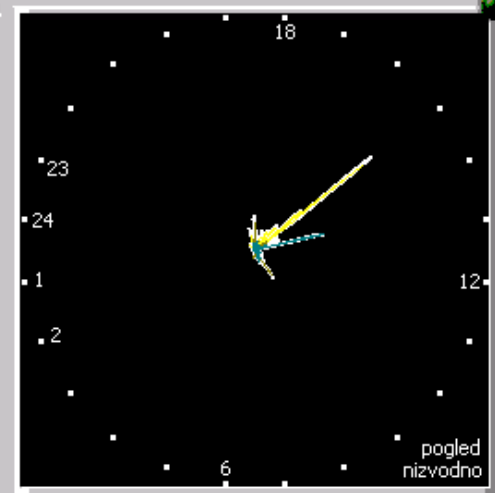
Zračni raspored (mm) i magnetski tok (T)



Vibracije vratila (µm)

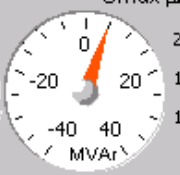
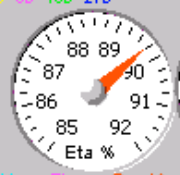


Intenzitet kavitacije

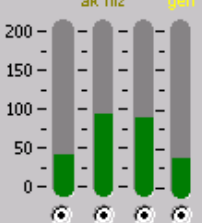


Temperatures

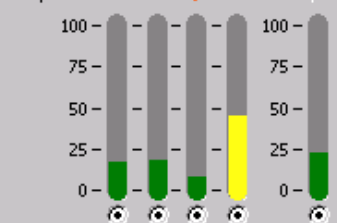
Ekscentricitet uzvod nizvod 0 90 180 270



Smax µm tur ak niz ak uz gen



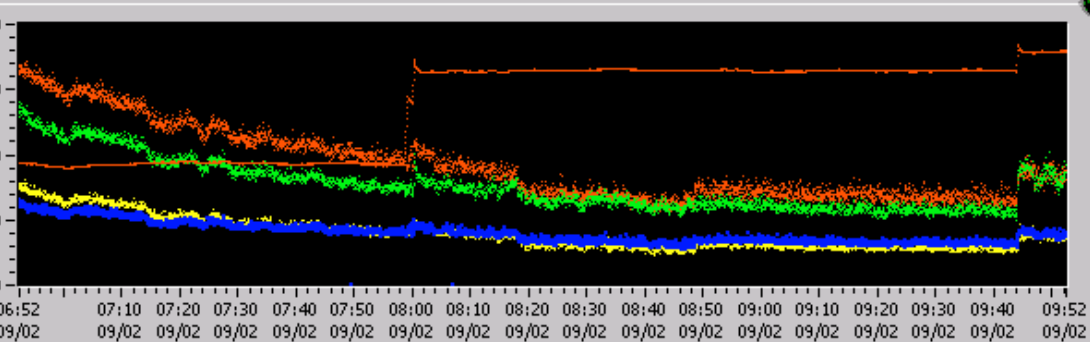
Lopata 1 2 3 4 Ukupno



Raslučivanje grubo fino



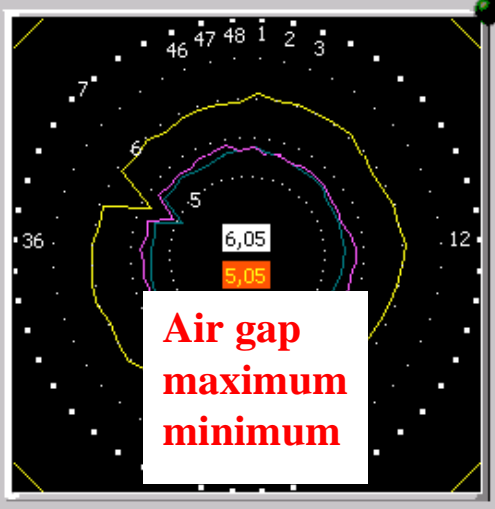
Opk	ORK	Eta	SradA
uv uk	GVS	DVS	OPK
150	134	100	100
149	132	80	80
148	130	60	60
147	128	40	40
146	126	20	20
145	124	0	0



HED Ag A

Režim	Temperatura
GVS m	blaz gen
149,25	46,0
DVS m	blaz aks uz
129,65	53,5
Pad ul r m	blaz ak niz
0,36	68,0
OPK %	blaz turb
70,4	46,2
ORK %	ulje gen
69,6	39,3
Qag m3/s	ulje aks
198,3	44,9
Srad MW	ulje turb
35,9	38,7
Sjal MVar	ulje g spr
4,7	40,7
Eta %	sred stat
89,7	72,9
SradD MW	
0,5	
SjaD MVar	
-0,8	
QagD m3/s	
0,9	

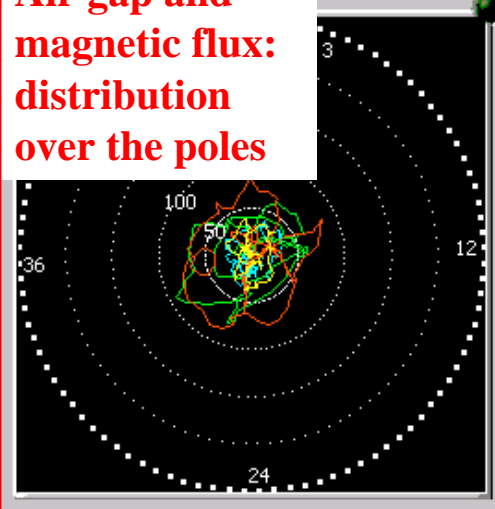
Zračni raspored (mm) i magnetski tok (T)



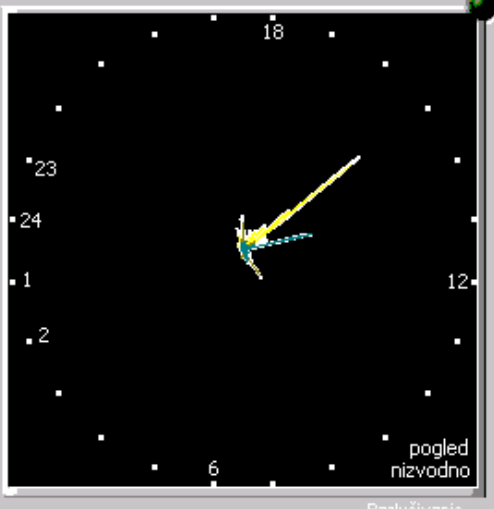
Air gap maximum minimum

Air gap and magnetic flux: distribution over the poles

Intenzitet kavitacije (μm)



Intenzitet kavitacije



Ekscenimentet - izvod nizvod - 100 - 210

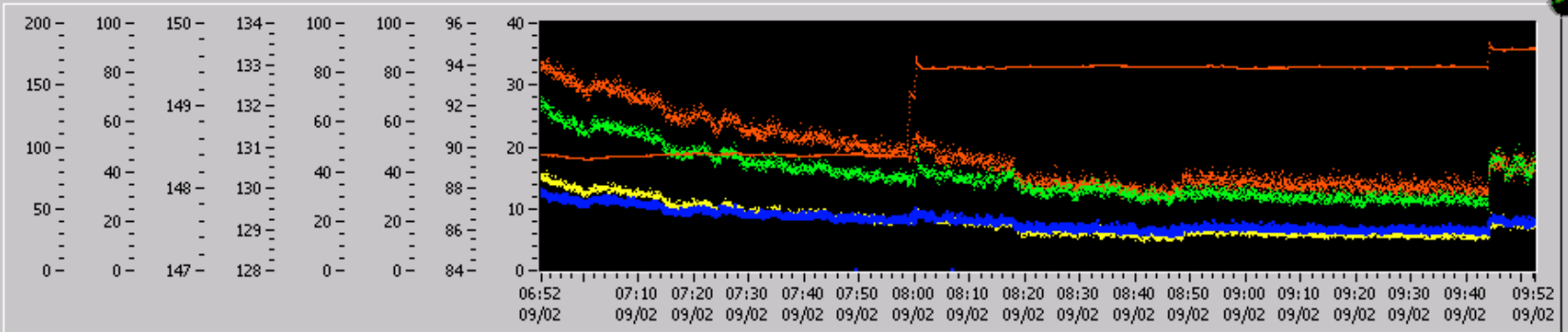
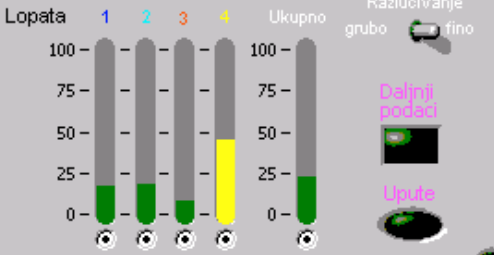
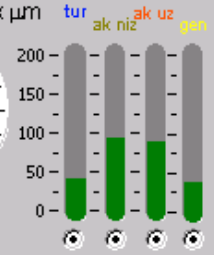
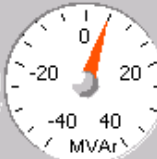
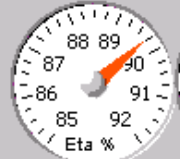
iznos (μm): 0 8

na polu: 0,0 25,6

sred stat tur ak niz ak uz gen

Kav uk sred % GVS m DVS m OPK % ORK % Eta % SradA MW

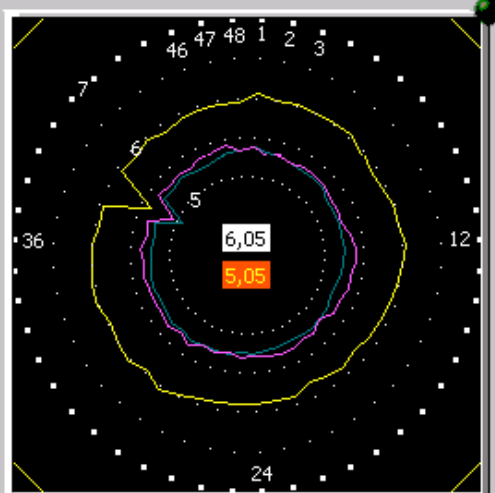
Smax μm



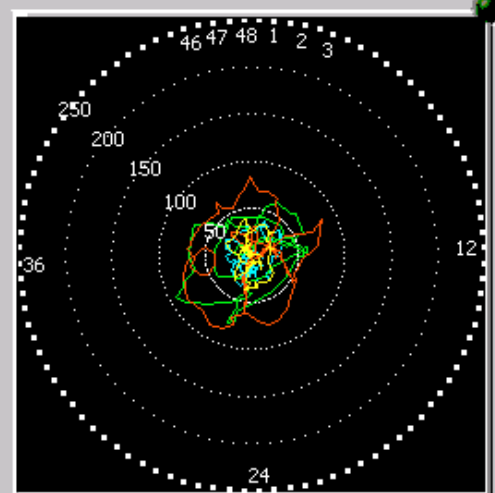
HED Ag A

Režim	Temperatura
GVS m	blaz gen
149,25	46,0
DVS m	blaz aks uz
129,65	53,5
Pad ul r m	blaz ak niz
0,36	68,0
OPK %	blaz turb
70,4	46,2
ORK %	ulje gen
69,6	39,3
Qag m3/s	ulje aks
198,3	44,9
Srad MW	ulje turb
35,9	38,7
Sjal MVar	ulje g spr
4,7	40,7
Eta %	sred stat
89,7	72,9
SradD MW	
0,5	Smax μ m
SjaD MVar	
-0,8	
QagD m3/s	
0,9	

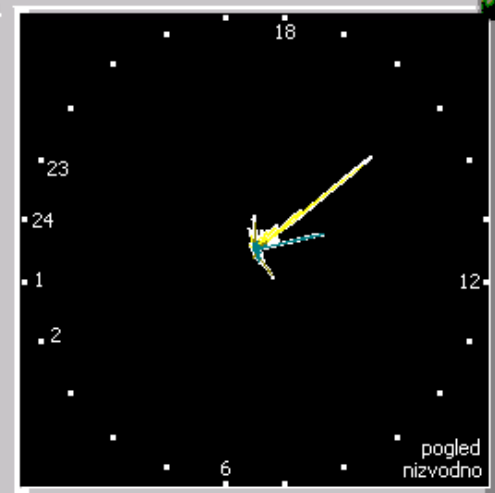
Zračni raspored (mm) i magnetski tok (T)



Vibracije vratila (μ m)



Intenzitet kavitacije

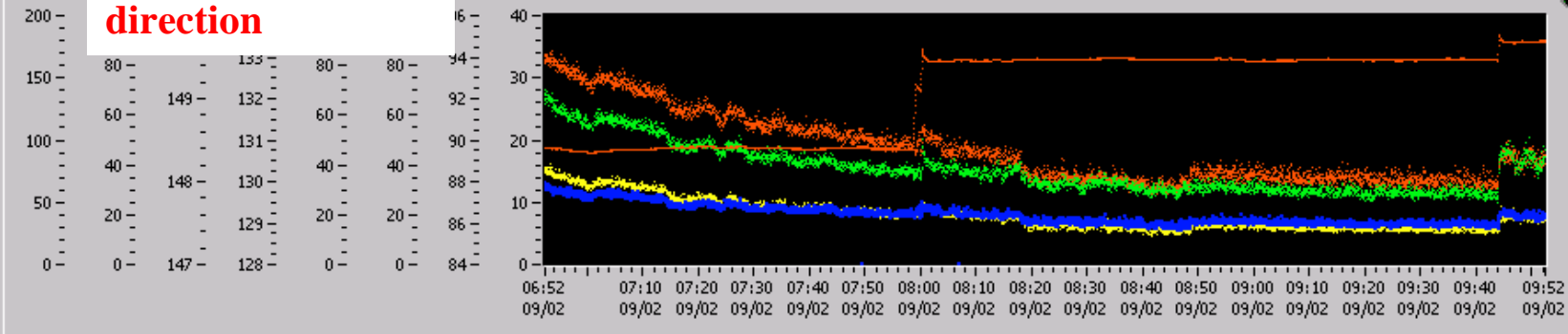
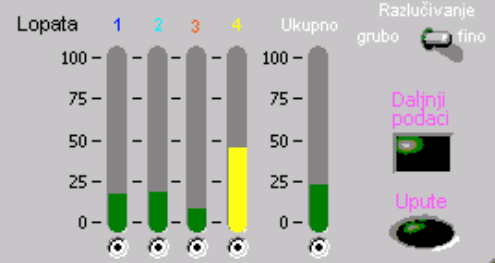
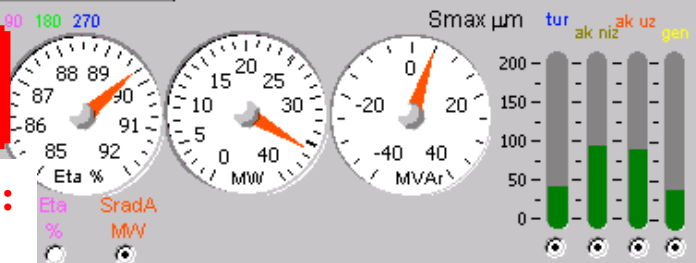


Ekscentricitet *uzvod* *nizvod* 1 30 180 270

iznos (μ m):

na polu:

Rotor eccentricity: magnitude and direction



HED Ag A

Režim Temperatura

GVS m blaz gen
149,26 46,0

DVS m blaz aks uz
129,69 53,5

Pad ul r m blaz ak niz
0,36 68,0

OPK % blaz l
70,3 46,2

ORK % ulje i
68,9 39,3

Qag m3/s ulje i
196,4 44,5

Srad MW ulje
35,5 38,7

Sjal MVar ulje g spr
4,7 40,7

Eta % sred stat
89,9 72,9

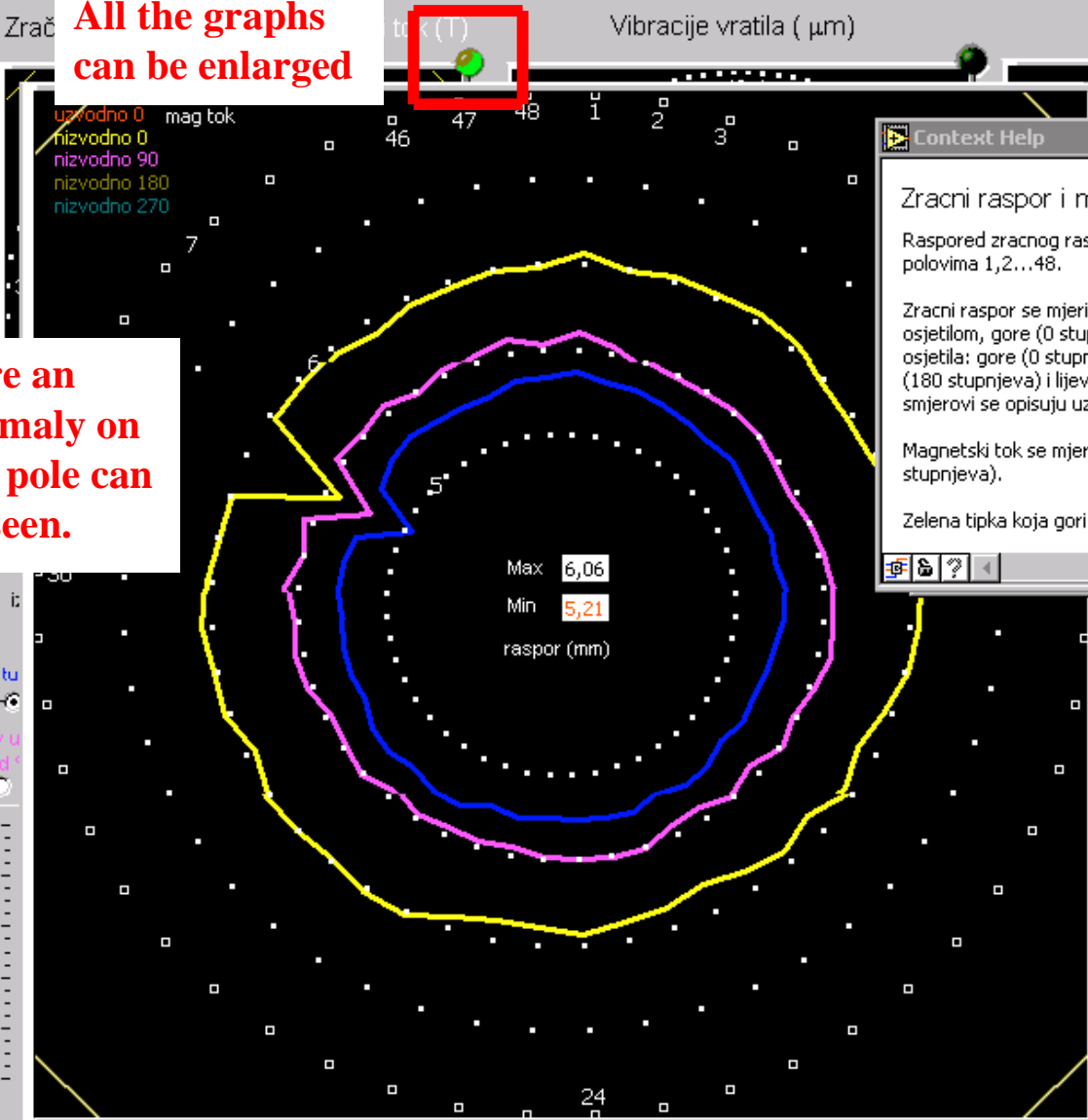
SradD MW Smax
0,5 μm

SjaD MVar
-0,8

QagD m3/s
0,8

Here an anomaly on one pole can be seen.

All the graphs can be enlarged



Context Help

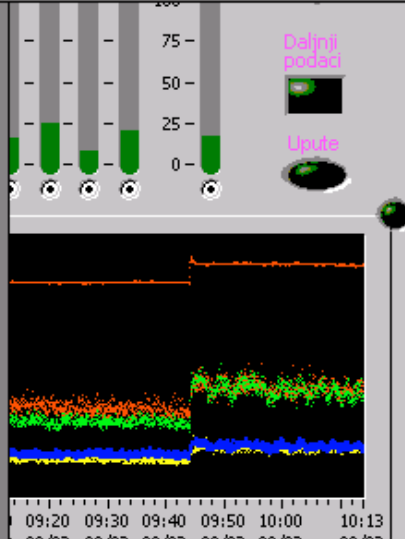
Zracni raspor i magnetski tok u njemu

Raspored zracnog raspora i magnetskog toka u rasporu po polovima 1,2...48.

Zracni raspor se mjeri na uzvodnoj strani generatora jednim osjetilom, gore (0 stupnjeva), te nizvodno pomocu 4 osjetila: gore (0 stupnjeva), desno (90 stupnjeva), dolje (180 stupnjeva) i lijevo (270 stupnjeva). Ovdje i drugdje smjerovi se opisuju uz pogled nizvodno.

Magnetski tok se mjeri jednim osjetilom nizvodno, gore (0 stupnjeva).

Zelena tipka koja gori gore smanjuje graf.



HED Ag A

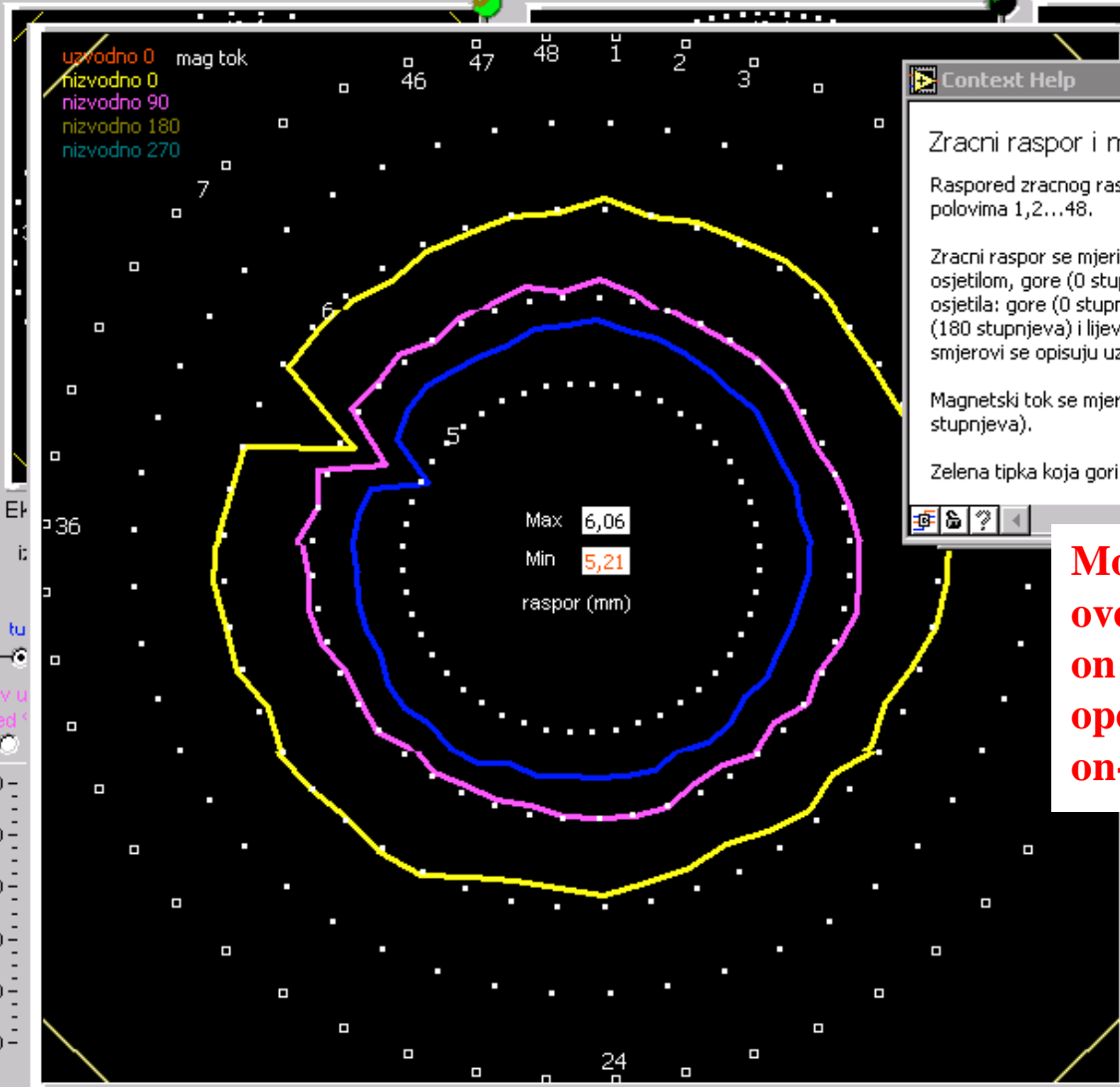
Zračni raspor (mm) i magnetski tok (T)

Vibracije vratila (μm)

Intenzitet kavitacije

Režim Temperatura

GVS m	blaz gen
149,26	46,0
DVS m	blaz aks uz
129,69	53,5
Pad ul r m	blaz ak niz
0,36	68,0
OPK %	blaz turb
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ORK %	ulje gen
68,9	39,3
Qag m3/s	ulje aks
196,4	44,9
Srad MW	ulje turb
35,5	38,7
Sjal MVar	ulje g spr
4,7	40,7
Eta %	sred stat
89,9	72,9
SradD MW	Smax μm
0,5	100
SjaD MVar	200
-0,8	150
QagD m3/s	100
0,8	50
	20
	10
	0



Context Help

Zracni raspor i magnetski tok u njemu

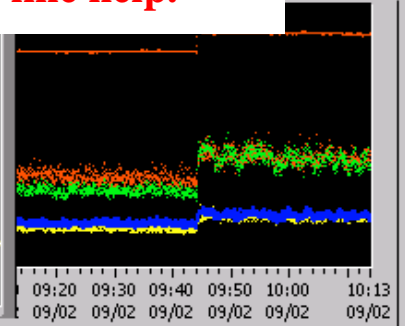
Raspored zracnog raspora i magnetskog toka u rasporu po polovima 1,2...48.

Zracni raspor se mjeri na uzvodnoj strani generatora jednim osjetilom, gore (0 stupnjeva), te nizvodno pomocu 4 osjetila: gore (0 stupnjeva), desno (90 stupnjeva), dolje (180 stupnjeva) i lijevo (270 stupnjeva). Ovdje i drugdje smjerovi se opisuju uz pogled nizvodno.

Magnetski tok se mjeri jednim osjetilom nizvodno, gore (0 stupnjeva).

Zelena tipka koja gori gore smanjuje graf.

Mouse cursor over an element on the screen opens the related on-line help.



Daljnji podaci



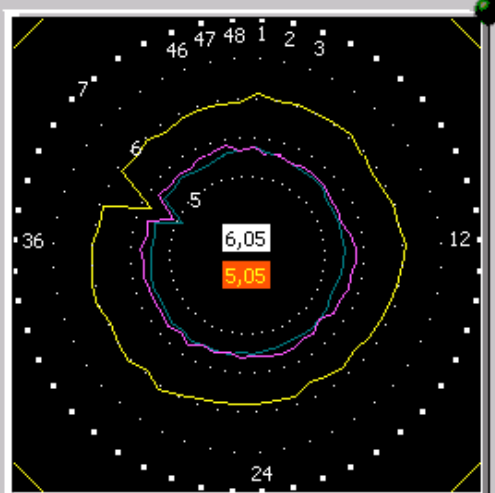
Upute



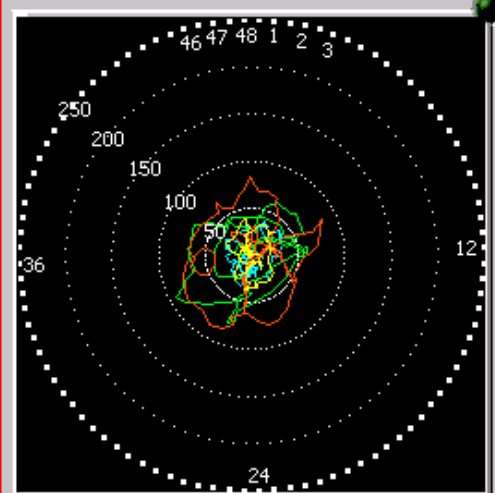
HED Ag A

Režim	Temperatura
GVS m	blaz gen
149,25	46,0
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89,7	72,9
Srad MW	
0,5	
SjaD MVar	
-0,8	
QagD m3/s	
0,9	

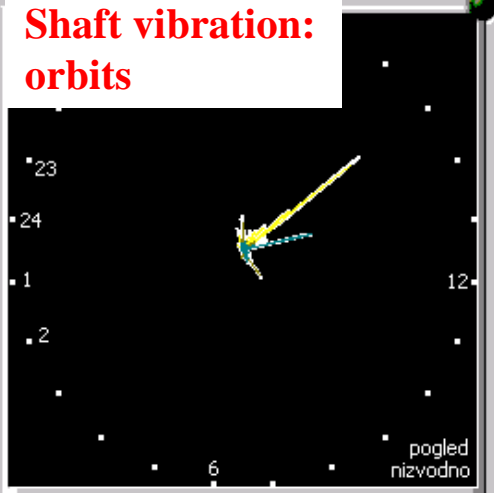
Zračni raspored (mm) i magnetski tok (T)



Vibracije vratila (µm)



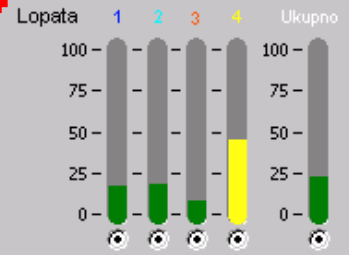
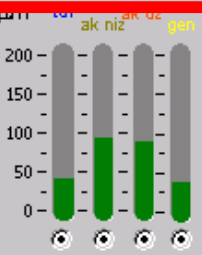
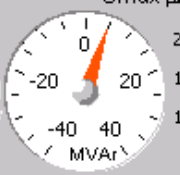
Intenzitet kavitacije



Shaft vibration: orbits

Ekscentricitet uzvod nizvod 0 90 180 270

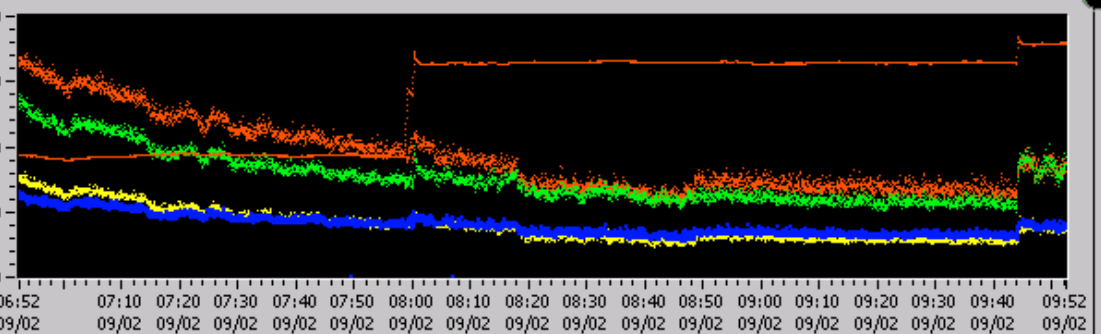
iznos (µm): 0 8
na polu: 0,0 25,6



Raslučivanje grubo fino



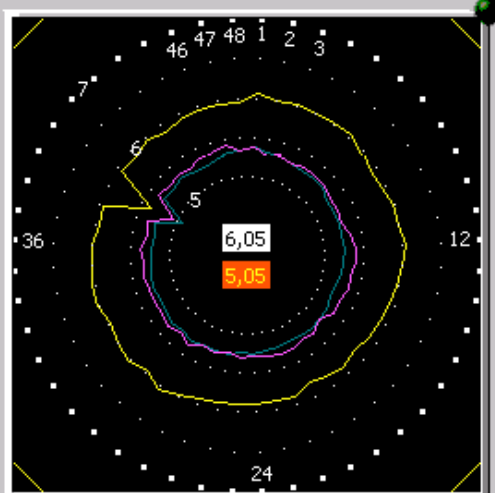
Smax µm	Kav uk sred %	GVS m	DVS m	OPK %	ORK %	Eta %	SradA MW
200	100	150	134	100	100	96	40
150	80	133	132	80	80	94	30
100	60	149	131	60	60	92	20
50	40	148	130	40	40	88	10
0	20	129	128	20	20	86	0



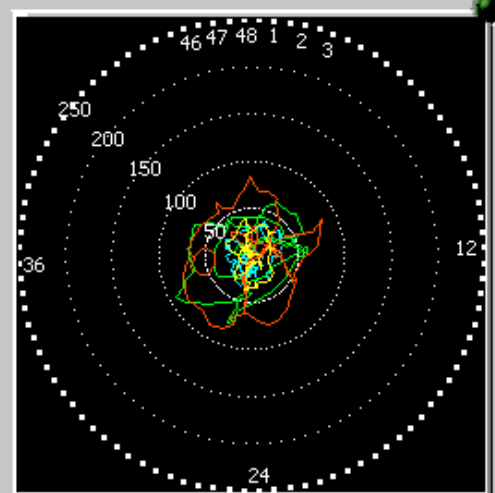
HED Ag A

Režim	Temperatura
GVS m	blaz gen
149,25	46,0
DVS m	blaz aks uz
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4,7	40,7
Eta %	sred stat
89,7	72,9
SradD MW	
0,5	
SjaD MVar	
-0,8	
QagD m3/s	
0,9	

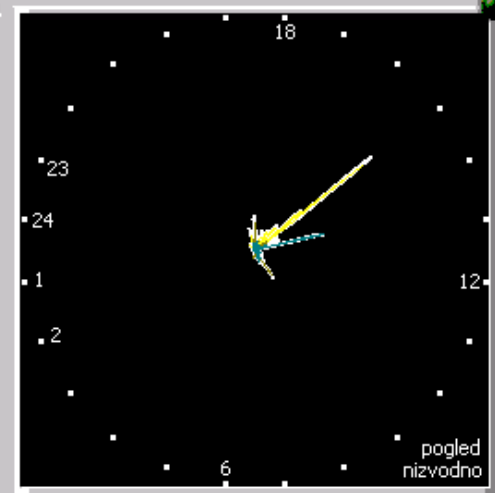
Zračni raspored (mm) i magnetski tok (T)



Vibracije vratila (µm)



Intenzitet kavitacije

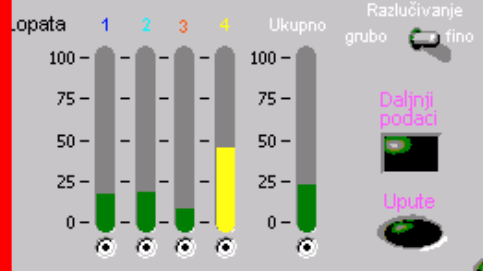
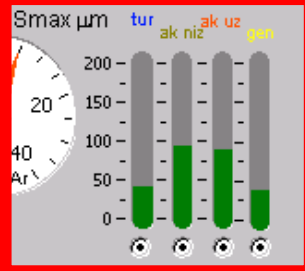


Ekscentricitet uzvod nizvod 0 90 180 270

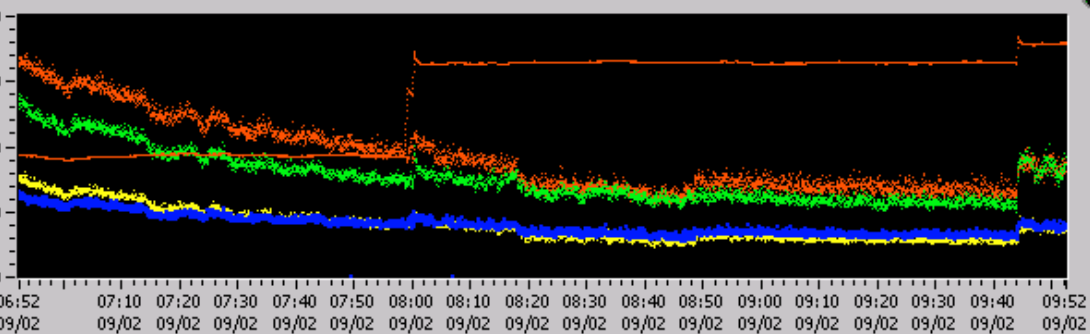
iznos (µm): 0 8
na polu: 0,0 25,6



Shaft vibration: amplitudes



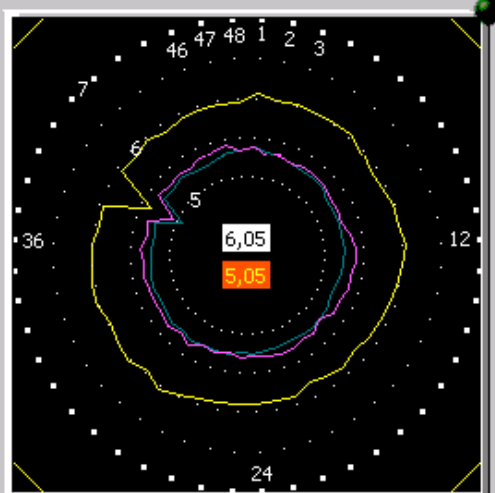
Kav uk	GVS	DVS	OPK	ORK	Eta	MVV
149	129	129	70	69	89	0,5
148	129	129	70	69	89	0,5
147	129	129	70	69	89	0,5



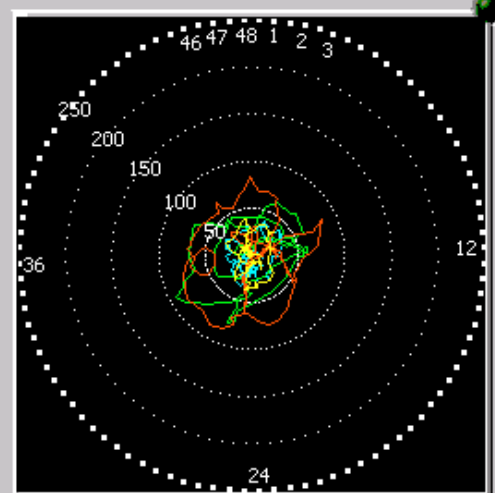
HED Ag A

Režim	Temperatura
GVS m	blaz gen
149,25	46,0
DVS m	blaz aks uz
129,65	53,5
Pad ul r m	blaz ak niz
0,36	68,0
OPK %	blaz turb
70,4	46,2
ORK %	ulje gen
69,6	39,3
Qag m3/s	ulje aks
198,3	44,9
Srad MW	ulje turb
35,9	38,7
Sjal MVar	ulje g spr
4,7	40,7
Eta %	sred stat
89,7	72,9
Srad MW	
0,5	
Sjad MVar	
-0,8	
QagD m3/s	
0,9	

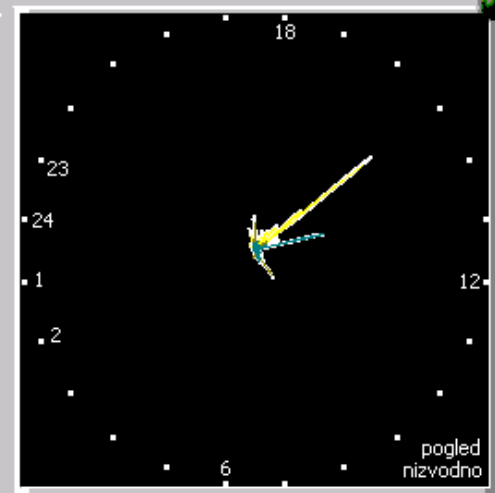
Zračni raspored (mm) i magnetski tok (T)



Vibracije vratila (µm)



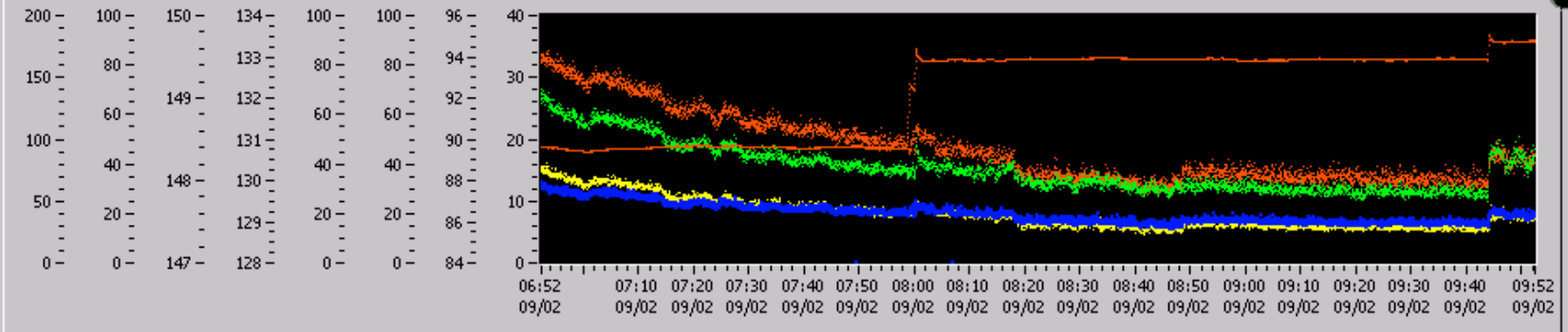
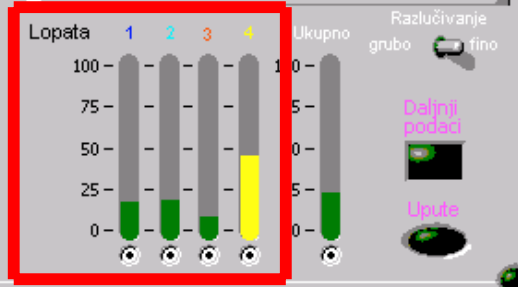
Intenzitet kavitacije



Ekscentricitet uzvod nizvod 0 90 180 270

iznos (µm): 0 8
na polu: 0,0 25,6

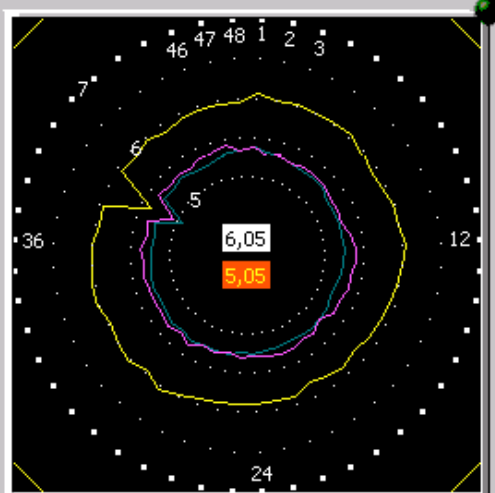
Mean total intensity of cavitation at each of the runner blades



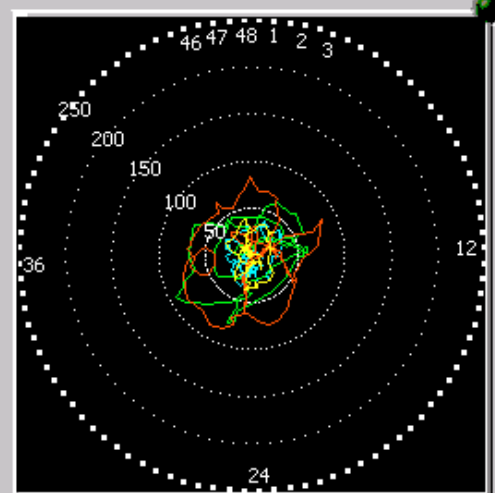
HED Ag A

Režim	Temperatura
GVS m	blaz gen
149,25	46,0
DVS m	blaz aks uz
129,65	53,5
Pad ul r m	blaz ak niz
0,36	68,0
OPK %	blaz turb
70,4	46,2
ORK %	ulje gen
69,6	39,3
Qag m3/s	ulje aks
198,3	44,9
Srad MW	ulje turb
35,9	38,7
Sjal MVar	ulje g spr
4,7	40,7
Eta %	sred stat
89,7	72,9
SradD MW	
0,5	
SjaD MVar	
-0,8	
QagD m3/s	
0,9	

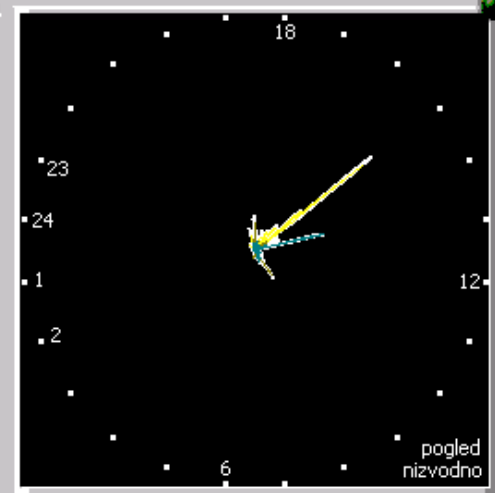
Zračni raspored (mm) i magnetski tok (T)



Vibracije vratila (µm)

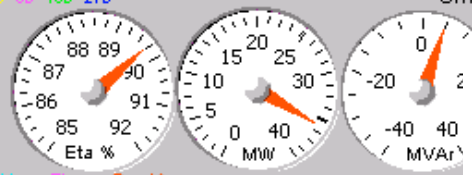


Intenzitet kavitacije

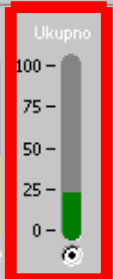


Ekscentricitet uzvod nizvod 0 90 180 270

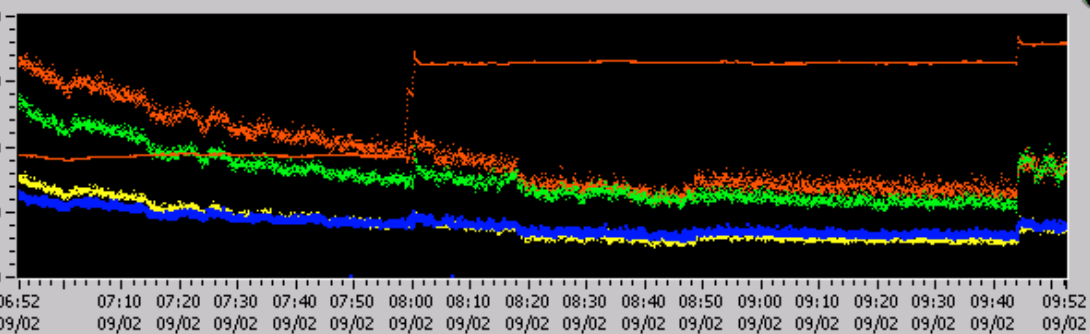
iznos (µm): 0 8
na polu: 0,0 25,6



Mean total intensity of cavitation in the turbine



Smax µm	Kav uk sred %	GVS m	DVS m	OPK %	ORK %	Eta %	SradA MW
200	100	150	134	100	100	96	40
150	80	133	132	80	80	94	30
100	60	149	132	60	60	92	20
50	40	148	131	40	40	90	10
0	20	148	130	20	20	88	0
	0	147	129	0	0	86	
		147	128	0	0	84	



HED Ag A

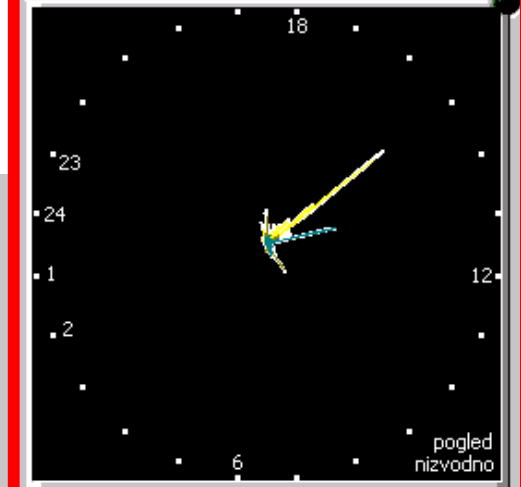
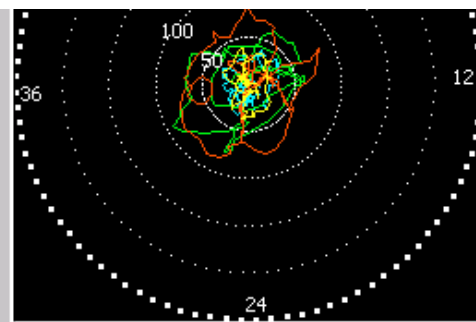
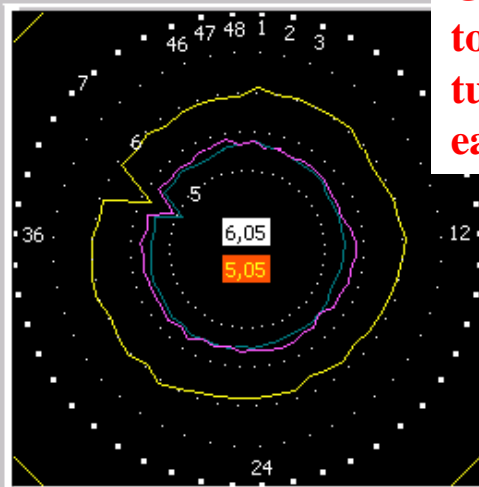
Zračni raspored (mm) i magnetski tok

Guide-vane influence on the total mean intensity in the turbine and such intensity at each of the runner blades

Intenzitet kavitacije

Režim Temperatura

GVS m	blaz gen
149,25	46,0
DVS m	blaz aks uz
129,65	53,5
Pad ul r m	blaz ak niz
0,36	68,0
OPK %	blaz turb
70,4	46,2
ORK %	ulje gen
69,6	39,3
Qag m3/s	ulje aks
198,3	44,9
Srad MW	ulje turb
35,9	38,7
Sjal MVar	ulje g spr
4,7	40,7
Eta %	sred stat
89,7	72,9
SradD MW	
0,5	
Sjad MVar	



Ekscentricitet uzvod nizvod 0 90 180 270

iznos (µm): 0 8

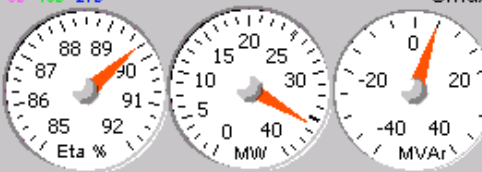
na polu: 0,0 25,6

tur ak niz ak uz gen

Kav uk sred % GVS m DVS m OPK % ORK % Eta % SradA MW

Smax µm

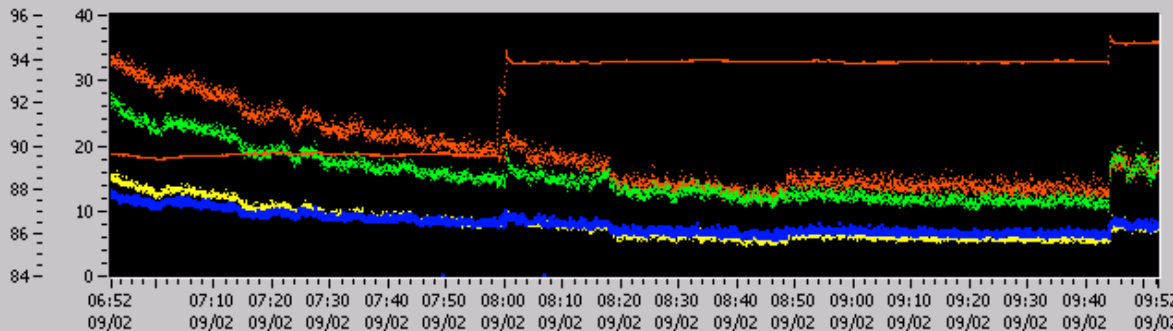
200 - 100 - 150 - 134 - 100 - 100



Selection of the resolution grade



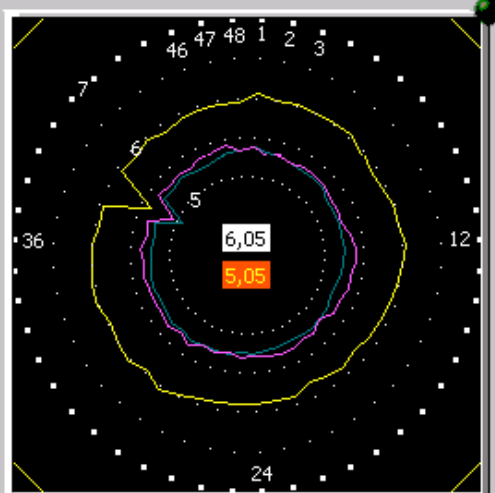
Cavitation intensity over the operation parameters and accumulated erosion are shown in additional windows



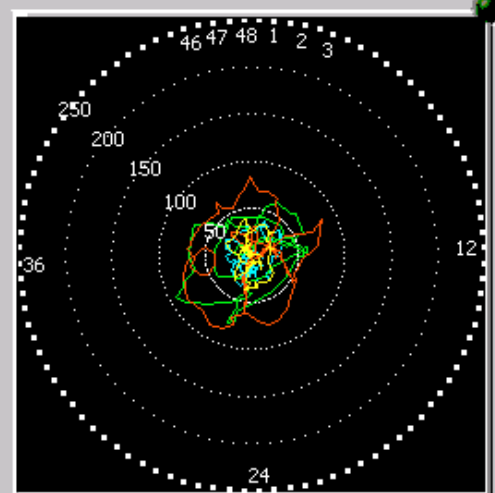
HED Ag A

Režim	Temperatura
GVS m	blaz gen
149,25	46,0
DVS m	blaz aks uz
129,65	53,5
Pad ul r m	blaz ak niz
0,36	68,0
OPK %	blaz turb
70,4	46,2
ORK %	ulje gen
69,6	39,3
Qag m3/s	ulje aks
198,3	44,9
Srad MW	ulje turb
35,9	38,7
Sjal MVar	ulje g spr
4,7	40,7
Eta %	sred stat
89,7	72,9
SradD MW	
0,5	
SjaD MVar	
-0,8	
QagD m3/s	
0,9	

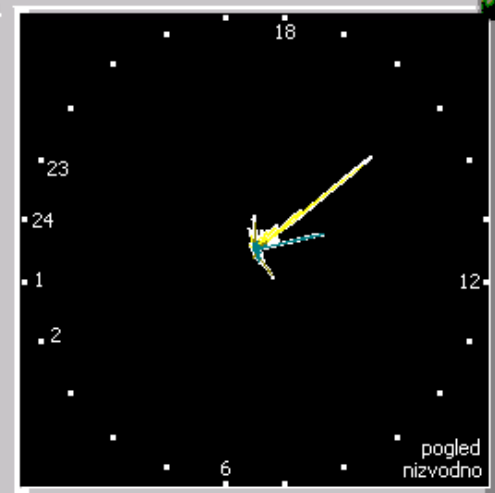
Zračni raspored (mm) i magnetski tok (T)



Vibracije vratila (µm)



Intenzitet kavitacije

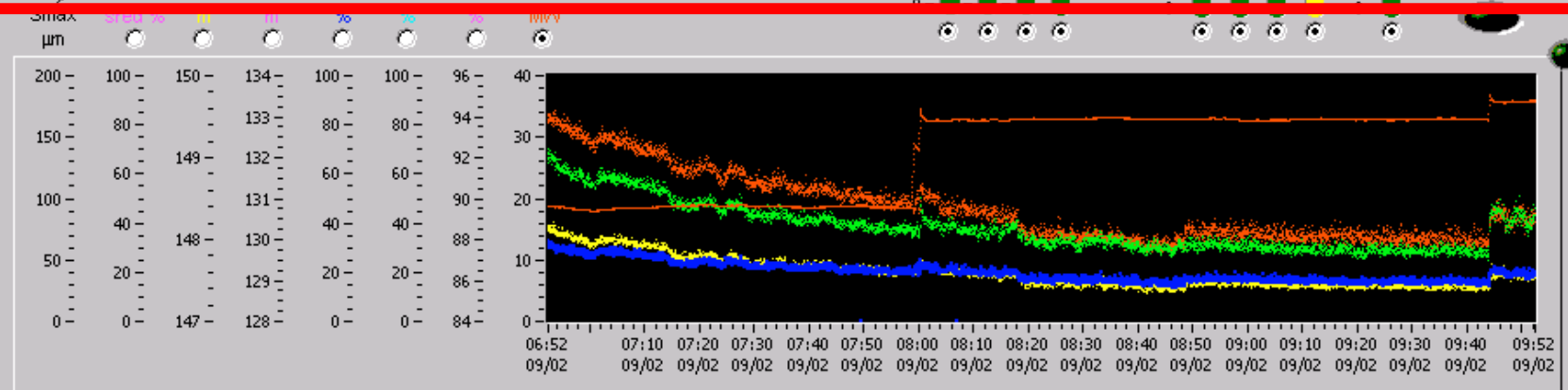


Ekscentricitet uzvod nizvod 0 90 180 270

iznos (µm): 0 8
na polu: 0,0 25,6



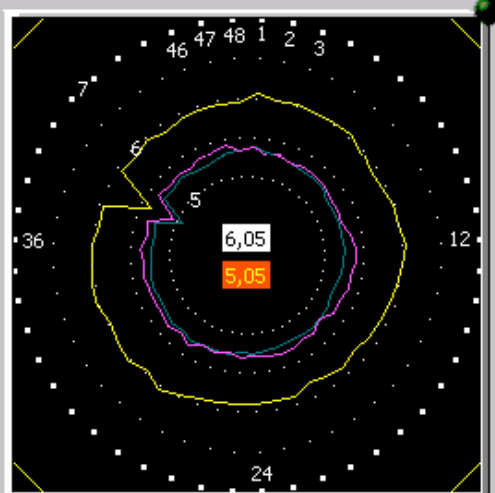
Time log of selected quantities over a time period of a selectable length



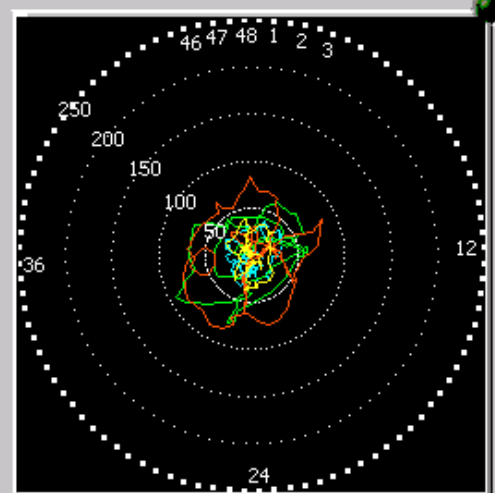
HED Ag A

Režim	Temperatura
GVS m	blaz gen
149,25	46,0
DVS m	blaz aks uz
129,65	53,5
Pad ul r m	blaz ak niz
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OPK %	blaz turb
70,4	46,2
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Qag m3/s	ulje aks
198,3	44,9
Srad MW	ulje turb
35,9	38,7
Sjal MVar	ulje g spr
4,7	40,7
Eta %	sred stat
89,7	72,9
SradD MW	Smax μ m
0,5	
SjaD MVar	
-0,8	
QagD m3/s	
0,9	

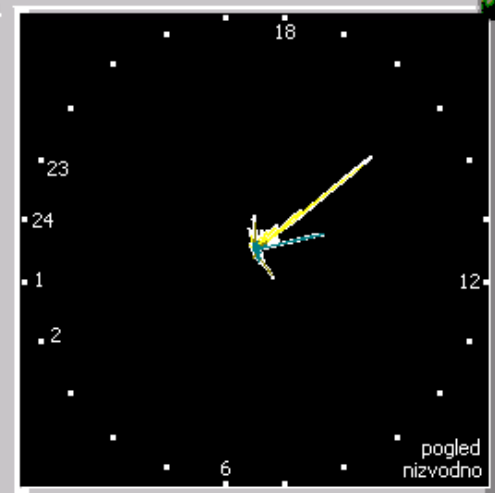
Zračni raspored (mm) i magnetski tok (T)



Vibracije vratila (μ m)



Intenzitet kavitacije



Ekscentricitet uzvod nizvod 0 90 180 270

Smax μ m tur ak niz ak uz gen

Lopata 1 2 3 4 Ukupno Raslučivanje grubo fino

iznos (μ m): 0 8

na polu: 0,0 25,6

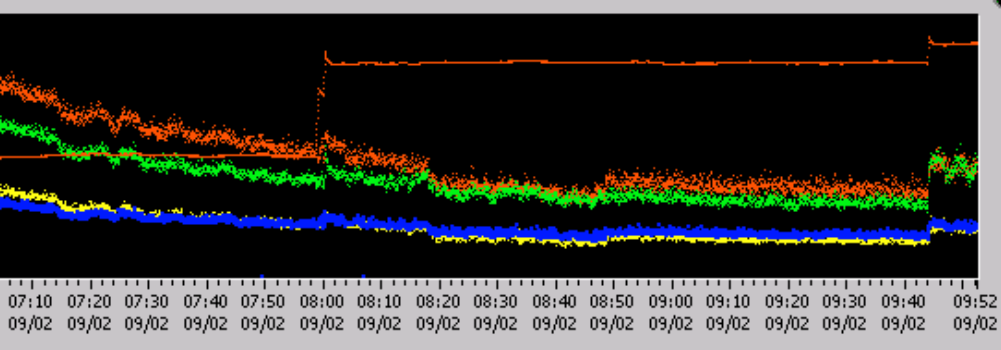
Selection of the curves to be shown on a respective graph

tur ak niz ak uz gen

sv uk GVS DVS OPK ORK Eta SradA

ed % m m % % % MW

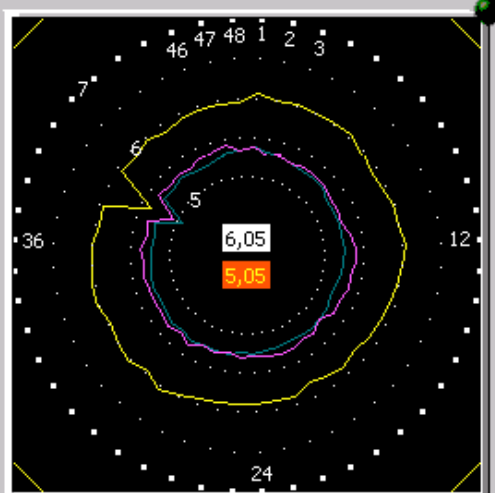
	sv uk	GVS	DVS	OPK	ORK	Eta	SradA
154	133	132	131	130	129	128	
149	132	131	130	129	128		
148	130	129	128				
147	128						



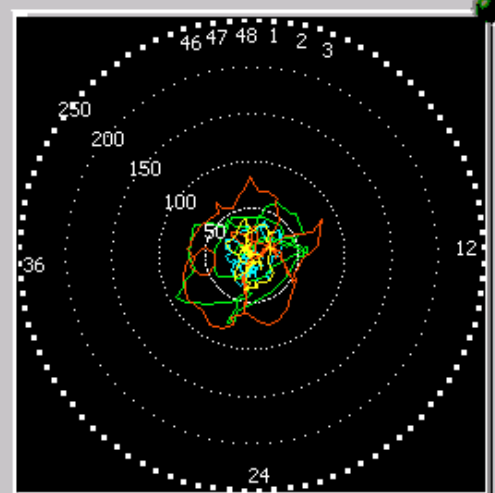
HED Ag A

Režim	Temperatura
GVS m	blaz gen
149,25	46,0
DVS m	blaz aks uz
129,65	53,5
Pad ul r m	blaz ak niz
0,36	68,0
OPK %	blaz turb
70,4	46,2
ORK %	ulje gen
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Qag m3/s	ulje aks
198,3	44,9
Srad MW	ulje turb
35,9	38,7
Sjal MVar	ulje g spr
4,7	40,7
Eta %	sred stat
89,7	72,9
SradD MW	
0,5	
SjaD MVar	
-0,8	
QagD m3/s	
0,9	

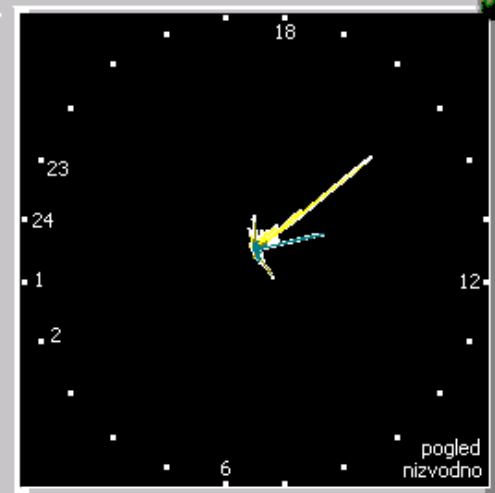
Zračni raspored (mm) i magnetski tok (T)



Vibracije vratila (µm)

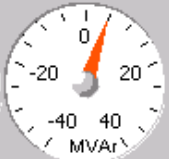
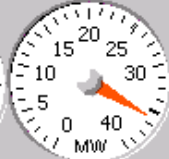
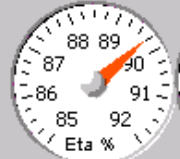


Intenzitet kavitacije

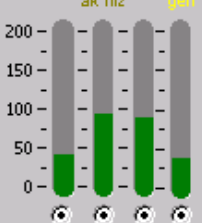


Ekscentricitet uzvod nizvod 0 30 180 270

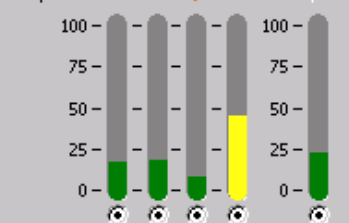
iznos (µm): 0 8
na polu: 0,0 25,6



Smax µm tur ak niz ak uz gen



Lopata 1 2 3 4 Ukupno

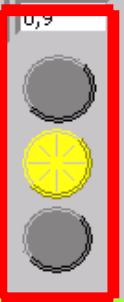
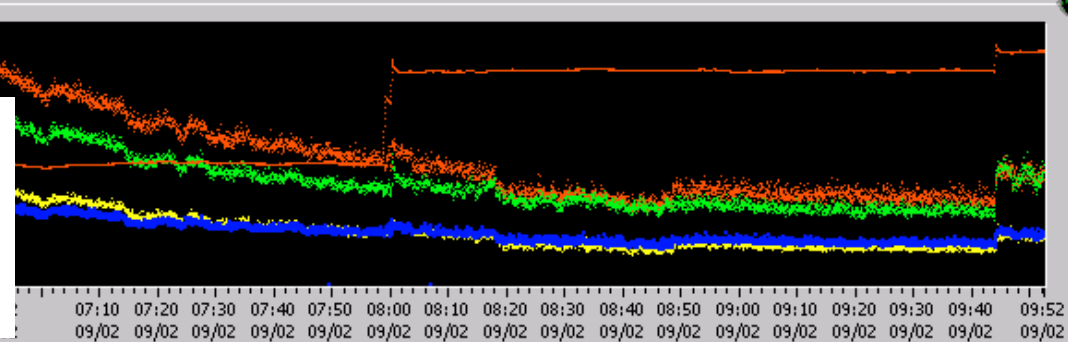


Raslučivanje grubo fino



Kav uk	GVS	DVS	OPK	ORK	Eta	SradA
sred %	m	m	%	%	%	MW
150	134	100	100	96	40	
80	133	80	80	94	30	

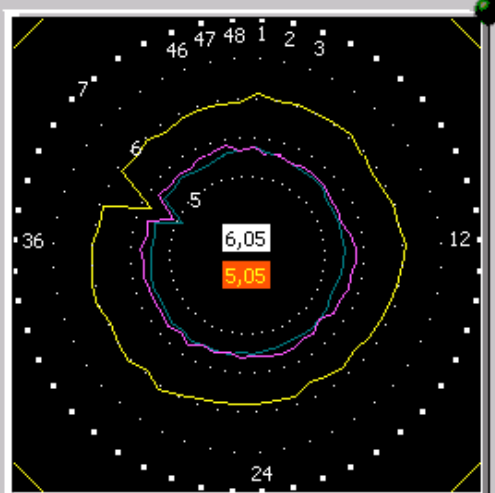
Alarm in three colours; the display of the quantity which caused the alarm changes colour and flashes.



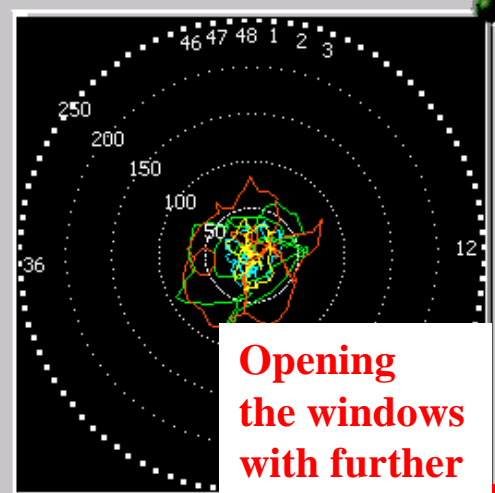
HED Ag A

Režim	Temperatura
GVS m	blaz gen
149,25	46,0
DVS m	blaz aks uz
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Sjal MVar	ulje g spr
4,7	40,7
Eta %	sred stat
89,7	72,9
SradD MW	
0,5	
SjaD MVar	
-0,8	
QagD m3/s	
0,9	

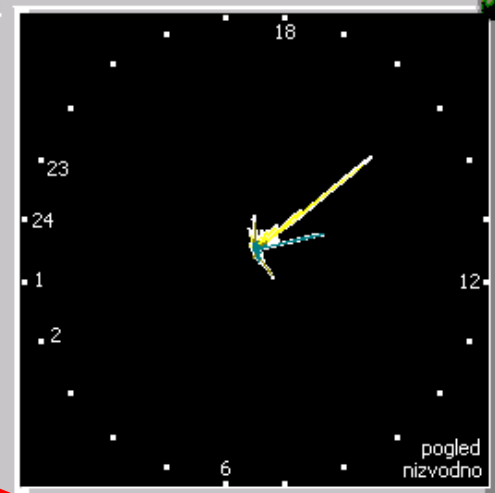
Zračni raspored (mm) i magnetski tok (T)



Vibracije vratila (µm)



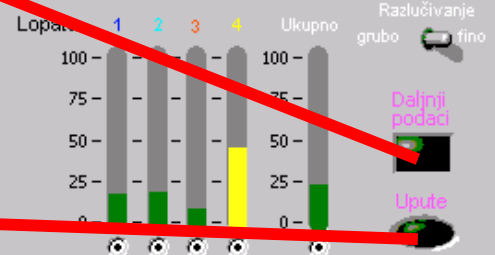
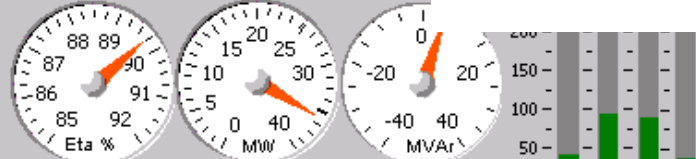
Intenzitet kavitacije



Opening the windows with further data

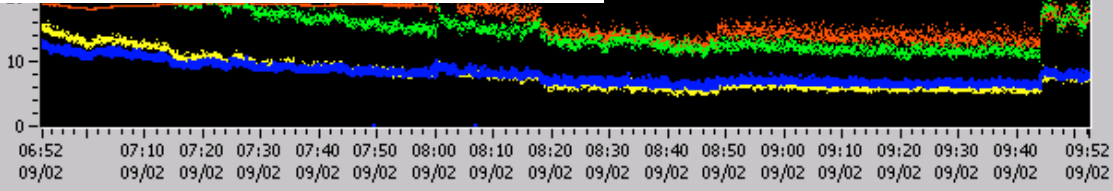
Ekscentricitet uzvod nizvod 0 90 180 270

iznos (µm): 0 8
na polu: 0,0 25,6

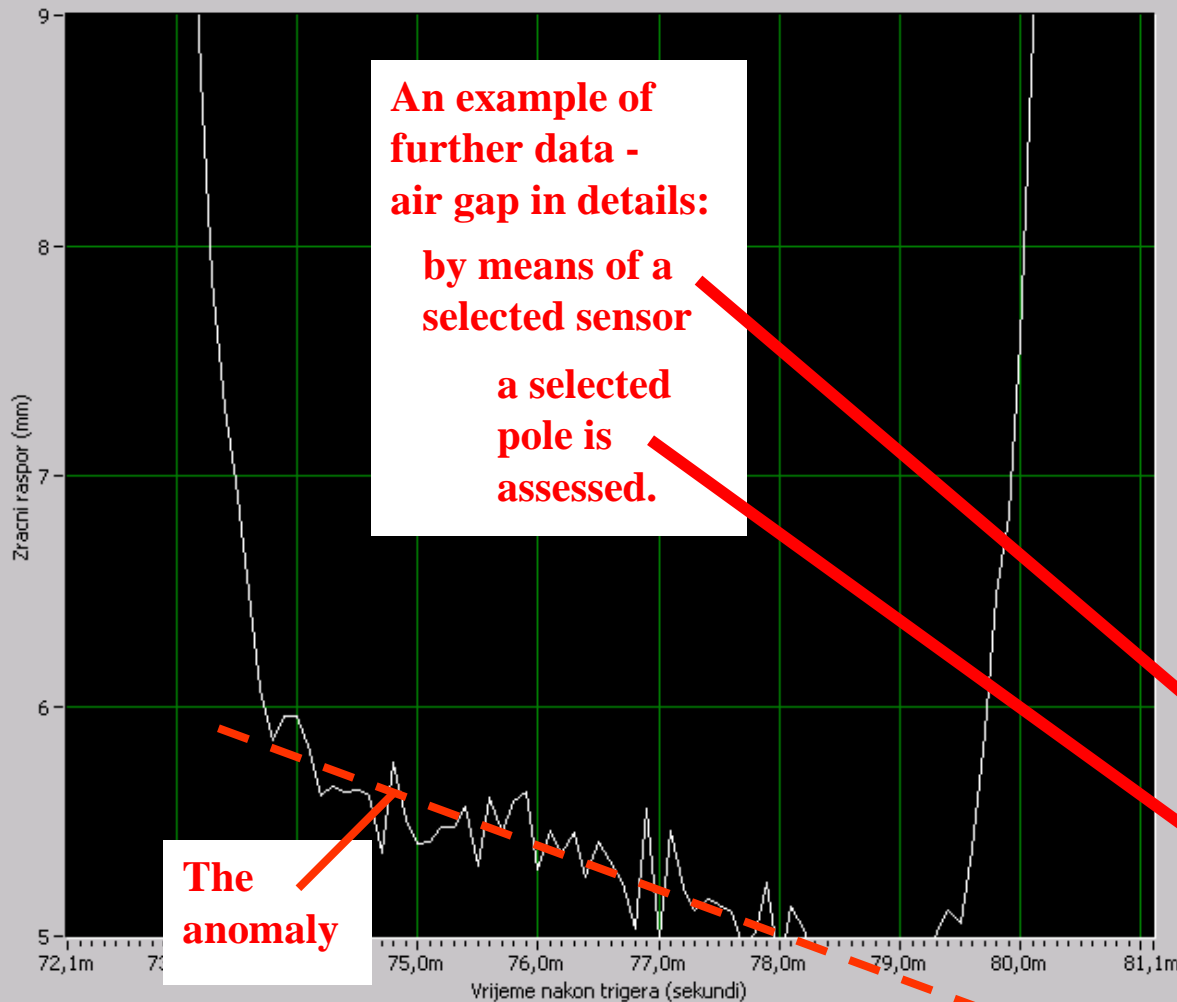


Instructions for the operators: everything is organised in an intuitive way - no reading of manuals is necessary.

Smax µm	Kav uk sred %	GVS m	DVS m	OPK %	ORK %	Eta %
200	100	150	134	100	100	96
150	80		133	80	80	94
100	60	149	132	60	60	92
60	40	148	131	40	40	90
40	20	148	130	20	20	88
20	0	148	129	0	0	86
0	0	147	128	0	0	84



Detaljni raspored zracnog raspora iznad odabranog pola, mjereno odabranim osjetilom



An example of further data - air gap in details: by means of a selected sensor a selected pole is assessed.

The anomaly

- DALJNI PODACI
- Vibracije vratila - pregled
 - Vibracije vratila nad parametrima rezima
 - Zracni raspor iznad pola detaljno**
 - Zracni raspor iznad pola nad vremenom
 - Oblik rotora i statora
 - Gibanje osi rotora
 - Radijalno rastezanje polnog kotaca
 - Radijalna stabilnost spoja vratila i polnog kotaca
 - Magnetski tok nad vremenom
 - Magnetska karakteristika polova
 - Njihanje snage nad parametrima rezima
 - Njihanje snage nad vremenom
 - Kavitacija - intenzitet nad parametrima rezima
 - Temperature
 - Radna tocka
 - Pregled signala- valni oblici
 - Pregled signala - spektri

- ZRACNI RASPOR IZNAD POLA DETALJNO
- Osjetilo zracnog raspora:
- uzvodno 0 stupnjeva
 - nizvodno 0 stupnjeva**
 - nizvodno 90 stupnjeva
 - nizvodno 180 stupnjeva
 - nizvodno 270 stupnjeva
- Pol: 41

12

pogled nizvodno

azlucivanje

fino

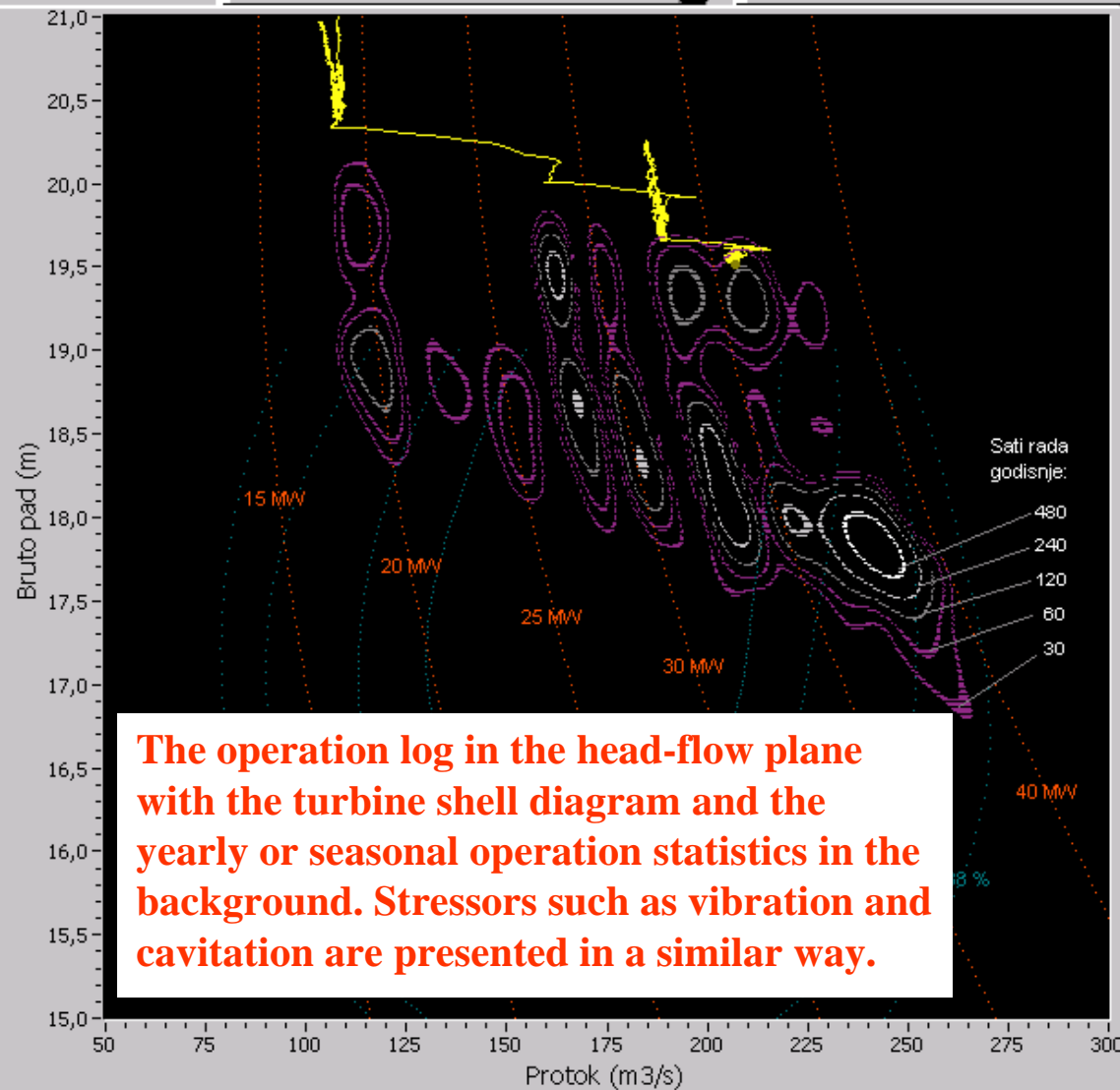
Daljni podaci

Upute

HED Ag A

Zračni raspor (mm) i magnetski tok (T)

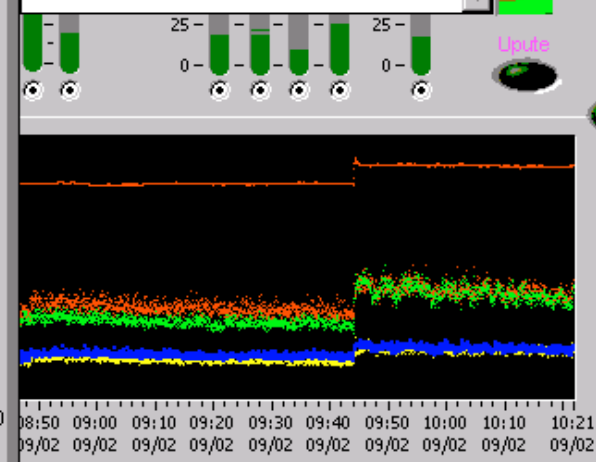
Vibracije vratila (μm)



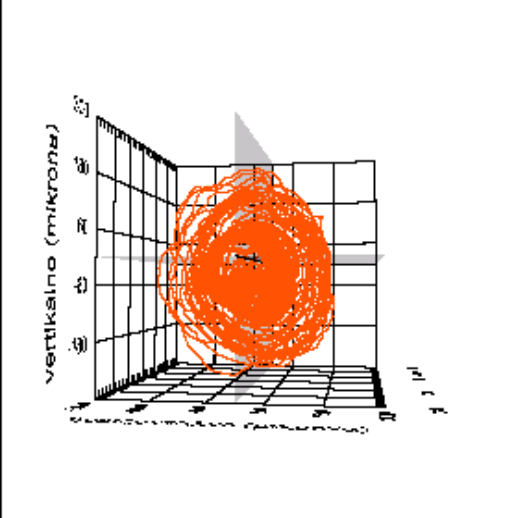
The operation log in the head-flow plane with the turbine shell diagram and the yearly or seasonal operation statistics in the background. Stressors such as vibration and cavitation are presented in a similar way.

DALJNI PODACI

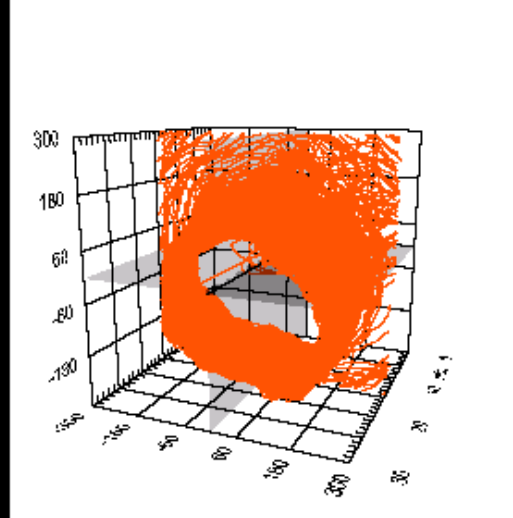
- Vibracije vratila - pregled
- Vibracije vratila nad parametrima rezima
- Zracni raspor iznad pola detaljno
- Zracni raspor iznad pola nad vremenom
- Oblik rotora i statora
- Gibanje osi rotora
- Radijalno rastezanje polnog kotaca
- Radijala stabilnost spoja vratila i polnog kotaca
- Magnetski tok nad vremenom
- Magnetska karakteristika polova
- Njihanje snage nad parametrima rezima
- Njihanje snage nad vremenom
- Kavitacija - intenzitet nad parametrima rezima
- Temperature
- Radna točka**
- Pregled signala- valni oblici
- Pregled signala - spektri



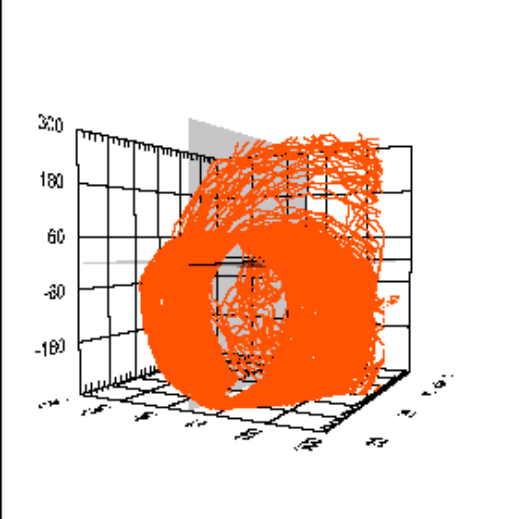
Tekuci položaj osi rotora uz generatorski lezaj



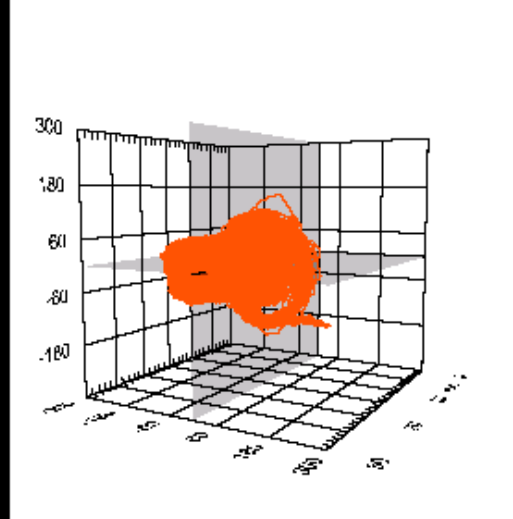
... uz aksijalni lezaj, uzvodno



... uz aksijalni lezaj, nizvodno



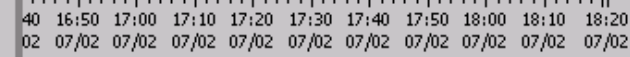
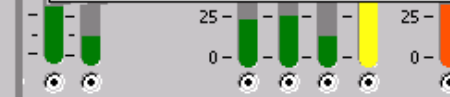
... uz turbinski lezaj



The shaft axis kinematics monitored at four locations along the axis

DALJNI PODACI

- Vibracije vratila - pregled
- Vibracije vratila nad parametrima rezima
- Zracni raspored iznad pola detaljno
- Zracni raspored iznad pola nad vremenom
- Oblik rotora i statora
- Gibanje osi rotora**
- Radijalno rastezanje polnog kotaca
- Radijalna stabilnost spoja vratila i polnog kotaca
- Magnetski tok nad vremenom
- Magnetska karakteristika polova
- Njihanje snage nad parametrima rezima
- Njihanje snage nad vremenom
- Kavitacija - intenzitet nad parametrima rezima
- Temperature
- Radna točka
- Pregled signala- valni oblici
- Pregled signala - spektri



12

pogled nizvodno

azlučivanje

0 fino

Daljni podaci

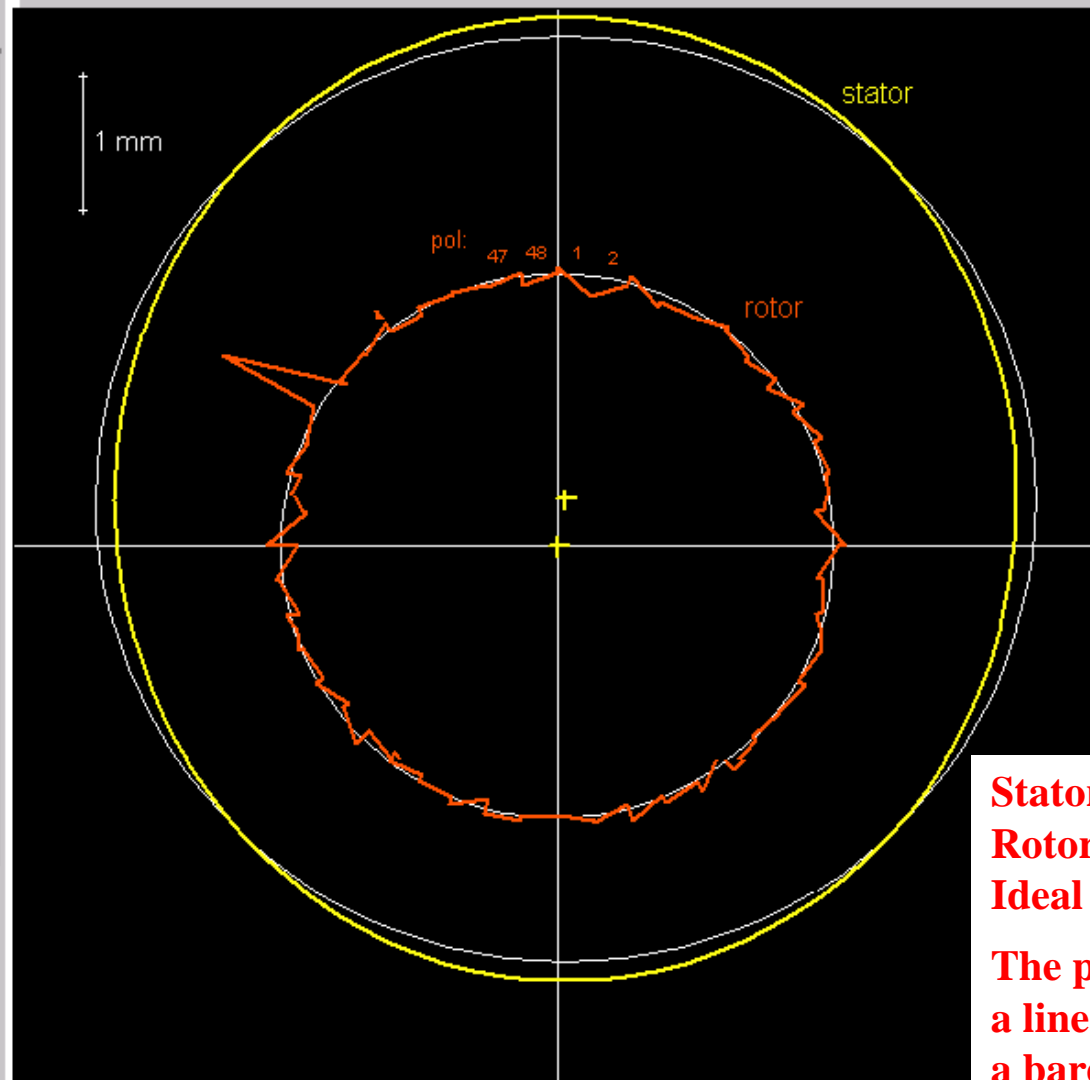
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HED Ag A

Zračni raspor (mm) i magnetski tok (T)

Vibracije vratila (μm)

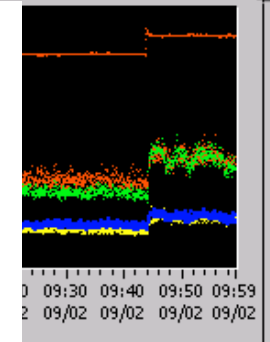


- DALJNI PODACI
- Vibracije vratila - pregled
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Stator form yellow
Rotor form red
Ideal forms white

The poles are described by a linear approximation, not a bare mean gap value.

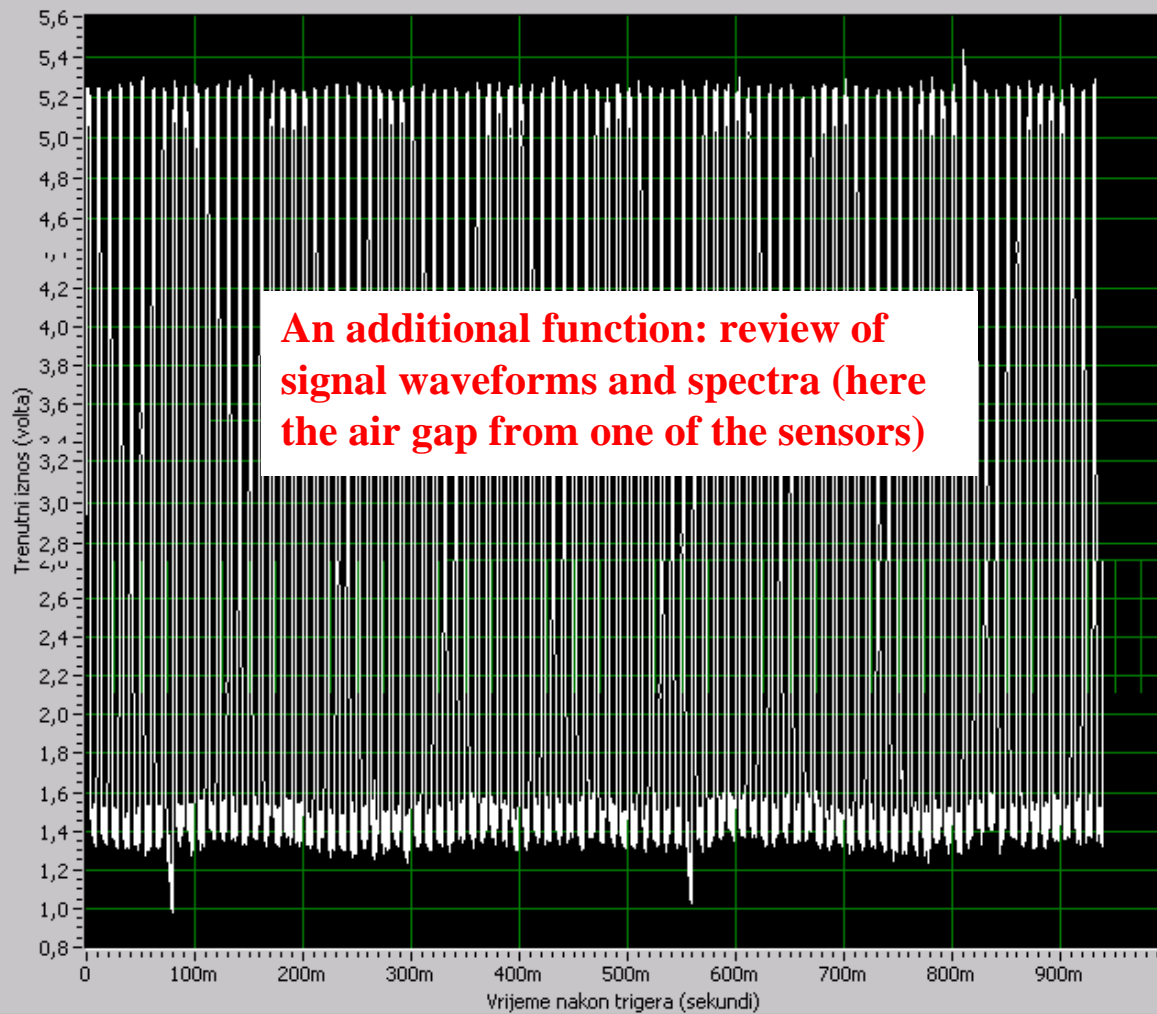


HED Ag A

Zračni raspored (mm) i magnetski tok (T)

Vibracije vratila (μm)

Valni oblik odabranog signala



An additional function: review of signal waveforms and spectra (here the air gap from one of the sensors)

DALJNIJI PODACI

Vibracije vratila - pregled
Vibracije vratila nad parametrima rezima

Zračni raspored iznad pola detaljno
Zračni raspored iznad pola nad vremenom

Oblik rotora i statora
Gibanje osi rotora
Radijalno rastezanje polnog kotaca
Radijalna stabilnost spoja vratila i polnog kotaca

Magnetski tok nad vremenom
Magnetska karakteristika polova

Njihanje snage nad parametrima rezima
Njihanje snage nad vremenom

Kavitacija - intenzitet nad parametrima rezima

Temperature

Radna točka

Pregled signala- valni oblici

Pregled signala - spektri

Položaj vratila uz aks. lež. nizv. dolje
Položaj vratila uz aks. lež. nizv. desno
Položaj vratila uz turb. lež. dolje
Položaj vratila uz turb. lež. desno

Zračni raspored uzvodno 0 stupnjeva
Zračni raspored nizvodno 0 stupnjeva
Zračni raspored nizvodno 90 stupnjeva
Zračni raspored nizvodno 180 stupnjeva
Zračni raspored nizvodno 270 stupnjeva

Aksijalni pomak vratila (nije spojeno)

Magnetski tok, iznos
Magnetski tok, maksimum (nije spojeno)

12

pogled
nizvodno

azlučivanje
fino

Daljni
podaci

Update

09:50 10:03

09/02 09/02

Thank you for your attention.

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