

DVS TECHNOLOGY GROUP

Process Monitoring with HRI[®] & HRIexpert[®]

Training overview

Day 1

- Machining procedures
- HRI[®] process monitoring
- HRI[®] parameters
- HRI[®] visualization
- Practical exercises

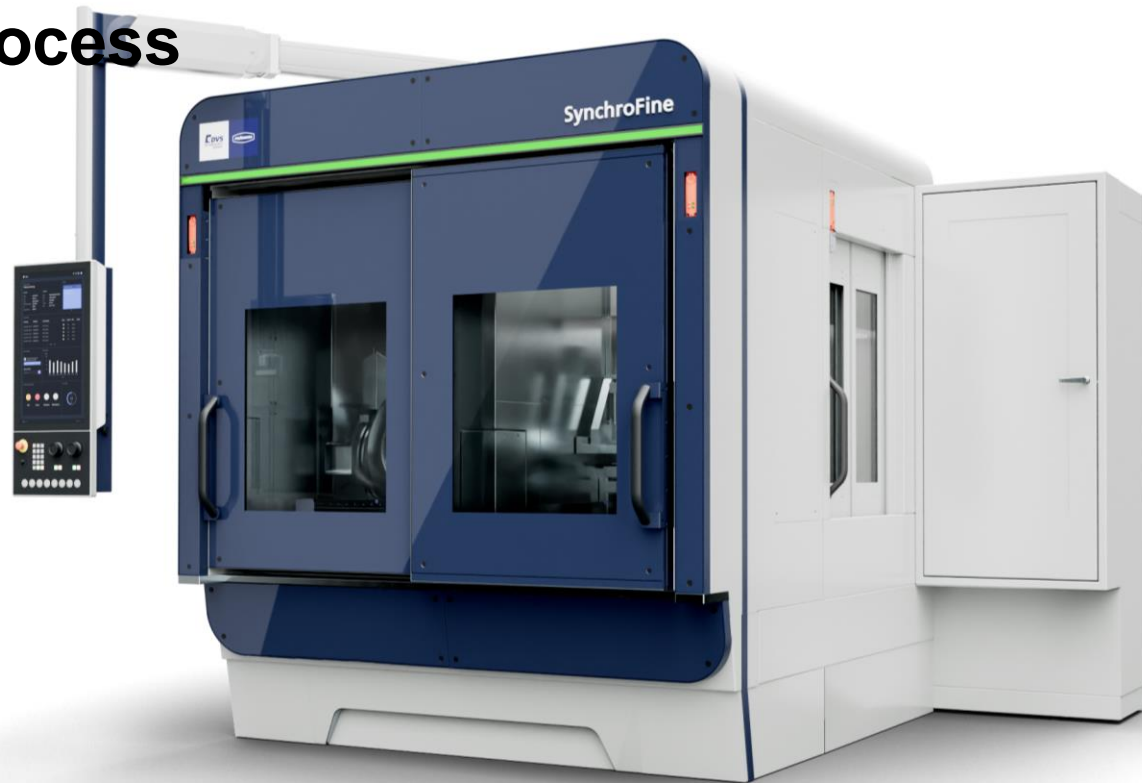
Day 2

- HRI[®] Settings
- Process Monitoring HRlexpert[®]
- HRlexpert[®] Visualization
- Practical Exercises

Day 3

- Software tool HRI[®] analyze+
- Joint data analysis
- Known phenomena
- Further development
- Index

Machining process gear honing Synchro Fine



Description – SynchroFine®

The **high-performance gearing honing machine SynchroFine®** is a self-loading machine which picks up the workpiece using the clamping system, aligns this electronically, checks the tolerance range and moves the workpiece into the machining station. The machine works using the hobbing method.

By utilizing individual drives, the machine is excellently adapted to the requirements of tooth honing. The angular and linear adjustment possibilities allow the tool to be adjusted continuously to the workpiece.

The feed rate of the workpiece axes is continuously adjustable, allowing it to be adapted optimally to the respective workpiece, the material thickness to be removed and the respective tolerance range of the toothing as well as to the material. The position and speed of the feed axes can be freely programmed by the user as an NC axis.

Short machining times and the automatic loading system make the machine particularly suitable for use as an automatic processing unit for large quantities.

As standard, the machine is equipped with a CNC control made by Bosch Rexroth MTX as well as with a SERCOS interface. Error messages are displayed in plain text on the CNC monitor, and language can be selected.

The drive torques of tool and workpiece are designed for an operationally safe and high performance of the machine.

A tailstock can be used during the machining of long workpieces. It stabilizes the workpiece and permits oscillation of the Z-axis without becoming loose from the workpiece.

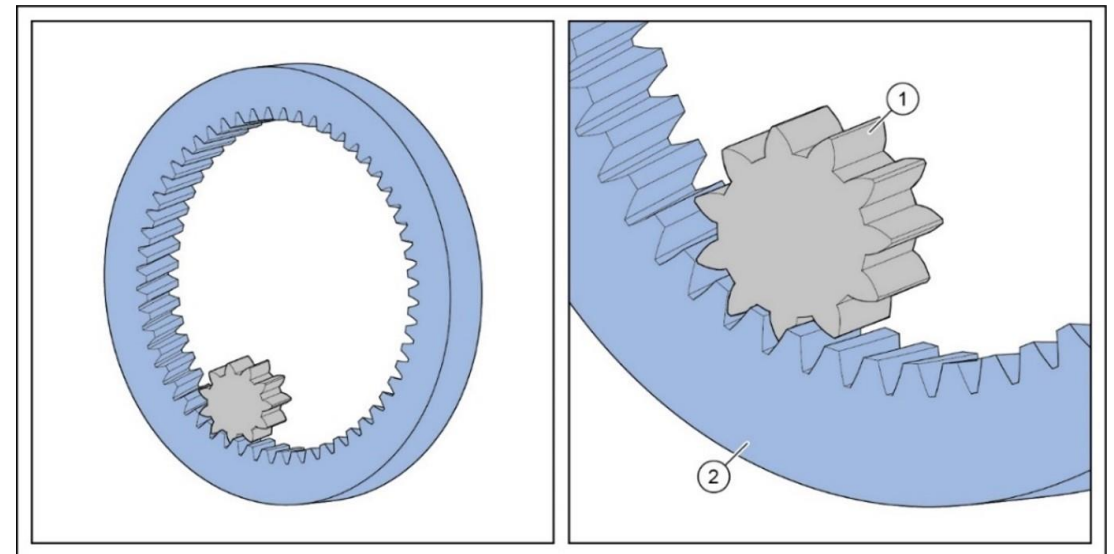
Machining process gear honing

Honing is based on a relative movement caused by the cross-axis angle between a helical or straight-toothed workpiece (1) and a helical-toothed tool (2) in the meshing area.

The speeds of the tool and the workpiece are proportional to their respective numbers of teeth.

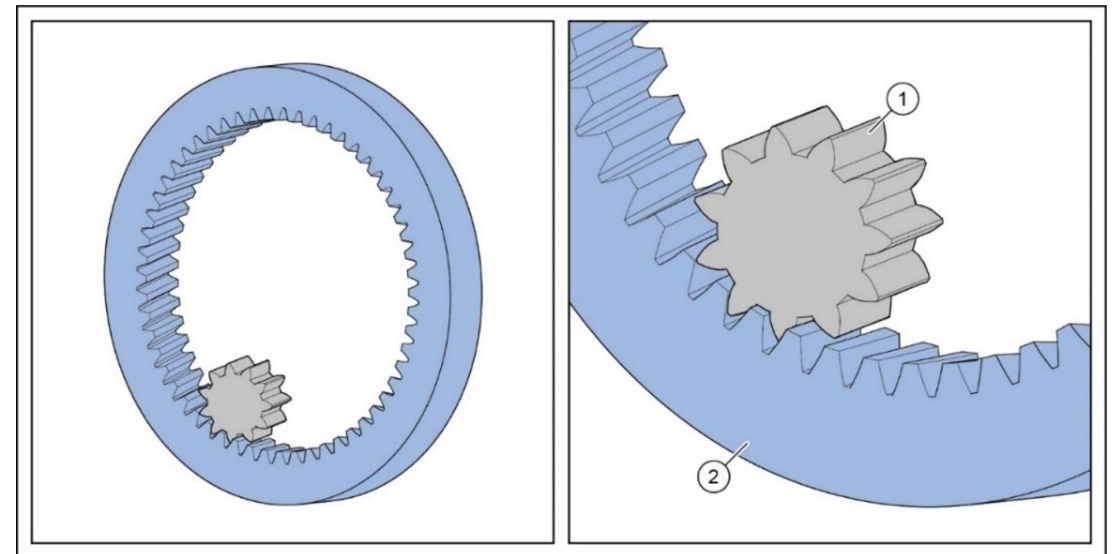
(1) Workpiece

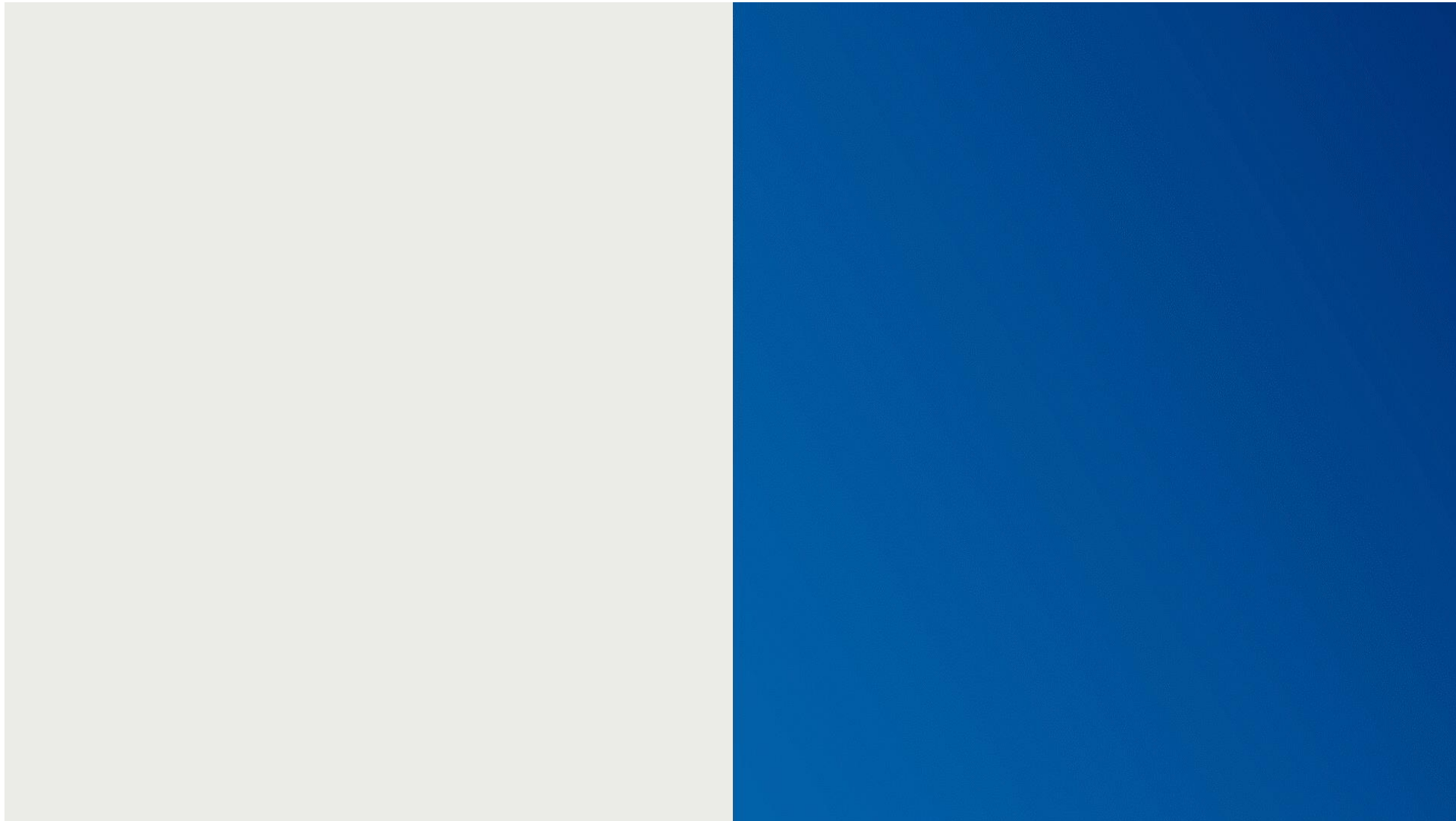
(2) Honing ring tool



Machining process gear honing

The depth of cutting on both tooth flanks is specified precisely through a continuous, precisely defined rotational speed displacement in both positive and negative direction. The direction of rotation does not change during machining of the two tooth flanks. Workpieces whose tooth width exceeds the width of the honing tool can be machined over their whole width if an oscillation movement of the Z axis is also incorporated.





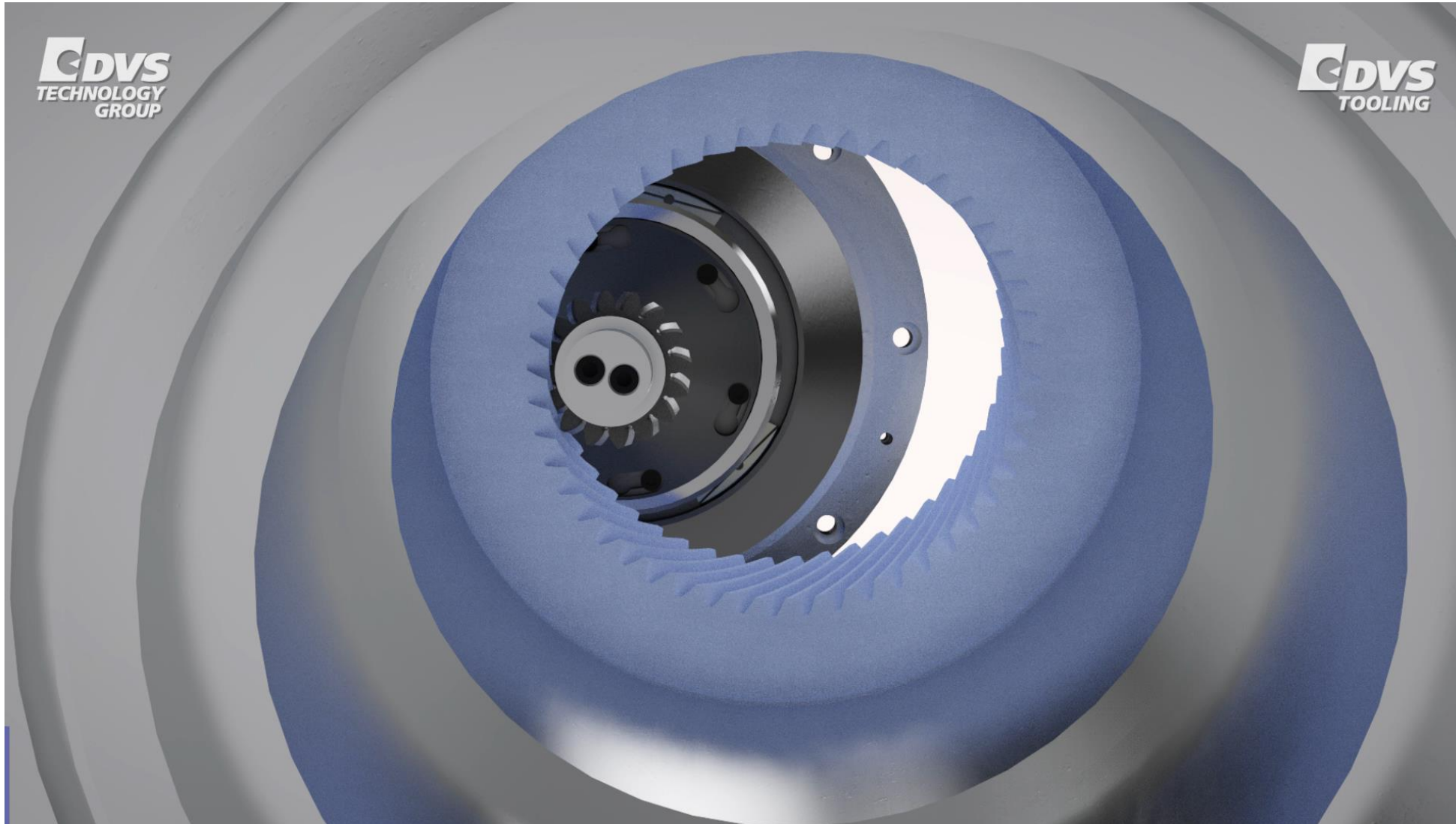
Machining process Dressing the tool

Two dressing tools are available in a magazine for correcting tool wear (honing ring). These tools are collected by the clamping fixture in separate intervals and fed into the honing tool. The tooth flanks and the head area of the tool are dressed separately.

Due to the tool wear, the final dimension of the honed parts changes continuously. The size of the tolerance range for the gearing defined in the drawing determines the dressing frequency.

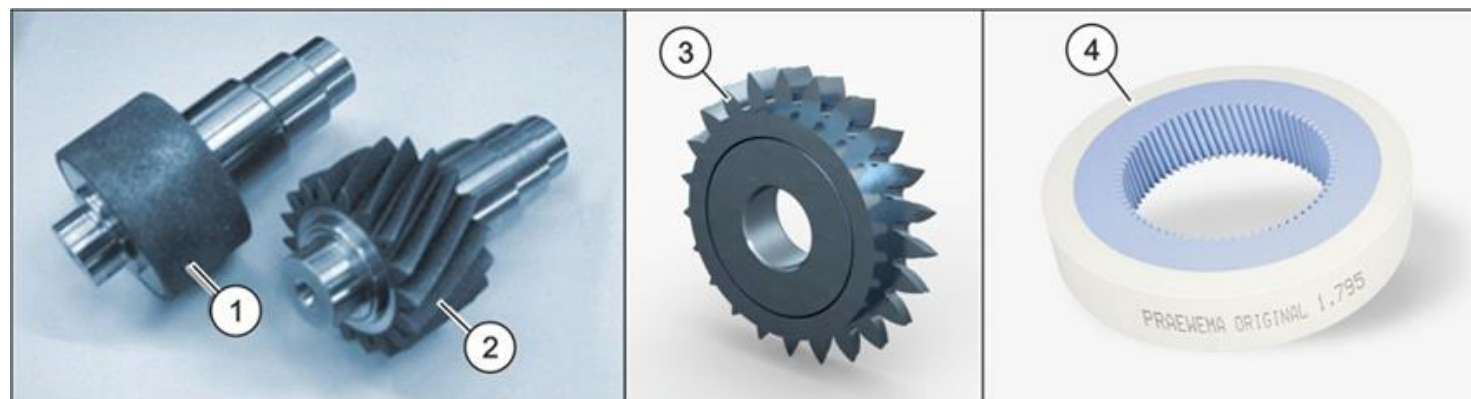
Experience shows that a dressing process is required every 40 - 50 workpieces. This interval is stored in the automatic program and is followed until an approximate 5 mm increase in the honing ring diameter has been reached. The tool change is then indicated on the display.

Approx. 0.1 mm is worked off the tool per dressing cycle. This is automatically followed by a program correction of the axial distance.

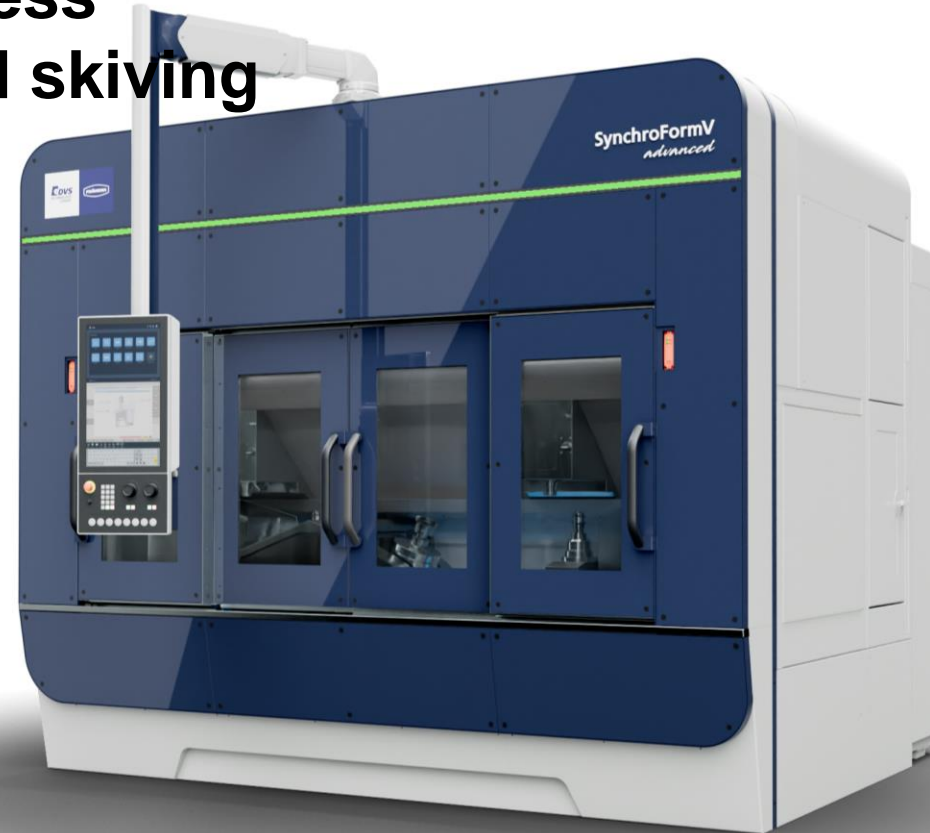


Machining process gear honing

- 1 Head dresser - Diamond Dressing Ring (DDR)
- 2 Gearing dresser - Diamond Dressing Gear (DDG)
- 3 Gearing dresser - Vario Speed Dresser (VSD)
- 4 Ceramic honing ring



Machining process gear honing and skiving Synchro Form



Description – Synchro Form

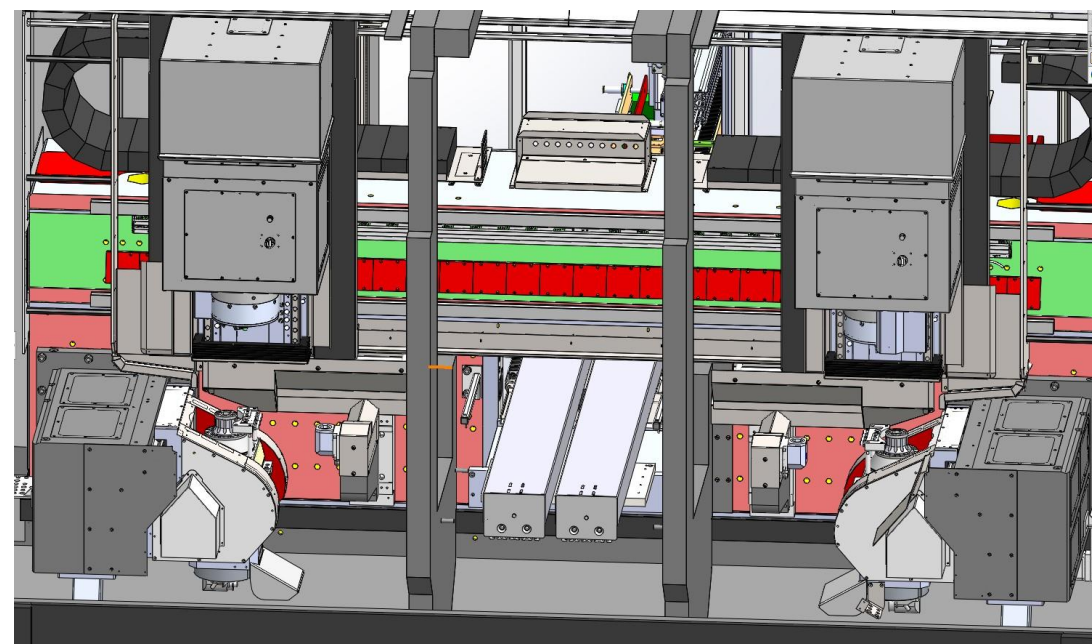
The **CNC gearwheel finishing machine type SynchroForm®** has been designed for making gears and subsequent deburring.

The machine is loaded/unloaded by the shuttle fitted in the center. On the shuttle carriage the workpiece raw part and finished part racks are mounted. There are two shelves on the shuttle for the dressing tools for internal honing.

The machine has the symmetric structure.

For machining the tothing of the workpieces, one power skiving module each is placed on the left and right outside. Two disk-type turrets are permanently installed next to each of the power skiving modules for deburring the workpiece.

The two workpiece spindles are equipped with a suitable seat flange for holding a chucking device. The workpiece spindles are electronically coupled to the milling spindles.



Work sequence – Synchro Form

Various machining processes such as skiving (soft machining) and internal gear honing and hard turning (hard machining) are carried out on the machine.

The raw parts are separated on the conveyor belt in the machine to the pickup position. A gantry with two grippers for raw and finished parts is mounted on the loading portal. The blank gripper takes the workpiece from the pick-up position on the conveyor belt, moves it to the shuttle and places it on the blank tray. The shuttle moves forward with the raw part into the machining area of the machine. The two workpiece spindles alternately move to the blank and finished part storage areas on the shuttle carriage and take over or transfer workpieces to the storage areas.

Soft processing:

- The respective workpiece spindle takes the blank from the blank storage on the shuttle and clamps it externally.
- The workpiece spindle moves with the workpiece for skiving to the skiving module for skiving the gearing.
- Then to the turning station to remove the resulting burr.
- After machining, the respective workpiece spindle with the finished part moves back to the pick-up position on the shuttle and transfers the finished part to the finished part storage.

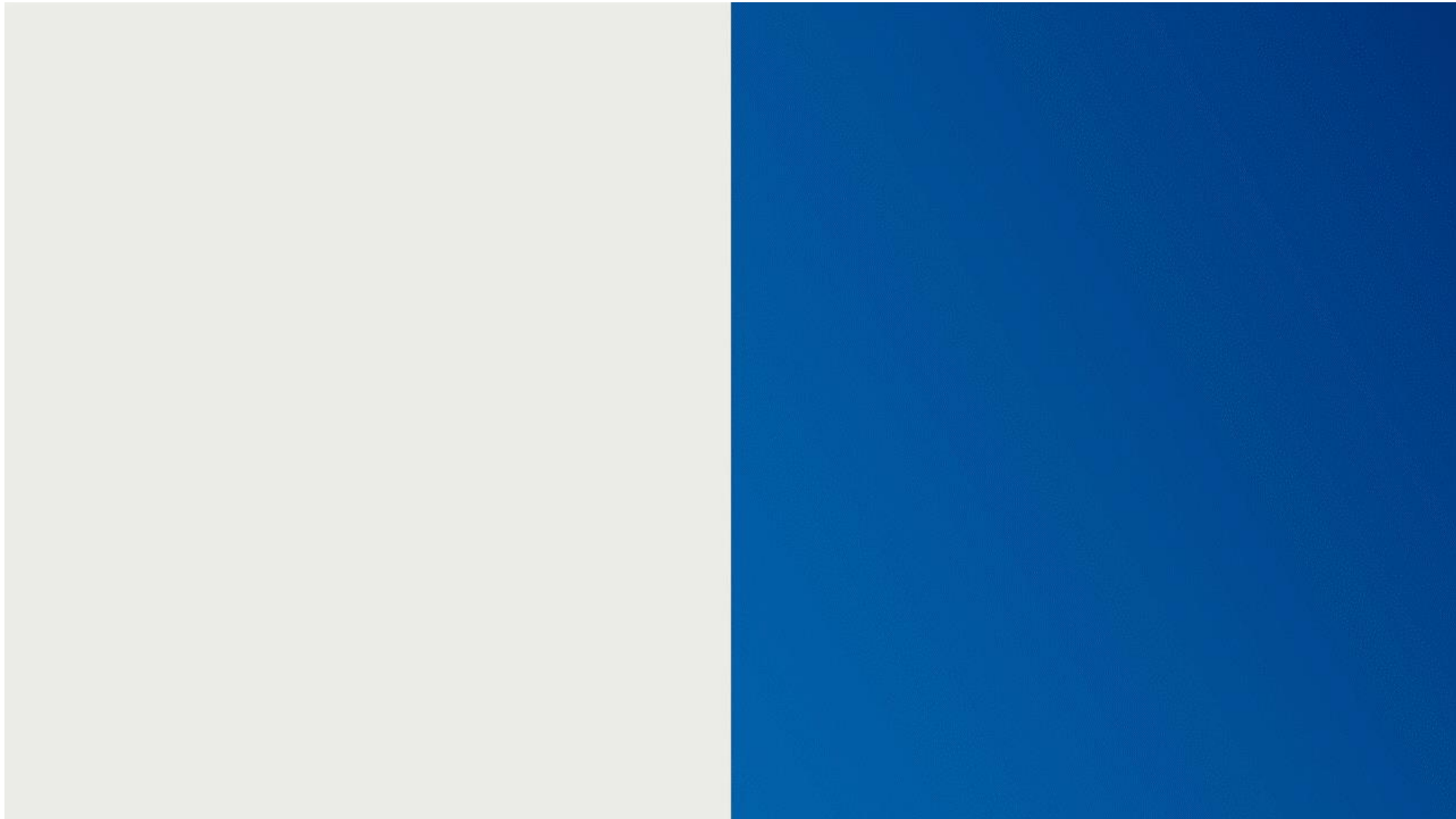
Work sequence – Synchro Form

Hard machining:

- The workpiece spindle C1+C2 takes the hardened workpiece, clamps it on the outside and moves it to the positioning device. There the gearing is centered on an initiator.
- The workpiece spindle moves with the raw part to the rollchecker. Here the raw part is checked using a two-flank rolling test to see whether it meets the requirements.
- Internal honing of the internal gearing takes place on the gear skiving module.
- The workpiece spindle moves with the workpiece to the turning station for hard turning of the inner seat.

After machining, the respective workpiece spindle moves with the finished part back to the pick-up position on the shuttle carriage and transfers the finished part to the finished part storage.

The shuttle carriage moves the finished part out of the machine to the rear. The gripper of the loading gantry takes the finished part from the rest of the shuttle carriage, moves it to the conveyor belt and places it on an empty pallet. The conveyor belt continues to cycle.



Process monitoring HRI®



Process monitoring HRI®

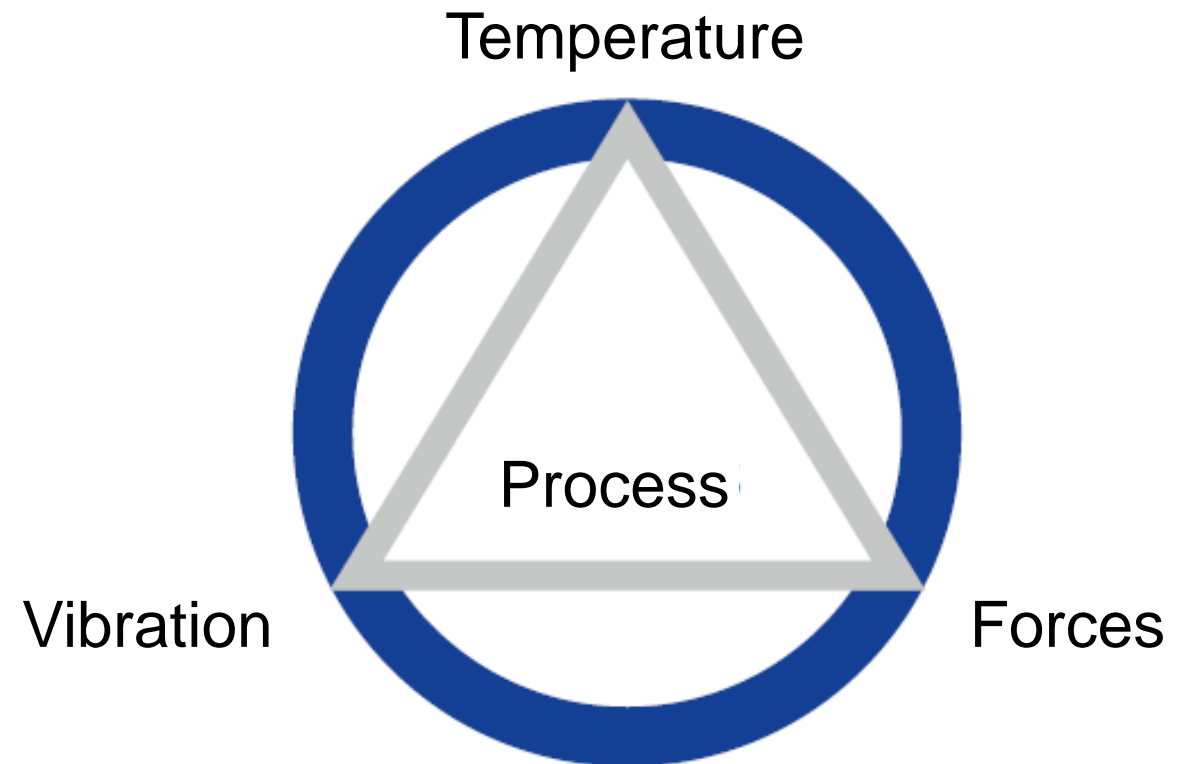
What does HRI® mean?

HRI® stands for Hybrid Reactive Index.

HRI® reflects the process in a value.

An index that is created by combining three process parameters using a formula. This index enables a unitless representation of the process.

HRI® reflects the whole process in a value.



Process monitoring HRI®

What offers HRI®?

The HRI® process monitoring system provides comprehensive control over every step of the machining process.

Separate limits can be defined for each process step, each axis and each sensor.

By implementing the extended status, limit violations and error reactions are displayed in plain text on the HMI.

A feed limiter allows precise process control.

Component identifiers, such as data matrix codes, can also be recorded for efficient tracking.

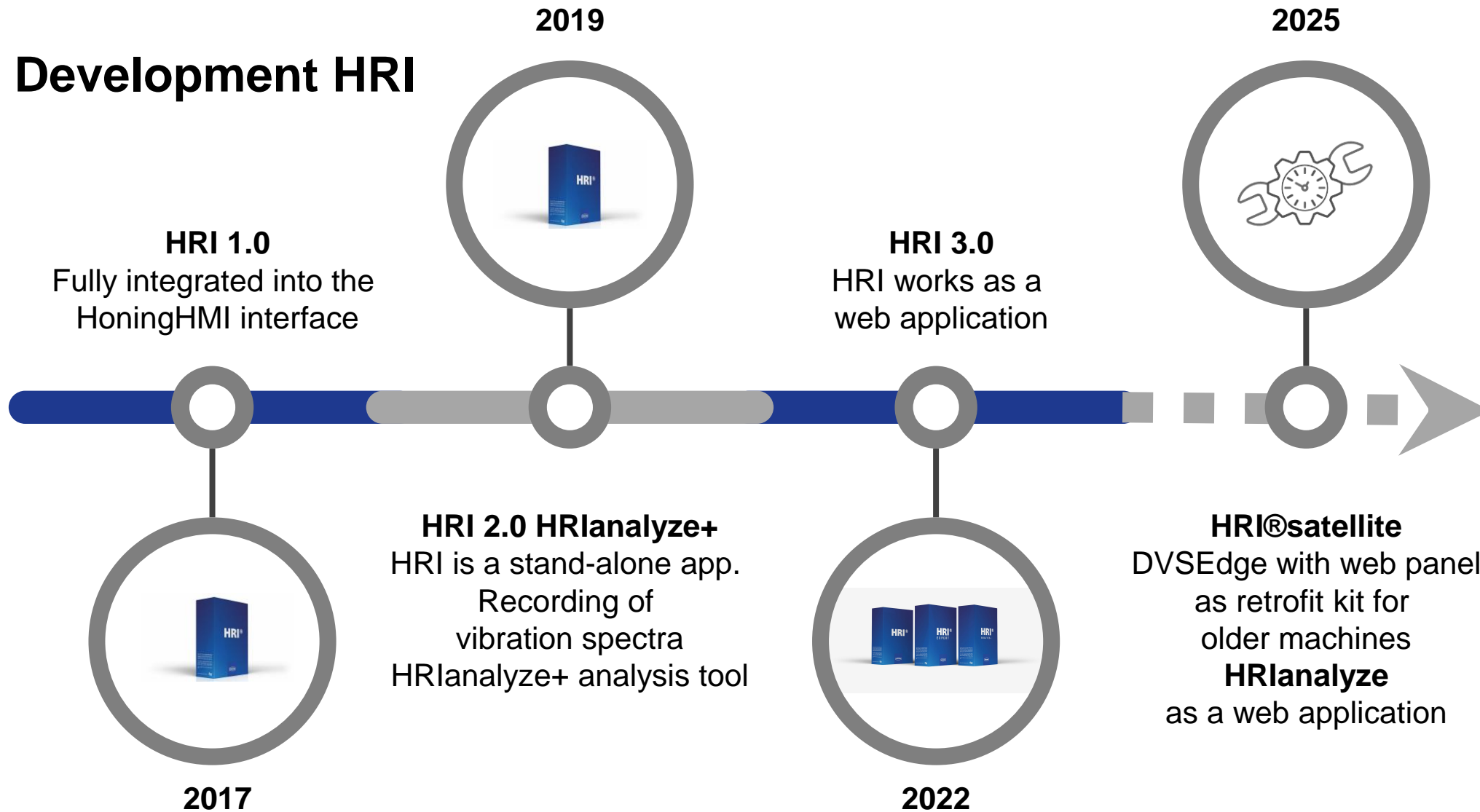
What should be done with HRI®?

The implementation of HRI aims to use only high-quality parts (no raw or bad parts) in assembly to ensure a trouble-free production process.

The application also includes the early detection of tool breakages and the continuous monitoring of process and input quality.

The implementation of preventive maintenance ensures that potential problems are proactively addressed and rectified.

Development HRI

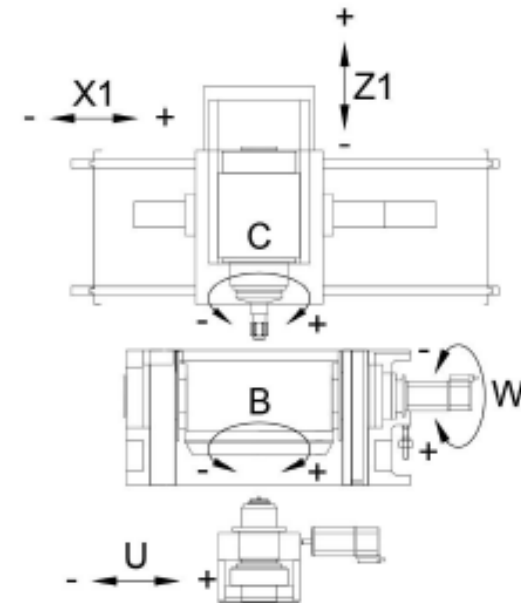


Process monitoring HRI[®]

With this process values is the HRI[®] calculated?

Synchro Fine:

- Temperature from the B - axis und C - axis
- Current / forces from the B - axis, C - axis, X - axis and Z - axis
- Values from the vibration sensor B - axis, C - axis and U - axis.

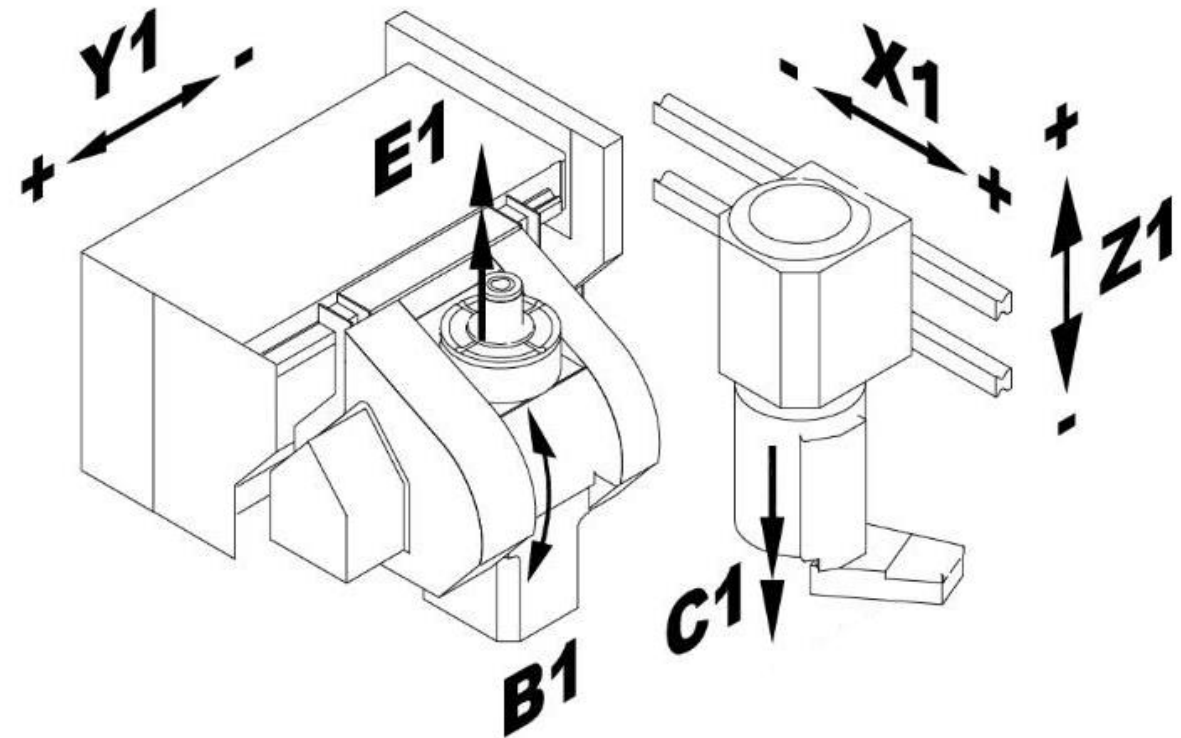


Process monitoring HRI[®]

With this process values is the HRI[®] calculated?

Synchro Form:

- Temperature from the C – axis und E – axis
- Current / forces from the C – axis and E – axis [X – axis, Y - axis (skiving) and Z – axis in process]
- Values from the vibration sensor C – axis and E – axis.



HRI® values



HRI® values

Temperature

The temperature can be monitored. Changes in the temperatures of the tool spindle (B axis or E axis) and the workpiece spindle (C axis) have a negative effect on the quality of the workpieces. The higher temperatures cause a change in the length and height of the spindles.

The temperature sensors are installed in the motors and the individual values are provided as parameters by the BOSCH Rexroth control or the Siemens control.

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	50000	1,2,3,4,5,6	35	HandlingChannel1 HandlingChannel2	None
Temperature	0 °C	55 °C	0,1,2,3,4,5,6,7...	50	C1	StopCycle
Temperature	0 °C	50 °C	1,2,3,4,5,6	35	C2	StopCycle

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HRI® values

Temperature

The temperature can be monitored individually. If the set value is exceeded, the corresponding error response is triggered.

In the example, the machine is stopped with "StopCycle" if the limit value of 50°C or 55°C is exceeded.

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	50000	1,2,3,4,5,6	35	HandlingChannel1 HandlingChannel2	None
Temperature	0 °C	55 °C	0,1,2,3,4,5,6,7...	50	C1	StopCycle
Temperature	0 °C	50 °C	1,2,3,4,5,6	35	C2	StopCycle

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HRI[®] values

Temperature at HRI[®]

An offset is subtracted from the recorded values and then squared. Temperature changes are considered more.

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	50000	1,2,3,4,5,6	35	HandlingChannel1 HandlingChannel2	None
Temperature	0 °C	55 °C	0,1,2,3,4,5,6,7...	50	C1	StopCycle
Temperature	0 °C	50 °C	1,2,3,4,5,6	35	C2	StopCycle

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HRI® values

Currents / forces

The current values are recorded from the axes that are involved in the process. These correspond to the process forces. The individual values are summed up squarely. In this way a better signal / noise ratio is achieved.

The current values are provided as parameters by the BOSCH Rexroth control or the Siemens control. The values are percentages of the nominal current.

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	50000	1,2,3,4,5,6	35	HandlingChannel1 HandlingChannel2	None
Force	0 %	120 %	3,7,4,10,9	50	C1,C2	StopCycle
ForceAvg	20	60	1,2,3,4,5,6	35	X2,Z2	SPC

Items per page: 50 ▾

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HRI® values

Currents / forces

In addition to recording the individual forces, HRI also offers the option of monitoring the average value of these forces. This average value is calculated at the end of the machining process and enables monitoring of both a minimum and a maximum range.

This monitoring is crucial in order to identify any deviations in force behavior during the process and to react at an early stage if necessary.

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	50000	1,2,3,4,5,6	35	HandlingChannel1 HandlingChannel2	None
Force	0 %	120 %	3,7,4,10,9	50	C1,C2	StopCycle
ForceAvg	20	60	1,2,3,4,5,6	35	X2,Z2	SPC

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HRI® values

Currents / forces

However, it is important to note that there is no direct contact between the workpiece and the tool at the start of the machining process. In this phase, monitoring for an absolute minimum value would not make sense, as this does not provide any meaningful information.

The absolute minimum value at the beginning does not differ from the value that would occur after a tool breakage. It is therefore advisable to activate monitoring for an average value.

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	50000	1,2,3,4,5,6	35	HandlingChannel1 HandlingChannel2	None
Force	0 %	120 %	3,7,4,10,9	50	C1,C2	StopCycle
ForceAvg	20	60	1,2,3,4,5,6	35	X2,Z2	SPC

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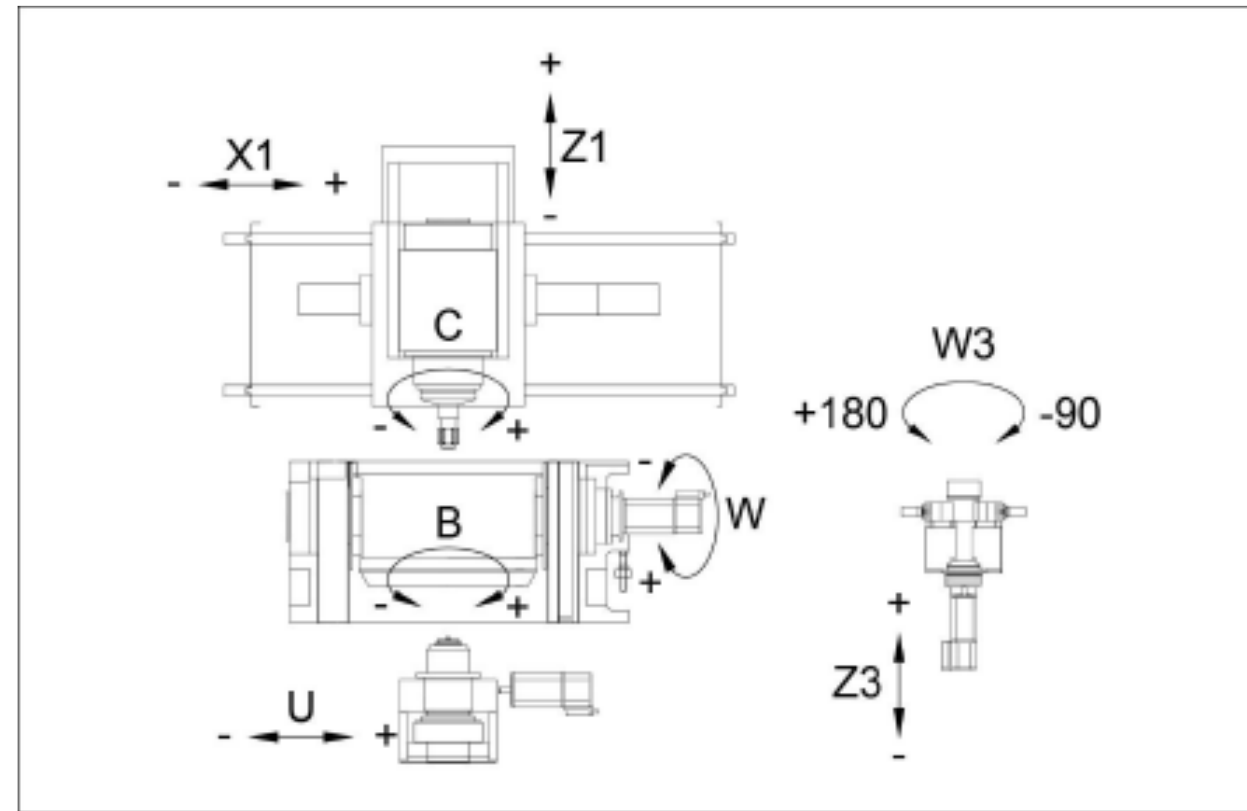
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HRI[®] values

Currents / forces - Synchro Fine

From the following axis are the forces measured at the Synchro Fine machines:

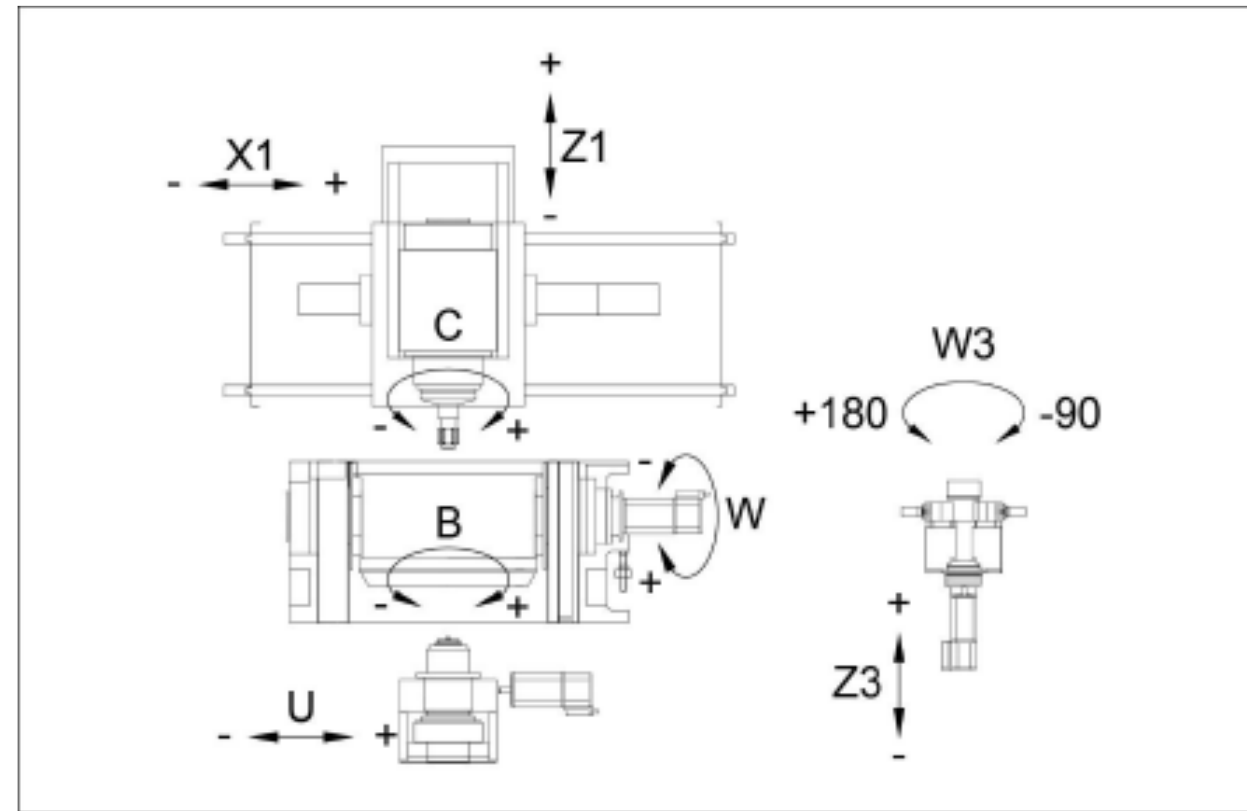
- B-axis (Tooling spindle)
- C-axis (Workpiece spindle)
- X-axis (infeed axis)
- Z-axis (oscillating axis)



HRI[®] values

Currents / forces - Synchro Fine

It is possible that the motors may be briefly overloaded, e.g. during acceleration. With Bosch Rexroth controllers, measured values can exceed 100%. The spindles can be overloaded up to 350% and the linear axes up to 450%.



HRI® values

Currents / forces - Synchro Fine

By machines with activated tailstock HRI® calculated an Offset from 30%.

Because tailstock and Z-axis working against each other. The operation grade from machines with activated tailstock is about 30% higher than machines without tailstock.

The offset is adjustable in the settings.

Base settings

OPCUAServerIpPort	BridgeCredentials	BridgeTopic	MachineClient
hri-mds:183	Ctrl2MqttBridge:Ctrl2MqttBridge	ctrl2mqttbridge/	mds
AdaptivHonServerIP	S7Connectio...	ZOffsetHRI	HRIOffsetIFM
127.0.0.1		30	0
HRIFactorIFM	MachineNo	Channel	BackupPath
1	MachineNo	1	
RawDataPath	NetworkCredentials	MinimumFreeSpace	
/app/testdata/production/raw	username:password	4	
DeleteProductionDataAfterDays	ActiveProfile		
60	SynchroForm		
<input type="checkbox"/> ReadDMCArryFromS7	<input type="checkbox"/> Debug	<input type="checkbox"/> Experimental	<input checked="" type="checkbox"/> GenerateLegacyCsvs
<input type="checkbox"/> GenerateWave	<input type="checkbox"/> GenerateDatagrams	<input type="checkbox"/> GenerateWaveUnzipped	
<input type="checkbox"/> CompressDatagrams	<input type="checkbox"/> DeleteAfterBackup		

HRI® values

Currents / forces - Synchro Fine

If there is no offset, the Z axis is weighted too heavily into the calculation of HRI and changes in the other axes are not recognized.

When computing the Z-axis offset, results less than zero are not accepted and written to zero.

Base settings

OPCUAServerIpPort	BridgeCredentials	BridgeTopic	MachineClient
hri-mds:183	Ctrl2MqttBridge:Ctrl2MqttBridge	ctrl2mqttbridge/	mds
AdaptivHonServerIP	S7Connectio...	ZOffsetHRI	HRIOffsetIFM
127.0.0.1		30	0
HRIFactorIFM	MachineNo	Channel	BackupPath
1	MachineNo	1	
RawDataPath	NetworkCredentials	MinimumFreeSpace	
/app/testdata/production/raw	username:password	4	
DeleteProductionDataAfterDays	ActiveProfile		
60	SynchroForm		

ReadDMCArryFromS7
 Debug
 Experimental
 GenerateLegacyCsvs
 GenerateWave
 GenerateDatagrams
 GenerateWaveUnzipped
 CompressDatagrams
 DeleteAfterBackup

HRI[®] values

Currents / forces - Synchro Fine

Example of normal condition for Synchro Fine:

$$F_{HRI} = 1.269,07$$

Example for shaft honing without offset for Synchro Fine:

$$F_{HRI} = 3.297,07$$

Base settings

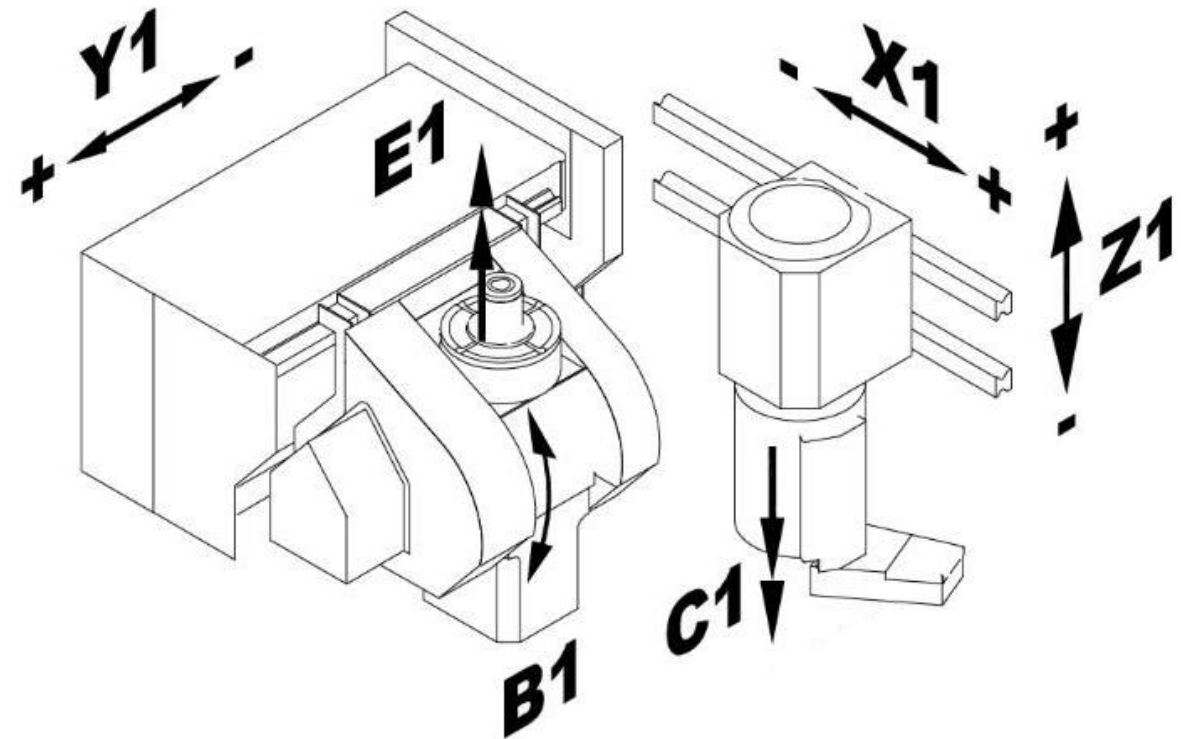
OPCUAServerIpPort	BridgeCredentials	BridgeTopic	MachineClient
hri-mds:183	Ctrl2MqttBridge:Ctrl2MqttBridge	ctrl2mqttbridge/	mds
AdaptivHonServerIP	S7Connectio...	ZOffsetHRI	HRIOffsetIFM
127.0.0.1		30	0
HRIFactorIFM	MachineNo	Channel	BackupPath
1	MachineNo	1	
RawDataPath	NetworkCredentials	MinimumFreeSpace	
/app/testdata/production/raw	username:password	4	
DeleteProductionDataAfterDays	ActiveProfile		
60	SynchroForm		
<input type="checkbox"/> ReadDMCArryFromS7	<input type="checkbox"/> Debug	<input type="checkbox"/> Experimental	<input checked="" type="checkbox"/> GenerateLegacyCsvs
<input type="checkbox"/> GenerateWave	<input type="checkbox"/> GenerateDatagrams	<input type="checkbox"/> GenerateWaveUnzipped	
<input type="checkbox"/> CompressDatagrams	<input type="checkbox"/> DeleteAfterBackup		

HRI[®] values

Currents / forces - Synchro Form

From the following axis are the forces measured:

- E – axis (Tooling spindle)
- C – axis (Workpiece spindle)
- X – axis (infeed axis, in process)
- Z – axis (oscillating axis, in process)
- Y – axis (infeed axis – only skiving, in process)

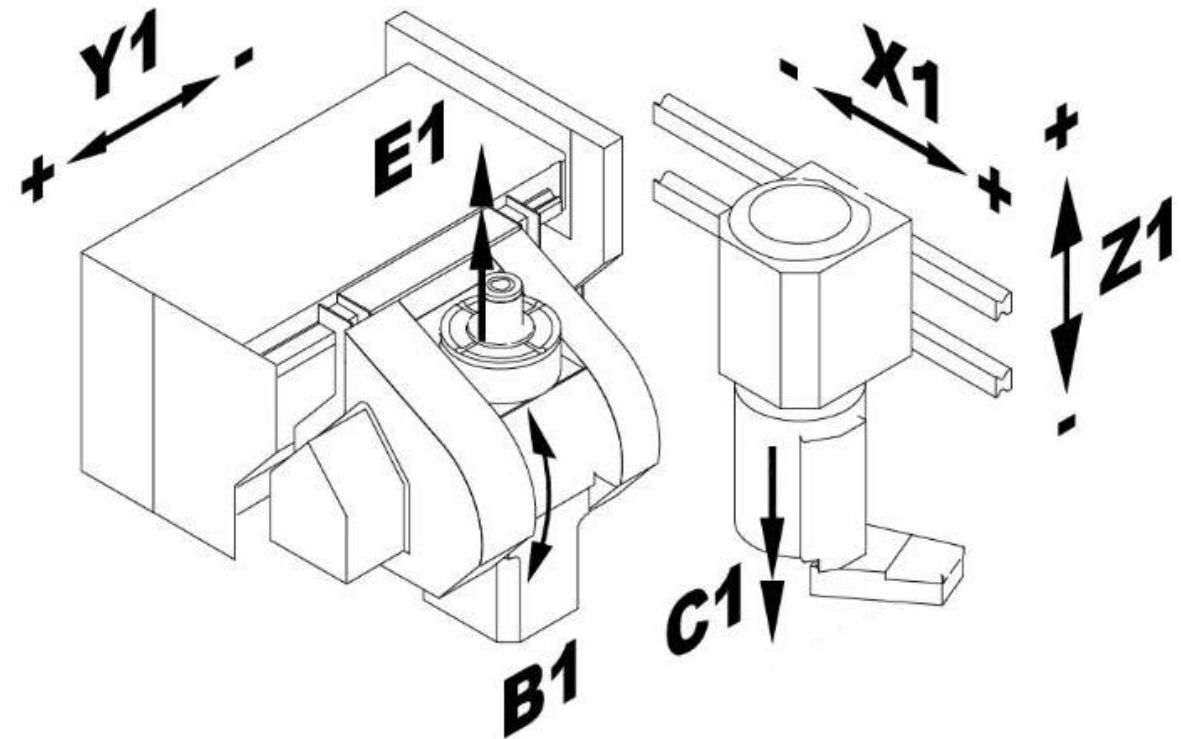


HRI® values

Currents / forces - Synchro Form

The motors can be briefly overloaded, particularly during acceleration processes. It is important to emphasize that the Siemens controllers do not record any measured values that exceed 100% of the nominal current. No measured values above 100% are transmitted to HRI.

When setting limit values, it must be ensured that no values above 100% are entered for machines with a Siemens controller. HRI would not trigger an error response for limits above 100% of the nominal current.



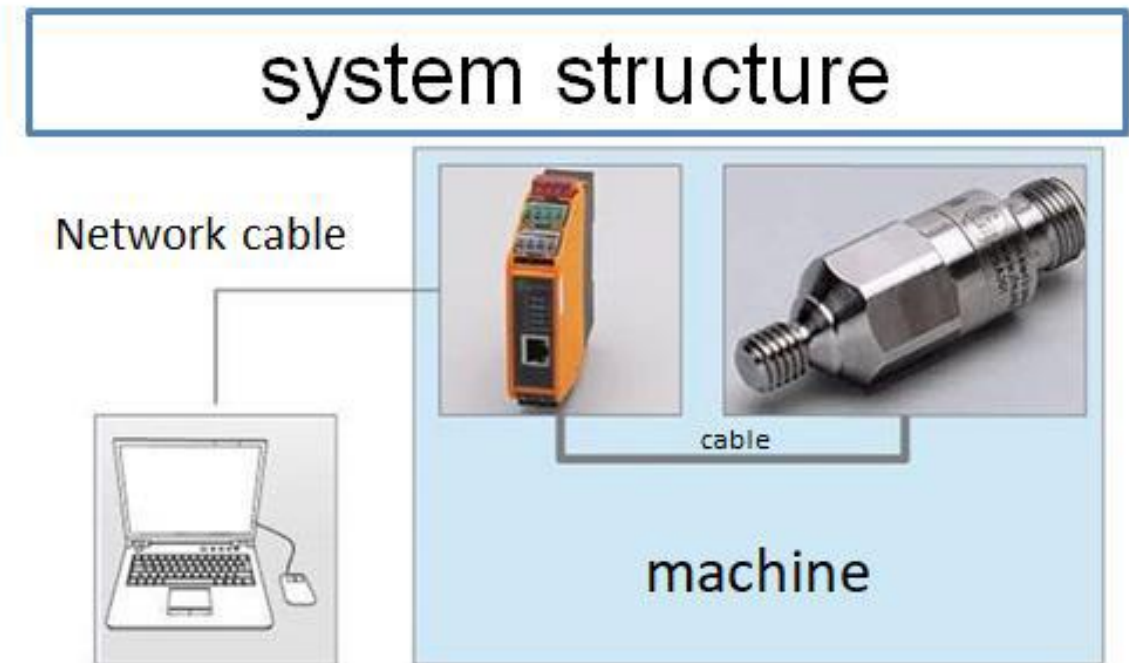
HRI® values

Vibration sensors

Sensors and evaluation units from the manufacturer IFM are installed to detect vibrations in the machine.

Präwema install three different vibration sensors from IFM. On the one hand single axis vibration sensors (VSA001 or VSA004) are installed as standard.

The picture shows an IFM VSA001.

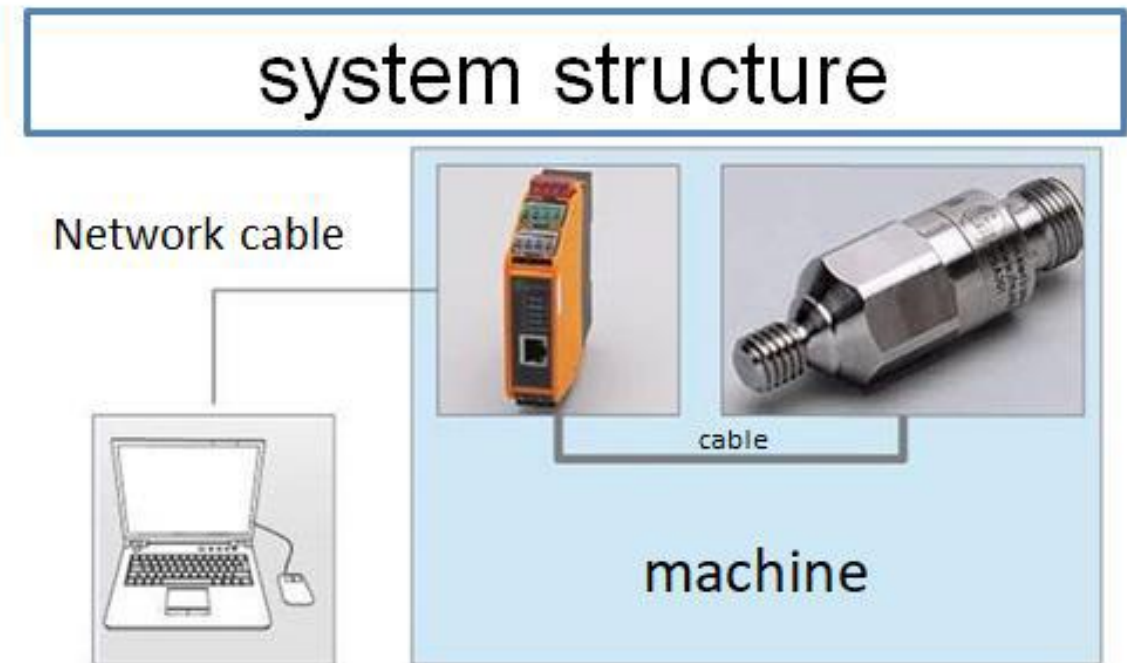


HRI® values

Vibration sensors

On the other side, IFM has been manufacturing a triaxial vibration sensor since 2022 (VSM10X).

This is installed on the tooling spindle of the Synchroform or on special request on the tooling spindle of the Synchrofine.

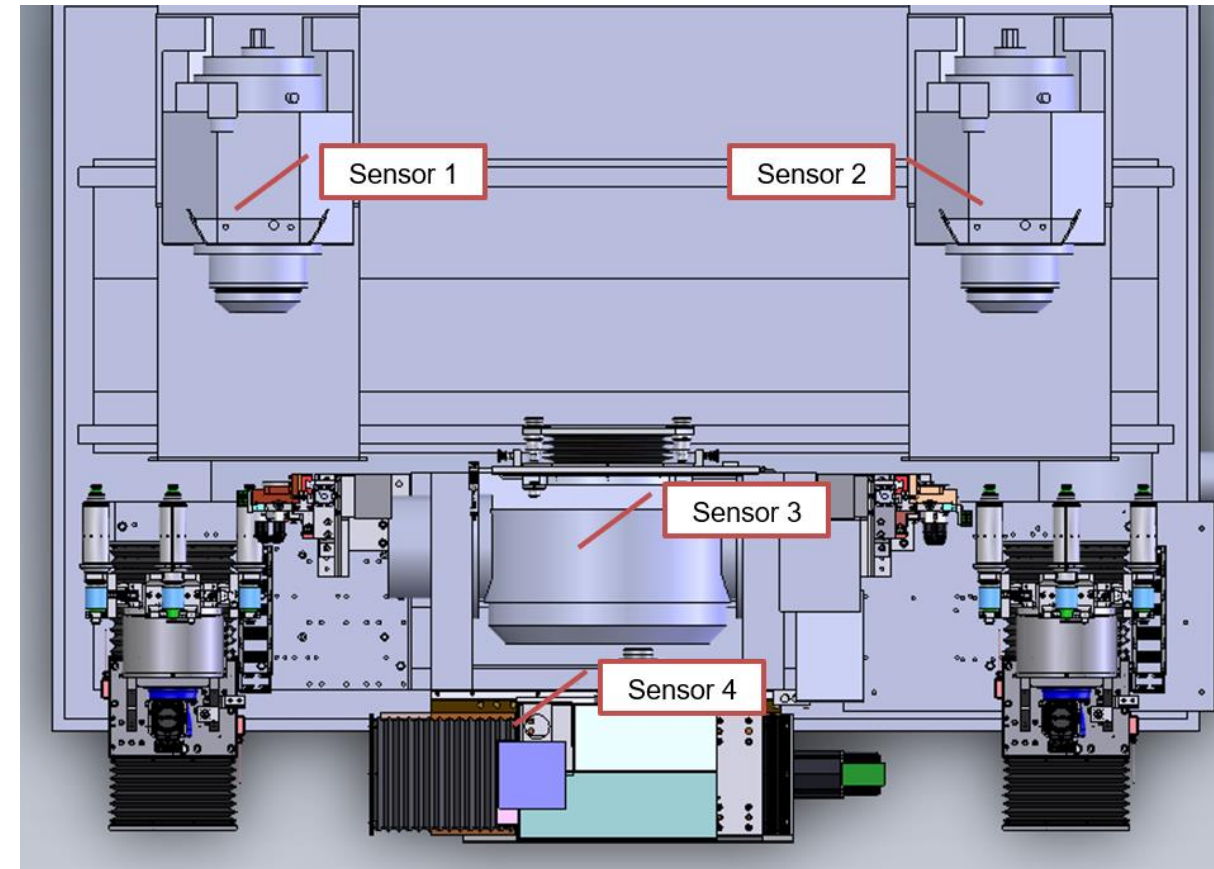


HRI[®] values

Vibration sensors Synchronfine

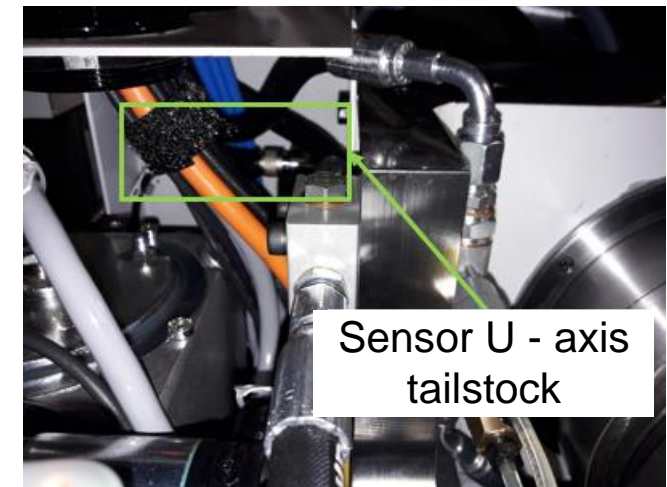
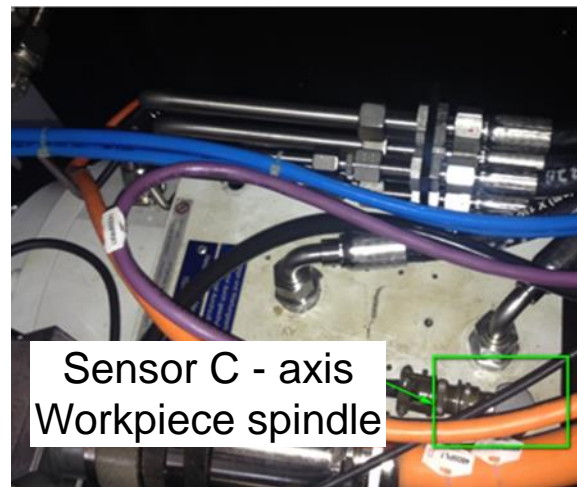
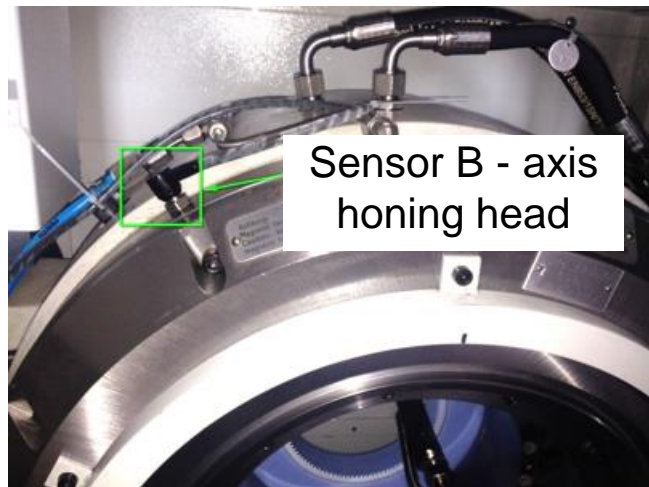
The vibration monitoring sensors are mounted on the following axles on external honing machines:

- B-axis (tooling spindle - sensor 3)
Y-direction
- C-axis (workpiece spindle - sensors 1+2)
Y-direction
- U-axis (tailstock - sensor 4)
X-direction



HRI® values

Vibration sensors Synchronfine



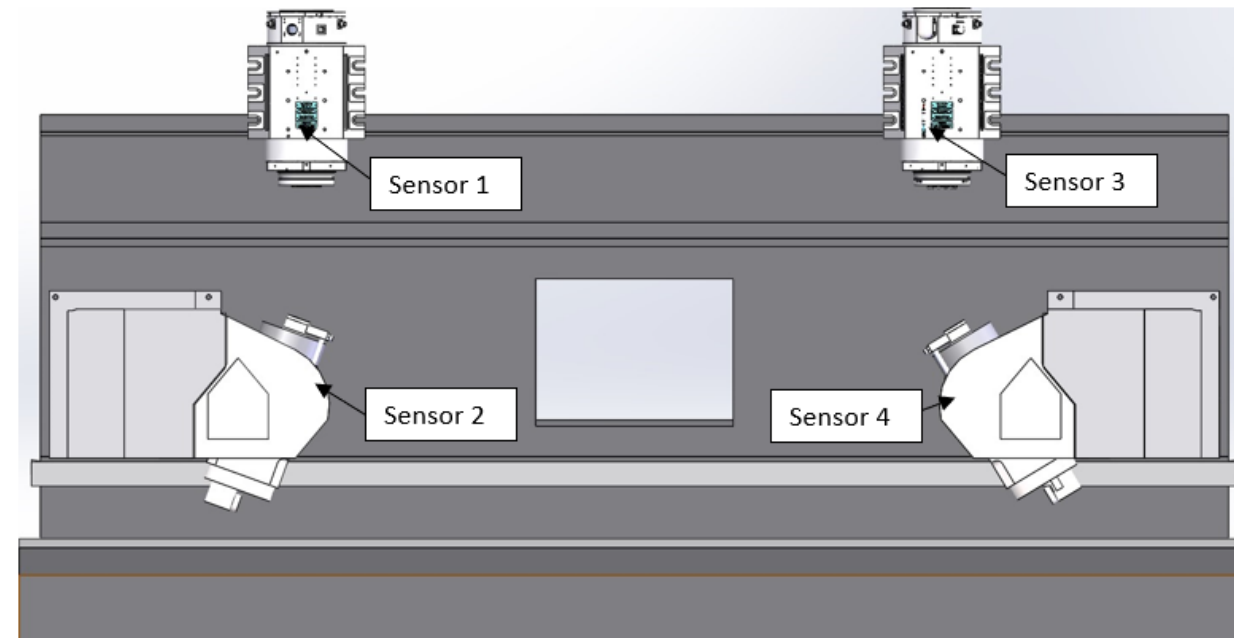
HRI[®] values

Vibration sensors SynchroForm

The vibration monitoring sensors are mounted on the following axles on external honing machines:

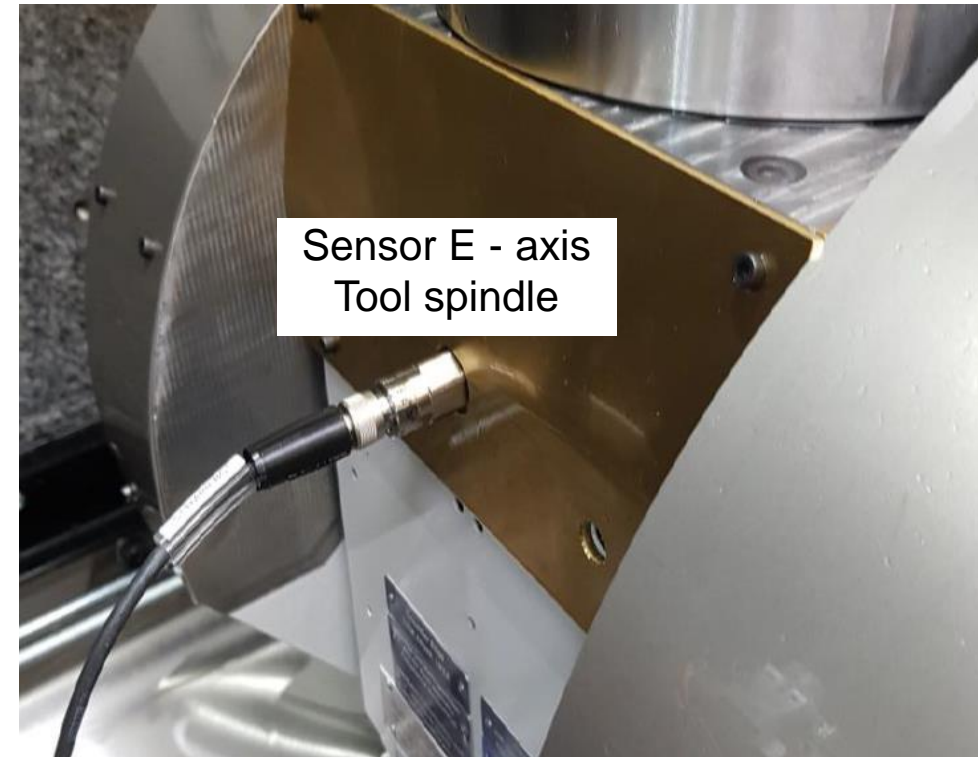
- E-axis (tooling spindle - sensor 2+4)
- C-axis (workpiece spindle - sensors 1+3)

A three-axis vibration sensor was installed on the workpiece spindle.



HRI[®] values

Vibration sensors SynchroForm



HRI® values

Vibration sensors

The data recorded by the individual vibration sensors is transmitted as raw data, with each sensor outputting its measured value in mg (thousandths of the acceleration due to gravity).

In order to emphasize the importance of the measured vibration values in the calculation of the HRI, specific adjustments have been implemented. These include an adjustable offset and factor, which are available in the basic settings. These adjustments make it possible to influence the proportion of vibration in the calculation of HRI and adapt it to specific requirements.

Base settings

OPCUAServerIpPort	BridgeCredentials	BridgeTopic	MachineClient
hri-mds:183	Ctrl2MqttBridge:Ctrl2MqttBridge	ctrl2mqttbridge/	mds
AdaptivHonServerIP	ZOffsetHRI	HRIOffsetIFM	
127.0.0.1	S7Connectio... 30	0	
HRIFactorIFM	MachineNo	Channel	BackupPath
1	MachineNo	1	
RawDataPath	NetworkCredentials	MinimumFreeSpace	
/app/testdata/production/raw	username:password	4	
DeleteProductionDataAfterDays	ActiveProfile		
60	SynchroForm		
<input type="checkbox"/> ReadDMCArrayFromS7 <input type="checkbox"/> Debug <input type="checkbox"/> Experimental <input checked="" type="checkbox"/> GenerateLegacyCsvs <input type="checkbox"/> GenerateWave <input type="checkbox"/> GenerateDatagrams <input type="checkbox"/> GenerateWaveUnzipped <input type="checkbox"/> CompressDatagrams <input type="checkbox"/> DeleteAfterBackup			

HRI® values

Vibration sensors

The default offset is 0 and the factor is 1.

The formula is:

$$VIB_{HRI} = (IFM - 0) * 1$$

Grundeinstellungen

OPCUAServerIpPort hri-master-mds:1	BridgeCredentials Ctrl2MqttBridge:Ctrl2MqttBridge	BridgeTopic ctrl2mqttbridge	MachineClient mds
AdaptivHonServ 127.0.0.1	S7Connectic	ZOffsetHRI 30	HRIOffsetIFM 0
HRIFactorIFM 1	MachineNo MachineN	Channel 2	BackupPath
NetworkCredentials username:passv	MinimumFreeSpace 4	DeleteProductionDataAfterDays 60	ActiveProfile SynchroFc

/app/testdata/production/right/raw

HRI® visualization



HRI® visualization

HRI® monitoring object

An HRI® monitoring object should always be created.

On the one hand, to set the scaling of the Y-axis in the diagram. On the other hand, because otherwise the secondary processes will also be recorded and the result of the HRI® calculation will be distorted. Due to the acceleration of the linear drives in the delivery processes, an HRI® value that is too high is calculated.

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaxtion
Hri	0	2000	3,7,4,10,9	50	HandlingChannel1 HandlingChannel2	None

+ - ✎

HRI® visualization

Honing HMI

The current HRI® value is displayed as a bar graph in the "Operate" window.

The value is scaled to 110% of the maximum HRI® value. If the set value is exceeded, the color changes from blue to red.

Currently, this function is only active for the Synchrofine.

The screenshot displays the HMI interface for a honing process. It is divided into several sections:

- Workpiece counter survey:** Shows 'Remaining lifetime of honing wheel' at 5885 Workpieces (8960 total) and 'Workpieces till dressing' at 125 Workpieces (140 total). Both are represented by green bar graphs.
- Program information:** Lists 'Active program: Honing', 'Active workpiece', 'Rollchecker: Min/Max', 'Type of loading system: Automatic', and 'Simulation: active 15.0 mm Fx1'.
- Axis indication:** A table showing current and remaining positions for X, Z, C, and W axes.
- Selected channel:** A list of channels including Master, Honing, Handling right side, Handling left side, and Gantry, with 'Main program: Honing' selected.
- Process status:** A bar graph showing the HRI value, which is currently blue. A red box highlights this area.
- Positioning diagram:** A diagram at the bottom showing X-axis positions: X-position end (-0.100 mm), tooth/tooth (-0.472 mm, -6.379 mm, -42.902 mm), and X-processing distance (-49.854 mm).

ACS		Nominal position	Remaining
X	mm	-49.567	-0.187
Z	mm	-417.142	-0.318
C	"	1.452	28.548
W	"	-13.735	0.000

ACS		RPM	Override
B	1/min	17	F 100 %
C	1/min	50	G

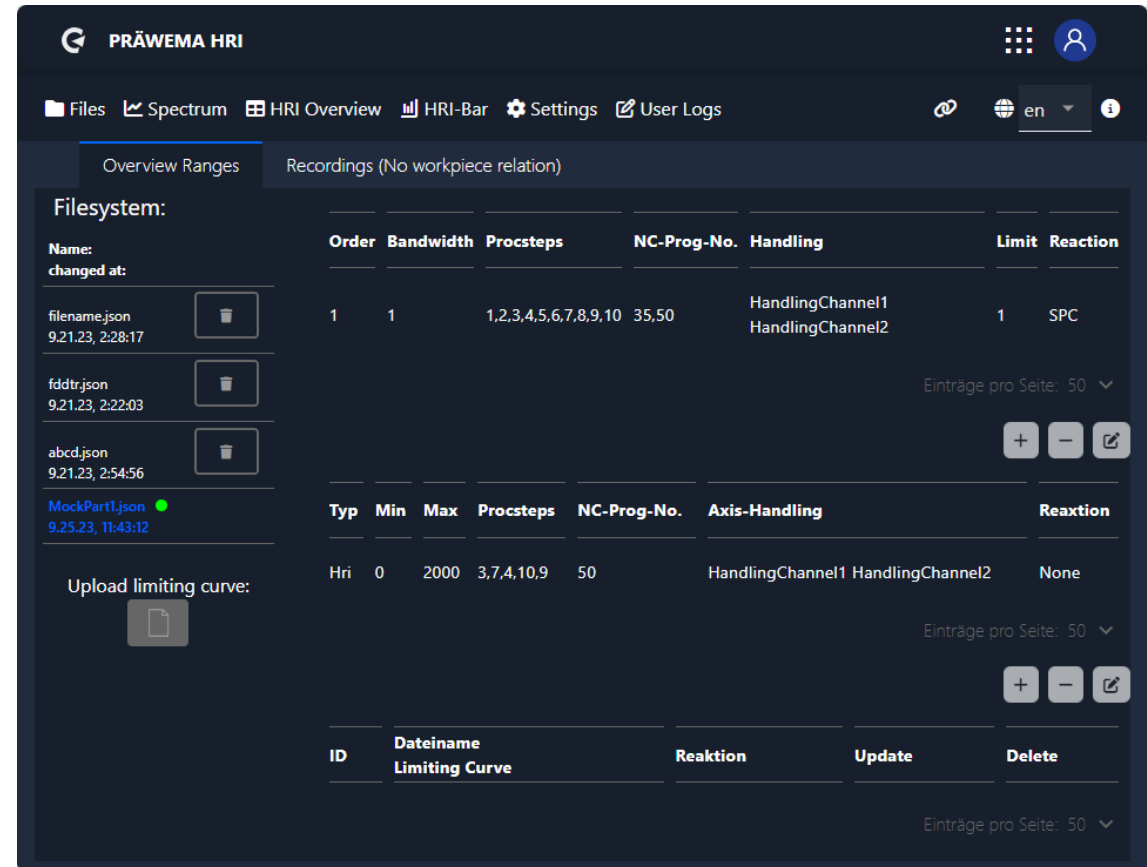
HRI® visualization

Overview of limit values

The programs present in the file system of the Honing HMI are loaded.

The current program is preselected.

Individual variables can be monitored, and error responses defined under diagnostic objects



The screenshot shows the PRÄWEMA HRI interface with the following components:

- Navigation:** Files, Spectrum, HRI Overview (selected), HRI-Bar, Settings, User Logs.
- Overview Ranges:**
 - Filesystem:** Lists files like filename.json, fddtr.json, abcd.json, and MockPart1.json with their last changed dates and delete icons.
 - Table:**

Order	Bandwidth	Procsteps	NC-Prog-No.	Handling	Limit	Reaction
1	1	1,2,3,4,5,6,7,8,9,10	35,50	HandlingChannel1 HandlingChannel2	1	SPC
- Recordings (No workpiece relation):**
 - Table:**

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	2000	3,7,4,10,9	50	HandlingChannel1 HandlingChannel2	None

HRI® visualization

Edit Screen

An editing screen has been added since version 2.5. The limits are easier to set with the screen and the possibility of incorrect entries has been minimized.

When HRI® is selected, only HandlingChannel 1 or HandlingChannel 2 can be selected.

New diagnostic object

Type
Undefined

Reaction
None

NC program number
e.g.: 1,2,3,12,22,53...

Proc steps
Bsp.: 1,2,3,12,22,53... empty = all

Axis-handling

Max
Max

Min
Min

Status Value
0

OK Cancel

HRI® visualization

HRI® monitoring object

designation	description
Type	The variables can be selected here.
Reaction	Error reaction that is triggered, when the value is exceeded or not reached.
NC program number	NC program to be monitored.
Proc steps	Process steps to be monitored.

New diagnostic object

Type

Reaction

NC program number

Proc steps

Axis-handling

Max

Min

Status Value

HRI® visualization

HRI® monitoring object

designation	description
Axis – handling	Axis or handling to be monitored.
Max	Maximum value that must not be exceeded in the process step.
Min	Minimum limit that must be reached in the process. Only possible with HRIAvg, HRI Integral and ForceAvg.

New diagnostic object

Type

Reaction

NC program number

Proc steps

Axis-handling

Max

Min

Status Value

HRI® visualization

HRI® monitoring object

designation	description
Status Value	The status value is sent to the HoningHMI and displayed there for the ejected workpieces. This allows the operator at the machine to determine the reason why a workpiece was ejected.

New diagnostic object

Type

Reaction

NC program number

Proc steps

Axis-handling

Max

Min

Status Value

HRI[®] visualization

NC program number

The table lists various NC program numbers that represent different subroutines. Each number represents a specific subroutine that performs a specific machining task, such as honing, profiling or calibrating.

The image shows a dark-themed user interface for creating a 'New diagnostic object'. The form contains several input fields:

- Type:** Undefined
- Reaction:** None
- NC program number:** 35 (This field is highlighted with a red border)
- Proc steps:** Bsp.: 1,2,3,12,22,53... empty = all
- Axis-handling:** (Empty dropdown menu)
- Max:** Max
- Min:** Min
- Status Value:** 0

At the bottom right, there are 'OK' and 'Cancel' buttons.

HRI® visualization

NC program number

NC program number	
1	Footprint / KM 0 measurement
2-9	Other programs (turning, drilling, etc.)
21	Honring measuring head
22	Honring measuring gear
31	Profiling head
32	Profiling gear
33	Pre profiling only with Vario Speed Dresser

New diagnostic object

Type
Undefined

Reaction
None

NC program number
35

Proc steps
Bep.: 1,2,3,12,22,53... empty = all

Axis-handling
[Dropdown menu]

Max
Max

Min
Min

Status Value
0

OK Cancel

HRI® visualization

NC program number

NC program number	
34	Profiling only with the Vario Speed Dresser
35	Skiving
36	reprofiling head circle
40	Omit workpiece measurement
41	Workpiece measure left
42	Workpiece measure right
50	Honing

New diagnostic object

Type
Undefined

Reaction
None

NC program number
35

Proc steps
Bsp.: 1,2,3,12,22,53... empty = all

Axis-handling

Max
Max

Min
Min

Status Value
0

OK Cancel

HRI® visualization

NC program number

NC program number	
51	Dressing gearing with DDG
52	Dressing head circle
53	Dressing with Vario Speed Dresser
60	Calibrate

New diagnostic object

Type

Reaction

NC program number

Proc steps

Axis-handling

Max

Min

Status Value

OK Cancel

HRI® visualization

Honing machines – Proc steps

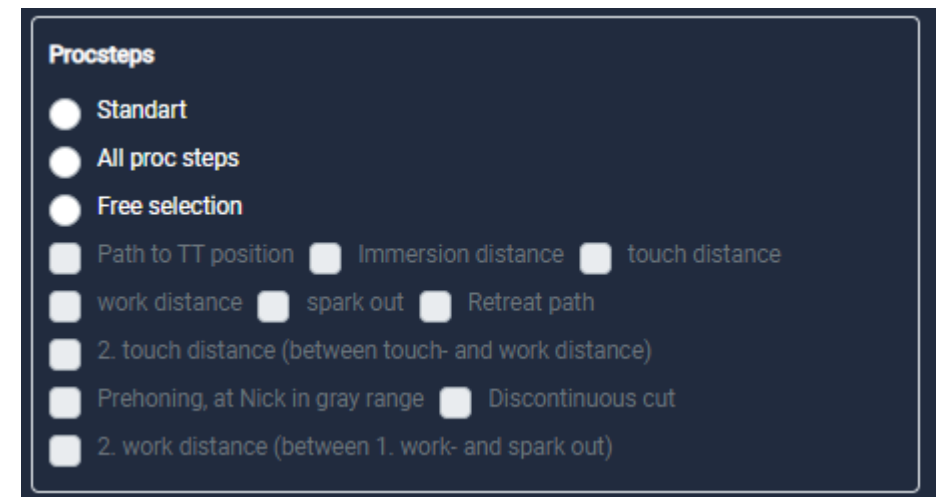
During honing, various program steps are carried out. Each of these steps, such as: touch distance, immersion distance and working distance, represents a specific process within the honing process.



HRI® visualization

Honing machines – Proc steps

Proc steps honing	
0	inactive
1	way from 0 to tooth-tooth position (rapid)
2	immersion distance (high feed of 1000 mm/min)
8	prehoning, at Nick in gray range
3	touching (1)
7	touching (2) (optional)
9	lift distance (optional)



HRI[®] visualization

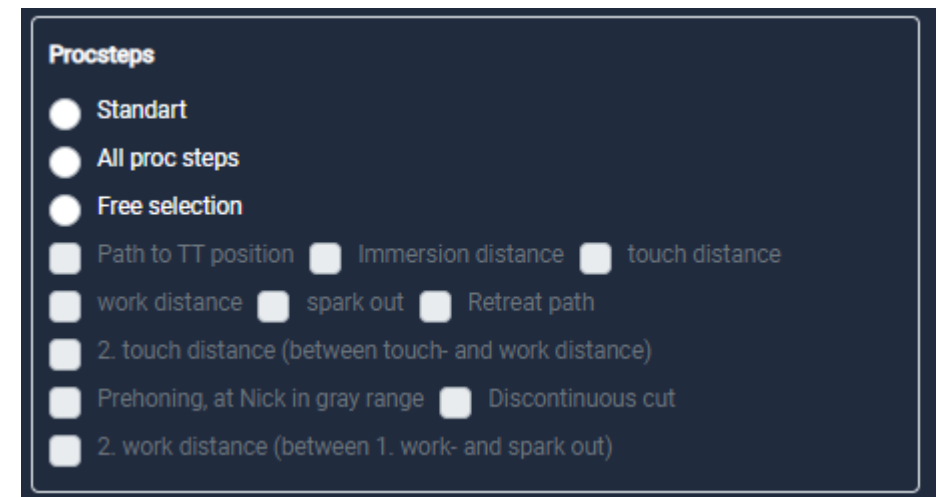
Honing machines – Proc steps

Proc steps honing

4	working (1)
10	working (2) (optional)
5	spark out (residence time on end distance with oscillation)
6	retreat path

Proc steps dressing with VSD

25	VSD cuts without correction
26	VSD cuts with correction



HRI® visualization

Skiving machine and other machines DVS Technology Group

With the gear skiving machine, each skiving stroke is considered a separate process step. If, for example, a workpiece is to be processed with 15 peeling strokes, the machine records 15 process steps accordingly.

With other machines from the DVS Technology Group, the process steps are individually adapted to the processing of the machine.

New diagnostic object

Type
Undefined

Reaction
None

NC program number
e.g.: 1,2,3,12,22,53...

Proc steps
Bsp.: 1,2,3,12,22,53... empty = all

Axis-handling
▼

Max
Max

Min
Min

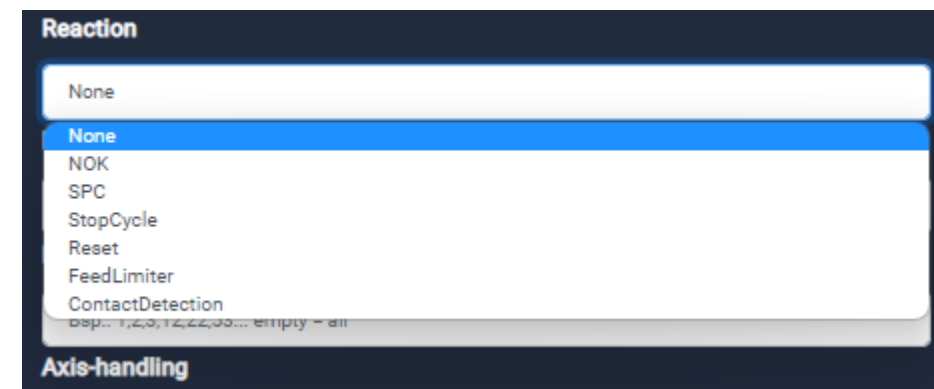
Status Value
0

OK Cancel

HRI® visualization

Error reaction

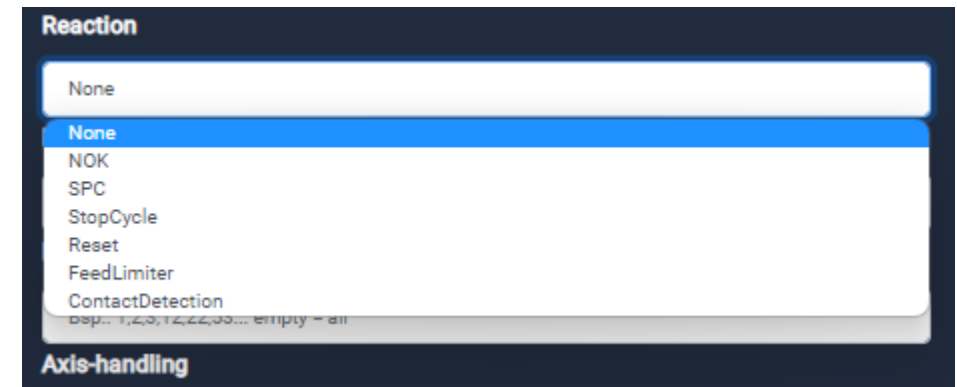
The following is a description of the error reactions that are triggered when certain values are exceeded or not reached. These error reactions could include various actions such as stopping the process, triggering an alarm or displaying a warning message to indicate deviations or problems in the machining process.



HRI® visualization

Error reaction

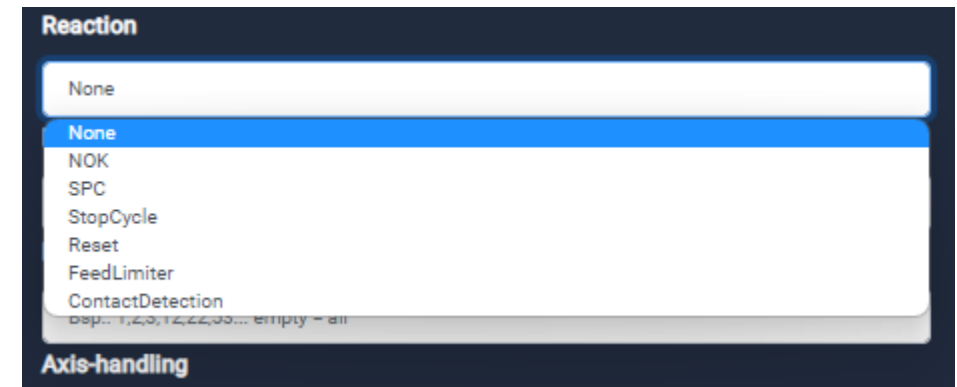
Error reaction	
None	No reaction from the machine.
NOK	The part is discharged as NOK part.
SPC	The part is discharged as SPC part.
StopCycle	The machine will be stop after the cycle.



HRI® visualization

Error reaction

Error reaction	
Reset	Emergency stop and retraction to X 0 position
Feed Limiter	Feed limitation from the infeed axis
Contact Detection	Contact Detection from the tooling to the workpiece



HRI[®] visualization

Error reaction Min.

If the average value of the honing process is not reached, the monitoring responds and the defined error reaction is executed. The minimum monitoring is intended to detect a honing break. If there is little or no contact between the honing and the workpiece, this is detected, and the error reaction is triggered. Only possible for HRIavg, HRI surface and ForceAvg.

Error reaction Max.

If the entered value in the process is exceeded, the monitoring responds and the defined error reaction is executed. If there are too high forces, vibration or temperatures during the honing process, the error reaction is triggered.

Error reaction Surface

The HRI machine reacts when the area under the HRI[®] curve is smaller than the entered value.

When machining is slowed down by hand intervention or feed rate limitation, the maximum and minimum values are lower. However, the integral of the HRI[®] remains relatively stable and in this way changes in the machine can be detected.

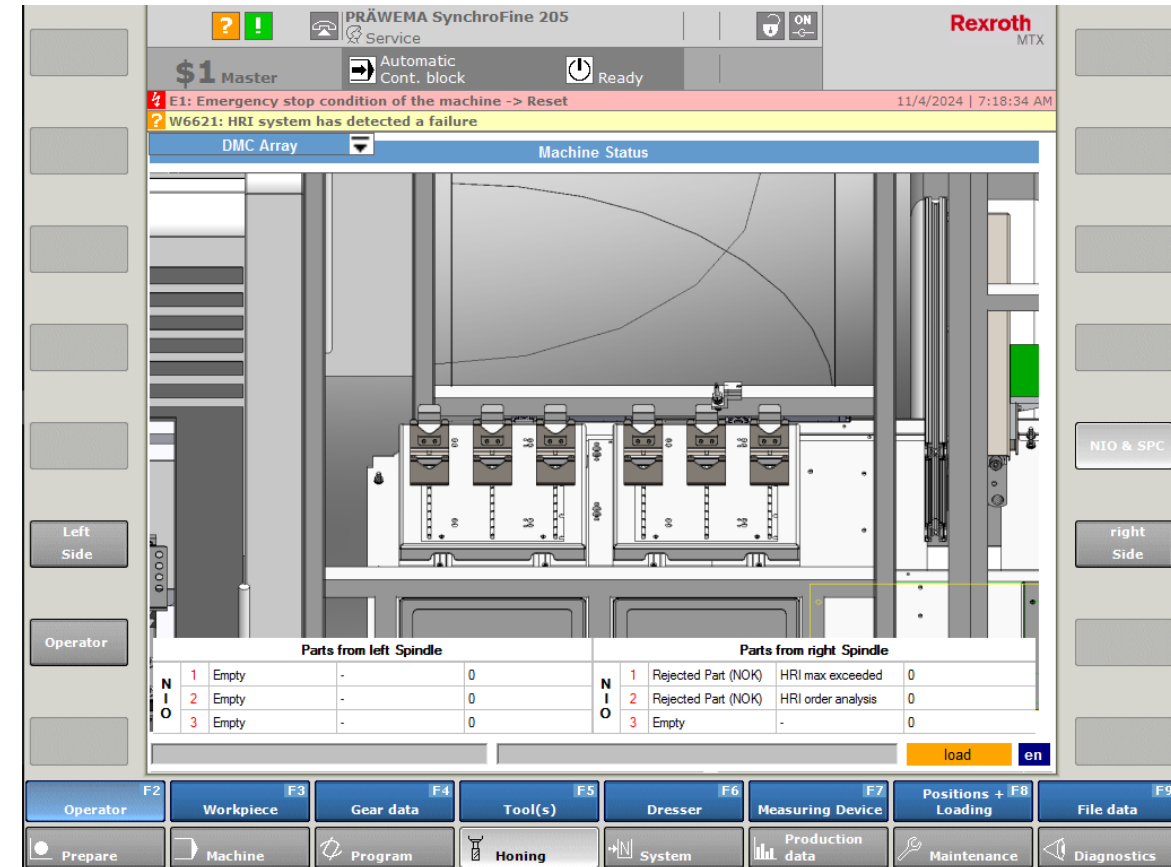
HRI[®] visualization

Status value

The status value is sent to the HoningHMI and displayed there for the ejected workpieces. This allows the operator at the machine to determine the reason why a workpiece was ejected.

The texts for the status value can be expanded.

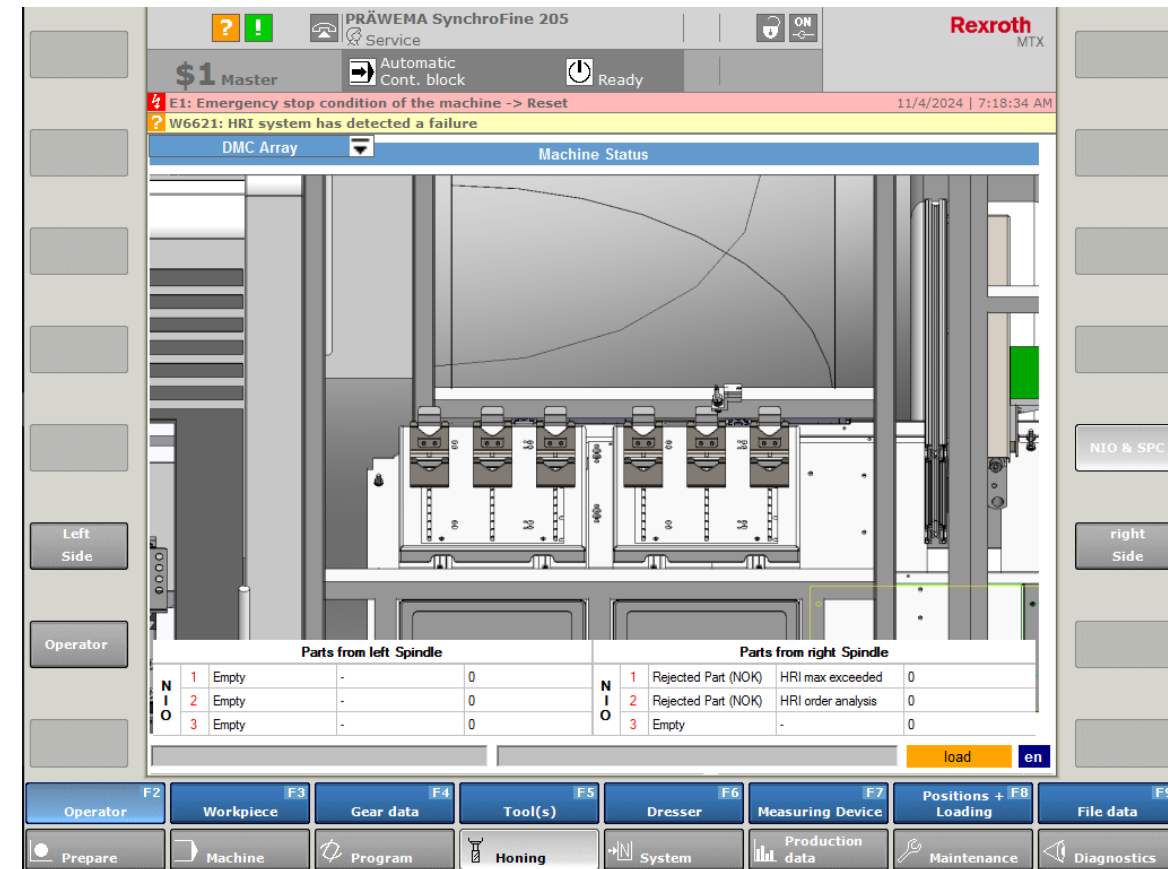
The display depends on the installed version of HoningHMI. The texts are displayed from revision 1839 onwards.



HRI® visualization

Status value

Status Value	Explanation
18	HRI max exceeded
19	HRI min not reached
20	HRI surface exceeded
21	HRI surface not reached
22	HRI order analysis
23	HRI reserve



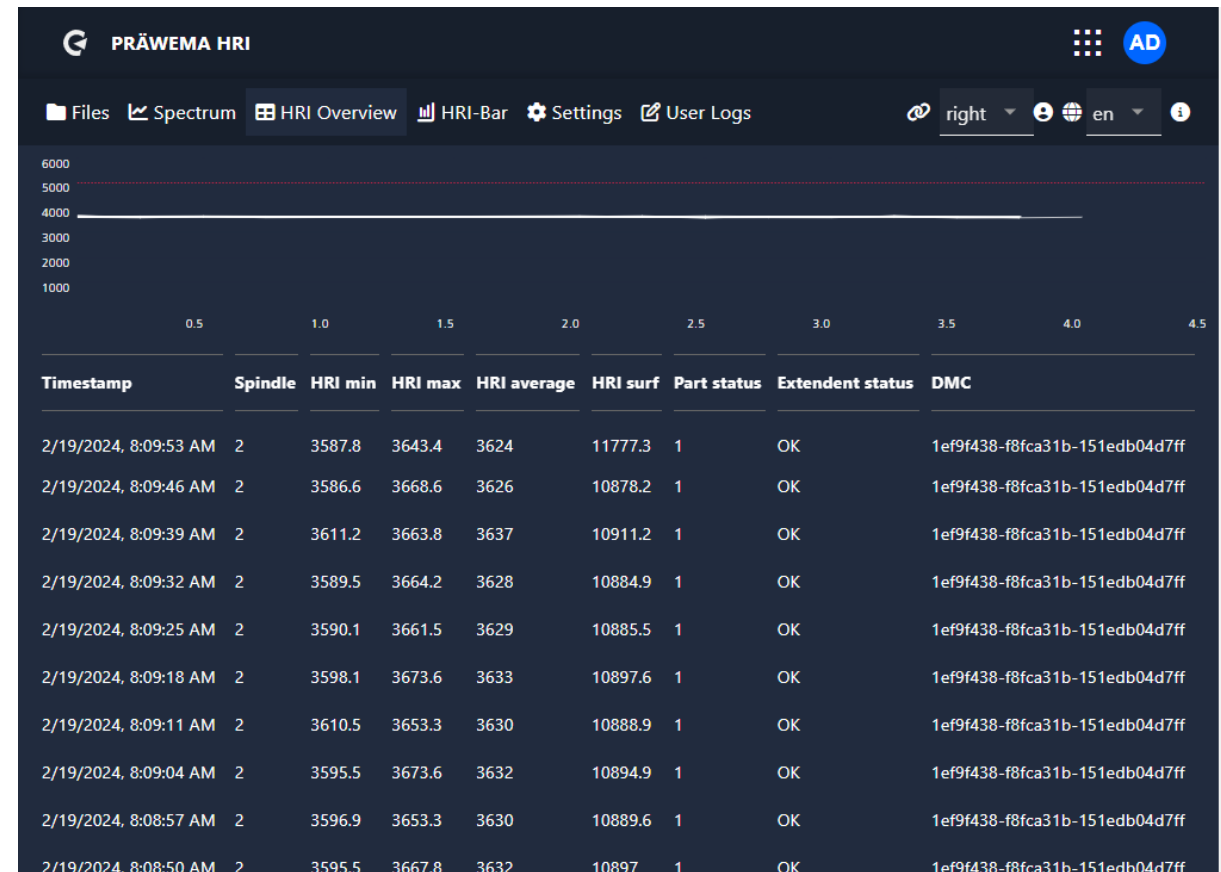
HRI® visualization

HRI® overview

The HRI® diagrams and the HRI® table are summarized in the HRI® overview.

Here is an example of a test machine at Prävema. The HRI limit has been set at 5,000 HRI points. Accordingly, a red line has been drawn in the chart at 5,000. The y-axis of the chart has been scaled 6,000 (+ 20%).

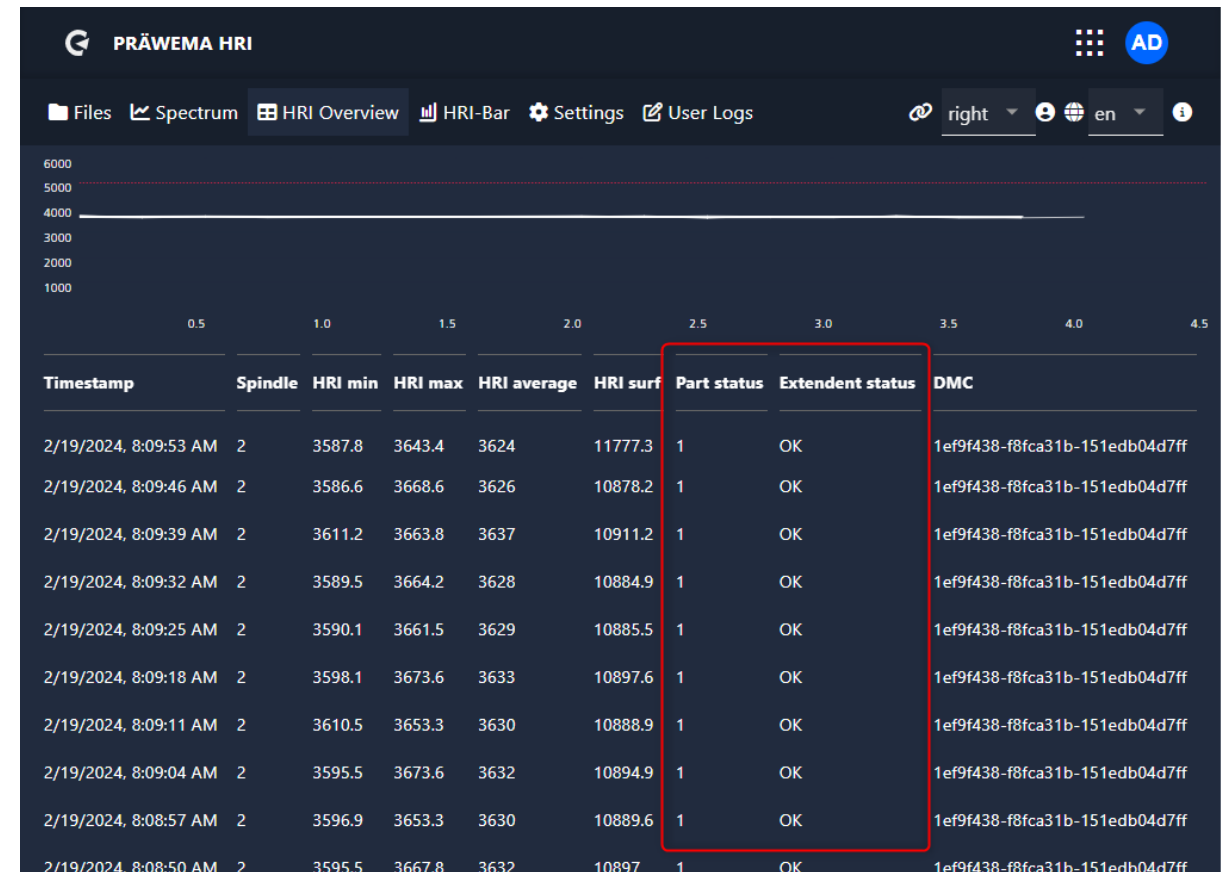
For machines where the process can run in parallel, a distinction is made between the left and right sides of the machine.



HRI® visualization

HRI® overview

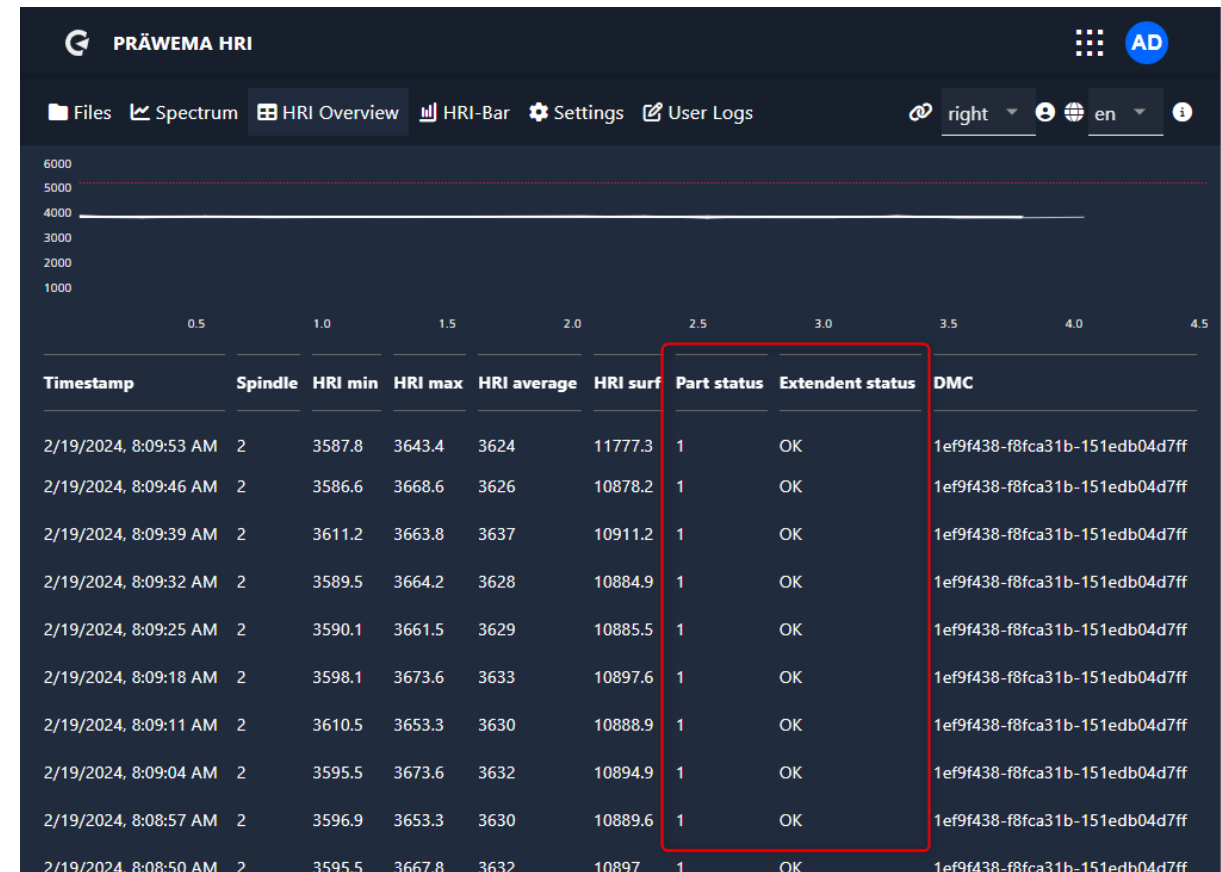
Workpiece status	
1	Measurement is OK - limit value was not exceeded
2	The limit was exceeded during processing
4	The average value was not reached during processing
8	The integral was not reached during processing
16	Error message via HRI® (vibration, force or temperature)



HRI® visualization

HRI® overview

Workpiece status	
32	Error message via HRlexpert® (order object or limiting curve)
64	stop after the end of cycle
128	Eject workpiece (SPC)
256	Reset - Emergency retraction to X0 position
512	Eject workpiece (NOK)



HRI® visualization

workpiece status

The individual workpiece status signals are bit values and can be combined with one another.

A triggering error message "4 - The average value was not reached during processing" with the error response "64 - Stop after end of cycle" would be output as workpiece status "68".

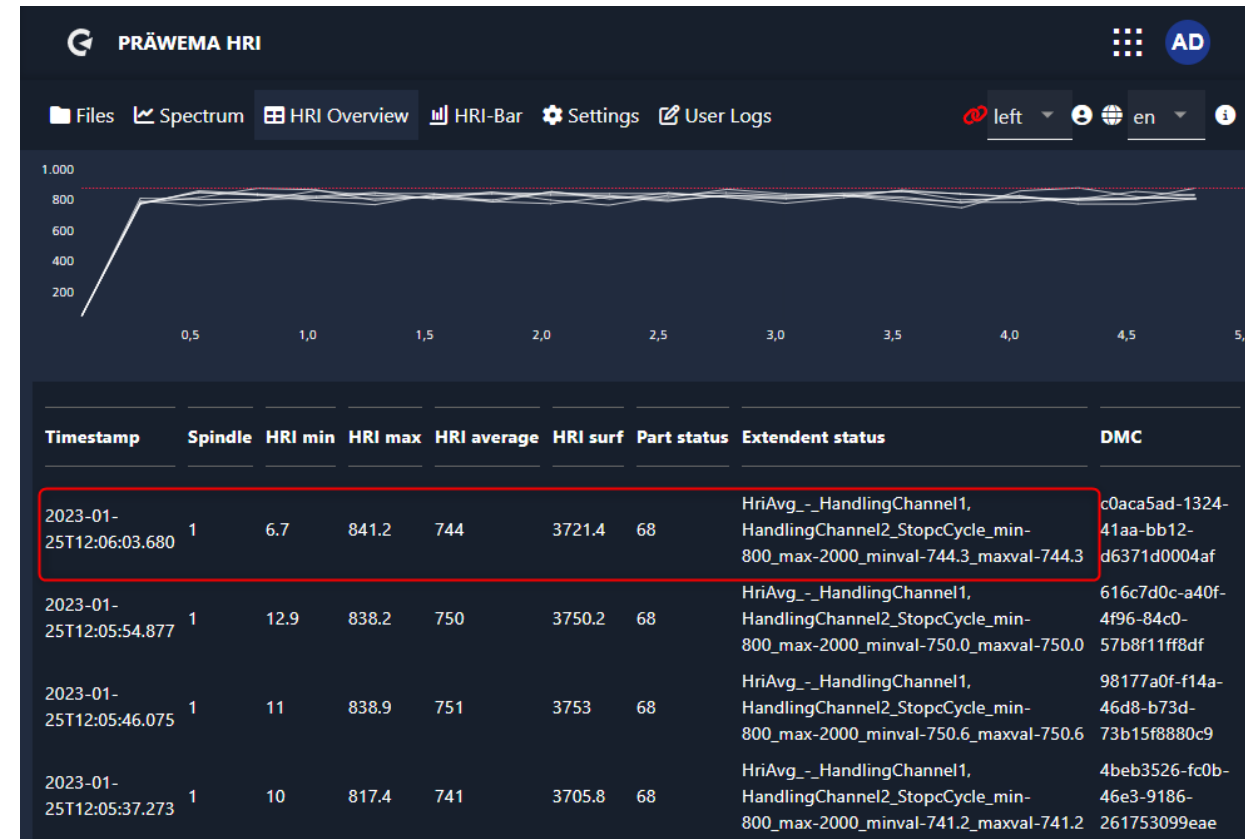


HRI® visualization

Extended status

In the extended status, the limit violations are displayed as plain text.

With the set limit values and the values of exceeding or falling below the values, as well as the set error reaction.

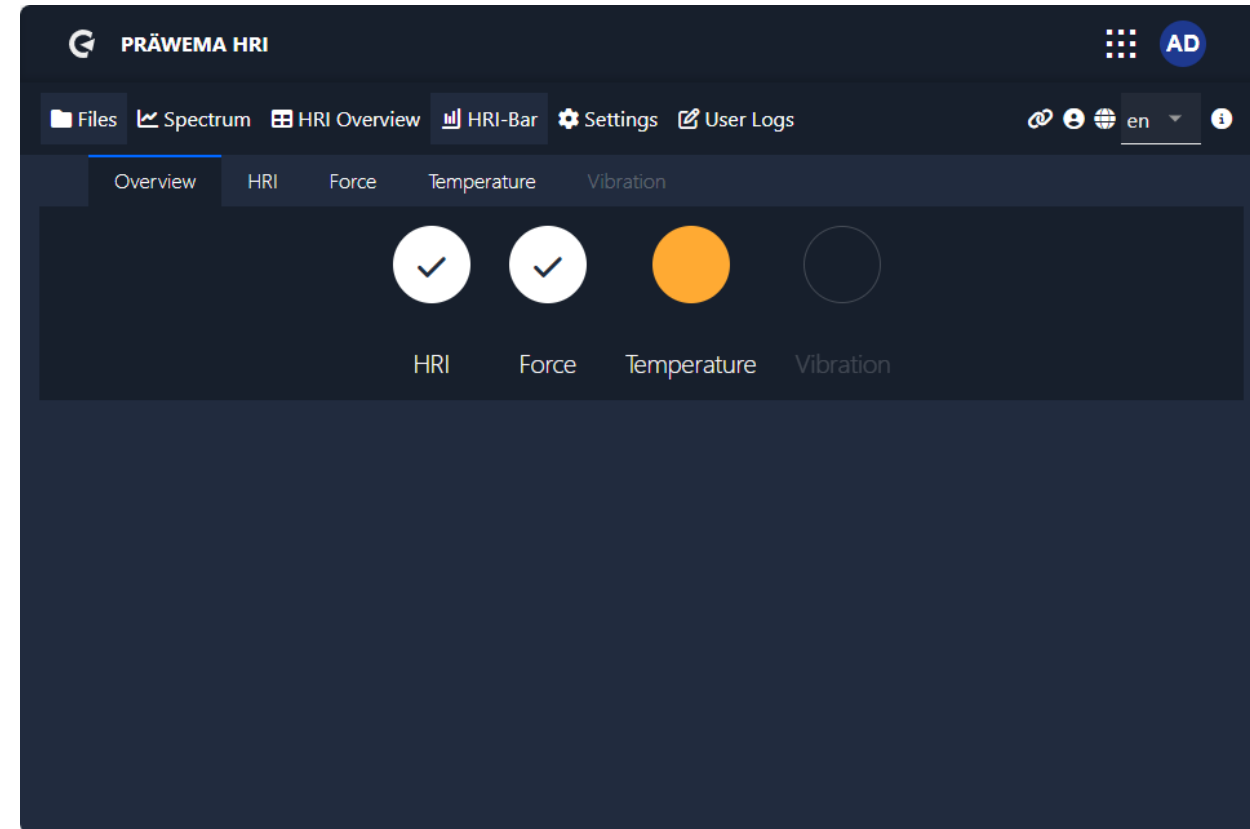


HRI® visualization

HRI - Bar

As of version 3.1 an overview page has been added. All 4 variables that can be monitored are shown here.

If a monitoring object is created, the corresponding button is activated. If the value is below 80% of the limit value, the button is displayed as a white circle with a check mark. If the value is more than 80% of the set limit value, the button will turn orange and if it is exceeded, it will turn red.



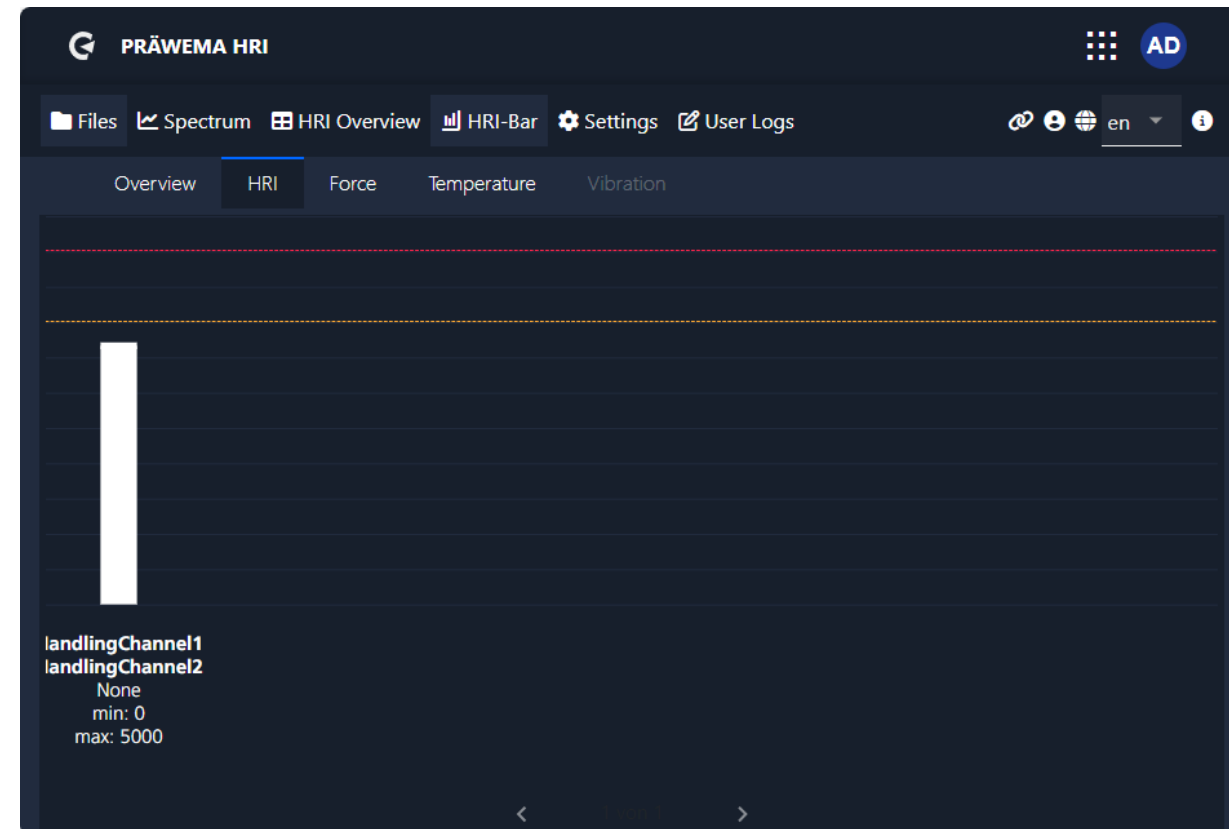
HRI® visualization

HRI - Bar

Click on the button to switch to the single view.

Here the created monitoring objects are displayed.

The monitoring objects of HRIAvg, HRIsurface and ForceAvg are not displayed. The values of these monitoring objects are calculated only at the end of the process.



HRI® visualization

HRI - Bar

In the example, three monitoring objects have been created for the temperature.

At the C1 spindle the limit value is exceeded, at the C2 spindle the measured value is between 80% and 99%. At the B spindle the measured temperature value is below 80% of the limit value.



Feed Limiter



Feed Limiter

How does the feed limiter work?

The machine feed rate is reduced by entering limit values for current and vibrations. If 100% of the set limit value is exceeded, the feed limitation becomes active. First, the feed is only reduced. If 120% of the limit exceeded, the feed limiter writes the value to 0%.

The feed rate is increased again only when the value falls below 100% of the limit.

Diagnostic objects

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Force	0	70	3,7,4,10,9	50	X1,X2	FeedLimiter
Vibration	0	500	3,7,4,10,9	50	C1-Spindel X,C1-Spindel Y,C1-Spindel Z	FeedLimiter

+ - ↗

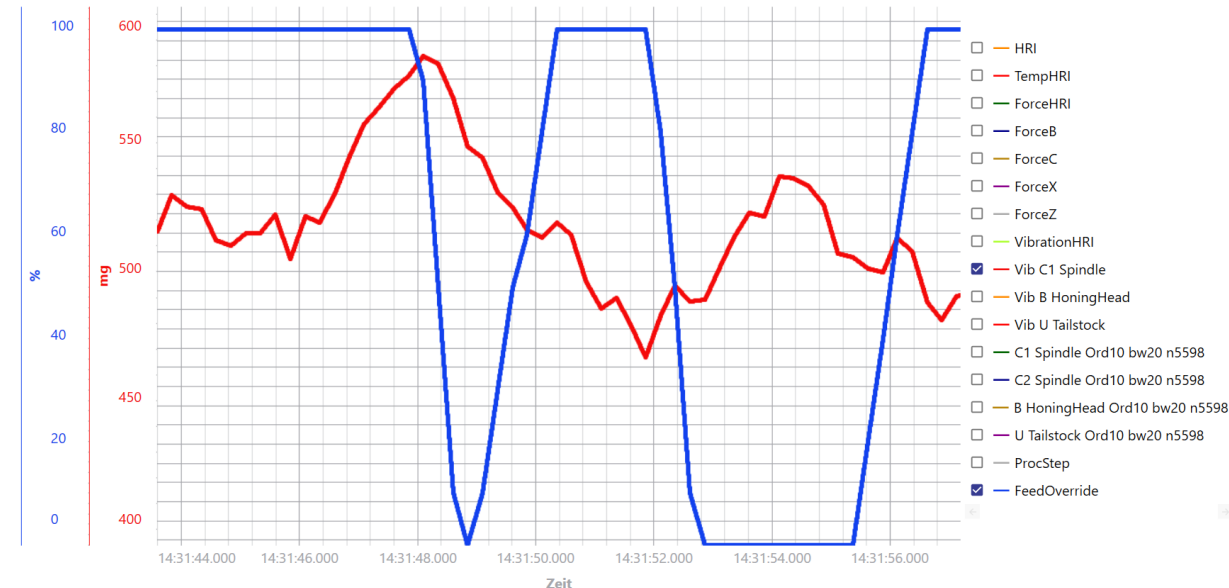
Feed Limiter

Example of a feed limitation

The machine feed is limited by the vibrations of the U-axis.

First the feed is reduced to 90% and after this measure is insufficient it is reduced to 0%.

When the vibrations fall below the limit value again, the feed is increased again.



HRI[®] settings



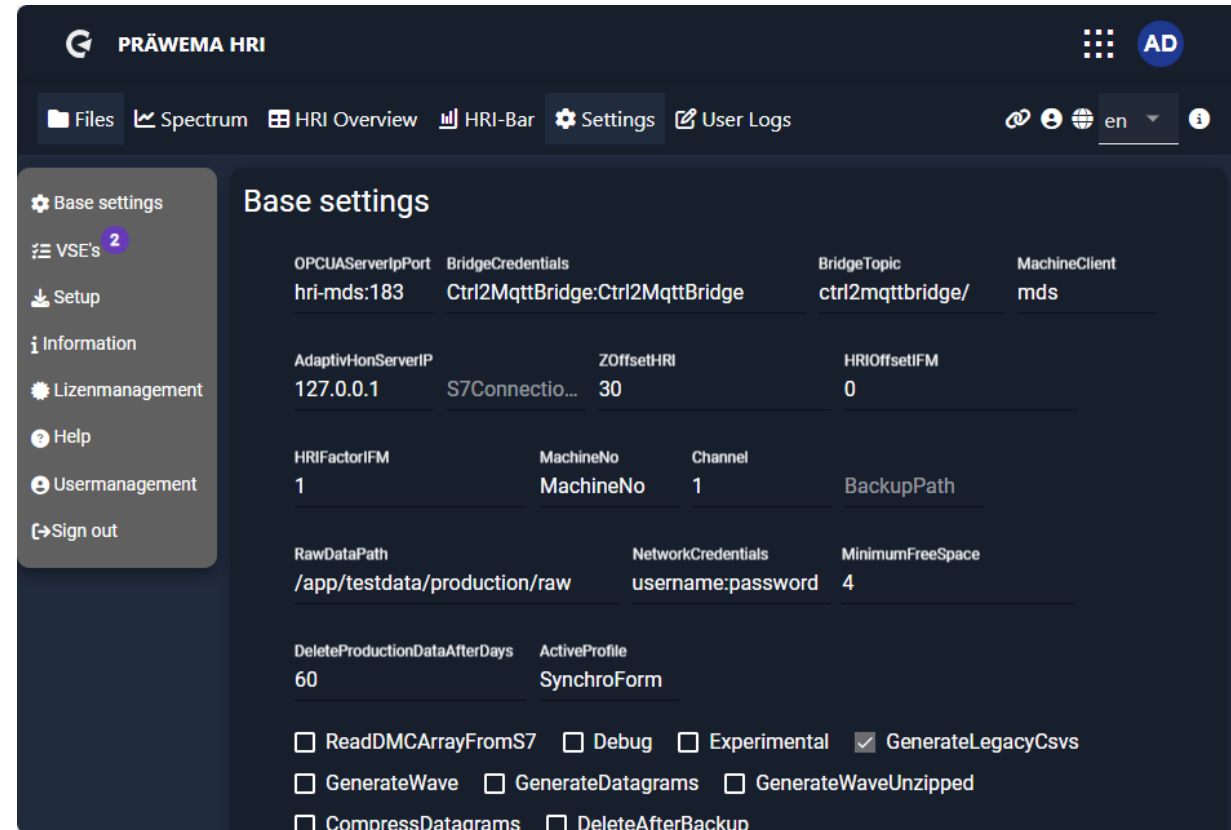
HRI® settings

Base settings

All important settings for communication between the HRI machine and the control can be set under base settings.

Furthermore, some additional options can be set.

The basic settings are defined once during commissioning. No further adjustments are required. Except in the event of faults or changes to the programming, no changes need to be made here.



The screenshot shows the PRÄWEMA HRI settings interface. The 'Base settings' tab is active, displaying various configuration parameters. A left sidebar contains navigation options: Base settings, VSE's (2), Setup, Information, Lizenmanagement, Help, Usermanagement, and Sign out. The main content area lists settings in a grid format:

OPCUAServerIpPort	BridgeCredentials	BridgeTopic	MachineClient
hri-mds:183	Ctrl2MqttBridge:Ctrl2MqttBridge	ctrl2mqttbridge/	mds
AdaptivHonServerIP	ZOffsetHRI	HRIOffsetIFM	
127.0.0.1	S7Connectio... 30	0	
HRIFactorIFM	MachineNo	Channel	BackupPath
1	MachineNo	1	
RawDataPath	NetworkCredentials	MinimumFreeSpace	
/app/testdata/production/raw	username:password	4	
DeleteProductionDataAfterDays	ActiveProfile		
60	SynchroForm		

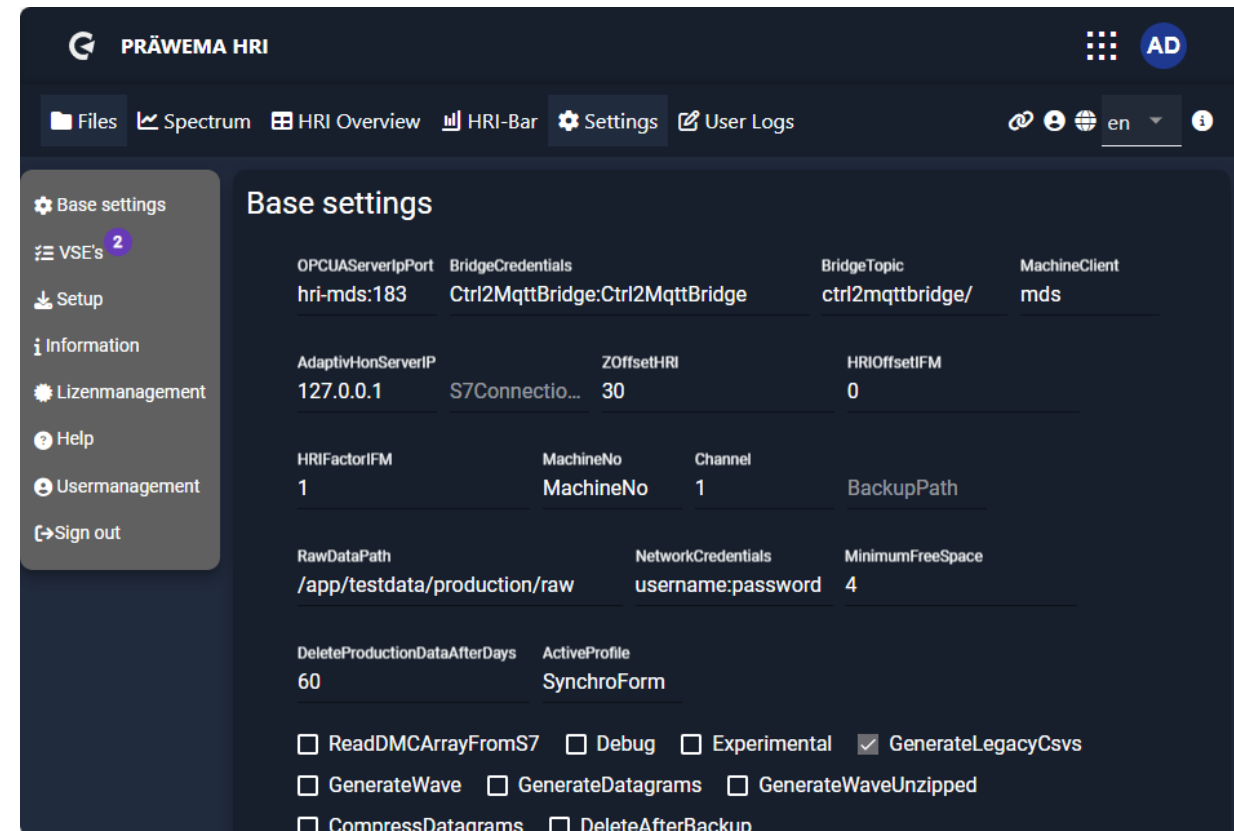
At the bottom, there are several checkboxes for additional options:

- ReadDMCArryFromS7
- Debug
- Experimental
- GenerateLegacyCsvs
- GenerateWave
- GenerateDatagrams
- GenerateWaveUnzipped
- CompressDatagrams
- DeleteAfterBackup

HRI® settings

Basic settings for Praewema installation

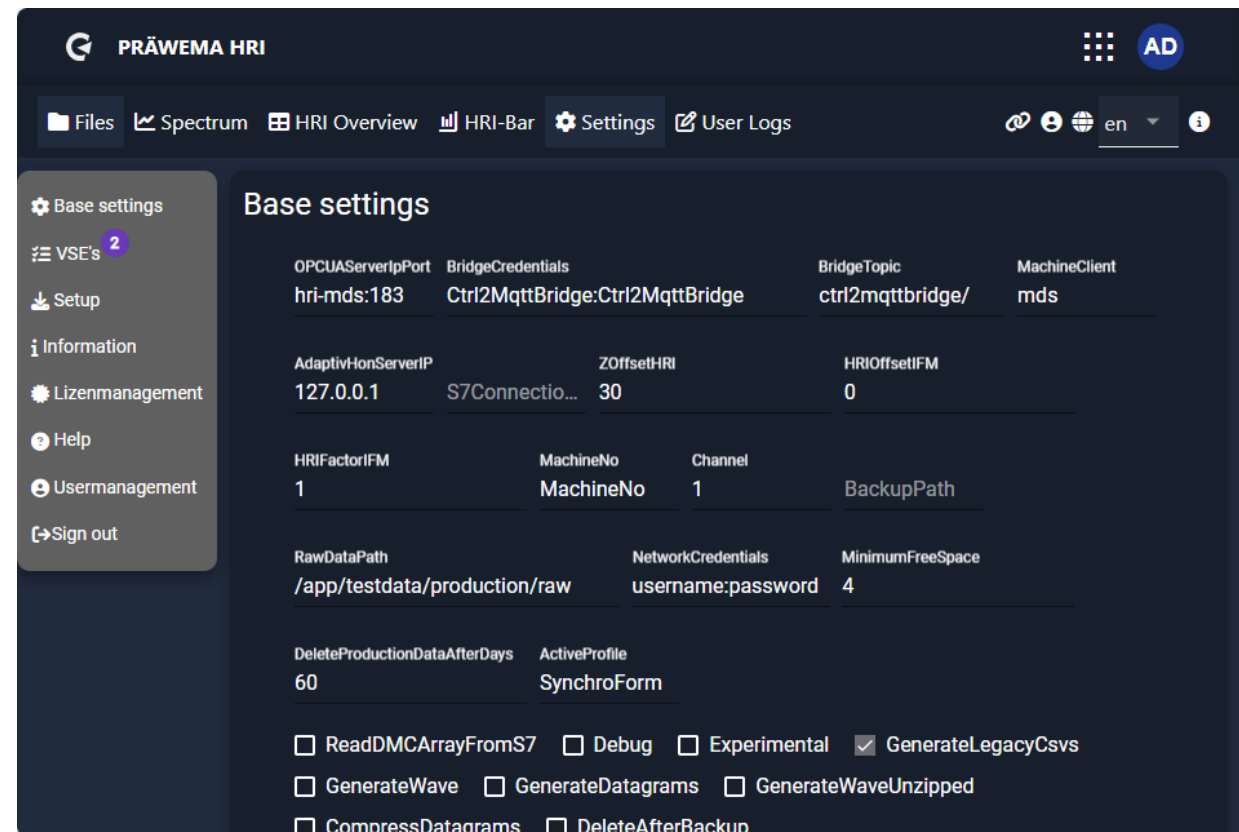
OPCUAServer Port	IP address of the controller with the OPC UA server port
Bridge Credentials	Username and password for the network bridge for DVS Edge
Bridge Topic	For DVS Edge
Machine Client	For DVS Edge
Adaptiv Hon ServerIP	IP address of the controller with the AdaptivHonServer
S7Connection IP	IP address of the S7 CPU in Profinet



HRI[®] settings

Basic settings for Praewema installation

ReadDMC ArrayFromS7	Read data matrix code from Siemens S7
Channel	NC Channel from the Siemens S7 controller
PublishRaw DataViaMqtt	Sends raw data via MQTT
ForceOrder Monitoring	At least one regulatory monitoring system must be in place.
Experimental	Beta functions – be careful with production machines!



The screenshot shows the 'Base settings' page of the PRÄWEMA HRI web interface. The interface is dark-themed and includes a navigation menu on the left with options like 'Base settings', 'VSE's', 'Setup', 'Information', 'Lizenmanagement', 'Help', 'Usermanagement', and 'Sign out'. The main content area displays various configuration parameters:

- OPCUAServerIpPort:** hri-mds:183
- BridgeCredentials:** Ctrl2MqttBridge:Ctrl2MqttBridge
- BridgeTopic:** ctrl2mqttbridge/
- MachineClient:** mds
- AdaptivHonServerIP:** 127.0.0.1
- ZOffsetHRI:** 30
- HRIOffsetIFM:** 0
- HRIFactorIFM:** 1
- MachineNo:** MachineNo
- Channel:** 1
- BackupPath:** BackupPath
- RawDataPath:** /app/testdata/production/raw
- NetworkCredentials:** username:password
- MinimumFreeSpace:** 4
- DeleteProductionDataAfterDays:** 60
- ActiveProfile:** SynchroForm

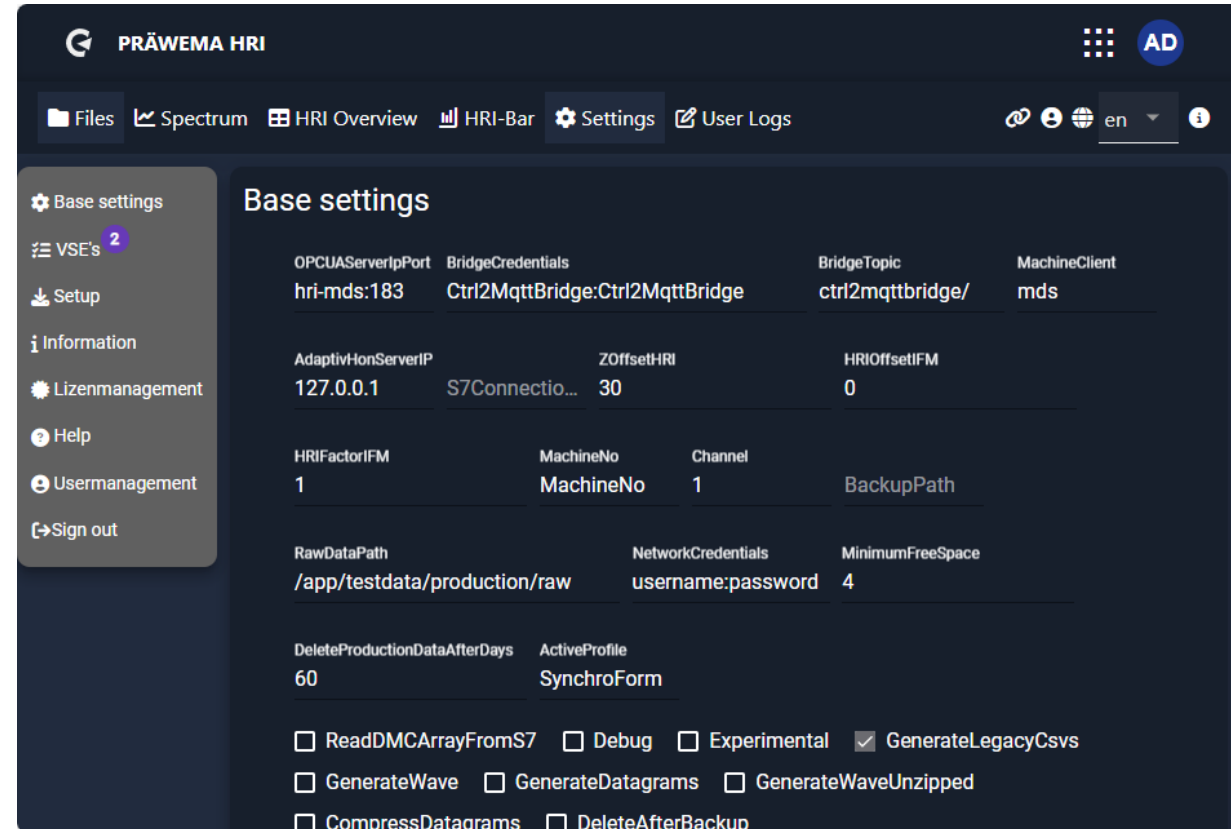
At the bottom, there are several checkboxes for optional features:

- ReadDMCArrayFromS7
- Debug
- Experimental
- GenerateLegacyCsvs
- GenerateWave
- GenerateDatagrams
- GenerateWaveUnzipped
- CompressDatagrams
- DeleteAfterBackup

HRI® settings

Basic settings for Praewema installation

ActiveProfile	Active profile – SynchroForm or SynchroFine
InvertHRI CommMonitor	Invert communication monitoring
FeedOverride InPercent	Feed limiter is written to PLC in percent.



The screenshot shows the 'Base settings' page in the PRÄWEMA HRI web interface. The left sidebar contains navigation options: Base settings, VSE's (2), Setup, Information, Lizenmanagement, Help, Usermanagement, and Sign out. The main content area displays various configuration parameters:

- OPCUAServerIpPort:** hri-mds:183
- BridgeCredentials:** Ctrl2MqttBridge:Ctrl2MqttBridge
- BridgeTopic:** ctrl2mqttbridge/
- MachineClient:** mds
- AdaptivHonServerIP:** 127.0.0.1
- S7Connectio...:** S7Connectio...
- ZOffsetHRI:** 30
- HRIOffsetIFM:** 0
- HRIFactorIFM:** 1
- MachineNo:** MachineNo
- Channel:** 1
- BackupPath:** BackupPath
- RawDataPath:** /app/testdata/production/raw
- NetworkCredentials:** username:password
- MinimumFreeSpace:** 4
- DeleteProductionDataAfterDays:** 60
- ActiveProfile:** SynchroForm

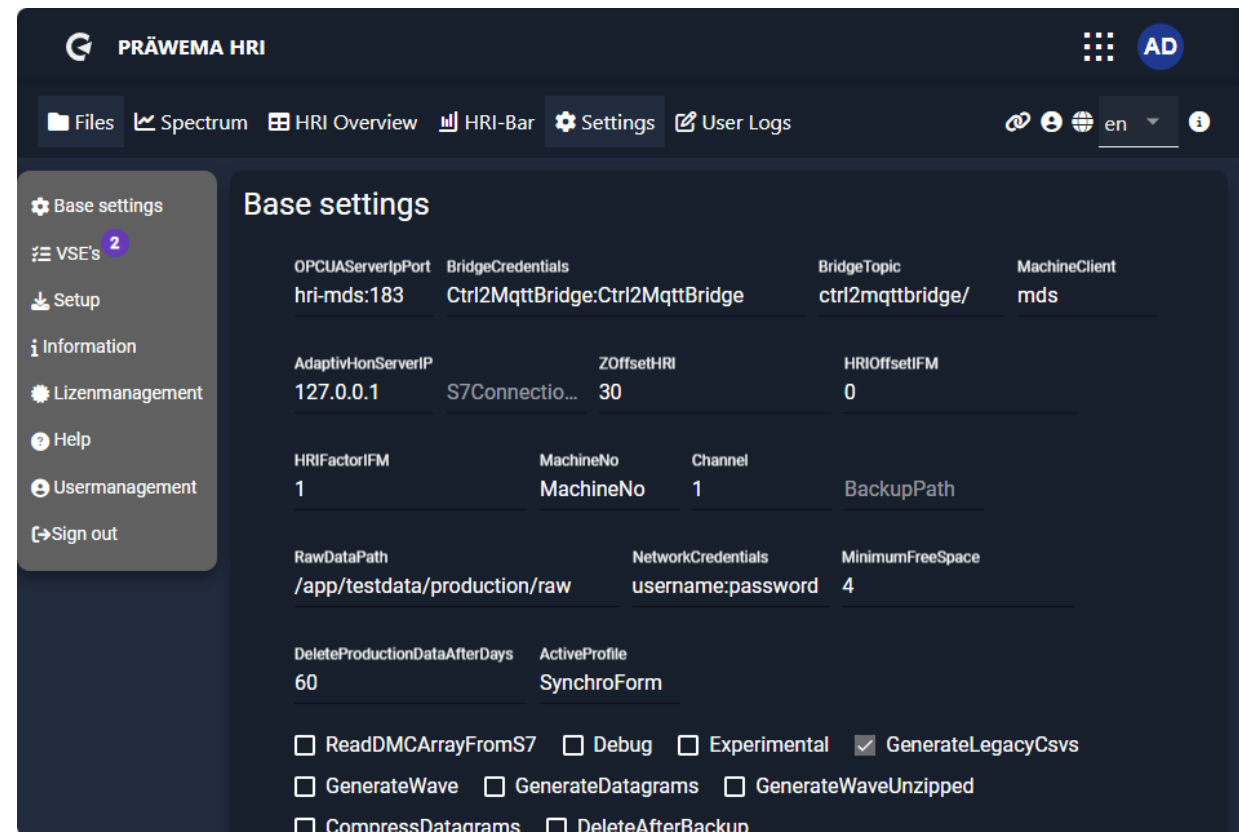
At the bottom, there are several checkboxes for advanced settings:

- ReadDMCArryFromS7
- Debug
- Experimental
- GenerateLegacyCsvs
- GenerateWave
- GenerateDatagrams
- GenerateWaveUnzipped
- CompressDatagrams
- DeleteAfterBackup

HRI® settings

Basic settings for costumer

ZOffsetHRI	Only for SynchroFine – offset to the force of the Z axis when the tailstock is activated
HRIOffsetIFM	Offset from the vibration of the HRI calculation
HRIFactorIFM	Factor from the vibration of the HRI calculation
MachineNo	Number of the machine
Debug	Debug function for more recordings



The screenshot shows the 'PRÄWEMA HRI' settings page. The 'Base settings' section is active, displaying various configuration parameters:

- OPCUAServerIpPort:** hri-mds:183
- BridgeCredentials:** Ctrl2MqttBridge:Ctrl2MqttBridge
- BridgeTopic:** ctrl2mqttbridge/
- MachineClient:** mds
- AdaptivHonServerIP:** 127.0.0.1
- S7Connectio...:** S7Connectio...
- ZOffsetHRI:** 30
- HRIOffsetIFM:** 0
- HRIFactorIFM:** 1
- MachineNo:** MachineNo
- Channel:** 1
- BackupPath:** BackupPath
- RawDataPath:** /app/testdata/production/raw
- NetworkCredentials:** username:password
- MinimumFreeSpace:** 4
- DeleteProductionDataAfterDays:** 60
- ActiveProfile:** SynchroForm

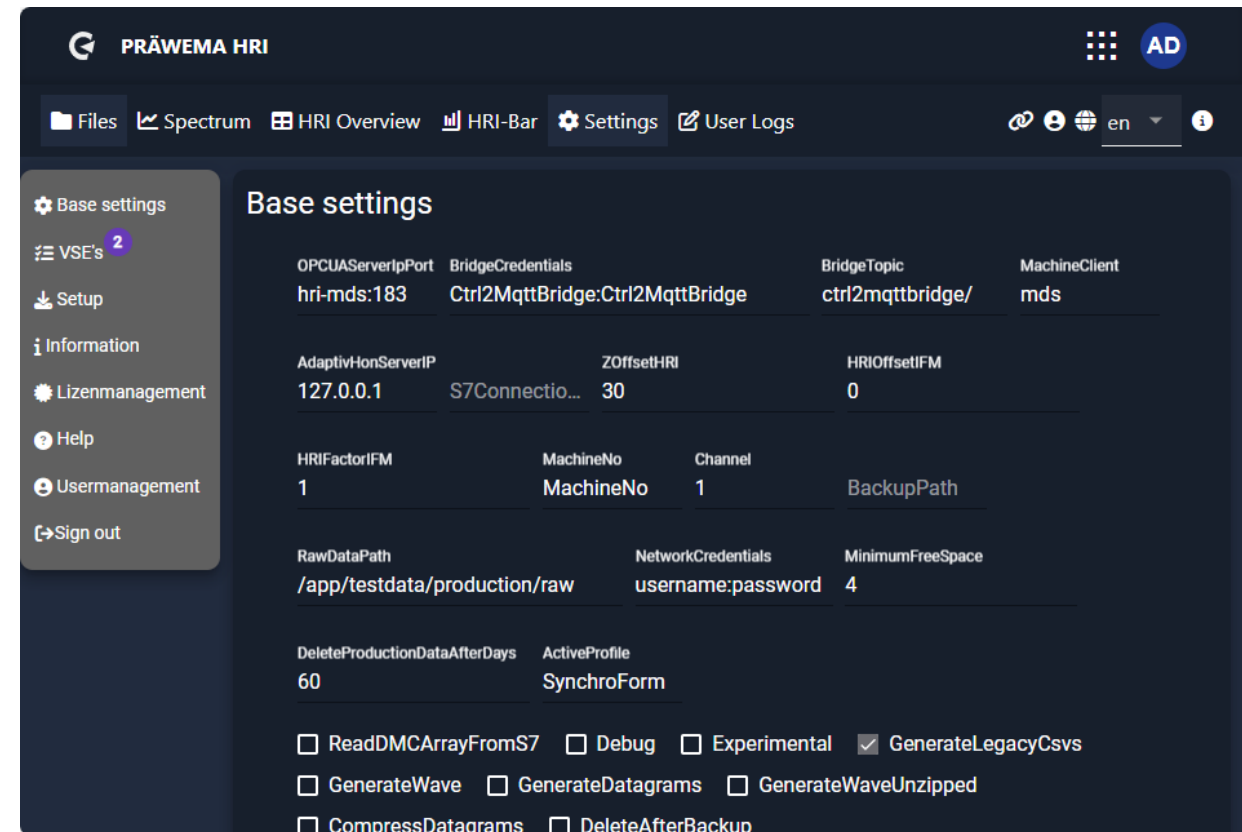
At the bottom, there are several checkboxes for additional settings:

- ReadDMCArrayFromS7
- Debug
- Experimental
- GenerateLegacyCsvs
- GenerateWave
- GenerateDatagrams
- GenerateWaveUnzipped
- CompressDatagrams
- DeleteAfterBackup

HRI® settings

Base settings for costumer

BackupPath	Storage path for the HRI backup on a server
RawDataPath	Storage path for the raw data
Network Credentials	Username and password to log in to a server
Minimum Free Space	Minimum free disk space (in MB)
Delete Production Data After Days	Deletion of logging files after number of days on the machine.



HRI® settings

Base settings for customer

LegacyCsv SaveAvgMax	Stores the average and maximum amplitude of the vibrations for IO components.
DeleteAfter Backup	Deletes the logging files on the machine if an external backup path is set up.

The screenshot shows the PRÄWEMA HRI Settings page. The 'Base settings' section is active, displaying various configuration parameters:

- OPCUAServerIpPort:** hri-mds:183
- BridgeCredentials:** Ctrl2MqttBridge:Ctrl2MqttBridge
- BridgeTopic:** ctrl2mqttbridge/
- MachineClient:** mds
- AdaptivHonServerIP:** 127.0.0.1
- ZOffsetHRI:** 30
- HRIOffsetIFM:** 0
- HRIFactorIFM:** 1
- MachineNo:** MachineNo
- Channel:** 1
- BackupPath:** BackupPath
- RawDataPath:** /app/testdata/production/raw
- NetworkCredentials:** username:password
- MinimumFreeSpace:** 4
- DeleteProductionDataAfterDays:** 60
- ActiveProfile:** SynchroForm

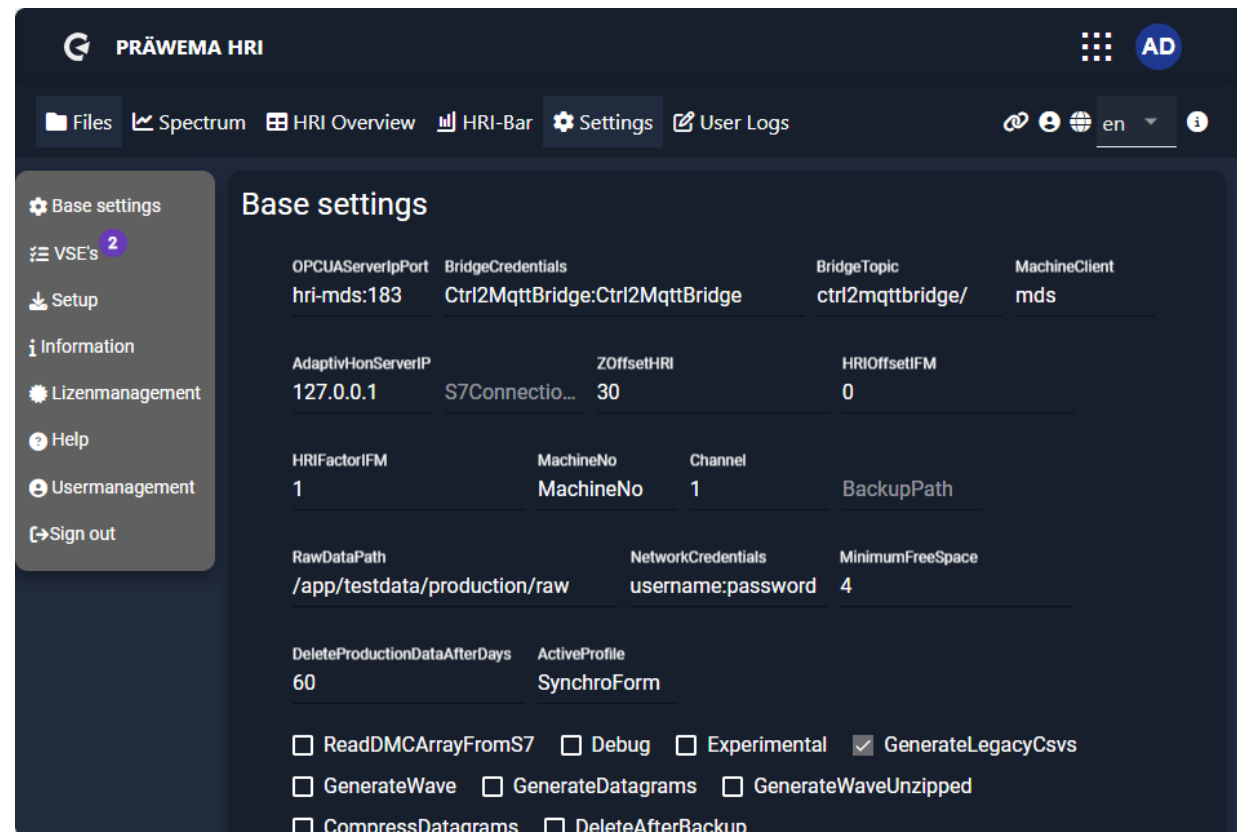
At the bottom, there are several checkboxes for additional settings:

- ReadDMCArryFromS7
- Debug
- Experimental
- GenerateLegacyCsvs
- GenerateWave
- GenerateDatagrams
- GenerateWaveUnzipped
- CompressDatagrams
- DeleteAfterBackup

HRI® settings

Base settings for data formats

Generate LegacyCsvs	Create standard CSV log files
Generate Wave	Creates a compressed WAVE file from the data from the vibration sensors.
Generate Datagrams	Generates datagrams for analyzing the parts
Generate WaveUnzipped	Creates an uncompressed WAVE file from the data from the vibration sensors.



The screenshot shows the PRÄWEMA HRI Settings interface. The 'Base settings' section is active, displaying various configuration parameters:

- OPCUAServerIpPort:** hri-mds:183
- BridgeCredentials:** Ctrl2MqttBridge:Ctrl2MqttBridge
- BridgeTopic:** ctrl2mqttbridge/
- MachineClient:** mds
- AdaptivHonServerIP:** 127.0.0.1
- ZOffsetHRI:** 30
- HRIOffsetIFM:** 0
- HRIFactorIFM:** 1
- MachineNo:** MachineNo
- Channel:** 1
- BackupPath:** BackupPath
- RawDataPath:** /app/testdata/production/raw
- NetworkCredentials:** username:password
- MinimumFreeSpace:** 4
- DeleteProductionDataAfterDays:** 60
- ActiveProfile:** SynchroForm

At the bottom, there are several checkboxes for data format generation:

- ReadDMCArryFromS7
- Debug
- Experimental
- GenerateLegacyCsvs
- GenerateWave
- GenerateDatagrams
- GenerateWaveUnzipped
- CompressDatagrams
- DeleteAfterBackup

HRI[®] settings

Base settings for data formats

CompressData grams	Compress datagrams
EnableRaw Data	Record raw data

The screenshot shows the PRÄWEMA HRI Settings page. The 'Settings' tab is active, and the 'Base settings' section is expanded. The settings are organized into a grid:

- OPCUAServerIpPort:** hri-mds:183
- BridgeCredentials:** Ctrl2MqttBridge:Ctrl2MqttBridge
- BridgeTopic:** ctrl2mqttbridge/
- MachineClient:** mds
- AdaptivHonServerIP:** 127.0.0.1
- ZOffsetHRI:** 30
- HRIOffsetIFM:** 0
- HRIFactorIFM:** 1
- MachineNo:** MachineNo
- Channel:** 1
- BackupPath:** BackupPath
- RawDataPath:** /app/testdata/production/raw
- NetworkCredentials:** username:password
- MinimumFreeSpace:** 4
- DeleteProductionDataAfterDays:** 60
- ActiveProfile:** SynchroForm

At the bottom, there are several checkboxes for additional settings:

- ReadDMCArryFromS7
- Debug
- Experimental
- GenerateLegacyCsvs
- GenerateWave
- GenerateDatagrams
- GenerateWaveUnzipped
- CompressDatagrams
- DeleteAfterBackup

HRI[®] settings

VSE base settings

The individual VSE evaluation units from the manufacturer IFM are displayed in the VSE basic settings.

Usually, one or two VSE with the firmware AnReSa are used. 4 vibration sensor inputs can be connected to each evaluation unit.

On older machines, a VSE unit was installed for each sensor.

In the example, a single-axis VSA001 sensor and a three-axis VSM103 sensor are connected.

The screenshot displays the 'VSE Base settings' interface. At the top, it shows 'VSE1' with a 'REMOVE VSE...' button and an upward arrow. Below this, the IP address '192.168.142.200' is shown next to a checked checkbox labeled 'isAnresa'. A list of four sensor inputs is shown, each with a dropdown arrow: 'E1-Spindle', 'C1-Spindle_X', 'C1-Spindle_Y', and 'C1-Spindle_Z'. At the bottom right of the list are minus and plus buttons. A large blue 'SAVE' button is located at the bottom of the interface.

HRI[®] settings

VSE base settings

The single-axis sensor VSA001 is connected to sensor input 1 and set up as an IFM standard vibration sensor.

The three-axis sensor is connected to inputs 2-4 and set up as an IEPE sensor (current). Each axis of the sensor requires a separate input on the evaluation unit.

The screenshot displays the configuration interface for VSE1. At the top right, there is a blue button labeled "REMOVE VSE..." and an upward arrow. Below this, the IP address "192.168.142.200" is shown next to a checked checkbox labeled "isAnresa".

The interface is divided into two main sections, each with a title and an upward arrow:

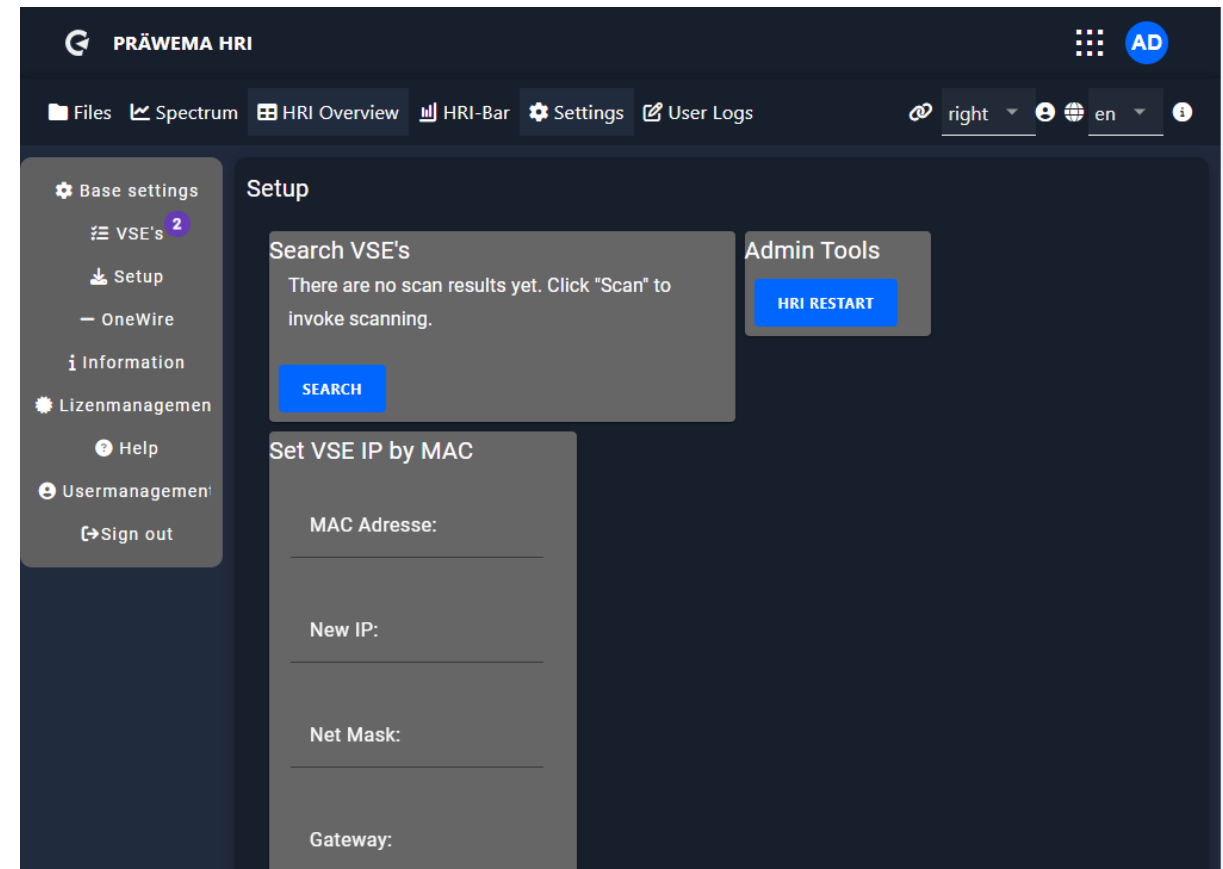
- E1-Spindle:**
 - Input-Channel: 1
 - Name: E1-Spindle
 - Handling: 1
 - isIEPE:
- C1-Spindle_X:**
 - Input-Channel: 2
 - Name: C1-Spindle_X
 - Handling: 1
 - isIEPE:

HRI® settings

Setup

In the “Setup” tab, you can search for the evaluation units of the VSE vibration sensors.

The HRI backend can be restarted and if the search for a VSE was unsuccessful, the IP address of the VSE unit can be changed via the MAC address.



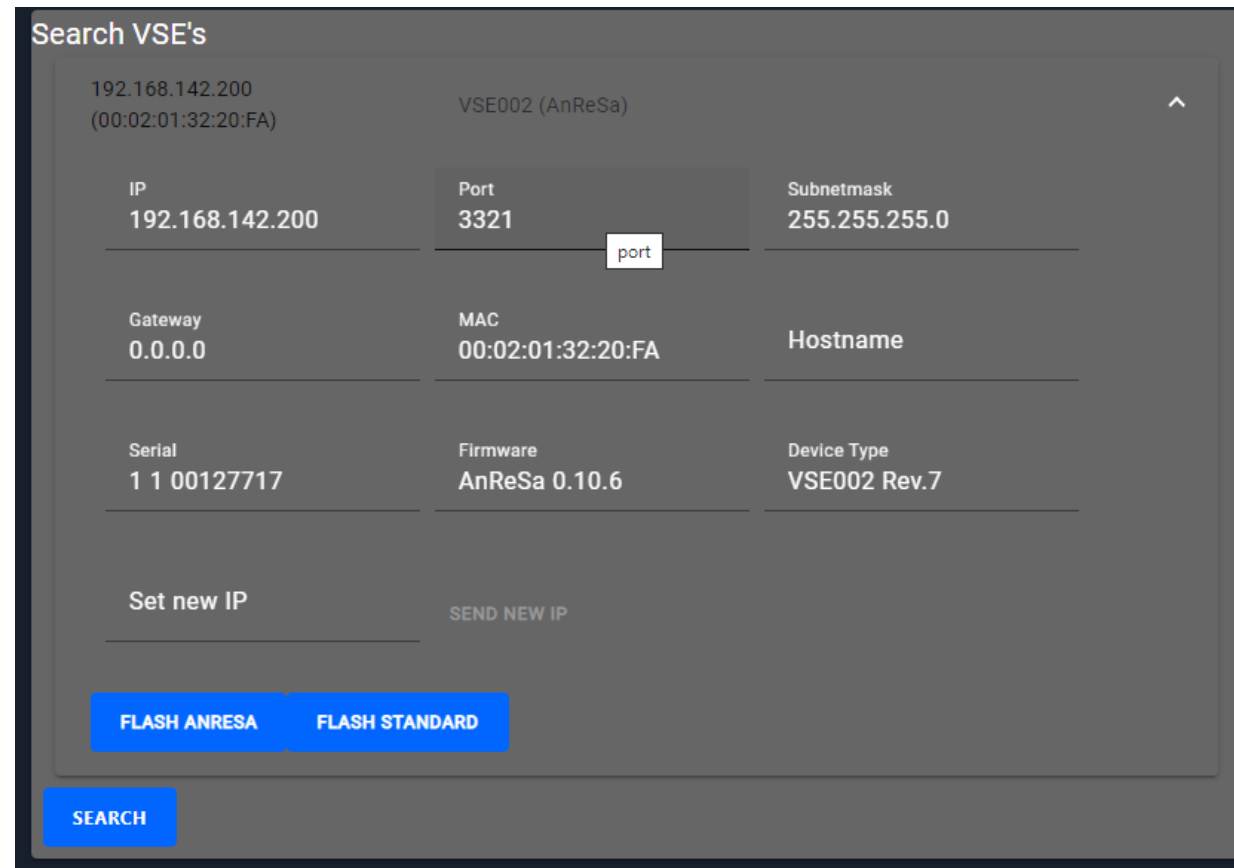
HRI[®] settings

Setup

After identifying a VSE unit, all relevant settings and information are displayed. In this context, it is possible to change the IP address. It is also possible to switch between the two firmware versions (AnReSa or Standard).

Please note that changes with the IFM Octavis software can only be made with the standard firmware.

Flashing the AnReSa firmware is only possible from hardware version (DeviceType) 6. If the hardware is older, updating the firmware requires the VSE unit to be replaced.



The screenshot shows a web interface for configuring a VSE unit. At the top, there is a search bar with the text "Search VSE's". Below the search bar, the following information is displayed:

- IP: 192.168.142.200 (00:02:01:32:20:FA)
- Port: 3321 (with a dropdown menu showing "port")
- Subnetmask: 255.255.255.0
- Gateway: 0.0.0.0
- MAC: 00:02:01:32:20:FA
- Hostname: (empty field)
- Serial: 1 1 00127717
- Firmware: AnReSa 0.10.6
- Device Type: VSE002 Rev.7

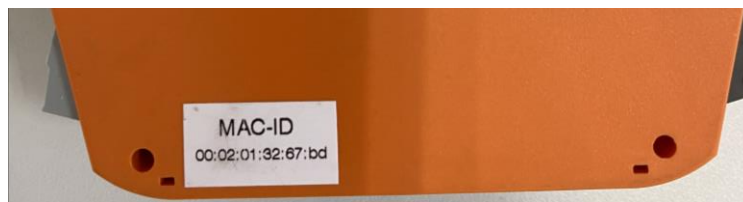
Below the configuration fields, there are two buttons: "Set new IP" and "SEND NEW IP". At the bottom, there are two blue buttons: "FLASH ANRESA" and "FLASH STANDARD". A "SEARCH" button is located at the bottom left of the interface.

HRI[®] settings

Setup

If no VSE unit is found or it is not possible to configure the IP address, there is the option of setting the IP address using the MAC address.

The MAC address is located on a sticker on the side of the VSE unit.



To carry out the configuration, the MAC address, the new IP address and the subnet mask must be entered.

Set VSE IP by MAC

MAC Adresse:
00:02:01:32:20:FA

New IP:
192.168.142.202

Net Mask:
255.255.255.0

Gateway:

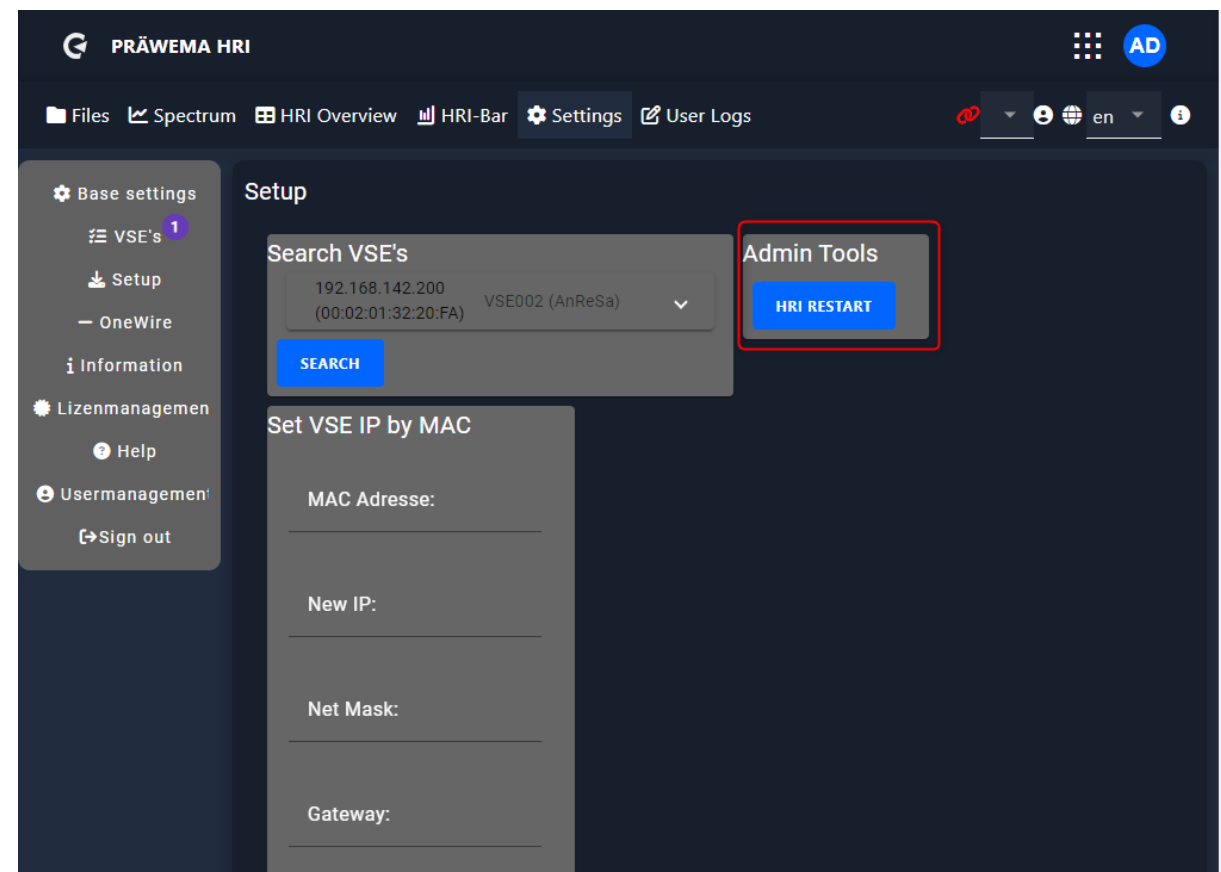
SET VSE IP BY MAC

HRI[®] settings

Setup

To apply changes, it is necessary to restart HRI.

HRI can be restarted in the setup tab.



HRI® settings

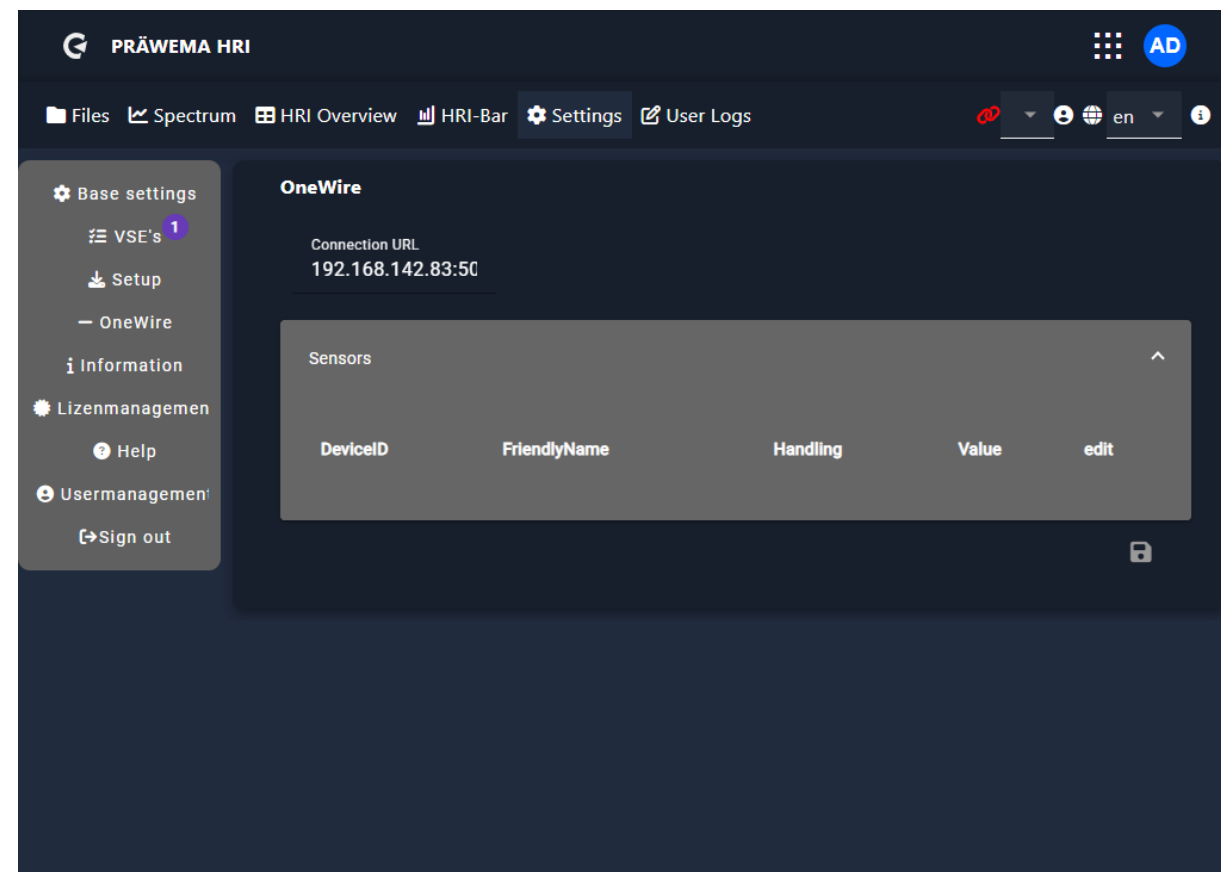
OneWire

The tooling and workpiece spindles have temperature sensors to monitor the bearing temperature.

These sensors use the OneWire bus.

The IP address of the controller must be entered in the HRI. After a successful connection to the controller, all connected sensors are automatically recognized.

The sensors are assigned to the respective mounting locations by using the serial number of the OneWire sensors.



HRI® settings

Information

The backend and frontend versions are displayed under Information.

In case of errors, be sure to indicate the program versions.

The screenshot shows the PRÄWEMA HRI settings application. The top navigation bar includes 'Files', 'Spectrum', 'HRI Overview', 'HRI-Bar', 'Settings', and 'User Logs'. The 'Settings' menu is open, showing options like 'Base settings', 'VSE's', 'Setup', 'OneWire', 'Information', 'Lizenmanagemen', 'Help', 'Usermanagemen', and 'Sign out'. The 'Information' section is selected, displaying the PRÄWEMA logo, a technical diagram, and the following details:

- Information**
- PRÄWEMA Antriebstechnik GmbH
- Version Frontend: 3.2.7
- Version Backend: 3.2.7
- Support: hrisupport@praewema.de

A blue button at the bottom of the information section reads 'SHOW 3RD PARTY LICENSES...'.

HRI® settings

License management

The installed licenses are displayed under the license management. Under the button "ADD" further licenses can be installed and under "REMOVE" the licenses can be deleted again.

With "GENERATE TEST LIC" a test license can be generated twice. The test license works until the last day of the following month.

The screenshot shows the PRÄWEMA HRI web interface. The top navigation bar includes 'Files', 'Spectrum', 'HRI Overview', 'HRI-Bar', 'Settings', and 'User Logs'. A sidebar on the left contains menu items: 'Base settings', 'VSE's 2', 'Setup', 'Information', 'Lizenmanagement', 'Help', 'Usermanagement', and 'Sign out'. The main content area displays a table with columns: 'Licence Key', 'Customer', 'Test Licence', 'ValidDate', and 'Options'. Below the table, there are four buttons: 'ADD', 'REMOVE', 'GENERATE REQUEST', and 'GENERATE TEST LIC (2 REM.)'.

Licence Key	Customer	Test Licence	ValidDate	Options

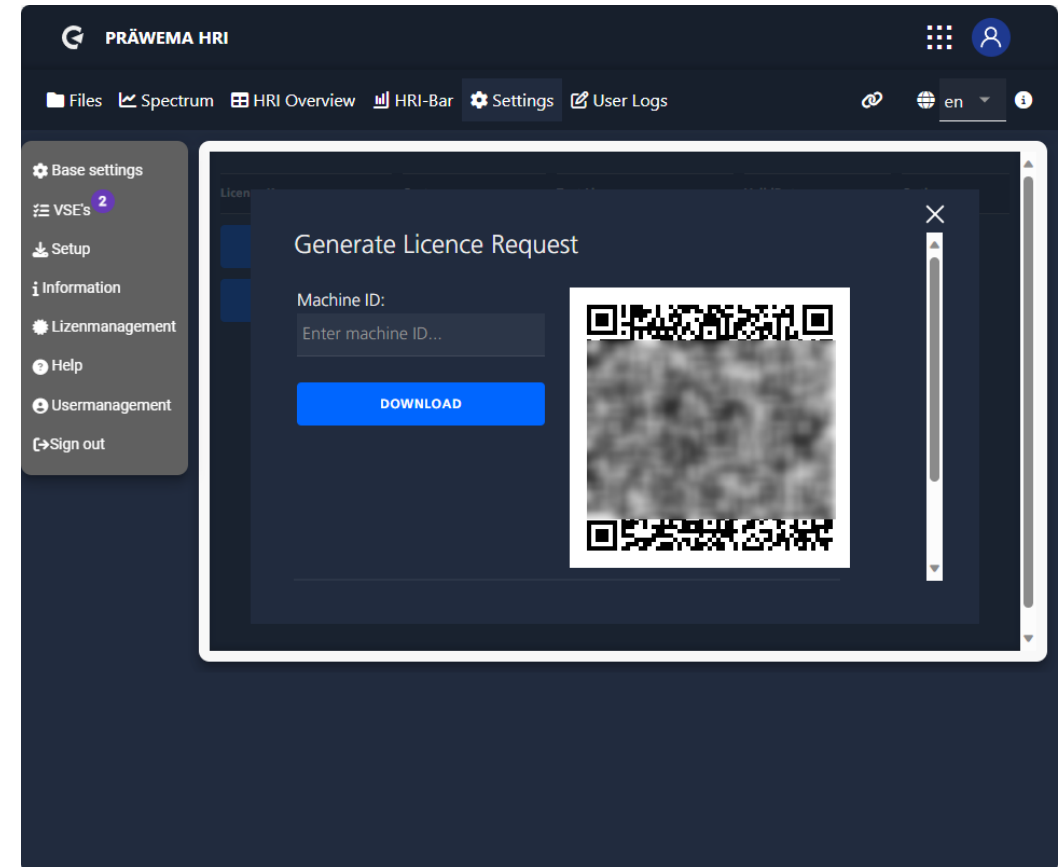
HRI® settings

License management

"GENERATE REQUEST" creates an LRQ file. This file can then be used to generate a permanent license. The machine number must be entered to create the LRQ file.

The license key is linked to a MAC address of the controller. When the controller is replaced, a new license must be created. Test licenses can be used for the transition.

The LRQ file is saved in the Downloads folder.

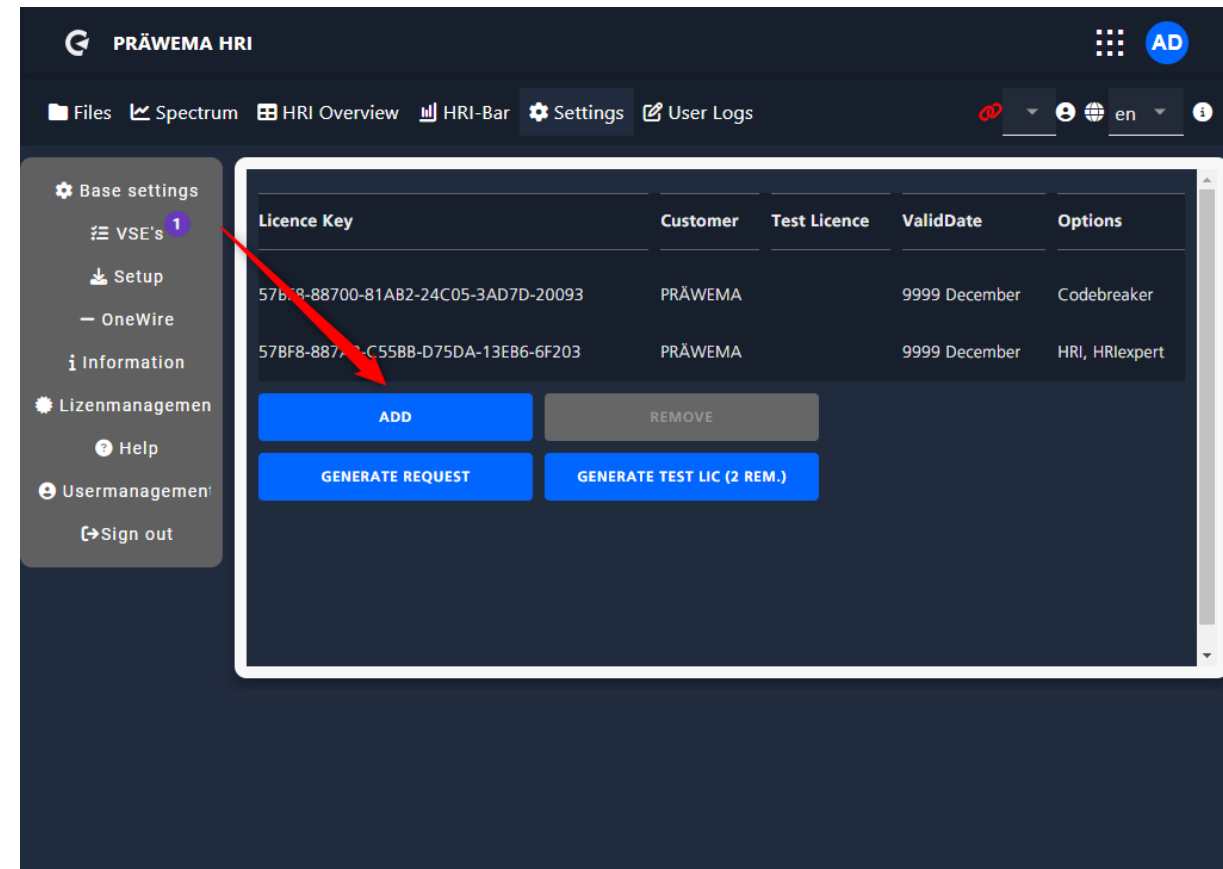


HRI® settings

License management

The information from the License Request File can be used to create a permanent or provisional license and a License File is generated. This license file must be installed in the HRI in order to activate all functions.

The ADD button opens another window.



The screenshot shows the 'Settings' page for 'PRÄWEMA HRI'. The 'Licenmanagemen' (License Management) section is active. A table displays existing license keys. A red arrow points to the 'ADD' button below the table.

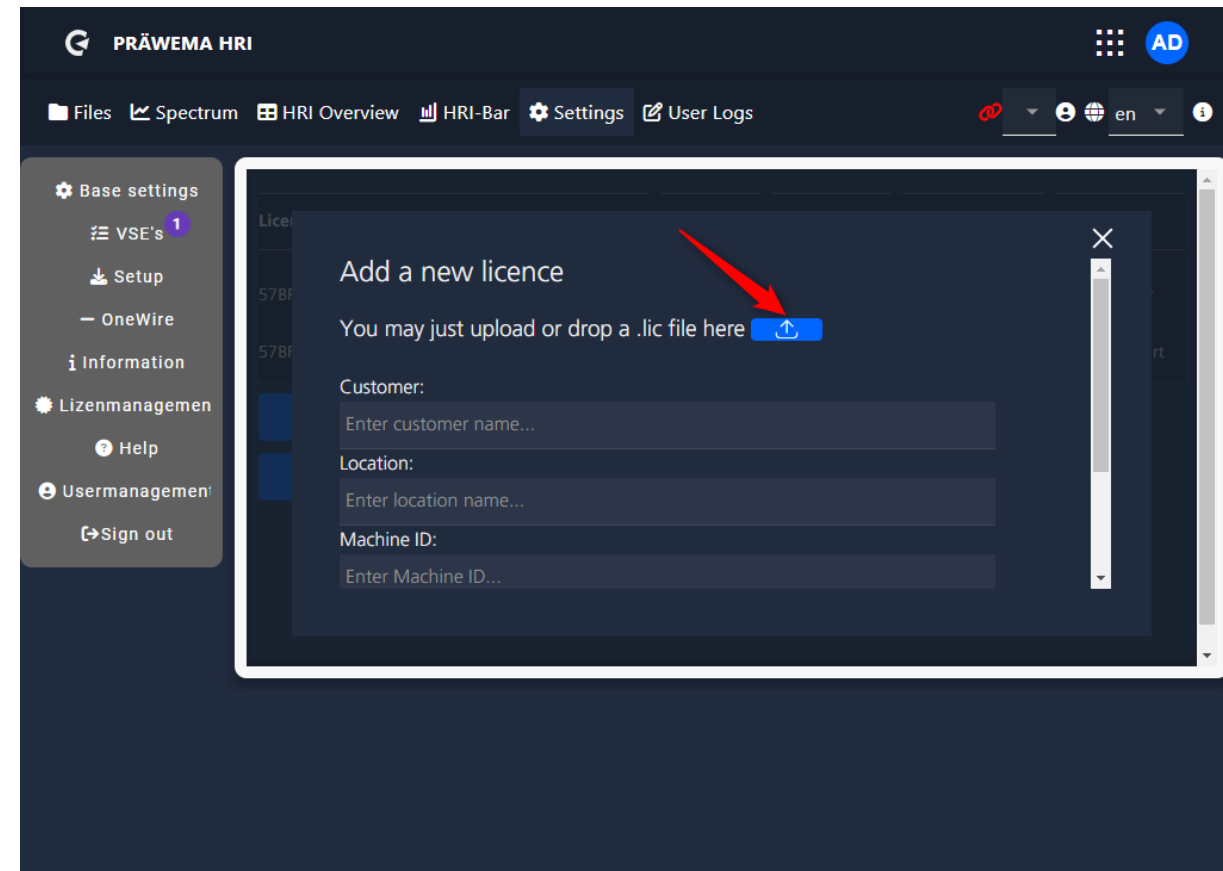
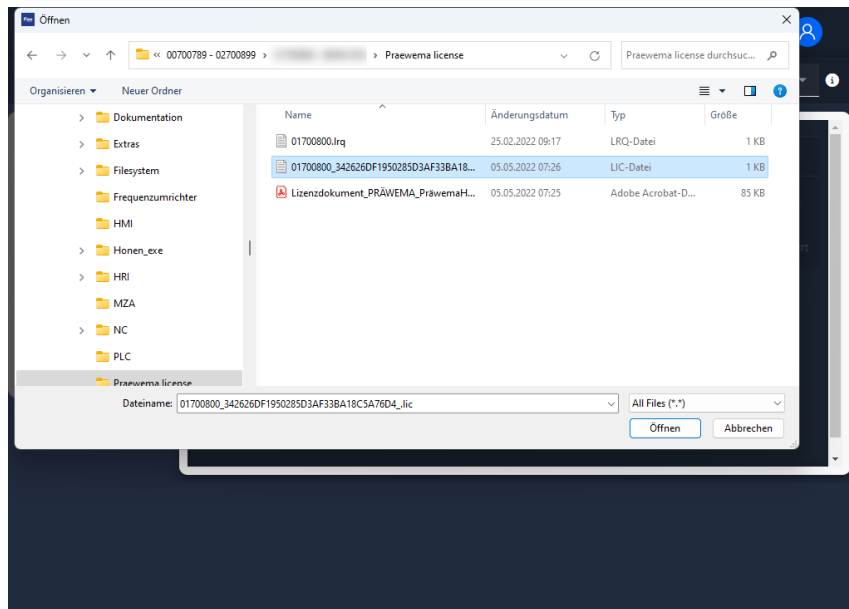
Licence Key	Customer	Test Licence	ValidDate	Options
57BF8-88700-81AB2-24C05-3AD7D-20093	PRÄWEMA		9999 December	Codebreaker
57BF8-88700-C55BB-D75DA-13EB6-6F203	PRÄWEMA		9999 December	HRI, HRIexpert

Buttons below the table: ADD, REMOVE, GENERATE REQUEST, GENERATE TEST LIC (2 REM.)

HRI® settings

License management

Here you can import the LIC file by clicking on the blue button.



HRI® settings

License management

After the import you have to scroll down in the window and save the license key. The new license key is then displayed in the overview.

Licence Key	Customer	Test Licence	ValidDate	Options
57BF8-88700-81AB2-24C05-3AD7D-20093	PRÄWEMA		9999 December	Codebreaker
57BF8-887A8-C55BB-D75DA-13EB6-6F203	PRÄWEMA		9999 December	HRI, HRlexpert

You may just upload or drop a .lic file here

Customer:

Location:

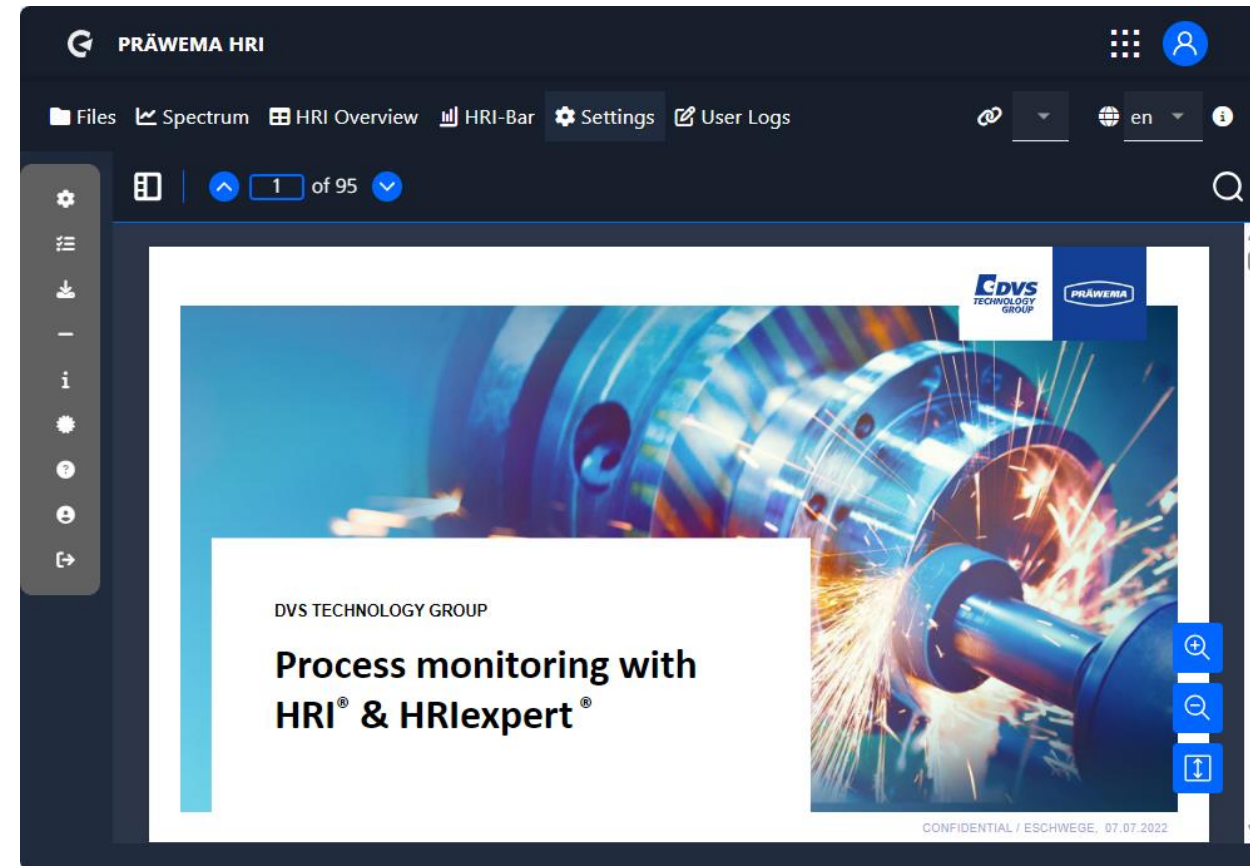
Machine ID:

Licence Key:

HRI[®] settings

Help

The training documentation for HRI[®] and HRlexpert[®] can be found under Help.



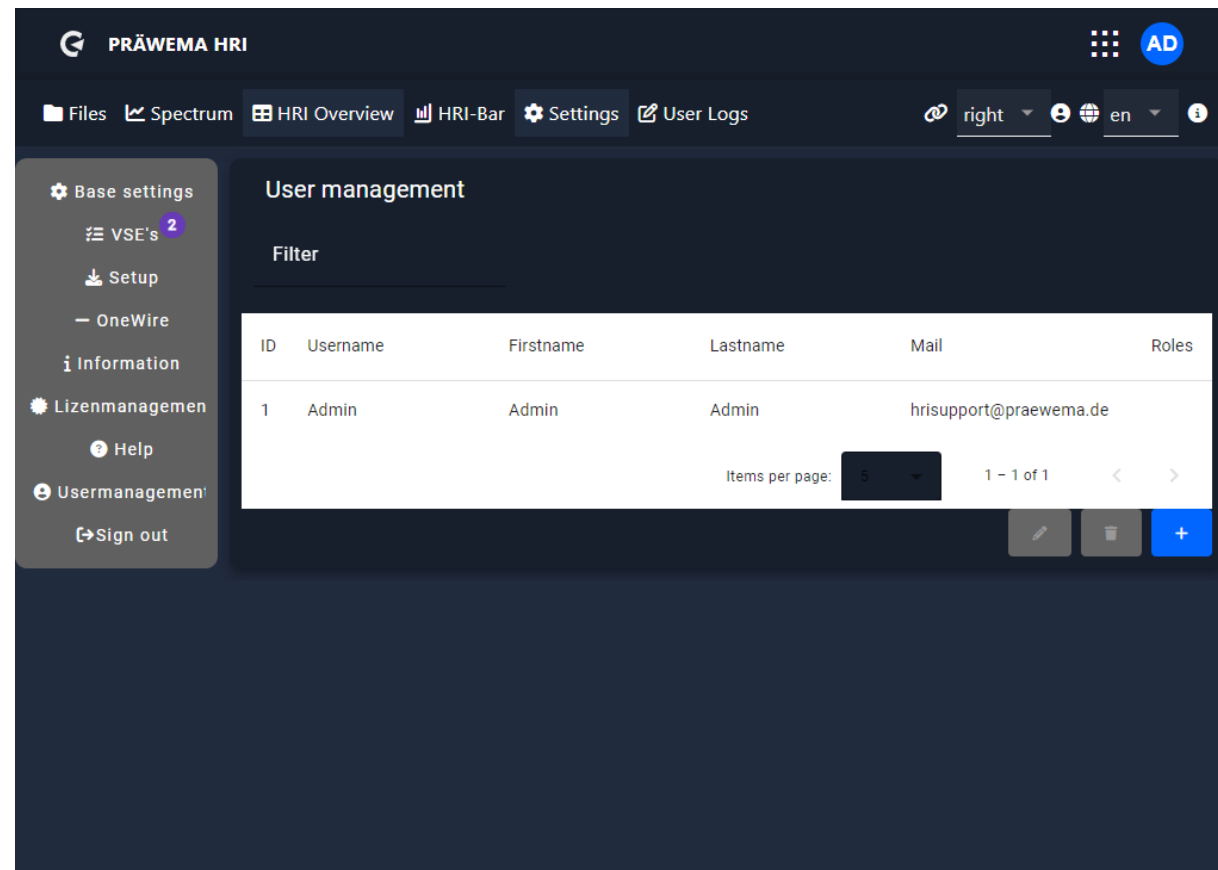
HRI® settings

User management

Different users can be created in user management.
There are 3 permission levels

Permission levels

Operator	No authorization to change limit values.
Setter	Changes to the limit values by the setter are possible.
Administrator	Changes to limit values and settings are possible.



The screenshot shows the PRÄWEMA HRI user management interface. The top navigation bar includes 'Files', 'Spectrum', 'HRI Overview', 'HRI-Bar', 'Settings', and 'User Logs'. The main content area is titled 'User management' and features a 'Filter' section above a table of users. The table has columns for ID, Username, Firstname, Lastname, Mail, and Roles. A single user is listed with ID 1, Username Admin, Firstname Admin, Lastname Admin, and Mail hrisupport@praewema.de. The interface also includes a sidebar with navigation options like 'Base settings', 'VSE's', 'Setup', 'OneWire', 'Information', 'Lizenmanagemen', 'Help', 'Usermanagemen', and 'Sign out'.

HRI® settings

User logs

A logbook for the machine can be created in the “User Logs” tab.

Here notes about changes and adjustments can be entered. This allows you to document why HRI objects were changed and what effects it has.

The screenshot shows the PRÄWEMA HRI user interface. At the top, there is a navigation bar with the PRÄWEMA logo and the text 'PRÄWEMA HRI'. Below this is a menu with options: Files, Spectrum, HRI Overview, HRI-Bar, Settings, and User Logs. The 'User Logs' tab is selected. On the right side of the menu, there are icons for 'right', 'en', and a user profile icon labeled 'AD'. Below the menu, there is a 'History' section with a 'NEW LOG' button. The history list contains three entries:

- 1/25/23, 11:04 AM
Change limit to 120mg [trash icon]
- 1/25/23, 11:03 AM
Add new frequency object order 12 bw 2 limit 100mg - problems EOL. [trash icon]
- 1/25/23, 10:47 AM
This is a test. [trash icon]

At the bottom right of the history list, there is a pagination control showing 'items per Page: 5' and '1 - 3 of 3'. In the bottom left corner, there is a 'VSE1' status indicator with a checkmark. In the bottom right corner, there is version information: 'VERSION FRONTEND: 3.1.2' and 'VERSION BACKEND: 3.1.2'.

Process monitoring HRIexpert®



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Process monitoring HRlexpert®

What is HRlexpert®?

HRlexpert® extends the functional scope of HRI® to include frequency analysis (FFT) of high-frequency data. This function enables the targeted monitoring of specific orders to effectively prevent quality failures of the produced components and to detect them at an early stage, before the next process. The ability to define limit values individually and in detail is extended to orders or even entire limit curves. Saving the frequency curves creates the basis for a workpiece-related detailed analysis.

What added value does HRlexpert® offer?

Order analysis and monitoring are essential functions that require **expert knowledge for parameterization**.

Advanced logging functions enable detailed recording of various machining processes.

The HRlexpert® system generates CSV files that are compatible with third-party systems, ensuring seamless integration into various platforms.

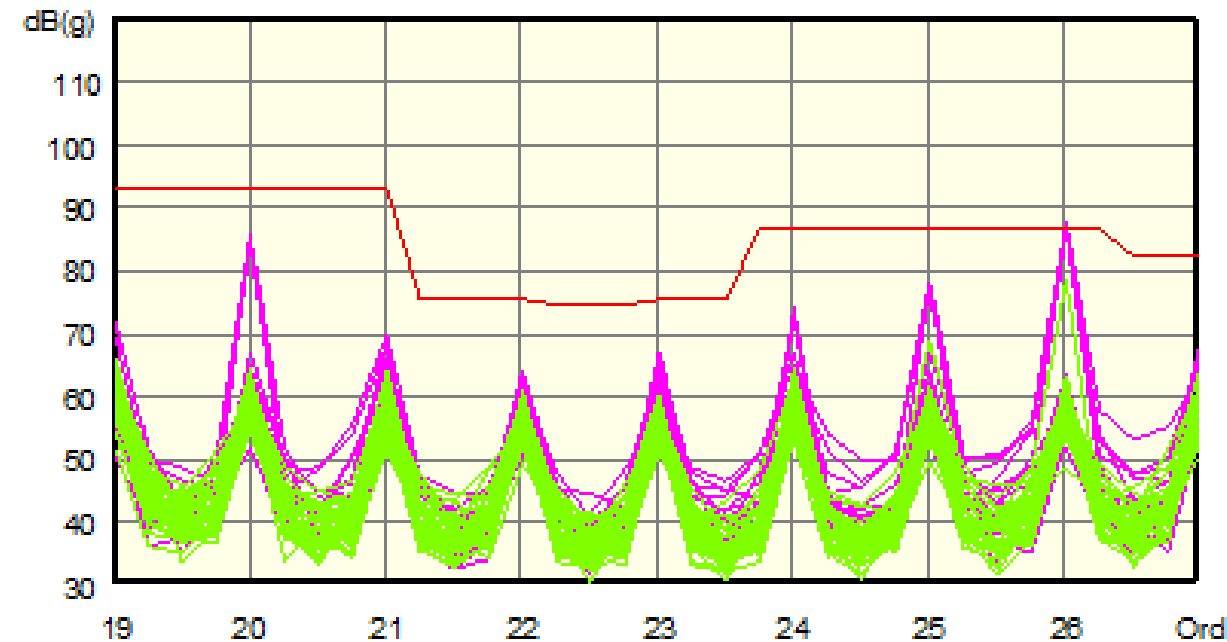
Process monitoring HRlexpert®

Example of an order analysis

In the example, the 26th order causes problems in the transmission.

This order can be specifically monitored with HRlexpert® and the conspicuous workpieces are ejected.

The red line has been defined by the test bench.



HRIexpert® settings



HRlexpert® settings

Example of an order analysis

- As in the example, the 26th order is monitored with a bandwidth of two orders.
- All workpieces that exceed the limit of 100 mg are rejected as SPC parts.

The screenshot shows the PRÄWEMA HRI software interface. The top navigation bar includes 'Files', 'Spectrum', 'HRI Overview', 'HRI-Bar', 'Settings', and 'User Logs'. The main content area is divided into two sections: 'Overview Ranges' and 'Recordings (No workpiece relation)'. The 'Recordings' section contains two tables.

Recordings Table:

Order	Bandwidth	Procsteps	NC-Prog-No.	Handling	Limit	Reaction
26	2	3,7,4,10,9	50	HandlingChannel1	100	SPC
9	3	3,7,4,10,9	50	C1-Spindle	120	StopCycle

Limiting Curve Table:

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	5000	1,2,3,4,5,6,7,8	35	HandlingChannel1 HandlingChannel2	None
Force	0	60	1,2,3,4,5,6,7,8	35	C1,C2	NOK
Temperature	0	60	1,2,3,4,5,6,7,8	35	B	NOK
Temperature	0	30	1,2,3,4,5,6,7,8	35	C1	StopCycle
Temperature	0	40	1,2,3,4,5,6,7,8	35	C2	SPC

HRlexpert® settings

Example of an order analysis

Since version 2.5 an edit screen has been added. The limits are easier to set with the screen and the possibility of incorrect entries has been minimized.

New order object

Order

Order

Bandwidth

Bandwidth

NC program number

e.g.: 1,2,3,12,22,53...

Proc steps

Bsp.: 1,2,3,12,22,53... empty = all

Axis-Handling

Limit

Limit

Reaction

None

Status Value

Status value as number

OK Cancel

HRIexpert® settings

Example of an order analysis

designation	description
Orders	Orders to be monitored => Feedback from the assembly line required.
Bandwidth	Bandwidth of orders.
Proc steps	Process steps of processing that are monitored.
NC prog no	NC program number to be monitored.

The screenshot shows the PRÄWEMA HRI interface with the following data:

Recordings (No workpiece relation)

Order	Bandwidth	Procsteps	NC-Prog-No.	Handling	Limit	Reaction
26	2	3,7,4,10,9	50	HandlingChannel1	100	SPC
9	3	3,7,4,10,9	50	C1-Spindle	120	StopCycle

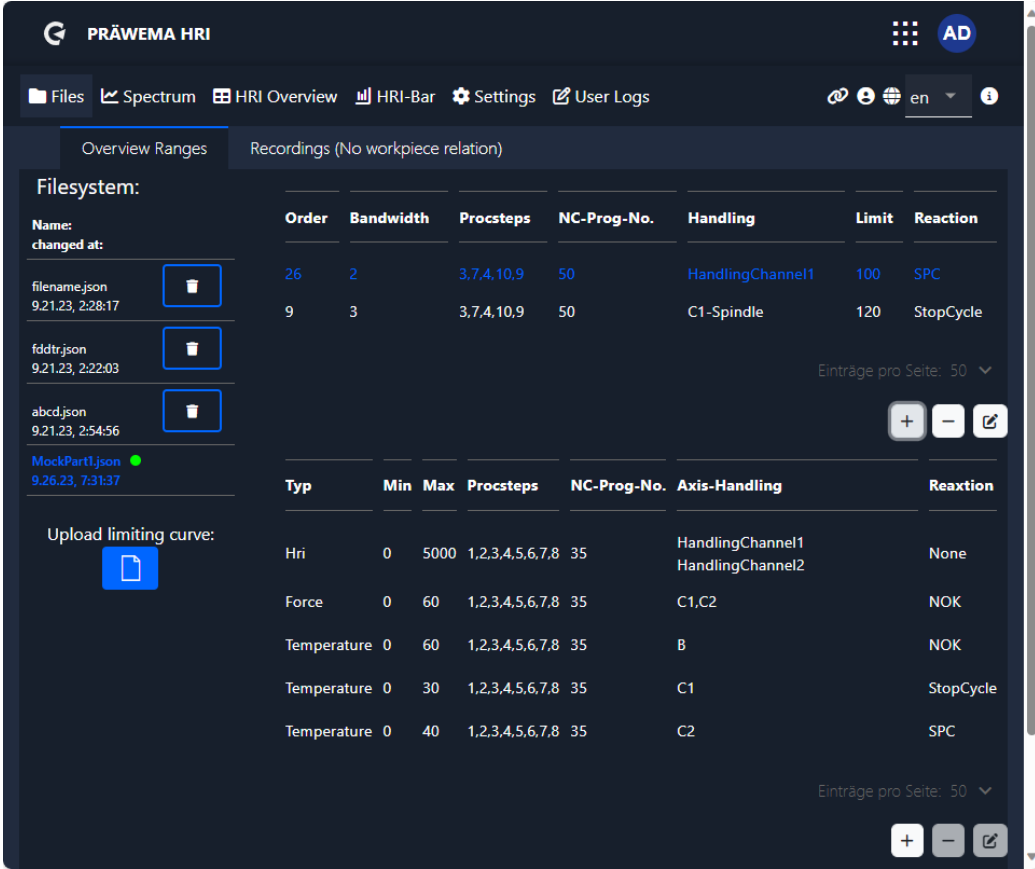
Upload limiting curve:

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	5000	1,2,3,4,5,6,7,8	35	HandlingChannel1 HandlingChannel2	None
Force	0	60	1,2,3,4,5,6,7,8	35	C1,C2	NOK
Temperature	0	60	1,2,3,4,5,6,7,8	35	B	NOK
Temperature	0	30	1,2,3,4,5,6,7,8	35	C1	StopCycle
Temperature	0	40	1,2,3,4,5,6,7,8	35	C2	SPC

HRlexpert® settings

Example of an order analysis

designation	description
Handling	Selection of which spindle or which sensor is to be monitored.
Limit	Limit value which, when exceeded, triggers the error reaction.



The screenshot shows the PRÄWEMA HRI software interface. The top navigation bar includes 'Files', 'Spectrum', 'HRI Overview', 'HRI-Bar', 'Settings', and 'User Logs'. The main content area is divided into 'Overview Ranges' and 'Recordings (No workpiece relation)'. The 'Recordings' section contains a table with columns: Order, Bandwidth, Procsteps, NC-Prog-No., Handling, Limit, and Reaction. Below this, there is a 'Filesystem' section with a list of files (filename.json, fdtr.json, abcd.json, MockPart1.json) and an 'Upload limiting curve:' section with a file upload icon. A second table below shows details for different types (Hri, Force, Temperature) with columns: Typ, Min, Max, Procsteps, NC-Prog-No., Axis-Handling, and Reaction.

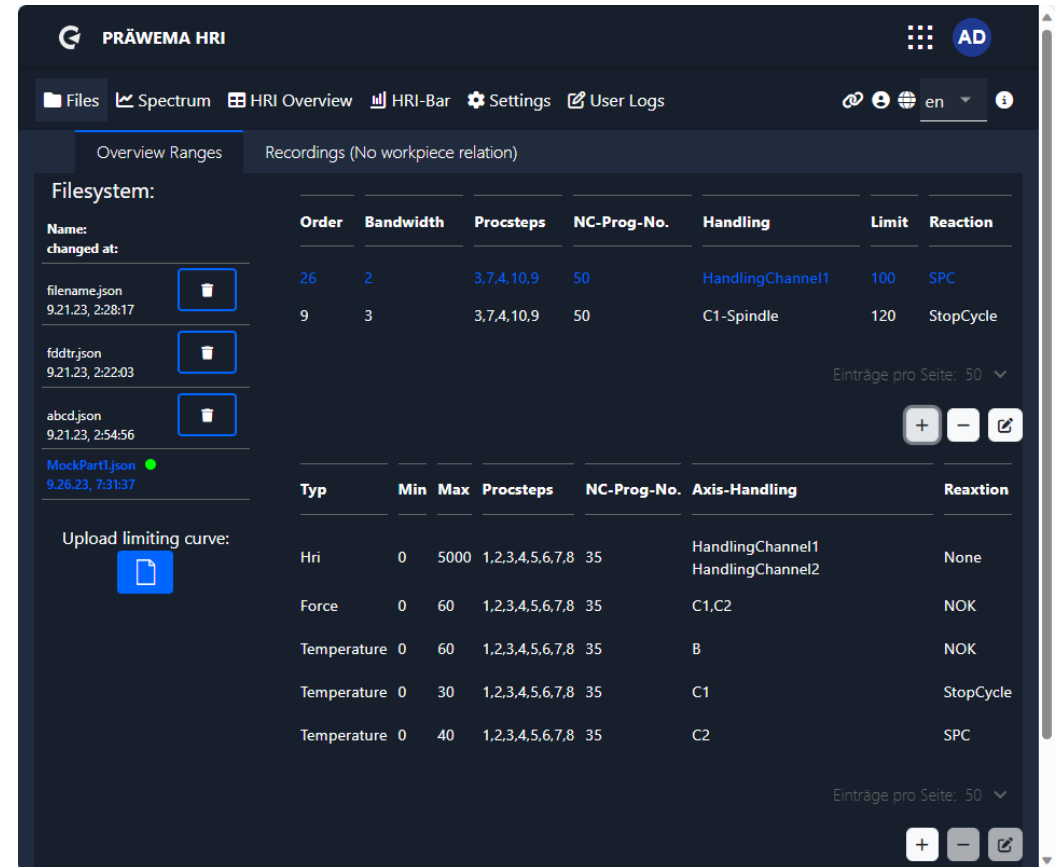
Order	Bandwidth	Procsteps	NC-Prog-No.	Handling	Limit	Reaction
26	2	3,7,4,10,9	50	HandlingChannel1	100	SPC
9	3	3,7,4,10,9	50	C1-Spindle	120	StopCycle

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	5000	1,2,3,4,5,6,7,8	35	HandlingChannel1 HandlingChannel2	None
Force	0	60	1,2,3,4,5,6,7,8	35	C1,C2	NOK
Temperature	0	60	1,2,3,4,5,6,7,8	35	B	NOK
Temperature	0	30	1,2,3,4,5,6,7,8	35	C1	StopCycle
Temperature	0	40	1,2,3,4,5,6,7,8	35	C2	SPC

HRlexpert® settings

Example of an order analysis

designation	description
Reaction	Error reaction that is triggered when the value is exceeded.
Status value	The status value is sent to the HoningHMI and displayed there for the ejected workpieces.



The screenshot shows the PRÄWEMA HRI interface with a dark theme. At the top, there are navigation tabs: Files, Spectrum, HRI Overview, HRI-Bar, Settings, and User Logs. Below this, there are two main sections:

- Filesystem:** A list of files with columns for Name, changed at, and a trash icon. Files listed include filename.json, fddtr.json, abcd.json, and MockPart1.json.
- Recordings (No workpiece relation):** A table with columns: Order, Bandwidth, Procsteps, NC-Prog-No., Handling, Limit, and Reaction. It contains two rows of data.
- Upload limiting curve:** A section with an upload icon and a table with columns: Typ, Min, Max, Procsteps, NC-Prog-No., Axis-Handling, and Reaction. It lists various parameters like Hri, Force, and Temperature.

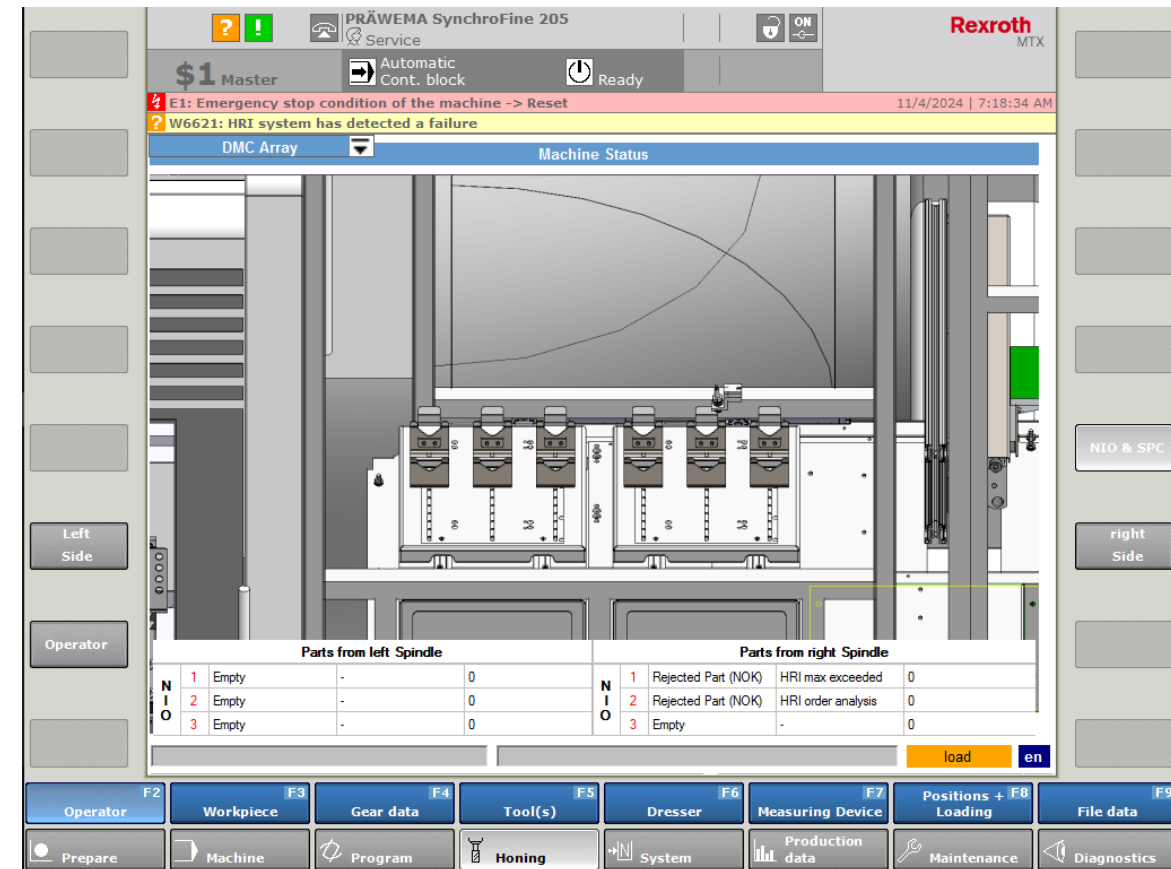
HRI[®] visualization

Status value

The status value is sent to the HoningHMI and displayed there for the ejected workpieces. This allows the operator at the machine to determine the reason why a workpiece was ejected.

The texts for the status value can be expanded.

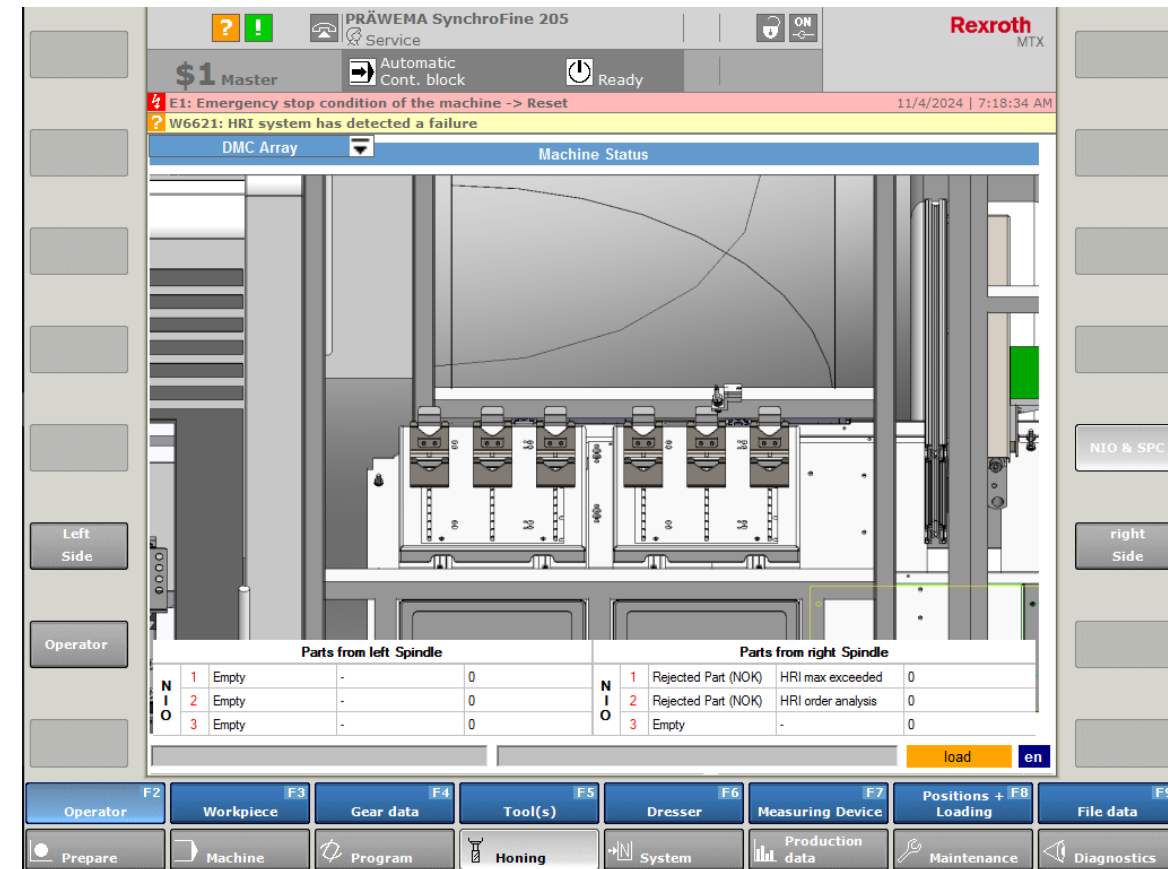
The display depends on the installed version of HoningHMI. The texts are displayed from revision 1839 onwards.



HRI® visualization

Status value

Status Value	Explanation
18	HRI max exceeded
19	HRI min not reached
20	HRI surface exceeded
21	HRI surface not reached
22	HRI order analysis
23	HRI reserve



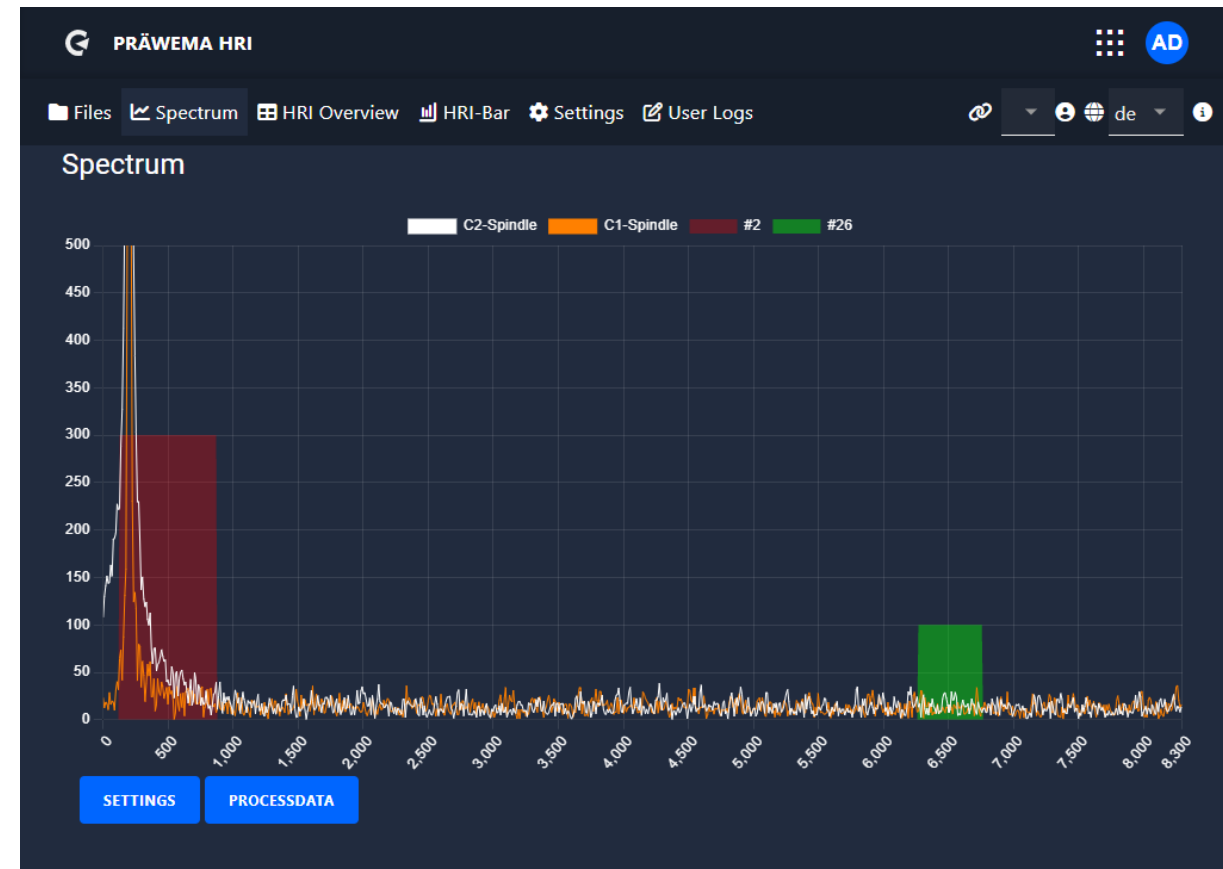
HRlexpert® settings

Example of an order analysis

The frequency objects are displayed in the spectrum screen as a bar graph.

If the process step is not active, the bar is colored light blue.

If the limit value is exceeded, the bar changes its color to red, otherwise the bar is colored green.



HRIexpert[®] settings

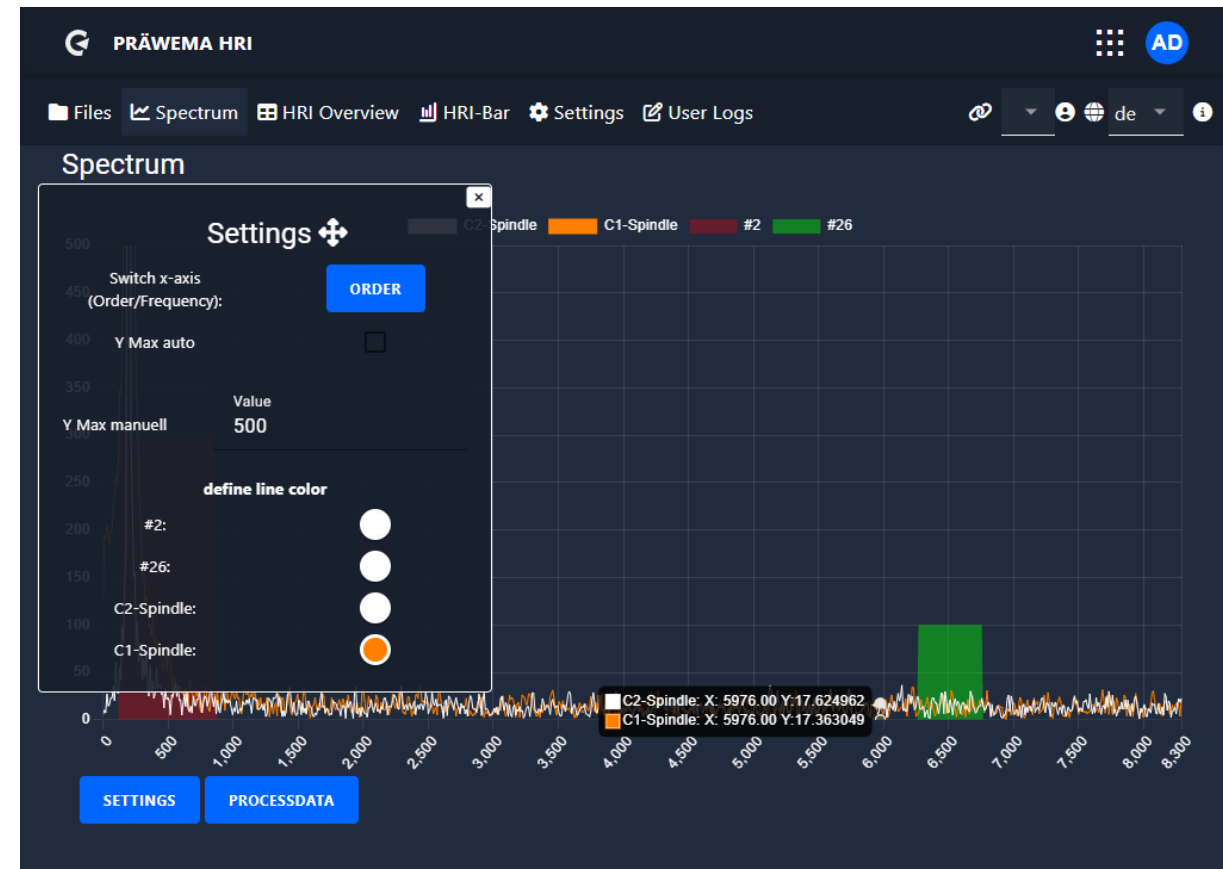
Example of an order analysis

In the “settings” tab, the X-axis can be switched between the frequency and the orders in relation to the speed of the workpiece spindle.

The Y-axis offers the option of either being set to a fixed value or being adjusted automatically.

The colors of the individual lines can also be set individually.

All settings made are saved and are available again the next time the page is called up.



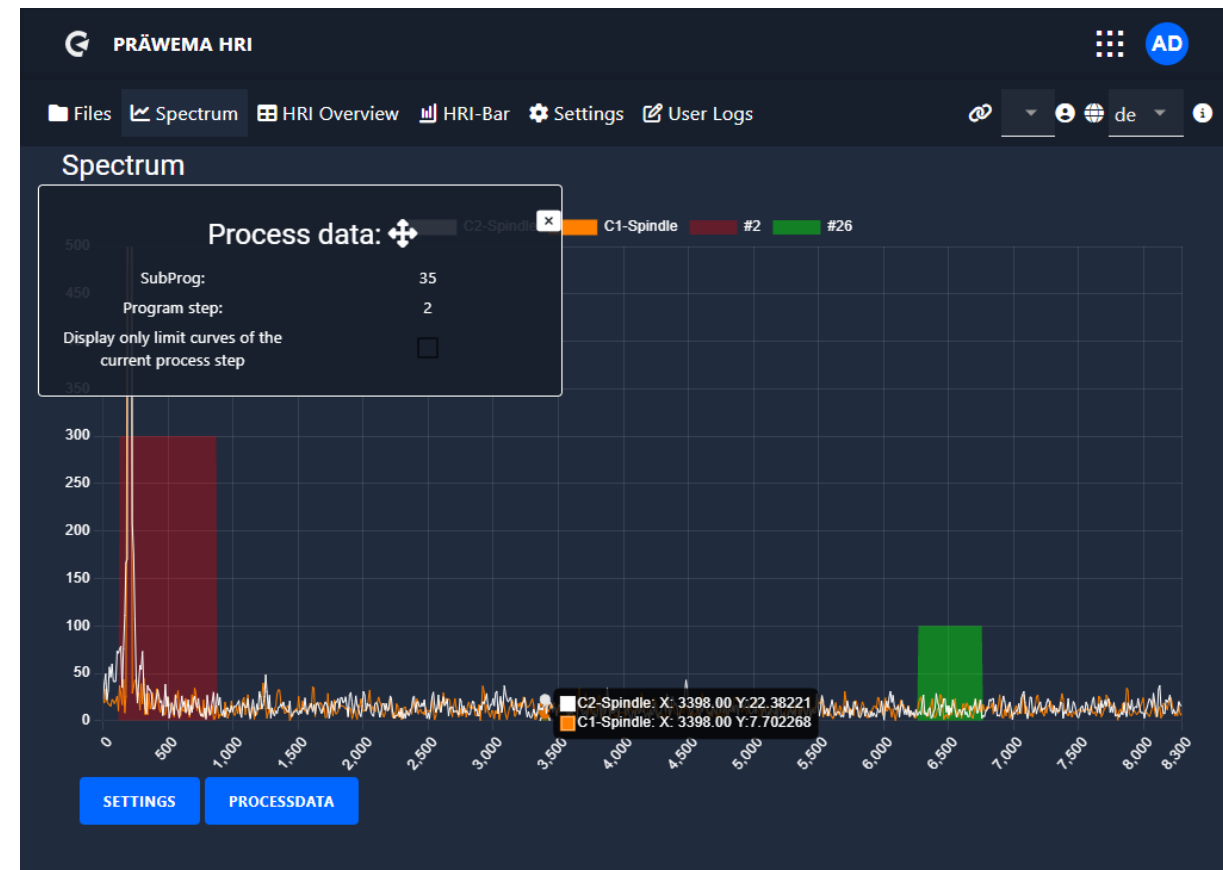
HRlexpert[®] settings

Example of an order analysis

The current NC program and the current process step are displayed under Process data.

This is used to check in which process step the machine is processing the workpieces.

A button can be used to display the limit curves only in the current process step.



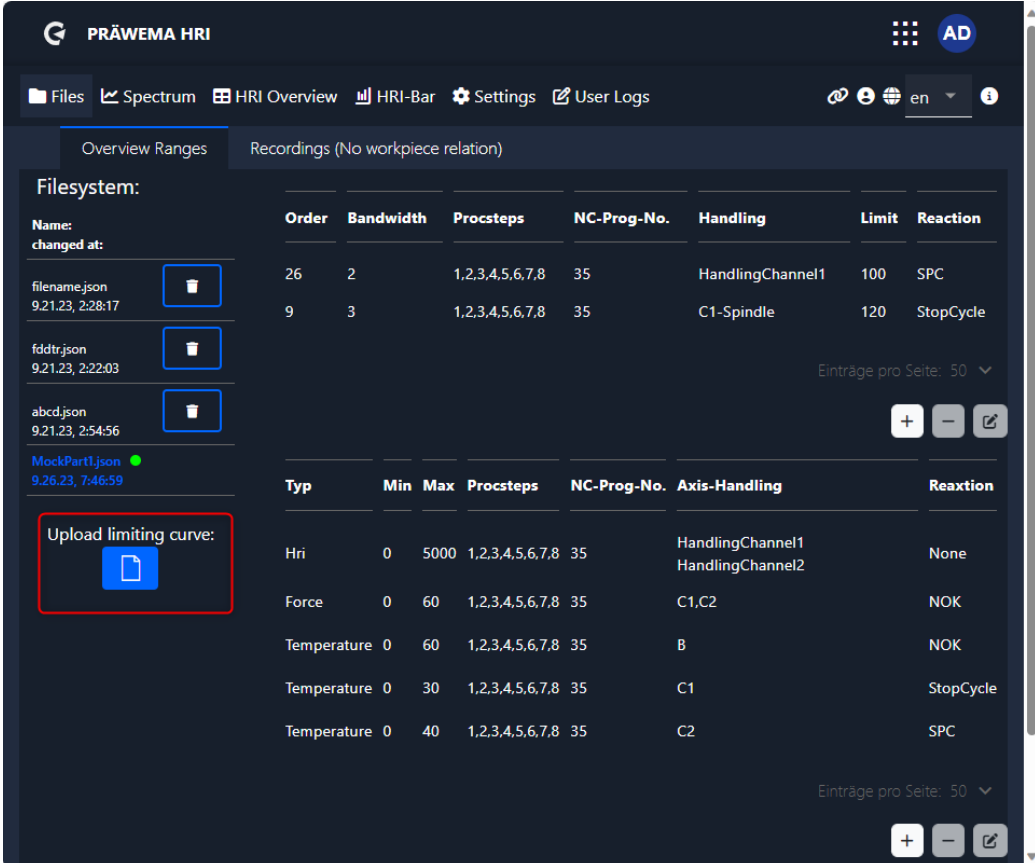
HRIexpert[®] settings

Limiting curve

With HRI[®]analyze+ a limit curve can be created and saved as a JSON file.

This limit curve can be read in and visualized with HRI[®]machine.

The name of the JSON file from the limiting curve must be the same name from the part.



The screenshot shows the PRÄWEMA HRI software interface. The top navigation bar includes 'Files', 'Spectrum', 'HRI Overview', 'HRI-Bar', 'Settings', and 'User Logs'. The main content area is divided into two sections: 'Overview Ranges' and 'Recordings (No workpiece relation)'. The 'Filesystem:' section on the left lists several JSON files with their names and 'changed at' timestamps, each with a trash icon for deletion. A red box highlights the 'Upload limiting curve:' button, which features a document icon. The 'Recordings' section contains two tables. The first table lists recording parameters, and the second table lists recording types.

Order	Bandwidth	Procsteps	NC-Prog-No.	Handling	Limit	Reaction
26	2	1,2,3,4,5,6,7,8	35	HandlingChannel1	100	SPC
9	3	1,2,3,4,5,6,7,8	35	C1-Spindle	120	StopCycle

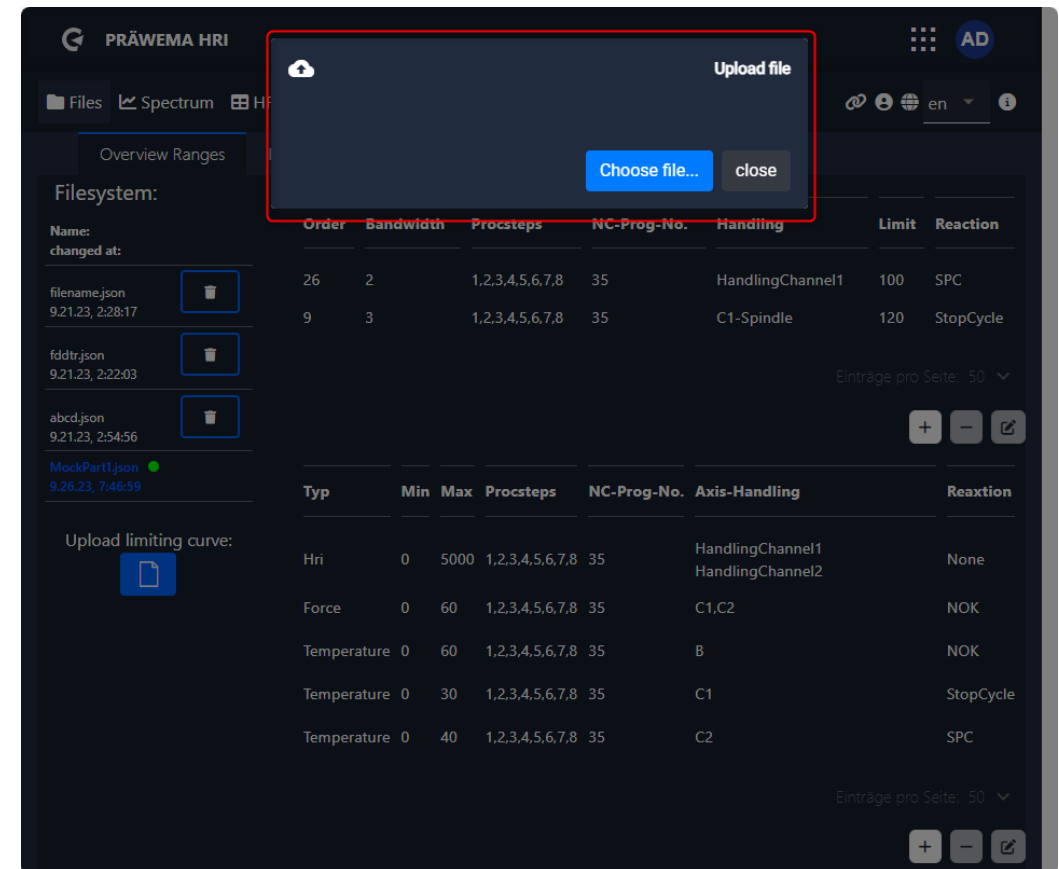
Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	5000	1,2,3,4,5,6,7,8	35	HandlingChannel1 HandlingChannel2	None
Force	0	60	1,2,3,4,5,6,7,8	35	C1,C2	NOK
Temperature	0	60	1,2,3,4,5,6,7,8	35	B	NOK
Temperature	0	30	1,2,3,4,5,6,7,8	35	C1	StopCycle
Temperature	0	40	1,2,3,4,5,6,7,8	35	C2	SPC

HRlexpert[®] settings

Limiting curve

Clicking the button opens a second window.

Here you can select the corresponding file to be loaded.

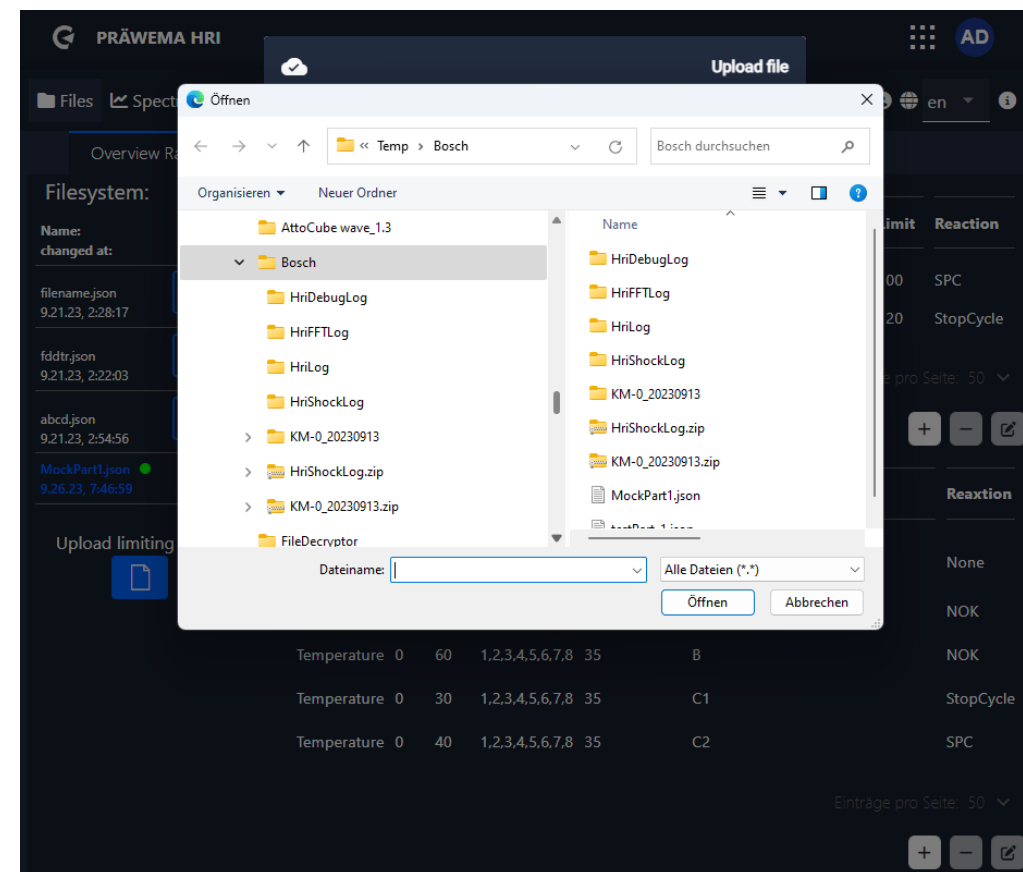


HRlexpert® settings

Limiting curve

A file has been saved in the Downloads folder. The file name of the limiting curve must have the same name as the corresponding component.

Otherwise, the limiting curve cannot be assigned to a component.

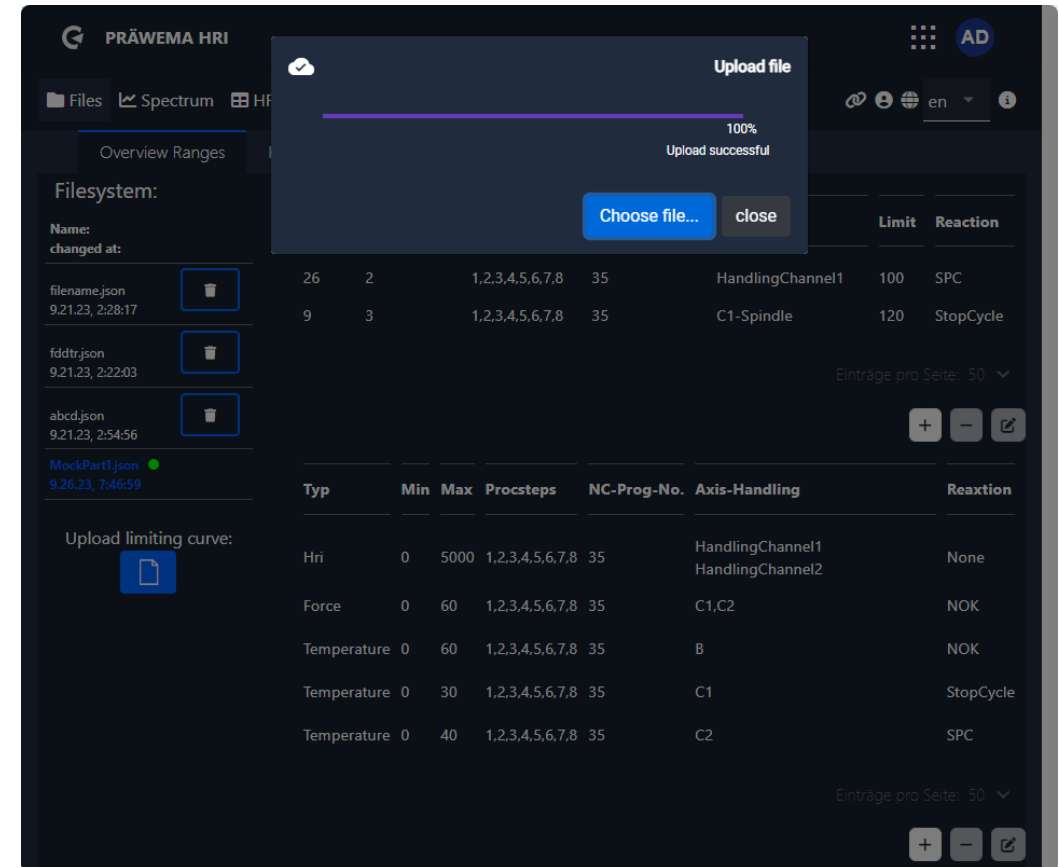


HRlexpert® settings

Limiting curve

After loading the file, the loading bar changes color.
There is no confirmation that the file has been loaded.

After the file has been loaded successfully, you can switch to the spectrum page.



HRlexpert® settings


Limiting curve

The loaded limiting curve is displayed in the visualization.
The error response can be changed.


An update of the limiting curve can be uploaded.

Filesystem:


Name:
changed at:
MockPart1.json ●
2.19.24, 10:58:30



Upload limiting curve: 


Order	Bandwidth	Procsteps	NC-Prog-No.	Handling	Limit	Reaction
2	3	1,2,3,4,5,6	35	HandlingChannel1 HandlingChannel2	300 mg	NOK
26	2	1,2,3,4,5,6	35	HandlingChannel1 HandlingChannel2	100 mg	NOK

Items per page: 50 + - 

Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	5000	2,3,4,5,6	35	HandlingChannel1 HandlingChannel2	None
Temperature	0 °C	55 °C	0,1,2,3,4,5,6,7...	50	C1	StopCycle
Temperature	0 °C	50 °C	1,2,3,4,5,6	35	C2	StopCycle

Items per page: 50 + - 

ID	Dateiname Limiting Curve	Reaktion	Update	Delete
0	MockPart1.json	▼		

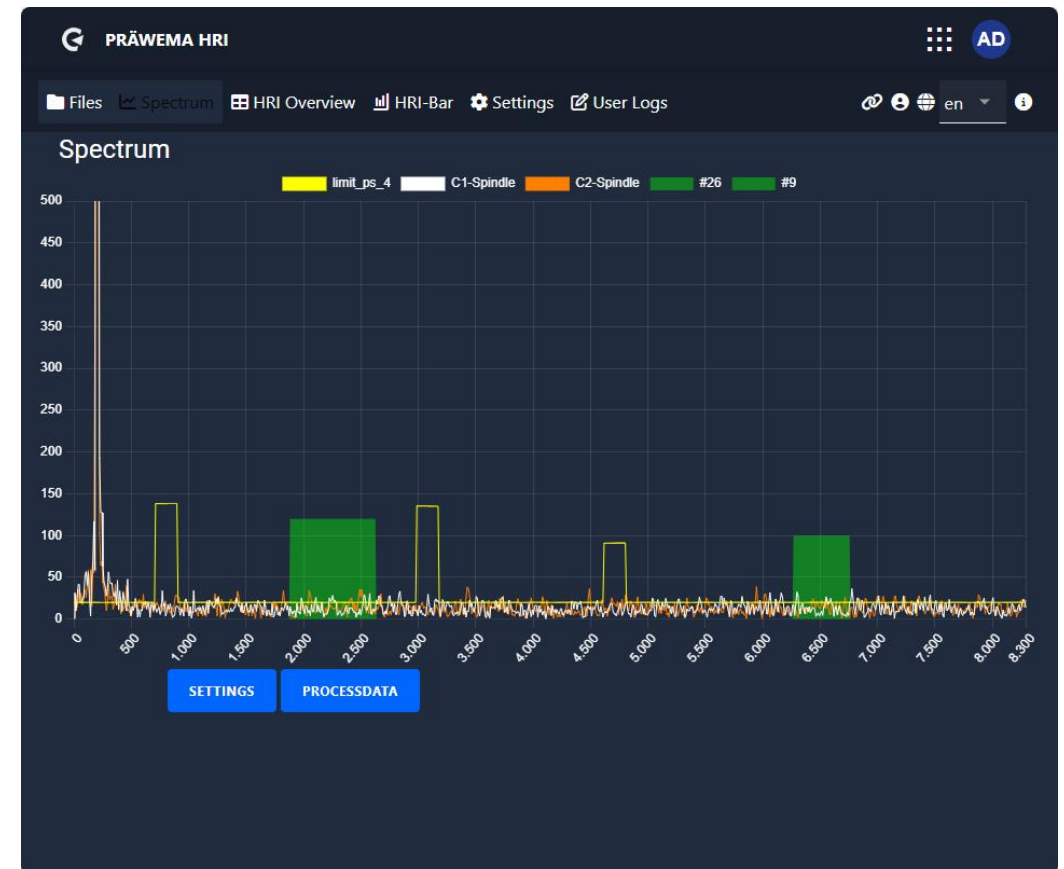
Items per page: 50 + - 

HRlexpert® settings

Limiting curve

The limiting curve is displayed in the spectrum as a yellow border line.

Each active process step has its own limiting curve.



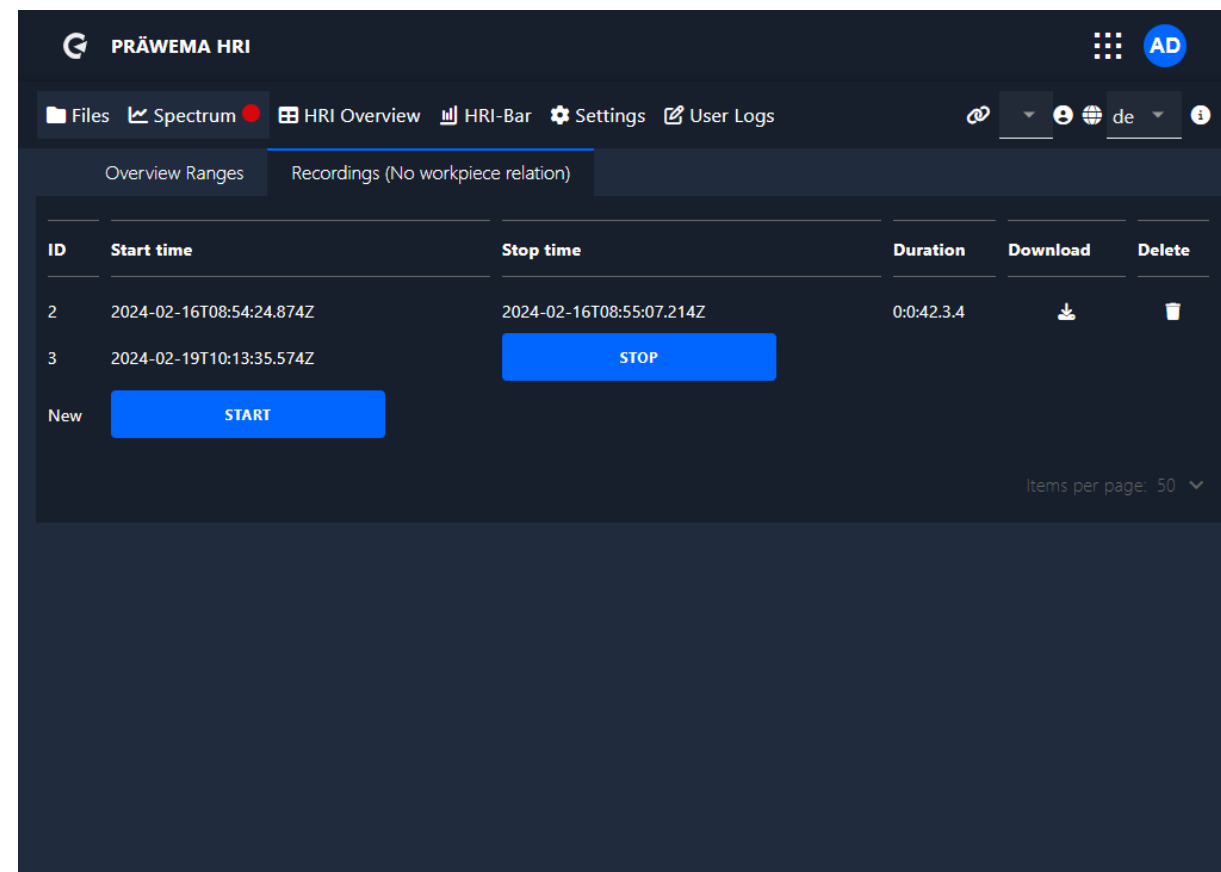
HRlexpert® settings

Recordings spectrum page

A manual recording function of the vibration spectra can be started on the Files page.

The recording can also be stopped and saved here.

The recording is saved as a BIN file. The recording can be opened and analyzed with HRIanalyze+.

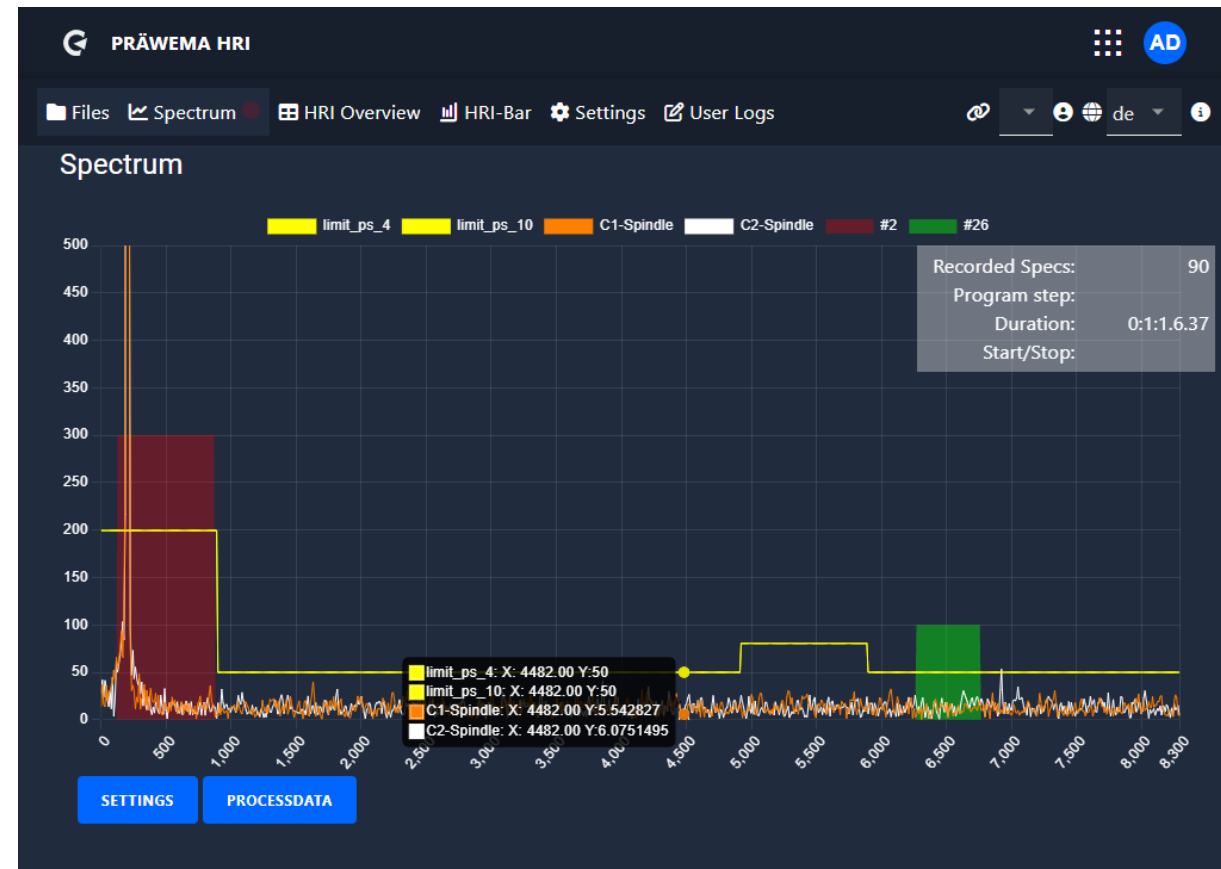


HRlexpert[®] settings

Recordings spectrum page

When the recording function is activated, an additional field is displayed on the Spectrum page. The recording can be started and stopped there.

To save the recording, switch to the "Files" page.

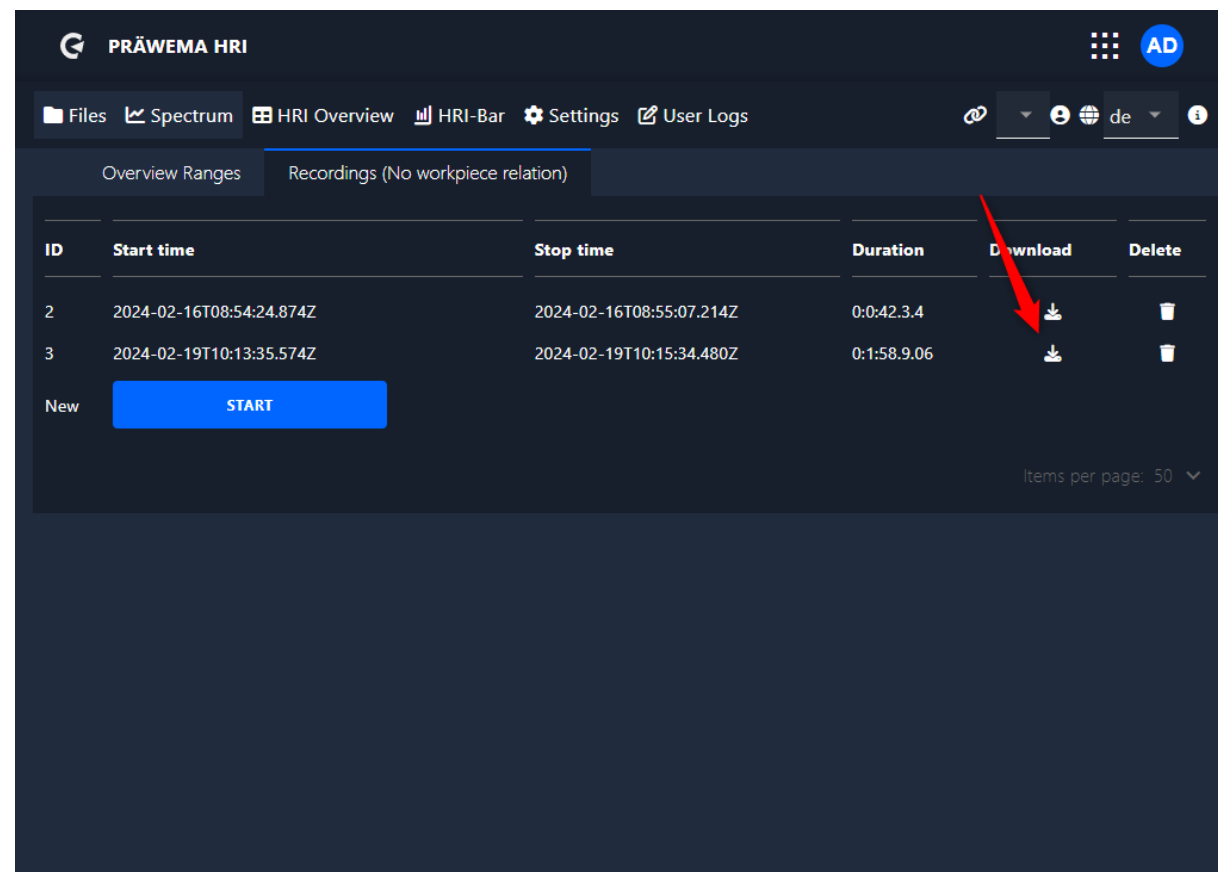


HRIexpert[®] settings

Recordings spectrum page

After finishing the recording, the BIN file can be downloaded and saved.

The analysis is then carried out with HRI[®]analyze+.



HRIexpert® Feed Limiter



CDVS MACHINE TOOLS & AUTOMATION |

HRlexpert® Feed Limiter

Feed Limiter with HRlexpert®

To make the process more stable and to absorb acceleration peaks, a feed rate limit has been programmed.

A limit value for vibration monitoring is programmed under HRlexpert®.

Order	Bandwidth	Procsteps	NC-Prog-No.	Handling	Limit	Reaction
26	2	1,2,3,4,5,6,7,8	35	HandlingChannel1	100	SPC
9	3	1,2,3,4,5,6,7,8	35	C1-Spindle	120	FeedLimiter

HRlexpert® Feed Limiter

Feed Limiter with HRlexpert®

The feed rate limiter has been added to the selection of the error reaction.

If 100% of the set limit is exceeded, the feed is reduced in 10% steps until the vibrations stabilize. If the vibrations fall below the 100% limit, the feed rate is increased again in steps.

When 120 % of the limit is exceeded, the feed rate is reduced to 0 %. When the vibrations have fallen below 100 % of the limit, the feed rate is increased again to 100 % in 10 % steps.

New order object

Order
9

Bandwidth
3

NC program number
35

Proc steps
1,2,3,4,5,6,7,8

Axis-Handling

Limit
120

Reaction
FeedLimiter

Status Value
0

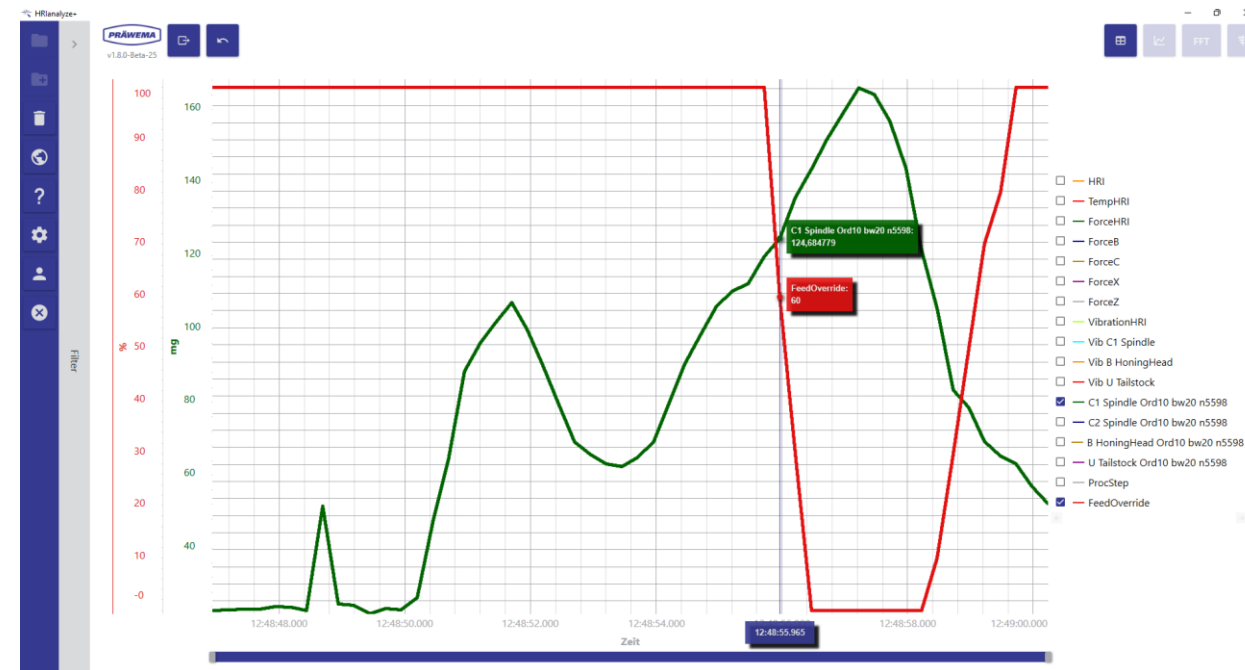
OK Cancel

HRlexpert® Feed Limiter

Feed Limiter with HRlexpert®

The signals "Vibration C1 spindle" [for the first 20 orders, value in mg] and FeedOverride [feed limitation] are shown.

When the limit of 120 mg is exceeded, the feed limitation becomes active and reduces the feed of the X axis.



Software tool HRI[®]analyze+



CDVS TECHNOLOGY GROUP | DVS MACHINE TOOLS & AUTOMATION

Software tool HRI[®]analyze+

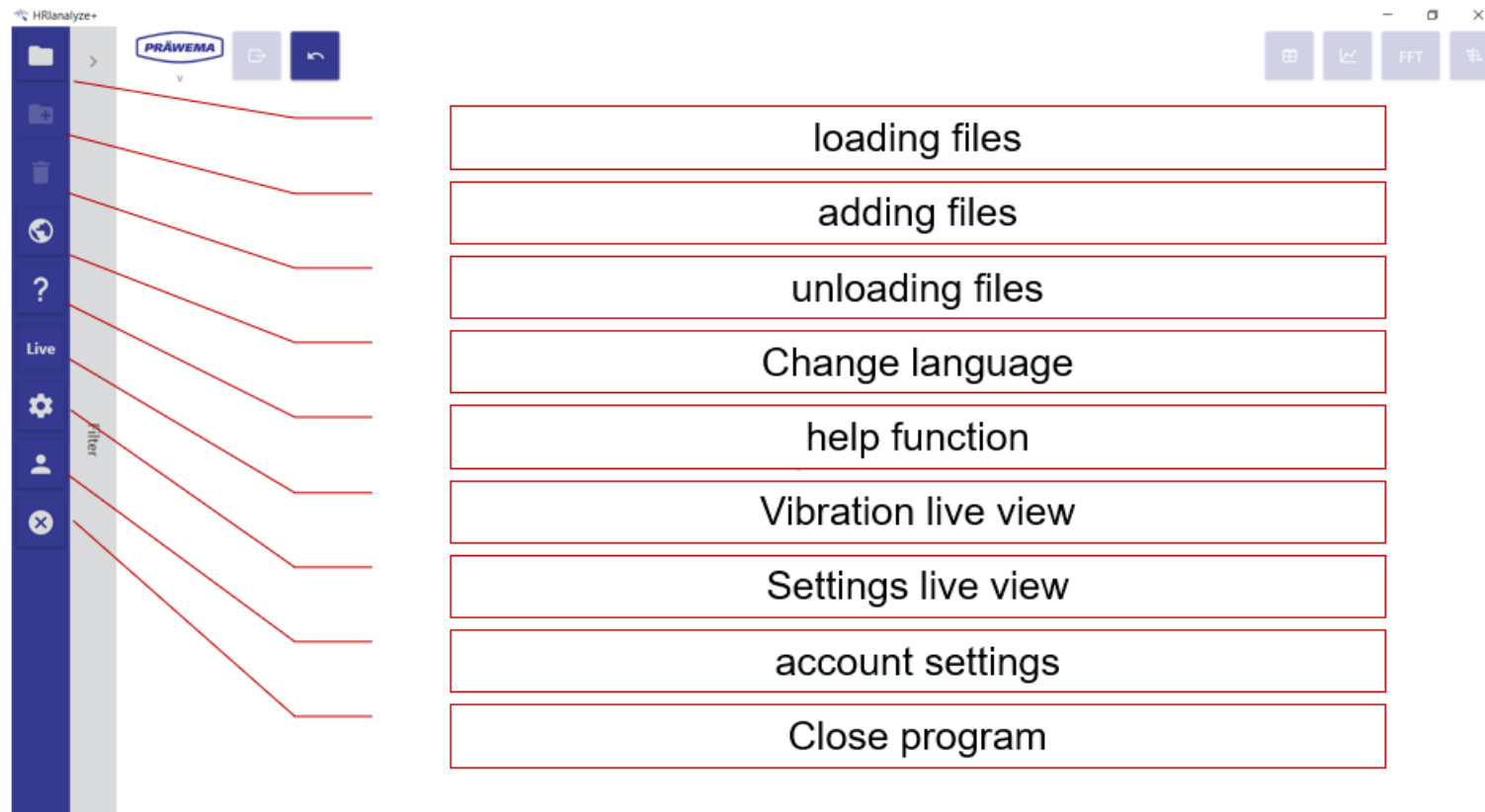
The HRI[®]analyze + program was developed to analyze the recorded HRI data. The program recognizes independently whether it concerns HriLog-, HriDebugLog- , HriFFTLog- or HriShockLogfiles.

The values can be displayed in diagrams to get an overview of the production and part quality as quickly as possible.

For a better overview, certain parameters are always preselected.

It is possible to read the XML files from the Siemens Servo Trace and CSV files from the drive oscilloscope from Bosch Rexroth and have an FFT calculated from the imported data.

Software tool HRI[®]analyze+



Software tool HRI[®]analyze+

The screenshot shows the HRIanalyze+ software interface. On the left is a vertical menu with icons for file management, help, and settings. At the top right of the main window, there is a PRÄWEMA logo and two buttons: a light blue button with a document icon and a dark blue button with a right-pointing arrow. A red box labeled "Export button" points to the light blue button. To the right, a list of four options is shown in red-bordered boxes: "Table", "Diagram", "FFT Diagram (Trace)", and "Campbell diagram". Red lines connect these options to a floating window on the right, which contains four icons: a table icon, a diagram icon, an FFT icon, and a Campbell diagram icon.

Export button

- Table
- Diagram
- FFT Diagram (Trace)
- Campbell diagram

Please load files for analysis via the menu on the left

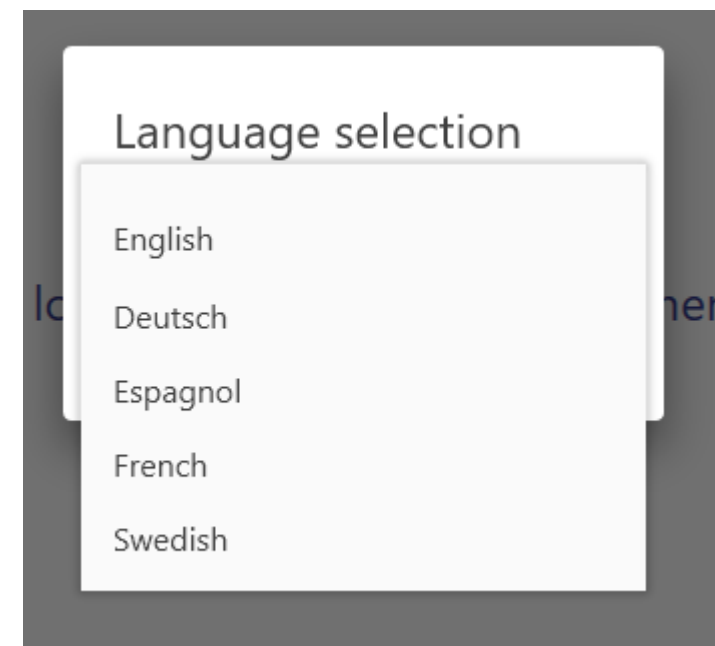
Software tool HRI[®]analyze+

Language selection

Now it is possible to chose five languages.

- English
- German
- Spain
- French
- Swedish

Other language packages are in progress.



Software tool HRI[®]analyze+

Help function

Via HRI[®]analyze + you can contact a Prävema team of experts in the "Software" tab.

You send an email to:

hrisupport@praewema.de

You can also open a training documentation and online documentation.

Support

What kind of support do you need?

Software Machine

T Subject
is required

✉ Your mail address
is required

☰ Problem description...

Open manual Online documentation HRI Wiki

OK Cancel

Software tool HRI[®]analyze+

Help function

An email is sent to

service@praewema.de

under the Machine tab.

Inquiries about problems with the machines are processed there.

The screenshot shows a 'Support' dialog box with the following elements:

- Title:** Support
- Question:** What kind of support do you need?
- Navigation:** Two tabs at the top: 'Software' (selected) and 'Machine'.
- Form Fields:**
 - Subject:** A text field with a red 'T' icon and the text 'Subject is required' below it.
 - Your mail address:** A text field with a red envelope icon and the text 'Your mail address is required' below it.
 - Problem description...:** A text area with a red hamburger menu icon.
- Buttons:** At the bottom, there are three blue buttons: 'Open manual', 'Online documentation', and 'HRI Wiki'. Below these are two smaller buttons: 'OK' and 'Cancel'.

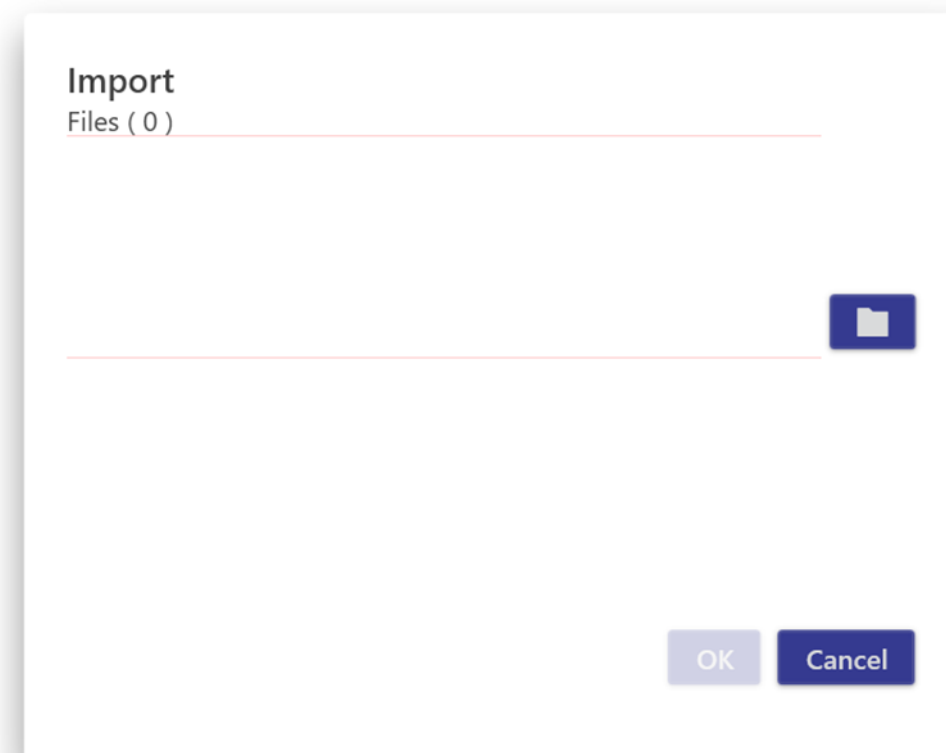
Software tool HRI[®]analyze+

Loading Files

All 4 file types of HRI[®] and HRIexpert[®] can be loaded.
The program automatically recognizes what type it is.

- HriLog
- HriDebugLog
- HriFFTLog
- HriShockLog

It is although possible to open the files from the
HRI[®]machine spectrum analyzer.



Software tool HRI[®]analyze+

HriLog files

For each day, HRI creates a file for each type of workpiece machined on the machine.

Each row represents a produced workpiece.

All relevant information is stored in this file type. A separate column is created for each sensor for frequency objects.

Some columns are not displayed in HRIanalyze+. The columns are columns with text information. In this case, the HriLog files must be opened with a text editor or a spreadsheet program.

Time stamp	Spindle	TempB_min	TempB_avg	TempB_max	TempC_min	TempC_avg	TempC_max	Vib_min	Vib_avg	Vib_max	ForceB_min	ForceB_avg	ForceB_max
24.08.2023 23:0008.166	1	39.4	39.5	39.6	35	42.5	42.8	1918.3	2262.1	2777.5	0	8.3	2
24.08.2023 23:0035.916	2	39.4	39.6	39.6	45.3	45.4	45.8	1899.4	2225.1	2749.1	1.5	10.8	2
24.08.2023 23:0102.125	1	39.4	39.6	39.6	35	39.7	42.8	1917.3	2257.5	2811.6	0	10.4	2
24.08.2023 23:0130.042	2	39.4	39.6	39.6	35	44.9	45.3	1766.1	2239.8	2767.2	0	8.3	2
24.08.2023 23:0156.067	1	39.4	39.5	39.6	35	42.5	42.8	1921.4	2272	2882.7	0.2	9.9	2
24.08.2023 23:0223.009	2	39.4	39.4	39.4	35	44.9	45.8	1728.4	2230.7	2872.6	0.9	8.7	2
24.08.2023 23:0249.057	1	39.4	39.4	39.4	42.6	42.7	42.8	1944.2	2271	2885.5	0.6	8.7	2
24.08.2023 23:0317.049	2	39.2	39.5	40.1	45.1	45.2	45.8	1899.4	2246.4	2787.7	0.5	11.1	3
24.08.2023 23:0343.093	1	38.5	39.3	39.4	42.6	42.6	42.6	1839.7	2270.1	3036.9	0	9.3	2
24.08.2023 23:0411.161	2	39.2	39.2	39.2	44.9	45.1	45.1	1728	2221	2920.7	0.2	9.9	2
24.08.2023 23:0437.139	1	39.2	39.2	39.2	35	42.3	42.6	1898.3	2233.3	2802.5	0.2	11.5	2
24.08.2023 23:0504.997	2	38.5	38.9	39.4	35	44.7	45.1	1790.5	2174.8	2740.1	0.5	8.7	2
24.08.2023 23:0531.221	1	39.4	39.4	39.4	35	42.5	42.8	1780.8	2192.2	2727.6	0.2	10.2	3
24.08.2023 23:0558.201	2	39.4	39.4	39.4	35	45.1	45.8	1803.1	2169.7	2719.4	1.4	10.5	2
24.08.2023 23:1434.606	2	35.1	35.8	36.1	35	40.5	41.6	1858.2	2241.1	2875.7	0	8.8	3
24.08.2023 23:1500.778	1	36.1	36.1	36.3	34.6	34.6	35	1957.7	2275.2	2894.9	0.4	9.5	2
24.08.2023 23:1527.915	2	36.1	36.1	36.1	35	41.8	42.1	1875.9	2262.8	2907.3	0.4	9.3	2
24.08.2023 23:1554.111	1	36.1	36.2	36.3	35	36.5	37.3	1944.6	2298.8	2853.8	0.1	8.4	2
24.08.2023 23:1621.119	2	36.3	36.3	36.3	35	42.6	43	1943.8	2264.9	2812.6	0	11.3	2
24.08.2023 23:1647.184	1	36.6	36.6	36.6	35	38.1	38.3	1958.6	2294.1	2945.2	0	8.5	2
24.08.2023 23:1714.792	2	36.6	36.8	36.8	35	43.2	43.7	1938.6	2268.3	2813.7	0.1	9	3
24.08.2023 23:1739.959	1	36.8	37.1	37.1	35	39.4	39.6	1925.7	2285.5	2836.8	0	8	2
24.08.2023 23:1808.018	2	37.1	37.3	37.3	35	43.9	44.2	1909.8	2252.3	2933.3	0	9.6	3
24.08.2023 23:1834.195	1	37.5	37.5	37.5	35	40.4	40.7	1901.1	2263.1	2799.5	0.2	8.1	3
24.08.2023 23:1901.122	2	37.5	37.7	37.8	35	44.4	44.7	1865.7	2217	2794.6	0.1	7	1

Software tool HRI[®]analyze+

HriLog files

For components that have been assigned a label via DMC, for example, this information is stored in the HriLog, HriFFTLog and HriShockLog.

Parts traceability from honing to the assembly line should be given.

Basically, the total part count is saved in all log files.

Time stamp	Spindle	TempB_min	TempB_avg	TempB_max	TempC_min	TempC_avg	TempC_max	Vib_min	Vib_avg	Vib_max	ForceB_min	ForceB_avg	ForceB_max
24.08.2023 23:00:08.166	1	39.4	39.5	39.6	35	42.5	42.8	1918.3	2262.1	2777.5	0	8.3	2
24.08.2023 23:00:35.916	2	39.4	39.6	39.6	45.3	45.4	45.8	1899.4	2225.1	2749.1	1.5	10.8	2
24.08.2023 23:01:02.125	1	39.4	39.6	39.6	35	39.7	42.6	1917.3	2257.5	2811.6	0	10.4	2
24.08.2023 23:01:30.042	2	39.4	39.6	39.6	35	44.9	45.3	1766.1	2239.8	2767.2	0	8.3	2
24.08.2023 23:01:56.067	1	39.4	39.5	39.6	35	42.5	42.8	1921.4	2272	2882.7	0.2	9.9	2
24.08.2023 23:02:23.009	2	39.4	39.4	39.4	35	44.9	45.8	1728.4	2230.7	2872.6	0.9	8.7	2
24.08.2023 23:02:49.057	1	39.4	39.4	39.4	42.6	42.7	42.8	1944.2	2271	2885.5	0.6	8.7	2
24.08.2023 23:03:17.049	2	39.2	39.5	40.1	45.1	45.2	45.8	1899.4	2246.4	2787.7	0.5	11.1	3
24.08.2023 23:03:43.093	1	38.5	39.3	39.4	42.6	42.6	42.6	1839.7	2270.1	3036.9	0	9.3	2
24.08.2023 23:04:11.161	2	39.2	39.2	39.2	44.9	45.1	45.1	1728	2221	2920.7	0.2	9.9	2
24.08.2023 23:04:37.139	1	39.2	39.2	39.2	35	42.3	42.6	1898.3	2233.3	2802.5	0.2	11.5	2
24.08.2023 23:05:04.997	2	38.5	38.9	39.4	35	44.7	45.1	1790.5	2174.8	2740.1	0.5	8.7	2
24.08.2023 23:05:31.221	1	39.4	39.4	39.4	35	42.5	42.8	1780.8	2192.2	2727.6	0.2	10.2	3
24.08.2023 23:05:58.201	2	39.4	39.4	39.4	35	45.1	45.8	1803.1	2169.7	2719.4	1.4	10.5	2
24.08.2023 23:14:34.606	2	35.1	35.8	36.1	35	40.5	41.6	1858.2	2241.1	2875.7	0	8.8	3
24.08.2023 23:15:00.778	1	36.1	36.1	36.3	34.6	34.6	35	1957.7	2275.2	2894.9	0.4	9.5	2
24.08.2023 23:15:27.915	2	36.1	36.1	36.1	35	41.8	42.1	1875.9	2262.8	2907.3	0.4	9.3	2
24.08.2023 23:15:54.111	1	36.1	36.2	36.3	35	36.5	37.3	1944.6	2298.8	2853.8	0.1	8.4	2
24.08.2023 23:16:21.119	2	36.3	36.3	36.3	35	42.6	43	1943.8	2264.9	2812.6	0	11.3	2
24.08.2023 23:16:47.184	1	36.6	36.6	36.6	35	38.1	38.3	1958.6	2294.1	2945.2	0	8.5	2
24.08.2023 23:17:14.792	2	36.6	36.8	36.8	35	43.2	43.7	1938.6	2268.3	2813.7	0.1	9	3
24.08.2023 23:17:39.959	1	36.8	37.1	37.1	35	39.4	39.6	1925.7	2285.5	2836.8	0	8	2
24.08.2023 23:18:08.018	2	37.1	37.3	37.3	35	43.9	44.2	1909.8	2252.3	2933.3	0	9.6	3
24.08.2023 23:18:34.195	1	37.5	37.5	37.5	35	40.4	40.7	1901.1	2263.1	2799.5	0.2	8.1	3
24.08.2023 23:19:01.122	2	37.5	37.7	37.8	35	44.4	44.7	1865.7	2217	2794.6	0.1	7	1

Software tool HRI[®]analyze+

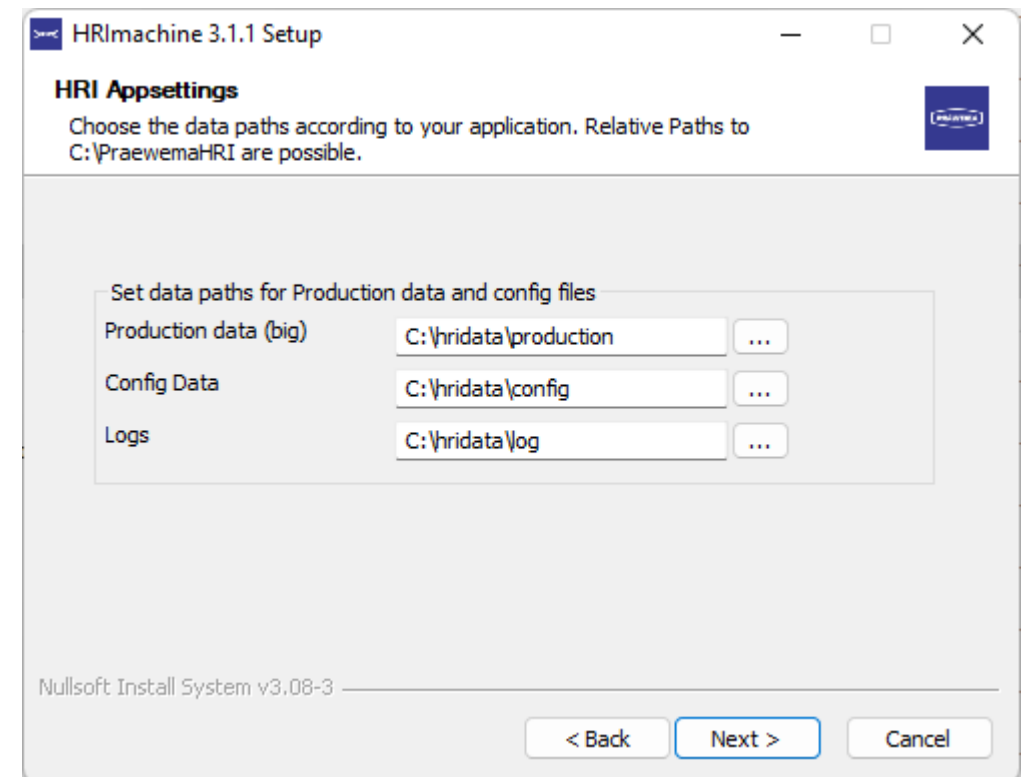
HriLog files

During the installation of HRImachine you will be asked for a storage path for the HRI data. This setting cannot be changed later.

In the folder Production the HRI files concerning the production are stored (HriLog, HriDebugLog, HriFFTLog, HriShockLog).

Under Config Data the settings, part programs and limit curves are stored. It is recommended to backup this folder with the Indra Works project backup.

In the Logs folder the logging files for error analysis are stored.



Software tool HRI[®]analyze+

HriLog files

The files are saved in the folder:

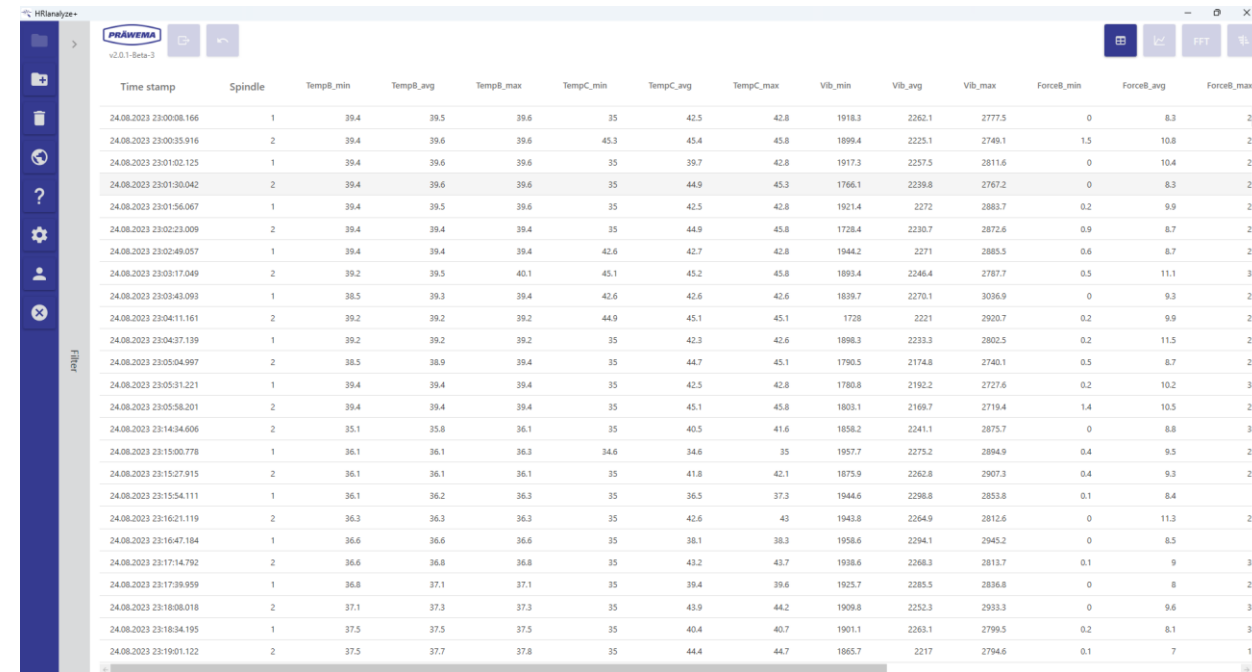
(C/D):\hridata\production\(\left\right)HRILog

The file name is structured as follows:

File_type_channel_name_component_name_date_index

hriolog_50_Gear_rile_20200901_0

Should diagnostic objects be added or changed, a new file with an ascending index is created.



Time stamp	Spindle	TempB_min	TempB_avg	TempB_max	TempC_min	TempC_avg	TempC_max	Vib_min	Vib_avg	Vib_max	ForceB_min	ForceB_avg	ForceB_max
24.08.2023 23:00:08.166	1	39.4	39.5	39.6	35	42.5	42.8	1918.3	2262.1	2777.5	0	8.3	2
24.08.2023 23:00:35.916	2	39.4	39.6	39.6	45.3	45.4	45.8	1899.4	2225.1	2749.1	1.5	10.8	2
24.08.2023 23:01:02.125	1	39.4	39.6	39.6	35	39.7	42.6	1917.3	2257.5	2811.6	0	10.4	2
24.08.2023 23:01:30.042	2	39.4	39.6	39.6	35	44.9	45.3	1766.1	2239.8	2767.2	0	8.3	2
24.08.2023 23:01:56.067	1	39.4	39.5	39.6	35	42.5	42.8	1921.4	2272	2882.7	0.2	9.9	2
24.08.2023 23:02:23.009	2	39.4	39.4	39.4	35	44.9	45.8	1728.4	2230.7	2872.6	0.9	8.7	2
24.08.2023 23:02:49.057	1	39.4	39.4	39.4	42.6	42.7	42.8	1944.2	2271	2885.5	0.6	8.7	2
24.08.2023 23:03:17.049	2	39.2	39.5	40.1	45.1	45.2	45.8	1899.4	2246.4	2787.7	0.5	11.1	3
24.08.2023 23:03:43.093	1	38.5	39.3	39.4	42.6	42.6	42.6	1839.7	2270.1	3036.9	0	9.3	2
24.08.2023 23:04:11.161	2	39.2	39.2	39.2	44.9	45.1	45.1	1728	2221	2920.7	0.2	9.9	2
24.08.2023 23:04:37.139	1	39.2	39.2	39.2	35	42.3	42.6	1898.3	2233.3	2802.5	0.2	11.5	2
24.08.2023 23:05:04.997	2	38.5	38.9	39.4	35	44.7	45.1	1790.5	2174.8	2740.1	0.5	8.7	2
24.08.2023 23:05:31.221	1	39.4	39.4	39.4	35	42.5	42.8	1780.8	2192.2	2727.6	0.2	10.2	3
24.08.2023 23:05:58.201	2	39.4	39.4	39.4	35	45.1	45.8	1803.1	2169.7	2719.4	1.4	10.5	2
24.08.2023 23:14:34.606	2	35.1	35.8	36.1	35	40.5	41.6	1858.2	2241.1	2875.7	0	8.8	3
24.08.2023 23:15:00.778	1	36.1	36.1	36.3	34.6	34.6	35	1957.7	2275.2	2894.9	0.4	9.5	2
24.08.2023 23:15:27.915	2	36.1	36.1	36.1	35	41.8	42.1	1875.9	2262.8	2907.3	0.4	9.3	2
24.08.2023 23:15:54.111	1	36.1	36.2	36.3	35	36.5	37.3	1944.6	2298.8	2853.8	0.1	8.4	2
24.08.2023 23:16:21.119	2	36.3	36.3	36.3	35	42.6	43	1943.8	2264.9	2812.6	0	11.3	2
24.08.2023 23:16:47.184	1	36.6	36.6	36.6	35	38.1	38.3	1958.6	2294.1	2945.2	0	8.5	2
24.08.2023 23:17:14.792	2	36.6	36.8	36.8	35	43.2	43.7	1938.6	2268.3	2813.7	0.1	9	3
24.08.2023 23:17:39.959	1	36.8	37.1	37.1	35	39.4	39.6	1925.7	2285.5	2836.8	0	8	2
24.08.2023 23:18:08.018	2	37.1	37.3	37.3	35	43.9	44.2	1909.8	2252.3	2933.3	0	9.6	3
24.08.2023 23:18:34.195	1	37.5	37.5	37.5	35	40.4	40.7	1901.1	2263.1	2799.5	0.2	8.1	3
24.08.2023 23:19:01.122	2	37.5	37.7	37.8	35	44.4	44.7	1865.7	2217	2794.6	0.1	7	1

Software tool HRI[®]analyze+

HriLog files

When editing, a distinction is made between the following NC Progsb numbers:

NC program number	
1	Footprint / KM 0 measurement
2-9	Other programs (turning, drilling, etc.)
21	Honring measuring head
22	Honring measuring gear
31	Profiling head
32	Profiling gear

Time stamp	Spindle	TempB_min	TempB_avg	TempB_max	TempC_min	TempC_avg	TempC_max	Vib_min	Vib_avg	Vib_max	ForceB_min	ForceB_avg	ForceB_max
24.08.2023 23:00:08.166	1	39.4	39.5	39.6	35	42.5	42.8	1918.3	2262.1	2777.5	0	8.3	2
24.08.2023 23:00:35.916	2	39.4	39.6	39.6	45.3	45.4	45.8	1899.4	2225.1	2749.1	1.5	10.8	2
24.08.2023 23:01:02.125	1	39.4	39.6	39.6	35	39.7	42.8	1917.3	2257.5	2811.6	0	10.4	2
24.08.2023 23:01:30.042	2	39.4	39.6	39.6	35	44.9	45.3	1766.1	2239.8	2767.2	0	8.3	2
24.08.2023 23:01:56.067	1	39.4	39.5	39.6	35	42.5	42.8	1921.4	2272	2882.7	0.2	9.9	2
24.08.2023 23:02:23.009	2	39.4	39.4	39.4	35	44.9	45.8	1728.4	2230.7	2872.6	0.9	8.7	2
24.08.2023 23:02:49.057	1	39.4	39.4	39.4	42.6	42.7	42.8	1944.2	2271	2885.5	0.6	8.7	2
24.08.2023 23:03:17.049	2	39.2	39.5	40.1	45.1	45.2	45.8	1899.4	2246.4	2787.7	0.5	11.1	3
24.08.2023 23:03:43.093	1	38.5	39.3	39.4	42.6	42.6	42.6	1839.7	2270.1	3036.9	0	9.3	2
24.08.2023 23:04:11.161	2	39.2	39.2	39.2	44.9	45.1	45.1	1728	2221	2920.7	0.2	9.9	2
24.08.2023 23:04:37.139	1	39.2	39.2	39.2	35	42.3	42.6	1898.3	2233.3	2802.5	0.2	11.5	2
24.08.2023 23:05:04.997	2	38.5	38.9	39.4	35	44.7	45.1	1790.5	2174.8	2740.1	0.5	8.7	2
24.08.2023 23:05:31.221	1	39.4	39.4	39.4	35	42.5	42.8	1780.8	2192.2	2727.6	0.2	10.2	3
24.08.2023 23:05:58.201	2	39.4	39.4	39.4	35	45.1	45.8	1803.1	2169.7	2719.4	1.4	10.5	2
24.08.2023 23:14:34.606	2	35.1	35.8	36.1	35	40.5	41.6	1858.2	2241.1	2875.7	0	8.8	3
24.08.2023 23:15:00.778	1	36.1	36.1	36.3	34.6	34.6	35	1957.7	2275.2	2894.9	0.4	9.5	2
24.08.2023 23:15:27.915	2	36.1	36.1	36.1	35	41.8	42.1	1875.9	2262.8	2907.3	0.4	9.3	2
24.08.2023 23:15:54.111	1	36.1	36.2	36.3	35	36.5	37.3	1944.6	2298.8	2853.8	0.1	8.4	2
24.08.2023 23:16:21.119	2	36.3	36.3	36.3	35	42.6	43	1943.8	2264.9	2812.6	0	11.3	2
24.08.2023 23:16:47.184	1	36.6	36.6	36.6	35	38.1	38.3	1958.6	2294.1	2945.2	0	8.5	2
24.08.2023 23:17:14.792	2	36.6	36.8	36.8	35	43.2	43.7	1938.6	2268.3	2813.7	0.1	9	3
24.08.2023 23:17:39.959	1	36.8	37.1	37.1	35	39.4	39.6	1925.7	2285.5	2836.8	0	8	2
24.08.2023 23:18:08.018	2	37.1	37.3	37.3	35	43.9	44.2	1909.8	2252.3	2933.3	0	9.6	3
24.08.2023 23:18:34.195	1	37.5	37.5	37.5	35	40.4	40.7	1901.1	2263.1	2799.5	0.2	8.1	3
24.08.2023 23:19:01.122	2	37.5	37.7	37.8	35	44.4	44.7	1865.7	2217	2794.6	0.1	7	1

Software tool HRI[®]analyze+

HriLog files

When editing, a distinction is made between the following NC Progsb numbers:

NC program number	
33	Pre profiling only with Vario Speed Dresser
34	Profiling only with the Vario Speed Dresser
35	Skiving
40	Omit workpiece measurement
41	Workpiece measure left

Time stamp	Spindle	TempB_min	TempB_avg	TempB_max	TempC_min	TempC_avg	TempC_max	Vib_min	Vib_avg	Vib_max	ForceB_min	ForceB_avg	ForceB_max
24.08.2023 23:00:08.166	1	39.4	39.5	39.6	35	42.5	42.8	1918.3	2262.1	2777.5	0	8.3	2
24.08.2023 23:00:35.916	2	39.4	39.6	39.6	45.3	45.4	45.8	1899.4	2225.1	2749.1	1.5	10.8	2
24.08.2023 23:01:02.125	1	39.4	39.6	39.6	35	39.7	42.6	1917.3	2257.5	2811.6	0	10.4	2
24.08.2023 23:01:30.042	2	39.4	39.6	39.6	35	44.9	45.3	1766.1	2239.8	2767.2	0	8.3	2
24.08.2023 23:01:56.067	1	39.4	39.5	39.6	35	42.5	42.8	1921.4	2272	2882.7	0.2	9.9	2
24.08.2023 23:02:23.009	2	39.4	39.4	39.4	35	44.9	45.8	1728.4	2230.7	2872.6	0.9	8.7	2
24.08.2023 23:02:49.057	1	39.4	39.4	39.4	42.6	42.7	42.8	1944.2	2271	2885.5	0.6	8.7	2
24.08.2023 23:03:17.049	2	39.2	39.5	40.1	45.1	45.2	45.8	1899.4	2246.4	2787.7	0.5	11.1	3
24.08.2023 23:03:43.093	1	38.5	39.3	39.4	42.6	42.6	42.6	1839.7	2270.1	3036.9	0	9.3	2
24.08.2023 23:04:11.161	2	39.2	39.2	39.2	44.9	45.1	45.1	1728	2221	2920.7	0.2	9.9	2
24.08.2023 23:04:37.139	1	39.2	39.2	39.2	35	42.3	42.6	1898.3	2233.3	2802.5	0.2	11.5	2
24.08.2023 23:05:04.997	2	38.5	38.9	39.4	35	44.7	45.1	1790.5	2174.8	2740.1	0.5	8.7	2
24.08.2023 23:05:31.221	1	39.4	39.4	39.4	35	42.5	42.8	1780.8	2192.2	2727.6	0.2	10.2	3
24.08.2023 23:05:58.201	2	39.4	39.4	39.4	35	45.1	45.8	1803.1	2169.7	2719.4	1.4	10.5	2
24.08.2023 23:14:34.606	2	35.1	35.8	36.1	35	40.5	41.6	1858.2	2241.1	2875.7	0	8.8	3
24.08.2023 23:15:00.778	1	36.1	36.1	36.3	34.6	34.6	35	1957.7	2275.2	2894.9	0.4	9.5	2
24.08.2023 23:15:27.915	2	36.1	36.1	36.1	35	41.8	42.1	1875.9	2262.8	2907.3	0.4	9.3	2
24.08.2023 23:15:54.111	1	36.1	36.2	36.3	35	36.5	37.3	1944.6	2298.8	2853.8	0.1	8.4	2
24.08.2023 23:16:21.119	2	36.3	36.3	36.3	35	42.6	43	1943.8	2264.9	2812.6	0	11.3	2
24.08.2023 23:16:47.184	1	36.6	36.6	36.6	35	38.1	38.3	1958.6	2294.1	2945.2	0	8.5	2
24.08.2023 23:17:14.792	2	36.6	36.8	36.8	35	43.2	43.7	1938.6	2268.3	2813.7	0.1	9	3
24.08.2023 23:17:39.959	1	36.8	37.1	37.1	35	39.4	39.6	1925.7	2285.5	2836.8	0	8	2
24.08.2023 23:18:08.018	2	37.1	37.3	37.3	35	43.9	44.2	1909.8	2252.3	2933.3	0	9.6	3
24.08.2023 23:18:34.195	1	37.5	37.5	37.5	35	40.4	40.7	1901.1	2263.1	2799.5	0.2	8.1	3
24.08.2023 23:19:01.122	2	37.5	37.7	37.8	35	44.4	44.7	1865.7	2217	2794.6	0.1	7	1

Software tool HRI[®]analyze+

HriLog files

When editing, a distinction is made between the following NC Progsb numbers:

NC program number	
42	Workpiece measure right
50	Honing
51	Dressing gearing with DDG
52	Dressing tip circle
53	Dressing with Vario Speed Dresser
60	Calibrate

Time stamp	Spindle	TempB_min	TempB_avg	TempB_max	TempC_min	TempC_avg	TempC_max	Vib_min	Vib_avg	Vib_max	ForceB_min	ForceB_avg	ForceB_max
24.08.2023 23:00:08.166	1	39.4	39.5	39.6	35	42.5	42.8	1918.3	2262.1	2777.5	0	8.3	2
24.08.2023 23:00:35.916	2	39.4	39.6	39.6	45.3	45.4	45.8	1899.4	2225.1	2749.1	1.5	10.8	2
24.08.2023 23:01:02.125	1	39.4	39.6	39.6	35	39.7	42.8	1917.3	2257.5	2811.6	0	10.4	2
24.08.2023 23:01:30.042	2	39.4	39.6	39.6	35	44.9	45.3	1766.1	2239.8	2767.2	0	8.3	2
24.08.2023 23:01:56.067	1	39.4	39.5	39.6	35	42.5	42.8	1921.4	2272	2882.7	0.2	9.9	2
24.08.2023 23:02:23.009	2	39.4	39.4	39.4	35	44.9	45.8	1728.4	2230.7	2872.6	0.9	8.7	2
24.08.2023 23:02:49.057	1	39.4	39.4	39.4	42.6	42.7	42.8	1944.2	2271	2885.5	0.6	8.7	2
24.08.2023 23:03:17.049	2	39.2	39.5	40.1	45.1	45.2	45.8	1899.4	2246.4	2787.7	0.5	11.1	3
24.08.2023 23:03:43.093	1	38.5	39.3	39.4	42.6	42.6	42.6	1839.7	2270.1	3036.9	0	9.3	2
24.08.2023 23:04:11.161	2	39.2	39.2	39.2	44.9	45.1	45.1	1728	2221	2920.7	0.2	9.9	2
24.08.2023 23:04:37.139	1	39.2	39.2	39.2	35	42.3	42.6	1898.3	2233.3	2802.5	0.2	11.5	2
24.08.2023 23:05:04.997	2	38.5	38.9	39.4	35	44.7	45.1	1790.5	2174.8	2740.1	0.5	8.7	2
24.08.2023 23:05:31.221	1	39.4	39.4	39.4	35	42.5	42.8	1780.8	2192.2	2727.6	0.2	10.2	3
24.08.2023 23:05:58.201	2	39.4	39.4	39.4	35	45.1	45.8	1803.1	2169.7	2719.4	1.4	10.5	2
24.08.2023 23:14:34.606	2	35.1	35.8	36.1	35	40.5	41.6	1858.2	2241.1	2875.7	0	8.8	3
24.08.2023 23:15:00.778	1	36.1	36.1	36.3	34.6	34.6	35	1957.7	2275.2	2894.9	0.4	9.5	2
24.08.2023 23:15:27.915	2	36.1	36.1	36.3	35	41.8	42.1	1875.9	2262.8	2907.3	0.4	9.3	2
24.08.2023 23:15:54.111	1	36.1	36.2	36.3	35	36.5	37.3	1944.6	2298.8	2853.8	0.1	8.4	2
24.08.2023 23:16:21.119	2	36.3	36.3	36.3	35	42.6	43	1943.8	2264.9	2812.6	0	11.3	2
24.08.2023 23:16:47.184	1	36.6	36.6	36.6	35	38.1	38.3	1958.6	2294.1	2945.2	0	8.5	2
24.08.2023 23:17:14.792	2	36.6	36.8	36.8	35	43.2	43.7	1938.6	2268.3	2813.7	0.1	9	3
24.08.2023 23:17:39.959	1	36.8	37.1	37.1	35	39.4	39.6	1925.7	2285.5	2836.8	0	8	2
24.08.2023 23:18:08.018	2	37.1	37.3	37.3	35	43.9	44.2	1909.8	2252.3	2933.3	0	9.6	3
24.08.2023 23:18:34.195	1	37.5	37.5	37.5	35	40.4	40.7	1901.1	2263.1	2799.5	0.2	8.1	3
24.08.2023 23:19:01.122	2	37.5	37.7	37.8	35	44.4	44.7	1865.7	2217	2794.6	0.1	7	1

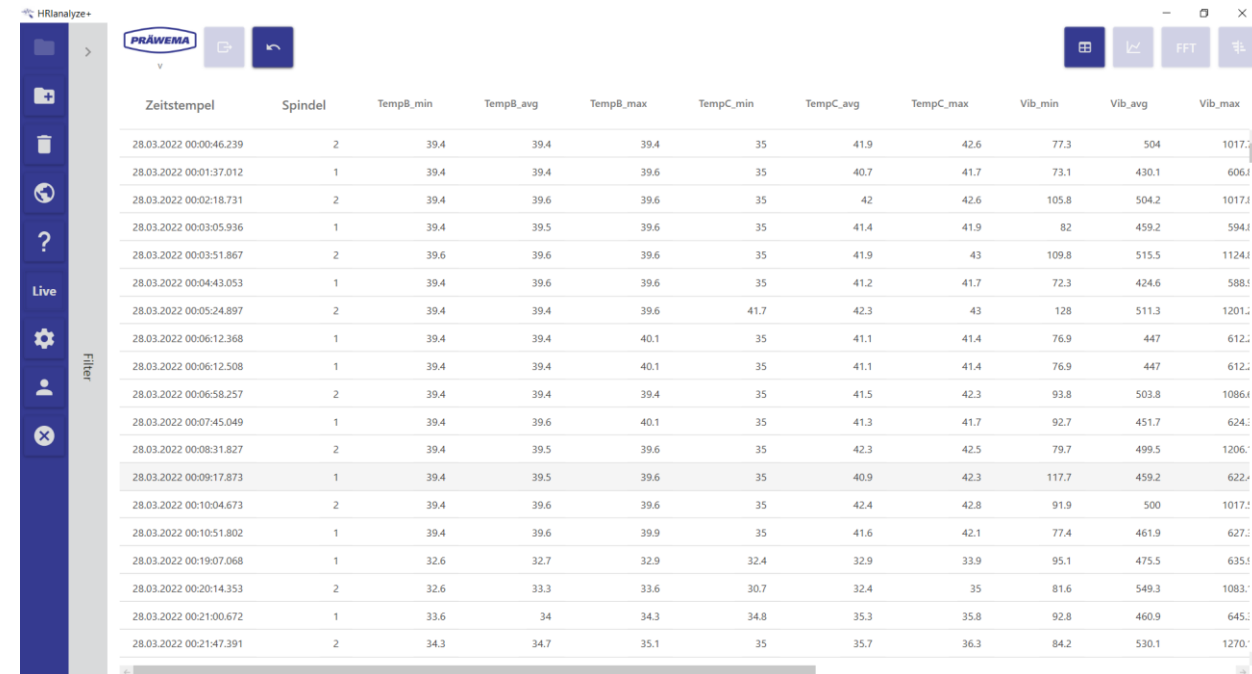
Software tool HRI[®]analyze+

HriLog files

Each row represents a workpiece that has been processed with the machine.

If the machine is working in simulation mode or on standby, the parts counter does not count them. This can lead to duplicate part numbers and DMC. This is suppressed from backend version 3.1.

If the processing is aborted via the emergency retraction (reset), current peaks occur and thus a high HRI value. Such components must be viewed separately via HriDebugLog files.



Zeitstempel	Spindel	TempB_min	TempB_avg	TempB_max	TempC_min	TempC_avg	TempC_max	Vib_min	Vib_avg	Vib_max
28.03.2022 00:00:46.239	2	39.4	39.4	39.4	35	41.9	42.6	77.3	504	1017.2
28.03.2022 00:01:37.012	1	39.4	39.4	39.6	35	40.7	41.7	73.1	430.1	606.1
28.03.2022 00:02:18.731	2	39.4	39.6	39.6	35	42	42.6	105.8	504.2	1017.2
28.03.2022 00:03:05.936	1	39.4	39.5	39.6	35	41.4	41.9	82	459.2	594.1
28.03.2022 00:03:51.867	2	39.6	39.6	39.6	35	41.9	43	109.8	515.5	1124.1
28.03.2022 00:04:43.053	1	39.4	39.6	39.6	35	41.2	41.7	72.3	424.6	588.1
28.03.2022 00:05:24.897	2	39.4	39.4	39.6	41.7	42.3	43	128	511.3	1201.2
28.03.2022 00:06:12.368	1	39.4	39.4	40.1	35	41.1	41.4	76.9	447	612.2
28.03.2022 00:06:12.508	1	39.4	39.4	40.1	35	41.1	41.4	76.9	447	612.2
28.03.2022 00:06:58.257	2	39.4	39.4	39.4	35	41.5	42.3	93.8	503.8	1086.1
28.03.2022 00:07:45.049	1	39.4	39.6	40.1	35	41.3	41.7	92.7	451.7	624.2
28.03.2022 00:08:31.827	2	39.4	39.5	39.6	35	42.3	42.5	79.7	499.5	1206.2
28.03.2022 00:09:17.873	1	39.4	39.5	39.6	35	40.9	42.3	117.7	459.2	622.2
28.03.2022 00:10:04.673	2	39.4	39.6	39.6	35	42.4	42.8	91.9	500	1017.2
28.03.2022 00:10:51.802	1	39.4	39.6	39.9	35	41.6	42.1	77.4	461.9	627.2
28.03.2022 00:19:07.068	1	32.6	32.7	32.9	32.4	32.9	33.9	95.1	475.5	635.2
28.03.2022 00:20:14.353	2	32.6	33.3	33.6	30.7	32.4	35	81.6	549.3	1083.2
28.03.2022 00:21:00.672	1	33.6	34	34.3	34.8	35.3	35.8	92.8	460.9	645.2
28.03.2022 00:21:47.391	2	34.3	34.7	35.1	35	35.7	36.3	84.2	530.1	1270.2

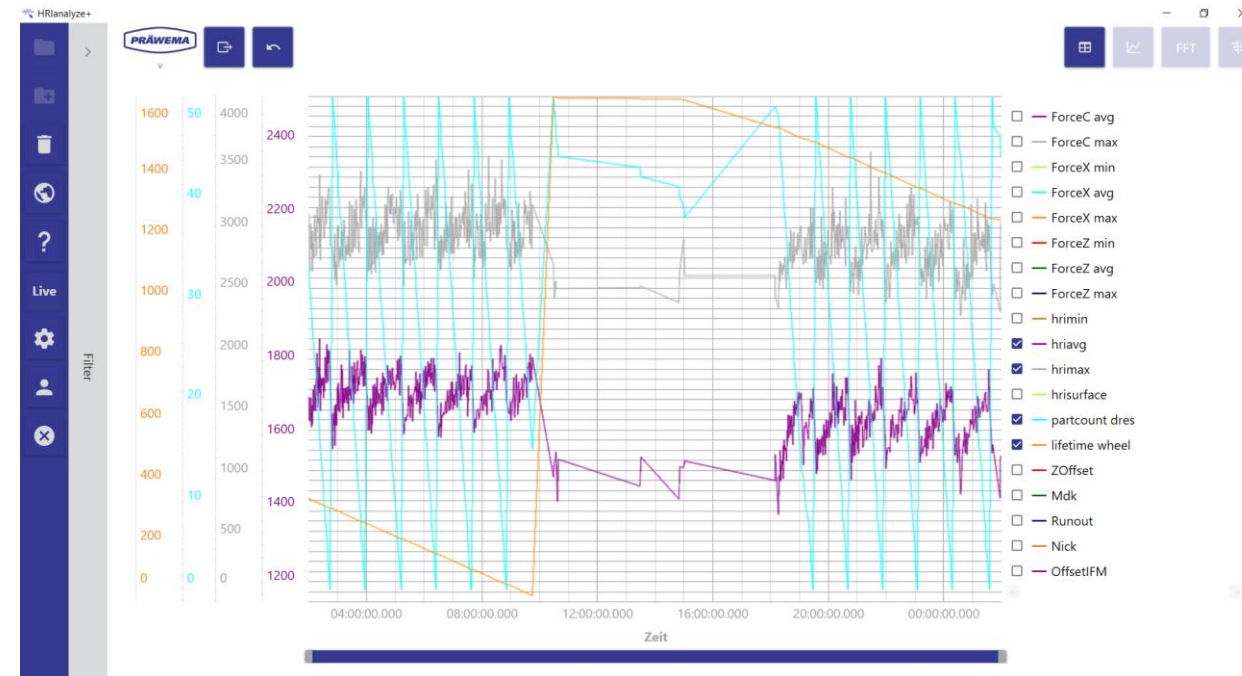
Software tool HRI[®]analyze+

HriLog files

On the right side of the chart, you can select and deselect the displayed parameter.

A pre-selection is made for HRI_{max}, HRI_{avg}, Partcount Dress and Lifetime Wheel.

A separate Y-axis is calculated for each column. For this reason, there can be longer waiting times for many order or diagnosis objects when the diagram is calculated.

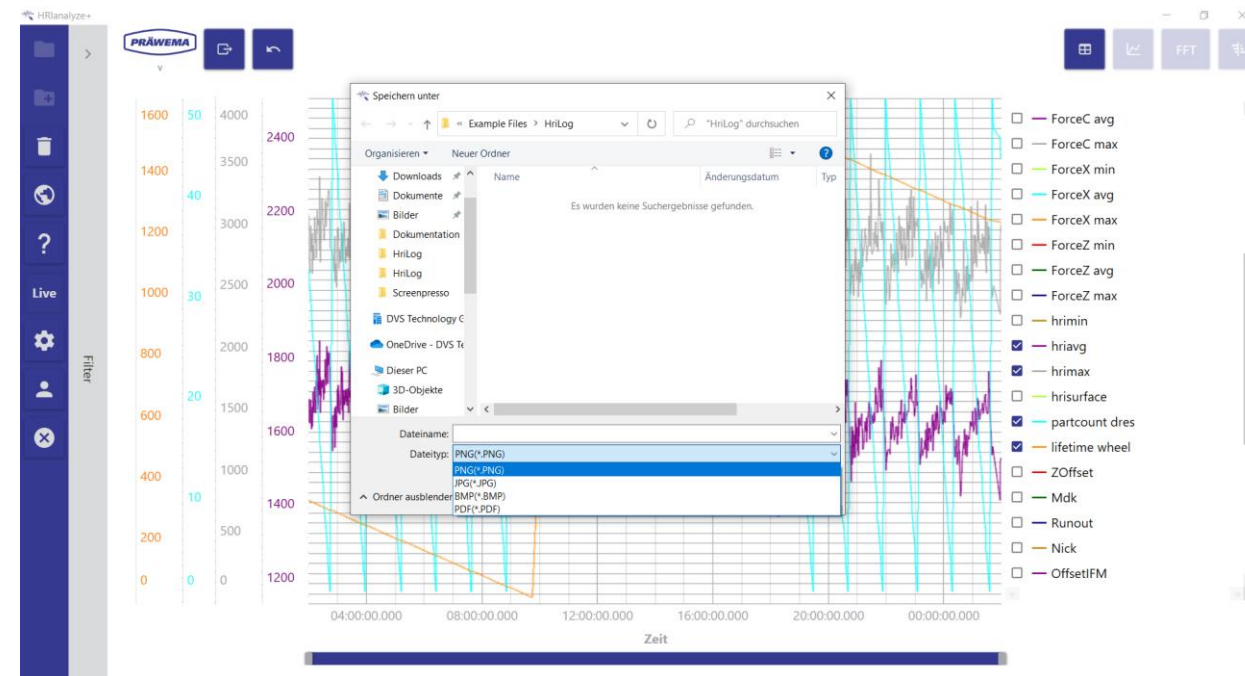


Software tool HRI[®]analyze+

Export Button

Files can be exported as PNG, JPG, BMP or PDF format.

Exports are performed in the current view.

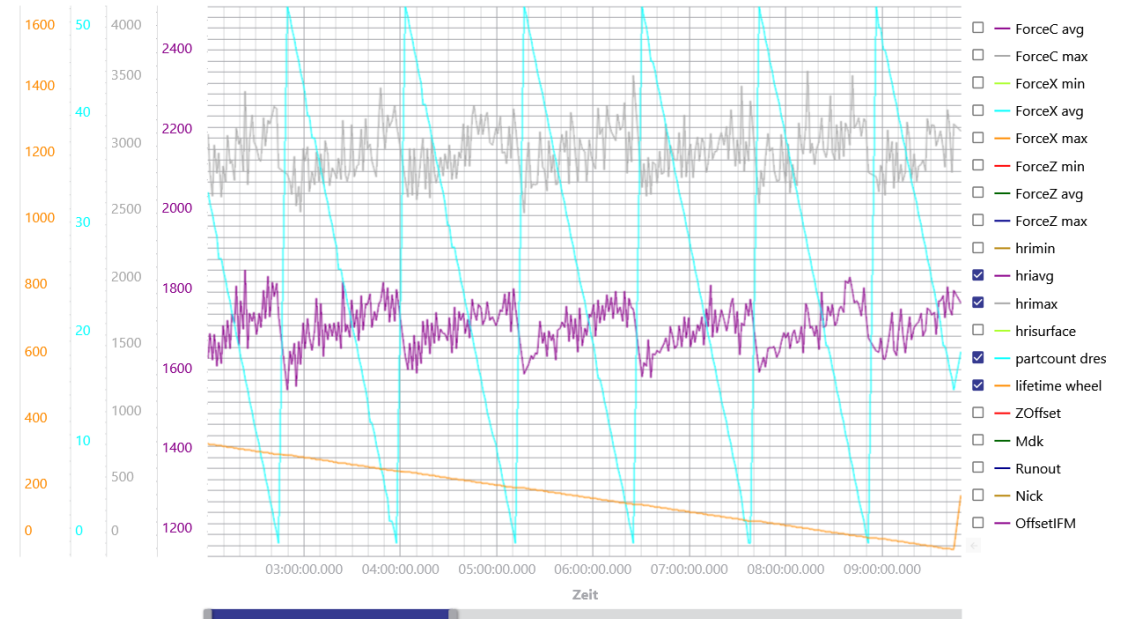


Software tool HRI[®]analyze+

Export Button

Example of an export in PNG format.

The time range up to the tool change was limited via the scroll bar below.



Software tool HRI[®]analyze+

HriDebugLog files

For each part, HRI creates a debug file.

With these files it is possible to check the course of the temperature, the forces and the vibration during the machining process.

The positions of the linear axes X, Y, and Z are recorded.

With the SynchroFine, the W-axis is recorded instead of the Y-axis.

Time stamp	HRI	TempHRI	ForceHRI	ForceB	ForceC	ForceX	ForceZ	PosX	PosY	PosZ	VibrationHRI	Vib_C2-Spindle	Vib_B-Honinghead	Vib_U-Tailstock
19.06.2023 17:05:40.931	774.4	0	334.86002	7.7	0.1	16.6	0	-5.8921	-13.358	-424.2135	439.5583	261.74103211901064	153.5115940864147	24.30210154388660
19.06.2023 17:05:41.181	5733.7	0	5279.33	0.8	61.2	20.6	33.3	-9.3072	-13.3581	-424.2134	474.32132	300.33168340273147	154.0616917639188	19.92795923644233
19.06.2023 17:05:41.431	4869.2	0	4400.06	5.7	55.4	10.4	34.5	-26.2498	-13.358	-424.2134	469.187	295.00178222514484	149.68997277002168	24.49525760325467
19.06.2023 17:05:41.681	3133.2	0	2629.29	2.3	38.4	11.2	32	-36.327	-13.3581	-424.2134	503.91064	331.002399868258	146.52399939652246	26.3843032835270
19.06.2023 17:05:41.931	4184.2	0	3644.2998	2.6	47.6	21.3	30.3	-43.1251	-13.358	-424.2134	539.87976	354.382920761051	155.25460350440996	30.24223369828806
19.06.2023 17:05:42.181	4773.8	0	3809.53	5.2	49.7	16.6	32.2	-53.2362	-13.358	-424.2135	964.22532	782.2430848902942	153.29777741062566	28.68434116924974
19.06.2023 17:05:42.431	1775.7	0	1354.86	9.4	14.5	8	31.5	-59.8248	-13.358	-424.2138	420.82894	235.83691686647416	155.2902693864278	29.75174644528813
19.06.2023 17:05:42.681	1524.6	0	1089.4601	9.4	14.5	8.2	26.900002	-61.8072	-13.358	-423.956	435.1589	259.66705474889295	153.1929924107085	22.2988543551882
19.06.2023 17:05:42.931	2170	0	1767.8098	6.7	2.8	18.2	37.199997	-63.4738	-13.358	-424.3431	402.19806	238.64829968184878	153.97375939647551	19.57600698731316
19.06.2023 17:05:43.181	1034.7	0	566.42	3.3	2.5	10.8	20.8	-65.1493	-13.3581	-424.1572	468.2973	262.69582807740807	172.6953760172928	32.9608074460972
19.06.2023 17:05:43.431	2177.8	0	1731.1902	0.9	10.6	5.1	39.9	-66.4099	-13.358	-423.9597	446.61478	252.858675111886	162.9573022559683	30.79878592909925
19.06.2023 17:05:43.681	1797	0	1338.5298	2.2	2.3	12.6	34.199997	-66.4125	-13.3581	-424.2806	458.49786	255.22340113914444	172.53192490775902	30.74254152465220
19.06.2023 17:05:43.931	2462.8	0	1991.9502	12.8	1.9	10.9	41.300003	-66.4296	-13.358	-424.0005	470.80106	249.45295874036665	189.34523903058036	32.00286458784458
19.06.2023 17:05:44.181	1521.3	0	1075.3901	14.1	3.6	17.1	23.900002	-66.4372	-13.3579	-424.3564	445.87006	242.14136756117935	175.9093640553175	27.819156800049227
19.06.2023 17:05:44.431	2284.1	0	1784.2098	15.8	4.8	11.3	37.199997	-66.4512	-13.358	-424.0974	499.65666	281.60021478716493	189.7834603568654	28.47299484076997
19.06.2023 17:05:44.681	1943.7	0	1483.2799	4.6	10.2	16.8	32.8	-66.4583	-13.3581	-424.3555	460.38562	240.85241748110641	191.012893954859	28.52029955133498
19.06.2023 17:05:44.931	1586.1	0	1087.25	10.6	4.5	17	25.8	-66.4621	-13.3582	-424.1379	498.80862	275.6619601879649	191.8058274251978	31.3408341832603
19.06.2023 17:05:45.181	3136	0	2663.4	6.6	0.8	18.8	47.6	-66.4773	-13.3581	-424.3569	472.63287	256.9403988482398	183.44331419357388	32.2491752872115
19.06.2023 17:05:45.431	1474.4	0	977.19006	7.7	9.5	10.2	26.900002	-66.4804	-13.3583	-424.31	497.22125	263.2997808459189	199.85758935278868	34.0689030871283
19.06.2023 17:05:45.681	3861.1	0	3364.81	8.2	9.1	22.6	52	-66.4938	-13.3581	-424.3119	486.29205	262.6432207576545	198.72958131775965	34.91924806574092
19.06.2023 17:05:45.931	3038.7	0	2538.94	17.1	2.7	26.8	39	-66.502	-13.3582	-424.2311	499.7981	265.2120480964872	201.89806278209002	32.6879911462903
19.06.2023 17:05:46.181	2852.9	0	2358.29	14.1	0.6	16.6	43.4	-66.5099	-13.3584	-423.9564	494.62393	263.35659474087885	203.06749284337369	28.19904687123738
19.06.2023 17:05:46.431	4211.2	0	3723.1702	18.3	6.6	16.6	55.4	-66.5171	-13.3581	-424.3532	487.9835	253.6417367424825	205.97049380306322	28.3712547677985
19.06.2023 17:05:46.681	3288.7	0	2764.7402	15.8	6.7	27.5	41.4	-66.5238	-13.3582	-424.1209	524.00684	288.9801692640454	202.33713208794634	32.6895390944161
19.06.2023 17:05:46.931	2987.2	0	2532.3403	9.5	8.2	27.4	40.300003	-66.5404	-13.3582	-424.3089	454.89438	238.2155912392609	187.635479568939	29.0452467717147

Software tool HRI[®]analyze+

HriDebugLog files

The files are saved in the folder:

(C/D):\hridata\production\(\left/right)\HriDebugLog

The file name is structured as follows:

hri_data_debug_2020-09-21T11-30-36_50_470

File_Type_Date_Time_Channel_Name_Counter

The components can be clearly assigned using the total part count.

Time stamp	HRI	TempHRI	ForceHRI	ForceB	ForceC	ForceX	ForceZ	PosX	PosY	PosZ	VibrationHRI	Vib_C2_Spindle	Vib_B_Honinghead	Vib_U_Tailstock
19.06.2023 17:05:40.931	774.4	0	334.86002	7.7	0.1	16.6	0	-5.8921	-13.358	-424.2135	439.5583	261.74103211901064	153.51515940864147	24.30210154388660
19.06.2023 17:05:41.181	5753.7	0	5279.33	0.8	61.2	20.6	33.3	-9.3072	-13.3581	-424.2134	474.32132	300.33168340273147	154.0616917639188	19.92795923644233
19.06.2023 17:05:41.431	4869.2	0	4400.06	5.7	55.4	10.4	34.5	-26.2498	-13.358	-424.2134	469.187	295.00178222514484	149.68997277002168	24.49525760325467
19.06.2023 17:05:41.681	3133.2	0	2629.29	2.3	38.4	11.2	32	-36.327	-13.3581	-424.2134	503.91064	331.002399863258	146.52399939652246	26.3843032835270
19.06.2023 17:05:41.931	4184.2	0	3644.2998	2.6	47.6	21.3	30.3	-43.1251	-13.358	-424.2134	539.87976	354.3829202761051	155.25460350440996	30.24223369883860
19.06.2023 17:05:42.181	4773.8	0	3809.53	5.2	49.7	16.6	32.2	-53.2362	-13.358	-424.2135	964.2252	782.2430848902942	153.29777741062566	28.68434116924974
19.06.2023 17:05:42.431	1775.7	0	1354.86	9.4	14.5	8	31.5	-59.8248	-13.358	-424.2138	420.87894	235.83691686647416	155.2902693864278	29.75174644528813
19.06.2023 17:05:42.681	1524.6	0	1089.4601	9.4	14.5	8.2	26.900002	-61.8072	-13.358	-423.956	435.1589	259.66705474889295	153.1929624107085	22.298543551882
19.06.2023 17:05:42.931	2170	0	1767.8098	6.7	2.8	18.2	37.199997	-63.4738	-13.358	-424.3431	402.19806	238.64829968184878	153.97375939647551	19.5760068731316
19.06.2023 17:05:43.181	1034.7	0	566.42	3.3	2.5	10.8	20.8	-65.1493	-13.3581	-424.1572	468.2973	262.69582807740807	172.6953760173928	32.9606874460972
19.06.2023 17:05:43.431	2177.8	0	1731.1902	0.9	10.6	5.1	39.9	-66.4099	-13.358	-423.9597	446.61478	252.858675111886	162.9573022559683	30.79878592909925
19.06.2023 17:05:43.681	1797	0	1338.5298	2.2	2.3	12.6	34.199997	-66.4125	-13.3581	-424.2806	458.49786	255.22340113914444	172.53192490775902	30.74254152445220
19.06.2023 17:05:43.931	2462.8	0	1991.9502	12.8	1.9	10.9	41.300003	-66.4296	-13.358	-424.0005	470.80106	249.45295874036665	189.34523903058036	32.00286458784458
19.06.2023 17:05:44.181	1521.3	0	1075.3901	14.1	3.6	17.1	23.900002	-66.4372	-13.3579	-424.3564	445.87006	242.14136756117935	175.90953640553175	27.81915680049227
19.06.2023 17:05:44.431	2284.1	0	1784.2098	15.8	4.8	11.3	37.199997	-66.4512	-13.358	-424.0974	499.85666	281.60021478716493	189.78346035686534	28.47299484076997
19.06.2023 17:05:44.681	1943.7	0	1483.2799	4.6	10.2	16.8	32.8	-66.4583	-13.3581	-424.3555	460.38562	240.85241748110641	191.012893954859	28.52029955133498
19.06.2023 17:05:44.931	1586.1	0	1087.25	10.6	4.5	17	25.8	-66.4621	-13.3582	-424.1379	498.80862	275.6619601879649	191.8058274251978	31.3408341836285
19.06.2023 17:05:45.181	3136	0	2663.4	6.6	0.8	18.8	47.6	-66.4773	-13.3581	-424.3569	472.63287	256.9403988482398	183.44331419357388	32.2491752872115
19.06.2023 17:05:45.431	1474.4	0	977.19006	7.7	9.5	10.2	26.900002	-66.4804	-13.3583	-424.31	497.22125	263.2997808459189	199.85758935278868	34.06389030871283
19.06.2023 17:05:45.681	3861.1	0	3364.81	8.2	9.1	22.6	52	-66.4938	-13.3581	-424.3119	486.29205	262.6432207576545	198.7295813175965	34.9192480574092
19.06.2023 17:05:45.931	3038.7	0	2538.94	17.1	2.7	26.8	39	-66.502	-13.3582	-424.2311	499.7981	265.2120408964872	201.89806278209002	32.6879911462903
19.06.2023 17:05:46.181	2852.9	0	2358.29	14.1	0.6	16.6	43.4	-66.5099	-13.3584	-423.9564	494.62393	263.35659474087885	203.0674928437389	28.19904687123738
19.06.2023 17:05:46.431	4211.2	0	3723.1702	18.3	6.6	16.6	55.4	-66.5171	-13.3581	-424.3532	487.9835	253.6417367424825	205.97049380306322	28.3712547677985
19.06.2023 17:05:46.681	3288.7	0	2764.7402	15.8	6.7	27.5	41.4	-66.5238	-13.3582	-424.1209	524.00684	288.9801692640454	202.33713208794634	32.6895390944161
19.06.2023 17:05:46.931	2987.2	0	2532.3403	9.5	8.2	27.4	40.300003	-66.5404	-13.3582	-424.3089	454.89438	238.2155912392609	187.635479568393	29.0452467717147

Software tool HRI[®]analyze+

HriDebugLog files

The process step of the machine can be restricted using the filter function. You can hide certain cuts when skiving or work steps when honing.

With the gear skiving machine, each skiving stroke is considered a separate process step. If, for example, a workpiece is to be processed with 15 skiving strokes, the machine records 15 process steps accordingly.

With other machines from the DVS Technology Group, the process steps are individually adapted to the processing of the machine.

The screenshot shows the HRIanalyze+ v2.0.1-Beta-3 interface. On the left, a 'Filter' sidebar is open, showing options for Machine, Devices, Sensors, Working steps (1-10), and Custom filters. The Custom filters include: Frequency range < 2500, DMC = TC04A2320000234M/98 7G214 BB, Part = 653873, Max. Amplitude > 1000, Spindle = 1, Part = 31011, Frequency range > < 1500, DMC LIKE 7982, Revolutions = 5451, and Part = 33734. The main window displays a table with columns: Time stamp, HRI, TempHRI, ForceHRI, ForceB, ForceC, ForceX, ForceZ, PosX, PosY, PosZ, VibrationHRI, and Vib_C2-5. The table contains 20 rows of data representing process steps.

Time stamp	HRI	TempHRI	ForceHRI	ForceB	ForceC	ForceX	ForceZ	PosX	PosY	PosZ	VibrationHRI	Vib_C2-5
19.06.2023 17:05:40.931	774.4	0	334.86002	7.7	0.1	16.6	0	-5.8921	-13.358	-424.2135	439.5583	261.741032
19.06.2023 17:05:41.181	5753.7	0	5279.33	0.8	61.2	20.6	33.3	-9.3072	-13.3581	-424.2134	474.32132	300.331683
19.06.2023 17:05:41.431	4869.2	0	4400.06	5.7	55.4	10.4	34.5	-26.2498	-13.358	-424.2134	469.187	295.001782
19.06.2023 17:05:41.681	3133.2	0	2629.29	2.3	38.4	11.2	32	-36.327	-13.3581	-424.2134	503.91064	331.00235
19.06.2023 17:05:41.931	4184.2	0	2644.2998	2.6	47.6	21.3	30.3	-43.1251	-13.358	-424.2134	539.87976	354.38292
19.06.2023 17:05:42.181	4773.8	0	3809.53	5.2	49.7	16.6	32.2	-53.2362	-13.358	-424.2135	964.2252	782.24308
19.06.2023 17:05:42.431	1775.7	0	1354.86	9.4	14.5	8	31.5	-59.8248	-13.358	-424.2138	420.87894	235.836916
19.06.2023 17:05:42.681	1524.6	0	1089.4601	9.4	14.5	8.2	26.900002	-61.8072	-13.358	-423.956	435.1589	259.667054
19.06.2023 17:05:42.931	2170	0	1767.8098	6.7	2.8	18.2	37.199997	-63.4738	-13.358	-424.3431	402.19806	228.648299
19.06.2023 17:05:43.181	1034.7	0	566.42	3.3	2.5	10.8	20.8	-65.1493	-13.3581	-424.1572	468.2973	262.695028
19.06.2023 17:05:43.431	2177.8	0	1731.1902	0.9	10.6	5.1	39.9	-66.4099	-13.358	-423.9597	446.61478	252.85867
19.06.2023 17:05:43.681	1797	0	1338.5298	2.2	2.3	12.6	34.199997	-66.4125	-13.3581	-424.2896	458.49786	255.223401
19.06.2023 17:05:43.931	2462.8	0	1991.9502	12.8	1.9	10.9	41.300003	-66.4296	-13.358	-424.0005	470.80106	249.452958
19.06.2023 17:05:44.181	1521.3	0	1075.3901	14.1	3.6	17.1	23.900002	-66.4372	-13.3579	-424.3564	445.87006	242.141367
19.06.2023 17:05:44.431	2284.1	0	1784.2098	15.8	4.8	11.3	37.199997	-66.4512	-13.358	-424.0974	499.85666	281.600214
19.06.2023 17:05:44.681	1943.7	0	1483.2799	4.6	10.2	16.8	32.8	-66.4583	-13.3581	-424.3555	460.38562	240.852417
19.06.2023 17:05:44.931	1586.1	0	1087.25	10.6	4.5	17	25.8	-66.4621	-13.3582	-424.1379	498.80862	275.66198
19.06.2023 17:05:45.181	3136	0	2663.4	6.6	0.8	18.8	47.6	-66.4773	-13.3581	-424.3569	472.63287	256.94039
19.06.2023 17:05:45.431	1474.4	0	977.19006	7.7	9.5	10.2	26.900002	-66.4804	-13.3583	-424.31	497.22125	263.29978
19.06.2023 17:05:45.681	3861.1	0	3364.81	8.2	9.1	22.6	52	-66.4938	-13.3581	-424.3119	496.29205	262.64322
19.06.2023 17:05:45.931	3038.7	0	2538.94	17.1	2.7	26.8	39	-66.502	-13.3582	-424.2311	499.7981	265.21204
19.06.2023 17:05:46.181	2852.9	0	2358.29	14.1	0.6	16.6	43.4	-66.5099	-13.3584	-423.9564	494.62393	263.356594
19.06.2023 17:05:46.431	4211.2	0	3723.1702	18.3	6.6	16.6	55.4	-66.5171	-13.3581	-424.3532	487.9835	253.641773
19.06.2023 17:05:46.681	3288.7	0	2764.7402	15.8	6.7	27.5	41.4	-66.5238	-13.3582	-424.1209	524.00684	288.98016
19.06.2023 17:05:46.931	2987.2	0	2532.3403	9.5	8.2	27.4	40.300003	-66.5404	-13.3582	-424.3089	454.89438	238.21559

Software tool HRI[®]analyze+

HriDebugLog files

Proc steps honing	
0	inactive
1	way from 0 to tooth-tooth position (rapid)
2	way from tooth-tooth to "scratching point" (high feed of 1000 mm/min)
8	Prehoning, at Nick in gray range
3	touching (1)
7	touching (2) (optional)
9	lift distance (optional)

Zeitstempel	HRI	TempHRI	ForceHRI	ForceB	ForceC	ForceX	ForceZ	PosX	PosY	PosZ
22.02.2022 00:08:48.926	3112.5	275.5601	2620.42	2	49.1	8	11.900002	-20.7486	13.0016	-449.54
22.02.2022 00:08:49.176	5486.3	275.5601	4898.8496	5.8	68.6	4.2	11.900002	-28.33	13.0016	-449.54
22.02.2022 00:08:49.427	4331.4	275.5601	3640.89	2.4	58.6	7.4	12.099998	-35.9112	13.0016	-449.54
22.02.2022 00:08:49.677	4399.4	275.5601	3600.6199	1.9	58.8	3.1	11.400002	-47.2817	13.0016	-449.54
22.02.2022 00:08:49.928	4428.2	275.5601	3600.6199	1.9	58.8	3.1	11.400002	-58.6529	13.0016	-449.54
22.02.2022 00:08:50.178	4314.5	275.5601	3600.6199	1.9	58.8	3.1	11.400002	-62.5769	13.0016	-449.57
22.02.2022 00:08:50.428	1600.6	275.5601	918.87006	0.1	9.9	15.8	23.900002	-65.3357	13.0016	-450.51
22.02.2022 00:08:50.679	863.3	275.5601	181.47998	0.1	2.9	12.5	4.0999985	-71.467	13.0015	-449.98
22.02.2022 00:08:50.930	783.5	275.5601	87.49003	1.2	1.8	3.5	8.400002	-71.4749	13.0016	-449.1
22.02.2022 00:08:51.180	772	275.5601	87.49003	1.2	1.8	3.5	8.400002	-71.4815	13.0016	-450.64
22.02.2022 00:08:51.431	1125.2	275.5601	446.10004	1.1	5.6	6.7	19.2	-71.4839	13.0015	-450.38
22.02.2022 00:08:51.681	1293.9	275.5601	601.2299	0	4.1	1.9	24.099998	-71.4883	13.0016	-449.5
22.02.2022 00:08:51.938	1285.7	275.5601	601.2299	0	4.1	1.9	24.099998	-71.4917	13.0016	-450.7
22.02.2022 00:08:52.189	850.2	275.5601	151.14001	3.2	4	8.1	7.700001	-71.493	13.0016	-451.1
22.02.2022 00:08:52.440	988.6	275.5601	310.36	0.1	6.7	13.9	8.5	-71.4992	13.0016	-449.71
22.02.2022 00:08:52.693	1221.4	275.5601	536.18005	2.5	3	5.3	22.2	-71.5017	13.0015	-450.38
22.02.2022 00:08:52.944	954.8	275.5601	276.45996	3.3	0	14.9	6.5999985	-71.5066	13.0016	-451.08
22.02.2022 00:08:53.195	800.9	275.5601	103.20003	3.4	0.2	1.8	9.400002	-71.5095	13.0016	-449.6
22.02.2022 00:08:53.446	1319.4	275.5601	631.29004	4.2	7.1	5	23.2	-71.5154	13.0016	-450.52

Software tool HRI[®]analyze+

HriDebugLog files

Proc steps honing	
4	working (1)
10	working (2) (optional)
5	Spark out (residence time on end distance with oscillation)
6	Retreat path
Proc steps dressing with VSD	
25	VSD cuts without correction
26	VSD cuts with correction

Zeitstempel	HRI	TempHRI	ForceHRI	ForceB	ForceC	ForceX	ForceZ	PosX	PosY	PosZ
22.02.2022 00:08:48.926	3112.5	275.5601	2620.42	2	49.1	8	11.900002	-20.7486	13.0016	-449.54
22.02.2022 00:08:49.176	5486.3	275.5601	4898.8496	5.8	68.6	4.2	11.900002	-28.33	13.0016	-449.54
22.02.2022 00:08:49.427	4331.4	275.5601	3640.89	2.4	58.6	7.4	12.099998	-35.9112	13.0016	-449.54
22.02.2022 00:08:49.677	4399.4	275.5601	3600.6199	1.9	58.8	3.1	11.400002	-47.2817	13.0016	-449.54
22.02.2022 00:08:49.928	4428.2	275.5601	3600.6199	1.9	58.8	3.1	11.400002	-58.6529	13.0016	-449.54
22.02.2022 00:08:50.178	4314.5	275.5601	3600.6199	1.9	58.8	3.1	11.400002	-62.5769	13.0016	-449.57
22.02.2022 00:08:50.428	1600.6	275.5601	918.87006	0.1	9.9	15.8	23.900002	-65.3357	13.0016	-450.51
22.02.2022 00:08:50.679	863.3	275.5601	181.47998	0.1	2.9	12.5	4.0999985	-71.467	13.0015	-449.96
22.02.2022 00:08:50.930	783.5	275.5601	87.49003	1.2	1.8	3.5	8.400002	-71.4749	13.0016	-449.1
22.02.2022 00:08:51.180	772	275.5601	87.49003	1.2	1.8	3.5	8.400002	-71.4815	13.0016	-450.64
22.02.2022 00:08:51.431	1125.2	275.5601	446.10004	1.1	5.6	6.7	19.2	-71.4839	13.0015	-450.38
22.02.2022 00:08:51.681	1293.9	275.5601	601.2299	0	4.1	1.9	24.099998	-71.4883	13.0016	-449.5
22.02.2022 00:08:51.938	1285.7	275.5601	601.2299	0	4.1	1.9	24.099998	-71.4917	13.0016	-450.71
22.02.2022 00:08:52.189	850.2	275.5601	151.14001	3.2	4	8.1	7.700001	-71.493	13.0016	-451.10
22.02.2022 00:08:52.440	988.6	275.5601	310.36	0.1	6.7	13.9	8.5	-71.4992	13.0016	-449.71
22.02.2022 00:08:52.693	1221.4	275.5601	536.18005	2.5	3	5.3	22.2	-71.5017	13.0015	-450.36
22.02.2022 00:08:52.944	954.8	275.5601	276.45996	3.3	0	14.9	6.5999985	-71.5066	13.0016	-451.08
22.02.2022 00:08:53.195	800.9	275.5601	103.20003	3.4	0.2	1.8	9.400002	-71.5095	13.0016	-449.60
22.02.2022 00:08:53.446	1319.4	275.5601	631.29004	4.2	7.1	5	23.2	-71.5154	13.0016	-450.52

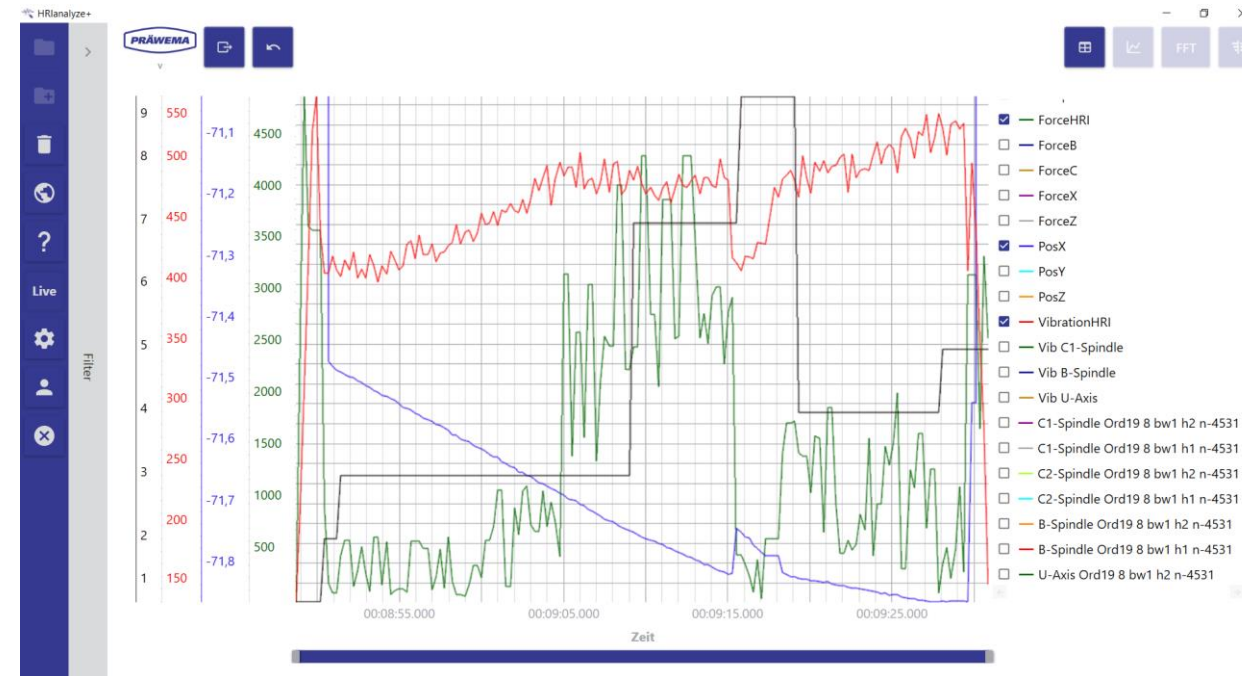
Software tool HRI[®]analyze+

HriDebugLog files

The example shows the honing of a workpiece.

The blue line is the x-axis position. During work step 9 (lift distance), the X-axis is retracted briefly. The force component and the vibration component on the HRI are significantly reduced during the lift distance.

After the component is in contact with the workpiece again, the forces are lower than before it was lifted off.

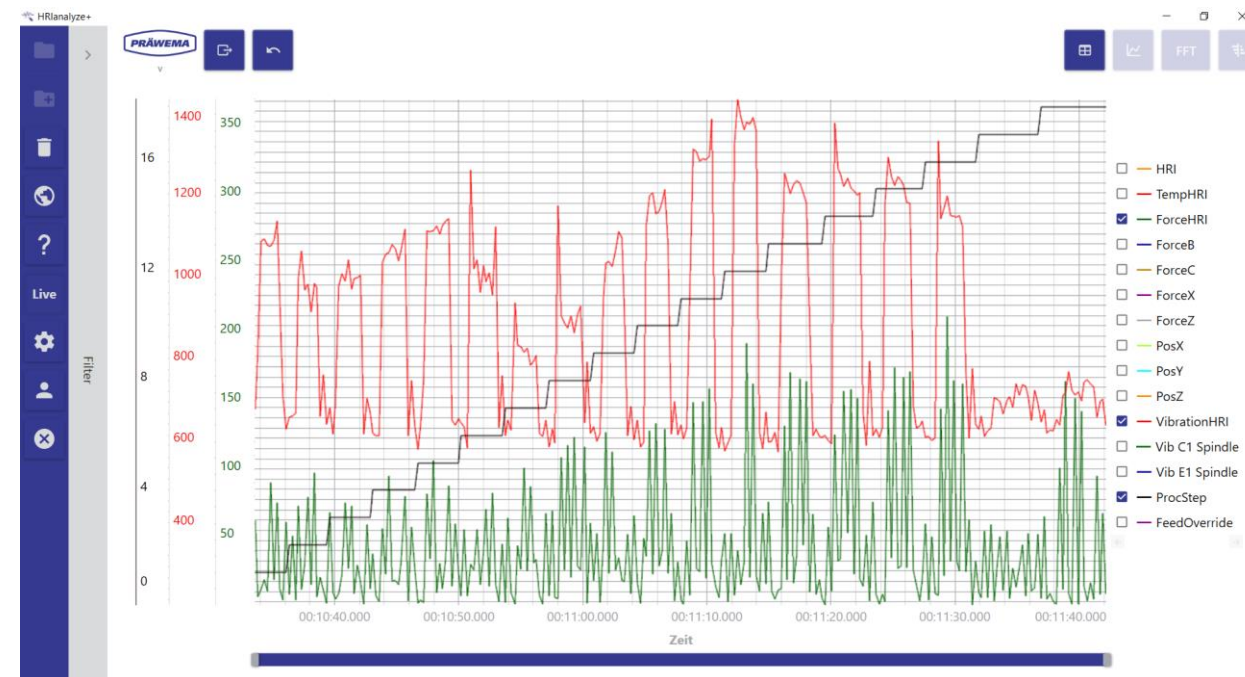


Software tool HRI[®]analyze+

HriDebugLog files

The example shows the skiving of a workpiece.

The workpiece is machined with 16 scrubbing strokes and 2 finishing strokes. During the 6th to 8th skiving stroke, the vibrations are lower than with the other skiving strokes. The process can be optimized using the debug files.



Software tool HRI[®]analyze+

HriFFTLog files

The vibration spectra are stored in the HriFFTLog files.

A complete spectrum of each sensor is stored every 120ms. Each line is a frequency spectrum.

The spectra can be visualized with HRI[®]analyze+ as a line diagram or as a Campbell diagram.

Time stamp	Machine	Material	Device	Sensor	Working step	Resolution	Alarmlevel	Part	Revolutions	DMC	Max. Amplitude	Max. An
07.02.2022 16:28:44.175	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		67	
07.02.2022 16:28:44.175	09700774		B-Spindle	2	1	9.765625	0	107843	5609		21	
07.02.2022 16:28:44.176	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.278	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		86	
07.02.2022 16:28:44.278	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.278	09700774		B-Spindle	2	1	9.765625	0	107843	5609		21	
07.02.2022 16:28:44.380	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		124	
07.02.2022 16:28:44.380	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.380	09700774		B-Spindle	2	1	9.765625	0	107843	5609		20	
07.02.2022 16:28:44.483	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		138	
07.02.2022 16:28:44.483	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.483	09700774		B-Spindle	2	1	9.765625	0	107843	5609		20	
07.02.2022 16:28:44.585	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		124	
07.02.2022 16:28:44.585	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.585	09700774		B-Spindle	2	1	9.765625	0	107843	5609		20	
07.02.2022 16:28:44.687	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		122	
07.02.2022 16:28:44.687	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.687	09700774		B-Spindle	2	1	9.765625	0	107843	5609		21	
07.02.2022 16:28:44.790	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		119	
07.02.2022 16:28:44.790	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.790	09700774		B-Spindle	2	1	9.765625	0	107843	5609		20	
07.02.2022 16:28:44.893	09700774	L400-EW-9896032-04	C1-Spindle	0	1	9.765625	0	107843	5609	AS20041902A	206	
07.02.2022 16:28:44.893	09700774	L400-EW-9896032-04	U-Axis	3	1	9.765625	0	107843	5609	AS20041902A	0	
07.02.2022 16:28:44.893	09700774	L400-EW-9896032-04	B-Spindle	2	1	9.765625	0	107843	5609	AS20041902A	21	
07.02.2022 16:28:44.994	09700774	L400-EW-9896032-04	C1-Spindle	0	1	9.765625	0	107843	5609	AS20041902A	232	

Software tool HRI[®]analyze+

HriFFTLog files

The files are stored in the folder:

(C:\D):\hridata\production\(\left\right)\HriFFTLog

The file name is set up as follows:

34_2020090208_partname_B_HoningHead_26_FFT

Channel_date_hour_partname_sensorname_
process step_fft

Time stamp	Machine	Material	Device	Sensor	Working step	Resolution	Alarmlevel	Part	Revolutions	DMC	Max. Amplitude	Max. An
07.02.2022 16:28:44.175	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		67	
07.02.2022 16:28:44.175	09700774		B-Spindle	2	1	9.765625	0	107843	5609		21	
07.02.2022 16:28:44.176	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.278	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		86	
07.02.2022 16:28:44.278	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.278	09700774		B-Spindle	2	1	9.765625	0	107843	5609		21	
07.02.2022 16:28:44.380	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		124	
07.02.2022 16:28:44.380	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.380	09700774		B-Spindle	2	1	9.765625	0	107843	5609		20	
07.02.2022 16:28:44.483	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		138	
07.02.2022 16:28:44.483	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.483	09700774		B-Spindle	2	1	9.765625	0	107843	5609		20	
07.02.2022 16:28:44.585	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		124	
07.02.2022 16:28:44.585	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.585	09700774		B-Spindle	2	1	9.765625	0	107843	5609		20	
07.02.2022 16:28:44.687	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		122	
07.02.2022 16:28:44.687	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.687	09700774		B-Spindle	2	1	9.765625	0	107843	5609		21	
07.02.2022 16:28:44.790	09700774		C1-Spindle	0	1	9.765625	0	107843	5609		119	
07.02.2022 16:28:44.790	09700774		U-Axis	3	1	9.765625	0	107843	5609		0	
07.02.2022 16:28:44.790	09700774		B-Spindle	2	1	9.765625	0	107843	5609		20	
07.02.2022 16:28:44.893	09700774	L400-EW-9896032-04	C1-Spindle	0	1	9.765625	0	107843	5609	AS20041902A	206	
07.02.2022 16:28:44.893	09700774	L400-EW-9896032-04	U-Axis	3	1	9.765625	0	107843	5609	AS20041902A	0	
07.02.2022 16:28:44.893	09700774	L400-EW-9896032-04	B-Spindle	2	1	9.765625	0	107843	5609	AS20041902A	21	
07.02.2022 16:28:44.994	09700774	L400-EW-9896032-04	C1-Spindle	0	1	9.765625	0	107843	5609	AS20041902A	232	

Software tool HRI[®]analyze+

HriFFTLog files

A new FFT and shock file is generated every two hours to divide up the data volume. The amount of data for one day can exceed one gigabyte for a processing machine with 4 sensors.

This amount of data must be loaded completely in order to analyze the vibrations. Therefore, the splitting of the data is carried out every 2 hours.

Time stamp	Machine	Material	Device	Sensor	Working step	Resolution	Alarmlevel	Part	Revolutions	DMC	Max. Amplitude	Max. An
07.02.2022 16:28:44.175	09700774		C1-Spindle	0	1	9.765625	0	107843	5609			67
07.02.2022 16:28:44.175	09700774		B-Spindle	2	1	9.765625	0	107843	5609			21
07.02.2022 16:28:44.176	09700774		U-Axis	3	1	9.765625	0	107843	5609			0
07.02.2022 16:28:44.278	09700774		C1-Spindle	0	1	9.765625	0	107843	5609			86
07.02.2022 16:28:44.278	09700774		U-Axis	3	1	9.765625	0	107843	5609			0
07.02.2022 16:28:44.278	09700774		B-Spindle	2	1	9.765625	0	107843	5609			21
07.02.2022 16:28:44.380	09700774		C1-Spindle	0	1	9.765625	0	107843	5609			124
07.02.2022 16:28:44.380	09700774		U-Axis	3	1	9.765625	0	107843	5609			0
07.02.2022 16:28:44.380	09700774		B-Spindle	2	1	9.765625	0	107843	5609			20
07.02.2022 16:28:44.483	09700774		C1-Spindle	0	1	9.765625	0	107843	5609			138
07.02.2022 16:28:44.483	09700774		U-Axis	3	1	9.765625	0	107843	5609			0
07.02.2022 16:28:44.483	09700774		B-Spindle	2	1	9.765625	0	107843	5609			20
07.02.2022 16:28:44.585	09700774		C1-Spindle	0	1	9.765625	0	107843	5609			124
07.02.2022 16:28:44.585	09700774		U-Axis	3	1	9.765625	0	107843	5609			0
07.02.2022 16:28:44.585	09700774		B-Spindle	2	1	9.765625	0	107843	5609			20
07.02.2022 16:28:44.687	09700774		C1-Spindle	0	1	9.765625	0	107843	5609			122
07.02.2022 16:28:44.687	09700774		U-Axis	3	1	9.765625	0	107843	5609			0
07.02.2022 16:28:44.687	09700774		B-Spindle	2	1	9.765625	0	107843	5609			21
07.02.2022 16:28:44.790	09700774		C1-Spindle	0	1	9.765625	0	107843	5609			119
07.02.2022 16:28:44.790	09700774		U-Axis	3	1	9.765625	0	107843	5609			0
07.02.2022 16:28:44.790	09700774		B-Spindle	2	1	9.765625	0	107843	5609			20
07.02.2022 16:28:44.893	09700774	L400-EW-9896032-04	C1-Spindle	0	1	9.765625	0	107843	5609	AS20041902A		206
07.02.2022 16:28:44.893	09700774	L400-EW-9896032-04	U-Axis	3	1	9.765625	0	107843	5609	AS20041902A		0
07.02.2022 16:28:44.893	09700774	L400-EW-9896032-04	B-Spindle	2	1	9.765625	0	107843	5609	AS20041902A		21
07.02.2022 16:28:44.994	09700774	L400-EW-9896032-04	C1-Spindle	0	1	9.765625	0	107843	5609	AS20041902A		232

Software tool HRI[®]analyze+

HriFFTLog files

On the left side of the overview, filters for the files HriFFTLog and HriShockLog can be defined.

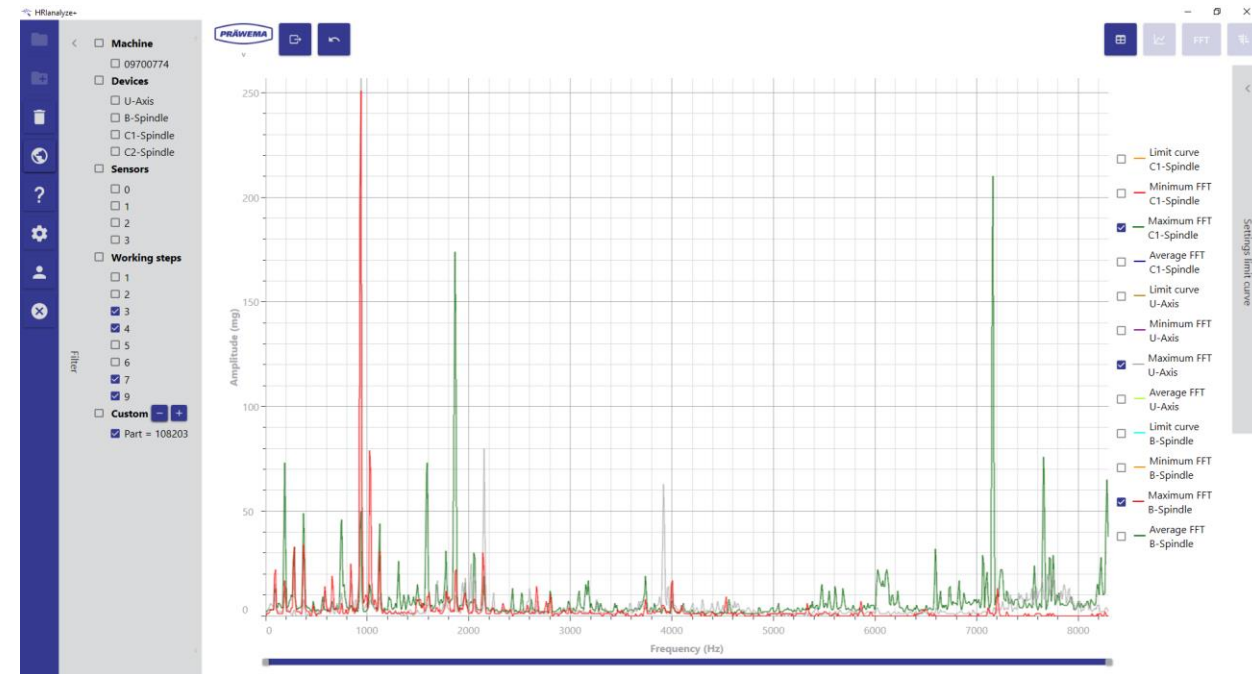
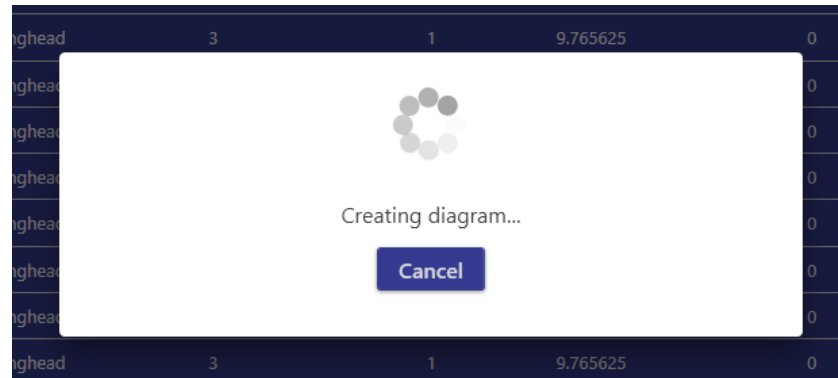
The name of the sensors is displayed in the text.

Time stamp	Machine	Material	Device	Sensor	Working step	Resolution	Alarmlevel	Part	Revolutions	DMC
07.02.2022 16:28:44.175	09700774		C1-Spindle	0	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.175	09700774		B-Spindle	2	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.176	09700774		U-Axis	3	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.278	09700774		C1-Spindle	0	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.278	09700774		U-Axis	3	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.278	09700774		B-Spindle	2	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.380	09700774		C1-Spindle	0	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.380	09700774		U-Axis	3	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.380	09700774		B-Spindle	2	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.483	09700774		C1-Spindle	0	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.483	09700774		U-Axis	3	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.483	09700774		B-Spindle	2	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.585	09700774		C1-Spindle	0	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.585	09700774		U-Axis	3	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.585	09700774		B-Spindle	2	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.687	09700774		C1-Spindle	0	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.687	09700774		U-Axis	3	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.687	09700774		B-Spindle	2	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.790	09700774		C1-Spindle	0	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.790	09700774		U-Axis	3	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.790	09700774		B-Spindle	2	1	9.765625	0	107843	5609	
07.02.2022 16:28:44.893	09700774	L400-EW-9896032-04	C1-Spindle	0	1	9.765625	0	107843	5609	AS20041902A
07.02.2022 16:28:44.893	09700774	L400-EW-9896032-04	U-Axis	3	1	9.765625	0	107843	5609	AS20041902A
07.02.2022 16:28:44.893	09700774	L400-EW-9896032-04	B-Spindle	2	1	9.765625	0	107843	5609	AS20041902A
07.02.2022 16:28:44.994	09700774	L400-EW-9896032-04	C1-Spindle	0	1	9.765625	0	107843	5609	AS20041902A

Software tool HRI[®]analyze+

HriFFTLog files

It is always recommended to view only a few components in the line chart. The calculation of the minimum, average and maximum value need a lot of CPU power and can take a long time for many components.

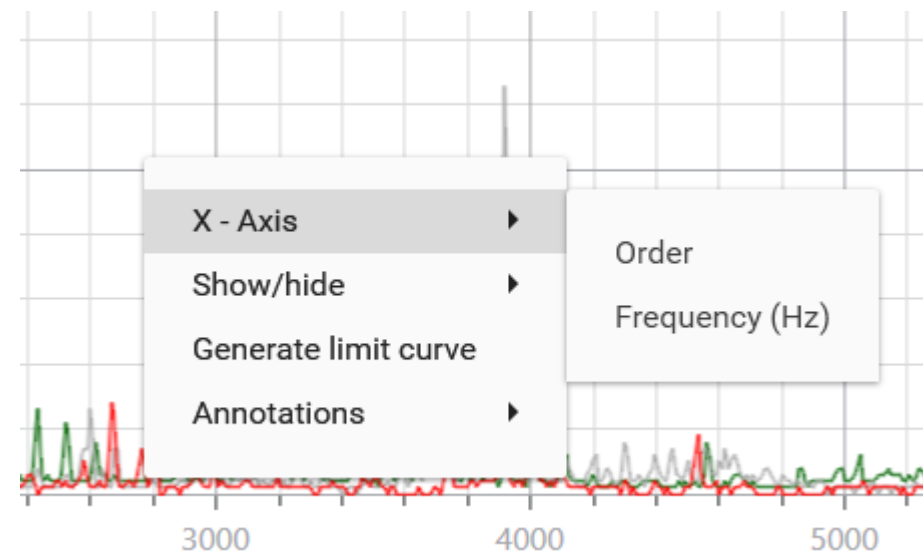


Software tool HRI[®]analyze+

HriFFTLog files

A dialog box opens with the right mouse button. Here, among other things, the scaling of the X-axis can be switched between orders and frequencies.

Additional markings can be displayed, such as the meshing frequency or the rotational frequency.



Software tool HRI[®]analyze+

HriFFTLog files

In the example, a component with 25 teeth is processed. The first three tooth engagement frequencies can be represented by the "Mark" function => "Tooth action".

+ Tooth action

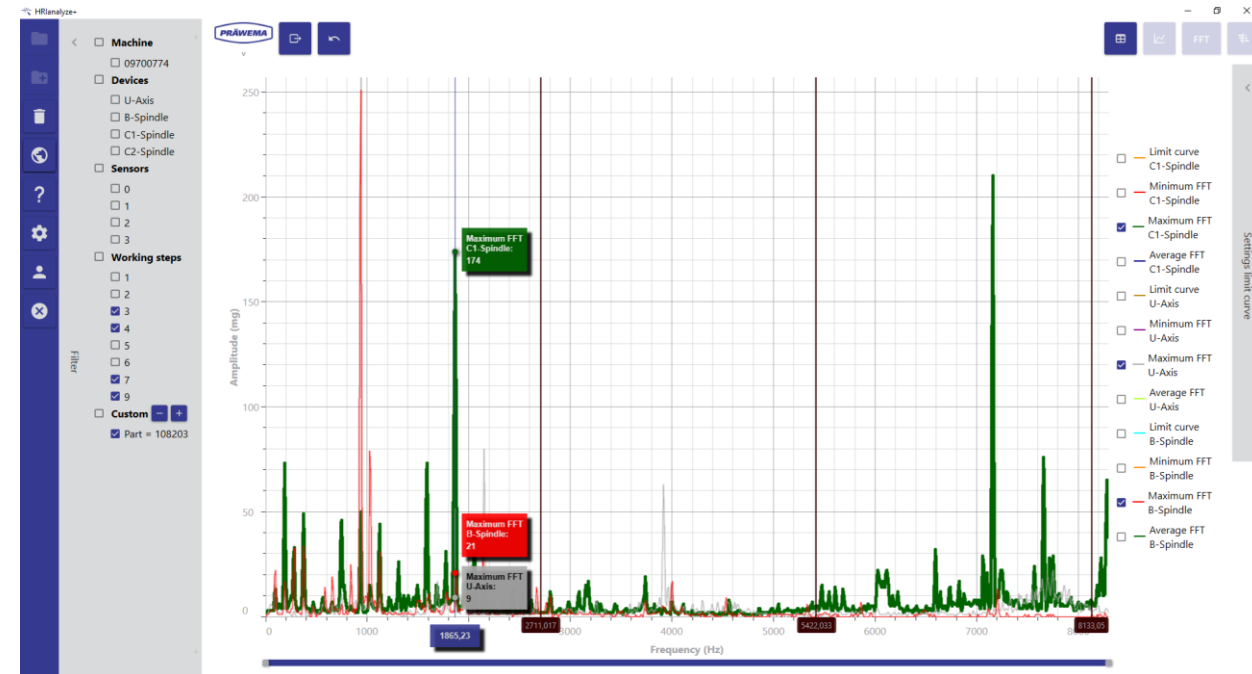
Insert number of teeth.
25

Insert rpm
5755

SelectColor

Cancel OK

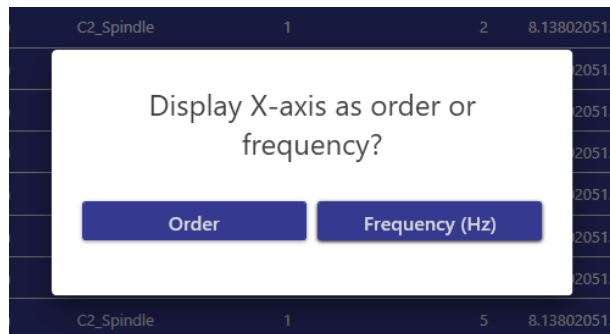
By clicking on a line, the display is highlighted, and the line is displayed thicker.



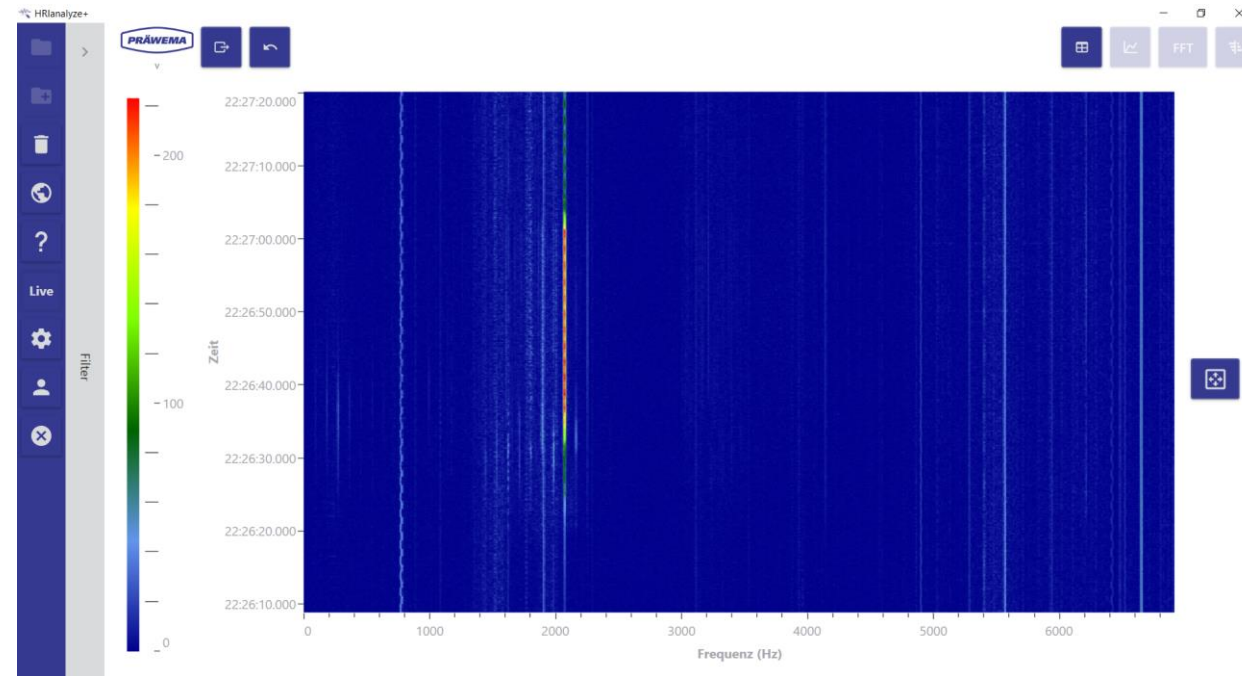
Software tool HRI[®]analyze+

HriFFTLog files

If a Campbell diagram is to be created, a query comes, as the X-axis is to be displayed:



When creating a Campbell diagram, make sure that only one sensor is selected for the filter. Otherwise, the creation will be aborted with an error message.



Software tool HRI[®]analyze+

HriFFTLog files

The meshing frequency and rotation frequencies can also be displayed in the Campbell diagrams via the dialog menu.


In the example, the 1st meshing frequency is very pronounced during machining.

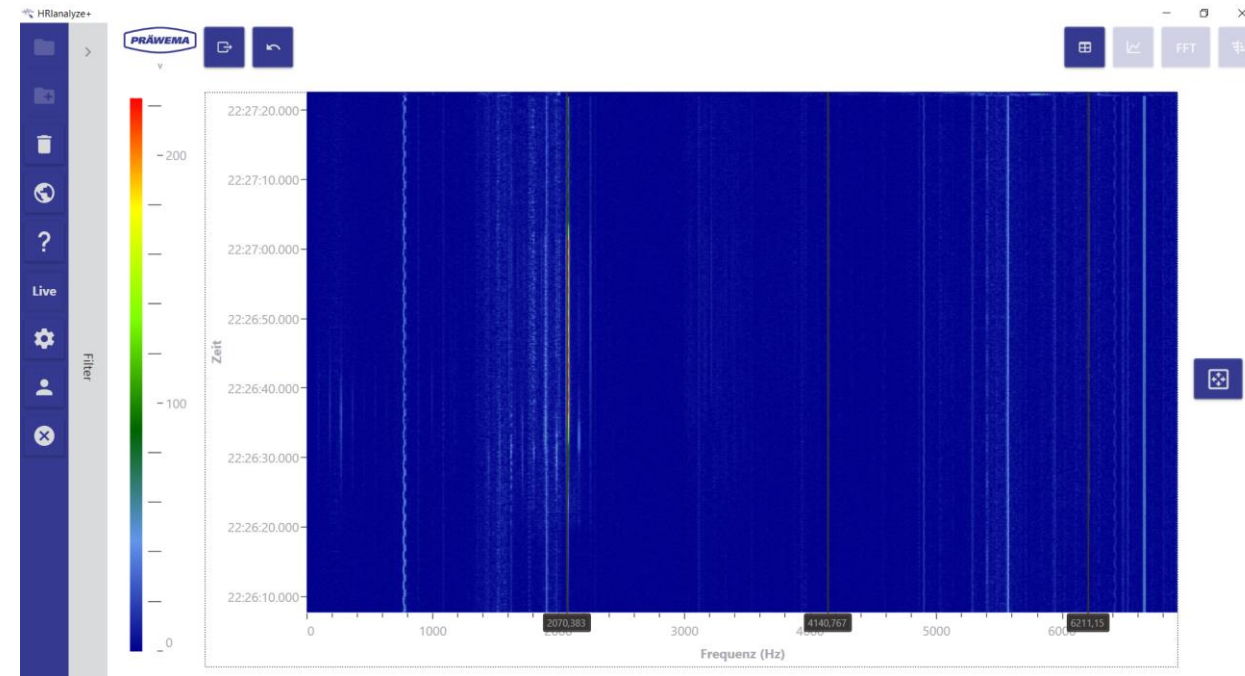
+ Tooth action

Insert number of teeth.
25

Insert rpm
5755

SelectColor

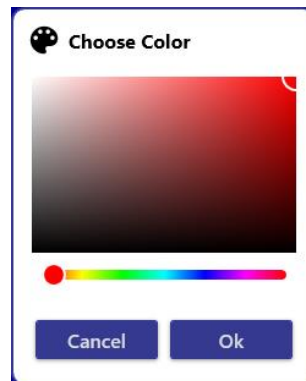




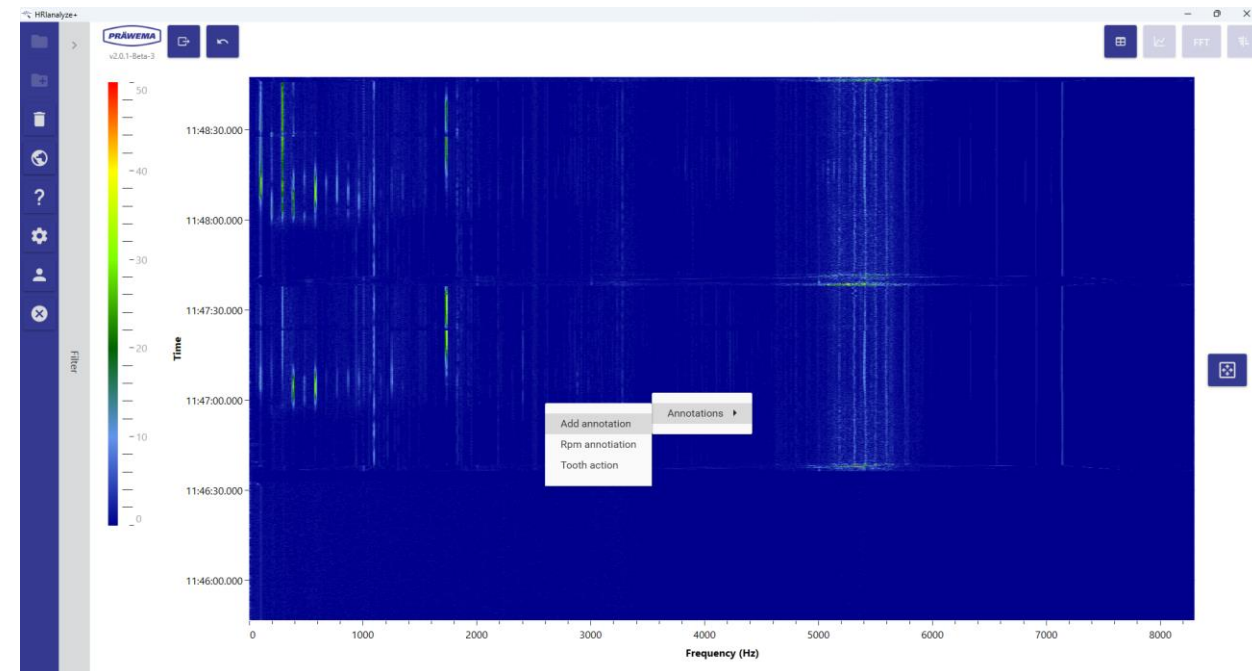
Software tool HRI[®]analyze+

HriFFTLog files

You can open a pop-up menu with the right mouse button and add specific markers. After selecting, you will be asked for the color of the marker.



Set the desired color and confirm with OK.

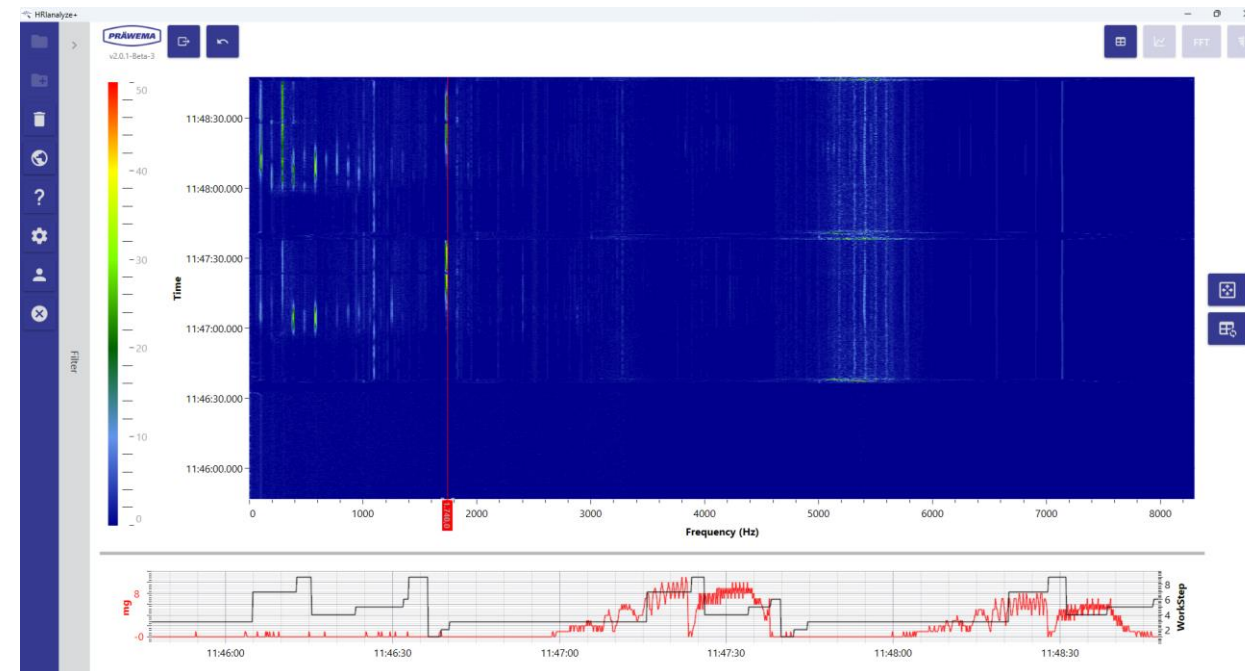
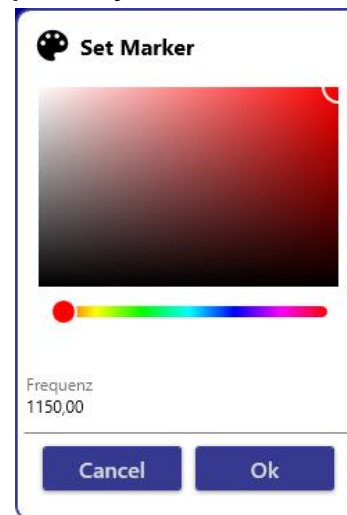


Software tool HRI[®]analyze+

HriFFTLog files

Another line diagram appears below the Campbell diagram. The marker can be moved to the desired position with the mouse, or a pop-up menu can be opened by double-clicking on the frequency or order specification.

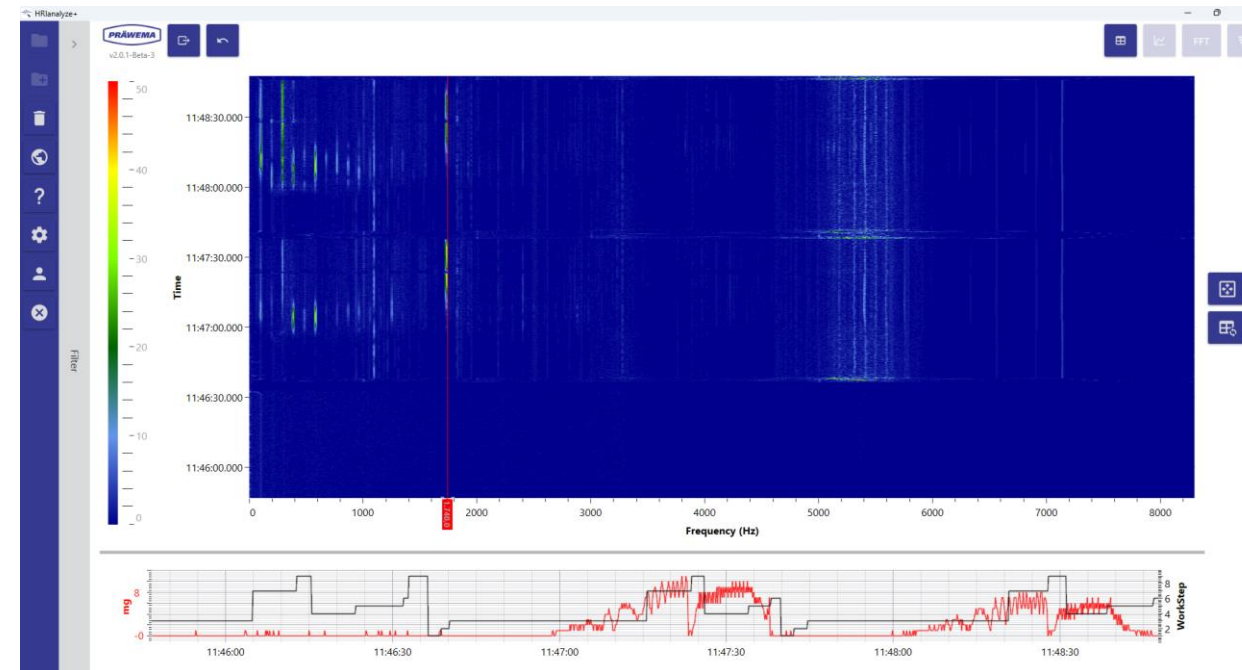
Here you can enter the desired frequency or order directly and change the color if necessary.



Software tool HRI[®]analyze+

HriFFTLog files

The line diagram shows the progression of a certain frequency or order over time. The work steps are also displayed. This allows you to differentiate between the components and you can see how long a component has been processed.

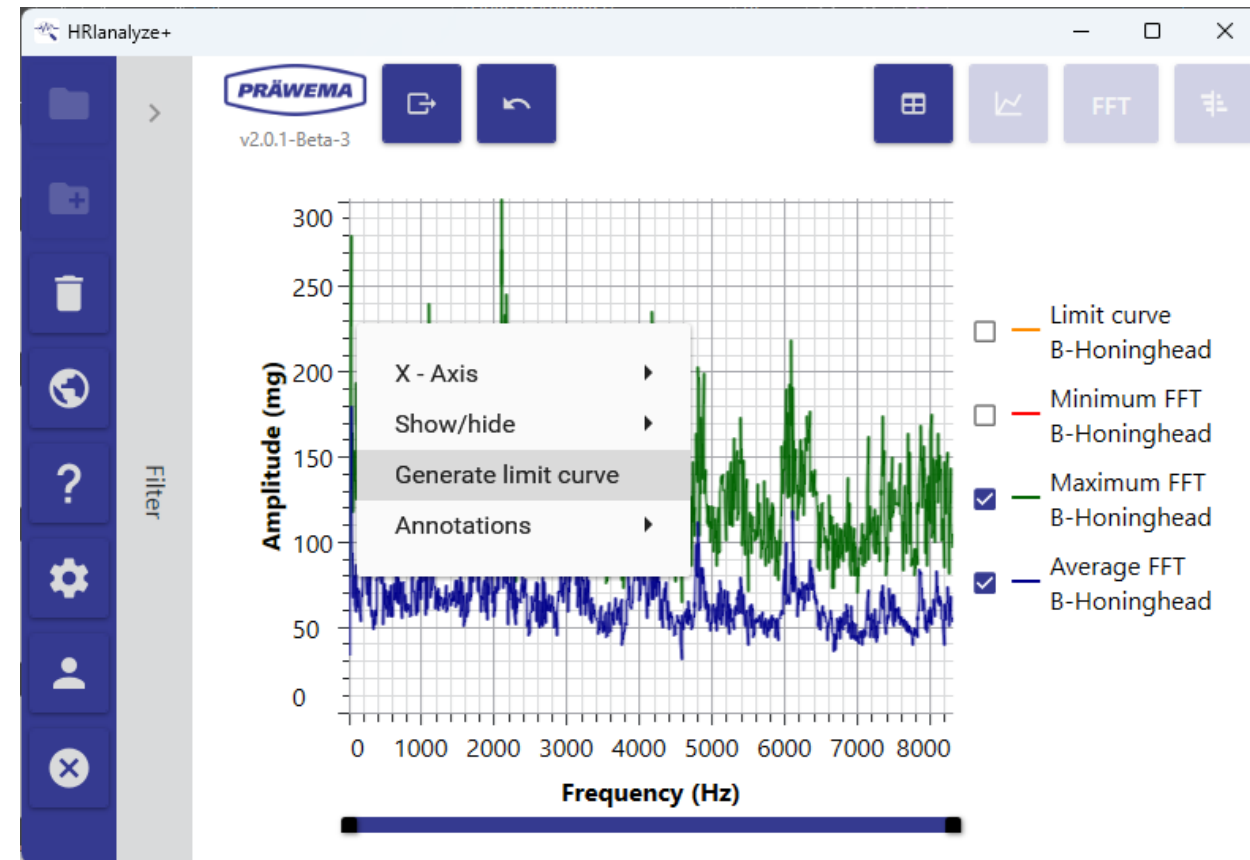


Software tool HRI[®]analyze+

HriFFTLog files – Limiting curve

In the line chart of the FFT the dialog window can be opened with the right mouse button.

There you can create a limiting curve.



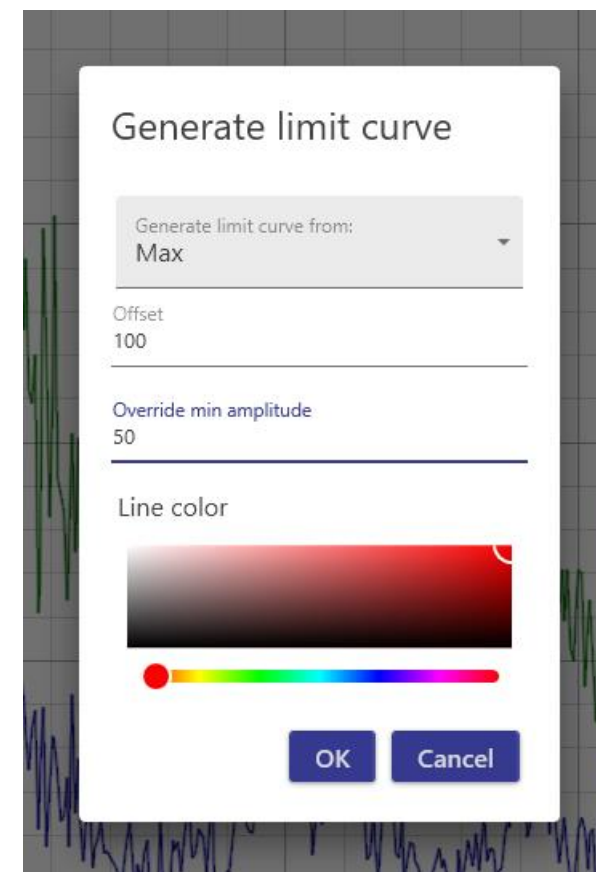
Software tool HRI[®]analyze+

HriFFTLog files – Limiting curve

There you can select from which spectrum the limiting curve should be created.

Furthermore, an offset is defined and a minimum limit for the limit curve.

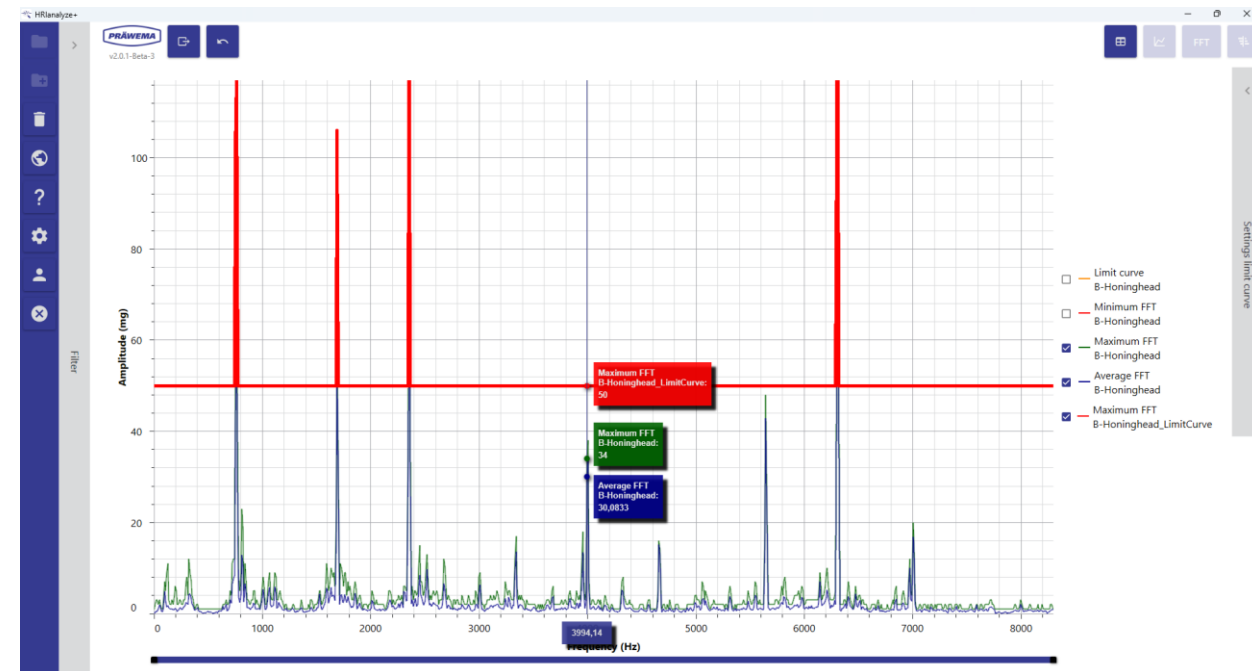
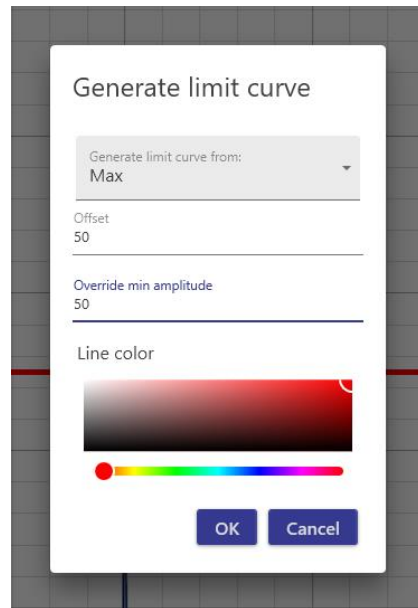
In addition, the line color of the limit curve can be set.



Software tool HRI[®]analyze+

HriFFTLog files – Limiting curve

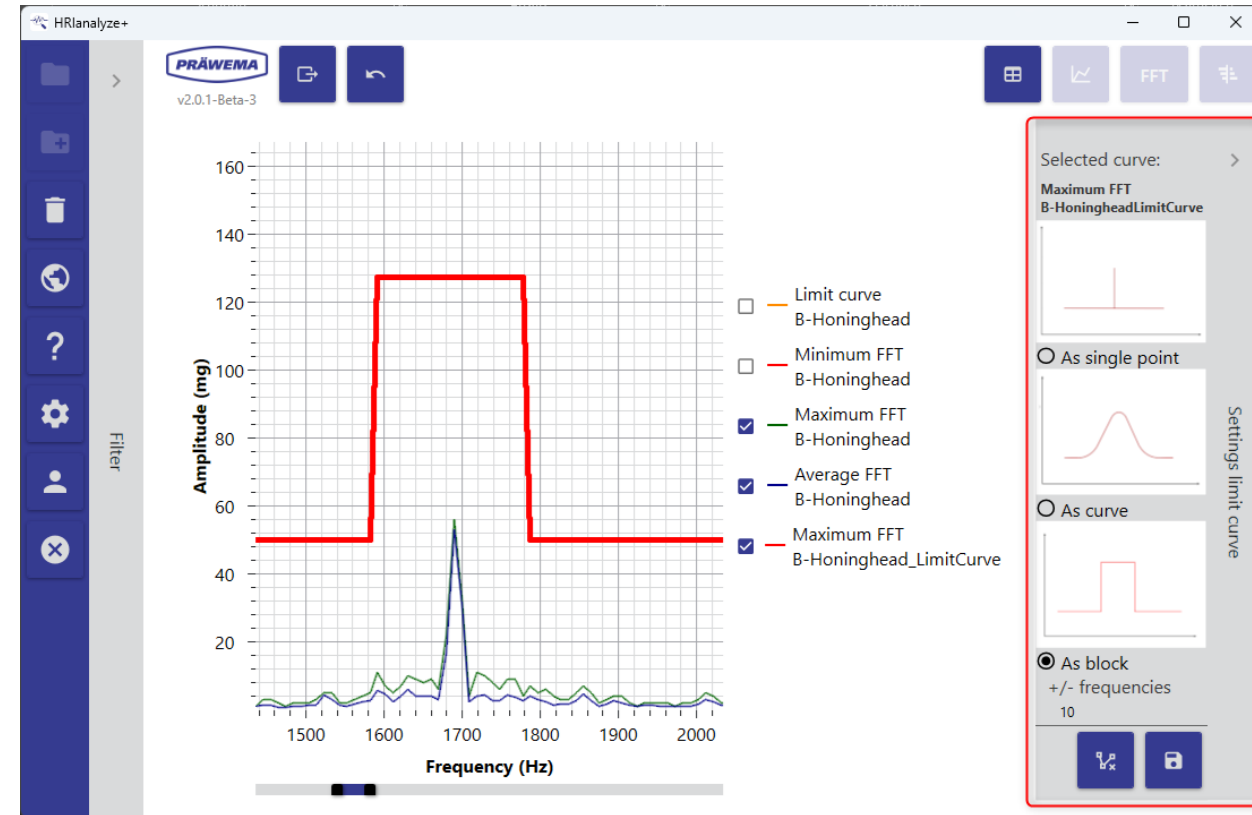
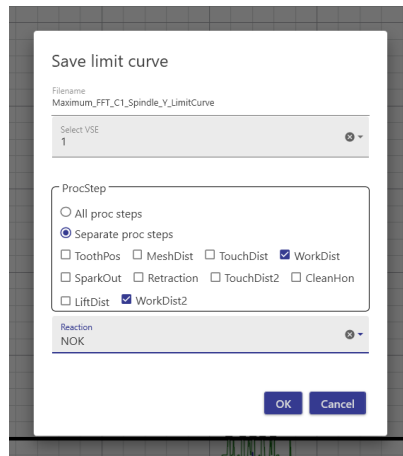
The following settings were used to create the limit curve.



Software tool HRI[®]analyze+

HriFFTLog files – Limiting curve

After creating the limiting curve, a menu appears on the right side of the screen. Here you can make fine adjustments to the limiting curve.



Software tool HRI[®]analyze+

HriFFTLog files – Limiting curve

The file name of the limit curve and the file name of the component for which the limit curve is to apply must be identical. Otherwise HRI machine cannot assign the limit curve.

The process steps, the sensors and the error response are defined in the window. These settings can no longer be changed later on the machine.

Click OK to generate a file that can be loaded onto the machine for the corresponding component.

Save limit curve

Filename
Maximum_FFT_C1_Spindle_Y_LimitCurve

Select VSE
1

ProcStep

All proc steps
 Separate proc steps

ToothPos MeshDist TouchDist WorkDist
 SparkOut Retraction TouchDist2 CleanHon
 LiftDist WorkDist2

Reaction
NOK

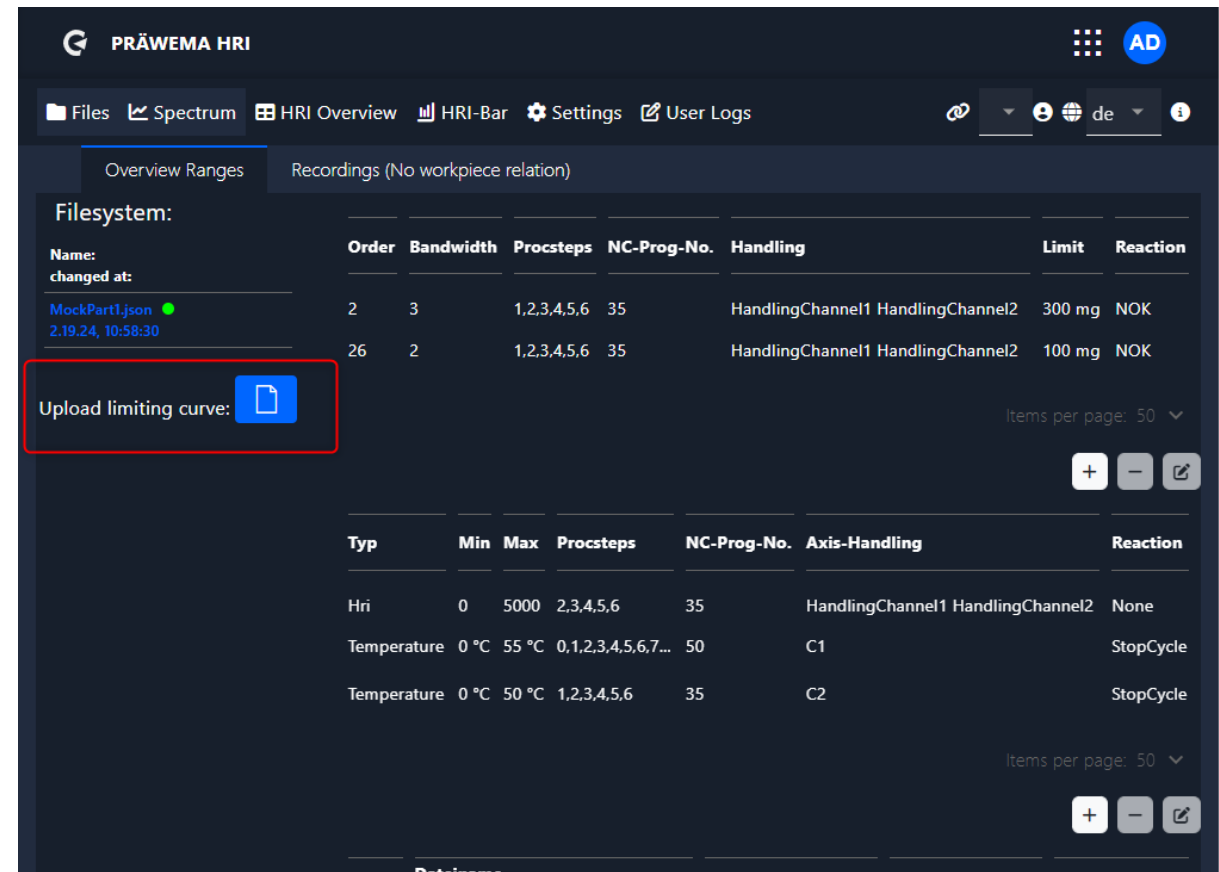
OK Cancel

Software tool HRI[®]analyze+

HriFFTLog files – Limiting curve

With HRI[®]analyze+ a limiting curve can be created and saved as JSON file.

This limit curve can be read in and visualized with HRI[®]machine.



The screenshot shows the PRÄWEMA HRI software interface. At the top, there are navigation tabs: Files, Spectrum, HRI Overview, HRI-Bar, Settings, and User Logs. Below this, there are two main sections: 'Overview Ranges' and 'Recordings (No workpiece relation)'. The 'Recordings' section contains a table with the following data:

Filesystem:	Order	Bandwidth	Procsteps	NC-Prog-No.	Handling	Limit	Reaction
Name: MockPart1.json changed at: 2.19.24, 10:58:30	2	3	1,2,3,4,5,6	35	HandlingChannel1 HandlingChannel2	300 mg	NOK
	26	2	1,2,3,4,5,6	35	HandlingChannel1 HandlingChannel2	100 mg	NOK

Below the table, there is a section for 'Upload limiting curve:' with a document icon. At the bottom of the interface, there is another table with the following data:

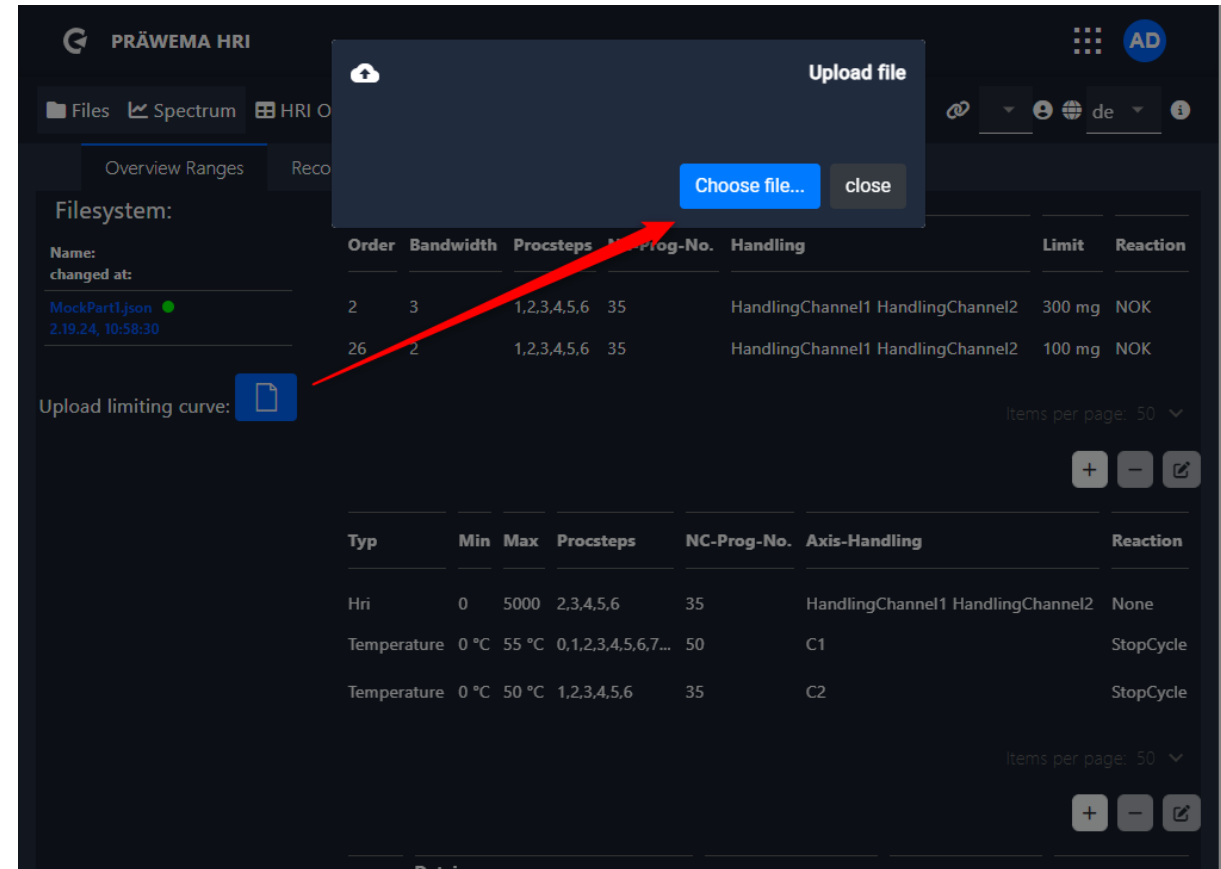
Typ	Min	Max	Procsteps	NC-Prog-No.	Axis-Handling	Reaction
Hri	0	5000	2,3,4,5,6	35	HandlingChannel1 HandlingChannel2	None
Temperature	0 °C	55 °C	0,1,2,3,4,5,6,7...	50	C1	StopCycle
Temperature	0 °C	50 °C	1,2,3,4,5,6	35	C2	StopCycle

Software tool HRI[®]analyze+

HriFFTLog files – Limiting curve

Clicking the button opens a new window.

Here you can select the corresponding file to be loaded.

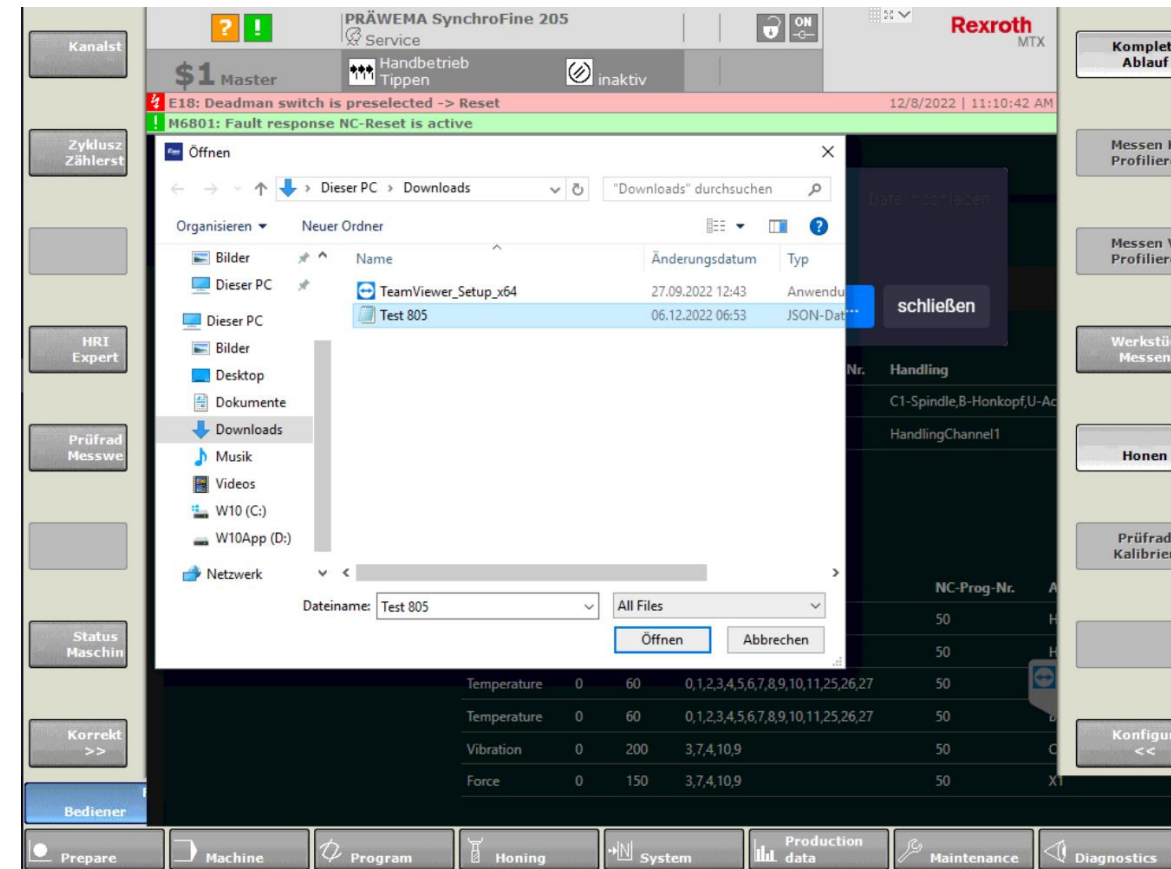


Software tool HRI[®]analyze+

HriFFTLog files – Limiting curve

A file has been saved in the Downloads folder. The file name of the limit curve must have the same name as the corresponding component.

Otherwise, the limit curve cannot be assigned to any component.

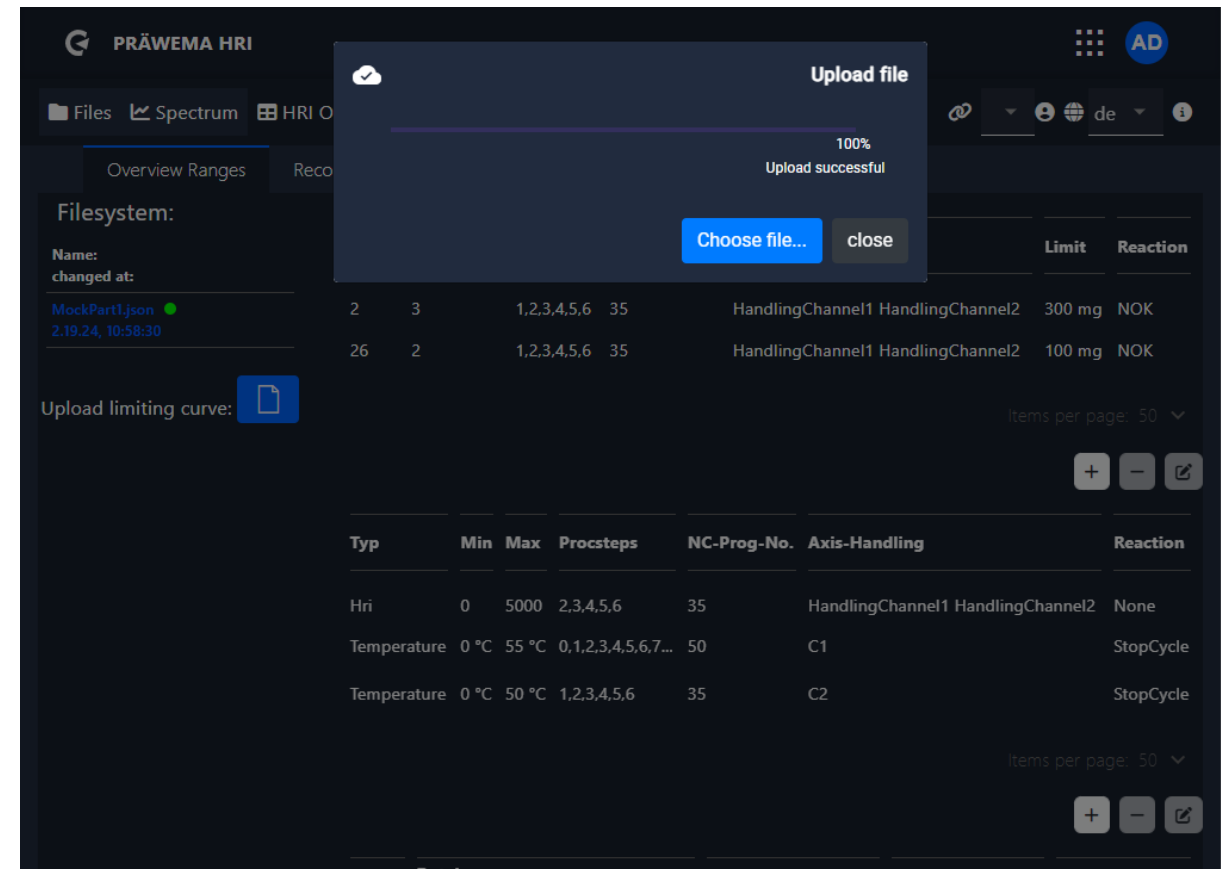


Software tool HRI[®]analyze+

HriFFTLog files – Limiting curve

After the file has been loaded, the loading bar changes color and confirmation is given that the file has been loaded.

After the file has been loaded successfully, you can switch to the spectrum page.

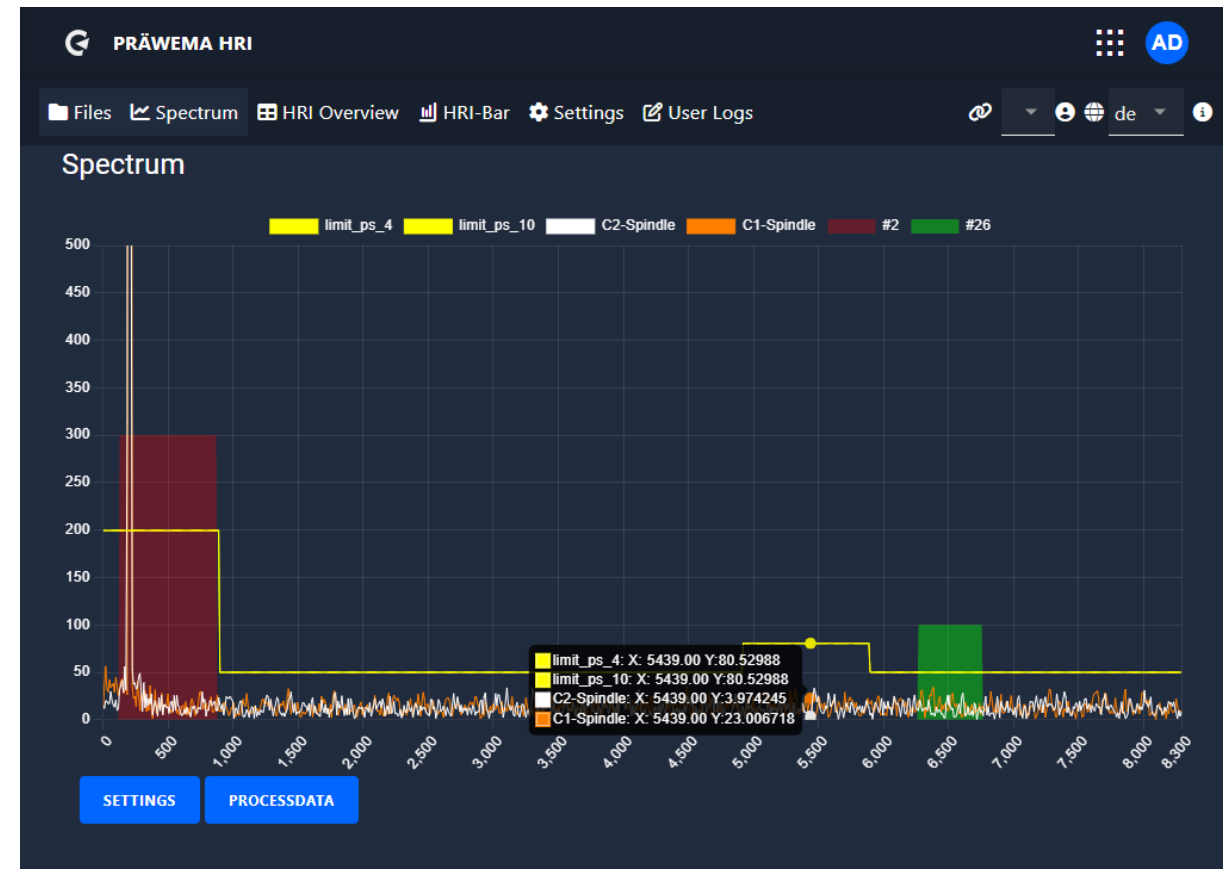


Software tool HRI[®]analyze+

HriFFTLog files – Limiting curve

The limiting curve is shown in the spectrum as a yellow limit line.

Each active process step has been given its own limit curve.



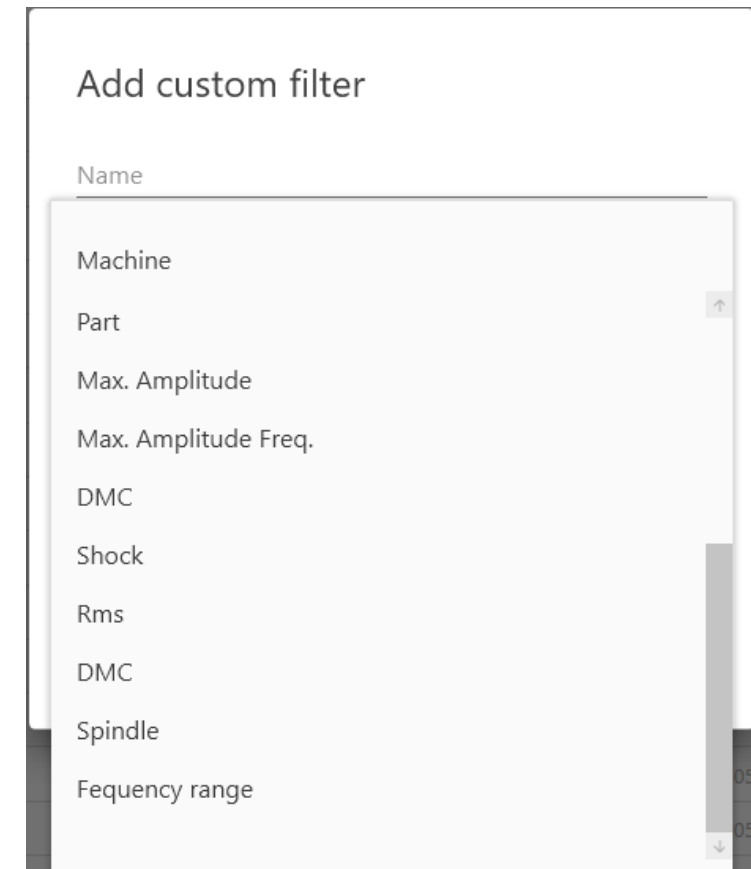
Software tool HRI[®]analyze+

Filter options

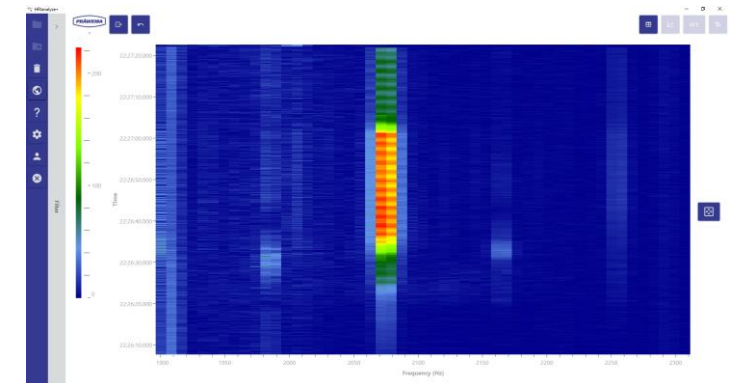
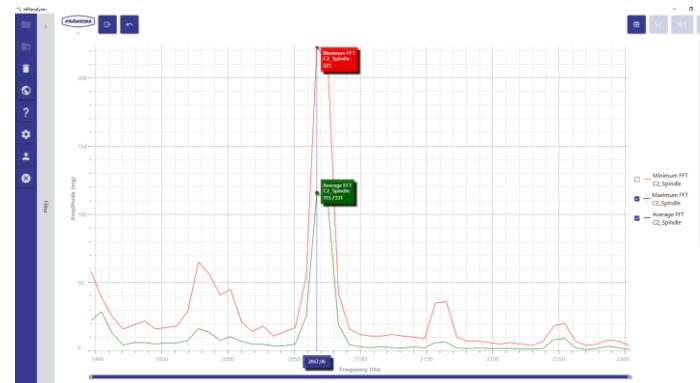
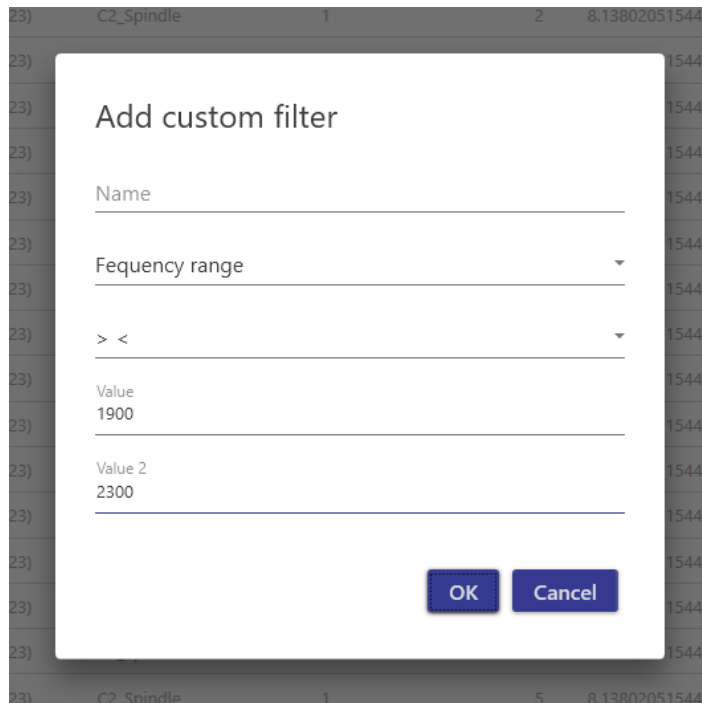
Filters can be set to analyze the FFT and shock files better.

In addition to the filters for sensors and work steps, a wide range of user-defined filters are possible.

Certain frequency ranges can also be filtered. Only these frequency ranges are then displayed in the line or Campbell diagram.



Software tool HRI[®]analyze+

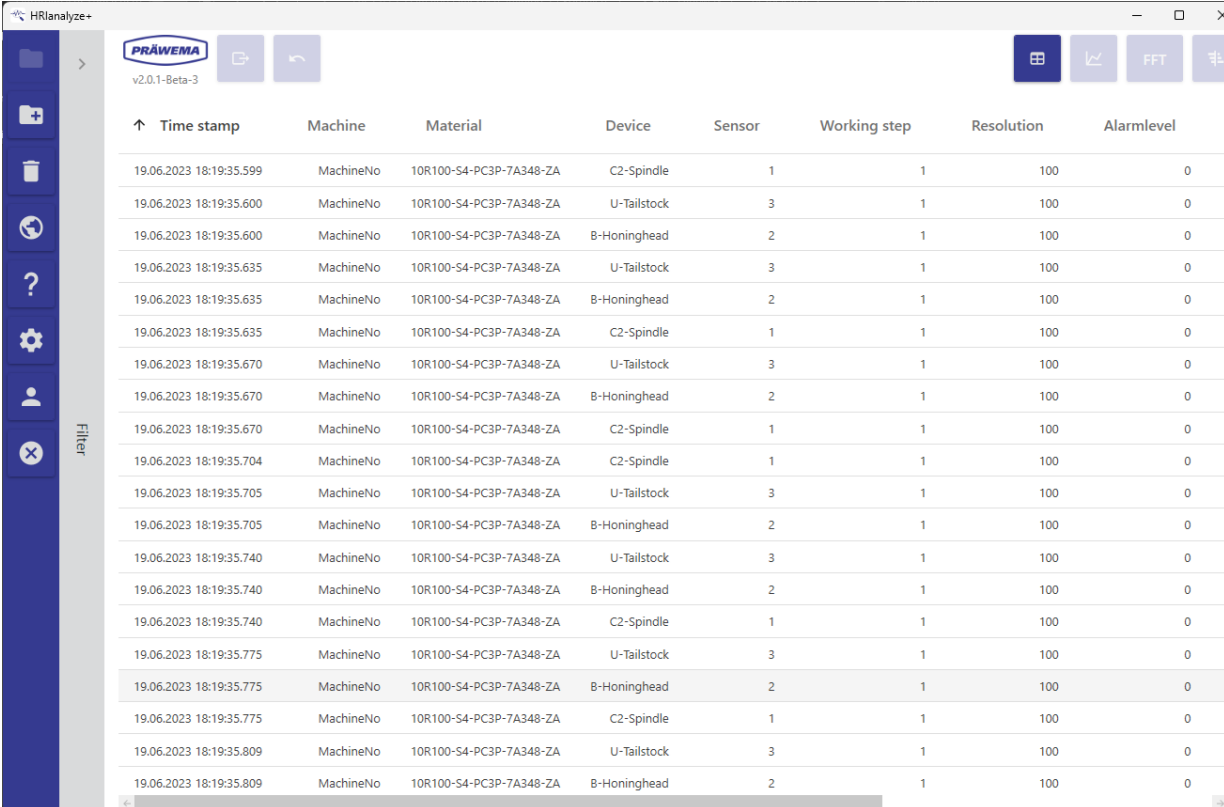


Software tool HRI[®]analyze+

HriShockLog files

The fourth type of the logging files are the HriShockLog files.

With these files, a breakage of a tool can be detected.



Time stamp	Machine	Material	Device	Sensor	Working step	Resolution	Alarmlevel
19.06.2023 18:19:35.599	MachineNo	10R100-S4-PC3P-7A348-ZA	C2-Spindle	1	1	100	0
19.06.2023 18:19:35.600	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.600	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0
19.06.2023 18:19:35.635	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.635	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0
19.06.2023 18:19:35.635	MachineNo	10R100-S4-PC3P-7A348-ZA	C2-Spindle	1	1	100	0
19.06.2023 18:19:35.670	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.670	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0
19.06.2023 18:19:35.670	MachineNo	10R100-S4-PC3P-7A348-ZA	C2-Spindle	1	1	100	0
19.06.2023 18:19:35.704	MachineNo	10R100-S4-PC3P-7A348-ZA	C2-Spindle	1	1	100	0
19.06.2023 18:19:35.705	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.705	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0
19.06.2023 18:19:35.740	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.740	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0
19.06.2023 18:19:35.740	MachineNo	10R100-S4-PC3P-7A348-ZA	C2-Spindle	1	1	100	0
19.06.2023 18:19:35.775	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.775	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0
19.06.2023 18:19:35.775	MachineNo	10R100-S4-PC3P-7A348-ZA	C2-Spindle	1	1	100	0
19.06.2023 18:19:35.809	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.809	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0

Software tool HRI[®]analyze+

HriShockLog files

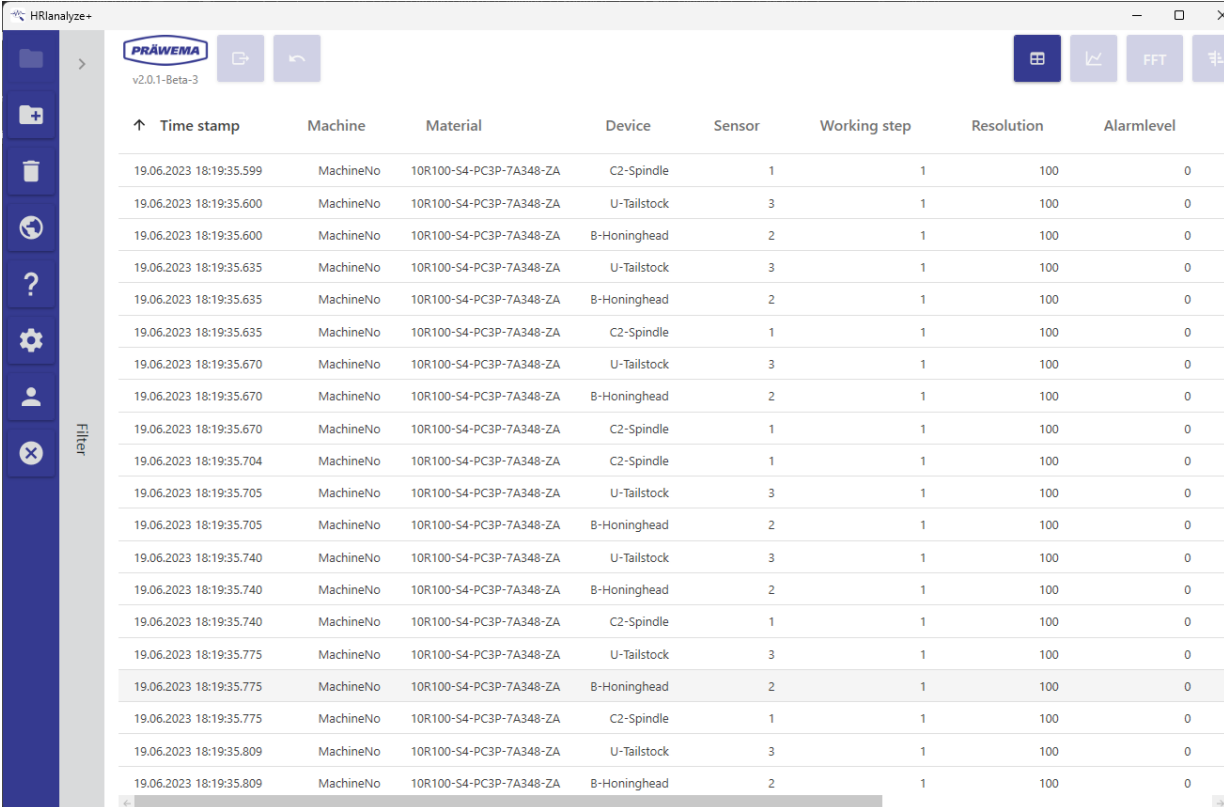
The files are stored in the folder:

(C/D):\hridata\production\(\left\right)\HriShockLog

The file name is set up as follows:

50_2020090208_partame_B_HoningHead_2_Shock

Channel_date_hour_partname_
sensorname_procstep_Shock



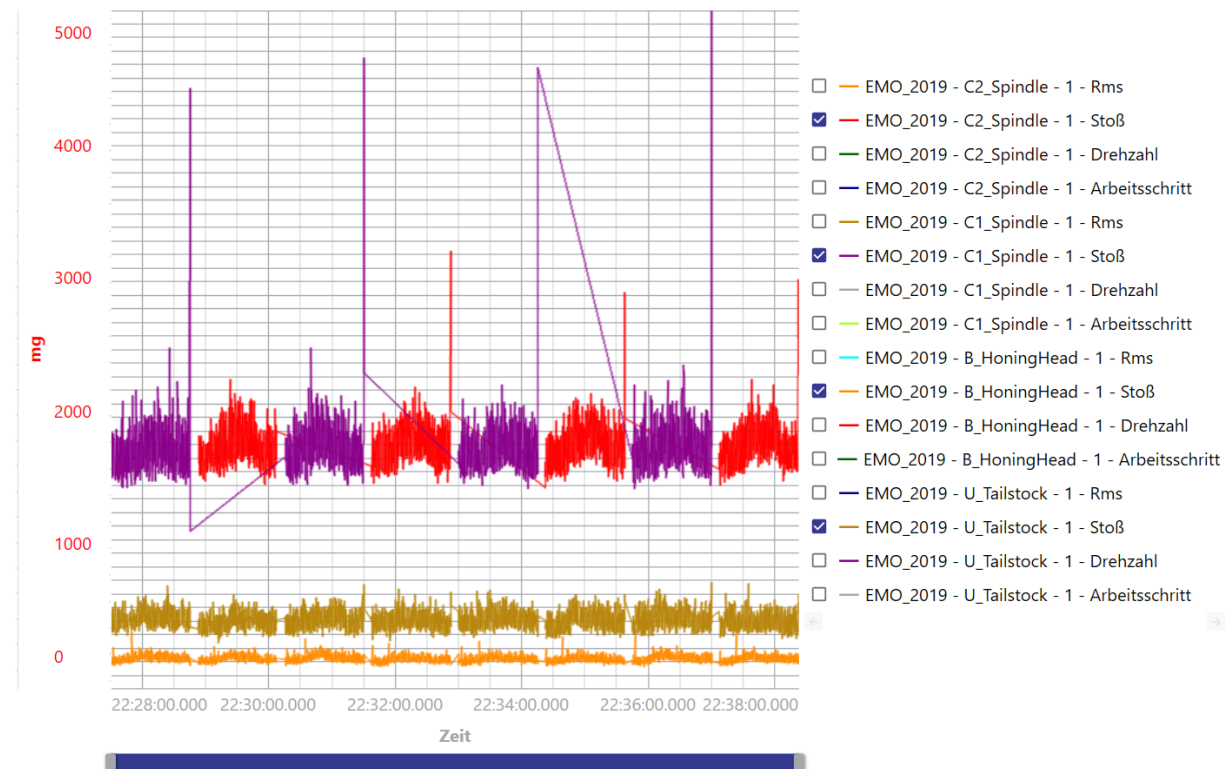
Time stamp	Machine	Material	Device	Sensor	Working step	Resolution	Alarmlevel
19.06.2023 18:19:35.599	MachineNo	10R100-S4-PC3P-7A348-ZA	C2-Spindle	1	1	100	0
19.06.2023 18:19:35.600	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.600	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0
19.06.2023 18:19:35.635	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.635	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0
19.06.2023 18:19:35.635	MachineNo	10R100-S4-PC3P-7A348-ZA	C2-Spindle	1	1	100	0
19.06.2023 18:19:35.670	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.670	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0
19.06.2023 18:19:35.670	MachineNo	10R100-S4-PC3P-7A348-ZA	C2-Spindle	1	1	100	0
19.06.2023 18:19:35.704	MachineNo	10R100-S4-PC3P-7A348-ZA	C2-Spindle	1	1	100	0
19.06.2023 18:19:35.705	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.705	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0
19.06.2023 18:19:35.740	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.740	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0
19.06.2023 18:19:35.740	MachineNo	10R100-S4-PC3P-7A348-ZA	C2-Spindle	1	1	100	0
19.06.2023 18:19:35.775	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.775	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0
19.06.2023 18:19:35.775	MachineNo	10R100-S4-PC3P-7A348-ZA	C2-Spindle	1	1	100	0
19.06.2023 18:19:35.809	MachineNo	10R100-S4-PC3P-7A348-ZA	U-Tailstock	3	1	100	0
19.06.2023 18:19:35.809	MachineNo	10R100-S4-PC3P-7A348-ZA	B-Honinghead	2	1	100	0

Software tool HRI[®]analyze+

HriShockLog files

The example of a shock file shows a SynchroFine with two workpiece spindles.

When processing, only one spindle is engaged in each case.



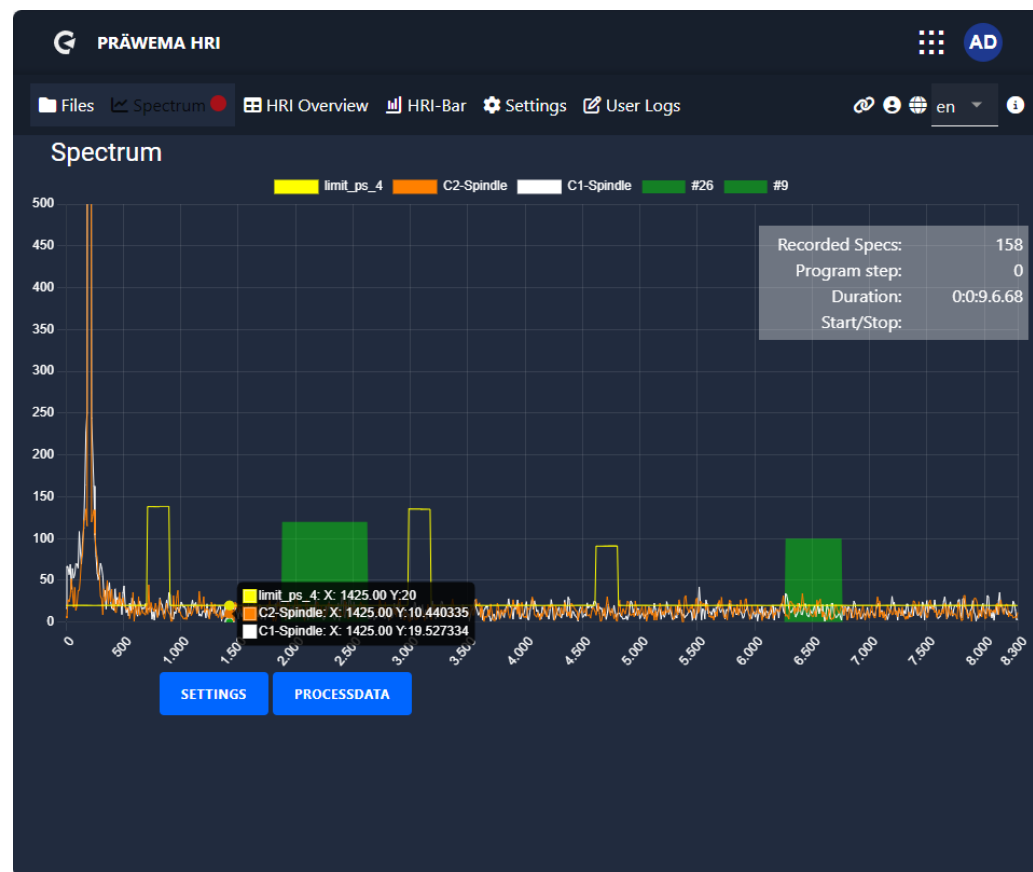
Software tool HRI[®]analyze+

Spectrum display

Vibrations can be recorded with HRI machine. The recordings are saved as a compressed folder. A file is stored in the folders as a binary database.

The data can be analyzed with HRIanalyze+.

As with the HriFFTLog files, line diagrams and Campbell diagrams can be created.

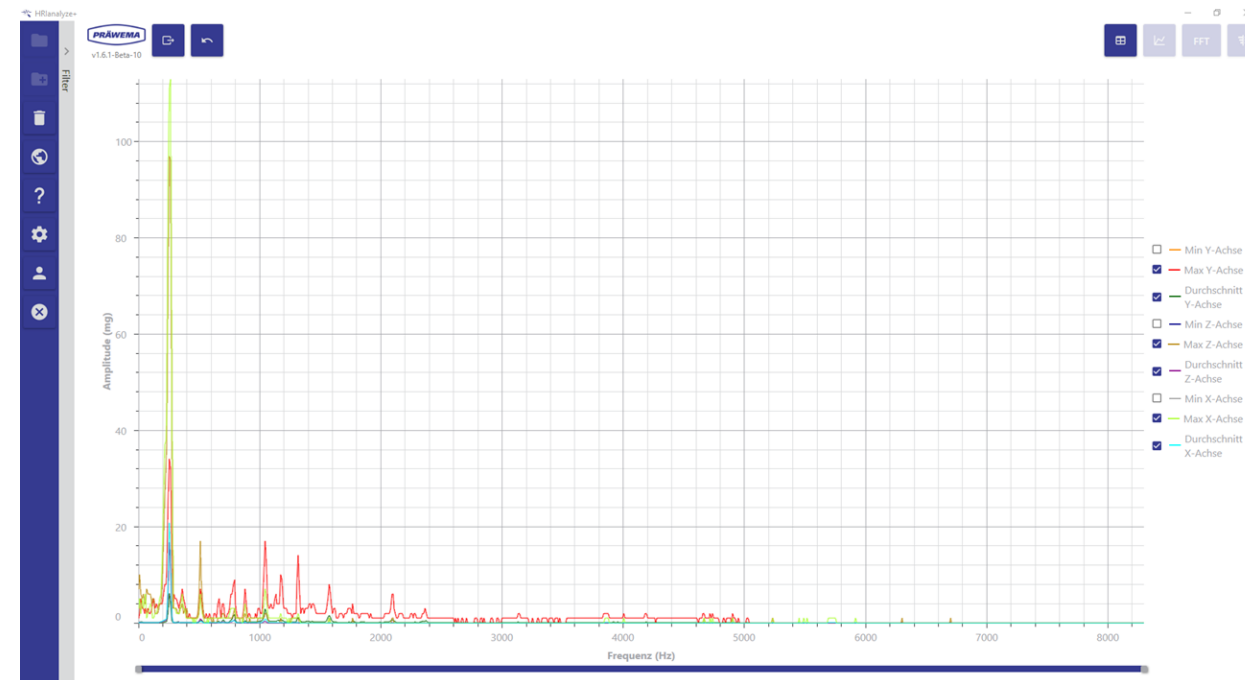


Software tool HRI[®]analyze+

Spectrum display

Example of recording with a three-axis sensor.

The sensor names are taken from the settings of the HRI machine.

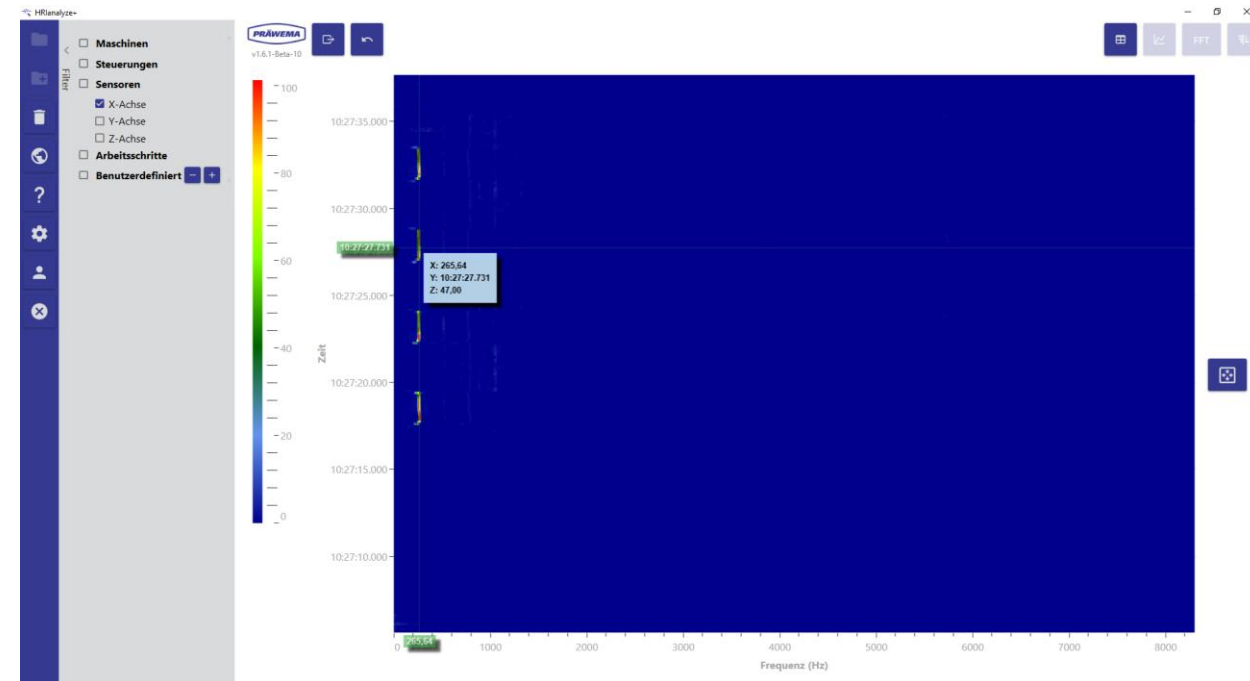


Software tool HRI[®]analyze+

Spectrum display

Example of recording with a three-axis sensor.

The sensor names are taken from the settings of the HRI machine.



Software tool HRI[®]analyze+

measurements from other sources

Measurement files from other programs can also be opened with the HRI[®]analyze+.

Currently, measurements from

- Siemens Trace
- Bosch Rexroth INDRA Works drive oscilloscope
- Digital Way SP Visu C
- Open Attocube IDS 3010.

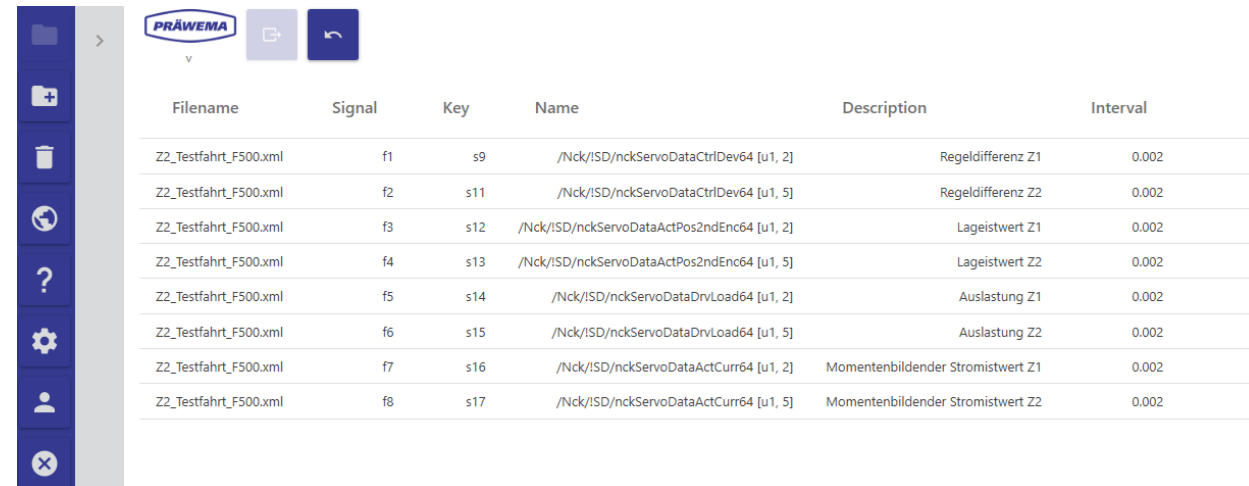
The measurements from the Bosch Rexroth drive oscilloscope and Attocube must be converted into a CSV format before being read.



Software tool HRI[®]analyze+

Siemens Trace

After opening, the measured signals are displayed. The signals to be visualized must be marked and then a distinction can be made between a line diagram or an FFT calculation.



The screenshot shows the software interface with a sidebar on the left containing icons for home, add, delete, search, help, settings, user, and close. The main area displays a table of signals with the following columns: Filename, Signal, Key, Name, Description, and Interval.

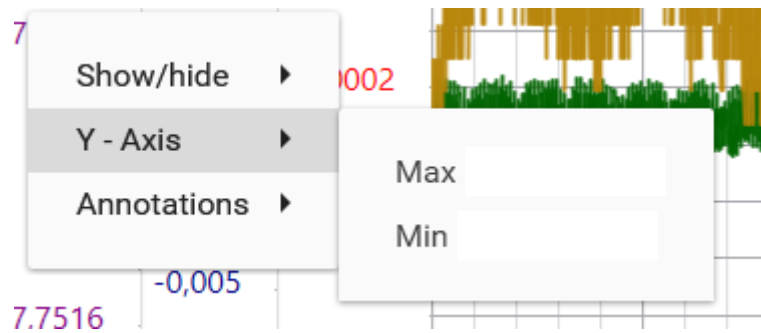
Filename	Signal	Key	Name	Description	Interval
Z2_Testfahrt_F500.xml	f1	s9	/Nck/!SD/nckServoDataCtrlDev64 [u1, 2]	Regeldifferenz Z1	0.002
Z2_Testfahrt_F500.xml	f2	s11	/Nck/!SD/nckServoDataCtrlDev64 [u1, 5]	Regeldifferenz Z2	0.002
Z2_Testfahrt_F500.xml	f3	s12	/Nck/!SD/nckServoDataActPos2ndEnc64 [u1, 2]	Lageistwert Z1	0.002
Z2_Testfahrt_F500.xml	f4	s13	/Nck/!SD/nckServoDataActPos2ndEnc64 [u1, 5]	Lageistwert Z2	0.002
Z2_Testfahrt_F500.xml	f5	s14	/Nck/!SD/nckServoDataDrvLoad64 [u1, 2]	Auslastung Z1	0.002
Z2_Testfahrt_F500.xml	f6	s15	/Nck/!SD/nckServoDataDrvLoad64 [u1, 5]	Auslastung Z2	0.002
Z2_Testfahrt_F500.xml	f7	s16	/Nck/!SD/nckServoDataActCurr64 [u1, 2]	Momentenbildender Stromistwert Z1	0.002
Z2_Testfahrt_F500.xml	f8	s17	/Nck/!SD/nckServoDataActCurr64 [u1, 5]	Momentenbildender Stromistwert Z2	0.002

Software tool HRI[®]analyze+

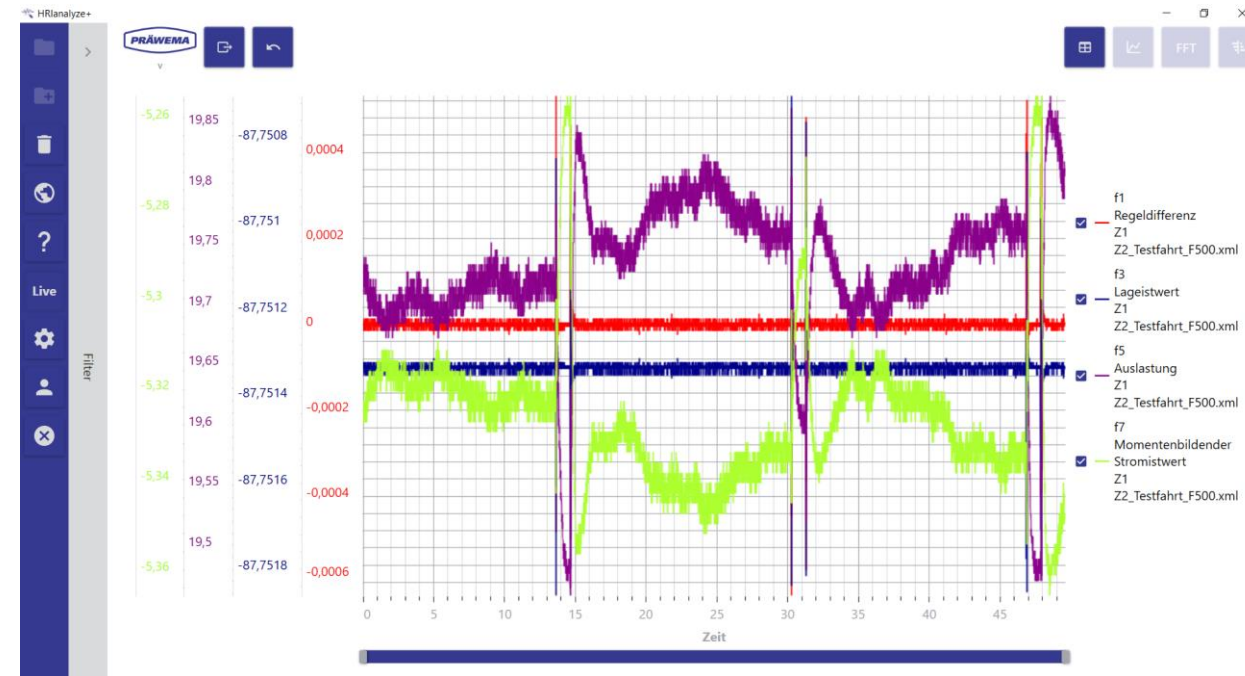
Siemens Trace

Example of a line chart.

The individual signals can be shown and hidden. A pop-up menu opens with the right mouse button.



Here you can set the scale from the y-axis.



Software tool HRI[®]analyze+

Siemens Trace

Spectra can be calculated from the signals of the trace.

Before starting the calculation, the period must be limited. The amplitudes of the oscillations and the frequencies change over the process. With the time limitation, certain anomalies can be examined in a targeted manner.

The block size must be an exponent of 2.

The screenshot shows a software interface with a dialog box titled "FFT settings". The dialog has a white background and a dark blue border. At the top, it says "FFT settings". Below that, there are several input fields with labels and values:

- Start time in ms: 0
- Blocksize: 2048
- Berechnet:** (Calculated) section containing:
 - Calc endtime (ms): 4096
 - Framesize: 4.096
 - Interval: 0.002
 - Samplerate: 500

At the bottom right of the dialog, there are two buttons: "OK" and "Cancel". The background of the software shows a dark blue header with "Lageistwert Z1" and "0.002", and a list of items on the left with labels like "[u1, 2]" and "[u1, 5]".

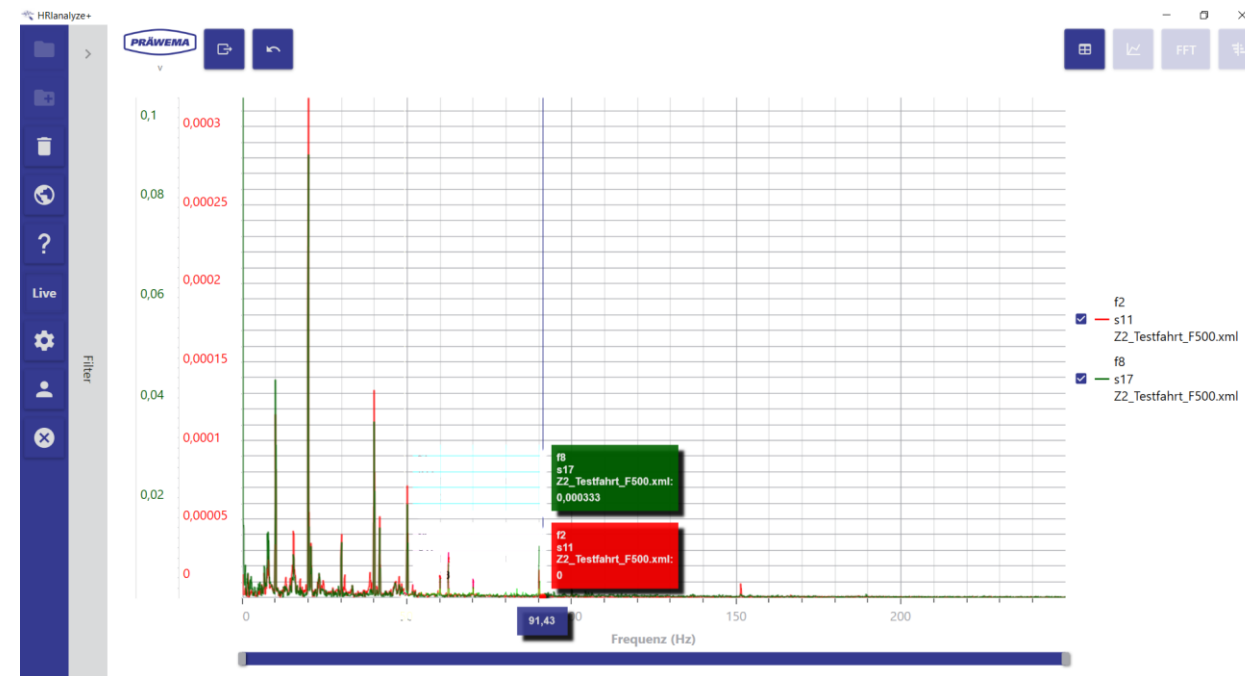
Software tool HRI[®]analyze+

Siemens Trace

Example of an FFT.

Here the trip to Z+ was considered, with the following settings:

- Start time 16,000ms
- Block length 4096

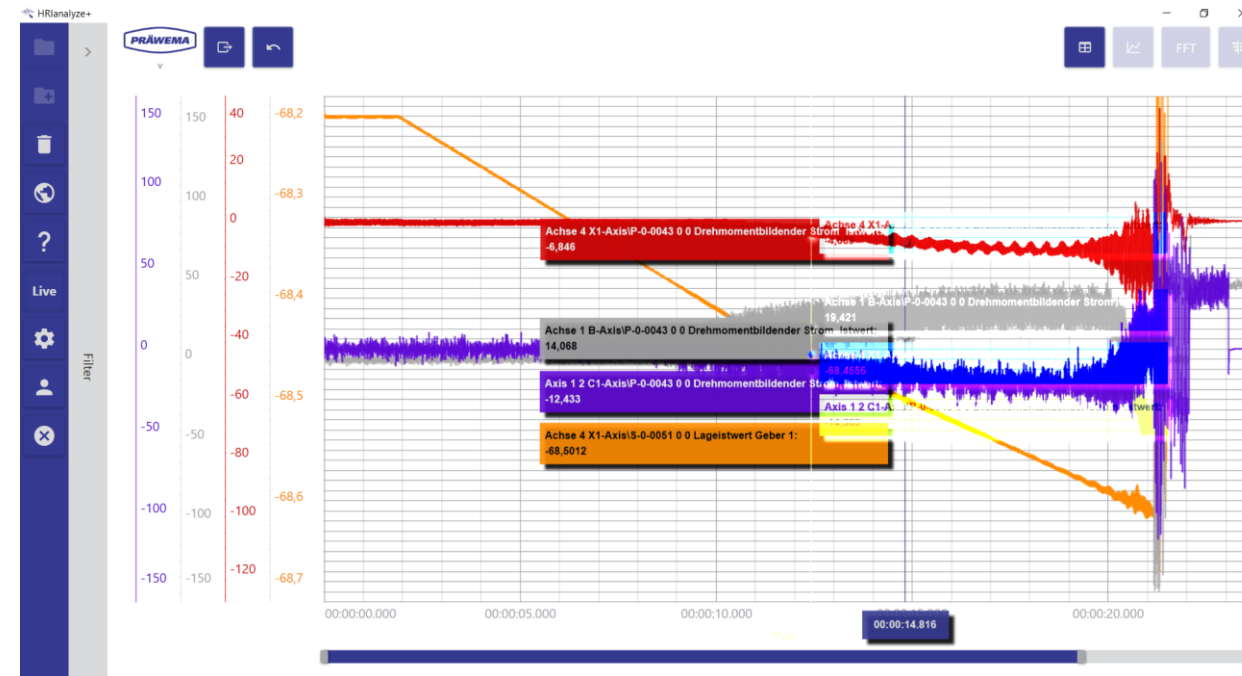


Software tool HRI[®]analyze+

Bosch Rexroth INDRA Works

During the measurement, the honing ring broke shortly before the end of the machining.

The position of the X-axis shows how the process gets out of control and leads to the breakage of the honing ring.



Known phenomena



SynchroFine

Known problematic frequencies

- 240 - 300 Hz as self-resonance of the cross slide, (nom. 280Hz)
- approx. 1,040 Hz as self-resonance of the spindle box (unlikely)
- approx. 1,050-1,850 Hz as self-resonance clamping device / clamping system
- approx. 3,000 - 4,000 Hz as self-resonance of the clamping system incl. tail stock

All frequencies are based on the sensor from the C spindle.

SynchroFine

Known problematic orders

- 1st Order as round run / unbalance
- 2nd / 3rd Order as tumbling and/or false position of the tailstock
- 3rd / 4th Order as an indication of worn guides of the X- or Z-axis

All order information is based on the rotation frequency of the C spindle.

SynchroFine

Bearing orders of the spindles

B - Honing head 205

Outer ring	26.36
Inner ring	28.61
rolling body	22.64

C - spindle ZX05-039-00K front

Outer ring	9.9
Inner ring	12.2
rolling body	7.47

B - Honing head 305

Outer ring	30.65
Inner ring	32.43
rolling body	15.73

C - spindle ZX05-039-00K back

Outer ring	8.73
Inner ring	11.27
rolling body	6.66

SynchroFine

Bearing orders of the spindles

C - spindle ZX05-053-00K front

Outer ring	11.93
Inner ring	13.07
rolling body	19.13

U - tailstock front

Outer ring	8.08
Inner ring	8.92
rolling body	17.7

C - spindle ZX05-053-00K back

Outer ring	9.42
Inner ring	10.58
rolling body	15.64

U - tailstock back

Outer ring	8.0
Inner ring	11.98
rolling body	3.95

SynchroFine

possible causes of current peaks

Axis	Causes
B-axis (Tooling spindle)	<ul style="list-style-type: none"> • Current tips in the honing head are caused by oversized raw parts or parts with hardening delay • One-sided honing of a flank creates current peaks during honing.
C-axis (Workpiece spindle)	<ul style="list-style-type: none"> • Small outbreaks in the honing stone or too high following distance cause current peaks in the C axis
X-axis (infeed axis)	<ul style="list-style-type: none"> • Chips in the tooth base create peaks in the current of the X axis
Z-axis (oscillating axis)	<ul style="list-style-type: none"> • A burr on the tooth flank creates a current peak on the Z axis. • If the pneumatic pressure of the tailstock is too high, the Z-axis is overloaded. • A broken spring on the splash guard door creates an overload on the Z axis

SynchroForm

Bearing orders of the spindles

ZZ0507800K + ZZ0507900K + ZZ0507900K

Bearing front

Outer ring	9.74
Inner ring	12.26
rolling body	7.77

Bearing back

Outer ring	8.72
Inner ring	11.27
rolling body	3.73

ZX0518200K + ZX0520100K + ZX0520400K

Bearing front

Outer ring	10.92
Inner ring	13.07
rolling body	4.99

Bearing back

Outer ring	8.26
Inner ring	10.73
rolling body	3.64

SynchroForm

Bearing orders of the spindles

ZX0501800K + ZF0509800K

Bearing front

Outer ring	9.79
Inner ring	12.2
rolling body	4.09

Bearing back

Outer ring	9.23
Inner ring	12.76
rolling body	3.93

Unique selling points and further developments



Unique selling points HRI[®] and HRIexpert[®]

- Machine and process diagnostics
- “Self Diagnosis”
- High machine integration (homogeneous, directly from a single source)
- Support through own program development
- No dependency on external companies

Unique selling points HRI[®] and HRIexpert[®]

- Operation in the HMI on the machine
- Detecting the causes of errors as a system goal
- The original function of the vibration sensor system is retained
- Reporting and documentation of all parameters recorded for direct investigation of failure causes
- Create limiting curve via HRI[®]analyze+ and activate in HRI[®]machine

Differences between HRI® und HRlexpert®

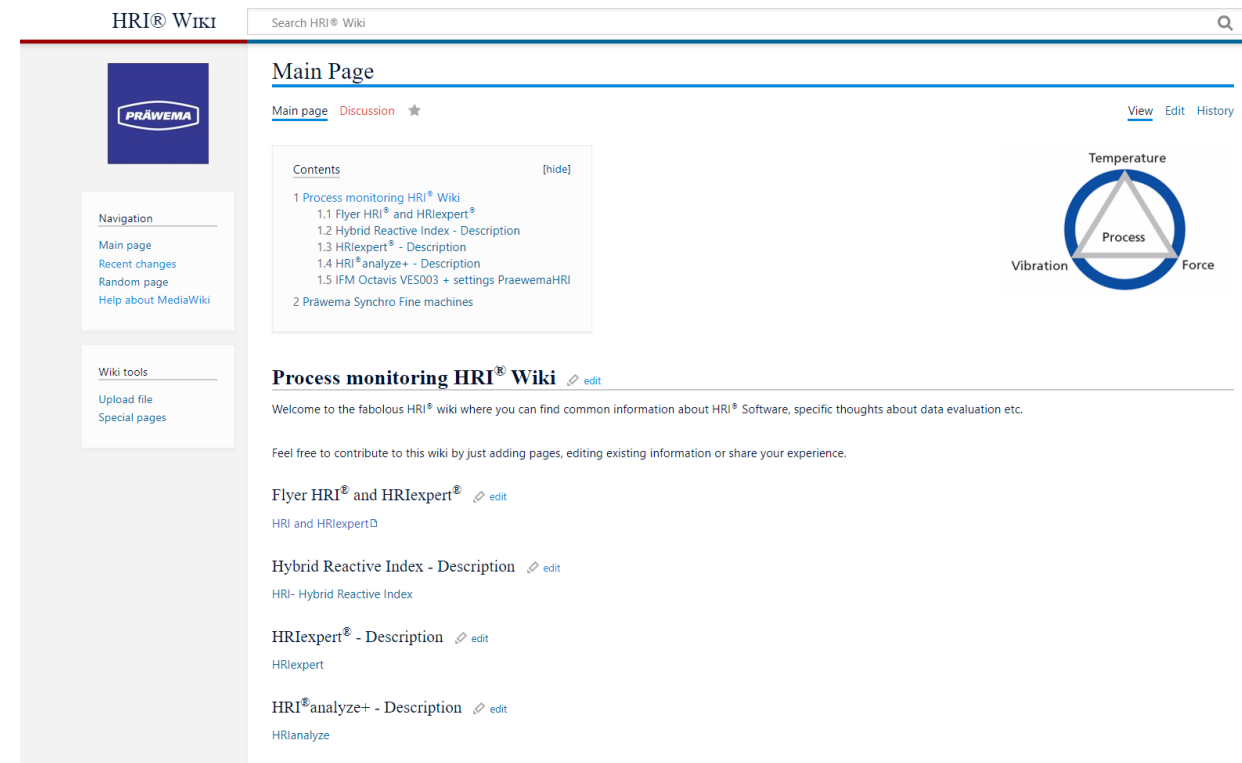
HRI® options	HRI®	HRlexpert®
Feed limitation via currents and vibrations	✓	✓
Vibration measurement, the currents / forces and the spindle temperature as a time signal	✓	✓
Individual limit values for each sensor / each axis	✓	✓
Individual error reaction for each sensor / each axis	✓	✓
Logging files with the minimum, average and maximum values for all sensors / axes	✓	✓
Feed limitation via orders	✗	✓
Display of the orders on the machine and individual limit values for the orders	✗	✓
FFT and shock logging files for all sensors	✗	✓

Unique selling points HRI® and HRlexpert®

HRI® Wikipedia

Own wiki page for sharing experiences about HRI® and HRlexpert® at

<https://ekon.praewema.de/hriwiki>



The screenshot shows the main page of the HRI® Wiki. At the top, there is a search bar and the title 'HRI® Wiki'. Below the search bar is a navigation menu with 'Main page' selected. A 'Contents' table lists various articles, including 'Process monitoring HRI® Wiki' and 'Präwema Synchro Fine machines'. On the right side, there is a diagram showing a triangle with 'Temperature' at the top, 'Vibration' at the bottom left, and 'Force' at the bottom right, with 'Process' in the center. Below the diagram, there is a section titled 'Process monitoring HRI® Wiki' with a welcome message and a list of related articles.

Further developments

- Help functionality in HRI[®] machine
- Remote diagnosis via HRI[®]analyze+ and DVS Edge



Thank you for your attention!

Matthias Mänz

Eschwege, 2/7/2025

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Index of keywords



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Key word	Explanation
Honing	Honing is a fine machining or hard finishing process and represents the final manufacturing process in production.
Skiving	Gear skiving is a soft machining process for the production of gears.
HRI®	Basic version of the DVS Group's process monitoring program.
HRIexpert®	Extension of HRI with the possibility to monitor orders and limit curves.
Feed Limiter	Active procedure for reducing the machining feed rate during the process.
Data-Matrix-Code	2-D codes for marking the components, each component receives an individual code.

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Key word	Explanation
1-Wire Bus	1-Wire is a digital, serial bus with one data line and one earth line. It is used to record the spindle bearing temperature.
Temperature (HRI)	The temperature component is recorded in °Celsius. The temperature sensors of the spindle motors are used.
current / forces (HRI)	The currents / forces is the percentage utilization of the individual motor and refers to the nominal current. The value is given as a percentage.
Vibration (HRI)	The vibrations are recorded via sensors. The unit of vibration is mg (thousandths of the acceleration due to gravity).

Overview NC program number

The table lists various NC program numbers that represent different subroutines. Each number represents a specific subroutine that performs a specific machining task, such as honing, profiling or calibrating.

NC-Prog. Nr.	Erläuterung
1	Footprint / KM 0 measurement
2-9	Other programs (turning, drilling, etc.)
21	Honring measuring head
22	Honring measuring gear
31	Profiling head
32	Profiling gear
33	Pre profiling only with Vario Speed Dresser
34	Profiling only with the Vario Speed Dresser

Overview NC program number

NC program number	Explanation
35	Skiving
36	reprofiling head circle
40	Omit workpiece measurement
41	Workpiece measure left
42	Workpiece measure right
50	Honing
51	Dressing gearing with DDG
52	Dressing head circle
53	Dressing with Vario Speed Dresser
60	Calibrate

Overview Honing machines – Proc steps

During honing, various program steps are carried out. Each of these steps, such as: touch distance, immersion distance and working distance, represents a specific process within the honing process.

Prozessschritte	Erläuterung
0	inactive
1	way from 0 to tooth-tooth position (rapid)
2	way from tooth-tooth to "scratching point" (high feed of 1000 mm/min)
8	Prehoning, at Nick in gray range
3	touching (1)
7	touching (2) (optional)
9	lift distance (optional)

Overview Honing machines – Proc steps

Proc steps	Explanation
4	working (1)
10	working (2) (optional)
5	Spark out (residence time on end distance with oscillation)
6	Retreat path

Overview Proc steps dressing and skiving

Proc steps	Explanation
25	VSD cuts without correction
26	VSD cuts with correction

With the skiving machine, each skiving stroke is considered a separate process step. If, for example, a workpiece is to be processed with 15 skiving strokes, 15 process steps are recorded on the machine accordingly.

No distinction is made between roughing and finishing strokes.

Overview error reaction

The following is a description of the error reactions that are triggered when certain values are exceeded or not reached. These error reactions could include various actions such as stopping the process, triggering an alarm or displaying a warning message to indicate deviations or problems in the machining process.

Status	Explanation
None	No reaction from the machine.
NOK	The part is discharged as NOK part.
SPC	The part is discharged as SPC part.
StopCycle	The machine will be stop after the cycle.
Reset	Emergency stop and retraction to X 0 position
Feed Limiter	Feed limitation from the infeed axis

Overview part status

Status	Explanation
1	Measurement is OK - limit value was not exceeded
2	The limit was exceeded during processing
4	The average value was not reached during processing
8	The integral was not reached during processing
16	Error message via HRI® (vibration, force or temperature)
32	Error message via HRlexpert® (order object or limiting curve)
64	stop after the end of cycle
128	Eject workpiece (SPC)
256	Reset - Emergency retraction to X0 position
512	Eject workpiece (NOK)

Overview Status Value

The status value is sent to the HoningHMI and displayed there for the ejected workpieces. This allows the operator at the machine to determine the reason why a workpiece was ejected. The texts in the status value can be expanded.

Status Value	Explanation
18	HRI max exceeded
19	HRI min not reached
20	HRI surface exceeded
21	HRI surface not reached
22	HRI order analysis
23	HRI reserve