Operating Manual
MHM-97924-PBF, Rev 4.5
August 2024

AMS Asset Monitor

Online Prediction, Protection, and Process Monitor

EMERSON

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Patents

The product(s) described in this manual are covered under existing and pending patents.

Vermerk zur Installation der Messketten in explosionsgefährdeter Umgebung.

Soll die Messkette in explosionsgefährdeter Umgebung installiert werden, so ist auf die Einhaltung der in der Gebrauchsanwesisung enthaltenen Installationshinweise zu achten. Sollten dabei sprachliche Schwierigkeiten auftreten, wenden Sie sich bitte an die Herstellerfirma, sie wird Ihnen eine Übersetzung der relevanten Artikel in der Landessprache des Verwendungslandes zukommen lassen.

Nota fuq l–installazzjoni tal–ktajjen tal–kejl f'ambjent esplożiv

Jekk il–katina tal–kejl suppost li tigi installata f'ambjent esplożiv, hu importanti li ssegwi l–istruzzjonijiet pertinenti tal–manwal.Jekk issib xi diffikultà bil–lingwa, jekk joghgbok ikkuntattja lill–manifattur biex tikseb traduzz-joni tal –paragrafi rilevanti fil–lingwa mehtiega.

Anmärkning beträffande installation av mätkedjorna i explosionsfarlig miljö.

Ska mätkedjan installeras i explosionsfarlig miljö, måste de anvisningar följas som ges i instruktionsboken beträffande installationen. Skulle därvid språkproblem uppstå, ber vi dig kontakta det tillverkande företaget som då kommer att sända dig en översättning av de relevanta artiklarna på användningslandets språk.

Opomba za namestitev merilne verige v eksplozivno ogroženem okolju

Èe se merilna veriga namešèa v eksplozivno ogroženem okolju, je potrebno upoštevati namestitvena opozorila, ki so v Navodilih za uporabo. Èe se pri tem pojavijo jezikovne težave, se posvetujte z izdelovalcem; poslali vam bodo prevod ustreznih èlankov v jeziku države, kjer se naprava uporablja.

Záznam k inštalácii meracích reťazcov vo výbušnom prostredí

Ak má byť merací reťazec inštalovaný vo výbušnom prostredí, treba dbať na dodržiavanie pokynov k inštalácii, uvedených v návode na použitie. V prípade, že by sa pritom vyskytli jazykové problémy, obráťte sa prosím na výrobcu, ktorý Vám zašle preklad relevantných èlánkov v jazyku Vašej krajiny.

Nota referente à instalação de cadeias de agrimensor em ambientes potencialmente explosivos

Caso a cadeia de agrimensor deva ser instalada em um ambiente potencialmente explosivo, é imprescindível observar e cumprir as indicações de instalação das instruções de serviço. Caso tenha dificuldades idiomáticas, queira entrar em contato com a firma produtora, esta poderá enviar–lhe uma tradução dos capítulos mais importantes no idioma do país onde o produto deverá ser empregado.

Wskazówka dotycząca instalacji łańcuchów mierniczych w otoczeniach zagrożonych eksplozją.

Jeżeli łańcuch mierniczy ma być zainstalowany w otoczeniu zagrożonym eksplozją, należy uwzględnić wskazówki dotyczące instalacji, które są zawarte w instrukcji obsługi. Jeżeli w trakcie lektury wystąpią jakiekolwiek problemy związane ze zrozumieniem tekstu, prosimy zwrócić się do producenta, który chętnie wykona tłumaczenie wybranych części dokumentacji na język danego kraju.

Opmerking m.b.t. installatie van elektrische meet circuits in explosiegevaarlijke omgeving

Dient de installatie van elektrische meet circuits in een explosiegevaarlijke omgeving te geschieden, moet men toezien dat de in de gebruikshandleiding opgenomen installatieinstructies worden nageleefd. Bij taalkundige problemen gelieve contact op te nemen met de fabrikant, deze zal u vervolgens een vertaling in de taal van het gebruiksland doen toekomen.

Pastaba dėl matavimo grandinės įrengimo sprogimo atžvilgiu pavojingoje aplinkoje

Jei matavimo grandinė turi būti įrengta sprogimo atžvilgiu pavojingoje aplinkoje, privaloma laikytis vartotojo instrukcijoje pateiktų įrengimo nurodymų. Jei kiltų sunkumų dėl kalbos, prašome kreiptis į gamintojo įmonę, kuri pateiks Jums reikiamo skyriaus vertimą į vartotojo valstybės kalbą.

Nota sull'installazione delle catene per misurazione in ambienti a rischio di esplosioni

Nel caso in cui si debbano installare le catene per misurazione in ambienti a rischio di esplosioni, è necessario attenersi alle avvertenze per l'installazione contenute nelle istruzioni d'uso. Per difficoltà di carattere linguistico, rivolgetevi alla ditta produttrice. Quest'ultima Vi farà pervenire una traduzione degli articoli rilevanti nella lingua del paese d'impiego.

Megjegyzés a mérőláncok robbanásveszélyes környezetben történő szereléséhez.

Ha a mérőláncot robbanásveszélyes környezetben kell felszerelni, akkor ügyeljen a Használati útmutatóban közölt szerelési utasítások betartására. Amennyiben nyelvi nehézségek merülnek fel, szíveskedjen a gyártó céghez fordulni, amely elküldi Önnek a felhasználó ország nyelvére lefordított, erre vonatkozó cikket.

Remarque concernant l'installation des chaînes de mesure dans un environnement présentant un risque d'explosion

Si la chaîne de mesure doit être installée dans un environnement présentant un risque d'explosion, il est impératif de veiller à respecter les consignes d'installation contenues dans les instructions de service. S'il devait ce faisant surgir des problèmes linguistiques, veuillez vous adresser à la société fabricante: elle vous fera parvenir une traduction des articles significatifs dans la langue du pays de mise en oeuvre.

Huomautus mittausketjun asentamisesta räjähdysalttiissa ympäristössä

Jos mittausketju tulee asentaa räjähdysalttiissa ympäristössä, on käyttöohjeessa annettuja asennusohjeita noudatettava. Jos käyttöohjeessa käytetty kieli aiheuttaa ongelmia, kääntykää valmistajayrityksen puoleen. Se toimittaa käyttöönne tarvittavat artikkelit käyttömaan vir alliselle kielelle käännettynä.

Juhend mõõdukettide ülespanemiseks plahvatusohtlikus piirkonnas.

Kui panna üles mõõdukettid plahvatusohtlikkus piirkonnas, nii tuleb jälgida kasutusjuhendis sisaldatud instalationimärkmeid. Juhul kui tekkivad raskused keelega, siis pöörduge palun tootja poole. Tootja saadab emakeelse tõlge vastavalt artiklile ning maale.

Notas sobre la instalación de cadenas de medición en un entorno potencialmente explosivo.

Si ha de instalar la cadena de medición en un entorno potencialmente explosivo, deberá respetar las indicaciones sobre la instalación, contenidas en el manual de uso. Si surgieran dificultades lingüísticas, póngase en contacto con la empresa fabricante, que le facilitará una traducción del artículo en la lengua del país donde se emplee.

Note on the installation of the measuring chains in an explosive environment

If the measuring chain is supposed to be installed in an explosive environment, it is important to follow the pertinent installation instructions in the manual. Should you encounter difficulties with the language, please contact the manufacturer to obtain a translation of the relevant paragraphs into the language required.

Σημείωση για την εγκατάσταση αλυσίδωυ μέτρησης σε περιβάλλου, στο οποίο υπàρΧει κίυδυυος έκρηξης

Εάυ η αλυσυδα μέτρησης πρόκειται υα εγκατασταΘεί σε περιβάλλου, στο οποίο υπάρΧει κίυδυυος έκρηξης, πρέπει υα τηρηΘούυ οπωσδήποτε οι οδηγίες εγκατάστασης που περιλαμβάυουται στις οδηγίες Χρήσης. Εάυ υπάρξουυ γλωσσικές δυσκολίες καταυόησης, παρακαλούμε υα απευΘυυΘείτε στηυ κατασκευάστρια εταιρεία, η οποία Θα φρουτίσει για την αποστολή μιας μετάφρασης τωυ σΧετικωυ άρΘρωυ στη γλωσσα της Χωρας Χρήσης.

Info vedrørende installation af målekæderne i eksplosionstruede omgivelser

Hvis målekæden skal installeres i eksplosionstruede omgivelser, skal installationsanvisningerne i brugsanvisningen følges. Hvis der i denne forbindelse opstår sproglige problemer, bedes De henvende Dem til produktionsfirmaet, som så vil sørge for, at De modtager en oversættelse af den relevante artikel på Deres sprog.

Poznámka k instalaci měřicích řetězců v prostředí s nebezpečím výbuchu.

Když má být měřicí řetězec (sestávající z čidla a konvertoru) instalován v prostředí s nebezpečím výbuchu, tak je třeba respektovat instalační pokyny, které jsou součástí návodu k upotřebení. Kdyby při tom došlo k jazykovým potížím, tak prosíme kontaktujte výrobní firmu, která Vám relevantní článek zašle v jazyku krajiny použití.

Piezīme par mērīšanas ķēžu instalēšanu sprādziena bīstamās zonās.

Ja mērīšanas ķēde jāuzstāda sprādzienbīstamā zonâ, ir jāievēro lietošanas instrukcijā dotie instalēšanas norādījumi. Ja rodas kādas valodas grūtības, lūdzu griezieties pie izgatavotāja firmas, kas Jums nosūtīs nozīmīgâko nodaļu tulkojumus lietotāja valsts valodā.

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Contents

1 General

1.1 About this manual

This manual contains information and step-by-step instructions for configuring and operating the AMS Asset Monitor.

Read this manual completely prior to starting installation of the device. Comply with all safety instructions.

This operating manual applies for AMS Asset Monitors with a hardware revision and firmware version listed in Table 1-1. See type plate for hardware revision level. The firmware version is displayed in the status overview of the system (see Status overview – system).

Table 1-1: Hardware revision and firmware version

Component	Hardware revision	Firmware version
AMS Asset Monitor	13 and later	3.x

Include the operating manual when transferring the device to third parties.

Note
When requesting technical support, indicate type and serial number from the type plate.

See Table 1-2 for a list of documents referred to in this operating manual.

Table 1-2: Referenced documents

MHM Number	Document name
MHM-97925-PBF	Installation Guide VI Piezo CHARM
MHM-97929-PBF	Installation Guide VI Voltage CHARM
MHM-97930-PBF	Installation Guide VI Tach CHARM
MHM-97923-PBF	Installation Guide AMS Asset Monitor
MHM-97937-PBF	Operating Manual Fleet Manager
AMS-SEC-PSG-001	AMS Product Security Documentation
---	User Guide AMS Machine Works

1.2 Symbols

Note
This symbol marks passages that contain important information.

⚠ CAUTION

This symbol marks operations that can lead to malfunctions or faulty measurements, but will not damage the device.

⚠ DANGER

A danger indicates actions that can lead to property damage or personal injury.

1.3 Liability and guarantee

Emerson is not liable for damages that occur due to improper use. Proper use also includes the knowledge of, and compliance with, this document.

Customer changes to the device that have not been expressly approved by Emerson will result in the loss of guarantee.

Due to continuous research and further development, Emerson reserves the right to change technical specifications without notice.

1.4 Technical support

You may need to ship this product for return, replacement, or repair to an Emerson Product Service Center. Before shipping this product, contact Emerson Product Support to obtain a Return Materials Authorization (RMA) number and receive additional instructions.

Product Support

Emerson provides a variety of ways to reach your Product Support team to get the answers you need when you need them:

Phone	Toll free 1 800 833 8314 (U.S. and Canada) +1 512 832 3774 (Latin America) +63 2 8702 1111 (Asia Pacific, Europe, and Middle East)
Email	Guardian.GSC@Emerson.com
Web	http://www.emerson.com/en-us/contact-us

To search for documentation, visit http://www.emerson.com.

To view toll free numbers for specific countries, visit http://www.emerson.com/technicalsupport.

Note
If the equipment has been exposed to a hazardous substance, a Material Safety Data Sheet (MSDS) must be included with the returned materials. An MSDS is required by law to be available to people exposed to specific hazardous substances.

1.5 Disposal of the device

Provided that no repurchase or disposal agreement exists, recycle the following components at appropriate facilities:

- Recyclable metal
- Plastic elements

Sort the remaining components for disposal, based on their condition. National laws or provisions on waste disposal and protection of the environment apply.

Note
Environmental hazards! Electrical waste and electronic components are subject to treatment as special waste and may only be disposed by approved specialized companies.

1.6 Installation awareness

Note
When planning a measurement, follow these guidelines:

- Consider environmental conditions which might have an influence on the measurement such as temperature, humidity, substances aggressive to the sensor, and pollution.
- Always use a stiff and vibration-free sensor holder.
- Define a suitable measuring range, not larger than necessary, in consultation with the operator of the plant.
- Define the trip limit in consultation with the operator of the plant.
- Take measurement deviations into account when defining trip limits.
- Use a sensor that meets the requirements of the defined measuring range.
- Ensure an EMC-compatible installation including the use of proper cables.
- Ensure proper function of the measurement before activating the measurement in the production environment.

2 Safety instructions

To ensure safe operation, carefully follow all the instructions in this manual.

The correct and safe use of this device requires that both operating and service personnel understand and comply with general safety guidelines and observe the special safety comments listed in this manual. Where necessary, safety-sensitive points on the device are marked.

⚠ DANGER

Because the device is electrical equipment, only specially trained and authorized personnel may commission, service, and maintain this equipment.

2.1 Using the device

Install and use the device as specified in this document.

If the device is used in a manner not specified by the manufacturer, the functions and protection provided by the device may be impaired.

2.2 Owner's responsibility

If there is a reason to suspect that hazard-free operation, and thus, adequate machine protection is no longer possible, take the device out of operation and safeguard it from unintentional operation. This is the case:

- if the device shows visible damage.
- if the device no longer works.
- after any kind of overload that has exceeded the permissible limits (see technical data of the device for permissible limits).

⚠ DANGER

If device tests have to be completed during operation or if the device has to be replaced or decommissioned, it will impair the machine protection and may cause the machine to shut down. Make sure to deactivate machine protection before starting such work, and reactivate it after work has been completed.

2.3 Radio interference

The device is carefully shielded and tested to be technically immune to radio interference and complies with current standards. However, if you operate this device together with other peripheral devices that are not properly shielded against radio interference, disturbances and radio interferences may occur.

2.4 ESD safety

⚠ DANGER

Internal components can be damaged or destroyed due to electrostatic discharge (ESD) during the handling of the device.

Take suitable precautions before handling the device to prevent electrostatic discharges through the electronics. Such measures might include, for example, wearing an ESD bracelet. Transport and storage of electronic components may only be made in ESD-safe packaging.

Handle the device with particular care during dry meteorological conditions with relative humidity below 30% as electrostatic discharges can occur more frequently.

2.5 Important information about hazardous voltages

⚠ DANGER

The KL4502X1-MA1 CHARM Relay Output Terminal Block may have hazardous live voltages on its output terminals. This terminal block is capable to switch field power of 250 V AC. Ensure that proper safety precautions, such as de-energizing field power, are observed during installation, maintenance, or any time wiring changes are made to the CHARM Relay Output Terminal Block.

3 Functional overview

The AMS Asset Monitor is a field mountable device for collecting data from driven and none-driven assets (see Table 3-1) by using different kinds of sensors such as piezoelectric vibration sensors to analyze the machine health and to provide alarms depending on the machine state.

The hardware is designed to carry up to 12 CHARMs[1] to connect input and output signals:

- VI Piezo CHARMs
- VI Tach CHARMs
- VI Voltage CHARMs
- Compatible DeltaV™ CHARMs

See AMS Asset Monitor Installation Guide for further details on the hardware.

The AMS Asset Monitor can be used as a standalone prediction device with basic protection functions or integrated into a network and connected to subsequent systems such as Emerson's AMS Machine Works or AMS Plantweb Optics.

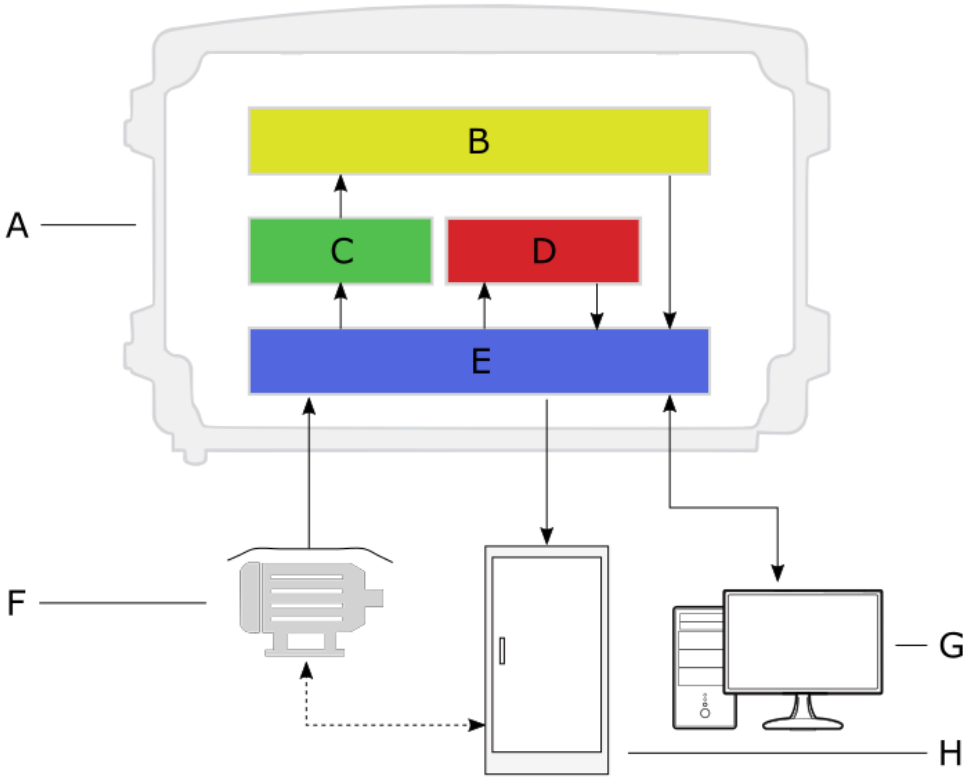
The installation of additional software on your PC or Laptop is not necessary. Use your web browser to configure and control the AMS Asset Monitor.

The input signals measured by sensors mounted on the equipment to be monitored are connected through sensor specific CHARMs to the signal processing parts of the AMS Asset Monitor. The preprocessed sensor signals are forwarded to the prediction unit for analysis based on predefined rules with configurable parameters. The prediction results are output based on selectable logics through output CHARMs or forwarded to subsequent systems through the Ethernet interface. The input sensor signals are also forwarded to the unit for basic protection. The typical reaction time of the basic protection is < 1 second. Detected alarms are output through output CHARMs.

The AMS Asset Monitor has a data collection function to send specific waveform data to AMS Machine Works.

1 ***CHAR****acterizing* ***M****odule*

Figure 3-1: Functional overview



A. *AMS Asset Monitor*
B. *Prediction and logic unit*
C. *Signal preprocessing*
D. *Basic protection unit*
E. *Signal input CHARMs and output CHARMs (available input signals depend on installed CHARMs) and Ethernet interface for data exchange through Modbus over TCP/IP, OPC UA, and configuration.*
F. *Equipment to be monitored (see Table 3-1)*
G. *Configuration PC, Server, etc.*
H. *Control cabinet of the Equipment*

Table 3-1: Supported assets

Driver	Intermediate		Driven		Non-driven
Electric motor Wind turbine Wind turbine – generator	Gear box	Single reduction	Pump	Center hung	Heat exchanger – shell & tube, counter-current
		Double reduction		Over hung	
			Hydrocarbon pump	Overhung	
		Triple reduction	Fan	Center hung	

Table 3-1: Supported assets *(continued)*

Driver	Intermediate		Driven		Non-driven
				Over hung	
				Axial	
				Axial, direct motor drive	
				Axial, gearbox drive	
			Electric generator		

For rotating assets, not listed in Table 3-1, there are two generic asset templates, rotating centerhung and rotating overhung.

3.1 Implemented analytics

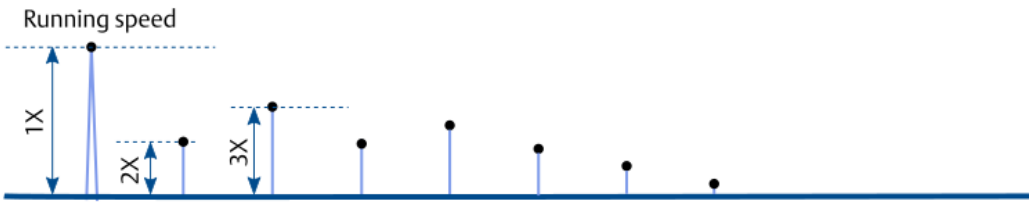
The AMS Asset Monitor has several functions such as FFT, Energy in Bands, or PeakVue Plus™ for analyzing the collected machine data. Prediction functions use predefined analytics which have configurable parameters to evaluate the health of machines. The analytics identify the running speed amplitude using data from a tachometer, a DeltaV DI CHARM, from an AI CHARM, from the VI Tach CHARM, from an external data point, from another asset, or from a manual input.

Note
To achieve consistent results with the highest accuracy for PeakVue Plus™, Emerson recommends using the VI Tach CHARM to measure the speed required for PeakVue Plus™.

The following spectrum-based analytics are implemented into the AMS Asset Monitor:

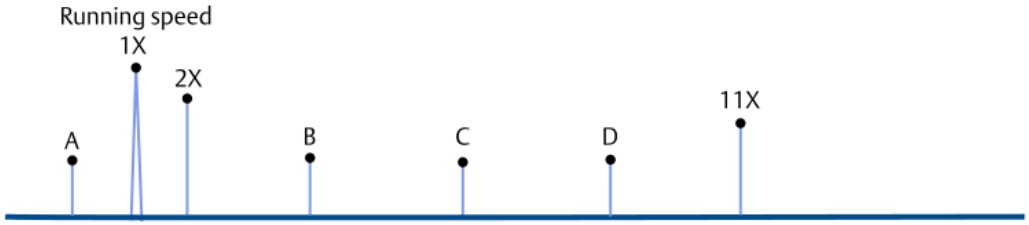
Alignment	Alignment analytics look for symptoms of misalignment between two assets connected with a coupling by checking the 2X to1X amplitude ratio in the bearing vibration spectra.
Alignment – shaft vibration	Alignment analytics look for symptoms of misalignment between two assets connected with a coupling by checking the 2X to1X amplitude ratio in the shaft vibration spectra.

Figure 3-2: Spectrum



Bearing Bearing analytics use the PeakVue Plus™ algorithm to detect mechanical faults in antifriction bearings. In addition,it works on the PeakVue spectra to identify the type of fault (fault frequency identification).

Figure 3-3: Fault frequencies bearing



A. FTF (Fundamental train frequency)
B. BSF (Ball spin frequency)
C. BPFO (Ball pass frequency outer)
D. BPFI (Ball pass frequency inner)

Balance Balance analytics check the 1X amplitude to detect imbalance symptoms in the bearing vibration spectra.

Balance – shaft vibration Balance analytics check the 1X amplitude to detect imbalance symptoms in the shaft vibration spectra.

Blade pass Blade pass analytics check the amplitude of the blade pass frequency in the bearing vibration spectra. For impellers with staggered blades, it also checks the double blade pass frequency peak.

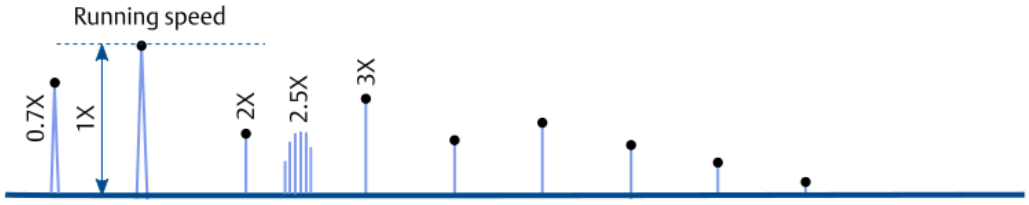
Figure 3-4: Velocity spectrum – blade pass

A. Amplitude 1
B. Blade pass 1
C. Amplitude 2
D. Blade pass 2

Flow turbulence pump Flow turbulence analytics for pumps check the high frequency energy (3 kHz to10 kHz) in the bearing vibration spectra to detect flow cavitation or excessive aeration symptoms.

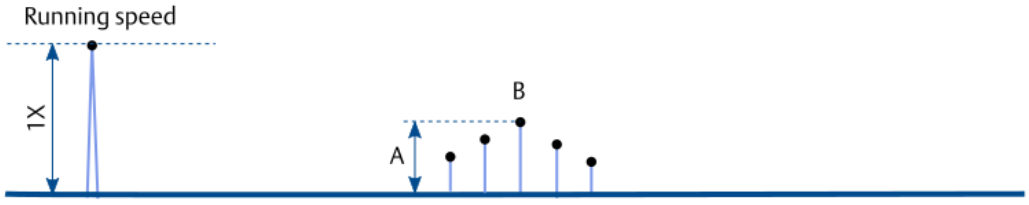
Flow turbulence fan	Flow turbulence analytics for fans check the 0.6X to 0,74X energy in the bearing vibration spectra to detect symptoms of rotation stall or surge.
Flow turbulence fan – shaft vibration	Flow turbulence analytics for fans check the 0.6X to 0.7X energy in the shaft vibration spectra to detect symptom of rotating stall or surge.

Figure 3-5: Velocity spectrum – flow



Uneven air gap	Uneven air gap analytics check the second harmonic of the line frequency in the bearing vibration spectra to find symptoms of an uneven air gap (static rotor eccentricity/motor stator deformation).
Gear misalignment	Gear misalignment analytics check the gear mesh harmonic amplitudes in the bearing vibration spectra to detect symptoms of shaft misalignment in the gearboxes.
Tooth wear	Tooth wear analytics check the energy of the sidebands of the gear mesh frequencies in the bearing vibration spectra to detect symptoms of general wear and tear in the gearboxes.
Cracked or broken tooth	Cracked/broken tooth analytics use the PeakVue Plus™ algorithm to detect gear faults.

Figure 3-6: Velocity spectrum – example for gear mesh frequency with sidebands

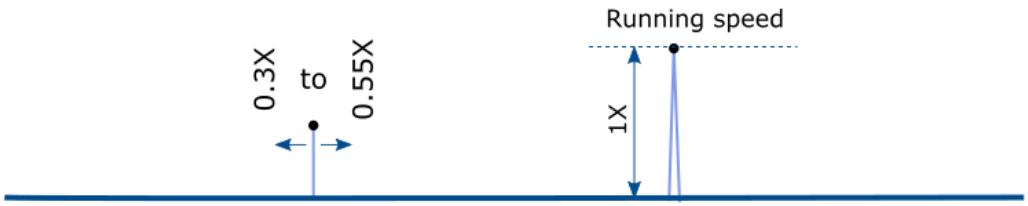


A. Gear mesh amplitude
B. Gear mesh frequency

Looseness	Looseness analytics check the 3X and 4X to 1X amplitude ratio to detect looseness symptoms in the bearing vibration spectra.

Lubrication	Lubrication analytics use the PeakVue Plus™ algorithm to detect insufficient/improper lubrication conditions in antifriction bearings.
Oil whirl	Oil whirl analytics check the 0.3X to 0.55X energy in the shaft vibration spectra to detect the oil whirl (sleeve bearing instability) problems.

Figure 3-7: Spectrum – oil whirl



Fouling	Fouling analytics monitors the heat duty to detect fouling symptoms in heat exchangers.
Duty	Duty analytics detects an inequality between hot and cold side duty in heat exchangers which indicates an instrumentation fault (uncertain measurements).

An integrated bearing database with fault frequencies and mechanical parameters of typically used types of antifriction bearing supports the asset health supervision.

3.2 External interfaces

The AMS Asset Monitor is equipped with several interfaces such as OPC UA, Modbus TCP, and AMS Machine Works to provide data to subsequent systems. A subsequent system is, for example, AMS Plantweb Optics, which is able to receive data through the OPC UA interface.

Use external data points to import data such as temperature or pressure into the AMS Asset Monitor through the OPC UA or Modbus TCP interface (see External data points).

OPC UA

The integrated OPC UA (Open Platform Communications United Architecture) server can provide data simultaneously to five OPC UA clients. Up to 1000 OPC items (data points) per connection can be read at a minimum cycle time of one second. See OPC UA.

Modbus TCP

The integrated Modbus server can provide data simultaneously to up to five Modbus TCP clients. Writing data to the AMS Asset Monitor is also supported. Assign internal values to the Modbus registers to get a user defined Modbus table. See Modbus TCP.

AMS Machine Works

The Machine Works interface is designed to provide data to Emerson's AMS Machine Works by using the data collection function, see Data collections. Create an AMS Machine

Works user to use this interface with AMS Machine Works. See Parameter description and AMS Machine Works interface.

3.3 Notification system

Standardized elements such as a color system, different alert levels and texts help to distinguish the importance level of notifications.

General color meanings

Buttons and notifications are colored depending on their functions and meanings.

Table 3-2: General color meanings

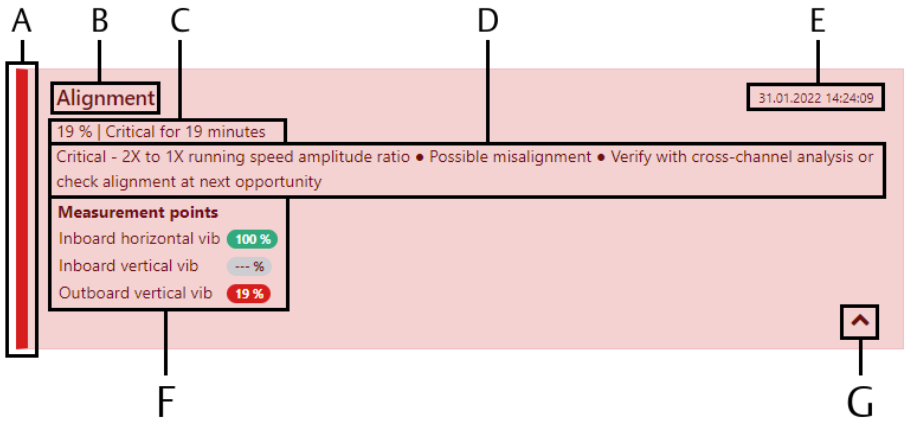
Color		Meaning
Blue		Information
Green		OK
Yellow		Advice
Orange		Warning
Red		Critical
Gray		Unknown
Purple		Unconfigured, maintenance
Light purple		Disabled

Messages in the notification area

Color coded messages for events that reduce the health status of assets or CHARMs appear in the notification area[2]. The background color of the message depends on the alert level.

2 See *Status overview – CHARM* and *Status overview – asset*.

Figure 3-8: Structure of the message



A. Colored status bar
B. Name of the analysis function that detected the event.
C. Calculated health value in percent, alert level, and indication how long the event is already present.
D. Description of the health event, possible cause, and recommended steps.
E. Time stamp of the event
F. Measurement points with health indication used for the analytics. The measurement point with the lowest health indication provides the overall alert in the analytics. Measurement points without a value (---%) are not available for the analytics calculation.
G. Button for opening or closing the measurement point information

Alert levels

There are four alert levels to indicate the health of the supervised assets, the health of the AMS Asset Monitor, and measurement alerts.

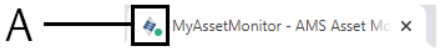
Table 3-3: Alert levels

Health and alert level	Color
OK	
Advice	
Warning	
Critical (Danger)	

AMS Asset Monitor status in browser tab name

The system status of the AMS Asset Monitor is indicated with a colored dot in the browser tab.

Figure 3-9: Status in browser tab



A. Status indication

See Table 3-2 for color explanation.

Status light of the AMS Asset Monitor

The most important notifications are also indicated by a tricolored status light at the front of the AMS Asset Monitor.

Table 3-4: Status light of the AMS Asset Monitor

Event	Status light		Meaning
	Color	Blinking pattern	
No fault detected	Green	Solid	---
Asset health value is ≥60% and <90% (advice state)			---
Asset health value is OK (≥ 90%)			---
External data points are OK			---
Installed CHARMs are OK			---
Logics are OK			---
Maintenance state is active for one or more of the following elements: • CHARMs • Assets • Data collections • Output Logics • Predicates	Green	Slow flashing (1 per 2 seconds)	Open AMS Asset Monitor Web Interface to check which element is affected. A cause for the maintenance state indication could be: • An unconfigured CHARM • An Asset with a missing source

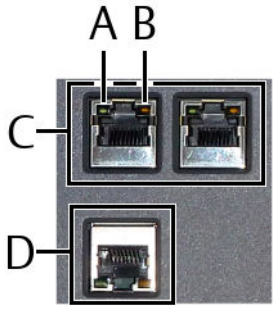
Table 3-4: Status light of the AMS Asset Monitor *(continued)*

Event	Status light		Meaning
	Color	**Blinking pattern**	
Warning state is active for one or more of the following elements: • AMS Asset Monitor • Assets • Logics	Orange	Slow flashing (1 per 2 seconds)	Open AMS Asset Monitor Web Interface to check which element is affected. A cause for the warning state indication could be: • Temperature of the AMS Asset Monitor is to high but not critical • Asset health value is ≥30% and <60%
Critical state is active for one or more of the following elements: • AMS Asset Monitor • CHARMs • Logics • External data points • Assets	Red	Fast flashing (1 per 300 milliseconds)	Open AMS Asset Monitor Web Interface to check which element is affected. A cause for the warning state indication could be: • Asset health value is <30% • CHARM failure or sensor/ loop failure • Communication time out of an external data point • Temperature of the AMS Asset Monitor is critical • Supply voltage of the AMS Asset Monitor is out of the OK range (21.6 V to 26.4 V)
No supply voltage	---	Off	Check the power supply.

Ethernet socket LEDs

Each Ethernet socket has two integrated LEDs, a green LED on the left and an orange LED on the right side. See Figure 3-10.

Figure 3-10: Location of the Ethernet socket LEDs



A. Green LED (left)
B. Orange LED (right)
C. LAN2 (LAN2.1 and LAN2.2)
D. LAN1

Table 3-5: Meaning of the Ethernet socket LEDs

Speed	LAN1		LAN2	
	Green LED (left)	Orange LED (right)	Green LED (left)	Orange LED (right)
No connection	Off	Off	Off	Off
10 Mbit/s connection	Solid	Flashing[1]	Solid	Flashing[1]
100 Mbit/s connection	Solid	Flashing[1]	Solid	Flashing[1]
1 Gbit/s connection	Solid	Flashing[1]	---	---

1 *Frequency depends on the data traffic.*

Status light – analog CHARMs

Table 3-6 describes the meaning of the colors and patterns of the bicolored LED on the following CHARMs:

- VI Piezo CHARM
- VI Tach CHARM
- VI Voltage CHARM
- AI 4 to 20 mA CHARM
- RTD CHARM
- Thermocouple/mV input CHARM

The following figure describes the position of the bicolored LED.

Figure 3-11: CHARM's LED

A. Red/Green LED

Table 3-6: Meaning of the LED indication – analog CHARMs

LED color and pattern	Description and corrective action
Green (continuous)	The channel and CHARM status is good and the CHARM is configured. **Note** If a bad configuration is downloaded to a successfully configured CHARM, the CHARM rejects the bad configuration and remains configured with the good configuration. In this case the LED pattern is Green (continuous).
Green (flashing twice per second)	The CHARM has a connected device but is not configured. • If the AMS Asset Monitor supervision function displays the **Critical** status for this CHARM, a configuration error, such as a configuration mismatch has occurred. • If the AMS Asset Monitor supervision function displays the **Maintenance** status for the CHARM, the CHARM has not been configured. In this case, configure the CHARM in AMS Asset Monitor Web Interface.
Green (flashing ten times per second)	A user has issued an identify CHARM command from AMS Asset Monitor Web Interface. This is not a fault and no action is required.
Red (continuous)	No communications on the bus or no address. • If this pattern is seen on an individual CHARM, replace the CHARM. • If this pattern is seen on all installed CHARMs within an AMS Asset Monitor, ensure that the correct address plug is installed. • If this pattern is seen on all installed CHARMs within an AMS Asset Monitor, ensure that the AMS Asset Monitor is functioning correctly.
Red (flashing twice per second)	Channel fault or hardware error. Check wiring and associated field device. If wiring and device are correct, replace the CHARM. This pattern can also occur if an unconfigured CHARM with no connected device is installed in the AMS Asset Monitor.
Red (flashing)	If this pattern is seen on a VI Piezo CHARM or a VI Voltage CHARM, check the status overview of the CHARM (see Status overview – CHARM). If "Not calibrated" is displayed, replace the CHARM.

Table 3-6: Meaning of the LED indication – analog CHARMs *(continued)*

LED color and pattern	Description and corrective action
Green then red flashing four times per second	A CHARM fault (such as a bad address or a faulty CHARM bus) exists that does not affect the channel status. • If this pattern is seen on an individual CHARM, replace the CHARM. • If this pattern is seen on all installed CHARMs within an AMS Asset Monitor, ensure that the correct address plug is installed. • If this pattern is seen on all installed CHARMs within an AMS Asset Monitor, ensure that the AMS Asset Monitor is functioning correctly.
Green and red alternating two times per second	The CHARM is being upgraded or is in upgrade mode.
Green then red flashing briefly once every 1.5 seconds (for output CHARMs only)	The AMS Asset Monitor has placed the CHARM in a fault state.
No colors	The CHARM is unpowered or not functioning. • If none of the LEDs on the CHARMs are showing a color, check the power connections. • If none of the LEDs on the CHARMs in an AMS Asset Monitor are showing a color, check the connection to the AMS Asset Monitor. • If the LED on one CHARM is not showing a color, replace the CHARM.

Status light – discrete CHARMs

Table 3-7 describes the meaning of the colors and patterns of the two LEDs on the following CHARMs:

- DI 24 V DC Low-Side Sens (dry contact) CHARM
- DO 24 V DC High-Side CHARM

The following figure describes the position of both LEDs.

Figure 3-12: CHARM's LED

A. Red/Green LED
B. Yellow LED

Table 3-7: Meaning of the LED indication – discrete CHARMs

LED color and pattern	Description and corrective action
Green (continuous)	The channel and CHARM status is good and the CHARM is configured.

Table 3-7: Meaning of the LED indication – discrete CHARMs *(continued)*

LED color and pattern	Description and corrective action
Green (flashing twice per second)	The CHARM is not configured. • If the AMS Asset Monitor supervision function displays the **Critical** status for this CHARM, a configuration error, such as a configuration mismatch has occurred. • If the AMS Asset Monitor supervision function displays the **Maintenance** status for the CHARM, the CHARM has not been configured. In this case, configure the CHARM in AMS Asset Monitor Web Interface.
Green (flashing ten times per second)	A user has issued an identify CHARM command from AMS Asset Monitor Web Interface. This is not a fault and no action is required.
Red (continuous)	No communications on the bus or no address. • If this pattern is seen on an individual CHARM, replace the CHARM. • If this pattern is seen on all installed CHARMs within an AMS Asset Monitor, ensure that the correct address plug is installed. • If this pattern is seen on all installed CHARMs within an AMS Asset Monitor, ensure that the AMS Asset Monitor is functioning correctly.
Red (flashing twice per second)	Channel fault. Check wiring and associated field device. If wiring and device are correct, replace the CHARM.
Green then red flashing four times per second	A CHARM fault (such as a bad address or a faulty CHARM bus) exists that does not affect the channel status. • If this pattern is seen on an individual CHARM, replace the CHARM. • If this pattern is seen on all installed CHARMs within an AMS Asset Monitor, ensure that the correct address plug is installed. • If this pattern is seen on all installed CHARMs within an AMS Asset Monitor, ensure that the AMS Asset Monitor is functioning correctly.
Green and red alternating two times per second	The CHARM is being upgraded or is in upgrade mode.
Green then red flashing briefly once every 1.5 seconds (for output CHARMs only)	The AMS Asset Monitor has placed the CHARM in a fault state.
No colors	The CHARM is unpowered or not functioning. • If none of the LEDs on the CHARMs are showing a color, check the power connections. • If none of the LEDs on the CHARMs in an AMS Asset Monitor are showing a color, check the connection to the AMS Asset Monitor. • If the LED on one CHARM is not showing a color, replace the CHARM.

Table 3-7: Meaning of the LED indication – discrete CHARMs *(continued)*

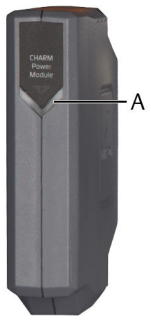
LED color and pattern	Description and corrective action
Yellow	This is the channel state indication: • Yellow (continuous) – The actual input value or the intended output value is **ON**. • Off – The actual input value or the intended output value is **OFF**.

Meaning of LED indication – AM 5730 +24 V DC Power Module

Table 3-8 describes the meaning of the colors and patterns of the LED on the AM 5730.

The following figure describes the position of the bicolored LED.

Figure 3-13: +24 V DC Power Module LED



A. Red and Green LED

Table 3-8: Meaning of the LED indication – +24 V DC Power Module

LED color and pattern	Description and corrective action
Green (continuous)	Power Module active
Red (continuous)	Fault detected • Input voltage is below 21.6 V DC • Input voltage is above 26.4 V DC
No colors	• The +24 V DC Power Module is not supplied. • Hardware error. In that case replace the +24 V DC Power Module.

3.4 Health calculation

The AMS Asset Monitor calculates the health of each configured asset and displays it as a numerical rating. Different analytics such as Alignment, Balance, or Looseness (see Implemented analytics) and configured measurement alerts (see Measurement alerts) are used for the calculation. The analytics or measurement alert with the worst result is used for the health score evaluation of the asset.

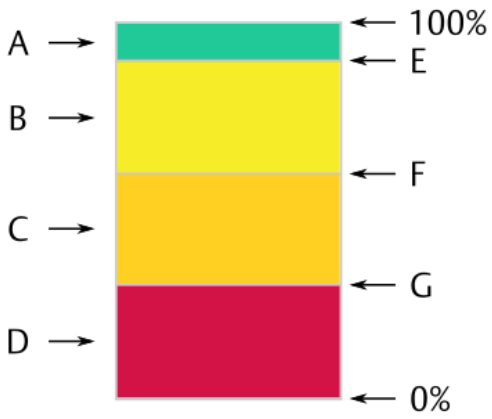
Note
Measurement points with a source with status **Critical** are not available for the analytics calculation. Analytics cannot be calculated if fewer than the required minimum number of measurement points are available for the analytics. See Assets for required measurement points.

The health score is between 0-100, where 0 is completely unhealthy, and 100 is completely healthy.

The AMS Asset Monitor also uses the health score to derive the overall assets status. The health calculation of the asset with the worst result is used for the indication.

Figure 3-14 explains the health score and the different health levels **OK**, **Advice**, **Warning**, and **Critical**.

Figure 3-14: Asset health score



A. *OK ≥90%*
B. *Advice ≥60% and <90%*
C. *Warning ≥30% and <60%*
D. *Critical <30%*
E. *Limit value – Advice (90%)*
F. *Limit value – Warning (60%)*
G. *Limit value – Critical (30%)*

Health calculation cycle

The health of the configured assets is calculated every 60 minutes. Click the refresh button in the analytics display to manually start a health calculation (see Status overview – asset). The health is also calculated when **Save & Close** is clicked in the asset configuration dialog or after a reboot of the AMS Asset Monitor. A manually started health calculation does not affect the 60 minutes cycle.

3.5 Trend data storage

The data visualized by the overall health trend of the assets (see Figure 8-1) and the asset specific health trends (see Figure 8-11) are permanently saved on the AMS Asset Monitor. The data is aggregated depending on the age of the data:

Table 3-9: Data aggregation

Data age	Interval between data points
≤5 minutes	1 second
>5 minutes and ≤1 hour	10 seconds
>1 hour and ≤1 day	5 minutes
>1 day and ≤1 week	30 minutes
>1 week and ≤1 month	2 hours
>1 month and ≤1 year	1 day
>1 year and ≤14 years	1 week

Time stamp

Trend data and alerts are stored together with the current time of the AMS Asset Monitor.

3.6 Basic protection

The AMS Asset Monitor is equipped with basic functions for machine protection. The following signal evaluations for dynamic signals are available:

0-to-Peak The measured value is proportional to the vibration of the supervised asset in 0-to-peak evaluation.

Peak-to-Peak The measured value is proportional to the vibration of the supervised asset in peak-to-peak evaluation.

RMS The measured value is proportional to the vibration of the supervised asset in RMS[3] evaluation.

Equivalent peak (√2 * Velocity RMS) The measured RMS value of the supervised asset is multiplied by √2 to get the Equivalent peak value for the output. This evaluation is available for VI Piezo CHARMs.

PeakVue PeakVue detects impact-like events such as bearing defects. The detected amplitudes can be supervised by user defined alarm limits. This evaluation is available for VI Piezo CHARMs.

All values measured by CHARMs, or imported as a external data points, can be supervised on limit violations. Configure alarm limits in:

- the **Measurement alerts** dialog (see Measurement alerts) of the asset where the CHARM or external data point is used.
- the **Output logics** dialog (see Output logics).

3 *Root Mean Square*

3.7 Predicates and data collections

Predicates

The AMS Asset Monitor is equipped with a logic editor to define predicates to control the execution of data collections and asset health calculations (see Health calculation).

Predicates are based on input signals such as measurement values or logic states. The sources for predicates are:

- Input CHARMs
- External data points
- Assets
- Other predicates (predicate-in-predicate)
- Output logics

Up to 20 predicates with up to 10 different conditions can be defined.

Data collections

The AMS Asset Monitor has a data collection function to send specific waveform data through the AMS Machine Works interface to AMS Machine Works. The data collection is controlled by user defined time intervals and predicates. Up to 12 data collections are supported by AMS Asset Monitor and AMS Machine Works. The data collection contains up to 24 waveforms. Lines of resolution (LOR) and a maximum signal frequency can be configured for each waveform. One vibration and one PeakVue[4] waveform can be collected for each CHARM. The waveform data is sent along with average speed data. The average speed is calculated over the length of time of the collected waveform. CHARM waveforms are not collected if the CHARM is disabled, has an error, or the configuration is deleted. This function requires AMS Machine Works 1.7.5 or higher.

If data is not collected due to an untrue predicate or unstable speed, the AMS Asset Monitor retries to collect data until the predicate becomes true or the speed is stable again and the pending data collection can be executed. See Parameter description – Data collections.

4 *Available for VI Piezo CHARMs with a connected accelerometer.*

4 First steps

This chapter describes the process of connecting to the AMS Asset Monitor for the first time, provides an overview about the web interface, and explains the basic settings required for operating the AMS Asset Monitor.

4.1 Requirements on the configuration device

The AMS Asset Monitor Web Interface running on the AMS Asset Monitor provides the user interface to configure the AMS Asset Monitor and to provide status and health information. AMS Asset Monitor Web Interface runs on desktop and mobile devices with a compatible web browser. Requirements for the first connection:

- PC, laptop, or similar with one free Ethernet port for a direct one-to-one connection to the AMS Asset Monitor
- Ethernet cable (CAT 5 or better)
- Compatible web browser

Table 4-1: Compatible web browser

Web browser	Version
Google Chrome	78.0 or later
Microsoft Edge	79.0 or later
Mozilla Firefox	70 or later
Apple Safari	12.1 or later

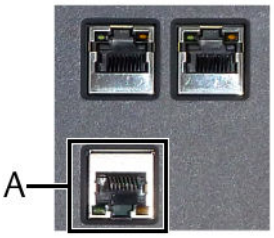
Note
The first step to resolving any browser issues is to bypass the cache and reload the page. Use **Ctrl+F5** on Microsoft Windows PCs, and **Cmd+Shift+R** on Apple Mac.

4.2 Connect to the AMS Asset Monitor

Procedure

1. Ensure that the AMS Asset Monitor is powered by a +24 V DC power supply.
2. Open the AMS Asset Monitor.
   The default configuration interface is the lower sockets of the three RJ-45 sockets. See the AMS Asset Monitor Installation Guide for details.

Figure 4-1: Configuration and data exchange interface



A. RJ-45 Ethernet connector for configuration and to connect to subsequent systems.

3. Connect the configuration device through the Ethernet connection to the AMS Asset Monitor.

Note
The default IP address of the configuration interface is **169.254.153.110**

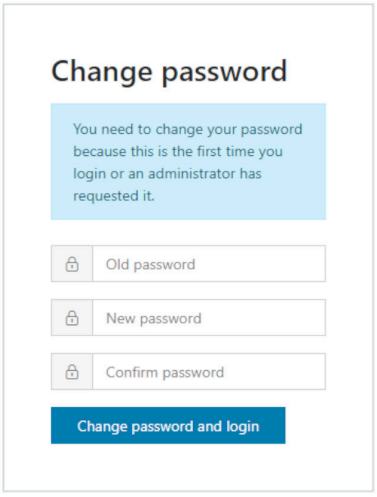
4. Start your web browser and enter the default IP address.
5. Add a certificate to verify the identity of the AMS Asset Monitor Web Interface (optional). See Data and network security.
   The login dialog of the AMS Asset Monitor Web Interface opens.
6. Enter user name and password to log on to the AMS Asset Monitor Web Interface.
   Credentials for the first login:

   User name: **admin**

   Password: **admin**

   At the first login, the dialog to change the password appears. Change the password of the administration account.

Figure 4-2: Change password at login



Depending on the user account settings (see Users), a change of the password at the login could also be necessary.

7. Read and confirm the software license agreement.
   The home screen of the AMS Asset Monitor Web Interface opens.

Note
It is recommended that not more than five browsers simultaneously connect to the AMS Asset Monitor Web Interface.

4.3 Log out from AMS Asset Monitor Web Interface

Procedure

1. To log out from the AMS Asset Monitor Web Interface click the user icon in the upper right corner.
   The user menu opens.
2. Click **Logout**.
   The AMS Asset Monitor Web Interface closes and the login dialog appears.

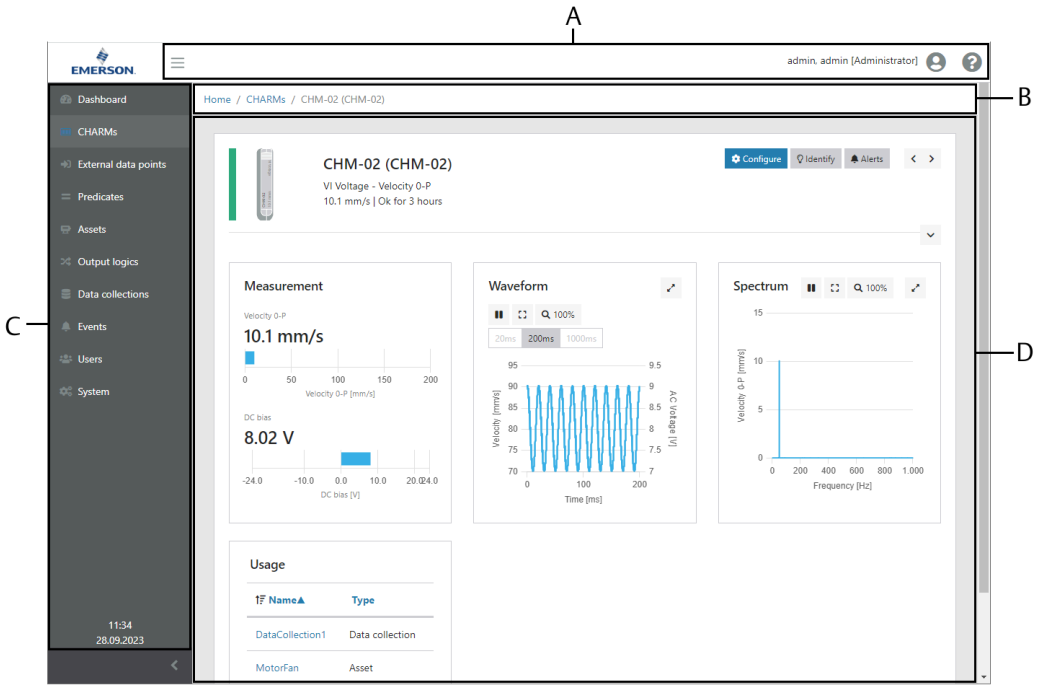
Note
All unsaved changes are lost.

Note
The current user is automatically logged out 30 minutes after the last user action in the AMS Asset Monitor Web Interface.

4.4 AMS Asset Monitor Web Interface – Overview

The AMS Asset Monitor comes with its own web interface called AMS Asset Monitor Web Interface. This section describes the main function of AMS Asset Monitor Web Interface.

Figure 4-3: AMS Asset Monitor Web Interface – Overview



A. Symbol bar
B. Navigation bar
C. Sidebar
D. Content area

Symbol bar

The symbol bar contains several general buttons and displays the name of the current user, and in brackets, the assigned user right level.

Sidebar button	Click the sidebar button ☰ to close or open the Sidebar.
User button	Click the user button to open or close the user menu. See User menu.
Help button	Click the help button to open or close the help menu.
Help	Click **Help** to open the online help.
About AMS Asset Monitor	Click **About AMS Asset Monitor** to display version and license information.

Navigation bar

The navigation bar indicates the location of the currently displayed page. Click the highlighted page names to easily navigate through the hierarchy.

Sidebar

List of all pages. Click a page to open it. The current time and date are displayed below the pages.

Dashboard	Main page of AMS Asset Monitor Web Interface with a general overview containing health and status information: • Assets status • CHARMs status • Device status • Overall assets health trend
CHARMs	Configuration and status overview of the installed CHARMs.
External data points	Configuration of external data points to import data through the Modbus and OPC UA interfaces. The imported data can be used as input for analytics and measurements of an asset.
Predicates	Configuration of predicates to control the execution of certain actions. For example, calculating an asset's health only if the machine is running within a certain speed range.
Assets	Configuration of machine and machine parts to be supervised.
Output Logics	Assignment of asset statuses and measurements to a digital output by using a predefined condition.
Data collections	Configuration of data collection to send specific waveform data, collected based on schedules and optional predicates, for further analysis to AMS Machine Works.
Events	List of events from assets, CHARMs, external data points, predicates, data collections, output logics, system, and cybersecurity related events[5].
Users	Overview of existing users and user administration. Visible for users with administrator rights.
System	Configuration and status overview of the AMS Asset Monitor.

Content area

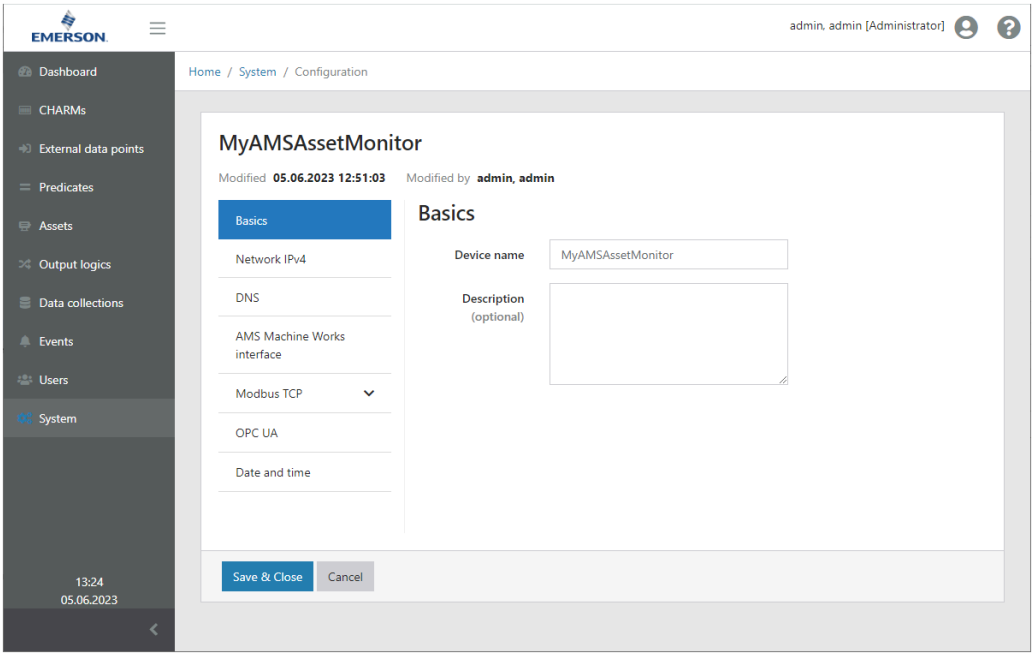
The content of the selected page is displayed in this area.

4.5 Enter basic settings

Enter the basic settings for the operation of the AMS Asset Monitor.

5 *Visible for users with administration right.*

Figure 4-4: System configuration dialog



Procedure

1. Go to **System** and click **Configure**.
   The dialog for the system configuration opens. Different dialogs for the system configuration are available.
2. Go through the dialogs **Basics**, **Network IPv4**, **DNS**, and **Date and time** and complete the fields according to your needs. The dialogs **AMS Machine Works**, **Modbus TCP**, and **OPC UA** can be completed later, for example after the configuration of the external data points.
3. Click **Save & Close** to save the settings on the AMS Asset Monitor or click **Cancel** to discard the entries.
   The changes take effect immediately. Use the new network settings for the connection to the AMS Asset Monitor the next time.

4.5.1 Basics

Enter a name and a description for the AMS Asset Monitor.

Device name Enter a name for the AMS Asset Monitor. The change of the name requires an update of the SSL certificate and can also affect OPC UA, Modbus TCP, and AMS Machine Works connections.

Note
When updating the firmware from version 1.x.x to 2.x.x, a name already configured in version 1.0.0 is moved to **Description** and the serial number of the AMS Asset Monitor is entered instead.

Description Enter a description of the AMS Asset Monitor.

4.5.2 Network IPv4

Enter network settings for the communication with the AMS Asset Monitor.

To avoid connection issues, do not use the IP address ranges listed in Table 4-2, regardless of whether the IP addresses are entered manually or assigned automatically using a DHCP server.

Table 4-2: Excluded IP address ranges

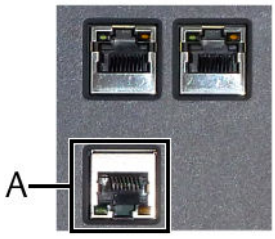
IP address	Subnet mask	Gateway	Comment
10.123.255.0	255.255.255.0	10.123.255.0/24	Internal use
127.0.0.0	255.0.0.0	127.0.0.0/8	Loopback, internal use
169.254.0.0	255.255.0.0	169.254.0.0/16	AUTO-IP range, do not use in production environments, default IP address of the AMS Asset Monitor is 169.254.153.110. Do not use this range for LAN2.

Note
Ensure that the networks of LAN1 and LAN2 do not overlap.

LAN1

These settings are assigned to the lower socket of the three RJ-45 sockets. This 1 Gbit/s interface is the default interface for configuration and data exchange with subsequent systems.

Figure 4-5: Configuration and data exchange interface



A. RJ-45 Ethernet connector for configuration and to connect to subsequent systems.

- Select **Obtain an IP address automatically** to automatically obtain an IP address from a DNS server.
- Select **Use the following IP address** to enter IP address settings manually.
  With this selection, the entry fields for manually entering the IP address are active. The setting for the DNS server and for automatically obtaining the IP address of a NTP server (**Date and time → Obtain an IP address automatically**) is deactivated.

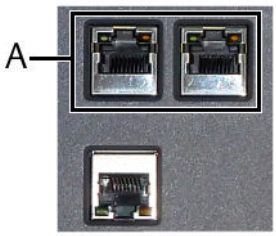
Ask your local network administrator for the required address data.

IP address	Enter the IP address according to the IPv4 standard.
Subnet mask	Enter the subnet mask.
Default gateway	Enter the gateway address. This is an optional entry.

LAN2

These settings are assigned to the two upper sockets of the three RJ-45 sockets. These 100 Mbit/s interfaces are for building up a group of AMS Asset Monitors. Because of the possible network traffic, Emerson recommends to daisy chain no more than eight AMS Asset Monitors.

Figure 4-6: LAN2 interface



A. Ethernet switch with two RJ-45 connectors to daisy chain AMS Asset Monitors.

Enable	Check this box to enable the LAN2 interface. The entry field for entering the IP address becomes active. Ask your local network administrator for the required address data.
IP address	Enter the IP address according to the IPv4 standard.
Subnet mask	Enter the subnet mask.
Default gateway	Enter the gateway address. This is an optional entry.

4.5.3 DNS

The AMS Asset Monitor can use a **D**omain **N**ame **S**ystem (DNS) server to obtain an IP address.

DNS address

- Select **Obtain an IP address automatically** to automatically obtain an IP address from a DNS server. This option is selectable if **Obtain an IP address automatically** is also activated for **Network IPv4 → LAN1**.
- Select **Use the following IP address** to enter the IP address of a DNS server.
  With this selection, the entry field **DNS address** for entering the IP address is active.
  Ask your local network administrator for the required address data.

Domain name	Optionally you can enter a domain name to access the AMS Asset Monitor via the name instead of the IP address. The configured name of the AMS Asset Monitor (**System** → **Configure** → **Basic** → **Name**) defines the sub-domain. Example: The entered **Name** → **MyAssetMonitor** and the entered **Domain name** → **example.com** builds **MyAssetMonitor.example.com**. The change of the domain name requires an update of the SSL certificate and can also affect OPC UA, Modbus TCP, and Data Collector connections.

4.5.4 Date and time

The internal time of the AMS Asset Monitor can manually be set or it can be synchronized with the time provided by a Network Time Protocol (NTP) server to keep the AMS Asset Monitor system's time current. This function requires a permanent connection to a NTP server.

⚠ CAUTION

The proper system time setting is crucial for the operation of the AMS Asset Monitor. Verify the system time and make any necessary time adjustments before continuing with the AMS Asset Monitor configuration.

A significant time adjustment of the AMS Asset Monitor causes the following issues:

- The current user is logged out after the system time is set more than 30 minutes forward or backward compared to the current system setting.
  Log in again.
- Trend data are deleted if the system time of the AMS Asset Monitor is set back for more than 12 hours, regardless of whether the time was changed manually or through a time server. Deletion if the trend data is indicated by the event list entry: System trend reset.

Emerson recommends using the time server synchronization to always ensure a correct AMS Asset Monitor system time setting.

The current date and time of the AMS Asset Monitor (**System time**) is displayed at the top of the configuration page.

Time zone	Select the time zone where the AMS Asset Monitor is installed.
Synchronize with time server	Check this box to activate the automatic synchronization of the system time. Use a reliable NTP server.
Obtain an IP address automatically	Only if **Synchronize with time server** is selected. Select this option to automatically connect to an arbitrary NTP server. This option is selectable if **Obtain an IP address automatically** is also activated for **Network IPv4** → **LAN1**.
Use the following NTP server address	Only if **Synchronization with time server** is selected. Select this option to enter an IP address of a specific NTP server. The assigned entry field for the IP address is enabled.
From local PC/ device	Only if **Synchronization with time server** is not selected. Click **Set date and time now** to synchronize the time of the AMS Asset

	Monitor with the time of the local PC or other device connected to the AMS Asset Monitor.
Manually	Only if **Synchronization with time server** is not selected. Click the entry fields to open the dialogs to select date and time. • Date entry: Use the left and right arrows to select a month then click a day to select it. • Time entry: Use the up and down arrows to enter the time or type it in. Click **Set time and date now** to activate the date and time entry.

The AMS Asset Monitor contains a real time clock with a 48-hour buffer in case of the power supply fails.

5 Data and network security

Emerson recommends working with qualified IT personnel to ensure your installation complies with your plant's network security policy and industry best practices. For detailed information about cybersecurity and AMS Asset Monitor specific cybersecurity see AMS Product Security Documentation (AMS-SEC-PSG-001).

6 Configure the AMS Asset Monitor

There are eight different elements for the configuration of the AMS Asset Monitor:

CHARMs	Configuration of each installed CHARM.
External data points	Configuration of points for the data import through Modbus and OPC UA.
Predicates	Configuration of predicates to control the execution of certain actions such as calculating an asset health only if the machine is running within a certain speed range.
Assets	Entry of basic data and bearing information of the supervised asset, mapping of the available sources to the measurement points, defining of measurement alarms, and selection of health calculations.
Output Logics	Assignment of an asset status to a digital output by using a predefined condition.
Data collections	Configuration of the acquisition of waveform data for sending to AMS Machine Works.
Users	Administration of different users.
System	Configuration of the AMS Asset Monitor – name, description, communication, and time settings.

Note
The system dialogs **Basics**, **Network IPv4**, **DNS**, and **Date and time** are generally configured at the first start of the AMS Asset Monitor. See Enter basic settings.

Prerequisites

- Powered AMS Asset Monitor.
- Connected configuration device (PC or Laptop).
- All CHARMs required for the measuring task are already installed.

  Note
  During the system start the installed CHARMs are automatically recognized by the AMS Asset Monitor.

- Installed address plug.

General sequence for the configuration of the AMS Asset Monitor:

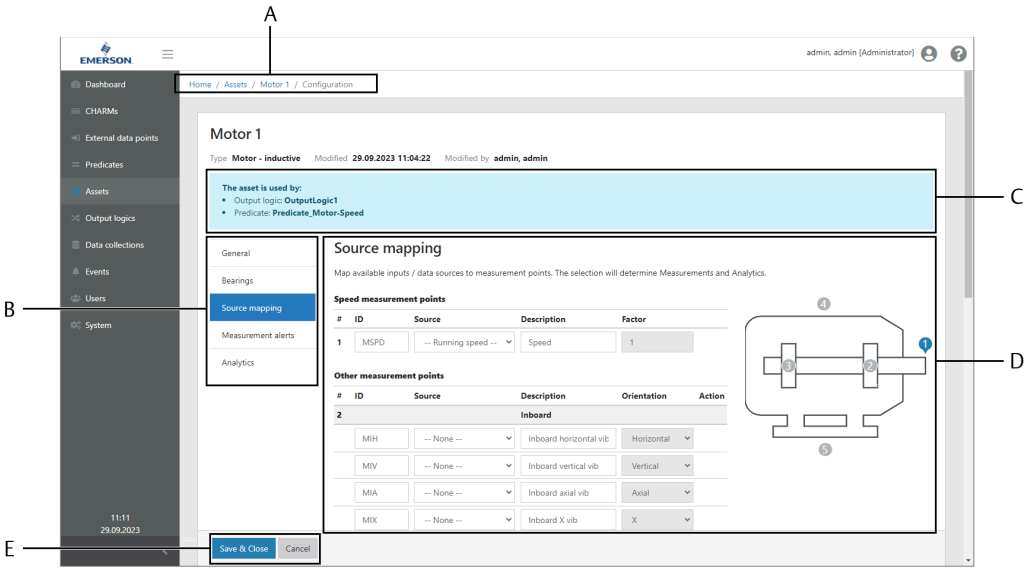
1. System (dialogs **Basics**, **Network IPv4**, **DNS**, and **Date and time**)
2. User
3. CHARMs
4. External data points
5. Predicates

6. System (dialogs **AMS Machine Works**, **OPC UA**, and **Modbus TCP**)
7. Assets
8. Output logics
9. Data collections

6.1 Configuration page overview

The configuration page of each configurable element (CHARMs, External data points, Assets, Output logics, Data collections, and System) is structured in the same way.

Figure 6-1: Structure configuration page



A. Navigation bar
B. Parameter groups (Asset configuration only)
C. Notification area
D. Input area
E. Buttons

Navigation bar

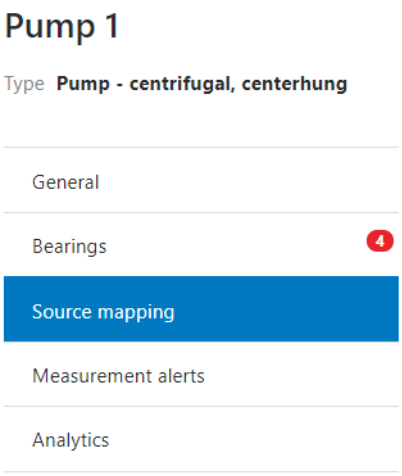
The navigation bar indicates the location of the currently displayed page. Click the highlighted page names to easily navigate backwards through the pages visited before.

Parameter groups

Related parameters of the asset configuration are combined in groups. Select a group to open the parameters in the input area.

Wrong settings within a parameter group are indicated behind the group name with a red dot that displays the number of errors.

Figure 6-2: Configuration error indication – parameter group



Notification area

The notification area shows in which other element the configured element is used.

Example: A configured asset is also used in an output logic configuration and in a predicate. Then the name of the output logic and the name of the predicate are listed in the notification area.

Input area

The input area lists all parameters of a selected parameter group. Enter here the configuration parameters of the selected parameter group.

Required entry fields have red frames if an entry is missing or the entry is out of the permissible range.

Figure 6-3: Configuration error indication – entry fields

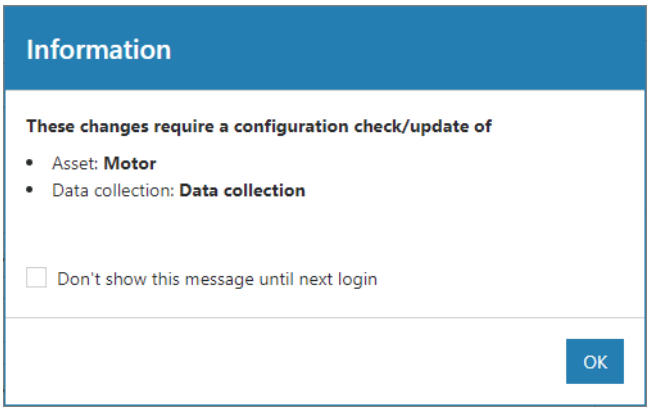
Buttons

Buttons to decline or accept the parameter entries.

A configuration cannot be saved as long as there are entry fields with an error.

An information box, as shown in Figure 6-4, appears when a configuration is to be saved that affects other configuration elements. Click **OK** to continue saving the configuration, then check the listed configuration elements and update them as required.

Figure 6-4: Overview of configuration elements affected by the configuration change



6.2 CHARMs

Recommended procedures – CHARMs describes procedures to create and change a configuration, and to remove or replace a CHARM. Parameter description – CHARMs describes the parameters of all compatible CHARMs.

6.2.1 Recommended procedures – CHARMs

First configuration – CHARMs

Procedure

1. Select **CHARMs** from the sidebar.
2. Open the configuration dialog.
   - In the **Tiles** view, click the gear wheel below the icon of the CHARM to be configured.
   - In the **List** view, click **Configure** in the column **Action** in the row of the CHARM to be configured.
3. Enter configuration parameters in accordance with the task of the CHARM.
4. Click **Save & Close** to send the configuration to the CHARM.

Configuration change – CHARMs

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Procedure

1. Select **CHARMs** from the sidebar.
2. Open the configuration dialog.
   - In the **Tiles** view, click the gear wheel below the icon of the CHARM to be configured. See Tiles view – CHARMs.
   - In the **List** view, click **Configure** in the column **Action** in the row of the CHARM to be configured. See List view – CHARMs.
3. Check the configuration parameters and change them in accordance with your needs.
4. Click **Save & Close** to send the configuration to the CHARM.

Remove or replace a CHARM

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

The configuration of the CHARM is part of the AMS Asset Monitor configuration and assigned to the slot where the CHARM is installed. The configuration is not stored in the CHARM. This has the advantage that the CHARM can be replaced without creating a new configuration. The CHARM type is automatically detected by the AMS Asset Monitor. If the new CHARM is equal to the CHARM installed before in the slot, it starts working with the configuration made for the slot. If another CHARM type is installed in the slot, the system issues a type mismatch message.

See AMS Asset Monitor Installation Manual for how to physically install or remove a CHARM.

Remove a CHARM

Procedure

1. Select **CHARMs** from the sidebar.
2. Open the CHARM overview.
   - In the **Tiles** view, click the CHARM icon.
   - In the **List** view, click the CHARM designation in column **Name** in the row of the respective CHARM.
3. Remove the CHARM from the AMS Asset Monitor.
   The system displays a message that the CHARM is defective or missing. This message contains a button to delete the configuration.
4. Click **Delete configuration** to delete the configuration of the CHARM.
   The configuration is deleted and the slot is prepared for the installation of another CHARM type.

Replace a CHARM with a CHARM of the same type

The replacement of a CHARM with a CHARM of the same type does not require any user action in the AMS Asset Monitor Web Interface. Use the AMS Asset Monitor Web Interface to follow the automatic process.

Procedure

1. Select **CHARMs** from the sidebar.
2. Open the CHARM overview.
   - In the **Tiles** view, click the CHARM icon.
   - In the **List** view, click the CHARM designation in column **Name** in the row of the respective CHARM.
3. Remove the CHARM from the AMS Asset Monitor.
   The system displays a message that the CHARM is defective or missing.
4. Install the new CHARM of the same type.
   The new CHARM is automatically detected by the AMS Asset Monitor and starts working.

Replace a CHARM with another type of CHARM

Procedure

1. Select **CHARMs** from the sidebar.
2. Open the CHARM overview.
   - In the **Tiles** view, click the CHARM icon.
   - In the **List** view, click the CHARM designation in column **Name** in the row of the respective CHARM.
3. Remove the CHARM from the AMS Asset Monitor.
   The system displays a message that the CHARM is defect or missing.
4. Install another CHARM.
   The system issues a type mismatch message. This message contains a button to delete the configuration.
5. Click **Delete configuration** to delete the configuration of the old CHARM.
   The configuration is deleted and the system indicates that the installed CHARM is not configured. This message contains a button to open the configuration page.
6. Click **Configure** and complete the configuration.

6.2.2 Parameter description – CHARMs

Each CHARM has a specific set of parameters to define function and measurement. The CHARM specific parameters of all CHARMs compatible with the AMS Asset Monitor are described in the following chapters. The common parameters are described subsequently.

Note
Signal evaluation and evaluation filters, which are set in the CHARM configuration, do not affect the signal used for calculating the analytics.

The type of the installed CHARM, date and time of the last configuration change, and the name of the user who made the last change to the configuration is displayed at the top of the configuration page.

Common parameters, available for all CHARM types:

Basic

Enabled	Check this box to enable the function of the CHARM.
Name	Enter a name for the CHARM.
Description	Enter a description of the CHARM.
Cabling ID	Enter the identification code of the measurement point.

VI Piezo CHARM

Sensor type

- Select **Velocity** if a piezoelectric sensor is connected that provides a signal proportional to the velocity of the vibration (velocity sensor).
- Select **Acceleration** if a piezoelectric sensor is connected that provides a signal proportional to the acceleration of the vibration (accelerometer).
- Select **Strain** if an IEPE strain sensor is connected.

Unit

Select a unit according to the technical data of the connected sensor from the drop-down list. The available options depend on the selected sensor type. It is not necessary that the unit aligns to the selected system of units configured for the logged in user. The unit is automatically converted to the user's system of units for the following parameters.

Evaluation

Select the required signal evaluation from the drop-down list. Which evaluations are available depend on the selected sensor type. The VI Piezo CHARM has an integrated signal integration function. If an accelerometer is connected, acceleration and velocity evaluations can be selected. With a velocity sensor, velocity and displacement evaluations can be selected. The signal of a strain sensor cannot be integrated.

Table 6-1: Selectable evaluations

Accelerometer		Velocity sensor		Strain sensor
Integration not active	**Integration active**	**Integration not active**	**Integration active**	**No integration**
Acceleration 0-P + PeakVue	Velocity 0-P + PeakVue	Velocity 0-P	Displacement 0-P	Strain 0-P
Acceleration P-P + PeakVue	Velocity P-P + PeakVue	Velocity P-P	Displacement P-P	Strain P-P
RMS[1] Acceleration + PeakVue	RMS[1] Velocity + PeakVue	RMS[1] Velocity	RMS[1] Displacement	Strain RMS[1]

1 Root Mean Square

Signal level determination

The zero-peak and peak-peak signal evaluation of the VI Piezo CHARM is formed from the waveform in the time domain. The waveform is searched for minimum and maximum and the largest of the absolute values of minimum and maximum is the zero-peak value and the sum of the absolute minimum and maximum is the peak-peak value. The equivalent peak is calculated form the RMS values of the waveform (see Equivalent peak (√2*Velocity RMS)).

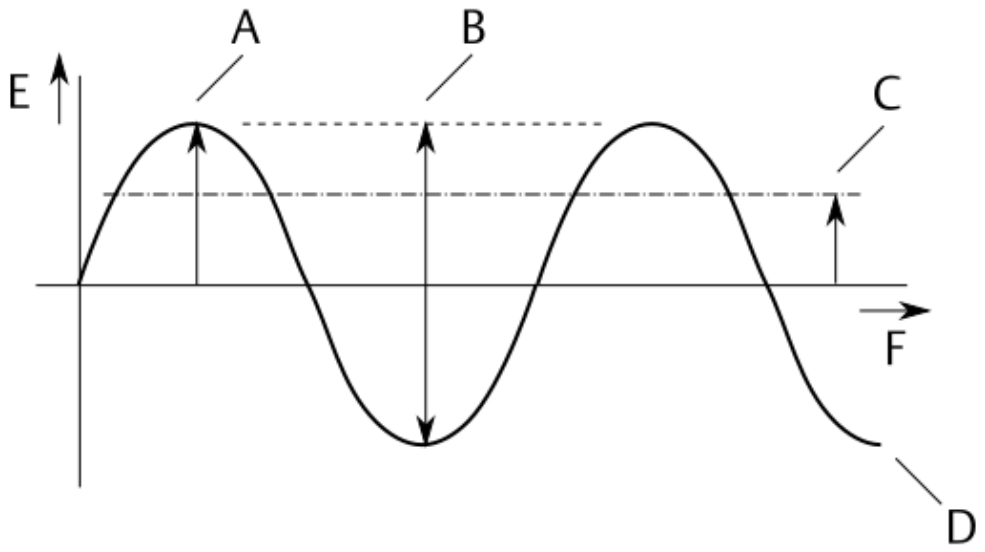
Note
Signal evaluation and evaluation filters, which are set in the CHARM configuration, do not affect the signal used for calculating the analytics.

PeakVue

PeakVue (Peak Values) is a method to detect impact-like events such as bearing defects. This function can be used if **Sensor type** → **Acceleration** is selected.

Use this evaluation in combination with diagnose calculations for bearings to detect bearing faults.

Figure 6-5: Signal evaluation explanation



A. *0-P: zero-to-peak evaluation.*
B. *P-P: peak-to-peak evaluation*
C. *RMS: Root Mean Square evaluation*
D. *Sensor signal*
E. *Voltage*
F. *Time*

Equivalent peak (√2*Velocity RMS)	Check this box to enable the equivalent peak calculation. This function is available for signals from accelerometers with signal evaluation **Velocity 0-P + PeakVue** and from velocity sensors with signal evaluation **Velocity 0-P**. With selected evaluations based on a

connected accelerometer the PeakVue value is also displayed in the CHARM's status overview and available through the OPC UA interface. The RMS value is multiplied by √2 to get the **Equivalent peak** value for the output. An active equivalent peak calculation is indicated in the CHARM's status view (see Measurement displays).

Sensitivity Enter the sensitivity of the connected piezoelectric sensor or strain sensor.

Evaluation filter Select a bandpass filter according to your measurement application. See Table 6-2 for some example settings.

Table 6-2: Example filter settings

Standard/Application	Evaluation	Filter range
ISO 20816	Velocity RMS	2 to 1000 Hz or 10 to 1000 Hz
API 670	Velocity RMS	10 to 1000 Hz or 5 to 1000 Hz for assets with speed <750 rpm
	Acceleration 0-to-Peak	10 to 5000 Hz
Low speed applications such as hydropower plant	Velocity RMS	1 to 600 Hz or 0.3 to 200 Hz

PeakVue filter Select a high pass filter or a bandpass filter for the PeakVue evaluation. See Table 6-3 for some example settings depending on the asset speed when using antifriction bearings.

Table 6-3: Example filter settings

Speed	Filter
<100 rpm	50 Hz (high-pass) optionally 20 to 150 Hz (band-pass) or 50 to 300 Hz (band-pass)
100 to 700 rpm	500 Hz (high-pass)
700 to 1500 rpm	1000 Hz (high-pass)
1500 to 3000 rpm	1000 Hz (high-pass) or 2000 Hz (high-pass)
3000 to 4000 rpm	2000 Hz (high-pass) or 5000 Hz (high-pass)[1]
>4000 rpm	5000 Hz (high-pass)[1]

1 *When a 5000 Hz high pass filter is selected ensure that the accelerometer uses a stud-mount to avoid high frequency damping.*

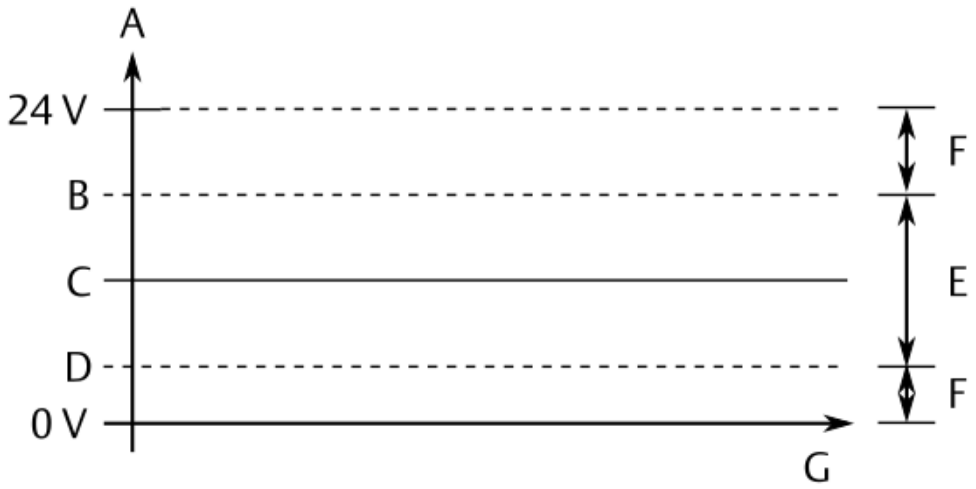
Note
The selected **Evaluation filter** and **PeakVue filter** are used for the CHARM's internal signal processing. The resulting measurement values are used for the measurement alert function (see Measurement alerts) and are shown in the CHARM's status view. These filters have no influence on the signals used to calculate the analytics.

Current supply Check this box to enable the current supply of the CHARM. Enter a current in accordance with the sensor documentation to supply the sensor.

DC bias voltage range Enter a lower limit value and an upper limit value to define a DC bias range for the CHARM supervision. See technical data of the connected sensor for the typical bias voltage. The CHARM's supervision function indicates a **not OK** status if the DC part of the input voltage is out of the defined **OK** range.

If the input voltage returns to the **OK** range the **not OK** status is reset.

Figure 6-6: DC bias voltage range – example



A. DC voltage range
B. Upper limit value
C. Bias (DC offset)
D. Lower limit value
*E. Input signal **OK** range*
*F. Input signal **not OK** range*
G. Time

Measurement range (±) Enter a limit value to define a ± **OK** range for the CHARM supervision. See technical data of the connected sensor for the measurement range. The CHARM's supervision function indicates a **not OK** status if the measurement value is out of the defined **OK** range.

	If the measurement value returns to the **OK** range the **not OK** status is reset.
Evaluation display range	Enter a lower limit value and an upper limit value to define a range for displaying the measured value.
PeakVue display range	Enter a lower limit value and an upper limit value to define a range for displaying the PeakVue value. This range is available for accelerometers.

VI Tach CHARM

Requirements and information

An input signal with a minimum signal amplitude of 2.0 V peak-to-peak is required for a reliable speed measurement. Ensure that the sensor used for the speed measurement is adjusted so that the signal amplitude is always higher than the minimum required signal amplitude.

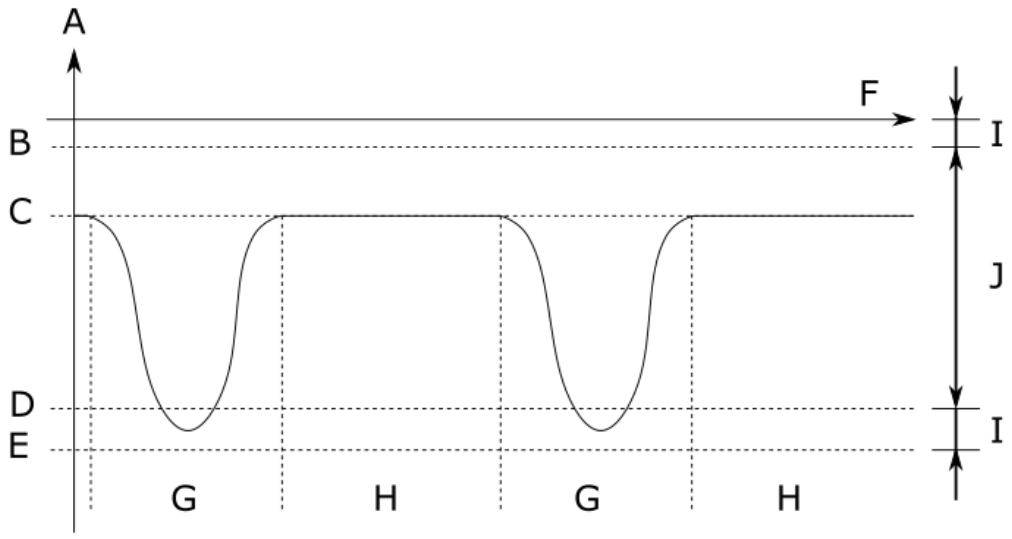
The key-signal is always generated based on one rotation, regardless of the setting for **Measurement mode**. Even if a partial gear measuring mode such as **Standard** or **Standard + stabilization (max. speed < 720; increased update time)** is used for the speed measurement.

Parameter description

Sensor type	• Select **Hall effect** if a Hall-effect sensor is connected. The maximum permissible input voltage range is 0 to + 24 V. • Select **Passive magnetic pickup** if a variable reluctance sensor (magnetic pickup) is connected. The maximum permissible input voltage range is 85 V peak-to-peak (30.3 V AC). • Select **Proximity probe + converter** if an eddy current measuring chain is connected. The maximum permissible input voltage range is 0 to -24 V.
Voltage limits	This entry field is available if **Sensor type → Proximity probe + converter** is selected. Enter a lower limit value and an upper limit value to define a signal range for the sensor supervision. The CHARM's supervision function indicates a **Not OK** status if the input voltage is out of the defined **OK** range. If the input voltage returns to the **OK** range the **Not OK** status is reset.

Note
If no sensor is connected to the VI Tach CHARM or there is a sensor cable break, the status overview indicates an open-circuit voltage in the range of +12 V to +17 V. The open-circuit voltage is caused by the sensing current of approximately 240 µA, required for the open sensor circuit detection of Hall-effect and passive magnetic sensors. This behavior is independent of the configured sensor type.

Figure 6-7: Input signal with supervision limits



A. Input voltage
B. Upper limit value
C. Sensor adjustment voltage
D. Lower limit value
E. Maximum output voltage
F. Time
G. Tooth gap
H. Tooth
*I. Input signal **Not OK** range*
*J. Input signal **OK** range*

Wheel type

- Select **One tooth** if the sensor measures at a key-mark on the shaft or at a trigger wheel with one tooth.
- Select **Multi tooth** if the sensor measures at a trigger wheel with more than one tooth.

Number of teeth

This entry field is available if **Wheel type** → **Multi tooth** is selected. Enter the number of teeth of the multi-tooth wheel on which the sensor is mounted.

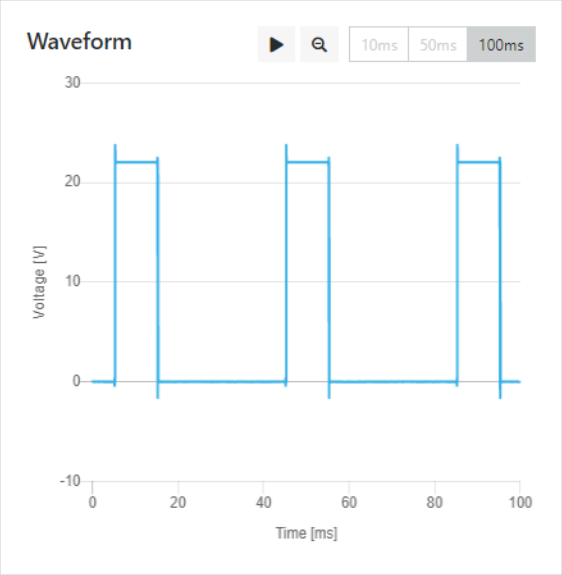
Symmetry

Enter the pulse to pause ratio of the input signal. Use the trend display **Waveform** in the status overview of the VI Tach CHARM (see VI Voltage CHARM and VI Piezo CHARM) to calculate the symmetry based on the input signal.

1. Use the time scaling buttons to adjust the view of the waveform so that at least one period of the input signal is

visible. Click the pause button to stop the continuous writing of the trend. Example with a signal of a Hall-effect sensor connected to the VI Tach CHARM:

Figure 6-8: Waveform of the input signal



2. Move the cursor over the waveform. The signal voltage and the time in milliseconds are displayed at the cursor position. Note down the time of one period. Example:

Figure 6-9: Beginning of the period (Point 1)

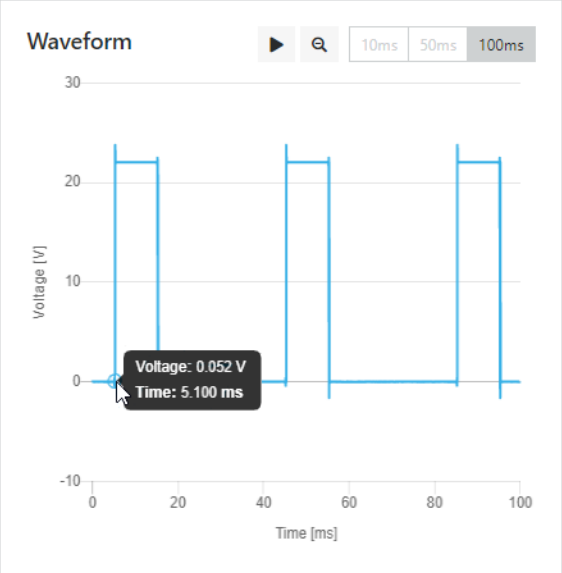


Figure 6-10: End of the period (Point 2)

The time of one period is the time at end of the period (Point 2) minus the time at the beginning of the period (Point 1).

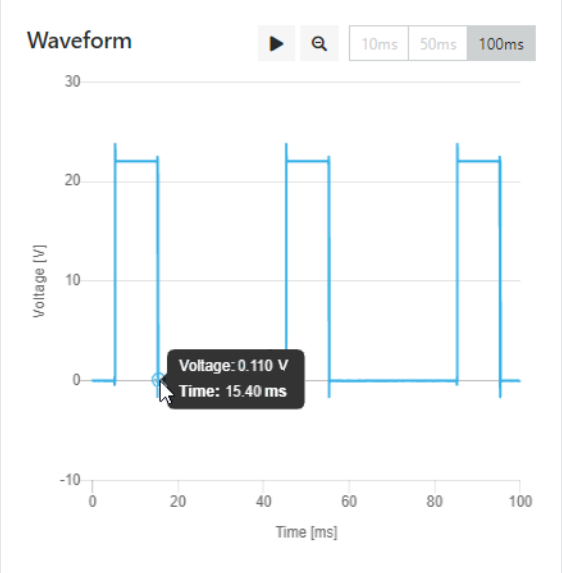
Time of one period = Point 2 - Point 1

Example:

45.1 ms - 5.1 ms = 40.0 ms

3. Note down the time of the period portion which is smaller than or equal to 50%.

Figure 6-11: End of the period portion smaller than or equal to 50% (Point 3)



The time of one period portion smaller than or equal to 50% is the time at end of the period (Point 3) minus the time at the beginning of the period (Point 1).
Time of the period portion $_{<50\%}$ = Point 3 - Point 1
Example:
15.4 ms - 5.1 ms = 10.3 ms

4. Calculate the symmetry.
   Symmetry = Period portion$_{<50\%}$ * 100% / Period
   Example:
   Symmetry = 10.3 ms * 100% / 40 ms = 25.75 %
   Discard the digits to the right of the decimal place to get an integer value, for example, 25.75% becomes 25%. Only integer values can be entered.
5. Enter the calculated symmetry.

AMS Asset Monitor Web Interface checks the entries of the parameters **Number of teeth**, **Symmetry**, and **Maximum speed** for plausibility. The entry fields are red framed if the entries do not meet the minimum requirements of the VI Tach CHARM. In this case select another wheel as a source for the measurement.

Measurement mode

This entry field is available if **Wheel type** → **Multi tooth** is selected. Select a measurement mode suitable to your machine.

- **Standard**
  This mode is suitable for most machines. The speed value is refreshed every 104 to 216 ms, regardless of the entered

maximum machine speed (**Maximum speed**). A disadvantage of this mode is that the indication of the speed can be more unstable. This is caused by measuring results varying during a rotation because of shaft vibrations and mechanical deviations of tooth gaps and sizes.

- **Standard + stabilization (max. speed < 720; increased update time)**
  This mode is like **Standard** but uses higher refresh rates at maximum machine speeds (**Maximum speed**) below 720 rpm to increase stability of the speed value.
- **On full rotations (eliminates speed invariance within one rotation)**
  Select this mode if the machine, on which the speed is measured, has high vibrations. The speed value is refreshed after every rotation.

Maximum speed

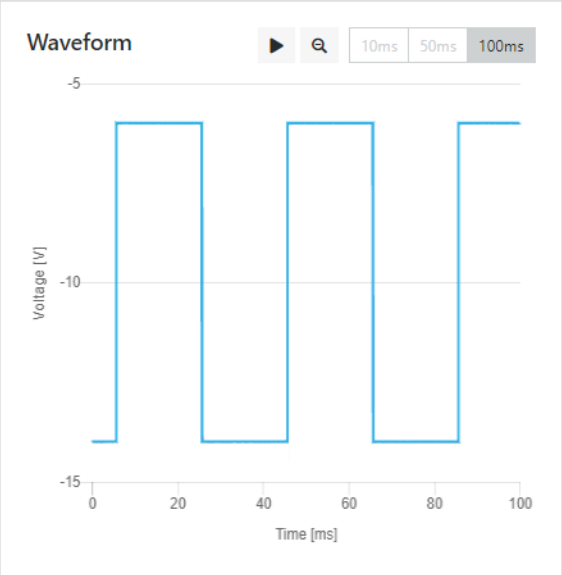
Enter the maximum speed of the machine.

Trigger threshold limits

Enter the upper and lower trigger threshold limit for the detection of the signal pulses. The limits must be within the peak-to-peak signal. Use the trend display **Waveform** in the status overview of the VI Tach CHARM (see Status overview – CHARM) to define the trigger threshold limits based on the input signal.

1. Use the time scaling buttons to adjust the view of the waveform so that at least one period of the input signal is visible. Click the pause button ⏸ to stop the continuous writing of the trend. Example with a signal including DC level of an eddy current measuring chain (Converter) connected to the VI Tach CHARM:

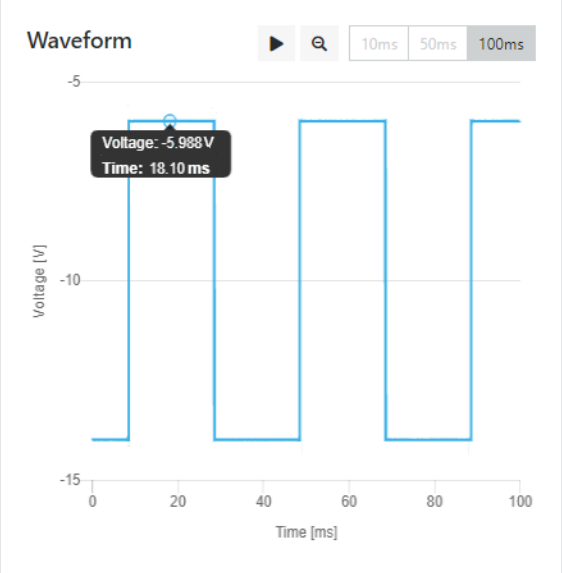
Figure 6-12: Waveform of a negative input signal



2. Move the cursor over the waveform. The signal voltage and the time in milliseconds are displayed at the cursor position. Note down the voltage. There are two cases positive and negative voltage ranges:
   - For voltage waveforms in the positive range, note down the lowest point. This voltage is also the DC level if using sensors that generate a signal with a DC level.
   - For voltage waveforms in the negative range, note down the highest point.

   Example:

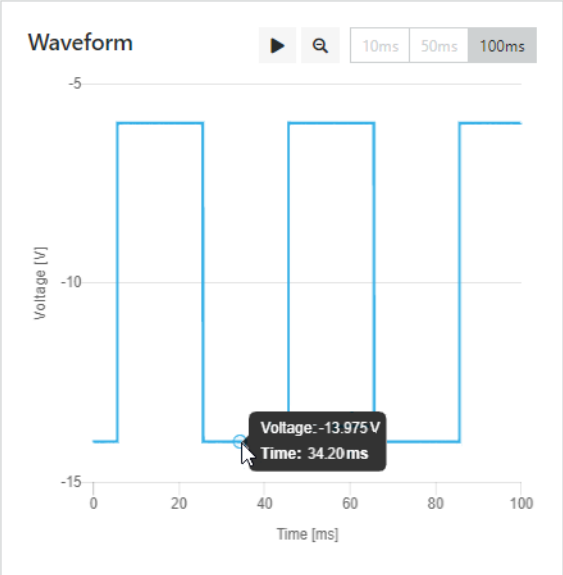
Figure 6-13: Upper voltage and DC level of a negative input signal



3. Move the cursor over the waveform. Note down the voltage. There are two cases positive and negative voltage ranges:
   - For voltage waveforms in the positive range, note down the highest point.
   - For voltage waveforms in the negative range, note down the lowest point.

   Example:

Figure 6-14: Lower voltage of a negative input signal



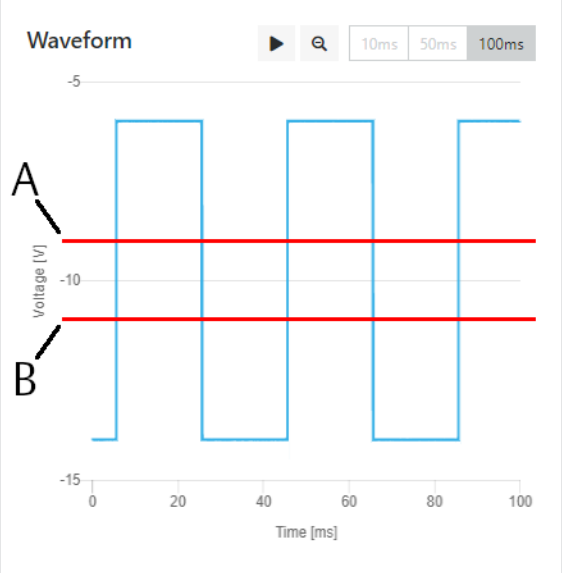
4. Determine the signal amplitude (peak-to-peak voltage).
   Positive input signal: $U_{Amplitude}$ = Lower voltage - Upper Voltage
   Negative input signal: $U_{Amplitude}$ = |Upper voltage| - |Lower Voltage|
   Example for a negative sensor signal:
   $U_{Amplitude}$ = |-14.0 V| - |-6.0 V| = 8 V peak-to-peak
5. Calculate the trigger threshold limits. Select a formula from the table. Experience has shown that values 3/8 and 5/8 of the signal amplitude provide suitable trigger threshold limits.

Table 6-4: Formulas based on the input signal for calculating trigger level thresholds

Formula	Use case
LTT = (-5*$U_{Amplitude}$/8)+$U_{DC\ Level}$	Use these formulas if the sensor signal is negative and contains a DC level. Such as a signal from an eddy current measuring chain.
UTT = (-3*$U_{Amplitude}$/8)+$U_{DC\ Level}$	
LTT = 3*$U_{Amplitude}$/8	Use these formulas if the sensor signal is positive and does not contain a DC level. Such as a signal from a Hall-effect sensor or a magnetic pickup (MPU).
UTT = 5*$U_{Amplitude}$/8	
LTT = (3*$U_{Amplitude}$/8)+$U_{DC\ Level}$	Use these formulas if the sensor signal is positive and contains a DC level. Such as a signal from a Hall-effect sensor with DC offset.
UTT = 5*$U_{Amplitude}$/8+$U_{DC\ Level}$	

LTT: Lower trigger threshold limit
UTT: Upper trigger threshold limit
$U_{Amplitude}$: Amplitude of the input signal (peak-to-peak)
$U_{DC\ Level}$: DC offset, such as the sensor adjustment level over a tooth if using an eddy current measuring chain.
Example for a negative sensor signal:
LTT = (-5 * 8 V / 8) + (-6 V) = -11 V
UTT = (-3 * 8 V / 8) + (-6 V) = - 9 V

Figure 6-15: Example: trigger threshold limits



A. Upper trigger threshold limit: - 9 V
B. Lower trigger threshold limit: - 11 V

6. Enter the calculated trigger threshold limits.

Zero speed detection time Enter a time for the zero speed detection. The entered time must elapse after the last detected pulse at the signal input before zero speed is indicated. The entered time must be longer than the time between two detected pulses with the machine running. The zero speed indication is reset as soon as the next pulse is detected at the signal input.

Display range Enter a lower limit value and an upper limit value to define a range for displaying the measured value.

VI Voltage CHARM

Functionality Select the function of the CHARM.

- **Dynamic measurement**

The AC component of the voltage input signal is evaluated based on the selected dynamic measurement types.

- **Static measurement**

  The DC component of the voltage input signal is evaluated based on the selected static measurement types.

Measurement type

Select a measuring type according to the connected signal source. The connected signal source must meet the electrical input requirements of the VI Voltage CHARM.

Dynamic measurement:

- Select **Displacement** if an AC voltage signal source is connected that provides a signal proportional to a dynamic displacement value.
- Select **Velocity** if an AC voltage signal source is connected that provides a signal proportional to a velocity value.
- Select **Voltage** if a signal source is connected that provides a signal proportional to an AC input voltage.

Static measurement:

- Select **Displacement** if a DC voltage signal source is connected that provides a signal proportional to a static displacement value.
- Select **Pressure** if a DC voltage signal source is connected that provides a signal proportional to a pressure value.
- Select **Proportion** if a DC signal source is connected that provides a proportion.
- Select **Temperature** if a DC signal source is connected that provides a signal proportional to a temperature value.

Source unit

Select a unit according to the technical data of the connected signal source. The available options depend on the selected measurement type. It is not necessary that the unit aligns to the selected system of units configured for the logged in user. The unit is automatically converted to the user's system of units for the following parameters.

Evaluation

Available if **Functionality** → **Dynamic measurement** is selected.

Select the required signal evaluation from the drop-down list. Which evaluations are available depend on the selected measurement type.

Table 6-5: Selectable evaluations

Displacement	Velocity	Voltage
Displacement 0-P	Velocity 0-P	Voltage 0-P
Displacement P-P	Velocity P-P	Voltage P-P
Displacement RMS	Velocity RMS	Voltage RMS

Signal level determination

The zero-peak and peak-peak signal evaluation of the VI Voltage CHARM is formed from the waveform in the time domain. The waveform is searched for minimum and maximum and the largest of the absolute values of minimum and maximum is the zero-peak value and the sum of the absolute minimum and maximum is the peak-peak value.

Note
Signal evaluation and evaluation filters, which are set in the CHARM configuration, do not affect the signal used for calculating the analytics.

Sensitivity

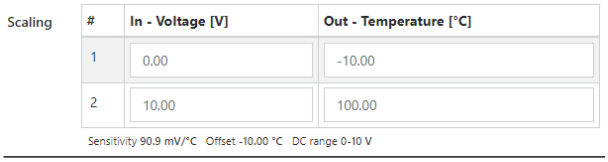
Available if **Functionality** → **Dynamic measurement** is selected.

Enter the sensitivity of the connected signal source.

Scaling

Enter an input voltage range and an output value range for the measurement type to assign input voltages to output values. See Figure 6-16. Sensitivity, output signal offset, and DC voltage range resulting from the entries are shown below the scaling table.

Figure 6-16: Signal scaling



The entered input voltage range is used for signal supervision. If the input signal is out of the defined range, a sensor error message is issued. The error message is withdrawn as soon as the voltage is back in the defined voltage range.

Evaluation filter

Select a bandpass filter according to your measurement application. The evaluation filter is fixed to **1 Hz (low-pass)** if **Functionality** → **Static measurement** is selected.

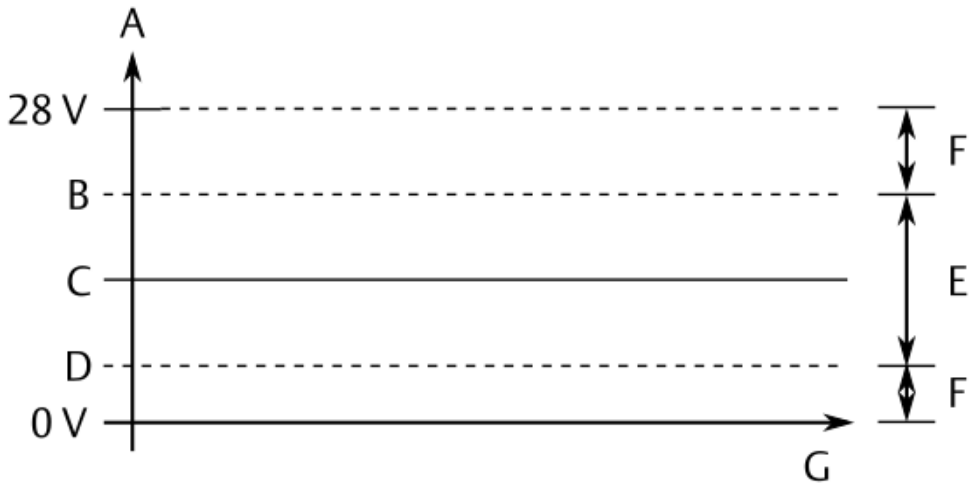
DC voltage range

Available if **Functionality** → **Dynamic measurement** is selected.

Enter a lower limit value and an upper limit value to define a DC bias range for the CHARM supervision. See technical data of the connected signal source for the typical bias voltage. The CHARM's supervision function indicate a **not OK** status if the DC part of the input voltage is out of the defined **OK** range.

If the input voltage returns to the **OK** range the **not OK** status is reset.

Figure 6-17: DC voltage range – example



A. DC voltage range
B. Upper limit value
C. Bias (DC offset)
D. Lower limit value
*E. Input signal **OK** range*
*F. Input signal **not OK** range*
G. Time

Measurement range (±)	Available if **Functionality** → **Dynamic measurement** is selected. Enter a limit value to define a ± **OK** range for the CHARM supervision. See technical data of the connected signal source for the measurement range. The CHARM's supervision function indicates a **not OK** status if the measurement values is out of the defined **OK** range. If the measurement value returns to the **OK** range the **not OK** status is reset.
Evaluation display range	Enter a lower limit value and an upper limit value to define a range for displaying the measured value.

RTD CHARM

Functionality	Select the type of the connected RTD temperature sensor from the drop-down list. • Resistance RTD Input • User defined RTD Input If the connected RTD sensor is not listed use this option to define the sensor. Parameters for entering temperature range and coefficients appears if this functionality is selected.

- Pt 100 RTD Input
  Platinum temperature sensor, 0°C at 100 Ω
- Pt 200 RTD Input
  Platinum temperature sensor, 0°C at 200 Ω
- Pt 500 RTD Input
  Platinum temperature sensor, 0°C at 500 Ω
- Pt 1000 RTD Input
  Platinum temperature sensor, 0°C at 1000 Ω
- Ni 100 RTD Input
  Nickel temperature sensor, 0°C at 100 Ω
- Ni 120 RTD Input
  Nickel temperature sensor, 0°C at 120 Ω
- Ni 200 RTD Input
  Nickel temperature sensor, 0°C at 200 Ω
- Ni 500 RTD Input
  Nickel temperature sensor, 0°C at 500 Ω
- Ni 1000 RTD Input
  Nickel temperature sensor, 0°C at 1000 Ω
- CU 10 RTD Input
  Copper temperature sensor, 0°C at 10 Ω

Number of wires Select the number of wires according to the sensor connection.

- 2 Wire
- 3 Wire
- 4 Wire

Compensation Only if **Number of wires → 2 Wire** is selected.

Enter the resistance of the length of the wires in ohms to compensate a temperature offset caused by the two wire connection of the sensor.

Antialiasing filter Select a period of time from the drop-down list according to your measurement application or select **Disabled** to disable the filter.

The signal filtering is made within the CHARM. Select a short period of control for highly dynamic input signals where signal peaks must also be detected. Use shorter periods of control for critical measurements to ensure that no signal parts are missed. For slow changing input signals, or to avoid detection of signal peaks, select a longer period of control.

Temperature range Only if **Functionality → User defined RTD Input** is selected.

Enter the lower temperature of the temperature range in the left input field and the upper temperature of the temperature range in the right input field.

Alpha coefficient Only if **Functionality** → **User defined RTD Input** is selected.

Enter the alpha coefficient. See documentation provided with your RTD sensor for the coefficient.

Beta coefficient Only if **Functionality** → **User defined RTD Input** is selected.

Enter the beta coefficient. See documentation provided with your RTD sensor for the coefficient.

Delta coefficient Only if **Functionality** → **User defined RTD Input** is selected.

Enter the delta coefficient. See documentation provided with your RTD sensor for the coefficient.

Display range Enter a lower limit value and an upper limit value to define a range for displaying the measured temperature.

TC CHARM

Functionality Select the type of the connected thermocouple temperature sensor or voltage input range from the drop-down list.

- Uncharacterized Thermocouple Input
  The absolute value of the voltage at the screw terminals is measured. The voltage is uncompensated for temperature.
  Operating range: ±100 mV
- Type B Thermocouple Input
  Material: Platinum-Rhodium (Pt30Rh) - Platinum-Rhodium (Pt6Rh)
  Operating range: 250 to 1820°C
- Type E Thermocouple Input
  Material: Nickel-Chromium – Copper-Nickel
  Operating range: -200 to 1000°C
- Type J Thermocouple Input
  Material: Iron – Copper-Nickel
  Operating range: -210 to 1200°C
- Type K Thermocouple Input
  Material: Nickel-Chromium – Nickel-Aluminum
  Operating range: -200 to 1372°C
- Type N Thermocouple Input
  Material: Nickel-Chromium-Silicon – Nickel-Silicon
  Operating range: -200 to 1300°C
- Type R Thermocouple Input
  Platinum-Rhodium (Pt12Rh) – Platinum (Pt)
  Operating range: -50 to 1768°C
- Type S Thermocouple Input
  Material: Platinum-Rhodium (Pt10Rh) – Platinum (Pt)
  Operating range: -50 to 1768°C

- Type T Thermocouple Input
  Material: Copper – Copper-Nickel
  Operating range: -200 to 400°C
- 20 Millivolt Input
  Operating range: ±20 mV
- 50 Millivolt Input
  Operating range: ±50 mV
- 100 Millivolt Input
  Operating range: ±100 mV

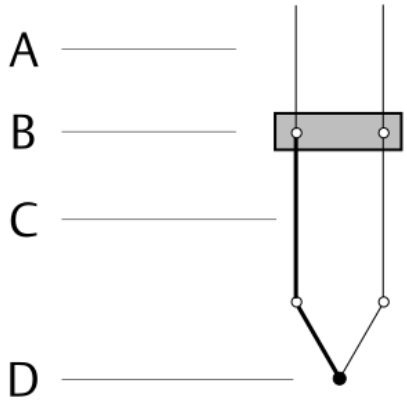
Cold junction temperature source

Select a source for the cold junction compensation.

A thermocouple temperature sensor consists of two different materials welded together. The weld point is called **Hot junction** (tip of the thermocouple). A second point where two different materials are connected together is the terminal block – connection of the thermocouple wires to copper of the clamps. This point is called **Cold junction**. A voltage – a thermoelectric voltage – is generated if there is a temperature difference between the hot junction point and the colt junction point. To measure the temperature at the hot junction (tip of the thermocouple) the colt junction temperature must be known. This procedure is called **Cold junction compensation**. The AMS Asset Monitor provides two options for the cold junction compensation:

- **Local Compensation**, measurement of the cold junction temperature with the RTD temperature sensor integrated into the Thermocouple/mV Terminal Block.
- **CHMx-yy** (x: number of the address plug, yy: slot number), measurement of the cold junction temperature with a RTD CHARM. The temperature sensor connected to this CHARM must be installed close to the cold junction of the TC measurement. All installed RTD CHARMs are listed.

Figure 6-18: Thermocouple – simplified diagram



A. Regular copper wires
B. Terminal block, cold junction temperature T_0
C. Compensation wires (same material as the connected thermocouple)
D. Thermocouple, hot junction temperature T_1

Compensation	Use this parameter to add an offset (positive or negative) to the measured temperature. This might be necessary if the temperature of interest cannot be measured directly, but the temperature difference between the required measuring point and the actual measuring point is fixed and known. Enter this temperature difference here.
Antialiasing filter	Select a period of time from the drop-down list according to your measurement application or select **Disabled** to disable the filter. The signal filtering is made within the CHARM. Select a short period of control for highly dynamic input signals where also signal peaks must be detected. Use shorter periods of control for critical measurements to ensure that no signal parts are missed. For slow changing input signals, or to avoid detection of signal peaks, select a longer period of control.
Display range	Enter a lower limit value and an upper limit value to define a range for displaying the measured temperature.

24 V DO CHARM

Functionality Select the function of the CHARM.

- **Discrete Output**

  The CHARM drives the output to a discrete value written by the AMS Asset Monitor and holds the output at that value. The output immediately reflects the output value that was received. Upon receiving a configuration that indicates a change from one type of output to another, the output switches to the **OFF** state.

- **Momentary Output**
  The CHARM produces a momentary pulse by driving the output active for a specific time period each time the AMS Asset Monitor writes a value of **TRUE (1, ON)**. Upon receiving a new pulse value, the existing pulse is allowed to terminate normally before the new value is written. Upon receiving a configuration that indicates a change from one type of output to another, the output switches to the **OFF** state.
- **Continuous Pulse Output**
  The CHARM produces a continuous pulse by driving the channel output value **ON** for a percentage of the specified time period. Upon receiving a new on-time value (which is a percent of the pulse period), the output of the channel stays **ON** for that amount of time and goes to the **OFF** state for the remainder of the pulse period. At that time the channel receives a new on-time value from the module.

Failure action mode
Controls the behavior of the channel when the CHARM goes into failure action condition due to lost communication with the system's controller. Select an option:

- **Hold last value**
  The channel holds the value at the start of the failure action condition.
- **Go to configured failure action value**
  The channel uses the configured failure action value (see **Failure action value**).

Failure action value
Select the Boolean value the channel goes to when the CHARM goes into failure action condition. This value is used only if **Failure action mode Go to configured failure action value** is selected.

- **OFF (0)**
- **ON (1)**

On time
Only if **Functionality** → **Momentary** or **Continuous Pulse Output** is selected.

- **Momentary**: Enter the length of time (in milliseconds) that the output is turned on when the CHARM's input value changes from 0 to 1.
- **Continuous Pulse Output**: Enter the length of time (in milliseconds) that the output is turned on.

Initial on time
Only if **Functionality** → **Continuous Pulse Output** is selected.

Enter the percentage of the pulse period (see **Pulse period**) the channel is **ON** during initial download before any system actions. Set **Initial on time** to zero for no pulse.

Pulse period
Only if **Functionality** → **Continuous Pulse Output** is selected.

Enter the length of time between pulses of the channel, from 2 to 200 milliseconds. The pulse period consists of output channel being **ON** for a portion of the period (based on the configured **On time** value) and **OFF** for the remainder of the period.

Initial value

Only if **Functionality** → **Discrete Output** is selected.
Select the Boolean value the channel goes to upon initial download before any AMS Asset Monitor action.

- **OFF (0)**
- **ON (1)**

Line fault detection

Check this box to enable the CHARM to detect an open or shorted circuit. Once per second the current output state is changed for testing. The test time does not exceed 200 µs (microsecond).

- Output state **ON**: The output is turned **OFF** and tested. The **OFF** time does not exceed 200 µs.
- Output state **OFF**: The output is turned **ON** and tested. The **ON** time does not exceed 200 µs.

Note
Do not connect the output with enabled line fault detection to a device that is capable of sensing a change of state in 200 µs.

Note
Line fault detection is not compatible with significant capacitive loading (cable + load > 30 nF) and must be disabled under these conditions.

The line fault detection levels are:

- <50 Ω load for short circuit detection,
- 240 Ω to 10 kΩ load for the good status, and
- >20 kΩ load for open circuit detection.

24 V DI CHARM

Functionality

Select the function of the CHARM.

- **Discrete Input**
  The CHARM reports the discrete value present at the channel.
- **Pulse Count Input**
  The CHARM reports the number of discrete pulses detected at the channel. Maximum input frequency is 10 kHz.

Debounce filter

Only if **Functionality** → **Discrete Input** is selected.

Select a debounce filter.

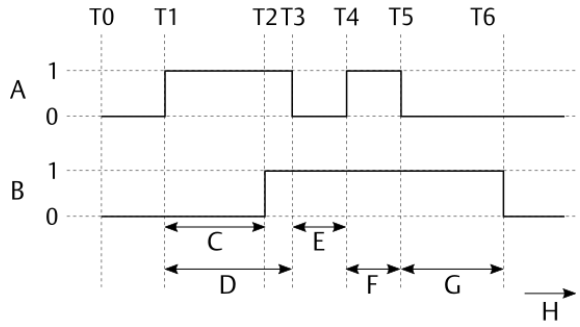
- **None**

No debounce filter is active. No effect on the input value. The input state equals the raw state. If the system cannot obtain a reading for the raw state in 10 samples, it sets the status to bad.

- **Delay**

  The input state turns **ON** or **OFF** after the raw state has been **ON** or **OFF** for at least the configured time duration (see **Value**).

Figure 6-19: Debounce filter – Delay

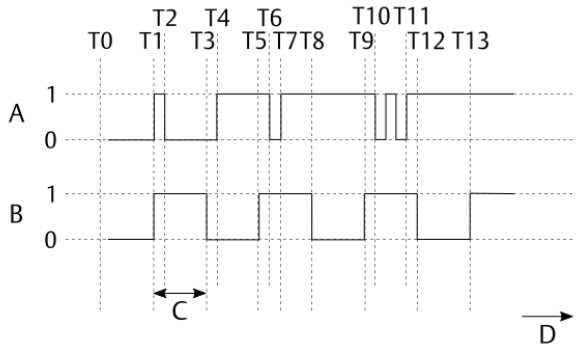


A. Raw state
B. Output state
C. Filter time
D. Duration > Filter time
E. Duration < Filter time
F. Duration < Filter time
G. Duration > Filter time
H. Time

- **Glitch**

  The input state change is held for at least the configured time duration (see **Value**). A change to the raw state during the hold time causes the input state to response to the change after the hold expires and then hold again for the configured time.

Figure 6-20: Debounce filter – Glitch



A. Raw state
B. Output state
C. Duration = Filter time
D. Time

- **Average**
  The CHARM samples input 1000 times per second. When **Average** is selected the counter is incremented or decremented once per sample. When the input is **True**, the counter is incremented. When the input is **False**, the counter is decremented. If the counter decrements to zero, the output is set to **False** and the counter ignores further decrements. If the counter increments up to the threshold, the output is set to **True** and the counter ignores further increments. If the counter is between zero and the threshold, the output retains its previous state. The threshold determines the amount of filtering: a threshold of one performs no filtering and a threshold of N requires a signal to be present for N accumulated samples before the output changes state (see **Value**).

Value

Only if a **Debounce** filter is selected.

Depending on the selected Debounce filter, enter a filter time or select a counter.

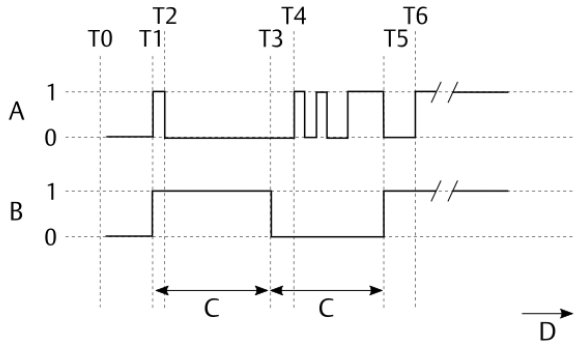
Output filter

Only if **Functionality** → **Discrete Input** is selected.

Select an output filter.

- **None**
  No effect on the output value. The output state equals the raw state.
- **Extend**
  The output state is held for the configured time duration (see **Value**). The output state responds only to the most recent raw state at the end of the configured hold time.

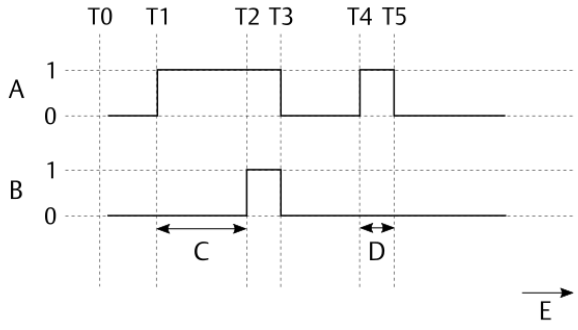
Figure 6-21: Output filter – Extend



A. Raw state
B. Output state
C. Duration = Filter time
D. Time

- **Delay**
  The output state is delayed by the configured filter time (see **Value**). The delay affects the output on both changes from **OFF** to **ON** and from **ON** to **OFF**. If the state changes but does not maintain the state for greater than or equal to filter time, the output state does not change. See Figure 6-19.
- **Delay On**
  The output state turns **ON** after the raw state has been **ON** for at least the configured time duration (see **Value**).

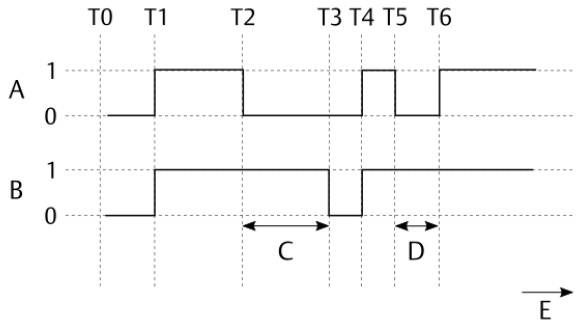
Figure 6-22: Output filter – Delay on



A. Raw state
B. Output state
C. Duration = Filter time
D. Duration < Filter time

- **Delay Off**
  The output state turns **OFF** after the raw state has been **OFF** for at least the configured time duration (see **Value**).

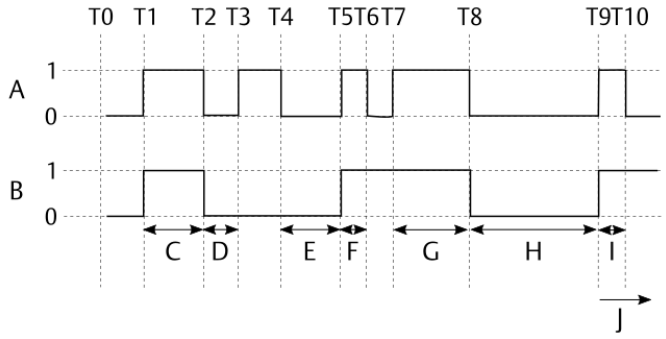
Figure 6-23: Output filter – Delay off



A. Raw state
B. Output state
C. Duration = Filter time
D. Duration < Filter time
E. Time

- **Glitch**
  The input state change is held for at least the configured time duration (see **Value**). A change to the raw state during the hold time causes the input state to respond to the change after the hold expires and then hold again for the configured time. See Figure 6-20.
- **Settle**
  An output state change is held until a matching raw state is maintained for the configured time duration (see **Value**). A change in the raw state causes a change in the output state.

Figure 6-24: Output filter – Settle



A. Raw state
B. Output state
C. Duration = Filter time
D. Duration < Filter time
E. Duration = Filter time
F. Duration < Filter time
G. Duration > Filter time
H. Duration > Filter time
I. Duration < Filter time
J. Time

Value
Only if an **Output filter** is selected.
Depending on the selected output filter, enter a filter time.

Modify input
Only if **Functionality** → **Discrete Input** is selected.
Place a check mark in the box to invert the raw signal.

Averaging time
Only if **Functionality** → **Pulse Count Input** is selected.
Select an averaging time suitable for your application. A wrong selection causes bouncing pulse count values.

Line fault detection
Check this box to activate the detection of open and short circuit. This fault detection requires external resistors added to the input wiring. See AMS Asset Monitor Installation Guide (MHM-97923-PBF) for details.
The Line fault detection levels are:

- <100 Ω load for short circuit detection,
- 400 Ω to 40 kΩ load for the good status, and
- >75 kΩ load for open circuit detection.

Display range
Enter a lower value and an upper value to define a range for displaying the counted pulses. This parameter is only available if **Pulse Count Input** is selected for **Functionality**.

4 to 20 mA AI CHARM

Functionality

Select the function of the CHARM.

- **Analog Input 0-20 mA**
  The assigned value is scaled on an input current range of 0 to 20 mA.
- **Analog Input 4-20 mA**
  The assigned value is scaled on an input current range of 4 to 20 mA. Select this range if an input channel supervision is required.

Measurement type

Select a measurement type for the scaling.

- Acceleration
- Acoustic emission
- Current
- Displacement
- Frequency
- Mass flow rate
- Moisture in oil, saturation
- Moisture in oil, water activity
- Moisture in oil, water content
- Oil quality
- Pressure
- Proportion
- Resistance
- Rotational speed
- Strain
- Temperature
- Velocity
- Voltage

The input fields **Unit** and **Scaling** are available depending on the selected measurement type.

Unit

Select a unit according to the source of the input signal. Depending on the selection, input fields for defining a scaling appears.

Antialiasing filter

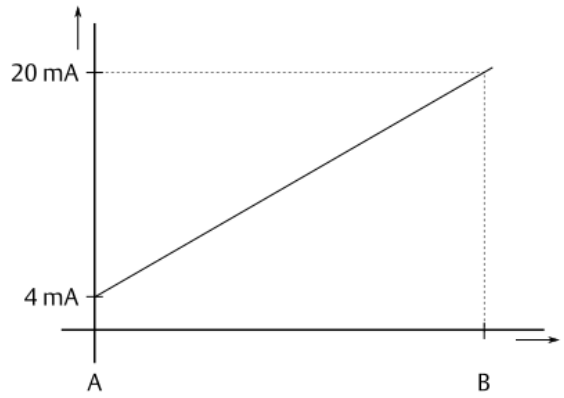
Select a period of time from the drop-down list according to your measurement application or select **Disabled** to disable the filter.

The signal filtering is made within the CHARM. Select a short period of control for highly dynamic input signals where also signal peaks must be detected. Use shorter periods of control for critical measurements to ensure that no signal parts are missed. For slow changing input

signals or to avoid detection of signal peaks select a longer period of control.

Scaling The current signal of a process value such as temperature or pressure can be scaled on a defined range. Enter a lower limit and an upper limit value to define the scaling. See Figure 6-25 for an example where a 4 to 20 mA current input is scaled on a defined range.

Figure 6-25: Scaling example



A. Lower limit – assigned to 4 mA
B. Upper limit – assigned to 20 mA

Display range Enter a lower limit value and an upper limit value to define a range for displaying the measured value.

6.3 External data points

Recommended procedures – External data points describes procedures to create, change, and delete a configuration of an external data point. Parameter description – External data points describes the parameters to be configured.

6.3.1 Recommended procedures – External data points

First configuration – External data points

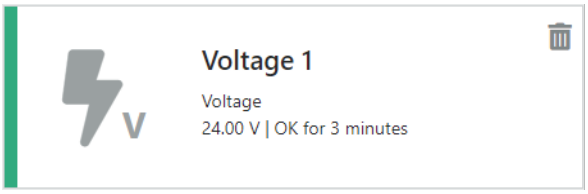
Procedure

1. Select **External data points** from the sidebar.
2. Click **+ New external data point**.

   The dialog for defining an external data point opens. Up to 50 external data points can be defined.
3. Enter the parameters in accordance with the data to be imported to define the external data point.

4. Click **Save & Close** to accept the entries.
   A new external data point object appears on the overview page.

Figure 6-26: New external data point



The new external data point is automatically added to the OPC UA Server. To use the new data point with the Modbus TCP communication add it to the holding registers. See Holding registers.

Configuration change – External data point

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Procedure

1. Select **External data points** from the sidebar.
2. Click the external data point object to be changes to open the dialog to define the data point.
   - In the **Tiles** view, click on the external data point object to be changed to open the configuration. See Tiles view – External data points.
   - In the **List** view, click **Configure** in the column **Action** in the row of the external data point to be configured. See List view – External data points.
3. Check the settings and change them in accordance with your needs.
4. Click **Save & Close** to accept the entries.

Delete an external data point

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Procedure

1. Select **External data point** from the sidebar.
2. Delete the **External data point**.
   - In the **Tiles** view, click the trash can icon in the data point object to be deleted to remove the data point. See Tiles view – External data points.

- In the **List** view, click **Delete** in the column **Action** in the row of the external data point to be deleted to remove the data point. See List view – External data points.

3. Confirm the confirmation prompt.
The external data point is automatically removed from the OPC UA tree. Assets in which the external data point was used switch to the maintenance state. Check the associated asset configuration and updated the measuring point where the external data point was mapped to (see Source mapping). An external data point that was used for the Modbus communication is not automatically removed from the Modbus Holding registers. Go to the Modbus configuration and remove the deleted external data point (see Modbus TCP).

6.3.2 Parameter description – External data points

Basic

Enabled	Check this box to enable the external data point.
Name	Enter a name for the external data point. This entry is also used to build the name for the OPC UA data points and the Modbus data points.
Description	Enter a description of the external data point.

Value

Measurement type	Select a measurement type according to the measured physical value from the drop-down list.
Source unit	Select a source unit according to the technical data of the connected source from the drop-down list. The available options depend on the selected measurement type. It is not necessary that the source unit aligns to the selected system of units configured for the logged in user. The unit is automatically converted to the user's system of units.
Timeout	Enter a time in seconds to define a timeout for the supervision of the external data point. The status of the external data point is set to **Critical** if the external data point has not been refreshed within the entered time.

Display

Display range	Enter a lower limit value and an upper limit value to define a range for displaying the measured value.

6.4 Predicates

Recommended procedures – Predicates describes the procedures to create, change, and delete a configuration of a predicate. Parameter description – Predicates described the parameters to be configured.

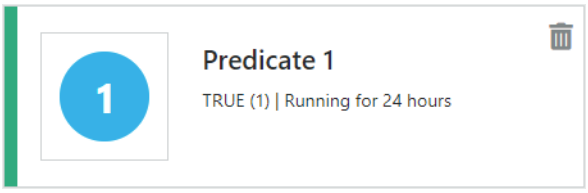
6.4.1 Recommended procedures – Predicates

First configuration – Predicates

Procedure

1. Select **Predicates** from the sidebar.
2. Click **+New Predicate**.
   The dialog for defining a predicates opens. Up to 20 predicates can be defined.
3. Define the predicate.
4. Click **Save & close** to accept the entries.
   A new predicate object appears on the overview page.

Figure 6-27: New predicate object



The new predicate can be used for assets and data collections.

Configuration change – Predicates

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Procedure

1. Select **Predicates** from the sidebar.
2. Click the predicate object to be changed to open the dialog to define the predicate.
   - In the **Tiles** view, click on the predicate object to be changed to open the configuration. See Tiles view – Predicates.
   - In the **List** view, click **Configure** in the column **Action** in the row of the predicate to be configured. See List view – Predicates.
3. Check the settings and change them in accordance with your needs.
4. Click **Save & Close** to accept the entries.

Delete a predicate

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

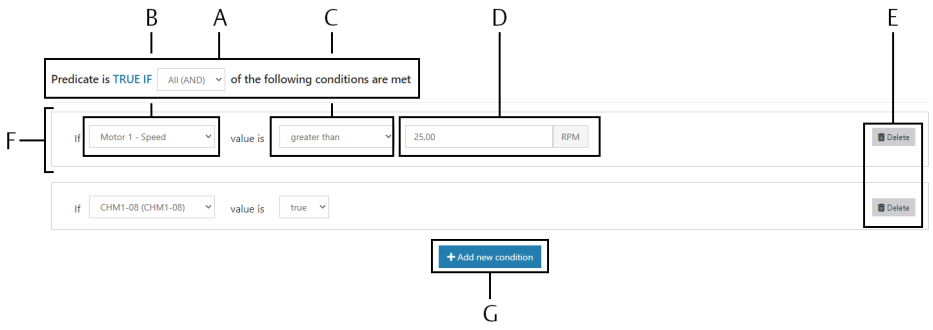
Procedure

1. Select **Predicates** from the sidebar.
2. Delete the predicate.
   - In the **Tiles** view, click the trash can icon in the predicate object to be deleted to remove the predicate. See Tiles view – Predicates.
   - In the **List** view, click **Delete** in the column **Action** in the row of the predicate to be deleted to remove the predicate. See List view – Predicates.
3. Confirm the confirmation prompt.
   The predicate is removed from the system. Data collections and assets where the predicate to be deleted is used continue to work without the predicate.

6.4.2 Parameter description – Predicates

Enabled	Check this box to enable the predicate.
Name	Enter a name for the predicate.
Description	Enter a short description of the predicate.

Figure 6-28: Condition configuration



A. Execution condition
B. Data source selection
C. Limit condition
D. Limit value
E. Button to delete a condition
F. Condition
G. Button ***+ Add new condition***

TRUE IF Select when the predicate is **TRUE**.

- **Any (OR)**
  One or more of the defined conditions has been fulfilled.
- **All (AND)**
  All defined conditions have been fulfilled.

+Add a new condition

Click **+Add a new condition** to add a new row for defining a predicate condition. Up to 10 conditions can be defined.

Complete the new condition.

1. Select the data source from the drop-down list.
   The available sources depend on the configuration of the AMS Asset Monitor. Measurement values, states, and alerts of the following data groups can be selected.
   - CHARMS
   - External data points
   - Other predicates
   - Assets
   - Output logics
2. Depending on the selected data source further selection and entry fields for defining the condition appear, see Table 6-6. Select the limit condition.

Table 6-6: Configuration fields depending on data source selection

Data source characteristic	Condition	Level/Limit
Binary value	• TRUE (1) • FALSE (0)	-/-
State or alert	• better than OR equal • worse than OR equal	• Unknown • OK • Maintenance • Advice • Warning • Critical
Measurement value	• greater than • greater than OR equal • less than • less than OR equal • between (> min AND <= max) • not between (<= min OR > max)	Entry field for limit value, two entry fields for conditions **between** and **not between**

3. Enter a limit value if a source is selected that provides a limit value entry field. Two entry fields are available if **between** or **not between** is selected for the limit condition.

To delete a condition, click the trash can icon at the end of the row to be deleted.

If an asset has more than one measurement point, the status of the measurement point with currently the worst measuring result is used for the condition.

Note
A data source in **Critical** state, such as a CHARM with a sensor error, sets the condition to **FALSE**. If the data source is **OK** again, the condition is set to **TRUE** – provided that the configured condition is also **TRUE**.

6.5 Assets

Typical measuring points and available analytics are described for each asset type. Recommended procedure – Assets describes procedures to create, change, and delete a configuration. Parameter description – Assets describes the parameters of all assets.

6.5.1 General

For a proper health detection, sensors must be arranged on the equipment in a certain way. The knowledge about the sensor arrangement is also necessary for the asset configuration.

Note
The more measuring points are equipped, the more accurate is the health calculation of the asset.

General recommendations:

- Use a point distribution that allows some horizontal, vertical, and axial inputs to get a good overview of both the equipment's health and the equipment's general movement.
- A radial measurement is recommended to evaluate balance and alignment.
- Generally measure radial vibration in horizontal direction because of the gravity load of the measurement in vertical direction.
- For a good PeakVue and PeakVue Plus reading, place the sensor near the bearing load zone.
- Select measuring points according to your measuring task.

Some assets such as the **Heat exchanger – shell & tube, counter-current** and the **Hydrocarbon pump – centrifugal, overhung** require input signals other than of vibration sensors such as pressure, flow, and temperature sensors. See Table 6-7 for sensor types and CHARMs or external data points required for the measurements.

Table 6-7: Sensor types and CHARMs or external data points required for the measurements

Measurement	Sensor type	CHARM/External data point
Vibration	Piezoelectric acceleration sensor	VI Piezo CHARM
	Piezoelectric velocity sensor	
	Proximity probe and converter[1, 2]	VI Voltage CHARM
Speed	Hall-effect sensor	VI Tach CHARM
	Passive magnetic pickup	
	Proximity probe and converter[2]	
	Sensor that provides a scaled current signal (0 to 20 mA or 4 to 20 mA)	AI 4 to 20 mA CHARM
	Sensor that provides pulses countable by the CHARM	DI 24 V DC Low-Side Sens CHARM
	Signal source that provides the required data	External data point
Temperature	Thermocouple	Thermocouple/mV input CHARM
	RTD sensor	RTD CHARM
	Sensor that provides a scaled current signal (0 to 20 mA or 4 to 20 mA)	AI 4 to 20 mA CHARM
	Signal source that provides the required data	External data point
Motor current	Sensor that provides a scaled current signal (0 to 20 mA or 4 to 20 mA) or a signal source that provides the required data for the external data point	AI 4 to 20 mA CHARM or an external data point
Oil quality		
Flow turbulence		
Suction pressure		
Discharge pressure		
Seal pressure		
Seal level		
Hydrocarbon leak		
Flow		
Differential pressure		

1 *For measurement of relative shaft vibration.*
2 *Requires an external voltage supply.*

Note
Signal evaluation and evaluation filters, which are set in the CHARM configuration, do not affect the signal used for calculating the analytics.

Note
For installation and operation instructions of the used sensors see related documents.

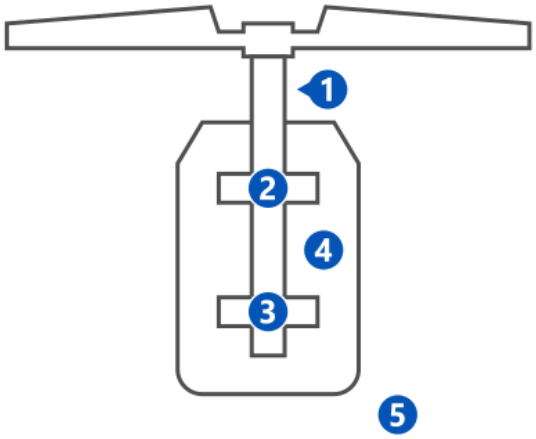
The following chapters describe for each asset type the typical measurement points, the available analytics, and the minimum required CHARMs for the analytics. It is not mandatory to install sensors at each shown measuring point but ensure that the minimum requirements of the used rules are fulfilled, otherwise the analytics cannot be calculated.

6.5.2 Fan – axial, direct motor drive

Asset consisting of a combination of fan and electric motor. The fan is directly connected to the motor without any gearbox in between.

Typical measuring points

Figure 6-29: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-8: Typical measuring points

Position	Measuring point	
	Description	**Abbreviation**
1	Speed	FSPD
2	Inboard horizontal vibration	FIH
	Inboard vertical vibration	FIV
	Inboard axial vibration	FIA
	Inboard X vibration	FIX

Table 6-8: Typical measuring points *(continued)*

Position	Measuring point	
	Description	**Abbreviation**
	Inboard Y vibration	FIY
	Inboard temperature	FIT
3	Outboard horizontal vibration	FOH
	Outboard vertical vibration	FOV
	Outboard axial vibration	FOA
	Outboard X vibration	FOX
	Outboard Y vibration	FOY
	Outboard temperature	FOT
4	Winding 1 temperature	FW1T
	Winding 2 temperature	FW2T
	Winding 3 temperature	FW3T
	Motor current	FMC
5	Auxiliary	AUX

Available analytics

Table 6-9 lists the selectable analytics and their available input signals for the fan – axial, direct motor drive asset.

Table 6-9: Fan – axial, direct motor drive

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points**[1]	**Configuration**
Uneven air gap	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA,FOH, FOV, or FOA	
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA,FOH, FOV, or FOA	
	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	FIH, FIV, FIA,FOH, FOV, or FOA	Configured bearings (see Bearings)
Blade pass	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA,FOH, FOV, or FOA	

Table 6-9: Fan – axial, direct motor drive *(continued)*

Analytics	Available input signals			
	CHARM	Sensor	Measuring points[1]	Configuration
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA,FOH, FOV, or FOA	
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	FIH, FIV, FIA,FOH, FOV, or FOA	
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	Configured bearing clearance (see Bearings)
Flow turbulence – fan[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA,FOH, FOV, or FOA	
	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	FSPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

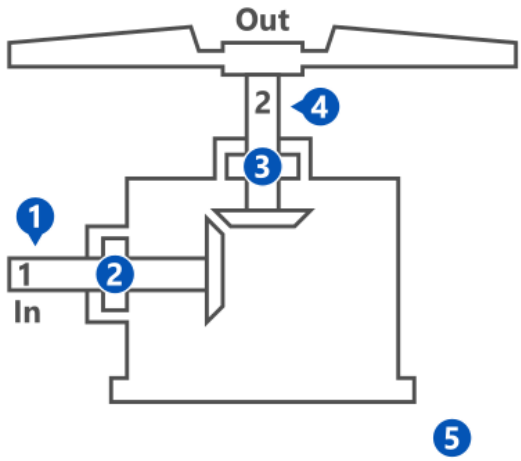
At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.3 Fan – axial, gearbox drive

Asset consisting of a combination of fan and gearbox where the fan is directly connected to a single reduction gearbox.

Typical measuring points

Figure 6-30: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-10: Typical measuring points

Position	Measuring point	
	Description	Abbreviation
1	Shaft 1 speed	F1SPD
2	Shaft 1 outboard horizontal vibration	FIH
	Shaft 1 outboard vertical vibration	FIV
	Shaft 1 outboard axial vibration	FIA
	Shaft 1 outboard X vibration	FIX
	Shaft 1 outboard Y vibration	FIY
	Shaft 1 outboard temperature	FIT
3	Shaft 2 inboard horizontal vibration	FOH
	Shaft 2 inboard vertical vibration	FOV
	Shaft 2 inboard axial vibration	FOA
	Shaft 2 inboard X vibration	FOX
	Shaft 2 inboard Y vibration	FOY
	Shaft 2 inboard temperature	FOT
4	Shaft 2 speed	F2SPD
5	Oil quality	FOQ
6	Auxiliary	AUX

Available analytics

Table 6-11 lists the selectable analytics and their available input signals for the fan – axial, gearbox drive asset.

Note
The following analytics are not applicable to gearboxes that contain a gear wheel of less than 10 teeth, such as a worm gearbox.

- Tooth wear
- Cracked or broken tooth
- Gear misalignment

Table 6-11: Fan – axial, gearbox drive

Analytics	Available input signals			
	CHARM	Sensor	Measuring points[1]	Configuration
Alignment	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	Only shaft 1 (In), see Figure 6-30
	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	FIH, FIV, FIA, FOH, FOV, or FOA	Configured bearings (see Bearings)
Blade pass	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
Tooth wear	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
Cracked or broken tooth (using PeakVue Plus, under development)	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
Gear misalignment	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	

Table 6-11: Fan – axial, gearbox drive *(continued)*

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points**[1]	**Configuration**
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	FIH, FIV, FIA, FOH, FOV, or FOA	
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	F1IX, F1IY, FOX, or FOY	Configured bearing clearance (see Bearings)
Flow turbulence – fan[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	FSPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

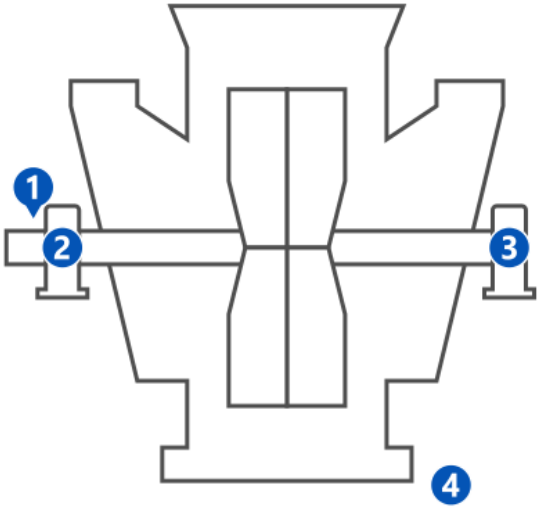
At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.4 Fan – centrifugal, center hung

Asset consisting of a fan with a rotating part mounted in the center of two bearings.

Typical measuring points

Figure 6-31: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-12: Typical measuring points

Position	Measuring point	
	Description	**Abbreviation**
1	Outboard horizontal vibration	FOH
	Outboard vertical vibration	FOV
	Outboard axial vibration	FOA
	Outboard X vibration	FOX
	Outboard Y vibration	FOY
	Outboard temperature	FOT
2	Inboard horizontal vibration	FIH
	Inboard vertical vibration	FIV
	Inboard axial vibration	FIA
	Inboard X vibration	FIX
	Inboard Y vibration	FIY
	Inboard temperature	FIT
3	Speed	FSPD
4	Auxiliary	AUX

Available analytics

Table 6-13 lists the selectable analytics and their available input signals for the fan centrifugal – center hung asset.

Table 6-13: Fan centrifugal – center hung

Analytics	Available input signals			
	CHARM	Sensor	Measuring points[1]	Configuration
Alignment	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	FIH, FIV, FIA, FOH, FOV, or FOA	Configured bearings (see Bearings)
Blade pass	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	FIH, FIV, FIA, FOH, FOV, or FOA	
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	Configured bearing clearance (see Bearings)
Flow turbulence – fan[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	FSPD	Accurate name plate speed of the asset is always required

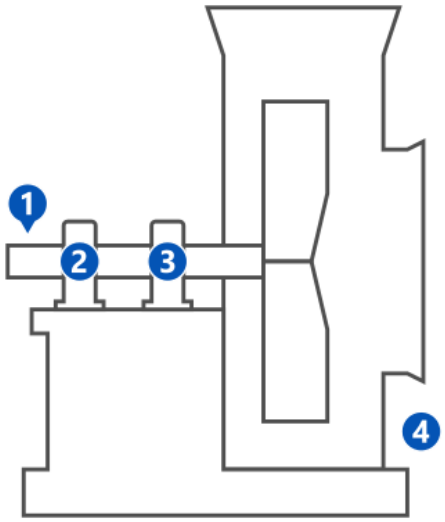
1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.5 Fan – centrifugal, over hung

Asset consisting of a fan in which the rotating part is mounted in an overhung position – the rotating part is supported by two bearings at one side of the fan.

Figure 6-32: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-14: Typical measuring points

Position	Measuring point	
	Description	**Abbreviation**
1	Outboard horizontal vibration	FOH
	Outboard vertical vibration	FOV
	Outboard axial vibration	FOA
	Outboard X vibration	FOX
	Outboard Y vibration	FOY
	Outboard temperature	FOT
2	Inboard horizontal vibration	FIH
	Inboard vertical vibration	FIV

Table 6-14: Typical measuring points *(continued)*

Position	Measuring point	
	Description	**Abbreviation**
	Inboard axial vibration	FIA
	Inboard X vibration	FIX
	Inboard Y vibration	FIY
	Inboard temperature	FIT
3	Speed	FSPD
4	Auxiliary	AUX

Available analytics

Table 6-15 lists the selectable analytics and their available input signals for the fan – centrifugal, over hung asset.

Table 6-15: Fan – centrifugal, over hung

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points**[1]	**Configuration**
Alignment	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	FIH, FIV, FIA, FOH, FOV, or FOA	Configured bearings (see Bearings)
Blade pass	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	FIH, FIV, FIA, FOH, FOV, or FOA	
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	Configured bearing clearance (see Bearings)

Table 6-15: Fan – centrifugal, over hung *(continued)*

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points[1]**	**Configuration**
Flow turbulence – fan[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	FIH, FIV, FIA, FOH, FOV, or FOA	
	VI Voltage CHARM	Eddy current measuring chain	FIX, FIY, FOX, or FOY	
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	FSPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

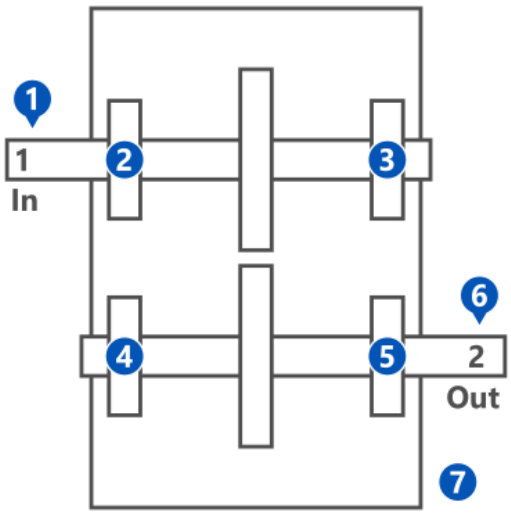
At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.6 Gearbox – single reduction

Asset consisting of a single reduction gearbox with an input shaft and an output shaft. Each shaft is supported by two bearings.

Typical measuring points

Figure 6-33: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-16: Typical measuring points

Position	Measuring point	
	Description	**Abbreviation**
1	Shaft 1 speed	G1SPD
2	Shaft 1 inboard horizontal vibration	G1IH
	Shaft 1 inboard vertical vibration	G1IV
	Shaft 1 inboard axial vibration	G1IA
	Shaft 1 inboard X vibration	G1IX
	Shaft 1 inboard Y vibration	G1IY
	Shaft 1 inboard temperature	G1IT
3	Shaft 1 outboard horizontal vibration	G1OH
	Shaft 1 outboard vertical vibration	G1OV
	Shaft 1 outboard axial vibration	G1OA
	Shaft 1 outboard X vibration	G1OX
	Shaft 1 outboard Y vibration	G1OY
	Shaft 1 outboard temperature	G1OT
4	Shaft 2 inboard horizontal vibration	G2IH
	Shaft 2 inboard vertical vibration	G2IV

Table 6-16: Typical measuring points *(continued)*

Position	Measuring point	
	Description	**Abbreviation**
	Shaft 2 inboard axial vibration	G2IA
	Shaft 2 inboard X vibration	G2IX
	Shaft 2 inboard Y vibration	G2IY
	Shaft 2 inboard temperature	G2IT
5	Shaft 2 outboard horizontal vibration	G2OH
	Shaft 2 outboard vertical vibration	G2OV
	Shaft 2 outboard axial vibration	G2OA
	Shaft 2 outboard X vibration	G2OX
	Shaft 2 outboard Y vibration	G2OY
	Shaft 2 outboard temperature	G2OT
6	Shaft 2 speed	G2SPD
7	Oil quality	GOQ
	Auxiliary	AUX

Available analytics

Table 6-17 lists the selectable analytics and their available input signals for the gearbox – single reduction asset.

Note
The following analytics are not applicable to gearboxes that contain a gear wheel of less than 10 teeth, such as a worm gearbox.

- Tooth wear
- Cracked or broken tooth
- Gear misalignment

Table 6-17: Gearbox – single reduction

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points[1]**	**Configuration**
Alignment[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, or G2OA	

Table 6-17: Gearbox – single reduction *(continued)*

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points[1]**	**Configuration**
	VI Voltage CHARM	Eddy current measuring chain	G1IX, G1IY, G1OX, G1OY, G2IX, G2IY, G2OX, or G2OY	
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, or G2OA	
	VI Voltage CHARM	Eddy current measuring chain	G1IX, G1IY, G1OX, G1OY, G2IX, G2IY, G2OX, or G2OY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, or G2OA	Configured bearings (see Bearings)
Tooth wear	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, or G2OA	
Cracked or broken tooth (using PeakVue Plus, under development)	VI Piezo CHARM	Accelerometer	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, or G2OA	
Gear misalignment	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, or G2OA	
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, or G2OA	

Table 6-17: Gearbox – single reduction *(continued)*

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points[1]**	**Configuration**
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, or G2OA	
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	G1IX, G1IY, G1OX, G1OY, G2IX, G2IY, G2OX, or G2OY	Configured bearing clearance (see Bearings)
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	G1SPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

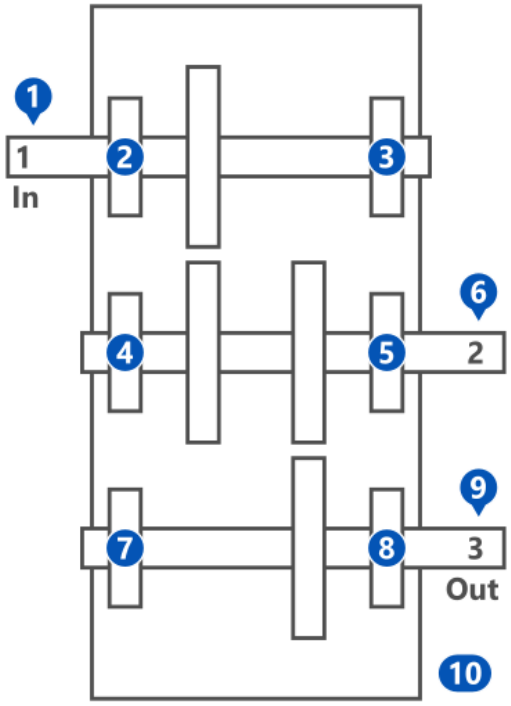
At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.7 Gearbox – double reduction

Asset consisting of a double reduction gearbox with an input shaft, an intermediate shaft, and an output shaft. Each shaft is supported by two bearings.

Typical measuring points

Figure 6-34: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-18: Typical measuring points

Position	Measuring point	
	Description	Abbreviation
1	Shaft 1 speed	G1SPD
2	Shaft 1 inboard horizontal vibration	G1IH
	Shaft 1 inboard vertical vibration	G1IV
	Shaft 1 inboard axial vibration	G1IA
	Shaft 1 inboard X vibration	G1IX
	Shaft 1 inboard Y vibration	G1IY
	Shaft 1 inboard temperature	G1IT
3	Shaft 1 outboard horizontal vibration	G1OH
	Shaft 1 outboard vertical vibration	G1OV
	Shaft 1 outboard axial vibration	G1OA
	Shaft 1 outboard X vibration	G1OX
	Shaft 1 outboard Y vibration	G1OY

Table 6-18: Typical measuring points *(continued)*

Position	Measuring point	
	Description	**Abbreviation**
	Shaft 1 outboard temperature	G1OT
4	Shaft 2 inboard horizontal vibration	G2IH
	Shaft 2 inboard vertical vibration	G2IV
	Shaft 2 inboard axial vibration	G2IA
	Shaft 2 inboard X vibration	G2IX
	Shaft 2 inboard Y vibration	G2IY
	Shaft 2 inboard temperature	G2IT
5	Shaft 2 outboard horizontal vibration	G2OH
	Shaft 2 outboard vertical vibration	G2OV
	Shaft 2 outboard axial vibration	G2OA
	Shaft 2 outboard X vibration	G2OX
	Shaft 2 outboard Y vibration	G2OY
	Shaft 2 outboard temperature	G2OT
6	Shaft 2 speed	G2SPD
7	Shaft 3 inboard horizontal vibration	G3IH
	Shaft 3 inboard vertical vibration	G3IV
	Shaft 3 inboard axial vibration	G3IA
	Shaft 3 inboard X vibration	G3IX
	Shaft 3 inboard Y vibration	G3IY
	Shaft 3 inboard temperature	G3IT
8	Shaft 3 outboard horizontal vibration	G3OH
	Shaft 3 outboard vertical vibration	G3OV
	Shaft 3 outboard axial vibration	G3OA
	Shaft 3 outboard X vibration	G3OX
	Shaft 3 outboard Y vibration	G3OY
	Shaft 3 outboard temperature	G3OT
9	Shaft 3 speed	G3SPD
10	Oil quality	GOQ
	Auxiliary	AUX

Available analytics

Table 6-19 lists all selectable analytics and their available input signals for the gearbox – double reduction asset.

Note
The following analytics are not applicable to gearboxes that contain a gear wheel of less than 10 teeth, such as a worm gearbox.

- Tooth wear
- Cracked or broken tooth
- Gear misalignment

Table 6-19: Gearbox – double reduction

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points**[1]	**Configuration**
Alignment[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G3IH, G3IV, G3IA, G3OH, G3OV, or G3OA	Not available for the intermediate shaft (shaft 2).
	VI Voltage CHARM	Eddy current measuring chain	G1IX, G1IY, G1OX, G1OY, G3IX, G3IY, G3OX, or G3OY	
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, or G3OA	
	VI Voltage CHARM	Eddy current measuring chain	G1IX, G1IY, G1OX, G1OY, G2IX, G2IY, G2OX, G2OY, G3IX, G3IY, G3OX, or G3OY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, or G3OA	Configured bearings (see Bearings)

Table 6-19: Gearbox – double reduction *(continued)*

Analytics	Available input signals			
	CHARM	Sensor	Measuring points[1]	Configuration
Tooth wear	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, or G3OA	
Cracked or broken tooth (using PeakVue Plus, under development)	VI Piezo CHARM	Accelerometer	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, or G3OA	
Gear misalignment	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, or G3OA	
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, or G3OA	
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, or G3OA	

Table 6-19: Gearbox – double reduction *(continued)*

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points**[1]	**Configuration**
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	G1IX, G1IY, G1OX, G1OY, G2IX, G2IY, G2OX, G2OY, G3IX, G3IY, G3OX, or G3OY	Configured bearing clearance (see Bearings)
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	G1SPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

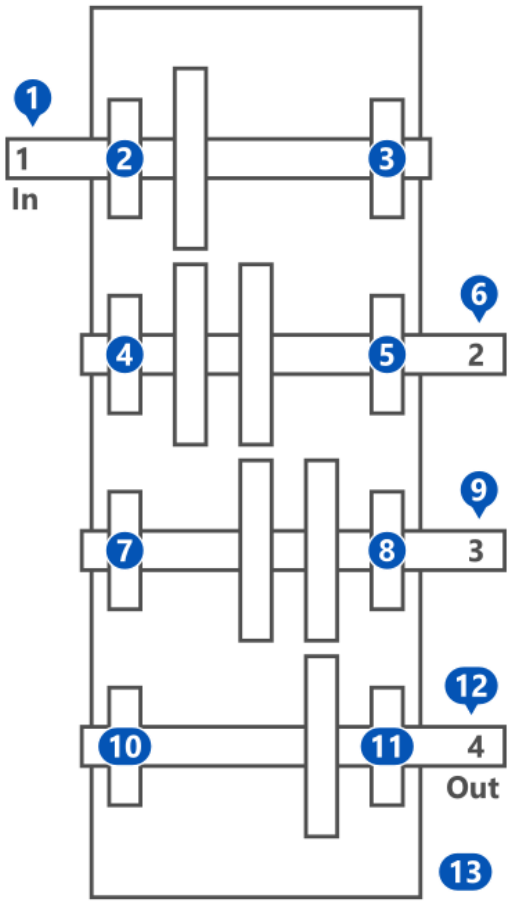
At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.8 Gearbox – triple reduction

Asset consisting of a triple reduction gearbox with an input shaft, two intermediate shafts, and an output shaft. Each shaft is supported by two bearings.

Typical measuring points

Figure 6-35: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-20: Typical measuring points

Position	Measuring point	
	Description	Abbreviation
1	Shaft 1 speed	G1SPD
2	Shaft 1 inboard horizontal vibration	G1IH
	Shaft 1 inboard vertical vibration	G1IV
	Shaft 1 inboard axial vibration	G1IA
	Shaft 1 inboard X vibration	G1IX
	Shaft 1 inboard Y vibration	G1IY
	Shaft 1 inboard temperature	G1IT
3	Shaft 1 outboard horizontal vibration	G1OH

Table 6-20: Typical measuring points *(continued)*

Position	Measuring point	
	Description	**Abbreviation**
	Shaft 1 outboard vertical vibration	G1OV
	Shaft 1 outboard axial vibration	G1OA
	Shaft 1 outboard X vibration	G1OX
	Shaft 1 outboard Y vibration	G1OY
	Shaft 1 outboard temperature	G1OT
4	Shaft 2 inboard horizontal vibration	G2IH
	Shaft 2 inboard vertical vibration	G2IV
	Shaft 2 inboard axial vibration	G2IA
	Shaft 2 inboard X vibration	G2IX
	Shaft 2 inboard Y vibration	G2IY
	Shaft 2 inboard temperature	G2IT
5	Shaft 2 outboard horizontal vibration	G2OH
	Shaft 2 outboard vertical vibration	G2OV
	Shaft 2 outboard axial vibration	G2OA
	Shaft 2 outboard X vibration	G2OX
	Shaft 2 outboard Y vibration	G2OY
	Shaft 2 outboard temperature	G2OT
6	Shaft 2 speed	G2SPD
7	Shaft 3 inboard horizontal vibration	G3IH
	Shaft 3 inboard vertical vibration	G3IV
	Shaft 3 inboard axial vibration	G3IA
	Shaft 3 inboard X vibration	G3IX
	Shaft 3 inboard Y vibration	G3IY
	Shaft 3 inboard temperature	G3IT
8	Shaft 3 outboard horizontal vibration	G3OH
	Shaft 3 outboard vertical vibration	G3OV
	Shaft 3 outboard axial vibration	G3OA
	Shaft 3 outboard X vibration	G3OX
	Shaft 3 outboard Y vibration	G3OY
	Shaft 3 outboard temperature	G3OT
9	Shaft 3 speed	G3SPD
10	Shaft 4 inboard horizontal vibration	G4IH

Table 6-20: Typical measuring points *(continued)*

Position	Measuring point	
	Description	**Abbreviation**
	Shaft 4 inboard vertical vibration	G4IV
	Shaft 4 inboard axial vibration	G4IA
	Shaft 4 inboard X vibration	G4IX
	Shaft 4 inboard Y vibration	G4IY
	Shaft 4 inboard temperature	G4IT
11	Shaft 4 outboard horizontal vibration	G4OH
	Shaft 4 outboard vertical vibration	G4OV
	Shaft 4 outboard axial vibration	G4OA
	Shaft 4 outboard X vibration	G4OX
	Shaft 4 outboard Y vibration	G4OY
	Shaft 4 outboard temperature	G4OT
12	Shaft 4 speed	G4SPD
13	Oil quality	GOQ
	Auxiliary	AUX

Available analytics

Table 6-19 lists all selectable analytics and their available input signals for the gearbox – double reduction asset.

Note
The following analytics are not applicable to gearboxes that contain a gear wheel of less than 10 teeth, such as a worm gearbox.

- Tooth wear
- Cracked or broken tooth
- Gear misalignment

Table 6-21: Gearbox – triple reduction

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points[1]**	**Configuration**
Alignment[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G4IH, G4IV, G4IA, G4OH, G4OV, or G4OA	Not available for the intermediate shafts (shaft 2 and shaft 3).

Table 6-21: Gearbox – triple reduction *(continued)*

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points[1]**	**Configuration**
	VI Voltage CHARM	Eddy current measuring chain	G1IX, G1IY, G1OX, G1OY, G4IX, G4IY, G4OX, or G4OY	
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, G3OA, G4IH, G4IV, G4IA, G4OH, G4OV, or G4OA	
	VI Voltage CHARM	Eddy current measuring chain	G1IX, G1IY, G1OX, G1OY, G2IX, G2IY, G2OX, G2OY, G3IX, G3IY, G3OX, G3OY, G4IX, G4IY, G4OX, or G4OY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, G3OA, G4IH, G4IV, G4IA, G4OH, G4OV, or G4OA	Configured bearings (see Bearings)
Tooth wear	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, G3OA, G4IH, G4IV, G4IA, G4OH, G4OV, or G4OA	

Table 6-21: Gearbox – triple reduction *(continued)*

Analytics	Available input signals			
	CHARM	Sensor	Measuring points[1]	Configuration
Cracked or broken tooth (using PeakVue Plus, under development)	VI Piezo CHARM	Accelerometer	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, or G3OA	
Gear misalignment	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, G3OA, G4IH, G4IV, G4IA, G4OH, G4OV, or G4OA	
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, G3OA, G4IH, G4IV, G4IA, G4OH, G4OV, or G4OA	
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	G1IH, G1IV, G1IA, G1OH, G1OV, G1OA, G2IH, G2IV, G2IA, G2OH, G2OV, G2OA, G3IH, G3IV, G3IA, G3OH, G3OV, G3OA, G4IH, G4IV, G4IA, G4OH, G4OV, or G4OA	

Table 6-21: Gearbox – triple reduction *(continued)*

Analytics	Available input signals			
	CHARM	Sensor	Measuring points[1]	Configuration
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	G1IX, G1IY, G1OX, G1OY, G2IX, G2IY, G2OX, G2OY, G3IX, G3IY, G3OX, G3OY, G4IX, G4IY, G4OX, or G4OY	Configured bearing clearance (see Bearings)
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	G1SPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

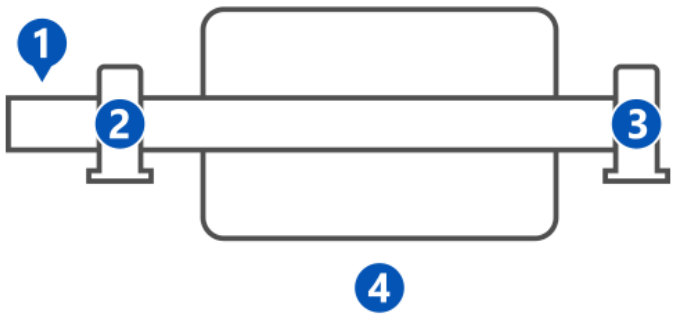
At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.9 Generic – rotating, center hung

Generic asset consisting of a device with a rotating part mounted in the center of two bearings.

Typical measuring points

Figure 6-36: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-22: Typical measuring points

Position	Measuring point	
	Description	Abbreviation
1	Speed	GSPD
2	Inboard horizontal vibration	GIH
	Inboard vertical vibration	GIV
	Inboard axial vibration	GIA
	Inboard X vibration	GIX
	Inboard Y vibration	GIY
	Inboard temperature	GIT
3	Outboard horizontal vibration	GOH
	Outboard vertical vibration	GOV
	Outboard axial vibration	GOA
	Outboard X vibration	GOX
	Outboard Y vibration	GOY
	Outboard temperature	GOT
4	Auxiliary	AUX

Available analytics

Table 6-23 lists the selectable analytics and their available signal inputs for the generic – rotating, center hung asset.

Table 6-23: Generic – rotating, center hung

Analytics	Available signal inputs			
	CHARM	Sensor	Measuring points[1]	Configuration
Alignment[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	GIH, GIV, GIA, GOH, GOV, or GOA	
	VI Voltage CHARM	Eddy current measuring chain	GIX, GIY, GOX, or GOY	
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	GIH, GIV, GIA, GOH, GOV, or GOA	
	VI Voltage CHARM	Eddy current measuring chain	GIX, GIY, GOX, or GOY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	GIH, GIV, GIA, GOH, GOV, or GOA	Configured bearings (see Bearings)

Table 6-23: Generic – rotating, center hung *(continued)*

Analytics	Available signal inputs			
	CHARM	**Sensor**	**Measuring points[1]**	**Configuration**
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	GIH, GIV, GIA, GOH, GOV, or GOA	
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	GIH, GIV, GIA, GOH, GOV, or GOA	
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	GIX, GIY, GOX, or GOY	Configured bearing clearance (see Bearings)
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	GSPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

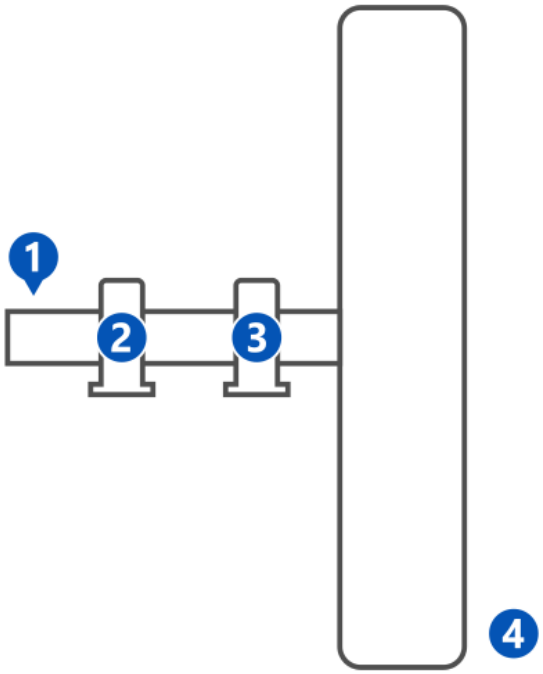
At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.10 Generic – rotating, over hung

Generic asset consisting of a device with a rotating part mounted in an overhung position – the rotating part is supported by two bearings at one side of the device.

Typical measuring points

Figure 6-37: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-24: Typical measuring points

Position	Measuring point	
	Description	Abbreviation
1	Outboard horizontal vibration	GOH
	Outboard vertical vibration	GOV
	Outboard axial vibration	GOA
	Outboard X vibration	GOX
	Outboard Y vibration	GOY
	Outboard temperature	GOT
2	Inboard horizontal vibration	GIH
	Inboard vertical vibration	GIV
	Inboard axial vibration	GIA
	Inboard X vibration	GIX
	Inboard Y vibration	GIY

Table 6-24: Typical measuring points *(continued)*

Position	Measuring point	
	Description	**Abbreviation**
	Inboard temperature	GIT
3	Speed	GSPD
4	Auxiliary	AUX

Available analytics

Table 6-25 lists the selectable analytics and their available input signals for the generic – rotating, over hung asset.

Table 6-25: Generic – rotating, over hung

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points**[1]	**Configuration**
Alignment[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	GIH, GIV, GIA, GOH, GOV, or GOA	
	VI Voltage CHARM	Eddy current measuring chain	GIX, GIY, GOX, or GOY	
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	GIH, GIV, GIA, GOH, GOV, or GOA	
	VI Voltage CHARM	Eddy current measuring chain	GIX, GIY, GOX, or GOY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	GIH, GIV, GIA, GOH, GOV, or GOA	Configured bearings (see Bearings)
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	GIH, GIV, GIA, GOH, GOV, or GOA	
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	GIH, GIV, GIA, GOH, GOV, or GOA	
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	GIX, GIY, GOX, or GOY	Configured bearing clearance (see Bearings)
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	FSPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*

3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.11 Heat exchanger – shell & tube, counter-current

Typical measuring points

Asset consisting of a counter current shell and tube heat exchanger.

Figure 6-38: Typical measuring points

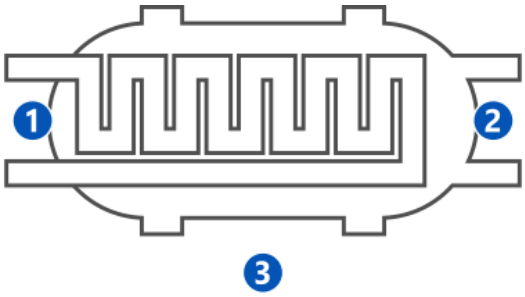


Table 6-26: Heat exchanger – shell & tube, counter-current

Position	Measuring point		
	Description	**Abbreviation**	**Minimum required[1]**
1	Hot side flow	HHFL	x
	Hot side inlet temperature	HHITMP	x
	Hot side differential pressure	HHDP	
	Hot side outlet temperature	HHOTMP	x
2	Cold side flow	HCFL	x
	Cold side inlet temperature	HCITMP	x
	Cold side differential pressure	HCDP	
	Cold side outlet temperature	HCOTMP	x
3	Auxiliary	AUX	

1 *Required measuring points are marked with **x**.*

Available analytics

Table 6-27 lists the selectable analytics and their minimum requirements for the asset.

Table 6-27: Heat exchanger – shell & tube, counter-current

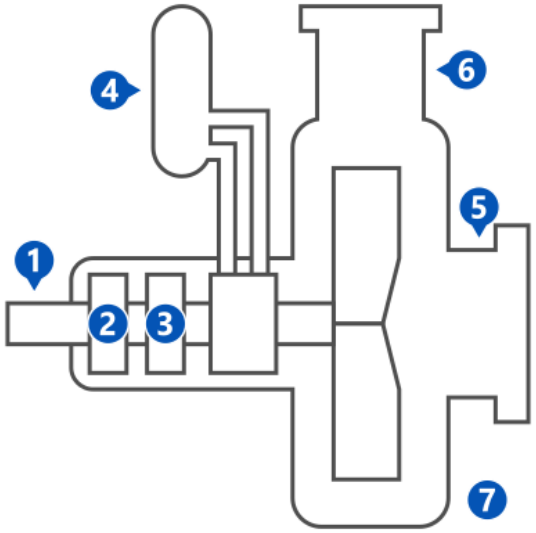
Analytics	Minimum requirement		
	CHARM	Sensor	Configuration
Duty	RTD CHARM or Thermocouple/mV input CHARM Quantity: 4	Temperature	
	AI 4 to 20 mA CHARM Quantity: 2	Pressure	
	AI 4 to 20 mA CHARM Quantity: 2	Mass flow	
Fouling	RTD CHARM or Thermocouple/mV input CHARM Quantity: 4	Temperature	
	AI 4 to 20 mA CHARM Quantity: 2	Pressure	
	AI 4 to 20 mA CHARM Quantity: 2	Mass flow	

6.5.12 Hydrocarbon pump – centrifugal, overhung

Typical measuring points

Asset consisting of a hydrocarbon pump including fluid sealing. The rotating part is mounted in an overhung position – it is supported by two bearings at one side of the pump.

Figure 6-39: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-28: Typical measuring points

Position	Measuring point	
	Description	Abbreviation
1	Speed	PSPD
2	Inboard horizontal vibration	PIH
	Inboard vertical vibration	PIV
	Inboard axial vibration	PIA
	Inboard X vibration	PIX
	Inboard Y vibration	PIY
	Inboard temperature	PIT
3	Outboard horizontal vibration	POH
	Outboard vertical vibration	POV
	Outboard axial vibration	POA
	Outboard X vibration	POX
	Outboard Y vibration	POY
	Outboard temperature	POT
4	Seal pressure	PSLP
	Seal level	PSLL
5	Suction pressure	PSP
6	Discharge pressure	PDP
	Flow turbulence	PFT
7	Auxiliary	AUX
	Hydrocarbon leak	PHL

Available analytics

Table 6-29 lists the selectable analytics and their available signal inputs for the hydrocarbon pump – centrifugal, overhung asset.

Table 6-29: Hydrocarbon pump – centrifugal, overhung

Analytics	Available signal inputs			
	CHARM	Sensor	Measuring points[1]	Configuration
Alignment[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, or POA	
	VI Voltage CHARM	Eddy current measuring chain	PIX, PIY, POX, or POY	

Table 6-29: Hydrocarbon pump – centrifugal, overhung *(continued)*

Analytics	Available signal inputs			
	CHARM	**Sensor**	**Measuring points**[1]	**Configuration**
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, or POA	
	VI Voltage CHARM	Eddy current measuring chain	PIX, PIY, POX, or POY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	PIH, PIV, PIA, POH, POV, or POA	Configured bearings (see Bearings)
Blade pass	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, or POA	
Flow turbulence – pump	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, POA, or PFT	
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, or POA	
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	PIH, PIV, PIA, POH, POV, or POA	
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	PIX, PIY, POX, or POY	Configured bearing clearance (see Bearings)
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	PSPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

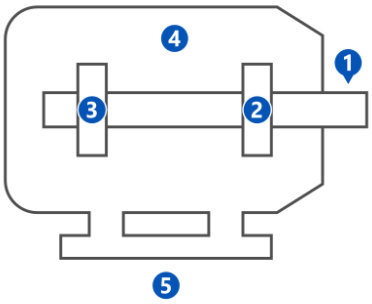
At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.13 Motor – inductive

Asset consisting of an inductive motor.

Typical measuring points

Figure 6-40: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-30: Typical measuring points

Position	Measuring point	
	Description	**Abbreviation**
1	Speed	MSPD
2	Inboard horizontal vibration	MIH
	Inboard vertical vibration	MIV
	Inboard axial vibration	MIA
	Inboard X vibration	MIX
	Inboard Y vibration	MIY
	Inboard temperature	MIT
3	Outboard horizontal vibration	MOH
	Outboard vertical vibration	MOV
	Outboard axial vibration	MOA
	Outboard X vibration	MOX
	Outboard Y vibration	MOY
	Outboard temperature	MOT
4	Winding 1 temperature	MW1T
	Winding 2 temperature	MW2T
	Winding 3 temperature	MW3T
	Motor current	MC
5	Auxiliary	AUX

Available analytics

Table 6-31 lists the selectable analytics and their available input signals for the motor – inductive asset.

Table 6-31: Motor – inductive

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points[1]**	**Configuration**
Uneven air gap	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	MIH, MIV, MIA, MOH, MOV, or MOA	
Alignment[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	MIH, MIV, MIA, MOH, MOV, or MOA	
	VI Voltage CHARM	Eddy current measuring chain	MIX, MIY, MOX, or MOY	
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	MIH, MIV, MIA, MOH, MOV, or MOA	
	VI Voltage CHARM	Eddy current measuring chain	MIX, MIY, MOX, or MOY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	MIH, MIV, MIA, MOH, MOV, or MOA	Configured bearings (see Bearings)
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	MIH, MIV, MIA, MOH, MOV, or MOA	
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	MIH, MIV, MIA, MOH, MOV, or MOA	
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	MIX, MIY, MOX, or MOY	Configured bearing clearance (see Bearings)
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	FSPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

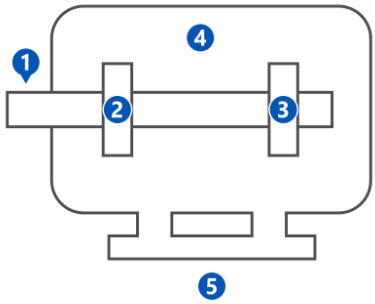
At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.14 Electric generator

Asset consisting of an electric generator.

Typical measuring points

Figure 6-41: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-32: Typical measuring points

Position	Measuring point	
	Description	**Abbreviation**
1	Speed	GSPD
2	Inboard horizontal vibration	GIH
	Inboard vertical vibration	GIV
	Inboard axial vibration	GIA
	Inboard X vibration	GIX
	Inboard Y vibration	GIY
	Inboard temperature	GIT
3	Outboard horizontal vibration	GOH
	Outboard vertical vibration	GOV
	Outboard axial vibration	GOA
	Outboard X vibration	GOX
	Outboard Y vibration	GOY
	Outboard temperature	GOT
4	Winding 1 temperature	GW1T
	Winding 2 temperature	GW2T
	Winding 3 temperature	GW3T
	Current	GC

Table 6-32: Typical measuring points *(continued)*

Position	Measuring point	
	Description	Abbreviation
5	Auxiliary	AUX

Available analytics

Table 6-33 lists the selectable analytics and their available input signals for the motor – inductive asset.

Table 6-33: Electric generator

Analytics	Available input signals			
	CHARM	Sensor	Measuring points[1]	Configuration
Alignment[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	GIH, GIV, GIA, GOH, GOV, or GOA	
	VI Voltage CHARM	Eddy current measuring chain	GIX, GIY, GOX, or GOY	
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	GIH, GIV, GIA, GOH, GOV, or GOA	
	VI Voltage CHARM	Eddy current measuring chain	GIX, GIY, GOX, or GOY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	GIH, GIV, GIA, GOH, GOV, or GOA	Configured bearings (see Bearings)
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	GIH, GIV, GIA, GOH, GOV, or GOA	
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	GIH, GIV, GIA, GOH, GOV, or GOA	Oil
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	GIX, GIY, GOX, or GOY	Configured bearing clearance (see Bearings)
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	GSPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

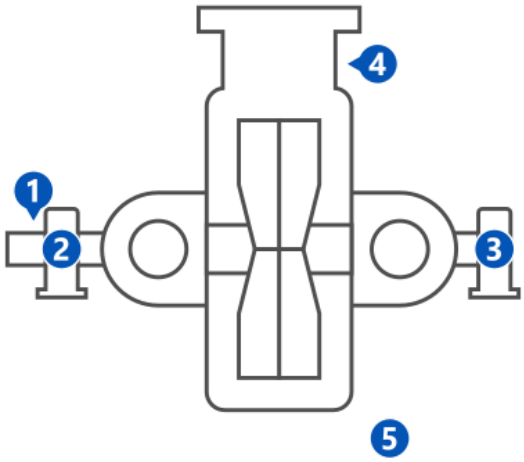
At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.15 Pump – centrifugal, center hung

Asset consisting of a centrifugal pump with a rotating part mounted in the center of two bearings.

Typical measuring points

Figure 6-42: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-34: Typical measuring points

Position	Measuring point	
	Description	**Abbreviation**
1	Outboard horizontal vibration	POH
	Outboard vertical vibration	POV
	Outboard axial vibration	POA
	Outboard X vibration	POX
	Outboard Y vibration	POY
	Outboard temperature	POT
2	Inboard horizontal vibration	PIH
	Inboard vertical vibration	PIV
	Inboard axial vibration	PIA

Table 6-34: Typical measuring points *(continued)*

Position	Measuring point	
	Description	**Abbreviation**
	Inboard X vibration	PIX
	Inboard Y vibration	PIY
	Inboard temperature	PIT
3	Speed	PSPD
4	Flow turbulence	PFT
5	Auxiliary	AUX

Available analytics

Table 6-35 lists the selectable analytics and their available input signals for the pump – centrifugal, center hung asset.

Table 6-35: Pump – centrifugal, center hung

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points**[1]	**Configuration**
Alignment[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, or POA	
	VI Voltage CHARM	Eddy current measuring chain	PIX, PIY, POX, or POY	
Balance[2]	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, or POA	
	VI Voltage CHARM	Eddy current measuring chain	PIX, PIY, POX, or POY	
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	PIH, PIV, PIA, POH, POV, or POA	Configured bearings (see Bearings)
Blade pass	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, or POA	
Flow turbulence – pump	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, POA, or PFT	
Looseness	VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, or POA	
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	PIH, PIV, PIA, POH, POV, or POA	

Table 6-35: Pump – centrifugal, center hung *(continued)*

Analytics	Available input signals			
	CHARM	Sensor	Measuring points[1]	Configuration
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	PIX, PIY, POX, or POY	Configured bearing clearance (see Bearings)
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	PSPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

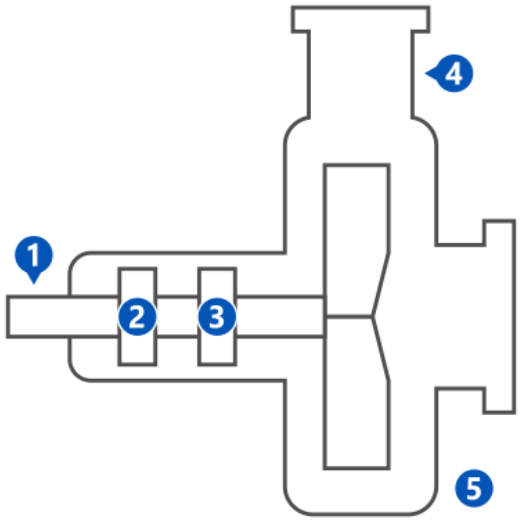
At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.16 Pump – centrifugal, over hung

Asset consisting of a centrifugal pump with a rotating part mounted in an overhung position – the rotating part is supported by two bearings at one side of the pump.

Typical measuring points

Figure 6-43: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-36: Typical measuring points

Position	Measuring point	
	Description	Abbreviation
1	Outboard horizontal vibration	POH
	Outboard vertical vibration	POV
	Outboard axial vibration	POA
	Outboard X vibration	POX
	Outboard Y vibration	POY
	Outboard temperature	POT
2	Inboard horizontal vibration	PIH
	Inboard vertical vibration	PIV
	Inboard axial vibration	PIA
	Inboard X vibration	PIX
	Inboard Y vibration	PIY
	Inboard temperature	PIT
3	Speed	PSPD
4	Flow turbulence	PFT
5	Auxiliary	AUX

Available analytics

Table 6-37 lists the selectable analytics and their available input signals for the pump – centrifugal, over hung asset.

Table 6-37: Pump – centrifugal, over hung

Analytics	Available input signals			
	CHARM	Sensor	Measuring points[1]	Configuration
Alignment[2]	AM 5125 VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, or POA	
	VI Voltage CHARM	Eddy current measuring chain	PIX, PIY, POX, or POY	
Balance[2]	AM 5125 VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, or POA	
	VI Voltage CHARM	Eddy current measuring chain	PIX, PIY, POX, or POY	

Table 6-37: Pump – centrifugal, over hung *(continued)*

Analytics	Available input signals			
	CHARM	Sensor	Measuring points[1]	Configuration
Bearing (using PeakVue Plus)	AM 5125 VI Piezo CHARM	Accelerometer	PIH, PIV, PIA, POH, POV, or POA	Configured bearings (see Bearings)
Blade pass	AM 5125 VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, or POA	
Flow turbulence – pump	AM 5125 VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, POA, or PFT	
Looseness	AM 5125 VI Piezo CHARM	Accelerometer or piezo electric velocity sensor	PIH, PIV, PIA, POH, POV, or POA	
Lubrication (using PeakVue Plus)	AM 5125 VI Piezo CHARM	Accelerometer	PIH, PIV, PIA, POH, POV, or POA	
Oil whirl	VI Voltage CHARM	Eddy current measuring chain	PIX, PIY, POX, or POY	Configured bearing clearance (see Bearings)
All analytics[3]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[4]	PSPD	Accurate name plate speed of the asset is always required

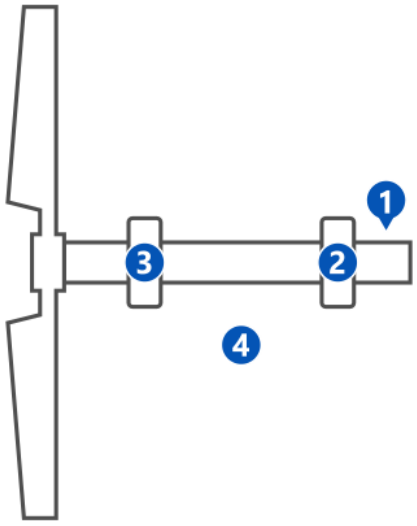
1 *A single measuring point is sufficient to activate the analytics.*
2 *One of the listed CHARMs is sufficient for the analytics.*
3 *Actual rpm input is recommended.*
4 *Requires an external voltage supply.*

At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.17 Wind turbine

Asset template for a wind turbine rotor shaft with two bearings.

Figure 6-44: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-38: Typical measuring points

Position	Measuring point	
	Description	**Abbreviation**
1	Speed	WSPD
2	Inboard horizontal vibration	WIH
	Inboard vertical vibration	WIV
	Inboard axial vibration	WIA
	Inboard X vibration	WIX
	Inboard Y vibration	WIY
	Inboard temperature	WIT
3	Outboard horizontal vibration	WOH
	Outboard vertical vibration	WOV
	Outboard axial vibration	WOA
	Outboard X vibration	WOX
	Outboard Y vibration	WOY
	Outboard temperature	WOT
4	Auxiliary	AUX

Available analytics

Table 6-39 lists the selectable analytics and their available input signals for the wind turbine asset.

Table 6-39: Wind turbine

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points**[1]	**Configuration**
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	WIH, WIV, WIA, WOH, WOV, or WOA	Configured bearings (see Bearings)
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	WIH, WIV, WIA, WOH, WOV, or WOA	
All analytics[2]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[3]	WSPD	Accurate name plate speed of the asset is always required

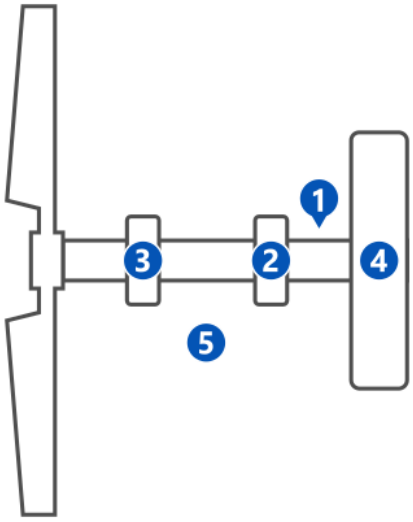
1 *A single measuring point is sufficient to activate the analytics.*
2 *Actual rpm input is recommended.*
3 *Requires an external voltage supply.*

At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.18 Wind turbine – generator

Asset template for a wind turbine where the rotor is connected without a gearbox in between to the generator. The shaft is supported by two bearings.

Figure 6-45: Typical measuring points



One bearing vibration measurement with a piezoelectric accelerometer on each bearing of the asset is the recommended measurement.

Table 6-40: Typical measuring points

Position	Measuring point	
	Description	**Abbreviation**
1	Speed	WSPD
2	Inboard horizontal vibration	WIH
	Inboard vertical vibration	WIV
	Inboard axial vibration	WIA
	Inboard X vibration	WIX
	Inboard Y vibration	WIY
	Inboard temperature	WIT
3	Outboard horizontal vibration	WOH
	Outboard vertical vibration	WOV
	Outboard axial vibration	WOA
	Outboard X vibration	WOX
	Outboard Y vibration	WOY
	Outboard temperature	WOT
4	Winding 1 temperature	WW1T
	Winding 2 temperature	WW2T
	Winding 3 temperature	WW3T

Table 6-40: Typical measuring points *(continued)*

Position	Measuring point	
	Description	**Abbreviation**
	Generator current	WGC
5	Auxiliary	AUX

Available analytics

Table 6-41 lists the selectable analytics and their available input signals for the wind turbine – generator asset.

Table 6-41: Wind turbine – generator

Analytics	Available input signals			
	CHARM	**Sensor**	**Measuring points**[1]	**Configuration**
Bearing (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	WIH, WIV, WIA, WOH, WOV, or WOA	Configured bearings (see Bearings)
Lubrication (using PeakVue Plus)	VI Piezo CHARM	Accelerometer	WIH, WIV, WIA, WOH, WOV, or WOA	
All analytics[2]	VI Tach CHARM (optionally 24 V DI CHARM, 4 to 20 mA AI CHARM, or External data point)	Passive magnetic pickup, Hall-effect sensor, or Proximity probe and converter[3]	WSPD	Accurate name plate speed of the asset is always required

1 *A single measuring point is sufficient to activate the analytics.*
2 *Actual rpm input is recommended.*
3 *Requires an external voltage supply.*

At least one valid vibration sensor (connected and working properly) is needed to activate an analytics. The use of multiple sensors and vibration measuring points helps significantly to detect asset condition deterioration and is recommended. Analytics can work with configured nominal asset speed (**Running speed**), but the monitoring of the actual rotor speed with a VI Tach CHARM is recommended.

6.5.19 Recommended procedure – Assets

First configuration – Assets

Procedure

1. Select **Assets** from the sidebar.
2. Click **New asset**.

   The dialog for selecting a new asset opens.

3. Select an asset type and click **Create asset**.

   The assets (fan, pump, motor, generator, gearbox, and heat exchanger) have analytics assigned in accordance with their structure and function.

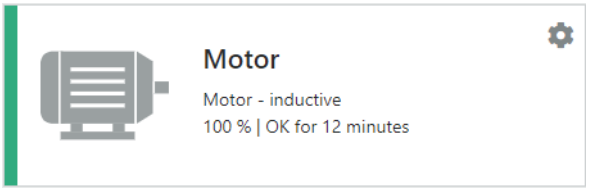
   Up to 12 assets can be created.

4. Enter configuration parameters in accordance with the selected asset and map CHARMs to the measurement points.

   Note
   An available source can only be mapped to one measurement point of an asset. Once mapped, the source cannot be mapped to other measurement points of the same asset or to measurement points of other assets. Undo the mapping to use the source for another measurement point.

5. Click **Save & Close** to accept the entries.
   A new asset object appears on the overview page and the health of the asset is calculated for the first time. All further calculations are made according to the health calculation cycle of 60 minutes.

Figure 6-46: New asset object



Configuration change – Assets

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Procedure

1. Select **Assets** from the sidebar.
2. Click on the asset object to be changed to open the asset's overview.
   - In the **Tiles** view, click on the asset object to be changed to open the asset's overview. Click **Configure** in the right upper corner of the content area to open the configuration. See Tiles view – Assets.
   - In the **List** view, click **Configure** in the column **Action** in the row of the asset to be configured. See List view – Assets.
3. Check the configuration parameters and change them in accordance with your needs.
4. Click **Save & Close** to accept the entries.

Delete an Asset

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Procedure

1. Select **Assets** from the sidebar.
2. Click on the asset object to be deleted to open the asset's overview.
3. Click **Delete** in the right upper corner of the content area to remove the asset.
4. Confirm the confirmation prompt.
   The asset is removed from the system.

6.5.20 Parameter description – Assets

General

This page contains parameters for general asset information and specific basic parameters. Optional parameters are marked with **(optional)**.

Basic

Parameter group for entering identification data.

Name	Enter a name for the asset.
Description	Enter a description of the asset.
Asset ID	Enter an identifier for the asset.

Vendor information

Parameter group for entering vendor data.

Manufacturer	Enter the manufacturer of the asset.
Model	Enter the model name of the asset.
Serial number	Enter the serial number of the asset.

Details – asset specific parameter

Parameter group for entering specific basic parameters. The available parameters depend on the selected asset.

Fans

Running speed	Enter the running speed of the fan.
Number of poles	Fan with direct motor drive only. Enter the number of poles – not the number of pole pairs.
Line frequency	Fan with direct motor drive only. Enter the line frequency of the motor's power supply.

Number of blades	Enter the number of the fan blades.
Staggered blades	If the fan has staggered blades check this box.

Gearbox – single reduction, double reduction, and triple reduction

Running speed	Enter the running speed of the input shaft.

Generic assets

Running speed	Enter the running speed of the generic asset.

Motor – inductive

Running speed	Enter the running speed of the motor.
Number of poles	Enter the number of poles – not the number of pole pairs.
Line frequency	Enter the line frequency of the motor's power supply.

Pumps

Running speed	Enter the running speed of the pump.
Number of vanes	Enter the number of the vanes of the pump.
Staggered vanes	If the pump has staggered vanes check this box.

Heat exchanger – shell & tube, counter-current

Transfer coefficient	Enter the transfer coefficient.
Transfer area	Enter the transfer area value.

Wind turbine

Running speed	Enter the running speed of the wind turbine.

Wind turbine – generator

Running speed	Enter the running speed of the wind turbine
Number of poles	Enter the number of poles of the generator – not the number of pole pairs.
Line frequency	Enter the line frequency.

Bearings

This chapter describes the bearing configuration. If a gearbox asset is selected, one parameter group per shaft is available containing parameters to configure inboard bearing, outboard bearing, and gears.

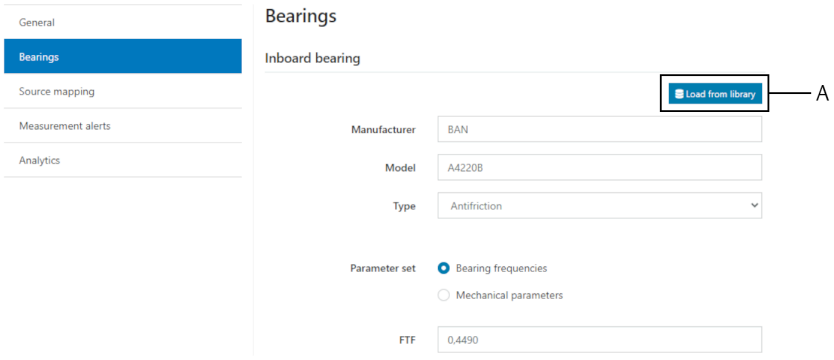
Inboard bearing

Parameter group for entering bearing data of the assets, except for the **Heat exchanger – shell & tube, counter-current** assets.

Enter bearing data or load antifriction bearing data from the integrated library.

1. Click **Load from library** to open the bearing selection dialog.

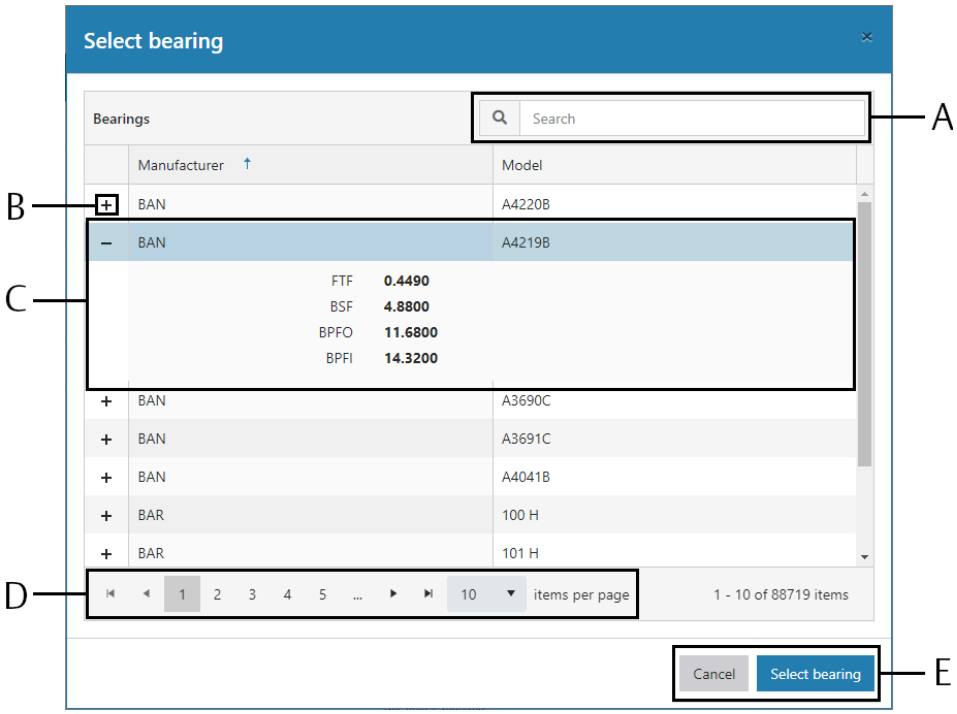
Figure 6-47: Open bearing selection dialog



*A. Button **Load from Library***

2. Select a bearing from the list.
   Use the search function to search for a bearing manufacturer or a bearing model.
   Click the plus sign the open the bearing details.
   Click the desired bearing to select it. A selected bearing is highlighted in blue.

Figure 6-48: Bearing selection



A. Search field
B. Button to open the bearing details
C. Selected bearing with opened details
D. Navigation buttons
E. Buttons to cancel the dialog or the confirm the selection

3. Click **Select bearing** to transfer the selected bearing data to the bearing configuration.

Enter the bearing data by hand if the bearing is not contained in the library or if the asset is equipped with sleeve bearings.

Manufacturer Enter the manufacturer of the bearing.

Model Enter the bearing model.

Type Select the bearing type.

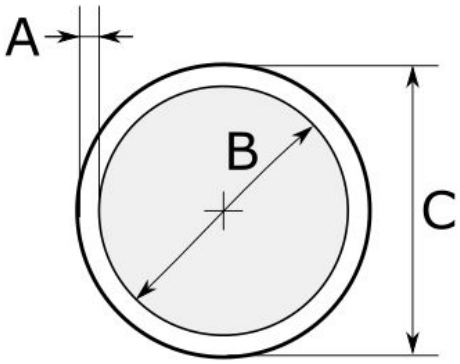
- **Antifriction**
- **Sleeve**
- **Unknown**
  The entry fields for bearing details are not available.

Bearing clearance Only if **Sleeve** is selected for **Type**.

Enter the bearing clearance, the width of the nominal gap between journal (shaft) and bearing.

The bearing clearance (c) is defined as bearing diameter (D) minus the journal diameter (d).

Figure 6-49: Bearing clearance definition



A. *Bearing clearance (c)*
B. *Diameter of the journal (d)*
C. *Diameter of the bearing (D)*

Parameter set

Only if **Antifriction** is selected for **Type**.

Select whether mechanical data or bearing frequencies are available for the bearing.

- **Mechanical parameters**
  Select this option if the mechanical data of the bearing is known.
- **Bearing frequencies**
  Select this option if the bearing fault frequencies of the bearing are known.

Mechanical parameters

Number of balls/rollers	Enter the number of balls or rollers of the bearing.
Ball/roll diameter	Enter the diameter of the ball or roller.
Pitch diameter	Enter the pitch diameter.
Contact angle	Enter the contact angle.

Bearing frequencies

FTF	Enter the Fundamental Train Frequency.
BSF	Enter the Ball Spin Frequency.
BPFO	Enter the Ball Pass Frequency Outer.
BPFI	Enter the Ball Pass Frequency Inner.

Outboard bearing

See Inboard bearing.

Gear

Only if an asset with a gear box is selected.

Number of teeth	Enter the number of teeth of the gear wheel. The number of teeth of the gear wheel of both shafts is used to calculate the transmission ratio of the gear box. This ratio is used for further calculations such as calculation of an output shaft's speed if only one physical sensor is installed at the input shaft of a gear box. For intermediate shafts, enter the number of teeth of the input gear and the output gear.

Hot side

Parameter group for entering hot side data of the **Heat exchanger – shell & tube, counter-current** assets.

Maximum flow	Enter the maximum flow of the process fluid.
Heat capacity	Enter the heat capacity of the air.
Vaporization heat	Enter the heat of the vaporization.
Inlet vapor fraction	Enter the inlet vapor fraction.
Outlet vapor fraction	Enter the outlet vapor fraction.

Cold side

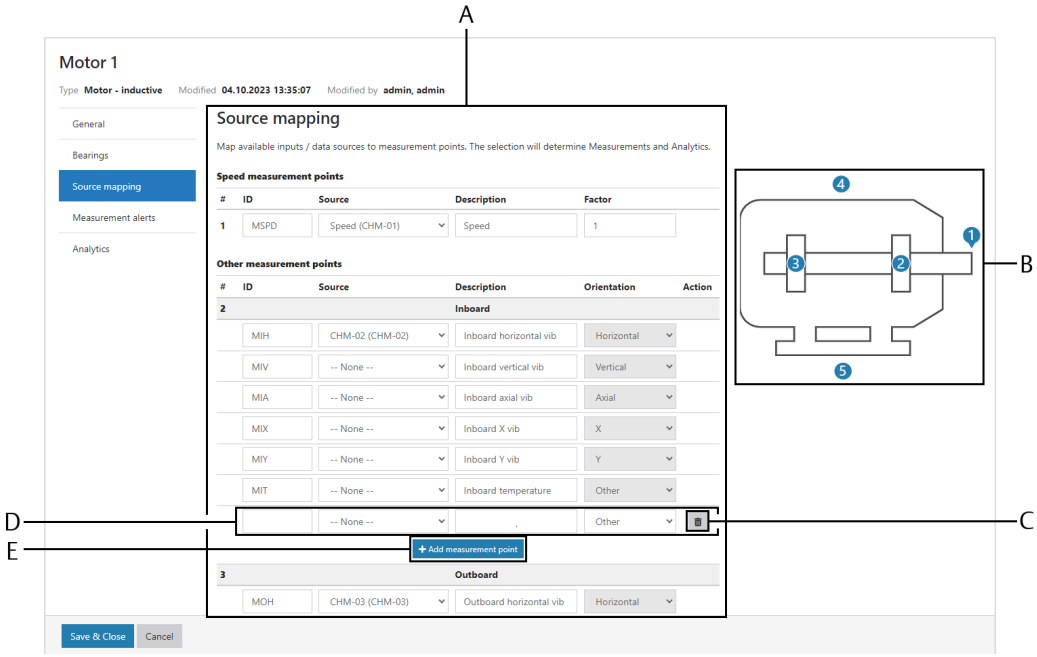
Parameter group for entering cold side data of the **Heat exchanger – shell & tube, counter-current** assets. See Hot side for parameter description.

Source mapping

Assign installed CHARMs and external data points to measurement points of the asset. Predefined measurement points including a short description are listed. Additional measurement points can be added. Up to 62 mapped sources per asset are allowed. The measurement points are grouped by measurement locations such as inboard bearing or outboard bearing. A list field, containing all available sources (installed CHARMs and all configured external data points), is assigned to each measurement point.

Note
An available source can only be mapped to one measurement point of an asset. Once mapped, the source cannot be mapped to other measurement points of the same asset or to measurement points of other assets. Undo the mapping to use the source for another measurement point.

Figure 6-50: Source mapping

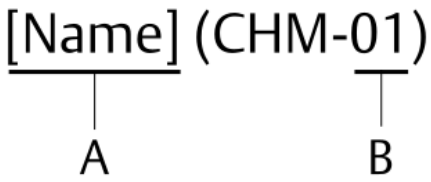


A. List of measurement points of the asset, grouped by measurement locations, including description and selection field
B. Asset with marked measurement locations (see Measurement points and measurement locations for details)
C. Button to delete a measurement point.
D. New measurement point
*E. Button **+ Add measurement point***

Select the CHARM or external data point that is physically connected to the measurement point of the asset from the list field. Repeat this for all physically connected measurement points.

The CHARMs are named according to the entered name (**CHARM → Configure → Basic → Name**) and related to their position within the AMS Asset Monitor.

Figure 6-51: CHARM naming



A. Name entered during CHARM configuration
B. Slot number (1 to 12)

The name of the external data points are defined during the data point configuration (see Parameter description – External data points).

Column description of the list for the source mapping:

Number of the measurement location.

ID Enter an identifier for the measurement point. The identifier of the predefined measurement points is structured as followed:

[Asset][Measuring point]

Table 6-42: Abbreviations used for the measurement point identifier – Asset

Abbreviation	Meaning
M	Motor
G	Generator
P	Pump
G	Generic
G1	Gearbox, shaft 1
G2	Gearbox, shaft 2
G3	Gearbox, shaft 3
G4	Gearbox, shaft 4
F	Fan
F1	Fan with gearbox, shaft 1
F2	Fan with gearbox, shaft 2
H	Heat exchanger
W	Wind turbine

Table 6-43: Abbreviations used for the measurement point identifier – Measuring point

Abbreviation	Meaning	Abbreviation	Meaning
IH	Inboard Horizontal	W3T	Winding 3 temperature
IV	Inboard Vertical	C	Current
IA	Inboard Axial	SPD	Speed
IX	Inboard X	FT	Flow turbulence
IY	Inboard Y	OQ	Oil Quality
IT	Inboard Temperature	HFL	Hot Side Flow
OH	Outboard Horizontal	CFL	Cold Side Flow
OV	Outboard Vertical	HITMP	Hot Side Inlet temperature

Table 6-43: Abbreviations used for the measurement point identifier – Measuring point *(continued)*

Abbreviation	Meaning	Abbreviation	Meaning
OA	Outboard Axial	CITMP	Cold Side Inlet temperature
OX	Outboard X	HDP	Hot Side Differential pressure
OY	Outboard Y	CDP	Cold Side Differential pressure
OT	Outboard Temperature	HOTMP	Hot Side Outlet temperature
SLL	Seal level	COTMP	Cold Side Outlet temperature
HL	Hydrocarbon leak	SP	Suction pressure
AUX	Auxiliary input	DP	Discharge pressure
W1T	Winding1 temperature	SLP	Seal pressure
W2T	Winding 2 temperature		

Source Select a source from the list of available sources to map it to a measurement point.

CHARMs or external data points can be mapped as sources to a measurement point. For speed measurement points are further sources selectable:

- Running speed, speed entered in the asset configuration (**General** → **Running speed**)
- From gear ratio, calculated from the number of teeth entered in the configuration of assets with a gearbox (**Shaft 1 - input** → **Number of teeth** and **Shaft 2 - output** → **Number of teeth**)
- Speed measured by a CHARM
- Speed from another asset

Description Enter a description for the measurement point. Predefined measurement points already have a description.

Factor Available for CHARMs, external data points, and assets used as a speed measurement source.

Enter a factor to change the measured speed. The measured speed is multiplied by the entered factor.

Orientation	Select an orientation to indicate the direction of the installed measurement. Predefined measurement points already have an orientation selected which cannot be changed.
Action	Click the trash can icon to delete an added measurement point. Predefined measurement points cannot be deleted.

Auxiliary input

The source mapping table of almost all assets, except the **Heat exchanger – shell & tube, counter current** asset, contains an additional auxiliary input (AUX). Use this input to add further process data to the asset. Sources for the auxiliary input are:

- External data points
- CHARMs
- Predicates
- Output logics

Configure alarm limits for the auxiliary input (see Measurement alerts) to supervise this measurement. The source mapped to the auxiliary input is not used for the health calculation of the asset.

Add a new measurement point

If predefined measurement points do not fit to the physical measurement point or if there are more measurement points at the machine than predefined measurement points are available add further measurement points.

1. Click **+ Add measurement point** to add a new measurement point. A row for entering data of the measurement point is added to the measurement locations where the button **+Add measurement point** belongs to.
2. Enter the data for the new measurement point.

Delete a measurement point

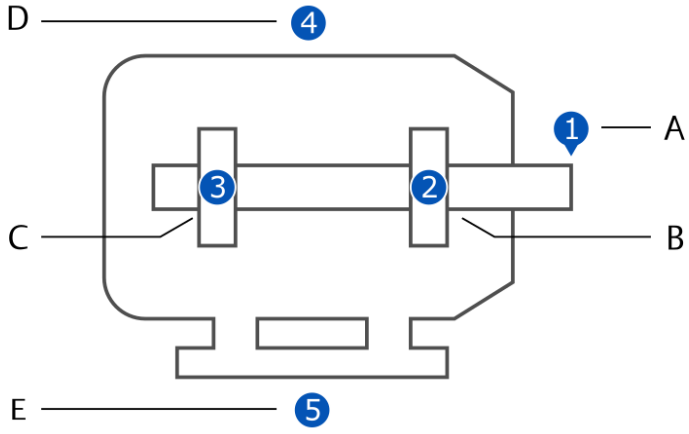
Click the trash can icon in the row of the measurement point to be deleted. Predefined measurement points cannot be deleted.

The measurement point is immediately removed form the list.

Measurement points and measurement locations

Measurement locations are marked on the asset diagram with numbered bubbles. Each bubble represents a single measurement point or a group of measurement points.

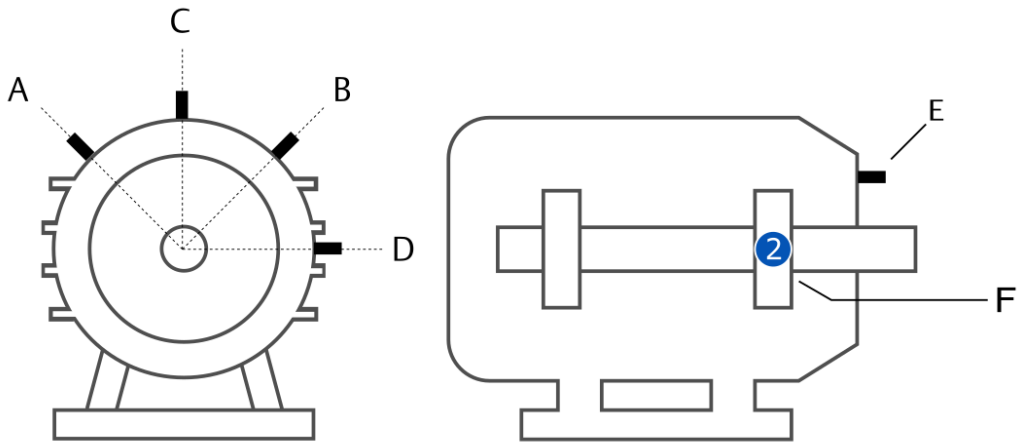
Figure 6-52: Inductive motor asset with marked measurement locations.



A. Speed
B. Measurement locations at the inboard bearing
C. Measurement locations at the outboard bearing
D. Temperature measurement location
E. Auxiliary input (AUX)

Bearing measurement locations can contain measurement points in X, Y, vertical, horizontal, and axial direction, and a temperature measurement. See Figure 6-53 for an example about measurement points at an inboard bearing of the inductive motor asset.

Figure 6-53: Measurement points – inboard bearing



A. X (-45°)
B. Y (+45°)
C. Vertical
D. Horizontal
E. Axial
F. Marked inboard bearing (measurement location)

Measurement alerts

Define a set of alarm limits for each source assigned to the asset. An alarm limit set can consists of up to six alarm limits depending on the selected alert type. The result of the limit supervision is included in the asset health calculation (see Health calculation) and can be used for output logics (see Output logics).

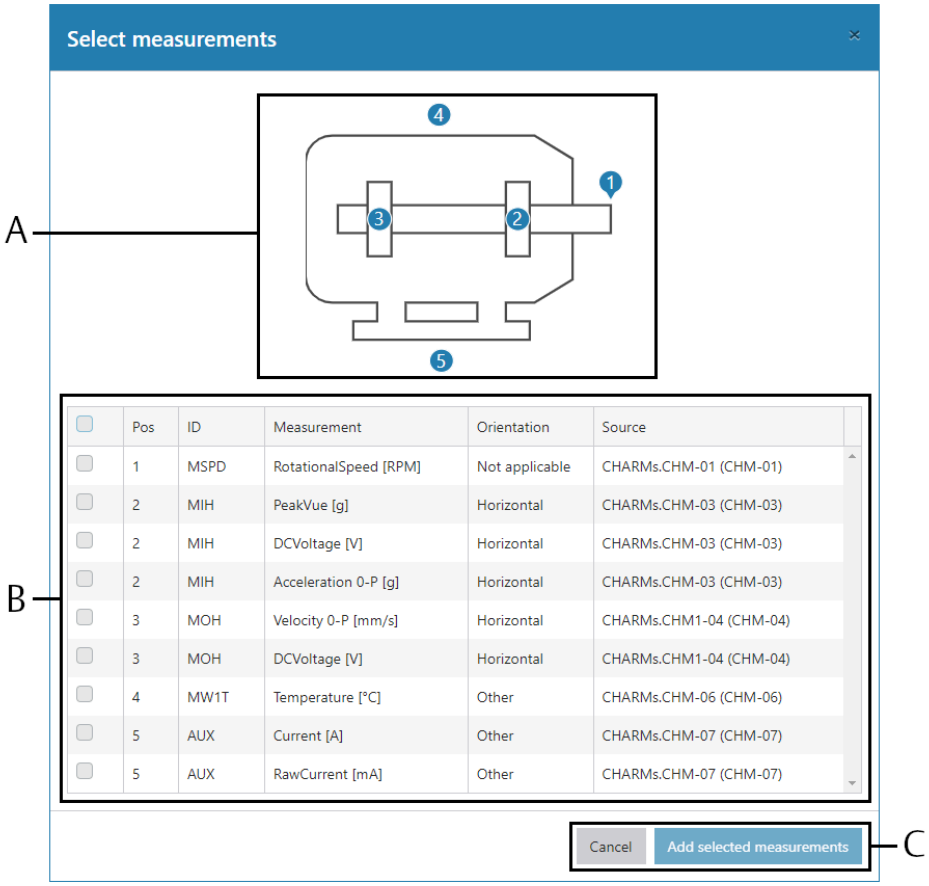
Figure 6-54: Measurement alerts

A. Alarm limit set
B. Button to add a further alarm limit set
C. Designation of the measurement point with signal type and unit.
D. Checkbox to enable the alarm limit set
E. Button to delete the alarm limit set

Add a new measurement alert

1. Click **+Add measurement** to open the dialog for selecting a measurement.

Figure 6-55: Dialog Select measurements



A. Asset with used measurement locations (highlighted blue)
B. List of available measurement points
C. Buttons to confirm of discard the selection

2. Check the box in the row of the measurement to be supervised. To select all measurements at once, check the box in the table header. Click a selected box again to deselect it.
3. Click **Add selected measurements** to create an alarm limit set for each selected measurement. Click **Cancel** to discard the selection.
4. Configure the alarm limit set.

Enable	Check this box to enable the alarm limit set.
Alert type	Select an alert type. Depending on the selection, fields for entering alert limits appear. The switching behavior of the alert types is described in Table 6-44.

Table 6-44: Alert types

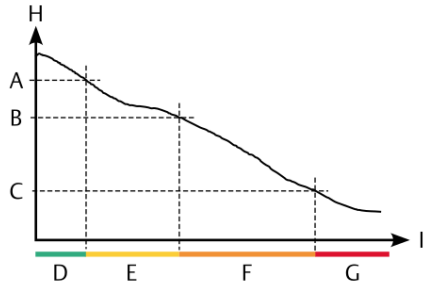
Alert type	Alert behavior
Lower absolute	**Figure 6-56: Alert sequence – Lower absolute**  The sequence of the limits is decreasing. Enter alert limits in decreasing order (Lower advice limit > Lower warning limit > Lower critical limit) The alert (advice, warning, or critical) is active if the measurement value is less than the corresponding limit value. If the measurement value exceeds the limit again, the corresponding alert is withdrawn. At least one alert limit must be entered. *A. Lower advice limit* *B. Lower warning limit* *C. Lower critical limit* *D. OK range* *E. Lower advice alert active* *F. Lower warning alert active* *G. Lower critical alert active* *H. Measurement value* *I. Time*

Table 6-44: Alert types *(continued)*

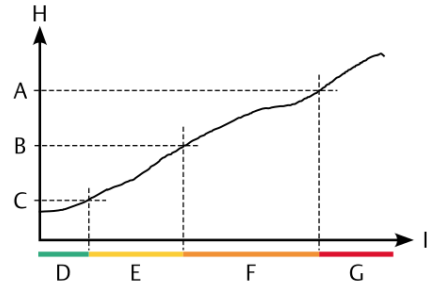
Alert type	Alert behavior
Upper absolute	The sequence of the limits is increasing. Enter alert limits in increasing order (Upper advice limit < Upper warning limit < Upper critical limit) The alert (advice, warning, or critical) is active if the measurement value is greater than the corresponding limit value. If the measurement value is below the limit again, the corresponding alert is withdrawn. At least one alert limit must be entered. **Figure 6-57: Alert sequence – Upper absolute**  *A. Upper critical limit* *B. Upper warning limit* *C. Upper advice limit* *D. OK range* *E. Upper advice alert active* *F. Upper warning alert active* *G. Upper critical alert active* *H. Measurement value* *I. Time*

Table 6-44: Alert types *(continued)*

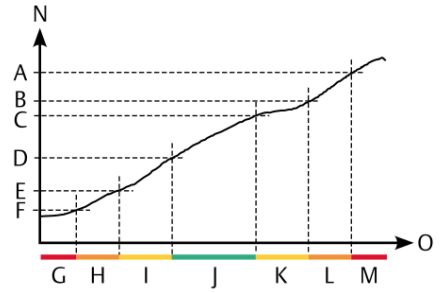
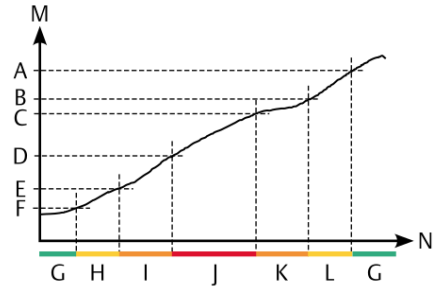
Alert type	Alert behavior
Outside absolute window	The alert (advice, warning, or critical) is active if the measurement value is outside the window defined by a corresponding alert limit pair. If the measurement value is inside a defined window again, the corresponding alert is withdrawn. See Figure 6-58 At least one alert limit pair such as **Lower critical** and **Upper critical** must be entered. Enter alert limits in increasing order (Lower critical limit < Lower warning limit < Lower advice limit < Upper advice < Upper warning < Upper critical) **Figure 6-58: Alert sequence – Outside absolute window**  *A. Upper critical limit* *B. Upper warning limit* *C. Upper advice limit* *D. Lower advice limit* *E. Lower warning limit* *F. Lower critical limit* *G. Lower critical alert active* *H. Lower warning alert active* *I. Lower advice alert active* *J. OK range* *K. Upper advice alert active* *L. Upper warning alert active* *M. Upper critical alert active* *N. Measurement value* *O. Time*

Table 6-44: Alert types *(continued)*

Alert type	Alert behavior
Inside absolute window	The alert (advice, warning, or critical) is active if the measurement value is inside the window defined by a corresponding alert limit pair. If the measurement value is outside a defined window again, the corresponding alert is withdrawn. See Figure 6-59. At least one alert limit pair such as **Lower critical** and **Upper critical** must be entered. Enter alert limits in increasing order (Lower advice limit < Lower warning limit < Lower critical limit < Upper critical < Upper warning < Upper advice) **Figure 6-59: Alert sequence – Inside absolute window**  *A. Upper advice limit* *B. Upper warning limit* *C. Upper critical limit* *D. Lower critical limit* *E. Lower warning limit* *F. Lower advice limit* *G. OK range* *H. Lower advice alert active* *I. Lower warning alert active* *J. Lower critical alert active* *K. Upper warning alert active* *L. Upper advice alert active* *M. Measurement value* *N. Time*

Lower critical Enter a limit value for the lower critical alarm.

Lower warning Enter a limit value for the lower warning alarm.

Lower advice Enter a limit value for the lower advice alarm.

Upper advice Enter a limit for the upper advice alarm.

Upper warning	Enter a limit for the upper warning alarm.
Upper critical	Enter a limit for the upper critical alarm.

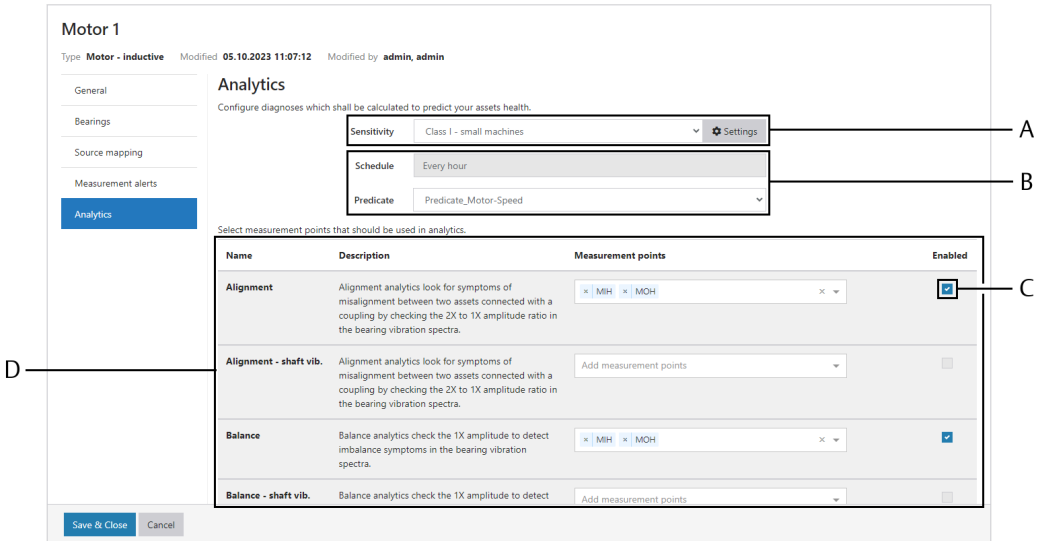
Delete a measurement alert

Click the trash can icon in the upper right corner of an alarm limit set (see Figure 6-54) to delete it. The alarm limit set is deleted immediately. Check the configured output logics (see Output logics) whether the deleted measurement alert has been used for an output logic or not. Reconfigure the output logic if necessary.

Analytics

Enable or disable available analytics, map measurement points (see Source mapping) to analytics, and select a sensitivity for the health calculation. The availability of the analytics depends on the selected asset.

Figure 6-60: Analytics



A. *Calculation sensitivity selection with button **Settings***
B. *Diagnoses settings*
C. *Checkbox to enable or disable analytics*
D. *List of analytics with mapped measurement points*

Configuration

Define when and under which conditions health is calculated. The asset health can be calculated at a defined interval in combination with a configurable condition (predicate). With a selected predicate, health is calculated at the scheduled interval when the predicate is **TRUE**.

Sensitivity	Select a sensitivity for the diagnosis calculation according to the ISO 10816 classification of your asset. Select **Custom** to use customized limits for the

calculation. This option is recommended for expert users who know the function of the selected analytics and the influence of limit changing.

- **Class I – small machines**
- **Class II – medium machines**
- **Class III – large rigid foundation**
- **Class IV – large soft foundation**
- **Custom**

Click **Settings** to open a dialog with all limits used for the calculation. **Custom** limits can be modified. See Settings.

Schedule The schedule is set to **Every hour**. This setting cannot be changed. To execute a diagnoses manually click the refresh button in the upper right corner of the analytics display (see Status overview – asset).

Predicate Select a predicate from the drop-down list or select **None** if only the configured time schedule is to be used for the health calculation. All predicates configured on page **Predicates** are listed.

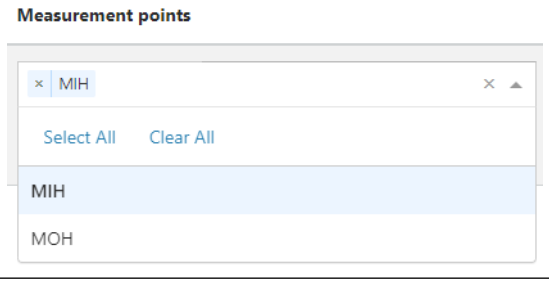
List of available analytics

Name Name of the analytics.

Description Description of the analytics.

Measurement point Select a measurement point from the drop-down list to assign the measurement point to the analytics.

Figure 6-61: Drop-down list measurement points



Click **Select All** to assign all measurement points in the drop-down list to the analytics.

Click **Clear All** to undo the selection.

Click a single measurement point in the drop-down list to assign it to the analytics.

Click **x** in front of the measurement point to unassign a single measurement from the analytics.

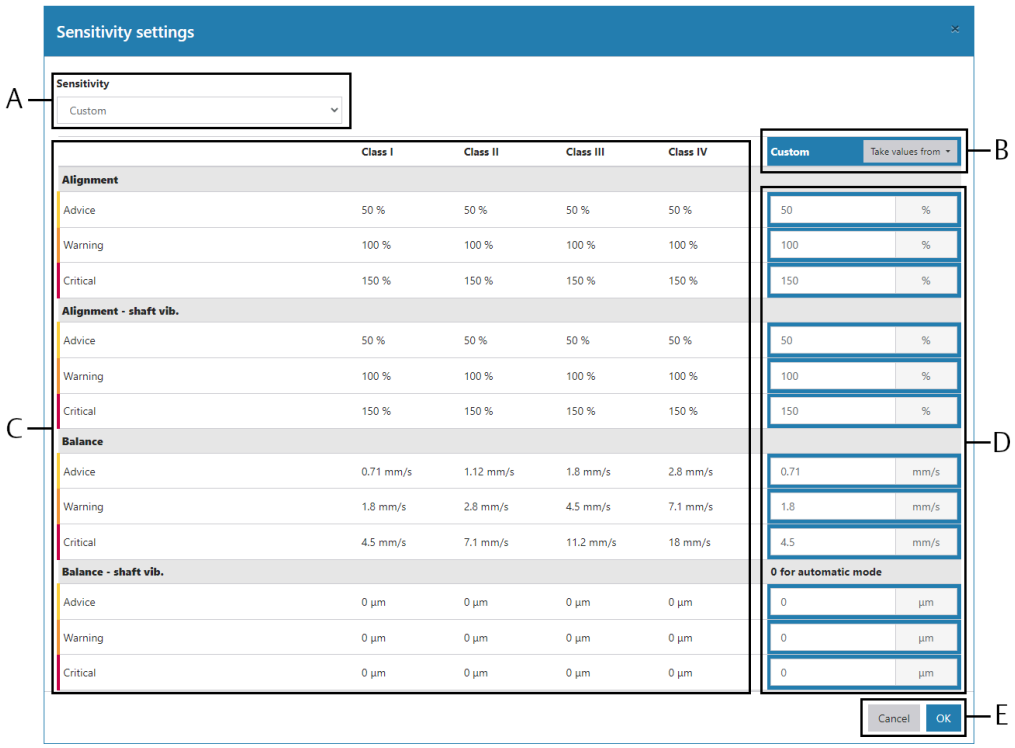
For an explanation of the measurement point abbreviations see Table 6-42.

Enable Check this box assigned to the analytics to activate the calculation.

Settings

View limits of the predefined sensitivity settings and create or modify an own sensitivity setting.

Figure 6-62: Sensitivity settings



A. Drop-down list for sensitivity selection
B. Drop-down list for limits transfer
C. List of limits for the single analytics depending on the selected predefined sensitivity
D. Entry fields for custom sensitivities
E. Accept or discard buttons

Select a predefined sensitivity:

1. Select one of the predefined sensitivities from the drop-down list **Sensitivity**:
   - **Class I – small machines**
   - **Class II – medium machines**
   - **Class III – large rigid foundation**
   - **Class IV – large soft foundation**

   The column with the selected sensitivity is highlighted.
2. Click **OK** to confirm the selection and to close the dialog. Click **Cancel** to close the dialog without changes.

Create a custom sensitivity:

1. Select **Sensitivity** → **Custom**.
   The column **Custom** is highlighted and the entry fields for the limits are enabled.
2. If you want the custom settings to be based on one of the predefined sensitivities, click **Take values from** to open a drop-down list with the predefined sensitivities.
3. Select a suitable predefined sensitivity from the drop-down list.
   The values are transferred from the selected predefined sensitivity to the column **Custom**.
4. Modify the limits according to your needs.
5. Click **OK** to confirm the selection and to close the dialog. Click **Cancel** to close the dialog without changes.

6.5.21 Tachometer

There are three different sources with different accuracy that can be used for a tachometer signal. The most accurate of the available sources is automatically used by the AMS Asset Monitor.

Running speed	The running speed entered into the configuration (**Asset** → **Configure** → **General** → **Running speed**) is used as a tachometer signal. This is the most inaccurate source as the real asset speed is not known.
Converted speed	The speed measured at the input shaft of an asset is converted to the speed of the output shaft, or the other way round. Ensure that the entered number of teeth (**Asset** → **Configure** → **Shaft 1 or Shaft 2** → **Number of teeth**) is correct to avoid wrong speed calculation, which would significantly affect the quality of the analysis output.
Measured speed	The speed measurement and the measurement for the health calculation are located at the same shaft. This is the most accurate source. Two different CHARMs are available to measure speed. Use a VI Tach CHARM to detect pulses provided by an externally powered eddy current sensor, a passive magnetic sensor, or a Hall-effect sensor. Select the VI Tach CHARM during the asset configuration as the source for the speed (**Asset** → **Configure** → **Source mapping**) Use a DI 24 VDC Low-Side CHARM configured as pulse counter (**CHARM** → **Configure** → **Functionality** → **Pulse Count Input**) to detect pulses provided by a suitable speed sensing device. The input frequency range for the pulse counter is 0.1 Hz to 10 kHz with 50 µs minimum pulse width. Select this DI CHARM during the asset configuration as the source for the speed (**Asset** → **Configure** → **Source mapping**). An external data point or the 4 to 20 mA AI CHARM (**CHARM** → **Configure** → **Measurement type** → **Rotational speed**) can also be used to provide measured speed.

6.6 Output logics

Recommended procedures – External data points describes procedures to create, change, and delete a configuration of an output logic. Parameter description – Output Logics describes the parameters to be configured.

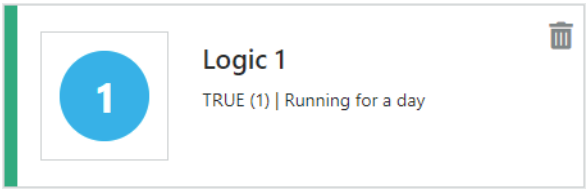
6.6.1 Recommended procedures – Output logics

First configuration – Output logics

Procedure

1. Select **Output logics** from the sidebar.
2. Click **New output logic**.
   The dialog for defining the logic opens. Up to 20 output logics can be defined.
3. Define the logic.
4. Click **Save & Close** to accept the entries.
   A new logic object appears on the overview page.

Figure 6-63: New logic object



Configuration change – Output logics

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Procedure

1. Select **Output logics** from the sidebar.
2. Click the output logic object to be changed to open the dialog for defining the logic.
   - In the **Tiles** view, click on the output logic object to be changed to open the configuration. See Tiles view – Output logics.
   - In the **List** view, click **Configure** in the column **Action** in the row of the output logic to be configured. See List view – Output logics.
3. Check the settings and change them in accordance with your needs.
4. Click **Save & Close** to accept the entries.

Delete an output logic

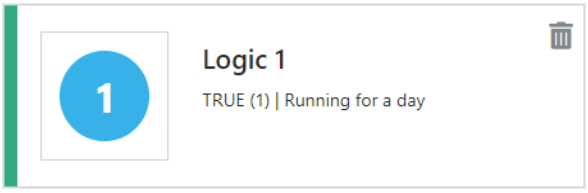
⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Procedure

1. Select **Output logics** from the sidebar.
2. Click the trash can icon in the logic object to be deleted to remove the logic.

Figure 6-64: Output logic object – trash can icon

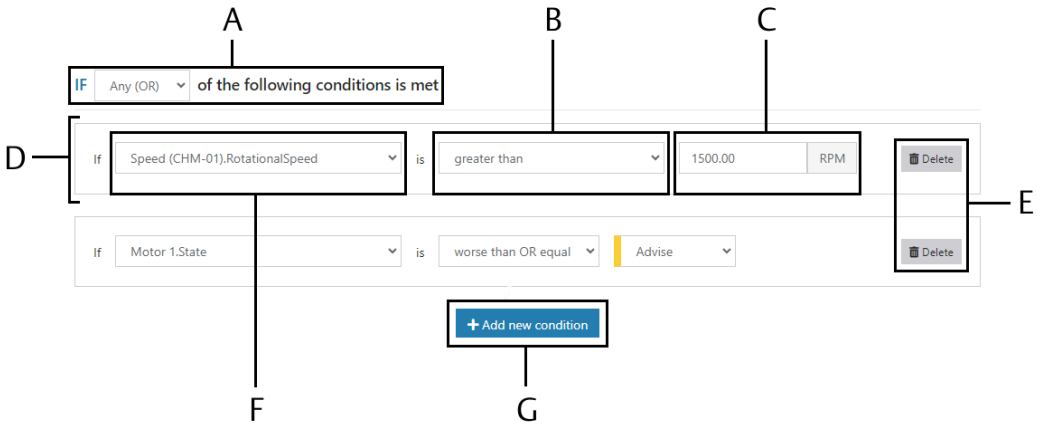


The output logic is removed immediately.

6.6.2 Parameter description – Output Logics

Enabled	Check this box to enable the logic.
Name	Enter a name for the logic.
Description	Enter a short description of the logic.

Figure 6-65: Condition configuration



A. Execution condition
B. Condition
C. Limit or level
D. Condition row
E. Button to delete a condition
F. Data source selection
G. Button to add a new condition

If

Select when the logical conditions listed below must be executed.

- **Any**
  One or more of the selected conditions has been fulfilled (OR).
- **All**
  All selected conditions have been fulfilled (AND).

Add a new condition

Click **+Add new condition** to add a new row for defining a logic condition. Up to 20 conditions can be defined.

Complete the new logical condition.

1. Select the data source from the drop-down list.
   The available data sources depend on the configuration of the AMS Asset Monitor. Measurement values, states, and alerts of the following data groups can be selected.
   - CHARMS
   - External data points
   - Predicates
   - Assets
   - Output logics
2. Depending on the selected data source further selection and entry fields for defining the condition appear, see Table 6-45. Select a limit condition.

Table 6-45: Configuration fields depending on data source selection

Data source characteristic	Condition	Level/Limit
Binary value	• TRUE (1) • FALSE (0)	-/-
State or alert	• better than OR equal • worse than OR equal	• Unknown • OK • Maintenance • Advice • Warning • Critical
Measurement value	• greater than • greater than OR equal • less than • less than OR equal • between (> min AND <= max) • not between (<= min OR > max)	Entry field for limit value, two entry fields for conditions **between** and **not between**

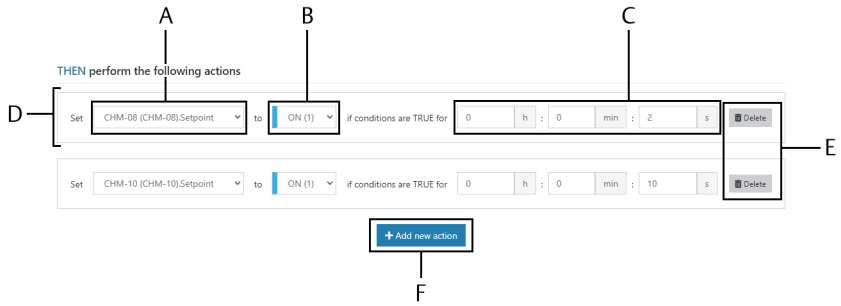
3. Enter a limit value if a source is selected that provides a limit value entry field. Two entry fields are available if **between** or **not between** is selected for the limit condition.

To delete a condition, click the trash can icon at the end of the row to be deleted.

If an asset has more than one measurement point, the status of the measurement point with currently the worst measuring result is used for the logic.

Note
A data source in **Critical** state, such as a CHARM with a sensor error, sets the condition to **FALSE**. If the data source is **OK** again, the condition is set to **TRUE** – provided that the configured condition is also **TRUE**.

Figure 6-66: Action configuration



A. Output CHARM selection
B. Selection of the output state if the condition is met
C. Fields to enter a delay
D. Action
E. Button to delete an action
F. Button to add a new action

Then Click **+Add new action** to add a new row for defining an output action. Up to 12 output actions can be defined.
Complete the new action.

1. Select the output CHARM form the list field. Only discrete output CHARMs are selectable.
2. Select the output state the selected CHARMs must switch to if the selected logical condition is met.
   - **ON**
   - **OFF**
3. Enter a delay time in hours, minutes, and seconds for switching the output. The entered value is the time between the detection of the alarm status and the switching of the output.

To delete an action, click the trash can icon at the end of the row to be deleted.

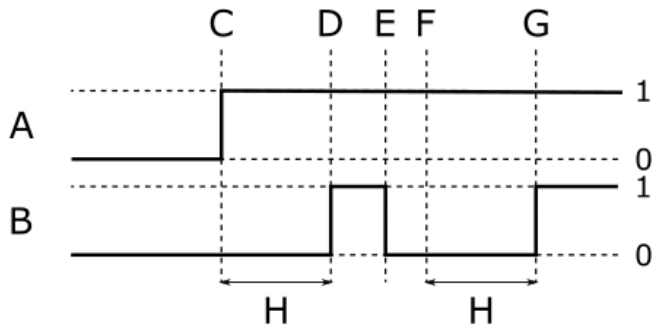
Output behavior when the configuration is changed during an active condition

The behavior of an assigned CHARM might change if an Output Logics configuration is saved while the configured logic condition is fulfilled.

Table 6-46: Output behavior during a configuration change

Change to the output logic configuration	Output behavior
General change during a running delay	The delay starts anew if an output logic configuration is saved during a running delay. If the delay time is changed, the delay starts with this new time. Example: • Delay for switching the output is set to 30 seconds. • A condition has been met and the delay starts to run. • The configuration of the output logic is changed, the delay time is unchanged. The change was sent after 20 seconds have elapsed. • The condition is still met. The delay is restarted and the output is switched 50 seconds after the condition has been met.

Table 6-46: Output behavior during a configuration change *(continued)*

Change to the output logic configuration	Output behavior
Change of the output state configuration (**ON** or **OFF**) during an active logic condition	• **Change from OFF (0) to ON (1)** Baseline scenario: The output state is configured to switch off (**OFF (0)**) the output of the assigned CHARM in case of a fulfilled logic condition. The logic condition is met **(1)**, so the output is switched off **(0)**. When a configuration with output state set to **ON (1)** is saved while the logic condition is met **(1)**, the output of an assigned CHARM is switched on **(1)** after the configured delay time has elapsed, see Figure 6-67, starting from point **F**. • **Change from ON (1) to OFF (0)** Baseline scenario: The output state is configured to switch on (**ON (1)**) the output of the assigned CHARM in case of a fulfilled logic condition. The logic condition is met **(1)**, so the output is switched on **(1)** after the configured delay time has elapsed. When a configuration with output state set to **OFF (0)** is saved while the logic condition is met **(1)**, the output of an assigned CHARM is immediately switched off **(0)**, see Figure 6-67, starting from point **C**. **Figure 6-67: Output behavior**  *A. Logic condition* *B. Output state* *C. Condition change to alarm* *D. After delay, output is switched on **(1)*** *E. Output state configuration changed from **ON (1)** to **OFF (0)*** *F. Output state configuration changed from **OFF (0)** to **ON (1)*** *G. After delay, output is switched on **(1)*** *H. Configured delay*

6.7 Data collections

6.7.1 Recommended procedures – Data collections

First configuration – Data collections

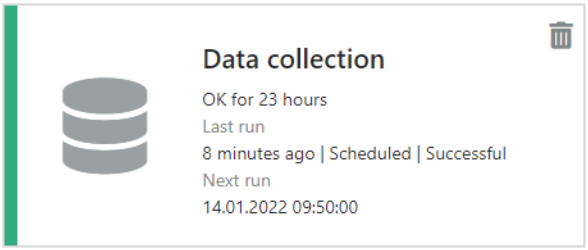
Procedure

1. Select **Data collections** from the sidebar.
2. Click **+ New Data Collection**.

   The dialog for defining a data collection opens. Up to 12 data collections can be defined.
3. Enter parameters in accordance with the needed data collection task.
4. Click **Save & Close** to accept the entries.

   A new data collection object appears on the overview page.

Figure 6-68: New data collection



Now the AMS Asset Monitor automatically sends waveform data to a connected AMS Machine Works, based on the configured schedule or predicate.

Configuration change – Data collections

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Procedure

1. Select **Data collections** from the sidebar.
2. Click the data collection to be changed to open the dialog to define the data collection.
   - In the **Tiles** view, click on the data collection object to be changed to open the configuration. See Tiles view – Data collections.
   - In the **List** view, click **Configure** in the column **Action** in the row of the data collection to be configured. See List view – Data collections.
3. Check the settings and change them in accordance with your needs.
4. Click **Safe & Close** to accept the entries.

Delete a data collection

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Procedure

1. Select **Data collections** from the sidebar.
2. Delete the data collection.
   - In the **Tiles** view, click the trash can icon in the data collection object to be deleted to remove the data collection. See Tiles view – Data collections.
   - In the **List** view, click **Delete** in the column **Action** in the row of the data collection to be deleted to remove the data collection. See List view – Data collections.
3. Confirm the confirmation prompt.

   The data collection is removed from the system. Waveform data is no longer sent to AMS Machine Works.

6.7.2 Parameter description – Data collections

Basic

Enabled	Check this box to enable the data collection.
Name	Enter a name for the data collection.
Description	Enter a description of the data collection.

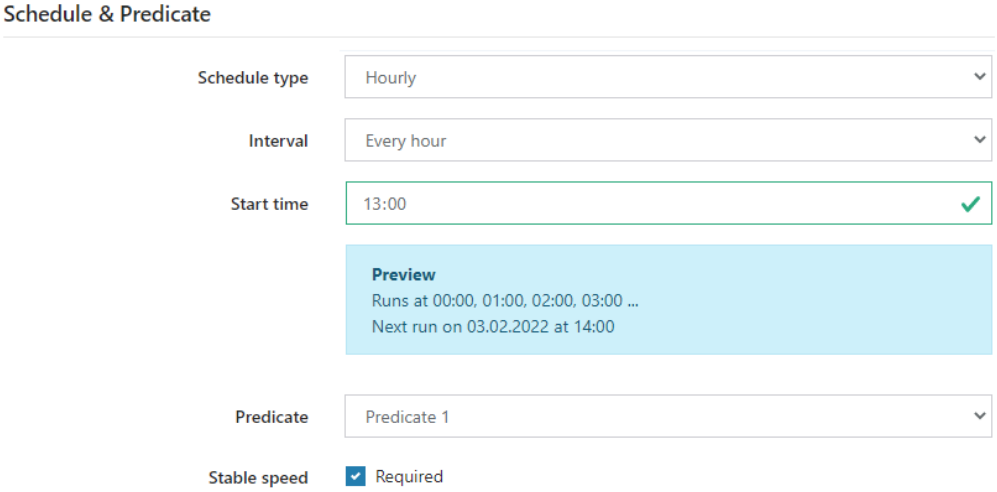
Schedule & Predicate

Define when and under which conditions data is collected. Data can be collected at a defined interval or time in combination with a configurable condition (predicate). With a selected predicate, data is collected at the scheduled time when the predicate is **TRUE**.

A preview note below the schedule parameters informs about the configured intervals and the next run of the data collection. This note is available after the schedule has been fully configured.

Note
Data collections configured to start at the same time are processed one after another, where the sequence is random. So collected data can have different time stamps.

Figure 6-69: Schedule Preview



Schedule type

Select a schedule type.

- **Hourly**
  Data is collected at a definable hourly interval.
- **Daily**
  Data is collected daily at a definable time.
- **Weekly**
  Data is collected weekly at definable days.
- **Monthly**
  Data is collected monthly at definable days.

Depending on the selection, further parameters appear.

Interval

Is available if **Schedule type** → **Hourly** is selected.

Select an interval from the drop-down list.

Start time

Enter a time when the configured data collection is execute. See Table 6-47 for the execution behavior depending on the selected schedule type.

Table 6-47: Data collection execution depending on start time and schedule type

Schedule type	Behavior
Hourly	The start time defines an offset for the configured interval. The example in Figure 6-71 explains this behavior. Configured parameter used for the example: **Schedule type**: Hourly **Interval**: Every 4 hours **Start time**: 06:00 The data collection will be configured around midnight.
Daily	The data collection is executed every day at the entered start time.
Weekly	The data collection is executed on each selected day of the week at the entered start time.
Monthly	The data collection is executed on each selected day of the month at the entered start time.

Days of the week

Is available if **Schedule type** → **Weekly** is selected.

Click the days on which you want to collect data. Selected days are colored blue. To unselect a day, click it again.

Days of the month

Is available if **Schedule type** → **Monthly** is selected.

Click the days on which you want to collect data. Selected days are colored blue. To unselect a day, click it again.

Note
Data is not collected at days that do not belong to the current month. Example: Day 31 is ignored at all month with less than 31 days.

Predicate

Select a predicate from the drop-down list or select **None** if only the configured time schedule is to be used for the data collection. All predicates configured on page **Predicates** (Parameter description – Predicates) are listed.

Note
Data is not collected if a predicate is not **TRUE**. The AMS Asset Monitor retries to collect data until the predicate becomes **TRUE** and the pending data collection can be executed. After the successful data collection the AMS Asset Monitor continuous collecting data based on the configured schedule.

If a predicate becomes **FALSE** during a running data collection, the data collection is aborted. The data collection is executed as soon as the predicate is **TRUE** again.

Stable speed

Check this box to activate the supervision of speed stability during data collection.

This function checks the stability of the speed source, assigned to the measurement, during the data collection. The data collection is canceled if the speed differs more than 2% from the mean speed. The scheduled data collection is retried until data has been successfully collected. A short message informs about the cause of the failed data capturing (see Figure 6-70).

Figure 6-70: Notification about failed data collection because of unstable speed in the asset status overview

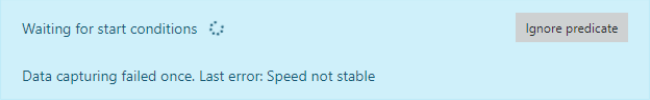
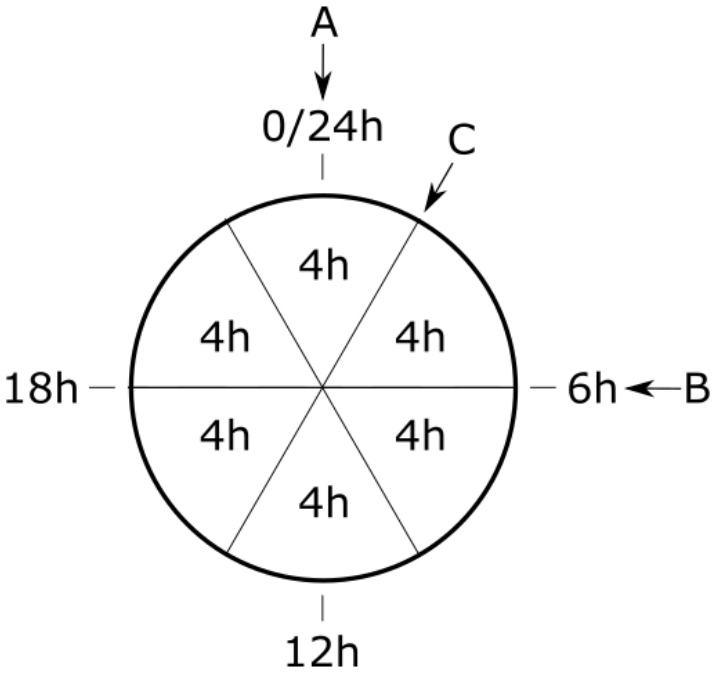


Figure 6-71: Hourly – Start time example



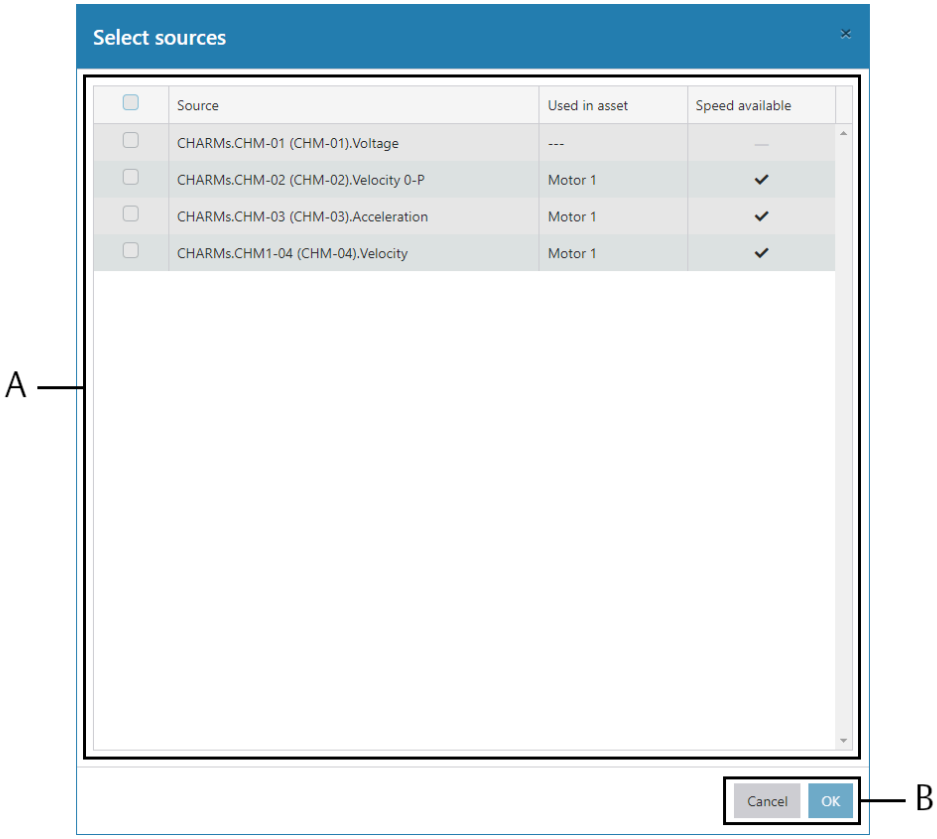
A. Time when the schedule is configured
B. Configured start time
C. First data collection

The first collection occurs before the configured **Start time** at 02:00, as the next interval after the time of the configuration is always used for the collection.

Waveform sources

Click **+ Add source** to add waveform sources line by line. The dialog for selecting sources opens.

Figure 6-72: Select sources



A. List of available measurements providing waveform data
B. Buttons to confirm or discard the selection

The availability of data sources depends on the installed CHARMs and their configuration. All available waveform sources are listed.

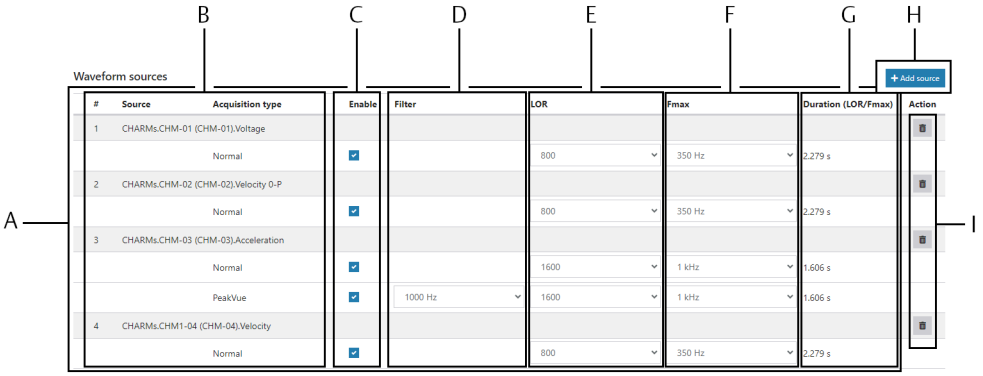
1. Check the box in front of the waveform source you want to select. Check the box in the header of the list (in front of **Source**) to select all waveform sources at once.
   Uncheck a box to deselect a waveform source.
2. Click **OK** to add the selected waveform sources to the list of waveform sources.

To add all available waveform sources at once click **+ Add all available sources**[6].

The same waveform sources is added twice if different acquisition types are available for the source. The maximum number of waveform sources per data collection is 24.

6 *Available as long as no waveform source is selected.*

Figure 6-73: Waveform sources



A. List of selected waveform sources
B. Selected CHARMs and acquisition type
C. Enable or disable a waveform
D. PeakVue filter
E. Lines of resolution
F. Maximum frequency
G. Collection duration as a result of selected LOR and Fmax
H. Button to add a source
I. Button to remove a waveform source from the list

Source The selected waveform source (CHARM) is displayed.

Acquisition type The available acquisition types of the selected source are displayed.

- **Normal**
  The vibration waveform provided by the selected CAHRM is collected.
- **PeakVue**
  The PeakVue waveform provided by the selected CHARM is collected. This acquisition type is additionally available when using VI Piezo CHARMs with an accelerometer.

Enable Check the box of the acquisition type to be used for the data collection.

Filter This drop-down list is available for **Acquisition type** → **PeakVue**. Select a filter from the list. See Table 6-3 for some filter recommendations depending on the machine speed.

LOR Select lines of resolution (LOR) for the data capturing from the drop-down list. This selection has an influence on the duration of the data collection.

Fmax Select an upper cut of frequency for the data collection, which could be, for example, according to the maximum of the expected signal frequency. This selection has an influence on the duration of the data collection.

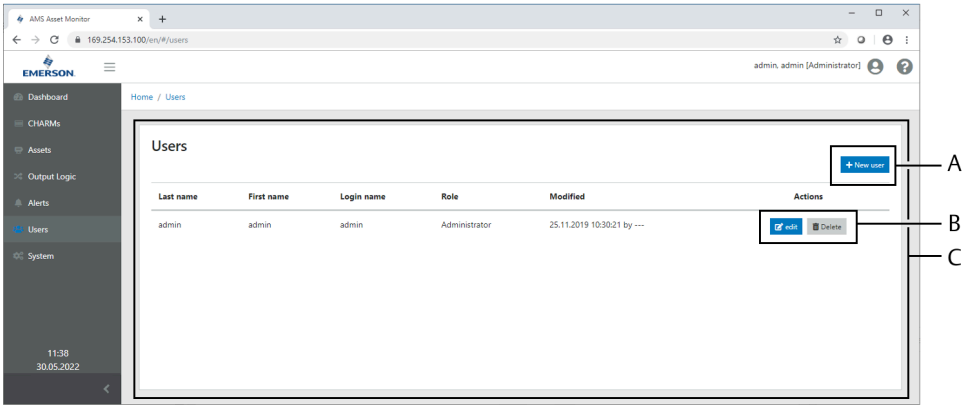
Duration (LOR/ Fmax)	Time (length) of the collected data block. The duration depends on the selected LOR and Fmax.

6.8 Users

Add a new user, delete a user, or edit a user.

Click **Users** to open the list of the existing users.

Figure 6-74: List of existing users



A. *Button **New user***
B. *Buttons for editing or deleting an user*
C. *List of existing users*

Recommended procedures – Users describes procedures to add, edit, and delete a user. Parameter description describes the parameters to be configured. See User menu for the description of the user menu.

6.8.1 Recommended procedures – Users

Add a new user

Add a new user.

Procedure

1. Click **+ New user** to open the dialog for creating a new user.
   The dialog for entering the user settings opens. Up to 50 users can be defined.
2. Complete the dialog. See Parameter description for a detailed description of the parameters.
3. Click **Save & Close** to save the settings on the AMS Asset Monitor or click **Cancel** to discard the entries.
   The changes take effect immediately.

Edit a user

Change an existing user.

Procedure

1. Click **Edit** in the row of the user to be changed.
   The dialog for entering the user settings opens.
2. Change the user settings in accordance with your needs.
   See Parameter description for a detailed description of the parameters.
3. Click **Save & Close** to save the settings on the AMS Asset Monitor or click **Cancel** to discard the entries.
   The changes take effect immediately.

Delete a user

Remove an user from the list.

Procedure

1. Click **Delete** in the row of the user to be deleted.
   A confirmation dialog opens.
2. Confirm the security query.
   The user is removed from the list.

Note
The last user with administration rights in the list cannot be deleted.

6.8.2 Parameter description

Information

Login name	Enter a login name used for the login dialog.
First name	Enter the user's first name.
Last name	Enter the user's last name. The name, displayed in AMS Asset Monitor Web Interface, consists of the entered first and last name.
Password	Define a password with the following requirements: • Minimum 10 characters • Maximum 30 characters • The password must consist of numbers, letters, and special characters.
Confirm password	For confirmation, enter the password again.

User must change password at next login	Check this box to force the user to change the password at the next login. The box is automatically cleared after the user password is changed.

Role

Click one of the listed roles to select it. You can select between the following options:

Administrator	The user has all rights except the right to read data through the OPC UA interface or the AMS Machine Works interface.
Operator	The user can read all information and is allowed to create new configurations or to change existing configurations. The operator is not allowed to administrate other users.
Observer	The user has access to all pages that display information but cannot change the configuration.
OPC UA user	The user has the right to read data through the OPC UA interface. The defined credentials are necessary to get access to the OPC UA interface. The OPC UA user cannot log in to the web interface. This user is required if the box **System → OPC UA → Allow anonymous access** is not checked.
AMS Machine Works user	The user has the right to read data through the AMS Machine Works interface. The defined credentials are necessary to get access to the AMS Machine Works interface. The AMS Machine Works user cannot log in to the web interface.

Preferences

Language	Use the drop-down list to select a language.
Units	Click **SI** to select the metric system of units or click **Imperial** to select imperial units.

6.8.3 User menu

The user menu contains the following items:

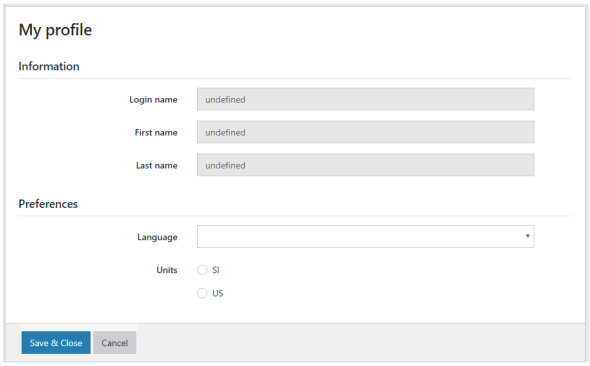
- Profile
- Change password
- Logout

Profile

Click **Profile** to open the profile of the user currently logged in.

The language of AMS Asset Monitor Web Interface and the system of units can be changed in this dialog.

Figure 6-75: Menu item: Profile



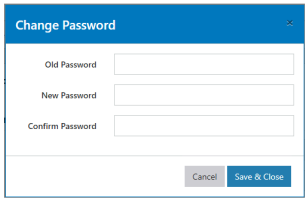
For a parameter description see Parameter description.

Change password

Change the password of the user currently logged in.

1. Click **Change password** to open the dialog for changing the password.

Figure 6-76: Change password dialog



2. Enter the old password in the field **Old Password**.
3. Enter the new password in the field **New Password**.
4. To confirm the new password enter it in the field **Confirm Password** again.
5. Click **Save & Close** to save the change or click **Cancel** to discard the changes.
   Use the new password at the next log in of the user.

Logout

Click **Logout** to exit AMS Asset Monitor Web Interface. The login dialog opens.

6.9 System

Recommended procedures – System describes a procedures to change the system configuration. Parameter description – System describes the parameters to be configured for OPC UA and Modbus TCP communication. For a description of the other system parameters and configuration procedures see Enter basic settings.

6.9.1 Recommended procedures – System

Configuration change – System

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Procedure

1. Select **System** from the sidebar.
2. Click **Configure** in the right upper corner of the content area to open the configuration.
3. Check the configuration parameters and change them according to your needs.
4. Click **Save & Close** to accept the entries.

6.9.2 Parameter description – System

See Enter basic settings for description of the dialogs **Basics**, **Network IPv4**, **DNS**, and **Date and time**.

AMS Machine Works interface

The AMS Asset Monitor is equipped with an interface to send data to AMS Machine Works. Table 6-48 lists the provided data.

Note
The available data depends on the configuration of the AMS Asset Monitor.

Table 6-48: Provided data

Data	Unit	Note
Waveform data		
Waveform data collected by the Data collection function (including speed data[1])	Depends on configuration	See Data collections
Scalar values		
Main value of the CHARMs	Depends on configuration	See CHARMs
Value of the external data points		See External data points
Internal temperature of the AMS Asset Monitor	°C	
Supply voltage level of the AMS Asset Monitor	V	
Overall assets health	%	
Asset health		
CHARM health		

Table 6-48: Provided data *(continued)*

Data	Unit	Note
AMS Asset Monitor health		
Overall asset status	---	
Asset status		
CHARM status		
AMS Asset Monitor status		

1 If the CHARM is mapped to an asset.

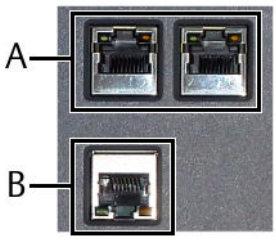
Update rate

Waveform data is provided according to the configured schedule (see Parameter description – Data collections). Scalar values are provided according to the entered **Scalar values publish rate** (see Configuration) and when waveform data is provided.

Connection

Each of the three RJ-45 sockets can be used as a connection for the AMS Machine Works interface.

Figure 6-77: Connection interface



A. Ethernet switch with two RJ-45 connectors (left connector LAN2.1, right connector LAN2.2)
B. RJ-45 Ethernet connector LAN1

Configuration

Enable for LAN1 and LAN2	Check this box to activate the AMS Machine Works interface of the AMS Asset Monitor for both LAN interfaces, LAN1 and LAN2 (LAN2.1 and LAN2.2). Both interfaces LAN1 and LAN2 can be used for the communication to AMS Machine Works. Emerson recommends to connect not more than one AMS Machine Works to an AMS Asset Monitor.
Scalar values publish rate	Enter a time to define an update rate of the scalar values. Scalar values are sent in the configured interval to AMS Machine Works.

Modbus TCP

The AMS Asset Monitor is equipped with a Modbus TCP server. The Modbus registers that need to be provided by the Modbus TCP server can be freely arranged in a register range of

0 to 65535. The data format complies with IEEE 754. Float values occupy two 16 bit registers. See Table 6-49 for the byte order.

Note
Modbus data is generally provided in SI units, independently of the selected system of units in the user configuration (see Users). Except for external data points, the configured source unit is used (see Parameter description – External data points).

Table 6-49: Two-register value float

First register		Second register	
Register low (bit 15 to bit 0)		Register high (bit 31 to bit 16)	
High byte	Low byte	High byte	Low byte

Data points

⚠ CAUTION

After updating the firmware of the AMS Asset Monitor from version 2.x to 3.x, the Modbus register structure has been changed. Adapt existing Modbus registers to the changed structure.

Table 6-50 to Table 6-58 provide a general overview about the available data points. The availability of the data points depends on the configuration of the AMS Asset Monitor. The assignment of the data points to the Modbus registers depends on the configured Input and Holding registers (see Input registers and Holding registers).

Table 6-50: General data points – AMS Asset Monitor

Data point	Data type	Length	Note
Interface version	String	15	
Display name	String	15	
Mainboard serial number	String	15	
Device revision	String	15	
Device type	String	15	
Inner temperature	Float	2	Unit: °C
Supply voltage	Float	2	Unit: V
Cold starts	Float	2	
Warm starts	Float	2	

Table 6-50: General data points – AMS Asset Monitor *(continued)*

Data point	Data type	Length	Note
Status	Uint16	1	Status value meaning 0: Not applicable 1: Unknown 2: Disabled 3: Active 4: OK 5: Advice 6: Maintenance 7: Warning 8: Critical

Table 6-51: Data points – Assets

Data point	Data type	Length	Note
Display name	String	15	
Type	Uint16	1	Asset type 1: Pump – centrifugal, overhung 2: Generic – rotating, overhung 3: Generic – rotating, centerhung 4: Motor – inductive 5: Pump – centrifugal, centerhung 6: Gearbox – single reduction 7: Fan – axial, gearbox drive 8: Fan – centrifugal, centerhung 9: Fan – axial, direct motor drive 10: Fan – centrifugal, overhung 11: Heat exchanger – shell & tube advisor, counter-current 12: Hydrocarbon pump – centrifugal, overhung 13: Gearbox – double reduction 14: Gearbox – triple reduction 15: Wind turbine 16: Wind turbine – generator 17: Electric generator
Status	Uint16	1	Status value meaning 0: Unknown 1: OK 2: Advice 3: Maintenance 4: Warning 5: Critical

Table 6-51: Data points – Assets *(continued)*

Data point	Data type	Length	Note
Health	Float	2	Unit: %
Symptom text	String	15	
Assessment text	String	15	
Recommendation text	String	15	

Table 6-52: Data points – Measurements

Data point	Data type	Length	Note
Display name	String	15	
Status	Uint16	1	Status value meaning 0: Unknown 1: OK 2: Advice 3: Maintenance 4: Warning 5: Critical
Health	Float	2	Unit: %
Symptom text	String	15	
Assessment text	String	15	
Recommendation text	String	15	
Value	Float	2	Unit depends on configuration

Table 6-53: Data points – Analytics

Data point	Data type	Length	Note
Status	Uint16	1	Status value meaning 0: Unknown 1: OK 2: Advice 3: Warning 4: Critical
Health	Float	2	Unit: %
Symptom text	String	15	
Assessment text	String	15	
Recommendation text	String	15	

Table 6-54: Data points – CHARMs

Data point	Data type	Length	Note
Display name	String	15	

Table 6-54: Data points – CHARMs *(continued)*

Data point	Data type	Length	Note
Type	Uint16	1	CHARM type: 2: Unsupported 3: Free slot 4: DI 24 VDC Dry Contact 5: DO 24 VDC High-Side 6: AI 4-20 mA HART 8: RTD / Resistance Input 9: Thermocouple / mV Input 10: VI Piezo 11: VI Voltage 12: VI Tach
Serial number	String	15	
Firmware revision	String	15	
Hardware revision	String	15	
Info slot	Float	2	Slot number
Address error	Uint16	1	Status value meaning: 0: False 1: True 2: Not applicable
Self test error	Uint16	1	
Fail safe state	Uint16	1	
Not calibrated	Uint16	1	
Hardware error	Uint16	1	
Out of range	Uint16	1	
Channel open	Uint16	1	
Channel shorted	Uint16	1	
Field power error	Uint16	1	
Faulty cold junction compensation	Uint16	1	
Voltage out of range	Uint16	1	
Sensor error	Uint16	1	
Tuning phase	Uint16	1	
Bad reference	Uint16	1	
Faulty comparator	Uint16	1	
Faulty converter	Uint16	1	

Table 6-54: Data points – CHARMs *(continued)*

Data point	Data type	Length	Note
Status	Uint16	1	Status value meaning 0: Not applicable 1: Disabled 2: OK 3: Maintenance 4: Critical
Values	Float	2	

Table 6-55: Data points – External data points

Data point	Data type	Length	Note
Display name	String	15	
Value	Float	2	Unit depends on configuration
Status	Uint16	1	Status value meaning 0: Unknown 1: Disabled 2: OK 3: Critical

Table 6-56: Data points – Predicates

Data point	Data type	Length	Note
Display name	String	15	
Value	Bool	1	
Status	Uint16	1	Status value meaning 0: Disabled 1: Running 2: Maintenance

Table 6-57: Data points – Output logics

Data point	Data type	Length	Note
Display name	String	15	
Value	Bool	1	
Status	Uint16	1	Status value meaning 0: Disabled 1: Running 2: Maintenance

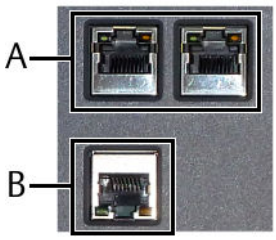
Table 6-58: Data points – Data collections

Data point	Data type	Length	Note
Display name	String	15	
Last run – status	Uint16	1	Status value meaning 0: Successful 1: Aborted due to predicate 2: Aborted due to not stable speed 3: Aborted 4: Failed 5: Partially failed 6: Not run yet
Lat run – time	String	15	
Next run	String	15	
Status	Uint16	1	Status value meaning 0: Disabled 1: Idle 2: Due 3: Collecting data 4: Maintenance

Connection and communication

Each of the three RJ-45 sockets can be used as a connection interface for the Modbus TCP server. See Figure 6-78 for position of the RJ-45 sockets.

Figure 6-78: RJ-45 sockets



A. *Ethernet switch with two RJ-45 connectors (left connector LAN2.1, right connector LAN2.2)*
B. *RJ-45 Ethernet connector LAN1 for configuration and connection to subsequent systems*

Up to five Modbus TCP clients can be simultaneously connect to the Modbus TCP server. The three RJ-45 connectors can also be used simultaneously.

An IP address and a port is required for the client to connect to the Modbus TCP server. The communication is designed for reading and writing data.

Server

Configure the Modbus TCP server.

Enable for LAN1
Check this box to activate the Modbus TCP server with communication through the LAN1 interface (lower socket of the three RJ-45 sockets).

Enable for LAN2
Check this box to activate the Modbus TCP server with communication through the LAN2 interface (upper two sockets of the three RJ-45 sockets).

Both interfaces LAN1 and LAN2 can be simultaneously used for the Modbus TCP communication. A disabled LAN interface is indicated at the top of the configuration page. Ensure that the interfaces are enabled (see Network IPv4) before using them for the Modbus TCP configuration.

Read response for unmapped register
Choose the response if an unmapped register is read. The register mapping depends on the configuration of the AMS Asset Monitor.

- **Zero fill**
  If an unmapped register is read, the AMS Asset Monitor responses with **0**.
- **Illegal data address**
  If an unmapped register is read, the AMS Asset Monitor responses with **Illegal data address** (recommended setting)
  Exception code: **02**

This selection is valid for both the LAN1 interface and the LAN2 interface.

Write response for unmapped register
Choose the response if an unmapped register is written. The register mapping depends on the configuration of the AMS Asset Monitor.

- **OK**
  If an unmapped register is written, the AMS Asset Monitor responses with **OK**.
- **Illegal data address**
  If an unmapped register is written, the AMS Asset Monitor responses with **Illegal data address**.
  Exception code: **02**

Use IP whitelist
Check this box to enable the IP white list for the Modbus TCP interface. IP addresses entered in the following field are allowed to communicate with the Modbus TCP interface.
The white list is valid for both the LAN1 interface and the LAN2 interface.

IP address
Enter IP addresses of Modbus TCP clients allowed to communicate with the Modbus TCP server. Click **+Add new** to add further IP addresses. Up to ten IP addresses can be entered. To remove an IP address from the list, click the trash can icon behind the IP address.

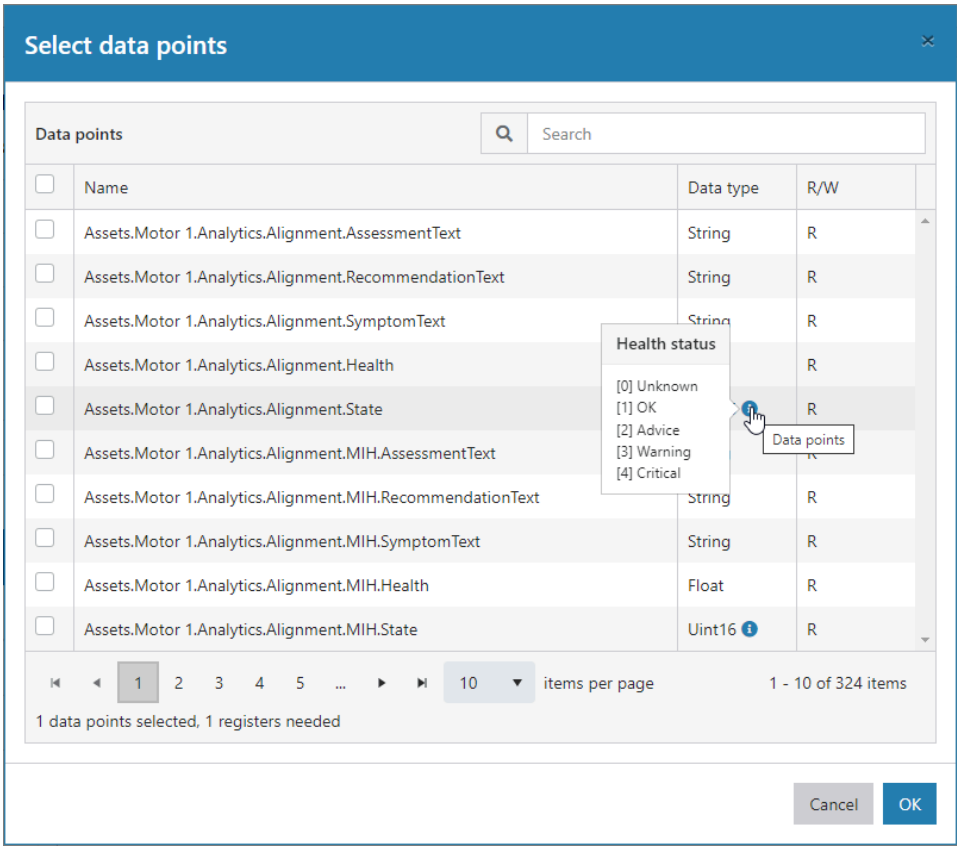
Input registers

Compose a list of input registers that are provided by the Modbus TCP server. The list can contain up to 1000 registers. A report containing the list of registers can be created, see Report.

Procedure

1. Click **+ Add register** to open the dialog for selecting data points.

Figure 6-79: Select data points



The availability of data points are defined by the configuration of the AMS Asset Monitor. All available data points are listed. Use the search function to reduce the amount of listed data points to facilitate the data point selection. All data points are listed whose name contains the entered search string, regardless of which part of the name is entered. The search string can consist of several words separated by a blank. The **Uint16** data types in the column **Data type** are marked with the information icon. Hover the cursor over the icon to get further information such as the meaning of status values. The column **R/W** indicates whether the register is readable, writable, or both.

a) Check the box in front of the data points you want to select. Check the box in the header of the list (in front of **Data point**) to select all data points listed on the page.

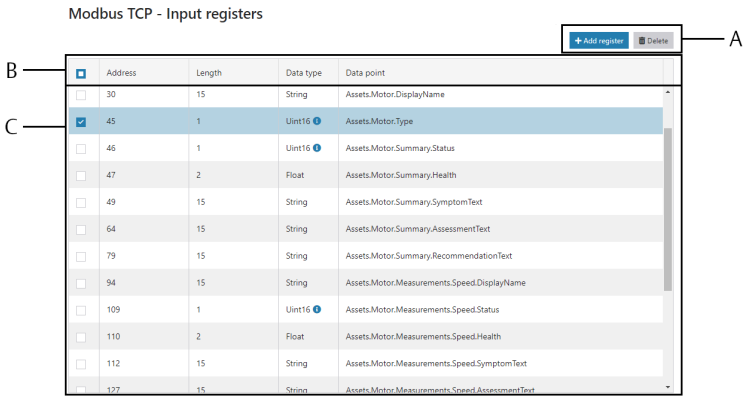
   Uncheck a box to deselect a data point.

b) Click **OK** to add the selected data points to the data points entry field of the **Add register** dialog.

2. Enter the start address for the list of registers. The selected data points are sequentially added to the list started with the start address. If registers are already contained in the list the next possible start address for adding the selected registers is entered as default. This default address can be changed.
3. Click **Add register** to add the selected data points to the list, starting at the entered start address.

   The selected registers are added to the list. A report of the composed Modbus registers can be created and exported. See Report.

Figure 6-80: List of registers



A. Buttons for add and delete registers
B. List header
C. List of registers

Change a register address

a. Click the desired address filed to enable the entry of addresses.
b. Enter a address or use the arrows to stepwise changes the address.
   The field is red framed and a error message appears if an already used address is entered. The entry field is green framed if the address is valid.
c. Click somewhere outside the list to close the entry field.

Change a data point

a. Click the desired data point to select it. The row is highlighted and a button to browse for a new data point appears at the end of the row.
b. Click **Browse** to open the dialog for selecting data points.
c. Select a new data point and click **OK**.
d. Click somewhere outside the list to unselect the data point.

Delete a register

a. Check the box in the row of the register to be deleted to select it. The row is highlighted. Select further registers if a number of register must be deleted. Check the box in the list header to select all registers.

b. Click **Delete** to remove the selected registers from the list. The selected rows are removed immediately.

Holding registers

Compose a list of user defined holding registers that are provided by the Modbus TCP server. Each new external data point creates a new holding registers (see First configuration – External data points). The list can contains up to 1000 registers. For the procedure see Input registers.

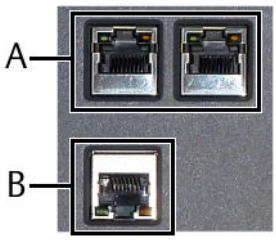
OPC UA

The AMS Asset Monitor is equipped with an OPC UA (Open Platform Communications United Architecture) server.

Connection and communication

Each of the three RJ-45 sockets can be used as a connection interface for the OPC UA server.

Figure 6-81: Configuration and data exchange interface



A. Ethernet switch with two RJ-45 connectors (left connector LAN2.1, right connector LAN2.2)
B. RJ-45 Ethernet connector LAN1 for configuration and connection to subsequent systems

Up to five OPC UA clients can be simultaneously connect to the OPC UA server.

An IP address and port is required for the client to connect to the OPC UA server. The OPC UA communication is protected by selectable policies. The communication is designed for the reading of data and for writing of external data points. The sending of commands is not possible through the OPC UA communication.

Note
OPC UA is not backwards compatible to OPC.

OPC UA data points and cycle time

The available data points depend on the configuration of the AMS Asset Monitor.

A total number of 2000 OPC UA items (data points) can be monitored for all OPC UA connections to an AMS Asset Monitor. Example: If two OPC UA clients are connected to an

AMS Asset Monitor and one OPC UA client already monitors 1500 items, 500 items remain for the second OPC UA client.

The AMS Asset Monitor supports multiple OPC UA Subscriptions. Up to 1000 OPC UA Subscriptions are permitted, not exceeding the total number of 2000 OPC UA items across all OPC UA Subscriptions.

⚠ CAUTION

After updating the firmware of the AMS Asset Monitor from version 2.x to 3.x, existing OPC UA connections no longer work because of the changed item structure. Adapt existing OPC UA clients to the changed item structure.

The data points (nodes) of the OPC UA server are structured as shown in Table 6-59 to Table 6-67 to facilitate the location of the single data points. The structure of the CHARM's items is based on the physical structure of the AMS Asset Monitor. The structure of the asset items is based on the configuration of the assets.

Groups of data points are marked **bold** in the structure tables. Data points (nodes) are not bold.

The availability of the data points depends on the installed CHARM types and the configuration of assets and CHARMs.

Table 6-59: Assets – items structure

<table>
<tr><td colspan="4">Health</td></tr>
<tr><td rowspan="11">Asset Name</td><td rowspan="7">Analytics</td><td rowspan="5">Analytics Name</td><td>AssessmentText</td></tr>
<tr><td>Health</td></tr>
<tr><td>RecommendationText</td></tr>
<tr><td>Status</td></tr>
<tr><td>SymptomText</td></tr>
<tr><td colspan="2">Health</td></tr>
<tr><td colspan="2">Status</td></tr>
<tr><td colspan="3">DisplayName</td></tr>
<tr><td colspan="3">Health</td></tr>
<tr><td rowspan="3">Measurements</td><td rowspan="2">Measurement Name</td><td>Status</td></tr>
<tr><td>Value</td></tr>
<tr><td colspan="2">Status</td></tr>
<tr><td colspan="3">Status</td></tr>
<tr><td colspan="3">Type</td></tr>
<tr><td colspan="4">Status</td></tr>
</table>

Table 6-60: Charms – items structure

CHM01 - CHARM Name	**CharmInfo**	FirmwareVersion
		HardwareRevision

Table 6-60: Charms – items structure *(continued)*

		SerialNumber
		Slot
	DisplayName	
	ErrorFlags	ChannelOpen
		ChannelShort
		Failsafe
		FieldPowerError
		FrequencyOutOfRange
		SelftestError
		SliceBusAddressError
		Uncalibrated
		VoltageOutOfRange
	Status	
	Type	
	Values	CHARM specific items such as **RotationalSpeed** and **RunStatus**
Status		

Table 6-61: Data collections – items structure

Data collection Name	DisplayName	
	LastRun	Status
		Time
	NextRun	
	Status	

Table 6-62: External data points – items structure

Status	
External data point Name	DisplayName
	Status
	Value[1]

1 *Data point is named according to the name of the external data point*

Table 6-63: Interface version

InterfaceVersion

Table 6-64: Output logics – items structure

Output logic Name	DisplayName
	Status
	Value
Status	

Table 6-65: Predicates – items structure

Predicate Name	DisplayName
	Status
	Value
Status	

Table 6-66: Status

Status

Table 6-67: System – items structure

DisplayName	
HardwareInfo	DeviceRevision
	DeviceType
	MainboardSerialNumber
HardwareStatus	ColdStarts
	InnerTemperature
	SupplyVoltage
	WarmStarts
Status	

The minimum OPC UA server cycle time is one second. Use the OPC UA client to change its cycle time.

Note
The OPC UA data is generally provided in SI units, independently of the selected system of units.

Configuration

Enable for LAN1 Check this box to activate the OPC UA server of the AMS Asset Monitor for interface LAN1 (lower socket of the three RJ-45 sockets).

Enable for LAN2 Check this box to activate the OPC UA server of the AMS Asset Monitor for interface LAN2 (upper two sockets of the three RJ-45 sockets).

	Both interfaces LAN1 and LAN2 can be simultaneously used for the OPC UA communication. A disabled LAN interface is indicated at the top of the configuration page. Ensure that the interfaces are enabled (see Network IPv4) before using them for the OPC UA configuration.
Allow anonymous access	Check this box if no access control is required. If access control is required ensure that this box is not checked and an OPC UA user is created (see Parameter description).
Convert data type double to float	Check this box to convert OPC UA data provided as data type **Double** to data provided as data type **Float**.
Policies	Select one or more policies to protect the communication between OPC UA Client and OPC UA server. Select **None** to operate the OPC UA communication without any protection. Ensure that all existing OPC UA clients the sever needs to communicate with supports the selected policy. Try to find the strongest common policy all clients are compatible with.
Use IP whitelist	Check this box to enable the IP white list for the OPC UA interface. IP addresses entered in the following field are allowed to communicate with the OPC UA interface.
OPC UA whitelist IP address	Enter IP addresses of OPC UA clients allowed to communicate with the OPC UA server. Click **+ Add new** to add further IP addresses. Up to five IP addresses can be entered. To remove an IP address from the list, click the trash can icon behind the IP address.

7 Commission the AMS Asset Monitor

Prerequisites

Commission the AMS Asset Monitor when the following has been completed:

- The AMS Asset Monitor is installed.
- Sensors are mounted on the equipment to be supervised and connected to the AMS Asset Monitor.
- Power supply of the AMS Asset Monitor is switched on.
- The AMS Asset Monitor is configured according to the measuring and analysis tasks.

Procedure

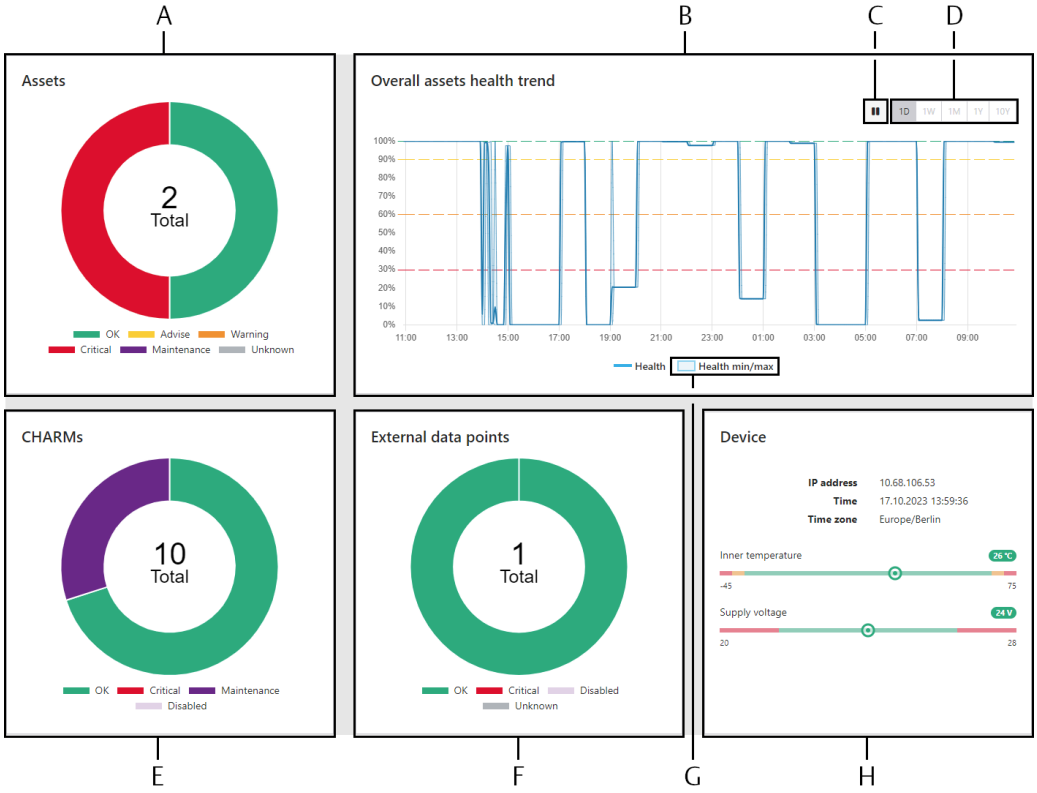
1. Ensure that all installed CHARMs are working fault free – Status LED of all installed CHARMs show a steady green light.
2. Check the input signals on plausibility. See CHARM status overview (Status overview – CHARM) for the input signal indication.
3. Check if the output signals (Ethernet connection and discrete output signals, if applicable) arrive the systems they are connected to.

8 Status and health indication

8.1 Dashboard

The dashboard contains several widgets for an overview about status and health information.

Figure 8-1: Dashboard – overview



A. *Assets status*
B. *Overall assets health trend*
C. *Button for pausing the trend displaying*
D. *Interval selection*
E. *CHARMs status*
F. *External data points status*
G. ***Health min/max** button for displaying minimum and maximum health values used for the averaging.*
H. *Device status*

Assets status

The assets status is visualized by a doughnut chart. The center of the chart displays the number of configured assets. The circular graph informs about the status statistic – how many assets are okay, issue an advice or a warning,

are critical, or unknown. The legend below the doughnut chart explains the meaning of the colors. See also Notification system. Click somewhere on the widget to go to the assets page.

CHARMs status

The status of the installed CHARMs is visualized by a doughnut chart. The center of the chart displays the total number of the installed CHARMs. The circular graph informs about the status statistic – how many CHARMs are okay, critical, unconfigured, or are in maintenance mode. The legend below the doughnut chart explains the meaning of the colors. See also Notification system. Click somewhere on the widget to go to the CHARMs page.

External data points status

The status of all defined external data points is visualized by a doughnut chart. The center of the chart displays the total number of defined external data points. The circular graph informs about the status statistic – how many external data points are okay, critical, disabled, or unknown. The legend below the doughnut chart explains the meaning of the colors. See also Notification system. Click somewhere on the widget to go to the external data points page.

Device status

The status of the AMS Asset Monitor is displayed.

IP address	Displays the IP address of the connected interface.
Time and date	Displays the current time and date.
Time zone	Displays the configured time zone
Inner temperature	Displays the temperature, measured with the internal temperature sensor of the AMS Asset Monitor.
Supply voltage	Displays the supply voltage level.

Overall assets health trend

The overall assets health trend is visualized by a diagram over selectable time intervals (see Trend data storage). The blue solid line displays the overall asset health – the health of all configured assets – scaled on a basis of 0 to 100% (see Health calculation). The trend is generated by averaging the calculated health values over a certain time. The solid blue line is displayed by default. Click **Health min/max** to enable the indication of the minimum and maximum of the health values used for the averaging.
The notification levels **Advice**, **Warning**, and **Critical** are displayed by colored dotted lines. See for Notification system meaning of the colors.

Click the pause button to pause the continuous writing of the trend. Only the displaying of the trend is paused. The health calculation and data storage are not affected by this button. With paused trending move the cursor over arbitrary points of the trend to display health value, and date and time at this point. Click the button again to restart the continuous writing of the trend.

8.2 Status overview – CHARM

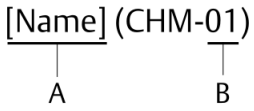
To open the status overview of a CHARM click in the CHARM list view on the CHARM's name or click in the CHARM tiles view on the CHARM's symbol. The available display objects depend on the selected CHARM.

Figure 8-2: Status overview – CHARM

A. CHARM status
B. Information area
C. Buttons
D. Button for opening or closing the information area
E. Notification area
F. Measurement display

CHARM status Displays the CHARM's name (see Figure 8-3), the CHARM's function, the CHARM's status with a health percentage and a colored bar, and a time information about a how long the current status already last.

Figure 8-3: CHARM naming



*A. Name entered in field **Name** of the CHARM configuration*
B. Slot number (1 to 12)

Buttons

- **Configure**

Click **Configure** to open the CHARM's configuration dialog.

- **Identify**
  Click **Identify** to start a short time blinking pattern at the selected CHARM to identify it within the AMS Asset Monitor. The upper LED of the CHARM flashes green with a high frequency for approximately 15 seconds.
- **Events**
  Click **Events** to open a list of the recent events.
- **Left/Right arrows**
  Click the left or right arrow to switch through the installed CHARMs.

Information area	Click the down arrow on the right to open the CHARM's information area with name, type, description, serial number, firmware version, hardware version, health, status, and information about the last change to the configuration.
Notification area	Error messages, information about the reduced health of the CHARM, and maintenance information such as available firmware updates are displayed in this area.
Measurement display	See Measurement displays for details.

Note
If no sensor is connected to the VI Tach CHARM or there is a sensor cable break, the status overview indicates an open-circuit voltage in the range of +12 V to +17 V. The open-circuit voltage is caused by the sensing current of approximately 240 µA, required for the open sensor circuit detection of Hall-effect and passive magnetic sensors. This behavior is independent of the configured sensor type.

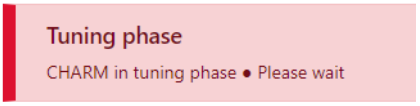
Tuning phase

CHARMs for dynamic input signals such as the VI Voltage CHARM and the VI Piezo CHARM have input filters that require a certain time of around 15 seconds to become active – tuning phase. The following events cause a tuning phase:

- Power-on of the CHARM
- Saving a configuration
- After a corrected sensor failure (disconnect, cable break, defect)
- After the input signal was out of the permissible range and has returned to the OK range (such as configured DC bias voltage range)

A CHARM in tuning phase is indicated by a message in the notification area. See Figure 8-4.

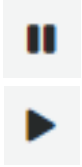
Figure 8-4: Tuning phase indication



8.2.1 Measurement displays

The four different objects **Measurement**, **Waveform**, **Spectrum**, and **Output** display measurement data. The trend displays **Waveform** and **Spectrum** contain buttons to adjust the displayed trend to the viewers needs. The availability of the objects depend on the CHARM type.

Stop/Continue

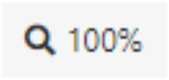


Click this button to stop the continuous writing of the trend. With stopped trending move the cursor over arbitrary points of the trend to display voltage and time at this point. Click the button again to restart the continuous writing of the trend.

Zoom to fit

Click this button to scale to the measured maximum value. The time axis is not influenced by this command.

Reset zoom to 100%



Click this button to reset the zoom to the measuring range. The button is gray when the trend is scaled to the measuring range. The time axis is not influenced by this command.

Time scaling

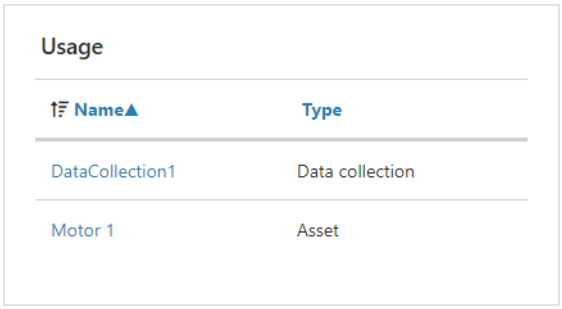
The display **Waveform** contains three additional buttons, **20 ms**, **200 ms**, and **1000 ms**, to change the time scaling of the trend. Select a time scaling suitable to the input signal. The button of the active scaling is colored gray.

Enlarge view

The waveform and spectrum displays can show up to 1000 lines of resolution. Click this button to enlarge the display for a better view. Click the **X** in the upper right corner to close the enlarged view.

The object **Usage** is available for all CHARMs and shows in which asset, CHARM, predicate, data collection, or output logic the CHARM is used.

Figure 8-5: Usage



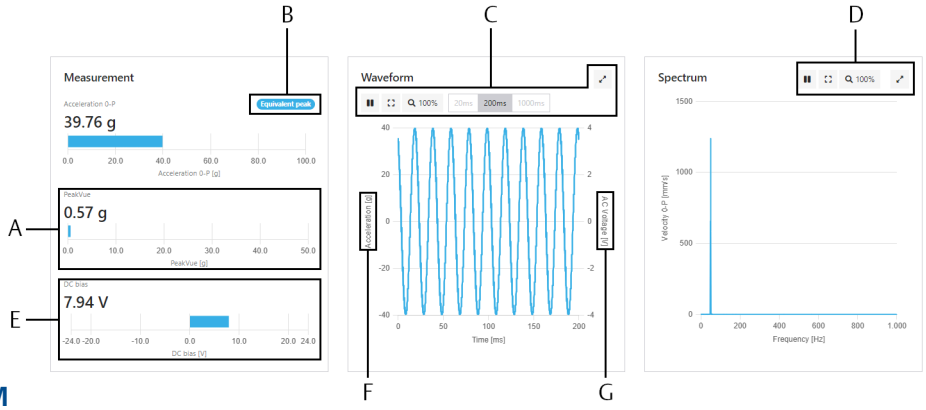
Click the listed name in the **Name** column to go to the corresponding page.

VI Voltage CHARM and VI Piezo CHARM

Measurement data of the VI Voltage CHARM and the VI Piezo CHARM is displayed with the three objects **Measurement**, **Waveform**, and **Spectrum**.

The waveform display shows the AC part of the input signal. The DC part (Bias voltage) is filtered out and shown in **Measurement**.

Figure 8-6: Display objects VI Voltage CHARM and VI Piezo CHARM



CHARM

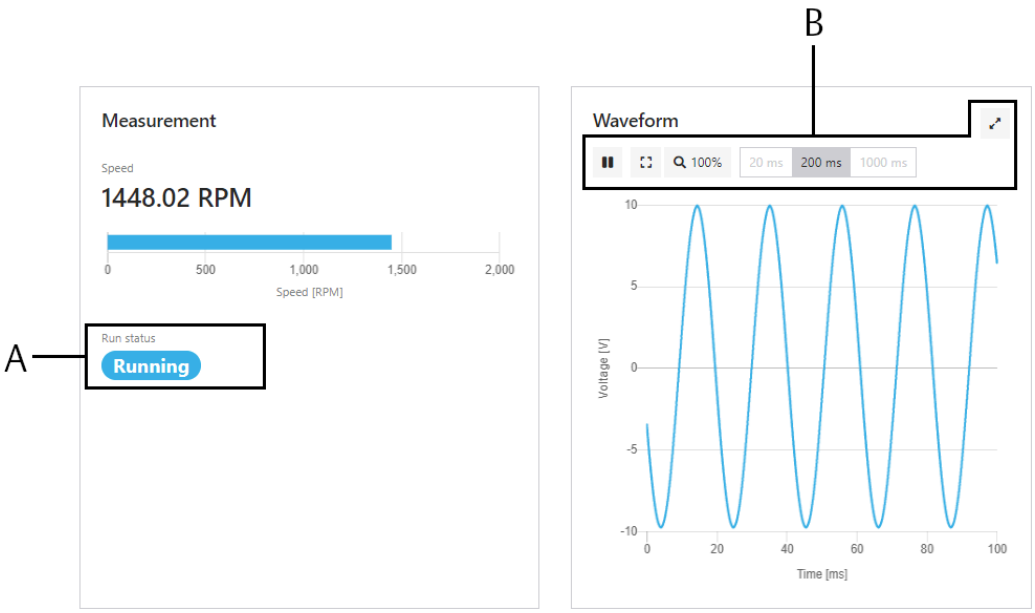
A. *PeakVue value*
B. *Equivalent peak indication*
C. *Buttons to adjust the trend and change the time scaling*
D. *Buttons to adjust the trend*
E. *DC bias voltage*
F. *Sensor signal, not influenced by the configured evaluation (**Configuration** → **Details** → **Evaluation**)*
G. *AC signal voltage*

Measurement of the VI Piezo CHARM additionally indicates the PeakVue value if a signal evaluation combined with PeakVue, such as **Velocity 0-P + PeakVue**, is selected. **Equivalent peak** is shown if the **Equivalent peak (√2*Velocity RMS)** calculation is activated for a VI Piezo CHARM.

VI Tach CHARM

Measurement data of the VI Tach CHARM is displayed with the two objects **Measurement** and **Waveform**.

Figure 8-7: Display objects VI Tach CHARM



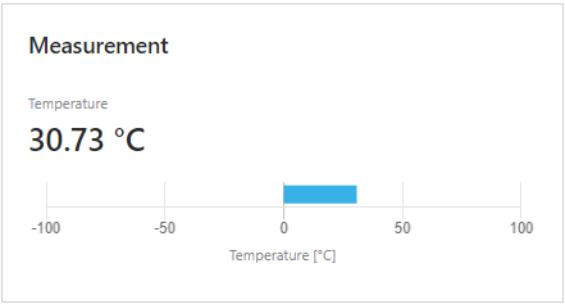
A. Run status of the asset where the speed is measured
B. Buttons to adjust the trend and change the time scaling

Run status indicates whether, the asset where the speed is measured, is **Running** or **Stopped**.

RTD CHARM and TC/mV CHARM

Measurement data of the RTD CHARM and the TC/mV CHARM is displayed with the object **Measurement**.

Figure 8-8: Display object RTD CHARM and TC/mV CHARM



24 V DO CHARM and 24 V DI CHARM

Measurement data of the 24 V DO CHARM and 24 V DI CHARM is displayed with the objects **Measurement**. The displayed data depends on the configured functionality of the CHARM.

Figure 8-9: Display objects 24 V DO CHARM and 24 V DI CHARM

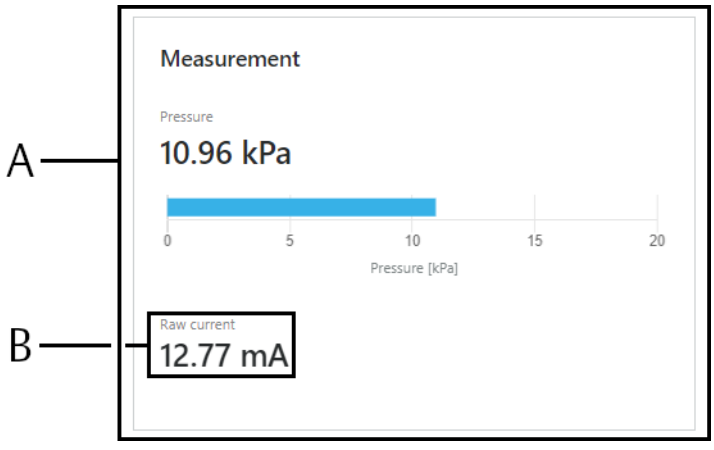
A. *Display object **Output** 24 V DO CHARM, **Functionality** → **Discrete Output** and **Momentary Output***
B. *Setpoint of the output signal*
C. *Display object **Output** 24 V DO CHARM, **Functionality** → **Continuous Pulse Output***
D. *Display object **Measurement** 24 V DI CHARM, **Functionality** → **Discrete Input***
E. *Display object **Measurement** 24 V DI CHARM, **Functionality** → **Pulse Count Input***

The setpoint indication can be use to check if the current output is equal to the setpoint.

4 to 20 mA AI CHARM

Measurement data of the 4 to 20 mA AI CHARM is displayed with the object. The measured input current and the scaled measurement value is displayed.

Figure 8-10: Display object 4 to 20 mA AI CHARM

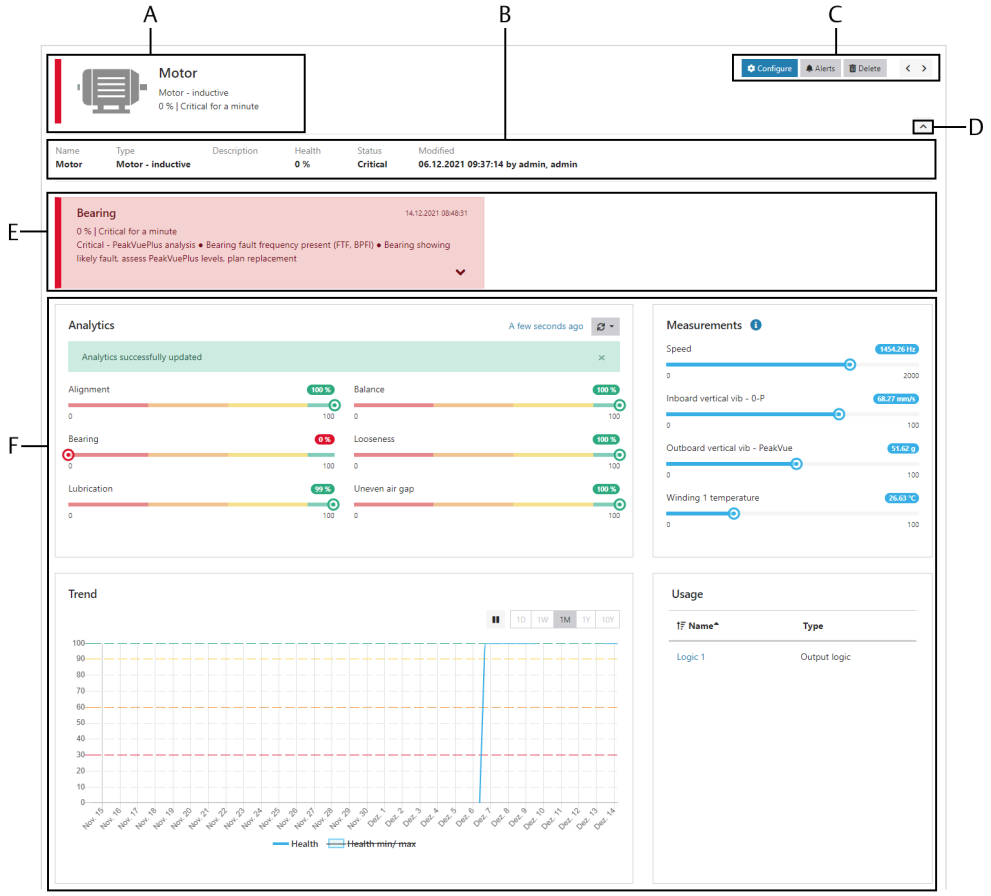


A. *Measurement display*
B. *Indication of the measured current*

8.3 Status overview – asset

To open the status overview of an asset click in the assets list view on the asset name or click in the assets tiles view on the asset symbol. The available display objects depend on the selected asset.

Figure 8-11: Status overview – Asset



A. Asset status
B. Information area
C. Buttons
D. Button for opening or closing the information area
E. Notification area
F. Health display

Asset status Displays the asset name, the asset type, the asset status with a health percentage and a colored bar, and a time information about a how long the current status already last.

Buttons
- **Configure**

Click **Configure** to open the asset's configuration dialog.

- **Alerts**
  Click **Alerts** to open a list of the last health events. See Events.
- **Delete**
  Click **Delete** to delete the asset.
- **Left/Right arrows**
  Click the left or right arrow to switch through the configured assets.

Information area	Click the down arrow on the right to open the asset's information area with asset name, type, description, health percentage, status, and information about the last asset modification.
Notification area	Error messages and information about the reduced health of the asset are displayed in this area.
Health displays	See Health displays for details.

8.3.1 Health displays

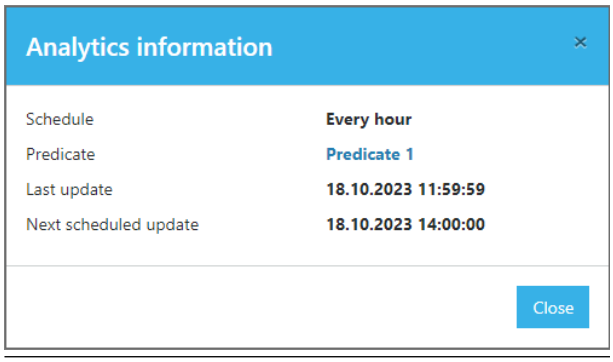
Different objects display health information of the asset.

Analytics

Displays the individual health status of the configured diagnose calculations.
The time that has passed since the last health calculation is displayed in the upper right corner. Click the time to see further analytics information:

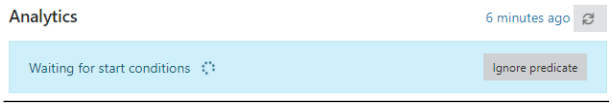
- Schedule: Interval is fixed set to **Every hour**.
- Predicate: The name of the predicate selected in the asset configuration (**Analytics** → **Diagnoses** → **Predicate** is displayed. **None** is displayed if no predicate is selected.
- Last update: Date and time of the last health calculation.
- Next scheduled update: Date and time of the next health calculation.

Figure 8-12: Analytics information display



Click the refresh button in the upper right corner to manually start a health calculation. When a predicate is configured and it is not **TRUE**, the following dialog appears:

Figure 8-13: Pending heath calculation because of an untrue predicate



There are two options for proceeding:

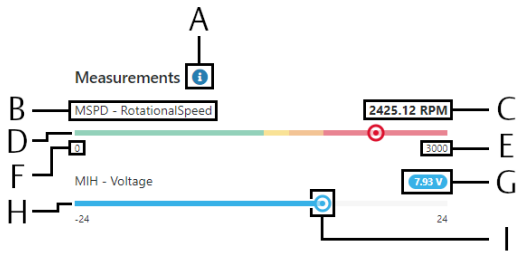
- Wait until the predicate becomes **TRUE**, then the health calculation starts automatically.
- Click **Ignore predicate** to run the health calculation regardless of the assigned predicate.

Whether a health calculation was successful or not is indicated by a message below the refresh button.

If a predicate is not **TRUE**, health is not calculated on the hourly basis. A pending calculation is indicated by a message, see Figure 8-13. The AMS Asset Monitor retries to calculate health until the predicate becomes **TRUE** and the pending health calculation can be executed. After the successful health calculation, the AMS Asset Monitor continuous calculating health on the hourly basis – the interval is not shifted because of a pending health calculation.

Measurements Displays all measurement values of the sources assigned to the asset. The diagram of the single measurement values depends on the configuration of the CHARMs used for the asset and the asset configuration. See Figure 8-14.

Figure 8-14: Bar graph

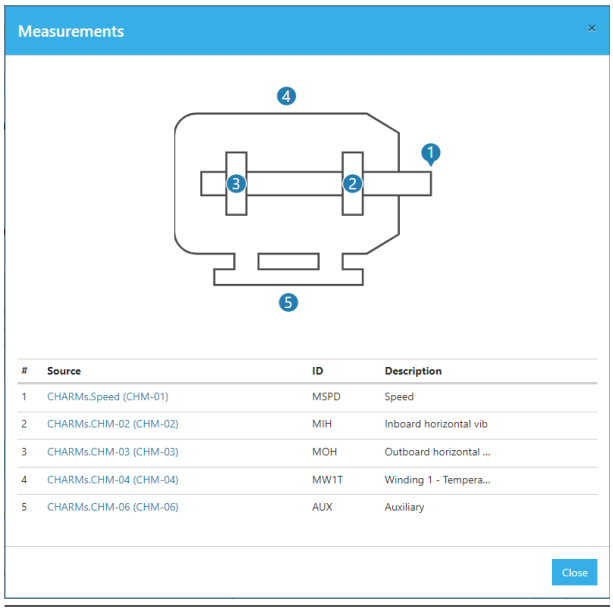


A. Information icon
B. Name of the measurement point
C. Actual measurement value
D. Bar graph with colored alert limits. Available if alert limits are defined for the measurement point (see Measurement alerts).
E. Upper range limit, defined in the CHARM configuration.
F. Lower range limit, defined in the CHARM configuration.
G. Actual measurement value, appearance if no limits are defined for the measurement point.
H. Bar graph, appearance if no limits are defined for the measurement point.
I. Indication of the actual measurement value within the defined range.

Missing or bad values are indicated by three dashes ---.

Click the information icon to open the measurement points overview.

Figure 8-15: Measurements overview



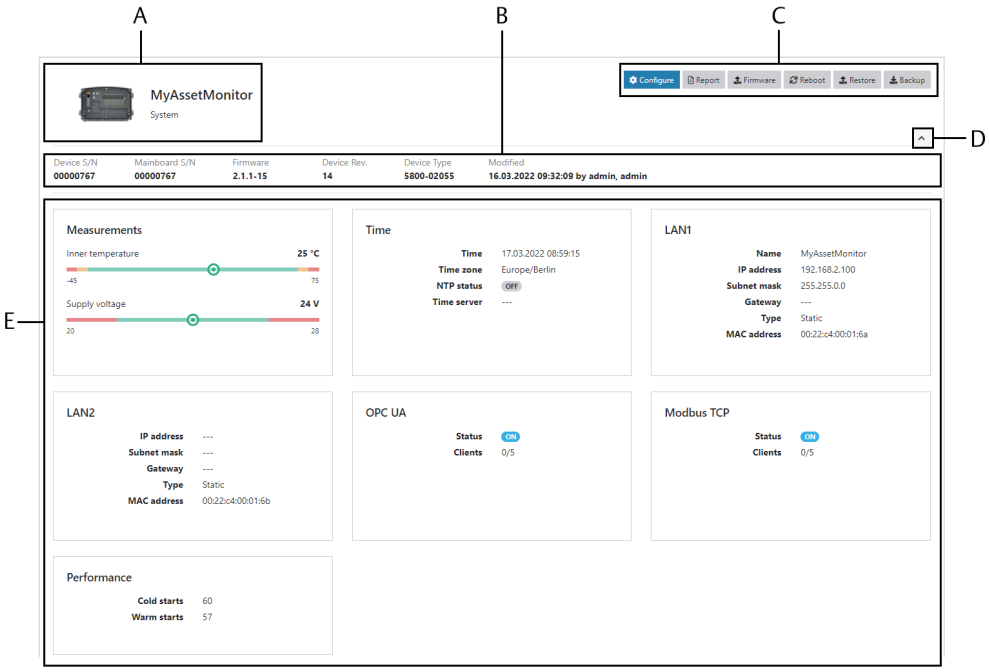
Trend Displays the health trend of the asset over selectable time intervals. The trend is generated by averaging the calculated health values over a certain time (see Trend data storage). Click **Health min/max** to enable the indication of the minimum and maximum of the health values used for the averaging.
Click the pause button to pause the continuous writing of the trend. Only the displaying of the trend is paused. The health calculation and data storage are not affected by this button. With paused trending move the cursor over arbitrary points of the trend to display health value, and date and time at this point. Click the button again to restart the continuous writing of the trend.

Usage Shows in which other asset or output logic the asset is used. Click the listed name of the asset, predicate, or output logic in the **Name** column to go to the corresponding page.

8.4 Status overview – system

Select **System** from the sidebar to open the system overview. This page is the starting point for all system related actions such as configuration, firmware update, and backup and restore. Information about the AMS Asset Monitor is displayed. For information about the installed CHARMs see Status overview – CHARM.

Figure 8-16: System overview



A. AMS Asset Monitor
B. Information area
C. Buttons
D. Button to open or close the information area
E. Detailed status information

AMS Asset Monitor Displays the name of the AMS Asset Monitor.

Information area Click the down arrow on the right to open the AMS Asset Monitor's information area with device serial number, mainboard serial number, firmware version, hardware version, device type, and information about the last change to the configuration.

Buttons

Configure Click **Configure** to open the dialog for the system configuration. See Enter basic settings.

Report Click **Report** to create a report. See Report.

Firmware Click **Firmware** to update the firmware of the AMS Asset Monitor. See Firmware update – AMS Asset Monitor.

Note
This function updates the firmware of the AMS Asset Monitor. For updating the CHARM's firmware see Firmware update – CHARM.

Reboot Click **Reboot** to reboot the AMS Asset Monitor. See Reboot.

Restore Click **Restore** to load a backup file into the AMS Asset Monitor. See Restore.

Backup Click **Backup** to create a backup file to restore the AMS Asset Monitor. See Backup.

Detailed status information

This area contains additional details about communication interfaces, internal clock, and system measurements

Measurements Temperature of the AMS Asset Monitor measured by the internal temperature sensor and the current supply voltage level.

Time Current time information, settings of the time synchronization, and NTP status information.

Table 8-1: NTP status indication

NTP status	Description	Recommendation
Off	Time synchronization with a NTP server is not activated.	
Synchronized	Time has been successfully synchronized.	
Server not Reachable	The AMS Asset Monitor is configured for time synchronization with a NTP server but the server is either not reachable or does not provide a reliable time.	Verify that the NTP server is reachable for the AMS Asset Monitor and provides a reliable time.

Table 8-1: NTP status indication *(continued)*

NTP status	Description	Recommendation
Not Synchronized	The AMS Asset Monitor is configured for time synchronization with a NTP server and the server is reachable, but the time provided by NTP server is rejected. This status is expected for a short time after the NTP service is configured. This status can be additionally observed if the time of the NTP server was manually changed or there is a problem with the network stability.	If this state lasts longer than 5 minutes, restart the NTP service on the AMS Asset Monitor. 1. Open the system configuration. 2. Select **Date and time**. 3. Remove the checkmark from the box **Synchronize with time server**. 4. Click **Save & Close**. 5. Open the system configuration again. 6. Check the box **Synchronize with time server**. 7. Check the IP address settings. 8. Click **Save & Close**.
Internal Error	The AMS Asset Monitor is configured for time synchronization with a NTP server, but an internal error occurred. Most probable reason for this state is a considerable time change received from the NTP server.	Restart the NTP service on the AMS Asset Monitor: See **Not Synchronized**.

LAN1 Summarized settings of the LAN1 interface

LAN2 Summarized settings of the LAN2 interface

OPC UA Status of the OPC UA interface and number of connected clients.

Modbus TCP Status of the Modbus TCP interface and number of connected clients.

Performance Number of cold starts and warm starts.

- The **Cold starts** counter is increase at each power on of the AMS Asset Monitor.
- **Warm starts** are software initialized reboots of the AMS Asset Monitor. An event such as a firmware update increases this counter.

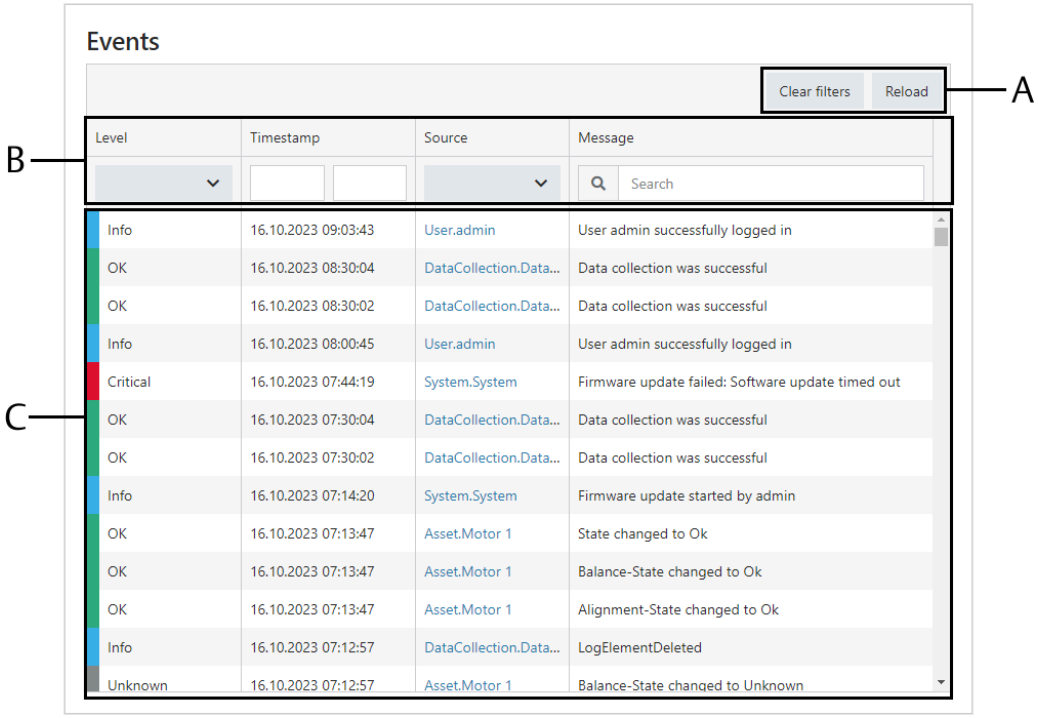
8.5 Events

Events provides an overview about all events logged on the AMS Asset Monitor such as alerts, statuses, and information. The shown events consist of two event lists:

- **System log**
  All system related events such as asset health, data collection state, configuration changes, or firmware update information are contained in this log file.
- **Audit log**
  Users with administration rights can see events related to cybersecurity such as successful or failed log in attempts.

Both lists can contain up to 10000 events with level, time stamp, source, and message. The oldest event in the respective event list is overwritten if the maximum number of events for the ring buffer has been reached and a new event occurs.

Figure 8-17: Events – overview



A. Buttons
B. Column names with associated filter functions
C. List of events

Filter functions:

Filter functions

Use filter functions to limit the amount of displayed events to the events you are interested in. A selected filter becomes active immediately. The name of the filter option selected first from the drop-down list is shown. All further selections are indicated as a number in brackets behind the name. Click **Clear** at the bottom of the drop-down list to reset all selections. Click a selected filter again to deselect it. Click the selection filed to open the drop-down list again to close the list.

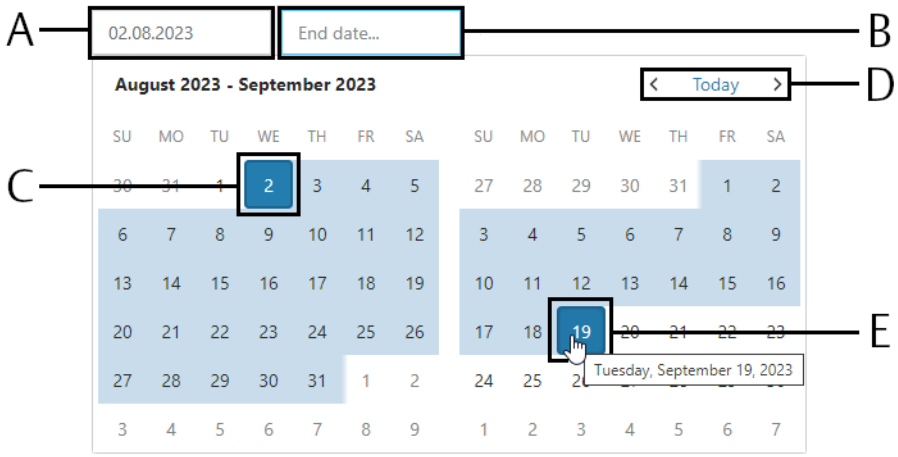
Level Click the selection filed to open a drop-down list with all available levels. Check the box in front of the level you want to filter for.

Timestamp Enter a start date and an end date to display events of this period. Click one of the entry fields to open the date selection field. Click one date to select the start date then click another date to define the end date of the period. See Figure 8-18. Click somewhere outside of the date selection field to close it. Start date and end date can also be entered directly into the entry fields while the date selection field is open.

Source Click the selection filed to open a drop-down list with all available sources. Which sources are available depend on the configuration of the AMS Asset

	Monitor. Click the black arrow in front of a source to see further options for source filtering. Check the box in front of the source you want to filter for.
Message.	Enter a search term to search for particular alerts.
Clear filters	Click **Clear filters** to reset all filter settings.
Reload	Click **Reload** to refresh the list of events, considering the filter settings.

Figure 8-18: Date selection field



*A. Entry field **Start date***
*B. Entry field **End date***
C. Selected start date
*D. Buttons for switching through the months, click **Today** to jump to the current day.*
E. Selected end date, the days between start date and end date are highlighted.

List elements

The columns contain the following information:

Level	The events are classified into different levels such as **Info**, **Advice**, **Warning**, **Maintenance**, or **Error**.
Timestamp	Time and Date when the event has occurred.
Source	Source of the event.
Message	Description of the event.

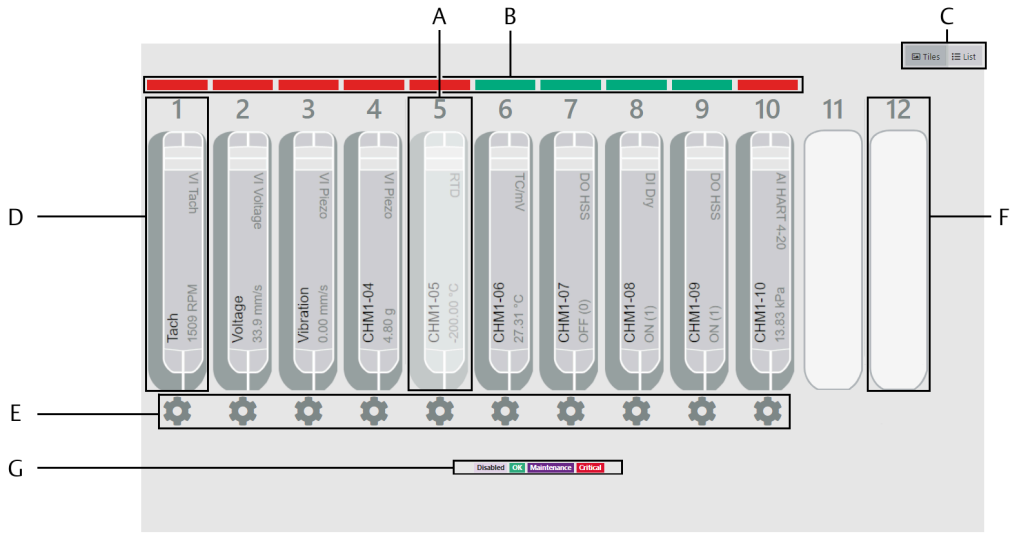
8.6 Tiles view and list view

There are two different views – **Tiles** and **List** – to provide an overview about all installed **CHARMs**, all defined **External data points**, all configured **Assets**, and all defined **Logics**.

8.6.1 Tiles view – CHARMs

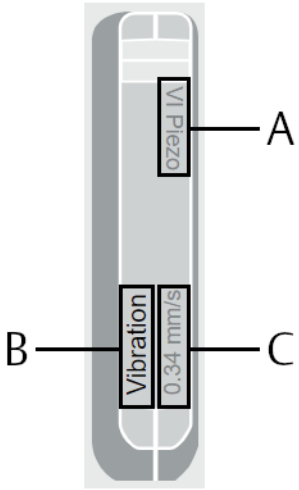
Select **CHARMs** in the sidebar to open the overview of all installed CHARMs. If the **List** view is opened, click **Tiles** in the upper right corner to open the **Tiles** view.

Figure 8-19: Tiles view – CHARMs



A. Configured but empty slot
B. Status indication (see Notification system)
*C. Buttons to switch between **Tiles** and **List** view*
D. Position of the installed CHARM within the AMS Asset Monitor including further details, see Figure 8-20
E. Buttons to open the configuration
F. Free slot
G. Legend

Figure 8-20: Details – tiles view

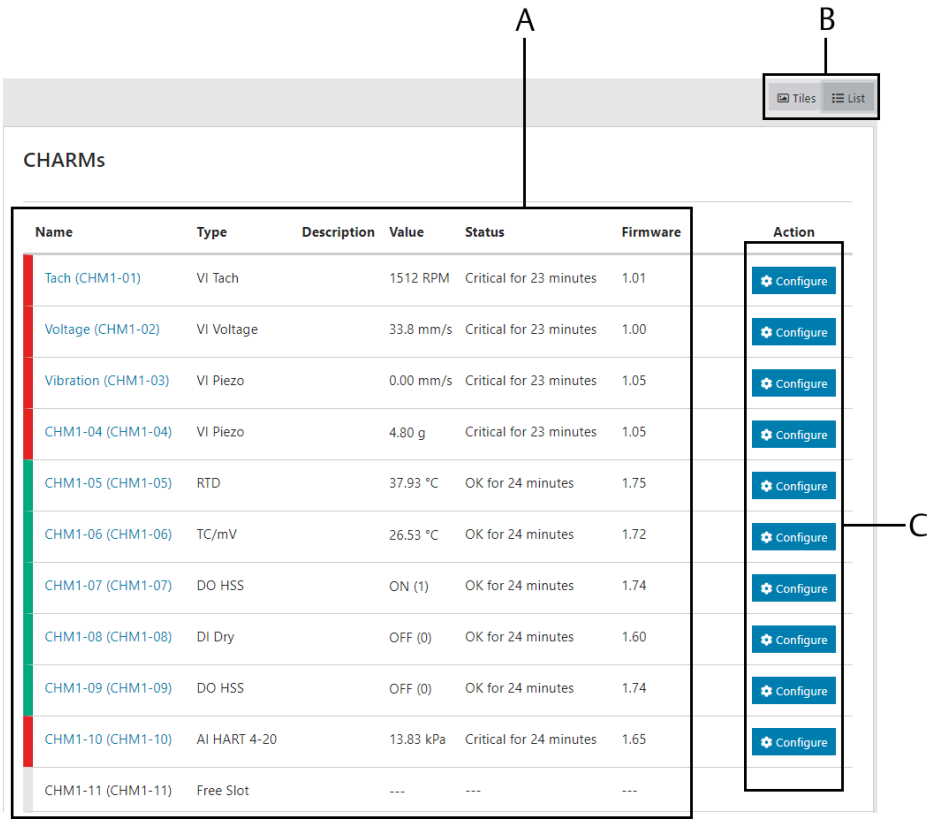


A. CHARM type
*B. Configured name (**Configuration** → **Basic** → **Name**)*
C. Current measurement value with unit

8.6.2 List view – CHARMs

Select **CHARMs** in the sidebar to open the overview of all installed CHARMs. If the **Tiles** view is opened, click **List** in the upper right corner to open the **List** view. The **List** view provides a more detailed overview of the installed CHARMs.

Figure 8-21: List view – CHARMs



A. Detailed list of all installed CHARMs.
*B. Buttons to switch between **Tiles** and **List** view*
C. Buttons to open the configuration

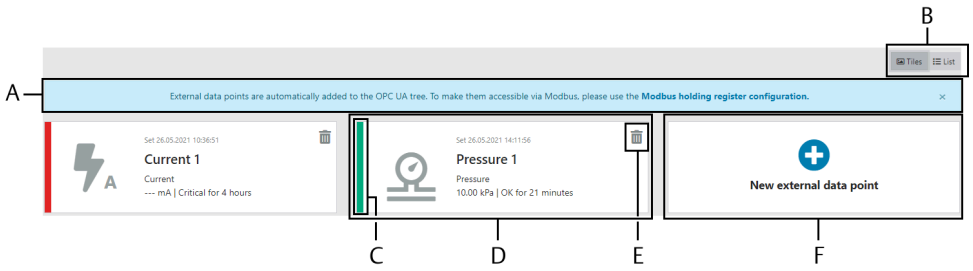
Listed details of the installed CHARMs:

Name	The name entered in the configuration of the CHARM. Click the blue colored name to open the CHARM's status overview.
Type	Type of the installed CHARM
Description	The description entered in the configuration of the CHARM.
Value	Current measurement value with unit.
Status	Status of the CHARM including how long this status has been present. The status is also indicated by a colored bar in front of the name.
Firmware	Version of the firmware installed on the CHARM. See Firmware update – CHARM.

8.6.3 Tiles view – External data points

Select **External data points** in the sidebar to open the overview of all defined **External data points**. If the **List** view is opened, click **Tiles** in the upper right corner to open the **Tiles** view.

Figure 8-22: Tiles view – External data points

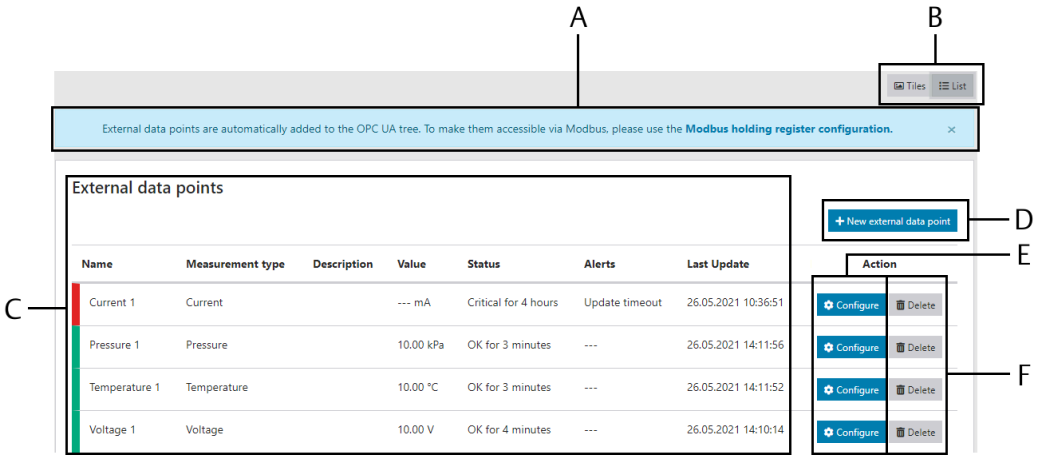


A. Notification area
*B. Buttons to switch between **Tiles** and **List** view*
C. Status indication (see Notification system)
D. External data point, click somewhere on the tile to open the configuration
E. Button to delete the external data point
F. Button to add a new external data point

8.6.4 List view – External data points

Select **External data points** in the sidebar to open the overview of all defined **External data points**. If the **Tiles** view is opened, click **List** in the upper right corner to open the **List** view.

Figure 8-23: List view – External data points

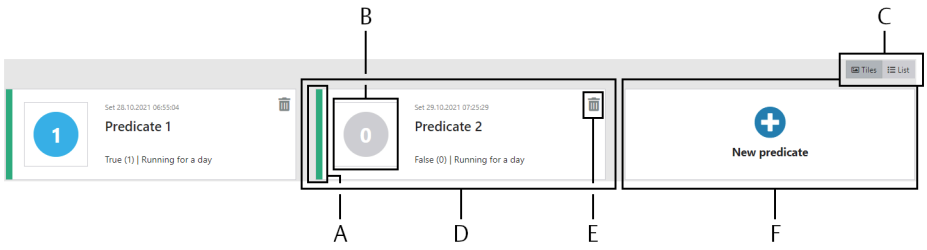


A. Notification area
*B. Buttons to switch between **Tiles** and **List** view*
C. Detailed list of all configured external data points
D. Button to add a new external data point
E. Button to open the configuration
F. Button to delete the external data point

8.6.5 Tiles view – Predicates

Select **Predicates** in the sidebar to open the overview of all defined predicates. If the **List** view is opened, click **Tiles** in the upper right corner to open the **Tiles** view.

Figure 8-24: Tiles view – Predicates

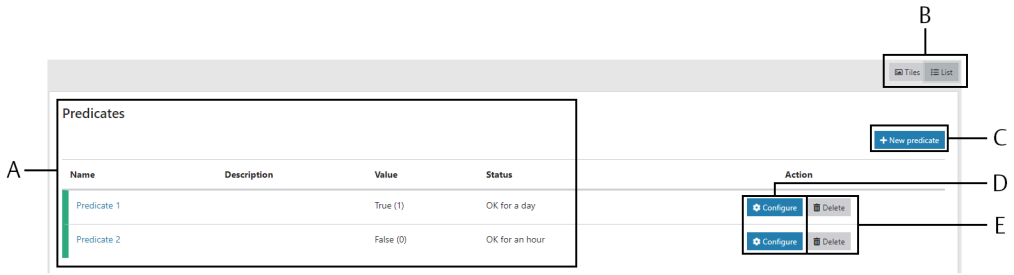


A. Status indication (see Notification system)
B. Indication of the predicate's logic state
*C. Buttons to switch between **Tiles** and **List** view*
D. Predicate, click somewhere on the tile to open the configuration
E. Button to delete the predicate
F. Button to add a new predicate

8.6.6 List view – Predicates

Select **Predicates** in the sidebar to open the overview of all defined predicates. If the **Tiles** view is opened, click **List** in the upper right corner to open the **List** view.

Figure 8-25: List view – Predicates

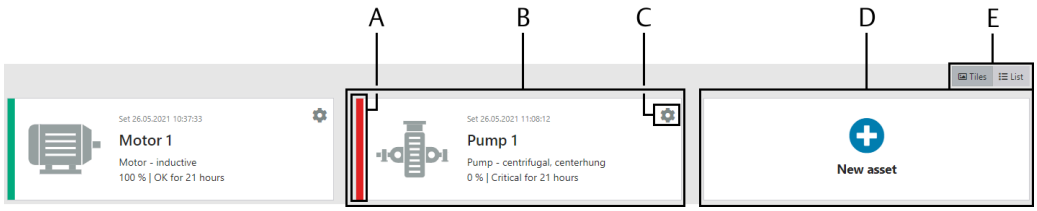


A. Detailed list of all configured predicates
*B. Buttons to switch between **Tiles** and **List** view*
C. Button to add a new predicate
D. Button to open the configuration
E. Button to delete the predicate

8.6.7 Tiles view – Assets

Select **Assets** in the sidebar to open the overview of all configured assets. If the **List** view is opened, click **Tiles** in the upper right corner to open the **Tiles** view.

Figure 8-26: Tiles view – Asset

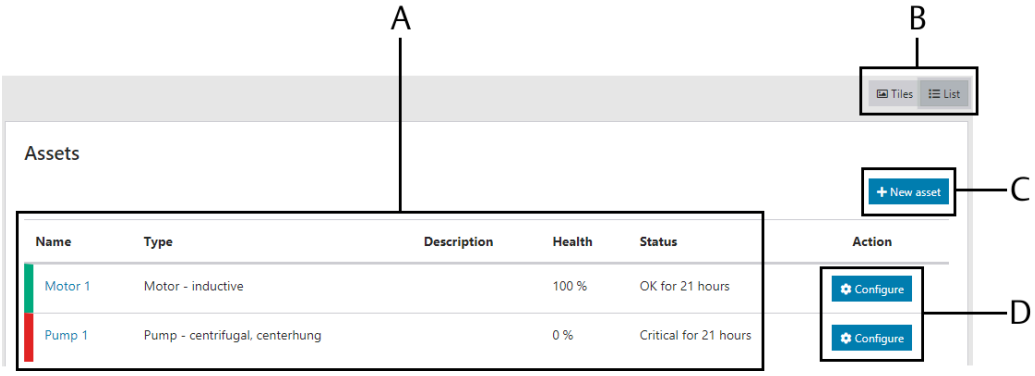


A. Status indication (see Notification system)
B. Asset, click somewhere on the tile to open the status view of the asset
C. Button to open the configuration
D. Button to add a new asset
*E. Buttons to switch between **Tiles** and **List** view*

8.6.8 List view – Assets

Select **Assets** in the sidebar to open the overview of all configured assets. If the **Tiles** view is opened, click **List** in the upper right corner to open the **List** view.

Figure 8-27: List view – Assets

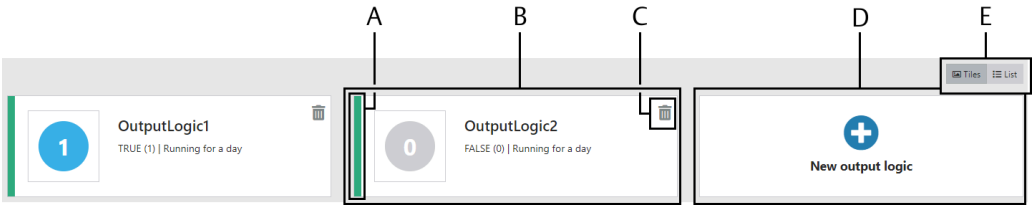


A. Detailed list of all configured assets, click on the blue colored asset name to open the status view of the asset
*B. Buttons to switch between **Tiles** and **List** view*
C. Button to add a new asset
D. Button to open the configuration

8.6.9 Tiles view – Output logics

Select **Output logics** in the sidebar to open the overview of all configured output logics. If the **List** view is opened, click **Tiles** in the upper right corner to open the **Tiles** view.

Figure 8-28: Tiles view – Output logics

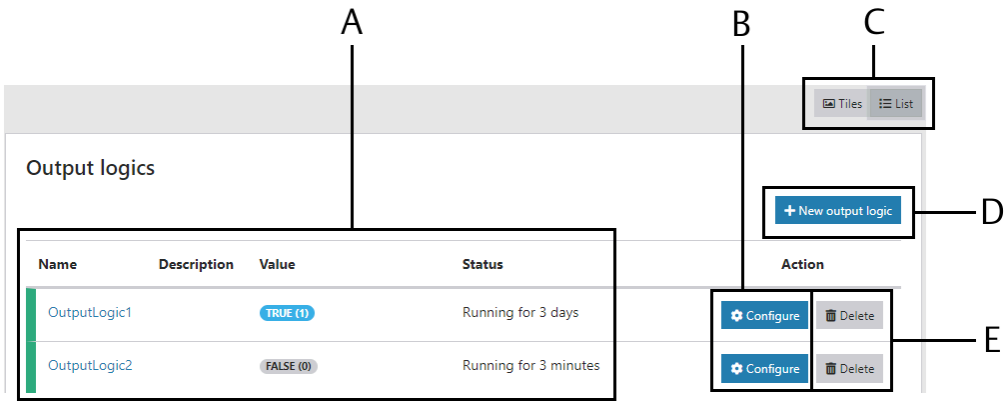


A. Status indication (see Notification system)
B. Logic, click somewhere on the tile to open the configuration of the output logic
C. Button to delete the output logic
D. Button to add a new output logic
*E. Buttons to switch between **Tiles** and **List** view*

8.6.10 List view – Output logics

Select **Output logics** in the sidebar to open the overview of all configured output logics. If the **Tiles** view is opened, click **List** in the upper right corner to open the **List** view.

Figure 8-29: List view – Output logics

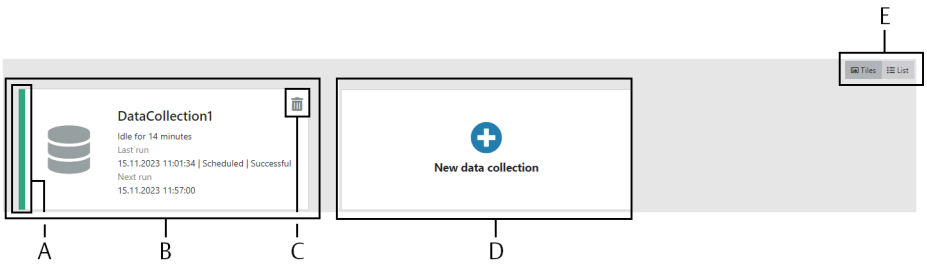


A. Detailed list of all configured output logics, click the blue colored name to open the configuration of the output logic
B. Button to open the configuration
*C. Buttons to switch between **Tiles** and **List** view*
D. Button to add a new output logic
E. Button to delete the output logic

8.6.11 Tiles view – Data collections

Select **Data collections** in the sidebar to open the overview of all defined data collections. If the **List** view is opened, click **Tiles** in the upper right corner to open the **Tiles** view.

Figure 8-30: Tiles view – Data collections



A. Status indication (see Notification system)
B. Data collection, click somewhere on the tile to open the configuration
C. Button to delete the data collection
D. Button to add a new data collection
*E. Buttons to switch between **Tiles** and **List** view*

The tile contains additional status information about the last run of the data collection and the next run.

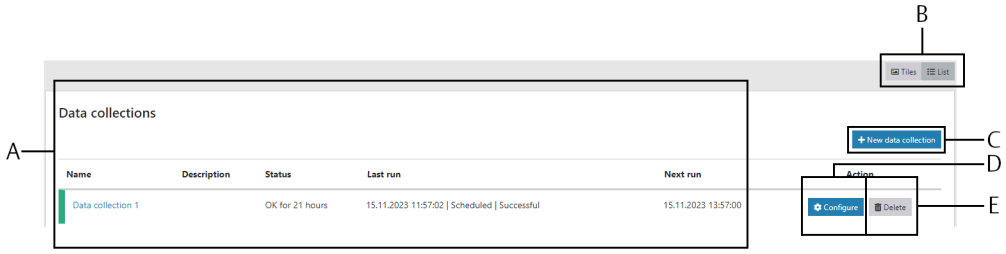
- Event that has started the collection, scheduled or on demand
- Date and time of the last data collection

- Status of the collection: successful, failed, or skipped by a predicate
- Date and time of the next scheduled data collection

8.6.12 List view – Data collections

Select **Data collections** in the sidebar to open the overview of all defined data collections. If the **Tiles** is opened, click **List** in the upper right corner to open the **List** view.

Figure 8-31: List view – Data collections



A. Detailed list of the configured data collections
*B. Buttons to switch between **Tiles** and **List** view*
C. Button to add a new data collection
D. Button to open the configuration
E. Button to delete the data collection

The list contains additional status information about the last run of the data collection and the next run.

- Event that has started the collection, scheduled or on demand
- Date and time of the last data collection
- Status of the collection: successful, failed, or skipped by a predicate
- Date and time of the next scheduled data collection

9 Maintenance

9.1 Firmware update

The firmware of the AMS Asset Monitor and the firmware of the installed CHARMs can be updated on-site. The firmware file contains the firmware for the AMS Asset Monitor and for all compatible CHARMs. The file has the extension *.swu. Necessary firmware updates for the CHARMs are displayed after the installation of the firmware update for the AMS Asset Monitor.

Firmware update to version 3.y.z

Firmware version 3.y.z brings a lot of performance improvements which requires structural changes in the background of the AMS Asset Monitor. Use the migration firmware file **AMSAssetMonitor_v2.x_to_v3.y.z.fwp**[7] with the extension *.fwp to update the firmware of the AMS Asset Monitor to version 3.y.z.

Note
Emerson recommends updating from version 2.3.3 or 2.3.4 to version 3.y.z.

Execute the following steps:

1. Ensure that the firmware of the AMS Asset Monitor to be updated is 2.3.3 or 2.3.4. Otherwise update the firmware of the Asset Monitor to one of these firmware versions before starting the update process to version 3.y.z.
2. Update the AMS Asset Monitor as described in Firmware update – AMS Asset Monitor by using the migration firmware file **AMSAssetMonitor_v2.x_to_v3.y.z.fwp**. Use the AMS Asset Monitor - Fleet Manager to update multiple AMS Asset Monitors to 3.y.z at once.

   Note
   The upgrade to 3.y.z can take up to 12 minutes.

3. After the update reconfigure the OPC UA (OPC UA) and Modbus (Modbus TCP) interfaces and check the configuration of the other elements of the AMS Asset Monitor configuration.

9.1.1 Firmware update – AMS Asset Monitor

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Prerequisites

You need an AMS Asset Monitor firmware file with the extension ***.swu**.

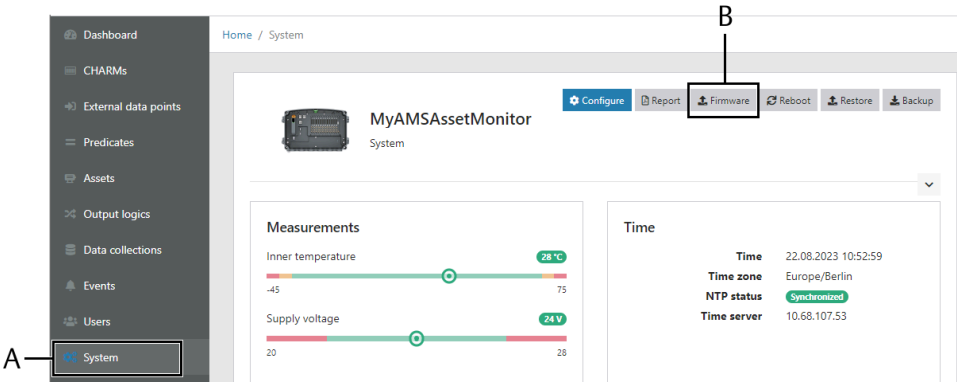
7 ***y*** *and* ***z*** *are place holder for the version to which the AMS Asset Monitor is updated.*

Note
Use the migration firmware file **AMSAssetMonitor_v2.x_to_v3.y.z.fwp** to update AMS Asset Monitors with firmware version 2.3.3 or 2.3.4 to version 3.y.z.

Procedure

1. In the sidebar click **System** to open the system page. Click **Firmware** to open the dialog for updating the firmware.

Figure 9-1: Firmware update



A. System
*B. Button **Firmware***

2. Click **Browse** to open the files browser.
3. Go to the storage location of the firmware file and select it.
   The dialog shows the current firmware version and information about the selected firmware file.
4. Click **Update now** to start the process.

Note
The system cannot respond during the update process.

The AMS Asset Monitor restarts automatically after the update process is finished. The current firmware version is indicated in the information area of the system overview page.

The configuration of the AMS Asset Monitor remains unchanged by the update process.

Update from firmware version 2.3.3 or 2.3.4 to 3.y.z failed

It can occur that the update from firmware version 2.3.3 or 2.3.4 to 3.y.z fails without notice. Check the firmware version after the update process. The current firmware version is displayed in the information area of the system overview page, see Status overview – system. If the firmware version is still 2.3.3 or 2.3.4, the update to 3.y.z was rejected by the AMS Asset Monitor. In this case, the firmware of the AMS Asset Monitor is still unchanged. To get help with this failed update create a report file as described below.

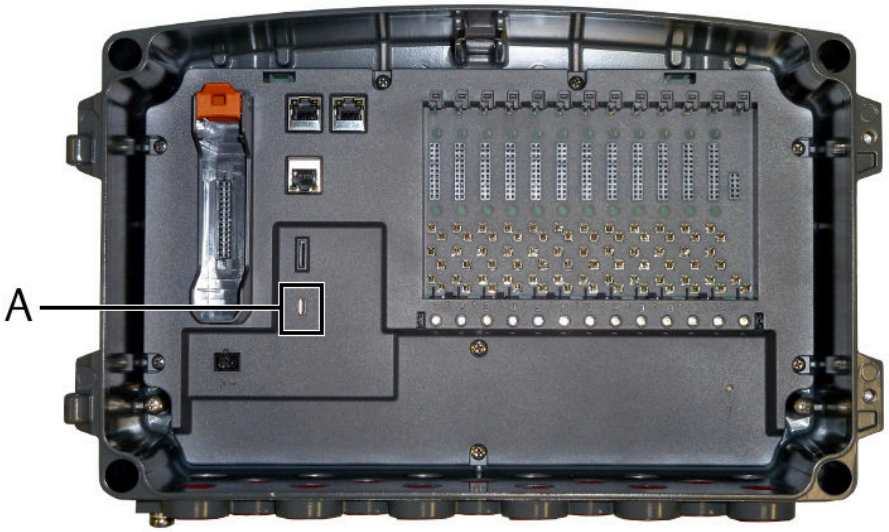
Prerequisites

You need a USB-C flash drive with a single partition in exFAT format and at least 100 MB of free space. Because of the limited power supply through the USB-C port an external USB hard drive cannot be used.

Procedure

1. Connect the USB-C flash drive to the USB-C port of the AMS Asset Monitor. See Figure 9-2 for location of the USB-C port.

Figure 9-2: Location USB-C port



A. USB-C port

2. Repeat the update procedure from firmware 2.3.3 or 2.3.4 to 3.y.z.
3. Wait for approximately five minutes, then disconnect the USB-C flash drive from the AMS Asset Monitor.

   A file named 'rejection_reason' has been created and stored on the flash drive.
4. Connect the flash drive to a computer and send the file 'rejection_reason' for investigation and further advice to Technical Support. See Technical support.

9.1.2 Firmware update – CHARM

The firmware of the installed CHARMs is updated automatically. The firmware matching the monitor firmware is always installed on the CHARM. The firmware for the CHARMs is part of the AMS Asset Monitor firmware file. Table 9-1 explains the update behavior with different scenarios.

Table 9-1: Update scenarios

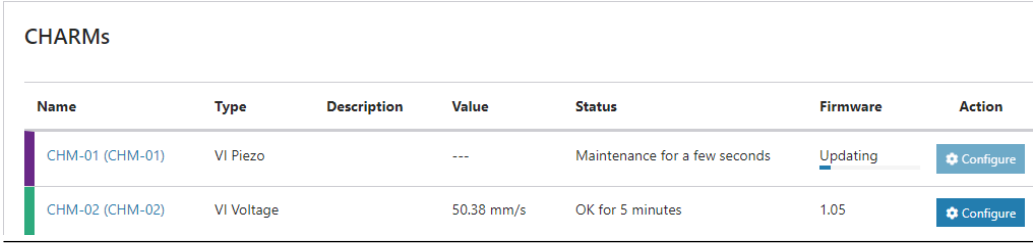
Scenario	CHARM firmware
Firmware of the AMS Asset Monitor was updated.	The AMS Asset Monitor checks the firmware version of the installed CHARMs and updates outdated CHARM firmwares automatically.
A CHARM with an older firmware version than contained in the AMS Asset Monitor firmware is installed.	The firmware of the CHARM is updated to the version contained in the AMS Asset Monitor firmware.
A CHARM with a higher firmware version than contained in the AMS Asset Monitor firmware is installed.	The firmware of the CHARM is downgraded to the version contained in the AMS Asset Monitor firmware.

A running firmware update or downgrade of the CHARM is indicated with a progress bar in the status overview or list view of the CHARMs. See Figure 9-3.

⚠ DANGER

Do not interrupt the update or downgrade process to avoid damaging the CHARM. Loss of the power supply of the AMS Asset Monitor or removal of the CHARM to be updated or downgraded interrupts the process.

Figure 9-3: CHARMs list view with running firmware update indication



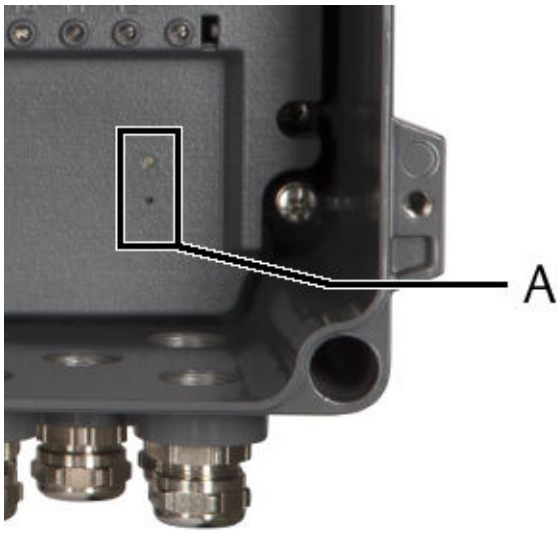
9.2 Reset button

The AMS Asset Monitor is equipped with a reset button to start the following functions:

- Recovery mode
- Bypass IP address activation
- Reset to factory default

See Figure 9-4 for the location of the reset button and its allocated feedback LED.

Figure 9-4: Location of the reset button



A. Reset button with allocated LED.

Prerequisites

Use a screwdriver such as Wera 118002 0.23x1.5, a paper clip, or a suitable pen to press the reset button.

9.2.1 Recovery mode

If the AMS Asset Monitor does not boot successfully because of a failed firmware update for example, use the recovery mode to bring the AMS Asset Monitor into a defined condition that allows to reboot the AMS Asset Monitor, to set the AMS Asset Monitor to factory default, or to install the firmware of the AMS Asset Monitor anew.

Prerequisites

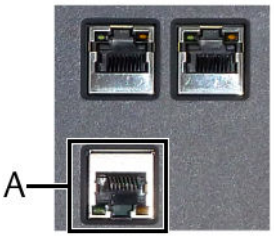
- PC, laptop, or similar with one free Ethernet port for a direct (Peer-to-Peer) connection to the AMS Asset Monitor.
- Ethernet cable (CAT 5 or better)
- Latest version of Google Chrome
- Screwdriver, pen, or paperclip.
- Firmware in file format *swu (only for firmware update)

Procedure

1. Ensure that the power supply of the AMS Asset Monitor is switched off.
2. Open the door.
3. Make a direct connection (Peer-to-Peer) between your configuration device and the AMS Asset Monitor.

   The configuration interface of the AMS Asset Monitor is the lower socket of the three RJ-45 sockets.

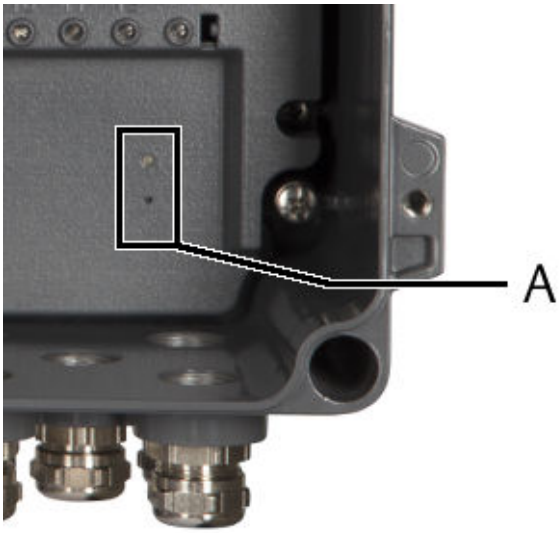
Figure 9-5: Configuration and data exchange interface



A. RJ-45 Ethernet connector for configuration and to connect to subsequent systems.

4. Press the reset button with a screwdriver, pen, or paperclip and hold it pressed.

Figure 9-6: Location of the reset button



A. Reset button with allocated LED

5. Switch on the power supply.
6. Hold the reset button pressed until the LED above the button shows a blue steady light.
7. Release the reset button.
   The LED switches to a green steady light after finishing the boot process. The AMS Asset Monitor is in the recovery mode and accessible through the recovery IP address (169.254.153.110) of the AMS Asset Monitor.

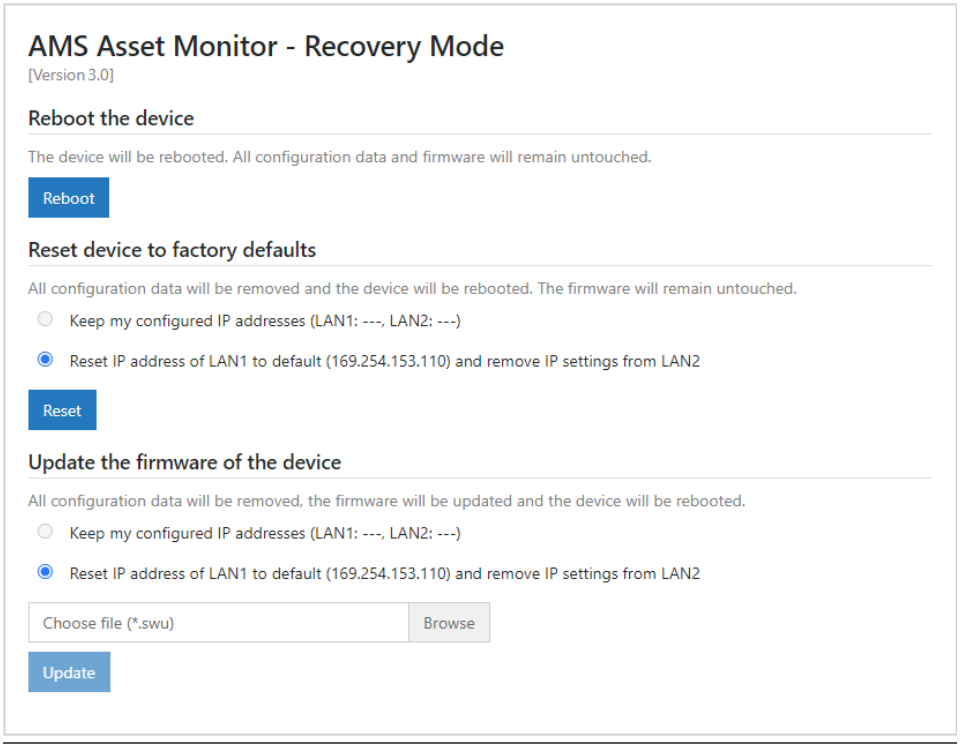
Note
To exit the recovery mode without any changes, switch off the power supply and switch it on again.

8. It might take some time before the IP address is accessible. Wait for approximately two minutes before accessing the AMS Asset Monitor.

9. Start your web browser and enter the recovery IP address 169.254.153.110.
The page of the recovery mode opens.

Note
If the page does not appear, click **Ctrl+F5** to override the browser cache and to reload the page.

Figure 9-7: Recovery mode



10. Select an option.

Reboot the device	Reboot of the AMS Asset Monitor without any changes. See Reboot.
Reset device to factory defaults	Reboot of the AMS Asset Monitor with factory default settings or default settings but unchanged IP addresses. All customized settings, except the IP addresses – if you select to keep it, are deleted. See Reset to factory defaults.
Update the firmware of the device	Update of the firmware. All customized settings, except the IP addresses – if you select to keep it, are deleted. See Firmware update.

Reboot

Procedure

1. Click **Reboot** to reboot the AMS Asset Monitor.

A confirmation prompt with the summary of the task to be executed appears. Click **Reboot now** to start the process.

2. After the reboot, wait a few minutes then connect to the AMS Asset Monitor by using the configured IP address.

Reset to factory defaults

Procedure

1. Select an option for the reset.
   - Select **Keep my configured IP addresses (LAN1: configured IP address, LAN2: configured IP address)** to reboot the AMS Asset Monitor with factory default settings, but the configured IP addresses remain unchanged.
   - Select **Reset IP address of LAN1 to default (169.254.153.110) and remove IP settings from LAN 2** to reboot the AMS Asset Monitor with factory default settings. Configured IP addresses are also set to factory default.
2. Click **Reset** to reboot the AMS Asset Monitor with the selected option (reset of IP addresses or not).
   A confirmation prompt with the summary of the task to be executed appears. Click **Reset now** to start the process.
3. After the reboot, wait a few minutes then connect to the AMS Asset Monitor by using the default IP address (169.254.153.110) or the configured IP address if **Keep my configured IP addresses (LAN1: configured IP address, LAN2: configured IP address)** has been selected.
   The AMS Asset Monitor is reset to factory settings. All user defined settings and configurations are deleted.

Firmware update

Procedure

1. Select an option for the firmware update.
   - Select **Keep my configured IP addresses (LAN1: configured IP address, LAN2: configured IP address)** to update the firmware and reboot the AMS Asset Monitor with factory default settings, but the configured IP addresses remain unchanged.
   - Select **Reset IP address of LAN1 to default (169.254.153.110) and remove IP settings from LAN 2** to update the firmware and reboot the AMS Asset Monitor with factory default settings. Configured IP addresses are also set to factory default.
2. Click **Browse** to open the file browser.
3. Go to the storage location of the *.swu file and select it.
4. Click **Open** to select the firmware package for the update process.
   The version of the selected firmware is displayed.
5. Click **Update** to start the update process.

A confirmation prompt with the summary of the task to be executed appears. Click **Update now** to start the process. The progress of the update process is displayed.

The AMS Asset Monitor automatically reboots after the successful update.

6. Once the reboot process is finished – status light of the AMS Asset Monitor is solid green, flashing green, or flashing red – enter the default IP address or the IP address previously configured to access the AMS Asset Monitor.

   If it is not possible to access the AMS Asset Monitor by using the configured IP address, activate the bypass IP address. See Activate bypass IP address.

Note
If the login dialog does not appear, click **Ctrl+F5** to override the browser cache and to reload the page.

9.2.2 Activate bypass IP address

The IP address of the RJ-45 Ethernet interface for the configuration is generally set during the first configuration of the AMS Asset Monitor. If the AMS Asset Monitor cannot be reached through this IP address, you can enable a bypass IP address, which is 169.254.153.110.

The enabled bypass IP address is indicated by a flashing blue LED and active for approximately five minutes. Afterwards the bypass is automatically disabled.

Note
The bypass IP address does not replace the configured IP address. Both addresses – the configured IP address and the bypass IP address – are active in parallel.

Procedure

1. Ensure that the power supply of the AMS Asset Monitor is already switched on.
2. Open the cover.
3. Press the button with a screwdriver, pen, or paperclip until the allocated LED starts flashing in blue.
4. Release the button.
   The bypass IP address is enabled for approximately five minutes.

9.2.3 Reset to factory default

Use the reset button to reset the AMS Asset Monitor to factory default without using the recovery mode.

Procedure

1. Ensure that the power supply of the AMS Asset Monitor is already switched on.
2. Press the button with a screwdriver, pen or paperclip for 15 seconds until the allocated LED starts fast flashing in blue.
3. Release the button and press it again for approximately five seconds until the allocated LED shows a blue steady light. Then release the button to activate the reset.

The AMS Asset Monitor is reset to factory default and reboots automatically. All user defined settings and configurations are deleted.

4. After the reboot, wait a few minutes then connect to the AMS Asset Monitor by using the default IP address (169.254.153.110).

9.3 Reboot

Use the reboot function to reboot the AMS Asset Monitor without power off and power on the AMS Asset Monitor. The reboot function is available for users with the role **Administrator** or **Operator**.

During the reboot, all connected devices lose their connection until the AMS Asset Monitor is completely rebooted.

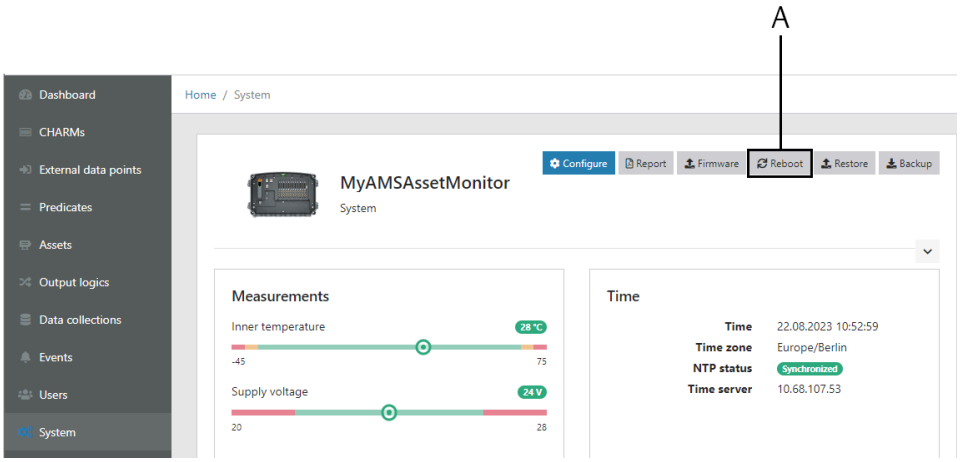
⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

Procedure

1. Select **System** from the sidebar to open the page of the system configuration.

Figure 9-8: Reboot



*A. **Reboot** button*

2. Click **Reboot** to start the process to reboot the AMS Asset Monitor.
   The confirmation dialog opens.
3. Click **Reboot**.
   The reboot process can take several minutes.
4. After the successful reboot, click **OK** to return to the web interface.

9.4 Backup and restore

Use the backup and restore function to create a backup of the AMS Asset Monitor and to restore it.

Note
The availability of this function depends on the rights of the currently active user.

The backup file contains the following data:

- General configuration of the AMS Asset Monitor (system configuration)
- Configuration of the assets
- Configuration of the CHARMs
- Configuration of the external data points
- Configuration of the predicates
- Configuration of the output logics
- Configuration of the data collections
- User accounts

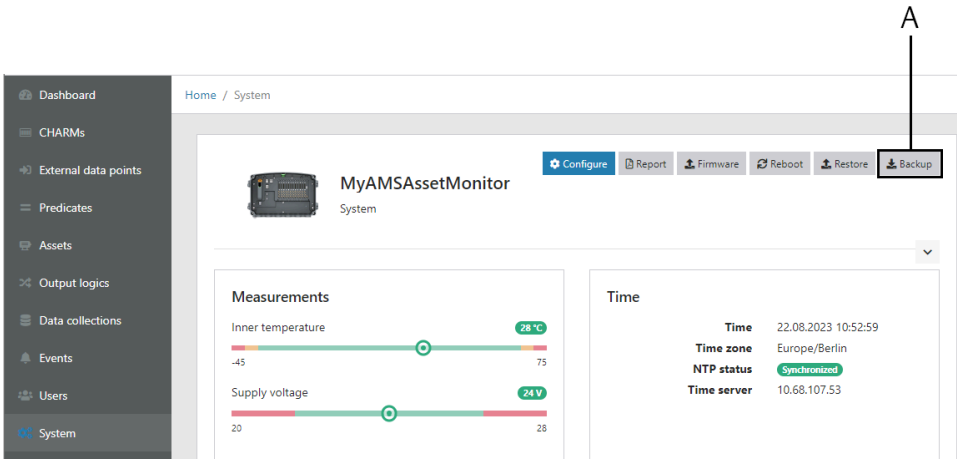
Note
Before restoring a system ensure that the hardware setup (installed CHARM types and position of the CHARMs within the system) of the AMS Asset Monitor has not been changed since the creation of the backup file.

9.4.1 Backup

Procedure

1. Select **System** from the sidebar to open the page of the system configuration.

Figure 9-9: Backup



*A. **Backup** button*

2. Click **Backup** to generate a backup file.

   The backup file is generated. The default file name is **Asset_Monitor_Backup_YYYY-MM-DD_hh-mm-ss.amb** (Y, M, D, h, m, and s are placeholders for the current year, month, day, hour, minute, and second). Depending on the settings of the used browser, the file is automatically copied to the predefined download location or the dialog for selecting a download location opens (continue with Step 3).

3. Use the default name or enter a name for the file and select a storage location.
4. Click **Save** to save the backup file.

9.4.2 Restore

⚠ CAUTION

Any work on the system may impair asset health monitoring and machine protection.

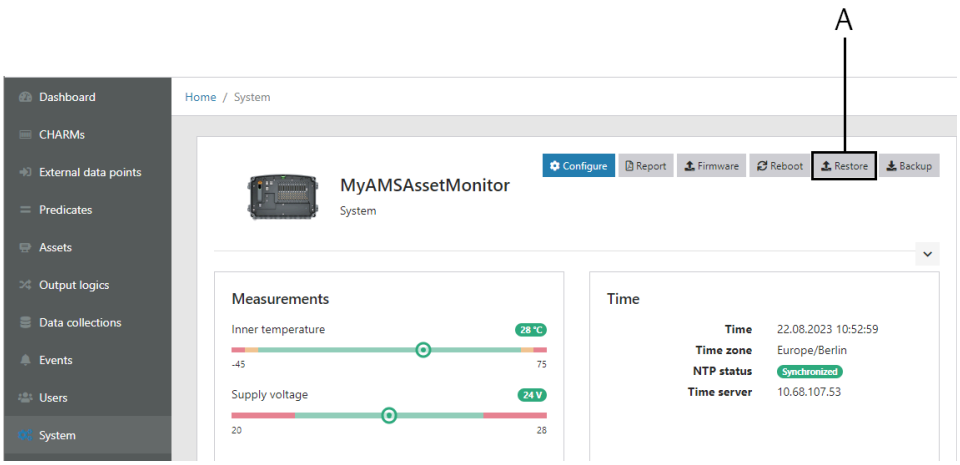
Observe the following points before restoring the configuration of an AMS Asset Monitor:

- The firmware version installed on the AMS Asset Monitor at that time the backup was generated must be identical with the firmware version of the AMS Asset Monitor where the backup is going to be restored.
- Ensure that the login details of the users contained in the backup are known. Otherwise it is not possible to get access to the AMS Asset Monitor after the backup is restored.

Procedure

1. Select **System** from the sidebar to open the page of the system configuration.

Figure 9-10: Restore



*A. **Restore** button*

2. Click **Restore** to open the dialog for restoring the configuration.
   The dialog opens.
3. Click **Browse** to select a backup file.
   Backup files have the extension ***.amb** or ***.zip**.
4. Click **Restore now** to restore the configuration.

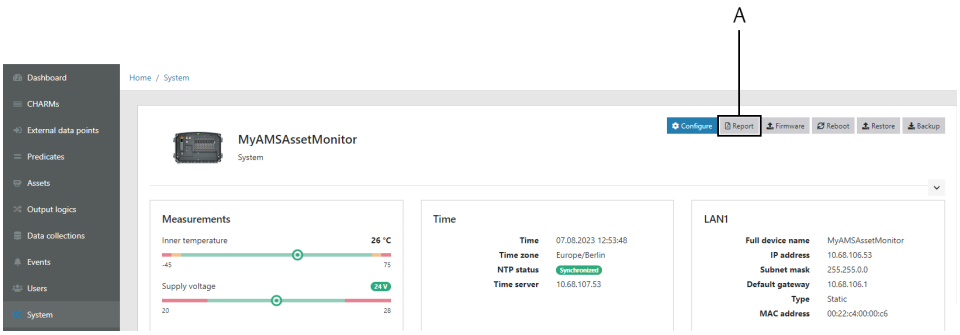
9.5 Report

Use the report function to create a report of the configured Modbus TCP connection and the Modbus registers (see Modbus TCP).

Procedure

1. Select **System** from the sidebar to open the page of the system configuration.

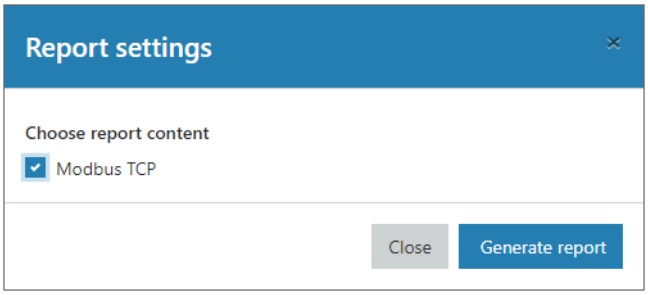
Figure 9-11: Report



*A. **Report** button*

2. Click **Report** to open the dialog for creating a report.

Figure 9-12: Report dialog



3. Select the report content to be created and click **Generate report**.

   The report is created. The default name is **System**. Depending on the settings of the used browser, the report is automatically copied to the predefined download location or the dialog for selecting a download location opens (continue with Step 4)

4. Use the default name or enter a name for the report and select a storage location.
5. Click **Save** to save the report.
   Use a PDF viewer to open the report.

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MHM-97924-PBF
Rev. 4.5
2024

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