

# AMS 6500 ATG

- API 670 compliant TSI protection system
- Embedded predictive diagnostics including PeakVue™ technology, order analysis, band analysis and energy in bands
- Interface with other applications through OPC UA, Modbus TCP/IP, or Modbus RTU
- SNTP time synchronisation
- 3-year warranty
- Airborne contaminants resistance class G3 according to ISA-S71.04

## Overview

**Five percent of the rotating machines in every plant have the ability to impact production if they fail. Although your critical machines have vibration shutdown protection systems in place to prevent catastrophic failure, is your plant really protected?**

Predictive intelligence is the key to increasing availability and improving the reliability of plant assets. Emerson's AMS 6500 ATG is a stand-alone machinery protection solution that also allows users to cost effectively introduce prediction monitoring of critical assets from the same system.

With four reconfigurable cards the AMS 6500 ATG can be setup in the field for a wide range of protection measurements, including all the required TSI measurements, which include embedded prediction capabilities, such as impacting or peak-to-peak data used in Emerson's PeakVue™ methodology.

Prediction data from PeakVue technology cuts through the complexity of machinery analysis to provide a simple, reliable indication of equipment health, working through a single trend that filters out traditional vibration signals to focus exclusively on impacting.



*Real-time machinery health feedback integrates to digital control systems so you can run your plant with confidence.*

With the addition of this impact data, users can monitor the start-up and coast down of critical turbo machinery for safe operation and receive the earliest indications of developing faults in gearboxes and bearings.

**What about the shocking repair costs, missed production goals, and unfulfilled customer commitments associated with a trip or a missed trip?**

With the AMS 6500 ATG protection system users benefit with prediction monitoring of critical assets from the same cards, without the additional cost of another system, and production impact is virtually non-existent. Greater flexibility of the cards will help with fewer inventory spares, as well.

Real-time machinery health feedback integrates to digital control systems so you can run your plant with confidence.

**As many as 50% of machinery malfunctions that lead to downtime are process induced, and 90% are predictable – even controllable.**

With the focus on impact data, users will experience a lot fewer “process induced” failures because they will have a much better indicator of overall asset health on pumps, fans, motors, and other types of rolling-element bearing machines, which are most often the reason for downtime.

The AMS 6500 ATG presents all available information about the critical machine such as main value, trending data, and status data. Part of Emerson's digital architecture, the AMS 6500 ATG provides enterprise-wide information needed for real-time decision making.

Emerson is a global leader of combined technologies for integration to digital control systems and plant-wide predictive technologies for managing both fixed and rotating assets.

## Protection System You Can Count On

The AMS 6500 ATG provides API 670 protection on the industry's most critical equipment: steam turbine generators, gas turbines, boiler feed pumps, offshore compressors, pipeline turbo compressors, chemical industry compressors, turbo exhausters, blowers, and boosters. Missed trips, false trips, and running blind are not acceptable in your plant.

The AMS 6500 ATG helps prevent missed trips by using module self-health checking, instrumentation health monitoring and hot swappable, external, redundant power. External power removes heat and user "touches" away from the rack. The same architecture is used in all Emerson integration to digital controls systems and critical SIS systems.

False trips are addressed through features such as 2oo3 voting logic for increased decision accuracy and limiting channel count to two-channel modules. Two channel modules mean that swapping a protection module will affect no more than two channels – an API 670 requirement. Redundant communications ensure that the operator is never blind to machinery health information.

AMS 6500 ATG provides new communication protocol with embedded OPC Unified Architecture (UA) technology.

There are five key features that OPC UA delivers to the end-users:

- Ease-of-use
- Plug-and-play
- High reliability and redundancy
- Enhanced performance
- Multiplatform support

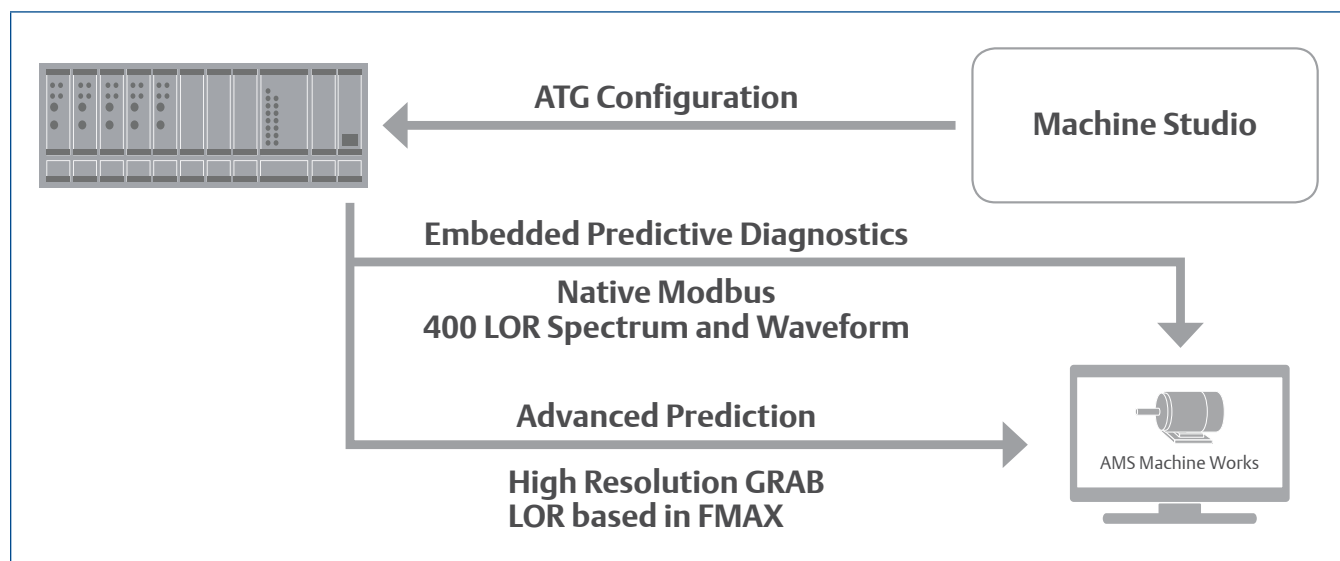
OPC UA ensures easy integration of relevant system status and values without a huge effort.

## Instrumentation

While the AMS 6500 ATG delivers field-based intelligence, accurate information starts with quality instrumentation.

Eddy current displacement sensors are the preferred method for monitoring sleeve-bearing machines. These displacement sensors penetrate the machine case and directly monitor the motion and position of the shaft without contacting the shaft surface.

Accelerometers and velometers are the industry accepted sensors for monitoring the health of gearboxes and rolling element bearings. Although temperature sensors are sometimes used to measure health, temperature alone is only a small part of the machinery health picture.



AMS 6500 ATG provides new communication protocol with embedded OPC UA technology.

When a shaft begins to rub the bearing as a result of misalignment, a displacement probe can directly track the misalignment behavior. By the time the rub is severe enough to trigger a temperature alarm, the damage is already done.

Mounting location and instrumentation bracket design are both critical for quality data.

A complete range of sensors, adapters, cables, connectors, converters, and fittings are available for new installations, retrofits, or replacement of sensors during an overhaul.

AMS 6500 ATG components (Shown in the graphic below):

#### A6500-UM

- Shaft vibration
  - (Displacement 0-Peak, Peak-Peak, RMS, Smax, SmaxPP)
- Case vibration
  - Displacement (0-Peak, Peak-Peak, RMS, Smax, SmaxPP)
  - Velocity (0-Peak, Peak-Peak, RMS, Smax, SmaxPP)
  - Acceleration (0-Peak, Peak-Peak, RMS, Smax, SmaxPP)
- Position
  - Distance (Single, tandem, cone)
  - Rod gap
  - Rod drop (Average, Triggered)
  - Eccentricity (Peak-Peak, Min, Max)
- Speed/Key
- Pressure
  - Dynamic (0-Peak, Peak-Peak, RMS)
  - Cylinder (0-Peak, Peak-Peak, RMS)

#### A6500-TP

- Temperature measurement
- Process parameter input

#### A6500-RC

- 16 output relays SPDT-type
- 16 logic layers
- 66 logic inputs
- Graphical logic engine (drag and drop)

#### A6500-CC

- Rack communication (USB and TCP)
- MODBUS TCP/IP
- Modbus RTU
- OPC UA
- 32GB SD- Card

#### A6500-SR

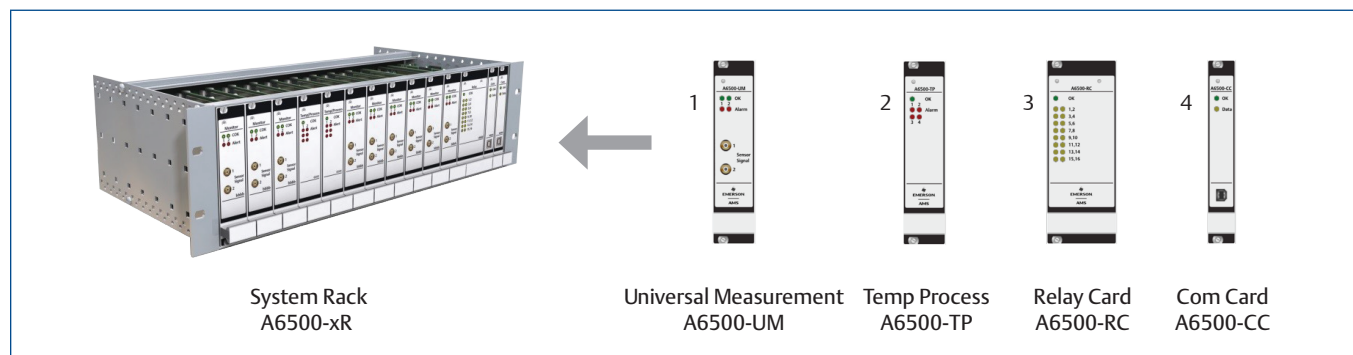
- 19" 3U-system rack
- 11 measurement cards
- 1 relay card
- 2 communication cards (for redundancy)

#### A6500-RR

- 19" 3U- redundant relay rack
- 9 measurement cards
- 2 relay card
- 2 communication cards (for redundancy)

#### A6500-FR

- 12.25" 6U- front termination short rack
- 6 measurement cards
- 1 relay card
- 1 communication card



## Embedded Predictive Diagnostics

The AMS 6500 ATG features embedded predictive diagnostic capabilities, including the ability to view the following data in real-time:

- Order Analysis including Peak and Phase
- Band Analysis with up to eight programmable filter bands
- Energy in bands
- Time Waveform
- Frequency spectrum
- Trend
- PeakVue technology

PeakVue is something Emerson offers in all its vibration technologies, because PeakVue provides a unique and better methodology for early identification of rolling element bearing and gearbox problems. When used in online monitoring, it can be particularly valuable in catching turbomachinery cracks in real-time before harm to personnel, property, and the environment can occur.

## Advanced Prediction

Emerson offers licensed Advanced Prediction functionality on top of the embedded predictive diagnostic capabilities within AMS 6500 ATG.

This prediction capability allows the AMS Machine Works software to communicate directly over Ethernet to the ATG to provide high resolution waveform and spectrum analysis and special “transient” recordings of data, based on demand, alert or schedule.

Just with activating the optional Prediction License within the Machine Studio configuration and no hardware change, the Advanced Prediction can be included to the entire AMS 6500 ATG Protection system. This gives the whole installation a more streamlined profile.

ATG Prediction provides a rich trend, spectrum, waveform history for an analyst to use to evaluate machinery health status. AMS Machine Works is available including the Advanced Analysis Tools which provides:

- Orbit Plot
- Bode Plot
- Nyquist Plot

- Waterfall Plot
- Cascade Plot
- Spectrum Plot
- Full Spectrum Plot
- Shaft Centerline Plot

This now makes it simple to extend this prediction/protection monitoring from critical assets to include BOP (balance of plant) assets in a comprehensive monitoring solution. ATG is the perfect choice to provide advanced prediction and shutdown protection to such BOP assets as ID and FD fans and BFP (boiler feedwater pumps). For more common BOP assets which have dangerous environments requiring agency approved monitoring solutions this monitoring combination of ATG and AMS Machine Works couldn't be better. And this solution can be a part of plant-wide reliability solution.

### Putting things together

AMS 6500 ATG advanced prediction is a read only application using AMS Machine Works. The actual setup of the waveform and spectral prediction data is done only in Machine Studio to ensure security. Alerts used to trigger “transient” recordings are also setup in Machine Studio AMS Machine Works reads the waveform and spectral data from the ATG and then treats it the same way it would treat data from AMS 2140. Capabilities of AMS Machine Works can be applied such as bearing and gear analysis.

The AMS 6500 ATG is a versatile condition monitoring performer; with built in logic for special measurement setup, OPC UA communications, modbus data trending in AMS Machine Works, “transient” recordings, multiple agency approvals and the ATG View wireless APP. Sowhether ATG prediction is deployed as a full online protection system or a full prediction system it can deliver everything you need for asset or process protection and health analysis.

AMS 6500 ATG Prediction, General	
Analog Channels	up to 44 (2 full ATG racks)
Tachometer Channels	Same
Sampling Rate	48 kHz
ADC Resolution/Fmax	24 bit / 18.75 kHz
Lines of Resolution (via Modbus)	400
Waveform samples (via Modbus)	1024
Input Type	See A6500-UM specifications
Channel Scan	2 up to 44 Channel simultaneous
High Frequency Detection	PeakVue, PeakVue Waveform (OPC-UA, Modbus TCP)
Communication with AMS Machine Works	Ethernet (Data Transfer Service to database)

Transient “GRAB” Recordings	
Maximum Sampling Rate	96 kHz
Resolution/Fmax	24 bit / 37.5 kHz Fmax (User selectable)
Lines of Resolution	User selectable
Channel Scan	All channels simultaneous
“Transient” Recordings Length @ Fmax	320s @ 1172 Hz 160s @ 2344 Hz 80s @ 4688 Hz 40s @ 9375 Hz 20s @ 18750 Hz 10s @ 37500 Hz
“Transient” Trigger	Event, Schedule, Manual

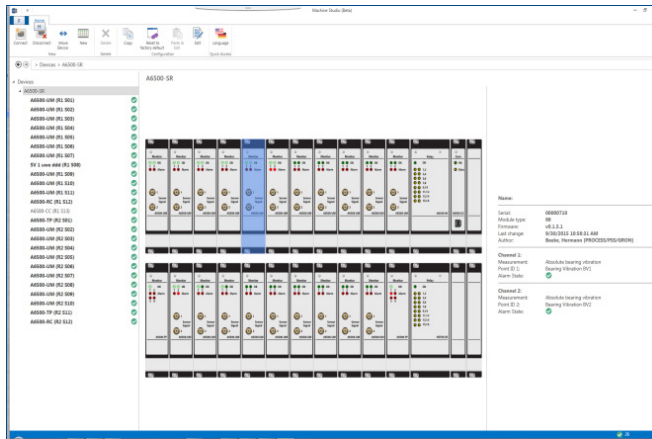
## Machine Studio Configuration Software

The user interface for Machine Studio configuration software is designed based on human-centered design to be intuitive and easy. The software helps to configure the system, define functionality for a UM module, and develop trip logics. While connected, the user has access to the integrated prediction functionality, which is used to configure the ATG cards. Results of the prediction functionality are displayed in the configuration software.

## ATG View Mobile Application

With ATG View it is no longer necessary to return to the control room or to open cabinets in the field to view or analyze data from your AMS 6500 ATG system. Simply use a mobile device to scan a quick response code (QRC) located on the cabinet and data from the associated rack is viewable on your device screen. Buffered outputs are still available on the rack for access to prediction data; however, users no longer risk tripping a machine offline since plugging into these buffered outputs is now optional.

The reliability professional can look at all available information about a critical machine – including the overall health of his system, the status of alarms, external inputs such as bypasses, and outputs such as trips and whether they are active or not.

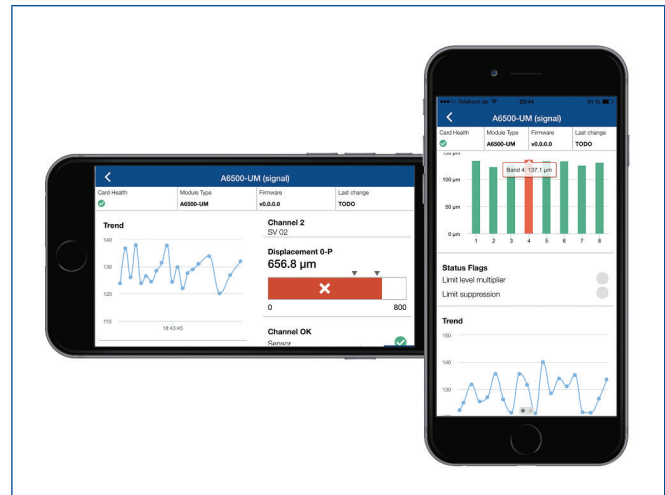


*Machine Studio configuration software features a familiar, more intuitive user interface.*

A technician can watch on his mobile device the status and health of all cards and measurements, such as:

- Universal measurement card
  - Monitor over speed
  - Monitor vibrations, eccentricity, positions and more than a 100 different measurements.
  - Be directly informed about alert and danger alarms.
  - Watch trend curves and visualize all kind of vibration, position, and speed data, etc.
- Temp/Process card
  - Monitor temperature of the machine and other process values you want to monitor
  - Be directly informed about alert and danger alarms
  - Watch trend curves, etc.
- Relay Card
  - Monitor all digital inputs and relay outputs
- Com Card
  - Enable OPC UA, Modbus TCP, Modbus RTU
  - Machine Studio and ATG View clients and general settings of the card

Be informed about module types, firmware versions, serial numbers, and date of the last change of configuration, etc., with ATG View. Use the list view or simply tap on a visualized card to get detailed information.



*ATG View delivers asset health information to the user anywhere on the plant network.*



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## Ordering Information

Please see individual monitoring module spec sheets for specific functionality of the ATG Parts.

Model Number	Product Description
A6500-UM	Universal Measurement Card, Speed, VIB, POS
A6500-TP	Temperature / Process Card
A6500-RC	System Relay Card, 16 output relays SPDT
A6500-CC	System Communication Card, MODBUS RTU/TCP, OPC UA
A6500-PE	Prediction Extension License
A6500-CC-P	Package A6500-CC & A6500-PE
A6500-SR	System Rack, 11 UM, 1 RC, 2 CC SLOTS
A6500-RR	Redundant Relay Rack, 9 UM, 2 RC, 2 CC Slots
A6500-FR	Front Termination Rack, 6 UM, 1 RC, 1 CC Slots

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