

## The Problem

Plant operators are often faced with a high number of alarms and abnormal situations and are therefore unable to respond quickly enough to prevent safety related incidents, environmental issues, shutdowns and equipment damage. A poorly applied alarm management policy resulting in excessive alarms and events can also make operators routinely ignore alarms due to the excessive amount of information being received.

## The Solution

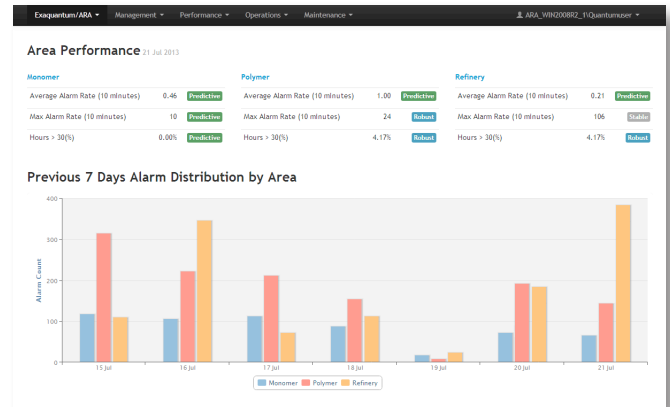
Exaquantum/ARA is Yokogawa's Alarm Reporting and Analysis solution. Based on EEMUA 191 and ANSI/ISA-18.2-2009, Exaquantum/ARA assists supervisors and managers in implementing effective alarm management by highlighting patterns in alarm and event occurrences making it easier to identify and correct areas of concern.

## Benefits

- Reducing the number of distracting and nuisance alarms will allow operators to focus on and react faster to abnormal situations with the proper corrective action
- Reduced operator stress will improve reaction times for incident resolution
- Improved plant safety and reduced risk of serious environmental incidents
- Identification of improvement opportunities through focused KPIs
- Consolidated alarm and process information can be supplied in custom reports to provide additional analysis information
- Information available to key stakeholders on demand and by email, facilitating efficient and timely decision making

## Key Features

- 35 reports, many based on EEMUA 191 and ANSI/ISA-18.2-2009
- On demand access to Operator and Area KPIs
- Drill down from summary reports to the individual alarms and events
- Detailed filtering options to expose hidden problem areas
- Automatic replication of CENTUM plant hierarchy
- Reports can be scheduled for printing, storing and emailing
- Integration with Yokogawa's CENTUM DCS, CAMS for HIS and FAST/TOOLS SCADA
- Compatible with non-Yokogawa systems via OPC A&E 1.1

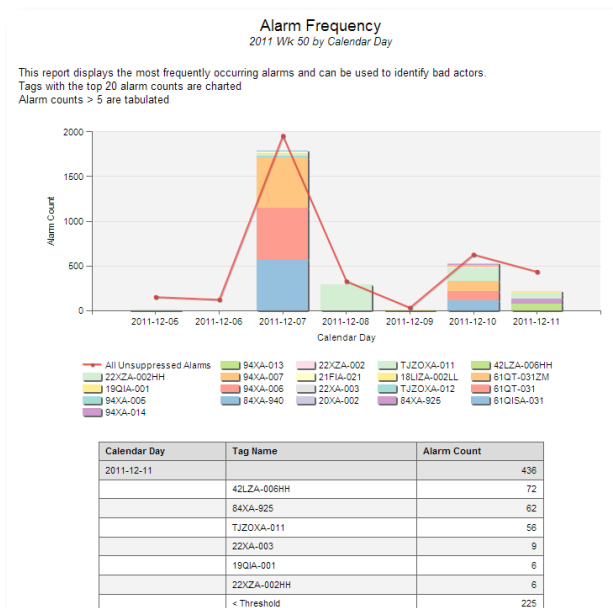


## Introduction

Exaquantum/ARA, hereafter referred to as 'ARA', continuously collects alarm and event data to provide statistical reports based on EEMUA 191 and ANSI/ISA-18.2-2009. These reports aid supervisors and managers in identifying which alarms and events are occurring most frequently and where the alarm management policy can be improved. Each report can be filtered and drilled down to desired levels, including individual alarm occurrences, and then exported to a number of file formats including PDF, Word and Excel.

ARA can be installed on a single server and provides access to multiple users via its intuitive web user interface, eliminating the need for any client software.

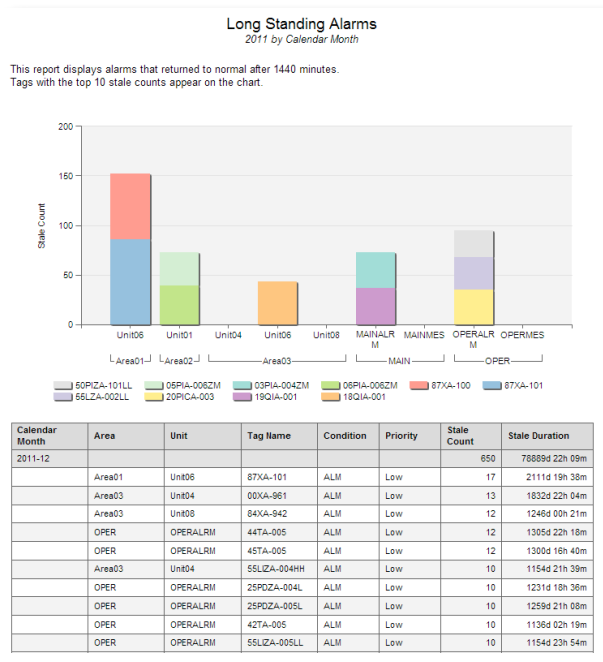
In addition to the web user interface, authorized access to the data is provided via Excel and SQL Server Report Builder, allowing custom reports to be created.



## Capabilities

### Alarm and Event Collection

Alarms and event data is continuously collected via OPC A&E 1.1. For those Yokogawa systems that use Exaopc, Yokogawa has extended Exaopc's OPC HDA server to include Historical Alarms & Events (HAE), which allows Exaopc to automatically buffer all alarms and events if the network connection to Exaquantum PIMS is lost. Once the connection is restored, all buffered Exaopc alarms and events will be available to be processed by ARA.



### Automatic Plant Hierarchy Creation

If configured in the Process Control System, ARA can extract and store plant hierarchy information contained within received alarm and event messages. This plant hierarchy can then be used to filter information displayed in reports.

### Reports Overview

ARA provides 35 reports (described below), grouped into the following four areas:

- Management – providing a high-level overview of plant KPIs
- Performance – covering specific EEMUA 191 performance guidelines to quickly highlight potential areas of concern
- Operations – day-to-day operator reports covering alarm rates and trends
- Maintenance – highlighting problem alarms and aiding in the alarm rationalization process

### Report Filters

ARA report filters are used to refine and analyze the report information to expose hidden alarming problems. As the information on the report is already generated, filtering occurs on demand. Depending on the report, the filters may include:

- Time resolution and periods to determine when problems are occurring and the alarming patterns
- Plant area or units to isolate areas of particular concern
- Operator selection to help identify the alarms and events that the selected operator sees most frequently
- Alarm tag and conditions help to identify patterns in a particular alarms behavior, enabling effective corrective action to be taken
- Alarm priority to highlight the priority distribution and discover alarms that may have an inappropriate priority level assigned to them
- Suppression types to view statistics on the number of alarms that have been disabled, group suppressed and shelved

### Interface with Yokogawa's 'CAMS for HIS'

ARA can retrieve the following information from Yokogawa's 'CAMS for HIS':

#### Detection Disabled Alarms

This status is used in CAMS to annunciate important alarms and remove low-value alarm messages from DCS alarm displays within an operator station. Reports that are designed to reflect alarm loading from the operator's perspective exclude detection disabled alarms. Reports are provided that display information about the number and frequency of disabled alarms.

#### Alarm Priority Overrides

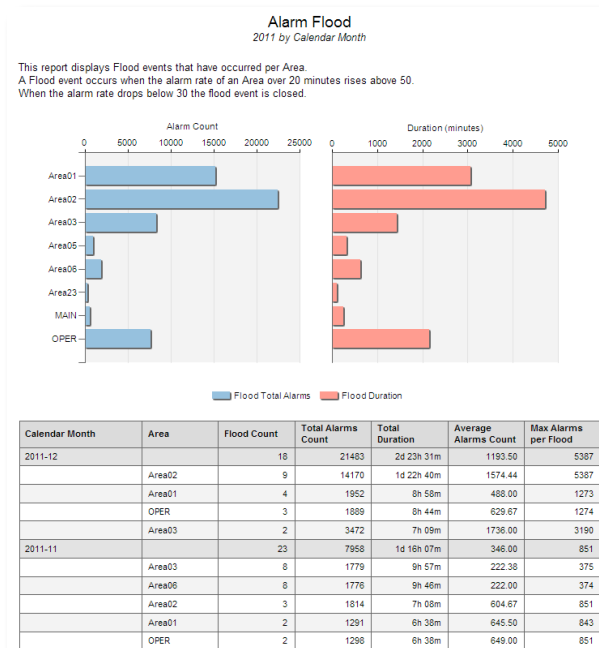
CAMS provides alternative priority settings to override those present in the DCS. If present, ARA processes new alarms using the CAMS priority; otherwise the DCS alarm level is used.

#### GroupSuppressions

CAMS group suppression allows a group of alarms to be suppressed from the operator's perspective. Reports that contain alarm loading from the operator's perspective can be filtered to include or exclude group suppressed alarms.

#### Shelved Alarms

CAMS allows operators to shelve alarms, temporarily removing them from the operator's view, allowing them to concentrate on more important alarms and return to the shelved alarms when convenient. Reports that relate to actions by operators can be filtered to include or exclude shelved alarms.

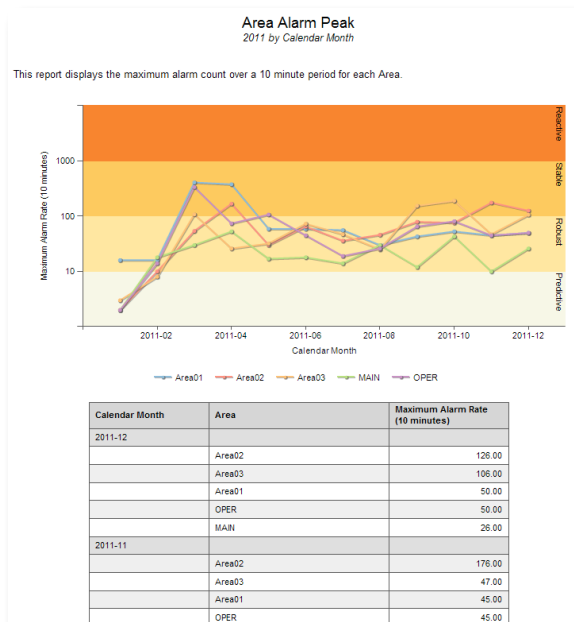


## Report Scheduling and Exporting

Microsoft Reporting Services technology is used by ARA to schedule and distribute reports to various file locations and email addresses.

In addition, ARA provides key exporting options for ARA reports, such as:

- PDF – Standard for publishing, storing and distributing reports
- Excel – Allows further analysis and combining of disparate data for reporting
- Word – Creation of weekly/monthly reports that can be annotated and signed off



## Exaquantum/ARA Report Branding

Report styles are stored centrally in ARA, allowing style changes to be made easily and consistently across all reports. This ensures that company standards can be adhered to in the production of reports.

## Custom Reports

In addition to the reports supplied with ARA, custom reports can be created in:

- Excel – ARA data can be further analyzed and charted with process data from Exaquantum PIMS also incorporated to produce a single report containing both alarm and process data
- SQL Server Report Builder – Created in SQL Report Builder and accessed via the ARA web browser menu of reports, these reports can be scheduled and distributed

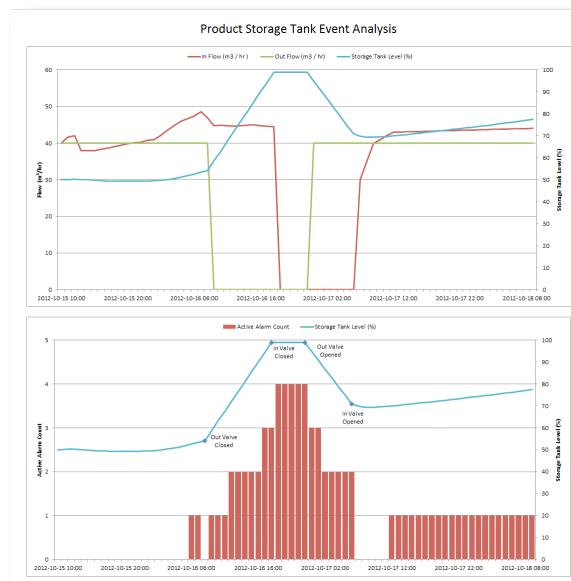
## Web User Interface

Client access to ARA is provided via an intuitive web user interface, eliminating the need for specific client software. A central navigation bar provides links to each of the reports, localization options and other Exaquantum products.

The web user interface is compatible with Microsoft Internet Explorer versions 8, 9 and 10 with security provided through Windows local and domain user groups.

## Localization

The ARA user interface can be seamlessly switched between installed languages. ARA is provided with US English by default with support for additional languages on request – please contact a local Yokogawa office for more information.



## Alarm Rationalization using Exaquantum/ARA with Exaquantum/AMD (Alarm Master Database)

Alarm rationalization can be provided by using Exaquantum/ARA with Yokogawa's Master Alarm Database solution 'Exaquantum/AMD'.

Exaquantum/ARA provides a comprehensive set of reports in order to understand the performance of the system and to identify problem areas. Once such problem alarms have been identified, the alarm settings can then be modified using Exaquantum/AMD's comprehensive Management of Change (MOC) environment.

## ■ Reports

The reports provided by ARA are listed below.

### Dashboard

Name	Description	EEMUA 191 & ANSI/ISA-18.2-2009 Reference
Dashboard	<p>The upper section of the Dashboard shows each area performance for the previous whole day. Each area is defined by an area title and three KPI's (Average Alarm Rate, Max Alarm Rate and Hours &gt; 30(%)). Adjacent to each KPI value is the related EEMUA performance level.</p> <p>The lower section of the Dashboard shows a graph of Alarm Distribution by Area for the seven previous whole days recorded.</p>	EEMUA 191: A4.1.2

### Management Reports

Name	Description	EEMUA 191 & ANSI/ISA-18.2-2009 Reference
Alarm Overview	This report displays a summary of the total, minimum, maximum, mean and median values for Alarm rate, Standing Alarms and Suppressed Alarms.	EEMUA 191: A12.5
Key Performance Indicators by Operator	This report summarizes actual Alarm System performance against KPI targets set by the users in the Parameters tab of the configurator. KPI performance can be viewed for the selected Operator and period. Both KPI sets indicate the number of alarms handled by one Operator, i.e. only those alarms presented to the Operator are analyzed.	EEMUA 191: A4.1.1 A12.5 ISA-18.2: 16.5.1 16.5.2
Area KPI	This report displays the total alarm raise count, the average daily alarm raise count and the average % of the top 5 alarms for each Area.	

### Performance Reports

Name	Description	EEMUA 191 & ANSI/ISA-18.2-2009 Reference
Area Performance	This report displays the EEMUA 191 performance levels of areas in the plant. The report is split into 3 tables: 1. Area performance overview 2. Key 3. % Time in each performance category	EEMUA 191: A4.1.2
Area Alarm Average	This report displays the average alarm count over a 10 minute period for each Area. The chart is broken up into the 4 performance levels available for the Alarm Average performance KPI.	EEMUA 191: A4.1.2
Area Alarm Peak	This report displays the maximum alarm count over a 10 minute period for each Area. The chart is broken up into the 4 performance levels available for the Alarm Maximum performance KPI.	EEMUA 191: A4.1.2

### Operation Reports

Name	Description	EEMUA 191 & ANSI/ISA-18.2-2009 Reference
Alarm by Condition	This report displays the distribution of alarms by condition (e.g. IOP/HH/ALM) for each Unit.	
Alarm by Condition and Tag	This report displays the distribution of alarms by condition (e.g. IOP/HH/ALM) for each Alarm Tag.	
Alarm Frequency	This report displays the most frequently occurring alarms and can be used to identify bad actors.	EEMUA 191: A12.6 ISA-18.2: 16.5.4
Alarm Peak	This report displays the maximum 10 minute alarm count for each Unit an Operator controls.	
Alarm Rate	This report displays the alarm count for Critical, High, Medium and Low priority alarms.	EEMUA 191: A12.9 A5.3 ISA-18.2: 16.5.7
Area Alarm Counts	This report displays the alarm count for each Area.	
Top Alarms	This report displays the most frequently occurring alarms for each Area. Each Area is displayed on a separate page, to help identify which are the top occurring alarms in each Area.	EEMUA 191: A12.6

Top Alarms by Operator	This report displays the most frequently occurring alarms for each Operator. Each Operator is displayed on a separate page, to help identify which are the top occurring alarms for each operator.	EEMUA 191: A12.6
Alarm Rationalization Progress	This report displays the average daily alarm count and the configured target for each Area. Each Area is displayed on a separate page, to help identify which Areas are meeting their alarm targets.	
Alarm Setting Change	This report displays the tags for which alarm setting changes have occurred.	
Consequential Alarms	This report displays potential relationships between alarms where the child activation closely follows the parent activation.	EEMUA 191 A12.11
Alarm Flood	This report displays Flood events that have occurred per Area.	ISA-18.2: 16.5.3
Alarm Responsiveness	This report displays alarms where no acknowledge is received within the Operator Response Threshold, and alarms where the return to normal exceeded the Alarm Return Threshold.	EEMUA 191: A12.10
Event Balanced Trend	This report displays alarms raised against alarms acknowledged. This report displays Average Alarms raised per minute (Process Requests) and Average Alarms Acknowledged per minute (Operator Actions).	EEMUA 191: A12.7

#### Maintenance Reports

Name	Description	EEMUA 191 & ANSI/ISA-18.2-2009 Reference
Calibration Events	This report displays the number of completed calibration events and duration of calibration events.	
Chattering Alarms	This report displays alarms that go to raise state and recovery state repeatedly within one minute.	EEMUA 191: A11.7 ISA-18.2: 16.5.5
MVSV Change	This report displays the Total Count, Maximum and Minimum values of the MV changes (when Mode is MAN) or SV changes (when Mode is AUT).	
Long Standing (Stale) Alarms	This report displays alarms that returned to normal after the configured stale duration parameter (default is 1440 minutes).	EEMUA 191: A12.8 ISA-18.2: 16.5.6

Suppressed Alarms	This report displays the number of completed suppression events and the duration of those suppression events for the selected suppression type (e.g. Operator Suppression, CAMS Group Suppression).	EEMUA 191: A8.3
Suppressed Alarms by Tag (Drill Down)	When viewing the Suppressed Alarms report (previous row) further details of the suppression events can be obtained by clicking on the suppressed count for a specific tag. Upon clicking on the suppressed count the Suppressed Alarms by Tag report will be displayed and this report shows the suppressed events for a specific tag.	EEMUA 191: A8.3
Bad Actors	A Bad Actor is defined as a repeatedly occurring alarm over a long period of time. To help identify Bad Actors, this report displays the alarm count for the Tags with highest alarm counts.	EEMUA 191: A12.6
Bad Actors by Condition	A Bad Actor is defined as a repeatedly occurring alarm over a long period of time. To help identify Bad Actors, this report displays the alarm count for the Tags and Condition with highest alarm counts.	EEMUA 191: A12.6
Alarm Messages Segregation (Drill Down)	When viewing the Bad Actors report, further details of the tag conditions that caused the alarm raises can be obtained by clicking on the alarm count for a specific tag. Upon clicking on the alarm count the Alarm Message Segregation report will be displayed and this report shows the alarm counts for a specific tag by condition.	
Active Alarms	This report displays alarms that have been raised but have not returned to normal.	
Active Events	This report displays the following events that have started but not yet completed: <ul style="list-style-type: none"> <li>■ Calibration Events</li> <li>■ Flood Events</li> <li>■ Mode Change Events for Manual or Cascade</li> </ul>	
Active Suppression Events	This report displays suppression events that have started but have not yet completed.	
Force	Displays Alarms relating to Controller Force events.	
Override	Displays Alarms relating to Controller Override events.	
Settings	This report displays the current ARA configuration parameters.	

## ■ Hardware and Software Requirements

Tables: Minimum Hardware and Software Specifications

Component	Hardware Specifications
<b>Exaquantum/ARA Server</b>	<ul style="list-style-type: none"> <li>• 2.2 GHz multi-core processor</li> <li>• 8 GB RAM</li> <li>• 300 GB disk</li> </ul>
<b>Exaquantum/ARA Web Server*</b>	<ul style="list-style-type: none"> <li>• 2.2 GHz multi-core processor</li> <li>• 8 Gbytes RAM</li> <li>• 300 GB disk</li> </ul>
<b>Exaquantum/ARA Clients</b>	As appropriate for Internet Explorer 8, 9 or 10

\*A dedicated web server may be required dependent on the Exaquantum requirements, the number of Exaquantum expansion packages (such as Exaquantum/SER, Exaquantum/ARA, Exaquantum/AMD, Exaquantum/SFM, Exaquantum/DTA, etc.) being installed on The Exaquantum server and the total number of concurrent Web users. Please contact your local Yokogawa office for assistance.

Component	Software Specifications
<b>Exaquantum/ARA Server</b>	<p><b>&lt;Operating Systems&gt;</b></p> <ul style="list-style-type: none"> <li>• Windows Server 2012 Standard 64 bit</li> <li>• Windows Server 2008 Standard (SP2) 32 bit</li> <li>• Windows Server 2008 R2 Standard (SP1) 64 bit</li> </ul> <p><b>&lt;Other Software&gt;</b></p> <ul style="list-style-type: none"> <li>• Exaquantum PIMS R2.85 Server (Legacy or Standard Security)</li> <li>• Interface to 'CAMS for HIS' data via CENTUM R3.08.10 onwards</li> </ul>
<b>Exaquantum/ARA Web Server</b>	<p><b>&lt;Operating Systems&gt;</b></p> <ul style="list-style-type: none"> <li>• Windows Server 2012 Standard 64 bit</li> <li>• Windows Server 2008 Standard (SP2) 32 bit</li> <li>• Windows Server 2008 R2 Standard (SP1) 64 bit</li> </ul> <p><b>&lt;Other Software&gt;</b></p> <ul style="list-style-type: none"> <li>• Exaquantum PIMS R2.80 Server (Legacy or Standard Security)</li> </ul>
<b>Exaquantum/ARA Client</b>	<p><b>&lt;Operating Systems&gt;</b></p> <ul style="list-style-type: none"> <li>• Windows Server 2012 Standard 64 bit</li> <li>• Windows Server 2008 Standard (SP2) 32 bit</li> <li>• Windows Server 2008 R2 Standard (SP1) 64 bit</li> <li>• Windows Vista Business Edition (SP2)</li> <li>• Windows 7 Professional (SP1) 32 or 64 bit</li> <li>• Windows 8 Pro 32 or 64 bit</li> </ul> <p><b>&lt;Other Software&gt;</b></p> <ul style="list-style-type: none"> <li>• Microsoft Office 2013 (SP2) or 2010 (SP1) 32 bit</li> <li>• Internet Explorer 8, 9 or 10</li> </ul>

## ■ Models and Suffix Codes

Table: Exaquantum/ARA Server License

	Product Codes	Description
Model	GMSCD06	Exaquantum/nHance Package: Exaquantum/ARA
Suffix Codes	-S	Basic Software License
	1	New Order (with Media)
	1	English Version
	-01	Alarm Reporting and Analysis Package
	-01D	Alarm Reporting and Analysis Package 50% Discount*
	-N□□	Enter the number of New per-seat Exaquantum/ARA Web Client Licenses in □□ (01 - 99)
	-ND□□	Enter the number of discounted New per-seat Exaquantum/ARA Web Client Licenses in □□ (01 - 99) discounted by 50%*
	-U□□	Enter the number of per-seat Exaquantum/Web Client Licenses to be Upgraded in □□ (01 - 99)
	-UD□□	Enter the number of per-seat Exaquantum/Web Client Licenses to be upgraded in □□ (01 - 99) discounted by 50%*
	-YY	Select an Option Code
Option Codes	/CAMS□□	Enter the number of Yokogawa CAMS for HIS Interface Licenses in □□ (01 - 99)
	/FAST□□	Enter the number of Yokogawa Fast/Tools Interface Licenses in □□ (01 - 99)
	/DV□□	Enter the number of Emerson DeltaV Interface Licenses in □□ (01 - 99)
	/HOE□□	Enter the number of Honeywell Experion Interface Licenses in □□ (01 - 99)
	/CAMX□□	Enter the number of Yokogawa CAMS for HIS Interface Licenses for 3rd Party Systems in □□ (01 - 99)
	/XXXX□□	Enter the number of Interface Licenses for other Yokogawa and 3rd Party systems Licenses in □□ (01 - 99)

\*A price discount of 50% is applied if Exaquantum/SER (Sequence of Events and Trip Recorder) is also purchased at full price for installation on the same server as Exaquantum/ARA when ordered at the same time. This discount does not apply to the Exaquantum/ARA Interface licenses.

An Exaquantum PIMS and Web server license must also be purchased if Exaquantum/ARA is not installed on a server with an existing Exaquantum PIMS installation.

**Table: Exaquantum/ARA Maintenance Service**

	Product Codes	Description
Model	GMSCD80	Exaquantum/nHance Maintenance Service
Suffix Codes	-S	Annual Contract
	1	Always 1
	1	Always 1
	-6P□□	Enter the number of Exaquantum/ARA (Alarm Reporting and Analysis) Package Licenses in □□ (01 - 99)
	-6N□□	Enter the number of New per-seat Exaquantum/ARA Web Client Licenses in □□ (01 - 99)
	-6U□□	Enter the number of Upgraded per-seat Exaquantum/Web Client Licenses in □□ (01 - 99)
	-YY	Select an Option Code
Option Codes	/6CAMS□□	Enter the number of Yokogawa CAMS for HIS Interface Licenses in □□ (01 - 99)
	/6FAST□□	Enter the number of Yokogawa Fast/Tools Interface Licenses in □□ (01 - 99)
	/6DV□□	Enter the number of Emerson DeltaV Interface Licenses in □□ (01 - 99)
	/6HOE□□	Enter the number of Honeywell Experion Interface Licenses in □□ (01 - 99)
	/6CAMX□□	Enter the number of Yokogawa CAMS for HIS Interface Licenses for 3rd Party Systems in □□ (01 - 99)
	/6XXXX□□	Enter the number of Exaquantum/ARA Interface Licenses for other Yokogawa and 3rd Party systems in □□ (01 - 99)

## ■ Trademarks

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