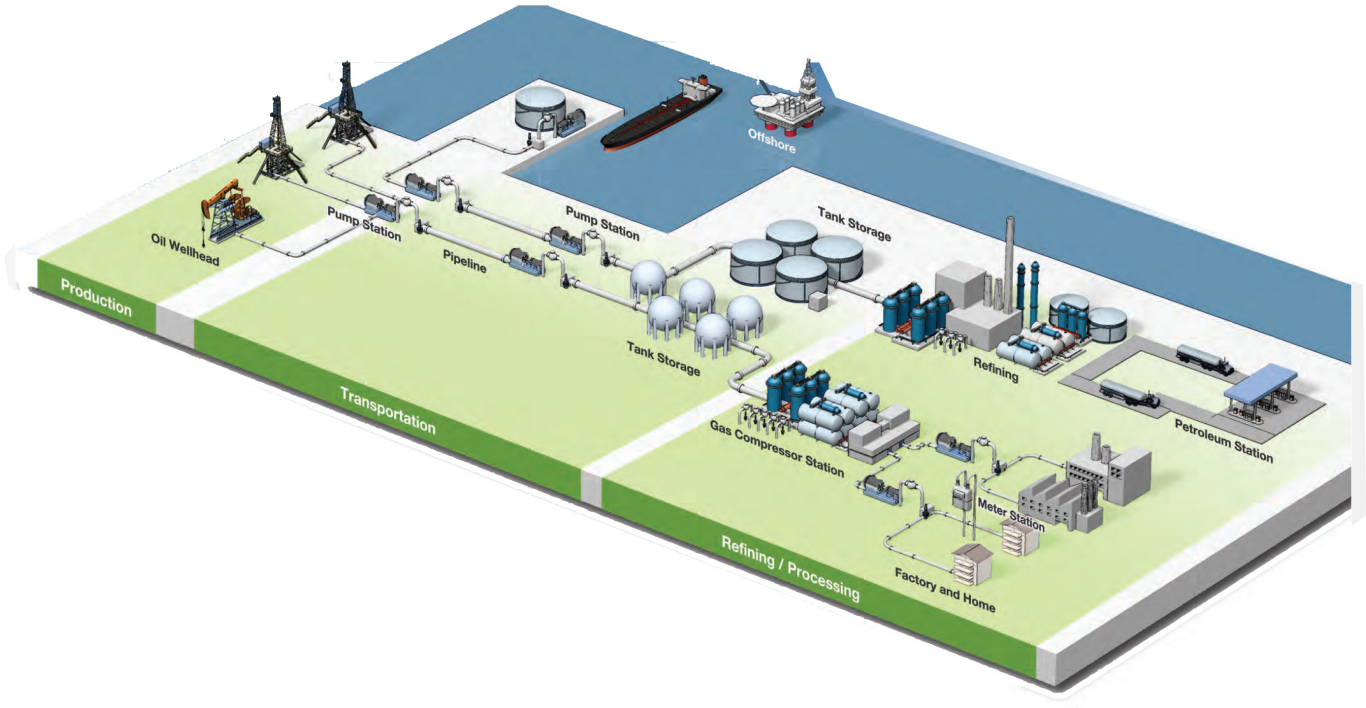
# Advantech´s Oil & Gas Solutions

## Certified Products & Solutions for Hazardous Applications

## Industrial Solutionsfor Oil & GasApplications




The oil and gas industry is stillat the heart of the world?s energysupply. From exploration and development,drilling and production, to fuel transportationand processing, creating reliable, efficient and accuratemonitoring and control systems is important for every stage of theoil & gas industry. These applications are still some of the most dangerousand demanding of any industrial application, and require rugged and reliableproducts to ensure safety and efficiency. Advantech leverages over 25 years experiencein the automation industry to design different product offerings and solutions for reliable use inhazardous locations.

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**Information and Applications**

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**Certification Definition - Class I, Division 1 & 2**

Hazardous locations are areas where potential hazards (e.g., fires, explosions, etc.) may exist under normal orabnormal conditions because of the presence of flammable gases or vapors, flammable liquids, combustible dustsor ignitable fibers. According to the NEC (National Electrical Code), there are three types of hazardous locationscategorized by Class I (gases, vapors, and liquids), Class II (dusts), and Class III (fibers and flyings). Division 1 meansnormally explosive and hazardous and Division 2 means not normally present in an explosive concentration but mayaccidentally exist.

Class I is directly related to the oil and gas market applications, such as petroleum refineries, gasoline storage,dispensing areas and utility gas plants. According to the ignition temperature of the substance, its explosionpressure, and other flammable characteristics, the gases and vapors of Class I locations are broken into four groupsby the Codes: A, B, C, and D. Temperature classes also exist to designate the permissible surface temperature ofelectrical equipment which allows them to operate normally in the surrounding atmosphere.

| CLASSES | GROUPS | DIVISIONS | |
|---|---|---|---|
| | | 1 | 2 |
| Class I :<br>Gases, vapors, and liquids | A: Acetylene<br>B: Hydrogen, gases or vapors ofequivalent hazard<br>C: Ethyl-ether | Normally explosive andhazardous | Not normally present in anexplosive concentration (butmay accidentally exist) |

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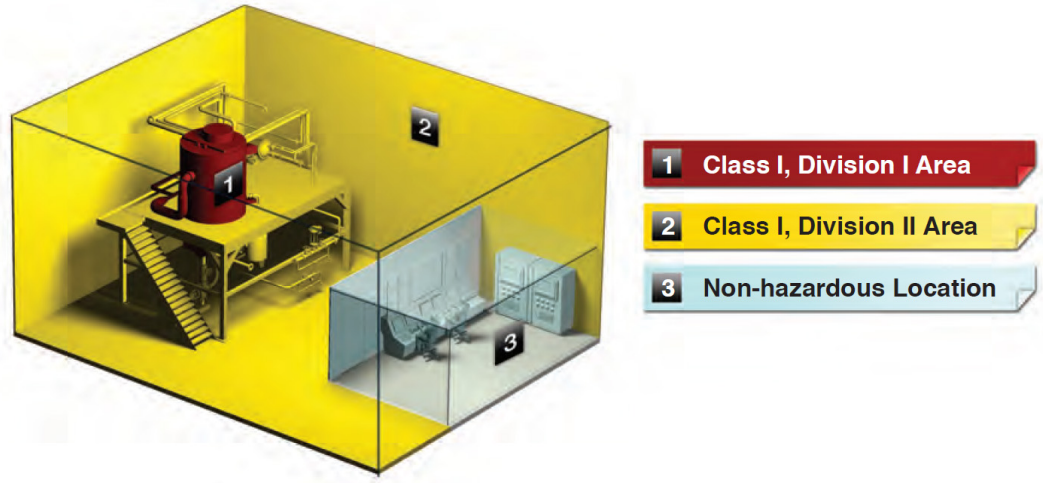
| | vapors, ethylene, orcyclo-propane D: Gasoline, hexane, naptha,benzene, butane, propane,alcohol, etc. | | |
| TEMPERATURE CLASSES | | | |
| ? T6 85 ~ 100° C (185 ~ 212° F)<br>? T5 100 ~ 135° C (212 ~ 275° F)<br>? T4 135 ~ 200° C (275 ~ 392° F) | | ? T3 200 ~ 300° C (392 ~ 572° F)<br>? T2 300 ~ 450° C (572 ~ 842° F)<br>? T1 450° C + (842° F +) | |

**Hazardous and Non-hazardous Locations**

Below is a conceptual diagram of Class I, Division 1 & 2 hazardous areas and non-hazardous areas.

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**Advantech?s CertifiedProducts & Solutions**

HMI/SCADA Software Industrial Monitors Industrial Ethernet Switches Media Converters Serial Device Servers Modbus Gateways DIN-rail PCs PACs Data Acquisition ModulesAdvantech continues to provide vertical market-oriented product solutions to fulfillvarious application needs. Advantech?s CID2 certified product offering includes; HMI,Industrial Communication, Embedded Automation Computers, and Data Acquisitionmodules. These solutions are well suited to fit the demanding requirements of variousoil and gas applications. Furthermore,

Advantech?s standard product offerings can beused in non-hazardous locations, such as facility control and management for the oiland gas industry.

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## Oil Field Drilling Monitoring System

An oil field is a region with an abundance of oil wells extracting petroleum frombelow ground. Because the oil reservoirs typically extend over a large area,possibly several hundred kilometers across, full exploitation entails multiple wellsscattered across the area. In addition, there may be exploratory wells probing theedges, pipelines to transport the oil elsewhere, and support facilities. Because anoil field may be remote from civilization, establishing a field is often an extremelycomplicated exercise in logistics.

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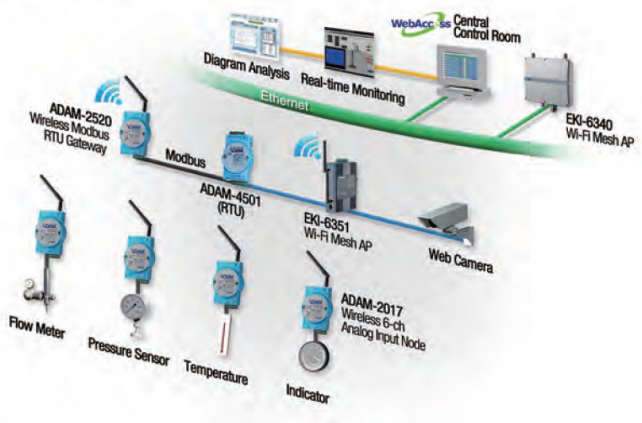
| | **System Description**<br>Oil well management is a complicated process, but Advantech?s Internetof-Things system for oil and gas production produces good |




effects. OnsiteRTU module (ADAM-4501), supports Modbus RTU/TCP, completes onsitedata acquisition, packaging and uploads. Through an industrial wirelessnetwork, built by EKI-6351 and EKI-6341 modules, remote WebAccesssoftware compiles and analyzes the data of well mouths. WebAccess? B/Sstructure shows its outstanding performance when it comes to remotemanagement and maintenance.

- Zigbee wireless data acquisition module of ADAM-2000 Series acquiresanalog data of temperature, flow, pressure, etc., at oil wells. WirelessZigbee method greatly saves wiring costs. It is easy-to-use, increasingsystem maintainability.
- ADAM-4501, supporting Modbus RTU/TCP communication, works as onsiteRTU. It is responsible for processing and uploading the acquired data, andpackaging and uploading the acquired data from dynamometer.
- Industrial EKI-2525Ethernet switch, suitable for rugged production site,connects onsite RTU, network camera, and wireless AP EKI-6351.
- Wireless AP at the pooling station is responsible for receiving

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| | data fromeach oil well. Industrial wireless AP EKI-6340 is IP67 protection rating,suitable for outdoor implementation. |

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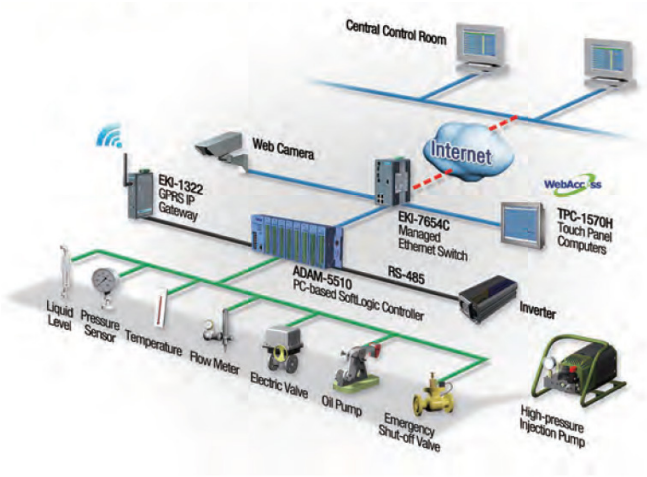
## Pump Station Monitoring System

The oil & gas industry includes the global processes of exploration, extraction,refining, transporting, and marketing petroleum products, such as oil, which istransported through large pipes that can stretch across continents. The oil iskept in motion by pump stations along the pipeline, and usually flows at speed ofabout 1 to 6 meters per second.




**System Description**

The main function of an intelligent remote supervisory system is to monitorthe operating status of local and remote intelligent equipment. WebAccesssoftware manages and controls the water injection pumps & valves, theparameters of intelligent equipment such as the temperature and pressureof lubricating oil; valve opening angles; the details of valves, alerts and theopen/close functions. WebAccess? powerful network functions are perfectfor on-site and remote monitoring of intelligent equipment.

- High-performance ADAM-5510PAC controller controls all relevantparameters and control loops, which has 8 I/O slot expansion to expand I/Omodule easily.

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| | ADAM-5510controller acquires all monitoring data of waterinjection pump, and controls valves and inverter. According to experts?request, it gives real-time alarm and malfunction alert, correspondinganalysis, and animated demo.<br>◦ Industrial EKI-1322alert module sends real-time alert message todesignated phone number, effectively help administrator to handle alert andmalfunction of equipment.<br>◦ Industrial IP65-compliant TPC-1770Htouch panel works as onsite HMI,facilitating human-computer interaction for the onsite personnel to controland operate intelligent equipment.<br>◦ Industrial EKI-7654CEthernet switch builds a communication network,connecting ADAM-5510, webcam, and industrial touch panel TPC-1770H. |

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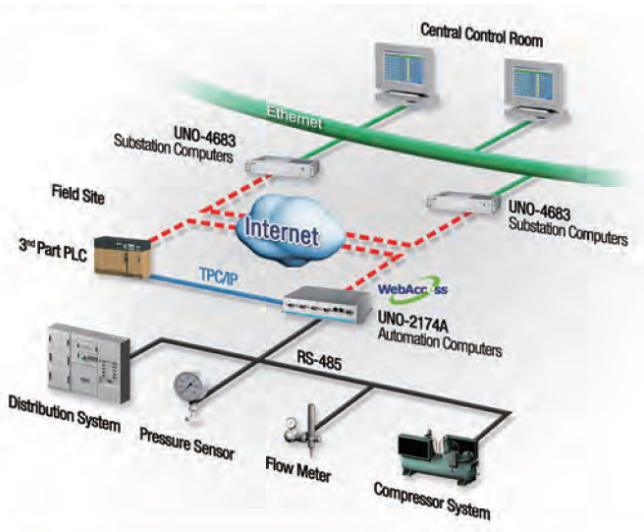
## Oil Pipeline Monitoring

Oil pipelines are made from steel or plastic tubes with inner diameter typicallyfrom 4 to 48 inches. Most pipelines are buried at a typical depth of about 3 to6 feet. As crude oil contains varying amounts of wax, buildup may occur withina pipeline. Often these pipelines are inspected and cleaned using pipelineinspection gauges,

used to detect anomalies in the pipe such as dents, metalloss caused by corrosion, cracking or other mechanical damage.




**System Description**

To ensure transmission quality, there are a lot of stations along long-distanceoil and gas pipelines. The control system of the pipeline needs to performreal-time monitoring and control of each station. To guarantee its safety andstability, a communication system has to be stable, reliable, safe and rugged.With long-term cooperation with many professional oil and gas pipelinecompanies, Advantech?s gateway and industrial Ethernet switch products havebeen successfully applied to many such systems.

- UNO-2174A/UNO-2178A embedded computer with WebAccess software hasfeatures like multiple serial ports, Ethernet ports, wide operating temperature,etc. UNO-2174A/UNO-2178A serves as protocol converter gateway at stations toconvert protocols, such as electronic control system, compressor system, etc.,for connecting PLC.
- Other than serving as a unified data protocol gateway at stations, UNO-2174A/UNO-2178A embedded computer also serves as protocol converter gateway;for

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| | example, converting Modbus RTU/TCP to IEC-60870-5-104 for controlcenter. UNO series with flexible and high-performance protocol convertingfunction is very suitable for onsite system.<br>◦ Control center adopts high-performance communication server UNO-4683with an Intel Core i7 processor to process uploaded data, and to receive datawith IEC-60870-5-104 protocol. |

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## Tank Storage Monitoring

This application was setup to help monitor a fueling operation. Theinformation & machine diagnostic data will be collected and sent back tothe office and corporate headquarters. An accurate monitoring system notonly measures fuel levels, but also temperatures and estimated volumeinformation.

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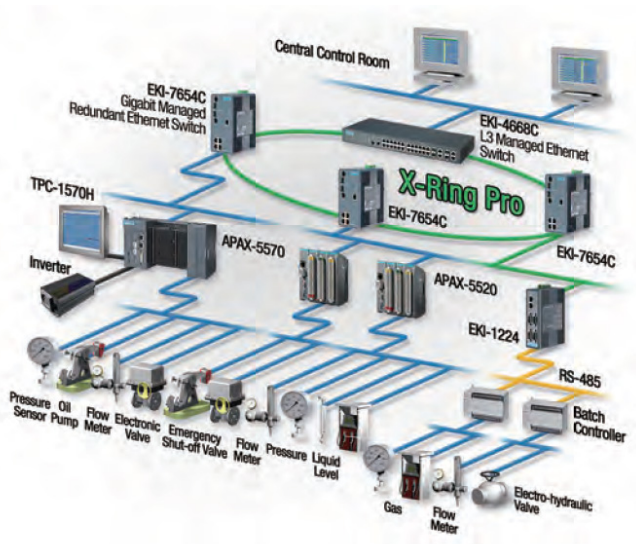
|  | **System Description**<br>Oil terminal supervisory systems need technology that?s reliable, easy tomaintain, and scalable. They are not only responsible for safe production andtransportation, but also need to have easy comprehensive data access. Toacquire data separately from the tank farm and oil distribution zone the systemuses a unified control module to control all the points of the oil terminal andensure data transmission quality and |

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| | safety whilst being compatible with othersystems such as ERP.<br>◦ This case uses Advantech APAX-5570 and APAX-5520 PAC controllers as themain control system, coupled with Advantech TPC-1570Htouch panel at onsiteworking station, to control various valves of oil discharge zone and tank farm,and to acquire specific parameters of flow, temperature, pressure, level of tankfarm, and so on, in each region.<br>◦ Oil distribution zone uses Advantech EKI-1224serial server to send serial dataof flow computer to control center through Ethernet.<br>◦ The communication network of the whole oil terminal uses Advantech EKI-7654Cto build industrial redundant network, and adopts EKI-4668C layer 3switch to isolate office and onsite control networks. |

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## Equipment Safety Status Monitoring

Supervisory control and data acquisition system in refinery is mainly to acquire realtimemeter data of each factory, meter alert, and alert design, and to feedback tomanagement system immediately.

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**System Description**

Supervisory control and data acquisition systems in refineries are used toacquire the real-time meter data of each factory to immediately feedbackto the management system. The system uses the industry-leading internetconfiguration software, WebAccess, to build system network of data acquisitionand process, utilizing the outstanding network features of WebAccess.It ensures effective and accurate large scale data acquisition (successfullybeing applied to 30,000 nodes), and fully supports a remote full-featuredclient.

- Advantech high-performance UNO-2174A /UNO-2178Aembedded computer withWebAccess SCADA node in factory works as data communication server ofDCS, SIS, PLC, and other systems to integrate and upload data.
- After UNO-2174A/UNO-2178A unifies protocol, all data goes to factorymanagement workstation (IPC) with WebAccess SCADA node.
- At factory management workstation, WebAccess application compiles andsorts data, and upload to redundant and hot-standby server. After buildingconnection, server will acquire data

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| | through SCADA node.<br>◦ If WebAccess remote client-end needs to check onsite data, it can directlycheck onsite SCADA node which ensures real-time data. |

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## Fueling Station Management

This project implemented a gasoline pump control system for the dispensing,metering, and monitoring of gasoline tanks at a gas station. This fully automatedsystem automated the process of dispensing gasoline and is supported by real-timeconnectivity between the gas station and its corporate headquarters.

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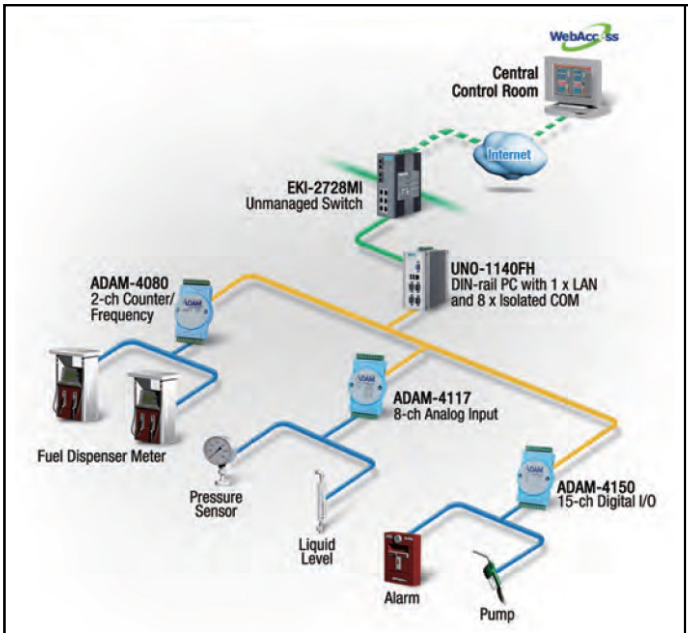
|  | **System Description**<br>The control & management platform is an UNO-1140FH that is integratedwith ADAM-4000 Seriesas a turn-key solution. An ADAM-4080counter/frequency Input module with two 32-bit counter input channels and abuilt-in programmable timer for frequency measurement helps to managethe details of the fuel dispenser meters data and ADAM-4117analog inputmodules gather tank liquid levels, and pressure information. ADAM-4150digital input/output module is in charge of alarms trigger and pumps on/off.Then the control & management platform can transmit all information viaEKI-2728MIEthernet switch to the corporate headquarters.<br><br>**Benefits**<br>In this application Advantech?s |

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| | complete turn-key system & softwareprovided a good cost-effective solution. All the products installed provideexcellent safety & reliability. The ADAM-4100 Series modules are compact,versatile sensor-to-computer interface units designed for reliable operationin harsh environments. Their built-in microprocessors, encased in ruggedindustrial-grade ABS+PC plastic, independently provide intelligent signalconditioning, analog I/O, digital I/O, LED data display, and an address modewith a user-friendly design for convenient address reading. |

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**Advantech WebAccess**

**Browser-based HMI/SCADA Software**

**Powerful Architecture for Multiple SCADA Servers and Client Applications**

Advantech WebAccess is a browser-based software package for human-machine interfaces (HMI), and supervisory control and data acquisition(SCADA). All the features found in conventional HMI and SCADA software packages are available in an ordinary browser including AnimatedGraphics Displays, Real-time Data Control, Trends, Alarms and Logs. Advantech WebAccess is based on standard Internet architecture; itsbasic components include SCADA Node, Project Node, Client and Thin Client. Advantech WebAccess is also featured key functions below formultiple SCADA servers and clients.

**Remote Diagnostics and Maintenance toEnhance Management Efficiency**
The unique feature, which distinguishes Advantech WebAccessfrom the competition, is that all engineering projects, configurations,graphics building (DRAW), historical data analysis, automatic reportgeneration and software management (download, start and restartremote nodes) is performed using a standard web browser. If thereis any troubleshooting needed, no matter wherever the operator islocated, he can use a web browser to operate the system. This cansignificantly increase the efficiency of maintenance operation andreduce the maintenance cost.

**Redundant SCADA & COM Ports to AssureReliable Communications**
Advantech WebAccess is built-in to redundant SCADA and COMports functionality, assuring continuous, reliable communications toautomation equipment.

**Integrated Audio, Video and Graphic Animations**
To increase the operating efficient, Advantech WebAccess supports livefull-motion video, audio, Adobe Flash and Windows Media and allowthem to view in the same display, such as information of trends, alarms,push buttons and live data.

**Free Dynamic DNS Services to ReduceInfrastructure Construction Costs**
To decrease the inconvenience of varied IP address and increaseconvenient network access, Advantech WebAccess also provides freedynamic Domain Name System (DNS) services. The function not onlyreduces infrastructure construction cost, but also provides easy domainnetwork access.

**Supports Apple® iPhone® and Smart Phones UsingAndroid?**
In addition, Advantech WebAccess supports Apple iPhones and smartphones using

Android through the WebAccess Thin Client and alsosupports GPS to send alarm messages as well. Users can use theirsmart devices to access the Advantech WebAccess to get informationfrom field at anytime, anywhere.
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*all pictures are provided by Advantech*

**Produkter til løsningen:**
ADAM-4100 Series

ADAM-4000 Series

ADAM-4080

ADAM-4117

EKI-1224

EKI-1322

EKI-2728MI

EKI-7654C

TPC-1570H

TPC-1770H

UNO-4683

UNO-2178A

UNO-2174A

ADAM-5510