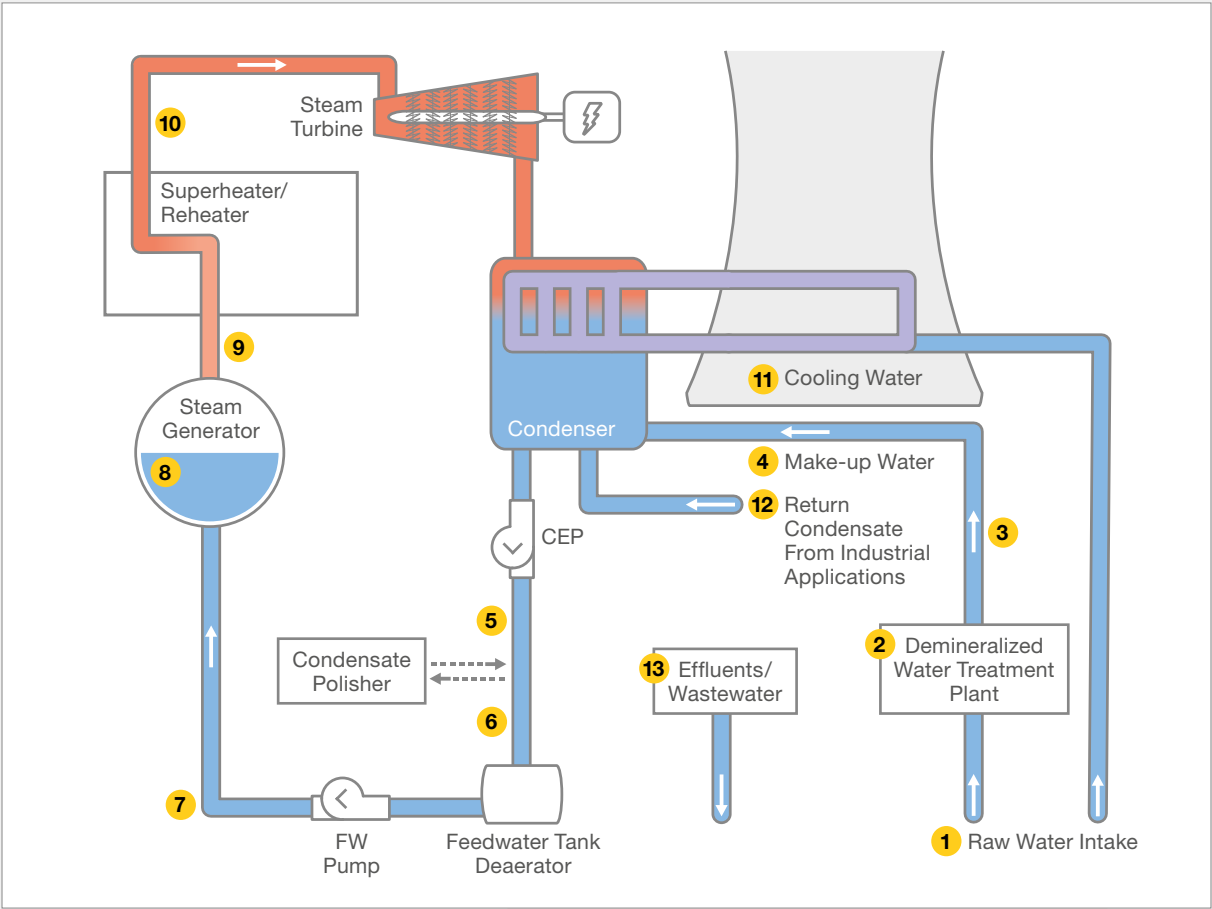




Reliable Online Monitoring
of Power and Industrial Water



Reliable Online Monitoring for Power and Steam Applications



Monitoring Points and Key Parameters

1	Raw Water	(pH, SC, TURB, DISF, UV ₂₅₄)
2	Demineralized Water Treatment Plant	(pH, SC, TURB, DISF, UV ₂₅₄ , TOC, Na, SiO ₂)
3	Demineralized Plant Outlet	SC, (SiO ₂ , Na, TOC)
4	Make-up Water	SC, (SiO ₂ , Na)
5	Condensate	pH, CACE, DO, Na, (SC, DCACE, TURB, N ₂ H ₄)
6	Condensate Polisher Outlet	CACE, Na, (SC, SiO ₂)
7	Feedwater	pH, SC, CACE, DO, (ORP, TURB, H ₂ , N ₂ H ₄)
8	Boiler Water	pH, SC, CACE, (Na, SiO ₂ , PO ₄ , TURB)
9	Saturated Steam	CACE, Na, (H ₂)
10	Superheated/ Reheated Steam	CACE, Na, (DCACE, SiO ₂ , H ₂)
11	Cooling Water	pH, SC, DISF, (TURB, PO ₄)
12	Return Condensate	pH, CACE, (SC, DCACE, DO, Na, SiO ₂ , TURB)
13	Effluents/Wastewater	pH, SC, TURB, (PO ₄)

Acronyms and Terms

CACE	= Conductivity After Cation Exchange
DCACE	= Degassed Conductivity After Cation Exchange
DISF	= Disinfectant
DO	= Dissolved Oxygen
H ₂	= Dissolved Hydrogen
Na	= Sodium
N ₂ H ₄	= Hydrazine (or CH ₆ N ₄ O Carbohydrazide)
ORP	= Oxidation/Reduction Potential
pH	= pH Value
PO ₄	= Phosphate
SC	= Specific Conductivity
SiO ₂	= Silica
TOC	= Total Organic Carbon
TURB	= Turbidity
UV ₂₅₄	= Organics Trend

() = Optional parameters depending on water quality, water treatment process, power plant configuration, operation mode, metallurgy and chemical treatment applied

Conductivity (Acid)



AMI Powercon A

Conductivity after cation exchange (CACE)

- Temperature compensation for strong acids
- Integrated, easy to replace cation exchanger with automatic deaeration
- Option for second pre-rinsed cation exchanger to allow fast replacement of exhausted cation resin

Acid Conductivity
0.055-1000 $\mu\text{S/cm}$

Conductivity (Specific/Acid)



AMI Deltacon Power

Conductivity before and after cation exchange (CACE) with conventional resin columns

- Calculation and display of pH and alkalinizing reagent concentration by differential conductivity measurement (VGB-S-010-T-00)
- Automatic monitoring of cation resin consumption with alarm
- Selectable temperature compensations (for all common alkalinizing agents and strong acids)

Specific Conductivity
0.055-1000 $\mu\text{S/cm}$
Acid Conductivity
0.055-1000 $\mu\text{S/cm}$
pH Range
pH 7.5-11.5
Alkalinizing Agent
Concentration in ppm
(e.g ammonia 0.01-10 ppm)



AMI CACE

Conductivity before and after cation exchange (CACE) with EDI module for automatic and continuous resin regeneration

- No resin columns needed:
 - no resin exchange
 - no chemicals for regeneration
 - reduced maintenance
 - reduced operation costs
- Uninterrupted measurement of CACE: No gaps and no high CACE values caused by exhausted resin column

Specific Conductivity
0.055-1000 $\mu\text{S/cm}$
Acid Conductivity
0.055-1000 $\mu\text{S/cm}$
pH Range
pH 7.5-11.5
Alkalinizing Agent
Concentration in ppm
(e.g ammonia 0.01-10 ppm)

Conductivity (Degassed Acid)



AMI Deltacon DG

Specific conductivity, CACE and degassed CACE according to ASTM D4519 via sample reboiler

- Atmospheric pressure measurement for automatic boiling point compensation if air pressure changes, to ensure reproducible measurements
- Safe operation due to automatic shutdown function of sample heater if sample flow is low
- Integrated sample cooling system: cooling water supply not necessary

Conductivity (Specific, Acid, Acid Degassed)
0.055-1000 $\mu\text{S/cm}$
pH Range
pH 7.5-11.5
Alkalinizing Agent
Concentration in ppm
(e.g ammonia 0.01-10 ppm)



Conductivity (Specific)



AMI Powercon S

Specific (total) conductivity for high purity water

- Selectable temperature compensations for different sample qualities and alkalizing agents
- Automatic zero verification with integrated high precision resistor
- Two-electrode titanium conductivity sensor with high precision cell constant, integrated Pt1000 temperature probe
- Patented slot lock sensor design for easy installation and release

Specific Conductivity
0.055 μ S/cm-30 mS/cm



AMI Solicon4

Specific (total) conductivity for surface water, cooling water and effluents

- Selectable temperature compensation with absolute (none), linear coefficient or non-linear function
- Insensitive to fouling due to 4-electrodes principle. No measuring errors due to polarization effects
- Measurement of concentrations (for NaCl, NaOH and acids in %), salinity and TDS possible
- Optional deltaT sensor for flow detection

Specific Conductivity
0.1 μ S/cm-100 mS/cm
Salinity (as NaCl)
0-4.6%
TDS (Coefficient)
0.0 mg/l-20 g/l

Disinfectants



AMI Codes-II

Colorimetric measurement (DPD-method) of free chlorine and other disinfectant concentrations

- No interference with sea water and effluents, or additives like corrosion inhibitors and antiscalants
- High accuracy and reproducibility due to automatic zero-value calibration before each measurement
- Reduced maintenance with optional cleaning module and high tolerance against fouling

Free Chlorine
0-5 ppm
Chlorine Dioxide, Bromine
0-6 ppm
Ozone
0-1 ppm



AMI Codes-II CC

Colorimetric measurement (DPD-method) of free, bound and total chlorine

- Determines free available and total chlorine, and calculates monochloramine, dichloramine and combined chlorine
- Freely adjustable measuring intervals for optimized use of reagents
- Fast and easy to use verification with user-friendly solid state standard

Free Chlorine
0-5 ppm
Bound Chlorine
by calculation
Total Chlorine
0-5 ppm
Monochloramine
by calculation
Dichloramine
by calculation





AMI Codes-II TC

Colorimetric measurement (DPD-method) of total chlorine and dichloramine

- Determines total chlorine and calculates dichloramine
- Continuous, automatic monitoring of main instrument functions (dirty photometer, sample flow, reagents level)
- Integrated pH measurement with temperature compensation available as option

Total Chlorine
(standard mode)
0-5 ppm
Total Chlorine
(extended mode)
0-10 ppm
Dichloramine
by calculation

Dissolved Hydrogen



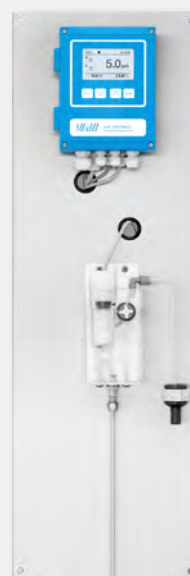
AMI Hydrogen QED

Measurement of trace dissolved hydrogen for corrosion monitoring

- Faraday electrode for automatic or manual verification by electrochemically generated hydrogen concentration in the ppb-range
- Automatic sensor self-regeneration at configurable intervals
- Long-life amperometric hydrogen sensor

Dissolved Hydrogen (H₂)
0-800 ppb
Saturation
0-50%

Dissolved Oxygen



AMI Oxytrace

Amperometric measurement of trace dissolved oxygen concentrations

- Sensor with 3 electrode set-up (gold cathode, silver anode and silver guard) and temperature sensor. Faster initial response time after maintenance due to silver guard
- Automatic temperature and air pressure compensation for simple calibration using ambient air
- Automatic surveillance of electrolyte
- Available on a compact sized panel (280 x 180 mm)

Dissolved Oxygen
0-20 ppm
Saturation
0-200%





AMI Oxytrace QED

Measurement of true dissolved oxygen including integrated auto-verification

- Faraday electrode setup for automatic or manual verification by electro-chemically generated oxygen concentration in the ppb range
- Monitoring of electrolyte and membrane integrity through faraday verification
- Easy to handle membrane and electrolyte exchange, sensor cap for up to 24 months of operation
- Available on a compact sized panel (400x420 mm)

Dissolved Oxygen

0-20 ppm

Saturation

0-200%

Hydrazine/ Carbohydrazide



AMI Hydrazine

Membrane-free, amperometric three electrode system for determination of hydrazine or carbohydrazide

- Low maintenance device without need for membrane or electrolyte exchange
- Highly reliable measurement with stable zero-point, sample conditioning without measurement interference
- Long-life sensor due to automatic sensor cleaning and continuous monitoring of cleaning efficiency

Hydrazine

0-600 ppb

Carbohydrazide

0-600 ppb

Organics (UV₂₅₄)



AMI SAC254

Measurement of UV absorption at 254 nm (SAC254) for organic carbon trending

- Insensitive to fouling of the optical components due to dynamic measurement at multiple path lengths
- Integrated grab sample function
- Correlation to DOC, TOC and other parameters via calibration or manual configuration of the correlation parameters
- Integrated turbidity correction at 550 nm per DIN 38404-3

UV Absorption

UVA 0-300 m⁻¹

UV Transmission

0-100%

DOC, TOC

Concentration ppm



pH/Redox Potential



AMI pH-Redox QV-Flow

Potentiometric determination of pH value or redox potential for low conductivity samples

- pH or redox electrode with liquid electrolyte reference sensors, and Pt1000 temperature probe
- Automatic temperature compensation models for pH measurement, for high purity water
- Straightforward calibration procedure without sensor disassembling
- Economical operation of the instrument due to refillable liquid electrolyte

pH Range

pH 1-12

Redox Potential (ORP)

-500 to +1500 mV



AMI pH-Redox M-Flow

Potentiometric measurement of pH value or redox potential for surface water, cooling water and effluents

- pH or redox combined electrode with gel electrolyte, with a Pt1000 temperature probe
- Automatic temperature compensation for pH measurement according to Nernst
- Easy calibration without sensor disassembling
- Minimized maintenance with optional spray nozzle for sensor cleaning

pH Range

pH 1-13

Redox Potential (ORP)

-400 to +1200 mV

Phosphate



AMI Phosphate HL

Colorimetric measurement of ortho-phosphate in boiler water and applications with high phosphate concentration

- Based on vanadate-molybdate yellow colorimetric method
- No interferences with presence or in excess of silica
- Automatic zero before measurement for reproducible readings
- Selectable measurement interval for low reagent consumption
- Optional 2nd sample, automatic sequencer up to 6 samples and cleaning module

Phosphate (PO_4)

0-50 ppm

Phosphate (P- PO_4)

0-16 ppm





AMI Phosphate II

Colorimetric measurement of ortho-phosphate with low concentration in potable water, effluents and cooling water

- Based on molybdenum blue (ascorbic acid) colorimetric method
- No interferences with presence of silica
- Automatic zero reading before each measurement
- Optional automatic cleaning module extends the maintenance free operating time

Phosphate (PO₄)
0-10 ppm

Silica



AMI Silica

Colorimetric measurement of reactive silica in the water steam cycle and demineralized water production

- Detection limit of 1 ppb
- Automatic zero prior to each measurement
- Selectable measurement interval for low reagent consumption
- Easy to use, integrated grab sample capability
- Optional 2nd sample channel, or automatic sample sequencer up to 6 sample streams

Silica
0-5000 ppb



AMI Silitrace

Determination of trace concentrations of silica

- Detection limit of 0.5 ppb
- Automatic sample heating and regulated reaction time features for highest precision
- Automatic zero verification (daily)
- Programmable, automatic calibration
- Easy to use, integrated grab sample capability
- Optional 2nd sample channel, or automatic sample sequencer up to 6 sample streams

Silica
0-1000 ppb



Sodium



AMI Sodium P

Dissolved sodium for samples with $\text{pH} \geq 7$

- Detection limit of 0.1 ppb
- Reliable alkalization reagent addition system for diisopropylamine or ammonia, with continuous pH-monitoring and alarm
- Automatic temperature compensation and simple two-point calibration
- Easy to use, integrated grab sample function
- Optional 2nd sample channel, automatic sample sequencer up to 6 sample streams, and automatic regeneration of sodium electrode
- Available on a compact sized panel (375 x 700 mm)

Sodium
0-10000 ppb



AMI Sodium A

Dissolved sodium measurement for samples with $\text{pH} \geq 2$ and $\text{pH} < 8$

- Detection limit of 0.1 ppb
- pH controlled alkalization reagent addition for diisopropylamine with maintenance-free air pump
- Optional 2nd sample channel, or automatic sample sequencer up to 6 sample streams

Sodium
0-10000 ppb



AMI Soditrace

Measurement of trace sodium concentration in high purity water

- Lowest available detection limit for sodium ion concentrations of 0.001 ppb
- pH controlled alkalization reagent addition for diisopropylamine to a pH 12, via maintenance-free air pump
- Programmable automatic three-point known addition calibration in ppb-range (detection limit for sodium remains: 0.001 ppb)
- Programmable automatic regeneration of sodium electrode

Sodium
0-10000 ppb



Total Organic Carbon



AMI LineTOC

Online monitoring for Total Organic Carbon (TOC) in high purity water

- Reagent-free monitoring system using conductivity differential prior to and after UV-oxidation
- Reaction time below 2 minutes, for fast trend identification without costly lab analysis
- Automatic function test to verify the proper operation of the instrument
- Easy to use, integrated grab sample function

Total Organic Carbon (TOC)
0-1000 ppb

Turbidity



AMI Turbiwell Power

Contact-free turbidity measurement for corrosion product trend monitoring

- LED light source for long life and stable measurement, heated optics to prevent condensation effects
- Automatic or manual draining of the measuring chamber for cleaning
- Non-contact design avoids fouling of optical surfaces and analyzer drifting: calibration-free

Turbidity
0-200 FNU/NTU



AMI Turbiwell 7027/W/LED

Contact-free measurement of turbidity in raw water, water treatment plant, cooling water and effluents

- AMI Turbiwell W/LED as per US EPA 180.1
- AMI Turbiwell 7027 as per ISO 7027 (infrared red LED)
- Heated optics prevent measurement errors and condensation
- Integrated constant head for continuous sample flow into the measuring chamber
- Fast and easy verification with primary and secondary standard
- No consumables, no wearing parts, no maintenance costs
- Optional deltaT flow meter, and sample degasser to avoid the formation of interfering bubbles in the sample

Turbidity (ISO)
0-200 FNU/NTU
Turbidity (EPA)
0-100 FNU/NTU



Portable Instruments



AMI Inspector

Portable quality assurance (verification) of existing online measurements. Available for conductivity, hydrogen, oxygen and pH measurements

- USB data logger interface for lifelong data storage at a selectable interval
- Rechargeable battery for more than 24 hours of stand-alone operation
- Recertification by Swan possible

Conductivity

0.055-1000 $\mu\text{S}/\text{cm}$

Hydrogen

0-800 ppb

0-50% Saturation

Dissolved Oxygen

0-20 ppm

0-200% Saturation

pH Range

pH 1-12

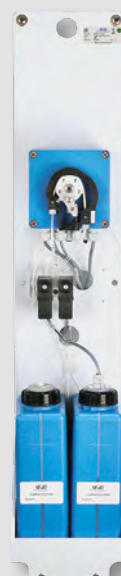
Options



AMI Sample Sequencer

Complete system for the automatic, continuous multiplexing of up to six sample streams to one process analyzer

- Complete system including control unit, back pressure regulator and needle-valve for each stream, and flow measurement
- Signal outputs for indication of active sample stream and flow alarm
- Optional module to use conjointly with these monitoring systems:
 - AMI Sodium P
 - AMI Sodium A
 - AMI Silica
 - AMI Silitrace
 - AMI Phosphate HL



Cleaning Module

Reliable accurate measurements ensured by counteracting bio-growth inside the flow cell and photometer

- Automatic cleaning with addition of one or two cleaning solutions (e.g. 2.5% hypochlorite solution and/or diluted sulfuric acid 2.5%)
- Individual programmable cleaning interval
- Automatic reagent level monitoring
- Optional module to use conjointly with these monitoring systems:
 - AMI Codes-II
 - AMI Codes-II CC
 - AMI Codes-II TC
 - AMI Phosphate-II
 - AMI Phosphate HL
 - AMI SAC254



Swan AMI Monitor Concept



Swan instruments are delivered as fully functional, ready-to-use instruments. This ensures easy system integration as well as user-friendly operation and maintainability.

Highest standards in development and production assure the instrument quality expected by our customers.

SWISS  MADE

Full System Integration

- Complete panel-mounted systems with fluidics connections preconfigured for quick start up
- Various communication possibilities with Profibus, Modbus, HART-Protocol, USB-interface and analog output
- Simple process engineering with regulation functions (P, PI, PID or PD), relay or analog output

Easy Maintenance

- Uniform menu navigation for easy operation and maintenance – one platform for all instruments
- Clearly arranged setup of instruments, good accessibility of all components for efficient operation and maintenance
- Self-explanatory maintenance procedures can be easily performed by the operating company

Highest Quality Assurance

- Every analyzer is wet bench tested and factory calibrated prior to delivery
- Automatic instrument alarms and self-diagnostic such as reagent level and sensor functions for validated results
- Integrated sample flow control for measurement check available for all analyzers





- Swan Headquarters
- Swan Subsidiaries
- Distributors

