

# Steam and Water Analysers

A Comprehensive Range for Steam and Water Analysis System (SWAS)



# Steam and Water Analysers (SWAN)

In power plants, high pressure boilers and steam turbines are under constant attack from erosive and corrosive elements. To prevent damage of steam turbine, steam boiler and other machines, on line steam and water analysis of critical parameters such as pH, Conductivity, Dissolved Oxygen, Silica, Sodium, Phosphate etc. is a must.

Forbes Marshall Steam and Water Analysis Systems (SWAS) are designed to keep you in power. They ensure the safety of your boiler and turbines, by extracting and analysing up to a dozen samples from all the water and steam circuits.

The Forbes Marshall SWAS comes equipped with online water analysers from SWAN Analytical Instruments AG, Switzerland, a global leader for online analytical systems.



Without accurate measurement and monitoring of critical parameters, power plants may suffer heavy mechanical damage due to imbalance of turbines, reduced efficiency, deposition on turbine blades, corrosion of steam pipe work and so on.

The Forbes Marshall SWAS is a robust and reliable solution that can handle sample conditions as high as 600 DegC and 300 bar. It works in two stages:

Sample conditioning

Sample analysis

SWAN has extensive expertise in steam and water cycle chemistry and manufactures a wide range of analysers suitable for analysis of power plant samples. With each component manufactured and tested within their factory, their products are of the highest quality and accuracy.

Precision, reliability and a determination for excellence are qualities which make SWAN analysers ideal partner for the Forbes Marshall SWAS.

Application and Parameter Matrix							
Applications	High Purity Water	Feedwater, Steam and Condensate	Pharma Water	Potable Water	Pool and Sanitary	Cooling Water	Waste Water and Effluents
Ammonium				●			
Chlorine / Ozone / ClO <sub>2</sub>	●		●	●	●	●	●
Conductivity and Resistivity	●	●	●	●		●	●
Fluoride				●			
Hydrazine / Carbohydrazine		●					
Hydrogen		●					
Nitrate				●			
Oxygen (dissolved)	●	●		●		●	●
pH	●	●		●	●	●	●
Phosphate		●		●		●	●
Redox (ORP)	●	●		●	●	●	●
Silica	●	●					
Sodium	●	●					
Turbidity	●	●		●	●	●	●
Total Organic Carbon	●		●				
Various		●		●	●		

### Applications

Feedwater, steam, condensate and cooling water

Potable water, waste water and effluents

High purity and pharma water

Pool and sanitary

## Transmitter AMI Powercon

Electronic transmitter and controller for the measurement of the conductivity in power cycles. For the measurement before (specific / total conductivity) or after a cation exchanger (acid / cationic conductivity).



Measuring and control transmitter in a rugged aluminum enclosure (IP66)

Conductivity measurement range from 0.005  $\mu\text{S}/\text{cm}$  to 30  $\text{mS}/\text{cm}$

Connections for a 2-electrode conductivity sensor with integrated Pt1000 temperature probe, eg. Swan sensor UP-Con1000 with titanium electrodes and for a digital SWAN sample flow meter

Temperature compensations: non linear for high purity water, neutral salts, strong ac-ids, strong bases, ammonia, ethanol-amine, morpholine or linear with coefficient

Big backlit LCD display for the reading of measuring value, sample temperature, sample flow and operating status

Easy user menus in English, German, French and Spanish. Simple programming of all parameters by keypad

Electronic record of major process events

Real-time clock for time stamp in data logs and for automated functions

Data logger for 1,500 data records stored at a selectable interval (data download to PC requires optional Hyper Terminal interface)

Galvanically separated sensor connection

Over-voltage protection for inputs and outputs

Two current signal outputs (0/4 - 20 mA) for measured signals

Potential free alarm contact as summary alarm indication for programmable alarm values and for instrument faults

Two potential free contacts programmable as limit switch or PID-control

Input for potential free contact to freeze the measuring value or to interrupt control in automated installations (hold function or remote off)

## Conductivity Measurement

### Conductivity sensor type

2-electrode sensor

### Measuring range

0.005 to 0.999  $\mu\text{S/cm}$

1.00 to 9.99  $\mu\text{S/cm}$

10.0 to 99.9  $\mu\text{S/cm}$

100 to 999  $\mu\text{S/cm}$

1.00 to 2.99  $\text{mS/cm}$

3.0 to 9.9  $\text{mS/cm}$

10 to 30  $\text{mS/cm}$

### Resolution

0.001  $\mu\text{S/cm}$

0.01  $\mu\text{S/cm}$

0.1  $\mu\text{S/cm}$

1  $\mu\text{S/cm}$

0.01  $\text{mS/cm}$

0.1  $\text{mS/cm}$

1  $\text{mS/cm}$

Automatic range switching.

Values for cell constant 0.0415  $\text{cm}^{-1}$ , with Swan sensor UP-Con1000

**Accuracy**  $\pm 1\%$  of measured value

### Sensor cell constant

Default value 0.0415  $\text{cm}^{-1}$

Selectable from 0.005 to 10  $\text{cm}^{-1}$

### Temperature compensations

Non linear function (NLF) for high purity water

Neutral salts

Strong acids

Strong bases

Ammonia

Ethanolamine

Morpholine

Linear coefficient 0.00 – 10.00  $\%/^{\circ}\text{C}$  Absolute (none)

Influence of temperature see PPChem 2012 14(7) [Wagner]

### Temperature measurement

with Pt1000 type sensor (DIN class A)

Measuring range -30 to +250  $^{\circ}\text{C}$

Resolution 0.1  $^{\circ}\text{C}$

### Sample flow measurement

with digital SWAN sample flow sensor

## Transmitter Specifications and Functionality

Electronics case Cast aluminum

Protection degree IP66 / NEMA 4X

Display backlit LCD, 75 x 45 mm

Electrical connectors screw clamps

Dimensions 180 x 140 x 70 mm

Weight 1.5 kg

Ambient temperature -10 to +50  $^{\circ}\text{C}$

Humidity 10 to 90 % rel., non cond.

### Power supply

Voltage 100 - 240 VAC ( $\pm 10\%$ ), 50/60 Hz ( $\pm 5\%$ ) or 24 VDC ( $\pm 10\%$ )

Power consumption max. 30 VA

### Operation

Easy operation based on separate menus for messages, diagnostics, maintenance, operation and installation

User menus in English, German, French and Spanish

Separate menu specific password protection

Display of process value, sample flow, alarm status and time during operation

Storage of event and alarm log

Storage of the last 1500 data records in logger with selectable time interval

### Real-time clock with calendar

For action time stamp and pre programmed actions

### Safety features

No data loss after power failure, all data is saved in non-volatile memory

Overvoltage protection of inputs and outputs

Galvanic separation of measuring inputs and signal outputs

### Transmitter temperature monitoring

with programmable high/low alarm limits

#### 1 Alarm relay

One potential free contact for summary alarm indication for programmable alarm values and instrument faults

Maximum load 1A / 250 VAC

#### 1 Input

One input for potential free contact

Programmable hold or remote off function

#### 2 Relay outputs

Two potential free contacts program-mable as limit switches for measuring values, controllers or timer for system cleaning with automatic hold function

Rated load 1A / 250 VAC

#### 2 Signal outputs (3rd as option)

Two programmable signal outputs for measured values (freely scaleable, linear or bilinear) or as continuous control outputs (control parameters programmable) as current source. 3rd signal output selectable as current source or current sink.

Current loop 0/4 - 20 mA

Maximum burden 510 W

### Control functions

Relays or current outputs programmable for 1 or 2 pulse dosing pumps, solenoid valves or for one motor valve

Programmable P, PI, PID or PD control parameters

#### 1 Communication interface (option)

RS485 interface (galvanically separated) with Fieldbus protocol Modbus RTU or Profibus DP

3rd signal output

USB interface

## Transmitter AMU Powercon

Electronic transmitter and controller for the measurement of conductivity in power cycles, before (specific resp. total conductivity) or after a cation exchanger (acid resp. cationic conductivity).



Measuring and control transmitter for panel installation in a Noryl<sup>®</sup> resin enclosure, 96 x 96 x 120 mm (DIN 43700)

Measurement range: 0.005  $\mu\text{S}/\text{cm}$  to 30  $\text{mS}/\text{cm}$

Connections for a 2-electrode conductivity sensor with integrated Pt1000 temperature probe (eg. Swan sensor UP-Con1000) and for a digital SWAN sample flow meter

Temperature compensations: non linear for high purity water, neutral salts, strong acids, strong bases, ammonia, ethanolamine, morpholine or linear with coefficient

Big backlit LCD display for measuring value, sample temperature, sample flow and operating status

Easy user menus in English, German, French and Spanish. Simple programming of all parameters by keypad

Data logger for 1500 data records stored at a selectable interval. Serial interface included for data download to PC with Microsoft Hyper Terminal.

Galvanically separated sensor connection

Overvoltage protection for inputs and outputs

Two current outputs (0/4 - 20 mA) for measured signals

Potential free alarm contact as summary alarm indication for programmable alarm values and for instrument faults

Two potential free contacts programmable as limit switch or PID control

Input for potential free contact to freeze the measuring value or to interrupt control in automated installations (hold function or remote-off)

## Conductivity Measurement

### Conductivity sensor type

for 2 electrode sensor

### Measuring range

0.005 to 0.999  $\mu\text{S/cm}$

1.00 to 9.99  $\mu\text{S/cm}$

10.0 to 99.9  $\mu\text{S/cm}$

100 to 999  $\mu\text{S/cm}$

1.00 to 2.99  $\text{mS/cm}$

3.0 to 9.9  $\text{mS/cm}$

10 to 30  $\text{mS/cm}$

Automatic range switching

Values for cell constant 0.0415  $\text{cm}^{-1}$

(Swansensor UP-Con1000)

### Accuracy

$\pm 1\%$  of measured value

### Sensor cell constant

Default value

0.0415  $\text{cm}^{-1}$   
or selectable from 0.005 to 10  $\text{cm}^{-1}$

### Resolution

0.001  $\mu\text{S/cm}$

0.01  $\mu\text{S/cm}$

0.1  $\mu\text{S/cm}$

1  $\mu\text{S/cm}$

0.01  $\text{mS/cm}$

0.1  $\text{mS/cm}$

1  $\text{mS/cm}$

### Temperature compensations

Non linear function (NLF) for high purity water

Neutral salts

Strong acids

Strong bases

Ammonia

Ethanolamine

Morpholine

Linear coefficient in  $\%/^{\circ}\text{C}$

Absolute (none)

Temperature measurement with Pt1000 type sensor  
(DIN class A)

Measuring range -30 to +250  $^{\circ}\text{C}$

Resolution 0.1  $^{\circ}\text{C}$

Sample flow measurement with digital SWAN sample flow  
sensor

## Transmitter Specifications and Functionality

Electronics case Noryl<sup>®</sup> resin

Protection degree IP54 (front)

Display backlit LCD, 75 x 45 mm

Electrical connectors clamping yoke

Dimensions 96 x 96 x 120 mm

Weight 0.45 kg

Ambient temperature -10 to +50  $^{\circ}\text{C}$

Humidity 10 - 90% rel., non-condensing

### Power supply

Voltage 100 - 240 VAC ( $\pm 10\%$ ),  
50/60 Hz ( $\pm 5\%$ )  
or 24 VDC ( $\pm 15\%$ )

Power consumption max. 8 VA

### Operation

Easy operation based on separate menus for messages,  
diagnostics, maintenance, operation and installation

User menus in English, German, French and Spanish

Separate menu specific password protection

Display of process value, sample flow, alarm status and time  
during operation

Storage of event and alarm log

Storage of the last 1,500 data records in logger with selectable  
time interval

### Safety features

No data loss after power failure, all data is saved in  
non-volatile memory

Overvoltage protection of in and outputs

Galvanic separation of measuring inputs and signal outputs

### Transmitter temperature monitoring

with programmable high/low alarm limits

### Real-time clock with calendar

For action time stamp and preprogrammed actions

### 1 Alarm relay

One potential free contact for summary alarm indication for  
programmable alarm values and instrument faults

Maximum load 100 mA / 50 V

### 1 Input

One input for potential free contact

Programmable hold or remote off function

### 2 Relay outputs

Two potential free contacts programmable as limit switches for  
measuring values, controllers or timer for system cleaning with  
automatic hold function

Maximum load 100 mA / 50 V

### 2 Signal outputs

Two programmable signal outputs for measured values (freely  
scaleable, linear or bilinear) or as continuous control outputs  
(control parameters programmable)

Current loop 0/4 - 20 mA

Maximum burden 510  $\Omega$

### Control functions

Relays or current outputs programmable for 1 or 2 pulse  
dosing pumps, solenoid valves or for one motor valve

Programmable P, PI, PID or PD control parameters

### 1 serial interface RS232

For data logger download to PC using Microsoft Hyper  
Terminal and for transmitter firmware updates

### 1 serial interface RS485 (option)

With Fieldbus protocol Modbus or Profibus DP, galvanically  
separated

Remote instrument access with PC requires Modbus interface  
and optional *Webserver*

## Monitor AMI CACE

Complete monitoring system for automatic, continuous measurement of conductivity before (specific / total conductivity) and after a cation exchanger with electro deionisation (acid / cation conductivity).



Complete system mounted on stainless steel panel:

**Transmitter AMI CACE** in a rugged aluminum enclosure (IP66)

**Swansensor UP-Con1000-SL** two 2-electrode conductivity sensors with slot-lock design and integrated Pt1000 temperature probe,  $k = 0.04 \text{ cm}^{-1}$

**Flow cell Catcon-Plus-SL CACE** made of stain-less steel 316L with digital sample flow meter. Quick sensor release with patented slot-lock de-sign. EDI-Module with exchangeable sample chamber module and automatic deaeration.

Factory tested, ready for installation and operation

### Specifications

Conductivity measurement range: 0.055 to 1000  $\mu\text{S}/\text{cm}$

Calculation of pH value in the range from pH 7.5 to 11.5 (VGB-S-010-T-00)

Calculation of alkalisng reagent concentration, eg. ammonia in the range from 0.01 to 10 ppm

Simultaneous measurement and display of both conductivities, pH, alkalisng reagent, sample temperature and sample flow

Temperature compensation preset for strong acids but wide range of others selectable for other sample conditions

Two current outputs (0/4 - 20 mA) for measured signals (3rd as option)



## Conductivity Measurement

Swansensor UP-Con1000-SL with integrated Pt1000 temperature probe

### Measuring range resolution

0.055 to 0.999 $\mu\text{S}/\text{cm}$	0.001 $\mu\text{S}/\text{cm}$
1.00 to 9.99 $\mu\text{S}/\text{cm}$	0.01 $\mu\text{S}/\text{cm}$
10.0 to 99.9 $\mu\text{S}/\text{cm}$	0.1 $\mu\text{S}/\text{cm}$
100 to 1000 $\mu\text{S}/\text{cm}$	1 $\mu\text{S}/\text{cm}$

Automatic range switching

### Accuracy

$\pm 1\%$  of measured value or  $\pm 1$  digit (whichever is greater)

### Temperature compensation

Strong acids or non-linear function for high purity water, neutral salts, strong bases, ammonia, ethanolamine, morpholine, linear coefficient in  $\%/^{\circ}\text{C}$ , absolute (none). Influence of temperature see PPChem2012 14(7) [Wagner]

### pH and alkalinizing reagent calculation

Ranges (25° C) pH 7.5 to 11.5  
eg. ammonia 0.01 to 10 ppm

### Temperature measurement Pt1000

Measuring range -30 to +130 °C  
Resolution 0.1 °C

### Sample flow measurement

With digital SWAN sample flow meter

## Transmitter Specifications and Functionality

Electronics case	Cast aluminum
Protection degree	IP66 / NEMA 4X
Display	backlit LCD, 75 x 45 mm
Electrical connectors	screw clamps
Dimensions	180 x 140 x 70 mm
Weight	1.5 kg
Ambient temperature	-10 to +50°C
Humidity	10 - 90% rel., non-condensing

### Power supply

Voltage	100 - 240 VAC ( $\pm 10\%$ ), 50/60 Hz ( $\pm 5\%$ ) or 24 VDC ( $\pm 10\%$ )
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Power consumption: max. 30 VA

### Operation

Easy operation based on separate menus for messages, diagnostics, maintenance, operation and installation  
User menus in English, German, French and Spanish  
Separate menu specific password protection  
Display of process value, sample flow, alarm status and time during operation  
Storage of event log, alarm log and calibration history  
Storage of the last 1,000 data records in logger with selectable time interval

### Safety features

No data loss after power failure, all data is saved in non-volatile memory  
Overvoltage protection of in- and outputs. Galvanic separation of measuring inputs and signal outputs.

### Transmitter temperature monitoring

with programmable high/low alarm limits

#### 1 Alarm relay

One potential free contact for summary alarm indication for programmable alarm values and instrument faults

Maximum load 1A / 250 VAC

#### 1 Input

One input for potential free contact  
Programmable hold or remote off function

#### 2 Relay outputs

Two potential free contacts programmable as limit switches for measuring values, controllers or timer for system cleaning with automatic hold function

Rated load 1A / 250 VAC

### 2 Signal outputs (3rd as option)

Two programmable signal outputs for measured values (freely scalable, linear or bilinear) or as continuous control outputs (control parameters programmable) as current source. 3rd signal output selectable as current source or current sink.

Current loop 0/4 - 20 mA  
Maximum burden 510 W

### Control functions

Relays or current outputs programmable for 1 or 2 pulse dosing pumps, solenoid valves or for one motor valve. Programmable P, PI, PID or PD control parameters.

### 1 Communication interface (option)

RS485 interface (galvanically separated) with Fieldbus protocol Modbus RTU or Profibus DP / 3rd Signal output / USB interface

### Monitor Data

#### Sample conditions

Flow rate	3 to 4 L/h
Temperature	up to 50 °C
Inlet pressure (25 °C)	0.5 bar
Outlet pressure	pressure free
No sand, no oil	
EDI Capacity	scmax = 40 $\mu\text{S}/\text{cm}$ as NH <sub>4</sub> OH scmax = 350 $\mu\text{S}/\text{cm}$ as NaOH

The use of SWAN Back Pressure Regulator is highly recommended. Particle filtration recommended in case of high iron concentration. Use of film forming products may reduce lifetime of EDI-module.

### Conditions for pH calculation

Only 1 alkalinizing reagent, contamination is mostly NaCl, phosphates < 0.5 mg/L, if pH value < 8 the concentration of contaminant must be small compared to alkalinizing reagent.

### Sample connections

Inlet	Swagelok 1/4" tube adapter
Outlet	G 3/8" adapter for tube for flexible tube $\varnothing$ 20 x 15 mm

### Panel

Dimensions	280 x 850 x 200 mm
Material	stainless steel
Total instrument weight	14.0 kg

## Transmitter AMI pH-Redox

Electronic transmitter / controller for the continuous measurement of the pH value or redox (ORP) in water



Measuring and control transmitter in a rugged aluminum enclosure (IP66)

Measuring range: 0 to 14 pH respectively -500 to +1500 mV

Sensor connections for a pH or ORP sensor, reference electrode, Pt1000 temperature and for a digital sample flow meter (QV-Flow or deltaT-Flow)

Galvanically separated sensor connections

Automatic temperature compensations according to Nernst with or without correction functions

Values for pH buffer solutions and redox calibration solution programmable

Big backlit LCD display for the reading of measuring value, sample temperature, sample flow, temperature compensation type and operating status

Easy user menus in English, German, French and Spanish. Simple programming of all parameters by keypad

Electronic record of major process events and calibration data

Real-time clock for time stamp in data logs and for automated functions

Data logger for 1500 data records stored at a selectable interval

Overvoltage protection for inputs and outputs

Two current outputs (0/4 - 20 mA) for measured signals

Potential free alarm contact as summary alarm indication for programmable alarm values and for instrument faults

Two potential free contacts programmable as limit switch or PID-control

Input for potential free contact to freeze the measuring value or to interrupt control in auto-mated installations (hold function or remote-off)

## pH / ORP Measurement

Signal inputs galvanically separated.

Input resistance  $> 10^{13} \text{ } \Omega$

### pH measurement

Measuring range 0.00 to 14.00 pH

Resolution 0.01 pH

Reference temperature 25 °C

### ORP measurement

Measuring range -500 to +1500 mV

Resolution 1 mV

### Temperature compensations

automatic, according to

Nernst (for potable water and wastewater)

Nernst with non-linear solution compensation  
(for high purity water)

Nernst with linear compensation with selectable coefficient  
(for high purity water)

### Calibration solutions table

Programmable table for pH buffers and ORP calibration solution

### Sensor monitoring

Indication of glass breakage and line disconnection

### Temperature measurement

with SWAN Pt1000 sensor

Measuring range -30 to +130 °C

Resolution 0.1 °C

### Sample flow measurement

with digital sample flow meter

## Transmitter Specifications and Functionality

Electronics case Cast aluminum

Protection degree IP66 / NEMA 4X

Display backlit LCD, 75 x 45 mm

Electrical connectors screw clamps

Dimensions 180 x 140 x 70 mm

Weight 1.5 kg

Ambient temperature -10 to +50 °C

Humidity 10 - 90 % rel., non cond.

### Power supply

Voltage 100 - 240 VAC ( $\pm 10\%$ ),  
50/60 Hz ( $\pm 5\%$ )  
or 24 VDC, ( $\pm 10\%$ )

Power consumption max. 30 VA

### Operation

Easy operation based on separate menus for messages, diagnostics, maintenance, operation and installation

User menus in English, German, French and Spanish

Separate menu specific password protection

Display of process value, sample flow, alarm status and time during operation

Storage of event log, alarm log and calibration history

Storage of the last 1'500 data records in logger with selectable time interval

### Real-time clock with calendar

For action time stamp and preprogrammed actions

### Safety features

No data loss after power failure, all data is saved in non-volatile memory

Over voltage protection of in- and out-puts. Galvanic separation of measuring inputs and signal outputs

### Transmitter temperature monitoring

with programmable high/low alarm limits

### 1 Alarm relay

One potential free contact for summary alarm indication for programmable alarm values and instrument faults.

Maximum load 1A / 250 VAC

### 1 Input

One input for potential free contact.

Programmable hold or remote off function.

### 2 Relay outputs

Two potential free contacts programmable as limit switches for measuring values, controllers or timer for system cleaning with automatic hold function.

Max. load: 1A / 250 VAC

### 2 Signal outputs (3rd optional)

Two programmable signal outputs for measured values (freely scaleable, linear or bilinear) or as continuous control output (control parameters programmable) as current source. 3rd signal output selectable as current source or current sink.

Current loop 0/4 - 20 mA

Maximum burden 510 W

### Control functions

Relays or current outputs programmable for 1 or 2 pulse dosing pumps, solenoid valves or for one motor valve

Programmable P, PI, PID or PD control parameters

### 1 Communication interface (option)

RS485 interface (galvanically separated) with Fieldbus protocol Modbus RTU or Profibus DP

3rd signal output

USB interface

HART interface

## Transmitter AMU pH-Redox

Electronic transmitter / controller for the continuous measurement of the pH value or redox (ORP) in water.



Measuring and control transmitter for panel installation in a Noryl<sup>®</sup> resin enclosure, 96 x 96 x 120 mm (DIN 43700)

Measuring range: 0 to 14 pH respectively -500 to +1500 mV

Sensor connections for a pH or ORP sensor, reference electrode, Pt1000 temperature and for a digital sample flow meter

Galvanically separated sensor connections

Automatic temperature compensations according to Nernst with or without correction functions

Values for pH buffer solutions and redox calibration solution programmable

Big backlit LCD display for measuring value, sample temperature, sample flow and operating status

Easy user menus in English, German, French and Spanish. Simple programming of all parameters by keypad

Data logger for 1,500 data records stored at a selectable interval. Serial interface included for data download to PC with Microsoft Hyper Terminal

Overvoltage protection for inputs and outputs

Two current outputs (0/4 - 20 mA) for conductivity and temperature signals

Potential free alarm contact as summary alarm indication for programmable alarm values and for instrument faults

Two potential free contacts programmable as limit switch or PID-control

Input for potential free contact to freeze the measuring value or to interrupt control in automated installations (hold function or remote-off)

## pH / ORP Measurement

Signal inputs galvanically separated

Input resistance > 1013 Ω

### pH measurement

Measuring range 0.00 to 14.00 pH

Resolution 0.01 pH

Reference temperature 25 °C

### ORP measurement

Measuring range -500 to +1500 mV

Resolution 1 mV

### Temperature compensations

Selectable modes, according to

Nernst (for potable water and wastewater)

Nernst with non-linear solution compensation  
(for high purity water)

Nernst with linear compensation with selectable coefficient  
(for high purity water)

### Calibration solutions table

Programmable table for pH buffers and ORP calibration solution

### Sensor monitoring

Indication of glass breakage and line disconnection

### Temperature measurement

with SWAN Pt1000 sensor

Measuring range -30 to +130 °C

Resolution 0.1 °C

### Sample flow measurement

with digital sample flow meter

## Transmitter Specifications and Functionality

Electronics case Noryl® resin

Protection degree IP54 (front)

Display backlit LCD, 75 x 45 mm

Electrical connectors clamping yoke

Dimensions 96 x 96 x 120 mm

Weight 0.45 kg

Ambient temperature -10 to +50 °C

Humidity 10 - 90% rel., non-condensing

### Power supply

Voltage 100 - 240 VAC (± 10 %),  
50/60 Hz (± 5 %)  
or 24 VDC (± 15 %)

Power consumption max. 8 VA

### Operation

Easy operation based on separate menus for messages, diagnostics, maintenance, operation and installation

User menus in English, German, French and Spanish

Separate menu specific password protection

Display of process value, sample flow, alarm status and time during operation

Storage of event log, alarm log and calibration history

Storage of the last 1,500 data records in logger with selectable time interval

### Safety features

No data loss after power failure, all data is saved in non-volatile memory

Overvoltage protection of inputs and outputs

Galvanic separation of measuring inputs and signal outputs

### Transmitter temperature monitoring

with programmable high/low alarm limits

### Real-time clock with calendar

For action time stamp and preprogrammed actions

### 1 Alarm relay

One potential free contact for summary alarm indication for programmable alarm values and instrument faults

Maximum load 100 mA / 50 V

### 1 Input

One input for potential free contact  
Programmable hold or remote off function

### 2 Relay outputs

Two potential free contacts programmable as limit switches for measuring values, controllers or timer for system cleaning with automatic hold function

Maximum load 100 mA / 50 V

### 2 Signal outputs

Two programmable signal outputs for measured values (freely scaleable, linear or bilinear) or as continuous control outputs (control parameters programmable)

Current loop 0/4 - 20 mA

Maximum burden 510 Ω

### Control functions

Relays or current outputs programmable for 1 or 2 pulse dosing pumps, solenoid valves or for one motor valve. Programmable P, PI, PID or PD control parameters.

### 1 serial interface RS232

For data logger download to PC using Microsoft Hyper Terminal and for transmitter firmware updates

### 1 serial interface RS485 (option)

With Fieldbus protocol Modbus or Profibus DP, galvanically separated

Remote instrument access with PC requires Modbus interface and optional *Webserver*

## Transmitter AMI Oxytrace

Electronic transmitter and controller for the measurement of the dissolved oxygen in high purity water.



Measuring and control transmitter in a rugged aluminum enclosure (IP66)

Measurement ranges: Dissolved oxygen: 0.01ppb to 20 ppm; Saturation: 0 to 200%

Connections for a three-electrode oxygen sensor with integrated NT5k temperature probe, eg. Swan sensor Oxytrace G with cathode (gold), anode (silver) and guard (silver) and for a SWAN digital sample flow meter

Temperature and air pressure compensation

Big backlit LCD display for the reading of measuring value, sample temperature, sample flow and operating status

Easy user menus in English, German, French and Spanish

Simple programming of all parameters by keypad

Electronic record of major process events and calibration data

Real-time clock for time stamp in data logs and for automated functions

Data logger for 1,500 data records stored at a selectable interval

Galvanically separated sensor connection

Overvoltage protection for inputs and outputs

Two current signal outputs (0/4 - 20 mA) for measured signals

Potential free alarm contact as summary alarm indication for programmable alarm values and for instrument faults

Two potential free contacts programmable as limit switch or PID-control

Input for potential free contact to freeze the measuring value or to interrupt control in automated installations (hold function or remote-off)

## Dissolved Oxygen Measurement

### Dissolved oxygen sensor type

Three-electrode sensor with cathode, anode and guard

Measuring range	Resolution
0.01 to 9.99 ppb	0.01 ppb
10 to 199.9 ppb	0.1 ppb
200 to 1999 ppb	1 ppb
2 to 20 ppm	0.01 ppm
0 to 200% saturation	0.1% saturation

Automatic range switching

### Automatic temperature and air pressure compensation

#### Temperature measurement

with NT5k

Measuring range -30 to +130 °C

Resolution 0.1 °C

#### Sample flow measurement

with digital SWAN sample flow sensor

## Transmitter Specifications and Functionality

Electronics case Cast aluminum

Protection degree IP66 / NEMA 4X

Display backlit LCD, 75 x 45 mm

Electrical connectors screw clamps

Dimensions 180 x 140 x 70 mm

Weight 1.5 kg

Ambient temperature -10 to +50 °C

Humidity 10 to 90 % rel., non cond.

### Power supply

Voltage 100 - 240 VAC (± 10 %),  
50/60 Hz (± 5 %)  
or 24 VDC (± 10 %)

Power consumption max. 30 VA

### Operation

Easy operation based on separate menus for messages, diagnostics, maintenance, operation and installation

User menus in English, German, French and Spanish

Separate menu specific password protection

Display of process value, sample flow, alarm status and time during operation

Storage of event log, alarm log and calibration history

Storage of the last 1,500 data records in logger with selectable time interval

### Real-time clock with calendar

For action time stamp and pre-programmed actions

### Safety features

No data loss after power failure, all data is saved in non-volatile memory

Overvoltage protection of in- and outputs

Galvanic separation of measuring inputs and signal outputs

### Transmitter temperature monitoring

with programmable high/low alarm limits

### 1 Alarm relay

One potential free contact for summary alarm indication for programmable alarm values and instrument errors

Maximum load 1A / 250 VAC

### 1 Input

One input for potential free contact

Programmable hold or remote off function

### 2 Relay outputs

Two potential free contacts program-mable as limit switches for measuring values, controllers or timer for system cleaning with automatic hold function

Rated load: 1A / 250 VAC

### 2 Signal outputs (3rd as option)

Two programmable signal outputs for measured values (freely scaleable, linear or bilinear) or as continuous control outputs (control parameters programmable) as current source. 3rd signal output selectable as current source or current sink.

Current loop 0/4 - 20 mA

Maximum burden 510 W

### Control functions

Relays or current outputs programmable for 1 or 2 pulse dosing pumps, solenoid valves or for one motor valve

Programmable P, PI, PID or PD control parameters

### 1 Communication interface (option)

RS485 interface (galvanically separated) with Fieldbus protocol Modbus RTU or Profibus DP

3rd Signal output

USB interface

HART interface

## Transmitter AMU Oxytrace

Electronic transmitter / controller for the measurement of dissolved oxygen in high purity water.



Measuring and control transmitter for panel installation in a Noryl<sup>®</sup> resin enclosure, 96 x 96 x 120 mm (DIN 43700)

Measurement ranges: Dissolved oxygen: 0.01ppb to 20 ppm; Saturation: 0 to 200%

Sensor connections for Oxytrace G oxygen sensor with integrated NT5k temperature probe and for a digital sample flow meter

Automatic compensation of temperature and air pressure

Big backlit LCD display for measuring value, sample temperature, sample flow and operating status

Easy user menus in English, German, French and Spanish. Simple programming of all parameters by keypad

Data logger for 1,500 data records stored at a selectable interval. Serial interface included for data download to PC with Microsoft Hyper Terminal.

Galvanically separated sensor connection

Overvoltage protection for in- and outputs

Two current outputs (0/4 - 20 mA) for measured signals.

Potential free alarm contact as summary alarm indication for programmable alarm values and for instrument faults

Two potential free contacts programmable as limit switch or PID-control

Input for potential free contact to freeze the measuring value or to interrupt control in automated installations (hold function or remote-off)



## Dissolved Oxygen Measurement

### Oxygen sensor

Oxytrace G sensor with integrated NT5k temperature probe and guard electrode

Measuring range	Resolution
0.01 to 9.99 ppb	0.01 ppb
10 to 199.9 ppb	0.1 ppb
200 to 1999 ppb	1 ppb
2 to 20 ppm	0.01 ppm
0-200% saturation	0.1% saturation

Automatic range switching

Automatic temperature and air pressure compensation

### Temperature measurement

with SWAN NT5k sensor

Measuring range -30 to +130 °C

Resolution 0.1 °C

Sample flow measurement

with digital SWAN sample flow sensor

## Transmitter Specifications and Functionality

Electronics case	Noryl <sup>®</sup> resin
Protection degree	IP54 (front)
Display	backlit LCD, 75 x 45 mm
Electrical connectors	clamping yoke
Dimensions	96 x 96 x 120 mm
Weight	0.45 kg
Ambient temperature	-10 to +50 °C
Humidity	10 - 90% rel., non-condensing

### Power supply

Voltage	100 - 240 VAC (± 10 %), 50/60 Hz (± 5 %) or 24 VDC (± 15 %)
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Power consumption max 8 VA

### Operation

Easy operation based on separate menus for messages, diagnostics, maintenance, operation and installation

User menus in English, German, French and Spanish

Separate menu specific password protection

Display of process value, sample flow, alarm status and time during operation

Storage of event log, alarm log and calibration history

Storage of the last 1,500 data records in logger with selectable time interval

### Safety features

No data loss after power failure, all data is saved in non-volatile memory

Overvoltage protection of inputs and outputs.

Galvanic separation of measuring inputs and signal outputs

### Transmitter temperature monitoring

with programmable high/low alarm limits

### Real-time clock with calendar

For action time stamp and pre-programmed actions

### 1 Alarm relay

One potential free contact for summary alarm indication for programmable alarm values and instrument errors

Maximum load 100 mA / 50 V

### 1 Input

One input for potential free contact. Programmable hold or remote off function

### 2 Relay outputs

Two potential free contacts programmable as limit switches for measuring values, controllers or timer for system clean-ing with automatic hold function

Maximum load 100 mA / 50 V

### 2 Signal outputs

Two programmable signal outputs for measured values (freely scaleable, linear or bilinear) or as continuous control outputs (control parameters programmable)

Current loop 0/4 - 20 mA

Maximum burden 510 W

### Control functions

Relays or current outputs programmable for 1 or 2 pulse dosing pumps, solenoid valves or for one motor valve

Programmable P, PI, PID or PD control parameters

### 1 serial interface RS232

For data logger download to PC using Microsoft Hyper Terminal and for transmitter firmware updates

### 1 serial interface RS485 (option)

With Fieldbus protocol Modbus or Profibus DP, galvanically separated

Remote instrument access with PC requires Modbus interface and optional *Webserver*

## Monitor AMI Silica

Complete monitoring system for the automatic, continuous measurement of silica in water steam cycles



Measuring range 1 to 5'000 ppb

Based on colorimetric measurement principle

Complete system including measurement and control electronics, photometer with integrated reaction chamber, flow indicator, reagent dosing system and reagent containers

Measurement values are available as analog output signals

Alarm display and activation of alarm relay when user defined, critical limits are reached

Continuous, automatic monitoring of main instrument functions (sample flow, reagent supply)

Large back-lit LCD display showing all measured values and status information simultaneously

Easy user menus in English, German, French and Spanish. Simple programming of all pa-rameters by keypad

Data logger for 1,500 data records stored at a selectable interval

Factory tested, ready for installation and operation. to freeze the measuring value or to interrupt control in automated installations (hold function or remote-off)

### Instrument Options

Communication interface (Profibus, Modbus, 3rd Signal Output, USB, HART)

2nd sample stream

### Accessories

AMI Sample Sequencer, switching up to 6 sample streams

## Analytical System

### Oxygen sensor

Colorimetric, Molybdosilicat method

### Silica measurement

Measuring range 1 to 5'000 ppb

Reproducibility  $\pm 1$  ppb or  $\pm 5\%$ , whichever is greater

Cycle time 10'

Measurement interval 10', 15', 20' or 30'

### Flow cell

Made of acrylic glass with water inlet and flow adjustment valve

## Transmitter Specifications and Functionality

Electronics case Aluminum

Protection degree IP66 / NEMA 4X

Display backlit LCD, 75 mm x 45 mm

Electrical connectors screw clamps

Ambient temperature -10 to +50 °C

Limit range of operation -25 to +65 °C

Storage and transport -30 to +85 °C

Humidity 10 to 90 % relative, non condensing

### Power supply

Voltage 100 - 240 VAC ( $\pm 10\%$ )  
50/60 Hz ( $\pm 5\%$ )  
or 24 VDC ( $\pm 10\%$ )

Power consumption max. 30 VA

### Operation

Easy operation based on separate menus for messages, diagnostics, maintenance, operation and installation

Separate menu specific password protection possible

Display of process value, sample flow, alarm status and time during operation. Storage of event log, alarm log and calibration history.

Storage of the last 1,500 data records in logger with selectable time interval

### Safety features

No data loss after power failure, all data is saved in non-volatile memory. Over voltage protection of inputs and outputs. Galvanic separation of measuring inputs and signal outputs.

### Transmitter temperature monitoring

With programmable high/low alarm limits

### Real-time clock with calendar

For action time stamp and pre-programmed actions

### Monitoring of reagent consumption

Warning if low level is reached and alarm for lack of reagents

### 1 Alarm relay

One potential free contact for summary alarm indication for programmable alarm values and instrument faults

Maximum load 1A / 250 VAC

### 1 Input

One input for potential free contact. Programmable hold or remote off function.

### 2 Relay outputs

Two potential free contacts programable as limit switches for measuring values, controllers or timer with automatic hold function

Max. load 1A / 250 VAC

### 2 Signal outputs (3rd as option)

Two programmable signal outputs for measured values (freely scalable, linear or bilinear) or as continuous control output (control parameters programmable) as current source. 3rd signal output selectable as current source or current sink.

Current loop 0/4 - 20 mA

Maximum burden 510 W

### Control function

Relays or current outputs programmable for 1 or 2 pulse dosing pumps, solenoid valves or for one motor valve

Programmable P, PI, PID or PD control parameters

### 1 Communication interface (option)

RS485 interface (galvanically separated) with Fieldbus protocol Modbus RTU or Profibus DP

3rd Signal output

USB interface

HART interface

### Sample and Monitor Data

#### Sample conditions

Flow rate min. approx. 10 l/h

Temperature up to 50 °C

Inlet pressure 0.15 to 2 bar

Outlet pressure pressure free, atmospheric drain

Phosphate (as PO<sub>4</sub>) < 10 ppm

#### Sample connections

Inlet Serto PVDF 6 mm (1/8"),  
for tubing 4x6 mm

Drain Ø 16 mm, tubing 15x20 mm

#### Panel

Dimensions 400 x 850 x 160 mm

Material stainless steel

Weight 16.0 kg

## Analyser AMI Sodium P

For the continuous determination of dissolved sodium in the ppb-range for steam, condensate and high purity water for samples with pH  $\geq 7$



Complete system mounted on stainless steel mounting panel

Transmitter AMI Sodium P in a rugged aluminum enclosure (IP66)

Flow cell with temperature probe, sodium sensor, reference, pH sensor and bubble detector

Reliable alkalisation reagent addition with continuous pH monitoring

Continuous sample flow detection

Simple two-point calibration

Easy to use grab sample capability

Factory tested, ready for installation and operation

### Specification

Measuring range 0.1 – 10,000 ppb Na (under reference conditions) with automatic range switching

Automatic temperature compensation

Big backlit LCD display for the reading of all measured values and status information simultaneously

Easy user menus in English, German, French and Spanish

Simple programming of all parameters by keypad

Electronic record of major process events and calibration data

Real-time clock for time stamp in data logs and for automated functions

Data logger for 1,500 data records stored at selectable intervals

Option for second sample stream with programmable stream switching

## Sodium Measurement

Sodium electrode, calomel reference electrode (liquid junction: ground glass sleeve) and pH electrode

pH-conditioning with diisopropylamine (~1 L / 30 d) or ammonia (~3 L / 30 d)

Interferences: none, if total acidity of sample < 10 meq/l

Automatic temperature compensation

Measuring range	Resolution
0 - 99.9 ppb	0.1 ppb
0 - 999 ppb	1 ppb
0 - 9.99 ppm	0.01 ppm

Automatic range switching

Accuracy  $\pm 5\%$  of reading after calibration

Repeatability 5%

Response time 180 s (95%)

### Sodium calibration

Manual 1- or 2-point calibration with direct standard injection

### Temperature measurement

Temperature sensor SWAN NT5K

Measuring range -10 to +100 °C

Resolution 0.1 °C

## Transmitter Specifications and Functionality

Electronic case	Aluminum
Protection degree	IP66 / NEMA 4X
Display	backlit LCD, 75 x 45 mm
Electrical connectors	screw clamps
Dimensions	180 x 140 x 70 mm
Weight:	1.5kg
Ambient temperature	-10 to +50 °C
Humidity	10 - 90 % relative non condensing

### Power supply

Voltage	100 - 240 VAC ( $\pm 10\%$ ), 50/60 Hz ( $\pm 5\%$ ) or 24 VDC ( $\pm 10\%$ )
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Power consumption max. 30 VA

### Operation

Easy operation based on separate menus for messages, diagnostics, maintenance, operation and installation

User menus in English, German, French and Spanish

Separate menu specific password protection

Display of process values, alarm status and time during operation

Storage of event log, alarm log and calibration history. Storage of the last 1,500 data records in logger with selectable time interval.

### Safety features

No data loss after power failure, all data is saved in non-volatile memory

Overvoltage protection of inputs and outputs

Galvanic separation of measuring inputs and signal outputs

### Transmitter temperature monitoring

with programmable high/low alarm limits

#### 1 Alarm relay

One potential free contact for summary alarm indication for programmable alarm values and instrument faults

Max. load 1A / 250 VAC

#### 1 Input

One input for potential free contact

Programmable hold or remote off function

#### 2 Relay outputs

Two potential free contacts programmable as limit switches for measuring values, controllers or timer for system cleaning with automatic hold function

Max. load 1A / 250 VAC

### 2 Signal outputs (3rd as option)

Two programmable signal outputs for measured values (freely scaleable, linear or bilinear) or as continuous control outputs (control parameters programmable) as current source. 3rd signal output selectable as current source or current sink.

Current loop 0/4 - 20 mA

Max. burden 510 W

### Control functions

Relays or current outputs programmable for 1 or 2 pulse dosing pumps, solenoid valves or for one motor valve. Programmable P, PI, PID or PD control parameters.

### 1 Communication interface (option)

RS485 interface (galvanically separated) with Fieldbus protocol Modbus RTU or Profibus DP

3rd Signal output

USB interface

HART interface

### Analyser Data

#### Sample conditions

pH value  $\geq$  pH 7.0

Ammonium concentration < 10 ppm

Dissolved solids smaller than 10 ppm

Flow rate min. 100 ml/min.

Inlet pressure 0.3 - 3 bar (4 - 43 PSI)

Outlet pressure ambient pressure

Temperature 5 - 45 °C (41 - 113 F)

No fat or grease

#### Flow cell and connections

Made of acrylic glass with photoelectric bubble sensor for sample flow detection

One or two (option) sample streams

Stream switching time  $\geq$  15 min.

Sample inlet Serto PVDF 6 mm

Sample outlet G1/2" adapter for flexible tube  
 $\varnothing$  20 x 15 mm

#### Panel

Dimensions 400 (or 280) x 850 x 200 mm

Material Stainless steel

Total weight 12 or 9 kg

## Monitor AMI Phosphate-II

Complete monitoring system for the automatic, continuous measurement of phosphate in potable water, effluents and cooling water



Measuring range 0.01 to 10 ppm (mg/L) PO<sub>4</sub>

Based on colorimetric measurement principle according to EN ISO 6878 / APHA 4500-P E

No interferences with silica

Complete system including measurement and control electronics, photometer, flow indicator, reaction chamber, reagent dosing system and reagent containers

Measurement values are available as analog output signals

Alarm display and activation of alarm relay when user defined, critical limits are reached

Continuous, automatic monitoring of main instrument functions (sample flow, reagent supply)

Large back-lit LCD display showing all measured values and status information simultaneously

Easy user menus in English, German, French and Spanish

Simple programming of all parameters by keypad

Data logger for 1,500 data records stored at a selectable interval (data download requires optional Hyper Terminal interface)

Factory tested, ready for installation and operation

### Accessories

Cleaning module for automatic chemical cleaning of flow cell and photometer

## Analytical System

### Phosphate (PO<sub>4</sub>) measurement

Measuring range	Resolution
0.01 to 0.99 ppm	0.01 ppm
1.0 to 4.9 ppm	0.1 ppm
5 to 10 ppm	1.0 ppm
Reproducibility	
up to 5 ppm	± 0.01 ppm or ± 2.5%, whichever is the greater
5 to 10 ppm	± 10%
Measurement time	7 minutes
Cycle time	10 minutes

### Flow cell

Made of acrylic glass with water inlet filter and flow adjustment valve

## Transmitter Specifications and Functionality

Electronics case	Aluminum
Protection degree	IP66 / NEMA 4X
Display	backlit LCD, 75 x 45 mm
Electrical connectors	screw clamps
Ambient temperature	-10 to +50 °C
Limit range of operation	-25 to +65 °C
Storage and transport	-30 to +85 °C
Humidity	10 to 90 % relative, on condensing

### Power supply

Voltage	100 - 240 VAC (± 10 %), 50/60 Hz (± 5 %) or 24 VDC (± 10 %)
Power consumption	max. 30 VA

### Operation

Easy operation based on separate menus for messages, diagnostics, maintenance, operation and installation

Separate menu specific password protection possible

Display of process value, sample flow, alarm status and time during operation

Storage of event log, alarm log and calibration history

Storage of the last 1,500 data records in logger with selectable interval

### Real-time clock with calendar

For action time stamp and pre-programmed actions

### Safety features

Data storage in non-volatile memory

Over voltage protection of inputs and outputs

Galvanic separation of measuring inputs and signal outputs

### Reagents monitoring

Warning if low level is reached and alarm for lack of reagents

### Temperature monitoring

Alarm if the transmitter temperature is higher than +65 °C or lower than 0 °C

### 1 Alarm relay

One potential free contact for summary alarm indication for programmable alarm values and instrument faults

Maximum load	1A / 250 VAC
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### 1 Input

One input for potential free contact. Programmable hold or remote off function

### 2 Relay outputs

Two potential free contacts program-able as limit switches for measuring values, controllers or timer with automatic hold function

Max. load	1A / 250 VAC
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### 2 Signal outputs (3rd as option)

Two programmable signal outputs for measured values (freely scalable, linear or bilinear) or as continuous control output (control parameters programmable) as current source. 3rd signal output selectable as current source or current sink.

Current loop	0/4 - 20 mA
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Maximum burden	510 W
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### Control function

Relays or current outputs programable for 1 or 2 pulse dosing pumps, solenoid valves or for one motor valve

Programmable P, PI, PID or PD control parameters

### 1 Communication interface (option)

RS485 interface (galvanically separated) with Fieldbus protocol Modbus RTU or Profibus DP

3rd Signal output

USB interface

## Sample and Monitor Data

### Sample conditions

Flow rate	min. approx. 10 l/h
Temperature	up to 50 °C
Inlet pressure	0.15 to 2 bar
Outlet pressure	pressure free, atmospheric drain

### Sample connections

Inlet	Serto PVDF 8 mm (1/4"), for tubing tubing 6x8 mm
Drain	Ø 16 mm, tubing 15x20 mm

### Panel

Dimensions	400 x 850 x 200 mm
Material	white PVC
Weight	9.5 kg

## Monitor AMI Hydrazine

Microprocessor controlled system for the determination and control of hydrazine or carbohydrazide used as boiler feedwater oxygen scavengers



Complete system on stainless steel mounting panel

Transmitter AMI Hydrazine in a rugged aluminum enclosure (IP66)

Sensor system self-cleaning three-electrode system for determination of hydrazine or carbohydrazide

Flow cell made of acrylic glass with flow adjustment valve, digital sample flow monitor and integrated temperature probe. Sample alkalization with highly efficient diisopropylamine.

Factory tested, ready for installation and operation

### Specifications

Measurement range for hydrazine or carbohydrazide: 0.1 to 600 ppb

Automatic temperature compensation

Automatic, continuous monitoring of sample flow and sensor cleanliness

Big backlit LCD display for the reading of measuring value, sample temperature, sample flow and operating status

Easy user menus in English, German, French and Spanish

Simple programming of all parameters by keypad

Electronic record of major process events and calibration data

Data logger for 1,500 data records stored at a selectable interval. (data download to PC requires optional Hyper Terminal interface)

Two current signal outputs (0/4-20 mA), galvanically separated from sensor input, for hydrazine or carbohydrazide concentration and temperature or as continuous control outputs



## Hydrazine / Carbohydrazide Measurement

Self-cleaning three-electrode system with automatic temperature compensation. Maintenance-free reference electrode

Range	0.1 - 600 ppb
Accuracy	5% of reading up to 200 ppb ± 15% up to 600 ppb or ± 2 ppb (whichever is greater)
Stability	± 5% of reading per month or ± 2 ppb per month (whichever is greater)
Response time	90 % of change 60 sec after sample entered flow cell

### Temperature measurement NT5K

Measuring range	up to 60 °C
Resolution	0.1 °C

### Sample flow measurement

With digital SWAN sample flow meter and alarm in case of insufficient sample flow

## Transmitter Specifications and Functionality

Electronics case	Cast aluminum
Protection degree	IP66 / NEMA 4X
Display	backlit LCD, 75 x 45 mm
Electrical connectors	screw clamps
Dimensions	180 x 140 x 70 mm
Weight	1.5 kg
Ambient temperature	-10 to +50°C
Humidity	10 - 90% rel., non condensing

### Power supply

Voltage	100 - 240 VAC (± 10 %), 50/60 Hz (± 5 %) or 24 VDC (± 10 %)
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Power consumption: max. 30 VA

### Operation

Easy operation based on separate menus for messages, diagnostics, maintenance, operation and installation

User menus in English, German, French and Spanish

Separate menu specific password protection

Display of process value, sample flow, alarm status and time during operation

Storage of event log, alarm log and calibration history

Storage of the last 1,500 data records in logger with selectable time interval

### Safety features

No data loss after power failure, all data is saved in non-volatile memory

Overvoltage protection of in- and outputs

Galvanic separation of measuring inputs and signal outputs

Transmitter temperature monitoring with programmable high/low alarm limits

### 1 Alarm relay

One potential free contact for summary alarm indication for programmable alarm values and instrument faults

Maximum load 1A / 250 VAC

### 1 Input

One input for potential free contact

Programmable hold or remote off function

### 2 Relay outputs

Two potential free contacts programmable as limit switches for measuring values, controllers or timer for system cleaning with automatic hold function

Rated load 1A / 250 VAC

### 2 Signal outputs (3rd as option)

Two programmable signal outputs for measured values (freely scaleable, linear or bilinear) or as continuous control outputs (control parameters programmable) as current source. 3rd signal output selectable as current source or current sink.

Current loop 0/4 - 20 mA

Maximum burden 510 W

### Control functions

Relays or current outputs programmable for 1 or 2 pulse dosing pumps, solenoid valves or for one motor valve

Programmable P, PI, PID or PD control parameters

### 1 Communication interface (option)

RS485 interface (galvanically separated) with Fieldbus protocol Modbus RTU or Profibus DP

3rd Signal output

USB interface

### Monitor Data

#### Sample conditions

Flow rate approx. 15 L/h

Temperature range 15 - 45 °C

Inlet pressure 0.15 - 2 bar

Outlet pressure pressure free

pH value equal or higher than pH 7.0

Reagent consumption (at 25°C) < 1L diisopropylamine per month

#### Flow cell and connections

Acrylic glass with safety filter, metering tap and sample tap, inserts for all sensors

Sample inlet tube adapter 4 x 6 mm

Sample outlet tube adapter 15 x 20 mm

#### Panel

Dimensions 280 x 850 x 200 mm

Material stainless steel

Total weight 10.0 kg

## Monitor AMI Turbiwell Power

Nephelometric system based on ISO 7027 for the automatic and continuous measurement of turbidity in pure water in water steam cycles



Non-contact turbidimeter: System optics is not in direct contact with sample, no fouling on optical surfaces

Complete system including optoelectronics, sample chamber, turbidimeter and sample flow meter mounted on stainless steel panel

Suitable for the measurement of other liquids of which the turbidity correlates with the concentration of a suspended solid or an emulsified liquid, eg. an oil water emulsion

Measuring range: 0.000 - 200.0 FNU/NTU automatic range switching

Precision:  $\pm 0.003$  FNU/NTU or 1% of reading

Manual or automated draining of the sample chamber

Easy user menus in English, German, French and Spanish

Simple programming of all parameters by keypad

Electronic record of major process events and calibration data

Real-time clock for time stamp in data logs and for automated functions

Data logger for 1,500 data records stored at selectable intervals

Big back-lit LCD display for the reading of all measured values and status information simultaneously

Measurement values are available as analog output signals

potential free alarm contact as summary alarm indication for programmable alarm values and for instrument faults

Input for potential free contact to freeze the measuring value or to interrupt control in automated installations (hold function or remote-off)

Factory tested, ready for installation and operation

### Further options

Turbidity verification kits (low or high FNU for dry verification)

## Turbidimeter System

Nephelometer according to ISO 7027  
Measuring range 0.000 to 200.0FNU/NTU  
Precision  $\pm 0.003$  FNU/NTU or  $\pm 1\%$ ,  
whichever is greater  
Two-part turbidimeter body made of PETP with drain valve.  
Heated optics to avoid condensation.

Easy cleaning of sample compartment  
Factory calibrated with Formazine  
Possibility to detect oil in pure water. Restrictions do apply.  
Sample flow measurement with digital Swan sample flow sensor

## Transmitter Specifications and Functionality

Electronics case Aluminum  
Protection degree IP66 / NEMA 4X  
Display backlit LCD, 75 x 45 mm  
Electrical connectors screw clamps  
Ambient temperature -10 to +50 °C  
Limit range of operation -25 to +65 °C  
Storage and transport -30 to +85 °C  
Humidity 10 to 90 % relative,  
non condensing

### Power supply

Voltage 100 - 240 VAC ( $\pm 10\%$ ),  
50/60 Hz ( $\pm 5\%$ )  
or 24 VDC ( $\pm 10\%$ )  
Power consumption max. 30 VA

### Operation

Easy operation based on separate menus for messages,  
diagnostics, maintenance, operation and installation  
Separate, menu specific password protection  
Display of process value, alarm status and time during  
operation  
Storage of event log, alarm log and calibration history  
Storage of the last 1,500 data records in logger with selectable  
time interval

### Real-time clock with calendar

For action time stamp and preprogram-med actions.

### Safety features

No data loss after power failure, all data  
is saved in non-volatile memory. Over-voltage protection of  
inputs and outputs.  
Galvanic separation of measuring inputs and signal outputs

### Transmitter temperature monitoring

With programmable high/low alarm limits

### 1 Alarm relay

One potential free contact for summary alarm indication for  
programmable alarm values and instrument errors

Maximum load 1A / 250 VAC

### 1 Input

One input for potential free contact. Programmable hold or  
remote off function.

### 2 Relay outputs

Two potential free contacts programable as limit switches for  
measuring values, controllers or timer with automatic hold  
function

Rated load 1A / 250 VAC

### 2 Signal outputs (3rd as option)

Two programmable signal outputs for measured values (freely  
scalable, linear or bilinear) or as continuous control output  
(control parameters programmable) as current source. 3rd  
signal output selectable as current source or current sink.

Current loop 0/4 - 20 mA

Maximum burden 510 W

### Control functions

Relays or current outputs programmable for 1 or 2 pulse  
dosing pumps, solenoid valves or for one motor valve

Programmable P, PI, PID or PD control parameters

### 1 Communication interface (option)

RS485 interface (galvanically separated) with Fieldbus  
protocol Modbus RTU or Profibus DP

3rd Signal output

USB interface

HART interface

## Sample and Monitor Data

### Sample conditions

Flow rate approx. 20-60l/h

Temperature up to 40 °C

Sample temperature max. 5°C  
over ambient temperature

Outlet pressure pressure free,  
atmospheric drain

### Sample connections

Inlet Serto, 6mm

Drain Ø 16 mm, tubing 15 x 20 mm

### Panel

Dimensions 400 x 850 x 200 mm

Material Stainless steel

Weight 14.0 kg

## Swas Panel



Forbes Marshall  
Krohne Marshall  
Forbes Marshall Arca  
Codel International  
Forbes Solar  
Forbes Vyncke  
Forbes Marshall Steam Systems

Opp 106th Milestone  
Bombay Poona Road  
Kasarwadi, Pune - 411 034. INDIA  
Tel : 91(0)20-27145595, 39858555  
Fax : 91(0)20-27147413

Email : [swasmktg@forbesmarshall.com](mailto:swasmktg@forbesmarshall.com), [ccmidc@forbesmarshall.com](mailto:ccmidc@forbesmarshall.com)

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B-85, Phase II, Chakan Indl Area  
Sawardari, Chakan, Tal. Khed  
Dist. Pune - 410 501. INDIA  
Tel : 91(0)2135-393400

A-34/35, MIDC H Block  
Pimpri, Pune - 411 018. INDIA.  
Tel : 91(0)20-27442020, 39851199  
Fax : 91(0)20-27442040

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