

Multiwave Process Photometers

Most common field-proven applications



Reliable, field-proven measurements for simple and fast process control, quality assurance, environmental compliance and safety.

Measurement made easy.

— Multiwave measurements for the refining, petrochemical and chemical industries.

Applications

ABB PIR3502, PUV3402, PUV3402-LED Multiwave Process Photometers provide online measurements of gas or liquid components in simple or complex process streams for:

- Process control and efficiency
- Catalyst protection
- Product quality
- Environmental concerns
- Safety

Multiwave Process Photometers provide reliable performance in the petrochemical, chemical, refining, gas processing and product pipeline industries. These lists provide a general reference for determining potential multiwave photometer applications. Other considerations will be the remaining stream matrix, stream temperature, pressure and phase. The sample must be homogeneous, single phase in order to apply the method. Please provide ABB with detailed information on your measurement needs and our application specialists will determine the feasibility.

Field-proven applications

This table is a partial listing of field-proven applications, which are grouped by process. Measured components and key benefits are indexed by each application.

PUV3402 and PIR3502

Process	Measurement	Benefits	IR/UV
Acid gas scrubbers	Sodium hydroxide 0 to 15%	Improved scrubber efficiency and reduced cost	IR
Acetic acid	CO 80 to 100% in reactor feed	Maximized process yield	IR
	Water 0 to 20% in reactor outlet	Distillation tower control	IR
		2nd half of distillation tower control and determining expected life of drying column	IR
	Water 0 to 1500 ppm in drying column outlet	Drying column efficiency	IR
Ammonia	Methyl iodide 0 to 1000 ppm	Scrubber efficiency and safety	UV
	CO 0 to 500 ppm	Catalyst protection	IR
Area monitoring	CH ₄ 0 to 0.5%	Safety	IR
	Ethyl benzene 0 to 200 ppm,	Safety, leak detection	IR
	Styrene 0 to 100 ppm,		IR
	Isooctane 0 to 2500 ppm,		IR
	Divinylbenzene 0 to 300 ppm		IR
Crude unit	ASTM color 0 to 8	Product quality	IR
Ethylene	Acetylene 0 to 2%	Hydrogenation reactor inlet continuous control	IR
	Acetylene 0 to 0.5%	Hydrogenation reactor mid-bed continuous control	IR
Ethylene dichloride	CO 0 to 10%, CO ₂ 0 to 5%, and ethylene 0 to 5%	Process efficiency and safety	IR
	Chlorine 0 to 2000 ppm in EDC with sparger system	Process efficiency	UV
Maleic anhydride	CO 0 to 2.5%, CO ₂ 0 to 2.5%, butane 0 to 0.5%, and maleic anhydride 0 to 2%	Reactor outlet – process efficiency	IR
	Butane 0 to 2% and water vapor 0 to 5%	Reactor inlet – LEL control	IR
Phosgene	CO 0 to 2.5%, CO ₂ 0 to 2.5%, Butane CO 0 to 10%	Process control	IR
	Chlorine 0 to 200 ppm	Process control	UV
	Phosgene 0 to 100 ppm	Safety	IR
Product pipeline	CO ₂ 0 to 1000 ppm	Prevent freezing of natural gas lines	IR
Sulfur recovery	H ₂ S 0 to 100%, CO ₂ 0 to 100%	Acid gas feed forward control	IR
	H ₂ S 0 to 100%, NH ₃ 0 to 50%	Sour gas feed	IR
Vinyl chloride	Water 0 to 50 ppm in EDC	Catalyst protection, corrosion protection of reactors	IR
	Vinyl chloride 0 to 200 ppm, 0 to 2% in HCl	Condenser efficiency	IR

IR absorbing compounds

Potential measurements – partial list

1,3-Butadiene	Ethyl alcohol	Nitroethane
n-Butane	Ethyl chloride	Nitrogen dioxide
Carbon dioxide	Freon™ (13B, 14, C-318)	Nitrogen pentoxide
Carbon monoxide	Hydrazine	Nitromethane
Carbon tetrachloride	Hydrogen bromide	1-Nitropropane
Chloroform	Hydrogen chloride	2-Nitropropane
Cyanogen	Hydrogen cyanide	Nitrosyl chloride
Cyclopropane	Hydrogen sulfide	Nitrous oxide
Diazomethane	Isobutane	Phosgene
1,1-Dichloroethane	Methane	Propane
1,2-Dichloroethane	Methyl alcohol	Propylene
Dichloromethane	Methyl azide	Trimethylhydrazine
Dimethyl amine	Methyl chloride	Trimethylamine
Dimethyl ether	Methyl mercaptan	Vinyl chloride
Dimethyl hydrazine	Nitric acid	Water
Ethane	Nitric oxide	

UV absorbing compounds

Potential measurements – partial list

Acetic acid	m-Chlorophenol	Nitrobenzene
Acetone	p-Chlorophenol	Ozone
Ammonia	Dioxane	Perchloroethane
Aniline	Ethylbenzene	Phenol
Anthracene	Ferric chloride	Phosgene
Benzene	Fluorine	Pyridine
Bromine	Furfural	Sodium sulfide
Carbon disulfide	Hydrogen sulfide	Styrene
Carbon tetrachloride	Iodine	Sulfur
Chlorine	Methyl mercaptan	Sulfur dioxide
Chlorine dioxide	Naphthalene	Toluene
o-Chlorophenol	Nickel carbonyl	

Additional field-proven application examples

Multicomponent measurements

Multiwave process photometers can physically handle up to 7 components in a stream

2 components

- Acrylonitrile (0-50 ppm) and styrene (0-50 ppm) in air
- Carbon monoxide (0-100 ppm) and carbon dioxide (0-100 ppm) in hydrogen at 200 psig
- Carbon dioxide (0-15%) and ethylene (0-80 %) in mixed hydrocarbon stream as a vapor
- Dimethylsulfoxide (0-5%) and water (0-1000 ppm) in monochlorobenzene
- Ethylene oxide (0-50 ppm) and propylene oxide (0-50 ppm) in air
- Methane (0-1000 ppm) and ethane (0-250 ppm) in ethylene at 100 psig
- Methyl chloride (0-70%) and methylene chloride (30-55%)
- Propane (0-55%) and propylene (0-20%)

3 components

- Toluene (0-1.2%), tetrahydrofuran (0-2%) and LEL of gas mix (0-100%)
- Ethane (0-5000 ppm), ethylene (0-5000 ppm) and methane (0-80%)
- Carbon dioxide (0-20%), carbon monoxide (0-20%) and methane (0-5%)
- Methyl acetylene (0-40%), propadiene (0-20%) and methylacetylene-propadiene (0-60%)
- Carbon dioxide (0-40%), carbon monoxide (0-40%) and water vapor (0-25%) in air

4 components

- Ethylene (0-100%), EDC (0-10%), hydrogen chloride (0-50%) and ethyl chloride (0-20%)
- Carbon dioxide (0-5%), carbon monoxide (0-5%), benzene (0-1%) and toluene (0-1%) in air oxidation vent
- Sulfur dioxide (0-5000 ppm), nitric oxide (0-2000 ppm), nitrogen dioxide (0-2000 ppm) and NO_x (0-2000 ppm)
- Carbon dioxide (0-20%), carbon monoxide (0-100%), ethylene (0-60%) and ethyl chloride (0-5%) at 70 psig

Moisture measurements

- Water (0-0.5%) in acetone
- Water (0-200 ppm) in allyl chloride
- Water (0-100 ppm) in benzene
- Water in (0-250 ppm) chlorine (vapor phase) at 75 psig
- Water(0-500 ppm) in dimethylacetamide
- Water (0-0.5%) in ethylene diamine
- Water (0-50 ppm) in ethylene dichloride
- Water (0-200 ppm) in methyl ethyl ketone
- Water (0-1000 ppm) in methyl ethyl ketone and alcohols
- Water (0-1500 ppm) in methanol
- Water (0-500 ppm) in monochlorobenzene
- Water (0-2%) in phenol
- Water (0-500 ppm) in propylene glycol
- Water(0-300 ppm) in toluene diamine
- Water (0-100 ppm) in vinylidene chloride

Single component measurements

- Acetic Acid (0-2%) in acetic anhydride
- Acetylene (0-1%) in methane; ethane and ethylene
- Acetylene (0-1.5%)
- Ammonia (0-250 ppm) in air
- 1,3-butadiene (0-50%) in isobutene
- 1,3-butadiene (0-70%)
- Carbon dioxide (0-1%) in methane and ethane
- Carbon dioxide (0-1%) in ethane
- Carbon dioxide (0-5000 ppm) in ethane
- Carbon dioxide (0-5000 ppm) in propane
- cis-2-butene (0-10%) in butadiene
- Cyclohexane (0-30%) in cyclohexanol
- Cyclohexanone (0-500 ppm) in cyclohexane
- Ethane (0-10%) in methane and propane
- Ethylene (0-2%) in ethane
- Hydrogen sulfide (0-15%) in sour fuel gas
- Hexamethylene imine (0-400 ppm)
- Hydrogen cyanide (0-1%)
- Methanol (0-20%) in methyl tert-butyl ether and tert-amyl methyl ether
- Methane (0-6%) in hydrogen and water vapor
- Methanol (0-40%) in methyl tert-butyl ether
- Methyl bromide (0-100 ppm) in air
- Propane (0-6%) in propylene
- Propylene (80-100%)
- Total hydrocarbons (0-10%) in propylene
- Total hydrocarbons (0-300 ppm) as 1-butene
- Vinyl acetate (0-10%) in ethylene
- Vinyl acetate (0-20%) in ethylene

UV measurements

- Benzene (0-100 ppm) in water
- Bisphenol A (0-25 ppm) and (0-100 ppm) in water
- Chlorine (0-2%) in hydrogen chloride
- Chlorine (0-30%) in propane
- Chlorine (0-30%) in propylene
- Chlorine (0-200 ppm) and sulfur dioxide (0-200 ppm) in vent gas
- Chlorine (0-10%) in sodium hydroxide and water
- Dimethylacetamide (0-1000 ppm) in water
- Dimethylaniline (0-2000 ppm) in nitrogen saturated with water
- Hydrogen sulfide (0-10%) in hydrogen
- Hydrogen sulfide (0-4%) in nitrogen
- Styrene (0-20 ppm) butadiene in water
- Sulfur dioxide (0-500 ppm)
- Sulfur dioxide (0-5000 ppm) in stack gas
- Total aminobenzenes as aniline (0-50 ppm)
- Total phenols as 2-chlorophenol (0-25 ppm) in 33 % hydrogen chloride and water (balance)
- APHA color (0 to 500)
- ASTM color (0 to 8)
- Saybolt color (-16 to 30)

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