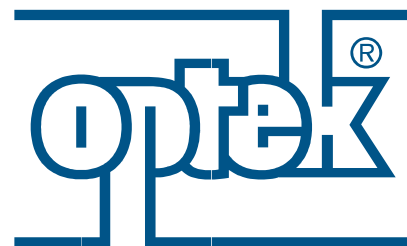


## Product Information



inline control

# Haze Control 4000

Scattered Light Turbidity Analyzers



english  
deutsch  
portuguese  
中文  
français



For over 30 years, optek has focused on measuring process liquids through their interaction with light in facilities all over the world. Although global, optek remains a family owned company with a team of more than 100 qualified, customer-driven professionals.

Our confidence is born from experience. With the expertise of more than 30,000 installations worldwide, our value to the customer resides in providing a superior product that pays back. High quality materials withstand the toughest process conditions including aggressive media, high temperature, and

high pressure applications. Cleanability is ensured using high quality wetted materials, superior design, as well as sapphire optical windows.

As a global partner to various industries, optek offers the most advanced technologies including superior signal amplification, inline calibration support, PROFIBUS® PA, FOUNDATION™ Fieldbus and multilingual user interfaces for easy onsite operations.

Our support ensures long term satisfaction with programs such as “Speed-Parts” and “SwapRepair” to provide our

customers sustainable operations and minimized downtime at the lowest cost of ownership.

Conformity to international (ISO 9001), industry-specific (FM/ATEX approval) or company standards is easily achieved with optek. Wherever process composition is controlled, the name optek has become synonymous with world-class products and support.

**Optimize your process  
with optek inline control.**



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**See our various product and application brochures for further details**



## The Haze Control 4000 is a powerful, microprocessor based converter.

The advanced modular design has been specifically engineered for high precision haze (turbidity) measurements. The menu based software is easy to use and configure and available in German, English, French, Dutch, Spanish, Russian and Portuguese. The software includes adjustable signal damping, 16 linearization tables and advanced calculation capabilities. An integrated data logger captures vital process information for quality assurance and plant control records. This data is easily transferred to a PC via a RS232 port.

## HC 4000 – Photometric converter

The Haze Control 4000 photometric converter is designed to operate with the optek DTF16 (11°/90° scattered light sensor) and additionally with AF16 or AS16, visible (VIS) or near-infrared (NIR) based sensors.

The graphic display can show absorbance, turbidity and concentration in real-time and in any unit of measure such as EBC, FTU, ppm (DE), NTU, ASBC and Helms.

These measurements may also be displayed as text, bar graphs or trend values. A factory zero point is implemented for the scattered light sensors.

A secondary user zero for additional offset is included, as well as a slope and shift adjustment. This manual adjustment can be used to compensate for long term process related disturbances.

Haze Control Units and Measuring Ranges Haze Control DTF16

Unit	EBC Correlation	90° Side Scatter	11° Forward Scatter	0° Absorption
EBC	1	0 - 25	0 - 25	0 - 500
FTU	4 = 1 EBC	0 - 100	0 - 100	0 - 2,000
NTU	4 = 1 EBC	0 - 100	—	—
ASBC-FTU	69 = 1 EBC	0 - 1,725	—	0 - 34,500
Helms	40 = 1 EBC	0 - 1,000	—	—
ppm (DE)	6.4 ≈ 1 EBC*	—	0 - 200	—

\* non linear correlation

- EBC** = European Brewery Convention
- FTU** = Formazin Turbidity Units
- NTU** = Nephelometric Turbidity Units
- ASBC** = American Society of Brewing Chemists
- Helms** = Turbidity Unit
- ppm (DE)** = Parts per Million (Diatomaceous Earth)

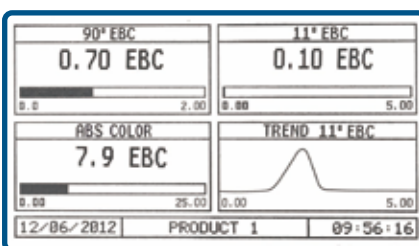
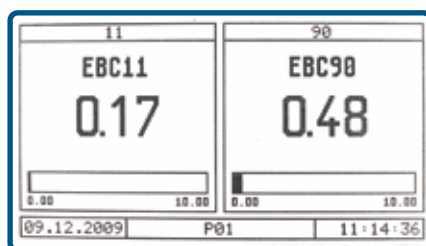
## 04 | HC4000 - Photometric Converter



**The Haze Control 4000 is available in various configurations to meet the exact needs of your process.**

- Multiple photometric sensors
- Multiple parameter sets
- Multiple linearization tables
- Data logger
- Factory zero for scattered light sensors
- Remote control

Sensor		Converter							
1	2	4301	4321	4351	4361	4402	4422	4452	4462
DTF16	—	✓	✓	✓	✓	✓	✓	✓	✓
DTF16	AS16 or AF16	—	—	—	—	✓	✓	✓	✓



### Display Modes

- 1 - 4 simultaneously displayed values (configurable)
- Numeric with bar graph and alarm setting
- Trendline

### Software Tools

- 8 parameter sets (incl. range, alarm, display, etc.)
- 16 linearization tables (max. 11 points)
- 8 offset and slope sets
- Auto zero (local or remotely activated)
- Factory zero setting (scattered light sensors only)
- Password protection (3 levels and none)
- Memory (non-volatile) retains all configurations and logged data

### Remote Control

- Parameter set (e.g. range)
- Zero
- Hold



HC4000 Configuration		4301	4321	4351	4361	4402	4422	4452	4462
Detector inputs (optek)	①	3	3	3	3	4	4	4	4
Power supply 115/230 or 24 V	②	✓	✓	✓	✓	✓	✓	✓	✓
Remote-IN: (Zero, Range, Hold)	③	—	✓	—	—	—	✓	—	—
Relay-outputs	④	3	3	3	3	3	3	3	3
Failsafe-relay (active)	④	✓	✓	✓	✓	✓	✓	✓	✓
Lamp outputs (optek)	⑤	1	1	1	1	2	2	2	2
mA-outputs (0/4 - 20 mA)	⑥	2	2	2	2	4	4	4	4
mA-inputs (4 -20 mA)	⑦	—	2	—	—	—	2	—	—
Profibus® PA	⑧	—	—	✓	—	—	—	✓	—
FOUNDATION™ Fieldbus	⑧	—	—	—	✓	—	—	—	✓



## PROFIBUS® PA

- Fulfills application profile for process automation (version 3.01)
- Cyclic:
  - 4 Measuring outputs, each with 4x limit and status
  - Status of all 4 relays
  - 2 Measuring inputs
- Acyclic:
  - Zero, Hold, Product change, Monitors, Error codes
- GSD, EDD file and DTM for FDT interface provided
- Interface to profibus DP segment using a segment coupler



## FOUNDATION™ Fieldbus

- Fulfills FOUNDATION™ Fieldbus H1 (IEC 61158-2)
- Registered function blocks: 1xRB, 8xAI(s), 4xDI(s), 2xAO(s)
- H1 Profile class: 31P, 32L
- H1 Device class: basic, link master
- 4 Measuring outputs with status
- 4 Relays with status
- 2 Measuring inputs
- With optek specific resource block parameter:
  - Zero, Hold, Product change
- Device description (DD) and capabilities files provided



## 06 | HC4000 - Accessories

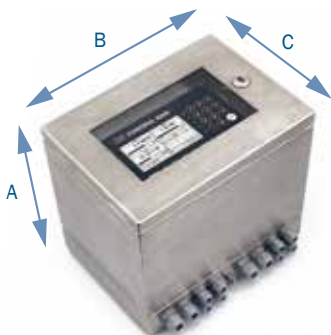
The PC-Transfer software allows communication between converter and PC via a RS-232 port. Documentation and set-up including identical set-up of multiple converters are made simple.

**Converter to PC:**

- Parameter set
- Trend data online
- Data logger

**PC to converter:**

- Parameter set
- Software update



### S19-42

Wall mount housing (IP65)  
Material: stainless steel 1.4301 / SS 304  
A: 301 mm (11.9 in.)  
B: 340 mm (13.4 in.)  
C: 237 mm (9.4 in.)



### B19-42

Wall mount housing (IP66)  
Material: plastic (ABS)  
A: 287 mm (11.3 in.)  
B: 353 mm (13.9 in.)  
C: 147 mm (5.8 in.)  
D: 237 mm (9.4 in.)



### T19-42

Table top housing  
Material: aluminum  
A: 150 mm (5.9 in.)  
B: 260 mm (10.2 in.)  
C: 320 mm (12.6 in.)

### Front-Kit

Front panel mounting (IP65 - front only)  
(not shown)



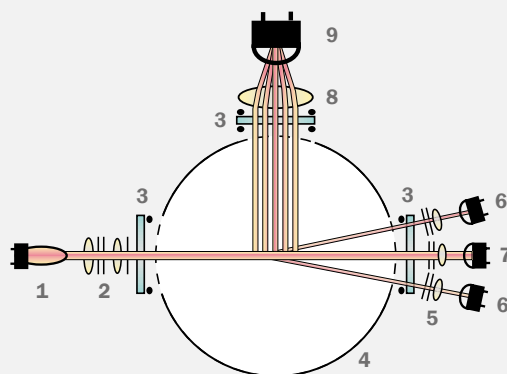
### B-ADS / B-ADS-WS Air Drying System

Condensation can affect any optical instrument operating in an environment where process piping is colder than ambient air. For this reason optek sensors are equipped with air purge connections. If no dry and dust free air is available, the B-ADS / B-ADS-WS (Beko Air Drying System) can be used to condition supplied air.

Technical Data	HC4000
<b>Housing</b>	19"-version for mounting in control cabinets 3 U / 42 HP - dimensions: W 213.0 mm (8.39 in.) H 128.4 mm (5.06 in.) D 230.0 mm (9.05 in.) - material: stainless steel / polyester / silicone / glass / diverse plastics - protection: front IP40 / rear IP20 (mains supply secured against accidental touching)
<b>Display</b>	LCD graphic display black on white (240 x 128 pixel), LED background illuminated
<b>Operation</b>	18-button keyboard
<b>System clock</b>	accuracy approx. 1 minute/month (battery life approx. 15 years)
<b>LED</b>	1 LED (green): power on 1 LED (red-flashing): system failure 3 LEDs (yellow): alarm I, II, III
<b>Data logger</b>	4 parallel measuring values (ring buffer with approx. 25,000 data points x 4) (interval: 1/second - 1/hour)
<b>Sensor-inputs</b>	3 or 4 for optek photometric sensors
<b>mA-inputs</b>	optional: 2 x 4 - 20 mA (functionally galvanically isolated) - accuracy: < 0.5% - resolution: < 0.05% - load: < 200 Ohm
<b>Remote-inputs</b>	optional: 7 x 24 V (19 ... 29 V DC), typically 6.0 mA for remote range setting, remote zero, remote hold
<b>Profibus® PA interface</b>	optional: Profibus® PA profile, version 3.01, amendment 2
<b>FOUNDATION™ Fieldbus interface</b>	optional: FOUNDATION™ Fieldbus H1 (IEC 61158-2)
<b>Sensor lamp-outputs</b>	1 or 2 lamp supply for optek photometric sensors 4.5 ... 8.5 V DC
<b>mA-outputs</b>	2 or 4 x 0/4 - 20 mA (NAMUR) (functionally galvanically isolated) - accuracy: < 0.5% - resolution: < 0.05% - load: < 600 Ohm
<b>Relay-outputs</b>	3 independent software-configurable relay contacts 0 - 50 V AC, 0 - 75 V DC, 0 - 2 A - for alarm or status feedback - initiation delay configurable: 0 - 999 sec.
<b>Failsafe-output</b>	1 SPDT contact to alarm in case of lamp or system failure (active) 0 - 50 V AC, 0 - 75 V DC, 0 - 2 A
<b>Serial communication</b>	RS232 bi-directional interface on front panel (with software package optek PC-transfer) - upload and download of configuration, download of data logger content
<b>Cable lengths (sensor)</b>	2, 3, 5, 10, 15, 20, 30 ... 100 m (7, 10, 16, 33, 49, 66, 98 ... 328 ft) cable length > 100 m on request up to 1,000 m (3,280 ft) sensors: AS16: max: 50 m
<b>Power supply</b>	115 / 230 V AC, selectable (93.5 - 132 / 187 - 264 V AC, 47 - 64 Hz) or 24 V AC / DC (AC: 20.4 - 26.4 V AC, 47 - 64 Hz; DC: 20.4 - 28.8 V DC) - power consumption: < 50 VA
<b>Ambient conditions</b>	temperature during operation (no direct sunlight): - converter: -10 - 55 °C (14 - 131 °F) - with optional stainless steel housing S19-42 (IP65): -20 - 45 °C (-4 - 113 °F) - with optional plastic housing B19-42 (IP66): -10 - 40 °C (14 - 104 °F) temperature during transport (no direct sunlight): -20 - 70 °C (-4 - 158 °F)
<b>Software languages</b>	English, German, French, Spanish, Dutch, Portuguese, Russian

Data given are subject to changes without prior notice.

## 08 | Turbidity Sensor DTF16



**Model DTF16** Dual Channel Scattered Light (11° and 90°)

- 1 Lamp module
- 2 Optics module
- 3 Windows
- 4 Sensor body
- 5 Focusing optics
- 6 Eight 11° detectors
- 7 Detector 0° (Abs.)
- 8 Optics module 90°
- 9 Detector 90°

### DTF16 Haze Control Process Turbidimeter

The DTF16 is a precision turbidimeter featuring an advanced, triple-beam scattered light optical design. It precisely measures light at a forward angle of (11°) and side angle of (90°) with simultaneous light compensation.

The DTF16 effectively measures a broad range of particles inline that contribute to turbidity and fine haze while providing the Nephelometric results required by most QA/QC guidelines. The combination of precise scattering light optics and optimized sensor body geometry prevents external or internal stray light from affecting the measurement.

Variable disturbances, such as sample color, color changes and lamp variations have no influence on the measured value.

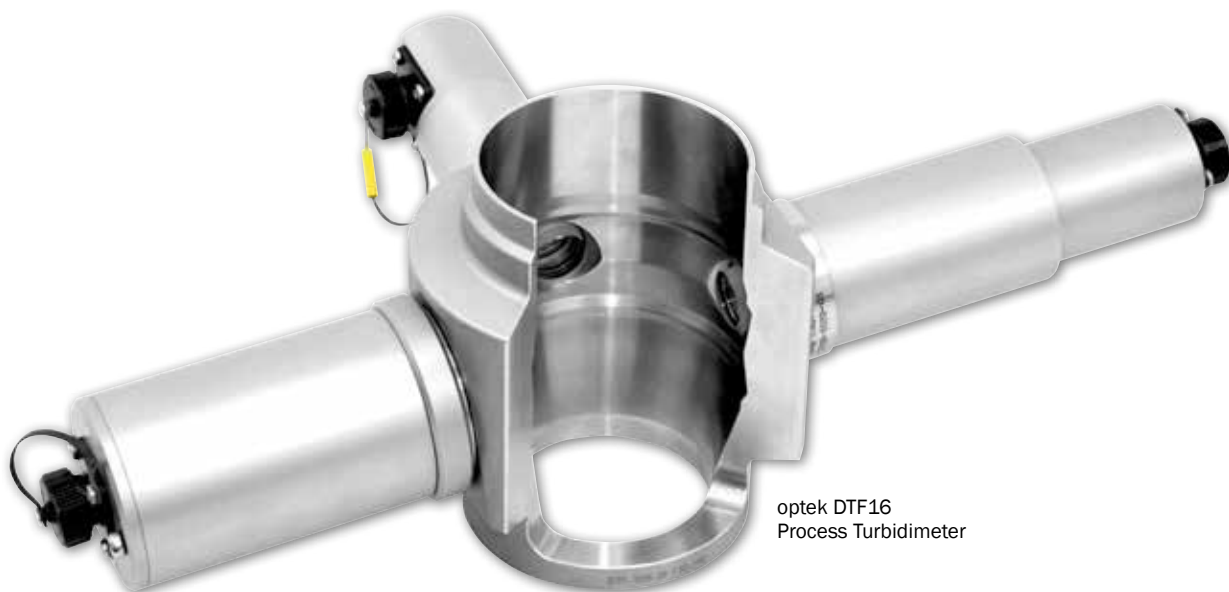
The sensor body is constructed of sanitary stainless steel. The DTF16 O-rings are made from FDA-approved EPDM. The optical windows are made from a single crystal sapphire providing superior resistance to abrasive and corrosive media. Armatures are available in nominal sizes of DN50 - DN125. Weld ends allow adaptation to any pipe/tube standard.

The DTF16 features a drift-free factory zero point, eliminating the need for calibration or zero adjustments.

#### Typical Applications:

- Filter control
- Filter break-through
- Filter backwash

**See our various product and application brochures for further details**



optek DTF16  
Process Turbidimeter



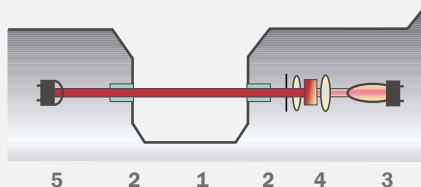


# Turbidity Sensor DTF16 | 09

Technical Data	DTF16
Measurement	
Measurement principle	1- Channel Absorption of light and 2-Channel Scattering of light (11° and 90°)
Measurement wavelength	590 nm - 1100 nm
Detector(s)	1 silicon photodiode (hermetically sealed) (Abs.) 1 silicon photodiode (hermetically sealed) (90°) 8 silicon photodiodes (hermetically sealed) (11°)
Measuring range NIR-Absorption	any measuring range between 0 - 0.1 to 500 EBC 0 - 0.4 to 2,000 FTU
Measuring range Scattered Light (11°)	any measuring range between 0 - 0.1 to 25 EBC 0 - 0.4 to 100 FTU
Measuring range Scattered Light (90°)	any measuring range between 0 - 0.1 to 25 EBC 0 - 0.4 to 100 FTU / NTU
Optical path length	80 mm standard
Calibration	factory calibration (11° and 90°) 0 - 25 EBC / 0 - 100 FTU in standard sensor body (OPL = 80 mm)
Light source	special halogen lamp 5.0 V DC, 970 mA typical life span: 1.5 to 3 years (12,500 to 25,000 hours)
Resolution	< ± 0.05% of respective measuring range
Repeatability	< ± 0.3% of respective measuring range
Linearity	< ± 0.5% of respective measuring range (with standard solution, specific to application)
Protection	all optical parts have an IP rating of IP65 or higher
Sensor body	
Material	Stainless steel 1.4435 (SS 316L), others on request
Line size	2 in. to 5 in. (DN 50 to DN 125), others on request
Process connection	butt weld tube ends: DIN 11850, ISO 1127, IPS (Schedule 5), OD (BS 4825-1), (e.g., Flange (DIN, ASME), Tri-Clamp) others on request
Process pressure	0 to 20 bar (0 to 280 psi)
Windows	3-Sapphire Biotech (type 3A)
Window gaskets	EPDM (FDA / USP Class VI), others on request
Temperature ratings	
Process temperature	permanent: 0 - 120 °C (32 - 248 °F) / peak 15 min/day: 0 - 150 °C (32 - 302 °F)
Ambient temperature	operation: 0 - 40 °C (32 - 104 °F) transport: -20 - 70 °C (-4 - 158 °F)

Pressure and temperature ratings specified herein may be subject to limitations - see instruction manual.  
The appropriate choice of material for all wetted parts is the sole responsibility of the user.  
Data given are subject to changes without prior notice.

## 10 | Probe Sensors AS16-N/AS16-F



**Model AS16** Single Channel Absorption

- |                   |                                 |
|-------------------|---------------------------------|
| 1 OPL             | 2 Windows                       |
| 3 Lamp module     | 4 Optics modules (incl. filter) |
| 5 Detector module |                                 |

*No window gaskets used*

The AS16 series probes are high precision sensors measuring turbidity (AS16-N) or color (AS16-F) for use in various industries. The sensors are designed for inline operation and provide accurate concentration measurements with remarkable repeatability, linearity and resolution.

### AS16

The AS16 series offers the high-end range of optek probe sensors. A wide selection of different optical path lengths and insertion depths combined with optional calibration filters and electro-polished stainless steel meet the requirements of the biotechnology and beverage industries.

#### NIR-Absorption (Turbidity) VIS-Absorption (Color)

A special tungsten lamp produces a constant light beam that passes through the process medium. The attenuation of the light intensity, caused by absorption and/or scattering by dissolved and undissolved substances, is detected by a sealed silicon photodiode. AS16-N uses light from 730 - 970 nm to measure solids concentration independent from color or color changes (e.g. yeast concentration in beer during tank transfer). AS16-F uses a specific wavelength in the visible spectrum to measure color in liquids with little or no turbidity (e.g. beer in water during phase change).

### OPL

Special optical windows are made from a single crystal sapphire, providing superior resistance to all abrasive and corrosive media. optek's superior manufacturing techniques allow mounting the windows without gaskets or glue for a lifetime without maintenance. The appropriate choice of the optimal OPL (optical path length = distance between the windows) supports all measurement requirements, e.g., low/high measuring ranges at highest resolution.

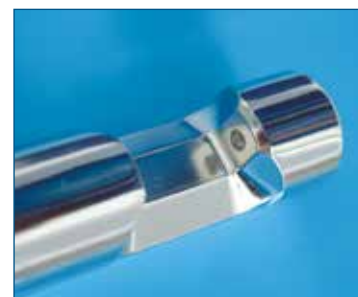
### NIST-traceable

NIST-traceable calibration accessories (AS16 only) provide absolute measurement confidence (for details refer to our Control 4000 product information brochure).

### Typical Applications:

- Filter feed monitoring (AS16-N)
- Beer/water phase separation (AS16-F)

*See our various product and application brochures for further details*



optek AS16-N Single Channel Absorption Probe



optek AS16-VB-N  
Single Channel Absorption Probe with Calibration Option

Technical Data		AS16	
Measurement			
Measurement principle		1- Channel Absorption of light	
Detector		1 silicon photodiode (hermetically sealed)	
Measurement wavelength		<ul style="list-style-type: none"><li>AS16-N: 730 - 970 nm</li><li>AS16-F: 430, 550 or 620 nm</li></ul>	
Measuring range		AS16-N: any measuring range between 0 - 0.05 to 6 CU AS16-F: any measuring range between 0 - 0.05 to 2 CU (depending on wavelength)	
Optical path length		1, 5, 10, 20 or 40 mm	
Calibration		CU (concentration units) application specific calibration	
Light source		special incandescent tungsten lamp 5.0 V DC, 970 mA typical life span: 3 to 5 years (25,000 to 40,000 hours)	
Resolution		< ± 0.05% of respective measuring range	
Repeatability		< ± 0.5% of respective measuring range	
Linearity		< ± 1% of respective measuring range (specific to application)	
Protection		all optical parts have an IP rating of IP65 or higher	
Process adaption			
Material		wetted parts: stainless steel 1.4435 (SS 316L) dF < 1%, BN2 surface: N5: Ra < 0.4 µm (16 µinch) – electropolished housing: stainless steel 1.4571 (SS 316 Ti)	
Port connection		thread G1-1/4 in., ISO 228/1 for port AS25 (similar Ingold-port) diameter: 25 mm (D = 25 H7) O-ring groove for 30 mm and for 60 mm port length	
Port gasket		O-ring 18.64 x 3.53 mm EPDM (FDA / USP Class VI)	
Insertion depth		35 mm (1.38 in.) + OPL at a port length of 60 mm (2.36 in.)	
		135 mm (5.31 in.) + OPL at a port length of 60 mm (2.36 in.)	
Process pressure		0 to 20 bar (0 to 290 psi)	
Windows		sapphire (seal-less)	
Window gaskets		n/a	
Installation accessories		weld-in ports, Varivent adapter (50.00), clamp adapter (1.5 and 2.0 in.)	
Temperature ratings			
Process temperature		permanent:           0 - 100 °C (32 - 212 °F) peak 60 min/day:   0 - 150 °C (32 - 302 °F) peak 90 min/day:   0 - 130 °C (32 - 266 °F)	
Ambient temperature		operation:            0 - 40 °C (32 - 104 °F) transport:           -20 - 70 °C ( -4 - 158 °F)	
Calibration			
Calibration adapter		none	
Calibration adapter OPTION VB		Filter adapter FH03 for calibration filter used for sensor verification	

Pressure and temperature ratings specified herein may be subject to limitations - see instruction manual.  
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