High Speed, Non-Contact Diameter Gauge

InteliSENS® DG-K Series Diameter Gauge

Features

- Completely solid-state design with no moving parts for very high measurement speed and long term reliability.
- Eye-safe LED illumination.
- Integrated air wipes.
- Comprehensive selection of standard and optional industrial communications interfaces.
- Optional integrated PI feedback controller for controlling extruders or capstan drives on insulation lines.
- Optional integrated lump and neck flaw detection capability (SMFD-Single Measurement Flaw Detection).
- Optional integrated fast Fourier transform(FFT), statistical analysis and Statistical Process Control SPC) functions available.

Introduction

Proton Products InteliSENS® DG-K series dual and triple-axis diameter gauges are super fast, with scan rates of 1000 to 12500 scans/second/axis, providing outstanding product quality supervision.

Using LED light sources, high-speed Digital Signal Processing (DSP) and specialized optical design to measure, control, inspect, alarm and report diameter as well as Surface Quality Defects (SQD) as they happen, reducing customer complaints and improving your reputation as a quality product supplier.

The LED light sources cover the complete circumference of the product and any change in the diameter is immediately detected by the CCD optical receiver, measuring, controlling, alarming and reporting the diameter as well as the height, length and location of lumps and necks (if the SMFD option is purchased) along and around the product.

Extremely easy to install, integrate and use, InteliSENS® DG-K series super fast diameter gauges can be used as a stand-alone device or integrated with production line PLCs. Optional audio/visual alarm units, fault printers and data logging PC software are available to complement the diameter gauge and close the loop on quality control.

Applications include production processes such as insulation extrusion and jacketing, wire drawing, quality control during rewinding and coiling, and rubber and plastic extrusion processes for hose, tube and pipe production.

Operating principle

The Proton Products InteliSENS® DG-k series of diameter gauges illuminate each axis of the measured object with light from a LED light source. The measured object obstructs part of the light which is then imaged onto a CCD detector array. Analysis of the pixel data from the CCD yields the object diameter. As this system is entirely solid state, it provides a very fast measurement rate together with the reliability and robustness of a system free from moving parts.

The high measurement rate of the InteliSENS® DG-k series also enables it to function as a lump and neck flaw detector at medium line speeds (< 500 m/min) when purchased with the high speed (12.5k) and SMFD (Single Measurement Flaw Detection) options.

Specifications

InteliSENS® DG2015-k 15mm Diameter Gauges

Model	DG2015-5K	DG2015-12.5K	Units
Number of axes	2	2	-
Scan rate	5000	12500	scan/s/axis
Cumulative scan rate	10000	25000	scan/s
Update time	200	80	µs
Maximum weight	3.4		g

Specification	Minimum	Typical	Maximum	Units
Object diameter	0.2		15	mm
Optical gate diameter			16	mm
Accuracy*	-1		1	µm
Output resolution			1	µm

InteliSENS® DG2030-k and DG3030-k 30mm Diameter Gauges

Model	DG2030-5K	DG2030-12.5K	DG3030-5K	DG3030-12.5K	Units
Number of axes	2	2	3	3	-
Scan rate	5000	10000	5000	10000	scan/s/axis
Cumulative scan rate	10000	25000	15000	37500	scan/s
Update time	200	80	200	80	µs
Maximum weight	5		6.5		kg

Specification	Minimum	Typical	Maximum	Units
Object diameter	0.2		30	mm
Optical gate diameter			32	mm
Accuracy*	-1		1	µm
Output resolution			1	µm

** For a < 15mm diameter object centred in the optical gate. Accuracy is ±3µm for a 15 to 30mm diameter object centred in the optical gate. Add an additional 0.05% for objects not centred in the optical gate.*

InteliSENS® DG2060-k and DG3060-k 60mm Diameter Gauges

Model	DG2060-5K	DG2060-12.5K	DG3060-5K	DG3060-12.5K	Units
Number of axes	2	2	3	3	-
Scan rate	5000	12500	5000	12500	scan/s/axis
Cumulative scan rate	10000	25000	15000	37500	scan/s
Update time	200	80	200	80	µs
Maximum weight	TBA		18		kg

Specification	Minimum	Typical	Maximum	Units
Object diameter	0.3		60	mm
Optical gate diameter			64	mm
Accuracy*			±(3µm+0.01% of object diameter)	-
Output resolution			1	µm

InteliSENS® DG2200-k 200mm Diameter Gauges

Model	DG2200-1K	DG2200-3K	Units
Number of axes	2	3	-
Scan rate	5000	12500	scan/s/axis
Cumulative scan rate	10000	37500	scan/s
Update time	200	80	µs
Maximum weight	TBA		kg

Specification	Minimum	Typical	Maximum	Units
Object diameter	2		180	mm
Optical gate diameter			200	mm
Accuracy*			±(10µm+0.005% of object diameter)	µm
Output resolution			0.01	µm

** For an object centred in the optical gate.*

Specification	Min	Typical	Max	Units
Operating temperature	5		45	℃
Environmental protection			IP65	
For DC power supply models only:				
DC Power supply voltage	15	24	28	VDC
DC Power consumption (with optional AiG2 interface display unit)			30	W
For AC power supply models only:				
AC Power supply voltage	85		274	VAC
AC Power supply frequency	47		63	HZ
DC Power consumption (with optional AiG2 interface display unit)			40	W

Light source	LED	
Air wipe	Integrated air wipe system	
Measurement units (user configurable)	Millimetres (line speed:millimetres/minute, length:metres)	
Measurement modes	Solid	Solid object diameter
	Glass	Transparent object diameter

Standard Interfaces

2x digital inputs	User configurable	Reset	Print Activation			
	Maximum input voltage	24 Vdc				
4x relay outputs	User configurable function	Guage OK	Upper tolerances exceeded	Lower tolerances exceeded	Single Measurement Flaw Detection (SMFD)	
	Isolated contact rating	maximum 50 VDC/30 VAC/0.5 A				
Line speed inputs*	Analogue input	0 - 10 Vdc, user scalable				
	Speed pulse input	250 kHz max frequency, 30 V or 50 V max pulses (on two distinct inputs), user scalable				
Communication interfaces		RS-232**	RS - 422	RS - 485	CAN-bus***	Ethernet

**Required for optional PI feedback controller operation*
***An optional RS-232-to-USB converter cable is available for connection to USB equipped computers.*
***CAN-bus protocol is proprietary and reserved for connection to other Proton Products equipment such as an AiG2 interface display unit.*

Optional Interfaces

Must be specified for installation at time of manufacture, cannot be retrofitted.

3x Analogue outputs	±10 Vdc output of diameters errors, user scalable
Wireless communication interfaces	Choice of any one of: Bluetooth or WiFi
Industrial communication interfaces	Choice of any one of: PROFIBUS, EtherNet/IP or DeviceNET

** Wireless interfaces are not available in units destined for European markets.*

Optional Functionality

Must be specified for installation at time of manufacture, cannot be retrofitted.

PI feedback controller	Proportional Integral feedback controller
Statistics	Maximum, minimum, mean, standard, deviation, Cp, Cpk
SPC	Statistical Process Control automatic set point for PI feedback controller(requires PI feedback controller option)
FFT	Fast Fourier Transform analysis for amplitude and frequency of periodic diameter variations
SMFD	Single Measurement Flaw Detection (Lump and Neck detection)

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