3D Shaper
Product Catalog

Laser-Based Dimensional Measurement Systems for Long Products

3D Shaper Lj Series: Measurement Frame and Electronics Power Cabinet

3200 Kettering Blvd., Moraine, Ohio 45439 USA
Phone: +1 (937) 254-3500 | www.globalgauge.com

1. System Overview

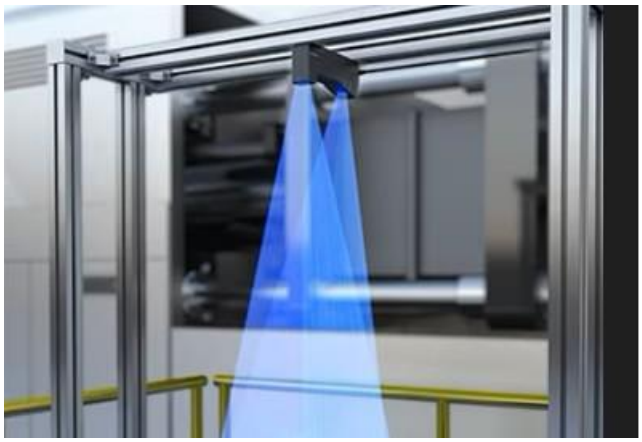
The 3D Shaper is a laser-based dimensional measurement system designed for inline inspection of long products during manufacturing. Using multiple linear laser sensors arranged in a fixed frame, the system reconstructs the full 360-degree cross-sectional profile of rods, tubes, box profiles, billets, and custom sections as they pass through the measurement field.

The system is entirely static with no moving parts. Sensors are fixed to a precision frame, eliminating the alignment maintenance and mechanical wear associated with rotating or gyroscopic measurement devices. Shape detection occurs by triangulating the distance from each sensor to the product surface, with the resulting distance vectors combined to reconstruct the complete sectional geometry.

Data acquisition and processing are handled by a PAC (Programmable Automation Controller), which integrates PLC I/O management with PC-based computation. The operator interface is served as a web application accessible from any browser-equipped device on the plant network.

2. Sensor Family

The 3D Shaper platform supports multiple sensor models to match a wide range of product sizes and measurement precision requirements. All sensors use blue semiconductor laser technology (405 nm visible light, Class 2M) with integrated emitter/receiver units and single-capture HDR for reliable measurement across all surface reflectance.

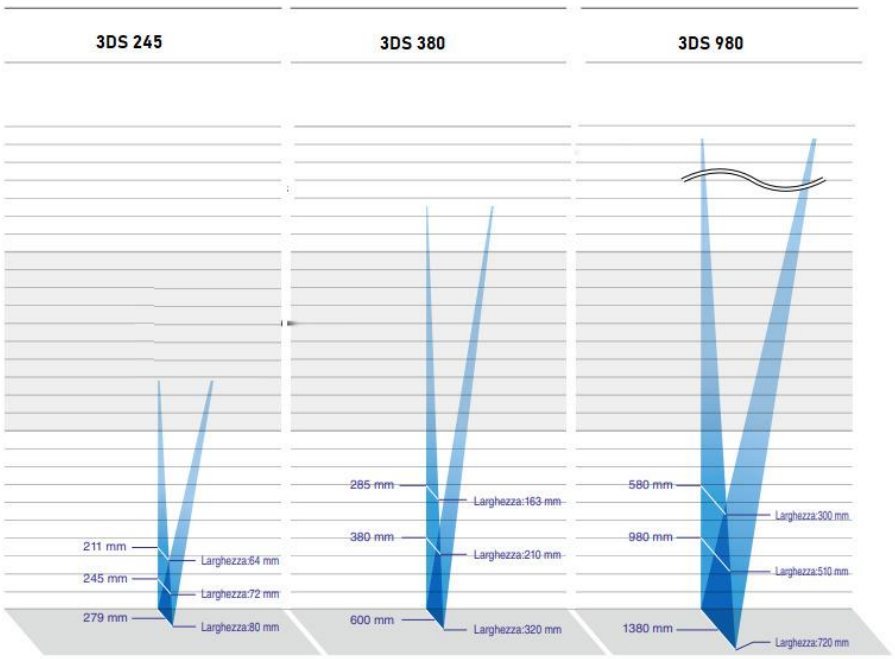


Blue semiconductor linear laser sensor in operation

2.1 Sensor Model Comparison

The following table summarizes the key parameters across the three available sensor models. The 3DS 245 targets small to medium products, the 3DS 380 covers the mid-range, and the 3DS 980 addresses large cross-sections up to 400 mm.

Parameter	3DS 245	3DS 380	3DS 980
Reference Distance	245 mm	380 mm	980 mm
Z Measuring Range	+/-34 mm (F.S.=68 mm)	+/-60 mm (F.S.=315 mm)	+/-400 mm (F.S.=800 mm)
X Range (Near)	64 mm	163 mm	300 mm
X Range (Ref.)	72 mm	210 mm	510 mm
X Range (Far)	80 mm	320 mm	720 mm
Repeatability (Z)	1 um	5 um	10 um
Repeatability (X)	3 um	10 um	25 um
Profile Data Range (X)	25 um (20 um~)	75 um (100 um~)	75 um (100 um~)
Profile Points	3,200	3,200	3,200
Light Source	405 nm Blue	405 nm Blue	405 nm Blue
Laser Class	2M	2M	2M
HDR	Single Capture	Single Capture	Single Capture
Enclosure	IP67	IP67	IP67
Weight	~1,200 g	~1,400 g	~1,600 g



Sensor working range comparison: 3DS 245, 3DS 380, and 3DS 980

All sensor models share the same controller interface, software platform, and communication architecture. Upgrading from one model to another requires only a sensor and frame change; the EPC and Shape Monitor software remain the same.

2.2 Sensor Selection Guidance

Sensor selection depends on the maximum product cross-section, the required measurement resolution, and the available space on the process line. As a general guideline:

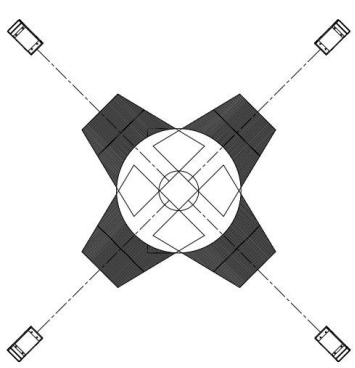
- 3DS 245: Best suited for small to medium products (up to approximately 80 mm OD/section) where sub-micron Z repeatability is required. Typical applications include precision tubing, small round bars, and wire rod. Sensors are positioned 211 to 279 mm from the product.
- 3DS 380: The most versatile model for general-purpose long product inspection (up to approximately 250 mm OD/section). Handles large tubes, box profiles, and rectangular sections with 5 um Z repeatability. Sensors positioned 285 to 600 mm from the product.
- 3DS 980: Designed for the largest cross-sections (up to 400 mm and beyond). The extended 980 mm reference distance accommodates large frame openings required for heavy sections and high-temperature environments. Sensors positioned 580 to 1,380 mm from the product.

3. Sensor Configurations

The number of sensors and their angular arrangement are configured based on the product geometry and the required measurement coverage. The following standard configurations are available.

3.1 Four-Sensor X-Configuration (Standard)

Four sensors are arranged at 90-degree intervals in an X-pattern. This is the standard configuration for full 360-degree cross-section reconstruction of round, square, and rectangular products. Each sensor covers a 90-degree arc, and the overlapping zones at transitions provide redundancy for profile stitching.

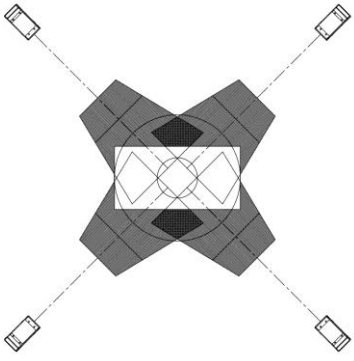


Standard four-sensor X-configuration

Applications: tubes, pipes, round bars, square bars, box profiles, rectangular sections.

3.2 Six-Sensor Configuration

Six sensors are arranged at 60-degree intervals for enhanced resolution and redundancy on complex or large cross-sections. The additional sensor pairs improve profile accuracy in the overlap zones and provide higher angular resolution for detecting localized surface anomalies.

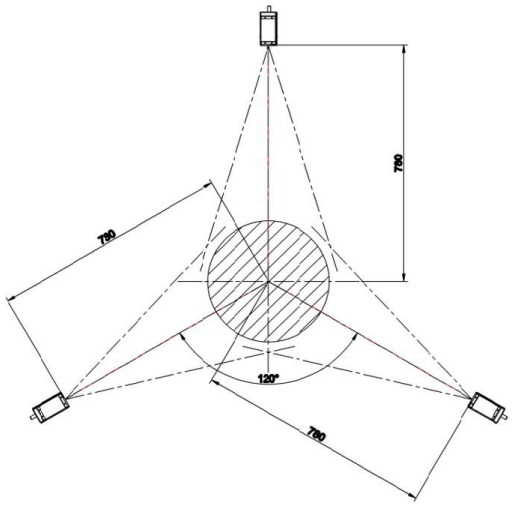


Six-sensor configuration for enhanced coverage

Applications: precision tubes with tight ovality requirements, large structural sections, products where defect detection sensitivity is critical.

3.3 Three-Sensor Configuration

Three sensors arranged at 120-degree intervals. Suitable for round products where full rectangular coverage is not required, or where physical space constraints prevent additional sensor positions.



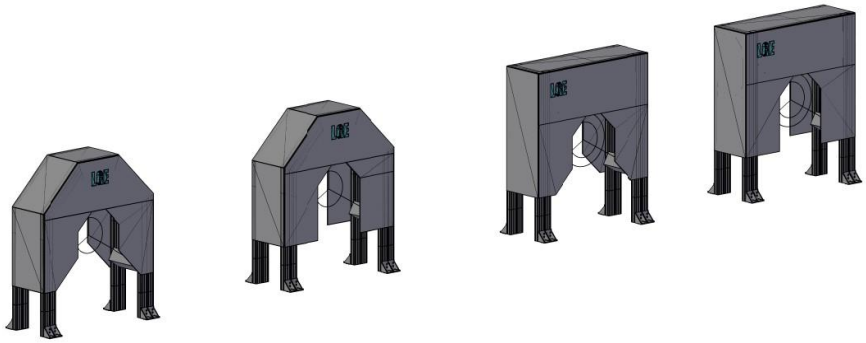
Three-sensor configuration with 120-degree angular coverage

3.4 Custom Configurations

For specialized applications, sensor count and angular positions can be customized. Examples include asymmetric arrangements for products constrained on one side, or dual-ring configurations where two sets of sensors are spaced along the product travel direction to enable straightness measurement over a defined gauge length.

4. Frame Options

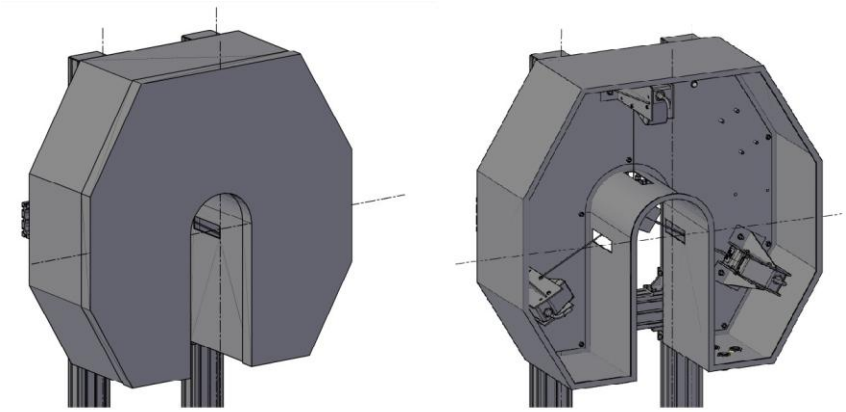
The measurement frame houses the sensors and provides the structural reference for dimensional accuracy. Frame designs are customized to the product size range, sensor model, and physical constraints of the installation location.



Frame Hex variants scaled to product size requirements

4.1 Standard Hex Frame

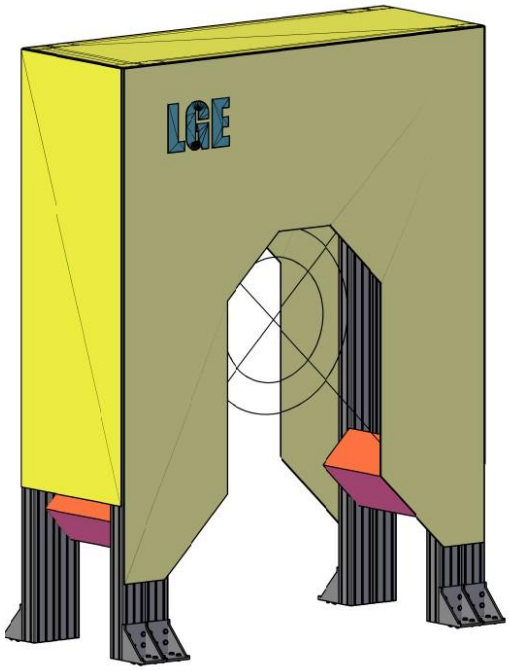
The hexagonal frame is the standard enclosure for four-sensor and six-sensor configurations. It provides an open pass-through aperture for the product, with sensor windows on each face. The hex geometry provides excellent structural rigidity while minimizing the overall footprint.



Frame Hex: external view (left) and internal cutaway showing sensor mounting (right)

4.2 Large-Format Frame

For applications using the 3DS 980 sensor with profiles up to 400 mm, the resulting frame has significant dimensions. The large-format frame includes thermal management provisions and reinforced mounting for heavy industrial environments.



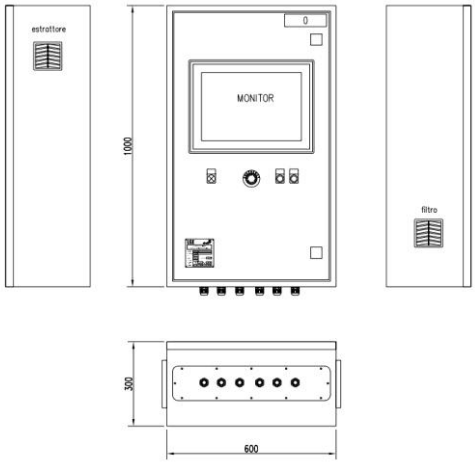
Large-format Frame Hex for 3DS 980 applications

4.3 Frame Sizing

Frame internal dimensions are determined by the maximum product cross-section plus the required sensor standoff distance. Final frame dimensions are confirmed during the engineering phase after receipt of detailed line drawings and product specifications from the customer. The frame contains, but is not limited to, the sensors, windows, and interconnections.

5. Electronics Power Cabinet (EPC)

Each 3D Shaper system includes a floor-standing Electronics Power Cabinet containing all processing, control, and power distribution components. The EPC is designed for installation in the mill environment and includes Peltier-cell thermal management to maintain stable internal temperatures without compressed air or water cooling.



EPC dimensional drawing (600 mm W x 300 mm D x 1000 mm H)

5.1 Standard EPC Contents

- PAC (Programmable Automation Controller): integrated PLC + PC platform for sensor data acquisition, profile computation, and HMI serving
- Sensor controller(s): one controller per sensor pair, managing laser timing and data transfer
- HMI local panel PC with industrial touchscreen monitor, pre-loaded with Shape Monitor software
- Peltier cell refrigeration unit for cabinet thermal management
- Power supplies, safety relay, hardware start/stop buttons, and E-stop mushroom button

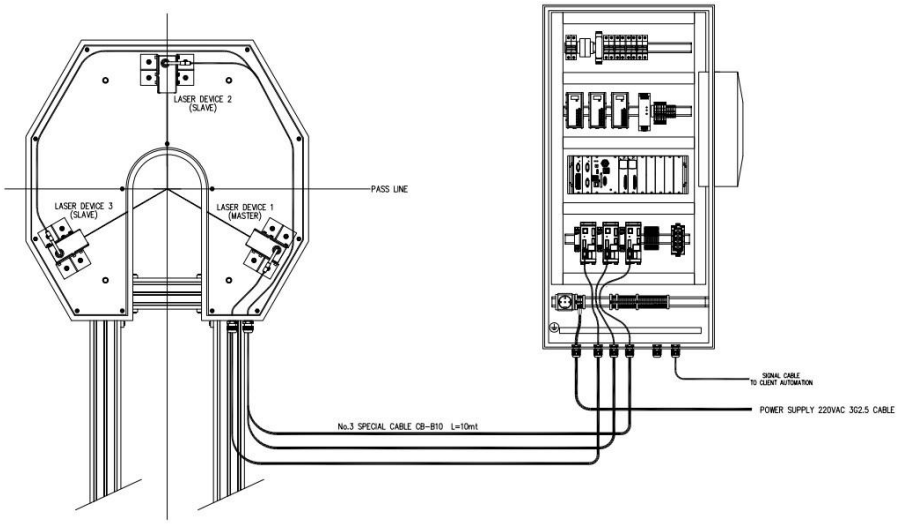
EPC internal view showing PAC, sensor controllers, and Peltier cooling unit

5.2 Electrical Standards

The EPC is manufactured in accordance with CEI EN 61439-1, CEI EN 61439-2, and CEI EN 61439-3 standards, with the following operating parameters: rated insulation voltage Ui 690VAC, rated operating voltage Ue 400/230VAC, nominal auxiliary voltage 24VDC, nominal frequency 50Hz, rated short-time allowable current Icw 6kA.

5.3 System Interconnections

Each sensor connects to the EPC via a dedicated data cable. Signal cable to client automation and power supply connections are routed through the bottom of the cabinet.



System interconnection diagram: frame sensors to EPC to plant automation

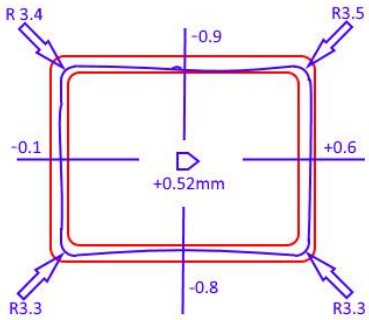
6. Shape Monitor Software

The Shape Monitor software provides the operator interface, data processing, tolerance management, and communication functions for all 3D Shaper configurations. The software runs on the PAC inside the EPC and serves its interface as a web application accessible from any browser on the plant network.

Shape Monitor main HMI: longitudinal trend (left), cross-section profile with dimensional callouts (right), overall quality gauge (bottom left)

6.1 Core Functions

- Real-time cross-sectional profile display with deviation-from-target overlay
- Longitudinal trend chart showing profile compliance along the full product length
- Configurable tolerance thresholds per profile type (manual or automatic via Level 2)
- Alarm indication via HMI display and digital output contacts (dry contact terminal block)
- Cursor-based section inspection: select any point on the longitudinal trend to display the corresponding cross-section with dimensional callouts
- Overall quality gauge with pass/fail summary



Selected profile detail: measured cross-section vs. target tolerance template for a square bar product

6.2 Measurement Outputs

Depending on product type and sensor configuration, the Shape Monitor software computes and displays the following measurements:

Measurement	Round Products	Square/Rectangular	Billets/Sections
Outside Diameter	Yes	N/A	N/A
Ovality	Yes	N/A	N/A
Width / Height	N/A	Yes	Yes
Corner Radius	N/A	Yes	Application-dependent
Flatness per Face	N/A	Yes	Application-dependent
Symmetry	Yes	Yes	Yes
Straightness	Yes	Yes	Yes
Curvature	Yes	Yes	Yes
Surface Anomalies	Yes (6+ sensors)	Yes (6+ sensors)	Yes (6+ sensors)
Position / Alignment	Yes	Yes	Yes

6.3 Communication Protocols

- Native Ethernet (TCP/IP): standard for HMI access, data export, and network integration
- PROFIBUS (optional): for integration with Siemens and other PROFIBUS-based Level 1/Level 2 systems
- Digital I/O: dry contact outputs for tolerance alarms, product sort decisions, and system status
- Bidirectional protocol support: Level 2 systems can send target dimensions and product ID; the 3D Shaper returns measured values and quality results automatically

7. Optional Add-On Stations

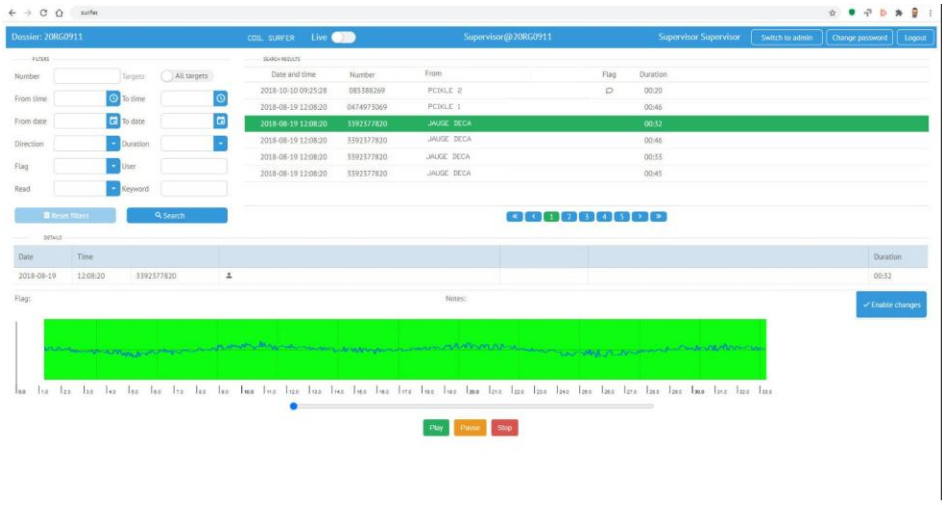
7.1 Remote Operator Station

One or more remote operator stations can be added to extend the Shape Monitor display to additional locations such as the main control pulpit, quality control office, or supervisory workstation. Remote stations connect via UTP Cat.5e network cable (up to 90 meters; optical fiber beyond that distance) and access the same web-based HMI served by the PAC.

Remote operator station installed in a mill control pulpit

7.2 Data Server Station (ReportSurfer)

The Data Server station provides centralized storage, search, comparison, and printing of historical inspection reports. Workstations are equipped with ReportSurfer software, which enables quality control personnel to review data from each process run. A single Data Server can aggregate data from multiple 3D Shaper systems across different production lines.



ReportSurfer software: historical data search, comparison, and playback

8. Supported Product Range

The 3D Shaper platform covers the following throat measurements and section sizes. Wall thickness range is 5 to 20 mm.

Round (OD, mm)	Square/Rectangular (mm)	Large Rectangular (mm)
< 100	100x100 to 180x180	200x100 to 254x254
127 to 355.6	120x80 to 160x90	250x100 to 300x300
(14 standard sizes)	(18 standard sizes)	400x200

Custom sizes outside these ranges can be accommodated with appropriate sensor and frame selection. Contact GGC for application review.

9. Standard Scope of Supply

Every 3D Shaper system is delivered as a complete, ready-to-install measurement solution.

Hardware

- Laser sensor package (quantity per configuration: 3, 4, or 6 units)
- Electronics Power Cabinet (EPC) with PAC, sensor controllers, HMI, and thermal management
- Measurement frame assembly, custom-sized per application
- System cables (Cat 6, up to 100 m) and local power cables (up to 25 m)

Software

- Shape Monitor application, pre-loaded on EPC
- Tolerance configuration and alarm management tools

Documentation

- Checkout test certificates
- Operator and maintenance manuals in standard GGC format
- Three sets of system drawings on standard GGC title blocks

Services (Billed at Actual)

- Installation supervision (optional): equipment removal, cable pulling, frame mounting, EPC placement
- Commissioning: estimated 3 days (8-hour shifts) after customer completes installation
- On-site operator and maintenance training

All designs meet or exceed applicable Codes and Standards.

10. Environmental Specifications

The following environmental specifications apply to all sensor models in the 3D Shaper family.

Parameter	Specification
Operating Temperature	0 to +45 C (sensor head, mounted on metal plate)
Relative Humidity	85% or less (non-condensing)
Enclosure Rating	IP67 (IEC60529)
Ambient Light Tolerance	Incandescent: 10,000 lux or less
Vibration Resistance	0 to 57 Hz, 1.5 mm double amplitude, 3 hrs per axis
Impact Resistance	15 G / 6 ms
Sensor Material	Aluminum
Laser Safety Classification	Class 2M (IEC60825-1, FDA CDRH 1040.10)
Temperature Stability	0.01% of S.C. per degree C

11. Contact

For application review, budgetary pricing, or technical consultation on the 3D Shaper product family, contact Global Gauge Corporation:

David Kober, Vice President, Sales and Marketing
d.kober@globalgauge.com | +1 (937) 254-3500 | +1 (334) 475-1611 (cell)

Bill McCormick, President
b.mccormick@globalgauge.com | +1 (937) 254-3500