Budgetary Proposal for
3D Shaper 380 Series

Global Gauge Mission

We will consistently deliver the most advanced, accurate and reliable measurement systems to flat product producers throughout the world. We will continue to succeed because of our hard work, our innovative solutions and our intense commitment to solving our customers' problems.

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Revision History

Date	*Remarks*	*Revision*
March 25, 2024	Author: D. Kober	A_00
January 16, 2025		A_01

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1.0 Customer & Application Information

1.1 Primary Contacts

Commercial Contact

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Plant Manager - JM Steel SC
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Phone: 843-297-6368
TX Facility: 8534 Hwy 89 Suite 1, Sinton, TX 78387

1.2 Application Information

Application

Desired Units: Metric
Desired Ovality Identification Range: 127mm OD
(+/-0.076 is the acceptable passing tube OD range)
Desired Straightness Identification Range: Straightness is equal or less than the length multiplied by 0.75mm (lengths vary from ~ 20ft - 42ft)
Max Pipe Diameter: 127.076mm
Min Pipe Diameter: 126.924mm
Material Types: HR Galvanized

Utilities

Power: 120V, 60HZ, 10-15 amp

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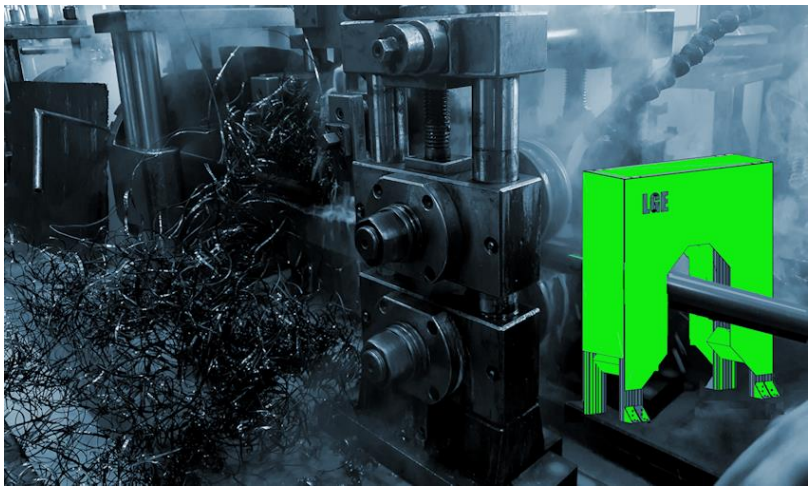
2.0 Global Gauge Recommended System

3D Shaper is an innovative solution to identify external visible shape, dimensions, defects and out of dimensional tolerances in line during the manufacturing processes of long products. It finds its natural application in the identification of deviations from the standard of the external shape and in the diameter of rods, tubes, box profiles and billets compared to expected.



2.1 Overview of Proposed Solution

The 3D Shaper uses laser technology and is equipped with linear laser sensors, generally 4 in number arranged to cover an angle of 90° each, reconstructing the sectional shape of the object at 360°.

Depending on the size of the object to be measured, type of sensors, dimensions of the frame and distances of the sensors from the object can vary significantly.

The system is designed to have no moving parts, but uses static sensors fixed to the frame which guarantees protection, proper alignment, and safe use. The invariance of the positioning tolerances and the distance from the piece to be inspected make it a system that does not require excessive care in controlling the alignment of the mechanics, compared to parts in translation/rotation (e.g. gyroscopes).

The detection of the shape and the quantification of the dimensions occur by determining the distance of the object from the measurement sensor. The distance vector reconstruction represents the shape of the measured linear/conical/rounded surface.

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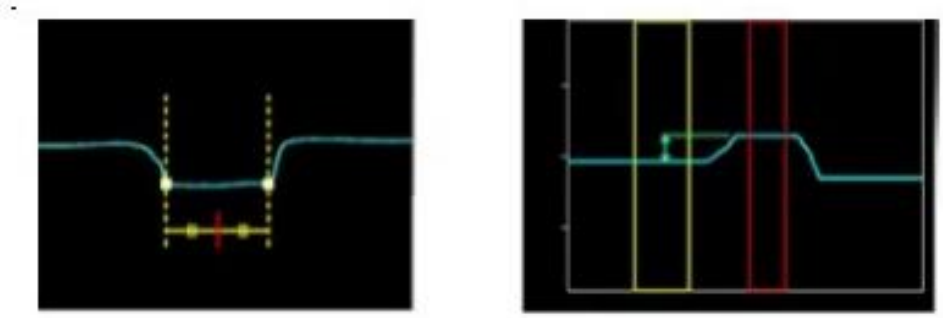
The acquisition of data from the sensor and the software for its processing and presentation is carried out by a PAC system, which is a PLC integrated into a PC.



Signal Processing

While the PLC part carries out the function of managing the IOs internal and external to the system, the PC part carries out calculations and builds the operator interface as a web server where a graphic trend of the value resulting from the amount of data in tolerance is generated.

The data received from the controllers in the form of vectors are organized to be integrated with each other, reconstructing the profile of the object section, and valuating its physical dimensions.

This allows for the operator interface to be visualized on any PC with any operating system by leveraging the HTTP protocol (a normal internet browser is sufficient).

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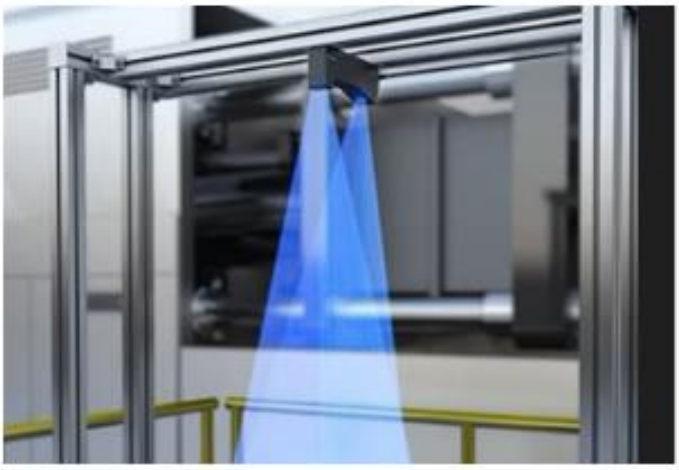
3.0 System Specifications

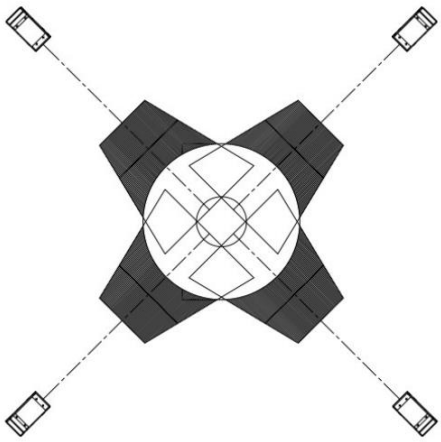
3.1 Sensors- 3DS 380

The sensors used are integrated emitter and receiver units that are located on the same side. Fixing in the correct position is essential for correct operation. The frame is optimally designed to guarantee protection, efficiency, and safe use.



Blue Semiconductor Linear Lasers

Based on the dimensions, and the required measurement range, the system will be equipped with class 2M blue light (405nm visible light) linear laser sensors with an extended working range. The application will require 4 sensors in an 'X' configuration.



Proposed Sensor Configuration

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3.1.1 Sensor Specification Table

The table below outlines the technical details of the linear laser sensors.

Reference distance			380 mm	
Measuring range	Z		±60 mm (F.S.=315 mm)	
	X	Near	163 mm	
		Ref.	210 mm	
		Far	320 mm	
Light source			Blue semiconductor laser	
	Wavelength		405 nm (visible)	
	Class		Class 2M laser equipment (IEC60825-1, FDA (CDRH) Detail 1040.10)	*1*2
	Exit		10 mW	
Spot diameter			Approximately 275 mm × 249 µm (reference distance	
Repeatability	Z		5 µm	*3*4
	X		10 µm	*3*5
Linearity			Near~reference: distance ±0.015% of F.S. (±0.004%) Total range ±0.035% of F.S. (±0.035%)	*6
Profile data range	X		75 µm (100 µm~)	*7*8
Profile data range number			3200 points	
HDR (High Dynamic Range)			Single capture HDR	*9
Laser irradiation position confirmation function	Light Source		LED blue (405 nm)	
Temperature characteristics			0.01% of S.C./°C	
Environmental resistance	Casing Classification		IP67 (IEC60529)	*10
	Ambient Light		Incandescent lamp: 10,000 lux or less	*11
	Ref. Temperature		0 to +45°C	*12
	Relative Humidity		85% UR or less	
	Vibration Resistance		0 – 57 Hz, double amplitude 1.5 mm; 3 hours each for the X, Y and Z axes	
	Impact Resistance		15 G / 6 ms	
Material			Aluminum	
Weight			About 1400 g	

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3.1.2 Sensors Specification Notes

*1 Classification performed according to IEC60825-1 in accordance with FDA (CDRH) Laser Notice No. 56.

*2 Do not look directly into the light beam with optical instruments (such as eyepiece magnifiers, magnifying glasses, microscopes, telescopes, or binoculars). Observing laser light with optical instruments is dangerous and can cause eye damage.

*3 Values measured with an average of 4096 cycles at the reference distance.

*4 The measurement target is a standard target value obtained from cases where the average height of the default area is measured using the height and position tools. All other settings are default.

*5 The measurement target is a hole gauge. This value is obtained in cases where the position of the intersection between the rounded surface of the hole gauge and the edge level is measured using the height and position tools. All other settings are default.

*6 The measurement target is a standard target. The profile data is obtained in cases where the measurement was performed with 64 smoothing cycles averaging over 8 cycles. All other settings are default. Values in parentheses are representative examples of averages for all profile data.

*7 You can change the profile data range. If changed, the measurement range in the X direction also changes.

*8 Values in brackets cannot be used when connecting

*9 Feature that enables stable, high-precision measurement with a single acquisition (exposure) at all reflectance levels, from black surfaces (low) to shiny surfaces (high).

10 This value is obtained in cases where the head cable (CB-B) or extension cable (CBB*E) is connected. Does not include CB-B**L connection.

*11 When measuring white paper, illumination on the light receiving surface of the sensor head applied to the white paper.

*12 The head must be mounted on a metal plate for use.

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3.2 Electronics Power Cabinet (EPC)

The local Electronics Power Cabinet (EPC) contains, but is not limited to;

- PAC
- Sensor controller
- HMI Local panel PC / Industrial monitor
- Peltier cell refrigerator
- Power supplies
- Safety relay
- Hardware buttons for starting and ending operations
- Emergency mushroom button

Example EPC External & Internal Views

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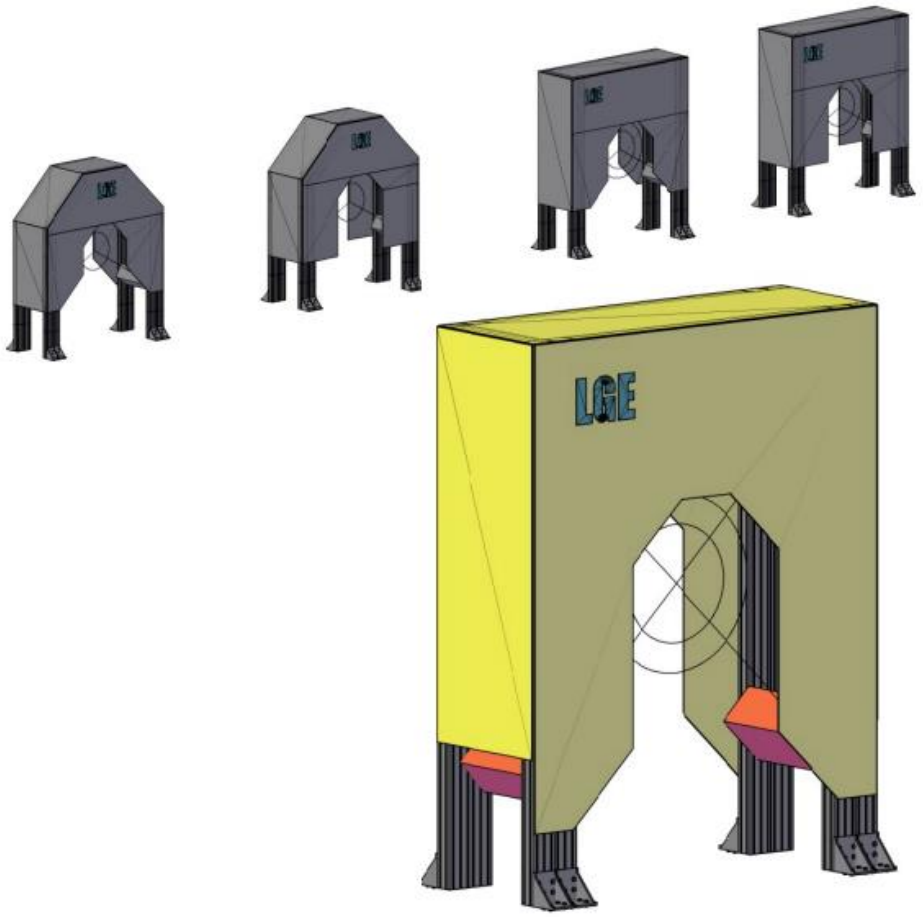
3.3 Frame Options

Depending on the shape of the process line and the size of the long product being checked, the frame can have different dimensions that guarantee the sensors the appropriate working distance, protection, and safe use.

This distance is sized based on the minimum and maximum diameter (or section) on which the check is carried out, but also based on the shape of the spaces in the check area.

It will be necessary to acquire additional information on the line for the final definition of the dimensions and dimensions of the frame. The frame contains, but not limited to the sensors, windows, and interconnections.



Frame Hex – External View

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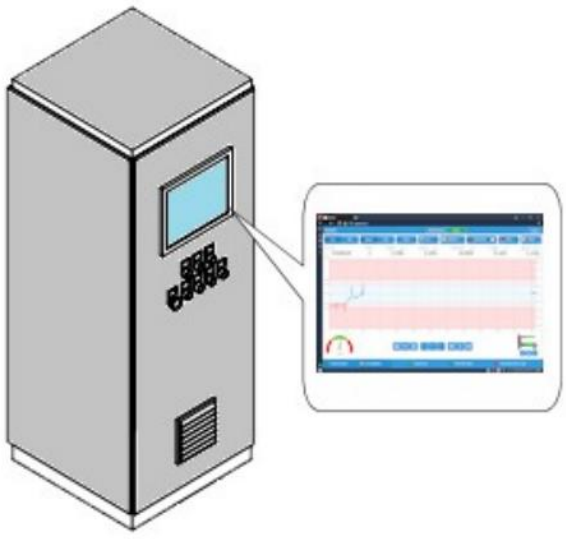
3.4 Outputs

The system is completely static, thus lacking moving parts, and reconstructs the cross-section of the measured object. The autonomous translation within the system's operational field generates a three-dimensional projection of the object along its length. If the object remains stationary, the system provides the shape of the section (circular, square, or rectangular) at the data acquisition point.

Sampling frequency and intervals can be normalized based on the object's translation speed during inspection, primarily for easier interpretation of the data displayed in the video.

If the piece is guided and virtually free of degrees of freedom except for autonomous (longitudinal) translation within the control system's area, it can also assess deviation along the longitudinal axis of the object, representing any curvature within the described constraints.

On the software's main interface, a graph displaying the trend of profiles relative to the set target is presented, accompanied by a title block indicating the respective tolerances along the longitudinal direction. Additionally, it offers the option, area by area, to obtain information on the profile's shape at a desired point.



Main HMI on EPC

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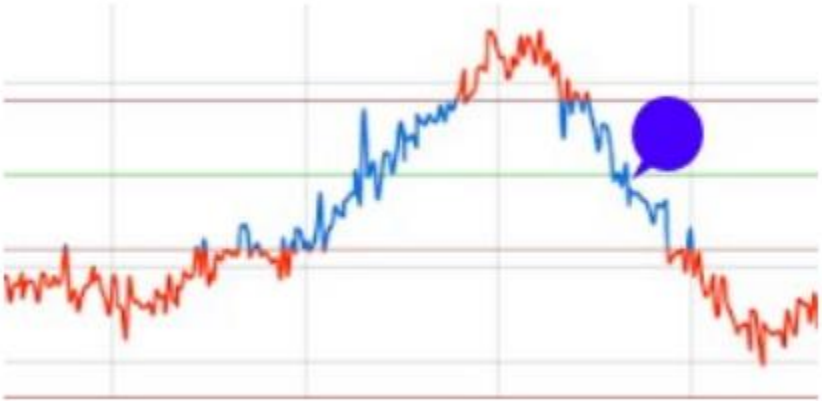
Depending on the parameter of greatest interest for process monitoring, users can incorporate limit thresholds or tolerance areas for specific parameters (such as excess curvature, symmetry defects, bending on one side, etc.). Subsequently, this information can be reported through the HMI interface for operators or at higher levels of supervision.



Example Shape Trend Chart with Limit Thresholds

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3.5 Shape Monitor Software

The Shape Monitor Software fulfills the function of presenting detected data. Users can manually or automatically define the type of profile and the tolerances for shape and size that should be adhered to. The system can identify deviations from tolerances using the entered threshold values, indicating them via the HMI interface and digital output contacts (dry contact in the terminal block) for downstream management by higher automation systems.

Example of Main HMI

The software interface is customizable, allowing immediate access to data of interest for line operators, or it can communicate results via a network bus or communication protocol (such as native Ethernet or optional PROFIBUS).

In cases where a bidirectional protocol is established with expected dimensions and target values for the object to be measured, operators won't need to preset values on the system; it will autonomously generate the processing report.

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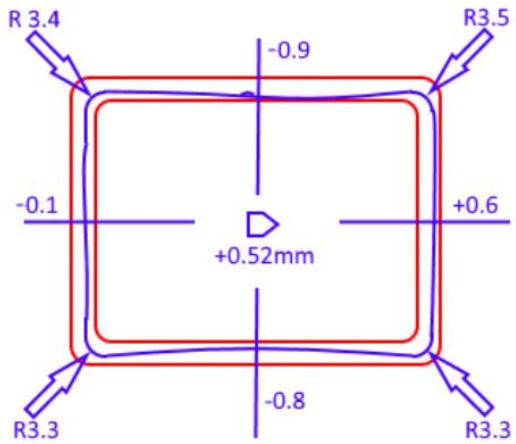
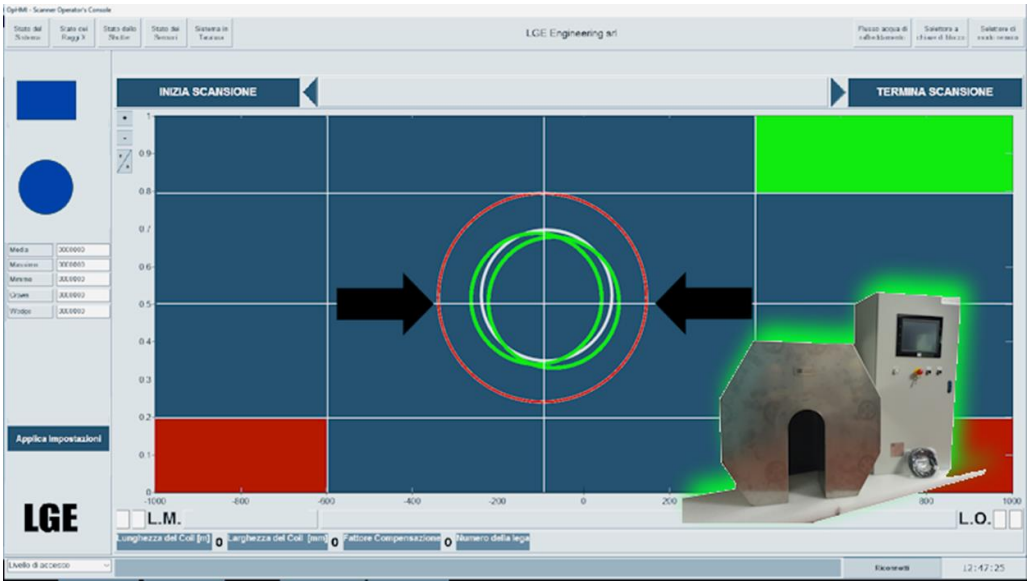
By setting the target manually or automatically, the system provides a trend indicating compliance with required tolerances. Operators can utilize a software cursor to select a point on the graphical trend, displaying the relevant section in relation to the set tolerance template and providing a numerical indication of the actual dimensions.



Selected profile details for square bar

Note:
Thresholds can be configured before commencing the check for each profile individually, or alternatively, the option for fixed thresholds can be established (which can be parameterized at start-up) for each type of profile designated as a target.



Example view for pipe and round products

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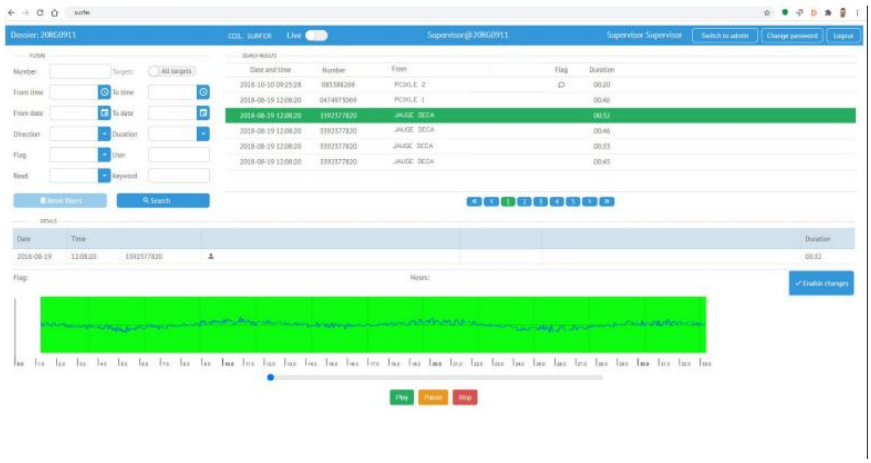
3.6 Remote Operator Station (Optional)

To enhance viewing and control operations for line operators or quality control personnel, the addition of one or more remote stations, such as those in the main control pulpit, is feasible.

Remote Operator Station

3.7 Data Server Station (Optional)

To streamline the viewing and management of processing reports by quality control personnel, the addition of one or more data server stations is possible. This software facilitates tasks such as viewing, searching, comparing, and printing the data acquired from each process. It's worth noting that a single data server has the capability to collect data from multiple lines.



Data Server Station

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4.0 Scope of Supply

The following equipment would be provided under this project. All components are being provided to result in a fully functional Width Gauge System, including all interconnecting cables.

4.1 3DS 380

Sensor Package:

4 Units, including but not limited to:

- Class 2M blue light (405nm visible light) linear laser sensors
- Integrated emitter and receiver units

Electronics Power Cabinet (EPC):

1 Unit, including but not limited to:

- Sensor controller
- HMI Local panel PC / Industrial monitor
    - Pre-loaded with applicable software tools
- Power supplies
- Safety relay
- Hardware buttons for starting and ending operations
- E-stop button

Frame Assembly

1 Unit, including but not limited to:

- Sensor enclosure, designed for sensor protection.
- Mounting for 4 sensors in an 'X' configuration

4.2 System Cables as Required

- System cables from the EPCs to the camera assembly
- Cat 6 cables, up to 100m
- Local Power Cables, up to 25 m

4.3 Documentation

- Check out test certificates
- Operator's and Maintenance Manuals, in standard GGC format
- Three Sets of system drawings on standard GGC Title Blocks

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4.4 Installation Supervision (Optional, Billed at Actual)

Gauge installation including but not limited to:

- Removal of old equipment, if applicable
- Pulling cables
- Mounting of frame assembly
- EPC placement

4.5 Commissioning (Billed at Actual)

- Complete commissioning of gauge after customer completes installations.
- Estimated at 3 8-hour days.

4.6 Training (Billed at Actual)

- On-site operator and maintenance training

Note that all designs meet or exceed all applicable Codes and Standards.

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4.7 Payment and Shipping Terms

Downpayment due with PO 40%
Shipment Payment (Net 30) 50%
Commissioning Payment (Net 30), NTE 60-days of shipment 10%

Shipping via Ex-Works, seller's dock

Shipment estimated at 24-30 weeks after Order, depending on production schedules at GGC at the time of Order placement.

Goods to be packaged in a crate suitable for domestic commercial carriers. Freight to be billed at actual cost.

4.8 Craft Labor Rates

Regular On-Site Hours & Travel Time:
Monday through Friday, 8:00 am to 5:00 pm

Rates: $220.00 per hour - Technician
$240.00 per hour – Engineer

Overtime Hours: Monday through Friday, 5:01 pm to 7:59 am, and/or any hours exceeding 8 hours per day. Saturday, Sunday & Holidays, All Day.

Rates: $240.00 per hour – Technician
$295.00 per hour – Engineer

4.9 GGC Limited Warranty

Global Gauge Corporation warrants the Global Gauge System to be free from defect in material and workmanship, under normal and proper use in accordance with Global Gauge's instructions, for a period of two years after the date of commissioning of the system, provided that commissioning occurs within six (6) months after the date of shipment from Global Gauge Corporation factory.

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5.0 Global Gauge Corporation – Key Contacts

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