

SEE SCOPE OF SUPPLY DRAWING FOR SCOPE INCLUSIONS / EXCLUSIONS

- CABLING - - - - -
- WIRE - - - - -
- EXHAUST PRESSURE TUBING - - - - -
- REACTANT - - - - -

COMPONENT MODELS
<ul style="list-style-type: none"> <li>• REACTANT BOOSTER PUMP - BLU-RP-10)</li> <li>• REACTANT INJECTOR - (BLU-INJ-10)</li> <li>• SAMPLE PROBE - (NP-10)</li> <li>• SAMPLE PROBE - (NP-12)</li> </ul>


PROJECT NAME <b>Generator Source</b>	PROPRIETARY AND CONFIDENTIAL  THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.
PROPOSAL NUMBER <b>BBC-22-000122</b>	
SALES ORDER NO. <b>32604</b>	
CUSTOMER P.O.	

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED

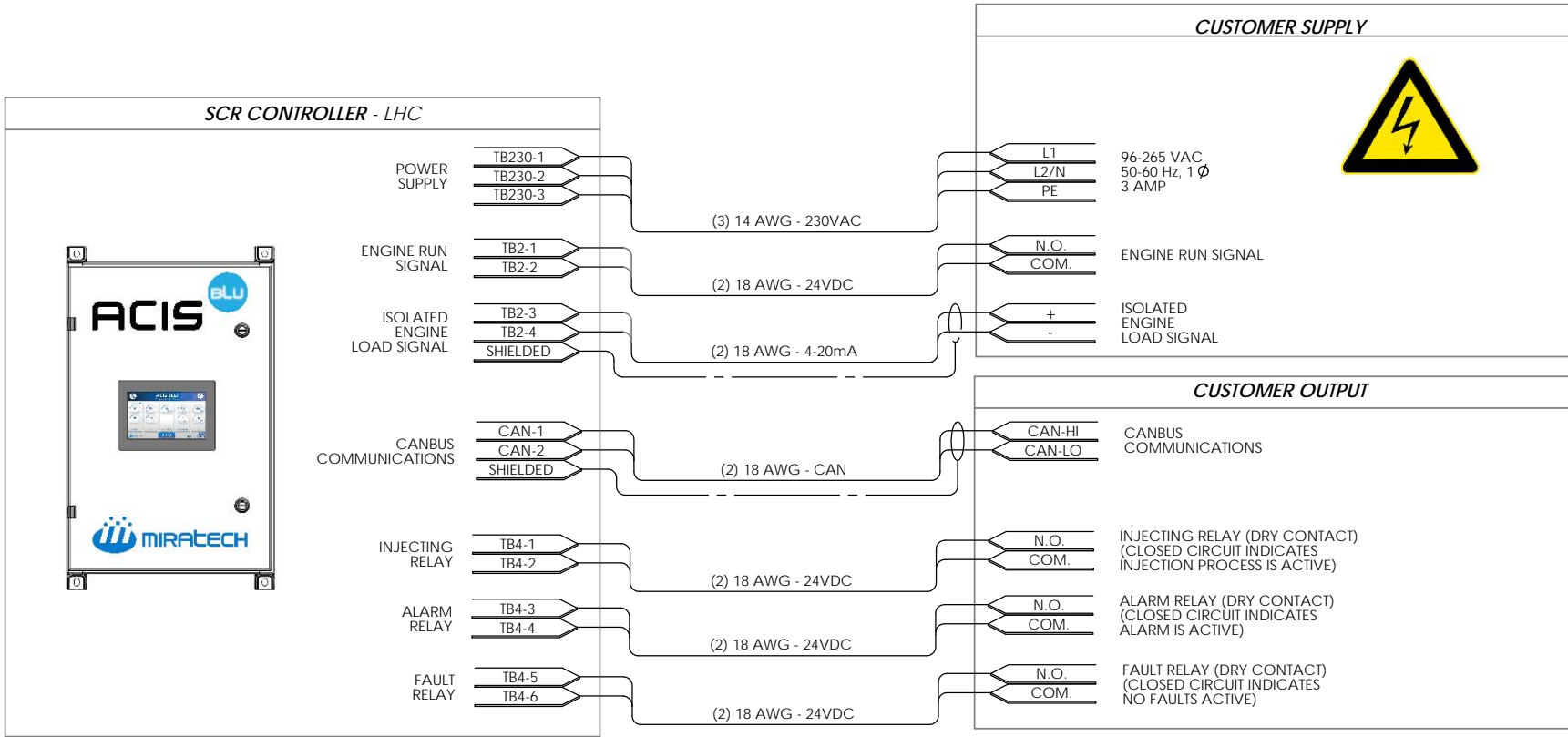
**DO NOT SCALE DRAWING**

DRAWN GFS	DATE 07/02/2019
REVIEWED BY AJM	DATE 07/08/2019

DRAWING Generator Source ACIS-BLU SL0		REV 0
SIZE A	NOT TO SCALE	SHEET 1 OF 1



**LTR CBL ACIS-BLU System Interconnect**



**NOTES:**

- ALL SHIELDED CABLE SHOULD BE TWISTED TYPE - MINIMUM 6 TURNS/FOOT
- ALL CABLE RUNS SHOULD BE CLEARLY LABELED AT ORIGIN AND DESTINATION
- WIRE SIZES SHOWN ARE MINIMUM REQUIREMENTS

PROJECT NAME <b>Generator Source</b>
PROPOSAL NUMBER <b>BBC-22-000122</b>
SALES ORDER NO. <b>32604</b>
CUSTOMER P.O.

**PROPRIETARY AND CONFIDENTIAL**

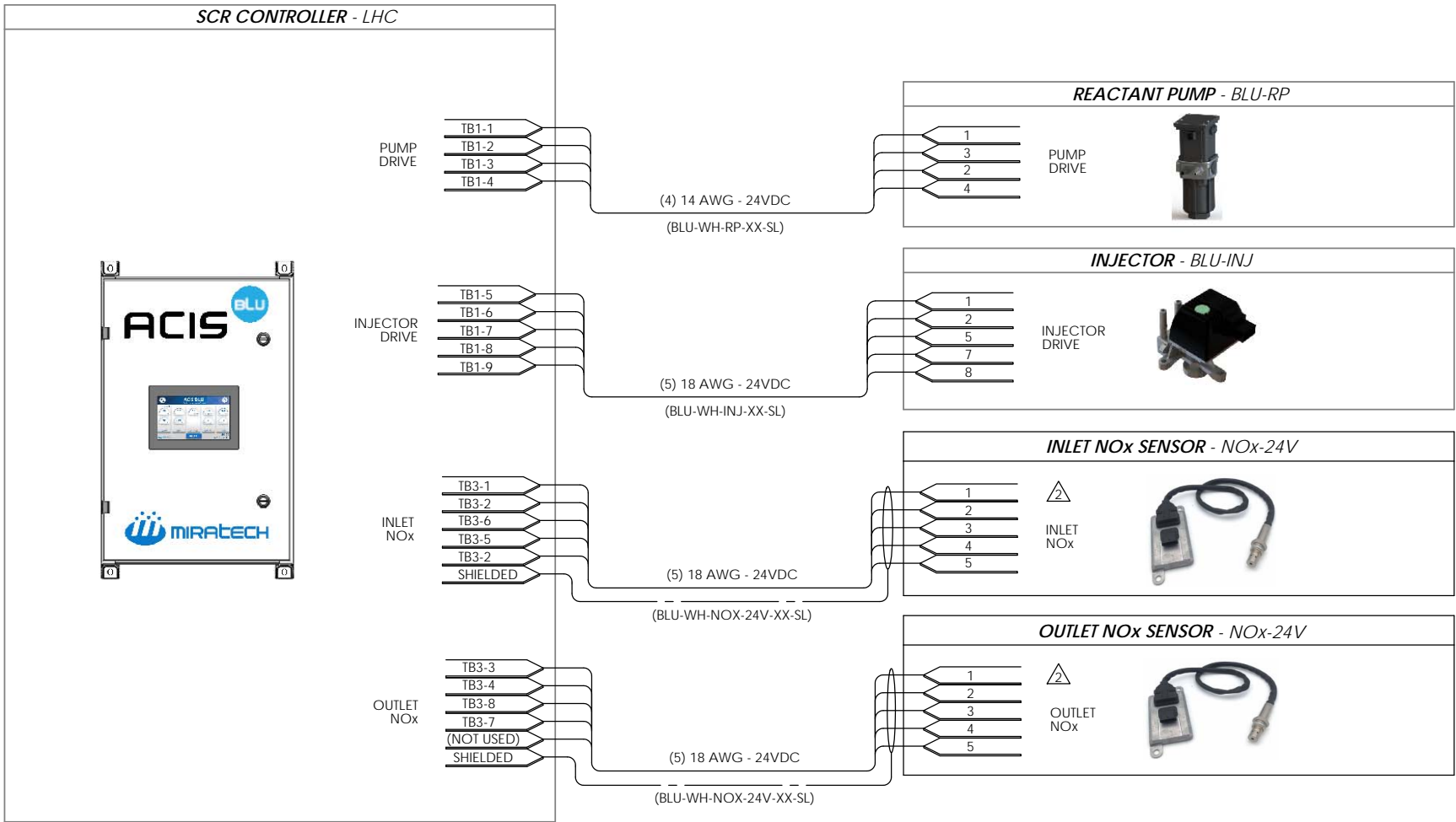
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED	
DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED	
ANGLES	
MACH: ±2*	INCHES: ±1/8
BEND: ±5*	MILLIMETERS: ±5
<b>DO NOT SCALE DRAWING</b>	
DRAWN GFS	DATE 08/22/2019
REVIEWED BY AJM	DATE 08/23/2019



**ACIS-BLU**  
**Wiring Interconnect**

DRAWING ACIS-BLU WI		REV 0
SIZE A	SCALE 1:1	SHEET 1 OF 3



**NOTES:**


- ALL SHIELDED CABLE SHOULD BE TWISTED TYPE - MINIMUM 6 TURNS/FOOT
- ALL CABLE RUNS SHOULD BE CLEARLY LABELED AT ORIGIN AND DESTINATION
- WIRE SIZES SHOWN ARE MINIMUM REQUIREMENTS

PROJECT NAME <b>Generator Source</b>
PROPOSAL NUMBER <b>BBC-22-000122</b>
SALES ORDER NO. <b>32604</b>
CUSTOMER P.O.

**PROPRIETARY AND CONFIDENTIAL**

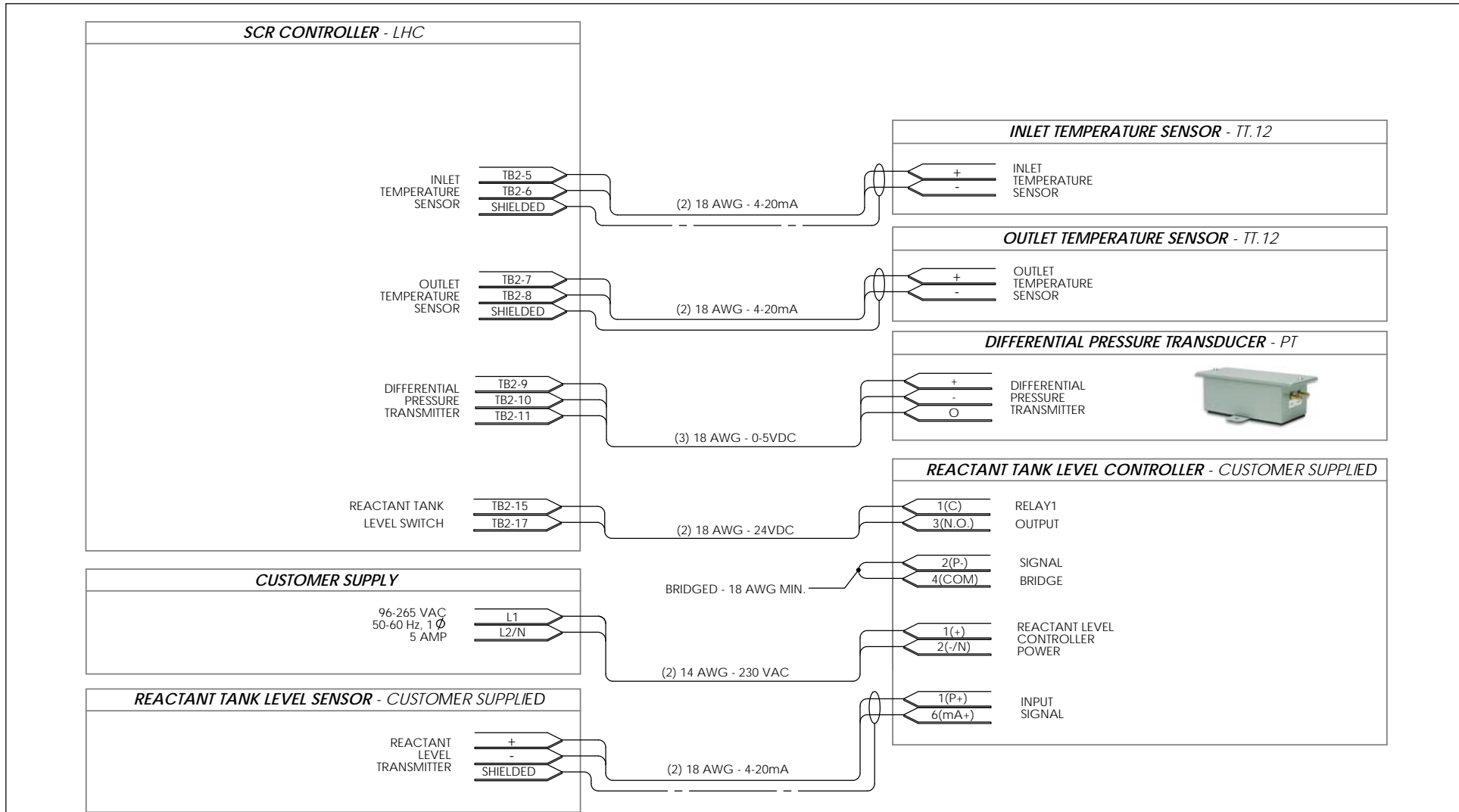
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED	
DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED	
ANGLES	
MACH: ±2*	INCHES: ±1/8
BEND: ±5*	MILLIMETERS: ±5
<b>DO NOT SCALE DRAWING</b>	
DRAWN GFS	DATE 08/22/2019
REVIEWED BY AJM	DATE 08/23/2019



**ACIS-BLU**  
**Wiring Interconnect**

DRAWING		REV
ACIS-BLU WI		0
SIZE	SCALE 1:1	SHEET 2 OF 3



**NOTES:**

- ALL SHIELDED CABLE SHOULD BE TWISTED TYPE - MINIMUM 6 TURNS/FOOT
- ALL CABLE RUNS SHOULD BE CLEARLY LABELED AT ORIGIN AND DESTINATION
- WIRE SIZES SHOWN ARE MINIMUM REQUIREMENTS

PROJECT NAME	<b>Generator Source</b>
PROPOSAL NUMBER	<b>BBC-22-000122</b>
SALES ORDER NO.	<b>32604</b>
CUSTOMER P.O.	

**PROPRIETARY AND CONFIDENTIAL**

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.

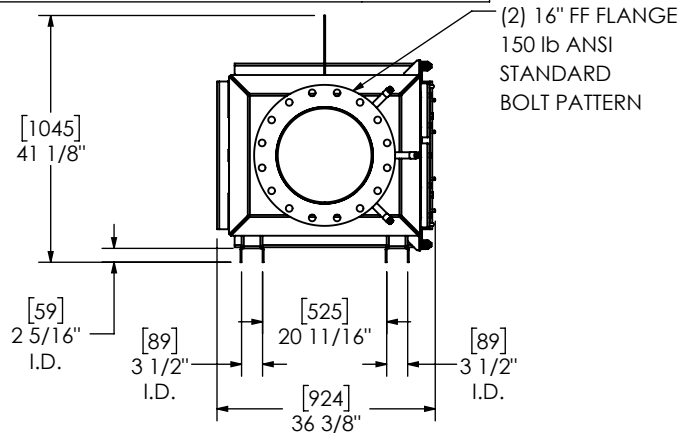
DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED	
DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED	
ANGLES	
MACH: $\pm 2^*$	INCHES: $\pm 1/8$
BEND: $\pm 5^*$	MILLIMETERS: $\pm 5$
<b>DO NOT SCALE DRAWING</b>	
DRAWN	DATE
GFS	08/22/2019
REVIEWED BY	DATE
AJM	08/23/2019



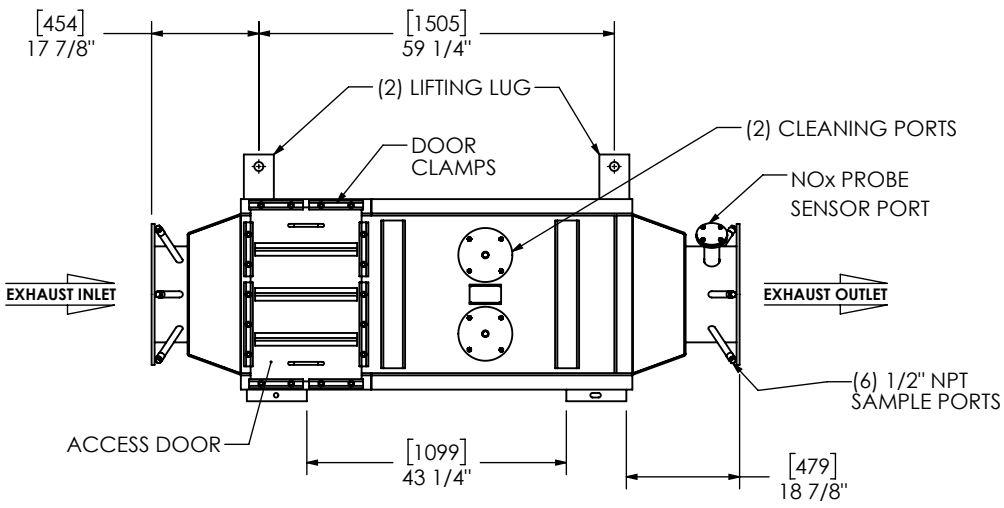
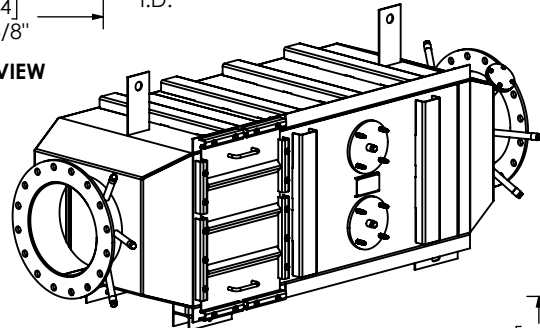
**ACIS-BLU**  
**Wiring Interconnect**

DRAWING		REV
ACIS-BLU WI		0
SIZE	SCALE 1:1	SHEET 3 OF 3
A		

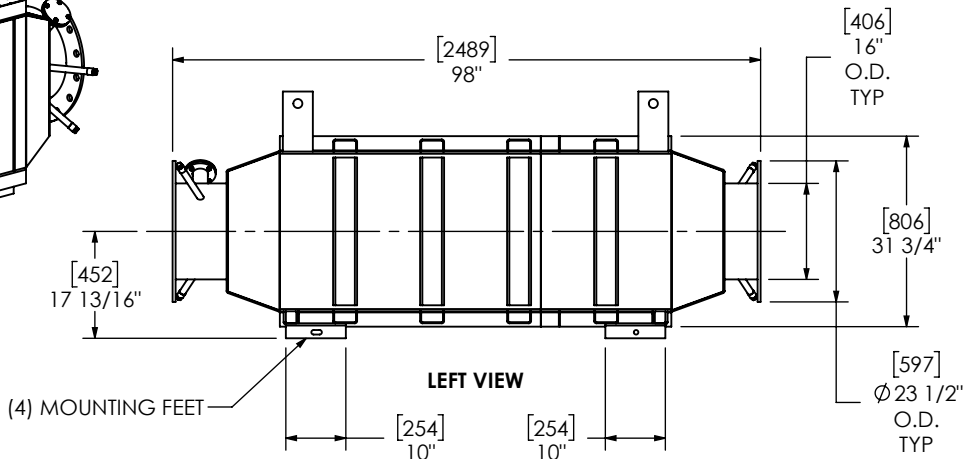
WEIGHTS (APPROXIMATE)	
EMPTY HOUSING	990 lb
ONE (1) FULL SCR CATALYST LAYER	532 lb
TWO (2) FULL SCR CATALYST LAYERS	1064 lb
• HOUSING HAS CAPACITY FOR TWO (2) FULL SCR CATALYST LAYERS	



FRONT VIEW



RIGHT VIEW



LEFT VIEW

- NOTES:**
- ONLY USE LIFTING LUGS TO LIFT HOUSING
  - ALLOW MINIMUM 36" CLEARANCE FROM DOOR FOR LOADING AND MAINTENANCE
  - NO FORCES OR MOMENTS MAY BE APPLIED TO THE FLANGES
  - MUST BE MOUNTED HORIZONTALLY (CUSTOM HOUSING REQUIRED TO MOUNT VERTICALLY)


- MATERIAL CONSTRUCTION:**
- CARBON STEEL
- PAINT:**
- HIGH TEMPERATURE BLACK (MIRATECH COATING SYSTEM 1)
  - NOT SUITABLE FOR USE UNDER EXTERNAL INSULATION

PROJECT NAME <b>Generator Source</b>
PROPOSAL NUMBER <b>BBC-22-000122</b>
SALES ORDER NO. <b>32604</b>
CUSTOMER P.O.

**PROPRIETARY AND CONFIDENTIAL**

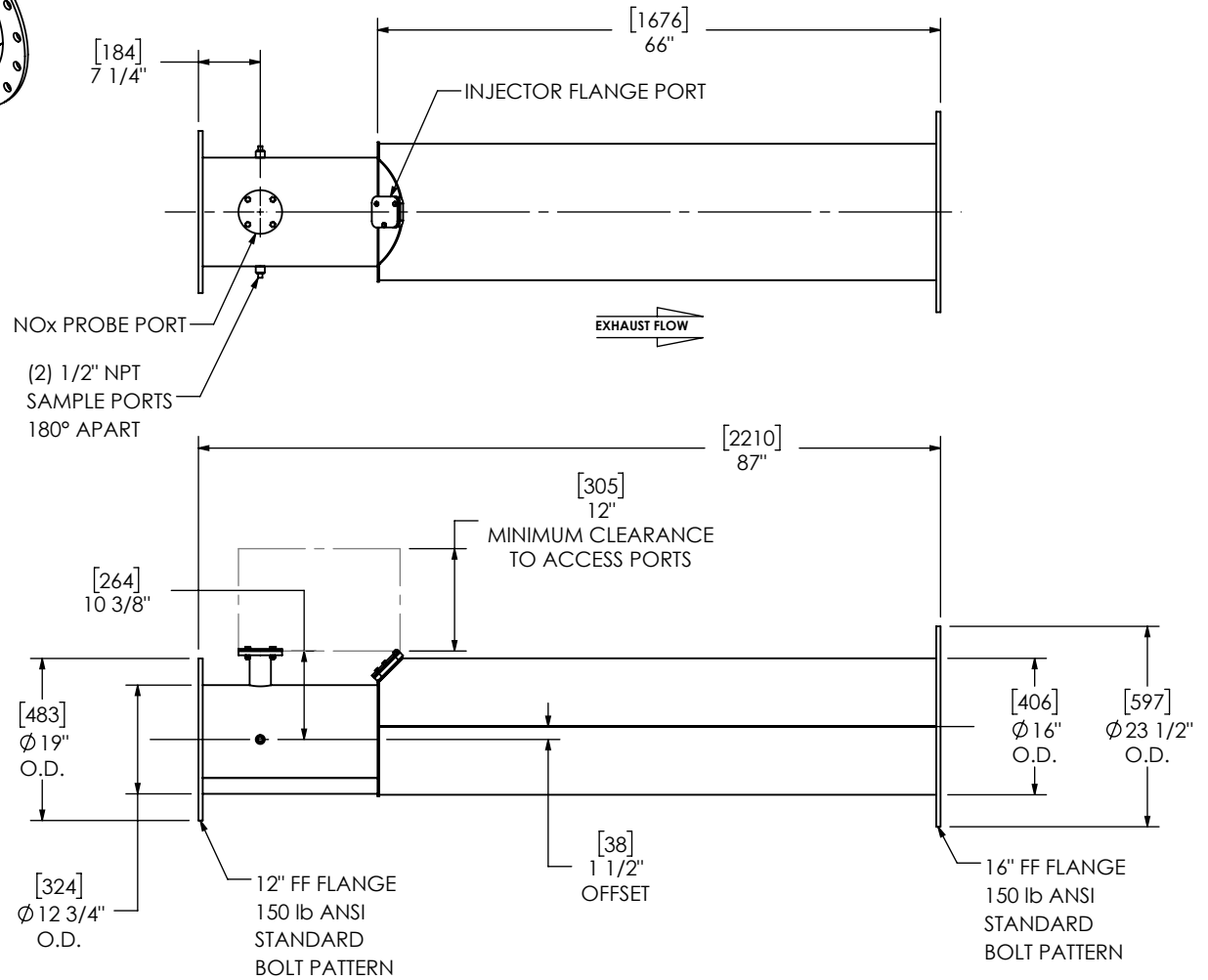
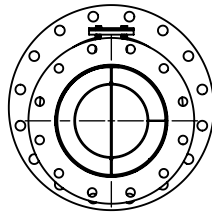
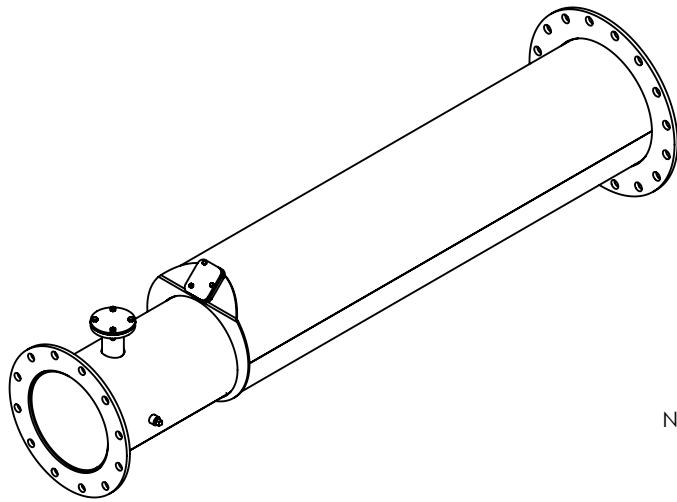
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED	
DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED	
ANGLES	
MACH: ±2°	INCHES: ±1/8
BEND: ±5°	MILLIMETERS: ±5
DO NOT SCALE DRAWING	
DRAWN	DATE
HTH	11/08/2021
REVIEWED BY	DATE
LCM	11/15/2021



**SP-CBL20-21100041**  
**Submittal Drawing**

DRAWING	SP-CBL20-21100041 SD	REV	0
SIZE	A	SCALE	1:32
			SHEET 1 OF 1



**NOTES:**

- INJECTOR FLANGE MUST BE POSITIONED AT OR ABOVE HORIZONTAL
- DO NOT USE EQUIPMENT TO SUPPORT OTHER PARTS OF THE EXHAUST SYSTEM WITHOUT PROPER REINFORCEMENT

**MATERIAL CONSTRUCTION:**

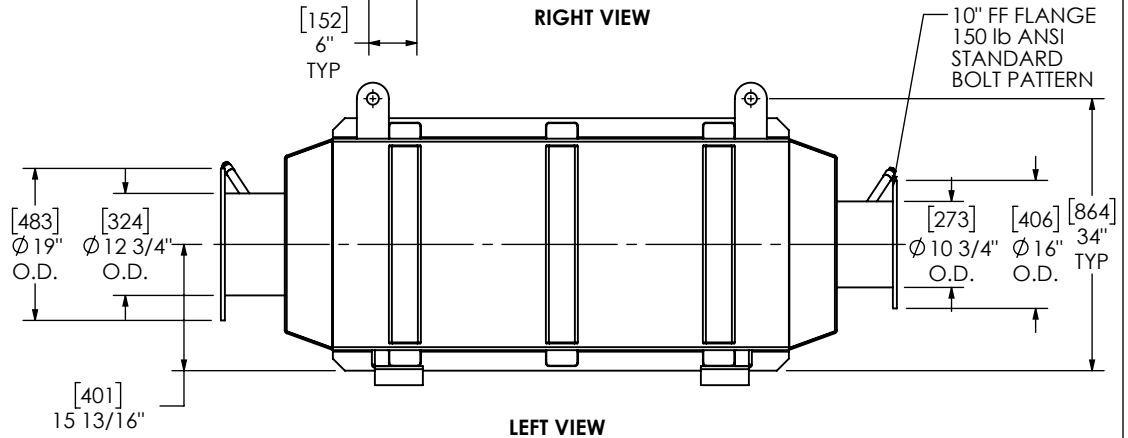
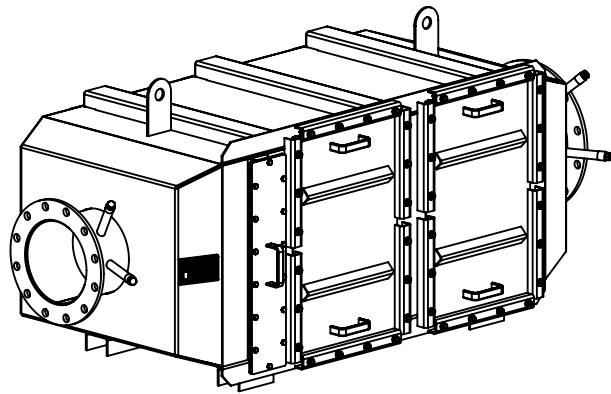
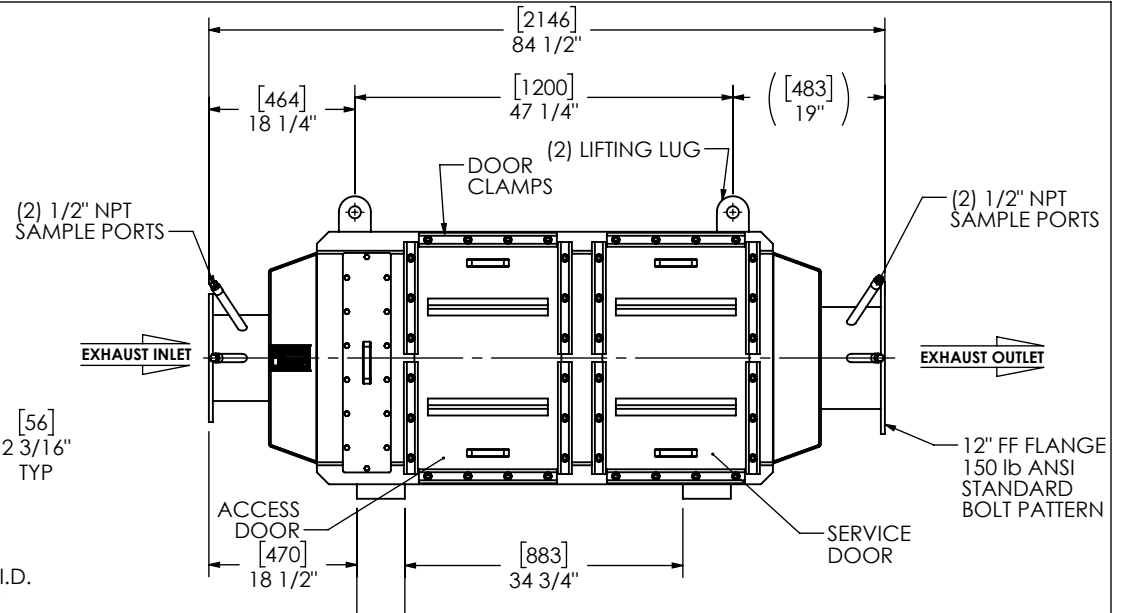
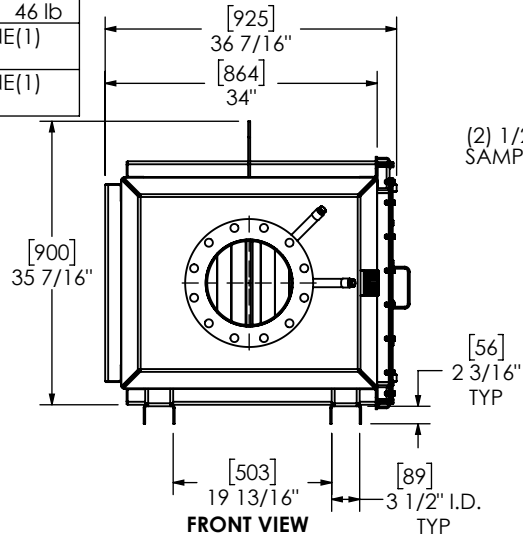
- 304 STAINLESS STEEL

**PAINT:**

- NONE (MIRATECH COATING SYSTEM 4)

PROJECT NAME <b>Generator Source</b>	PROPRIETARY AND CONFIDENTIAL	DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED		<p><b>MS-BLU-12-16-3</b> Submittal Drawing</p>		
PROPOSAL NUMBER <b>BBC-22-000122</b>	THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.	<small>DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED</small> ANGLES MACH: ±2°   INCHES: ±1/8 BEND: ±5°   MILLIMETERS: ±5				
SALES ORDER NO. <b>32604</b>		DRAWN SSC	DATE 4/1/2021	DRAWING MS-BLU-12-16-3 SD		REV 0
CUSTOMER P.O.		REVIEWED BY CAC	DATE 4/1/2021	SIZE A	SCALE 1:22	WEIGHT 293 lb

WEIGHTS (APPROXIMATE)	
EMPTY HOUSING	802 lb
ONE (1) FULL DPF CATALYST LAYER	365 lb
ONE (1) OXIDATION ELEMENT	46 lb
• HOUSING HAS CAPACITY FOR ONE(1) OXIDATION ELEMENT	
• HOUSING HAS CAPACITY FOR ONE(1) FULL DPF CATALYST LAYERS	



**NOTES:**

- ONLY USE LIFTING LUGS TO LIFT HOUSING
- ALLOW MINIMUM 50" CLEARANCE FROM DOOR FOR LOADING AND MAINTENANCE
- NO FORCES OR MOMENTS MAY BE APPLIED TO THE FLANGES
- MUST BE MOUNTED HORIZONTALLY (CUSTOM HOUSING REQUIRED TO MOUNT VERTICALLY)

**MATERIAL CONSTRUCTION:**

- CARBON STEEL

**PAINT:**

- HIGH TEMPERATURE BLACK (MIRATECH COATING SYSTEM 1) NOT SUITABLE FOR USE UNDER INSULATION

PROJECT NAME <b>Generator Source</b>
PROPOSAL NUMBER <b>BBC-22-000122</b>
SALES ORDER NO. <b>32604</b>
CUSTOMER P.O.

**PROPRIETARY AND CONFIDENTIAL**

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED	
DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED	
ANGLES	
MACH: ±2"	INCHES: ±1/8
BEND: ±5°	MILLIMETERS: ±5
<b>DO NOT SCALE DRAWING</b>	
DRAWN JCO	DATE 11/18/2020
REVIEWED BY CAC	DATE 11/18/2020



**SP-LTR20-20110078**  
**Submittal Drawing**

DRAWING	SP-LTR20-20110078 SD	REV 0
SIZE A	SCALE 1:24	SHEET 1 OF 1



## Pre Commissioning Checklist for SCR Equipment

Project Name: Generator Source  
Customer Name: Cummins Business Services  
Converter Model: SP-CBL20-21100041  
Control System: ACIS-BLU

Date: 3/4/2022  
Project Location: PA

MIRATECH Customer

- Installation of converter, mixing section, control equipment and exhaust piping is complete per the supplied project drawings.
- Installation of any heat recovery or co-generation devices is complete and is operational.
- All wiring, including, power, load signal, run signal, and interconnects are complete per project wiring diagram.
- All wiring and devices should be away from heat sources and accessible while the engine is in operation.
- Isolated load signal has been verified at SCR Control Equipment
- Run signal has been verified at SCR control equipment
- Voltage to SCR Controller and equipment is per the ACIS-BLU wiring interconnect.
- If SCR Controller is located in enclosure the enclosure is temperature controller not to exceed 104° F and is well ventilated.
- Engine has been successfully operated and untreated emissions have been confirmed with a calibrated analyzer to be within guarantee levels at full and minimum load conditions.
- The genset has the ability to operate at various loads including minimum load and 100% manufactured stated full load. If 100% manufactured stated load is not possible a load bank must be provided at time of commissioning.
- All tubing associated with the SCR system (urea supply, urea return, air injection, urea injection, and exhaust gas sample if required) are properly installed per the project piping diagram and free of debris.
- Urea in accordance with the MIRATECH Specification is on site and has been supplied and tested by an approved vendor. Attach copy of the urea analysis.
- Engine is available to be out of operation for 24 hours prior to entering the converter housing and for 8 hours during the catalyst loading process.
- All equipment and labor required for handling catalyst during the catalyst loading process has been coordinated with MIRATECH Technical Services Department, will be on site, and available for use.
- Safety alarms, annunciation, and engine shutdown sequence are programmed and tested.
- Engine and qualified operator will be made available to MIRATECH Technical Service personnel and will be available to be locked at various loads upon request.

Customer Signature \_\_\_\_\_ Date \_\_\_\_\_

MIRATECH Representative \_\_\_\_\_ Date \_\_\_\_\_

Company Name \_\_\_\_\_

**Water Quality**

The water quality of urea or ammonia solutions for SCR units is critical for the overall performance. Solid and solubilized substances contained in water create particles that can clog the honeycombs or injector, reducing life and performance. The increased number of particles also increases the cleaning frequency of the system components. Furthermore, these particles are commonly composed of known catalyst poisons, which can reduce catalyst performance.

The recommended specifications to minimize catalyst clogging and poisoning from substances coming from the water are:

- Utilization of demineralized water for urea or ammonia solutions. This can be done by reverse osmosis or by utilizing ion exchange cartridges.
- Salt should be minimized because it can create solid deposits. Salt content of the water should be below 0.005 lb/gal

**Caution:** Water softening cartridges (Ca- and Mg- Ion exchangers) cannot be utilized. These cartridges cannot remove evaporation residues, or remove them only in part. These cartridges use Na as an exchange ion for Ca and Mg.

**Urea Quality**

Chemical Names: Urea, Carbonyldiamide, Carbamide

Molecular Formula: (H<sub>2</sub>N)<sub>2</sub>CO

Molecular Weight: 60.06

The urea used in the SCR injection solution should be commercial or technical grade (99.45% pure). A typical solution consists of 32.5 wt% or 40 wt% urea. This can be obtained from mixing urea granulates and water or purchased in a solution form. The urea consumption of an SCR system will vary depending on the urea concentration used. It is important to check the SCR system proposal to ensure that the correct urea concentration is used for the design of the system. As urea dissolves it absorbs heat from the solution which can make it dissolve slowly. If mixing the urea solution, hot water is recommended to decrease the dissolving time, or an immersion heater should be added to the tank.

**Storage and Safety**

32.5% and 40% urea solutions can begin to stratify or form precipitates when temperatures fall below 32 F. This can cause the urea concentration to be inconsistent in the tank or could result in solid deposits on the bottom of the tank. For this reason it is recommended to keep the urea solution above freezing temperatures. Because of the risks of chemical reactions, urea must be kept away from nitrates and substances that contain nitrites. They must also be transported in separate containers. Urea is not classified as a dangerous substance, but should be stored carefully because of small concentration of ammonia vapors on the surface of urea solutions.

**Chemical Analysis of Commercial/Technical Grade Urea**

	Value
Specific Weight (at 68 °F)	69.4 lb/ft <sup>3</sup>
Biuret	< 0.30 wt%
Aldehyde	< 5 ppm
Insoluble	< 20 ppm
Phosphate	< 0.5 ppm
Calcium	< 0.5 ppm
Iron	< 0.5 ppm
Copper	< 0.2 ppm
Zinc	< 0.2 ppm
Chromium	< 0.2 ppm
Nickel	< 0.2 ppm
Aluminum	< 0.5 ppm
Magnesium	< 0.5 ppm
Sodium	< 0.5 ppm
Potassium	< 0.5 ppm

# Limits of poisonous substances for SCR catalysts



Element	Sym- bol	Max concentration in fuel			Effect	
		Liquid bio-fuels <sup>05</sup>	Liquid fossil fuels	Gaseous fuels	SCR	Oxi/ Filter
[mg/kg] (elementary)						
Aluminium	Al	0.5	0.5	0.5	02	02
Antimony	Sb	0.5	0.5	0.5	02	02
Arsenic	As	1	0.2	0.2	04	02
Lead	Pb	0.5	0.5	0.5	03	04
Boron	B	0.5	0.5	0.5	02	02
Bromine	Br	1	1	1	02	02
Cadmium	Cd	1	0.5	0.5	02	04
Calcium	Ca	12	5	5	02	02
Chlorine	Cl	1	5	5	03	02
Chromium	Cr	0.5	0.5	0.5	02	02
Iron	Fe	15	0.5	0.5	03	02
Fluorine	F	1	0.5	0.5	03	02
Iodine	J	1	1	1	03	02
Potassium	K	5	1	1	04	02
Cobalt	Co	0.5	0.5	0.5	02	02
Copper	Cu	0.5	0.5	0.5	02	02
Lithium	Li	0.5	0.5	0.5	02	02
Magnesium	Mg	12	5	5	02	02
Manganese	Mn	0.5	0.5	0.5	02	02
Molybdenum	Mo	0.5	0.5	0.5	02	02
Sodium	Na	8	5	5	03	02
Nickel	Ni	0.5	0.5	0.5	03	02
Phosphorous	P	16	5	5	04	02
Mercury	Hg	0.5	0.5	0.5	04	04
Sulfur	S	20	15'000 <sup>06</sup>	20	01	03
Selenium	Se	0.5	0.5	0.5	02	02
Silicon organic	Si	0.5	0.5	0.5	03	03
Silicon inor- ganic	Si	15	15	15	02	02
Tin	Sn	0.5	0.5	0.5	02	03
Vanadium	V	1	15'000 <sup>07</sup>	1	01	04
Zinc	Zn	0.5	0.5	0.5	03	03

- 01 Positive effect
- 02 Lightly harmful
- 03 harmful
- 04 strongly harmful
- 05 → Limitations
- 06 → Limitations
- 07 → Limitations

The limits of catalyst poisons in the exhaust gas can be calculated as follows ( $\lambda \cong 2$ ):

$$\frac{\text{Limit in fuel [mg/kg]}}{30} = \text{Limit in exhaust gas [mg/kg]}$$

In the exhaust gas there are also the poisons that originate in the lube oil. According to our experience the common, approved lube oils do not harm our catalyst. Exceptions see "Guidelines to catalyst lifetime"

The reactant that is used for the SCR reaction has to be free of catalyst poisons, see also C.00214 "Reactant specifications"

## Limitations:

### 05 Phosphorous

Fuel	Phosphorous- content	Limitations
Bio fuel	P ≤ 16 mg/kg	<ul style="list-style-type: none"> <li>• SCR volume needs to be adapted</li> <li>(→ layout rules for SCR catalyst)</li> </ul>

### 06 Sulphur

Fuel	Sulphur con- tent	Limitations
Light fuel oil (Diesel)	S ≤ 0,1%	<ul style="list-style-type: none"> <li>• No Limitations</li> </ul>
Marine fuel oil MDO	S > 0,1%	<ul style="list-style-type: none"> <li>• No precious metal oxidation catalyst (Pt, Pd)</li> </ul>
Heavy fuel oil HFO	S ≥ 0,5%	<ul style="list-style-type: none"> <li>• No Oxidation catalysts</li> <li>• Dust blowers for all catalyst layers</li> </ul>
Heavy fuel oil HFO	S ≥ 1,5%	<ul style="list-style-type: none"> <li>• Special case, requires detailed analysis</li> </ul>

### 07 Vanadium

Fuel	Vanadium content	Limitations
all	V > 1 mg/kg	<ul style="list-style-type: none"> <li>• No Oxidation catalysts</li> </ul>



## **Guidelines for Successful Operation of LTR™ DPF April 2014**

Many owner/operators of engine-DPF systems are seeking guidelines that help ensure trouble-free operation of their equipment and avoid catastrophic and costly failures. Below are many of the questions asked by owner/operators of DPF systems.

### ***What are the typical “standing orders” for successful operation of DPF systems?***

- Exhaust system backpressure shall not exceed the maximum allowable specified by the engine manufacturer
- Exhaust temperature measured at the exhaust manifold shall not exceed the maximum allowable specified by the engine manufacturer
- DPF shall be fully regenerated when DPF backpressure reaches the maximum allowable specified by the DPF manufacturer (to avoid a runaway regeneration situation)
- Operators shall follow appropriate startup / shutdown practices that avoid accumulation of particulate in the DPF without the opportunity to regenerate
- Operators shall minimize engine operating conditions in which the particulate deposition rate exceeds the regeneration burn-off rate of the DPF
- Operators shall maximize engine operating conditions in which the regeneration burn-off rate of the DPF exceeds the particulate deposition rate of the engine; this is measured and verified by observing a static or decreasing backpressure reading across the DPF during engine operation.
- Operators shall follow all operating and maintenance practices specified by the DPF manufacturer, which include periodic vacuuming of accumulated ash from the DPF's.
- Operators shall follow all engine and DPF manufacturers' requirements for engine maintenance, compatible lube oil (e.g. ash content, TBN), fuel quality (e.g. sulfur content), urea quality (when using DPF-SCR systems), and lube oil consumption rate.

### ***What affects the DPF regeneration (“burn-off”) rate?***

- DPF block temperature – a “cold” DPF will not burn off and remove diesel particulate, it will only accumulate particulate matter. Depending on the engine warm-up procedures and operating load on the engine, DPF blocks may require 10 – 60 minutes of engine run time before the DPF blocks reach a temperature where the particulate matter (PM) is burned and removed faster than it is accumulated.

- Exhaust temperature – the exhaust transfers its heat to the DPF blocks: the exhaust can either increase the temperature of the blocks, sustain the temperature of the blocks, or reduce the temperature of the blocks, depending on engine and/or ambient transients. For this reason, most DPF exhaust systems are insulated to preserve exhaust heat and maximize the DPF block temperature. Also, operators should manage engine loads (and duration at given load points) to minimize system operation in which the particulate accumulation rate exceeds the DPF regeneration rate.
- Exhaust chemistry – wet particulate and diesel aerosols in exhaust will plug a DPF at a much faster rate than dry particulate exhaust streams. NO<sub>2</sub> present in diesel exhaust will accelerate the oxidation reactions in a DPF. The LTR uses a diesel oxidation catalyst to oxidize both diesel aerosols and NO, yielding a drier particulate and higher NO<sub>2</sub> concentrations, both of which enhance DPF regeneration reactions.
- As the DPF accumulates operating hours, it will also accumulate ash from combusted particulate and lube oil. As the ratio of ash to diesel particulate within the DPF changes, so does the regeneration activity. This will be observed by changes in regeneration burn-off rate at a given temperature (i.e. slower burn-off rates are indicated by a lower inches water/hour decrease in DPF backpressure).
- Exhaust flow – lower exhaust flow rates (associated with lower engine loads) generally have lower temperatures and lower velocities through the DPF blocks, both of which impede regeneration reactions.

### ***What affects the diesel particulate deposition rate upon the DPF blocks?***

- Particulate matter concentration in the exhaust stream – higher particulate concentrations will plug the DPF more quickly than lower concentrations. This can fluctuate due to engine transients (e.g. turbo lag, cold start emissions), inlet air density changes (e.g. elevation), clogged intake air filters, changes in turbo-charger performance or efficiency (as could be induced by an excessive backpressure on the engine exhaust system), inter-cooler performance, worn fuel injectors, lube oil consumption, lube oil ash content, etc.
- Exhaust flow rate -- higher exhaust flow rates will yield higher backpressures across the DPF. A high exhaust flow rate with a high particulate concentration accelerates the plugging of DPF's. If an operator has a high back-pressure on the engine at idle or low load conditions and then increases the load and exhaust flow rate, a much higher back-pressure will be observed.
- DPF temperature relative to exhaust temperature – cold DPF blocks in a hot exhaust (e.g. immediately after startup, during warm-up) will not regenerate; DPF block temperatures must be sufficiently high to activate and sustain the oxidation reactions which burns out the accumulated soot.

### ***What should an operator monitor (i.e. “watch”) and record (i.e. “write down for reference”) as part of sound operating practices for an engine-DPF system?***

- Pressure drop across the DPF system.
- Exhaust temperature at the inlet to the DPF – a close indication of the actual temperature of the DPF blocks. Comparing DPF inlet and outlet temperatures will give an indication of when the DPF temperature has reached equilibrium with the exhaust temperature after a cold start.

- Engine load or rack position.
- Engine operating hours
- Together, this data will assist the operator in understanding the dynamics of the “P-Q Curve” (pressure vs. flow rate) for the engine-DPF system. The P-Q curve for a DPF is always moving: the accumulation of soot and ash, and the ratio of soot to ash, are always changing the measured value of the pressure drop at a given flow rate (engine load). For this reason, P-Q curves have a wide band showing the pressure drop clean, the pressure drop when loaded with diesel particulate, and the pressure drop when loaded with some combination of ash and diesel particulate: the P-Q curve shifts, but it does not shift linearly!

***How does an operator manage a DPF system to accommodate repeated cold starts and excessive idling during a new engine installation?***

- If possible, owner/operators should remove the DPF blocks during the commissioning of a new engine installation. The engine, the driven component (e.g. a generator), interconnects, and other system components in a new installation will all usually require test runs, debugging and the like, which often requires numerous cold starts and prolonged idle. Further, if the DPF blocks were to reach a plugged condition and require regeneration, the installation may not be at a stage at which load may be applied to the engine to create the necessary regeneration conditions and duration.
- If left installed and operated at conditions with zero regeneration possible (e.g. cold starts, prolonged idling), the DPF blocks will plug with accumulated particulate. For some engines, the not-to-exceed published PM emission rate at idle will plug the blocks in as little as 12 operating hours. At that plugged condition, the DPF must be regenerated immediately: further operation will either plug the DPF irreversibly (requiring complete replacement), or leave the DPF at risk of a runaway regeneration (i.e. a meltdown) when regeneration next initiates.
- Once project installation is completed, the system components are de-bugged and functioning correctly, and the operating duty cycle of the engine is following its “normal” design profile, the DPF blocks should then be installed, sparing them from the heavy particulate deposition that often occurs during the final stages of completing the project installation.

***How will the engine-DPF system behave?***

- Due to the many variables that affect DPF regeneration, the performance can be very dynamic. In general, here are a few guidelines on how a system performs, based on field data from installed systems. All guidelines assume the system is in equilibrium and DPF blocks are at the same temperature as the exhaust. All temperatures are approximate, may vary from installation to installation, and will often drift over time as the DPF blocks age!
- Below 500°F, the particulate deposition rate will typically exceed the regeneration burn-off rate within the DPF: the particulate from current operation is accumulating faster than it is being combusted by the reactions within the DPF. The operator will observe an increase in the pressure drop across the DPF. The pressure drop will increase at a rate of 5 mbar/hour or higher! As exhaust temperature decreases from 500°F, the rate of pressure drop increase (mbar/hour) will accelerate as the reactions slow and combustion of particulate is extinguished. With pressure drop across the DPF increasing at a rate of 5 mbar/hour, the

DPF can reach a plugged condition in as little as three hours ... sooner if the DPF is already loaded with accumulated particulate from prior operation!

- Between 500 and 525°F, the operator will find an engine condition at which the regeneration burn-off rate equals the particulate deposition rate: the particulate from current operation is combusting as quickly as it is accumulating within the DPF. The operator will observe no net change in the pressure drop across the DPF at this equilibrium condition.
- Above 525°F the particulate from current operation as well as accumulated particulate from prior operation are burning off. The operator will observe a decrease in the pressure drop across the DPF. The pressure drop will decrease at a rate of 2 mbar/hour. As exhaust temperature increases from 525°F, the rate of decrease (mbar/hour) will increase as the reactions accelerate (e.g. 7 mbar/hr at 650°F, 15 mbar/hr at 700°F). When all of the accumulated particulate from prior operation is combusted, the pressure drop across the DPF will stabilize.

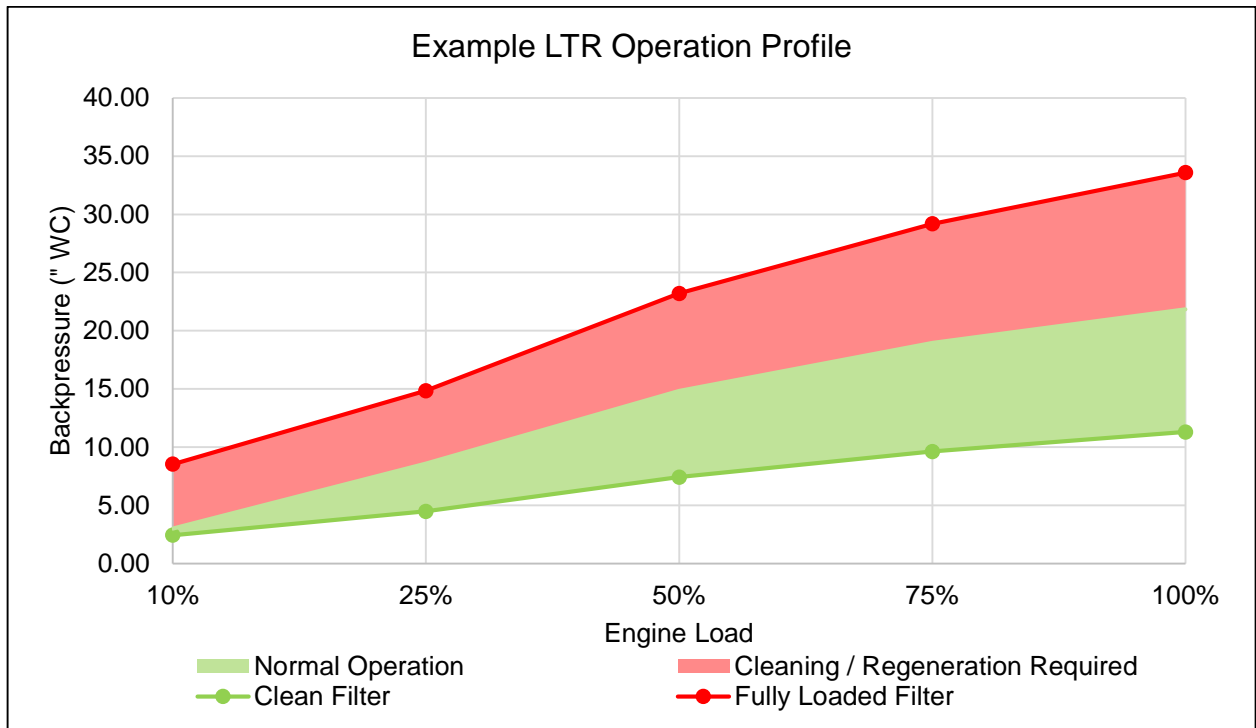
### ***What is the regeneration temperature for the DPF?***

After some operating experience, most operators realize that this question is not precise enough for understanding the operation of the DPF. Reliance upon temperature alone as the metric for engine and DPF operating decisions can lead to irreversible plugging and/or the catastrophic failure of runaway regeneration. The better questions operators then ask are as follows:

- Under what engine operating conditions will the regeneration rate of the DPF equal or exceed the particulate deposition rate? What operating practices will keep the engine operating at these conditions for the majority of the time?
- Under what engine operating conditions will the particulate deposition rate exceed the regeneration rate of the DPF? What operating practices will minimize the engine operating time with these conditions present?
- How will the operator(s) know when the DPF has reached a point at which the regeneration rate must be accelerated to combust accumulated particulate and reduce exhaust system backpressure?
- What operating practices will be adopted to avoid irreversible plugging of the DPF and/or a runaway regeneration condition?
- The answers to these questions assist operators in understanding the unique behavior of each engine-DPF system and guide them through successful, trouble-free operation of their systems.

### ***How do you determine need for Regeneration vs. Service?***

If part load data is provided MIRATECH can supply an estimated P-Q curve prior to commissioning, which is then validated at commissioning, to better understand the backpressure operation profile of the DPF equipment. An example of the operation profile is below for discussion purposes.



- If back pressure is in the cleaning / regeneration required area (or region) adequate load should be applied to engine to raise exhaust temperature to a favorable temperature for regeneration.
- If after regeneration the back pressure decreases and stabilizes at a back pressure in the cleaning/regeneration required area (or region) the filter has accumulated enough ash to warrant cleaning.
- Operating the filter in the cleaning/regeneration region knowing service is needed will limit the number of hours your engine can operate before regeneration is required.

***How would an experienced operator prioritize and summarize the activities that lead to successful operation of the engine-DPF system?***

- Understand the behavior of the engine-DPF system. Determine the load and exhaust temperature points at which the regeneration rate exceeds the particulate deposition rate and maximize operation at points where the regeneration rate is faster than the deposition rate. Recognize that the P-Q curve for the DPF is always changing, and increases in backpressure at part-load will be multiples larger at full-load.
- Insulate the exhaust system: preserve the available exhaust temperature, reduce the heat loss, and help the DPF warm up quickly after a cold start. Avoid/minimize short duration runs after a cold start, repeated cold starts, and prolonged idling. Understand the time required after a cold start for the DPF to reach its operating temperature.
- When the design load or demand is unavailable for prolonged periods of time and the engine must operate at part-load or idle, find a means to artificially load the engine (e.g. a load bank) when periodic regeneration must be initiated.

## Application & Performance Warranty Data

### Project Information

Site Location:	PA
Project Name:	Generator Source
Application:	Standby Power
Number Of Engines:	1
Operating Hours per Year:	200

### Engine Specifications

Engine Manufacturer:	Cummins
Model Number:	QSK23-G7
Rated Speed:	1800 RPM
Generator Power:	600 ekW
Type of Fuel:	Ultra-Low Sulfur Diesel (ULSD)
Type of Lube Oil:	1 wt% sulfated ash or less
Lube Oil Consumption:	0.1 % Fuel Consumption
Number of Exhaust Manifolds:	1

### Engine Cycle Data

Load	Speed	Power	Exhaust Flow	Exhaust Temp.	Fuel Cons.	NO <sub>x</sub>	CO	NMHC	NMNEHC	PM <sub>10</sub>	O <sub>2</sub>	H <sub>2</sub> O
%		bhp	acfm (cfm)	° F		g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	%	%
25	Rated	220	2,030	576								
100	Rated	880	4,600	810		4.49	0.4	0.14	0.14	0.05	10	12

### Emission Data (100% Load)

Emission	Raw Engine Emissions						Target Outlet Emissions						Calculated Reduction
	g/bhp-hr	tons/yr	ppmvd @ 15% O <sub>2</sub>	ppmvd	g/kW-hr	lb/MW-hr	g/bhp-hr	tons/yr	ppmvd @ 15% O <sub>2</sub>	ppmvd	g/kW-hr	lb/MW-hr	
NO <sub>x</sub> *	4.49	0.87	391	722	6.021	13.27	0.5	0.1	44	80	0.671	1.48	88.9%
CO	0.4	0.08	57	106	0.536	1.18	2.6	0.5	372	687	3.487	7.69	
NMHC	0.14	0.03	35	65	0.188	0.41	0.14	0.03	35	65	0.188	0.41	
PM <sub>10</sub>	0.05	0.01	17	31	0.067	0.15	0.02	0	7	12	0.027	0.06	60%
NH <sub>3</sub>							0.09	0.02	20	37	0.114	0.25	

\* MW referenced as NO<sub>2</sub>

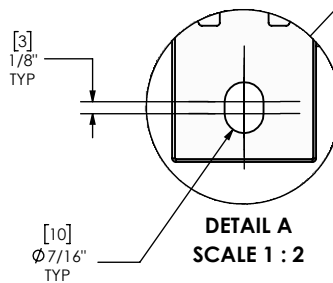
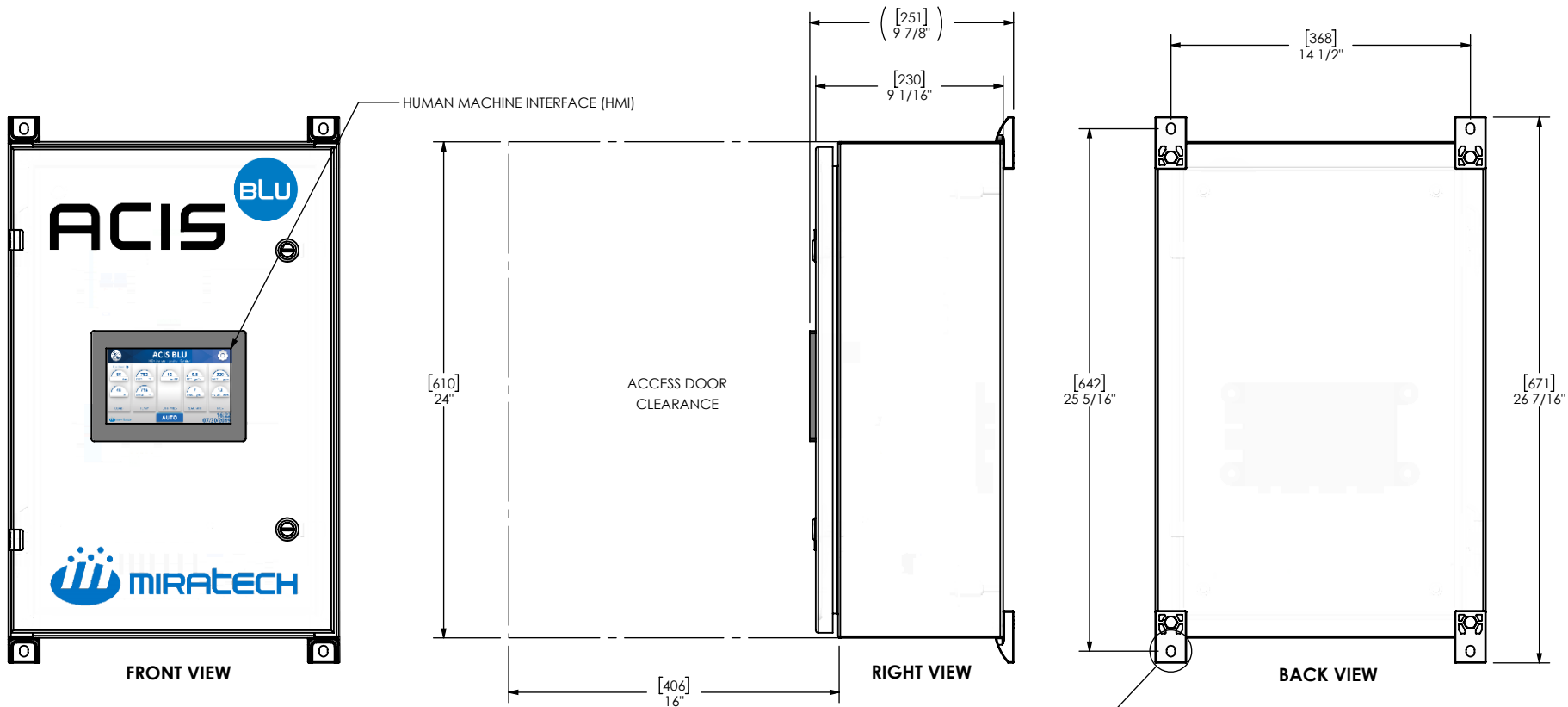
## System Specifications

### SCR/DOC/DPF System Specifications (SP-CBL20-21100041, SP-LTR20-20110078-R1, ACIS-BLU, Commissioning & Startup, MS-BLU-12-16-3)

SCR Catalyst Space Velocity:	7,901 1/hr
Sound Attenuation:	Critical Grade
Reactant:	Urea
Percent Concentration:	32.5%
Design Exhaust Flow Rate:	4,600 acfm (cfm)
Design Exhaust Temperature <sup>1</sup> :	810° F
Exhaust Temperature Limits:	572° F – 977° F
Minimum Regeneration Temperature <sup>2</sup> :	500° F
SCR Catalyst Volume:	14 ft <sup>3</sup>
System Dosing Capacity:	10 L/hr
System Pressure Loss:	14.0 inH <sub>2</sub> O (Clean)
Estimated Reactant Consumption:	2.1 gal/hr (8 L/hr) / Per Engine

## Special Notes & Conditions

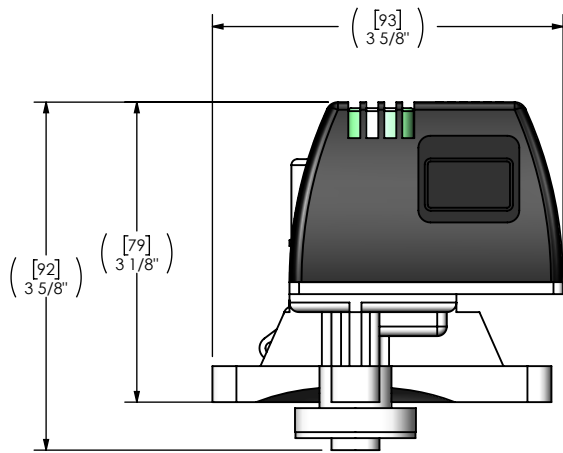
- For housings and exhaust components that are insulated, internally or externally, please refer to Section 7.1 of the General Terms and Conditions of Sale to prevent voiding MIRATECH product warranty.
    - Carbon steel is suitable for temperatures up to 900° F / 482° C continuously, when covered with external insulation or a heat shield. For continuous operation above 900° F / 482° C, where the equipment is externally insulated or has a heat shield, stainless steel should be used.
  - Diesel Particulate Filters depend on exhaust temperature to keep soot regenerated and the filter back pressure within acceptable levels. If the engine will be operated consistently at low loads/low exhaust temperatures, the customer should make provisions to add load via facility operations or a load bank. Refer to the included [Guidelines for Successful Operation of LTR™ DPF](#).
- A packed silencer installed upstream of the MIRATECH catalyst system will void MIRATECH's limited warranty.
  - Any sound attenuation or emission reductions listed are based on housing with catalyst elements installed.
  - MIRATECH Corporation warrants that the emissions reductions requested for this inquiry will be achieved at the design and test load point as outlined in the proposal. Tier 4 is an engine certificate designation, not an actual tons/yr or g/bhp-hr measurement. MIRATECH will utilize the engine manufacturer's emission data at 100% load to provide our warranty. This is the maximum volume potential point for pollutants to be emitted. Permitting is normally done on a mass flow or tons per year basis, therefore the system will be sized accordingly. The MIRATECH design is to achieve the blended Tier 4 emission targets from the D2 test cycle, measured at 100% engine load conditions.
  - MIRATECH Coating System 1 is not suitable for use under external insulation.



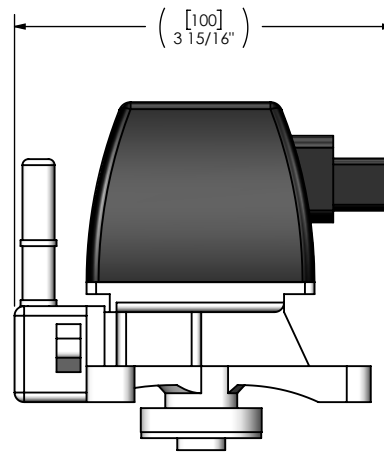
**NOTES:**

- POWER CONSUMPTION: 240 W MAX
- VOLTAGE: 96-265 VAC, 50-60 HZ, SINGLE  $\Phi$
- OPERATING TEMPERATURE: 32°F - 122°F (0°C - 50°C) (NON-CONDENSING)
- ENCLOSURE SUITABLE FOR INDOOR/OUTDOOR INSTALLATION. NEMA4 (IP66) RATED (REQUIRES USE OF PROVIDED MOUNTING TABS).

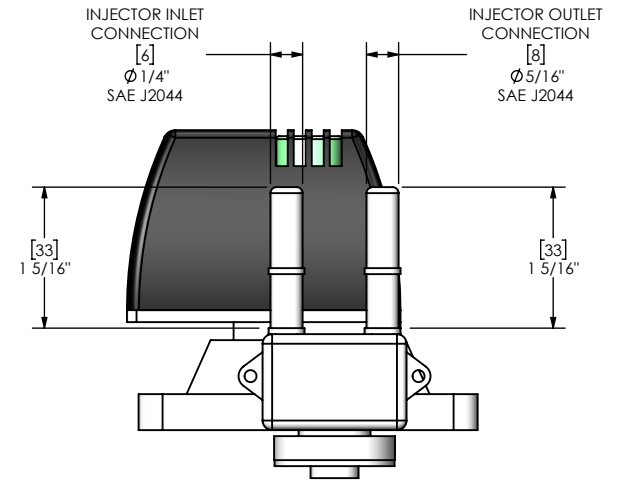
PROJECT NAME <b>Generator Source</b>		<b>PROPRIETARY AND CONFIDENTIAL</b>		DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED		 <b>SP-LHC-01-20020035 Controller</b> <b>Submittal Drawing</b>			
PROPOSAL NUMBER <b>BBC-22-000122</b>		THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.		<small>DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED</small> ANGLES MACH: ±2° INCHES: ±0.125 BEND: ±5° MILLIMETERS: ±3				DRAWING SP-LHC-01-20020035 SD	
SALES ORDER NO. <b>32604</b>				DO NOT SCALE DRAWING		DRAWN TES 02/27/2020		REV 0	
CUSTOMER P.O.				REVIEWED BY MLC		DATE 02/27/2020		SIZE A SCALE 1:8 WEIGHT: 71lb SHEET 1 OF 1	



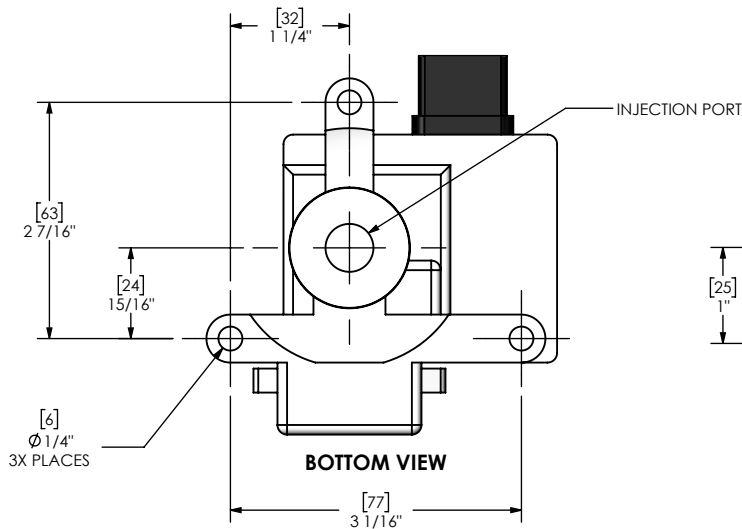
FRONT VIEW



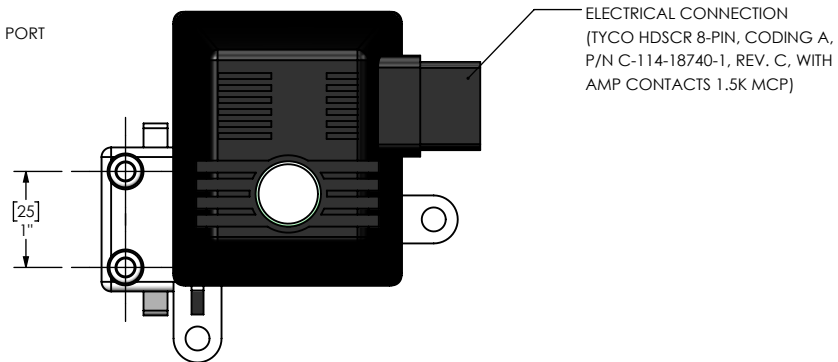
LEFT VIEW



BACK VIEW



BOTTOM VIEW



TOP VIEW

**NOTES:**


- MOUNT WITHIN 100FT (30M) OF REACTANT PUMP WITH LESS THAN 30FT (10M) OF VERTICAL RISE BETWEEN PUMP OUTLET AND INJECTOR INLET.
- MOUNT WITHIN 100FT (30M) OF REACTANT TANK WITH LESS THAN 30FT (10M) OF VERTICAL RISE BETWEEN REACTANT TANK RETURN AND INJECTOR OUTLET.
- AMBIENT OPERATING TEMPERATURE: 32°F - 266°F (0°C - 130°C) (NON-CONDENSING)
- MAXIMUM EXHAUST TEMPERATURE: 1382°F (750°C)
- SUITABLE FOR INDOOR/OUTDOOR INSTALLATION. IP6K7 AND IP6K9K RATED ACCORDING TO DIN 40050-9 WITH PLUGGED CONNECTIONS.

PROJECT NAME	<b>Generator Source</b>
PROPOSAL NUMBER	<b>BBC-22-000122</b>
SALES ORDER NO.	<b>32604</b>
CUSTOMER P.O.	

**PROPRIETARY AND CONFIDENTIAL**

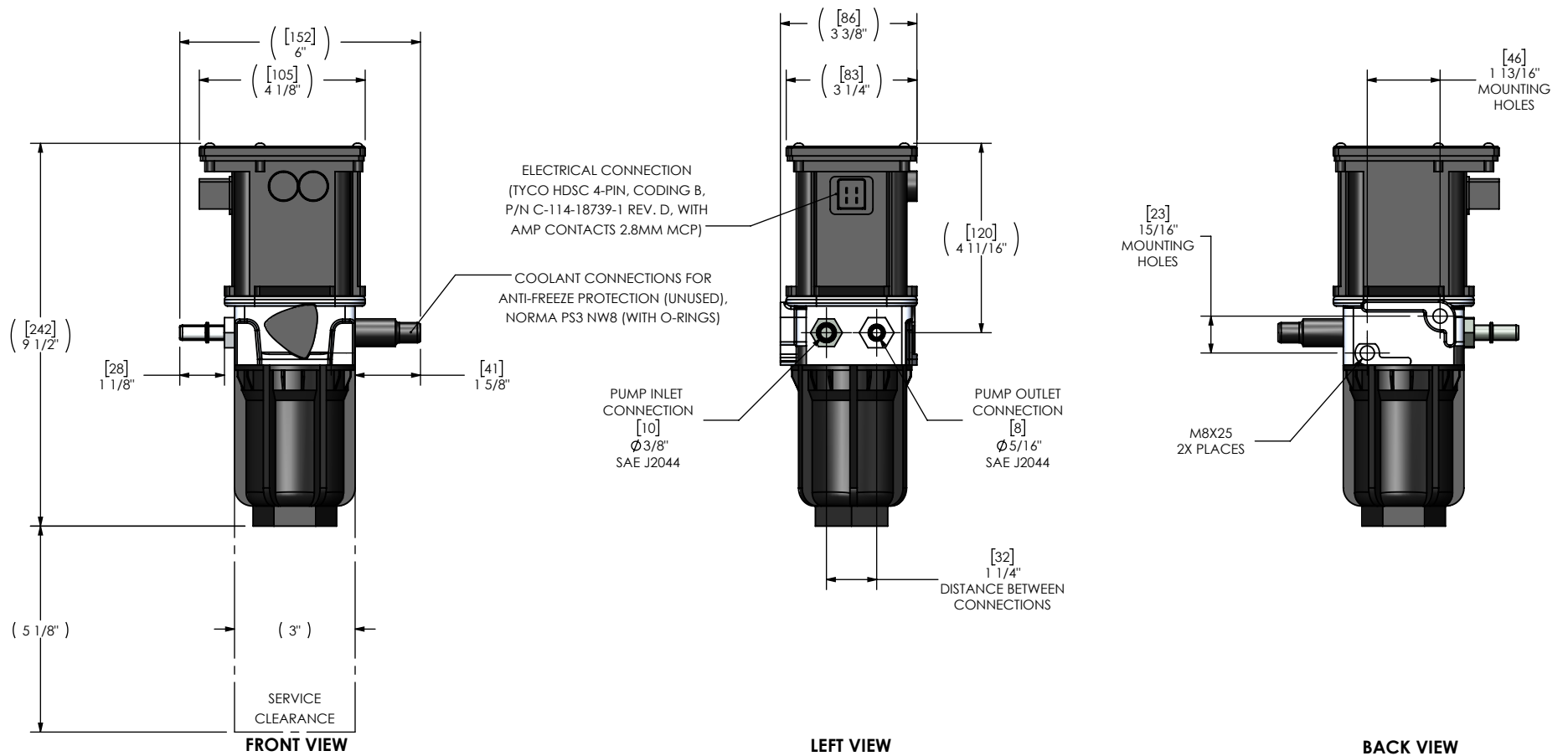
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED	
DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED	
ANGLES	
MACH: ±2°	INCHES: ±0.125
BEND: ±5°	MILLIMETERS: ±3
<b>DO NOT SCALE DRAWING</b>	
DRAWN	DATE
GFS	07/02/2019
REVIEWED BY	DATE
AJM	07/08/2019



**BLU-INJ-10 Injector**  
**Submittal Drawing**

DRAWING		BLU-INJ-10 SD		REV	0
SIZE	SCALE 1:6	WEIGHT: 3lb	SHEET 1 OF 1		



**NOTES:**


- MOUNT WITHIN 10FT (3M) OF REACTANT TANK WITH LESS THAN 3FT (1M) OF VERTICAL RISE BETWEEN BOTTOM OF TANK AND PUMP INLET.
- MOUNT WITHIN 100FT (30M) OF INJECTOR WITH LESS THAN 30FT (10M) OF VERTICAL RISE BETWEEN PUMP OUTLET AND INJECTOR INLET.
- PUMP MUST BE MOUNTED VERTICALLY (AS SHOWN).
- OPERATING TEMPERATURE: 32°F - 185°F (0°C - 85°C) (NON-CONDENSING)
- SUITABLE FOR INDOOR/OUTDOOR INSTALLATION. IP6K7 AND IP6K9K RATED ACCORDING TO DIN 40050-9 WITH PLUGGED CONNECTIONS.

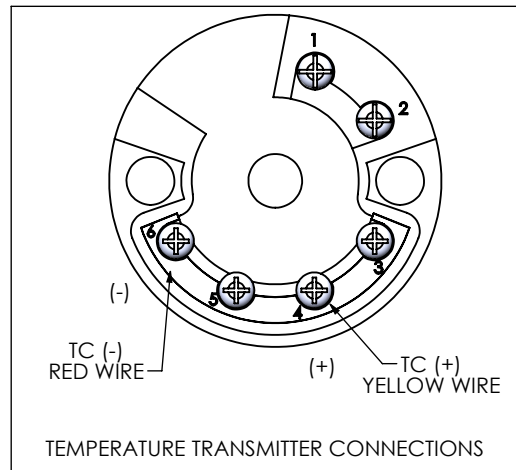
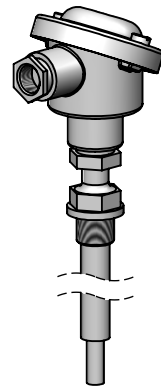
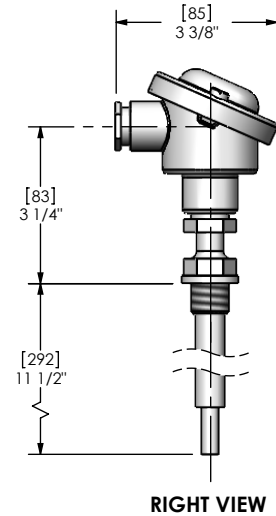
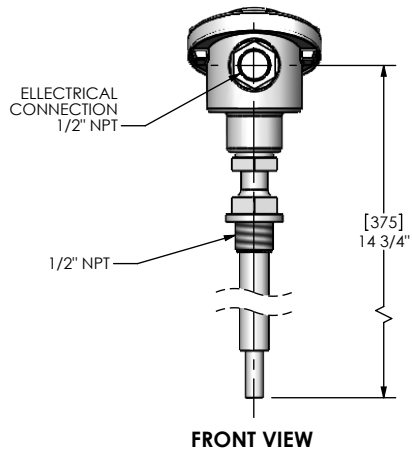
PROJECT NAME <b>Generator Source</b>
PROPOSAL NUMBER <b>BBC-22-000122</b>
SALES ORDER NO. <b>32604</b>
CUSTOMER P.O.

**PROPRIETARY AND CONFIDENTIAL**

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED	
DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED	
ANGLES	
MACH: ±2°	INCHES: ±0.125
BEND: ±5°	MILLIMETERS: ±3
<b>DO NOT SCALE DRAWING</b>	
DRAWN GFS	DATE 07/01/2019
REVIEWED BY AJM	DATE 07/08/2019

			
<b>BLU-RP-10 Pump Submittal Drawing</b>			
DRAWING BLU-RP-10 SD			REV 0
SIZE A	SCALE 1:4	WEIGHT: 6lb	SHEET 1 OF 1



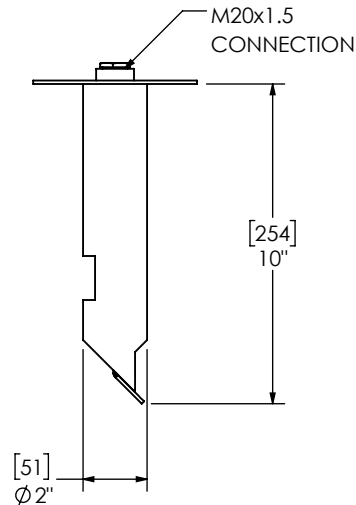
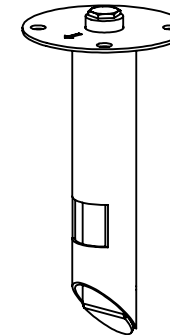
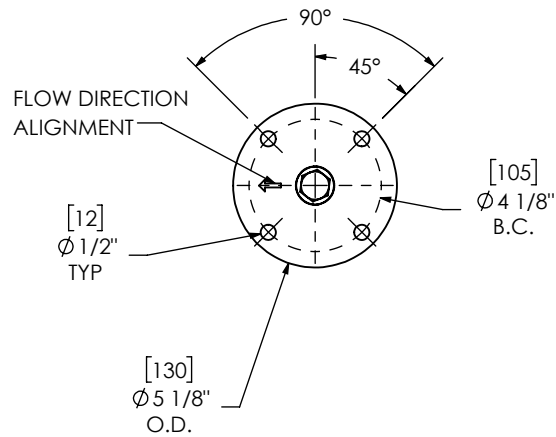
**NOTES:**

- OPERATING TEMPERATURE RANGE: 32°F - 1112°F
- AMBIENT TEMPERATURE RANGE: -40°F - 185°F

**INSTALLATION INSTRUCTIONS:**

- TEMPERATURE SENSOR AND WIRING SHOULD BE FREE OF INSULATION
- APPLY ANTI-SIEZE COMPOUND TO THREADS BEFORE INSTALLATION

PROJECT NAME <b>Generator Source</b>	<b>PROPRIETARY AND CONFIDENTIAL</b>  THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.	DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED					
PROPOSAL NUMBER <b>BBC-22-000122</b>		<small>DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED</small> ANGLES MACH: ±2°    INCHES: ±0.125 BEND: ±5°    MILLIMETERS: ±3					
SALES ORDER NO. <b>32604</b>		<b>DO NOT SCALE DRAWING</b>		<b>TT.12 Temperature Sensor Submittal Drawing</b>			
CUSTOMER P.O.		DRAWN CLV	DATE 6/9/2017				DRAWING TT.12 SD
		REVIEWED BY GFS	DATE 6/9/2017	SIZE A	SCALE 1:4	WEIGHT: 3.61 lb FULLY LOADED	SHEET 1 OF 1



**MATERIAL CONSTRUCTION:**

- 304 STAINLESS STEEL

**PAINT:**


- NONE (MIRATECH COATING SYSTEM 4)

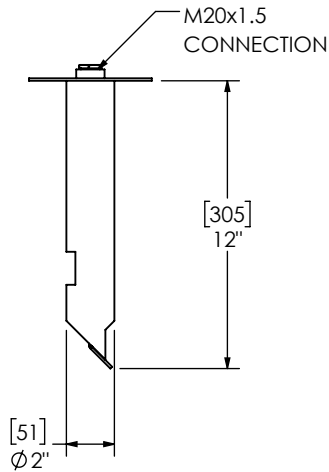
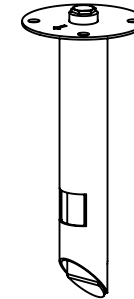
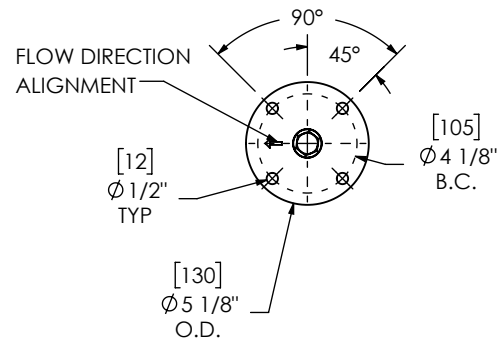
PROJECT NAME <b>Generator Source</b>
PROPOSAL NUMBER <b>BBC-22-000122</b>
SALES ORDER NO. <b>32604</b>
CUSTOMER P.O.

**PROPRIETARY AND CONFIDENTIAL**

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED	
DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED	
ANGLES	
MACH: ±2*	INCHES: ±1/8
BEND: ±5*	MILLIMETERS: ±5
<b>DO NOT SCALE DRAWING</b>	
DRAWN	DATE
JCO	05/06/2021
REVIEWED BY	DATE
CAC	05/06/2021

			
<b>NP-10</b> <b>Submittal Drawing</b>			
DRAWING		REV	
NP-10 SD		0	
SIZE	SCALE 1:6	WEIGHT: 2 lb	SHEET 1 OF 1




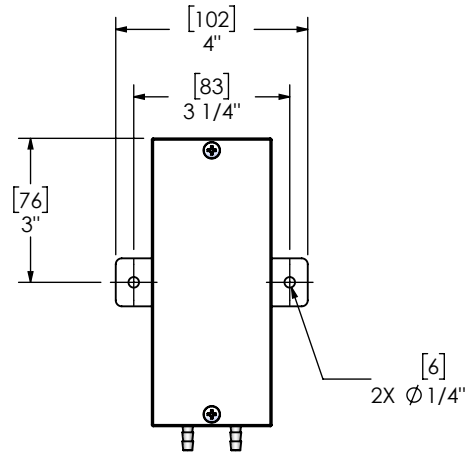
**MATERIAL CONSTRUCTION:**

- 304 STAINLESS STEEL

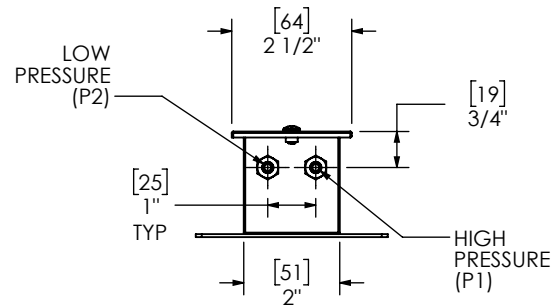
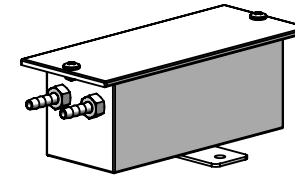
**PAINT:**

- NONE (MIRATECH COATING SYSTEM 4)

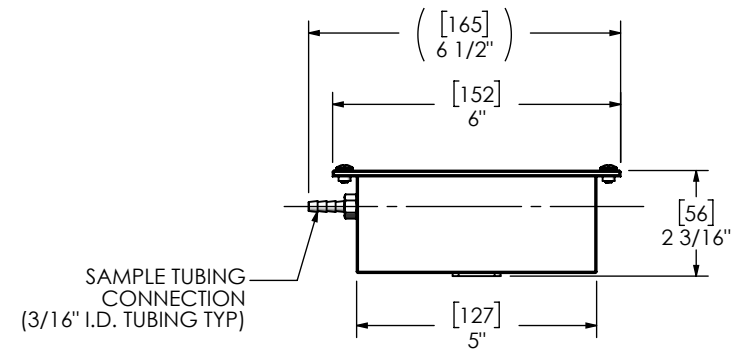
PROJECT NAME <b>Generator Source</b>	<b>PROPRIETARY AND CONFIDENTIAL</b>  THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.	DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED		 <b>NP-12</b> <b>Submittal Drawing</b>		
PROPOSAL NUMBER <b>BBC-22-000122</b>		<small>DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED</small> <small>ANGLES</small> <small>MACH: ±2°</small>   <small>INCHES: ±1/8</small> <small>BEND: ±5°</small>   <small>MILLIMETERS: ±5</small>				
SALES ORDER NO. <b>32604</b>		<b>DO NOT SCALE DRAWING</b>		DRAWING		
CUSTOMER P.O.		<small>DRAWN</small> CSF	<small>DATE</small> 03/05/2020	<small>SIZE</small> A	<small>SCALE</small> 1:8	<small>WEIGHT</small> 3 lb
			<small>REVIEWED BY</small> CAC		<small>DATE</small> 03/05/2020	<small>SHEET</small> 1 OF 1



TOP VIEW



FRONT VIEW



RIGHT VIEW

**NOTES:**

- OPERATING TEMPERATURE RANGE: 0 °F - 175 °F

**INSTALLATION INSTRUCTIONS:**

- P1 = HIGH PRESSURE SIDE (INLET SIDE OF SCR HOUSING)
- P2 = LOW PRESSURE SIDE (OUTLET SIDE OF SCR HOUSING)
- SENSOR SHOULD BE INSTALLED SO TUBING SLOPES DOWN TOWARD SCR HOUSING SO ANY CONDENSATE THAT FORMS IN THE TUBING WILL DRAIN INTO SCR HOUSING
- SENSOR SHOULD BE INSTALLED AWAY FROM HEAT SOURCES AND FREE OF INSULATION
- ELECTRICAL CONNECTION PLUG NOT SHOWN FOR CLARITY

PROJECT NAME <b>Generator Source</b>	<b>PROPRIETARY AND CONFIDENTIAL</b>  THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.
PROPOSAL NUMBER <b>BBC-22-000122</b>	
SALES ORDER NO. <b>32604</b>	
CUSTOMER P.O.	

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED ANGLES MACH: ±2° INCHES: ±0.125 BEND: ±5° MILLIMETERS: ±3	
<b>DO NOT SCALE DRAWING</b>	
DRAWN TES	DATE 08/13/2019
REVIEWED BY MLC	DATE 08/13/2019



**PT-0-30-5V Pressure Transmitter  
Submital Drawing**

DRAWING	PT-0-30-5V SD	REV 0
SIZE A	SCALE 1:4	WEIGHT: 1 lb
		SHEET 1 OF 1