TRANSTECTOR
an INFINITE brand

Series 700 AV/T-S Power Conditioner

Designed for Varian Novalis™ TX, Trilogy™ IX with ExacTRAC™ and OBI or Truebeam™ STX, Truebeam™ with ExacTRAC™ and OBI or any system with a high energy accelerator, Exactrac™ and OBI

Input Voltages: 208 VAC, 240 VAC, 480 VAC or 600 VAC (60 Hz)

Output Voltages: 208/120 VAC, 480/277 VAC and 120 VAC

- Integrated Input and Output Breakers
  - One Input Breaker - Four Output Breakers
- Intelligent Voltage Regulation (± 2.5% Output Typical)
- Output Voltage Monitoring
- Internal Bypass Switch
- Triple Shielded Isolation Transformer
- Internal TVSS
- Front Access “Zero Clearance” Cabinet

Quadruple Output Power Conditioner with Voltage Regulation

Submittal Package and Specifications

TRANSTECTOR SERIES 700 AV/T-S

Specifications for Quadruple Output 60 Hz Power Conditioner, designed for Varian Novalis™ TX, Trilogy™ IX with ExacTRAC™ and OBI or Truebeam™ STX, Truebeam™ with ExacTRAC™ and OBI or any system with a high energy accelerator, Exactrac™ and OBI.

1.0 SCOPE

This specification covers the electrical characteristics of the Transtector Power Conditioner which provides clean regulated power for the entire Novalis™ TX, Trilogy™ IX with ExacTRAC™ and OBI or Truebeam™ STX, Truebeam™ with ExacTRAC™ and OBI or any system with a high energy accelerator, Exactrac™ and OBI.

2.0 GENERAL

The Power Line Conditioner consists of a front access power cabinet incorporating an all copper, multiple tapped, triple shield isolation/regulation transformer. The ultra low output impedance of the transformer in conjunction with the electrostatic shields assures precision hospital grade performance with excellent noise and transient attenuation. Independently controlled inverse parallel electronic switches for each of the 7 taps per phase provide tight regulation over a wide input range. Linear devices are used for line synchronization to prevent phase shift errors normally associated with simple CT zero current crossing acquisition. The microprocessor control accurately selects the correct tap to maintain the output no greater than ± 2.5% of nominal in a typical installation, correcting for voltage disturbances within one cycle. Digital processing technique provides fast and accurate regulation without output voltage over or undershoots.

2.01 MODEL NUMBERS

MODEL INPUT VOLTAGE OUTPUT VOLTAGES

Standard Models - other configurations are available including 50 Hz

Model	Input Voltage	Output Voltages
8BLNX-160 K (i) -700AV/T-S	208 VAC nominal	208/120 VAC, 480/277 VAC and 120 VAC
8CLNX-160 K (i) -700AV/T-S	240 VAC nominal	208/120 VAC, 480/277 VAC and 120 VAC
8DLNX-160 K (i) -700AV/T-S	480 VAC nominal	208/120 VAC, 480/277 VAC and 120 VAC
8ELNX-160 K (i) -700AV/T-S-C	600 VAC nominal	208/120 VAC, 480/277 VAC and 120 VAC

2.1 AGENCIES

2.1.1 STANDARDS

The systems shall be designed in accordance with:

- American National Standards Institute
- Institute of Electrical and Electronic Engineers
- National Electric Code (NEC)
- National Fire Protection Association (NFPA Article 70)
- Underwriters Laboratories (UL) 1449, 1012
- FCC Article 15, Section J, Class A
- ISO 9001

2.1.2 LISTINGS

- The system shall be listed to C-UL, UL standard UL1012.
- The system shall comply to: FCC Article 15, Section J, Class A and ANSI C62.14 (electromagnetic compatibility).
- The SPD shall be UL 1449 3rd Edition listed/recognized.

3.0 DYNAMIC ELECTRICAL CHARACTERISTICS

3.1 OPERATING VOLTAGE AND OUTPUTS

The input voltage shall be 208 VAC, 240 VAC or 480 VAC, Delta, three phase, 60Hz. Each unit will be pre-wired at the factory to accommodate the nominal input voltage selected. Units with other input voltages (i.e. 380, 400, 415, 600 VAC) and/or frequencies (50 Hz) are produced upon request.

3.2 LINE VOLTAGE REGULATION

Usable Input Line Voltage +15%, -23%.
Nominal Input Line Voltage +10% to -15%

3.2.1 OUTPUT VOLTAGE REGULATION ± 2.0% to ± 2.5% typical.

The design of the system shall indicate that with an input voltage of -10% of nominal, increasing the load to 1000% shall cause the output voltage to fall no lower than -6%.

3.3 OUTPUT VOLTAGES

Two (2) separate WYE configured, 3 phase voltage outputs shall be provided as follows:
Output #1 shall be 208/120 VAC.
Output #2 shall be 208/120 VAC or 480/277 VAC.
Output #3 shall be 480/277 VAC.
A single (1) phase voltage output shall be provided as follows:
Output #4 shall be 120 VAC.

3.4 OUTPUT CONNECTIONS

Output #1: 150 Amp, three (3) pole circuit breaker for Linear Accelerator or a 175 Amp three (3) pole circuit breaker for TrueBeam™.
Output #2: 100 Amp, three (3) pole circuit breaker if 208 VAC, or a 70 Amp three (3) pole 480 VAC circuit breaker for the BrainLAB ExacTRAC™ generator.
Output #3: 60 Amp, three (3) pole circuit breaker for OBI or a 90 Amp three (3) pole circuit breaker for TrueBeam™.
Output #4: 30 Amp, single (1) pole circuit breaker for power peripherals.

** The TrueBeam™ STx will use either the 175 Amp 208 VAC output or the 90 Amp 480 VAC output.

Refer to chart on page #8 for output configurations.

3.5 INPUT/OUTPUT WIRING
The input/output wiring sizes are dependant upon the terminals provided by the circuit breakers.

Input wiring sizes:

208 VAC	300 Amp breaker	#1 AWG to #600 KCMIL
240 VAC	250 Amp breaker	#3/0 AWG to #350 KCMIL
480 VAC	150 Amp breaker	#14 AWG to #3/0 AWG
600 VAC	100 Amp breaker	#14 AWG to #3/0 AWG

Output wiring sizes:

208/120 VAC	175 Amp breaker	#4 AWG to #4/0 AWG
208/120 VAC	150 Amp breaker	#14 AWG to #3/0 AWG
208/120 VAC	100 Amp breaker	#14 AWG to #3/0 AWG
480/277 VAC	90 Amp breaker	#14 AWG to #3/0 AWG
480/277 VAC	70 Amp breaker	#14 AWG to #3/0 AWG
480/277 VAC	60 Amp breaker	#14 AWG to #3/0 AWG
120 VAC	30 Amp breaker	#14 AWG to #2 AWG

Refer to chart on page #8 for output configurations.

The ILSCO TA-2/0 terminal allows wire sizes from #14 to 2/0 to be connected to the ground.

3.6 RESPONSE TIME
Response time is less than 1/2 cycle.

3.7 CORRECTION TIME
The output voltage is corrected within 1 cycle.

3.8 LOAD REGULATION
The output is maintained to within 2% of nominal or less, from no load to full load.

3.9 IMPEDANCE
Output #1 and Output #2: impedance shall be less than 2.33% (Measured with the linear accelerator in beam on state @45 KVA with the OBI and ExacTrac™ @ 5 KVA continuous)
Output #3: impedance shall be less than 1.45% (45.9 mOhms) (Measured with the linear accelerator in ready state @ 20 KVA, ExacTrac™ in standby state @ 5 KVA and OBI @ 45.7 KVA (55 A) momentary)

3.10 OPERATING FREQUENCY
60 Hertz ± 3 Hertz.

3.11 HARMONIC DISTORTION
Less than 1% THD added to the output waveform under any dynamic linear loading conditions presented to the line regulator.

3.12 TURN-ON CHARACTERISTICS
When energized the voltage overshoot is 5% or less of the nominal voltage for less than 1 cycle.

3.13 OVERLOAD RATING
200% for ten seconds.
1000% for one cycle.

3.14 NOISE ATTENUATION
Common mode noise attenuation is typically 140 dB or greater.
Transverse mode noise attenuation is 3 dB down at 1000 Hertz, 40 dB down per decade to below 50 dB with a resistive load.

3.15 AUDIBLE NOISE
Not to exceed 55dB measured @1 meter.

3.16 EFFICIENCY
Efficiency shall be > 96% typical at full load. Excitation losses shall be less than 1.5% of KVA rating.

3.17 BTU
The Power Line Conditioner shall generate no more than 10,230 BTU/Hour in typical use.

3.18 POWER FACTOR
Input power factor shall be greater than .95 with a resistive load and reflect no triplen harmonics to the utility under non-linear loads.

3.19 LINE TO LINE BALANCE
The Power Line Conditioner shall not produce more than a 2% phase to phase unbalance.

3.20 MTBF
The system shall exhibit a MTBF > 10,000Hr.

3.21 ENHANCED TRANSIENT OVER VOLTAGE SURGE SUPPRESSION
An enhanced surge protection device (SPD) shall be installed parallel to the secondary output of the power line conditioner to provide all mode, bi-directional and bi-polar surge protection. The SPD is rated for 100 KA per phase, 50 KA per mode capacity. (L-L, L-N, L-G, N-G) The surge suppressor shall be listed to UL 1449 3rd edition ratings when subjected to ANSI/IEEE 62.41-1991 category 3 waveforms. Unit shall conform to UL 1283 requirements for electromagnetic interference. Unit shall provide attenuation against EMI/RFI noise up to 50 dB at 1MHz. The surge suppressor is installed on the load side of the transformer, connected in parallel.

4.0 MAIN TRANSFORMER

4.1 BASIC CONSTRUCTION
The transformer windings are of all copper conductor construction with separate primary and secondary isolated windings.

4.2 MAGNETIC
Grain oriented, stress relieved silicon transformer steel is utilized to minimize losses and provide maximum efficiency. Flux density will not exceed 14k gauss.

4.3 INSULATION
Class N (200° C) insulation is utilized throughout.

4.4 SHIELDING
The transformer has multiple (three) copper shields to minimize inner winding capacitance, transient and noise coupling between primary and secondary windings. Inner winding capacitance is limited to .001 pf or less.

4.5 COOLING
The transformer is designed for natural convection cooling. Fans are inside the unit.

4.6 OPERATING TEMPERATURE
The system operating range: 0 to 40 degrees Celsius, 32 to 104 degrees Fahrenheit.

4.7 OPERATING HUMIDITY
0-95% relative humidity, non-condensing.

5.0 MAIN INPUT BREAKER

A main input molded case thermal magnetic circuit breaker, rated at 125 % of the full load input current, is furnished as an integral part of the unit. For example, a 300 Amp input breaker will be provided for 208 VAC input, a 250 Amp input breaker will be provided for a 240 VAC input, or a 150 Amp input breaker will be provided for 480 VAC input. A 100 Amp input breaker will be provided for 600 VAC input.

6.0 BY-PASS SWITCH

A manually operated rotary bypass switch provides bypassing of the SCR controlled voltage regulator portion of the Power Line Conditioner. The Power Line Conditioner can be operated in either the on-line or bypassed mode with one turn of the switch. The transformer and surge suppression circuitry remains in the circuit when in the bypass mode. All nominal output voltages, 208/120 and 480/277 VAC three (3) phase 4 wire, and 120 VAC single (1) phase will remain available in the bypass mode. The bypass switch is located on the front of the unit.

7.0 MONITORING

7.1 ALERT LIGHT
An indicator light shall annunciate that the output has been disabled by one of the following conditions.
(1) Transformer over-temperature.
(2) SCR thermal over-temperature.

7.2 INPUT OUT OF RANGE LEDs

Input “Out of Range” red indicating LEDs shall be provided for each phase. If any phase of the input voltage source exceeds the specified +10%, -15% from nominal, the appropriate phase LED shall be illuminated.

7.3 INDICATING LAMPS
Output “ON” indicating lamps shall provided for each phase.

7.4 OUTPUT VOLTAGE METERS

Two (2) digital output meters shall be provided. One shall monitor the 208/120 VAC output and the other shall monitor the 480/277 VAC output. Each meter shall monitor and display Line-to-Line and Line-to-Neutral voltages.

Minimum and maximum voltage values shall be recorded in EPROM. High and low output voltage limit alarms shall be programmable and a visual indication given if limits are exceeded.

8.0 CABINET

8.1 TERMINATION
Terminations is front access with input and output connections to the input and output circuit breakers. A ground terminal will also be provided, Ilsco TA-2/0.

The unit is constructed using an isolation transformer and is considered to be a “separately derived system”. It should be grounded in accordance with the NFPA 70 article 250.20 “Alternating-Current Circuits and Systems to be Grounded”, article 250.20 (D) “Separately Derived Systems” and article 250.30 “Grounding Separately Derived Alternating-Current Systems”.

The Output Neutral and Ground connection points are common to both WYE outputs (208/120 VAC & 480/277 VAC). Therefore, it is considered a single, separately derived, power source and should be wired accordingly.

8.2 VENTILATION
Ventilation originates from the front of the cabinet, exiting through the top and/or sides.

8.3 MOBILITY
The Power Line Conditioner cabinets are equipped with angle iron supports that allow for transport by pallet jack or fork lift. These can be used for mounting unit to the floor in seismic zones.

8.4 ACCESSIBILITY
The Power Line Conditioner will have front access. Access to all wiring inputs, outputs, and breakers will be accessible through the front access door or panels. The output meters and bypass switch will be located on the front of the unit. The back of the unit may be set next to a wall without impeding access. It will also incorporate lift off side panels.

8.5 WEIGHT
Unit weight: Approximately 2,194 lbs. (995.18 kg.).

8.6 DIMENSIONS
76” Height x 34.5” Wide x 35.875” Deep (193.04 cm. x 87.63 cm. x 91.12 cm.).

9.0 CONTROLS

The control portion of the cabinet containing the circuit boards and connection to the semi-conductor devices is separate from the transformer section and apart from the input/output power connections.

10.0 WARRANTY

Units shall include a comprehensive warranty for the first year, covering all parts and workmanship, inclusive of on site labor and travel expenses in geographical areas covered. Consult factory for details. All units are provided with a standard two (2) year warranty covering parts and workmanship.

11.0 SERVICE

Transtector shall provide immediate phone support/consultation and if possible, same day parts shipment. (contact must be prior to 12:00 PM PST). If necessary, on site service shall be scheduled the same day for service to be conducted within 24 to 48 hours, based on customer requirements. Typical service hours are 8 AM to 5 PM Monday through Friday.

12.0 CONTACT

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Transtector Systems

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INPUT AND OUTPUT CONFIGURATION

INPUT

OUTPUT KVA	INPUT BREAKER SIZE
160 K(I)	300 A @ 208 VAC 250 A @ 240 VAC 150 A @ 480 VAC 100 A @ 600 VAC

OUTPUT

Novalis™ TX - Trilogy™ with ExacTRAC™ Output Breaker Configurations

BRL #1	BRL #2 (Varian preferred breakers)	BRL #6
150 A 208 VAC CB for the Linear Accelerator	150 A 208 VAC CB for the Linear Accelerator	150 A 208 VAC for the Linear Accelerator
100 A 208 VAC CB for the BL Generator	70 A 480 VAC CB for the BL Generator	70 A 480 VAC CB for the BL Generator
60 A 480 VAC CB for the OBI	60 A 480 VAC CB for the OBI	60 A 480 VAC CB for the OBI
30 A 120 VAC CB for the BL Computers	30 A 120 VAC CB for the BL Computers	30 A 120 VAC CB for the BL Computers
		30 A 120 VAC CB for the VMS Computers

TrueBeam™ STx - TrueBeam™ with ExacTRAC™ Output Breaker Configurations

BRL #4	BRL #5
150 A 208 VAC CB (Not Used)	175 A 208 VAC CB for the TrueBeam™
70 A 480 VAC CB for the BL Generator	70 A 480 VAC CB for the BL Generator
90 A 480 VAC CB for the TrueBeam™	60 A 480 VAC CB (Not Used)
30 A 120 VAC CB for the BL Computers	30 A 120 VAC CB for the BL Computers

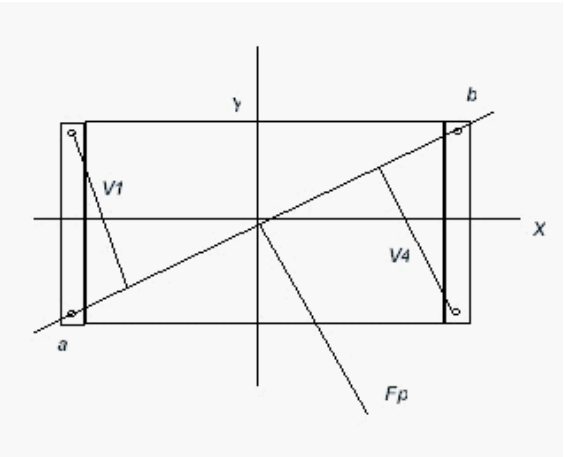
WEIGHTS, BTU AND DIMENSIONS

UNIT SIZE IN KVA (I)	WEIGHT	OPERATIONAL BTU/HR TYPICAL	MAXIMUM BTU/HR	DIMENSIONS
160 K(I)	2,194 lbs. 995.18 kg.	5,115*	10,230	76” H x 34.5” W x 35.875” D (193.04 cm. x 87.63 cm. x 91.12 cm.2)

* Stated BTU’s / Hr is at 100% rated load, 100% duty cycle. Operational BTU’s / Hr is typically at 50% of rated load. Input over current protection provided by others.

SEISMIC CALCULATIONS

Coastal California, Zone 4	Z = 0.4
Equipment Anchorage	I = 1.5
Uniform Building Code, Table 160	Cp = 0.75
Cabinet Weight	2100 lbs.
Center of Gravity Height	33 in.
	Wp (max) 2,415.0 lbs.
	Wp (min) 1,785.0 lbs.
Vertical Force	Fp = 0.45 x 2415 = 1,086.8 lbs.
Moment	Fp = 0.15 x 2415 = 1,086.8 lbs.
	Mo = 33 x 1086 = 35,863 in. lbs.



Corners (a,b) 43.1 in

V1 = V4 = 21.6

Tension = Fp x Cg / V4 = 3,213.6 lbs.

Shear = Wp(max)Fp/4 lbs., each anchor = 603.8

EXAMPLE: <Rawl Power Bolt # 6913>

3/8” embedded 2.5”in minimum 2000 psi concrete

Tension rating of bolt: 5,200 lbs.

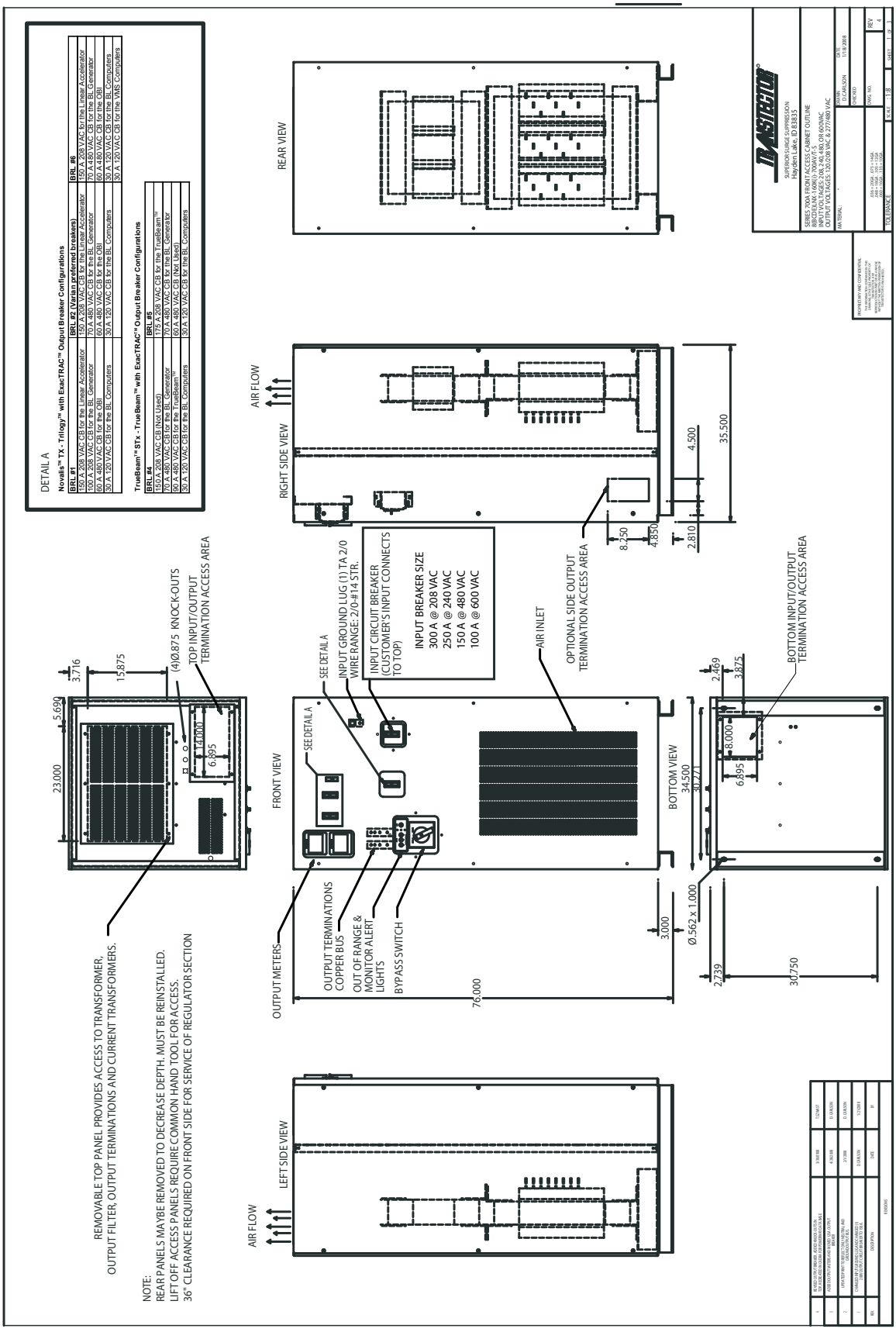
Shear rating of bolt: 7,270 lbs.

Interaction = (T/Tbolt) + (S/Sbolt)

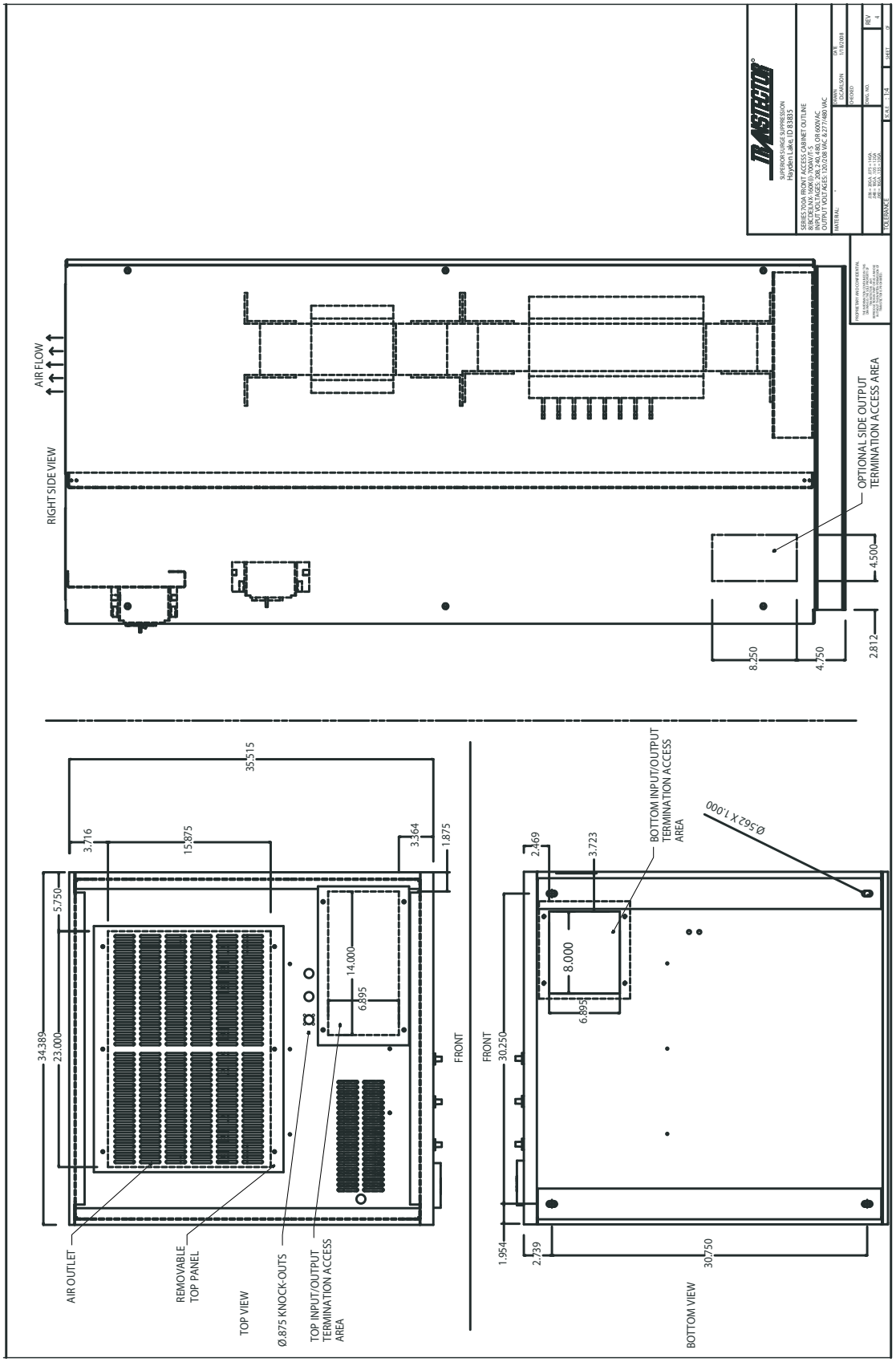
Interaction = 0.70

Interaction = < 1 (OK)

CABINET OUTLINE



CABINET OUTLINE



CABINET OUTLINE