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Project Title:	Charcot Avenue Backup Generating Facility (CABGF)
TN #:	273211
Document Title:	Charcot Avenue Backup Generating Facility SPPE Application Appendix C Part 1 - Part IV of XII
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Organization:	DayZenLLC
Submitter Role:	Applicant Representative
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APPENDIX C

Caterpillar 3516E Specifications

CARTER POWER SYSTEMS

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CARTER POWER SYSTEMS

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CARTER POWER SYSTEMS

SPECIFICATION CLARIFICATIONS

This Project is confined to the Proposed Bill of Material as outlined within this submittal. Should something not be listed, do not assume that is or will be provided. Please check with ACPS's Project Manager for verification.

All field labor provided by others. Any and all installation of this equipment shall be by others.

Assembly of enclosure and /or enclosure accessories (on site) is not included in this proposal. Installing contractor is responsible for rigging, assembly and installation.

All fuel provided by others.

Items marked as ships loose on the Bill of Material to be installed by others.

Federal, State and local code compliance is strictly the responsibility of the owner and his engineers and/or representatives.

All permits; Air, Electrical, Mechanical, Fire, etc (unless stated here in) are the responsibility of others.

Title and risk of loss will pass to Buyer upon delivery of the equipment to project site or designated delivery address.

If the Buyer cannot accept delivery of the equipment and requests that the delivery be delayed by more than 2 weeks from the ready for shipment date, Alban Engine Power Systems will invoice Buyer for the purchase price of the equipment and make arrangements for storage. Please refer to ACPS Terms and Conditions for storage fees.

Buyer may not cancel a purchase order, return equipment or change the delivery date without Alban's written consent. Any cancellation, return or change of delivery date is subject to additional charges based on Alban's costs.

ACPS makes no representation of outlined equipments ability to fulfill requirements for EPA, State or Local emissions requirements. Customer should contact local agencies to ensure equipment is compliant with applicable permitting requirements.

Clean Air Act Compliance

Air Permits

Air permits are often required and must be issued before construction commences. Obtaining air permits is the responsibility of the owner or contractor. Air pollution control regulations may prevent delivery to the jobsite or installation of the equipment prior to issuance of the air permit.

To facilitate compliance with air pollution control regulations, AlbanCat Power Systems has qualified personnel who will perform an on-site inspection and will inquire about the air permit before a technician is sent to perform the start-up. AlbanCat Power Systems may not be able to start the engine until an air permit has been obtained, a waiver has been received from the permitting agency, or it is determined that an air permit is not required at this time.

Emission Testing (General requirements – may differ per site or testing agency)

If emission testing is required, the owner or contractor will be required to provide the following for the emission technician to be able to conduct the testing:

- One ½" port needs to be furnished in the exhaust stack located immediately after the engine exhaust connection; and
- Two 4" ports and two 1" ports, 90° apart, need to be equipped with removable covers and located at least two stack diameters down from the outlet of the exhaust.

These ports should be accessible from the roof of the enclosure/building. In all cases, the accessibility to the ports for the person operating the emission sampling probe must be an OSHA approved device. These devices can include a set of steps up to a platform, a man lift, or similar device. An A-frame ladder is an unacceptable device and cannot be provided to the probe operator.

If sampling is required, it must be performed within 180 days of startup or within 60 days of the unit reaching maximum rated power, unless otherwise stated in the air permit issued by the state regulatory agency. A stack sampling protocol is required to be submitted to the state air regulatory agency at least 30 days prior to testing and the report of the sampling results is due within 60 days of completion of the sampling.

When it comes to Clean Air Act compliance, many variables, such as the size and type of unit, as well as emission units already installed at the facility, will affect the type of air permit and whether emission testing is required. If you require assistance with Clean Air Act compliance, AlbanCat Power Systems has the necessary and qualified staff that can assist you.

CARTER POWER SYSTEMS

Bill of Materials

Manufacturer/ Part No.	Qty	Description	Ships
General			
This submittal provides detailed information based upon our best interpretation of the project requirements. Please check this submittal closely to verify dimensions, configurations, connection locations, capacities/performance, weights, etc., to be certain that all project requirements are met.			
Carter CAT Power Systems (CCPS) is an equipment supplier only and as such does not provide any field labor. The purchaser is responsible for all installation of the equipment described in this submittal. All equipment required to perform any loading / offloading / manhandling / installation of the equipment and/or auxiliary items described in this submittal is the responsibility of the purchaser.			
Though CCPS on occasion provides application information on their products, we are not design consultants and, therefore, not responsible in any way for the design of the generator/switchgear whether or not indicated in the contract documents.			
The scope of supply is limited to the equipment and/or services described below. Equipment not indicated as being provided will be by others.			
To prevent damage during transportation some items are shipped loose and should be installed, mounted, wired, piped, etc., by the installing contractor as part of unit installation.			
Package Generator Set			
Caterpillar	1	3516E	**Loose**
	KW	3000	
	Duty	Standby	
	RPM	1800	
	Fuel	Diesel	
	Phase	3	
	Line Voltage	480	
	Phase Voltage	1	
	Hertz	60	
	Starting Voltage	24 VDC	
Generator is rated for Standby power - applicable for supplying power for the duration of an emergency outage at variable load with an average power output of 70% of standby rating [no overload permitted] with maximum expected usage of 500 hours per year.			
EPA Emissions Certified for Emergency Standby Use Only (Tier 2 Emission Levels)			

CARTER POWER SYSTEMS

Bill of Materials

Manufacturer/ Part No.	Qty	Description	Ships
Generators described in this submittal will provide power to the system independent of other generators.			
Includes all standard equipment as indicated on the enclosed specification sheet			
Unit designed for outdoor installation on concrete pad provided by others.			
Unit is located on building roof.			
Please refer to Section 1 of this submittal for generator set dimensions and weights.			
Air Inlet System			
Caterpillar	1	Standard Duty Air Filters	
Charging System			
LeMarche	2	High Frequency Battery Charger Rectifier,MSM-30-24V-U1, 102-264 VAC, 45/66 Hz Input, 30 Amps, 24 VDC Output F/U/W Lead Acid Batteries	
LeMarche Best Battery Selector	1	Automatic Redundant Battery Selector Diode Isolator, ARBS-500-50	
Control System (governor)			
Caterpillar	1	ADEM A4 ECM, Speed Control Governor, Electronic 0% Regulation	
Cooling System			
IEA	1	Engine driven Radiator sized for 45C ambient temperature	
Caterpillar	1	Coolant Level Sensor	
Caterpillar	1	Antifreeze, 50/50 Caterpillar Ethylene Glycol - Extended Life Coolant	
Enclosures			
Tomball Controls	1	Standard Enclosure factory mounted on the generator, Weatherproof Sound Attenuated.	
	Please refer to the enclosure section for additonal information		

CARTER POWER SYSTEMS

Bill of Materials

Manufacturer/ Part No.	Qty	Description	Ships
Enclosure is provided with sealant to be field installed by the installing contractor. This will make the interface between the enclosure base and the support structure water-tight if the support structure is level, smooth and even, which often is not the case. To assure that water will not penetrate at the base/support interface, we highly recommend that a flashing system be provided and installed by others. If requested, we can provide suggested details of the recommended flashing.			
Please refer to the attached drawings for additional information.			
Exhaust System			
Caterpillar	1	SCR System, side/end inlet, end outlet, xx" ASA Inlet and Outlet Flanges	**Loose**
Caterpillar	1	SCR Dosing Cabinet	
ATLAS CopCo	1	Air Compressor	**Loose**
All urea is provided by others			
Fuel System			
Diesel Fuel	Total Circulated Fuel Flow required **---** GPH. (May be greater than 100% Fuel Consumption Rate)		
	Maximum suction pressure capability of the CAT Onboard Fuel Pump is **--- PSI (--- ft. H2O)**		
All Fuel Tanks and Fuel Transmission Systems are provided and Installed by others.			
Caterpillar	1	Primary Fuel Filter	
Caterpillar	1	Fuel Water Separator	
Caterpillar	1	Fuel Priming Pump	
Please refer to the "Contractor Installation Requirement" in Section 1 of this submittal for important additional information.			
All fuel piping and fuel trim (valves, switches, gauges, etc.,) if required, upstream of the generator set fuel connections, base tank fuel inlet and / or discharge connections are provided and installed by others.			
All fuel is provided by others.			
NOTE: The required fuel for the engines on this project is Ultra Low Sulfur Fuel. This is fuel that has a sulfur content less than 15 ppm.			
Generator and Circuit Breakers			
Caterpillar	1	Generator	
	Model	3516E	
	Frame	1868	
	Pitch	.667	

CARTER POWER SYSTEMS

Bill of Materials

Manufacturer/ Part No.	Qty	Description	Ships
	Excitation	Permanent Magnet	
Caterpillar	1	Digital Voltage Regulator	
Caterpillar	1	Space Heater; One 1200W, 240 VAC, 60 Hz	
LSIS	1	Circuit Breaker, Freestanding Entry, 4000 Amp, LSIG, 3-	**Loose**
Load Side Lugs provided and installed by others.			
Instrumentation & Controls			
Caterpillar	1	ECS 100 Control Panel	
		Standard Features :	
		Run/Auto/Stop Control	
		Speed and Voltage Adjust	
		Local and Remote Emergency Stop	
		Remote Start/Stop	
		Cycle Crank	
		Electronic Display:	
		Oil Pressure	
		Coolant Temperature	
		RPM	
		Run Hours	
		Battery Voltage	
		AC Voltage	
		AC Amperage	
		Frequency	
		Average kW, kVAr, kVA	
		Average Power Factor	
		Total kW-hr, kVAr-hr	
		Stator and Bearing Temperature	
Caterpillar	1	Local Alarm Module, 16 Point, 32 Light	
Protection Devices And Indication (See Annunciation List)			
Lube System			
Caterpillar	1	Lube Oil	
Caterpillar	1	Oil Pan Drain Valve	
Caterpillar	1	Closed Crank Case Ventilation System	
Mounting System			
Caterpillar	1	Base; Narrow Formed Steel	

CARTER POWER SYSTEMS

Bill of Materials

Manufacturer/ Part No.	Qty	Description	Ships
VMC Group	16	Vibration Isolators with integral seismic restraint and external adjustment 2" deflecion, linear, mointed between base and engine-generator, M2SS-2E-5400N. **For Installation By Others.**	**Loose**
Protection System			
Caterpillar	1	Engine Shutdown Sensors; Low Oil Pressure, High Coolant Temperature, Overspeed	
Caterpillar	1	Engine Pre-Alarm Sensors; Low Oil Pressure, High Coolant Temperature	
Caterpillar	1	Low Coolant Temperature Sensor	
Caterpillar	1	Low Coolant Level Sensor	
Caterpillar	1	Battery Voltage: Low, High and Weak	
Caterpillar	1	Generator Protection:	
		Over/Under Voltage	
		Over/Under Frequency	
		Overcurrent	
		Reverse Power	
		Generator Phase Sequence	
Starting System			
Caterpillar	1	Electric; 24 VDC Automatic	
Caterpillar	1	Jacket Water Heater with pump; 9 KW, 480 VAC, 60 Hz, Three Phase, 480V, 3 phase power source to be connected directly to each jack water heater	
Caterpillar	2	Sets of Batteries; Lead Acid, 24 VDC, 570 Amp\Hr, (6) 8D's per set, high output, 4200 CCA. Each gen will have (2) sets of batteries (12 total per gen). Each set of (6) batteries will be connected to a set of (2) engine starting motors. Each enginer will have two sets of starting morors (one on each side). A control power best battery selector will be useds to select the best battery for engine controls only, but not starting power. Starting power is truly redundant due to the redundant starts and their respective batteires.	**Loose**

CARTER POWER SYSTEMS

Bill of Materials

Manufacturer/ Part No.	Qty	Description	Ships
System Check, Test and Start-up			
Carter Cat Power Systems (CCPS)		CCPS will provide time-to-time supervision, as required, of the work performed by the Installation Contractor for the System Check, Test and Start-up of the generator system provided under this contract. All tools required to perform this field work will be provided by the Installation Contractor.	
		Material provided by CCPS for the System Check, Test and Start-up will be received by the Installation Contractor and positioned in locations indicated by CCPS.	
		Prior to calling Carter for start-up, the installing contractor should:	
		-Review the "Contractor Installation Requirements" included in this submittal.	
		-Fill out the "Installing Contractor Pre-Start-Up and Testing Site Evaluation" included in this submittal and forward to your Carter Cat Project Manager.	
Load Testing			
		All fuel is provided by others. **ULTRA LOW SULFUR FUEL is required.**	
Carter Cat Power Systems (CCPS)		CCPS will provide a service technician to perform a load test. Please refer to the sample "Load Testing Form" provided in this submittal indicating the readings that will be documented. All load banks are provided by others.	
Operation & Maintenance Manuals			
Caterpillar	1	Sets of manual(s) will be provided for use by the owner and for use during Instruction. **O&M Manuals will be manufacturer's standard.**	**Loose**
Instruction			
		Instruction of Owner's personnel in the operation and maintenance of the packaged generator using the O&M Manuals described above.	
Carter		CCPS will provide on-site training. A copy of the "Operation and Maintenance Training Form" describing the content of the training is included in this submittal	
		Training / Demonstration will be provided immediately following the completion of the startup / load bank testing.	
Warranty			

CARTER POWER SYSTEMS

Bill of Materials

Manufacturer/ Part No.	Qty	Description	Ships
Standard Warranty: Caterpillar will, at it's option, repair or replace items found to be defective in material or workmanship for a period of Standby Operation - 24 months from Start-up not to exceed 500 hours per annum.			
Warranty covers All equipment provided by Caterpillar with the exception of consumables (filters, fluids, belts, hoses, power take offs, paint, batteries, clutches, etc.).			
All "Covered Components" must pass inspection or be replaced at the proper intervals as prescribed by the Operations and Maintenance Manual by an "Authorized Dealer" to qualify for continued coverage under the Service Contract. Failure to follow the Operations and Maintenance Manual may result in denial of claims.			

Dimensions and Estimated* Rigging Weights

Please refer to enclosure section of submittal for more information

OFF LOADING AND RIGGING INFORMATION

1 All off loading and rigging is performed by others. Off loading/Rigging must be performed in a manner that is safe and does not damage the equipment. If you require any information that is not in this submittal and required to safely unload/rig the unit, Please contact your Alban Project Manager and that information will be provided to you.

2 Generator packages and integral Generator/Enclosure Packages are provided with lifting lugs at the base rail. These lifting lugs MUST be used. When units are lifted using base mounted lifting lugs, the use of spreader bars and fabric scraps are required to protect the equipment. Do not lift without spreader bars or with chains or metal cable as this will damage the equipment.

3 Drop over Enclosures are generally provided with lifting lugs at the enclosure roof. Spreader bars and fabric straps are recommended for these applications.

Under NO CIRCUMSTANCES should a unit carrying fuel be lifted.

Carter CAT
6387 Old Washington Road
Elkridge, MD 21075
800-449-9813

INSTALLING CONTRACTOR
PRE-START UP & TESTING SITE
EVALUATION

(*To be completed by installing contractor prior to scheduling Alban technician for startup*)

Project Name: _____ Project Number: _____

Customer Name: _____ Customer Contact: _____

Contact Phone Number: _____ Cell Number: _____

Site Address: _____

Equipment Delivery Date: _____ Startup Date: _____

Parking For:

Technicians Truck: _____

Load Bank: _____

Miscellaneous: _____
_____
_____
_____

Air Permit: Received [ ] Not Received [ ]

Equipment Information

Genset Model / KW _____ Serial Number _____

Generator Serial # _____ Generator Arrangement # _____

Engine Serial # _____ Fuel Type _____

ATS Model # _____ Serial Number: _____

ATS Model # _____ Serial Number: _____

_____
_____

Note: Below is a list of items the contractor must check prior to start-up. This is a Generic List for most installations and some of these items may not pertain to every project, but mark them as NA if it does not apply to your particular project.

Site and Equipment Inspection / Accessibility

	OK	NO	N/A	Comments
Any visible Damage	☐	☐	☐	☐
All equipment easily assessable	☐	☐	☐	☐
Area clean of all debris / dirt / etc.	☐	☐	☐	☐
Security clearance required?	☐	☐	☐	☐
Permanent access to:				
Control panels, switchgear and / or ATS(s)	☐	☐	☐	☐
All filters: air, fuel, oil, water	☐	☐	☐	☐
Piping valves and solenoids	☐	☐	☐	☐
Fuel priming pump	☐	☐	☐	☐
Day tank controls	☐	☐	☐	☐
Day tank fuel fill port	☐	☐	☐	☐
Temporary access for:				
Placing Portable Load bank(s)	☐	☐	☐	☐
Load cables, routing, and connection	☐	☐	☐	☐
Technician truck(s) parking	☐	☐	☐	☐

Comments:

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Enclosure Mounting:

	OK	NO	N/A	Comments
Enclosure or fuel base tank is mounted on vibration isolators (spring or rubber)	☐	☐	☐	☐
Vibration isolators are located properly	☐	☐	☐	☐
Mounting pad is level to within 1/8” across generator length and width	☐	☐	☐	☐
Mounting pad is proper thickness for support	☐	☐	☐	☐
Appropriate hold down bolts used for isolators and/or for mounting of enclosure to mounting pad	☐	☐	☐	☐
Flexible connections to genset	☐	☐	☐	☐
Proper free air clearance all around genset	☐	☐	☐	☐
All shipped loose items installed, i.e., exhaust elbow, rain cap, rain shield exterior lighting, air intake / discharge hoods, sound baffles, platforms & stairs, battery racks and batteries	☐	☐	☐	☐
Crankcase vent hoses installed and ran to exterior	☐	☐	☐	☐

Comments:

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Ventilation:

	OK	NO	N/A	Comments
Air louvers in place and clear of shipping braces	☐	☐	☐	☐
No obstructions within 10 feet (free air) of air intake or radiator discharge	☐	☐	☐	☐
Condensate trap properly located and installed	☐	☐	☐	☐
Provisions exist for supplying the proper amount of cooling air, at a maximum temperature of 100°F for engine intake air and to remove the radiated heat from the engine block and from the exhaust system	☐	☐	☐	☐

Refer to the specification sheet within the Submittal for airflow recommendations

All screens on intake and discharge louvers in place				
Sufficient air inlet size for necessary air into room	☐	☐	☐	☐
Louver dampers are powered and operating properly	☐	☐	☐	☐
Louver and fans wired: powered to close, failed to open	☐	☐	☐	☐

Comments:

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Generator Mounting:

	OK	NO	N/A	Comments
Genset or fuel base tank is mounted on vibration isolators (spring or rubber)	☐	☐	☐	☐
Vibration isolators are proper location	☐	☐	☐	☐
Vibration isolation shipping blocks & hold-downs removed	☐	☐	☐	☐
Spring Isolators are adjusted for height & deflection	☐	☐	☐	☐
Floor mounting pad is level to within 1/8” across generator length and width	☐	☐	☐	☐
Floor mounting pad is proper thickness for support	☐	☐	☐	☐
Appropriate hold down bolts used for isolators and for mounting of genset to fuel base tank	☐	☐	☐	☐
Flexible connections to genset	☐	☐	☐	☐
Crankcase vent hoses installed and ran to exterior	☐	☐	☐	☐
Proper free air clearance all around genset	☐	☐	☐	☐

Comments:

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Engine Exhaust System:

	OK	NO	N/A	Comments
Silencer properly located and connected	☐	☐	☐	☐
Muffler is properly supported from the enclosure structure or Building structure without the weight bearing on the exhaust flange of the engine	☐	☐	☐	☐
NOTE: It is the contractor's responsibility to install shipped loose mufflers and flex connections				
Exhaust piping is secure, properly supported and piped to the exterior with a rain cap installed	☐	☐	☐	☐
Flexible fittings are installed at the engine to isolate the engine vibration from the exhaust system piping	☐	☐	☐	☐
Only long radius "sweep" elbows are used in the exhaust system and there are no system restrictions.	☐	☐	☐	☐
System must be below the allowable backpressure limit.	☐	☐	☐	☐
Exhaust piping discharge is positioned away from outside "ventilation" air intakes to the building, generator air intakes and radiator inlets	☐	☐	☐	☐
Exhaust piping is positioned away from the generator control panel to protect it from any heat related damage to the electronic circuitry	☐	☐	☐	☐
Exhaust piping includes all necessary expansion joints required to compensate for thermal growth	☐	☐	☐	☐
Exhaust insulation installed	☐	☐	☐	☐

Comments:

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Lubrication System:

	OK	NO	N/A	Comments
Shipping plugs removed from crankcase breather	☐	☐	☐	☐
Crankcase breather pipe hoses connected and routed smoothly to discharge to building exterior	☐	☐	☐	☐
Crankcase sump full of oil – verify using dipstick	☐	☐	☐	☐
No visible oil leaks	☐	☐	☐	☐
Oil make-up system installed, filled and operational	☐	☐	☐	☐
Verify oil dipstick is properly seated after crank case check	☐	☐	☐	☐

Comments:

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Diesel Fuel System:

	OK	NO	N/A	Comments
Flexible fuel lines used to all connections on the Generator Set	☐	☐	☐	☐
Fuel day tank plumbed to engine	☐	☐	☐	☐
Fuel day tank plumbed to main tank	☐	☐	☐	☐
Fuel lines are to match the material of the tank, either black iron or steel.	☐	☐	☐	☐
NOTE: Zinc alloy or galvanized pipe should not be used as it will react with the fuel				
Plumbed fuel supply lines are correct size	☐	☐	☐	☐
Fuel return line has been checked from engine to day tank and from day tank to storage tank to ensure that no restrictions exist	☐	☐	☐	☐
IMPORTANT: Restrictions in return line can cause severe damage to engine				
Confirm that there are no stop valves in the return line between the engine and day / main tank	☐	☐	☐	☐
IMPORTANT: If closed during operation, this will restrict flow and cause engine damage				
Fuel lines purged	☐	☐	☐	☐
Fuel tank vent lines installed properly	☐	☐	☐	☐
Fuel tank vent lines are correct height	☐	☐	☐	☐
Day tank pump operational	☐	☐	☐	☐
System pressure test completed	☐	☐	☐	☐
Fuel day tank full of fuel	☐	☐	☐	☐
No visible leaks in fuel day tank	☐	☐	☐	☐
All fuel alarms and monitoring connected	☐	☐	☐	☐
Water separators installed	☐	☐	☐	☐
Sufficient fuel available in main tank	☐	☐	☐	☐

Comments:

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Natural or LP Gas Fuel System:

	OK	NO	N/A	Comments
Gas lines connected	☐	☐	☐	☐
Correct gas pressure regulator installed	☐	☐	☐	☐
What size is incoming gas line	_____			**Inch**
How long of a gas line run from Genset to main regulator	_____			**Feet**
Flexible connections between engine and piping	☐	☐	☐	☐
Gas meter (is used) connected to high pressure side of regulator	☐	☐	☐	☐
Dirt traps installed upstream of all Gas Regulators	☐	☐	☐	☐

Comments:

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Cooling System:

	OK	NO	N/A	Comments
System full of proper antifreeze solution	☐	☐	☐	☐
Low level gauges installed and connected	☐	☐	☐	☐
Remote radiator pipes plumbed and valves installed	☐	☐	☐	☐
Expansion tanks are installed at the highest point in piping system	☐	☐	☐	☐
System is pressure tested at 15psi for a 24-hour period	☐	☐	☐	☐
No coolant leaks visible anywhere in system	☐	☐	☐	☐
Remote radiator fan motor starter wired	☐	☐	☐	☐
Electric discharge louvers connected	☐	☐	☐	☐
Radiator ducts properly sized	☐	☐	☐	☐
On cooling systems with remote radiators, the piping system has been designed such that no air will be trapped in the lines	☐	☐	☐	☐

Comments:

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DC Electrical System:

	OK	NO	N/A	Comments
Battery racks installed and batteries in place	☐	☐	☐	☐
Battery cables connected	☐	☐	☐	☐
Battery charger installed and connected to power	☐	☐	☐	☐
On batteries that are not sealed, do not energize battery charger until batteries have been filled with acid				
Day tank solenoids installed and connected	☐	☐	☐	☐
Remote annunciator(s) installed and connected	☐	☐	☐	☐
Discrete Input/Output Module(s) (DIO) installed and connected	☐	☐	☐	☐
All DC wiring installed in dedicated conduit	☐	☐	☐	☐
All DC control wiring is stranded type	☐	☐	☐	☐
Engine start wires connected	☐	☐	☐	☐
Additional DC wiring installed as required	☐	☐	☐	☐

Comments:

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AC Electrical System:	OK	NO	N/A	Comments
Transfer switch(s) installed and connected	☐	☐	☐	☐
Power cables from genset connected	☐	☐	☐	☐
Control wiring to genset connected	☐	☐	☐	☐
Power wiring to jacket water heater connected	☐	☐	☐	☐
Do not energize jacket water heater until the engine coolant has been installed				
Power wiring to strip heaters connected	☐	☐	☐	☐
Power wiring to battery charger connected	☐	☐	☐	☐
Power wiring to fuel oil cooler connected	☐	☐	☐	☐
Power wiring to genset enclosure panel board connected	☐	☐	☐	☐
All AC wiring installed in dedicated conduit	☐	☐	☐	☐
All AC control wiring is stranded type	☐	☐	☐	☐
Generator grounding connected to common ground	☐	☐	☐	☐
Generator neutral connected to ground (If system is bonded)	☐	☐	☐	☐
All low voltage power wiring on the load side bus				
Utility power available	☐	☐	☐	☐
All low voltage accessories energized	☐	☐	☐	☐
For voltages above 600 VAC, all cables and connected items to be hi-pot tested	☐	☐	☐	☐

Comments:

_____

_____

_____

_____

_____

_____

_____

NOTE: ***To prevent damage during transportation, some items are shipped loose and should be mounted, wired, piped, etc. by the installing contractor as part of the unit installation procedure.***

Additional Comments and Notes:

All deficiencies noted above must be completed and/or corrected by the customer prior to start-up so that we can effectively start up and test the product we have supplied. Discrepancies that are out of Alban's scope of supply will require a change order to the existing contract to complete.

Signature	Signature
Printed	Printed
CarterCAT Power Systems	Customer
Date	Date

CHECK-TEST AND START UP

END USER DATA

Company Name: _____

Address: _____

_____

Genset Location: _____

_____

GENERATOR SET DATA

Generator Set Model/ Serial No: _____ / _____ Duty: Standby / Prime

Engine Model/ Serial No: _____ / _____ Volts:_____V

Radiator Serial No: _____ Rating: _____kVA

Alternator Model/ Serial No: _____ / _____ Phase: _____

Control Panel Type/ Serial No: _____ / _____ Frequency: _____Hz

Load Transfer Panel Type/ Serial No: _____ / _____ ☐ Inspection Satisfactory?

Electrical Drawing No: _____ ☐ Refer to Comments

Date of Commissioning: _____ ☐ Not Applicable

Fuel System		Fuse and Fuse Ratings	
Water Level and Additives		Manuals/Drawings Available and Correct	
Lube Oil Level		Load Test	
Battery Electrolyte Level		Exhaust System	
Battery Terminals and Wiring		Cooling System	
Belt Tensions		Jacket Water/Oil Heater	
Radiator and Alternator Guards		Crankcase Breather System	
Electrical Instruments		Air Filtration System	
Engine Instruments		Battery Charging System Engine/Trickle	
Engine Termperature	°C	Mains Fail System Functional Operation	
Engine Oil Pressure	Bar	Panel Functional Operation	
Earth Connections		Changeover Panel Functional Operation	
Electrical Connections Power		Main Circuit Breaker Functional Operation	
Electrical Connections Control		Motor Controls	
Alarm and Shutdown Devices		Synchronising Equipment	
Enclosure		Vibration	
Phase Rotation		Running Gear	

Comments: _____

_____

_____

AEPS Technician Name: _____ Signed: _____ Date: _____

End User Name: _____ Signed: _____ Date: _____

SAMPLE

Generator Set Load Test

Project #: ______ Project Name: ______ Date: ______

System Model #: ______ System S/N: ______ Site Location: ______

Witnessed By: ______

Engine	Generator	Control Panel/Switchboard	
Brand: Caterpillar	Brand: Caterpillar	Brand: Caterpillar	Type: Standby HZ: 60
Model:	Model:	Model:	KW: F/L Amps: 1.0 pf
S/N:	S/N:	S/N:	Voltage: 0.8 pf

Time	Voltage			Amperage			Hertz	Average KW	% Load	Oil PSI	Water Temp Degrees F	Fuel PSI	Engine Hours	Ambient Temp
	ØA	ØB	ØC	ØA	ØB	ØC								

Service Tech: ______ ______ Certified By: ______

Electric Power Service Manager

Signature: ______ ______

OPERATION AND MAINTENANCE TRAINING

Project #:
Project Name:
Date:

The following personnel were present for and completed Operation and Maintenance Training

Trainee's Signature	Printed Name	Company	Position	Phone

Confirm that the following systems were covered in the training.

	Description	☑ if Training Complete
1.	General Safe Operation Instructions	☐
2.	Identification of Major Genset Components	☐
3.	Major Equipment Identification	☐
4.	General Theory of Operation	☐
5.	Demonstrations of Various Modes	☐
6.	Air Filtration Filter Change Procedure and Interval	☐
7.	Battery Charger	☐
8.	Governor	☐
9.	Engine Cooling System	☐
10.	Radiator System	☐
11.	Silencer Drain	☐
12.	Engine Fuel Filter Change Procedure and Interval	☐
13.	Day Tank	☐
14.	Generator	☐
15.	Voltage Regulator	☐
16.	Circuit Breaker	☐
17.	Emergency Stop Push Button	☐
18.	Manual Fuel Shutdown	☐
19.	Engine Protection Systems (LO, WT, OS, OC)	☐
20.	Engine Lubrication Type	☐
21.	Oil Sump Screen	☐
22.	Oil Filter Change Procedure and Interval	☐
23.	Oil Change Procedure and Interval	☐
24.	S.O.S	☐
25.	Starting System	☐
26.	Jacket Water Heaters	☐
27.	Automatic Transfer Switch	☐
28.	Troubleshooting	☐
29.	Replacement Parts Ordering	☐
30.	SCR / DPF / CEM	☐
31.	DEF (Urea) System	☐
32.	Miscellaneous Items	☐
33.		☐

Technician _____ Date _____

CARTER POWER SYSTEMS

Section Two
PACKAGE TECHNICAL DATA

Caterpillar 3516E 3000kW Package Brochure
Engine Specific Performance Data
Alternator & Generator Cut sheet
Generator Specific Technical Data
Voltage Regulator
Control Panel
Radiator Data Sheet

Cat® 3516E

High Power Density (HPD) Diesel Generator Sets

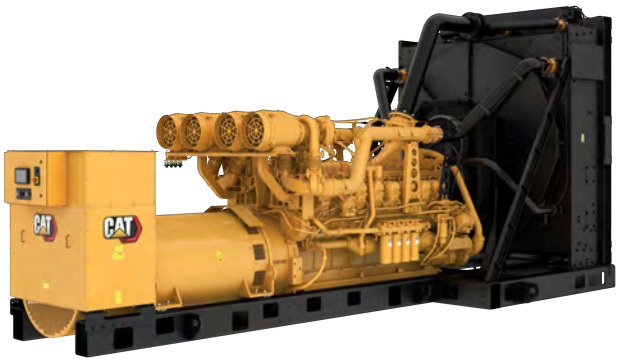


Image shown may not reflect actual configuration

Bore – mm (in)	170 (6.69)
Stroke – mm (in)	215 (8.46)
Displacement – L (in^3)	78.1 (4766)
Compression Ratio	13.9:1
Aspiration	TA
Fuel System	MEUI
Governor Type	ADEM™ A5

Standby 60 Hz ekW (kVA)	Mission Critical 60 Hz ekW (kVA)	Prime 60 Hz ekW (kVA)	Emissions Performance
3000 (3750)	3000 (3750)	2725 (3406)	U.S. EPA Certified for Emergency Stationary Applications (Tier 2) and meets Northern Virginia NO_x requirements

Features

Cat® Diesel Engine

- Meets U.S. EPA Stationary Emergency (Tier 2) and Northern Virginia NO_x requirements
- Reliable performance proven in thousands of applications worldwide
- Certified alternative fuels including Hydrotreated Vegetable Oil (HVO), Renewable Diesel (RD) and Hydrotreated Renewable Diesel (HRD) which meet EN 15940 or ASTM D975 can be used or blended with EN 590 diesel

Generator Set Package

- Accepts 100% block load in one step
- Meets NFPA 110 loading requirements
- Conforms to ISO 8528-5 G3 load acceptance requirements
- Reliability verified through torsional vibration, fuel consumption, oil consumption, transient performance, and endurance testing

Alternators

- Superior motor starting capability minimizes need for oversizing generator
- Designed to match performance and output characteristics of Cat diesel engines

Cooling System

- Cooling systems available to operate in ambient temperatures up to 50°C (122°F)
- Tested to ensure proper generator set cooling

Cat Energy Control System (ECS)

- User-friendly interface and navigation
- Scalable system to meet a wide range of installation requirements
- Expansion modules and site specific programming for specific customer requirements
- Graphical touchscreen display
- Easily upgradeable

Warranty

- 24 months/1000-hour warranty for standby and mission critical ratings
- Extended service protection is available to provide extended coverage options

Worldwide Product Support

- Cat dealers have over 1,800 dealer branch stores operating in 200 countries
- Your local Cat dealer provides extensive post-sale support, including maintenance and repair agreements

Financing

- Caterpillar offers an array of financial products to help you succeed through financial service excellence
- Options include loans, finance lease, operating lease, working capital, and revolving line of credit
- Contact your local Cat dealer for availability in your region

Standard and Optional Equipment

Engine

Air Cleaner
- ■ Dual Element
- ❑ Service Indicator

Muffler
- ❑ Industrial grade (15 dB)
- ❑ Critical grade (25 dB)
- ❑ Hospital grade (35 dB)

Starting
- ❑ Standard batteries
- ■ Oversized batteries
- ■ Dual electric starting motors
- ❑ Air starter(s)
- ■ Jacket water heater

Alternator

Output voltage
- ■ 480V ❑ 12470V
- ❑ 600V ❑ 13200V
- ❑ 4160V ❑ 13800V

Temperature Rise (over 40°C ambient)
- ❑ 150°C
- ❑ 125°C/130°C

105 deg C

Winding type
- ❑ Random wound
- ■ Form wound

Excitation
- ❑ Internal excitation (IE)
- ■ Permanent magnet (PM)

Attachments
- ■ Anti-condensation heater
- ❑ Stator and bearing temperature monitoring and protection

Power Termination

Type
- ■ Bus bar
- ❑ Circuit breaker
- ❑ 5000A ❑ UL
- ❑ 3-pole ❑ 4-pole
- ❑ Manually operated
- ❑ Electrically operated

Trip Unit
- ❑ LSI ❑ LSI-G
- ❑ LSIG-P

Control System

Controller
- ■ Cat ECS 100
- ❑ Cat ECS 200
- ❑ EMCP 4.4

Attachments
- ❑ Local annunciator module
- ❑ Remote annunciator module
- ❑ Expansion I/O module
- ❑ Remote monitoring software

Charging

- ❑ Battery charger – 10A
- ❑ Battery charger – 20A
- ❑ Battery charger – 35A

Vibration Isolators

- ❑ Spring
- ❑ Seismic rated

Cat Connect

Connectivity
- ■ Ethernet
- ❑ Cellular

Extended Service Options

Terms
- ❑ 2 year (prime)
- ❑ 3 year
- ❑ 5 year
- ❑ 10 year

Coverage
- ❑ Silver
- ❑ Gold
- ❑ Platinum
- ❑ Platinum Plus

Ancillary Equipment

- ❑ Automatic transfer switch (ATS)
- ❑ Paralleling switchgear
- ❑ Paralleling controls

Certifications

- ■ ULC 2200 Listed
- ❑ IBC seismic certification

Note: *Some options may not be available on all models. Certifications may not be available with all model configurations. Consult factory for availability.*

Package Performance

Performance	Standby		Mission Critical		Prime	
Engine Speed	1800 rpm		1800 rpm		1800 rpm	
Frequency	60 Hz		60 Hz		60 Hz	
Gen set power rating with fan	3000 ekW		3000 ekW		2725 ekW	
Gen set power rating with fan @ 0.8 power factor	3750 kVA		3750 kVA		3406 kVA	
Emissions	Tier 2 (EPA ESE)		Tier 2 (EPA ESE)		Tier 2 (EPA ESE)	
Performance number	EM6283-00		EM6285-01		EM6287-01	
Fuel Consumption						
100% load with fan – L/hr (gal/hr)	776.0	(205.0)	776.0	(205.0)	711.1	(187.9)
75% load with fan – L/hr (gal/hr)	624.2	(164.9)	624.2	(164.9)	581.6	(153.7)
50% load with fan – L/hr (gal/hr)	467.5	(123.5)	467.5	(123.5)	438.1	(115.7)
25% load with fan – L/hr (gal/hr)	246.4	(65.1)	246.4	(65.1)	229.2	(60.6)
Cooling System						
Radiator air flow restriction (system) – kPa (in. water)	0.12	(0.48)	0.12	(0.48)	0.12	(0.48)
Radiator air flow – m³/min (cfm)	3476	(122753)	3476	(122753)	3476	(122753)
Engine coolant capacity – L (gal)	179.0	(47.3)	179.0	(47.3)	179.0	(47.3)
Radiator coolant capacity – L (gal)	255.0	(67.4)	255.0	(67.4)	255.0	(67.4)
Total coolant capacity – L (gal)	434.0	(114.7)	434.0	(114.7)	434.0	(114.7)
Inlet Air						
Combustion air inlet flow rate – m³/min (cfm)	258.7	(9133.9)	258.7	(9133.9)	230.5	(8137.8)
Exhaust System						
Exhaust stack gas temperature – °C (°F)	483.9	(903.0)	483.9	(903.0)	484.4	(904.0)
Exhaust gas flow rate – m³/min (cfm)	678.9	(23970.8)	678.9	(23970.8)	600.2	(21194.7)
Exhaust system backpressure (maximum allowable) – kPa (in. water)	7.0	(28.1)	7.0	(28.1)	7.0	(28.1)
Heat Rejection						
Heat rejection to jacket water – kW (Btu/min)	917	(52144)	917	(52144)	854	(48592)
Heat rejection to exhaust (total) – kW (Btu/min)	3091	(175769)	3091	(175769)	2875	(163492)
Heat rejection to aftercooler – kW (Btu/min)	944	(53683)	944	(53683)	827	(47047)
Heat rejection to atmosphere from engine – kW (Btu/min)	158	(8993)	158	(8993)	154	(8766)
Heat rejection from alternator – kW (Btu/min)	119	(6739)	119	(6739)	108	(6119)
Emissions* (Nominal) - Full Load						
NO_x mg/Nm³ (g/hp-h)	2404.9	(5.13)	2404.9	(5.13)	2312.7	(5.01)
CO mg/Nm³ (g/hp-h)	257.5	(0.55)	257.5	(0.55)	405.3	(0.89)
HC mg/Nm³ (g/hp-h)	17.6	(0.04)	17.6	(0.04)	15.0	(0.04)
PM mg/Nm³ (g/hp-h)	Not Available		Not Available		Not Available	
Emissions* (Potential Site Variation) - Full Load						
NO_x mg/Nm³ (g/hp-h)	2885.9	(6.15)	2885.9	(6.15)	2775.2	(6.01)
CO mg/Nm³ (g/hp-h)	463.5	(0.99)	463.5	(0.99)	729.6	(1.60)
HC mg/Nm³ (g/hp-h)	23.4	(0.06)	23.4	(0.06)	19.9	(0.05)
PM mg/Nm³ (g/hp-h)	Not Available		Not Available		Not Available	

mg/Nm³ levels are corrected to 5% O_2. Contact your local Cat dealer for further information

1.2" WC
117.200 ACFM
48.73 gal
0 gal
48.73 gal

PERFORMANCE DATA [EM4716]

OCTOBER 22, 2024

For Help Desk Phone Numbers Click here

Perf No: EM4716 **Change Level:** 02

General | Heat Rejection | Emissions | Regulatory | Altitude Derate | Cross Reference | Supplementary Data | Perf Param Ref

View PDF

SALES MODEL:	3516E	**COMBUSTION:**	DIRECT INJECTION
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,800
MACHINE SALES MODEL:		**HERTZ:**	60
ENGINE POWER (BHP):	4,393	**FAN POWER (HP):**	154.2
GEN POWER WITH FAN (EKW):	3,000.0	**ASPIRATION:**	TA
COMPRESSION RATIO:	13.9	**AFTERCOOLER TYPE:**	ATAAC
RATING LEVEL:	STANDBY	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC, ATAAC
PUMP QUANTITY:	1	**INLET MANIFOLD AIR TEMP (F):**	122
FUEL TYPE:	DIESEL	**JACKET WATER TEMP (F):**	219.2
MANIFOLD TYPE:	DRY	**TURBO CONFIGURATION:**	PARALLEL
GOVERNOR TYPE:	ADEM5	**TURBO QUANTITY:**	4
ELECTRONICS TYPE:	ADEM5	**TURBOCHARGER MODEL:**	TPX44-H32-CT70-CA50-TT70-TA80
IGNITION TYPE:	CI	**CERTIFICATION YEAR:**	2020
INJECTOR TYPE:	MEUI-C	**CRANKCASE BLOWBY RATE (FT3/HR):**	4,390.2
FUEL INJECTOR:	5816980	**FUEL RATE (RATED RPM) NO LOAD (GAL/HR):**	17.2
UNIT INJECTOR TIMING (IN):	0.88	**PISTON SPD @ RATED ENG SPD (FT/MIN):**	2,539.4
REF EXH STACK DIAMETER (IN):	12		
MAX OPERATING ALTITUDE (FT):	6,562		

INDUSTRY	SUB INDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET

General Performance Data Top

Note(s)
THE INLET MANIFOLD AIR TEMP LISTED IN THE HEADER, AND IN THE GENERAL PERFORMANCE DATA, IS THE AVERAGE INLET MANIFOLD TEMP FRONT TO REAR ON THE ENGINE.
THIS STANDBY RATING IS FOR A STANDBY ONLY ENGINE ARRANGEMENT. RERATING THE ENGINE TO A STANDARD PRIME OR CONTINUOUS RATING IS NOT PERMITTED.

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)	ELEC SPEC FUEL CONSUMPTN (ESFC)	ISO ELEC SPEC FUEL CONSUMPTN (ESFC)
EKW	%	BHP	PSI	LB/BHP-HR	LB/BHP-HR	GAL/HR	GAL/HR	LB/EKW-HR	LB/EKW-HR
3,000.0	100	4,393	406	0.336	0.330	208.2	204.3	0.492	0.483
2,700.0	90	3,976	367	0.340	0.333	190.3	186.7	0.500	0.491
2,400.0	80	3,557	328	0.349	0.343	175.1	171.7	0.517	0.508
2,250.0	75	3,347	309	0.356	0.349	168.1	164.9	0.530	0.520
2,100.0	70	3,137	290	0.362	0.355	160.2	157.1	0.541	0.531
1,800.0	60	2,716	251	0.370	0.363	141.7	139.0	0.559	0.548
1,500.0	50	2,294	212	0.389	0.382	125.9	123.5	0.595	0.584
1,200.0	40	1,872	173	0.406	0.398	107.2	105.2	0.634	0.622
900.0	30	1,449	134	0.401	0.393	81.8	80.3	0.645	0.633
750.0	25	1,236	114	0.381	0.374	66.4	65.1	0.628	0.616
600.0	20	1,022	94	0.392	0.384	56.4	55.4	0.667	0.655
300.0	10	590	55	0.441	0.433	36.7	36.0	0.869	0.852

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BHP	IN-HG	DEG F	DEG F	IN-HG	DEG F	IN-HG	DEG F
3,000.0	100	4,393	91.7	119.6	1,263.2	61.5	901.9	100	451.3
2,700.0	90	3,976	82.2	119.3	1,247.8	54.4	904.4	90	423.5
2,400.0	80	3,557	74.9	118.9	1,242.3	48.9	913.3	82	403.8
2,250.0	75	3,347	72.1	119.0	1,240.1	46.9	917.3	79	395.9
2,100.0	70	3,137	67.8	119.3	1,240.0	43.8	925.8	74	384.0
1,800.0	60	2,716	56.0	120.2	1,245.9	35.5	953.4	62	348.0
1,500.0	50	2,294	47.1	118.6	1,248.2	29.9	973.6	52	318.8
1,200.0	40	1,872	33.9	114.2	1,255.9	21.9	1,002.7	38	269.7
900.0	30	1,449	16.7	112.4	1,203.6	12.3	984.1	20	191.4
750.0	25	1,236	8.9	110.5	1,091.8	8.1	915.3	11	150.2
600.0	20	1,022	5.8	108.3	1,004.5	6.6	847.7	8	133.3
300.0	10	590	0.9	104.2	780.2	4.2	671.9	3	108.0

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
EKW	%	BHP	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
3,000.0	100	4,393	8,689.8	22,803.0	37,643.0	39,120.1	8,234.2	7,508.7
2,700.0	90	3,976	8,100.6	21,092.5	34,770.1	36,119.8	7,602.7	6,941.1
2,400.0	80	3,557	7,618.2	19,872.8	32,572.6	33,813.7	7,116.5	6,503.0
2,250.0	75	3,347	7,434.9	19,421.7	31,724.7	32,917.4	6,934.8	6,343.9
2,100.0	70	3,137	7,140.4	18,713.3	30,413.9	31,551.3	6,641.0	6,078.0
1,800.0	60	2,716	6,316.6	16,737.0	26,667.4	27,671.7	5,823.4	5,324.6
1,500.0	50	2,294	5,698.5	15,244.3	23,951.1	24,844.2	5,229.6	4,787.6
1,200.0	40	1,872	4,748.1	12,895.5	19,832.8	20,593.5	4,335.7	3,959.7
900.0	30	1,449	3,421.3	9,198.1	14,210.7	14,791.0	3,132.4	2,847.7
750.0	25	1,236	2,813.2	7,143.6	11,655.6	12,126.4	2,554.4	2,332.7

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
600.0	20	1,022	2,588.4	6,214.7	10,705.5	11,105.8	2,337.3	2,139.1
300.0	10	590	2,189.5	4,545.1	9,126.5	9,387.3	1,974.8	1,838.2

Heat Rejection Data Top

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHAUST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
3,000.0	100	4,393	52,144	8,993	175,769	91,810	23,854	53,683	186,315	447,861	477,084
2,700.0	90	3,976	48,348	8,755	162,671	85,129	21,755	46,560	168,590	408,442	435,094
2,400.0	80	3,557	45,188	8,663	152,310	80,972	19,852	39,923	150,835	372,717	397,037
2,250.0	75	3,347	43,721	8,625	147,003	79,360	18,929	37,161	141,942	355,388	378,578
2,100.0	70	3,137	42,430	8,593	141,837	77,229	18,002	34,024	133,031	337,986	360,040
1,800.0	60	2,716	40,153	8,591	130,286	71,150	16,087	27,442	115,184	302,034	321,742
1,500.0	50	2,294	37,137	8,662	118,761	66,069	14,137	20,821	97,288	265,422	282,742

Emissions Data Top

Units Filter All Units

Note(s)
PARTICULATE EMISSIONS WERE NOT MEASURED FOR THIS RATING. PUBLISHED PM DATA IS ESTIMATED FROM MEASURED SMOKE METER DATA.

DIESEL

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITH FAN ENGINE POWER		EKW BHP	3,000.0 4,393	2,250.0 3,347	1,500.0 2,294	750.0 1,236	300.0 590
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	24,589	12,160	6,934	8,735	6,302
TOTAL CO		G/HR	2,899	2,470	1,673	2,077	1,535
TOTAL HC		G/HR	190	142	118	84	160
TOTAL CO2		KG/HR	2,097	1,691	1,268	673	371
PART MATTER		G/HR	200.9	249.8	229.1	153.7	16.6
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,610.4	1,597.8	1,214.4	2,955.6	3,548.5
TOTAL CO	(CORR 5% O2)	MG/NM3	305.9	319.2	290.7	686.3	917.4
TOTAL HC	(CORR 5% O2)	MG/NM3	17.4	16.0	17.7	24.0	84.5
PART MATTER	(CORR 5% O2)	MG/NM3	17.6	27.2	33.4	41.1	11.3
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	968.6	592.9	450.6	1,096.7	1,316.7
TOTAL CO	(CORR 15% O2)	MG/NM3	113.5	118.5	107.9	254.7	340.4
TOTAL HC	(CORR 15% O2)	MG/NM3	6.4	5.9	6.6	8.9	31.4
PART MATTER	(CORR 15% O2)	MG/NM3	6.5	10.1	12.4	15.3	4.2
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,272	778	592	1,440	1,728
TOTAL CO	(CORR 5% O2)	PPM	245	255	233	549	734
TOTAL HC	(CORR 5% O2)	PPM	32	30	33	45	158
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	472	289	219	534	641
TOTAL CO	(CORR 15% O2)	PPM	91	95	86	204	272
TOTAL HC	(CORR 15% O2)	PPM	12	11	12	17	59
TOTAL NOX (AS NO2)		G/HP-HR	5.63	3.65	3.03	7.07	10.68
TOTAL CO		G/HP-HR	0.66	0.74	0.73	1.68	2.60
TOTAL HC		G/HP-HR	0.04	0.04	0.05	0.07	0.27
PART MATTER		G/HP-HR	0.05	0.07	0.10	0.12	0.03
TOTAL NOX (AS NO2)		G/KW-HR	7.66	4.96	4.12	9.61	14.53
TOTAL CO		G/KW-HR	0.90	1.01	0.99	2.29	3.54
TOTAL HC		G/KW-HR	0.06	0.06	0.07	0.09	0.37
PART MATTER		G/KW-HR	0.06	0.10	0.14	0.17	0.04
TOTAL NOX (AS NO2)		LB/HR	54.21	26.81	15.29	19.26	13.89
TOTAL CO		LB/HR	6.39	5.44	3.69	4.58	3.38
TOTAL HC		LB/HR	0.42	0.31	0.26	0.18	0.35
TOTAL CO2		LB/HR	4,623	3,728	2,794	1,484	819
PART MATTER		LB/HR	0.44	0.55	0.51	0.34	0.04
OXYGEN IN EXH		%	8.9	9.4	9.5	8.5	12.0
DRY SMOKE OPACITY		%	2.0	2.6	2.9	4.3	0.2
BOSCH SMOKE NUMBER			0.86	0.96	1.02	1.16	0.70

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITH FAN ENGINE POWER		EKW BHP	3,000.0 4,393	2,250.0 3,347	1,500.0 2,294	750.0 1,236	300.0 590
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	29,507	14,592	8,321	10,482	7,562
TOTAL CO		G/HR	5,219	4,446	3,012	3,738	2,763
TOTAL HC		G/HR	253	188	157	111	213
PART MATTER		G/HR	281.2	349.8	320.7	215.1	23.3
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	3,132.5	1,917.4	1,457.3	3,546.7	4,258.2
TOTAL CO	(CORR 5% O2)	MG/NM3	550.6	574.6	523.3	1,235.4	1,651.3
TOTAL HC	(CORR 5% O2)	MG/NM3	23.1	21.3	23.6	31.9	112.4
PART MATTER	(CORR 5% O2)	MG/NM3	24.6	38.1	46.7	57.6	15.8
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	1,162.4	711.5	540.8	1,316.1	1,580.1
TOTAL CO	(CORR 15% O2)	MG/NM3	204.3	213.2	194.2	458.4	612.8
TOTAL HC	(CORR 15% O2)	MG/NM3	8.6	7.9	8.8	11.8	41.7
PART MATTER	(CORR 15% O2)	MG/NM3	9.1	14.1	17.3	21.4	5.9
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,526	934	710	1,728	2,074
TOTAL CO	(CORR 5% O2)	PPM	441	460	419	988	1,321
TOTAL HC	(CORR 5% O2)	PPM	43	40	44	60	210
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	566	347	263	641	770
TOTAL CO	(CORR 15% O2)	PPM	163	171	155	367	490
TOTAL HC	(CORR 15% O2)	PPM	16	15	16	22	78
TOTAL NOX (AS NO2)		G/HP-HR	6.76	4.38	3.64	8.49	12.82
TOTAL CO		G/HP-HR	1.20	1.33	1.32	3.03	4.68
TOTAL HC		G/HP-HR	0.06	0.06	0.07	0.09	0.36
PART MATTER		G/HP-HR	0.06	0.10	0.14	0.17	0.04
TOTAL NOX (AS NO2)		G/KW-HR	9.19	5.95	4.94	11.54	17.43
TOTAL CO		G/KW-HR	1.63	1.81	1.79	4.11	6.37
TOTAL HC		G/KW-HR	0.08	0.08	0.09	0.12	0.49
PART MATTER		G/KW-HR	0.09	0.14	0.19	0.24	0.05
TOTAL NOX (AS NO2)		LB/HR	65.05	32.17	18.34	23.11	16.67
TOTAL CO		LB/HR	11.51	9.80	6.64	8.24	6.09
TOTAL HC		LB/HR	0.56	0.42	0.35	0.25	0.47
PART MATTER		LB/HR	0.62	0.77	0.71	0.47	0.05

Regulatory Information Top

EPA EMERGENCY STATIONARY	2011 - ----			
GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 60 SUBPART IIII AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE EMERGENCY STATIONARY REGULATIONS.				
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
U.S. (INCL CALIF)	EPA	STATIONARY	EMERGENCY STATIONARY	CO: 3.5 NOx + HC: 6.4 PM: 0.20

Altitude Derate Data Top

Note(s)

A BLANK IN THE ALTITUDE DERATE TABLE SIGNIFIES THAT NO RATING IS AVAILABLE AT THAT SPECIFIED ALTITUDE AND AMBIENT TEMPERATURE.

THE TEMPERATURES LISTED IN THE CHART ARE AMBIENT TEMPERATURES. THE FOLLOWING DERATE CHART WAS CALCULATED ASSUMING A 5 DEG C RISE IN AIR TEMPERATURE BETWEEN AMBIENT AND THE TURBOCHARGER INLET.

STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	30	40	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)													
0	4,393	4,393	4,393	4,393	4,393	4,393	4,393	4,393	4,393	4,393	1,927		4,393
1,000	4,393	4,393	4,393	4,393	4,393	4,393	4,393	4,393	4,393	4,393	1,860		4,393
2,000	4,393	4,393	4,393	4,393	4,393	4,393	4,393	4,393	4,393	4,304			4,393
3,000	4,393	4,393	4,393	4,393	4,393	4,393	4,393	4,393	4,313	2,786			4,393
4,000	4,393	4,393	4,393	4,393	4,393	4,393	4,393	4,355	4,037	1,625			4,393
5,000	4,393	4,393	4,393	4,393	4,393	4,383	4,334	4,221	3,517				4,393
6,000	4,393	4,393	4,393	4,356	4,307	4,246	4,183	4,064	2,023				4,393
7,000	4,393	4,380	4,306	4,226	4,160	4,072	3,968	3,778					4,378
8,000	4,347	4,247	4,153	4,051	3,974	3,836	3,573	3,093					4,274
9,000	4,203	4,068	3,954	3,831	3,738	3,550	3,208	2,621					4,152
10,000	3,990	3,831	3,691	3,541	3,442	3,250	2,968	2,196					3,986
11,000	3,755	3,560	3,390	3,239	3,162	3,018	2,762	1,678					3,815
12,000	3,413	3,252	3,123	3,015	2,940	2,762	2,300	1,104					3,539
13,000	3,070	2,977	2,897	2,829	2,750	2,477	1,702						3,198
14,000	2,754	2,728	2,691	2,660	2,553	2,240							2,841
15,000	2,454	2,461	2,285	2,143	2,057	1,713							2,523

Cross Reference Top

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
5643811	LL2327	5577462	PG296	-	ZNL00001	

Supplementary Data Top

Type	Classification	Performance Number
ALTITUDE DATA	HIGH RESOLUTION	EM5585

Performance Parameter Reference Top

Parameters Reference: DM9600 - 15

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600

APPLICATION: Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS: Power +/- 3% Torque +/- 3% Exhaust stack temperature +/- 8% Inlet airflow +/- 5% Intake manifold pressure-gage +/- 10% Exhaust flow +/- 6% Specific fuel consumption +/- 3% Specific fuel consumption (C7-C18) +/- 4% Fuel rate +/- 5% Specific DEF consumption +/- 3% DEF rate +/- 5% Heat rejection +/- 5% Heat rejection exhaust only +/- 10% Heat rejection CEM only +/- 10%
Heat Rejection values based on using treated water.
Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
On 3500 and C175 engines, at speeds below Peak Torque these values are provided for reference only, and may not meet the tolerance listed.
These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS: Heat rejection +/- 10% Heat rejection to Atmosphere +/- 50% Heat rejection to Lube Oil +/- 20% Heat rejection to Aftercooler +/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS: Torque +/- 0.5% Speed +/- 0.2% Fuel flow +/- 1.0% Temperature +/- 2.0 C degrees Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR FOR 3500 ENGINES AND SMALLER SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.
FOR 3600 ENGINES Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL DIESEL Reference fuel is #2 distillate diesel with a 35API gravity; A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 15 deg C (59 deg F), where the density is 850 G/Liter (7.0936 Lbs/Gal).
GAS Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.
Standard temperature values versus altitude could be seen on TM2001.
When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.
Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.
Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.
Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

EMISSION CYCLE LIMITS: Cycle emissions Max Limits apply to cycle-weighted averages only. Emissions at individual load points may exceed the cycle-weighted limit.

WET & DRY EXHAUST/EMISSIONS DESCRIPTION: Wet - Total exhaust flow or concentration of total exhaust flow Dry - Total exhaust flow minus water vapor or concentration of exhaust flow with water vapor excluded

EMISSIONS DEFINITIONS: Emissions : DM1176

EMISSION CYCLE DEFINITIONS
1. For constant-speed marine engines for ship main propulsion, including,diesel-electric drive, test cycle E2 shall be applied, for controllable-pitch propeller sets test cycle E2 shall be applied.
2. For propeller-law-operated main and propeller-law-operated auxiliary engines the test cycle E3 shall be applied.
3. For constant-speed auxiliary engines test cycle D2 shall be applied.
4. For variable-speed, variable-load auxiliary engines, not included above, test cycle C1 shall be applied.

HEAT REJECTION DEFINITIONS: Diesel Circuit Type and HHV Balance : DM9500

HIGH DISPLACEMENT (HD) DEFINITIONS: 3500: EM1500

RATING DEFINITIONS: Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039
On-Highway Truck : TM6038

SOUND DEFINITIONS: Sound Power : DM8702
Sound Pressure : TM7080

Date Released : 03/12/24

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Alternator



Image Shown may not Reflect Actual Package.

SR5 — 1800 Frame

Standby Power
50 Hz, 1500 rpm 1688 – 3500 kVA
60 Hz, 1800 rpm 1800 – 3500 ekW

Prime Power
50 Hz, 1500 rpm 1688 – 3181 kVA
60 Hz, 1800 rpm 1800 – 3181 ekW

Continuous Power
50 Hz, 1500 rpm 1688 – 3181 kVA
60 Hz, 1800 rpm 1800 – 3181 ekW

Features

General
- Standards: meets the requirements of NEMA,
- IEC, ISO, IEEE, BS, AS
- Industry leading insulation technology
- Proven mechanical and electrical design
- Reliable and durable construction
- Improved excitation system for high power quality
- Improved motor starting capability
- Radio frequency noise suppression better than industry standards
- Superior construction and testing

Standard
- 3 Phase brushless, salient pole
- NEMA Class H insulation
- Class H Temperature rise at 40°C ambient
- 2/3 Winding pitch
- Form Wound
- Standard voltages:
  60 Hz: 480V, 4160V
  50 Hz: 400V, 3300V
- Busbar connections:
  60 Hz models: NEMA standard hole pattern
  50 Hz models: EC standard hole pattern

Optional
- Space heater kit
- Bearing temperature detectors
- Optional voltages:
  60 Hz: 380V, 440V, 600V
  50 Hz: 380V, 415V
- Oversized generators for Class F temperature rise
- UL Listing

Alternator

Specifications

Type
Brushless, revolving field solid-state automatic voltage regulator
Construction
Two bearings 3 phase, series star connected
Enclosure
Drip proof IP23, guarded
Over-speed capability
60 Hz — 125% of synchronous speed
50 Hz — 150% of synchronous speed
Waveform deviation, line to line, no load
Less than 3%
Paralleling capability
Standard with adjustable voltage droop
Voltage level adjustment
+/- 5%
Voltage regulator
3 Phase sensing with variable Volts-Per Hertz response
Voltage regulation, steady state
+/- 0.5%
Voltage regulation with 3% speed change
+/- 0.5%
Voltage gain
Adjustable to compensate for engine speed droop and line loss
TIF
Less than 50
Number of leads 6

Product Support

- Standard Caterpillar warranty
- Optional extended Caterpillar warranty
- Serviceable parts available through Caterpillar Parts System
- Service intervals agree with recommended engine practices

Serviceability

- Stator leads exit top
- Replaceable bearing sleeve(s) for longer life and lower repair cost
- Easy access to serviceable parts
- Improved wire and terminal idenfication ensuring reliable connection

Cable Entry

- Top cable entry on LV package
- Bottom cable entry on MV packages

Main Stator Construction

The 1800 frame generators use Round lamination stator design. Stator coil pitch, coil distribution designed to produce optimum waveform and minimum total harmonic distortion. Stator slots are insulated by slot liners and coil separators. Slot liners, coil separators, and top sticks provide an adequate distance from the coil to ground.

The thickness of liners, separators, and phase sheets provides superior protection between phases and ground.

Low voltage stator windings are given a 3000 volt “high pot” test (150% of the NEMA and IEC requirements for 460 volt generators) before the insulation is applied. The stators are then given a vacuum impregnation treatment of polyester material, followed by an application of epoxy resin. This sealed stator is then given a final 2000 volt “high pot” test.

Rotor Construction

The main rotor is constructed using a precision “wet” layer winding process with epoxy painted on the bare rotor and on each layer. This ensures bonding of all the wire layers together, bonding of the coils to the rotor laminations, and a sealed insulation system. The rotor is put in the oven for curing the epoxy.
The exciter rotor is machine wound and receives a trickle coat of a fungus-resisting resin. Numerically controlled turning and grinding machines produce rotor shafts with close repeatable tolerances. Grade-8 bolts are used wherever joints are subject to induced stresses. A complete coating of red sealer is applied to protect the rotors and shaft from corrosion.

Every production rotor is dynamically balanced in two planes to within 0.0508 mm deflection peak-to-peak amplitude and run at rated speed before assembly into the stator.

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GENERATOR DATA

OCTOBER 22, 2024

For Help Desk Phone Numbers Click here

Selected Model

Engine: 3516	**Generator Frame:** 1868E	**Genset Rating (kW):** 3000.0	**Line Voltage:** 480
Fuel: Diesel	**Generator Arrangement:** 5851976	**Genset Rating (kVA):** 3333.0	**Phase Voltage:** 277
Frequency: 60	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.9	**Rated Current:** 4009.0
Duty: STANDBY	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current

Version: 20224 /20224 /20224 /672758

Spec Information

Generator Specification

Frame: 1868E **Type:** SR5	**No. of Bearings:** 2
Winding Type: FORM WOUND	**Flywheel:** 21.0
Connection: SERIES STAR	**Housing:** 00
Phases: 3	**No. of Leads:** 6
Poles: 4	**Wires per Lead:** 8
Sync Speed: 1800	**Generator Pitch:** 0.67

Generator Efficiency

Per Unit Load	kW	Efficiency %
0.25	750.0	93.7
0.5	1500.0	96.0
0.75	2250.0	96.7
1.0	3000.0	96.8

Reactances	Per Unit	Ohms
SUBTRANSIENT - DIRECT AXIS X''_d	0.1013	0.0070
SUBTRANSIENT - QUADRATURE AXIS X''_q	0.1100	0.0076
TRANSIENT - SATURATED X'_d	0.1302	0.0090
SYNCHRONOUS - DIRECT AXIS X_d	2.6635	0.1841
SYNCHRONOUS - QUADRATURE AXIS X_q	1.1328	0.0783
NEGATIVE SEQUENCE X_2	0.1461	0.0101
ZERO SEQUENCE X_0	0.0405	0.0028

Time Constants	Seconds
OPEN CIRCUIT TRANSIENT - DIRECT AXIS T'_{d0}	5.5950
SHORT CIRCUIT TRANSIENT - DIRECT AXIS T'_d	0.3618
OPEN CIRCUIT SUBSTRANSIENT - DIRECT AXIS T''_{d0}	0.0087
SHORT CIRCUIT SUBSTRANSIENT - DIRECT AXIS T''_d	0.0073
OPEN CIRCUIT SUBSTRANSIENT - QUADRATURE AXIS T''_{q0}	0.0080
SHORT CIRCUIT SUBSTRANSIENT - QUADRATURE AXIS T''_q	0.0068
EXCITER TIME CONSTANT T_e	0.2230
ARMATURE SHORT CIRCUIT T_a	0.0463

Short Circuit Ratio: 0.53	Stator Resistance = 8.0E-4 Ohms	Field Resistance = 1.106 Ohms

Voltage Regulation

Voltage level adjustment: +/-	5.0%
Voltage regulation, steady state: +/-	0.5%
Voltage regulation with 3% speed change: +/-	0.5%
Waveform deviation line - line, no load: less than	3.0%
Telephone influence factor: less than	100

Generator Excitation

	No Load	Full Load, (rated) pf	
		Series	Parallel
Excitation voltage:	13.4 Volts	47.29 Volts	Volts
Excitation current	1.23 Amps	3.58 Amps	Amps

Selected Model

Engine: 3516 **Generator Frame:** 1868E **Genset Rating (kW):** 3000.0 **Line Voltage:** 480
Fuel: Diesel **Generator Arrangement:** 5851976 **Genset Rating (kVA):** 3333.0 **Phase Voltage:** 277
Frequency: 60 **Excitation Type:** Permanent Magnet **Pwr. Factor:** 0.9 **Rated Current:** 4009.0
Duty: STANDBY **Connection:** SERIES STAR **Application:** EPG **Status:** Current

Version: 20224 /20224 /20224 /672758

Generator Mechanical Information

Center of Gravity

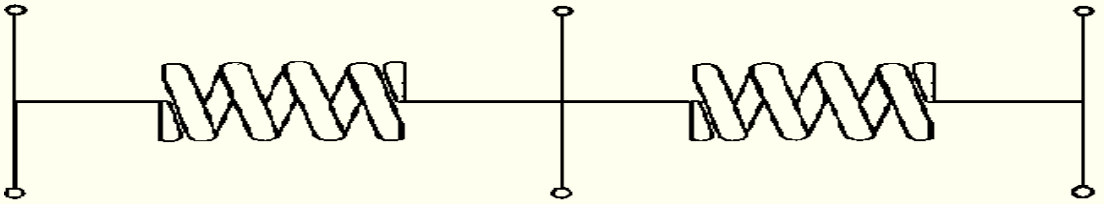
Dimension X	-1182.3 mm	-46.5 IN.
Dimension Y	0.0 mm	0.0 IN.
Dimension Z	0.0 mm	0.0 IN.

- "X" is measured from driven end of generator and parallel to rotor. Towards engine fan is positive. See General Information for details
- "Y" is measured vertically from rotor center line. Up is positive.
- "Z" is measured to left and right of rotor center line. To the right is positive.

Generator WT = 5864 kg * Rotor WT = 2109 kg * Stator WT = 3225 kg
12,928 LB 4,650 LB 7,110 LB

Rotor Balance = 0.0508 mm deflection PTP
Overspeed Capacity = 125% of synchronous speed

Generator Torsional Data



J1 = Coupling and Fan **J2 = Rotor** **J3 = Exciter End**
TOTAL J = J1 + J2 + J3

K1 = Shaft Stiffness between J1 + J2 (Diameter 1)
K2 = Shaft Stiffness between J2 + J3 (Diameter 2)

J1	K1	Min Shaft Dia 1	J2	K2	Min Shaft Dia 2	J3
46.9 LB IN. s^2	58.6 MLB IN./rad	5.0 IN.	632.8 LB IN. s^2	44.3 MLB IN./rad	3.7 IN.	6.2 LB IN. s^2
5.3 N m s^2	6.62 MN m/rad	127.0 mm	71.5 N m s^2	5.01 MN m/rad	95.2 mm	0.7 N m s^2

Total J
685.9 LB IN. s^2
77.5 N m s^2

Selected Model

Engine: 3516 **Generator Frame:** 1868E **Genset Rating (kW):** 3000.0 **Line Voltage:** 480
Fuel: Diesel **Generator Arrangement:** 5851976 **Genset Rating (kVA):** 3333.0 **Phase Voltage:** 277
Frequency: 60 **Excitation Type:** Permanent Magnet **Pwr. Factor:** 0.9 **Rated Current:** 4009.0
Duty: STANDBY **Connection:** SERIES STAR **Application:** EPG **Status:** Current

Version: 20224 /20224 /20224 /672758

Generator Cooling Requirements - Temperature - Insulation Data

Cooling Requirements:		**Temperature Data: (Ambient 40 ^{0}C)**	
Heat Dissipated:	99.2 kW	**Stator Rise:**	105.0 ^{0}C
Air Flow:	271.8 m^3/min	**Rotor Rise:**	105.0 ^{0}C

Insulation Class: H

Insulation Reg. as shipped: 100.0 MΩ minimum at 40 ^{0}C

Thermal Limits of Generator

Frequency:	60 Hz
Line to Line Voltage:	480 Volts
B BR 80/40	3000.0 kVA
F BR -105/40	3438.0 kVA
H BR - 125/40	3750.0 kVA
F PR - 130/40	3750.0 kVA
H PR - 150/40	4063.0 kVA

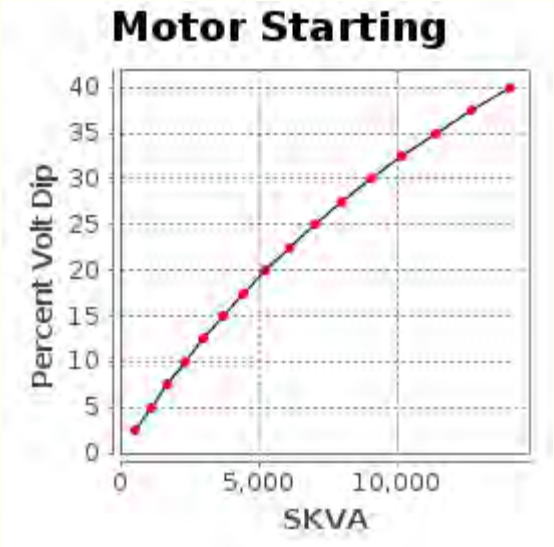
Selected Model

Engine: 3516	**Generator Frame:** 1868E	**Genset Rating (kW):** 3000.0	**Line Voltage:** 480
Fuel: Diesel	**Generator Arrangement:** 5851976	**Genset Rating (kVA):** 3333.0	**Phase Voltage:** 277
Frequency: 60	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.9	**Rated Current:** 4009.0
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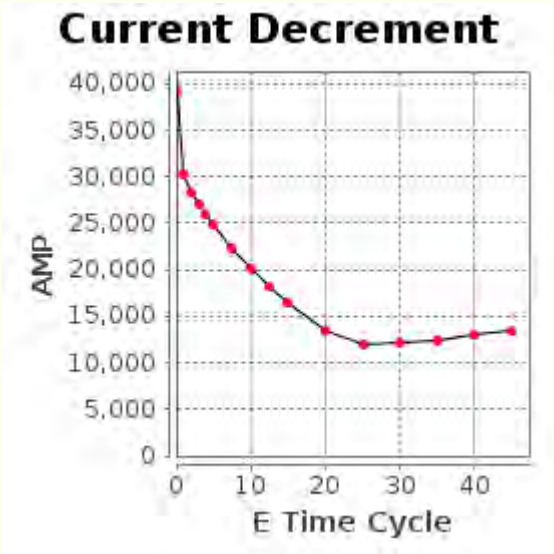
Starting Capability & Current Decrement
Motor Starting Capability (0.4 pf)

SKVA	Percent Volt Dip
541	2.5
1,111	5.0
1,711	7.5
2,345	10.0
3,015	12.5
3,725	15.0
4,477	17.5
5,277	20.0
6,128	22.5
7,036	25.0
8,006	27.5
9,046	30.0
10,163	32.5
11,366	35.0
12,665	37.5
14,072	40.0



Current Decrement Data

E Time Cycle	AMP
0.0	39,350
1.0	30,307
2.0	28,266
3.0	27,011
4.0	25,882
5.0	24,812
7.5	22,343
10.0	20,144
12.5	18,183
15.0	16,436
20.0	13,492
25.0	12,018
30.0	12,065
35.0	12,455
40.0	12,923
45.0	13,391



Instantaneous 3 Phase Fault Current: 39350 Amps **Instantaneous Line - Line Fault Current:** 27929 Amps

Instantaneous Line - Neutral Fault Current: 41595 Amps

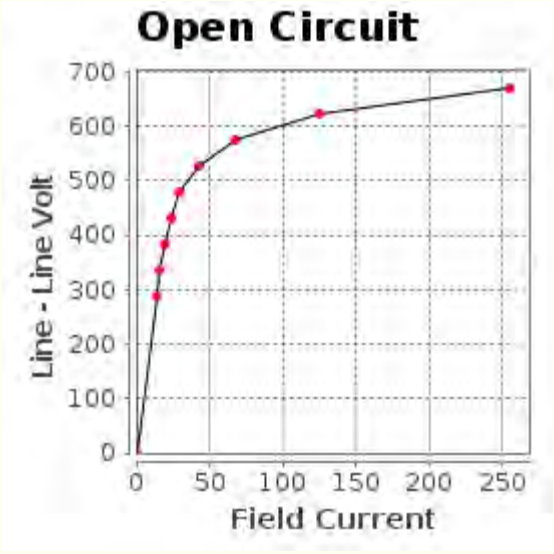
Selected Model

Engine: 3516	**Generator Frame:** 1868E	**Genset Rating (kW):** 3000.0	**Line Voltage:** 480
Fuel: Diesel	**Generator Arrangement:** 5851976	**Genset Rating (kVA):** 3333.0	**Phase Voltage:** 277
Frequency: 60	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.9	**Rated Current:** 4009.0
Duty: STANDBY	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current

Version: 20224 /20224 /20224 /672758

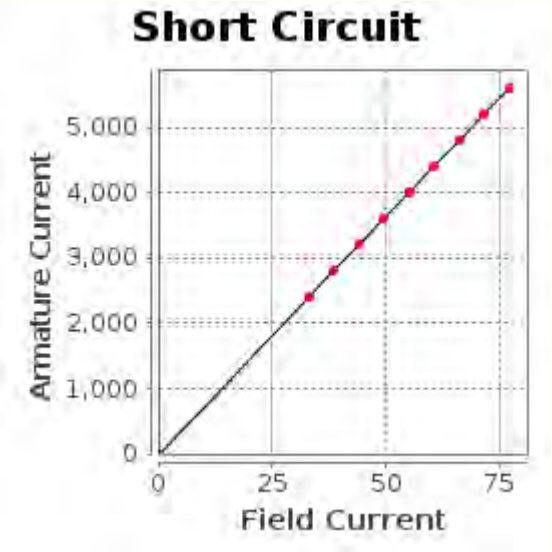
Generator Output Characteristic Curves
Open Circuit Curve

Field Current	Line - Line Volt
0.0	0
13.8	288
16.4	336
19.4	384
23.5	432
30.1	480
42.5	528
68.3	576
125.4	624
255.7	672



Short Circuit Curve

Field Current	Armature Current
0.0	0
33.0	2,406
38.5	2,807
44.0	3,208
49.5	3,608
55.0	4,009
60.6	4,410
66.1	4,811
71.6	5,212
77.1	5,613



Selected Model

Engine: 3516 **Generator Frame:** 1868E **Genset Rating (kW):** 3000.0 **Line Voltage:** 480

Fuel: Diesel **Generator Arrangement:** 5851976 **Genset Rating (kVA):** 3333.0 **Phase Voltage:** 277

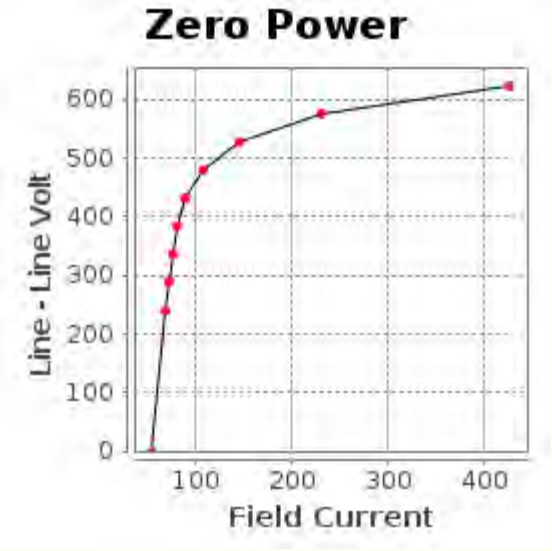
Frequency: 60 **Excitation Type:** Permanent Magnet **Pwr. Factor:** 0.9 **Rated Current:** 4009.0

Duty: STANDBY **Connection:** SERIES STAR **Application:** EPG **Status:** Current

Version: 20224 /20224 /20224 /672758

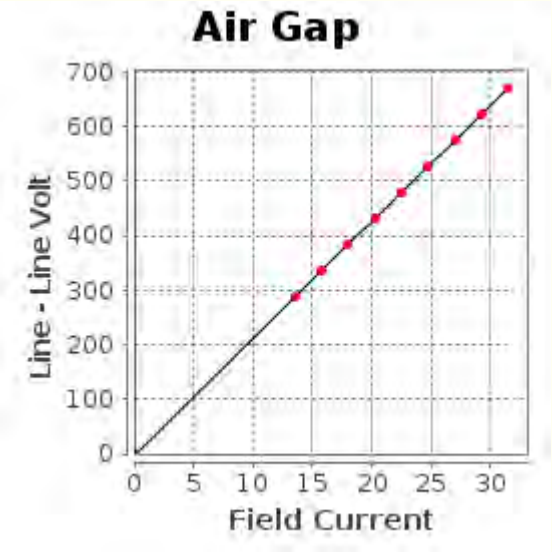
Generator Output Characteristic Curves
Zero Power Factor Curve

Field Current	Line - Line Volt
55.0	0
69.7	240
72.6	288
76.0	336
81.1	384
89.9	432
107.4	480
145.1	528
230.1	576
425.4	624



Air Gap Curve

Field Current	Line - Line Volt
0.0	0
13.5	288
15.8	336
18.0	384
20.3	432
22.5	480
24.8	528
27.0	576
29.3	624
31.5	672

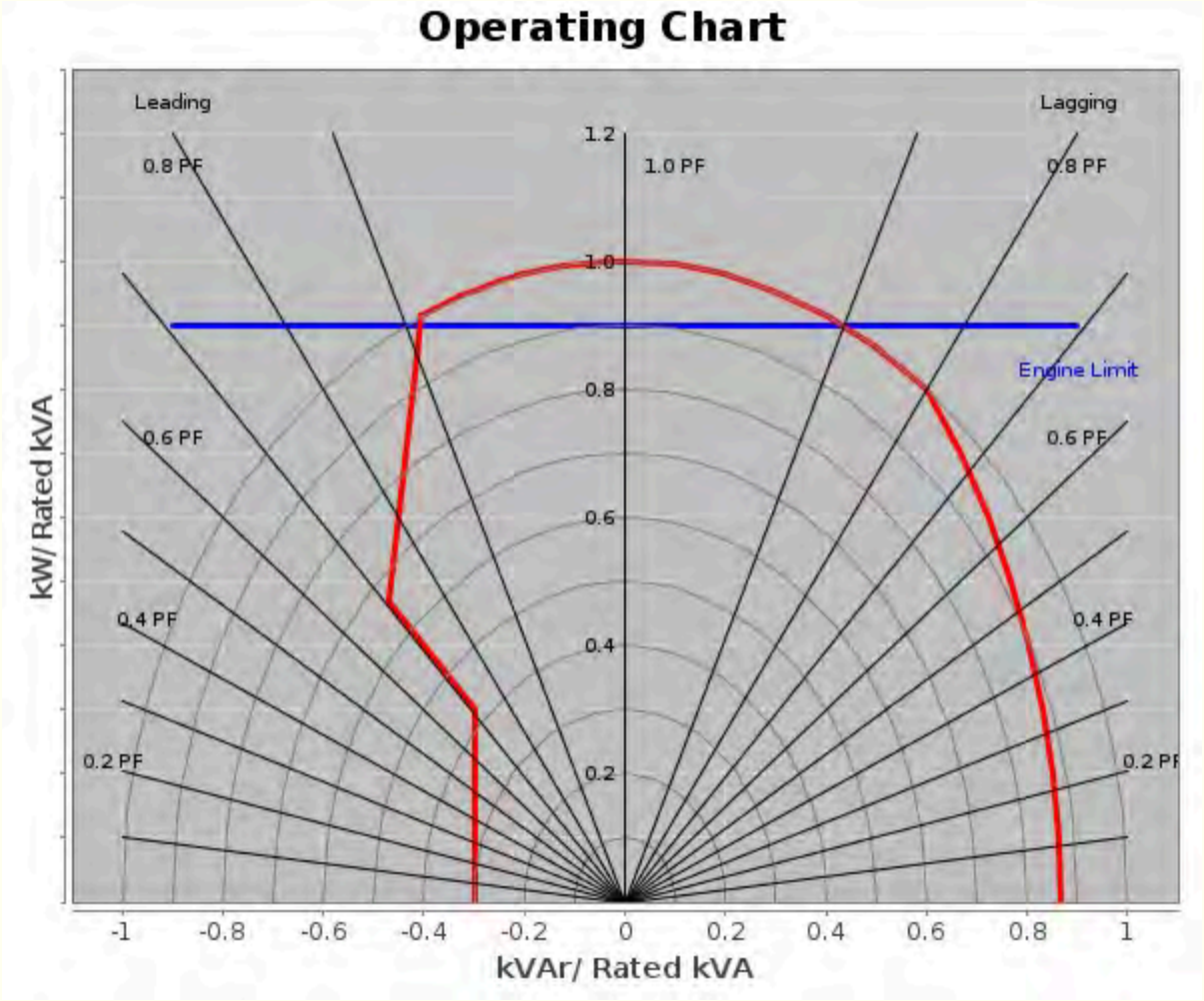


Selected Model

Engine: 3516 **Generator Frame:** 1868E **Genset Rating (kW):** 3000.0 **Line Voltage:** 480
Fuel: Diesel **Generator Arrangement:** 5851976 **Genset Rating (kVA):** 3333.0 **Phase Voltage:** 277
Frequency: 60 **Excitation Type:** Permanent Magnet **Pwr. Factor:** 0.9 **Rated Current:** 4009.0
Duty: STANDBY **Connection:** SERIES STAR **Application:** EPG **Status:** Current

Version: 20224 /20224 /20224 /672758

Reactive Capability Curve



Selected Model

Engine: 3516	**Generator Frame:** 1868E	**Genset Rating (kW):** 3000.0	**Line Voltage:** 480
Fuel: Diesel	**Generator Arrangement:** 5851976	**Genset Rating (kVA):** 3333.0	**Phase Voltage:** 277
Frequency: 60	**Excitation Type:** Permanent Magnet	**Pwr. Factor:** 0.9	**Rated Current:** 4009.0
Duty: STANDBY	**Connection:** SERIES STAR	**Application:** EPG	**Status:** Current

Version: 20224 /20224 /20224 /672758

General Information

DM7825 Caterpillar SR5 Generators (50 Hz, 60 Hz)
Data for 1400, 1600, 1700, 1800 and 1900 frames Caterpillar SR5 generators built by Leroy Somer - USA and Leroy Somer . France.

Refer to DM7821 for explanation of all generator data in Technical Marketing Information (TMI) except generator efficiency for which the explanation is given below.

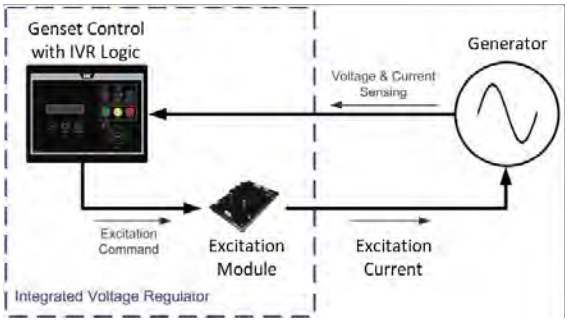
GENERATOR EFFICIENCY
Generator efficiency is the percentage of engine flywheel (or other prime mover) power that is converted into electrical output. The generator efficiency shown is calculated by the summation of all losses method, and is determined in accordance with the IEC Standard 60034. The efficiency considers only the generator. There is no consideration of engine or parasitic losses here.

Refer to DM7829 for low and medium voltage protective setting values a nd limits.

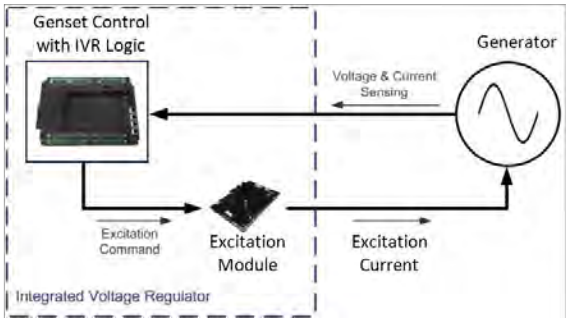
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INTEGRATED VOLTAGE REGULATOR

EMCP 4.x Controllers



Cat® ECS 100 / Cat ECS 200 Controllers *



* Cat® Energy Control System (Cat ECS)

INTEGRATED VOLTAGE REGULATOR

The Integrated Voltage Regulator (IVR) is designed to provide robust, precise closed-loop control of the generator voltage, optimized transient performance and industry leading feature specification.
Caterpillar is leading the power generation marketplace with power solutions engineered to deliver unmatched flexibility, expandability, reliability, and cost-effectiveness.

FEATURES

When used with an Excitation Module, EMCP 4.3/4.4 and IVR-compatible EMCP 4.1/4.2 (B), and Cat ECS 100 / Cat ECS 200 controllers offers:

- Automatic Voltage Regulation (AVR)
- Programmable stability settings
- Soft start control with an adjustable time setting in AVR control mode
- Dual Slope, Configurable Under Frequency (Volts/Hz) regulation
- Three-phase or single-phase generator voltage (RMS) sensing/regulation in AVR mode
- Setpoint adjustment from the EMCP / Cat ECS display or Cat ET Service Tool
- IVR Operating Status and Voltage Bias Overview screens to provide an enhanced level of user interface
- Integrated Voltage Regulator event monitoring

EMCP 4.3/4.4 and IVR-compatible EMCP 4.2 (B), and Cat ECS 100 / Cat ECS 200 controllers also offer:

- Power Factor Regulation (PF)
- Reactive Droop compensation
- Line drop compensation

WORLDWIDE PRODUCT SUPPORT

- Worldwide parts availability through the Cat dealer network
- Over 1,800 dealer branch stores operating in 200 countries
- The best product support record in the industry
- Cat dealers provide extensive post sale support including maintenance and repair agreements

COMPLETE SYSTEM INTEGRATION

Fully designed and factory tested to work seamlessly with Cat generators using Self Excitation (SE), Internal Excitation (IE) or Permanent Magnet (PMG) excitation systems and EMCP and Cat ECS controls.

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INTEGRATED VOLTAGE REGULATOR

INTEGRATED VOLTAGE REGULATOR FEATURE SPECIFICATION

Confirm proposed engine controller can be coordinated with SEL-400G Control scheme proposed in design documents.

	EMCP 4.1	EMCP 4.2(B)	EMCP 4.3	EMCP 4.4	Cat® ECS 100 / Cat ECS 200
					
SPECIFICATIONS					
No Load to Full Load Regulation	±0.5%	±0.25%	±0.25%	±0.25%	±0.25%
Configurable Volts / Hz Characteristic	•	•	•	•	•
Configurable Knee Frequency	•	•	•	•	•
Regulator ResponseTime	10 ms	10 ms	5 ms	5 ms	5 ms
Single and Three Phase Sensing	•	•	•	•	•
Voltage Adjustment Range	± 30%	± 30%	± 30%	± 30%	± 100%
CONTROL					
Characteristic	•	•	•	•	•
Excitation Enable I Disable Selection	•	•	•	•	•
Line Loss (I^2R) Compensation	–	•	•	•	•
Reactive Droop Compensation	–	•	•	•	•
Power Factor Control Mode	–	•	•	•	•
PROTECTION I ALARMS					
Generator Overvoltage	•	•	•	•	•
Generator Under voltage	•	•	•	•	•
Over Excitation	•	•	•	•	•
Loss of Sensing	•	•	•	•	•
Generator Reverse VARs	–	•	•	•	•
Event Log	•	•	•	•	•
METERING					
AC Metering	•	•	•	•	•
Power Metering	–	•	•	•	•
Excitation Command Percentage	•	•	•	•	•
Operating Mode Status Indication	•	•	•	•	•
VOLTAGE ADJUSTMENT					
Display Voltage Bias	•	•	•	•	•
Digital Input (Raise I Lower) Voltage Bias[1]	•	•	•	•	•
Potentiometer Voltage Bias[1]	•	•	•	•	•
Analog Voltage Bias -Voltage Range[1]	0V to SV	0V to SV	-10V to +10V	-10V to +10V	-10V to +10V
Analog Voltage Bias - Current Range[1]	-	-	0mA to 20mA	0mA to 20mA	0mA to 20mA
Analog Voltage Bias - PWM Range[1]	-	-	0% to 100%	0% to 100%	0% to 100%
SCADA (Modbus) Voltage Bias	-	•	•	•	•

[1]Requires an available input on the EMCP 4.

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EMCP 4 DISPLAY

EXAMPLE SCREENS - EMCP 4.1/4.2

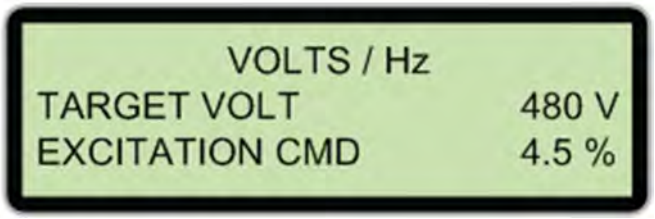


Figure 3: IVR Overview Screen

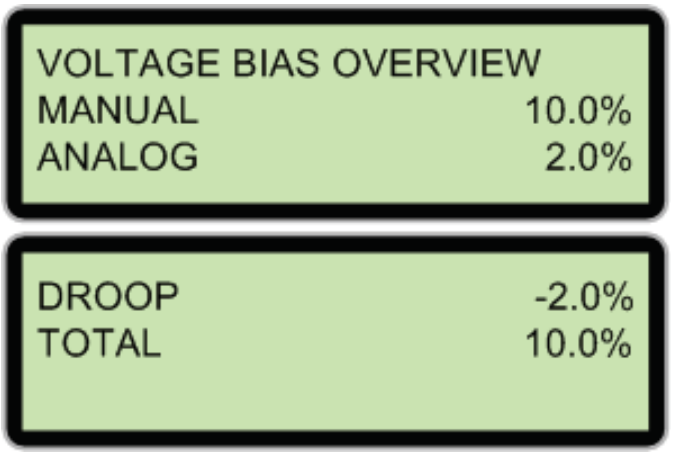


Figure 4: Voltage Bias Overview Screens

EXAMPLE SCREENS - EMCP 4.3/4.4

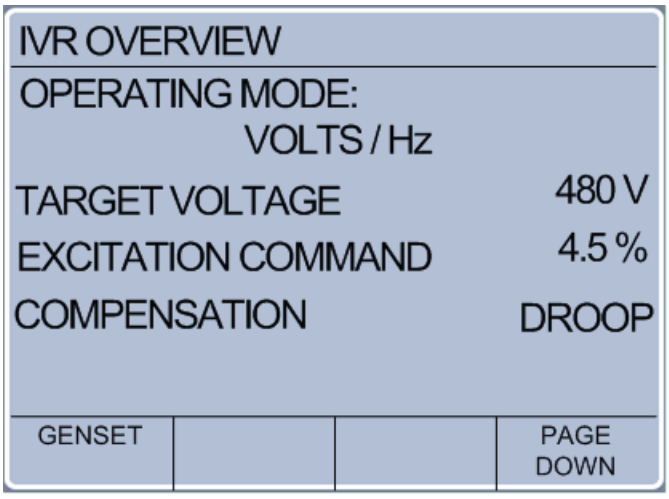


Figure 5: IVR Overview Screen

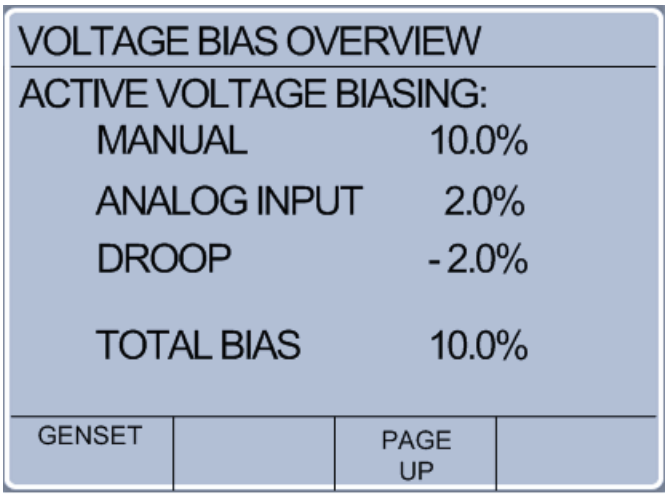


Figure 6: Voltage Bias Overview Screen

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EXAMPLE SCREENS – Cat ECS 100 / Cat ECS 200



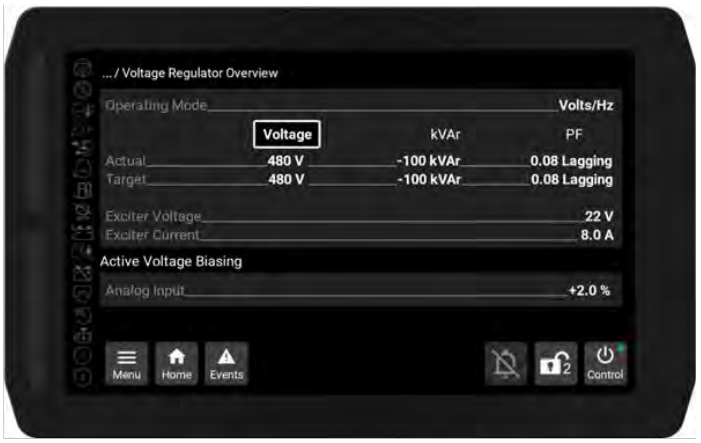


Figure 7: Cat ECS 100 / Cat ECS 200 IVR Overview

Materials and specifications are subject to change without notice.
The International System of Units (SI) is used in this publication.

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Image shown may not reflect actual configuration.

Cat® Energy Control System (ECS) 100

The Cat ECS 100 generator set controller uses system graphic icons and labels that allow for simple, comprehensive generator set operation. The easy-to-use 203 mm (8”) color LED touchscreen display features scroll navigation. Generator set and remote-mount options are available.

FEATURES

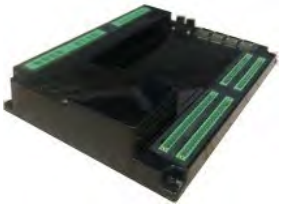
- Island mode – single unit operation
- High visibility graphical touchscreen display with alarm/event descriptions, set points, engine and generator monitoring
- Meets UL 2200, 3rd Edition requirements including UL 6200
- Local annunciation to meet NFPA 110 (subject to local authority having jurisdiction approval)
- Ethernet Modbus TCP for external communications
- Intuitive navigation for display of power metering, protection, engine and generator parameters and tuning
- Lockout security provision to assure platform integrity with three programable security levels
- Support of up to four (4) remote HMI’s (sold separately)
- Multi-language support.
- Compatible with Cat Connect Product Link™ devices
- IVR or CDVR voltage regulation compatibility
- Emergency Override

Advanced Functionality

- Automatic mains failure with utility voltage sensing capability (open transition) and remote breaker or contactor control/monitoring
- Engine remote start integrity monitoring
- Single genset transient load relief (TLR)
- Basic programmable logic control (PLC) function
- Embedded webserver
- EPA Tier 4 integration
- Real (kW) load histograms
- Status event log
- Supports Dynamic Gas Blending™ (DGB™)

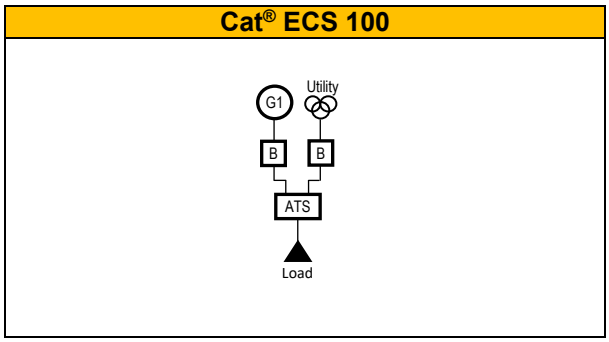
Control Module and Display

The Cat A6L3 is the base module controller utilizing the high-resolution display for the human machine interface (HMI).





Typical(1) Single Line Diagram (SLD)



(1) - More single line diagrams (SLD’s) are available to meet application requirements. Contact your local Cat dealer for more information.

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Standard Features

Controls	• Auto / Start / Stop • Emergency stop • Engine cooldown timer • Engine cycle crank • Programmable cycle timer • Speed and voltage adjust
Generator Set Monitoring	• Generator AC voltage monitoring (+/- 0.25% controller lifetime accuracy) • Utility/Bus AC voltage monitoring (+/- 0.25% controller lifetime accuracy) • 3 phase/4 wire (L-L&L-N) sensing • Current sensing (3 phase/6 wire) (+/- 0.1% up to 100% of rated current controller accuracy) • Generator AC current (per phase & avg) • Generator frequency • Power metering (kW, kVA, kVAr, pf) • kW-hr (export), kVAr-hr (import and export), total and trip • Generator stator and bearing temp (with optional RTD module) • kW load histogram
Generator Protection	• Generator phase sequence (47G) • Over/Under voltage (27/59) • Over/Under frequency (81 O/U) • Overcurrent timed & inverse (50/51) • Overcurrent (Thermal Damage Curve) (51) • Reverse power real (kW) (32) • Reverse power reactive (kVAr) (32RV) • Current balance (46) • Overload (49)
Engine Monitoring	• Engine oil pressure (kPa or psi) • Engine oil temperature (°C or °F) • Engine coolant temperature (°C or °F) • Engine speed (RPM) • Battery voltage • Crank attempt and successful start counter • Run hour meter • Real time clock
Engine Protection	• Control switch not in auto (alarm) • Low oil pressure • High coolant temperature (alarm and shutdown) • Low coolant temp (alarm) • Low coolant level (alarm and shutdown) • High engine oil temp (alarm and shutdown) • Low/High/Weak battery voltage • Fail to start • Overspeed • Overcrank • Low gas pressure (alarm and shutdown)

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Standard Features *(continued)*

Digital Inputs	• Emergency Stop • Remote Start • 16 programmable inputs (4 used for functional safety)(2)
Digital Outputs	• 12 programmable outputs (4 used for functional safety)(2)
Analog Outputs	• 2 analog outputs
PWM Outputs	• 3 Total (1 used for IVR - standard)
Analog Inputs	• 3 programmable inputs (0-5V, 0.5-4.5V, 1-5V, or resistive)(2)
Communication	• Primary & accessory CAN data link • Remote annunciator data link up to 1219 m (4000 ft) • Cat® Data Link (CDL) - with optional PLE702 • Ethernet (Modbus TCP/IP) - 100 baseT • USB- touchscreen display • Four 4-wire ports for internal and customer use • Two 2-wire ports for internal device network
Environmental	• HMI (front touchscreen) IP66 • A6L3 Controller Operating Temp. -40°C to + 70°C • Control module box: - Ingress protection IP23 - Health Care Access and Information (HCAI) ground and roof seismic certification
Languages	• Chinese | Danish | English | French | German | Italian | Japanese | • Portuguese | Russian | Spanish | additional languages on request |

(2) - Generator set configuration may affect available features.

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Enhanced Control Features

Advanced overcurrent protection
The Cat ECS 100 provides advanced overcurrent protection of the generator set system via programmable Definite Time and Inverse Time curves.
For the Inverse time curve the following four selections are available:
- Normally Inverse
- Very Inverse
- Extremely Inverse
- Thermal Damage Curve - the Thermal Damage curve may be more closely aligned to specific generators.

Arc Flash Maintenance mode
The Cat ECS 100 Programmable Arc Flash Energy Reducing Maintenance Mode feature provides a method to reduce clearing time via two functions that work together to meet the 2023 edition of NFPA 70, Section 240.87 (Arc Energy Reduction).
- A means to accept an energy-reducing maintenance switch and provide means to connect a local status indicator.
- An instantaneous overcurrent setting that can be set below the available arcing current.

Integrated programmable logic controller (PLC)
This feature set of the Cat ECS 100 allows the user to create custom logic functions in similar fashion to that of the capability of a PLC controller. These logic functions allow for increased capability of the Cat ECS 100 through interaction and control of internal signals within the control software as well as the programmable inputs/outputs of the device.

Programmable kW relay
The Cat ECS 100 includes three programmable kW relay outputs configured based on the % kW of the generator set. The configurable set points of the kW relay include: trigger condition, percentage threshold, hysteresis percentage and trip activation & deactivation delay time. These output functions may also be used to trigger events, recordable within the event log and included in the remote monitoring of the generator set.

Real-time clock
The real-time clock allows for date and time stamping of diagnostics and events in the control's logs as well as service maintenance reminders based on engine operating hours or calendar days.

Diagnostic System and Status Event Logs
Up to 40 unique diagnostic events (e.g., warnings, shutdowns, etc.) are stored in the non-volatile memory. It also allows for the creation of a status event log. This log holds the last 500 control events such as Engine Control Switch Position, Remote Initiate, Load Shed, etc. Events are stored in a "first in, first out" strategy.

Programmable cycle timer
The programmable cycle timer (PCT) feature allows for programming of seven independent times, when tasks (called PCT outputs), will be activated or deactivated automatically during the week. This is useful for exercising generator sets, or cases where two or more generators are required to automatically share the duty of supplying a load throughout the week. Using the PCT, each generator set can be programmed to start and stop at pre-set times. The PCT can handle a seven-day sequence with seven independent starts happening one or more times each week. Each of the seven timers has the following set points: activation day of the week,
activation start time, active time and includes three (3) independent activation outputs.

Real (kW) load histogram
The Cat ECS 100 is equipped with a real (kW) load histogram. This feature keeps track of the amount of time the generator percent kW is within certain predefined ranges. The ranges monitored are in 10% steps (0 to <10%, 10% to <20%, …, 90% to 100%).

HMI Webserver
The Cat ECS 100 HMIs include an embedded web server. The embedded web server allows the operator to operate a virtual HMI with the same control and permissions as the host HMI (local or remote, if applicable) over an Ethernet connection to a local and/or remote station. Custom screen creation is also available. Each HMI webserver is independent.

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Optional Modules

Off Package HMI

The Cat ECS 100 supports up to four (4) optional full function off package HMI displays with the addition of an unmanaged Ethernet switch. The interactive 203 mm (8”) color touchscreen graphical interface serves to display generator set system alarm conditions, status indications and annunciation (with RCA output) to meet NFPA110 (subject to local authority having jurisdiction approval).



RS-485 Remote Annunciator

The remote RS-485 annunciator serves to display genset system alarm conditions and status indications for 16 points with a standard NFPA 99 & 110 label. The annunciator has been designed for use on the long-distance annunciator datalink and may be used off package up to 1220m (4000 feet) applications. A maximum of four (4) annunciators may be used with a Cat ECS 100.

See LEHE21395.

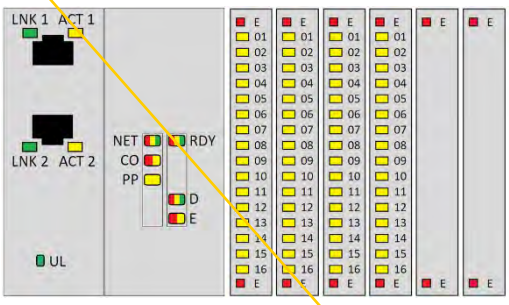


Expansion Input/Output Ethernet Modules

- Supports expanded Inputs/Outputs (IO) capability of the Cat ECS 100 control:
  - Analog & digital I/O
  - Temperature sensing (RTD)
- Configure I/O for any event (read & write function)
- Package mounted and/or ship loose options

See LEHE22466

Modbus Coupler Digital & Analog I/O

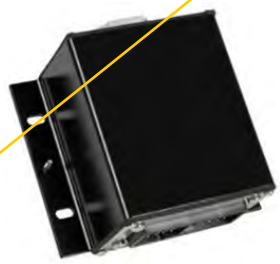


Caterpillar: Non-Confidential

Optional Modules*(continued)*

Digital Input/Output Module
The Digital Input/Output (DI/O) module serves to provide expandable Input and Output for any event and is capable of reading 12 discrete inputs to trigger system events and setting 8 relay outputs based on system events. The DI/O module has been designed for use on the accessory communication network and may be used in either local (package mounted) or off package up to 244 m (800 feet) applications. A maximum of four DI/O modules may be used with a Cat ECS 100.

See LEHE21394



RTD Module
The RTD module serves to provide expandable generator temperature monitoring capability of the Cat ECS 100 control system and is capable of reading up to eight 2-wire, 3-wire and 4-wire RTD inputs. The RTD Module has been designed for use on the accessory communication network and may be used in either local (package mounted) or off package up to 244 m (800 feet)applications. A maximum of one RTD Module may be used with a Cat ECS 100.

See LEHE21396



Caterpillar: Non-Confidential

Dimensions

Package-Mounted or Ship Loose (with harness)

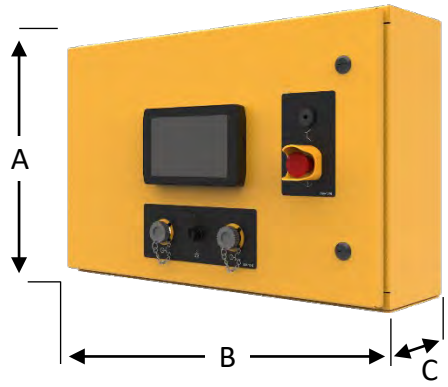


Image shown may not reflect actual configuration.

Dimensions				
Control Box Dimensions	A	B	C[3]	Weight
Units	mm (in)	mm (in)	mm (in)	kg (lbs)
Cat ECS 100	515 (20.28)	794 (31.27)	273 (10.73)	43 (95)

[3] - Dimension including E-Stop button is 263 mm (10.35 in).

Worldwide Product Support
Cat dealers have over 1,800 dealer branch stores operating in 200 countries and offer extensive post-sale support including maintenance and repair agreements

Materials and specifications are subject to change without notice.
The International System of Units (SI) is used in this publication.

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www.cat.com/electricpower

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9625 55th Street Kenosha, WI 53144
Phone: 262.942.1414 Fax: 262.942.1410

Quote # **94091224003**

Rev #: **2**

DATA SHEET

Title **Cloud Hyperion**

Date Sent: **4/2/2025**

Prepared for: **Carter Machinery Company, Inc.**
6387 Old Washington Rd
Elkridge, MD 21075

Attn: **Rajiv Paul**

Job Reference: **EM6283**

Engine Data

Engine Manufacturer: **Caterpillar**
Engine Model: **3516E**
Rating: **Standby**
HP: **4393** KW: **3000** HZ: **60** RPM: **1,800**
Manifold Type: **Dry** Coolant: **50** % E.G.
Data Supllied By: **Customer**

JW Heat Load: **57,358** Btu/Min
JW Flow: **515** GPM
JW Outlet Temp: **210** Deg. F
CAC Heat Load: **55986.0** Btu/Min
CAC Flow: **660** Lbs/Min
CAC Allow Temp: **155** Deg. F

Site Data

Environment
Normal

Ambient: **110** Deg. F
Deg. Air Rise: **8** Deg. F
Elevation: **1000** Ft.

Site Location: **Enclosure**
Total External Static: **1.2** Inches H2O
Data Supplied By: **Customer**

Radiator Data

Radiator Model: **ECCS073** **Wide unit**
JW/AC Split: **N/A**
ACFM: **117,200**
Fan Speed: **858** RPM
Fan Diameter: **84** Inches
Fan Tip Speed: **18,868** FPM
Number of Blades: **8**
Fan Type: **Pusher**
Fan Part # **84in 8bl 25.6 deg S24 STD 813RPM**
Blade Material: **Alum Adj Pitch, Airfoil**

Fan Drive Type: **V-Belt**
Horse Power: **153.0**
Motor RPM:
Phase:
HZ:
Volts:

	JW	CAC	
Pressure Drop:	**2.47**	**0.84**	PSI
Number of Passes:	**1**	**1**	

Maximum Ambient: **110** Deg. F
System: **Cloud Hyperion**
Radiator SPL: **101.0** @ 25 FT

JW Top Tank Temp: **209** Deg. F
JW Bottom Tank Temp: **193** Deg. F
CAC Top Tank Temp: **500** Deg. F
CAC Bottom Tank Temp: **153** Deg. F

corrected

REV03. YC/KW: Provide package performance data with correct radiator information shown here instead of just deleting the package performance data.

Available Optional Equipment
Wishbone
Connections JW and AC with supports, fan and belt guards
Fuel cooler
Murphy low level switch

Special Notes:

IMTD was taken at 77 degrees F as stated on system data sheet EM6283. A copy was attached with the quote. Radiator is capable of using Propylene Glycol, no greater than 50%.

Prepared By: Joshua Unser

Representative: House

CARTER POWER SYSTEMS

Section Three
ACCESSORIES CUTSHEETS

Breaker Cabinet and CT 4000:5
Diff and Ground CT Submittal and Vibration Isolators
Generator Space Heater
Batteries
Battery Charger
Best Battery Selector
Closed Crankcase Ventilation (CCV)
Starter
Fuel Filter/Water Separator
Pre-lube Pump
Jacket Water Heater
Air Compressor
Warranty

Letter of Transmittal

October 23, 2024

To: Maria Drybread [Maria_Drybread@cartermachinery.com]
Carter Machinery CAT

From: Brandon Lopez [brandon.l@aptinc.net]
Advanced Power Technologies, LLC
Direct Dial: (765) 446-2343 Ext 504

ADVANCED POWER TECHNOLOGIES
1501 Veterans Memorial Pkwy E
Lafayette, IN 47905

Please find the enclosed Submittal documentation for the following project:

P25CARTE01

CloudHQ Hyperion LC11

GTB 480V, 4000A Extended Generator Terminal Boxes DO LB, N1

Submittal Package

Revision 04

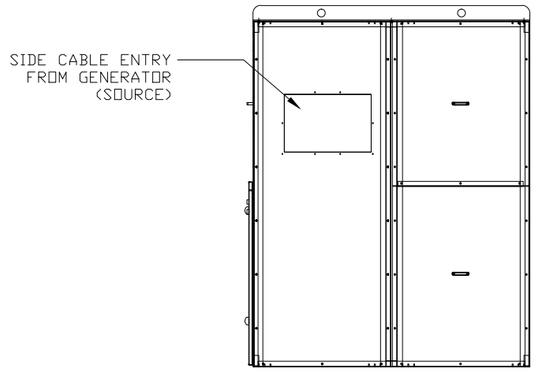
Bill of Material

Item #	Description	Item Quantity Each Unit	*Supplier/ Mfgr	*Model Number	Status
01	GTB 480V,4000A Extended Generator Terminal Boxes with Drawout Load Bank LVPCB, N1	82 of 233 To Be Released with Approval	APT	P25CARTE01	Submittal Rev 04 w/ CDE Comments on Drawings
02	Low Voltage Power Circuit Breaker – 4000A, 480VAC, 3 Pole, 130kAIC, Electrically Operated, 3a, 3b Aux Contacts, 24VDC Charge, Close, Shunt Trip, Provision for Key Interlock, Drawout Type	1	LS Electric	Circuit Breaker: UAH-40 G 3P 20-40 A M4D4D4 GC AD2 U0 B Cradle: UAL S50G 3 AVET + PL Rating Plug 73263466365	Submittal Rev 03
03	ERMS, Energy Reduction Maintenance Switch	1	Schneider Electric	ZB4BD2, ZB4BZ105, ZBE101, ZBE102	Submittal Rev 03
04	22mm Pilot Light with Protected LED, Blue	1	Schneider Electric	XB5AVB6	Submittal Rev 03
05	2 Point Wire Terminal Blocks	20	Phoenix	PT4	Submittal Rev 03
06	Current Transformer, 4000:5	3	APT	Part Number: APN1986-4000	Submittal Rev 01
07	Captive Key Interlock, by Others	1	Kirk Key or other	Type CN22 Breaker provision. Key interlock supplied and installed by others	Note

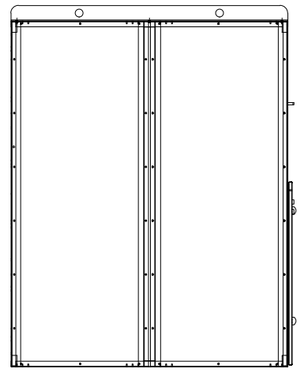
*Note: Component Quantity, Manufacturer, and Part Number are for reference only, APT maintains the right to substitute any component above with an equivalent product.

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LEFT GENERATOR ENCLOSURE

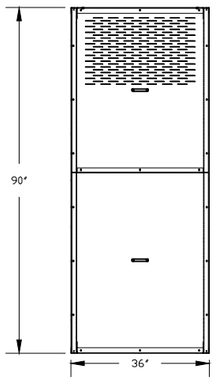


RIGHT SIDE VIEW

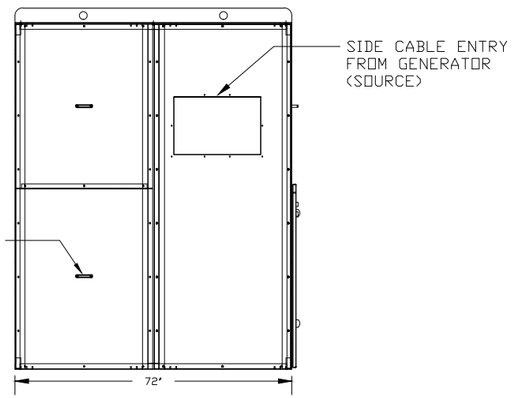


LEFT SIDE VIEW

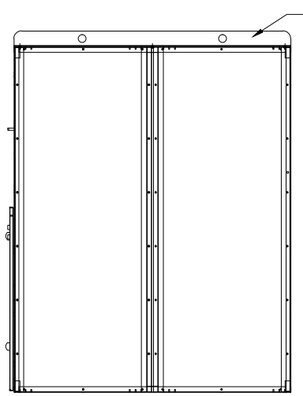
RIGHT GENERATOR ENCLOSURE



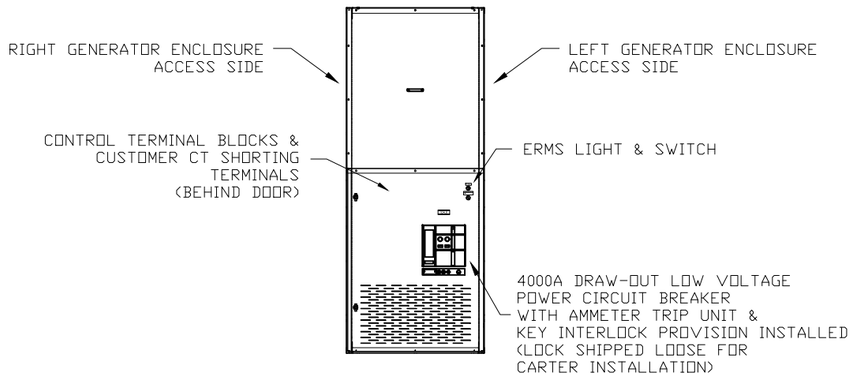
REAR (ACCESS) VIEW TYPICAL



LEFT SIDE VIEW



RIGHT SIDE VIEW



FRONT (ACCESS) VIEW TYPICAL

REV	DATE
02	04/11/25
01	02/28/25

PAGE #: 1 of 8

STATUS: AS BUILT

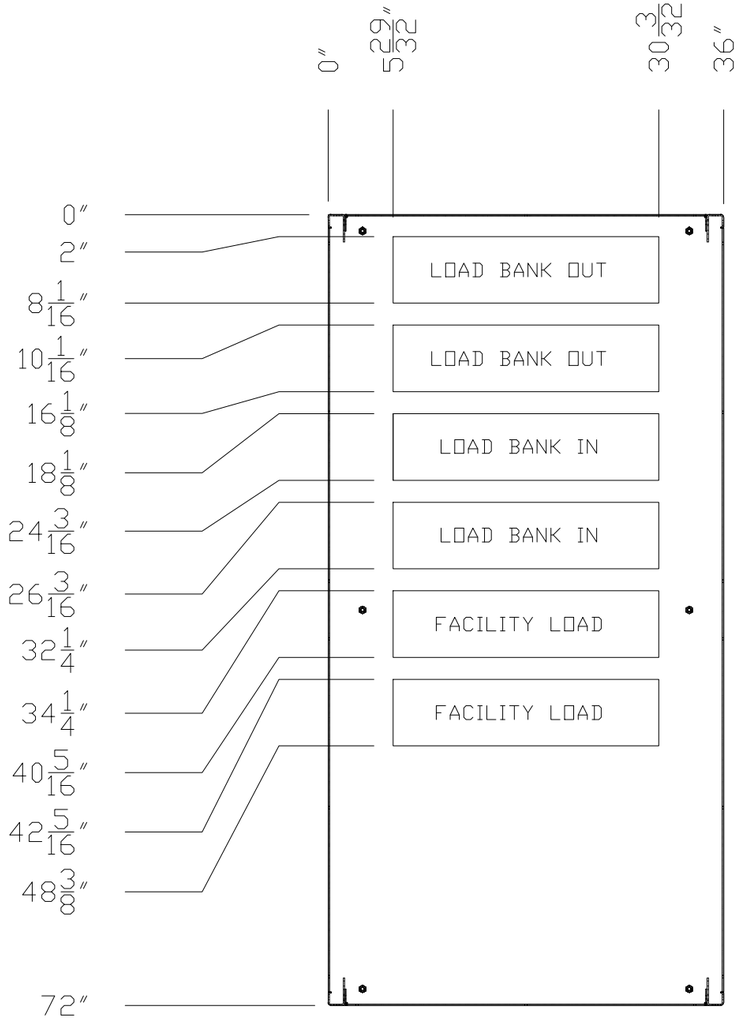
PAGE DESC: EXTERNAL LAYOUT

PROJECT: GTB-SERIES 480V, 4000A
EXTD GEN TERMINAL BOX
WITH DO LB LVPCB

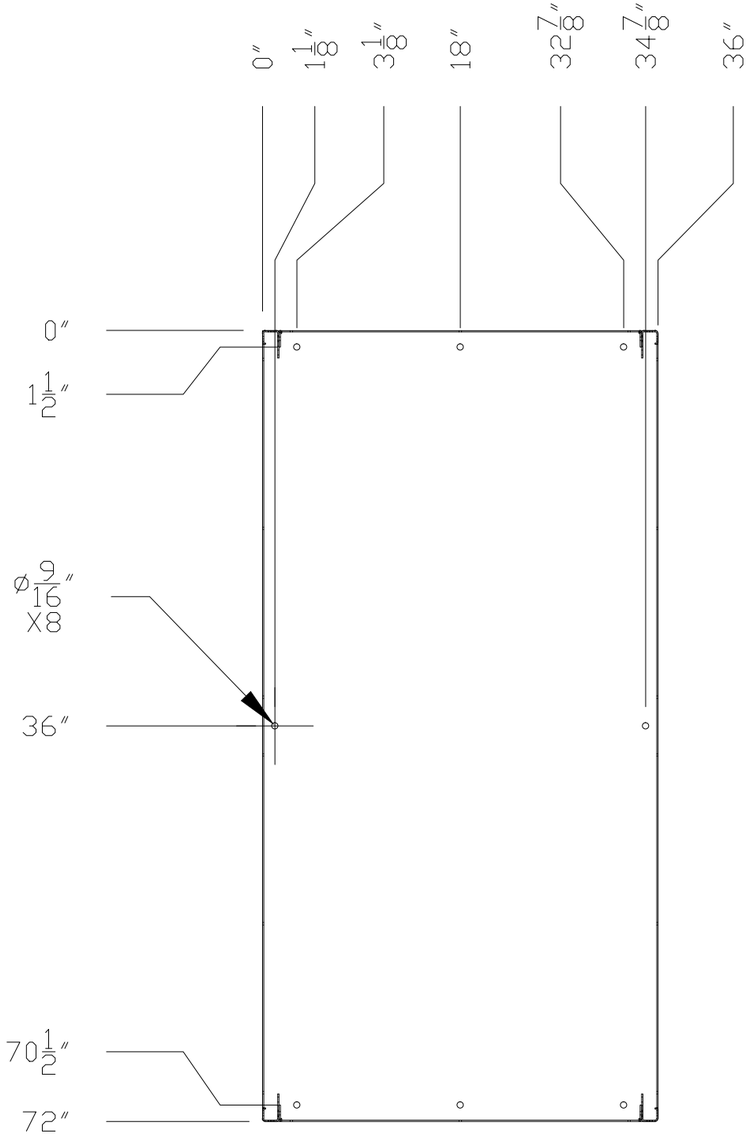
PROJ #: P25CARTE01

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TOP VIEW
CABLE ENTRY



PLAN VIEW
ANCHORING

REV	DATE
02	04/11/25
01	02/28/25

PAGE #: 2 of 8

STATUS: AS BUILT

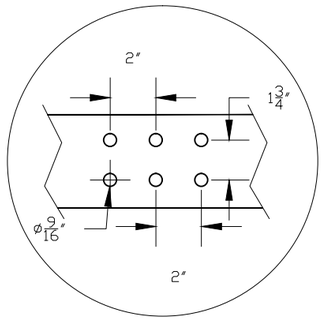
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PROJECT: GTB-SERIES 480V, 4000A
EXTD GEN TERMINAL BOX
WITH DO LB LVPCB

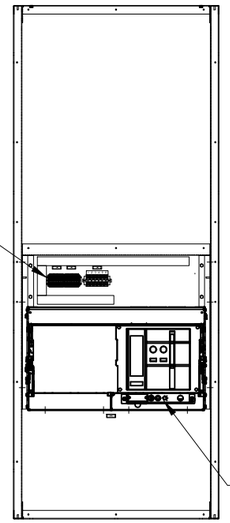
PROJ #: P25CARTE01

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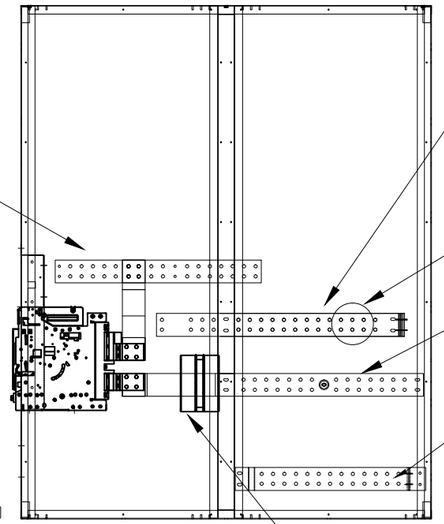


BUS DETAIL 'A'



CONTROL TERMINAL BLOCKS & CUSTOMER CT SHORTING TERMINALS

4000A DRAW-OUT LOW VOLTAGE POWER CIRCUIT BREAKER WITH AMMETER TRIP UNIT & KEY INTERLOCK PROVISION INSTALLED (LOCK SHIPPED LOOSE FOR CARTER INSTALLATION)



4000A NEUTRAL BUS (GEN, FACILITY LOAD, LOAD BANK IN LOAD BANK OUT) 14X CONNECTIONS EACH

A/B/C GENERATOR & FACILITY LOAD 14X CONNECTIONS EACH

BUS DETAIL 'A'

A/B/C LOAD BANK IN / OUT 14X CONNECTIONS EACH

1000A GROUND BUS (GEN, FACILITY LOAD, LOAD BANK IN LOAD BANK OUT) 14X CONNECTION EACH

CURRENT TRANSFORMER (CT) MOUNTING LOCATION

REV	DATE
02	04/11/25
01	02/28/25

PAGE #: 3 of 8

STATUS: AS BUILT

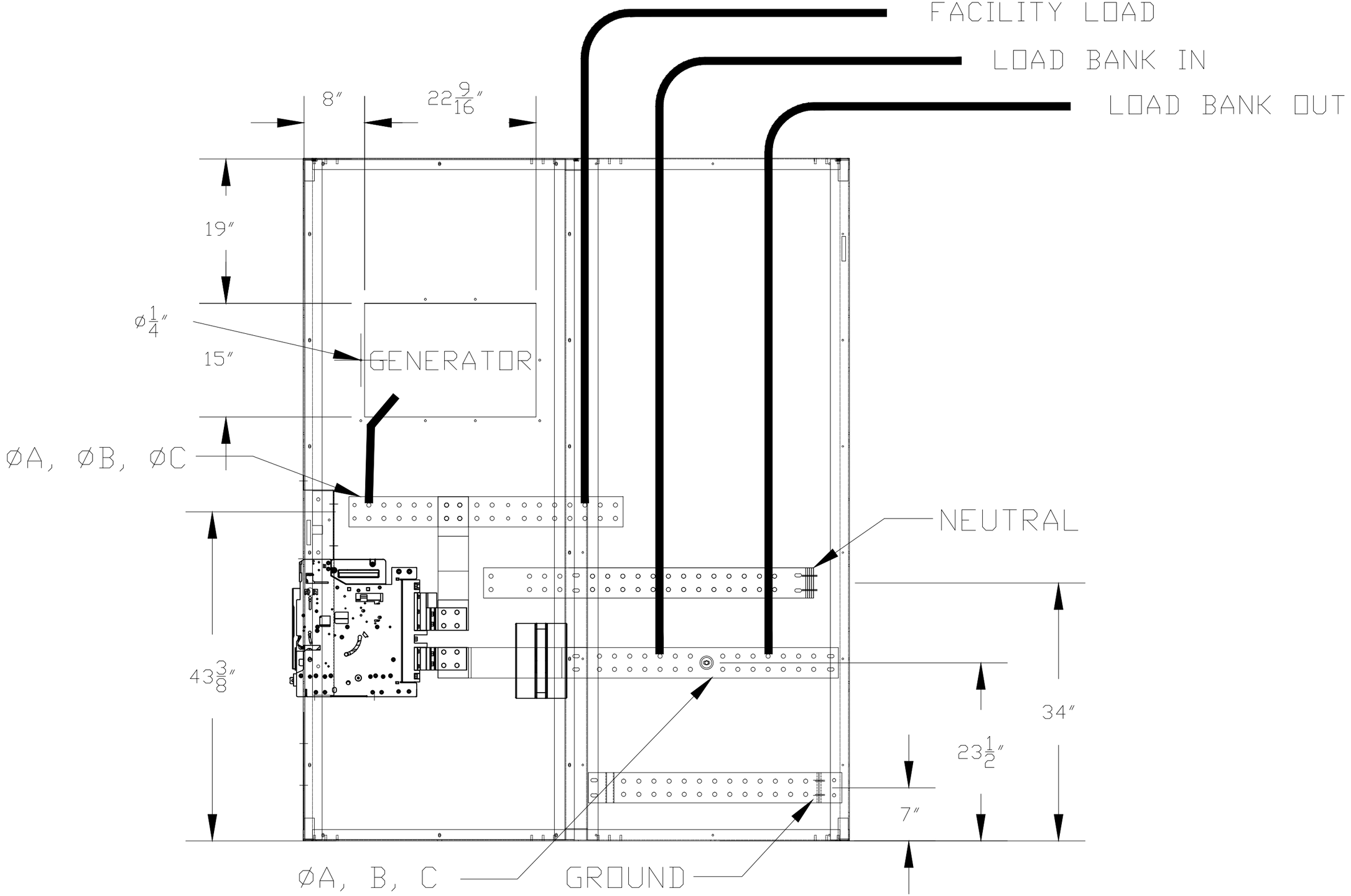
PAGE DESC: INTERNAL LAYOUT

PROJECT: GTB-SERIES 480V, 4000A EXTD GEN TERMINAL BOX WITH DO LB LVPCB

PROJ #: P25CARTE01

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REV	DATE
02	04/11/25
01	02/28/25

PAGE #: 4 of 8

PAGE DESC: CABLING LAYOUT

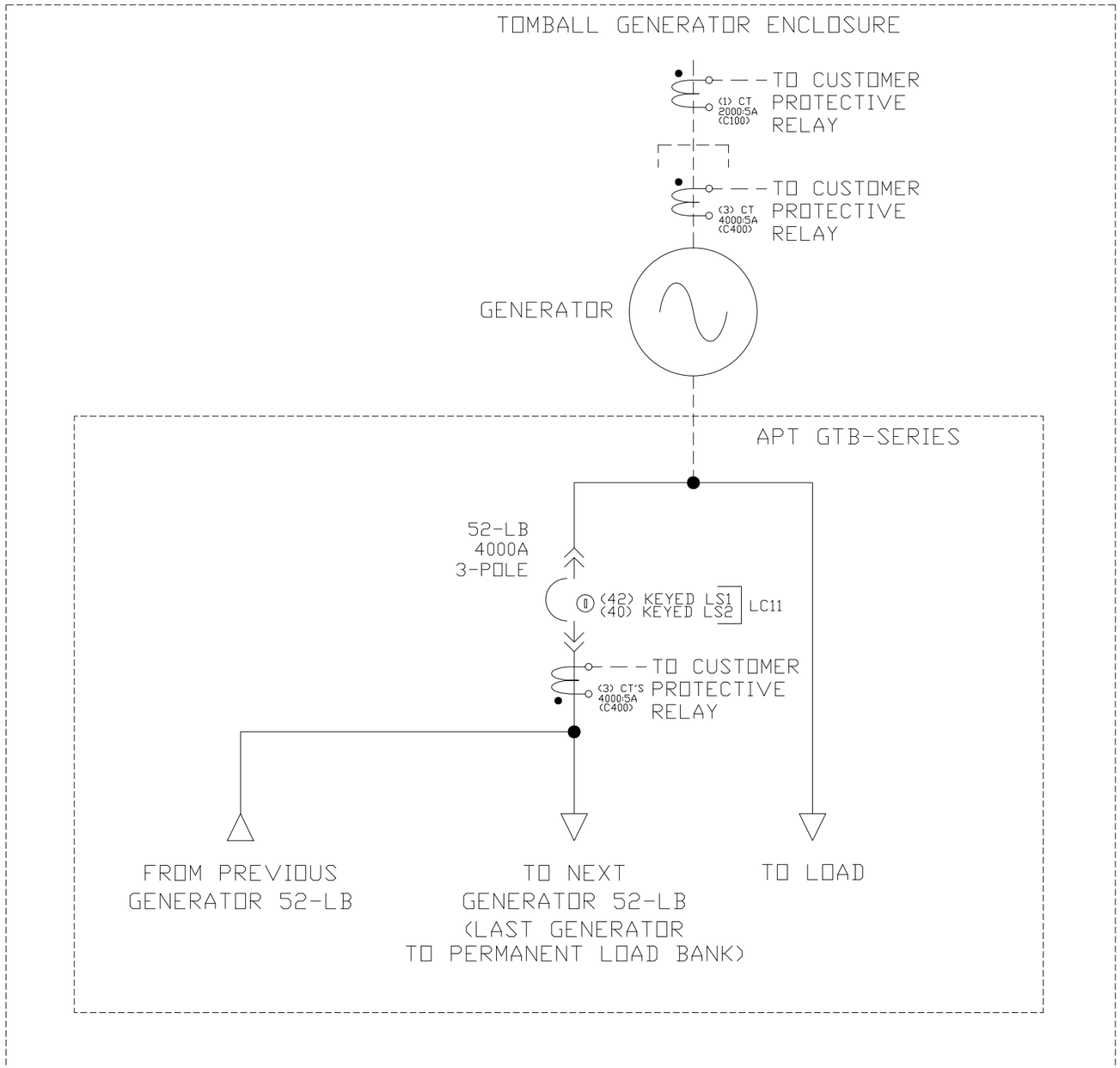
PROJECT: GTB-SERIES 480V, 4000A
EXTD GEN TERMINAL BOX
WITH DO LB LVPCB

PROJ #: P25CARTE01

STATUS: AS BUILT

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KEY:

PROVIDED BY APT

POWER CABLE NOT BY APT

CONNECTION POINT

REV	DATE
02	04/11/25
01	02/28/25

PAGE #: 5 of 8

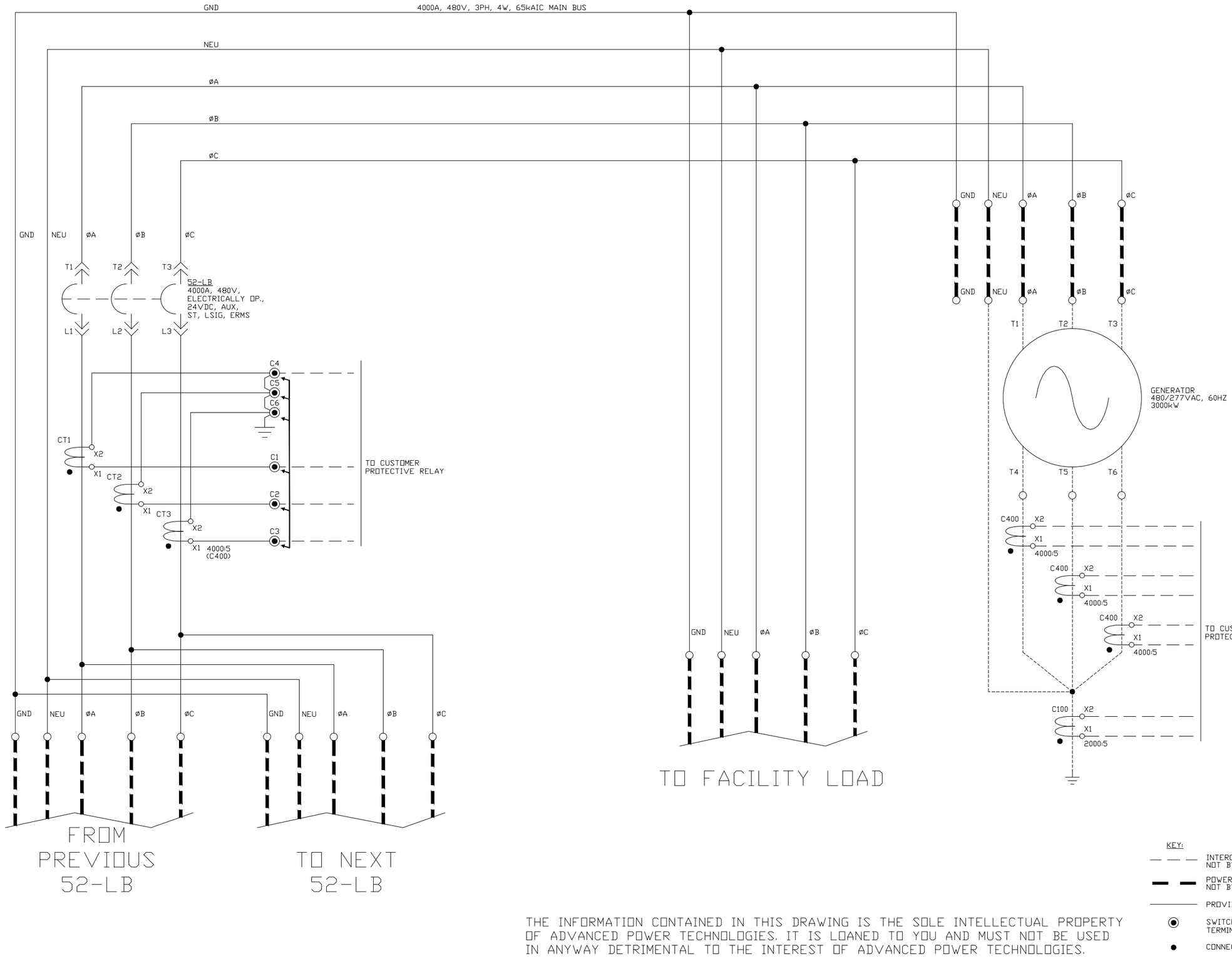
PAGE DESC: ONE-LINE DIAGRAM

STATUS: AS BUILT

PROJECT: GTB-SERIES 480V, 4000A
EXTD GEN TERMINAL BOX
WITH DO LB LVPCB

PROJ #: P25CARTE01

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KEY:

- INTERCONNECT WIRING NOT BY APT
- POWER CABLE NOT BY APT
- PROVIDED BY APT
- SWITCHBOARD TERMINAL POINT
- CONNECTION POINT

REV	DATE
02	04/11/25
01	02/28/25

PAGE #: 6 of 8

STATUS: AS BUILT

PAGE DESC: AC SCHMEMATIC 1
THREE LINE DIAGRAM

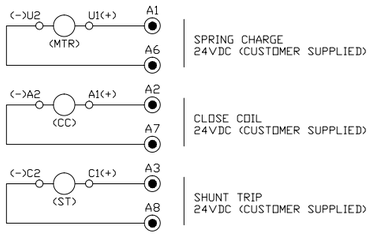
PROJECT: GTB-SERIES 480V, 4000A
EXTD GEN TERMINAL BOX
WITH DD LB LVPCB

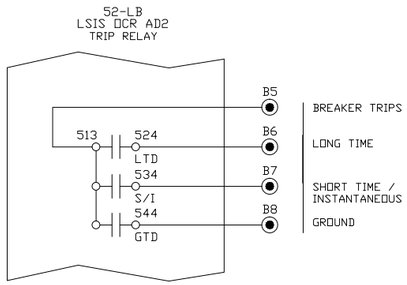
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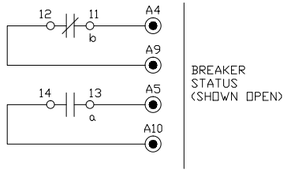
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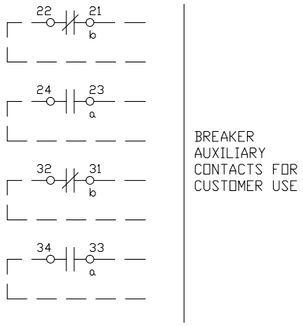
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BREAKER 52LB

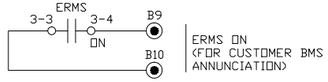








ERMS CONTROL STATUS



KEY:

- INTERCONNECT WIRING NOT BY APT
- POWER CABLE NOT BY APT
- PROVIDED BY APT
- SWITCHBOARD TERMINAL POINT
- CONNECTION POINT

REV	DATE
02	04/11/25
01	02/28/25

PAGE #: 7 of 8

PAGE DESC: DC SCHMEMATIC 1
LSIS LVPCB
AVAILABLE CONTACTS

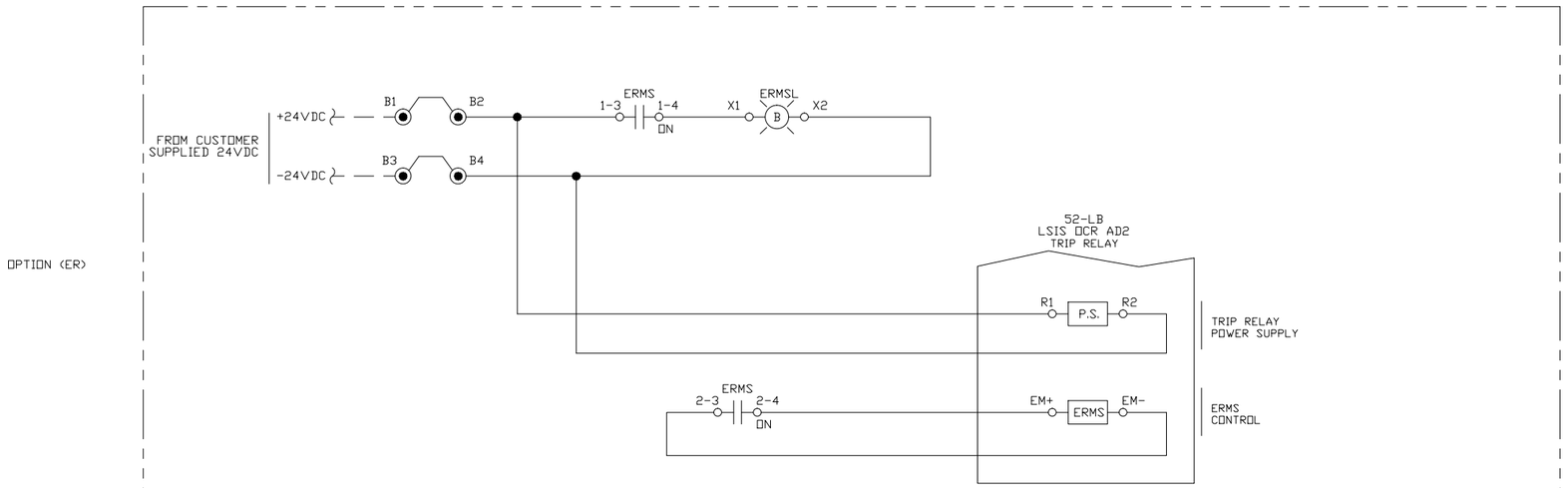
STATUS: AS BUILT

PROJECT: GTB-SERIES 480V, 4000A
EXTD GEN TERMINAL BOX
WITH DO LB LVPCB

PROJ #: P25CARTE01

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KEY:

- INTERCONNECT WIRING NOT BY APT
- POWER CABLE NOT BY APT
- PROVIDED BY APT
- SWITCHBOARD TERMINAL POINT
- CONNECTION POINT

PAGE DESC:	DC SCHEMATIC 2	REV	DATE
	LSIS LVPCB ERMS	02	04/11/25
		01	02/28/25
PROJECT:	GTB-SERIES 480V, 4000A	PAGE #:	8 of 8
	EXTD GEN TERMINAL BOX		
	WITH DO LB LVPCB	STATUS:	AS BUILT
PROJ #:	P25CARTE01		

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ADVANCED POWER TECHNOLOGIES

Technical Datasheet Item (1) – List of Equipment Features & Accessories

APT Product Configurator 9.7 Part Number Selector	Selection Notes

APT PRODUCT QUOTED:

Voltage Class:	LV
Product Family (PF):	GTB-Series

CONTROL FEATURES INCLUDED:

Control Feature 1 (CF1):	External Controls By Others	electrically operated via downstream by SEL400G0
Controls Location (CL):	None	

SYSTEM RATINGS:

System Voltage (V):	480V	
Main Bus, System Ampacity (A):	4000A	
Bus Material (MB):	Silver Plated Copper	
Braced Withstand Rating (WR):	65kA	
Frequency (F):	60Hz (Standard)	
Pole/Wire (PW):	3P/4W (Neutral Bus)	
System Grounding (SG):	Solid	
Enclosure Type (ET):	NEMA 1 with split height rear, sides, bottom front cable access panels and handles	
Surge Protection Device (SPD/TVSS):	None	Available Upon Request for Adder
Current Transformers (CT):	Current Sensing for load bank	
Section Cable Entrance (EN):	Top Only	
Section Cable Exit (EX):	Bottom Only	

CIRCUIT SWITCHING EQUIPMENT:

Circuits - Main/Utility (UM):	**None (0)**	
Circuits - Generator (GA):	**None (0)**	
Circuits - Bus Tie (TB):	**None (0)**	
Circuits - Distribution (DF):	**One (1) Insulated Case Circuit Breaker**	
Circuit Type: 4000AF w/ERMS ICCB(s) -	One (1)	4000A, 3-pole, LSIG - No NCT, 130kAIC@480V, 100% Rated, 3a/3b Aux, 24VDC Shunt Trip, Electrically Operated — Insulated Case CB, Drawout

Portable Equipment Connection (PC):	Temporary Generator - Male: None	Temporary Load Bank - Female: None

CONTROL POWER USAGE:

AC Control Power (AC):	None	
DC Control Power (DC):	24VDC Customer Supplied	for Motor Operator

OTHER OPTIONAL FEATURES INCLUDED:

Other Options 1 (O1):	Energy Reduction Maintenance Setting	with ERMS 'ON' Contact
Other Options 2 (O2):	Key Interlocking (Kirk captive key type)	Provision Only
Other Options 3 (O3):	Line Side Common Bus	
Other Options 4 (O4):	On/Off Indication Status Contacts	
Other Options 5 (O5):	Padlock Provisions	
Other Options 6 (O6):	Specified Color	CAT Yellow
Other Options 7 (O7):	Seismic Rated (By Calculations)	
Other Options 8 (O8):	Extra Large Enclosure for Conduit Entry/Exit	

EQUIPMENT SUPPLY NOTES:

Special Note 1:	Torque Marks are to be made with permanent marker only. Raised torque seal is available upon request for an adder.

See Technical Descriptions Item (1) – Equipment Features & Accessories Descriptions starting on the next page for more details on the selected options

CONFIDENTIAL

Technical Descriptions Item (1) – Equipment Features & Accessories Descriptions

QUOTED APT EQUIPMENT GENERAL FEATURES

Switchgear shall have the following features:

Extended Generator Terminal Box shall be a complete, grounded, continuous-duty, integral assembly, metal-enclosed, dead-front, self-supporting assembly.

Devices/all related components required to fulfill the operational and functional requirements shown and described per the drawings & specifications are incorporated to the extent included herein.

The switchgear shall be supplied as a complete system and shall include all the necessary components and equipment to accommodate described system operation unless otherwise noted.

Extended Generator Terminal Box shall be fully assembled, connected, and wired at the factory so that only external circuit connections are required at the construction site.

The unit shall be integrated into the generator enclosure as an extension of the generator terminals. The unit shall house the generator output circuit breaker and the Temporary Load Bank circuit breaker & cam receptacles and be designed for placement as close to the generator busbar terminals as possible. Jumper cables shall connect the generator terminal stabs to the extension box. Space to accommodate up to fourteen (14) sets of 600kcmil cables per phase plus foureen (14) ground outgoing cables.

Packaging shall include the equipment shipment(s) to be stretch-wrapped and mounted to a skid and to provide adequate protection against rough handling during shipment.

HOUSING & STRUCTURES

Enclosure Type (ET)

(1D) – NEMA 1

Frames & Enclosures:

Enclosure shall be designed according to the NEMA 1 standard for indoor operation.

The enclosure frame shall be produced from at least 11 gauge metal. The switchgear enclosure front hinged half door shall be produced from at least 12 gauge metal. The switchgear enclosure bottom front, side and rear sheets shall be produced from at least 14 gauge metal.

Each enclosure shall be of rigid frame construction.

The enclosure shall be metal, leveled, and not less than the gauge required by applicable publications.

Enclosure shall have mounting holes for connecting adjacent structures to ensure proper alignment, and to allow for future additions.

For ease of on-site cable connections and maintenance an open bottom and removable full depth side sheets shall be provided.

For ease of equipment service, maintenance and future upgrades, all support structures, braces and cover sheets shall be removable and attached to the frame via bolts.

Each section/lineup shall have a label permanently affixed to it, listing the following information:

Name of manufacturer, system voltage, ampacity, interrupting rating, enclosure type, and manufacturer's order

Where used, each control switch, indicating light, or other door/front sheet mounted device/component shall be identified by a nameplate.

The nameplates shall be produced from clear textured polycarbonate, laminated on high performance pressure sensitive adhesive. To ensure high performance and longevity, printing shall be done on the interior surface of the laminate. This avoids scratching or other deterioration of nameplate text.

The lettering shall be white on black background.

Enclosure Finish:

All metal surfaces shall be thoroughly cleaned with the following cleaning process:

Double Steam Cleaner Rinsed

High Pressure Pretreatment process (phosphate-free)

Steam Clean Water Final Rinse

BUS

(SC) – Silver Plated Copper

All bus (main, neutral, ground, extension, etc.) shall be produced from Silver Plated Copper.

Silver Plated Copper ground bus shall run the full width of the switchgear assembly.

Bus is fully rated for the amperage shown on the drawings for entire width of the switchgear.

Appropriately sized bus bar extensions shall have NEMA standard "2-hole" pattern where required to accommodate customer cable connections.

Bus mounted on appropriately spaced insulators and braced to the short circuit current rating.

All bolts, nuts, and washers shall be zinc-plated steel. Bolts shall be torqued to 55 foot-lbs. for 1/2” hardware.

CIRCUIT SWITCHING DEVICES

(ID) – Insulated Case CB, Drawout

Low voltage power circuit breaker(s) shall be UL (1066) listed and provided in the quantity requested with the following features:

1. Switchboard shall be equipped with (electrically) operated circuit breaker(s).

2. Circuit Breakers shall be removable from the front without disconnecting screws from the bus, drawout type with cradle, 100% rated, with a stored energy mechanism, and “a” and “b” auxiliary contacts.

3. Interlock provided to prevent withdrawal of the circuit breaker in closed position. A padlock hasp shall be provided on all drawout carriage assemblies to allow padlocking to prevent insertion of the circuit breaker.

4. Circuit breaker control interface shall have color-coded visual indicators to indicate contact open or closed positions as well as mechanism charged and discharged positions. Manual control pushbuttons on the breaker face for opening and closing the circuit breaker shall be provided.

5. Interrupting Rating:

- For a circuit breaker rated at 2500A and up, interrupting rating shall be (100kA)@480VAC min.

6. Trip unit shall be solid-state, electronic microprocessor-based with true three phase RMS sensing of sinusoidal and non-sinusoidal currents.

7. Provide the following minimum independent time-current curve shaping adjustments for each circuit breaker:

Adjustable long time pick-up and delay.

Adjustable short time pick-up, delay, and I2t settings (as required/specified).

Adjustable instantaneous pickup.

Neutral to Ground Bonding Link with Residual Earth Fault Protection for LSIG (No Neutral Sensing CT) for use in systems without significant line to neutral loads. For systems with significant line to neutral loads, a Neutral Sensing CT is available upon request for an adder.

INSTRUMENTATION TRANSFORMERS

Current Transformers (CTs)

(CS) – Current Sensing

One set of 3 CTs 4000:5 ratio mounted. Secondaries wired to shorting type terminal blocks.

The current transformer mounting assembly shall be insulated for the full voltage rating of the switchgear.

DC CONTROL POWER

(2C) – 24VDC Customer Supplied

The switchgear shall utilize a 24VDC control power battery system supplied by others.

OTHER APT EQUIPMENT FEATURES INCLUDED

(ER) – Energy Reduction Maintenance Setting

Energy Reduction Maintenance Setting (ERMS), otherwise known as a Reduced Energy Let-Through (RELT) switch, included for circuit breakers equal to or greater than 1200A.

Temporarily reduces the instantaneous time pickup setting of the circuit breaker using an Energy Reduction Maintenance Setting (ERMS) switch. When the ERMS switch is turned “ON”, the blue LED is illuminated, the circuit breaker is in maintenance mode, and the circuit breaker tripping time is reduced. The ERMS function is used to reduce the normal LI protection settings in order to trip with no intentional delay @ 2xIn when a fault occurs.
Remote Alarm status contact to indicate when the system is in ERMS 'ON' Mode to the Customer's BMS.

(KX) – Key Interlocking (Kirk captive key type)

Provision Only

(LB) – Line Side Common Bus

A common bus shall connect the line side of the generator output circuit breaker and the load bank circuit breaker and be fed from the generator terminal stabs. Jumper cables (by others) shall connect the common bus to the generator output terminals.

(OF) – On/Off Indication Status Contacts

Standard block of minimum three contacts for indication of the open/closed position of ICCB/LVPCB main poles.

(PD) – Padlock Provisions

A pad-lockable 'off' button cover is included for circuit breakers in locations requested to prevent the manual closing of the circuit breaker via pushing of the circuit breaker 'close' button, when padlocked, preventing operating out of the 'open' position.

CB cradle shall include padlocking provision to prevent the main body of the CB from moving in connected, test, or disconnected when drawing in or out. When padlocked, the main body of ACB cannot be drawn into or out of the cradle.

(SC) – Specified Color

CAT Yellow

(SR) – Seismic Rated (By Calculations)

Seismic Rating to IEEE Std 693. Bracing: all component bracing sized to withstand Seismic Zone 1 requirements as specified by customer/appropriate for the installation location by the calculations of a State of Indiana Licensed Professional Engineer (PE).

(XL) – Extra Large Enclosure for Conduit Entry/Exit

Top 100
Global
Innovator
for 10 years

Susol Super Solution

UL Air Circuit Breakers



LS ELECTRIC

Susol Super Solution

UL ACB

Air Circuit Breakers

Premium Susol ACBs meet your demands for not only the high breaking capacity with its full line-up reaching up to 6000A, with optimized frame sizes for panel designs but also the high max voltage up to 847Vac with harsh environment conditions for renewable energy systems. Our various accessories and terminal configurations allow for user-friendly handling.

Susol ACB provides the total solution with an advanced trip relay for measurement, diagnosis, analysis, and communication as well as protective functions for absolute protective coordination and electric power monitoring system.



UL listed/ANSI certified
Low-Voltage Power Circuit Breaker UA series



Susol Super Solution

UL Air Circuit Breakers

Codes and standards

UA Series Low-Voltage Power Circuit Breakers are manufactured and tested in accordance with the following standards:

- ANSI C37.13
- ANSI C37.16
- ANSI C37.17
- ANSI C37.50
- UL 1066 (cULus Listed)
- CSA C22.2 No.31-10

Note) Throughout this document, the phrase "ANSI Certified" means the product meets the requirements of UL 1066 and ANSI C37

Contents

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- Internal configuration 18
- Ordering 20
- Ratings 24
- Trip relays 26
- Accessories 56
- Electrical diagram 94
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- Technical information 144
- Accessories Item Code 146

Susol series





- **Modular design**
- **High (130kA) breaking capacity full line-up to 6000A**
- **Satisfy the needs for compact sized panels**
- **N-Phase conducting capacity 100%**
- **Interchangeable trip unit and rating plug**
- **High rated maximum voltage-Up to 847Vac**

Safety

Monitor temperatures for safety (Optional)

- Careful selection of materials
- Zero arc space
- Perform discriminations between upstream and downstream levels

User convenience

Various connection types for main circuit terminals

- Easy installation of accessories
- Interchangeable Trip unit and Rating plug

Intelligent trip relay

Various advanced functions for protection, measurement, diagnosis, analysis, communication



Susol Manual Motor Starters

UL 1066
ANSI C37



Smart Air Circuit Breakers



Susol Molded Circuit Breakers











Susol Magnetic Contactors & Overload Relays

Full line-up & Compact

Up to 6000A, Susol ACB provides a full line-up of 3 compact frame sizes.
Enables users to design panels of optimal volume.

800 ~ 1600 AF



800 ~ 3200 AF



85kA

UAS-08/16D

08	800AF
16	1600AF

85kA at 508Vac
W=13.15" (334mm) 3p,
16.50" (419mm) 4p

100kA

UAH-08~32E

08	800AF
16	1600AF
20	2000AF
25	2500AF
32	3200AF

100kA at 508Vac
W=16.22" (412mm) 3p,
20.75" (527mm) 4p

3200 ~ 6000 AF



130kA

- High breaking capacity: 85/100/130kA (at 508Vac)
- 3 ampere frame sizes: 1600/3200/6000AF
- N phase current conducting capacity: 100%

UAH- 32~60G

32	3200AF
40	4000AF
50	5000AF
60	6000AF

130kA at 508Vac
W=30.91" (785mm) 3p,
39.96" (1015mm) 4p

Susol ACB Trip relay

N type



- L/S/I/G

- Self Power
- RTC Timer mounted
- Fault indicator (LED)
- NFC

A type



- L/S/I/G (or Gext)
- ZSI (Protective coordination)
- Remote Reset
- Modbus/RS-485

- Self Power
- AC/DC 100~ 250V
- RTC Timer mounted
- Fault Recording (10EA)
- ERMS , Local/Remote DI (selectable)
- USB Terminal (Power, Communication)
- Ethernet (Optional product required)
- Self Power
- AC/DC 100 ~ 250V
- RTC Timer mounted
- Fault Recording
- Fault Wave Recording (6EA)
- DC 24 ~ 48V

P type



- L(N)/S1/I/G(or Gext)
- Thermal(linear hot start)
- UV1/OV1/RV/D/S(V)1/VU/IU
- UF1/OF1/ROCOF/RP/RQ1/OP/OQ/UP
- Measurement: V/A/W/Wh/F/PF
- ZSI (Protective coordination)
- Remote Reset
- ERMS , Local/Remote DI (selectable)

- USB Terminal (Power, Communication)
- Modbus/RS-485
- Bluetooth (Option)
- Ethernet (Optional product required)

- Self Power
- AC/DC 100~ 250V
- RTC Timer mounted
- Event Recording (255EA)
- Fault Recording (127EA)
- Fault Wave (6EA)
- DC 24 ~ 48V

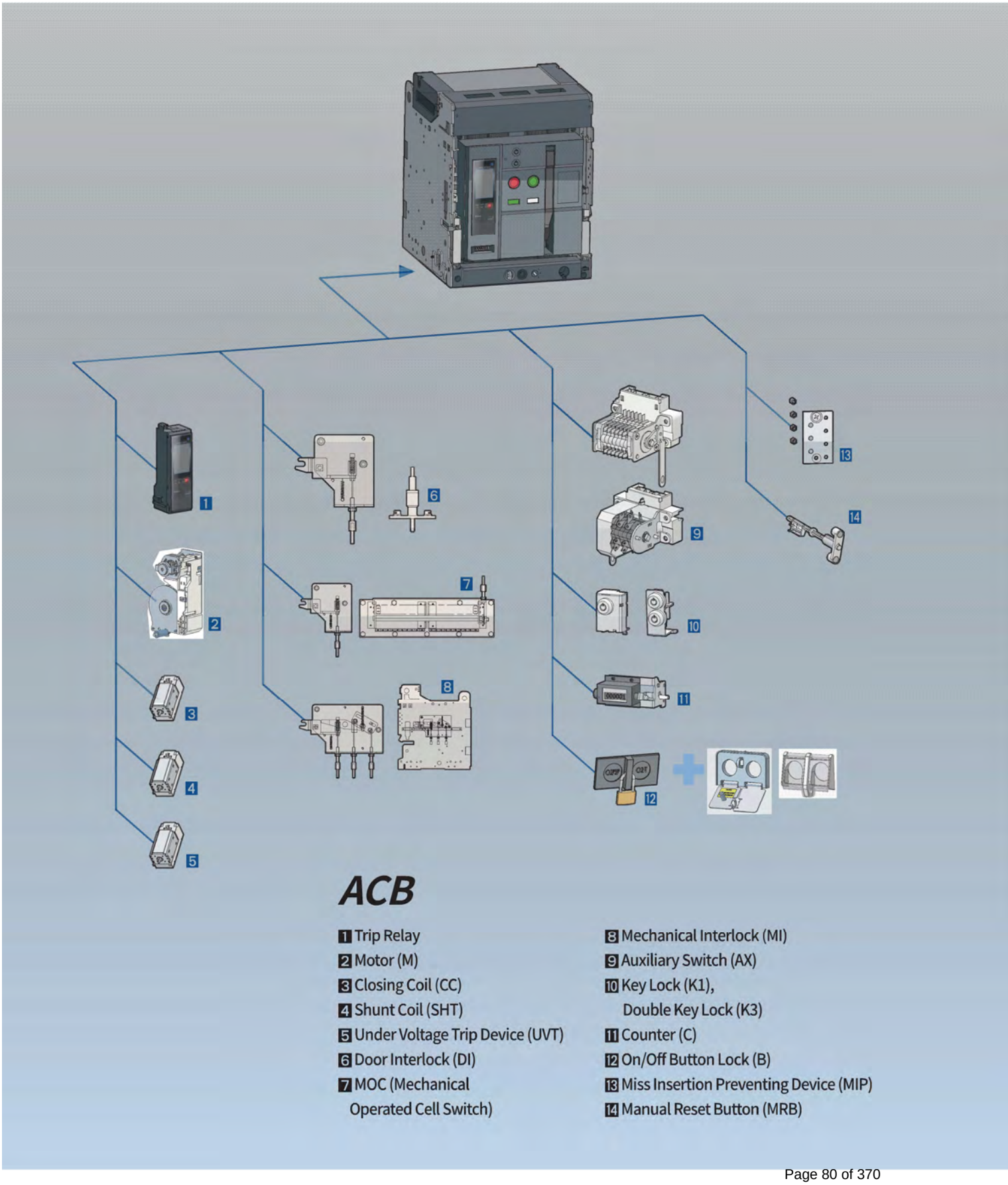
S type



- L(N)/S(1,2)/I/G(or Gext)
- Thermal (linear hot start)
- UV(1,2)/OV(1,2)/RV/D/S(V)(1,2)/VU/IU
- UF(1,2)/OF(1,2)/ROCOF/RP/RQ(1,2)/OP/OQ/UP
- Measurement: V/A/W/Wh/F/PF
- Relay Group control (A,B)
- ZSI(Protective coordination)
- Remote Reset
- ERMS, Local/Remote, Group A/B DI (selectable)

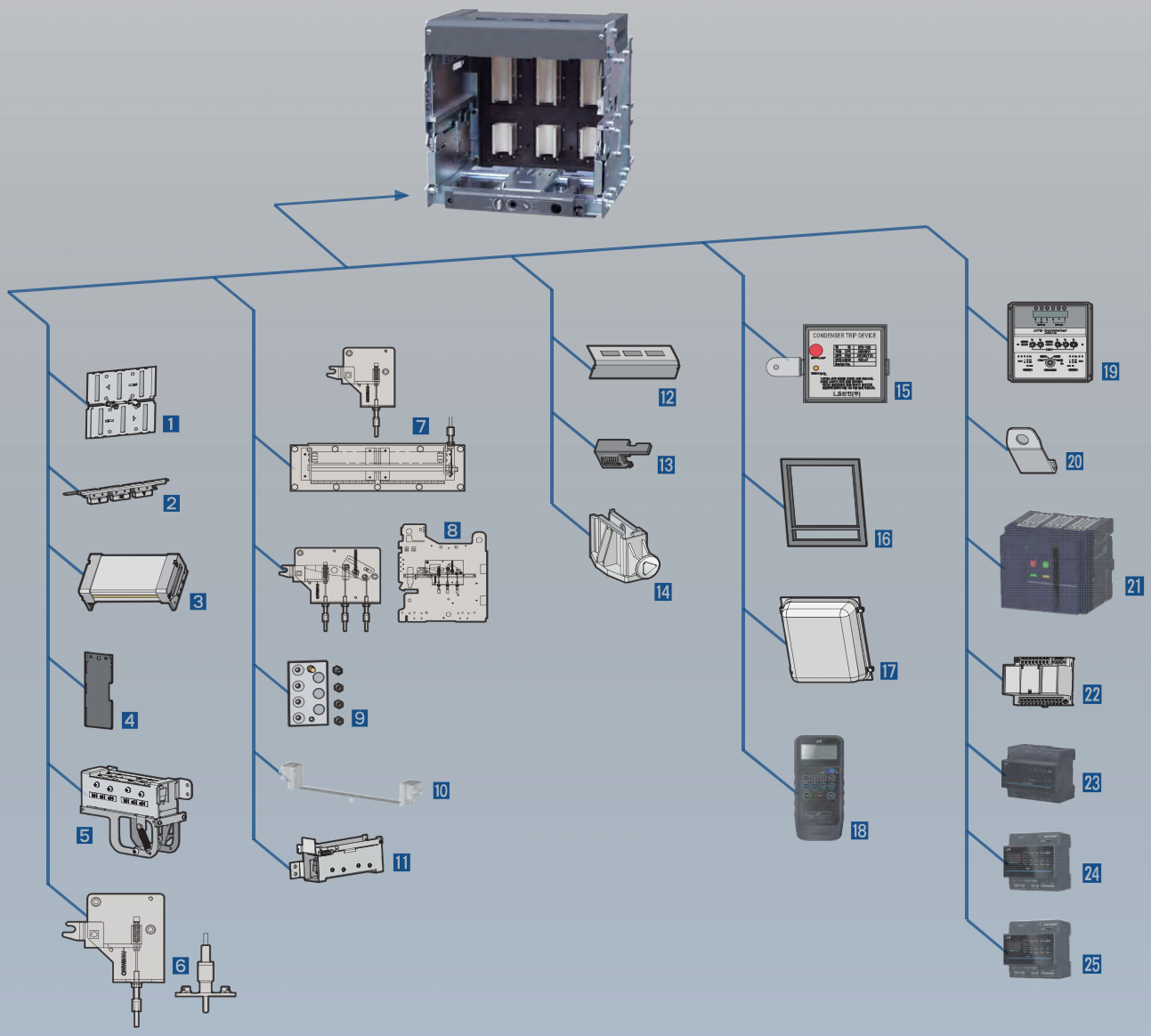
- USB Terminal (Power, Communication)
- Modbus/RS-485
- Bluetooth
- Ethernet (Optional product required)
- NFC

- Self Power • AC/DC 100 ~ 250V
- RTC Timer mounted
- Event Recording (255EA)
- Fault Recording (127EA)
- Fault Wave (6EA)
- DC 24 ~ 48V



ACB

1 Trip Relay
2 Motor (M)
3 Closing Coil (CC)
4 Shunt Coil (SHT)
5 Under Voltage Trip Device (UVT)
6 Door Interlock (DI)
7 MOC (Mechanical Operated Cell Switch)
8 Mechanical Interlock (MI)
9 Auxiliary Switch (AX)
10 Key Lock (K1), Double Key Lock (K3)
11 Counter (C)
12 On/Off Button Lock (B)
13 Miss Insertion Preventing Device (MIP)
14 Manual Reset Button (MRB)



Cradle

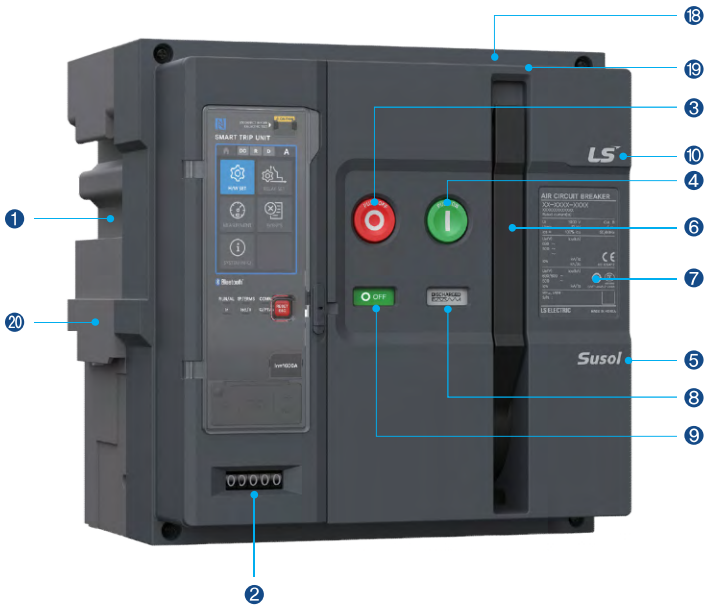
1 Safety Shutter (ST)
2 Manual Connector
3 Zero Arc Space (ZAS)
4 Insulation Barrier (IB)
5 Cell Switch (CEL)
6 Door Interlock (DI)
7 MOC (Mechanical Operated Cell switch)
8 Mechanical Interlock (MI)
9 Miss Insertion Prevent Device (MIP)
10 Body Supporter (BSP)
11 Shorting "b" Contact (SBC)
12 Safety Control Cover (SC)
13 Racking Interlock (RI)
14 Safety Shutter Lock (STL)

Other

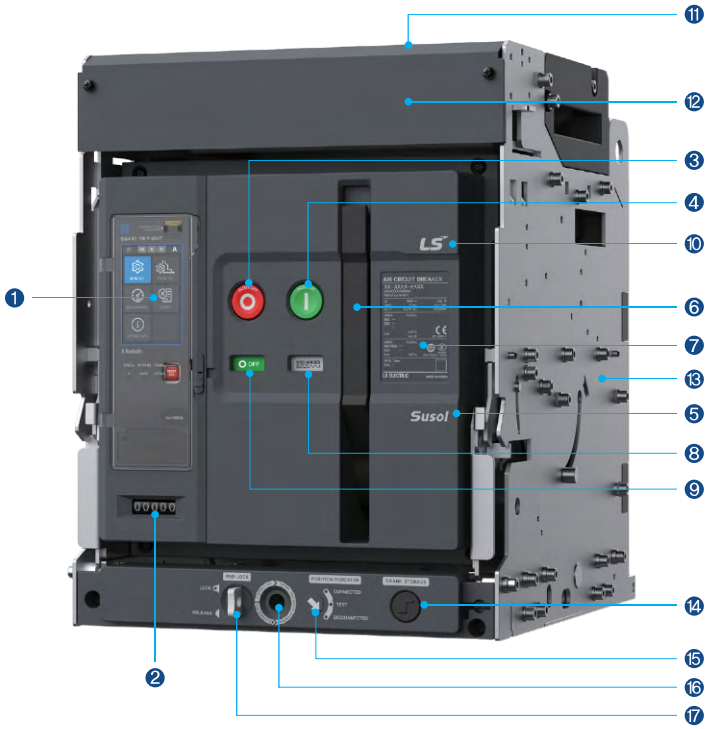
15 Condenser Trip Device (CTD)
16 Door Frame (DF)
17 Dust Cover (DC)
18 Intelligent Potable OCR Tester (IPOT)
19 ATS Controller (ATS)
20 Lifting Hook (LM)
21 Dummy ACB
22 UVT Time Delay Controller (UDC)
23 Gateway/Data Logger
24 Profibus-DP
25 Temperature Alarm

External configuration

Fixed type ACB



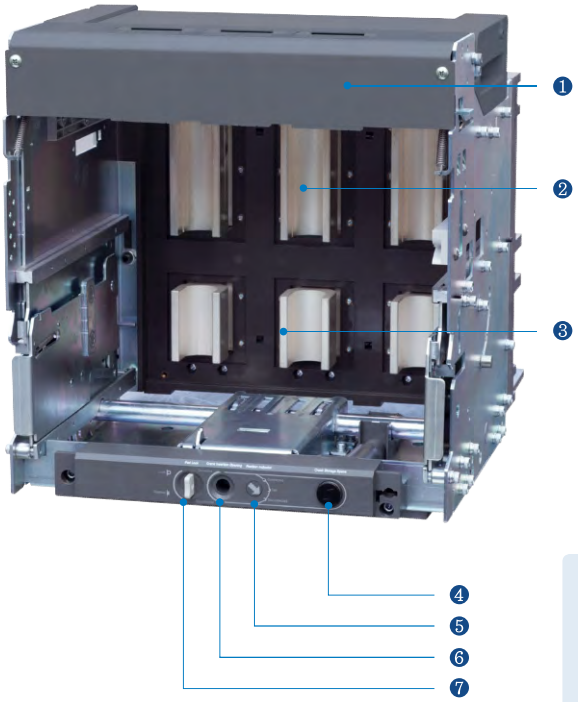
Draw-out ACB (Cradle)



Terms

1. Trip relay
2. Counter
3. OFF button
4. ON button
5. Series name
6. Charge handle
7. Rated name plate
8. Charge/Discharge indicator
9. ON/OFF indicator
10. Corporation logo
11. Arc cover (Zero Arc Space)
12. Safety control cover
13. Cradle
14. Draw-out handle
15. Position indicator
16. Handle inserting hole
17. Pad lock button
18. Arc chute
19. Front cover
20. Fixed type bracket

Cradle (Internal)



Cradle (Rear)

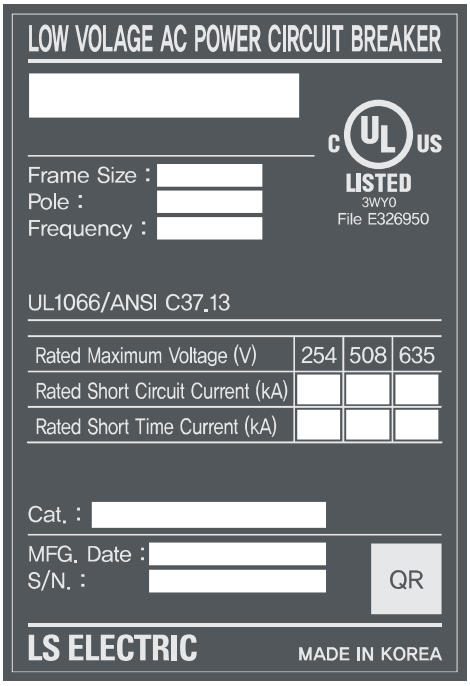


Terms

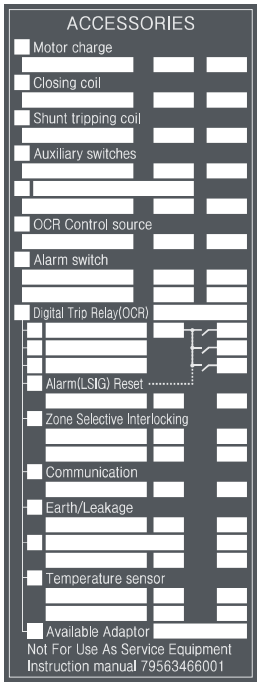
1. Safety control cover
2. Cradle finger
3. Cradle finger
4. Draw-out handle
5. Position indicator
6. Handle inserting hole
7. Pad lock button
8. Connecting terminal
9. Connecting terminal

Main nameplate

[Acronym explanation]



[Secondary nameplate]

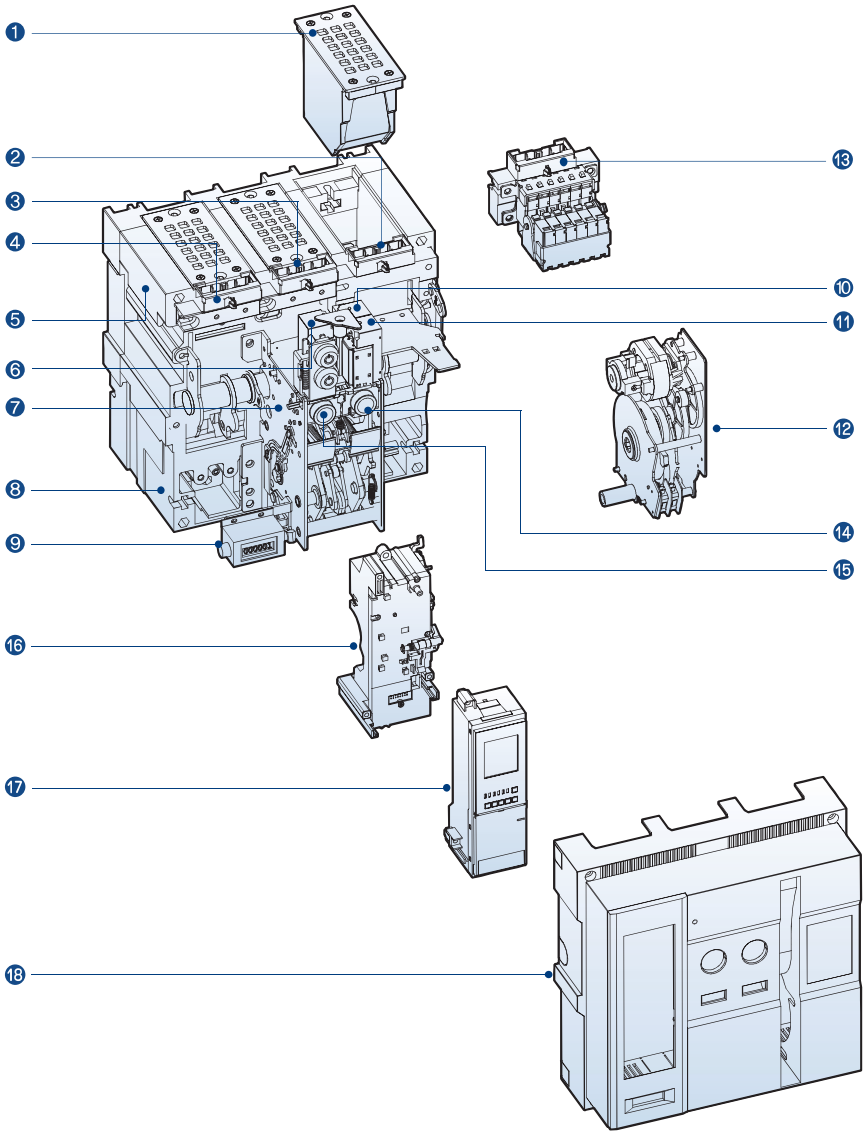


Explanation of terminologies

- Motor charge
- Closing coil
- Shunt tripping coil

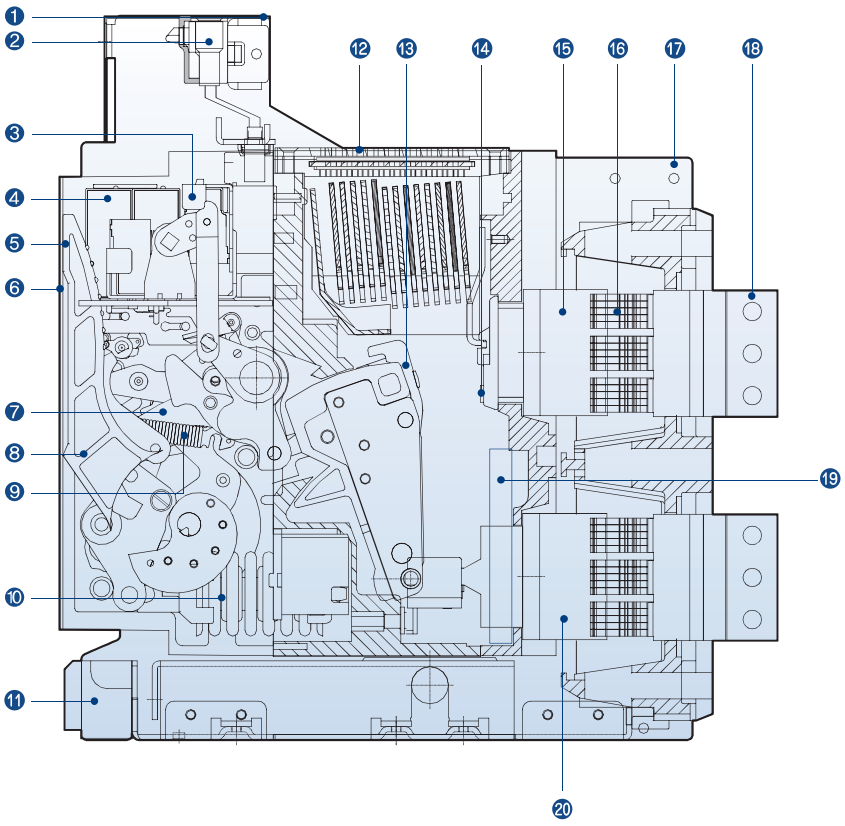
  Control power and terminal No.
- Auxiliary switches: Contact specification and terminal No.
- Under voltage trip: UVT terminal No.
- Trip Relay control source: Trip relay control power
- Alarm switch: Alarm and terminal No.
- Digital trip relay: Switching diagram
- Z.S.I: Input/Output terminal No.
- Reset: LED/LCD reset
- Communication: Communication and terminal No.
- Voltage module: Phase voltage and symbol
- Earth/Leakage: Ground fault / Earth leakage input terminal No.

Internal configuration



Terms

1. Arc chute
2. Aux. switch control terminal
3. Control power supply terminal
4. Trip relay control terminal
5. Carrying grip
6. Shunt coil
7. Mechanism
8. Main body
9. Counter
10. Shunt coil
11. Closing coil
12. Motor Ass'y
13. Aux. switch
14. ON button
15. OFF button
16. MTD base
17. Trip relay
18. Front cover



Terms

1. Control circuit terminal block
2. Control terminal
3. Auxiliary switches
4. Closing, Shunt, UVT coil
5. Trip relay
6. Front cover
7. Mechanism
8. Charge handle
9. Trip spring
10. Closing spring
11. Draw-in/out device
12. Arc chute
13. Moving contact
14. Fixed contact
15. Terminal on line side
16. Cradle finger
17. Cradle
18. Connecting terminal
19. Power supply CT
20. Terminal on load side

Ordering

Breaker and accessories

UAS — 16 D 3 — 16 A

Frame type
UAS

Frame size	
08	800AF
16	1600AF

Phasing	
D	3/4P standard RST(N)
W	4P reversed NRST

Poles	
3	3P
4	4P

Sensor rating	
04~08	400A~800A
08~16	800A~1600A

Mounting and terminal	
Mounting	
A	Drawout
Fixed	
H	Horizontal terminals
V	Vertical terminals
M	Horizontal for line
	Vertical for load
N	Vertical for line
	Horizontal for load
P	Front terminal
G	Horizontal-con type
W	Vertical-con type

UAH — 32 E 3 — 32

Frame type
UAH

Frame size	
08	800AF
16	1600AF
20	2000AF
25	2500AF
32	3200AF
32	3200AF
40	4000AF
50	5000AF
60	6000AF

Phasing	
E	3/4P standard RST(N)
X	4P reversed NRST
G	3/4P standard RST(N)
Z	4P reversed NRST

Poles	
3	3P
4	4P
3	3P
4	4P

Sensor rating	
04~08	400A~800A
08~16	800A~1600A
10~20	1000A~2000A
12~25	1200A~2500A
16~32	1600A~3200A
16~32	1600A~3200A
20~40	2000A~4000A
25~50	2500A~5000A
30~60	3000A~6000A

* Terminals for P type must be ordered separately
* G and W types are applicable to D-frame only
* Front terminal is only available for 800~2000A
* 3200AF(E, X), 6000AF(G,Z) offers only vertical type terminals (Busbar).
* 6000AF is only available for drawout type

UAW — 32 E 3 — 32

Frame type
UAW

Frame size	
08	800AF
16	1600AF
20	2000AF
25	2500AF
32	3200AF

Phasing	
E	3/4P standard RST(N)
X	4P reversed NRST

Poles	
3	3P
4	4P

Sensor rating	
04~08	400A~800A
08~16	800A~1600A
10~20	1000A~2000A
12~25	1200A~2500A
16~32	1600A~3200A

UAA — 16 D 3 — 00

Frame type
UAA

Frame size	
08	800AF
16	1600AF
08	800AF
16	1600AF
20	2000AF
25	2500AF
32	3200AF
32	3200AF
40	4000AF
50	5000AF
60	6000AF

Phasing	
D	3/4P standard RST(N)
W	4P reversed NRST
E	3/4P standard RST(N)
X	4P reversed NRST
G	3/4P standard RST(N)
Z	4P reversed NRST

Poles	
3	3P
4	4P

Sensor rating
Not applied

M1 D1 D1 HX NH0 U1 AL

Motor operator	
MA	None (Manual operated)
M1	AC/DC 100V~125V
M2	AC/DC 200V~250V
M3	DC 125V
M4	DC 24V~30V
M5	DC 48V~60V
M8	AC 48V

Shunt trip	
D0	None
D1	AC/DC 100V~125V
D2	AC/DC 200V~250V
D3	DC 125V
D4	DC 24V~30V
D5	DC 48V~60V
D7	AC 48V

Trip relay
Refer to page 23

AD2

Option

Closing coil	
D0	None
D1	AC/DC 100V~125V
D2	AC/DC 200V~250V
D3	DC 125V
D4	DC 24V~30V
D5	DC 48V~60V
D7	AC 48V

Charging/Auxiliary switch	
HX	High capacity OFF charge/5a5b
HC	High capacity ON charge/5a5b
GX	High capacity OFF charge/3a3b
GC	High capacity ON charge/3a3b
JC	Capacity ON charge/6a6b

UVT	
U0	None
U1	AC/DC 100V~125V
U2	AC/DC 200V~250V
U3	DC 125V
U4	DC 24V~30V
U5	DC 48V~60V
U6	AC 380V~480V
U7	AC 48V

Code	Description		Code		Description
AL	AL1+MRB		K	K1	Key lock
A1	AL1+MRB +RES (AC110~130V) *AC only		K2	K2	Key Interlock set
A2	AL1+AL2 +MRB		K3	K3	Key Interlock double
A3	AL1+MRB +RES (DC110~125V) *DC only		K4	K4	Key lock (Same key)
A4	AL1+MRB +RES (AC200~250V) *AC only		K5	K5 Note 4)	Profalux lock (CAMLOCK type)
A5	AL1+MRB +Auto reset		K6	K6 Note 4)	Kirkkey lock (CAMLOCK type)
A6	AL1+AL2 +MRB +Auto reset		K7	K7 Note 4)	Kirkkey lock (CN-22 type)
A7	AL1+MRB +RES (DC110~125V) +Auto reset *DC only		R	RCS	Ready to close switch
A8	AL1+MRB +RES (AC200~250V) +Auto reset *AC only		T	TM	Temperature monitoring
A9	AL1+MRB +RES (AC110~130V) +Auto reset *AC only		H1	SHT2 Note 2)	AC/DC 100V ~125V, Double shunt coil
S	CS2	Charge switch communication	H2		AC/DC 200V ~250V, Double shunt coil
B	B	Lockable On/Off button cover	H3		DC 125V, Double shunt coil
M	MI	Mechanical interlock	H4		DC 24V ~30V, Double shunt coil
D	DI or MOC	Door interlock or MOC (Mechanism operated cell switch)	H5		DC 48V ~60V, Double shunt coil
(-V)	Without VDM module (External type VDM is required to order)		H7		AC 48V, Double shunt coil

N01	A4 (AL1+MRB +RES(AC200~250V))+B(Lockable On/Off button cover)+K(Key lock)+R(Ready to close switch)+M(Mechanic interlock)+E(Spring auto release)
N02	AL (AL1+MRB)+K(Key lock(OFF lock))+R(Ready to close switch)+D(Door interlock or MOC)+H1(AC/DC 100V ~ 130V, Double shunt coil)+E(Spring auto release)
N03	B(Lockable On/Off button cover)+K2(Key interlock set)+R(Ready to close switch)+T(Temperature monitoring)
N04	A4(AL1+MRB+RES(AC200~250V))+B(Lockable On/Off button cover)+K(Key lock(OFF lock))+M(Mechanical interlock)+T(Temperature monitoring)
N05	A1(AL1+MRB+RES110~130V)+B(Lockable On/Off button cover)+K(Key lock(OFF lock))+R(Ready to close switch)+M(Mechanical interlock)+T(Temperature monitoring)
N06	A2(AL1+AL2+MRB)+K(Key lock(OFF lock))+R(Ready to close switch)+T(Temperature monitoring)

Note) 1. * Codes for over 5 optional accessories are composed separately.
2. UVT and SHT2 can not be selected together. Select one of two.
3. C(counter) is provided as standard.
4. K5, K6, K7 options are factory installed keylock.

Ordering

Adapter (Cradle)

UAL — S16D 3 A H E S

UAL — For UL ACB cradle type



S16D — Frame size Note)

S16D	1600AF
S20E	2000AF
S25E	2500AF
S32E	3200AF
S50G	5000AF
S60G	6000AF

3 — Number of poles

3	3P
4	4P

A — Secondary connector type

A	Connector type
B	Screw joint type
C	Spring type

H — Terminal configuration

H	Horizontal type
V	Vertical type
M	Line: Horizontal Load: Vertical
N	Line: Vertical Load: Horizontal
P	Front type
G	Horizontal-con type
W	Vertical-con type

* Terminals for P type must be ordered separately
* G and W types are applicable to S16D (1600AF) only.
* Metering CT for ST type must be ordered sesparatedly

E — Shutter

E	Without safety shutter
F	With safety shutter

S — Other options

N	ARC Cover N/A
S	Arc cover
ST	Arc Cover+Metering CT

* The depth of Metering CT included cradle is longer than normal cradle

T - CT Provision

Note) The corresponding Breaker Adapter

Breaker		Adapter
UAS-08D	UAS-08W	S16D
UAS-16D	UAS-16W	
UAH-08E	UAH-08X	S20E
UAH-16E	UAH-16X	
UAH-20E	UAH-20X	
UAH-25E	UAH-25X	S25E

Breaker		Adapter
UAH-32E	UAH-32X	S32E
UAH-32G	UAH-32Z	
UAH-40G	UAH-40Z	S50G
UAH-50G	UAH-50Z	
UAH-60G	UAH-60Z	S60G

Rating plug

Rating plug classfication				ACB ampere frame							
	For none NCT type	For NCT type	Rating	800A	1600A	2000A	2500A	3200A	4000A	5000A	6000A
Rating plug code	73263466352	73263466372	400A	400A~ 800A							
	73263466353	73263466373	600A								
	73263466354	73263466374	630A								
	73263466355	73263466375	800A		800A~ 1600A						
	73263466356	73263466376	1000A			1000A~ 2000A					
	73263466357	73263466377	1200A				1200A~ 2500A				
	73263466358	73263466378	1250A								
	73263466359	73263466379	1600A					1600A~ 3200A			
	73263466360	73263466380	2000A						2000A~ 4000A		
	73263466361	73263466381	2500A							2500A~ 5000A	
	73263466362	73263466382	3000A								3000A~ 6000A
	73263466363	73263466383	3200A								
	73263466364	73263466384	3600A								
	73263466365	73263466385	4000A								
	73263466366	73263466386	5000A								
	73263466367	73263466387	6000A								

* A rating plug ranging from 50 to 100% of the ACB ampere frame should be used.
* The minimum value of the Trip Relay self-power supply is based on the CT rating, not the rating plug rating.

Trip relay









N — Trip Relay Type

N	
000	Trip Relay N/A
N	Normal

H — Communication & protection

H	
H	L, S, I, G

O — Control voltage & frequency

0	Frequency used	Control power voltage	Comm.
0	60Hz	Self-Power Note1)	NFC
5	50Hz	Self-Power Note1)	NFC

A

A	
A	Ammeter

H

H	
H	L, S, I, G
D	L, S, I, G + Comm.
Y	L, S, I, Gext + Ground wire CT + Comm.
O **	L, S, I, G + Neutral CT + Comm.

* L,S,I: Long time delay trip, Short time delay trip, Instantaneous trip
* G: Ground fault (Residual earth fault protection)
* Ground fault system by vector sum
* Communication and output contacts DO NOT work under self-power condition
* Gext + Ground wire CT: Source return Type
* Customers must purchase their own Ground wire CT (Secondary output: 5A, accuracy 1%)

** AO provide the function to detect and protect the ground fault current by applying the NCT (Neutral CT) in the neutral wire when 3pole circuit breaker is used in 3-phase 4-wire system.
* Customers must purchase their own Neutral CT (Primary output: same as ACB's Rated Current / Secondary output: 5A, accuracy 1%)

0

0	Frequency used	Control power voltage	Comm.
0	60Hz	Self-Power	N/A
1	60Hz	AC/DC 85V~264V	N/A
2	-	DC 21V~54V	N/A
5	50Hz	Self-Power	N/A
6	50Hz	AC/DC 85V~264V	N/A
7	-	DC 21V~54V	N/A

* The Self-Power function is to receive power from the main circuit inside the circuit breaker without external power to the STU Communication, ZSI, Remote Reset, DO functions are not available and EVENT is not logged when using Self - Power only.

P — Trip unit type

P	
P	Power meter

S — Relay function / Communtation (MODBUS)

S	
S	L, S, I, G + PTA
Y	L, S, I, Gext + Ground wire CT
O	L, S, I, G + Neutral CT

1

	Frequency	Control power voltage	Communication
1	60Hz	AC/DC 85V~264V	N/A
2	60Hz	DC 21V~54V	N/A
3	60Hz	AC/DC 85V~264V	Bluetooth
4	60Hz	DC 21V~54V	Bluetooth
6	50Hz	AC/DC 85V~264V	N/A
7	50Hz	DC 21V~54V	N/A
8	50Hz	AC/DC 85V~264V	Bluetooth
9	50Hz	DC 21V~54V	Bluetooth

S — Trip unit type

S	
S	Supreme meter

S — Relay function / Communtation (MODBUS)

S	
S	L, S, I, G + PTA
Y	L, S, I, Gext + Ground wire CT
O	L, S, I, G + Neutral CT

1

	Frequency	Control power voltage	Communication
1	60Hz	AC/DC 85V~264V	Bluetooth, NFC
2	60Hz	DC 21V~54V	Bluetooth, NFC
6	50Hz	AC/DC 85V~264V	Bluetooth, NFC
7	50Hz	DC 21V~54V	Bluetooth, NFC

* Self-power is basic function (Automatic power supply to the Trip Unit without additional control power)
* L,S,I: Long time delay trip, Short time delay trip, Instantaneous trip
* G: Ground fault (Residual earth fault protection)
* Gext + Ground wire CT: Source return Type * PTA: Pre-trip alarm Function
* Customers must purchase their own Ground wire CT (Secondary output: 5A, accuracy 1%)
* Customers must purchase their own Neutral CT (Primary output: same as ACB's Rated Current / Secondary output: 5A, accuracy 1%)
* The STU acceptable voltage range is 100 to 250V.
* If you want an external VDM, please insert '(-V)' at the end of the full ordering.

Item	Description	Features	Remark
72313460708	TOTAL ASS'Y,VDM(Shield Cable), EXTERNAL, STU	Accessory	Separate purchasing

* If you want to apply external VDM separately, please order the code above.

Ratings for UL Listed/ANSI Certified Susol UA Circuit Breakers



Type					Susol UAS-□□D	
AF					08	16
Rated current (CT Ration)	(A)			at 40°C	800	1600
Rated current (Available Rating plug)	(V)			at 40°C	400 600 630 800	800 1000 1200 1250 1600
Rated maximum voltage	(V)				254V / 508V / 635V	
Frequency	(Hz)				UAS: 50/60	
Number of poles	(P)				3P / 4P	
Type of trip relay (Electronic trip device)					N, A, P, S (4 type)	
Rated short circuit current (Sym.) (Duty: O-15s-CO)	(kA)	With instantaneous	AC	847V(60Hz)	-	
				635V	65	
				508V	85	
				254V	85	
		Without instantaneous	AC	847V(60Hz)	-	
				635V	65	
				508V	65	
				254V	65	
Rated making current (X/R=more than 6.6)	(kA peak)	With instantaneous	AC	847V(60Hz)	-	
				635V	149.5	
				508V	195.5	
				254V	195.5	
		Without instantaneous	AC	847V(60Hz)	-	
				635V	149.5	
				508V	150.5	
				254V	151.5	
Rated short time current	(kA)		AC		60	
Operating time (t)	(ms)	Breaking time			Less than 30ms	
		Opening time			Less than 50ms	
		Closing time			Less than 80ms	
		Charging time			Less than 5 sec.	
Endurance Rating C/O Cycles) (Without maintenance)	(Cycles)	Mechanical (60 times per hour)			12,500	
		Electrical (30 times per hour)			2,800	
Weight (Include Charging motor)	lb (kg)	Drawout type	Main Body with Cradle	3P	154 (70)	
				4P	187 (85)	
			Only Cradle	3P	71 (32)	
				4P	84 (38)	
		Fixed type		3P	77 (35)	
				4P	99 (45)	
External dimension 	Draw-out type	in (mm)	H×W×D	3P	16.93×13.15×16.02 (430×334×407)	
				4P	16.93×16.50×16.02 (430×419×407)	
	Fixed type	in (mm)	H×W×D	3P	11.81×11.81×11.61 (300×300×295)	
				4P	11.81×15.16×11.61 (300×385×295)	
Enclosure dimension		in (mm)	H×W×D	3P	19.69×15.75×13.39 (500×400×340)	
				4P	19.69×19.69×13.39 (500×500×340)	
Operation Temperature					-13°F ~ 140°F (-25°C ~ 60°C)	
Certified Standards					UL 1066 / ANSI C37.13	





Susol UAH-□□E / UAW-□□E				
08	16	20	25	32
800	1600	2000	2500	3200
400	800	1000	1200	1600
600	1000	1200	1250	2000
630	1200	1250	1600	2500
800	1250	1600	2000	3000
	1600	2000	2500	3200
254V / 508V / 635V / 847V(UAW)				
UAH/UAW: 50/60				
3P / 4P				
N, A, P, S (4 type)				
85				
85				
100				
100				
85				
85				
85				
85				
195.5				
195.5				
230				
230				
195.5				
195.5				
195.5				
195.5				
85				
Less than 30ms				
Less than 50ms				
Less than 80ms				
Less than 5 sec.				
12,500				5,000
2,800				1,000
214 (97) 269 (122)			245 (111) 309 (140)	326 (148) 414 (188)
99 (45) 121 (55)			123 (56) 152 (69)	205 (93) 256 (116)
101 (46) 126 (57)			110 (50) 137 (62)	196 (89) 249 (113)
16.93×16.22×16.02 (430×412×407)				
16.93×20.75×16.02 (430×527×407)				
11.81×14.88×11.61 (300×378×295)				
11.81×19.41×11.61 (300×493×295)				
19.69×19.69×13.39 (500×500×340)				
19.69×24.21×13.39 (500×615×340)				
-13°F ~ 140°F (-25°C ~ 60°C)				
UL 1066 / ANSI C37.13				

Susol UAH-□□G			
32	40	50	60
3200	4000	5000	6000
1600	2000	2500	3000
2000	2500	3000	3200
2500	3000	3200	3600
3000	3200	3600	4000
3200	3600	4000	5000
	4000	5000	6000
254V / 508V / 635V			
UAH: 50/60			
3P / 4P			
N, A, P, S (4 type)			
-			
100			
130			
130			
-			
100			
100			
100			
-			
230			
299			
299			
-			
230			
230			
230			
100			
Less than 30ms			
Less than 50ms			
Less than 90ms			
Less than 5 sec.			
5,000			
1,000			
489 (222) 626 (284)			
276 (125) 355 (161)			
227 (127) 287 (130)			
18.11×30.91×16.02 (460×785×407)			
18.11×39.96×16.02 (460×1015×407)			
11.81×29.57×11.61 (300×751×295)			
11.81×38.62×11.61 (300×981×295)			
31.50×32.48×13.39 (800×825×340)			
31.50×41.54×13.39 (800×1055×340)			
-13°F ~ 140°F (-25°C ~ 60°C)			
UL 1066 / ANSI C37.13			

Trip Relay (STU : Smart Trip Unit)

The trip relay of Susol ACB provides the additional protection functions for voltage, frequency, unbalance, and others in addition to main protection functions for over current, short-circuit, ground fault. It supports the advanced measurement functions for voltage, current, power, electric energy, harmonics, communication function, and others.
Analog trip function interlocked with mechanism enhanced a durability of devices as well as the breaking capacity of ACB.
Zone selective interlocking function makes the protective coordination more simple and thermal memory can be applied to various loads.





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Trip relay types

		N-Type	A-Type	P-Type	S-Type
Externals					
Current relay		• L, S, I, G	• L(N), S, I, G, PTA, Gext	• L(N), S1, I, G, PTA, Gext • D, S(V)1, IU	• P type Current relay • S(V)2
Voltage relay		-	-	• UV1, OV1, RV, VU	• P type Voltage relay • UV2, OV2
Frequency relay		-	-	• UF1, OF1, ROCOF	• P type Frequency relay • UF2, OF2
Power relay		-	-	• RP, RQ1, OP, OQ, UP	• P type Power relay • RP, RQ1, RQ2
Group control		-	-	-	• A,B (Control by DI and communication)
Relay fine tuning		-	-	• Possible (Adjust knob and freely set operating value current)	• Possible (Freely set operating value current)
ERMS		-	• Control by DI and Communication	• Control by DI and Communication	• Control by DI and Communication
IDMTL Support		-	• L relay element (Thermal, DT, SIT, VIT, EIT, EIT50)	• L relay element (Thermal, DT, SIT, VIT, EIT, EIT50)	• L relay element (Thermal,DT,SIT,VIT, EIT,EIT50)
Trip information Maintenance LED		• L, S, I, G • SP : Self protection	• L, S, I, G/Gext/PTA, SP	• L, S, I, G/Gext/PTA, SP	• L, S, I, G/Gext/PTA, SP
Incident record	Screen	-	• Display of 32 incident events (Incident phase/current/time)	• Display of 127 incident events (Incident phase/current/time)	• Display of 127 incident events (Incident phase/current/time)
	Memory	-	• Saves 127 incident events • Saves 6 incident waveforms (In case of operation by Self Power, incident waveform is not saved)	• Saves 127 incident events • Saves 6 incident waveforms (In case of operation by Self Power, incident waveform is not saved)	• Saves 127 incident events • Saves 6 incident waveforms (In case of operation by Self Power, incident waveform is not saved)

Trip relay (STU)

Trip relay types

		N-Type	A-Type	P-Type	S-Type
Measuring function		• Current [R/S/T/N]	• Current [R/S/T/N] • External CT current • Current phase (Based on the phase A) • Vector Sum zero sequence current • Imbalance negative sequence current • Previous current demand for each phase	• 3 phase voltage, line - to - line voltage • Current (R/S/T/N) • Vector Sum zero sequence Current • 3 phase voltage, line - to - line voltage • Frequency • External CT current • Voltage/Current phase (Based on the phase A) • Total/Each phase power (P, Q, S) • Total/Each phase power factor • Positive/Negative, Effective/ Reactive/Apparent energy • Vector sum zero sequence voltage • Vector sum zero sequence current • Positive, Negative sequence voltage • Positive, Negative sequence current • Voltage imbalance rate • Current imbalance rate • Previous current demand for each phase • Previous apparent, reactive and active power demand	3 phase voltage, line - to - line voltage • Current (R/S/T/N) • Vector Sum zero sequence Current • 3 phase voltage, line - to - line voltage • Frequency • External CT current • Voltage/Current phase (Based on the phase A) • Total/Each phase power (P, Q, S) • Total/Each phase power factor • Positive/Negative, Effective/ Reactive/Apparent energy • Vector sum zero sequence voltage • Vector sum zero sequence current • Positive, Negative sequence voltage • Positive, Negative sequence current • Voltage imbalance rate • Current imbalance rate • Previous current demand for each phase • Previous apparent, reactive and active power demand
Accuracy degree of measur-ement	Current	• 0.5%	• 0.5%	• 0.5%	• 0.5%
	Voltage	-	-	• 0.5%	• 0.5%
	Power	-	-	• Class 1 (IEC 62053 - 21, 22)	• Class 1 (IEC 62053 - 21, 22)
	Frequency	• 50Hz or 60Hz	• 50Hz or 60Hz	• 0.1% (10 ~ 200Hz)	• 0.1% (10 ~ 200Hz)
PQ function		-	• Voltage/Current harmonics harmonics 63rd • Current THD, TDD, K – Factor	• Voltage/Current harmonics harmonics 63rd • Voltage THD • Current THD, TDD, K – Factor	• Voltage/Current harmonics harmonics 63rd • Voltage THD • Current THD, TDD, K – Factor
Measurement record		-	• Max Ext Io • Max Current demand • Max Io • Max In • Max Max internal temperature	• Max Current demand • Demand for max apparent, reactive and active power • Max active power • Max Vo • Max Io • Max Ext Io • Max In • Max internal temperature	• Max Current demand • Demand for max apparent, reactive and active power • Max active power • Max Vo • Max Io • Max Ext Io • Max In • Max internal temperature
Real time waveform		• Using USB communication	• Using USB/RS485 communication	• Using USB/RS485 communication • Using LCD screen	• Using USB/RS485 communication • Using LCD screen

* N type can check measurement function, measurement record, and PQ function through USB communication.



		N-Type	A-Type	P-Type	S-Type
Communication		• USB (For site operator) • NFC (Near Field communication)	• USB (For site operator) • RS485/Modbus (Communication type Only))	• USB (For site operator) • RS485/Modbus • BLE (Bluetooth, Option)	• USB (For site operator) • RS485/Modbus • BLE(Bluetooth) • NFC (Near Field communication)
Power		• Self Power (Operates when it is higher than 30% of rated current by single phase load)	• Self Power (Operates when it is higher than 30% of rated current by single phase load) • AC/DC 88~264V • DC 24V/48V	• Self Power (Operates when it is higher than 50% of rated current by single phase load) • AC/DC 88~264V	• Self Power (Operates when it is higher than 50% of rated current by single phase load) • AC/DC 88~264V
Event record		-	• 255 kinds including change of device status (Information, status, date and time)	• 255 kinds including change of device status (Information, status, date and time)	• 255 kinds including change of device status (Information, status, date and time)
Clock		-	• RTC embedded (Back up with battery)	• RTC embedded (Back up with battery)	• RTC embedded (Back up with battery)
Other LED		• Run, Alarm, Self diagnosis	• Run, Alarm, Self diagnosis, Communication	• Run, Alarm, Self diagnosis, Communication	• Run, Alarm, Self diagnosis, Communication
Operating button		• Reset button	• Reset/Menu/Tap/Up, Down/ Enter	• Reset button • LCD Touch	• Reset button • LCD Touch
Self diagnosis	LED	• RUN/AL LED blinking (Red ↔ Blue blinking)	-	• RUN/AL LED blinking (Red ↔ Blue blinking)	• RUN/AL LED blinking (Red ↔ Blue blinking)
	LCD	-	• Displays relevant Segment or error number at LCD	• Can check at self diagnosis screen on LCD	• Can check at self diagnosis screen on LCD
	List	• Battery Low Alarm: Occurs when internal battery is not inserted or battery voltage is low. • Rating Plug Unmatched or Error: Rating Plug is not assembled or there's error with Rating Plug. • Ampere Frame Error: Value of Rating Plug is not within 45 ~ 100% of AF. • MTD Fail (Wiring check): STU is not assembled with MTD or Trip coil is disconnected. • Factory Cfg Error: Factory mode setting is wrong. • Device Type Error: Rating Plug information is different from CT information. • Over Heat Error: Internal temperature of CPU is over 100 degree (N/A type) or 115 degree (P/S type) • Contact Wear Alarm: Contact wear rate is over 80% • Electrical Open Count Over Alarm: Electrical Open Count is over the tolerable degree of 80%. • Mechanical Open Count Over Alarm: Mechanical Open Count is over the tolerable degree of 80% • RTC Error: There's error at internal RTC information. • Memory Error: Duplicated internal setting saved at internal nonvolatile memory was damaged. • CT disconnection Error: CT disconnection occurred (Each phase is monitored). • ROM Err: Occurs when there is a problem with the software ROM • RAM Err: Occurs when there is a problem with the software RAM • CLOCK Err: Occurs when there is a problem with the software clock • PROGRAM Cnt. Err: Occurs when there is a problem with the software program counter • CPU Reg. Err: Occurs when there is a problem with the software CPU Register			

* N type can check the event records through USB communication

Trip relay (STU)

A type: 「Ammeter」 type

Characteristic

- Overload protection
  - Long-time delay/Long-time delay neutral
  - Thermal(Hot/Cold)
  - IDMTL (DT,SIT,VIT,EIT,EIT50)
- Short-circuit protection
  - Short-time delay/Instantaneous
  - Choose I^2t On or Off (For short-time delay)
- Ground fault protection
  - Choose I^2t On or Off
- Earth Leakage
  - Applied to use External CT or ZCT(LS)
  - Available to select Alarm/Trip
- Power Quality measurement
  - 1st ~ 63rd Current/harmonic measurement
  - THD, TDD, K-factor of current
- Start-up function
  - Select S/I/G/Gext
  - Set the start-up current and time
- ZSI(Zone Selective Interlocking)
  - Easy to implement the protective coordination.
- ERMS(Energy Reduction Maintenance Setting)
  - To secure safety for electric technician or site operator
- Fault recording
  - Records 127ea of fault event information(Fault type, phase, current and time)
  - Recording 6ea of fault event waveforms.
- Event Recording
  - Records 255ea events of device (Related to changes of device setting, operation and status)
- 3ea of DO(Digital Output)
- Segment LCD
- Real time Waveform
  - Checking by USB communication
- Self Power
  - Operates when it is higher than 30% of rated current by single phase load
- Communication
  - USB - Modbus/RS485
- Self diagnosis
  - CB status - Trip coil monitoring
  - Battery Low Alarm - Rating Plug
  - CT disconnection
  - Over heat error- Rating Plug
  - Mechanical/Electrical Open Count Over Alarm
  - RTC error - Memory error
  - MCU

Product appearance and structure



① **Segment LCD: Displaying information of measurement or status**

② **LED: LED: Indicating information of status or measurement**



1) RUN/AL
- RUN: Indicating the operation(Blinking blue LED during turn on)
- AL: Indicating an overload(Turn on above 90%, Blink above 105%)
(Self diagnose error: Blinking blue and red LED)

2) SP/ERMS: Override/MCR operation: Red LED, ERMS operation: Blue LED
3) COMM: Communication display LED(green)
4) Ir: LED Display for long-time over current relay operation
5) Isd/Ii: LED Display for short-time/INSTANTANEOUS OVER CURRENT Relay Operation
6) G/PTA: LED displaying operation for Ground/Leakage fault protection relay, PTA

③ **Fault Reset/Esc Key: Fault/LED reset, Return to menu, Battery test**

④ **Key: Move to menu or reset**



Enter: Enter into secondary menu or setting input
Up/Down: Move the cursor up/down on screen or increase/decrease a setting value
Tap: Move setting item / Fix screen
Menu: Menu display ↔ Measurement display

⑤ **Iu/Ir: Long-time current setting, tr: Long-time tripping delay setting**

⑥ **Isd: Short-time current setting, tsd: Short-time tripping delay setting**

⑦ **Ii: Instantaneous current setting**

⑧ **Ig: Ground fault current setting, tg: Ground fault tripping delay setting**

⑨ **Rating Plug**

⑩ **Battery**

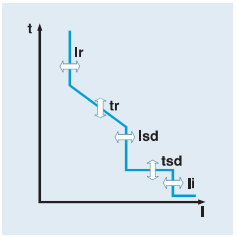
⑪ **ride setting: DIP switches for override setting**

⑫ **TESTER: Connected with IPOT(TESTER)**

Protection

Long time

Threshold (A) Trip between 1.05 and 1.2 Ir	Iu = In×...	0.5	0.6	0.7	0.8	0.9	1.0			
	Ir = Iu×...	0.8	0.83	0.85	0.88	0.9	0.93	0.95	0.98	1.0
Time delay (s) Accuracy : Largest value of ±10% (Ir < 6In), ±20% (Ir ≥ 6In) or ±40ms	tr@(1.5×Ir)	12.5	25	50	100	200	300	400	500	Off
	tr@(6.0×Ir)	0.5	1	2	4	8	12	16	20	Off
	tr@(7.2×Ir)	0.34	0.69	1.38	2.7	5.5	8.3	11	13.8	Off



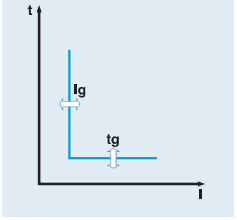
Note) 1. See manual for checking IDTML and equations.
2. Time tolerance should add +40ms for L/S/I/G, if power does not supply to the trip unit.

Short time

Threshold (A) Tolerance: ±10%	Isd = Ir×...		1.5	2	3	4	5	6	8	10	Off
Time delay (s) Accuracy(I^2t ON): Largest value of ±15% (Ir < 6In), ±20% (Ir ≥ 6In) or ±40ms	tsd	I^2t Off	0.05	0.1	0.2	0.3	0.4				
		I^2t On@(10×Ir)		0.1	0.2	0.3	0.4				
	(I^2t Off)	Min. Trip Time (ms)	20	80	160	260	360				
		Max. Trip Time (ms)	80	140	240	340	440				
ZSI	ZSI Time (s)		0.04 ~ 0.2 (0.01s steps), OFF								
Start up	Pick up (A)		Above 1.2×Isd (10A steps)								
	Time delay (s)		0.1 ~ 30 (0.01s steps), OFF								

Instantaneous

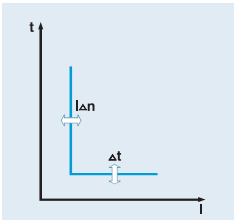
Threshold (A) Tolerance: ±10%	Ii = In×...	2	3	4	6	8	10	12	15	Off
Trip time		50ms 이하								
Start up	Pick up (A)	Above 1.2×Isd (10A steps)								
	Time delay (s)	0.1 ~ 30 (0.01s steps), OFF								



Ground fault

Threshold (A) Tolerance: ±10%	Ig = In×...		0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	Off
Time delay (s) Accuracy(I^2t ON): Largest value of ±15% or ±40ms	tg	I^2t Off	0.05	0.1	0.2	0.3	0.4				
		I^2t On@(1×Ir)		0.1	0.2	0.3	0.4				
	(I^2t Off)	Min. Trip Time (ms)	20	80	160	260	360				
		Max. Trip Time (ms)	80	140	240	340	440				
ZSI	ZSI Time (s)		0.04 ~ 0.2 (0.01s steps), OFF								
Start up	Pick up (A)		Above 1.2×Isd (10A steps)								
	Time delay (s)		0.1 ~ 30 (0.01s steps), OFF								

Note) Ig cannot over 1200A.



Earth Leakage(Option)

Threshold (A) Tolerance: ±10%	I△n		0.5	1	2	3	5	10	20	30	Off
Time delay (ms) Accuracy(I^2t OFF): Largest value of ±10% (Ig_ext ≥ 5A), ±20% (Ig_ext < 5A) or ±40ms Accuracy(I^2t ON@30A): Largest value of ±25% or ±40ms	t△t	Alarm Time (ms)	140	230	350	800	950				
		Trip Time (ms)	140	230	350	800					
ZSI	ZSI Time (s)		0.04 ~ 0.2 (0.01s steps), OFF								
Start up	Pick up (A)		Above 1.2×Isd (0.1A steps)								
	Time delay (s)		0.1 ~ 30 (0.01s steps), OFF								

Note) 1. It is impossible to use both ground fault and earth leakage at same time.
2. The CT accuracy depends on the applied CT. It can be changed by applied CT accuracy.

PTA(Pre Trip Alarm)

Threshold (A) Tolerance: ±10%	Ip = Ir×...	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0
Time delay (ms) Accuracy: Largest value of ±10% (Ip < 1.2In), ±20% (Ip ≥ 1.2In) or ±40ms tp@(1.2×Ip)	tp@(1.2×Ip)	1	5	10	15	20	25	30	35	Off

Relay element

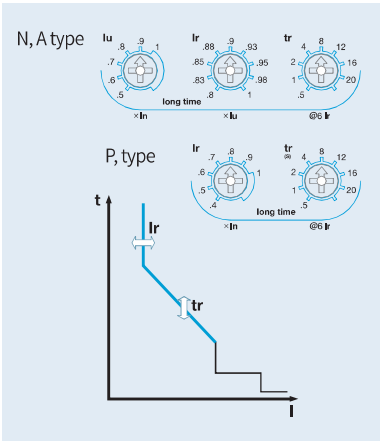
No.	Relay element	N	A	P	S	
		Group A	Group A	Group A	Group A	Group B
1	L	○	○	○	○	○
2	S1	○	○	○	○	○
3	S2				○	○
4	I	○	○	○	○	○
5	LN	○	○	○	○	○
6	G	○	○	○	○	○
7	Gext (I△n)		○	○	○	○
8	PTA	○	○	○	○	○
9	UV1			○	○	○
10	UV2				○	○
11	OV1			○	○	○
12	OV2				○	○
13	RV			○	○	○
14	D			○	○	○
15	S(V)1			○	○	○
16	S(V)2				○	○
17	IU			○	○	○
18	VU			○	○	○
19	UF1			○	○	○
20	UF2				○	○
21	OF1			○	○	○
22	OF2				○	○
23	ROCOF			○	○	○
24	RP			○	○	○
25	RQ1			○	○	○
26	RQ2				○	○
27	OP			○	○	○
28	OQ			○	○	○
29	UP			○	○	○

Symbol	ANSI code	Description
L	49RMS, 51	LONG - TIME OVER CURRENT RELAY
S1	51	SHORT - TIME OVER CURRENT RELAY (Stage 1)
S2	51	SHORT - TIME OVER CURRENT RELAY (Stage 2)
I	50	INSTANTANEOUS OVER CURRENT RELAY
LN	49NRMS	LONG - TIME NEUTRAL LINE OVER CURRENT RELAY
G	50G/51G	GROUND - FAULT PROTECTION RELAY (Vector Sum)
Gext (I△n)	50G/51G	EXTERNAL GROUND - FAULT PROTECTION (EXTERNAL CT)
PTA		PTA(Pre Trip Alarm)
UV1	27	UNDER VOLTAGE RELAY (Stage 1)
UV2	27	UNDER VOLTAGE RELAY (Stage 2)
OV1	59	OVER VOLTAGE RELAY (Stage 1)
OV2	59	OVER VOLTAGE RELA (Stage 2)
RV	64	OVER VOLTAGE GROUND RELAY (Vector Sum)
D	67D	DIRECTIONAL OVER CURRENT RELAY
S(V)1	51V	VOLTAGE CONTROLLED & RESTRAINED OVER CURRENT RELAY (Stage 1)
S(V)2	51V	VOLTAGE CONTROLLED & RESTRAINED OVER CURRENT RELAY (Stage 2)
IU	46	CURRENT UNBALANCE PROTECTION RELAY
VU	47	VOLTAGE UNBALANCE PROTECTION RELAY
UF1	81U	UNDER FREQUENCY RELAY (Stage 1)
UF2	81U	UNDER FREQUENCY RELAY (Stage 2)
OF1	81O	OVER FREQUENCY RELAY (Stage 1)
OF2	81O	OVER FREQUENCY RELAY (Stage 2)
ROCOF	81R	RATE OF CHANGE OF FREUENGY
RP	32RP	REVERSE ACTIVE POWER RELAY
RQ1	40 or 32RQ	REVERSE REACTIVE POWER RELAY (Stage 1)
RQ2	40 or 32RQ	REVERSE REACTIVE POWER RELAY (Stage 2)
OP	32OF	ACTIVE OVER POWER
OQ	32OF	REACTIVE OVER POWER
UP	32LF	ACTIVE UNDER POWER

Operation characteristics

Long-time delay (L)

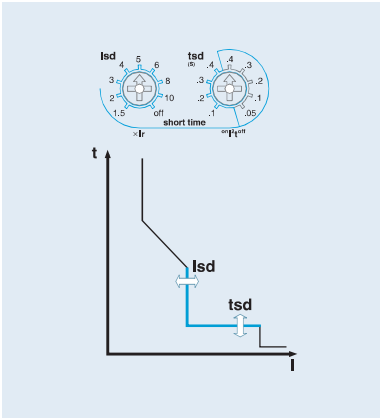
The function for overload protection which has time delayed characteristic in inverse ratio to fault current.



1. Standard current setting knob: Ir *The S type STU is set on HMI (No knob exist).
   1) Setting range in P type and S type: (0.4–0.5–0.6–0.7–0.8–0.9–1.0)×In
   2) Setting range in N type and A type: (0.4 ~ 1.0)×In
      – Iu: (0.5–0.6–0.7–0.8–0.9–1.0) ×In
      – Ir: (0.8–0.83–0.85–0.88–0.9–0.93–0.95–0.98–1.0)×Iu
2. Time delay setting knob: tr *The S type STU is set on HMI (No knob exist).
   – Standard operating time is based on the time of 6×Ir
   – Setting range: 0.5-1-2-4-8-12-16-20-Off sec (9 modes)
3. Relay pick-up current
   – When current over (1.15)×Ir flows in, relay is picked up.
4. Relay operates based on the largest load current among A/B/C/N phase.

Short-time delay (S)

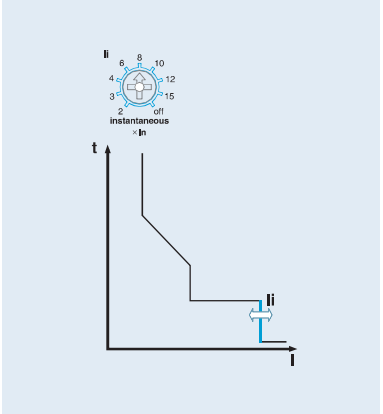
The function for fault current (over current) protection which has definite time characteristic and time delayed in inverse ratio to fault current.



1. Standard current setting knob: Isd *The S type STU is set on HMI (No knob exist).
   – Setting range: (1.5-2-3-4-5-6-8-10-Off)×Ir
2. Time delay setting knob: tsd *The S type STU is set on HMI (No knob exist).
   – Standard operating time is based on the time of 10×Ir.
   – Inverse time (I^2t On): 0.1–0.2–0.3–0.4 sec
   – Definite time (I^2t Off): 0.05–0.1–0.2–0.3–0.4 sec
3. Relay operates based on the largest load current among R/S/T/N phase.
4. When ZSI function is set, the protection operation will take place instantaneously when there is no ZSI input signal by downstream devices. Disabling the ZSI function on the last downstream device is advised.

Instantaneous (I)

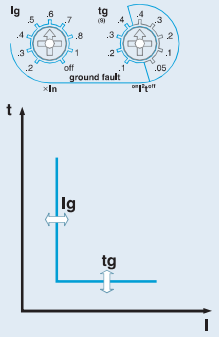
The function for breaking fault current above the setting value within the shortest time to protect the circuit from short-circuit.



1. Standard current setting knob: Ii *The S type STU is set on HMI (No knob exist).
   – Setting range: (2–3–4–6–8–10–12–15–Off)×In
   – S type setting range: (2-16)×In
2. Relay operates based on the largest load current among R/S/T/N phase.
3. Total breaking time is below 50ms.

Ground Fault (G)

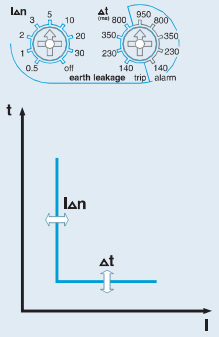
The function for breaking ground fault current above setting value after time-delay to protect the circuit from ground fault.



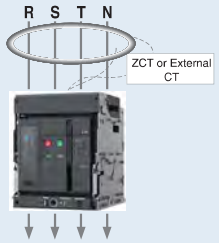
1. Standard setting current knob: Ig *The P/S type is set on HMI (No knob exist).
   – Setting range: (0.2–0.3–0.4–0.5–0.6–0.7–0.8–1.0–Off)×In
2. Time delay setting knob: tg *The P/S type is set on HMI (No knob exist).
   – Inverse time (I^2t On): 0.1–0.2–0.3–0.4 sec
   – Definite time (I^2t Off): 0.05–0.1–0.2–0.3–0.4 sec
   – P/S type setting range: 0.05 ~ 3.0 sec
3. The fault current is the value detected by Vector sum of the current input as the R, S, T phase (3P) or the R, S, T, N (4P).
4. When ZSI function is set, the protection operation will take place instantaneously when there is no ZSI input signal by downstream devices. Disabling the ZSI function on the last downstream device is advised.

Earth Leakage (G) - Option

The function for breaking earth leakage current above setting value after time delay to protect the circuit from earth leakage. (A, P, S type)



1. Standard setting current knob: IΔn *The P/S type is set on HMI (No knob exist).
   – A type setting range: 0.5-1-2-3-5-10-20-30-Off (A)
   – P/S type setting range: 0.1 ~ 30
2. Time delay setting knob: Δt *The P/S type is set on HMI (No knob exist).
   A type setting range
   – Trip time: 140–230–350–800 ms – Alarm time: 140–230–350–800–950 ms
   P/S type setting range (Same as Trip/Alarm)
   – Long-time: 0.1 ~ 1.0 sec – Short-time: (0.1 ~ 1.0 sec)@30A
3. Setting values within the alarm range will not trip the breaker but will activate its alarm.
4. This function is enabled and can be used only with private external CT(secondary output 5A) selected by customers.
5. When ZSI function is set, the protection operation will take place instantaneously when there is no ZSI input signal by downstream devices. Disabling the ZSI function on the last downstream device is advised.

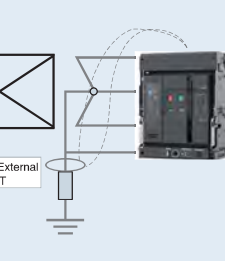


*** Use cautions with earth-leakage current settings**

- When using ZCT provided by customers, the setting range should be from 0.5 to 5A based on its secondary current.(Secondary output rating: 5A)
  Hence, under 100: 5A CT, if trip relay is set to 0.5A, earth-leakage exceeding 10A will activate its operation (0.5A×20 = 10A)

※ Guideline for the external CT usage

- Earth-leakage protection characteristics using the standard CT which is installed inside of ACB can protect currents from 20 to 100% range on its rated current.
- As rated currents on ACB increases, current that is covered by its standard CT increase as well. This can not protect against small leakage currents.
  ex) 400A ACB Min. Earth-leakage current 400A×20% =80A
  4000A ACB Min. Earth-leakage current 4000A×20% =800A
- Therefore, customers are advised to install an external CT in accordance with its rated currents within its systems. And choose trip relay (E, X type) which is required with external CT usage in order to provide earth-leakage functions.



Measurement function

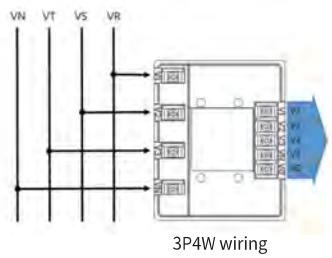
Type			Class.	Measurement element	Detailed element	Unit	Display range
S type	P type	A type	Current	Line current	Ia, Ib, Ic	A	0.02In~23In
				Normal current	I_1		
				Reverse current	I_2		
			Voltage	Line voltage	Vab, Vbc, Vca	V	55~660V
				Phase voltage	Va, Vb, Vc		
				Normal voltage	V_1		
				Reverse voltage	V_2		
			Angle	Line-to-line Line-to-current	∠VabIa, ∠VabIb, ∠VabIc, ∠VabVbc, ∠VabVca	°	0~360°
				Phase-to-phase	∠VaVb, ∠VaVc		
				Phase-to-current	∠VaIa, ∠VbIb, ∠VcIc		
			Power	Active power	Pa(ab), Pb(bc), Pc(ca), P	kW	1kW~99999kW
				Reactive power	Qa(ab), Qb(bc), Qc(ca), Q	kVar	1kVar~99999kVar
				Apparent power	Sa(ab), Sb(bc), Sc(ca), S	kVA	1kVA~99999kVA
			Energy	Active energy	WHa(ab), WHb(bc), WHc(ca), WH	kWh, MWh	1kWh~9999.99MWh
				Reactive energy	VARHa(ab), VARHb(bc), VARHc(ca), VARH	kVarh, Mvarh	1kVarh~9999.99MVarh
				Reverse active energy	rWHa(ab), rWHb(bc), rWHc(ca), rWH	kWh, MWh	1kWh~9999.99MWh
			Freq.	Frequency (F)	Frequency	Hz	45~65Hz
			Power factor	Power factor (PF)	PFa(ab), PFb(bc), PFc(ca), PF	-	+: Lead -: Lag
			Unbalance	Unbalance rate	Iunalance, Vunbalance	%	0.0~100.0
			Demand	Active power Demand	Peak demand	kW	1kW~99999kW
				Current demand	Peak demand	A	80A~65535A
			Harmonics	Voltage harmonics	1st~63th harmonics of Va(ab),Vb(bc),Vc(ca)	V	55~660V
				Current harmonics	1st~63th harmonics of Ia,Ib,Ic	A	80A ~ 65535A
				THD, TDD	-	%	0.0 ~ 100.0
				K-Factor	-	-	0.0 ~ 100.0

Shield cable

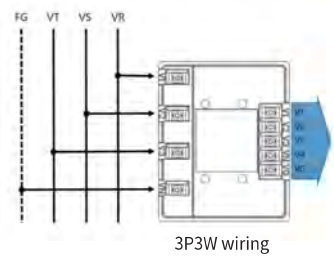
For P/S type trip relay, it is necessary to use voltage trip module for measuring the voltage at the load side of ACB.

Voltage input range
- Phase voltage: 35Vac ~ 973Vac
- Line voltage: 35Vac ~ 1635Vac

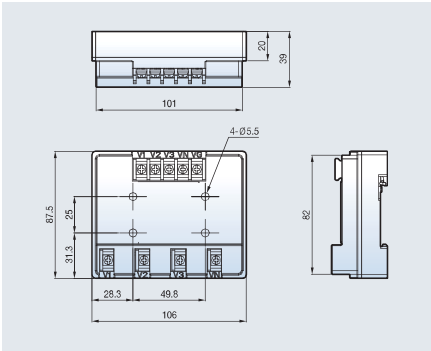




3P4W wiring



3P3W wiring

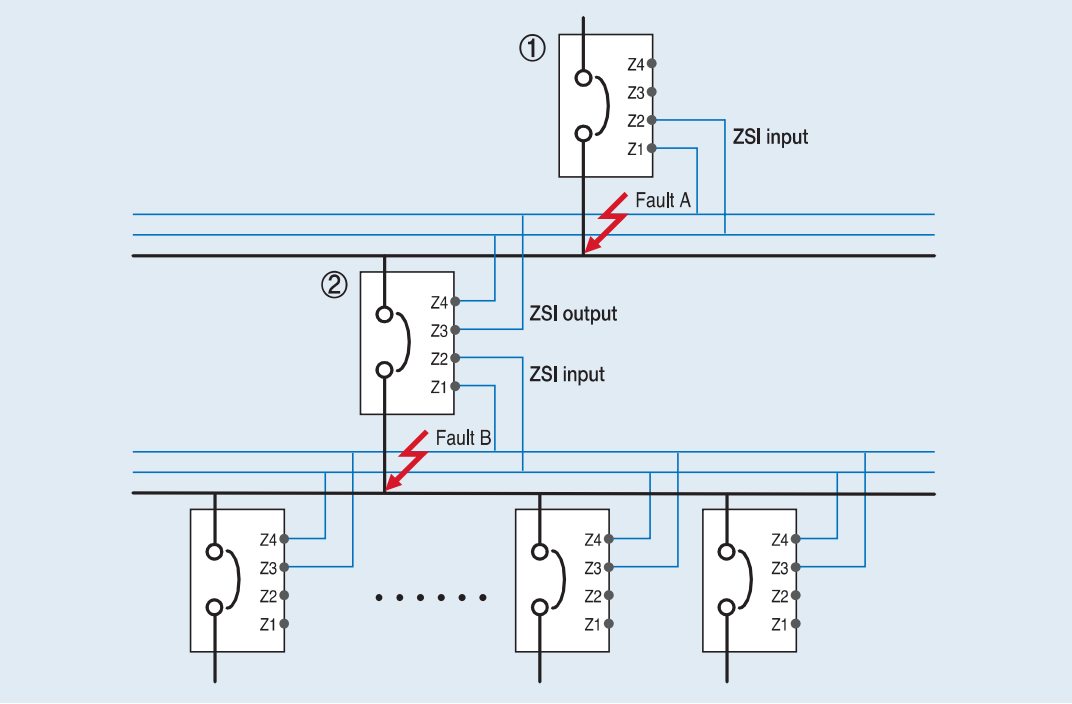


Item	Description	Feature	Remark
72313460708	TOTAL ASS'Y, VDM(Shield Cable), EXTERNAL, STU	Accessory	Separate purchasing

ZSI–Zone Selective Interlocking (A, P, S type)

Zone-selective interlocking drops the delay time for breakers to eliminate faults.
It minimizes the shock that all kinds of electric machineries get under fault conditions.

1. During a short-time or ground fault in the system in which ZSI is established, the device at the point of failure generates a ZSI output signal to suppress the operation of the upstream devices.
2. The Trip Relay (Trip Relay) of ACB at the point of failure performs an instantaneous trip without time delay to eliminate the breakdown.
3. The upstream ACB that has received the ZSI input signal operates according to the short-time or ground fault operation delay time set for protection cooperation in the system, but the upstream ACB that has not received the ZSI input signal from the downstream ACB performs an instantaneous trip without time delay.
4. In ZSI operation, in case of overcurrent/short-time/ground fault, the operation time for protection coordination must be set correctly so that the downstream devices operate before the upstream devices.
5. ZSI connecting line needs to be Max. 3m.



1) Occurrence of fault A
   - Only breaker ① performs instantaneous trip operation.
2) Occurrence of fault B
   - Breaker ② performs instantaneous trip operation,
     breaker ① performs trip operation after prearranged delay time
   - But if breaker ② did not break the fault normally,
     breaker ① performs instantaneous trip operation to protect system.

Trip relay (STU)

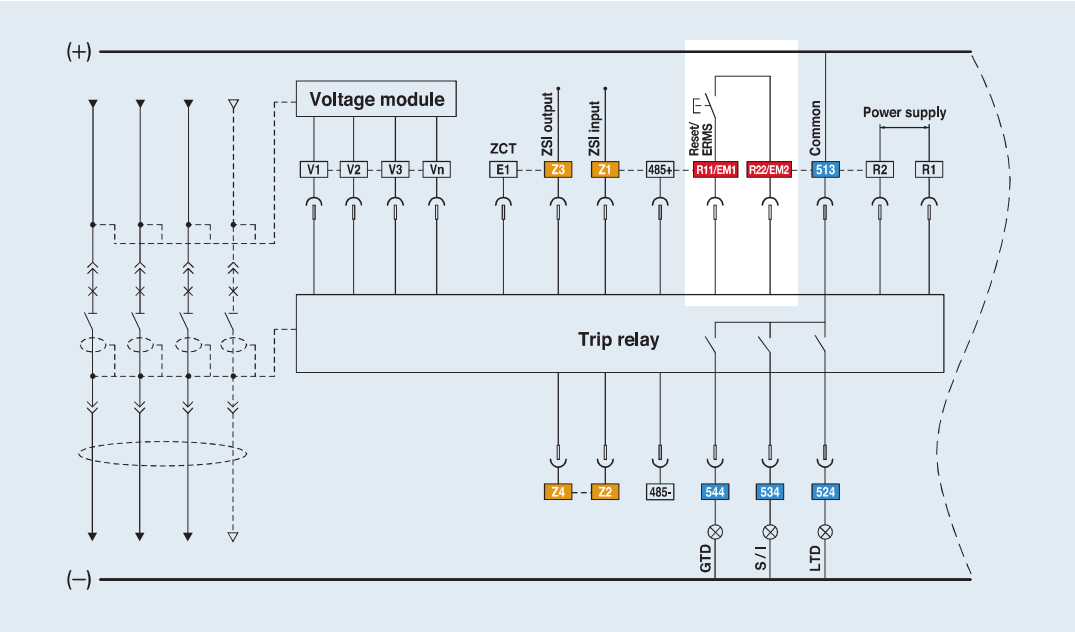
ERMS and digital I/O (A, P, S type)

ERMS(Energy Reduction Maintenance Setting) is a function to reduce the arc energy to ensure workers' safety. When using the ERMS function, the instantaneous setting value is minimized(2*In). A, P, and S type trip relays are able to perform the ERMS by digital input and have 3 DO (digital output).

1. To use the ERMS function, jump between two ends of ERMS terminal.
2. Digital input
   - Input[GD/EM(+) – GD/EM(-)] : Select ERMS, Local/Remote or Group DI (Programmable signaling contacts)
   - [R11-R22] input: Remote reset
   - [Z1-Z2] Input: ZSI input
   - [E1-E2] Input: ZCT for earth leakage detection or external CT input

※ All DI are dry contact that has 3.3V of recognition voltage. When inputting close by SSR(Solid State Relay) or open-collector, connect collector (Drain) to EM1.

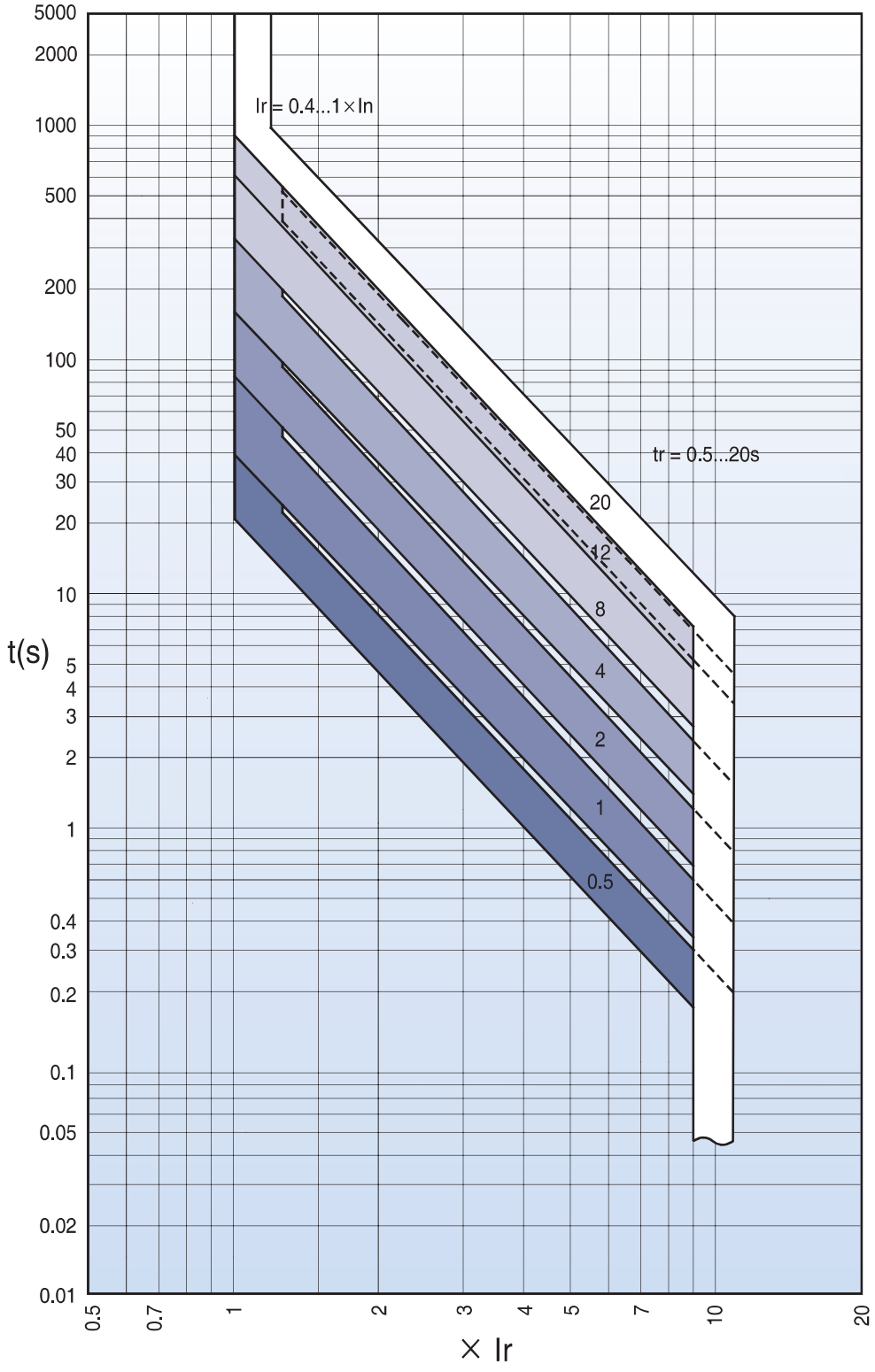
3. Digital output 3a(524, 534, 544-513)
   - It is available to extend and use the DO when the STU connects with the New TRIO.
   - However, the DO output when the ERMS is activated is only available only in the New TRIO.
   - Fault output: Long/Short time delay, Instantaneous, Ground fault, UVR, OVR, UFR, OFR, rPower, Vunbal, Iunbal (Maintains state as Latch form until user pushes reset.)
   - General DO: when setting L/R as remote, it is available to control close/open remotely by using communication.



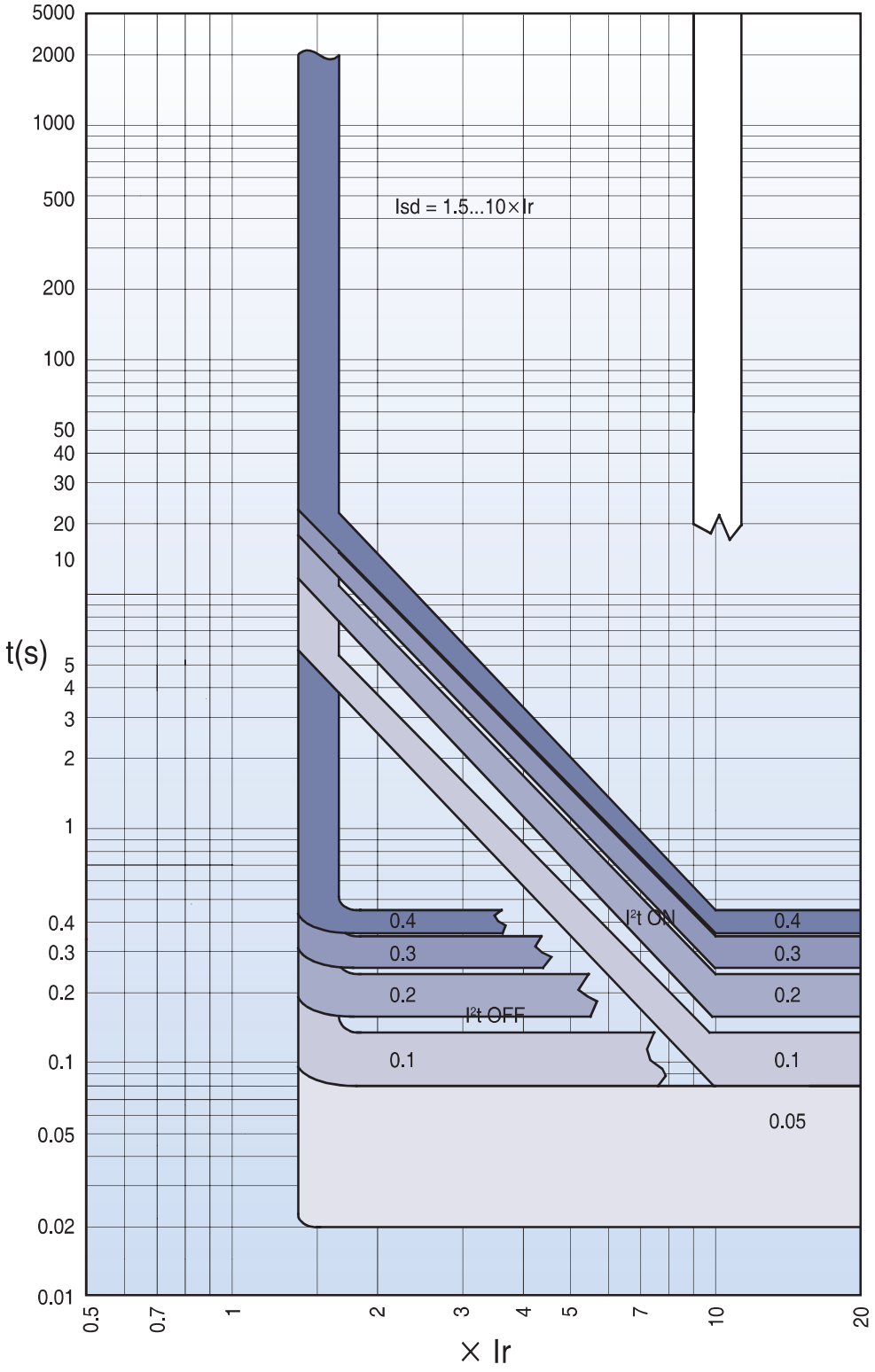
Trip Relay	Digital Output	Long time	Short time	Instant-aneous	Ground	Overload Alarm	UV	OV	UF	OF	IU	VU	D	S(V)	ROCOF	RP	RO	OP	OQ	UP	Note	General DO
P, S type	DO1(524)	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Program-mable	○
	DO2(534)	○	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
	DO3(544)	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○
A type	DO1(524)	●	×	×	×	Not available																
	DO2(534)	×	●	●	×																	
	DO3(544)	×	×	×	●																	

Characteristics curves

Long-time delay (L)

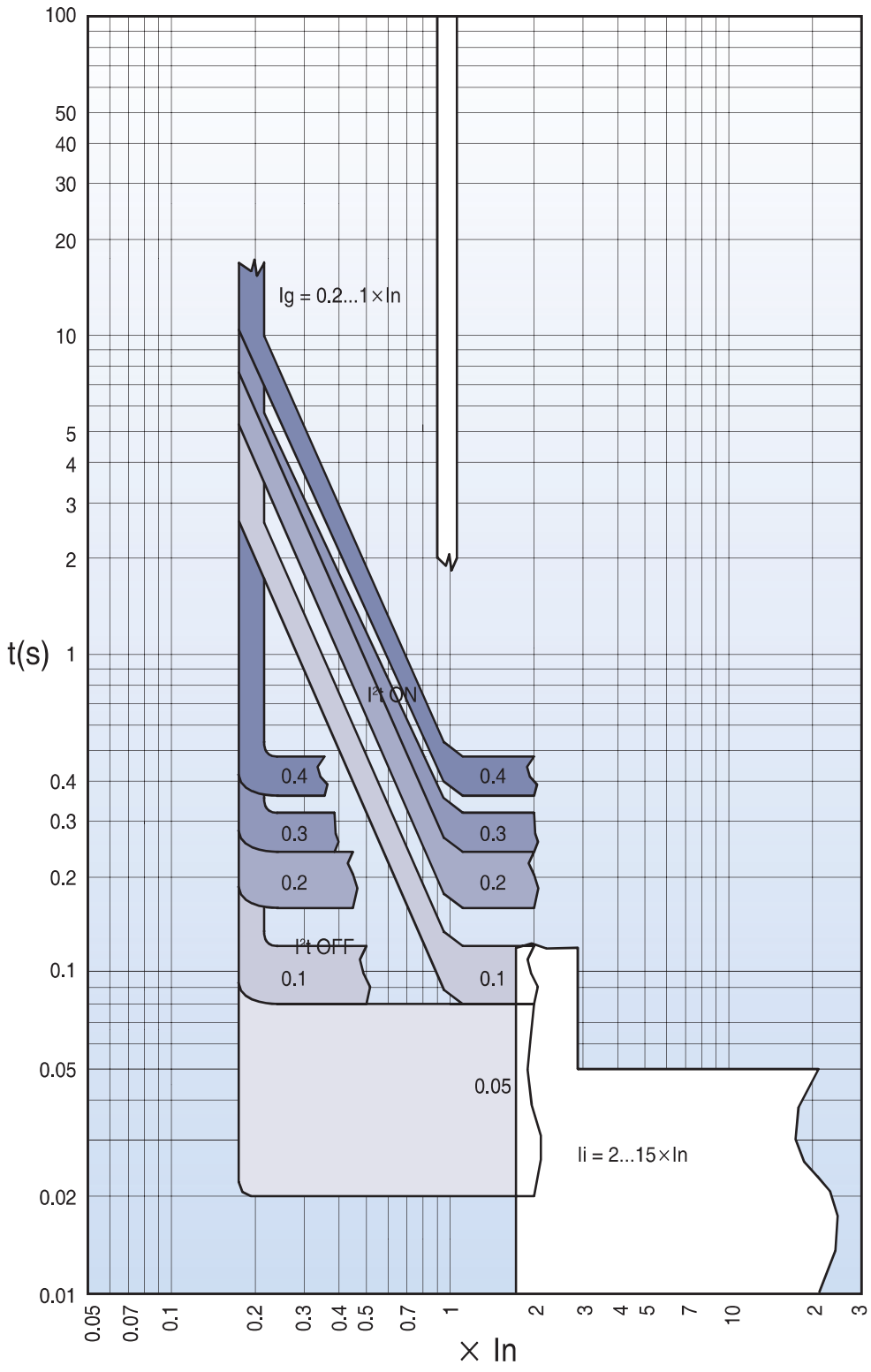


Short-time delay (S)

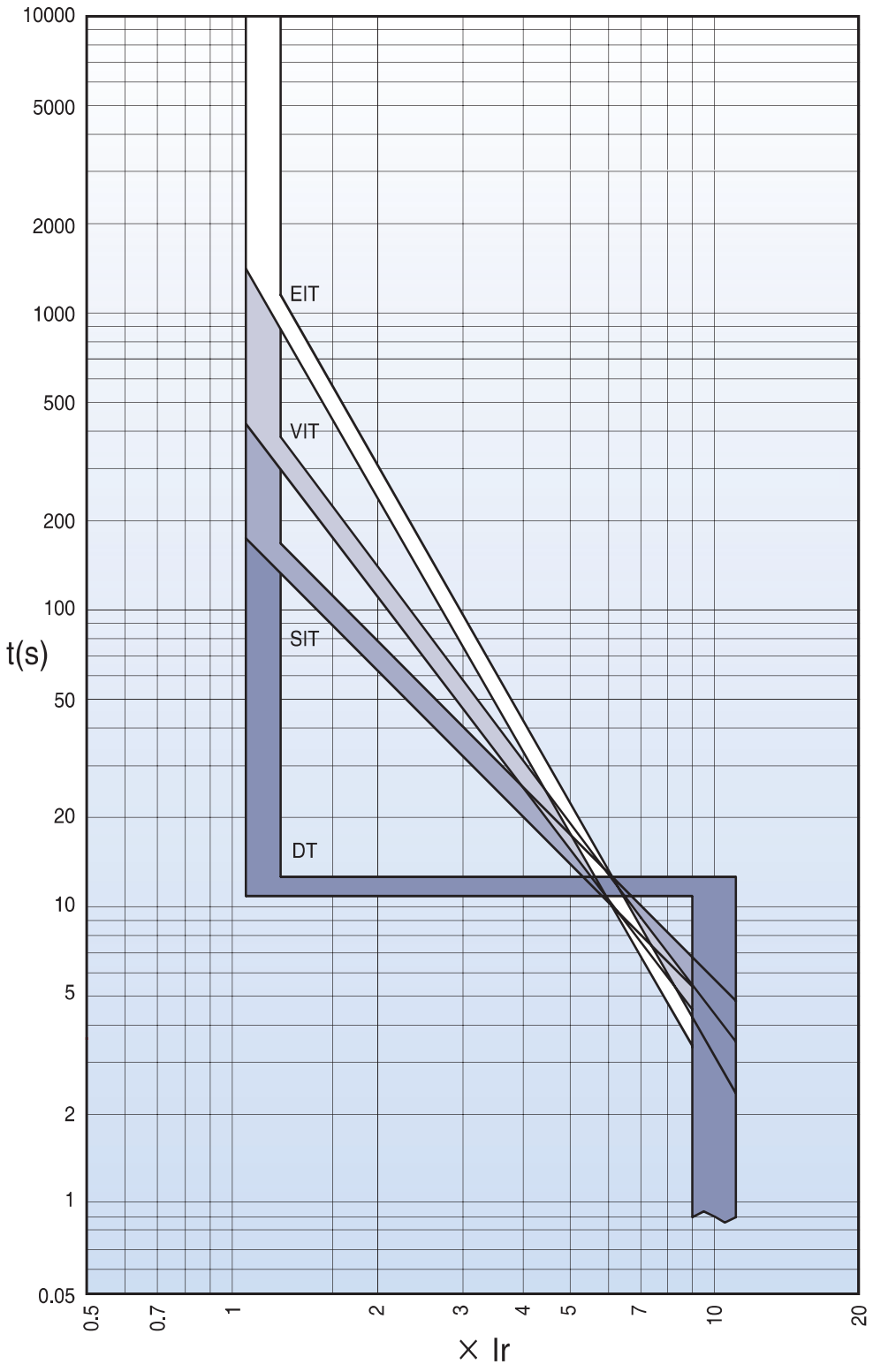


Characteristics curves

Instantaneous (I)
Ground fault (G)

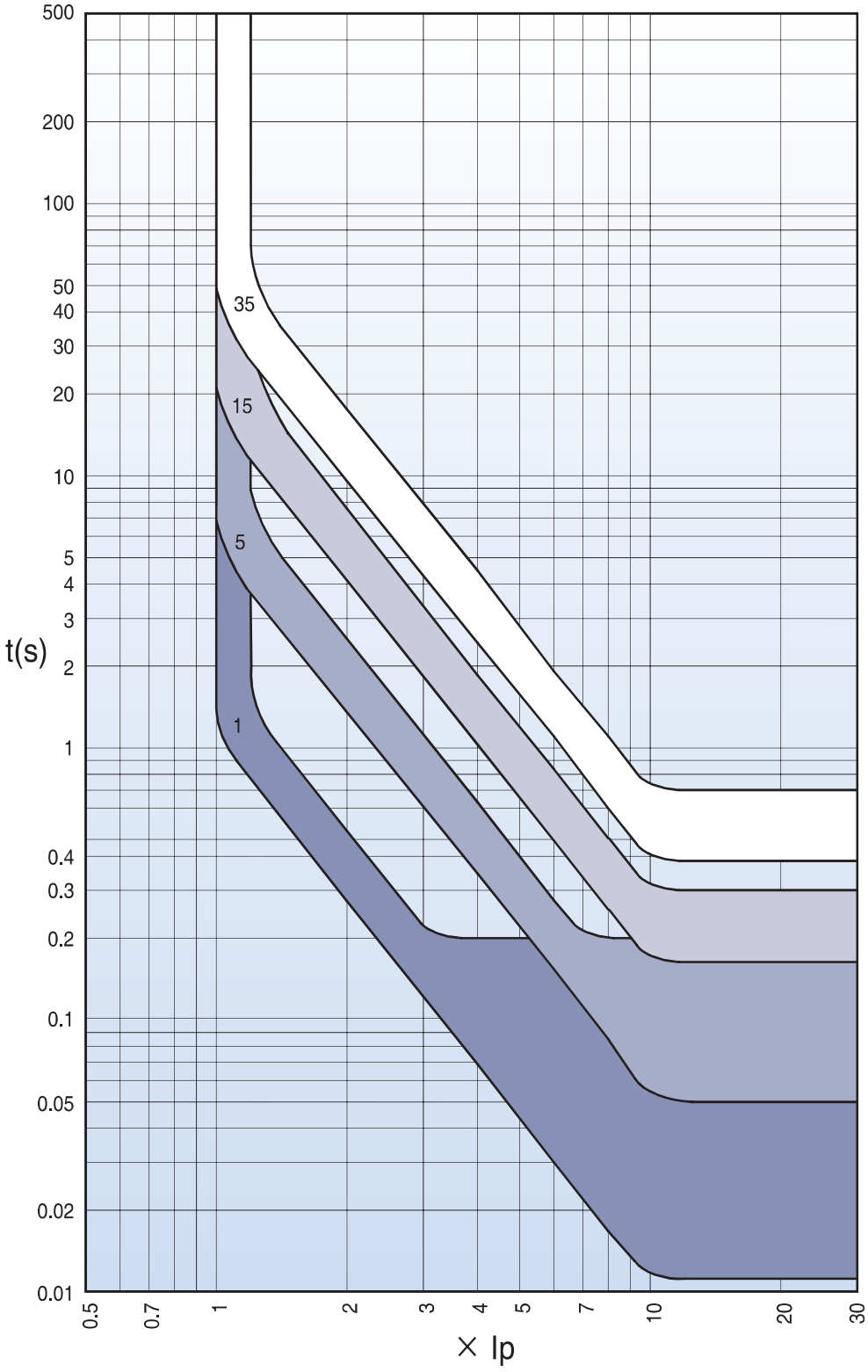


IDMTL

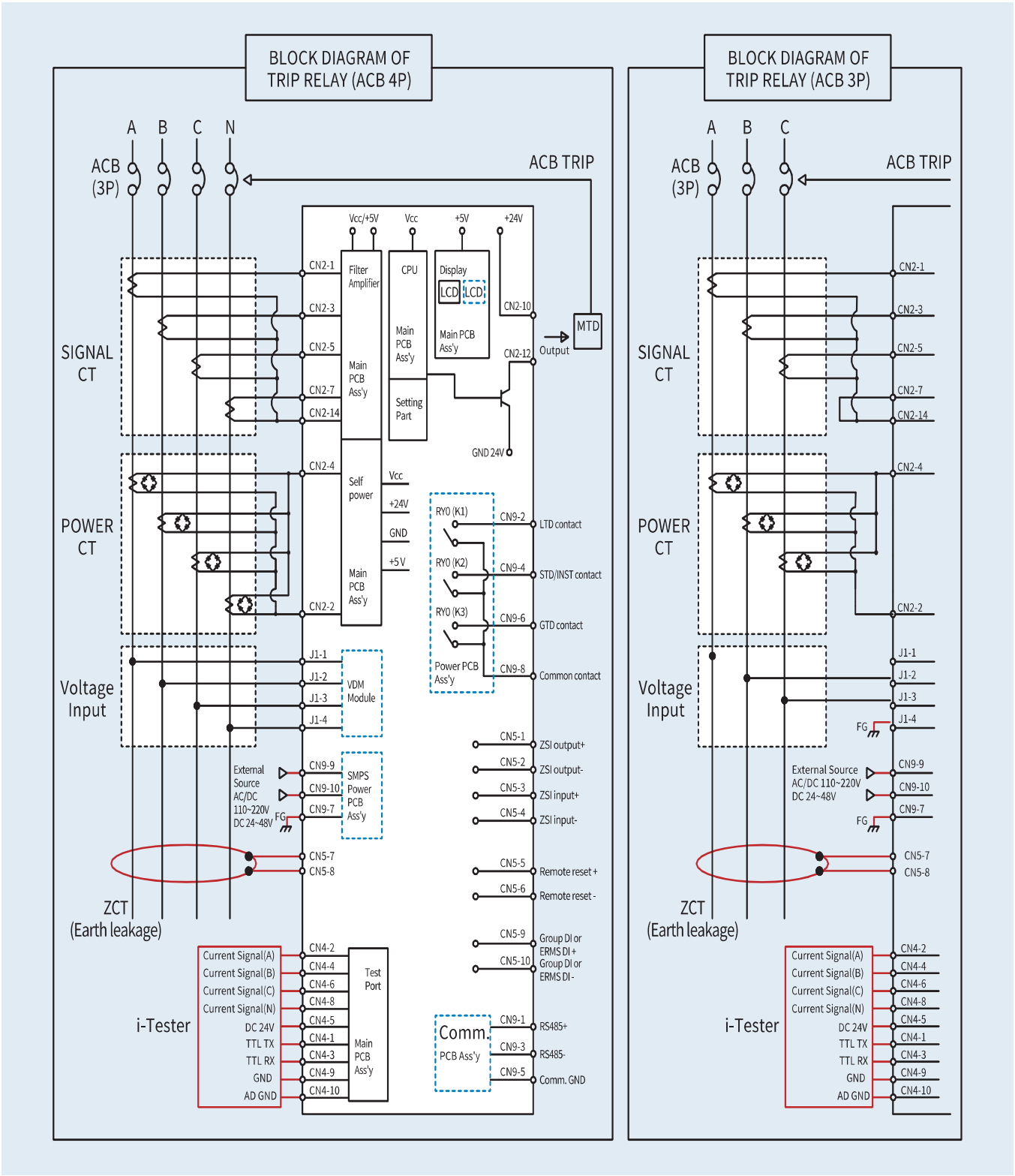

10000
5000
2000
1000
500
200
100
50
20
10
5
2
1
0.05
t(s)
EIT
VIT
SIT
DT
0.5
0.7
1
2
3
4
5
7
10
20
× Ir

Characteristics curves

Pre Trip Alarm



System block diagram(STU)



Main body

Mounting	Accessories		UAS/UAH/UAW		Page
			Default	Option	
Internal	SHT1	Shunt Coil	-	○	58
	SHT2	Double Shunt Coil	-	○	59
	CC	Closing Coil	-	○	60
	M	Motor	-	○	61
	CS1	Charge Switch	-	○	61
	CS2	Charge Switch Communication**	-	○	61
	UVT	Under Voltage Trip Device	-	○	62
	AL	Trip Alarm Contact**	-	○	63
	MRB	Manual Reset Button**	-	○	63
	RES	Remote Reset Switch	-	○	64
	RCS	Ready to Close Switch	-	○	64
	C	Counter	●	-	70
	AX	Auxiliary Switch	-	○	65
	TM	Temperature Alarm**	-	○	86
	MI	Mechanical Interlock**	-	○	72
External	K1	Key Lock	-	○	66
	K2	Key Interlock Set	-	○	66
	K3	Double Key Lock	-	○	67
	K4	Key Lock	-	○	67
	K5	Profalux Lock (CAMLOCK Type)	-	○	66
	K6	Kirkkey Lock (CAMLOCK Type)	-	○	66
	K7	Kirkkey Lock (CN22 Type)	-	○	66
	B	Lockable ON/OFF Button Cover	-	○	68
	LH	Lifting Hook	F/G-Frame	D/E-Frame	76
	CTD	Condenser Trip Device	-	○	68
	ATS	Automatic Transfer Switch Controller	-	○	69
	DC	Dust Cover	-	○	70
	DF	Door Frame	-	○	77
	IPOT	IPOT (Intelligent Potable OCR Tester)*	-	○	86
Trip relay	N	N-Type	-	○	30
	A	A-Type	-	○	32
	P	P-Type	-	○	34
	S	S-Type	-	○	36
	VM	Voltage Module	-	○	40







* Non UL Listed.
** Separate purchase unavailable. Each item must be purchased with the main body.

Cradle

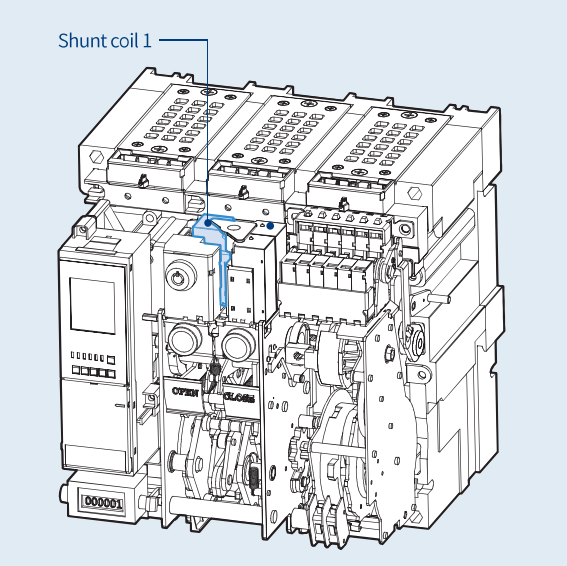
Mounting	Accessories		AH		Page
			Default	Option	
Cradle	SBC	Shorting b Contact*	-	○	77
	ST	Safety Shutter	-	○	79
	MIP	Mis-Insertion Prevention Device	-	○	84
	MOC	Mechanical Operated Cell Switch	-	○	71
	CEL	Cell Switch	-	○	78
	DI	Door Interlock	-	○	73
	BSP	Body Supporter	-	○	79
	RI	Racking Interlock	-	○	79
	PL	Lockable Position Lock	●	-	76
	T	Metering Current Transformer	-	○	80
	UDC	UVT time delay controller	-	○	83
Other	RCO	Remote I/O	-	○	
	PC	Profibus-DP comm. module	-	○	



* Non UL Listed.

Shunt Coil [SHT1]

- SHT1 is a control device that remotely trips a circuit breaker when voltage is applied to coil terminals (C1, C2) continuously or instantaneously for a minimum of 200ms.
- When UVT coil is installed, the location of the shunt coil changes.

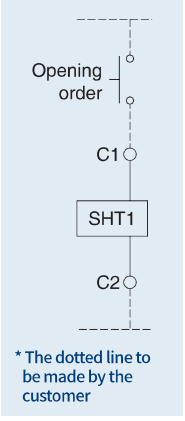




1. Rated voltage and characteristics of trip coil

Rated voltage (Vn)		Operating voltage range (V)	Power consumption (VA or W)		Trip time (ms)
DC (V)	AC (V)		Inrush	Steady-state	
24~30	–	14 ~ 33	200	5	Less than 40ms under
48~60	48	28 ~ 66			
100~125	100~125	70 ~ 140			
200~250	200~250	140 ~ 280			
–	380~480*	266 ~ 528			

Note) Operating voltage range is the min. rated voltage standard for each rated voltage(Vn).
* Non UL Listed.



Wiring Diagram

2. Specification of the wire

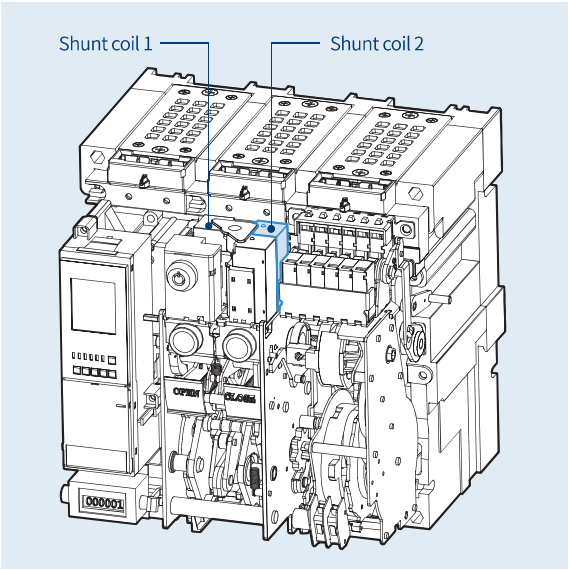
- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC / AC 48~60V of rated voltage.

The maximum wire length

		Rated voltage (Vn)			
		DC 24~30V		DC/AC 48V	
Wire type		#14 AWG (2.08mm²)	#16 AWG (1.31mm²)	#14 AWG (2.08mm²)	#16 AWG (1.31mm²)
Operating voltage	100%	95.7m	61m	457.8m	287.7m
	85%	62.5m	38.4m	291.7m	183.2m

Double Shunt Coil [SHT2]

- SHT2 is a control device that remotely trips a circuit breaker when SHT1 does not operate normally, allowing the circuit breaker to be tripped safely.
- Shunt coil 1: Install it at existing location.
- Shunt coil 2: Install it on the right side of the Shunt coil 1
- UVT coil is unavailable when installing Double Shunt Coil.

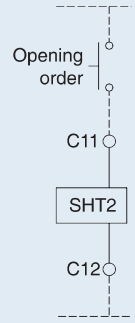




1. Rated voltage and characteristics of trip coil

Rated voltage (Vn)		Operating voltage range (V)	Power consumption (VA or W)		Trip time (ms)
DC (V)	AC (V)		Inrush	Steady-state	
24~30	–	14 ~ 33	200	5	Less than 40ms
48~60	48	28 ~ 66			
100~125	100~125	70 ~ 140			
200~250	200~250	140 ~ 280			
–	380~480	266 ~ 528			

Note) Operating voltage range is the min. rated voltage standard for each rated voltage(Vn).
* Non UL Listed.



* The dotted line to be made by the customer

Wiring Diagram

2. Specification of the wire

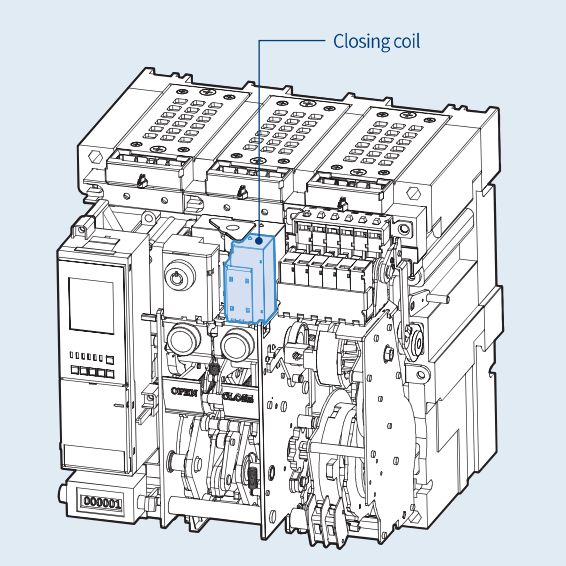
- Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC / AC 48~60V of rated voltage.

The maximum wire length

		Rated voltage (Vn)			
		DC 24~30V		DC/AC 48V	
Wire type		#14 AWG (2.08mm²)	#16 AWG (1.31mm²)	#14 AWG (2.08mm²)	#16 AWG (1.31mm²)
Operating voltage	100%	95.7m	61m	457.8m	287.7m
	85%	62.5m	38.4m	291.7m	183.2m

Closing Coil [CC]

• It is a control device that remotely closes a circuit breaker when voltage is applied to coil terminals (A1, A2) continuously or instantaneously for a minimum of 200ms.

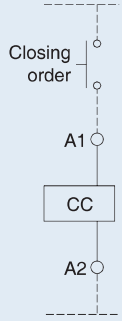




1. Rated voltage and characteristics of closing coil

Rated voltage (Vn)		Operating voltage range (V)	Power consumption (VA or W)		Trip time (ms)
DC (V)	AC (V)		Inrush	Steady-state	
24~30	–	14 ~ 33	200	5	Less than 80ms/90ms ** under
48~60	48	28 ~ 66			
100~125	100~125	70 ~ 140			
200~250	200~250	140 ~ 280			
–	380~480	266 ~ 528			

Note) Operating voltage range is the min. rated standard for each rated voltage (Vh).
* Non UL Listed.
** Close time of G frame (3200~5000A) is less than 95ms.



* The dotted line to be made by the customer

Wiring Diagram

2. Specification of the wire

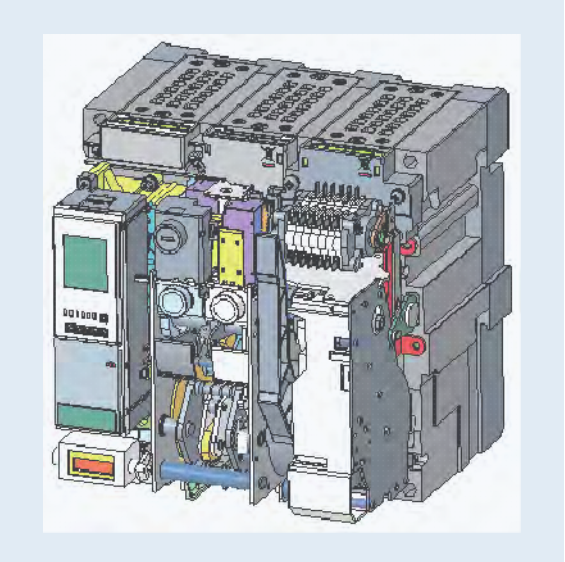
• Refer to the below table regarding the length and specification of wire when using trip coil with DC 24~30V or DC / AC 48~60V of rated voltage.

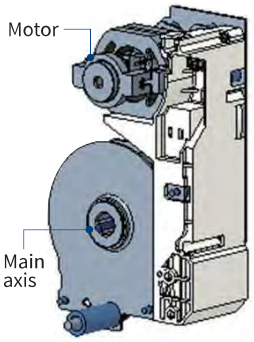
The maximum wire length

		Rated voltage (Vn)			
		DC 24~30V		DC/AC 48V	
Wire type		#14 AWG (2.08mm²)	#16 AWG (1.31mm²)	#14 AWG (2.08mm²)	#16 AWG (1.31mm²)
Operating voltage	100%	95.7m	61m	457.8m	287.7m
	85%	62.5m	38.4m	291.7m	183.2m

Motor [M]

- Charges the closing spring of a circuit breaker using an external power source. Without an external power source, the closing spring can be charged manually.
- Operating voltage range 85%~110%Vn





Input voltage (V)	DC 24~30V	AC/DC 48~60V	AC/DC 100~130V	AC/DC 200~250V	AC 380V *	AC 440~480V *
Load current (max.)	5A	3A	1A	0.5A	0.3A	0.3A
Starting current (Max.)	5 times of load current					
Load rpm (Motor)	15000~19000 rpm					
Charge time	Less than 5sec.					
Dielectric strength	2kV/min					
Using temperature range	-20°~ 60°					
Using humidity range	Max. RH 80% (No dew condensation)					
Endurance	15,000 cycle (Load connection, 2 times/min)					
Charge switch	10A at 250VAC					

* Non UL Listed.

Charge Switch [CS1]
Charge Switch Communication [CS2]

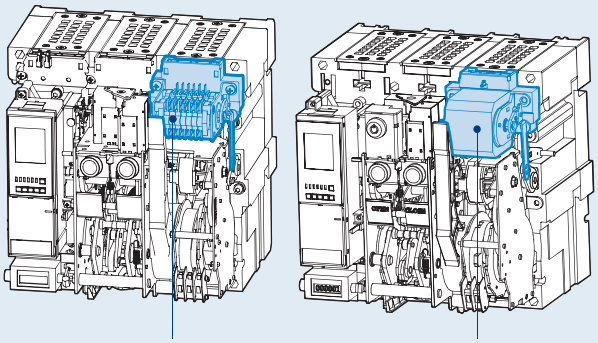
- Built-in contact that sends a signal to an external device when motor charging is complete. (2a)
- Has a “1a” contact for communication and another “1a” contact for complete charging.
- When using an extra communication module (Remote I/O), the state of contacts can be displayed through the network.

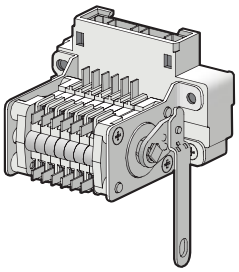
Classification	Standard		Remark
Contactor Capacity	250/125 Vac	10 A	
	250 Vdc	0.3 A	
	125 Vdc	0.6 A	
	48 Vdc	3 A	
	24 Vdc	5 A	

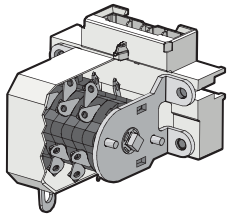
Auxiliary switch [AX]

• Contact used to remotely monitor ON/ OFF position of the ACB.

AUX. contact & charging types	
GX	High capacity OFF charge 3a3b
GC	High capacity ON charge 3a3b
HX	High capacity OFF charge 5a5b
HC	High capacity ON charge 5a5b
JC	High capacity ON Charge 6a6b

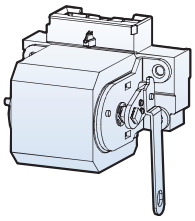






Standard classification

High capacity	
2000, 5000AF	4000, 6300AF



Classification			High capacity		Remark
			Resistive load	Inductive load	
Minimum current			DC 5V, 1mA		
Contact capacity	AC	490V	5A	2.5A	
		250V	10A	10A	
		125V	10A	10A	
	DC	250V	3A	1.5A	
		125V	10A	6A	
		30V	10A	10A	
No. of Contact that can be used		GX	3a3b	-	Standard charging type
		HX	5a5b	-	
		GC	3a3b	-	Rapid auto-reclosing charging type
		HC	5a5b	-	
		JC	6a6b	-	

Key Lock

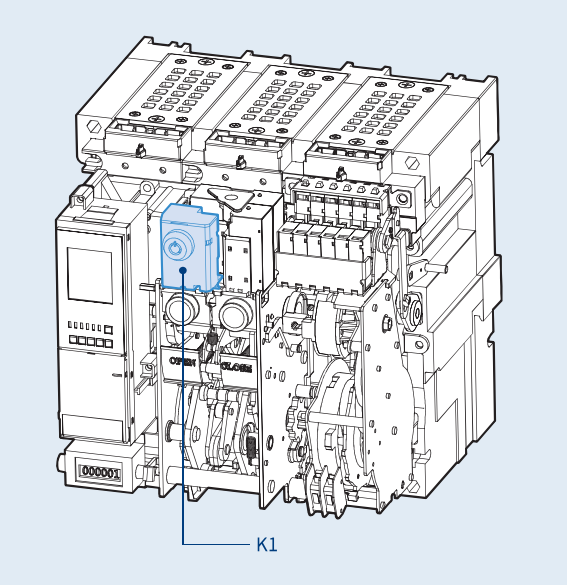
Provision Only, Provided by others

- Device that prevents unauthorized users from operating the circuit breaker when two or more circuit breakers are in use at the same time.
- Factory installed keylock: K1, K5, K6, K7
  (Key number, code shall be provided by clients)

Code	Description	Type
K1	NORMAL TYPE KEYLOCK	-
K5	PROFALUX LOCK	CAMLOCK type
K6	KIRKKEY LOCK	CAMLOCK type
K7	KIRKKEY LOCK	CN-22 type

- Mounting Kits for client installed keylock:
  Separately sold part

Key	Type	Keylock type	Code	Key part number
Profalux	CAMLOCK	Single	54623460001	
Kirkkey	CAMLOCK	Single	54623460001	KCAM00010
	CN-22	Single	72313460864	KC40-10
	CAMLOCK	Double	72313460902	KCAM00010





Key Interlock Set [K2]

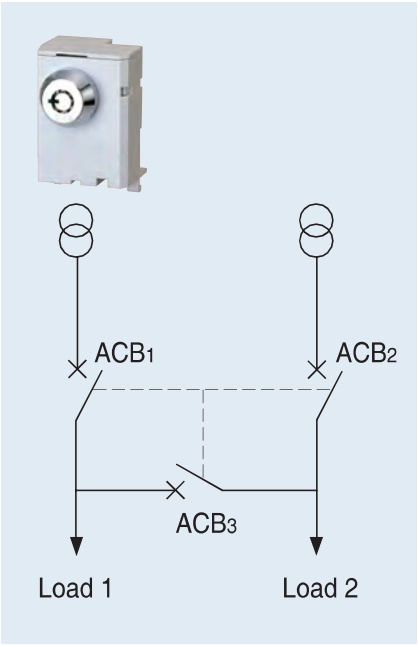
- Three circuit breakers can be arranged to supply continuous power to the load side. They will be interlocked by their attached key locks.

* How to order: 3 breakers must be ordered as a set, and K2 description must be added to the additional breakers. (2 keys are provided per 3 breakers.)

ACB-1	ACB-2	ACB-3	Status	
			LOAD1	LOAD2
●	●	●	OFF	OFF
●	○	○	ON	ON
○	●	○	ON	ON
○	○	●	ON	ON
●	●	○	OFF	OFF
●	○	●	OFF	ON
○	●	●	ON	OFF

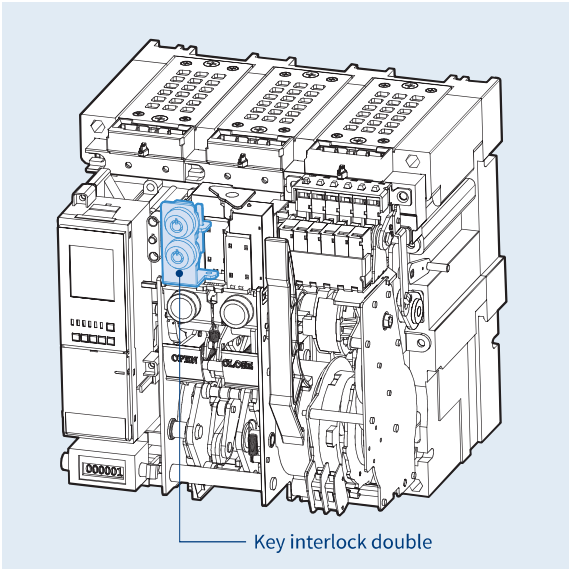
○: Release ●: Lock

Wiring



Double Key Lock [K3]

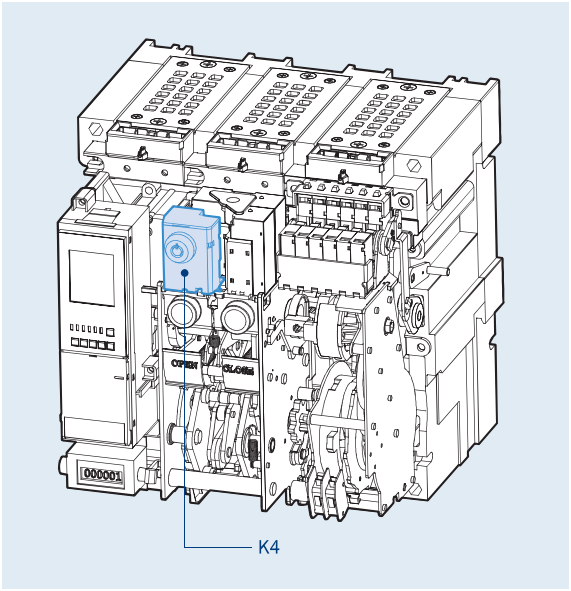
- The circuit breaker operates only when two keys are released at the same time. Handling method is same as K1.





Key Lock [K4]

- This keylock accessory provides a key which has same serial number.
- All ACBs with “K4” in the product description receive the same key.

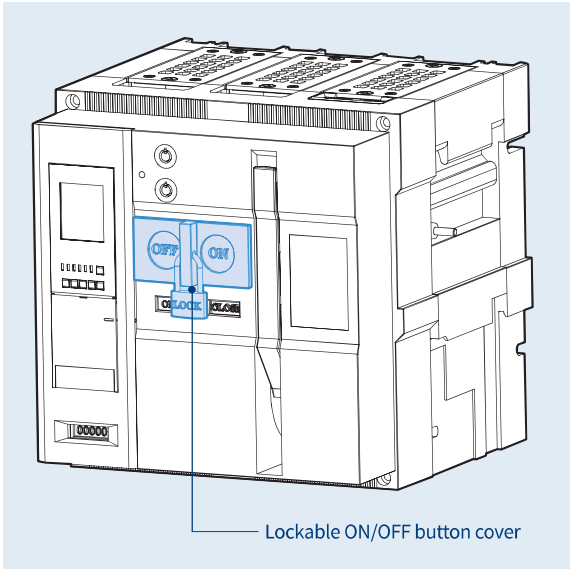




Lockable ON/OFF Button Cover [B]

- Prevents accidents or mishandling of the ACB's manual closing/trip buttons.
- It is not possible to handle ON/OFF operation under the "Button lock" status.

Note) Padlocks(Ø5 ~ Ø6) are not supplied.



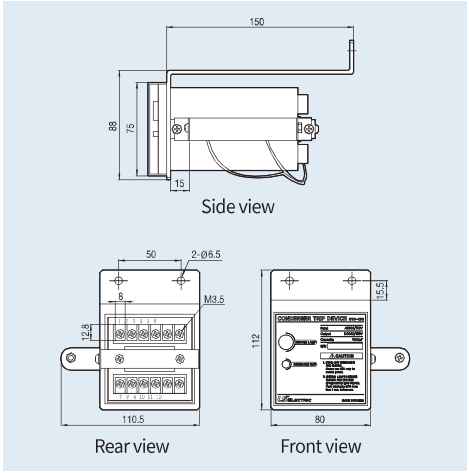


Condenser Trip Device [CTD]

- When the circuit breaker loses control power supply, the CTD allows a certain period of time before the breaker trips.
- Used in combination with the Trip Coil (Shunt coil, SHT)
- In instances without DC power, it can be used as a rectifier that supplies DC power to a circuit breaker by rectifying AC power.

External dimension

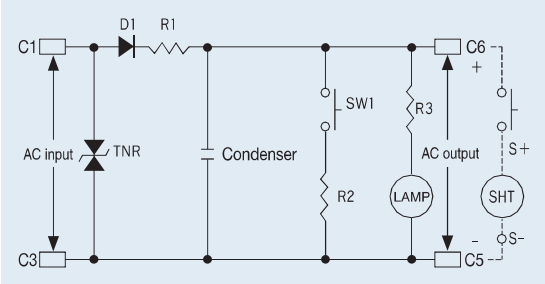
Unit (mm)



Ratings

Ratings	Specification	
Model	CTD–100	CTD–200
Rated input voltage (V)	AC 100/110	AC 200/220
Frequency (Hz)	50/60	50/60
Rated charge voltage (V)	140/155	280/310
Charging time	Within 5s	Within 5s
Trip possible time	Over 3 min	Over 2 min
Range of Input voltage (%)	85~110	85~111
Condenser capacity	1000μF	560μF

Circuit diagram

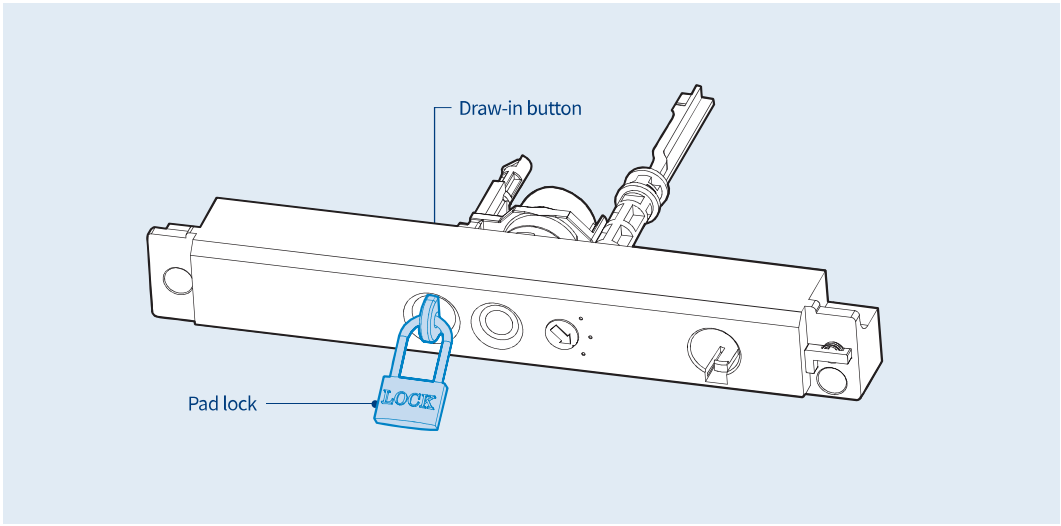


* Non UL certification.

Voltage	Code	Description
110V	76123460001	CTD ASS'Y, AC100/110V, ACB
220V	76123460002	CTD ASS'Y, AC200/220V, ACB



Lockable Position Lock [PL]





ACB is subject to restriction regarding moving in connected, test, disconnected when drawing in or out.

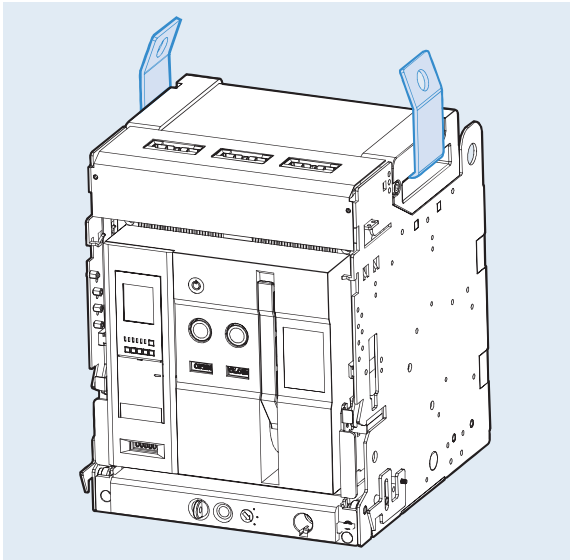
- As shown in the figure, if draw-in/out button pops out, it means locking is operating.
- To continue Draw-in/out operation, release lock by pushing Draw-in/out button
- When locked as shown in the figure above, the main body of ACB can not be drawn in or out into the cradle.
- User must provide padlock. (Ø5 ~ Ø6)

Lifting Hook [LH]

- Device that makes an ACB easy to lift.
- Please hang it to both handles of the arc cover.

Frame	Code	Description
D/E*	46513451003	HOOK, LIFT, LBA-C 630~3200A
F/G**	46513460882	HOOK, LIFT, AN, AS, AH

* D/E-Frame: Necessary to purchase separately.
** F/G-Frame: Provide by default when purchasing ACB.
*** Required to order 2ea for use.







ZB4BD4



ZB4BJ3



ZB4BG8

Non-Illuminated Selector Switches ■▲

Shape of Head	Type of Operator	Number and Type of Positions	Catalog Number
	**Standard lever, black** For colored lever add the following code to end of part number: 01 - white 03 - green 04 - red 05 - yellow 06 - blue (Example: ZB4BD204)	2 - maintained 	**ZB4BD2**
		2 - momentary from right to left 	**ZB4BD4**
		3 - maintained 	**ZB4BD3**
		3 - momentary to center 	**ZB4BD5**
		3 - momentary from left to center 	**ZB4BD7**
		3 - momentary from right to center 	**ZB4BD8**
	**Extended lever, black**	2 - maintained 	**ZB4BJ2**
		2 - momentary from right to left 	**ZB4BJ4**
		3 - maintained 	**ZB4BJ3**
		3 - momentary to center 	**ZB4BJ5**
		3 - momentary from left to center 	**ZB4BJ7**
		3 - momentary from right to center 	**ZB4BJ8**

Non-Illuminated Key Switches

Shape of Head	Type of Operator	Number and Type of Positions		Catalog Number ●
	**Key (No. 455)**	2 - maintained		**ZB4BG2**
				**ZB4BG4**
		2 - momentary from right to left		**ZB4BG6**
		3 - maintained		**ZB4BG0**
				**ZB4BG3**
				**ZB4BG5**
				**ZB4BG9**
				**ZB4BG09**
		3 - momentary from left to center		**ZB4BG1**
		3 - momentary to center		**ZB4BG7**
		3 - momentary from right to center		**ZB4BG8**
				**ZB4BG08**

The symbol ⚷ indicates key withdrawal position(s).

■ For actuation of outside contacts only.

▲ See selector switch sequence charts on page 56.

● Other key numbers:
- key No. 421E: add the suffix 12 to the reference.
- key No. 458A: add the suffix 10 to the reference.
- key No. 520E: add the suffix 14 to the reference.
- key No. 3131A: add the suffix 20 to the reference.

Example:
The catalog number for a head with key No. 421E for a 2 position maintained, lockable selector switch, with key withdrawal from the left-hand position, becomes: ZB4BG212.

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ZB4BZ101


ZB4BZ102

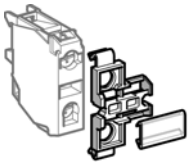

ZBE101


ZBE102


ZBE203


ZBE204


ZB4BZ009


ZBZ001

Contact Blocks (Mounting Base with Contact Blocks)

Description	Type of Contact		Catalog Number
	N/O	N/C	
Screw clamp terminal connections	1	–	**ZB4BZ101**
	–	1	**ZB4BZ102**
	2	–	**ZB4BZ103**
	–	2	**ZB4BZ104**
	1	1	**ZB4BZ105**
	1	2	**ZB4BZ141**
Gold-Flashed Low Power Switching (5 - 24 V, 0.1 - 100 mA) Dust Protected (IP5x per IEC 60529) ▲	1	–	**ZB4BZ1016**
	–	1	**ZB4BZ1026**
	2	–	**ZB4BZ1036**
	–	2	**ZB4BZ1046**
	1	1	**ZB4BZ1056**
Quick-Connect (1 x 0.250" or 2 x 0.110")	1	–	**ZB4BZ1013**
	–	1	**ZB4BZ1023**
	2	–	**ZB4BZ1033**
	–	2	**ZB4BZ1043**
	1	1	**ZB4BZ1053**
Ring Tongue Compatible (# 8 stud, ≤ 5.8 mm width)	1	–	**ZB4BZ1019**
	–	1	**ZB4BZ1029**

Add-On Contact Block (with screw clamp terminal connections) ■

Description	Type of Contact		Catalog Number
	N/O	N/C	
Standard single contact blocks	1	–	**ZBE101**
	–	1	**ZBE102**
Standard double contact blocks	2	–	**ZBE203**
	–	2	**ZBE204**
	1	1	**ZBE205**
Special contact blocks (for low power switching and dust protected) ▲	1	–	**ZBE1016**
	–	1	**ZBE1026**

Specialty Add-On Contact Blocks ■

Quick-Connect (1 x 0.250" or 2 x 0.110")	1	–	**ZBE1013**
	–	1	**ZBE1023**
Ring tongue Compatible (# 8 stud, ≤ 5.8 mm width)	1	–	**ZBE1019**
	–	1	**ZBE1029**

Body/Mounting Collar

For use with	Catalog Number
Electrical block (contact or light module)	**ZB4BZ009**

Clip-on Legend Holders for Electrical Blocks (Contact Blocks and Light Modules)
(with screw clamp terminal connections)

Identification of an XB4B control or signalling unit	**ZBZ001**

■ The contact blocks enable variable composition of body sub-assemblies and can be stacked to 3 rows, either: 3 rows of 3 single contacts or 1 row of 3 double contacts + 1 row of 3 single contacts (double contact blocks occupy 2 rows).

▲ Cannot stack additional contact blocks onto these blocks.

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Product data sheet

Specifications



Harmony XB5, Pilot light, plastic, blue, Ø22, plain lens with integral LED, 24 V AC/DC

XB5AVB6

Main

Range of product	Harmony XB5
Product or component type	Pilot light
Device short name	XB5
Bezel material	Dark grey plastic
Fixing collar material	Plastic
Head type	Standard
Mounting diameter	0.87 in (22 mm)
Sale per indivisible quantity	1
Shape of signaling unit head	Round
Cap/Operator or lens colour	Blue
Operator additional information	With plain lens
Light source	Protected LED
Bulb base	Integral LED
Light source colour	Blue
[Us] rated supply voltage	24 V AC/DC 50/60 Hz
Device presentation	Complete product

Complementary

Height	1.65 in (42 mm)
Width	1.18 in (30 mm)
Depth	2.13 in (54 mm)
Terminals description ISO n°1	(X1-X2)PL
Net weight	0.08 lb(US) (0.038 kg)
Resistance to high pressure washer	1015.26 psi (7000000 Pa) 131 °F (55 °C) 0.1 m
Connections - terminals	Screw clamp terminals, <= 2 x 1.5 mm² with cable end EN/IEC 60947-1 Screw clamp terminals, 1 x 0.22...2 x 2.5 mm² without cable end EN/IEC 60947-1
[Ui] rated insulation voltage	250 V 3)EN 60947-1
[Uimp] rated impulse withstand voltage	4 kV EN 60947-1

* Price is “List Price” and may be subject to a trade discount – check with your local distributor or retailer for actual price.

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications

Signalling type	Steady
GCR BRIDGE	XB5AVCUST03
Compatibility code	XB5
Supply voltage limits	19.2…30 V DC 21.6…26.4 V AC
Current consumption	18 mA
Service life	100000 h at rated voltage and 25 °C
Surge withstand	1 kV IEC 61000-4-5

Environment

Protective treatment	TH
Ambient air temperature for storage	-40…158 °F (-40…70 °C)
Ambient air temperature for operation	-40…158 °F (-40…70 °C)
Overvoltage category	Class II IEC 60536
IP degree of protection	IP66 IEC 60529 IP67 IEC 60529 IP69 IEC 60529 IP69K ISO 20653
NEMA degree of protection	NEMA 13 NEMA 4X
IK degree of protection	IK05 IEC 50102
Product certifications	CSA UL Listed
Vibration resistance	5 gn 12…500 Hz)IEC 60068-2-6
Shock resistance	50 gn 18 ms) half sine wave acceleration IEC 60068-2-27 30 gn 11 ms) half sine wave acceleration IEC 60068-2-27
Resistance to fast transients	2 kV IEC 61000-4-4
Resistance to electromagnetic fields	9.14 V/m (10 V/m) IEC 61000-4-3
Electromagnetic compatibility	Electrostatic discharge 6 kV on contact (on metal parts)) IEC 61000-4-2 Electrostatic discharge 8 kV in free air (in insulating parts)) IEC 61000-4-2 Electromagnetic emissionclass B IEC 55011
Resistance to electrostatic discharge	6 kV on contact (on metal parts) IEC 61000-4-2 8 kV in free air (in insulating parts) IEC 61000-4-2
Electromagnetic emission	Class B IEC 55011

Ordering and shipping details

Category	22467 - PUSHBUTTONS,22MM(PLASTIC) NEW
Discount Schedule	CS2
GTIN	3389110136906
Nbr. of units in pkg.	1
Package weight(Lbs)	1.23 oz (34.8 g)
Returnability	Yes
Country of origin	FR

Packing Units

Unit Type of Package 1	PCE
Package 1 Height	3.46 in (8.8 cm)
Package 1 width	1.34 in (3.4 cm)
Package 1 Length	2.13 in (5.4 cm)

Unit Type of Package 2	BB1
Number of Units in Package 2	5
Package 2 Weight	6.14 oz (174 g)
Package 2 Height	1.34 in (3.4 cm)
Package 2 width	3.46 in (8.8 cm)
Package 2 Length	10.43 in (26.5 cm)
Unit Type of Package 3	S03
Number of Units in Package 3	150
Package 3 Weight	12.79 lb(US) (5.8 kg)
Package 3 Height	11.81 in (30 cm)
Package 3 width	11.81 in (30 cm)
Package 3 Length	15.75 in (40 cm)

Offer Sustainability

Sustainable offer status	Green Premium product
California proposition 65	WARNING: This product can expose you to chemicals including: Lead and lead compounds, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov
REACh Regulation	REACh Declaration
REACh free of SVHC	Yes
EU RoHS Directive	Pro-active compliance (Product out of EU RoHS legal scope) EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration
Environmental Disclosure	Product Environmental Profile
Circularity Profile	End of Life Information
WEEE	The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins.

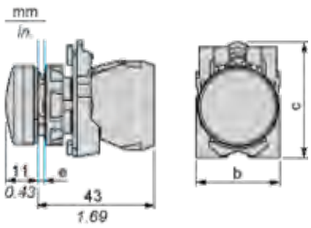
Contractual warranty

Warranty	18 months

Product data sheet
Dimensions Drawings

XB5AVB6

Dimensions



e: clamping thickness: 1 to 6 mm / 0.04 to 0.24 in.

b: 30 mm / 1.18 in.

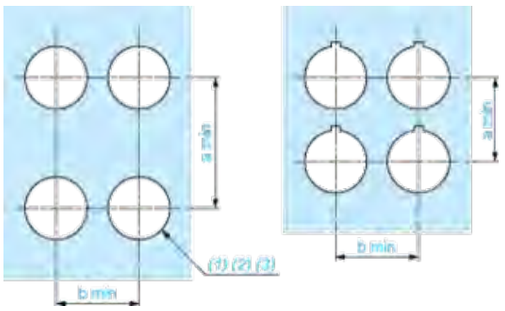
c: 41.5 mm / 1.63 in.

Product data sheet XB5AVB6

Mounting and Clearance

Panel Cut-out for Pushbuttons, Switches and Pilot Lights (Finished Holes, Ready for Installation)

Connection by Screw Clamp Terminals or Plug-in Connectors or on Printed Circuit Board



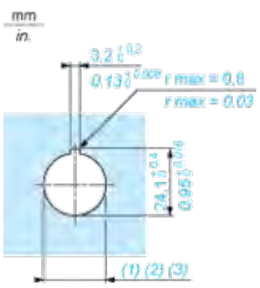
(1) Diameter on finished panel or support

(2) For selector switches and Emergency stop buttons, use of an anti-rotation plate type ZB5AZ902 is recommended.

(3) Ø22.5 mm recommended (Ø22.3 $_{0}^{+0.4}$) / Ø0.89 in. recommended (Ø0.88 in. $_{0}^{+0.016}$)

Connections	a in mm	a in in.	b in mm	b in in.
By screw clamp terminals or plug-in connector	40	1.57	30	1.18
By Faston connectors	45	1.77	32	1.26
On printed circuit board	30	1.18	30	1.18

Detail of Lug Recess



(1) Diameter on finished panel or support

(2) For selector switches and Emergency stop buttons, use of an anti-rotation plate type ZB5AZ902 is recommended.

(3) Ø22.5 mm recommended (Ø22.3 $_{0}^{+0.4}$) / Ø0.89 in. recommended (Ø0.88 in. $_{0}^{+0.016}$)

PT 4 - Feed-through terminal block

3211757

https://www.phoenixcontact.com/us/products/3211757

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Feed-through terminal block, nom. voltage: 800 V, nominal current: 32 A, number of connections: 2, connection method: Push-in connection, Rated cross section: 4 mm^2, cross section: 0.2 mm^2 - 6 mm^2, mounting type: NS 35/7,5, NS 35/15, color: gray

Your advantages

- The compact design and front connection enable wiring in a confined space
- In addition to the testing option in the double function shaft, all terminal blocks provide an additional test pick-off
- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- Tested for railway applications

Technical data

Product properties

Product type	Feed-through terminal block
Product family	PT
Area of application	Railway industry
	Machine building
	Plant engineering
	Process industry
Number of connections	2
Number of rows	1
Potentials	1

Insulation characteristics

Overvoltage category	III
Degree of pollution	3

Electrical properties

Rated surge voltage	8 kV
Maximum power dissipation for nominal condition	1.02 W

Connection data

Number of connections per level	2
Nominal cross section	4 mm²
Stripping length	10 mm ... 12 mm
Internal cylindrical gage	A4
Connection in acc. with standard	IEC 60947-7-1
Conductor cross section rigid	0.2 mm² ... 6 mm²
Cross section AWG	24 ... 10 (converted acc. to IEC)
Conductor cross section flexible	0.2 mm² ... 6 mm²
Conductor cross section, flexible [AWG]	24 ... 10 (converted acc. to IEC)
Conductor cross-section flexible (ferrule without plastic sleeve)	0.25 mm² ... 4 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.25 mm² ... 4 mm²
2 conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm² ... 1 mm²
Nominal current	32 A
Maximum load current	36 A (with 6 mm² conductor cross section, rigid)
Nominal voltage	800 V
Nominal cross section	4 mm²

Connection cross sections directly pluggable

Conductor cross section rigid	0.5 mm² ... 6 mm²
Conductor cross-section flexible (ferrule without plastic sleeve)	0.75 mm² ... 4 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.5 mm² ... 4 mm²

Ex data

Rated data (ATEX/IECEx)

Identification	Ⓔx II 2 G Ex eb IIC Gb
Operating temperature range	-60 °C ... 110 °C
Ex-certified accessories	3030420 D-ST 4
	3030721 ATP-ST 4
	1204517 SZF 1-0,6X3,5
	3022276 CLIPFIX 35-5
	3022218 CLIPFIX 35
List of bridges	Plug-in bridge / FBS 2-6 / 3030336
	Plug-in bridge / FBS 3-6 / 3030242
	Plug-in bridge / FBS 4-6 / 3030255
	Plug-in bridge / FBS 5-6 / 3030349
	Plug-in bridge / FBS 10-6 / 3030271
	Plug-in bridge / FBS 20-6 / 3030365
Bridge data	25 A / 4 mm²
Ex temperature increase	40 K (26 A / 4 mm²)
Rated voltage	550 V
for bridging with bridge	550 V
- At bridging between non-adjacent terminal blocks	352 V
- At bridging between non-adjacent terminal blocks via PE terminal block	352 V
- At cut-to-length bridging	220 V
- At cut-to-length bridging with cover	275 V
- At cut-to-length bridging with partition plate	550 V
Rated insulation voltage	500 V
output	(Permanent)

Ex level General

Rated current	26 A (4 mm²)
Maximum load current	30 A (6 mm²)
Contact resistance	0.59 mΩ

Ex connection data General

Nominal cross section	4 mm²
Rated cross section AWG	12
Connection capacity rigid	0.2 mm² ... 6 mm²
Connection capacity AWG	24 ... 10
Connection capacity flexible	0.2 mm² ... 4 mm²
Connection capacity AWG	24 ... 12

Dimensions

Width	6.2 mm
Height	56 mm

Depth	35.3 mm
Depth on NS 35/7,5	36.5 mm
Depth on NS 35/15	44 mm

Material specifications

Color	gray
Flammability rating according to UL 94	V0
Insulating material group	I
Insulating material	PA
Static insulating material application in cold	-60 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Electrical tests

Surge voltage test

Test voltage setpoint	9.8 kV
Result	Test passed

Temperature-rise test

Requirement temperature-rise test	Increase in temperature ≤ 45 K
Result	Test passed
Short-time withstand current 4 mm²	0.48 kA
Short-time withstand current 6 mm²	0.72 kA
Result	Test passed

Power-frequency withstand voltage

Test voltage setpoint	2 kV
Result	Test passed

Mechanical properties

Mechanical data

Open side panel	Yes

Mechanical tests

Mechanical strength

Result	Test passed

Attachment on the carrier

DIN rail/fixing support	NS 35
Test force setpoint	1 N
Result	Test passed

Test for conductor damage and slackening

Rotation speed	10 rpm
Revolutions	135
Conductor cross section/weight	0.2 mm² / 0.2 kg
	4 mm² / 0.9 kg
	6 mm² / 1.4 kg
Result	Test passed

Environmental and real-life conditions

Aging

Temperature cycles	192
Result	Test passed

Needle-flame test

Time of exposure	30 s
Result	Test passed

Oscillation/broadband noise

Specification	DIN EN 50155 (VDE 0115-200):2008-03
	DIN EN 50155 (VDE 0115-200):2022-06
Spectrum	Service life test category 2, bogie-mounted
	Service life test category 1, class B, body mounted
Frequency	f_1 = 5 Hz to f_2 = 250 Hz
	f_1 = 5 Hz to f_2 = 150 Hz
ASD level	6.12 $(m/s^2)^2/Hz$
	0.964 $(m/s^2)^2/Hz$
Acceleration	3.12g
	0.58g
Test duration per axis	5 h
	5 h
Test directions	X-, Y- and Z-axis
	X-, Y- and Z-axis
Result	Test passed
	Test passed

Shocks

Specification	DIN EN 50155 (VDE 0115-200):2008-03
	DIN EN 50155 (VDE 0115-200):2022-06
Pulse shape	Half-sine
	Half-sine
Acceleration	30g

	5g
Shock duration	18 ms
	30 ms
Number of shocks per direction	3
	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
	X-, Y- and Z-axis (pos. and neg.)
Result	Test passed
	Test passed

Ambient conditions

Ambient temperature (operation)	-60 °C ... 110 °C (Operating temperature range incl. self-heating; for max. short-term operating temperature, see RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, no longer than 24 h, -60°C to +70°C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (operation)	20 % ... 90 %
Permissible humidity (storage/transport)	30 % ... 70 %

Standards and regulations

Connection in acc. with standard	IEC 60947-7-1

Mounting

Mounting type	NS 35/7,5
	NS 35/15

Approvals

To download certificates, visit the product detail page: https://www.phoenixcontact.com/us/products/3211757

CSA
Approval ID: 2030668

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
Use group B				
	600 V	30 A	24 - 10	-
Use group C				
	600 V	30 A	24 - 10	-

IECEE CB Scheme
Approval ID: DE1-65853

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
	800 V	32 A	-	0.2 - 4

EAC
Approval ID: RU C-DE.BL08.B.00644

cULus Recognized
Approval ID: E60425

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
Use group B				
	600 V	30 A	24 - 10	-
Use group C				
	600 V	30 A	24 - 10	-

LR
Approval ID: LR2371832TA

NK
Approval ID: 22ME0007

RS
Approval ID: 22.44.01.00083.250

BV
Approval ID: 39980/B0 BV

VDE Gutachten mit Fertigungsüberwachung
Approval ID: 40036696

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
	800 V	32 A	-	0.2 - 4

PRS
Approval ID: TE/2107/880590/21

DNV
Approval ID: TAE000010T

cUL Recognized
Approval ID: E192998

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
	550 V	30 A	24 - 10	-

IECEx
Approval ID: IECExPTB10.0046U

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
Only flexible conductors	550 V	26 A	-	0.2 - 4
Only rigid conductors	550 V	30 A	-	0.2 - 6

UL Recognized
Approval ID: E192998

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
	550 V	30 A	24 - 10	-

ATEX
Approval ID: PTB09ATEX1112U

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
Only flexible conductors	550 V	26 A	-	0.2 - 4
Only rigid conductors	550 V	30 A	-	0.2 - 6

CCC
Approval ID: 2020322313000631

UKCA-EX
Approval ID: CSAE 22UKEX1100U

cULus Recognized

Classifications

ECLASS

ECLASS-11.0	27141120
ECLASS-13.0	27250101

ETIM

ETIM 9.0	EC000897

UNSPSC

UNSPSC 21.0	39121400

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Phoenix Contact USA
586 Fulling Mill Road
Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

CARTER MACHINERY ENGINEERING SERVICES

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Carter Machinery Company, Inc
8346 Old Richfood Road, Mechanicsville, VA 23116
Phone: 804-823-1183

I Cloud HQ LC11 CT Addition Submittal Transmission

September 26, 2025

Rajiv Paul
Sr. Project Manager
Carter Machinery

We thank you for choosing Carter Machinery to provide you with engineering and equipment for **Cloud HQ LC11 differential CT addition**. Carter Machinery's Engineering Services has gathered the necessary information to provide data pertaining to the hardware and completed design submittals required for installation and integration of the provided services and equipment.

The submittal included herein identifies the core features of the solution and contains documentation of the hardware data and design necessary for the approval of the proposed installation. Please review the document and let me know if there are any questions or concerns that you may have.

Thank you again for choosing Carter Machinery's Engineering Services to provide you with your power system solutions.

With regards,

Jonathan D. Morton

Jonathan D. Morton
Control Systems Engineer

Carter Machinery Company, Inc
8346 Old Richfood Road, Mechanicsville, VA 23116
Phone: 804-823-1183

II Submittal Contents

Sections

I Transmittal Page **1**

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III Hardware Data **3**

III.i DATA SUBSECTION 4

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2 Flexcore CT115-202 6
3 Electro Industries 6-Pole CT Shorting Block 9
4 Pheonix Contact Din rail End Anchors 11
5 Pheonix Contact 4 Pole Terminal Blocks 17
6 Pheonix Contact 4 Pole Terminal Block Cover 29
7 Pheonix Contact Din rail 33

Carter Machinery Company, Inc
8346 Old Richfood Road, Mechanicsville, VA 23116
Phone: 804-823-1183

III Hardware Data

Bill of Materials			
Qty.	Manufacture	Description	Part Number
3	Amran	Differential CT	CT103-402
1	Flex Core	Ground CT	115-202
1	Electro Industries	CT Shorting Block	EI-30CT06DR
2	Pheonix Contact	Din Rail End Barrier	800886
2	Pheonix Contact	4 Pole Terminal Block	3209578
2	Pheonix Contact	4 Pole Terminal Block Cover	3030514
1	Pheonix Contact	Din Rail	1207640

III.i DATA SUBSECTION

Model CT103 – Single Ratio Current Transformers for Switchgear Type Applications
Window 6.5", 600V, 10kV BIL

AMRAN
INSTRUMENT TRANSFORMERS



c UL us E205113 SA 231838

- **UL, cUL Recognized and CSA Certified**
- **As per ANSI/IEEE C57.13, IEC, OR relevant standard**
- ***Approved for revenue metering by Industry Canada No. AE-2251**

TABLES:

CATALOG NUMBER	CURRENT RATIO	RELAY CLASS	ANSI METERING CLASS @ 60 HZ				
			B0.1	B0.2	B0.5	B0.9	B1.8
CT103-500	50:5	C 10	4.8	4.8	-	-	-
CT103-750	75:5	C 20	2.4	4.8	4.8	-	-
CT103-101	100:5	C 20	1.2	2.4	4.8	-	-
CT103-151*	150:5	C 50	0.6	1.2	2.4	2.4	4.8
CT103-201*	200:5	C 50	0.6	0.6	1.2	2.4	2.4
CT103-251*	250:5	C 50	0.3	0.6	1.2	1.2	2.4
CT103-301*	300:5	C100	0.3	0.3	0.6	1.2	1.2
CT103-401*	400:5	C100	0.3	0.3	0.6	1.2	1.2
CT103-501*	500:5	C100	0.3	0.3	0.3	0.3	0.6
CT103-601*	600:5	C200	0.3	0.3	0.3	0.3	0.6
CT103-751*	750:5	C200	0.3	0.3	0.3	0.3	0.3
CT103-801*	800:5	C200	0.3	0.3	0.3	0.3	0.3
CT103-102*	1000:5	C200	0.3	0.3	0.3	0.3	0.3
CT103-122*	1200:5	C400	0.15	0.15	0.15	0.15	0.3
CT103-152*	1500:5	C400	0.15	0.15	0.15	0.15	0.15
CT103-162*	1600:5	C400	0.15	0.15	0.15	0.15	0.15
CT103-202*	2000:5	C400	0.15	0.15	0.15	0.15	0.15
CT103-252*	2500:5	C400	0.15	0.15	0.15	0.15	0.15
CT103-302*	3000:5	C400	0.15	0.15	0.15	0.15	0.15
CT103-402*	4000:5	C400	0.15	0.15	0.15	0.15	0.15

INSULATION LEVEL
600 V, BIL 10kV full wave

FREQUENCY
50-400 Hz

THERMAL RATING
50:5-3000:5 - 2.0 @ 30 deg. C ambient
1.5 @ 55 deg. C ambient

4000:5 - 1.5 @ 30 deg. C ambient
1.33 @ 55 deg. C ambient

OUTER ENCAPSULATION
Plastic Cased

SECONDARY TERMINALS
Brass screw # 10-32 with one flat washer and lock washer, accessible from either side

APPROX. WEIGHT
59 lbs.

CUSTOM OPTIONS (CONTACT US)
- Different Ratios
- IEC Ratios/Accuracies
- Non-standard thermal rating
- Different encapsulation
- Different secondary termination
- Special mounting needs

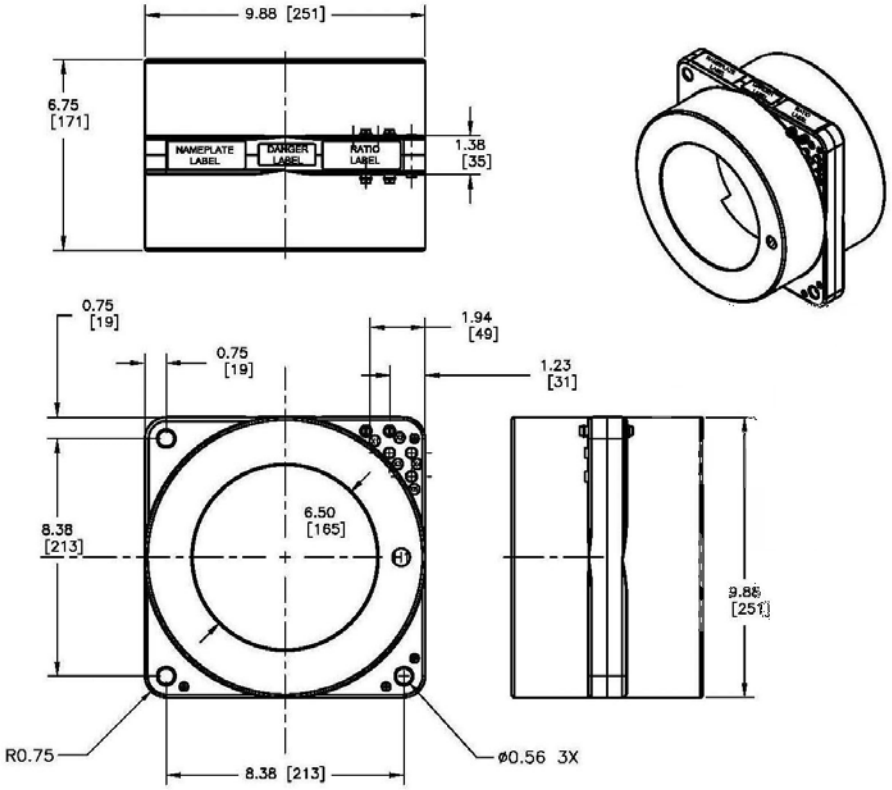
AMRAN INC., 12320 Cardinal Mdw, Suite 100, Sugar Land, TX 77478 - Phone: 281-243-2200 - Toll Free: 866-829-1572 - Fax: 281-243-2205
sales@amranit.com – www.amranit.com
09/16

Amran CT103-402

Model CT103 – Single Ratio Current Transformers for Switchgear Type Applications
Window 6.5", 600V, 10kV BIL

AMRAN
INSTRUMENT TRANSFORMERS

DIMENSIONS - ALL DIMENSIONS ARE IN INCHES (MM)



EXCITATION CURVES:

Available upon request:

CURRENT TRANSFORMERS

RELAY/METER CLASS CURRENT TRANSFORMER *MODEL* 115

CURRENT TRANSFORMERS

Model 115 (**Window Size**: 4.00" Diameters)

Application: Used for Relay and Metering applications
Frequency: 50-400 Hz
Insulation Level: 600 Volts, 10Kv BIL Full Wave

- Terminals are brass studs No. 8-32 UNC with one flat washer, one lock washer and one nut each.
- Other Ratios available on request.
- Mounting Bracket Kits are sold separately (P/N 0221B01525)
- Approximate weight: 19 lbs.

c UL us E238872 c SA us 245941



Catalog Number	Current Ratio	Relay Class	ANSI Metering Class at 60 Hz.					Secondary Winding Resistance	Continuous Thermal Rating Factor	
			B0.1	B0.2	B0.5	B0.9	B1.8	Ohms at 75ºC	at 30ºC	at 55ºC
115-500	50:5	----	2.4	4.8	---	---	--	0.025	2.0	2.0
115-750	75:5	----	1.2	2.4	4.8	---	---	0.037	2.0	2.0
115-101	100:5	C10	1.2	1.2	2.4	4.8	---	0.046	2.0	2.0
115-151	150:5	C10	0.6	0.6	1.2	2.4	4.8	0.074	2.0	2.0
115-201	200:5	C20	0.3	0.3	0.6	1.2	2.4	0.099	2.0	2.0
115-251	250:5	C20	0.3	0.3	0.6	1.2	2.4	0.127	2.0	2.0
115-301	300:5	C20	0.3	0.3	0.3	0.6	1.2	0.148	2.0	2.0
115-401	400:5	C50	0.3	0.3	0.3	0.3	0.6	0.208	2.0	2.0
115-501	500:5	C50	0.3	0.3	0.3	0.3	0.3	0.247	2.0	1.5
115-601	600:5	C50	0.3	0.3	0.3	0.3	0.3	0.305	2.0	1.5
115-751	750:5	C100	0.3	0.3	0.3	0.3	0.3	0.428	1.5	1.33
115-801	800:5	C100	0.3	0.3	0.3	0.3	0.3	0.457	1.5	1.0
115-102	1000:5	C100	0.3	0.3	0.3	0.3	0.3	0.571	1.5	1.0
115-122	1200:5	C100	0.3	0.3	0.3	0.3	0.3	0.660	1.33	1.0
115-152	1500:5	C100	0.3	0.3	0.3	0.3	0.3	0.825	1.0	0.8
115-162	1600:5	C100	0.3	0.3	0.3	0.3	0.3	0.880	1.0	0.8
115-202	2000:5	C200	0.3	0.3	0.3	0.3	0.3	1.100	1.0	0.8
115-252	2500:5	C100	0.3	0.3	0.3	0.3	0.3	1.292	1.0	0.8
115-302	3000:5	C200	0.3	0.3	0.3	0.3	0.3	1.550	0.8	0.6
115-322	3200:5	C200	0.3	0.3	0.3	0.3	0.3	1.653	0.8	0.6

FLEX-CORE
Div. Morlan & Associates, Inc.
4970 Scioto Darby Rd. Hilliard, Ohio 43026

WWW.FLEX-CORE.COM
sales@flex-core.com

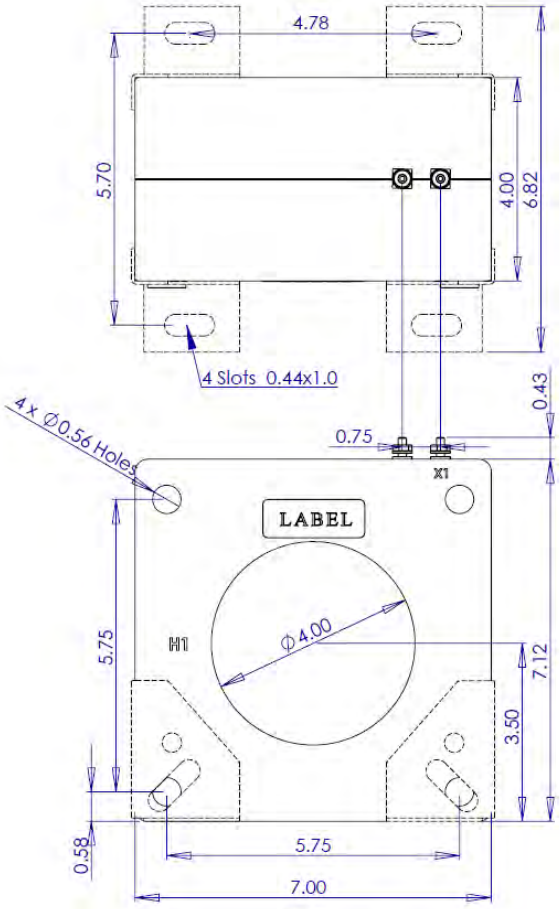
PHONE (614) 889-6152
TECH. ASSISTANCE (614) 876-8308
FAX # (614) 876-8538

Flexcore CT115-202

CURRENT TRANSFORMERS

RELAY/METER CLASS CURRENT TRANSFORMER *MODEL* 115

CURRENT TRANSFORMERS
Model 115 (**Window Size**: 4.00" Diameter)



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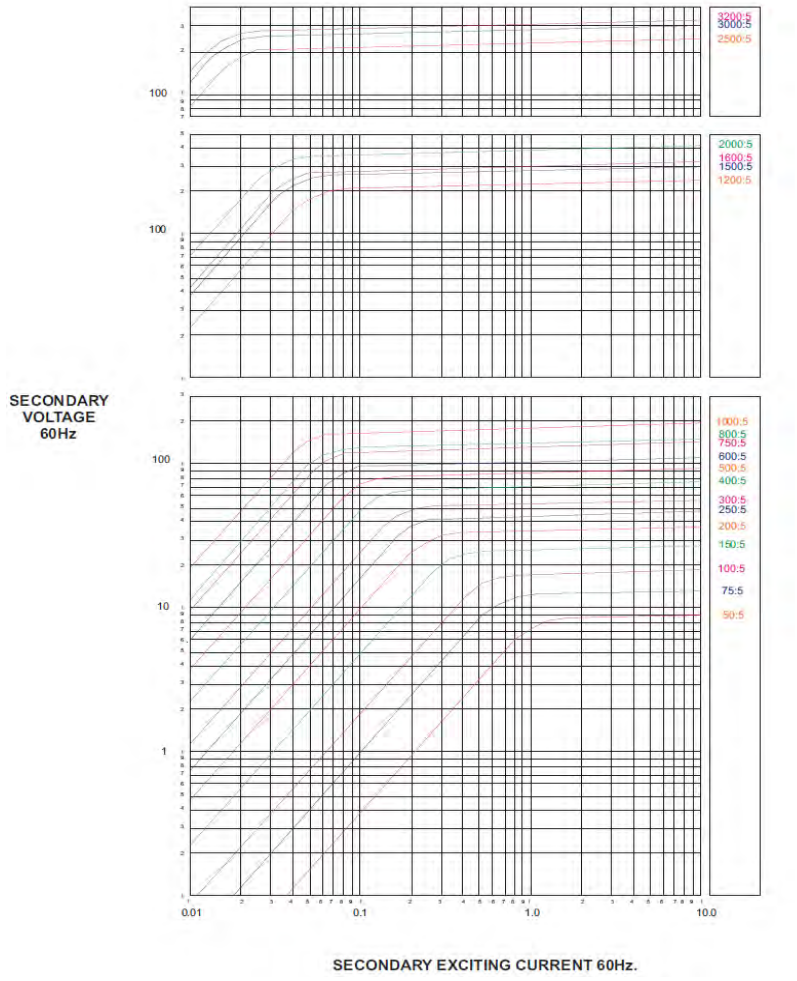
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FAX # (614) 876-8538

Flexcore CT115-202

CURRENT TRANSFORMERS

RELAY/METER CLASS CURRENT TRANSFORMER *MODEL* 115

Model 115

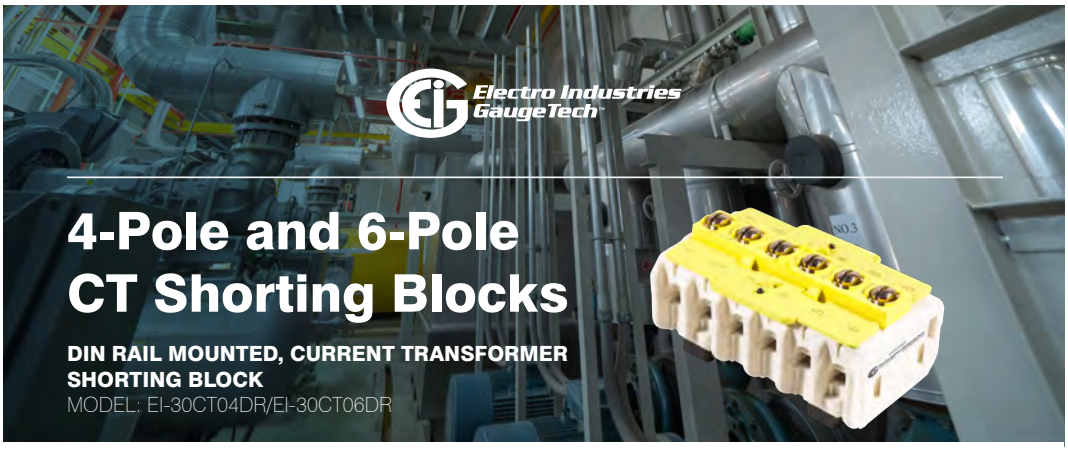


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Div. Morlan & Associates, Inc.
4970 Scioto Darby Rd. Hilliard, Ohio 43026

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FAX # (614) 876-8538

Flexcore CT115-202



Description

EIG offers two options for CT shorting for meter installation:

- 4-pole Block Part #: EI-30CT04DR
- 6-pole Block Part #: EI-30CT06DR.

These shorting blocks are designed to be a superior alternative to the traditional shorting block. They uniquely have captive hardware to prevent lost grounding screws. This design protects against errors, ensuring inherently safer installation or removal of meters from service. The CT shorting blocks indicate clearly when the screw is engaged and the circuit shunted. They are mounted using a traditional DIN mount for faster installation.

Features

- Captive hardware.
- Finger safe covers.
- DIN rail mounted.
- Safer than traditional shorting blocks.
- Easier to install.

Physical Specifications
.562 Line to Line Spacing
Wire Range #10-#18 AWG Copper
Crimp Ring Lug or Spade Lug

Electrical Ratings
Current: 30 A (50/60 Hz or DC)
Voltage: 600 Volts AC/DC UL 1059 Class C, User Group-General Industrial
D.W.V. 4000 Volts RMS
Factory and Field Wiring
Short Circuit Current Rated At 10,000 A

Mechanical Ratings
Maximum Insulator Base Temperature:
• Continuous +300 °F (+149 °C) • Short Term +338 °F (+170 °C)
Storage and Transportation Temperature
• +257 °F (+125 °C) to -55 °F (-48 °C)
Flammability Rating of Insulator: UL 94 VO
• Use outside these ranges needs to be evaluated based on end use

Materials
Connector
• Brass Per QQ-B-613 • Cu Flash with Nickel Plate Per QQ-N-290 • 8-32 Threaded Terminations
Insulator
• Glass Reinforced Polyester (Modified) Free of Halogens, Fluorocarbons, Chlorinated Hydrocarbons, Silicone, Asbestos, Cadmium and Formaldehyde
Screws
• 8-32 (Torque 10-12 LB. In/1.1-1.4 N-M) • Brass Per QQ-W-321 • Cu Flash with Nickel Plate Per QQ-N-290
CT Shorting Circuit Bar
• Brass, tin plated

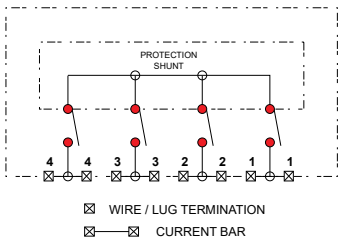
HUBBELL

Electro Industries 6-Pole CT Shorting Block

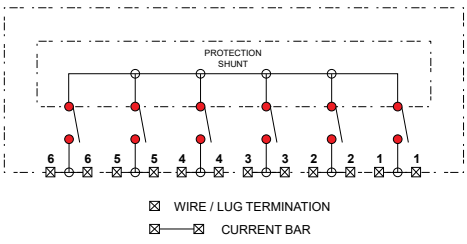
Electro Industries GaugeTech

Wiring Diagrams

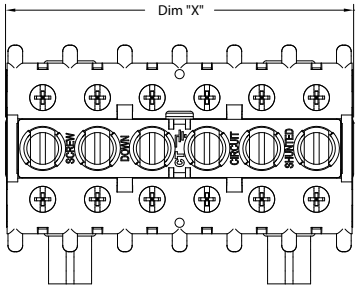
30CT 04 - Shunt Off/Open Unwired



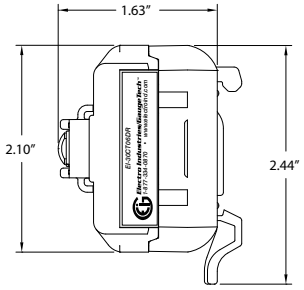
30CT 06 - Shunt Off/Open Unwired



Front Dimensions



Side Dimensions



Features

- UL Certified
- RoHS Compliant 2002/95/EC

Ordering Information	
Model: EI-30CT04DR	4-Pole CT Shorting Block
Model: EI-30CT06DR	6-Pole CT Shorting Block

No. of Poles	Dimension "X"	Part No.
4	2.40"	EI-30CT04DR
6	3.50"	EI-30CT06DR

To Order Online
https://www.electroind.com/product/4-pole-and-6-pole-ct-shorting-blocks/

1800 Shames Drive
Westbury, NY, 11590

1-877-EIMETER
(1-877-346-3837)

Tel: 516-334-0870
Fax: 516-338-4741

Email: EIG_sales@hubbell.com
Website: www.electroind.com

HUBBELL

EI-30CT Series 020725 V.1.04

Electro Industries 6-Pole CT Shorting Block

E/NS 35 N - End bracket

0800886

https://www.phoenixcontact.com/us/products/0800886

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End clamp, width: 9.5 mm, color: gray

Your advantages

- Large-surface marking

Commercial data

Item number	0800886
Packing unit	50 pc
Minimum order quantity	50 pc
Sales key	BE07
Product key	BE7111
Catalog page	Page 539 (C-3-2019)
GTIN	4017918129309
Weight per piece (including packing)	14.16 g
Weight per piece (excluding packing)	13.708 g
Customs tariff number	39269097
Country of origin	DE

E/NS 35 N - End bracket

0800886

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Technical data

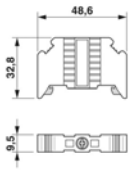
Product properties

Product type	End bracket

Connection data

Screw thread	M3
Tightening torque	0.5 ... 0.8 Nm

Dimensions

Dimensional drawing	
Width	9.5 mm
Height	48.6 mm
Depth	32.8 mm
Depth on NS 35/7,5	34.3 mm
Length	48.6 mm

Material specifications

Color	gray (RAL 7042)
Material	PA
Flammability rating according to UL 94	V0
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C

Environmental and real-life conditions

Ambient conditions

Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Mounting

E/NS 35 N - End bracket

0800886

https://www.phoenixcontact.com/us/products/0800886

Mounting type	NS 35/7,5
	NS 35/15

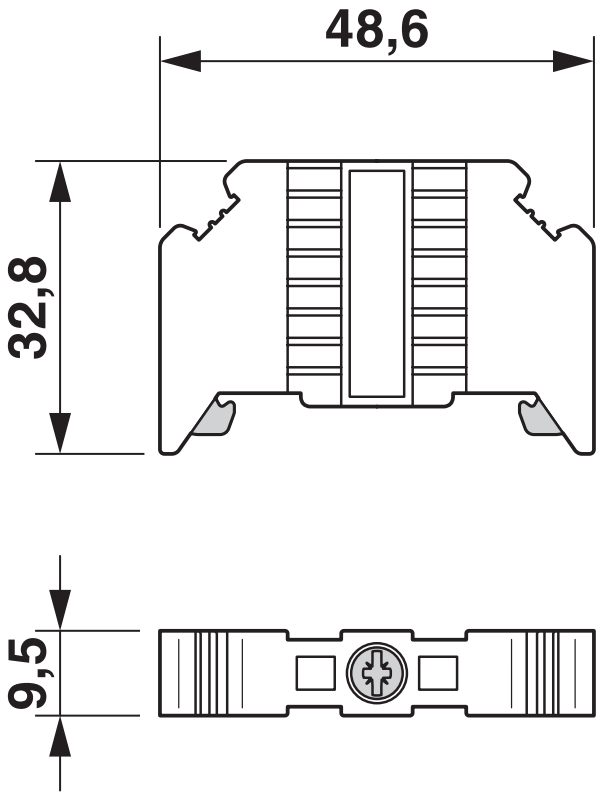
E/NS 35 N - End bracket

0800886

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Drawings

Dimensional drawing



Pheonix Contact Din rail End Anchors

E/NS 35 N - End bracket

0800886

https://www.phoenixcontact.com/us/products/0800886

Classifications

ECLASS

ECLASS-11.0	27141135
ECLASS-12.0	27141135
ECLASS-13.0	27250302

ETIM

ETIM 9.0	EC001041

UNSPSC

UNSPSC 21.0	39121400

E/NS 35 N - End bracket

0800886

https://www.phoenixcontact.com/us/products/0800886

Environmental product compliance

EU RoHS

Fulfills EU RoHS substance requirements	Yes, No exemptions

China RoHS

Environment friendly use period (EFUP)	EFUP-E
	No hazardous substances above the limits

EU REACH SVHC

REACH candidate substance (CAS No.)	No substance above 0.1 wt%

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Phoenix Contact USA
586 Fulling Mill Road
Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

PT 2,5-QUATTRO - Feed-through terminal block

3209578

https://www.phoenixcontact.com/us/products/3209578

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Feed-through terminal block, nom. voltage: 800 V, nominal current: 24 A, number of connections: 4, connection method: Push-in connection, Rated cross section: 2.5 mm^2, cross section: 0.14 mm^2 - 4 mm^2, mounting type: NS 35/7,5, NS 35/15, color: gray

Your advantages

- In addition to the testing option in the double function shaft, all terminal blocks provide an additional test pick-off
- The compact design and front connection enable wiring in a confined space
- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- Tested for railway applications

Commercial data

Item number	3209578
Packing unit	50 pc
Minimum order quantity	50 pc
Sales key	BE22
Product key	BE2213
Catalog page	Page 71 (C-1-2019)
GTIN	4046356329859
Weight per piece (including packing)	10.539 g
Weight per piece (excluding packing)	9.942 g
Customs tariff number	85369010
Country of origin	US

PT 2,5-QUATTRO - Feed-through terminal block

3209578

https://www.phoenixcontact.com/us/products/3209578

Technical data

Notes

General

Note	The max. load current must not be exceeded by the total current of all connected conductors.

Product properties

Product type	Multi-conductor terminal block
Product family	PT
Area of application	Railway industry
	Machine building
	Plant engineering
	Process industry
Number of connections	4
Number of rows	1
Potentials	1

Insulation characteristics

Overvoltage category	III
Degree of pollution	3

Electrical properties

Rated surge voltage	8 kV
Maximum power dissipation for nominal condition	0.77 W

Connection data

Number of connections per level	4
Nominal cross section	2.5 mm²
Stripping length	8 mm ... 10 mm
Internal cylindrical gage	A3
	B2
Connection in acc. with standard	IEC 60947-7-1
Conductor cross section rigid	0.14 mm² ... 4 mm²
Cross section AWG	26 ... 12 (converted acc. to IEC)
Conductor cross section flexible	0.14 mm² ... 4 mm²
Conductor cross section, flexible [AWG]	26 ... 12 (converted acc. to IEC)
Conductor cross-section flexible (ferrule without plastic sleeve)	0.14 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.14 mm² ... 2.5 mm²
2 conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm²
Nominal current	24 A
Maximum load current	28 A (with 4 mm² conductor cross section, rigid)
Nominal voltage	800 V

PT 2,5-QUATTRO - Feed-through terminal block

3209578

https://www.phoenixcontact.com/us/products/3209578

Nominal cross section	2.5 mm²

Connection cross sections directly pluggable

Conductor cross section rigid	0.34 mm² ... 4 mm²
Conductor cross-section flexible (ferrule without plastic sleeve)	0.5 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.34 mm² ... 2.5 mm²

Ex data

Rated data (ATEX/IECEx)

Identification	Ex II 2 G Ex eb IIC Gb
Operating temperature range (1)	-60 °C ... 85 °C
Operating temperature range (2)	-40 °C ... 110 °C
Ex-certified accessories	3030514 D-ST 2,5-QUATTRO
	3030815 ATP-ST QUATTRO
	3036602 DS-ST 2,5
	1204517 SZF 1-0,6X3,5
	3022276 CLIPFIX 35-5
	3022218 CLIPFIX 35
List of bridges	Plug-in bridge / FBS 2-5 / 3030161
	Plug-in bridge / FBS 3-5 / 3030174
	Plug-in bridge / FBS 4-5 / 3030187
	Plug-in bridge / FBS 5-5 / 3030190
	Plug-in bridge / FBS 10-5 / 3030213
	Plug-in bridge / FBS 20-5 / 3030226
Bridge data	19 A (2.5 mm²)
Ex temperature increase	40 K (19 A / 2.5 mm²)
Rated voltage	550 V
for bridging with bridge	550 V
- At bridging between non-adjacent terminal blocks	352 V
- At cut-to-length bridging	220 V
- At cut-to-length bridging with cover	275 V
- At cut-to-length bridging with partition plate	550 V
Rated insulation voltage	500 V
output	(Permanent)

Ex level General

Rated current	19 A
Maximum load current	23 A
Contact resistance	1.14 mΩ

Ex connection data General

Nominal cross section	2.5 mm²
Rated cross section AWG	14
Connection capacity rigid	0.14 mm² ... 4 mm²
Connection capacity AWG	26 ... 12

PT 2,5-QUATTRO - Feed-through terminal block

3209578

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Connection capacity flexible	0.14 mm² ... 2.5 mm²
Connection capacity AWG	26 ... 14

Dimensions

Width	5.2 mm
End cover width	2.2 mm
Height	72.2 mm
Depth	35.3 mm
Depth on NS 35/7,5	36.8 mm
Depth on NS 35/15	44.3 mm

Material specifications

Color	gray (RAL 7042)
Flammability rating according to UL 94	V0
Insulating material group	I
Insulating material	PA
Static insulating material application in cold	-60 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Electrical tests

Surge voltage test

Test voltage setpoint	9.8 kV
Result	Test passed

Temperature-rise test

Requirement temperature-rise test	Increase in temperature ≤ 45 K
Result	Test passed
Short-time withstand current 2.5 mm²	0.3 kA
Result	Test passed

Power-frequency withstand voltage

Test voltage setpoint	2 kV
Result	Test passed

Mechanical properties

Mechanical data

Open side panel	Yes

PT 2,5-QUATTRO - Feed-through terminal block

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Mechanical tests

Mechanical strength

Result	Test passed

Attachment on the carrier

DIN rail/fixing support	NS 35
Test force setpoint	1 N
Result	Test passed

Test for conductor damage and slackening

Rotation speed	10 (+/- 2) rpm
Revolutions	135
Conductor cross section/weight	0.14 mm² / 0.2 kg
	2.5 mm² / 0.7 kg
	4 mm² / 0.9 kg
Result	Test passed

Environmental and real-life conditions

Aging

Temperature cycles	192
Result	Test passed

Needle-flame test

Time of exposure	30 s
Result	Test passed

Oscillation/broadband noise

Specification	DIN EN 50155 (VDE 0115-200):2022-06
Spectrum	Long life test category 2, bogie-mounted
Frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 (m/s²)²/Hz
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Result	Test passed

Shocks

Specification	DIN EN 50155 (VDE 0115-200):2018-05
Pulse shape	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Result	Test passed

PT 2,5-QUATTRO - Feed-through terminal block

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Ambient conditions

Ambient temperature (operation)	-60 °C ... 110 °C (Operating temperature range incl. self-heating; for max. short-term operating temperature, see RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (operation)	20 % ... 90 %
Permissible humidity (storage/transport)	30 % ... 70 %

Standards and regulations

Connection in acc. with standard	IEC 60947-7-1

Mounting

Mounting type	NS 35/7,5
	NS 35/15

PT 2,5-QUATTRO - Feed-through terminal block

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https://www.phoenixcontact.com/us/products/3209578

Drawings

Circuit diagram



Pheonix Contact 4 Pole Terminal Blocks

PT 2,5-QUATTRO - Feed-through terminal block

3209578

https://www.phoenixcontact.com/us/products/3209578

Approvals

To download certificates, visit the product detail page: https://www.phoenixcontact.com/us/products/3209578

CSA
Approval ID: 2030668

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
Use group B				
	600 V	20 A	26 - 12	-
Use group C				
	600 V	20 A	26 - 12	-

IECEE CB Scheme
Approval ID: DE1-66980

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
	800 V	24 A	-	0.2 - 2.5

EAC
Approval ID: RU C-DE.BL08.B.00644

cULus Recognized
Approval ID: E60425

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
Use group B				
	600 V	20 A	26 - 12	-
Use group C				
	600 V	20 A	26 - 12	-
Use group F				
	800 V	20 A	26 - 12	-

LR
Approval ID: LR2371832TA

NK
Approval ID: 22ME0007

BV
Approval ID: 25278/C1 BV

PT 2,5-QUATTRO - Feed-through terminal block

3209578

https://www.phoenixcontact.com/us/products/3209578

VDE approval of drawings
Approval ID: 40032222

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
	800 V	24 A	-	0.2 - 2.5

ABS
Approval ID: 21-2192245-PDA

NK
Approval ID: 14ME0912

DNV
Approval ID: TAE000010T

cUL Recognized
Approval ID: E192998

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
	550 V	20 A	26 - 12	-

EAC Ex
Approval ID: RU C-DE.AB72.B.02351

IECEx
Approval ID: IECExPTB10.0021U

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
Only flexible conductors	550 V	19 A	-	0.14 - 2.5
Only rigid conductors	550 V	23 A	-	0.14 - 4

UL Recognized
Approval ID: E192998

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
	550 V	20 A	26 - 12	-

ATEX
Approval ID: PTB09ATEX1111U

	Nominal voltage U_N	Nominal current I_N	Cross section AWG	Cross section mm^2
Only flexible conductors	550 V	19 A	-	0.14 - 2.5

PT 2,5-QUATTRO - Feed-through terminal block

3209578

https://www.phoenixcontact.com/us/products/3209578

Only rigid conductors	550 V	23 A	-	0.14 - 4

CCC
Approval ID: 2020322313000631

UKCA-EX
Approval ID: CSAE 22UKEX1096U

EAC Ex
Approval ID: KZ 7500525010101950

cULus Recognized

PT 2,5-QUATTRO - Feed-through terminal block

3209578

https://www.phoenixcontact.com/us/products/3209578

Classifications

ECLASS

ECLASS-11.0	27141120
ECLASS-13.0	27250101

ETIM

ETIM 9.0	EC000897

UNSPSC

UNSPSC 21.0	39121400

PT 2,5-QUATTRO - Feed-through terminal block

3209578

https://www.phoenixcontact.com/us/products/3209578

Environmental product compliance

EU RoHS

Fulfills EU RoHS substance requirements	Yes, No exemptions

China RoHS

Environment friendly use period (EFUP)	EFUP-E
	No hazardous substances above the limits

EU REACH SVHC

REACH candidate substance (CAS No.)	No substance above 0.1 wt%

EF3.0 Climate Change

CO2e kg	0.062 kg CO2e

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Phoenix Contact USA
586 Fulling Mill Road
Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

D-ST 2,5-QUATTRO - End cover

3030514

https://www.phoenixcontact.com/us/products/3030514

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End cover, depth: 29.1 mm, width: 2.2 mm, height: 72.2 mm, color: gray



Commercial data

Item number	3030514
Packing unit	50 pc
Minimum order quantity	50 pc
Sales key	BE29
Product key	BE2Z1X
Catalog page	Page 71 (C-1-2019)
GTIN	4017918187972
Weight per piece (including packing)	2.88 g
Weight per piece (excluding packing)	2.74 g
Customs tariff number	85389099
Country of origin	DE

D-ST 2,5-QUATTRO - End cover

3030514

https://www.phoenixcontact.com/us/products/3030514

Technical data

Product properties

Product type	End cover

Environmental and real-life conditions

Ambient conditions

Ambient temperature (operation)	-60 °C ... 110 °C (Operating temperature range incl. self-heating; for max. short-term operating temperature, see RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (operation)	20 % ... 90 %
Permissible humidity (storage/transport)	30 % ... 70 %

Material specifications

Color	gray (RAL 7042)
Material	PA
Flammability rating according to UL 94	V0
Static insulating material application in cold	-60 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Dimensions

Width	2.2 mm
Height	72.2 mm
Depth	29.1 mm

D-ST 2,5-QUATTRO - End cover

3030514

https://www.phoenixcontact.com/us/products/3030514

Classifications

ECLASS

ECLASS-11.0	27141133
ECLASS-12.0	27141133
ECLASS-13.0	27250301

ETIM

ETIM 9.0	EC000886

UNSPSC

UNSPSC 21.0	39121400

D-ST 2,5-QUATTRO - End cover

3030514

https://www.phoenixcontact.com/us/products/3030514

Environmental product compliance

EU RoHS

Fulfills EU RoHS substance requirements	Yes, No exemptions

China RoHS

Environment friendly use period (EFUP)	EFUP-E
	No hazardous substances above the limits

EU REACH SVHC

REACH candidate substance (CAS No.)	No substance above 0.1 wt%

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Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

NS 35/ 7,5 PERF 755MM - DIN rail perforated

1207640

https://www.phoenixcontact.com/us/products/1207640

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DIN rail perforated, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, Standard profile, color: silver

Commercial data

Item number	1207640
Packing unit	10 pc
Minimum order quantity	10 pc
Sales key	BE72
Product key	BE7244
Catalog page	Page 527 (C-3-2019)
GTIN	4017918932640
Weight per piece (including packing)	240 g
Weight per piece (excluding packing)	240 g
Customs tariff number	72166190
Country of origin	DE

NS 35/ 7,5 PERF 755MM - DIN rail perforated

1207640

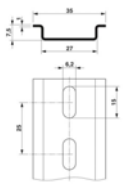
https://www.phoenixcontact.com/us/products/1207640

Technical data

Product properties

Product type	DIN rail

Dimensions

Dimensional drawing	
Width	35 mm
Hole width	15 mm
Hole height	6.2 mm
Depth	7.5 mm
Length	755 mm
Drill hole spacing	25 mm

Material specifications

Color	silver-colored
Material	Steel
Coating	galvanized, passivated with a thick layer

Standards and regulations

Connection in acc. with standard	IEC / EN
Tests	acc. to EN 60715

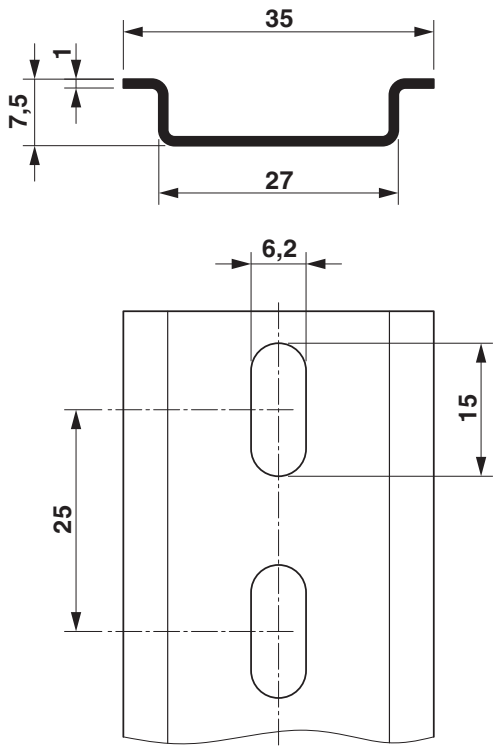
NS 35/ 7,5 PERF 755MM - DIN rail perforated

1207640

https://www.phoenixcontact.com/us/products/1207640

Drawings

Dimensional drawing



NS 35/ 7,5 PERF 755MM - DIN rail perforated

1207640

https://www.phoenixcontact.com/us/products/1207640

Classifications

ECLASS

ECLASS-11.0	27400602
ECLASS-13.0	27400602
ECLASS-12.0	27400602

ETIM

ETIM 9.0	EC001285

UNSPSC

UNSPSC 21.0	39121700

NS 35/ 7,5 PERF 755MM - DIN rail perforated

1207640

https://www.phoenixcontact.com/us/products/1207640

Environmental product compliance

EU RoHS

Fulfills EU RoHS substance requirements	Yes, No exemptions

China RoHS

Environment friendly use period (EFUP)	EFUP-E
	No hazardous substances above the limits

EU REACH SVHC

REACH candidate substance (CAS No.)	No substance above 0.1 wt%

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Middletown, PA 17057, United States
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IV Design Drawings

Page	Drawing
40	Electrical Schematics Title Page
41	Electrical Schematics General Information
42	Electrical Schematics Wiring Diagram
43	Ground CT Bracket & Hardware Assembly
44	Ground CT Installation View
45	Ground CT Orientation View
46	Ground CT Bracket Assembly
47	Ground CT Main Supporting Bracket
48	Ground CT Small Angled Bracket
49	Ground CT Bracket Support
50	Differential CT Mounting Assembly Overview
51	Differential CT Mounting Assembly
52	Differnetial CT Installation View
53	Differential CT Mounting Board
54	Lower CT Mounting Bracket
55	Upper CT Mounting Bracket

Drawing List

CLOUD HYPERION CT ADDITION

SYSTEM INFORMATION

PROJECT NUMBER:	425DK011
DESIGN ENGINEER:	JONATHAN D. MORTON
DATE DRAWN:	06/05/2025
DRAWING STATUS:	FOR INSTALLATION
DRAWING REVISION	2.0

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Mechanicsville, VA 23116

Carter CAT

DATE DRAWN	06/05/2025
PROJECT REFERENCE	
PROJECT NUMBER	425DK011
DESIGN ENGINEER	Jonathan D. Morton
STATUS	FOR REVIEW
REVISION	2

CLOUD HYPERION

CT ADDITION

TITLE PAGE

DRAWING NUMBER: CMCO-CHCT-G01

SHEET NUMBER: 1 OF 3

DRAWING REVISION HISTORY

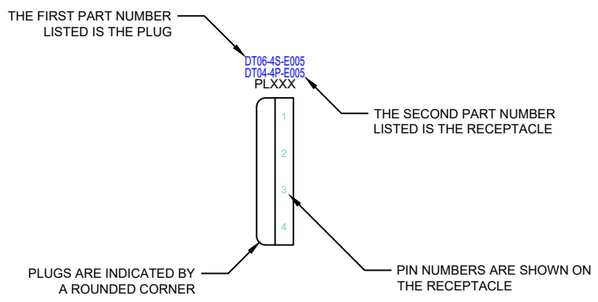
DRAWING REVISIONS			
REVISION	DESCRIPTION	AFFECTED PAGE(S)	DATE
1.0	INITIAL DRAFT	ALL	3/10/2025
1.3	UPDATE OF SCHEMATICS & BLOCK USAGE	ALL	4/16/2025
2.0	UPDATED CT CONTROL WIRING	S01	6/5/2025

QTY	PART NUMBER	MANUFACTURER	PART DESCRIPTION
1	EI-30CT06DR	ELECTRO INDUSTRIES	6 POLE CT SHORTING BLOCK
1	EI-30CT04DR	ELECTRO INDUSTRIES	4 POLE CT SHORTING BLOCK
2	800886	PHEONIX CONTACT	DIN RAIL END ANCHORS
1	1207640	PHEONIX CONTACT	7" SECTION OF DINRAIL

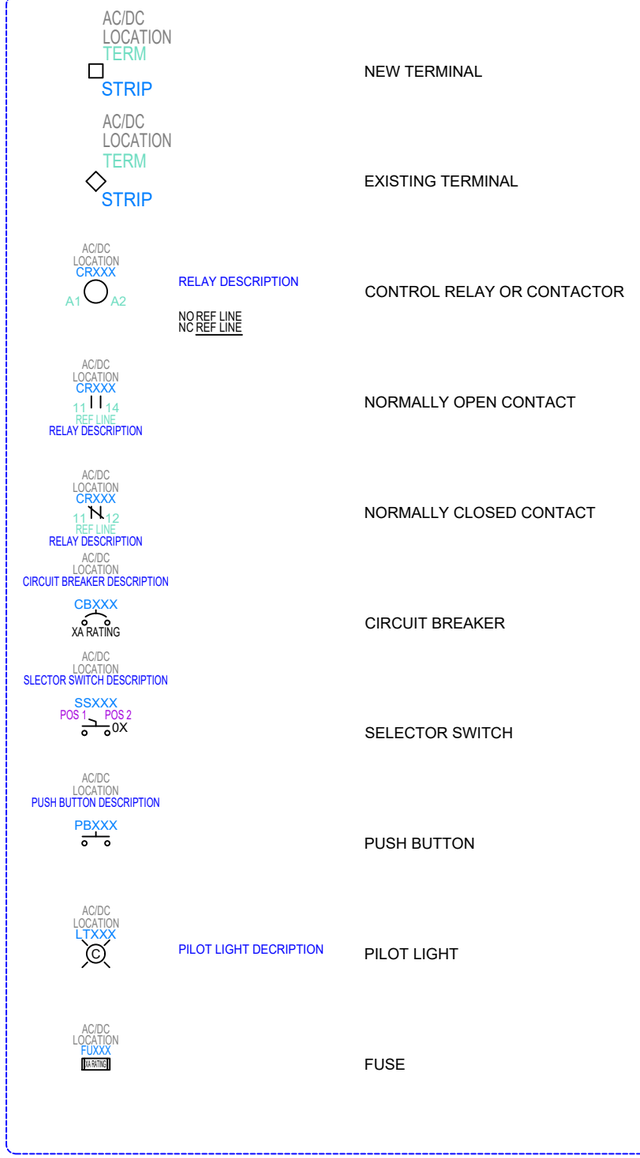
WIRE LAYER DEFINITIONS

- NEW PRE INSTALLED WIRE
- NEW FIELD INSTALLED WIRE
- NEW PRE INSTALLED DOOR WIRE
- NEW FIELD TERMINATED DOOR WIRE
- DC+ COMMON JUMPER
- DC- COMMON JUMPER
- TERMINAL JUMPER
- EXISTING FIELD WIRE/WIRE BY OTHERS
- CAT 6 INTERNAL CABLE
- CAT 6 FIELD CABLE
- CAT 6 DOOR CABLE
- TWISTED INTERNAL WIRES
- TWISTED FIELD WIRES
- TWISTED DOOR WIRES

PLUG/RECEPTACLE CONNECTOR NOTES



BASIC SYMBOL LEGEND



NOTES:

1) ALL UNMARKED WIRES SHALL BE #16 AWG GRAY WIRE.
2) WHITE TERMINAL MARKERS AND WIRE LABELS INDICATE AC POTENTIAL AND ARE REPRESENTED WITH DASHES ON THE WIRE NUMBERS (-XXXX-) IN THE SCHEMATICS; YELLOW TERMINAL MARKERS AND WIRE LABELS INDICATE DC POTENTIAL AND ARE REPRESENTED WITHOUT DASHES ON THE WIRE NUMBERS (XXXX) IN THE SCHEMATICS;

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DATE DRAWN	06/05/2025
PROJECT REFERENCE	
PROJECT NUMBER	425DK011
DESIGN ENGINEER	Jonathan D. Morton
DRAWN BY	FOR REVIEW
REVISION	2

CLOUD HYPERION

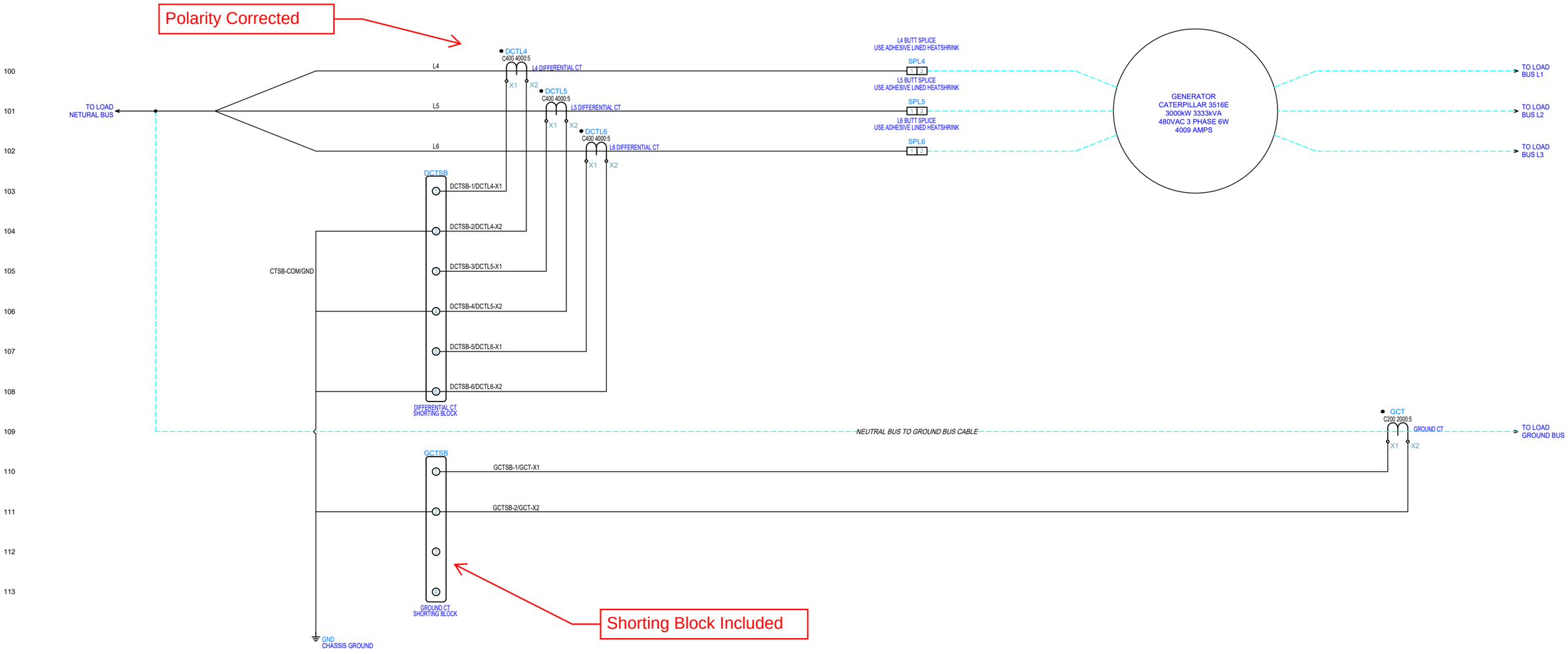
CT ADDITION

GENERAL NOTES

DRAWING NUMBER: CMCO-CHCT-G02

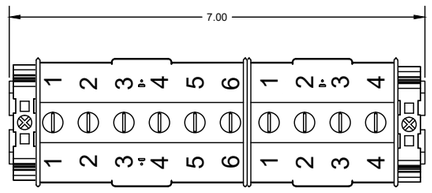
SHEET NUMBER: 2 OF 3

Polarity Corrected



Shorting Block Included

TERMINAL STRIP DETAILS



NOTES

A) ALL WIRING SHALL BE 14 AWG GRAY SIS UNLESS OTHERWISE SPECIFIED.

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DATE DRAWN	06/05/2025
PROJECT REFERENCE	
PROJECT NUMBER	425DK011
DESIGN ENGINEER	Jonathan D. Morton
DRAWN BY	FOR REVIEW
REVISION	2

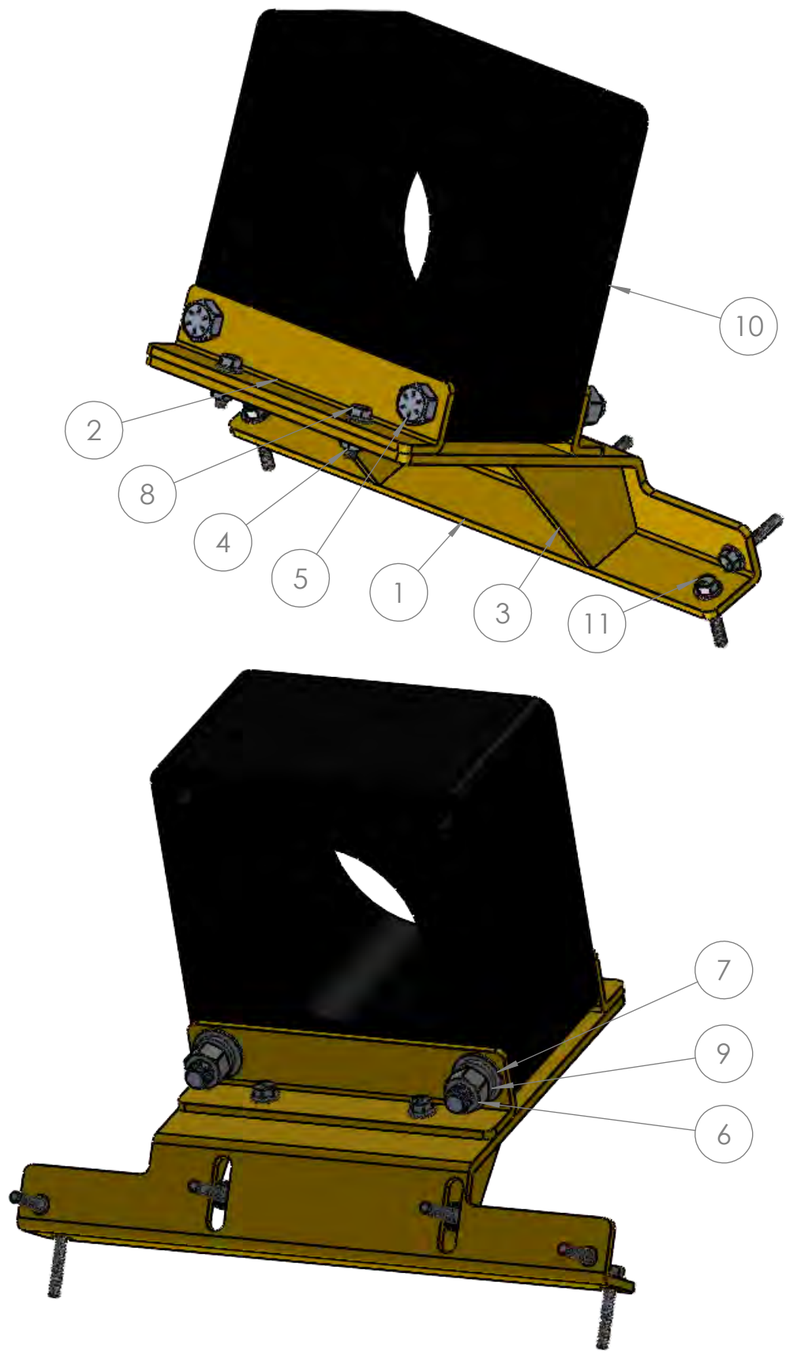
CLOUD HYPERION

CT ADDITION

ELECTRICAL SCHEMATICS

DRAWING NUMBER: CMCO-CHCT-S01

SHEET NUMBER: 3 OF 3

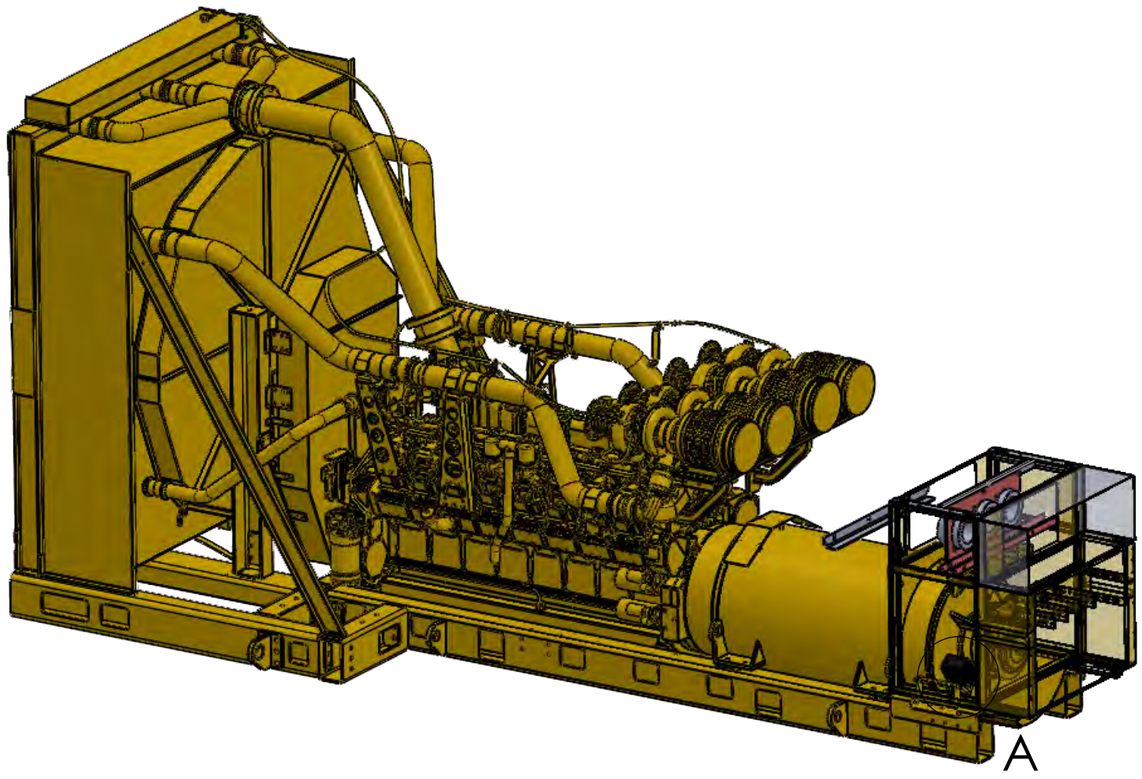


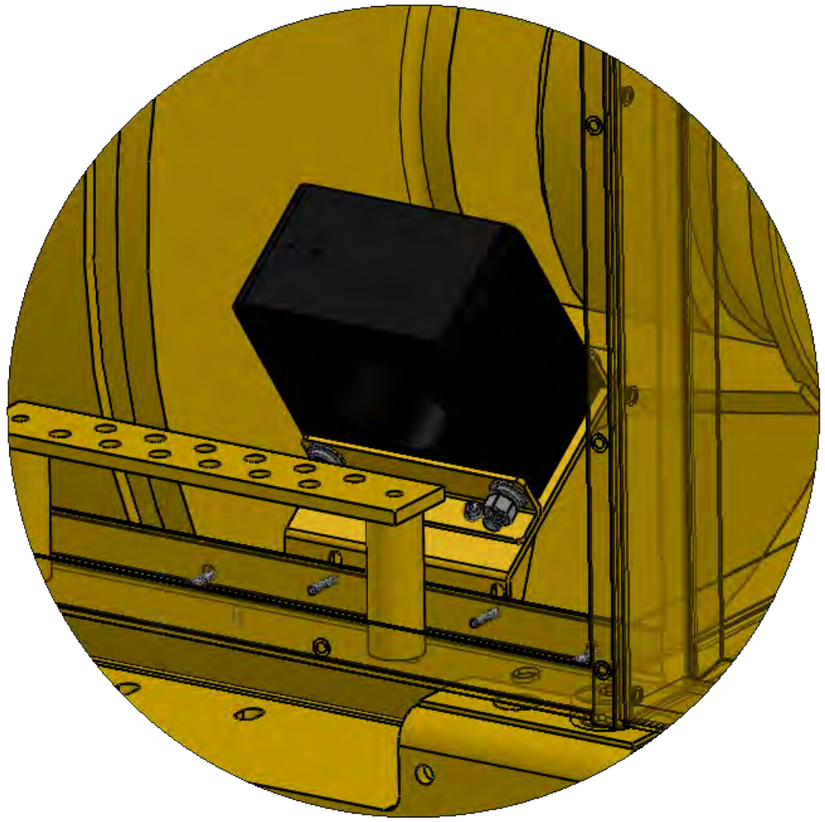
ITEM NO.	Source	External Vendor	Material	PART NUMBER	DESCRIPTION	QTY.
1	Specialty's Our Name (SON)	N/A	3/16" CRS Sheet Metal	CMCO-CLHQ-MP02	MAIN SUPPORTING BRACKET	1
2	Specialty's Our Name (SON)	N/A	3/16" CRS Sheet Metal	CMCO-CLHQ-MP01	SMALL ANGLED BRACKET	2
3	Specialty's Our Name (SON)	N/A	3/16" CRS Sheet Metal	CMCO-CLHQ-MP03	BRACKET SUPPORT	2
4	MCMASTER-CARR	N/A	Steel	90593A005	WELDED ON Black-Oxide Steel Hex Nut	4
5	MCMASTER-CARR	N/A	Steel	92620A730	Zinc Yellow-Chromate Plated Hex Head Screw	2
6	MCMASTER-CARR	N/A	Steel	95462A033	Medium-Strength Steel Hex Nut	2
7	MCMASTER-CARR	N/A	Steel	98023A033	Zinc Yellow-Chromate Plated Grade 8 Steel Washer	2
8	MCMASTER-CARR	N/A	Steel	98093A440	Black-Phosphate Class 10.9 Steel Screw	4
9	MCMASTER-CARR	N/A	Steel	91102A770	Zinc-Plated Steel Split Lock Washer	2
10	Flexcore	N/A	Various	ct model	Ground Current Transformer	1
11	MCMASTER-CARR	N/A	Steel	90386A105	Medium-Strength Serrated-Flange Hex Head Screws	6

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Mechanicsville, VA 23116

PART NUMBER:	CMCO-CLHQ-MA99	DATE DRAWN:	June 03, 2025	CT Bracket	
PART DESCRIPTION:	Full Bracket Assembly	REFERENCE:	CT Bracket	CMCO-CLHQ-MA99	
MATERIAL:		PROJECT NUMBER:		Full Bracket Assembly	
FINISH:	CAT Yellow Powder Coat	DRAWN BY:	M. Galvin	DRAWING NUMBER	SHEET NUMBER: 1 OF 3
SOURCE:	Speciaty's Our Name (SON)	REVISION:	FOR CONSTRUCTION		
EXTERNAL VENDOR:		SCALE:	1:3		





DETAIL A

SCALE 1 : 4

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8346 Old Richfood Road
Mechanicsville, VA 23116

PART NUMBER:	CMCO-CLHQ-MA99
PART DESCRIPTION:	Full Bracket Assembly
MATERIAL:	
FINISH:	CAT Yellow Powder Coat
SOURCE:	Specialty's Our Name (SON)
EXTERNAL VENDOR:	

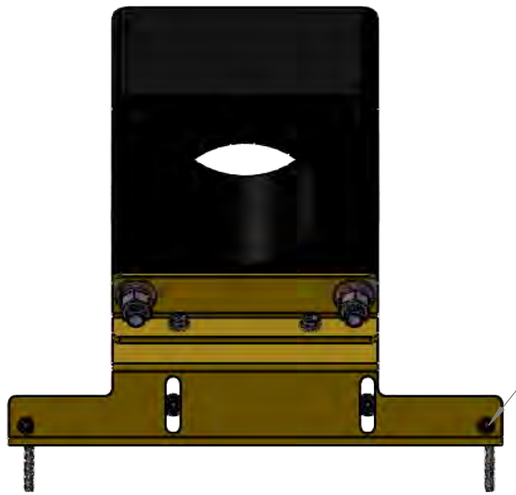
DATE DRAWN:	June 03, 2025
REFERENCE:	CT Bracket
PROJECT NUMBER:	
DRAWN BY:	M. Galvin
REVISION:	FOR CONSTRUCTION
SCALE:	1:40

CT Bracket
CMCO-CLHQ-MA99
Full Bracket Assembly

DRAWING NUMBER

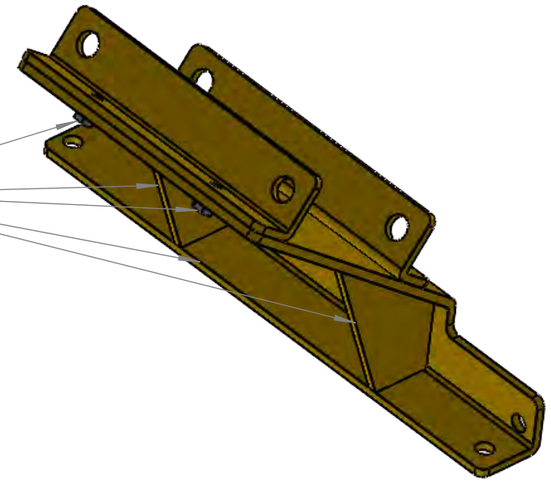
SHEET NUMBER 2 OF 3

THIS SIDE FACING OUTWARDS



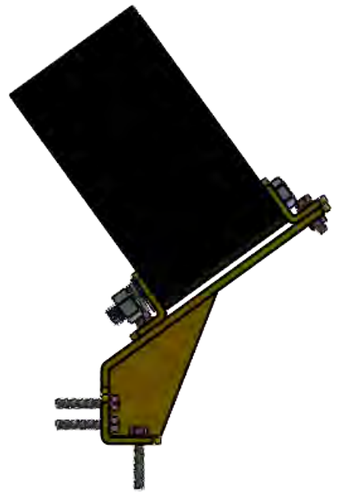
M6 BOLTS (X6)

CMCO-CLHQ-M



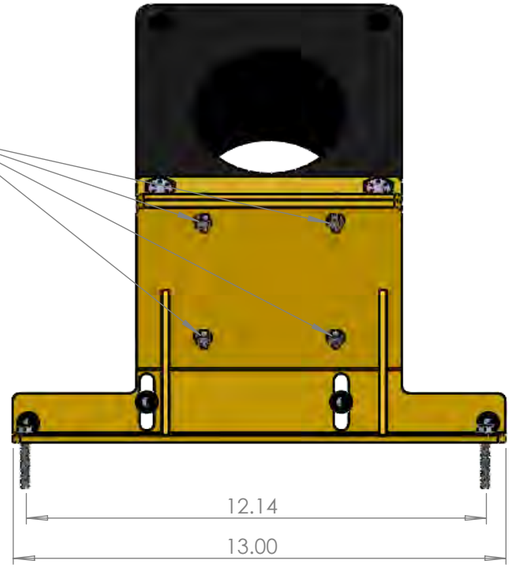
PRE-ASSEMBLED

FACING OUT



FACING IN

THIS SIDE FACING INWARDS



WELDED NUTS

12.14

13.00

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Mechanicsville, VA 23116

PART NUMBER:	CMCO-CLHQ-MA99
PART DESCRIPTION:	Full Bracket Assembly
MATERIAL:	
FINISH:	CAT Yellow Powder Coat
SOURCE:	Specialty's Our Name (SON)
EXTERNAL VENDOR:	

Carter CAT

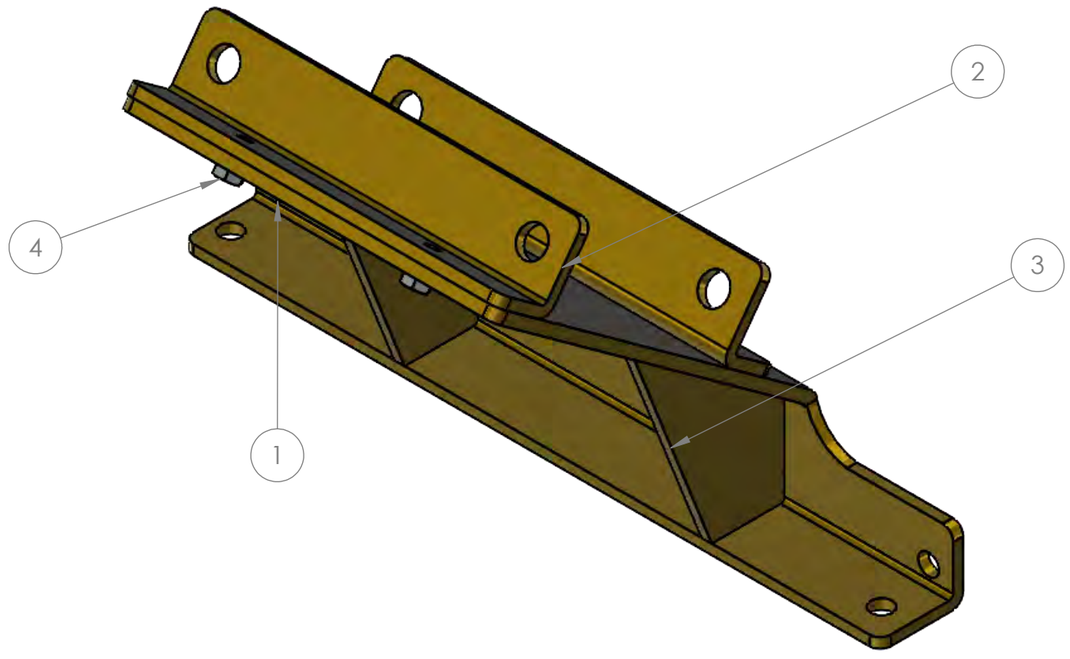
DATE DRAWN:	June 03, 2025
REFERENCE:	CT Bracket
PROJECT NUMBER:	
DRAWN BY:	M. Galvin
REVISION:	FOR CONSTRUCTION
SCALE:	1:4

CT Bracket
CMCO-CLHQ-MA99
Full Bracket Assembly

DRAWING NUMBER

SHEET NUMBER 3 OF 3

Item No.	Source	External Vendor	Material	Part No	Part Desc	QTY
1	Specialty's Our Name (SON)	N/A	3/16" CRS Sheet Metal	CMCO-CLHQ-MP02	Main Supporting Bracket	1
2	Specialty's Our Name (SON)	N/A	3/16" CRS Sheet Metal	CMCO-CLHQ-MP01	Small Angled Bracket	2
3	Specialty's Our Name (SON)	N/A	3/16" CRS Sheet Metal	CMCO-CLHQ-MP03	Bracket Support	2
4	MCMASTER-CARR	N/A	Steel	90593A005	M6 Hex Nut	4



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Mechanicsville, VA 23116

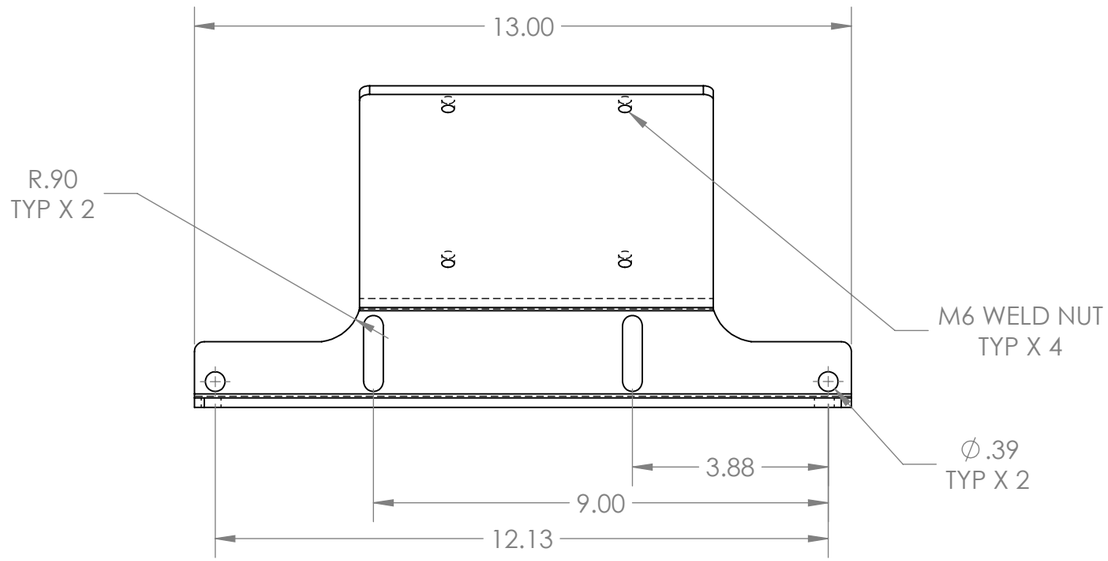
PART NUMBER:	CMCO-CLHQ-MA99
PART DESCRIPTION:	Full Bracket Assembly
MATERIAL:	
FINISH:	CAT Yellow Powder Coat
SOURCE:	Specialty's Our Name (SON)
EXTERNAL VENDOR:	

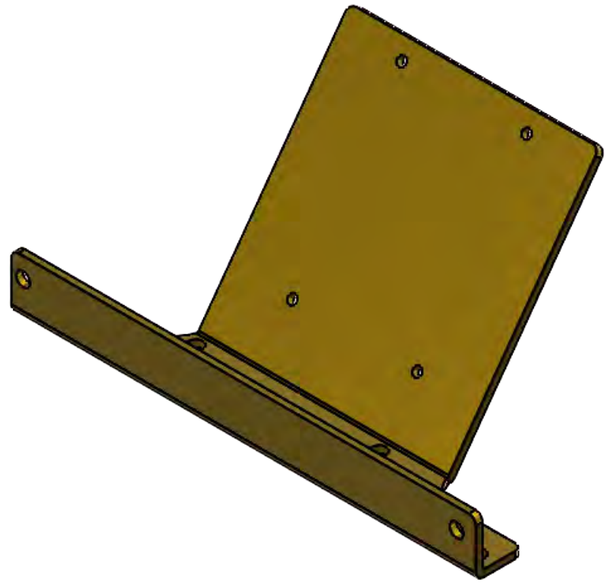
DATE DRAWN:	1/22/2025
REFERENCE:	CT Bracket
PROJECT NUMBER:	--
DRAWN BY:	R. Burke
REVISION:	FOR CONSTRUCTION
SCALE:	1:1

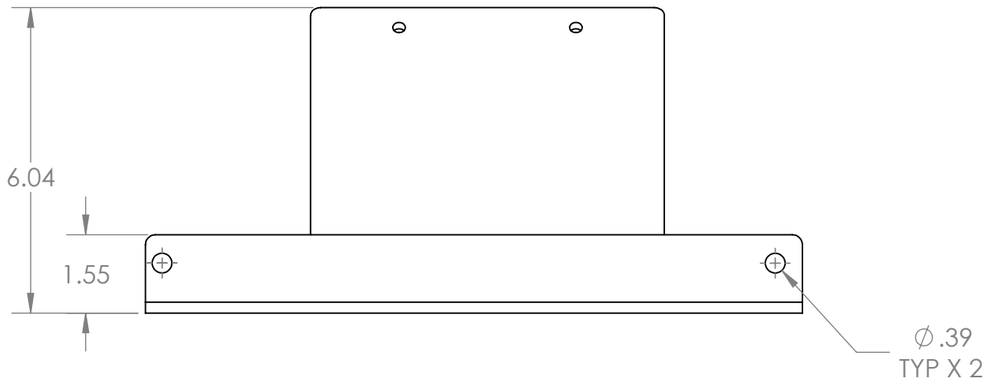
CT Bracket
CMCO-CLHQ-MA99
Full Bracket Assembly

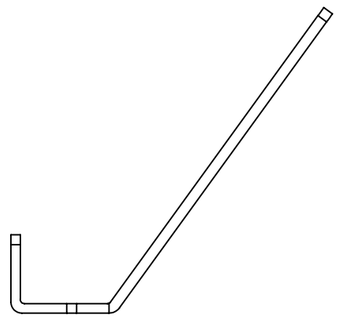
DRAWING NUMBER

SHEET NUMBER 1 OF 4









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8346 Old Richfood Road
Mechanicsville, VA 23116

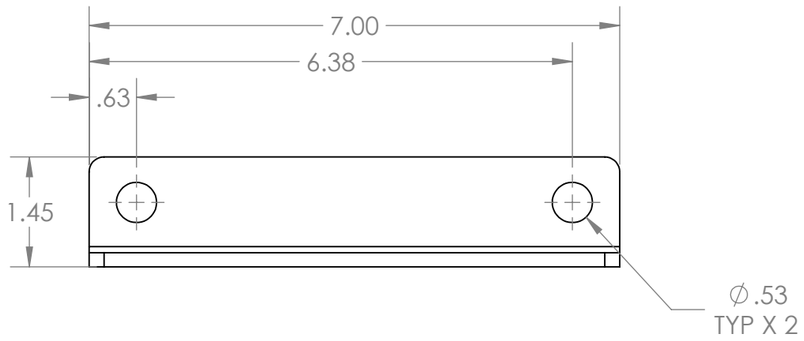
PART NUMBER:	CMCO-CLHQ-MP02
PART DESCRIPTION:	Main Supporting Bracket
MATERIAL:	3/16" CRS Sheet Metal
FINISH:	CAT Yellow Powder Coat
SOURCE:	Specialty's Our Name (SON)
EXTERNAL VENDOR:	N/A

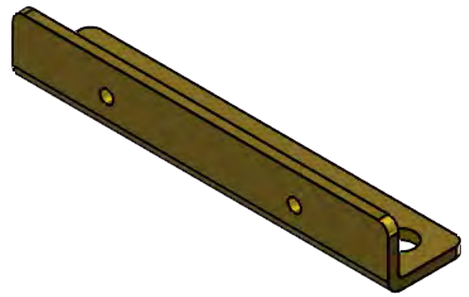
DATE DRAWN:	1/22/2025
REFERENCE:	CT Bracket
PROJECT NUMBER:	--
DRAWN BY:	R. Burke
REVISION:	FOR CONSTRUCTION
SCALE:	1:3

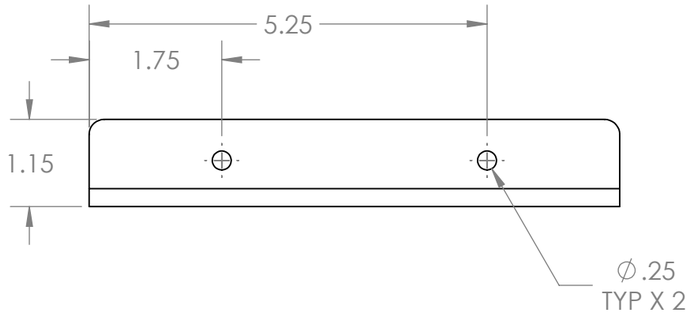
CT Bracket
CMCO-CLHQ-MP02
Main Supporting Bracket

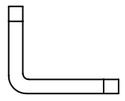
DRAWING NUMBER

SHEET NUMBER 2 OF 4









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Carter Machinery Engineering Services
8346 Old Richfood Road
Mechanicsville, VA 23116

PART NUMBER:	CMCO-CLHQ-MP01
PART DESCRIPTION:	Small Angled Bracket
MATERIAL:	3/16" CRS Sheet Metal
FINISH:	CAT Yellow Powder Coat
SOURCE:	Specialty's Our Name (SON)
EXTERNAL VENDOR:	N/A

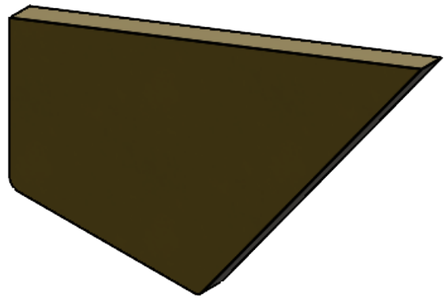
DATE DRAWN:	1/22/2025
REFERENCE:	CT Bracket
PROJECT NUMBER:	--
DRAWN BY:	R. Burke
REVISION:	FOR CONSTRUCTION
SCALE:	1:2

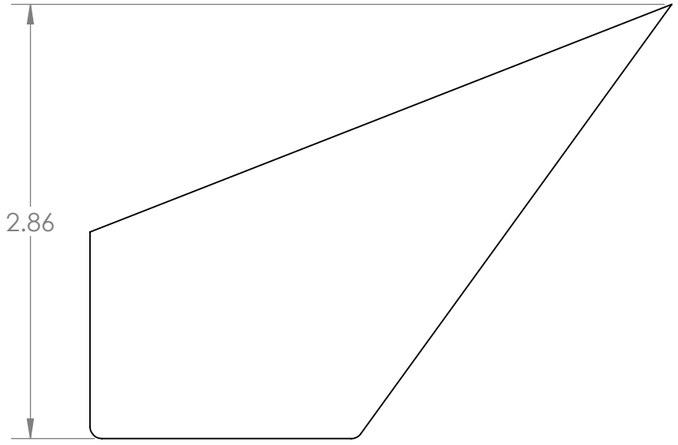
CT Bracket
CMCO-CLHQ-MP01
Small Angled Bracket

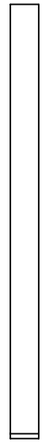
DRAWING NUMBER

SHEET NUMBER 3 OF 4









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Carter Machinery Engineering Services
8346 Old Richfood Road
Mechanicsville, VA 23116

PART NUMBER:	CMCO-CLHQ-MP03
PART DESCRIPTION:	Bracket Support
MATERIAL:	3/16" CRS Sheet Metal
FINISH:	CAT Yellow Powder Coat
SOURCE:	Specialty's Our Name (SON)
EXTERNAL VENDOR:	N/A

DATE DRAWN:	1/22/2025
REFERENCE:	CT Bracket
PROJECT NUMBER:	--
DRAWN BY:	R. Burke
REVISION:	FOR CONSTRUCTION
SCALE:	1:1

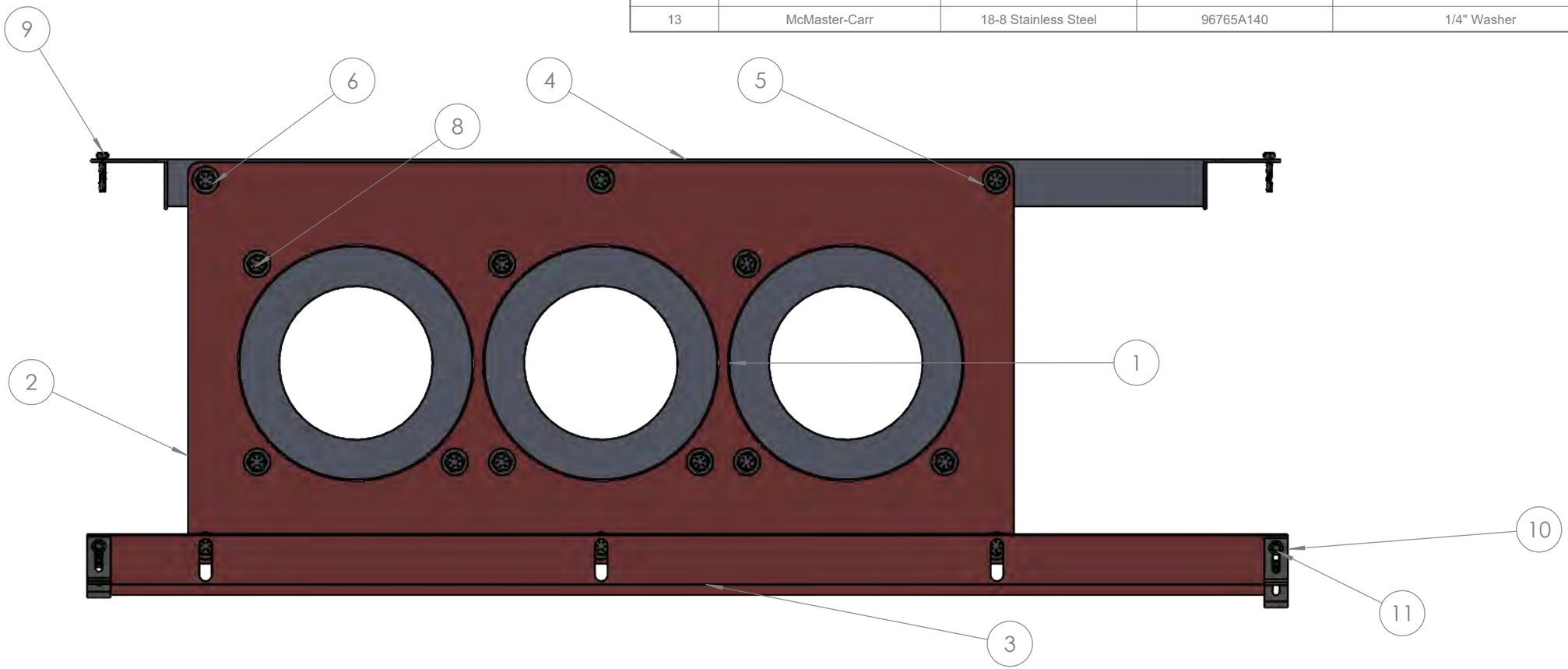
CT Bracket
CMCO-CLHQ-MP03
Bracket Support

DRAWING NUMBER

SHEET NUMBER 4 OF 4

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	Initial Design and Draft	3/7/2025	
B	Updated lower bracket mounts	3/10/2025	
C	Updated drawing dimension callouts	3/26/2025	
D	Updaed design to match field installation	4/24/2025	

Item No.	Source	Material	Part No	Part Desc	QTY
1	Amran	Various	CT103-402	Differential Current Transformer	3
2	TBD	GPO3 Glastic	DCTMB	CT Mounting Board	1
3	TBD	GPO3 Glastic	LCTMB	Lower CT Mounting Bracket	1
4	TBD	Mild Steel	UCTMB	Upper CT Mounting Bracket	1
5	McMaster-Carr	Steel	98029A033	Fender Washers	27
6	McMaster-Carr	Steel	91268A436	1/2"-13x1.5" Bolt	6
7	McMaster-Carr	Steel	97135A423	1/2"-13 Nylock Nut	15
8	McMaster-Carr	Steel	91268A446	1/2"-13 x 3" Bolt	9
9	McMaster-Carr	Steel	90386A105	M6-1.00 x 35mm	8
10	McMaster-Carr	6061 Aluminum	2313N794	Corner Machine Bracket	8
11	McMaster-Carr	Steel	90409A113	Flange Head 1/4-20 Bolt	8
12	McMaster-Carr	Steel	97135A414	1/4-20 Nylock	8
13	McMaster-Carr	18-8 Stainless Steel	96765A140	1/4" Washer	8



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Carter Machinery Engineering Services
8346 Old Richfood Road
Mechanicsville, VA 23116

PART NUMBER:	DCTMA3516E
PART DESCRIPTION:	3516E Differential CT Mounting Assembly
MATERIAL:	Various
FINISH:	Various
SOURCE:	Various
EXTERNAL VENDOR:	Various

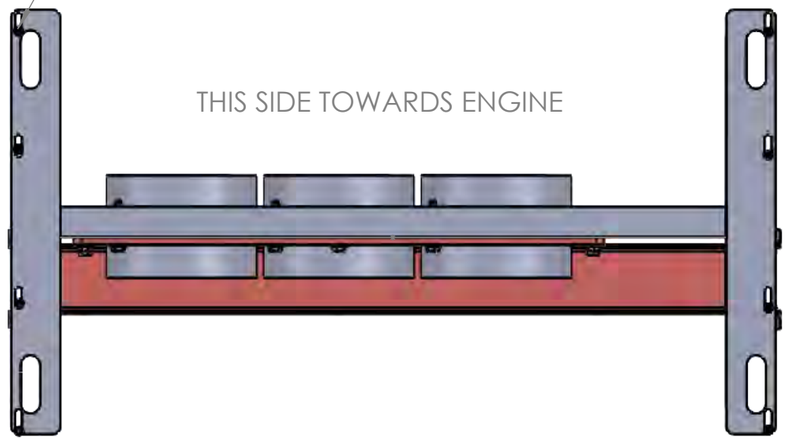
DATE DRAWN:	03/07/25
REFERENCE:	Cloud Differential CT's
PROJECT NUMBER:	425DK011
DRAWN BY:	J. Morton
REVISION:	D
SCALE:	1:5

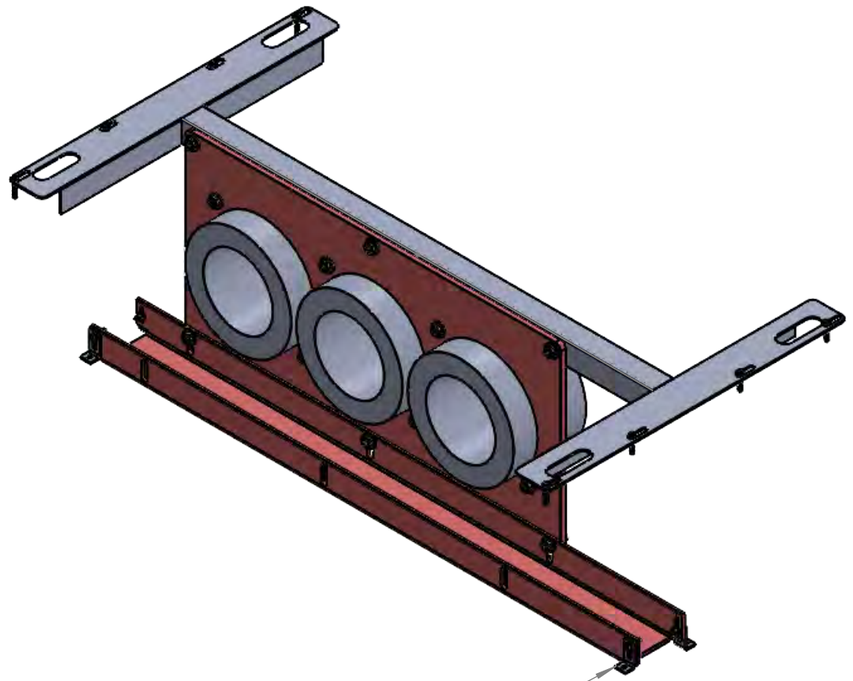
Cloud Differential CT's
DCTMA3516E
3516E Differential CT Mounting Assembly

DRAWING NUMBER: DCTMA3516E-MD01

SHEET NUMBER: 1 OF 6

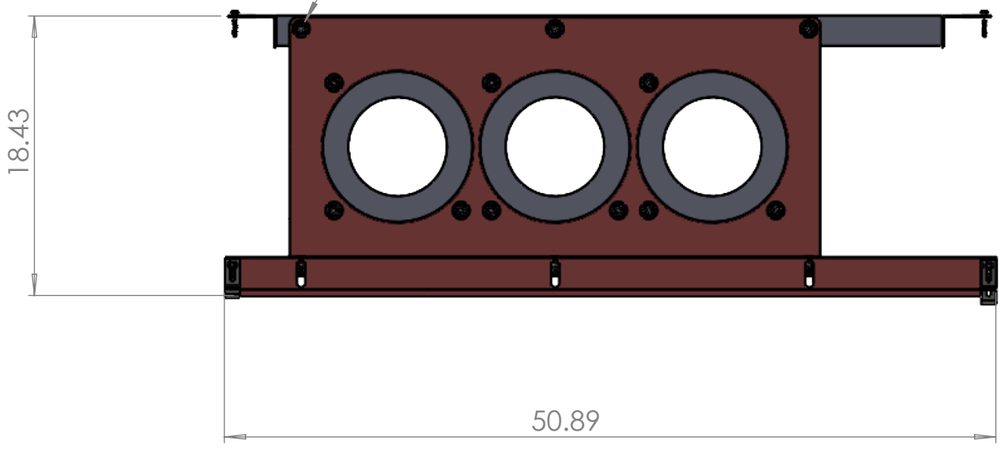
Included M6 Bolts to replace OEM CAT Bolts

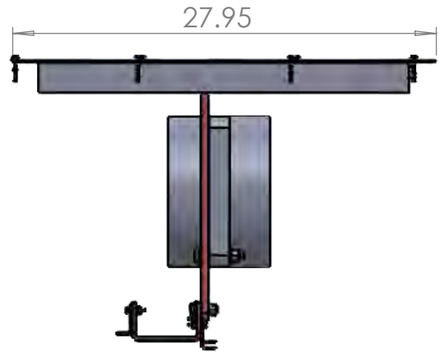




L brackets to be used for securing cross bar

Provided 1/2" Mounting Bolts for CT Board and CT's





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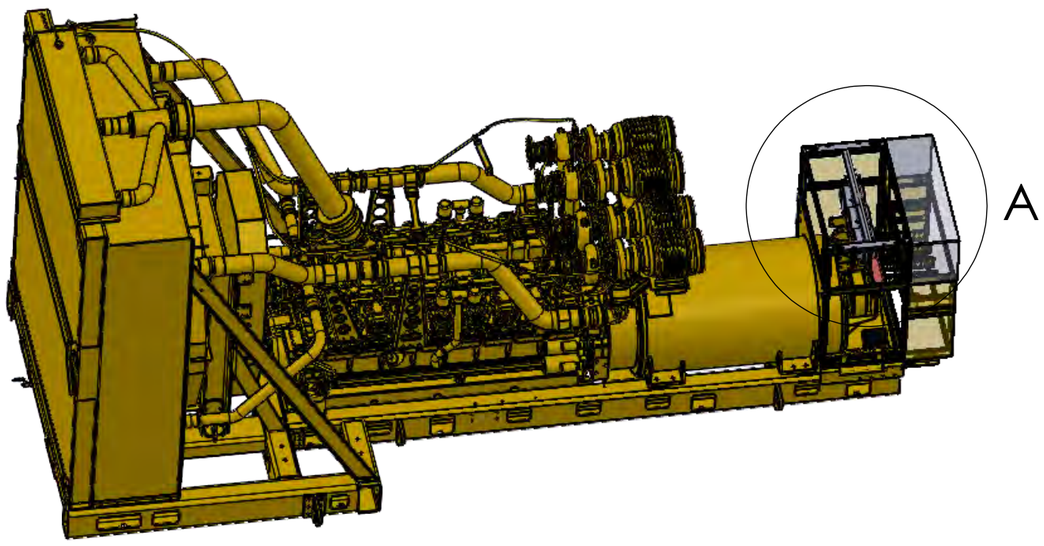
PART NUMBER:	DCTMA3516E
PART DESCRIPTION:	3516E Differential CT Mounting Assembly
MATERIAL:	Various
FINISH:	Various
SOURCE:	Various
EXTERNAL VENDOR:	Various

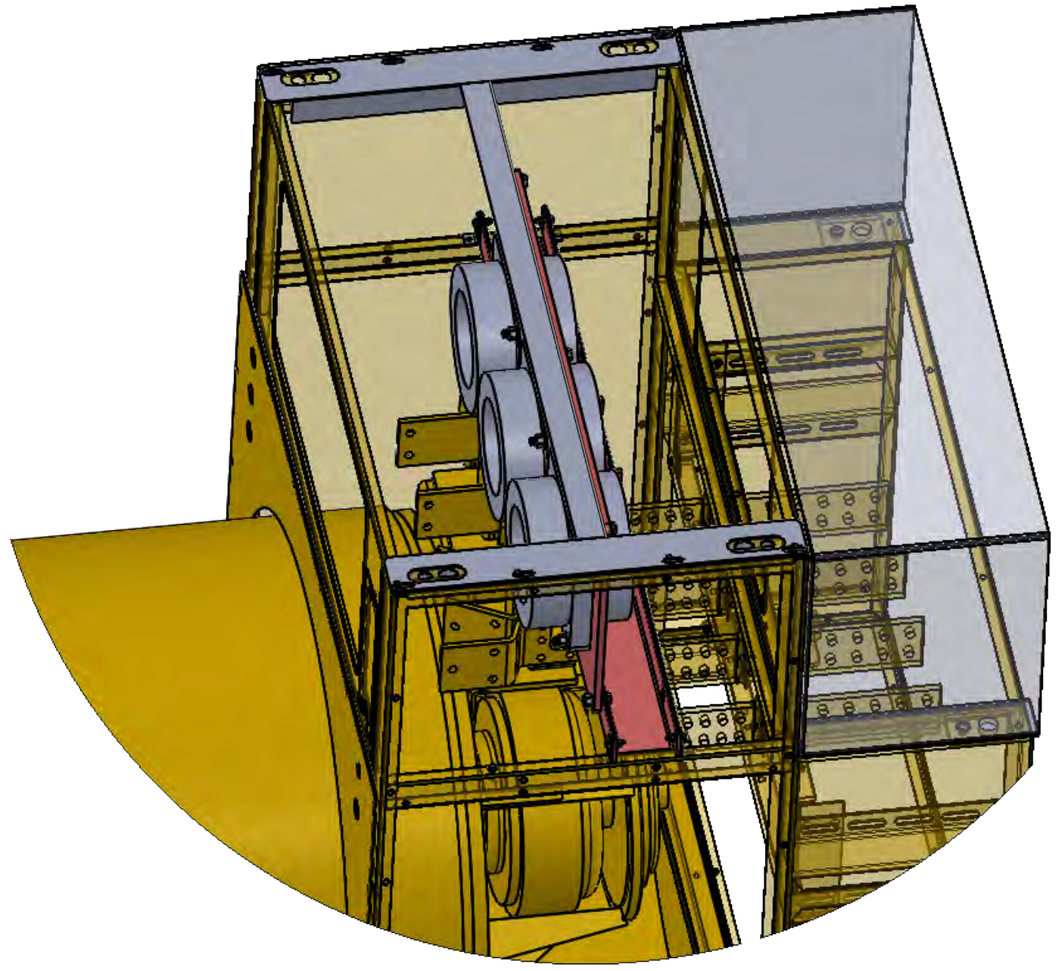
DATE DRAWN:	03/07/25
REFERENCE:	Cloud Differential CT's
PROJECT NUMBER:	425DK011
DRAWN BY:	J. Morton
REVISION:	D
SCALE:	1:10

Cloud Differential CT's
DCTMA3516E
3516E Differential CT Mounting Assembly

DRAWING NUMBER: DCTMA3516E-MD02

SHEET NUMBER: 2 OF 6





DETAIL A

SCALE 1 : 10

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Carter Machinery Engineering Services
8346 Old Richfood Road
Mechanicsville, VA 23116

PART NUMBER:	DCTMA3516E
PART DESCRIPTION:	3516E Differential CT Mounting Assembly
MATERIAL:	Various
FINISH:	Various
SOURCE:	Various
EXTERNAL VENDOR:	Various

DATE DRAWN:	03/07/25
REFERENCE:	Cloud Differential CT's
PROJECT NUMBER:	425DK011
DRAWN BY:	J. Morton
REVISION:	D
SCALE:	1:50

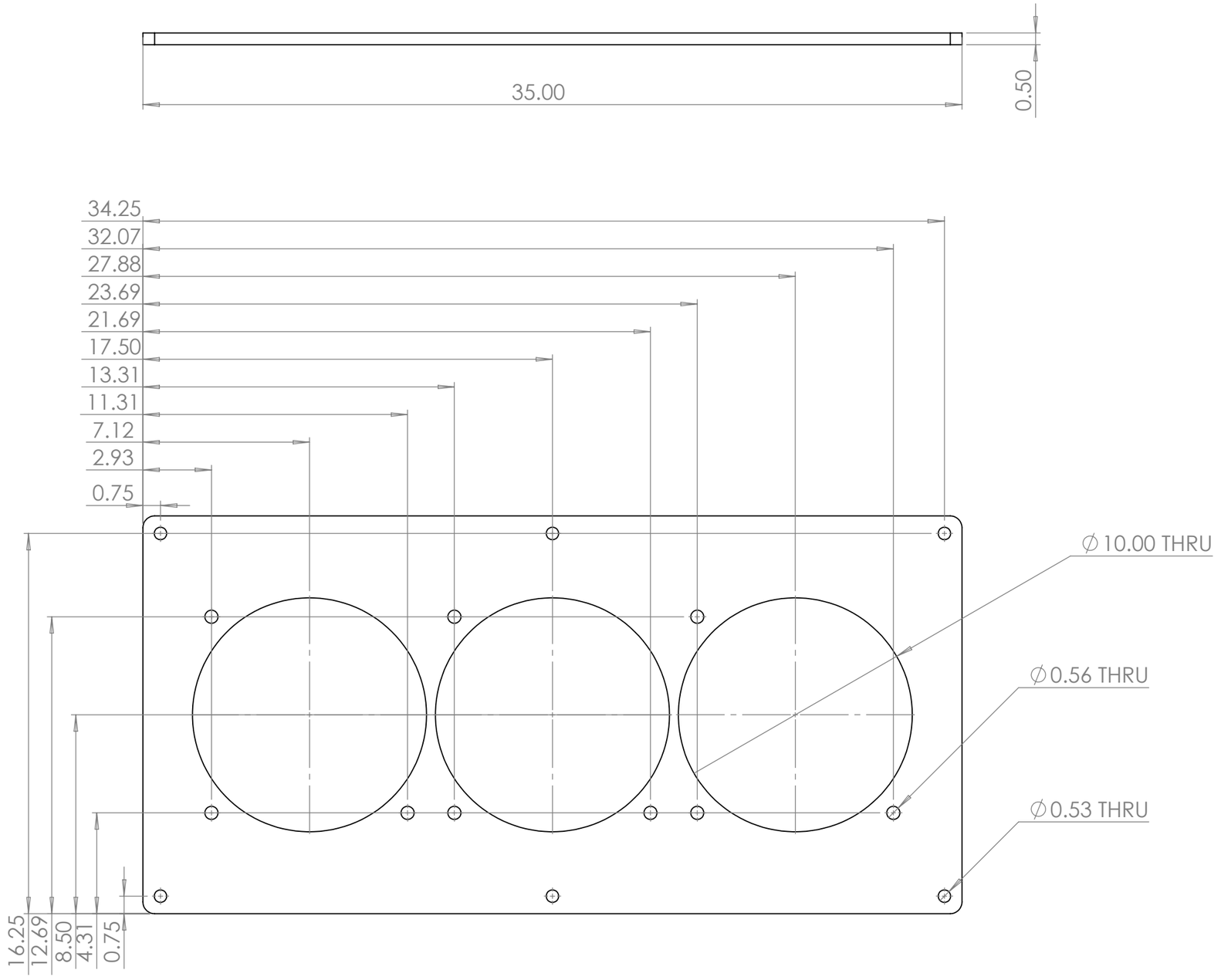
Cloud Differential CT's

DCTMA3516E

3516E Differential CT Mounting Assembly

DRAWING NUMBER: DCTMA31E-PAV

SHEET NUMBER: 3 OF 6



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Carter Machinery Engineering Services
8346 Old Richfood Road
Mechanicsville, VA 23116

PART NUMBER:	DCTMB
PART DESCRIPTION:	Differential CT Mounting Board
MATERIAL:	GPO3 Glastic
FINISH:	None
SOURCE:	Various
EXTERNAL VENDOR:	Various

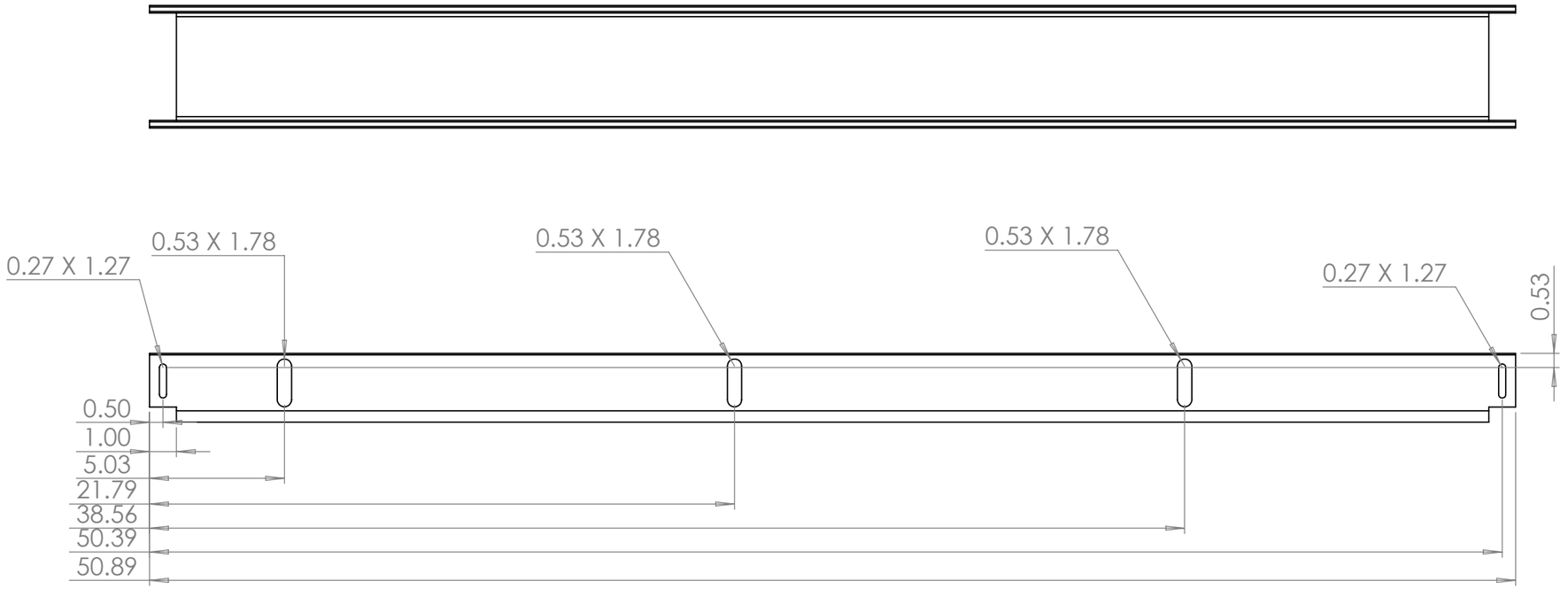
DATE DRAWN:	03/07/25
REFERENCE:	Cloud Differential CT's
PROJECT NUMBER:	425DK011
DRAWN BY:	J. Morton
REVISION:	D
SCALE:	1:5

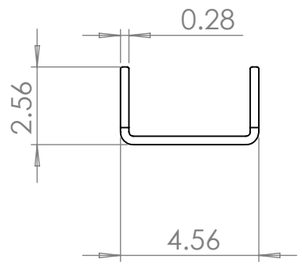
Cloud Differential CT's
DCTMA3516E
3516E Differential CT Mounting Board

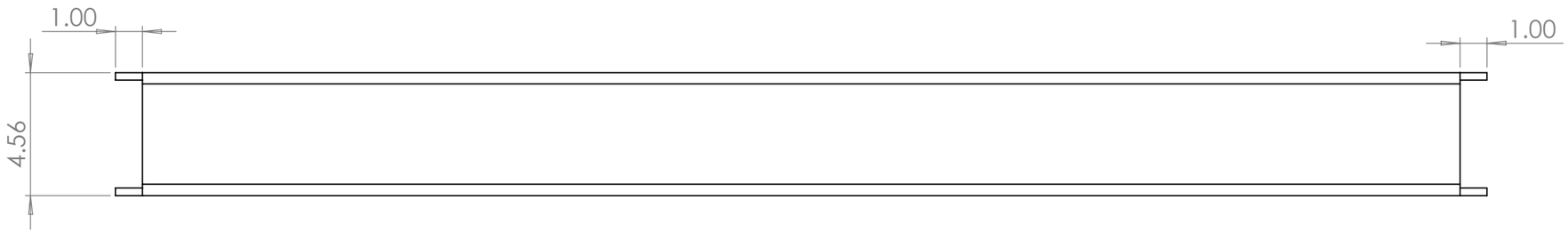
DRAWING NUMBER: DCTMA3516E-MD03

SHEET NUMBER: 4 OF 6

Slots to be machines in both sides of this piece.







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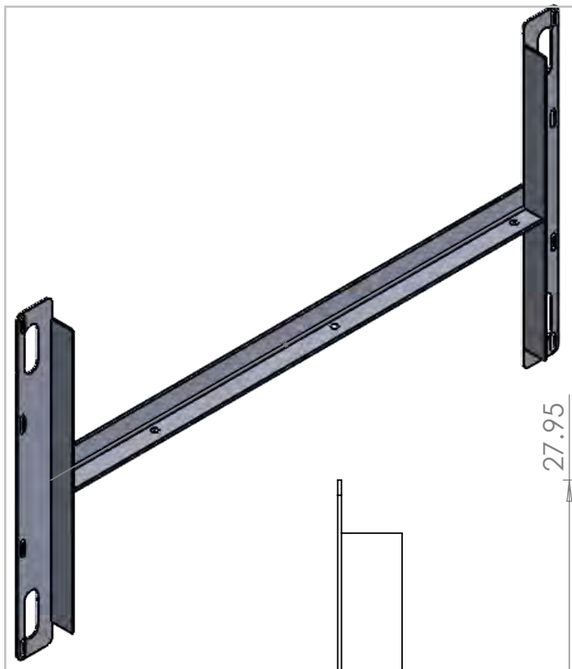
PART NUMBER:	LCTMB
PART DESCRIPTION:	Lower CT Mounting Bracket
MATERIAL:	GPO3 Glastic
FINISH:	None
SOURCE:	Various
EXTERNAL VENDOR:	Various

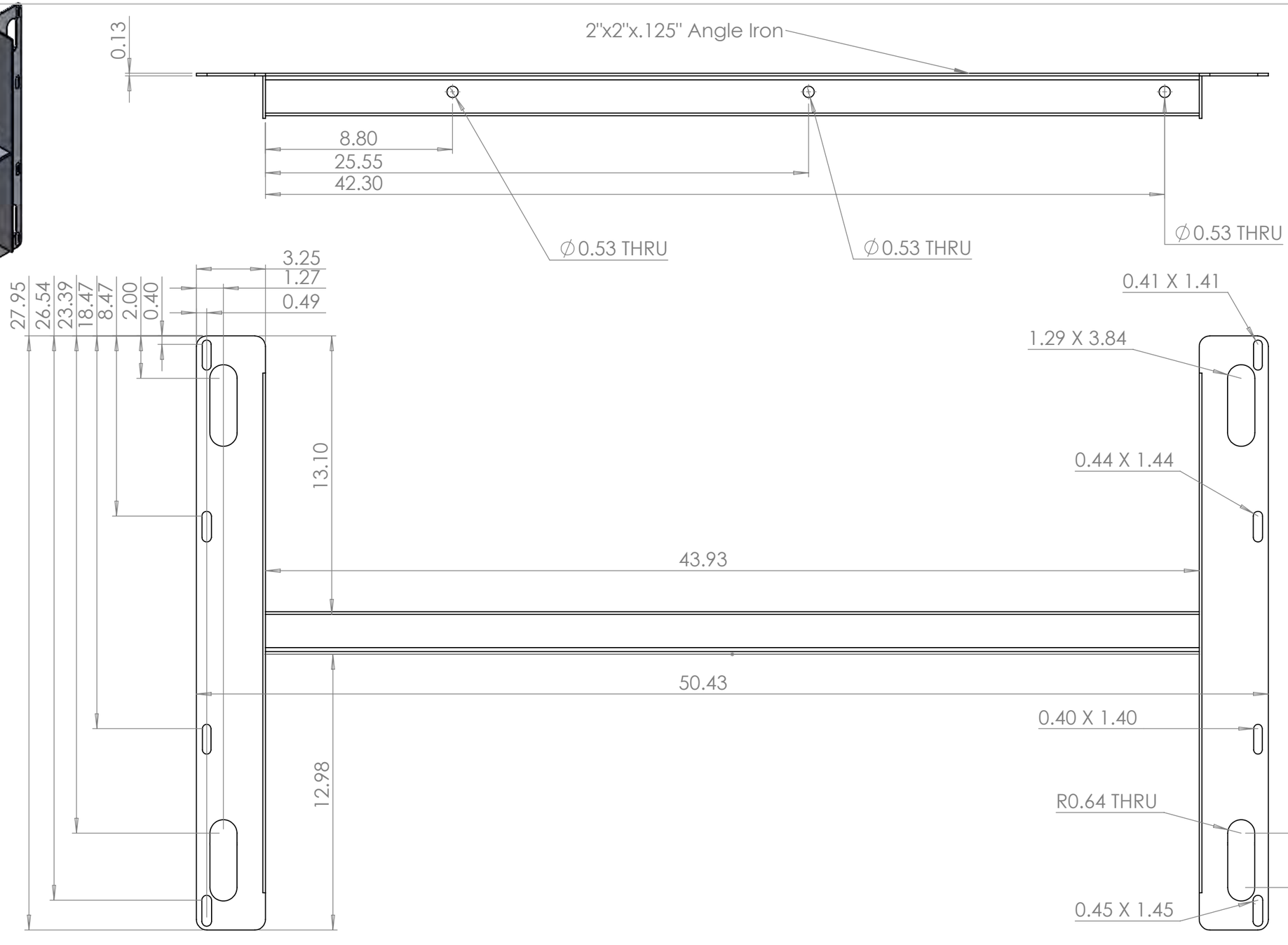
DATE DRAWN:	03/07/25
REFERENCE:	Cloud Differential CT's
PROJECT NUMBER:	425DK011
DRAWN BY:	J. Morton
REVISION:	D
SCALE:	1:5

Cloud Differential CT's
LCTMB
3516E Lower CT Mounting Bracket

DRAWING NUMBER: DCTMA3516E-MD04

SHEET NUMBER: 5 OF 6





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Carter Machinery Engineering Services
8346 Old Richfood Road
Mechanicsville, VA 23116

PART NUMBER:	UCTMB
PART DESCRIPTION:	Upper CT Mounting Bracket
MATERIAL:	Mild Steel
FINISH:	CAT Yellow Powdercoat
SOURCE:	Various
EXTERNAL VENDOR:	Various

DATE DRAWN:	03/07/25
REFERENCE:	Cloud Differential CT's
PROJECT NUMBER:	425DK011
DRAWN BY:	J. Morton
REVISION:	D
SCALE:	1:5

Cloud Differential CT's
UCTMB
3516E Upper CT Mounting Brackets

DRAWING NUMBER: DCTMA3516E-MD05

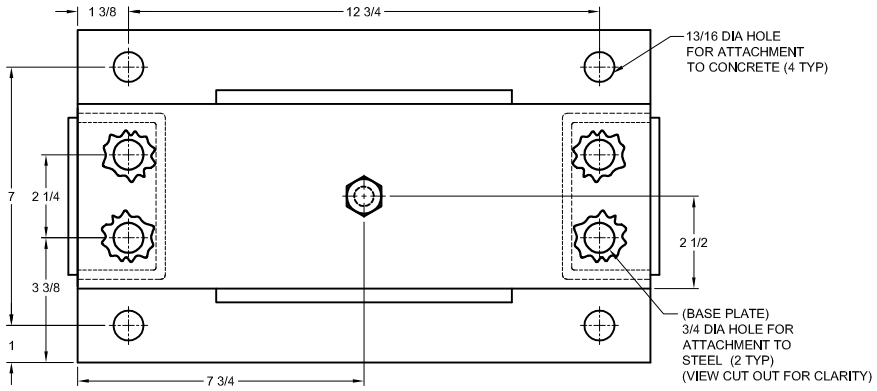
SHEET NUMBER: 6 OF 6

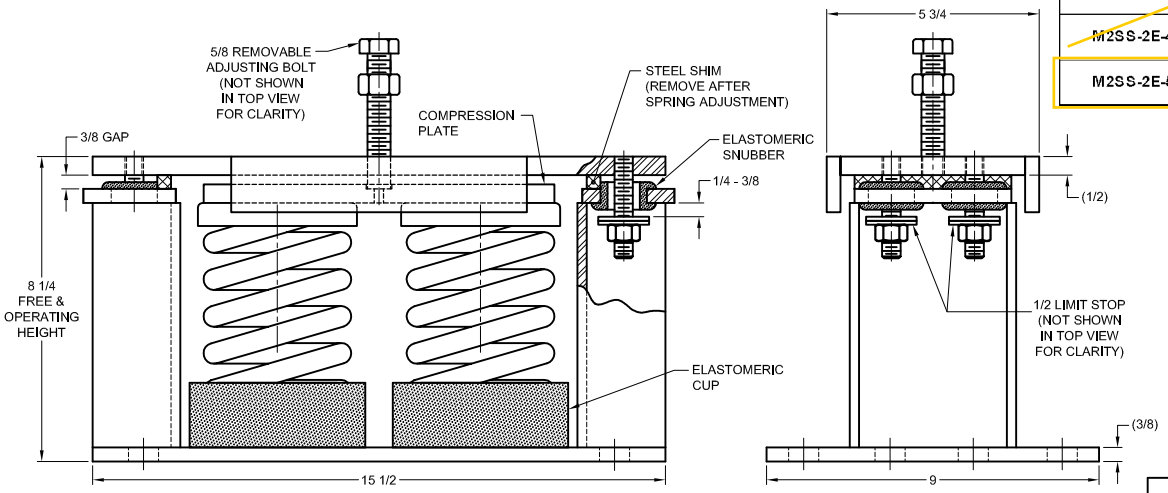
Carter Machinery Company, Inc
8346 Old Richfood Road, Mechanicsville, VA 23116
Phone: 804-823-1183

END OF DOCUMENT

172R–101107 | REV.: 11

REV.	DESCRIPTION	DATE	BY

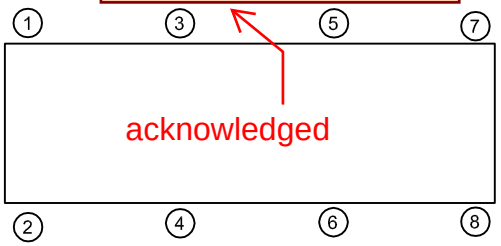




MODEL M2SS-2E SEISMICALLY RESTRAINED VIBRATION ISOLATOR FOR 2" DEFLECTION

SEISMIC MOUNT SIZE	RATED LOAD (LBS)	RATED DEFLECTION (IN)	SPRING RATE (LBS/IN)	COLOR CODE
M2SS-2E-2000	2000	2.00	1000	TAN
M2SS-2E-2800	2800	1.87	1500	RED
M2SS-2E-3200N	3200	2.13	1500	TAN/ RED
M2SS-2E-3600	3600	1.71	2105	DK GRAY
M2SS-2E-4100	4100	1.64	2500	DK BLUE
M2SS-2E-4500N	4500	1.62	2778	DK BLUE/ BLACK
M2SS-2E-4920N	4920	1.64	3000	DK BLUE/ RED
M2SS-2E-5400N	5400	1.64	3300	DK BLUE/ GREEN

See comments on BOM. Provide to Arch/struct for review.



ISOLATOR SELECTIONS	
LOC 1:	LOC 2:
LOC 3:	LOC 4:
LOC 5:	LOC 6:
LOC 7:	LOC 8:
CUSTOMER EQP'T. TAG:	

NOTE: MATERIAL SHOWN IS FOR (1) SET.

NOTES:
1. ALL DIMENSIONS ARE IN INCHES, INTERPRET PER ANSI Y14.
2. STANDARD FINISH: HOUSING - POWDER COAT (COLOR:BLACK), SPRING - POWDER COAT (COLOR: SEE TABLE), HARDWARE ZINC-ELECTROPLATE.
3. EQUIPMENT MUST BE BOLTED OR WELDED TO THE TOP PLATE TO MEET ALLOWABLE SEISMIC RATINGS.
4. ISOLATOR BASE PLATE MUST BE ANCHORED TO CONCRETE WITH (4) 3/4 DIA ANCHORS.
5. ALL SPRINGS ARE DESIGNED FOR 50% OVERLOAD CAPACITY.
6. REFER TO SHEET 2 OF 2 FOR INSTALLATION INSTRUCTIONS.
7. RATED DEFLECTIONS ARE WITHIN 25% OF NOMINAL. HIGHER DEFLECTIONS ARE ALLOWED IF THEY MEET SPECIFICATIONS.

OTHER MATERIALS, COMPOUNDS, OR FINISHES WITH EQUAL OR SUPERIOR PROPERTIES MAY BE SUBSTITUTED AS THEY BECOME AVAILABLE.

CERTIFIED FOR:

JOB NAME: _____

CUSTOMER : _____

CUSTOMER P.O.: _____

SALES ORDER: _____

TYPE M2SS-2E 2000-5400 LBS. VIBRATION ISOLATOR WITH INTEGRAL SEISMIC RESTRAINT AND EXTERNAL ADJUSTMENT 2 INCH DEFLECTION

THE VMC GROUP
The Power of Together
Bloomingdale, NJ 07403
Houston, TX 77041

SCALE : NONE

SHEET: 1 OF 2

Member VISCMA

DRAWING NO.:

REVISION

PROPRIETARY: EXCEPT AS OTHERWISE AGREED IN WRITING, THE INFORMATION AND DESIGN DISCLOSED HEREIN ARE THE PROPERTY OF THE VMC GROUP AND MUST NOT BE COPIED OR DISTRIBUTED OUTSIDE THE VMC GROUP EXCEPT TO AUTHORIZED PERSONS WITH A GENUINE NEED TO KNOW WHO BY THE USE HEREOF ACKNOWLEDGE THE VMC GROUP'S OWNERSHIP AND AGREE TO MAINTAIN THIS INFORMATION AND DESIGN IN STRICT CONFIDENCE.



Picture shown may not reflect actual configuration

Generator Space Heater

for 1200, 1400*, 1600 and 1800 Frames

*only with 3512C

GENERAL DESCRIPTION

Humidity is a natural enemy of generators and all electrical equipment.

Space heaters are designed to protect generator windings from abnormally high humidity conditions when the generator is idle. The heater maintains the air around the windings at a suitable temperature to prevent winding corrosion due to condensation.

Generator space heaters use electrical resistance and are located within the generator stator housing.

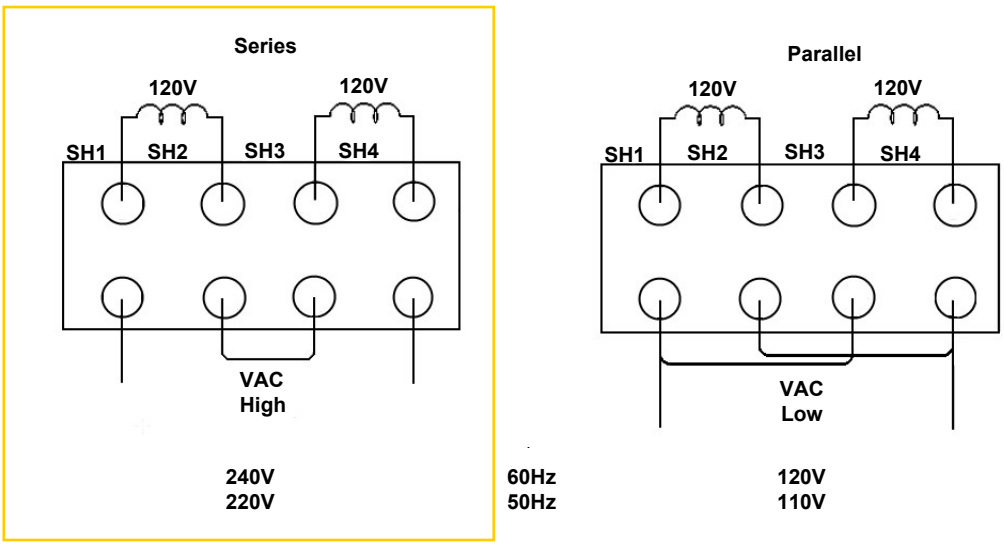
Space heaters are particularly recommended for generator sets located in a low ambient and/or high humidity environment. As a further benefit, space heaters provide an excellent method of drying out a generator after long transit or storage.

Because space heaters are required only during non-operative periods, they require availability of a power source separate from the generator set itself.

When the generator set is not running the heater automatically connects to the AC supply through a power relay mounted in the control panel. Upon receiving a start signal the AC supply is automatically disconnected by the power relay and automatically reconnected when the start signal is removed.

The generator space heater uses two heating elements.
Heater element electrical data: Voltage - 120V, Power - 600W.

Space Heaters Connection Diagram



Materials and specifications are subject to change without notice.
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Cat® Batteries



Cat® Batteries—Greater Starting Power—Lower Maintenance—Longer Life

Cat Premium High Output (PHO) batteries are used in all Cat Machines and Engine Gen-Sets. They are designed to meet stringent Caterpillar design specifications, which provide industry leading cold cranking amps (CCA) capability and maximum vibration resistance.

Maintenance Free Accessible or low maintenance designs are available in wet and dry configurations.

General Service Line batteries are available in Maintenance Free Accessible or low maintenance designs. Wide selections of BCI group sizes are available for automotive, light truck, bus, industrial, agricultural, marine, recreational and valve regulated (VRLA-AGM & Gel) applications.

Cat® Batteries

World's Toughest Batteries



Premium High Output—Maximum Vibration Resistance

- Vibration Resistance...five times the Industry Standard
- Exclusive "flat top" BCI group 4D & 8D batteries are Maintenance Free Accessible and have the industries highest cold cranking amps (CCA)
- Popular BCI group 31 Maintenance Free Accessible batteries with industry leading cold cranking amps...up to 1000 (CCA), for electric power, machine or on-highway truck and bus applications. Deep cycle models are available for truck, marine or recreational usage

Specifications for Cat Premium High Output Batteries-Available Worldwide

									BCI Overall Dimensions			Nominal Weight	
BCI Group Size	Part No.	CCA ≈	RC Mins †	Volts	Amp Hr. Capacity @ 20 Hrs.	Construction Notes	Accessiblity - Fluid Level Check Hours	Length In (mm)	Width In (mm)	Height In (mm)	Wet Lb (kg)	Dry Lb (kg)	Nominal Acid to Fill Qt (liter)
8D	153-5720	1500	465	12	210	C/MFA	A - 1000	20.5 (520)	10.8 (275)	9.8 (248)	132 (59.9)	-	-
8D	101-4000	1400	400	12	190	LAC+	A - 1000	20.8 (527)	11.0 (278)	9.8 (248)	132 (59.9)	86 (39.0)	18.0 (17.0)
4D	153-5710	1400	425	12	200	C/MFA	A - 1000	20.5 (520)	8.6 (218)	9.8 (248)	119 (54.0)	-	-
4D	9X-9730	1300	400	12	190	LAC+	A - 1000	20.8 (527)	8.6 (218)	9.8 (248)	120 (54.0)	81 (36.8)	14.8 (14.0)
4D	153-5700	1125	305	12	145	C/MFA	A - 1000	20.5 (520)	8.6 (218)	9.8 (248)	101 (45.8)	-	-
4D	9X-9720	1000	275	12	140	LAC+	A - 1000	20.8 (527)	8.6 (218)	9.8 (248)	102 (45.8)	59 (26.8)	15.9 (15.0)
31	175-4390	1000	180	12	90	C/MFA/S	A - 1000	12.9 (329)	6.8 (172)	9.3 (236)	60 (27.2)	-	-
31	175-4370	825	190	12	100	C/MFA/S**	A - 1000	12.9 (329)	6.8 (172)	9.3 (236)	61 (27.2)	-	-
31	175-4360	710	185	12	100	C/MFA/S***	A - 1000	12.9 (329)	6.8 (172)	9.3 (236)	62 (28.1)	-	-
31/30H	115-2422	1000	170	12	90	C/MFA	A - 1000	12.9 (329)	6.8 (172)	9.5 (241)	63 (28.6)	-	-
31/30H	115-2421	950	170	12	90	C/MFA+	A - 1000	12.9 (329)	6.8 (172)	9.5 (241)	64 (29.1)	44 (20.0)	6.6 (6.2)
31/30H	9X-3404(1)	950	165	12	95/100	C/MF	NA	13.0 (331)	6.8 (172)	9.5 (241)	58 (26.3)	-	-
31/30H	3T-5760	750	165	12	95/100	C/MF	AV - 1000	13.0 (331)	6.8 (172)	9.5 (241)	56 (25.4)	-	-
65	230-6368	880	140	12	70	C/MF	NA	11.9 (304)	7.5 (191)	7.5 (191)	46 (20.9)	-	-
24	153-5656	650	110	12	52	C/MF	NA	11.0 (279)	6.9 (174)	9.0 (229)	39 (17.7)	-	-

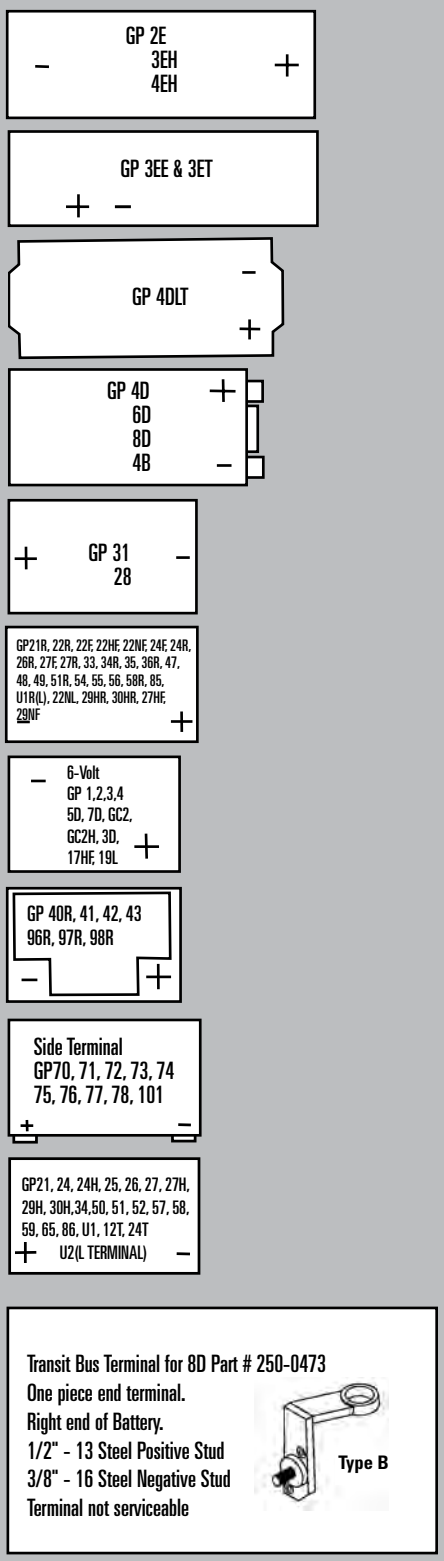
Construction Notes:
Batteries use SAE taper post design and are shipped wet except as:

LAC = Low Maintenance - Hybrid Construction
C = Calcium Lead Alloy Grid Design
MF = Maintenance Free Non-Accessible
MFA = Maintenance Free Accessible
A = Accessible
NA = Non-Accessible
AV = Accessibly Varies - Accessibility varies depending on supplier used. If it has caps, it is accessible and fluid levels should be checked.
S = Stud Terminals
+ = Shipped Dry Only
* = Side Terminals Only
** = Starting and Deep Cycle Battery
*** = Deep Cycle and Starting Battery
≈ = Cold Cranking Amps for 30 seconds at 0° F (-18° C)
† = Reserve Capacity Minutes minimum of 25 amp output at 80° F (27°C)
SDT = Dual, Top mounted Terminals - Stud and SAE Post. Marine Deep Cycle/ Starting Battery
1 = Available in EAME and China only

Rugged Design–Built Tough–Reliable Starting

- Positive and negative plates are anchored to container bottom and locked at the top of cell element for maximum vibration resistance.
- Heavy-duty forged terminal post bushings provide maximum strength and resistance to acid seepage.
- Hefty full-frame grids, no sharp edges, optimum acid/paste combination provides better charge acceptance after deep discharge.
- Manifold vented cover with built-in Flame Arrestor…a safety feature that directs corrosive gases away from the battery and hold-downs.
- Thick, robust container resists rugged treatment typical of heavy-duty commercial use. Embossed part number & descriptors for easy serviceability.

BCI Terminal Locations



Transit Bus Terminal for 8D Part # 250-0473
One piece end terminal.
Right end of Battery.
1/2" - 13 Steel Positive Stud
3/8" - 16 Steel Negative Stud
Terminal not serviceable

Cat Premium High Output Batteries — Built Tough to Exceed Demanding Performance Test Requirements:

- **100 hour Vibration Testing – Five Times the Industry Standard**

  Battery must be able to withstand vibration forces without suffering mechanical damage, loss of capacity, loss of electrolyte or without developing internal/external leaks

  Battery must pass a high rate discharge test after the vibration testing

- **Five 72-hour Deep Discharge/Recharge Test Cycles**

  Battery must recover to 25 charging amps within 20 minutes and meet Industry Electrical Performance Standards

- **30 Day Complete Discharge Test**

  Battery must recover to 25 charging amps within 60 minutes and meet Industry Electrical Performance Standards after recharging

- **SAE J2185 Life Cycle Test**

  Battery subject to deeper discharge and charge cycles at extreme temperatures not normally encountered in starting a machine or vehicle

- **Cold Soak Test**

  Battery cold soaked at sub-freezing temperatures and then tested by starting an equally cold engine



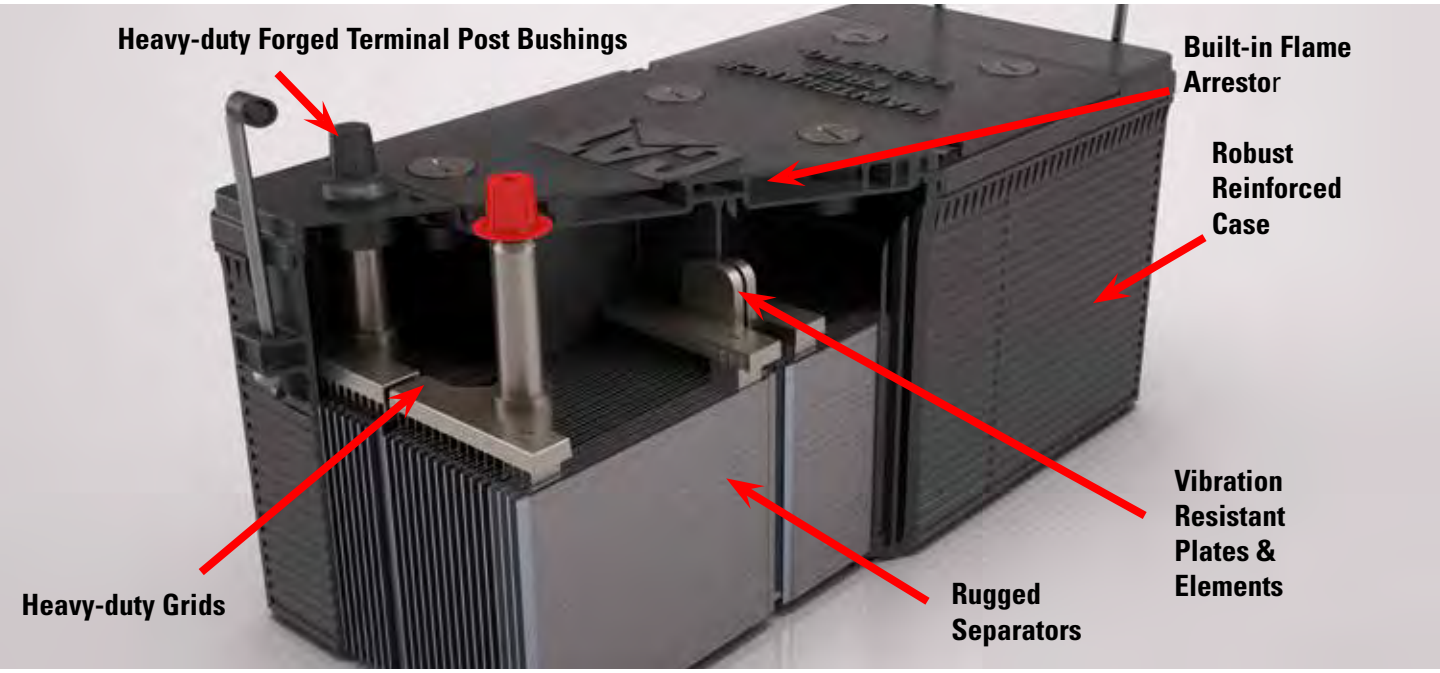
Battery Accessories

Group 31 - Charging Posts for Stud Terminals - Part # 4C-5637
Screw-in Charging Posts for Side Terminals - Part # 4C-5638
Wing Nut - Part # 2B-9498 for Part #'s 175-4390/175-4370/175-4360/8C-3628
Wing Nut - Part # 3B-0723 for Part #'s 8C-3638 and 8C-3639
Booster Cable 12' (3.66 m) - Part # 4C-4911
Booster Cable 20' (6.00 m) - Part # 4C-4933
Heavy Duty Commercial Fast Charger (110V) - Part # 4C-4921
Heavy Duty Commercial Fast Charger (220V) - Part # 4C-4910

Note: Ratings and Part Numbers are subject to change without notice.

Recycle all scrap batteries.
We accept lead-acid batteries for recycling.

Cat® Batteries



Robust Components = Long Life + Reliable Starts

- Heavy-duty forged terminal post bushings provide maximum strength and resistance to acid seepage that causes corrosion and black posts. Thicker internal terminal posts provide lower electrical resistance and higher cold cranking amp output.
- Rugged micro porous polyethylene envelope separators protect against “shorts” and vibration damage. Deep Cycle batteries utilize double insulated Glass mat separators for longer cycling life.
- Maintenance Free Accessible batteries utilize calcium lead alloy on both positive and negative plates that reduces gassing and water consumption. Automotive batteries have Silver (Ag) Calcium Alloy Grids for resistance to high underhood temperatures.
- Heavy-duty, full frame battery grids with no sharp edges. An optimum acid/paste combination provides better charge acceptance after a deep discharge.
- Positive and Negative plates are anchored to the container bottom and the cell element is locked at the top for maximum vibration resistance. Straps are thicker, heavier and cast (not welded) into the plates.
- Manifold vented cover with built-in Flame Arrestor…a safety feature that directs corrosive gases away from the battery and hold-downs.
- Robust reinforced case provides extra strength in all temperature extremes. Brickwork design on sides reduces chance of punctures and case flexing. Embossed part number and descriptors for easy serviceability.

CAT DEALERS DEFINE WORLD-CLASS PRODUCT SUPPORT.

We offer you the right parts and service solutions, when and where you need them.

The Cat Dealer network of highly trained experts keeps your entire fleet up and running to maximize your equipment investment.



PEHJ0073-03
www.cat.com

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MSM

High Frequency Battery Charger / Rectifier



46LE C62.41 USCG

The MSM is a Smart High Frequency Switch Mode battery charger specifically developed for Marine and Engine Starting applications. MSM series incorporates Power Factor Correction (PFC) Circuitry with a wide input voltage range in order to accommodate many marine charging applications.

The MSM has an Integrated Battery Charge Divider / Isolator which provides connections for charging up to three independent batteries simultaneously with a three-stage charge cycle. MSM's filtered output is suitable to charge different types of batteries for Marine/Industrial applications. This series is equipped with an LCD display for ease of navigation through the configurations menu. The LCD also displays Input AC voltage, Output DC Voltage & Current, and Alarm Status. The front of the unit provides three status LED indicators for the overall status of the system.

The MSM charger is built in a robust, non-corrosive enclosure that withstands harsh environments, meeting stringent safety and regulatory standards. MSM chargers can be used inside engine rooms as this series is ignition protected 33 CFR 183.410 compliant.

Standard Features

- Smart Microprocessor Controlled High Frequency Charging Technology
- Single Phase AC Input 102-264VAC, 45-65Hz
- Complete Isolation from AC to DC
- LCD Digital Voltmeter & Ammeter
- Current Limit Protection
- Filtered Output for VRLA (Gel-Cell & AGM) Batteries
- Battery Isolator (Charge Divider allows for charging up to three Batteries Simultaneously)
- Input & Output Fuses (Output Fuses Accessible)
- On/Off Switch
- AC Voltage Metering
- Conformal Coated Circuit Boards
- Internal or External Temp. Compensation w/Disable Option
- Audible Charger Failure Alarm with LED Indicator and Form "C" Dry Relay Contacts
- IP22/NEMA Type 2 (with dripshield)
- 33 CFR 183.410 - Ignition Protection
- Corrosion Resistant
- Meets ABS & USCG Requirements
- CE Certified
- 2-Year Warranty

Optional Accessories

- **11Y** External Temperature Probe 100 feet
- **11W** External Temperature Probe 24 Feet
- **57Y** Modbus (Ethernet) TCP/IP
- **551** VFD Display
- **57B** 5 Isolated Output Terminals
- **18W** Water Tight Connectors
- **19P** AC Cord (9.84ft) 14 AWG NEMA 5-15P
- **35F** External Termination Box (5 Outputs)
- **35G** Expanded Cable Entry Box
- **---** EAB-JBOX: Provides Low/High Voltage and Ground Fault alarm contacts (ordered separately)

Specifications subject to change without notice

La Marche Mfg. (A U.S. Company)
106 Bradrock Drive, Des Plaines, IL 60018
Tel: 847.299.1188 Fax: 847.299.3061
sales@lamarchemfg.com
www.lamarchemfg.com

P25-DSMSM-1
ECN 23600
08/24

Model Number	AC Input 100% (load)		DC Output		Case No.	Net Weight*	
	Volts (Nominal)	Amps	Volts (Nominal)	Amps		lbs	kgs
MSM-10-12V-U1	120	1.5	12	10	201	5	2.3
	240	0.8					
MSM-20-12V-U1	120	3.1	12	20	201	5	2.3
	240	1.6					
MSM-30-12V-U1	120	4.6	12	30	203	11	5.0
	240	2.4					
MSM-40-12V-U1	120	6.0	12	40	203	11	5.0
	240	3.2					
MSM-60-12V-U1	120	9.2	12	60	205	18	8.2
	240	4.8					
MSM-80-12V-U1	120	12.0	12	80	205	18	8.2
	240	6.4					

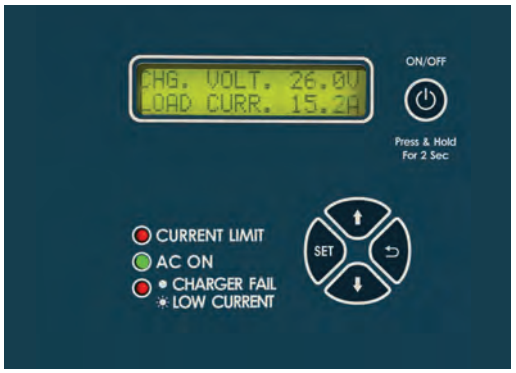
*Weight does not include shipping packaging

Model Number	AC Input 100% (load)		DC Output		Case No.	Net Weight*	
	Volts (Nominal)	Amps	Volts (Nominal)	Amps		lbs	kgs
MSM-10-24V-U1	120	2.6	24	10	201	5	2.3
	240	1.4					
MSM-20-24V-U1	120	5.2	24	20	203	11	5.0
	240	2.7					
MSM-25-24V-U1	120	6.5	24	25	203	11	5.0
	240	3.1					
MSM-30-24V-U1	120	7.8	24	30	203	11	5.0
	240	3.8					
MSM-35-24V-U1	120	9.1	24	35	203	11	5.0
	240	4.4					
MSM-50-24V-U1	120	13	24	50	205	18	8.2
	240	6.3					
MSM-65-24V-U1	120	16.9	24	65	205	18	8.2
	240	8.2					
MSM-100-24V-U1	120	26.0	24	100	207	32.6	14.8
	240	12.6					

Charger Specifications

- **AC Input**
  Wide AC Input Range 102 - 264VAC
  Single Phase 45 - 65 Hz
- **DC Output**
  10 - 80A / 12V
  10 - 100A / 24V
- **Power Factor**
  0.99
- **Load Regulation**
  <±0.5%
- **Input Protection**
  Fuse with Surge and Transient Protection
  AC Over Voltage Protection
- **Output Protection**
  Current Limit Protection
  Fuse with Surge Protection
  Reverse Current Polarity
  Thermal Protection
  Short Circuit Protection
- **LED Indicators**
  Current Limit
  AC ON
  Charger Fail
  Low Current
- **Alarm Contacts**
  Charger Failure
- **LCD Digital Display**
  AC Input Voltmeter
  DC Output Voltmeter and Ammeter (2%)
- **Environmental**
  Operating: -20° to 50°C (-4° to 122°F)
  Storage: -40° to 85°C (-40° to 185°F)
  Relative Humidity: 0 to 95% non condensing
- **Adjustable Voltage Range**
  10.4 to 14.1 (12V)
  20.8V to 28.2V (24V)
- **Mounting**
  Wall mount
- **Cable Entry**
  Bottom
- **Finish**
  Powder coated aluminum enclosure (corrosion resistant)
- **Standards**
  UL 1236, ABS & USCG Requirements
  EN 60335-1 (Electrical Safety)
  IEC 60335-2-29 (Electrical Safety)
  IEC 60068-2-6 (Sinusoidal Vibration)
  EN 55011 (Radiated EMI)
  IEC 1000-4-2 (Electrostatic Discharge)
  IEC 1000-4-4 (Electrical Fast Transient)
  33 CFR 183.410 (Ignition Protection)

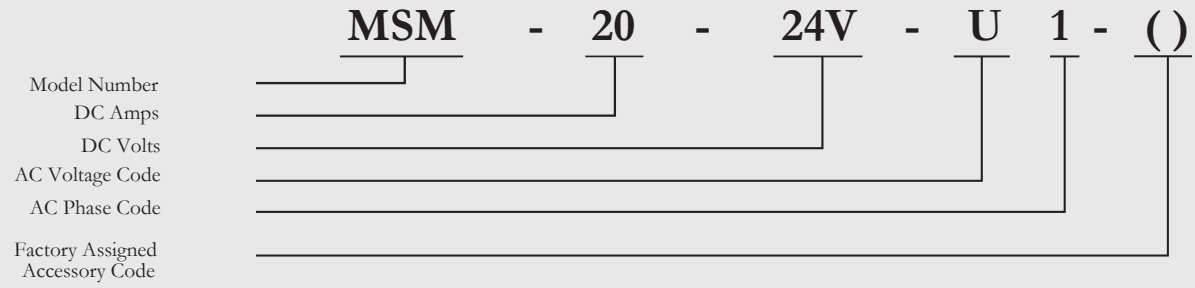
LCD Display



Case Specifications

Case No.	Overall Dimensions					
	Width		Depth		Height	
	in	mm	in	mm	in	mm
201	9.63	244	6.16	156	14.20	360
203	9.63	244	6.16	156	18.30	464
205	9.63	244	9.85	250	18.30	464
207	15.38	391	11.67	297	20.42	519

Model Number Nomenclature



AC Voltage Code
U1 - 102-264 VAC

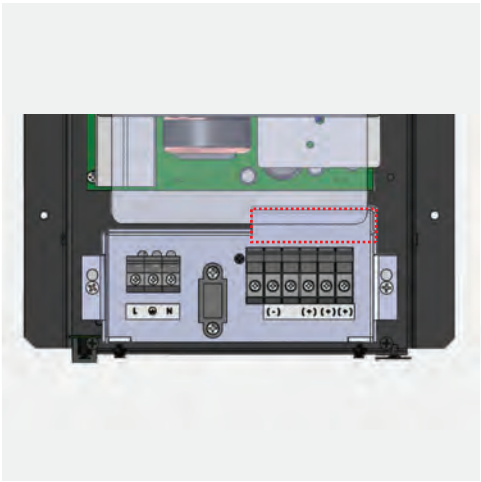
AC Phase Code
1 - Single Phase

OPTIONAL ACCESSORIES



Termination Box

The optional termination box provides external space for managing the cables of multiple output/battery connections to the MSM battery charger. The termination box provides an easy carefree solution for installations that require additional space for connecting thicker cabling and multiple outputs.



Expanded Cable Entry Box

The optional Expanded Cable Entry Box provides an extra 0.70 inches of space for input/output connections. This makes connecting to the MSM battery charger easier for installations with multiple outputs or thicker cabling.



MODBUS Ethernet TCP/IP

Optional Modbus Ethernet allows for remote monitoring of the battery charger. This allows for easier servicing and maintenance of the battery charger by receiving alerts and battery charger data points remotely.



Water Tight Connectors

The optional watertight connectors offer robust protection against moisture, water, and dust. By forming a secure seal around cable connections, these connectors significantly reduce the risk of electrical faults, corrosion, and damage caused by environmental elements.



EAB-JBOX Alarm Box

The optional external alarm box is connected to the battery charger and includes one form "C" contact each for High DC Voltage, Low DC Voltage and Ground Fault (Positive or Negative) in addition to the charger fail alarm that is integrated into the MSM battery charger by default.

ARBS

Automatic Redundant Battery Selector Diode Isolator



Model Shown: ARBS-1600-50

The La Marche ARBS is a solid state device that controls redundant power in engine starting switchgear applications. Our product is designed with high powered diodes to select the higher voltage of the two isolated DC power sources.

The ARBS selects power from the best available battery while isolating the alternate battery bank. The special heat sink diode assembly is manufactured to handle high output requirements with safety margin to spare. This Automatic Redundant Battery Selector is also known in the market as Best Battery Selector, Diode Isolator, and Automatic Battery Selector.

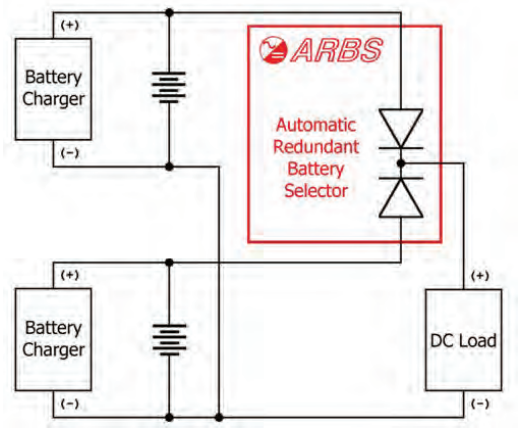
The diodes in the ARBS allows the current to flow from the DC power source to the load. The ARBS is sized based on the maximum load inrush current

Standard Features

- Fully Automatic
- Convection Cooled
- Isolation From One Battery to Another
- Diodes Designed to Carry 100% of the Starter/Load
- Surge Protection
- Two Diodes, Common Cathode
- Finish - ANSI - 61 gray paint
- 1 Year Warranty

Optional Feature

65F Alternator Battery Recharge Option*
(Charge Divider and Control Circuit for connecting Single Alternator to two Batteries)
*Case size subject to change, please consult factory



Model Number	Nominal Voltage	Rated DC Inrush Current per NFPA 110	Continuous DC Rated Current	Dimensions W x D x H	Approx. Weight (lbs)	Case No.	Mounting
ARBS-500-50	(max: 300VDC)	500A	50A @ +50C	12.8" x 10" x 17.12" 326 x 254 x 435mm	36	2	Wall
ARBS-500-100	(max: 300VDC)	500A	100A @ +50C	15.4" x 11" x 23.75" 391 x 279 x 603mm	57	3	Wall/Floor
ARBS-500-200	(max: 300VDC)	500A	200A @ +50C	25.58" x 13.93" x 28" 650 x 354 x 711mm	CF	4	Wall/Floor/Rack
ARBS-1000-50	(max: 300VDC)	1000A	50A @ +50C	14.25"x 10.62" x 19.87" 362 x 270 x 505mm	50	7	Wall/Floor
ARBS-1000-100	(max: 300VDC)	1000A	100A @ +50C	25.58" x 13.93" x 28" 650 x 354 x 711mm	120	4	Wall/Floor/Rack
ARBS-1000-200	(max: 300VDC)	1000A	200A @ +50C	27.24" x 15.25" x 32.5" 691 x 387 x 826mm	180	8A	Floor
ARBS-1600-50	(max: 300VDC)	1600A	50A @ +50C	14.25"x 10.62" x 19.87" 362 x 270 x 505mm	46	7	Wall/Floor
ARBS-2600-85	(max: 300VDC)	2600A	85A @ +50C	25.58" x 13.93" x 28" 650 x 354 x 711mm	115	4	Wall/Floor/Rack
ARBS-3000-85	(max: 300VDC)	3000A	85A @ +50C	25.58" x 13.93" x 28" 650 x 354 x 711mm	115	4	Wall/Floor/Rack
ARBS-4800-150	(max: 300VDC)	4800A	150 @ +50C	25.58" x 13.93" x 28" 650 x 354 x 711mm	124	4	Wall/Floor/Rack

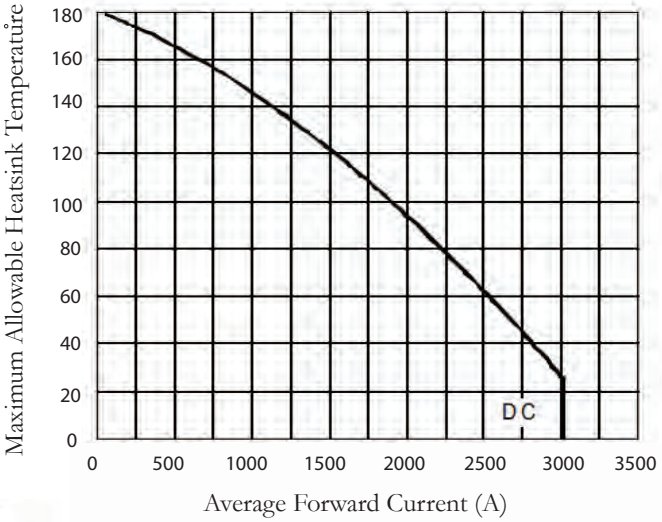
Note: Models Available with Common Positive Arrangement.

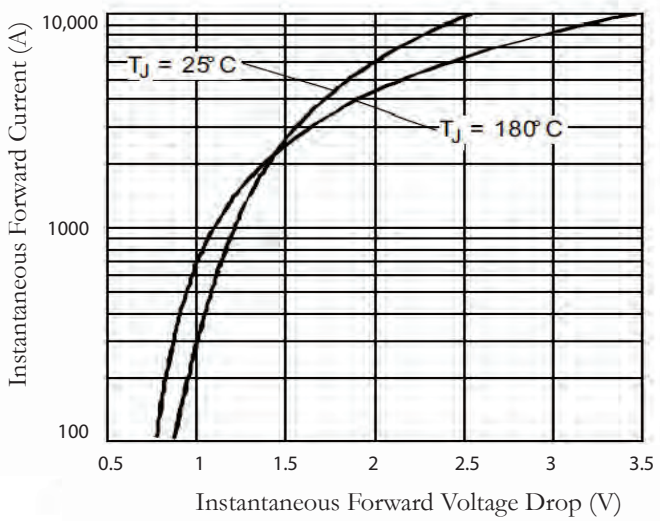
Specifications subject to change without notice

La Marche Mfg. (A U.S. Company)
106 Bradrock Drive, Des Plaines, IL 60018
Tel: 847.299.1188 Fax: 847.299.3061
sales@lamarchemfg.com
www.lamarchemfg.com

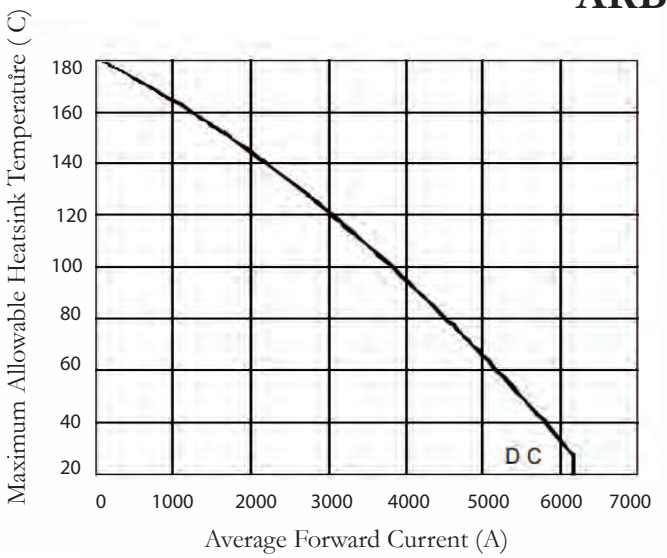
P25-DSARBS-1
ECN 23016
09/21

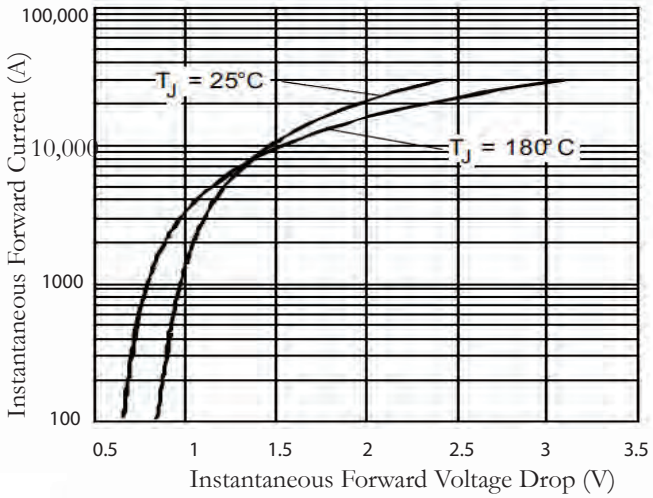
ARBS-1600



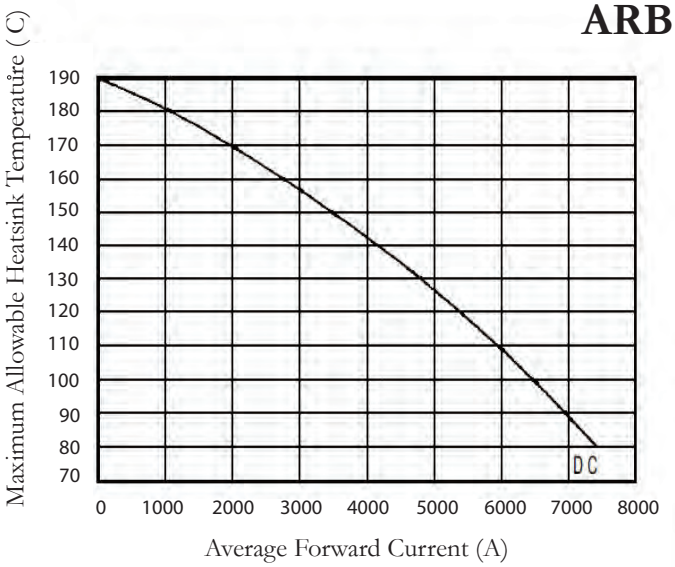


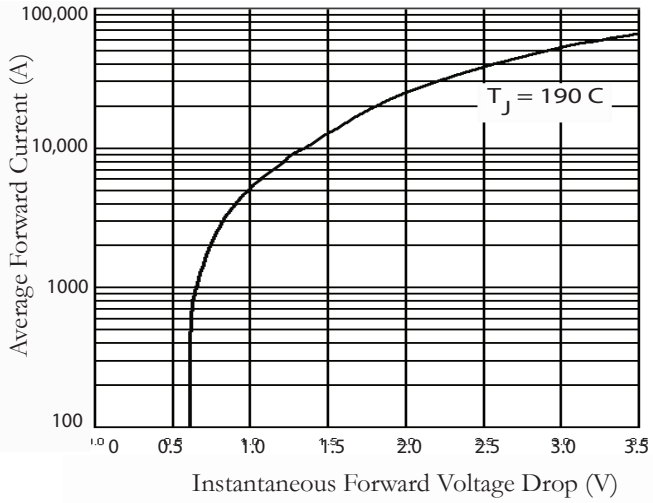
ARBS-3000





ARBS-4800













aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding







Crankcase Ventilation

Products and Custom Solutions



Parker Racor

ENGINEERING YOUR SUCCESS.

Closed Crankcase Ventilation

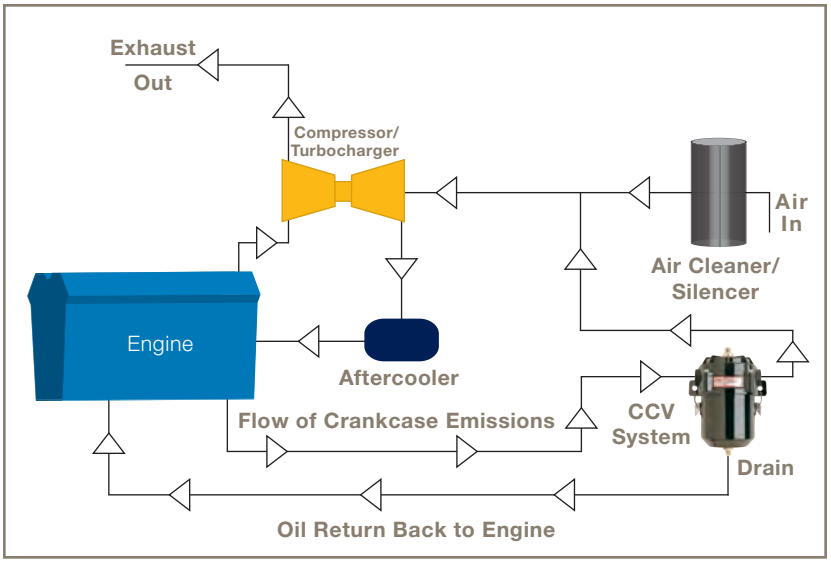
Market Challenges and Overview

The Problem – Engines Releasing Pollutants Through Unfiltered Breathers

Environmental concerns and legislation to control crankcase emissions have increased significantly. To further reduce the total emissions of engines, in some applications it is becoming necessary to close the crankcase breather system, routing these gases into the air intake system.

Crankcase blow-by is produced when combustion gases under high pressure are blown passed the piston rings into the crankcase. As these blow-by gases pass though the crankcase, they become contaminated. Racor's Crankcase Ventilation System removes these contaminations. The exhaust can then be allowed to vent to the atmosphere.

For applications requiring more stringent emissions requirements, a closed crankcase filter is recommended. In this application, the exhaust from the crankcase filter is routed to the inlet side of the turbo. A regulator in the crankcase filter controls the vacuum in the crankcase to ensure proper operation.





CCV4500KIT01 is currently being used in many different front and rear engine configurations.



CCV4500 installed on a CAT engine.



CCV3551KIT01 installed on a Mercedes Sprinter Van.

- In closed environments like generator sets and marine engine rooms, damage to surrounding equipment such as radiators and electronic control panels can cause hazardous conditions, down time, and expensive maintenance.
- Oil mist will coat and contaminate the aftercooler and other engine components. This coating reduces engine cooling capacity, causes a degradation of engine performance and reliability over time, and shortens the useful service life of the engine components.
- The engine intake inhales contaminated gasses, clogging air filter systems, and damaging turbocharger components. It is imperative that oil mist be removed from the crankcase emissions prior to introduction into the engine air intake in closed breather systems.

Racor CCV Systems

In a robust, compact package, the patented Racor Closed Crankcase Ventilation (CCV) Filter System provides superior oil coalescence and crankcase pressure control under the most severe conditions.

The only routine maintenance required for the CCV system is filter replacement. Typical service life of the high-performance filter in diesel applications is 750 hours. Some variations in service life occur depending on load profile, engine wear condition, flow and aerosol mass concentration of crankcase emissions, and soot concentration.

How To Select A CCV Assembly:

CCV systems are designed to handle various crankcase flow rates up to 50 CFM. Traditionally, the crankcase flow rate can be calculated as follows: rated horsepower ÷ 40 = cubic feet per minute (CFM). This formula can only be used as a guide since recent improvements in piston design have produced engines with higher horsepower and lower blow-by flow rates. The blow-by flow rate of a worn engine, at time of overhaul, is generally double the flow rate when the engine is new. The flow rate of a worn engine is factored into the formula. Note: Specify left or right-hand inlet when ordering.

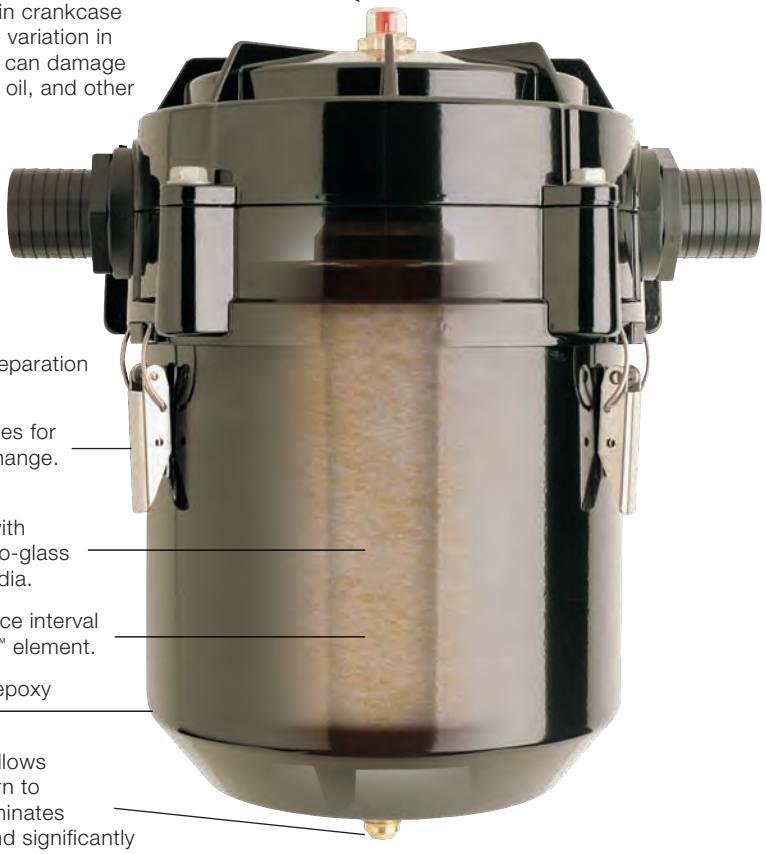
Examples:
CAT 3116
260 HP / 40 = 6.5 CFM
Select CCV4500

CAT 3406
525 HP / 40 = 13.13 CFM
Select CCV6000

Closed Crankcase Ventilation

Features and Benefits





Pop-up style indicator alerts of bypass condition and need for filter change.

Unique crankcase pressure regulator with integral bypass valve minimizes variation in crankcase pressure. Excessive variation in crankcase pressure can damage seals, cause loss of oil, and other problems.

Choose left or right-hand inlet. Available with or without bypass indicator.

High-efficiency oil separation to 0.3 micron.

Stainless steel latches for tool-less element change.

Replaceable high-performance filter with depth-loading, micro-glass fiber coalescing media.

Extended filter service interval from the Vaporbloc™ element.

Steel housing with epoxy powder coating.

Drain check valve allows collected oil to return to crankcase. This eliminates frequent draining and significantly reduces oil consumption.

Continuous operating temperature range is -40°F to +240°F (-40°C to 116°C).

Closed Crankcase Ventilation Specifications



Qty. (2) per genset



	CCV1500	CCV3500	CCV4500	CCV6000	CCV8000	CCV12000
Maximum Flow Rate	1 CFM (28 LM)	3 CFM (85 LM)	10 CFM (283 LM)	20 CFM (566 LM)	40 CFM (1133 LM)	50 CFM (1416 LM)
Maximum Engine Rating	40 HP (30 KW)	120 HP (89 KW)	400 HP (298 KW)	800 HP (597 KW)	1600 HP (1193 KW)	2000 HP (1491 KW)
Inlet/Outlet Port Size	3/4” hose	3/4” hose	1 3/16”-12 STOR	1 5/8”-12 STOR	1 7/8”-12 STOR	1 7/8”-12 STOR
Weight	1.5 lbs (0.7 kg)	2.3 lbs (1.0 kg)	3.3 lbs (1.5 kg)	5.0 lbs (2.3 kg)	8.7 lbs (3.9 kg)	9.3 lbs (4.2 kg)
Replacement Filter Media Density: Low	CCV55365-04	N/A	CCV55248-04	N/A	N/A	N/A
Replacement Filter Media Density: High	N/A	CCV55304-08	CCV55248-08	CCV55274-08	CCV55222-08	CCV55222-12-08
Replacement Filter Media Density: Ultra	N/A	N/A	CCV55248-10	CCV55274-10	CCV55222-10	CCV55222-12-10
Housing Material	Glass-filled nylon and black powder epoxy-coated steel bracket.	Glass-filled nylon components.	Die cast head, glass-filled nylon and black powder epoxy-coated steel bowl.	Die cast head, glass-filled nylon and black powder epoxy-coated steel bowl.	Die cast head, glass-filled nylon and black powder epoxy-coated steel bowl.	Die cast head, glass-filled nylon and black powder epoxy-coated steel bowl.
Crankcase Pressure Regulator	Vacuum Limiting valve	Integral	Integral	Integral	Integral	Integral
Bypass/Change Indicator	N/A	Integral	Integral or Remote	Integral or Remote	Integral or Remote	Integral or Remote
Engine Block Check Valve Return Fitting	N/A	1/4” NPT	1/4” NPT	1/4” NPT	3/8” NPT	3/8” NPT
Swivel Fitting (Qty.)	N/A	#6 JIC (2 pcs.)	#6 JIC (2 pcs.)	#6 JIC (2 pcs.)	#8 JIC (2 pcs.)	#8 JIC (2 pcs.)
Oil Drain Hose I.D.	N/A	0.375 in. (0.95 cm)	0.375 in. (0.95 cm)	0.375 in. (0.95 cm)	0.5 in. (1.27 cm)	0.5 in. (1.27 cm)

Units can be manifolded to handle higher flow rates. Do not use CCV1500 in continuous duty applications.



Picture shown may not reflect actual configuration

Electric Starting Motor

for C27, C32, 3512, 3516, C175-16 and C175-20

U.S. Sourced

Electric Starting Motors are used for improved engine start capability.
Battery-powered electric motors utilize low voltage direct current and provide fast, convenient, pushbutton starting with lightweight, compact, engine-mounted components.

Design

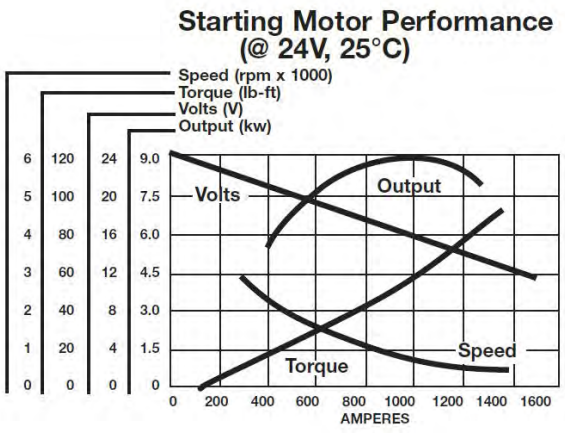
- Splash-proof and environmentally protected.
- Seamless one-piece solenoid case is sealed for corrosion protection.
- Positive-engagement shift mechanism assures pinion–to-ring gear engagement prior to cranking, minimizing milled ring gears and pinions.
- Epoxy impregnation and glass banding give starter armature exceptional rotation strength.
- Positive spring retention in the six wide, one-piece brushes gives uniform pressure and brush wear for extended service life.
- Extra-large brush leads are used to handle the high current experienced during the cranking of high-power diesel engines.
- Rotatable drive housing, with 12 positions, allows easy repositioning of the solenoid switch.
- Totally Enclosed Shift mechanism.
- Bearing Lubrication and Sealing: Three sintered-bronze bearing extra-large oil reservoirs.

Specifications

- System Voltage: 24 V
- Rotation: Clockwise
- Polarity: Insulated
- Mounting: SAE #3
- Pinion Data:
  - No Teeth/Pinion Blank: 11/12
  - Pitch: 6/8
- Output: 24V: 9.0 kW
- Weight: 34 kg (75 lbs)
- Operation temperature range
  - - 25°C to +121°C
- Pressure Angle: 20°
- Oil Sealed: ± 6 PSI
- Water Sealed: ± 6 PSI and 3500 PSI Pressure Wash

Option

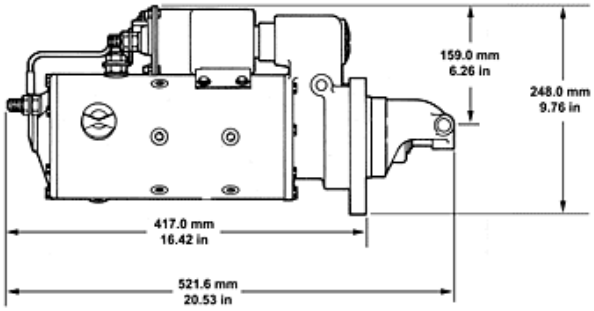
- Heavy-Duty Applications: Two or more units can be tandem-mounted for starting large engines.

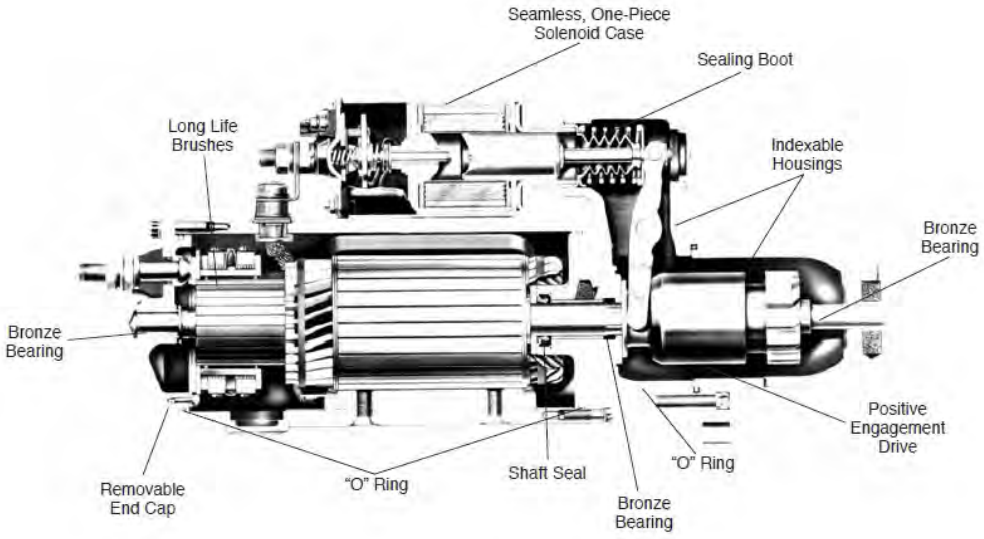


Available Options

Model	Single	Dual	Quadruple
C27		+	
C32		+	
3512	+	+	
3512B	+	+	
3512C	+	+	
3516		+	
3516B		+	
3516C		+	
C175-16		+	+
C175-20		+	+

Dimensions Drawing





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Primary Fuel Filter with water separator

for 3512, 3516, 3516B, 3516C*

* excluding 3516C EPA Tier 2 (2750 ekW)

Picture shown may not reflect actual configuration

General Description

Fuel contamination, either in the form of dirt or water, will find its way into your fuel system no matter how careful you are. Even a small amount of dirt or water corrosion can start problems. Water or particulates can cause microscopic surface damage that is then focused on by the high-pressure fuel flow, which causes wear that will eventually lead to reduced efficiency and complete breakdown.

Using fuel filter with water separator you will achieve system cleanliness for reliable engine operation.

Features

- The high-grade aluminum components and powdercoat paints mean that corrosion is never a worry.
- A durable single bolt mounting bracket doubles resistance to vibration fatigue.
- Sheds water and keeps engines waterproof, rustproof and dirtproof.
- Polymer bowl withstands impact and temperature extremes.
- Self-venting drain. A single twist makes draining clean, fast and easy.
- Unique media to increase dirt holding capacity and extend filter life
- Treated media that separates and coalesces water from fuel

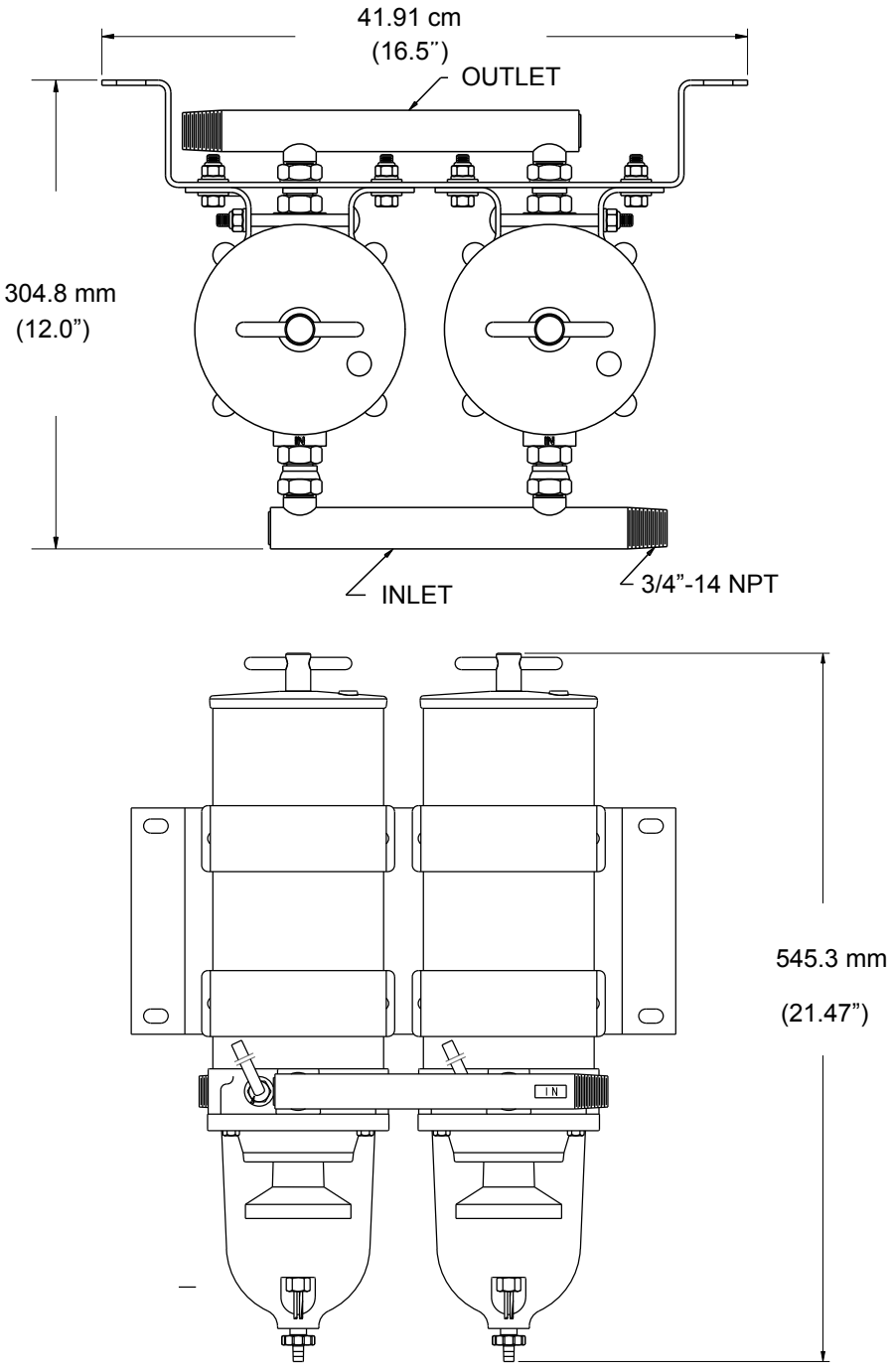
Specifications

- Filtration Rating: 30 micron
- Two filters on-line
- Ports: 3/4”-14 NPT
- Maximum Pressure: 1.03 bar (15 psi)
- Max Flow Rate: 1362 lph (360 gph)
- Height: 545.3 mm (21.47”)
- Width: 419.1 mm (16.5”) with Bracket
- Depth: 304.8 mm (12.0”) with Bracket
- Weight: 11.8 kg (26.0 lbs)

Filter Element Specifications

- Effective media area: 9980 cm^2
- Weight: 0.59 kg (1.3 Lbs.)
- Length: 213 mm (8.38”)
- Diameter 109 mm (4.29”)

General Dimensions Drawing



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Electrical Pre-Lube Pumps

for 3512 and 3516 Diesel
and G3516 Gas Generator Sets

Picture shown may not reflect actual configuration

General Description

Pre-lube pump provides protection to generator set engine by delivering oil under pressure to the engine's principal components during initial startup. Which helps to eliminate cold start wear out.

Features and Benefits

- Prevent engine premature wear and failures
- Extend engine life
- 24 VDC control
- Class H Insulation
- Lip seal standard and mechanical seal optional

Specifications

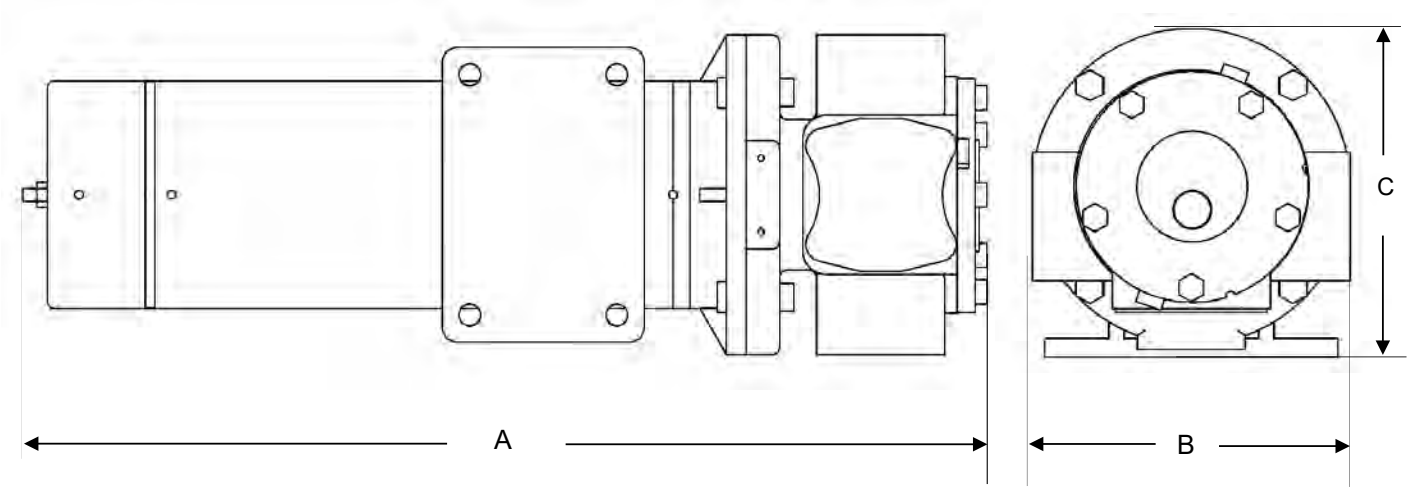
Motor Specification

24 VCD
1200 RPM
0.559 kW / 0.75 HP
29 A
Permanent Magnet

Pump Specification

450 +/-70 kPa with 280 cSt oil
1200 RPM
Flow 49 L/Min

General Dimensions Drawing



Weight and Dimensions

Length (A)	435 mm (17.12")
Width (B)	165 mm (6.49")
Height (C)	171.5 mm (6.75")
Weight	20.09 kg (44.29 Lbs.)

Wiring diagram

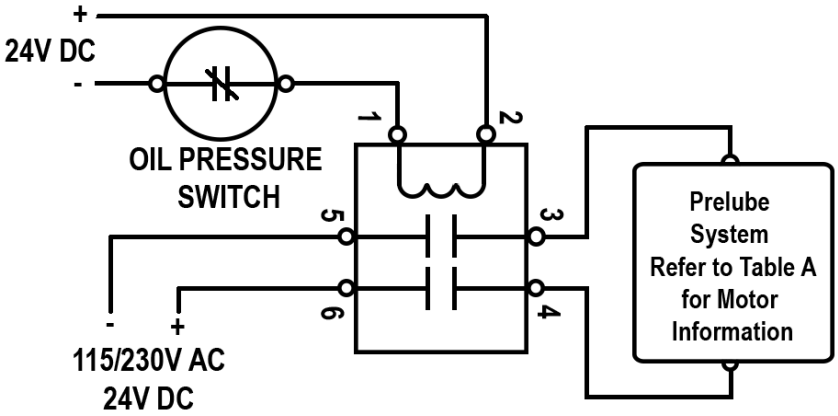


Table A

	Relay + (3)	Relay – (4)	Join
115V AC	1,3,5	2,4,8	-
230V DC	1	4,8	2,3,5
24V DC	+A1	-A2	-

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Picture shown may not reflect actual configuration

JACKET WATER HEATER With Pump

Diesel Gensets: 3512, 3516 and C175-16
Gas Gensets: G3412, G3512 and G3516

Caterpillar offers a factory-installed jacket water heater for improved cold-starting capability.

The Jacket Water Heater is a complete coolant preheater with thermostat, pump and all required controls. Forced circulation of the coolant delivers uniform heating throughout the entire engine, reduces wear from cold spots and offers a significant reduction in electrical consumption.

The Jacket Water Heater operates automatically when provided contacts are supplied with a 24 Volt DC signal from the engine.

FEATURES

- Factory Installed
- Complete with hoses, thermostat and pump
- Base frame mounting minimizes engine induced vibration
- Automatically disconnected when engine is running via the generator jacket water heater relay
- Supplied with UL recognized components
- Standard thermostat is factory preset to 54°C (130°F)
  - o Optional High Temperature thermostat is available with factory preset to 71°C (160°F)

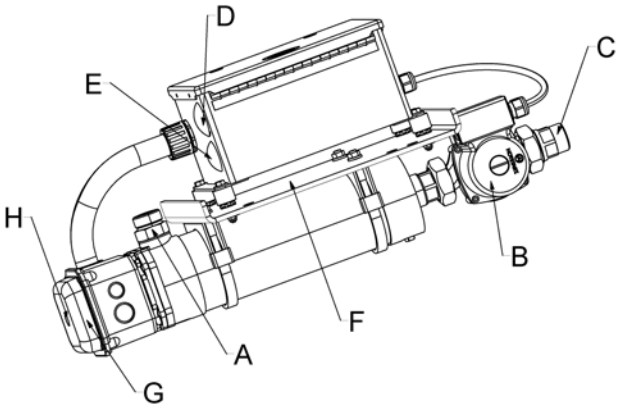
HEATER DESIGN DESCRIPTION

The jacket water heater package is designed to efficiently pre-heat the engine by heating and circulating the engine's coolant.
This design results in the following benefits

- Increase life of heater hoses, engine seals, and heating elements.
- Improve heat transfer efficiency from elements to engine coolant.
- More uniform engine temperature distribution.
- Application of a thermostat with a reduced thermal differential.
- Lower customer utility costs and increased heater reliability.
- Heater thermostat's setpoint is preset from the factory.

HEATER OPERATION/WIRING

A 38 L/pm (10 gpm) pump is located at the heater inlet to push the coolant through the heater.
A fixed thermostat is located inside Element enclosure box, near the outlet of the heater and responds to the temperature of the coolant inside the tank. The figure below shows the general heater design.



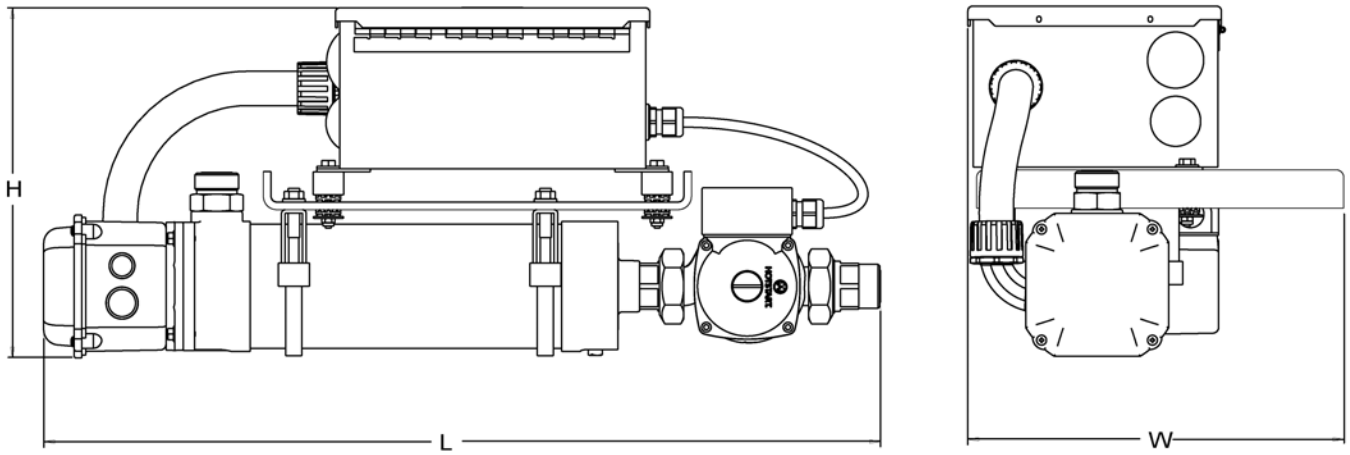
A. Discharge port
B. Pump/motor
C. Suction Port
D. Power Wiring Entrance
E. Control Wiring Entrance
F. Mounting base
G. Element assembly
H. Thermostat

SPECIFICATIONS

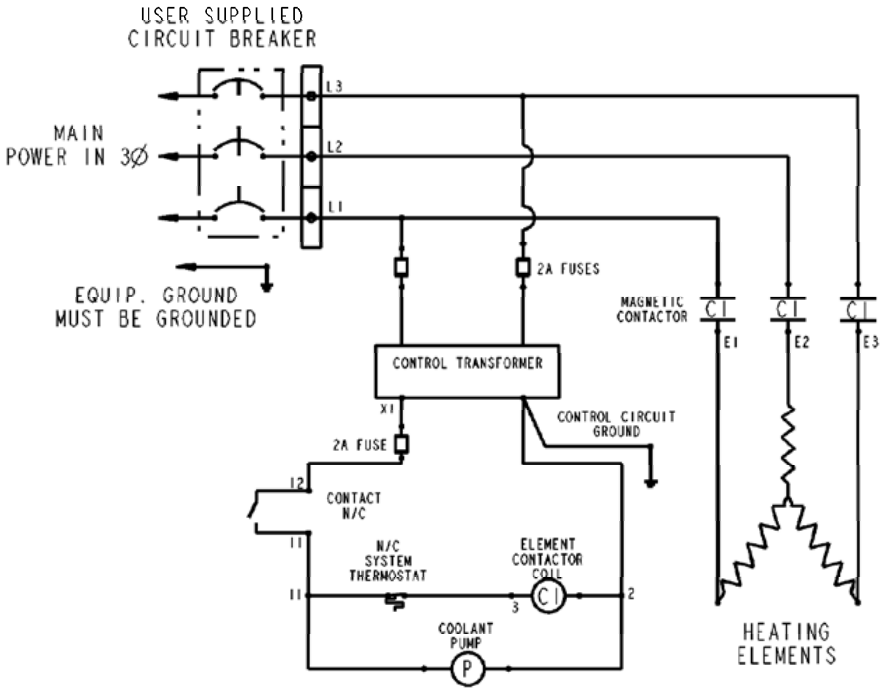
Voltage (VAC)	480	400*	240	220	208
Fixed Thermostat (Standard)	38°C - 54°C (100°F - 130°F)				
Power (with Standard Thermostat)	9 kW / 12 kW	9 kW / 12 kW	9 kW / 12 kW	9 kW	9 kW / 10.5 kW
Amperage (with Standard Thermostat)	10.8 A / 14.4 A	13.0 A / 17.4 A	37.5 A / 50.0 A	40.9 A	43.3 A / 50.5 A
Fixed Thermostat (High Temperature)	60°C - 71°C (140°F - 160°F)				
Power (with High Temperature Thermostat)	9 kW / 12 kW	9 kW	9 kW / 12 kW	9 kW / 12 kW	9 kW / 10.5 kW
Amperage (with High Temperature Thermostat)	10.8 A / 14.4 A	13.0 A	37.5 A / 50.0 A	40.9 A / 54.5 A	43.3 A / 50.5 A
Frequency	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
Phase	Three Phase		Single Phase		
Flow Rate	38 LPM (10 GPM)				
Pump Power	97 W	95 W	97 W	95 W	97 W
Length (L)	695 mm (27.4")				
Width (W)	312 mm (12.3")				
Height (H)	291 mm (11.4")				
Weight	24.0 kg (52.8 lbs)	24.2 kg (53.4 lbs)	21.5 kg (47.5 lbs)	21.4 kg (47.2 lbs)	24.2 kg (53.4 lbs)

*Only available with diesel gensets

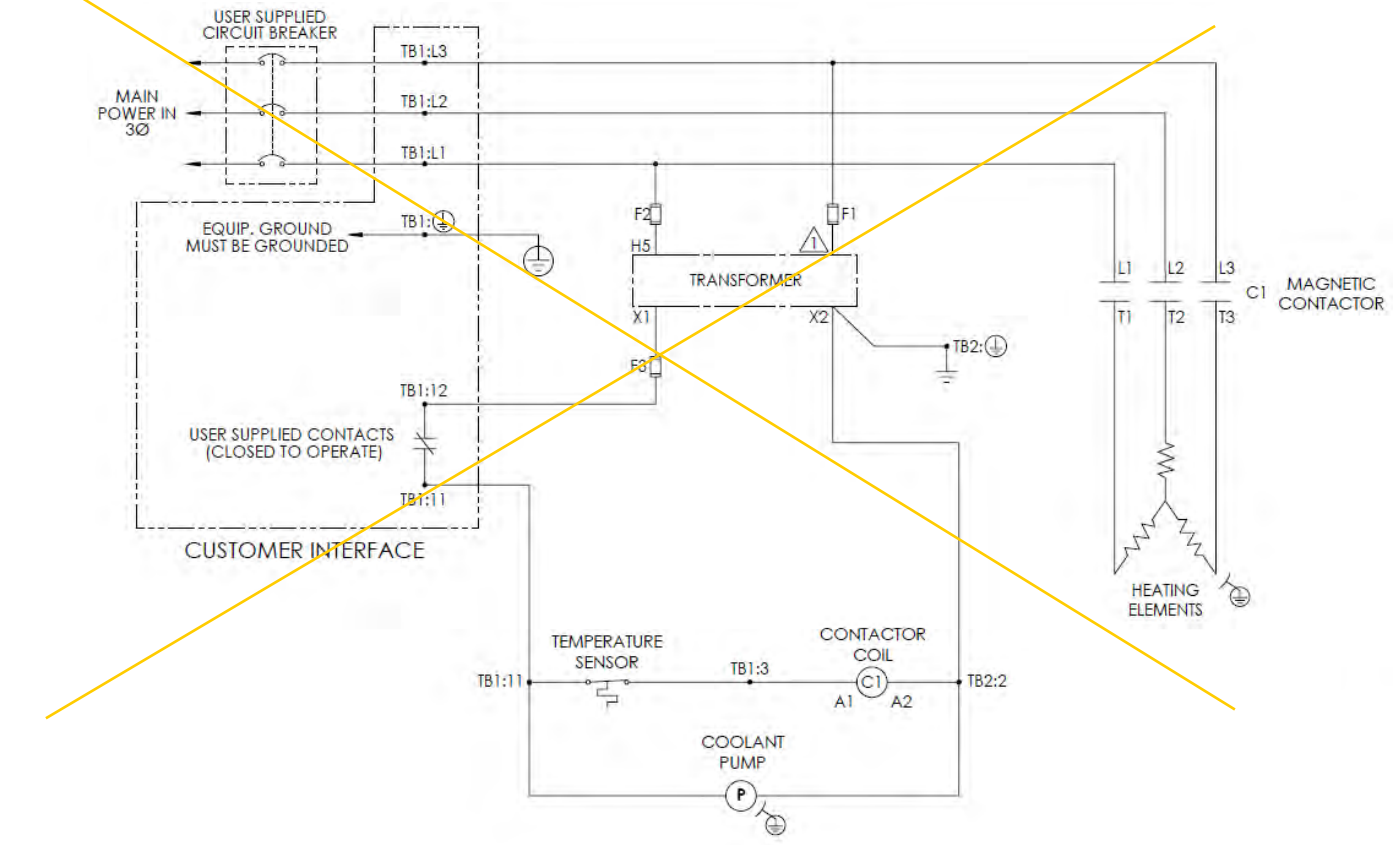
GENERAL DRAWING



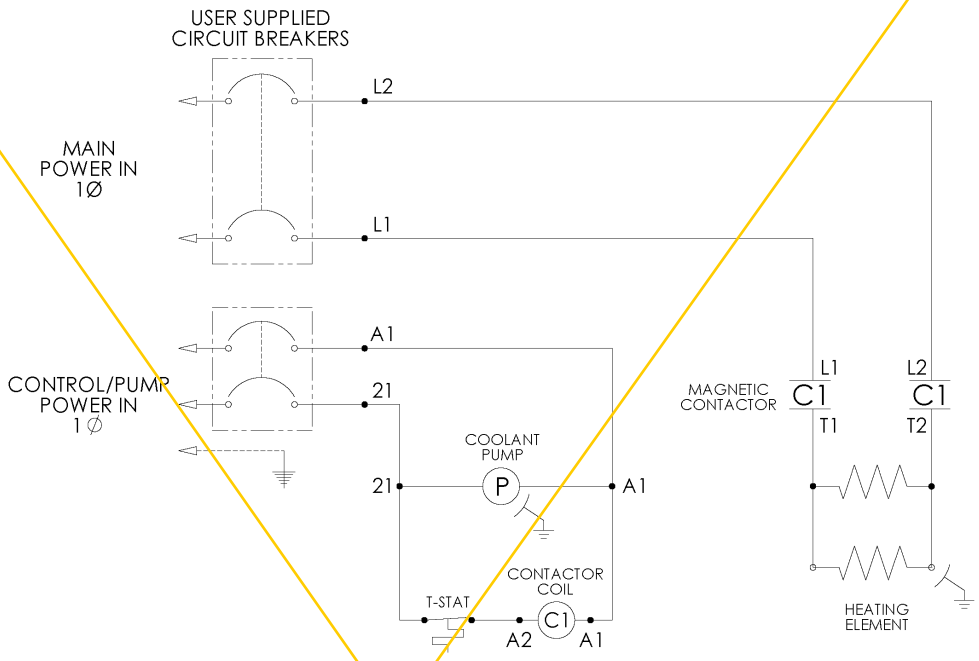
Wiring Diagram - 480 V Three Phase JWH (9 kW and 12 kW Heating Systems)



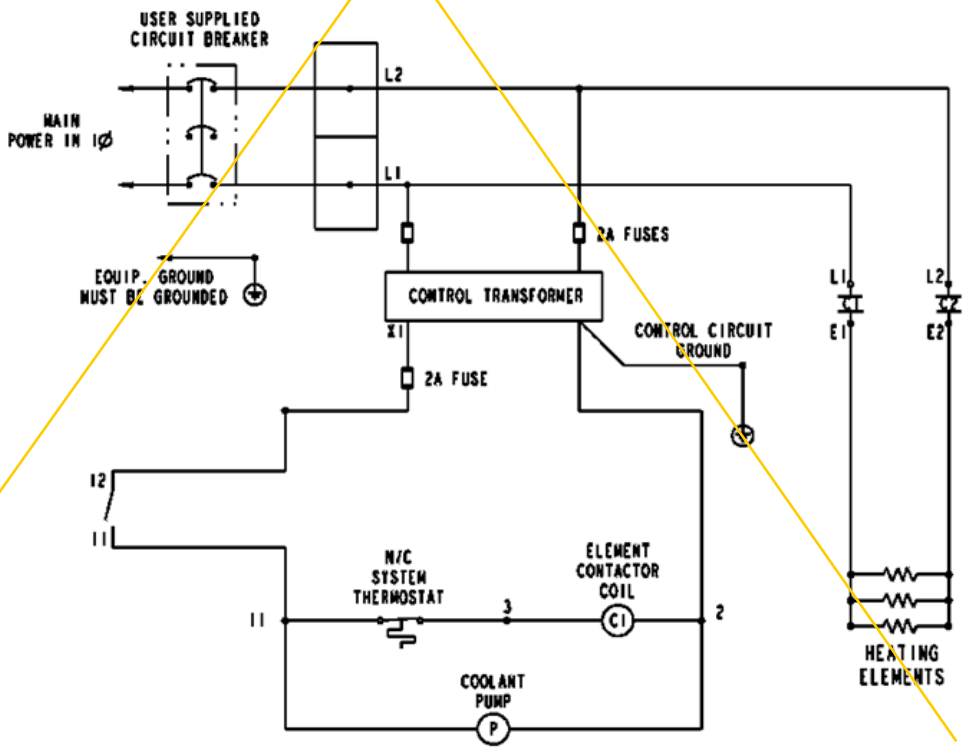
Wiring Diagram - 400 V Three Phase JWH (9 kW and 12 kW Heating Systems)



Wiring Diagram - 208, 220 and 240 V Single Phase JWH (9 kW Heating Systems) and 240 V Single Phase JWH (12 kW Heating Systems)



Wiring Diagram - 208 V Single Phase JWH (10.5 kW Heating Systems)



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G 2-7 PRODUCT DESCRIPTION

ATLAS COPCO COMPRESSORS

Model: G 2 - 7 Oil Injected Rotary Screw Air Compressor

We are pleased to offer our G single stage, oil injected, rotary screw air compressor.

PACK UNITS FEATURE:



- Inlet air filter
- TEFC motor
- Differential pressure oil system with oil cooler
- Air/oil separator
- Oil filter
- Two pressure variant offerings: 116 psi and 145 psi
- Factory oil fill
- Microprocessor controlled
- Full voltage motor starter mounted and pre-wired
- Emergency stop button
- CSA/UL approved control cubicle
- Aftercooler and moisture separator
- Designed for 115ºF maximum ambient operating temperature

FULL FEATURE UNITS ADDITIONALLY FEATURE:

- UL/CSA approved integrated refrigerated air dryer
- Dew point gauge
- Electronic compressor drain valve

AVAILABLE OPTIONS:

- Electronic tank drain
- Tropical Thermostat
- Tank mounted on a 53 or 120 gallon ASME approved tank
- Oil Heating Kit
- High efficiency DDX particulate and coalescing air filter (available on full feature units only)
- Food Grade oil
- Water separators on compressor (must have aftercooler included)
- Water separator electronic and timer drains (must have water separator)

Technical Data Sheet

G2-7 145 psi FF

ATLAS COPCO COMPRESSORS

	G2	G4	G5	G7	Unit
Inlet conditions					
1. Barometric pressure	14.5	14.5	14.5	14.5	**psi(a)**
2. Ambient air temperature	68	68	68	68	**°F**
3. Relative humidity	0	0	0	0	**%**
Performance[(1)]					
1. Discharge pressure[1]	145	145	145	145	**psi(g)**
2. Capacity delivered	9.8	18	26.1	34.1	**CFM**
3. Package power input, loaded FF	3.25	5.11	6.98	9.35	**kW**
4. Package power input, unloaded FF	N/A	N/A	1.9	2.74	**kW**
7. Sound level[(2)]	61	62	65	67	**dB(A)**
8. Minimum ambient temperature	33.8	33.8	33.8	33.8	**°F**
9. Maximum ambient temperature	115	115	115	115	**°F**
Cooling data					
1. Cooling air flow Pack	148	318	381	551	**CFM**
2. Cooling air flow Integrated Dryer	74	74	113	162	**CFM**
Electrical data					
1. Motor	3	5	7.5	10	**HP**
2. Motor type	IE3 Prem. Eff.	IE3 Prem. Eff.	IE3 Prem. Eff.	IE3 Prem. Eff.	
3. Enclosure	TEFC	TEFC	TEFC	TEFC	
4. Efficiency	86.5	88.5	89.5	90.2	**%**
5. Starter type	DOL	DOL	DOL	DOL	
Physical data					
1. Dimensions(L x W x H)/Weight(lbs)					
- Floor-mounted FF	40x25x38 / 331	40x25x38 / 353	40x27x38 / 375	40x27x38 / 408	**In/lbs**
- 53G Tank-mounted FF	57x24x50 / 452	57x24x50 / 474	57x27x50 / 496	57x27x50 / 529	**In/lbs**
- 120G Tank-mounted FF	77x25x60 /	77x25x60 /	77x25x60 /	77x25x60 /	**In/lbs**
2. Air discharge size	1/2"	1/2"	1/2"	1/2"	**NPT**
3. Condensate drain size	0.375	0.375	0.375	0.375	**NPT**
4. Oil sump capacity	0.7	0.7	0.7	0.7	**gal**

1. Performance (free air delivery) measured according to ISO1217.

2. Operating Sound Level: Operating sound levels for machines equipped with recommended standard motors and enclosures are guaranteed ±3 dB(A) when measured in free field conditions at a distance of 1 meter according to CAGI PNEUROP Test Code.

EWD – Zero Air Loss Drain

Condensate Drain



Atlas Copco's range of EWD electronically controlled condensate drains is synonymous with safe, dependable and economical condensate management.

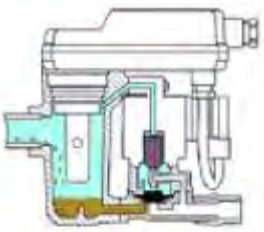
The intelligent drain function monitors condensate build-up with liquid level sensors and evacuates the condensate only when necessary, thereby avoiding compressed air waste and providing for considerable energy savings.

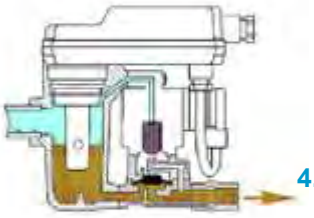
The EWD drain device offers security and confidence, enabling you to solve all condensate discharge problems even in heavily contaminated systems.

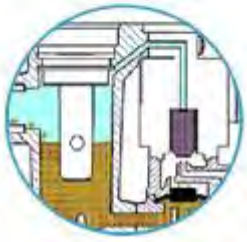
How is an EWD better than a timer operated drain?

Atlas Copco's EWD range is superior to timer operated drains in several key ways. First, Atlas Copco's EWDs have wide passage ways and timer operated drains have narrow ones; narrow passage ways increase the likelihood that the unit will become blocked, thereby not allowing the unit to drain properly. Second, timer operated drains are inferior in their design and often result in drains becoming stuck open, which wastes air and decreases overall efficiency. Lastly, timer controlled drains open at constant intervals and each time they open, an average of 25cfm of compressed air is wasted, which can become very expensive; Atlas Copco's EWDs wastes absolutely no compressed air.

The EWD Process







1. Condensate enters the drain and collects in the sump.
2. The diaphragm valve is closed due to the solenoid valve allowing pressure compensation through the pilot supply line. The pressurized space above the diaphragm is larger than that below it, ensuring and absolutely leak-proof seal.
3. Once the condensate level reaches the upper limit the solenoid valve is engaged, closing the pilot supply line.
   The pressure on top of the diaphragm is allowed to escape and the diaphragm lifts off the valve seat.
4. Then the pressurized condensate forces its way into the discharge pipe.
5. As the condensate drains away, the level probe monitors the speed at which the level drops, calculating exactly when to shut the diaphragm so that no air escapes.
6. If a problem develops, such as a blocked outlet or faulty diaphragm, the drain switches to "fault mode". Both the flashing alarm light and the volt free contact are activated and the drain switches to a "timer" mode until the problem is resolved.

Filters UD+, DD+, DDp+, PD+, PDp+, QD+

ATLAS COPCO QUALITY AIR SOLUTIONS

General Description

Untreated compressed air can be contaminated by dust, water, and oil. In almost all applications, contamination of the air supply can cause serious performance decline and increase maintenance costs in terms of actual repairs and lost productivity. Therefore, filtration is a crucial component of your air system. Atlas Copco has developed filtration solutions that protect your air-powered tools, your processes, and your final products. Our extensive offer includes different filter types and a range of purity grades to meet your specific requirements. We design filtration solutions to provide compressed air purity that meets or exceeds levels set forth by the International Standard Organization. (ISO). Filters are tested in accordance with these standards:

- ISO 8573-1: 2010 Filtration Qualification
- ISO 8573-2 sampling and measuring OCO
- ISO 12500-1: inlet conditions for Oil Aerosol
- ISO 12500-3: inlet conditions for Dust



Among its filter ranges, Atlas Copco offers more than 200 filters that span from coalescing filters for general purpose protection to active carbon filters used for removal of oil vapor and hydrocarbon odors:

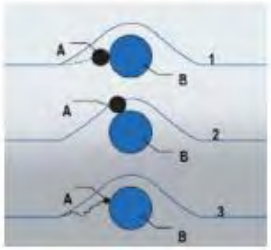
- UD+, a high-efficient coalescing filter type, combining DD+ and PD+ in one. Its unique low density provides a 40% pressure drop reduction. The maximum oil carry-over of this unique filter is 0,0009 mg/m³.
- DD+, a coalescing filter type, removes contaminants such as liquid water, oil aerosol up to 0.1ppm and particle size down to 1 micron.
- PD+, a coalescing filter type, removes contaminants such as liquid water, oil aerosol up to 0.01ppm and particle size down to 0.01 micron.
- DDp+ particulate filter type, dust protection, particle size down to 1 micron.
- PDp+ particulate filter type, dust protection, particle size down to 0.01 micron.
- QD+, activated carbon filter type, removes oil vapor, hydrocarbon odor contaminants.

Regardless of your quality air and filtration needs, Atlas Copco undoubtedly offers a filter that is perfect for your application.

Working Principle

Particles in the air stream that pass through a filter can be removed in several different ways. If the particles are larger than the openings between the filter material, they are separated mechanically ("sieving"). This usually applies for the particles larger than 1mm. The filter efficiency in this regard increases with the tighter filter material, consisting of fine fibers. Particles smaller than 1mm are collected on the fiber material by three physical mechanism:

1. inertial impaction
2. interception
3. diffusion



Impaction occurs for relatively large particles and for high gas velocities. Due to a large inertia of a heavy particle, it does not follow the streamlines but instead travels straight ahead and collides with fiber. Interception occurs when a particle does follow the streamline, but the radius of the particle is larger than the distance between the streamline and the fiber perimeter. Particle deposition due to diffusion occurs when a very small particle does not follow the streamlines but moves randomly across the flow due to Brownian motion. It becomes increasingly important with smaller particle size and lower the velocity. Oil and water in aerosol form behave like the other particles and can be separated using a coalescing filter. In the filter, these liquid aerosols coalesce to larger droplets that sink to the bottom due to gravity.

Depending on the purpose of the filter, we have designed different type of filter element:

1. Wrapped for wet particles: Wrapped media offer durability in wet and oil contaminated environments. The patented Nautilus technology combines multiple wrapped layers to ensure constant air quality in the harshest conditions.
2. Pleated for solid particles: Pleated technology is the preferred method to capture dry particulate in compressed air. Over time, particles will clog the filter media. Pleated surfaces have a larger surface area and therefore give you a longer filter service lifetime as well as a lower pressure drop.
3. Macro-structured activated carbon: Macro-structured activated carbon has a larger surface compared to the typical carbon dust filter media. Thanks to its supreme adsorption capacity, it delivers a steady performance over a longer period.

Scope of Supply



1. Filter Cartridge:
    - Wrapped for wet particles
    - Pleated for solid particles
    - Macro-structured activated carbon for oil aerosols
2. InPASS bypass (only for inPASS filter range)
    - Built-in by-pass system
3. Differential pressure gauge
    - Manual gauge (standard)
    - Smart indicator (optional upgrade – standard on inPASS)
4. Non-stick float drain
    - Automatic water removal
5. Housing
    - Aluminum die casted head and bowl

Features & Benefits

Energy Savings

• Large flow capacity

- Low resistance to the air flow
- Considerable reduction of air turbulence and pressure drop

Reliable operation

• Proven durable design

- Dedicated filter element technology based on purpose
- High-performance stainless-steel filter cores
- Internal ribs to protect the element from damage and route oil droplets
- High performance automatic drain
- Anti-corrosive coating
- Patented drainage technology

Easy set-up and use

• Operational ease

- Easy monitoring via differential gauge or optional smart indicator
- Ribbed housing for easy removal of the bowl during maintenance
- Push on element
- Anti-re-entrainment barrier is color coded to easily indicate filter grade
- Bypass for the inPASS range: internal bypass in the housing for easy maintenance

OSC 12-2500

ATLAS COPCO OIL WATER SEPARATOR

General Description

The condensate generated by oil-injected compressors contains traces of oil. Because oilposes an environmental risk, it must be treated before it can be disposed. Atlas Copco condensate management solutions allow you to separate the oil from the water, after which you can safely dispose the clean water in the sewage system. This provides you with a far more cost-efficient solution as opposed to collection and processing by an external waste company.

Atlas Copco's OSC range offers adsorption-based condensate management for oil- injected compressors between 12 and 250 l/s (25 – 5300 cfm). The oil water separator uses a proven, reliable, and robust technology to remove oil concentrations to maximum of 10 ppm.

As different types of oil react differently, we offer 2 different types of filter media, assuringto have the correct solution for every installation.



Operating Principle / Working Principle

1. Inlet: The condensate enters the unit via one single or multiple inlets. It passes through a diffuser and depressurizes in the expansion chamber. The diffuser removes bigger solid particles from the condensate so that these cannot compromise the filter media.

2. First chamber: The oil-water mixture seeps through the polypropylene filter, which adsorbs the oil, but not the water. The condensate remains in the chamber for a while, starting a secondary, natural filtration as the remaining free oil floats to the topand is adsorbed by the filter bag.

3. Second chamber: A removable cartridge, filled with activated carbon or organoclay, separates the remaining oil droplets from the condensate.

4. Outlet: Clean condensate exits from the removable cartridge with almost no residual oil content, allowing for safe discharge into the sewer system.



Scope of supply



1. Service indicator: A hollow plastic green tube rests on the polypropylene filter and will gradually go downwards together with it. Once it is almost completely downwards, theunit needs to be serviced.

2. Overflow indicator: Indicates the abnormal event of a water passage being blocked.

3. Test capsule: the turbidity of a small sample of the condensate can be compared tothe turbidity of condensate with the concentration of 10ppm.

4. Sampling point: Extra drain point, making it unnecessary to disconnect the unit from the installation when taking a sample.

5. Service drain: During service, the condensate in the units can be easily drained.

6. Flow divider (only for OSC2500): Assuring an even load over the 2 units, with a precision up to 5%.

Features & Benefits

Multiple solutions

Depending on the oil types used, we offer 2 different types of filter media:

1. Activated Carbon: Use in case of simple emulsions – Typical for mineral oils

2. Organo clay: Use in case of stronger emulsions – Typical for synthetic oils and oil mixtures.

No stagnant separated oil/water mixtures

Minimizes the potential risk for bacteria formation & accompanying health risks andinconveniences

No rotating equipment is used

Very simple and robust product

Very simple and robust mechanical maintenance and blockage indicators

Accurately and quickly identifies the need for filter replacement

Easy service

- Split filter bags of first stage filter media for safer an easier service
- Removable cartridges to quickly and safe replace the second stage filter media

Options

- Wall mounting for OSC 12 and 25
- Test capsule: standard for OSC50-2500
- Photo-electrical alarm
- Inlet manifold: in case more than 2 drain lines needs to be connected to the OSC
- Drip tray: Clean service: in case of spillage, the condensate is captured by the driptray

Effective with sales to the first user on or after August 1, 2016

CATERPILLAR LIMITED WARRANTY

Industrial, Petroleum, Locomotive, and Agriculture Engine Products and Electric Power Generation Products

Worldwide

Caterpillar Inc. or any of its subsidiaries ("Caterpillar") warrants new and remanufactured engines and new and rebuild electric power generation products sold by it (including any products of other manufacturers packaged and sold by Caterpillar), to be free from defects in material and workmanship.

This warranty does not apply engines sold for use in on-highway vehicle or marine applications; engines in machines manufactured by or for Caterpillar; C175, 3500 and 3600 series engines used in locomotive applications; 3000 Family engines, C0.5 through C4.4 and ACERT™ (C6.6, C7, C7.1, C9, C9.3, C11, C13, C15, C18, C27, and C32) engines used in industrial, mobile agriculture and locomotive applications; or Cat® batteries; or Electric Power Generation Products manufactured or assembled in India. These products are covered by other Caterpillar warranties.

This warranty is subject to the following:

Warranty Period

- For industrial engines, engines in a petroleum applications or Petroleum Power Systems (excluding petroleum fire pump application), or engines in a Locomotive application, or Uninterruptible Power Supply (UPS) systems, the warranty period is 12 months after date of delivery to the first user.
- For engines used in petroleum fire pump and mobile agriculture applications the warranty period is 24 months after date of delivery to the first user.
- For controls only (EPIC), configurable and custom switchgear products, and automatic transfer switch products, the warranty period is 24 months after date of delivery to the first user.
- For new CG132, CG170 and CG260 series power generation products the warranty period is 24 months/16,000 hours, whichever comes first, after date of delivery to first user.
- For electric power generation products other than CG132, CG170 and CG260 series in prime or continuous applications the warranty period is 12 months. For standby applications the warranty period is 24 months/1000 hours. For emergency standby applications the warranty period is 24 months/400 hours. All terms begin after date of delivery to the first user.
- For Caterpillar rebuild electric power generation products the warranty period is 12 months, but not to exceed 24 months from shipment of rebuilt electric power generation product from Caterpillar.
- For all other applications the warranty period is 12 months after date of delivery to the first user.

Caterpillar Responsibilities

If a defect in material or workmanship is found during the warranty period, Caterpillar will, during normal working hours and at a place of business of a Cat dealer or other source approved by Caterpillar:

- Provide (at Caterpillar's choice) new, Remanufactured, or Caterpillar approved repaired parts or assembled components needed to correct the defect.

Note: New, remanufactured, or Caterpillar approved repaired parts or assembled components provided under the terms of this warranty are warranted for the remainder of the warranty period applicable to the product in which installed as if such parts were original components of that product. Items replaced under this warranty become the property of Caterpillar.

- Replace lubricating oil, filters, coolant, and other service items made unusable by the defect.
- Provide reasonable and customary labor needed to correct the defect, including labor to disconnect the product from and reconnect the product to its attached equipment, mounting, and support systems, if required.

For new 3114, 3116, and 3126 engines and, new and Caterpillar rebuild electric power generation products (which includes the following: any new products of other manufacturers packaged and sold by Caterpillar)

- Provide travel labor, up to four hours round trip, if in the opinion of Caterpillar, the product cannot reasonably be transported to a place of business of a Cat dealer or other source approved by Caterpillar (travel labor in excess of four hours round trip, and any meals, mileage, lodging, etc. is the user's responsibility).

For all other products:

- Provide reasonable travel expenses for authorized mechanics, including meals, mileage, and lodging, when Caterpillar chooses to make the repair on-site.

User Responsibilities

The user is responsible for:

- Providing proof of the delivery date to the first user.
- Labor costs, except as stated under "Caterpillar Responsibilities," including costs beyond those required to disconnect the product from and reconnect the product to its attached equipment, mounting, and support systems.
- Travel or transporting costs, except as stated under "Caterpillar Responsibilities."
- Premium or overtime labor costs.
- Parts shipping charges in excess of those that are usual and customary.
- Local taxes, if applicable.
- Costs to investigate complaints, unless the problem is caused by a defect in Caterpillar material or workmanship.
- Giving timely notice of a warrantable failure and promptly making the product available for repair.
- Performance of the required maintenance (including use of proper fuel, oil, lubricants, and coolant) and items replaced due to normal wear and tear.
- Allowing Caterpillar access to all electronically stored data.

Limitations

Caterpillar is not responsible for:

- Failures resulting from any use or installation that Caterpillar judges improper.
- Failures resulting from attachments, accessory items, and parts not sold or approved by Caterpillar.
- Failures resulting from abuse, neglect, and/or improper repair.
- Failures resulting from user's delay in making the product available after being notified of a potential product problem.
- Failures resulting from unauthorized repairs or adjustments, and unauthorized fuel setting changes.
- Damage to parts, fixtures, housings, attachments, and accessory items that are not part of the engine, Cat Selective Catalytic Reduction System or electric power generation product (including any products of other manufacturers packaged and sold by Caterpillar).
- Repair of components sold by Caterpillar that is warranted directly to the user by their respective manufacturer. Depending on type of application, certain exclusions may apply. Consult your Cat dealer for more information.

(Continued on reverse side…)

This warranty covers every major component of the products. Claims under this warranty should be submitted to a place of business of a Cat dealer or other source approved by Caterpillar. For further information concerning either the location to submit claims or Caterpillar as the issuer of this warranty, write Caterpillar Inc., 100 N. E. Adams St., Peoria, IL USA 61629.

Caterpillar's obligations under this Limited Warranty are subject to, and shall not apply in contravention of, the laws, rules, regulations, directives, ordinances, orders, or statutes of the United States, or of any other applicable jurisdiction, without recourse or liability with respect to Caterpillar.

A) For products operating outside of Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:

NEITHER THE FOREGOING EXPRESS WARRANTY NOR ANY OTHER WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED, IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS THAT IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, EXCEPT CATERPILLAR EMISSION-RELATED COMPONENTS WARRANTIES FOR NEW ENGINES, WHERE APPLICABLE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISION OF MATERIAL AND SERVICES, AS SPECIFIED HEREIN.

CATERPILLAR IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS EXCLUDED IN ITS ENTIRETY.

For personal or family use engines or electric power generation products, operating in the USA, its territories and possessions, some states do not allow limitations on how long an implied warranty may last nor allow the exclusion or limitation of incidental or consequential damages. Therefore, the previously expressed exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights, which vary by jurisdiction. To find the location of the nearest Cat dealer or other authorized repair facility, call (800) 447-4986. If you have questions concerning this warranty or its applications, call or write:

In USA and Canada: Caterpillar Inc., Engine Division, P. O. Box 610, Mossville, IL 61552-0610, Attention: Customer Service Manager, Telephone (800) 447-4986. Outside the USA and Canada: Contact your Cat dealer.

B) For products operating in Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:

T**HIS WARRANTY IS IN ADDITION TO WARRANTIES AND CONDITIONS IMPLIED BY STATUTE AND OTHER STATUTORY RIGHTS AND OBLIGATIONS THAT BY ANY APPLICABLE LAW CANNOT BE EXCLUDED, RESTRICTED OR MODIFIED ("MANDATORY RIGHTS"). ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED (BY STATUTE OR OTHERWISE), ARE EXCLUDED. WITHOUT LIMITING THE FOREGOING PROVISIONS OF THIS PARAGRAPH, WHERE A PRODUCT IS SUPPLIED FOR BUSINESS PURPOSES, THE CONSUMER GUARANTEES UNDER THE CONSUMER GUARANTEES ACT 1993 (NZ) WILL NOT APPLY.**

NEITHER THIS WARRANTY NOR ANY OTHER CONDITION OR WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED (SUBJECT ONLY TO THE MANDATORY RIGHTS), IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS THAT IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

IF THE MANDATORY RIGHTS MAKE CATERPILLAR LIABLE IN CONNECTION WITH SERVICES OR GOODS, THEN TO THE EXTENT PERMITTED UNDER THE MANDATORY RIGHTS, THAT LIABILITY SHALL BE LIMITED AT CATERPILLAR'S OPTION TO (a) IN THE CASE OF SERVICES, THE SUPPLY OF THE SERVICES AGAIN OR THE PAYMENT OF THE COST OF HAVING THE SERVICES SUPPLIED AGAIN AND (b) IN THE CASE OF GOODS, THE REPAIR OR REPLACEMENT OF THE GOODS, THE SUPPLY OF EQUIVALENT GOODS, THE PAYMENT OF THE COST OF SUCH REPAIR OR REPLACEMENT OR THE ACQUISITION OF EQUIVALENT GOODS.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

CATERPILLAR IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES UNLESS IMPOSED UNDER MANDATORY RIGHTS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS EXCLUDED IN ITS ENTIRETY.

C) For products supplied in Australia:

IF THE PRODUCTS TO WHICH THIS WARRANTY APPLIES ARE:

- **I. PRODUCTS OF A KIND ORDINARILY ACQUIRED FOR PERSONAL, DOMESTIC OR HOUSEHOLD USE OR CONSUMPTION; OR**
- **II. PRODUCTS THAT COST AUD 40,000 OR LESS,**

WHERE THOSE PRODUCTS WERE NOT ACQUIRED FOR THE PURPOSE OF RE-SUPPLY OR FOR THE PURPOSE OF USING THEM UP OR TRANSFORMING THEM IN THE COURSE OF PRODUCTION OR MANUFACTURE OR IN THE COURSE OF REPAIRING OTHER GOODS OR FIXTURES, THEN THIS SECTION C APPLIES.

THE FOLLOWING MANDATORY TEXT IS INCLUDED PURSUANT TO THE AUSTRALIAN CONSUMER LAW AND INCLUDES REFERENCES TO RIGHTS THE USER MAY HAVE AGAINST THE DIRECT SUPPLIER OF THE PRODUCTS: OUR GOODS COME WITH GUARANTEES THAT CANNOT BE EXCLUDED UNDER THE AUSTRALIAN CONSUMER LAW. YOU ARE ENTITLED TO A REPLACEMENT OR REFUND FOR A MAJOR FAILURE AND COMPENSATION FOR ANY OTHER REASONABLY FORESEEABLE LOSS OR DAMAGE. YOU ARE ALSO ENTITLED TO HAVE THE GOODS REPAIRED OR REPLACED IF THE GOODS FAIL TO BE OF ACCEPTABLE QUALITY AND THE FAILURE DOES NOT AMOUNT TO A MAJOR FAILURE. THE INCLUSION OF THIS TEXT DOES NOT CONSTITUTE ANY REPRESENTATION OR ACCEPTANCE BY CATERPILLAR OF LIABILITY TO THE USER OR ANY OTHER PERSON IN ADDITION TO THAT WHICH CATERPILLAR MAY HAVE UNDER THE AUSTRALIAN CONSUMER LAW.

TO THE EXTENT THE PRODUCTS FALL WITHIN THIS SECTION C BUT ARE NOT OF A KIND ORDINARILY ACQUIRED FOR PERSONAL, DOMESTIC OR HOUSEHOLD USE OR CONSUMPTION, CATERPILLAR LIMITS ITS LIABILITY TO THE EXTENT IT IS PERMITTED TO DO SO UNDER THE AUSTRALIAN CONSUMER LAW TO, AT ITS OPTION, THE REPAIR OR REPLACEMENT OF THE PRODUCTS, THE SUPPLY OF EQUIVALENT PRODUCTS, OR THE PAYMENT OF THE COST OF SUCH REPAIR OR REPLACEMENT OR THE ACQUISITION OF EQUIVALENT PRODUCTS.

THE WARRANTY SET OUT IN THIS DOCUMENT IS GIVEN BY CATERPILLAR INC. OR ANY OF ITS SUBSIDIARIES, 100 N. E. ADAMS ST, PEORIA, IL USA 61629, TELEPHONE 1 309 675 1000, THE USER IS RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH MAKING A CLAIM UNDER THE WARRANTY SET OUT IN THIS DOCUMENT, EXCEPT AS EXPRESSLY STATED OTHERWISE IN THIS DOCUMENT, AND THE USER IS REFERRED TO THE BALANCE OF THE DOCUMENT TERMS CONCERNING CLAIM PROCEDURES, CATERPILLAR RESPONSIBILITIES AND USER RESPONSIBILITIES.

TO THE EXTENT PERMISSIBLE BY LAW, THE TERMS SET OUT IN THE REMAINDER OF THIS WARRANTY DOCUMENT (INCLUDING SECTION B) CONTINUE TO APPLY TO PRODUCTS TO WHICH THIS SECTION C APPLIES.

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