



## Submittal

To: Airex  
  
  
  
Attn: John Senobio

Date: (\*) July 11, 2025

Client PO#TBA

Project Name: Enbridge Gas Station  
Sales Office: Kildonan Energy Products  
Kildonan Job #: PRJ25-32624  
Submittal for: Record  
X Approval

Approved By:   
Released For:   
Manufacturing and Shipment:   
Hold For Release:   
Approved:   
Approved as Noted:   
Disapproved:   
Explanation for Disapproval:

Explanation: VFD Submittals

Please Return Drawings to: Kildonan Energy Products  
195 Clayton Drive, Unit 8 & 9  
Markham, On, L3R 7P3  
Attn: Pritesh Mistry  
E-mail: [Pmistry@kildonanenergy.com](mailto:Pmistry@kildonanenergy.com)



(\*) To avoid risk of price escalation, the equipment presented within this submittal must be released for production within 12 months of date shown on the Kildonan Submittal Cover Sheet



PRJ25-32624  
JOB NAME: Enbridge Gas Station

**VFD's**

VFD's									
Qty.	Tag Numbers	HP	Frame Size NEMA1	VLT Model	Voltage	Amps	Mechanical Drawing #	Electrical Drawing #	Material No.
2	EF-3&4	3	A2	FC-102P2K2T2	208	10.6	<a href="#">176U5288</a>	<a href="#">007N0299</a>	<a href="#">OP_100</a>

## **ELECTRO-MECHANICALLY CONTROLLED BYPASS (EMB) FEATURES**

### **General Features**

All optional features shall be built, mounted and tested by Danfoss. The factory warranty will apply to the entire assembly as shipped. All options will carry a UL / C-UL Enclosed Industrial Control Panel label. All optional devices will be factory tested as assembly.

### **Bypass Power Features**

- *Three Contactor bypass* will be provided that allows operation of the motor via line power in the event of a failure of the VFD. Motor control selection shall be through either a VFD output contactor or a bypass contactor that is interlocked to ensure that both contactors are not energized simultaneously.
- *Main input disconnect* will be provided that removes power from both the bypass and VFD.
- *VFD-only, fast acting input fuses* will be provided.
- *Mechanical Overload protection* will be supplied for bypass mode (Electronic Thermal Overloads are provided in the VFD).
  - Adjustable current setting for complete motor protection when operating on line power.
  - Overload protection shall include phase loss and phase imbalance protection.
- *A third contactor*, the drive input contactor, will be supplied. This allows powering of the VFD with the motor off or operating in bypass mode for testing, programming and troubleshooting purposes.

### **Bypass Interface and Control Features**

- *Bypass or VFD selection* shall be via a *DRIVE – OFF –BYPASS* selector switch.
- A BYPASS pilot light will illuminate when operating in bypass mode.
- Units that include an optional drive input contactor shall include a fourth switch position; TEST. This shall allow the ability to supply power to the drive for testing purposes while running the motor in bypass.
- Selection of Bypass or VFD operation will be by any one of the following: Manually via the selector switch or automatic bypass operation based on VFD programming.
- Bypass package will include an *External Safety* interlock that will disable motor operation in either bypass or VFD mode when open.
- **EMB2** control package will be provided. There shall be complete *Common Start/Stop command* when operating in either Bypass or VFD mode. Also a Run Permissive circuit allowing for the connection of the VFD directly to a damper and end switch common to both VFD and Bypass. An Automatic bypass feature is selectable, allowing automatic switch to bypass in the event of a VFD fault.
- **Additional Protective features**

In addition to the power and operational protective features listed above, each bypass will include the following:

- Low voltage contactor operation shall be maintained to 70% of the package's nominally rated voltage. This will ensure VFD operation on low voltage conditions that would otherwise be interrupted due to contactor dropout.

The VFD shall be able to operate the motor at a reduced load with the loss of any one of the three phases of power. Contactors shall remain closed regardless of which phase is lost. This will ensure VFD operation on single-phase conditions that would otherwise be interrupted due to contactor dropout.

**WARRANTY**

The VLT HVAC Drive packages for this project carry a 18-month on-site warranty from the date of shipment. This warranty includes parts, labor, travel, and expenses.

**STARTUP**

Danfoss authorized service technician will perform a professional startup service.



## **DRIVE FEATURES – OPERATOR INTERFACE**

### ***The VLT®HVAC Drive***

The VLT HVAC Drive Series is a microprocessor-based, high frequency IGBT-based, PWM AC drive with control functions and software designed solely for the unique needs of HVAC systems. The VLT HVAC Drive uses state-of-the-art Voltage Vector Control to supply full rated motor voltage at rated load and frequency, full motor performance without derating, high efficiency for both drive and motor, and a nearly perfect output sine wave. The diode-bridge rectifier and DC-link reactor provide a high displacement power factor at all speeds and loads and minimize power line harmonics. The VLT HVAC Drive utilizes a common user interface for all units.

### ***Fully Graphic, Multilingual Display***

The VLT HVAC Drive uses a large, bright, backlit graphic display to provide complete drive information at a glance. The logical arrangement of all elements simplifies the setup, operation and monitoring of the drive. Choose from 25 different items to display, including input reference, motor current, hours run, output frequency, horsepower, kW or kWh. Or select from custom units, such as GPM or HP and calibrate the maximum value to the maximum frequency of the unit. After programming one drive, the keypad can be used to transfer the same settings to all other drives. Drive can run without the keypad in place to assure tamper-proof operation. Drive status is shown even with the keypad removed.

### ***LED Indication***

Three LEDs are provided on the VLT HVAC Drive for indication of power applied, warning and fault. Upon power up, all LEDs will briefly light as a lamp test.

*Alarm* – Will flash red when the drive has registered a fault condition which has caused the drive to shut down.

*Warning* – Will flash yellow to indicate a situation exists that exceeds the normal drive/system parameters, and if that condition continues, a trip may be imminent.

*On* – Will glow green to indicate that the VFD is connected to AC power (line voltage is present).

### ***Operating Keys***

*Hand On* – Starts the drive regardless of remote start/stop contact (assuming safety interlock is closed). The speed of the drive will generally be controlled manually via the keypad "+" and "-" buttons.

*Off* – Shuts the drive down regardless of other commands.

*Auto/On* – The drive will start and stop via the external contact closure (building automation time clock). The speed is generally controlled via the building automation signal (4 to 20 mA, 0 to 10 V DC, etc.).

*Reset* – Will reset any trip level fault (not trip lock) if the drive is not set for infinite automatic fault resets.

### ***Directional Keys***

*Right / Left / Up / Down arrows* – Used as the electronic potentiometer to manually control the speed in the Hand/Start mode. All four keys are active during operation as well as programming. They provide the ability to move the cursor around the display, or sequence through display values.

### ***Programming Keys***

*Status* – Used to display operational data and status.

*Cancel* – Used to cancel the last programming command so the change is not carried out.

*OK* – Used to confirm that the last programming change should be saved to memory.

*Back* – Used to exit present display or menu to the previous display or menu.

*Quick Menu* – Used for programming the VLT HVAC Drive for the most typical applications.

*Main Menu* – Used to access all parameters for programming. It can switch directly from this mode to quick menu.

*Alarm Menu* – Used to access all fault and warning data.

*Info Key* – Accesses an on-board manual that gives detailed explanation of a parameter.

## **PROGRAM OPTIONS**

### ***Application-Specific Software***

The VLT HVAC Drive was designed specifically for the HVAC market. This specialization has allowed Danfoss to factory program and configure the VLT HVAC Drive to make it ready to use, out of the box. This eliminates the time-consuming and often confusing job of selecting the correct parameters in the field. For the advanced user, the parameters are logically grouped, making modifications simple. Customized text fields are available to show user-specific data. Four independent setups are available for unmatched flexibility.

### ***Menu Structure***

***Quick Setup Menu*** – Contains the 14 required setup parameters to easily start the application.

***HVAC Application Menu*** – Easy access to the most relevant parameters for each of the most common HVAC applications.

***Personal Menu*** – Contains up to 20 user-selectable parameters for customized access.

***Changes Made Menu*** – Provides easy access to previously modified parameters

### ***Keypad Features***

- Hot-pluggable with upload and download capabilities
- On-screen scroll bars and graphs
- Up to five separate meters displayed simultaneously
- Two-level password protection
- Plain language alarms and warnings
- Remote keypad mounting kits available

### ***USB Connectivity***

The VLT HVAC Drive can be remotely commissioned and monitored through a standard USB connection and MCT 10 PC software.

### **Agency listing:**

All drives and option packages are factory built and carry UL and C–UL listings.

All drives and option packages are built in ISO 9000 and 14001 certified facilities.

## **DRIVE FEATURES – MOTOR AND DRIVE INTERACTION**

### ***Constant-Torque Start***

The VLT HVAC Drive's constant-torque start mode provides full torque to accelerate different loads until the drive reaches the setpoint. Breakaway current can be set up to 160% for up to 0.5 seconds for starting high friction loads.

### ***Current Limit Circuit***

Adjustable from 0 to 110% of the VLT HVAC Drive's rated current (factory set at 110%). If during acceleration the current required to accelerate the load exceeds the current limit, the VLT HVAC Drive will stop accelerating until the motor current is reduced to normal levels, at which time the load will continue to accelerate at the rate set by the acceleration time.

### ***Three-Phase Output Current Measurement***

The VLT HVAC Drive's software measures output current on all three phases. Phase grounding is detected instantly. Output contactors may be repeatedly used with no damage to the drive. Multiple motors may be run from one drive.

### ***Advanced Motor Protection***

The VLT HVAC Drive features integrated electronic, thermal motor protection. The VFD calculates the motor temperature based on current, frequency, and time. This system allows for changing cooling conditions as speed and load vary. The drive can predict motor overheating and reports a % of thermal load.

### ***Motor Preheat Circuit***

This preheat function can be activated to avoid condensation on the motor windings when it is stopped.

### ***Stall Protection***

The VLT HVAC Drive provides protection against a stalled motor. When activated, this function can provide a warning or a fault condition caused by excessive motor current at low speeds.

## **DRIVE FEATURES**

### ***DC-Link Reactor***

A dual, 5% DC-link reactor on the positive and negative rails of the DC bus is standard equipment on the VLT HVAC Drive. This reactor reduces the level of harmonics reflected back into the building power system without causing a voltage loss at the drive's input and reducing efficiency as an external AC line reactor would. This reactor also improves input power factor. The reactor is non-saturating (linear) to provide full harmonic filtering throughout the entire load range. In performance, the DC-link reactor is equivalent to a 5% AC line reactor.

### ***Power Line Protection***

Power line voltage surge protection is provided by means of input Metal Oxide Varistors (MOVs). This protects the diodes in the VLT HVAC Drive's 3-phase full wave diode bridge. The DC-link reactor also acts to reduce input current caused by power line disturbances.

### ***Sleep Mode***

Automatically stops the drive when speed drops below set "sleep" level for specified time. Automatically restarts when speed command exceeds set "wake" level. Saves energy and reduces wear on driven equipment.

### ***Run Permissive Circuit***

Ability to accept a "system ready" signal assures that dampers or other auxiliary equipment are in the proper state for drive operation. This feature also provides the ability for the drive to send a "start signal applied" signal to the system to notify the auxiliary equipment of the drive's request to start.

### ***Firefighter's Override Mode***

Overrides all other commands to provide desired operation. Ignores most alarms including overload, overcurrent, overtemperature, and phase loss. When used with bypass, selectable to run from drive, from bypass, or switch from drive to bypass in the event of a drive failure.

### ***Acceleration / Deceleration Rates***

The VLT HVAC Drive can provide four individually controlled sets of acceleration/deceleration rates each from 1 to 3600 seconds. The shape of these curves may be automatically contoured to prevent tripping.

### ***Enclosure***

The VLT HVAC NEMA 1 drive is recognized by UL for installation in air handling compartments.

### ***Auto Restarts***

The VLT HVAC Drive can be automatically restarted up to 20 times or infinitely at 0 to 600 second intervals. If the application causes the drive to trip more than the number of trials set, the drive will stop operating and display the fault on the display screen. A manual reset will be required by means of the reset key, a digital input, or EIA-485 command. In cases of severe trips, as a safety feature, the drive's input power may have to be cycled to restart a fault.

### ***Carrier Frequency***

By using IGBTs, the VLT HVAC Drive can employ high switching frequencies, so the motor current is practically sinusoidal. Audible motor noise can also be minimized by adjusting the switching frequency. These frequencies can be set or adjust themselves automatically to fit the application.

### ***Input Power***

The VLT HVAC Drive is equipped with an automatic sustained power or phase loss circuit. The VLT HVAC Drive will provide a full rated output with an input voltage as low as 90% of the nominal. The drive will continue to operate with reduced output with an input voltage as low as 164 volts for 208/230 volt units, 313 volts for 460 volt units, and 394 volts for 600 volt units.

### ***Automatic Motor Adaptation (AMA)***

Knowing motor stator resistance, the drive automatically optimizes performance and efficiency. The motor does not have to be run or decoupled from the load for the AMA setup to be performed.

### ***Automated Frequency Avoidance / Critical Frequency Lockouts***

For applications where it may be necessary to avoid specific frequencies due to mechanical resonance problems in the driven equipment, the VLT HVAC Drive, with its Critical Frequency Lockout Function, makes it possible to set up to four different frequency ranges which will be avoided during operation of the drive. This feature can be programmed by simply activating the feature and pushing OK at the top and bottom points that you wish to avoid.

- Each critical frequency setting can avoid a frequency band which is from 1 to 100 Hz wide. If the reference signal defines that the VLT HVAC Drive is to operate within this critical frequency range, the critical frequency lockout function will keep the drive operating continuously within this range.
- When the frequency reference signal rises above the critical frequency maximum limit, the VLT HVAC Drive will allow the motor to accelerate through the critical frequency at the rate set by the acceleration rate.

### ***Automatic Energy Optimization Circuitry***

The Automatic Energy Optimization (AEO) function adapts the output of the drive to the specific motor and load connected. This circuit optimizes the system efficiency as system loads change. The AEO function regulates the output voltage on the basis of the reactive current and the effective current. A savings of 3 to 10% in power consumption can be obtained with this function.

### ***Preset Speeds***

The VLT HVAC Drive allows for a maximum of 16 programmable preset speeds to be selected from the digital inputs.

### ***Energy Monitoring***

Real energy savings are always available without the additional expense of external equipment.

### ***Real-Time Clock***

Adds sophisticated performance to basic control schemes for increased comfort and energy savings.

### ***Automatic High Ambient Derate***

If the ambient temperature exceeds the normal limit, the drive can be set to warn of its overtemperature and continue to run, keeping the HVAC system functional. To control its temperature, the drive will reduce the output carrier frequency and then, if necessary, reduce the output current.

### ***Preventive Maintenance Scheduling***

The VLT HVAC Drive can monitor system usage and notify the operator when preventive maintenance is required.

### ***Intelligent HVAC Controller***

Four auto-tuning PIDs control the drive and up to three other devices, eliminating external controllers and reducing cost.

- **Proportional:** The proportional gain dictates the rate at which the deviation between actual and desired feedback signal is corrected. The higher the gain, the faster the response, but too high a gain can cause hunting and a large overshoot.
- **Integral Time:** The integral time continually compares the feedback value with the desired setpoint over time to make sure the setpoint is reached. The greater the integral time, the longer it takes to actually achieve the setpoint, but improves the system stability.
- **Derivative:** The derivative function monitors the rate at which the feedback is closing on the desired setpoint and slows the rate of approach to prevent overshooting. This function allows rapid accurate system control.

### ***Built-in Communications***

The VLT HVAC Drive is fully equipped for serial communication (EIA-485). Up to 31 drives can be connected to one serial bus up to 5,000 feet long.

Communicates directly with *Johnson Controls Metasys (N2)*, *Siemens Building Technologies System 600 (FLN)*, and *Modbus RTU* systems with no hardware changes or additional costs.

### ***Broken Belt, Loss of Load***

A minimum motor current value can be set to indicate the motor is not using any more current than to run at idle. This can be used to indicate a broken belt or coupler. This feature can also be used to detect when a motor is disconnected from the drive.

## SPECIFICATIONS

### **Drive Input Power**

Input voltage, 3 phase .....	200–240, or 380–460, or 525–600 VAC
Input voltage range for full output.....	Nominal $\pm 10\%$
Undervoltage trip point .....	164, 313 VAC, or 394 VAC
Overvoltage trip point.....	299, 538, or 690 (792 for 100 HP and above) VAC
Input frequency .....	50 or 60 Hz, $\pm 2$ Hz
Displacement Power factor.....	0.98 or greater at all speeds and loads

### **Drive Output Power**

Output frequency .....	Selectable 0 to 120 Hz
Motor voltages .....	200, 208, 220, 230; 380, 400, 415, 440, 460; 550 or 575 VAC
Continuous output current .....	100% rated current
Output current limit setting.....	Adjustable to 110% of drive rating
Current limit timer .....	0 to 60 seconds or infinite
Adjustable maximum speed .....	From minimum speed setting to 120 Hz
Adjustable minimum speed .....	From maximum speed setting to 0 Hz
Acceleration time .....	To 3,600 seconds to base speed
Deceleration time.....	To 3,600 seconds from base speed
Breakaway torque time.....	0.0 to 0.5 seconds (1.6 times motor nameplate current)
Start voltage.....	0 to 10%
DC braking time .....	0 to 60 seconds
DC braking start.....	0 to maximum frequency
DC braking current.....	0 to 50% of rated motor current

### **Environmental limits:**

Efficiency .....	97% or greater at full load and nominal motor speed
Ambient operating temperature .....	14°F to 113°F (–10°C to 45°C) frames A2–C2; 14°F to 104°F (–10°C to 40°C) frames D1–E1
Humidity .....	< 95%, non-condensing
Altitude: maximum without derating.....	3,300 ft. (1,000 m)
Drive and options enclosure(s).....	NEMA/UL Type 1

## **Software**

Lost speed reference action .....	Selectable to go to a preset speed, go to maximum speed, stay at last speed, stop, turn off, or stop and trip
Time delay for lost speed reference action .....	1 to 99 seconds
Adjustable auto restart time delay .....	0 to 600 seconds
Automatic restart attempts.....	0 to 20 or infinite
Automatic restart time delay .....	0 to 600 seconds between each attempt
Relay ON delay and relay OFF delay .....	0 to 600 seconds
Maximum number of preset speeds .....	16
Maximum number of frequency stepovers .....	4
Maximum stepover width.....	100 Hz
Maximum number of accel rates .....	4
Maximum number of decel rates .....	4
Delayed Start.....	0 to 120 seconds



### **Protections:**

Low frequency and high frequency warnings .....	0 to 120 Hz
Low current and high current warnings .....	0 to maximum current
Low reference and high reference warnings .....	-999,999 to 999,999
Low feedback and high feedback warnings .....	-999,999 to 999,999
Ground fault .....	Protected
Motor stall .....	Protected
Motor overtemperature .....	Protected (Predictive motor temperature)
Motor Condensation .....	Protected (Motor pre-heat circuit)
Pump No-Flow .....	Protected
Pump end-of-curve .....	Protected
Dry pump .....	Protected
Short-cycle .....	Protected
Motor overload .....	Protected (Programmable action)
Vibration protection .....	Protected (Programming automated)

### **Control Connections**

Follower signal, analog input .....	2; selectable voltage or current, direct and inverse acting
Programmable digital inputs .....	6 (2 can be used as digital outputs)
Programmable analog outputs .....	1; 0/4 to 20 mA
Programmable relay outputs .....	2 standard Form C 240 V AC, 2 A; 1 or 3 additional optional
Auxiliary voltage .....	+24 V DC, maximum 200 mA

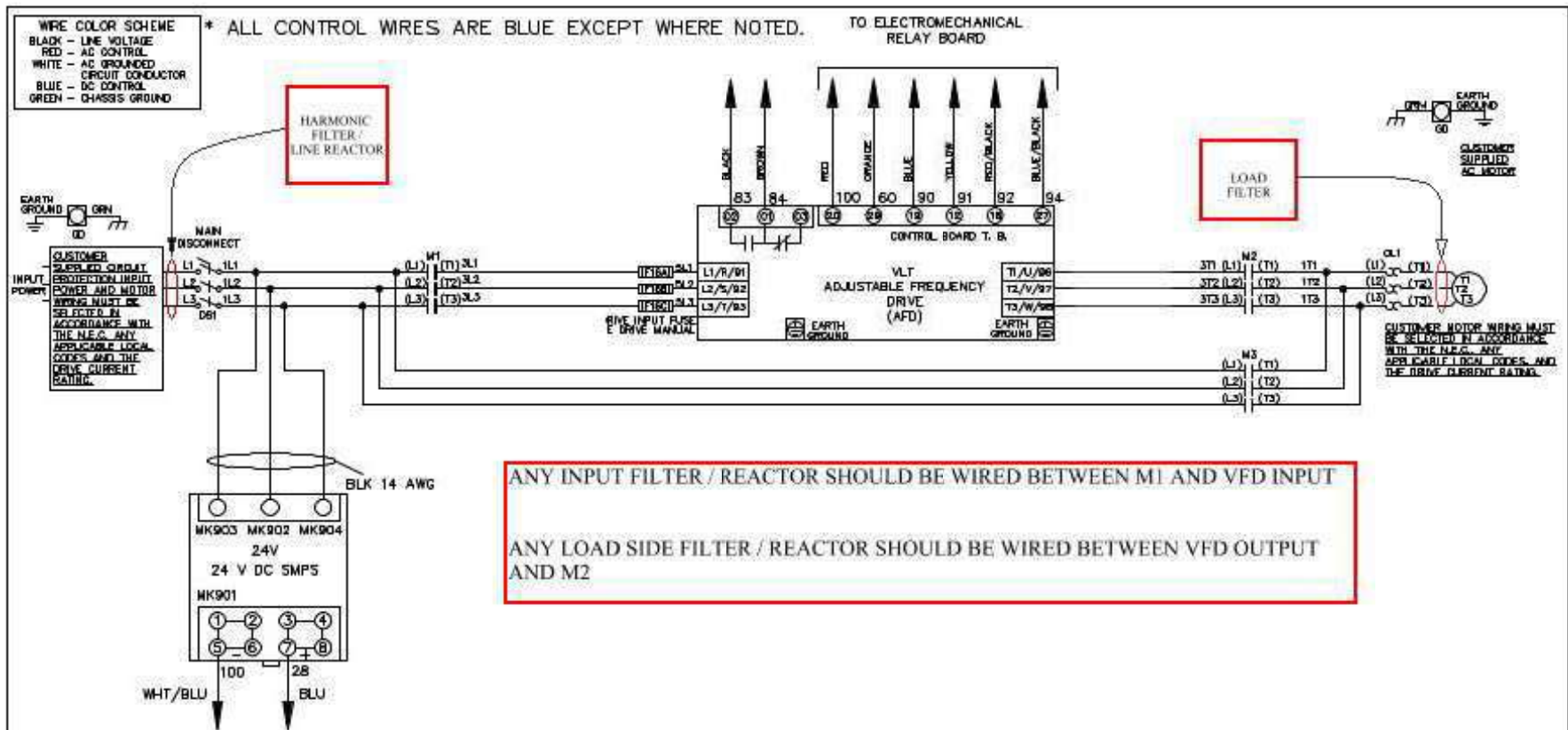
### **Control Optional**


MCB 101 General Purpose I/O .....	3 DI, 2 DO, 2 AI (voltage), and 1 AO (current)
MCB 105 Relay Card .....	3 standard Form C 240 V AC, 2 A
MCB 107 24V DC Supply .....	Allows external 24 V DC power to be connected to the VLT HVAC Drive
MCB 109 Analog I/O .....	3 AO(voltage), 3 AI(voltage or PT1000 or NI1000), Battery backup
MCB 110 Battery backup .....	Battery backup for real-time clock

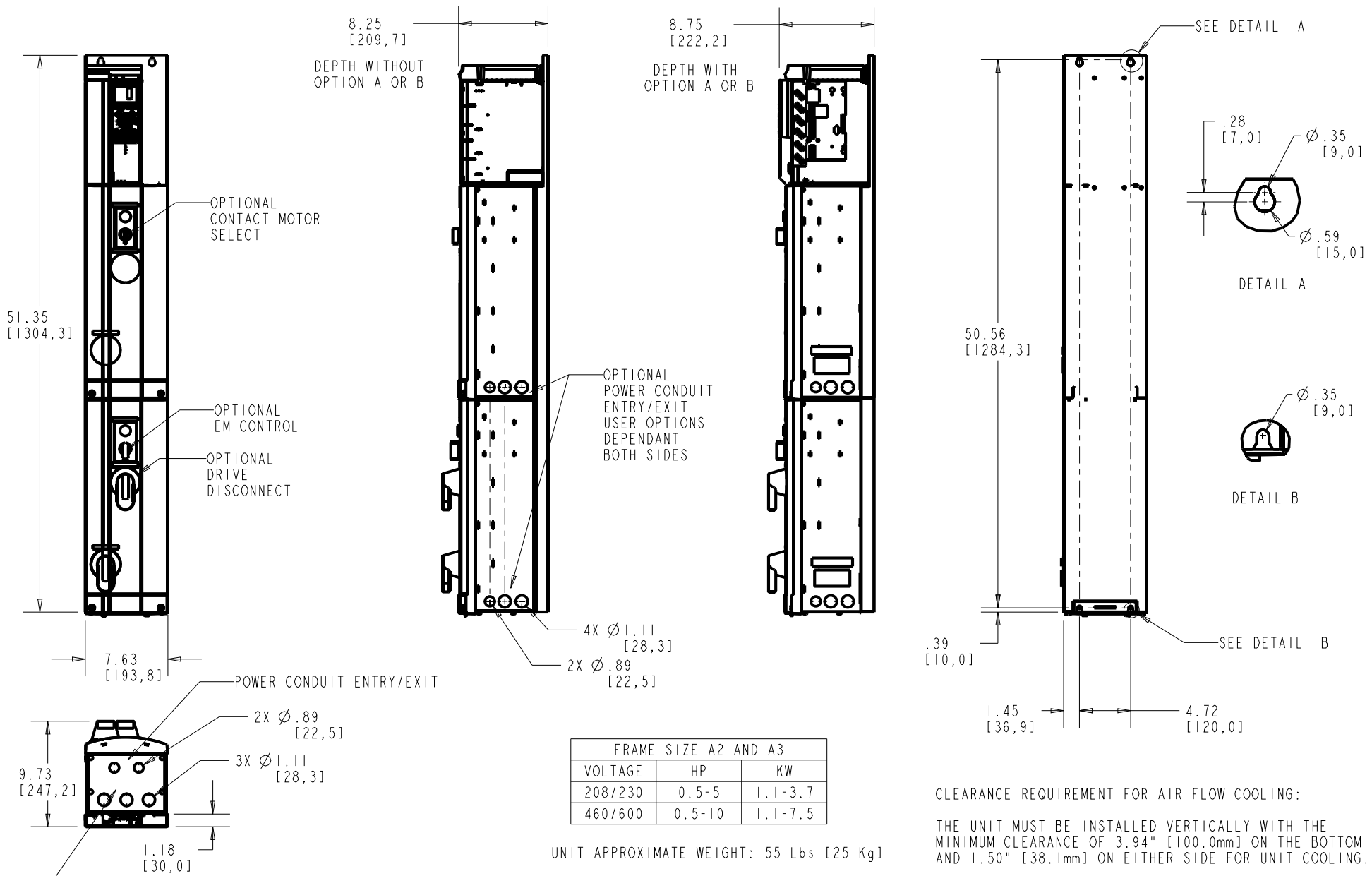
Optional Features:

Input Disconnect Switch	<u>Included</u>
Input Fuses	<u>Included</u>
Input DC Link Reactor	<u>Included</u>
Firemans Override (VFD and Bypass)	<u>Included</u>
Run Permissive Circuit (VFD & Bypass)	<u>Included</u>
BACnet Ip communication Protocol	<u>Included</u>
NEMA 1 Enclosure	<u>Included</u>
Three Contactor Bypass	<u>Included</u>
Integrated 3% Input Line Reactor	<u>Included</u>
100kAIC Drive & Bypass Rating	<u>Included</u>
Load Reactor in a Nema 1 Box	<u>Included</u>

## External Filter Placement & Wiring Guideline



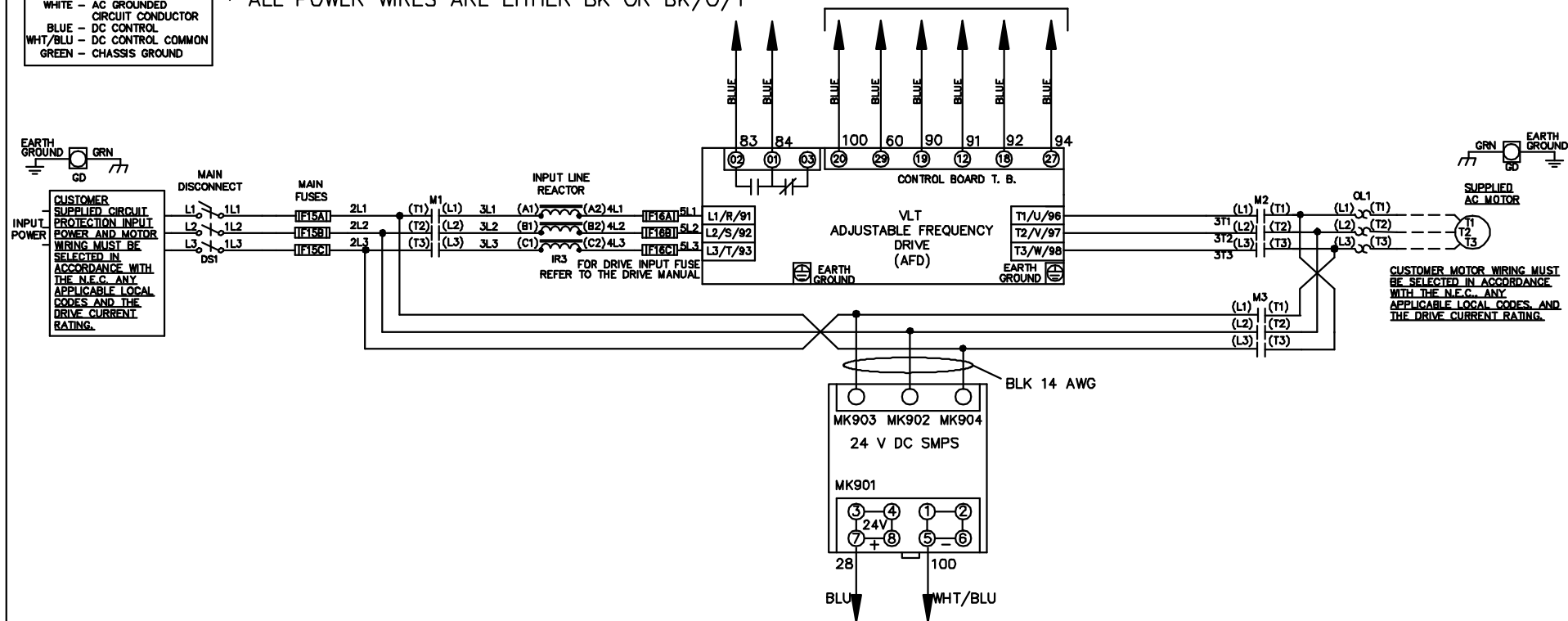
			- NOTICE - THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF DANFOSS DRIVES. IT IS LOANED BY DANFOSS DRIVES SUBJECT TO THE CONDITIONS THAT IT AND THE INFORMATION EMBODIED THEREIN SHALL BE USED ONLY FOR RECORD AND REFERENCE PURPOSES, SHALL NOT BE USED OR CAUSED TO BE USED IN ANY WAY PREJUDICIAL TO THE INTERESTS OF DANFOSS DRIVES, SHALL NOT BE REPRODUCED OR COPIED IN WHOLE OR IN PART, OR DISCLOSED TO ANYONE WITHOUT THE DIRECT WRITTEN PERMISSION OF DANFOSS DRIVES AND SHALL BE RETURNED UPON REQUEST.		DRN JNW 2/14/07	NAME 208-600VOLT,3C,MAIN DISC DRIVE FUSE,EMB2,FRAME A2-A3 NO REACTOR & DVDT,SINGLE MTR					
REV	ECN	DATE	APR	MODEL	VLT	PAGE	1 OF 2	SIZE	A	DWG NO.	174U3338




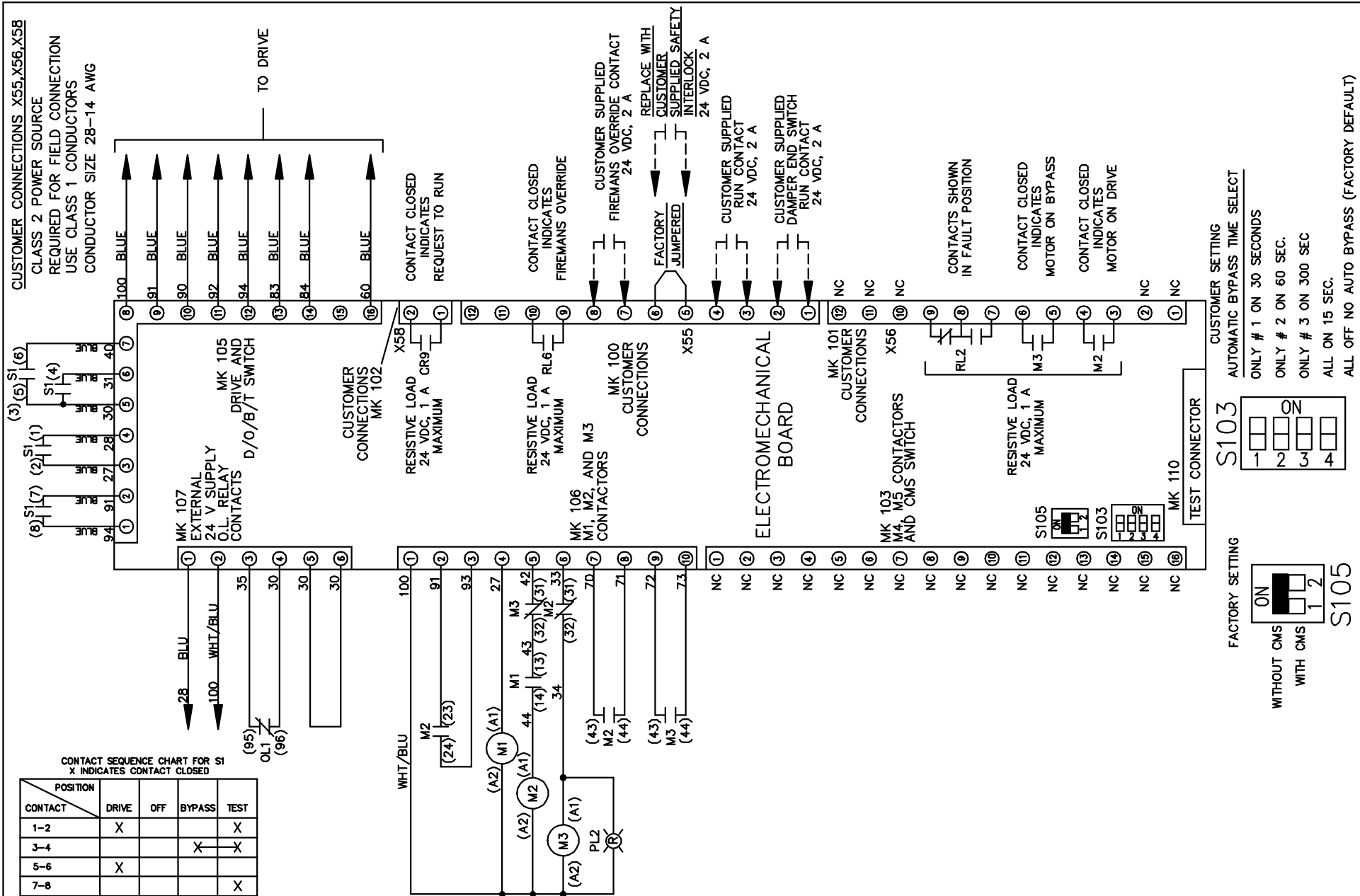
<p>- NOTICE -</p> <p>THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF DANFOSS DRIVES. IT IS LOANED BY DANFOSS DRIVES SUBJECT TO THE CONDITIONS THAT IT AND THE INFORMATION EMBODIED THEREIN SHALL BE USED ONLY FOR RECORD AND REFERENCE PURPOSES, SHALL NOT BE USED OR CAUSED TO BE USED IN ANY WAY PREJUDICIAL TO THE INTERESTS OF DANFOSS DRIVES, SHALL NOT BE REPRODUCED OR COPIED IN WHOLE OR IN PART OR DISCLOSED TO ANYONE WITHOUT THE DIRECT WRITTEN PERMISSION OF DANFOSS DRIVES, AND SHALL BE RETURNED UPON REQUEST.</p>		<p>PRO-E ENTRY BY/DATE:</p> <p>MG 03/02/07</p> <p>DESIGNED BY/DATE:</p> <p>MG 03/02/07</p> <p>APPROVAL:</p>	<p>CHECKED BY/DATE:</p> <p>MFG. APPROVAL BY/DATE:</p> <p>ENG. APPROVAL BY/DATE:</p>	<p><b>Danfoss</b></p> <p>DANFOSS DRIVES</p> <p>4401 N. BELL SCHOOL RD. LOVES PARK, ILLINOIS 61111 USA</p> <p>(815) 639-8600 FAX (815) 639-8000</p>	
<p>LATEST E.C.N. NO.:</p> <p>SP10032</p>		<p>E.C.N. PRO-E ENTRY BY/DATE:</p> <p>SAK 04/30/10</p>	<p>PLOT SCALE:</p> <p>1.000</p>	<p>PRO-E FILE:</p> <p>APU-A2-A3_MAIN-T2-T3</p>	<p>TITLE:</p> <p>DWG, REF, SUBMITTAL, A2-A3-TIER 3</p>
<p>SHEET:</p> <p>1</p>		<p>OF:</p> <p>1</p>	<p>DRAWING NO.:</p> <p>176U5288</p>	<p>REV.:</p> <p>A</p>	

**WIRE COLOR SCHEME**  
 BLACK - LINE VOLTAGE  
 RED - AC CONTROL  
 WHITE - AC GROUND  
 WHITE - AC GROUND  
 BLUE - DC CONTROL  
 BLUE - DC CONTROL  
 WHT/BLU - DC CONTROL COMMON  
 GREEN - CHASSIS GROUND

- \* ALL CONTROL WIRES ARE BLUE EXCEPT WHERE NOTED.  
 \* ALL POWER WIRES ARE EITHER BK OR BK/O/Y



			<p align="center">- NOTICE -</p> <p>THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF DANFOSS DRIVES. IT IS LOANED BY DANFOSS DRIVES SUBJECT TO THE CONDITIONS THAT IT AND THE INFORMATION EMBODIED THEREIN SHALL BE USED ONLY FOR RECORD AND REFERENCE PURPOSES, SHALL NOT BE USED OR CAUSED TO BE USED IN ANY WAY PREJUDICIAL TO THE INTERESTS OF DANFOSS DRIVES, SHALL NOT BE REPRODUCED OR COPIED IN WHOLE OR IN PART, OR DISCLOSED TO ANYONE WITHOUT THE DIRECT WRITTEN PERMISSION OF DANFOSS DRIVES AND SHALL BE RETURNED UPON REQUEST.</p>	DRN GWT	NAME 208-600VOLT,3C,MAIN DISC				
02	065295	01/22		10/01/21	,MAIN FUSE,EMB2,FRAME A2-A3				
01	060346	10/21		APR TWB	MODEL		PAGE 1 OF 2	SIZE A	DWG NO.
REV	ECN	DATE		10/01/21	EMB2 3C A2-A3 R-02				007N0299

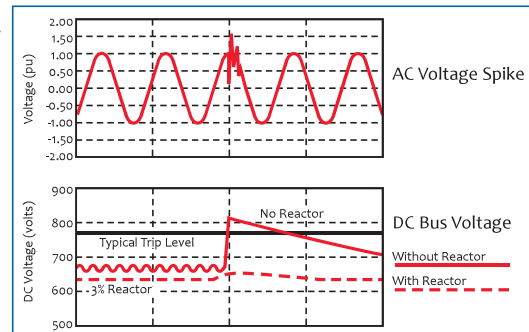


## RL Line/Load Reactors

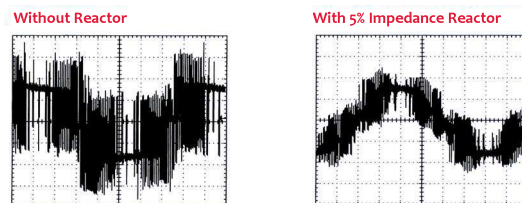
### Selection Table, Technical Details & Product Application Guide

**MTE HARMONIC COMPENSATED LINE/LOAD REACTORS** help keep your equipment running longer by absorbing many of the power line disturbances which otherwise damage or shut down your inverters, variable frequency drives (VFDs), variable speed controllers, or other sensitive equipment. They are a robust filtering solution for virtually any 6 pulse rectifier or power conversion unit. There is no need to de-rate MTE Reactors as they are harmonic compensated and IGBT protected to assure optimum performance in the presence of harmonics, and are very effective at reducing harmonics produced by inverters and drives. Standard MTE Reactors may be applied up to 690 VAC with compatible impedance ratings. **MTE RL Reactors have higher continuous and overload ratings.**

**VOLTAGE SPIKE PROTECTION** - Voltage spikes on the AC power lines cause rapid elevation of the DC Bus voltage which may cause the inverter to "trip-off" and indicate an over-voltage protection condition. RL Reactors absorb these line spikes and offer protection to the rectifiers and DC Bus capacitors while minimizing nuisance tripping of the inverter. A 3% impedance RL Reactor is 90% effective at protecting against transients or nuisance tripping of AC voltage source inverters due to voltage spikes. The 5% RL Reactor extends spike protection to 99%.



**MOTOR PROTECTION** - MTE RL Reactors help to protect motors and cables from the high peak voltages and fast rise times (dV/dt) which can be experienced in IGBT inverter applications when the distance between the inverter and motor is up to 300 feet. For guaranteed long lead protection up to 1000 feet use the MTE **dV/dt Filter** or the MTE **Sine Wave Filter** as the ultimate in motor and wire protection.



#### HARMONICS:

Drive Harmonic currents will be reduced by adding an input line reactor.

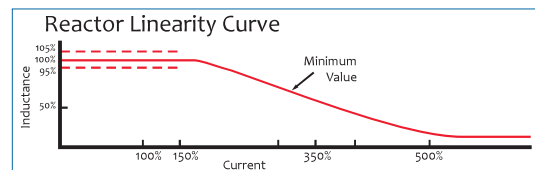
3% impedance reactor yields 35-55% THID

5% impedance reactor yields 25-45% THID

*Note: for guaranteed compliance to IEEE519 (5% THID) use a MTE Matrix Series D Filter*

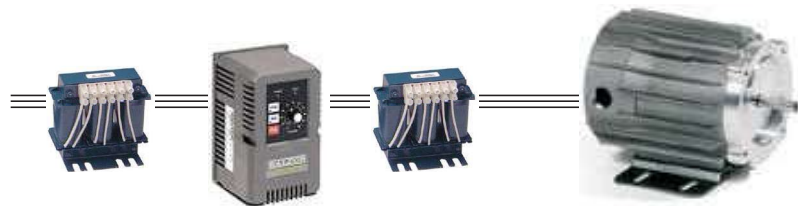


**REACTOR LOADED PERFORMANCE:** The curve to the right illustrates the linearity of MTE RL Reactors. Even at 150% of their rated current, these reactors still have 100% of their nominal inductance. This assures maximum filtering of distortion even in the presence of severe harmonics and the best absorption of surges. The typical tolerance on rated inductance is plus-or-minus 10%.



#### Typical uses include:

- Protect Motors from Long Lead Effects
- Reduce Output Voltage dV/dt
- Virtually Eliminate Nuisance Tripping
- Extend Semiconductor Life
- Reduce Harmonic Distortion
- Reduce Motor Temperature
- Reduce Motor Audible Noise



For three phase applications you can use the same MTE catalog part number to protect both line and load side of a VFD.

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## Selection Table 208-690 VAC Three-Phase and Single-Phase Applications

Input Voltage		% Impedance	0.25hp 0.18kw	0.33hp 0.25kw	0.5hp 0.37kw	0.75hp 0.55kw	1hp 0.75kw	1.5hp 1.1kw	2hp 1.5kw	3hp 2.2kw	5hp 3.7kw	7.5hp 5.5kw	10hp 7.5kw	15hp 11kw	20hp 15kw	25hp 18.5kw
Three Phase input or output applications selected by Motor	208 vac 60Hz	3%	RL-00204	RL-00204	RL-00401	RL-00401	RL-00802	RL-00801	RL-01201	RL-01801	RL-02501	RL-03501	RL-04501	RL-05501	RL-08001	RL-10001
		5%	RL-00201	RL-00201	RL-00402	RL-00803	RL-00802	RL-00802	RL-01202	RL-01802	RL-02502	RL-03502	RL-05502	RL-08002	RL-10002	RL-08001
	240 vac 60Hz	3%	RL-00201	RL-00204	RL-00204	RL-00401	RL-00401	RL-00801	RL-00801	RL-01201	RL-01801	RL-02501	RL-03501	RL-04501	RL-08001	RL-10001
		5%	RL-00202	RL-00201	RL-00403	RL-00402	RL-00803	RL-00802	RL-00802	RL-01202	RL-01802	RL-03502	RL-03502	RL-05502	RL-08002	RL-10002
	400 vac 50Hz	3%	RL-00103	RL-00103	RL-00202	RL-00202	RL-00201	RL-00403	RL-00402	RL-00803	RL-01202	RL-01202	RL-01802	RL-02502	RL-03502	RL-04502
		5%	RL-00102	RL-00102	RL-00203	RL-00203	RL-00202	RL-00404	RL-00404	RL-00804	RL-01203	RL-01203	RL-01803	RL-02503	RL-03503	RL-04503
	480 vac 60Hz	3%	RL-00103	RL-00103	RL-00104	RL-00201	RL-00201	RL-00402	RL-00402	RL-00803	RL-00802	RL-01202	RL-01802	RL-02502	RL-03502	RL-03502
		5%	RL-00102	RL-00102	RL-00103	RL-00202	RL-00202	RL-00404	RL-00404	RL-00804	RL-00803	RL-01203	RL-01803	RL-02503	RL-03503	RL-03503
	600 vac 60Hz	3%	RL-00102	RL-00102	RL-00103	RL-00202	RL-00202	RL-00201	RL-00403	RL-00402	RL-00803	RL-01202	RL-01202	RL-01802	RL-02502	RL-02502
		4%	RL-00101	RL-00101	RL-00102	RL-00203	RL-00203	RL-00202	RL-00404	RL-00404	RL-00804	RL-01203	RL-01203	RL-01803	RL-02503	RL-02503
	690 vac 50Hz	2%								RL-00403	RL-00402	RL-00801	RL-01202	RL-01202	RL-01802	RL-02502
		3%								RL-00402	RL-00404	RL-00804	RL-01203	RL-01203	RL-01803	RL-02503
Single Phase Input Applications	Use outer two windings															
	120 vac 60Hz	5%	RL-00801	RL-001201	RL-01801	RL-02501	RL-02501	RL-03503	RL-03501	RL-05501	RL-10001	RL-13001	RL-13001			
	208 vac 60Hz	5%	RL-00401	RL-00401	RL-00401	RL-01202	RL-00801	RL-01201	RL-02502	RL-03502	RL-03501	RL-04501	RL-05501	RL-08001	RL-13001	RL-13001
	240 vac 60Hz	5%	RL-00402	RL-00401	RL-00803	RL-00802	RL-01202	RL-01201	RL-01201	RL-01801	RL-04502	RL-08002	RL-08002	RL-08001	RL-10001	RL-16002
	240 vac 50Hz	5%	RL-hp	RL-00402	RL-00402	RL-00802	RL-00802	RL-01802	RL-01802	RL-02502	RL-03502	RL-05502	RL-08002	RL-10002	RL-13002	RL-16002
	400 vac 50Hz	5%	RL-00103	RL-00202	RL-00201	RL-00201	RL-00403	RL-00402	RL-00803	RL-01203	RL-01803	RL-02503	RL-03503	RL-04502	RL-05502	RL-08002
	480 vac 60Hz	5%	RL-00202	RL-00202	RL-00202	RL-00404	RL-00403	RL-00402	RL-00803	RL-01203	RL-01803	RL-02503	RL-02502	RL-05503	RL-08003	RL-08003
	600 vac 60 Hz	5%			RL-00202	RL-00202	RL-00404	RL-00403	RL-00403	RL-00803	RL-01203	RL-01803	RL-02503	RL-03503	RL-04503	RL-05503

For detailed product specifications refer to the RL User Manual or RL Reference Sheet.

This table is suitable for selection of both input & output 3-phase reactors because their harmonic compensation & conservative design allow them to be used in either application. Specific current & inductance ratings are indicated on Pages 4 & 5. Consult factory for any special applications (higher current, motor rating different than controller rating, etc).

Select RL line/load reactors based upon motor horsepower (or kilowatts) and voltage. Verify that the motor full load ampere name plate rating is within the RMS current rating of the reactor, & the drive/inverter rating is within the maximum continuous current rating of the reactor

### Agency Approvals:

MTE RL Reactors are manufactured to the exacting standards of MIL-I-45208, VDE-0550, & are UL Listed and CSA certified. All UL approvals are for USA & Canada.

- CSA File #LR29753-13, open units up to 2400A
- UL-508 File #E180243, open and enclosed up to 2400A

### NEMA Cabinets:

RL reactors are available as either open type or in a NEMA Type 1 general purpose enclosure or NEMA type 3R weather. To order a reactor mounted in a cabinet simply change the second last digit of the part number from "o" to "1" (NEMA1) or "3" for (NEMA 3R) Cabinets.

Example: RL-00802 enclosed becomes RL-00812.

### Impedance Rating:

**3% impedance** reactors are typically sufficient to absorb power line spikes and motor current surges. They will prevent nuisance tripping of drives or circuit breakers in most applications.

**5% impedance** reactors are best for reducing harmonic currents and frequencies. Use them when you must reduce VFD drive generated harmonics, and to reduce motor operating temperature, or to reduce motor noise.

$$\%_{\text{impedance}} = \frac{I_{\text{RMS}} \times 2\pi F_{50/60\text{Hz}} \times L_{\text{RL Inductance}} \times \sqrt{3}}{V_{\text{L-L}}} \times 100$$

**Note: The effective impedance of the reactor changes with actual RMS current through the reactor as seen in the above equation.**

**A 5% impedance reactor becomes 3% if its current is reduced to 60%.**

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## Selection Table 208-690 VAC Three-Phase and Single-Phase Applications ... Continued

30hp 22kw	40hp 30kw	50hp 37.5kw	60hp 45kw	75hp 55kw	100hp 75kw	125hp 93kw	150hp 112kw	200hp 150kw	250hp 187kw	300hp 225kw	350hp 262kw	400hp 300kw	500hp 375kw	600hp 450kw	700hp 550kw	800hp 600kw
RL-13001	RL-13001	RL-16001	RL-20001B14	RL-25001B14	RL-32001B14	RL-50001B14	RL-50001B14	RL-60001	RL-75001	RL-85001B14	RL-100001B14	RL-120001B14	RL-40001			
RL-10001	RL-13001	RL-16001	RL-20002B14	RL-25002B14	RL-32001B14	RL-50002	RL-60002	RL-60001	RL-75002	RL-85001B14	RL-100002B14	RL-120002B14	RL-40001			
RL-10001	RL-13001	RL-13001	RL-16001	RL-20001B14	RL-25001B14	RL-32001B14	RL-40001B14	RL-50001B14	RL-60001	RL-75001	RL-85001B14	RL-100001B14	RL-120001B14			
RL-10002	RL-13002	RL-13001	RL-16002	RL-20002B14	RL-25002B14	RL-32002B14	RL-40002B14	RL-50002	RL-60002	RL-75002	RL-85002B14	RL-100002B14	RL-120002B14			
RL-04502	RL-05502	RL-08002	RL-10002	RL-13002	RL-16002	RL-20002B14	RL-25002B14	RL-32002B14	RL-40002B14	RL-50002	RL-60002	RL-75002	RL-90002B14	RL-100002B14	RL-120002B14	
RL-04503	RL-05503	RL-08003	RL-10003	RL-13003	RL-16003	RL-20003B14	RL-25003B14	RL-32003B14	RL-40003B14	RL-50003	RL-60003	RL-75003	RL-90003B14	RL-100003B14	RL-120003B14	
RL-04502	RL-05502	RL-08002	RL-08002	RL-10002	RL-13002	RL-16002	RL-20002B14	RL-25002B14	RL-32002B14	RL-40002B14	RL-50002	RL-60002	RL-75002	RL-85002B14	RL-100002B14	
RL-04503	RL-05503	RL-08003	RL-08003	RL-10003	RL-13003	RL-16003	RL-20003B14	RL-25003B14	RL-32003B14	RL-40003B14	RL-50003	RL-60003	RL-75003	RL-85003B14	RL-100003B14	
RL-03502	RL-04502	RL-05502	RL-08002	RL-08002	RL-10002	RL-13002	RL-16002	RL-20002B14	RL-25002B14	RL-32002B14	RL-40002B14	RL-50002	RL-60002	RL-75002	RL-85002B14	
RL-03503	RL-04503	RL-05503	RL-08003	RL-08003	RL-10003	RL-13003	RL-16003	RL-20003B14	RL-25003B14	RL-32003B14	RL-40003B14	RL-50003	RL-60003	RL-75003	RL-85003B14	
RL-02502	RL-02501	RL-03501	RL-04502	RL-05502	RL-08002	RL-08002	RL-10002	RL-13002	RL-13002	RL-16002	RL-20002B14	RL-25002B14	RL-32002B14	RL-40002B14	RL-50002	
RL-02503	RL-02503	RL-03503	RL-04503	RL-05503	RL-08003	RL-08002	RL-10003	RL-13003	RL-13003	RL-16003	RL-20003B14	RL-25003B14	RL-32003B14	RL-40003B14	RL-50003	
Use outer two windings																
RL-16001	RL-20001B14	RL-25001B14	RL-32001B14	RL-40001B14	RL-50001B14											
RL-20002B14	RL-25002B14	RL-32002B14	RL-40002B14	RL-50002	RL-60002											
RL-16002	RL-20002B14	RL-25002B14	RL-32002B14	RL-40002B14	RL-50002											
RL-08002	RL-10002	RL-13003	RL-16003	RL-20003B14	RL-25003B14											
RL-08003	RL-10002	RL-13003	RL-16003	RL-20003B14	RL-25003B14	RL-32003B14	RL-40003B14	RL-50003								
RL-08003	RL-08002	RL-10003	RL-13003	RL-16003	RL-20003B14	RL-25003B14	RL-32003B14	RL-40003B14								

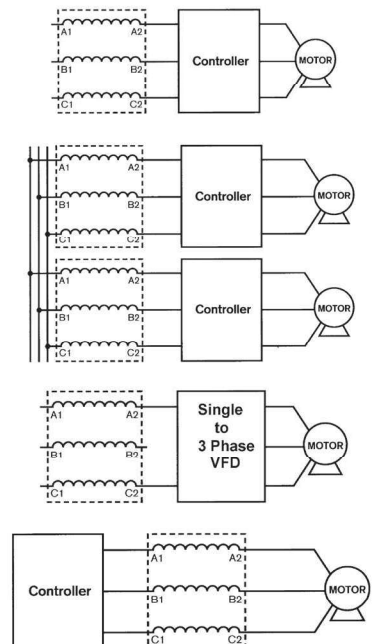
### Standard Application of RL Line/Load Reactors:

On the input of motor VFD controller or six-pulse nonlinear load, RL Reactors protect sensitive electronic equipment from electrical noise created by the drive or inverter (notching, pulsed distortion or harmonics). RL Reactors protect the controller from surges or spikes on the incoming power lines and reduce harmonic distortion. They help to reduce VFD produced non-linear current harmonics that may cause voltage distortion and effect other devices powered from the same AC mains.

Multiple drives or inverters on a common power line require one reactor per controller. Individual reactors provide filtering between each controller (reducing crosstalk) and also provide optimum surge protection for each unit. A single reactor serving several controllers does not provide adequate protection, filtering or harmonic reduction when the system is partially loaded.

Single Phase input configured drives can be protected from spikes and transient voltage by using standard 3-phase RL Line/Load Reactors for 1-phase applications by routing each of the two supply conductors through an outside coil and leaving the center open. Application Note **AN0102** details this use. Note that the single drive input current is  $\sqrt{3}$  (SQRT 3) times the 3-phase motor values. The above table may be used to select a reactor for 1-phase input applications.

In extended motor lead applications up to 300 feet use RL Reactors between the inverter & motor to reduce dV/dT & motor terminal peak voltage. The use of a separate load reactor also protects the controller from surge current caused by a rapid change in the load, & even from a short circuit at the load. MTE Reactors also reduce operating temperature & audible noise in motor loads. For a guaranteed long lead solution up to 1000 feet use the **MTE Series A dV/dT Filter**. More than one motor on a single drive presents a complex load not suited to reactor protection. Use an **MTE Series A Sine Wave Filter** when there is a need to protect more than one motor or for single motor distances to 15,000 feet.



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## Selection Table RL Line/Load Reactor Technical Data

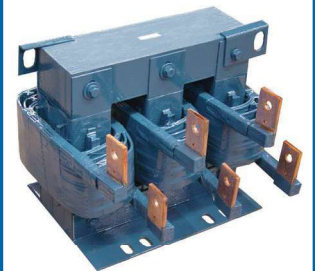
Open Part	amps	Inductance mH	Watts	Size inches	Size mm	Open Weight	Cabinet
RL-00101	1	100	13.5	3.5 in H x 3.8 in W x 1.2 in D	89 mm H x 97 mm W x 30 mm D	2.2# 1Kg	CAB-8
RL-00102	1	50	12.8	3.5 in H x 3.8 in W x 1.2 in D	89 mm H x 97 mm W x 30 mm D	2.1# 1Kg	CAB-8
RL-00103	1	36	11.9	3.5 in H x 3.8 in W x 1.2 in D	89 mm H x 97 mm W x 30 mm D	2.1# 1Kg	CAB-8
RL-00104	1	18	9.6	3.5 in H x 3.8 in W x 1.2 in D	89 mm H x 97 mm W x 30 mm D	2# 0.9Kg	CAB-8
RL-00201	2	12	7.5	4.1 in H x 4.4 in W x 2.8 in D	104 mm H x 112 mm W x 71 mm D	4# 1.8Kg	CAB-8
RL-00202	2	20	11.3	4.1 in H x 4.4 in W x 2.8 in D	104 mm H x 112 mm W x 71 mm D	4# 1.8Kg	CAB-8
RL-00203	2	32	16	4.1 in H x 4.4 in W x 2.8 in D	104 mm H x 112 mm W x 71 mm D	4# 1.8Kg	CAB-8
RL-00204	2	6	10.7	4.1 in H x 4.4 in W x 2.5 in D	104 mm H x 112 mm W x 64 mm D	3# 1.4Kg	CAB-8
RL-00401	4	3	14.5	4.1 in H x 4.4 in W x 2.8 in D	104 mm H x 112 mm W x 71 mm D	4# 1.8Kg	CAB-8
RL-00402	4	6.5	20	4.1 in H x 4.4 in W x 2.8 in D	104 mm H x 112 mm W x 71 mm D	4# 1.8Kg	CAB-8
RL-00403	4	9	20	4.1 in H x 4.4 in W x 3.4 in D	104 mm H x 112 mm W x 86 mm D	5# 2.3Kg	CAB-8
RL-00404	4	12	21	4.1 in H x 4.4 in W x 3.4 in D	104 mm H x 112 mm W x 86 mm D	6# 2.7Kg	CAB-8
RL-00801	8	1.5	19.5	4.8 in H x 6 in W x 3 in D	122 mm H x 152 mm W x 76 mm D	7# 3.2Kg	CAB-8
RL-00802	8	3	29	4.8 in H x 6 in W x 3 in D	122 mm H x 152 mm W x 76 mm D	8# 3.6Kg	CAB-8
RL-00803	8	5	25.3	4.8 in H x 6 in W x 3.4 in D	122 mm H x 152 mm W x 86 mm D	11# 5Kg	CAB-8
RL-00804	8	7.5	28	4.8 in H x 6 in W x 3.4 in D	122 mm H x 152 mm W x 86 mm D	13# 5.9Kg	CAB-8
RL-01201	12	1.25	26	5 in H x 6 in W x 3.3 in D	127 mm H x 152 mm W x 84 mm D	9# 4.1Kg	CAB-8
RL-01202	12	2.5	31	5 in H x 6 in W x 3.3 in D	127 mm H x 152 mm W x 84 mm D	10# 4.5Kg	CAB-8
RL-01203	12	4.2	41	5 in H x 6 in W x 3.9 in D	127 mm H x 152 mm W x 99 mm D	18# 8.2Kg	CAB-8
RL-01801	18	0.8	36	5.3 in H x 6 in W x 3.2 in D	135 mm H x 152 mm W x 81 mm D	9# 4.1Kg	CAB-8
RL-01802	18	1.5	43	5.3 in H x 6 in W x 3.5 in D	135 mm H x 152 mm W x 89 mm D	12# 5.4Kg	CAB-8
RL-01803	18	2.5	43	6.1 in H x 8.1 in W x 4 in D	155 mm H x 206 mm W x 102 mm D	16# 7.3Kg	CAB-13V
RL-02501	25	0.5	48	5.8 in H x 7.2 in W x 3.5 in D	147 mm H x 183 mm W x 89 mm D	11# 5Kg	CAB-13V
RL-02502	25	1.2	52	5.8 in H x 7.2 in W x 3.5 in D	147 mm H x 183 mm W x 89 mm D	14# 6.4Kg	CAB-13V
RL-02503	25	1.8	61	5.8 in H x 7.2 in W x 4.3 in D	147 mm H x 183 mm W x 109 mm D	20# 9.1Kg	CAB-13V
RL-03501	35	0.4	49	5.8 in H x 7.2 in W x 4 in D	147 mm H x 183 mm W x 102 mm D	14# 6.4Kg	CAB-13V
RL-03502	35	0.8	54	5.8 in H x 7.2 in W x 4 in D	147 mm H x 183 mm W x 102 mm D	16# 7.3Kg	CAB-13V
RL-03503	35	1.2	54	7.4 in H x 9 in W x 4.7 in D	188 mm H x 229 mm W x 119 mm D	30# 13.6Kg	CAB-13V
RL-04501	45	0.3	54	7.4 in H x 9 in W x 4.7 in D	188 mm H x 229 mm W x 119 mm D	23# 10.4Kg	CAB-13V
RL-04502	45	0.7	62	7.4 in H x 9 in W x 4.7 in D	188 mm H x 229 mm W x 119 mm D	28# 12.7Kg	CAB-13V
RL-04503	45	1.2	65	7.3 in H x 9 in W x 5.3 in D	185 mm H x 229 mm W x 135 mm D	39# 17.7Kg	CAB-13V
RL-05501	55	0.25	64	7.3 in H x 9 in W x 5.3 in D	185 mm H x 229 mm W x 135 mm D	24# 10.9Kg	CAB-13V
RL-05502	55	0.5	67	7 in H x 9 in W x 5.3 in D	178 mm H x 229 mm W x 135 mm D	27# 12.2Kg	CAB-13V
RL-05503	55	0.85	71	7 in H x 9 in W x 6 in D	178 mm H x 229 mm W x 152 mm D	41# 18.6Kg	CAB-13V
RL-08001	80	0.2	82	7.2 in H x 9 in W x 6.3 in D	183 mm H x 229 mm W x 160 mm D	25# 11.3Kg	CAB-13V
RL-08002	80	0.4	86	7.2 in H x 9 in W x 6.5 in D	183 mm H x 229 mm W x 165 mm D	33# 15Kg	CAB-13V
RL-08003	80	0.7	96	8.5 in H x 10.8 in W x 6.8 in D	216 mm H x 274 mm W x 173 mm D	61# 27.7Kg	CAB-13V
RL-10001	100	0.15	94	7.3 in H x 9 in W x 6.5 in D	185 mm H x 229 mm W x 165 mm D	29# 13.2Kg	CAB-13V
RL-10002	100	0.3	84	7.3 in H x 9 in W x 6.8 in D	185 mm H x 229 mm W x 173 mm D	37# 16.8Kg	CAB-13V
RL-10003	100	0.45	108	8.25 in H x 10.8 in W x 6.16 in D	210 mm H x 274 mm W x 156 mm D	74# 33.6Kg	CAB-13V

Specifications subject to change without notice

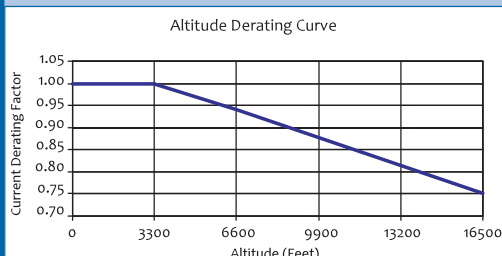
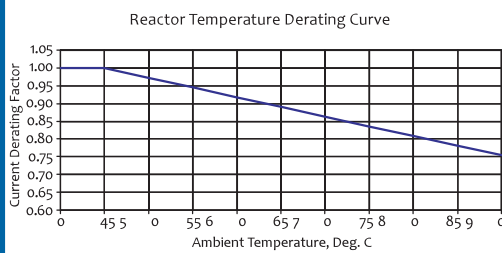
MTE RL Reactors can be supplied in a variety of standard enclosures or open frame type to enable you to mount them in your system in the most efficient manner



**RL-10012**



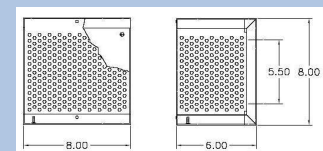
**RL-50003**



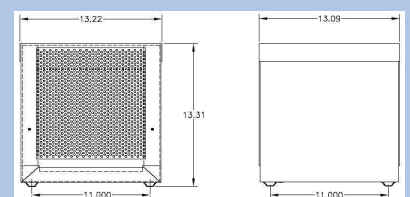
MTE RL Reactors connection types and terminals vary by model and rating



**CAB-8 - 7# 3.2kg**



**CAB-13V - 18# 8.2kg**



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## Selection Table RL Line/Load Reactor Technical Data ... Continued

Open Part	amps	Inductance mH	Watts	Size inches	Size mm	Open Weight	Cabinet
RL-13001	130	0.1	108	7 in H x 9 in W x 4.66 in D	178 mm H x 229 mm W x 118 mm D	29# 13.2Kg	CAB-13V
RL-13002	130	0.2	180	7.2 in H x 9 in W x 6.8 in D	183 mm H x 229 mm W x 173 mm D	43# 19.5Kg	CAB-13V
RL-13003	130	0.3	128	8.5 in H x 11 in W x 6.16 in D	216 mm H x 279 mm W x 156 mm D	64# 29Kg	CAB-13V
RL-16001	160	0.075	116	7.2 in H x 9 in W x 6.8 in D	183 mm H x 229 mm W x 173 mm D	41# 18.6Kg	CAB-13V
RL-16002	160	0.15	149	8.3 in H x 10.8 in W x 6 in D	211 mm H x 274 mm W x 152 mm D	50# 22.7Kg	CAB-13V
RL-16003	160	0.23	138	8.5 in H x 11.5 in W x 9 in D	216 mm H x 292 mm W x 229 mm D	67# 30.4Kg	CAB-13V
RL-20001B14	200	0.055	124	7.5 in H x 9 in W x 7.3 in D	191 mm H x 229 mm W x 185 mm D	38# 17.2Kg	CAB-13V
RL-20002B14	200	0.11	168	7.5 in H x 9 in W x 8.3 in D	191 mm H x 229 mm W x 211 mm D	54# 24.5Kg	CAB-13V
RL-20003B14	200	0.185	146	8.3 in H x 10.8 in W x 10 in D	211 mm H x 274 mm W x 254 mm D	100# 45.4Kg	CAB-13V
RL-25001B14	250	0.045	154	7.5 in H x 9 in W x 9 in D	191 mm H x 229 mm W x 229 mm D	47# 21.3Kg	CAB-13V
RL-25002B14	250	0.09	231	8.5 in H x 10.8 in W x 9 in D	216 mm H x 274 mm W x 229 mm D	80# 36.3Kg	CAB-17V
RL-25003B14	250	0.15	219	11.2 in H x 14.4 in W x 10.3 in D	284 mm H x 366 mm W x 262 mm D	125# 56.7Kg	CAB-17V
RL-32001B14	320	0.04	224	9 in H x 10.8 in W x 8.3 in D	229 mm H x 274 mm W x 211 mm D	80# 36.3Kg	CAB-17V
RL-32002B14	320	0.075	264	9 in H x 10.8 in W x 10 in D	229 mm H x 274 mm W x 254 mm D	102# 46.3Kg	CAB-17V
RL-32003B14	320	0.125	351	11.25 in H x 14.4 in W x 10.5 in D	286 mm H x 366 mm W x 267 mm D	160# 72.6Kg	CAB-17V
RL-40001B14	400	0.03	231	10 in H x 10.8 in W x 10 in D	254 mm H x 274 mm W x 254 mm D	84# 38.1Kg	CAB-17V
RL-40002B14	400	0.06	333	11.25 in H x 15 in W x 11.5 in D	286 mm H x 381 mm W x 292 mm D	118# 53.5Kg	CAB-17V
RL-40003B14	400	0.105	293	11.25 in H x 14.4 in W x 12.5 in D	286 mm H x 366 mm W x 318 mm D	149# 67.6Kg	CAB-17V
RL-50001B14	500	0.025	266	9 in H x 10.8 in W x 10.5 in D	229 mm H x 274 mm W x 267 mm D	93# 42.2Kg	CAB-17V
RL-50002	500	0.05	340	11.5 in H x 14.4 in W x 11.5 in D	292 mm H x 366 mm W x 292 mm D	118# 53.5Kg	CAB-26C
RL-50003	500	0.085	422	11.5 in H x 14.4 in W x 13.3 in D	292 mm H x 366 mm W x 338 mm D	210# 95.3Kg	CAB-26C
RL-60001	600	0.02	307	11.5 in H x 14.4 in W x 10 in D	292 mm H x 366 mm W x 254 mm D	120# 54.4Kg	CAB-26C
RL-60002	600	0.04	414	11.25 in H x 14.4 in W x 12 in D	286 mm H x 366 mm W x 305 mm D	175# 79.4Kg	CAB-26C
RL-60003	600	0.065	406	11.25 in H x 14.4 in W x 15 in D	286 mm H x 366 mm W x 381 mm D	270# 122.5Kg	CAB-26C
RL-75001	750	0.015	427	11.5 in H x 14.4 in W x 11 in D	292 mm H x 366 mm W x 279 mm D	140# 63.5Kg	CAB-26C
RL-75002	750	0.029	630	11.5 in H x 14.4 in W x 12.5 in D	292 mm H x 366 mm W x 318 mm D	190# 86.2Kg	CAB-26C
RL-75003	750	0.048	552	14.5 in H x 14.4 in W x 14 in D	368 mm H x 366 mm W x 356 mm D	265# 120.2Kg	CAB-26C
RL-85001B14	850	0.015	798	15.5 in H x 17.8 in W x 14.5 in D	394 mm H x 452 mm W x 368 mm D	195# 88.5Kg	CAB-26C
RL-85002B14	850	0.027	930	15.5 in H x 17.8 in W x 15.5 in D	394 mm H x 452 mm W x 394 mm D	215# 97.5Kg	CAB-26C
RL-85003B14	850	0.042	1133	15.5 in H x 17.8 in W x 17.5 in D	394 mm H x 452 mm W x 445 mm D	315# 142.9Kg	CAB-26D
RL-90001B14	900	0.013	860	16.8 in H x 17.8 in W x 13 in D	427 mm H x 452 mm W x 330 mm D	200# 90.7Kg	CAB-26D
RL-90002B14	900	0.025	1020	15.5 in H x 17.8 in W x 15.5 in D	394 mm H x 452 mm W x 394 mm D	215# 97.5Kg	CAB-26D
RL-90003B14	900	0.04	1365	15.8 in H x 17.8 in W x 17.1 in D	401 mm H x 452 mm W x 434 mm D	315# 142.9Kg	CAB-26D
RL-100001B14	1000	0.011	810	14.5 in H x 17.8 in W x 12.7 in D	368 mm H x 452 mm W x 323 mm D	144# 65.3Kg	CAB-26D
RL-100002B14	1000	0.022	1080	15.5 in H x 17.8 in W x 15.5 in D	394 mm H x 452 mm W x 394 mm D	215# 97.5Kg	CAB-26D
RL-100003B14	1000	0.038	1250	15.8 in H x 17.8 in W x 17.5 in D	401 mm H x 452 mm W x 445 mm D	315# 142.9Kg	CAB-26D
RL-120001B14	1200	0.009	870	15.5 in H x 17.8 in W x 14.5 in D	394 mm H x 452 mm W x 368 mm D	195# 88.5Kg	CAB-26D
RL-120002B14	1200	0.019	1270	15.5 in H x 17.8 in W x 17.8 in D	394 mm H x 452 mm W x 452 mm D	275# 124.7Kg	CAB-26D
RL-120003B14	1200	0.03	1530	15.4 in H x 17.4 in W x 18.3 in D	391 mm H x 442 mm W x 465 mm D	390# 176.9Kg	CAB-26D
RL-140001	1400	0.008	1235	17 in H x 22 in W x 22 in D	432 mm H x 559 mm W x 559 mm D	500# 226.8Kg	CAB-42C
RL-140002	1400	0.016	1523	17 in H x 19 in W x 19 in D	432 mm H x 483 mm W x 483 mm D	525# 238.1Kg	CAB-42C
RL-140003	1400	0.027	1680	17 in H x 22 in W x 22 in D	432 mm H x 559 mm W x 559 mm D	850# 385.6Kg	CAB-42C
RL-150001	1500	0.008	1432	17 in H x 22 in W x 22 in D	432 mm H x 559 mm W x 559 mm D	635# 288Kg	CAB-42C
RL-150002	1500	0.015	1671	17 in H x 16.9 in W x 16 in D	432 mm H x 429 mm W x 406 mm D	675# 306.2Kg	CAB-42C
RL-150003	1500	0.025	1815	17 in H x 22 in W x 22 in D	432 mm H x 559 mm W x 559 mm D	900# 408.2Kg	CAB-42C

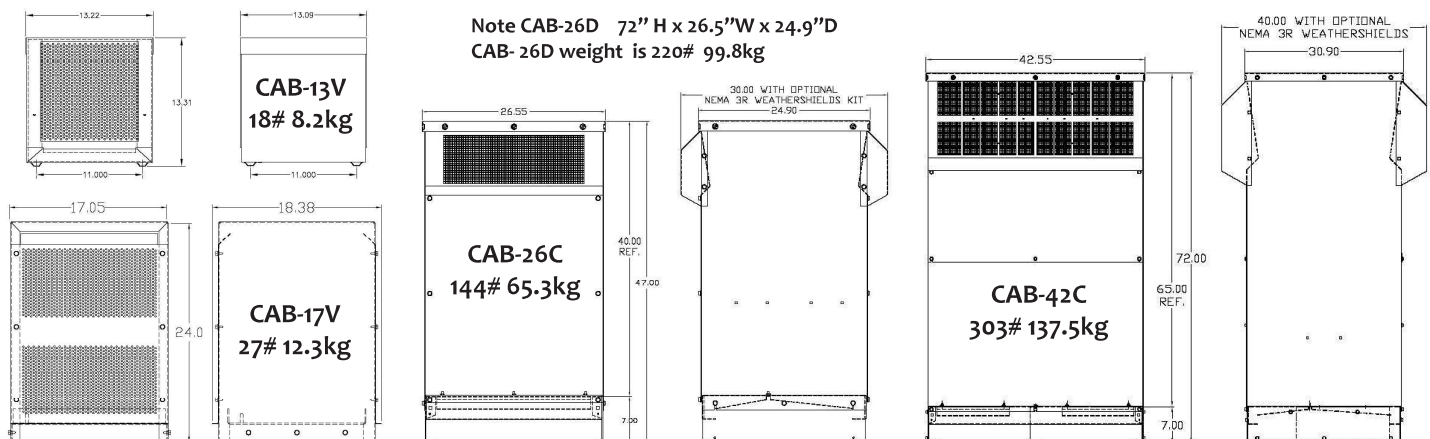
### PRODUCT SELECTION:

See MTE RL Selection Brochure or visit the MTE website at [www.mtecorp.com](http://www.mtecorp.com) and select the handy >> Reactor Click Find << for complete product selection & CAD files.

**TERMINALS:** Terminals are standard and save installation cost by minimizing panel space. Finger-proof (IP20) terminals are provided through 45 amps. Solid copper box lugs are provided above 45 amps to 160 amps. Copper tab type B14 or B1 flag terminals are used beyond 160 amps (see photo above).

**INSTALLATION OPTIONS:** MTE line/load reactors are available in a variety of enclosures. The NEMA 1 for general protection or the NEMA 3R for weather protection.

**TRANSIENT PROTECTION OPTIONS:** Various voltage rated MOV transient devices may be factory installed to reactor's output to offer the maximum over-voltage input drive security.



# THE GLOBAL POWER QUALITY RESOURCE

MTE Corporation - Menomonee Falls, WI - 1-800-455-4MTE - [www.mtecorp.com](http://www.mtecorp.com)

# PRODUCT SPECIFICATIONS - RL THREE PHASE REACTORS

Refer to the RL Line /Load Reactor User Manual for Detailed Specifications

## Standard impedance values by calculation:

### Impedance basis

#### Service Factor (continuous)

Reactors rated 1 to 750 Amps

Reactors rated above 750 Amps

### Overload rating

### Maximum system voltage

### Maximum switching frequency

### Insulation system

### Temperature rise (open or enclosed reactors)

### Ambient temperature (open or enclosed reactors)

### Altitude (maximum)

### Fundamental frequency (Line or Load)

### Approvals:

### Inductance curve (typical)

### Inductance tolerance

### Impregnation:

### Dielectric Strength

### dV/dT Protection

### AGENCY APPROVALS:

UL-508

UL-508

**Note: Short Circuit rating not required under Exception No.1 of UL508A SB4.2.1 effective 4/25/06**

### CSA C22.2

Class N, 200° C

CE

### MATERIAL:

#### Core Steel:

#### Windings:

#### Enclosures:

#### Brackets:

#### Sheet Insulation:

#### Epoxy:

### CONSTRUCTION:

#### CORE:

#### WINDINGS:

### ASSEMBLY:

### COLOR:

### TESTING:

1.5%, 2, 3%, 4%, 5% available

Reactor rated current, line voltage, frequency and inductance

**Note: Select reactor based on rated current only**

150% of rating

125% of rated minimum

200% of rated for 30 minutes

300% of rated for 1 minute

600 Volts (units with terminal blocks)

690 Volts (units with box lugs or tab terminals)

20 KHz

Class N (200°C 392°F)

135°C 275°F (maximum)

45°C 113°F (Full rated)

1000 meters

50/60 Hz

CE, UL-508, CSA C22.2

100% at 100% current

100% at 150% current

50% at 350% current (minimum)

+/- 10%

High Bond Strength "Solvent-Less" Epoxy, 200° C

UL94HB recognized

3000 volts rms (4243 volts peak)

Meets NEMA MG-1, part 31 (same as inverter duty motors)

File E180243 Component Listed (1 amp – 2400 amps)

File E180243 **UL Listed** NEMA 1 units (1 amp – 2400 amps)

**Note: Short Circuit rating not required under Exception No.1 of UL508A SB4.2.1 effective 4/25/06**

File LR29753-13 CSA Certified (1 amp – 2400 amps)

File E66214, Type 200-18, UL Recognized Insulation System

Marked

Electrical grade high frequency silicon steel

High dielectric withstand solid copper conductor (220° C)

Sheet steel per UL and CSA requirements. Painted ANSI-61 Grey

ASTM structural steel or structural aluminum

DuPont Nomex 410 (220° C)

Ripley Resin Type 468-2 (220° C)

Electrical grade silicon steel magnetic laminations.

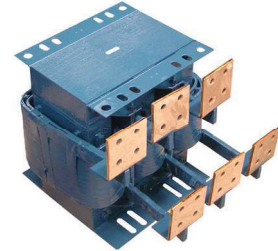
3000 volts rms dielectric strength (coil-to-coil & coil-to-core).

Windings are assembled onto EI laminations, secured in place &

epoxy impregnated for minimum noise & maximum structural rigidity.

Royal Blue

Inductance, Hi-Pot 3000 Volts rms (5656 volts peak)



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## THE GLOBAL POWER QUALITY RESOURCE