



# Installation Instructions

## Field Replacement Instructions of GP4 Classic Compressors on RTAE Chillers

### **⚠ SAFETY WARNING**

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.



# Introduction

Read this manual thoroughly before operating or servicing this unit.

## Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

**⚠ WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**⚠ CAUTION** Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

**NOTICE** Indicates a situation that could result in equipment or property-damage only accidents.

## Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs and HCFCs such as saturated or unsaturated HFCs and HCFCs.

## Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified according to local rules. For the USA, the Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

### ⚠ WARNING

#### Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring **MUST** be performed by qualified personnel. Improperly installed and grounded field wiring poses **FIRE** and **ELECTROCUTION** hazards. To avoid these hazards, you **MUST** follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

### ⚠ WARNING

#### Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, **MUST** follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- Before installing/servicing this unit, technicians **MUST** put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). **ALWAYS** refer to appropriate Material Safety Data Sheets (MSDS)/Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.
- When working with or around hazardous chemicals, **ALWAYS** refer to the appropriate MSDS/SDS and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.
- If there is a risk of energized electrical contact, arc, or flash, technicians **MUST** put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, **PRIOR** to servicing the unit. **NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

**⚠ WARNING****Follow EHS Policies!**

Failure to follow instructions below could result in death or serious injury.

- All Ingersoll Rand personnel must follow Ingersoll Rand Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. All policies can be found on the [BOS site](#). Where local regulations are more stringent than these policies, those regulations supersede these policies.
- Non-Ingersoll Rand personnel should always follow local regulations.

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# General Information

Initial production RTAE Chillers include 1<sup>st</sup> Gen GP4 Screw Compressors with legacy motors (Phase Motion), external inductors between the drive and compressor, and (on some units) smaller AFD3 frames compared to second

generation chillers. While 2<sup>nd</sup> Gen GP4 Screw Compressors include updated motor (Regal Beloit), no external inductors, and (on some units) larger AFD3 frames.

**Table 1. Gen GP4 classic compressor**

Description	1st Gen GP4 Classic Compressor	2nd Gen GP4 Classic Compressor
Motor	Phase Motion	Regal Beloit
External Inductor	Yes	No
AFD3 Frame Size	Smaller on some units	Larger on Some units

With Trane's conversion to the GP4 Variable VI ratio (VarVI) compressor architecture, in the event of a compressor failure it is not possible to replace either 1<sup>st</sup> or 2<sup>nd</sup> Gen GP4 Classic Compressor with the new GP4 VarVI model. Thus, a service model GP4 VarVI Compressor was developed for replacement of both 1<sup>st</sup> and 2<sup>nd</sup> Gen GP4 Classic Compressors. This service model compressor performs similarly as a classic GP4 compressor due to the following adaptations:

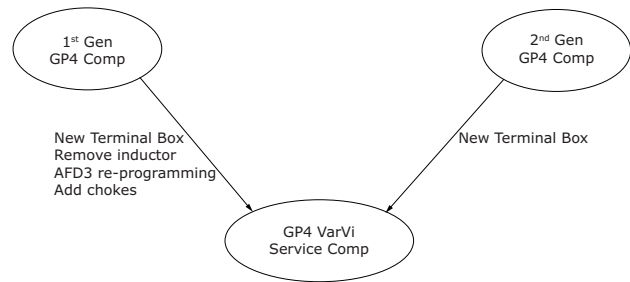
- Locked VI assembly to 'high VI' configuration (same as GP4 Classic).
- 2<sup>nd</sup> generation motor (Regal Beloit instead of Phase Motion).
- Removal of external inductors (if installed).

Replacement of a 2<sup>nd</sup> Gen GP4 Classic Compressor requires replacement of the compressor motor terminal box but no other adaptations to unit electrical wiring or AFD3 programming. However, replacement of the 1<sup>st</sup> Gen GP4 Classic Compressor requires extra steps to replicate similar unit operation. This document explains these extra retrofit conversion steps in event of a failure of a 1st Gen GP4 Classic Compressor on an RTAE Chiller:

- Replacement of 1<sup>st</sup> Gen GP4 Classic Compressor to GP4 VarVI Service Compressor.
- Installation of new compressor terminal box.
- Removal of external inductors.
- Re-programming of AFD3 (including special RLA values for some models).
- Addition of common mode chokes.

*Note: Some units will lose a small portion of top end capacity due to the difference in motor performance and the size of the originally installed AFD3 on the 1st Gen RTAE unit. The reduction of top end capacity is small, and is noted later in this document.*

**Figure 1. Replacement of 1<sup>st</sup> or 2<sup>nd</sup> Gen GP4 classic compressor to VarVI service compressor on RTAE**





# Installation

## Compressor Replacement

If either a 1<sup>st</sup> Gen or 2<sup>nd</sup> Gen GP4 Classic Compressor has failed on an RTAE Chiller, only the VarVi Service Compressor can be used as a replacement as the Classic chassis has been discontinued. Motor information for a

specific compressor can be obtained by checking the model number on the compressor nameplate. Motor number (MN) is stored in the 6<sup>th</sup> and 7<sup>th</sup> digit of the compressor model number. For example, compressor model CHHSRB1A1A0 indicates a B1 motor, which is a 100T Standard Lift 1st Gen GP4 Classic motor. Refer to RTAE Service Guide (RTAE-SVG001\*-EN) for more detailed instructions for compressor replacement procedure.

**Table 2. GP4 compressor cross-list for RTAE chiller**

GP4 Screw Compressors			1st Gen GP4 Classic (Phase Motion Motor)			2nd Gen GP4 Classic (Regal Beloit Motor)			VarVi GP4 Service Model (Regal Beloit Motor)		
Capacity	Lift	Voltage	MN	Motor#	Service#	MN	Motor#	Service#	MN	Motor#	Service#
100T	SL	440-528V	B1(a)	145-010	COM11023	BA	2520869-003	COM11539	BA	2520869-003	COM13092
		360-439V				BB	2520869-004	COM11540	BB	2520869-004	COM13093
100T	HL	440-528V	C1(a)	170-011	COM11024	CA	2520869-001	COM11541	CA	2520869-001	COM13094
		360-439V				CB	2520869-002	COM11542	CB	2520869-002	COM13095
125T	SL	440-528V	E3	165-016	COM11027	EA	2520867-005	COM11543	EA	2520867-005	COM13087
125/150T	SL	360-439/440-528V	E2	165-014	COM11026	EB	2520867-006	COM11544	EB	2520867-006	COM13086
150T	SL	360-439V	E1	165-010	COM11029	EC	2520867-007	COM11545	EC	2520867-007	COM13085
150T	HL	440-528V	F2(a)	190-014	COM11031	FA	2520867-001	COM11546	FA	2520867-001	COM13088
		360-439V				FB	2520867-002	COM11547	FB	2520867-002	COM13089

(a) Covers both 360-439V and 440-528V voltage range. However, voltage specific replacement compressor for 360-439V or 440-528V depends on chiller rated voltage. Refer to chiller nameplate to identify the rated voltage. 360-439V motors are used on 380V/400V chillers. 440-528V motors are used on 200V/230V/460V/575V chillers.

## Additional Compressor Parts

### Compressor Terminal Box (Required)

The GP4 VarVi Service Model compressor does not include a terminal box, so the circuit specific terminal box must be ordered as well.

**Table 3. Compressor terminal box**

Terminal Box	Terminal Box Assembly Number	Mnemonic
Circuit 1A Terminal Box	572448490001	BOX03969
Circuit 2A Terminal Box	572447700001	BOX03970

### Sound Attenuation Package (Optional)

If the unit in the field includes the sound attenuation option, then the appropriate kit must be ordered for the

new GP4 VarVi frame size. Two parts are required for the package appropriate for the compressor frame size (R or S), see the table below.

**Table 4. Sound attenuation package**

Frame	Mnemonic	Part Number	Description
R	ATT00536	572448450001	ATTENUATOR; SOUND BOX, BOTTOM, R
	ATT00538	572448470001	ATTENUATOR; SOUND BOX, FRONT, R
S	ATT00537	572448460001	ATTENUATOR; SOUND BOX, BOTTOM, S
	ATT00539	572448480001	ATTENUATOR; SOUND BOX, FRONT, S

# Removal of Output Inductors (1st Gen GP4 Classic Compressor Only)

off coolant lines that pass through the inductor. Reconnect the power conductors together with insulated in-line splice connector of appropriate ampacity, refer to [Table 5](#).

Physically remove output inductor from each circuit.  
Jumper across thermal cutout relay to drive. Bypass or cap

Figure 2. Electrical schematic with output inductor

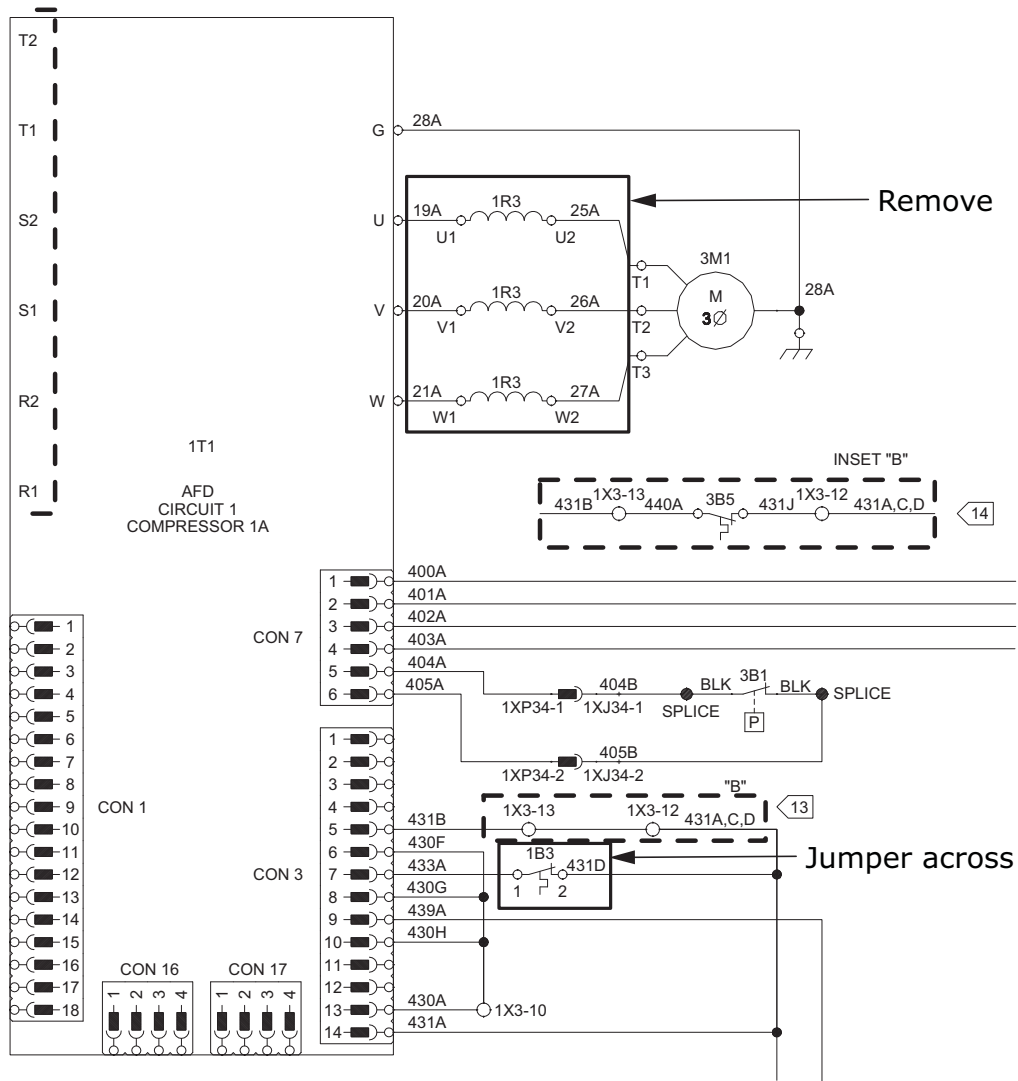


Figure 3. Output inductor location

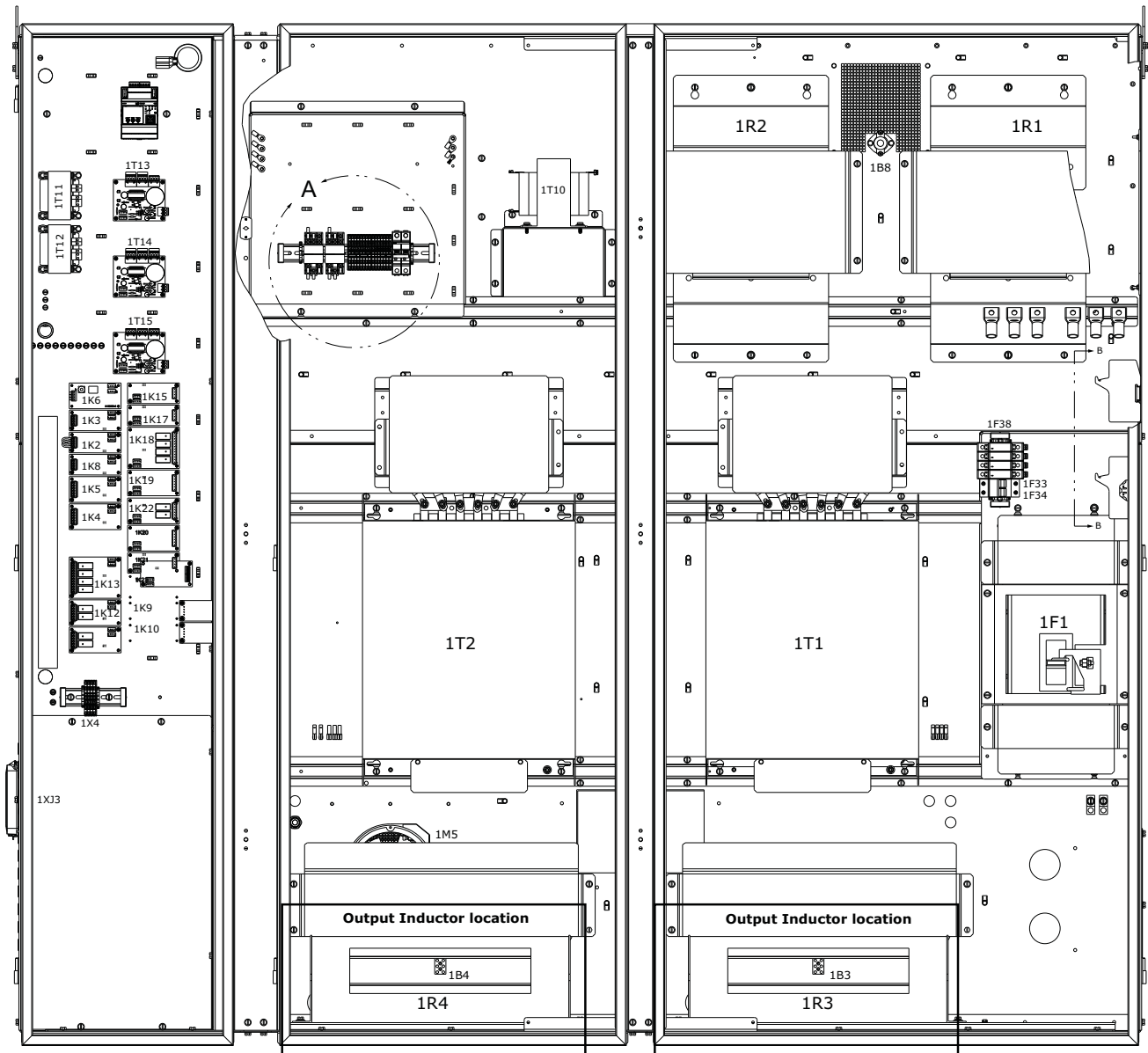


Figure 4. System cooling

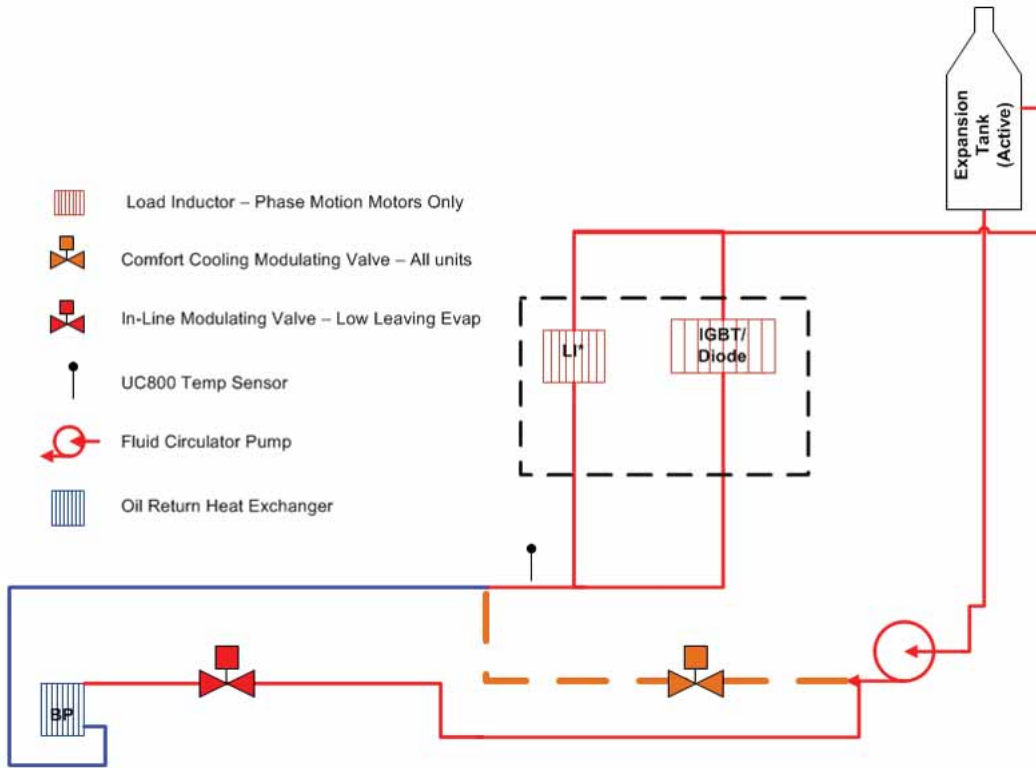


Table 5. Insulated in-line connectors (recommended parts)

Vendor	Catalog Number	Max Wire Gauge
Polaris Electrical Connectors	IT-1/0	1/0 AWG
	IT-3/0	3/0 AWG
	IT-250	4/0 AWG

Figure 5. Insulated in-line connectors



Table 6. Common mode chokes

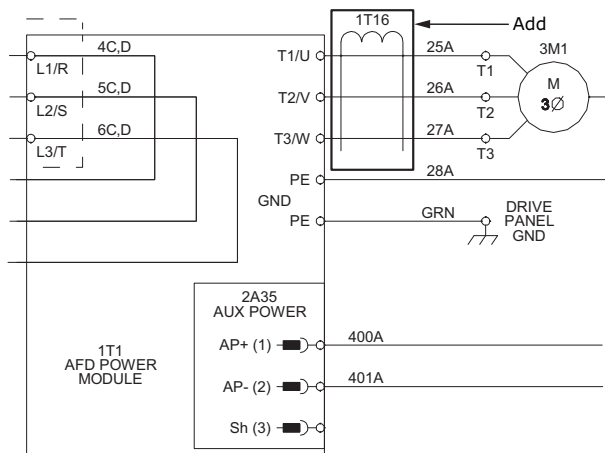
Description	Quantity	Mnemonic	PN
Common Mode Core Assembly	One (1) per circuit	COR00252	50711456
Individual Conductor Core	Five (5) per conductor	COR00253	X13641390010

### Adding Common Mode Chokes (1<sup>st</sup> Gen GP4 Classic Compressor Only)

Common mode chokes are necessary to maintain protection against bearing currents causing pre-mature failure of the compressor bearings. With the removal of the output inductor, common mode chokes are necessary. The choke assembly encircles all current carrying conductors between the drive and compressor (meaning do not include ground conductors). Individual cores must also be installed on the power conductors. Refer to the schematic and image below.



**Figure 6. Electrical schematic with output chokes**



**Figure 7. Output chokes locations**



*Note: Ignore the VFD shown in image, as it is the newer model used on ACRA, not the VFD used on legacy RTAE.*

## Reprogramming AFD3

Re-programming the AFD3 is necessary after replacing either the 1<sup>st</sup> or 2<sup>nd</sup> Gen GP4 Classic compressor with the GP4 VarVi Service Model on an RTAE unit. Specifically, modification of the Motor Nameplate RLA (MRAX). The rest of the AFD configurations remain unchanged.

**Figure 8. AFD1 or compressor1A**

Motor Type (MTP1)	Internal Permanent Magnet	Motor Nameplate D-Axis Inductance (MDI1)	378	μH	
Input Transformer Turns Ratio (ITR1)	1	Motor Nameplate Q-Axis Inductance (MQ11)	378	μH	
Total System Inertia (TSI1)	0.36	kg-m <sup>2</sup>	Motor Nameplate Stator Resistance (MSR1)	28400	μ#
Motor Nameplate Voltage (MVT1)	400	Vac	Active Harmonic Damping (AHD1)	Disable	
Drive Module Maximum Current (DMA1)	300	Amps	Reset to Defaults (RDF1)	No	
Motor Nameplate RLA (MRA1)	150	Amps	Input Choke Impedance (IMP1)	3	%
Motor Nameplate Power (MRP1)	103	kW	Unit System Voltage (UNV1)	460	Vac
Motor Nameplate Number of Poles (MNP1)	6	poles	Rectifier Type (RCT1)	6 Pulse	
Motor Nameplate RPM (MRS1)	5800	RPM	Motor Leakage SigmaLs Inductance (MLI1)	300	μH
Motor Nameplate Magnet Flux (MMF1)	141	mWb			

The 1<sup>st</sup> Gen RTAE Chillers have smaller AFD3 frame sizes on some units compared to 2<sup>nd</sup> Gen. So it should be noted that some MRAX values must be truncated by the size of the installed AFD3 frame. The process is as follows:

1. Via Tracer TU, put the chiller in Bind Mode.
2. Modify MRAX (as shown in the below table) for the appropriate replaced circuit.
3. Re-bind the chiller.

**Table 7. Motor nameplate RLA (MRAX) for GP4 VarVi service model on RTAE chillers**

GP4 Screw Compressors			GP4 VarVi Service Model (Regal Beloit Motor)			Replacing 1 <sup>st</sup> Gen Classic GP4		Replacing 2 <sup>nd</sup> Gen Classic GP4	
Capacity	Lift	Voltage	MN <sup>(a)</sup>	Motor#	Service#	AFD3 Frame	MRAX	AFD3 Frame	MRAX
100T	SL	440-528V	BA	2520869-003	COM13092	A2	158A	A2	158A
		360-439V	BB	2520869-004	COM13093	A2	204A	A2	204A
100T	HL	440-528V	CA	2520869-001	COM13094	A2	188A	A2	188A
		360-439V	CB	2520869-002	COM13095	A2	225A <sup>(b)</sup>	A3	232A
125T	SL	440-528V	EA	2520861-005	COM13087	A2	214A	A2	214A
125T	SL	360-439V	EB	2520867-006	COM13086	A2	225A <sup>(b)</sup>	A3	250A
150T	SL	440-528V				A2	225A <sup>(b)</sup>	A3	249A
150T	SL	360-439V	EC	2520867-007	COM13085	A2	304A	A4	304A
150T	HL	440-528V	FA	2520867-001	COM13088	A2	274A <sup>(b)</sup>	A4	298A
		360-439V	FB	2520867-002	COM13089	A2	304A <sup>(b)</sup>	B1	338A <sup>(b)</sup>

(a) Motor information is stored in the 6<sup>th</sup> and 7<sup>th</sup> digit of the model number.

(b) These units are limited by the installed AFD3 frame size. No worse than 10% of top end capacity is lost due to this limitation. The other compressors are not limited by the installed AFD3 frame size.





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