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Hubbell Industrial Controls

VARIMAX DRIVE

Variable Frequency Drive Motor Control System

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General Information

The VariMax™ Variable Frequency Drive Motor Control system features AC controls that reduce maintenance time and cost. The system is fully integrated. All on-panel components and terminal blocks are DIN rail mounted, providing easy installation and maintenance.

These drives may be used for all hoist applications with overhauling loads with standard gear arrangements when used with encoders. In addition, these drives can also be used without encoders on travel motions that might otherwise skew. These systems can be used with both AC inverter duty squirrel cage or AC wound rotor motors, along with AC thruster or rectifier operated brakes, and power and control limit switches. When using a power limit switch, auxiliary control contacts are required, which open prior to the main power limit switch contacts. Standard panels are rated to 40° C. A flange mounted option is available, rated up to 55° C.

The 4960 VariMax Variable Frequency Drive Motor Control system is mounted in a NEMA 12 Enclosure with the following standard equipment:

- Panel mounted Variable Frequency Drive (VFD)
- Brake contactor (BC)
- Molded case circuit breaker with operating mechanism (MCS)
- Control fuses
- Relays and contactors needed for drive motion based on user's drive schematics
  - Limit switches, motions and aux contacts
- 2A service receptacle
- Hoist panel includes 120 VAC to 24 VDC power supply (PS)
- Hoist drive includes encoder card
- Consult factory for different NEMA enclosure options and modifications

Available Configurations:

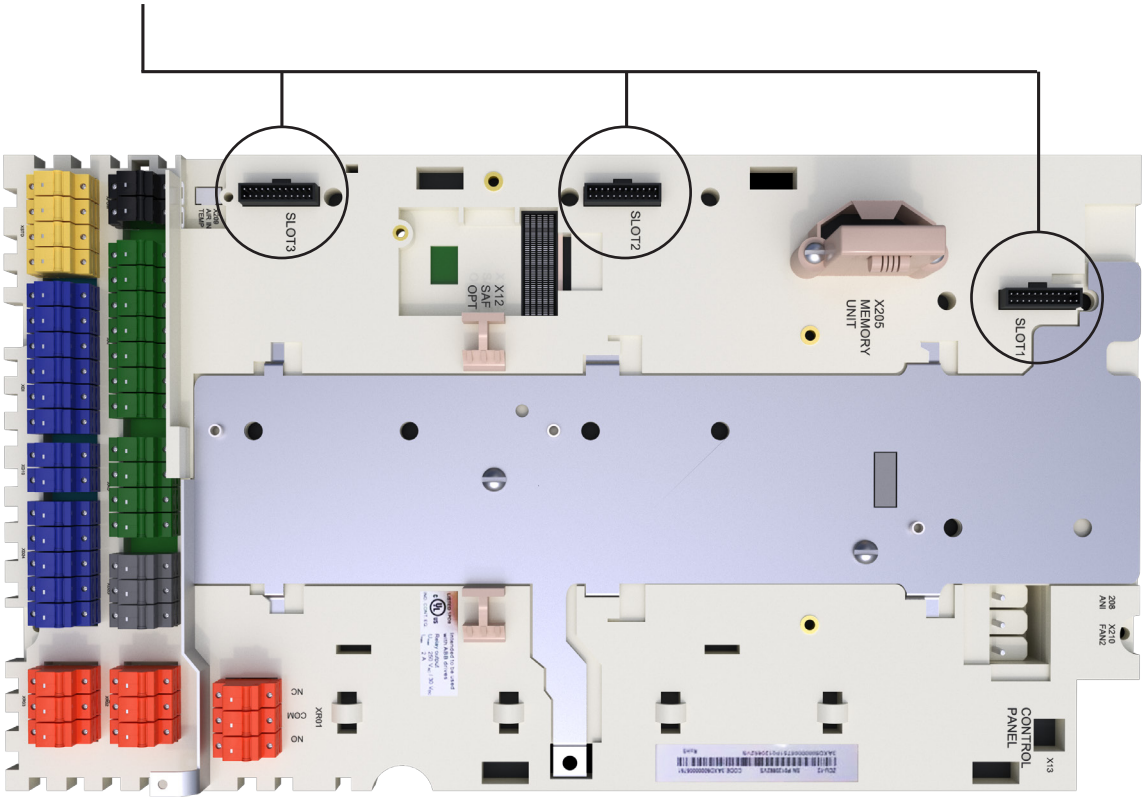
- Single motor
- Duplex system
  - Single VariMax drive with multiple motors
  - Overloads are required for each motor
- Master/Follower system
  - 2 drives with 2 motors (1 motor per drive) working in synchronous motion
- Multi-inverter system
  - Multi-motor motion control system, each motor controlled by a separate drive
  - Built with modular enclosures measuring 60"x40"x20"

The AC Hoist or Travel motor control system for AC inverter duty squirrel cage or wound rotor motors offers the following features:

- Direct torque control
  - Excellent torque linearity
  - Available for different types of motors, including permanent magnet and synchronous reluctance motors
  - Accurate torque and speed control at low speed, as well as full starting torque down to zero speed
- Removable memory unit
  - Contains the crane software and parameters for the drive, transferable to replacement drives
- Built-in Dynamic Braking (DB) module
  - Optional separate DB Resistor required for operation (see page 10)
- Speed control options
  - Up to 4 programmable steps, via external contact closures
  - Infinitely variable speed control, via analog signal input, 0-10 VDC
    - Twisted shielded pair connection required
- dV/dT filter required for wound motor applications. Optional for all other applications
  - See page 10 for filter selection guide
- *Optional:* Expandable I/O, DeviceNet, Profi-bus, EtherCAT, Modbus and Profinet IO
- Built in Bluetooth™ communications link to tune and troubleshoot
- Power and control circuit protection
  - Wiring diagram indicating typical fuse and circuit breaker location (see page 7)
- Brake contactor and optional relays included on panel and wiring diagram based on the customer's current design
- 2A convenience receptacle for laptop charging
- Standard in a NEMA 12 Enclosure.
  - Open panels and other enclosures available, consult factory
- Relay options available
  - Brake acknowledge
  - Power limit
  - Upper and lower limit switch
- Encoder required for hoist applications
- Hoist Drive Systems include 120VAC to 24 VDC Power Supply
- *Optional:* Regenerative drive systems available, consult factory
- *Optional:* Master/Follower feature available for multi-motor systems
- *Optional:* Flange Mount Kit available allowing higher ambient operation to 55° C without air conditioning unit
- *Optional:* air conditioning

Technical Data:

- 480 VAC rated, (+10 to -15%)
  - +1.7 Amps to 477 Amps / 0.75 horsepower to 500 horsepower
- Operating temperature -15 to 40°C
  - +40 to +55°C with optional flange mount drive
  - +40 to +50°C with derating of 1% for each 1°C
- Consult factory for derate needed above 1000 meter elevation
- Control connections standard
  - 2 Analog inputs
  - 2 Analog outputs
  - 6 Digital inputs
  - 3 Relay outputs
    - With expandable I/O an additional
      - 4 Digital inputs
      - 3 Analog input
      - 1 Analog output
      - 2 Relay outputs
- 3 expandable slots available



Drive Connections

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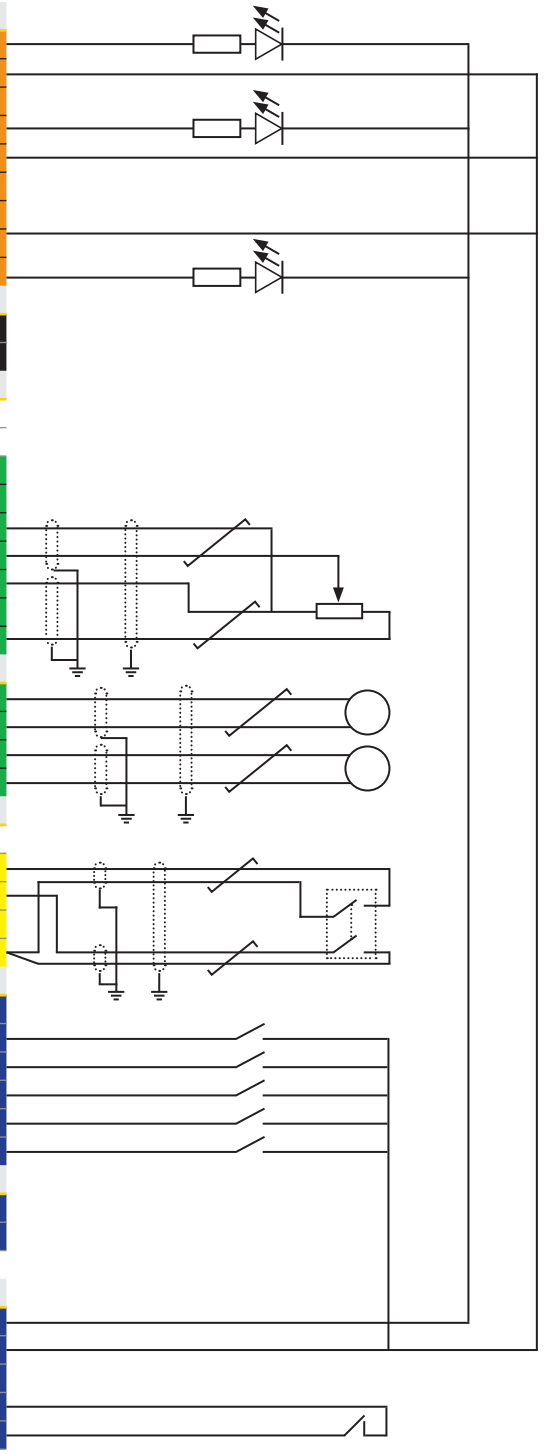
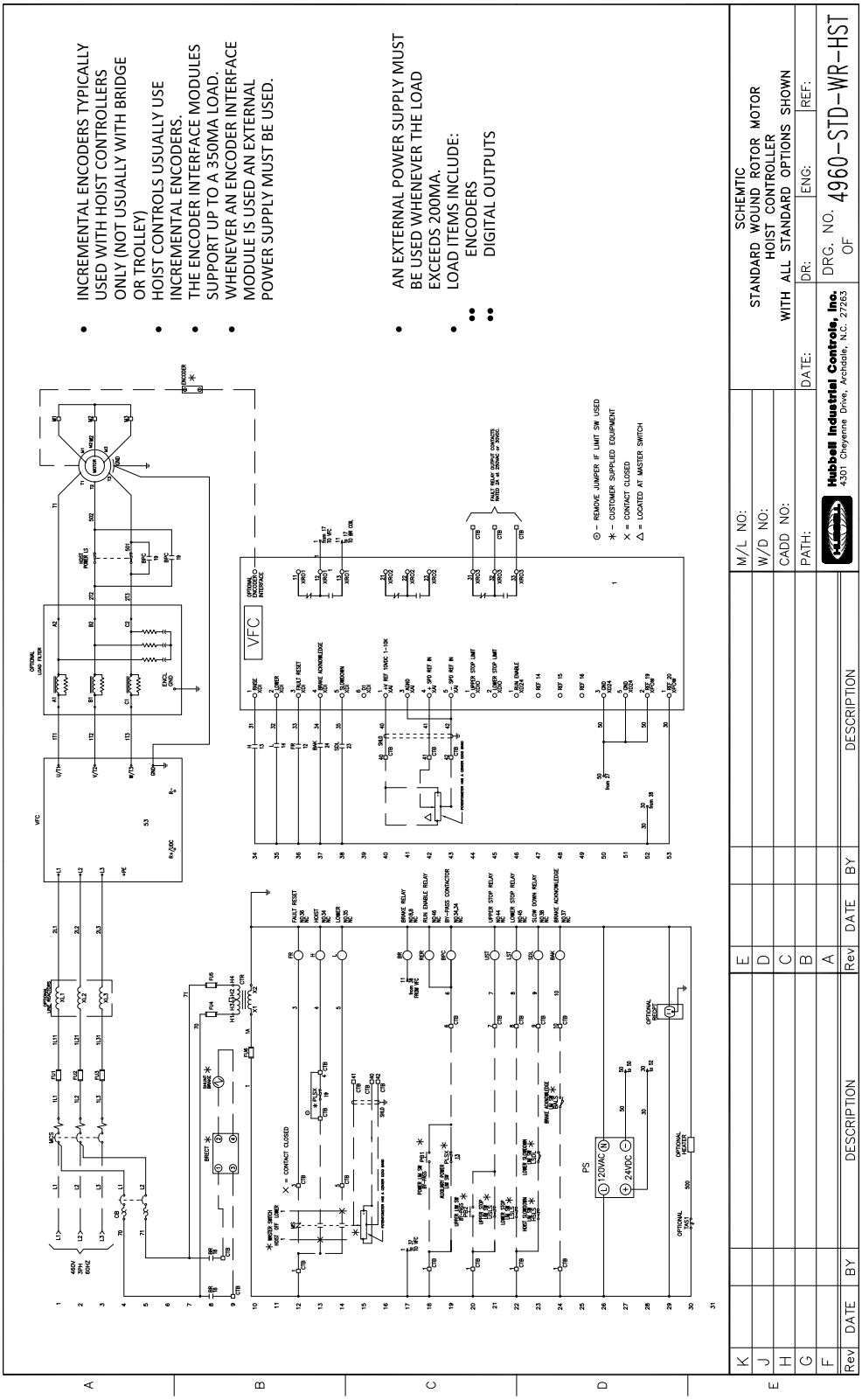
Relay outputs		**XR01, XR02, XR03**
Ready 250 VAC/30 VDC 2 A	NO	13
	COM	12
	NC	11
Ready 250 VAC/30 VDC 2 A	NO	23
	COM	22
	NC	21
Ready 250 VAC/30 VDC 2 A	NO	33
	COM	32
	NC	31
External power inputs		**XPOW**
24 VDC, 2 A	GND	2
	+24VI	1
Reference voltage and analog inputs		**J1, J2, XAI**
AI1/AI2 current/voltage selection	AI1:U	AI2:U
	AI1:I	AI2:I
By default not in use. 0(4) to 20 mA, R_n = 100 ohm	AI2-	7
	AI2:I+	6
Speed reference 0(2) to 10 V, R_n > 200 kohm	AI1-	5
	AI1+	4
Ground	AGND	3
-10 VDC, R_1 1 to 10 kohm	-VREF	2
10 VDC, R_1 1 to 10 kohm	+VREF	1
Analog outputs		**XAO**
Motor current 0 to 20mA, R_1 < 500 ohm	AGND	4
	AO2	3
Motor speed rpm 0 to 20mA, R_1 < 500 ohm	AGND	2
	AO1	1
Drive-to-drive link		**J3, XD2D**
Drive-to-drive link termination		ON ▭ OFF
Drive-to-drive link termination	Shield	4
	BGND	3
	A	2
	B	1
Digital inputs		**XDI**
By default not in use	DI6	6
Constant speed 1 select (1=on)	DI5	5
Acceleration and deceleration select	DI4	4
Rest	DI3	3
Forward (0)/Reverse (1)	DI2	2
Stop (0)/Start (1)	DI1	1
Digital input/outputs		**XDIO**
Output: Running	DIO2	2
Output: Ready	DIO1	1
Ground selection		
Auxiliary voltage output, digital input interlock		**XD24**
Digital input/output ground	DIOGND	5
+24 VDC 200 mA	+24VD	4
Digital input ground	DICOM	3
+24 VDC 200 mA	+24VD	2
Digital interlock	DILL	1
Ground selection		**X12**
Ground selection		**X13**
Ground selection		**X205**



General Hoist System Diagram



Typical Motor Rating Table

Maximum Motor Rated Full Load Current	Horsepower Est.
7.5	5
11	7.5
14	10
21	15
27	20
34	25
40	30
52	40
60	50
77	60
96	75
124	100
156	125
180	150
260	200
302	250
361	300
414	350
477	400
566	450
625	500

Ordering Information Required*

- Motor data including current rating, horsepower, volts and motor type
- Wye or Delta power configuration, FLA at connection point
- Type of motion: Hoist or Travel
- Number and type of brakes on the system
- Power and limit switches on the system
- Required temperature rating
- Mounting location and preferred enclosure type

*Configure your system at hubbell.com/hubbellindustrialcontrols

Options

- Encoder
  - Required for hoist applications
- Dynamic Braking resistor with cane metal covers
- dV/dT, Load Filter Reactors
  - Open filter
  - Required for wound motors
- Line Reactors
  - Open filter
  - Recommended for all systems
- Pendent Stations
  - Potentiometer
  - 4 step inserts
- Master Switches
  - Potentiometer
  - 4 step inserts
- Side Pull Sensor
- Collision Avoidance System
- Air Conditioning
- Automation
- DC Regen
- Power Loss back-Up
- Sun Shield
- Radio Systems

Resistor Table

Class F		Trolley		Hoist	
Current	HP ND	Ohms	Watts	Ohms	Watts
1.7	1	80	400	80	800
2.1	1.5	80	400	80	1200
3.0	2	80	800	80	1600
3.4	3	80	800	80	2000
4.8	3	80	1200	80	2800
5.2	5	80	1600	80	3600
7.6	7.5	80	2000	80	4800
11	10	40	2800	40	7200
14	15	40	4000	40	9600
21	20	20	6480	20	13520
27	25	20	8000	20	16820
34	30	14	9500	14	22000
40	40	14	12000	14	28000
52	50	8	12800	8	39200
65	60	8	16200	8	39200
77	75	6	21600	6	60000
96	100	6	29400	6	60000
124	125	3.5	35000	3.5	101150
156	150	3.5	50400	3.5	101150
180	175	2.5	45563	2.5	162563
240	200	2.5	56250	2.5	162563
302	300	2.5	72250	2.5	225000
361	350	2.5	100000	2.5	225000

*For larger resistors consult factory

dV/dT Filter Reactors
Open filter
480V 3Ø 60Hz
(Required for Wound Motors)

Amps	Horsepower
7.5	5
11	7.5
14	10
21	15
27	20
34	25
40	30
52	40
60	50
77	60
96	75
124	100
156	125
180	150
260	200
302	250
361	300
414	350
477	400
515	450
515	500

Line Reactors
Open filter
480V 3Ø 60Hz
3% Impedance

Amps	Horsepower
7.5	5
11	7.5
14	10
21	15
27	20
34	25
40	30
52	40
60	50
77	60
96	75
124	100
156	125
180	150
260	200
302	250
361	300
414	350
477	400
480	450
600	500

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