469

SR Motor Management Relay®

Complete, integrated protection and management of medium and large motors.

Features and Benefits

- Cost-effective motor protection, fault diagnostics, power metering and communications
- Drawout unit for serviceabilty
- Integrated benchmark protection features
- Standardized for any application
- VT inputs for voltage and power protection
- CT inputs for phase differential protection
- Easy programming features
- Diagnostic features – event recording and oscillography
- Powerful simulation feature for testing functionality and response
- Complete local and remote user capabilities
- Flash memory for field upgrades

Applications

- Protection and management of medium and large horsepower motors and driven equipment

Protection and Control

- Thermal overload, overcurrent
- Voltage compensated acceleration
- Over, undervoltage and reverse phase sequence
- Mechanical jam

Monitoring and Metering

- A V W var VA PF Hz Wh varh demand
- Torque, temperature, trending

User Interfaces

- RS232 and RS485 ports
- Includes enerVista software

Protection

The 469 is a digital motor management relay designed to protect and manage medium and large motors and driven equipment. The 469 offers extensive protection features such as:

Motor Thermal Model

The primary protective function of the 469 is the thermal model with six key elements:

- Overload curves
- Unbalance biasing
- Hot/cold motor compensation
- Motor cooling time constants
- Start inhibit
- Emergency Restart

Overload Curves

The curve can take one of three formats: standard, custom, or voltage dependent. For all curve styles the 469 retains thermal memory in a thermal capacity used register which is updated every 0.1 second. The overload pickup determines where the running overload curve begins.

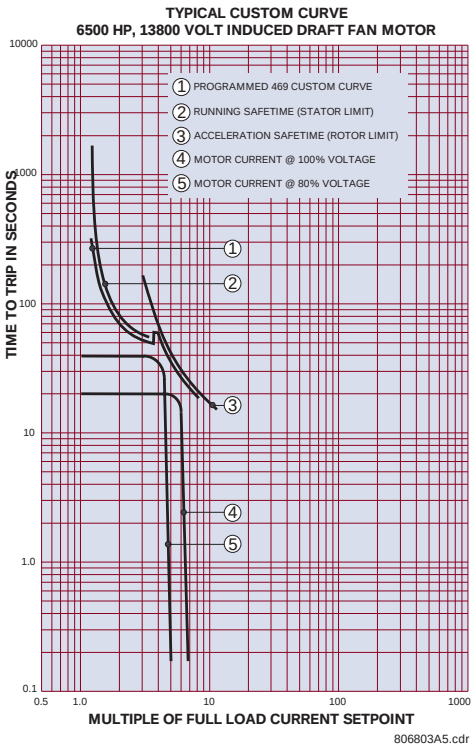
The 469 standard overload curves are a standard shape with a multiplier value of one to 15. The 469 also allows the user to create their own custom curve for special applications.

The thermal limit curve must be provided by the motor vendor when starting high inertia loads because the motor acceleration time can actually exceed the safe stall time.

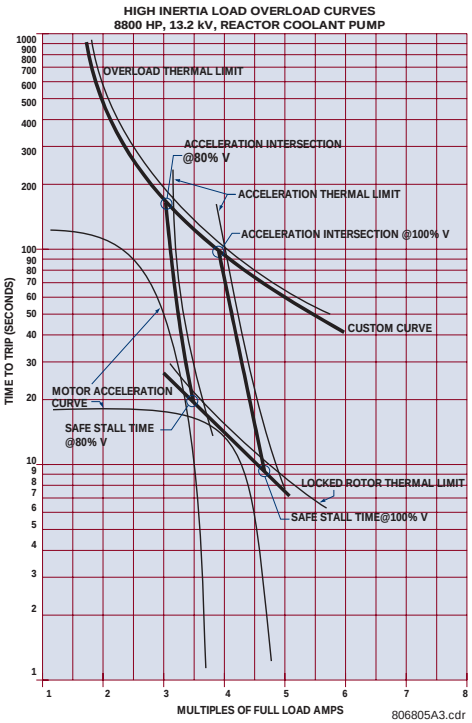
The voltage dependent overload curve feature protects motors by monitoring voltage. During motor starting and acceleration, the thermal limit curve is adjusted accordingly. An acceleration curve is created for both minimum line voltage and 100% line voltage. The line voltage is monitored and the acceleration protection curve is adjusted between the minimum and maximum line voltage.

Changes in impedance are reflected by motor terminal voltage and line current.

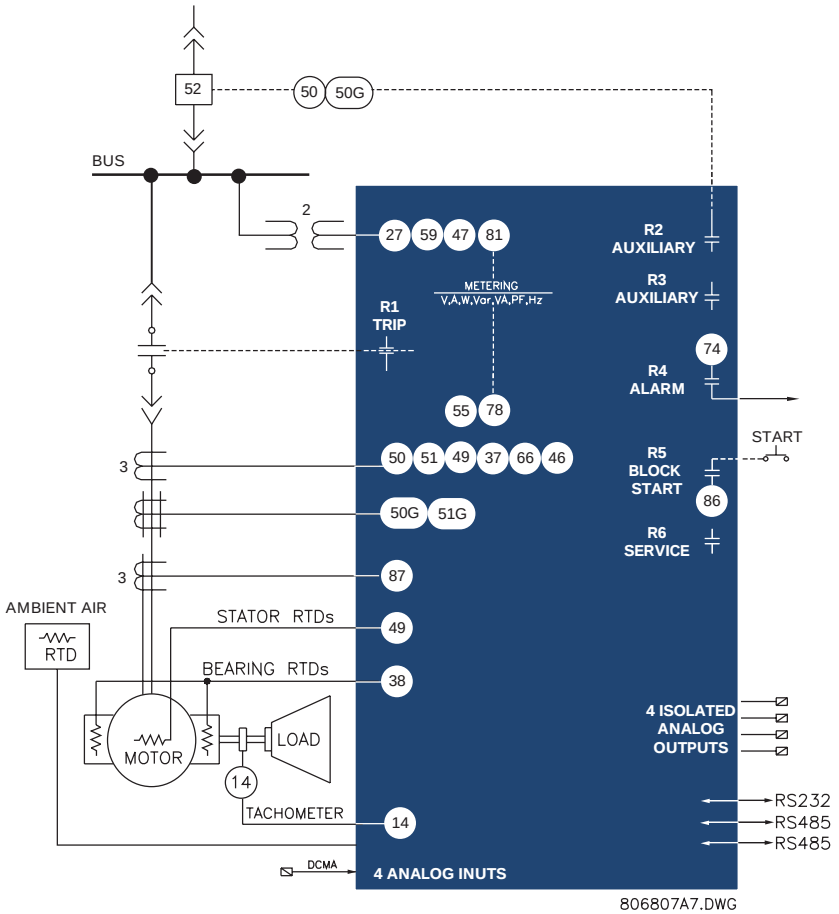
Typical custom overload curve.



An example of a voltage dependent overload curve; in this example the user has set the minimum voltage to 80%.



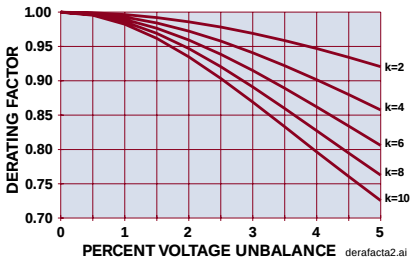
Functional Block Diagram



Unbalance (Negative Sequence Current) Bias

Negative sequence current, which causes rotor heating, is not accounted for in the thermal limit curves supplied by the motor manufacturer. The 469 measures unbalance as the ratio of negative to positive sequence current. The thermal model is biased to reflect the additional heating. Motor derating due to current unbalance can be selected via the setpoint unbalance bias k factor.

Medium motor derating factor due to unbalanced voltage. Note that the k=8 curve is almost identical to the NEMA derating curve.

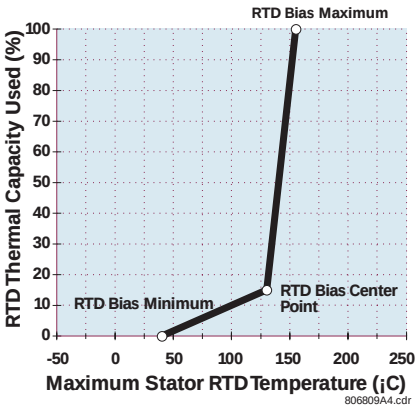


Hot/Cold Motor Compensation

The 469 has a unique feature for protecting the motor based on the hot/cold thermal damage information provided by the motor manufacturer. Hot motor compensation allows RTD measuring the stator temperature to act as thermal capacity check by confirming the value calculated by the thermal model. A two-part curve is constructed using three points:

- RTD bias minimum: if the minimum stator RTD is below this point no biasing occurs (typically 40° C)
- RTD bias maximum: if the maximum stator RTD temperature is above this setpoint the thermal memory is fully biased and thermal capacity is forced to 100% used (this is typically at the stator insulation rating)
- RTD bias center point: the center point temperature and thermal capacity used values are the rated running temperature and value determined by the hot/cold safe stall ratio respectively

For values between the RTD bias maximum and minimum, the present thermal capacity used (created by the overload curve) is compared to the RTD bias thermal capacity. If the RTD bias thermal capacity used value is higher, it is used from that point forward.



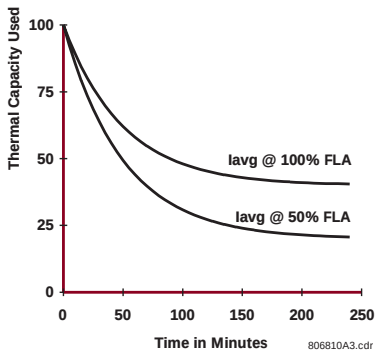
RTD Bias curve.

Motor Cooling Time Constants

The 469 thermal capacity used value is reduced exponentially when the motor current is below the overload pickup setpoint. This reduction simulates motor cooling. The motor cooling time constants are programmed for both the stopped and running cases as a stopped motor will normally cool slower than a running motor. Since actual motor cooling is exponential the thermal model will track motor heating and cooling cycles accurately and always provide optimum protection.

Hot/cold ratio define the steady state condition for the motor, and cooldown curve limit for the running motor to reflect the actual motor cooling.

Exponential cooldown (hot/cold curve ratio 60%).



Start Inhibit and Emergency Restart

The Start Inhibit function prevents starting of a motor when insufficient thermal capacity is available or motor start supervision functions dictate the start inhibit. In case of emergency the thermal supervision timers can be reset to allow the hot motor starting.

Motor Start Supervision

Motor Start Supervision consists of the following features:

Time-between-starts, Starts-per-Hour, Restart Time. These elements intend to guard the motor against excessive starting duty, which are normally defined by motor manufacturer in addition to the thermal damage curves.

Protection and Control

The 469 contains a full range of selectively enabled, self contained protection and control elements as detailed in the Applicability of 469 Features table.

The 469 also has the ability to learn motor acceleration time, starting current and thermal capacity.

Mechanical Jam and Acceleration Time

These two elements are used to prevent a motor damage at the abnormal operational conditions: such as too long acceleration time and stalled rotor.

Additional Features

Torque metering and protection, pulsed outputs, analog input differential for dual motor drives and cyclic load averaging for reciprocating motors have all been added to the 469 features.

Special Features

Upon request the 469 can also be programmed with the following modifications: undervoltage autorestart and an experimental broken rotor bar detection system.

Inputs and Outputs

Current and Voltage Inputs

The 469 has three-phase CT inputs for phase current protection, three additional inputs for differential protection, and a ground CT for sensitive detection of ground faults or earth leakage. Voltage transformer inputs allow for numerous protection features based on voltage and power quantities.

RTD Inputs

The 469 has 12 field programmable RTDs that are normally used for temperature monitoring. The 469 circuitry compensates for lead resistance for leads of equal length.

Digital Inputs

The 469 has five pre-defined and four assignable digital inputs which can be configured to any one of 14 different functions or turned off.

Analog Inputs

The 469 has four analog inputs that can be used to monitor any external quantity.

Output Relays

Four output relays are assigned to trip, alarm, start block and service. Two auxiliary relays may be programmed for extra functions, in addition to a forced output relay feature.

Analog Outputs

If analog outputs are connected to a PLC, real time process control is possible based on any of the four parameters that the 469 measures. If the motor is about to trip on overload or hot rotor stator for example, the PLC could reduce the load, preventing any downtime.

Applicability of 469 Features

ANSI		Trip	Alarm	Block Start	Control
51	Overload	●	●	●	
86	Overload Lockout			●	
66	Starts/Hour and Time Between Starts			●	
	Restart Block (Anti-Backspin Timer)			●	
50	Short Circuit and Short Circuit Backup	●		●	
	Mechanical Jam	●		●	
37	Undercurrent/Underpower	●	●	●	
46	Current Unbalance	●	●	●	
50G/51G	Ground Fault and Ground Fault Backup	●	●	●	
87	Differential	●		●	
	Acceleration	●		●	
49	Stator RTD	●	●	●	
38	Bearing RTD	●	●	●	
	Other RTD and Ambient RTD	●	●	●	
	Open RTD Alarm		●		
	Short/Low RTD		●		
27/59	Undervoltage/Overvoltage	●	●	●	
47	Phase Reversal	●		●	
81	Frequency	●	●	●	
	Reactive Power	●	●	●	
55/78	Power Factor	●	●	●	
	Analog Input	●	●	●	
	Demand Alarm: A kW kvar k VA		●		
	SR469 Self-Test, Service		●		
	Trip Coil Supervision		●		
	Welded Contactor		●		
	Breaker Failure		●		
	Remote Switch	●	●	●	
14	Speed Switch and Tachometer Trip	●	●	●	
	Load Shed Switch	●		●	
	Pressure Switch	●	●	●	
	Vibration Switch	●	●	●	
19	Reduced Voltage Start				●
48	Incomplete Sequence	●		●	
	Remote Start/Stop				●
	Over Torque		●	●	

PROCTLA5.AI

Monitoring and Metering

The 469 provides impressive monitoring and metering functions in one compact unit:

Metering

The 469 provides accurate metering of:

- A V W var VA PF Hz
- Wh varh, torque
- Demand: A W var VA peak
- Temperature (RTDs)
- Speed (if tachometer function is assigned to one of the digital inputs)
- Analog inputs

Event Recording

The event recorder stores motor and system information with a date and time stamp each time an event occurs up to 40 events.

Oscillography

The 469 records up to 64 cycles with 12 samples per cycle of waveform data for 10 waveforms (I_a, I_b, I_c, I_g, $Diff_a$, $Diff_b$, $Diff_c$, V_a, V_b, V_c) each time a trip occurs. The record is date and time stamped.

Simulation

The simulation feature tests the functionality and relay response to programmed conditions without the need for external inputs. When placed in simulation mode the 469 suspends reading of the actual inputs and substitutes the simulated values. Pre-trip and fault conditions can be simulated.

User Interfaces

Keypad and Display

The 469 has a keypad and 40 character display for local control and programming without a computer. Up to 20 user-selected default messages can be displayed when inactive. In the event of a trip, alarm, or start block, the display will automatically default to the pertinent message and the Message LED indicator will flash.

LED Indicators

The 469 has 22 LED indicators on the front panel. These give a quick indication of 469 status, motor status, and output relay status.

Communications

The 469 is equipped with three communications ports. A front panel RS232 port allows easy local computer access. Two rear RS485 ports provide remote communications or connection to a DCS, SCADA, or PLC. The three ports support ModBus® RTU protocol. The RS232 baud rate is fixed at 9600, while the RS485 ports are variable from 300 to 19,200 bps. All communications ports may be active simultaneously.

Software

The relay comes with the Windows®-based enerVista 469 setup software which can be used to manipulate and display 469 data. A simple point and click interface allows setpoint files for each motor to be stored, printed for verification, and downloaded to the 469 for error-free setpoint entry. The entire 469 manual is included as a help file for quick local access.

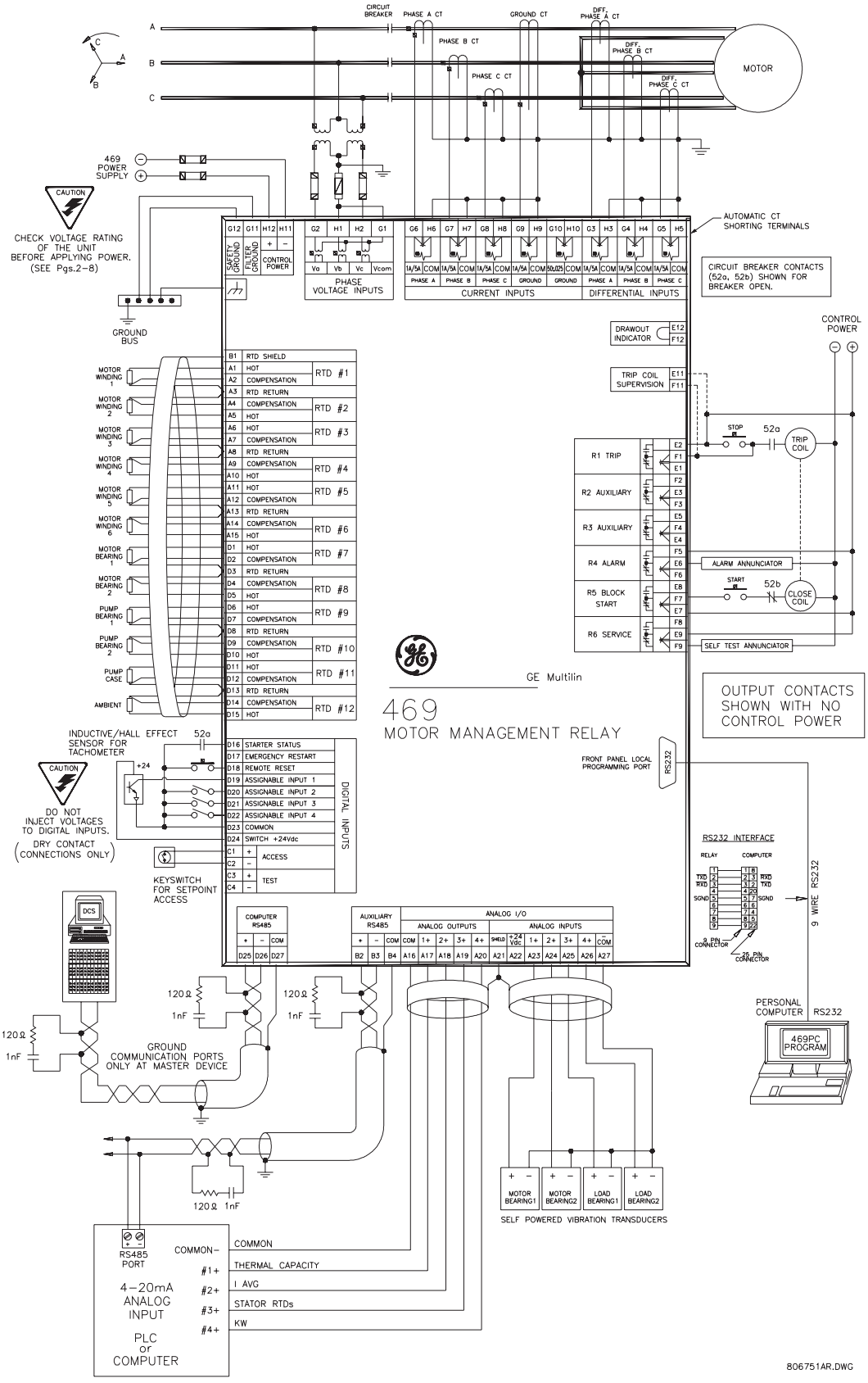
enerVista

The Windows®-based enerVista program allows the creation of single line diagrams for substation and system monitoring schemes. Annunciator panel viewing, metering, and simple settings changes can also be performed using the program. The enerVista program allows the user to access multiple 469s or different devices for metering in real time. The program may be used locally through the RS232 serial port or remotely through the other ports on the device.

469 Guideform Specifications

For an electronic version of the 469 guideform specifications, please visit: www.GEindustrial.com/Multilin/specs, fax your request to 905-201-2098 or email to literature.multilin@indsys.ge.com.

Typical Wiring



469 Technical Specifications

INPUTS:

PHASE CURRENT INPUTS

CT Primary:	1 to 5000 A
CT Secondary:	1 A or 5 A (must be specified with order)
Burden:	Less than 0.2 VA at rated load
Conversion Range:	0.05 to 20 x CT
Nominal Frequence:	20 - 70 Hz
Frequency Range:	20 - 120 Hz
Accuracy:	at < 2 x CT: ± 0.5% of 2 x CT at ≥ 2 x CT: ± 1% of 20 x CT
CT Withstand:	1 second at 80 x rated current 2 seconds at 40 x rated current continuous at 3 x rated current

DIFFERENTIAL CURRENT INPUTS

CT Primary:	1 to 5000 A
CT Secondary:	1 A or 5 A (Set point)
Burden:	Less than 0.2 VA at rated load
Conversion Range:	0.02 to 1 x CT primary Amps
Nominal Frequence:	20 - 70 Hz
Frequency Range:	20 - 120 Hz
Accuracy:	± 0.5% of 1 x CT for 5 A ± 0.5% of 5 x CT for 1 A
CT Withstand:	1 second at 80 x rated current 2 seconds at 40 x rated current continuous at 3 x rated current

GROUND CURRENT INPUTS

CT Primary:	1 to 5000 A
CT Secondary:	1 A or 5 A (Set point)
Burden:	< 0.2 VA at rated load for 1 A or 5 A < 0.25 VA for 50:025 at 25 A
Conversion Range:	0.02 to 1 x CT primary Amps
Nominal Frequence:	20 - 70 Hz
Frequency Range:	20 - 120 Hz
Accuracy:	± 0.5% of 1 x CT for 5 A ± 0.5% of 5 x CT for 1 A ± 0.125 A for 50:0.025
CT Withstand:	1 second at 80 x rated current 2 seconds at 40 x rated current continuous at 3 x rated current

VOLTAGE INPUTS

VT Ratio:	1.00 to 150.00:1 in steps of 0.01
VT Secondary:	273 V AC (full scale)
Conversion Range:	0.05 to 1.00 x full scale
Nominal Frequence:	20 - 70 Hz
Frequency Range:	20 - 120 Hz
Accuracy:	±0.5% of full scale
Max. Continuous:	280 V AC
Burden:	> 500 kΩ

DIGITAL INPUTS

Inputs:	9 opto-isolated inputs
External Switch:	dry contact < 400 Ω, or open collector NPN transistor from sensor; 6 mA sinking from internal 4 KΩ pull-up at 24 V DC with Vce < 4 V DC
469 Sensor Supply:	+24 V DC at 20 mA maximum

RTD INPUTS

3 wire RTD Types:	100 Ω Platinum (DIN.43760), 100 Ω Nickel, 120 Ω Nickel, 10 Ω Copper
RTD Sensing Current:	5mA
Isolation:	36 Vpk (isolated with analog inputs and outputs)
Range:	–50 to +250°C
Accuracy:	±2°C
Lead Resistance:	25 Ω Max per lead for Pt and Ni type 3 Ω Max per lead for Cu type
No Sensor:	>1000 Ω
Short/Low Alarm:	< –50°C

TRIP COIL SUPERVISION

Applicable Voltage:	20 to 300 V DC / V AC
Trickle Current:	2 to 5 mA

ANALOG CURRENT INPUTS

Current Inputs:	0 to 1 mA, 0 to 20mA or 4 to 20 mA (setpoint)
Input Impedance:	226 Ω ±10%
Conversion Range:	0 to 21 mA
Accuracy:	±1% of full scale
Type:	passive
Analog In Supply:	+24 V DC at 100 mA maximum
Response Time:	≤ 100 ms

PROTECTION

PHASE SHORT CIRCUIT

Picup Level:	4.0 to 20.0 x CT primary in steps of 0.1 of any one phase
Time Delay:	0 to 1000 ms in steps of 10
Pickup Accuracy:	as per Phase Current Inputs
Timing Accuracy:	+50 ms
Elements:	Trip

REDUCED VOLTAGE START

Transition Level:	25 to 300% FLA in steps of 1
Transition Time:	1 to 250 s in steps of 1
Transition Control:	Current, Timer, Current and Timer

PROTECTION

OVERLOAD/STALL PROTECTION/THERMANL MODEL

Overload Curves:	15 Standard Overload Curves, Custom Curve, Voltage Dependent Custom Curve for high inertia starting (all curves time out against average phase current)
Curve Biasing	Phase Unbalance Hot/Cold Curve Ratio Stator RTD Running Cool Rate Stopped Cool Rate Line Voltage
Overload Pickup:	1.01 to 1.25 (for service factor)
Pickup Accuracy:	as per Phase Current Inputs
Timing Accuracy:	±100 ms or ±2% of total time
Elements:	Trip and Alarm

MECHANICAL JAM

Picup Level:	1.01 to 3.00 x FLA in steps of 0.01 of any one phase, blocked on start
Time Delay:	1 to 30 s in steps of 1
Pickup Accuracy:	as per Phase Current Inputs
Timing Accuracy:	±0.5 s or ±0.5% of total time
Elements:	Trip

UNDERCURRENT

Picup Level:	0.10 to 0.95 x CT primary in steps of 0.01 of any one phase
Time Delay:	1 to 60 s in steps of 1
Block From Start:	0 to 15000 s in steps of 1
Pickup Accuracy:	as per Phase Current Inputs
Timing Accuracy:	±0.5 s or ±0.5% of total time
Elements:	Trip and Alarm

CURRENT UNBALANCE

Unbalance:	I2 / I1 if Iavg > FLA I2 / I1 x Iavg / FLA if Iavg < FLA
Range:	0 to 100% UB in steps of 1
Pickup Level:	4 to 40% UB in steps of 1
Time Delay:	1 to 60 s in steps of 1
Pickup Accuracy:	±2%
Timing Accuracy:	±0.5 s or ± 0.5% of total time
Elements:	Trip and Alarm

PHASE DIFFERENTIAL

Pickup Level:	0.05 to 1.0 x CT primary in steps of 0.01 of any one phase
Time Delay:	0 to 1000 ms in steps of 10
Pickup Accuracy:	as per Phase Differential Current Inputs
Timing Accuracy:	+50 ms
Elements:	Trip

GROUND INSTANTANEOUS

Pickup Level:	0.1 to 1.0 x CT primary in steps of 0.01
Time Delay:	0 to 1000 ms in steps of 10
Pickup Accuracy:	as per Ground Current Input
Timing Accuracy:	+50 ms
Elements:	Trip and Alarm

ACCELERATION TIMER

Pickup:	Transition of no phase current to > overload pickup
Dropout:	When current falls below overload pickup
Time Delay:	1.0 to 250.0 s in steps of 0.1
Timing Accuracy:	±100 ms or ± 0.5% of total time
Elements:	Trip

JOGGING BLOCK

Starts/Hour:	1 to 5 in steps of 1
Time between Starts:	1 to 500 min.
Timing Accuracy:	±0.5 s or ± 0.5% of total time
Elements:	Block

RESTART BLOCK

Time Delay:	1 to 50000 s in steps of 1
Timing Accuracy:	±0.5 s or ± 0.5% of total time
Elements:	Block

RTD

Pickup:	1 to 250°C in steps of 1
Pickup Hysteresis:	2°C
Time Delay:	3 s
Elements:	Trip and Alarm

UNDERVOLTAGE

Pickup Level:	
Motor Starting:	0.60 to 0.99 x Rated in steps of 0.01
Motor Running:	0.60 to 0.99 x Rated in steps of 0.01 any one phase
Time Delay:	0.1 to 60.0 s in steps of 0.1
Pickup Accuracy:	as per Voltage Inputs
Timing Accuracy:	<100 ms or ±0.5% of total time
Elements:	Trip and Alarm

OVERVOLTAGE

Pickup Level:	1.01 to 1.10 x rated in steps of 0.01 any one phase
Time Delay:	0.1 to 60.0 s in steps of 0.1
Pickup Accuracy:	as per Voltage Inputs
Timing Accuracy:	±100 ms or ±0.5% of total time
Elements:	Trip and Alarm

VOLTAGE PHASE REVERSAL

Configuration:	ABC or ACB phase rotation
Timing Accuracy:	500 to 700 ms
Elements:	Trip

FREQUENCY

Required Voltage:	> 30% of full scale in Phase A
Overfrequency Pkp:	25.01 to 70.00 in steps of 0.01
Underfrequency Pkp:	20.00 to 60.00 in steps of 0.01
Accuracy:	±0.02 Hz
Time Delay:	0.1 to 60.0 s in steps of 0.1
Timing Accuracy:	<100 ms or ±0.5% of total time
Elements:	Trip and Alarm

DIGITAL INPUTS

REMOTE SWITCH

Configurable:	Assignable to Digital Inputs1 to 4
Timing Accuracy:	100 ms max.
Elements:	Trip and Alarm

SPEED SWITCH

Configurable:	Assignable to Digital Inputs1 to 4
Time Delay:	1.0 to 250.0 s in steps of 0.1
Timing Accuracy:	100 ms max.
Elements:	Trip

LOAD SHED

Configurable:	Assignable to Digital Inputs1 to 4
Timing Accuracy:	100 ms max.
Elements:	Trip

PRESSURE SWITCH

Configurable:	Assignable to Digital Inputs1 to 4
Time Delay:	0.1 to 100.0 s in steps of 0.1
Block From Start:	0 to 5000 s in steps of 1
Timing Accuracy:	±100 ms or ±0.5% of total time
Elements:	Trip and Alarm

VIBRATION SWITCH

Configurable:	Assignable to Digital Inputs1 to 4
Time Delay:	0.1 to 100.0 s in steps of 0.1
Timing Accuracy:	±100 ms or ±0.5% of total time
Elements:	Trip and Alarm

DIGITAL COUNTER

Configurable:	Assignable to Digital Inputs1 to 4
Count Frequency:	≤ 50 times a second
Range:	0 to 1 000 000 000
Elements:	Alarm

TACHOMETER

Configurable:	Assignable to Digital Inputs1 to 4
RPM Range:	100 to 7200 RPM
Pulse Duty Cycle:	> 10%
Elements:	Trip and Alarm

GENERAL PURPOSE

Configurable:	Assignable Digital Inputs1 to 4
Time Delay:	0.1 to 5000.0 s in steps of 0.1
Block From Start:	0 to 5000 s in steps of 1
Timing Accuracy:	±100 ms or ±0.5% of total time
Elements:	Trip and Alarm

OUTPUS

ANALOG OUTPUTS

Type:	Active
Range:	4 to 20 mA, 0 to 1 mA (must be specified with order)
Accuracy:	±1% of full scale
Maximum	4 to 20 mA input: 1200 Ω,
Load:	0 to 1 mA input: 10 kΩ
Isolation:	36 Vpk (Isolation with RTDs and Analog Inputs)
4 Assignable Outputs:	phase A current, phase B current, phase C current, 3 phase average current, ground current, phase AN (AB) voltage, phase BN (BC) voltage, phase CN (CA) voltage, 3 phase average voltage, hottest stator RTD, hottest bearing RTD, hottest other RTD, RTD # 1 to 12, Power factor, 3-phase Real power (kW), 3-phase Apparent power (kVA, 3-phase Reactive power (kvar), Thermal Capacity Used, Relay Lockout Time, Current Demand, kvar Demand, kW Demand, kVA Demand, Motor Load, Torque

OUTPUT RELAYS

Configuration:	6 Electromechanical Form C
Contact Material:	silver alloy
Operate Time:	10 ms

Max ratings for 100000 operations

VOLTAGE		MAKE/CARRY CONTINUOUS	MAKE/CARRY 0.2 SEC	BREAK	MAX LOAD
DC Resistive	30 VDC	10 A	30A	10 A	300 W
	125 VDC	10 A	30A	0.5 A	62.5 W
	250 VDC	10 A	30A	0.3 A	75 W
DC Inductive L/R = 40 ms	30 VDC	10 A	30A	5 A	150 W
	125 VDC	10 A	30A	0.25 A	31.3 W
	250 VDC	10 A	30A	0.15 A	37.5 W
AC Resistive	120 VAC	10 A	30A	10 A	2770 VA
	250 VAC	10 A	30A	10 A	2770 VA
AC Inductive P.F. = 0.4	120 VAC	10 A	30A	4 A	480 VA
	250 VAC	10 A	30A	3 A	750 VA

MONITORING

POWER FACTOR

Range:	0.01 lead or lag to 1.00
Pickup Level:	0.99 to 0.05 in steps of 0.01, Lead & Lag
Time Delay:	0.2 to 30.0 s in steps of 0.1
Block From Start:	0 to 5000 s in steps of 1
Pickup Accuracy:	±0.02
Timing Accuracy:	±100 ms or ±0.5% of total time
Elements:	Trip and Alarm

3-PHASE REAL POWER

Range:	0 to ±99999 kW
Underpower Pkp:	1 to 25000 kW in steps of 1
Time Delay:	1 to 30 s in steps of 1
Block From Start:	0 to 15000 s in steps of 1
Pickup Accuracy:	
at Iavg < 2 x CT:	±1% of √3 x 2 x CT x VT x VTfull scale
at Iavg > 2 x CT	±1.5% of √3 x 20 x CT x VT x VTfull scale
Timing Accuracy:	±0.5 s or ±0.5% of total time
Elements:	Trip and Alarm

3-PHASE APPARENT POWER

Range:	0 to 65535 kVA
at Iavg < 2 x CT:	±1% of √3 x 2 x CT x VT x VTfull scale
at Iavg > 2 x CT	±1.5% of √3 x 20 x CT x VT x VTfull scale

3-PHASE REACTIVE POWER

Range:	0 to ±99999 kW
Pickup Level:	±1 to 25000 kW in steps of 1
Time Delay:	0.2 to 30.0 s in steps of 1
Block From Start:	0 to 5000 s in steps of 1
Pickup Accuracy:	
at Iavg < 2 x CT:	±1% of √3 x 2 x CT x VT x VTfull scale
at Iavg > 2 x CT	±1.5% of √3 x 20 x CT x VT x VTfull scale
Timing Accuracy:	±100 ms or ±0.5% of total time
Elements:	Trip and Alarm

OVERTORQUE

Pickup Level:	1.0 to 999999.9 Nm/ft·lb in steps of 0.1; torque unit is selectable under torque setup
Time Delay:	0.2 to 30.0 s in steps of 0.1
Pickup Accuracy:	±2.0%
Time Accuracy:	±100 ms or 0.5% of total time
Elements:	Alarm (INDUCTION MOTORS ONLY)

METERED REAL ENERGY CONSUMPTION

Description:	Continuous total real power consumption
Range:	0 to 999999.999 MW·hours.
Timing Accuracy:	±0.5%
Update Rate:	5 seconds

METERED REACTIVE ENERGY CONSUMPTION

Description:	Continuous total reactive power consumption
Range:	0 to 999999.999 Mvar·hours
Timing Accuracy:	±0.5%
Update Rate:	5 seconds

METERED REACTIVE POWER GENERATION

Description:	Continuous total reactive power generation
Range:	0 to 2000000.000 Mvar·hours
Timing Accuracy:	±0.5%
Update Rate:	5 seconds

POWER SUPPLY

CONTROL POWER

Options:	LO / HI (must be specified with order)
LO Range:	DC: 20 to 60 V DC AC: 20 to 48 V AC at 48 to 62 Hz
Hi Range:	DC: 90 to 300 V DC AC: 70 to 265 V AC at 48 to 62 Hz
Power:	45 VA (max), 25 VA typical

Proper operation time without supply voltage: 30 ms

COMMUNICATIONS

RS232 Port:	1, Front Panel, non-isolated
RS485 Ports:	2, Isolated together at 36 Vpk
Baud Rates:	RS485: 300 - 19,200 Baud programmable parity RS232: 9600
Parity:	None, Odd, Even
Protocol:	Modbus® RTU / half duplex

PRODUCT TESTS

Thermal Cycling:	Operational test at ambient, reducing to –40°C and then increasing to 60°C
Dielectric Strength:	2.0 kV for 1 minute from relays, CTs, VTs, power supply to Safety Ground

TYPE TESTS

Dielectric Strength:	Per IEC 255-5 and ANSI/IEEE C37.90 2.0 kV for 1 minute from relays, CTs, VTs, power supply to Safety Ground
Insulation Resistance:	IEC255-5 500 V DC, from relays, CTs, VTs, power supply to Safety Ground
Transients:	ANSI C37.90.1 Oscillatory (2.5kV/ 1MHz); ANSI C37.90.1 Fast Rise (5kV/10ns); Ontario Hydro A-28M-82; IEC255-4 Impulse/High Frequency Disturbance, Class III Level
Impulse Test:	IEC 255-5 0.5 Joule 5 kV
RFI:	50 MHz/15 W Transmitter
EMI:	C37.90.2 Electromagnetic Interference at 150 MHz and 450 MHz, 10 V/m
Static:	IEC 801-2 Static Discharge
Humidity:	95% non-condensing
Temperature:	–40°C to +60°C ambient
Environment:	IEC 68-2-38 Temperature/Humidity Cycle
Vibration:	Sinusoidal Vibration 8.0 g for 72 hrs.

CERTIFICATION

ISO:	Manufactured under an ISO9001 registered system.
CSA:	CSA approved
CE:	Conforms to EN 55011/CISPR 11, EN 50082-2
IEC:	Conforms to IEC 947-1,1010-1

ENVIRONMENTAL

Temperatrue Range:	
Operating:	-40 °C to +60 °C
Ambient Storage:	-40 °C to +80 °C
Abiment Shipping:	-40 °C to +80 °C
Humidity:	Up to 90% noncondensing
Pollution degree:	2
IP Rating:	40-X

Features

DISPLAY
40 character display, clear messages which do not require deciphering

STATUS INDICATORS
- 469 status
- Motor status
- Output relays

Numeric keypad

VALUE KEYS
Value Up, and Value Down keys to change setupoint values

CONTROL AND PROGRAMMING KEYS
Menu, Escape, Reset, Enter, Menu Up, and Menu Down keys for complete access without a computer

DRAWOUT HANDLE
With provision for a wire lead seal to prevent unauthorized removal

PROGRAM PORT INTERFACE
RS232 for connection to a computer, 9600 baud

Ordering

469	*	*	*	*	
469					Basic unit
	P1				1 A phase CT secondaries
	P5				5 A phase CT secondaries
		LO			DC: 24 – 60 V; AC: 20 – 48 V @ 48 – 62 Hz control power
		HI			DC: 90 – 300 V; AC: 70 – 265 V @ 48 – 62 Hz control power
			A1		0 – 1 mA analog outputs
			A20		4 – 20 mA analog outputs
				E	Enhanced display, larger LCD, improved keypad
				B	Standard display

Accessories

enerVista:	Provided free with each relay
DEMO:	Metal carry case in which 469 unit may be mounted
19-1 PANEL:	Single cutout 19" panel
19-2 PANEL:	Dual cutout 19" panel
SCI MODULE:	RS232 to RS485 converter box designed for harsh industrial environments
Phase CT:	50, 75, 100, 150, 200, 250, 300, 350, 400, 500, 600, 750, 1000
HGF3, HGF5, HGF8:	For sensitive ground detection on high resistance grounded systems
1 3/8" Collar:	For shallow switchgear, reduces the depth of the relay by 1 3/8".
	For shallow switchgear, reduces the depth of the relay by 3".

Dual mounting available with the 19-2 Panel.