Unipower® **HPL420**

D i g i t a l   P o w e r   M o n i t o r

User's Manual

True Motor Power Monitor with...

- High Trip Alarm

- Low Trip Alarm

- Dual Relays

- Hysteresis Function

- Analog Output

Typical Applications

- Pumps

- Fans

- Conveyors

- Crushers and mixers

- Broken belt detection

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Contents

⚠ **WARNING: Dangerous voltages are present in motor control panels; INSTALLATION MUST BE CARRIED OUT BY QUALIFIED PERSONNEL.**

⚠ **WARNING: Improper installation or programming can cause damage to the unit and/or result in ineffective protection and/or nuisance tripping.**

1 System Overview

The Unipower HPL420 Digital Power Monitor is a member of the Unipower® family of "Intelligent Power-Control Units" designed for supervision and control of motor driven mechanical systems.

The HPL420 measures true power consumption of 3-phase AC motors (single phase versions also available) and displays consumption as a percentage of selected power range. Power consumption (kW) is calculated from the formula:

$$P = \sqrt{3} \times U \times I \times \cos \varphi$$

The display shows power in units of %kW which represent the percentage of full load power range for the unit.

Control functions comprise two independent and programmable trip functions:

Low Power Alarm - for example, to stop a pump in the event of dry-running, and

High Power Alarm - for example, to stop a feeder when blocked.

The alarm functions activate independent alarm relays - one for high and one for low alarms - which may be used to supervise the system being monitored, typically stopping the motor to protect the load being driven.

The HPL420 also lends itself to control applications where a secondary function is initiated by the alarm relays. An example of this would be to use the high/low alarm relays to speed up or slow down the rate at which material is fed to a crusher to ensure optimum crushing productivity.

The HPL420 may be configured to monitor any size motor and provides consistent sensitivity across the complete motor load range making it ideal for low trip applications where amp meters are not effective. In addition, the HPL420 measurement principle allows it to be used on non-sine shaped loads such as Variable Frequency Drives.

The HPL420 also incorporates an analog 4-20mA output and basic phase fault alarm functions.

2 Functional Description

A typical Power vs. Time graph for the HPL420 is shown in Figure 2.1 with the Y-axis showing power P in units of %kW and the X-axis showing time.

At rest with mains power on, the HPL420 unit is energized and the alarm relays activated as shown.

When the motor is turned on, the load immediately surges due to the starting current inrush before settling to a steady value. The HPL420 detects this surge and inhibits monitoring for a period Ts as shown. Once Ts has completed, limits, hysteresis, Tr etc. become active.

This example shows power rising above the L1 Max. Limit which triggers an alarm - Relay 1 switches - once the %kW value has remained above L1 for the duration of the delay timer Tr1.

This example denotes a control situation where the alarm is automatically reset once the %kW value drops below the Hysteresis band. For protection applications, Hysteresis is typically not used and the alarm would be physically reset.

A continuation is shown where the motor load drops such that it falls below the L2 Min Limit which triggers a Relay 2 alarm once %kW has remained below L2 for the duration of the delay timer Tr2.

Again, the HPL420 is reset using the automatic Hysteresis function but this can also be done physically. Note also that the relay logic for the HPL420 can be programmed which is shown in the diagram as N. Inv. or Inv.
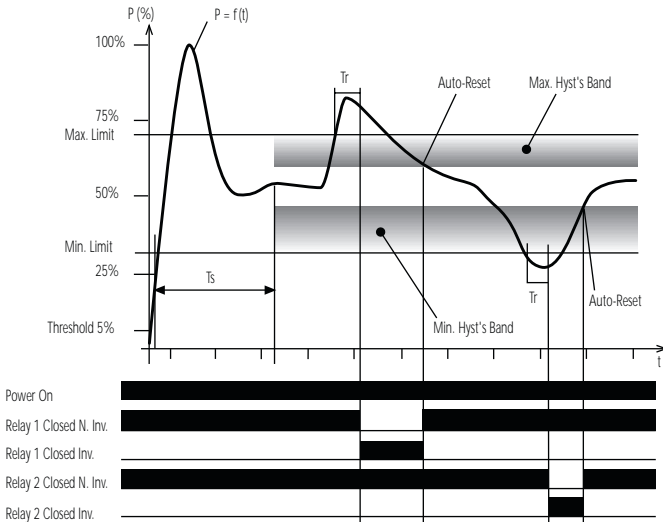

Figure 2.1

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The HPL420 functions in these examples are as follows:

P - **Power %kW:** The display shows true power in units of % of full scale for the HPL420 as installed.

Ts - **Start Delay Timer:** Ts is used to delay the start of active monitoring until after the start surge is completed.

The HPL420 assumes that the motor is OFF when measured load - %kW - is below 5% full scale. The Ts timer starts when the load reaches 5% and monitoring is disabled for the duration of the Ts period. Ts is programmable in the range 0.1 to 25.0 seconds.

On conclusion of the Ts period, monitoring becomes active.

If P drops below 5%, monitoring is immediately disabled and a new Ts period will start as soon as load again reaches 5%.

L1 - **Max. Limit:** Max. alarm limit programmable in the range 5% to 100% / OFF and used in conjunction with the Tr1 Reaction Timer.

A Max. Limit alarm is tripped if P exceeds L1 for a period Tr1; Max. Alarm is indicated by a flashing Max. Limit LED and by switching of Relay 1 status.

Tr1 - **Reaction Timer:** Used in conjunction with the L1 Max. Limit and programmable in the range 0.0 to 25.0 seconds.

Tr1 is time for which the P must remain above the L1 Max. Limit before an alarm is declared. If P falls below L1 during the Tr1 timer period, the timer is re-set to zero.

Note: *if Tr1 is set to 0.0 seconds, actual reaction time will be one cycle or approx. 16 msec. at 60Hz and 20 msec. at 50Hz*

L2 - **Min. Limit:** Min. alarm limit programmable in the range OFF / 5% to 100% and used in conjunction with the Tr2 Reaction Timer.

A Min. Limit alarm is tripped when P remains below the L2 Min. Limit for a period of time Tr2; Min Alarm is indicated by a flashing Min. Limit LED and by switching of Relay 2 status.

Tr2 - **Reaction Timer:** Used in conjunction with the L2 Min. Limit and programmable in the range 0.0 to 25.0 seconds. Tr2 is time for which the P must remain below the L2 Min. Limit before an alarm is declared.

Hyst's - Hysteresis: Optional hysteresis function to initiate an automatic reset after an alarm. Hysteresis is independently programmable for both L1 and L2 and may be set in the range 2 to 50 %kW.

Peak Hold Functions:

Δ -   **Max. Level:** If the Δ up arrow key is depressed while the HPL420 is in monitor mode, the display will show the maximum load - in %kW - experienced since the last Ts.

∇ -   **Min. Level:** Vice versa for minimum load when Δ down arrow key is depressed.

Digital Input Functions:

S1 -   **Reset:** A momentary actuation of the S1 Reset function will initiate a Reset. Continuous actuation of the S1 Reset function - jumper S1 to Gnd - activates the optional Hysteresis function allowing automatic resets for control applications.

S2 -   **Inhibit:** Actuation of the S2 Inhibit input will disable monitoring for the duration of the actuation. The HPL420 will still function and display %kW but no alarms will occur.

Phase Error Functions:

The phase order error functions are activated by DIP switch setting, see Section 6.2.

These alarms switch the Max. Limit alarm relay in the same manner as an overload alarm but are immediately cancelled when the alarm condition is corrected. During a phase error alarm, the 4-20mA signal Iout is set to 0mA (for possible remote alarm signaling).

Phase Order: Phase order supervision generates an alarm when phase order is not L1 - L2 - L3. Phase order alarms are denoted by a flashing display of "PH1".

Phase Asymmetry: A voltage deviation alarm is triggered when voltage deviates
.   between phases by more than 8%.

    A phase angle alarm is triggered when the angle between phases varies by more than 5 degrees.

    Voltage deviation is denoted by flashing display "PH2" and phase angle by "PH3".

3 Typical Applications

The HPL420 is designed for applications where both over- and under-load supervision is required and differentiation between these conditions—separate alarm relays—is mandated, e.g. for differentiated remote alarm enunciation or for control applications using both limits.

Combined with its integral Hysteresis function, analog output and phase error alarm functions, the HPL420 is a particularly versatile digital load monitor.

Centrifugal Pumps

Have a power curve which is proportional to flow rate. Power monitoring using the HPL420, therefore, is very effective at ensuring the pump is running within the design minimum and maximum flow limits. Particularly for "dry-running" protection - low power condition - where ammeters are not effective.

Positive Displacement Pumps

Flow rate is constant but excessive outlet restriction results in high pressure and high power. The HPL420 provides a simple, non-intrusive monitoring function which can be effectively used to protect against dead-heading and by-pass flow.

Conveyors and Feeders

Immediately detect a low power condition resulting from transmission chain or belt breakage and is far more sensitive to such "low power" conditions than a simple current sensor.

Immediately generate a max. kW alarm when a feeder mechanism is jammed or overloaded; in many cases, can replace mechanical shear pins and is easier to set.

Other Aplications
Many Other Applications exist including: Fans, Mixers, Crushers, Grinders, etc.

④ System Configuration

The Unipower HPL420 measures voltage in all three legs of the 3-phase supply and current in one leg. The HPL420 has an internal current transformer with a measurement range of 8 Amps.

In configuring the HPL420 for a particular application, the voltage rating of the unit must match the mains supply being used and the effective current measured by the unit must be within its internal 8 Amp capacity.

4.1 VOLTAGE MATCHING:

From Table 4.1, ensure that the rated voltage for the HPL420 unit matches the mains voltage being used.

Catalog Number	Phase	Use for 50/60 Hz Mains Voltages
HPL420/220	3-Phase	208/220/230/240 VAC
HPL420/380	3-Phase	380/415 VAC
HPL420/460	3-Phase	460/480 VAC
HPL420/575	3-Phase	575/600 VAC
HPL420/S24	1-Phase	110/120 and 208/220/230/240 VAC

Figure 4.1

Note: The display full scale for the HPL420 is based on the nominal voltage of the unit; e.g. when using a nominal 220V unit at 208V, the display range will read 95% at full load (208/220 in %).

4.2 CURRENT MATCHING:

From the motor name plate, note the full load current in Amps.

If full load amperage for the motor is 8 amps or less, an external current transformer is not required.

If the full load current is greater than 8 amps, then an external N/1 or N/5 current transformer must be used.

Refer to Table 4.2 for the appropriate selection of current transformer and current range setting for the HPL420.

The HF3A current transformers specified in this table are low voltage, through-primary devices offered as accessories for the Unipower product line; equivalent devices from other manufacturers may be substituted at user's discretion.

Full Load Amps	Current Transformer	Ratio Primary : Secondary	Primary Turns	HPL110 Range Setting	Effective Range Amps
1	Internal	1 : 1	1	1	1
3	Internal	1 : 1	1	3	3
5	Internal	1 : 1	1	5	5
8	Internal	1 : 1	1	8	8
10	HF3A,050/5	50 : 5	1	1	10
15	HF3A,050/5	50 : 5	2	3	15
25	HF3A,050/5	50 : 5	2	5	25
30	HF3A,050/5	50 : 5	1	3	30
50	HF3A,050/5	50 : 5	1	5	50
75	HF3A,075/5	75 : 5	1	5	75
100	HF3A,100/5	100 : 5	1	5	100
150	HF3A,150/5	150 : 5	1	5	150

Figure 4.2

Note: The two ranges given for full load ratings of 15 and 25 Amps require two primary wraps of the current transformer whereas all other ranges require a single through primary.

Figure 4.3 shows the HF3A current transformers with a single through primary hook-up and with two primary wraps. When taking multiple primary wraps on the HF3A current transformers, ensure that the wraps are wound to the sides and not across the top or bottom of the current transformer.
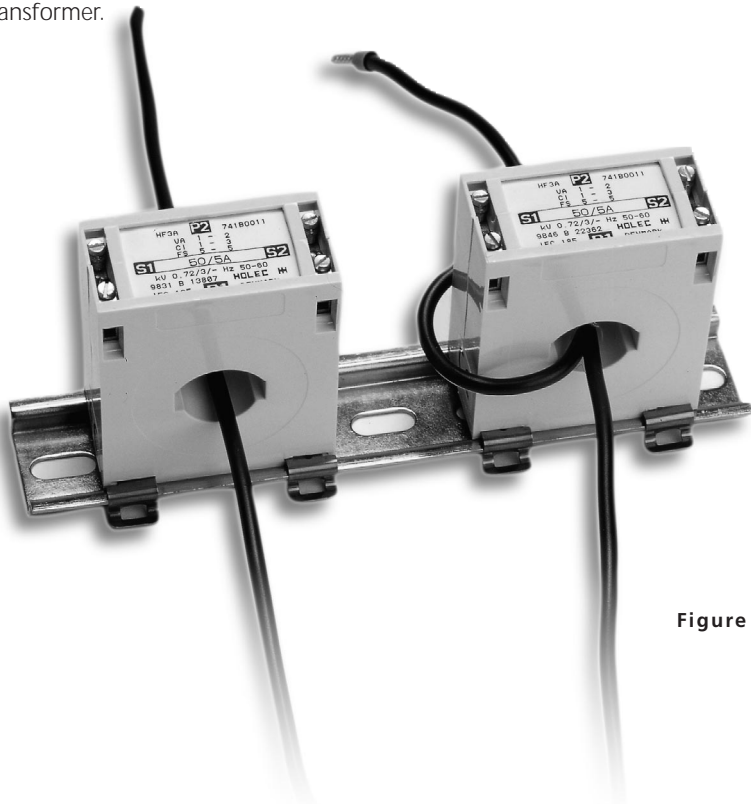

Figure 4.3

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5 Installation - Electrical

5.1 3-PHASE HOOK-UP

The HPL420 should be connected directly in front of the motor starter unit and downstream of the motor fuses and/or isolation breaker as shown in Figure 5.1.

An external current transformer with a secondary rating of 1 or 5 amps must be used if the rated full load motor current is in excess of 8 amps. Figure 5.1 shows correct installation using the internal current transformer (<8A), and using an external current transformer (>8A).

For correct readings, the current measurement must always be made on the L3 leg of the 3-phase supply. The direction of the current measurement, however, is not important.

Power-Down Alarm Blocking: When the motor is turned off, power drops to zero and a Min. Limit Alarm will be triggered if L2 is active. Figure 5.1 shows an auxiliary normally closed contact on the motor starter being used to short S2 to Gnd when the motor is off. This activates the S2 Inhibit function which inhibits alarm functions and prevents a Min. Limit alarm on power down.

Soft Starts and Frequency Inverters: When using the HPL420 with a soft start or a motor driven by a frequency inverter, the HPL420 connections must be made directly in front of these devices.

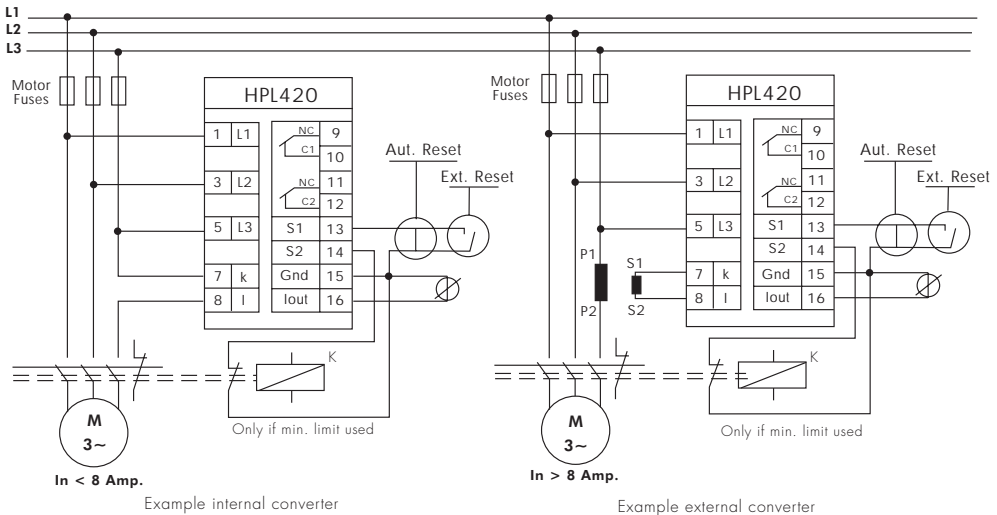Example internal converter

Example external converter

Figure 5.1

5.2 ALARM RELAY STATES

The HPL420 has two single throw alarm relays which can be programmed as "N. Inv." or "Inv.".

When programmed as "N. Inv.", the relays switch from open with power off to closed with power on. When programmed as "Inv.", the relays remain open with power on and switch to closed when an alarm is tripped.

Figure 5.2 shows the states for the alarm relays when programmed as "N. Inv.". States are reversed with Power ON when programmed as "Inv.".

Power	Off	On	On	On
Max Alarm	No	No	Yes	No
Max (1) LED	Off	Off	On	Off
Min Alarm	No	No	No	Yes
Min (2) LED	Off	Off	Off	On

Relays Programmed "N.INV."

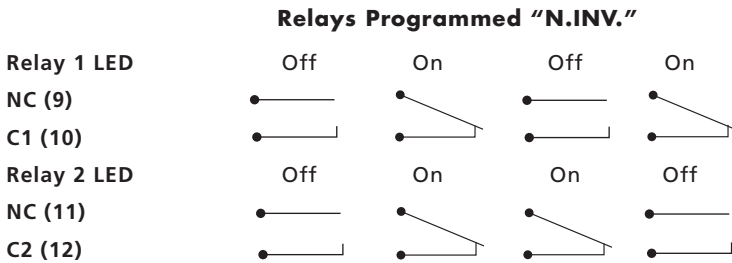| Relay 1 LED	Off	On	Off	On
NC (9)				
C1 (10)				
Relay 2 LED	Off	On	On	Off
NC (11)				
C2 (12)				

Figure 5.2

5.3 RESET FUNCTION

The HPL420 may be reset by any one of three methods:

Manual Reset: Depress the Reset key on the front panel.

Remote Reset: By wiring an Auxiliary reset button across contacts S1 to GND (pins 13 to 15) on the HPL420, a remote reset may be achieved.

Automatic Reset: By wiring a jumper across contacts S1 to GND, the HPL420 operates in automatic reset mode with the Hysteresis function active; this is typically only used for two-point control applications and not for protection applications.

5.4 ALARM INTEGRATION

In order for the HPL420 to stop the motor in the event of an alarm, the alarm relay (terminals 9 and 10, 11 and 12) must be integrated into the motor starter circuit such that it duplicates the effect of activating the STOP button.

One possibility is shown in Figure 5.4 where the relay contacts (terminals 9 and 10, 11 and 12) are connected in series with the STOP button. When an alarm occurs, either Terminals 9 and 10 or Terminals 11 and 12 change from closed to open. In either case, it is equivalent to pressing the STOP button and the motor will stop.
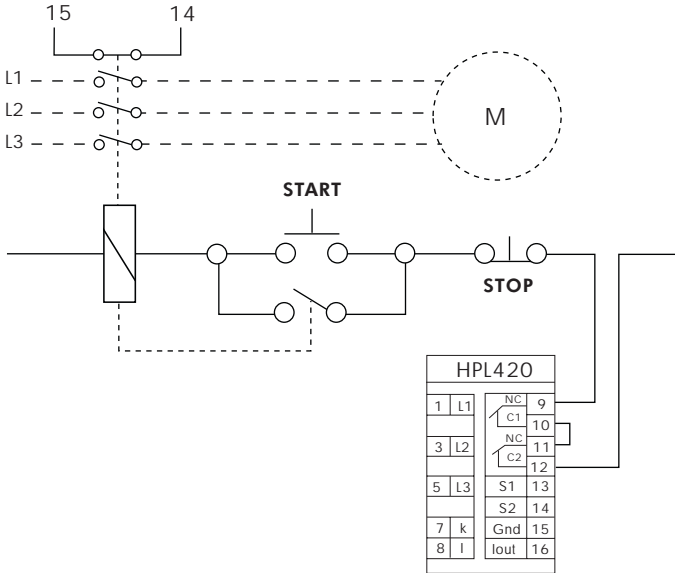

Figure 5.4

6 Specifications

6.1. TECHNICAL SPECIFICATIONS

Electrical

Voltage Range: See unit for range
Standard ranges—
3 x 220, 380, 460, and 575V
Also available—
1 x 24V for 420/220V single phase
Current Range:
Internal - max. 8A
External - N/1 or N/5 converter
Cos φ Range: $0 \rightarrow 1$
Frequency Range: $45 \rightarrow 65$ Hz
Consumption:
Supply voltage = measurement voltage, 3 VA
Relay Output: 250VAC/5Amp
Analog Output:
4-20mA, 0-500 Ohm, electrically isolated
from measurement system

Mechanical

Housing:
Polycarbonate (30%GFR),UL94V-1(house)
Polycarbonate, UP94V-2 (connector + front)
Mounting: Snap on for 35mm DIN rail
mounting or panel mounting
Protection Class: IP40 (house),
IP20 (connector)
Terminals: 12 AWG max., 20A,
7in.lb torque
Operating Temperature Range:
$+5 \rightarrow +122^{0}$F $(-15 \rightarrow +50^{0}$C)
Weight: ~1lb (0.5 kg)
Dimensions:
D 3.0″ x B 2.1″ x H 4.3″
(D 75 x B 56 x H 110 mm)

Listing: CE mark to EN50081-1, 50082-2, 61010-1
UL certified to UL508 (USA) and C22.2 No.14-M91
(Canada) standards for Industrial Control Equipment

6.2 DIP SWITCHES

Figure 6.1

1. Disconnect Mains Power
2. Remove face-plate (snap-out with small screwdriver)
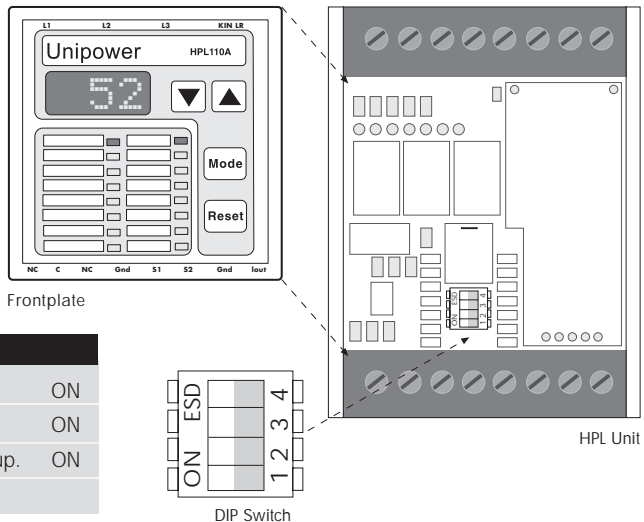3. Program switches and reassemble

Frontplate

HPL Unit

DIP Switch

Functions		
SW1	Unit Protected	ON
SW2	Phase Order Sup.	ON
SW3	Phase Asymmetry Sup.	ON
SW4	Not Used	

7 Installation - Mechanical

HPL420 Module

The HPL420 unit is typically mounted inside the motor starter enclosure or existing electrical cabinet. The unit is configured to snap directly on to 35mm DIN rail or may be attached to a panel using 2 x M4 or #8 screws.
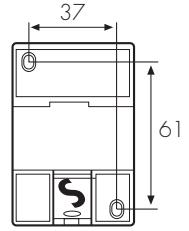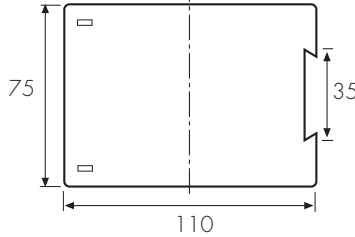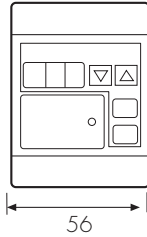

Figure 7.1

The HPL420 housing is not sealed and must be protected inside an appropriate environmental enclosure. The terminal connections are rated for 12 AWG (4mm2) wires max. and 7in.lb tightening torque.

Current Transformers

The optional HF3Axxx/x series current transformers may be mounted either directly to standard 35mm DIN rail, as shown on Page 9, using accessory 741B0231—not included—or screwed directly to a panel using two M5 or #10 cap screws with accessory 741B0230/6—not included—as shown in Fig. 7.2
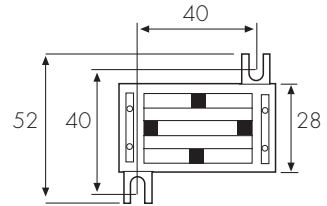

Figure 7.2
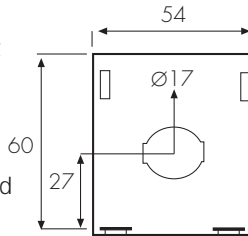
Rail Mounting Kit - UPR.14K50

Optional installation kit for the HPL420 comprises a section of 35mm DIN rail, a set of terminal blocks for through wiring of mains supply and a wiring harness to complete connection to HPL420. Rail space is provided for mounting both HPL420 unit and HF3A current transformer. Terminal blocks accommodate 8 AWG (10mm2) max. wires, 50 Amp.
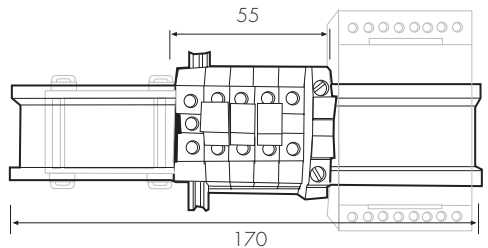

Figure 7.3

⑧ Programming

Mode	Function	Variable	▼	▲	Display	Default
(kW)%	Normal Mode	-	Min.Peak	Max.Peak	kW (%)	-
Limit (%)	Max. Limit	5-100%	Decrease	Increase	Limit (%)	80%
Limit (%)	Min. Limit	5-100%	Decrease	Increase	Limit (%)	20%
TS (S)	Start Delay	0.1-25.0 Sec.	Decrease	Increase	Ts (Sec.)	2.0 Sec.
Tr (S)	Max.Alarm Reaction	0.0-25.0 Sec	Decrease	Increase	Tr (Sec.)	0.1 Sec.
Tr (S)	Min.Alarm Reaction	0.0-25.0 Sec	Decrease	Increase	Tr (Sec.)	0.1 Sec.
Hyst's	Max. Hysteresis	2-50%	Decrease	Increase	Hyst's (%)	10%.
Hyst's	Min. Hysteresis	2-50%	Decrease	Increase	Hyst's (%)	10%.
Range	Current Range	1,3,5,8 Amp.	8 <—1	1—>8	" Cut"	5 Amp.
Relay 1	Relay 1 Polarity	N. Inv./Invert.	N.Inv. <->Inv.	N.Inv. <->Inv.	" Pol"	N. Inverted
Relay 2	Relay 2 Polarity	N. Inv./Invert.	N.Inv. <->Inv.	N.Inv. <->Inv.	" Pol"	N. Inverted

The HPL420 is programmed using only three keys - MODE Δ, ∇. The MODE key is used to select the variable to be programmed and the values are adjusted using the Δ, ∇ keys. The default state for the HPL420 on power up is kW[%] mode. If any key is continuously depressed, its action is repeated. When no key has been depressed for about 5 seconds, the mode reverts to kW[%] mode.

The HPL420 is programmed in the following sequence:

8.1 CURRENT RANGE
Depress the MODE key to select Current Range [A] mode. From Table 4.2, find the correct Current Range value for the unit as installed and enter this value using the Δ, ∇ keys.

8.2 RELAY POLARITY

Since the HPL420 has dual single pole, single throw relays, an option has been provided to program relay operation as either normally closed - open on alarm or vise versa.

Depress the MODE key to select Relay 1 and use the Δ, ∇ keys to select either N. Inv. or Inv. function; see Fig. 5.2 for interpretation of function.

Repeat for Relay 2.

8.3 CHOOSING LIMITS

The HPL420 may be programmed while running and it is useful to observe normal conditions in order to set the remaining parameters - Ts, L1, Tr1, L2 and Tr2.

To run the HPL420 before the limits have been set, first de-activate the high and low alarms by programming the L1 Max Limit to 101% and the L2 Min Limit to 0%. When a limit is de-activated, "OFF" is written in the display.

Then start the motor and:
- note time delay between pressing start button and stable display reading,
- load the system to max. normal operating load and press the Δ key to note the max. running %kW value,
- load the system to min. normal operating load and press the ∇ key to note the min. running %kW value.

Use the values noted to set the remaining program parameters as described below.

8.4 TS: START TIMER

The Ts Start Delay Timer is used to inhibit monitoring during the motor start-up surge. To determine the appropriate value for Ts, start the motor and observe how long - seconds - it takes for the HPL420 kW[%] display value to stabilize.

Depress the MODE key to select Start Timer [s] and then use the Δ, ∇. keys to adjust Ts value to a duration which is slightly longer than the settling time observed.

Since monitoring is inhibited while Ts is active, always try to set this parameter as low as possible without generating false alarms.

8.5 MAX. LIMIT TRIP POINT

Using the Peak Detect function, run the system at its maximum load condition and observe the max. normal reading by depressing the Δ key.

Set the Max. Limit value a few units higher than this value by depressing the MODE key to select Max. Limit [%] and then use the Δ, ∇ keys to adjust.

8.6 MIN. LIMIT TRIP POINT

Again using the Peak Detect function, run the system at its minimum load condition and observe the min. normal reading by depressing the ∇ key.

Set the Min. Limit value a few units lower than this value by depressing the MODE key to select Min. Limit [%] and then use the Δ, ∇ keys to adjust.

8.7 REACTION TIMER SETTING

The HPL420 has independent Reaction Timers for both the Max. Limit alarm and Min. Limit alarm which delay the alarm response when running outside the programmed limits. Their purpose is to reduce false alarms due to normal process fluctuations.

Both Reaction Timers should be set to the lowest value which does not result in false tripping.

The default values of 0.1 sec. will be good starting points for applications requiring rapid response, e.g. blockage detection on conveyors. For process applications such as pumps and mixing, longer Tr values - 1 to 2 sec. - will probably be more appropriate.

To set Reaction Time, depress the MODE key to select Reaction Timer [s] and Max. Limit [%] and then use the Δ, ∇ keys to adjust for Max. Limit Reaction Time.

Depress the MODE key again to select Reaction Timer [s] and Min. Limit [%] and then use the Δ, ∇ keys to adjust for Min. Limit Reaction Time.

8.8 RESPONSE TEST

A system response test should now be carried out to ensure that the HPL420 correctly stops the motor in the event of an alarm. To do this, run the system under normal conditions - no alarm should occur and then depress the MODE key to select Max. Alarm [%] mode.

While in Max. Alarm [%] mode, use the Δ, ∇ keys to adjust the alarm limit to a value which is lower than normal running.

Use the MODE key to return to Power = kW [%] mode and wait. The Reaction Timer LED should illuminate and, once the reaction time has expired, a Max. Limit alarm should be triggered.

When the Max. Limit alarm triggers, the motor should stop. Repeat for Min. Limit.

8.9 DIP SWITCH FUNCTIONS

Program Lock: Once the HPL420 has been programmed, accidental changes may be prevented by turning the PROGRAM LOCK function on. To do this, set DIP Switch 1 to the "ON" position, see section 6.2 for access. When Program Lock is "ON", all setting values may be viewed but not changed. The Reset button, however, remains functional.

Phase Order: Enables alarm function if phase order is reversed. Activated by setting DIP Switch 2 to the "ON" position, see section 6.2 for access.

Phase Asymmetry: Enables alarm function if Phases are Asymmetric. Activated by setting DIP Switch 3 to the "ON" position, see section 6.2 for access.

8.10 USING HYSTERESIS

Hysteresis enables automatic resetting which is often used for control functions using logic of the type "if power exceeds L1, take action XX until power drops below L1 minus Hysteresis". Hysteresis is programmable in the range 2 - 50 %kW; if set too low, there will be a risk of chatter instability.

To enable Hysteresis, jumper S1 to Gnd as shown in Fig, 5.1 - Aut. Reset.

To program Max. Limit Hysteresis, use the MODE key to select Hyst's mode with Max.(1) flashing; then use the Δ, ∇ keys to select the desired Hysteresis value.

To program Min. Limit Hysteresis, use the MODE key to select Hyst's mode with Min.(2) flashing; then use the Δ, ∇ keys to select the desired Hysteresis value.

8.11 CONVERTING %KW TO ENGINEERING UNITS.

If it is necessary to set alarm limits in units of HP or kW or Torque, please refer to your supplier or directly to WEN Technology for assistance. All set-up information on the Set-Up Log Sheet - see back cover - will be required with the Max. and Min. Limit values required given in the desired units.

⑨ Trouble Shooting

Symptom	Suggestion
No Display	HPL420 is not getting power, check mains electrical connection
Display stays at "000" with motor running	HPL420 is not receiving a current signal, check that full L3 current is flowing into Terminal 7 and back out of Terminal 8 or from Secondary Terminals—S1 and S2—of current transformer, if used.
Max. Limit alarm trips immediately when unit is turned on	First check that Max. Limit setting is correct, then check that the Ts Start Timer setting is sufficiently long. Either increase L1 Max. Limit or TS Start Timer as appropriate.
Nuisance alarms during normal operation	First check that alarm values are correct. If nuisance alarms persist, increase the Tr Reaction Timer associated with the nuisance alarm.
Alarm trips but motor does not stop	Check integration of the HPL420 alarm relay with the motor starter. Verify that the HPL420 relay is switching correctly.
Min. Limit alarm trips when motor is switched off	This is normal when using a Min. Limit alarm function. To correct, implement the S2 alarm inhibit as described in Section 5.1 Power-Down Alarm Blocking.
Display shows "100" during normal operation	HPL420 current range is saturating, check settings for Current Range against the motor ratings and correct as necessary. HPL420 voltage rating is too low, check and install correct HPL420 model. Motor is undersized.
Display decreases when load increases or vise versa	Check electrical connection and ensure that the L3 leg of the mains supply is connected to L3 - terminal 5 - and also used for the K-L current taps - terminals 7 and 8.

⑩ Set-Up Log Sheet

Application

Description _____

Motor

Model _____

Full Load Power _____ ❏ kW ❏ HP   Current _____ A

Mains Voltage _____ V   Frequency ❏ 60 Hz ❏ 50 Hz

Mains Phase ❏ 3-Phase ❏ 1-Phase   Motor Efficiency _____ %

Unipower ®

Model HPL420/xxx   ❏ 220   ❏ 380 ❏ 415 ❏ 460 ❏ 575 ❏ S24

Current Transformer   ❏ None ❏ 50/5 ❏ _____ / _____

Turns through CT   ❏ 1x   ❏ 2x   ❏ _____ x

Program

Current Range (A)   ❏ 1   ❏ 3   ❏ 5   ❏ 8

Relay 1   ❏ N. INV. ❏ INV.   Relay 2   ❏ N. INV. ❏ INV.

Start Time TS _____ S

Max. Limit _____ % kw   Reaction TR1_____ S

Min. Limit _____ % kw   Reaction TR2 _____ S

Hysteresis   ❏ Off   ❏ On   Max _____%kw   Min _____%kw

Program Lock (DIP 1)   ❏ On   ❏ Off

Phase Order (DIP 2)   ❏ On   ❏ Off

Phase Asymmetry (DIP 3)   ❏ On   ❏ Off

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