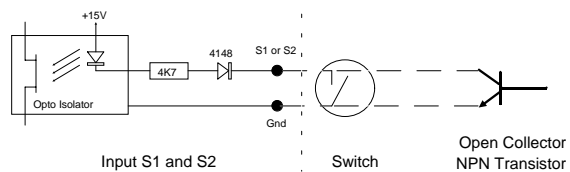
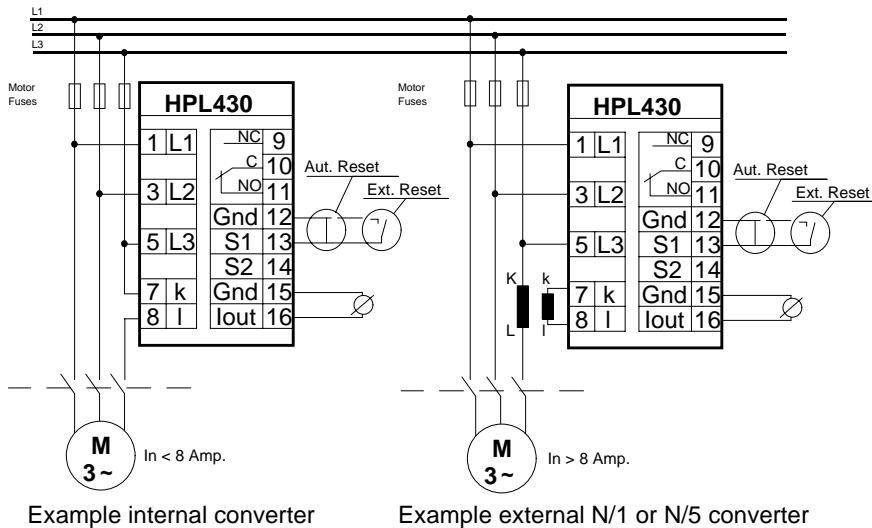


Examples.

The examples below shows the HPL430 used as a max. load protection unit. When the max. kW limit or the dP/dt limit is crossed an alarm is generated and the relay changes state. The drawing does not show how the alarm relay is used in the actual protection scheme (application specific). The alarm must be reset, either using the reset key located on the front panel or from the external reset input, S1. In these examples the HPL430 is mounted directly at the motor-switch after the fuses. This enables the use of phase asymmetry supervision (motor-fuse blown). If the input S1 and Grd are shorted (Auto-

Reset) then the max. kW alarm activates the hysteresis function implementing a simple two-point regulation. This is for instance used in a grinding mill where the HPL430 measures the power consumption of the mill, but the relay output controls the feeder mechanism (belt, screw etc). The input S2 is used to disable the generation of alarms caused by the max. kW or the dP/dt limit detector. The blocking of alarms is often necessary if the motor speed is changed either from a frequency converter or via a mechanical gear. If the motor current exceeds 8 Amp. then an external current converter must be mounted as shown in the second example below.

Note!!! An external current converter must always be mounted in the L3-phase for correct measurements. The converter polarity is not important.



If you need further information about the HPL-family of **Intelligent Power-Control Units** and its ability to solve your problems, please do not hesitate to contact your distributor.

WENtechnology
Raleigh, NC, USA
(919) 954-1004 www.wentec.com

Unipower

HPL430
Version 3.2

Technical Information

English Edition

Technical Specification

Electrical

Voltage Range

See technical info on the unit.
Also Available:
3 x 120 VAC -> 3 x 575 VAC

Current Range

Internal: max. 8 A.
External: N/1 or N/5 converter.

Cosφ Range: 0-1.

Frequency Range: 45-65 Hz.

Consumption

Supply voltage = measurement voltage, 3 VA.

Relay Output: 250 VAC/5 Amp.

Analog Output

4-20 mA, 0-400 Ohm, electrically isolated from the measurement system.

Mechanical

Housing

Makrolon 8020 (30% GV), UL94V-1 (house).
Makrolon 2800, UL94V-2 (connector + front).

Mounting

Snap-on construction for 35mm DIN rail mounting or panel mounting.

Protection Class

IP40 (house).
IP20 (connector).

Temperature Range: -15 - +50 °C.

Weight: Approximately 500g.

Dimensions

D 75 x W 56 x H 110 mm.

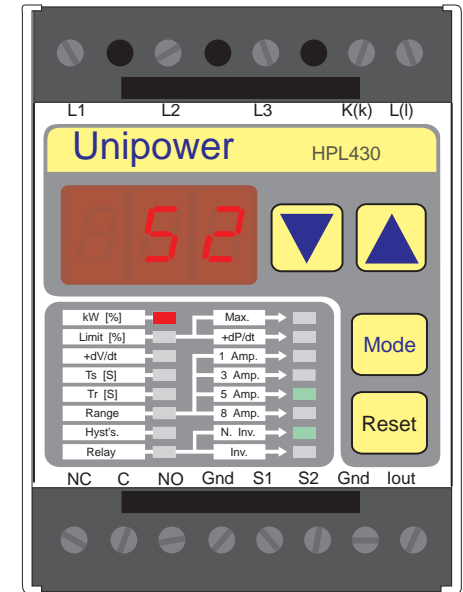
Terminal tight. torque: 7lbs/in, 0.79Nm
Use 60/75 copper (CU) wire only

CE mark to:

EN50081-1, EN50082-2, EN61010-1

UL certified:

UL 508 - Industrial Control Equipment



THE CONCEPT

The Unipower HPL430 is a member of a family of **"Intelligent Power Control Units"** which is based upon the latest advance in Micro controller Technology. The unit measures true power-consumption and shows the consumption as a percentage of the selected power-range. The consumption (kW) is calculated from the following formula:

$$P = \sqrt{3} \times U \times I \times \text{Cos}\phi.$$

The primary function of the unit lies in the supervision and control of machinery driven by 3-phase AC-motors. The HPL430 integrates a max. kW and a special dP/dt limit detector. The unit has been developed specifically for supervision of machinery that experiences variable power consumption because of shifting load or large temperature deviations. As well as the support functions Ts, Tr, hysteresis etc. the HPL430 has a built in current converter that works up to 8 Amp.

Programming & Display.

Mode	Function	Variable	▼	▲	Display	Default
[kW] %	kW display		Min. Peak	Max. Peak	kW [%]	
Limit [%]	Max. kW limit	5-100%	Decrease	Increase	Limit [%]	80%
Limit [%]	+dP/dt limit	1-50%	Decrease	Increase	Limit [%]	10%
dV/dt	+dV/dt limit	1-25%	Decrease	Increase	dV/dt	5%
Ts [S]	Start delay	0.1-25.0 Sec.	Decrease	Increase	Ts [Sek]	2.0 Sec.
Tr [S]	Alarm reaction delay	0.0-25.0 Sec.	Decrease	Increase	Tr [Sek]	0.1 Sec.
Range	Current range	1, 3, 5, 8 Amp.	8 --> 1	1 --> 8	"Cur"	5 Amp.
Hyst's	Hysteresis	1-50%	Decrease	Increase	Hyst's [%]	10%
Relay	Relay Polarity	N. Inv./ Invert.	N.Inv<->Inv	N.Inv<->Inv	"Pol"	N. Inverted

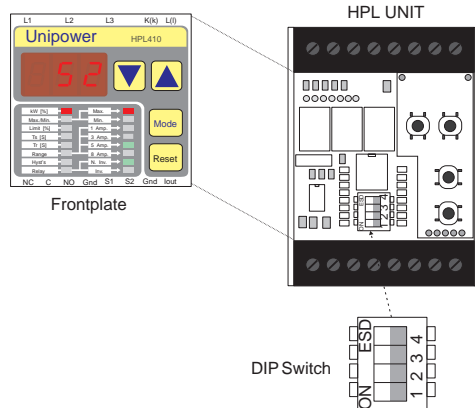
The HPL430 is programmed by the use of only three keys located on the front panel. The mode key is used to switch the display from showing kW [%] to display one of eight programmable variables. All variables and their programming ranges are listed in the function table above. The red mode LED in combination with the Max. and the +dP/dt LED are used to show which variable that may be altered. When a variable has been selected by the mode key the value may be altered by the two arrow-keys. Variables are stored in EEPROM. Note that the keys are repeated if held down continuously. When no key have been activated for about 5 seconds the display returns to the kW [%] position (Normal Operation). When the Dip. Sw. 1 is 'On' the unit is protected against programming; but it is still possible to display current settings.

LED Usage		Phase Error		Display		DIP Switch Usage	
Max. Alarm	Max. LED flashing	Phase order L1 L3 L2	PH 1 (flashing)	SW 1	Unit protected	ON	
+dP/dt Alarm	+dP/dt LED flashing	Voltage-deviation > 8%	PH 2 (flashing)	SW 2	Phase order sup.	ON	
+dV/dt Excp.	+dV/dt LED lit	Phase-deviation > 5 degree	PH 3 (flashing)	SW 3	Phase asymmetry sup.	ON	
Start Delay	Ts LED lit			SW 4	Not used		
Alarm Delay	Tr LED lit						
Relay Closed	Relay LED lit						

The Phase order supervision generates an alarm if the three phases L1, L2 and L3 have been reversed. The Phase asymmetry supervision is a combination of voltage-deviation and phase-deviation supervision. A phase error toggles the relay in exactly the same way as the crossing of a limit and the display shows which type of error has occurred. A phase error is automatically reset when it has been corrected. During a phase error the 4-20mA signal out is set to 0 mA (possible remote alarm signaling).

Dip. Switch Access.

1. Disconnect the Mains Power.
2. Remove the plastic cover. (Use a small screwdriver).
3. Change the switch settings and assemble the unit again.

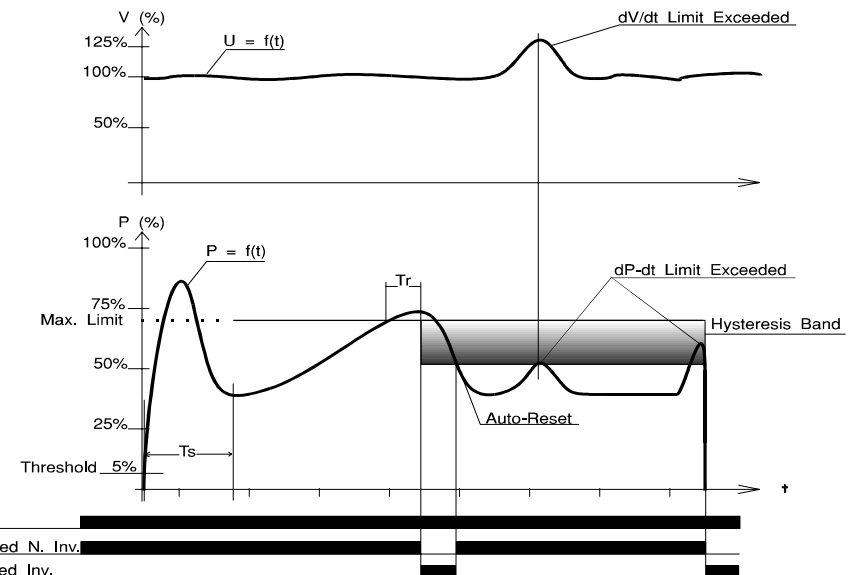


Function.

The drawing below shows a typical AC-motor power consumption curve immediately after power has been applied to the motor. The programmable start timer (Ts) is used to filter out from the protection/regulation cycle the large peak power consumption generated by the motor when starting. The Ts delay function is activated after the power consumption reaches 5%. When Ts has expired then the limits (max. kW [%], +dP/dt and +dV/dt), hysteresis, Tr etc. become active. If the power consumption drops below 5% then the supervising is switched off again. The HPL430 integrates, among others, an absolute max. kW limit detector. The drawing shows how the reaction timer (Tr) be-

Besides the absolute max. kW limit the HPL430 integrates a special limit detector, a dP/dt (immediate power increase) detector, which has been developed in order to solve very complex cases of supervision. A couple of situations are described here.

1.) A machine is driven by an AC-motor with a large gear, which has a high exchange ratio. The gear has typically a large idle power consumption when the motor is cold, but the power consumption decreases with rising temperature. Such cases are not easy to load protect using only an absolute max. kW limit, but the dP/dt supervision included with this unit can be used to great advantage, mainly because the dP/dt increases are usually caused for mechanical reasons (blocking from goods etc.).



comes active after the max. limit has been exceeded. Tr is used to avoid alarms unless the power consumption has been greater than the limit for a certain time duration. The default reaction time is set to 100 ms from the factory, but it may be programmed as low as 10 ms from the keyboard. This very fast reaction time, which may be essential to a lot of applications, is possible only due to the extremely fast digital type of power measurement principle used in the HPL430. The figure also shows how a possible max. hysteresis band would be placed relative to the max. limit. Hysteresis is activated when a max. kW alarm is generated and the external reset is active (Auto-Reset mode). **Note! The +dP/dt limit is ignored when hysteresis is active.**

2.) The supervision of a conveyor belt or chain of receptacles are also critical cases of load protection because the load is highly variable. In order to avoid false alarms by sudden mains voltage increases a dV/dt detector has been integrated into the HPL430. A voltage increase typically results in a square idle power consumption increase and might cause false alarms. If the dV/dt limit is exceeded simultaneously to a dP/dt infringement, then the dP/dt is ignored. The dV/dt limit must be programmed so that the dV/dt LED is not lit by normal operation, 5-8% is a typical figure perhaps 10% when the mains are unstable. The dP/dt limit typically varies from 5-15% but the value is application specific.