

Generally

Unipower APM380 is an electronic measurement transducer that measures power in kW on 3-phased asymmetric loads, also after frequency inverters, according to the formula:

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

- * Suitable for mains voltages from 3x230V to 3x575V
- * Measures after frequency inverters; PWM 10Hz - 1kHz
- * 10 ranges for currents up to 80A internally
- * 0(4)-20mA and 0(2)-10V analogue outputs
- * Programmable filter function
- * Galvanic isolation between mains net and I/O (incl. 24V)
- * Prepared for control functions and serial communication.



Features

Voltage measurement

APM380 is suitable for mains voltages from 3x230V to 3x575V. The measurement system in the unit is constructed for measuring after frequency inverters - i.e. between the frequency inverter and the motor. Hence the APM380 is not powered by the measuring voltage as opposed to the majority of the Unipower products, but by a 24Vdc. One of 7 mains voltage ranges is selectable from the front plate.

Current measurement

APM380 measures up to 80A with internal CTs. To take advantage of the large measurement range, the unit has 10 current ranges making APM380 suitable for nominal currents below 1A and up to 80A. The current range is set via a selector switch on the front plate.

Power measurement

The power measurement is performed by a specially developed circuit, which in principle is a 4-quadrant multiplier. The circuit is capable of handling the special voltage- and current signals coming from a frequency inverter. The unit contains a 4 step programmable filter, which may be used with advantage on low frequencies.

Analogue output

APM380 integrates a voltage- and a current output configurable via input (S1) as 0-20mA (0-10V) or 4-20mA (2-10V). It is not possible to generate 0-10V and 4-20mA simultaneously. 20mA (10V) is generated at nominal current, nominal voltage and $\cos\phi=1$. Selecting an invalid voltage range results in both outputs set to 0mA (0V).

Digital input

The unit is equipped with 6 digital inputs. In the standard edition only three are used; S1, S4 og S5. S1 is read only during power up. S4 and S5 are read continuously and are used for filter selection. All digital inputs are activated (On) when connected to +12-24V.

LED indicators

APM380 has 4 LED indicators. The LED marked „Load“ indicates that the unit is connected to mains supply. If the measurement is below 3% of the measurement range this LED flashes. The LED marked „kWh“ is not used in this standard unit. The LEDs marked „Limit 1“ and „Limit 2“ flash, if an invalid voltage range is selected, but otherwise have no function.

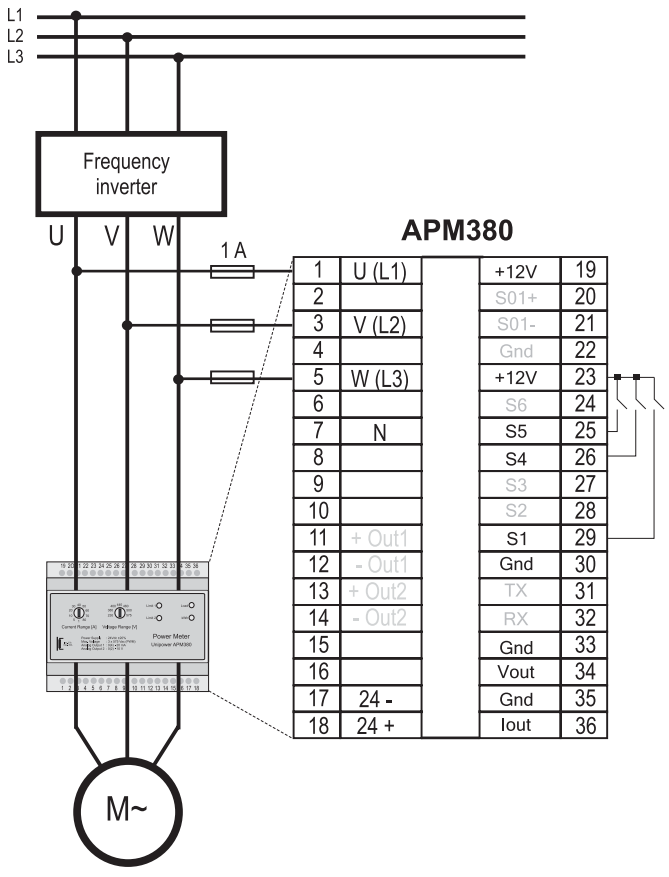
Technical Specifications

Mechanical

| | |
|------------|---|
| Housing: | Lexan UL94V-0 (Top) Noryl UL94V-0 (Bottom) |
| Mounting: | M36 for 35 mm DIN rail |
| IP class: | Housing IP40. Terminals IP20 |
| Terminals: | Max 16A. Max 2,5 mm ² Max torque 0,6 Nm |
| Temp.: | -15 to +50 °C |
| Weight: | 300 g |
| Dimens.: | D 58 x W 102 x H 86 mm |
| CE mrk: | EN50081-1, EN50082-2 EN61010-1 |

Electrical

| | |
|----------------------|------------------------|
| Supply: | 24Vdc ±10% |
| Measurement voltage: | Max. 3x600V (PWM) |
| Current input: | Nominal 80A, Max. 130A |
| Frequency: | 10Hz - 1kHz |
| Accuracy: | Class 2% |
| Analogue output 1: | 0(4)-20 mA max 300Ω |
| Analogue output 2: | 0(2)-10V min load 10kΩ |
| Digital inputs: | 12 - 24V DC |
| Options | |
| kWh output: | SO1, 1 kWh/impuls |
| Serial port: | RS232C, 19,6 kbaud |



Installation

The APM380 is connected to the mains and load as shown in the drawing to the left. Here an example is shown, where a frequency inverter is used. If this is not the case, L1, L2 and L3 are connected directly to the mains. The three wires supplying the motor (live wires) are lead through the tubes mounted in the unit. Each tube is encircled by a special CT capable of measuring currents linearly up to 130A. The CTs can withstand start-up currents up to 500A. For correct measurement the live wires must be lead through the correct tube as shown in the drawing. The direction of the current is not important but must be the same for all three phases. The power supply, the analogue outputs and the digital inputs are connected to a PLC or other equipment specified by the user.

Special editions

APM380 is equipped with the basic functionality as described, but may be delivered with additional functionality specified by the user. The unit contains a powerfull micro processor and has the possibility of an additional 3 digital inputs, 2 digital outputs as well as serial communication via RS232. The connections for these extras are shown in grey in the drawing to the left and listed below with a possible functionality:

- Out1 :Optocoupler output (Trip point)
- Out2 :Optocoupler output (Trip point)
- S01 :Pulse output (ex. kWh)
- S2 :Digital input
- S3 :Digital input
- S6 :Frequency input (Torque calculation)
- Rx :Input for serial communication (RS232)
- Tx :Output for serial communication (RS232)

Measurement Range

Setting up the measurement range in the APM380 is done choosing nominal current and voltage. Based on this the power range may be calculated according to:

$$P_{\text{Range}} = \sqrt{3} * U * I$$

The following table shows the measurement ranges in kW:

| I \ U | 230 | 380 | 400 | 440 | 460 | 500 | 575 |
|-------|------|------|------|------|------|------|------|
| 1 | 0.40 | 0.66 | 0.69 | 0.76 | 0.80 | 0.87 | 1.00 |
| 5 | 1.99 | 3.29 | 3.46 | 3.81 | 3.98 | 4.33 | 4.98 |
| 10 | 3.98 | 6.58 | 6.92 | 7.62 | 7.97 | 8.66 | 9.96 |
| 20 | 7.97 | 13.2 | 13.9 | 15.2 | 15.9 | 17.3 | 19.9 |
| 30 | 12.0 | 19.7 | 20.8 | 22.9 | 23.9 | 26.0 | 29.9 |
| 40 | 15.9 | 26.3 | 27.7 | 30.5 | 31.9 | 34.6 | 39.8 |
| 50 | 19.9 | 32.9 | 34.6 | 38.1 | 39.8 | 43.3 | 49.8 |
| 60 | 23.9 | 39.5 | 41.6 | 45.7 | 47.8 | 52.0 | 59.8 |
| 70 | 27.9 | 46.1 | 48.5 | 53.3 | 55.8 | 60.6 | 69.7 |
| 80 | 31.9 | 52.7 | 55.4 | 61.0 | 63.7 | 69.3 | 79.7 |

As always we are ready to develop software in co-operation with our customers, so if the APM380 standard edition is unable to solve your problem, but may do so using some of the extras as listed above, please do not hesitate to contact us for a special edition.

Digital input

| | | |
|----|-----------------------|-----|
| S1 | 4-20mA(2-10V) | Off |
| | 0-20mA(0-10V) | On |
| S4 | Filter (see figure 2) | |
| S5 | Filter (see figure 2) | |

Fig.1

Filter

| Filter | S4(26) | S5(25) |
|--------|--------|--------|
| 200 ms | On | On |
| 80 ms | Off | On |
| 40 ms | On | Off |
| 20 ms | Off | Off |

Fig.2