

POWER METER

HC 6030

Introduction

The power quality meter HC 6030 is an ideal device to power monitoring in power quality when continuous monitoring to a power system is required.

The HC 6030 provides metering for current, voltage, real and reactive power, power energy, power factor, frequency energy demand and 8 TOU channels with tariff to power energy. 24 programmable setpoints and 3 assignable output relays allow control functions to be added for specific applications. This includes basic alarm on over / under current or voltage, unbalance, demand based load shedding, and capacitor power factor correction control. More complex control is possible using the 8 switch inputs which also can be used for status such as breaker open / closed, or pulse counter to flow information or demand synchronized trigger and etc.

The provided measurement to main of AC power and auxiliary of 3 analog process inputs, 8 digital inputs, the HC 6030 may be used as a data gathering device for a plant automation system that integrates process, instrument and electrical requirements. All monitored values are available via two digital communication ports RS485 and RS232 running the ModBus® protocol. If analog values are required for direct interface to a PLC, and of the monitored values can be output to one of 4 isolated analog outputs and 2 pulse outputs. Process variables can be measured using 3 analog inputs. Other plant personnel can connect a front panel RS232 communication port to a PC for simultaneous access of information.

The quality of the power system is important with increasing use of electronic loads such as switching power or variable frequency drives. With the HC 6030 auxiliary input / output, any phase current / voltage can be displayed and the harmonic content calculated.

By knowing the harmonic distribution, action can be

taken to prevent overheated transformer, motors, capacitors, neutral wires and nuisance breaker trips. Redistribution of system loading can also be determined. Waveform and chart recorder printouts available from the HC 6030 assist in problem diagnosis.

Features

- Metering of distribution feeders, transformers, generators, capacitor banks and motors
- Medium and low voltage systems
- Commercial, industrial, utility
- Flexible control for demand load shedding, power factor, etc.
- Power quality analysis.
- A / W / Var / VA demand
- 8 digital inputs / pulse input totalizing
- 3 controlled relay outputs
- 3 analog process inputs
- 4 isolated analog outputs to a transducer function
- 2 pulse outputs based on KWH, KVarH, KVAH or AH
- 8 channels for time of use to power energy
- Load shedding
- Power factor control
- Event log
- Minimum / maximum logger
- Data trend logger
- Waveform capture / harmonic analysis through 31rd
- Triggered trace memory (Fault recording)
- Ports : RS232 front, RS485 rear
- ModBus® RTU protocol



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Standard features

The HC 6030 of panel mount type with display version is easy to local interface. Standard models offer RS485 ModBus® communications for programming and monitoring. To replace expensive additional devices as control output, transducer output and power analysis use with auxiliary I/O monitoring can be required to the HC 6030 option series.

Metering

Each voltage and current is sampled 64 times per cycle for 0.2% accuracy true RMS measured values.

- Ia, Ib, Ic, In, IE
- Va, Vb, Vc, Vab, Vbc, Vca, VE, VEE
- W, Var, VA, total & individual
- Hz & phase rotation sequence
- True PF crest & K factor
- WH, VarH, VAH, AH
- Demand : A, W, Var, VA

A keyboard and 3 illuminated VFD module each with 9 character display are used for field programming, setup monitoring values and status.

Setpoints to Alarms

Any of the assignable output relays may be used to trigger and alarm for specific applications.

Condition	Application
Over current	Motors / transformers
Under current	Pumps / compressors
Neutral current	Leakage / unbalance
Current unbalance	Motors
Over voltage	Equipment protection
Under voltage	Motors / load transfer
Phase sequence	Pumps / equipment
Over frequency	Generators
Under frequency	Load shedding
Power factor	Capacitor banks
Switch input	Process control

Communications

Integrate process, instrumentation and electrical requirements in a plant automation system by connecting HC 6030 meters together to a DCS or SCADA system. A PC running the HC 6030 can change system setpoints, monitor values, status and alarms. Continuous monitoring minimizes process downtime by immediately identifying potential problems due to faults or changes from growth.

- RS485 ModBus® 1,200 ~ 19,200 bps
- RTU SCADA system component
- Measure actual values
- Read status
- Issue control commands
- Load all setpoints from a file
- Change individual setpoints

The standard version the HC 6030 comes complete with a front RS232 port. The RS232 port can be used for data collection, printing reports or problem analysis without disturbing the main communication interface to rear RS485 port.

Upgrade to future expansion

Flash memory is used for firmware storage within the HC 6030. This allows future product upgrades to be loaded via the serial port.

Initially the HC 6030 meters can be used as stand-alone units. Open architecture allows connection to other ModBus® compatible system for over all process monitoring and control.

Option

8 status input : 8 status inputs with internal DC28V powered, can be configured to 8 status inputs (break condition) or to 7 counter inputs and one demand synchronized input.

4 analog output : 4 isolated analog outputs can be used to replace 4 or more analog transducers.

Output signals can be selected from any of the measured parameters.

- 2 energy pulse outputs: 2 energy pulse outputs of WH and VarH can be used to energy management or used to replace energy transducer.
- 24 setpoints with 3 relay control output

Control

3 output relays / 8 switch inputs / measured parameters from the standard HC 6030 can be combined with setpoints and input / outputs for control applications. With the control option, 3 output relays and 8 switch inputs are added along with programmable setpoints. Output relays can also be controlled via the communication port or assigned to different setpoints for user programming to accommodate many situations. Possibilities include:

- Under current alarm for pumps
- Over / under voltage for generators
- Unbalance alarm for rotating machines
- Dual level power factor for capacitor bank switching
- Under frequency / demand output for load shedding resulting in power cost savings
- KWH, KVarH and KVAH pulse output for PLC interface
- Fault reorder for 3 voltages and 3 currents

Power analysis

Data logger (trending): trending is useful as a troubleshooting aid when a problem is detected. Measured values can be selected and plotted with a programmable sampling rate to suit the time interval of interest. The generated chart recorder screen can be printed or exported to other programs for report writing.

Harmonic analysis: non linear loads such as variable speed drives, computers and electronic ballasts can cause harmonics which may lead to problems such as nuisance breaker tripping, telephone interference, transformer, capacitor or motor overheating. For fault diagnosis such as detecting undersized neutral wiring, need for a harmonic rated transformer, or effectiveness of harmonic filters, details of the

harmonic spectrum are useful and available with the power analysis option.

- Waveform capture : voltage and current waveforms can be captured and displayed on a PC using the HC 6030 PC program supplied with the HC 6030 or using third party software. Distorted peaks or notches from SCR switching provide clues for taking corrective action.
- Event logger : alarms, setpoint triggers, input and output events can be stored in a 200 event record and time / date stamped by the internal clock. This is use full for diagnosing problems and system activity. Minimum and maximum values are also continuously up dated and time stamped.

HC 6030 PC program

The HC 6030 PC program is a Windows® based program for the HC 6030. It can be used to enter setpoints, read metered values, monitor status and evaluate power quality. All data continuously gathered by the HC 6030 can be transferred to a third party software program for display, control or analysis via the communications interface.

Once all setpoints have been entered they can be downloaded into any HC 6030 or stored in a file with a tag name for later reference.

Screens are available for monitoring all measured values such as current, voltage or power. Status of alarms and control settings can also be displayed. Voltage and current wave shape can give important information about what is happening on a system. For example, nonlinear loads such as computers or variable speed drives may introduce distortion that indicates filtering is required.

Harmonic analysis may reveal excessive harmonic content requiring a dreaded transformer or larger neutral wire. Early warning of these problems can prevent equipment damage or nuisance breaker tripping

Model & ordering

Model : HC 6030

HC 6030 — B — 5.0A — H — 3 — N

Version

Current Input

1.0A

5.0A

Power

H : AC80~260V , DC80-330V

L : DC20~60V

Option

N : No option

A : DC Analog output x 4

B : Pulse output x 2

C : Relay control output x 3

Alarm setpoint x 24

D : Status input x 8

Communication Port

3 : RS-485 + RS-232

Y : Special Ordering

Example :

HC6030-5.0A-H-3-N (main specification only / no option)

HC6030-5.0A-H-3-A,D (with option A and D)

HC6030-5.0A-H-3-A,B,C,D (with options A, B, C and D)

Specification

Measured power parameters

Param.	Accuracy	Phase1	Phase2	Phase3	Phase0	Total
V. x 3	0.15% fs	VP1	VP2	VP3		VPE
V x 3	0.15% fs	VL1	VL2	VL3		VLE
A x 4	0.15% fs	A1	A2	A3	A0	
Watts	0.25% fs	W1	W2	W3		W
Vars	0.25% fs	Var1	Var2	Var3		Var
VA	0.25% fs	VA1	VA2	VA3		VA
PF	0.25% fs	PF1	PF2	PF3		PF
WH	0.8% rd					WH
VarH	1% rd					VarH
Hz	0.03% rd					
Phase Rotation						

- All measured display scaled to primary readout
- Accuracy class coincident to each auto-range scale
- Stability
Temperature range (-10 to +50°C) , maximum 100 ppm /°C
- Display 4 digits to V / W / Var / PF
- Display 5 digits to A / VA
- Display 8 digits to WH / VarH
- Note
 - VAN / VBN / VCN / VPE, phase to neutral voltage
 - VAB / VBC / VCA / VLE, line to line voltage
 - A1 / A2 / A3 / AE / A0, phase current
 - VPE / VLE / AE, 3 phase averaged
 - IO, neutral current
 - PF1 / PF2 / PF3, coincident to conversion element
 - WH / VarH accuracy vs limited input range
Voltage $\geq 50V$
Current $\geq 10\%$ of rating
PF ≥ 0.5

Main AC power input

- Phase and wires
 - 3 phase 4 wires wye 3VTs
 - 3 phase 3 wires
 - Single phase 3 wires
 - Single phase 2 wires
- Range / normal

- Voltage maximum 600V, auto range 0~150 / 600V
- Current switchable for CT secondary rating
Maximum 7.5A for 5A rating
Maximum 1.2A for 1A rating
- Power maximum 6500 (W / Var / VA)
- Frequency : 40~70Hz
- Triggered trace memory / fault recording range
V $\leq 600V$
A ≤ 8 x rated
- Burden
 - Voltage < 0.2VA at 600V / phase
< 0.02VA at 120V / phase
 - Current < 0.1VA at rating
- Overload capability
 - Current (5A)
2 x rated continuous 10 x rated 30 seconds
25 x rated 2 seconds 50 x rated 1 seconds
 - Voltage
750V continuous 1000V 10 seconds
1200V 3 seconds

Auxiliary monitoring

- Digital input (DI)
 - 8 status input / internal powered of DC 24V
 - Input / dry contact
 - Configurable
Switch status
Pulse input (pulse width minimum P 250 ms)
synchronized trigger of demand
- Control output (CO)
 - 3 relay outputs of dry contact / form C contact material / gold plate silver alloy
 - Normal operation
250Vac / 30Vdc, 10A resistive
250Vac / PF 0.4, 6A inductive
30Vdc / t = 7ms, 6A inductive
 - Interrupting capacity
300Vac, 10A
250Vdc, resistive 0.32A maximum, t=7ms

125Vdc, resistive 0.5A maximum, $t=7ms$

- Analog output (AO)
 - 0.5% fs accuracy
 - 4 isolated analog outputs
 - Standard output 4-20mA_{dc} / load < 500Ω
 - Configurable
 - Measured parameters
 - Input range, unipolar / bipolar
- Pulse output (PO)
 - 2 pulse outputs photo-isolated
 - configurable
 - Parameter, WH / VarH / VAH / AH
 - Unit, ±1WH / ±1QH / 1VAH / 0.01AH
 - Pulse width / 50% duty cycle

Display

VFD / 0.28" / green color
3 rows, 9 alphanumeric each

Communication port

Dual communication ports RS485 and RS232
MODBUS® RTU protocol

RTC

Maximum deviation 5 second in 24 hours
Time for year / month / day / hour / minute / sec

Alarm setpoints logger

- 24 setpoints
 - Over, under, unbalance, status change, reversed phase sequence function
 - Circuit set-value
 - Dead band
 - Time delay
- Control output
 - 3 assignable relay outputs

Data memory

> 1M bits
Cell backup > 400000 hours continuous at power OFF

Data logger

- Waveform capture log
 - Sample rate 64 / Hz, length 2 cycle
 - Parameter / 3 voltages and 3 currents
- Event logger
 - 200 events with time-stamped
 - Status change of switch input
 - Activation of setpoints / alarms
 - Operation of controlled relay output
 - Failure in communication to comport
 - Failure in self-test
 - Programming access
 - Trace memory triggered
 - Power ON / OFF
- Maximum / minimum logger
 - 20 parameters with time-stamped VAN, VBN, VCN, VPE, VAB, VBC, VCA, VLE, A1, A2, A3, A0, AE, W, Var, VA, PF, FQ, Vubl, Aubl

User programming

- Communication to baud rate and address.
 - Baud rate 1.2K / 2.4K / 4.8K / 9.6K / 19.2K bits
 - Address 1-254
- Measuring system to 3 phases 3 wires / 3 phase 4 wires / single phase 3 wires / single phase 2 wires
 - PT ratio 1.0-5000.0
 - CT ratio 1.0-5000.0
- Main frequency, 50 / 60Hz
- Display control
 - Manual / auto- scanning
- DI, input preset
 - DI1 - DI8 configurable
 - Switch status
 - Pulse input
 - Synchronized trigger to demand
- Analog output (AO1 -AO4)
- Preset pulse output, WH / QH
 - Preset LED indicator, WH / QH / AH / VAH
- 24 alarm setpoints with trigger parameter, dead band, time delay and operation to controlled relay output

- 3 assigned control relay output
- Reset to maximum / minimum log

Dielectric strength

IEC 255-5

2KV AC rms 1 minute between input / output /
power

Impulse and surge test

ANSI C37.90.1-1989 (3KV) SWC test

IEC 255-22-1 class III SWC test

IEC 255-22-4 class IV (IEC 801-4) SWC test

IEC 255-5 1.2 x 50us (5KV) impulse test

Operating condition

Temperature range -25 to +60°C

RH 20-95% non-condensed

Storage condition

Temperature range -25 to +70°C

RH 20-95% non-condensed

Power supply

AC 80-260V, 40-70Hz, DC 80-330V

DC 20-60V

Dissipation maximum 8 watts

Dimension / mounting

DIN 144 x 144 x 100mm, panel mount

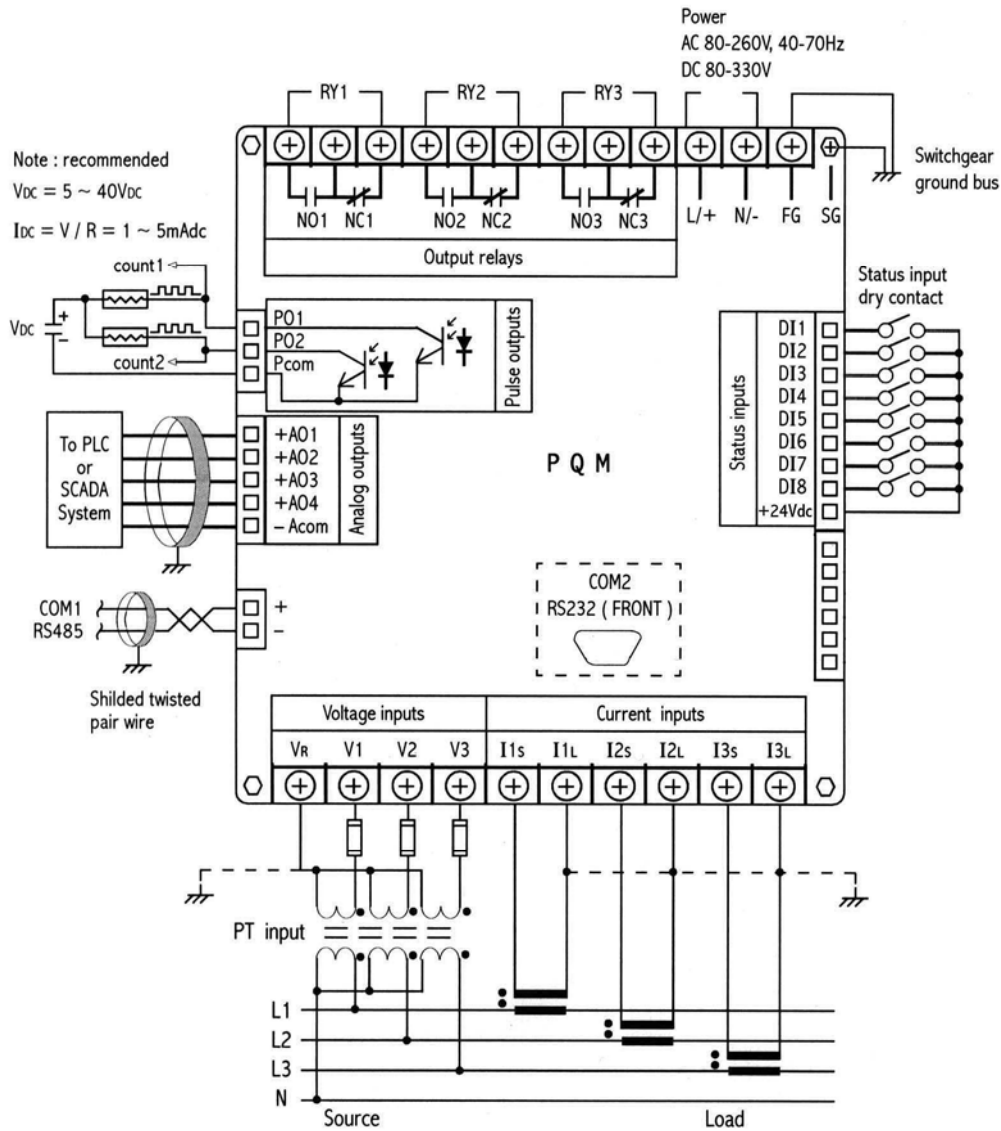
Cut out

138⁺¹ x 138⁺¹mm

Wiring

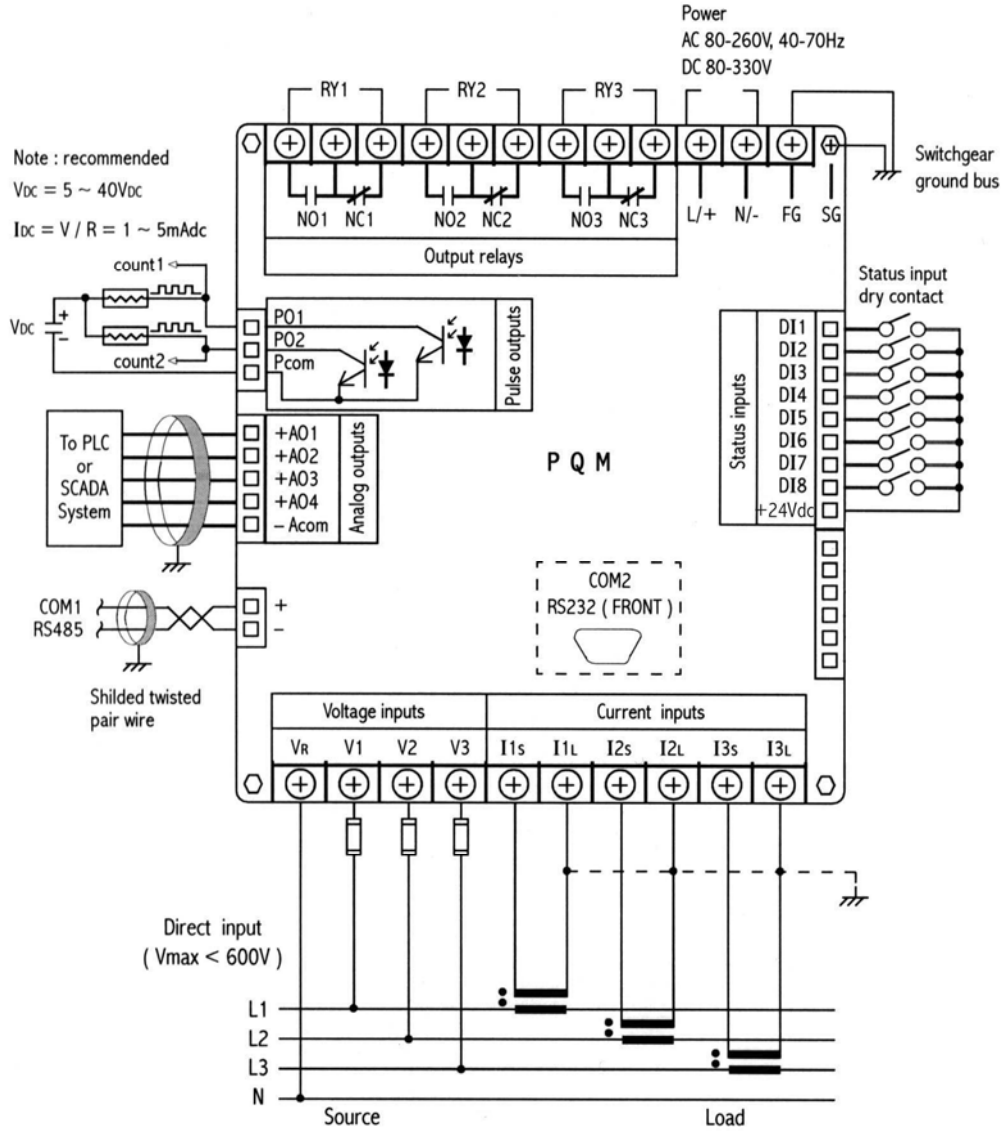
Three phase 4 wires WYE unbalance load / 3 VTs

- Note : 1. This diagram is a typical 4 wire WYE connection which covers any voltage range.
 2. System programming access to "3P4W 3VTs"



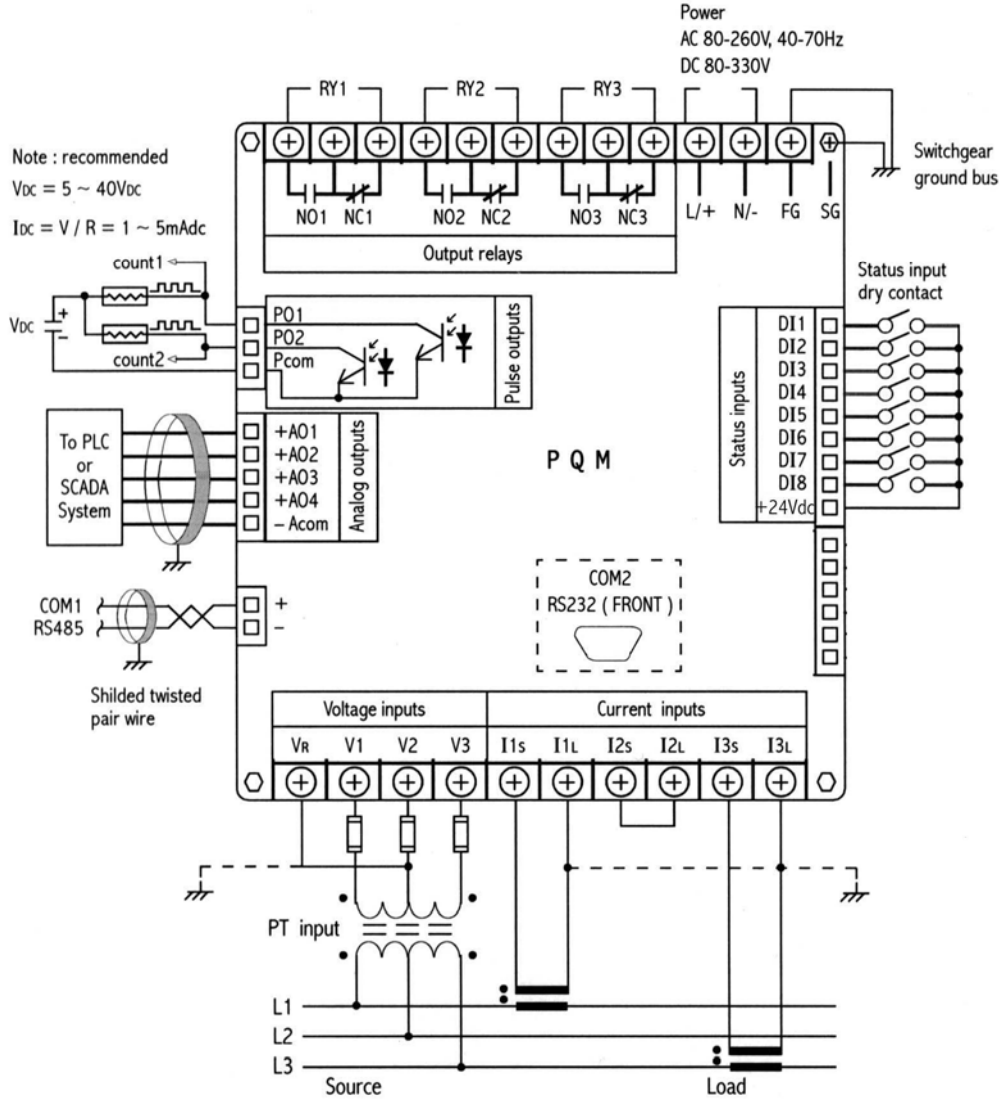
Three phase 4 wires WYE unbalance load / direct voltage

Note : System programming access to "3P4W 3VTs"



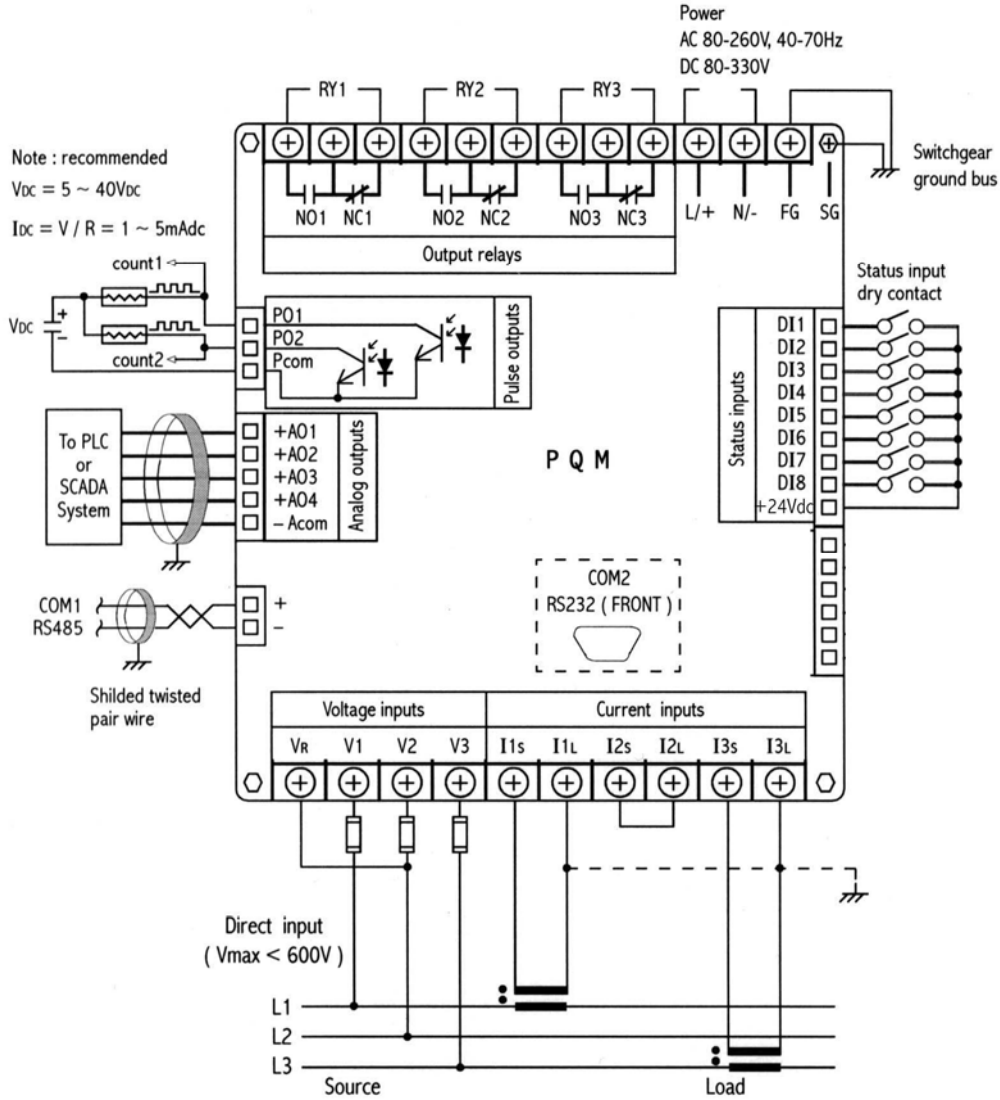
Three phase 3 wires unbalance load / 2 VTs

Note : System programming access to "3P3W 2VTs"



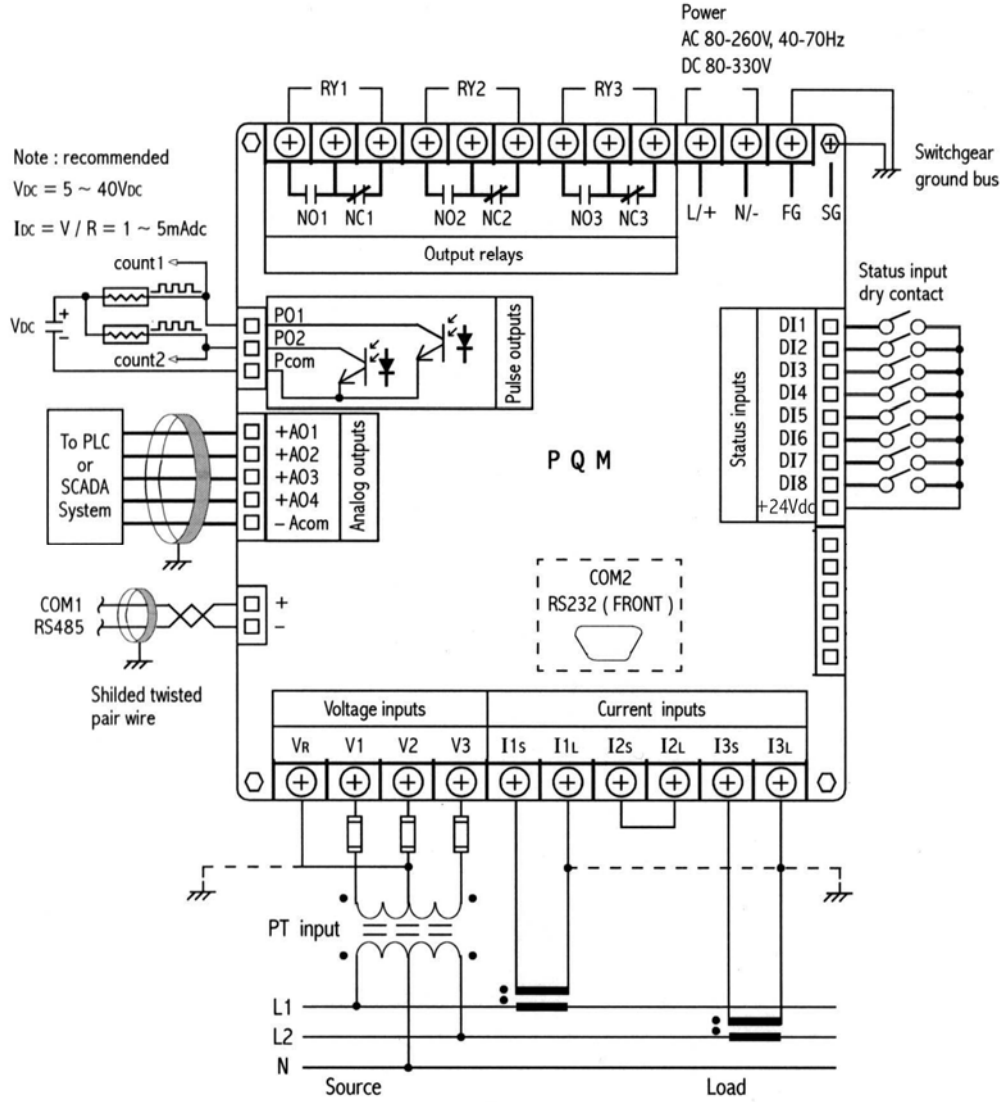
Three phase 3 wires unbalance load / direct voltage

Note : System programming access to "3P3W"



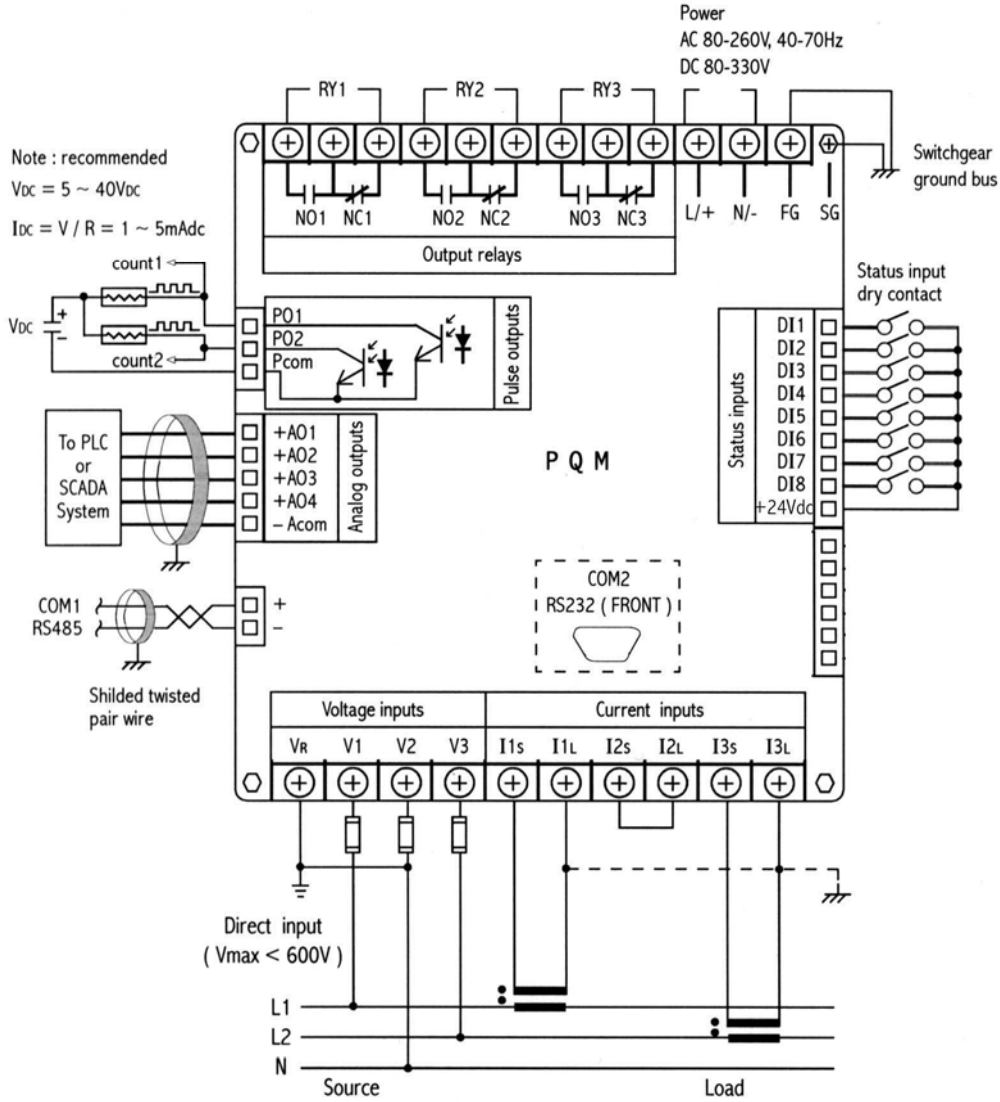
Single phase 3 wires / VT

Note : System programming access to "1P3W"



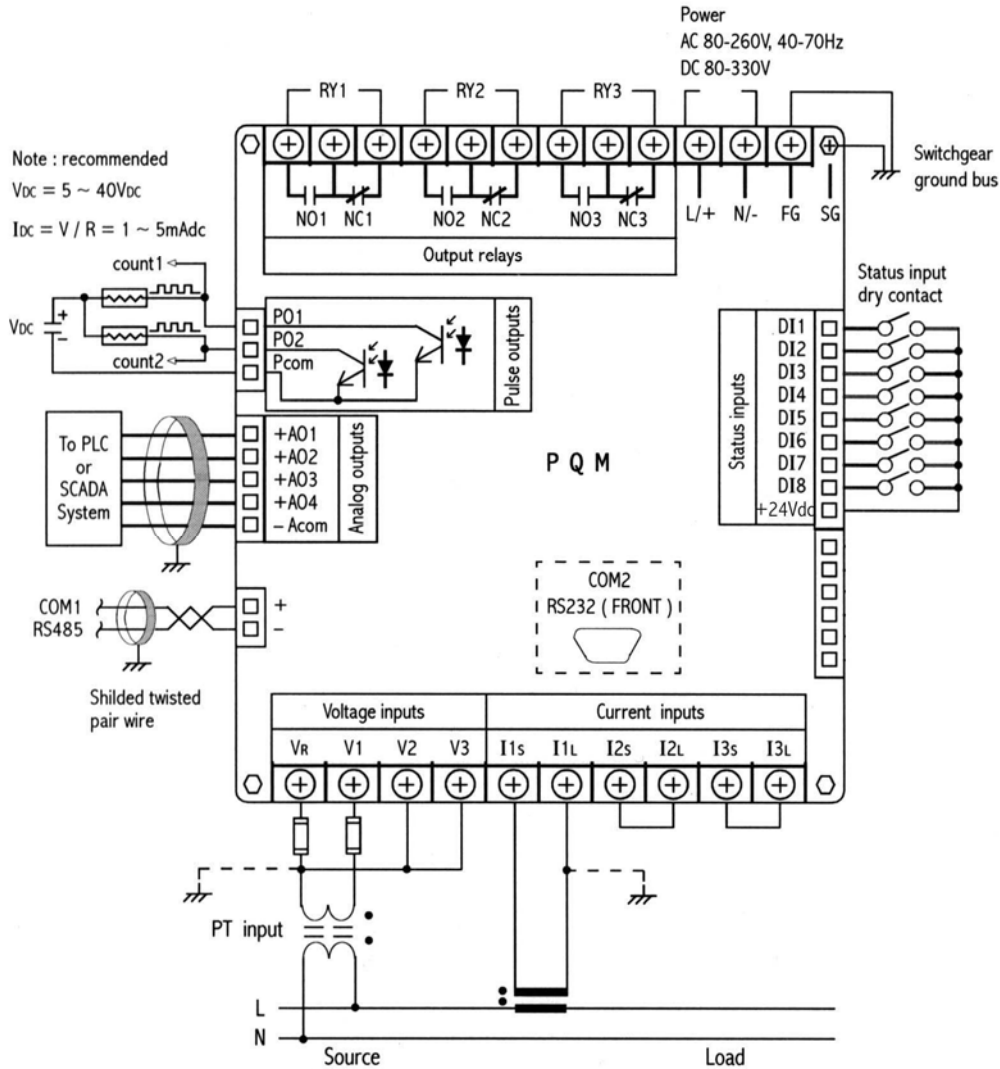
Single phase 3 wires / direct voltage

Note : System programming access to "1P3W"



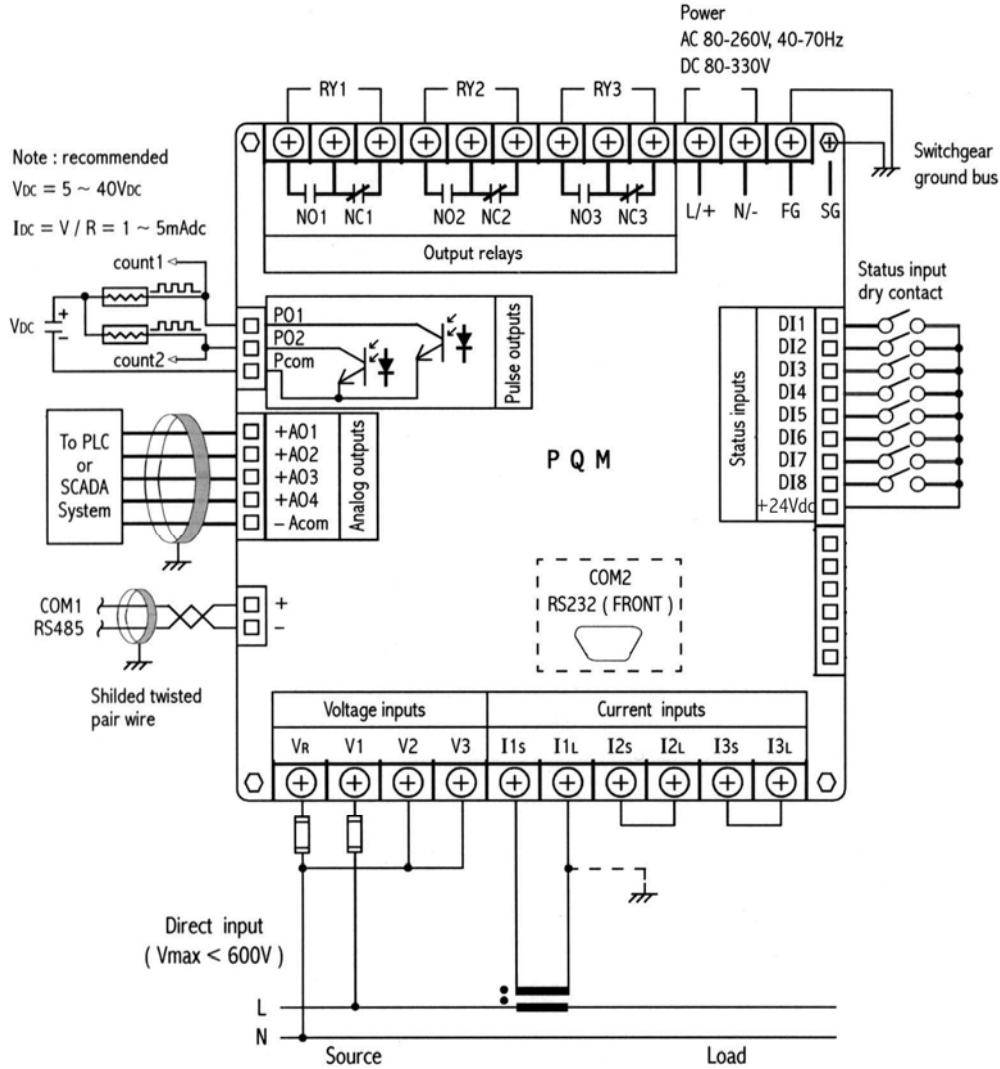
Single phase 2 wires / VT

Note : System programming access to "1P2W"

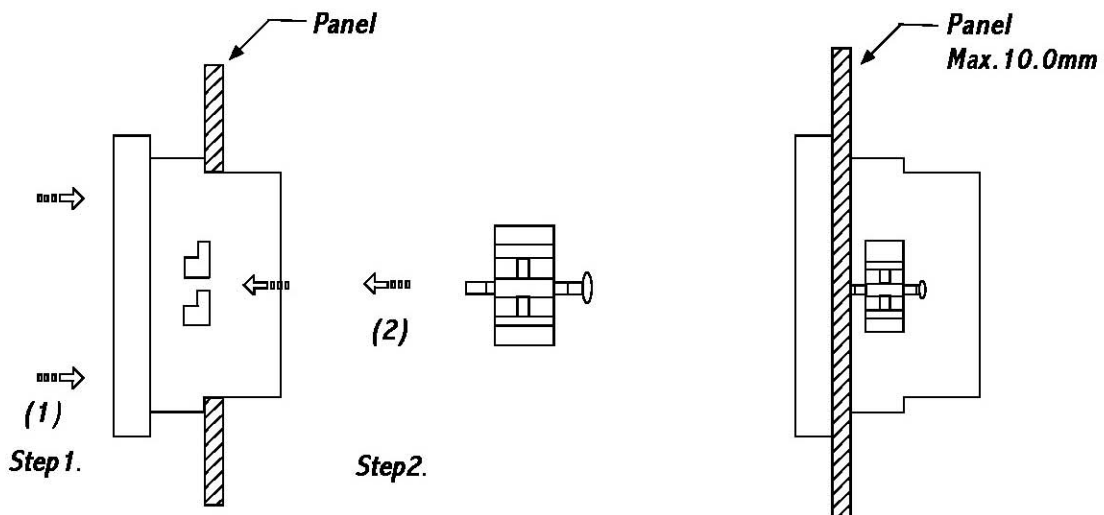
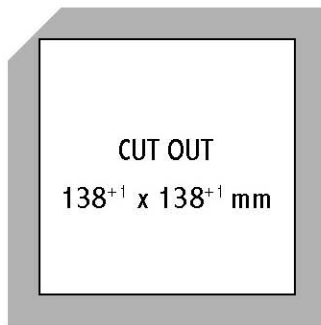
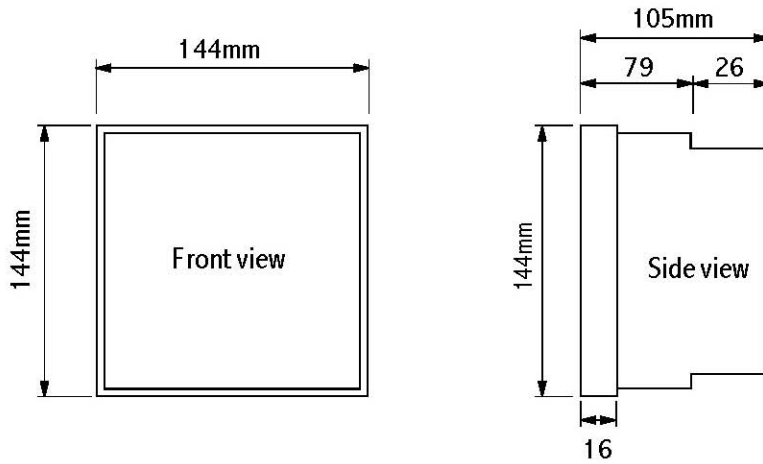


Single phase 2 wires / direct voltage

Note : System programming access to "1P2W"



Dimension

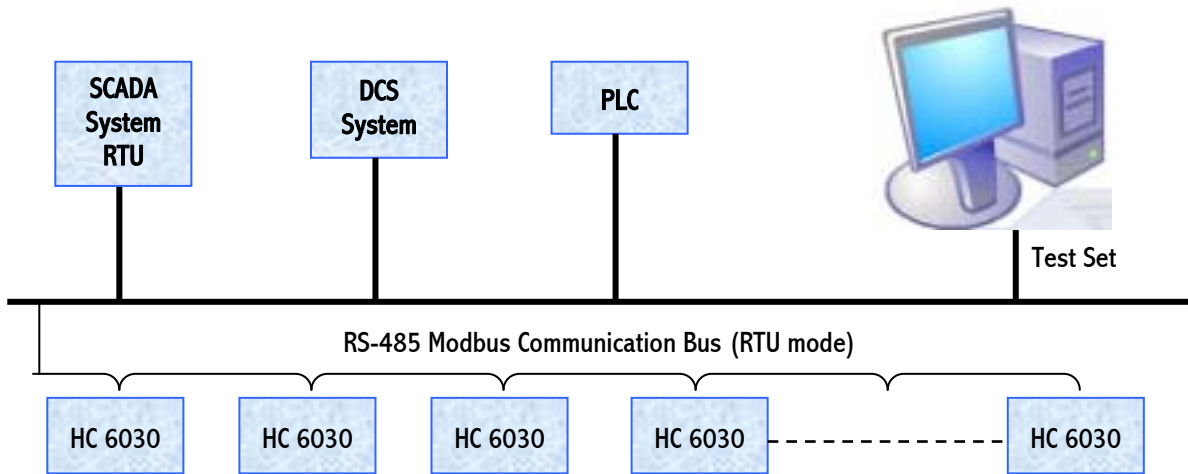


Applications

The HC 6030 PC tool a utility program that can help user to connect to "HC 6030 Power Transducer" rapidly. The HC 6030 PC Tool is provided along with every HC 6030, which allows easy access to all meter setup information and actual values via a personal computer running Windows 95/98 and one of the PC's communication ports (COM1 or COM2). The PC Tool is able to do the function as bellows:

- Program / Modify setup information
- Load / save setup information files from / to disk
- Read actual "Basic" value (current / voltage / power / frequency)
- Read actual "statistics" value (maximum/minimum/time of maximum/time of minimum)
- Output control (Pulse output / Analog output)

The HC 6030 PC Tool can be used as stand-alone without a HC 6030 to create or edit HC 6030 setup information file.



Communication Wiring

