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INTRODUCTION

The new **DH96 CT** performs operations of counter by the measurement of input signal pulses as well as the time through a on-board chronometer.

This **DH96 CT** instrument is equipped with a 5 digit red display. Parameters of the instrument are user-programmable by means of four frontal keys.

The instrument permits to save peak and valley values into an internal **EEPROM** memory. This storage process is even performed in case of power supply failure of the instrument.

The instrument also saves the visualized value into a **NON VOLATILE RAM** memory, this voiding inconveniences of systems with batteries.

The choice of the input transducer type is done through several on-board micro-dips.

The easy and intuitive setup process of digital indicators enables the user to quickly familiarize with their operation mode, for the modification of diverse configuration options with no need to consult this manual again.

Instruments of the **DH96** Series have been tested in laboratories and checked in industrial environments, and have successfully passed the most rigorous tests involving ambient conditions, electrical noises, electromagnetic disturbances, mechanical vibrations, etc.

Expansion options


The instrument standard features can be expanded with the use of optional pluggable cards, in order to meet particular requirements.

Available optional cards are:

- Cards equipped with two alarm.
- Cards equipped with four alarm.
- RS-485 communications.
- RS-232 communications.
(**Modbus - protocol**)

The instrument is equipped with a connector for the card input.

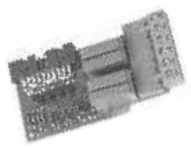
**Cards equipped with two alarm relay outputs &
Cards equipped with four alarm relay outputs.**

- Trip due to maximum or minimum condition.
- The alarms permits either a manual or automatic control mode. When working in manual mode, the user must press the  key to reset the counter to zero; and for the automatic mode, the time in seconds that the relay will be on can be defined by the user.
- Optional operation mode with failure safety function.



**Cards equipped with RS-485 or RS-232 serial
communication output**

- MODBUS communication protocol.
- User-configurable instrument direction.
- User-selectable baud rate: 1200, 4800, 9600 or 19200 bits/s.
- User-selectable parity: Even, Odd or None.
- User-selectable stop bits: 1 or 2.



TECHNICAL SPECIFICATIONS

Auxiliary supply

Rated value:	115 V or 230 V (-15%, +20%)
Frequency range:	45 to 65 Hz
Burden:	4 VA (without optional card) 7 VA (maximun burden)

Display

99999
7 segments
14 mm high 4 digits
Hi-efficacy red colour
Overrange indication : "----"
2 LED alarm indication
7 indication LED
Programmable decimal point
Data updating time on disp.100ms

Input circuit

High Voltage:	Meas. system by means of a microp. 30 to 600 V a.c.
Namur Sensor :	
Rc	1 k Ω
loff	< 1mA d.c.
Ion	> 2,2 mA d.c.
NPN or PNP Sensor :	
Rc	1 k Ω
Logic Level 0	< 2,4 V
Logic Level 1	> 2,6 V
Free Contact :	
Vc	5V
Rc	3,9 k Ω
Fc	100 Hz

Isolation

Between the input circuit, the measuring circuit and the output relays.

Voltage test:

Pulse test: 3 kV RMS 50Hz during 1 min
4 kV (1.2 / 50ms)

Environmental conditions

Storage temperature:	-40 °C ... + 70 °C
Operation temperature:	-10 °C ... + 65 °C:

Relays characteristics

Rated a.c. current:	8 A
Maximun a.c. current:	10 A
Rated voltage:	250 V a.c. 50 Hz
Maximun voltage (VDE 0435):	440 V a.c.
Maximun a.c. resistive load:	2000 VA
Isolation resistance at 500V:	> 10 ⁴ MΩ
Contact-coil isolation:	6000 V a.c.
Contact-contact isolation:	1000 V a.c.
Mechanical endurance:	> 20 x 10 ⁶ operations
Electrical endurance:	> 2 x 10 ⁶ operations at 5A and 35V

1 change over contact

Relays characteristics

Rated a.c. current:	5 A
Maximun a.c. current:	5 A
Rated voltage:	250 V a.c.. 50 Hz
Isolation resistance at 500V:	> 1000 MΩ
Contact-coil isolation:	2000 V a.c.. - 1 min
Contact-contact isolation:	1000 V a.c. - 1 min
Mechanical endurance:	> 20 x 10 ⁶ operations
Electrical endurance:	> 100 x 10 ³ operations

1 single contact

General characteristics

Dimensions:	96 x 48 x 138 mm
Weight:	550 g
Case material:	Self-exting. ABS, anthracite grey
Protection degree:	Frontal: IP54 IP65 with frontal protect.
	Case: IP20
	Terminal: IP20

Desing standards

IEC 1010 / IEC 348 / IEC 664
IEC 801 / VDE 0110 / VDE 0435
EN 50081-2 / EN 50082-2

SAFETY WARNINGS

17.3 Information and warning texts

The **DH96** meets protection class I.

All indicators are equipped with a grounding terminal

The case is not dangerous to tactile touching (isolating material)

Screws of terminals are not accessible for human appendix

This instrument has been designed and tested to meet **IEC 348** standard and is factory-shaped in proper conditions. The manual you hold in your hands contains information and warnings that the user should respect in order to guarantee a proper operation of all instrument's functions and keep its safety conditions.

17.3.2 Installation

The instrument is for indoor use. It could be occasionally subjected to temperatures between +75 °C and 10°C keeping its safety conditions.

The instrument must not be powered and used until to be correctly assembly on the board. Before powering the instrument, its grounding terminal must be connected to a suitable protection conductor.

17.3.4 Warning!

Any interruption of the protection conductor, either inside or outside the instrument, or the disconnection of the protection grounding terminal might imply a dangerous situation; therefore, any intentional interruption is totally forbidden.

17.3.5 Adjustment, element replacement and repairing actions

With the instrument powered on, the terminals could be dangerous to touch and cover opening actions may allow accessing dangerous parts. Therefore, before any adjustment, replacement, maintenance or repairing operation is carried out, the instrument must be disconnected from any power supply source.

No adjustment, maintenance or repairing operation should be done over the instrument open and powered and, should those are essential, high-qualified operators must perform them.

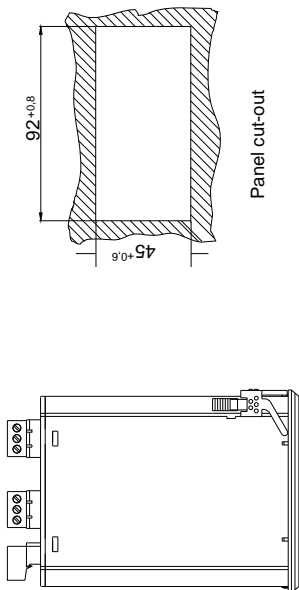
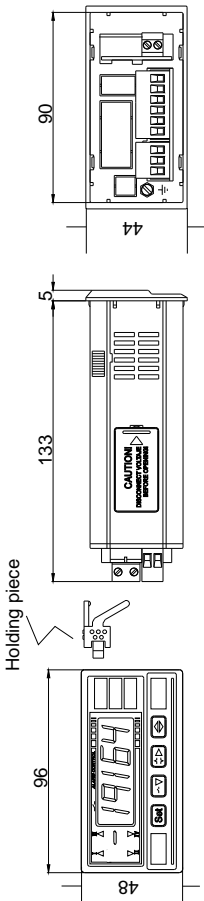
Check that fuses used for replacing damaged ones match required types and rated currents. The use of improvised fuses or to short-circuit fuse bases is totally avoided.

17.3.6 Defects and malfunction

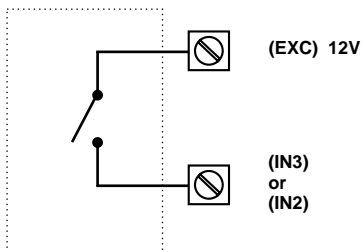
When any protection failure is suspected to exist, the instrument must be immediately put out of service. The protection could be damaged whether:

- You can see damages on the case
- It cannot perform proper measurements
- Storage conditions were not the suitable ones
- Any damage in transit occurred.

DIMENSIONS

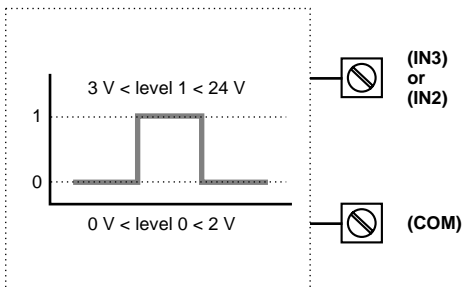


Connection for free potential pulses

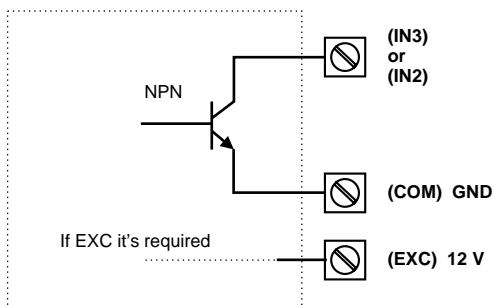


Note: If the instrument is used in counter mode, is very recommendable to enable the filter (page 21) in order to avoid the measuring of false pulses to occur

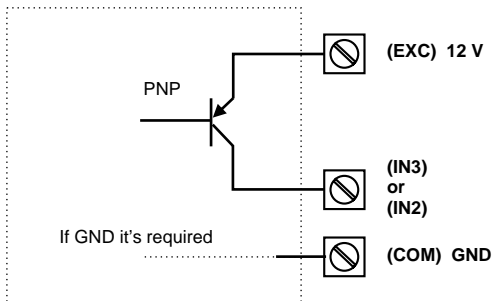
Connection for pulses by level of voltage (TTL/24V),



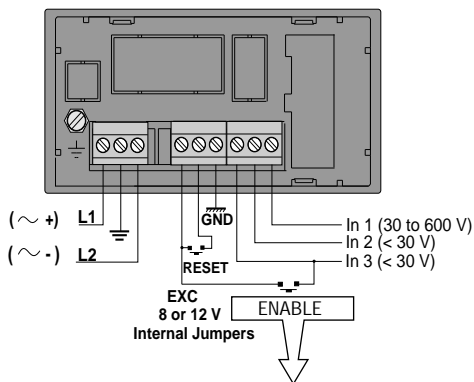
Connection for NPN sensor



Connection for PNP sensor

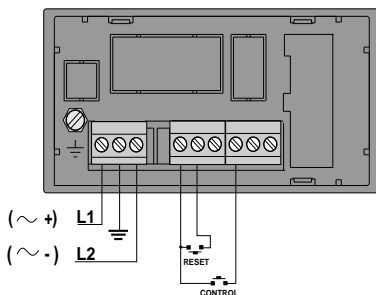


COUNTER

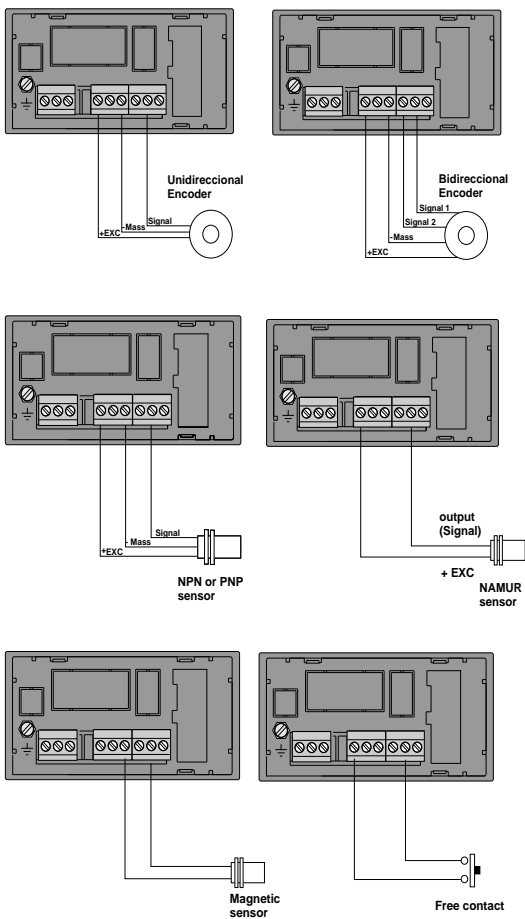


IMPORTANT:
In unidirectional counters, In3 must be connected to EXC to enable counting action

CHRONOMETER



SENSOR CONNECTION



Setting the input

The **DH96 CT** digital indicator permits several types of transducers to be used for measuring the input signal.

The transducer type will be selected by means of the on-board microswitches, **SW**. For accessing these microswitches the box must be opened according to indications in the page 12.

Once these microswitches have been located, select the transducer to be used just following indications attached in the page 11.

Note: The instrument is factory shipped for the use of a **NAMUR** transducer.

The microswitch number 3 acts over a low-pass filter that filters signals exceeding 5500 Hz. For measuring signals higher than this frequency, this microswitch must be disabled (off).

Transducer power supply

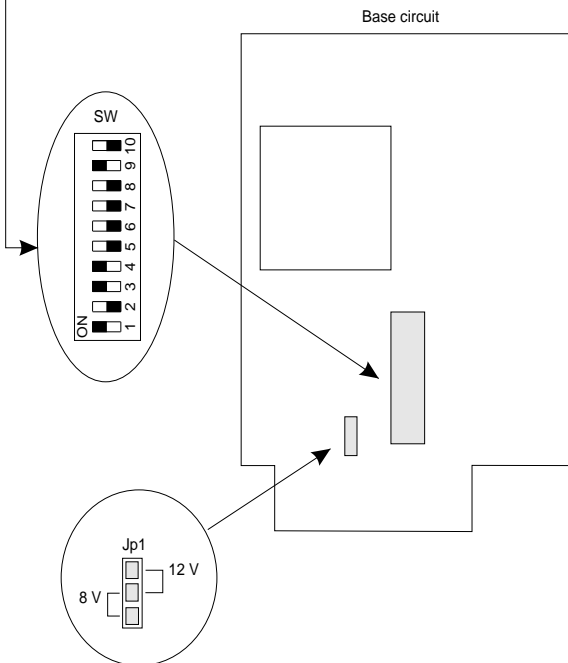
The instrument delivers an auxiliary voltage of 8 V (stabilized) and 12 V (no stabilized) for power supplying the transducers.

To select the type of required power supply mode, the instrument is equipped with a jumper **Jp1**, that delivers two positions, as the attached figure shows.

In case that the used transducer requires power supply different from the available in the instrument, the auxiliary power supply source for DIN rail mounting, **FM45**, can then be utilized. This source delivers an auxiliary voltage user-selectable by means of some internal jumpers with an easy access. Available output voltages delivered by this source are: 5, 10 or 15 V (stabilized), or 24 V (no stabilized). Insulation voltage of this source is of 3 kV.

INPUT SENSOR SELECTION

Sw1	1	2	3	4	5	6	7	8	9	10
NAMUR sensor	on	off	on	on	off	on	off	on	on	off
Magnetic sensor	off	off	on	off	off	off	off	on	off	off
NPN sensor	on	on	off	off	off	on	on	off	off	off
PNP sensor	on	off	off	on	off	on	off	off	on	off
TTL / 24 V	on	off	off	off	on	on	off	off	off	on



PLUGGING CARDS

WARNING: Insure that no incoming wire is connected to the instrument before doing any work on the equipment, since failure to observe this practice can result in equipment damage and even serious injury.

Proceed as below pictures show.

1) Press the case holding piece with a screwdriver or a similar tool in order to release the base from the rest of the case.



2) Remove the set composed by the base and circuits by pulling the base and carefully sliding it out.



3) Insert the card into the appropriate connector . Take care that only the connector is press but not all the card.



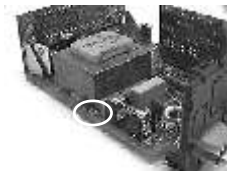
4) Put the set composed by the base and circuits in again by pushing the base and carefully sliding it into. When the set is totally inserted, press until the case holding pieces are fitted into the pertinent holes.



MODIFICATION OF THE AUXILIARY SUPPLY

Instrument is manufactured to be energized at 230 V a.c., But it is possible to change to 115 V a.c. Following the instructions below mentioned.

To perform this modification, open the instrument case (see page 9, "**Plugging cards**"), thoughtfully following all **safety warnings** (see section 17.3.5 at page 6), and identify the zone referred in the figure 1.



il. 1

For an auxiliary supply of 230 V only the jump labeled as 1 must be done (figure 2).



il. 2

On the contrary, if an auxiliary supply of 115V is required, only jumps labeled as 2 and 3 must be done (figure 3).



il. 3

Setup option



Pressing this key, setup menus are accessed for user-configuration actions. Once within the setup menus, use this key to validate the options and modifications.

Reset through keyboard



Whether the instrument have been set for enabling an internal reset, by pressing this key the value on display will be reset to zero, and for the case of the chronometer readout, this will be reset to the defined offset value.

Default values



Whether these both keys are simultaneously pressed during more than 5 seconds, all configuration parameters of the instrument will be deleted and default values will be restored.

Alarms



(Only in case that the instrument is equipped with any alarm card)

By pressing this key the alarm condition value can be visualized and modified (provided modification actions are enabled). Pressing then the button once again, the condition for the alarm 1 is shown by display, and can even be modified whether the ζE condition of the alarm is enabled

Password



Pressing simultaneously both keys when the instrument is powered on, a 4 digit password can be set in order to control the access configuration options. To disable this password, reset the instrument and simultaneously press again both keys when powering it. Enter the set password and menus will be accessible again.

Note: The password must be always entered twice, the first one to define it and the second one to confirm it. In case that the confirmation does not match with the first defined password, instrument will continue its initialization process.

Besides, the **DH96 CT** offers another security level against parameter modification. That way, the section ζE , with options YES or no , is shown at the end of any menu group.

In the case that, for instance, along the configuration of all the instrument's parameters, the option ζE has been always set at no , no parameter will be allowed to be modified when entering again into the setup unless this option is reached and set at YES .

SETUP INTRODUCTION

The **DH96 CT** configuration can be carried out in following a very simple and intuitive procedure.

The complete instrument configuration can be carried out in a logical mode through a tree-type menu.

Steps to be followed are:

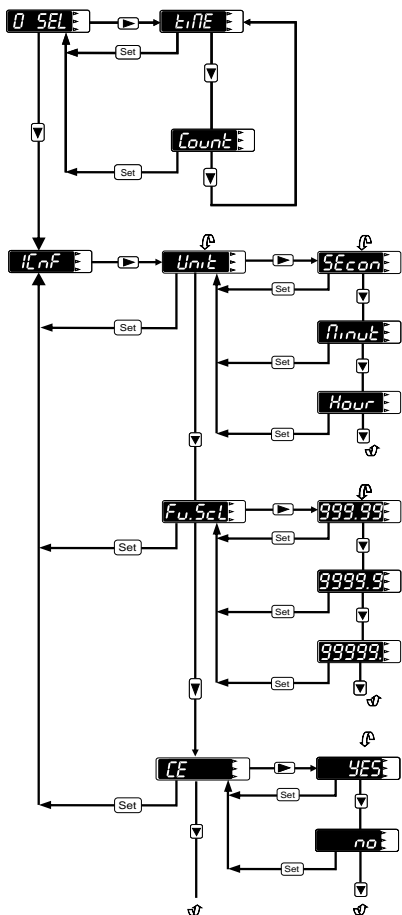
1) Select the instrument function, that is, counter or chronometer operation mode.

2) Proceed to the instrument configuration through the menu options that will be enabled according to previous selection of the operation mode.

- If the instrument is set for a counter operation, then the user can select the type of counter: increasing, decreasing or bi-directional. Other user-configurable points are the decimal point position, the readout offset value and the type of allowed reset action.

- If the instrument is set for a chronometer operation, then the user can select the measuring unit (seconds, minutes or hours), and the full-scale value together with the decimal point position.

CONFIGURATION AS CHRONOMETER



1.- Function selection

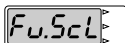


Select here the desired instrument function. For a chronometer operation set *Time* and for counter operation set *Count*.

2.-Menu for setting the instrument for chronometer operation



Select the measuring unit; seconds, minutes or hours.

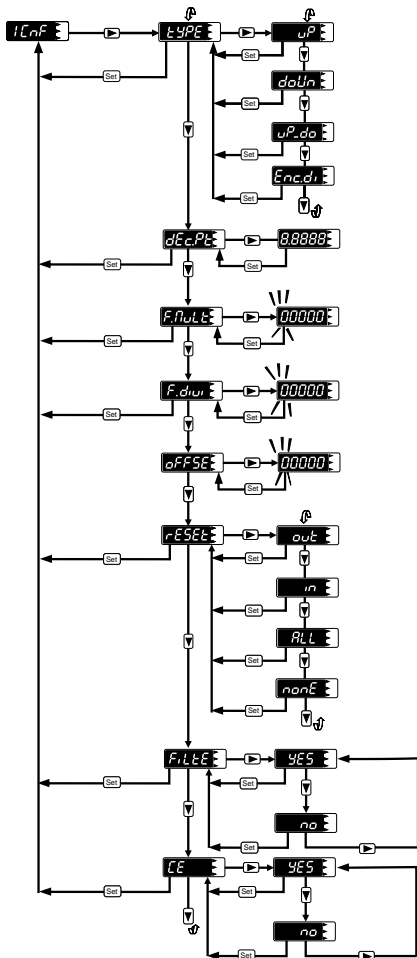


Set the full scale value, together with the decimal point position.



Set at *no* any modification of the above parameters is avoided. Set at *YES* their modification is then enabled.

CONFIGURATION AS COUNTER



3.- Menu for setting the instrument for counter operation.

Select the type of counter:

uP - increasing

doUn - decreasing

uP.do - increasing / decreasing

Enc.d1 - directional encoder

Set the decimal point position. By pressing the key the decimal point position is moved.

Enter the multiplying factor and the divisor factor, that will affect over the number of turns by the variation of the readout value in display.

Readout value in display = Nr of turns \times $\frac{\text{Multiplying factor}}{\text{Divisor factor}}$

For instance, to increase the counter every 7 input pulses, then the multiplying factor must be set at 1, and the divisor factor set at 7.

This value is the taken by the instrument in case that the reset key or the external reset press button are pressed.

The reset key or the external reset press-button are enabled to perform reset actions.

on - The reset key is enabled.

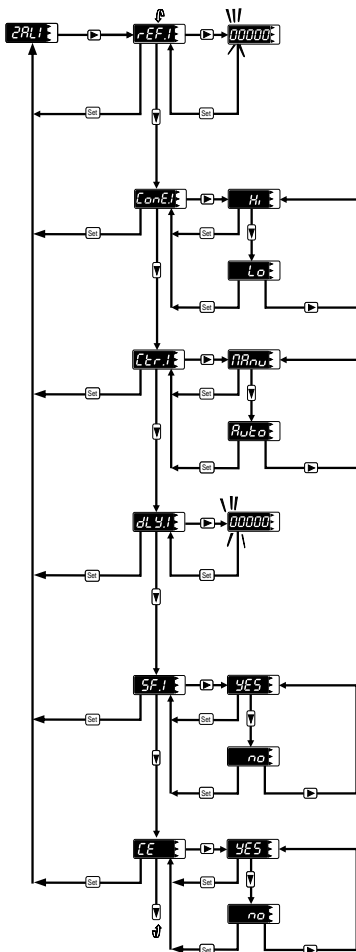
out - The external reset press-button is enabled.

RLl - Either the reset key and the external reset press-button are enabled.

nonE - Either the reset key and the external reset press-button are disabled.

This option is selected when the pulse input is done by means of a mechanical switch in order to avoid the measuring of false pulses to occur. Thus, the rebound effect of the mechanical switch will be nullified if this option is set as *YES*.

SETTING THE ALARMS




Reference value.

Set here the alarm reference value by entering the numeric value.

Type of comparison.

Defines whether the alarm trip will happen when the alarm condition value is exceeded *H*, or lowered *L*.

Type of control.

Select here an automatic or manual control mode. For the manual control operation, when the alarm condition is met the corresponding relay kept activated until the user presses the reset key  or the external reset press-button (according to instrument configuration). For the automatic control operation, the user must also set the time in seconds that the relay will kept latched from the moment the alarm condition is met. Once this time passes, the counter will be automatically reset and the relay will return to the **off** position.

Delay.

This menu option only is shown when the automatic control operation mode is selected.

Set here the time in seconds that the relay will kept latched from the moment the alarm condition is met.

Failure safety.

Select among two relay status. With power loss failure safety *YES* or without *no*.

Modification enabled.

Set at *no* any modification of the above parameters is avoided. Set at *YES* their modification is then enabled.

Digital serie's

DH96

Presents full range of digital panel instruments with high performance



- Fully programmable.
- High performance.
- Easy to use.
- Strong desing.



- 2 relay card.
- 4 relay card.
- Analog output card
- RS232 y Rs485 communications

Royal
A1-P

Voltage, current and frequency measurement.

Royal
A2-P

Three current measurement.

Royal
A3-P

Three voltage measurement.

Royal
A4-P

Single phase or three phase system measurement.

Royal
A5-P

Three current measurement for engines protection.

DH96
D.C. \equiv

Programmable digital meter d.c.

DH96
A.C. \simeq

Programmable digital meter a.c.

DH96
BG

Digital meters for electroplates b aths (A / hour - A / minute).

DH96
CPM

Measurement D.C. Parameters (V - I - P - E).

DH96
FT

Frequency and r.p.m. Digital meter.

DH96
CT

Counting drive and Chronometer.

SELECTION GUIDE

	DH96 D.C.	DH96 A.C.	DH96 BG	DH96 CPM	DH96 FT	DH96 CT	ROYAL A1	ROYAL A2	ROYAL A3	ROYAL A4	ROYAL A5
V d.c.	■	■	■	■	■	■	■	■	■	■	■
A d.c.	■	■	■	■	■	■	■	■	■	■	■
V a.c. ^{TRUE RMS}	■	■	■	■	■	■	■	■	■	■	■
A a.c. ^{TRUE RMS}	■	■	■	■	■	■	■	■	■	■	■
Hz	■	■	■	■	■	■	■	■	■	■	■
W ^{4 QUADRANTS}	■	■	■	■	■	■	■	■	■	■	■
var ^{4 QUADRANTS}	■	■	■	■	■	■	■	■	■	■	■
VA ^{4 QUADRANTS}	■	■	■	■	■	■	■	■	■	■	■
PF ^{4 QUADRANTS}	■	■	■	■	■	■	■	■	■	■	■
Distortion Factor d	■	■	■	■	■	■	■	■	■	■	■
Max. demand Amperes	■	■	■	■	■	■	■	■	■	■	■
Max. demand Watts	■	■	■	■	■	■	■	■	■	■	■
3-V a.c. ^{TRUE RMS}	■	■	■	■	■	■	■	■	■	■	■
3-A a.c. ^{TRUE RMS}	■	■	■	■	■	■	■	■	■	■	■
UNBALANCED CURRENT	■	■	■	■	■	■	■	■	■	■	■
Amper / h Amper / min	■	■	■	■	■	■	■	■	■	■	■
kW-kWh	■	■	■	■	■	■	■	■	■	■	■
Hz-r.p.m.	■	■	■	■	■	■	■	■	■	■	■
Count, pulses Chronometer	■	■	■	■	■	■	■	■	■	■	■

OPTIONAL CARDS

	DH96 D.C.	DH96 A.C.	DH96 BG	DH96 CPM	DH96 FT	DH96 CT
2 RELAYS	■	■	■	■	■	■
4 RELAYS	■	■	■	■	■	■
ANALOG OUTPUT	■	■	■	■	■	■
RS-485 OUTPUT	■	■	■	■	■	■
RS-232 OUTPUT	■	■	■	■	■	■
2 RELAYS + ANALOG OUTPUT	■	■	■	■	■	■

NOTE:

Equipment's serie ROYAL have included 2 change over contact relays

ANNOTATIONS

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