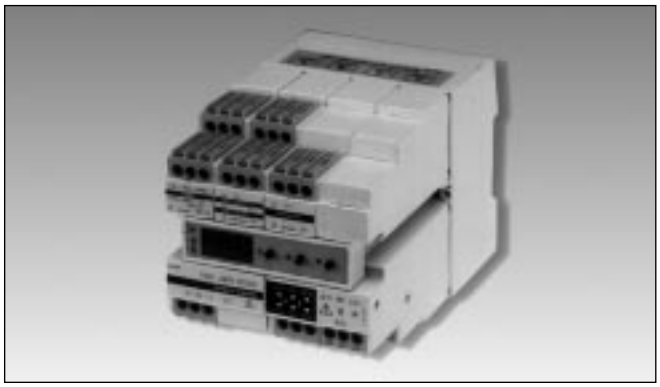
Energy Management
Modular Smart Power Transducer
Type SPT-90

CARLO GAVAZZI



- Class 0.5
- 16-bit µP-based modular smart power transducer
- Measurements of: W, W_{avg}, VA, VAr, PF, Wh, VAh, VArh, A_{max} (among the phases), $V_{L-L\ avg}$, V_{L1-N}, V_{L2-N}, V_{L3-N}, Hz_{L1}
- TRMS measurement of distorted waves (voltage/current)
- All configuration functions selectable by an optional removable key-pad or programming software
- Password protection of programming parameters
- Optional independent alarm setpoint
- Optional second analogue output (20 mADC/±20 mADC ±10 mADC/±5 mADC/10 VDC/±5 VDC/±1 VDC)
- Optional serial RS 422/485 or RS232 output
- MODBUS, JBUS protocol

Product Description

16-bit µP-based modular smart power transducer with an optional removable configuration key-pad or programming software. The housing is for DIN-rail mounting and ensures a degree of protection (front) of IP 20.

Ordering Key

SPT-90AV51HXA1XXX

- Model
- Range code
- Measurement
- Power supply
- Auxiliary output
- 1st output/input
- 2nd output
- Options

Type Selection

Range code

AV1: 100/√3/100 VAC-1 AAC (max. 130/√3 (L-N)/ 130 V (L-L) - 1.2 A) [1)]
AV3: 100/√3/100 VAC-5 AAC (max. 130/√3 (L-N)/ 130 V (L-L) - 6 A) [1)]
AV4: 250/433 VAC - 1 AAC (max. 300 V (L-N)/ 520 V (L-L) - 1.2 A) [1)]
AV5: 250/433 VAC - 5 AAC (max. 300 V (L-N)/ 520 V (L-L) - 6 A) (standard)
AV7: 400/690 VAC - 5 AAC (max. 480 V (L-N)/ 830 V (L-L) - 6 A) [1)]

Power supply

L: 18 to 60 VAC/DC
H: 90 to 260 VAC/DC

Measurement

1: One phase, three-phase system (3 or 4 wires, balanced load)
3: Three phase system (3 or 4 wires, unbalanced load)

Auxiliary output

X: None (standard)
D: Alarm set-point, relay [1)]
P: Pulse, open collector, DC type [1)]

Options

X: None
K: Programming key-pad
S: RS232 module + programming software

1st output/input

D1: 3 digital inputs (managed only by means of the serial communication) [1)]
A1: Analogue output, 20 mADC (standard)
A2: Analogue output, ±5 mA [1)]
A3: Analogue output, ±10 mA [1)]
A4: Analogue output, ±20 mA
V1: Analogue output, 10 VDC [1)]
V2: Analogue output, ±1 VDC [1)]
V3: Analogue output, ±5 VDC [1)]
V4: Analogue output, ±10 VDC [1)]

2nd output

XX: None (standard)
S1: Serial output, RS 485 multidrop bidirectional [1)]
A1: Analogue output, 20 mADC (standard)
A2: Analogue output, ±5 mA [1)]
A3: Analogue output, ±10 mA [1)]
A4: Analogue output, ±20 mA
V1: Analogue output, 10 VDC [1)]
V2: Analogue output, ±1 VDC [1)]
V3: Analogue output, ±5 VDC [1)]
V4: Analogue output, ±10 VDC [1)]

[1)] On request

Input Specifications

Number of inputs	
Current	2 (measurement code: 1) 6 (measurement code: 3)
Voltage	2 (measurement code: 1) 4 (measurement code: 3)
Digital	4, for 3 free of voltage contacts (inputs managed only by the serial communication) Reading voltage/current: 17.5 to 25 VDC/< 8 mA

Accuracy (basic unit)	
Voltage/current/energy	±0.5% f.s. includes also: frequency, power supply and output load influences
Frequency	±0.5% f.s. (45 to 500 Hz)
Active power (@ 25°C ± 5°C, R.H. ≤ 60%)	±0.5% f.s. (PF 0.7 L/C, 0.6 to 1 In, 0.9 to 1.1 Un) ±1% f.s. (PF 0.3 L/C, 0.2 to 1.2 In, 0.7 to 1.2 Un)

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Input Specifications (cont.)

Accuracy (cont.)	
Reactive power	
(@ 25°C ± 5°C, R.H. ≤ 60%)	±0.5% f.s. (PF 0.7 L/C, 0.6 to 1 In, 0.9 to 1.1 Un) ±1% f.s. (PF 0.3 L/C, 0.2 to 1.2 In, 0.7 to 1.2 Un)
Apparent power	
(@ 25°C ± 5°C, R.H. ≤ 60%)	±0.5% f.s., (0.6 to 1 In, 0.9 to 1.1 Un) ±1% f.s., (0.2 to 1.2 In, 0.7 to 1.2 Un)
Additional errors	
Humidity	≤ 0.3%, 60% to 90% R.H.
Input frequency	≤ 0.4%, 62 to 400 Hz
Magnetic field	≤ 0.5% @ 400 A/m
Ripple	≤ 1% according to IEC 60688-1 and EN 60 688-1
Sampling rate	1900 Hz
Display	7-segment, LED, h 9 mm
Max. and min. indication	Max. 999, min. -999
Measurements	W, Wavg, VA, VAr, PF, Wh, VAh, VArh, A_{max} (among the phases), $V_{L-L\ avg}$, V_{L1-N}, V_{L2-N}, V_{L3-N}, Hz_{L1}. TRMS measurement of a distorted wave voltage/current Coupling type : Direct Crest factor: ≥ 3

Ranges (impedances)	
AV1 (Un/In):	100 V /√3/100 V (>250 kΩ) - 1 AAC (≤ 0.3 VA)
AV3 (Un/In):	100 V /√3/100 V (>250 kΩ) - 5 AAC (≤ 0.3 VA)
AV4 (Un/In):	250 V/433 V (>450 kΩ) - 1 AAC (≤ 0.3 VA)
AV5 (Un/In):	250 V/433 V (>450 kΩ) - 5 AAC (≤ 0.3 VA)
AV7 (Un/In):	400 V/690 V (>1 MΩ) - 5 AAC (≤ 0.3 VA)
Frequency range	48 to 62 Hz
Over-load protection	
Continuous: voltage/current	1.2 Un/In
For 1 s	
Voltage:	2 Un
Current:	20 In
Programming keypad (on request)	Removable type 3 keys: "S" for enter programming phase and password confirmation, "UP" and "DOWN" for value programming/function selection
Programming software (on request)	Programming software for windows 95/98 combined with an RS232 serial communication module.

Output Specifications

Analogue outputs	
Number of outputs	1 (standard) + 1 (on request)
Accuracy	±0.2% f.s. (@ 25°C ± 5°C, R.H. ≤ 60%)
Range	0 to 20 mADC, ±5 mADC, ±10 mADC, ±20 mADC, 10 VDC, ±1 VDC, ±5 VDC, ±10 VDC.
Scaling factor	Programmable within the whole range of retransmission; it allows the retransmission management of all values from 0 to 20 mADC, ±5 mADC, ±10 mADC, ±20 mADC, 10 VDC, ±1 VDC, ±5 VDC, ±10 VDC.
Response time	≤ 250 ms typical (excl. filter)
Temperature drift	300 ppm/°C
Load: 20 mA output	≤ 600 Ω
±20mA output	≤ 550 Ω
±10 mA output	≤ 1100 Ω
±5 mA output	≤ 2200 Ω
10 V output	≥ 10 kΩ
±10 V output	≥ 10 kΩ
± 5 V output	≥ 10 kΩ
± 1 V output	≥ 10 kΩ
Insulation	By means of optocouplers, 4000 V_{rms} output to measuring input 4000 V_{rms} output to supply input

Serial output (on request)	
Type	RS422/RS485, multidrop bidirectional (static and dynamic variables)
Connections	2 or 4-wire, termination directly on the module
Adresses	255, selectable by key-pad
Protocol	MODBUS/JBUS
Data (bidirectional)	
Dynamic (reading only)	System variables: P, P_{AVG}, S, Q, PF, V_{L-L}, f, energy and status of digital inputs, setpoint output and status of the energy overflow bit, Single phase variables: P_{L1}, S_{L1}, Q_{L1}, PF_{L1}, V_{L1-N}, A_{L1}, P_{L2}, S_{L2}, Q_{L2}, PF_{L2}, V_{L2-N}, A_{L2}, P_{L3}, S_{L3}, Q_{L3}, PF_{L3}, V_{L3-N}, A_{L3}
Static (writing only)	All programming data, reset of energy, reset of energy overflow bit, activation of static output. Stored energy (EEPROM) ≥ 250,000.000 kWh
Data format	1-start bit, 8-data bit, no parity/even parity, 1 stop bit
Baud-rate	1200, 2400, 4800 and 9600 selectable bauds

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Output Specifications (cont.)

Serial output (cont.)	
Insulation	By means of optocouplers, 4000 V_{rms} output to measuring inputs 4000 V_{rms} output to supply input
Temperature drift	200 ppm/°C
RS 232 output (on request)	bidirectional (static and dynamic variables) 3 wires, max. distance 15 m
Data format	1-start bit, 8-data bit, no parity, 1 stop bit
Baud-rate	9600 bauds
Protocol	MODBUS (JBUS)
Other data	as for RS422/485
Pulse output (on request)	
Type	From 1 to 999 programmable pulses for kWh, KVAh, kVArh, MWh, MVAh, MVArh, open collector (NPN transistor) V_{ON} 1.2 VDC/ max. 100 mA V_{OFF} 30 VDC max. according to DIN43864
Pulse duration	20 ms (ON), ≥ 20 ms (OFF)
Insulation	By means of optocouplers, 4000 V_{rms} output to measuring input, 4000 V_{rms} output to supply input.
Alarms (on request)	
Number of setpoints	1 independent
Alarm type	Up alarm, down alarm
Setpoint adjustment	0 to 100% of the electrical scale
Hysteresis	0 to 100% of the electrical scale
On-time delay	0 to 255 s
Relay status	Normally de-energized
Output type	Relay, SPDT AC 1 - 8 A @ 250 VAC DC 12 - 5 A @ 24 VDC AC 15 - 2.5 A @ 250 VAC DC 13 - 2.5 A @ 24 VDC
Response time	typ. 250 ms, filter excluded, setpoint on-time delay: "0"
Insulation	4000 V_{rms} output to measuring input, 4000 V_{rms} output to supply input

Software Functions

Password	Numeric code of max. 3 digits; 2 protection levels of the programming data
1st level	Password "0", no protection
2nd level	Password from 1 to 499, all data are protected
Measurement selection	System's active power (W), system's apparent power (VA), system's reactive power (VAr), average active power (W_{avg}), system's power factor (cos φ), maximum current (A_{max}), average phase-phase voltage, phase-neutral voltage-phase 1, phase-neutral voltage-phase 2, phase-neutral voltage-phase 3, frequency-phase 1. System's (+) active energy, system's apparent energy, system's reactive energy, system's (+/-) active energy
Transformer ratio	For CT up to 5000 A, For VT up to 100 kV (1MV)
Scaling factor	
Operating mode	Electrical scale: compression/ expansion of the input scale to be connected to 1 or 2 analogue outputs and to the alarm output.
Electrical range	Programmable within the whole measuring range
Filter	
Filter operating range	0 to 99.9% of the input electrical scale
Filtering coefficient	1 to 255
Filter action	Both analogue and serial outputs (fundamental variables: V, I, W and their derived ones)

Supply Specifications

AC voltage	90 to 260 VAC/DC (standard), 50/60 Hz 18 to 60 VAC/DC, 50/60Hz (on request),
Power consumption	≤ 30 VA/20 W (90 to 260 V) ≤ 20 VA/20 W (18 to 60 V)

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Function Description

Input and output scaling capability
Working of the analogue outputs (y) versus input variables (x)

Figure A
The sign of measured quantity and output quantity remains the same. The output quantity is proportional to the measured quantity.

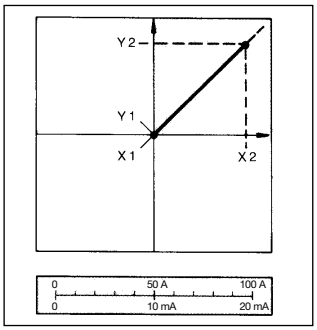


Figure B
The sign of measured quantity and output quantity changes simultaneously. The output quantity is proportional to the measured quantity.

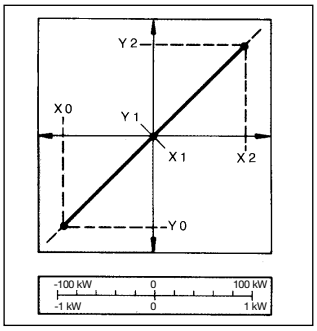


Figure C
The sign of measured quantity and output quantity remains the same. On the range X0...X1, the output quantity is zero. The range X1...X2 is delineated on the entire output range Y0 = Y1...Y2 and thus presented in strongly expanded form.

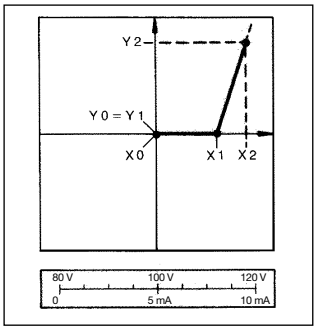


Figure D
The sign of measured quantity and output quantity remains the same. With the measured quantity being zero, the output quantity already has the value
Y1 = 0.2 Y2.
Live zero output.

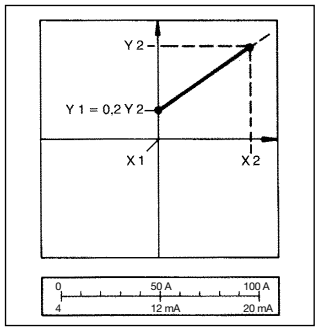


Figure E
The sign of the measured quantity changes but that of the output quantity remains the same. The output quantity steadily increases from value X1 to value X2 of the measured quantity.

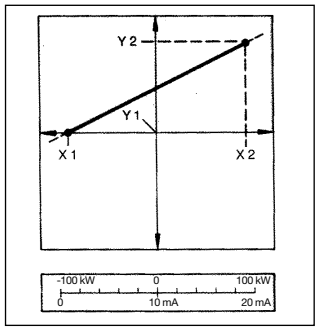
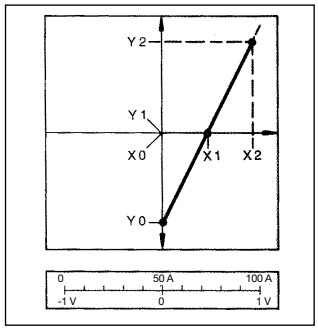


Figure F
The sign of the measured quantity remains the same, that of the output quantity changes as the measured quantity leaves range X0...X1 and passes to range X1...X2 and vice versa.



General Specifications

Operating temperature	0 to +50°C (32 to 122°F) (R.H. < 90% non-condensing)
Storage temperature	-10 to +60°C (14 to 140°F) (R.H. < 90% non-condensing)
Insulation reference voltage	300 V_{rms} to ground
Insulation	4000 V_{rms} between all inputs/ outputs to ground
Dielectric strength	4000 V_{rms} for 1 minute
Noise rejection CMRR	 100 dB, 48 to 62 Hz
EMC	EN 50 081-2, EN 50 082-2
Other standards Safety requirements:	 IEC 61010-1, EN 61010-1
Product requirements: Pulse output:	IEC 60688-1, EN 60688-1 DIN 43864
Connector	Screw-type, max. 2.5 mm^2 wires x 2
Housing Dimensions Material	 90 x 90 x 140 mm ABS, self-extinguishing: UL 94 V-0
Degree of protection	IP20
Weight	Approx. 550 g (packing included)

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Available Modules

Type	N. of channels	Ordering code	Note
SPT-90 base + AV1.1 input		AA1000	
SPT-90 base + AV3.1 input		AA1001	
SPT-90 base + AV4.1 input		AA1002	
SPT-90 base + AV5.1 input		AA1003	
SPT-90 base + AV7.1 input		AA1004	
SPT-90 base + AV1.3 input		AA1006	
SPT-90 base + AV3.3 input		AA1007	
SPT-90 base + AV4.3 input		AA1008	
SPT-90 base + AV5.3 input		AA1009	
SPT-90 base + AV7.3 input		AA1010	
18-60 VAC/DC power supply		AP1021	
90-260 VAC/DC power supply		AP1020	
Programming unit		AR1017	The same unit can be used in several SPT's
20 mADC analogue output	1	AO1050	
10 VDC analogue output	1	AO1051	
±5 mADC analogue output	1	AO1052	
±10 mADC analogue output	1	AO1053	
±20 mADC analogue output	1	AO1054	
±1 VDC analogue output	1	AO1055	
±5 VDC analogue output	1	AO1056	
±10 VDC analogue output	1	AO1057	
20 mADC analogue output	2	AO1026	SPT can be equipped also with 2 dual analogue outputs, in this case the second output of every module can be used as a redundant output
10 VDC analogue output	2	AO1027	
±5 mADC analogue output	2	AO1028	
±10 mADC analogue output	2	AO1029	
±20 mADC analogue output	2	AO1030	
±1 VDC analogue output	2	AO1031	
±5 VDC analogue output	2	AO1032	
±10 VDC analogue output	2	AO1033	
RS485 output	1	AR1034	
Relay output	1	AO1058	
Relay output	2	AO1035	The second output can be used as redundant output
Open collector output	1	AO1059	
Open collector output	2	AO1036	The second output can be used as redundant output
Digital inputs	3	AQ1038	
RS232 output + RTC	1	AR1039	The RS232 module works as alternative of the RS485 module. The RTC (real time clock) function is not available in the SPT

Possible Combinations

Basic unit	Out 1	Out 2	Out 3	PU
Single analogue output	●	●		
Dual analogue output		●		
RS485 input/output (1)		●		
Single relay output (alarm)			●	
Single open coll. output (pulse)			●	
Dual relay output (alarm)			●	
Dual open coll. output (pulse)			●	
3 digital inputs			●	
RS232 input/output (1)		●		
Programming unit				●

Notes:

PU is the programming unit

(1) The RS232 module works as alternative of the RS485 module

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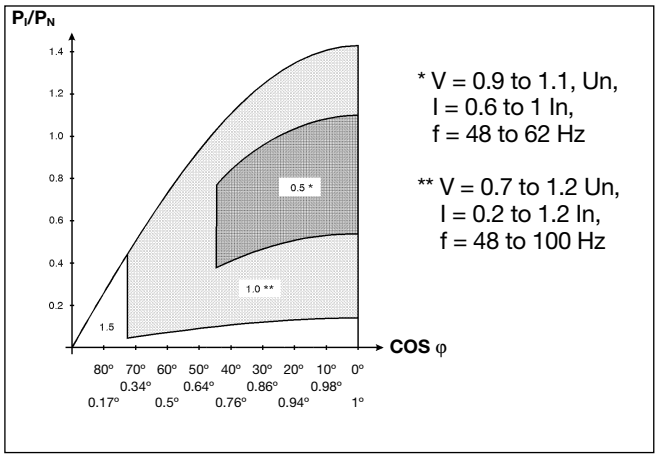
Mode of Operation

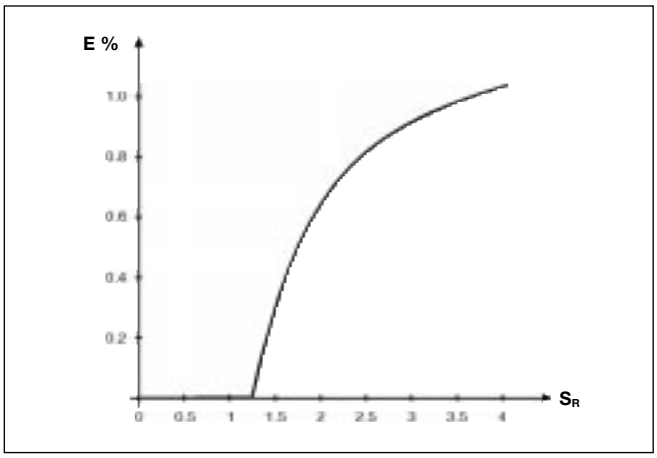
Accuracy class of the meter as a relation of P_i/P_N and cos φ (power factor)



* V = 0.9 to 1.1, Un,
I = 0.6 to 1 In,
f = 48 to 62 Hz

** V = 0.7 to 1.2 Un,
I = 0.2 to 1.2 In,
f = 48 to 100 Hz

Trends of the "E" error depending on the S_R scale ratio



Input	Star voltage	Delta voltage	Current
AV1	Un: 100 V/√3	Un: 100 V	In: 1 A
AV3	Un: 100 V/√3	Un: 100 V	In: 5 A
AV4	Un: 250 V	Un: 430 V	In: 1 A
AV5	Un: 250 V	Un: 430 V	In: 5 A

P_i: (installation power)
One phase system:

$$P_i = U_i \cdot I_i \cdot \cos\varphi$$

Three phase, 3-wire system:

$$P_i = \sqrt{3} \cdot U_i \cdot I_i \cdot \cos\varphi$$

Three phase, 4-wire system:

$$P_i = 3 \cdot U_i \cdot I_i \cdot \cos\varphi$$

where:
U_i = the real star voltage of the electrical system being measured.
I_i = the maximum phase current of the electrical system being measured.
Cos φ = the average cos φ of the electrical system being measured.

P_n: (rated power of transducer)
One phase system:

$$P_n = U_n \cdot I_n \cdot VT(ratio) \cdot CT(ratio)$$

Three phase, 3-wire system:

$$P_n = \sqrt{3} \cdot U_n \cdot I_n \cdot VT(ratio) \cdot CT(ratio)$$

Three phase, 4-wire system:

$$P_n = 3 \cdot U_n \cdot I_n \cdot VT(ratio) \cdot CT(ratio)$$

where:
U_n = the rated input voltage of SPT-90 depending on the model, see table above.
I_n = the rated input current of SPT-90 depending on the model, see table above.
VT (ratio) = the value of the voltage transformer ratio.
CT (ratio) = the value of the current transformer ratio.

Example 1:
Model AV3.3 (3-wire system).

U_i = 6 kV (delta voltage)
I_i = 265 A (single phase current)
Cos φ = 0.85 (system power factor)
U_n = 100 V
I_n = 5 A

$$VT\ (ratio) = \frac{6\ kV}{100} = 60$$

$$CT\ (ratio) = \frac{300}{5} = 60$$

$$P_i = \sqrt{3} \cdot U_i \cdot I_i \cdot \cos\varphi = \sqrt{3} \cdot 6000 \cdot 265 \cdot 0.85 = 2.33\ MW$$

$$P_n = \sqrt{3} \cdot U_n \cdot I_n \cdot VT(ratio) \cdot CT(ratio) = \sqrt{3} \cdot 100 \cdot 5 \cdot 60 \cdot 60 = 3.12\ MW$$

$$\frac{P_i}{P_n} = \frac{2.33}{3.12} = 0.75$$

Example 2:
Model AV3.3 (4-wire system).

$U_i = 6\ kV / \sqrt{3}$
I_i = 265 A
Cos φ = 0.85
$U_n = 100\ V / \sqrt{3}$
I_n = 5 A

$$VT\ (ratio) = \frac{6\ kV / \sqrt{3}}{100 / \sqrt{3}} = 60$$

$$CT\ (ratio) = \frac{300\ A}{5\ A} = 60$$

$$P_i = 3 \cdot U_i \cdot I_i \cdot \cos\varphi = 3 \cdot 6000 / \sqrt{3} \cdot 265 \cdot 0.85 = 2.33\ MW$$

$$P_n = 3 \cdot U_n \cdot I_n \cdot VT(ratio) \cdot CT(ratio) = 3 \cdot 100 / \sqrt{3} \cdot 5 \cdot 60 \cdot 60 = 3.12\ MW$$

$$\frac{P_i}{P_n} = \frac{2.33}{3.12} = 0.75$$

In both examples the accuracy of the measurement is 0.5% f.s. when considering the changing of the measured voltage from 0.9 Un to 1.1 Un and the measured current from 0.6 In to 1 In with a cos φ of 0.85. The accuracy of the output is connected to the accuracy of the measurement plus the scale ratio of both input (Hi.E - Lo.E) and output (Hi.A - Lo.A) as shown in the graph above (E% versus S_R).

Regarding S_R:

$$S_R = \frac{AFS \cdot (Hi.A - Lo.A)}{100 \cdot (Hi.E - Lo.E)} \leq 1.25$$

AFS = automatic electrical full scale calculated value.
S_R = scale ratio.
There is not any additional error on the output signal if $S_R \leq 1.25$.

Example 3:

AFS = 3.30 MW
Lo.E = 0 MW
Hi.E = 3.30 MW
Lo.A = 20%
Hi.A = 99.9%

$$S_R = \frac{3.30\ (99.9-20)}{100\ (3.30-0)} = 0.8$$

$0.8 \leq 1.25$ no additonal errors

Example 4:

AFS = 3.30 MW
Lo.E = 1.00 MW
Hi.E = 3.30 MW
Lo.A = 20%
Hi.A = 99.9%

$$S_R = \frac{3.30\ (99.9-20)}{100\ (3-1)} = 1.32$$

$1.32 \geq 1.25$ means that there is an additional error of 0.2% f.s. according to the graph at the previous page.

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Mode of Operation (cont.)

Waveform of the signals that can be measured

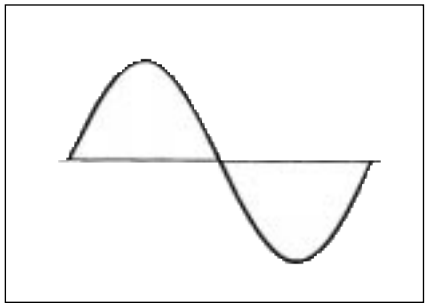


Figure G
Sine wave, undistorted
Fundamental content 100%
Harmonic content 0%
A_{rms} = 1.1107 | $\overline{A}$ |

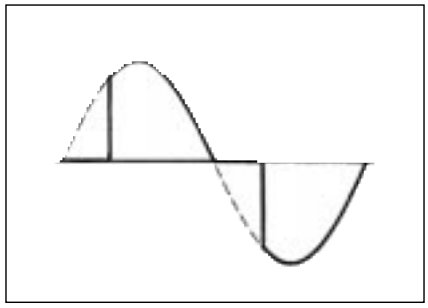


Figure H
Sine wave, indented
Fundamental content 10...100%
Harmonic content 0...90%
Frequency spectrum 3rd to 16th harmonic
Required result: additional error < 1%

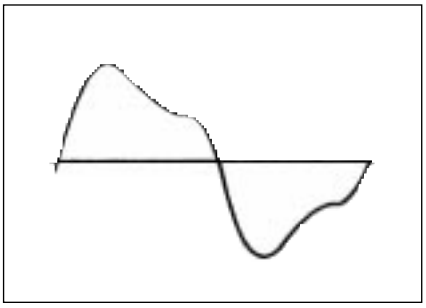
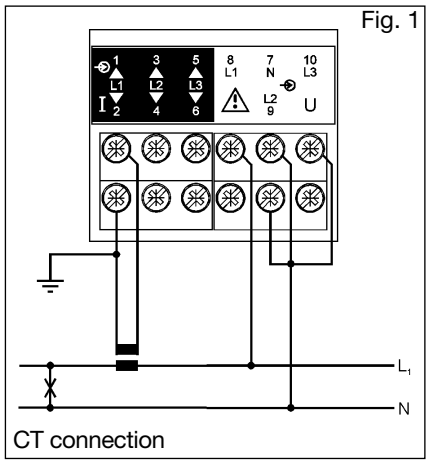
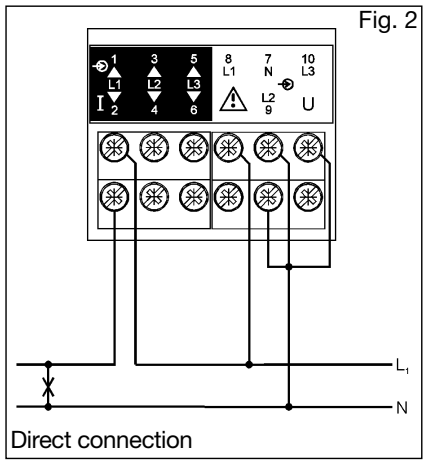


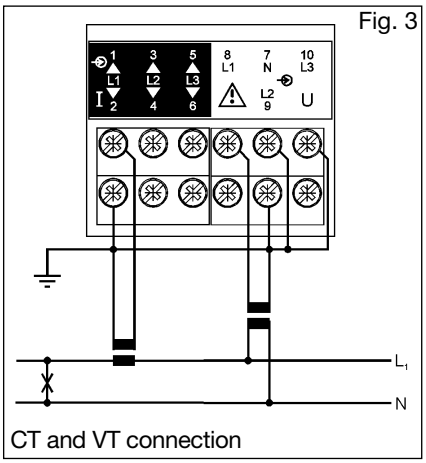
Figure I
Sine wave, distorted
Fundamental content 70...90%
Harmonic content 10...30%
Frequency spectrum 3rd to 15th harmonic
Required result: additional error < 0.5%

Wiring Diagrams

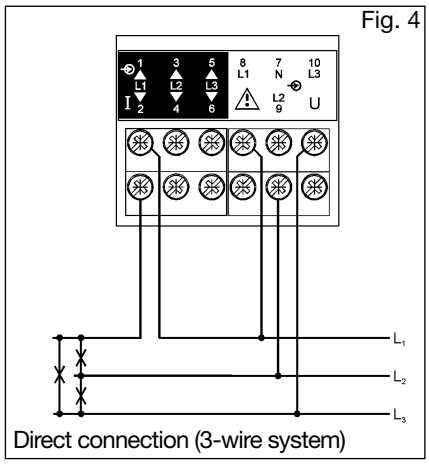
Single phase input connections

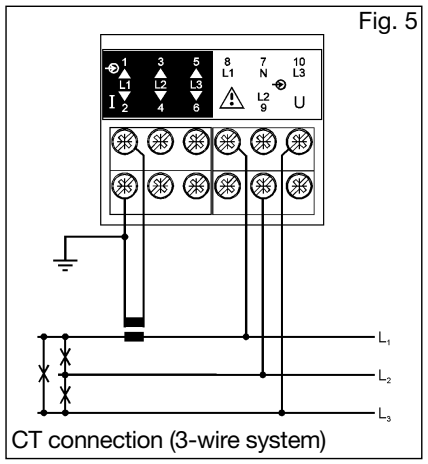


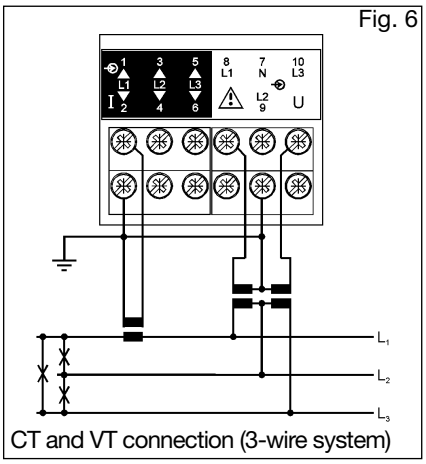




Three phase input connections - Balanced loads







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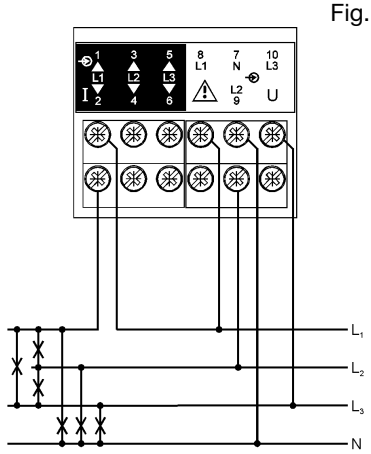
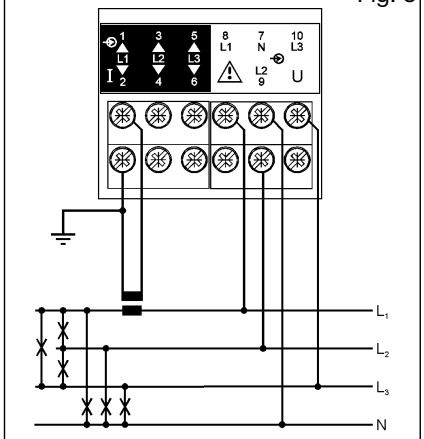
Wiring Diagrams (cont.)

Fig. 7



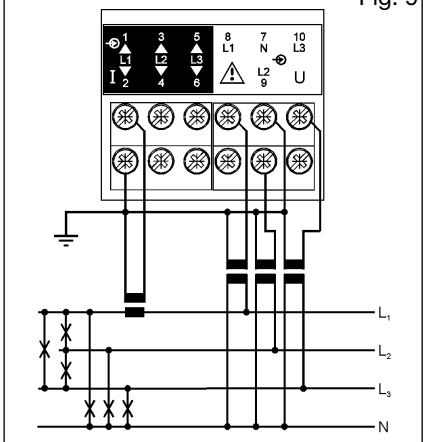
Direct connection (4-wire system)

Fig. 8



CT connection (4-wire system)

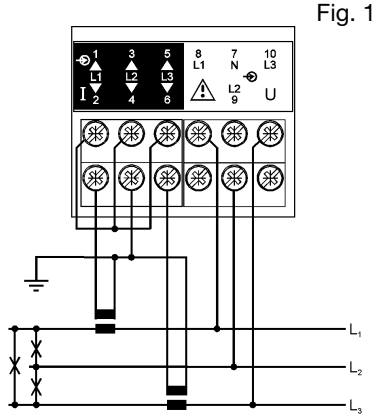
Fig. 9



CT and VT connection (4-wire system)

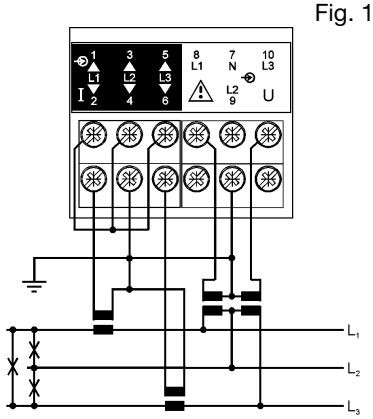
Three-phase, 3-wire ARON input connections - Unbalanced loads

Fig. 10



CT connection (3-wire system)

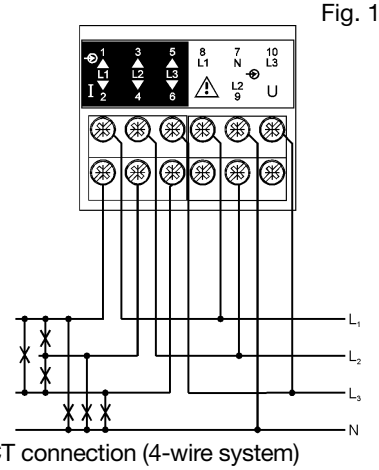
Fig. 11



CT and VT connection (3-wire system)

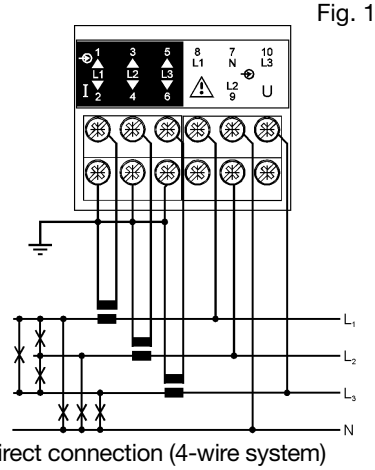
Three phase, 4-wire input connections - Unbalanced loads

Fig. 12



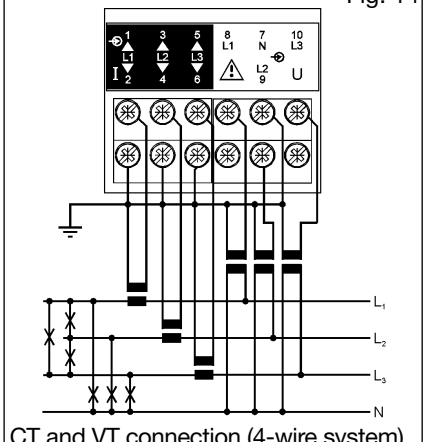
CT connection (4-wire system)

Fig. 13



Direct connection (4-wire system)

Fig. 14



CT and VT connection (4-wire system)

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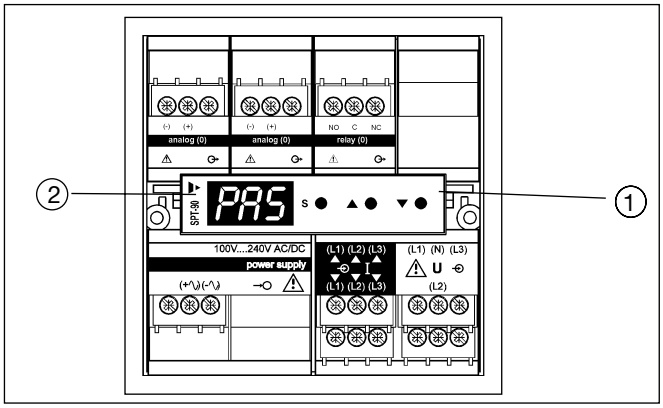
Front Panel Description



1. **Key-pad (optional)**
   Set-up and programming procedures are easily controlled by the 3 pushbuttons.

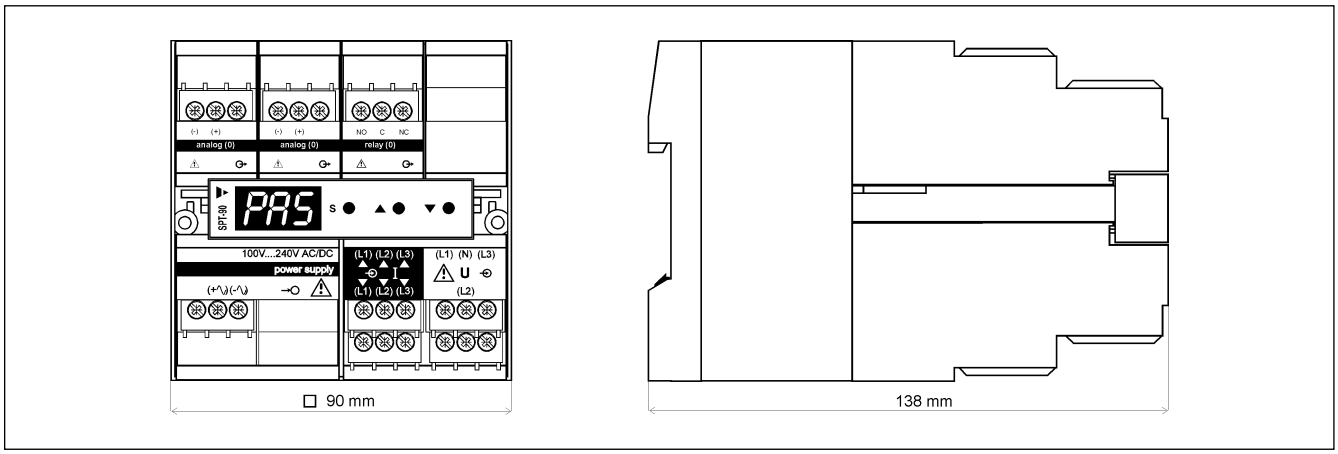
"S"
- Selection key to select programming function (transducer configuration) and alarm detection.

" ▲ " and " ▼ "
- Up and down keys for increasing or decreasing programming values.
- Selecting programming functions and transducer configuration together with the "S" key.

2. **Display (on request)**
   3-digit (maximum read-out 999).

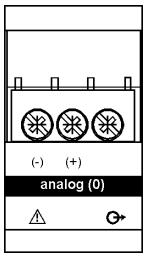
   Alphanumeric indication by means of 7-segment display for:
   - Displaying only the configuration parameters

Dimensions



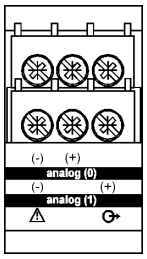
Terminal Boards

Single analogue output modules



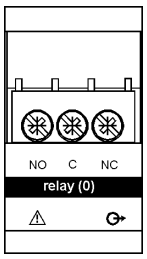
AO1050 (20 mADC)
AO1051 (10 VDC)
AO1052 (±5 mADC)
AO1053 (±10 mADC)
AO1054 (±20 mADC)
AO1055 (±1 VDC)
AO1056 (±5 VDC)
AO1057 (±10 VDC)

Dual analogue output modules

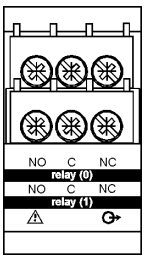


AO1026 (20 mADC)
AO1027 (10 VDC)
AO1028 (±5 mADC)
AO1029 (±10 mADC)
AO1030 (±20 mADC)
AO1031 (±1 VDC)
AO1032 (±5 VDC)
AO1033 (±10 VDC)

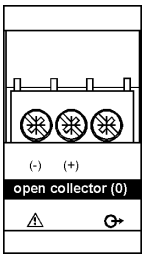
Digital output modules



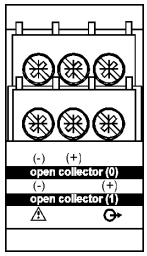
AO1058
Single relay output



AO1035
Dual relay output

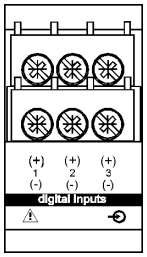


AO1059
Single open collector output

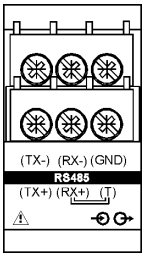


AO1036
Dual open collector output

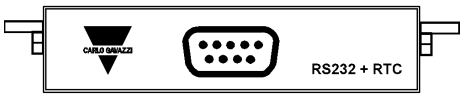
Other input/output modules



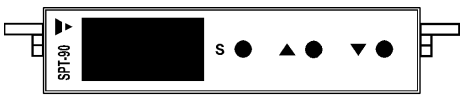
AQ1038
3 Digital inputs



AR1034
RS485 output

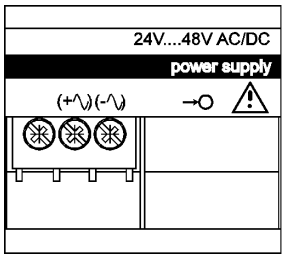


AR1039
RS232 output

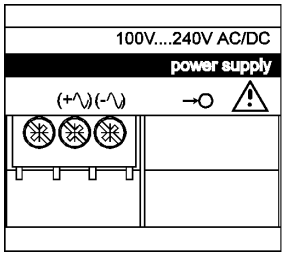


AR1017
Programming Unit

Power supply modules



AP1021
18-60 VAC/DC power supply



AP1020
90-260 VAC/DC power supply