

# Energy Management Modular Smart Power Transducer Type SPT-90

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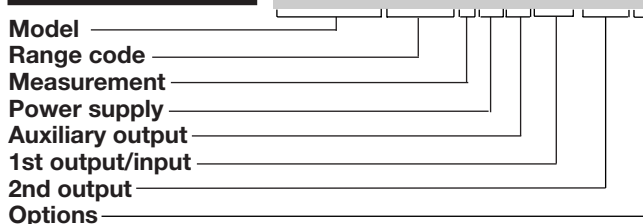
- Class 0.5
- 16-bit  $\mu$ P-based modular smart power transducer
- Measurements of:  $W$ ,  $W_{avg}$ ,  $VA$ ,  $VAR$ ,  $PF$ ,  $Wh$ ,  $VAh$ ,  $VARh$ ,  $A_{max}$  (among the phases),  $V_{L-L avg}$ ,  $V_{L1-N}$ ,  $V_{L2-N}$ ,  $V_{L3-N}$ ,  $Hz_{L1}$
- TRMS measurement of distorted waves (voltage/current)
- 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  $\mu$ P-based modular smart power transducer with an optional removable configuration key-pad or pro-

gramming software. The housing is for DIN-rail mounting and ensures a degree of protection (front) of IP 20.

## Ordering Key SPT-90AV51HXA1XXX



## Type Selection

Range code	Measurement	1st output/input	2nd output
<b>AV1:</b> 100/√3/100 VAC-1 AAC (max. 130/√3 (L-N)/ 130 V (L-L) - 1.2 A) <sup>1)</sup>	<b>1:</b> One phase, three- phase system (3 or 4 wires, balan- ced load)	<b>D1:</b> 3 digital inputs (managed only by means of the serial communication) <sup>1)</sup>	<b>XX:</b> None (standard) <b>S1:</b> Serial output, RS 485 multidrop bidirec- tional <sup>1)</sup>
<b>AV3:</b> 100/√3/100 VAC-5 AAC (max. 130/√3 (L-N)/ 130 V (L-L) - 6 A) <sup>1)</sup>	<b>3:</b> Three phase system (3 or 4 wires, unba- lanced load)	<b>A1:</b> Analogue output, 20 mADC (standard)	<b>A1:</b> Analogue output, 20 mADC (standard)
<b>AV4:</b> 250/433 VAC - 1 AAC (max. 300 V (L-N)/ 520 V (L-L) - 1.2 A) <sup>1)</sup>	<b>Auxiliary output</b>	<b>A2:</b> Analogue output, ±5 mA <sup>1)</sup>	<b>A2:</b> Analogue output, ±5 mA <sup>1)</sup>
<b>AV5:</b> 250/433 VAC - 5 AAC (max. 300 V (L-N)/ 520 V (L-L) - 6 A) (standard)		<b>A3:</b> Analogue output, ±10 mA <sup>1)</sup>	<b>A3:</b> Analogue output, ±10 mA <sup>1)</sup>
<b>AV7:</b> 400/690 VAC - 5 AAC (max. 480 V (L-N)/ 830 V (L-L) - 6 A) <sup>1)</sup>	<b>X:</b> None (standard) <b>D:</b> Alarm set-point, relay <sup>1)</sup> <b>P:</b> Pulse, open collector, DC type <sup>1)</sup>	<b>A4:</b> Analogue output, ±20 mA	<b>A4:</b> Analogue output, ±20 mA
<b>Power supply</b>	<b>Options</b>	<b>V1:</b> Analogue output, 10 VDC <sup>1)</sup>	<b>V1:</b> Analogue output, 10 VDC <sup>1)</sup>
<b>L:</b> 18 to 60 VAC/DC <b>H:</b> 90 to 260 VAC/DC	<b>X:</b> None <b>K:</b> Programming key-pad <b>S:</b> RS232 module + programming software	<b>V2:</b> Analogue output, ±1 VDC <sup>1)</sup>	<b>V2:</b> Analogue output, ±1 VDC <sup>1)</sup>
		<b>V3:</b> Analogue output, ±5 VDC <sup>1)</sup>	<b>V3:</b> Analogue output, ±5 VDC <sup>1)</sup>
		<b>V4:</b> Analogue output, ±10 VDC <sup>1)</sup>	<b>V4:</b> Analogue output, ±10 VDC <sup>1)</sup>

<sup>1)</sup>On request

## Input Specifications

Number of inputs	Accuracy (basic unit)	
Current	Voltage/current/energy	±0.5% f.s. includes also: frequency, power supply and output load influences
Voltage	Frequency	±0.5% f.s. (45 to 500 Hz)
Digital	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)
	Reading voltage/current: 17.5 to 25 VDC/< 8 mA	

## Input Specifications (cont.)

<b>Accuracy (cont.)</b> Reactive power (@ 25°C ± 5°C, R.H. ≤ 60%)  Apparent 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)  ±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)	<b>Ranges</b> (impedances) AV1 (Un/In):  AV3 (Un/In):  AV4 (Un/In):  AV5 (Un/In):  AV7 (Un/In):	100 V /√3/100 V (>250 kΩ) - 1 AAC (≤ 0.3 VA) 100 V /√3/100 V (>250 kΩ) - 5 AAC (≤ 0.3 VA) 250 V/433 V (>450 kΩ) - 1 AAC (≤ 0.3 VA) 250 V/433 V (>450 kΩ) - 5 AAC (≤ 0.3 VA) 400 V/690 V (>1 MΩ) - 5 AAC (≤ 0.3 VA)
<b>Additional errors</b> Humidity Input frequency Magnetic field	≤ 0.3%, 60% to 90% R.H. ≤ 0.4%, 62 to 400 Hz ≤ 0.5% @ 400 A/m	<b>Frequency range</b>	48 to 62 Hz
<b>Ripple</b>	≤ 1% according to IEC 60688-1 and EN 60 688-1	<b>Over-load protection</b> Continuous: voltage/current For 1 s Voltage: Current:	1.2 Un/In  2 Un 20 In
<b>Sampling rate</b>	1900 Hz	<b>Programming keypad</b> (on request)	Removable type 3 keys: "S" for enter pro- gramming phase and password confirmation, "UP" and "DOWN" for value programming/function selection
<b>Display</b>	7-segment, LED, h 9 mm	<b>Programming software</b> (on request)	Programming software for windows 95/98 combined with an RS232 serial communication module.
<b>Max. and min. indication</b>	Max. 999, min. -999		
<b>Measurements</b>	W, Wavg, VA, VAr, PF, Wh, VAh, VArh, A <sub>max</sub> (among the phases), V <sub>L-L avg</sub> , V <sub>L1-N</sub> , V <sub>L2-N</sub> , V <sub>L3-N</sub> , Hz <sub>L1</sub> . TRMS measurement of a dis- torted wave voltage/current Coupling type : Direct Crest factor: ≥ 3		

## Output Specifications

<b>Analogue outputs</b> Number of outputs Accuracy  Range  Scaling factor  Response time Temperature drift Load: 20 mA output ±20mA output ±10 mA output ±5 mA output 10 V output ±10 V output ± 5 V output ± 1 V output  Insulation	1 (standard) + 1 (on request) ±0.2% f.s. (@ 25°C ± 5°C, R.H. ≤ 60%)  0 to 20 mADC, ±5 mADC, ±10 mADC, ±20 mADC, 10 VDC, ±1 VDC, ±5 VDC, ±10 VDC. Programmable within the whole range of retransmis- sion; it allows the retrans- mission management of all values from 0 to 20 mADC, ±5 mADC, ±10 mADC, ±20 mADC, 10 VDC, ±1 VDC, ±5 VDC, ±10 VDC. ≤ 250 ms typical (excl. filter) 300 ppm/°C ≤ 600 Ω ≤ 550 Ω ≤ 1100 Ω ≤ 2200 Ω ≥ 10 kΩ ≥ 10 kΩ ≥ 10 kΩ ≥ 10 kΩ  By means of optocouplers, 4000 V <sub>rms</sub> output to measuring input 4000 V <sub>rms</sub> output to supply input	<b>Serial output</b> (on request) Type  Connections  Adresses Protocol Data (bidirectional) Dynamic (reading only)  Static (writing only)  Data format  Baud-rate	RS422/RS485, multidrop bidirectional (static and dynamic variables) 2 or 4-wire, termination directly on the module 255, selectable by key-pad MODBUS/JBUS  System variables: P, P <sub>AVG</sub> , S, Q, PF, V <sub>L-L</sub> , f, energy and status of digital inputs, setpoint output and status of the energy over- flow bit, Single phase variables: P <sub>L1</sub> , S <sub>L1</sub> , Q <sub>L1</sub> , PF <sub>L1</sub> , V <sub>L1-N</sub> , A <sub>L1</sub> , P <sub>L2</sub> , S <sub>L2</sub> , Q <sub>L2</sub> , PF <sub>L2</sub> , V <sub>L2-N</sub> , A <sub>L2</sub> , P <sub>L3</sub> , S <sub>L3</sub> , Q <sub>L3</sub> , PF <sub>L3</sub> , V <sub>L3-N</sub> , A <sub>L3</sub> All programming data, reset of energy, reset of energy overflow bit, activation of static output. Stored energy (EEPROM) ≥ 250,000.000 kWh 1-start bit, 8-data bit, no parity/even parity, 1 stop bit 1200, 2400, 4800 and 9600 selectable bauds
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## Output Specifications (cont.)

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

## Software Functions

<b>Password</b>	Numeric code of max. 3 digits; 2 protection levels of the programming data	<b>Measurement selection (cont.)</b>	system's reactive energy, system's (+/-) active energy
1st level	Password "0", no protection	<b>Transformer ratio</b>	For CT up to 5000 A, For VT up to 100 kV (1MV)
2nd level	Password from 1 to 499, all data are protected	<b>Scaling factor</b>	
<b>Measurement selection</b>	System's active power (W), system's apparent power (VA), system's reactive power (VAr), average active power (W <sub>avg</sub> ), system's power factor (cos φ), maximum current (A <sub>max</sub> ), 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,	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
		<b>Filter</b>	
		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

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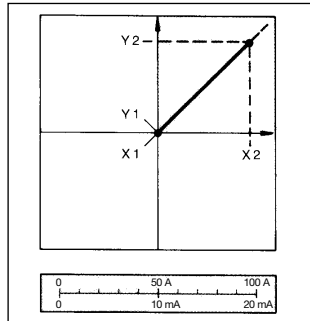
## Function Description

### Input and output scaling capability

Working of the analogue outputs (y) versus input variables (x)

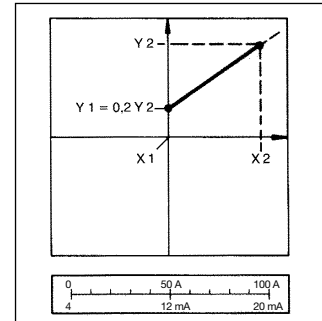
**Figure A**

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



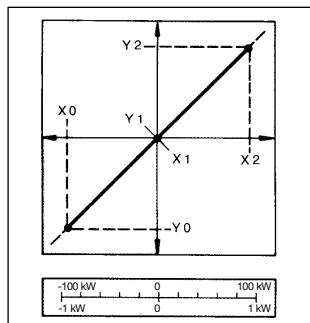
**Figure D**

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.



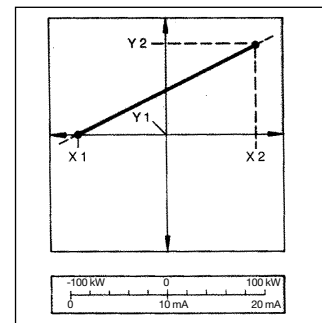
**Figure B**

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



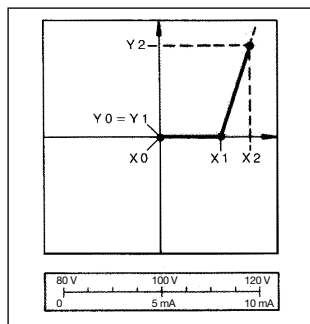
**Figure E**

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.



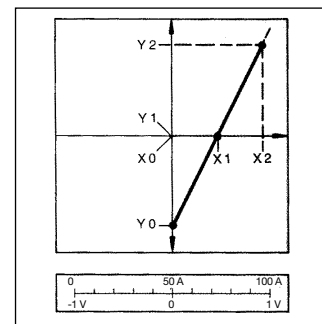
**Figure C**

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 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

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

## 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 <sup>(1)</sup>		●		
Single relay output (alarm)			●	
Single open coll. output (pulse)			●	
Dual relay output (alarm)			●	
Dual open coll. output (pulse)			●	
3 digital inputs			●	
RS232 input/output <sup>(1)</sup>		●		
Programming unit				●

Notes:

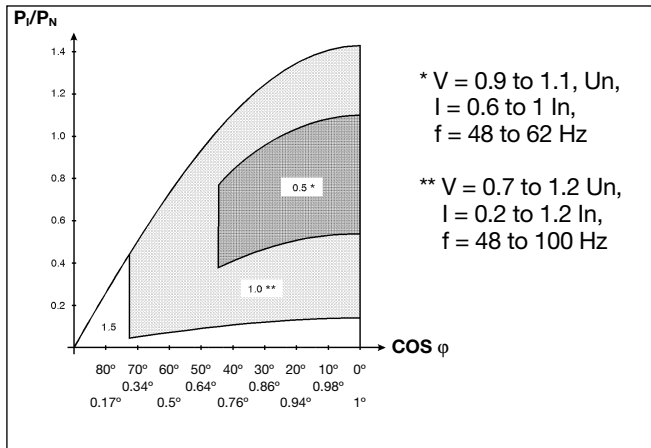
PU is the programming unit

<sup>(1)</sup> The RS232 module works as alternative of the RS485 module

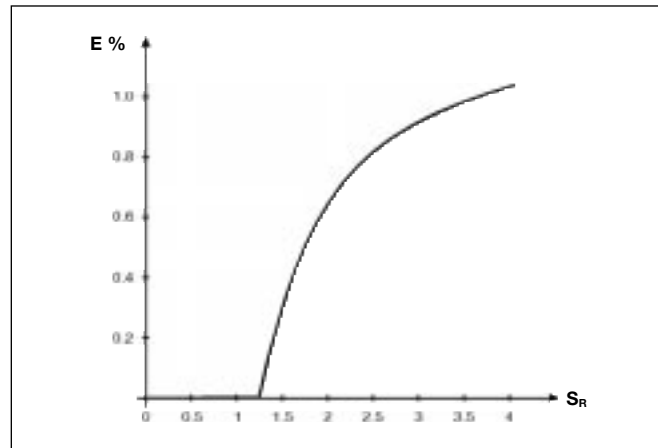


## Mode of Operation

### Accuracy class of the meter as a relation of $P_i/P_N$ and $\cos \varphi$ (power factor)



### 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<sub>i</sub>: (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.

$\cos \varphi$  = the average  $\cos \varphi$  of the electrical system being measured.

#### P<sub>s</sub>: (rated power of transducer)

One phase system:

$$P_s = U_s \cdot I_s \cdot VT(\text{ratio}) \cdot CT(\text{ratio})$$

Three phase, 3-wire system:

$$P_s = \sqrt{3} \cdot U_s \cdot I_s \cdot VT(\text{ratio}) \cdot CT(\text{ratio})$$

Three phase, 4-wire system:

$$P_s = 3 \cdot U_s \cdot I_s \cdot VT(\text{ratio}) \cdot CT(\text{ratio})$$

where:

$U_s$  = the rated input voltage of SPT-90 depending on the model, see table above.

$I_i$  = 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)

$\cos \varphi = 0.85$  (system power factor)

$U_s = 100$  V

$I_s = 5$  A

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

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

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

$$P_s = \sqrt{3} \cdot U_s \cdot I_s \cdot VT(\text{ratio}) \cdot CT(\text{ratio}) = \sqrt{3} \cdot 100 \cdot 5 \cdot 60 \cdot 60 = 3.12 \text{ MW}$$

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

#### Example 2:

Model AV3.3 (4-wire system).

$U_i = 6$  kV / √3

$I_i = 265$  A

$\cos \varphi = 0.85$

$U_s = 100$  V / √3

$I_s = 5$  A

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

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

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

$$P_s = 3 \cdot U_s \cdot I_s \cdot VT(\text{ratio}) \cdot CT(\text{ratio}) = 3 \cdot 100 / \sqrt{3} \cdot 5 \cdot 60 \cdot 60 = 3.12 \text{ MW}$$

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

In both examples the accuracy of the measurement is 0.5% f.s. when considering the changing of the measured voltage from 0.9  $U_n$  to 1.1  $U_n$  and the measured current from 0.6  $I_n$  to 1  $I_n$  with a  $\cos \varphi$  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 additional errors

#### Example 4:

AFS = 3.30 MW

Lo.E = 1.00 MW

Hi.E = 3.30 MW

Lo.A = 20%

Hi.A = 99.9%

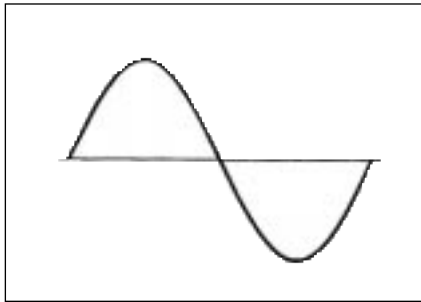
$$S_R = \frac{3.30 (99.9 - 20)}{100 (3.30 - 1)} = 1.32$$

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

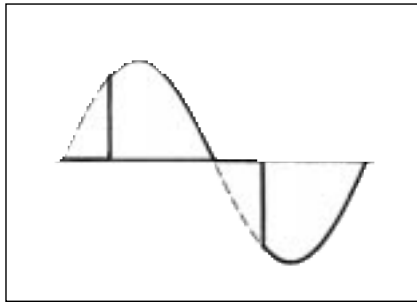


## Mode of Operation (cont.)

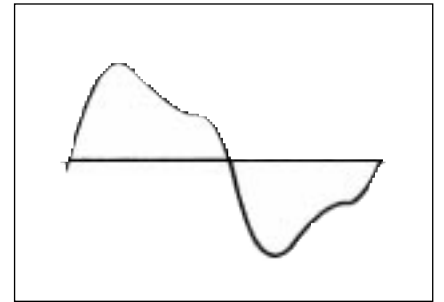
Waveform of the signals that can be measured



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



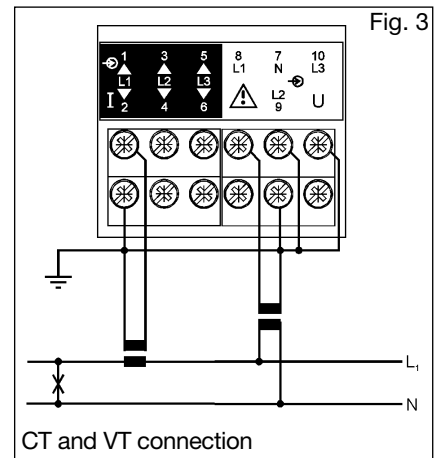
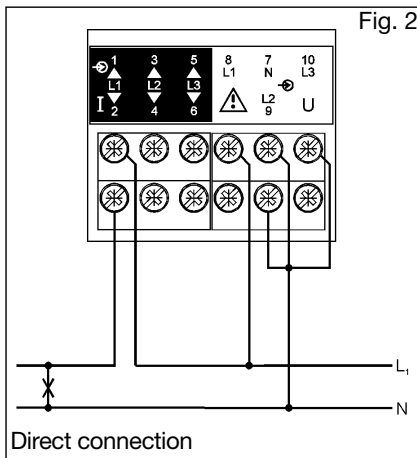
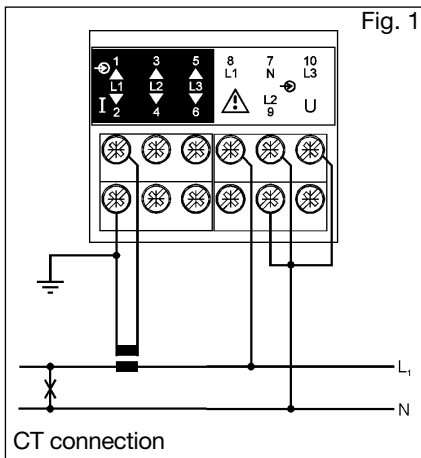
**Figure H**  
**Sine wave, indented**  
 Fundamental content 10...100%  
 Harmonic content 0...90%  
 Frequency spectrum 3rd to 16th harmonic  
 Required result: additional error < 1%



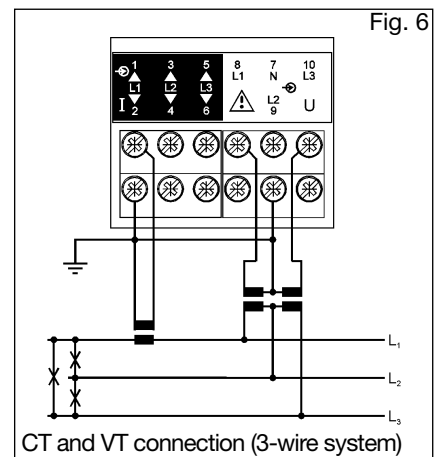
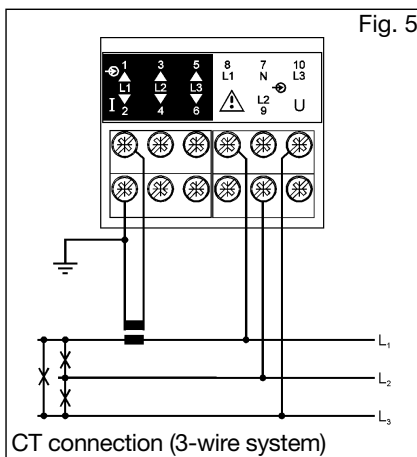
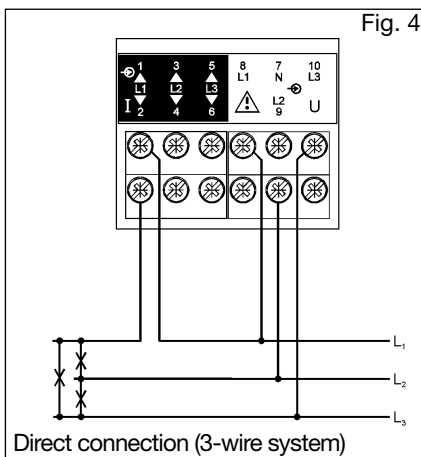
**Figure I**  
**Sine wave, distorted**  
 Fundamental content 70...90%  
 Harmonic content 10...30%  
 Frequency spectrum 3rd to 15th harmonic  
 Required result: additional error < 0.5%

## Wiring Diagrams

Single phase input connections

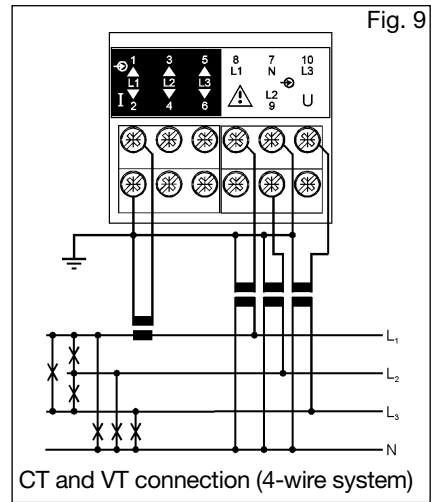
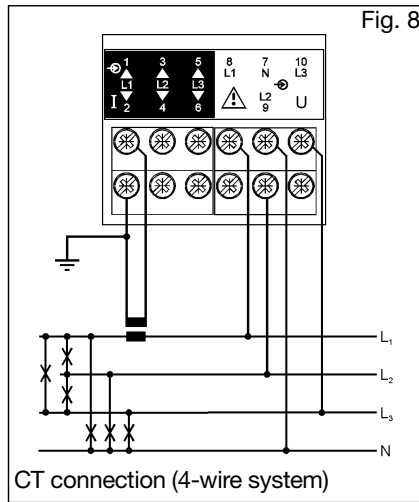
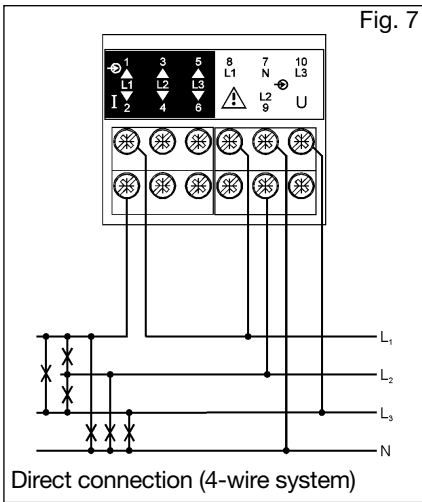


Three phase input connections - Balanced loads

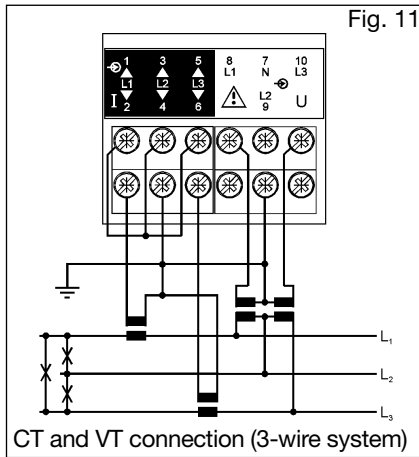
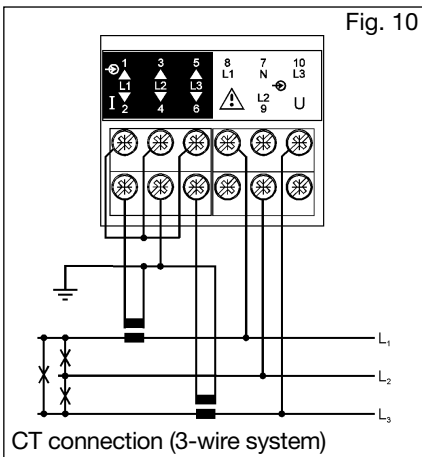




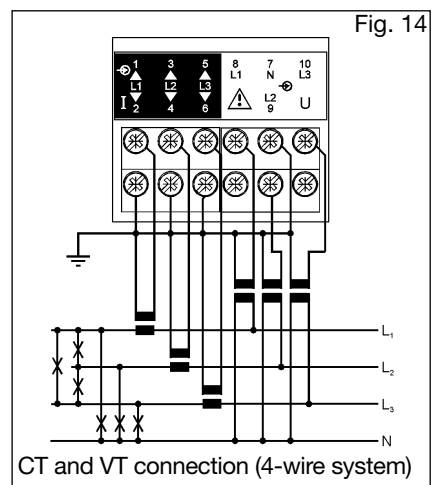
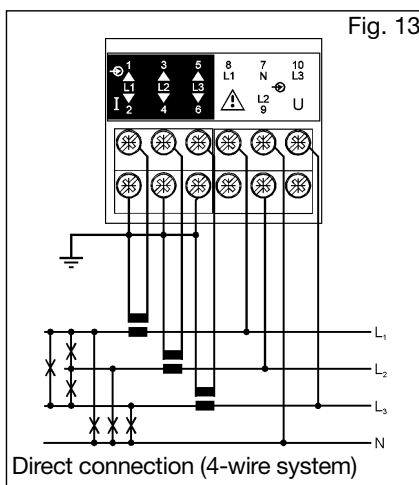
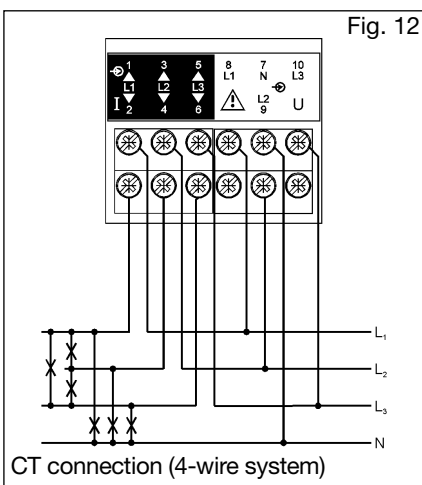
**Wiring Diagrams (cont.)**



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

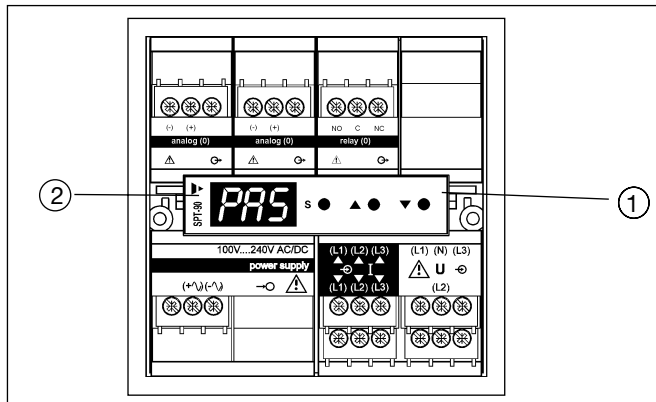


**Three phase, 4-wire input connections - Unbalanced loads**





## 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.

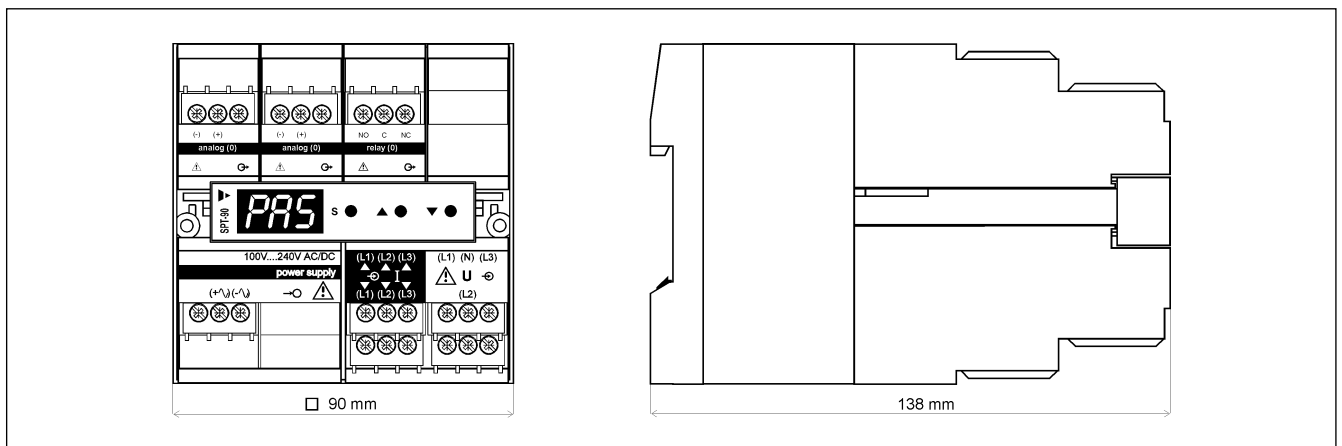
### 2. Display (on request)

3-digit (maximum read-out 999).

Alphanumeric indication by means of 7-segment display for:

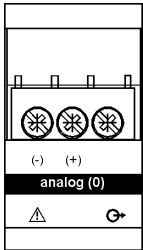
- Displaying only the configuration parameters

## Dimensions



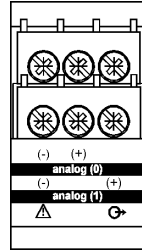
## Terminal Boards

### Single analogue output modules



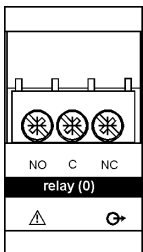
- AO1050** (20 mADC)
- AO1051** (10 VDC)
- AO1052** ( $\pm 5$  mADC)
- AO1053** ( $\pm 10$  mADC)
- AO1054** ( $\pm 20$  mADC)
- AO1055** ( $\pm 1$  VDC)
- AO1056** ( $\pm 5$  VDC)
- AO1057** ( $\pm 10$  VDC)

### Dual analogue output modules

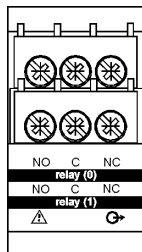


- AO1026** (20 mADC)
- AO1027** (10 VDC)
- AO1028** ( $\pm 5$  mADC)
- AO1029** ( $\pm 10$  mADC)
- AO1030** ( $\pm 20$  mADC)
- AO1031** ( $\pm 1$  VDC)
- AO1032** ( $\pm 5$  VDC)
- AO1033** ( $\pm 10$  VDC)

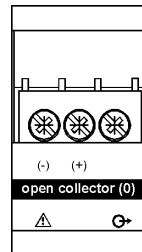
### Digital output modules



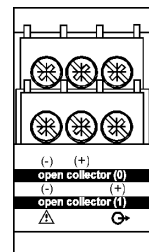
**AO1058**  
Single relay output



**AO1035**  
Dual relay output

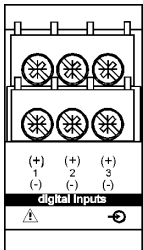


**AO1059**  
Single open collector output

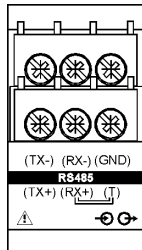


**AO1036**  
Dual open collector output

### Other input/output modules



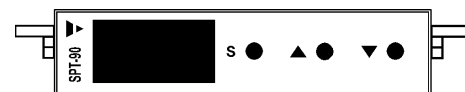
**AQ1038**  
3 Digital inputs



**AR1034**  
RS485 output

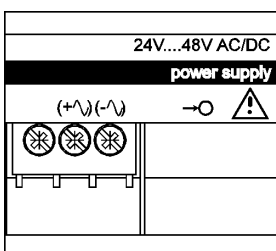


**AR1039**  
RS232 output

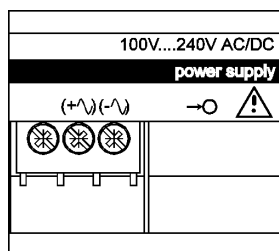


**AR1017**  
Programming Unit

### Power supply modules



**AP1021**  
18-60 VAC/DC power supply



**AP1020**  
90-260 VAC/DC power supply