

Energy Management Modular Smart Power Transducer Type SPT-90

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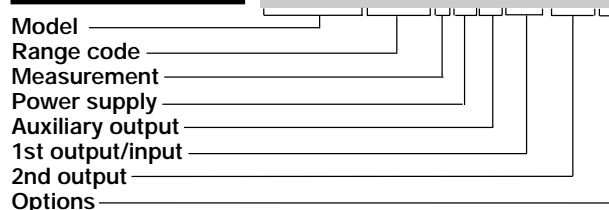


- Class 0.5
- 16-bit μ P-based modular smart power transducer
- Measurements of: W, Wavg, VA, VAr, PF, Wh, VAh, VArh, Amax (among the phases), VL-L avg, VL1-N, VL2-N, VL3-N, Hz L1.
- TRMS measurement of distorted waves (voltage/current)
- All configuration functions selectable by an optional removable key-pad or programming software
- Password protection of programming parameters
- Optional independent alarm setpoint
- Optional second analogue output (20 mADC/ \pm 20mADC \pm 10 mADC/ \pm 5 mADC/10 VDC/ \pm 5VDC/ \pm 1VDC)
- Optional serial RS 422/485 or RS232 output
- MODBUS, JBUS protocol.

Product Description

16-bit μ P-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**



Type Selection

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

¹⁾On request

Input Specifications

Number of inputs	Accuracy (basic unit)
Current	Voltage/current/energy
Voltage	Frequency
Digital	Active power (@ 25°C \pm 5°C, R.H. \leq 60%)
	Reading voltage/current: 17.5 to 25VDC/<8mA
	\pm 0.5% f.s. includes also: frequency, power supply and output load influences \pm 0.5% f.s. (45 to 500 Hz)
	\pm 0.5% f.s. (PF 0.7 L/C, 0.6 to 1 In, 0.9 to 1.1 Un) \pm 1% f.s. (PF 0.3 L/C, 0.2 to 1.2 In, 0.7 to 1.2 Un)

Specifications are subject to change without notice



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)	Ranges (impedances) AV1 (Un/In):	100 V $\sqrt{3}/100$ V (>250k Ω) - 1 AAC (≤ 0.3 VA)
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)	AV3 (Un/In):	100 V $\sqrt{3}/100$ V (>250k Ω) - 5 AAC (≤ 0.3 VA)
Additional errors Humidity	≤0.3% f.s., 60% to 90% R.H.	AV4 (Un/In):	250 V/433 V (>450k Ω) - 1 AAC (≤ 0.3 VA)
Input frequency	≤0.4% f.s., 62 to 400 Hz	AV5 (Un/In):	250 V/433 V (>450k Ω) - 5 AAC (≤ 0.3 VA)
Magnetic field	≤0.5% f.s. @ 400 A/m	AV7 (Un/In):	400 V/690 V (>1M Ω) - 5 AAC (≤ 0.3 VA)
Ripple	≤ 1% according to IEC 60688-1 and EN 60 688-1	Frequency range	48 to 62 Hz
Sampling rate	1900 Hz	Over-load protection Continuous: voltage/current For 1 s	1.2 Un/In
Display	7-segment, LED, h 9 mm	Voltage:	2 Un
Max. and min. indication	Max. 999, min. -999	Current:	20 In
Measurements	W, Wavg, VA, VAR, PF, Wh, VAh, VARh, Amax (among the phases), VL-L avg, VL1-N, VL2-N, VL3-N, Hz L1. TRMS measurement of a dis- torted wave voltage/current Coupling type : Direct Crest factor: ≥ 3	Programming keypad (on request)	Removable type 3 keys: "S" for enter pro- gramming 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)	Serial output (on request) Type	4000 V _{rms} output to supply input
Accuracy	±0.2% f.s. (@ 25°C±5°C, R.H. ≤60%)	Connections	RS422/RS485, multidrop bidirectional (static and dynamic variables)
Range	0 to 20 mADC, ±5mADC, ±10mADC, ±20mADC, 10VDC, ±1VDC, ±5VDC, ±10VDC.	Addresses	2 or 4-wire, termination directly on the module
Scaling factor	Programmable within the whole range of retransmis- sion; it allows the retrans- mission management of all values from 0 to 20 mADC, ±5mADC, ±10mADC, ±20mADC, 10VDC, ±1VDC, ±5VDC, ±10VDC.	Protocol	255, selectable by key-pad MODBUS/JBUS
Response time	≤ 250 ms typical (filter excluded)	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 over- flow 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}
Temperature drift	300 ppm/°C	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
Load:		Data format	1-start bit, 8-data bit, no parity/even parity, 1 stop bit
±20mA output	≤ 600 Ω	Baud-rate	1200, 2400, 4800 and 9600 selectable bauds
±10 mA output	≤ 550 Ω		
±5 mA output	≤ 1100 Ω		
10 V output	≤ 2200 Ω		
±10 V output	≥ 10 k Ω		
± 5 V output	≥ 10 k Ω		
± 1 V output	≥ 10 k Ω		
Insulation	By means of optocouplers, 4000 V _{rms} output to measuring input		

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

Software Functions

Password	Numeric code of max. 3 di- gits; 2 protection levels of the programming data Password "0", no protection Password from 1 to 499, all data are protected	Measurement selection (cont.)	system's reactive energy, system's (+/-) active energy
1st level		Transformer ratio	For CT up to 5000 A, For VT up to 100 kV (1MV)
2nd level		Scaling factor Operating mode	Electrical scale: compression/ expansion of the input scale to be connected to 1 or 2 ana- logue outputs and to the alarm output.
Measurement selection	System's active power (W), system's apparent power (VA), system's reactive power (VAr), average active power (Wavg), system's power factor (cos φ), maxi- mum current (A max), avera- ge phase-phase voltage, phase-neutral voltage- phase 1, phase-neutral vol- tage-phase 2, phase-neutral voltage-phase 3, frequency- phase 1. System's (+) active energy, system's apparent energy,	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 vari- ables: V, I, W and their derived ones)

Supply Specifications

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

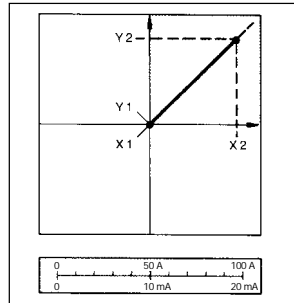


Figure D

The sign of measured quantity and output quantity remains the same. With the measured quantity being zero, the output quantity already has the value $Y_1 = 0.2 Y_2$. Live zero output.

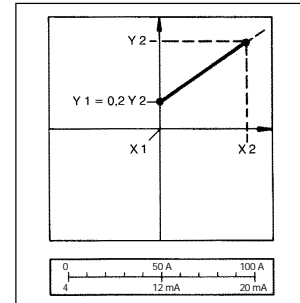


Figure B

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

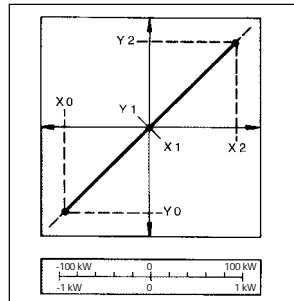


Figure E

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.

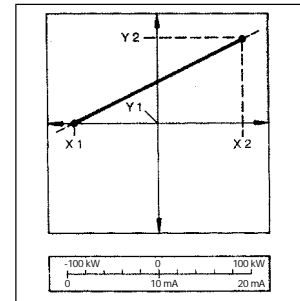


Figure C

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 $Y_0 = Y_1...Y_2$ and thus presented in strongly expanded form.

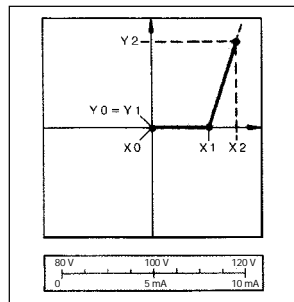
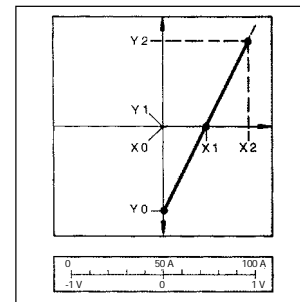


Figure F

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

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

The 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	
18-60VAC/DC power supply		AP1021	
90-260VAC/DC power supply		AP1020	
Programming unit		AR1017	The same unit can be used in several SPT's
20mADC analogue output	1	AO1050	
10VDC analogue output	1	AO1051	
±5mADC analogue output	1	AO1052	
±10mADC analogue output	1	AO1053	
±20mADC analogue output	1	AO1054	
±1VDC analogue output	1	AO1055	
±5VDC analogue output	1	AO1056	
±10VDC analogue output	1	AO1057	
20mADC 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
10VDC analogue output	2	AO1027	
±5mADC analogue output	2	AO1028	
±10mADC analogue output	2	AO1029	
±20mADC analogue output	2	AO1030	
±1VDC analogue output	2	AO1031	
±5VDC analogue output	2	AO1032	
±10VDC 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

The 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:

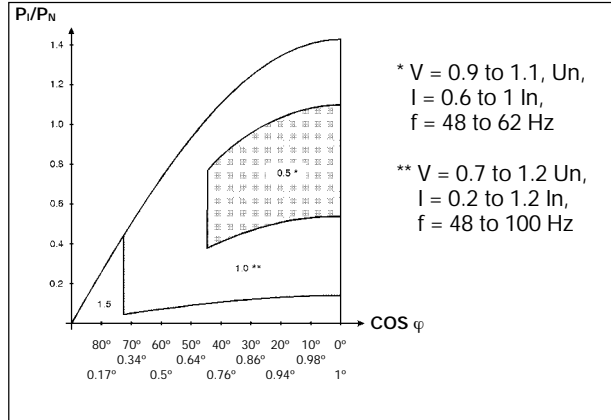
PU is the programming unit

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

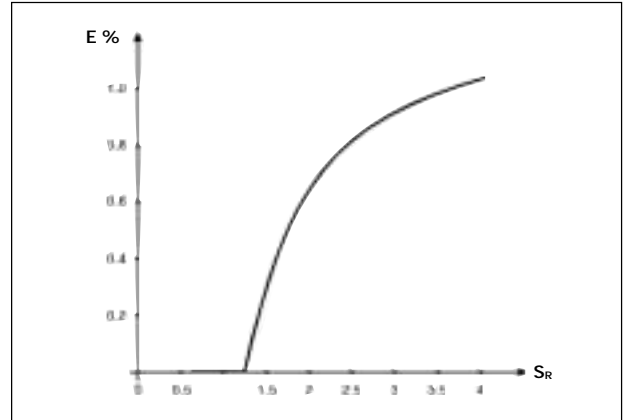


Mode of Operation

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_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.

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

P_i: (rated power of transducer)

One phase system:

$$P_i = U_i \cdot I_i \cdot VT(\text{ratio}) \cdot CT(\text{ratio})$$

Three phase, 3-wire system:

$$P_i = \sqrt{3} \cdot U_i \cdot I_i \cdot VT(\text{ratio}) \cdot CT(\text{ratio})$$

Three phase, 4-wire system:

$$P_i = 3 \cdot U_i \cdot I_i \cdot VT(\text{ratio}) \cdot CT(\text{ratio})$$

where:

U_i = 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).

$U_i = 6 \text{ kV}$ (delta voltage)

$I_i = 265 \text{ A}$ (single phase current)

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

$U_i = 100 \text{ V}$

$I_i = 5 \text{ A}$

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

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

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

$$P_i = \sqrt{3} \cdot U_i \cdot I_i \cdot VT(\text{ratio}) \cdot CT(\text{ratio}) = \sqrt{3} \cdot 100 \cdot 5 \cdot 60 \cdot 60 = 3.12 \text{ MW}$$

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

Example 2:

Model AV3.3 (4-wire system).

$U_i = 6 \text{ kV} / \sqrt{3}$

$I_i = 265 \text{ A}$

$\cos \varphi = 0.85$

$U_i = 100 \text{ V} / \sqrt{3}$

$I_i = 5 \text{ A}$

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

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

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

$$P_i = 3 \cdot U_i \cdot I_i \cdot VT(\text{ratio}) \cdot CT(\text{ratio}) = 3 \cdot 100 / \sqrt{3} \cdot 5 \cdot 60 \cdot 60 = 3.12 \text{ MW}$$

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

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%

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

$1.32 \geq 1.25$ 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

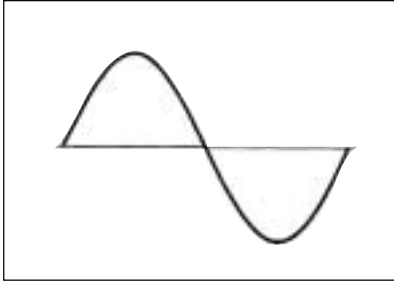


Figure G
Sine wave, undistorted
 Fundamental content 100%
 Harmonic content 0%
 $A_{rms} = 1.1107 |\bar{A}|$

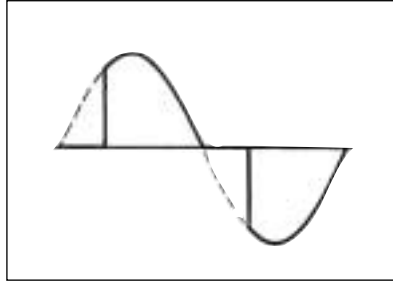


Figure H
Sine wave, indented
 Fundamental content 10...100%
 Harmonic content 0...90%
 Frequency spectrum 3rd to 16th harmonic
 Required result: additional error < 1%

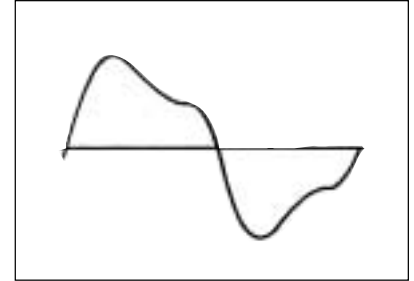
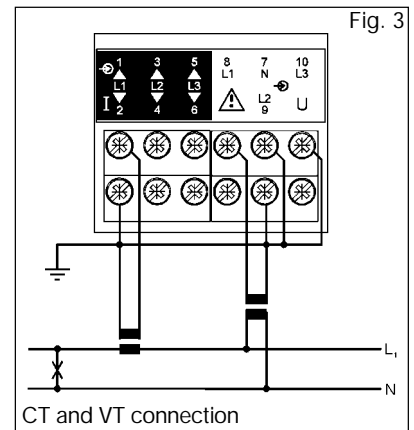
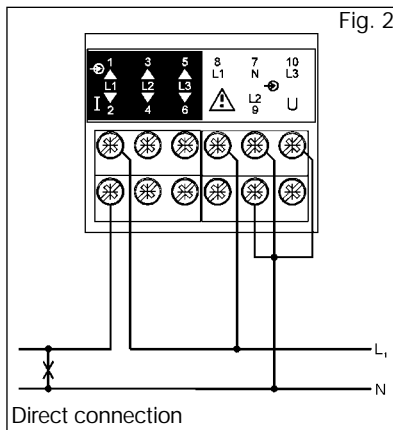
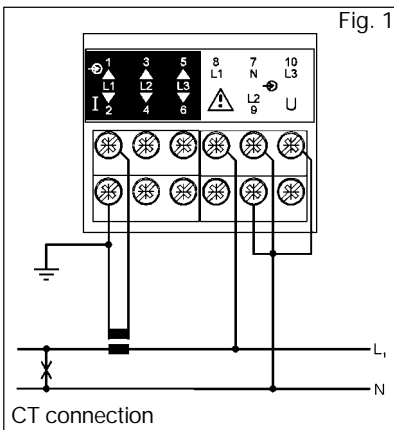


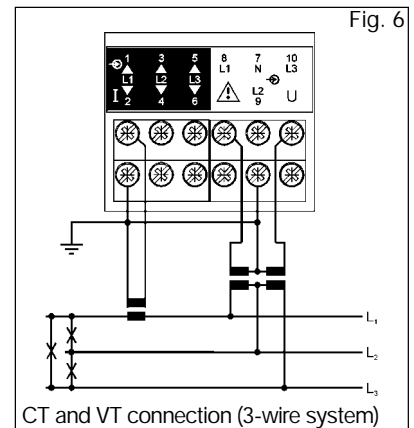
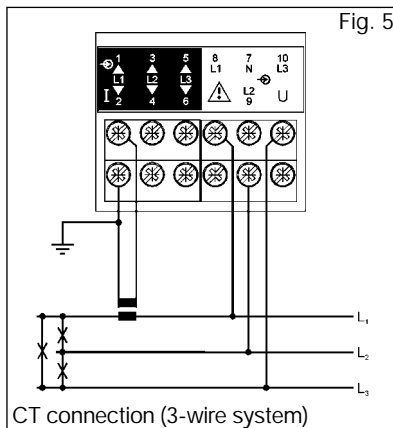
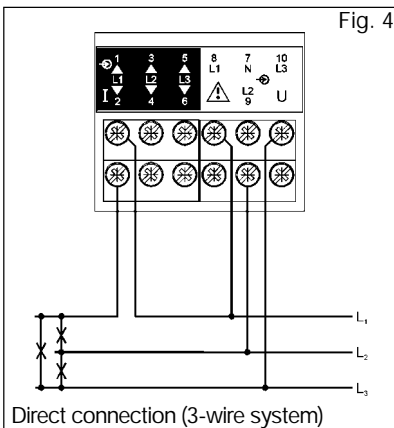
Figure I
Sine wave, distorted
 Fundamental content 70...90%
 Harmonic content 10...30%
 Frequency spectrum 3rd to 15th harmonic
 Required result: additional error < 0.5%

Wiring Diagrams

Single phase input connections

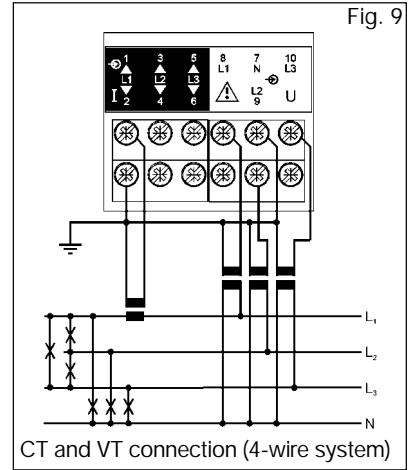
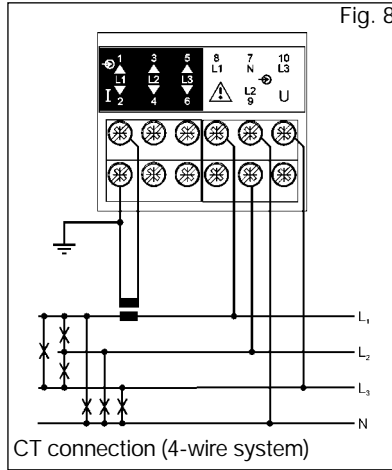
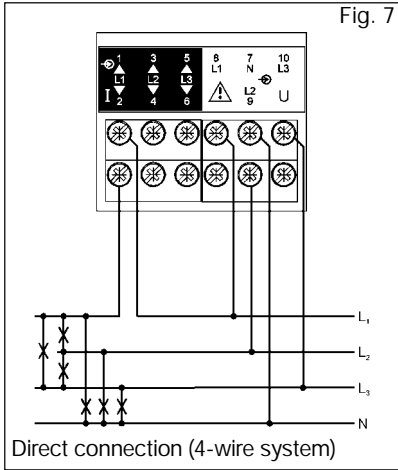


Three phase input connections - Balanced loads

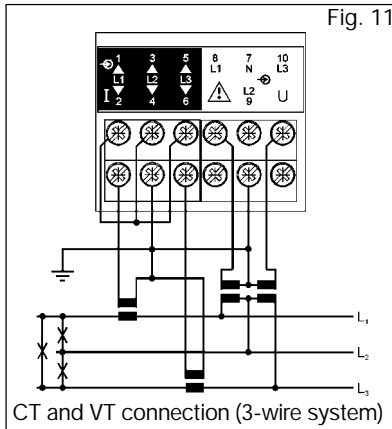
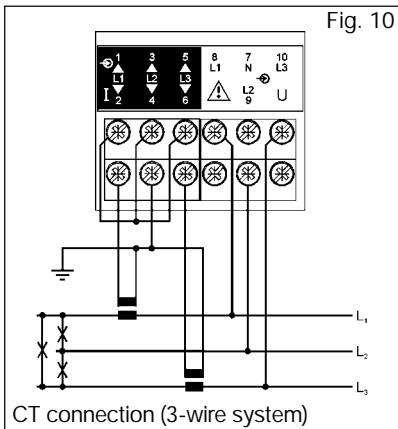




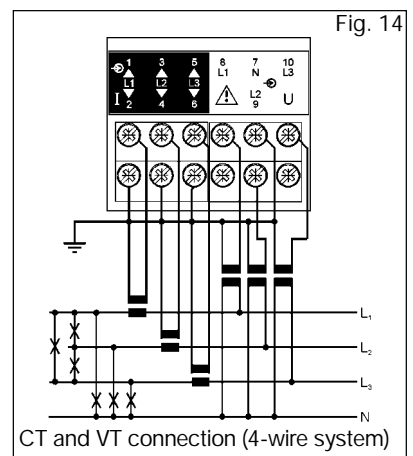
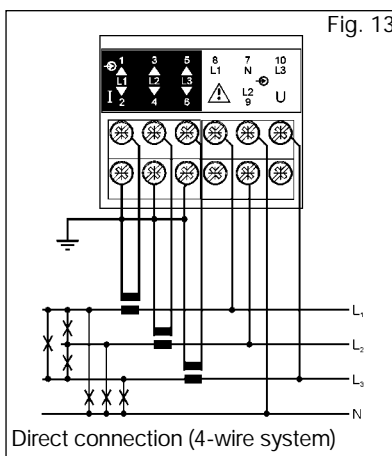
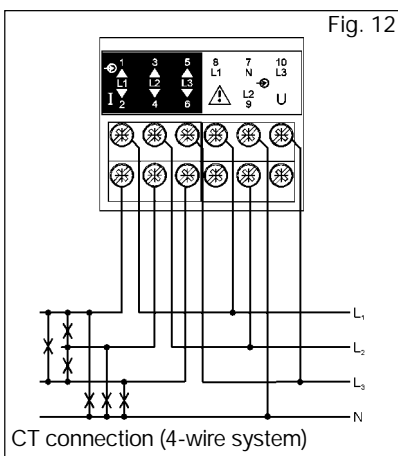
Wiring Diagrams (cont.)



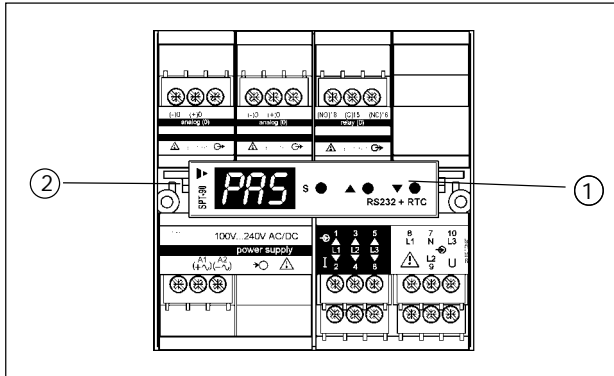
Three-phase, 3-wire ARON input connections - Unbalanced loads



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.

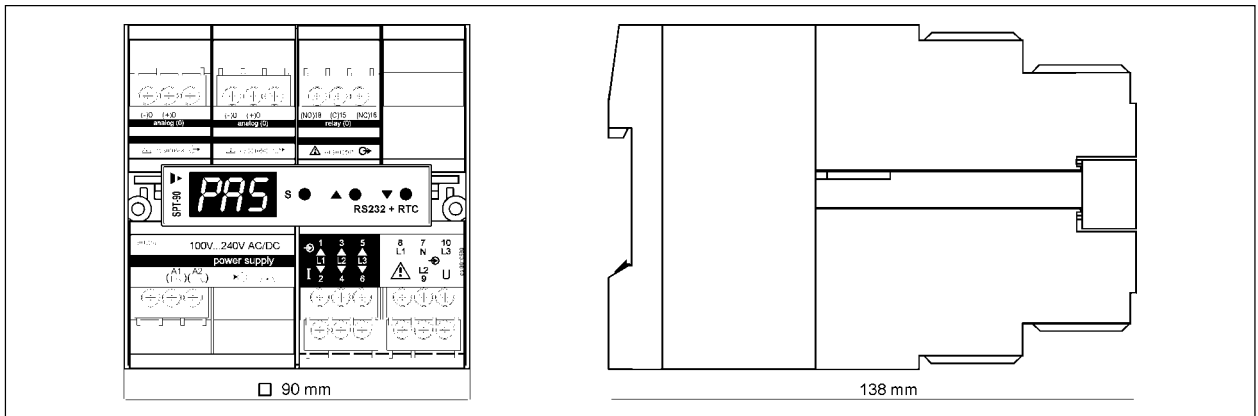
"▲" and "▼"
- Up and down keys for increasing or decreasing programming values.
- Selecting programming functions and transducer configuration together with the "S" key.

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

Alphanumeric indication by means of 7-segment display for:

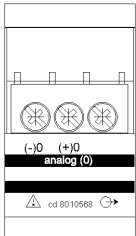
- Displaying only the configuration parameters

Dimensions



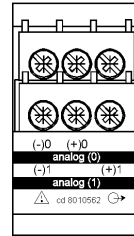
Terminal boards

Single analogue output modules



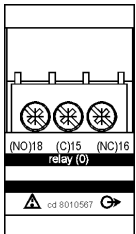
- AO1050 (20mADC)
- AO1051 (10VDC)
- AO1052 (± 5 mADC)
- AO1053 (± 10 mADC)
- AO1054 (± 20 mADC)
- AO1055 (± 1 VDC)
- AO1056 (± 5 VDC)
- AO1057 (± 10 VDC)

Dual analogue output modules

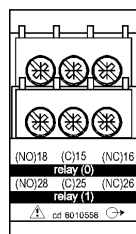


- AO1026 (20mADC)
- AO1027 (10VDC)
- AO1028 (± 5 mADC)
- AO1029 (± 10 mADC)
- AO1030 (± 20 mADC)
- AO1031 (± 1 VDC)
- AO1032 (± 5 VDC)
- AO1033 (± 10 VDC)

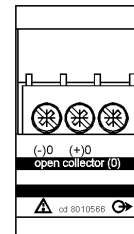
Digital output modules



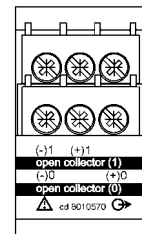
AO1058
Single relay output



AO1035
Dual relay output

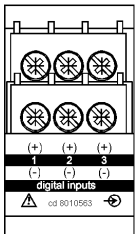


AO1059
Single open collector output

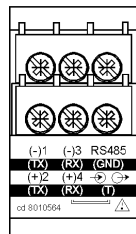


AO1036
Dual open collector output

Other input/output modules



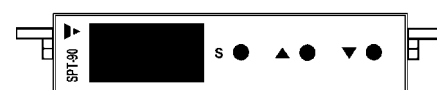
AQ1038
3 Digital inputs



AR1034
RS485 output

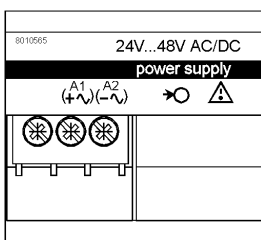


AR1039
RS232 output

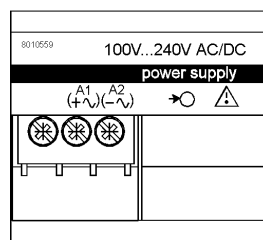


AR1017
Programming Unit

Power supply modules



AP1021
18-60VAC/DC power supply



AP1020
90-260 VAC/DC power supply