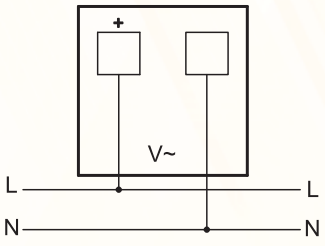
Analog indicating panel meters

These panel meters are produced with frames of three sizes: 96 × 96; 72 × 72 and 48 × 48 mm. The casing of these panel meters was made of heat resistant and flameproof, self-extinguishing ABS (UL94V-1). The protection degree of the instrument casings meets the requirements within IP 52, however the contacts have protection degree of IP 00. For this reason, during their mounting special measures to prevent electric shocks are required. The instruments are constructed for use in a vertical position; their dial plate of 90° is replaceable. The instruments can be fixed into the gap of the mounting plate using an attached plastic frame. The thickness of the mounting plate should be max. 5 mm. The instruments meet the requirements of IEC 51 and EN 61010-1 standards, the sizes of the cut-off panels fulfil the requirements of DIN 43700, and the size specifications of DIN 43718, while the indicator is made in accordance with the DIN 43802 standard. • Rated isolation voltage: 660 V. • Ambient temperature: - 25°C…+55 °C. • Vibration resistance at 50/60 Hz: 0.25 mm

AC voltage meters

These meters are eligible to measure the TRMS of the alternate voltage in 0-600 V voltage range. The measuring unit is of iron vane type the measured value is readable from the logarithmical scale of device.



Technical data

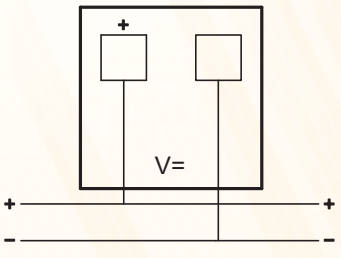
Type of scale: logarithmical scale
Overload: 1,5 U_n (constant), 2 U_n (momentary)

RELEVANT STANDARD
EN 60051-1

Tracon Code	Size (mm)	Metering range (V)	Accuracy (%)
ACVM96-30	96×96	0-30	1,5
ACVM96-120	96×96	0-150	1,5
ACVM96-250	96×96	0-250	1,5
ACVM96-450	96×96	0-500	1,5
ACVM96-600	96×96	0-600	1,5
ACVM72-30	72×72	0-30	1,5
ACVM72-120	72×72	0-150	1,5
ACVM72-250	72×72	0-250	1,5
ACVM72-450	72×72	0-500	1,5
ACVM72-600	72×72	0-600	1,5
ACVM48-30	48×48	0-30	1,5
ACVM48-120	48×48	0-150	1,5
ACVM48-250	48×48	0-250	1,5
ACVM48-450	48×48	0-500	1,5
ACVM48-600	48×48	0-600	1,5

DC voltage meters

These meters are eligible to measure the value of the direct voltage in 0-600 V voltage range. The measuring unit is of swinging coil type; the measured value is readable from the linear scale of device.



Technical data

Type of scale: linear scale
Overload: 1,2 U_n (constant), 4 U_n (momentary)

RELEVANT STANDARD
EN 60051-1

Tracon Code	Size (mm)	Metering range (V)	Accuracy (%)
DCVM96-30	96×96	0-30	1,5
DCVM96-120	96×96	0-120	1,5
DCVM96-250	96×96	0-250	1,5
DCVM96-400	96×96	0-400	1,5
DCVM96-600	96×96	0-600	1,5
DCVM72-30	72×72	0-30	1,5
DCVM72-120	72×72	0-120	1,5
DCVM72-250	72×72	0-250	1,5
DCVM72-400	72×72	0-400	1,5
DCVM72-600	72×72	0-600	1,5
DCVM48-30	48×48	0-30	1,5
DCVM48-120	48×48	0-120	1,5
DCVM48-250	48×48	0-250	1,5
DCVM48-400	48×48	0-400	1,5
DCVM48-600	48×48	0-600	1,5

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Direct AC current meters

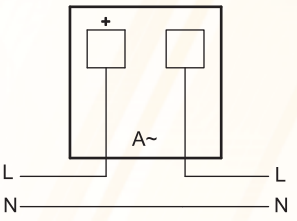
These meters are eligible to measure the TRMS of the alternate current in 0-100 A current range without any other accessories. The measuring unit is of iron vane type. On the logarithmical scale the maximal elongation means twice as much as the metering range.

Technical data

Type of scale: logarithmical scale
Overload: 1,2 I_n (constant), 4 I_n (momentary)

RELEVANT STANDARD
EN 60051-1

Tracon Code	Size (mm)	Metering range (A)	Accuracy (%)
ACAM96-5	96×96	0-5	1,5
ACAM96-10	96×96	0-10	1,5
ACAM96-30	96×96	0-30	1,5
ACAM96-50	96×96	0-50	1,5
ACAM96-75	96×96	0-75	1,5
ACAM96-105	96×96	0-100	1,5
ACAM72-5	72×72	0-5	1,5
ACAM72-10	72×72	0-10	1,5
ACAM72-30	72×72	0-30	1,5
ACAM72-50	72×72	0-50	1,5
ACAM72-75	72×72	0-75	1,5
ACAM48-5	48×48	0-5	1,5



Direct AC current meters with changeable dial plate

These meters are eligible to measure directly the current values of high current electric circuits. Suitable current transformers (CT) are used for extension of the measuring range. The basic instrument will be connected to the 5 A secondary coil of the CT. Changeable dial plates with 0 … X metering range can be ordered according to the table below.

Technical data

Type of scale: logarithmical scale
Overload: 1,2 I_n (constant), 4 I_n (momentary)

RELEVANT STANDARD
EN 60051-1

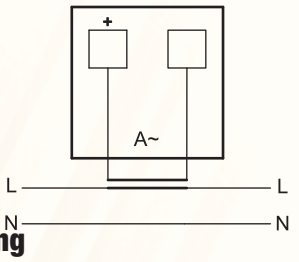
Basic AC instruments

Tracon Code	Size (mm)	Metering range (A)	Accuracy (%)
ACAM96-5	96×96	0-5	1,5
ACAM72-5	72×72	0-5	1,5
ACAM48-5	48×48	0-5	1,5

Dial plates for ACAM... current meters

Tracon code: SKALA-AC

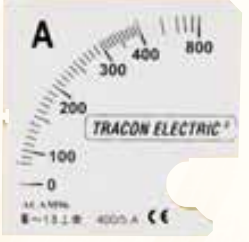
The instruments coded as ACAM 96-5; ACAM 72-5 and ACAM 48-5 can be used as measuring instruments in the secondary circuit (of 5 A) of low voltage current transformers (types AVA and AV).
The dial plate of the instruments can be changed simply, by using the proper plate; the instrument can be connected into the secondary circuit of a current transformer with any primary current intensity.



Harmonization table for current transformers and dial plates for direct current metering

CT ratio	Measuring range 0-X (A)	CT ratio	Measuring range 0-X (A)	CT ratio	Measuring range 0-X (A)	CT ratio	Measuring range 0-X (A)
30/5	0-30	120/5	0-120	400/5	0-400	1500/5	0-1500
40/5	0-40	125/5	0-125	500/5	0-500	2000/5	0-2000
50/5	0-50	150/5	0-150	600/5	0-600	2500/5	0-2500
60/5	0-60	200/5	0-200	750/5	0-750	3000/5	0-3000
75/5	0-75	250/5	0-250	800/5	0-800	4000/5	0-4000
80/5	0-80	300/5	0-300	1000/5	0-1000	5000/5	0-5000
100/5	0-100						

Please remark the X value at ordering according to the wanted measuring range!



Direct DC current meters

These meters are eligible to measure the value of the direct current in 0-20 A current range without any other accessories. The measured value is readable from the linear scale of device. The DC milliampere meters are eligible to measure the unified current values on electronic actuating and control systems. For the meter – after agreement – special dial plate is also can be ordered, so the device will be able to measure the physical value transformed to electric value (e.g. force, temperature, rev).

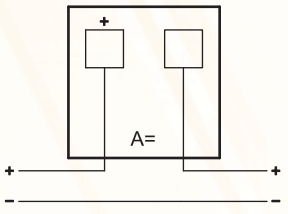
Technical data

Type of scale: linear scale
Overload: 1,2 I_n (constant), 4 I_n (momentary)

RELEVANT STANDARD
EN 60051-1

DC milliampere meters

Tracon Code	Size (mm)	Metering range (mA)	Accuracy (%)
DCAM96-0,02	96×96	4-20	1,5
DCAM72-0,02	72×72	4-20	1,5
DCAM48-0,02	48×48	4-20	1,5



DC ampere meters

Tracon Code	Size (mm)	Metering range (A)	Accuracy (%)
DCAM96-5	96×96	0-5	1,5
DCAM96-20	96×96	0-20	1,5
DCAM72-5	72×72	0-5	1,5
DCAM72-20	72×72	0-20	1,5
DCAM48-5	48×48	0-5	1,5
DCAM48-20	48×48	0-20	1,5

Direct DC current meters with changeable dial plate

These meters are eligible to measure directly the current values of high current electric circuits. The extension of the metering range happens with shunt; the basic meter with 0 ... 75 mV voltage range has to be connected to the measuring contact of the shunt. For basic DC current meter a changeable dial plate can be ordered with 0-X metering range, according to the next table.

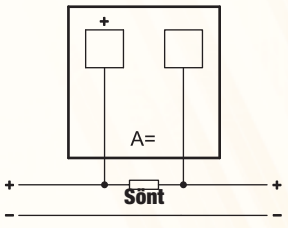
Technical data

Type of scale: linear scale
Overload: 1,2 I_n (constant), 4 I_n (momentary)

RELEVANT STANDARD
EN 60051-1

DC basic meters

Tracon Code	Size (mm)	Metering range (mV)	Accuracy (%)
DCVM-96B	96×96	0-75	1,5
DCVM-72B	72×72	0-75	1,5
DCVM-48B	48×48	0-75	1,5



Dial plates for DC current metering

Tracon code: SKALA-DC

The direct current measuring tasks can be solved by using shunts and DC current basic meters. The basic meters with the rated data seen above are eligible for DC current metering; they can connect to TSF type shunts with 75 mV metering voltage.

Harmonization table for shunts and dial plates for indirect current metering

Tracon code of shunt	Measuring range 0-X (A)	Tracon code of shunt	Measuring range 0-X (A)	Tracon code of shunt	Measuring range 0-X (A)	Tracon code of shunt	Measuring range 0-X (A)
TSF-30	0-30	TSF-100	0-100	TSF-400	0-400	TSF-1000	0-1000
TSF-40	0-40	TSF-150	0-150	TSF-500	0-500	TSF-1500	0-1500
TSF-50	0-50	TSF-200	0-200	TSF-600	0-600	TSF-2000	0-2000
TSF-75	0-75	TSF-300	0-300	TSF-750	0-750	TSF-3000	0-3000

Please remark the X value at ordering according to the wanted measuring range!

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Power meters

These power meters are eligible to measure the active power of one or three phases loads. The metering range of the devices is determined according to the primary current (X) of the applied CT-s with 5 A secondary current. In panel meters of 96 × 96 mm frame size, the basic instrument and the plastic casing (box) of the measuring electronics are placed in the same unit, whereas with the meters of 72×72 mm frame size, the measuring electronics and the basic instrument are delivered separately and should be placed and wired separately in the control box as well. Dial plates can be done according to the table below.

Technical data

Type of scale: linear scale
Overload: 1,2 I_n; 1,2 U_n (constant), 4 I_n; 2 U_n (momentary)

RELEVANT STANDARD
EN 60051-1
EN 60051-3

Meters for one phase measurements

Tracon Code	Size (mm)	Metering range	Rated voltage	CT ratio	Accuracy (%)
W96-240V/1	96×96	0-100 marks	240 V~	X/5 A	1,5
W72-240V/1	72×72	0-100 marks	240 V~	X/5 A	1,5

Meters for three phases measurements

Tracon Code	Size (mm)	Metering range	Rated voltage	CT ratio	Accuracy (%)	Number of CT-s	Number of wires on the circuit
W96-400V/3	96×96	0-100 marks	400 V~	X/5 A	1,5	2	3 wires
W96-400V/4	96×96	0-100 marks	400 V~	X/5 A	1,5	3	4 wires
W72-400V/3	72×72	0-100 marks	400 V~	X/5 A	1,5	2	3 wires
W72-400V/4	72×72	0-100 marks	400 V~	X/5 A	1,5	3	4 wires

Dial plates for power meters

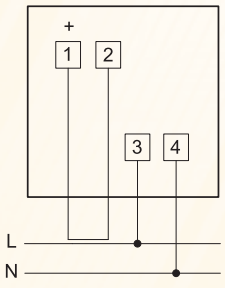
Values at variance from the measurement limits given in the table will appear depending on the primary current of the current transformer. The individual scales can be set to your requirements within 7 days. The harmonization between special dial plates and current transformers can be completed by next table.

Harmonization table for current transformers and dial plates for one or three phase power metering

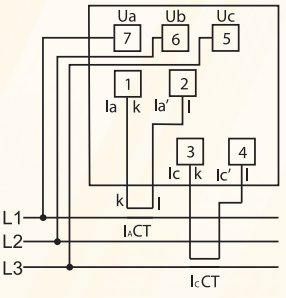
CT ratio X/5	Measuring range: One phases power meter	Measuring range: Three phases power meter	CT ratio X/5	Measuring range: One phases power meter	Measuring range: Three phases power meter
30/5	6 kW	24 kW	300/5	60 kW	240 kW
40/5	8 kW	32 kW	400/5	80 kW	320 kW
50/5	10 kW	40 kW	500/5	100 kW	400 kW
60/5	12 kW	48 kW	600/5	120 kW	480 kW
75/5	15 kW	60 kW	750/5	150 kW	600 kW
80/5	16 kW	64 kW	800/5	160 kW	640 kW
100/5	20 kW	80 kW	1000/5	200 kW	800 kW
120/5	24 kW	96 kW	1500/5	300 kW	1200 kW
125/5	25 kW	100 kW	2000/5	400 kW	1600 kW
150/5	30 kW	120 kW	2500/5	500 kW	2000 kW
200/5	40 kW	160 kW	4000/5	800 kW	3200 kW
250/5	50 kW	200 kW	5000/5	1000 kW	4000 kW

Legend

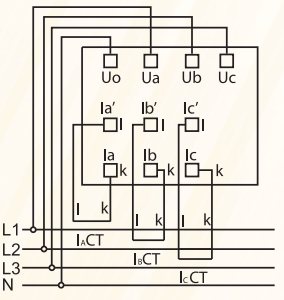
CT = current transformer
k,l = secondary terminals of CT



Wiring diagram of one phase power measurement



Wiring diagram of power measurements with 3 phases, 3-wire system



Wiring diagram of power measurements with 3 phases, 4- wire system

Frequency meters

Used to measure the frequency of low voltage networks, in the 45 … 55 Hz range. Voltage has to be connected to the terminals of the device; the instrument displays the value of the frequency by help of a transformer enclosed within the unit. Frequency meters shall be wired the same way as voltage meters, see p. I/2.

Technical data

Rated voltage: 230 V~
Type of scale: logarithmical scale, 0-X
Overload: 1,2 U_n (constant), 2 U_n (momentary)

RELEVANT STANDARD
EN 60051-1

Tracon Code	Size (mm)	Metering range (Hz)	Accuracy (%)
F96-220/50	96×96	45-55 (230 V)	1,5
F72-220/50	72×72	45-55 (230 V)	1,5
F48-220/50	48×48	45-65 (230 V)	2,5

Power factor (cos φ) meters

These devices are measuring the power factor of one or three phases system in 0,5 capacitive – 0,5 inductive range. If the current is higher than 5 A, a secondary current transformer of 5 A shall be used. According to capacitive or inductive load of system the pointer moves to left (capacitive) or to right (inductive) side on the symmetrical scale. The metering changer is installed in the housing.

Technical data

Rated voltage: 240/400 V~
Type of scale: logarithmical scale
Overload: 1,2 I_n; 1,2 U_n (constant), 4 I_n; 2 U_n (momentary)

RELEVANT STANDARD
EN 60051-1

Power factor meters for one phase

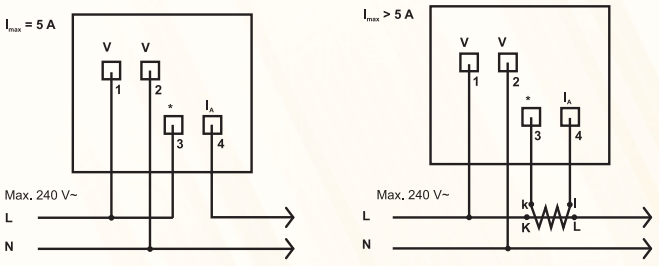
Tracon Code	Size (mm)	Metering range	Input values*	Accuracy (%)
CF96-0,5/1	96×96	0,5 cap-1-0,5 ind	240 V; 5 A	1,5
CF72-0,5/1	72×72	0,5 cap-1-0,5 ind	240 V; 5 A	1,5

Art of load
Lead = capacitive,
Lag = inductive

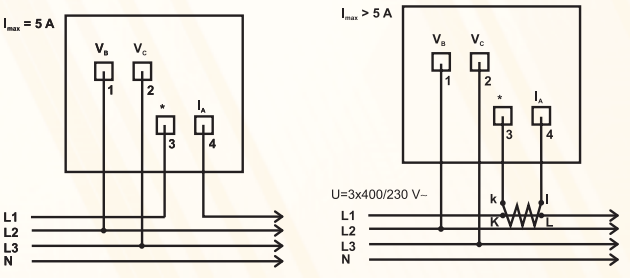
Power factor meters for three phases

Tracon Code	Size (mm)	Metering range	Input values*	Accuracy (%)
CF96-0,5/3	96×96	0,5 cap-1-0,5 ind	400 V; 5 A	2,5
CF72-0,5/3	72×72	0,5 cap-1-0,5 ind	400 V; 5 A	2,5

Wiring diagram for one phase system

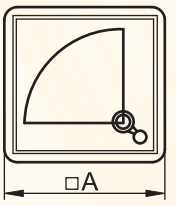


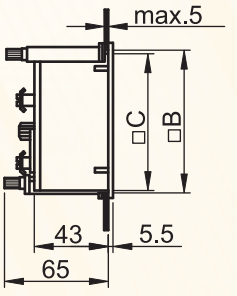
Wiring diagram for three phases system

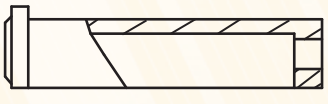


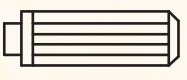
Dimensions and fixing of metering devices

Size (mm)	A (mm)	B (mm)	C (mm)
96×96	96	91	90
72×72	72	67	66
48×48	48	43	42





Fixer 

 Plastic bolt

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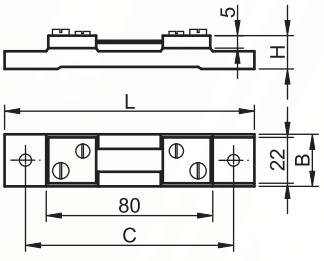
TSF shunt product family

The voltage drop between the two connectors of the shunt - induced by the current, flowing through the shunt - is proportional to the resistance of the shunt.
Therefore, the intensity of the current flowing through the circuit can be determined in function of the voltage measured between the end-points of the shunt with known resistance value.
The diagram illustrates the process of voltage drop (Um) in the shunt (Rs), measured with the instrument (mV). The current intensity value can be read directly on the dial scale in Ampere units.
The voltage drop between the measuring points of the available direct current shunts (TSF) is limited to max. 75 mV. Therefore, the measurement values of the attached basic instruments are also limited to 75 mV.

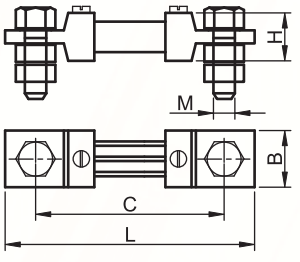
RELEVANT STANDARD
EN 61010-1 EN 61010-9

Tracon Code	Metering range (A/mV)	L (mm)	C (mm)	B (mm)	H (mm)	C1 (mm)	M (mm)
TSF-30	30A/75mV	120	102	25	15	-	-
TSF-40	40A/75mV	120	102	25	15	-	-
TSF-50	50A/75mV	120	102	25	15	-	-
TSF-75	75A/75mV	110	86	23	10	-	M8×35
TSF-100	100A/75mV	106	86	23	10	-	M8×35
TSF-150	150A/75mV	116	86	21	22	-	M8×35
TSF-200	200A/75mV	116	86	21	22	-	M8×35
TSF-300	300A/75mV	127	100	26	22	-	M10×35
TSF-400	400A/75mV	126	100	35	22	-	M10×35
TSF-500	500A/75mV	126	100	43	22	-	M10×35
TSF-600	600A/75mV	126	100	50	22	-	M10×35
TSF-750	750A/75mV	126	102	74	22	50	M10×35
TSF-1000	1000A/75mV	126	102	94	22	50	M12×60
TSF-1500	1500A/75mV	200	164	90	96	50	M12×60
TSF-2000	2000A/75mV	194	160	90	96	53	M12×60
TSF-3000	3000A/75mV	198	160	142	96	50	M12×60

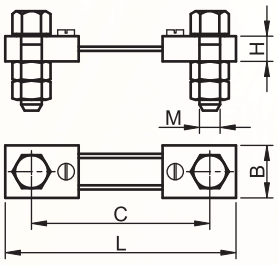
The technical data of SKALA-DC dial plates to be connected to the nominal current of the shunts are shown on the page I/4.
Orders for dial plates are delivered generally within three working days.



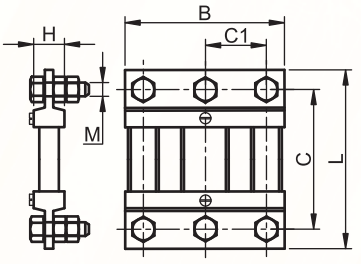
TSF-30...TSF-50

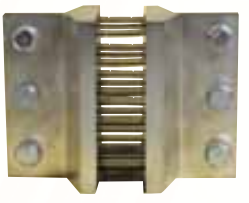


TSF-150...TSF-600

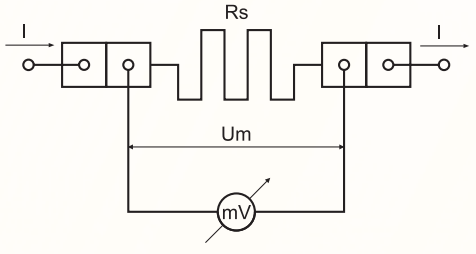


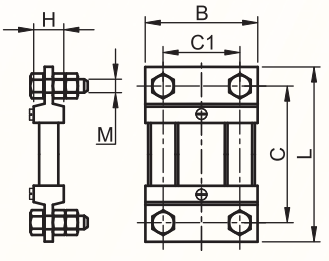
TSF-75...TSF-100





TSF-750...TSF-2000





TSF-3000

Digital displayed electric meters

With these electric meters alternate current (A), voltage (V), power (W), and in alternate current lines frequency (Hz), power ratio (cosφ), and reactive power (VAr) are measurable on distribution boxes and switching panels. This digital panel mount meters are available in two sizes: 96×96 and 72×72 mm. Enclosure of the instrument is made of heat and flame protective, self-extinguishing ABS (UL94V-1). The meters were produced in accordance with IEC 51 and EN 61010-1 standard requirements, the cut-out size is according to DIN 43700, the frame size is according to DIN 43718 standard. The meters are adaptable as meters in 5 A secondary lines of AVA and AV type low current CT's. The way of mounting and dimensions see on page I/10!

Direct digital ammeter

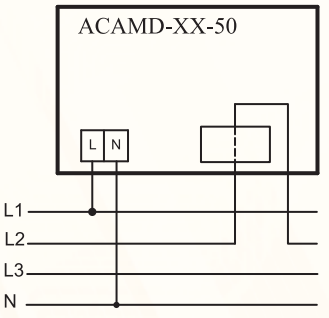
This device is able to measure directly the current up to 50 A without any extra accessories. The pluggable terminals for power supply and metering are on the back side of device. The output for current metering is one low-current transformer with 50/5A ratio also on the back side of device; the phase wire has to pass trough the CT. The meters are operating full automatically, a three digit display gives information from the measured value.

Technical data

Supply voltage:	230 V AC, 50/60 Hz
Operating range:	$(0,8 – 1,2)\times U_n$
Accuracy:	± 0,1 %
Terminal capacity:	1 – 2,5 mm²
Operating temperature:	-25 °C…+65 °C
Protection degree:	IP 20 at terminals
	IP 40 from front plate

RELEVANT STANDARD

EN 61010-1



Tracon Code	Metering range	Size	Weight
ACAMD-96-50	0-50 A AC	96×96 mm	445 g
ACAMD-72-50	0-50 A AC	72×72 mm	245 g

Digital ammeter with adjustable CT transfer ratio (with relay output)

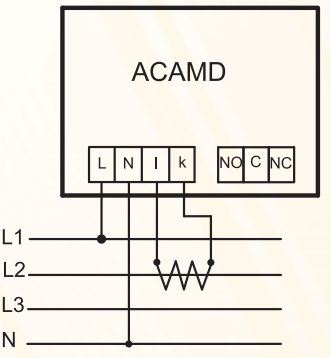
These meters are able to measure the effective value of alternate current, the CT-s transfer ratio is adjustable from 5/5 A to 10000/5 A. The device is programmable by front panel buttons. The microprocessor based programming enables the user to check the adjusted CT ratio, and define the critical current level for over-current alert via relay output. The **ACAMD** type meter is a version of **ACAMD-P** type without relay output.

Technical data

Supply voltage:	230 V AC, 50/60 Hz
Operating range:	$(0,8 – 1,2)\times U_n$
Input current:	0 – 5 A AC
CT transfer ratio:	1 – 9500/5 A
Output (ACAMD-P):	250 V AC – 5 A
Status of relay output:	1 pc changeover contact
Accuracy:	± 2 %
Terminal capacity:	1 – 2,5 mm²
Operating temperature:	-25 °C…+65 °C
Protection degree:	IP 20 at terminals
	IP 40 from front plate

RELEVANT STANDARD

EN 61010-1



Tracon Code	Status	Metering range*	Size	Weight
ACAMD-96	Without relay output	0-9500 A AC	96×96 mm	305 g
ACAMD-72	Without relay output	0-9500 A AC	72×72 mm	250 g
ACAMD-P-96	Programmable relay output	0-9500 A AC	96×96 mm	320 g
ACAMD-P-72	Programmable relay output	0-9500 A AC	72×72 mm	265 g

* Technical data and description about CT-s are on page I/22-I/26!

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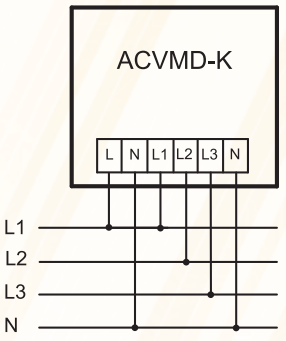
Digital voltmeter (with phase-selection)

The device is suitable to measure the effective value of alternate voltage. The **ACVMD-K-...-500** voltmeter is able to measure the effective value of three phase voltage; the result can be displayed to the user when desired. The power supply, the phase and the neutral wires can be mounted via plug-in terminals on the back of device. A three digit display gives information about the measured value.

Technical data

Supply voltage:	230 V AC
Rated frequency:	50/60 Hz
Operating range:	$(0,8 – 1,2)\times U_n$
Voltage inputs (ACVMD):	V1,V2
Voltage inputs (ACVMD-K):	L1, L2, L3, N
Accuracy:	± 1 %
Terminal cable diameter:	1 – 2,5 mm²
Operating temperature:	-25 °C…+65 °C
Protection degree:	IP 20 at terminals IP 40 from front plate



RELEVANT STANDARD
EN 61010-1

Tracon Code	Status	Measuring range*	Size	Weight
ACVMD-96-500	One phase	0-500 V AC	96×96 mm	300 g
ACVMD-72-500	One phase	0-500 V AC	72×72 mm	240 g
ACVMD-K-96-500	Three phases with phase selection*	0-500 V AC	96×96 mm	305 g
ACVMD-K-72-500	Three phases with phase selection*	0-500 V AC	72×72 mm	245 g

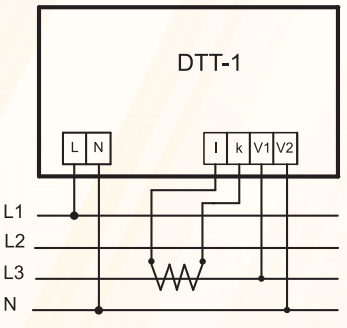
* The needed phase can be selected by pushbutton on the front panel of device.

Digital ammeter and voltmeter with adjustable CT ratio

With this microcontroller based device the connected line's current and voltage values are measurable. The current transformer (CT) ratio is adjustable from 5/5 A to 9500/5 A. The device meters the true effective (TRMS) values; the CT ratio is adjustable by front panel pushbuttons. The pluggable terminals for power supply and metering are on the back side of device. The voltage value is readable from 3 digits, the current value from 4 digits LED display.

Technical data

Supply voltage:	230 V AC
Rated frequency:	50/60 Hz
Operating range:	$(0,8 – 1,2)\times U_n$
Current inputs (I, k):	0 – 5 A AC
Voltage inputs (V1, V2):	0 – 500 V AC
Accuracy:	± 1 %
Terminal cable diameter:	1 – 2,5 mm²
Operating temperature:	-25 °C…+65 °C
Protection degree:	IP 20 at terminals IP 40 from front plate



RELEVANT STANDARD
EN 61010-1

Tracon Code	Measuring range of voltage	Measuring range of current*	Size	Weight
DTT-1-96	0-500 V AC	0-9500 A AC	96×96 mm	325 g
DTT-1-72	0-500 V AC	0-9500 A AC	72×72 mm	245 g

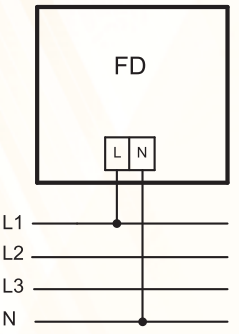
* Technical data and description about CT-s are on page I/22-I/26!

Digital frequency meter

This microprocessor controlled sensitive and accurate meter designed for metering the electric line's frequency. The measured value is readable from 3 digits LED display. The pluggable terminals for power are on the back side of device.

Technical data

Supply voltage:	230 V AC
Rated frequency:	50/60 Hz
Operating range:	$(0,8 – 1,2)\times U_n$
Accuracy:	± 0,1 %
Terminal cable diameter:	1 – 2,5 mm²
Operating temperature:	-25 °C…+65 °C
Protection degree:	IP 20 at terminals
	IP 40 from front plate



Tracon Code	Measuring range	Size	Weight
FD-96	45-75 Hz	96×96 mm	445 g
FD-72	45-75 Hz	72×72 mm	245 g

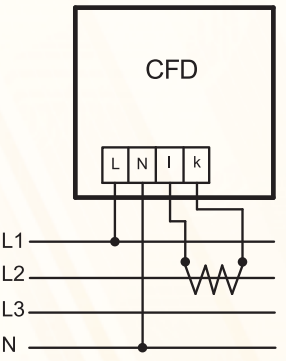
RELEVANT STANDARD
EN 61010-1

Digital power ratio meter

This is a microprocessor-controlled intelligent instrument used for measuring power ratios in one- and three-phase lines. The measured value is readable from 3 digits LED display. The pluggable terminals for power are on the back side of device. Front panels LED-s are giving information about power ratio's status.

Technical data

Supply voltage:	230 V AC
Rated frequency:	50/60 Hz
Operating range:	$(0,8 – 1,2)\times U_n$
Current output:	X / 5 A
Accuracy:	± 1 %
Terminal cable diameter:	1 – 2,5 mm²
Operating temperature:	-25 °C…+65 °C
Protection degree:	IP 20 at terminals
	IP 40 from front plate



Tracon Code	Metering range	Size	Weight
CFD-96	0,1-0,99	96×96 mm	305 g
CFD-72	0,1-0,99	72×72 mm	250 g

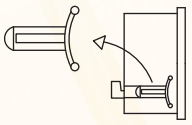
RELEVANT STANDARD
EN 61010-1

* Technical data and description about CT-s are on page I/22-I/26!

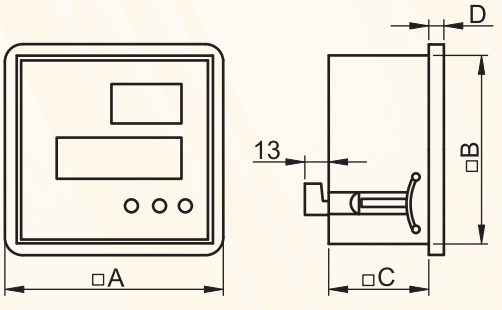
Mounting dimensions and fixation methods for digital panel meters

The instruments can be fixed to the mounting panel by two elastic clips to be placed into the holes formed on the side walls of the enclosure. Suggested thickness of the mounting panel: max. 5 mm.

Size	A (mm)	B (mm)	C (mm)	D (mm)
96×96	96	91	67	8
72×72	72	68	70	6



Fixing element



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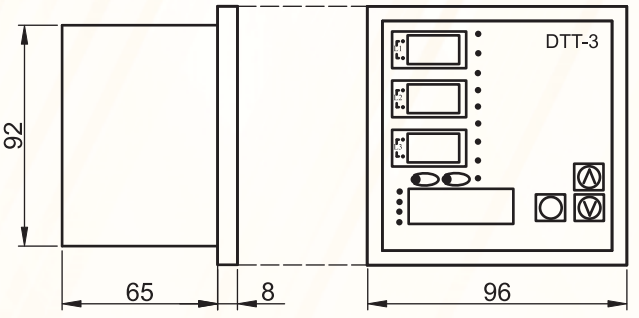
Digital multimeter

This microcontroller based device was designed to measure the true effective value (TRMS) of current and voltage all three phases and the frequency of the system. The multimeter is able to store minimum and maximum demands for both current and voltage, furthermore is capable to show these values to the user when desired. The **DTT-3** type also has programmable under and over voltage limits, under and over current limits and delay time before producing contact output. The **DTT-2** type is similar with **DTT-3** type but without relay output. The **DTT-3** type has two different contact outputs for current and voltage fault. The connection for power supply and metering is available trough pluggable terminations on the back side of device. The multimeter displays the momentary value of the current in all three phases and the frequency of the net. The line or phase voltage can be selected with front panel pushbuttons and these momentary values are readable from the display. A LED lamp marks the selected phase. The current transformer (CT) ratio is also selectable with front panel pushbuttons.

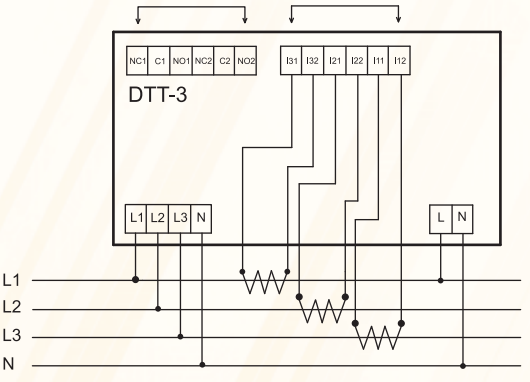
Technical data

Supply voltage:	230 V AC ± 20 % (L-N)
Operating frequency:	50/60 Hz
Power consumption:	> 4 VA
Input power:	< 1 VA
Input voltage range:	0-300 V AC (L-N) 0-500 V AC (L-L)
Primary current:	5 A … 9500 A
Current transformer (CT) ratio:	5/5 ... 9500/5 A
Secondary current:	50 mA … 5,5 A
Frequency measuring range:	40 – 99,9 Hz
Measurement accuracy:	±1%
Relay output:	250 V AC – 5 A
Alarm outputs:	1 CO contact per relay
Terminal capacity:	1 – 2,5 mm²
Operation temperature:	-25 °C…+65 °C
Protection degree:	IP 20 at terminals IP 40 from front plate

RELEVANT STANDARD
EN 61010-1



* Technical data and description about CT-s are on page I/22-I/26!



With CT connection

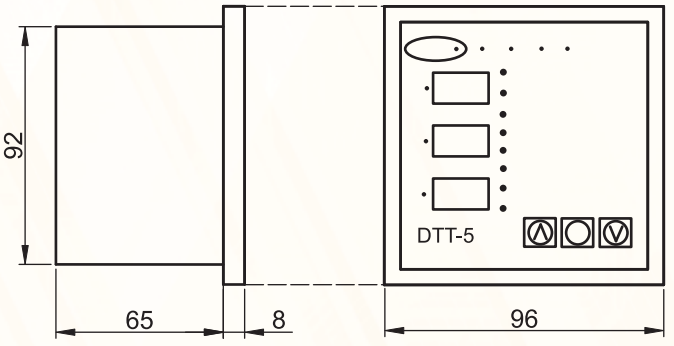
Tracon Code	Output status	Measuring range				Size	Weight
		Phase voltage	Line voltage	Phase current	Frequency		
DTT-2	Without alarm outputs	0-300 V AC	0-500 V AC	0-9500 A AC	40-99,9 Hz	96×96 mm	470 g
DTT-3	With programmable alarm outputs	0-300 V AC	0-500 V AC	0-9500 A AC	40-99,9 Hz	96×96 mm	515 g

DTT-5 detective multimeter

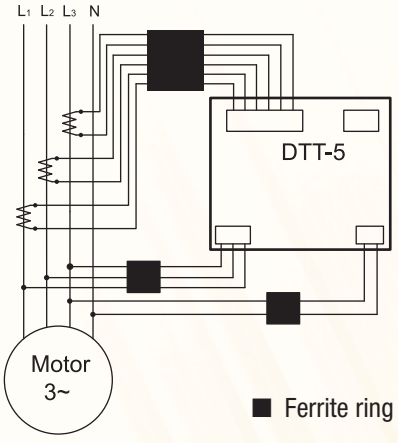
This device can measure current and voltage values and frequency of line on three phase systems. The detective multimeter was designed to sense, detect and inform impending mechanical and electrical failures in three phase motors. Modern detective multimeter technology with the capability of fault detection at early stage provides excellently reliable system monitoring advantages, a remarkable productivity of quality production, minimized maintenance and repair costs and extended life of machinery and equipment in use. The measured min/max current values are saved in memory and can be displayed by request. Moreover the device features adjustable over/under current and voltage protection limits with adjustable time delay settings prior to producing contact output for alert. The multimeter compares the stored values with the momentary values and switches on the alarm levels gradually according to deviation. The alarm output is a potential free changeover relay contact output what can work by voltage or current failure. Programming of the relay output allows for definition of the alarm level at which the relay shall react in case of abnormal current or voltage. The connection for power supply and metering is available trough pluggable terminations on the back side of device. The three digit LED displays are giving information from momentary metered values. A LED lamp signs the selected value. The current transformer (CT) ratio is also selectable with front panel pushbuttons.

Technical data

Supply voltage:	230 V AC
Operating frequency:	50/60 Hz
Input voltage range:	0-280 V AC (L-N) 0-500 V AC (L-L)
Primary current:	5 A … 9500 A
Current transformer (CT) ratio	5/5 ... 9500/5 A
Secondary current:	50 mA … 5,5 A
Frequency measuring range:	40 – 99,9 Hz
Measurement accuracy:	±0,1%
Relay output:	250 V AC – 5 A
Alarm outputs:	1 CO contact per relay
Terminal capacity:	1 – 2,5 mm²
Operation temperature:	-25 °C…+65 °C
Protection degree	IP 20 at terminals IP 40 from front plate



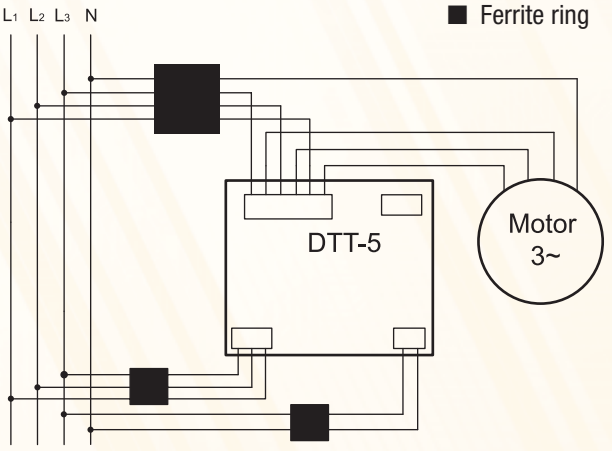
* Technical data and description about CT-s are on page I/22-I/26!



With CT connection

RELEVANT STANDARD

EN 61010-1



Direct connection

The terminal wires have to pass trough ferrite rings as seen above in order to prevent electromagnetic disorder.

Tracon Code	Output status	Measuring range				Size	Weight
		Phase voltage	Line voltage	Phase current	Frequency		
DTT-5	With programmable alarm outputs	0-280 V AC	0-500 V AC	0-9500 A AC	45-70 Hz	96×96 mm	305 g

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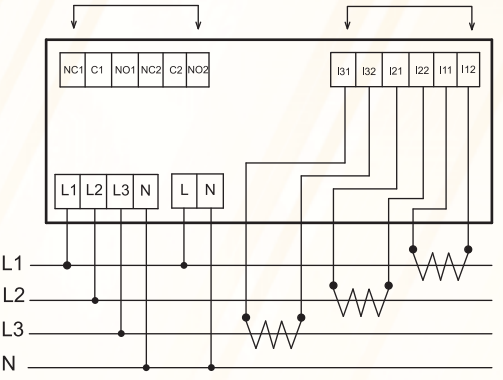
Power analyzer

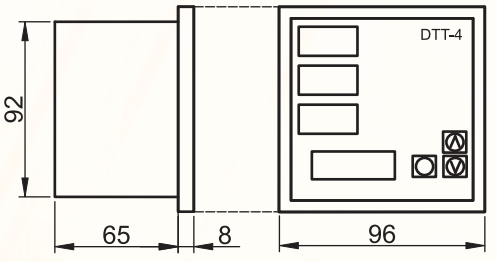
This device is ideal for measurement, monitoring and control of network electric parameters. Furthermore current, phase and line voltage frequency, power factor, real, apparent, reactive power and energy is measurable with the device; also able to meter both current and voltage harmonics of network. The four LED displays showing the needed values from 75 measurable parameters. The device meters the real effective values (TRMS), has two potential free, independent programmable relay outputs, which change state by alarm according to user adjusted limits. A LED indicator marks the selected . The connection for power supply and metering is available trough pluggable terminations on the back side of device. The current transformer (CT) ratio, the programming and the displayable value are all selectable with front panel pushbuttons. The operation of device is full automatic; its application is advantageous in all places, where the quality checking of energy-supply is important next to metering the electric values.

Technical data

Dimensions:	96×96×75mm (without terminals)
Power supply:	230 V ± 10 % 50 – 60 Hz (5 VA)
Display:	7 segment, 9 mm LED
Voltmeter inputs:	L1, L2, L3, N: 230 V~(L-N), 400 V~ (L-L)
Ammeter inputs:	I11, I12, I21, I22, I31, I32
Ammeter input overload:	max. 7 A constant, 20 A for 1 second
Measurement:	T.R.M.S. (true root mean square), up to 13. harmonics (50 Hz) up to 9. harmonics (60 Hz)
Sampling rate:	64 sample / period
Precision:	1 % at voltage and current metering 2 % at power metering
Relative humidity range:	from 20 % to 80 % without condensation
Load of relay output:	250 V AC – 5 A
Relay output status:	1 changeover contacts per relay
Operating temperature:	-25 °C…+65 °C
Terminal capacity:	1 – 2,5 mm²
Protection degree:	IP 20 at terminals IP 40 from front plate

RELEVANT STANDARD
EN 61010-1





* Device signs the mean value of metered values in three phases.

Remark	Measured value	Alarm	All	L1	L2	L3
VLN	Phase voltage (V)	✓	✓ (*)	✓	✓	✓
VLL	Line voltage (V)	✓	✓ (*)	✓	✓	✓
I	Phase current (A)	✓	✓	✓	✓	✓
FRQ	Frequency (Hz)	–	–	✓	–	–
PF	Power factor (cos φ)	–	✓ (*)	✓	✓	✓
kW	Real power (kW)	✓	✓	✓	✓	✓
kVAr	Reactive power (kVAr)	✓	✓	✓	✓	✓
kVA	Apparent power (kVA)	✓	✓	✓	✓	✓
kWh	Real energy (kWh)	–	✓	–	–	–
kVArh.IND	Inductive reactive energy (kVArh)	–	✓	–	–	–
kVArh.CAP	Capacitive reactive energy (kVArh)	–	✓	–	–	–
kVAh	Apparent energy (kVAh)	–	✓	–	–	–
V_{THD}	Total harmonics distortion of voltage (%)	–	–	✓	✓	✓
V_3 V_{13}	Voltage harmonics (THD; odd harmonics up to 13th)	–	–	✓	✓	✓
I_{THD}	Total harmonics distortion of current (%)	–	–	✓	✓	✓
I_3 I_{13}	Current harmonics (THD; odd harmonics up to 13th)	–	–	✓	✓	✓

Tracon Code	Status	Measurable values	Dimensions	Weight
DTT-4	With programmable alarm outputs	75 pcs according to table seen above	96×96 mm	500 g

Energy meters

Thanks to their performance, these energy meters with electro-mechanic or LCD display are applicable as one-rate supplementary meters. The devices can be secured with seal-lead; they measure the real electric energy consumption in one- or three-phase circuits directly or with current transformer. The plug-in versions are suitable for household appliances. These devices indicate the exact energy costs of flats, heating equipment or machines. The impulse-output enables the remote reading and signaling. The outgoing impulses indicate directly the energy consumption. The devices can be clipped onto 35 × 7,5 mm size mounting rails according to EN50022.


TVO-F1M2


TVO-F3M2


TVO-F1MV


TVO-F1-1


TVO-F3-2


TVO-F1M1.5

General technical data:

Rated frequency:	50/60 Hz
Power consumption:	10 VA/phase
Overload:	1.2 Imax
Metering modus:	direct or with current transformer (CT)
Accuracy class:	1
Operation temperature:	-15 °C – + 50 °C
Storage temperature:	-30 °C – + 65 °C
Relative humidity:	up to 95 %
Protection degree:	front plate IP20, after mounting IP40
Way of termination:	with female clips
Mounting:	clip-on 35 × 7.5 mm size mounting rail (EN50022)

Tracon code	Type of network	Type	Current metering	Metering range	Basis current	Display
TVO-F1M1	1 phase	Modular, 4 modules	With CT	0,002I_p – I_p**	5A/CT	Electro-mechanic
TVO-F1M2	1 phase	Modular, 4 modules	Direct	80 mA – 60 A	20 (60) A	
TVO-F3M1	3 phases	Modular, 7 modules	With CT	0,002I_p – I_p	** 5A/CT	
TVO-F3M2	3 phases	Modular, 7 modules	Direct	80 mA – 80 A	20 (80) A	
TVO-F1MV	1 phase	Modular, 1 module	Direct	20 mA – 30 A	5 (30) A	
TVO-F1M1.5	1 phase	Modular, 1,5 modules	Direct	40 mA – 65 A	10 (65) A	
TVO-1D116	1 phase	Plug-in	Direct	20 mA – 16 A	16 A*	
TVO-F1-1	1 phase	Modular, 4 modules	Direct	80 mA – 30 A	5 (30) A	LCD
TVO-F1V	1 phase	Modular, 1 module	Direct	20 mA – 32 A	5 (32) A	
TVO-F1-2	1 phase	Modular, 4 modules	Direct	80 mA – 100 A	20 (100) A	
TVO-F3-CT	3 phases	Modular, 7 modules	With CT	0,002I_p – I_p**	** 5A/CT	
TVO-F3-1	3 phases	Modular, 7 modules	Direct	20 mA – 30 A	5 (30) A	
TVO-F3-2	3 phases	Modular, 7 modules	Direct	80 mA – 100 A	20 (100) A	
TVO-1D216	1 phase	Plug-in	Direct	20 mA – 16 A	16 A*	

* Maximum load for plug-in meters

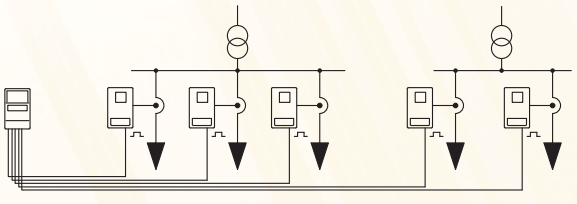
** I_p – Primary current of current transformer

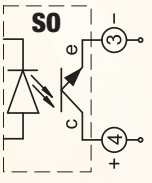
Note:
In case of metering with current transformer the real value can be obtained by multiplying the displayed value with the ratio of the current transformer.

RELEVANT STANDARD
IEC 61036 **IEC 62053-1**

Impulse-output

The TVO type modular energy meters are provided with S0 type passive impulse-output according to IEC 62053-1 standard; it is one of the most frequently used standard impulse output for energy metering supplied from the user's side. This way the measured value can be read from the display of the device but there is also possibility for distance reading. The impulse can be forwarded into electronic distance readers and data collector devices to get the measured value far from the metering device according to the attached scheme.





Technical data

Impulse width:	<30 ms
External power supply:	min. 18 V, max. 27 V
Maximal load of impulse output:	27 mA

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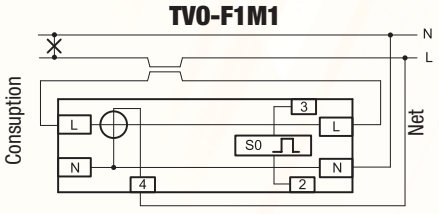
Energy meters for one-phase circuits with electromechanical display

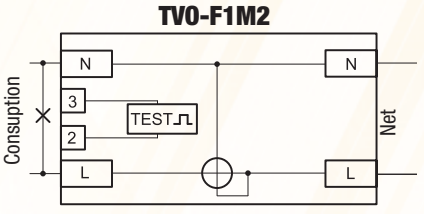
Tracon code	TVO-F1M1	TVO-F1M2
Rated voltage	220-240 V AC	
Starting current	0,002Ip	80 mA
Basis current (max. current)	5A/CT	20 (60) A
Current metering	With CT	Direct
Impulse output (S0)	6400 imp./kWh	1600 imp./kWh
Weight	200 g	
Terminal wire	Solid / flexible	
Metering clips	25 mm²/16 mm²	
Clips for impulse output	2,5 mm²/1,5 mm²	

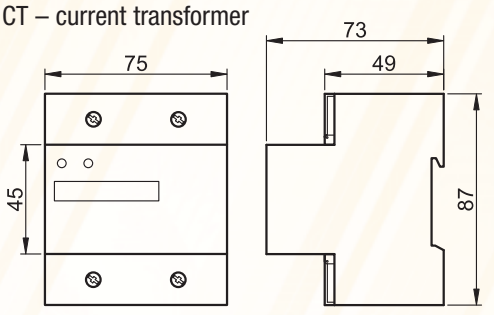
I_p – primary current of current transformer
CT – current transformer

TVO-F1M1



TVO-F1M2

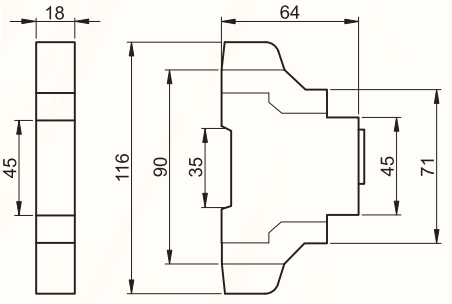




Energy meters for one-phase circuits with electromechanical display (1 and 1,5 module width)

Tracon code	TVO-F1MV	TVO-F1M1.5	TVO-F1V
Rated voltage	220-240 V AC	220-240 V AC	220-240 V AC
Starting current	20 mA	40 mA	20 mA
Basis current (max. current)	5 (30) A	10 (65) A	5 (32) A
Current metering	Direct	Direct	Direct
Impulse output (S0)	2000 imp./kWh	1000 imp./kWh	2000 imp./kWh
Weight	80 g	170 g	80 g
Terminal wire	Solid / flexible	Solid / flexible	Solid / flexible
Metering clips	25 mm²/10 mm²	25 mm²/10 mm²	25 mm²/10 mm²
Clips for impulse output	2,5 mm²/1,5 mm²	2,5 mm²/1,5 mm²	2,5 mm²/1,5 mm²

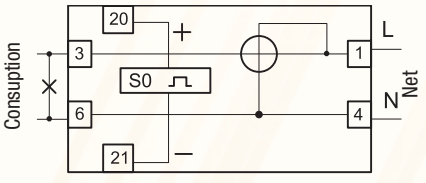
TVO-F1MV TVO-F1M1.5 TVO-F1V



RELEVANT STANDARD

IEC 61036
IEC 62053-1

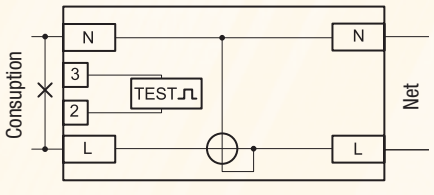
TVO-F1MV, TVO-F1M1.5, TVO-F1V



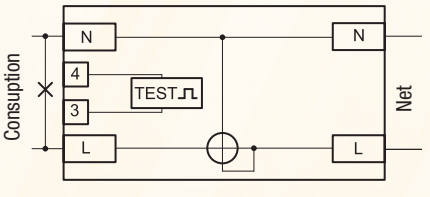
Energy meters for one phase with LCD display

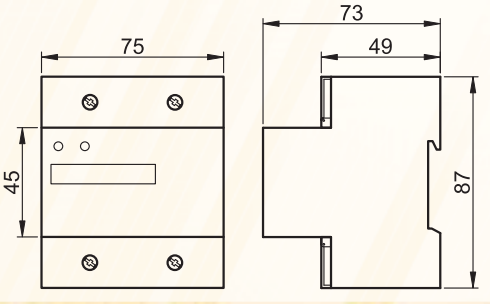
Tracon code	TVO-F1-1	TVO-F1-2
Rated voltage	220-240 V AC	
Starting current	80 mA	80 mA
Basis current (max. current)	5 (30) A	20 (100) A
Current metering	Direct	Direct
Impulse output (S0)	3200 imp./kWh	800 imp./kWh
Weight	200 g	
Terminal wire	Solid / flexible	
Metering clips	25 mm²/16 mm²	
Clips for impulse output	2,5 mm²/1,5 mm²	

TVO-F1-1



TVO-F1-2



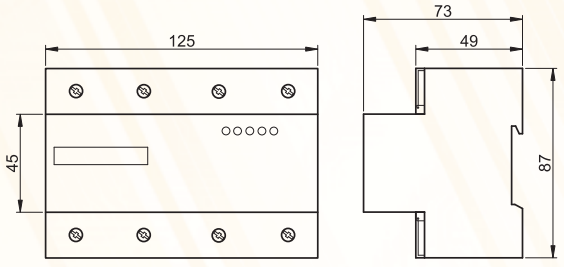


Energy meters for three phases with electromechanical display

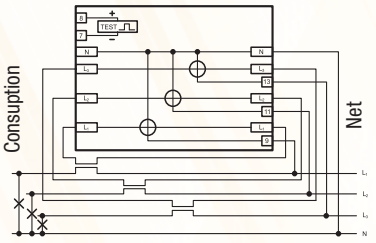
* per phase

Tracon code	TVO-F3M1	TVO-F3M2
Rated voltage	3x230/400 V AC±10 %	
Starting current	0,002Ip	80 mA
Basis current (max. current)	5A/CT*	20 (80) A*
Current metering	With CT	Direct
Impulse output (S0)	3200 imp./kWh	400 imp./kWh
Weight	450 g	
Terminal wire	Solid / flexible	
Metering clips	25 mm²/16 mm²	
Clips for impulse output	2,5 mm²/1,5 mm²	

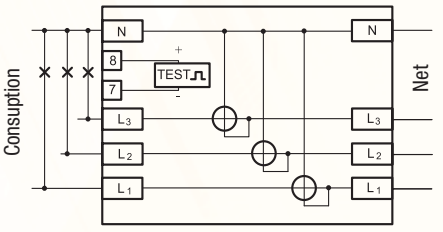
I_p – primary current of current transformer
CT – current transformer



TVO-F3M1



TVO-F3M2

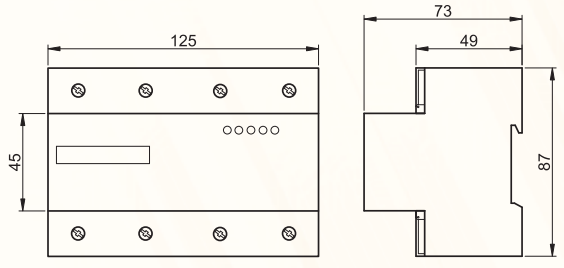


Energy meters for three phases with LCD display

* per phase

Tracon code	TVO-F3-CT	TVO-F3-1	TVO-F3-2
Rated voltage	3×230/400 V AC±10 %		
Starting current	0,002Ip	20 mA	80 mA
Basis current (max. current)	5A/CT*	5 (30) A*	20 (100) A*
Current metering	With CT	Direct	Direct
Impulse output (S0)	1600 imp./kWh	800 imp./kWh	400 imp./kWh
Weight	450 g	450 g	
Terminal wire	Solid / flexible	Solid / flexible	
Metering clips	25 mm²/16 mm²	25 mm²/16 mm²	
Clips for impulse output	2,5 mm²/1,5 mm²	2,5 mm²/1,5 mm²	

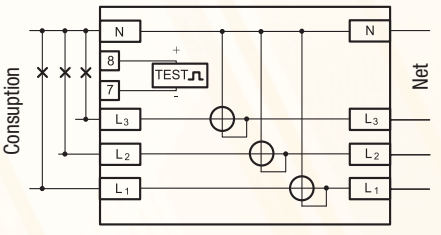
I_p – primary current of current transformer
CT – current transformer



RELEVANT STANDARD

IEC 61036
IEC 62053-1

TVO-F3-1, TVO-F3-2



Notes for using the energy meters

The LED lights on the front of front plate of meters indicate the operational state of devices. If the current on any phase falls below the starting current value, the control LED of that phase will start to blink. The meters detect the change of phase order and there is also a control LED on front plate to signaling phase change. These devices are suitable for 4-wires TNC, TNC-S or TN-S networks.

Operation and safety

- Always supply the device with proper voltage!
- Before mounting of device the network must be switched off from power supply!
- Always use proper voltage searching tool to check the voltage-free state of network!
- Service on device can be done by authorized persons only, according to relevant instructions!

RELEVANT STANDARD

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Plug-in digital energy meter

The TVO-1D216 type plug-in digital energy meter can display on its LCD the energy consumption in kWh and the energy costs of household or office devices plugged into its socket outlet.

Services:

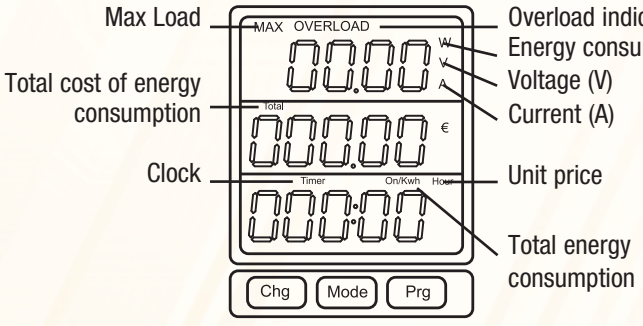
- Overload-alarm (warning signal)
- Display of maximal value of current and power
- Display of operation time
- Clock
- Energy cost calculation

Technical data

Rated voltage:	230 VAC, 50 Hz
Rated current:	max. 16 A
Power consumption:	4.5 VA
Overload:	3600 W adjustable upper limit
Power supply:	3 pcs 357A type button batteries
Ambient temperature:	0 °C ... +40 °C

Function buttons:

„Chg”: change between functions on upper row: maximal power, current overload, power overload, voltage, maximal voltage, current and maximal current
Max. W: the maximal load in Watts
Overload A: the maximal current load in Amperes (adjustable)
Overload W: the maximal power load in Watts (adjustable)
V: current voltage
Max. V: the highest metered voltage value
Max. A: the highest metered current value
„Mode”: change between functions on middle row: costs, total costs; on lower row: time of consumption and total consumption
Price: price of 1 kWh (adjustable)
W: the actual consumption
Total: the total cost of electric consumption
„Prg”: with its help one can adjust the unit price, the over-current limit and the actual time (clock)



RELEVANT STANDARD
IEC 60884-1 EN 60730-2-7 MSZ 9872

Tracon code	Description
TVO-1D216	Plug-in digital energy meter

Plug-in electromechanical energy meter

These devices were designed to control the energy consumption of consumer. The meter can be plugged simply between the socket outlet and the consumer device and the meter will show the energy consumption of the plugged electric device. The metered real energy consumption is displayed in kWh. The user is informed about status of device by front plate LEDs.

Technical data

Rated voltage:	230 VAC ±5%
Operation range:	170…300 V AC
Rated frequency:	50 Hz
Maximal operation current:	16 A
Maximal power:	3600 W
Power consumption:	2.5 VA
Accuracy:	<5 %
Display:	electro mechanic in kWh
Ambient temperature:	0 °C ... +40 °C

RELEVANT STANDARD
IEC 60884-1 EN 60730-2-7 MSZ 9872

Tracon code	Description
TVO-1D116	Plug-in electromechanical energy meter

Phase correctors

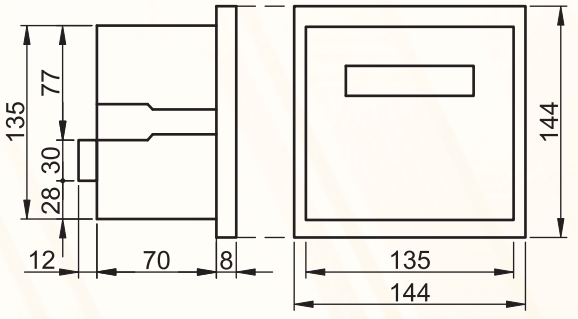
Phase correction is needed on alternate current networks under high inductive loads. The phase corrector controls the value of power factor (cos φ) and switches on or off the corrector capacitor groups on a central compensated network according to reactive power load. The basic requirement for operating networks is that the power factor's value (cos φ) has to be between 0,95 and 1. The reactive power makes higher load for consumer power consumption, most of all in production and transportation. The biggest reactor power consumers are the asynchronous motors and transformers.
The casing material was made by heat- and flameproof, self-extinguishing ABS (according to UL94V-0). The connection for power supply, for metering and for operating coils of capacitor's setting contactors is possible via plug terminals on the back side of device. It is always needed to use current transformer for metering the phase voltage. The instrument was designed for installation in panels.

Correctors for one phase (for 7 or 12 capacitor groups)

Hi-Tech, microprocessor based correctors with LCD display. They are suitable for setting 7 or 12 capacitor groups. These correctors are metering the parameters in one phase and the interference happens accordingly. The value and the style of power ratio, the phase current and voltage, the voltage harmonics, the capacitor's temperature and the number of switched capacitor groups are displayable. On manual state the user can control the number of capacitor groups. During testing process the connected levels and the level's reactive power ratio is defined automatically. In automatic mode, the switching of capacitor groups takes place according to needed capacitor power and pre-adjusted parameters. During rating process the switching of the levels follows a complex algorithm according to adjusted power factor value and level, protecting the capacitor groups and the switching contactors from run-down. The device has a potential free alarm output and it is programmable with front panel pushbuttons. The cooling is getting active according to pre-adjusted and memory stored level when the capacitor's temperature is rising up. The alarm output's active state is displayed by front panel LED.

Main functions

- adjustable power ratio (cos φ) between 0,8 ind. – 1,0 cap;
- automatic and manual mode functions;
- exact initial capacitor power calculation;
- automatic current limit adjustment (C/k value);
- automatic polarity recognition on the CT terminals (k-l);
- adjustable overvoltage-overheat protection limit;
- alarm in case of over or under compensation;
- adjustable voltage-harmonics and overload protection limit;
- adjustable capacitor on and off switching time;
- power factor, phase voltage and current, frequency, temperature, voltage harmonics range metering, control, display;
- the art of failure and the switched number of levels also can be displayed.

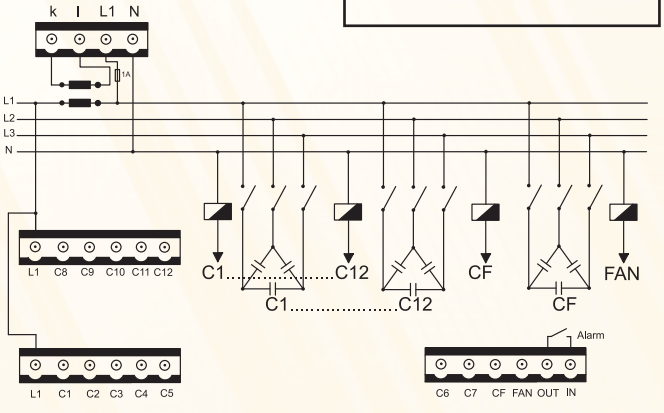


RELEVANT STANDARD

EN 61010-1
EN 60831

Technical data

Rated voltage:	230 V ± 20 %, 50/60 Hz
Current output:	0,02 A – 5,5 A
Current transformer ratio:	5/5 A… 5000/5 A
Contact output:	250 V / 5 A AC
Alarm output:	250 V / 5 A AC
Cooling output:	250 V / 5 A AC
Display:	2×16 LCD
Adjustable temperature range:	-25 °C … +99 °C (adjustable)
Protection degree:	IP 54 (housing)
	IP 20 (terminals)
	-25 °C … +55 °C
Ambient temperature:	1 – 2,5 mm²



Tracon Code	Operating voltage	Number of levels	Weight
TFJA-01	230 V AC	7 capacitor groups + 1 fix group	1000 g
TFJA-02	230 V AC	12 capacitor groups+ 1 fix group	1050 g

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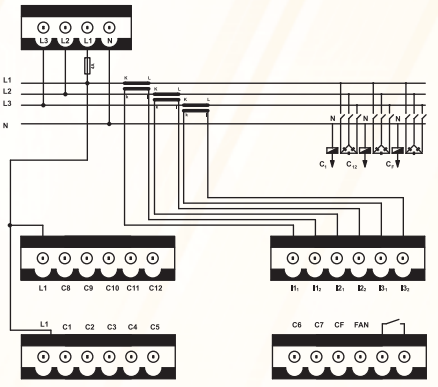
Correctors for three phases (for 7 or 12 capacitor groups)

Hi-Tech, microprocessor based correctors with LCD display. They are suitable for setting 7 or 12 capacitor groups. These correctors are metering the parameters in all three phase and the interference happens accordingly. The metering of values is on analyzer level, the different levels capacitor power can be adjusted independent. In manual mode the user can control the number of capacitor groups. In automatic mode, the switching of capacitor groups takes place according to needed capacitor power and pre-adjusted parameters. During rating process the switching of the levels follows a complex algorithm according to adjusted power factor value and level, protecting the capacitor groups and the switching contactors from run-down. The device has a potential free alarm output and it is programmable with front panel pushbuttons. The cooling is getting active according to pre-adjusted and memory stored level when the capacitor's temperature is rising up. The alarm output's active state is displayed by front panel LED.

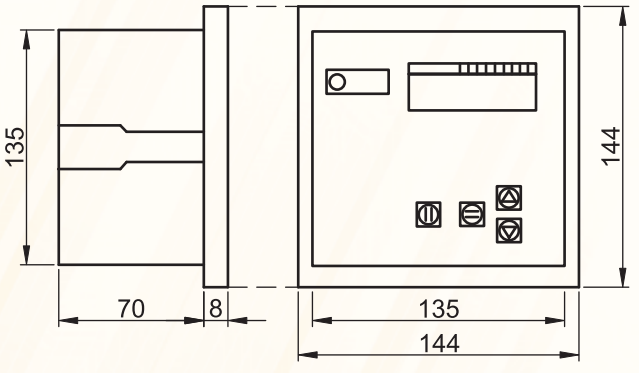
Main functions



- Adjustable cos φ range between 0,8 ind. and 0,9 cap. values;
- Automatic / manual mode;
- Independent adjustable capacitor power limits;
- Automatic current detection;
- Adjustable over voltage and overheat limit;
- Adjustable high harmonic level;
- Adjustable capacitor switching delay;
- Adjustable total harmonic distortion voltage level (V_{THD}; V_3; $V_5 \ldots V_{13}$);
- Dimmable total harmonic distortion current level (I_{THD}; I_3; $I_5 \ldots I_{13}$);
- Capacitor test mode;
- Real, inductive, capacitive energy metering;
- Voltage, current, cos φ, THD (total harmonic distortion) control on every phase;
- Capacitor power; temperature; frequency; total power factor control;
- Alarm in case of overvoltage, high temperature, high reactive and real energy rate, high harmonic ratio, with delay.

Technical data

Rated voltage:	3×230/400 V ±10%
Rated frequency:	50/60 Hz
Power consumption:	max. 10 VA
Max relative humidity:	90 %
Current metering range:	0,02 A – 5,5 A
CT ratio:	5/5 A – 5000/5 A
C/k adjustment:	automatic, manual
CT polarization:	automatic
LCD interface:	2×16
A/D converter	10 bit
Sampling:	64 sample/period
Contact / alarm output:	250 V/5 A AC
Ambient temperature:	-25 °C ... 55 °C
Storage temperature:	-25 °C ... 85 °C
Protection degree:	IP 54 (housing)
	IP 20 (terminals)
Terminal capacity:	1 – 2,5 mm²



RELEVANT STANDARD
EN 61010-1 EN 60831

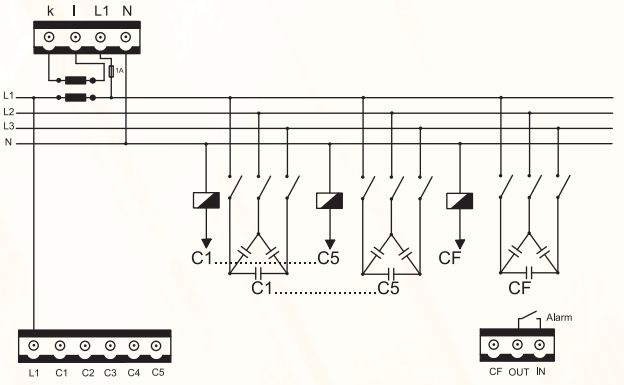
Tracon Code	Operating voltage	Number of levels	Weight
TFJA-03	3×230/400 V AC	7 capacitor groups + 1 fix group	1030 g
TFJA-04	3×230/400 V AC	12 capacitor groups+ 1 fix group	1030 g

Automatic or manual correctors

These devices are microprocessor based correctors with LCD display. They are suitable for setting 5 or 7 capacitor groups. These correctors are metering the parameters in one phase and the interference happens accordingly. The switching of capacitor groups is coordinated with the metered capacitor powers and the pre-adjusted full reactive power values. During rating process the switching of the levels follows a complex capacitor metering and power factor determine algorithm according to adjusted power factor value and level, protecting the capacitor groups and the switching contactors from run-down. The device has a potential free alarm output and it is programmable with front panel pushbuttons. The cooling is getting active according to pre-adjusted and memory stored level when the capacitor's temperature is rising up. The alarm output's active state is displayed by front panel LED.

Main functions

- Adjustable power ratio (cos φ) from 0,8 to 1;
- Automatic and manual mode;
- Capacitor power metering;
- Automatic Ck adjustment;
- Automatic current flow definition;
- Dimmable capacitor on/off time;
- Display of phase voltage and power factor values;
- In case of alarming the displaying happens with LED.

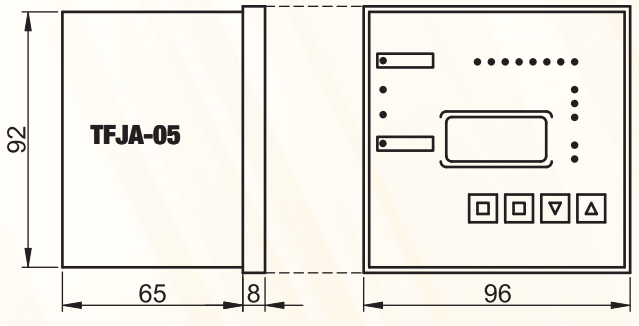


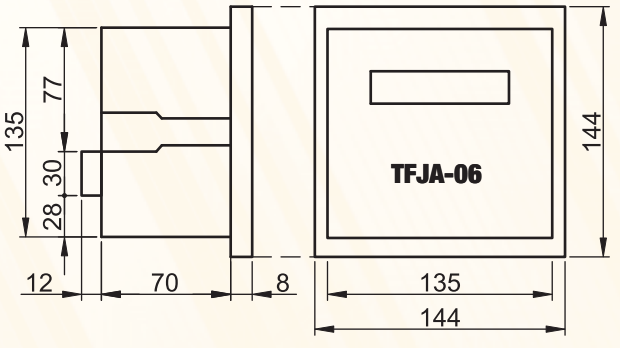
Technical data

Rated voltage	230 V ± 20 %, 50/60 Hz
C/k adjustment:	automatic
CT polarization:	automatic
Current range of metering:	0,02 A – 5,5 A
Current transformer ratio:	5/5 A – 5000/5 A
Contact output load:	250 V/5 A AC (TFJA-05), 250 V/3 A AC (TFJA-06)
Alarm output load:	250 V/5 A AC (TFJA-05), 250 V/3 A AC (TFJA-06)
Display:	3 × 7 segment LED display
Ambient temperature:	-25 °C ... 55 °C
Storage temperature:	-25 °C ... 85 °C
Protection degree:	IP 54 (housing), IP 20 (terminals)
Terminal capacity:	1 – 2,5 mm²

RELEVANT STANDARD

EN 61010-1
EN 60831





Tracon Code	Operating voltage	Number of levels	Weight
TFJA-05	230 V AC	5 capacitor groups + 1 fix group	1000 g
TFJA-06	230 V AC	7 capacitor groups + 1 fix group	600 g

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Automatic operated correctors (for 5 capacitor groups)

The TFJA-07 type reactive power corrector has full automatic operation and does not have any buttons on the front panel. The interference is happening according to phase voltage and current in one phase. The device switches on the five capacitor groups in five steps by microcontroller based rating algorithm with contactors if the cos φ value is less, than 0,95, and switches off the capacitors, when the cos φ value is more, than 1. The switch on of capacitor groups happening with 14 seconds, the switch off happens with 5 seconds time delay. In load free or less load state, where cosφ value is not between 0,95 and 1, the first capacitor level works as a joker capacitor; it switches on/off the capacitors according to defined delay time. The lowest capacitor power group has to be connected to the first level. During rating process the switching of the levels are happening by a complex algorithm protecting the capacitor groups and the switching contactors from run-down. The power factor value is readable from 3 digits front plate display. The front panel LED-s are giving information from number of switched levels and the power ratio's style. The capacitor group's power and the distributions for levels can be making by next table.

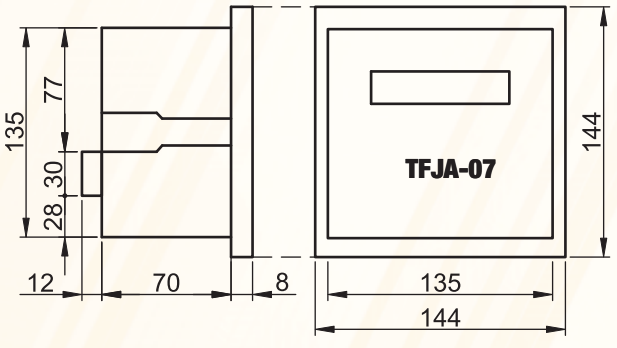
Capacitor outputs	1st level	2nd level	3rd level	4th level	5th level
Capacitor power	1 -1,5 kVAr	2,5 kVAr	5 kVAr	10 kVAr	20 kVAr

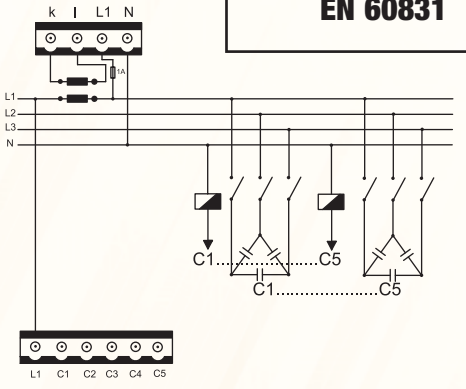
Technical data

Rated voltage:	230 V ± 10 %, 50/60 Hz
Power consumption:	max. 5 VA
Display:	7 segment, 9 mm LED display
Input of voltage meter:	L1, N
Sampling:	64 sample/period
Input of current meter:	k, l
Max. load of current input:	max. 7 A constant, 20 A / for 1 sec.
Current transformer ratio:	5/5 A – 5000/5 A
Contact / alarm output:	250 V/5 A AC
Accuracy:	1 %
Relative humidity:	from 20% to 80 % without condensation
Ambient temperature:	-25 °C ... 55 °C
Storage temperature:	-25 °C ... 85 °C
Protection degree:	IP 30 (housing), IP 20 (terminals)
Terminal capacity:	1 – 2,5 mm²

RELEVANT STANDARD

EN 61010-1
EN 60831





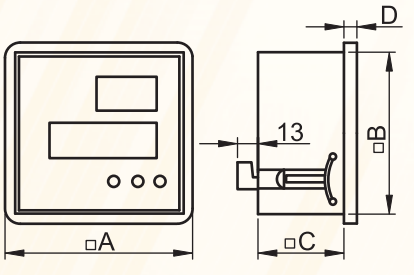
Tracon Code	Operating voltage	Number of levels	Weight
TFJA-07	230 V AC	5 capacitor groups	1200 g

Mounting dimensions and fixation methods for reactive power regulators

The instruments can be fixed to the mounting panel by two elastic clips to be placed into the holes formed on the side walls of the enclosure. Suggested thickness of the mounting panel: max. 5 mm.

Size	A (mm)	B (mm)	C (mm)	D (mm)
96×96	96	91	67	8
144×144	144	135	70	8

Fixing element



Low voltage current transformers

By using these devices, the measuring range of analogue or digital ammeters can be extendedin the ramge of 5 ÷ 3000A. Similarly, the measuring range of the counters, power meters, multimeters, varmeters connected to the secondary contacts to the current transformers can also be extended.

Current transformers are consisted of a primary coil, a secondary coil and a ferromagnetic core. The primary coil is an actual coil built into the housing of the transformer or a cable or rail passing through the central hole of the transformer. I case of built-in primary coil or passed cable, the transformer has to be fixed by the kit delivered as accessory. In case of built in rail, the transformer shall be directly fastened to the rail.

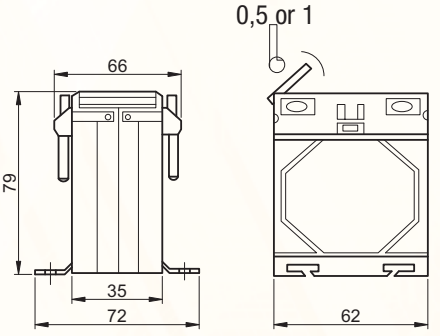
The P1 end of the primary coil shall be connected to the network, the P2 end to the consumer. The S1 and S2 connectors shall be connected directly to the measuring instrument.

Technical data

Max. nominal voltage:	660 V
Max. rated insulation voltage:	720 V
Operating frequency:	50-60 Hz
Typical use:	indoor
Constant operating current:	1,2 × I_n
Test voltage:	4 kV (for 1 minute)
Safety factor (F_s):	5
Rated primary current (I_n):	5 … 3000 A
Rated secondary current	5 A
Ambient temperature:	-5 °C ... +45 °C
Rated thermal current (I_{th}):	
• AVBS :	I_{th}=50 × I_n
• AV30...-SH :	I_{th}=100 ×I_n
• AV40...-SH:	I_{th}=50 × I_n
• AV60...-SH:	max. 50 kA_{eff}
• AV100...-SH :	max. 50 kA_{eff}
Rated dynamic current:	I_{din}=2,5 × I_{th}
Accuracy class:	0,5 or 1

RELEVANT STANDARD

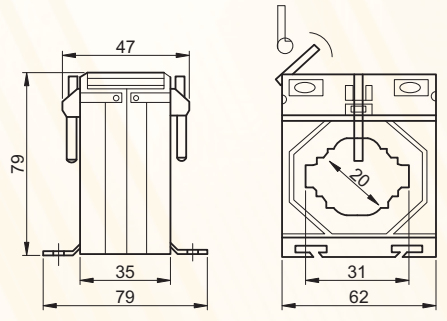
MSZ 1577
EN 60044-1
EN 61010-1



Tracon code	Rated current and ratio	Rated power	Accuracy class	Mass (kg)	Installation
AVBS-5	5A/5A	2,5 VA	0,5	0,37	on built-in rail
AVBS-15	15A/5A			0,38	
AVBS-30	30A/5A			0,40	
AVBS-50	50A/5A			0,42	
AVBS-60	60A/5A			0,43	
AVBS-75	75A/5A			0,45	
AVBS-100	100A/5A			0,48	
AVBS-150	150A/5A			0,51	

RELEVANT STANDARD

MSZ 1577
EN 60044-1
EN 61010-1



Tracon code	Rated current and ratio	Rated power	Accuracy class	Mass (kg)	Installation
AV3050SH	50A/5A	1 VA	1	0,46	onto 30 mm rail;
AV3060SH	60A/5A	1,5 VA		0,48	
AV3075SH	75A/5A	1,5 VA		0,52	onto cable with circular section, ∅ 20 mm
AV30100SH	100A/5A	1,5 VA	0,5	0,53	
AV30150SH	150A/5A	2 VA		0,53	
AV30200SH	200A/5A	2,5 VA		0,54	

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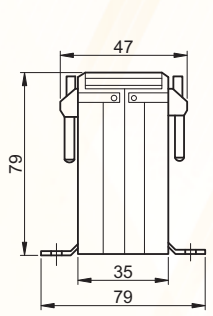
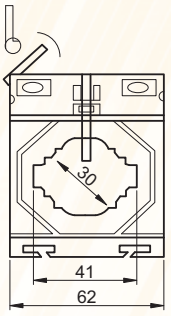
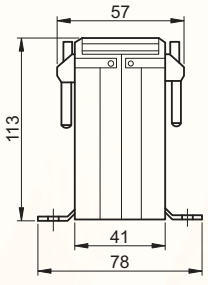


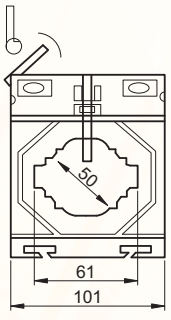


RELEVANT STANDARD

MSZ 1577
EN 60044-1
EN 61010-1

Tracon code	Rated current and ratio	Rated power	Accuracy class	Mass (kg)	Installation
AV40100SH	100A/5A	1 VA	0,5	0,36	onto 40 mm rail; onto cable with circular section, ∅ 030 mm
AV40150SH	150A/5A	1,5 VA		0,37	
AV40200SH	200A/5A	2,5 VA		0,39	
AV40250SH	250A/5A	3 VA		0,41	
AV40300SH	300A/5A	5 VA		0,42	
AV40400SH	400A/5A	2,5 VA		0,42	
AV40500SH	500A/5A	5 VA		0,42	

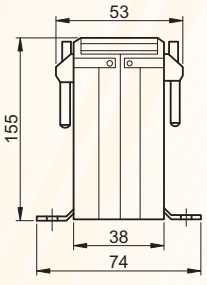


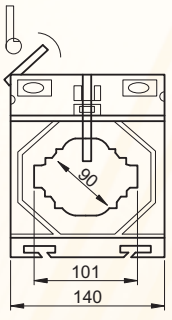


RELEVANT STANDARD

MSZ 1577
EN 60044-1
EN 61010-1

Tracon code	Rated current and ratio	Rated power	Accuracy class	Mass (kg)	Installation
AV60600SH	600A/5A	15 VA	0,5	0,45	onto 60 mm rail; onto cable with circular section, ∅ 50 mm
AV60800SH	800A/5A			0,48	
AV601000SH	1000A/5A			0,52	
AV601200SH	1200A/5A			0,52	





RELEVANT STANDARD

MSZ 1577
EN 60044-1
EN 61010-1

Tracon code	Rated current and ratio	Rated power	Accuracy class	Mass (kg)	Installation
AV1001200SH	1200A/5A	15 VA	0,5	0,69	onto 100 mm rail; onto cable with circular section, ∅ 90 mm
AV1001600SH	1600A/5A			0,85	
AV1002000SH	2000A/5A			1	
AV1002500SH	2500A/5A			1,05	
AV1003000SH	3000A/5A			1,2	

AV Low voltage current transformers

These current transformers can be used for measurement, control, display and recording of the operational characteristics of electrical instruments and devices and for their protection, if the nominal voltage in the AC circuit is below 660 V and the frequency is 50-60 Hz.

MEEI Type Test No.:

D0433V071

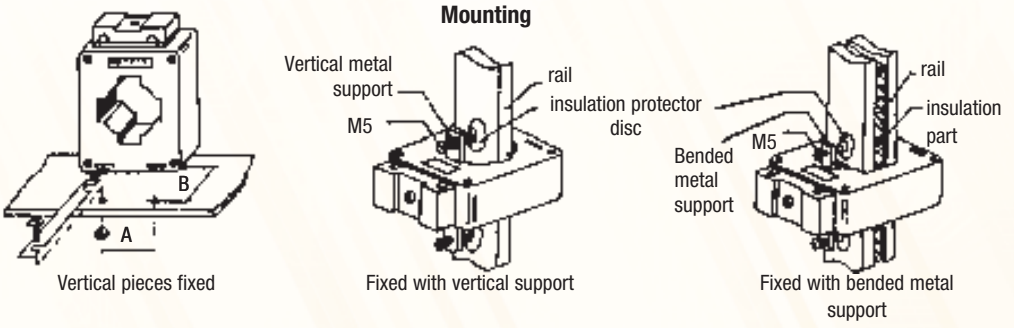
Technical data

Max. rated insulating voltage:	720 V
Typical use:	indoor
Constant operating current:	$1,2 \times I_n$
Test voltage:	4 kV (for 1 minute)
Rated security coefficient:	5
Rated primary current (I_n):	30 …5000 A
Rated secondary current:	5 A
Operating frequency:	50-60 Hz
Ambient temperature:	–5 °C …+45 °C
Rated thermal current:	
At AVA type	$I_{th} = 60 \times I_n$
At AV30 type	$I_{th} = 100 \times I_n$
At AV40 type	$I_{th} = 50 \times I_n$
At AV60, AV100 and AV125 types	max. 50 kA_{eff}
Rated secondary power:	
At AV30 type	5 VA;
At AVA, AV40 type	10 VA;
At AV60, AV100 and AV125 types	15 VA
Rated dynamical current:	$I_{dyn}=2,5 \times I_{th}$
Accuracy class:	0,5

RELEVANT STANDARD

MSZ 1577
EN 60044-1
EN 61010-1

Mounting



Vertical pieces fixed

Fixed with vertical support

Fixed with bended metal support

Required power of devices to be used in the secondary circuit of current transformers:

Devices	Power (VA)	Devices	Power (VA)
Current meter	0,7….1,5	Measurement units	12
Reactive power meter	0,2….5,0	Overload relays	0,2….6
Power factor (cos φ) meter	2,0….6,0	Inverse current relays	2
Consumption meter (active and reactive)	0,4….1	Secondary thermal relays	7,2….9

The power consumption of installing wires in case of 5 A secondary current

Wire length (m)	2,5 mm^2	4,0 mm^2	6,0 mm^2	10,0 mm^2
1	0,36	0,22	0,15	0,09
2	0,71	0,45	0,30	0,18
3	1,07	0,67	0,45	0,27
4	1,43	0,89	0,60	0,36
5	1,78	1,12	0,74	0,44
6	2,14	1,34	0,89	0,54
7	2,50	1,56	1,04	0,63
8	2,86	1,79	1,19	0,71
9	3,21	2,01	1,34	0,80
10	3,57	2,24	1,49	0,89

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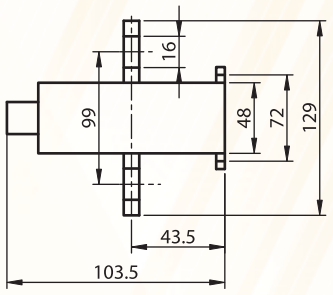
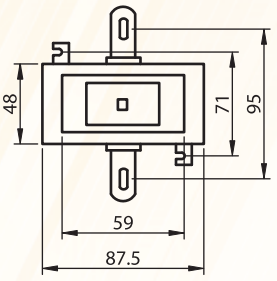
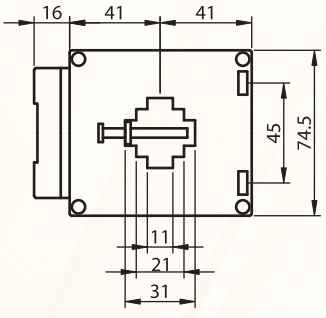


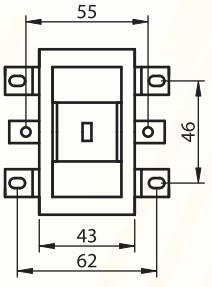


RELEVANT STANDARD

MSZ 1577
EN 60044-1
EN 61010-1

Tracon Code	Rated current and ratio (A)	Rated power (VA) Class 0,5	Class 1	Weight (kg)	Installation
AVA30	30/5	10	-	0,60	With installed 25 × 3,5mm rail
AVA40	40/5	10	-	0,60	
AVA50	50/5	10	-	0,60	
AVA60	60/5	10	-	0,60	
AVA75	75/5	10	-	0,60	
AVA80	80/5	10	-	0,60	
AVA100	100/5	10	-	0,60	
AVA120	120/5	10	-	0,60	
AVA125	125/5	10	-	0,60	
AVA150	150/5	10	-	0,60	
AVA200	200/5	10	-	0,60	
AVA250	250/5	10	-	0,60	

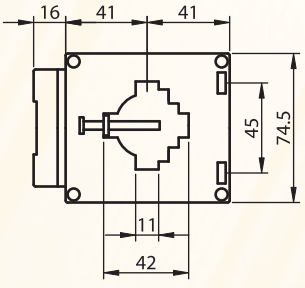


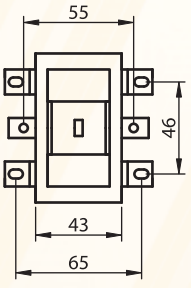


RELEVANT STANDARD

MSZ 1577
EN 60044-1
EN 61010-1

Tracon Code	Rated current and ratio (A)	Rated power (VA) Class 0,5	Class 1	Weight (kg)	Installation
AV30100	100/5	-	5	0,60	rail: 30 × 10 mm round wire diameter: 20 mm
AV30150	150/5	-	5	0,60	
AV30200	200/5	-	5	0,60	
AV30250	250/5	-	5	0,60	





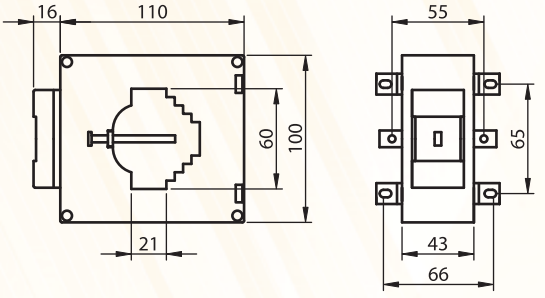
RELEVANT STANDARD

MSZ 1577
EN 60044-1
EN 61010-1

Tracon Code	Rated current and ratio (A)	Rated power (VA) Class 0,5	Class 1	Weight (kg)	Installation
AV40300	300/5	10	-	0,38	rail: 40 × 10 mm round wire diameter: 30mm
AV40400	400/5	10	-	0,38	
AV40500	500/5	10	-	0,38	

RELEVANT STANDARD

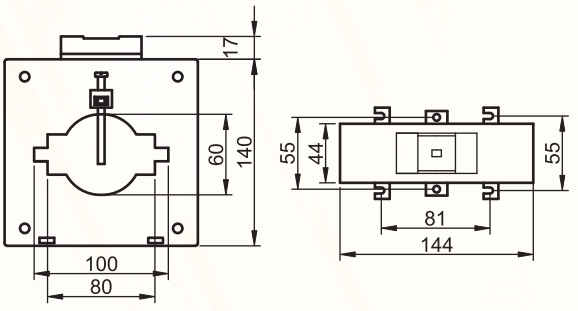
MSZ 1577
EN 60044-1
EN 61010-1



Tracon Code	Rated current and ratio (A)	Rated power (VA) Class 0,5	Class 1	Weight (kg)	Installation
AV60600	600/5	15	-	0,60	rail: 60 × 20 mm round wire diameter: 40 mm
AV60750	750/5	15	-	0,60	
AV60800	800/5	15	-	0,60	
AV601000	1000/5	15	-	0,60	

RELEVANT STANDARD

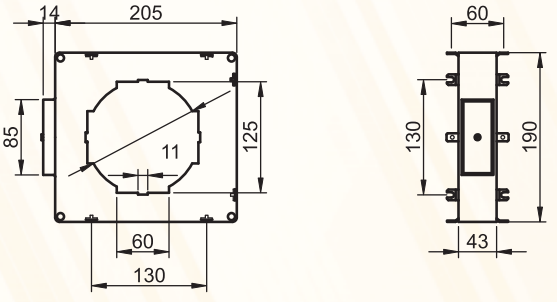
MSZ 1577
EN 60044-1
EN 61010-1



Tracon Code	Rated current and ratio (A)	Rated power (VA) Class 0,5	Class 1	Weight (kg)	Installation
AV1001500	1500/5	15	-	0,80	rail: 80 × 30 mm or 100 × 10 mm round wire diameter: 60 mm
AV1002000	2000/5	15	-	0,94	
AV1002500	2500/5	15	-	1,10	
AV1003000	3000/5	15	-	1,16	

RELEVANT STANDARD

MSZ 1577
EN 60044-1
EN 61010-1



Tracon Code	Rated current and ratio (A)	Rated power (VA) Class 0,5	Class 1	Weight (kg)	Installation
AV1251500	1500/5	15	-	1,00	rail: 125 × 57 mm or 125 × 10 mm round wire diameter: 120 mm
AV1252000	2000/5	15	-	1,15	
AV1252500	2500/5	15	-	1,45	
AV1253000	3000/5	15	-	1,60	
AV1254000	4000/5	15	-	1,90	
AV1255000	5000/5	15	-	2,20	

Important: During the installation of current transformers pay attention to the following:

- The current transformers are made for one phase use.
- Do not break the secondary circuit when the load current in the primary circuit is on.
- Caution: The resistance of current transformers is very low, so the secondary coil should be put into short circuit when checking the rated operation of the device. This will avoid induced voltage values that may be unsafe for the operators.

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Analog multimeter

Service operators often prefer to use measuring instruments with analogous display, most comfortable in workshops, laboratories, hobby and household applications.

RELEVANT STANDARD
EN 61010-1

Technical data / Tracon code		AMT-01	AMT-02
DC voltage measurement	Measurement limits	0,25 V, 10 V, 50 V, 250 V, 500 V, 1000 V	0,5 V, 2,5 V, 10 V, 50 V, 250 V, 1000 V
	Accuracy	± 5 % FS	± 4 % FS
	Input impedance	4 kΩ/V	4 kΩ/V
AC voltage measurement	Measurement limits	10 V, 50 V, 250 V, 500 V, 1000 V	10 V, 50 V, 250 V, 1000 V
	Accuracy	±5 % FS	±5 % FS
	Input impedance	4 kΩ/V	5 kΩ/V
	Ratio measurement	-	-10...+50 dB
DC current measurement	Measurement limits	250 μA, 25 mA, 500 mA	100 μA, 2,5 mA, 25 mA, 500 mA
	Accuracy	±5 % FS	±3 % FS
	Voltage fall	<0,4 V	<0,1 V
Resistance measurement	Measurement limits	1 kΩ, 10 kΩ, 1 MΩ	1 kΩ, 10 kΩ, 100 kΩ, 1 MΩ, 10 MΩ
	Accuracy	±5 % FS	±4 % FS
	Continuity test	With sound signal	With sound and light signal
	Transistor test	-	I_{CEO}: 150 μA-15 mA-150 mA h_{FE}: 0-1000 W/connector
	Battery test	1,5 V	-
	Diode test	-	+
	Battery state display	Under 0,8 V battery charge	-
	Accessories	Measuring wires, batteries, instruction manual	
	Power supply	1 pc 1,5V-os R6L type battery	2 pcs R6L and 1, 6F22 type batteries
	Operating temperature	0 °C ... +40 °C (relative humidity <75 %)	
	Storage temperature	-10 °C ... + 50 °C	
	Dimensions / Weight	140×96×38 mm / 270 g	152×123×41 mm / 280 g

Digital multimeters

These universal pocket multimeters – equipped with 3,5 digit LCD display – are useful in workshops, laboratories, hobby and household applications. They have 8 functions and 15 measuring ranges, to be selected quickly and easily by twisting-switch.

RELEVANT STANDARD
EN 61010-1

Technical data / Tracon Code		MT-01	MT-02	MT-03
DC voltage measurement	Measurement limits	200 mV, 2000 mV, 20 V, 200 V, 1000 V		
	Accuracy	±0,5 % RDG ± 5 D		
AC voltage measurement	Measurement limits	200 V, 750 V		
	Accuracy	±1,2 % RDG ± 10 D		
DC current measurement	Measurement limits	2000 μA, 20 mA, 200 mA, 10 A		
	Accuracy	±1-2 % RDG ± 5 D		
Resistance measurement	Measurement limits	200 Ω, 2000 Ω, 20 kΩ, 200 kΩ, 2 MΩ		
	Accuracy	±1 % RDG ± 5 D		
	Continuity test	With sound signal		
	Transistor test	-	h_{FE} β-test	h_{FE} β-test
	Polarity display	+	+	+
	Meas. range overflow	+	+	+
	Diode test	+	+	+
	Battery state display	+	+	+
	Temperature metering	-	-50 °C ... 200 °C	-
	Square-wave generator	-	-	kb. 1000 Hz
	Accessories	Measuring wires, batteries, instruction manual		
	Power supply	1 pc 9 V 6F22 Transistor battery		
	Operating temperature	0 °C ... +40 °C (relative humidity <75 %)		
	Storage temperature	-10 °C ... + 50 °C		
	Dimensions / Weight	125×70×27 mm / 150 g		

Technical data / Tracon code		MT-04*	MT-05	MT-06
DC voltage measurement	Measurement limits	200 mV, 2 mV, 20 V, 200 V, 600 V		
	Accuracy	± 0,8 %		
AC voltage measurement	Measurement limits	200 V, 600 V		
	Accuracy	± 1,2 %		
DC current measurement	Measurement limits	2 mA, 20 mA, 200 mA, 10 A		
	Accuracy	± 1,5 %		
Resistance measurement	Measurement limits	200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ		
	Accuracy	± 1,0 %		
	Continuity test	+	+	+
	Transistor test	h_{FE} V_{ce} 3V, I_b 10 µA		
	Polarity display	+	+	+
	Mass range overflow	+	+	+
	Diode test	2,8V/1mA		
	Battery state display	+	+	+
	Temperature metering	-	-	- 20 °C ~ 1370 °C ± 3,0 %
	Square-wave generator	50 Hz	50 Hz	-
	Accessories	Measuring wires, batteries, instruction manual		
	Power supply	1 pc 9V 6F22 button battery		
	Overload protection	+	+	+
	Data hold button	+	+	+
	Operation temperature	-10 °C...+50 °C		
* With backlight	Dimensions / weight	137x69x31 / 160 g	130x74x38 / 163 g	137x69x31 / 160 g

Technical data / Tracon code		MT-07			
DC voltage measurement	Measurement limits	400 mV, 4 V, 40 V, 400 V			1000 V
	Accuracy	±(0,8%+4D)			±(1,0%+4D)
	Input impedance	10 MΩ			
AC voltage measurement (40…400Hz)	Measurement limits	400 mV	4 V, 40 V, 400 V		750 V
	Accuracy	±(1,2%+5D)	±(1,0%+5D)		±(1,2%+5D)
	Input impedance	10 MΩ			
DC current measurement	Measurement limits	400 µA, 4 mA	40 mA, 400 mA		10 A
	Accuracy	±(1,0%+4D)	±(1,5%+4D)		±(2,0%+4D)
	Protection against overload	Fusible 250 V, 500 mA			250 V/10 A
AC current measurement (40…400Hz)	Measurement limits	400 µA, 4 mA	40 mA, 400 mA		10 A
	Accuracy	±(1,5%+4D)	±(2,0%+4D)		±(3,0%+10D)
	Protection against overload	Fusible 250 V, 500 mA			250 V/10 A
Resistance measurement	Measurement limits	400 Ω	4 – 40 - 400 kΩ	4 MΩ	40 MΩ
	Accuracy	±(1,2%+2)	±(1,0%+2)	±(1,2%+2)	±(1,5%+2)
Frequency measurement	Measurement limits	40 Hz, 400 Hz, 4000 Hz, 40 kHz, 400 kHz, 4 MHz, 10 MHz			
	Accuracy	±(1,5%+4)			
	Sensitivity	≤1 MHz: ≤300 mV RMS; >1 MHz: ≤600 mV RMS			
	Input	≤ 10 V RMS			
Capacity measurement	Measurement limits	4 nF		40 nF, 400 nF, 4 µF, 40 µF, 100 µF	
	Accuracy	±(5%+10) in REL mode		±(5%+5)	
Transistor measurement	h_{FE} (NPN, PNP)	0 – 1000, I_b≈10 µA			
	Accuracy	±(5%+5)			
	Diode test	Voltage value of open network ~ 1,48 V			
	Continuity test	Voltage value of open network ~ 0,45 V The build-in beeper makes signal			
	Display	3 ¾ digits LCD, Polarity sign out, Signal to step over measuring level			
	Battery state display	Signal for low battery state			
	Functions	Data HOLD, REL (measuring the relative value)			
	Speed of sampling	3 sample / sec			
	Accessories	Measuring wires (2 pcs), batteries (inside device), instruction manual			
	Power supply	1 pc 9 V battery (LF22)			
	Extras	Automatic power off after 15 sec			
	Operation temperature	0 – 40 °C (<75% relative humidity)			
	Dimensions / weight	186 x 91 x 36 mm / 225 g			

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Analog clamp meters

Four functions in one instrument. This universal instrument is designed for metering AC current and voltage, resistance and DC voltage. Clamp meters are suitable to test the parameters of high-current, power transmission networks, equipments and current distribution systems outdoors or in switching stations. They are also suitable for trouble tracing. The eye-shaped jaw can be used for measurement between cable ties. Its construction is very safe with protected plugs and input contacts. The DC voltage range can be used very well for controlling safety extra-low voltage systems. The indicator can be fixed for later reading as well.

RELEVANT STANDARD
EN 61010-1

Technical data / Tracon Code	LF2608
DC voltage metering:	60 V ±5 % FS
AC voltage metering:	150 V, 300 V, 600 V ±5 % FS
AC current metering:	6 A, 15 A, 60 A, 150 A, 300 A ±5 % FS
Resistance metering:	1 kΩ, 100 kΩ ±5 % FS
Overload protection:	With 0,5 A/250 V glass-fuse, with diode at resist. metering
Conductor diameter:	max. 33 mm (approx. 850 mm^2)
Electrical strength:	2000 VAC during a minute, between housing and circuit
Insulation resistance:	min. 10 MΩ/1000 V between housing and circuit
Power supply:	1 pc 1,5 V R6L battery
Accessories:	Measuring wires, battery, artificial leather bag, inst. manual
Dimensions:	193×78×39 mm
Operating temperature:	0 °C ... +50 °C (relative humidity max. 80 %)
Storage temperature:	-20 °C ... + 60 °C (relative humidity max. 80 %)
Weight:	280 g (including battery)

Digital clamp meters

The instrument has an LCD display, well visible in is at any kind of light. Features include automatic decimal point placing and polarity mark (minus) indication at negative polarity measurement. The measurement range overflow is indicated on the display by flashing the maximum value of range together with the decimal point and the polarity mark. The meter also can be used for measurement between cable ties.

RELEVANT STANDARD
EN 61010-1

Technical data / Tracon Code		LF266		LF266C		
DC voltage metering	Measurement limits	1000 V		200 mV, 2 V, 20 V, 200 V		1000 V
	Accuracy	±0,8 % +3 D		±0,8 % +3 D		±1,2 % +5 D
	Input impedance	9 MΩ		9 MΩ		
	Overload protection	1000 V DC/AC		1000 V DC/AC		
AC voltage metering (45 ... 400 Hz)	Measurement limits	750 V		200 V		750 V
	Accuracy	±2 % +5 D		±1,2 % +5 D		±2 % +5 D
	Input impedance	9 MΩ		9 MΩ		
	Overload protection	750 V_{eff} AC		750 V_{eff} AC		
AC current metering (50...60 Hz)	Measurement limits	200 A, 1000 A		20 A	200 A	1000 A
	Accuracy	±2,5 % +5 D		±2,5 % +8 D	±2,5 % +5 D	±2,5 % +5D
	Overload protection	1200 A over a minute		1200 A over a minute		
Resistance metering	Measurement limits	200 Ω	20 kΩ	200 Ω	20 kΩ	2 MΩ
	Accuracy	±1,2 % +5 D	±1 % +3 D	±1,2 % +5D	±1 % +3D	±1,5 % +5D
	Overload protection	250 V_{eff} AC		250 V_{eff} AC		
	Temperature measure	-		0 °C ... 400 °C ±1 % +3D		
	Continuity indication	With sound signal		-		
	Polarity indication	+		+		
	Overflow	+		+		
	Battery state display	+		+		
	Data store button	+		+		
	Conductor size	max. 50 mm (approx. 1950 mm^2)				
	Power supply	1 pc 9 V 6F22 transistor battery				
	Accessories	Measuring wires, battery, leather bag, instruction manual				
	Operating temperature	0 °C ... +50 °C (relative humidity max. 80 %)				
	Storage temperature	-20 °C ... + 60 °C (relative humidity max. 80 %)				
	Dimensions	123×70×37 mm				
	Weight	280 g (including battery)				

Technical data / Tracon code		LF-01	LF-02
DC voltage measurement	Measurement limits	-	1000 V
	Accuracy	-	± (0,5 % + 2 digit)
	Input impedance	-	9 MΩ
	Protection against overload	-	1000 V DC/AC
AC voltage measurement (40 ... 400 Hz)	Measurement limits	200 V, 600 V	750 V
	Accuracy	± (2 % + 5 digits)	± (1 % + 5 digits)
	Input impedance	9 MΩ	9 MΩ
	Protection against overload	1000 V_{eff} AC	1000 V_{eff} AC
AC current measurement (50...60 Hz)	Measurement limits	200 A, 600 A	20 A, 200 A, 1000 A
	Accuracy	± (2,5 % + 5 digits)	± (2,5 % + 5 digits)
	Protection against overload	120 % of metering range for 30 sec	
Resistance measurement	Measurement limits	200 Ω	2 kΩ, 200 kΩ
	Accuracy	± (1,5 % + 3 digits)	± (1,08 % + 3 digits)
	Protection against overload	250 V_{eff} AC	250 V_{eff} AC
	Continuity test	With sound signal if R<30 Ω	With sound signal if R<30 Ω
	Diode test	-	+
	Display back light	-	+
	Polarity display	+	+
	Mass range overflow	+	+
	Battery state display	+	+
	Data HOLD button	+	+
	Display	LCD, 3 ½ digits	LCD, 3 ¾ digits
	Max. diameter of metered wire	max. 33 mm	max. 42 mm
	Dielectric strength	2000 V AC for 1 min between housing and electric circuit	
	Isolation resistance	min. 10 MΩ / 1000 V between housing and electric circuit	
	Fuse against overload	0.2 A / 250 V miniature glass fuse	
	Speed of sampling	3 samples / sec	
	Power supply	1 pc 9 V 6F22 transistor battery	
	Accessories	Measuring wires (2 pcs), battery, user's manual, carrying bag	
	Operation temperature	0 – 40 °C (<75% relative humidity)	
	Storage temperature	-10 – 50 °C (<75% relative humidity)	
	Dimensions	208x90x40 mm	250x99x46 mm
	Weight (including battery)	290 g	400 g

ET261

Insulation testing adapter

The insulation testing adapter can be used together with the LF266- or LF266C-type digital clamp meter; the measured value is readable from the LCD-display of the clamp meter. It converts the 6V battery voltage up to 500V. The average lifetime of the batteries is 30 hours, their exhaust is indicated by the green LED signal lamp.

Technical data

Rated metering voltage:	500 V DC
Metering temperature:	18 °C…28 °C (Humidity: 80 %)
Power supply:	4 pcs AA type (R6) 1,5 V battery
Reference temperature:	23 °C ± 5 °C
Ambient temperature:	0 °C … +50 °C
Storage temperature:	-20 °C ... -60 °C
Relative humidity:	max. 80 %
Weight:	approx. 200 g
Dimensions:	90 × 70 × 50 mm
Accessories:	1 pair measuring wires, battery, user manual, carrying bag

RELEVANT STANDARD
EN 61010-1

Level	Metering range	Accuracy
20 MΩ	100 kΩ…19,99 MΩ	± 2 % + 2 digit
2000 MΩ	10 MΩ…1999 MΩ	± 5 % + 2 digit

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Infrared thermometer

- Temperature measurement without contact, °C/°F switchover
- Spot laser beam for precise positioning
- Clearly visible LCD display with blue background lighting
- Warning for low battery
- Data- Hold function; carrying bag

RELEVANT STANDARD
EN 61010-1

Technical data

Supply:	1 × 6F22 9 V battery (supplied accessory)
Optic:	D:S 6:1
Efficiency:	0,95 fix
Temperature measurement range:	-20 – 320 °C / -4 – 608°F
Temperature measurement precision:	±2'C
Response time:	500 ms
Displayed value resolution:	0.1
Size/Weight:	45×155×90 mm / 150 g (with battery)

Tracon code	Denomination
HM-01	Infrared thermometer

LDSZ Wood insert detector with water level and laser pointer

- Determining the position of covered wooden inserts
- Horizontal and vertical positioning
- Track determination with laser

Technical data

Operation range:	approx. 5 m
Power of laser:	≤1 mW
Operating current:	≤60 mA
Power supply:	1 pc 9 V 6F22 type transistor battery
Storage temperature:	-20 °C ... 50 °C
Operating temperature:	0 °C ... 40 °C
Relative humidity:	≤ 90 %

Tracon kód	Denomination
LDSZ	Wood insert detector with water level and laser pointer

AFK-1 Metal and wire detector

The device can detect metal parts and wires under surface. The red LED light shows the successful detection; if the wire is under voltage, the LED blinks. Sensitivity of the detection is adjustable by the rolling switch on the side of the device. The detector is applicable for up to 20 mm plastering thickness. Power supply: 1 pc 9 V 6F22 transistor battery

AFK-2 Metal, wire and wooden insert detector

The device has two detector ends. On the metal and electric wire detection part a red LED light shows successful detection; if the wire carries voltage, the LED blinks and an alarm sounds. On the wooden insert detection part a red LED light and a beeping sound of increasing frequency shows successful detection. Sensitivity of detection is adjustable by rolling switches on the side of the device. The detector is applicable up to 20 mm plastering thickness. Power supply: 1 pc 9 V 6F22 transistor battery

AFK-3 Self-calibrating compact detector for metal, wires and wooden inserts

The device automatically completes the self-calibration in a second. Thanks for its size it can be carried in pocket or hung on a belt. The detection surface is suited for detecting metal, electric wires and wooden inserts. Detection modes are easily selectable with a switch. On „Voltage" position, a lighting „Metal" LED and a continuous sound indicates metal parts, voltage in the wire is indicated by the „Voltage" LED and a trigged acoustic signal. On „Stud" position, a lighting „Stud" LED and a continuous sound indicates the wooden insert. The detector is applicable up to 30 mm plastering thickness.
Power supply: 1 pc 12V MN21/23 battery.

FK-10

Phase searching screwdriver

max. 250 V~

FK-02 Phase searching screwdriver

The device can indicate the live state of wires. The LED lights if the driver's head reaches a live conductor and the user's finger touches the metal insert on the side of device. Continuity test can also be done on a potential-free conductor by touching one end of the wire with the screwdriver's head and the other end with the test person's finger. The metal insert must also be touched during the process.

FV-01

Induction controlling instrument

This device can measure directly AC and DC voltage in 12; 36; 55; 110 and 230 V steps, and indirectly the live condition of earth and neutral wires.
Technical data Sensitivity: 12 … 230 V AC/DC • Ambient temperature: -10 ˚C … +50 ˚C

FV-02

Two-pole voltage controlling instrument

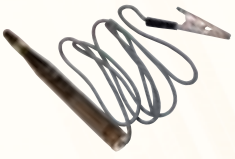
With this instrument the live state of conductor can be tested. It can detect track defects and the live state of devices or electric circuits before dismantling. It is adapted both for AC and DC voltage.

Technical data Sensitivity: 6…400 V AC/DC • Ambient temperature: -10 ˚C … +50 ˚C

FV-05

Voltage monitoring instrument

This instrument is applicable to detect voltages from 200 V to 600 V without direct contact (e.g. in wires under surface). If the color of the sensor edge changes to red (does not blink) means there is a live line underneath.
Technical data Ambient temperature: 200 V…600 V AC • Metering range: -10 ˚C … +50 ˚C



FV-06

Motor vehicle testing lamp

The testing lamp – mounted into hard body – is applicable to control the voltage in motor vehicles from 6 to 24 V voltage range.

FV-07 Multifunction control device

Testing of light bulbs and fuses: The tester must hold the light bulb or the fuse in one hand at one of the contact points and touch the screwdriver end of control device to the other contact point. At the same time the tester person has to touch the small metal plate on the side of control device. If the control lamp lights up, the tested light bulb or fuse is operable.

Testing the of wire continuity: The tested device must be under voltage. The tester person must hold the control device with touching the metal plate on the side. The screwdriver end of control device must follow the side of the tested wire. If the wire is under voltage the control lamp will blink or shine if the continuity of wire is correct. If the control lamp does not light, there is a discontinuity somewhere on the wire.

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FV-03

Pocket digital multimeter with search light

Modern instrument with 3 + ½ digit LCD display for metering values of electrical networks up to 600 V rated voltage. The device is adapted to meter AC and DC voltage, current, resistance, and also to diode metering. The data store button and the built-in search light makes the application more user-friendly, especially in narrow and dark places.

Technical data

Operation temperature:	5 °C ... +40 °C
Storage temperature:	-20 °C ... + 60 °C
Relative humidity:	max. 80 %
Input impedance:	10 MΩ
Dimensions:	155 × 55 × 26 mm
Power supply:	1 pc 3 V CR 2032 type lithium battery
Accessories:	metering head, battery and user manual
Weight:	130 g (including battery)

DC voltage metering:	**Metering range / Accuracy**	**AC voltage metering:**	**Metering range / Accuracy**
200 mV	± (0,5 % + 2 digit)	2 V	± (0,8 % + 3 digit)
2 V – 20 V - 200 V	± (0,7 % + 2 digit)	20 V - 200 V	± (1,2 % + 3 digit)
600 V	± (0,8 % + 2 digit)	600 V	± (1,5 % + 3 digit)
DC current metering:	**Metering range / Accuracy**	**AC current metering:**	**Metering range / Accuracy**
20 mA	± (1,2 % + 3 digit)	20 mA	± (1,2 % + 5 digit)
200 mA	± (1,2 % + 3 digit)	200 mA	± (1,2 % + 5 digit)
Resistance metering:	**Metering range / Accuracy**	**Continuity:**	**Term:**
200 Ω	± (1,2 % + 3 digit)	With sound signal	R<30 Ω
2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ	± (1,0 % + 2 digit)		
20 MΩ	± (2,0 % + 2 digit)	**Diode test:**	Metering data: 1,5 V; 0,5 mA

FV-04

Manual digital multimeter with logical level metering

This multimeter is used for measuring AC and DC voltage, current, resistance and diode, as well as for testing of control functions. Its use recommended for on-site measurements, operational and training purposes. The functions can be selected with selector switch on the front of the device.

Technical data

Operation temperature:	5 °C ... +40 °C
Storage temperature:	-10 °C … +50 °C
Relative humidity:	max. 75 %
Input impedance:	10 MΩ
Dimensions:	155 × 55 × 26 mm
Power supply:	2 pcs 1,5 V LR-44 type battery
Accessories:	metering wires, user manual
Weight:	130 g (including batteries)

DC voltage metering:	**Metering range / Accuracy**	**AC voltage metering:**	**Metering range / Accuracy**
200 mV	± 0,5 % + 2 digit	2 V	± 0,8 % + 4 digit
2 V, 20 V, 200 V	± 0,8 % + 2 digit	20 V, 200 V	± 1 % + 4 digit
500 V	± 1 % + 3 digit	500 V	± 1 % + 5 digit
DC current metering:	**Metering range / Accuracy**	**AC current metering:**	**Metering range / Accuracy**
200 mA	± 1,5 % + 3 digit	200 mA	± 2,5 % + 5 digit
Resistance metering:	**Metering range / Accuracy**	**Logical level metering: CMOS/TTL**	
20 Ω	± 1 % + 3 digit	0% 30% 70% 100%	
2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ	0,8 2 % + 2 digit	Low "0" GREEN LED On	High "1" RED LED On
20 MΩ	± 2 % + 5 digit		