



ELECTRUM AV

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3ph CRD-6.2-DIN_Rev4

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THREE-PHASE CONTROLLED THYRISTOR DRIVER
3phCTD – 6.2-DIN
USER'S MANUAL

5 Naugorskoe shosse, Orel, 302020, Russia Tel. +7(4862) 44-03-44, Fax +7(4862) 47-02-12

E-mail: mail@electrum-av.com

Three-phase controlled rectifier driver 3phCTD -6.2-DIN is intended for forming of control pulses by the drivers TD with fiber-optical receivers (manufactured by Electrum AV) composed of power bridge thyristor rectifier powered from three-phase 50 Hz with line voltage 80÷100 V.

Driver provides thyristor protection at maximum current (version CP1 and CP2). It may be also made without maximum-current protection (version CP0).

Operation

3phCTD-6.2-DIN is provided with vertical-pulse regulation method of average load voltage value when rms change is performed by duration change of thyristor open state during corresponding half-period of line voltage.

Functional circuit of 3phCTD-6.2-DIN is shown at Figure 1. Function of outputs 3phCTD-6.2-DIN is shown in Table 1.

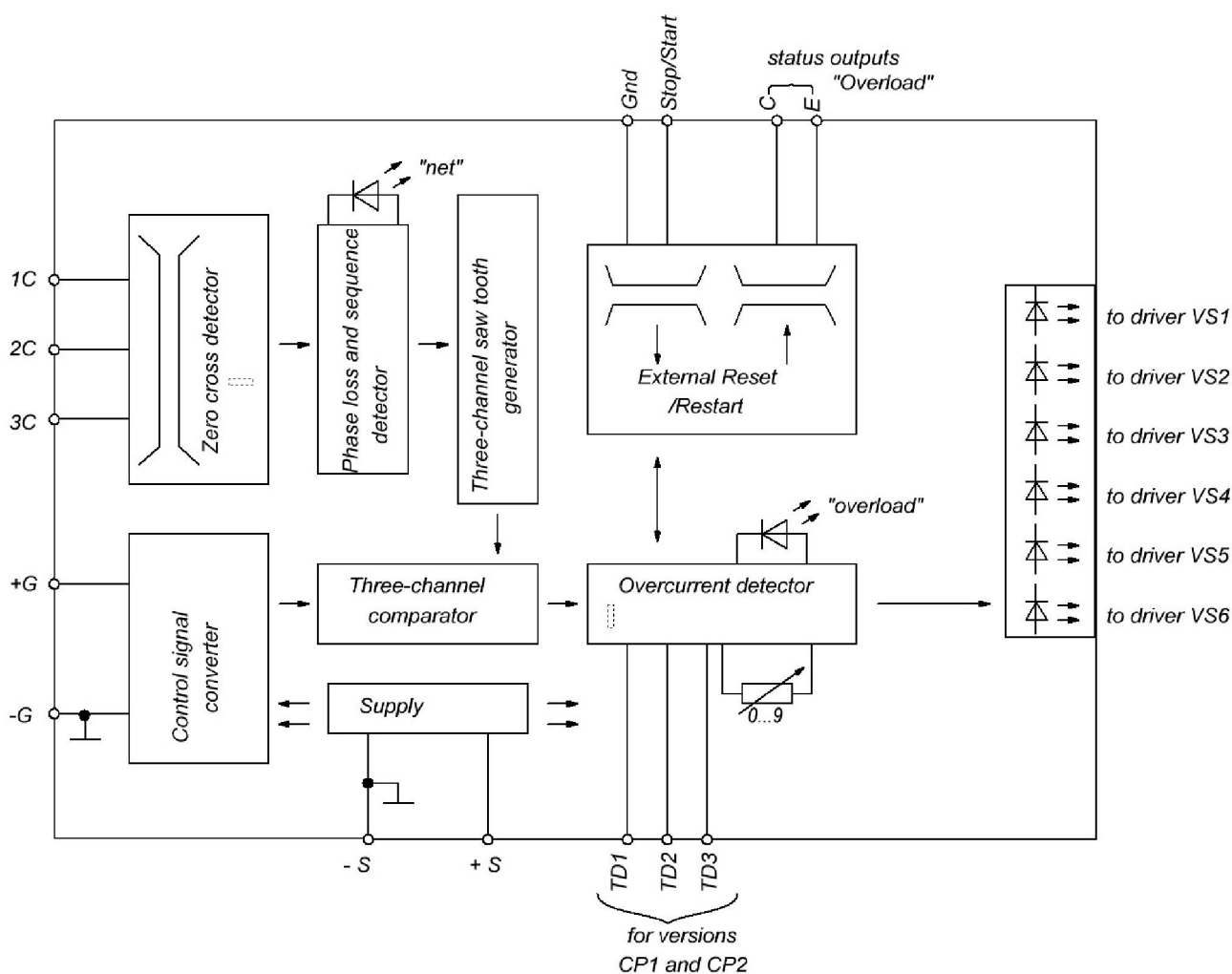


Figure 1 – Functional circuit

Table 1 – Output function of 3ph CTD-6.2-DIN

Output	Symbol	Function
X1	Stop / Start	Reset signal / Enable signal (for version with external control)
X3	Gnd.	Ground output for prohibit / enable signal (for version with external control)
X4	E	Emitter of status optocoupler (for version with status optocoupler)
X5	C	Collector of status optocoupler (for version with status optocoupler)
X7	TD1	Current sensor input of phase 1 (for version CP1 and CP2)
X8	TD2	Current sensor input of phase 2 (for version CP1 and CP2)
X9	TD3	Current sensor input of phase 3 (for version CP1 and CP2)
X10	– S	Supply 5 V
X11	+ S	
X12	+ G	Control
X13	– G	
X14	TD VS6	Optical connector of thyristor driver connection VS6
X17	TD VS5	Optical connector of thyristor driver connection VS5
X19	TD VS4	Optical connector of thyristor driver connection VS4
X22	TD VS3	Optical connector of thyristor driver connection VS3
X24	TD VS2	Optical connector of thyristor driver connection VS2
X27	TDVS1	Optical connector of thyristor driver connection VS1
X29	3 c	Inputs of synchronization with the network
X30	2 c	
X31	1 c	

Network synchronization node forms pulses at the moment of zero line voltage transient that synchronize sawtooth generator. In three-channel comparator the voltage of sawtooth generator and control signal U_{in} is compared that is delivered from converter circuit of input signal. On achievement STG voltage of value U_{cont} the turn-on pulses of thyristor driver will be generated. The change of control signal value will lead to change of equality moment of STG voltage and U_{cont} and thyristor conductance angle respectively. Thus, the regulation of rms load voltage is reached.

Smooth start mode at supply turn-on is provided in 3phCTD-6.2-DIN, synchronizing signals delivery and at returning from «Current overload» mode (for versions CP1 and CP2) into the operation mode that allows decreasing inrush current of capacity filter charge of three phase controlled rectifier.

In the 3phCTD -6.2 with CP1 and CP2 performance there are current inputs to connect the current sensors, intended for power thyristors protection against overload by currents that exceed the nominal value. If load current value is higher than the normal then 3phCTD -6.2-DIN moves in «Current overload» state, status LED is turned on (with red color) or status optocoupler transistor is opened (depending on the version), signals corresponding to closed thyristor state are formed on control outputs by thyristor drivers. Protection removes after 300 ms. The status LED is disconnected (or status optocoupler transistor will be closed), signals that perform smooth start from zero to mean load voltage value determined by control signal value are formed on control outputs by thyristor drivers.

If emergency is not eliminated then the above described process continues until the malfunction is eliminated. 3phCTD-6.2-DIN may be also made in version when Disable/Enable of driver operation is performed by external signals that are delivered to input “Stop/Start”, for instance, from controller board.

Therewith low logic level signal will correspond to state “Stop” and high logic level signal will correspond to state “Start”

There is a ten positional switcher (0 ... 9) for CP1 and CP2 version under 3phCTD -6.2-DIN hood that allows setting necessary protection operation current when entering of 3ph CRD -6.2-DIN the service. You need to take off the hood of 3phCTD -6.2-DIN and set the switcher in the right position (when delivering to the consumer it is set to the «0» position). Current values for CP1 and CP2 are shown in Table 2.

Table 2 – Current value for versions CP1 and CP2

Switch position		0	1	2	3	4	5	6	7	8	9
Version CP1	Protection operate current, A	20	40	60	80	100	120	140	160	180	200
	Input load protection operate current of TD.A, TD.B, TD.C, mA	14	28	42	56	70	84	98	112	126	140
Version CP2	Protection operate current, A	200	220	240	260	280	300	320	340	360	380

Input load protection operate current of TD.A, TD.B, TD.C, mA	140	154	168	182	196	210	224	238	252	266
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Besides current overload protection, the 3phCTD -6.21-DIN has protection that allows controlling voltage availability on all three phases connected to thyristor rectifier as well as correct phase rotation. Thus, eliminating work in open-phase mode as well as an unresponsive state in violation of phase sequence. At presence of the voltage in all three phases and at correct phase rotation, the “Net” indicator has green color. In case of phase breaking as well as when trouble of their rotation order the “Net” indicator has no a color on the thyristor driver outputs and the signals corresponding to its closed state are formed.

3phCTD -6.21-DIN operates as a unit of control devices (other manufacturer) that has standard analog output DC signal.

Control signal converter turns control signal of 5 types (0...5 V; 0...10V; 0...5 mA; 0...20mA; 4...20 mA) into «U_{cont}» signal for 2 control types depending on version of 3phCTD -6.1. Dependence of conduction thyristor angle (time when thyristors conduct current) versus relative value of control signal is shown at Figure 2.

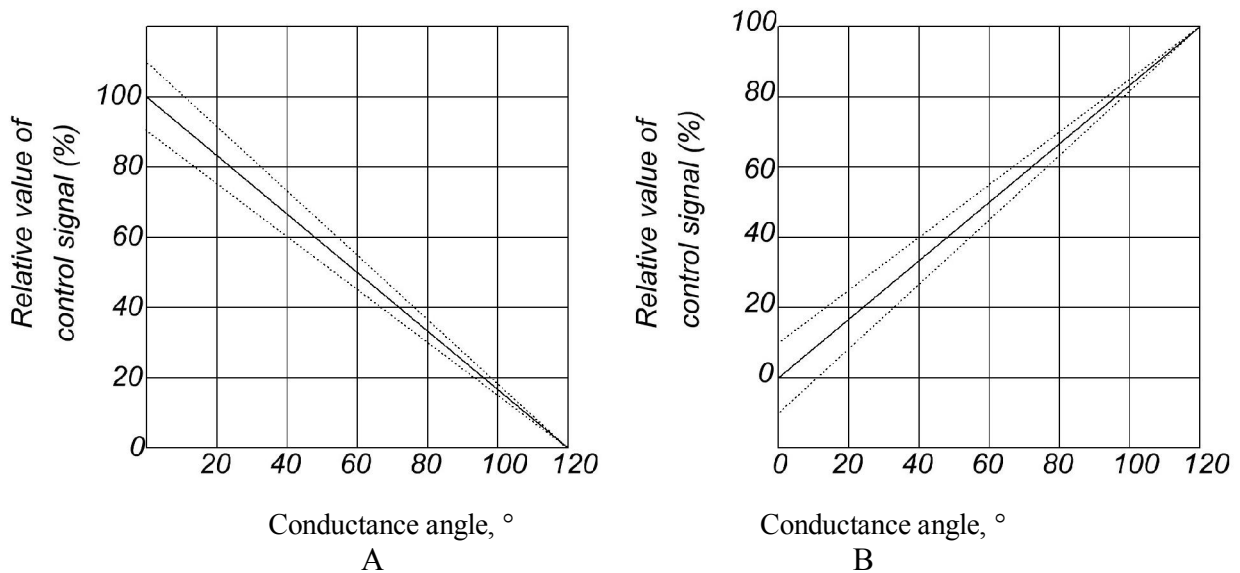


Figure 2 – Control characteristics

Basic technical characteristics of 3phCTD 6.2-DIN are shown in Table 3. Overall dimensions are given at Figure 3.

Technical characteristics

Table 3 – Basic technical characteristics

1 Supply

Parameter	Unit	Value	Note
1. Supply voltage	V	5	DC
2. Supply voltage value decline, max	%	± 10	
3. Current consumption, max	mA	600	

2 Input circuit characteristics

Parameter	Unit	Types of input circuits 3ph CRD-6.2										Note
		A-1	A-2	A-3	A-4	A-5	B-1	B-2	B-3	B-4	B-5	
1 Control signal value corresponding to minimum power	V	5±0.5	10±1	-	-	-	0÷0.5	0÷1	-	-	-	
	mA	-	-	20±2	5±0,5	20±2	-	-	4±0.4	0÷0.5	0÷2	
2 Control signal value corresponding to maximum power	V	0÷0.5	0÷1	-	-	-	5±0.5	10±1	-	-	-	
	mA	-	-	4±0.4	0÷0.5	0÷2	-	-	20±2	5±0.5	20±2	
3 Input circuit resistance of control signal, R _{in} , max	kΩ	12.5	11.1	0.062	0.2	0.05	12.5	11.1	0.062	0.2	0.05	

3 Output circuit characteristic

Type of optical transmitter	HFBR-1522
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4 Status circuit characteristic

Parameter	Unit	Value	Note
1 Collector current	max mA	50	
2 Collector-emitter voltage	max V	40	

5 Characteristics of external control circuits («Start», «Stop»)

Parameter	Unit	Value	Note
1. Voltage value of external control	max V	5	No external resistor
2. Smooth start time	ms	50 ±20 %	

6 Characteristics of synchronization circuits

Parameter	Unit	Value	Note
1. Synchronization voltage	V	80 ÷ 100	
2. Current consumption of synchronization input	max mA	15	

7 Insulation characteristic

Parameter		Unit	Value	Note
1 Electrical insulation strength of power circuits, input circuits, status circuits, external restart circuits relative to input circuits	max	kV	2.5	AC 50 Hz
2 Electrical insulation resistance of power circuits, input circuits, status circuits, external restart circuits relative to input circuits	min	MΩ	40	DC testing voltage 1000 V

8 Weight measure

Parameter		Unit	Value	Note
1 Weight	max	kg	-	
2 Overall dimensions	max	mm	91x160	Version 02

9 Service conditions

Parameter		Unit	Value	Note
1 operating temperature		°C	- 40 ÷ + 60	
2 Relative humidity	max	%	80	

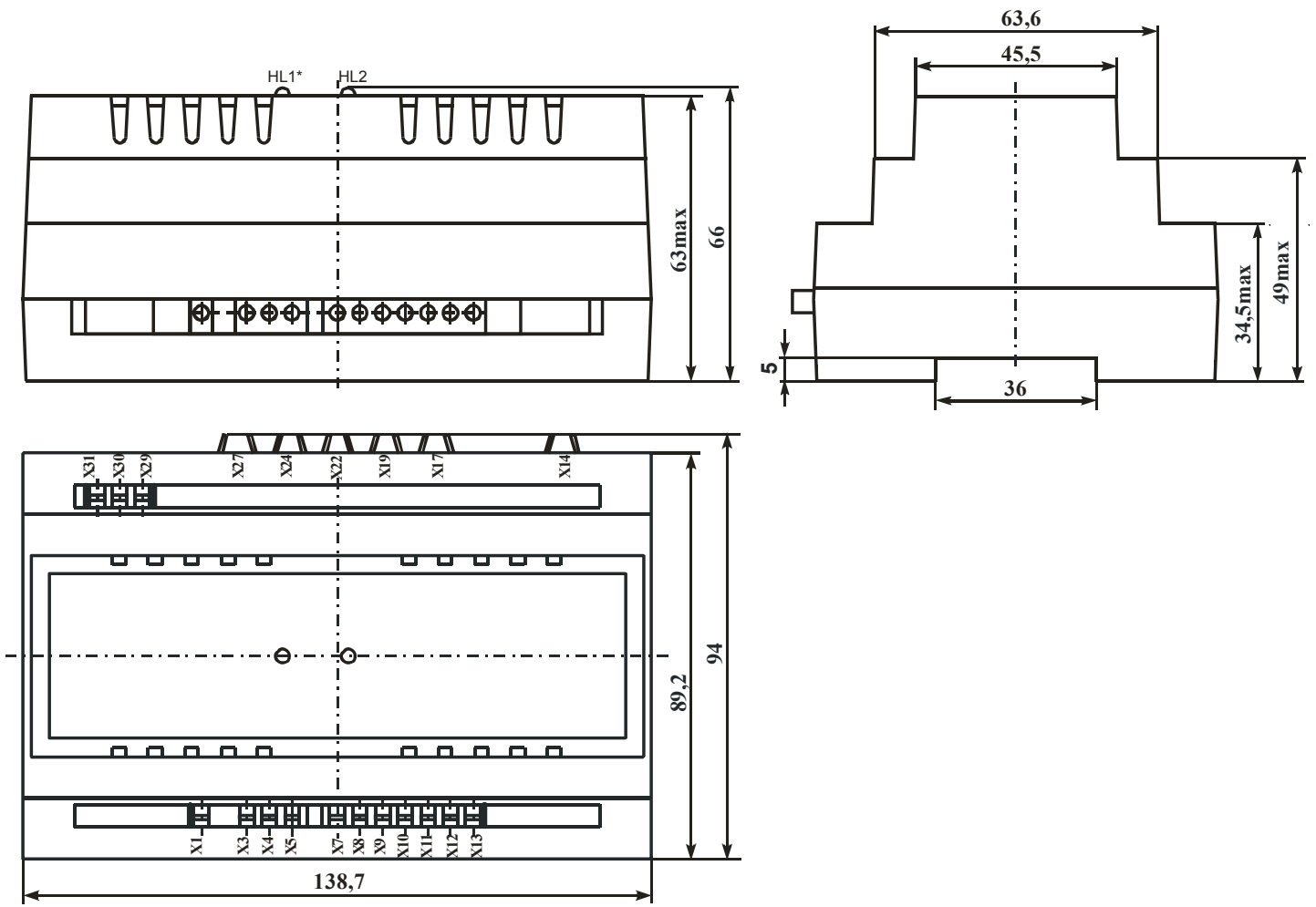
Notation

Notation: $\frac{3\text{phCTD} - 6.2 - \frac{A}{2} - \frac{1}{3} - \frac{CP2}{4} - \frac{A}{5} - \frac{1}{6} - \text{DIN}}{7}$

- 1 Driver name;
- 2 Control characteristics:
 - A - 100% control signal corresponds to zero power;
 - B - 100% control signal corresponds to total power;
- 3 Control signal type:
 - 1 - 0...5 V;
 - 2 - 0...10 V;
 - 3 - 4...20 mA;
 - 4 - 0...5 mA;
 - 5 - 0...20 mA;
- 4 Current protection range
 - CP1 - 20...200 A;
 - CP2 - 200...380 A;
 - CP0 – no current protection
- 5 External/automatic control
 - A - automatic
 - E – external
- 6 Indication type when current protection operation
 - 1 – status LED
 - 2 – status optocoupler;
- 7 Fastening to DIN-rail 35 mm.

ATTENTION!

For drivers with performance CP0, restart view by triggering T3 (5), and the type of display when triggering T3 (6) ARE NOT INDICATED



APPLICATION RECOMENDATIONS

It is permitted to wire field line and control circuits in one bundle or common tube (box) when mounting. Avoid kinks in connecting cables of control and supply circuits. Connecting wires should be made as twisted pairs to provide noise stability.

Connection circuit of 3phCTD-6.2-DIN is shown at Figure 4

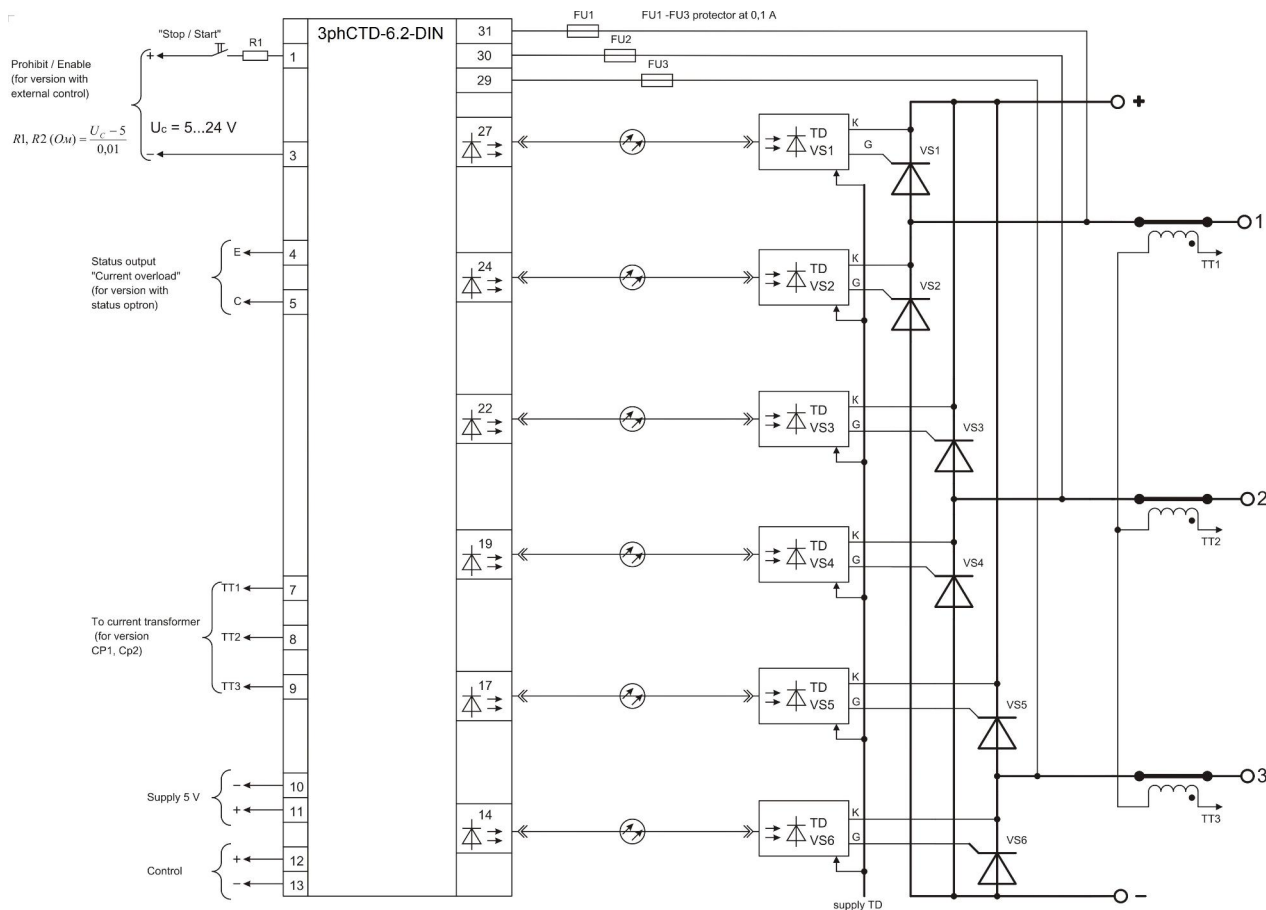


Figure 4 – Connection circuit

SUPPLY SET

- | | | |
|---|-------|-----------|
| 1. 3phCTD-6.2-DIN | _____ | _____ pcs |
| 2. Current sensor 1:2000±2% (for versions CP1, CP2) | _____ | _____ pcs |