

### Application

- power supply of serial current circuits for signal lights at airports and heliports

### Certificate basis

- FAA AC 150/5345-10E, specification L-829
- MAK

### Description/Properties

- thyristor regulation
- air cooled transformer 4-30 kVA
- multi-processor control system
- entering of data and display of operational values with use of push buttons and multi-functional LCD display
- current system 6,6 A or 8,3 A (switchable)
- regulation with 3/5/7 degrees of luminous intensity
- over-current and over-voltage protection with remote and local signalling
- remote and local control
- measuring insulating state of loops (module EFD)
- measuring the number of defective lamps
- comprehensive diagnostics of regulators with use of the AMS system
- all components and connection points are accessible from the front, which enables placing of regulators with back right to the wall
- easy repairs with use of quickly replaceable modules
- single and double execution
- execution for 2, 3, 4, and 5 output loops with the module LCS (for TCR.2.04 and TCR.2.10)
- the possibility of power optimization
- regulator operates in the range of 0-100% of the nominal performance

### Mechanical parameters TCR

- protection (in operating condition) IP 20
- temperature range from -25 (optionally -45) to 55 °C
- storage temperature - 40/+60 °C
- dimensions 575x540x1330 mm
- color gray / dark gray, gray baking enamel
- surface finish RAL 7035/RAL 7030
- weight TCR.2.04 = 126 kg
- weight TCR.2.04+04 = 195 kg
- weight TCR.2.10 = 173 kg
- weight TCR.2.20 = 225 kg
- weight TCR.2.30 = 268 kg

### Elektrical parameters TCR

- supply voltage 380-400 V or 208-240 V
- tolerance of supply voltage +10 %/-15 %
- frequency 50/60 Hz
- tolerance of output current  $\pm 0,1$  A



single execution



double execution

- current system (max. output current) 6,6/8,3 A
- current regulation 3/5/7 deg. of lumin. intens.
- over-current protection (6,6 A) 6,95 A
- over-current protection (8,3 A) 8,75 A
- output power TCR.2.04 4 kVA
- output power TCR.2.10 10 kVA
- output power TCR.2.20 20 kVA
- output power TCR.2.30 30 kVA
- efficiency min 95 % at rated power
- over-voltage (output) protection 110 % of rated power

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# TCR



Regulator TCR is identified by the manufacturer's label, which contains information about type output of regulator, input supply voltage and installed extending modules.

**Example:**

**TCR . 2 . 04 . 400 . D E L S2 C1**

**Rated output**

04	4 kVA
10	10 kVA
20	20 kVA
30	30 kVA
04+04	4 kVA + 4 kVA

**Input supply voltage**

400	380-400 VAC
230	208-240 VAC

**Remote control module (COM)**

(not listed)	it is not installed
D	DAP 128TC
R	RS-485
Bx	contact control, where „x” gives control voltage

**Module for measuring**

of circuit insulation state (EFD)	
(not listed)	it is not installed
E	module EFD is installed

**Module for indication**

of number of defective lamps (LFD)	
(not listed)	it is not installed
L	module LFD is installed

**Module for switching of output loop circuits (LCS)**

(not listed)	it is not installed
Sxy	Sxy module LCS is installed, where „xy” gives number of loop circuits and functions of switches (module can be installed only into regulator with rated output 4 and 10 kVA)

**Function of switching circuits**

(not listed)	alternative function
0	simultaneous function, by default it is switched off
1	simultaneous function, by default it is switched on

**Number of switched output loop circuits**

2	2 loop circuits
3	3 loop circuits
4	4 loop circuits
5	5 loop circuits

**Identification of language version (Country Code)**

Cx where „x” identifies language version (1=Czech, 2=English, 3=German, 4=Spanish, 5=Russian)

Note 1: constant current regulators TCR have identical solution for current systems 6,6 A and 8,3 A. Current system can be changed by replacement of the module IDK (supply contains IDK modules for both current systems).

**Description of functions**

- current regulation is based on the principle of phase control by thyristors
- output current circuit is galvanically separated by transformer
- multi-processor system for control of regulator ensures control, measurement and stabilization of output current in accordance with specified luminous intensity degree
- values of current for individual luminous intensity degrees are selected in compliance with the respective regulations and they are stored in memory of the control unit
- optional number of luminous intensity degrees
- continuous measurement with use of independent circuits enables evaluation of failure states (disagreement between required and true current, over-current, power overload ...)
- contactor disconnects primary winding of power transformer when any protection is activated
- regulator remembers the latest selected state in case of power failure of remote control failure

**Tables of currents**

- two standard and two user configurable tables of currents
- configuration of user table is made with use of push buttons and display on the module DSP
- all the settings remain in the regulator even after it is switched off and cut-off from its supply voltage

output currents for 5 luminous intensity levels

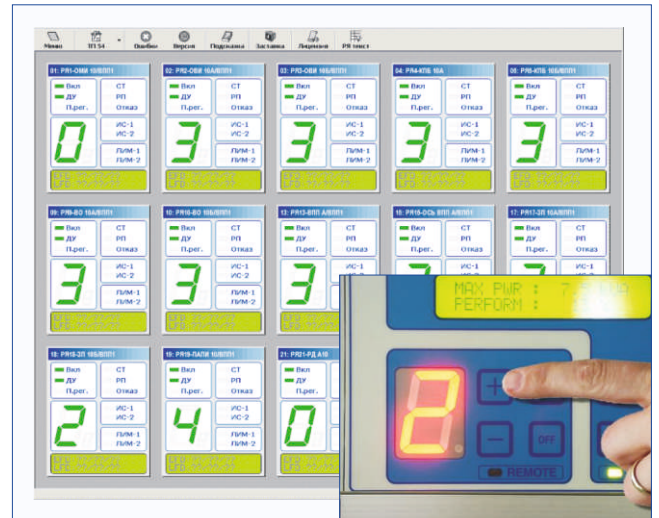
Luminous intensity level	Output current	
	System 6,6 A	System 8,3 A
TEMP	1,3 A	1,6 A
1	2,8 A	4,3 A
2	3,4 A	4,9 A
3	4,1 A	5,7 A
4	5,2 A	6,8 A
5	6,6 A	8,3 A

output currents for 7 luminous intensity levels

Luminous intensity level	Output current	
	System 6,6 A	System 8,3 A
TEMP	1,3 A	1,6 A
1	2,2 A	3,5 A
2	2,8 A	4,3 A
3	3,4 A	4,9 A
4	4,1 A	5,7 A
5	5,2 A	6,8 A
6	6,4 A	7,8 A
7	6,6 A	8,3 A

### Local and remote control

- there are three possibilities of remote control
  - via data transfer system DAP 128 TC (COM-DAP)
  - via serial line RS-485, prot. MODBUS (COM-RSC)
  - via contact inputs / outputs (module COM-BIN)
- change of system of remote control by simple replacement of the module COM
- local control with use of push buttons on the module DSP



### Data representation

- all important information about operation is displayed on control panel
- it is possible to choose with use of control push buttons from rich menu of displayed data, to calibrate and set regulator's parameters



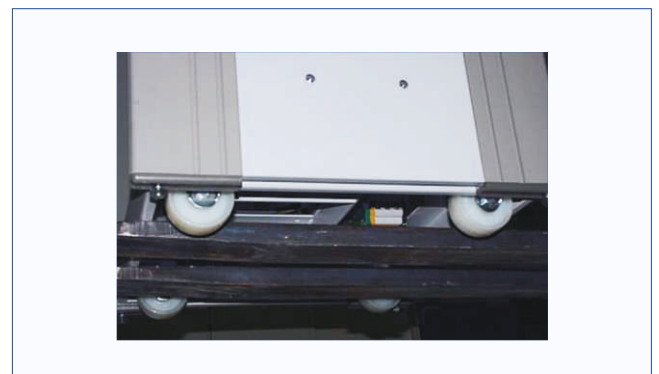
### Service

- easy and rapid replacement of regulator's modules in its front side
- setting of configuration remains unchanged during repair



### Mechanical mounting

- installation of racks in one row closely each to other, rear side right to the wall
- four wheels at the rack's bottom part make handling easy
- all connection points are accessible from the front side after removal of the front cover sheet



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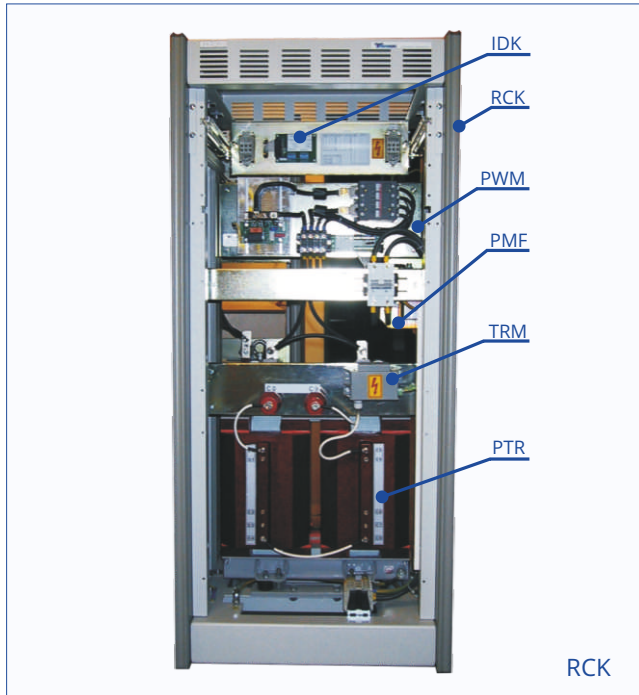
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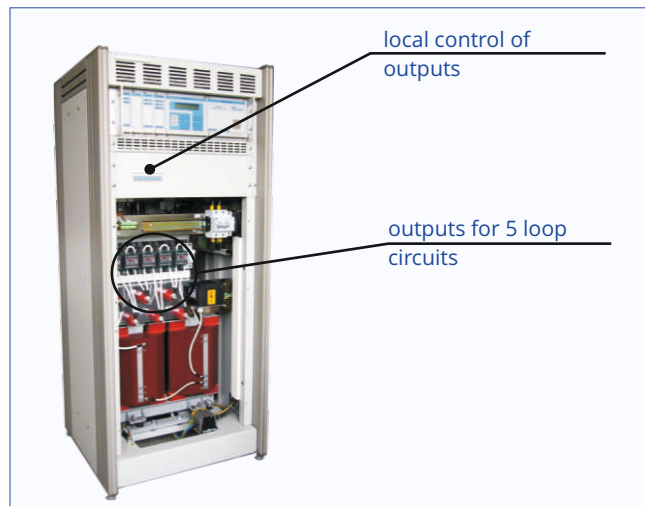
### Basic RACK- RCK

- basic rack of regulator
- steel/aluminum structure
- access to all components from the front side



### Module LCS

- switching of several loop circuits of serial current circuit, which are connected to one regulator (e.g. taxiways, stop bars, guidance systems, approach lights PAPI, extended axis of taxiways, etc.)
- installation into regulators TCR.2.04 and TCR.2.10
- switching of max. five loop circuits
- alternative or simultaneous execution
- alternative execution enables switching of one from max. five connected loop circuits (each loop circuit has max. output corresponding to regulator's rated output)
- simultaneous execution enables switching of any combination of connected loop circuits (with total output corresponding to regulator's rated output)



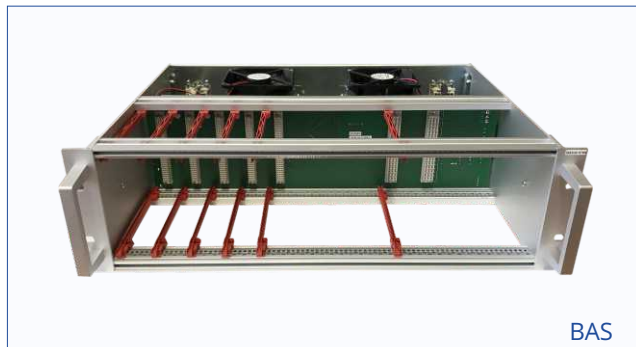
### Module IDK (ID KEY)

- regulator's identification key
- module is accessible after removal of the control unit sub-rack from the regulator's rack
- setting of the address in data transfer system for remote control
- setting of used combination of branches on power transformer
- regulator's identification (output, number of luminous intensity degrees, etc.)
- selection of current system by simple replacement of the module (modules IDK for both current systems are comprised in the supply)



**Module BAS (BASIC UNIT)**

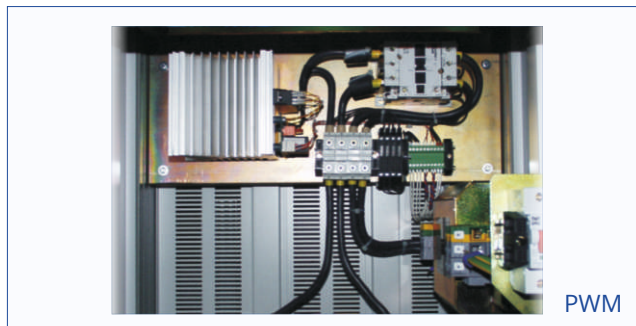
- 19" connector design with guides for easy insertion into the rack
- quick replacement of modules in case of failure
- module remembers after its removal the latest selected values
- it contains power circuits for outputs 4 and 10 kVA/400 V



BAS

**Module PWM (POWER MODULE)**

- power part of regulator
- it contains contactor and power thyristor with cooler
- utilization for regulator outputs 20 and 30 kVA / 400 V and for the whole power line for 230 V
- easy replacement of the whole module in case of failure



PWM

**PMF (power mains filter)**

- input noise suppressing filter
- it suppresses undesirable regulator's radiation
- it suppresses interference in power supply mains



PMF

**Module TRM (measurement transformer)**

- transformer for measurement of output current in the loop circuit
- separating circuits of modules for checking of insulation state of output current circuit



TRM

**Module PTR (power transformer)**

- power transformer
- universal for current systems 6,6 A and 8,3 A
- branches for optimization of regulator output



PTR

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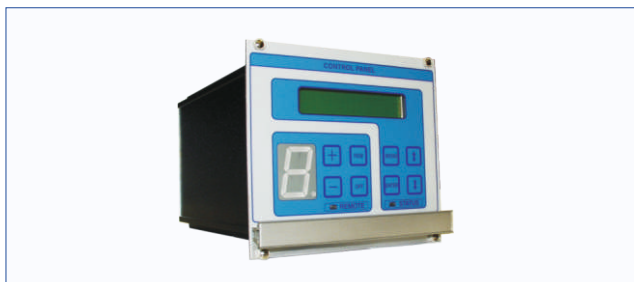
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## Module DSP (control panel - display)

- push buttons for local setting of luminous intensity degree and control mode
- seven segment two-color LED display for displaying of luminous intensity degree
- push buttons for control of data on LCD display
- alpha-numeric LCD display for display of detailed information on regulator



## Module PWR (power supply)

- power supply source for modules
- voltage transformers
- control circuits for thyristors and contactors
- switch on the front panel



## Module REG (regulator)

- regulator's control block
- it ensures function of current regulation in loop circuit
- it performs measurement of current and voltage
- it evaluates failure states



## Module EFD (earth fault detector)

- checks insulation state of current circuit
- evaluates two limits of insulation resistance, which can be set on the module DSP
- module DSP displays value of insulation resistance and module COM-DAP or COM-RSC transfers it to the monitoring system



## Module LFD (lamp fault detector)

- indication of number of defective lamps in output current circuit
- evaluates two limits of number of defective lamps, which can be set on the module DSP
- module DSP displays number of defective lamps and module COM-DAP or COM-RSC transfers it to the monitoring system, easy calibration on the module DSP



## Module COM-DAP (communication unit)

- remote control and monitoring of regulator with use of one pair of conductors in communication line
- data transfer by the system DAP 128TC (up to the distance of 10 km)



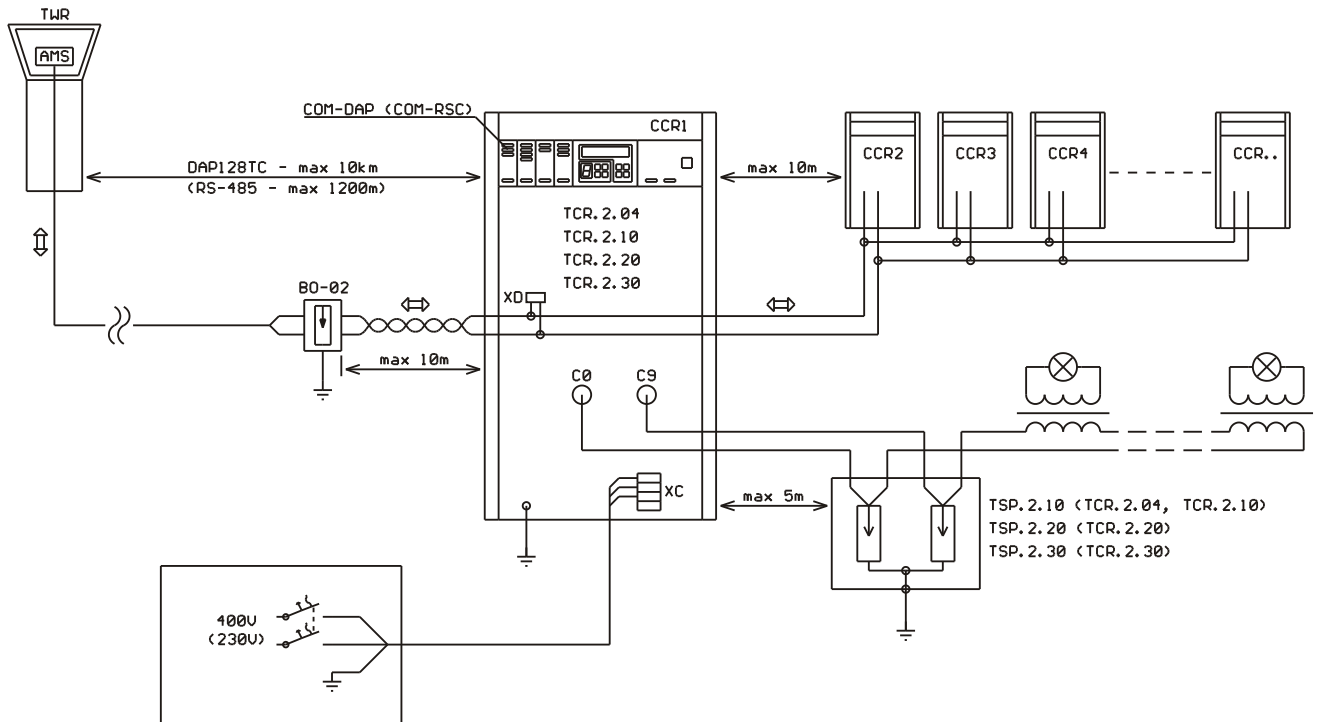
## Module COM-RSC (communication unit)

- remote control and monitoring of regulator with use of one pair of conductors in communication line
- data transfer with use of standard RS-485 (up to the distance of 1200 m)

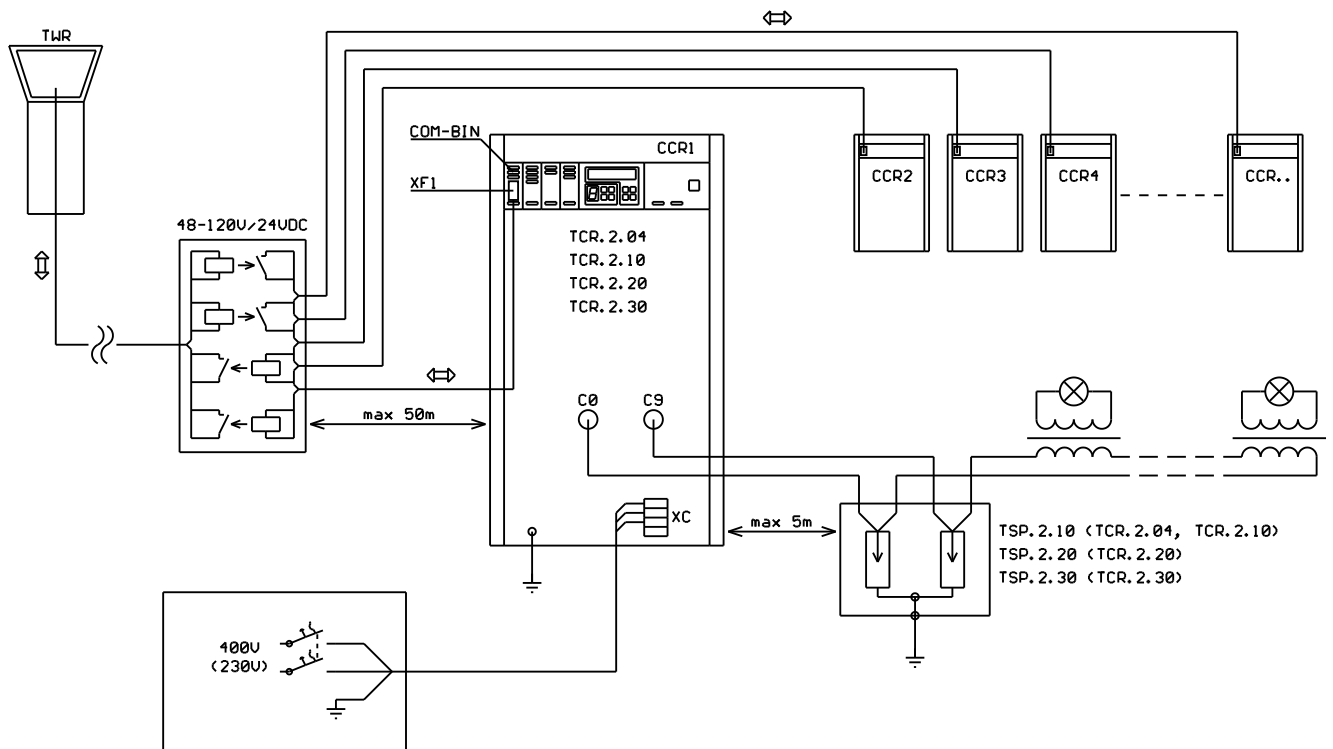
## Module COM-BIN (communication unit)

- remote control and monitoring of regulator with use of multi-wire cable
- data transfer with use of relay contacts (up to the distance of 50 m)

TCR.2 - serial communication



TCR.2 - parallel communication



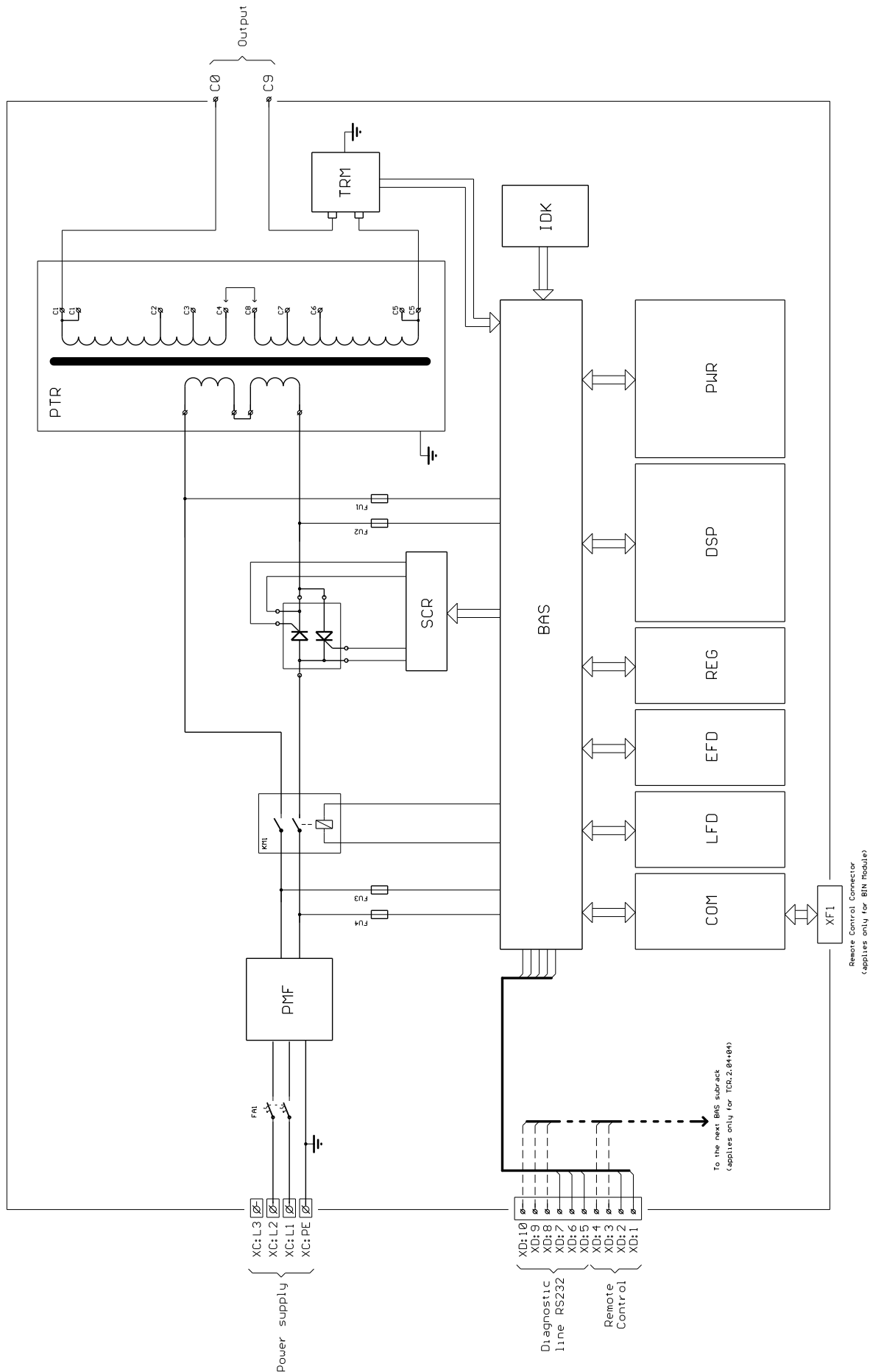
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Regulator TCR.2 - block diagram

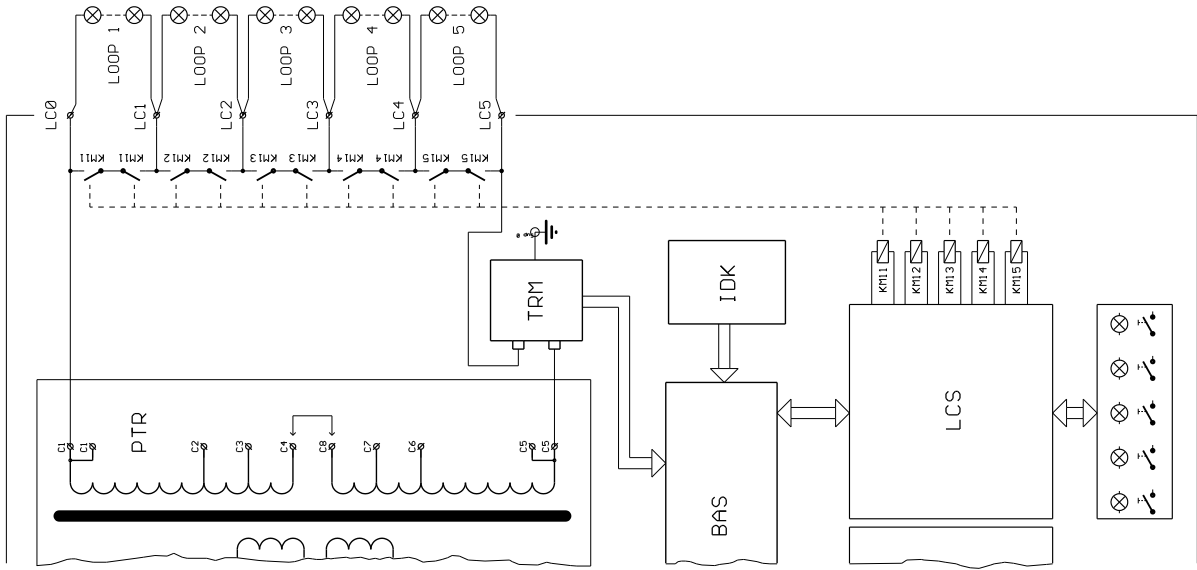




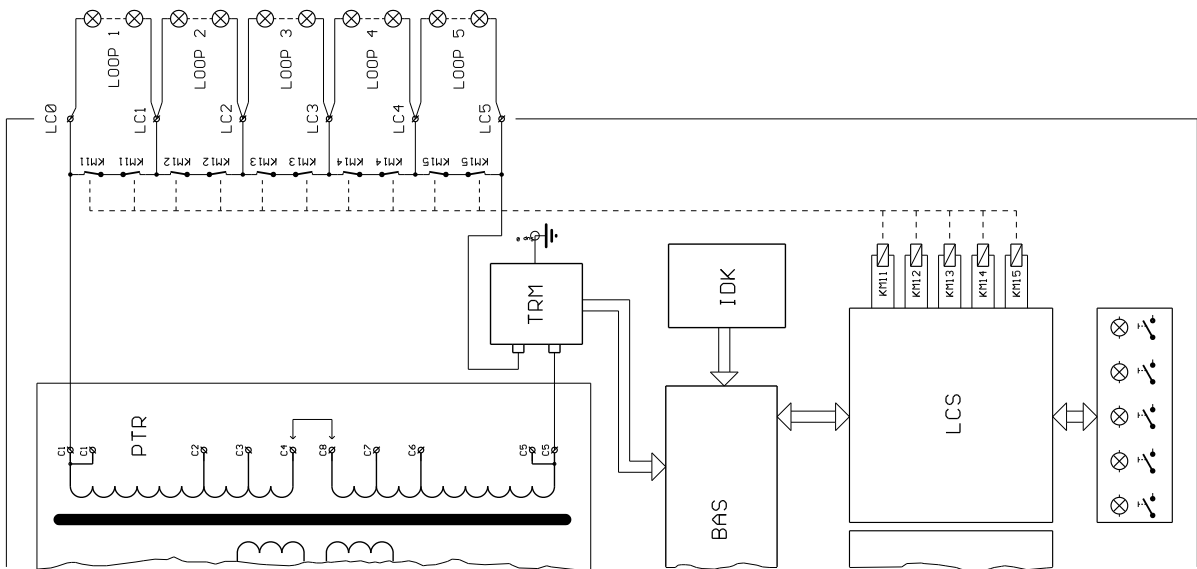


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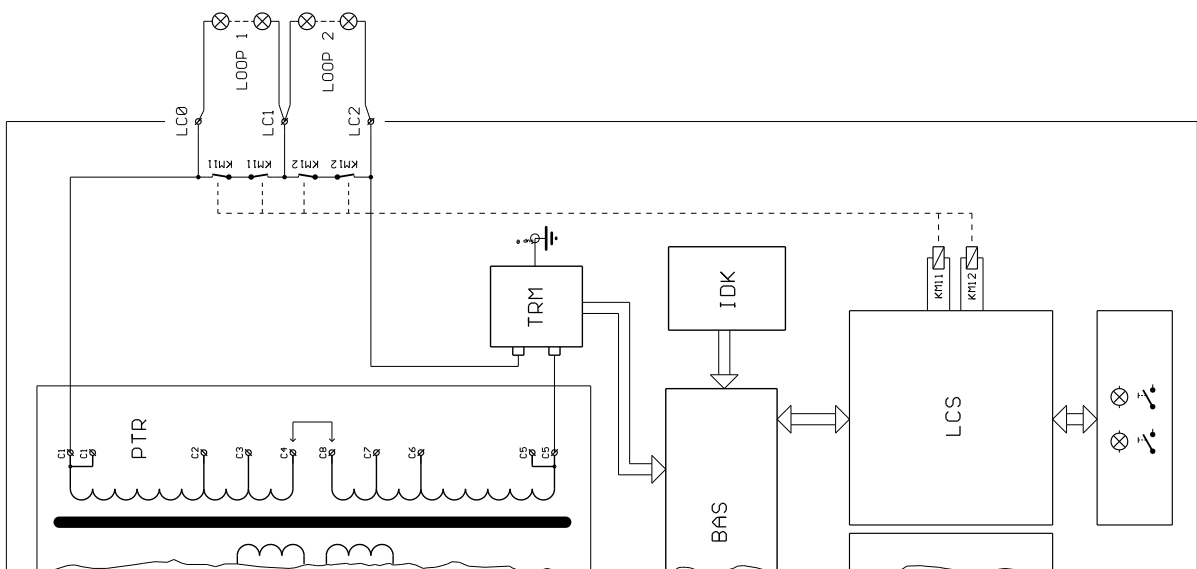
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Regulator TCR.2.xx.xxx.xxxS51 - block diagram of outputs



Regulator TCR.2.xx.xxx.xxxS50 - block diagram of outputs



Regulator TCR.2.xx.xxx.xxxS2 - block diagram of outputs

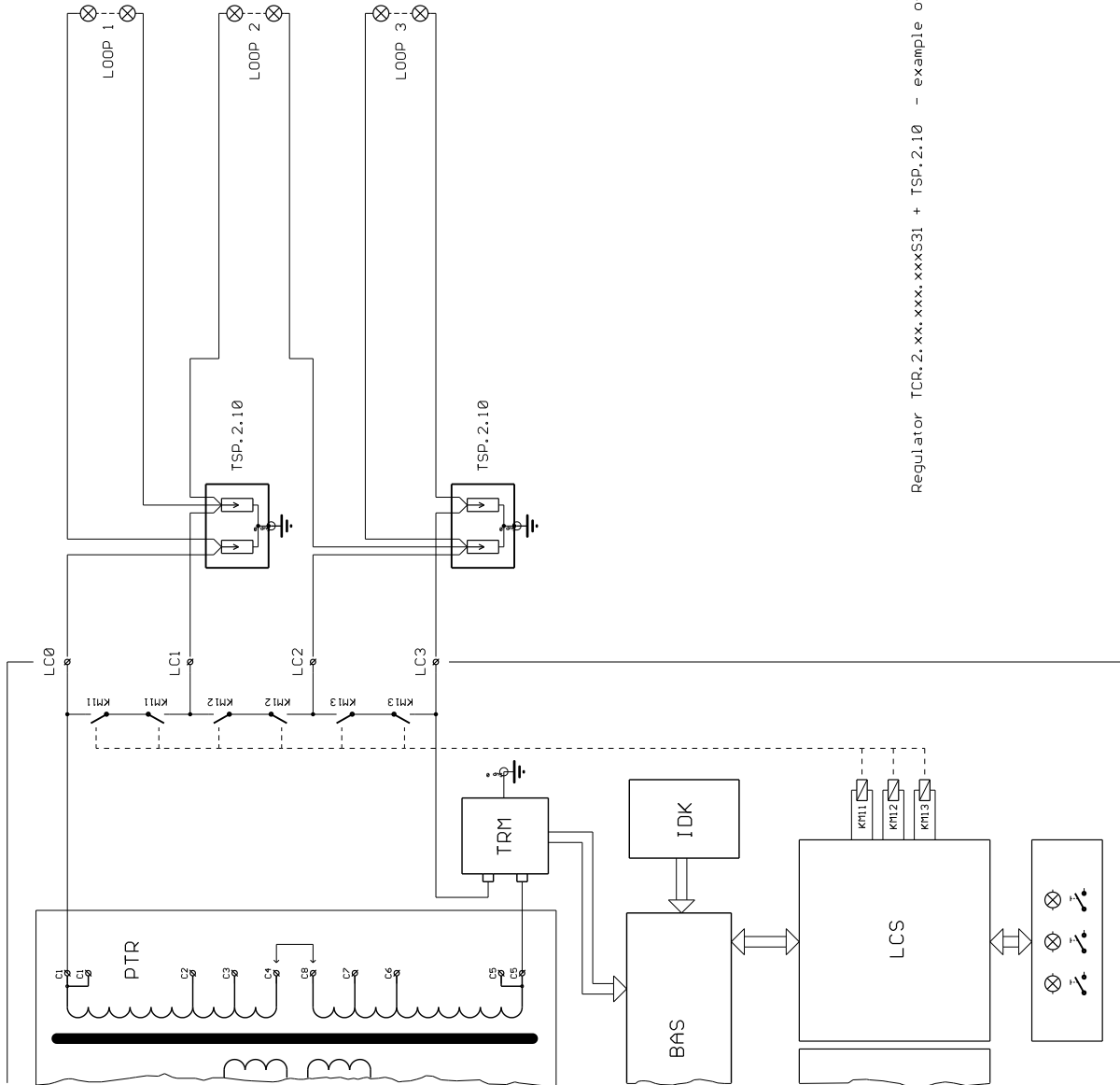
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Regulator TCR, 2. xx. xxx. xxxS31 + TSP, 2.10 - example of connection