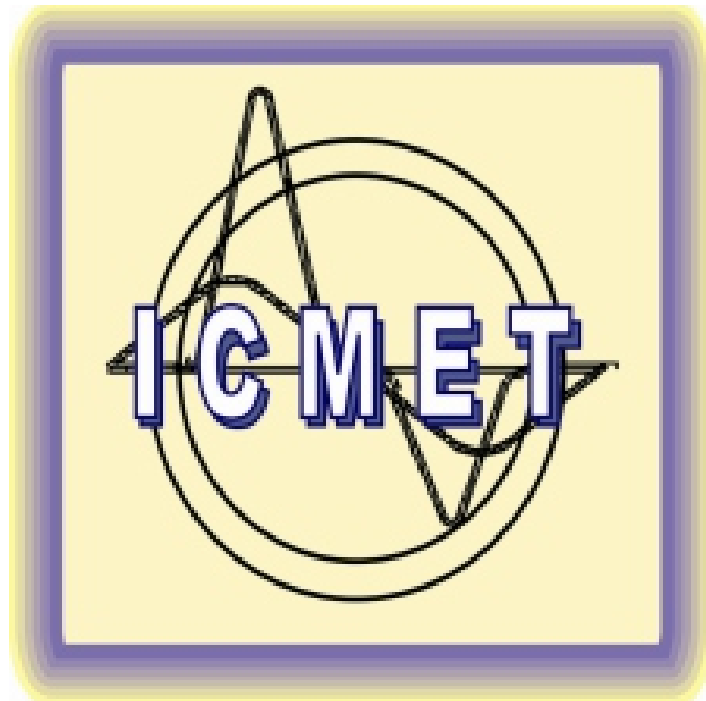




NATIONAL INSTITUTE FOR RESEARCH, DEVELOPMENT AND TESTING IN ELECTRICAL ENGINEERING - ICMET Craiova

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Method and equipment for digital control of multi-motor electrical drives with braking energy recovery, used for high capacity extraction plants

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The invention relates to a method and a device for digital control of multi-motor electric drive control with braking energy recovery, consisting in three inverters (A, B, C) for the drive of traction motors and an inverter (D) for braking energy recovery in the network, which are powered from the same intermediate DC circuit (1), the balancing of the torque output of each motor (5, 6, 7) being achieved via a "Slave Master" operating mode, the command and control being achieved via a data bus (15) which ensures the acquisition of the "master" inverter torque controller (13) output data and their application to the duration-modulated impulse generators (14, 16, 17), of the three inverters, with constant adjustments on the reference inputs, in order to avoid shocks during the drive control process. When the energy stored in the intermediate circuit exceeds the rated value, the inverter (D) is controlled in the sense of converting the DC power resulting from the braking operating mode, into alternating current power with frequency, phase and level parameters compatible with the RST three-phase network, by using software command and an output filter (23).

APPLICATION

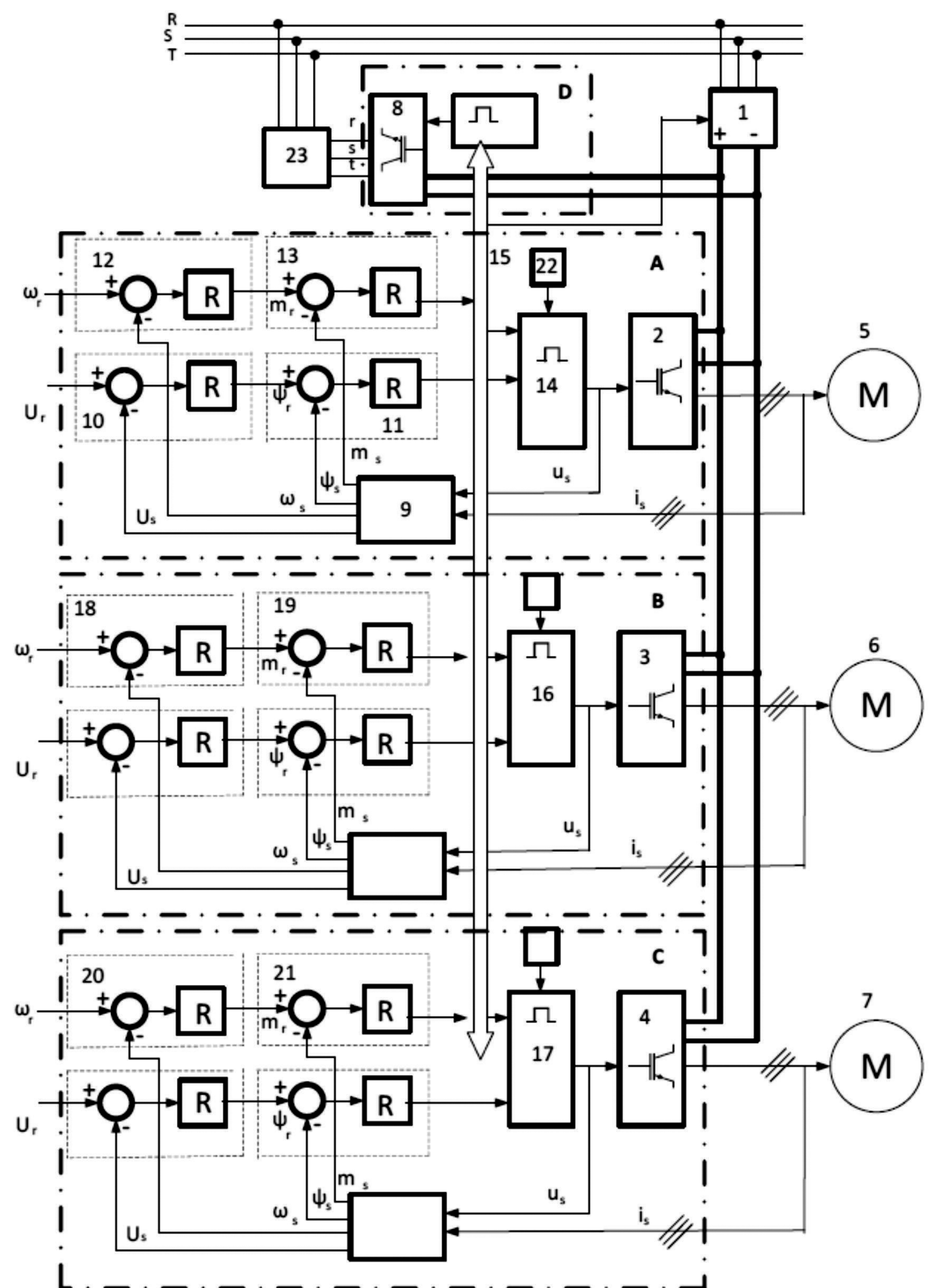
The method and equipment for industrial multi-motor drives control are designed for applications that have to synchronize motor speed (motors connected through a rigid coupling) or to synchronize motor torque output (motors connected through a flexible coupling). For high dynamic applications (high acceleration and high braking speeds), the energy resulting from the braking process is recovered to the industrial power grid by using an inverter that has the output synchronized to the three-phase power grid. The equipment replaces units of the high power brake chopper, necessarily involving a heavy and bulky brake resistance.

The equipment can be used in industrial applications:

- Industrial machinery and large excavators;
- Conveyor units;
- Electric traction vehicle in urban areas (tram, metro);
- Railway electric traction (locomotives, EMUs);
- Cement mills, coal mills.

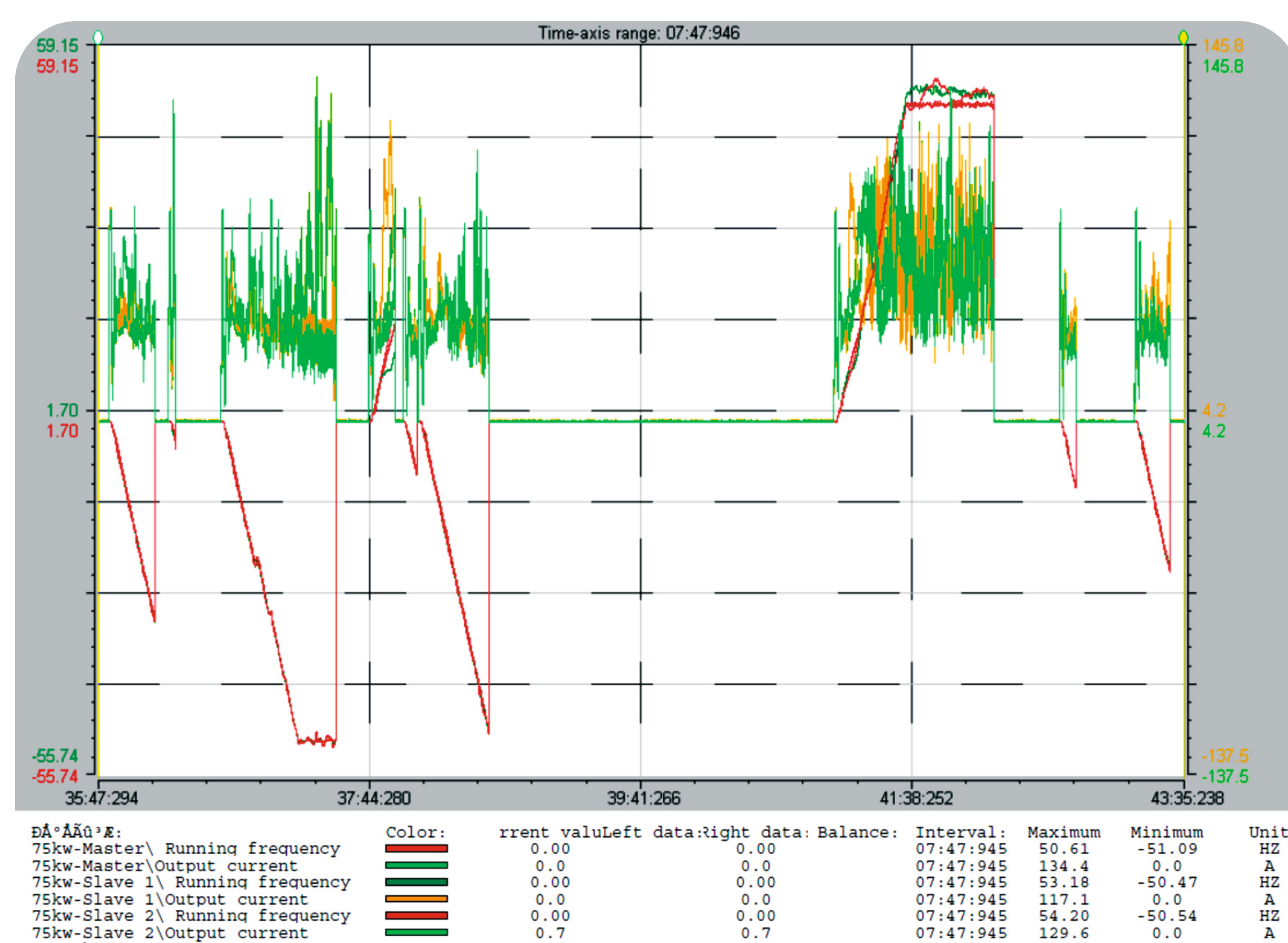
ADVANTAGES OF THE METHOD AND EQUIPMENT FOR MULTI-MOTOR ELECTRIC DRIVES CONTROL

- driving under acceleration and braking of two to six induction motors;
- electric drive using only one common DC bus;
- braking energy recovery in the industrial electrical network;
- operation in the master-slave mode by using the vector control method;
- no requirement for various transducers: motion, position, speed, etc;
- achieving equal or similar input frequencies in order to maintain maximum torque in each motor;
- achieving the entire range of frequency fluctuation, from min to max;
- providing the protection of electric motors in case of mechanical or electrical defects;
- equal or similar input frequencies in order to maintain maximum torque in each motor;
- protection of electric motors in case of electrical or mechanical defects;
- compensating current harmonics;
- compensating reactive power or improving the form of supply voltage;
- eliminating the high power brake choppers and the heavy and bulky brake resistance.



Block Diagram

RESULTS



Recorded Signals



Motor Control Cabinet