Signal Mont s.r.o.
Kydlinovská 1300
HRADEC KRÁLOVÉ
Czech Republic
www.signalmont.cz

TECHNICAL DESCRIPTION, INSTRUCTIONS FOR DESIGN, IN-STALATION AND MAINTENANCE

ELECTRONIC PHASE-SENSITIVE RE-CEIVER EFCP3,4/75(275) HZ

T 75069 - Design as instrument box

No.: 75069

TP SM HK 3/04

SKP 316 211 750 699 00.

Release: 1.
In Hradec Králové, February 2006

Authors: Ing.Horák Karel
Ing.Šedivý Miloslav

1 Contents:

2 Introduction

An electronic phase-sensitive receiver EFCP3, 4 is designed as replacement of electromechanical phase-sensitive relays (DSR, DSŠ type), which are used as phase-sensitive receivers in track circuits (TC), used on Czech Railways infrastructure.

An aim of electromechanical phase-sensitive relay replacement by electronic receiver, with better technical features, is reduction of maintenance costs, dependence on import and improvement of technical characteristics of track circuit.

EFCP3, 4 is mainly based on elements and circuits principles, leading to the inherent safety of its particular functional blocks. A neutral electromechanical relay NMŠ1-2000 makes the output of EFCP3, 4.

EFCP3, 4 is powered up by the voltage of local phase 230V AC. The one, or two systems of track phase can be installed into the device cabinet, which presents equivalent replacement of one, or two electromechanical relays of DSŠ type.

The following versions are made as cabinet design:

No. **75069a (e)** Electronic phase-sensitive receiver EFCP3(4)/75 − 1K - contains 1 circuit of local phase and 1 circuit of track phase, unit serves as a replacement of one relay of DSŠ 12P type for TC 75 Hz

No. **75069b (f)** Electronic phase-sensitive receiver EFCP3(4)/75 − 2K - contains 1 circuit of local phase and 2 circuits of track phase, unit serves as a replacement of two relays of DSŠ 12P type for TC 75 Hz

No. **75069c (g)** Electronic phase-sensitive receiver EFCP3(4)/275 − 1K - contains 1 circuit of local phase and 1 circuit of track phase, unit serves as a replacement of one relay of DSŠ 12S type for TC 275 Hz

No**. 75069d (h)** Electronic phase-sensitive receiver EFCP3(4)/275 − 2K - contains 1 circuit of local phase and 2 circuits of track phase, unit serves as a replacement of two relays of DSŠ 12S type for TC 275 Hz

– **Design EFCP3** variant a÷d - Al device cabinet on nibs with front and rear panel to place it on shelf for classical devices

– **Design EFCP4** variant e÷h – is adapted for installation into containers and 19“ racks for electronics. It is the same as basic design, however without nibs and with modified front panel (see annex 2).

3 Description of function

The realization of EFCP3, 4 is based on substitute electric model of function of electromechanical phase-sensitive relay and is shown on the block diagram on fig.1. Track phase voltage is brought through input isolation transformer Tr1 on signal input of the phase detector FD, which works as one-way synchronous detector. The reference signal is brought on control input of the synchronous detector. This signal is obtained from the local phase voltage by its transformation in Tr2 and shaped on rectangular shape voltage in shaping unit block. The part of reference voltage is also rectified to gain auxiliary dc voltage for power supply of all EFCP3, 4 circuits. Output voltage from the phase detector is brought through RC low-pass filter on input of level circuit with dynamic functional monitoring (comparator). It serves as converter of analog signal on two-state output signal that is used, after its rectification, to power up the reel of output electromechanical relay.

All described functional blocks are designed as circuits with inherent safety in order that all considered failures of their parts were converted to the safe state. In contrast with inductive relay, the maximum value of output voltage of ideal synchronous detector (after its filtration by DP) is maximum at zero phase angle between input and referential voltage.

4 Description of construction

Construction of EFCP3, 4 is made as sealed device cabinet from aluminous profile, which can be separately placed on the shelf (EFCP3), or as module to the standardized equipment 19" rack for electronics (EFCP4). Cabinet contains one board of local phase and according to variants one or two boards of track phase. The diagnostic LEDs are placed on the front panel (according to design variant the two or three). The opening for the easy access to connectors is in the rear panel. The output relay NMŠ1–2000, which isn't (aren't) part of the product delivery is (are) placed to the panel of free coupling.

The receiver is protected against external interfering signals and fields by location in metal cabinet and system of the over-voltage protections on both inputs.

The cabinet of EFCP3, 4 is equipped with elements, which enable evidence the encroachment.

5 Design

The EFCP3 and 4 is safe and highly reliable replacement of electromechanical phase-sensitive relay of DSŠ-12P and DSŠ-12S type. Electric characteristics are however different, because they were optimized to suit for the design of track circuits with better properties, without the need of additional transformers. For regulation of track circuits with these receivers, the adjustment tables of authorized track circuits, intended for this equipment, are used.

6 Installation

Equipment cabinet of the EFCP3 is placed on the shelf and the EFCP4 into the 19" container for electronics. Relay NMŠ1-2000 (one or two pieces) is placed to the panel of free coupling and it is **connected with output of the receiver by twisted pair of wires**. Maximum length of the wires is 10 m. The wiring of the local and track part of EFCP2 has to be carried out in accordance with adjustment tables of the track circuits.

All six (or ten) wires are connected to distribution frame, which is placed on the rear panel of EFCP cabinet – see annex 2. The distribution frame is made as connector due to the easy service.

The earthing wire (frame) is connected to the pin M6, which is located on the rear inside the cabinet.

7 Maintenance

The preventive maintenance of EFCP3 a 4 is not carried out during operation (except output relay).

Output relay NMŠ1-2000 is subject to standard regime of maintenance (including periodic checkups) according to the rules of operator.

The product, as a whole, is exchanged at failure, the defective one has to be sent to be repaired to the service of manufacturer or to the accredited service.

The repairs during guarantee period and afterwards are carried out by service workplace of Signal Mont, Ltd in Hradec Králové. The necessary condition for claiming the right for guarantee repair is the certification of quality (supplied with every product) and completeness of the product.

When sending EFCP3, 4 to the repairs (handover of request on repair), it's necessary to mention:

- place of deployment
- when claiming the right for guarantee repair the certification of quality and completeness of the product has to be included
- real time of operation
- brief description of failure
- correct address, incl. phone number of sender

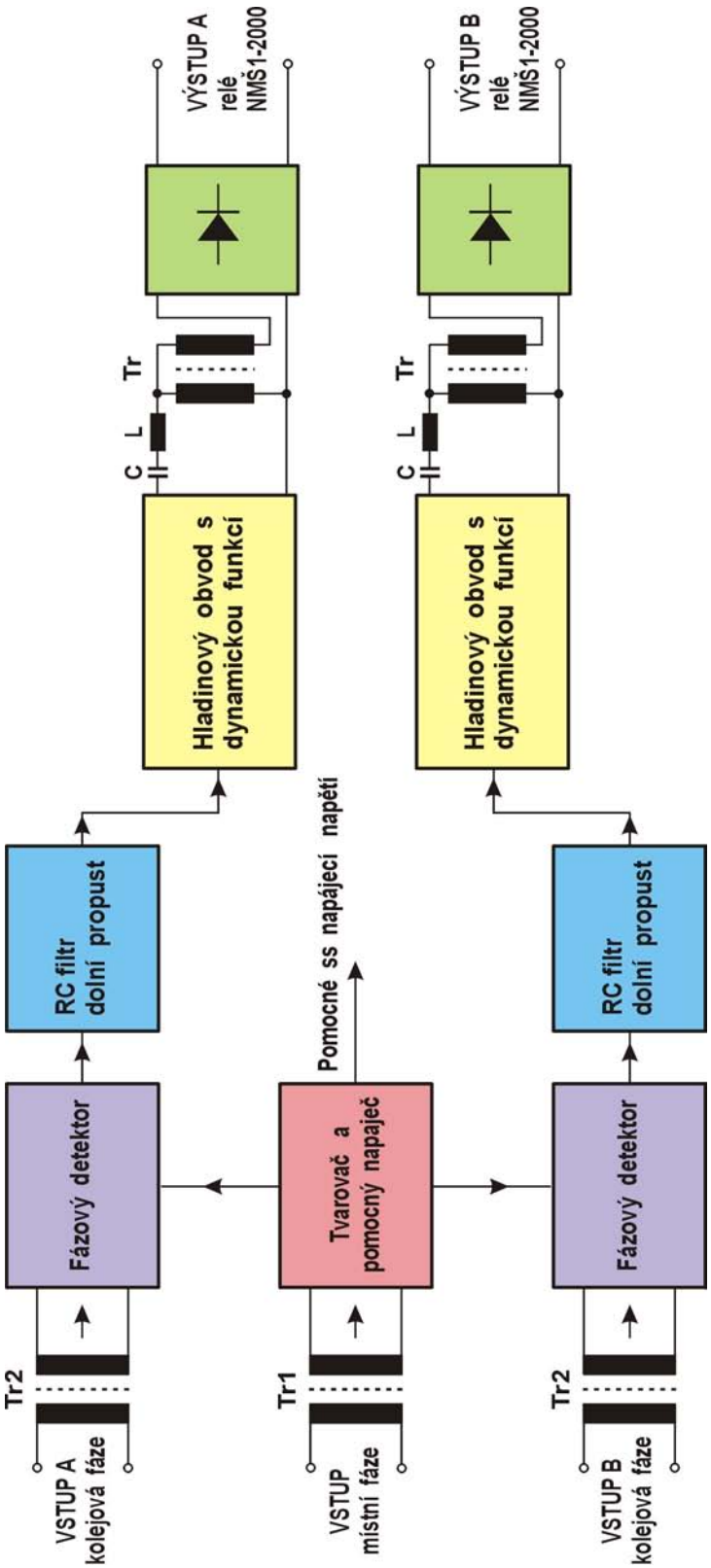
Annexes

Annex 1: Block scheme of electronic phase-sensitive receiver EFCP3,4 /75 (275) No. 75069a÷h

Annex 2: Connection of output connectors of electronic phase-sensitive receiver EFCP3,4 /75 (275) No. 75069 + illustration of dimensions

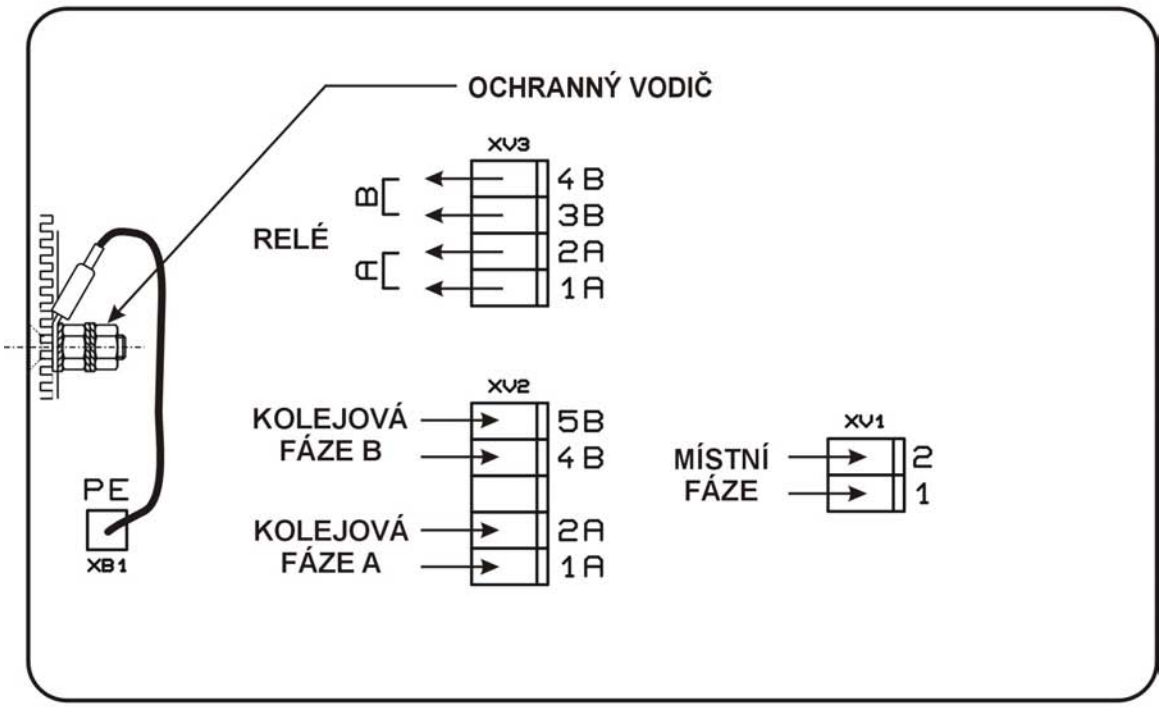
Annex 1: Block scheme of electronic phase-sensitive receiver EFCP3,4 /75 (275)

No. 75069a÷h (variants 75069a,c,e, g include always only one circuit of track phase)

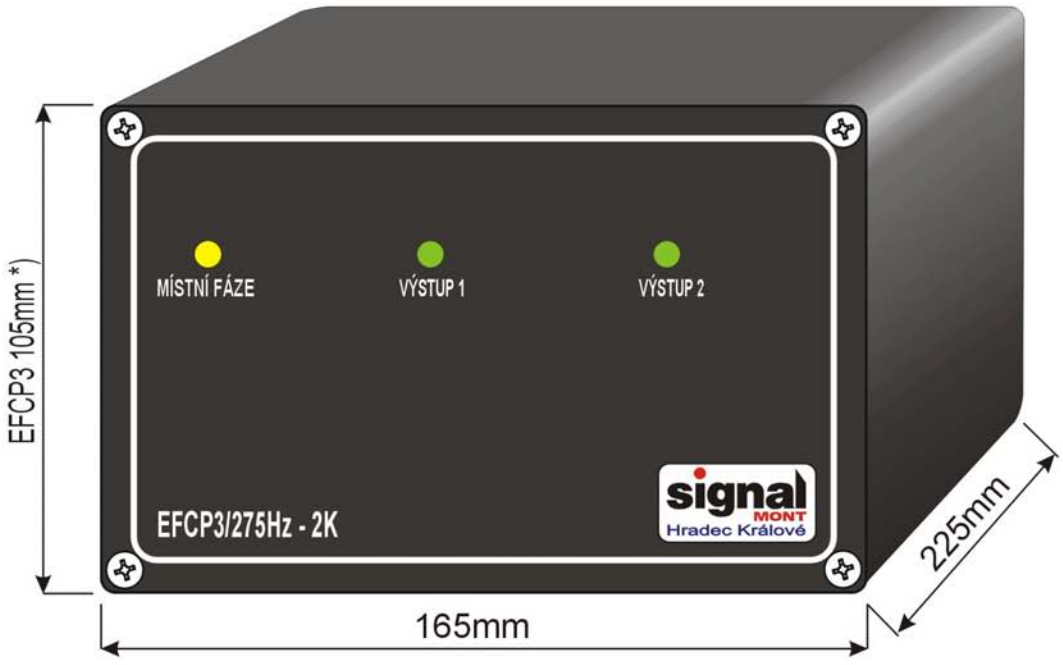


Annex 2: Connection of output connectors of electronic phase-sensitive receiver EFCP3,4 /75 (275) No. 75069 + illustration of dimensions

ZAPOJENÍ SVORKOVNIC FÁZOVĚ CITLIVÉHO PŘIJÍMAČE EFCP3,4



ROZMĚRY FÁZOVĚ CITLIVÉHO PŘIJÍMAČE EFCP3,4



*) EFCP4 128,5mm VARIANTA DO RÁMU STOJANU