D O M I N O C O N T R O L P A N E L

INTEGRA SYSTEM

THE NEW CONTROL AND OPERATING PANEL

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D O M I N O - the new Control and Operating Panel

Track control installations which combine provisions for repeat indications and operational functions in geographical order have been known for quite some time, in particular outside the European Continent. With the introduction of the improved relay technique into the field of interlocking such control apparatus were commonly adopted.

For many decades efforts have been made to use standard elements for the build-up of operating panels both for interlocking installations and in the construction of industrial operating installations. The aim was not only to achieve simplification but also greater economy in the manufacture through standardisation. More than 20 years ago operating desks were designed in the U.S.A. which were built up of standard units, generally comprising a group of tracks. After the war this approach was further developed in Germany and the groups were split up into individual units.

The Domino Technique is a parallel development with the aim to achieve a perfect and universally applicable form of units for interlocking installations and operating panels. This development was undertaken in close collaboration with the experts of the Swiss Federal Railways. In a relatively short time Domino Panels were accepted as standard by many Railway organisations throughout the world.

With industrial automation the general need arose to construct operating desks following very similar principles, and thus the Domino Panel had its application also in this field.

The Domino Panel

In electrical installations the traditional way of construction was to arrange the repeat indications on a track layout panel and the operating elements in a separate panel. The operating parts as such (levers and switches) and in particular their contact apparatus, were too large to be geographically incorporated in a panel. Even today certain countries favour the separation of control panel and track layout panel, but it is obvious that a maximum in clarity and speed of operation requires the combination of the two in a geographical order. This requirement, however, can only be fulfilled if pushbuttons are used as operating elements. The development of pushbutton operated installations started in Switzerland as early as 1941. The size of the then available operating elements and the small degree of standardisation of the track layouts put limits to the application of pushbutton operated installations.

Two fundamental conditions had to be fulfilled for the general application of the Domino Panel:

- The transition to the pure relay technique with the possibility to initiate the functions by impulses through pushbuttons.
- The miniaturisation of the repeat and operating elements in order to keep large installations within the reach of supervision.

The Operating Elements

The pushbuttons can be equipped with either one or two contacts. It has to be specially mentioned that both make and break contacts are available and the design assures that when change-over contacts are used, both contacts cannot be made in the event of one of the contacts welding. The following contact combinations per pushbutton are available:

- 1 make contact
- 2 make contacts
- 1 break contact
- 2 break contacts
- 1 make and 1 break contact (contact making with or without interruption)

The buttons as such are guided through a collar. The buttons and collars can be selected and combined in the following colours: red, blue, yellow, green, white, black and grey. 49 single or two-colour combinations are therefore possible.

The pushbuttons can be latched and provision made for sealing those push-buttons which are only to be used in special cases. For particularly important auxiliary pushbuttons an electrical counter unit can additionally be incorporated which will be operated together with the pushbutton through an impulse and only after effected counting will the impulse be transmitted. It is thus ensured that the pressing of the auxiliary push-button becomes operative only after effected counting.

As Domino Panels are also used in conjunction with interlocking circuits which do not permit pure pushbutton operation, rotary switches have been developed which are also used on industrial control panels. The following types are at present available:

- 3 position switches with independent make contacts.
  These switches occupy one half of a unit so that 6 repeat indications can additionally be housed.

- 4 and 6 position switches with common return.
  These special switches occupy one entire unit.

The Wiring of the Units

The terminals are differentiated according to their use as lamp or push-button contacts, but they have identical soldering tags. A common return is provided for the bulbs. The units are wired with pre-prepared cable trees according to a code; the cable trees vary from 2 to 13 strands.

Dependent on local conditions the cable trees are led to soldering tag blocks which are housed in the control panel itself or direct to soldering tag blocks on the relay racks or in their vicinity.

The "Blank Space"

To fill those spaces which are not occupied by repeat indications or operating elements, so-called "Blank Spaces" are used. They consist of a housing of moulded bakelite with a metal cover plate which, as those of the occupied spaces, can be painted and engraved.

Painting and Engraving

A pastel green colour has been chosen for the cover plates which is pleasant to the eye. The tracks are painted black thus creating a contrast with the green background. Naturally any colour combination is possible.

All colours are stoved which results in exceptional permanency and resistance to abrasion - this is a further feature of the Domino design.

Special care was given to the lettering. Only engraved lettering is lasting and permanently effective and that is why it has become standard in the Domino Panel. It also helps to create the clarity and distinctiveness of the track layout and even after long use will still have an attractive appearance.

Other Characteristics of the Domino Unit

Insulating Parts:	Commercial quality or tropical finish; all moving parts in Nylon, dyed.
Die Castings:	Standard quality zinc-die or high-grade material for tropical finish.
Contact Material:	Contact pins and bridges of solid silver.
Characteristics of the Contacts:	Contact Pressure: 70 gr. Contact Opening: 2 mm. [illegible] of Pushbutton: 4 mm. Contact Resistance R = 20 milli ohm. Contact Rating: 1 A/50 v. D.C. or 0.5 A/220v. (inductive load, time of clearance 2") A.C. 500,000 operations guaranteed.
Insulation Test:	2,000 v. effective during 1 minute.

The Domino Unit has been tested and approved by the S.E.V. (Association of Swiss Electro-Technicians).

The Domino Desk

A grid supports the units and "Blank Spaces". Fixing bolts secure one corner of each of 4 adjacent units and can be adjusted to regulate the height of the units.

It is obvious that even small deviations from the manufacturing tolerances of each individual unit would amount to something quite appreciable. Only when keeping to strict tolerances with the units as well as with the grid can the uniformity and evenness of the panel be achieved. This degree of accuracy, however, conforms to the accepted Swiss manufacturing standards.

The grid as support of the Domino units can be incorporated in the operating desk of any construction, either in horizontal, sloping or vertical position. For Domino installations there are standard type desks with the panel surface sloping 18° from the horizontal level. The width of the panel varies in groups of 2 units from 10 to 20 units, the length in groups of 4 units from 26 to 38 units. If a length of more than 38 units is required, any number of units divisible by 2 can be added. If a panel width of more than 20 units is required, a specially designed desk with more inclined surface will be provided to bring the entire width of the panel within arm reach.

Apart from these standard types there is a wide range of possibilities for special designs from the smallest operating box to extensive control desks.

Normal Arrangement for Domino Control Panels

With Domino control panels the route setting pushbuttons are usually placed in the tracks themselves, either next to the relevant signals or as start or terminating buttons. The character of a track (train or shunt route) is identifiable by different colours.

The group pushbuttons, as for instance for individual operation of the points and for cancellation of the shunt routes, are placed in the bottom row of the panel, whilst the individual point switches, as well as the auxiliary pushbuttons for emergency cancellations are usually placed in the top row of the panel.

Alterations to the Domino Panel

It is obvious that any alteration or addition to the Domino panel can be effected in a very short time by extracting, moving or replacing certain units. Such alterations can be effected on the spot after the necessary preparations. Any foreseeable additions to a panel can be provided for at the time of construction so that later only the cover plates of the units in question need be exchanged.

Domino Panel Accessories

Removal of unit cover plates for the purpose of access to the lamps and contacts is effected by means of a small Permanent Magnet.

A Lamp Testing Unit is usually incorporated in every panel so that bulbs can be tested before their insertion.

The following Electrical Measuring Instruments in the dimensions of a unit 40 x 40 mm are available for incorporation into the panel instead of any "Blank Space"-unit: Moving coil Volt- and Ammeters, with or without rectifier, deflection of pointer 0 - 90° or 0 - 270°.

The optical Repeat Indicator for the Integra System of Axle Counter is in the form of a specially designed Domino Unit.

The Domino Unit

The square form was chosen for the individual structural element - the DOMINO UNIT - which has the following advantages over other designs:

- The square unit can be used in any position (not only turned by 180° but also by 90°, left or right) thus limiting the number of eventualities to be catered for.

- The representation of points at 45° reduces the length of the panel and offers, consequently, better supervision in cases of large panels.

The Domino Unit has a base surface of 40 x 40 mm and comprises two main parts: the lower part consisting of insulating material which contains the contact pins and their connections and the upper moulded part which carries the optical parts and the pushbuttons, and further the cover plate which is part of the panel layout and indicator board respectively.

The unit contains, in three rows of four, a total of 12 contact points which serve as a lamp position, or, when coupled, as contact makers for pushbuttons. The required space per contact point is thus only 1.⅓ cm^2 which shows the extent of miniaturisation. In one unit, therefore, up to 12 lamps or 6 single contact pushbuttons can be housed, or combinations as for instance 8 lamps plus 2 single contact pushbuttons.

Optical Characteristics of the Domino Unit

The repeat indications can be in one or two colours in the form of square or oblong apertures. Standard colours are: white, red, yellow and green. Tracks generally are indicated in white to represent a set route; on occupation of the track by a train the indication changes to red.

It should be specially mentioned that only colourless lamps are used. All shortcomings with multi-coloured lamps or colour filters are thus eliminated. The colour optic of the Domino unit, which is subjected to direct heat, is of inorganic glass and therefore colour-fast and permanent in form.

A 24 V. 1,2 W. bulb of high quality is used as standard lamp, which has a working life of 800 hours at normal output to be appreciably increased if lower voltage is used. If required, lamps for different voltages can be used.

The illumination of the repeat indications in the Domino Panel is of superior intensity and guarantees good visibility even in normally bright rooms.

An electro-mechanical digital counter unit of high quality is used as a Train Describer Unit. The unit of 40 x 40 mm contains two systems of figures 0-9, so that a four figure digital counter unit will only occupy the space of 2 units and no additional arrangements inside the desk are required. It is, therefore, quite simple to place such counter units in the track layout itself. The illuminated numbers are 8 mm and therefore clearly visible from a distance of several yards. These units are well suited for the build-up of digital counter units outside the Control Panel, for wall mounting, etc.

Operating pushbuttons which are temporarily out of service, can be covered up with small magnetic lever collars.

The intensity of the repeat indications can be adapted to the light intensity of the surroundings by means of a pushbutton operated six-position switch, and the unit can be housed outside the desk, for instance on a relay rack.

Operating Principles of the Domino Control Panel

The apparatus is designed mainly for circuits built up according to the principle of two hand operation, as for instance the Geographical Circuit Technique of Integra. Every signalling and safety operation requires the simultaneous pressing of two pushbuttons.

Train routes are set by the pressing of the starting and terminating pushbutton of a train route. The result of this operation becomes only effective after the pushbuttons have been released. Other functions, as for instance the individual change-over of points, are made effective by the pressing of a group pushbutton and the respective point pushbutton.

S u m m a r y

The Domino System as a new constructional element for control panels or desks has the following advantages:

1. Extensive miniaturisation.
2. High quality finish and close tolerances according to Swiss Specifications.
3. Manifold possibilities of application of the individual unit.
4. Use of colourless bulbs: no colour filters of organic nature are subjected to heat.
5. Exceptional light intensity of the repeat indications.
6. Possibility to equip pushbuttons with make and break contacts.
7. Rotary switches for installations which do not permit all pushbutton operation.
8. Engraved and therefore permanent lettering.
9. Wide range of accessories.
10. Great adaptability to the requirements of control panel installations.

Apart from equipping our own installations with Domino Panels, we are also supplying panels for installations designed by other manufacturers; Domino units for incorporation into existing apparatus, as well as operating desks for all kinds of industrial purposes.

D O M I N O is a registered Trade Name