IS 8976 (1978): Guide for preparation and arrangement of sets of drawings and parts lists [PGD 24: Drawings]

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Indian Standard

GUIDE FOR PREPARATION AND ARRANGEMENT OF SETS OF DRAWINGS AND PARTS LISTS

1. Scope

1.1 This standard serves as a guide for the preparation of sets of drawings and parts lists which properly meets the requirements of production practice and efficient plant operation and which may be applied equally by manufacturer and user for the purposes of production, maintenance, overhaul and spares acquisition.

1.2 It does not cover other design data which are needed apart from the set of drawings and parts lists, for example, stress calculations, test reports, standard and design data sheets. It also does not cover proposal drawing or project layout.

1.3 Simplified sets of drawings are permitted for one-off manufacture, preproduction runs and the like; however, such simplification should not run counter to the fundamental arrangement of the drawing sets.

2. Terminology

2.1 *Set of Drawings and Parts Lists* — The aggregate of all the drawings and parts lists needed for manufacture and assembly of a product.

2.2 *Component Scheme* — A graphical representation of details of a product (*see* Appendix A). It is a useful document for job preparation purposes.

2.3 *Assembly Tree* — Identical to component scheme in content. Only the method of presentation is different (*see* Appendix B).

2.4 *Part* — An individual item which is not divisible.

2.4.1 Repeated parts are parts which occur in different assemblies/products.

2.5 *Groups* — Generally complete in themselves and consists of two or more parts and/or groups of lower order. Groups of loose parts such as name plates, accessories, etc, are also covered under it. Like repeated parts, there may be repeated groups.

2.5.1 *Functional groups* — When the component parts or groups are required to be matched/co-ordinated prior to the assemblies for adequate clearance or smooth functioning on assembly, these may be grouped as functional groups.

Although in most cases such groups form part of the set of drawings. Drawings for functional groups are generally referred as technical data (*see* **1**) and not as manufacturing drawing as defined in IS : 8930-1978 ' Nomenclature of general engineering drawings '.

2.6 *Product* — An item capable of functioning (for example, machines, equipment) which are complete in themselves and consist of a number of groups and/or parts representing the end products of a manufacturing sequence.

3. Function of Drawings and Parts Lists

3.1 A drawing is a production document.

3.2 Parts lists provide information about the items called for in the drawing, the list provides the full designation and quantity of each item called for in the drawing.

3.2.1 The parts lists may be integral on the drawing or separate. Parts lists and drawing, however, are complementary to each other regardless of whether the parts lists are integral or separate.

Adopted 20 October 1978

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4. Preparation of Drawings and Parts Lists

4.1 Drawings and parts lists shall be so prepared that they may be reused (rationalization) for other applications (for example, other models, other order, repairs, spares deliveries). This leads to the following requirements.

4.1.1 Drawings should not bear any order-tied particulars, except general arrangement drawings for equipment of one-off character. In addition, drawings of groups and parts should not contain special layout representations tying them to a specific place of use; instead, these specific layouts should be included in the higher-order assembly or attachment drawing. Particulars regarding use may be entered in the appropriate panel of the preprinted drawing sheet or recorded on an index card.

4.1.2 The quantity details given in the quantity columns of the design parts lists are to be related to unit item represented, and not to the quantity needed per product or per order. This is necessary to allow flexibility in the use of the drawing for other requirements (for example, different products, ordering of spares) in which the quantity required may differ from that indicated for first use. The number of times a piece is required in the particular instance is found from the higher-order parts list in the case of new production, and from the order in the case of spares acquisition.

4.2 Redundant detailing, that is, repetition of the same particulars (for example, materials, weights, dimension figures) at different points should be avoided because when changes are made there is a risk that one of the redundant details will be overlooked and the necessary correction of all redundant particulars involves much effort and leads to confusion. From this it leads to the following requirements.

4.2.1 Materials and weights of component parts are to be indicated only on the production drawings of these parts and the total weights of groups only on the assembly drawings of such groups, and not repeated on the higher-order drawings.

4.2.2 When there is a need for repetition on an assembly or attachment drawing of dimensions — as for guidance purposes (for example — which are not yielded for the first time by the process of assembly), but instead have already been laid down in a lower-order drawing (for example, in connection with the machining of a part) and therefore only constitute a repetition for the purpose of providing a clearer picture, then, such dimensions are to be placed alongwith the prefix REF in brackets.

4.3 All parts and groups belonging to the item represented, and including bolts, nuts, etc, are to be itemized, that is, are to be given serial numbers (item No.) even when, according to **5.4.2** they are not drawn separately. They are drawn in thick lines; the serial numbers should clearly define the item represented in its full extent.

All parts and groups not belonging to the item represented, and which are rather of an explanatory character (for example, layouts) are to be drawn in thin lines.

4.4 Drawings shall not reproduce specifications (for example, production, inspection and delivery specifications). Instead, these should be prepared separately; reference to them may be given in the drawings where required.

4.5 Identical parts in a drawing or parts list are to be combined in a single item number unless there are special reasons for not doing this.

4.6 Special particulars affecting a whole drawing and going beyond the content of the title block are to be entered above or alongside the drawing title block.

4.7 The combining of the representation of two or more items in a single drawing is a question of expediency. This is usually done for the purpose of simplifying drawing work, indicating existing variants (for example, different sizes, right-hand and left-hand versions), and hence rationalization. The usefulness of the drawings for the purpose of job preparation, manufacture, spares supply, etc, should not be impaired by such combining. Other aspects of combining are as follows.

4.7.1 Combining of different stages of manufacture to give a simplified set of drawings (**5.4.1**) (for example, machining and assembly or assembly and attachment), should preferably be recognizable from the sub-title of the name, for example, '.....assembly and attachment'.

4.7.2 The combining of several varieties or sizes of a part or a group differing from each other to only a minor extent (for example, right-hand and left-hand versions or in a small number of dimensions).

4.7.3 Set-wise combining of parts or groups which do not justify individual accounting and/or stocking and which are not useable singly, but instead are used in sets (for example, a set of holders for fixing an attachment, or plates from the same production sequence forming part of a single welded assembly).

4.7.4 The following shall not be combined, as combinations of this kind are unsuitable for shop purposes:

a) Varieties differing in type (for example, single-armed and double-armed levers), sets of parts or groups differing fundamentally in character (for example, chains, gaskets, castings and the like in a single drawing).

b) Parts and groups resulting from different manufacturing methods and different production sequences (for example, turned parts and stampings).

4.8 The subdividing of a drawing into several sheets (continuation sheets) may be desirable in the following conditions:

a) If the sheet size is too large and is, therefore, unwieldy in practical use, for example, for filling purposes or in the workshop (for example, subdivision of a side member into front end, centre section, rear end, or details and sections as well); and

b) To open up an excessively dense representation and thereby make it clearer to follow (for example, for frame assembly, attachment of buffer beam or head).

With any such subdivision, the first of the various related drawings shall bear a list of the associated sheets so as to provide a survey of the total content (for example, views, sections). It is convenient for this list to be indicated above or alongside the title block of the first sheet when a separate parts list is used, or to be placed at the start of the parts lists when an integral parts list is used.

The sheets resulting from the subdividing of a drawing are all given the same name and the same drawing number. They shall, however, be made identifiable and distinguishable by a supplementary mark behind the drawing number (Sheet 1, Sheet 2, Sheet 3, etc, or A, B, C, etc). Even when integral parts lists are used, the parts lists of these sheets form a single, coherent parts list.

4.9 Subdividing of the representation in supplementary drawings serves to allow a repeatedly recurring production process to be represented once only and this representation to be reused in a repeat application; this may be desirable (standard can form for different camshafts, or fitting of a standard window if, apart from the window, its method of installation-position of holes, washers, screws and nuts used, etc, is also standardized).

The subdivision of a drawing and representation described in **4.8** and **4.9** should not be used for the splitting up of large groups. This should be carried out only in accordance with the rules indicated in **5.1**.

5. Arrangement of Sets of Drawings and Parts Lists

5.1 The arrangement of the sets of drawings and parts lists shall correspond with the assembly flow.

This means that the set of drawings and parts lists shall be broken down into production groups which often will not match the functional groups. For example, a part which belongs functionally to the 'brake' group (functional group), but is welded to the frame, will need to be allocated to the 'frame' group (production group) for drawing and parts lists purposes.

The foregoing principle regarding the sequence corresponding the assembly flow does not relate to the sequence of entries within a group parts lists.

Note 1 — A product is made in the production workshop in various assembly stages starting with the combining of single parts to relatively small groups which in turn are combined to form larger groups until from the latter the complete product is finally assembled, possibly with the addition of fastening elements, such as bolts, nuts, etc. This assembly flow gives rise to a tree-like configuration of the set of drawings and parts lists which may be represented graphically, for example, as an assembly tree (*see* Appendix B), or as a component scheme (*see* Appendix A).

Note 2 — The assembly tree and the component scheme are identical in content. The form in which they are shown in the Appendices, the assembly tree provides an overall view of the total aggregate of all the components whereas the component scheme gives their sequence of manufacture and also serves as a planning document.

Note 3 — The assembly tree and component scheme show that, with regard to the subdivision into individual groups, a certain hierarchy emerges in respect of the incorporation of these groups into the complete product; that is to say, it appears that any particular group occupies either a higher or a lower position compared with another group. For these reasons it is desirable not to adopt any such evaluative designation, but rather to refer only to 'groups' which may be differentiated, where necessary, as groups of the 1st, 2nd, 3rd..... *n*th order.

Note 4 — If in such cases it were to become the practice to refer to sub-groups, then, to be logical, the next stage would have to be designated a 'sub-sub'-group and in this way there would be created as many different designations as there are ranks. Such ranking of a group may change between one application and another. When products on a large scale are concerned the ranking may also cover many levels.

Note 5 — If the arrangement of the set of drawings and parts lists corresponds with the subdivision described in so far as it covers the range from component parts to complete product and contains the group drawings and group parts lists corresponding to the various assembly stages, then such an arrangement may be said to promote orderly job preparation, execution and accounting, as well as proper spares holding.

5.2 An essential precondition for a proper and clearcut subdivision of the set of drawings and parts lists is unambiguous naming of the contents of the drawing.

Note 1 — The designer should be clear about the purpose of every group drawing. If the groups concerned are purely assembly groups, he should name them according to their content, for example, 'gear unit' or 'magnet system' or 'cab' (of a crane, locomotive or the like). At the same time it is necessary that assembly into a complete group and the attachment of such a group of the product should be shown separately in the drawings if such attachment takes place in a part of the plant quite different from that where assembly into a group is carried out, or indeed, as may sometimes happen, outside the plant when outdoor erection is involved, or when the assembled group is to be fitted on or in one or more products at different points thereon. A group drawing of this kind, which contains a self-contained group as individual items plus their attaching parts individually listed, is then named accordingly, for example, 'gear unit with attaching parts', 'cab with attaching parts' or 'gear unit, attachment', 'cab, attachment'.

Note 2 — The parts should, as far as possible, be named according to their nature and/or form and only according to their function if in future applications also, their use is tied to a specific purpose, for example, not 'contact spring' but instead 'compression spring', not 'pivot pin' but instead 'grooved pin', on the other hand not 'bearing' but instead 'axle bearing', not 'triangle' but instead 'brake triangle'.

This method of naming simplifies use of the parts represented as repetition parts in another product.

If the name of an assembled part (group) is the same as that of a later part in the parts list, the word 'complete' shall be appended to the name of the assembled part.

Note 3 — Additional particulars, such as 'right' or 'left', etc, should be used with caution, since they depend on the direction of viewing.

5.3 The arrangement of the set of drawings and parts lists shall agree. For every general arrangement drawing and for every assembly drawing a parts list shall be prepared which shall correspond exactly with content of the drawing, regardless of whether the parts list concerned is 'integral' or 'separate'.

The parts list is a complete enumeration and itemization of the parts, groups, etc, represented in the drawing, and it includes standard parts and auxiliary materials as well as groups and parts not drawn separately. Only the parts, etc, serving the specific purpose of the drawing (for example, assembly, attachment) shall be itemized.

5.3.1 The parts list also gives the drawing/code/catalogue number against serial numbers.

Every assembly drawing has a parts list which agrees with the content of drawing. Drawings are arranged according to the sequence of their numbering. The same arrangement is followed for the parts list, if made separately.

5.3.2 Through its serial numbers (items) the parts list of the complete product indicates what groups and single parts, including fastening elements are needed for assembling the product. The parts lists of the groups indicate what subordinate groups, parts, fastening elements and auxiliary materials are needed for assembly or attachment. The same applies to the parts lists for subordinate groups.

5.4 To simplify the set of drawings in specific instances, for example, in the case of one-off production or preliminary runs, certain variations are permitted. It is a basic principle that the aim should be to subdivide the set of drawings and parts lists in all branches of the assembly tree down to individual part drawings. If in individual cases, however, consistent subdivision down to individual part drawings is not economically justifiable, it is permissible for variations to be made from the provisions of **5.1** and **5.2** provided that such variations do not run counter to the basic arrangement of the set of drawings and parts lists. These departures are defined in **5.4.1** and **5.4.2** and it is not permissible for them to be extended arbitrarily.

Exceptions for these departures are repeated parts and spare parts which are always to be shown separately from each other on drawings of their own so that they may be used freely and replacements for them ordered according to the (same) drawings. This practice is also recommended for drawings of bought-out parts.

5.4.1 Assembly component drawings, that is the combining of several stages of manufacture, for example, the representing of parts with all their dimensions for production purposes and the assembling of these parts in a assembly component drawing, are only permissible as a means of reducing the amount of work in the drawing office provided it does not involve extra work on the production side.

Assembly component drawings may be split up into sections for the assembly drawing of the product or the group (at right bottom by the title block, with integral parts list where appropriate) and for the production drawings of the associated parts. For the purposes of manufacture, purchase etc, the prints of the same may be cut into their individual sections and used. Such drawings are not suitable for the products in that manufacturing range. Therefore, drawings of this type should be used only to limited extent.

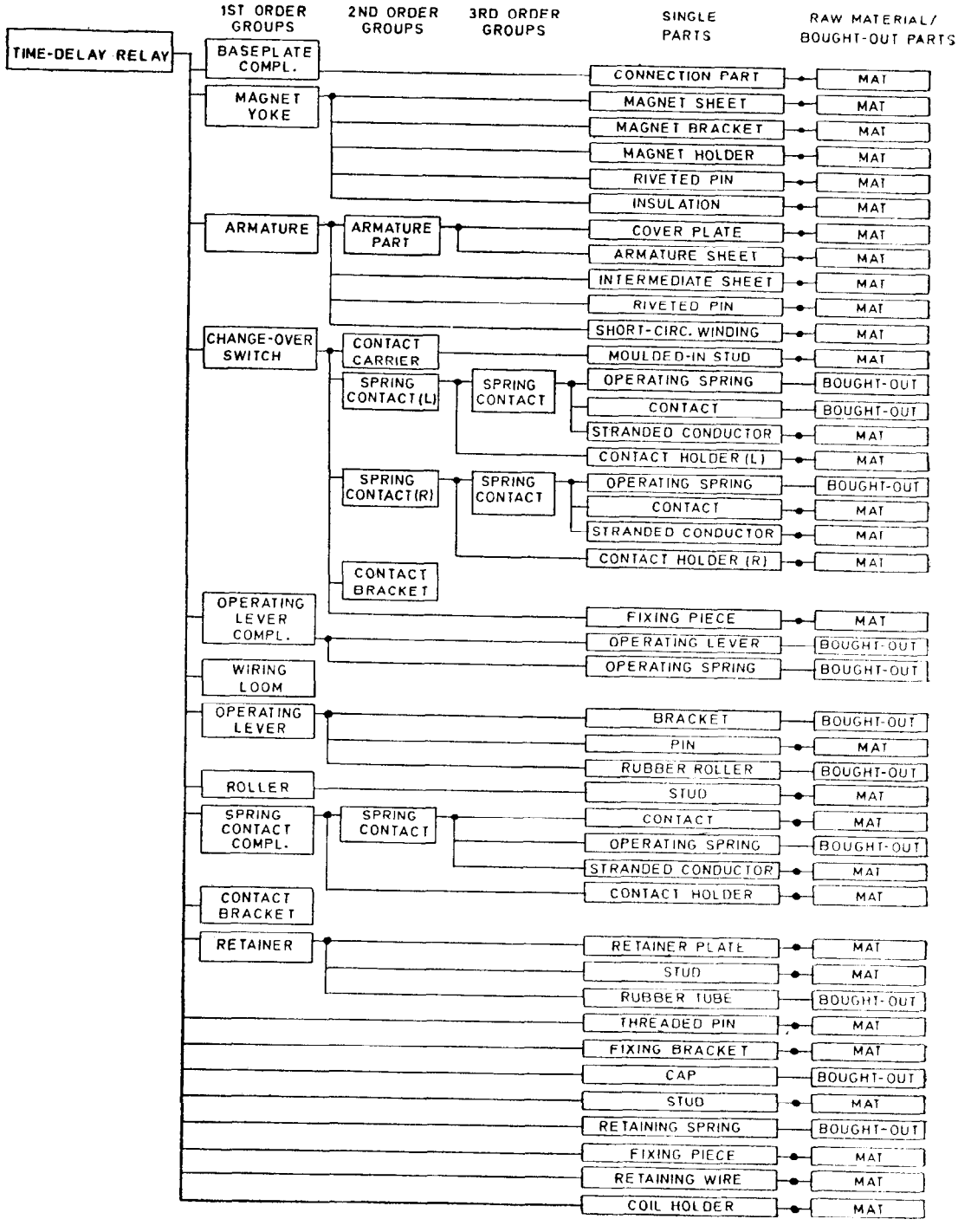
5.4.2 Parts which are not drawn are clearly designated by brief particulars in the parts list, for example, parts obtained simply by cutting half-finished products, standard parts obtained in the finished condition in so far as they are used unaltered, commercially obtainable parts or products in so far as they are clearly defined, for example, in catalogues — and do not require any dimension diagrams for the purpose of installing or inspection. Catalogue numbers or any other document numbers should be quoted.

All groups or parts not separately drawn should be itemized in the drawing and the parts list to which they belong and should be fully designated in the parts list.

APPENDIX A

(Clause 2.2)

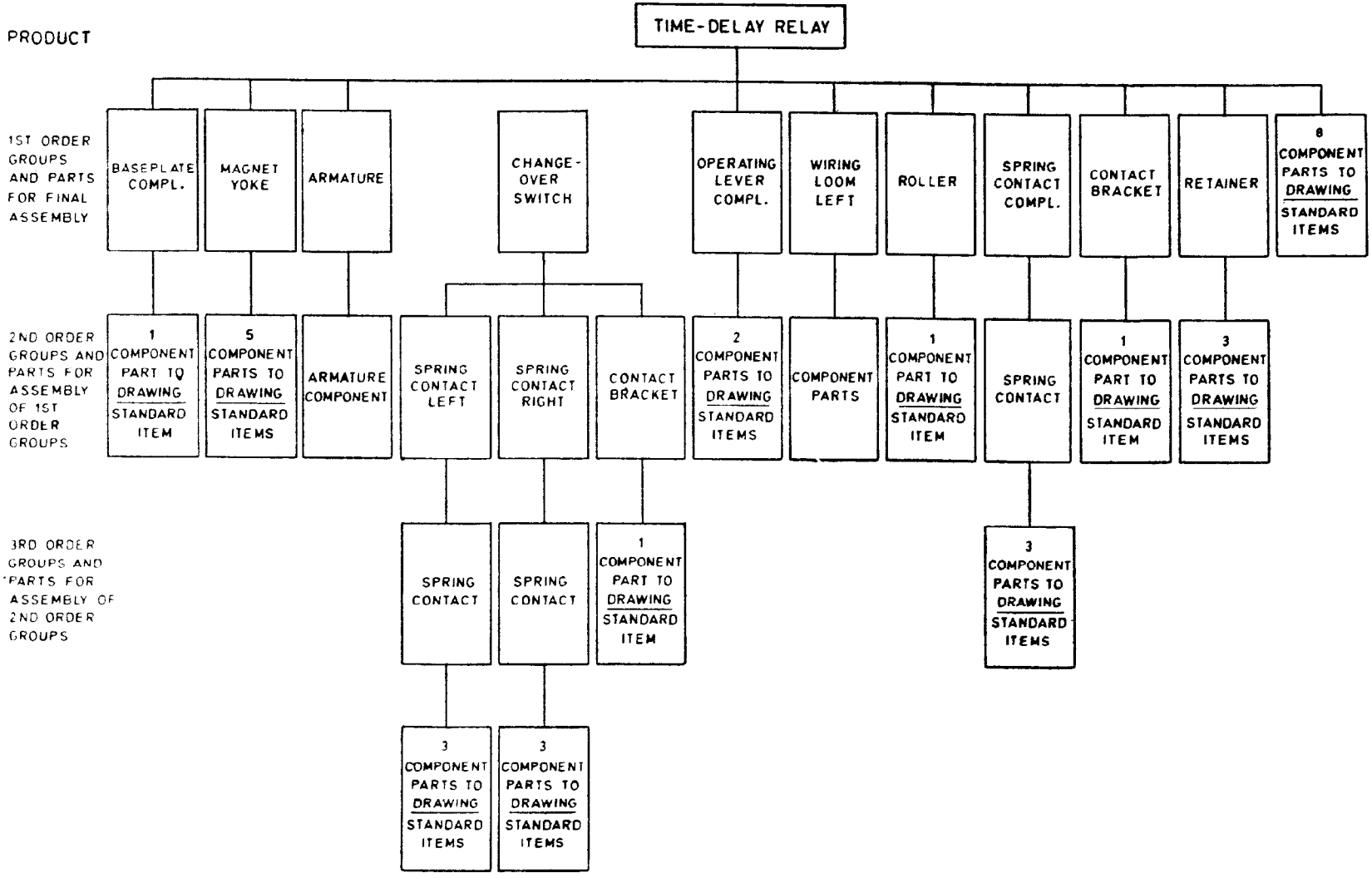
COMPONENT SCHEME



APPENDIX B

(Clause 2.3)

ASSEMBLY TREE



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EXPLANATORY NOTE

IS : 696-1972 'Code of practice for general engineering drawings' contains general recommendations for preparation of engineering drawings. IS : 8930-1978 'Nomenclature for general engineering drawings' provides the names of various engineering drawings and their short explanations. This standard contains further explanations to classify the role played by those drawings in a modern drawing set.

This standard first explains some important concepts, such as group, repeated part, etc, and then considers drawings and parts from the functional aspect and presents principles and rules to be applied in the arrangement of a set of drawings and parts lists as an aid to production. The appendices to the standard give examples of an assembly flow. All the explanations regarding parts lists are not oriented towards a specific preprinted form. The same applies to the remarks regarding drawings. No reference is made to the numbering of engineering drawings because this depends largely on the works organization concerned. The circuit diagrams have also been not dealt with in this standard.

This standard is based on DIN 6789-1965 'Systematic arrangement of drawings, set of drawings and parts lists as production aids, definitions, direction for arrangement' issued by Deutsches Institut für Normung (DIN).

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