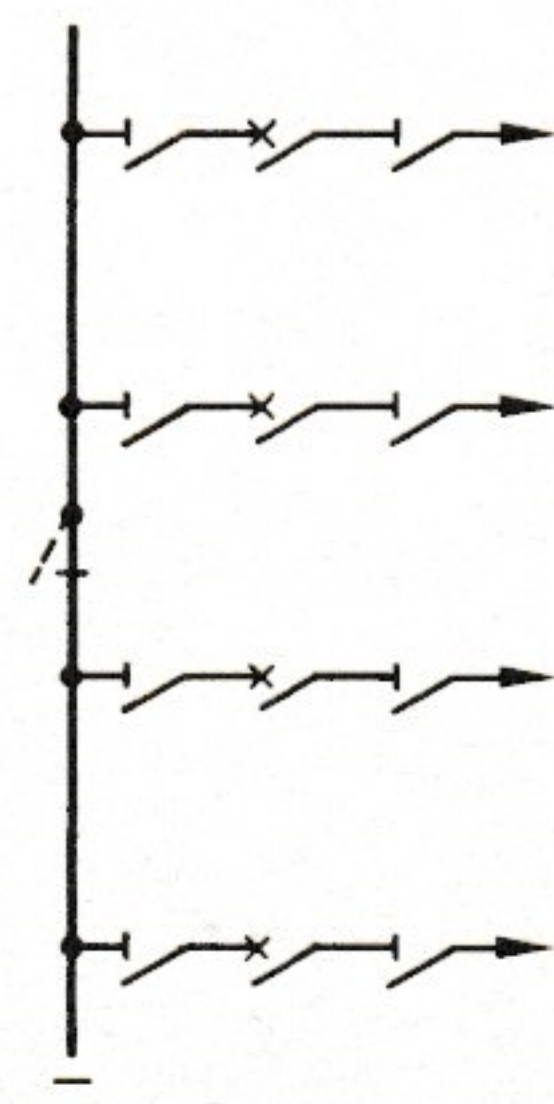


### 11.1.2 Circuit configurations for high- and medium-voltage switchgear installations

The circuit configurations for high- and medium-voltage switchgear installations are governed by operational considerations. Whether single or multiple busbars are necessary will depend mainly on how the system is operated and on the need for sectionalizing, to avoid excessive breaking capacities. Account is taken of the need to isolate parts of the installations for purposes of cleaning and maintenance, and also of future extensions.

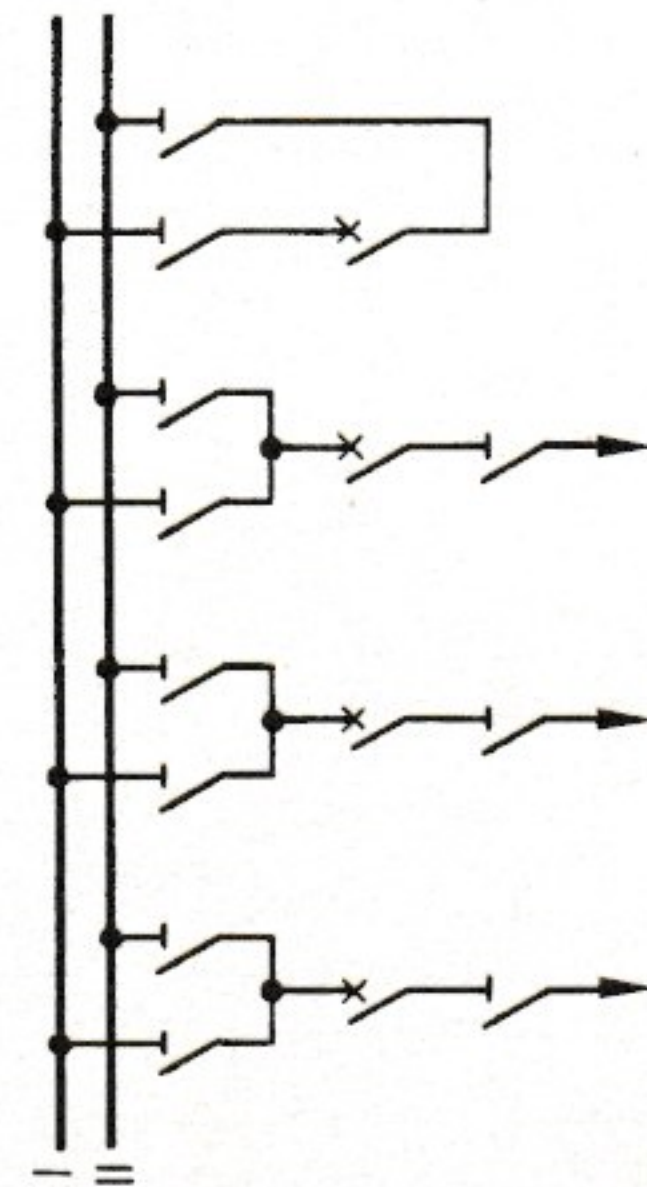
When drawing up a single line-diagram, a great number of possible combinations of incoming and outgoing connections have to be considered. The most common ones are shown in the following diagrams.

Common circuit configurations



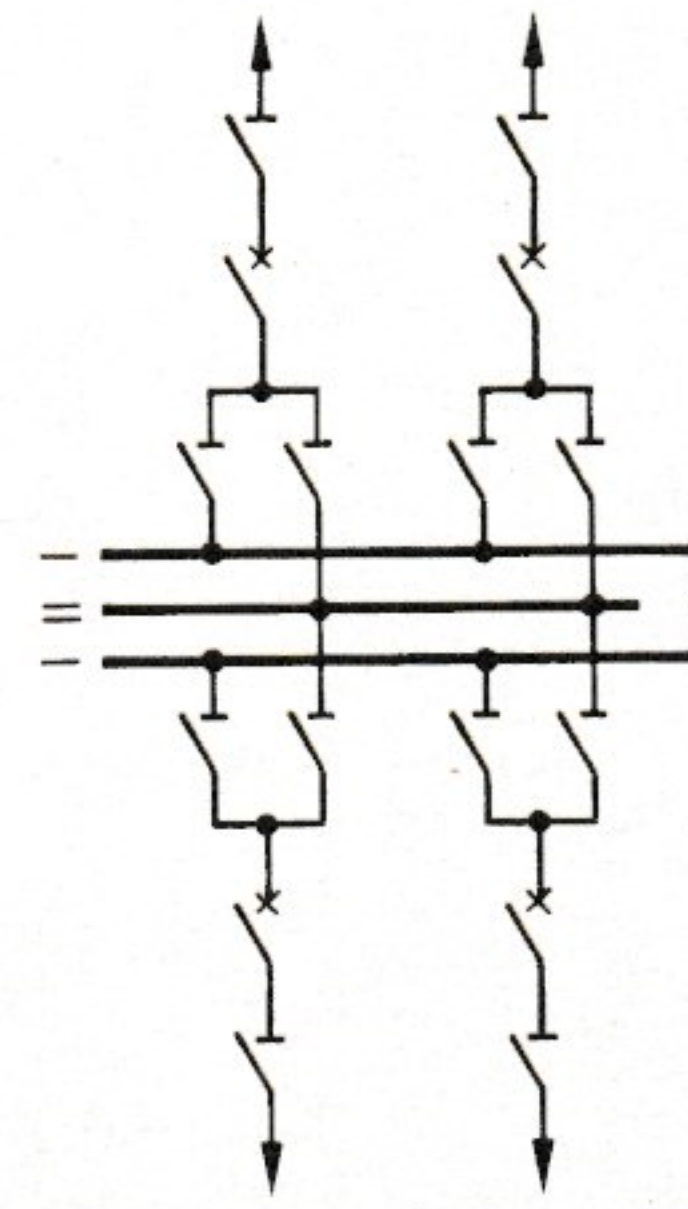
Single busbars

Suitable for smaller installations. A sectionalizer allows the station to be split into two separate parts and the parts to be disconnected for maintenance purposes.



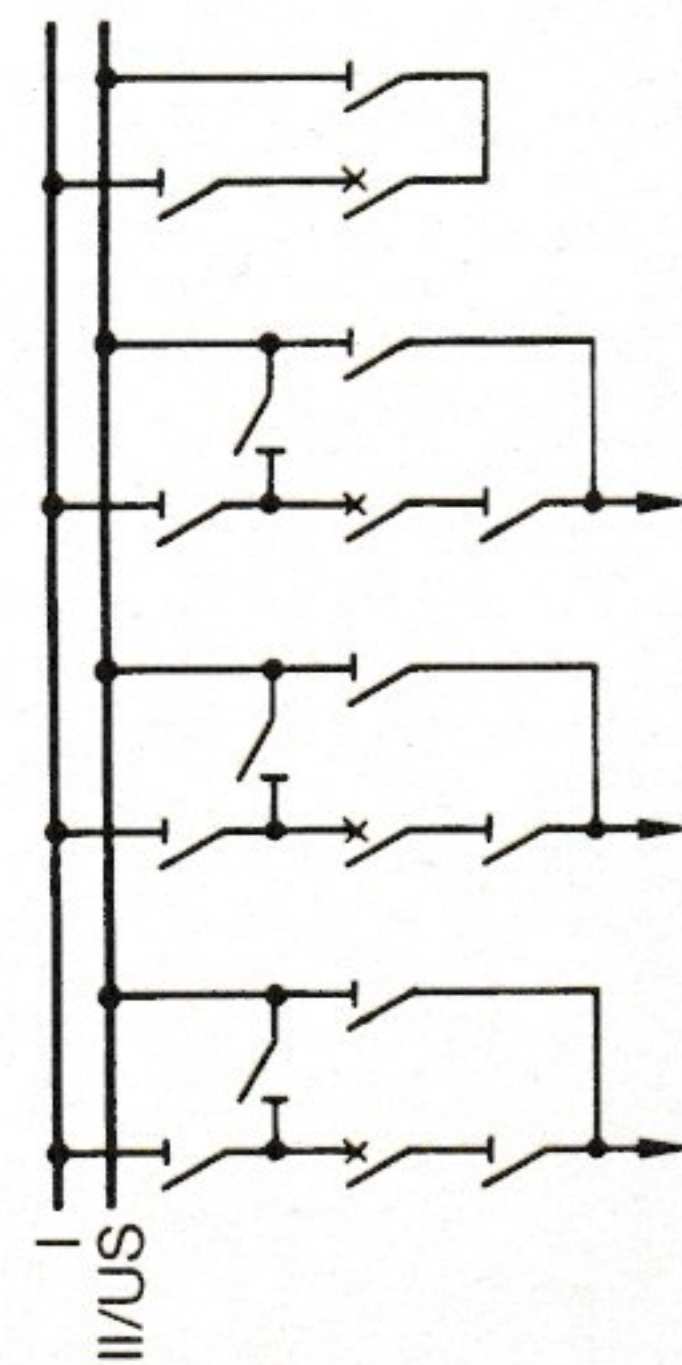
Double busbars

Preferred for larger installations. Advantages: cleaning and maintenance without interrupting supply. Separate operation of station sections possible from bus I and bus II. Busbar sectionalizing increases operational flexibility.



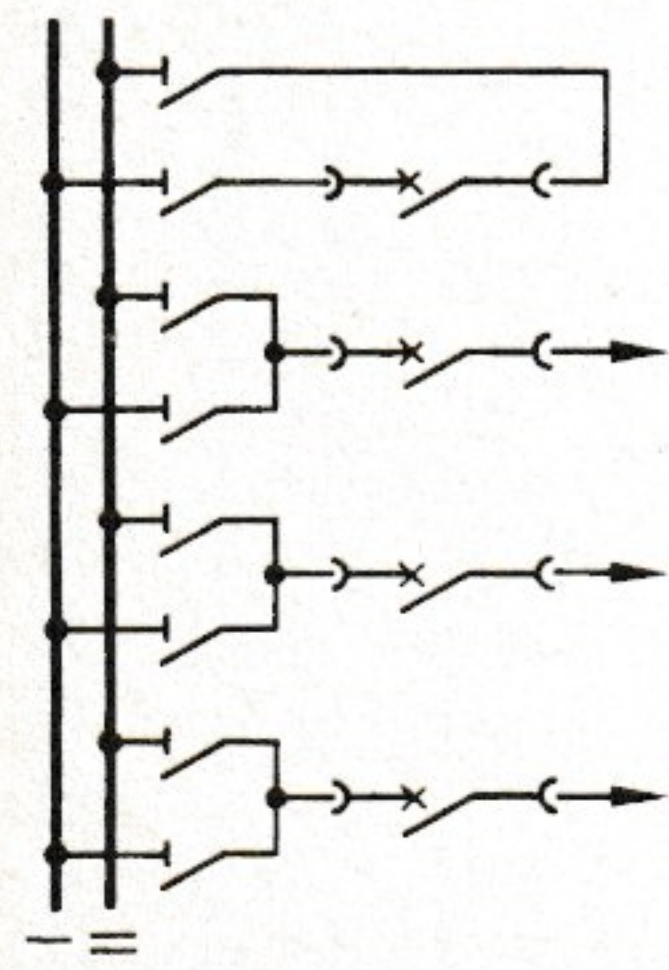
Double busbars in U connection

Low-cost, space-saving arrangement for installations with double busbars and branches to both sides.



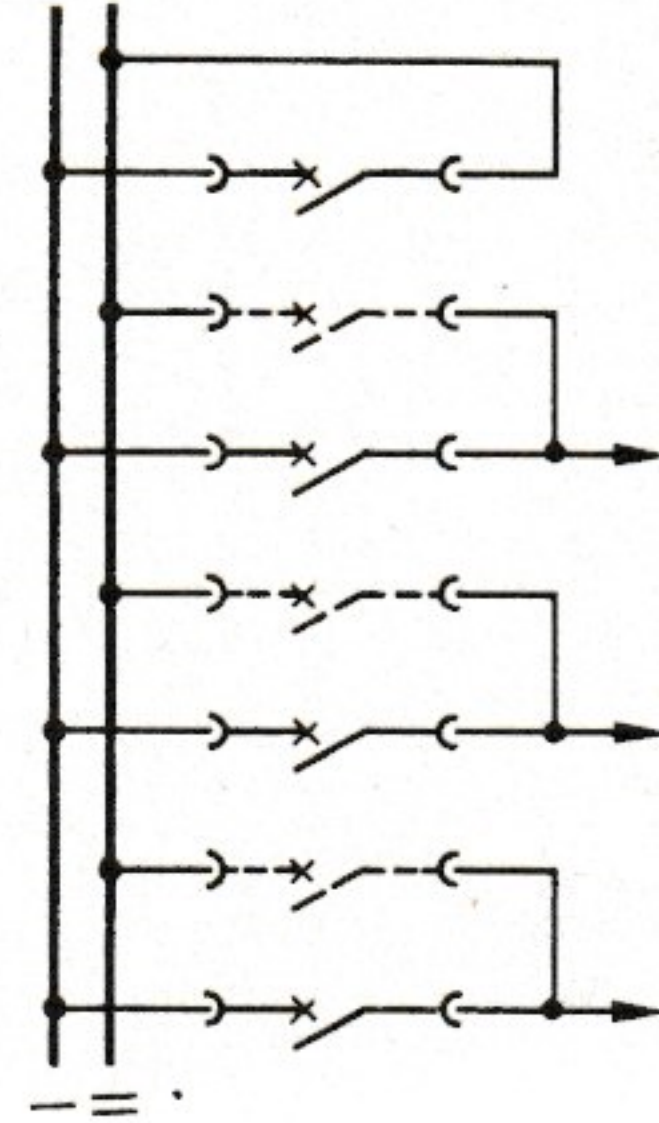
Composite double bus/bypass bus

This arrangement can be adapted to operational requirements. The station can be operated with a double bus, or with a single bus plus bypass bus.



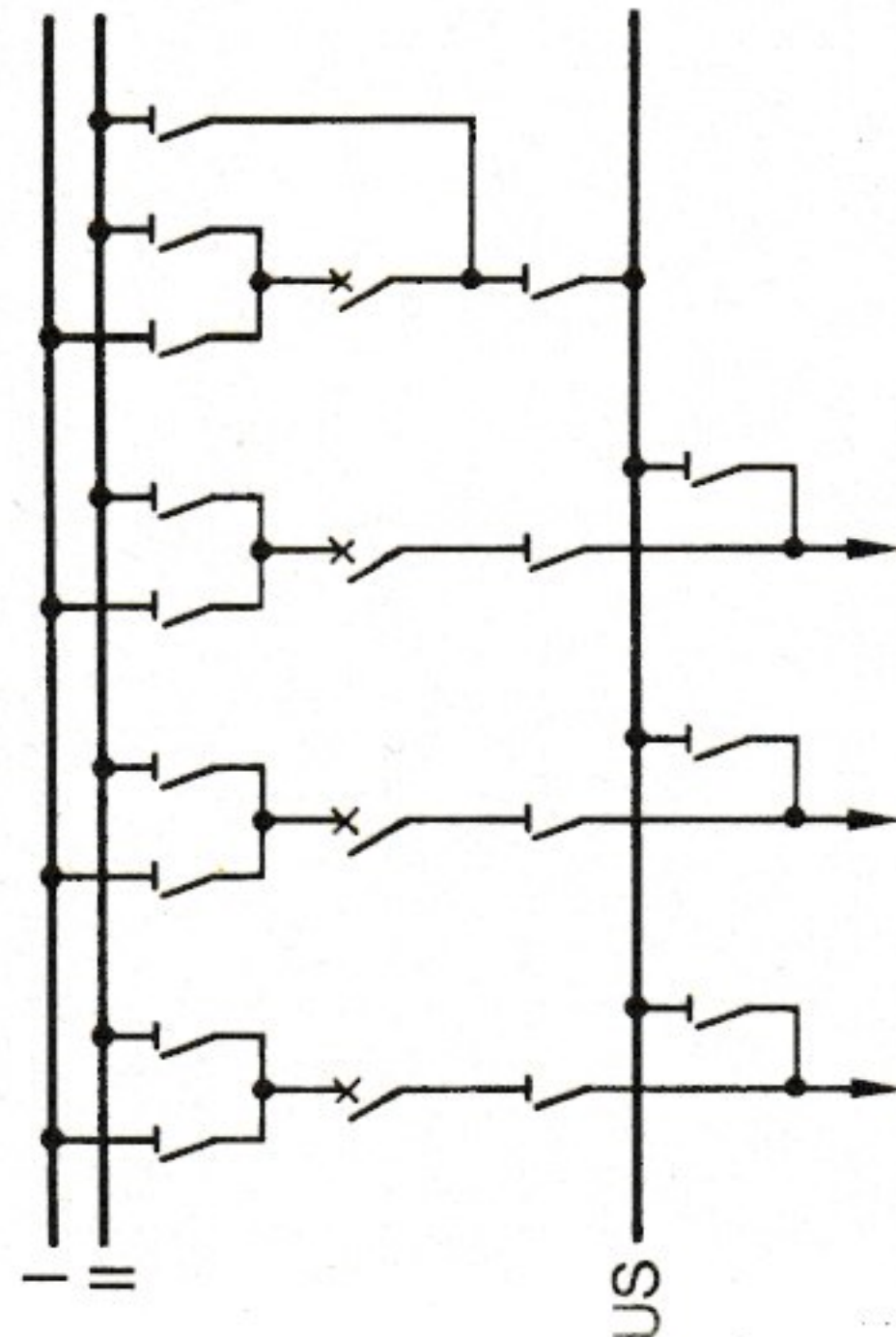
Double busbars with draw-out circuit-breaker

In medium-voltage stations, draw-out breakers reduce downtime when servicing the switchgear; also, a feeder isolator is eliminated.



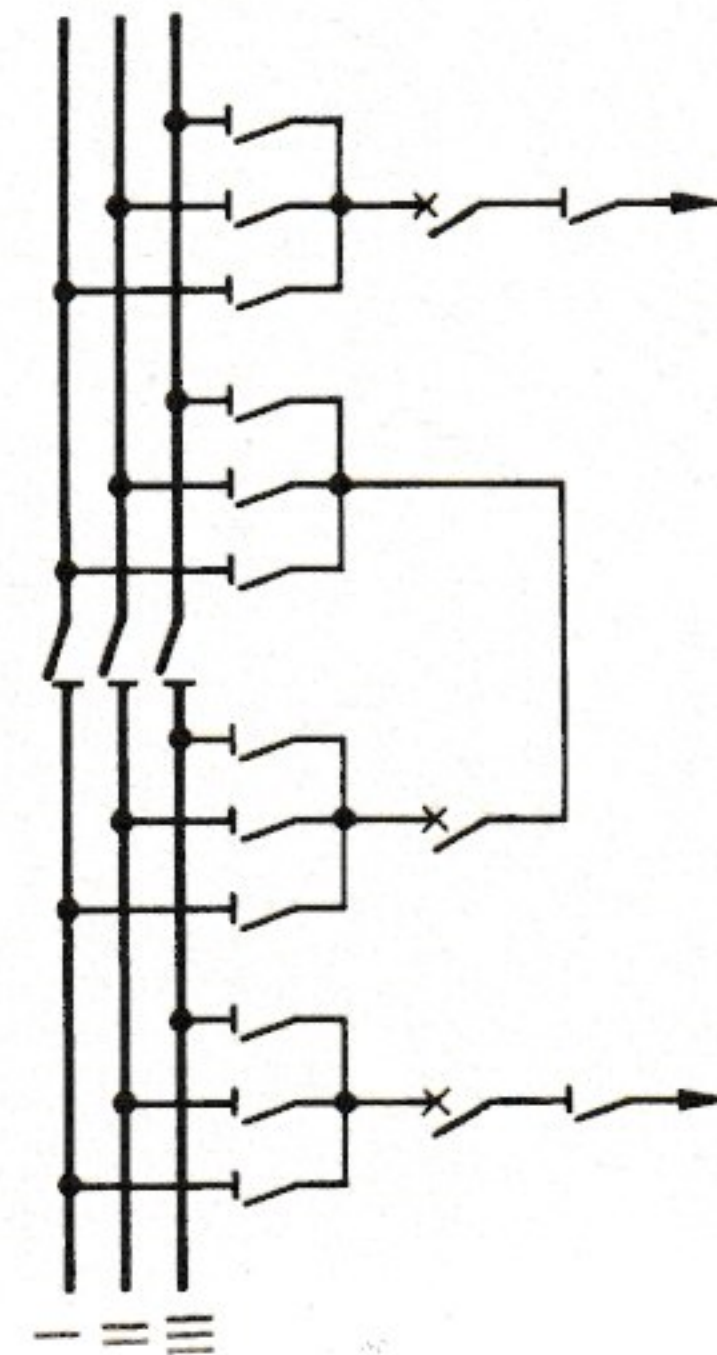
Two-breaker method with draw-out circuit-breakers

Draw-out circuit-breakers result in economical medium-voltage stations. There are no busbar isolators or feeder isolators. For station operation, the draw-out breaker can be inserted in a cubicle for either bus I or bus II.



Double busbars with bypass busbar (US)

The bypass busbar is an additional busbar connected via the bypass branch. Advantage: each branch of the installation can be isolated for maintenance without interrupting supply.



Triple (multiple) busbars

For vital installations feeding electrically separate networks or if rapid sectionalizing is required in the event of a fault to limit the short-circuit power. This layout is frequently provided with a bypass bus.