1. GENERAL

The SLJF 700-series thyristor bridges are fully-controlled, three-phase, six-pulse bridge units. Their principal application is the supply of armature circuits in d.c. machines, but are also used in excitation systems which require great generation of power and, as a three-pulse version, in electrolytic converters.

2. MECHANICAL DESIGN

2.1 Assembly

The six-pulse bridge unit is assembled of two three-pulse units which can also be used independently, if necessary. The three-pulse unit is assembled on a chassis made of fabricated sheet steel. Each puck-type thyristor has its own double-sided cooling element, an RC circuit and a fuse. In a six-pulse rectifier a connection frame, through which the bridge unit is connected to the rectifier cubicle busbars, is fitted between the two bridge units in such a way that the positive unit is on top. Connections are made via fuses and jointing via a busbar. The connection frame comprises the commutating chokes for each thyristor. The bridge units can be pulled out of the cubicle to enable maintenance. In addition, a complete rectifier comprises a fan for each switchgear cubicle, and a firing unit for each rectifier.

2.2 Material

The chassis is of hot-dip galvanised sheet steel. The cooling elements are of aluminium. The busbars are made of nickled copper. Varnished bakelite and glass-fibre reinforced polyamide are used as insulating material. The wirings of the RC circuits are of Teflon-insulated cable.

3. CHARACTERISTICS

3.1 Standards

The definitions of the nominal values and the symbols of the variables comply with the IEC Publ. 146.

3.2 Nominal values

Table 1 shows the current and power values of the SLJF 700-series bridge units.

Class of environment is Y1, except that the max. cooling air temperature during operation is +40°C. If the temperature exceeds +40°C, the nominal current of the bridge must be reduced by abt. 1.5 % for each degree exceeding +40°C. Max. temperature is +55°C.
Power generation of six-pulse SLJF 700-series bridges.

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>Number of parallel connections</th>
<th>DC power $P_d$/kW</th>
<th>DC current $I_{dmN}$/A</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>1</td>
<td>530</td>
<td>1200</td>
<td>SLJF 705 G_</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>970</td>
<td>2200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1450</td>
<td>3300</td>
<td></td>
</tr>
<tr>
<td>525</td>
<td>1</td>
<td>720</td>
<td>1200</td>
<td>SLJF 705 G_</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1320</td>
<td>2200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1980</td>
<td>3300</td>
<td></td>
</tr>
<tr>
<td>660</td>
<td>1</td>
<td>900</td>
<td>1200</td>
<td>SLJF 706 G_</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1650</td>
<td>2200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>2475</td>
<td>3300</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.

If higher power generation is required, it is possible to connect several power stages in parallel.

If higher d.c. voltage is required, two 660 V rectifiers can be connected in series. Another alternative is to use one rectifier, with max. supply voltage 1250 V.

The current and voltage values of high-power rectifiers are quoted case by case.

The same current values are obtained from the three-pulse version.

3.3 Value of d.c. current $I_d$ in different duty classes

In different duty classes, the d.c. currents indicated in Table 1 must be reduced by the coefficients given in Table 2.

<table>
<thead>
<tr>
<th>Duty class</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1.00</td>
</tr>
<tr>
<td>II</td>
<td>0.77</td>
</tr>
<tr>
<td>III</td>
<td>0.64</td>
</tr>
<tr>
<td>IV</td>
<td>0.64</td>
</tr>
<tr>
<td>V</td>
<td>0.55</td>
</tr>
<tr>
<td>VI</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Table 2.
3.4 Overload capacity

Fig. 1 shows the single overload capacity of the rectifier at different preload ratios. The graph also applies to parallel connections provided the parallel connected bridges are located in different cubicles. Cooling air temperature is +40°C.

1200 A bridge
Single overload capacity

Fig. 1.

3.5 Cooling

The SLJF 700-series bridge units cannot be used without ventilation. The fan type used in SZTR 12.2. The fan unit is installed on top of the cubicle. The cooling air is taken into the cubicle either through the air duct below the cubicle or from the electrical equipment room through a grating located at the bottom front side of the cubicle. In the latter case, sufficient ventilation of the electrical room must be taken care of. Max. temperature range of the cooling air at rated current is +5°C...+40°C. In the range +40°C...+55°C, the current must be reduced by 1.5 % for each degree exceeding +40°C.
3.6 Protection

Each thyristor is protected against short-circuit by a rapid fuse. The fuse type used is 400 A/1000 V, code 0983911-9. Each thyristor is protected by two fuses connected in parallel. The fuses can be equipped with microswitches for blown fuse indication.

Note. The fuses are rated for protection of the thyristors only. If the rectifier is used for supplying power to the mains, and the rated current of the motor is considerably smaller than that of the bridge, the protection of the motor must be checked.

3.7 Control

a) Analogue firing unit SELE 200

Two pulse amplifiers SGCP 6 F 1, code 5712721-0, are mounted on the front plate of the bridge unit. The other sections of the firing unit are connected to the regulator in the cubicle door. The same rectifier is also used for control of an anti-parallel connected bridge. In this case a reversing logic unit must be added to the firing unit frame.

Two parallel connected bridges can be controlled without any additional equipment. If three (or more than three) bridges are connected in parallel, an additional 48 V auxiliary voltage supply is required because of the increased pulse output. Connection of the firing unit to the bridge is described in 4.1.

Technical data of the firing unit are described on E-catalogue page, code 5151727-0.

b) Digital firing unit SELE 1000

Two pulse amplifiers SGCP 1000, code 5740974-6, are mounted on the front plate of the bridge unit. The other sections of the firing unit are connected to the regulator in the cubicle door. The same rectifier is also used for control of an anti-parallel connected bridge.

Two parallel connected bridges can be controlled without any additional equipment. If three (or more than three) bridges are connected in parallel, two additional 42 V auxiliary voltage supplies are required because of the increased pulse output.

Connection of the pulse amplifiers to the bridge unit is described in 4.2.

Technical data of the firing unit are included in:
- SELE 1000, functional description, code 5351702-1
- SELE 1000. manual, code 5351801-0
- SGHF 1000, functional description and instructions for use, code 5351720-0
- SGCP 1000, functional description, code 5352549-1
3.8. Losses

The losses of the SLJF 700-series bridge units (and connection frame) are indicated in Fig. 2.

![Graph showing losses vs. current]

Fig. 2.
4. CONNECTIONS

4.1 Thyristor bridge with a SELE 200 firing unit

Fig. 3 shows the circuit diagram and the terminal markings of the bridge unit. The connection frame is presented in detail in description 5151275-8.

Fig. 3.
4.2 Thyristor bridge with a SELE 1000 firing unit

Fig. 4 shows the circuit diagram and the terminal markings of the bridge unit.

Fig. 4.
5. OUTSIDE DIMENSIONS AND INSTALLATION

Installation of the thyristor bridge unit and the related structural parts into the cubicle is shown in Fig. 5. The outside dimensions of the bridge unit are indicated in Fig. 6.

Fig. 5.
Cable conduit for the thyristor bridge control cables
Terminals for the thyristor bridge control cables

Connection busbar 25x3, screw M10
"  " 25x6, screw M12

Weight: 88 kg

Fig. 6.
6. TO BE MENTIONED IN THE ORDER

SLJF 705 G 14
57772719  pos. unit SLJZ 705 P 14      57772727
neg. unit SLJZ 705 N 14      57772735

SLJF 706 G 13
57415843  pos. unit SLJZ 706 P 13      57415878
neg. unit SLJZ 706 N 13      57415886

7. SPARE PARTS

- thyristor

SLJF 705 G,       code 09801961
SLJF 706 G,       code 35066314

- pulse amplifier SGCP 6 F 1, code 5712721-0
- pulse amplifier SGCP 1000,     code 5740974-6
- fuse 400 A/1000 V, code 0983911-9

Note. Clamping forces of the thyristors:

DCR 1007 (AEI)     max. 17.5 kN
T900 (Westinghouse) max. 20     kN
C451 (GE)          25     kN