

Data Sheet 8.74-1/1¹⁾

Low-Voltage Compensation Unit, Type LVCCI

Application

The low-voltage compensation unit is used to increase the reactive power capacity of the transformer test system type WV. Since the power capacity of the CFI is limited (Data Sheet 8.73), the capacitive groups of the compensation unit can be applied for load-loss and temperature-rise tests of power transformers. The inductive group can be used to compensate capacitive reactive power of the transformer during the induced voltage test. When the reactive power is mostly compensated, the main task of the CFI is the supply of active power for the transformer under test.

Structure and Control

The compensation unit is connected in parallel to the output of the CFI and made of four sets of capacitive compensation groups (C1, C2, C3 and C4) and one set of inductive compensation (L5) group (Fig. 1). All components of the compensation unit are built in one compensation cubicle. The LC filter of the CFI and the primary tap switcher of the step-up transformer are also installed in that cabinet.

The switching of each compensation group as well as the series/parallel connection of capacitors/inductors for two-phase operation is carried out by the contactors (K1, K2, K3, K4 or K5). The operation of the contactors is controlled by a programmable logic controller (PLC) type SIMATIC, which communicates with the central PLC through an optical cable.

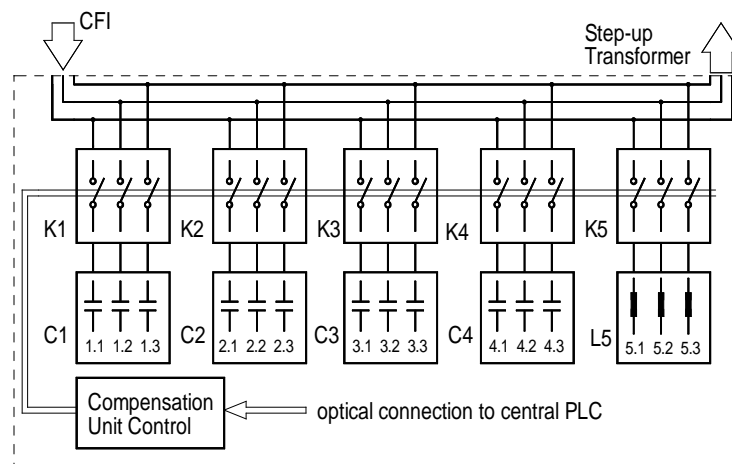


Figure 1: Principle structure of the low-voltage compensation unit

¹⁾ The prior version of the Data Sheet was 8.74/4.

Stages of Compensation

For the load-loss and temperature-rise tests at rated frequency (50 Hz or 60 Hz) the first three groups of capacitors can be used according to the demand of the inductive reactive power. It is possible to operate in three power stages for three-phase operation:

Table 1: Capacitive compensation for three-phase operation at 50/60 Hz

Stage	Capacitors in use	Capacitance of each phase (Δ) ²⁾
1	C1	2645 μ F
2	C1 C2	5290 μ F ³⁾
3	C1 C2 C3	7935 μ F

For two-phase operation it is possible to operate in eight power stages:

Table 2: Capacitive compensation for two-phase operation at 50/60 Hz

Stage	Capacitor in use	Capacitance
1	C1.1	2645 μ F
2	(C1.1 C1.2)+C1.3 ⁴⁾	3967 μ F
3	C1.1 C2.1	5290 μ F
4	(C1.1 C2.1) (C1.2+C1.3)	6612 μ F
5	C1.1 C2.1 C3.1	7935 μ F
6	C1.1 C2.1 C3.1 (C1.2 C1.3)	9257 μ F
7	C1.1 C2.1 C3.1 (C1.2+C1.3) (C2.2+C2.3)	10580 μ F
8	C1.1 C2.1 C3.1 (C1.2+C1.3) (C2.2+C2.3) (C3.2+C3.3)	11902 μ F

The inductive group (L5) can be applied for the induced voltage test in the frequency range from 70 to 200 Hz. For three-phase operation this group (L5) operates in one power stage with parameter: 3 X 2.02 mH (Δ)²⁾. The following two stages are prepared for two-phase operation:

Table 3: Inductive compensation for two-phase operation at 70 ... 200 Hz

Stage	Inductor in use	Inductance
1	L5.1	2.02 mH
2	L5.1 (L5.2 +L5.3)	1.35 mH

In the entire frequency range from 50 to 200 Hz the capacitive group 4 (C4) can be used to shift slightly the reactive power demand. The group 4 can be operated with 3 x 248.6 μ F (Δ) in three phases. For two-phase operation two stages can be selected:

Table 4: Capacitive compensation for two-phase operation at 50 ... 200 Hz

Stage	Capacitor in use	Capacitance
1	C4.1	248.6 μ F
2	(C4.1 C4.2) +C4.3	372.9 μ F

The initial stage of compensation can be selected according to the estimated reactive power demand of the transformer to be tested. It can be adjusted / optimized stepwise during the test. The contactors can be changed only when the output of the CFI is turned off.

Table 5: Main parameters

	Group 1 - 3 (C1 – C3)	Group 4 (C4)	Group 5 (L5)
Capacitor / Inductor	3x2645 μ F	3x248.6 μ F	3x2.02 mH
Rated Power (at frequency)	3x132 kVA (at 50 Hz)	3x50 kVA (at 200 Hz)	3x180 kVA (at 70 Hz)
Rated voltage range (r.m.s)	3~ /2~ 40 ... 400 V	3~ /2~ 40 ... 400 V	3~ /2~ 40 ... 400 V
Rated current (r.m.s.)	400 A	125 A	450 A
Rated frequency range	\leq 60 Hz	\leq 200 Hz	70~200 Hz

Power supply for control	
Operation voltage	230 V AC
Voltage / current	230 V AC / max. 2 A

Cooling	
Cubicle fan	3~400 V / 50 Hz or 3~480 V / 60 Hz

Dimensions, Weight, Environment of the unit	
Dimensions, approx. (W x H x D)	2007 mm x 2521 mm x 1603 mm
Weight approx.	2500 kg
Temperature / humidity	+5...+40 °C / 90 % (no condensation)

- 2) the symbol “ Δ ” describes the delta connection of three-phase elements;
 3) the symbol “||” describes the parallel connection;
 4) the symbol “+” describes the series connection.