

8.3 DCF503-0050 and DCF504-0050 (external)

The **half controlled** field exciter unit DCF503-0050 consists of the SDCS-FEX-32 board, two thyristor/diode power modules and auxiliaries (power supply, line choke). The **fully controlled** field exciter unit DCF504-0050 consists of the SDCS-FEX-31 board, four anti-parallel thyristor/ thyristor power modules and the same auxiliaries.

The control is structured similar to the SDCS-FEX-2 field supply. A micro controller is used for controlling and firing. The DC current is measured by using an AC current transformer (same configuration than at SDCS-FEX-2).

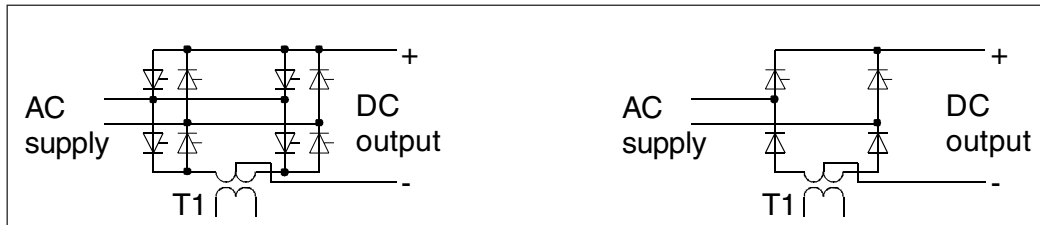


Fig. 8.3/1 Different versions of power section of the DCF50x-0050

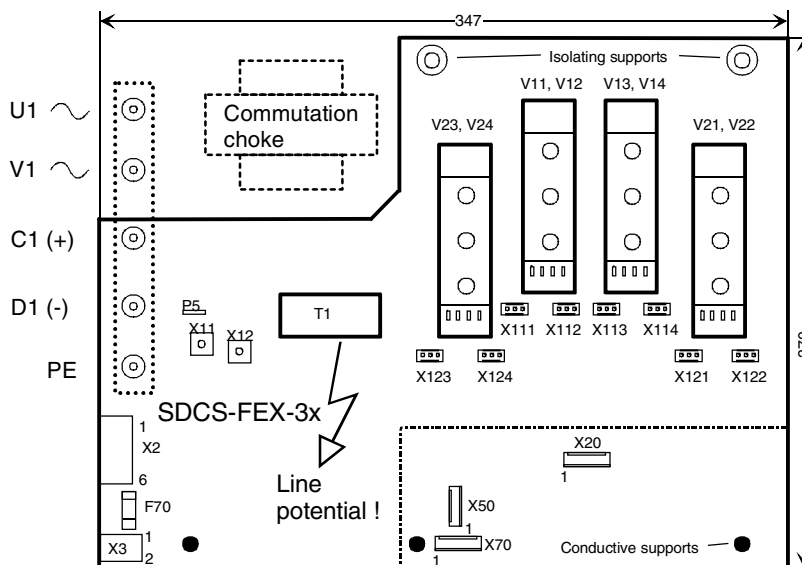


Fig. 8.3/2 Layout of the DCF504-0050 field exciter unit

8.3.1 Electrical data of DCF50x-0050

Power part	
AC input voltage:	110 V -15%...500 V +10%; single phase
AC input current:	≤ output current
Frequency:	same as DCS converter module
AC isolation voltage:	690 V
Line reactor:	160 μH; 45-65 Hz
DC output current: ①	0.3...50 A
Power loss at $I_{F rated}$:	≤180 W
Auxiliary voltage	
AC input voltage:	93 V ... 253 V; single phase terminal X3:1 and 2
Frequency:	45 ... 65 Hz
AC input power:	15 W; 30 VA
Inrush current:	<5 A / 20 ms
Mains buffering:	min 30 ms
Terminal row X2:	
X2: 1 RS 485	should be connected to X16: 1 at SDCS-CON-1
X2: 2 RS 485	should be connected to X16: 2 at SDCS-CON-1
X2: 3 Ground	should be connected to X16:3 at SDCS-CON-1 via screen (connected via L = 100 μH to electronic ground)
X2: 4 Coding	defines first / second field exciter
X2: 5 Ground	connected via L = 100 μH to electronic ground
X2: 6 output IACT	$U_{out} = 4 V \cdot I_{act} / I_{lim}$; $I_{lim} = 3A, 5A, 7A, 9A, 11A, 13A, 15A, 17A, 21A, 27A, 33A, 39A, 45A, 51A$

① If Field weakening is needed, actual field current of the motor at top speed must be higher than 0.3 A

8.3.2 Electronic power supply

There is a power supply unit on the board. Supply is connected at terminal X3. The rated AC voltages 115 V and 230 V can be applied without any changes. Fuse F70 is a protection fuse connected in series with the AC input of the power supply unit. The power supply unit provides the DC voltages 30 V, 15 V, 5 V and -15 V to the control electronics. Auxiliary voltages can be measured by means of a multimeter from the terminal X70 (see the layout).

Fuse data F70: dimensions 5x20 mm; T 500 mA/ 250 V - **S506 500 mA Bussmann**

Measured voltage	Positive measuring wire	Negative measuring wire
+5V	X70:1	X70:2
+30V	X70:3	X70:5
+15V	X70:4	X70:5
-15V	X70:6	X70:5

8.3.3 Control unit

The control unit includes the following main blocks:

- Micro controller 80C198 for controlling and firing
- Actual DC current measurement with an AC current transformer.
- RS485 interface to the converter's controller board SDCS-CON-x.

The software for the field current control is stored in the ROM memory of the 80C198. The control is done by using a PI structure for the current controller. All parameters needed for the control or for scaling reasons (selection of burden resistors) are stored in the non-volatile memory of the armature converter and transferred to the field controller during each initializing process via the RS485 link.

The output I_{act} represents the actual field current, which is measured via the AC transformer, then rectified and transferred into a voltage signal with burden resistors. The burden resistors, as mentioned before, are adapted by the board itself depending on the setting of the nominal field current of the motor (see list before). The resulting burden voltage can be measured at test terminals beside X14. The 2.2 kΩ resistor allows a short circuit at the terminals; the external measuring device should have an internal resistance higher than 1 MΩ.

The terminal row X20: is used for test purposes.

8.3.4 Power section

If a DCF503-0050 is in use two diode-thyristor modules are arranged as a half-controlled single-phase rectifier. If a DCS504-0050 is in use four thyristor-thyristor modules are arranged as a fully-controlled single-phase rectifier. The anodes of the two diodes (anodes / cathodes of the thyristors) are not connected directly to each other as usual; they are now connected to the ends of the primary winding of the current transformer. The centre tap is the negative output of the rectifier. Thus it is possible to measure the DC current with an AC current transformer.

A MOV (Metal Oxide Varistor) protects the AC input against voltage spikes from the external source. Another MOV protects the DC output against voltage surges which can be caused by the field winding of a DC machine. The free wheeling function needed e.g. during network failure is "build in" because of the diodes, if the half-controlled version is in use. If the fully-controlled version is used the free wheeling function is realized by using the thyristors in diode mode, controlled by the micro controller.

8.3.5 Field exciter configurations

The data exchange between the SDCS-CON-x and the field exciter SDCS-FEX-2 or the DCF503/504-0050 is done via a RS485 serial link, which is able to work not as a point to point connection, but as a bus structure. This link is used to transfer references, actual values and settings for up to two field exciter units.

The drive software located on the SDCS-CON-x board consists of two field supply modules. One of them is already connected to the EMF controller to allow the motor running in all points of his motor diagram. The other one is accessible via the field current reference.

The RS485 interface works with a screened two-wire cable. The allowed length is 5 m. The wires have to be connected to the terminals X2:1 and X2:2 and the screen to X2:3.

Typical application of this kind is two DC motors connected to one converter. The load sharing can be done by means of adjusting the excitation current of the second DC-motor.

There are two possible configurations for two field exciters:

- one SDCS-FEX-2 and one external field exciter (DCF503-0050, DCF504-0050 or 3 phase field exciter) or
- two external field exciter units (DCF503-0050, DCF504-0050 or 3 phase field exciter).

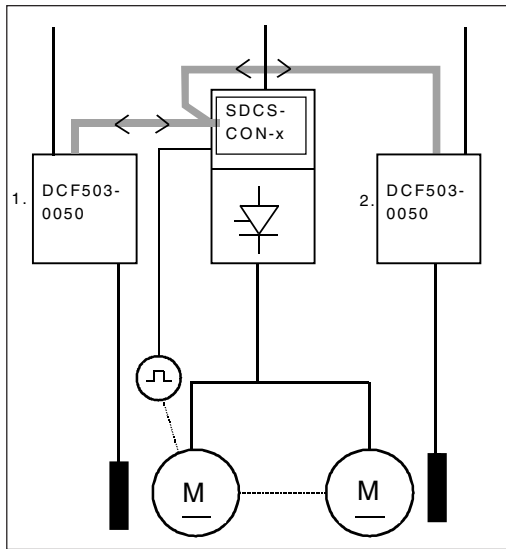


Fig. 8.3/3 Typical application example with two field exciter units and one converter.

If a SDCS-FEX-2 is used, it will be recognized as the first field exciter by the software and therefore, it cannot be coded as a second one. If a DCF503/504-0050 is used as the first or the second field exciter it must be coded according to the table below.

Field exciter 1		Field exciter 2	
Unit type	Connection X2:4-X2:5	Unit type	Connection X2:4-X2:5
SDCS-FEX-2	---	---	---
DCF 503/504		---	---
SDCS-FEX-2	---	DCF 503/504	
DCF 503/504		DCF 503/504	

Procedure for code changing of the DCS 503/504:

- Switch off the units voltage supply
- Set the appropriate connection according the table
- Initialization through switch on the electronics supply voltage

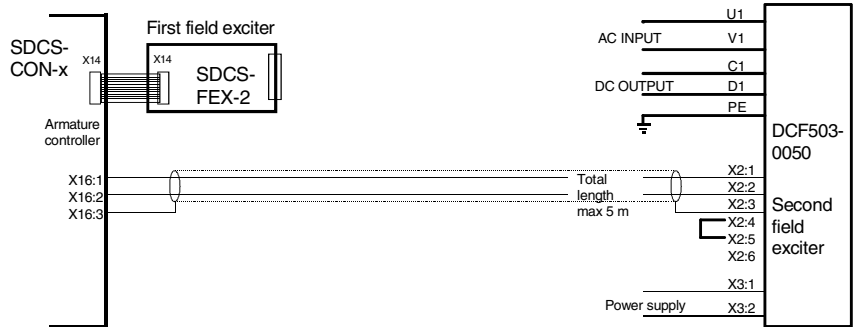


Fig. 8.3/4 Serial communication cable connection and address setting for first and second field exciter, using SDCS-FEX-2 and DCF50x-0050

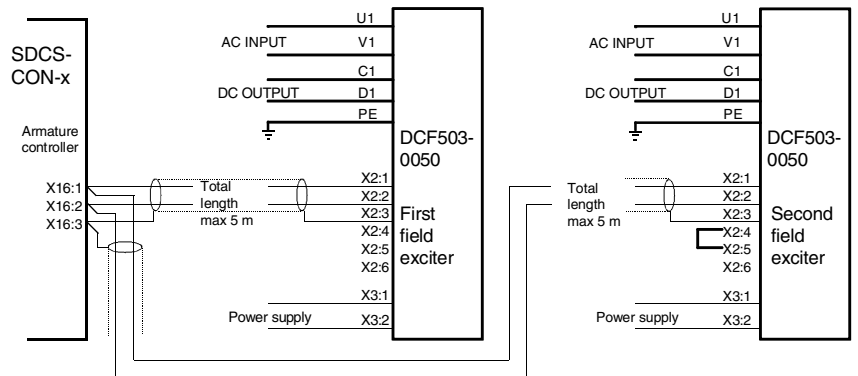


Fig. 8.3/5 Serial communication cable connection and address setting for first and second field exciter, using two times DCF50x-0050