



E-Learning, DC drives

DCS800 Hardware D1 – D4 G560e_a

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HARDWARE_D1-D4_R0301

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Welcome to the Hardware D1 to D4 training module for the DCS800, ABB DC Drives.

If you need help navigating this module, please click the Help button in the top right-hand corner.
To view the presenter notes as text, please click the Notes button in the bottom right corner.

Objectives

This training module covers:

- Voltage and current ratings
 - 2-Quadrant-Modules
 - 4-Quadrant-Modules
- Location of the hardware devices
- Power part (D1 – D4)
- Electronic boards PIN-4 and CON-4
- Line reactors and semiconductor fuses

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This training module covers:

- Voltage and current ratings DCS800
 - 2-Quadrant modules and
 - 4-Quadrant modules
- Location of the hardware devices
- Power part for D1 – D4 converters
- Electronic boards PIN-4 and CON-4
- Line reactors and semiconductor fuses

Ratings, types and voltages

Overview for module sizes D1 to D4

Unit size	2-Q rated Current DCS800-S01 I_{dc} [A]	4-Q rated Current DCS800-S02 I_{dc} [A]	Supply voltage [V _{AC}]						Weight [kg]	Dimensions	
			400	525	600	690	800	990		h x w x d [mm]	h x w x d [inch]
D1	20	25	●	●					11	370 x 270 x 200	14.56 x 10.65 x 7.90
	45	50	●	●							
	65	75	●	●							
	90	100	●	●							
	125	140	●	●							
D2	180	200	●	●					16	370 x 270 x 270	14.56 x 10.65 x 10.65
	230	260	●	●							
D3	315	350	●	●	● ^③				25	459 x 270 x 310	18.07 x 10.65 x 12.25
	405	450	●	●							
	470	520	●	●							
D4	610	680	●	●	● ^③				38	644 x 270 x 345	25.35 x 10.65 x 13.60
	740	820	●	●							
	900	1000	●	●							

③ 600 VAC units are limited to 290 / 590
ADC for 2-Q and 320 / 650 ADC for 4-Q
modules

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The size D1 to D4 modules have a current range from 20 ADC to 1000 ADC with standard supply voltages of 400 VAC and 525 VAC. 600 VAC types are also available.

This table shows detailed information about the converter modules:

- The converter module size is shown,
- then the rated current. Note, that the rated current of non-regenerative 2-Q modules is lower than that of regenerative 4-Q modules.
- The available rated supply voltage is shown. Note, that the modules for 600 VAC supply come without OnBoard field exciter.
- The next columns show the weight and dimensions of the modules.

Current ratings for 2-Q modules

Overview for 2-Q module sizes D1 to D4

Unit type 2-Q converters	IDC I		P _{out} ④		int. field current	Fan volt.	Air volume	P _{Loss}	Frame size
	[A]	[kW] 400V	[kW] 500V	[A]					
420 V / 500 V / 525 V									
DCS800-S01-0020-04/05	20	9	12	6		without fan	300	0.11	D1
DCS800-S01-0045-04/05	45	21	26	6		115/230; 1-ph	300	0.17	D1
DCS800-S01-0065-04/05	65	30	38	6			300	0.22	D1
DCS800-S01-0090-04/05	90	42	52	6			300	0.28	D1
DCS800-S01-0125-04/05	125	58	73	6			300	0.38	D1
DCS800-S01-0180-04/05	180	84	104	15			300	0.56	D2
DCS800-S01-0230-04/05	230	107	133	15			300	0.73	D2
DCS800-S01-0315-04/05	315	146	183	20			600	0.91	D3
DCS800-S01-0405-04/05	405	188	235	20			600	1.12	D3
DCS800-S01-0470-04/05	470	213	280	20			600	1.32	D3
DCS800-S01-0610-04/05	610	284	354	25		230; 1-ph ①	950	1.76	D4
DCS800-S01-0740-04/05	740	344	429	25			950	2.14	D4
DCS800-S01-0900-04/05	900	049	522	25			1900	2.68	D4
600 V / 690 V		600V	690V						
DCS800-S01-0290-06	290	203		-	115/230; 1-ph	600	0.91	D3	
DCS800-S01-0590-06	590	413		-	230; 1-ph ①	950	1.86	D4	

① 115 V is selectable via Plus code

④ ratings for rated input voltage -10 %

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The current ratings for the size D1 to D4 2-Q modules with 50 Hz and 60 Hz supplies are given on this slide. The characteristics are based on a maximum ambient temperature of 40 degree Celsius and a maximum elevation of 1000 meters above sea level.

- The 1st column shows the unit type.
- The 2nd column shows the rated DC current. The AC current is 0.82 times DC current. The current sizing must be done by motor current and load cycle. Please consult the DCS800 Hardware Manual or the sizing program Drive Size.
- The 3rd column shows the nominal power.
- The 4th column shows the maximum field current provided by the OnBoard field exciter.
- The 5th column shows the needed fan voltage.
- The 6th column shows the needed cooling air volume per hour.
- The 7th column shows the losses.
- The last column shows the frame size.

Current ratings for 4-Q modules

Overview for 4-Q module sizes D1 to D4

Unit type 4-Q converters	IDC I		P _{out} ④		Int. field current	Fan volt.	Air volume	P _{Loss}	Frame size
	[A]	[kW] 400V	[kW] 500V	[A]	[V AC]	[m³/h]	[kW]		
DCS800-S02-0025-04/05	25	10	13	6	without fan	300	0.11	D1	
DCS800-S02-0050-04/05	50	21	26	6	115/230; 1-ph	300	0.17	D1	
DCS800-S02-0075-04/05	75	31	39	6		300	0.22	D1	
DCS800-S02-0100-04/05	100	42	52	6		300	0.28	D1	
DCS800-S02-0140-04/05	140	58	73	6		300	0.38	D1	
DCS800-S02-0200-04/05	200	83	104	15		300	0.56	D2	
DCS800-S02-0260-04/05	260	108	135	15		300	0.73	D2	
DCS800-S02-0350-04/05	350	145	182	20		600	0.91	D3	
DCS800-S02-0450-04/05	450	187	234	20		600	1.12	D3	
DCS800-S02-0520-04/05	520	218	276	20		600	1.32	D3	
DCS800-S02-0680-04/05	680	282	354	25		950	1.76	D4	
DCS800-S02-0820-04/05	820	340	426	25	230; 1-ph ①	950	2.14	D4	
DCS800-S02-1000-04/05	1000	415	520	25		1900	2.68	D4	
		600V	690V						
DCS800-S02-0320-06	320	200	-	-	115/230; 1-ph	600	0.91	D3	
DCS800-S02-0650-06	650	405	-	-	230; 1-ph ①	950	1.86	D4	

① 115 V is selectable via Plus code

④ ratings for rated input voltage -10 %

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The current ratings for the size D1 to D4 4-Q modules with 50 Hz and 60 Hz supplies are provided on this slide. The characteristics are based on the same conditions as the 2-Q ones.

- The 1st column shows the unit type.
- The 2nd column shows the rated DC current. The AC current is 0.82 times DC current. The current sizing has to be done by motor current and load cycle. Please consult the DCS800 Hardware Manual or the sizing program Drive Size.
- The 3rd column shows the nominal power.
- The 4th column shows the maximum field current provided by the OnBoard field exciter.
- The 5th column shows the needed fan voltage.
- The 6th column shows the needed cooling air volume per hour.
- The 7th column shows the losses.
- The last column shows the frame size.

Incoming voltage and DCS800 voltage classes

Overview for module sizes D1 to D4

System connection voltage	DC voltage (recommended)		Ideal DC voltage without load	Recommended DCS800 voltage class
U_{VN} [V]	$U_{dmax\ 2-Q}$ [V]	$U_{dmax\ 4-Q}$ [V]	U_{dio} [V]	
230	265	240	310	04
380	440	395	510	04
400	465	415	540	04
415	480	430	560	04
440	510	455	590	05
460	530	480	620	05
480	555	500	640	05
500	580	520	670	05
525	610	545	700	05

For a 2-Q drive is valid:

$$U_{id\alpha} = 0.89 \cdot 1.35 \cdot U_{supply} \cdot |\cos 15^\circ|$$

For a 4-Q drive or 2-Q drive with field reversal is valid:

$$U_{id\alpha} = 0.89 \cdot 1.35 \cdot U_{supply} \cdot |\cos 150^\circ|$$

Incoming voltage and DCS800 voltage classes. The voltage sizing has to be done according to the incoming voltage.

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The table on this slide shows which DCS800 voltage class fits which incoming voltage. The voltage sizing has to be done according to the incoming voltage.

See 1st and last column.

- Voltage class 04 can stand incoming voltages up to 415 VAC.
- Voltage class 05 can stand incoming voltages up to 525 VAC.

Additionally, the maximum recommended DC voltage for non-regenerative 2-Q modules and regenerative 4-Q modules is shown.

It is also possible to calculate the DC voltage. The factor of 0.89 depends on the voltage tolerance of plus minus 10 % and an internal voltage drop of 1 %.

Hardware D1 - D4

Location of hardware



- Power stack
- Power interface board (SDCS-PIN-4) includes OnBoard field exciter, power supply and firing unit
- Electronic tray plus control board (SDCS-CON-4)
- Converter fan
- Intermediate cover
- Plug in options and DCS800 Control Panel
- Click on design cover

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Each thyristor power block incorporates two thyristors. All blocks are mounted on the heat sink and the internal busbars are fixed to the thyristor blocks.

On top of the power part sits the power interface board SDCS-PIN-4. It includes the OnBoard field exciter, the power supply for all internal voltages and the firing unit for the armature.

The next layer is the control board SDCS-CON-4 mounted on an electronic tray. The electronic tray is put in the housing by means of 4 hinges and the SDCS-CON-4 is connected to the SDCS-PIN-4 with three flat cables.

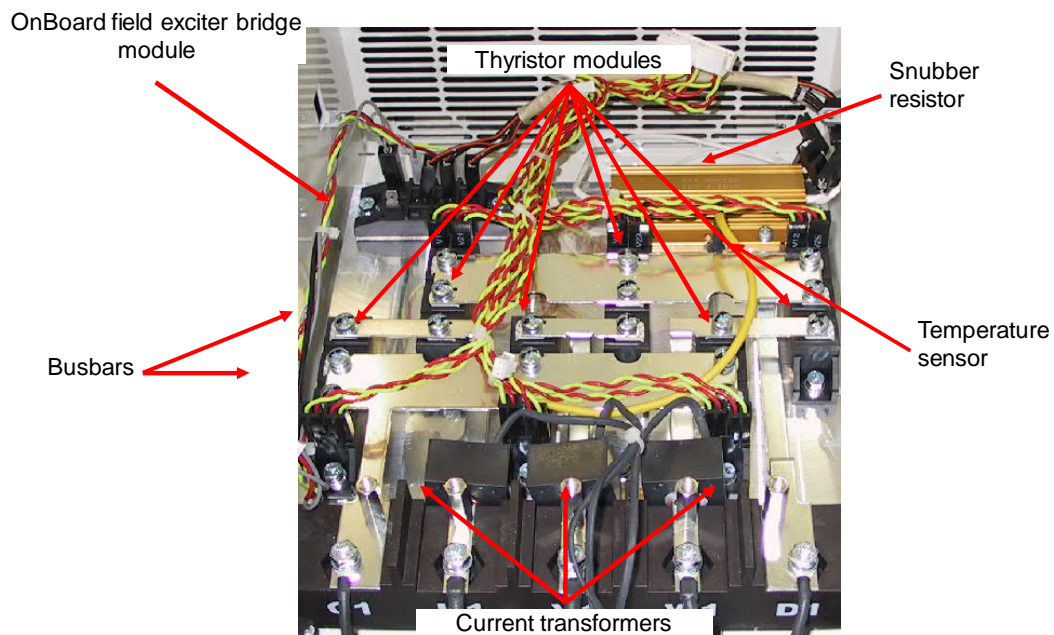
For cooling purposes, the fan unit is mounted on the top of the drive.

The intermediate cover is used to protect the sensitive electronic of the drive against electrostatic discharge when plug in options are used in slots 1 to 4.

This animation shows the DCS800 Control Panel and plug in options like serial communication and extension I/O.

Last but not least, the click-on design cover can be mounted on the drive module without using any screws.

Power part D1 to D4



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This is the power part of a D1 module.

The 4-Q drive uses six thyristor modules. Each thyristor module contains two thyristors thus two anti-parallel bridges can be constructed.

The snubber resistor for all thyristors is mounted on the heat sink.

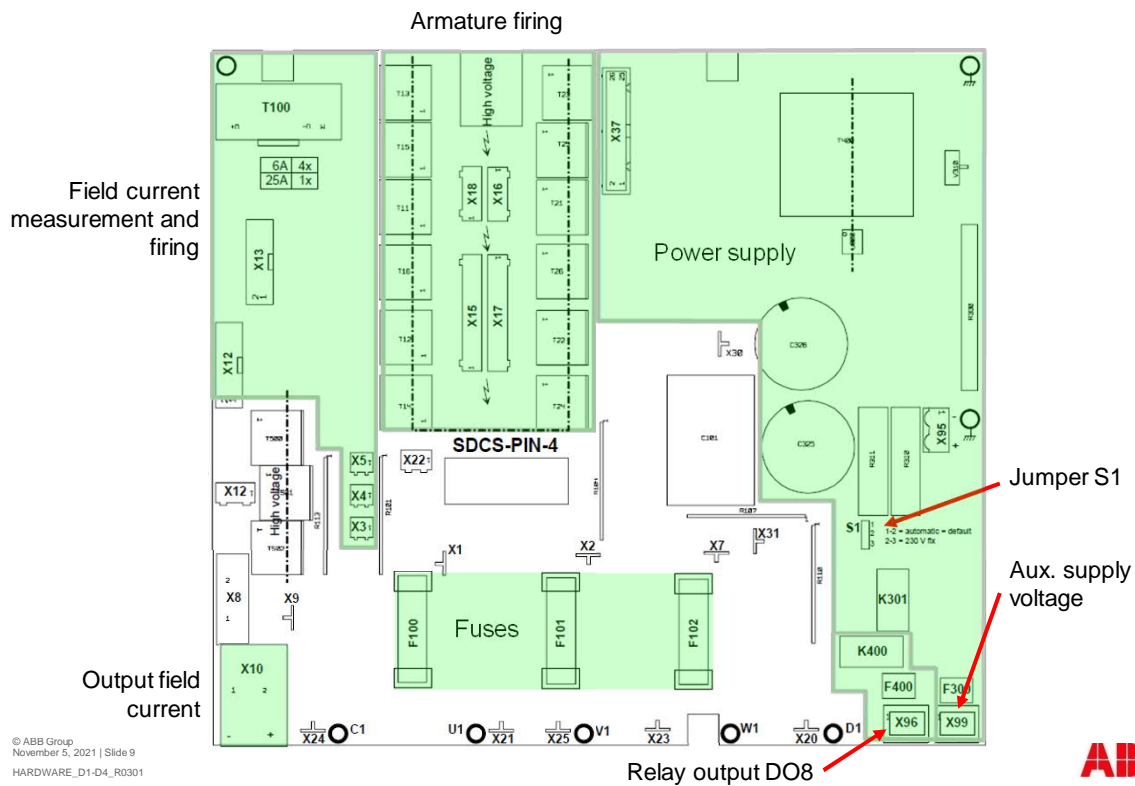
The bridge module for the OnBoard field exciter is located on the other side of the heat sink. The module contains a three-phase, half-controlled bridge.

The armature current is measured by means of three current transformers.

The internal drive busbars are mounted on top of the thyristor modules.

Heat sink temperature measurement with a PTC resistor.

SDCS-PIN-4



The power interface board SDCS-PIN-4 is located between the power part and the control board SDCS-CON-4.

In contrast to old ABB DC Drives where identification, current measurement, burden resistor settings and 2-Q or 4-Q operation was done via hardware on the power interface boards, the DCS800 provides an automatic adjustment option by setting parameters in the firmware.

The SDCS-PIN-4 provides:

- a high ohmic measurement of DC- and AC-voltage,
 - an interface for the current transformer measuring the armature current,
 - an interface for the heat sink temperature measurement with a PTC resistor and
 - a snubber circuit for thyristor protection together with the snubber resistor mounted on the heat sink.
- The armature bridge and OnBoard field exciter share the snubber circuit.

The F100 to F102 fuses protect the field supply, field cables, motor field windings, supply voltage measurement and overvoltage protection.

The power supply provides the auxiliary voltages for the whole drive and the connected options.

The 230 VAC or 115 VAC auxiliary supply voltage is connected to connector X99. The input features a hardware filter and a voltage limitation.

The power supply on the SDCS-PIN-4 is not a universal power supply. The power supply automatically adjusts itself to an auxiliary supply voltage of either 230 VAC or 115 VAC. With jumper S1 it is possible to suppress the automatic adjustment and set the power supply to a fixed incoming voltage of 230 VAC. This is done in case of varying 230 VAC incoming voltages, for example in a generator network.

The firing pulse transformers and connection cables for the armature bridge with either 6 or 12 thyristors are located here.

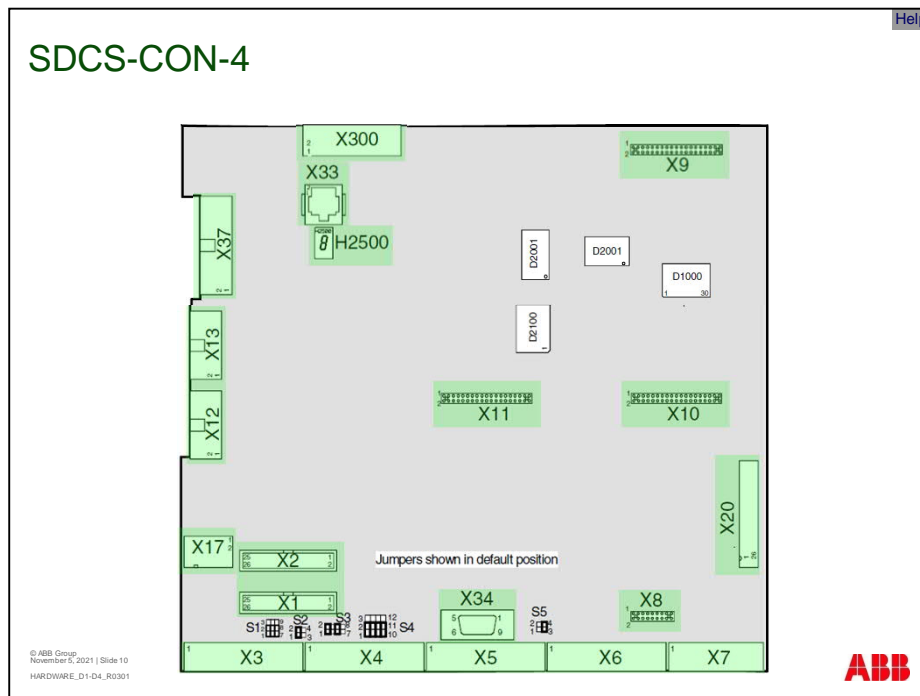
OnBoard field exciters with firing pulse transformers and field current measurement via the T100 transformer. The measurement of the field current is automatically scaled and selected by the firmware. If the OnBoard field exciter is not needed, it can be de-selected by the firmware.

The cables for the field supply are connected at connector X10.

To control the main circuit breaker a relay is needed. To save an additional relay in the cabinet, the DCS800 provides a normally open relay contact integrated on the SDCS-PIN-4. This relay output is controlled by digital output 8 and connected to connector X96. The function or signal definition of digital output 8 is done in the firmware by means of parameters.

SDCS-PIN-4 in a D1 unit.

SDCS-CON-4



The control board SDCS-CON-4 is mounted on an electronic tray in the size D1 to D4 modules. The electronic tray is put in the housing by means of 4 hinges and the SDCS-CON-4 is connected to the SDCS-PIN-4 through three flat cables.

The SDCS-CON-4 is equipped with flash PROM, which contains the firmware and the stored parameters. The parameters can be handled by the DCS800 Control Panel, DriveWindow, DriveWindow Light or by the overriding control. Changed parameters are stored immediately in the flash except for parameters for cyclic communication via the dataset table in groups 90 to 92 and pointers in group 51. The fault logger entries are also stored in the flash while de-energizing the auxiliary power.

Connectors X1 and X2 are used to connect the isolated I/O boards SDCS-IOB-2 and SDCS-IOB-3.

Connectors X3 to X7 provide the standard digital and analog connection of the drive and have the same terminal layout as the DCS 500 or DCS 600 for easy upgrading.

Connector X8 is needed for the SDCS-DSL-4, which provides the DCSLink interface to field exciters, 12-pulse converters, master-follower and drive-to-drive communication.

Connectors X9 to X11 or slots 1 to 3 respectively are used for R-type extension I/O modules, R-type serial communication adapters and the optical communication board SDCS-COM-8. Slot 1 is used for serial communication and extension I/O. Slot 2 is used for extension I/O only. Slot 3 is used for extension I/O and the SDCS-COM-8.

Connectors X12 and X13 connect the SDCS-CON-4 to the SDCS-PIN-4 for module sizes D1 to D4 or to the SDCS-PIN-51 for module sizes D5 to D7 for voltage, current and temperature measurement. Additionally, the firing pulses are sent to the thyristors through the SDCS-PIN-4 for D1 to D4 module sizes or to the SDCS-PIN-46 and SDCS-PIN-48 for module sizes D5 to D7.

Connectors X17 and X300 are used as routine test connectors during factory tests of the drive.

Connector X20 or slot 4 is used for the ABB Memory Card SDCS-MEM-8 to store the application program used for the PLC, which is integrated into the DCS800.

Connector X33 is used to connect the DCS800 Control Panel either directly via a 40 mm jack plug or via a CAT 1:1 cable with RJ45 plugs.

Connector X34 can be used to download firmware, to connect DriveWindow Light and the ControlBuilder DCS800 application programming tool. Usually, the RS232 interface is used to set parameters and to commission the drive via DriveWindow Light.

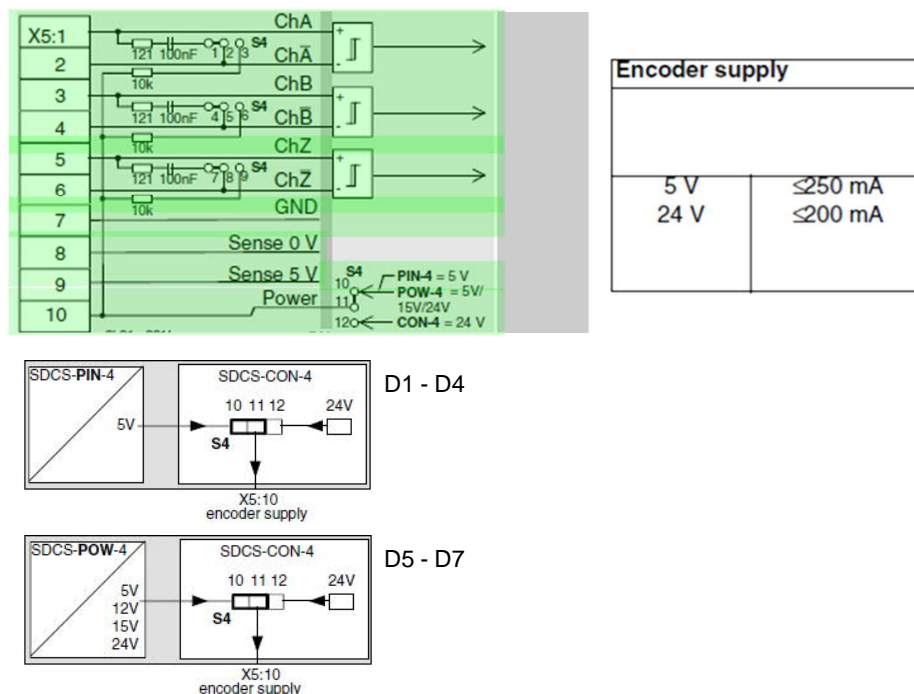
Connector X37 is used to connect the SDCS-CON-4 to the power supply from the SDCS-PIN-4 for size D1 to D4 modules or to the SDCS-POW-4 for size D5 to D7 modules . It is possible to measure the different supply voltages at the X37 terminals to ground.

A seven-segment display named H2500 is located on the control board SDCS-CON-4 to show the state of drive. It displays for example fault- and alarm codes.



This source can be used externally, for example to supply a speed reference potentiometer. The maximum load current is limited to 5 mA.

Pulse encoder connection of the SDCS-CON-4



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The connections used for a pulse encoder are available at connector X5. The inputs on connector X5 are not isolated.

Two different pulse encoder connections are available:

- The first one is the differential connection with double wire connection.
- The second one is a single-ended connection with single wire connection.

The maximum distance between pulse encoder and the SDCS-CON-4 is dependent on the voltage drop of the cable and the in- and output configuration. For the best results, use a cable with 4 twisted pairs. Each twisted pair should have its own shield plus an overall cable shield. Very low supply voltages, for example 5 volts, need a sense feedback connection.

These terminals provide the connection for the pulse trains A, not A and B, not B from the pulse encoder.

A, not A can be changed from differential to single ended by setting jumper S4 from 1-2 to 2-3.

B, not B can be changed from differential to single ended by setting jumper S4 from 4-5 to 5-6.

These terminals provide the connection for the zero pulse Z, not Z from the pulse encoder.

Z, not Z can be changed from differential to single ended by setting jumper S4 from 7-8 to 8-9.

The supply voltage for the pulse encoder is provided at terminals X5:10 and X5:7.

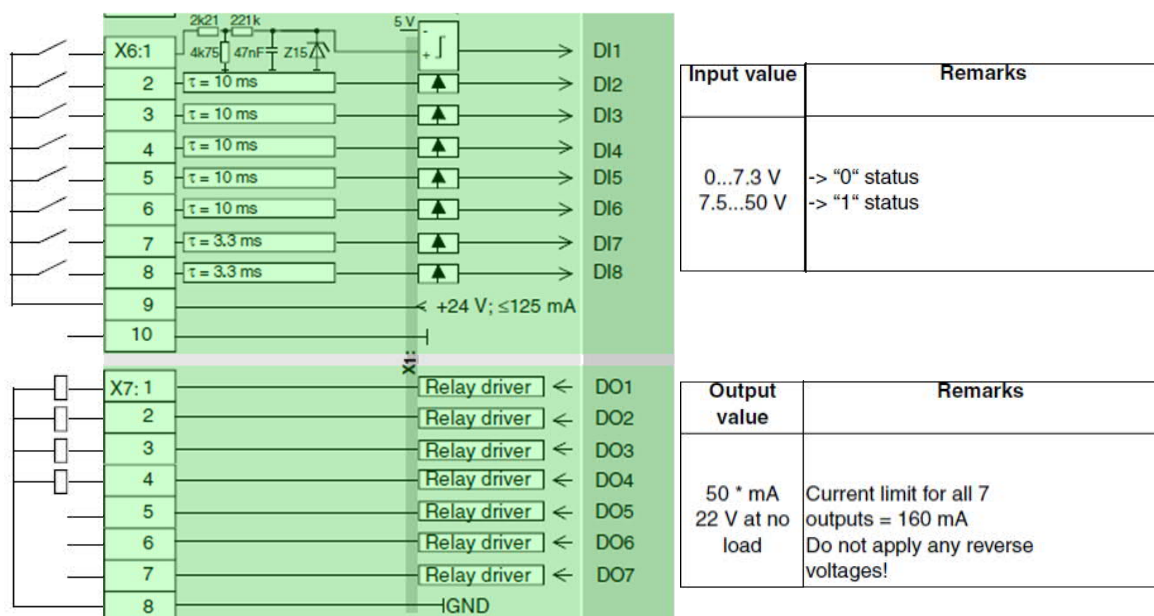
For size D1 to D4 modules equipped with a SDCS-PIN-4, either 5 V or 24 V are available for the pulse encoder supply. Setting S4 from 10-11 to 11-12 changes the pulse encoder supply from 5 V supplied by the SDCS-PIN-4 to 24 V supplied by the SDCS-CON-4. The maximum load current is limited to 250 mA.

For size D5 to D7 modules equipped with a SDCS-POW-4 5 V, 12 V, 15 V or 24 V are available for the pulse encoder supply. Setting S4 from 10-11 to 11-12 changes the pulse encoder supply from 5 V, 12 V, 15 V or 24 V supplied by the SDCS-POW-4 to 24 V supplied by the SDCS-CON-4. The maximum load current is limited to 250 mA.

The sense feedback connection is recommended when the power supply level for the differential pulse encoder is 5 V. Sense lines for ground and supply voltages are used to correct the voltage drop on the cable.

Setting S4 to 10-11 activates the sensing.

Digital I/O connection of the SDCS-CON-4



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Digital in- and outputs, as well as a voltage source for 24 VDC with a maximum load current of 125 mA, are available at connectors X6 and X7. The function or signal definition of all digital I/O is done in the firmware by means of parameters.




















Eight digital inputs are standard for the DCS800.

They can be supplied by the built in voltage source or an external supply voltage with up to 48 VDC.

Eight digital outputs are standard for the DCS800. All digital outputs are located on the SDCS-CON-4 except relay output DO8 which is located on the SDCS-PIN-4 for size D1 to D4 modules or on the SDCS-POW-4 for size D5 to D7 modules.

Each digital output provides 22 VDC at its output, thus it is not allowed to connect an external voltage source to the 7 digital outputs on the SDCS-CON-4. The maximum load current at each of the 7 digital output is limited to 50 mA. The maximum available load current for all 7 digital outputs summed together is 160 mA.

Jumper settings of the SDCS-CON-4

S1  Jumper parking position No filter; Normal DC Tacho  Filter for AC Tacho with rectifier  Tacho input X3:4 connected with 0 V / GND  Jumper parking position; no grounding of Tacho input  Tacho input 1 at X3:4 and X3:1/2/3 at SDCS-CON-4  reserved: Tacho input 2 at X2:23 and X2:24 at SDCS-IOB-3 / PS5311	S4  Encoder mode: differential ; RC load with R = 121 Ohm and C = 100 nF activated  Encoder mode: single ended , Pull-up resistors 10 kOhm activated  Encoder supply 5 V, sense X5:8-9 are active * or SDCS-POW-4 see section <i>Power supply board SDCS-POW-4</i>  Encoder supply 24 V, uncontrolled supplied from CON-4  Park position When connecting an encoder to IOB-3 set jumper S4 on CON-4 board to park position
S2  AI1 - X3:5-6: R _{IN} = 200 kOhm; Range -10V...0V...+10V  AI1 - X3:5-6: R _{IN} = 250 Ohm; ** Range I _{IN} = -20mA...+20mA	S5  Step 1: Preparation for Firmware download operation  Step 2: Text download + normal program execution
S3  AI2 - X3:7-8: R _{IN} = 200 kOhm; Range -10V...0V...+10V  AI2 - X3:7-8: R _{IN} = 250 Ohm; ** Range I _{IN} = -20mA...+20mA  Jumper parking position 5-6  Pull-up resistor 4.74 kOhm activated at X3:7 for PTC temperature sensor	* default value ** 250 Ohm x 20 mA = 5 V = 100%

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Jumpers on the SDCS-CON-4 are used to adapt the control board to different hardware configurations.

A star next to the jumper setting shows the control boards default setting from the factory. The jumpers have to be set during the commissioning of the drive.

Jumper S1 is used to adapt the analog tacho.

In case an analog AC tacho with rectifier is used, a filter is needed to smooth the voltage ripple. This filter is activated by setting jumper S1 from 1-2 to 2-3.

Normally one tacho input is grounded. To prevent high ground currents flowing through the SDCS-CON-4, it is possible to open the grounding path by setting jumper S1 from 4-5 to 5-6.

Jumper S2 is used to adapt the analog input 1.

AI1 (speak A I one) can be changed from voltage measurement to current measurement by setting jumper S2 from 1-2 to 3-4.

Jumper S3 is used to adapt the analog input 2 and the motor temperature measurement via a PTC.

AI2 can be changed from voltage measurement to current measurement by setting jumper S3 from 1-2 to 3-4. Setting jumper S3 from 5-6 to 7-8 activates the current source for a PTC temperature sensor.

Jumper S4 is used to adapt the pulse encoder.

Terminals A, not A can be changed from differential to single ended by setting jumper S4 from 1-2 to 2-3.

Terminals B, not B can be changed from differential to single ended by setting jumper S4 from 4-5 to 5-6.

Terminals Z, not Z can be changed from differential to single ended by setting jumper S4 from 7-8 to 8-9.

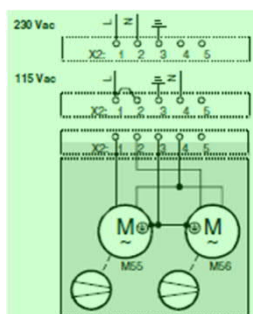
In case the pulse encoder is connected to a SDCS-IOB-3, the jumpers on S4 have to be set in park position.

Jumper S5 is only used for firmware download. For normal operation, jumper S5 has to be set to 3-4.

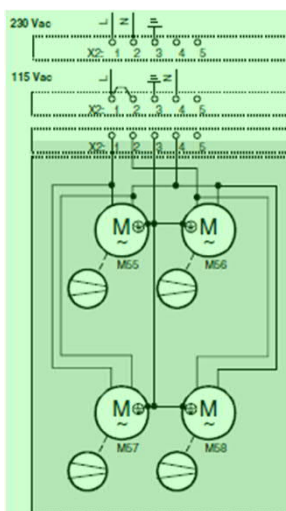
Fan connection D1 - D4

----- Terminals on top of converter housing -----

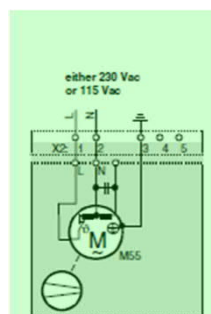
Converter housing



Configuration 1
D1 - D3
45 - 350 A



Configuration 2
D3
405 - 520 A



Configuration 3
D4
610 - 1000 A

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ABB

The converter fans are used to force cool air through the heat sink of the drive and thus the modules are cooled. Connector X2 for the cooling fans is located on top of the converter housing.

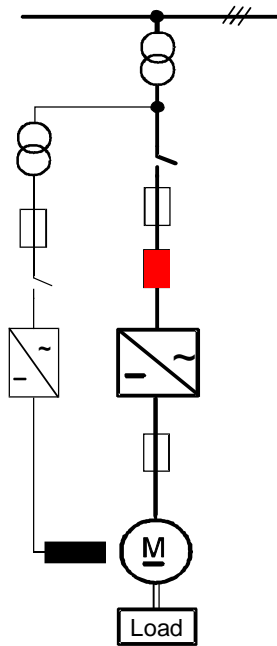
Forced cooling is not needed for all module sizes. The smallest drives, size D1, with nominal currents from 20 to 25 A are only convection cooled and thus delivered without fans.

For size D1 to D3 converters with nominal currents from 45 A to 350 A two fans of the same type are used. The fans have a nominal incoming voltage of 115 VAC. Thus, it is possible to use them for both mains voltages of 230 VAC and 115 VAC. For 230 VAC, the fans are connected in series and for 115 VAC the fans are connected in parallel.

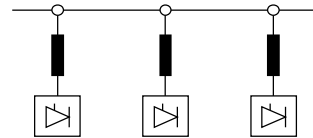
For size D3 converters with nominal currents from 405 A to 520 A, four fans of the same type are used. Thus, it is possible to use them for both mains voltages of 230 VAC and 115 VAC. For 230 VAC, two times two fans are connected in series and for 115 VAC two times two fans are connected in parallel.

For size D4 converters with nominal currents from 610 A to 1000 A, only one fan is used. When ordering converter modules select between 115 VAC and 230 VAC fan by using the plus code.

Why line reactors?



- For di/dt limitation during commutation
- Each converter needs its own line reactor to prevent interferences between converters connected to the same line



- Prevent interference with other upstream connected equipment due to reduction of voltage notches on the upstream line
- The disadvantage is the reduction of the maximum available DC voltage, due to the line reactors voltage drop

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Line reactors are located between the drive and other upstream connected equipment.

The purpose of line reactors is to limit the current rise during commutation.

It is essential to use line reactors to prevent interferences between converters connected on the same line. Thus, each converter gets its own line reactor.

Reduction of voltage notches on the upstream line prevents interference with other upstream connected equipment. A line reactor with an u_k of 1 % means that there is a voltage drop of 1 % of the incoming voltage in case nominal line reactor current is flowing. That means the voltage notches will be smaller if a line reactor with a larger u_k is used.

The voltage drop over the line reactor causes a reduction of the maximum DC output voltage.

Line reactors D1 - D4

DCS Type		Line choke 1 %	Design Fig.	Line choke 4 %	Design Fig.
2-Q Converter	4-Q Converter				
DCS800-S01-0020-04/05	DCS800-S02-0025-04/05	ND01	1	ND401	4
DCS800-S01-0045-04/05	DCS800-S02-0050-04/05	ND02	1	ND402	4
DCS800-S01-0065-04/05	DCS800-S02-0075-04/05	ND04	1	ND403	5
DCS800-S01-0090-04/05	DCS800-S02-0100-04/05	ND06	1	ND404	5
DCS800-S01-0125-04/05	DCS800-S02-0140-04/05	ND06	1	ND405	5
DCS800-S01-0180-04/05	DCS800-S02-0200-04/05	ND07	2	ND406	5
DCS800-S01-0230-04/05	DCS800-S02-0260-04/05	ND07	2	ND407	5
DCS800-S01-0290-06	DCS800-S02-0320-06	ND08	2	on request	-
DCS800-S01-0315-04/05	DCS800-S02-0350-04/05	ND09	2	ND408	5
DCS800-S01-0405-04/05	DCS800-S02-0450-04/05	ND10	2	ND409	5
DCS800-S01-0590-06	DCS800-S02-0650-06	ND13	3	on request	-
DCS800-S01-0470-04/05	DCS800-S02-0520-04/05	ND10	2	ND410	5
DCS800-S01-0610-04/05	DCS800-S02-0680-04/05	ND12	2	ND411	5
DCS800-S01-0740-04/05	DCS800-S02-0820-04/05	ND13	3	ND412	5
DCS800-S01-0900-04/05	DCS800-S02-1000-04/05	ND13	3	ND413	5

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This table shows all line reactors used for the size D1 to D4 modules.

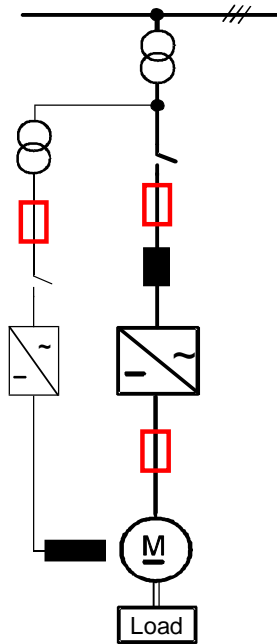
Standard line reactors with a uk of 1 % are available for all D1 to D4 sizes and incoming voltages from 400 VAC to 600 VAC. They are the minimum requirement in industrial environments. They feature a low inductive voltage drop and reduce deep commutation notches.

Line reactors ND01 (speak N D zero 1) to ND06 are equipped with cables. See design figure 1. The larger ones ND07 to ND13 are equipped with busbars. See design figures 2 and 3.

Line reactors with a uk of 4 % are available for all D1 to D4 sizes and incoming voltages from 400 VAC to 525 VAC. 4 % line chokes are usually used for field exciters or very weak incoming voltages. They have a high inductive voltage drop and strongly reduce deep commutation notches.

All 4 % line reactors are equipped with busbars. See design figures 4 and 5. Do not use the line reactor terminals as cable or busbar support.

Why semiconductor fuses?



- Module sizes D1 to D4 require external semiconductor fuses
- Module sizes D5 to D7 do not require external fuses since they are equipped with internal branch fuses (no additional external semiconductor fuses are needed)
- Protect against damages of semiconductors (SCR's) in the converter
- Protect against explosion of semiconductors with the risk of fire
- DC fuses (2 of them) should be used for all regenerative drives - sizes D1 to D4 - to protect the motor in case of a fault during regeneration

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Semiconductor fuses are specially designed fuses with a very short reaction time. They are especially made to protect semiconductors.

The three semiconductor fuses on the AC side are located between the line reactors of the drive and other upstream connected equipment. They are also used for the protection of the field exciter. Two of them are located between the drive and the motor as DC fuses.

Size D1 to D4 modules require external semiconductor fuses, whereas size D5 to D7 modules do not require external fuses since they are equipped with internal branch fuses.

The purpose of Semiconductor fuses is to protect the semiconductors in the drive. In case of overcurrent, it is their task to blow faster than the semiconductors itself. This also prevents the explosion of semiconductors and thus lowers the risk of fire.

For size D1 to D4 drives with regenerative possibilities, so called DC fuses are strongly recommended. The DC fuses protect the motor in case of a fault during regeneration. The rating for DC fuses depends on the application.

Semiconductor fuses D1 - D4

Type of converter		Type	Fuse holder	Design fig.
2-Q Converter	4-Q Converter			
DCS800-S01-0020-04/05	DCS800-S02-0025-04/05	UR 50A / 660V	OFAX 00 S3L	1
DCS800-S01-0045-04/05	DCS800-S02-0050-04/05	UR 63A / 660V	OFAX 00 S3L	1
DCS800-S01-0065-04/05	DCS800-S02-0075-04/05	UR 125A / 660V	OFAX 1 S3	1
DCS800-S01-0090-04/05	DCS800-S02-0100-04/05	UR 125A / 660V	OFAX 1 S3	1
DCS800-S01-0125-04/05	DCS800-S02-0140-04/05	UR 200A / 660V	OFAX 1 S3	1
DCS800-S01-0180-04/05	DCS800-S02-0200-04/05	UR 250A / 660V	OFAX 1 S3	1
DCS800-S01-0230-04/05	DCS800-S02-0260-04/05	UR 315A / 660V	OFAX 2 S3	1
DCS800-S01-0315-04/05	DCS800-S02-0350-04/05	UR 500A / 660V	OFAX 2 S3	1
DCS800-S01-0405-04/05	DCS800-S02-0450-04/05	UR 700A / 660V	OFAX 3 S3	1
DCS800-S01-0470-04/05	DCS800-S02-0520-04/05	UR 700A / 660V	OFAX 3 S3	1
DCS800-S01-0610-04/05	DCS800-S02-0680-04/05	UR 900A / 660V	3x 170H 3006	2
DCS800-S01-0740-04/05	DCS800-S02-0820-04/05	UR 900A / 660V	3x 170H 3006	2
DCS800-S01-0900-04/05	DCS800-S02-1000-04/05	UR 1250A / 660V	3x 170H 3006	2
DCS800-S01-0290-06	DCS800-S02-0320-06	UR 500A / 660V	OFAX 2 S3	1
DCS800-S01-0590-06	DCS800-S02-0650-06	UR 900A / 660V	OFAX 3 S3	1

This table shows all semiconductor fuses used for the size D1 to D4 modules.

For different module sizes and incoming voltages, different semiconductor fuses are needed.

For different module sizes and incoming voltages, different fuse holders are needed.

Design figures 1 and 2 show the different kinds of semiconductor fuses and fuse holders.

Summary

Key points of this module are:

- Voltage and current ratings
 - 2-Quadrant-Modules
 - 4-Quadrant-Modules
- Location of the hardware devices
- Power part (D1 – D4)
- Electronic boards PIN-4 and CON-4
- Line reactors and semiconductor fuses

Key points of this module are:

- Voltage and current ratings of the DCS800
 - 2-Quadrant modules and
 - 4-Quadrant modules
- Location of the hardware devices
- Power part for D1 – D4 converters
- Electronic boards PIN-4 and CON-4
- Line reactors and semiconductor fuses

Additional information

- DCS800 Hardware Manual (3ADW000194)
- DCS800 Technical Catalogue (3ADW000192)

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