Pulse encoder connection

Connecting a pulse encoder to the DCS800 converter

The connection diagram for a pulse encoder to the electronics of a DCS converter is quite similar, if the SDCS-CON-4 or the SDCS-IOB-3 is used. The basic difference between these 2 boards is the galvanically isolated circuit and pulse receivers via opto coupler on the SDCS-IOB-3 board.

Power supply for incremental encoder

SDCS-CON-4 and SDCS-IOB-3 board have jumpers to select a supply voltage. V17 LED on SDCS-IOB-3 indicates supply is OK.

	Hardware configuration		
Encoder supply	SDCS-CON-4 supplied by PIN-4	SDCS-CON-4 supplied by POW-1/POW-4	SDCS-IOB-3
5 V	sense controlled	sense controlled	sense controlled
12 V	-	no sense	sense controlled
24 V	no sense	no sense	no sense

Sense feedback connection is recommended when power supply level for differential pulse encoder is 5 V. The wiring is shown on figure below.


Commissioning hint

Note:

If the drive's direction of rotation is correct (if necessary, correct by exchanging the field connections), the **Tacho error** message may appear during start-up.

If with a positive reference the TACHO_PULSES signal does not look like the illustration below, then tracks A & $\overline{A}$ must be mutually exchanged with encoders with inverted signals, and tracks A and B with encoders without inverted signals.

If the TACHO_PULSES signal is missing or non-linear, the encoder's pulses are not being read correctly. Possible reasons for this may be the encoder supply, the encoder itself, or the wiring.
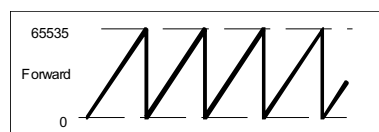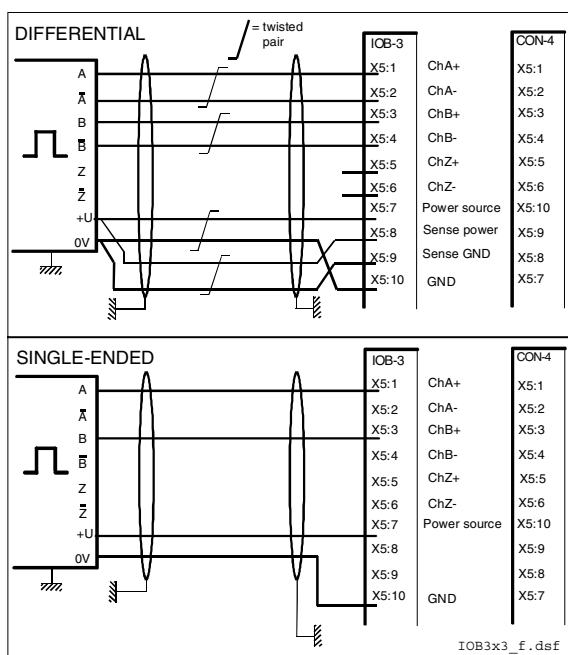
Pulse encoder receiver

Two different incremental encoder connections are available.

-differential connection; pulse encoders generating either voltage or current signals can be used

-single-ended (push pull) connection; voltage signals

Restrictions using jumper S4 (CON-4): or S10 (IOB-3): depending on the board

Line termination via S4/S10 should not be used at 12 V or 24 V encoders, because of the power consumption taken from the encoder. If a pulse encoder with a build in current source is used a burden resistor of 120 Ω is activated via jumper S4/S10: 1-2 a.s.o.
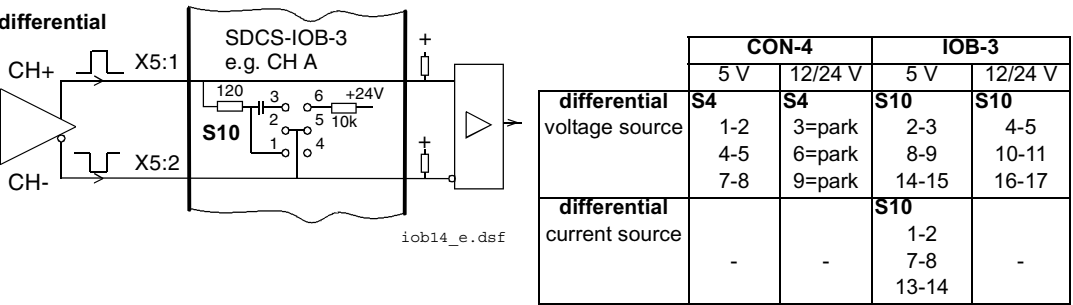
Pulse encoder connection principles
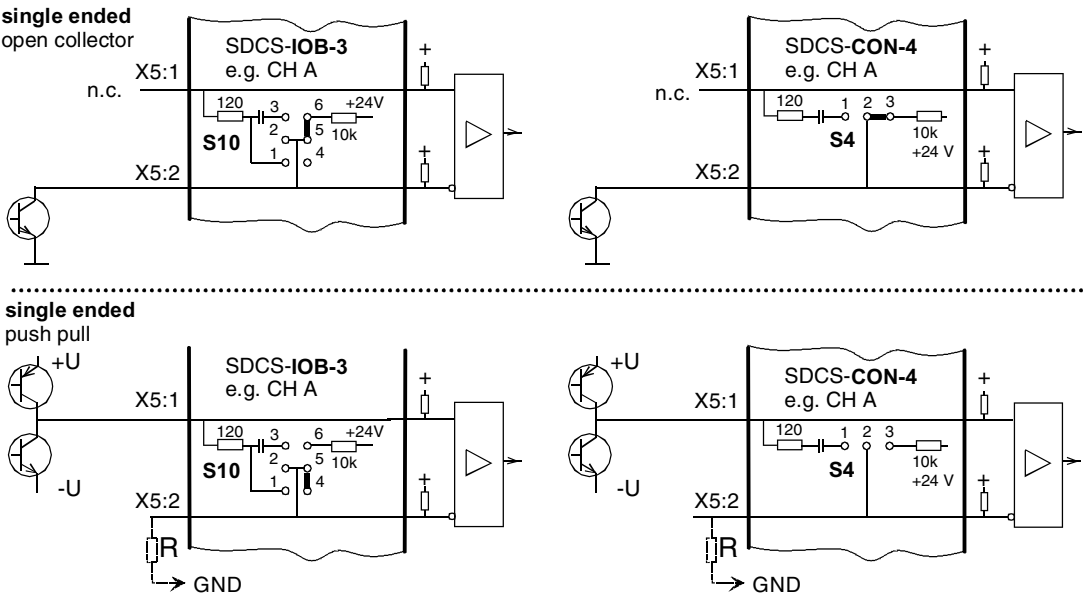
In case of a single ended 5 V encoder the jumpers S4 / S10 will be set to a neutral position. To get a threshold lower than 5 V each terminal X5:2 / X5:4 / X5:6 must be connected via a resistor R to GND according to the table below.

R	1 kΩ	1.5 Ω	2.2 kΩ
U thresh	1.2 V	1.8 V	2.3 V

Make sure the threshold is half of the supply voltage and the minimum voltage of the encoder output (saturation voltage UCE of a transistor).

	CON-4		IOB-3	
	5 V	12/24 V	5 V	12/24 V
differential voltage source	**S4** 1-2 4-5 7-8	**S4** 3=park 6=park 9=park	**S10** 2-3 8-9 14-15	**S10** 4-5 10-11 16-17
differential current source	-	-	**S10** 1-2 7-8 13-14	-

iob14_e.dsf

Electrical installation

Control Board SDCS-CON-4

Layout of the control board SDCS-CON-4

Jumper coding	
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
	Tacho input 2 at X2:23 and X2:24 at SDCS-IOB-3 / PS5311
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
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
S4	Encoder mode: **differential**; RC load with R = 121 Ohm and C = 100 nF activated
	Encoder mode: **single ended**; Pull-up resistors 4.75 kOhm activated
	Encoder supply 5 V, sense X5:8-9 are active
	Encoder supply 24 V, uncontrolled
S5	Step 1: Preparation for download operation
	Step 2: download + normal program execution
★ default value	

Con4_layout.dsf

Memory circuit

SDCS-CON-4 board is equipped with FlashPROM which contains the firmware plus the stored parameters. Parameters handled by DCS800 panel or DWL, PCtool or by Serial communication parameter service are stored immediately in the FlashPROM.

Parameters handled by cyclic serial communication (dataset table Group 90 - 92) are not stored in the Flash PROM. They must be stored by means of ParApplSave (16.6) service.

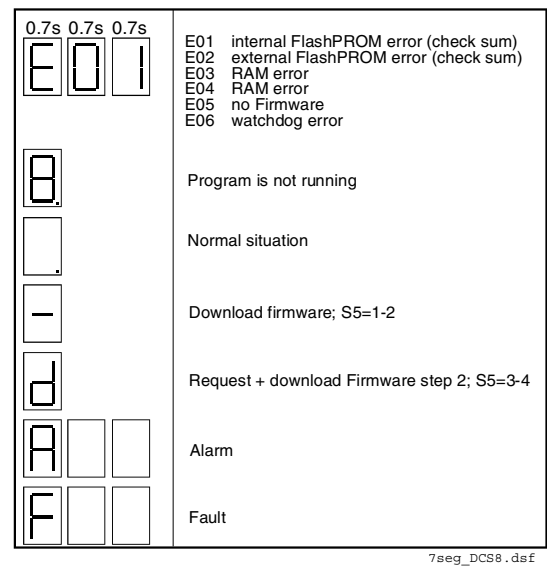The faultlogger entries are stored in the FlashPROM during power down (auxiliary power supply OFF).

Watchdog function

The control board has an internal watchdog. The watchdog controls the running of the control board program. If the watchdog trips, it has the following effects:

- Writing to FPROM is disabled.
- Thyristor firing control is reset and disabled.
- Digital outputs are forced low.
- Programmable analogue outputs are reset to zero, 0V.

Seven segment display

A seven segment display is located on the control board SDCS-CON-4 and it shows the state of drive.

0.7s 0.7s 0.7s	E01	internal FlashPROM error (check sum)	
	E02	external FlashPROM error (check sum)	
	E03	RAM error	
	E04	RAM error	
	E05	no Firmware	
	E06	watchdog error	

Program is not running

Normal situation

Download firmware; S5=1-2

Request + download Firmware step 2; S5=3-4

Alarm

Fault

```
7seg_DCS8.dsf
```

Terminal description

X37: Connector is used for supply of SDCS-CON-4 from SDCS-POW-1, SDCS-POW-4, SDCS-PIN-4

supply voltage can be measured to ground.

X37:3= 48V

X37:5=24V

X37:7=15V

X37:11=-15V

X37:13=5V encoder

X37:23=5V CPU

Supply voltage monitoring

5V CPU is monitored by 4.75 V and forces CPU to reset. In parallel the CPU monitors Powerfail signal from power supply (SDCS-PIN-4 or SDCS-POW-1).

X12: and **X13:** connector are used for measurement voltage, current and temperature and firing thyristors of SDCS-PIN-51/PIN-41, SDCS-PIN-4.

see chapter *Technical data*

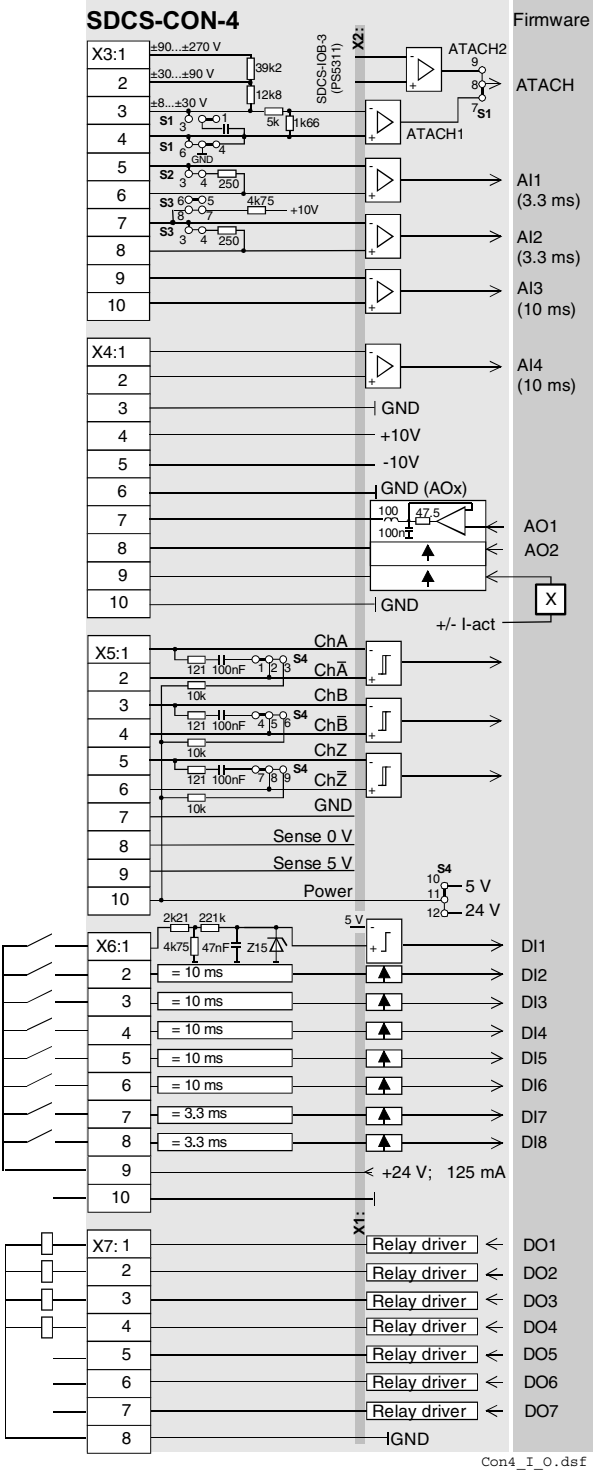**X17:** and **X300:** are routine test connectors.

X1: and **X2:** are used to connect SDCS-IOB-2 and SDCS-IOB-3 board.

see chapter *Technical data*

X33: is used to connect DCS800 Panel. It can be connected direct via 40 mm jack or via CAT 1:1 cable (RJ45).

X34: is used for download firmware and for DWL and IEC1131 programming connection.

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

Resolution [bit]	Input/output values Hardware	Scaling by	Common mode range	Remarks
15 + sign	±90...270 V ±30...90 V ±8...30 V	Firmware	±15 V	¿
15 + sign	-10...0...+10 V	Firmware	±15 V	
15 + sign	-10...0...+10 V	Firmware	±15 V	
15 + sign	-10...0...+10 V	Firmware	±15 V	
15 + sign	-10...0...+10 V	Firmware	±15V	

			Power	
	+10 V		≤ 5 mA	for ext. use
	-10 V		≤ 5 mA	e.g. refer. pot.
11 + sign	-10...0...+10 V	Firmware	≤ 5 mA	
11 + sign	-10...0...+10 V	Firmware	≤ 5 mA	
	-10...0...+10 V	Firmware + Hardw.	≤ 5 mA	3 V -> nom.?? motor curr.

Encoder supply		Remarks
		Inputs not isolated Impedance = 120 Ω, if selected max. frequence ≤300 kHz
5 V 24 V	≤ 250 mA ≤ 200 mA	Sense lines for GND and supply to correct voltage drops on cable (only if 5 V encoder is in use).

Input value	Signal definition by	Remarks
	Firmware	
0...7.3 V 7.5...50 V		-> "0" status -> "1" status

Output value	Signal definition by	Remarks
50 * mA 22 V at no load	Firmware	Current limit for all 7 outputs = 160 mA Do not apply any reverse voltages!

* short circuit protected ① gain can be varied in 15 steps between 1 and 4 by software parameter