Digital SSI Converter

DIGICON/V3

Typ: DK SSS/V3

Digitronic Automationsanlagen GmbH

Notification

This handbook corresponds with the unit version of 12/2017. The company Digitronic Automationsanlagen GmbH reserves the right to implement changes that result in an improvement of the quality and the functions of the device at any time and without any announcements.
This instructions manual was created with a maximum of care, but mistakes are not out of the question. We are thankful for any comments, regarding possible mistakes in the instruction manual.

Update

You can also obtain this instruction manual on the Internet at **http://www.digitronic.com** in the latest version as PDF file.

Qualified personal only

Commissioning and operation of the device may only be carried out by qualified personal. Qualified personal are persons, authorized with commissioning, grounding and labeling devices, systems and electrical circuits according to the applicable standards of security.

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Note: This device fulfills the following norms: DIN EN 61000-6-2, DIN EN 61000-4-2, DIN EN 61000-4-4, DIN EN 61000-4-5, DIN EN 61000-4-8 and DIN EN 55011 and RoHS 2 (2011/65/EU)..

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1. Introduction

Position measuring systems with an RS422 synchronous serial interface (SSI) can not be connected simultaneously to two separate controllers, both of which need the position value.

DIGICON makes it possible to transfer the data of a gray - coded position measuring system (Encoder) to two controllers (for example our digital cam controllers and a PLC) (copying the position values).

The version 3 of the DIGICON described here is a new development, since the DK SSS/V2 can no longer be produced. The DK SSS/V3 is backwards compatible with the DK SSS/V2.

The factory or default setting of the DK SSS/V3 is the factory default setting of a DK SSS/V2.

However, the DIGICON V3 offers even more options, a higher processing speed and adjustment options.

Features:

- Supply voltage: 24V DC $\pm$20%

- Current consumption 100mA without load or without connected SSI interface

- for SSI signals from 9 bits up to 26 bits

- optionally with RS422 incremental output (DK SI/V3 or DK SI/V3/BTL5)

- optionally also suitable for binary encoders (DK SSS/V3/BIN)

- SSI listening mode

- Slave Clock Mode (Clock Pass Through)

- Cycle time min. 0.08ms / max. Approx. 0.150ms depending on the master clock frequency

- Transmission level (SSI) RS422

- 4 x 24VDC inputs and outputs for special functions (currently not used)

- Screw terminals comply with IP20

- Snap-on mounting on symmetrical support rail according to EN 50 022, can be arranged in rows

- Enclosure enclosure corresponds to IP20

- Working temperature 0 ° C to + 55 ° C

- Weight about 100g

2. Installation

Before installing the device, configure the DIGICON or adapt it to your application. The adaptation is carried out by means of DIP switches. Please observe chapter "6. The DIP switches or the configuration" on page 8.

The device is snapped onto an "EN mounting rail" in the control cabinet (see chapter "4. Dimension" on page 6). The grounding connections and cable shields must be positioned in the shortest possible way on a series earth terminal to be arranged next to the device. The grounded mounting plate and its electrical connection to the EN mounting rail ensure optimum dissipation of the interference to the shield. All cable connections must be made in a de-energized state! Use only shielded, twisted pair cable. Do not lay the cable parallel to power cables. If possible, place the shield on both sides.

3. Commissioning

Connect DIGICON according to the pin assignment with the measuring system and the two controllers. See also chapter "5. Pin assignment" on page 7 and note chapter "6. The DIP switches or the configuration" on page 8.

After switching on at least one of the two controllers or the power supply at terminals 21 - 24, the DIGICON receives its power supply and forwards it to the master position measuring system.

Which of the control is switched on first is of no consequence, since the voltages are connected via diodes in the DIGICON (See also chapter "5.1. Pin assignment Power supply").

If the voltage supply is present, the "The Status LED" indicates the operating status of the device.

3.1. The Status LED

The DIGICON V3 has a yellow status LED that indicates the operating status of the device.

| LED	Possible causes	Troubleshooting
dark	There is no power supply to the DIGICON or the device is defective.	Check the voltage supply, this must be 24V DC ±20% or replace the device.
flashes evenly	There is an SSI protocol error. The number of data bits is wrong. The set clock frequency for the laid cable length is too high.	Check the measuring system or the encoder and the connecting cables. Reduce the master clock frequency or check the settings of the DIP switch S1 and compare them with the parameters of your position measuring system for compatibility.
flashes sporadically	There is a sporadic SSI protocol error. The clock frequency for the misplaced cable length is too high. A wrong non-stranded and shielded SSI cable is used. The SSI cables were laid near high power lines.	Reduce the master clock frequency. Use a shielded twisted pair cable designed for RS422 SSI data transmission. Change the cable guide and check the functional grounding and the connection of the cable shielding.
shines	OK – no error	-

4. Dimension
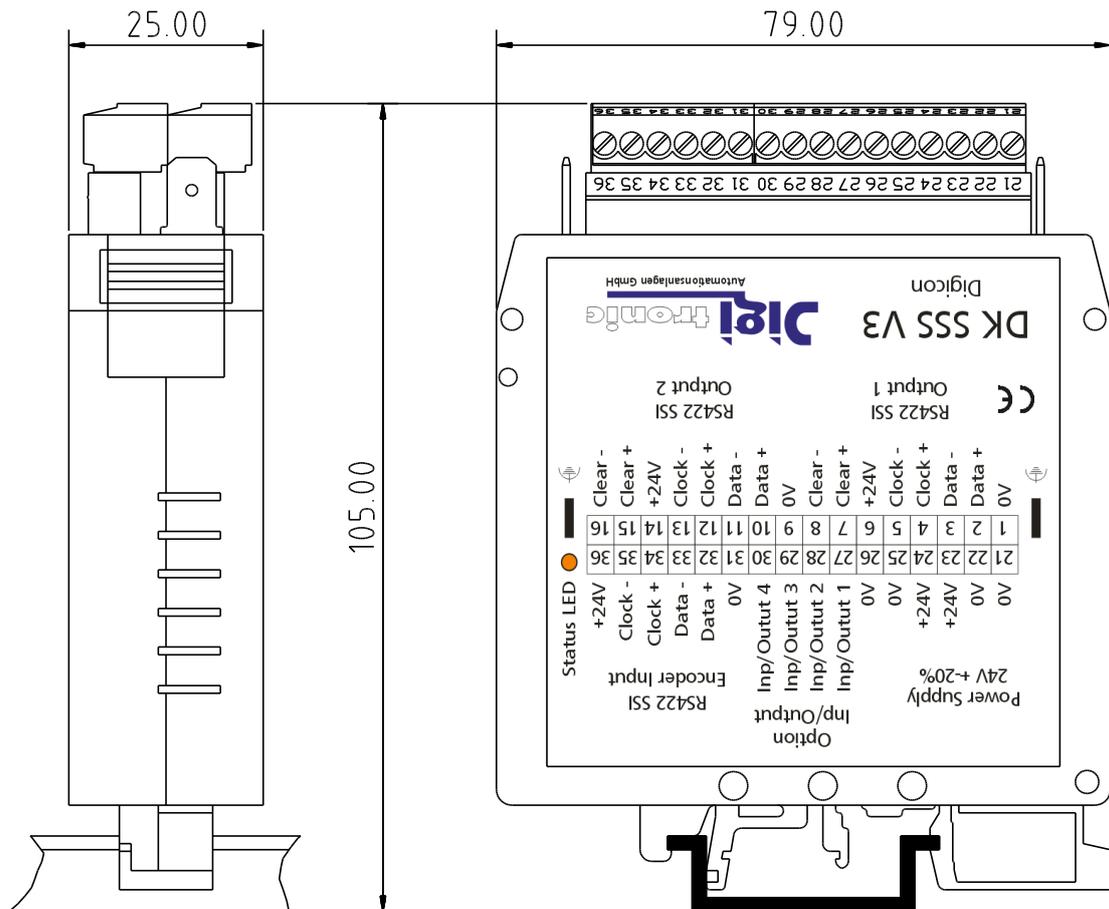
The following mounting rails can be used to mount the device:

NS 35 / 7.5 (DIN EN 50022)
NS 35 / 15 (DIN EN 50022)
NS 32 (DIN EN 50035)

5. Pin assignment

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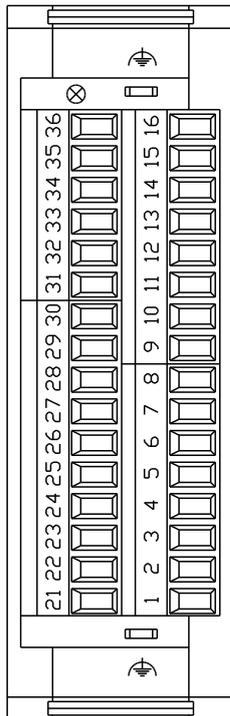
5.1. Pin assignment Power supply

Clamp	Name / function
21	0V Power supply
22	0V Power supply
23	+ 24V DC Power supply
24	+ 24V DC Power supply
25	0V
26	0V
27	Input and/or Output 1
28	Input and/or Output 2
29	Input and/or Output 3
30	Input and/or Output 4
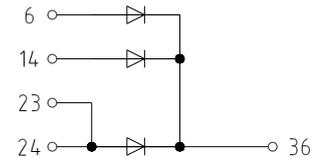
5.2. Pin assignment SSI Input (Master)

Clamp	Name / function
31	0V Encoder power supply
32	Data A (+) of the Encoder
33	Data B (-) of the Encoder
34	Clock A (+) of the Encoder
35	Clock B (-) of the Encoder
36	+ 24V DC Encoder power supply

5.3. Pin assignment SSI Output 1 (Slave)

Clamp	Name / function
1	0V Power supply
2	Data A (+)
3	Data B (-)
4	Clock A (+)
5	Clock B (-)
6	+ 24V DC Power supply
7	only with incremental output option -> Clear (+)
8	only with incremental output option -> Clear (-)

5.4. Pin assignment SSI Output 2 (Slave)

| Clamp	Name / function
9	0V Power supply
10	Data A (+)
11	Data B (-)
12	Clock A (+)
13	Clock B (-)
14	+ 24V DC Power supply
15	only with incremental output option -> Clear (+)
16	only with incremental output option -> Clear (-)

Note: The clamp 21, 22, 25, 26, 31, 1 and 9 are internally connected.
The clamp 23 and 24 are internally connected.

6. The DIP switches or the configuration

The three DIP switches in the device allow the DIGICON to be configured for a wide variety of applications.

In order to be able to change the DIP switch position of the DIGICON, the device must be opened. The housing can be pushed apart by means of a screwdriver in the middle.

Attention: Please take care not to damage the circuit board or components with the screwdriver.
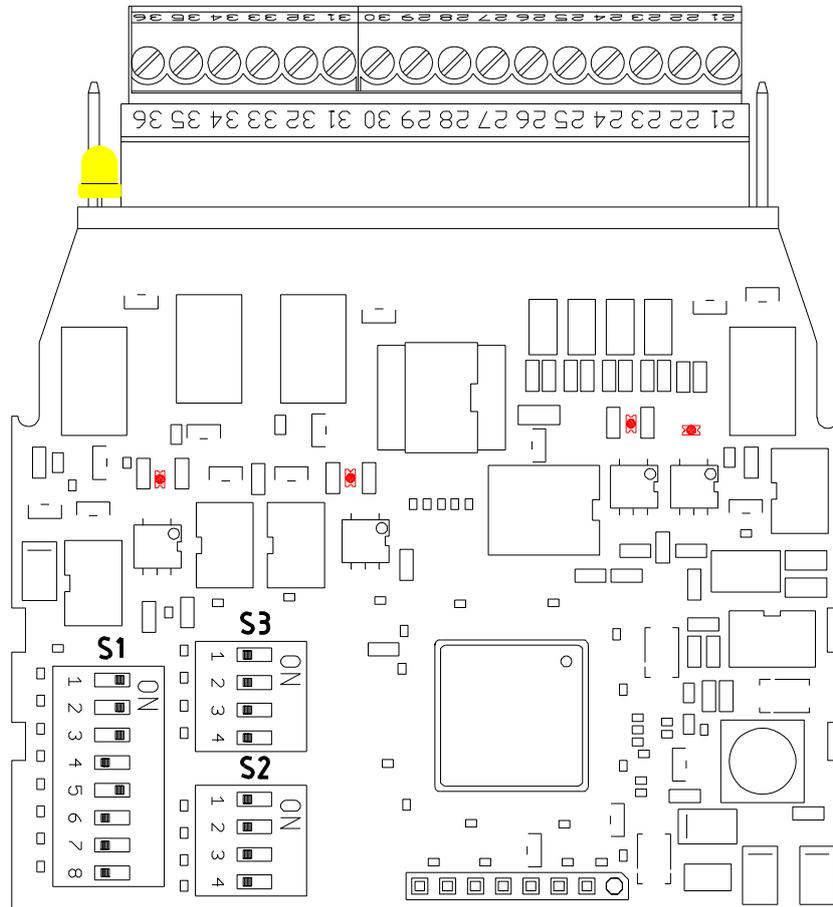
6.1. Factory setting of the DIP switches

In the factory or default setting of the DK SSS/V3, the default parameters of a DK SSS/V2 are set.

The switches are set as follows (see picture above):

    DIP Switch S1 : Switch 1 - 3 = ON, Switch 4 = OFF, Switch 5 = ON and Switch 6 - 8 = OFF.

    DIP Switch S2 : Switch 1 - 4 = OFF.

    DIP Switch S3 : Switch 1 - 4 = OFF.

This corresponds to the following parameters:

- Master clock frequency 519 kHz.

- 25 data bits are evaluated.

- An SSI error at the master input also leads to an SSI error at the two slave outputs.

6.2. DIP Switch S1 (Master Clock)

Via the DIP switch S1, the master SSI interface (clamp 31-36) is set to the DIGICON.

6.2.1. DIP Switch S1 : Switch 1 - 2 (Mode)

Switches 1 and 2 of DIP switch S1 determine the mode of the DIGICON. There are 4 modes to choose from:

Switch 1	Switch 2	Setting Master Clock (Clamp 34 + 35)
ON	ON	Mastermode, clock comes from the DIGICON (default)
OFF	ON	Listening mode (750 kHz max.)
ON	OFF	External clock on clamp 4 + 5 (750 kHz max.)
OFF	OFF	External clock on clamp 12 + 13 (750 kHz max.)

Note on the listening mode:

In the listening mode, the DIGICON no longer generates its own clock, but triggers an externally applied clock signal (listen in) (maximum 750 kHz) at clamp 34 and 35.

As a result, the listen/monitored data of the master SSI interface can be forwarded to two other terminals or controllers.

Note on the mode "external clock":

This mode is necessary to prevent the jitter caused by the delay or the cycle when acquiring the measured values. Positioning connected to one of the two slave outputs can prevent positioning control problems.

The position value is routed synchronously through the DIGICON at the selected SSI slave output.

Attention: If the control, which supplies the clock signal in the mode "listen" or "external clock" is switched off or the SSI connection is interrupted, then also the other slave output (s) no longer receive current data and thus also the connected controllers!

6.2.2. DIP Switch S1 : Switch 3 - 4 (Clock frequency)

Switches 3 and 4 of DIP switch S1 determine the SSI clock frequency in the master mode of the DIGICON.

This is necessary for SSI data transmission in order to be able to adapt the clock frequency to the cable length or if the position measuring system or the encoder does not support the clock frequencies.

Switch 3	Switch 4	Clock - frequency (recommended)
ON	ON	130 kHz (up to max. 300 meters cable length)
OFF	ON	259 kHz (up to max. 100 meters cable length)
ON	OFF	519 kHz (up to max. 30 meters cable length)
OFF	OFF	692 kHz (up to max. 10 meters cable length)

Attention: If the clock frequency for the cable length or the measuring system (encoder) is too high, sporadic data errors or SSI protocol error messages may occur!

6.2.3. DIP Switch S1 : Switch 5 - 7 (Number of SSI data bits)

Switches 5 - 7 of DIP switch S1 can be used to set the number of SSI data bits to be evaluated or the resolution. This is necessary to get the optimal / minimum cycle time.

Switch 5	Switch 6	Switch 7	Resolution / Number of data bits / Clock`s
ON	ON	ON	512 / 9 / 11 (single turn e.g. AAG60007)
OFF	ON	ON	1024 / 10 / 12 (single turn)
ON	OFF	ON	2048 / 11 / 13 (single turn)
OFF	OFF	ON	4096 / 12 / 14 (single turn)
ON	ON	OFF	8192 / 13 / 15 (single turn e.g. AAG615-8192)
OFF	ON	OFF	4096 * 4096 / 24 / 26 (multi turn / linear e.g. AAG626)
ON	OFF	OFF	8192 * 4096 / 25 / 27 (multi turn / linear) (default)
OFF	OFF	OFF	8192 * 8192 / 26 / 28 (multi turn / linear)

Note: With DK SSS/V2, the number of data bits could not be set. 25 data bits (26 clocks) were always evaluated. Occasionally, this caused problems when reading or recognizing the SSI error bit.

6.2.4. DIP Switch S1 : Switch 8 (not used)

The switch 8 is currently not used and has no function (default = OFF).

6.3. DIP Switch S2 (Slave output 1)

This DIP switch sets the parameters of the 1st slave output.

6.3.1. DIP Switch S2 : Switch 3

Switch 3	Behavior of the output in case of error (stop bit wrong)
ON	The SSI data will be frozen
OFF	The SSI Error bit is set in the SSI data (default)

6.3.2. DIP Switch S2 : Switch 1,2 + 4 (not used)

Switches 1, 2 and 4 of this DIP switch are currently not used and have no function (default = OFF).

6.4. DIP Switch S3 (Slave output 2)

This DIP switch sets the parameters of the 2nd slave output.

6.4.1. DIP Switch S3 : Switch 3

| Switch 3	Behavior of the output in case of error (stop bit wrong)
ON	The SSI data will be frozen
OFF	The SSI Error bit is set in the SSI data (default)

6.4.2. DIP Switch S3 : Switch 1,2 + 4 (not used)

Switches 1, 2 and 4 of this DIP switch are currently not used and have no function (default = OFF).
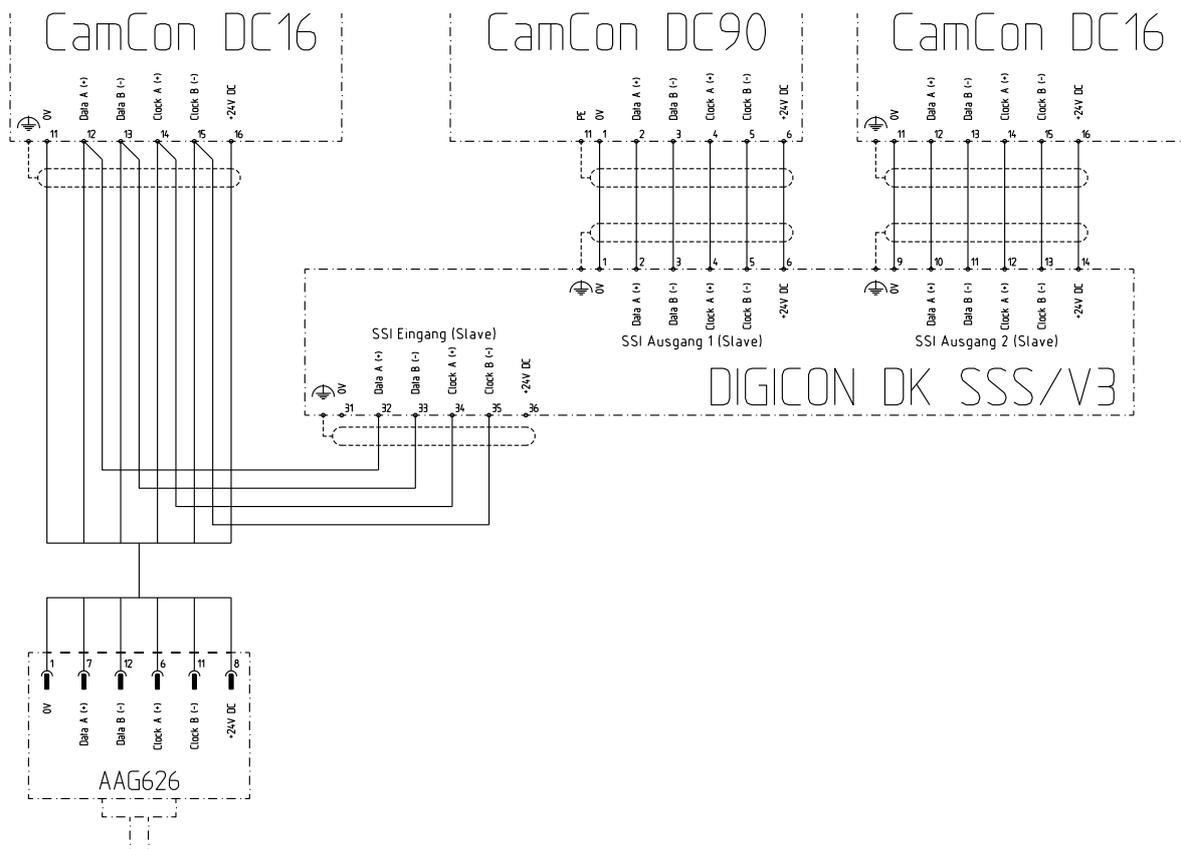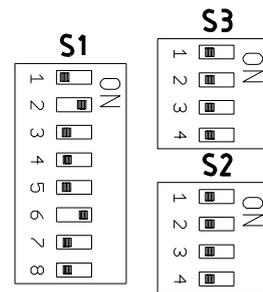
7. Connection examples

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7.1. Connection example for Multiturn – Encoder with 4096*4096 (24 Bit)

DIP Switch S1 :   Switch 1 - 3 = ON, Switch 4 = OFF, Switch 5 und 7 = OFF, Switch 6 = ON and Switch 8 = OFF.

DIP Switch S2 :   Switch 1 - 4 = OFF.

DIP Switch S3 :   Switch 1 - 4 = OFF.
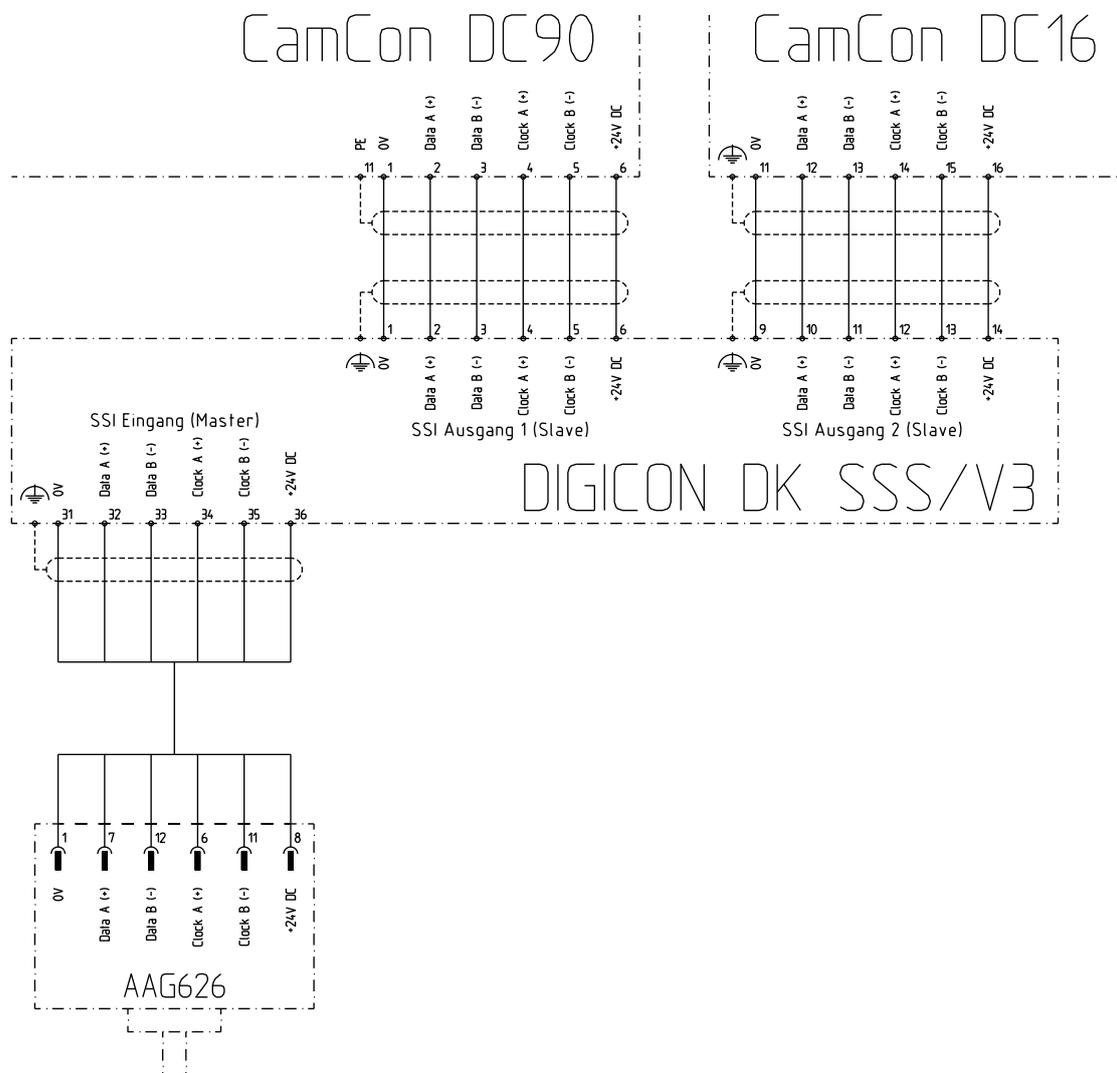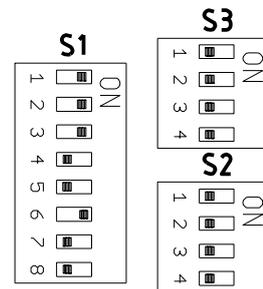
7.2. Connection example for Listen - mode of a Multiturn – Encoder with 4096*4096 (24 Bit)

DIP Switch S1 :   Switch 1 = OFF, Switch 2 = ON, Switch 5 + 7 = OFF
and Switch 6 = ON.
Switch 3, 4 and 8 = OFF, these are without function.

DIP Switch S2 :   Switch 1 - 4 = OFF.

DIP Switch S3 :   Switch 1 - 4 = OFF.

8. Technical data

Power supply .... 24V DC +/- 20% via the power supply of the controllers connected to the outputs.

Current consumption................ 100 mA without load.

Display.................................... 1 x yellow LED for operational readiness or error.

Input (SSI Master).................... 1 * synchronous serial (SSI) RS422 Gray code

Output (2 x SSI slave) .... 2 * synchronous serial (SSI) RS422, optional incremental output RS422 see DK SI/V3 or DK SI/V3/BTL5.

Logic inputs / outputs .... 4 * 24V PNP inputs / outputs for options (currently without function).

Transmission width .... 9 to 26 data bits. See also chapter "6.2.3. DIP Switch S1 : Switch 5 - 7 (Number of SSI data bits)".

Cycle time .... synchronous to the SSI master reading: approx. 80µsec - 150µsec depending on the set master clock frequency or externally by clock reaching at slave output 1 or 2 or by the adjacent clock in listening mode at the master input (DIP switch S1: Switch 1 + 2).

SSI Master Input .... Clock frequency 130, 259, 519, 692 kHz or external (750kHz max.). depending on the set master clock frequency. (DIP switch S1: Switch 3 + 4)

SSI master mono flop time ...... typ. 62μs.

SSI output 1 (slave) .... clock frequency 100 - 750 kHz.

SSI output 2 (slave) .... clock frequency 100 - 750 kHz.

SSI slave mono flop time......... typ. 25μs.

Transmission level .... RS422, one-sided galvanic isolation.

Housing .... flame retardant thermoplastic resin, continuous temperature up to 100°C

Connections............................ screw terminals

Connection cable .... shielded cable, max. length between measuring system and DIGICON 300 meters depending on the set clock frequency.

Mounting................................. convenient snap-on mounting on symmetrical mounting rail according to EN 50 022, can be arranged in rows.

Disassembly .... by pulling back the latch.

For dimension.......................... see chapter "4. Dimension".

Degree of protection .... housing corresponds to IP20.

Working temperature .... 0° to +55°C.

Weight.................................... approx. 100g.