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AC Main Spindle Drives with KDA, TDA and RAC

Fault Clearance Guidelines

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Indramat

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This documentation is used: It is intended for use by the maintenance personnel when fault finding in the machine

- for the identification of operating and fault states of the main spindle drive
- for the clarification of the current operating state display
- for the clarification of the current fault display. As far as possible, it names the cause of the fault and gives specific instructions on clearing that fault. These instructions can also take the form of references to the documents **"AC Main Spindle Drives with 2AD Main Spindle Motor or 1MB Frameless Spindle Motor; Applications", doc. no. 209-0041-4109-02**.
- and, so that the maintenance personnel can rapidly contact Indramat or the machine manufacturer in a qualified manner

The use of this documentation This document is a control cabinet insert. It should be kept handy in the vicinity of the main spindle drive for use by the maintenance personnel!

This document takes both the software versions MSP1V1.6, HSS1V0.8, Hase 0V1.6 and Hase 3V0.6 into consideration as well as the older software versions such as MSP1V1.5, MSP1V1.4 and so on.

Supplementary documentation "AC Main Spindle Drive with 2AD Main Spindle Motor or 1MB Frameless Spindle Motor; Application", doc. no. 209-0041-4109-02.

This document must be filed with the machine documents!

Change procedures

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1. What is the state of the drive?

1.1. Operating state or fault?

Operating state display

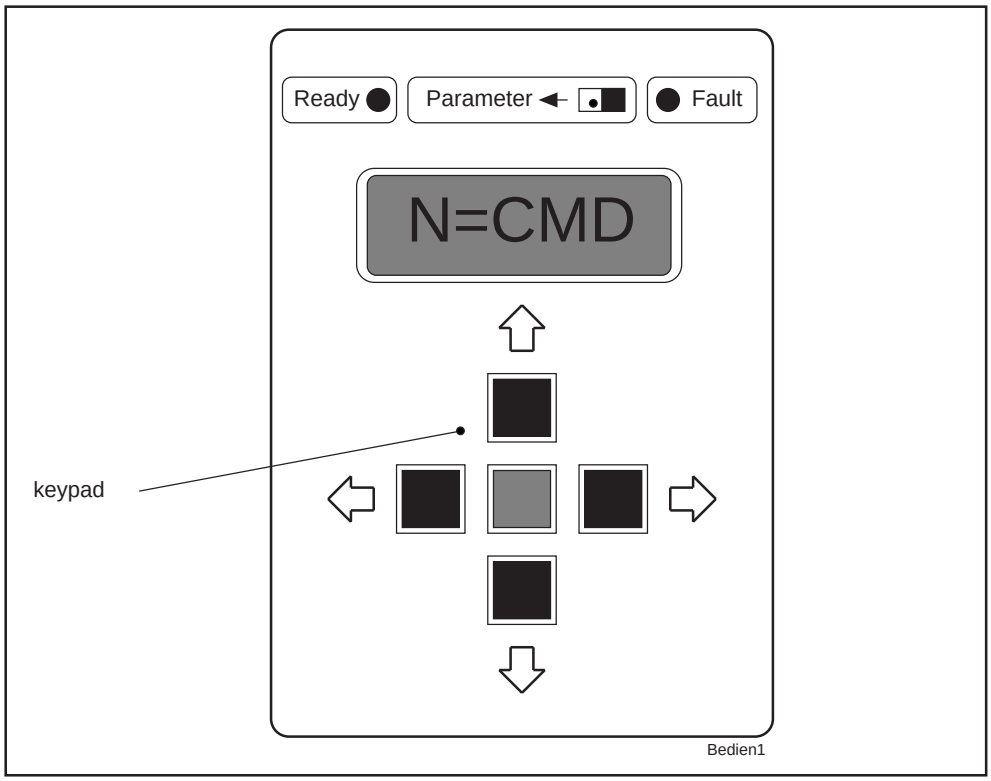


Figure 1.1: Example of an operating state display

The message in the display always indicates a proper operating state if the red LED "fault" is not lit up regardless of whether the green LED "ready" is illuminated or not.

Display of faults

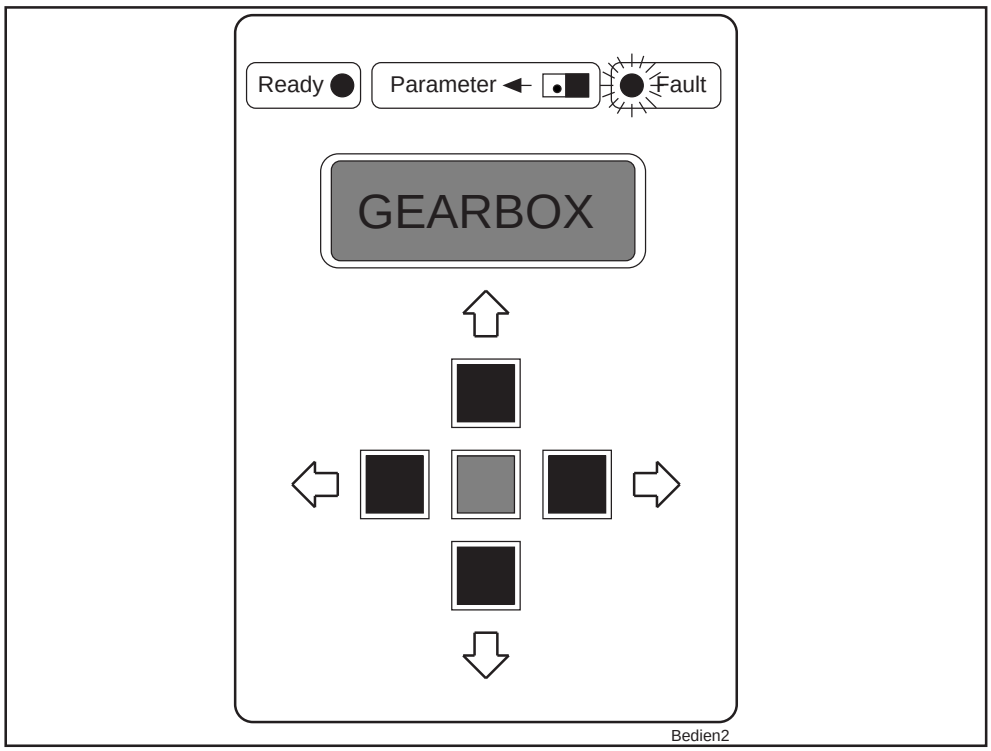


Figure 1.2: Example of a fault display

1.2. Display of an internal state variable

In operating mode, it is possible to call up all the important internal state variables of the drive on the display for the purpose of drive diagnostics. This is done by hitting the arrow key "up" and "down". With the use of the key "down", it is possible to move in the direction opposite to that shown in Figure 1.3. Both keys have a sustained function.

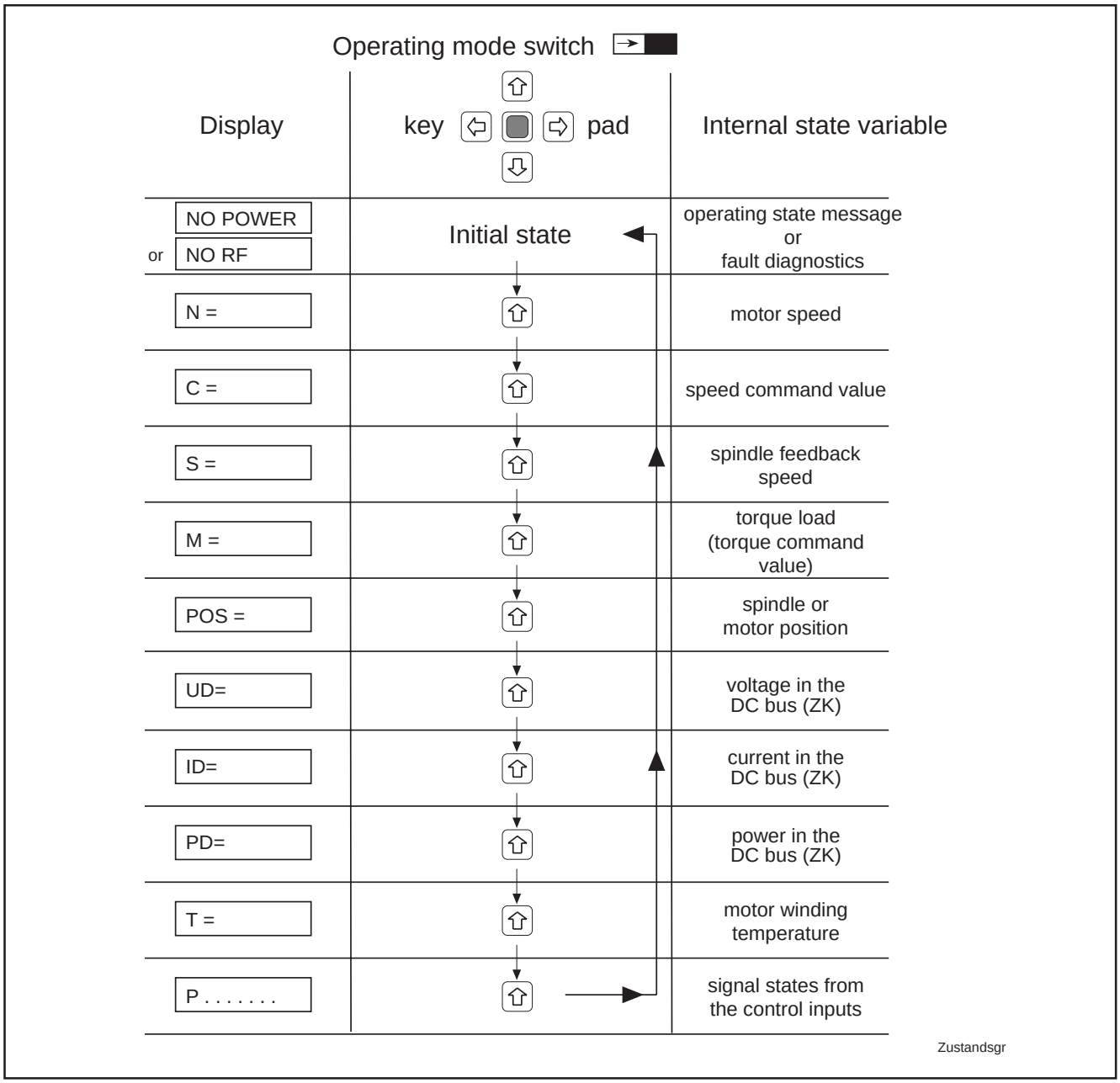


Figure 1.3: Display of the internal state variables of the drive

By pressing the red key in the center (acceptance key), it is possible to return to the initial state from any position.

The signal states of the control inputs are also annunciated on the display.

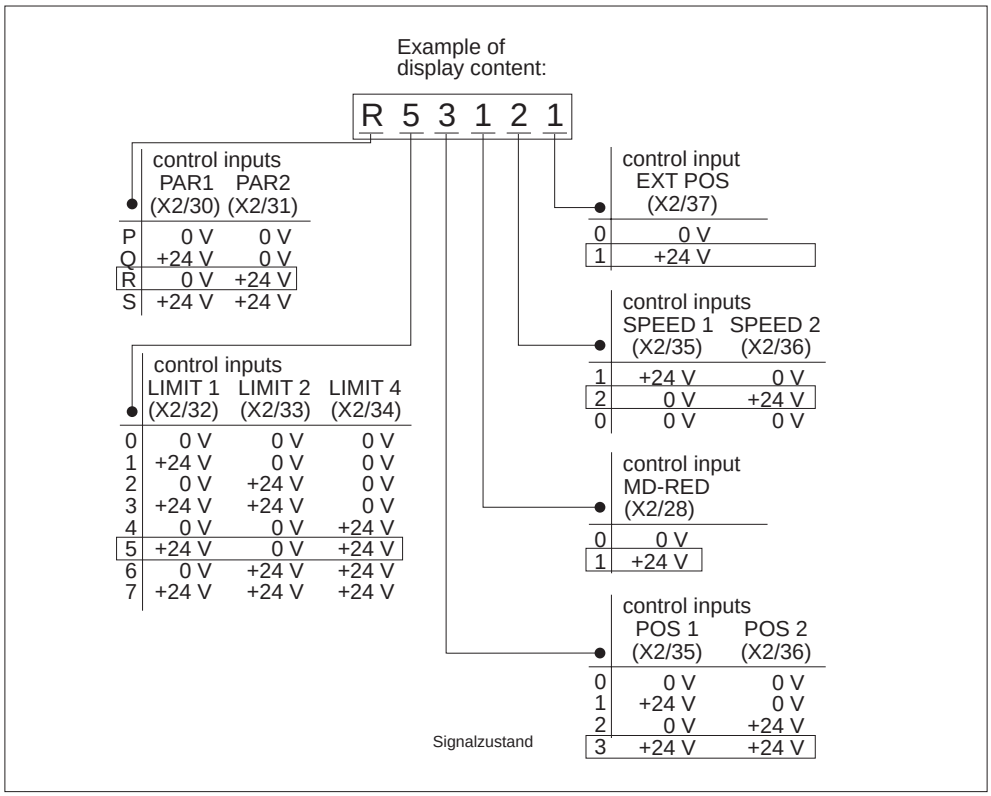


Figure 1.4: Display "signal state of control inputs" and allocation of alphanumeric code

1.3. Software version displayed

Not only the drive parameters, but also the operating software are stored in the AS programming module. The designation of the software which has been installed can be also called up on the display (software version).

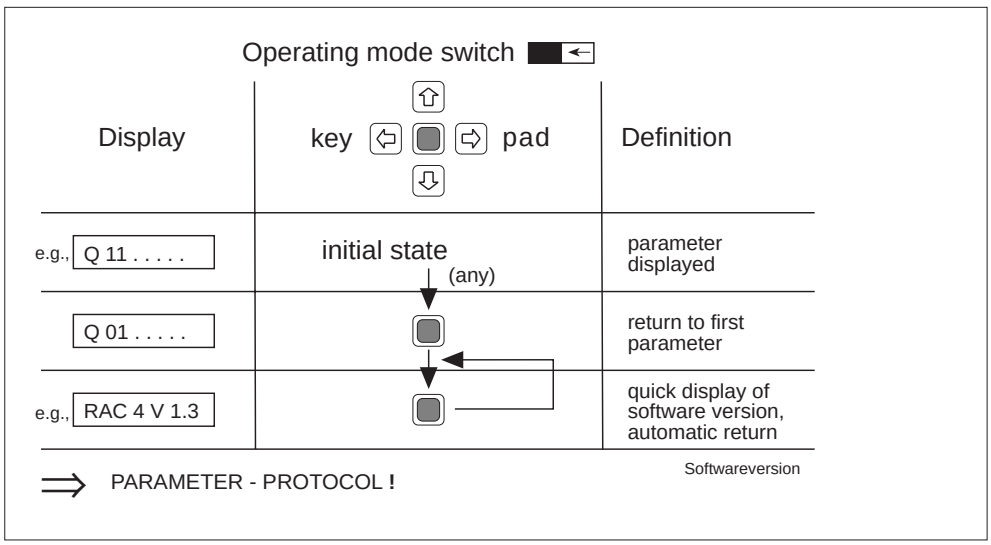


Figure 1.5: Display of the software version

2. Display of operating states

The green "READY" lamp is illuminated when in operating mode. Which operating mode it is, is indicated on the display.

DISABLED (only with KDA) — The drive is torque free. Power output is locked. +24V are not being applied at control input AS (X2/3).

E-STOP (only with RAC) — The drive is shut down and torque free. +24V are not being applied at control input E-STOP (X2/23).

HOMING — Using the speed, the drive searches for the spindle reference signal parameter P-MAXRPM (PQRS 15), or for the zero impulse of the spindle feedback or motor feedback in parameter POS RPM (PQRS 18).

IN POS — The spindle or the rotor position has reached the position command value within the tolerance window. The tolerance is the value of parameter P-WINDOW (PQRS 21).

NO POWER — The DC bus voltage in the drive controller is less than 400 V (RAC) or 200 V (KDA and TDA).



In this case, the green "READY" light is not illuminated as the drive is not ready to operate!

NO RF — The drive enable signal has not been issued. +24V are not being applied at control input RF (X2/24).

NO RUN — The command value applied is internally switched off. The drive is controlled drift-free at zero velocity. Control input RUN (X2/25)is at 0. No position command value has been activated (control inputs POS1 and POS2 are both at 0V, also see Figure 3)!

N = NCMD — The speed of the motor has reached the speed command value within the tolerance window (± value in parameter MAX DEV (A04)).

N * NCMD — The speed of the motor is deviating from the speed command value more than permitted by the set tolerance. The tolerance is the value of parameter MAX DEV (A04).

This message occurs if there are abrupt changes in the command value in accel/decel mode. The message can, however, also be generated with a purely parameter-controlled drive under load!

N<NMIN — The speed of the motor is less than the value set in parameter MIN RPM (A03).

OSCILLATE — The speed of the motor is oscillating with the value set in parameter 0SCI RPM (A20) for the purpose of supporting gear changes. Control input OSCILLATE (X2/29) is at 1.

POS ORDER — The drive has received a position command via control inputs POS1 (X2/26) and POS2 (X2/27) or the digital position default (option) and is now assuming the command position.

SLAVE — The drive is parametrized as a slave drive. It is now working in torque control.

SYNORDER — The drive is moving to synchronous position (angular synchronization!).

SYNCPOS — The drive is in the pre-selected positioning window. The message is linked to output “IN POS”.

KK WARN — The temperature of the heatsink of the drive controller is approaching shut down temperature. The signal output TEMP WARN (X2/9) has switched from +24V to 0V.



The drive must be perceptibly relieved if KK WARN is generated, as otherwise it will shut down after 30 seconds, if the temperature of the heatsink continues to rise! To prevent this, the control unit must relieve the drive in correlation to signal output TEMP WARN! Check the cooling conditions of the drive controller and the load cycle!

Cancel the message using the red key in the center of the keypad!

MOT WARN — The motor has reached a temperature of 145°C. Signal output TEMP WARN (X2/9) has gone from +24V to 0V.



The drive must be perceptibly relieved if MOT WARN is generated, as otherwise the drive will shut down when the motor reaches a temperature of 155°C! To prevent this, the control unit must relieve the drive in correlation to signal output TEMP WARN!

Check the cooling conditions of the drive controller and the load cycle!

Cancel the message using the red key in the center of the keypad!

RF AGAIN — The drive is waiting for the renewed drive enable signal to take up operations.

Remedy — Control input RF (X2/24) must be again switched from O to 1.

ZERO PULS — No zero impulse has come from the master encoder during spindle synchronization. The master drive is followed speed synchronously. The message disappears as soon as the zero impulse comes from the master encoder.

3. Fault messages

The red "FAULT" lamp lights up in case of a fault. The fault is annunciated on the display and the display flashes.



The safety guidelines must be noted prior to working on any wiring or when replacing a unit (see doc.no. 209-0041-4109).

BLEEDER

Bleeder overload

- *Bleeder monitor has been actuated because of overheating.*
- *The bleeder in the drive controller is defective or no bleeder is installed.*

Remedy

1. Check to see whether a bleeder resistor has been installed in the drive controller (wire filament). If yes, then let the drive controller cool down for at least 15 minutes. Then switch back on. If fault is still displayed, replace drive controller!



Note the safety guidelines when replacing a unit!
Note the guidelines on handling the programming module!
->See doc. no. 209-0041-4109-02!

- *If the drive controller is not equipped with a bleeder resistor (type designation ...-W1), then <256> has been incorrectly set in the value of parameter FUNCT2 (A06).*

Remedy

2. Reduce parameter value by 256!
->See doc. no. 209-0041-4109-02!

BS
(only with KDA)

Bridge fuse

The current limit, set at the electronic fuse in the drive controller, was exceeded.

Remedy

1. Check motor supply line for short circuit and ground fault. Check the motor for windings and ground fault.

DACFAULT

Error in digital/analogue converter

Error on the CDR card

1. Replace drive controller!

ADRERR ***Program error***

Remedy **Update software**

BUS-ERR ***Program error***

Remedy **Update software**

CDR16MHZ ***Incorrect software/drive controller combination***

Remedy **Replace software**

CDR S001 ***Incorrect software/drive controller combination***

Remedy **Replace software**

DC-FAULT (only with RAC) *The DC bus is not loading up properly after the power contactor has been switched on.*

Remedy

1. Switch drive controller and power feed off!

2. Check mains connection terminals (X14/L1,L2,L3) whether cable is firmly in place!

3. In the RAC2, check the DC bus voltage (X6/L+,L-) for short-circuit and eliminate!

4. Switch drive controller back on! If fault message continues, replace drive controller!

Note the safety guidelnes on replacing the unit!
Note the guidelines on handling the programming module!
->See doc. no. 209-0041-4109-02

EARTH CON ***Ground fault***
Ground fault in motor cable or DC bus.

Remedy

1. Switch drive controller off

2. Check motor power cable (control cabinet leadthrough?)

3. Check motor for ground fault

4. Check the DC bus wiring in the KDA/TDA for ground fault

5. Replace faulty components (motor, drive controller, cable) or correct faulty wiring!

EEPROM ***Programming error in parameter memory***
There is no EEPROM (IC3) on the programming module or the plugged-in EEPROM is defective.

Remedy

1. Switch drive controller off. Insert appropriate EEPROM into programming module or replace existing EEPROM.

2. If this is not possible, replace programming module! Note the handling of the programming module! Enter the machine-specific parameters specified in the documentation! ->See doc. no. 209-0041-4109-02!

EPRFAULT ***Loss of data in program memory***

The contents of the program memory (EPROM) have changed.

Remedy

1. The message can be reset by hitting the red key. The drive may continue to run. We do not guarantee problem-free operation.

2. Replace the programming module.

FEEDBACK ***Motor encoder error***

Wrong value in parameter FEEDBACK (M03). The feedback on the motor requires a different parameter value.

Remedy

1. Set parameter value in M03 that corresponds to the motor feedback type. ->See doc. no. 209-0041-4109-02!

Defective or wrong feedback cable

Remedy

2. Repair or replace feedback cable.

GEARBOX ***Gear switching error***

The gear cannot be switched, or the acknowledgement of the gear step is either not given or it comes too late (see control inputs SPEED1 and SPEED2 (X2/35,36), see Figure 1.4).

Remedy

1. Switch drive controller off.

2. Check the wiring of the contactor, acknowledgement contacts and the torque motor to see whether they correspond to the terminal diagram of INDRAMAT.

3. Check the indexing mechanism.
->See doc. no. 209-0041-4109-02

HOMING ***Reference impulse search***

Is normally cancelled after one spindle rotation.
Spindle referencing signal has not arrived at control input EXT POS (X2/37) (also see Figure 1.4)

Remedy

1. Replace drive controller.

2. Check spindle referencing switch for proper connection and cam angle! ->See doc. no. 209-0041-4109-02

Zero impulse of the spindle or the motor feedback does not arrive.

Remedy

1. Check feedback cables, replace if damaged!

I< >ITYP

Parameter M17 incorrectly programmed

The data in parameter M17 does not agree with the rated current of the drive controller.

Remedy

Reprogram parameter M17.

I > ITYP

Parameter M06 incorrectly programmed

The value in parameter M06 is greater than the rated current of the drive.

Remedy

Reprogram parameter M06.

KKTEMP

Heatsink overtemperature

The heatsink of the drive controller is too hot. The message TEMPWARN (X2/9) was ignored by the control unit. The drive controller has switched itself off!

Remedy

1. **Check the blowers of the drive, the air channels, the load cycle, the ambient temperature as well as the connection of the signal output TEMPWARN (X2/9) to the control unit!**
2. **Clear fault message once the problem has been eliminated by hitting the red key in the center of the keypad!**

MOTTEMP

Motor overtemperature

The temperature of the motor winding has reached 155°C. Message TEMPWARN (X2,9) was ignored. The drive controller has switched itself off.

Remedy

1. **Check the blowers of the drive, the air channels, the load cycle, the ambient temperature as well as the connection of the signal output TEMPWARN to the control unit!**
2. **Clear fault message once the problem has been eliminated by hitting the red key in the center of the keypad!**

MOTOR1/2

Motor switching error

The acknowledgement for motor contactor switchover is missing or it arrives too late (see control inputs SPEED1 and SPEED2 (X2/35,36), see Figure 1.4).

Remedy

1. **Replace drive controller.**
2. **Check contactor wiring and acknowledgement contacts for compliance with the terminal diagram of INDRAMAT.**
   ->See doc. no. 209-0041-4109-02!

NOMAINS
(only with RAC 3)

No mains voltage

No voltage at the mains terminals X14/L1,L2,L3 , or the voltage applied is too low.

Remedy

1. **Check mains!**

NO TEMP

Error in motor temperature detector

The connection between the thermistor of the motor and the drive controller is disrupted or the thermistor is defective (this message comes approximately ten minutes after the fault occurs).

Remedy

1. Check the thermistor connection. There are always two thermistors in 2AD and 1MB motors. Only one can be connected to the drive controller!

2. Check thermistor: R20°C= approx. 40KOhm, R80°C= approx. 3.5kOhm, R140°C= approx. 565 Ohm ±5 % each. If the measured values exceed this range, replace thermistor, motor (2AD) or stator (1MB)!

NO 8V

8 V - Control voltage faulty

The internal 8V supply of the drive controller is disrupted.

Remedy

1. Replace drive controller!

NO 15V

15 V - Control voltage faulty

The internal ± 15V supply of the drive controller is disrupted.

Remedy

1. With the KDA/TDA, check whether bus connection cable for control voltage is firmly in place. If fault is signalled, replace drive controller!

2. With an RAC, replace drive controller or call INDRAMAT customer service!

NO 24V

24 V - Control voltage faulty

The internal ± 24V supply of the drive controller is disrupted.

Remedy

1. With the KDA/TDA, check whether bus connection cable for control voltage is firmly in place. If fault is signalled, replace drive controller!

2. With an RAC, replace drive controller or call INDRAMAT customer service!

NO 8 MHZ ***Incorrect software-drive controller combination***

Remedy **Replace software**

NO 24 VEX *There is no external application of voltage for the control and signal outputs (X2/1 und 19), or these are incorrectly polarized or exceed tolerance range.*

Remedy

1. **Check connection and voltage level of external +24V . The voltage level must range between 18V and 36V. If the external +24V is in order, then the fault message should clear of its own accord.**
2. **If there is no external +24V/0V, then the internal +24V/OV of the drive controller can be used (apply bridge from +24Vint/OVint to +24Vext/ OVext (connector X2)).**

NO KDA
NO RAC2
NO RAC3
NO RAC4
NO TDA ***Parameter M17 incorrectly programmed***

Remedy **Reprogram parameter M17.**

OPCODE F ***Program error***

Remedy Update software

OVER VOLT
(only with RAC) ***Overvoltage***
The mains voltage exceeds the nominal voltage connection by more than 15%. It is not possible to switch on the mains contactor in the unit.

Remedy

1. **Check mains, transformer may have to be connected to adapt mains voltage.**

PARALOST ***Data loss in parameter storage***
There are no parameter values in the programming module. These were either cleared or not stored.

Remedy

1. **Move the operating mode switch to the left and press the red key. This loads general base parameters which can set the drive in motion. If ‹BASISPAR“ appears on the display, then loading is completed. Pressing the red key again will bring the drive into parameter mode. The base parameters are not optimal for the drive and should be replaced by optimized values (AS../...) (supplied as part of the parameter protocol of the programming module). ->See doc. no. 209-0041-4109-02.**

PHASE
(only with RAC 3) *There is no right-rotational field or one of the three phases is missing (with RAC 3 only phase failure)*

Remedy

1. **Check mains**

POS ERROR

Positioning error

Lag error monitor has been actuated during spindle positioning with spindle reference switch. Drive cannot comply with position command value.

Remedy

1. Check spindle for jamming, sluggishness and defects in the coupling component.

2. Check whether torque reduction of the drive is active (+24V at control input MD-RED (X2/28), see Figure 4)!

3. Reduce positioning speed POSRPM with a lesser value in parameter P18, Q18, R18 or S18!
->See doc. no. 209-0041-4109-02!

RAM FAULT
(only with RAC)

Error in data memory

Error while checking RAM memory in drive controller.

Remedy

1. Replace drive controller.

RSK FAULT
(only with RAC 3)

The RSK printed circuit board not working.

Remedy

1. Switch drive controller off. If message still comes after switching unit back on, then replace the drive controller

RSCURNT
(only with RAC 3)

Overcurrent during feedback

Remedy

1. Check mains

S-CIRCUIT ***Short circuit in motor cable***

Remedy

1. Replace drive controller.

2. Check motor power cable (control cabinet leadthrough?). Replace if damaged.

3. Check motor windings resistance.
In the event of a short-circuit, replace motor (2AD) or stator (1MB)!

SPINDLE ***Spindle encoder monitor***

No information is being received from spindle position encoder.

Remedy

1. Check the coupling component of spindle to the drive!

2. Check the coupling component of the spindle position encoder to the spindle!

3. Check electrical connections of spindle feedback and drive controller!

X12 IGS ***Incorrect drive controller configuration***

Two-motor changeover was programmed in connection with incremental encoder interface.

Remedy

1. Remove two-motor changeover by reprogramming parameter.

2. Remove inremental encoder interface (IGS card) from the drive controller.

4. Unit replacement

To guarantee continuous machine availability, the drive controller is replaced as a unit in the event of a defect, and subsequently returned to the factory for repair.

4.1. KDA and TDA drive controllers

As the programming module AS carries and implements the adaptation of the drive and machine specific data, the new controller does not neet to be matched since it is immediately compatible once the existing programming module is plugged in. The drive with the new drive controller now behaves in precisely the same manner as the original drive.

If it should, however, become necessary to replace a unit, then please follow these steps:

- Open the main switch and secure it against being back switched back before working on any electrical equipment. Due to voltage at the motor that might cause motor movement, make sure that the drives are standing still.
- Await the discharge time (>=1 minute) of the DC bus (L+, L-). Prior to working, check the voltage for less than 50 V; in case of doubt, short-circuit (copper wire: A >= 6 mm^2!).
- Remove the contact safety guards (window)of the drive controller and the adjacent modules of the drive package.
- Slacken and remove the rails of the DC bus and all other connections (do not forget the blower and the blower rail!).
- Remove stud bolts on the top and bottom of the housing and lift the drive controller out of the drive package.

KDA only:



When inserting the KDA 3, hold it by the long stud bolts on the top and bottom of the housing, otherwise hands could be injured.

- Insert the new KDA 3, heatsink first, into the opening above the heatsink blower. Fasten with the stud bolts at top and bottom of the mounting panel of the KDA.

TDA only:

- Remove the Allen screws at the top and bottom of the housing and lift the TDA 1 out of the housing.
- Hang the new TDA 1 onto the remaining Allen screws and tighten the screws.



When hanging the TDA 1 up, hold it at the top and bottom of the housing, otherwise hands could be injured.

- Pull the AS programming module out of the defective unit and insert it into the new one. Secure it with the knurled screw.



Do not remove or insert the programming module with voltage applied! The fixing bolt at the programming module must be tightly screwed into place prior to operating the unit!

- Connect the new unit as per the relevant terminal diagrams. Do not forget the heatsink blower!
- Screw on the see-thru panel.
- Start the machine up (see documentation "AC Main Spindle Drives with Controlled Asynchronous Motor or Frameless Spindle Motor - Applications", doc. no. 209-0041-4109-01, section on commissioning).

4.2. RAC Complete Drive Controller

- Loosen and remove all connections when replacing. Remove the fixing bolts and lift the RAC out of the control cabinet with a crane.
- Use a crane for the replacement as well. Tighten and fix into place with the screws. Remove the programming module from the defective unit and insert it into the replacement. Use the knurled screw to secure it against falling out.



Do not remove or insert the programming module when voltage is applied! The fixing bolt on the programming module must be firmly tightened prior to operating the RAC!

- Connect the new RAC as per the relevant terminal diagram.
- Start the machine up again (see documentation "AC Main Spindle Drives with controlled Asynchronous Motor or Frameless Spindle Motor - Applications", doc. no. 209-0041-4109-01, section on commissioning).

5. NC Control Unit and Feedback Interfaces

5.1. Control inputs, signal outputs, analogue outputs and Bb contact

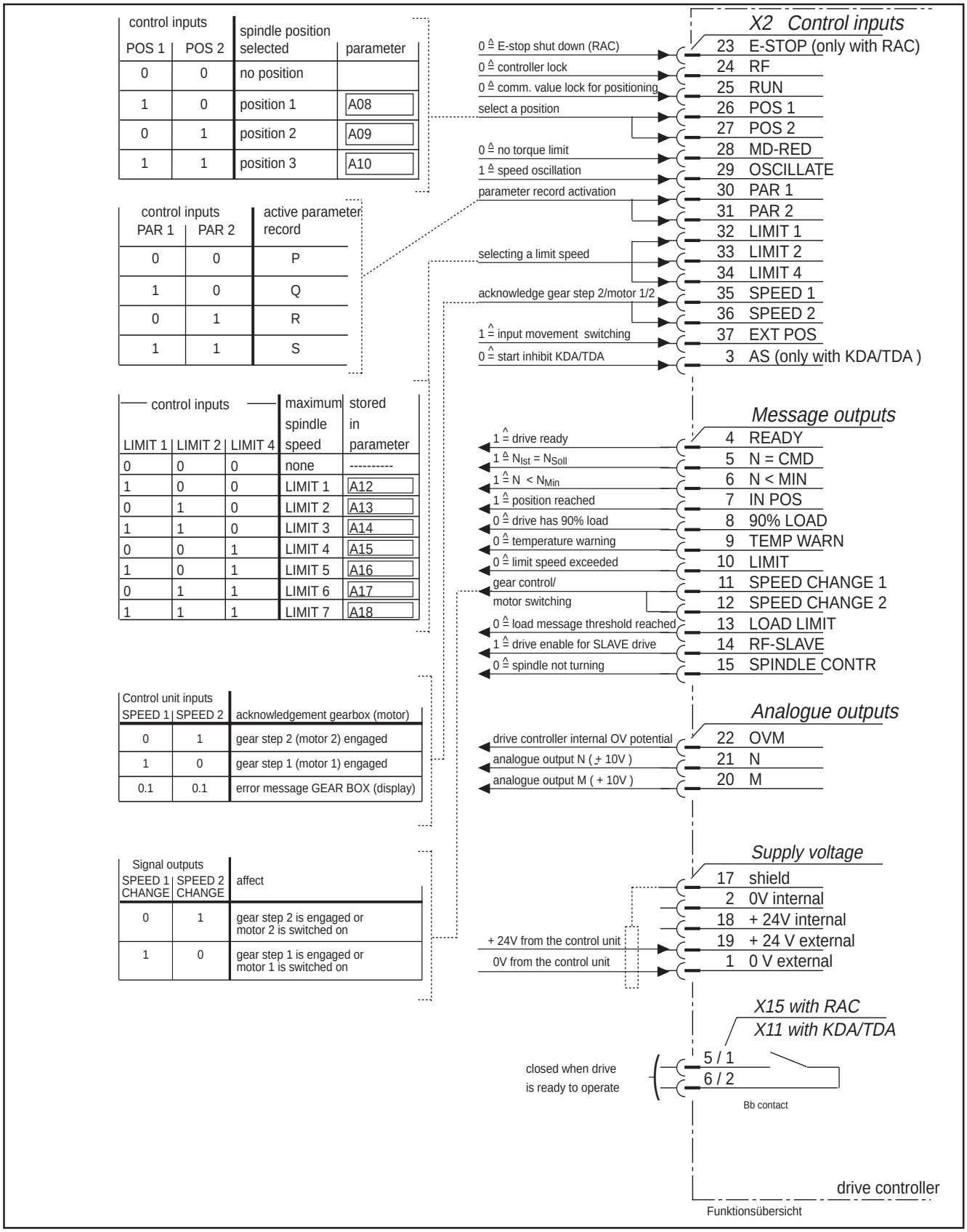


Figure 5.1: Overview of functions of the control inputs, signal and analogue outputs

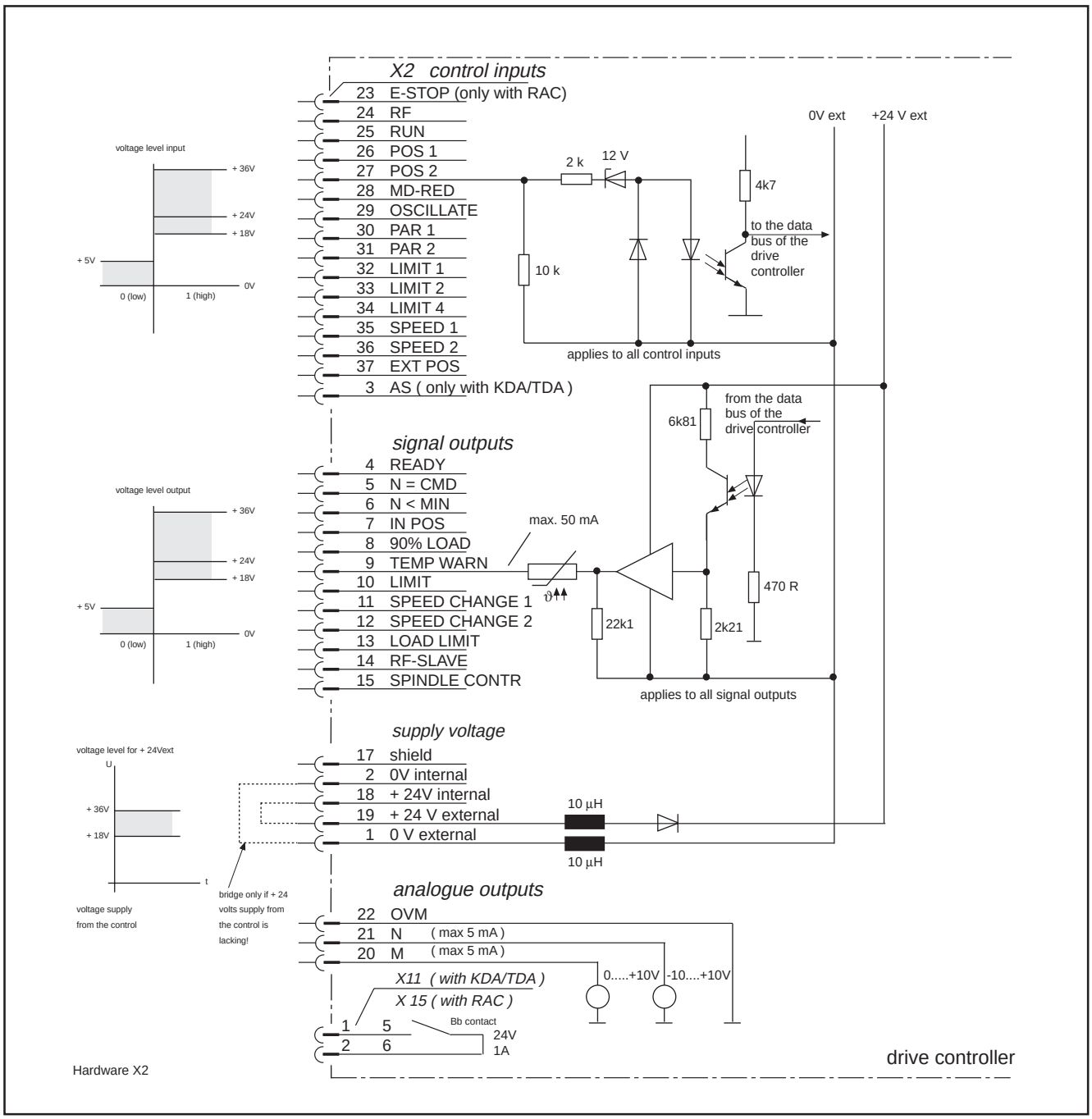


Figure 5.2: Control input, signal and analogue output hardware (X2)

The potential of the inputs and outputs is isolated. If the control unit does not supply +24 V/ 0 V to the outputs, then connect terminals 18 and 19 as well as 1 and 2.

5.2. Analogue Speed Command Value (standard)

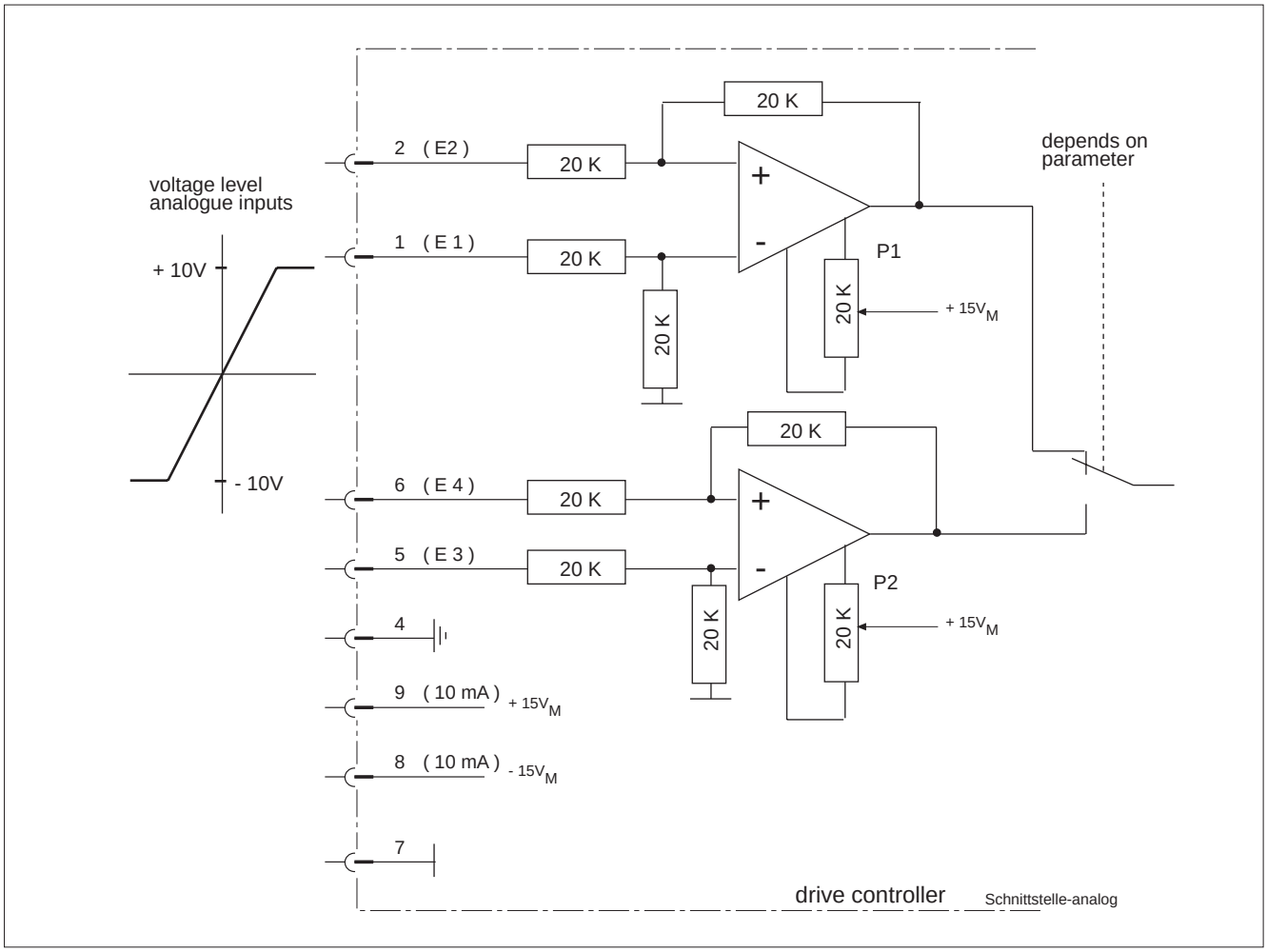


Figure 5.3: Interface for analogue speed command value

Analogue inputs E1/E2 and E4/E4 are differential inputs. The potentiometers P1 and P2 support drive alignment, if 0 V is applied to the relevant analogue input. They are located to the right and the left of the push-on terminal strip X4.

See type code field "Speed Command Value": A for designation.

5.3. Digital Speed Command Value (option)

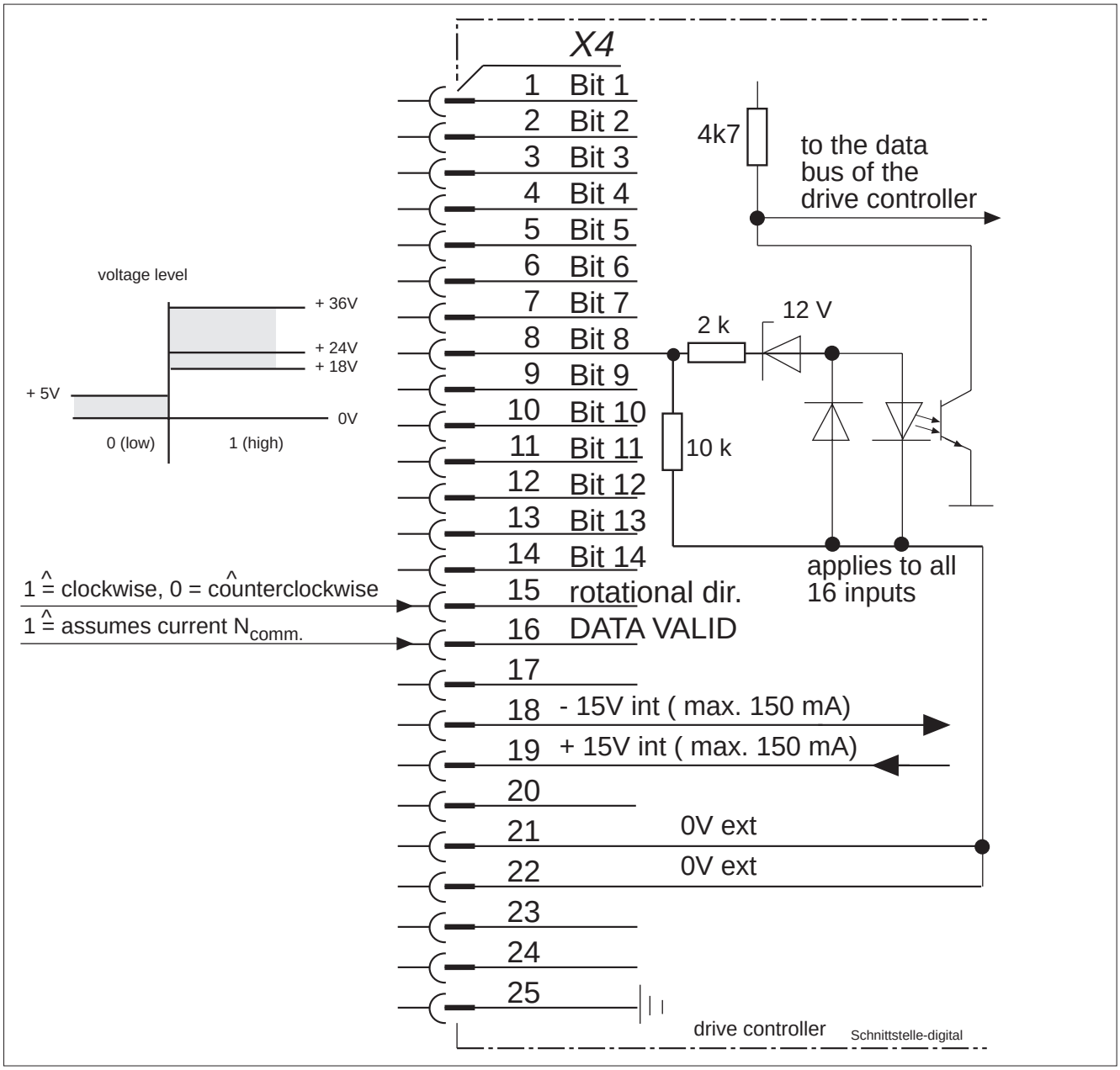


Figure 5.4: Interface for the digital speed command value

The potential of the inputs are isolated. If the control unit does not supply +24 V/0 V for the control of the inputs, then connect terminals 18 and 21.

Terminal 19 supplies 1 (high), while terminal 18 supplies 0 (low). In this case, the control unit must generate the bit pattern for the position command value via potential-free contacts.



If the internal ±15 V are used, then the total load may not exceed 150 mA!

Simultaneous digital position values via ±15 V int is not possible!

See type code field "Speed Command Value": D for designation.

5.4. SERCOS Interface (option)

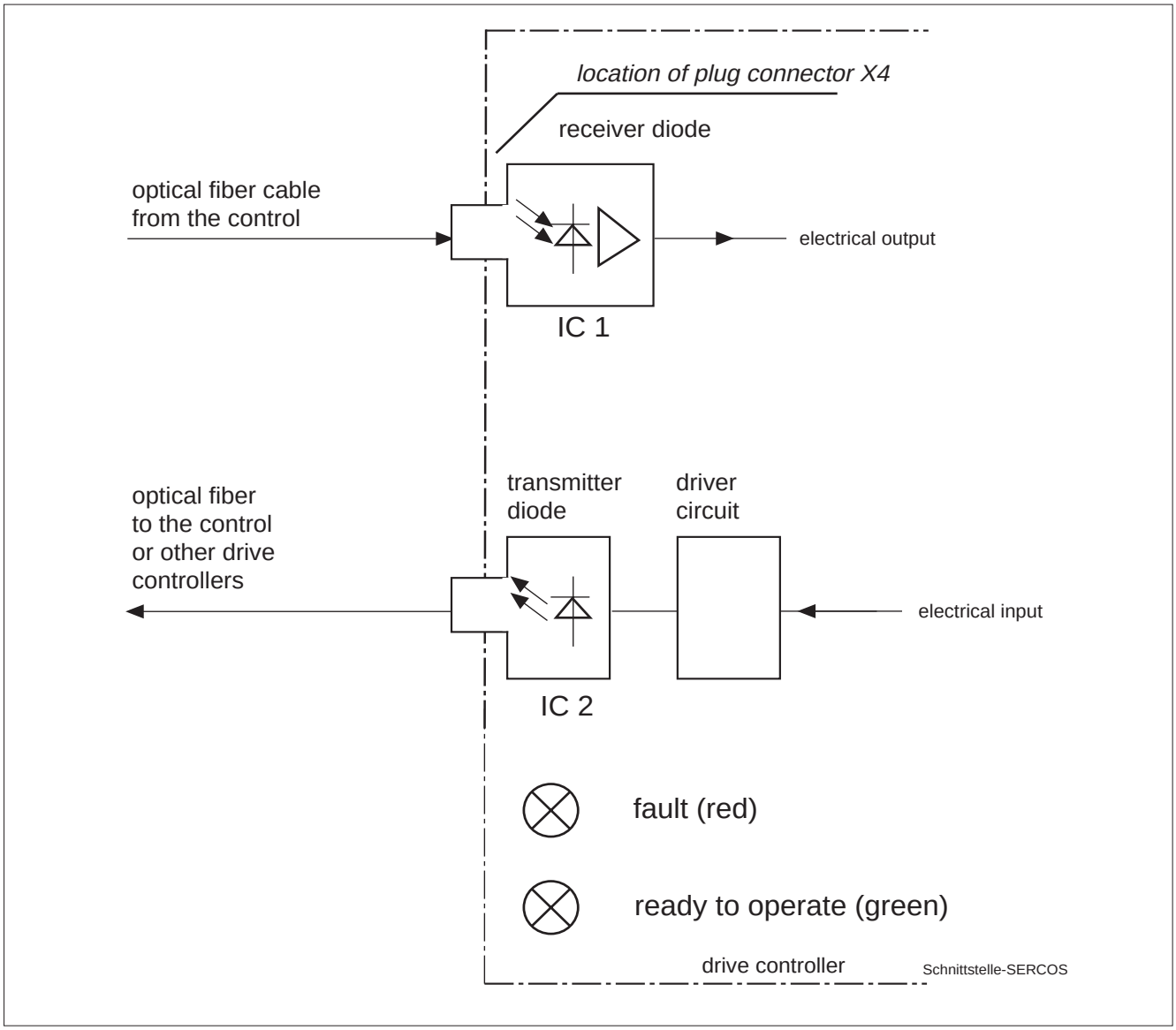


Figure 5.5: SERCOS interface (optional)

See type code field "Speed Command Value": L for designation.

5.5. Digital Position Command Value (option)

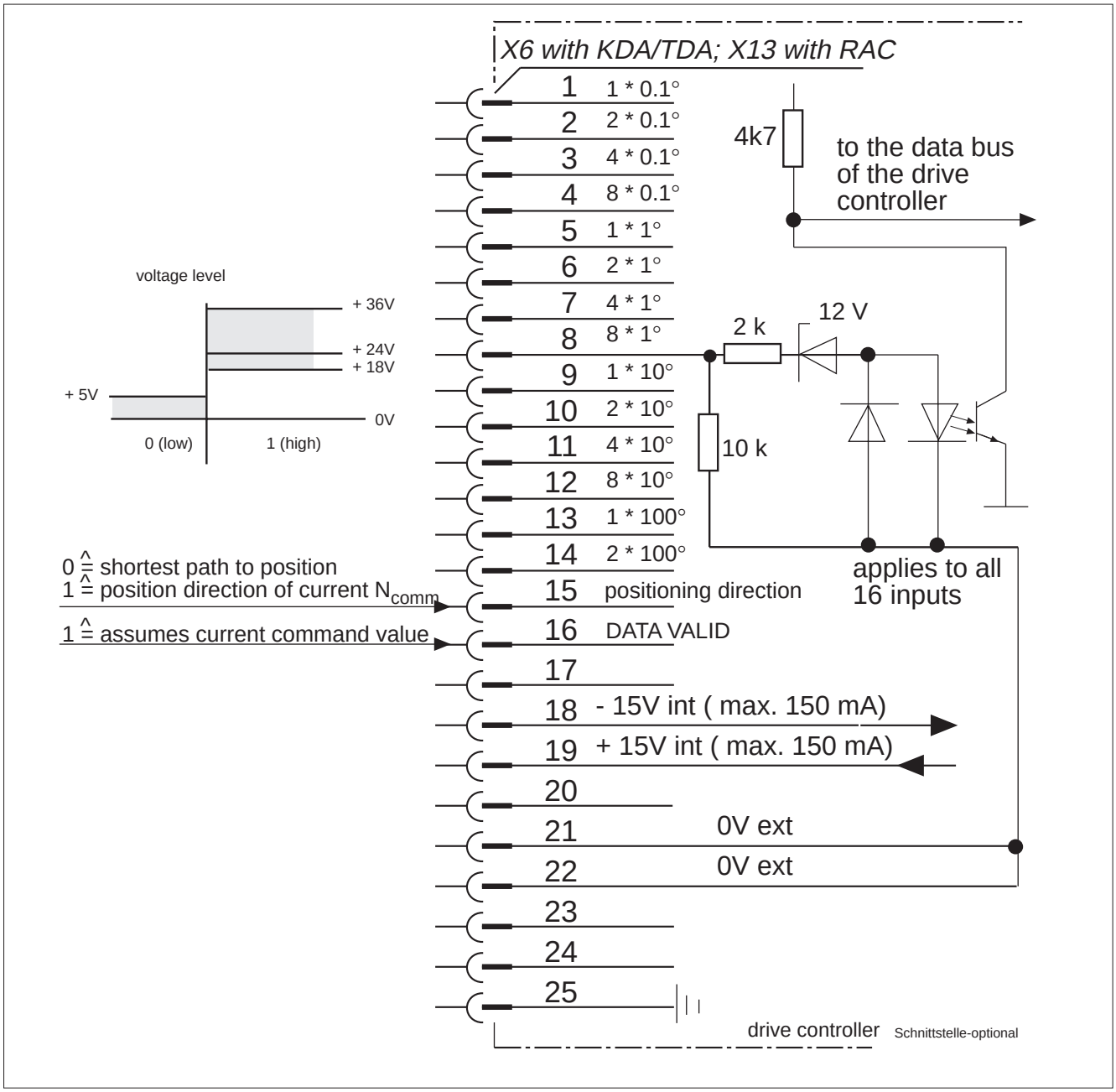


Figure 5.6: Interface for the digital command value (optional)

The potential of the inputs are isolated. If the control unit does not supply +24 V/0 V for the control of the inputs, then connect terminals 18 and 21.

Terminal 19 supplies 1 (high), while terminal 18 supplies 0 (low). In this case, the control unit must generate the bit pattern for the position command value via potential-free contacts.



If the internal ±15 V are used, then the total load may not exceed 150 mA!

Simultaneous digital position values via ±15 V int is not possible!

See type code field "Speed Command Value": D for designation.

5.6. Incremental Encoder Output (option)

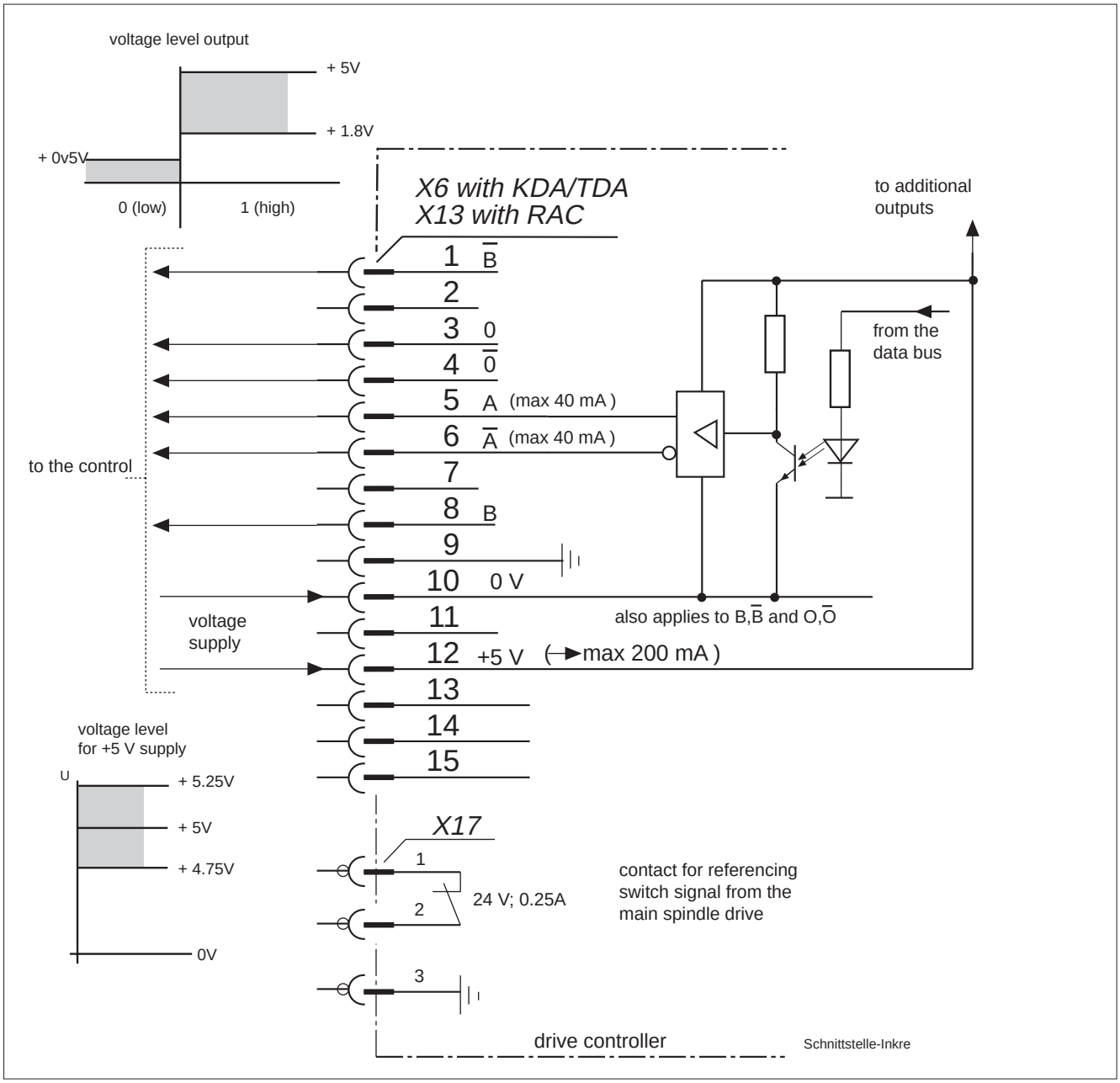


Figure 5.7: Interface for the incremental encoder output (optional)

The drive controller supplies incremental encoder compatible signals to the control unit via this output for the purpose of measuring distance. For this option, the motor must be equipped with a high-resolution feedback (feedback types 3 or 4).

The potential of the outputs is isolated. The control unit must supply the +5 V.

See type code field "Additional Interface": I for designation.

5.7. Serial Interface (option)

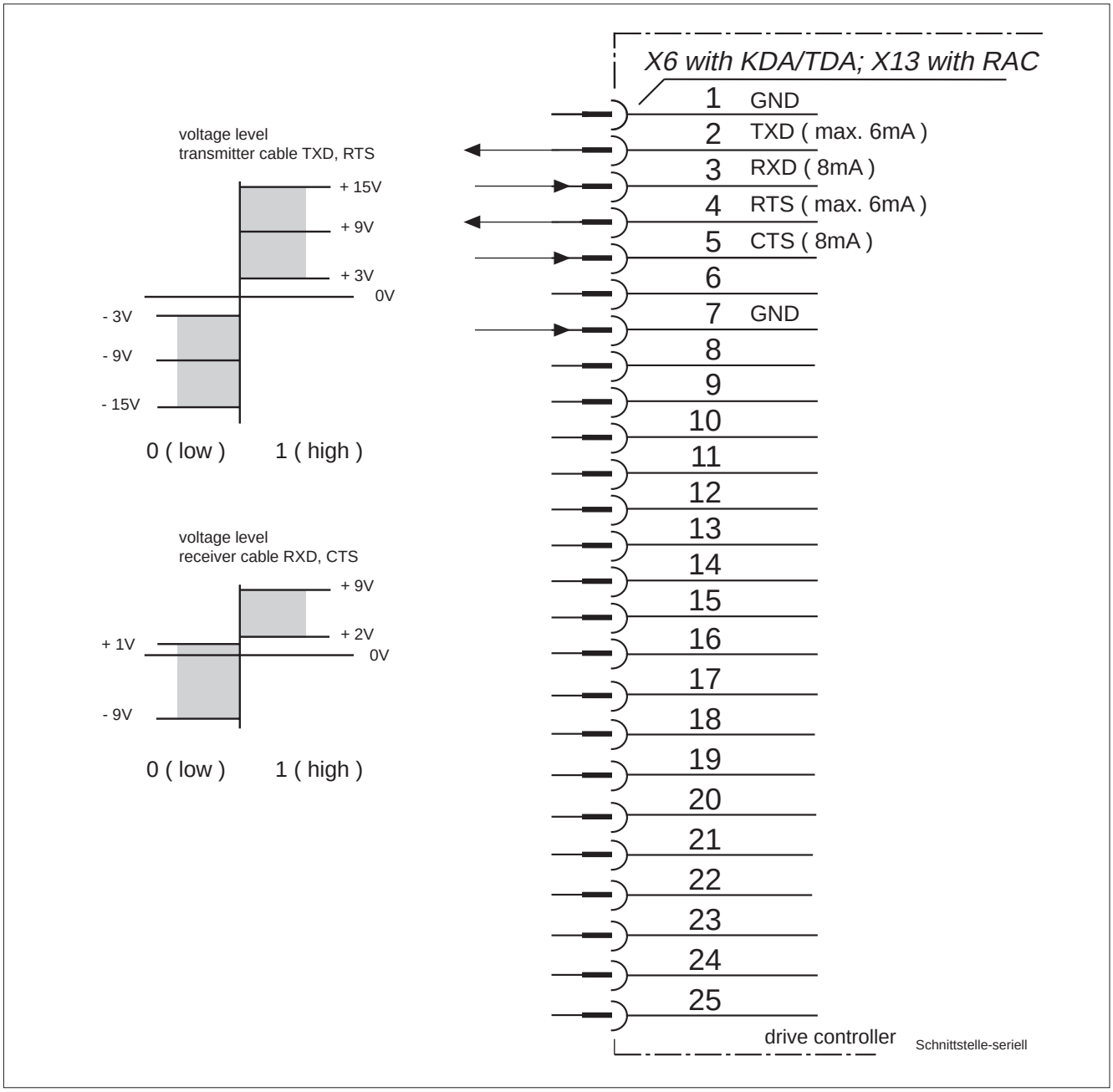


Figure 5.8: Serial interface RS 232 C (optional)

The serial interface is not potential-free. It can, however, by controlled without any difficulty with almost any input device such as a PC or something similar with the RS 232 C interface.

See type code field "Additional Interface": S for type designation.

5.8. Motor Feedback Connection

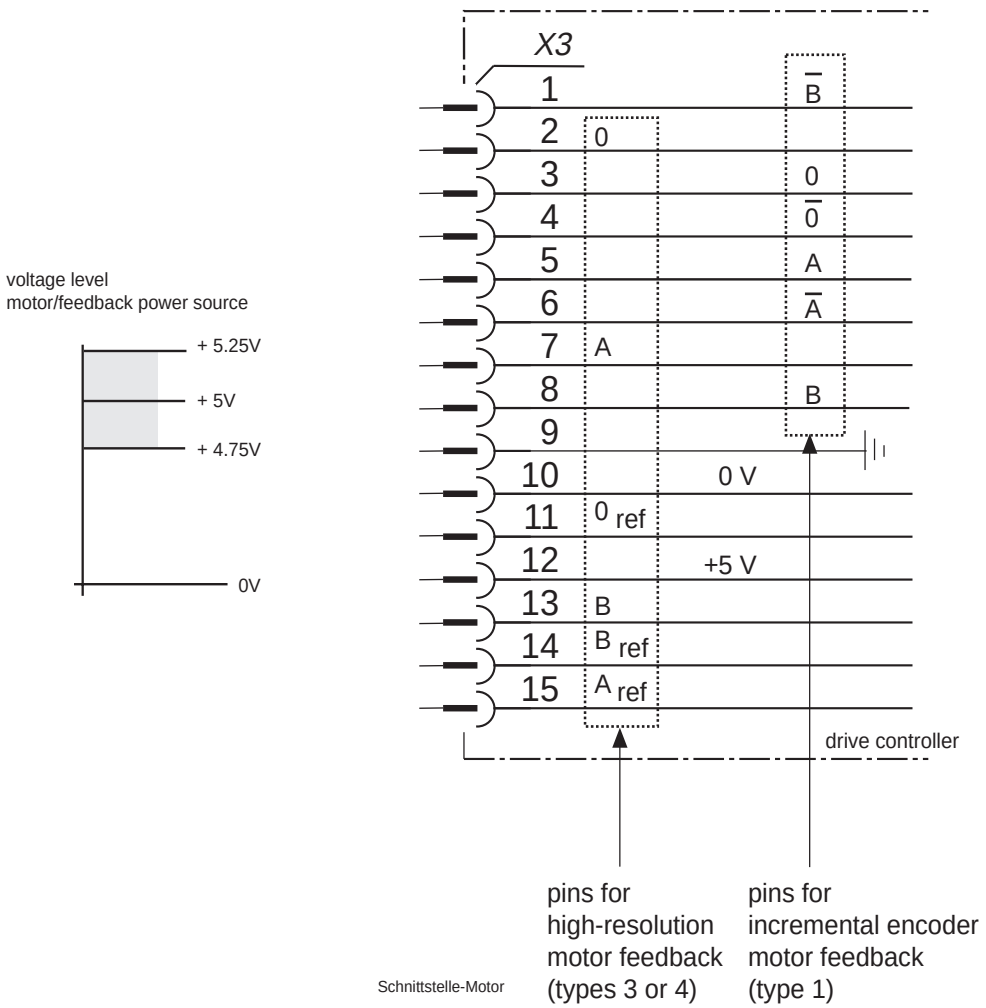


Figure 5.9: Motor feedback interface

Push-in terminal strip X3 has pins for the high-resolution motor feedback (types 3 or 4) and for an incremental encoder motor feedback (type 1).

5.9. Additional Encoder Input (option)

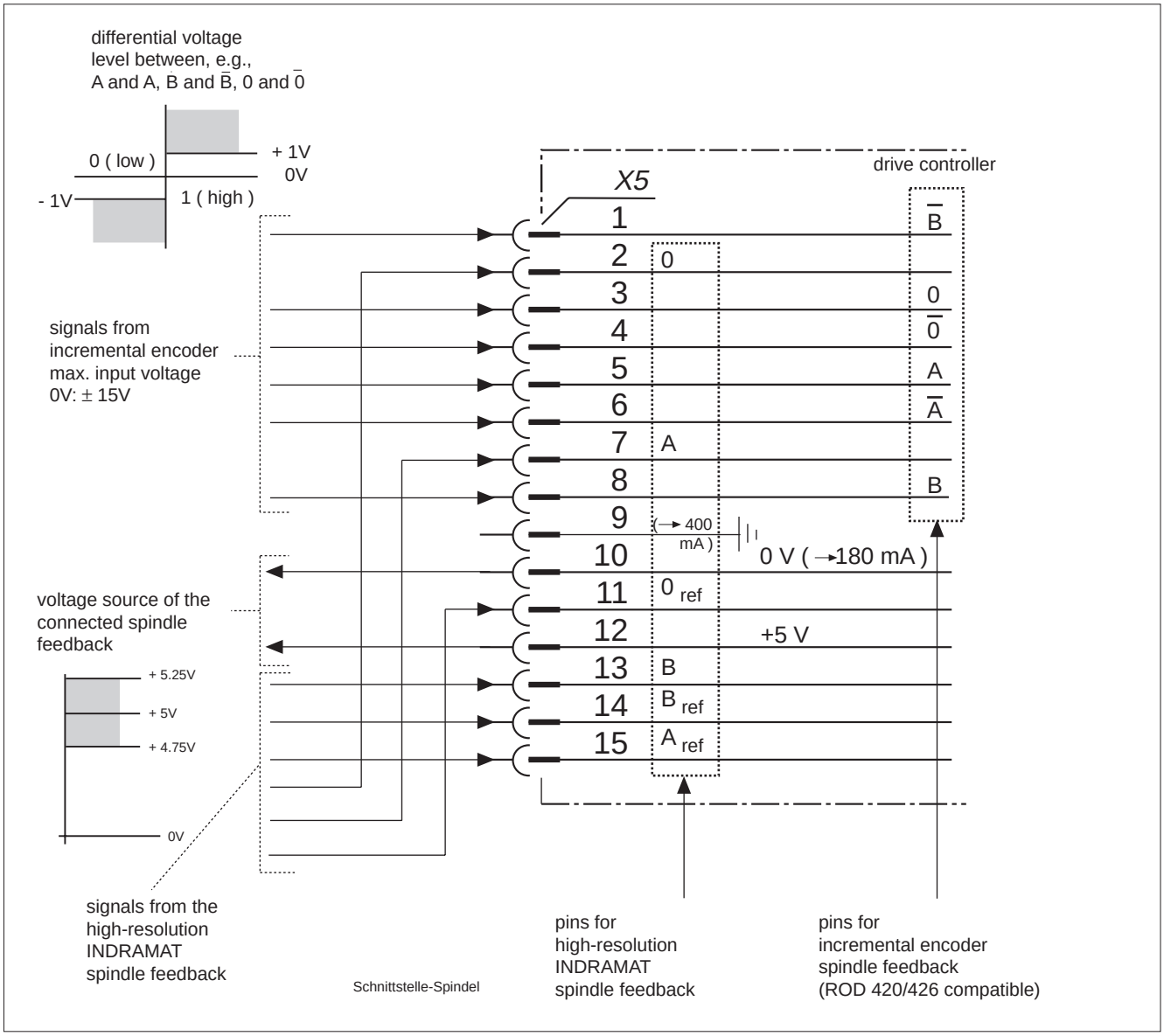


Figure 5.9: Additional encoder input interface (optional)

The drive controller supplies the connected spindle feedback with +5 V. The inputs AA, BB And 00 are differential inputs.

Push-in terminal strip X5 has pins for the high-resolution INDRAMAT spindle feedback and the incremental encoder as spindle feedback (ROD 420 or ROD 426 compatible).

Only one of the aforementioned feedback types can be connected!

See type code field "Additional Encoder Input": P for designation.

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