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Troubleshooting
P2282TS/EN
2015-12

m-Pro-400SG DGD intelligent spindles

Series BTS



Notes on this Troubleshooting

This manual was written to assist user trouble shooting for applications with Intelligent Spindle Systems BTS. This document is not a substitute for the equipment's original user manuals and documentation supplied with the equipment.

Symbols in text

→	Identifies instructions to be followed
•	Identifies lists
italics	Indicates menu items such as *Diagnostics* in software descriptions
<…>	Identifies elements that have to be selected or deselected, such as buttons or control boxes, i.e. <F5>
`Courier`	Indicates the name of paths and files, e.g. **`setup.exe`**
\	A backslash between two names indicates the selection of an item from the menu, e.g. file \ print

Abbreviations

BTS(E)	DGD Intelligent Spindle
CPM…	Central Power Modul
mPro400SG	Nutsetter control unit
TS	Tightening module
CPS3	Supply module

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Contents

1 Safety 5

1.1 Warnings and notes 5
1.2 Basic requirements for safe working practices 5
1.3 Operator training 6
1.4 Personal protective equipment 6

2 System overview 7

2.1 Nutsetter control unit mPro400SG-CPM 8
2.2 Function description 8
2.2.1 Component identification mPro400SG-CPM3 9
2.2.2 Component identification mPro400SG-CPM6 10
2.3 Central Power Supply CPS3 11
2.4 Intelligent spindle BTS 12
2.5 Nutsetter control unit mPro400SG 13
2.5.1 Description 13
2.5.2 Field of application 13
2.6 Field/Jumper Cables 14

3 What to check when troubleshooting 15

3.1 Field/Jumper Cables. 16
3.2 mPro400SG Hardware 16
3.3 mPro400SG Standard-Software S168813 17
3.3.1 Status line 17
3.3.2 Logbook – Station related results 18
3.3.3 Monitor Tool: Shut-off cause 19
3.3.4 System information – Arcnet 20
3.3.5 Diagnostics – Tool test 22
3.3.6 SysLog messages – save/export system log messages 23
3.4 Central Power Modul CPM… 23
3.4.1 Central Power Supply CPS3 24
3.5 Intelligent spindle BTS 30

4 Troubleshooting 31

4.1 Error messages displayed mPro400SG 31
4.2 No rundown possible – station 37
4.3 No rundown possible – single spindle 39
4.3.1 Identifying which spindle has failed 39
4.3.2 Transducer 41

5 Secondary information 42

1 Safety

1.1 Warnings and notes

DANGER!



A symbol combined with the word **DANGER** warns of an **impending health risk** or risk of fatal injury to personnel. If this danger note is not adhered to, severest injury that may lead to the death of people, is the consequence.

WARNING!



A symbol combined with the word **WARNING** warns of a **potentially dangerous** situation for the health of personnel, which could result in death or serious injury if not avoided.

CAUTION!



A symbol combined with the word **CAUTION** warns of a **potentially harmful** situation for the health of personnel or damage to property or the environment. If this warning is not observed, injuries, property or environmental damage may occur.



This symbol indicates a **general** instruction.
General instructions include application tips and special useful information, but no warnings against dangers.

1.2 Basic requirements for safe working practices

Take the fastening system into service only after you have read and completely understood the following safety instructions and this document. Failure to observe the instructions below may result in electric shock, fire and serious injuries.

WARNING!



High leakage current –
Fatal electric shock could occur!

- → Establish a protective earth (PE) ground connection to the mPro400SG-CPM before taking into operation!
- → Always disconnect the power supply before performing maintenance work on the BTS and the mPro400SG-CPM
- → Always disconnect the system cable, motor or motor cable from the mPro400SG-CPM or BTS before making throughput, resistance and short circuit measurements.
- → Do not attempt to repair possible faults on the fastening system by yourself if you do not have the required knowledge! Inform the local repair center or your Sales & Service Center.

CAUTION!



High temperature –
the motor on the BTS may heat up and cause burns during removal (max. temperature 90 °C).

- → Wear gloves.

WARNING!



Risk of flying parts.
Components of the spindle may rotate, come loose and cause injury.

→ Avoid speed increases of over 328 ft/s² (100 m/s²) on all axes.

CAUTION! **Work area**



→ Close all safety devices.
→ Ensure that there is enough space in the work area.
→ Keep the work area clean.

Electrical safety

→ Do not operate the fastening system outdoors.
→ Observe the safety notes on the BTS.

Safe working with and around fastening tools

→ Inspect screw bits and retaining ring for visible damage and cracks.
Replace damaged parts immediately.
→ Always disconnect the power supply to the BTS before changing screw bits.
→ Only use screw bits for machine-controlled fastening tools.
→ Make sure that the screw bits are retained securely.

→ We do not claim that these safety notes are complete. Read and observe all applicable, general and local safety and accident prevention rules.
→ Follow a safety-conscious maintenance program which takes into account the local regulations for maintenance and servicing in all phases of operation of the fastening electronics.

1.3 Operator training

- The fastening system may only be operated by personnel that have been trained and instructed correspondingly and authorized by the operator.
- The fastening system may only be maintained and serviced by personnel instructed by qualified staff from Apex Tool Group.
- The operator must make sure that all new operating and maintenance personnel are instructed in the operation and maintenance of the fastening system to the same extent and with the same care and attention.
- Personnel who are being trained may work on the fastening system only under the supervision of an experienced operator.

1.4 Personal protective equipment

When working



Danger of injury by being wound up in and caught by machinery

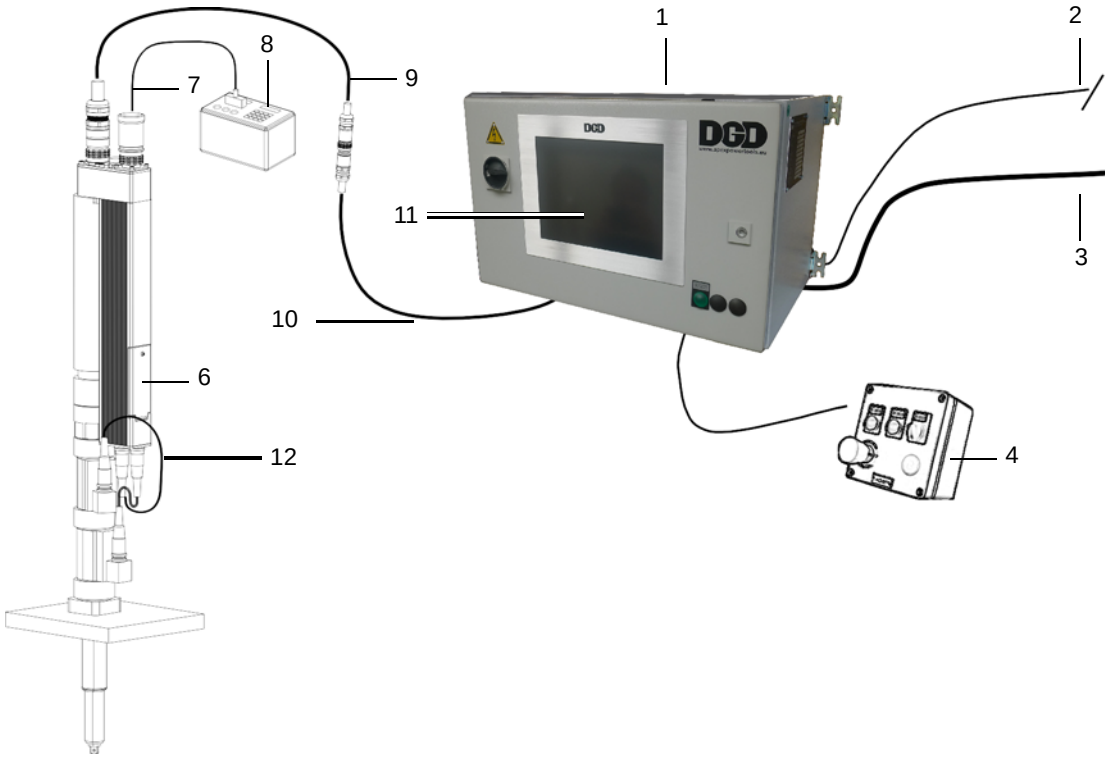
→ Do not wear gloves.
→ Wear close-fitting clothing.
→ Wear a hairnet, if necessary.
→ Do not wear jewelry.



Risk of injury due to metal splinters flying around

→ Wear protective goggles.

2 System overview



a00598_c.eps

Item	Designation
1	Nutsetter control unit mPro400SG-CPM
2	Cable, machine control
3	Mains cable, e.g. 3×400 VAC
4	Operator panel with emergency stop button, optional
6	DGD-IS
7	ARCNET terminator
8	Test case MPK with cable, optional
9	System cable, type A
10	System cable, type C
11	Station controller mPro400SG
12	Cable KMAG/KMAW

2.1 Nutsetter control unit mPro400SG-CPM



Item	Designation
1	Cooling element, aluminum
2	Front door, lockable
3	Cable outlet
4	"Ready" indicator (optional)
5	Main switch
6	Station controller mPro400SG
7	Supply module CPS3 (integrated)

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2.2 Function description

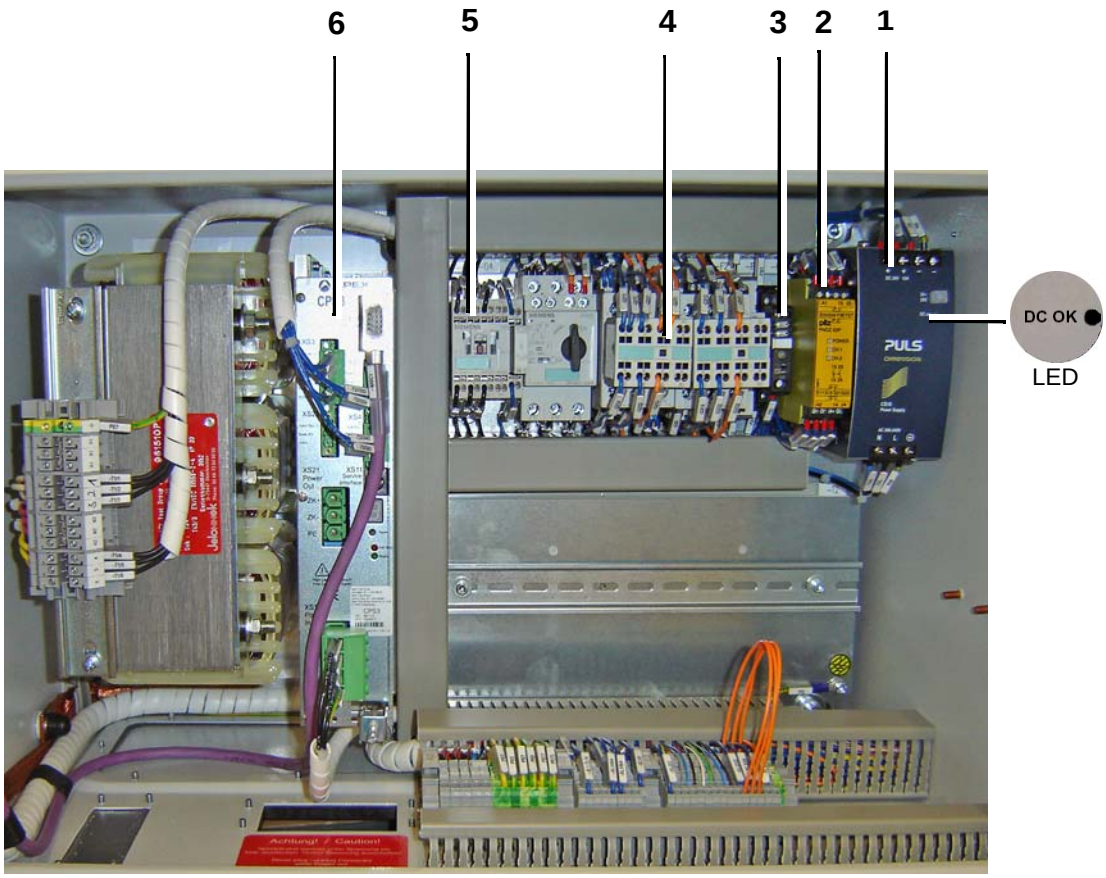
The nutsetter control unit mPro400SG-CPM

- controls the fastening sequence (mPro400SG).
- supplies the tightening module TS/TUS/TSE with 380 VDC (CPS3) and 24 VDC.

The machine control and the station controller mPro400SG transmit the signals *Control on* and *Emergency stop*, which activate and deactivate the intermediate circuit voltage to the DGD-IS.

The integrated emergency stop safety relay PNOZ activates and monitors two relays. The relays activate the supply voltage.

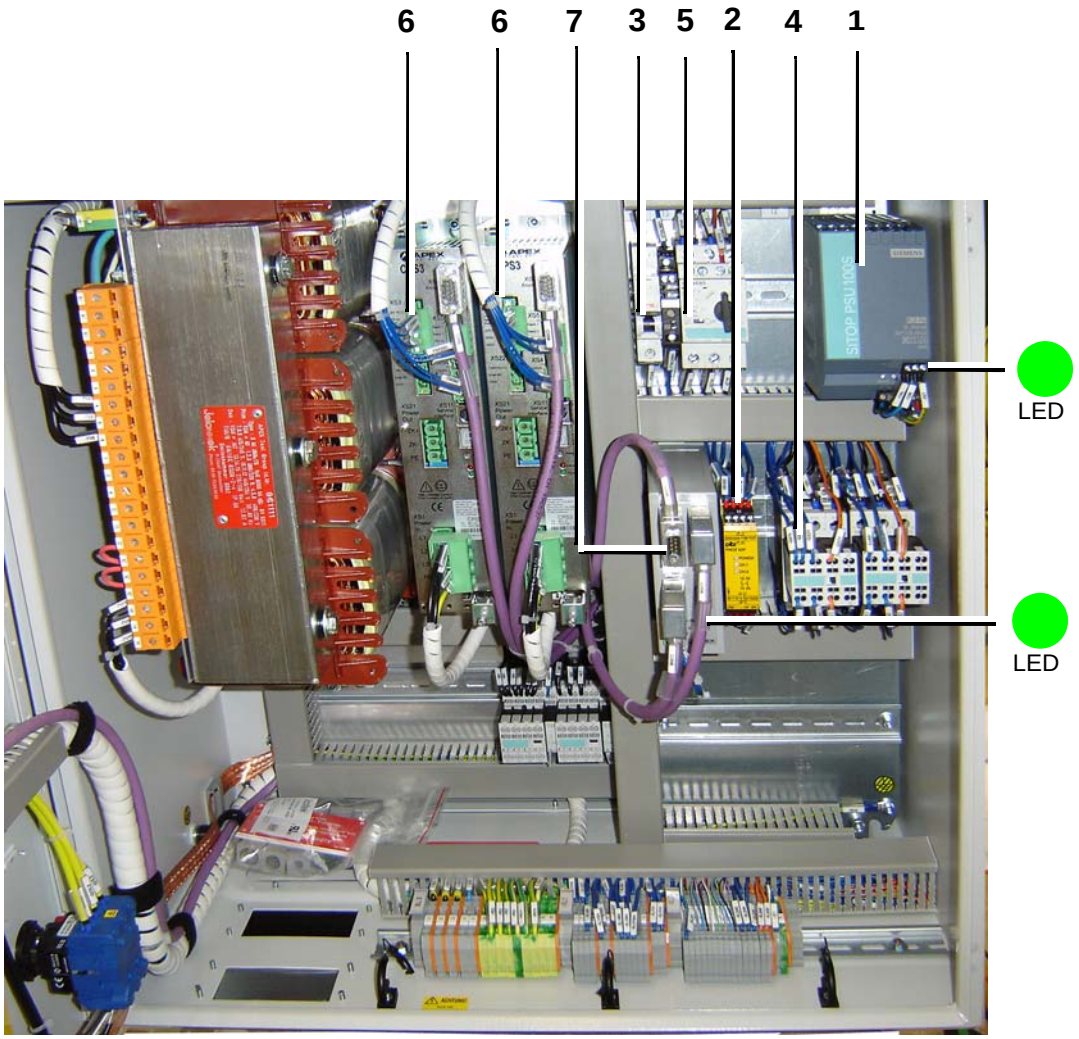
2.2.1 Component identification mPro400SG-CPM3



Item	Designation
1	24 VDC Power Supply
2	PNOZ Safety Relay
3	Fuses
4	Contactors
5	Control Relay
6	CPS3

Fig. 2-1: mPro400SG-CPM3 Interior View

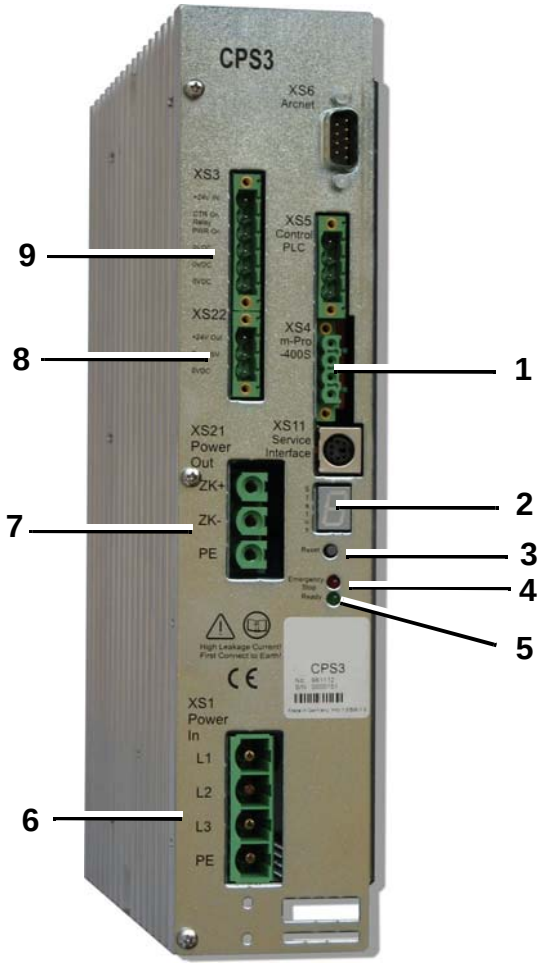
2.2.2 Component identification mPro400SG-CPM6



Item	Designation
1	24 VDC Power Supply
2	PNOZ Safety Relay
3	Fuses
4	Contactors
5	Control Relay
6	CPS3
7	ARCNET HUB

Fig. 2-2: mPro400SG-CPM6 Interior View

2.3 Central Power Supply CPS3



Item	Designation
1	Input signal from Emergency-Stop circuit to CPS3 XS4
2	Display for Error Codes
3	Reset Switch
4	Emergency Stop LED
5	Ready LED
6	Input AC power, 277 VAC, 3 Phase
7	Output DC power to BTS, 380 VDC
8	Output 24 VDC to BTS
9	Output signal from CPS3 to control relay 408CR XS3

Fig. 2-3: CPS3: Functional Description

2.4 Intelligent spindle BTS

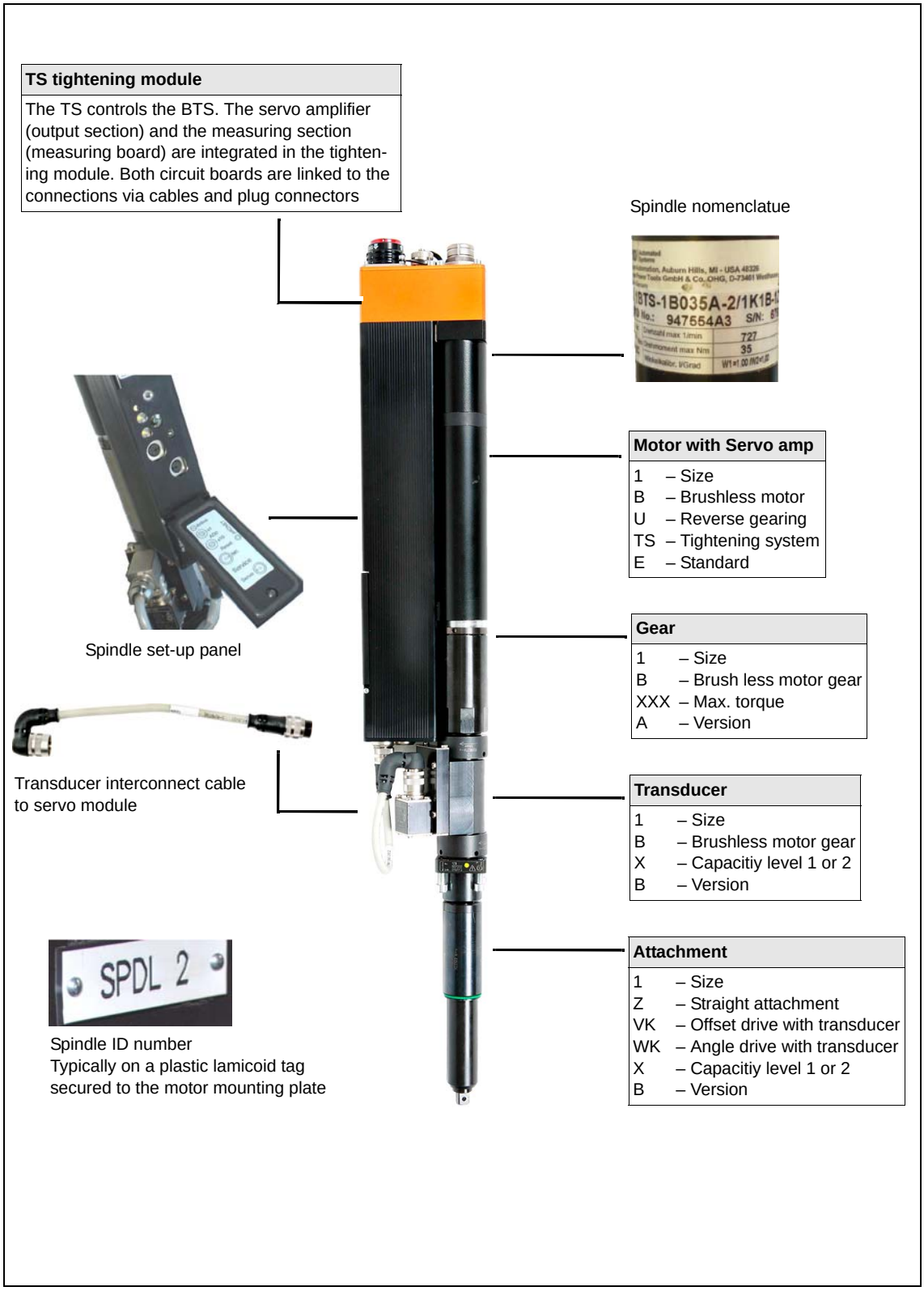


Fig. 2-4: BTS: Overview

2.5 Nutsetter control unit mPro400SG

Order number (without Software)	S961450-150
Designation	Controller mPro400SG
Usable software	Standard: S168813 For detailed information, please contact the Sales & Service Center.

2.5.1 Description

The station controller mPro400SG includes the following functions:

- Communication with resource control (for example, digital I/O, Profibus, Interbus, Open Protocol etc.).
- Data transmission (for example, Ethernet).
- Communication with the STM(H) tightening modules or DGD-Intelligent-Spindle Series BTS(E), via ARCNET high-performance fieldbus.
- Communication over optional Anybus CC Module (Profibus, Profinet).
- Printer control
- Tightening process control
- Menu operation via touchscreen and/or external keyboard
- Visualization via TFT color LCD monitor

2.5.2 Field of application

- The station controller mPro400SG is used as the master computer, data concentrator and interface concentrator in conjunction with the STM(…) tightening modules or DGD-Intelligent-Spindle Series BTS(E).
- A decentralized setup of the mPro400SG and STM(H) tightening modules or DGD-Intelligent-Spindle Series BTS(E) can be realized.



Fig. 2-5 Controller Description

2.6 Field/Jumper Cables

A typical system consists of the field cable that is terminated at the *mPro400SG-CPM* and the first fixtured spindle. The first spindle will have the field cable and a *jumper* to the second spindle attached to it. The very last spindle in the sequence will have an end terminator.

	Spindle shown with 90 degree connector location
1  2	1 Cable ID information 2 Spindle ID number tag on cable

3 What to check when troubleshooting

The following chapter will help you to troubleshoot. It describes where you can find information about errors at the different components:

1. Field/Jumper Cables
2. mPro400SG Hardware
3. mPro400SG Software
4. Central Power Modul (CPM…) including supply module CPS3
5. Intelligent spindle BTS

WARNING!



High leakage current –
Fatal electric shock could occur!

→ Always disconnect the power supply before performing maintenance work on the BTS and the CPM….

→ Always disconnect the system cable, motor or motor cable from the CPM… or BTS before making throughput, resistance and short circuit measurements.

→ Do not attempt to repair possible faults on the fastening system by yourself if you do not have the required knowledge! Inform the local repair center or your Sales & Service Center.



- Always replace CPS3 and TS/TUS completely.
- Opening the CPS3 or TS/TUS will void the warranty. This does not include the service panel.

Acknowledgment of Errors

The system is ready for operation again once the fault is rectified and the <Reset> button on the CPS3 or TS is pressed.

The measuring board acknowledges faults pending in the TS each time a spindle starts.

If the failure is brief (e.g. undervoltage), the TS becomes ready to operate automatically after the next acknowledgment signal.

All faults on the BTS (not from CPS3) are archived in the mPro400SG. The error information is displayed here during troubleshooting.

The error is permanent if the error mode cannot be acknowledged.

3.1 Field/Jumper Cables.

These are only the most important things to check.

→ For more information see Cable Management Reference Guide P2102JH.

	→ Check it the lock was coming open. → Mounting Safeguard Clip to the cable such that they cannot be lost. → Loop the retaining strap through the clear rubber holder on the cable.
	→ Secure the cable either with a mounting holder or wiht a Velcro strap.
	→ Check if an ARCNET terminator is installed at the last spindle
  Locked Unlocked	To connect cable, align the connectors and slide the black locking ring into the locked position. To disconnect do the opposite. → Check if locking rings are locked.

3.2 mPro400SG Hardware

→ Check main power supply.
→ 24V Power Supply: Check DC OK LED.
→ Check GFCI (if installed) and fuses.
→ Check E-Stop.

3.3 mPro400SG Standard-Software S168813

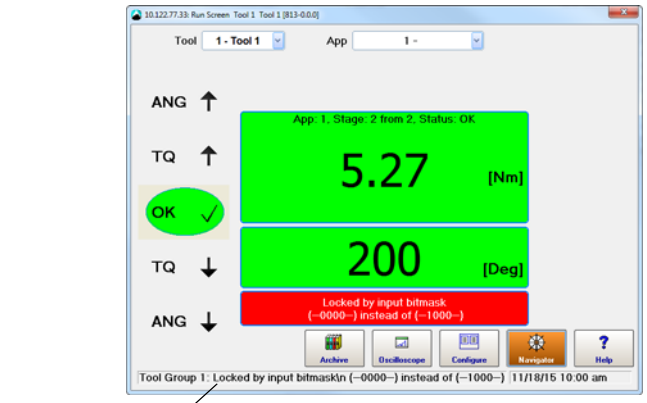
This chapter shows the different menus where you can find error information.

→ For more information see Programming Manual.

→ To get a more detailed description of the screens, press ?

3.3.1 Status line

→ See the status line at the bottom of several screens.

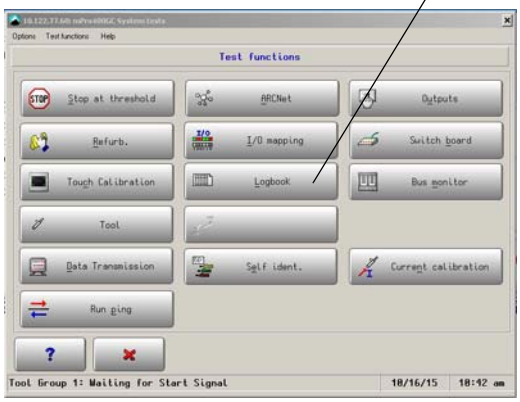


3.3.2 Logbook – Station related results

→ Select *Navigator* > *mPro* >  > 

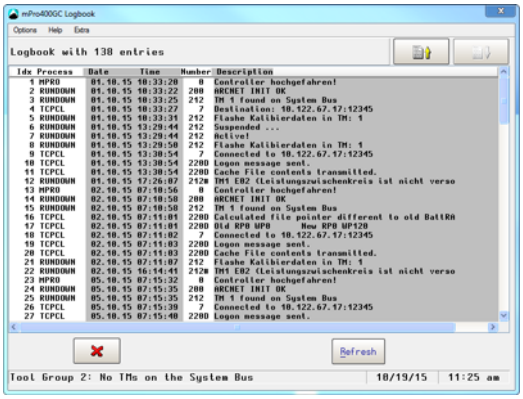


①



②

Entries with error marking



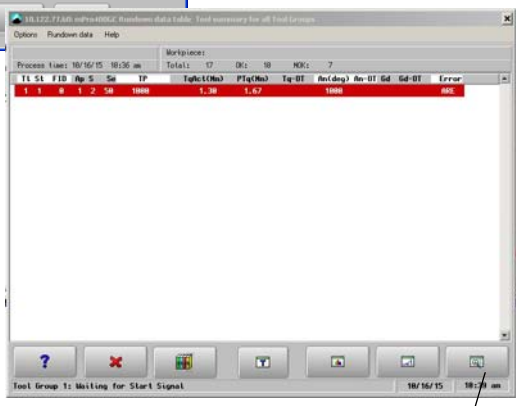
Entries are saved in the battery buffered RAM (software-dependent size).
The newest entry overwrites the oldest.

3.3.3 Monitor Tool: Shut-off cause

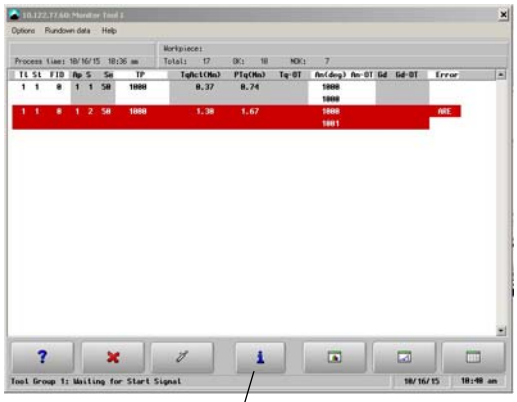
→ Select *Navigator* > *mPro* >  *Rundown data table* >  *Monitor Tool*



①

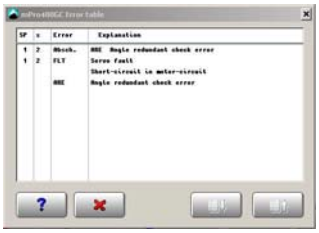


②



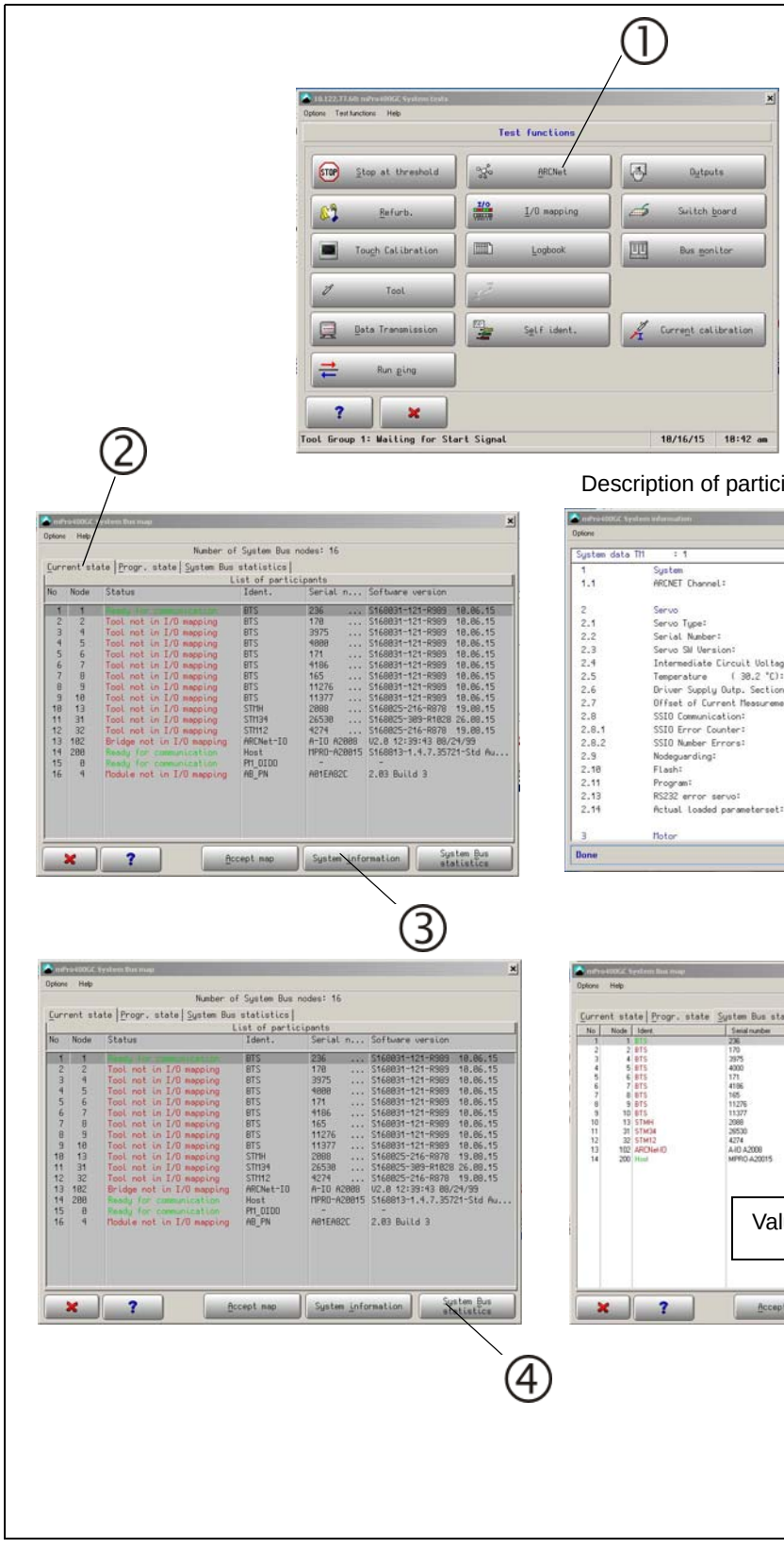
③

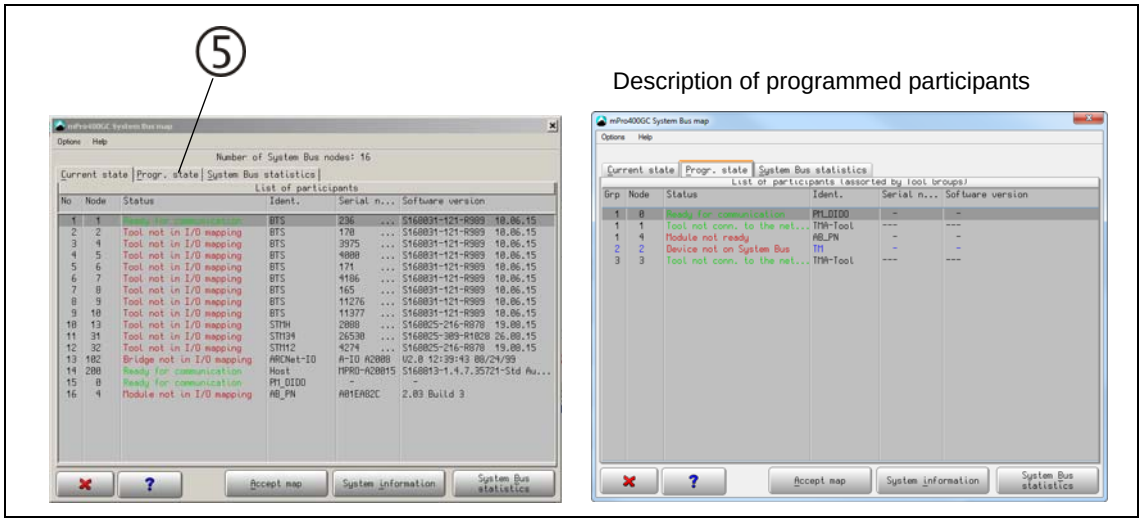
Description shut-off cause



3.3.4 System information – Arcnet

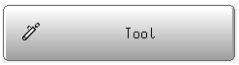
→ Select *Navigator* > *mPro* >  > 



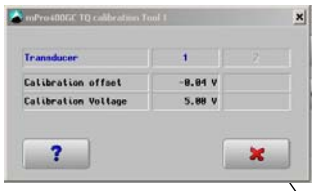

⑤
Description of programmed participants
Number of System Bus nodes: 16
Current state
Progr. state
System Bus statistics
List of participants
Accept map
System information
System Bus statistics

3.3.5 Diagnostics – Tool test

→ Run several tests for each spindle.

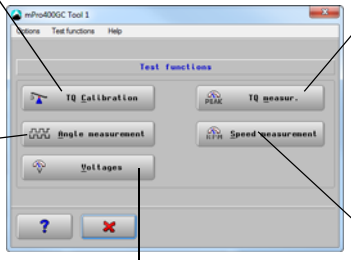
→ Select *Navigator* > *mPro* >  > 

Tool / Torque
Test function cyclically recalibrates the transducer the same way as immediately before the start of a rundown



Tool / TQ Measurement
Test function recalibrates the transducer the same way as immediately before the start of a rundown



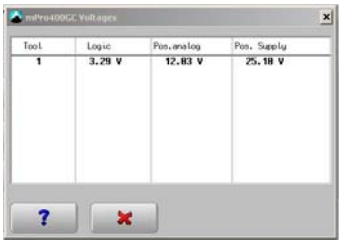




Tool / Angle
The test starts the tool and stopps after 360 deg. The total result is shown as *Actual Angle*



Tool / Speed
The test starts the tool with the maximum speed.

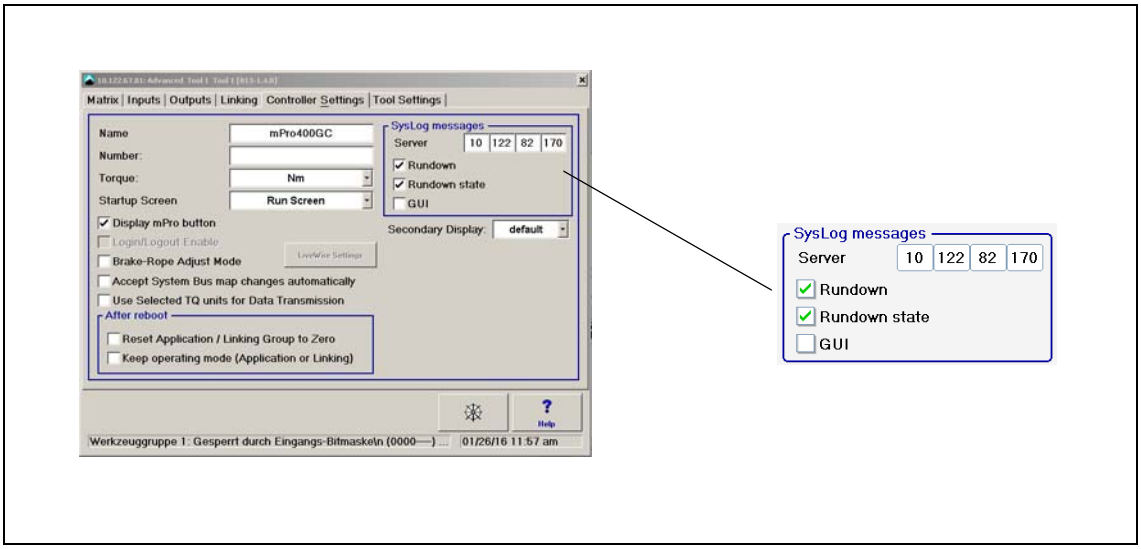


Tool / Voltages

3.3.6 SysLog messages – save/export system log messages

Advantage versus logbook: shows entries over a longer period, more data.

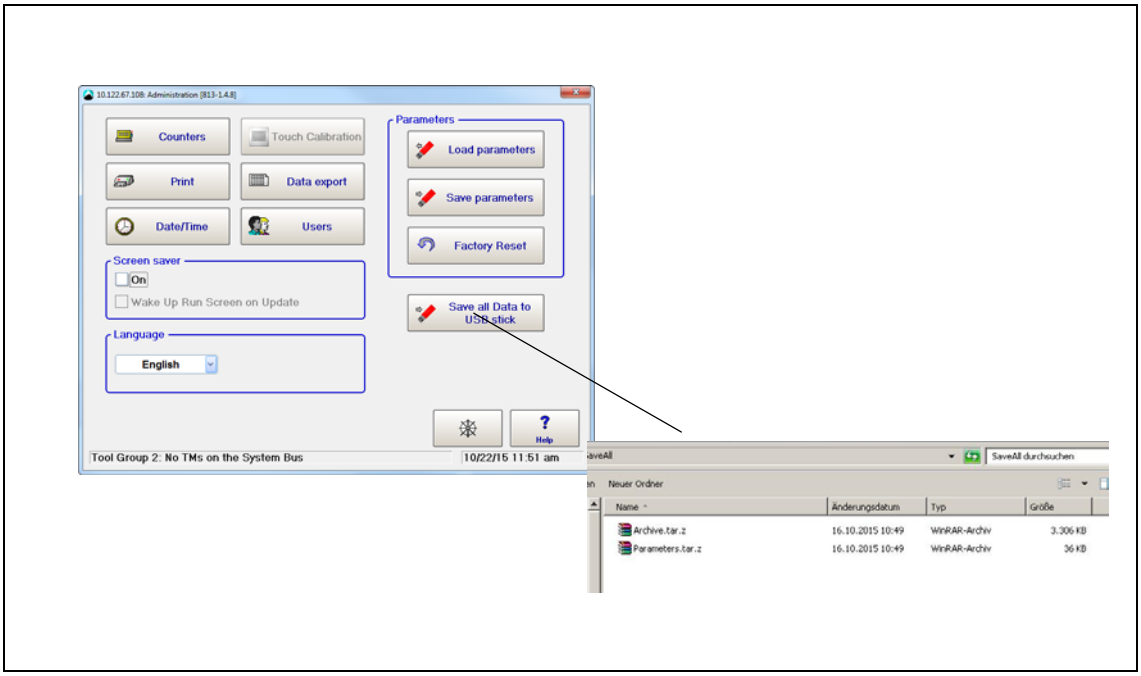
→ Select *Navigator > Advanced > Controller Settings*



→ Activate the error relevant system log messages.

→ Select *Navigator > Advministration*

→ Press <Save all Data to USB stick>

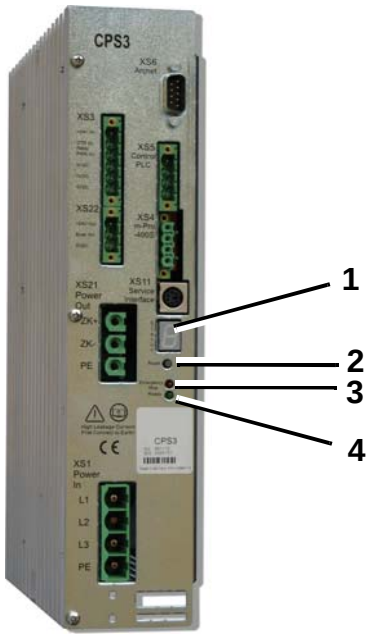


3.4 Central Power Modul CPM…

→ Check on front door:

- *Main Connect*
- *"Ready" indicator*

3.4.1 Central Power Supply CPS3



Item	Designation
1	7-Segment display / Error Codes
2	Reset Switch
3	Emergency Stop (E-Stop) LED
4	*Ready LED*

Fig. 3-1: CPS3 faults

Symptom	Action	Options refer to
Ready LED off	→ Check Error code displayed	→ See 7-Segment display - Error Codes
	→ Check E-Stop condition	→ Check E-Stop LED **If red** → See E-Stop LED
	→ Check Control On condition	→ Measure 24 VDC voltage between XS5/3 – XS5/4 **If missing** → Check wiring → Check control and fuses on condition
	→ Check 24 VDC supply	→ Check dot on 7-segment display (dot must be present if system is OK) → Measure voltage on connector XS3/1 to XS3/4 **If missing** → Check wiring
E-Stop LED on (red)	→ Check E-Stop condition	→ Measure input XS5/3 to XS5/4 **If missing** → Check E-Stop condition → Check fuses and wiring

Display for Error Codes: 7-segment display

Encoded errors are displayed in a 7-segment display on the CPS3. The display alternates between the first and second digit at brief intervals:

Display	Duration	Pause
1st digit	0.5 s	0.2 s
2nd digit	0.5 s	1 s
1st digit	0.5 s	0.2 s etc.

A period (.) in the display means NO error.

If several errors occur, the error with the highest priority is displayed, i.e. with the lowest number.

The errors or faults that the CPS3 detects are NOT communicated to the station controller via ARCNET and then displayed on the screen.

Symptom: Error Code	Action	Options Refer to
0 – 0 Error loading the intermediate circuit capacitors inside CPS3 after switching on	Check 3 phase input	→ Measure voltage at Control On Contactor line terminals. Voltage 240–300 VAC (Ph to Ph) **All 3 phase missing:** → Check supply components
	Check Relay Control On	→ Check Relay Control On signal XS3/2 to XS3/4 **Signal low** → Press reset, after reset signal is high for approx.0,5 sec – the Control On Contactor will switch on for this time before the error is detected again. → Check wiring → Check contactor **Signal high** Replace CPS3
	Check CPS3	→ Remove XS21 and press reset **If error is remaining** → Replace CPS3 **No error** → Check cables and spindles for short
	Check cables and spindles for short	→ Remove group of spindles and cables to isolate the defect component → Replace component
0 – 1 Faulty supply 3 x 270 VAC	Check 3 phase input	→ Measure voltage at Control On Contactor line terminals. Voltage 240–300 VAC (Ph to Ph) **Missing 1 phase or voltage too low or too high** → Check supply components
0 – 2 Excess current or short circuit on braking chopper in CPS3	Check amount of spindles on cable (Braking current >200 A)	Spindles: Max 16 size 1, max 6 size 2,3,4 → Remove connector XS2.1 press reset **Fault removed** → Check cable and spindles **Fault remains** → Replace CPS3 (Short circuit in the braking resistor)

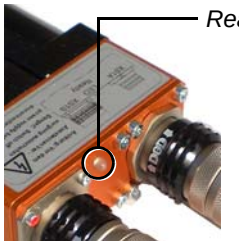
Symptom: Error Code	Action	Options Refer to
0 – 4 Braking chopper overload (I^2t control of break energy inside the CPS3)	Check amount of spindles on cable	Spindles: Max 16 size 1, max 6 size 2,3,4 → Reduce speed
1 – 1 Excessive voltage between artificial neutral point of the power supply and PE or the center of the intermediate circuit (approx. 190 VDC) and PE Voltage < 100 V	Check spindles and cables ➔ check field cable to find spindle or cable at fault	→ Switch 270 VAC input off (E-Stop or Servo Power Off) → Remove connector XS21 → Switch 270 VAC input on again → Press reset **Fault remains** → Replace CPS3 **Fault removed** → Check cables and spindles → Switch 270 VAC input off (E-Stop or Servo Power Off) → Reconnect connector XS21 to CPS3 → Remove field cable from first spindle → Switch 270 VAC input on again → Press reset **Fault remains** → Replace field cable **Fault removed** → Switch 270 VAC input off (E-Stop or Servo Power Off) → Reconnect cable to first spindle and disconnect jumper cable removing half of the spindles → Switch 270 VAC input on again → Press reset **Fault remains** → Problem still exists in removed half of spindles or jumper cables → Switch 270 VAC input off (E-Stop or Servo Power Off) → Connect half of removed spindles → Switch 270 VAC input on again → Press reset **Fault remains** → Switch 270 VAC input off (E-Stop or Servo Power Off) → Remove half of remaining spindles → Switch 270 VAC input on again → Press reset → **Continue the same procedure to isolate the faulted spindle or cable**

Symptom: Error Code	Action	Options Refer to
1 – 1		**Fault removed** → Switch 270 VAC input off (E-Stop or Servo Power Off) → Add half of spindles with jumper cables → Switch 270 VAC input on again → Press reset **Fault remains** → Problem still exists in removed half of spindles or jumper cables → Press reset **Fault remains** → Continue the same procedure to isolate the faulted spindle or cable **Fault removed** → Switch 270 VAC input off (E-Stop or Servo Power Off) → Add half of remaining spindles → Switch 270 VAC input on again → Press reset **Fault removed** → Switch 270 VAC input off (E-Stop or Servo Power Off) → Add half of remaining spindles → Switch 270 VAC input on again → Press reset → **Continue the same procedure to isolate the faulted spindle or cable** → Switch 270 VAC input off (E-Stop or Servo Power Off) → Remove suspected spindle, connect cable to remaining spindles → Switch 270 VAC input on again → Press reset **Problem remains** → Switch 270 VAC input off (E-Stop or Servo Power Off) → Replace jumper cable → Switch 270 VAC input on again **Problem removed** → Switch 270 VAC input off (E-Stop or Servo Power Off) → Replace spindle → Switch 270 VAC input on again

Symptom: Error Code	Action	Options Refer to
1 – 2 Excessive current or short circuit in the intermediate circuit Current >250 A	Check spindles and cables	→ Switch 270 VAC input off (E-Stop or Servo Power Off) → Remove connector XS21 → Switch 270 VAC input on again → Press reset **Fault removed** → Check cable and spindles → Use isolation procedure from Error Code 1 – 1 **Fault remains** → Replace CPS3 module
1 – 3 Temperature of the cooling element is too high (>90° C)	Check amount of spindles on cable	Spindles: Max 16 size 1, max 6 size 2,3,4
	Check ambient temperature	→ Check temperature inside panel **If temperature >70° C** → Reduce ambient temperature (avoid direct sun light, hot air, …) or use additional ventilation
1 – 4 The intermediate circuit inside CPS3 is overloaded. (I^2t Error too much output power)	Check amount of spindles on cable	Spindles: Max 16 size 1, max 6 size 2,3,4
1 – 6 The intermediate circuit voltage is too high (>480 VDC) May also occur momentarily if spindles are breaking	Check amount of spindles on cable	Spindles: Max 16 size 1, max 6 size 2,3,4
	Check CPS	→ Replace CPS3 (defect breaking chopper or reduced capacity of intermediate capacitors)
1 – 7 Intermediate circuit voltage is too low (<250 VDC)	Check amount of spindles on cable	Spindles: Max 16 size 1, max 6 size 2,3,4
	Check 3 phase input	→ Measure voltage at Control On Contactor line terminals. Voltage 240–300 VAC (phase to phase) **Voltage too low (fast voltage logging necessary). Voltage drops at the end of a rundown if much power is needed.** → Check power supply components
	Check CPS3	→ Replace CPS3 → Relay to the switch-on current limiter is defective and permanently open

Symptom: Error Code	Action	Options Refer to
2 – 0 Temperature in CPS3 is too high or too low (T <-40° C or T >+85° C)	Check amount of spindles on cable	Spindles: Max 16 size 1, max 6 size 2,3,4
	Check ambient temperature	→ Check temperature inside panel **If temperature > 70° C** → Reduce ambient temperature (avoid direct sun light, hot air, …) or use additional ventilation
	Check CPS3	→ Make sure CPS3 is not mounted close to or above a hot spot inside the panel **If ambient temperature and CPS3 temperature are ok** → Replace CPS3 (temperature sensor defective)
2 – 1 Switch-on relay contact inside CPS3 does not open	Check CPS3	Detection only occurs when switching on the unit. The relay contact is closed during operation. → Replace CPS3
2 – 2 Intermediate circuit (380 VDC) cannot be discharged	Check 3 phase input	→ Measure voltage at Control On Contactor load terminals. Voltage must be off. **If voltage is present** → Check voltage at Control Relay On output of CPS3, XS3/2 to XS3/4. It must be low. **If voltage is high (approx. 24 VDC)** → Replace CPS3 (defective output) **If voltage is low** → Check wiring → Replace Control On Relay **If no voltage is present** → Replace CPS3 (internal defect)
2 – 3 24 V supply is not within the range 21.5 V–27.3 V	Check CPS3	→ Check input voltage CPS3, XS3/1 to XS3/4 **If voltage out of range** → Adjust output voltage of 24V power supply **If voltage ok** → Replace CPS3 (internal defect)
2 – 5 Internal 5 V supply is not within the 4.5 V–5.5 V range	Check CPS3	→ Replace CPS3 (internal defect)
2 – 7 Error in 15 V driver supply for the braking chopper	Check CPS3	→ Replace CPS3 (internal defect)
3 - 3 Initialization or program error	Check CPS3	→ Replace CPS3 (internal defect)

3.5 Intelligent spindle BTS

	The *Ready LED* lights up green if there are no faults pending after switching on the unit.

Error	Possible causes	Measures and remedies
Ready LED lights up red	Error in the TS	→ The errors or faults that the TS fastening electronics detect are communicated to the station controller via ARCNET and then displayed on the screen, see 4.1 Error messages displayed mPro400SG, page 31
Ready LED lights up orange	Error in the TS	→ Hardware error. Replace TS

4 Troubleshooting

4.1 Error messages displayed mPro400SG

The errors that the TS fastening electronics detect are communicated to the controller via ARCNET and then displayed on the screen.
If an error occurs in the TS or BTS during fastening, the error reported by the TS appears in the *Rundown data table*: for example IP, FLT, FMK, FHW, KAL1, KAL2, OFF1, OFF2, VAP, VLP, AN1F, WG1D…
The *Error log* window opens with a description of the error that has occurred.



→ For more information see Programming Manual.

The *System information* window appears in the *System Bus map*. All current errors are displayed here in descriptive text and listed in the following table.

All errors are logged in the *Logbook* for the mPro400SG can be viewed at a later time.

Error Description	**Possible causes**	**Measures and remedies**
Servo: **IP monitoring: NOK** (also displayed in the rundown data table) Overload If a current higher than the maximum permissible current is required for fastening, TS/TUS switches off automatically.	Error in motor position tracing, e.g. resolver cable	→ Check the resolver wires in the BTS → Replace the BTS or the motor
	Error in the motor circuit, e.g. motor does not attain the required torque	→ Check the motor against PE and phase impedances for short circuits: 1BT… approx. 11 Ω, 2BT approx. 2 Ω, 3/4BT… approx. 0.6 Ω. → Replace motor
	Incorrect programming	→ Check programming in – Spindle constants – Calibration values – Fastening process (sequence) – Parameter set – Targets
Servo: **Intermediate circuit voltage: too high** The voltage in the intermediate power circuit is >440 VDC	Constant error	See CPS3 troubleshooting – no error on CPS3 → Replace the TS
	The error is triggered during braking, i. e. when the BTS stops	See CPS3 troubleshooting – no error on CPS3 → Replace the TS
	Sporadically, the voltage is temporarily too high	See CPS3 troubleshooting – no error on CPS3 → Replace the TS

Error Description	**Possible causes**	**Measures and remedies**
Servo: **Intermediate circuit voltage: too low** The voltage in the intermediate power circuit is <190 VDC	Constant error	See CPS3 troubleshooting – no error on CPS3 → Check the system cable for interruptions → Replace the system cable System cable OK → Replace the TS
	During fastening, error is triggered during the fastening process	See CPS3 troubleshooting – no error on CPS3 → Replace the TS
	Sporadically, the voltage is temporarily too low	See CPS3 troubleshooting – no error on CPS3 → Check the mains power supply for voltage drops
Servo: **Temperature output section: too high** The temperature in the TS output section is > 80 °C	The temperature sensor in the TS measures a temperature > 80 °C	Check temperature if > 80 °C → ensure adequate ventilation of the BTS BTS is ventilated sufficiently → Replace the TS
Servo: **Driver supply outp. section: NOK** The power adapter for the internal supply to the output section is overloaded or defective.	Internal error	→ Replace the TS
Servo: **Offset of current measurement: NOK** The zero point of the integrated motor current measurement has moved	Internal error	→ Replace the TS
Servo: **SSIO communication: NOK** The communication interface between the servo amplifier and the measuring board is faulty	Internal error	→ Replace the TS
Servo: **Node guarding: NOK** The servo amplifier monitors the function of the measuring board (watchdog).	Sporadic malfunction of the measuring board Internal error	→ Replace the TS
Servo: **Flash: NOK** The flash memory in the servo amplifier indicates an error	Internal error	→ Replace the TS
Servo: **Program: NOK** Error in the program execution for the servo amplifier	Internal error	→ Replace the TS → Inform Sales & Service Center

Error Description	**Possible causes**	**Measures and remedies**
Motor: **Motor cable: NOK** The motor cable is defective, motor wire in BTS is broken	Broken motor wire in the TS cable	Check the motor wires for breaks and short circuits → Replace BTS
	Motor phases interrupted	→ Check the motor against PE and phase impedances for short circuits: 1BT… approx. 11 Ω, 2BT approx. 2 Ω, 3/4BT… approx. 0.6 Ω. → Replace motor
	Test current for cable monitoring is misdirected	→ Replace motor Internal error → Replace the TS
Motor: **Short circuit surveillance: NOK** Motor short circuit monitoring There is a short circuit in the motor circuit on the BTS	in the motor	Check the motor for short circuits (for phase impedances, see above) → Replace motor
	In the TS	Internal error → Replace the TS
Motor: **Temperature: NOK** The motor temperature is > 90 °C	The temperature sensor in the motor measures a temperature > 90 °C	Check the motor temperature, if > 90 °C → ensure adequate ventilation of the motor
	Measuring cable in the motor is interrupted	Check the thermosensor for breaks. The resistance should be approx. 1 KΩ at 20 °C → Replace motor
	Measuring current is misdirected	Check the wires in the BTS for breaks and short circuits → Replace motor
	Measuring current is not measured	Internal error, → Replace the TS
	Motor is not connected	→ Connect the motor
Motor: **I^2t monitor: NOK** The I²t monitor has measured excessive power on the BTS	Motor power required is too high	Check the motor temperature, if > 80 °C → Shorten the fastening time by increasing the speed
	BTS is defective (e.g. gearing, bearings, motor)	Check the ease of movement of the gearing and motor on the BTS → Replace the BTS or motor

Error Description	**Possible causes**	**Measures and remedies**
Motor: **Resolver: NOK** No resolver signals measured	Signals are not present	Check whether the motor is connected → Connect the motor
	Signal interruption	Check the resolver wires in the BTS → Replace motor
	Short circuit of signals	Check the resolver wires in the BTS for short circuits → Replace motor
	Supply to the resolver is defective	Internal defect → Replace the TS
Measurement card: **Task monitoring: NOK** Error at the program execution end of the measuring board	Internal error	→ Replace the TS → Inform Sales & Service Center
Measurement card: **RAM:** Insufficient RAM available in the measuring board	Internal error	→ Replace the TS → Inform Sales & Service Center
Measurement card: **Sampling clock from servo: NOK** The system clock from the servo amplifier is missing	Internal error	→ Replace the TS
Measurement card: **Servo type correct: NOK** The selected servo amplifier type is incorrect	Error in programming	→ Check the system programming
	Self-identification of transducer is not OK	Check the transducer → Replace the transducer
	Internal error	→ Replace the TS
Measurement card: **Servo par. matching servo: NOK** The parameter set selected from the measuring board is not present in the TS/TUS.	Error in programming	→ Check the system programming
	Self-identification of transducer is not OK	Check the transducer → Replace the transducer
	Internal error	→ Replace the TS
Measurement card: **ARCNET communication:** **Dup ID** The same ARCNET addresses are preset	Several TS are preset to the same ARCNET address	Check the preset ARCNET addresses → Set different addresses
Measurement card: **ARCNET communication:** **Recon** The ARCNET is temporarily disrupted	ARCNET terminator missing	→ Plug in the ARCNET terminator
	No power supply to the ARCNET terminator	→ Switch on the power supply for the last device
	Error in cabling	→ Plug in all cables and lock
	Internal error	→ Replace the TS

Error Description	**Possible causes**	**Measures and remedies**
Measurement card: **Initialization: NOK** Initialization error in measuring board	Internal error	→ Replace the TS → Inform Sales & Service Center
Measurement card: **Flash image: NOK** Flash image in the measuring board is not OK	Station controller transferred the incorrect program	→ Check the program version
	The program transfer was interrupted	→ Repeat the program transfer
	Internal error	→ Replace the TS
Measurement card: **Voltage +3.3 V (…): NOK** The +3.3 V supply to the measuring board is outside the limits of +3.24 V... +3.53 V	The power adapter for the internal supply to the measuring board is overloaded or has an internal error.	→ Replace the TS
Measurement card: **Voltage +12 V (…): NOK** The +12 V supply to the measuring board and the transducer is outside the limits of +11.4 V... +12.6 V	+12 V short circuiting in BTS	Inspection of the controller in test mode – value outside the permissible limits: Check the KMAG/KMAW cable (transducer – TS), especially the +12 V and 0 V wires. → Replace the cable KMAG/ KMAW → Replace the transducer or BTS
	Internal power adapter defective	→ Replace the TS
Measurement card: **Voltage +24 V (…): NOK** The +24 V supply of the TS/TUS is outside the limits of +20.4 V…+27.6 V	Supply is overloaded	Inspection of the controller in test mode – value outside the permissible limits: → Check the load
	Voltage on power adapter in CPM… is incorrect	→ Set the power adapter to 26.0 V
Measurement card: **Temperature (…): NOK** The temperature of the measuring board is > 80 °C	The temperature sensor in the TS/TUS measures a temperature > 80 °C	→ Ensure adequate ventilation of the BTS
	Internal error	BTS is ventilated sufficiently → Replace the BTS
Transducer: **…Connected: NOK** The signals from the transducer are not OK	The connection to the transducer is – interrupted	Check the KMAG/KMAW cable (transducer – TS) for breaks → Replace the cable → Replace the transducer
	– short-circuited	Check the KMAG/KMAW cable for short circuits → Replace the cable → Replace the transducer
	– unavailable	→ Connect the transducer → Replace the cable
	Internal error	→ Replace the TS

Error Description	**Possible causes**	**Measures and remedies**
Transducer: **Calibration voltage: NOK** The calibration voltage is outside the permissible range of +4.85 V...+5.15 V	The calibration signal is interrupted	→ Check the KMAG/KMAW cable for breaks, especially the calibration signal wire
	The calibration signal is short circuiting with another signal	Check the KMAG/KMAW cable for short circuits → Replace the cable
	Error in the transducer	→ Replace the transducer
	Internal error	→ Replace the TS
Transducer: **Offset value: NOK** The zero-point voltage is outside the permissible range of -200 mV...+200 mV	The torque signal is interrupted	Inspection of the controller in test mode – value outside the permissible limits: → Check the KMAG/KMAW cable → Replace the cable
	The torque signal is short circuiting with another signal	→ Check the KMAG/KMAW cable for short circuits → Replace the cable
	Error in the transducer	→ Replace the transducer
	Internal error	→ Replace the TS
Transducer: **CRC of service memory: NOK** Could not read in the data for self-identification correctly	The data cables are interrupted	→ Check the KMAG/KMAW cable for breaks, especially the signal wires for data transfer (RS422) → Replace the cable
	The data cables are short circuiting with another signal	→ Check the KMAG/KMAW cable for short circuits → Replace the cable
	Error in the transducer	→ Replace the transducer
	Communication was disrupted when the transducer was plugged in	→ Unplug and plug in again
Transducer: **Tool identification: NOK** Station controller does not confirm the data for self-identification of the transducer	Data communication failed / not completed yet	→ See data transfer from the station controller 3.3.2 Logbook – Station related results, page 18 → Acknowledge the TS with <Reset>

4.2 No rundown possible – station

Power

Symptom	Action	Options
mPro400SG – Screen is not on	→ Check power distribution main switch (mPro400SG, CPM…) → Check GFCI → Check fuses → Check input power (3 phases input) → Power plug at the bottom of mPro400SG	→ Use DVM (Digital volt meter) and check status lights

mPro400SG Software

Symptom	Action	Options
mPro400SG is on – no rundown possible	→ See status line	Fault message active → See 3.3.1 Status line, page 17 3.3.3 Monitor Tool: Shut-off cause, page 19 3.3.5 Diagnostics – Tool test, page 22
	→ See rundown result	Fault message → See 3.3.1 Status line, page 17
	→ See ARCNET map	Status of spindles → See 3.3.3 Monitor Tool: Shut-off cause, page 19

CPM…

Symptom	Action	Options
mPro400SG is on – no rundown possible	→ Check *LED Servo Power On* at the front door	**LED off** → Press Start button (on front) → Check *E-Stop* condition → Check 24 V Power Supply **LED on** → See CPS3
	→ Check 24 V Power Supply	→ Check *OK LED* on Power Supply **LED off** → Check input and output voltage → Check input and output fuses (meter required) → Check temperature → Remove output fuse and check output voltage again → Voltage OK: check load side for shorts → Remove connector(s) XS3 on CPS3(s) **Fault removes** Fault in CPS3(s), cables or spindles → Reconnect connector(s) XS3 CPS3(s) → Disconnect XS2-2 on CPS3 **Fault remains** → Disconnect participants connected to 24 V one after the other → Check wiring **Voltage NOK** → Replace power supply **LED on** → Replace power supply
	→ Check CPS3	→ Check 7-segment display → Check connectors, see CPS3 Error Codes → Check *Ready LED* and E-*Stop LED*
	→ Check contactors	**Off** → Check input and output voltage (no output voltage) (meter necessary) **On** → Check input and output voltage (output voltage available) (meter necessary) **Output voltage not available** → Check enable signal (A1 A2) → Replace contactor
	→ Check PNOZ safety relay	Refer to schematic and PNOZ manual for input and output functionality → Check input voltage → Check status lights → Check output voltages

BTS

Symptom	Action	Options
mPro400SG is on – no rundown possible	→ Check spindle	***Ready LED* red** → See 3.3.1 Status line, page 17 for error → Check cables ***Ready LED* does not light up** → Measure the voltage 24–26 V at "XS1B", sockets A and B → Check the error display on the CPS3 → If error present, go to Display for Error Codes: 7-segment display, page 25 → Replace the system cable → Replace TS

Cable

Symptom	Action	Options
mPro400SG is on – no rundown possible	→ Check cable	→ Check red locking ring **If visible** → Reseat and latch → Check for excessive strain → See separate manual P2102JH Cable Management Reference Guide

ARCNET Terminator

Symptom	Action	Options
mPro400SG is on – no rundown possible	→ Check ARCNET terminator on last spindle	→ Check presents of ARCNET terminator → Check red locking ring **If visible** → Reseat and latch → Replace terminator

4.3 No rundown possible – single spindle

4.3.1 Identifying which spindle has failed

In order to determine which spindle is causing the fault, isolate the spindles one at a time. This can be done by either

- disconnecting all spindles except the first one
- building the system back up again, one spindle at a time
- by bypassing one spindle at time until the CPS3 fault can be reset.

If there is a large number of spindles in the system, it may be advantageous to divide the spindles into subgroups. See if values are stable 3.3.4 System information – Arcnet, page 20.

System example with 10 spindles

1. Switch off power. E. g. activate emergency stop.
2. Disconnect spindle 5 from spindle 6.
3. Connect ARCNET terminator on spindle 5.
4. Switch the power back on. If the fault does not occur, it is logical to assume that spindles 1 through 5 are OK and that the fault lies in spindles 6 through 10.
5. Re-connect spindle 5 to spindle 6 and then disconnect spindle 7 from spindle 8. If the fault occurs the defect is in either spindle 6 or spindle 7. See procedure 1–4.



Proceed through the spindles by dividing them into smaller sub groups until the defective spindle is isolated.

Note: Physical Bypass a Spindle

→ Step 1: Disconnect the power cables.

→ Step 2: Connect the power input cable to the power output cable.

→ Step 3: Switch power back on again use the system diagnostics to test run each spindle (Diagnostics / Tool / Select Spindle / RPM Test).



- If the CPS3 shuts down again, reconnect the bypassed spindle and bypass the next spindle until the defective spindle is found.
- If you wish to operate the nutrunner system with an electrically bypassed spindle, you must also delete that spindle from the Programmable I/O map.

mPro400SG Software

Symptom	Action	Options
mPro400SG is on – no rundown possible	→ See rundown result	Fault message active → See 3.3.1 Status line, page 17 3.3.3 Monitor Tool: Shut-off cause, page 19 3.3.5 Diagnostics – Tool test, page 22
	→ See application settings	Fault message → See P1730E System description Fastening sequences

BTS

Symptom	Action	Options
mPro400SG is on – no rundown possible	→ Check spindle	***Ready LED* red** → See 3.3.1 Status line, page 17 for error → Check cables ***Ready LED* does not light up** → Measure the voltage 24–26 V at "XS1B", sockets A and B → Check the error display on the CPS3 → If error present, go to Display for Error Codes: 7-segment display, page 25 → Replace the system cable → Replace TS

4.3.2 Transducer

When an operating failure occurs, the torque output is set to an output value of >6.5 V and an error bit is set in the operating data memory.

Error Description	**Possible causes**	**Measures and remedies**
Output signal is not linear	Measuring hub was overstretched	→ Send the transducer to Sales & Service Center for repair / recalibration
Offset voltage is too high	Measuring hub was overstretched	
No output signal	Transducer is defective	
Torque output is set to an output value > 6.5 V Error bit is set in the operating data memory	**CPU NOK** • internal transmission to D/A converter fails	
	HF section NOK • HF telemetry transmission fails • no measuring shaft (rotor) present • rotor electronics defective • gap between rotor and stator antenna too large	
	Supply voltage NOK • voltage under low supply voltage limit	

After an operation error, the transducer remains in the "operation error" state until one of the following events occurs:

- the operating voltage of the transducer is disconnected
- the transducer receives a calibration signal via the CAL input (pin K).
- the error bit in the operating memory is reset via the RS422 interface.

Cable

Symptom	**Action**	**Options**
mPro400SG is on – no rundown possible	→ Check cable	→ Check red locking ring **If visible** → Reseat and latch → Check for excessive strain → See separate manual P2102JH Cable Management Reference Guide

5 Secondary information

No.	Document
P1730E	System description Fastening sequences
P1916E	Assembly instructions BTS
P1917E	Systemhandbook BTS
P1918E	Assembly instructions Tightening module TS/TUS
P1919E	Assembly instructions Supply module CPS3
P1921E	Service manual BTS
P2102JH	Cable Management Reference Guide
P2128BA	Service manual ARCNET HUB

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