

Operating Manual

BROSA 0656 FlexLim Electronics



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Abbreviation

Abkürzung	Benennung
BSCT	BROSA System Configuration Tool
PuTTY	Terminal Program (Freeware)
POM	Point Of Measurement
LC	Location of Sensor
EEPROM	Electrically Erasable Programmable Read Only Memory
LSC	Load Spectrum Counter

1 General information

1.1 About this manual

This manual describes the features and operation of the BROSA 0656 System. It is intended to be used by qualified and authorized personnel for the handling and calibration of a BROSA 0656 system.

The manual is an integral part of the BROSA 0656 System and the FlexLim Safe firmware from the manufacturer.

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The manual explains the functions, general settings and calibration as well as troubleshooting for the BROSA 0656 FlexLim overload protection and weighing system using the FlexLim (Safe) operating system software.

It highlights the possible use of the system as well as the required qualification of the technical staff.

Before starting up the BROSA electronics 0656 FlexLim, read the operating instructions and the product-specific documents carefully.

Make sure that the electronics are fully suitable for the relevant applications.

Improper or non-intended use can lead to malfunctions in the electronics or to unwanted effects in your application. For this reason, assembly, electrical connection, commissioning and maintenance of the electronics may only be carried out by trained specialist personnel authorized by the system operator.

We also expressly point out that any liability is excluded if the instructions in this documentation are not observed.

Current certificates are available for download on the BROSA GmbH website.

Only the German version of the operating instructions represents the original document.

Please keep the instruction manual for future reference and the foreseeable lifespan of the product!

1.2 Disclaimer

The manual and the examples listed are protected by copyright. All rights reserved. This manual may not be copied or reproduced in whole or in part without the prior written consent of the manufacturer.

We hereby expressly point out that no liability can be assumed for parts or accessories that were not supplied by BROSA or not tested by BROSA to ensure they function correctly with the system. The use of such parts or accessories could adversely affect the overall security of the system.

The manufacturer reserves the right to change the content and form of this manual without prior notice. There is no maintained distribution list for this manual.

The manufacturer assumes no liability for content or typographical errors in this manual and for damage that arises directly or indirectly from the use of this manual.

Any modifications to the electronics and the sensors supplied are prohibited and will result in the loss of warranty / guarantee.

Nevertheless, deviations cannot be ruled out, so that the manufacturer cannot guarantee full compliance. The information in this publication is checked regularly and any necessary corrections are included in subsequent editions.

The manufacturer assumes no liability for damage or injury resulting from improper or improper use of the system. This risk is the sole responsibility of the user.

The manufacturer has checked the content of this document for agreement with the hardware and software described.

1.3 Safety instructions and warning symbols

For the sake of clarity and readability, icons are used to alert readers to important information:



Warning of imminent danger. Non-observance poses a risk to life and limb. Material damage to devices and equipment can occur.



Indication of a possible risk of electric shock. Parts marked with this symbol must never be touched.



Indication of a section with additional information and useful tips.

The sections labelled with the icons shown above contain important information and deserve special attention as you read this manual. Failure to observe the icons or recommendations will result in a significantly increased potential for risk.

1.4 Warnings and important information



Depending on the individual configuration, some systems can also be equipped with a 230V AC power supply (details can be found in the system documentation). This is indicated by a corresponding warning symbol on the voltage transformer and the relays. Although these parts are protected against direct contact, special caution should be exercised near them.



1.5 Intended Use



The BROSA 0656 electronic system is an overload protection and weighing system for crane systems, an important aid for the operation of cranes. The device provides the operating staff with all the information required for safe operation within target values when lifting. The system is designed and constructed to comply with all applicable safety standards.



The system may not be used for purposes other than those mentioned above. Improper use of the system endangers the life of the operating staff and other persons and may result in damage to the machine or property.

It is crucial that the system is always in perfect condition. In systems that consist of a large number of electronic and mechanical components, the occurrence of errors can never be completely ruled out. Such errors constitute a potential security risk and must therefore be remedied promptly by qualified technical staff.

An overload protection system is no substitute for good judgement, for experienced operating staff or for the necessary safety regulations during operation and the system should therefore also not be misused for this purpose.

1.6 Reasonably Foreseeable Abuse

Despite their robust design, BROSA systems must not be used for anything other than the intended purpose. Improper use may endanger the life and limb of the user or third parties and/or damage to the device in which the system is implemented or other property. Maintenance and repairs must not be carried out by untrained personnel. Likewise, the operation of the product in the private sector is prohibited. BROSA accepts no liability for damage resulting from non-compliance with the intended use. The risks lie with the user if the product is not used as intended. Never operate the product in potentially explosive areas.

1.7 Qualification and responsibility of the operating staff

To ensure safe operation of the system and crane, calibration and adjustment of the system by a qualified technician is mandatory. The technician must meet the following requirements:

- He/She has the necessary authorisations and has been sufficiently trained.
- He/She has read and understood this manual or received appropriate instruction or training.
- He/She is familiar with the operation of the system.
- He/She knows the relevant safety standards and accident prevention regulations.

A person's knowledge regarding the operation of the system does not automatically mean that this person is authorised to operate the system.



Responsibility for safe operation of the system and the crane lies with the operating staff. It must be ensured that the operating staff has understood all the information given here about operating safety and also follow it.

2 System description

The BROSA 0656 electronic system together with the BROSA “Flexible Limiter” (FlexLim (Safe, Weighing)) operating system software is a flexible overload protection or weighing system for crane systems. The system continuously monitors the various functions and operating conditions of a crane using a wide variety of external sensors (e.g. force sensors, angle sensors). An external display can be added to the system. The operator then receives permanent feedback (both visible and audible) about the operating status of the crane during lifting operations. The outputs on the display (sensor data, calculated values, utilisation percentage values, etc.) are adapted to the existing crane system and the configuration of the application.

Optionally, the BROSA 0656 electronic system can be used as a weighing system in accordance with SOLAS. Handling essentially corresponds to use as an overload protection, which is why explicit mention of this is omitted in the following.

The BROSA system is based on the 0656 electronic platform with the following features:

- 8 (typ.) CANopen nodes (ID 11 – ID 18)
- 2 analogue outputs
- 8 digital inputs
- 8 digital outputs + 1 system error output
- RS232 interface
- RS485 interface
- PROFINET interface (slave)
- PROFIBUS interface (slave)
- CANopen interface (slave)

For additional technical details, see chapter 6.

Each system can be adapted to the specific needs of a customer using BROSA’s FlexLim Safe operating system software. As the name implies, FlexLim Safe flexibly allows for the creation of customised load limiting applications. Depending on the version, the system achieves SIL 2 (PLd)

The software consists of predefined modules (inputs, outputs, comparators, mathematical operators, etc.) that can be combined appropriately to achieve the desired functionality. Each module has a number of specific parameters which can be changed either directly in the system (display) or by means of a PC connected via the RS232 interface. The function

of these parameters is application-dependent and is explicitly listed in a separate software description.

2.1 System Layout

Depending on the configuration level the system may differ but in general the following components are used in the 0656 Electronics

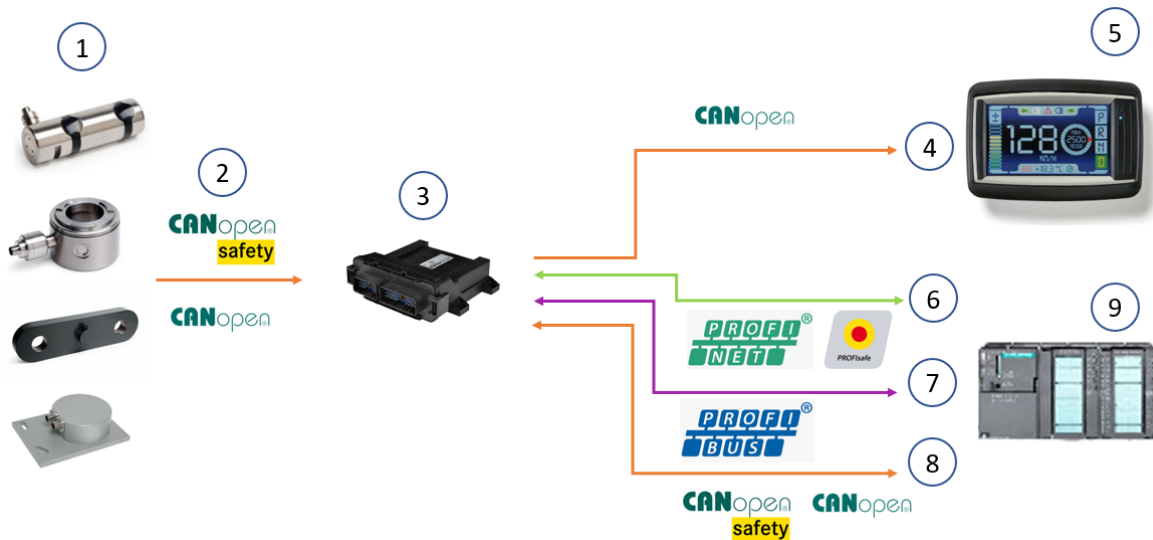


Figure 1: Standard system layout

Nr.	Designation
1	BROSA Sensors
2	CANopen (Plain / Safety) Communication
3	BROSA Electronics 0656 FlexLim
4	CANopen Communication
5	Display 4,3" / 7" (optional)
6	PROFINET / PROFINET safe bidirectional Communication
7	PROFIBUS bidirectional Communication
8	CANopen bidirectional Communication
9	Crane PLC

2.2 Topology of the CANopen network

According to standard ISO 11898-2:2003, BROSA uses only the trunk line topology to connect the Sensors to the 0656 System electronics. The Sensors are either equipped with 2 connectors (CAN In / CAN Out) or a T-Splitter can be used (Available on request)

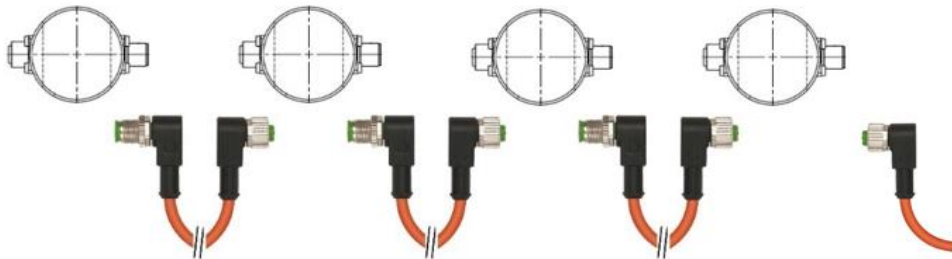


Figure 2: BROSA CAN BUS topology

The termination of the can line requires 120 Ohm resistors on both ends. A 120Ω Termination resistor (M12x1) is available at BROSA on request if not scope of supply.

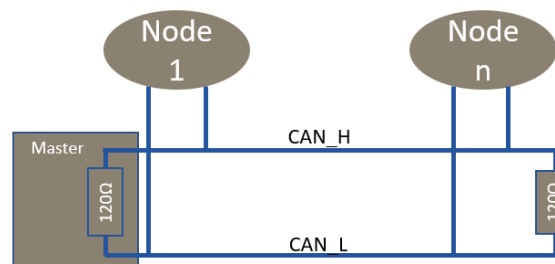



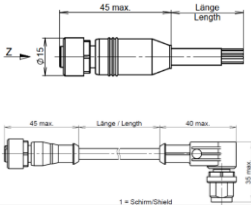






Figure 3: CAN Bus Termination at both ends


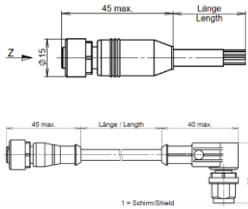




Note : If you intend to use other topology structures as the trunk line mentioned above, BROSA will not be liable for the functionality.

2.3 Scope of delivery

The BROSA Electronics 0656 FlexLim is available in three versions with the following options. The software is always customer-specific and is adapted to the corresponding application by the customer.

Execution	Electronics 0656 FlexLim	Cable	Display	Sensors
1	<p>Pre-wired on mounting plate with all modules for interface communication</p> 	<p>CANopen connection and connection cables to the sensors are optional and available on request</p> 	<p>Optionally with customer-specific design and on request</p> 	<p>Custom designs</p> 
2	<p>Electronics 0656 FlexLim</p> 	<p>Connection cable with open cable ends for the electronics 0656 FlexLim</p> 	<p>Optionally with customer-specific design and on request</p> 	<p>Custom designs</p> 

3	<p>Electronics 0656 FlexLim pre-wired on mounting plate in the housing</p> 	<p>CANopen connection and connection cables to the sensors are optional and available on request</p> 	<p>Optionally with customer-specific design and on request</p> 	<p>Custom designs</p> 
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2.4 Cables

BROSA offers a wide range of cables which has been approved in combination with the 0656 System electronics. All cables are shielded and certified for the use in CANopen networks. Further Information on request.



Note : If you intend to use cables which not have been approved by BROSA, we will not be liable for the functionality.


2.5 Display 4.3" / 7" (optional)

If requested a graphical Display with a screen of 4,3" or 7" can be supplied by BROSA. The Design can be customized and therefore differs in each project. The Communication between Display and 0656 System Electronics is CANopen based. For further Information please contact BROSA.




Figure 4: Display Example with Layout-Design

3 Instructions for safe handling of the BROSA electronics 0656 FlexLim

 **DANGER!** Non-observance of the following instructions can lead to damage to the electronics and/or impaired measurement results. Evaluating an incorrect measurement can result in personal injury and/or property damage.

3.1 Handling / Transport


 **DANGER!** The BROSA electronics contain high-quality measurement technology! Pay attention to careful handling!

- BROSA electronics are delivered in transport-safe packaging. We recommend that you only remove the electronics from the packaging immediately before installation. Only transport the electronics in the original packaging to avoid damage to the product. Secure the electronics during transport to avoid unexpected shocks.
- When selecting suitable handling devices and/or tools, the connection issues for the electronics must be taken into account (see the wiring diagram supplied).
- BROSA electronics must be secured against falling. Don't throw electronics!
- Use as a tool (e.g. impact, impact or lever tool) is not permitted; it can damage the electronics and thus falsify the measurement result. This also applies to the sensors supplied.

3.2 Installation and Commissioning

It is recommended to carry out the following measures in the given order using the four-eyes principle.

- a) Checking the assignment of the electronics to the rest of the electronics: It must be ensured that the electronics to be installed are intended for use at the intended location (in the control cabinet / externally). For this purpose, the information on the technical data sheet and the type plate, in particular the article or ID number and the measuring range of the sensors, must be compared with the data from the measuring point. In addition, the information from the supplied application description and application structure must be observed.

 **DANGER!** Electronics that are not intended for the respective machine must not be installed!

-
- b) Checking the electronics for intactness and function: It must be ensured that the electronics to be installed are free of any kind of damage.



DANGER! Damaged electronics must not be installed!

- c) Installing the electronics: The electronics must be installed in accordance with the drawing and the associated sensors and, if necessary, must be aligned accordingly on a designated support surface.



DANGER! The supplied force measurement sensors (further details in the respective operating instructions for the sensors) must not be installed or aligned using impact tools!

After the alignment that may be necessary depending on the sensor type, the force measuring sensor must be secured against movement and twisting with the elements provided for this purpose. Here, it may be necessary to ensure that the force measuring sensor is correctly aligned with the intended measuring direction according to the existing markings.



DANGER! An incorrectly aligned sensor (further details in the respective operating instructions for the sensors) leads to falsification of the measurement result!

- d) Making the electrical connection: The elements for the electrical connection on the sensor and the electronics, possibly including the grounding connection, must be connected to the power supply and the evaluation system of the device. The information on the connector or cable assignment given on the type plate and, if applicable, the laying instructions for the cable must be observed. Please note the supplied wiring diagram for the electronics with the connections specifically developed for the application.



DANGER! A faulty or incomplete electrical connection impairs or prevents the measurement.

- e) Functional test: After the mechanical and electrical installation has been completed, the electronics and the sensors must be loaded/checked over the entire intended measuring range if possible; the output measurement signals must be subjected to a plausibility check.



DANGER! If, due to unusual perceptions (e.g. deformation or unusual noise), implausibility of the measurement results or other reasons, there is a suspicion that there is a malfunction in the electronics or the sensors, they must not be put into operation.

3.3 Operation and Maintenance

3.3.1 Operation

BROSA electronics work automatically, tools need to be attached for operation. Direct manual intervention by the operator is necessary, which means that there are requirements for the operator's protective equipment during use. The relevant safety regulations for electrical systems of all voltage levels must be observed. The work may therefore only be carried out by a trained electrician, in compliance with the 5 safety rules (1. disconnect, 2. secure against being switched on again, 3. determine that there is no voltage, 4. earth and short-circuit, 5. cover or fence off neighboring live parts.) be performed.

BROSA electronics emit neither airborne noise nor electromagnetic radiation.

The operation of BROSA force measuring sensors is only permitted within the framework of the parameters and properties specified in the technical data sheets and on the type plate. Among other things, these are:

- Measuring range
- Temperature range
- Permissible supply voltage
- Electrical protection class
- Material

It must be ensured that no parasitic influences such as forces or moments transverse to the measuring direction are passed through the force measuring sensor.

Inductive or capacitive coupling to the connection cable(s) of the electronics and the sensor can falsify the measurement result and should therefore be avoided. Coupling of this type can be caused, for example, by unfavorable cable routing (high-voltage lines running in parallel, frequency converters, transformers, motors, incorrect earthing/shielding, etc.).

When electro-welding near the sensor, all connections must be disconnected and insulated. It must be ensured that no welding current flows through the sensor.



DANGER! Operation outside of the specified parameters or contrary to the existing properties or improper use can damage the electronics and the sensor and lead to its failure or result in incorrect measurement results. If the sensor is overloaded, this can lead to an equally overloaded machine as a whole and possibly jeopardize its stability.

3.3.2 Maintenance

In their capacity as a control unit, BROSA electronics are maintenance-free. As information-transmitting and calculating elements, however, they are subject to time-

related stresses, so all electronics must be checked regularly to ensure they are in perfect condition. The intervals between the checks depend on the intensity of use and must be specified by the end user.

An exam contains the following points:

- Visual inspection for damage to hardware and wiring as well as dirt
- Function test / plausibility check

The causes of existing errors must be identified and remedied. If the check reveals any indications that the electronics are not in a proper condition, they must no longer be operated. If a malfunction or damage to the electronics or the sensor is detected, these must be sent to the manufacturer for diagnosis and repair, if necessary.



DANGER! The electronics may only be repaired in the factory. If someone other than the manufacturer works (e.g. opening, mechanical processing, etc.), safe operation of the electronics can no longer be guaranteed and will void the warranty.

3.4 Dismantling

It is recommended that you perform the following actions in the order given.

- a) Before any disassembly, the 5 safety rules must be observed: 1. Disconnect, 2. Secure against being switched on again, 3. Ensure there is no voltage, 4. Earth and short-circuit, 5. Cover or fence off neighboring live parts.



DANGER! Failure to comply with the 5 safety rules poses serious risks to the life and limb of bystanders and can cause major damage to property.

- b) Loosen the mechanical connecting elements such as fastening screws
- c) Removal of the mechanical securing elements
- d) Removal of the BROSA electronics 0656 FlexLim



DANGER! If the electronics are to be reused, they must not be connected with force at the plug connections!

3.5 Storage

The electronics must be stored in a safe place that prevents the electronics from falling. The storage location must be clean, dry, weatherproof, cool and protected from direct sunlight. The storage temperature must be between +10°C and 25°C and must not exceed

+30°C. The operating temperatures can deviate from these temperatures. Please note the information from the product's technical data sheets.

3.6 Disposal

When the end of the service life has been reached, the electronics must be disposed of in an environmentally friendly manner. Since the non-metallic components represent a small proportion of the mass of the electronics, they can all be recycled as electronic waste. The electronics must not be disposed of with household waste.

If the electronics are stored prior to final disposal, a suitable storage location must be selected that prevents harmful substances from entering the environment. If necessary, the electronics must be cleaned.



DANGER! BROSA electronics contain traces of environmentally hazardous substances. This also applies to contamination caused by use. Contamination of the environment by these substances must be prevented.

4 Access to Service menu

The 0656 FlexLim electronics offers 2 different methods for calibration and setting of system parameters:

- PC with VT100 emulation (e.g. Putty in MS Windows) via the RS232 interface.
- External display 0680

The menu structure differs depending on the interface used. Input and menu guidance also depend on the periphery used.

4.1 External display 0680

BROSA provides* an External Multidot Display called Type 0680

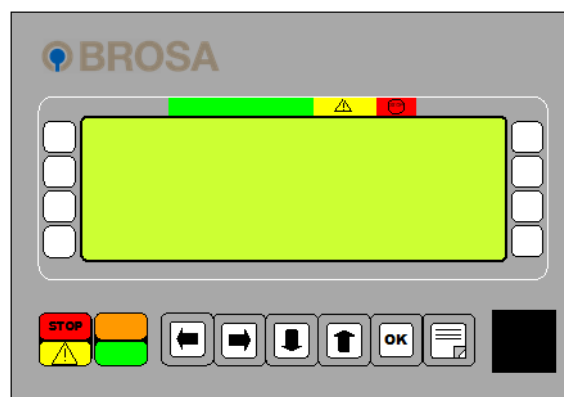


Figure 5: 0680 Display Layout

*This article is an discontinued model

The external display uses the built-in navigation keys to select menus and to enter parameter values.

4.1.1 Selecting the service menu








Press the “ESC” key to open the service menu.

4.1.2 Scrolling through the menu











The display can only show 4 lines at a time. If the menu consists of more lines, you can scroll up or down using the corresponding arrow keys.

4.1.3 Making a menu selection

-  Press the “ENTER” key. The menu then scrolls to the “select” option and a “1” is displayed in the first input field.
-   You can change this value to that of the menu to be selected by pressing the corresponding arrow keys (up or down).
-  Press the “ENTER” key to confirm your selection.
-  If the selected menu is incorrect, press the “ESC” key to return to the previous menu.

4.1.4 Entering a parameter value

-  Press the “ENTER” key. A “1” is displayed as a default in the first input field.
-   Change this by pressing the up and down arrow keys on the first digit of the parameter value.
-  The arrow key to the right moves the cursor to the next input field and a preset “1” is displayed.


Repeat this process with the remaining digits.
-   The left and right arrow keys can be used to move between the input fields.
-  Press the “ENTER” key to confirm the input value.
-  If you do not want to change the parameter value, press the “ESC” key to exit value entry and go to the next parameter or return to the previous menu.

4.1.5 Display set-up

From display software V1.0.2, there is a “Set-up menu” to select the following:


- Display test
- Baud rate selection
- Bootloader mode

4.1.6 Selection of the “Set-up menu” display


 Press the “ESC” key and turn on the display.

```
Setup menu :  
←: Display test  
→: Baudrate  
↓: Bootloader
```

4.1.7 Display test


 Press the left arrow key to scroll through the display test routine. The software version is displayed and the display goes through a test cycle.

4.1.8 Baud rate selection (conversion)

 Press an arrow key to change the baud rate. Default setting of the 0656 System is 38400bd (38k4)

```
Change baud rate:  
Old baud rate: xxKx  
Baud rate: 9K6/38K4  
Press key: ←/→
```

 Press the arrow key to the left for 9600bd

 Press the arrow key to the right for 38400bd



Note: This option changes the baud rate of the display. To ensure functioning communication with the system, the baud rate of the system must first be switched.

4.2 Computer with PuTTY terminal emulation

4.2.1 Required equipment

- Notebook with RS232 interfaces or USB with corresponding interface cable (USB to RS232)
- Terminal emulation program (e.g. PuTTY in MS Windows)

4.2.2 Connection of a PC to the 0656 electronic system

Connect a serial port of your PC to the 0656, as shown below:

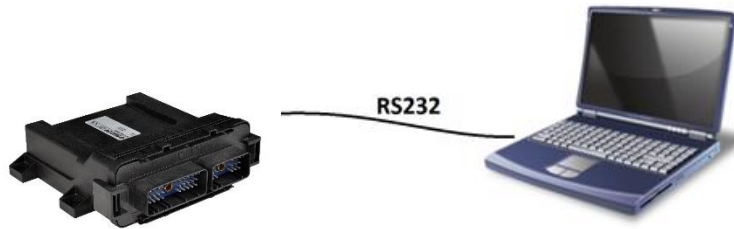


Figure 6: Principal connection



Note: Most Applications are equipped with a SUB D9 Module for the RS232 Interface. If no RS232 SUB D9 Module is present, please connect to the following contacts:

Designation:	Contact:
RS232_TXD_OUT	FL3
RS232_RXD_IN	GL1

4.2.3 Configuration of the VT100 terminal

Most VT100-capable terminal emulations should be compatible with FlexLim. However, you must make sure that the following parameters are set correctly. (Please refer to the documentation of your emulation program to see which parameters are named and how to set them):

- COM port: Set to the port to which the RS232 cable is connected.
- Baud rate: 115200 bps
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

You need a terminal program for configuration. The following examples were created with the free terminal program PuTTY.

4.2.3.1 Selection of the connected COM port

Set as shown:

1. Select the configuration menu in PuTTY.
2. Open the "Session" tab.
3. Set everything as marked in yellow in Fig. 7 "Com Port Selection".

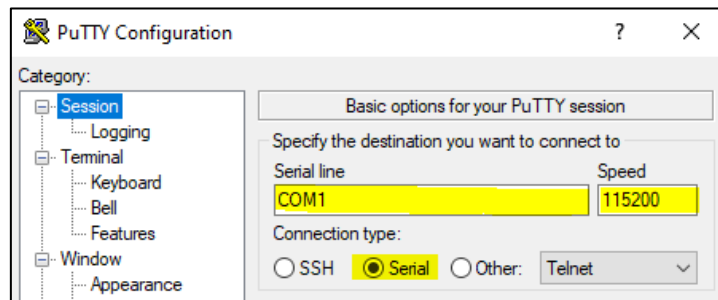


Figure 7 COM port choice

4. Now open the "Connection" tab.
5. Then open the "SSH" tab.
6. Select the "Serial" item.
7. Set everything as shown in "Fig. 8 Serial parameters" marked in yellow.

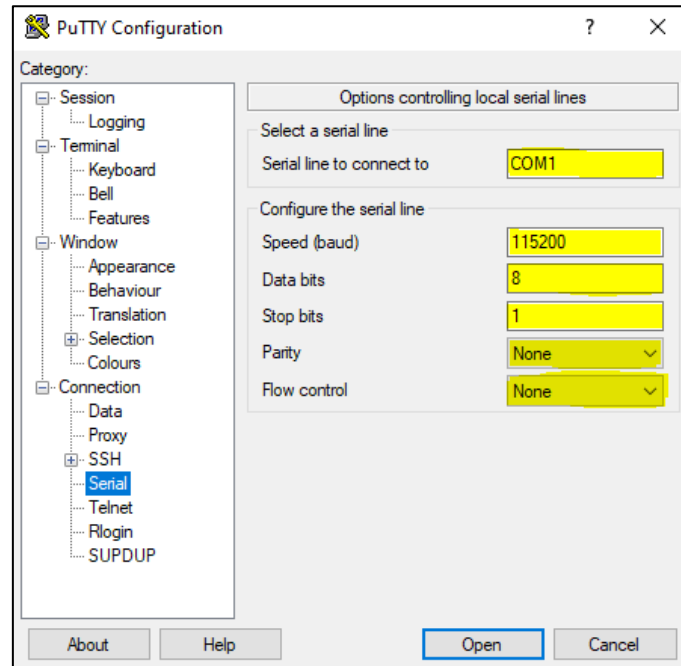


Figure 8: Serial parameters

8. Next, select "Keyboard" in the "Terminal" tab.
9. Set everything as shown in "Fig. 9 VT100 Settings" marked in yellow.

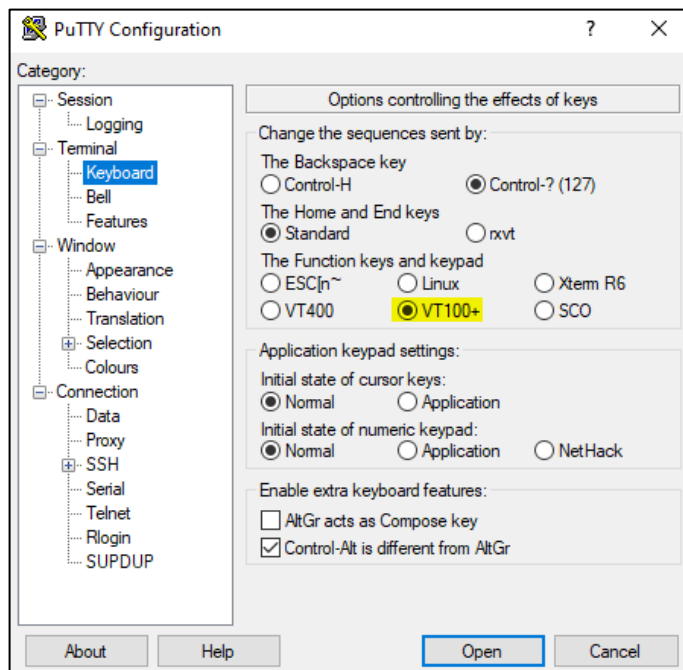


Figure 9: VT100 Settings

5 Using the Service menu

The service menu provides the possibility to adjust the 0656 System electronics to your designated machine. The parameters vary in each application and will be documented in the software description or the commissioning protocol of your project.

Only the parameters defined in the system configuration are displayed. For example, in a system configured with 3 CANopen inputs, only the inputs actually used by the program will be available for selection (though the BROSA 0656 system supports more channels on the software side). If there is no configuration available for the selected option, the system will indicate this by the "Nothing to select" indicator.

The selection menu basically offers the adjustments of:

- CANopen inputs
- Digital inputs / outputs
- Constants (2) and (3)
- Load spectrum counter
- Comparators

Each parameter can also be assigned its own units of measure. For example, in the block diagram above, the CANopen inputs are load sensors. They therefore record signals in tonnes [t]. Depending on the application, these could just as well be configured to output values in metres, kilonewtons or degrees. Although the parameter values can be changed at any time by changing to the machine setting input mode (see description below), the units of measure are application-specific. They can therefore only be set in the phase of program implementation.



Note: The parameters used in your project may differ and will be shown in the specific software description or commissioning protocol

5.1 Access with Terminal program over RS 232

To get access to the Service Menu please use the following steps:

1. Power off the 0656 System Electronics
2. Connect your PC with the RS232 Interface on the 0656 System Electronic

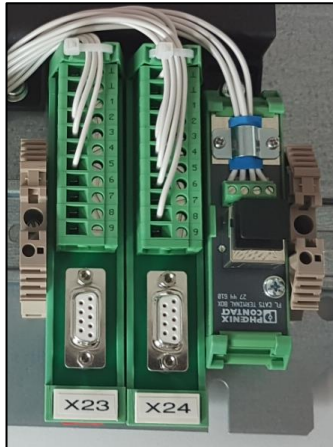
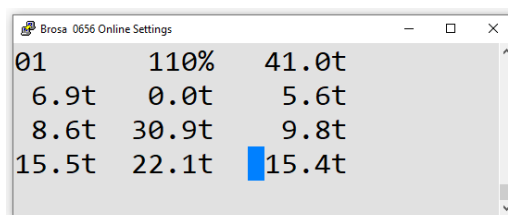


Figure 10 :RS232 SUB D Connector (X23) at 0656 System

3. Choose the Parameters in your Terminal program as shown in chapter 4.2.3
4. Open the Session via PuTTY
5. Power on the 0656 System Electronics

The main display with live values appears at your screen as shown in the example below.

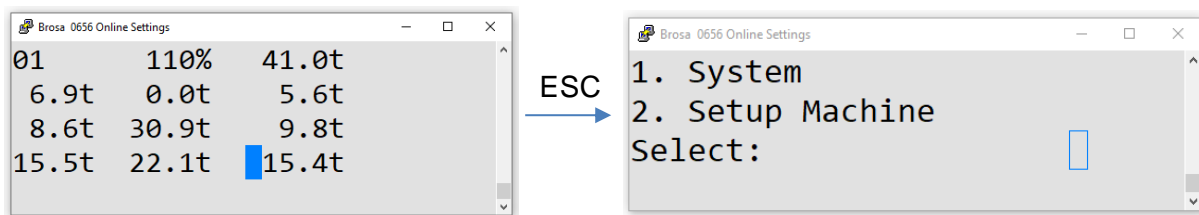


5.2 Navigation

This chapter contains instructions for navigating through the system structure of the 0656 via the terminal program PuTTY.

5.2.1 Selecting the service menu

Press the “ESC” key to open the service menu.



5.2.2 Making a menu selection

Select the desired menu by pressing the corresponding number on the numeric keypad.

Press “ENTER” twice to select the menu corresponding to the input.

If the selected menu is incorrect, press the “ESC” key to return to the previous menu.

5.2.3 Entering a parameter value

Enter the full parameter value on the numeric keypad.

Press the “ENTER” key twice to confirm.

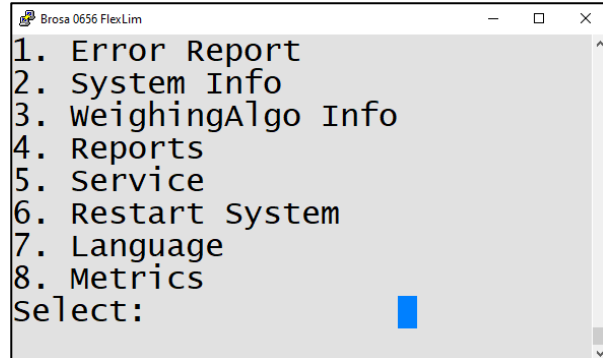
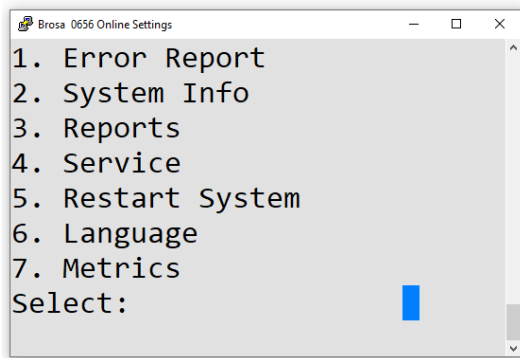
If you do not want to change the parameter value, press the “ESC” key to exit value entry and go to the next parameter or return to the previous menu.

5.3 System (No PIN required)

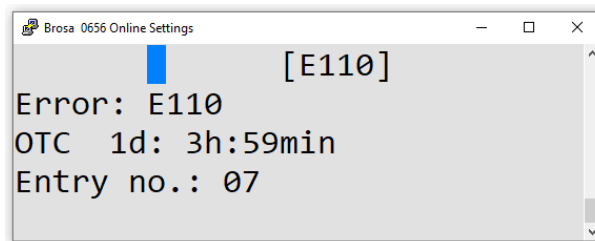
The System path provides all necessary information to maintain the 0656 System Electronics



Note: This menu section is accessible without pin, as no changings in terms of system security can be done



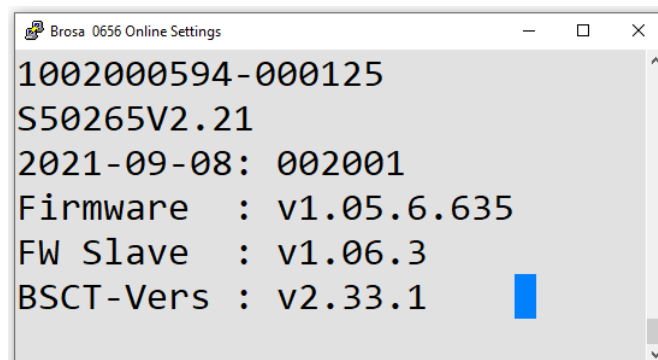
5.3.1 Error Report



“ESC” and “ENTER” will scroll through the recorded error list. For leaving the Error Report the system needs to be restarted or the combination "1+ <Enter>" must be entered.

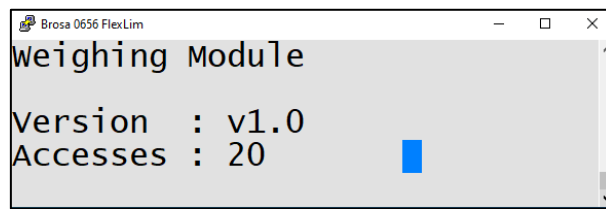
5.3.2 System Info

An example of the system info layout is shown in the picture below.



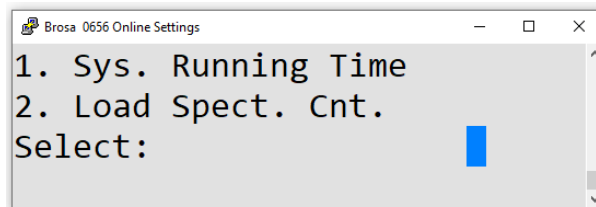
The System Info shows the important information about the project reference as well as the name of the application software and the tools that were used to create it. This information needs to be given to the manufacturer when enquiring for assistance.

5.3.3 WeighingAlgo Info



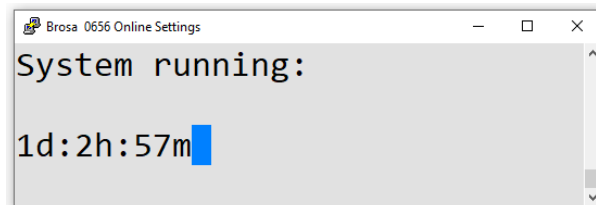
It shows of the current Weighing Module version and the number of times the password-protected weighing parameters have been accessed.

5.3.4 Reports



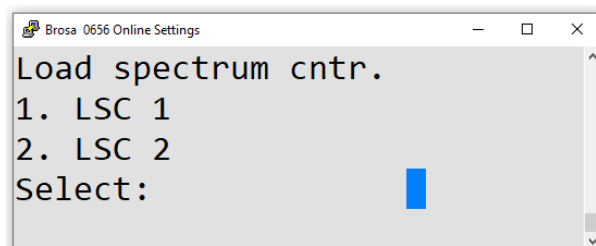
Select between System Running time and Load Spectrum Counter (LSC)

5.3.4.1 System Running Time

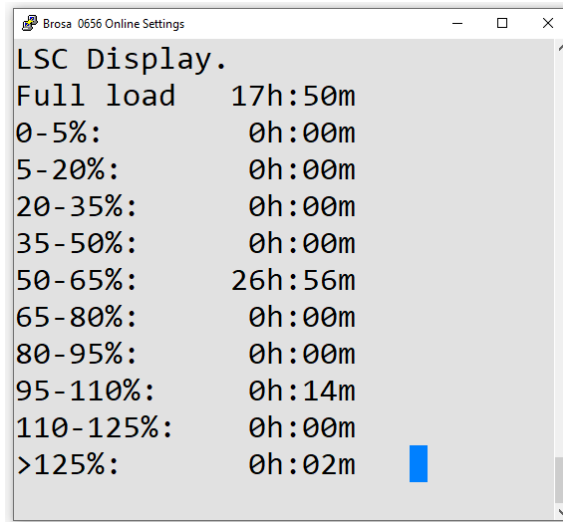


Shows of the current operating time of the system.

5.3.4.2 Load Spectrum Counter

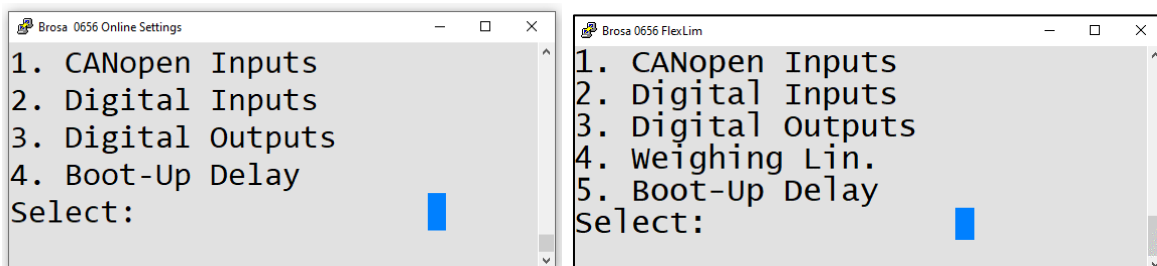


If one or more LSC are implemented in the project, they are visible at this section. A maximum number of four LSC is possible.



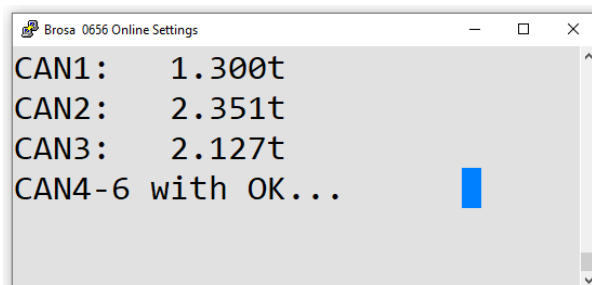
The Load Spectrum Counter shows the full load hours and the distribution according to utilization.

5.3.5 Service



Information of different types of input can be chosen

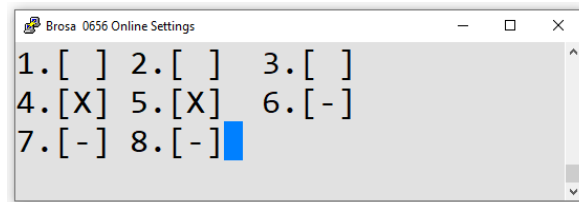
5.3.5.1 CANopen Inputs



Displays the current sensor data of each sensor. The number of sensors that are available depends on your application.

By pressing the "ENTER" key the CAN lines 4-6 will be shown. The definition of CAN 1-8 corresponds to the NODE 11-18 of the sensors.

5.3.5.2 Digital Inputs



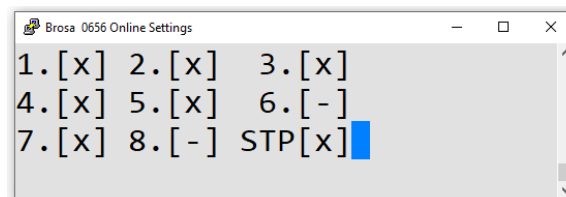
Shows the sensor data displayed on the digital inputs.

[-] Not active

[X] Input high (approx. supply voltage VDC)

[] Input low (0VDC)

5.3.5.3 Digital Outputs + System Error



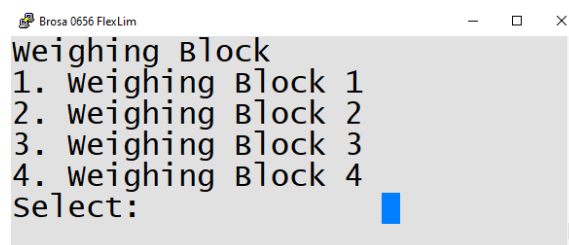
Displays the states of the digital outputs.

[-] Not active

[x] Input high (approx. supply voltage VDC)

[] Input low (0VDC)

5.3.5.4 Weighing Linearization



It shows the individual weighing modules that are used for service purposes, e.g. for on-site calibration.

Each weighing module shows a total of 16 values that are used for linearization and commissioning of sensors.

```
Brosa 0656 FlexLim
lin [IN] lin [OUT]
-10.0 -10.00
 1.0  1.00
 1.0  1.00
 1.0  1.00
 1.0  1.00
 1.0  1.00
 1.0  1.00
 1.0  1.00
 1.0  1.00
 1.0  1.00
 1.0  1.00
 1.0  1.00
 1.0  1.00
 1.0  1.00
 100.0 100.00
 100.0 100.00
 100.0 100.00
```



Note: The entered values must be entered in an ascending order.

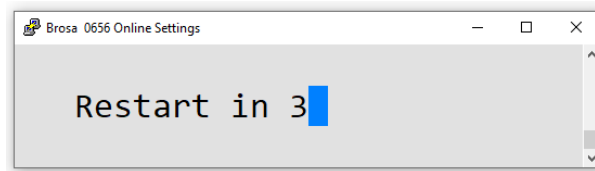
5.3.5.5 Boot-up Delay

```
Brosa 0656 Online Settings
Boot-Up Delay
Curr. val.:
  0 ms
New Value:[ ]:
```

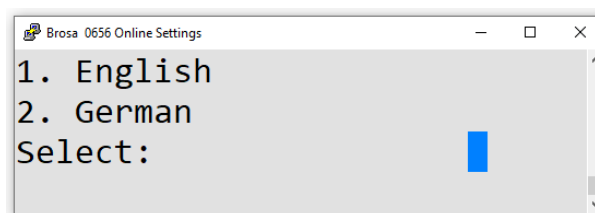
Defines a delayed start of the slave controller if the master PLC requires special startup behaviour (Default is 0 ms).

5.3.6 Restart System

The system will be reinitialised in 5 seconds (counting back).

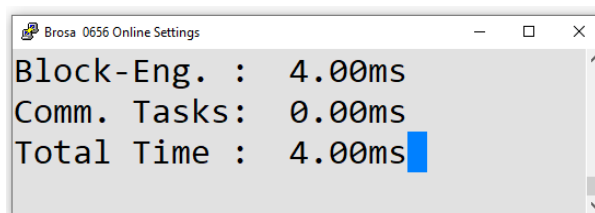


5.3.7 Language



Select the desired language.

5.3.8 Metrics



Notes on the performance of the overload/weighing FlexLim system.

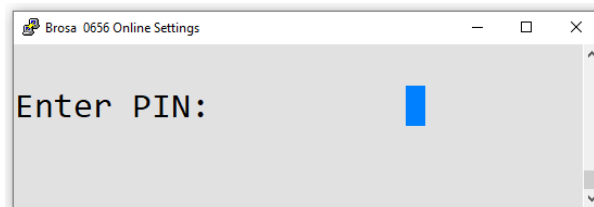
5.4 Setup Machine (Parameters for Calibration)

This section provides the possibility to adjust parameters while commissioning or recertifications. These parameters are relevant to the functionality of the 0656 system.

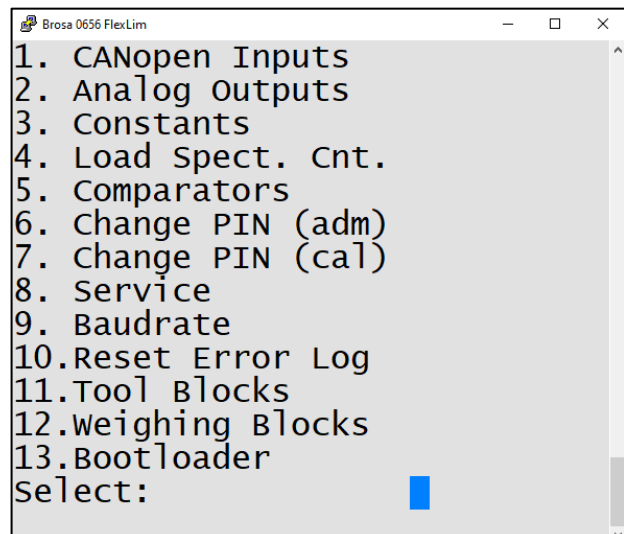
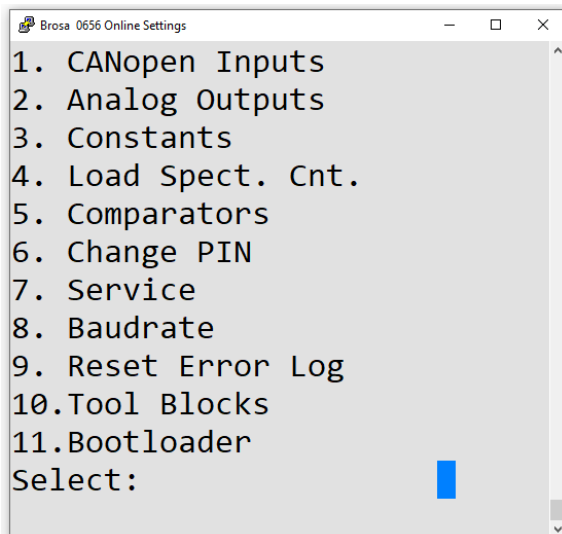


Certain menus are protected by a personal identification number. These are safety-critical menus (settings made here have a decisive influence on the safety and functionality of the system!). Access is limited to qualified staff for this reason.

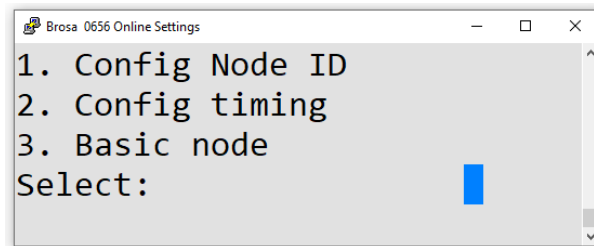
The manufacturer cannot be held responsible for the use and / or careless disclosure of the PIN code. The customer must ensure that the PIN is only issued to authorised specialist staff.



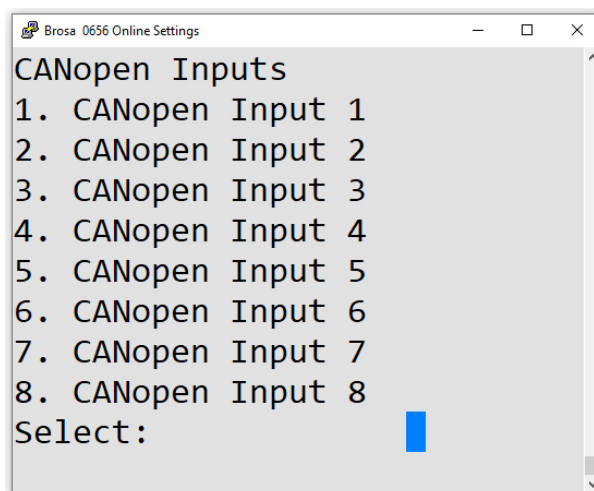
Enter the PIN number of the system and press the “ENTER” key twice.



5.4.1 CANopen Inputs

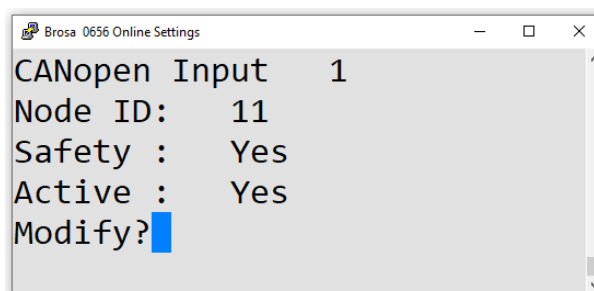


Select the desired CANopen Input



5.4.1.1 Configuration

Configured CANopen sensors can be selected in this screen. If a sensor is selected, status information is displayed and there is the option of assigning the node a new free node ID.



Selected example sensor:

Node ID: 11 => Currently configured node ID

Safety: Yes => The input expects a CANopen safety sensor
 No => The input expects a CANopen sensor

Active: Yes => A CANopen sensor with the expected settings was found.

Change? : <ENTER> => New node ID can be selected.

Important: The node ID must be configured and must not be assigned.



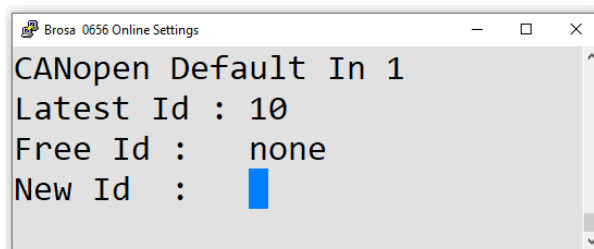
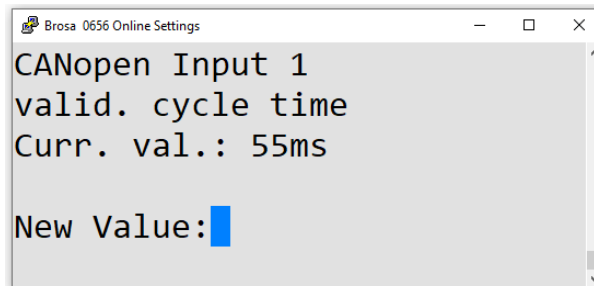
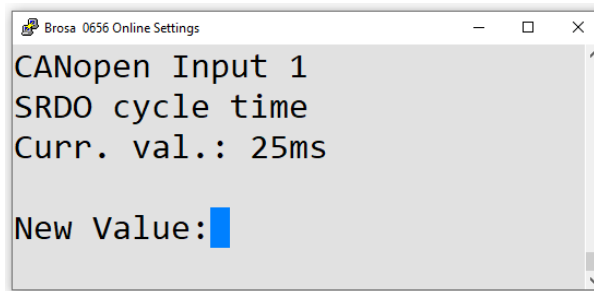
Note: For more information how to change the Node ID please see Chapter 6.2

```
Brosa 0656 Online Settings
CANopen Input 1
Latest Id : 11
Free Id : none
New Id : 
```

```
Brosa 0656 Online Settings
CANopen Input 1
1=safety / 2=plain
Curr. val.:SAFETY
New Value:
```

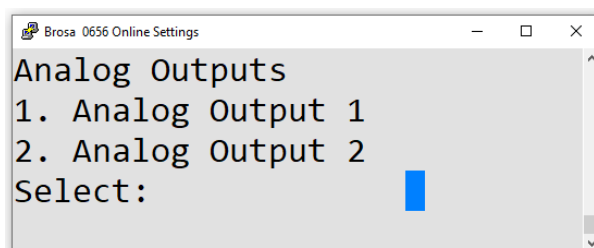
```
Brosa 0656 Online Settings
CANopen Input 1
Heartbeat producer
Curr. val.: 100ms
New Value:
```

```
Brosa 0656 Online Settings
CANopen Input 1
Heartbeat consumer
Curr. val.: 310ms
New Value:
```

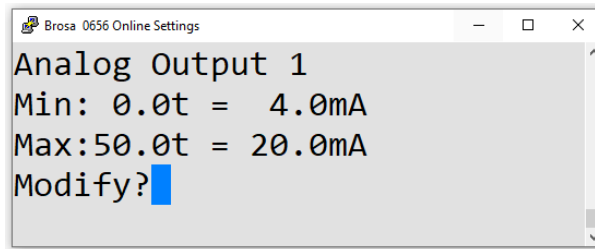



2

5.4.2 Analog Outputs

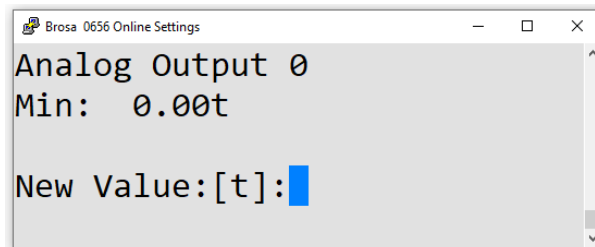


Select the desired analogue output.



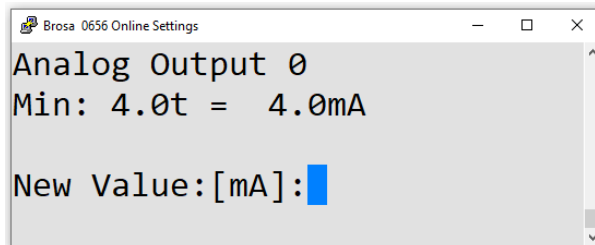
The minimum and maximum signals that the output channel provides are displayed along with the physical values that represent them.

Doubleclick the “ENTER” key to change. To exit entry and return to the previous menu, press the “ESC” key.

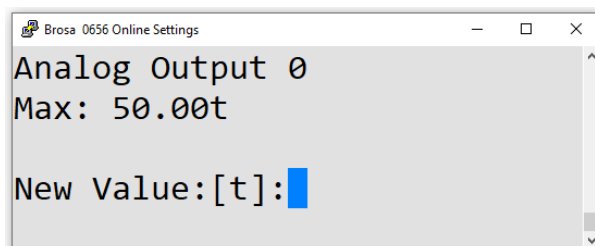


Enter a new value corresponding to the minimum signal in the specified unit of measure (in this case tonnes) and then doubleclick the “ENTER” key to accept the entry.

You can also press “ESC” to skip the entry. The current value then remains unchanged.

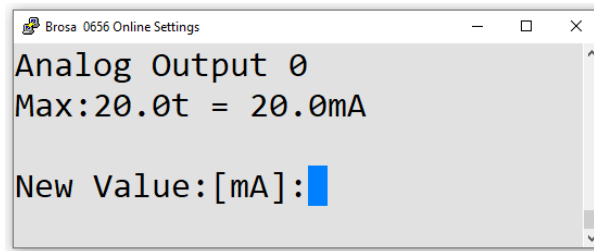


Enter a new signal value and doubleclick the “Return” key to accept the entry or press “ESC” to skip the entry. The set value then remains unchanged.

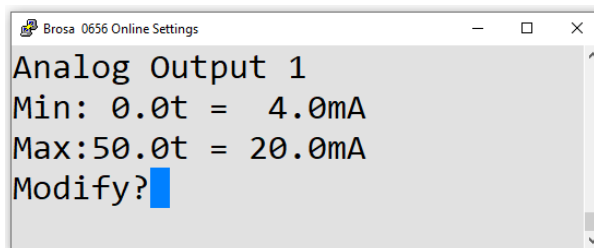


Enter a new value corresponding to the maximum signal in the specified unit of measure (in this case tonnes) and then press “OK” to accept the entry.

You can also press “ESC” to skip the entry. The current value then remains unchanged.



Enter a new signal value (in this case in mA) and press “OK” to accept the entry or press “ESC” to skip the entry. The set value then remains unchanged.



The system returns to the overview. Check that the displayed values are correct and then press “ESC” to return to channel selection (2.2).



Note: The minimum and maximum values for the signal form the absolute limit values for the analogue output.

Example: For an analogue output configured as follows:

Min: 2.0t = 4.0mA
Max: 10.0t = 20.0mA



No signal greater than 20mA and less than 4mA can be supplied even if the input exceeds 10t or falls below 2t.

5.4.3 Constants

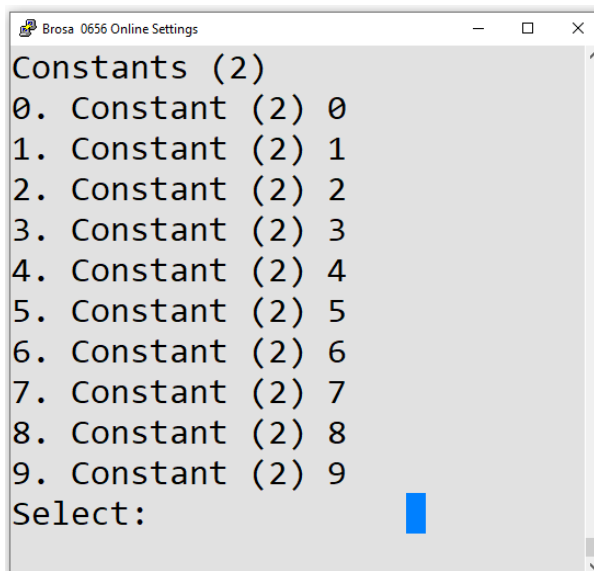
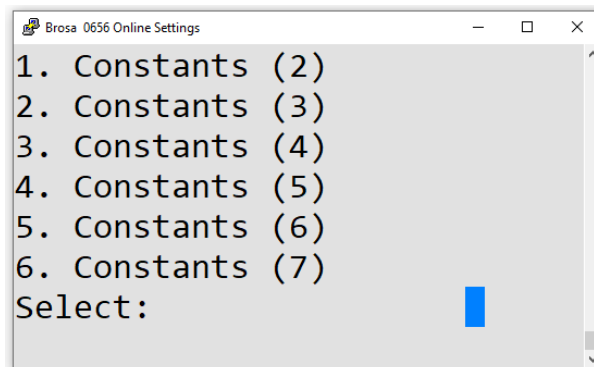
The Constants are the parameters changing the behaviour of the 0656 System Electronics. All Parameters are individual at every project and could even differ on each machine.



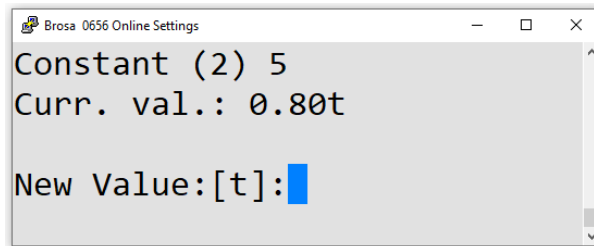
Before changing parameters, please note or save the previous values. A loss of them could require a new calibration of the crane. More Information about Backups see chapter 6.3



Note :The function of the Constants is defined in the Software Description or Commissioning protocol of your specific application.



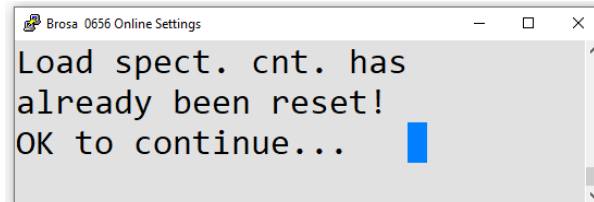
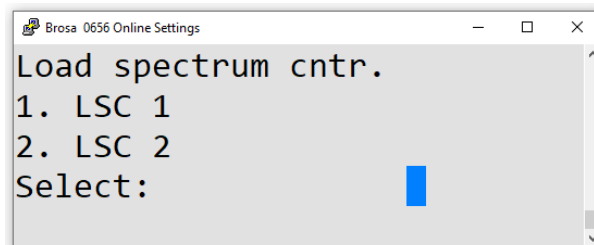
Select the constant to be changed. Only the constants that are actually used in the program are offered for selection.



The current value of the constant is displayed. Enter a new value in the specified unit of measure (in this case tonnes) or press “ESC” to leave the value unchanged and return to the previous menu.

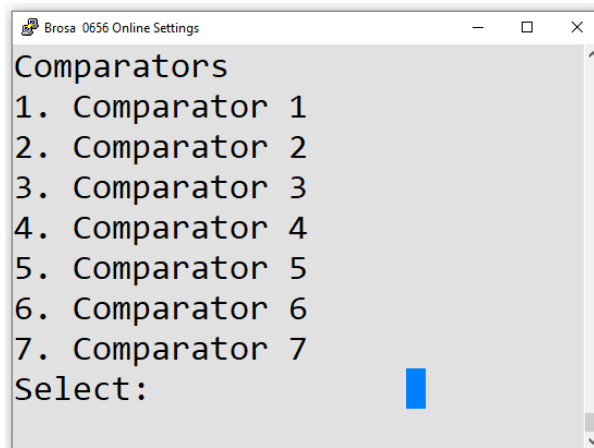
The same procedure as for “Constants (2)” applies for all other groups.

5.4.4 Load Spectrum Counter

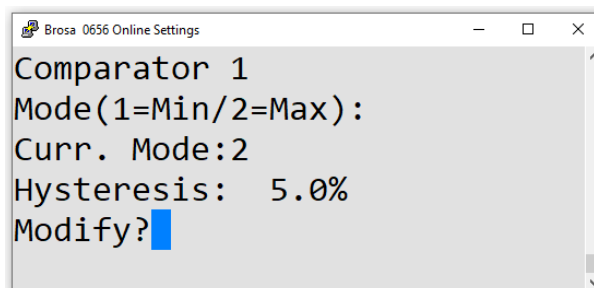


5.4.5 Comparators

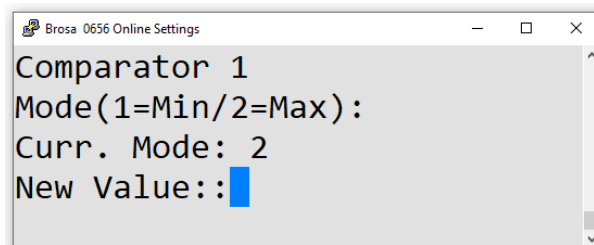
A comparator compares two values and triggers an event (usually a relay) if the first value is greater than (mode = max) or less than (mode = min) the second value. The system manual contains a list of comparators with the associated inputs and the events that trigger them. Since a comparator is usually assigned to each relay, they generally have the same index number (comparator 3, for example, would trigger relay 3). The comparator first triggers as soon as its limit value is exceeded, but returns to the previous state only when the first limit value exceeds the limit value plus the hysteresis percentage.



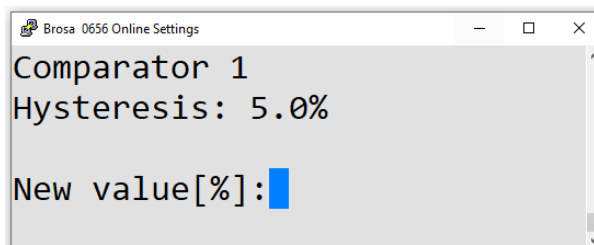
Select the comparator to be changed



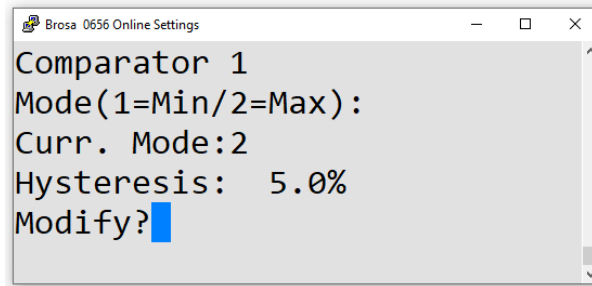
Press "OK" to change. To exit entry and return to the previous menu, press the "ESC" key.



Enter the new "Min" or "Max" comparator mode (1 or 2) or press "ESC" to leave the mode unchanged and go to the next menu.



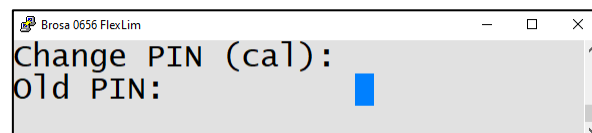
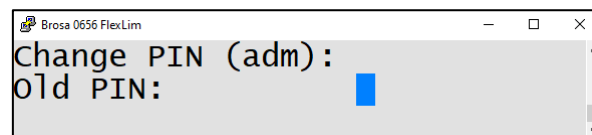
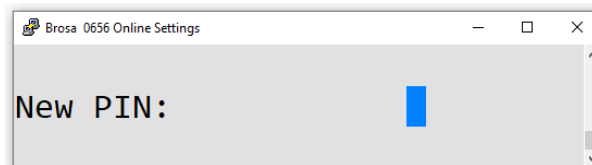
Enter the new hysteresis in percent or press "ESC" to leave the value unchanged and return to the comparator overview.



The system displays the new comparator parameters. Check that the entry is correct and then press “ESC” to return to the comparator selection menu (2.7).

5.4.6 Change PIN

The personal identification number for the system can be changed here. Please note that this PIN is essential for accessing the system settings. The user is responsible for ensuring that the number is neither lost nor gets into unauthorised hands.

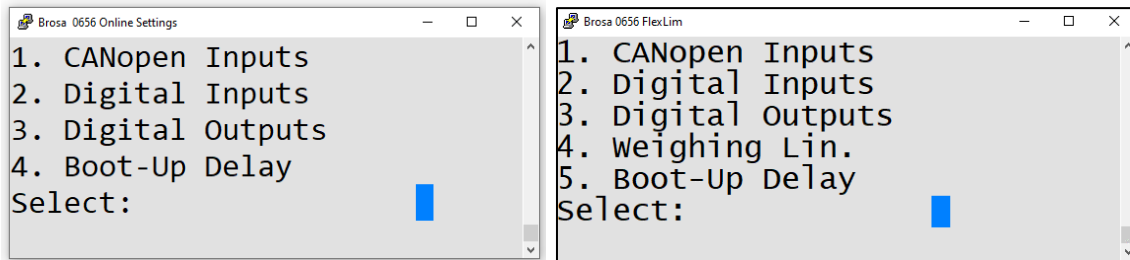


Enter the new number or leave the old PIN unchanged by pressing the “ESC” key and return to the previous menu.

PIN (adm): This PIN is used for the Weighing Blocks to get into the Configuration Parameters and the Linearisation.

PIN (cal): This PIN is equal to the Overload System and essential for accessing the system settings.

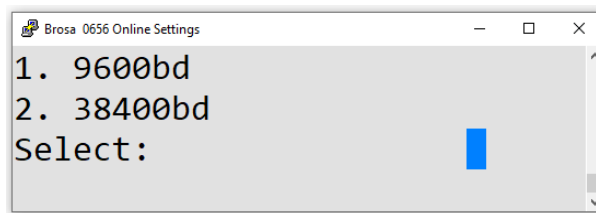
5.4.7 Service



These service functions require trained staff and are therefore located in the PIN secured section. The Functionality will be explained in Chapter 6.1

5.4.8 Baud rate

If there are problems communicating with the external display via the RS 485 interface, the baud rate can be adjusted.

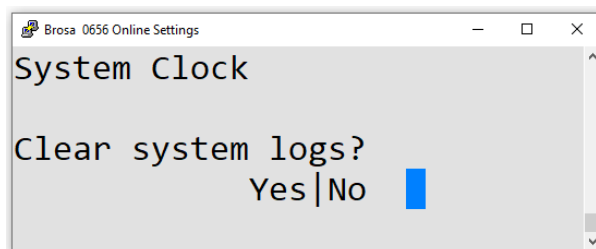


Select the desired baud rate.



Comment: This option only changes the baud rate of the system. To ensure proper communication between the system and the external display, the baud rate of the external display must also be switched.

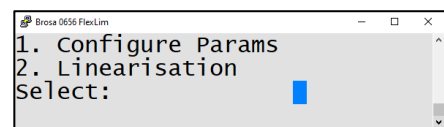
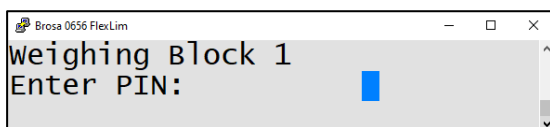
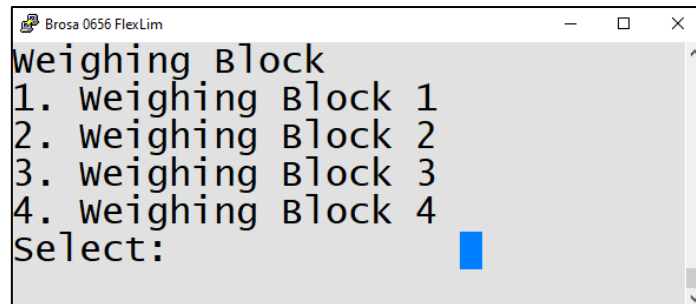
5.4.9 Reset Error Log



The error report is deleted by confirming with <Enter> and the menu entry can be exited without changes with "ESC".

5.4.10 Weighing Blocks

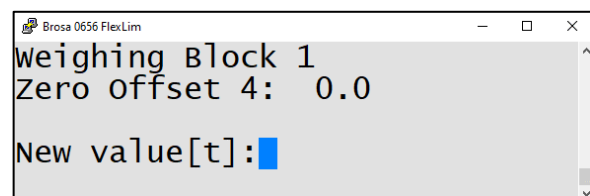
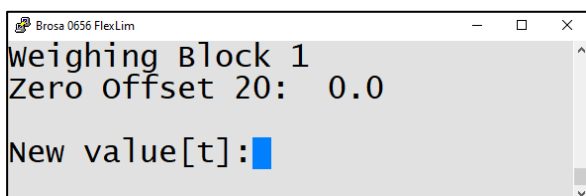
This modul is only included in the 0656 FlexLim Weighing. It consists of a total 4 blocks. Each block has its own configuration parameters and linearization values that are separated from each other and saved with a password.



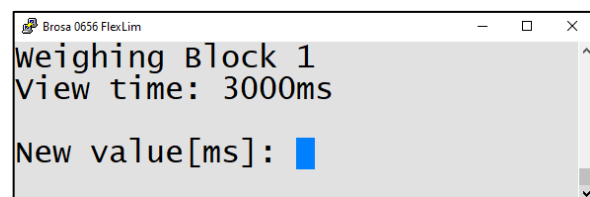
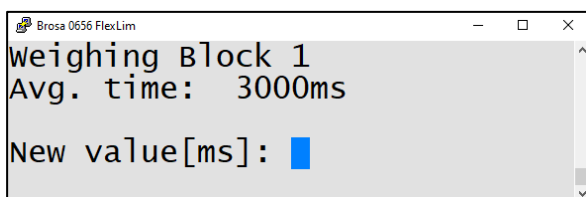
To enter a Weighing Block, a password is required (see chapter 4.4.6).

The configuration parameters includes the following setting options. The parameters are implemented as standard and can be used if necessary for calibration (commissioning).

The Offset values (20%, 4%) are used to zero a preload, e.g. the dead load of the spreader. This is stored in the system and saved permanently. Changes can be made via the weighing block parameters in the service menu.



The weighing result is determined using the averaging time (x ms) and then output. The value can be calculated as a mean or median. In the standard setting, the mean value is calculated. The weighing result is displayed in a certain time, the view time. This value can be adjusted as desired.



The weighing result is calculated with the factors "x" and "b" as follows:

- $\text{Result} = \text{weighing result} * \text{dynamic factor} + \text{dynamic offset}$

```

Brosa 0656 FlexLim
Weighing Block 1
Dynamic Fact. x: 1.0
New Value: █
    
```

```

Brosa 0656 FlexLim
Weighing Block 1
Dynamic Fact. b: 0.0
New Value: █
    
```

The measuring range is defined by Min. Capacity and Max. Capacity.

```

Brosa 0656 FlexLim
Weighing Block 1
Min. Capacity: 1.0
New value[t]: █
    
```

```

Brosa 0656 FlexLim
Weighing Block 1
Max. Capacity: 64.0
New value[t]: █
    
```

The measuring range in parts is defined by Min. Capacity (e) and Max. Capacity (e).

```

Brosa 0656 FlexLim
Weighing Block 1
Min. Capacity (e): 10
New value[e]: █
    
```

```

Brosa 0656 FlexLim
Weighing Block 1
Max. Capacity (e): 411
New value[e]: █
    
```

The calibration part value reflects the smallest unit of measurement that can be displayed in the system. This value defines the measurement accuracy and can be adjusted, for example, for commissioning and calibrations on site.

```

Brosa 0656 FlexLim
Weighing Block 1
Calib. Part(e): 0.1
New value[t]: █
    
```

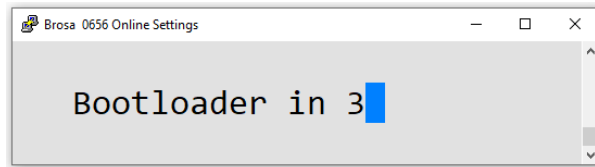
Each weighing block has a linearization based on 16 support points. The sum signal of all load measuring sensors is corrected.

```

Brosa 0656 FlexLim
WB 1 LIN.# 1/16
Raw value: 4.10
Cur.value: 4.10
OK to continue... █
    
```

5.4.11 Bootloader

The system will enter Bootloader mode in 5 seconds (counting down). As soon as the system is in Bootloader mode, an exclamation mark is sent.



Comment: This option has to be used if you would like to upload or download data from the 0656 System Electronics. Further Information see Chapter 6.3

6 Servicing and Troubleshooting

6.1 Disfunction of the 0656 System or Error Code on Bus

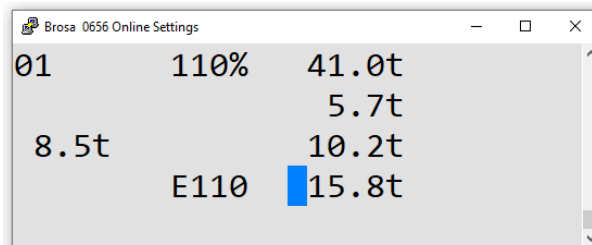
If a critical error occurs, the system is locked and displays a corresponding error code on the display (internal, external or PC).



Note: Depending on the configuration, a critical error in the system may cause the communication between higher-level systems and the 0656 electronic system to be interrupted

To identify the error please see Chapter 8

1. Connect your 0656 System to your PC via RS232 following the steps in Chapter 5.1



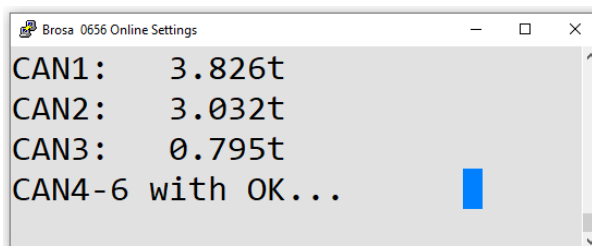
Example: The Error “E110” on the display shows that there is a fault on the Load cell named with the Node ID 11.



Comment: It is not possible to verify just by the Error Code, that all other load cells are working! Only the Error of the first faulty load cell (lowest Node ID) will be displayed

Solution:

1. Enter the Service menu and open the section “CANopen Input” (see Chapter 5.3.5.1)



Example:

This indicates that CAN 1 (NODE ID 11) and CAN 3 (NODE ID 13) are faulty. Please follow the possible remedy in Chapter 8.

6.2 Identify and replace faulty Load Sensor(s)



Note: If a faulty load cell has been identified and it has to be replaced, please keep in mind that all load cells have unique Node IDs in the CAN Bus system and has to be adjusted.

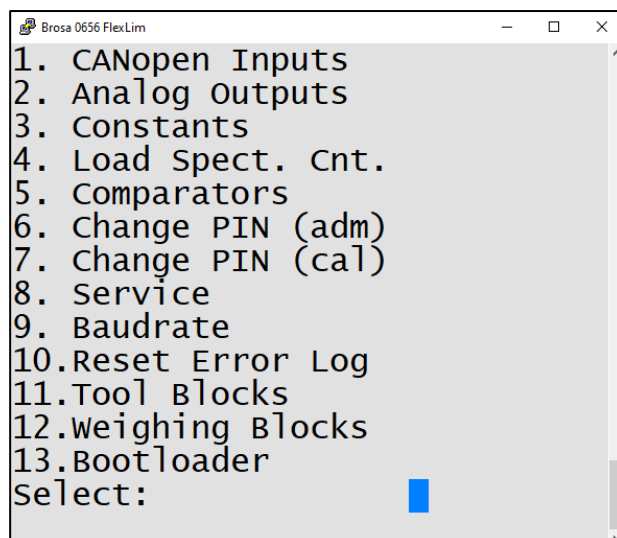
Depending on the system configuration, the sensors in the network are named from Node ID 11-18.

The Node ID for BROSA spare parts is 10 by default.

This “Basic Node” provides the possibility to change it directly at the 0656 System electronics to the designated NODE ID.

For Sensor adjustment, please follow the instructions:

1. Open the menu and choose “2” for the machine setup
2. If the PIN was correct the Machine setup will be displayed. Choose “CANopen Inputs”



3. The following menu will be shown. The individual CANopen sensors can be defined / configured with this menu. Select:
 - "Basic node" to assign a new ID to a sensor with node ID10.
 - "Config node ID" to change the Node ID on a connected sensor.
 - "Config timing" to change the safety / Plain parameters on a connected sensor and to set the timing.

```
Brosa 0656 FlexLim
1. Config Node ID
2. Config timing
3. Basic node
Select:
```

4. The menu for “Basic node” is shown below for further configuration.



If you change several sensors in a system, please assure to name the Sensors with the right ID according to the sensors position.

```
Brosa 0656 FlexLim
CANopen Input 1
Latest Id : 11
Free Id : 11 12 13 14
New Id :
```

The desired node ID can now be set in the “New ID” line. However, only the IDs listed as “Free ID” are allowed.



Please assure that only one sensor with node ID 10 is in the network. It is therefore advisable to connect the sensors individually and to repeat the step if necessary.

5. The menu for “Config node ID” is shown below for further configuration.

```
Brosa 0656 FlexLim
CANopen Inputs
1. CANopen Input 1
2. CANopen Input 2
3. CANopen Input 3
4. CANopen Input 4
Select:
```

After assigned a new ID to a sensor with node ID10 the following “Config node ID” menu is changed from Active “No” to “Yes”.

```
Brosa 0656 FlexLim
CANopen Input 1
Node ID: 11
Safety : No
Active : No
Modify?
```

```
Brosa 0656 FlexLim
CANopen Input 1
Node ID: 11
Safety : No
Active : Yes
Modify?
```

6.3 Safety Backup and Updates



After a 0656 System has been calibrated it is strongly recommended to save the adjusted parameter as BROSA is only able to deliver the project software with default parameters.

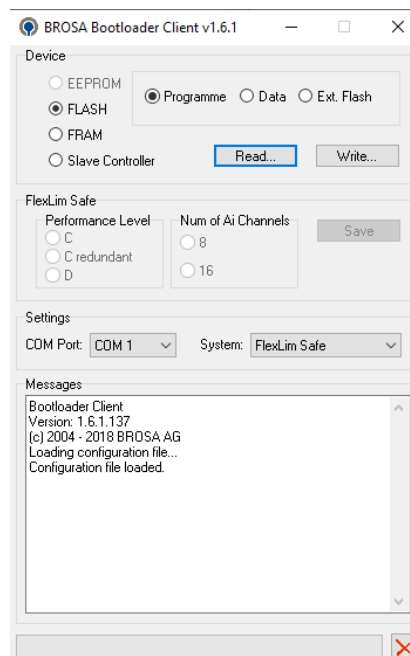
To save the parameter files *flash and *FRAM, the download of the parameter files from the 0656 System Electronics can be done with the BROSA Tool “Bootloader Client”

This tool is available on request and free of charge

If an update of the system is necessary the “Bootloader Client” is also needed.

6.3.1 Download of system parameter files (Backup)

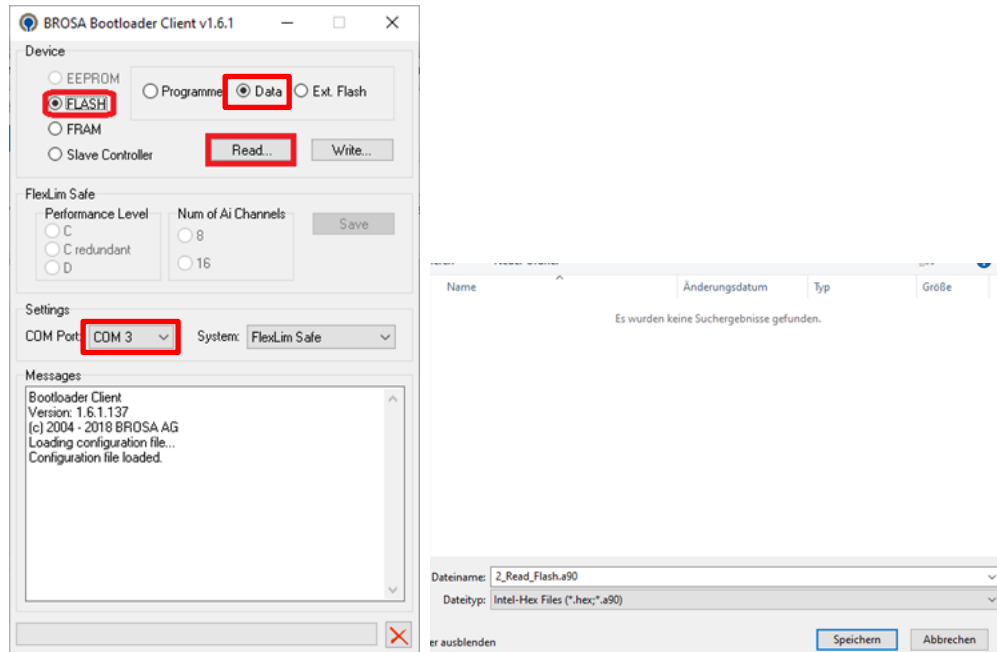
1. Set the 0656 System into the bootloader mode by using the service menu (see Chapter 5.4.11)
2. Close your Terminal Program Session before opening the Bootloader Client.
3. Open the Software Bootloader Client on your PC.



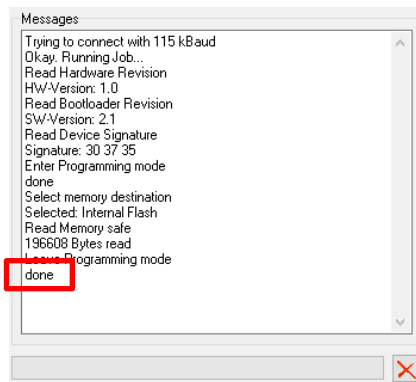
6.3.1.1 Backup FLASH file

1. Select “FLASH”, “Data” and the right COM Port

2. Click on “Read”
3. Name the file (e.g. “2_Read_Flash.a90”) and save

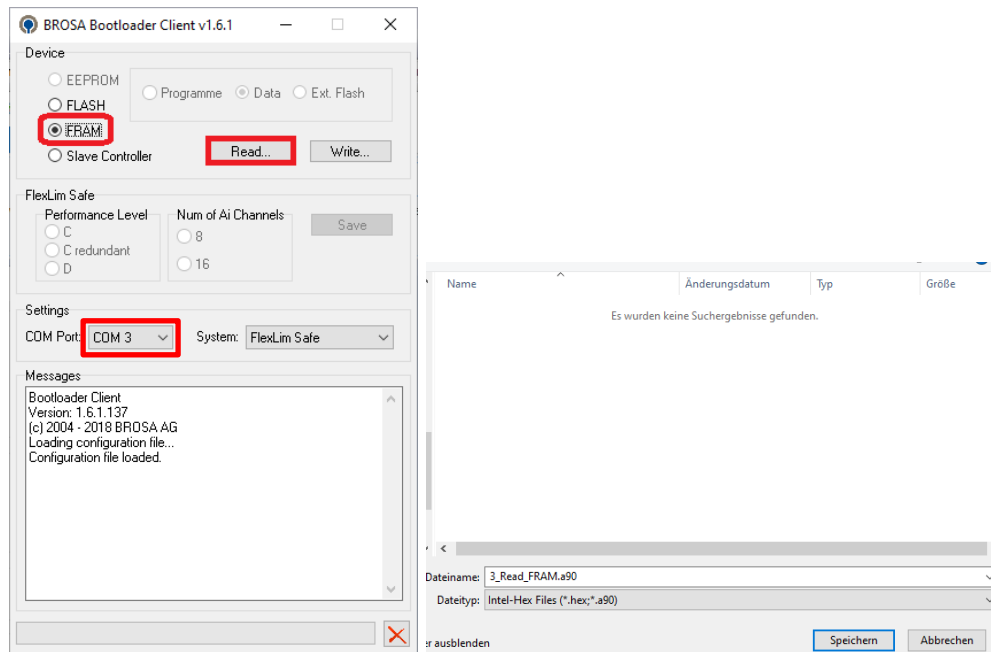


4. The following message will show up

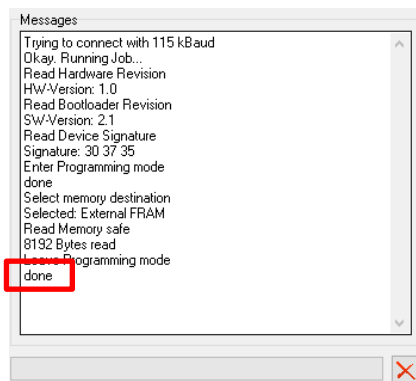


6.3.1.2 Backup FRAM file

1. Select “FRAM” and the right COM Port
2. Click on “Read”
3. Name the file (e.g. “3_Read_FRAM.a90”) and save



4. The following message will show up



6.3.2 Upload of firmware and software



The Upload of the Firmware and the Software must be also done with the Bootloader Client

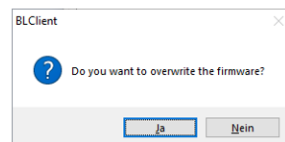
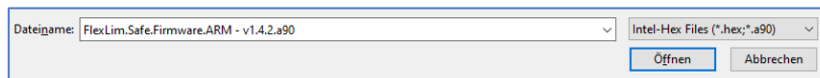
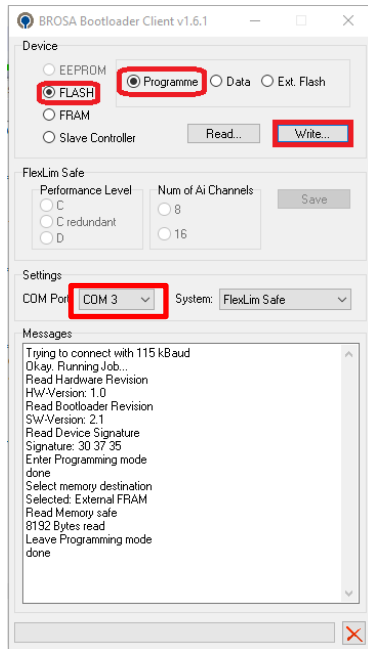
The Upload must be done step by step and in the ranking as shown in this chapter.

6.3.2.1 Upload Master Firmware (indicated with leading No."1")

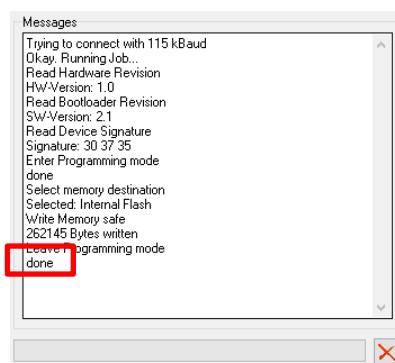
1. Select "FLASH", "Programme" and the right COM Port

2. Click on “Write”

3. Select the file (e.g. “1_FlexLim.Safe.Firmware.ARM – v1.4.2.a90”)

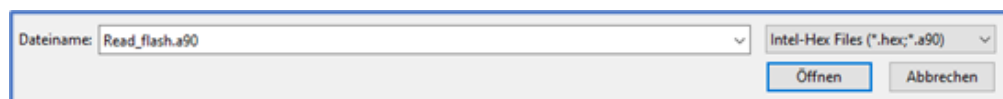
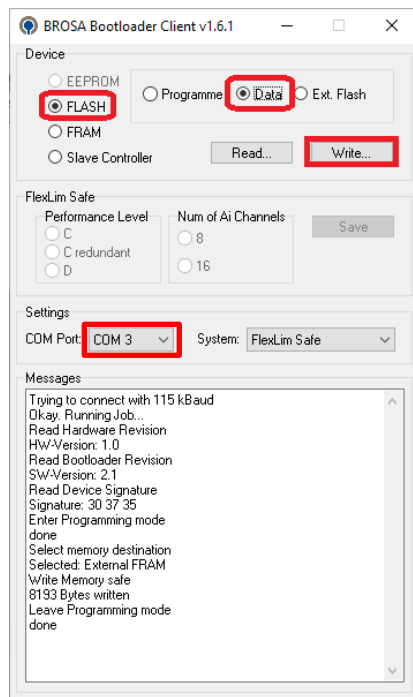


4. Confirm the pop up message and wait until the the message window at the Bootloader client shows “done”

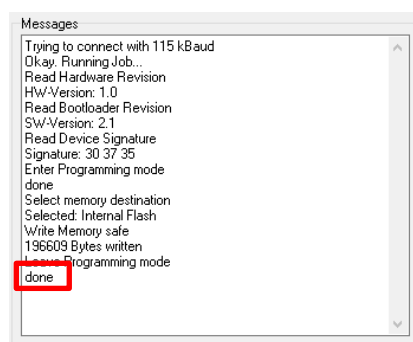


6.3.2.2 Upload FLASH file (indicated with leading No."2")

1. Select "FLASH", "Data" and the right COM Port
2. Click on "Write"
3. Select the file (e.g. "2_Read_Flash.a90")



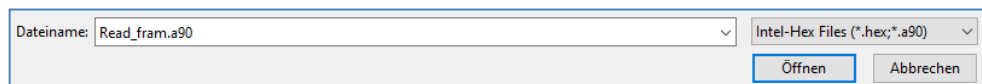
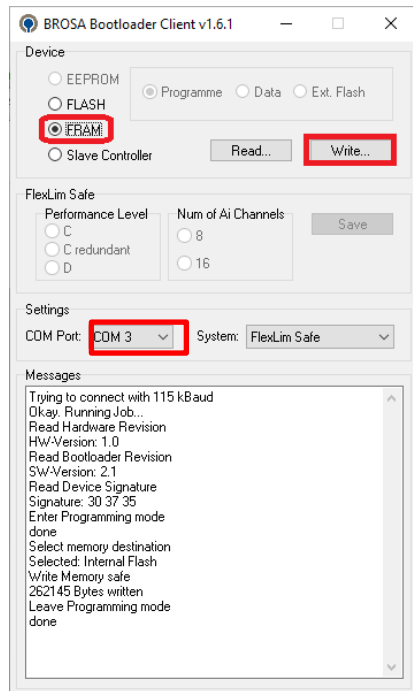
4. The following message will show up



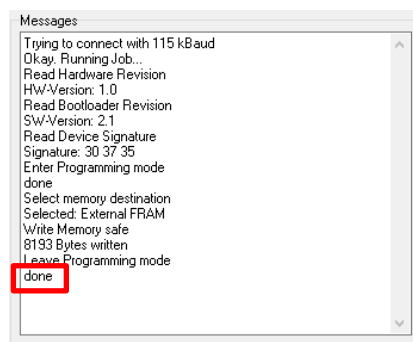
6.3.2.3 Upload FRAM file (indicated with leading No."3")

1. Select "FRAM" and the right COM Port

2. Click on “Write”
3. Select the file (e.g. “3_Read_FRAM.a90”)



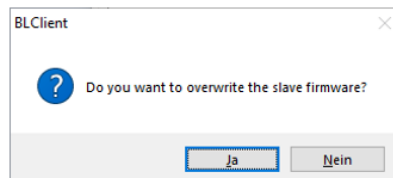
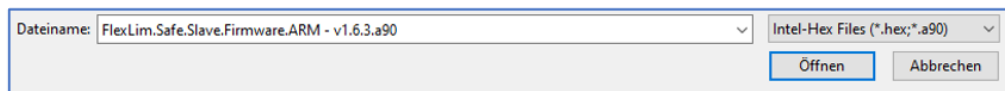
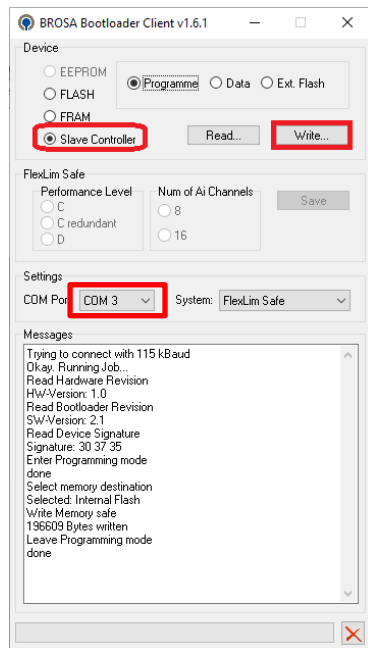
4. The following message will show up



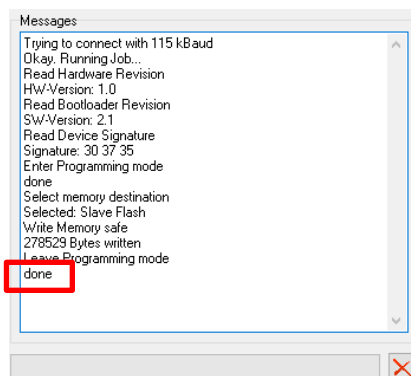
6.3.2.4 Upload Slave firmware (indicated with leading No.”4”)

1. Select “Slave Controller” and the right COM Port
2. Click on “Write”

3. Select the file (e.g. “4_FlexLim.Safe.Slave.Firmware.ARM – v1.6.3.a90”)



4. Confirm the pop up message and wait until the the message window shows “done”



6.3.2.5 Update confirmation

Confirm the success of the Update using the following steps:

1. Close the Programm “Bootloader Client”
2. Open the Terminal Program Session
3. Restart the System with a power curcuit
- 4 Open the Service menu
5. Chose “System Information” Chapter 5.3.1
6. Compare the displayed version to the intended version

7 Technical data of 0656 electronic system

As the 0656 System Electronics is available in different versions please refer to the article number shown on your System. Technical datas are available at BROSA

Example:

Designation	System electronics type 0656 FlexLim
Supply voltage	24V DC (10...30V DC)
Analogue outputs	2x 4...20mA
Digital inputs	8 x 24V
Digital outputs	8 x switching capacity typ. 24V / 500 mA 1 x safety output typ 24V / 500mA
Interfaces	1 x PROFIBUS DP Slave 1 x PROFINET IO (PROFIsafe) Slave 1 x CANopen (Safety) Slave 1 x RS 485 1 x RS 232
Housing	Cinch MODICE SE
Dimensions	134.6 x 153.2 x 52.2 (L x W x H) in mm
Electrical connection	Plug with crimps (0.5 mm ²)
Protection class	IP67, IP69K
Operating temperature	-40°C to +80°C
Short circuit protection	Yes
Reverse polarity protection	Yes
Vibration resistance	14g
Schock resistance	10g
EMC	CISPR 25 / EN 55025 DIN ISO 11452-4 DIN ISO 11452-5 DIN ISO 11452-2 EN 61000-4-2 EN 61000-4-4
Figure	

8 List of error codes and troubleshooting

If a critical error occurs, the system is locked and displays a corresponding error code on the display (internal, external or PC).



Note: Depending on the configuration, a critical error in the system may cause the communication between higher-level systems and the 0656 electronic system to be interrupted.

The following sections provide a list of error codes with possible causes and remedies.

8.1 CANopen input errors

Error code E 11X (where X is the configured CANopen input)

Example 1: E 111: → Configured CANopen input 1. **But Node ID 12**

Example 2: E 117: → Configured CANopen input 7. **But Node ID 18**

Error	Missing heartbeat message.
Possible causes	<ol style="list-style-type: none"> 1. Cable between sensor and electronics is damaged or there is a ground fault. 2. Electrical faults on the CANopen line. 3. Water in one of the distribution boxes or connections. 4. Damage to the sensor itself. 5. The electronics platform (0656) is damaged.
Possible remedy	<ol style="list-style-type: none"> 1. Check the cables and connections. Replace if necessary. 2. Sensor replacement. 3. Exchange of electronics.

Error code E 12X (where X is the configured CANopen input)

Error code
E 13X
(where X is
the
configured CANopen input)

Error	An SRDO communication (CANopen Safety) error has occurred.
Possible causes	<ol style="list-style-type: none"> 1. Cable between sensor and electronics is damaged or not connected. 2. Electrical faults on the CANopen line. 3. Damage to the sensor itself. 4. The electronics platform (0656) is damaged.
Possible remedy	<ol style="list-style-type: none"> 1. Check the cables and connections. Replace if necessary. 2. Sensor replacement. 3. Exchange of electronics.

Error	CANopen sensor reports a detected error with the help of an emergency message.
Possible causes	<ol style="list-style-type: none"> 1. See CANopen sensor error table.
Possible remedy	<ol style="list-style-type: none"> 1. Check the sensor. 2. Sensor replacement.

Error code E 15X (where X is the configured CANopen input)

Error	Error of the CANopen stack
Possible causes	<ol style="list-style-type: none"> 1. Sensor is not in operational state as expected. 2. Damage to the sensor itself.
Possible remedy	<ol style="list-style-type: none"> 1. Correction of the configuration parameters. 2. Checking wiring. 3. Sensor replacement.

8.2 2D curve

Error code E C1X (where X is the channel of the 2D curve)

Error	The input value is outside the 2D curve.
Possible causes	<ol style="list-style-type: none"> 1. The values of the 2D curve are too narrow. 2. Incorrect value of the input block obtained.
Possible remedy	<ol style="list-style-type: none"> 1. Correction of the "table values" for the input value. 2. Check the value of the input block.

8.3 Digital Input

Error code E 51X (where X is the channel of the DI)

Error	Supply voltage too low
Possible causes	<ol style="list-style-type: none"> 1. Missing or too low supply voltage. 2. Defective DI block on the circuit board.
Possible remedy	<ol style="list-style-type: none"> 3. Apply correct power supply. 4. Exchange of the 0656 FlexLim.

Error code E 52X (where X is the channel of the DI)

Error	DI block is overheated
Possible causes	<ol style="list-style-type: none"> 1. Digital voltage is too high. 2. Defective DI block on the circuit board.
Possible remedy	<ol style="list-style-type: none"> 3. Apply correct power supply. 4. Exchange of the 0656 FlexLim.

Error code E 53X (where X is the channel of the DI)

Error	Communication error between DI block and controller
Possible causes	<ol style="list-style-type: none"> 1. Circuit board failure. 2. Defective DI module / controller.
Possible remedy	<ol style="list-style-type: none"> 3. Eliminate the fault. 4. Exchange of the 0656 FlexLim.

Error code E 54X (where X is the channel of the DI)

Error	Undefined error message
Possible causes	1. Error from undefined definition of the parameters.
Possible remedy	2. Defining the parameters.

8.4 Digital Output

Error code E 91X (where X is the channel of the DO)

Error	Communication error between DI module and controller (CRC transmission error)
Possible causes	1. Circuit board failure. 2. Defective DO module / controller.
Possible remedy	3. Eliminate the fault. 4. Exchange of the 0656 FlexLim.

Error code E 92X (where X is the channel of the DO)

Error	Communication error between DI module and controller (CRC reception error)
Possible causes	1. Circuit board failure. 2. Defective DO module / controller.
Possible remedy	3. Eliminate the fault. 4. Exchange of the 0656 FlexLim.

Error code E 93X (where X is the channel of the DO)

Error	Supply voltage too low
Possible causes	1. Missing or too low supply voltage. 2. Defective DI block on the circuit board.
Possible remedy	3. Apply correct power supply. 4. Exchange of the 0656 FlexLim.

Error code E 94X (where X is the channel of the DO)

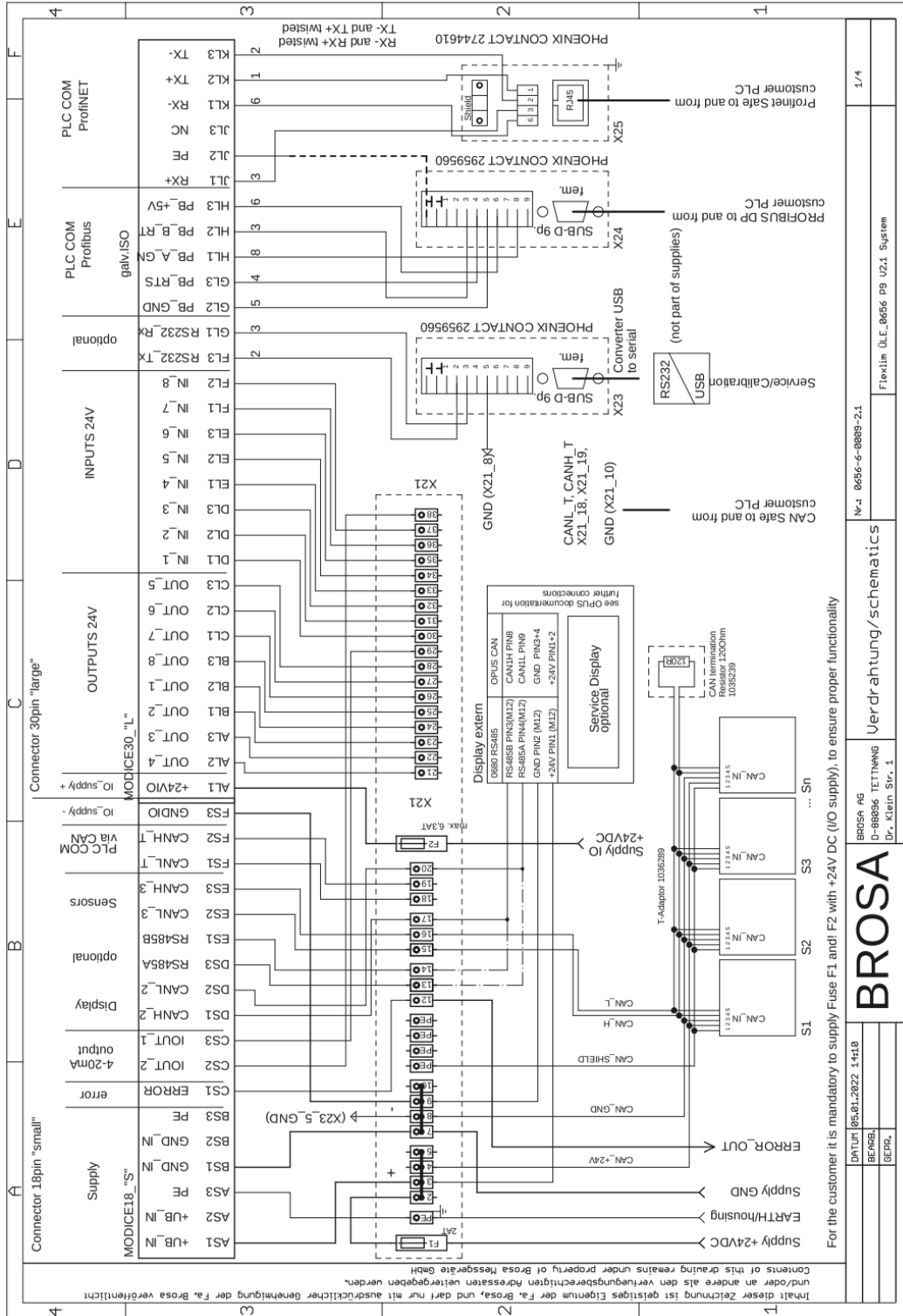
Error	Undefined error message
Possible causes	1. Error from undefined definition of the parameters.
Possible remedy	2. Defining the parameters.

8.5 System errors

Error code E XAX (where only A is relevant)

Error	EEPROM contains incorrect data
Possible causes	1. Defective parameter values (EEPROM) 2. Power failure during calibration
Possible remedy	1. Reload program from BSCT.

9 Appendix



BROSA

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0656-412622, 1410

Verdrahtung / schematics
N°: 0656-4-0089-2.1
FlexLim (UL_0656 P9 U2.1 System)

1/4

Exemplary wiring diagram of the 0656 FlexLim

10 Change history

Version	Date	Changes	Name
1.0	04.06.05	Temporary edition	TS
1.1	14.07.05	Content corrected / extended	JO / WZ
1.2	09.02.06	Logos, company name adapted	JO
1.3	31.05.07	Modification according to FlexLim V2.5.1	TS
2.2	15.08.14	Extensions for FlexLim (Safe)	WZ / RS
2.3	05.07.19	Changeover to 0656	FG / Wz
2.4	17.12.20	Additon of Chapter " Upload"	DS/FG
2.5	09.03.21	Revised Troubleshooting and Wiring	DS
2.6	19.10.2021	Revised Layout Design	MP / FM
2.7	03.12.2021	Addition of BSCT V 2.34.3 with Weighing Block	MP
2.8	16.08.2022	Error list extended	MP / FG
2.9	02.06.2023	Content processing	MP