



OPERATOR MANUAL

LMC-200 Labeling Motion Controller

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BLACK FOREST

L I N K

Thank you for purchasing our product.



But before you start working with the product ...

... READ THESE IMPORTANT POINTS OF INFORMATION FIRST !

1. See, carefully read and observe safety section and safety notes in this manual for additional important and critical safety information.
2. Contact us immediately if you have any safety questions and/or concerns. You find our contact information in the page footer on each page of this manual.
3. Do not start to work, install or operate this product until you are familiar with all safety information.
4. Our state-of-the-art products are designed and build to prevent any safety hazards or dangers. They do however not contain any safety functions, safety functionality or safety hardware and are therefore not approved for use in any application where the operation of the drive could endanger persons.
5. Additional safety equipment is required to exclude the possibility, risk and danger of uncontrolled, unexpected and unbraked motion of the drive and/or the connected mechanical application.
6. No personnel (including operator, service or maintenance) must be in the danger zone of drive and/or connected mechanical application unless adequate and suitable safety equipment prevents any personal danger. This applies for all situations including setup, test runs, production, service and maintenance.
7. The machine design must ensure personal safety and prevent any damage or property or then environment.
8. We reserve the right to make technical changes anytime without prior given notice. Specifications in this manual are technical data and not guaranteed characteristics.

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1 Introduction

1.1 General description



Option: External HMI



Option: IP54 protection

The LMC-200 is an integrated “plug-and-play” controller containing power supply, 2 phase stepping motor power drive and HMI to control the motion and peripheral electronic equipment of an automated label dispensing machine.

There are five additional options available:

- lower power version with 80V motor voltage
- external HMI feature
- IP 54 protection
- customized connector back panel
- customized key pad logo

Accessory kits: PICKIT3 firmware flash tool, RS232 SETUP TOOL/TEXTPROGRAMMER kit

The controller is supplied with one single AC mains voltage (selectable 115 V_{AC} or 230V_{AC}). It can generate up to 8A_{peak} motor phase current in each winding of the connected 2 phase stepping motor driving the labeling applicator.

All I/O signals are optically isolated.

1.2 Scope of supply, accessories and order numbers

LMC-200 VERSION	Order Number	Description
LMC-200	670001	LMC-200 standard model with no options added
LMC-200-UMOT80	670080	LMC-200 lower power version with 80V voltage. (Note: 230V AC mains supply voltage only)

STEPPING MOTOR	Order Number	Description
LMC-200-MOT	670100	7Nm 2Phase Stepping Motor NEMA34 with 2m cable

	Need matching motor pulleys for LMC-200-MOT ? AT5 Motor pulleys with 20 or 30 teeth are also available. Please contact us for technical detail and specification.
	Need a different motor size or type of stepping motor ? The LMC-200 drive module can changed to drive 3 phase stepping motors. Please contact us with you motor details.

LMC-200 OPTIONS	Order Number	Description
LMC-200-EXTHMI	670002	Option: External HMI with cable
LMC-200-IP54	670003	Option: IP54 upgrade
LMC-200-PLATE- LOGO	670004	Customized printed connector plate
LMC-200-PLATE- LOGO-INITCOST	670005	Initial setup charge for customized printed connector plate
LMC-200-HMI- LOGO	670006	Customized printed foil keypad
LMC-200-HMI- LOGO-INITCOST	670007	Initial setup charge for customized printed foil keypad
LMC-200-PICKIT3	670008	Flash adapter kit to flash firmware upgrades
LMC-200-RS232	670009	RS232 kit including software LMC-200 SETUP TOOL, Textprogrammer and an RS232 2meter cable

	This manual is also available as a free of charge internet download at www.blackfoli.com
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1.3 User interfaces and connectors

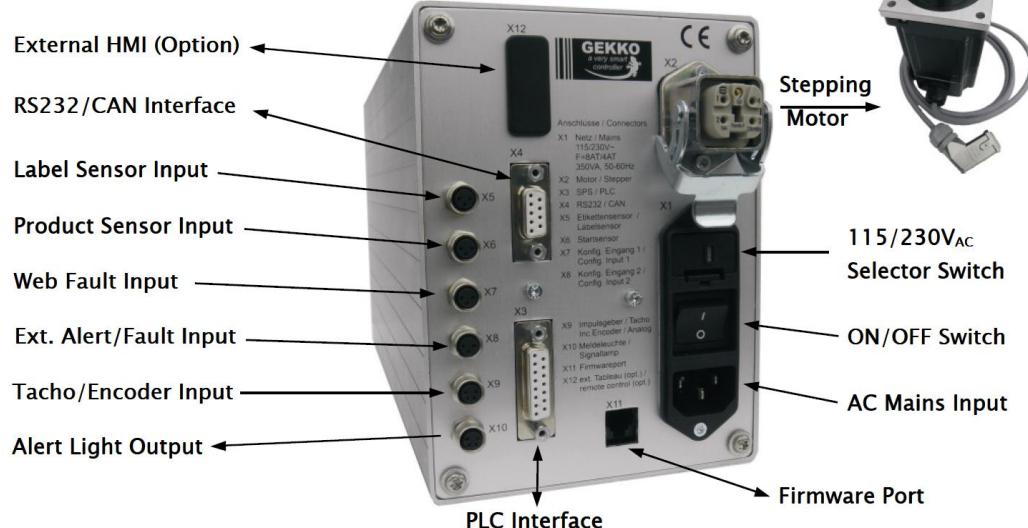
Standard device with integrated HMI



Device with customized external HMI option. HMI is connected to X12



LMC-200 Machine Interfacing



2 Safety

2.1 Important safety symbols and other symbols

The following table illustrates and describes the symbols used in this manual in combination with instructions.

	DANGER Failure to follow these instructions will result in death or serious injury.
	WARNING Failure to follow these instructions can result in death or serious injury.
	CAUTION Failure to follow these instructions will result in damage of product and property.
	ATTENTION Failure to follow these instructions can result in damage of product and property.
	ELECTRICAL SHOCK HAZARD Electrical shock hazard causing death or serious injury.
	HIGH TEMPERATURE SURFACE High temperature hazard causing death or serious injury.
	DO NOT TOUCH SURFACE OR MACHINE PART Mechanical hazard causing death or serious injury.
	ESD ENVIRONMENT Observe electrostatic environment guidelines.
	HELPFUL INFORMATION Supplementary and useful information.
	TIP Tips to make the work easier or to improve application performance.

2.2 Intended use

The intended use of the LMC-200 controller is as a fully integrated motion controller for label dispensing machines and applicators in permanently installed industrial applications.

	<p>DANGER The drive must not be used in the following environments: – with explosion hazard and without IP54 option: – wet environments (water, caustic solution etc.) – dusty particle environments (especially with conducting dusts)</p>
	<p>DANGER The devices are not equipped with safety functions and must therefore not be used for safety functions or in applications where the device operation can endanger persons and/or cause property damage. The risk and danger of uncontrolled, unexpected and unbraked motion of the drive and/or the connected mechanical application can never be totally ruled out without additional safety equipment. No personnel (operator, service or maintenance) must be in the danger zone of drive and/or connected mechanical application unless adequate and suitable safety equipment is installed and used. All technical data and environmental conditions must be observed and the machine and application design must ensure personal safety and prevention of property damage. Only after installation in accordance with specifications of this manual, EMC regulations and applicable local installation guidelines the drive must be commissioned and operated. To avoid, rule out and prevent any form of personal injury and damage to property damaged drive systems must not be installed or operated at all. All warranty will be voided and liability will not be accepted in case of any tampering, modifications or if changes are made to drives that are not permitted or if the drive is not used as intended. Only the originally specified accessories and spare parts must be used..</p>

**WARNING**

The device , the connected motor and cables emit electromagnetic waves as EMI (Electro Magnetic Interference) noise.

Therefore the drive must not be used in environments:

- where are electrical devices sensitive to electromagnetic interference
- where persons are EMI sensitive and react to so called "electro smog"

2.3 Qualification of personnel

Only skilled and trained technical personnel that are able to read and understand the contents of this manual are authorized to install, commission, operate and service this product. The effects and possible dangers caused by the drives parameter settings must be understood by the personnel and technicians working with the drive product.

The technicians must have knowledge, be familiar and observe according standards, guidelines and safety regulations when working with the device.

2.4 General safety instructions

 	<p>DANGER of Electric Shock, Fire, Explosion and Arcing</p> <ul style="list-style-type: none"> • Only qualified personnel who are familiar with and who understand the contents of this manual are authorized to work on and with this drive system. • Do not touch any unshielded drive components with voltage present. • Install all necessary covers and assure proper earth grounding before commissioning and operation. • The motor works as a generator and generates voltage when the shaft is rotated. Prevent unexpected motor shaft rotation by blocking and fixed locking the shaft before working on the system. • Before working with the drive system: – Switch off power to all application terminals. – Prevent system from accidental power-on by locking the power on switch and placing a sign "DO NOT SWITCH ON". – Wait 10 minutes for discharge of all DC bus charge capacitors. – Do not short-circuit discharge DC bus and DC bus capacitors at any time. – Assure by measuring that the DC bus voltage is below <45V before working with the drive <p>Failure to follow these instructions will result in death or serious injury.</p>
	<p>WARNING</p> <p>Danger of injury by loss of control!</p> <ul style="list-style-type: none"> • Observe the accident prevention regulations. (For USA see also NEMA ICS1.1 and NEMA ICS7.1) • The system manufacturer must take the potential error possibilities of the signals and the critical functions into account to ensure a safe state during and after errors. Some examples are: emergency stop, final position limitation, power failure and restart. • The assessment of error possibilities must also include unexpected delays and the failure of signals or functions. • Suitable redundant control paths must be in place for dangerous functions. • Check that measures taken are effective. <p>Failure to follow these instructions can result in death or serious injury.</p>

2.5 Device monitoring functions



WARNING

The LMC-200 device is equipped with multiple monitoring functions that can help to protect the device and the connected application system and reduce risk in the event of system malfunction. However these monitoring functions are not designed for personal safety.



With connector X3 a diagnostics interface is available to monitor the device status and also the HMI can be used to diagnose the system for malfunction.

3 Technical data and specifications

3.1 Mechanical data

Dimensions	Height: 160mm Width: 120mm Depth: 275mm (*140mm)	400mm (*265mm) deep with connectors plugged in
Weight	ca. 6500g (* ca. 6000g)	no accessories connected

*LMC-200-UMOT80

3.2 Environmental conditions

Ambient Temperature	0...+40 [°C]	no icing over permitted
Storage Temperature	0...+50 [°C]	dry and dust free no vibration no shock
Relative Humidity	<80% @ 30°C <50% @ 40°C	no condensation permitted
Electromagnetic Field		no electromagnetic stray fields permitted
Installation Altitude	< 1000 [m] above mean sea	for 100% device power
Shock and Vibration	reduce to a minimum	

3.3 Protection rating and protection class

IP40	standard device	
IP54	with IP 54 Option	(optional with IP65 seal)

	DANGER of Fire and Explosion Equipment must not be used in explosion proof environments Failure to follow these instructions will result in death or serious injury.
	Interference immunity: DIN EN 61000-6-2, generic standard, – Interference immunity for industry area Electrical noise emission: DIN EN 61000-6-3, generic standard, electrical noise emission living quarter, operation and trade area as well as small enterprises

3.4 Electrical data

3.4.1 Device supply

Description	Parameter	Min.	Typical	Max.	Unit
Mains supply voltage for 115 V _{AC} set①	U _{AC}	110	115	120	V _{AC}
Mains supply voltage for 230 V _{AC} set	U _{AC}	219	230	241	V _{AC}
Rated power LMC-200	P		350		W
Rated power LMC-200-UMOT80	P		140		W

	Rated for single phase mains supply only. --- L1 (line, phase) 115 V _{AC} ①/ 230 V _{AC} (selectable with mains switch insert①) --- N (neutral) --- PE (always connect device to PE for earthing)
---	---

	① Not available for LMC-200-UMOT80 devices
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3.4.2 Fusing

Description	Parameter	Min.	Typical	Max.	Unit
Fusing (slow blow) for 115V setting ①	F		8		A
Fusing (slow blow) for 230V setting	F		4		A

①

	Not available for LMC-200-UMOT80 devices
---	--

	Fuses are melting fuse inserts of type 5 x 20mm
	The device has an integrated inrush current limitation. For the fusing a line circuit breaker with B characteristic can be used.
	Change fuses only when device is completely disconnected from mains and discharged. Wait 15 min after disconnecting mains for discharge.

3.4.3 Motor connection

Description	Parameter	Min.	Typical	Max.	Unit
Motor Peak Phase Current	I_{PH}	1	8	8	A _{PEAK}
Motor Cable (type: LIYCY) Length	L_{MOTCAB}		1	2	m
Motor Cable Cross Section	ϕ_{MOTCAB}		4x 0.75		mm ²
Motor Cable Shield Capacity	C_{MOTCAB}			10	nF/100m
PWM Frequency	F_{PWM}		16		KHz

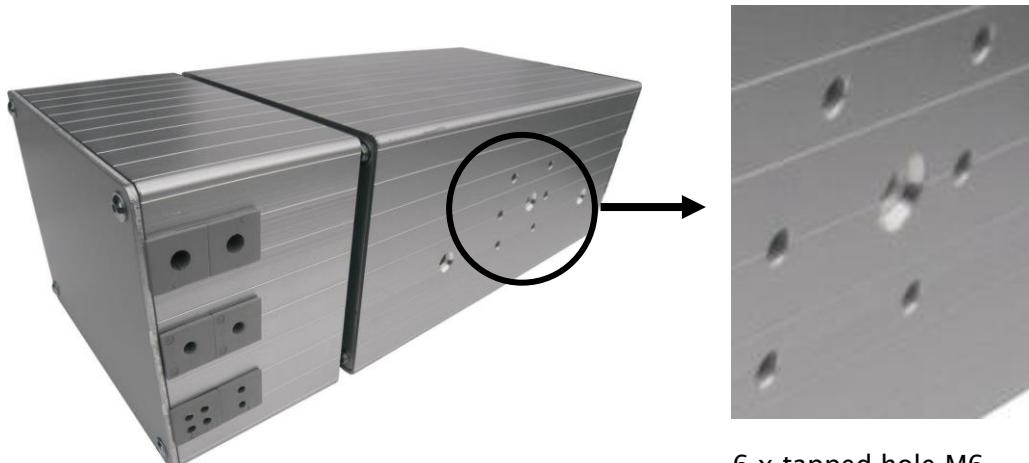
 	WARNING ELECTRICAL SHOCK HAZARD Electrical shock hazard causing death or serious injury. All metal parts of the machine must be connected to PE earth ground. The stepping motor is earthed on the controller side. Failure to follow these instructions can result in death or serious injury.
	The stepping motor cable mustn't exceed 2 m of length. Cable is of type LIYCY 4x0,75mm. The shield is connected on the controller side to the connector PE terminal and on the motor side either to the PE terminal of the stepping motor or to its housing.
	Use shielded motor cable with 2 x 2 twisted pairs for optimal performance. Contact us for cable specification or if you want to purchase this type of motor cable from us.

4 Installation

	DANGER Before installing the system follow all safety guidelines in this manual and all other applicable local safety regulations. Read and observe safety section in this manual. Failure to follow these instructions will result in death or serious injury.
	DANGER All supply and signal voltages must be disconnected during installation. Failure to follow these instructions will result in death or serious injury.
	DANGER Protect the drive and application from unexpected und uncontrolled movement. Read safety and observe safety section in this manual. Failure to follow these instructions will result in death or serious injury.
	WARNING Follow EMC (Electromagnetic Compatibility) regulations and guidelines and install the drive regarding these EMC requirements. Distorted signals can cause unwanted, unexpected and unpredicted reactions of the device and the connected application. Failure to follow these instructions can result in death or serious injury.
	WARNING Observe the technical data and ambient conditions for the drive. Failure to follow these instructions can result in death or serious injury.
	ESD ENVIRONMENT Observe electrostatic environment guidelines. Do not handle drive board, touch its connection pins or electronic components unless you are in an ESD save environment. Failure to follow these instructions can destroy the drive or damage drive functions.
	CONTACT US Should you any questions or concerns about safe handling and operation of this product please contact us.

4.1 Mechanical installation

	6 x M6 tapped mounting holes are located on the bottom side of the device.
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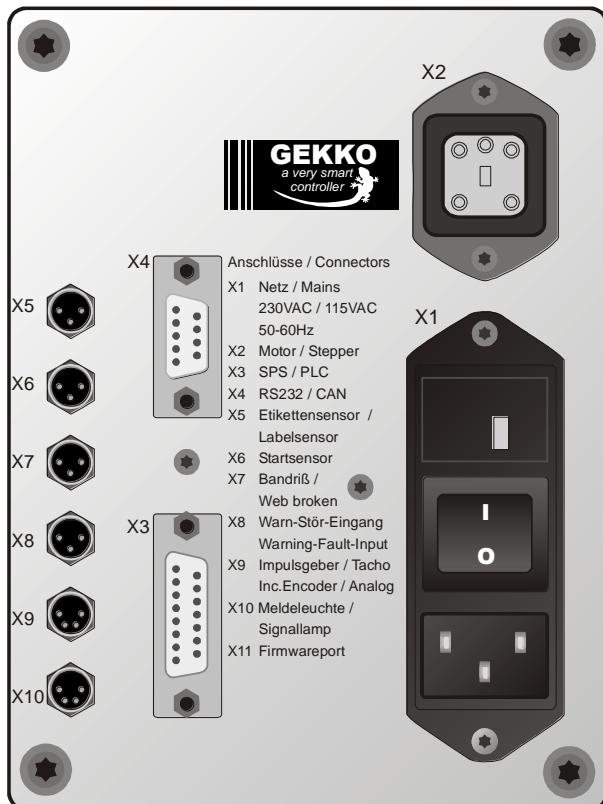
6 x tapped hole M6

	DANGER of Electric Shock, Fire, Explosion and Arcing The tapped holes are only 8 mm deep. This must not be exceeded by the length of the mounting screws Failure to follow these instructions will result in death or serious injury.
	For a sufficient heat transfer the controller must not be placed near heat sources.
	The 6 mounting holes match a commonly available mounting bracket.
	For vibrating installations we recommend isolation (damping) rubbers to mount between the controller and the vibration source.

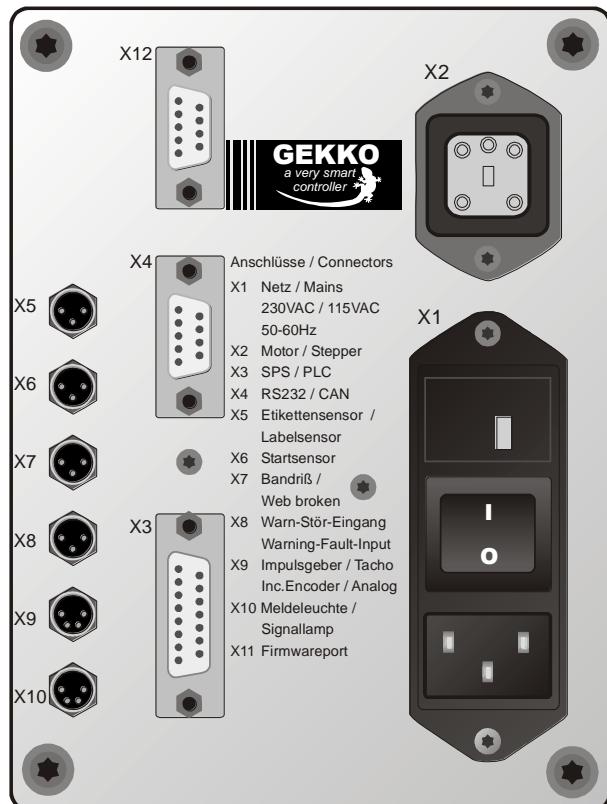
4.2 Electrical installation

	WARNING Run cable for supply , motor and signals separated from each other and use shielded cable connected to PE on each end.
	WARNING Do not connect unused free pins or terminals.
	WARNING Never connect live supply voltage wires to the terminals, because the sudden charge current of the internal electrolytic capacitors can destroy the internal fuses and/or arcing can occur that erodes the contact terminals.
	WARNING Check for C O R R E C T P O L A R I T Y of the supply voltage.
	WARNING Under no circumstances motor wires must be disconnected during operation. Induction voltages can destroy the power drive. For this reason assure proper contact of the motor wires at the connector pins. If the board is rack mount secure the board in the rack so it can't be pulled accidentally.
	OPTIMIZE CURRENT FLOW Wherever there are multiple pins with the same signal available (e.g. supply voltage, motor and PE connection) use and wire all pins to split current.

4.3 Connectors on back panel



Standard device with integrated HMI

Device with option: external HMI
HMI is connected to X12

Connector Name	Description	Function / Type
X1	AC mains connection	Line voltage 115/230 V _{AC} selectable Line filters, fuse  Warning: Select correct line voltage with voltage selector switch insert first before connecting line voltage to device.
X2	Stepping motor connection	Connector type: HARTING®, HAN10  Warning: Connect or disconnect motor only when device is completely switched off
X3	PLC connection	D-SUB-15 female
X4	RS232 / CAN interface	D-SUB-9 female
X5	Label sensor input	M8 3 pole
X6	Start(product) sensor input	M8 3 pole
X7	Web break sensor input	M8 3 pole, function programmable
X8	External alarm input	M8 3 pole, function programmable
X9	Analog tacho-generator / incremental encoder	M8 4 pole
X10	Status light output	M8 4 pole
X11	Firmware programming port	Western 6 pole
X12 (opt)	External HMI interface	D-SUB-9 female (optional)

4.3.1 AC mains connector [X1]

Manufacturer: SCHURTER®,

Inlet connector for non-heating apparatus

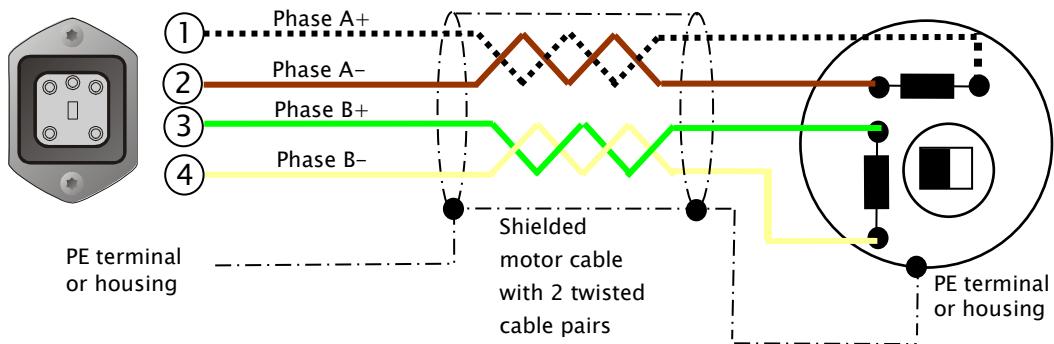
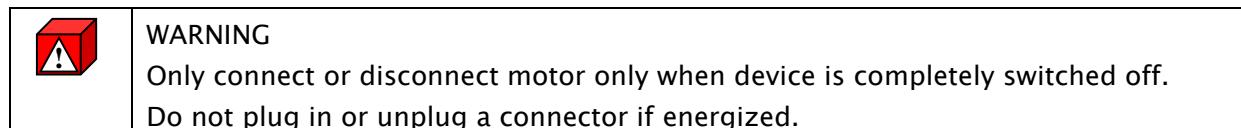
Fuse rating at 230V_{AC} line voltage: 4 Amps (check setting of the voltage selector)

Fuse rating at 115V_{AC} line voltage: 8 Amps (check setting of the voltage selector) ①

	WARNING Select correct line voltage with voltage selector switch insert before connecting line voltage to device. ①
	WARNING Inspect AC line cord or cable before first use. Do not use a damaged cable.
	WARNING Use only sufficiently rated AC line cord with PE conductor.
	WARNING Only plug in AC line cord into wall outlet that are equipped with an earth grounded PE (protective earth) conductor. Failure to follow these instructions will result in death or serious injury.
	WARNING Before plugging in AC line cord, make sure device is switched OFF.
①	Not available for LMC-200-UMOT80 devices

4.3.2 Motor connector [X2]

Type: HARTING® HAN4A-F

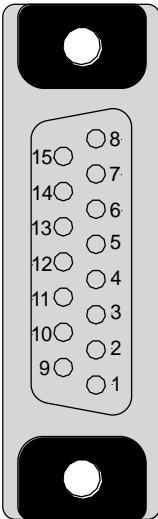


Pin	Name	Color	Twisted Pair	Function
1	Winding A+	white	one	Motor Phase A
2	Winding A-	brown		Motor Phase A-
3	Winding B+	green	two	Motor Phase B
4	Winding B-	yellow		Motor Phase B-
PE	Shield			Shield of the stepping motor cable

4.3.3 PLC connector [X3]

Type: D-SUB-15 female

Pin assignment

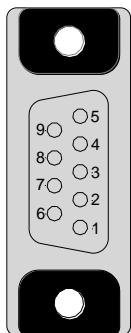


Pin	Name	Function
1	Supply voltage output	+24 V _{DC} can source max. 1200 mA
2	Programmable output (AUX2)	Output is switched to high level while the programmed condition is active PNP output, 24 V _{DC} /500 mA*
3	AUX output	Output is switched to high level while AUX-Timer runs. PNP output, 24 V _{DC} /500 mA*
4	Operational Status light = OK	Output is switched to high level if label dispenser ready to run. PNP output, 24 V _{DC} /500 mA*
5	AUX1 output	Output is switched to high level while AUX1 timer runs. PNP output, 24 V _{DC} /500 mA**
6,7,8	Fault (collective)	NO (normally open) contact will be closed at double label fault or missing label fault. Potential-free relay contact. 6 = NO (normally open) contact 7 = NC (normally closed) contact 8 = Root
9	GND	0V ground potential
10	Label Sensor signal	Output of the label sensor electrically connected to X5
11	Fault (external) input	High active, triggers fault when start attempt occurs on X3 pin14 or at connector X6
12	Reset	Rising signal edge resets alarms and faults
13	Programmable input.	Electrically connected to X7, programmable input. Input is programmable starting with firmware version 1.01
14	Start (Product Sensor)	Output of the product sensor electrically connected to X6
15	Start blocking	High active, triggers status message when start attempt occurs on X3 pin14 or at connector X6. Inhibits start of dispenser when input is active.

4.3.4 Interface connector [X4]

Type: D-SUB-9 female

Pin assignment

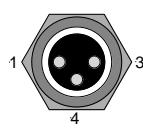


Pin	Name	Function
1	+24 V _{DC}	Supply voltage output for external equipment (GND reference for the voltage is Pin 9)
2	TxD ¹	RS232 LMC-200 → PC
3	RxD ¹	RS232 LMC-200 ← PC
4		
5	GND ¹	Supply voltage (-), isolated (potential-free) reference potential for TxD, RxD, CAN L and CAN H
6		
7	CAN L	
8	CAN H	
9	GND	Ground potential for Pin 1 (connected internally to PE)

	WARNING 1) connect to PC with straight (1:1) cable with only pin 2,3 and 5 connected and no other connection. Connecting Pin 1 (+24V _{DC}) will destroy the controller (e.g. PC) interface. See also chapter RS232 INTERFACE [X4] SERIAL COMMUNICATION
	See also chapter: RS232 INTERFACE [X4] SERIAL COMMUNICATION

4.3.5 Label sensor connector [X5]

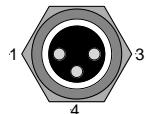
Type: BINDER®, series 718, M8x1, flange socket, 3 pole



Pin	Name	Function
1	+24 V _{DC}	Supply voltage +24 V _{DC}
3	GND	GND reference potential (-)
4	Sensor signal input	Input label sensor (for PNP “+ “-switching sensors)

4.3.6 Start (product) sensor connector [X6]

Type: BINDER®, series 718, M8x1, flange socket, 3 pole



Pin	Name	Function
1	+24 VDC	Supply voltage +24 V _{DC}
3	GND	GND reference potential (-)
4	Sensor signal input	Input start(product) sensor (for PNP “+ “-switching sensors)

4.3.7 Programmable input connector [X7]

Type: BINDER®, series 718, M8x1, flange socket, 3 pole



Pin	Name	Function
1	+24 VDC	Supply voltage +24 V _{DC}
3	GND	GND reference potential (-)
4	Sensor signal input	Input web break sensor (for PNP “+ “-switching sensors)

4.3.8 Programmable input connector [X8]

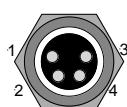
Type: BINDER®, series 718, M8x1, flange socket, 3 pole



Pin	Name	Function
1	+24 VDC	Supply voltage +24 V _{DC}
3	GND	GND reference potential (-)
4	Sensor signal input	Input for external alarm/fault signal (for PNP “+ “-switching sensors)

4.3.9 Incremental encoder / tacho-generator input connector [X9]

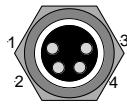
Type: BINDER®, series 718, M8x1, flange socket, 4 pole



Pin	Name	Function
1	+24 VDC	Supply voltage +24 V _{DC}
2	Channel A	Incremental encoder channel A
3	GND	GND reference potential (-)
4	Channel B / Analog In	Incremental encoder channel B or Analog tacho-generator input 0...10 V _{DC}

4.3.10 Status light output connector [X10]

Type: BINDER®, series 718, M8x1, flange socket, 4 pole



Pin	Name	Function
1	GND	GND reference potential (-)
2	Status light "OK"	PNP "+" switching
3	Status light "WARNING"	PNP "+" switching
4	Status light "FAULT"	PNP "+" switching

4.3.11 Firmware programming port [X11]

Type: Western 6 pole



See section "APPENDIX" for more information on firmware programming.
Matching firmware programmers are of type "ICD 3".and "PICkit3".
Contact us for more information.

4.3.12 External HMI port [X12]

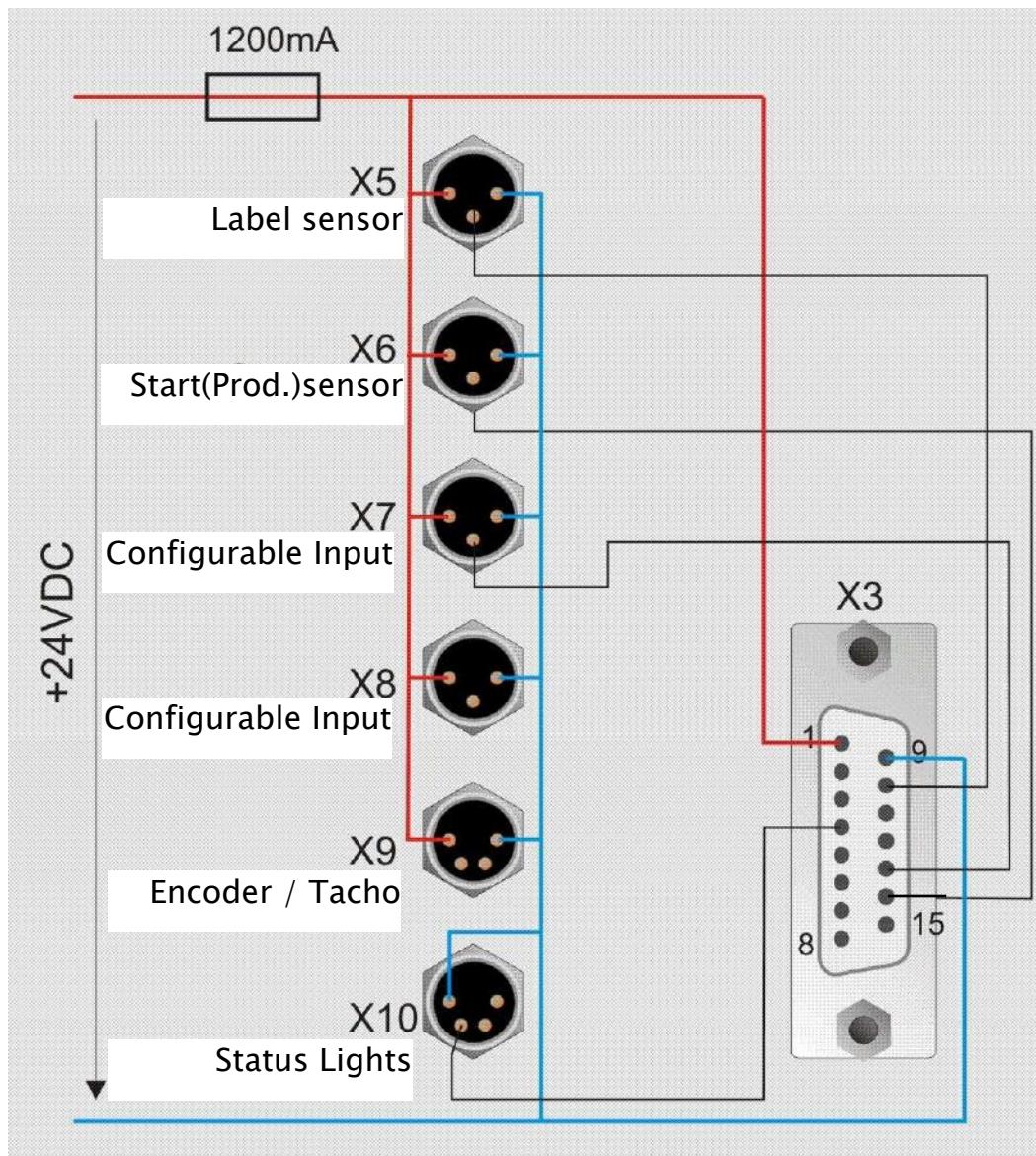
Type: D-SUB-9 female



Only available for LMC-200 devices with external HMI Option.

4.3.13 Wiring schematic M8 connectors and D_SUB15 connector

 Some of the M8 signal are physically connected to D-Sub 15 connector X3. They can be useful to either remotely monitor the signals or to control them with a PLC.



5 Parameter overview chart

Menu	Parameter name [Serial Para_ID]	Set	Range of values (min... default ...max) [Serial VALUE]
Basic parameters	Velocity [19]	✓	0.1... 25 ...100 m/min [1...1250]
	Position [20]	✓	0...5000 steps [0...48980]
	Start (product sensor) signal [30]	✓	Positive [0] negative signal edge [1]
	Label edge detection [32]	✓	Trailing [0] -/ leading edge [1]
	Load parameter set ¹⁾		0... 1 ...20 [0...20]
	Store parameter set ¹⁾		1 ...20 [1...20]
Label parameters	Feed length (pitch) [34]	✓	0...50000 [0...4898]
	Calibration length [12]		0...5000.0 cm [0...2000]
	Label edge detection [32]	✓	Trailing [0] -/ leading edge [1]
	Position [20]	✓	0...5000 steps [0...48980]
	Number of consecutively missing labels warning [35]	✓	0...20 [0...20]
	Number of consecutively missing labels fault [36]	✓	0...20 [0...20]
Motor parameters	Start ramp [37]	✓	1... 60 ...1000 steps [1...1000]
	Stop ramp [38]	✓	1... 30 ...1000 steps [1...1000]
	Start offset [39]	✓	0... 10 ...100% [1...100]
	Stop offset [40]	✓	0... 20 ...100% [1...100]
	Sense of motor rotation [3]		CCW [0] / CW [1]
	Translation (gear factor) [2]		0,10... 1,00 ...2,00 [10...200]
	Velocity [19]	✓	
Synchr. Para-meters	Synchroniz. source [33]	✓	internal [0], increm. encoder [1], analog [2]
	Encoder calibration [16]		1,00... 10,00 ...40,00 kHz [100...4000]
	Velocity [19]	✓	
	Analog signal gain [17]		0,10... 1,00 ...5,00 [10...500]

Menu	Parameter name [Serial Para_ID]	Set	Range of values (min... default ...max) [Serial VALUE]
I/O configuration	Start (product sensor) signal [30]	✓	Positive [0] negative signal edge [1]
	Start delay [22]	✓	0...60000ms / 0...60000 incremental encoder steps [0...60000]
	Start suppression [29]	✓	0...60000ms / 0...60000 incremental encoder steps [0...60000]
	AUX time [23]	✓	0...60000ms / 0...60000 incremental encoder steps [0...60000]
	AUX delay [24]	✓	0...60000ms / 0...60000 incremental encoder steps [0...60000]
	AUX start [25]	✓	Start signal [0], motor start [1], motor stop [2], external X7/X8 [3], motor cycle [4]
	AUX1 time [26]	✓	0...60000ms / 0...60000 incremental encoder steps [0...60000]
	AUX1 delay [27]	✓	0...60000ms / 0...60000 incremental encoder steps [0...60000]
	AUX1 start [28]	✓	Start signal [0], motor start [1], motor stop [2], external X7/X8 [3], motor cycle [4], AUX-Start [5], AUX-Stop [6], Mot+AUX cycle [7]
	AUX2 (Config 3.2) [11]	✓	Start delay [0], RUN [1], Motor cycle [2], motor+AUX-cycle [3], Start suppression [4], ready to start [5]

Menu	Parameter name [Serial Para_ID]	Set	Range of values (min... default ...max) [Serial VALUE]
X7, X8 configuration	X7 – Function [8],		Warning [0] Warning web end [1] Fault [2] Web break fault [3] Stop [4] Start blocking [5] Start delay + feed [6] Start delay + feed + AUX [7] Start AUX-Delay [8] Start AUX-Time [9] Reset AUX-Time [10] Start AUX1 delay [11] Start AUX1 time [12] Reset AUX-Time [13] No function[14]
	X7 – Signal edge [7]		Positive signal edge [0] Negative signal edge [1] High active [2] Low active [3]
	X8 – Function [9]		Warning [0] Warning web end [1] Fault [2] Web break fault [3] Stop [4] Start blocking [5] Start delay + feed [6] Start delay + feed + AUX [7] Start AUX-Delay [8] Start AUX-Time [9] Reset AUX-Time [10] Start AUX1 delay [11] Start AUX1 time [12] Reset AUX-Time [13] No function[14]
	X8 – Signal edge [10]		Positive signal edge [0] Negative signal edge [1] High active [2] Low active [3]

Menu	Parameter name [Serial Para_ID]	Set	Range of values (min... default ...max) [Serial VALUE]
Interface	Address [4]		0...32
	Baud rate RS232 [5]		9600 Baud [0] 19200 Baud [1] 57600 Baud [2] 115200 baud [3]
	Baud rate CAN [6]		125 kBaud [0] 250 kBaud [1] 500 kBaud [2] 1 Mbaud [3]
Settings	Language [13]		German [0] English [1] French (not yet implemented) Italian (not yet implemented) Spanish (not yet implemented) Portuguese (not yet implemented) Dutch (not yet implemented) Danish (not yet implemented) Swedish (not yet implemented)
	Beep [14]		Off [0] On [1]
	Recipe memory [15]		Off [0] On [1]
	Password [18]		0 (no password check) 1...255 [0...255]
	Store factory default settings		No , yes

	The bold green values represent the factory default settings The parameters [blue in brackets] are for the serial communication with RS232 1) The parameter is only visible if parameter "Recipe" is set to On “✓” signed parameters are a member of a parameter set. 0...20 are available.
	Please make copy of the parameter overview charts, then fill in or mark your actual settings. Send us prior to contacting us for technical support.

6 Quick commissioning instructions

The LMC-200 labeling motion controller is a flexible control system with many functions. To make the first setup a quick and easy task, you can proceed as described below:

	<p>ATTENTION</p> <p>LMC-200 controller with firmware version less than 1.02a can randomly show "Motor error" right after power on. Please reset this wrong fault by pressing the HMI key "R" to clear this message and to enable the drive. If the drive enables OK the initial "motor fault" was not a problem. In this case the fault was triggered by random boot-up times of the stepper drive. The slightly quicker booting LMC-200 controller then "sees" a drive fault. Starting with firmware 1.02a the time window to check the ready signal of the drive has been extended and the problem is eliminated.</p> <p>If the "motor fault" message remains even after a reset attempt with the "R" key then something is wrong with either the stepper drive, motor or the motor wiring.</p> <p>Note: Only connect or disconnect the motor while the LMC-200 is switched off, disconnected from the mains supply voltage and completely discharged.</p>
---	---

6.1 Preparation before first operation



DANGER

Before first operation follow all safety guidelines in this manual and all other applicable local safety regulations. Read and observe safety section in this manual. **Failure to follow these instructions will result in death or serious injury.**

1. Switch off LMC-200 and disconnect device from mains completely.
2. Plug in and lock connector of the stepping motor cable.
3. Check correct voltage setting and fuse values of the line selector switch then plug in line cord.
4. Connect label sensor.
5. Switch on LMC-200.
6. Check the sense of motor rotation by keeping the stop button pushed down and pressing the start button.
7. Check and match the machine translation (gear factor).
Note: With a false setting all the time and velocity dependent parameters are displayed and calculated wrongly.
8. If the sense of rotation is wrong it's possible to reverse it with a parameter setting of the stepping motor parameters.
9. Web up the dispenser.
10. Check the label sensor. Note the label sensor must only switch with the label gap present, the label sensor mustn't switch within the label.

6.2 Commissioning without “Autocal” function

1. Set a low dispensing velocity (e.g. 10 m/min)
2. Start a manual label dispense cycle by pressing the manual start button.
3. Use parameter “position” to adjust the distance to the peel plate edge.
4. Adjust velocity to the application needs

6.3 Commissioning with “Autocal” function

1. Adjust calibrating length (LABELSETTINGS → calib. length).

	ATTENTION The “Autocal” can only work with a previously entered parameter “calib. length”. This represents the distance in mm from the peel plate to the center of the label detector switch. This distance is used to calculate the amount of labels between label sensor and peel plate. For more information please also refer to the section Autocal function in this manual.
---	---

2. Keep “R” button pressed until “autocal.?→[I]“ appears.
3. Press the [I] button in addition.
4. The label dispenser starts the automatic calibration and automatically determines the label feed length, stop edge and position. All parameters can later be edited and changed.

7 Parameter setting

Tips for the menu navigation:

- ▶ All device settings are divided into two groups:
“Basic parameters” and “Service parameters”
- All essential parameters are contained in the basic parameter menu
- All machine relevant parameters and other parameters are contained in the service menu
- Setting a parameter can be accomplished with different methods:

Changing value one increment at a time:



Push button momentarily

(Slowly) increase or decrease a value automatically:

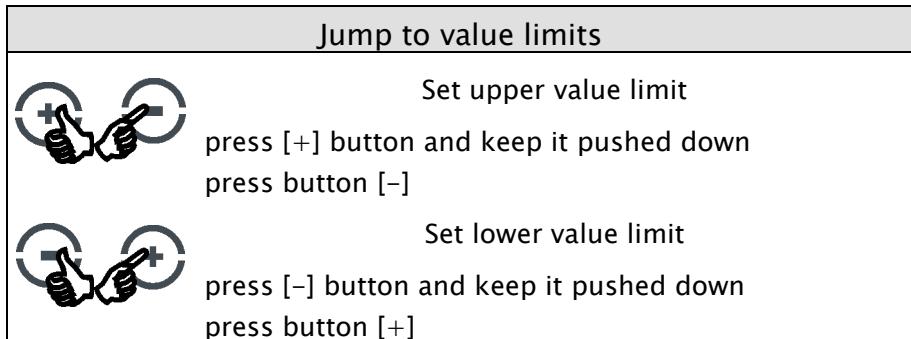


Press and keep button pushed down

(Fast) increase or decrease values automatically:



Double press and keep button pushed down
("double-click")



7.1 Basic parameter menu

7.1.1 Velocity

- ▶ Setting of the dispensing speed

Range of values: 0.1...100 m/min, increment: 0.08%

- The display of the velocity depends on

- the set machine translation (gear factor)
[Motor parameters → translation]
0.1...100 m/min with translation (gear factor) set to 1.00
- for operation with incremental encoder or analog tacho-generator the current speed depends on the actual value of the speed sensor.
Matching the speed sensor to application is carried out with:
[Synchronization → Encoder signal calibration]
[Synchronization → Analog signal amplification]

7.1.2 Position

- ▶ Setting of the relative label position to the label sensor.

- If the parameter “position” is selected in the display the label can be jogged with the [+]- button

- The displayed distance depends on the set translation (gear factor)

7.1.3 Start signal edge

- ▶ Setting of the signal edge for the X6 – start(product) sensor and the X3, 14 start input. Both inputs are electrically connected.

7.1.4 Stop edge

See label parameters for more information.

7.1.5 Loading a parameter set

- ▶ The machine operator can load a predefined or self-defined parameter set with the number of 0–20.
- This menu item is only visible if the parameter "show store/load?" = On
- With set number "0" the factory default settings can be loaded but not changed. However the settings can be saved to a different set number (= make a copy) and then these parameter set copies can be changed.

7.1.6 Saving a parameter set

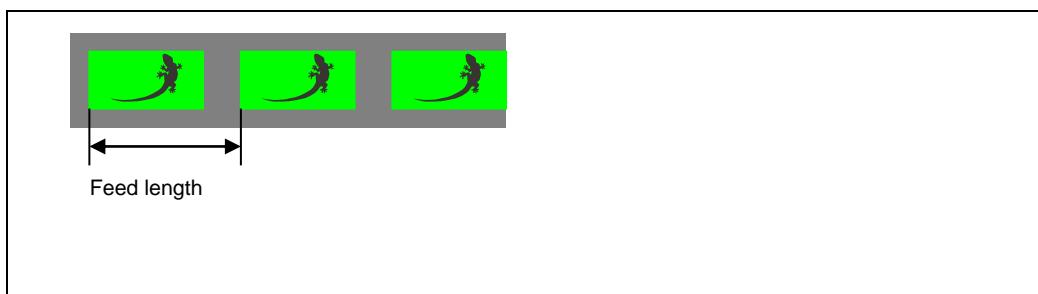
- ▶ This menu point allows to assign and save all current settings to a set number of 1...20.
- The table "Parameter overview" shows all parameters. But only parameters that can be saved to a set are marked with a [✓].
- This menu item is only visible if the parameter "show store/load?" = On
- Copies of the parameter set can be created by simply assigning these settings to different parameter set numbers
- Set number "0" represents the factory default setting. These factory defaults can only be stored in the Service Menu → SETTINGS.

7.2 Service menu

7.2.1 Label parameters

7.2.1.1 Label feed length (pitch)

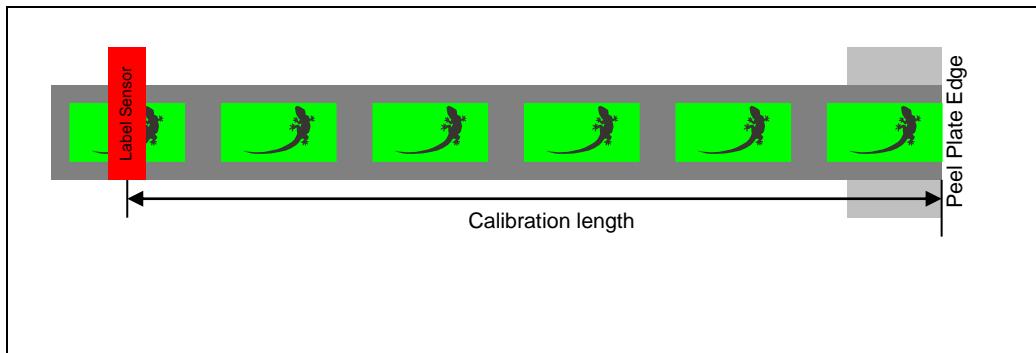
- The feed length (pitch) is the distance of label length plus the label gap



- The feed length can be entered manually or be measured automatically. To do this single labels are dispensed with the start button. The measured feed length is then updated in the display.
- Several labels should be dispensed if the feed length is measured automatically.
The displayed feed length should match the actual feed length.
- Activating the “Autocal“ – function determines the feed length automatically.
- If the determined feed length isn't correct, the parameter translation (gear factor) must be checked and corrected.
- If “feed length” = 0 is displayed the label length monitoring is switched off

7.2.1.2 Calibration length

- ▶ The calibration length is the distance between the peel plate edge and the focus of the label sensor.



- The controller calculates the number of labels between label sensor and peel plate edge with the calibration length and the feed length. The Skip – Function detects missing labels on the web. A missing label is automatically skipped at the peel plate to make sure that there is always a label at the peel plate.
- With “calib. length” = 0 the Skip – Function is switched off.

7.2.1.3 Number of missing labels warning

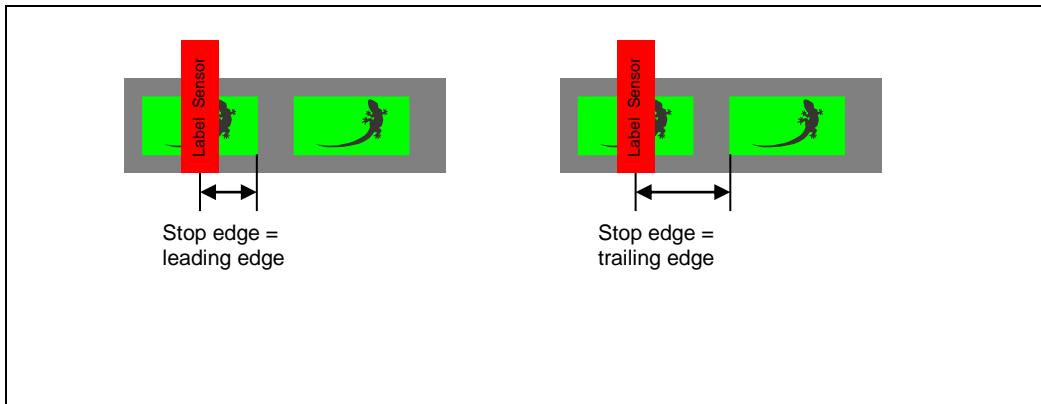
- ▶ Number of consecutively missing labels which lead to a warning
- With “number warning ” = 0 the function is switched off

7.2.1.4 Number of missing labels fault

- ▶ Number of consecutively missing places which lead to a fault
- With “number Error” = 0 the function is switched off

7.2.1.5 Stop edge

- With the setting the stop edge detected by the label sensor can be set to be either the trailing or the leading edge of the label



- To ensure proper operation the label sensor shouldn't be in the area near the active edge after dispensing a label. This can be achieved by switching the stop edge.
- If the Autocal – function is active the stop edge is automatically determined.

7.2.2 Stepping motor parameters

Acceleration and deceleration characteristics of the stepping motor can be adjusted with the ramp parameters. The label dispenser can be optimized with these parameters for high dispensing rates (many labels in a short period of time).

A maladjustment of the acceleration parameters can be the reason for the stepping motor to stall when starting to dispense a label. This can be caused by:

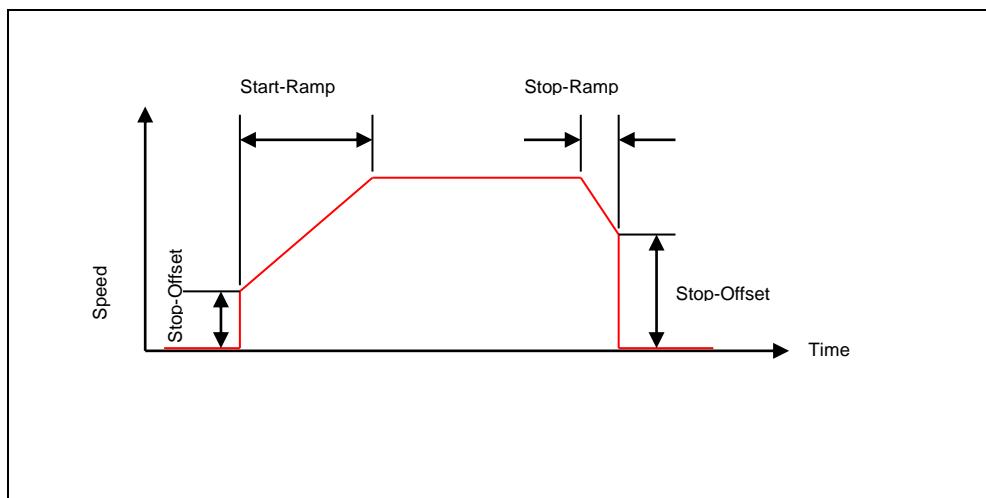
- a start ramp gradient that is too high and/or
- a start offset adjusted too high

Remedy: Reduce the start ramp gradient and/or reduce the start offset.

The reason for an inaccurate stop position can be a maladjustment of the deceleration parameters. This can be caused by:

- a stop ramp gradient that is too high and/or
- a stop offset adjusted too high

Remedy: Reduce the stop ramp gradient and/or reduce the stop offset.



7.2.2.1 Start ramp

- ▶ With parameter "start ramp" the number of acceleration steps can be set.
 - The higher the adjusted end velocity is set, the longer the acceleration ramp has to be. The length of the acceleration ramp depends strongly on the respective application. The acceleration ramp can be adjusted between 1 and 1000 steps.
 - An acceleration ramp set too short has the consequence that the stepping motor cannot be accelerated to the set end velocity.

7.2.2.2 Stop ramp

- ▶ With parameter "stop ramp" the number of deceleration steps can be set.
 - The higher the set end velocity, the longer the stop ramp must be set. The length of the stop ramp depends strongly on the respective application. The stop ramp can be adjusted between 1 and 1000 steps.
 - The stop ramp can generally be set considerably less than the start ramp since the mechanics of the label dispenser also has a braking effect.
 - A too short stop ramp can lead to an inaccurate even a not reproducible label position. Change of the stop ramp always causes a shift of the label position at the peel plate. Consequently the label must be repositioned after a stop ramp parameter change to correct the stop position at the peel plate edge.

7.2.2.3 Start offset

- ▶ The initial starting speed of the stepping motor can be set with this parameter. The value is adjustable in the range between 0 and 100% of the end velocity.
- Properly adjusting the start offset can reduce the acceleration time considerably.
- At average dispensing speeds the start offset should be in the range 5..25 %.
- A start offset set too high can cause the stepping motor to stall

7.2.2.4 Stop offset

- ▶ The deceleration time of the stepping motor can be set with this parameter. The value is adjustable in the range between 0 and 100% of the end velocity.
- Properly adjusting the stop offset can reduce the deceleration time considerably.
- A stop offset set too high can cause the stepping motor to brake uncontrolled. This can lead to a displacement of the label at the peel plate.

7.2.2.5 Recommended stepping motor parameters

► The table shown below shows typical stepping motor parameters as guideline values. These values were determined with real labeling machine applications.

But depending on the actual label application other parameter settings may be necessary. Particularly influential on the parameter settings are the following design features:

- mechanical design and construction of the unwind mechanism
- web path
- web tension
- mechanical design and construction of the peel plate edge (friction)

Dispensing velocity [in % of end velocity]	Typical stepping motor parameters			
	Start ramp [in motor steps]	Stop ramp [in motor steps]	Start offset [in % of end velocity]	Stop offset [in % of end velocity]
0..20	1–10	1–5	50	50
20..40	10–40	5–20	30	40
40..60	20–60	10–40	25	40
60..80	40–80	20–60	20	30
80..100	70–140	50–90	10	20

Note: The velocity is displayed in % because the setting TRANSLATION (gear factor) influences the end velocity.

7.2.2.6 Direction of rotation

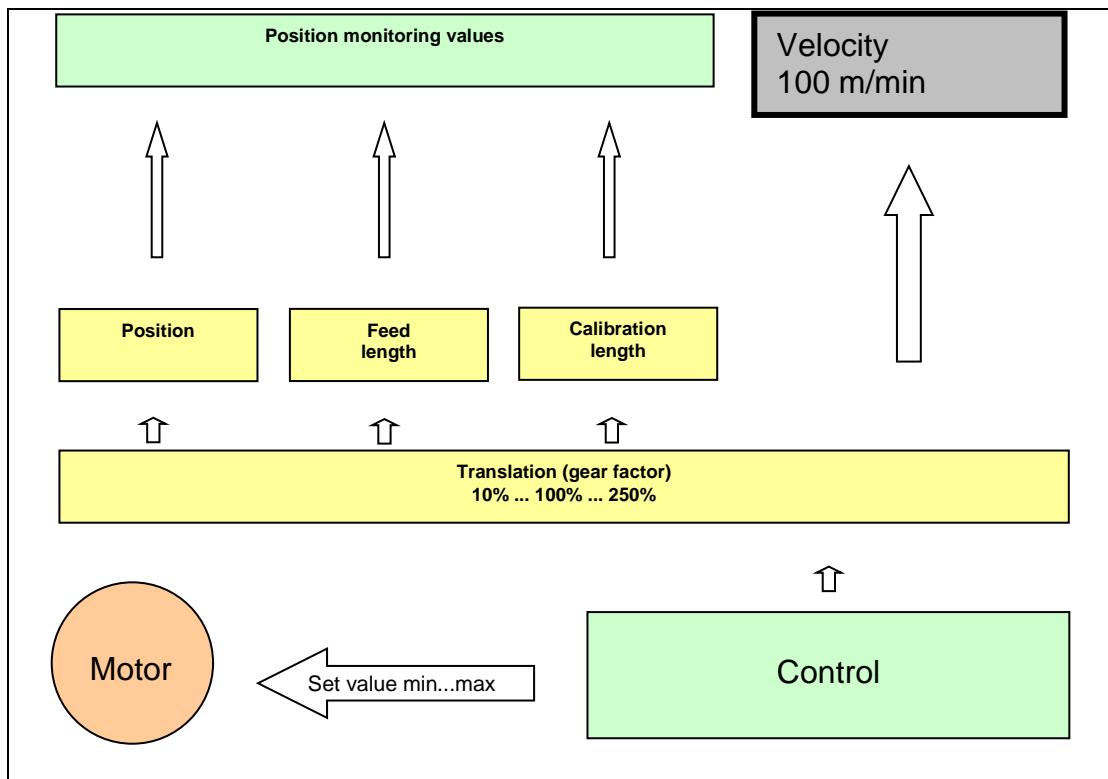
► Depending on mounting of the drive (on the left/on the right) the direction of the stepping motor motion must be adjusted correspondingly. "Left" is the default value.

7.2.2.7 Translation (gear factor)

► The translation (gear factor) is used to adapt the drive to the label dispenser's mechanical system.

For standard machines this setting is "1.00".

The setting of this parameter has a global effect on the dispensing speed and all positions.



The translation factor can simply be determined by calculation of the machine parameters with the following equation:

$$\text{Translation} = \frac{\text{Teeth of motor pulley}}{\text{Teeth of drive pulley}} * \frac{\text{Drive pulley diameter}}{39\text{mm}}$$

7.2.3 Synchronization

7.2.3.1 Synchronization source

- ▶ The dispensing speed for the label dispenser can be set in different ways.
 - **Internal** : The end velocity is set by the controller. This option is chosen if no external speed signal source exists. For constant product speeds this setting is the standard.
 - **Incremental encoder** : The machine is equipped with a slippage free incremental encoder that continuously sends actual and proportional velocity signals representing the product speed to the controller.
 - **Analog tacho-generator** : The machine is equipped with an analog set point generator which has 0..10 VDC output.

7.2.3.2 Incremental encoder calibration

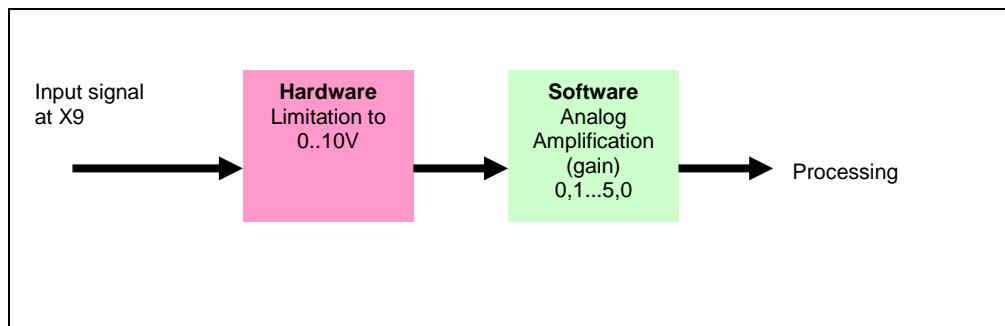
- ▶ This setting is only relevant if an incremental encoder is used for the speed synchronization.
- Before calibration the following points must be assured:
 - An incremental encoder is mounted free of slippage (e.g. with a friction wheel) the conveyor belt and electrically connected to controller.
 - The conveyor belt is started with the labeling speed
 - The adjusted dispensing speed must match the speed of the conveyor belt.
- The incremental encoder frequency must be within the range of 1...40 kHz. No automatic setting is possible at lower frequencies.
- The current frequency of the incremental encoder is shown in the 2nd display line on the right. The current calibration value is shown on the left. Pressing the “S-Button” stores the measured value.

■ With this calibration process the controller calculates the **step resolution** of the incremental encoder based on the **set speed** and the **incremental encoder frequency**. This value is required for the following parameter calculations:

- Start delay
- AUX-Delay
- AUX-Time duration
- Start suppressing

7.2.3.3 Analog signal amplifier (gain)

► This setting is only relevant if an analog tacho-generator is used for the speed synchronization.



■ If the input control signal is weak, it can be adjusted with the analog amplifier (gain).

7.2.4 I/O configuration

7.2.4.1 Start signal edge

- ▶ Set the signal edge of the X6 -- start (product) sensor as well as for the X3, 14 start input.

Both inputs are electrically connected

7.2.4.2 Start delay

- ▶ Setting of the start delay distance

- If an incremental encoder is used as a synchronization source, then the start delay works controlled by distance and is therefore independent from the velocity.
- If the synchronization source is an “analog tacho generator” or is set to “internal” then start delay controlled by time and therefore speed dependent. The controller calculates the delay distance with the set speed and the start delay.
- During the start delay the output “Start delay active” (X3, 5) is switched.
- Manually dispensing a label doesn’t activate the start delay

7.2.4.3 Start suppression

- ▶ The start suppression is an adjustable time/distance. The time or the distance starts with starting the stepping motor. The controller ignores unwanted start signals during this time.

- If as a synchronization source the incremental encoder is set, then the start inhibit is displayed as a distance. The start suppression is therefore independent of the velocity.

The diagram “Signal timing of a dispensing cycle” shows the function of the start suppression.

7.2.4.4 AUX-Time

- ▶ The AUX signal can be a set time duration or as an adjustable distance.
The output X3, 3 is switched during that time /distance.
This output can for example control a movable peel plate.
- If an incremental encoder is used as a synchronization source, then the AUX signal duration works distance controlled and is therefore speed independent.
- If the synchronization source is an “analog tacho generator” or is set to “internal” then start delay is time controlled and therefore speed dependent.
- The point of time when AUX-Time/distance starts can be set with parameter, AUX-Time start.

7.2.4.5 AUX-Delay

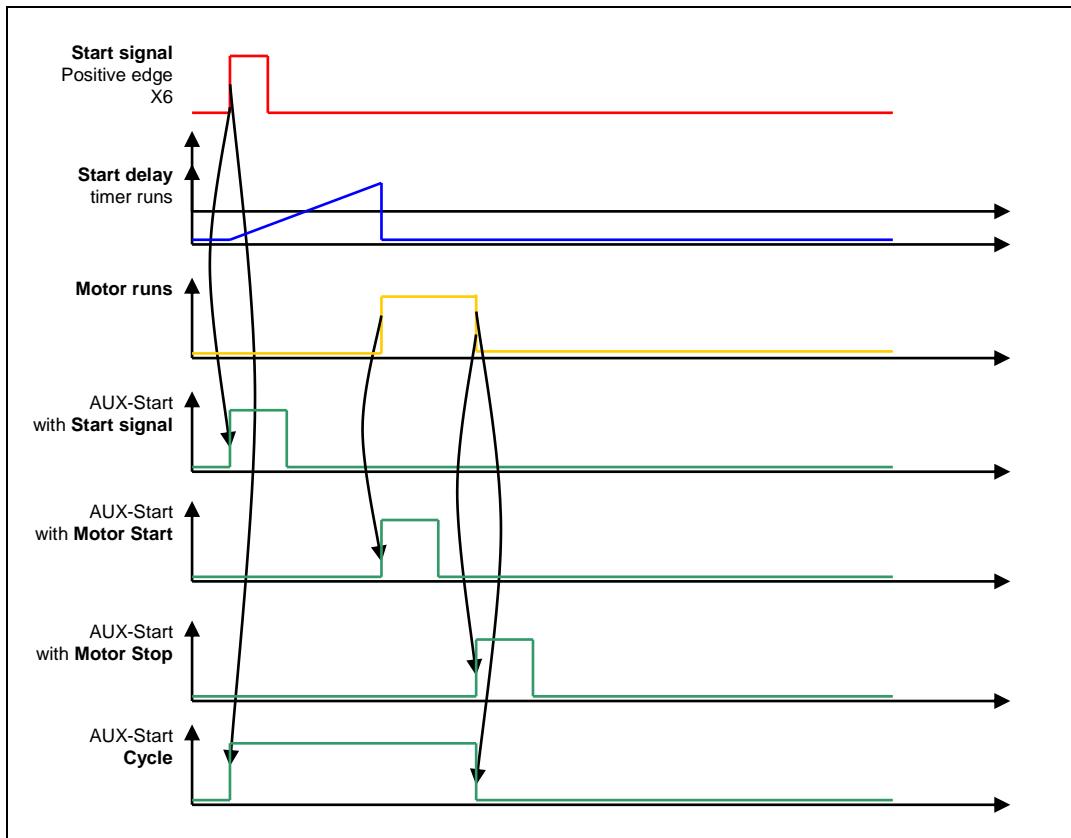
- ▶ The AUX-Delay is an adjustable time or distance before AUX-Time.
- The start time point of the AUX-Delay can be set with the parameter “AUX-Start”

7.2.4.6 AUX-Start

► The parameter defines the start event on which the AUX-Time should start. If an AUX-Delay is programmed, then the time/distance way still pass before the AUX-Time. While the AUX-Time is active, the output is X3,3 is switched on. The following parameter settings are possible:

AUX start	Description
Start signal	A positive or negative signal edge of the start(product) sensor input at the connector X6 (or X3, 14) starts AUX-Time/distance. If an AUX-Delay is programmed, then this delay time passes before the AUX-Time starts.
Stepping motor start	The AUX-Time/distance starts together the stepping motor motion. If an AUX-Delay is programmed, then this delay time passes before the AUX-Time starts. If the start delay is set to "0" the function is equal to AUX-Time start = start signal
Stepping motor stop	The AUX-Time/distance starts when the stepping motor stops. If an AUX-Delay is programmed, then this delay time passes before the AUX-Time starts.
External X7/X8	The AUX-Time isn't influenced by the dispensing cycle AUX-Time can only be started with the configurable input X7/X8. If AUX start is set for <ul style="list-style-type: none"> • Start signal • Motor start • Motor stop or • Cycle the AUX-Time can be started in addition with X7 or X8 if the X7 (or X8) function is programmed correspondingly.
Motor-cycle	The AUX-Time/distance starts with the start signal and ends with the stopping of the stepping motor. The Setting the AUX-Time/distance doesn't have any influence here.

Timing diagram: AUX-Start options



7.2.4.7 AUX1-Time

- ▶ The AUX1-Time is a settable time. During this time the output X3,5 is switched on. The output can be used to control an actuator (e.g. magnetic valve).
- The AUX1-Time is always time controlled, independent from the set synchronization source
- With parameter “AUX1-Start” it can be defined when the AUX1-Time starts

7.2.4.8 AUX1-Delay

- ▶ The AUX1-Delay is settable or distance that expires before the AUX1-Time is started
- The start time point of the AUX1-Delay can be set with the parameter AUX1-Start

7.2.4.9 AUX1-Start

- ▶ The parameter defines the start event on which the AUX1-Time should start. If an AUX1-Delay is programmed, then the time/distance way still pass before the AUX1-Time. While the AUX1-Time is active, the output is X3, 5 is switched active. The following parameter settings are possible:

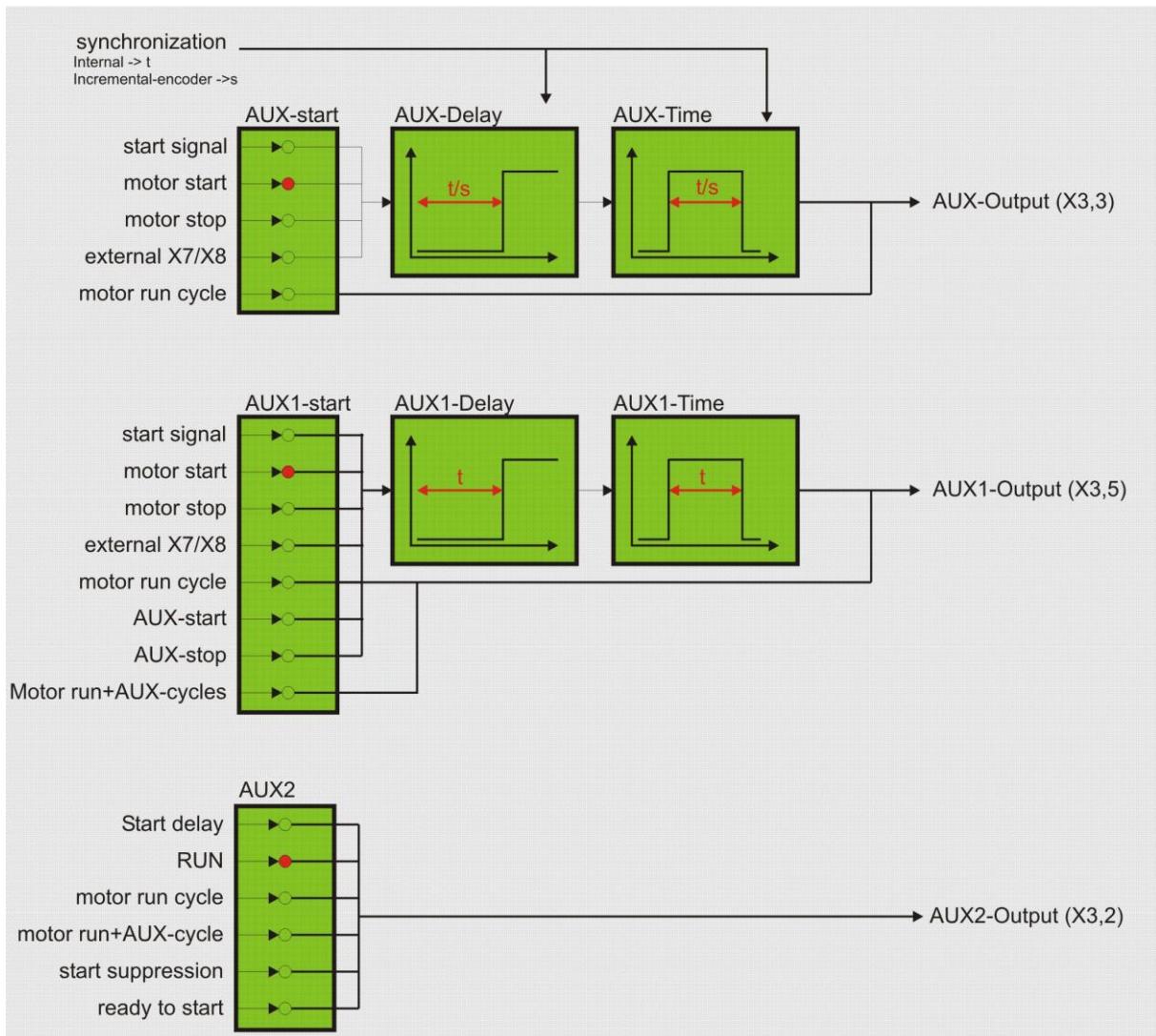
AUX1 start	Description	
Start signal	A positive or negative signal edge of the start(product) sensor input at the connector X6 (or X3, 14) starts AUX1 time/distance. If an AUX1 delay is programmed, then this delay time passes before the AUX1 time starts. <u>During AUX1-Time the AUX1 -output (X3,5) time is switched on.</u>	
Stepping motor start	The AUX1 time/distance starts together the stepping motor motion. If an AUX1-Delay is programmed, then this delay time passes before the AUX1-Time starts. If the start delay is set to "0" the function is equal to "AUX1 - start = start signal	
Stepping motor stop	The AUX1 time/distance starts when the stepping motor stops. If an AUX1-Delay is programmed, then this delay time passes before the AUX1-Time starts.	
External X7/X8	The AUX1 time isn't influenced by the dispensing cycle AUX1 time can only be started with the configurable input X7/X8. If AUX1-Start is set for <ul style="list-style-type: none"> • Start signal • Motor start • Motor stop or • Cycle the AUX1-Time can be started in addition with X7 or X8 if the X7 (or X8) function is programmed correspondingly.	Same settings as for AUX-Start
Motor-cycle	The AUX1-Time/distance starts with the start signal and ends with the stopping of the stepping motor. The Setting the AUX1-Time/distance doesn't have any influence here.	
AUX-Start	Together with the AUX-Time also the AUX1-Time starts	
AUX-Stop	Right after AUX-Time expires the AUX1-Time starts	
Motor + AUX cycle	The AUX1 output is switched on during the motor-cycle (start delay and motor) and the AUX cycle.	Additional Settings

7.2.4.10 Config x3,2 (AUX2) output

► The Config x3,2 (AUX2) output can be programmed to switch on based on different events.

AUX2 output	Description
Start delay	Output is switched on during <ul style="list-style-type: none"> • Start delay
Motor run	Output is switched on during <ul style="list-style-type: none"> • Motor run
Motor-cycle	Output is switched on during <ul style="list-style-type: none"> • Start delay • Motor run
Motor+AUX cycle	Output is switched on during <ul style="list-style-type: none"> • Start delay • Motor run • Aux-delay • Aux-time
Start suppression	Output is switched on during <ul style="list-style-type: none"> • Active start suppression
Ready	Output is switched on during <ul style="list-style-type: none"> • Controller ready state

7.2.4.11 Overview of AUX, AUX1 and Config. X3,2 (AUX2) output settings



7.2.4.12 Application example with AUX, AUX1 and Config. X3,2 (AUX2) outputs

Example 1: Label application with a controlled peel plate

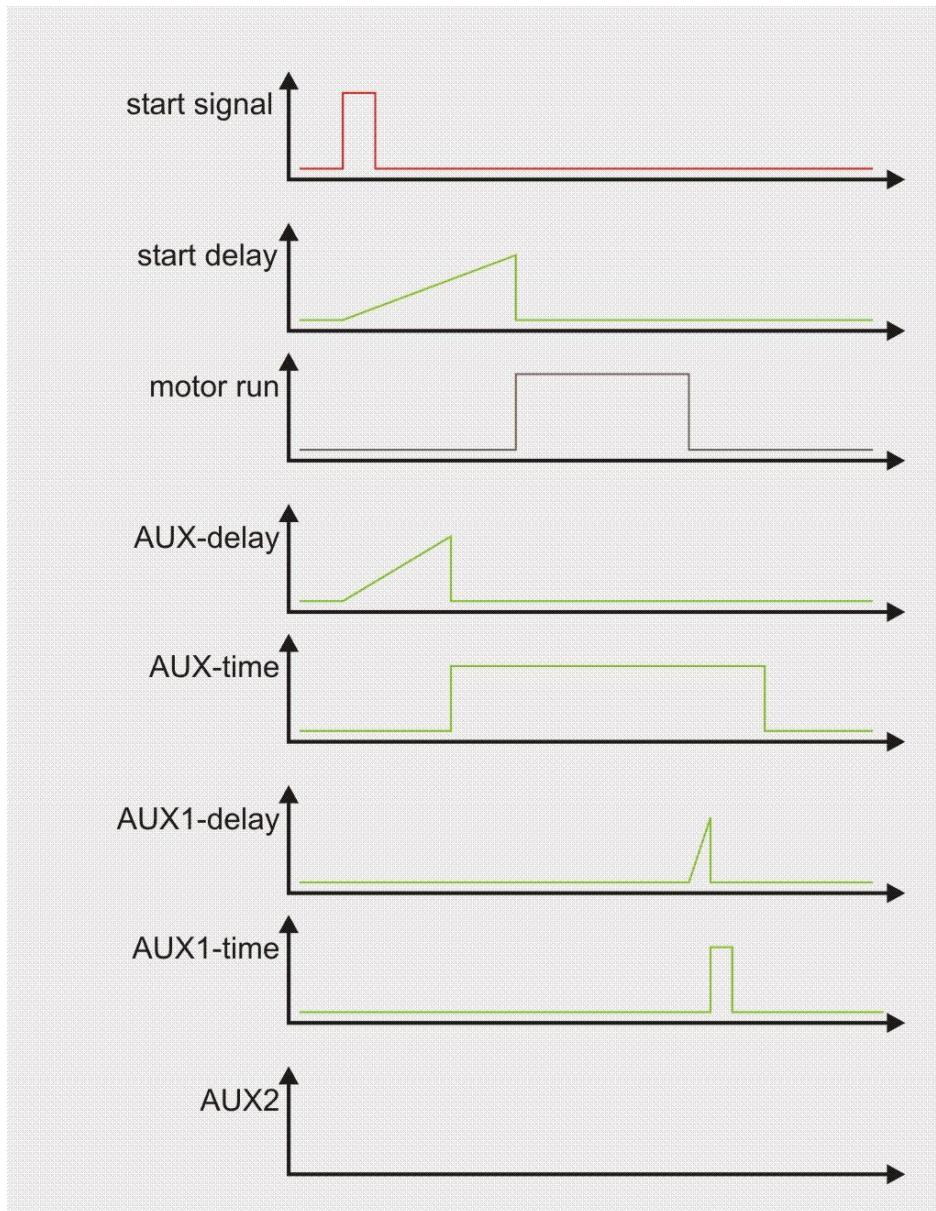
Application description:

A label should be placed on a product with a recessed location (e.g. lid of a container). The label dispenser is equipped with a movable peel plate for this task. The peel plate can be lowered towards the product with a magnet actuator or with a pneumatic cylinder.

Sequence:

1. The start(product) sensor mounted to the product conveyor detects the product before the peel plate has to be moved.
2. After a settable delay time the peel plate is controlled with the AUX output (X3,3) and remains in the “down” position for the AUX-Time.
3. The start delay of the label dispense cycle initiates the labeling cycle while the peel plate is in the “down” position.
4. This example uses the AUX1 output for an additional actuator (e.g. to control a “air-blow” impulse solenoid or imprinter).
5. The AUX1 output is activated after a short delay time following the label dispense cycle.

Timing diagram: Label application with a controlled peel plate



Example 2: Tamp/blow controlled label application

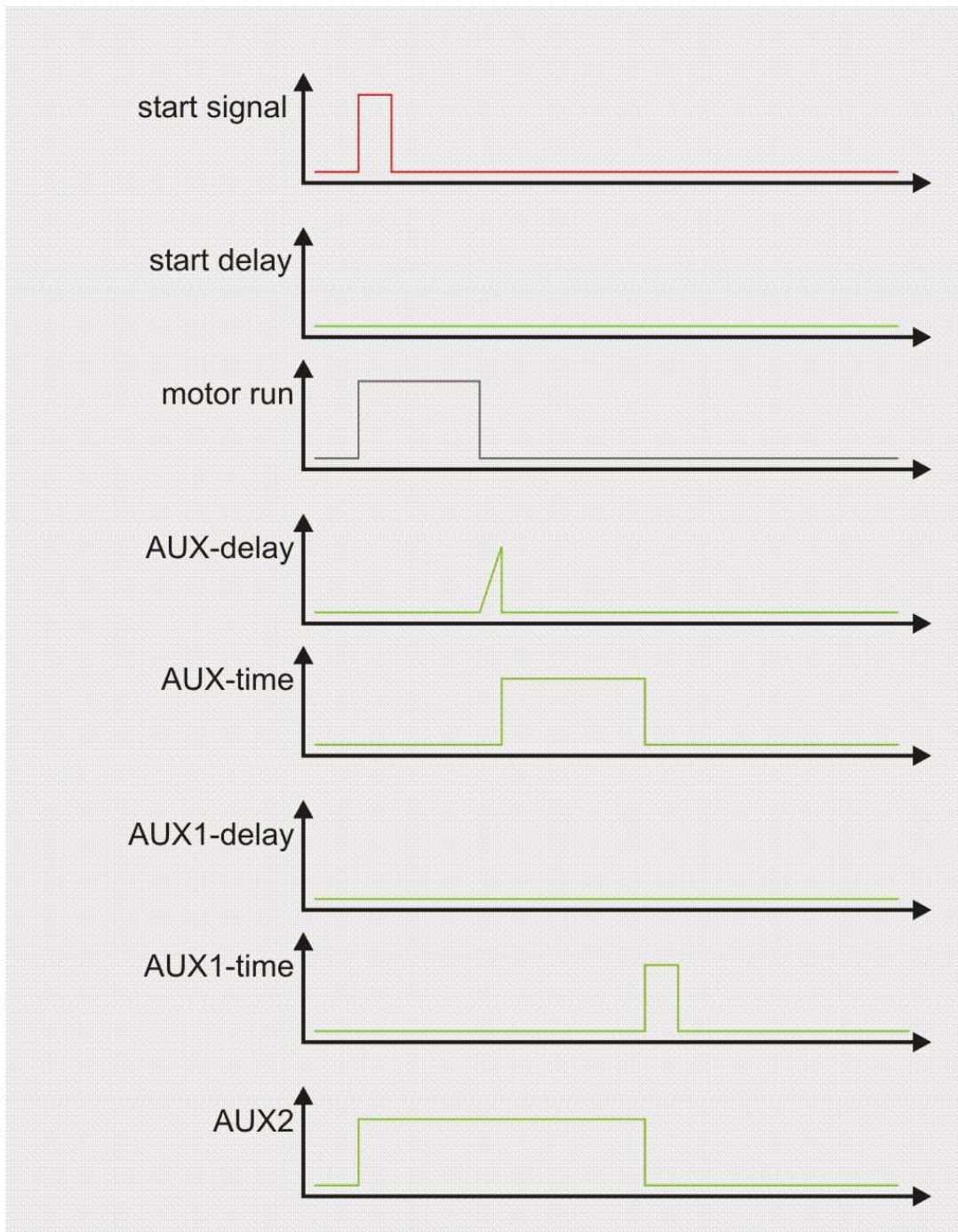
Application description:

A label should be transferred at to vacuum controlled tamp unit. After the label is dispensed to the tamp unit the tamp unit extends for a settable time. After the time has expired the label is applied to the product with a blow pulse.

Sequence:

1. The sequence is started with the start(product) sensor input X6.
2. With the start signal the label is dispensed and the vacuum of the tamp plate is activated with output AUX2. For this the parameter "AUX2-output" is set to "Mot.+AUX-cycle".
3. After label is transferred to the tamp plate and after a short delay time (AUX-Delay) the tamp is extended for the duration of the AUX-Time.
4. After the AUX-Time is expired the label is transferred to the product with a blow pulse controlled by the AUX1-Time. For this parameter "AUX1-Start" is set to "AUX-Stop".
5. After a short delay AUX1 is activated.
6. A sensor detecting the retracted "home" position of the tamp can be connected to input X7 or X8. If the sensor is for example connected to X7 then the parameter "X7-function" can be set to "start blocking" and "X7-signal edge" to "low active". This means not label dispense cycle is possible unless the tamp cylinder is at the "home" position.

Timing diagram: Tamp/blow controlled label application



7.2.5 X7/X8 input configuration

Starting with firmware version V1.01a the two inputs X7 and X8 can be configured with different functions. For the two inputs the function as well as the signal edge can be programmed separately.

7.2.5.1 X7 function

- ▶ Setting table below for the function of the input X7

7.2.5.2 X7 signal edge

- ▶ Setting of the active signal edge of X7

- **positive signal edge**, function is triggered only with a **positive signal edge**
- **negative signal edge**, function is triggered only with a **negative signal edge**
- **high active**, the function is triggered with a **positive signal edge**, while the signal is active high a “Warning/Fault” can’t be reset.
- **low active**, the function is triggered with a **negative signal edge**, while the signal function is active low a “Warning/Fault” can’t be reset. For safety relevant supervisions this setting is recommended since it’s *cable fail safe*.

7.2.5.3 X8 function

- ▶ see table below

7.2.5.4 X8 signal edge

- ▶ Setting of the active signal edge of X8

- **positive signal edge**, function is triggered only with a **positive signal edge**
- **negative signal edge**, function is triggered only with a **negative signal edge**
- **high active**, the function is triggered with a **positive signal edge**, while the signal is active high a “Warning/Fault” can’t be reset.
- **low active**, the function is triggered with a **negative signal edge**, while the signal function is active low a “Warning/Fault” can’t be reset. For safety relevant supervisions this setting is recommended since it’s *cable fail safe*.

X7/X8 function	X7/X8 signal edge			
	Pos. signal edge	Neg. signal edge	High active	Low active
Warning X7/X8	The status light "warning" is active. The HMI displays "warning X7/X8". Warning can be reset with the reset button given even if the signal is still active.		The status light "warning" is active. The HMI displays "warning X7/X8". Warning can only be reset if the signal is not active anymore.	
Warning web end	The status light "warning" is active. The HMI displays "low level Warning". Warning can be reset with the reset button given even if the signal is still active.		The status light "warning" is active. The HMI displays "low level Warning". Warning can only be reset if the signal is not active anymore.	
Fault X7/X8	The status light "fault" is active. The HMI displays "error X7/X8". Fault can be reset with the reset button given even if the signal is still active.		The status light "fault" is active. The HMI displays "error X7/X8". Fault can only be reset if the signal is not active anymore.	
Web break fault	The status light "fault" is active. The HMI displays "web broken". Fault can be reset with the reset button given even if the signal is still active.		The status light "fault" is active. The HMI displays "web broken". Fault can only be reset if the signal is not active anymore.	
Stop	Stops a running label dispenser Label dispenser can be started with active signal		Stops a running label dispenser Label dispenser cannot be started with an active signal externally at X6 (and X3, 14). At a start attempt the HMI status report "X7/X8-stop activ" is displayed. A keypad start is possible.	
Start blocking	With an active signal the label dispenser can not be started. However, an already running dispense cycle is not interrupted.			
Start label dispenser	The label dispenser is started immediately and without delay despite a programmed start delay time. After the dispense cycle the AUX-Delay and AUX-Time is activated when set under AUX-Start accordingly.			
Start cycle	Activated the start delay time, then the dispense cycle and if it's programmed AUX-Time.			

Start AUX-Delay	Activates the AUX-Output (X3,3): With a set AUX-Delay > 0 the AUX-outputs is after the time has expired. After the expired delay the output is activated for the set AUX-Time. When synchronization with encoder is selected the delay and duration time parameter are shown as distance.
Start AUX-Time	Activates the AUX-Output, see above: A possibly programmed delay time is ignored. When synchronization with encoder is selected the delay and duration time parameter are shown as distance.
Start AUX1-Delay	Activates the AUX1-Output (X3,5): With a set AUX1-Delay > 0 the AUX1-outputs is after the time has expired. After the expired delay the output is activated for the set AUX1-Time. Even if synchronization with encoder is selected the AUX1-Delay and AUX1-Time remains as time parameters.
Start AUX1-Time	Activates the AUX1-Output, see above: A possibly programmed delay time is ignored. Even if synchronization with encoder is selected the AUX1-Delay and AUX1-Time remains as time parameters.
No function	Input doesn't react on any signals

7.2.6 Communication Interface

7.2.6.1 Address

► This parameter sets the device address. This setting is only required when the serial communication interface is used.

For RS232 communication the address is set to 0.

For a network of multiple controllers each controller must have its own individual device address set (range : 1–32).

7.2.6.2 Baud rate RS232

► The following baud rates for different transmission rates can be set:

- 9600 baud (slow)
- 19200 baud
- 57600 baud
- 115200 baud (fast)

7.2.6.3 Baud rate CAN

► The following baud rates for different CAN transmission rates can be set:

- 125 kBaud (slow)
- 250 kBaud
- 500 kBaud
- 1 MBaud (fast)

7.2.7 Settings

7.2.7.1 Language

► Setting of the language. The following languages are selectable:

- German
- English

Up to 6 more languages can be stored

7.2.7.2 Beep

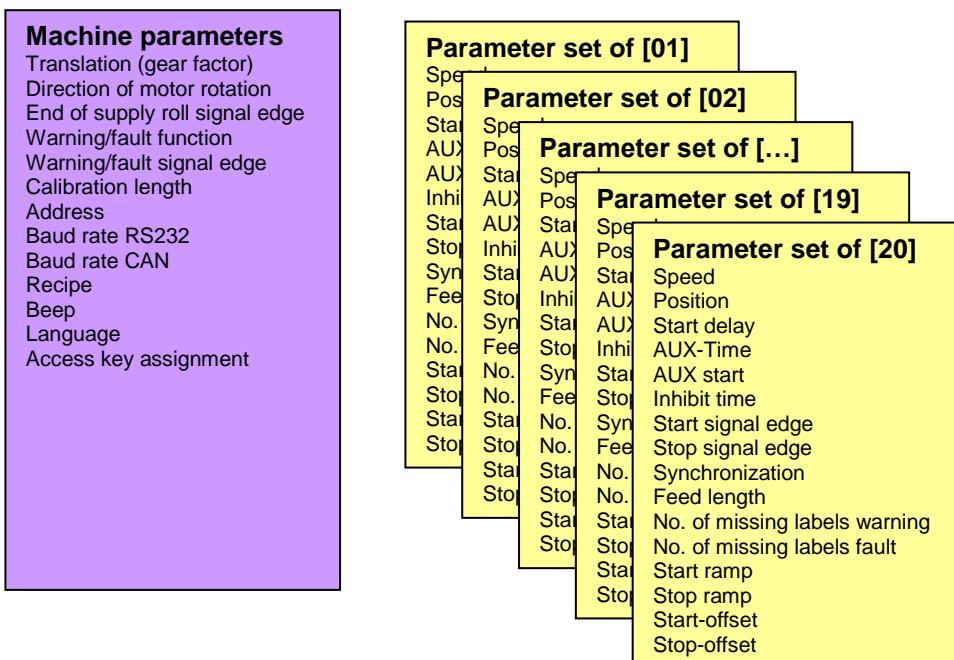
► As an acoustic feedback of a keystroke a short beep can be activated.

- off
- on

7.2.7.3 Recipe

► The control offers a recipe administration of 20 individual parameter sets.

With this menu item the recipe administration can be turned on or off.



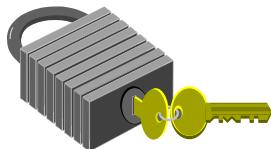
■ The last set parameter set remains active if the recipe function is switched off.

7.2.7.4 Password

- ▶ Starting with firmware version 1.01 the service parameters can be protected with a password.
- With setting 0 no password will be checked.
- With password between 1 and 255 the password is checked before access to the service menu. A false password switches the system back to the operating mode.
- A forgotten password can be bypassed. Contact your supplier for this information.



Write down the new parameter value in the table of this manual for future reference..



PASSWORD	CHANGED BY	DATE
0	BLACK FOREST LINK	DEFAULT

7.2.7.5 Factory default setting

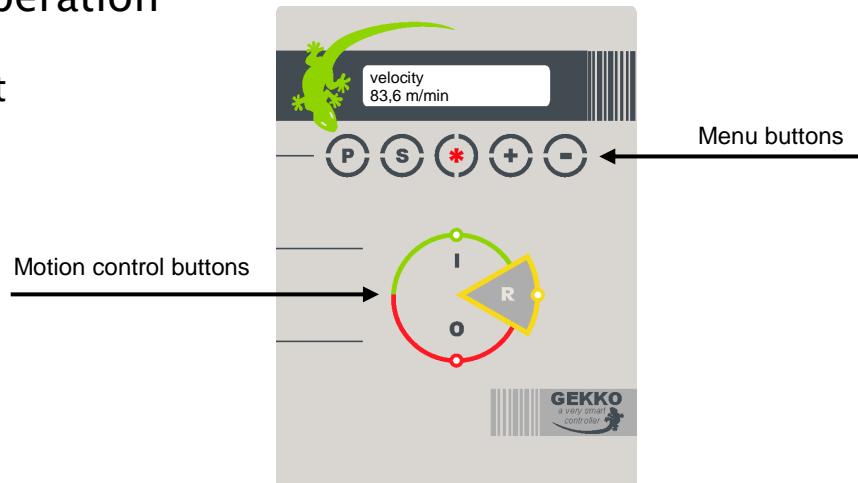
- ▶ With this menu point all current settings can be stored to the parameter set 0 (= factory default values).
- No other parameters can be stored in this set from within the menu.



Label machine OEM can customize their machines setting with this parameter.
Note: This parameter is used to store the current settings as factory defaults and not to restore any factory default settings.
Restoring these machine defaults is later done by loading parameter set 0.

8 HMI operation

8.1 Layout



Button symbol	Description
	START-button with green LED LED is lit while a label is dispensed
	STOP-button with red LED LED is lit while the label dispenser is idle
	RESET-button with yellow LED LED is lit if there is a fault condition that needs to be reset
	P button Used for menu navigation
	S button Used to save changed parameter values and for menu navigation
	Menu access button An individual parameter can be called and programmed using this button
	[+] button Increments a parameter value or changes to additional setting options.
	button [-] Decrements a parameter value or changes to additional setting options.

8.2 Functions

8.2.1 Menu selection

All parameters are contained in two different menus.

8.2.1.1 Basic parameter menu

The essential fundamental settings can be set in the basic parameter menu.



8.2.1.2 Service menu



8.2.1.3 Return to the operating mode

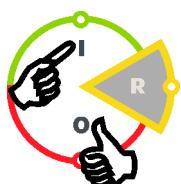
It's possible to directly return to operating mode after editing a parameter in the **service menu** by pressing the S button continuously for 2 sec.



8.2.2 Jog operation

In jog operation the drive of the label dispenser can be started independently from the input signals.

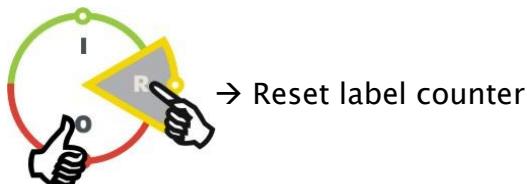
The drive stops immediately after releasing one of the buttons.



→ label dispenser starts with high speed

8.2.3 Resetting the label counter

Resets the counter (to the default value)



8.2.4 Display the status monitor



Press button for 2 sec → Status Monitor is displayed
(see also chapter Status-Monitor)

8.2.5 Activating/deactivating the start blocking

The start blocking prevents the label dispenser from unintentionally dispensing a label.

The start blocking can be activated and only deactivated with the HMI. Even the Reset input X3 ,12 cannot deactivate the start blocking. If the start blocking is activated, the yellow LED flashes at the RESET button.



8.2.6 Autocal – function

With the Autocal function a label can be automatically measured and placed.

Preparation:

- Thread label web
- Adjust calibration length

Activation:

- Press and hold the "R" button while the controller is in "ready" mode.
- After 1.5 sec the message "autocal? → [I]" appears. If the calibration length hasn't been set before (value 0) then the message "set calib. len" is displayed.
- Press start button [I]
- The label dispenser starts and dispenses several labels. The label length and the label gap is measured and the stop edge as well as the position is calculated.
- After the process the label at the peel plate must be flush otherwise the calibration length must be corrected correspondingly.
- If no flush label positioning at the peel plate is possible if the message "check autocal!" is shown.
- After this process the label dispenser is set up and operational.
The Skip-function is activated automatically.

8.2.7 Skip-function

Missing labels on the web are automatically skipped with the Skip-function.

If a blank web spot (with a missing label) arrives at the label sensor, then the dispenser will still stop correctly even without the switching signal of the label sensor. When the blank spot reaches the peel plate the empty place is skipped automatically so that there is always a label ready at the peel plate edge.

Note: Missing labels between the label sensor and the peel plate edge right after the controller was switched on will not be skipped because these aren't recognized by the controller.

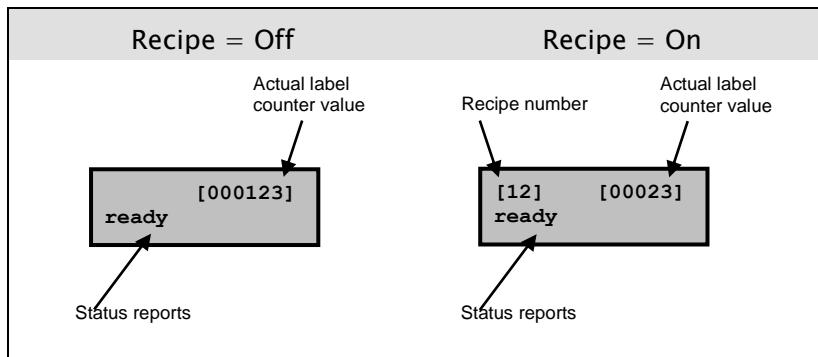
To activate the Skip-function, the following settings are necessary:

- Set **calibration length** (see parameter "Calibration length")
- Set **feed length**, better set automatically (see parameter "feed length")
- If a **Warning/fault message** is wanted after a certain amount of missing labels, the parameters "number of missing labels warning" and "number of being missing labels fault" must be set correspondingly
- To make sure that the function is working properly, a label can be manually removed **in front of the label sensor**. By starting the dispenser repeatedly it can be checked if the missing label spot is skipped when reaching the peel plate.
- The Skip-function can be monitored in the diagnostics menu "Label-Queue".

The following measure can be taken if the Skip function is not working properly:

- Check the setting of the **label sensor**. The label sensor must switch reliably in the gap but not show any switching signals in the area of the label.
- Check the **automatically read feed length**. This must correspond to the actual label feed length (see parameter "feed length")
- Check the set value of the **calibration length** (see parameter "calibration length")

8.2.8 Operating display



8.2.9 Access menu

- With the Menu-Access button the menu navigation can be simplified considerably.
- The function of the Access menu button can be programmed in operation.
- Calling menu item, menu group or service menu
- Press the Access Key for 2sec → The message "access stored" appears in the display
- When operating the Access button repeatedly the display toggles between the operating display and the corresponding parameter.

9 HMI messages (status, warning and fault)

All Messages are divided up into status, warning and fault messages. The fault messages have the highest priority, the status messages the lowest.

Fault messages		
Message text	cause	Note/remedy
memory error	EEPROM read error	Hardware defective
motor error	Short circuit in the stepping motor cable Motor drive overheats Motor drive fault	Check connector and cables Let drive cool down Repair required
missing label	One or more missing labels on the web	Check parameter: "No. Miss. Labels Fault"
error X7/X8	Input X7 or X8 is active	<ul style="list-style-type: none"> • Eliminate reason for fault • Check sensors • Check configuration of X7 or X8 and signal edge X7 or X8
web broken	Input X7 or X8 is active	<ul style="list-style-type: none"> • Eliminate reason for fault • Check sensors • Check configuration of X7 or X8 and signal edge X7 or X8
error X3,11	High-Signal at X3,11	Eliminate fault
start blocked	Start inhibit activated at HMI	Release start inhibit with HMI key "R"
short circuit	Overload condition of the outputs. An excessively high sum current is drawn of X3...X10. A maximum of 1200 mA are possible.	Check all connected loads remove if necessary. See diagnostic message "Power Fail"

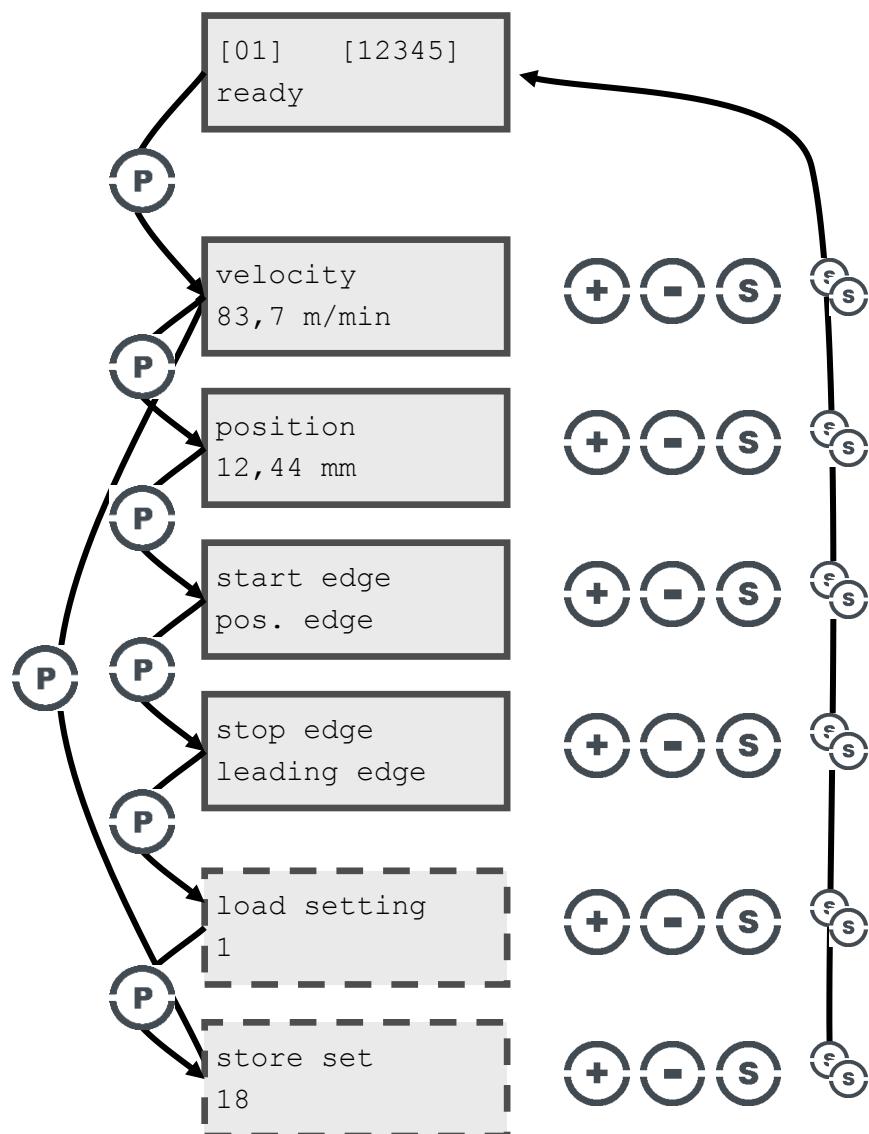
Warning messages		
Message text	cause	Note/remedy
low level Warning	Role end sensor at the connector X7 or X8 is active. The corresponding input (X7 or X8) is configured "warning role end" (X7/X8 configuration → X7 function or X8 function)	<ul style="list-style-type: none"> • Eliminate reason for role end • Check sensors • Check configuration of X7 or X8 and signal edge X7 or X8
warning X7/X8	Sensor at input X7 or X8 is active.	<ul style="list-style-type: none"> • Eliminate reason for role warning • Check sensors • Check configuration of X7 or X8 and signal edge X7 or X8
warn. high temp	Device temperature is approx. 70° degrees Celsius on the inside.	The message can be reset. The cooling must be improved.
autocal error	While the Autocal. function was executed it was not possible to determine reliable label data (repeating feed length and gaps)	Check label sensor
check autocal!	Due to the mechanical design it isn't possible to flush place the label on the peel plate.	Check stop ramp. Possibly a too large value is set here.

Status Messages		
Message text	Cause	Note/remedy
autocal. active	The automatic calibration is active	---
Autocal.? → [I]	The automatic calibration is ready for start. The start button must be pressed [I] for start	
set calib.length.	The automatic calibration shall be activated, however, no calibrating length was entered.	Adjust calibration length
run	Messages indicates that a label is currently dispensed.	
feeding	The manual jog button was activated	Press Stop [O] or release Start [I] button.
start suppressed	While the start inhibit (adjustable time or distance was active a start signal occurred which was ignored by the control.	The message is cleared automatically after 1 sec.
no signal	The controller is set to external synchronization (digital incremental encoder or analog tacho-generator). The dispenser was started at the HMI without there being an external set point. The label dispenser starts with an internal set speed and signals this with this message	
access Stored	The Access button was newly programmed	
default setting	Attempt to change a parameter value while the default parameters are loaded. The default parameters can't be overwritten in the menu.	Selecting a different parameter set between (1...20).
start blocked.	A start attempt occurred while the input X3, 15 (start inhibit) was active	Check signal on X3, 15.

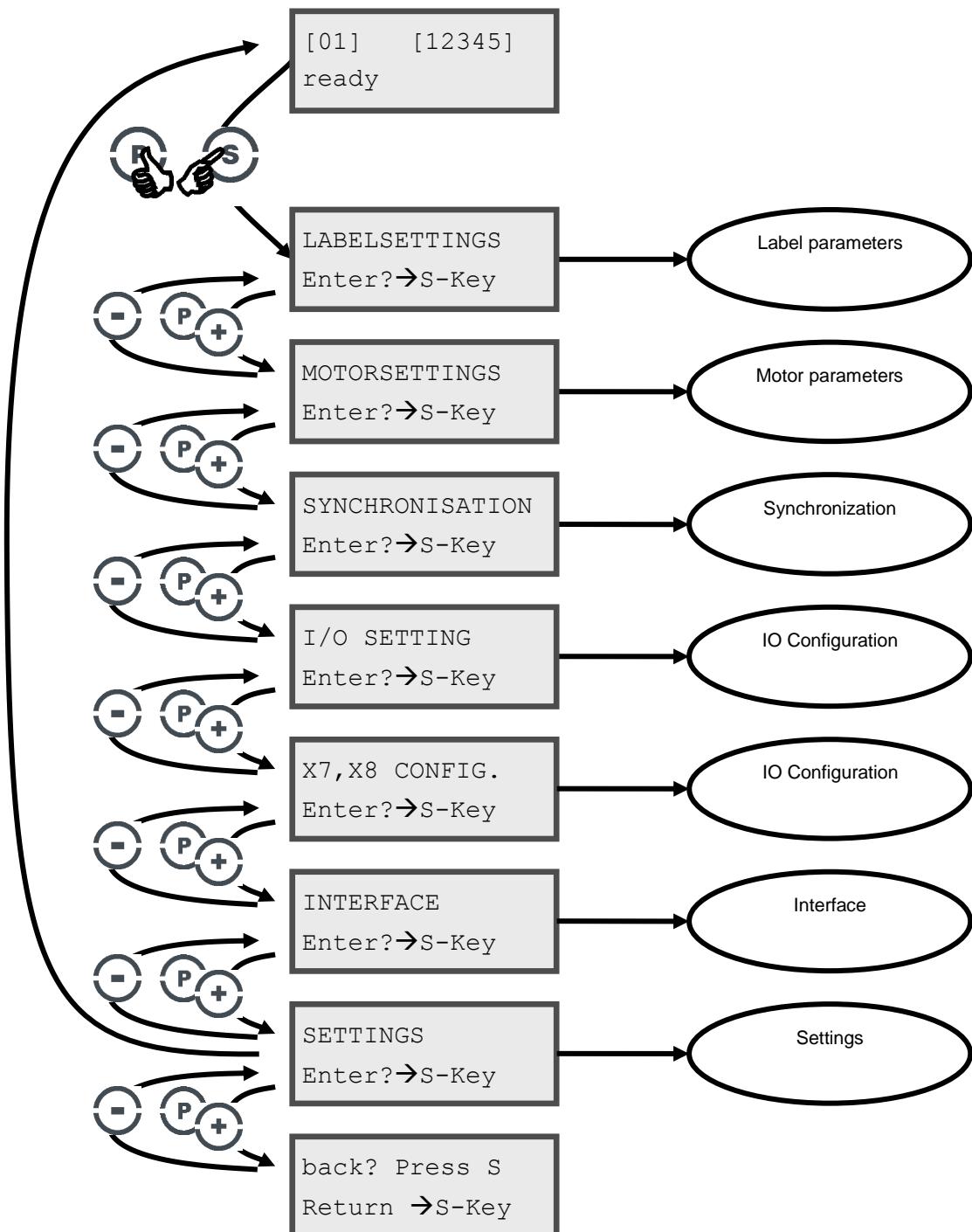
X7/X8-stop activ	A start attempt occurred while the input X7 or X8 is active. The start is ignored by the controller.	<ul style="list-style-type: none"> • Eliminate reason for role warning • Check sensors • Check configuration of X7 or X8 and signal edge X7 or X8 • The message is cleared automatically after 1 sec
ready	No other message active. Label dispenser is operational.	---

10 Menu navigation

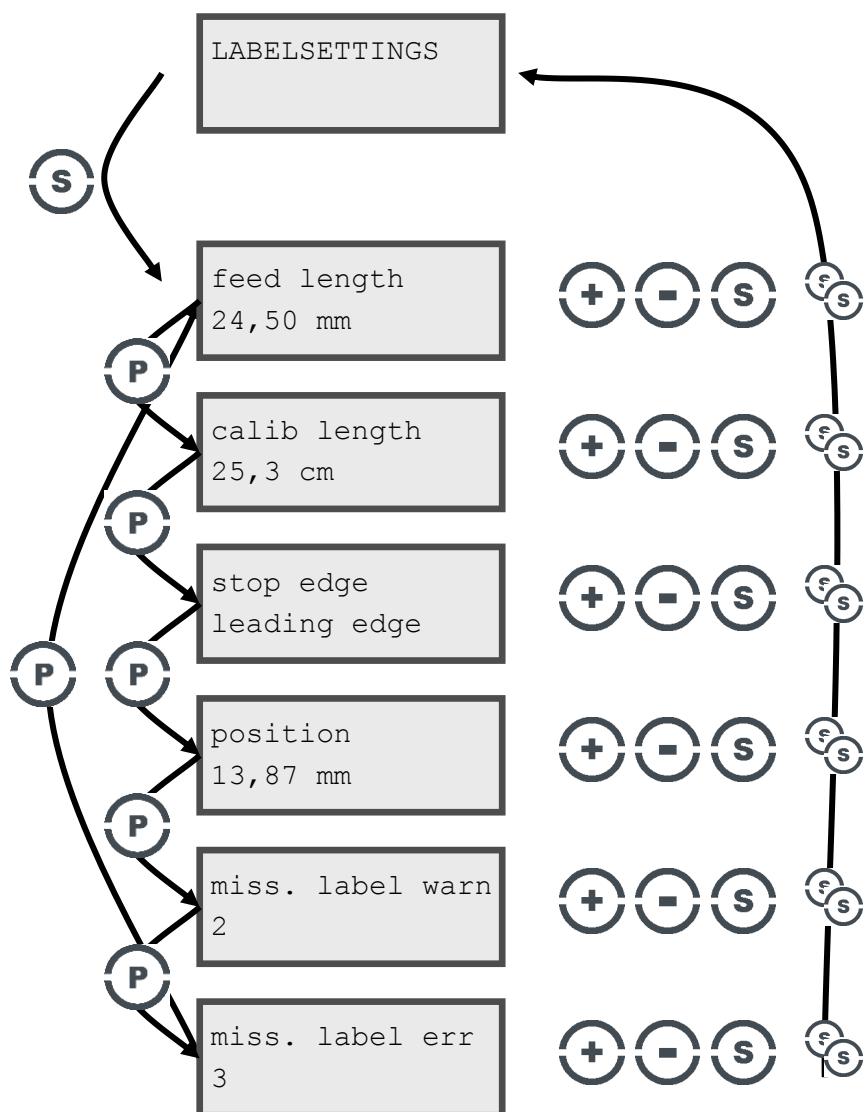
10.1 Basic parameters



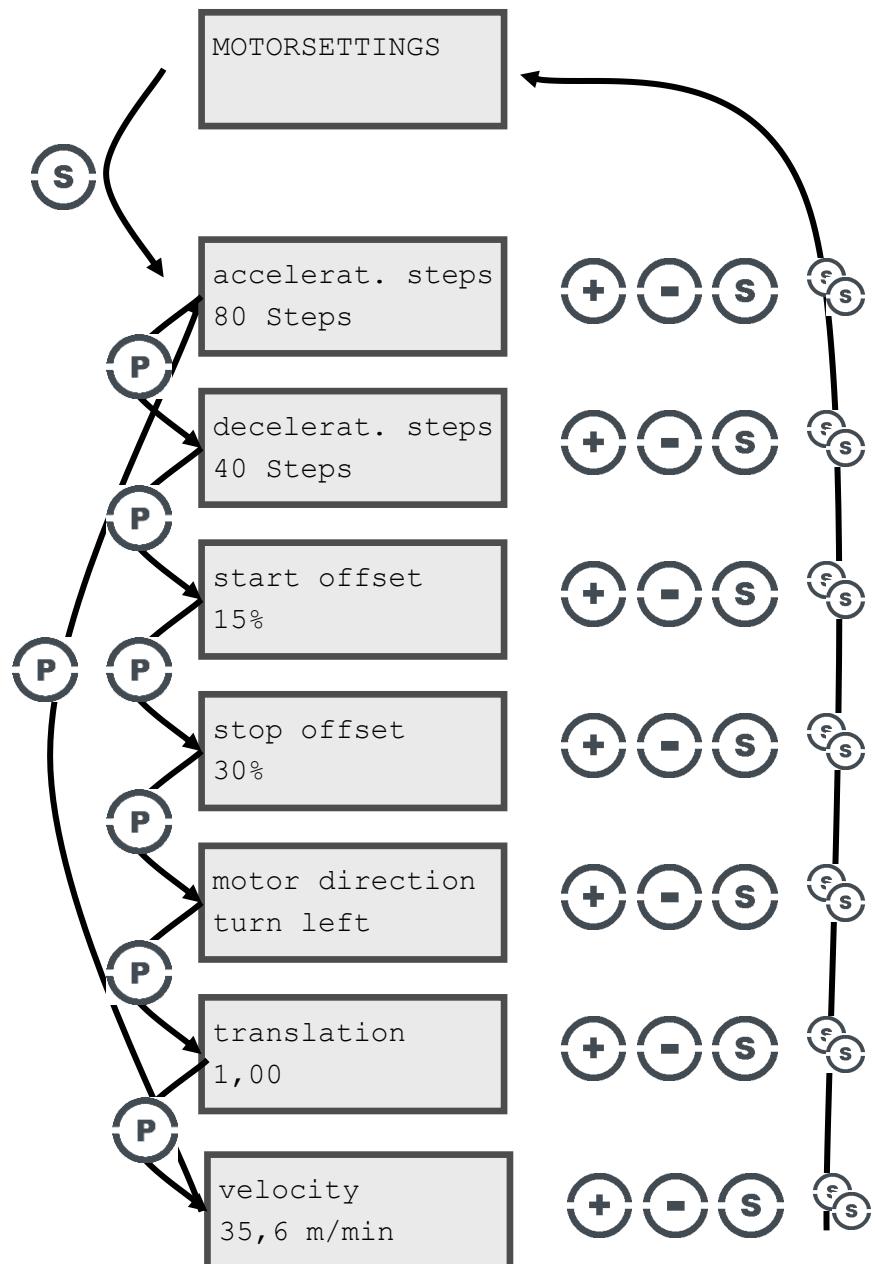
10.2 Menu groups



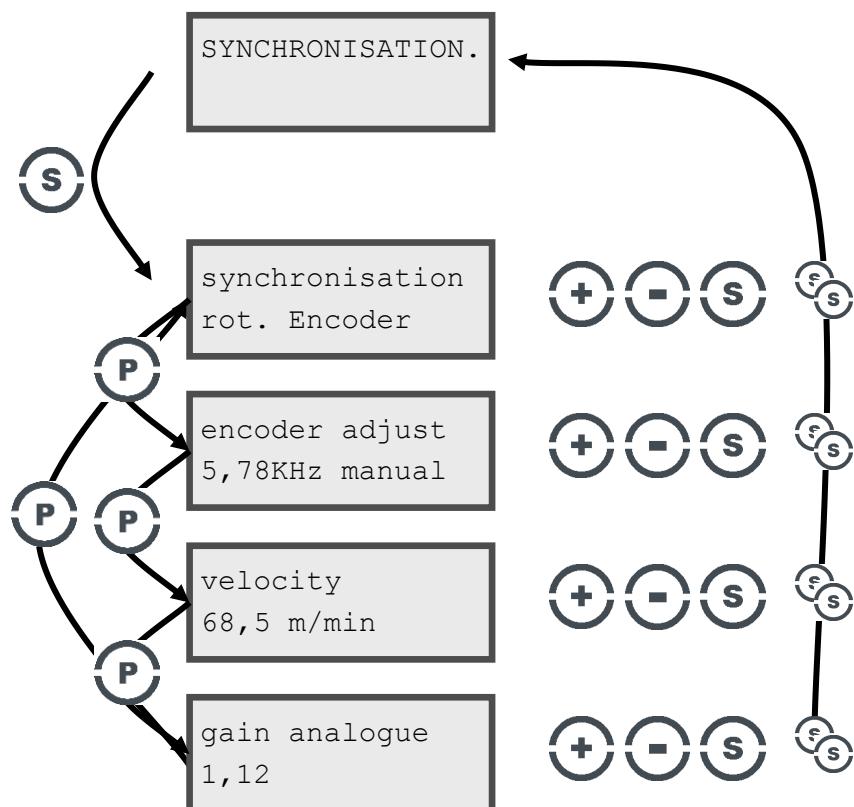
10.3 Label parameter



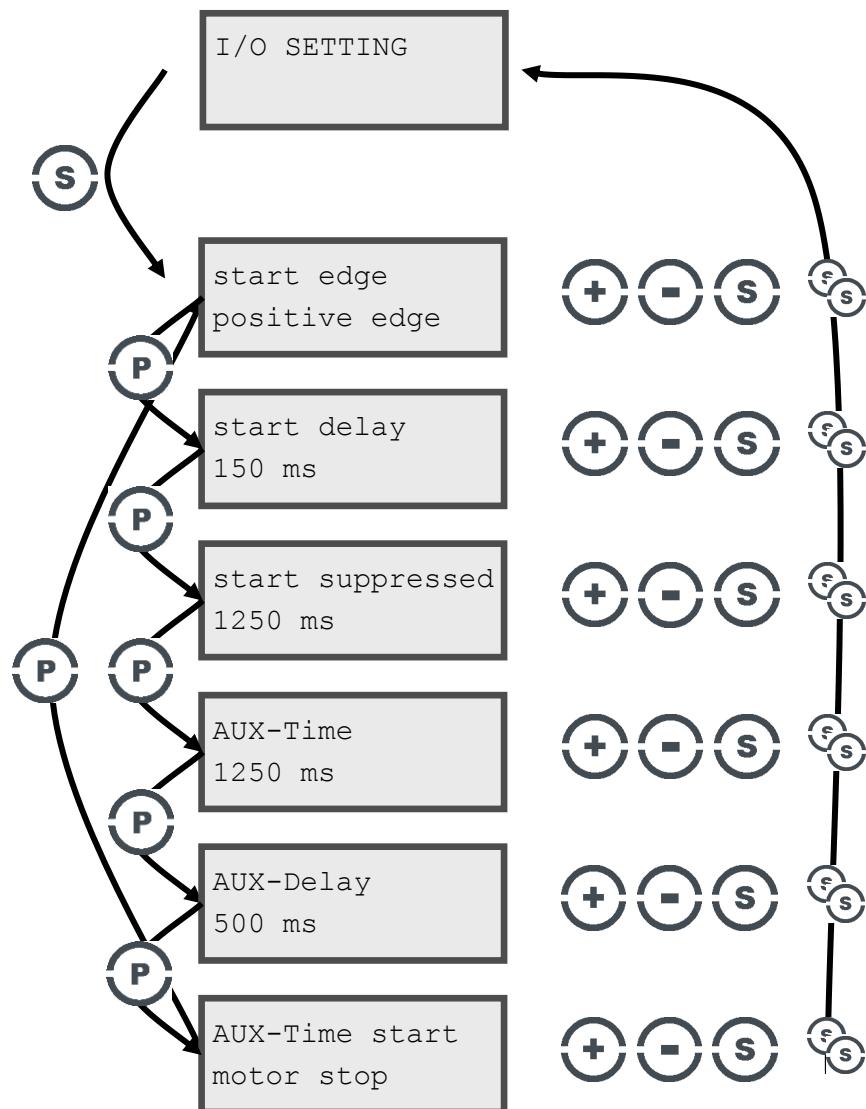
10.4 Stepping motor parameter setting



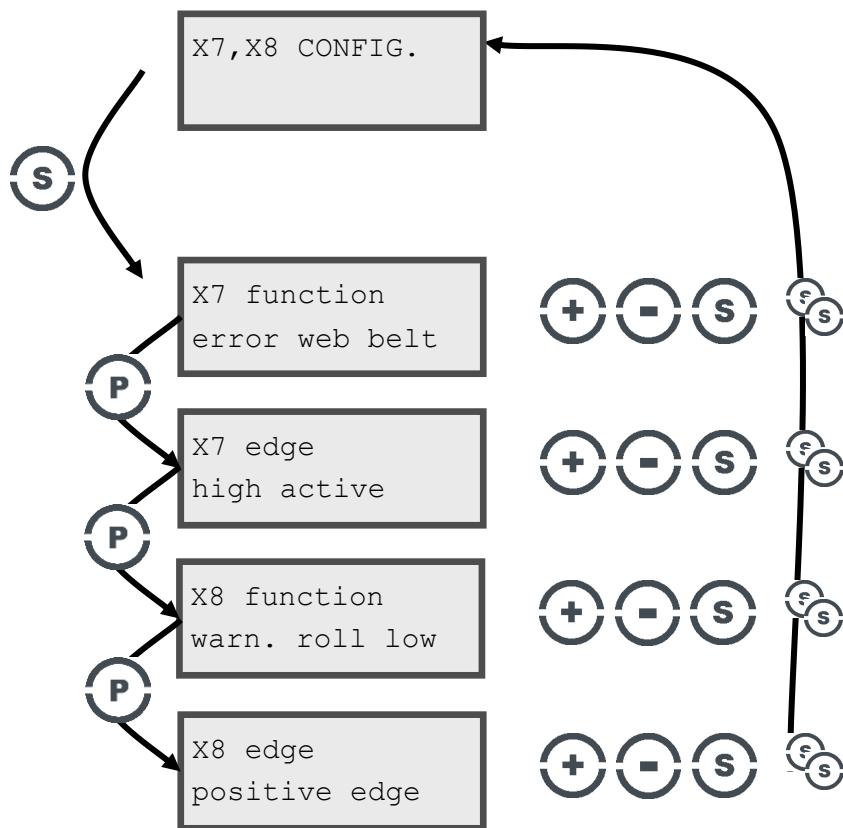
10.5 Synchronization parameter setting



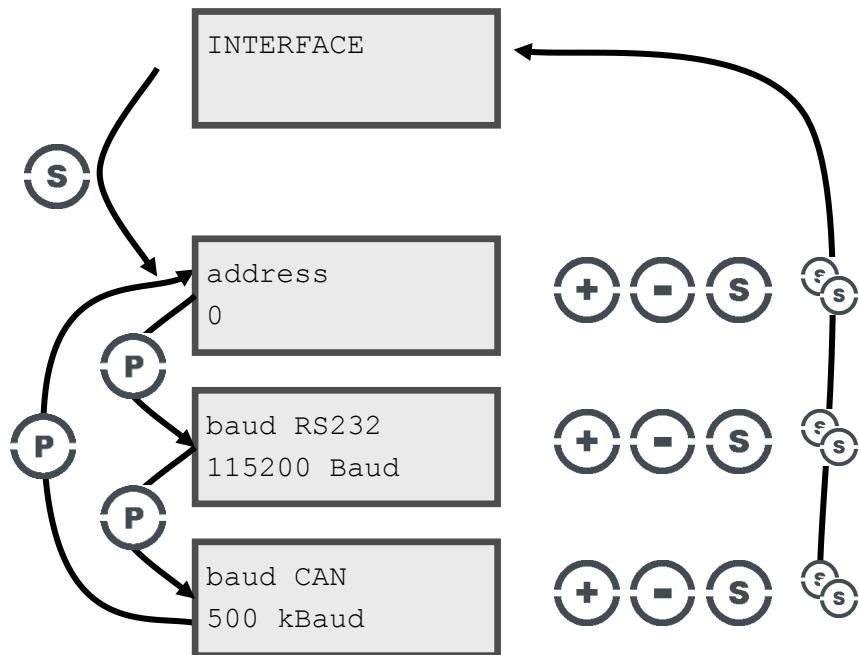
10.6 I/O configuration parameter setting



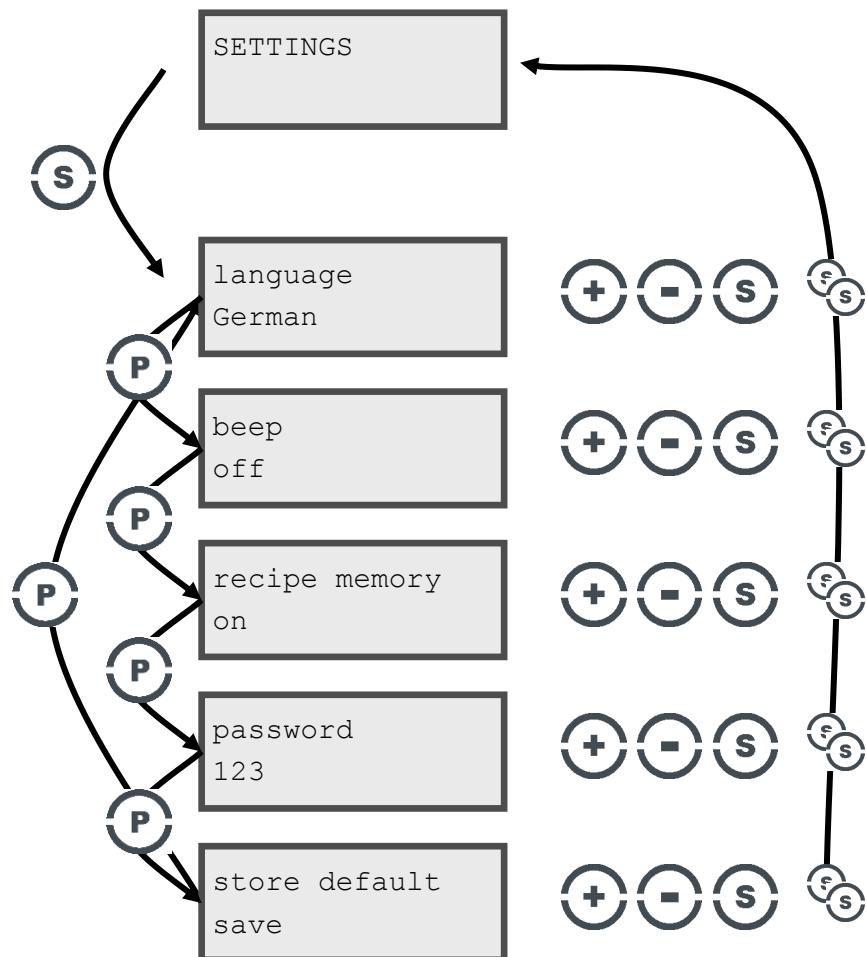
10.7 X7, X8 configuration parameter setting



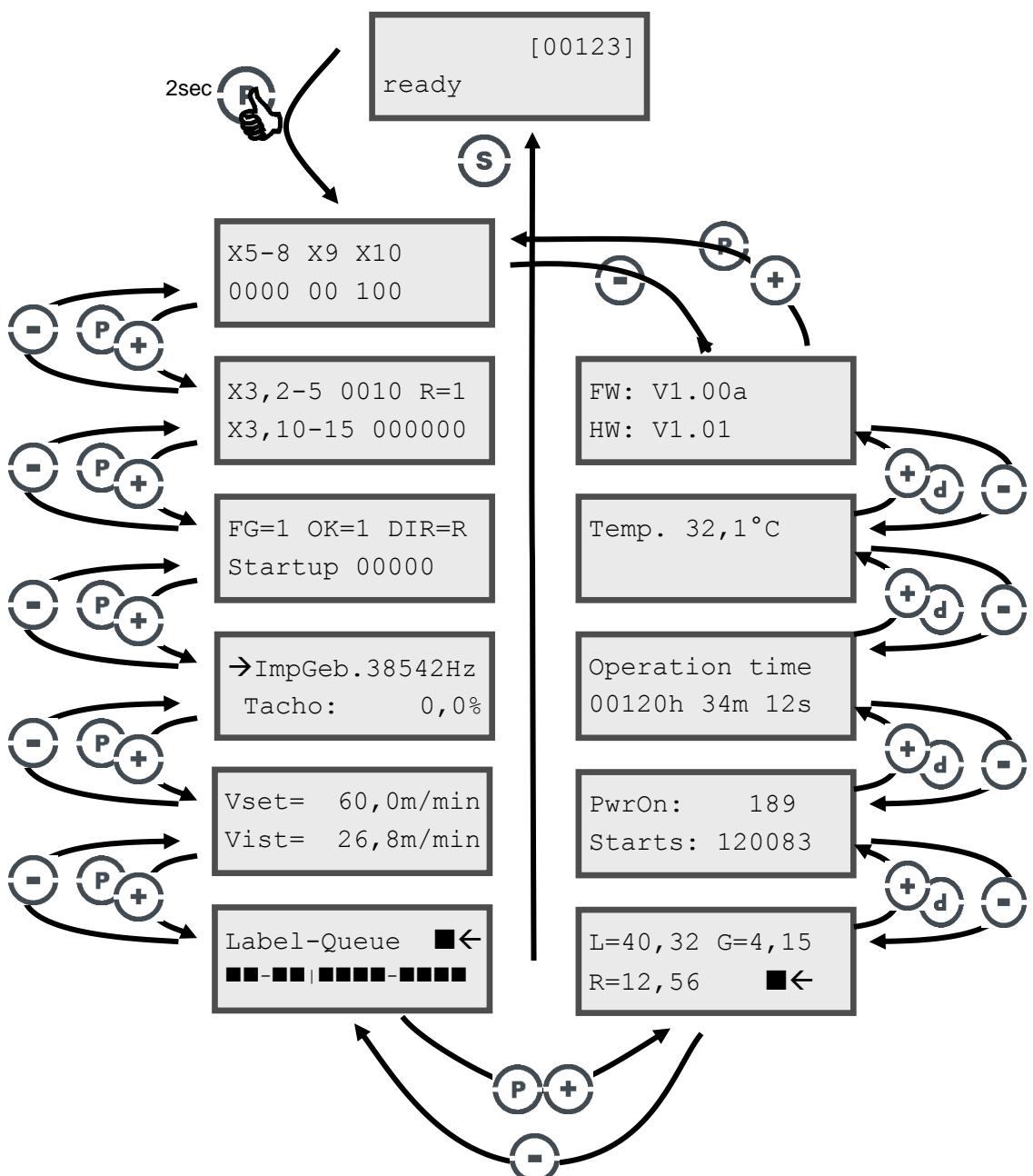
10.8 Interface parameter setting



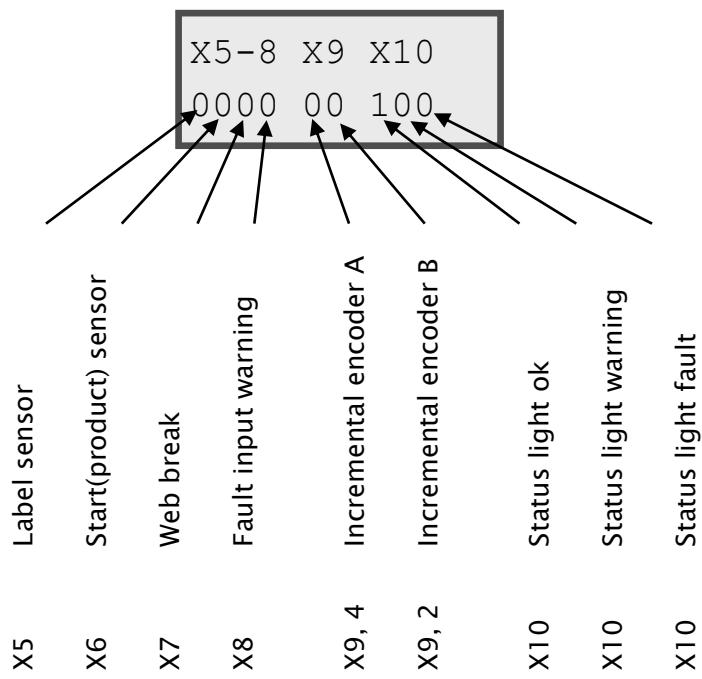
10.9 Settings parameter setting



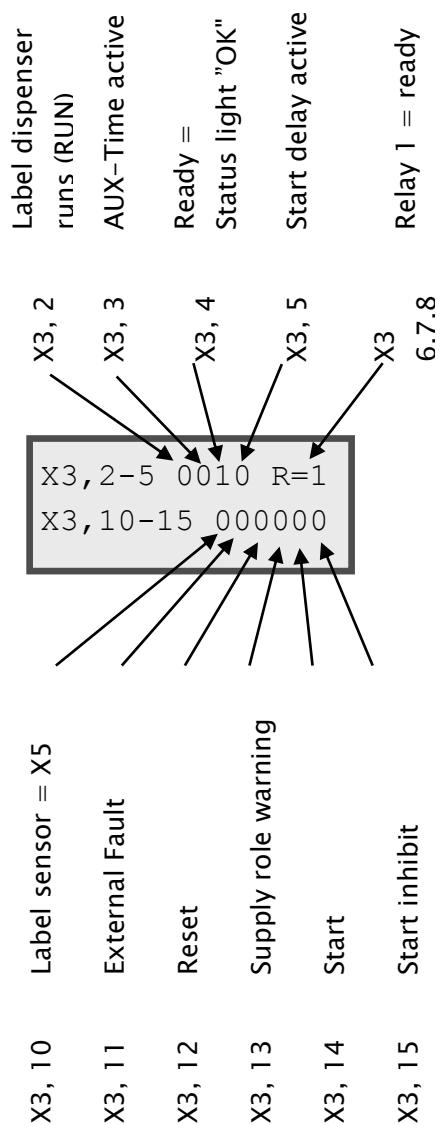
10.10 Diagnostics menu



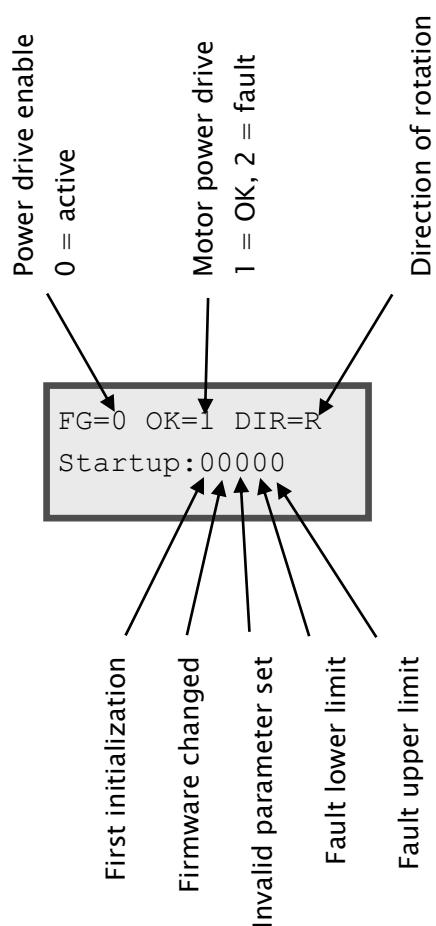
10.10.1 X5-X10 M8-Connectors – I/O



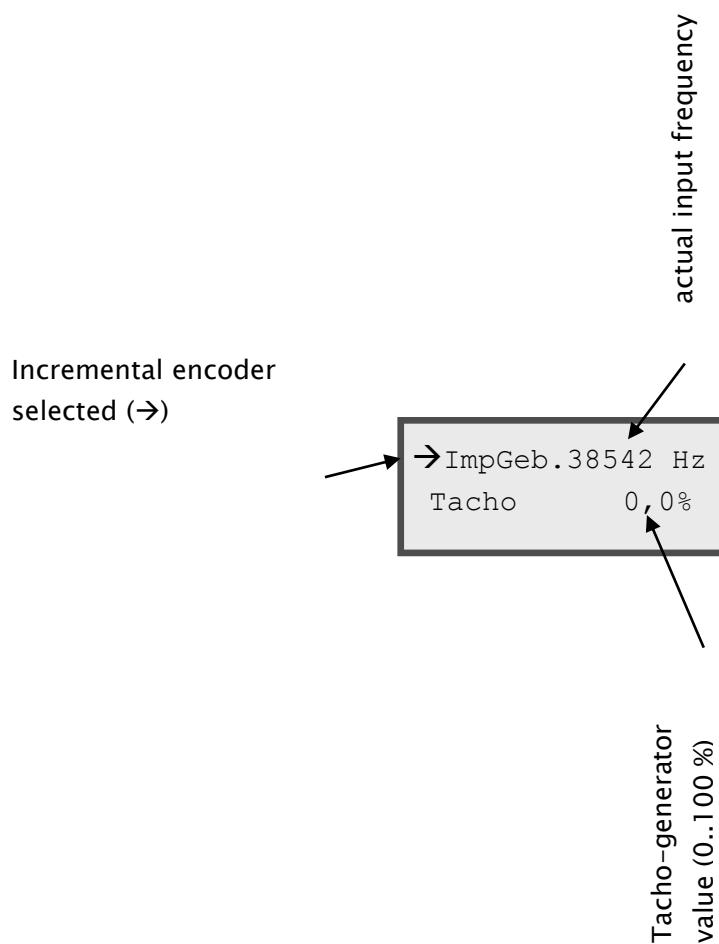
10.10.2 X3 Connector D-SUB15 -I/O



10.10.3 Power drive diagnosis / start-up



10.10.4 Incremental encoder/tacho-generator



10.10.5 Vset/Vist

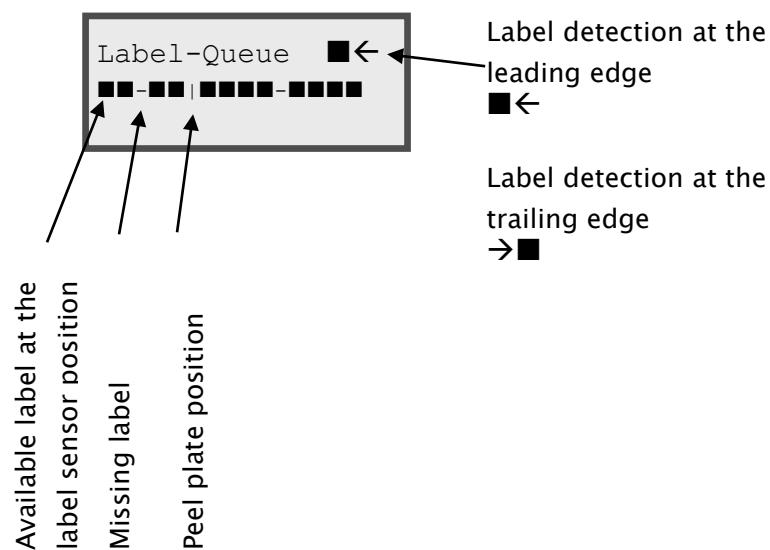
Vset: set end speed

Vist: current speed

With external synchronization the speed is depending on the incremental encoder/analog tacho-generator.

Vset= 60,0m/min
Vist= 26,8m/min

10.10.6 Label queue



10.10.7 Length/gap

L: Length of the label

G: Gap between the labels on the web

R: Rest steps. Not relevant for the application. Serves the Autocal function for monitoring.

■←: Label sensor reacts to the leading edge

→■: Label sensor reacts to the trailing edge

L=40,23	G=3,54
R=12,32	■←

10.10.8 Power on/starts

Power On: Number of power on cycles

Start: Number of start signals. Can not be reset.

PwrOn:	189
Starts:	120083

10.10.9 Operation time

Service time of the device. Can not be reset.

Operating time
00120h 34m 12s

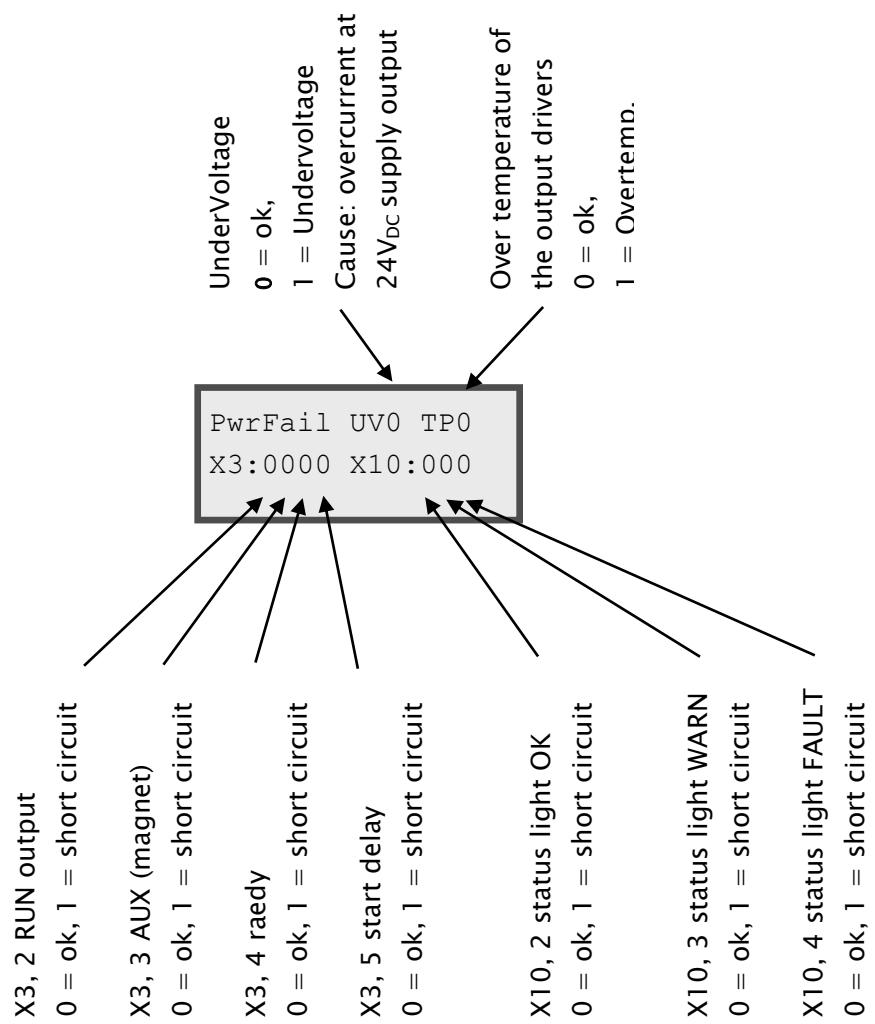
10.10.10 Temperature

Shows the internal equipment temperature

Temp: 32.1 °C

10.10.11 Power fail

Shows the status of the output drivers



10.10.12 Firmware/hardware -- version

FW: V1.00a
HW: V1.02a

11 RS232 INTERFACE [X4] SERIAL COMMUNICATION

- The controller is equipped with **galvanically (electrically) isolated RS232** and CAN interfaces.

The interface parameters can be configured with SERVICE-parameter group "Interface". This manual chapter describes only the RS232-Schnittstelle.

- The **Baudrate RS232** must match the setting of the communication parameter. Available settings are 9600 / 19200 / 57600 or 115200 Baud.

- Setting **Adresse = 0** receives all telegrams, independent of the address byte value.

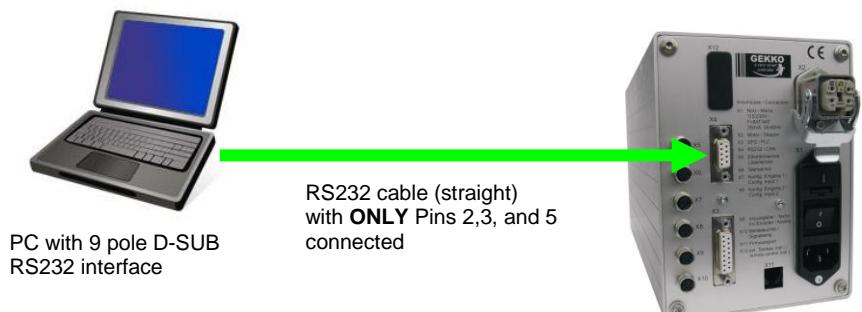
	WARNING
	Only pin 2,3 and 5 must be connected and no other connection. Connection Pin 1 (24V) will destroy the controller (e.g. PC) interface.

Controller (e.g. PC)		LMC-200 X4	
1	DCD	1	+24V
2	Receive data	2	transmit data
3	Transmit data	3	Receive data
4	DTR	4	
5	Ground	5	Ground
6	DSR	6	
7	RTS	7	
8	CTS	8	
9	RI	9	

WARNING:
DO NOT CONNECT PIN1

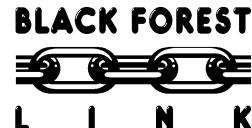
ONLY CONNECT
PIN 2, PIN 3 and PIN 5

Example: Peer-to-peer connection PC to LMC-200



LMC-200
Interface connector X4
Serial Interface

EBLE - BLACK FOREST LINK
Tel.: 07825 879 415
Fax: 07825 879 416
email: info@blackfoli.com
Web: www.blackfoli.com



11.1 Communication methods and telegrams

11.1.1 Transmit telegram frame design (Controller → LMC-200)

All transmit telegrams to the LMC-200 must have a 7-Byte frame design as follows:

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val_L	Val_H	Val_U	CHKSUM
LMC-200 Address	Command	Parameter No.	Parameter Value Low-Byte	Parameter Value High-Byte	Parameter Value Upper-Byte	XOR-Checksum of the first 6 Bytes



The individual fields of the send frame are described in the following chapters.

11.1.2 ADR field

Range 0–32_{dec}, contains the address of the target LMC-200 controller.



With the controller address set to "0" the controller ignores the content of the ADR field and receives all frames independent of their address setting.



The RS232 structure allows only a so called PEER-TO-PEER connection. That means the host controller and only communicate with one LMC-200 at a time.

11.1.3 CMD field

Range 1–10_{dec}, contains the command to the target LMC-200 controller.

Command	CDM command field value (decimal)	Description	Return value
Set_Parameter	1	Sets parameter to a specified value	Echo frame is returned: Same frame as received. If "ParaNr" or „Value“ are outside of their range then the range limits are set
Get_Parameter	2	Reads a parameter value from the controller	Return frame containing the parameter value
Load_Parameter_Set	3	Activates a parameter set stored in the controller	Echo frame. A copy of the received frame
Store_Parametersatz	4	Save all current settings to a specified parameter set number in the controller	Echo frame. A copy of the received frame
Get_Status	5	Status request of the I/O signals	Return frame with the status of the I/O signals
Ctrl_Feeder	6	Currently not implemented.	Acknowledge frame
Write_EEPROM	7	Transmits text data to the EEPROM	Acknowledge frame
Read_EEPROM	8	Reads text data from the EEPROM	Acknowledge frame
EA_Test	9	Control commands for hardware test	
Get_Type	10	Request data firmware revision, hardware revision and name of the text file	Return frame with requested data

11.1.4 ParaNr field

In the ParaNr field each parameter is represented by an unambiguous Para_ID.

	Refer to the chapter "Parameter Overview" in this manual for the list of controller parameters, their "Para_ID" setting with serial communication is represented by [blue numbers in brackets]
---	--

11.1.5 Val_L / Val_H / Val_U fields

The three fields contain the value of the parameter set in the ParaNr field

4. Byte	5. Byte	6. Byte
Val_L	Val_H	Val_U
Parameter Value Low-Byte	Parameter Value High-Byte	Parameter Value Upper-Byte

Result = Val_L + Val_H*256 + Val_U*65536.

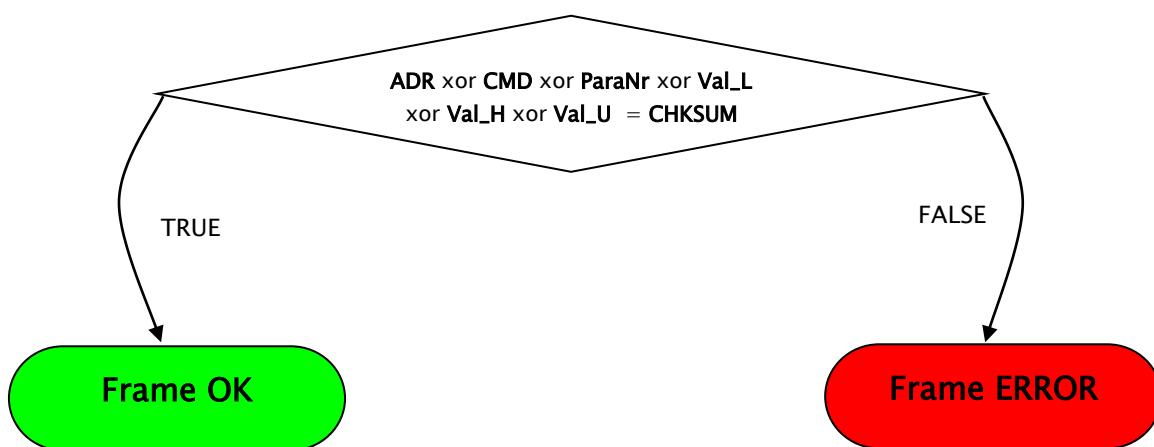
	Refer to the chapter "Parameter Overview" in this manual for the list of controller parameters, their "Value" range setting with serial communication is represented by [blue numbers in brackets]
	All controller parameter values can be displayed with 16Bit (2 Byte).

11.1.6 CHKSUM field

I: Creating the check sum

$$\text{CHKSUM} = \text{ADR xor CMD xor ParaNr xor Val_L xor Val_H xor Val_U}$$

II: Verification of the check sum



or



11.1.7 Set controller parameter values serially

Send frame configuration at Set_Parameter (CMD=1)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
LMC-200 address	1	0...40 see parameter table	Parameter Value Low-Byte	Parameter Value High-Byte	Parameter Value Upper-Byte	XOR-Checksum of the first 6 Bytes

Return frame configuration at Set_Parameter (CMD=1)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
LMC-200 address	2	as per request	Parameter Value Low-Byte	Parameter Value High-Byte	Parameter Value Upper-Byte	XOR-Checksum of the first 6 Bytes

If the received frame is not exactly 7 bytes in size:

1. Byte	2. Byte
ADR	ACK
LMC-200 address	Frame length error [2]

If the check sum is wrong:

1. Byte	2. Byte
ADR	ACK
LMC-200 address	Checksum error [1]

Example 1: Set start delay to 1000ms:

Send frame configuration at Set_Parameter (CMD=1)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
0	1	22	232	3	0	252

1000_{dec}

Return frame configuration at Set_Parameter (CMD=1)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
0	1	22	232	3	0	252

Example 2 : Configure AUX2 output to “ready to start“:

Send frame configuartion at Set_Parameter (CMD=1)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
0	1	11	5	0	0	15

5_{dec}

Return frame configuration at Set_Parameter (CMD=1)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
0	1	11	5	0	0	15

Example 3: Set AUX2 output to an invalid value (max. value out of range):

Send frame configuartion at Set_Parameter (CMD=1)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
0	1	11	20	0	0	31

20_{dec}

Return frame configuration at Set_Parameter (CMD=1)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
0	1	11	5	0	0	15

=Max. Value

11.1.8 Read controller parameter values serially

Send frame configuration at Get_Parameter (CMD=2)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
LMC-200 address	2	0...40 see parameter table	x	x	x	XOR-Checksum of the first 6 Bytes

Return frame configuration at Get_Parameter (CMD=2)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
LMC-200 address	2	as per request	Parameter Value Low-Byte	Parameter Value High-Byte	Parameter Value Upper-Byte	XOR-Checksum of the first 6 Bytes

If the received frame is not exactly 7 bytes in size:

1. Byte	2. Byte
ADR	ACK
LMC-200 address	Frame length error [2]

If the check sum is wrong:

1. Byte	2. Byte
ADR	ACK
LMC-200 address	Checksum error [1]

Example 1: Read position value

Send frame configuration at Get_Parameter (CMD=2)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val_L	Val_H	Val_U	CHKSUM
0	2	20	x	x	x	22

Return frame configuration at Get_Parameter (CMD=2)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val_L	Val_H	Val_U	CHKSUM
0	2	20	210	4	0	192

11.1.9 Call (load) a parameter set (recipe) serially

Send frame configuration at Get_Parameter (CMD=3)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
LMC-200 address	3	0...20	x	x	x	XOR-Checksum of the first 6 Bytes

Return frame configuration at Get_Parameter (CMD=3)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
LMC-200 address	3	as per request 0...20	as per request	as per request	as per request	XOR-Checksum of the first 6 Bytes

If the received frame is not exactly 7 bytes in size:

1. Byte	2. Byte
ADR	ACK
LMC-200 address	Frame length error [2]

If the check sum is wrong:

1. Byte	2. Byte
ADR	ACK
LMC-200 address	Checksum error [1]

Example 1: Call (load) a parameter set (recipe) 7 in the controller

Send frame configuration at Get_Parameter (CMD=3)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val_L	Val_H	Val_U	CHKSUM
0	3	7	x	x	x	4

Return frame configuration at Get_Parameter (CMD=3)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val_L	Val_H	Val_U	CHKSUM
0	3	7	x	x	x	4

11.1.10 Store (save) a parameter set (recipe) serially

Send frame configuration at Get_Parameter (CMD=4)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
LMC-200 address	4	0...20	x	x	x	XOR-Checksum of the first 6 Bytes

Return frame configuration at Get_Parameter (CMD=4)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
LMC-200 address	4	as per request 0...20	as per request	as per request	as per request	XOR-Checksum of the first 6 Bytes

If the received frame is not exactly 7 bytes in size:

1. Byte	2. Byte
ADR	ACK
LMC-200 address	Frame length error [2]

If the check sum is wrong:

1. Byte	2. Byte
ADR	ACK
LMC-200 address	Checksum error [1]

Example: Store (save) current parameters to set (recipe) no. 19

Send frame configuration at Get_Parameter (CMD=4)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val_L	Val_H	Val_U	CHKSUM
0	4	19	x	x	x	23

Return frame configuration at Get_Parameter (CMD=4)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val_L	Val_H	Val_U	CHKSUM
0	4	19	x	x	x	23

11.1.11 Get the I/O status serially

Send frame configuration at Get_Status

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
LMC-200 address	5	x	x	x	x	XOR-Checksum of the first 6 Bytes

Return frame configuration at Get_Status, ParaNr = 1 (Read Inputs)

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
LMC-200 address	5	Inputs	Analog value	Temperature	Outputs	XOR-Checksum of the first 6 Bytes

If the received frame is not exactly 7 bytes in size:

1. Byte	2. Byte
ADR	ACK
LMC-200 address	Frame length error [2]

If the check sum is wrong:

1. Byte	2. Byte
ADR	ACK
LMC-200 address	Checksum error [1]

Inputs

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Level X19	Start blocking	Reset X3,12	Fault external, X3,11	Config. input X8	Config. input X7	Start input X6	Label sensor X5

Analog value

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
8 highest value bits of the 10bit analog voltage at X9,4							

Temperature

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
8 highest value bits of the 10bit temperature value							

Outputs

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
		AUX1 X3,5	AUX X3,3	AUX2 X3,2	status light fault X10, 4	status light warning X10, 3	status light OK, X10, 2

11.1.12 Get the type of firmware, hardware revision and text file version

Send frame configuration at Get_Type

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
LMC-200 address	10	0 (Hardwareversion) 1 (Firmwareversion) 2 (Textfileversion)	x	x	x	XOR- Checksum of the first 6 Bytes

Return frame configuration at Get_Type

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	20. Byte	21. Byte
ADR	CMD	ParaNr	Val-L	Char 0	Char 15	CHKSUM
LMC-200 address	10	0 (Hardwareversion) 1 (Firmwareversion) 2 (Textfileversion)	x	Char 0... Char 15		XOR- Checksum of the first 20 Bytes

If the received frame is not exactly 7 bytes in size:

1. Byte	2. Byte
ADR	ACK
LMC-200 address	Frame length error [2]

If the check sum is wrong:

1. Byte	2. Byte
ADR	ACK
LMC-200 address	Checksum error [1]

Example: Get the firmware revision

Send frame configuration at Get_Type

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Val_H	Val_U	CHKSUM
0	10	1	x	x	x	23

Return frame

1. Byte	2. Byte	3. Byte	4. Byte	5. Byte	6. Byte	7. Byte
ADR	CMD	ParaNr	Val-L	Char 0	Char 15	CHKSUM
0	10	1	x	„FW300 V1.02f“	XOR-Checksum of the first 20 Bytes	

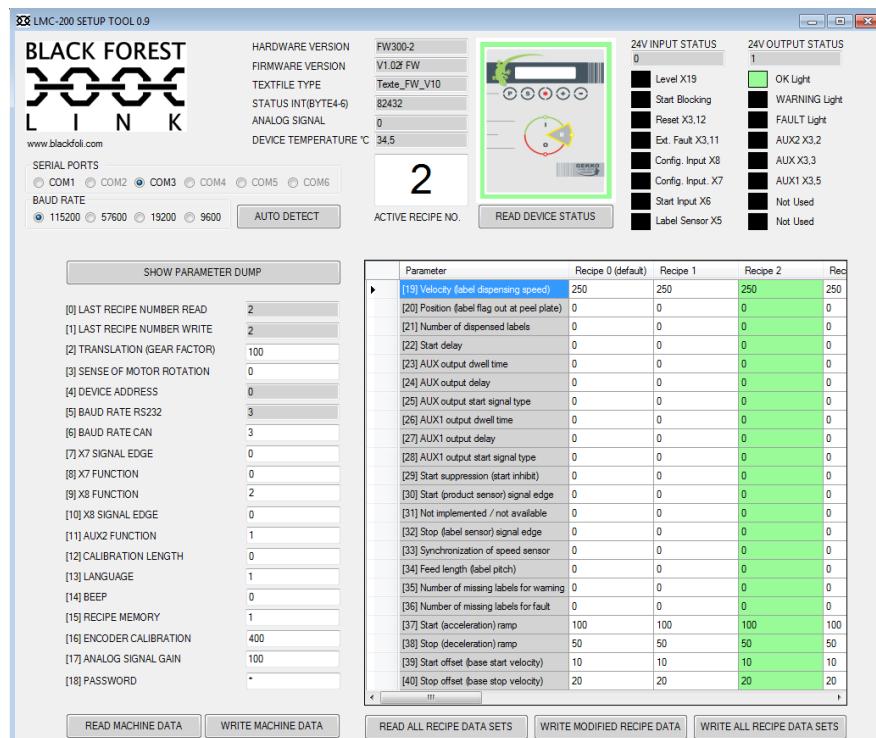
11.2 Accessory: SETUP TOOL software

For easy set-up and monitoring of the LMC-200 the SETUP TOOL software is part of the RS232 kit which is available from us.

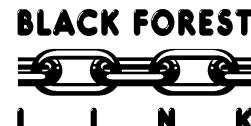
The SETUP TOOL features:

- AUTODETECT function for RS232 interface parameters
- Device status monitoring
- I/O status monitoring
- Machine parameter read and write
- Recipe set call, read and write function
- Parameter dump display for easy archiving and documentation of settings

Screen shot:



EBLE - BLACK FOREST LINK
Tel.: 07825 879 415
Fax: 07825 879 416
email: info@blackfoli.com
Web: www.blackfoli.com



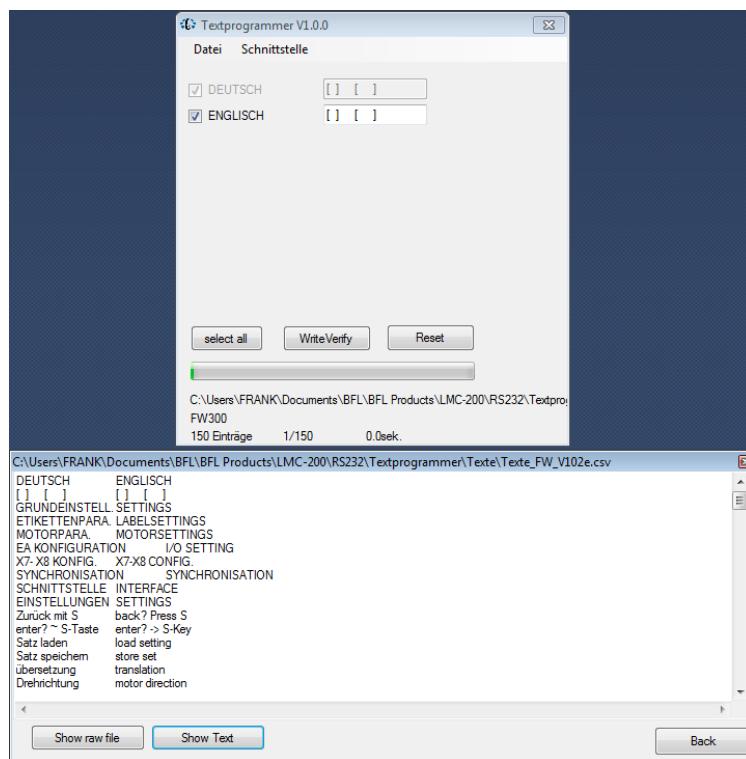
11.3 Accessory: TEXTPROGRAMMER software

With the text programmer all HMI texts can be loaded. The TEXTPROGRAMMER software is part of the RS232 kit which available from us.

The TEXTPROGRAMMER features:

- RS232 interface parameter menue show available ports and baud rates
- File management of "*.csv" type text files
- Download and write verify

Screen shot:



12 TROUBLESHOOTING

12.1 Read first before you start troubleshooting

	DANGER Before troubleshooting read and observe of safety information and safety regulations in this manual and all local safety regulations of the installation location.
	WARNING Do not plug in or unplug the device or motor if energized.
	Before trouble shooting we recommend you work through this checklist first: <input type="checkbox"/> 1. Are all safety measures and procedures in place and observed ? <input type="checkbox"/> 2. Are all supply and signal voltages available, properly connected and within the specified range ? <input type="checkbox"/> 3. Is the motor OK, connected and wired correctly ? <input type="checkbox"/> 4. Is the LMC-200 plugged correctly ? <input type="checkbox"/> 5. Are the device parameter settings in the range ? <input type="checkbox"/> 6. Are the environmental conditions in the specified range ? <input type="checkbox"/> 7. Is the device properly grounded and are the cables shielded ? <input type="checkbox"/> 8. Does the motor output torque match the application torque and inertia matching requirements ? <input type="checkbox"/> 9. Is the motor attached properly to the load ? <input type="checkbox"/> 10. Are there any visual damages to device (dents, scratches or missing parts) ?
	Please make copy of the parameter overview charts, then fill in or mark your actual settings. Please send us these settings when you contact us for technical support.

12.2 “Motor error” fault at power on



ATTENTION

LMC-200 controller with firmware version less than 1.02a can randomly show “Motor error” right after power on. Please reset this wrong fault by pressing the HMI key “R” to clear this message and to enable the drive. If the drive enables OK the initial “motor fault” was not a problem. In this case the fault was triggered by random boot-up times of the stepper drive. The slightly quicker booting LMC-200 controller then “sees” a drive fault. Starting with firmware 1.02a the time window to check the ready signal of the drive has been extended and the problem is eliminated.

If the “motor fault” message remains even after a reset attempt with the “R” key then something is wrong with either the stepper drive, motor or the motor wiring.

Note: Only connect or disconnect the motor while the LMC-200 is switched off, disconnected from the mains supply voltage and completely discharged.

12.3 Label placement accuracy



The label placement accuracy on the product is influenced by many single tolerance parameters that finally add up to the total variation of the label position on the product. The following list may help to find and eliminate some variations and to improve the labeling system

12.3.1 Web unwind and rewind mechanisms

Unwind and rewind mechanisms are varying with each machine.

Unwind:

The best unwind mechanism is of course a powered one where the web is always fed into a buffer loop. Some labelers are built with gravity loops, others use vacuum loops. This takes all the load moment away from motor when trying to accelerate the web spool. Other unwind systems use friction breaks or electrical brakes activated by a dancer. When the motor pulls on the web it releases web to a certain point. Then the break releases and feeds more web in a roller arrangement mounted on the dancer. Also the roller arrangement differs (sometimes only one roller, then two or even up to four or even more). Please note, that as soon as the

motor has also to unwind the web spool an error is added to the accuracy since there are situations where the motor goes into a higher temporary lag angle (max. 1.8 degrees = 5 half steps at 1000steps/rev). If the motor is not able to accelerate the spool it will stall. Considering all the gear factors between motor and drive roller this accuracy error can be added right from the start. Especially low cost label heads do not use powered unwind systems. But these systems will have higher accuracy errors.

Rewind:

Many of the just before said applies also to the rewind. The main purpose of the rewind is to keep the web tight around the peel plate and to move the empty "skeleton" web out of the way.

Many rewinds are driven by the stepper motor with a slightly geared up belt transmission and a slipping mechanism. A powered rewind takes load of stepper motor and can increase the machine dispensing speed. This is especially true if the rewind can hold a lot of the empty web (liner).

12.3.2 Controller processing times

Also the controller adds accuracy errors. But in contrast to the mechanical inaccuracies the LMC-200 contribution to errors is minimal. The controller has an interrupt scan time (for sensor detection) of only 250 nano seconds and a command execution time of 25nano seconds.

12.3.3 Web consistency

The worst results were seen with web carrier material made of "Mylar". This is clear plastic web that has the advantage that it almost never breaks at high dynamic dispensing cycles. The big disadvantage is that it is flexible. At a test it added error of about +/- 1.5 mm. The best web for accuracy is silicon paper web material. We found it's better to cut back the dynamics of the motor (lower acceleration ramp and start stop frequency) and to use silicon paper webs.

12.3.4 Web brakes and web brushes

They are almost a must. Where the label sensor is placed, there is no movement of the web after registration allowed. Some labelers us spring steal “fingers” to hold the web down others have brush arrangements. It is assumed that without using proper brake or brushing systems the error increases at least +/- 0.5mm at higher speeds.

12.3.5 Label adhesive and label quality

If the labels are old, they might not stick too good or probably not at all to the product surface. Often old labels are used for test runs and there is a good chance that these labels sat on the shelf for years or they are dye cut poorly and it was impossible to sell them to customers. As a result these labels are applied inconsistently. Also some adhesives seem to be more sticky and aggressive than others. Then the wrong adhesive maybe used for the product surface and the labels slip adding accuracy errors.

12.3.6 Peel plate brushes or foam roller

Especially when the adhesive is not very sticky, it is mandatory to brush or roll the label on the product. Usually the brush or roller is placed right after the peel plate at the position where the label touches the product. Once the label has touched the product, the brush or roller holds it down and avoids the label to slip. But the brush and roller adjustment is critical. If the brush presses with too high force the product itself may slip on the conveyor.

12.3.7 Dispensing labels in the air and electrostatic charges

Accuracy problems can also occur when dispensing a long distance in the air between peel plate and product especially when the labels are thin and also maybe electrostatic charged. The label intends to bend facing a higher air resistance at higher labeling speeds. At lower speed it is sometimes charged electrostatic and is “glued” or attracted to the web and peel plate. Grounded carbon or metal brushes can be used to discharge labels and products around the label application zone.

13 APPENDIX

13.1 Firmware flash with "PICkit3" USB programmer tool

13.1.1 Preparing and loading the "PICkit3"

1. A new "PICkit3" must have the correct firmware a driver loaded to be able to communicate with the LMC-200. For this please use either the:

– MPLAB (Version 8.85 or higher, but not the MPLAB X Versions) IDE

or

– PICKIT 3 Programmer GUI

Both are from Microchip and be downloaded from the website free of charge.



The "PICkit3" Programmer GUI is only about 3MB in size.

The full MPLAB IDE is more than 100MB.

2. Plug the "PICkit3" into the USB port of your PC. The green POWER led is lit immediately, the blue ACTIVE led is a bit delayed on and the STATUS led briefly flashes orange and is then switched off again.



If the "PICkit3" was previously setup as a "programmer to go", this status must be reset by following the instructions of the programming software. Only then communication is possible again.

2. Launch the programming software. You'll see the ACTIVE flashing and the STATUS led flashing orange and after program has launched it will stay green.

The "PICkit3" is now ready to be programmed.

3. Before importing any *.hex program file, it is mandatory the select the correct target device. This is the type:

PIC24HJ128GP504

3. Go to the tab "Programmer" and then to "PICkit3 Programmer-To-Go". You see the selected target processor PIC24HJ128GP504 and the source file path and name of your *.hex file.

	You can give build a name (e.g. "LMC_200_1.02f" to later identify it again when connected to the programming software again.
	The target is self powered.

4. Enable the "Programmer-To-Go" (PTG). The ACTIVE led is now flashing.

	Enabling the "Programmer-To-Go" terminates the USB communication with the PC.
--	---

5. The "PICkit3" is now ready to be used to flash a LMC-200 device.

13.1.2 Step-by-step instructions for flashing controller firmware

	No PC/Notebook is required to flash the firmware program. The "PICkit3" is a storage device containing the firmware program (a hexadecimal file type ending "*.hex") which was previously downloaded to the "PICkit3" via a USB cable from a PC/Notebook.
	The "PICkit3" must be supplied with power from a USB port. This can be a PC, laptop or other USB port power source.



1. Make sure correct AC mains voltage is selected.
2. Plug in 3 conductor AC mains cord (L1,N,PE).
3. Switch on LMC-200 with ON/OFF switch
4. Connect "PICkit3" with the USB cable to a USB port (e.g. PC, laptop, or outlet USB port etc.).
5. The green POWER led is lit now and the blue ACTIVE led flashes.
6. Connect ICD-connector (RJ-11 type connector) to firmware programming port X11
7. Push FUNCTION button on "PICkit3"
8. STATUS LED begins to flash orange (programming time is approximately 5 to 10 sec)
9. After a successful programming the Status led lights green.
10. Switch OFF LMC-200 with ON/OFF switch
11. Disconnect "PICkit3" from LMC-200 M8 and X11 connectors
12. Switch ON LMC-200 with ON/OFF switch
13. LMC-200 is now ready to operate with new firmware.

	The controller firmware version is displayed at start-up in the LMC-200 HMI.
--	--

13.2 Metric to Standard speed conversion table

m/min	m/s	inch/min	inch/s	ft/min	ft/s
10	0.166	394	6.562	32.833	0.547
20	0.333	787	13.123	65.583	1.09
30	0.5	1181	19.685	98.416	1.640
40	0.666	1575	26.247	131.25	2.188
50	0.833	1969	32.808	164.08	2.735
60	1	2362	39.370	196.83	3.281
70	1.166	2756	45.932	229.66	3.828
80	1.333	3150	52.493	262.50	4.375
90	1.5	3543	59.055	295.25	4.921
100	1.666	3937	65.617	328.08	5.468

13.3 Standard and metric conversion table for accuracies

inch	inch decimal	mm
1/64	0.015625	0.397
1/32	0.03125	0.794
3/64	0.046875	1.191
1/16	0.0625	1.588
5/64	0.078125	1.984
3/32	0.09375	2.381
7/64	0.109375	2.778
1/8	0.125	3.175
9/64	0.140625	3.572
5/32	0.15625	3.969
11/64	0.171875	4.366

mm	inch decimal
0.1	0.003937
0.2	0.007874
0.5	0.019685
1	0.03937
1.5	0.059055
2	0.07874
2.5	0.098425
3	0.11811
3.5	0.137795
4	0.15748
5	0.19685