Applicator Interface

Applicator Operation

Function

If direct labelling from the dispensing edge is not possible, the labeller can be equipped with an applicator. In applicator mode, the applicator takes the label from the dispensing edge and carries it to the product.

The labeller can be equipped with various applicators, depending on the need. Those applicators are all driven by compressed air. The following are possible:

LTP / LTPV
LTP (Light Touch Pneumatic) and
LTPV (Light Touch Pneumatic Vacuum):

Applicator with „Light Touch" function. „Light Touch" means, that the movement of the (compressed air) cylinder is limited by sensors, which react to a light touch onto the product. The LTPV additionally sucks the labels on with a vacuum nozzle.

Advantages:

- Application on products with different heights possible

- Only light pressure onto the product (important with sensitive products)

PEP
The cylinder movement is limited by a setable length of time. After the run out of this application time, the applicator moves back into home position.

PEP Blow on
PEP-type applicator with blow on function: After run out of the application time, the blow on function is activated. After run out of the blow on time, the applicator moves back into home position.

PEP II Sensor
The cylinder movement is limited by a (touch down) sensor, which signals the contact to the product and triggers the backwards-movement.

ASA
ASA (Air Stream Applicator)

This applicator type has no moving parts, but blows the label onto the product (also called „blow box"). After the start signal, the blow on valve is opened for a setable time length.

Reverse PEP
This applicator is partly time related. Working procedure:

The applicator moves to its end position and "waits" for the start signal. The start signal triggers the blow on valve which is active for the defined blow on time. After the run out or the blown on time, the applicator moves to home position, gets the next label and moves to the wait position.

BTS
BTS (Bad Tag Separator)

This device does the opposite of an applicator: it removes labels from the dispensing edge of a labeller. The BTS is used for sorting out RFID labels, which could not be read/written properly.

Connecting an applicator

Depending on the applied applicator type, different input and output signals are used.

The following applicator types, which are distributed by Avery Dennison, can be connected directly to the connector for Avery applicators, using the delivered cable, see .

- LTP / LTPV
- PEP IV
- BTS
- LA-BO (conforms to the „ASA" type)
- LA-TO (conforms to the „PEP" or „PEP II Sens." type)

For all other applicator types, the connection cable must be configured by the system integrator:

		LTP(V)	PEP [a]	PEP Blow on	PEP II Sens. [b]	ASA [c]	Rev. PEP	Direkt Spenden	BTS	O-Ring Appl.
Inputs	Home Position	●	●	●	●	○	●	○	●	●
	Touch Down	●	○	○	●	○	○	○	○	●
Outputs	Airstream Support	●	●	●	●	●	●	● [d]	○	●
	Vacuum	● [e]	●	●	●	●	●	○	○	●
	Cylinder	●	●	●	●	○	●	○	●	●
	Blow On	●	○	●	●	●	●	○	○	●
	+24V for fan	●	●	●	●	○	○	○	○	●
	BTS	○	○	○	○	○	○	○	●	○

[Tab. 1] Signals which are used by the different applicator types.

a)   Appropriate setting for LA-TO with time control
b)   Appropriate setting for LA-TO with sensor control
c)   Appropriate setting for LA-BO
d)   With pneumatic dispensing edge
e)   Only with LTPV

Legend for (Tab. 1):

●	Input signal used
○	Input signal not used
●	Output signal used
○	Output signal not used

4

Selecting an applicator type

➜ Select the applicator type using the function APPLICATOR PARA > Applicator type.

Dependent on the applicator type chosen, different functions for setting up the applicator appear in the APPLICATOR PARA menu.

		Applicator types:								
		LTP(V)	PEP [a]	PEP Blow on	PEP II Sens. [b]	ASA [c]	Rev. PEP	Direkt Spenden	BTS	O-Ring Appl.
	Blow on time	X	--	X	X	X	X	X	X	X
	Restart delay	X	X	X	X	X	X	X	X	X
Function:	Position timeout	X	X	X	X	X	X	X	X	X
	Start error stop	X	X	X	X	X	X	X	X	X
	Dwell time	--	X	X	--	--	X	--	X	--

[Tab. 2]   Available adjustment functions, dependent on applicator type (x = function available).

a)   Appropriate setting for LA-TO with time control
b)   Appropriate setting for LA-TO with sensor control
c)   Appropriate setting for LA-BO

Signal-Time-Diagrams

Time/sensor controlled applicators

With *time controlled* applicators, extension is stopped after the setable application time run down. (APPLICATOR PARA > Dwell time).
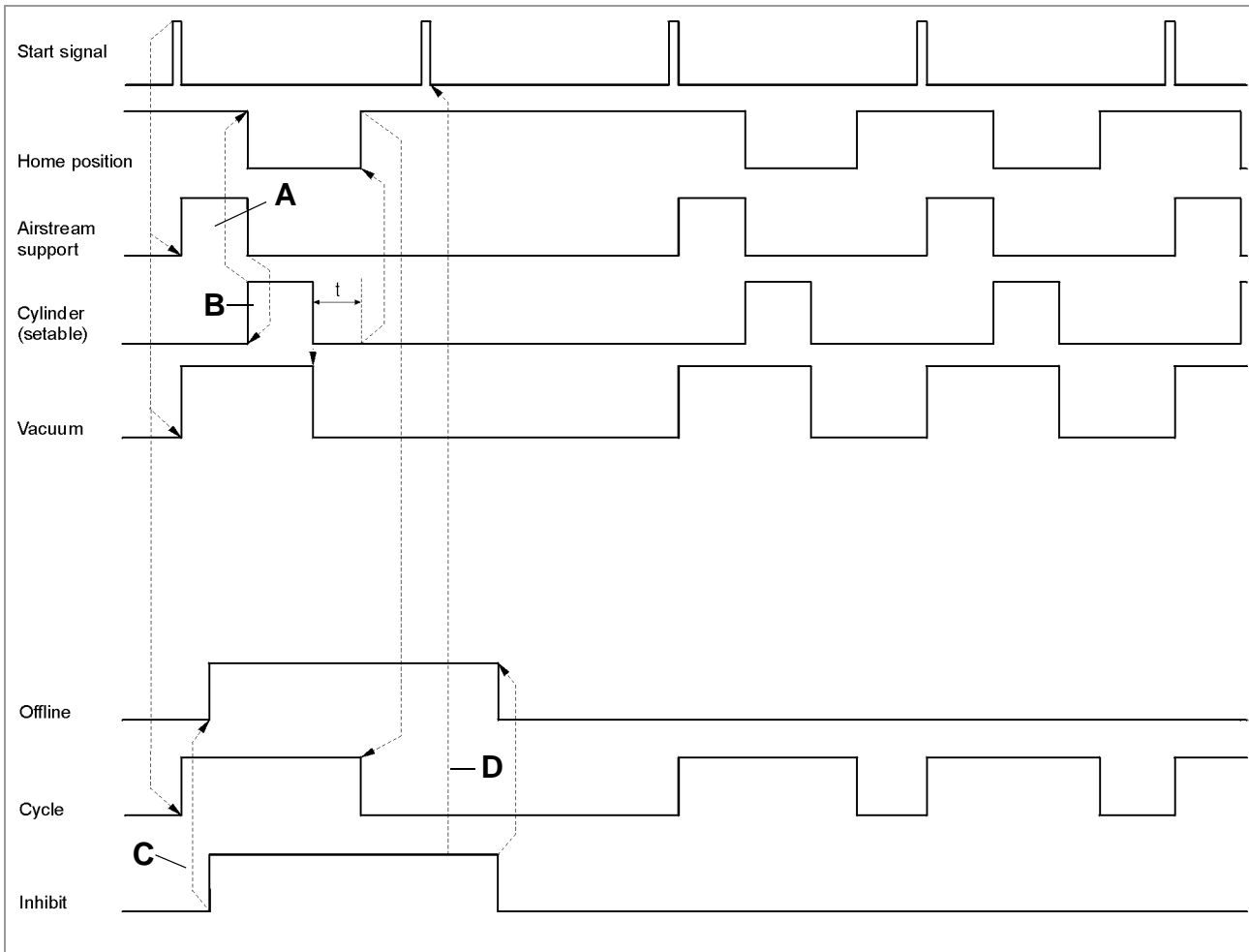
To this applicator group belong:

- PEP IV
- PEP Blow On
- Reverse PEP

With *sensor controlled* applicators, extension is stopped by the Touch Down signal.

To this group belong:
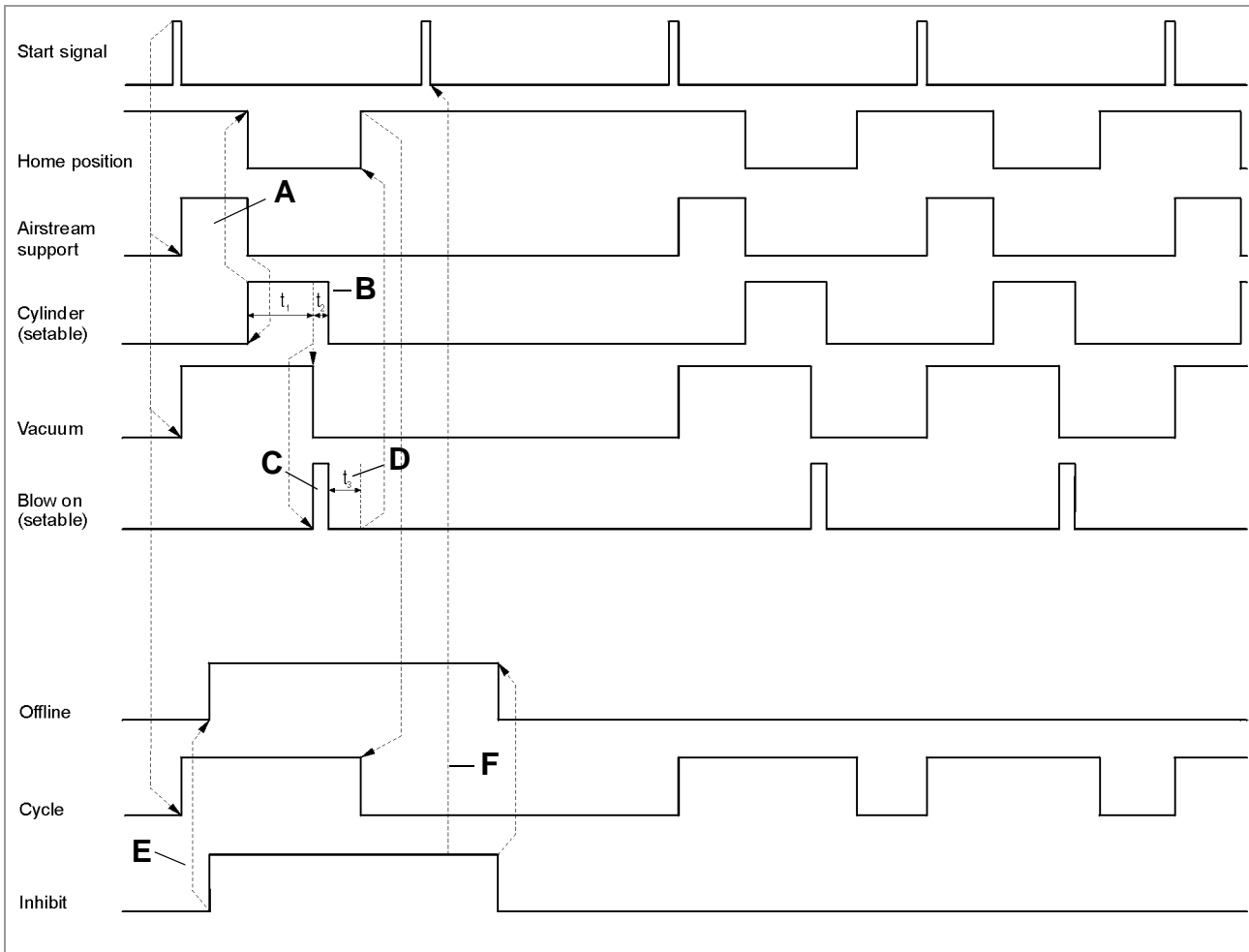
- LTP(V)
- PEP II Sensor

PEP IV

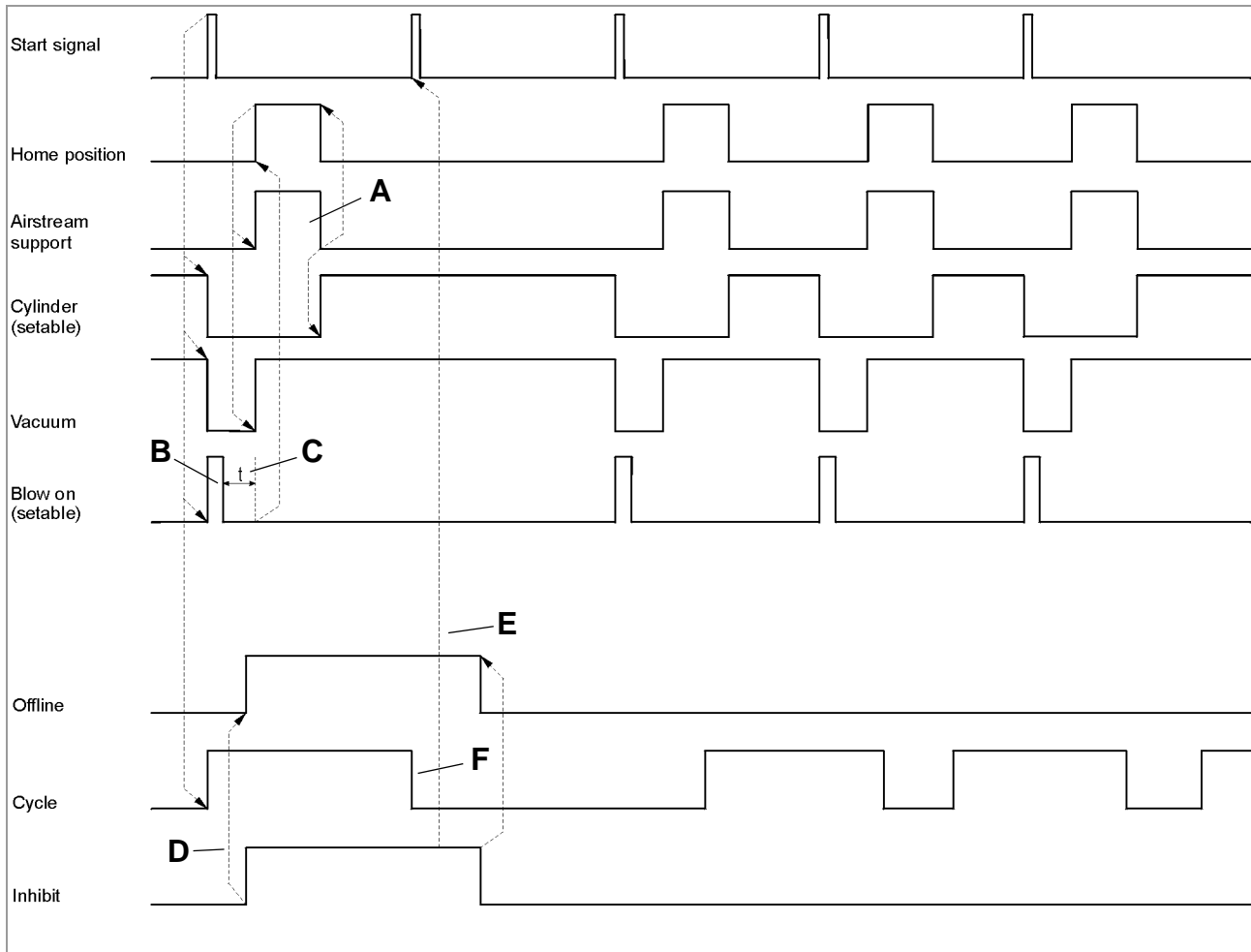[1] Pattern of control signals over time for PEP IV applicators.
  A Duration is determined by label length and dispensing speed. „Airstream Support" switching to low means the label is dispensed.
  B Can be adjusted via APPLICATOR PARA > Dwell time. Duration t is determined by the backwards movement of the applicator. The application cycle ends when the home position signal is high again.
  C The output signal „Offline" follows the input signal „Inhibit".
  D The start signal is ignored because of the active „Inhibit".

PEP Blow On

[2] Pattern of control signals over time for PEP Blow On applicators.

A Duration is determined by label length and dispensing speed. „Airstream Support" switching to low means the label is dispensed.

B The total duration of Cylinder is the sum of both durations t_1 and t_2. The duration t_1 is setable by APPLICATOR PARA > Dwell time; t_2 is setable by "APPLICATOR PARA > Blow on time" (see note C).

C Can be adjusted with APPLICATOR PARA > Blow on time.

D Duration t_3 is determined by the backwards movement of the applicator. The application cycle ends when the home position signal is high again.

E The output signal „Offline" follows the input signal „Inhibit".

F The start signal is ignored because of the active „Inhibit".
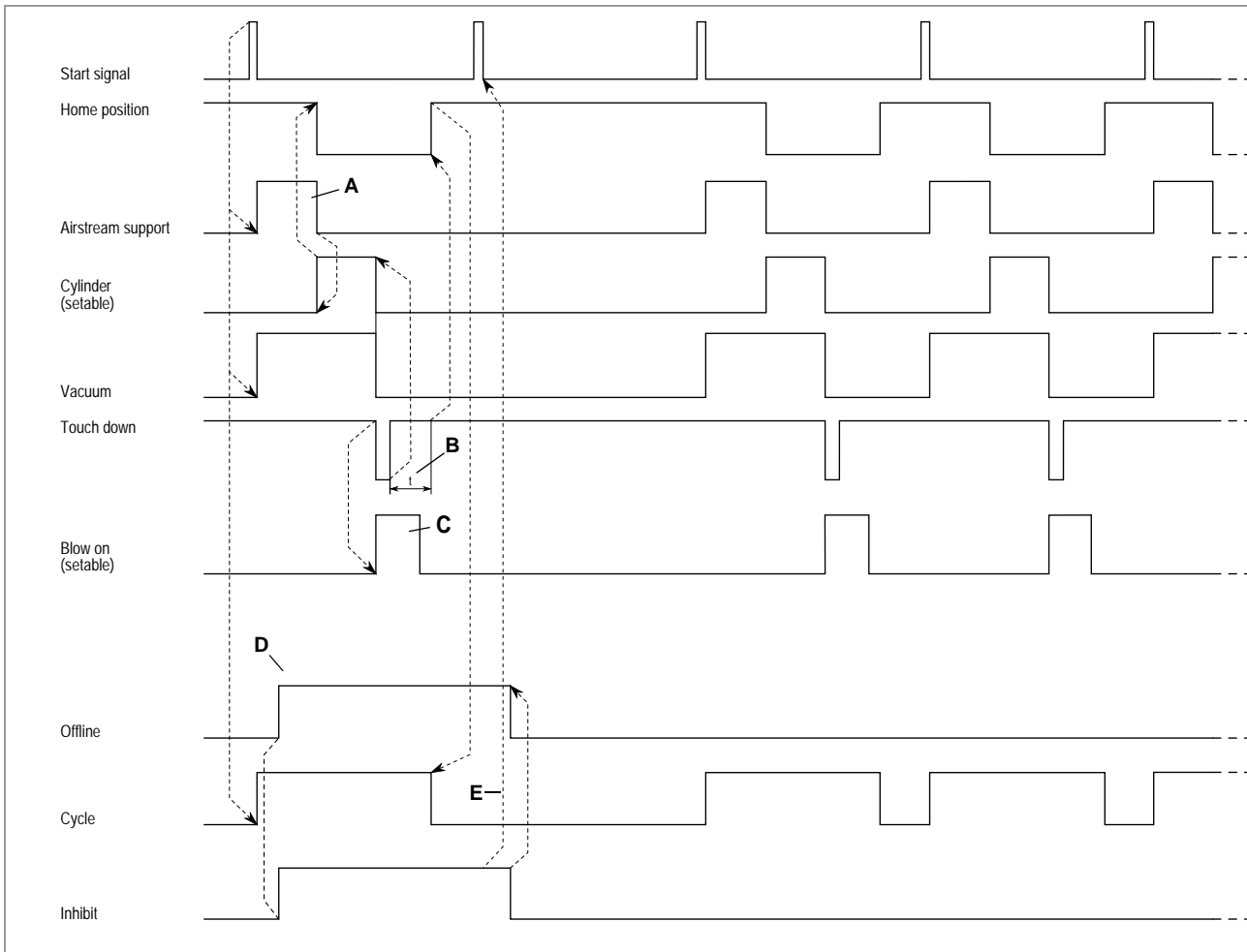
Reverse PEP

[3]   Pattern of control signals over time for Reverse PEP applicators.
   A Duration is determined by label length and dispensing speed. „Airstream Support" switching to low
       means the label is dispensed.
   B Adjustable with APPLICATOR PARA > Blow on time.
   C Duration t is determined by the backwards movement of the. applicator. The application cycle ends
       when the home position signal is high again
   D The output signal „Offline" follows the input signal „Inhibit".
   E The start signal is ignored because of the active „Inhibit".
   F The end of „Cycle" can be adjusted with APPLICATOR PARA > Dwell time (usually, this function sets the
       end of the „Cylinder" signal, in case of the Reverse PEP, „Cylinder" stays active up to the next
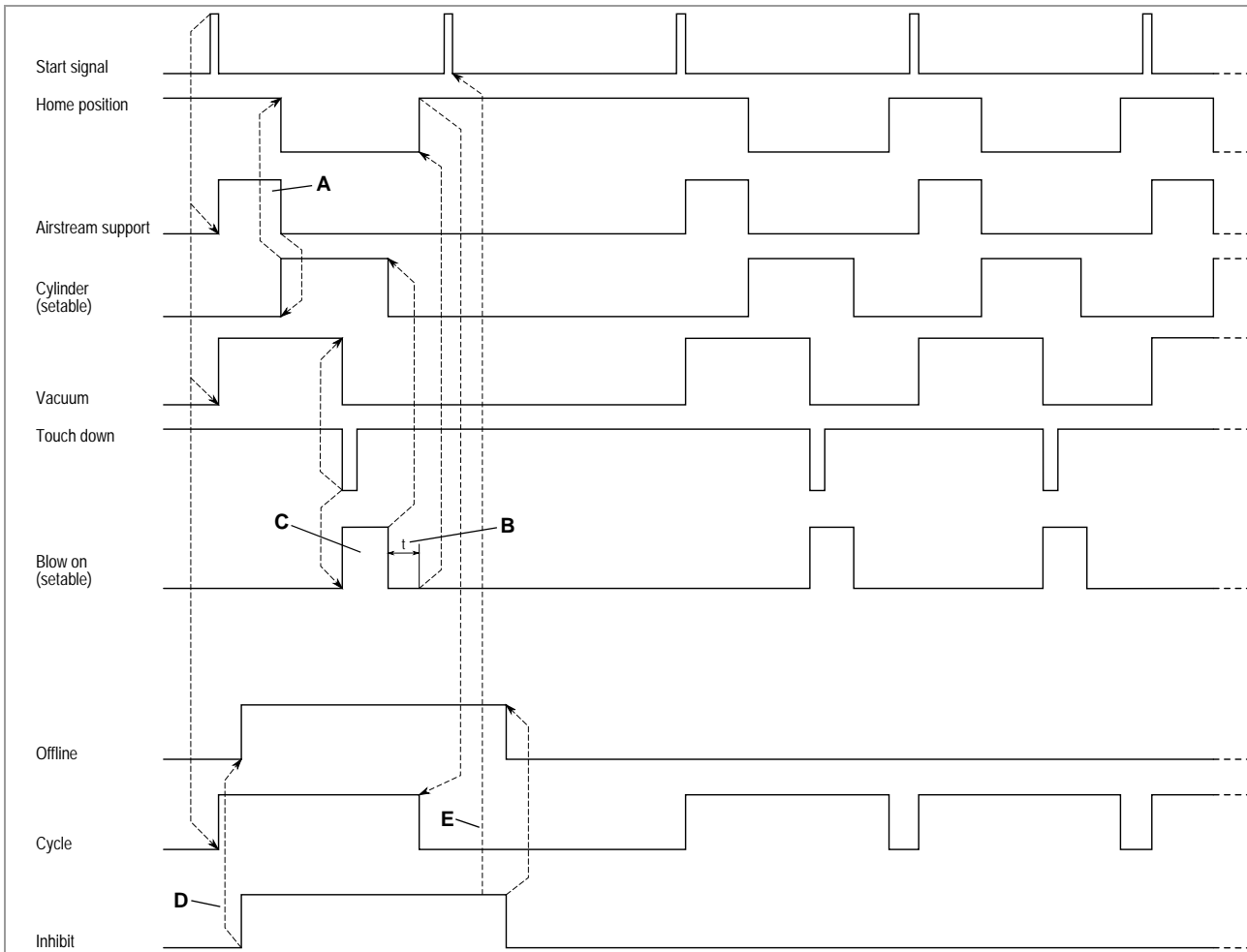   start signal, what means that the dwell time is ignored).

LTP und LTPV

[4]   Pattern of control signals over time for LTP(V) applicators.
   A Duration is determined by label length and dispensing speed. „Airstream Support" switching to low
         means the label is dispensed.
   B Duration t is determined by the backwards movement of the applicator. The application cycle ends
         when the home position signal is high again
   C Adjustable with APPLICATOR PARA > Blow on time.
   D The output signal „Offline" follows the input signal „Inhibit".
   E The start signal is ignored because of the active „Inhibit".
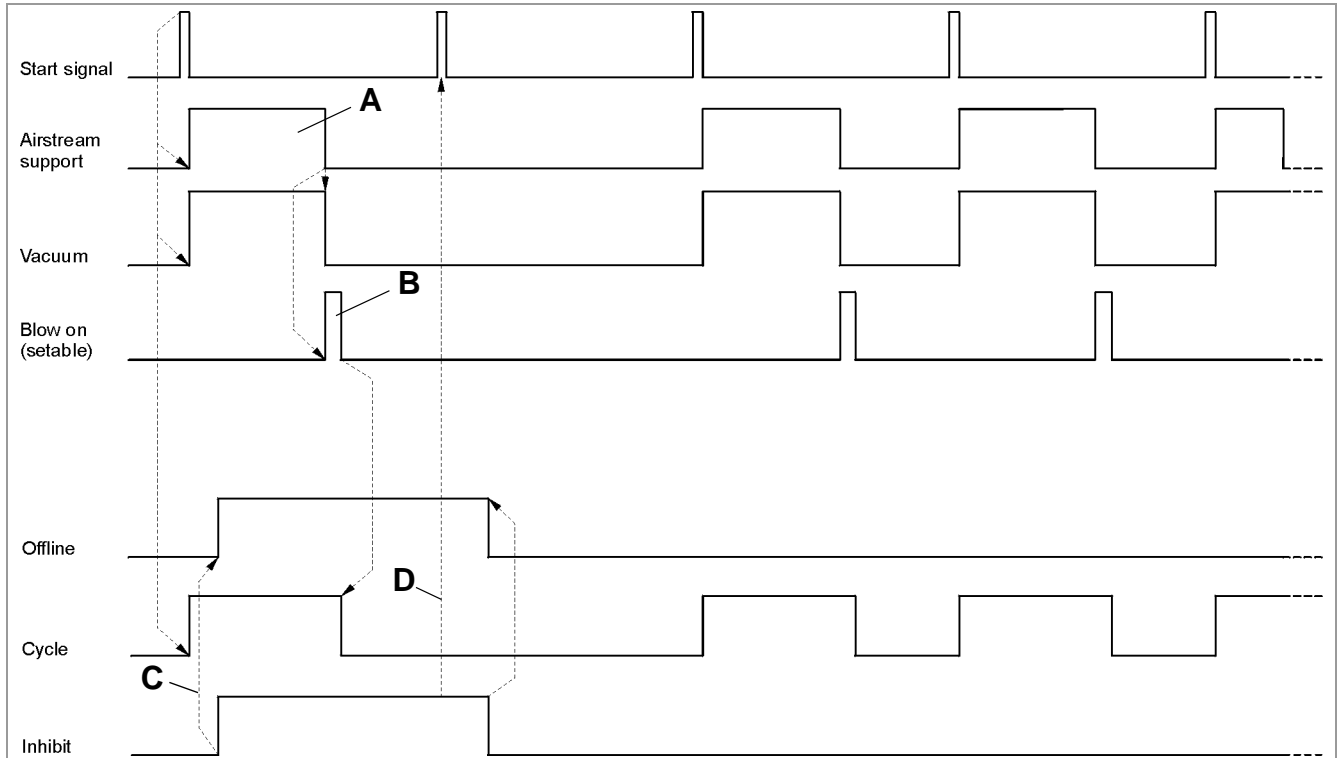
PEP II Sensor

[5] Pattern of control signals over time for PEP II Sensor applicators.

A Duration is determined by label length and dispensing speed. „Airstream Support" switching to low means the label is dispensed.

B Duration t is determined by the backwards movement of the applicator. The application cycle ends when the home position signal is high again.

C Adjustable with APPLICATOR PARA > Blow on time.

D The output signal „Offline" follows the input signal „Inhibit".

E The start signal is ignored because of the active „Inhibit".

ASA

The ASA type applicator (e.g. Avery Dennison LA-BO) is a special case, which does not have any moving parts. The label is applied only by compressed air. Therefore, signals controlling the movement of the applicator (Home Position, Cylinder) are not required.

[6] Pattern of control signals over time for ASA applicators.
  A Duration is determined by the label length and dispensing speed. „Airstream Support" switching to low means the label is dispensed.
  B Can be adjusted via APPLICATOR PARA > Blow on time.
  C The start signal is ignored because of the active „Inhibit".

Interface description

Important notes

The Applicator Interface (AI) is an option board for the ALX 92x. The AI works as a mini-PLC, which can control almost any applicator type. The AI is available in two Versions:

- *AI Basic*: power supply via the ALX 92x main power pack

- *AI Pro*: higher output currents due to a separate power pack

➠ „Basic" and „Pro" is only mentioned in this description, if the two versions are different in something.

Connectors

Required connectors: The „AI connector kit", Article no. A5069, contains (connector and connector housing for each):

- 1x D-Sub 15 high density

- 1x D-Sub 26 high density

- 1x D-Sub 44 high density

Firmware requirements

Both firmware versions, for ALX 92x and Applicator Interface must match the table below:

Firmware ALX 92x		Firmware AI
Gen. 2	**Gen. 3**	
3.40	—	1.03
4.00	—	1.11
4.10	—	1.15
4.11/4.22	5.00/5.01/5.02/5.03	1.17
4.31	5.31	1.19
4.33	5.33	1.23

Anzeige der Firmware-Versionen: SERVICE DATA > MODULE FW VERS.
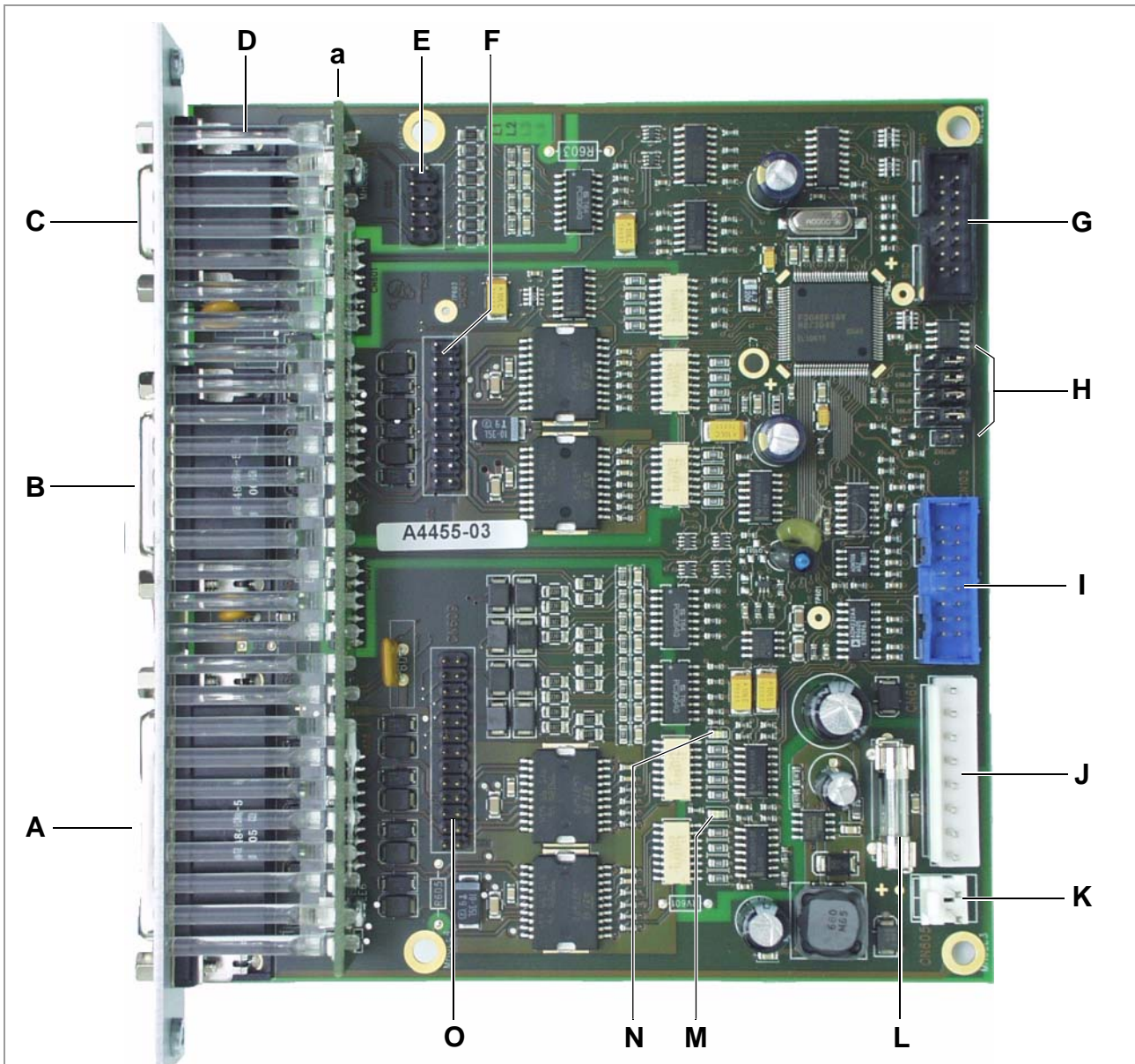
Connector Position
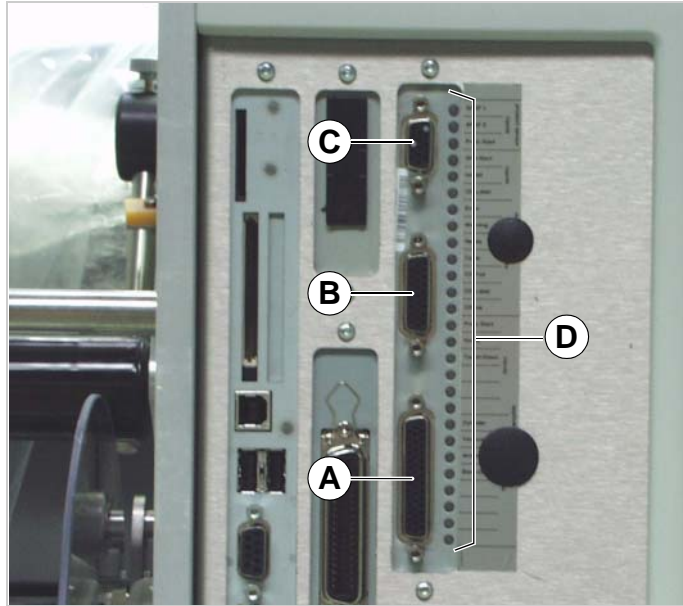
[7] Connections of the Applicator Interface:
     A Applicator connection (D-Sub 44 hd)
     B Machine status connection (D-Sub 26 hd)
     C Product (Start) sensor connection (D-Sub 15 hd)
   **D** Monitor-LEDs

[8] Connector for Avery Applicators (arrow) at an ALS 92x (LH). The connector
     is internally connected to the AI board.

Connections and configuration

[9]   Applicator Interface (PCA-Assy. = A4455-03)

A   CN 603: Connection for applicator

B   CN 602: Signal interface machine status

C   CN 401: Connection product (start) sensor

D   Light guides, which lead the LED signals from the plug-on board (a) to the boards mounting panel

E   CN 402: Internal connection product (start) sensor

F   CN 610: Internal signal interface machine status

G   CN 101: Connection CPU board

H   JP 101-104; JP 202: Jumpers for factory internal use
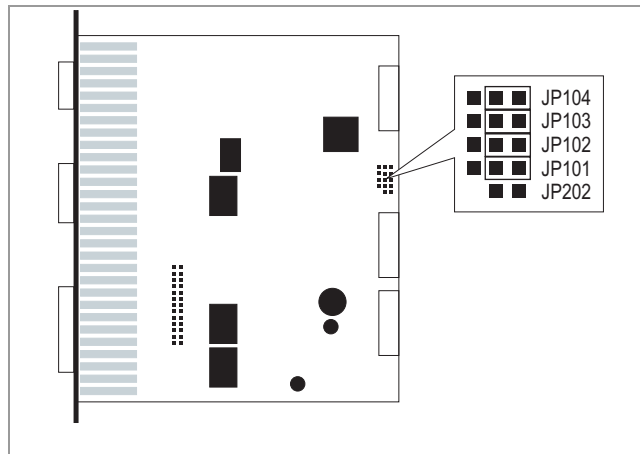
[10] Default settings for the jumpers JP 101-104 and JP 202.

I   CN 102: Debug interface

J   CN 604: Connection power supply

K   CN 605: not used

L   SI 601: Fuse

    – *AI Basic*: T1AH 250V
    – *AI Pro*: T4AH 250 V

M   D 331: Green LED; only for factory internal use; flashes if the AI works properly

N   D332: Yellow LED; only for factory internal use

**O**   CN 609: Internal connection applicator

Replacing older boards

⚠️ CAUTION! - Follow the following, to prevent malfunctioning:

➜ When replacing an older board with index -00/-01/-02 against a new board with index -03 *do not* take over the jumpers from the old board.

Older boards with index -00/-01/-02 had jumpers set on connector [11C].

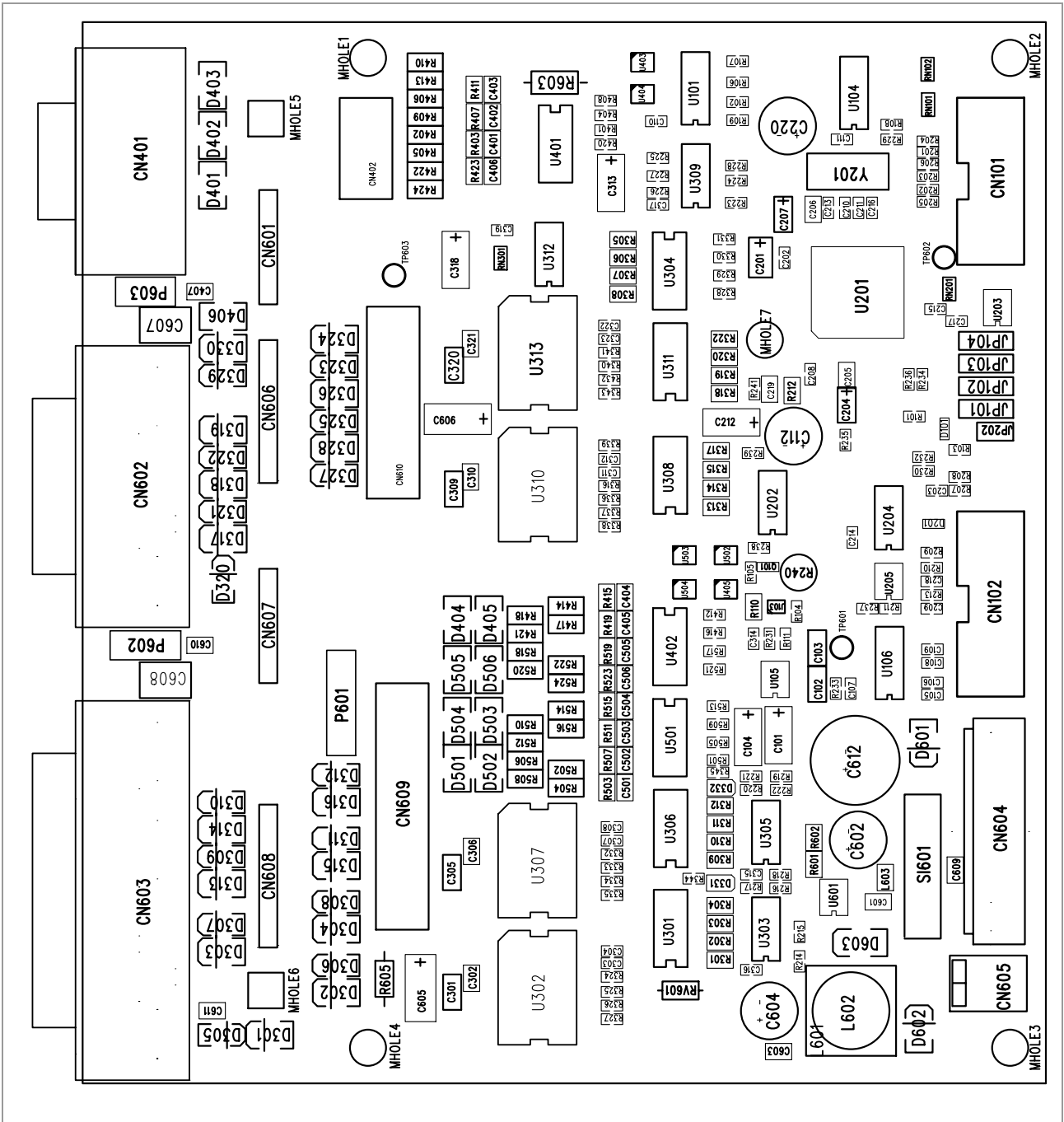New boards (index -03) provide additionally to [11C] the connectors [11A] and [11B].

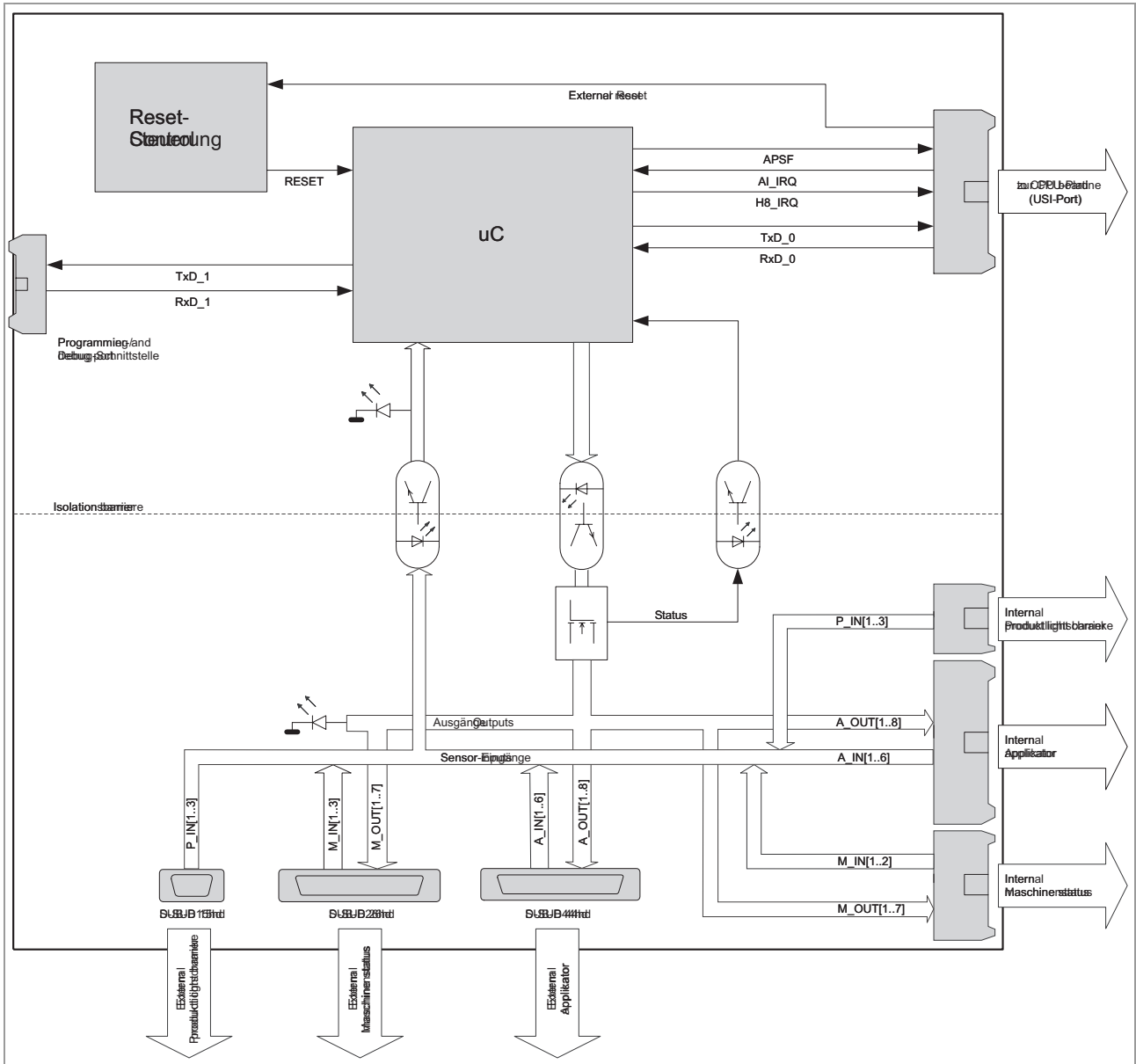▥➡ None of the 3 connectors may have any jumpers put on it!
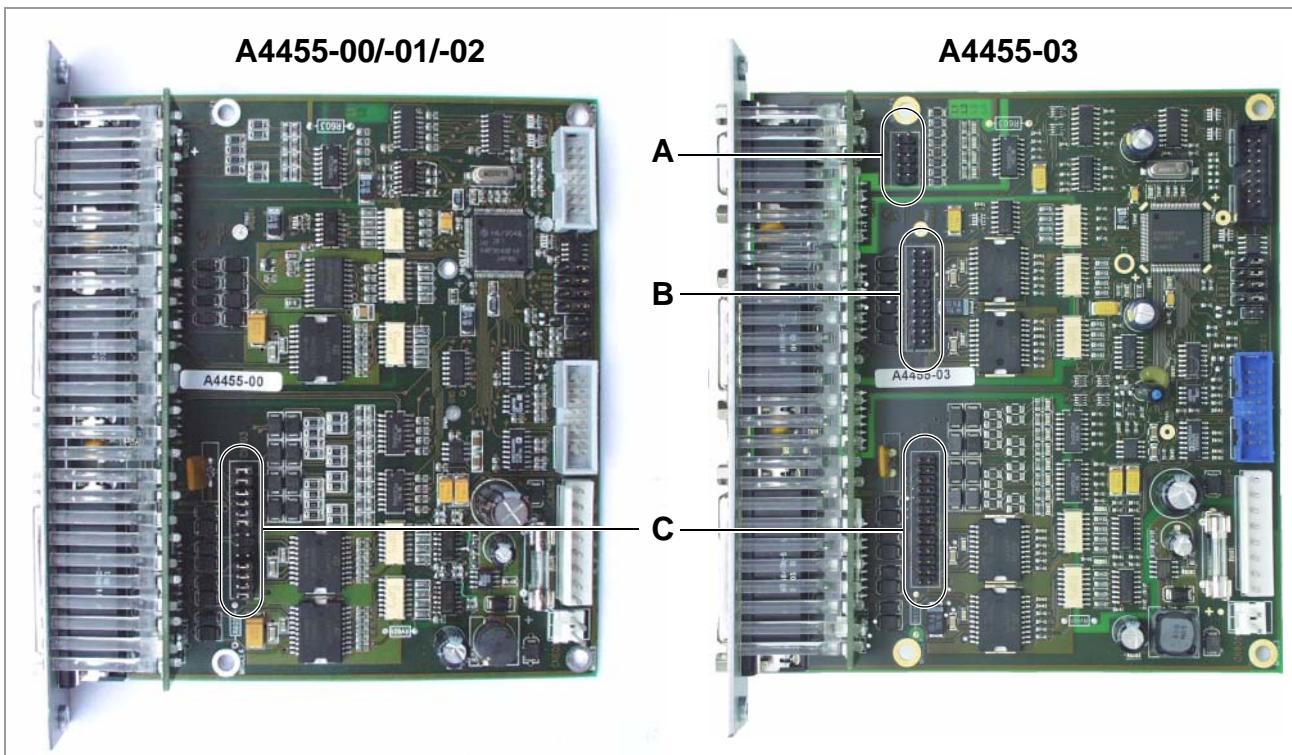
[11] Left: older board; right: current board.

Layout diagram

[12] Layout diagram for Applicator Interface (PCB = A3417-03)
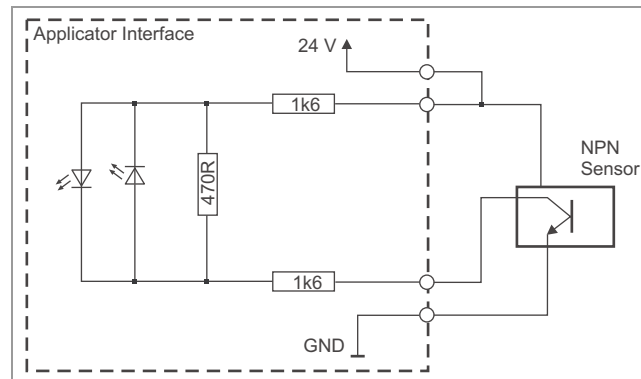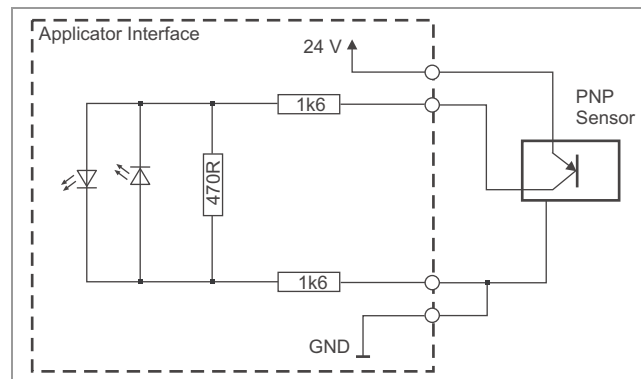
Block diagram

[13] Block diagram Applicator Interface.

Circuit diagrams for signal inputs

For each signal input are +24 V and GND 24 V separately available.

[14] Main circuit for signal inputs (NPN).
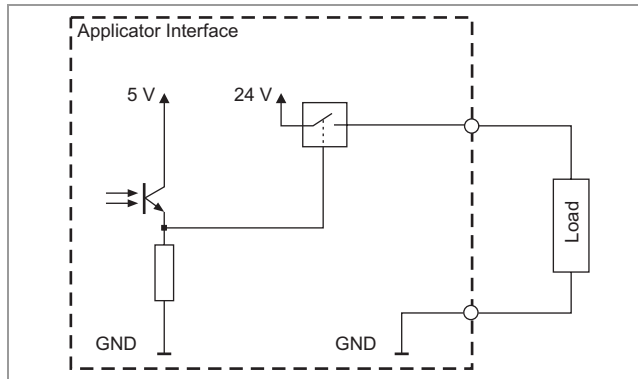

[15] Main circuit for signal inputs (PNP).

Quantity	Value
Supply voltage	24 V ±10%
V_{IL} (state „0")	≤ 5 V
V_{IH} (state „1")	18.0 V @ 3.8 mA
	26.4 V @ 5.7 mA
t_{delay} (propagation delay)	≤ 60 µs
$t_{debounce}$ [a)] (software debouncing)	10 ms

[Tab. 3]　Switching level definitions for signal inputs.

a)　24 V input → 5 V microcontroller input

Circuit diagrams for signal outputs

All signal outputs are designed as PNP and are galvanically separated from the 5 V control system (optocoupler).

[16] Main circuit for outputs (PNP).

Signal outputs

Signal outputs are mainly used for connecting to other devices or to machine controls.

Admissible resistive load: $\geq$ 240 Ohm @ 24 VDC.

Maximum admissible output current for each signal output: 0.1 A.

Quantity	Value	Note
Supply voltage	24 V ±10%	
Voltage drop at V_{OH}	$\leq$ 0.3 V @ 0.1 A	
t_{pLH}	$\leq$ 1 µs	Rise time „0" $\rightarrow$ „1" at 240 Ohm
t_{pHL}	$\leq$ 1 µs	Fall time „1" $\rightarrow$ „0" at 240 Ohm
t_{delay}	$\leq$ 30 µs	5 V microcontroller output $\rightarrow$ 24 V output

[Tab. 4] Switching levels of power outputs.

Power outputs

Power outputs can directly drive loads.

Load	Max. value
Resistive load	≥ 48 Ohm @ 24 VDC
Inductive load	≤ 200 mJ
Lamp	≤ 10 W

[Tab. 5] Admissible loads at power outputs.

Maximum admissible output current for each power output: 0.5 A: Total output current I_{max} over all outputs not more than:

- AI Basic: 1 A
- AI Pro: 4 A

Quantity	Value	Note
Supply voltage	24 V ±10%	
Voltage drop at V_{OH}	≤ 0.5 V @ 0.5 A	
t_{pLH}	≤ 5 µs	Rise time „0" $\rightarrow$ „1" at 48 Ohm
t_{pHL}	≤ 5 µs	Fall time „1" $\rightarrow$ „0" at 48 Ohm
t_{delay}	≤ 60 µs	5 V microcontroller output $\rightarrow$ 24 V output

[Tab. 6] Switching levels of power outputs.

Max power

Connection	Max. current
Signal output	0.1 A
Power output	0.5 A

[Tab. 7] Maximum ouput current for each output.

The maximum output power drawable from the 24 V supply is:

- AI Basic: 24 W (1 A)
- AI Pro: 96 W (4 A)

This is the sum of all sensor supplies and of all switch outputs which are active at the same time.

Overload

The outputs are equipped with quad channel power switches, which are protected against overcurrent and overtemperature as follows:

- *Overtemperature* of a power switch: all outputs of the power switch are turned off, until the temperature reaches the admissible range.
- *Overcurrent* of one or several outputs: the respective outputs are pulsed until the overcurrent condition is removed. During this, the output current is limited to 400 mA

During an error case, each quad channel power switch sets a diagnosis signal, which is detected and sent to the CPU by the microcontroller.
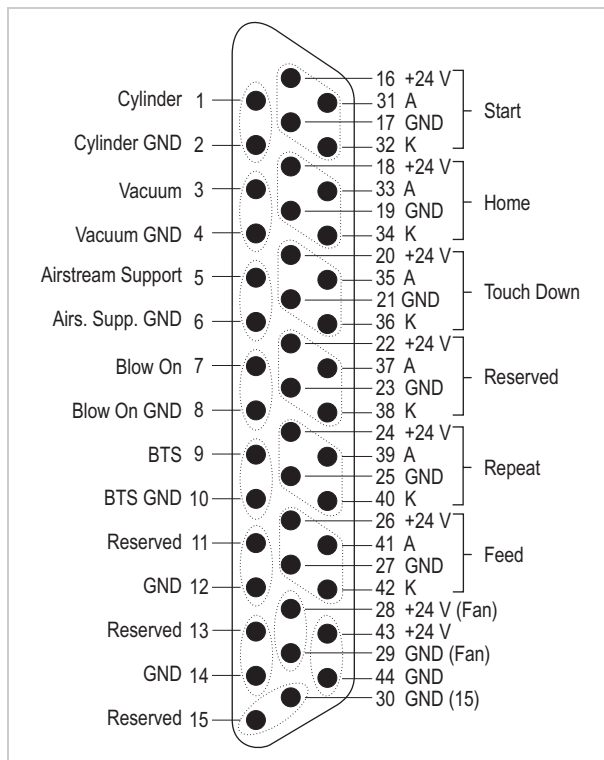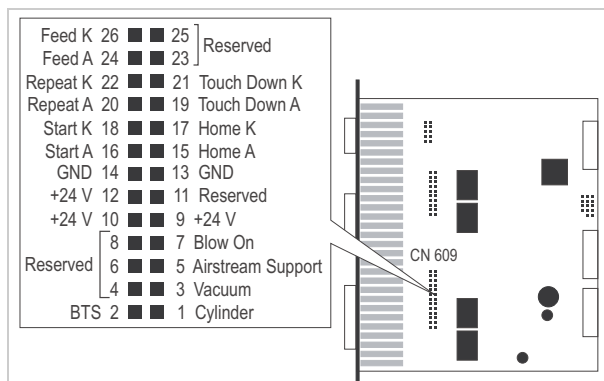
Pin assignments

Applicator connection

Signal name	Function
Cylinder	Power output ($I_{out} < 500$ mA)
	Controls the pneumatic cylinder of the applicator
	Active during the dwell time or until touch down
	Duration setable with: APPLICATOR PARA > Dwell time
Vacuum	Power output ($I_{out} < 500$ mA)
	Controls the vacuum at the applicator plate
	Active after the start signal until end of application (cylinder)
Airstream Support	Power output ($I_{out} < 500$ mA)
	Controls the airstream, which presses the label against the applicator plate.
	Active after the start signal until start of application (cylinder)
Blow On	Power output ($I_{out} < 500$ mA)
	Controls the blow-on valve of the applicator
	Active after end of application (cylinder)
	Duration setable with: APPLICATOR PARA > Blow on time
BTS	Power output ($I_{out} < 500$ mA)
	Controls the Bad Tag Separator (BTS)
	Active, if a bad RFID tag is detected
	Is set back by the following action (e. g. devaluating the bad tag)
Start	Input ($I_{in} < 8$ mA)
	Signal is generated by the product sensor
	Starts dispensing

[Tab. 8] Signals at applicator connection.
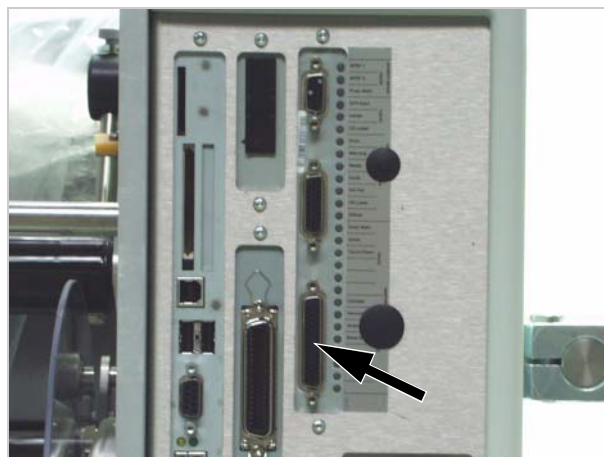
[17] Applicator connection (arrow).

[18] Pin assignment applicator connection.

[19] Position and pin assignment of the internal applicator connection (CN 609).

Signal name	Function
Home	Input (I_{in} < 8 mA)
	Active, if the applicator has reached the home position (application is finished)
Touch Down	Input (I_{in} < 8 mA)
	Use with sensor-controlled applicators (e. g. LTP)
	Active, if the applicator touches the product
Repeat	Input (I_{in} < 8 mA)
	Same function as start signal
Feed	Input (I_{in} < 8 mA)
	Feeding of the label material as long as the signal is active; at least one label is dispensed

[Tab. 8]   Signals at applicator connection.

24 V supply voltage outputs:

- Sensors: I_{max} = 10 mA

- Fan (pin 28):
  – AI Basic: I_{max} = 1 A
  – AI Pro: I_{max} = 4 A

- Pin 43/44: I_{max} = 100 mA

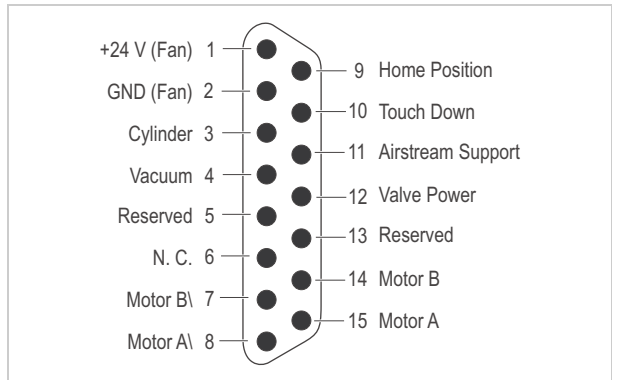➡ Total output current I_{max} over all outputs not more than:

- AI Basic: 1 A

- AI Pro: 4 A

Avery-Applicator-connection

Signal description see

[20] Connector (arrow) for Avery-Applicators

+24 V (Fan)	1		9	Home Position
GND (Fan)	2		10	Touch Down
Cylinder	3		11	Airstream Support
Vacuum	4		12	Valve Power
Reserved	5		13	Reserved
N. C.	6		14	Motor B
Motor B\	7		15	Motor A
Motor A\	8			

[21] Pin assignment Avery-Applicator connection

Machine status connection

24 V supply voltage outputs: $I_{max} = 10$ mA

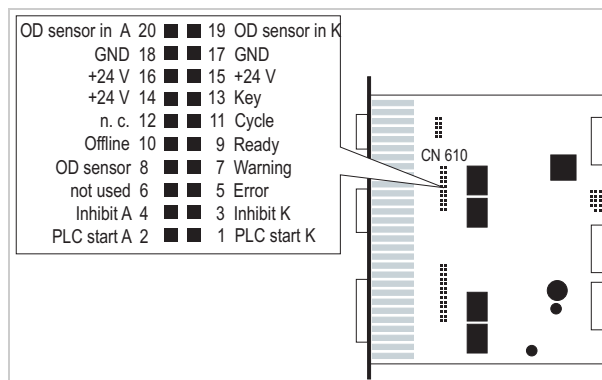| Signal name	Function
Error	Power output ($I_{out} < 500$ mA)
	Signal active when an error message appears on the operator panel display
Warning	Power output ($I_{out} < 500$ mA)
	Active, if a warning status occurs (e. g. label roll diameter below desired nominal value)
Ready	Power output ($I_{out} < 500$ mA)
	Active in printing/dispensing mode
	Not active in Offline mode
	Inverted Offline signal
Cycle	Power output ($I_{out} < 500$ mA)
	Active during application cycle
OD foil	Power output ($I_{out} < 500$ mA)
	Active, if the foil roll Ø fell below the value set in SYSTEM PARAMETERS > Foil end warning
PLC start	Input ($I_{in} < 8$ mA)
	Same function as start signal, see chap. Applicator connection ⃟ on page 22
Inhibit	Input ($I_{in} < 8$ mA)
	Start signals are ignored, while signal is active
OD sensor in	Input ($I_{in} < 8$ mA)
	Connection for optional roll outer diameter (OD) sensor, see topic section „Electronics Gen. 3", chap. OD control sensor (ALX) ⃟ on page 42.

[Tab. 9]   Signals at machine status connection.
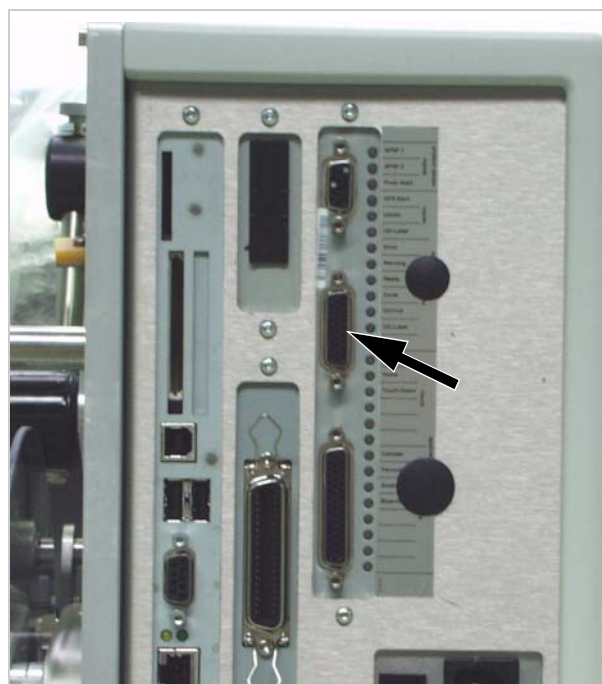
[22] Machine status connection (arrow).
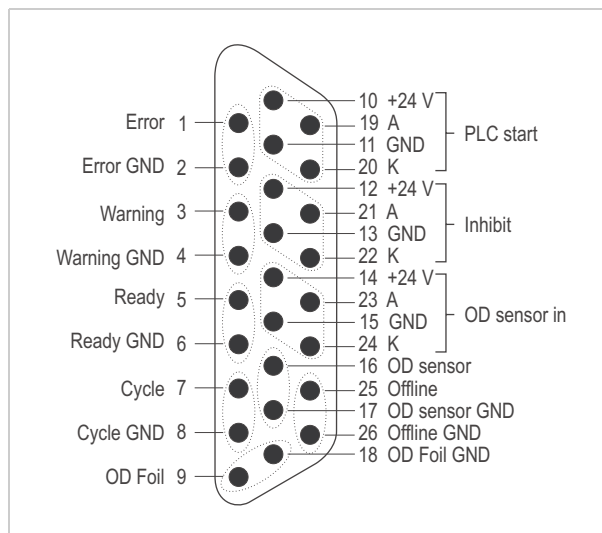
[23] Pin assignment machine status connection.

[24] Position and pin assignment of the internal machine status connection (CN 610).

Signal name	Function
OD sensor	Power output (I_{out} < 500 mA)
	May be used for driving a signal lamp indicating that the roll Ø is low.
	Active (0 V), if the OD light barrier is closed (roll Ø is to small).
	Active (0 V), if no OD sensor is connected.
	Inactive (24 V), if the OD light barrier is open (roll Ø is sufficient).
Offline	Power output (I_{out} < 500 mA)
	Active in offline mode
	Not active in printing/dispensing mode
	Inverted Ready signal

[Tab. 9]　Signals at machine status connection.
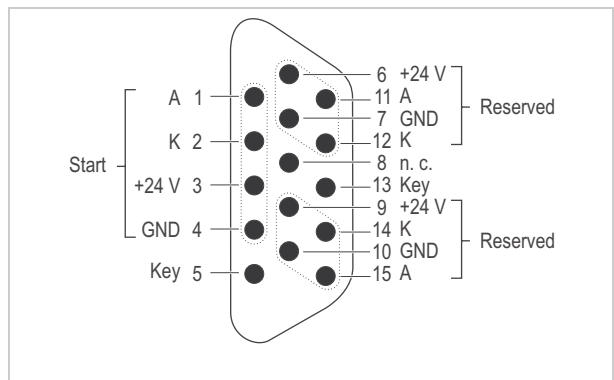
Product sensor connection

24 V supply voltage outputs: $I_{max} = 100\,mA$

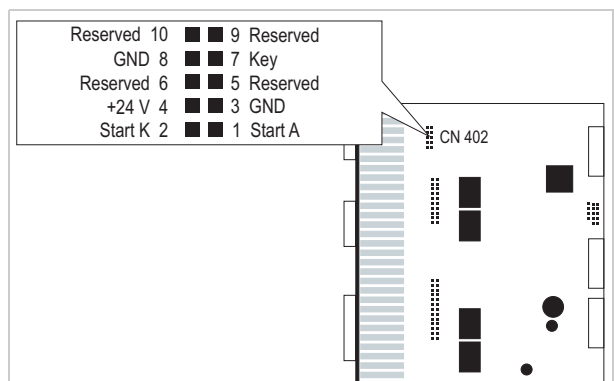| Signal name	Function
Start	Input
	$I_{in} < 8\,mA$
	Signal is generated by the product sensor
	Starts printing/dispensing
Key	Mechanic coding of the connector (reverse polarity protection)
Reserved	Input not applied
	$I_{in} < 8\,mA$

[Tab. 10] Signals at product sensor connection.
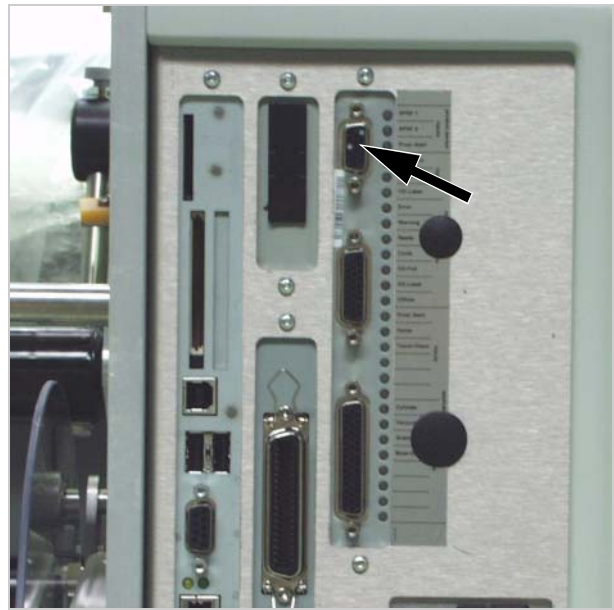
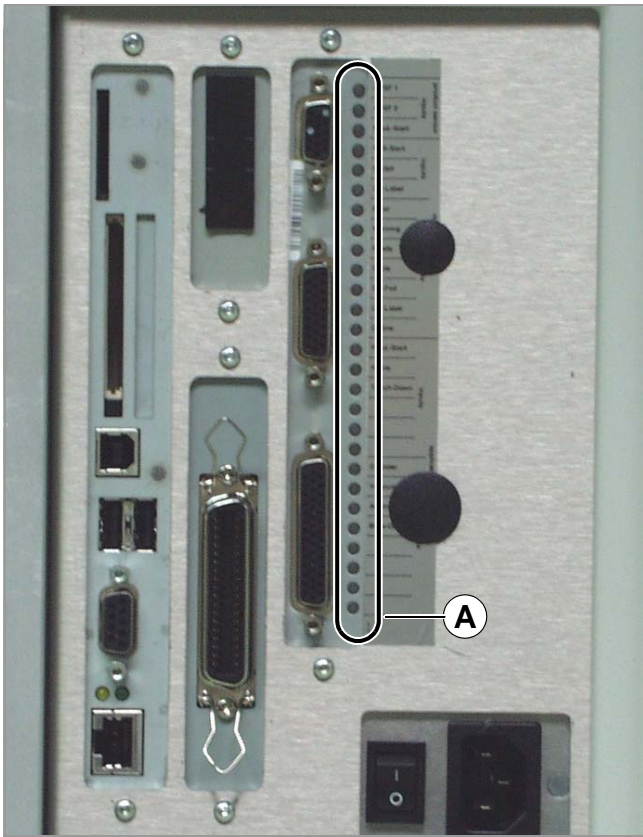[25] Product sensor connection (arrow).

[26] Pin assignment product sensor connection.

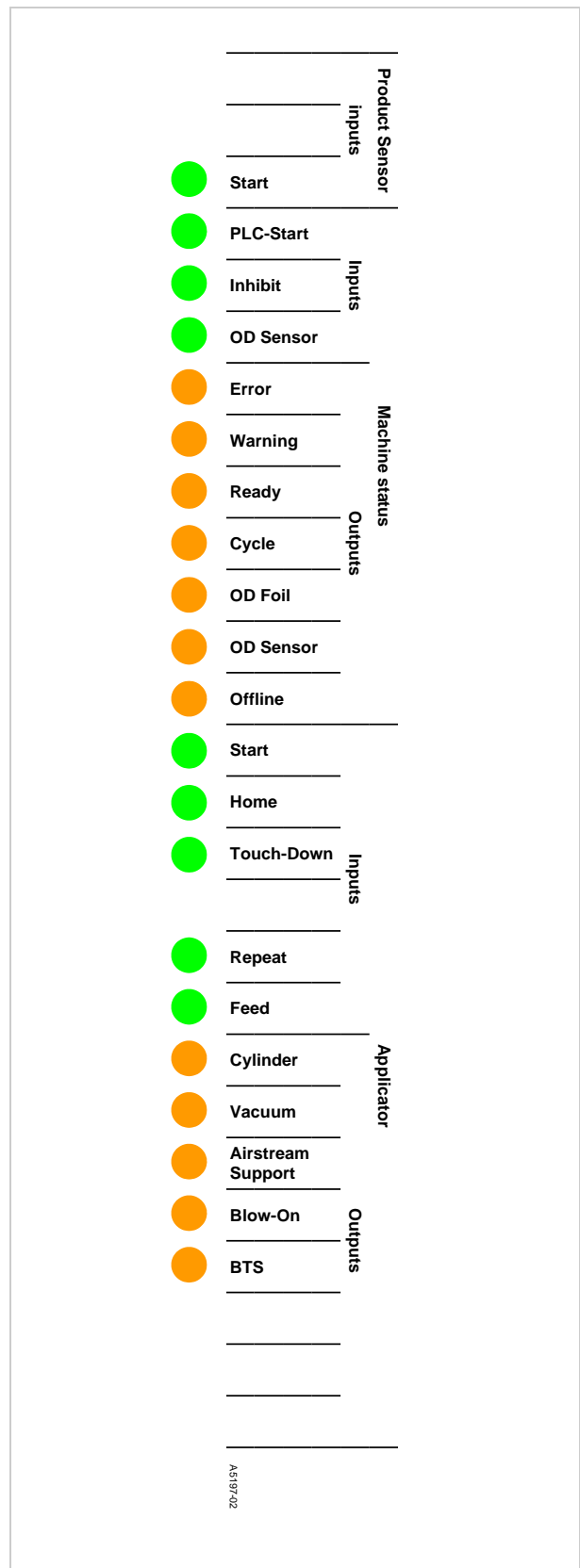[27] Position and pin assignment of the internal product sensor connection (CN 402).

Signal LEDs

[29] Signal LEDs (A).

The signal LEDs have the following meaning:

- Orange = Output
- Green = Input
- Lighting LED = Signal is active

[28] Signal LEDs schematic