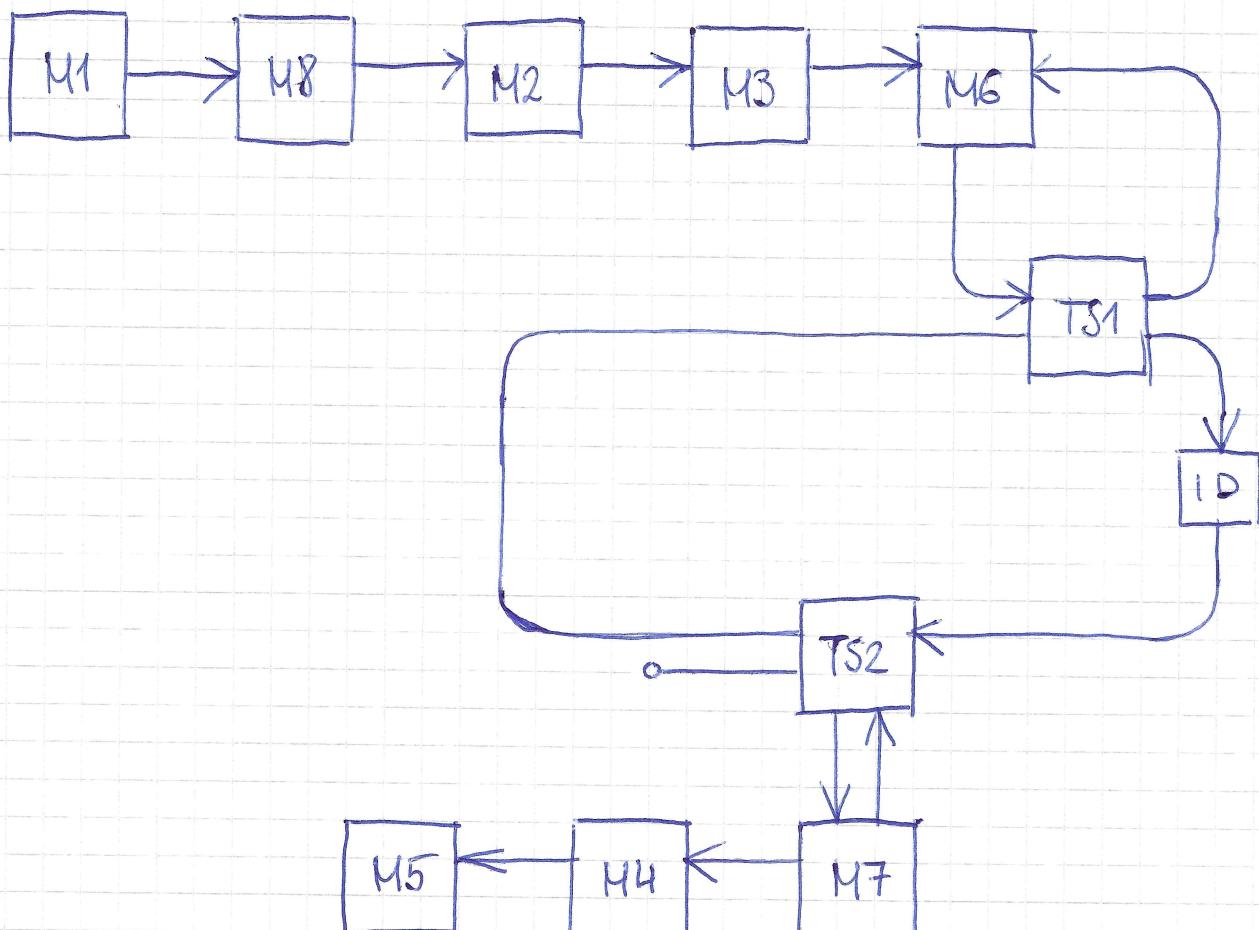


LeMF

DELIVERY SORTING TRANSPORT PORTIONING FILLING

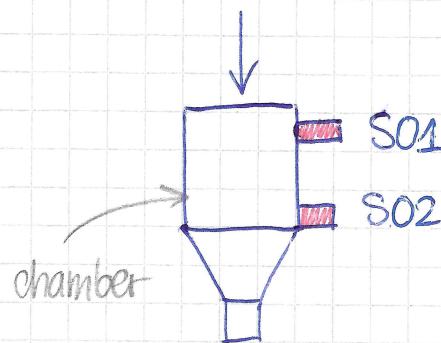


SERVING

PRODUCTION

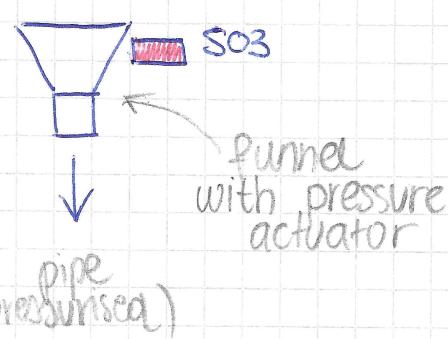
STORAGE +  
EMPTYING

## Module 1 "delivery"

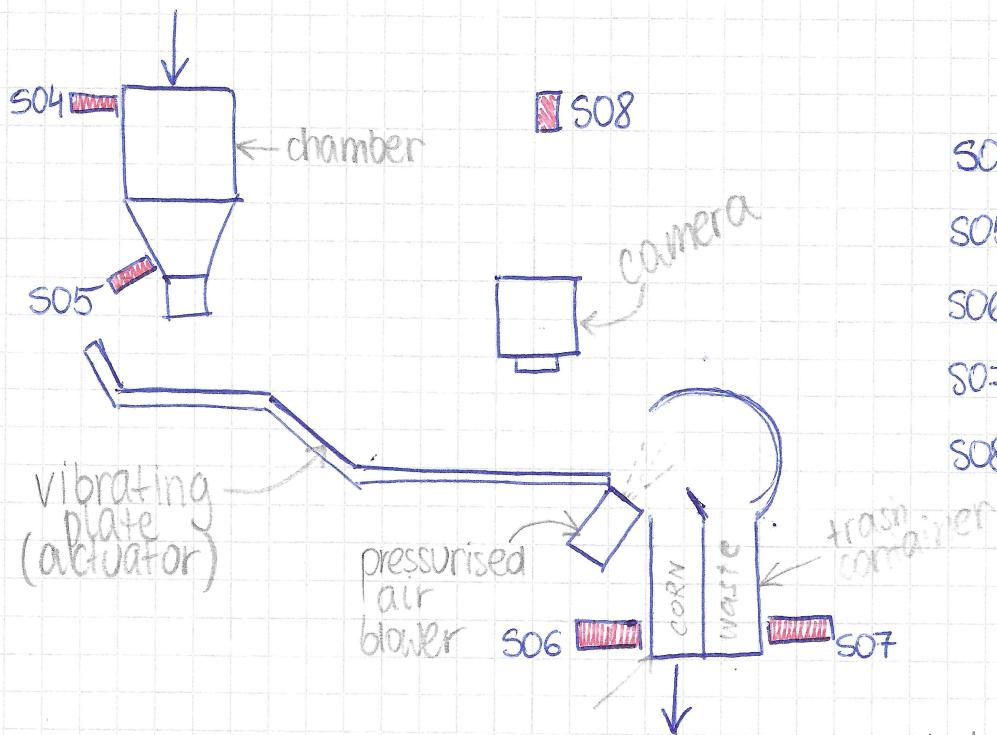


S01 - chamber is full  
S02 - chamber is empty  
S03 - funnel is blocked

conveyer belt  
with 2 actuators  
(L and R)



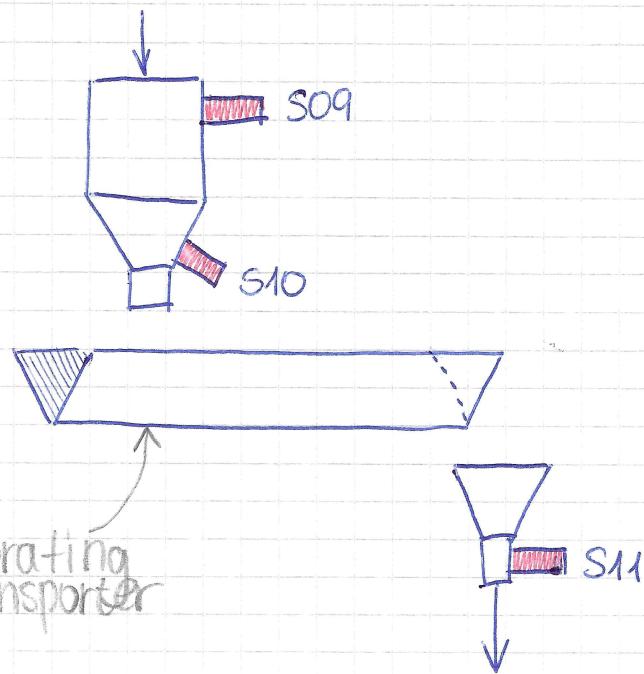
## Module 8 "table sort"



S04 - chamber is full  
S05 - chamber is empty  
S06 - corn funnel is blocked  
S07 - waste funnel is blocked  
S08 - pressure sensor

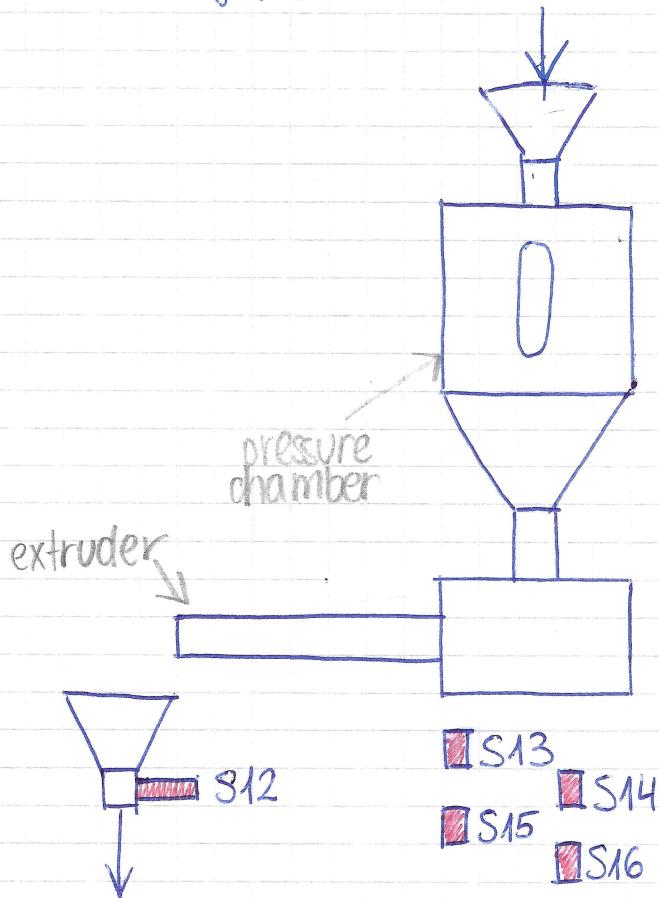
Module 8 removes trash from corn. Camera identifies the waste and signals the blower, which uses pressurised air to blow waste away from the corn.

## Module 2 "transport"



- S09 chamber is full
- S10 chamber is empty
- S11 funnel is blocked

## Module 3 "weighing"

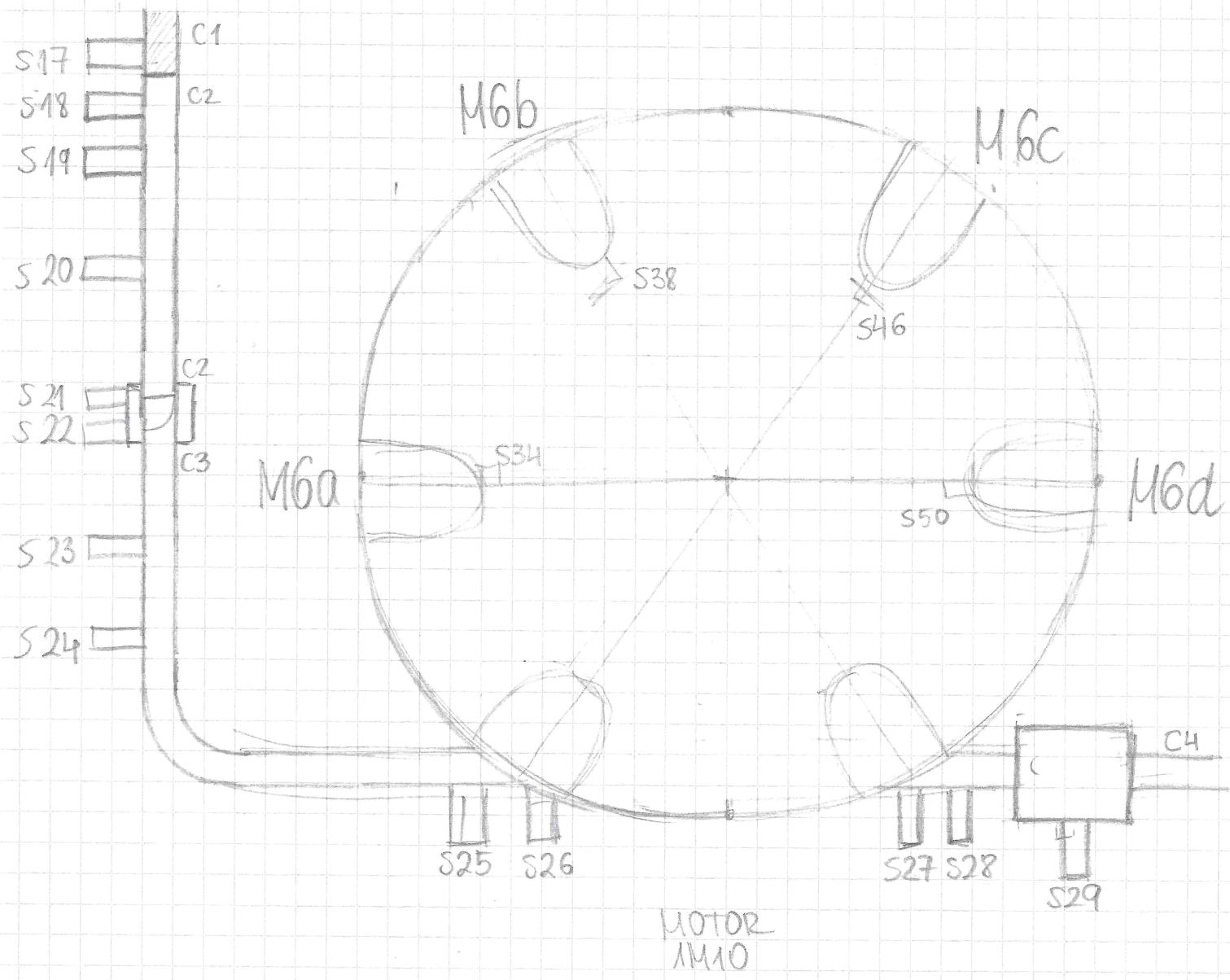


Modules 2 and 3  
cannot operate  
simultaneously.

Module 3 weighs the corn in chamber. corn is extruded until a set amount is removed from the chamber (difference in weight)

- S12 funnel is blocked
- S13 pressure sensor (Ba)
- S14 air sensor (l/min)
- S15 motor temperature is valid
- S16 weight (g)

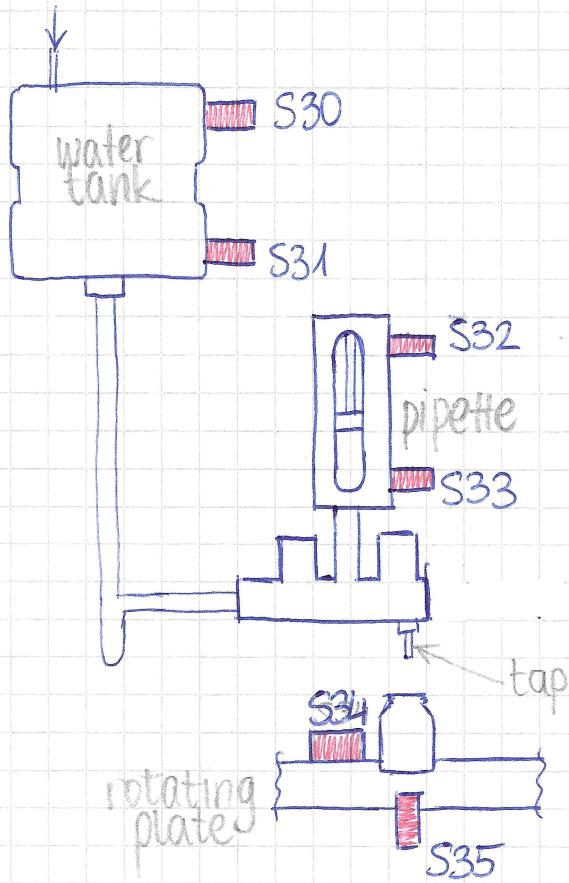
# Module 6 „Bottle filling station“



- S17 - bottle stuck on conveyor 1
- S18 - bottle stuck on conveyor 2
- S19 - bottle incoming
- S20 - bottle incoming
- S21 - gate open
- S22 - gate closed
- S23 - bottle incoming
- S24 - bottle has a top on (it shouldn't)
- S25 - bottle incoming (stop rotating plate)
- S26 - bottle is in position (start rotating plate)
- S27 - bottle is ready (stop revolving plate)
- S28 - bottle has left (start rotating plate)
- S29 - bottle in position for Q testing (camera) (cam only)

} rotating plate movement logic

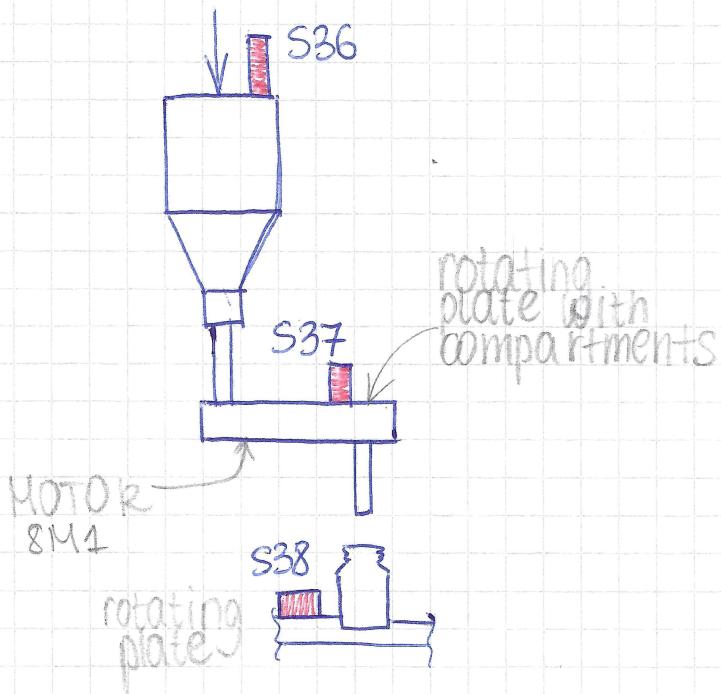
## Module 6 a „water filling“



- S30 - water tank full
- S31 - water tank empty
- S32 - pipette up (drawing water)
- S33 - pipette down (filling bottle)
- S34 - bottle in position
- S35 - rfid reader

pipette fills the bottle with water if rfid chip identifies it as a water bottle. It takes about 3 pumps to fill the bottle.

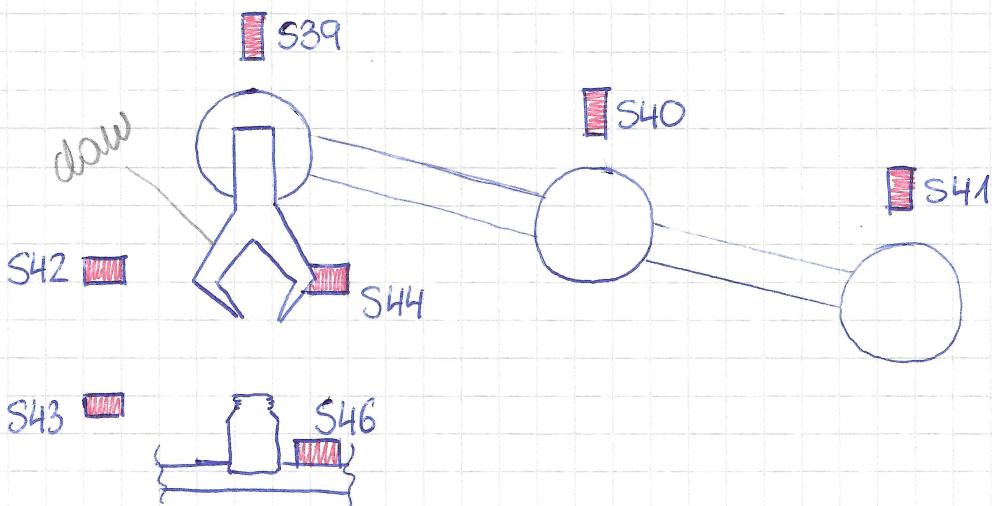
## Module 6 b „corn filling“



- S36 - corn container is full
- S37 - plate in position to disperse corn
- S38 - bottle in position

Rotating plate with compartments portions the corn into ~10g portions. Sensor S37 indicates that the compartment is in position.

## Module 6c "lid fitting"



S39 - claw in position 1

S40 - claw in position 2

S41 - claw in position 3

S42 - claw is up

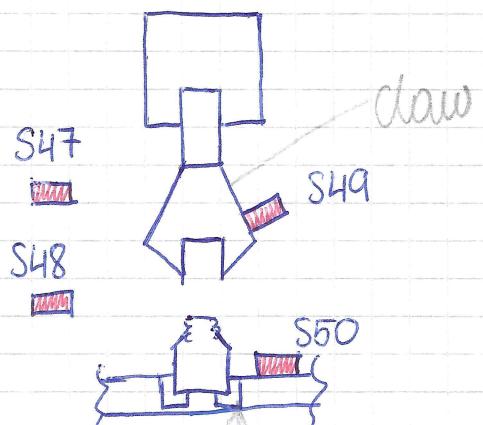
S43 - claw is down

S44 - lid inside claw

S45 - cap in queue

S46 - bottle in position

## Module 6d "lid fastening"



actuator to hold bottle in place

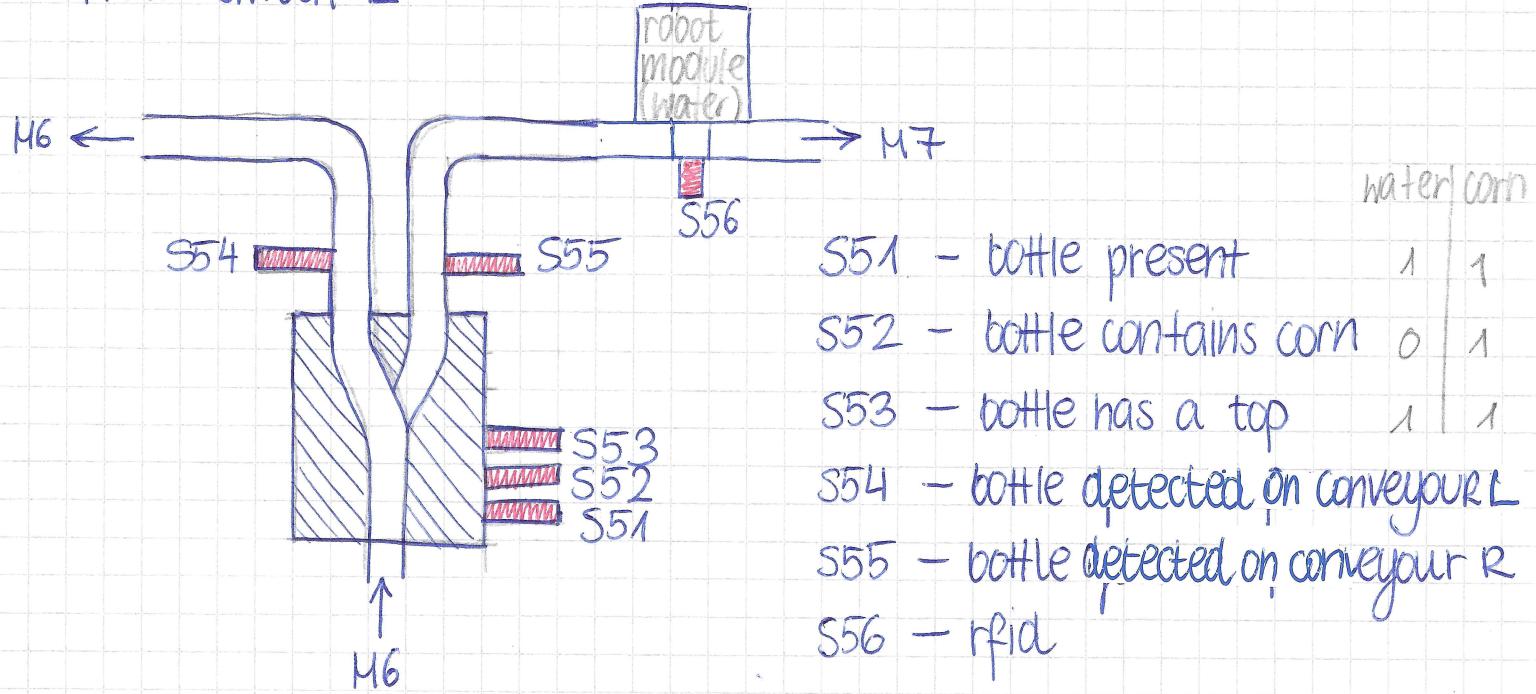
S47 - claw up

S48 - claw down

S49 - claw closed

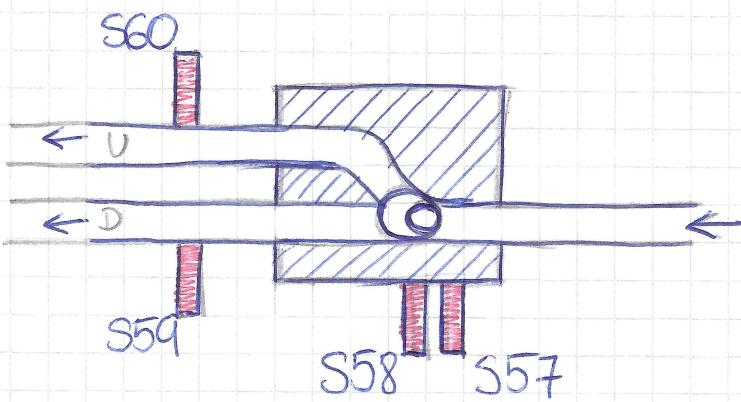
S50 - bottle in position

## Track switch 1



empty bottles are sent to the filling station (module 6) - L.  
full bottles are sent to the processing modules - R. Water bottles are identified by rfid chip and taken off. Corn bottles proceed to module 7.

## Track switch 2



S57 - bottle present

S58 - bottle contains corn

S59 - bottle detected on conveyor

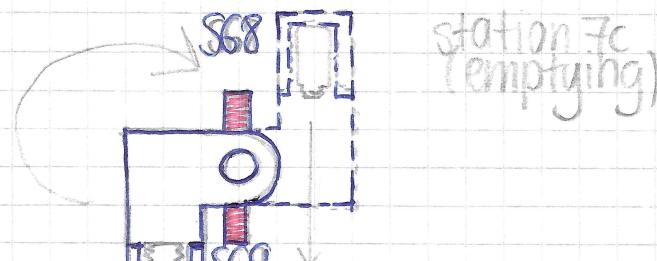
S60 - bottle detected on conveyor

S54, S55, S59, S60 indicate that a bottle was detected. They can also signal that queue is full when signal is constantly up.

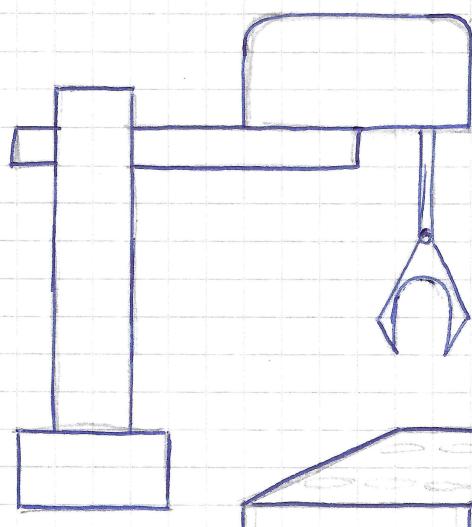
S59 signals time of bottle arrival to Module 7 (receiving)

S60 signals time of bottle departure for Module 7 (returning)

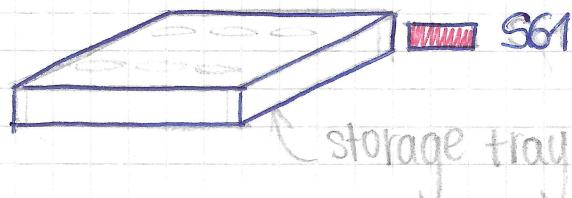
# Module 7 "pick and place"



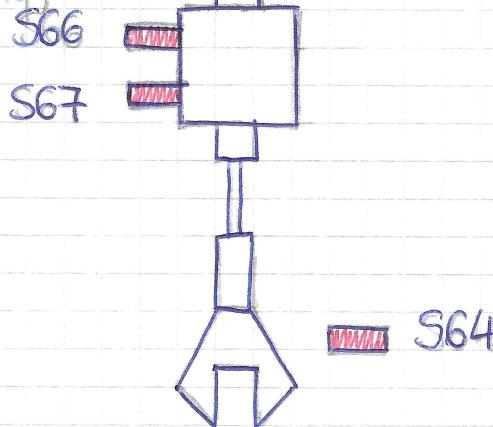
robotic arm transports the bottles from the track switch  
 - station 7a - station 7b  
 - station 7c - track



station 7a (storage)



station 7b (unscrewing)



S61 - tray in position

S62 - rail in bottle receiving position

S63 - rail in unscrewing position

S64 - claw up

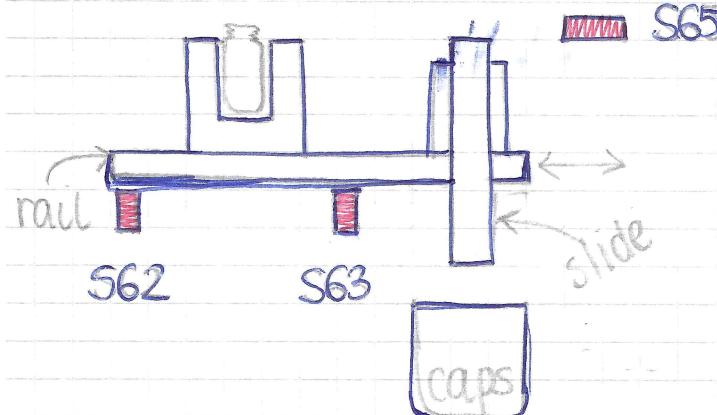
S65 - claw down

S66 - 3 rotation sensors for rotating

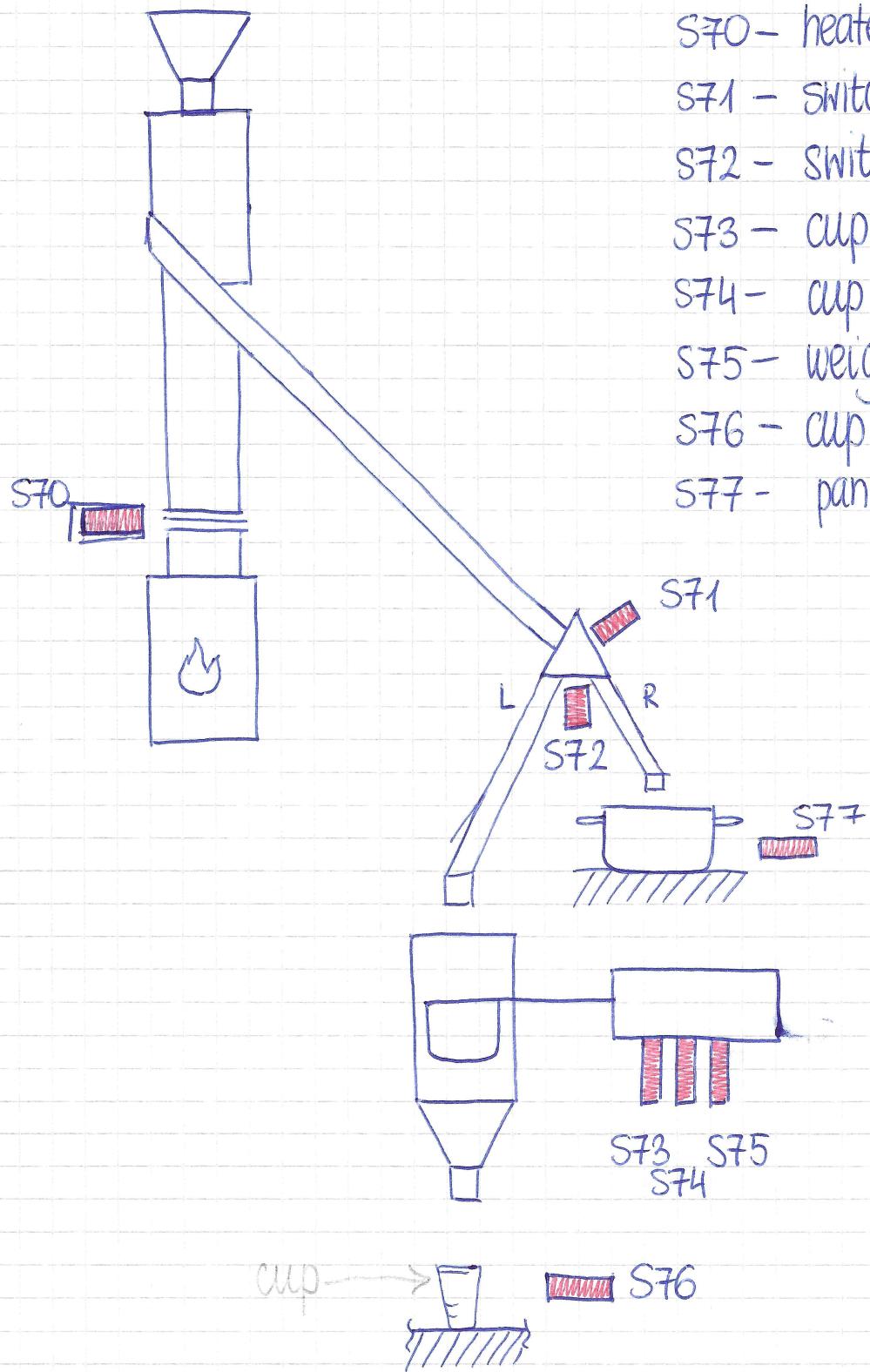
S67 -

S68 - loading position (normal)

S69 - emptying position (rotated 180°)



# Module 4+5 (producing + serving)



pan must always be present  
for operation.  
If the cup is present then  
corn will go to cup; otherwise it  
will go to pan.

Einen Überblick über den kompletten Aufbau der LMF liefert Abbildung 3.1.

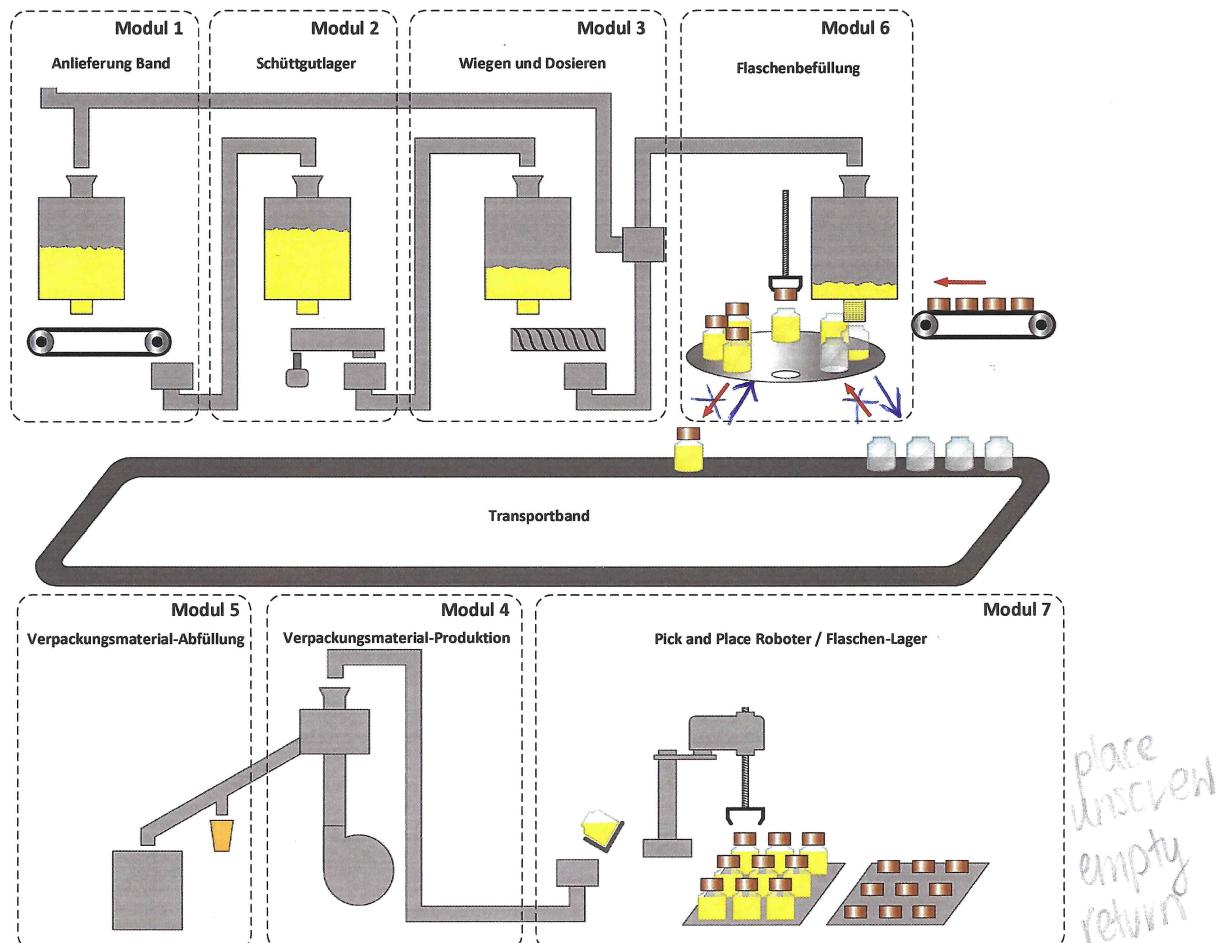


Abbildung 3.1: Lemgoer Modellfabrik

Für das Demosystem bezüglich des Bayes'schen Netzes wird sich auf das Prozessmodul 6 Flaschenbefüllung beschränkt. In Modul 6 werden aktuell die drei Produktionskomponenten Flaschen, Mais und Deckel zusammengeführt. In naher Zukunft soll neben einer Befüllung von Mais auch eine Befüllung mit Wasser in Modul 6 realisiert werden. Die-