



**SIEMENS software function blocks**

# **PALLETDISPENSER PD1**



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# 1 Version control

Tabel 01: Version control

Revision	Date	Author	Reason for revision
V1.0	22/10/2018	BJA	Initial version
V1.1	26/06/2019	BJA	Translation updates

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## 3 Introduction

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Read this chapter carefully before commissioning the software for the Pallet dispenser PD1.

### 3.1 Function of the document

This document attempts to clarify the functionality, operation and components of the Pallet dispenser PD1 for the purpose of commissioning the software function blocks.

### 3.2 Target audience

This document is intended for technical staff/engineers with basic knowledge of SIEMENS PLC programming.

## 4 Equipment description

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This chapter describes the system description of the Pallet dispenser PD1.

Please read this carefully to get a clear picture of what the software function block supports.

### 4.1 Basic operation of Pallet dispenser PD1

The design purpose of the pallet dispenser is too stack or de-stack pallets coming from or going to other equipment parts of the system.

The pallet dispenser has two different configurations

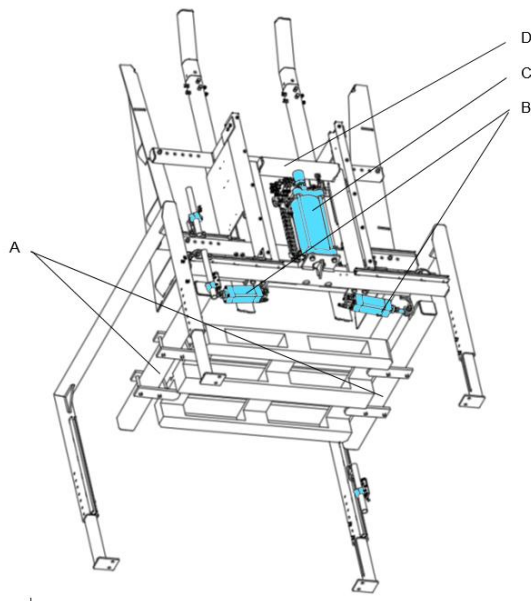
1. Stacking pallets in depot (*pallets coming from other equipment*)
2. De-stacking pallets from depot (*pallets going to other equipment*)



#### CAUTION

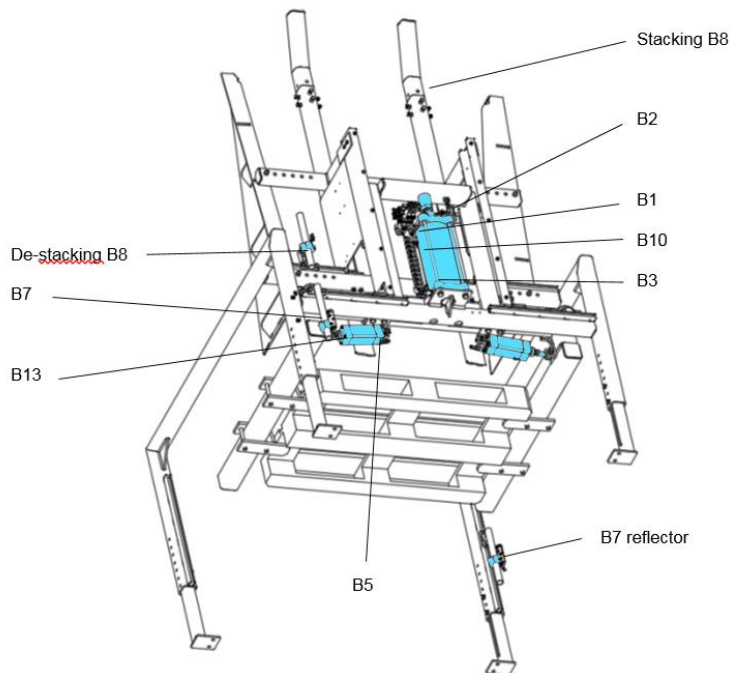
Do not exceed total weight and height of stacked pallets on the pallet dispenser, it will result in serious damage to the equipment and/or create an unsafe situation. See specification sheet for maximum load and pallet height.

### 4.2 Equipment parts Pallet dispenser PD1



- A. Pallet forks
- B. Cylinder for closing/opening pallet forks
- C. Cylinder for up-/downwards movement
- D. Frame palletdispenser

### 4.3 Sensors Pallet dispenser PD1



- B1 Upper position
- B2 Middle position single pallet
- B3 Bottom position
- B5 Forks in pallet stack
- B7 Pallet present under pallet dispenser
- B8 Pallet dispenser depot status
- B10 Middle position double pallet
- B13 Forks out pallet stack
- Y4 Valve upwards movement
- Y12 Valve downwards movement
- Y6 Valve close forks (*move forks in pallet stack*)
- Y14 Valve open forks (*move forks out of pallet stack*)

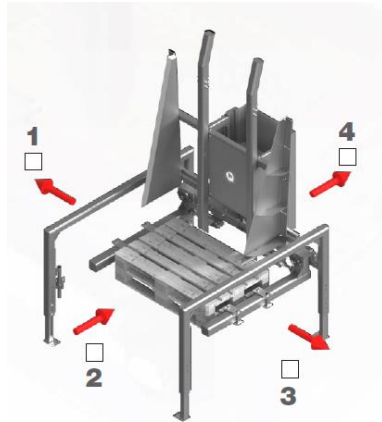


#### Note

*Dependent on the configuration depot status sensor B8 needs to be in the correct position.*

#### 4.4 De-stacking with Pallet dispenser PD1

De-stacking configuration has 3 options for output of pallets.  
Pallets are always loaded in depot though option (2)



De-stacking has two starting position, dependent of mode selection in settings;  
Mode selection;

1. Basic position; Upper position B1 and forks in pallet stack B5 (*Pallet stack in forks*)
2. Wait position; Bottom position B3 and forks out of pallet stack B13 (*Pallet stack on pallet conveyor*)

From the configured starting position, a single pallet can be requested through command 'Deliver', this start the deliver cycle. The cycle is completed when the Pallet dispenser is at upper position (B1) and forks in pallet stack (B5) and sensor B7 detects a pallet.

The pallet dispenser gives the status 'Pallet Present' to signal a new pallet is ready to transport.  
Transport can be started if status 'Basic position' is active

If mode 1 is used the depot will wait until receiving a new command "Deliver" is given and B7 is unblocked.

When using mode 2 the depot will move to wait position after B7 is unblocked and receiving command 'Wait position'

Pallet depot is empty after not detecting a pallet (B7) after the cycle reached bottom position (B3) and the forks are out of the pallet (B13) or when the depot reaches upper position (B1) and forks in pallet stack (B5)

Pallet depot is almost empty when sensor B8 is free for certain amount of time.



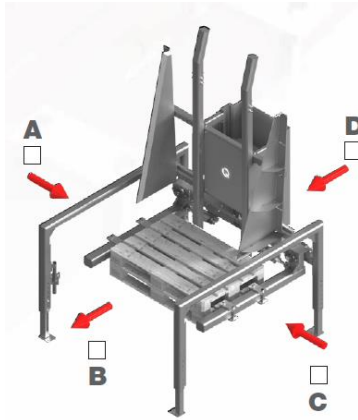
#### CAUTION

Sensor B7 must be correctly aligned!

This sensor must be able to detect a pallet in every situation!

#### 4.5 Stacking with Pallet dispenser PD1

De-stacking configuration has 3 options for input of pallets.  
Pallets are always unloaded in depot through option (B)



Stacking always has the same starting point → Upper position B1 and forks in pallet stack B5

From the starting position a single pallet can be stacked in the depot through command 'Receive', this starts the receive cycle. The cycle is completed when the Pallet dispenser is at upper position (B1) and forks in pallet stack (B5) and sensor B7 does not detect a pallet anymore.

New pallets can be transported to the pallet dispenser if status 'Basic position' is active and status 'Pallet Present' is off.

Pallet depot is full when sensor B8 is blocked for a certain amount of time. This is only checked on the basic position



#### CAUTION

Sensor B7 must be correctly aligned!

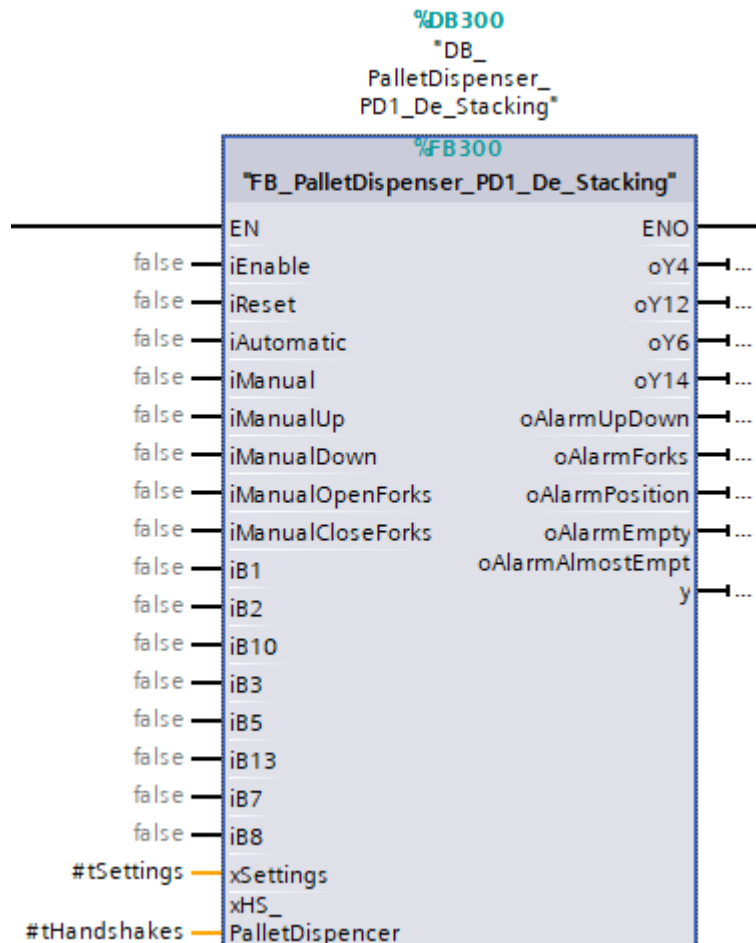
This sensor must be able to detect a pallet in every situation!

## 5 Function block De-stacking Pallet dispenser PD1

This chapter describes the function block used in the PLC program.

Please read this carefully to get a clear picture of what the integration of software function block.

### 5.1 Function block overview

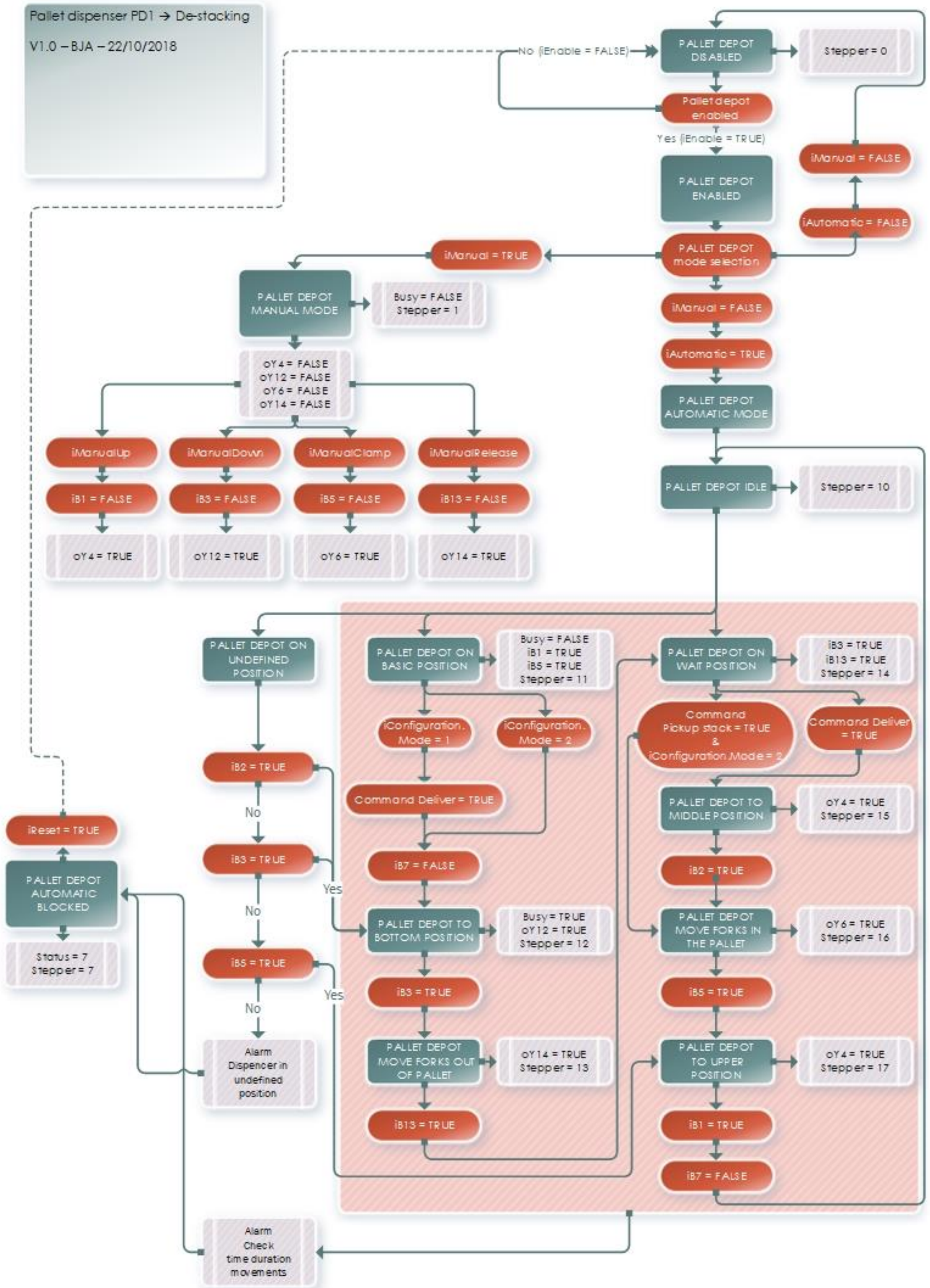


### 5.2 Function block specifications

Block name:	FB_PalletDispenser_PD1_De_Stacking
Block number:	FB300
Version:	V1.0.0
Required PLC blocks:	TON_TIMER
Required PLC data types:	"Handshakes_PalletDispenser_PD1" → V1.0.0 "Settings_PalletDispenser_PD1" → V1.0
Function block call	Cyclical (OB1)
Optimised block access	Yes/No
Programming language	SCL
STEP7 version	TIA Portal V14 + SP



## 5.3 Flow chart functionality



## 5.4 Function block settings

The settings consist of one UDT → “Settings\_Palletdispenser\_PD1”

Everything can/will be determined from the Qimarox configuration sheet.

We strongly recommend using the PDF configuration sheets provided by Qimarox for this.

Tabel 02: Settings pallet dispenser PD1

Naming	Data type	Unit	Description
Configuration.Mode	Int	1..2	1 = Start position upper position (Basic position) 2 = Start position bottom position (Wait position)
Configuration.Pallettype	Int	1..99	Actual pallettype in dispenser, this must match the pallettype requested when using de-stacking
Configuration.Double	Bool	0/1	0 = single pallet sensor (B2) 1 = double pallet sensor (B10)
MaximumDurationUpDown	Int	ms.	Maximum duration of movement before creating alarm
MaximumDurationForks	Int	ms.	Maximum duration of movement before creating alarm

## 5.5 Function block handshake

The handshake structure consists of one UDT → “Handshakes\_PalletDispenser\_PD1”

This enables the other equipment to communicate and control with the pallet dispenser

Tabel 03: Handshake pallet dispenser PD1

Naming	Data type	Unit	Description
Command.Deliver	Bool	0/1	TRUE = Request to deliver a pallet (De-stacking) Keep this command set to TRUE until pallet dispenser gives status “PalletPresent”
Command.PickUpStack	Bool	0/1	TRUE = Pick up stack when at wait position (De-stacking) Give this command when the dispenser is at wait position and something must pass the pallet dispenser. This will start the cycle of lifting the pallet stack
Command.WaitPosition	Bool	0/1	TRUE = Allowed to go to wait position (De-stacking) Clearance to go to wait position, use this command to enable the dispenser by first checking you’re equipment status and sensors.
Command.Pallettype	Int	1..99	Requested pallet type (De-stacking) This must match the pallet type configured in the settings. If not the cycle of de-stacking will not be started
Status.Blocked	Bool	0/1	TRUE = Alarm active OR not in right step
Status.PalletPresent	Bool	0/1	TRUE = Sensor pallet present (B7)
Status.BasicPosition	Bool	0/1	TRUE = Upper position (B1), forks in pallet stack (B5)
Status.WaitPosition	Bool	0/1	TRUE = Bottom position (B3), forks out of pallet stack (B13)
Status.Busy	Bool	0/1	TRUE = Busy with cycle
Status.Pallettype	Int	1..99	Actual pallet type
Status.Step	Int	1..20	Actual step number

## 5.6 Function block inputs

Inputs are required for the system to function properly. Here the required sensors are declared, and the status of the installation.

Tabel 04: Inputs pallet dispenser PD1

Naming	Data type	Unit	Description
iEnable	Bool	0/1	System is switched on. Safety functions are operational, hardware has no problems, and power supplies to any controllers are switched on. 1 = Installation switched on
iReset	Bool	0/1	Reset command to reset faults.
iAutomatic	Bool	0/1	Installation is in automatic mode. The direction of rotation of the PRORUNNER is only in the primary direction.
iManual	Bool	0/1	Installation is in manual mode. Manual commands influence the direction of rotation.
iManualUp	Bool	0/1	Command for upward movement, B1 is stop position
iManualDown	Bool	0/1	Command for downward movement, B3 is stop position
iManualOpenForks	Bool	0/1	Command for opening forks, B13 is stop position
iManualCloseForks	Bool	0/1	Command for closing forks, B5 is stop position
iB1	Bool	0/1	Upper position
iB2	Bool	0/1	Middle position >> single pallet
iB10	Bool	0/1	Middle position >> double pallet
iB3	Bool	0/1	Bottom position
iB5	Bool	0/1	Forks in pallet
iB13	Bool	0/1	Forks out of pallet
iB7	Bool	0/1	Pallet present
iB8	Bool	0/1	Pallet dispenser depot status

## 5.7 Function block outputs

Outputs must be declared by the integrator.

Outputs provide feedback such as faults, status and communication.

Tabel 05: Outputs pallet dispenser PD1

Naming	Data type	Unit	Description
oY4	Bool	0/1	Valve movement up
oY12	Bool	0/1	Valve movement down
oY6	Bool	0/1	Valve movement forks in pallet
oY14	Bool	0/1	Installation is in manual mode. Manual commands influence the direction of rotation.
oAlarmUpDown	Bool	0/1	Alarm time duration up/down movement. Time exceeded time limit in settings
oAlarmForks	Bool	0/1	Alarm time duration fork movement Time exceeded time limit in settings
oAlarmPosition	Bool	0/1	Alarm undetected position. Put dispenser manually back in basic position Upper position (B1), forks in pallet stack (B5)
oAlarmEmpty	Bool	0/1	Alarm depot empty Refill depot
oAlarmAlmostEmpty	Bool	0/1	Alarm depot almost empty Refill depot



## 5.8 Function block steps

The steps of the dispenser are known through status handshake.  
With the table we explain the different steps of the dispenser

Tabel 06: Steps pallet dispenser PD1

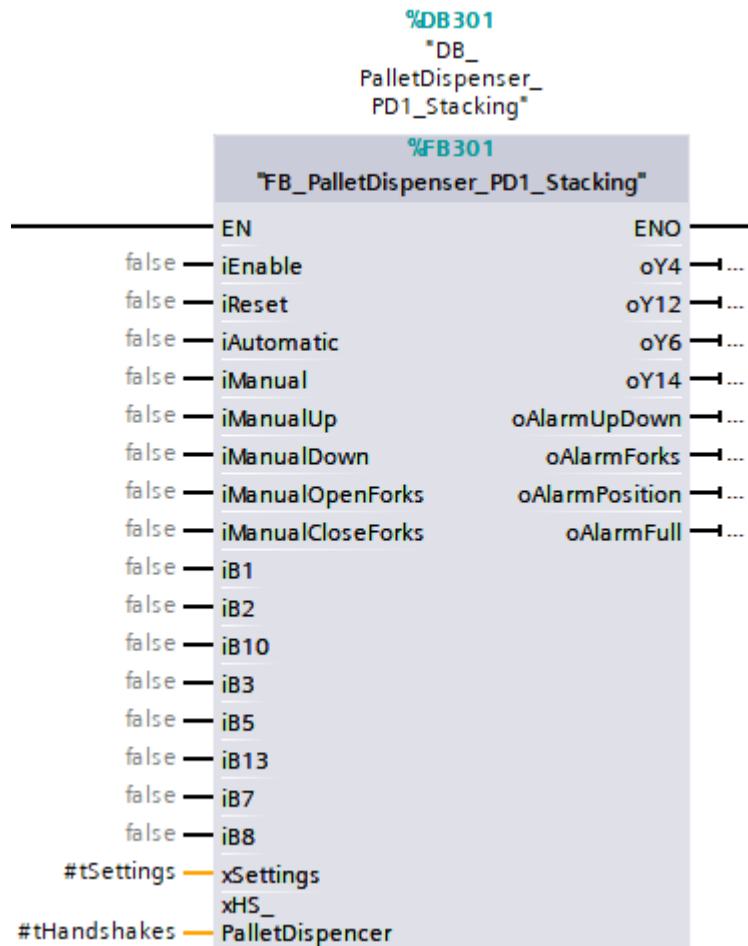
Value	Description
0	NO ACTION / SWITCHED OFF: Dispenser switched off / no mode active
1	MANUAL OPERATION / MANUAL MODE: Dispenser in manual mode
7	BLOCKED: Dispenser blocked by alarm, wait for reset command
10	IDLE: Dispenser determine next step by actual position. If no valid position is detected an alarm will be activated
11	BASIC POSITION: Dispenser on upper position (B1), forks in pallet stack (B5) Next step will be activated when <u>deliver</u> command is given OR when mode 2 is selected.
12	TO BOTTOM POSITION: Move dispenser to bottom position (B3)
13	FORKS OUT PALLET: Move forks out of pallet stack (B13)
14	WAIT POSITION: Dispenser on bottom position (B3), forks out of pallet stack (B13) If no pallet is detected (B7) an alarm will be activated Next step will be activated when <u>deliver</u> command is given OR when pick up stack command is given
15	TO EMPTY POSITION: Dispenser on bottom position (B3), forks out of pallet stack (B13)
16	EMPTY POSITION: Wait until B7 is blocked to detect an refill of the depot
17	TO MIDDLE POSITION: Move dispenser to middle position (B2) when Settings.Double is FALSE Move dispenser to middle position (B10) when Settings.Double is TRUE
18	FORKS IN PALLET: Move forks in pallet stack (B5)
19	TO UPPER POSITION: Move dispenser to upper position (B1) When pick up stack command is given go to step IDLE Or else wait until Pallet is not detected anymore (B7)

## 6 Function block Stacking Pallet dispenser PD1

This chapter describes the function block used in the PLC program.

Please read this carefully to get a clear picture of what the integration of software function block.

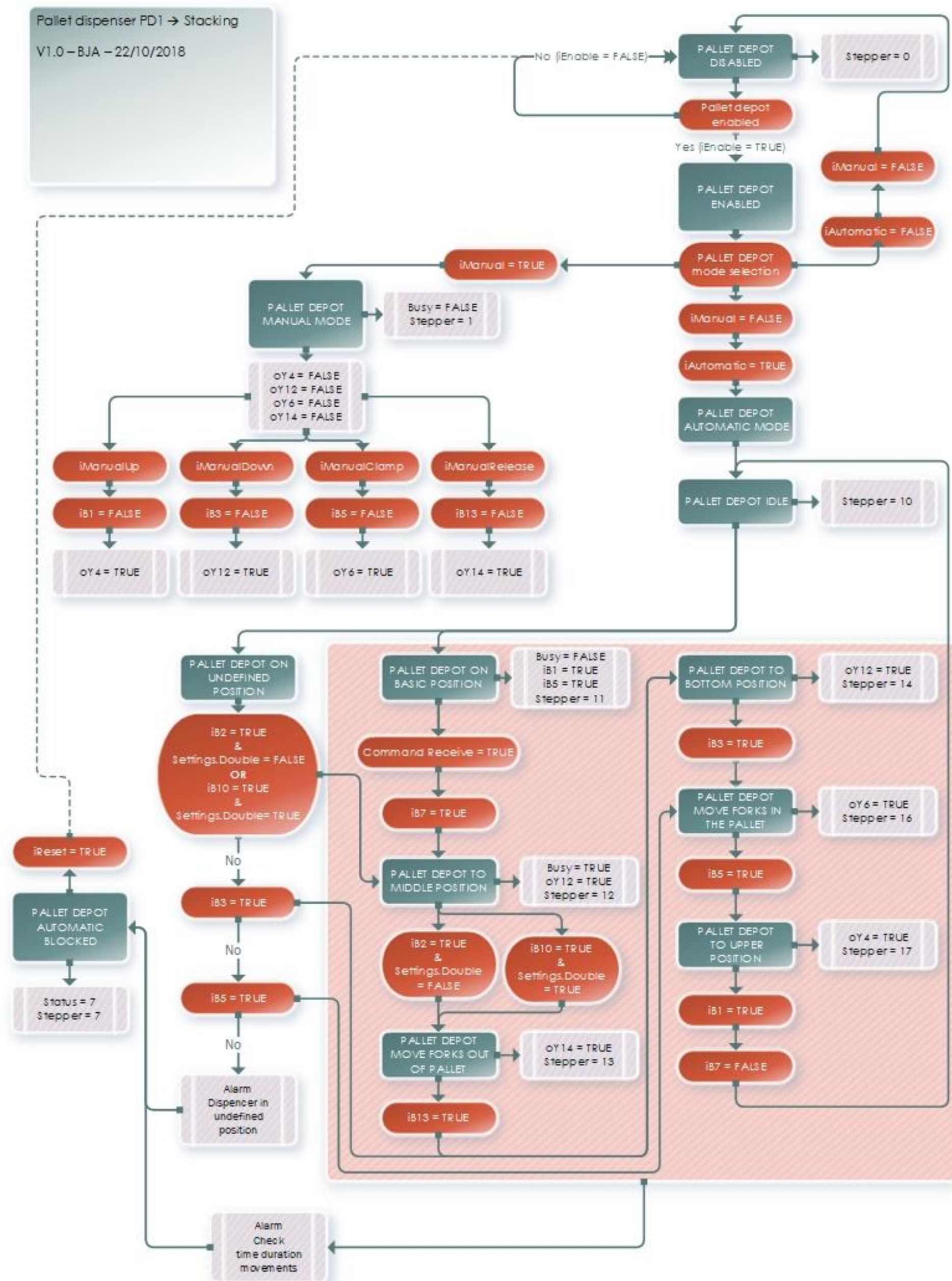
### 6.1 Function block overview



### 6.2 Function block specifications

Block name:	FB_PalletDispenser_PD1_Stacking
Block number:	FB301
Version:	V1.0.0
Required PLC blocks:	TON_TIMER
Required PLC data types:	"Handshakes_PalletDispenser_PD1" → V1.0.0 "Settings_PalletDispenser_PD1" → V1.0
Function block call	Cyclical (OB1)
Optimised block access	Yes/No
Programming language	SCL
STEP7 version	TIA Portal V14 + SP

### 6.3 Flow chart functionality



## 6.4 Function block settings

The settings consist of one UDT → “Settings\_Palletdispenser\_PD1”

Everything can/will be determined from the Qimarox configuration sheet.

We strongly recommend using the PDF configuration sheets provided by Qimarox for this.

Tabel 07: Settings pallet dispenser PD1

Naming	Data type	Unit	Description
Configuration.Mode	Int	1..2	1 = Start position upper position (Basic position) 2 = Start position bottom position (Wait position)
Configuration.Pallettype	Int	1..99	Actual pallettype in dispenser, this must match the pallettype requested when using de-stacking
Configuration.Double	Bool	0/1	0 = single pallet sensor (B2) 1 = double pallet sensor (B10)
MaximumDurationUpDown	Int	ms.	Maximum duration of movement before creating alarm
MaximumDurationForks	Int	ms.	Maximum duration of movement before creating alarm

## 6.5 Function block handshake

The handshake structure consists of one UDT → “Handshakes\_PalletDispenser\_PD1”

This enables the other equipment to communicate and control with the pallet dispenser

Tabel 08: Handshake pallet dispenser PD1

Naming	Data type	Unit	Description
Command.Receive	Bool	0/1	TRUE = Request to receive a pallet (Stacking) Keep this command set to TRUE until pallet dispenser gives status “Busy”
Status.Blocked	Bool	0/1	TRUE = Alarm active OR not in right step
Status.PalletPresent	Bool	0/1	TRUE = Sensor pallet present (B7)
Status.BasicPosition	Bool	0/1	TRUE = Upper position (B1), forks in pallet stack (B5)
Status.WaitPosition	Bool	0/1	TRUE = Bottom position (B3), forks out of pallet stack (B13)
Status.Busy	Bool	0/1	TRUE = Busy with cycle
Status.Pallettype	Int	1..99	Actual pallet type
Status.Step	Int	1..20	Actual step number



## 6.6 Function block inputs

Inputs are required for the system to function properly. Here the required sensors are declared, and the status of the installation.

Tabel 09: Inputs pallet dispenser PD1

Naming	Data type	Unit	Description
iEnable	Bool	0/1	System is switched on. Safety functions are operational, hardware has no problems, and power supplies to any controllers are switched on. 1 = Installation switched on
iReset	Bool	0/1	Reset command to reset faults.
iAutomatic	Bool	0/1	Installation is in automatic mode. The direction of rotation of the PRORUNNER is only in the primary direction.
iManual	Bool	0/1	Installation is in manual mode. Manual commands influence the direction of rotation.
iManualUp	Bool	0/1	Command for upward movement, B1 is stop position
iManualDown	Bool	0/1	Command for downward movement, B3 is stop position
iManualOpenForks	Bool	0/1	Command for opening forks, B13 is stop position
iManualCloseForks	Bool	0/1	Command for closing forks, B5 is stop position
iB1	Bool	0/1	Upper position
iB2	Bool	0/1	Middle position >> single pallet
iB10	Bool	0/1	Middle position >> double pallet
iB3	Bool	0/1	Bottom position
iB5	Bool	0/1	Forks in pallet
iB13	Bool	0/1	Forks out of pallet
iB7	Bool	0/1	Pallet present
iB8	Bool	0/1	Pallet dispenser depot status

## 6.7 Function block outputs

Outputs must be declared by the integrator.

Outputs provide feedback such as faults, status and communication.

Tabel 10: Outputs pallet dispenser PD1

Naming	Data type	Unit	Description
oY4	Bool	0/1	Valve movement up
oY12	Bool	0/1	Valve movement down
oY6	Bool	0/1	Valve movement forks in pallet
oY14	Bool	0/1	Installation is in manual mode. Manual commands influence the direction of rotation.
oAlarmUpDown	Bool	0/1	Alarm time duration up/down movement. Time exceeded time limit in settings
oAlarmForks	Bool	0/1	Alarm time duration fork movement Time exceeded time limit in settings
oAlarmPosition	Bool	0/1	Alarm undetected position. Put dispenser manually back in basic position Upper position (B1), forks in pallet stack (B5)
oAlarmFull	Bool	0/1	Alarm depot full Empty depot

## 6.8 Function block steps

The steps of the dispenser are known through status handshake.  
With the table we explain the different steps of the dispenser

Tabel 11: Steps pallet dispenser PD1

Value	Description
0	NO ACTION / SWITCHED OFF: Dispenser switched off / no mode active
1	MANUAL OPERATION / MANUAL MODE: Dispenser in manual mode
7	BLOCKED: Dispenser blocked by alarm, wait for reset command
10	IDLE: Dispenser determine next step by actual position. If no valid position is detected an alarm will be activated
11	BASIC POSITION: Dispenser on upper position (B1), forks in pallet stack (B5) Next step will be activated when <u>receive</u> command is given
12	TO MIDDLE POSITION: Move dispenser to middle position (B2) when Settings.Double is FALSE Move dispenser to middle position (B10) when Settings.Double is TRUE
13	FORKS OUT PALLET: Move forks out of pallet stack (B13)
14	TO BOTTOM POSITION: Move dispenser to bottom position (B3)
15	FORKS IN PALLET: Move forks in pallet stack (B5)
16	TO UPPER POSITION: Move dispenser to upper position (B1)

## 7 Troubleshooting

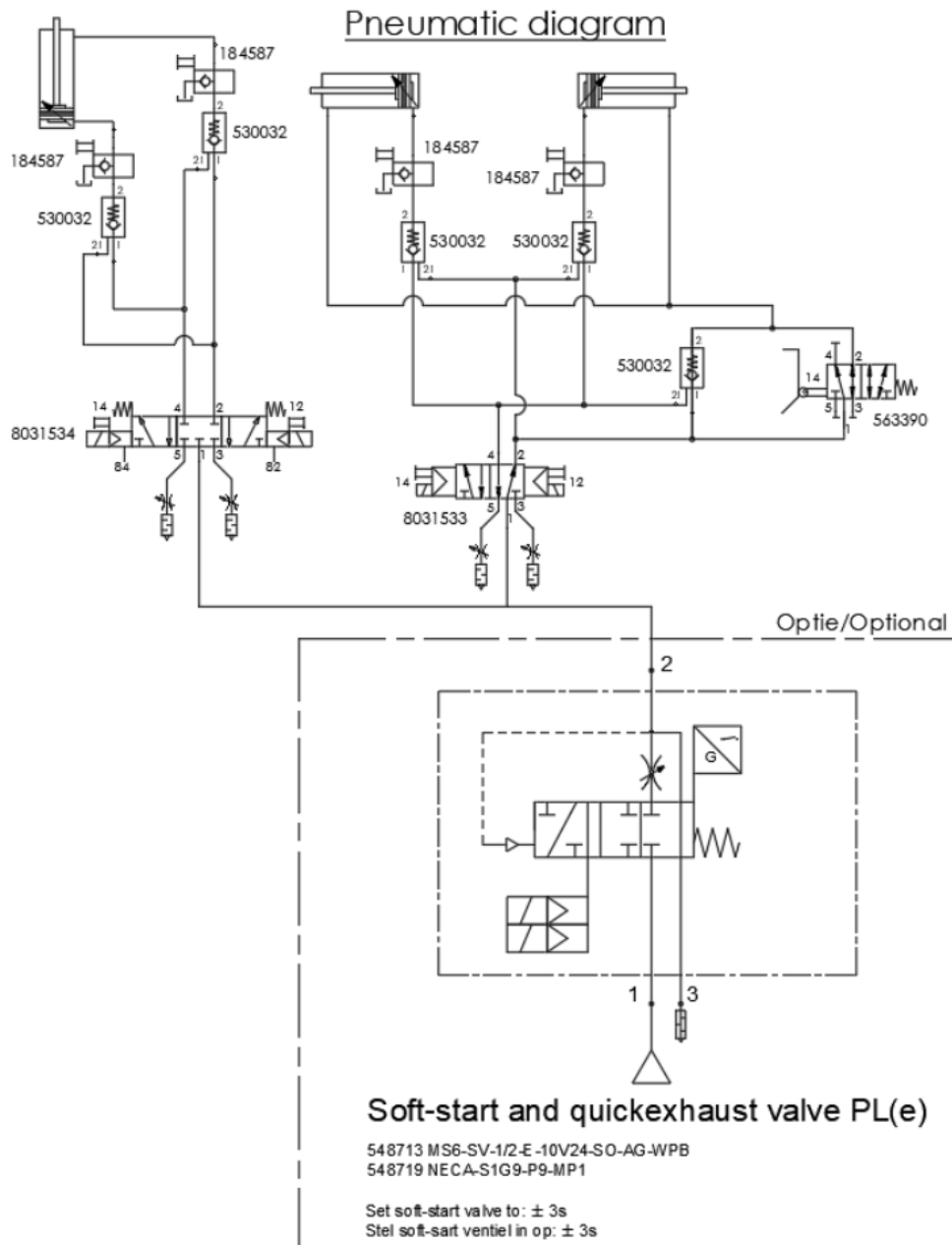
Problem	Possible cause	Solution
Arms do not open/close.	No air pressure.	Turn air pressure on.
	No air pressure. Connection to cylinder damaged.	Check connectors and tubing. If necessary, replace parts.
	Sensor error.	Check sensors. Adjust or replace if necessary.
Carrier doesn't go up and down.	No air pressure.	Turn air pressure on.
	No air pressure. Connection to cylinder damaged.	Check connectors and tubing. If necessary, replace parts.
	Sensor error.	Check sensors. Adjust or replace if necessary.
Pallets do not stack properly.	Lift arms and or fingers are not aligned correctly.	Adjust lift arms and or lift fingers.
	There is too much play between the pallets and side restraints.	Adjust the side restraints. There must be no more than 2,5cm/1inch of play between the pallet and side restraint.
The lifting arms/fingers do not reach the pallet on the .	Working height of machine is too high.	Adjust supports.
Pallet is stuck in machine.	Bad pallet or not properly aligned in machine.	Use manual control box to release pallet from lifting arms.

## 8 Electrical drawings

The drawings of this machine can be found in an external document. This document is provided with the machine.

Online reference is coming soon!

## 9 Pneumatic circuit diagram



Mechanical actuated valve 563390 ensures that there's no danger of possible constriction when the carrier is in its lowest position with lifting arms closed in case of lack of air pressure.

Air consumption at 6 bar with 120 pallets/hour is 20m<sup>3</sup>. With a different capacity, the air consumption can be calculated accordingly, or contact and check with Qimarox.



### CAUTION

Safety decals regarding switching off air pressure and venting cylinders need to be present and clearly visible on all three cylinders. Do not use machine if decals aren't present.