FUNTIME HANDELS GMBH

Freefall 2021 with Tiltseats

Orlando, Florida

USA

Operations & Maintenance Manual

VERSION: 2021_08_04

TABLE OF CONTENTS

TABLE OF FIGURES

1 FUNDAMENTALS, TERMS & DEFINITIONS

1.1 RIDE BASICS

Type: Giant Freefall Tower with a Catcher driven by a winch where the PCU is docked. The Passenger carrier Unit slowed down in the lower third of the tower by a magnetic brake system to about 1 m / s. The remaining speed is absorbed by oil dampers.

Passenger Carrier Unit (PCU):30 Passengers

Number of PCU`s: 1

Ride Structure: The 3.5 meter (11.3 feet) diameter steel tower is 120m tall. At the tower moves the Catcher, which is connected via two steel cables to a lifting unit. Using a special hook system, the PCU is connected or disconnected to the catcher.

Ride Layout:

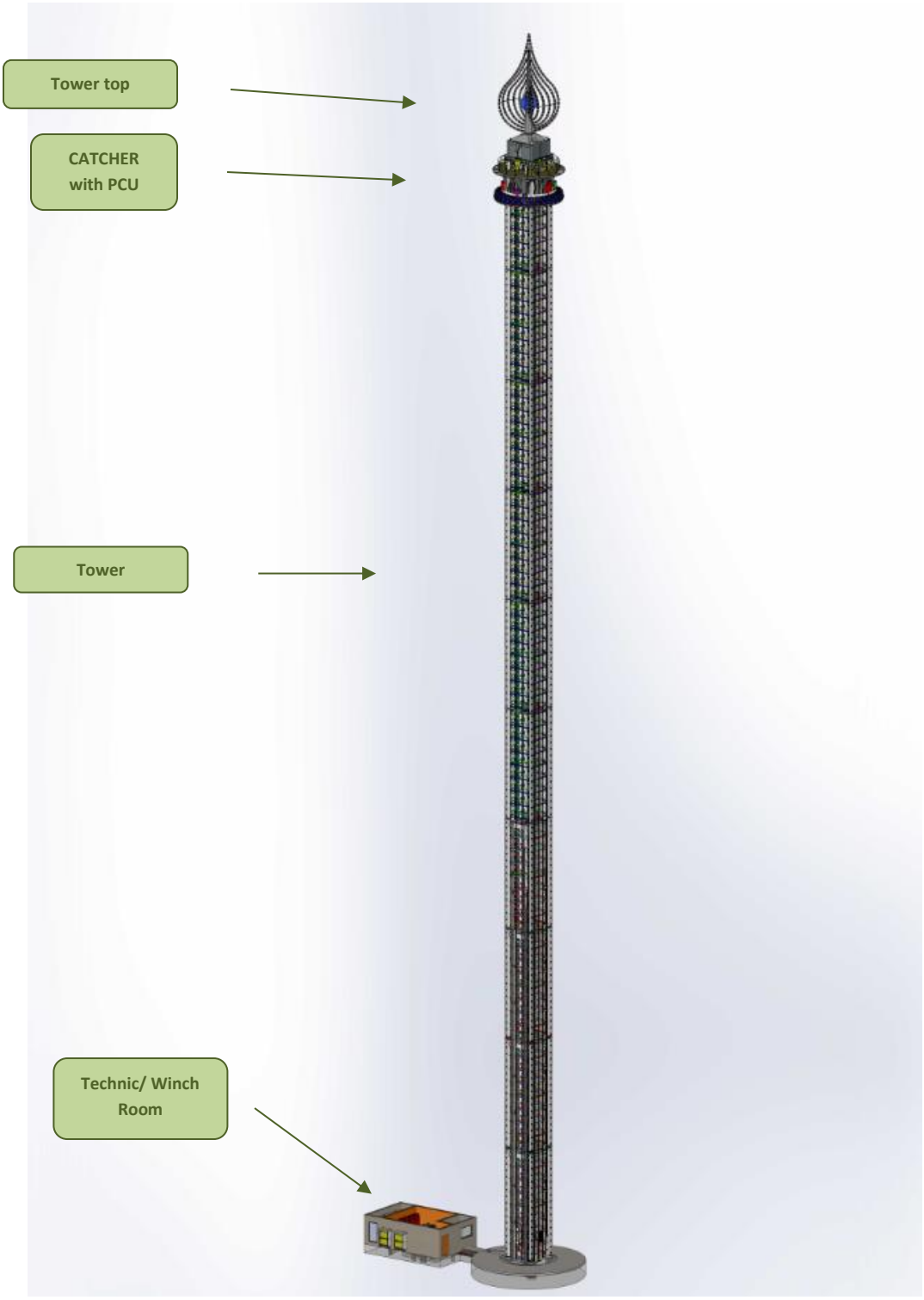


Figure1-1: Overview tower

Ride Elements:

Tower top

On top of the tower, the two guide pulleys, for the ropes on which the catcher is attached, are mounted. 4 buffers are mounted on the travel range limit and monitored. The undock mechanisms located in the area when the buffers are approached.

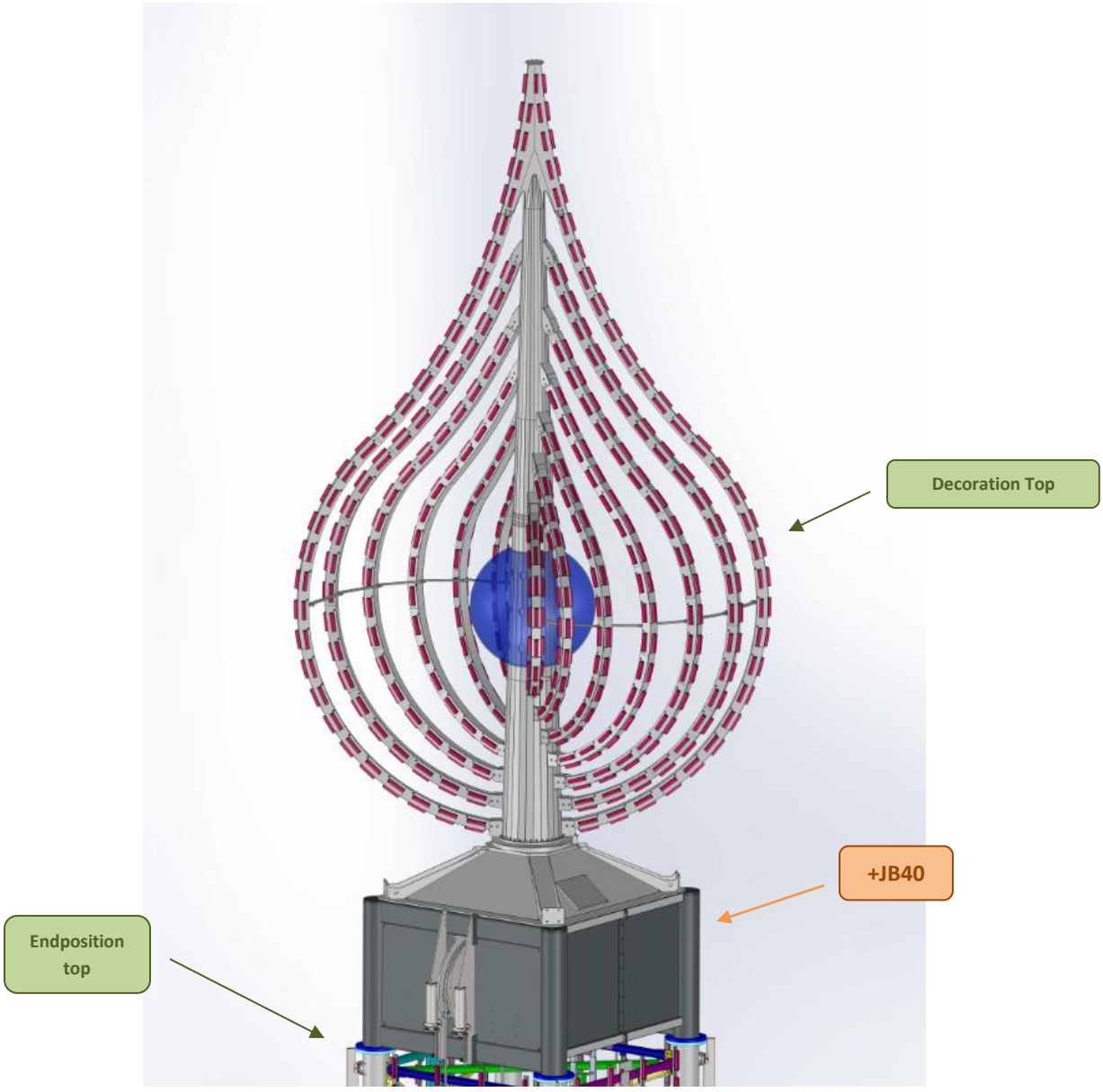


Figure1-2: tower top

Winch

- motors with brakes
- gearbox
- winch drum

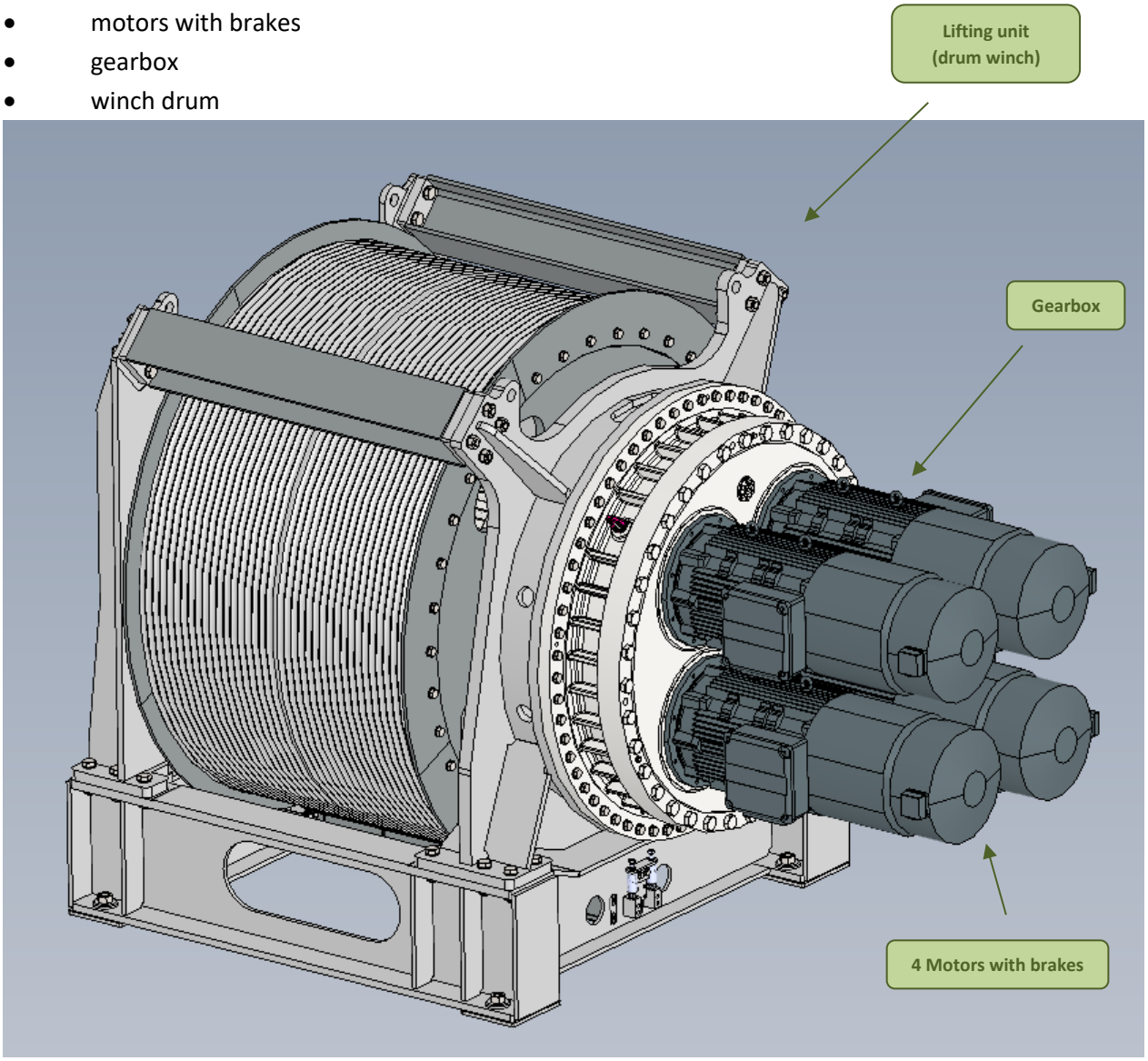


Figure1-3: base/ winch

Catcher/ PCU

Using a hook system, the PCU is connected to the catcher. At the lowest part of the tower, the PCU is connected to the safety-PLC system via current collectors. Monitored harnesses and a redundant designed hydraulic system keeps the passengers safe in the PCU.

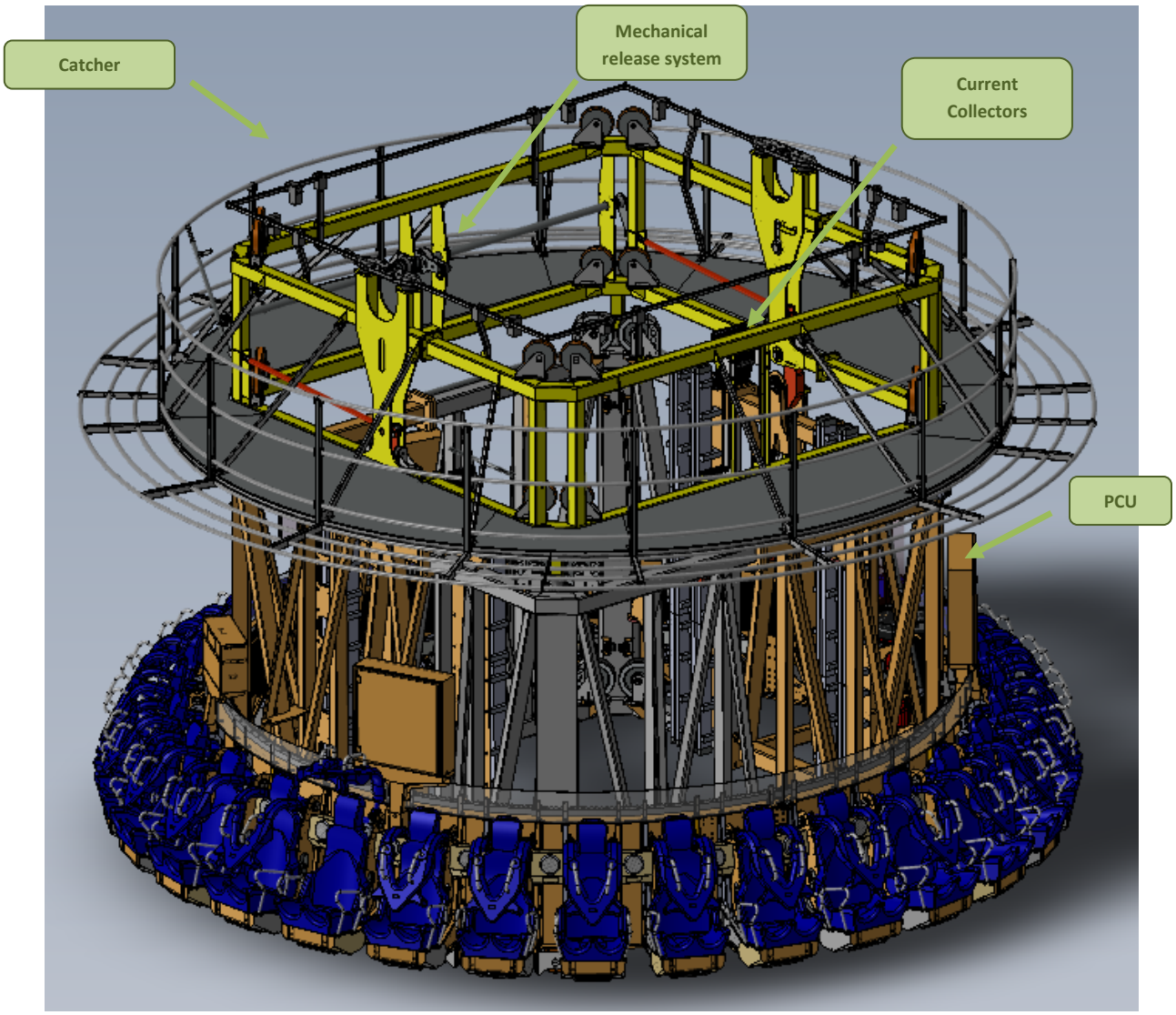
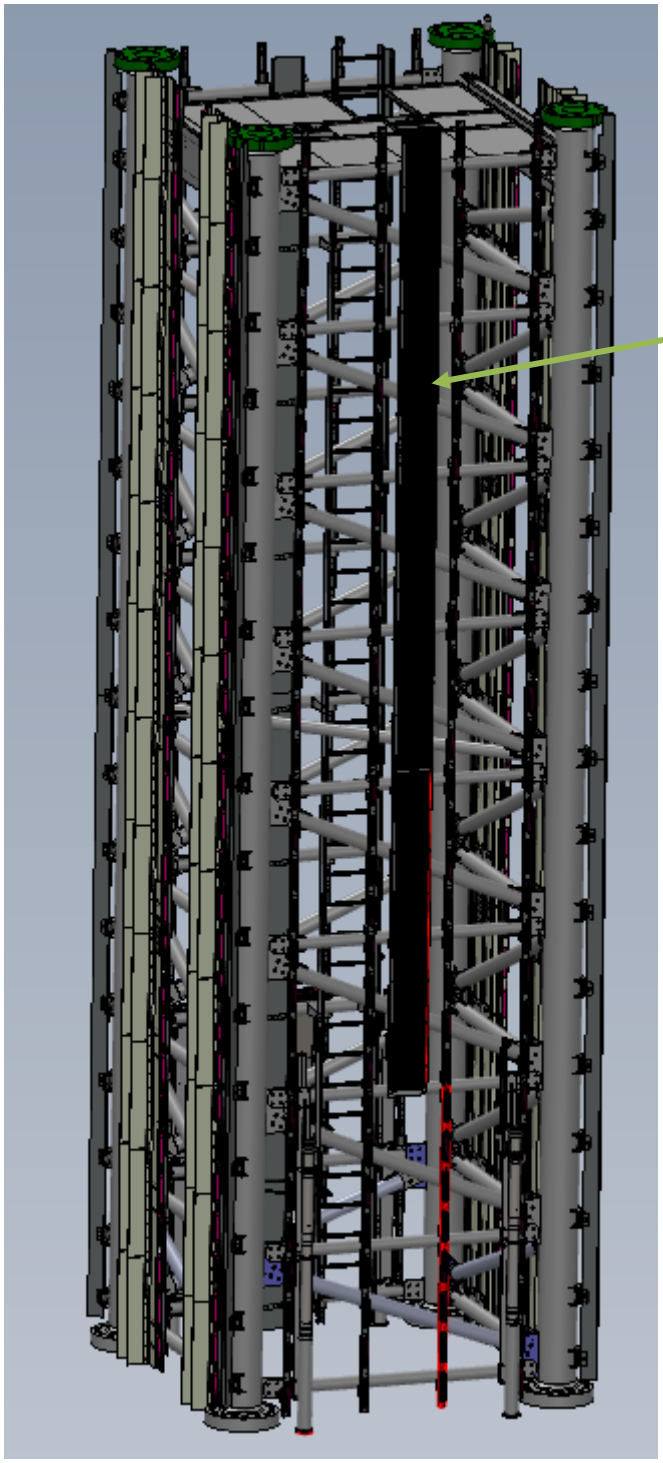


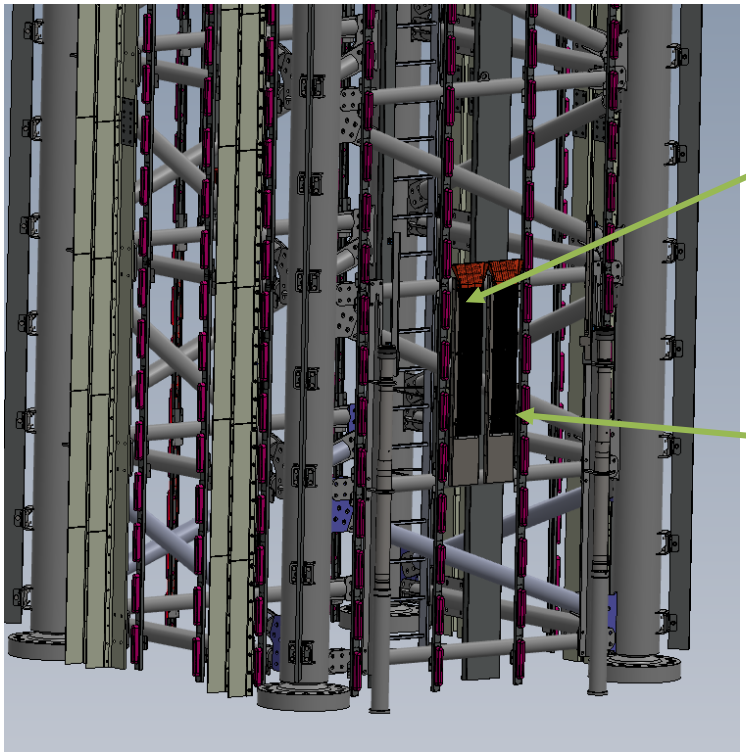
Figure1-4: PCU/Catcher



Conductor lines on the whole tower:

- 400VAC gondola supply
- 480VAC Motor gondola rotation with brake
- 24VDC monitoring Crowbar
- Sound system gondola

Figure1-5: Tower conductor lines



Conductor lines tower bottom DC:

- 24V supply
- Feedback seat monitoring
- Feedback Crowbar
- Feedback tilt cylinders
- Feedback docking mechanism

Conductor lines tower bottom AC:

- 120VAC supply open seats
- 400VAC supply gondola

Figure1-6: Tower conductor lines load/unload position

Electrical Enclosures

The control cabinets are distributed over the entire ride.

2 ELECTRICAL EQUIPMENT DESCRIPTION

2.1 LOCATION DESCRIPTION

The following is a listing of all the locations their acronyms and their description:

+ECR: **Electrical Control Room** in this room are located the +MCC, +RCC, +LCC and the winch for the elevator.

+MCC: **Motor Control Center** is a control cabinet including all the power distribution parts. The MCC is located inside the electrical control room.

+RCC: **Ride Control Center** is the control cabinet including all the control parts such as the PLC of the ride. The RCC is located inside the electrical control room.

+LCC: **Light Control Center** is the control cabinet including all the light components. The LCC is located near the electrical control room.

+OP: **Operator Panel** is an enclosure used for the man machine interface between maintenance or operational staff members and the ride. The Main Operator Panel is located in the operator room. Auxiliary Operator Panels are used for secondary loading position as well as for maintenance purposes.

+JB: **Junction Box** is an enclosure including terminal strips and in some cases remote input output modules as well as other electrical components. Junction Boxes are located in various locations throughout the ride.

+E…: **External** is the naming for all components located throughout the ride which are not part of any other location listed above.

2.2 LOCATION OVERVIEW

The ride has following locations:

Electrical Equipment Room

+MCC: Control Cabinet including all power components including main circuit breaker for incoming power.

+RCC: Control Cabinet including all control components such as the Safety-PLC.

+LCC: Control Cabinet including all components required for ride lighting.

Operator Stations

+OP1: Main Operator Panel located at the ride entrance.

+OP2: Remote Operator Panel located at opposite ride side.

+OP10: Wireless remote panel located in the electrical equipment room.

Winch

+JB19: Junction Box at winch where are the absolute encoder connected.

Tower Structure

+ES1: Is the first section from the tower and includes the +JB20 and shock absorbers

+JB20: Junction Box at +ES1 including active components such as remote input/output modules. The JB also includes an Emergency Stop Button.

+JB31: Junction Box for the position monitoring bottom area

+ES2-ES5: Various components mounted directly to structure (e.g. limit switches).

+JB33: Junction Box at the half height of the tower which includes wireless communication system

+ES6-ES10: Various components mounted directly to structure (e.g. limit switches, cylinder).

Tower Top

+JB40: Junction Box at dome including active components such as remote input/output modules. The JB also includes the Emergency Stop Button.

+ET1: various components mounted close to +JB40 (e.g. limit switches).

+JB41: Junction Box at dome provides the power and controls the lights on the top

Catcher

+JB70: Junction Box catcher
+ECA: components which are mounted on the catcher

Sledge

+JB80: Junction Box including power supplies for seats and various connection terminals (seat control, seat lights,...).
+JB81: Junction Box including active components such as remote input/output modules, proximity switches and various connection terminals.
+ESL: components which are mounted on the sledge

PCU

+JB90: Junction Box including control components such as the Safety-PLC and active components such as remote input/output modules. Fuses and power supplies for seat open and tilt effect.
+JB91: Junction Box including active components such as remote input/output modules. Fuses and power supplies for seat open and tilt effect.
+JB92: Junction Box including active components such as remote input/output modules. Fuses and power supplies for seat open and tilt effect.

+JB101: Junction Box at seat # 1	**+JB102:** Junction Box at seat # 2
+JB103: Junction Box at seat # 3	**+JB104:** Junction Box at seat # 4
+JB105: Junction Box at seat # 5	**+JB106:** Junction Box at seat # 6
+JB107: Junction Box at seat # 7	**+JB108:** Junction Box at seat # 8
+JB109: Junction Box at seat # 9	**+JB110:** Junction Box at seat # 10
+JB111: Junction Box at seat # 11	**+JB112:** Junction Box at seat # 12
+JB113: Junction Box at seat # 13	**+JB114:** Junction Box at seat # 14
+JB115: Junction Box at seat #15	**+JB116:** Junction Box at seat #16
+JB117: Junction Box at seat #17	**+JB118:** Junction Box at seat #18
+JB119: Junction Box at seat # 19	**+JB120:** Junction Box at seat #20
+JB121: Junction Box at seat #21	**+JB122:** Junction Box at seat #22
+JB123: Junction Box at seat #23	**+JB124:** Junction Box at seat #24
+JB125: Junction Box at seat #25	**+JB126:** Junction Box at seat #26
+JB127: Junction Box at seat #27	**+JB128:** Junction Box at seat #28
+JB129: Junction Box at seat #29	**+JB130:** Junction Box at seat #30

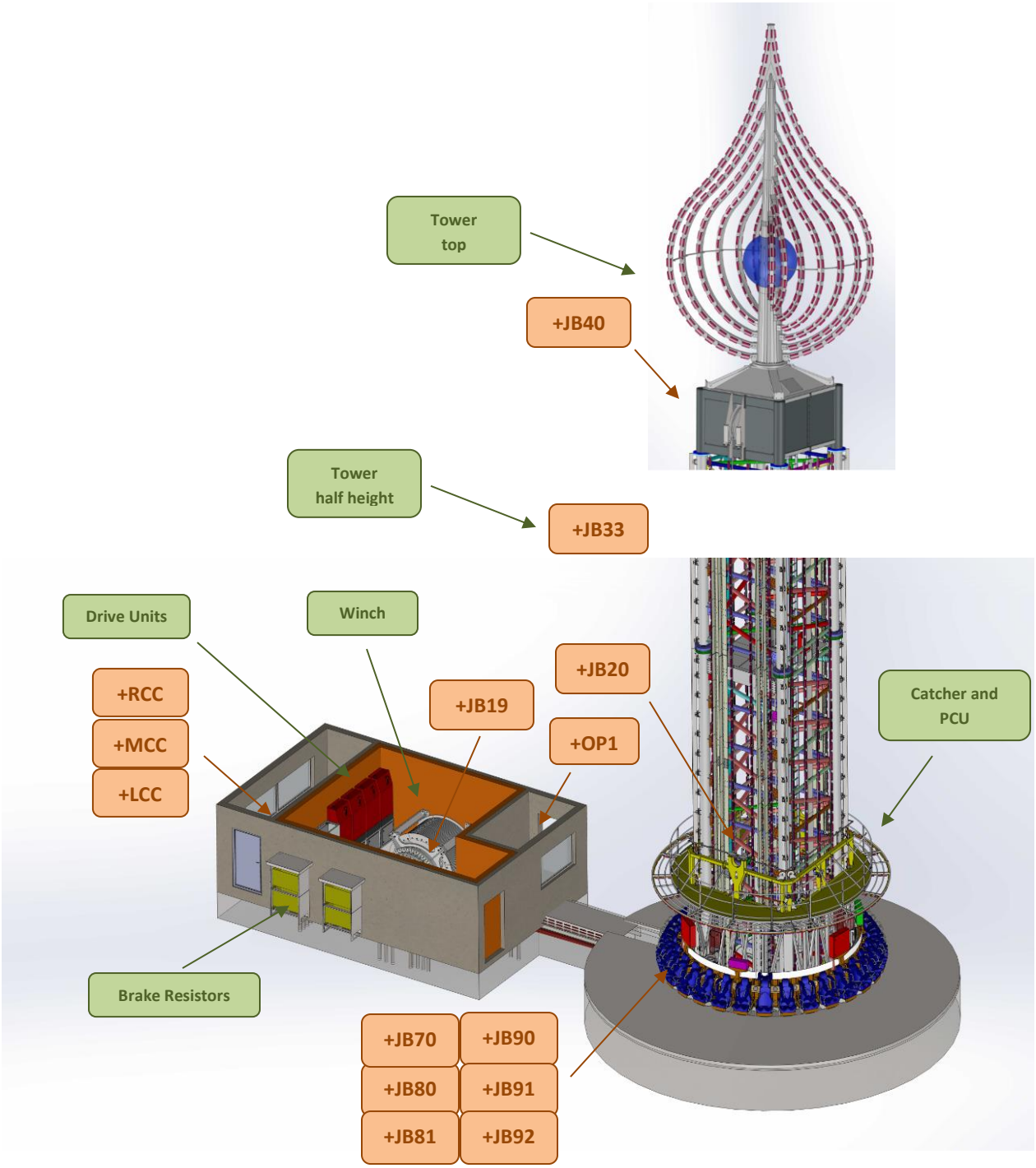


Figure2-1: Electrical Equipment Overview

2.3 ELECTRICAL INTERFACE

2.3.1 Incoming Power 1

+MCC; Motor Control Center

Voltage:	3x480VAC (+- 10%)
Frequency:	60Hz (+- 5%)
Nominal Current:	475A
Nominal Power	330kW

2.3.2 Incoming Power 2

+MCC; Motor Control Center

Voltage:	3x480VAC (+- 10%)
Frequency:	60Hz (+- 5%)
Nominal Current:	475A
Nominal Power	330kW

2.4 OPERATING INTERFACE

2.4.1 Motor Control Center (+MCC)

Equipment: Two **Circuit breaker [Main Power]**

Description: Remotely operated main circuit breaker 1 and 2 which is manually lockable for maintenance purposes.

Note: Lockout/Tagout (LOTO) for Maintenance purposes
The primary lock out tag out point for maintenance personnel is located on the Main Control Center inside the Control Room. The Main Circuit Breaker supplying 3x480VAC power to all motors can be locked and tagged.

2.4.2 Remote Control Center (+RCC)

Equipment: **Red Pilot Light** [**Fault]**

Description: Indicates and fault on the system, refer to the display for more fault information.

Function:	Light off:	No faults pending or ride is off
	Light pulsing:	Indicates fault in normal mode
	Light blinking fast:	Indicates a fault in maintenance mode

Equipment: **Red Mushroom Push Button** [**Emergency Stop]**
Description: Stops the ride immediately and takes off all power to motors and brakes on the ride, trips the main circuit breaker in MCC

Function:	Button pressed:	Cuts immediately all power to all systems
	Button released:	All systems ready to become reset

Equipment: **Selector switch [Lockout]**
Description: The lockable switch is used to activate operation by OP10 in order to perform maintenance work on the tower.
Lockable switch:

Function:	position ON:	agreement OP1
	position OFF:	agreement OP10

2.4.3 Main Operator Panel (+OP1)

The Main Operator Panel is the primary ride control location. The following ride functions are executed from this panel:

- Emergency Stop
- Ride Startup
- Operating Mode selection
- Maintenance Mode functions
- Normal Mode functions
- Fault handling, Emergency Stop reset
- Ride Shutdown

Note: Find a detailed description of all ride functions in the following link: Functional Description

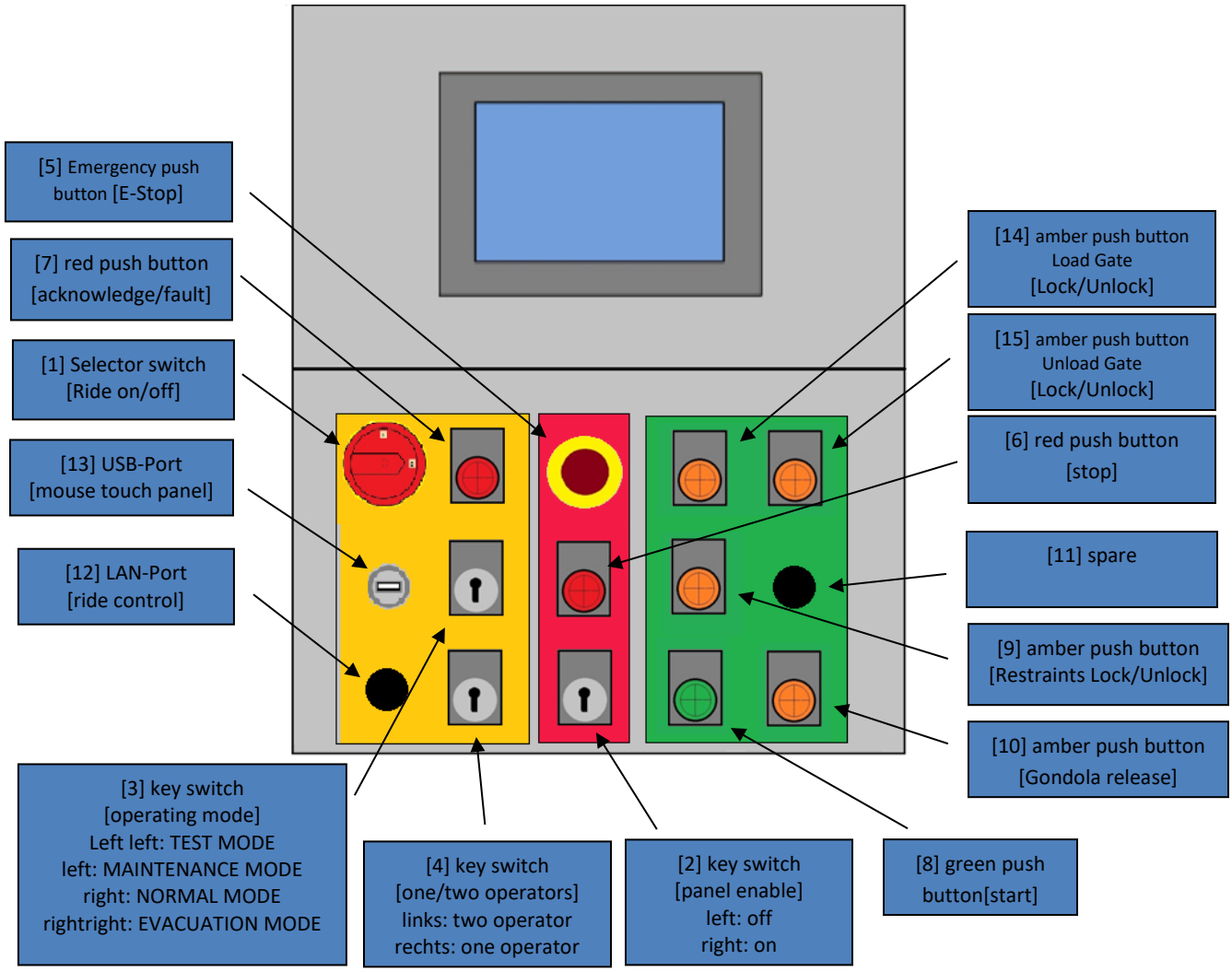


Figure2-2: Layout Main Operator Panel

Equipment:	**[1] Selector Switch [Ride on/off]**	
Description:	Switch on this selector switch to switch on the ride or switch off the ride	
Function:	Position On:	Ride is switched on
	Position Off:	Ride is switched off

Equipment:	**[2] Key Switch [Panel Enable]**	
Description:	Enable the operator panel functions of this panel by choosing the on position of this key switch	
Function:	left:	Panel operation off.
	right:	Panel operation on

Equipment:	**[3] Key Switch [Operating Mode]**	
Description:	Select with this key switch the required operating mode	
Function:	Position 1 Test Mode:	Ride is in test mode and ready to execute ride tests for maintenance purposes only
	Position 2 Maintenance Mode:	Ride is in maintenance mode and ready to operate the ride for maintenance mode only
	Position 3 Normal Mode:	Ride is in normal mode and ready to operate the ride with guests
	Position 4 Evacuation Mode:	Ride is in evacuation mode and ready to operate the ride manually with guests

Equipment:	**[4] Key Switch [ONE/TWO operator mode]**	
Description:	Allows staff to operate the ride alone in normal mode.	
Function:	left:	two operator mode
	right:	one operator mode

Equipment:	**[5] Red Mushroom Push Button [Emergency Stop]**	
Description:	Stops the ride immediately and takes off all power to motors and brakes on the ride	
Function:	Button pressed:	Cuts immediately all power to all systems
	Button released:	All systems ready to become reset

Equipment:	**[6] Red lighted Push Button [Ride Stop]**	
Description:	Press this button in case of any danger to stop the vertical and rotational movement of the ride.	
Function:	Pressed:	Stops the vertical and rotational movement of the ride
	Released:	Ready to reset the ride stop
Light:	When the ride has come to a complete stop the ride stop lamp will come on solid. If Main Operator Panel Ride Stop created the stop condition the lamp will flash (½ second on ½ second off) after the ride has come to a complete stop.	

Equipment:	**[7] Red lighted Push Button [acknowledge/fault]**	
Description:	Press this button to reset faults on the ride.	
Function:	button pressed:	acknowledge faults on the ride.
Light:	off:	No faults or ride off
	slow flashing:	warning
	fast flashing:	zone stop
	steady:	e-stop

Equipment:	**[8] Green lighted Push Button** [**ride start]**	
Description:	Main operating push button of this ride, pressed together with the Start Push Button right becomes the selected function on the display executed	
Function:	Button pressed:	Executes the selected function
Light:	off:	Buttons not active
	Slow flashing:	Ready to execute selected function
	steady:	Executing the selected function

Equipment:	**[9] Amber lighted Push Button [Restraints lock/unlock]**	
Description:	Locks and unlocks seats while ride is stopped in entry position.	
Function:	pressed:	Safety-PLC unlocks restraints if safety is ok.
	pressed again:	Safety-PLC locks restraints
Light:	When the ride has come to a complete stop in entry position lamp will come on solid. When restraints are open the lamp will flash (½ second on ½ second off).	

Equipment:	**[10] Amber lighted Push Button** [**Gondola release]**	
Description:	starts the undock-mechanism	
Function:	button pressed:	Starts the undock-sequence when ready
Light:	off:	not ready for undock
	Slow flashing:	ready for undock
	steady:	undock-sequence started

Equipment: **[11] [spare]**

Equipment: **[12] LAN-Port [ride control]**
Description: Allows to connect a service computer with ride control
Note: It is not allowed to connect other equipment to this port!!!
Connected equipment could cause high data traffic on ride control network and could be responsible for faults on the ride!!!

Equipment: **[13] USB-Port [mouse touch panel]**
Description: Allows to connect a USB-mouse for panel control

Equipment: **[14] Amber lighted Push Button [Load Gate Unlock/Lock]**
Description: Unlocks the load gates when the gondola is in home position

Function:	Button pressed:	magnet lock is de-energized, is the button pressed again magnet lock is energized.
Lights:	Light blinking 1/2s on 1/2s off:	load gate de-energized
	Light blinking 1/10s on 9/10s off:	load gate energized, gate not closed
	Light solid:	load gate energized, gate closed

Equipment: **[15] Amber lighted Push Button [Unload Gate Unlock/Lock]**
Description: Unlocks the unload gates when the gondola is in home position

Function:	Button pressed:	magnet lock is de-energized, is the button pressed again magnet lock is energized.
Lights:	Light blinking 1/2s on 1/2s off:	load gate de-energized
	Light blinking 1/10s on 9/10s off:	load gate energized, gate not closed
	Light solid:	load gate energized, gate closed

Equipment: **food pedal [agreement start]**
Description: Confirms the on the operator panel selected start command

Function:	Pedal pressed:	agreement active

2.4.4 Remote Operator Panel (+OP2)

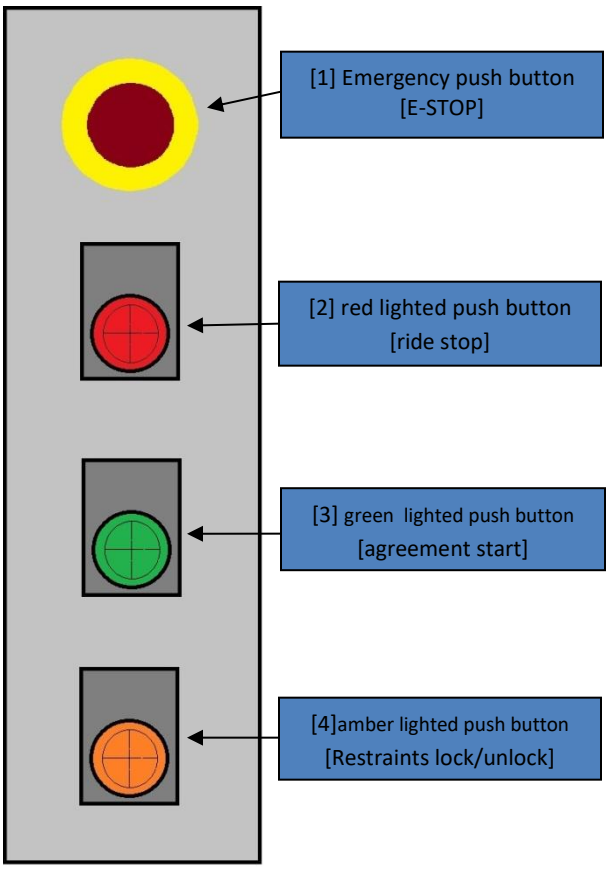


Figure2-3: Layout Remote Operator Panel

Equipment:	**[1] Red Mushroom Push Button [Emergency Stop]**	
Description:	Stops the ride immediately and takes off all power to motors and brakes on the ride	
Function:	Button pressed:	Cuts immediately all power to all systems
	Button released:	All systems ready to become reset
	Light off:	No emergency stop pending

Equipment:	**[2] Red lighted Push Button [Ride Stop]**	
Description:	Press this button in case of any danger to stop the vertical and rotational movement of the ride.	
Function:	Pressed:	Stops the vertical and rotational movement of the ride
	Released:	Ready to reset the ride stop
Light:	When the ride has come to a complete stop the ride stop lamp will come on solid. If Main Operator Panel Ride Stop created the stop condition the lamp will flash (½ second on ½ second off) after the ride has come to a complete stop.	

Equipment:	**[3] Green lighted Push Button** [**Start Enable]**	
Description:	Enable push button required to be pressed in order to start ride cycle in normal mode operation and to allow lowering of the carousel after a ride stop situation.	
Function:	Button pressed:	Start enable active
	Light off:	ride stop
	Light blinking slow:	button is enable
	Light steady on:	Ride in motion

Equipment:	**[4] Amber lighted Push Button [Restraints lock/unlock]**	
Description:	Locks and unlocks restraints while ride is stopped in entry position.	
Function:	pressed:	Safety-PLC unlocks restraints if safety is ok.
	pressed again:	Safety-PLC locks restraints
Light:	When the ride has come to a complete stop in entry position lamp will come on solid. When restraints are open the lamp will flash (½ second on ½ second off).	

2.4.5 Wireless Control Panel (+OP10)

Equipment:	**Red colored Push Button [Emergency Stop]**	
Description:	Stops the ride immediately and takes off all power to motors and brakes on the ride	
Function:	Button pressed:	Cuts immediately all power to all systems
	Button released:	All systems ready to become reset

Equipment:	**Push Button [Reset]**	
Description:	Reset for all pending faults.	
Function:	Button pressed:	Fault reset

Equipment:	**Push Button [Jog Elevator Up]**	
Description:	Used to jog up elevator in slow speed.	
Function:	Button pressed:	Jog up of elevator at slow speed
	Button released:	Stop of jog up move

Equipment:	**Push Button [Jog Elevator Down]**	
Description:	Used to jog down elevator in slow speed.	
Function:	Button pressed:	Jog down of elevator at slow speed
	Button released:	Stop of jog down move

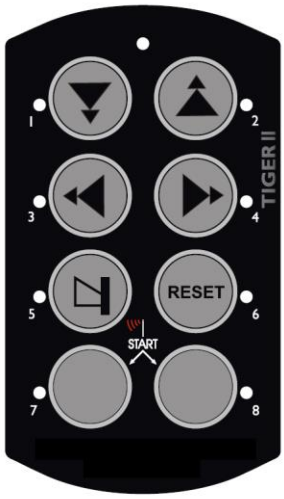


Figure2-4: Layout Wireless Operator Panel

2.4.6 Winch Control Cabinet (+JB20)

Equipment: **Red Mushroom Push Button [Emergency Stop]**
Description: Stops the ride immediately and takes off all power to motors and brakes on the ride
Function: Button pressed: Cuts immediately all power to all systems
Button released: All systems ready to become reset

Figure2-5: Junction Box JB20

2.4.7 Tower top Cabinet (+JB40)

Equipment: **Red Mushroom Push Button [Emergency Stop]**
Description: Stops the ride immediately and takes off all power to motors and brakes on the ride
Function: Button pressed: Cuts immediately all power to all systems
Button released: All systems ready to become reset

Figure2-6: Layout Junction Box JB40

2.5 TERMINOLOGY

2.5.1 Definitions and Conventions

In all provided documents each item is identically named by its given functional group, location and device name according to the following convention:

Examples: =G01+MCC-CB4.1
=E03+EXT-LS88.4

2.5.2 Definition of Functional Groups

Referring to the IEC standards, the entire application is split into functional groups. The symbol for a functional group is "=".

Examples: =G01 3-phase power 480VAC - incoming and distribution

=E03 elevator parts of the ride - speed/position monitoring

The **first digit (letter)** is the **main group indicator**. The following list shows all main groups for this application:

- =G General parts of the ride
- =E Elevator parts of the ride
- =C Rotation parts of the ride
- =S Seat parts of the ride
- =R Reserve (Spare Inputs & Outputs)
- =L Light parts of the ride

The **second & third digit (numbers)** are **sub group indicators** which indentify the functional group. Examples are:

- =G01 3-phase power 480VAC incoming and distribution
- =S01 Seat assembly #1 monitoring

2.5.3 Definition of Locations

Referring to the IEC standards, all locations are clearly identified. The symbol for the locations is “+”.

Examples:	+MCC	Motor Control Center
	+RCC	Ride Control Center
	+OP1	Operator Panel 1
	+JB20	Junction Box 20

2.5.4 Definition of Devices

Referring to the IEC standards, all devices are clearly identified. The symbol for the devices is “-”.

Examples:	-DR	Drive Unit
	-CB	Circuit Breaker
	-LS	Limit Switch

Additional explanation can be found in the following documentation:

- Electrical Schematics (introduction pages)

2.5.5 Tower Equipment

A general overview of the electric equipment is shown in the following figure. Below each of them will be descript.

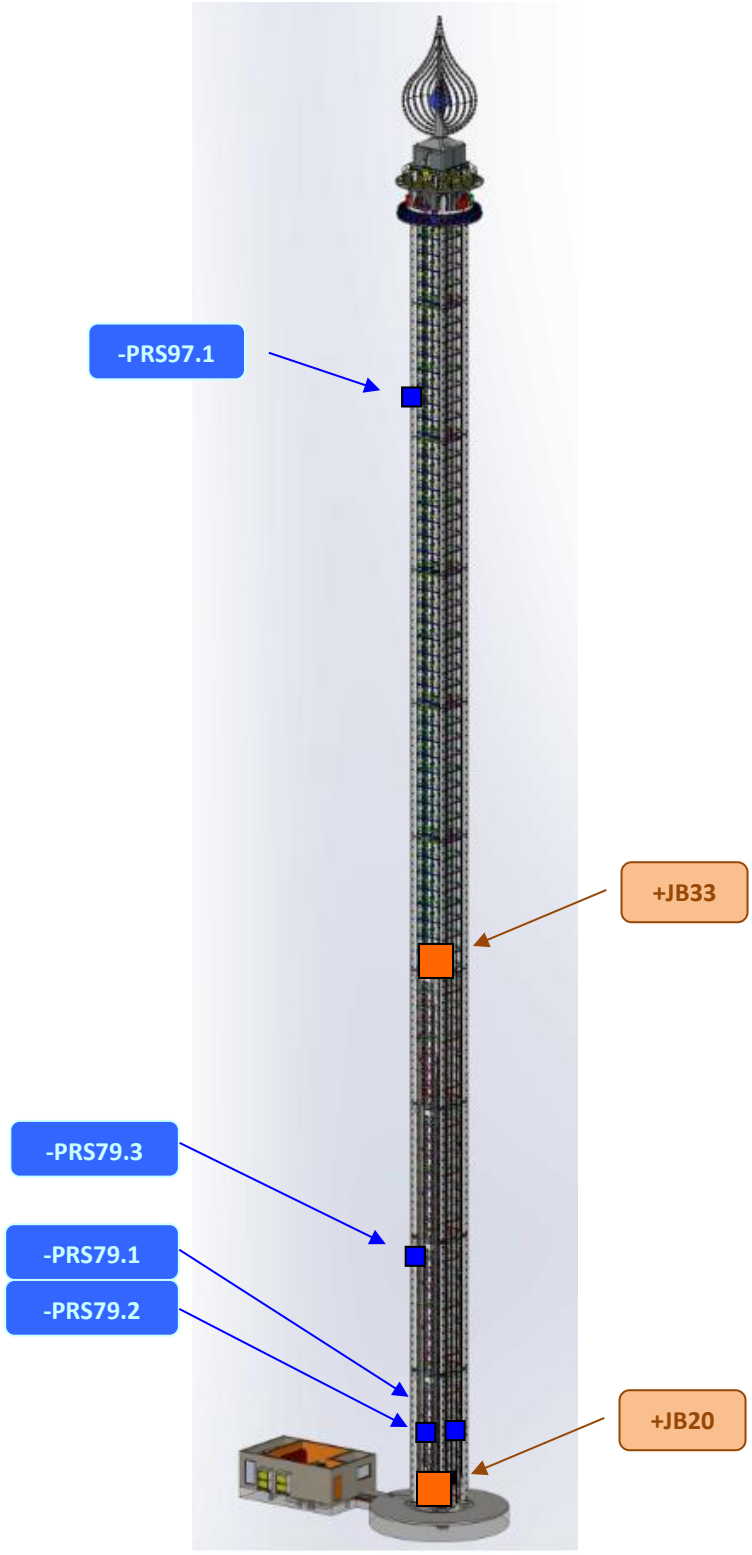


Figure2-5: tower equipment

Junction box lower area of tower (+JB20)

It is directly mounted on the tower near the current collectors and limit switches. It is used to connect all sensors on the tower bottom area as well as connection to the PCU over the current collectors.

Junction box lower area of tower (+JB33)

Is mounted in the middle of the tower. Includes the network distribution along the tower.

Proximity Switch [Docking Position1] (-PRS79.1)

The proximity switch monitors the PCU entry position and is used as condition to unlock seats.

Proximity Switch [Docking Position2] (-PRS79.2)

The proximity switch monitors the PCU entry position and is used as condition to unlock seats.

Proximity Switch [Bottom Area] (-PRS79.3)

The proximity switch [Bottom Area] is used to verify the functionality of the absolute encoder in the bottom part of the tower. Each time the proximity switch is passed by the elevator the verification will be done.

Proximity Switch [Top Area] (-PRS97.1)

The proximity switch [Bottom Area] is used to verify the functionality of the absolute encoder in the upper part of the tower. Each time the proximity switch is passed by the elevator the verification will be done.

2.5.5.1 Switching of the proximity switches

On the catcher are metal plates mounted. The distance between plates and switches should be around 10mm. To check the inductive limit switches, they have diagnostic lights.

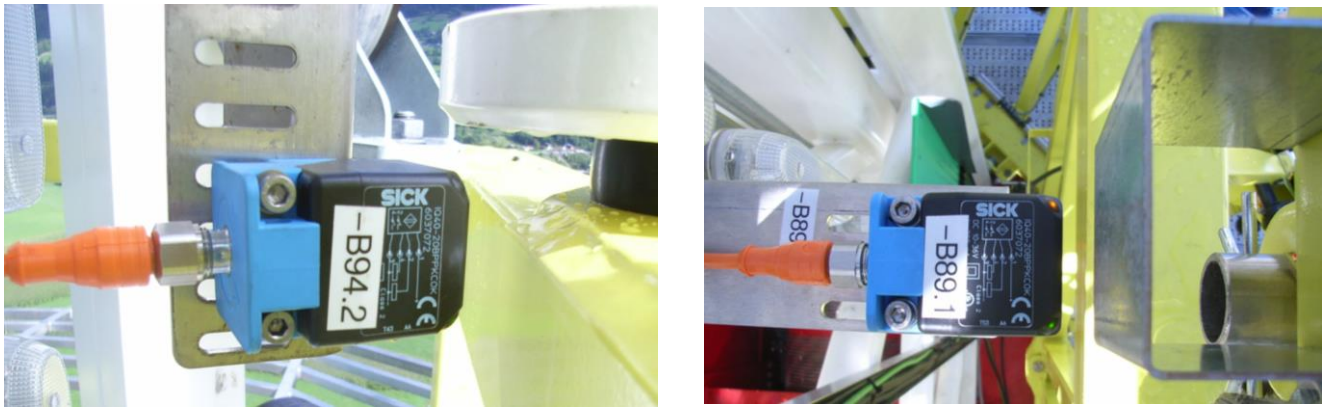


Figure2-6: Switching of the proximity switches

2.5.6 Equipment Tower top

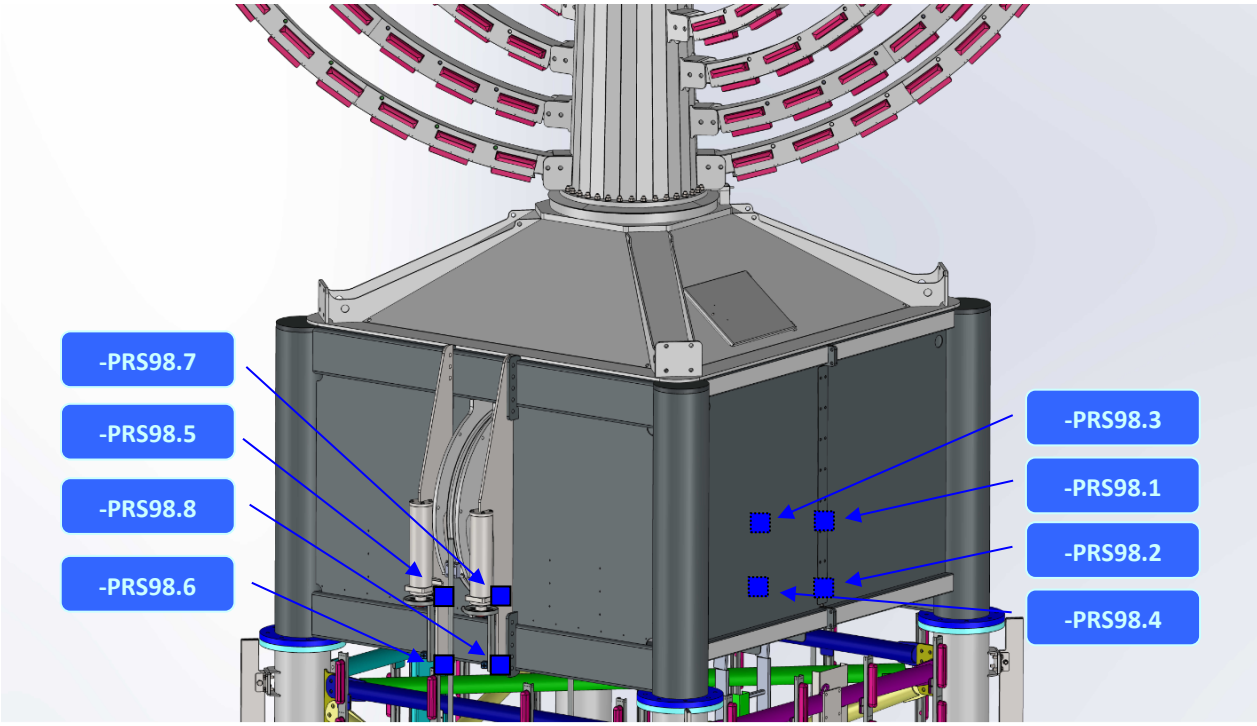


Figure2-7: Equipment tower top proxies

Proximity Switch [shock absorber top 1] (-PRS98.1)
The switch is used to monitor the position retracted on buffer 1.

Proximity Switch [shock absorber top 1] (-PRS98.2)
The switch is used to monitor the position extended on buffer 1.

Proximity Switch [shock absorber top 2] (-PRS98.3)
The switch is used to monitor the position retracted on buffer 2.

Proximity Switch [shock absorber top 2] (-PRS98.4)
The switch is used to monitor the position extended on buffer 2.

Proximity Switch [shock absorber top 3] (-PRS98.5)
The switch is used to monitor the position retracted on buffer 3.

Proximity Switch [shock absorber top 3] (-PRS98.6)
The switch is used to monitor the position extended on buffer 3.

Proximity Switch [shock absorber top 4] (-PRS98.7)
The switch is used to monitor the position retracted on buffer 4.

Proximity Switch [shock absorber top 4] (-PRS98.8)
The switch is used to monitor the position extended on buffer 4.

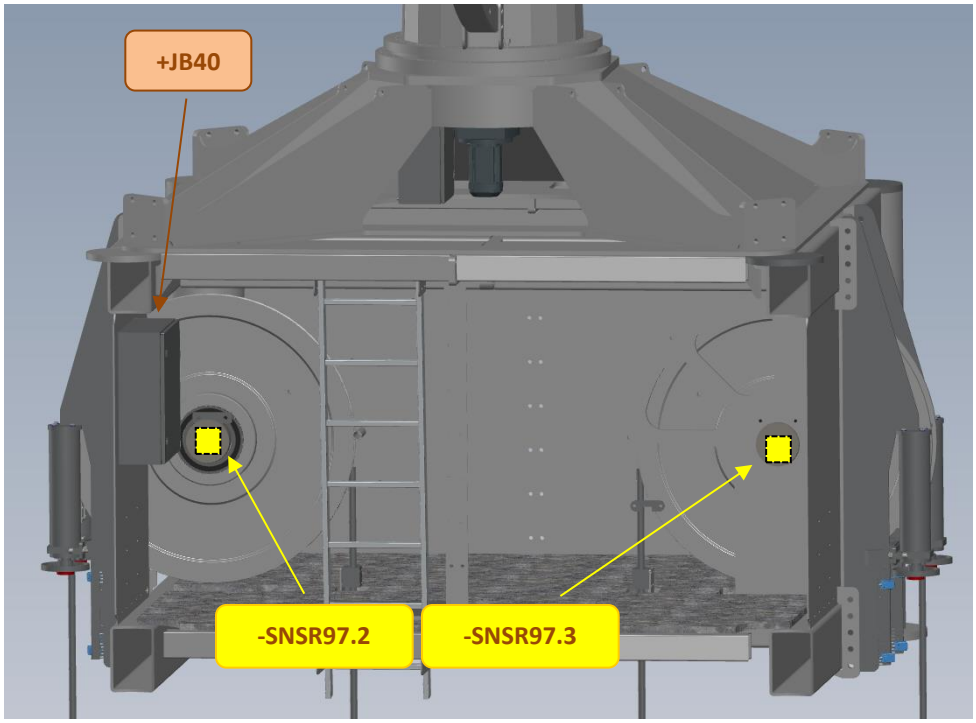


Figure2-8: Equipment tower top inside

Junction box top of tower (+JB40)

Junction box includes active components such as Point I/O with In- and Output modules. All components on the upper area of the tower are connected to JB40.

Shaft force sensor [pulley] (-SNSR97.2)

It monitors the force of the steel cable from the winch system

Shaft force sensor [pulley] (-SNSR97.3)

It monitors the force of the steel cable from the winch system

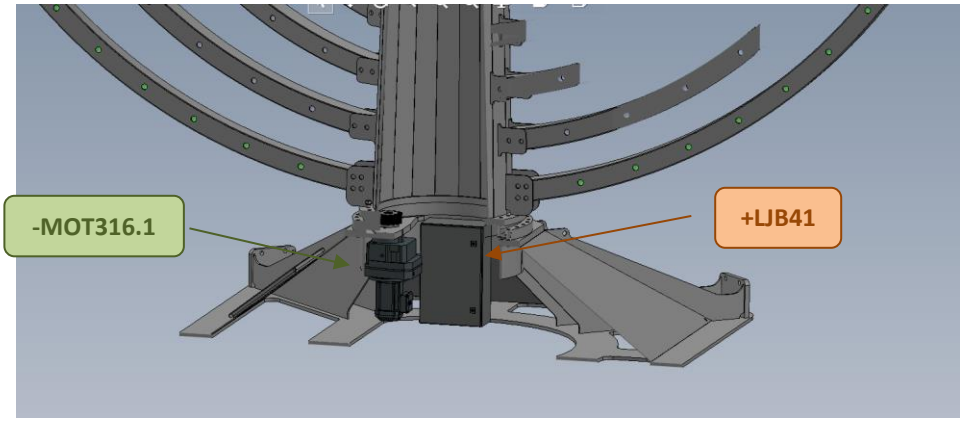


Figure2-9: Equipment tower top decoration

Junction box top of tower (+LJB41)

Junction box includes drive unit and other components to power and control the motor decoration

Motor rotation decoration (-MOT316.1)

The motors are responsible for turning the decoration.

2.5.7 Catcher/ PCU

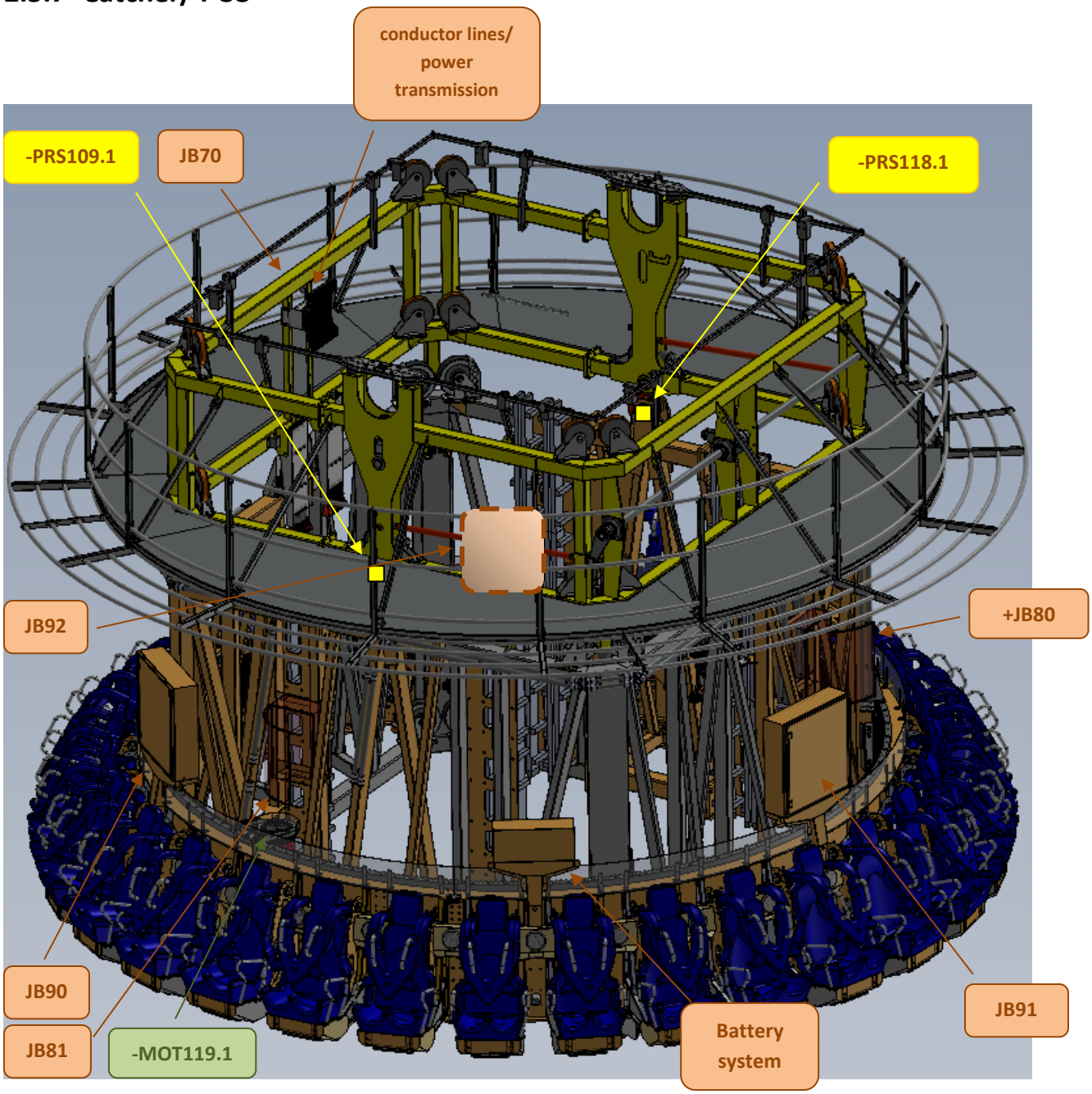


Figure2-10: Catcher/ PCU Equipment

Junction box Catcher (+JB70)
Collection point for the +JB81 to be forwarded over the current collectors

Junction box 1 sledge (+JB80)
Collection point for seats signals on the PCU to be forwarded to JB20 over the current collectors

Junction box 2 sledge (+JB81)
Connection terminals for the speed position monitoring and power to turn the PCU.

Junction box 1 at PCU (+JB90)

Includes PLC system for controling the gondola components. Point I/O with In- and Output modules are monitoring and controlling the seat and tilt effects.

Junction box 2 at PCU (+JB91)

Includes the switch for 24VDC on the gondola, battery protector and also Point I/O station with In- and Output modules for monitoring and controlling.

Junction box 3 at PCU (+JB92)

Includes active components such as Point I/O with In- and Output modules for monitoring and controlling the seat and tilt effects. Also other components like power supplies, breakers, contactors.

Motor gondola rotation (-MOT119.1)

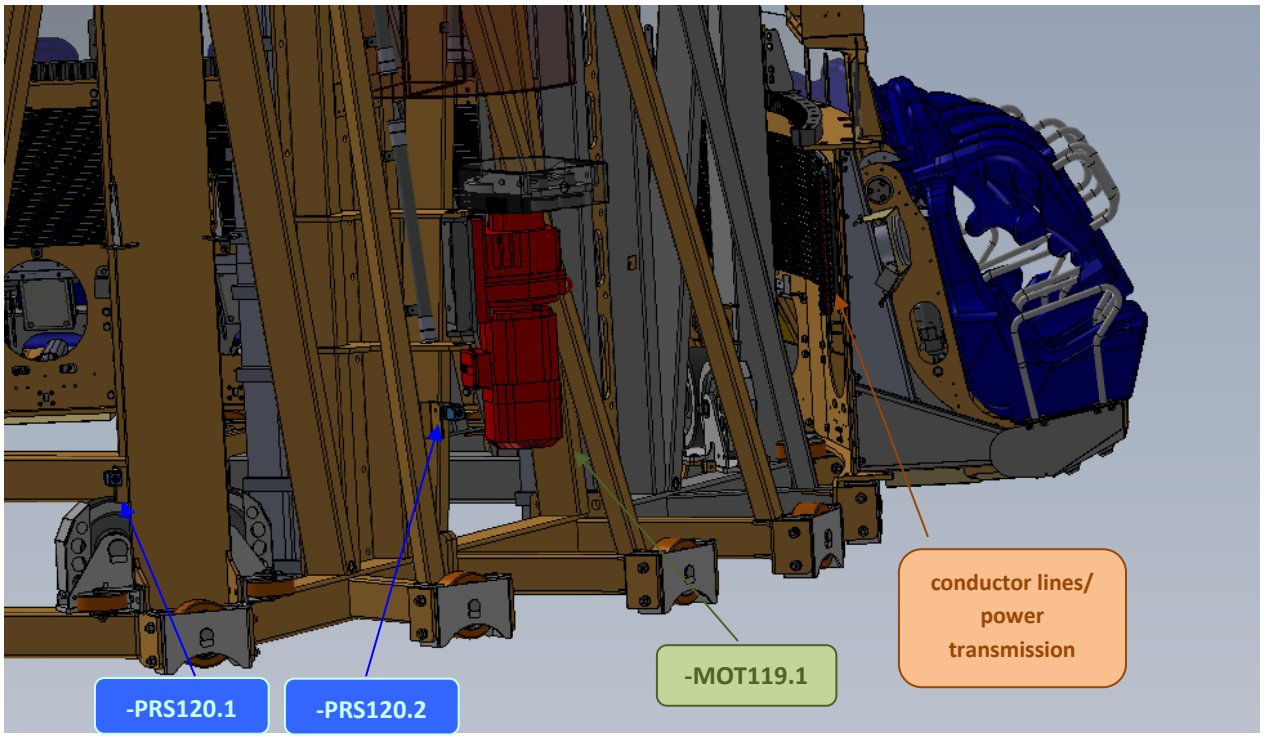
The motor are responsible for turning the gondola with a slow speed.

Proximity switch [Docking mechanism 1] (-PRS109.1)

It monitors the position of the docking mechanism.

Proximity switch [Docking mechanism 2] (-PRS118.1)

I t monitors the position of the docking mechanism.



Proximity Switch [carousel speed/position 1] (-PRS120.1)

The switch is used to monitor the speed and position of the turning part from the gondola

Proximity Switch [carousel speed/position 2] (-PRS120.2)

The switch is used to monitor the speed and position of the turning part from the gondola

2.5.8 Equipment seats

Each seat has an electrical box where all components connected.

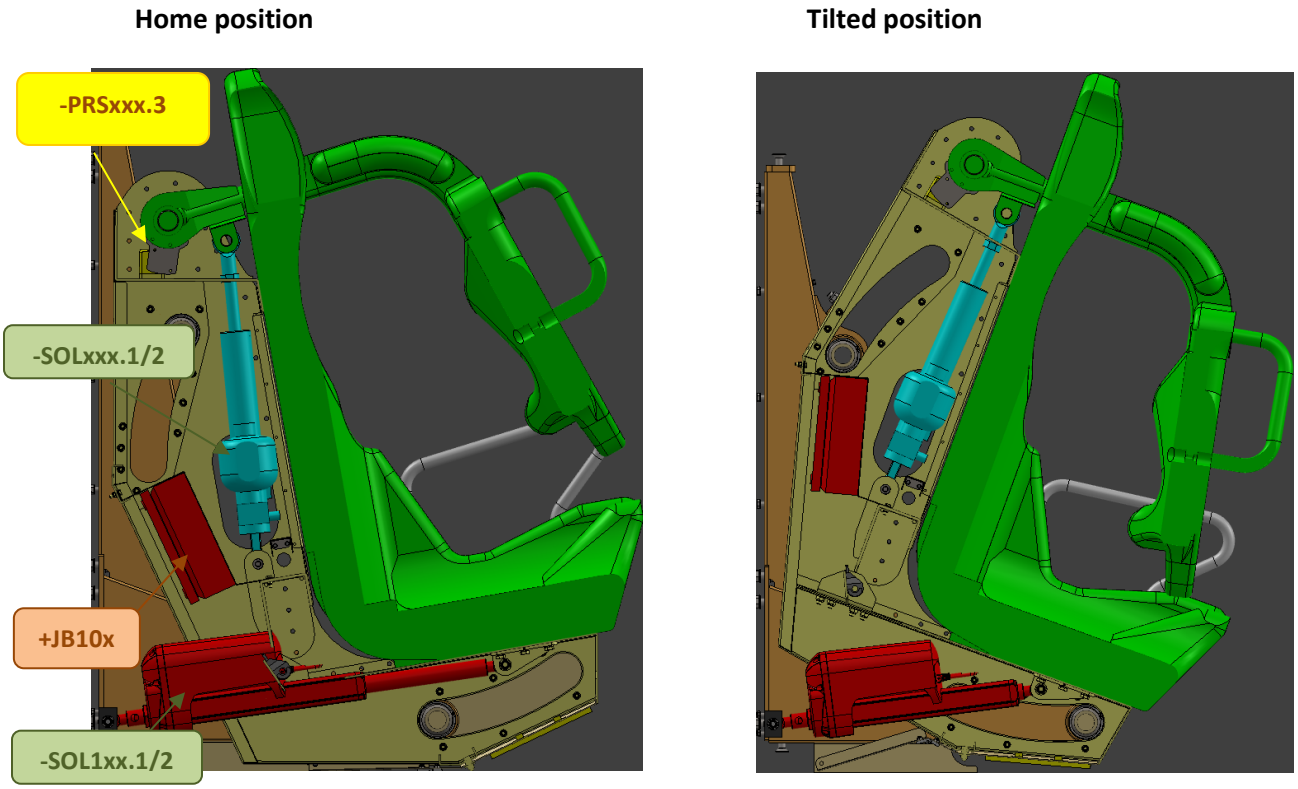


Figure2-11: Equipment seats

Junction box seats (+JB10x)

All components at the seat are connected to+JB10x.

Proximity switch [seat monitoring] (-PRSxxx.3)

It monitors the position of the seat frame.

Valves unlock restraint (-SOLxxx.1/2)

Two valves lock/unlock the restraint of the seat

Tilt cylinder (-SOL1xx.1/2)

Moves the whole seat unit

2.5.9 Buffer Bottom

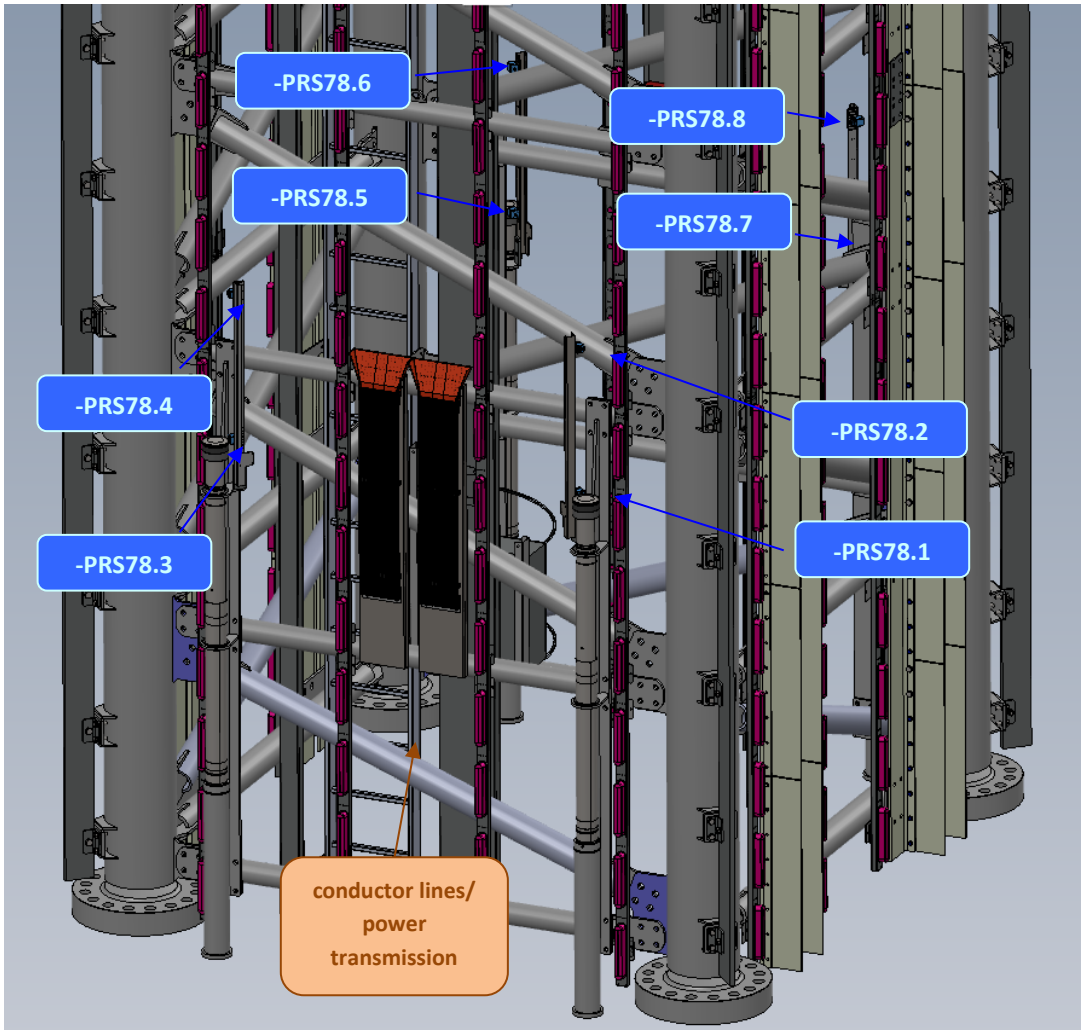


Figure 2-10 Puffer bottom

Proximity Switch [shock absorber bottom 1] (-PRS78.1)
The switch is used to monitor the position retracted on buffer 1

Proximity Switch [shock absorber bottom 1] (-PRS78.2)
The switch is used to monitor the position extended on buffer 1.

Proximity Switch [shock absorber bottom 2] (-PRS78.3)
The switch is used to monitor the position retracted on buffer 2

Proximity Switch [shock absorber bottom 2] (-PRS78.4)
The switch is used to monitor the position extended on buffer 2.

Proximity Switch [shock absorber bottom 3] (-PRS78.5)
The switch is used to monitor the position retracted on buffer 3

Proximity Switch [shock absorber bottom 3] (-PRS78.6)

The switch is used to monitor the position extended on buffer 3.

Proximity Switch [shock absorber bottom 4] (-PRS78.7)

The switch is used to monitor the position retracted on buffer 4

Proximity Switch [shock absorber bottom 4] (-PRS78.8)

The switch is used to monitor the position extended on buffer 4.

2.5.10 Equipment Base/Winch

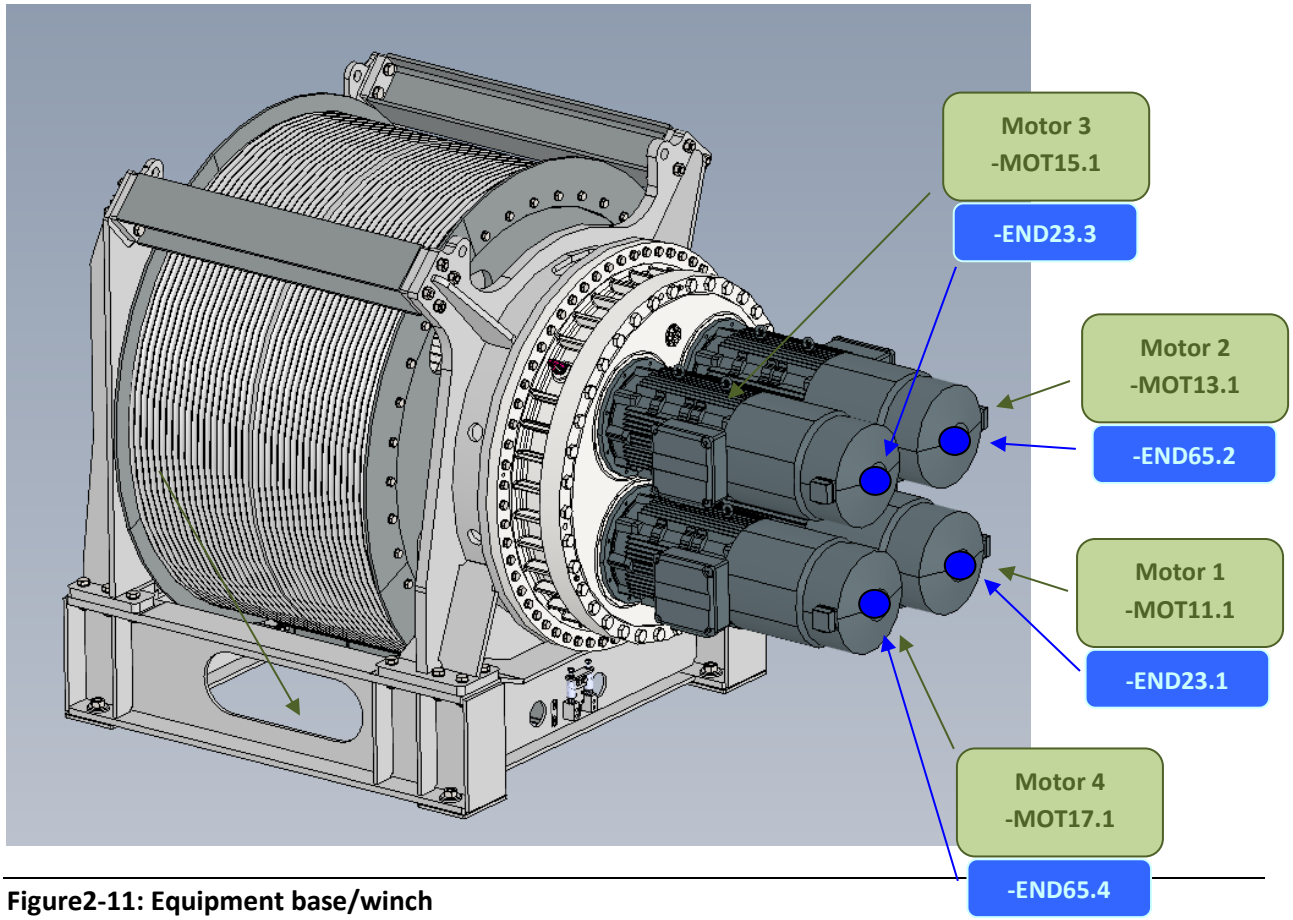


Figure2-11: Equipment base/winch

Winch motors (-MOT11.1 -MOT13.1 -MOT15.1 -MOT17.1)

The motors are responsible for driving the PCU and the catcher. Each motor is powered by a drive unit located in the technic room +ECR. Thermo-switches and brakes are monitored and connected to +MCC.

Encoder motor 1 sin/cos (-END23.1)

The encoder on the motor 1 is connected to the drive unit 1. It supplies the drive unit with the necessary data.

Encoder motor 2 sin/cos with SSI(-END65.2)

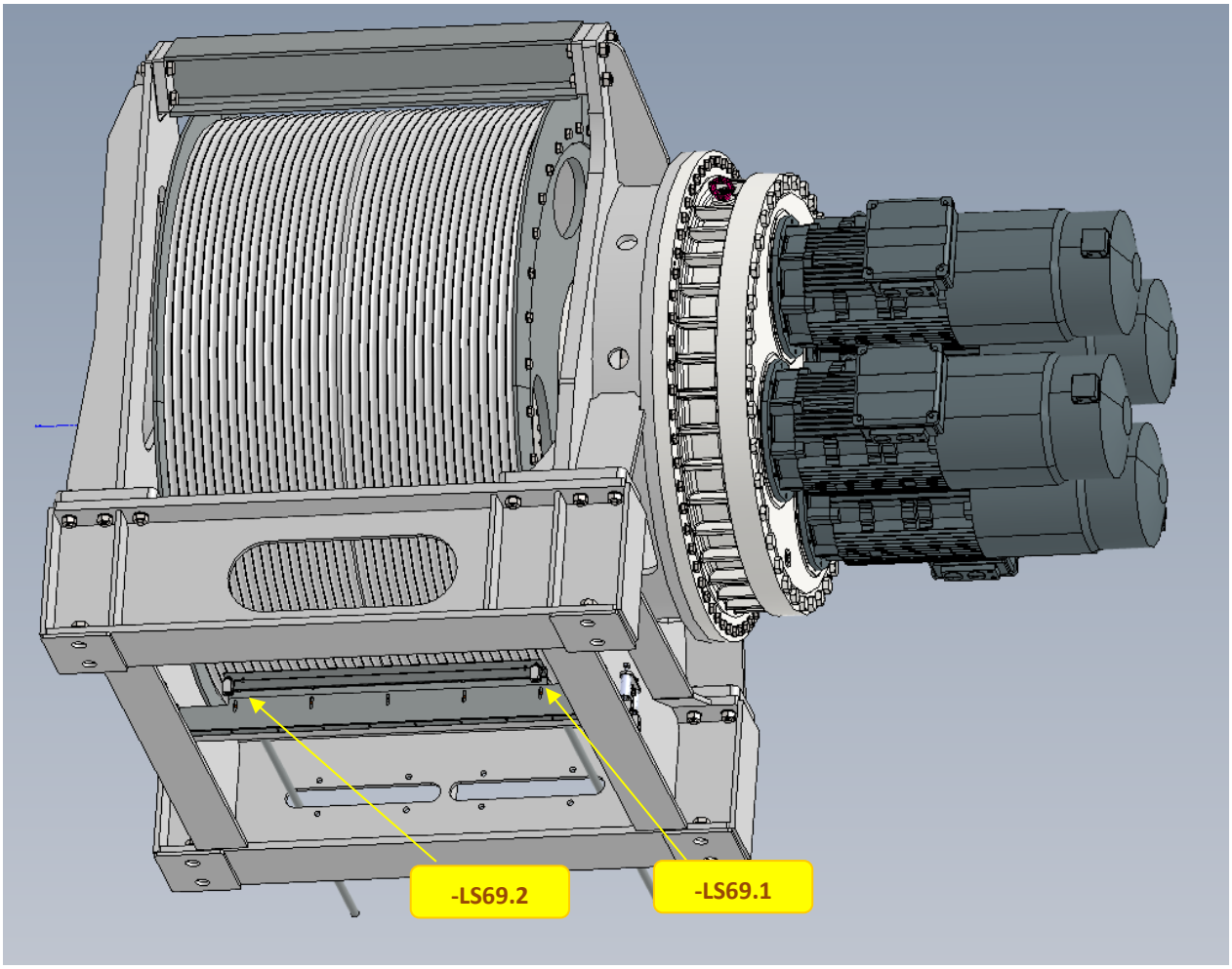
The encoder on the motor 2 is connected to the junction box +JB19. The SSI signal will be monitored by the safety PLC. The sin/cos signal feeds the drive unit 2 with the necessary data.

Encoder motor 3 sin/cos (-END23.3)

The encoder on the motor 3 is connected to the drive unit 3. It supplies the drive unit with the necessary data.

Encoder motor 4 sin/cos (-END65.4)

The encoder on the motor 4 is connected to the junction box +JB19. The sin/cos signal will be monitored by the safety PLC. A splited sin/cos signal feeds also the drive unit 4 with the necessary data.



Limit switches [derope] (-LS69.1/2)

The limit switches are connected in +MCC and monitors slack rope on the winch.

3 FUNCTIONAL DESCRIPTION

3.1 OVERVIEW

The following list shall provide an overview over all available ride functions and tasks during regular operation.

Ride Functions in all Operating Modes (General)

- Ride On/Off
- Operating Mode selection
- Emergency Stop
- Seat lock/unlock

Ride Functions in Maintenance Mode

- Fault reset
- Jog Elevator
- Rotate Gondola
- Tilt Seats

Functions in Test Mode

- Performtest [derope]
- Perform test [Over speed upward]
- Perform test [Over speed downward]
- Performtest [Test seat cylinder right]
- Performtest [Test seat cylinder left]
- Performtest [Test motor brake 1]
- Performtest [Test motor brake 2]
- Performtest [Test motor brake 3]
- Performtest [Test motor brake 4]

Ride Functions in Normal Mode

- Ride Cycle Start
- Ride Stop
- Ride Restart

Functions in Evacuation Mode

- Jog Elevator
- Fault reset

3.2 RIDE FUNCTIONS

3.2.1 General

Below listed ride functions are of general natures independent of any operating mode.

FG-00; Ride On

Location:	OP1
Human Action:	Switch Selector Switch [Ride On/Off] to position ON
Ride Reaction:	All Sensors energized

FG-01; Ride Off

Location:	OP1
Human Action:	Switch Selector Switch [Ride On/Off] to position OFF
Ride Reaction:	All Sensors de-energized

FG-10; Operating Mode Selection

Location:	OP1
Human Action:	Switch Key Switch [Operating Mode] to desired mode position
Ride Reaction:	According operating mode selected

FG-20; Emergency Stop

Location:	OP1, OP2, OP10, JB20, JB40, JB80, RCC
Human Action:	Press Push Button [Emergency Stop]
Ride Reaction:	All Actuators de-energized

FG-30; Unlock seats (General)

Location:	OP1
Pre-Condition:	Ride in Load/Unload position
Human Action:	Press Push Button [Restraint Unlock]
Ride Reaction:	All Restraint Actuators energized

3.2.2 Maintenance Mode

Service Mode is used for:

- Ride inspection (preventive maintenance)
- Prepare ride for Normal Mode operation (Start-Up at beginning of operating day)
- Recover ride for Normal Mode operation (Recovery after irregular operational event)

Attention!

Danger due to electrical shock

- **On the tower sections are contactor lines installed which provide electrical power for the carousel. During maintenance on the contactor lines ensure that the whole contactor is "volt-free" and protected against switching back on.**
- **The gondola has its own power supply (battery pack). During maintenance on the electrical installation of the gondola ensure that the fuses are switched off "volt-free".**

The following is a description of the various functionalities available in Maintenance Mode organized by the different ride areas, a more detailed description will follow later.

Entire Ride:

FM-00; Fault, acknowledge

Location:	OP1
Action:	Press [Acknowledge]
Reaction:	clears errors

Elevator:

FM-10; Jog Up slow

Location:	OP1
Pre-Conditions:	Maintenance Mode active
Human Action:	1. Select Function [Jog Up slow]
	2. Press and hold food pedal and press Push Button [Ride Start]
Ride Reaction:	Elevator raising at 0.25m/s and automatically stop at top position
Location:	OP10
Pre-Conditions:	Ride Lockout on JB20 in off position
Human Action:	Press and hold Push Button [Jog up]
Ride Reaction:	Elevator raising and automatically stop at top position
Human Action:	Release and Press and hold Push Button [Jog up]
Ride Reaction:	Elevator raising and creates an e-stop at the emergency over travel switch tower top
Human Action:	Reset and Press and hold Push Button [Jog up]
Ride Reaction:	Elevator raising and can go over the over travel switch tower top

FM-11; Jog Up fast

Location:	OP1
Pre-Conditions:	Maintenance Mode active
Human Action:	1. Select Function [Jog Up fast]
	2. Press and hold food pedal and press Push Button [Ride Start]
Ride Reaction:	Elevator raising and automatically stop at top position

FM-12; Jog Down slow

Location:	OP1
Pre-Conditions:	Maintenance Mode active
Human Action:	1. Select Function [Jog Down slow]
	2. Press and hold food pedal and press Push Button [Ride Start]
Ride Reaction:	Elevator lowering and automatically stop at load/unload position
Location:	OP10
Pre-Conditions:	Ride Lockout on JB20 in off position
Human Action:	Press and hold Push Button [Jog Down]
Ride Reaction:	Elevator lowering at and automatically stop at load/unload position
Human Action:	Release and Press and hold Push Button [Jog Down]
Ride Reaction:	Elevator lowering and creates an e-stop at the emergency over travel switch tower bottom
Human Action:	Reset and Press and hold Push Button [Jog up]
Ride Reaction:	Elevator rising at 0.25m/s and can go over the over travel switch tower bottom

FM-13; Jog Down fast

Location:	OP1
Pre-Conditions:	Maintenance Mode active
Human Action:	1. Select Function [Jog Down fast]
	2. Press and hold food pedal and press Push Button [Ride Start]
Ride Reaction:	Elevator lowering and automatically stop at load/unload position

Carousel:

FM-20; Rotate clockwise

Location:	OP1
Pre-Conditions:	Maintenance Mode active
Human Action:	1. Select Function [Rotate clockwise]
	2. Press and hold Push Button [Ride Start]
Ride Reaction:	Carousel rotating

3.2.3 Test Mode

Test Mode is used for:

- Execution of periodic functional safety test
- Error indication light, etc.

FT-11; Test 1 [Derope 1]

Location:	OP1
Pre-Conditions:	test mode active, ride in entry position
Human Action:	1. Select function [test derope] 2. Press food pedal and button start 3. Activate both derope sensors (-LS69.1 and -LS69.2)
Ride reaction:	Ride confirms test

FT-13; Test 3 [Over speed elevator up]

Location:	OP1
Pre-Conditions:	Test mode active, Ride in Load/Unload position, PCU disconnected from catcher
Human Action:	1. Select Function [Test Over speed elevator up] 2. Press and hold present switch and press Push Button [Ride Start]
Ride Reaction:	Elevator raising and then at random height speeding up triggering an over speed fault.

FT-14; Test 4 [Over speed down]

Location:	OP1
Pre-Conditions:	Test mode active, Ride in Load/Unload position, PCU disconnected from catcher
Human Action:	1. Select Function [Test Over speed elevator down] 2. Press and hold present switch and press Push Button [Ride Start]
Ride Reaction:	Elevator raising and then at random height returning in direction down and triggering an over speed fault.

FT-15; Test 5 [seat cylinder right]

Location:	OP1, PCU
Pre-Conditions:	Test mode active, Ride in Load/Unload position

Note: The test procedure is described in a following chapter!

FT-16; Test 6 [seat cylinder left]

Location: OP1, PCU
Pre-Conditions: Test mode active, Ride in Load/Unload position
Note: The test procedure is described in a following chapter!

FT-17; Test 7 [Motor brake 1]

Location: OP1
Pre-Conditions: Test mode active, Ride in Load/Unload position
Human Action: 1. Select function [Motor brakes 1]
2. Press and hold present switch and press Push Button [Ride Start]
Ride reaction: Ride performs a brake test with brakes 1

FT-18; Test 8 [Motor brake 2]

Location: OP1
Pre-Conditions: Test mode active, Ride in Load/Unload position
Human Action: 1. Select function [Motor brakes 2]
2. Press and hold present switch and press Push Button [Ride Start]
Ride reaction: Ride performs a brake test with brakes 2

FT-19; Test 9 [Motor brake 3]

Location: OP1
Pre-Conditions: Test mode active, Ride in Load/Unload position
Human Action: 1. Select function [Motor brakes 3]
2. Press and hold present switch and press Push Button [Ride Start]
Ride reaction: Ride performs a brake test with brakes 3

FT-20; Test 10 [Motor brake 4]

Location: OP1
Pre-Conditions: Test mode active, Ride in Load/Unload position
Human Action: 1. Select function [Motor brakes 4]
2. Press and hold present switch and press Push Button [Ride Start]
Ride reaction: Ride performs a brake test with brakes 4

3.2.4 Normal Mode

Normal Mode serves the following purposes:

- Operating Mode for normal passenger operation

Whole ride:

FN-10; Start Ride Cycle

Location:	OP1 & OP2
Pre-Conditions:	Normal Mode active, Ride in Load/Unload position
Human Action:	1. Operators to verify passengers are seated properly and secured
	2. Operator to verify that all gates are closed
	3. Operator at OP2 to press and hold Push Button [Start Enable]
	4. Operator at OP1 to press Push Button [Ride Start]
Ride Reaction:	Ride cycle started

FN-11; Ride Stop

Location:	OP1, OP2
Pre-Conditions:	Normal Mode active, Ride cycle being executed
Human Action:	Press Push Button [Ride Stop]
Ride Reaction:	Ride cycle aborted, elevator and carousel execute a Safe Stop 1

FN-13; Ride Recovery

Location:	OP1 & OP2
Pre-Conditions:	Normal Mode active, Ride not in load/unload position, No fault pending
Human Action:	1. Operator at OP2 to press and hold Push Button [Start Enable]
	2. Operator at OP1 to press and hold Push Button [Ride Start]
Ride Reaction:	Elevator slowly lowering to load/unload position

3.2.5 Evacuation Mode

Evacuation mode is used for:

- Evacuation if error in normal mode
- Acknowledge faults

FE-00; Acknowledge Fault

Location:	OP1
Human Action:	press button [acknowledge]
Ride reaction:	Errors are acknowledged

FE-10; Evacuation

Location:	OP1 & OP2
Pre-Conditions:	Normal mode active, Ride not in load/unload position, No fault pending
Human Action:	1. Operator at OP2 to press and hold Push Button [Start Enable] 2. Operator at OP1 to press and hold Push Button [Ride Start]
Ride Reaction:	Elevator slowly lowering to load/unload position as long both buttons are pressed.

4 GENERALSAFETY PRECAUTIONS

4.1 STAFFING

4.1.1 Certified Operator

The Certified Operator is responsible for overseeing all operations of the site. This person shall be versed in all operations, procedures, staffing and training. The Certified Operator is ultimately responsible for all actions and processes of the RIDE. The Certified Operator must have completed a factory authorized training program, which can also be taught by a staff member who has been trained by Funtime Handels GmbH. A Certified Operator must be physically present during all operations.

The area of responsibilities includes following points:

1. Pre-Ride check procedures.
2. Rider Safety.
3. Perform the first ride of the day after the inspection procedure.
4. Ensures adherence to the Operations Manual by all staff.
5. Training and advancement of all staff.
6. Knowledgeable of First Aid.

4.1.2 Loader / Unloader

The loader/unloader is responsible for rider order and briefing as well as ensuring guests are secured in the ride seats. The loader/unloader must have completed an onsite training program from a Funtime HandelsGesmbH-trained staff member.
Duties include but are not limited to:

1. Pre-Ride checkpoints.
2. Crowd control.
3. Rider order.
4. Ensuring guests are secured in seats.
5. Rider briefing.
6. Assisting guests in getting out of seats.

4.1.3 Maintenance Personnel

These personnel are responsible for daily, weekly, monthly and annual inspections, and for record keeping. Perform preventative and routine maintenance and maintain logbooks. Monitoring and replacement of limited use parts i.e., cables, decorative lighting etc.

4.2 STAFFING CHECKPOINTS

It is important that all staff be in a good mood. They must be physically and mentally capable of performing all duties that they are assigned to. The Certified Operator is responsible for assuring that all staff are ready for the day's activities. Some helpful tips for assuring a healthy and prepared staff are as follows:

1. Comfort Level: How comfortable does your staff feel in expressing their limitations to the Certified Operator?
2. Responsibility: Are your team members willing to take on the responsibilities that are placed on them?
3. Awareness: Are your team members aware of all that their duties entail?
4. Review: A good Certified Operator will always be reviewing with his/her team members.
5. Praise: Let your team members know when they are performing to the standards that you have placed on them. Also let them know when they are not.
6. Respect: Respect all those you come in contact with. Out of respect come growth, knowledge and loyalty. Respect your staff's limitations concerning assigned duties, hours of employment and pay scale.

4.3 EMERGENCY PROCEDURES AND UNUSUAL CIRCUMSTANCES

4.3.1 Panicked Rider

In the case that the rider breaks into hysterics or begins panicking, the Certified Operator should stop the ride and lower the riders back to the ground. In the event that a rider panics at the top of the ride cycle, stay calm and use comforting words until they can be lowered.
Your ability to speak calmly and assure them of safety is the key to controlling this type of situation.

4.3.2 Lightning Strike

In the case of lightning striking the structure(s), all equipment must be inspected by trained maintenance personnel before re-opening. If a person(s) is struck by lightning, follow emergency procedures as outlined in major accidents.

DO NOT operate the RIDE if lightning is in the area.

4.3.3 Electrical Failure

4.3.3.1 Minor electrical fault (e.g. a limit switch is defective).

The control system can be switched to the evacuation mode and the PCU is lowered at a low speed. The shoulder brackets can be opened electrically or manually

The procedure is described in "Evacuation Mode" section of this manual.

4.3.3.2 Serious electrical fault (e.g. electrical power failure).

In this case the PCU can still be lowered to the ground by manually opening the brake system. The shoulder brackets can be opened manually.

4.3.4 Mechanical Failure

4.3.4.1 Serious mechanical defect of the winch (e.g. damage of a gear or bearing at the winch)

The passenger unit will be connected via a rope which is pulled from the ground to the trip unit. The PCU will be undocked from the Catcher and braked by the magnetic brakes on the tower. The shoulder brackets can be opened manually.

4.3.4.2 Serious mechanical defect on the PCU (e.g., blocked pulley or brake sword)

The component which is causing the blockage must be removed. Here, you can try to raise the car using the Catcher. If this is impossible, the people must be lowered by height recovery. For attaching the ropes corresponding eyelets are provided on the tower.

4.3.5 Major Accidents

In the extremely unlikely case of a major accident:

FOLLOW ALL INTERNAL EMERGENCY POLICY AND PROCEDURES.

4.4 RIDER WALK THROUGH

All riders will go through the following procedures. Deviation from these steps can leave your operation vulnerable. Remember, prior to processing your first rider, all daily inspection checkpoints must be completed.

Step1. Rider arrives at site and is met by the Ride Operator. Answer all questions with the utmost confidence as these people are seeking your assurance for their well-being. This should not be taken lightly.

Step2. Rider(s) arrive at the loading area and are greeted. Here they are briefed on the riding techniques and protocol. Guests are let into the ride area, choose a seat, and close it.

Step3. At this point the Certified Operator gives the riders a thorough check, checking the seat bracket by pulling on them and making sure that the passenger has no loose items that could fall during the ride. Also check that the person fits properly into the seat.

Limitation: **Large people:** Be careful when seeing if large guests fit into the seats. Check that they fit within the contours of the seat and the bracket fits properly. If this is not so - **Do not let this person ride**.

Limitation: **Small People:** The minimum height for persons able to fit into the Freefall seats is 125cm. The main point is to make sure that you do not believe the passenger can in any way slide out of the seat. Make sure the seat brackets are properly latched. If you feel that the guest cannot safely ride the attraction **Do not let this person ride**.

**depends on the setting of seats. Size limit, according to TÜV report*

4.5 PATRON RESTRICTIONS

4.5.1 Height

The passengers must be min. 125cm* for proper fitting of the restraint and seat belts. This and all of the qualifications in section 4.4 need to be posted on site.

**depends on the setting of seats. Size limit, according to TÜV report*

4.5.2 Age

There is no age restriction

4.5.3 Physical & Mental Conditions

Riders must be in good mental and physical condition, specifically not under the influence of drugs or alcohol. Riders must not have any physical problems, such as heart condition or back injuries, which could be exacerbated by a ride. Rider must have the ability to hold an upright sitting position alone. At a minimum, riders must have legs that include the knee. Riders must have arms that extend at a minimum to the elbow and one natural, functioning hand on one of the two arms. Prosthetics may not be worn on the ride.

4.5.4 Weight and Size

There is no minimum weight except physical size, which may prevent the guest from properly being secured by the seat and restraint. According to EN 13814 the maximum passenger weight is 130kg.

4.5.5 Additional Rider Restrictions

- Ride operator instructions must be followed.
- Guests who can endanger themselves or others through their behavior are not permitted to ride.
- Guests that may be intoxicated or have physical ailments (such as: spine/back problems, high blood pressure, or pregnancy) are not allowed to ride.
- Riders are not allowed to smoke or hold items in their hands that could be dropped on other park-goers.
- Unsecured glasses, long jewelry, open-toed shoes as well as long scarves must be removed before a rider gets on the ride.
- There is no eating or drinking while riding.

4.6 SAFETY

The Ride was designed to be a safe amusement ride. However, human errors or deviation from the design and operation could result in injuries. Examples of dangerous deviations from procedures include:

4.6.1 Stunts

This can include riders strapping in inanimate objects such as stuffed animals, using different restraint attachments, trying to hold on to the seat in front or behind the rider, and climbing out of the seat.
For reasons of safety, staff (during morning testing) and Guests may not try to ride in any unsafe manner.

4.6.2 Foreign Objects

Any object dropped by a rider could become a deadly projectile. Therefore, no objects are to be hand carried by any rider. Objects include cameras, cell phones, purses, etc.

4.6.3 Entering & Exiting the Ride

Always ensure that the riders have unobstructed access while entering and exiting the loading area. The Certified Operator must advise the riders to use caution and be ready to physically assist anyone who appears impaired.

4.6.4 Tower Climbing

Each tower installation is provided with fall protection equipment for trained personnel who must ascend the towers for inspection, maintenance or repairs. No one is authorized to ascend without the protection given by a restraint and connecting lanyard.
In addition, a separate safety lanyard and carabineer are provided for support and secondary protection anytime work must be performed aloft. All tool and equipment carried aloft has to be attached via a lanyard to the climber or tower. Nothing should be freely carried by the climber.

4.6.5 Wind & Lightning Storm Restrictions

The ride must not be operated in wind speeds greater than 15 m/s (54 km/h). All towers must be grounded with lightning/grounding rods. Stop all operations and move all personnel from the site whenever lightning is likely to occur.

4.6.6 Ride Balancing

The ride should be run as balanced as possible.

4.6.7 Alterations

Alterations to the system are permitted only under permission from qualified Funtime Handels GmbH employees. Prior to modification, it is necessary to examine these, discuss and work out.

4.6.8 General safety rules for FREEFALL Operators

a) If patrons are misusing the ride, shut the operation down until condition is corrected.

b) Intoxicated persons must not be allowed on the ride

c) Smoking by patrons is not permitted.

d) If an unusual noise or condition develops while the ride is operating, stop it and notify Certified Operator.

e) Be cautious and ready for the unexpected when small children are present.

f) Ensure that all access gates to the loading area are securely closed during ride operation.

g) Patrons waiting for the next ride must be kept outside of loading area, away from the moving ride.

h) Be alert when the ride is operating and prepare for an emergency.

g) Take pride in operating safely: a safe guest experience is always the first priority.

4.7 CRITICAL OPERATIONAL ISSUES

a) Do report to work on time and be ready to work.

b) Do be neat, clean and well groomed.

c) Do know your ride and check it thoroughly BEFORE opening it to the public.

d) Do be courteous to ride patrons.

e) Do conduct yourself in a responsible manner - no horseplay. Remember that we work while others play.

f) Do maintain a positive and safe attitude.

g) Do stay alert and concentrate on the job at hand

h) Do keep your ride area clean and safe.

i) Do watch your ride and riders, anticipate potential problems.

j) Do report any unusual activities or conduct to the Certified Operator.

k) Do think SAFETY FIRST - if the ride is not functioning normally or if you are concerned about its mechanical operation SHUT DOWN and get the Certified Operator and correct the problem.

l) Don’t engage in unnecessary conversation while operating your ride.

m) Don’t argue with the ride patrons. If there is a problem with a guest, call the Certified Operator.

n) Don’t allow riders to carry any foreign objects such as cameras or cell phones while riding the attraction.

o) Don’t spend your breaks distracting other operators who are not on break.

p) Don’t leave your post to take a break until your replacement is there.

q) Don’t take prescription or over the counter medication without knowing its effects on you.

r) Don’t consume alcohol or controlled substances while working.

4.7.1 Attitude

SAFETY and ATTITUDE are two very important words in every walk of life - they are critical words in the ride industry. The public visits an amusement ride to be entertained - their primary concern is to have fun. As a ride operator you are in control of the machine that the public has come to enjoy. They look to you to maintain a watchful and safe attitude while they are in your care. Yours is a major responsibility. There are many jobs in other industries where you might hear it said, “my job or my attitude doesn’t really matter”. You will never hear that said of a ride operator - your job and your attitude may well matter the most.

4.7.2 Alcohol or Drugs

When you operate a ride you have the well-being of the riders in your hands. The use of alcohol or drugs in such situations shall be grounds for immediate dismissal.

It is not only controlled substances that slow your reflexes and impair your ability to react - medication prescribed by your doctor can have a similar effect. If you are taking medication, tell your doctor the critical nature of your job, and he will advise you of any necessary precautions.
Don’t jeopardize your safety and that of others when you are less than your best.

4.7.3 Fatigue

Operating a ride is hard work; it is tiring and requires skill and attention. A person must be in good physical and emotional condition to be a good operator.
Everyone knows that a person is unfit to operate a ride when he or she has been drinking, but fatigue can be just as dangerous.
Boredom can be viewed as a form of fatigue. The mind is tired or dull and no longer alert. You can combat fatigue and boredom by taking your scheduled breaks, walking around or by changing your routine.
It is essential that you are 100% focused on what you are doing while operating or assisting in ride operations.

4.7.4 Slips and Falls

Although not as highly publicized as a mechanical failure, the most frequent accident on an amusement ride is a slip, trip or fall.
Constantly check the areas on and around your ride for objects or liquids that could cause a slip and fall by a guest or fellow employees.
Watch your step and make sure that the ride enclosure and all rider access areas are free of any debris, liquids or any other obstructions.

4.7.5 Housekeeping

A messy ride area is a hazard for both employees and the public. Constantly check the ride for loose or fallen objects, for spillage or obstructions. Safe housekeeping is a constant activity that goes on throughout the day: it is not a job left for the night time cleanup crew.

Remember that if we have done our job by setting up a clean, exciting and well-lit ride, the public is only looking at the ride; they are not looking out for hazards or debris where they walk.

Also, remember, patrons may believe that if the operating area is messy and unkempt it could reflect that the equipment and maintenance is also messy and unkempt.

4.8 EMPLOYEE TRAINING

Ride operators will go through the corporate mandated training and certification program including proper documentation. These will be made available to Funtime Handels GmbH upon request.

5 OPERATING MODES

5.1 GENERAL OVERVIEW VISUALIZATION

As shown in the figures below, the visualization is split into four fields.

1. header
2. footer
3. information line
4. main screen

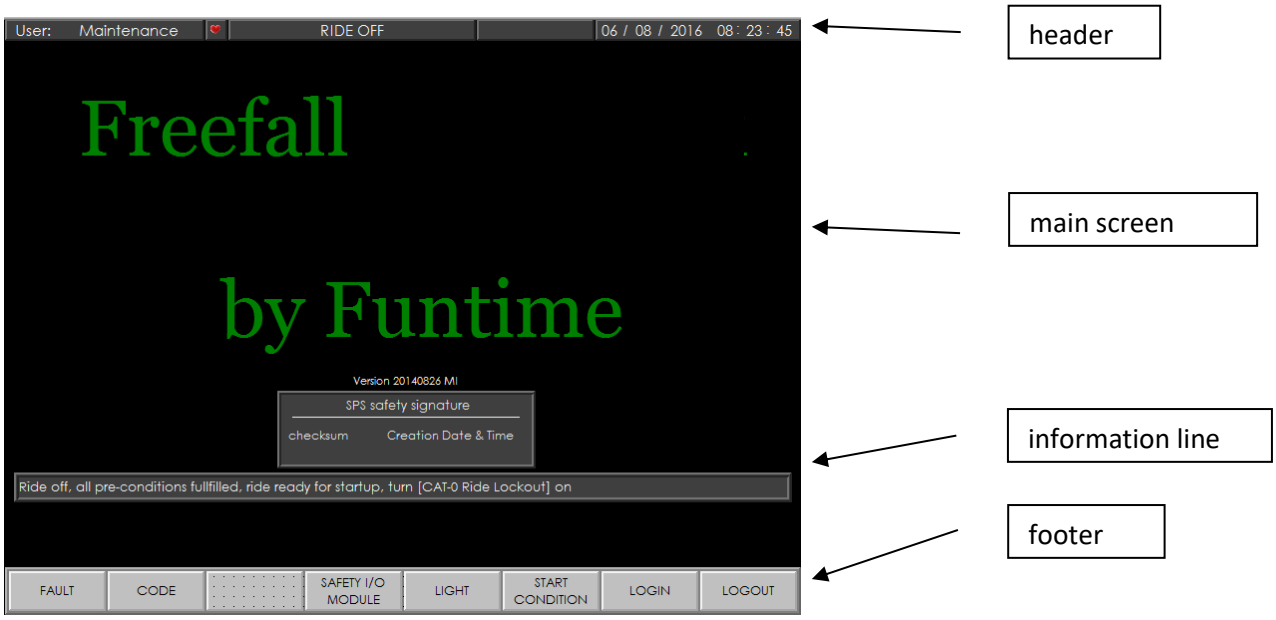


Figure5-1: overview visualization

The header shows the current user, the status of the connection to the controller (beating heart), the set operating mode, the location from where the system is operated and the date and time.

The footer has different functions, depending on the operating mode and the user

The information line shows the operator information about the ride, as well as pre-Conditions and error messages.

The main screen has a lot of different functions which are described in the following chapters.

5.1.1 Login/Logout

To login as a different user, the button "LOGIN" must be pressed. A popup window appears. By pressing "User"/"Password" appears a keyboard, type the user name and password and press Enter to confirm.

Complete the login process by pressing the Enter button in the login window. In the header of the current user can be read.

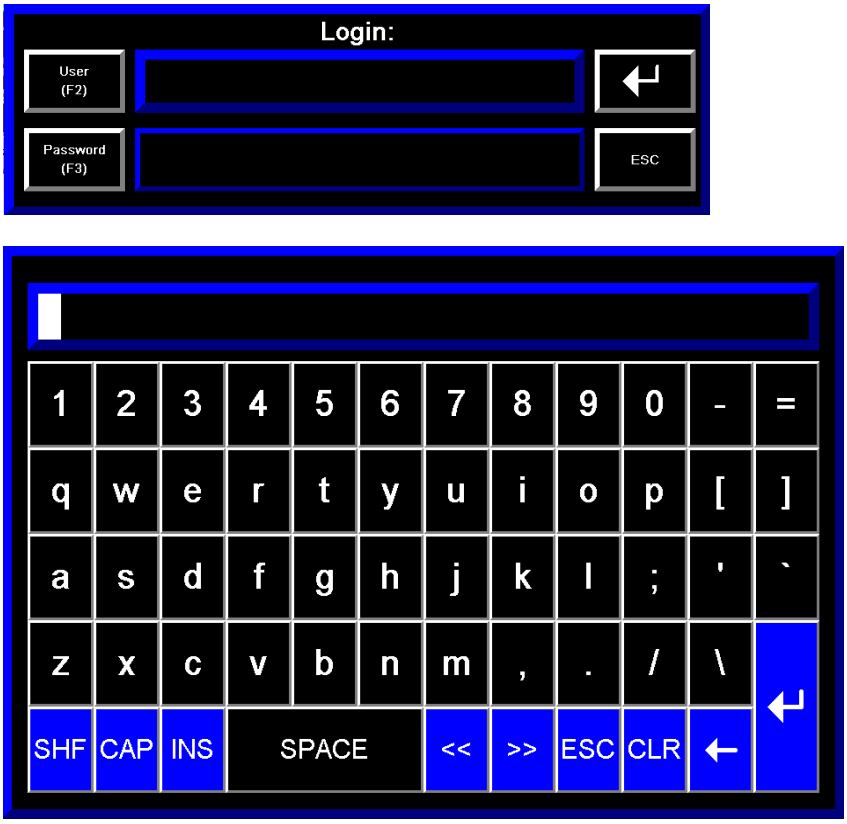


Figure5-2: login windows

To log out, press the "LOGOUT" in the footer. User shows “default”

5.2 SERVICE MODE

The operation Mode Maintenance Mode needs to be selected by the key switch operating mode, and allows various functions of the ride as it will be descript later. In general there are three different operating modes in the maintenance mode.

a) Controlled by OP1 (main operator panel)

b) Controlled by OP10 (wireless operator panel)

NOTE: In maintenance Mode there is no transportation of people allowed.

This mode is only for maintenance and inspections on the ride.

Attention!

Danger due to electrical shock

- **On the tower sections are contactor lines installed which provide electrical power for the carousel. During maintenance on the contactor lines ensure that the whole contactor is "volt-free" and protected against switching back on.**
- **The gondola has its own power supply (battery pack). During maintenance on the electrical installation of the gondola ensure that the fuses are switched off "volt-free".**

5.2.1 Controlled by OP1

5.2.1.1 Ride Startup

Before the ride is turned on the ride off screen is shown. Turn the key switch panel enable on, enable the key switch “Maintenance Enable” and turn the key switch operating mode onto maintenance mode. In the message column the required pre-conditions to startup the ride are shown. Are there pre-conditions missing they will be shown on the message column. If all the pre-conditions for the ride startup are fulfilled the message column will tell you to startup the ride by turning the CAT-0 Ride Lockout at OP1 on. To operate the ride from OP1 also the CAT-0 Ride Lockout at RCC needs to be switched on.

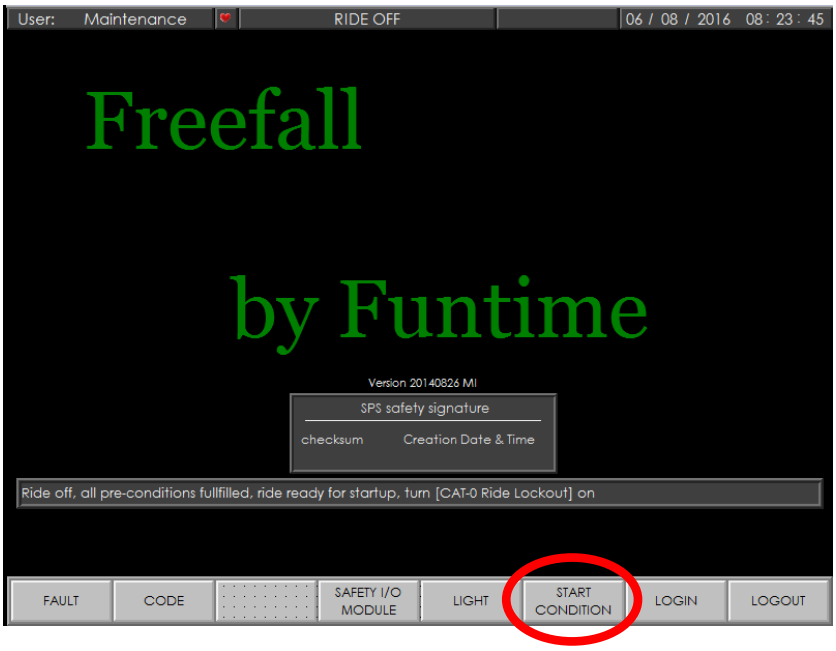


Figure5-3: startup screen

In the case of missing pre-conditions to turn the ride on maintenance can press the select button “PRE-CONDITIONS” in the footer. A popup window called “Ride On Pre-Conditions” is shown. Here you can find which preconditions are missing.

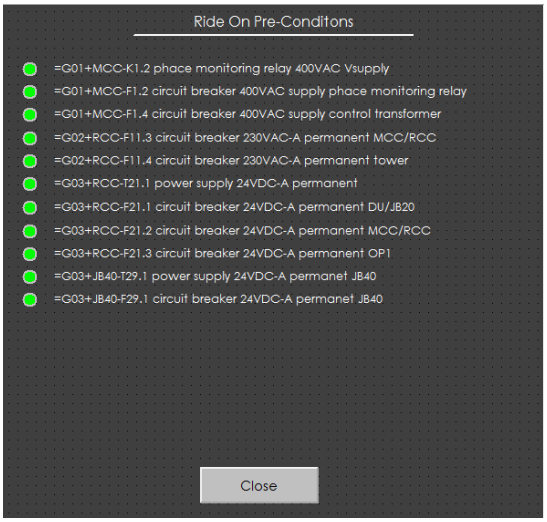


Figure5-4: Ride ON Pre-Conditions

To check the status of the Safety I/O Modules in the network, the select button “Safety I/O-Modules” needs to be pressed. A popup window will appear where all the safety modules on the ride are shown. Each one shows the connection status, input status or output status.

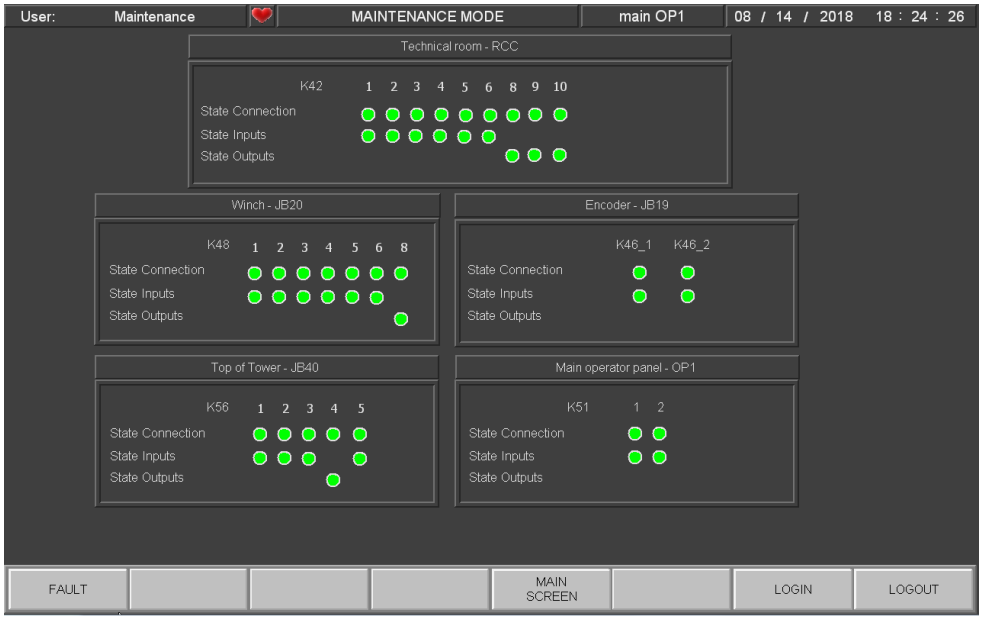


Figure5-5: Safety I/O Module Status

Is the ride turned on the following screen will appear, which provides all kind of functions and information which will be descript in the following chapter.

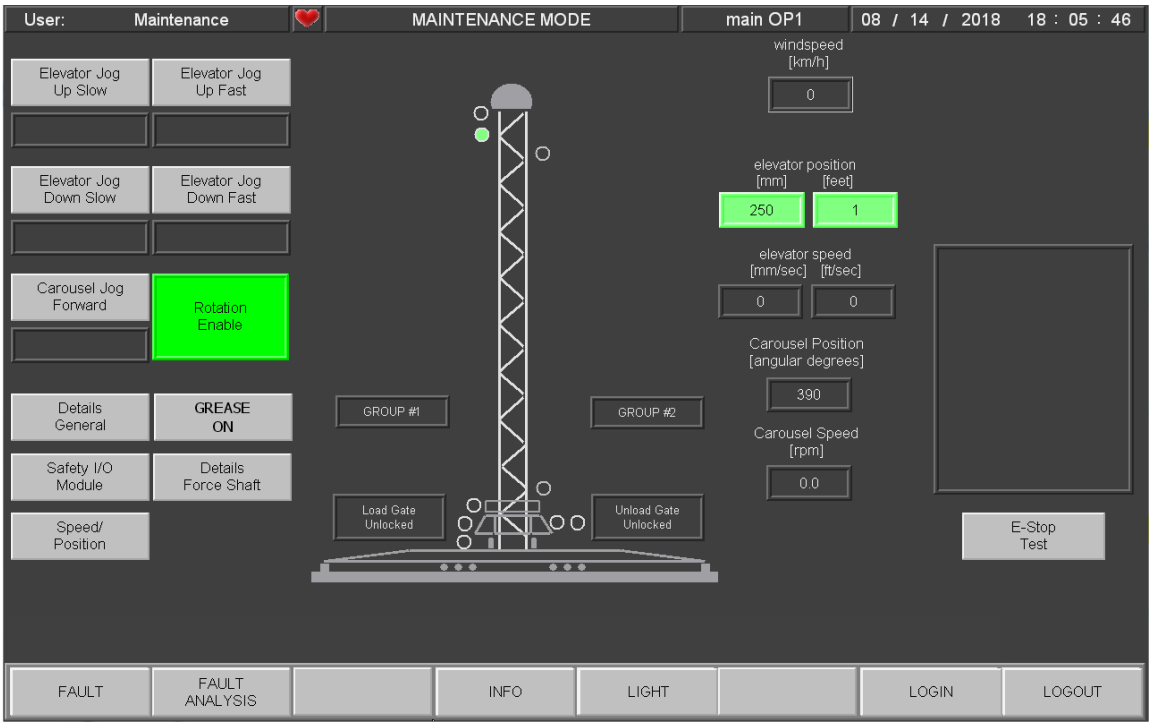


Figure5-6: Maintenance main screen

5.2.1.2 Emergency Push Button Test

After turning on the ride the first time in the day the Emergency Push Button Test needs to be done. By pressing the select button “Emergency Push Button Test” a popup window called Emergency Push Button Verification will come on. There are all Emergency Push Buttons listed. Each Emergency Push Button shows the status when the test needs to be done. When the Emergency Push Button is pressed the status will change to pressed. After the Emergency Push Button is pulled back out the status will change to done.

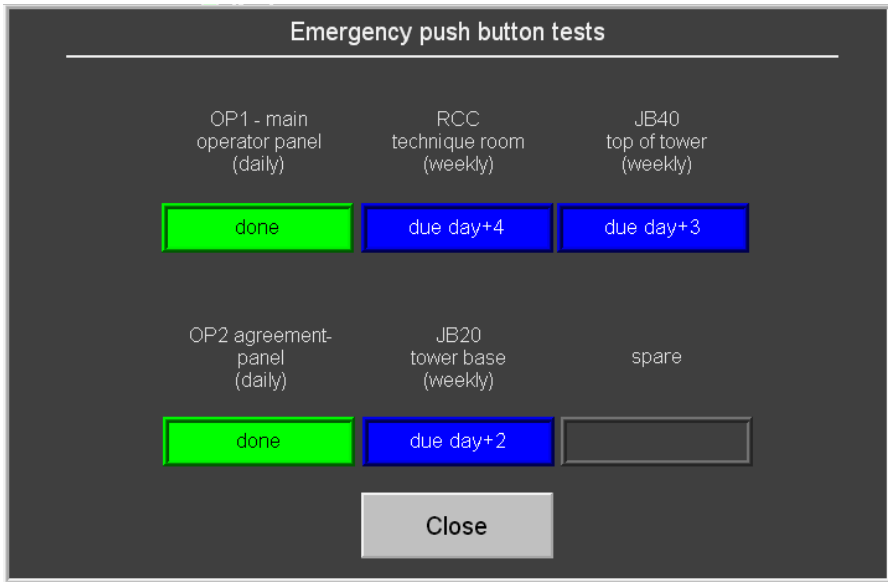


Figure5-7: Emergency push button verification

5.2.1.3 Lamptest

To start the lamp test the selector button “LAMP TEST” needs to be pressed. Therefore the Emergency Push Button needs to be pressed to select the lamp test. By pressing the selector button “LAMPTEST” again the lamp test will stop. Is the lamp test active, all indicator lights at the OP1 and OP2 will blink 1/2s on 1/2s off. By pressing each button the indicator light will change to solid. Are all of the lighted push buttons tested the lamp test will stop automatically, to stop the lamp test manually press the selector button like descript before.

5.2.1.4 General overview Maintenance Screen

The maintenance main screen is divided into the following sections.

1. Fault Section
2. Message Section
3. Speed/Position section
4. Tower Section
5. Seat Groups
6. Jog Section
7. General Section
8. Carousel Section

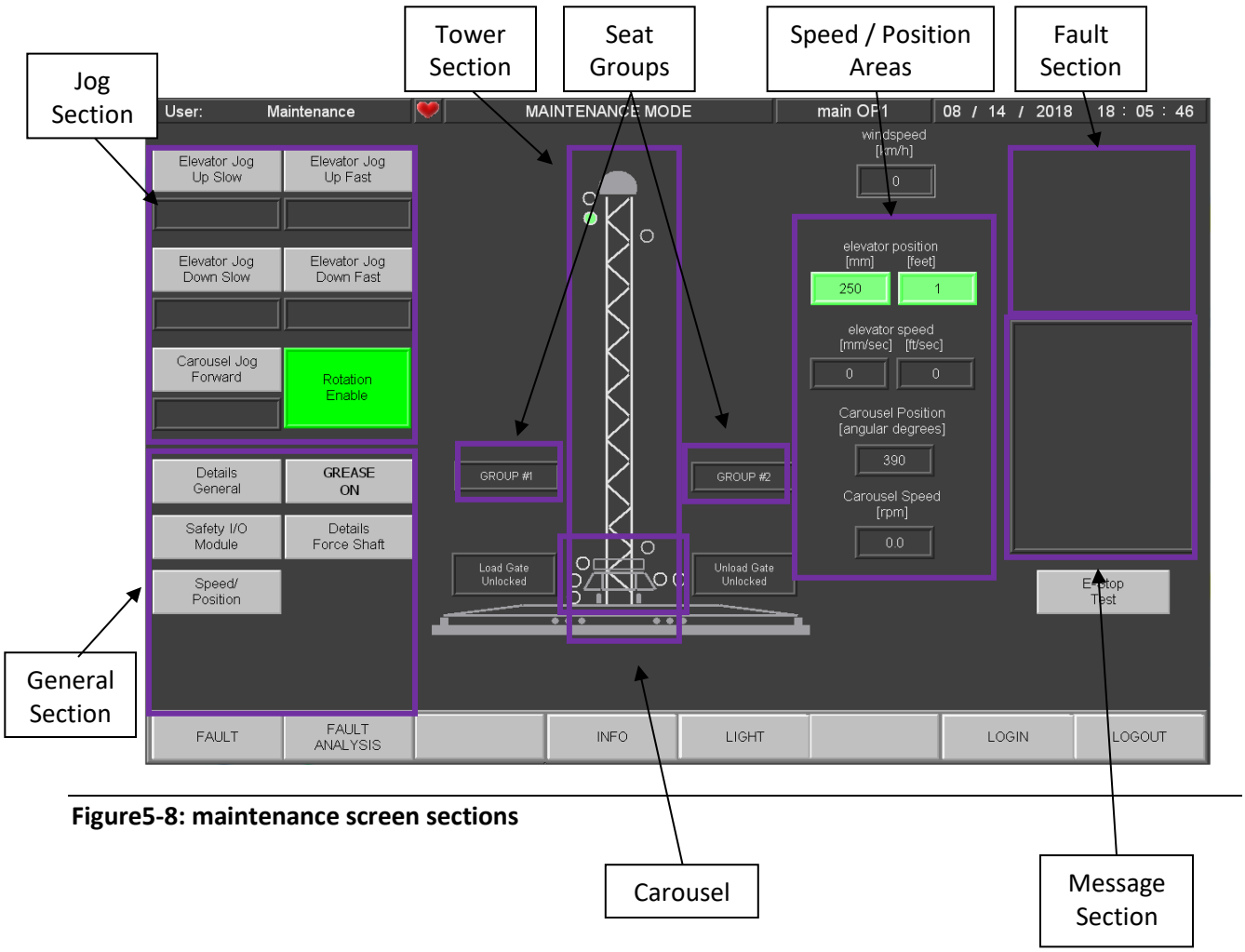
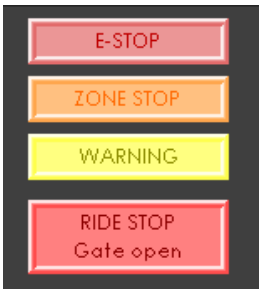


Figure5-8: maintenance screen sections

5.2.1.4.1 Fault Section



The ride has three fault categories.

1. E-Stop
2. Zone-Stop
3. Warning
4. Depending on the pending fault it will be displayed in the fault section and will be on there until the fault is acknowledged. By pressing on the fault in the fault section the fault history off the fault category will be opened in a popup window.

Figure5-9: fault list

5.2.1.4.2 Message Section

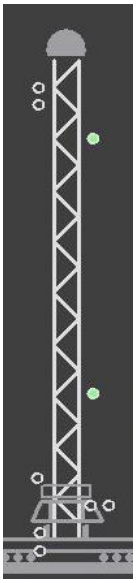
In the message section various information are given depended on what is happening.

5.2.1.4.3 Speed/Position Section

In the speed/position section information is given about the speed and position of the elevator and the carousel. There is also information given about the absolute encoder initialized status

5.2.1.4.4 Tower Section

In the tower section an overview of the ride is given. There is an indicator bar which shows the moving of the elevator. The proximity switches on the tower are shown and they will light green when they are activated. If one of them is faulted a red circle will be around the status light. By pressing the tower on the touch screen a new main screen called Details elevator will show up where various details about the tower and elevator are given. By pressing the carousel on the touch screen a new main sreen called Details carousel will show up where various details about the carousel are given



5.2.1.4.4.1 Details - Elevator

In the details elevator main screen information about the sensors on the tower is given.

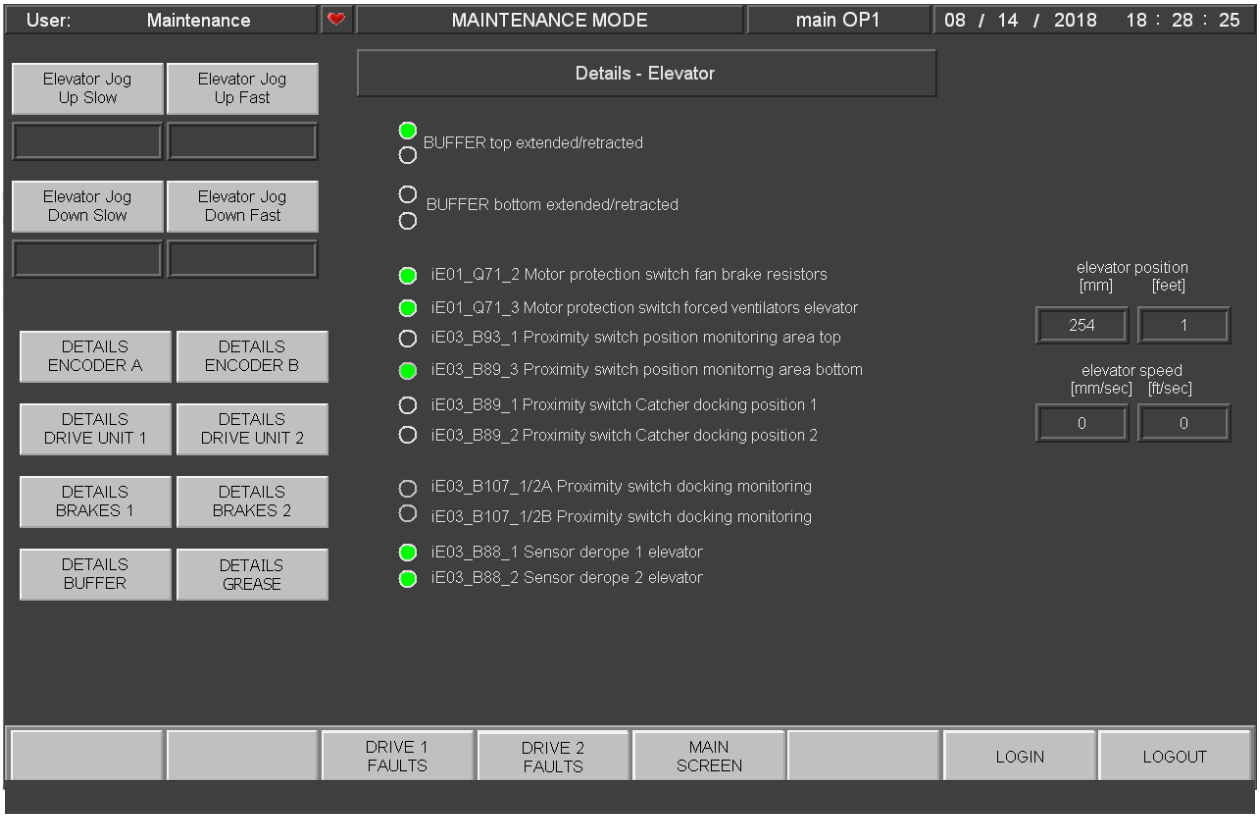


Figure5-10: Details Elevator

There are some more select buttons which open following popup windows and show information about the Input and Outputs, for example:

1. Details Encoder
2. Details Drive Unit
3. Details Brakes
4. Details Puffer

Figure5-11: Details Abs. Encoder Drum and Motor

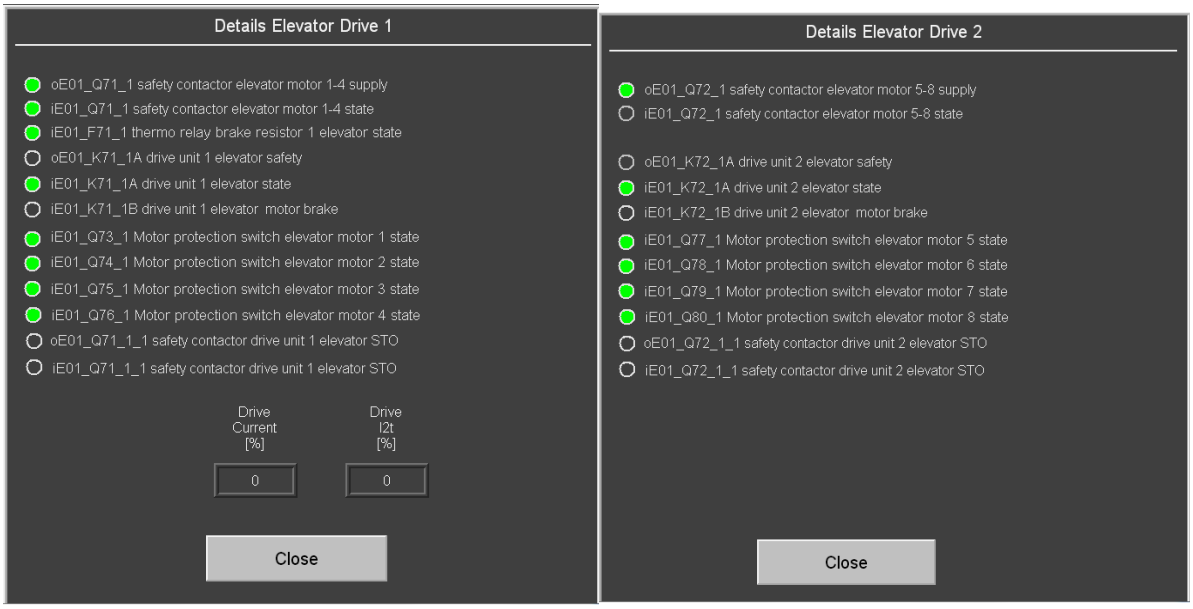


Figure5-12: Details Drive Unit 1 and Unit 2

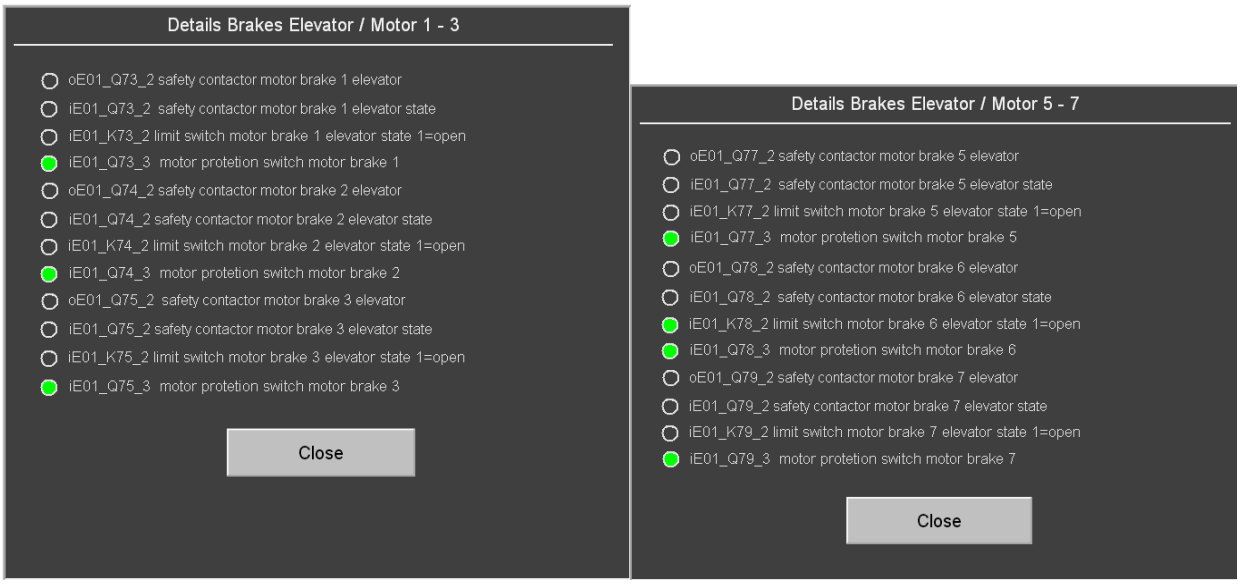


Figure5-13: Details Brakes 1-3 and Brakes 5-7

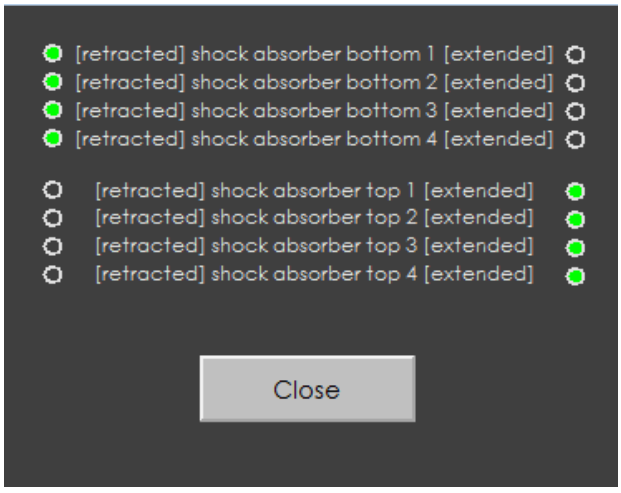
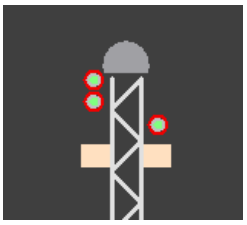


Figure5-14: Details Puffer

By pressing the select button “Drive 1 faults” or “Drive 2 faults” in the footer following popup screen will appear.

Figure5-15: fault handling elevator drive 1 and drive 2

5.2.1.4.5 Carousel Section



In the carousel section there is an indicator bar shown, which shows the rotating of it. By pressing the carousel on the touch screen a new main screen called Details carousel will show up where various details about the carousel are given.

5.2.1.4.5.1 Details - Carousel

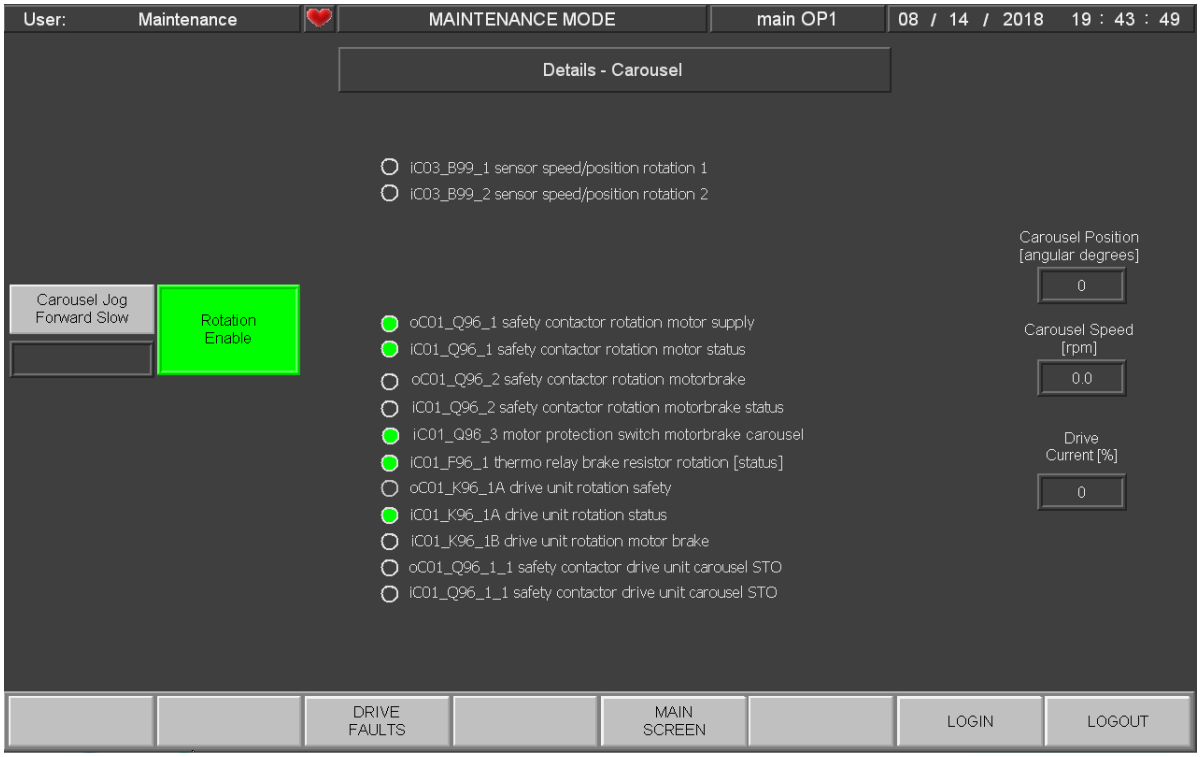


Figure5-16: Details Carousel

5.2.1.4.6 Restraint Section

In the restraint section the status of the restraints of each seat row is shown. Green light indicates the restraints are closed, no light on indicates restraints are opened and red light indicates the restraints are faulted. By pressing the restraint section on the touch screen a popup window will appear and gives you information about restraints and the restraint release.

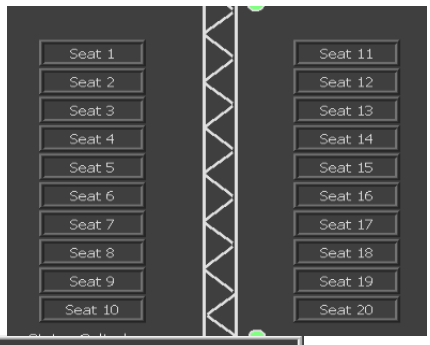


Figure5-17: Information Restraint Control

5.2.1.4.7 Tilt cylinder Section

In the tilt cylinder section the status of the tilt cylinder of each seat is shown. Green light indicates all tilt cylinders are retracted, red light indicates the tilt cylinders are extended. By pressing the tilt cylinder section on the touch screen a popup window will appear and gives you information about tilt cylinders on each seat.

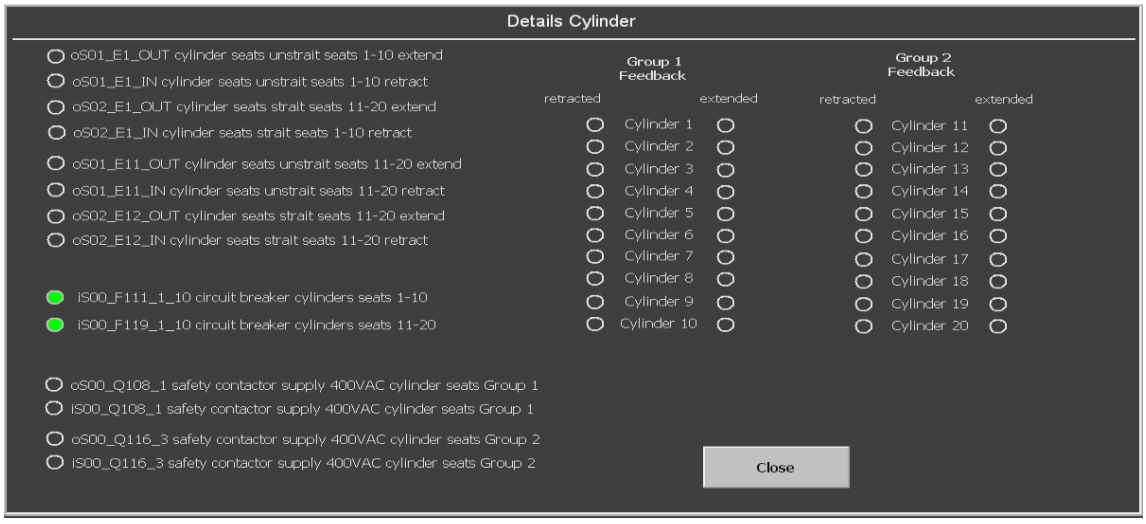
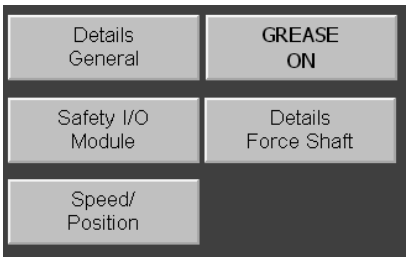


Figure5-8: Information Restraint Control

5.2.1.4.8 Jog Section

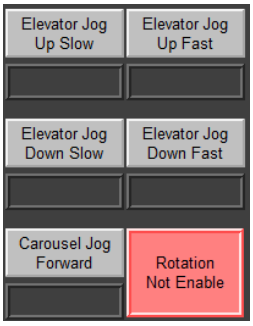
In the Jog Section there are select buttons for Jog Elevator UP/DOWN (Fast and Slow) and Jog Carousel. Below the select buttons there is status field. Is the button selected it will show selected in a red field. Is the function executed it will show executed in a yellow field. The function of the different will be descripting later.



5.2.1.4.9 General Section

In the general section there are selector buttons which will chance the main screen to following screen

- Details General
- Grease ON
- Details Force Shaft
- Safety I/O-Modules
- Speed Position



5.2.1.4.9.1 Details General

In the details general there are more select button for the different locations and functions of the control cabinet and the junction boxes. By selecting those details about Inputs and Outputs are given.

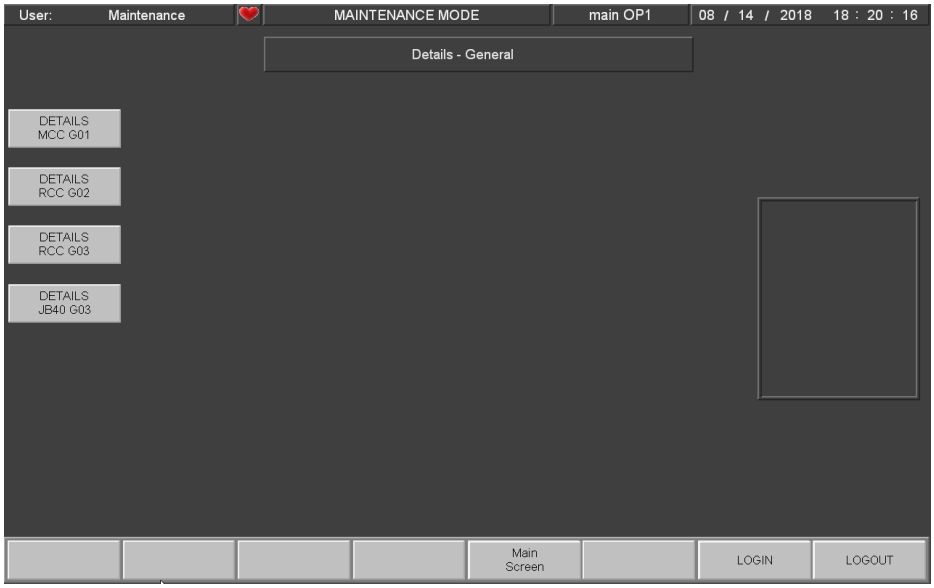


Figure5-18: Details General

5.2.1.4.9.2 Grease ON

By pressing the “Grease ON” Button the Grease Unit starts pumping.

5.2.1.4.9.3 Details Force Shaft

In the detail force shaft, you can see the tension of the cables.

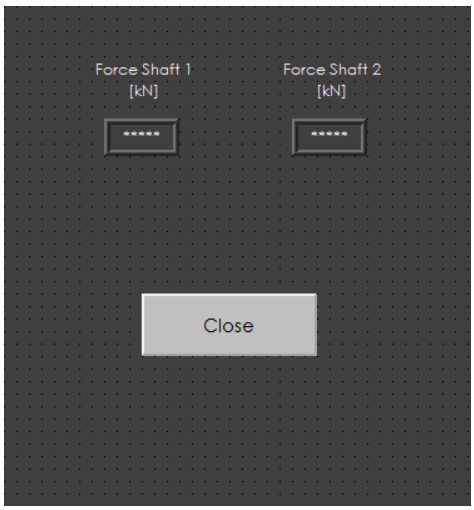


Figure 5-19 Force Shaft

5.2.1.4.9.4 Safety -I/O Module

To check the status of the Safety I/O Modules in the network, the select button “Safety I/O-Modules” needs to be pressed. A popup window will appear where all the safety modules on the ride are shown. Each one shows the connection status, input status or output status.

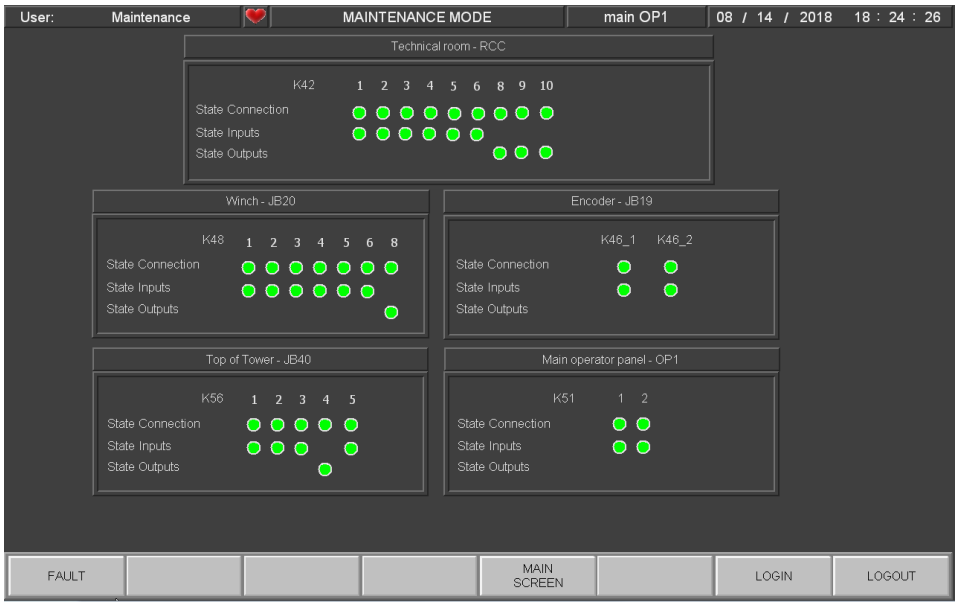


Figure5-20: Safety I/O Module

5.2.1.4.9.5 Speed / Position

In the Speed Position window a graphic is shown, where the violet line shows the elevator speed envelop depending on the elevator height and the green line shows the carousel speed envelop depending on the elevator height. The green dot shows the elevator movement and the violet dots show the carousel movement.

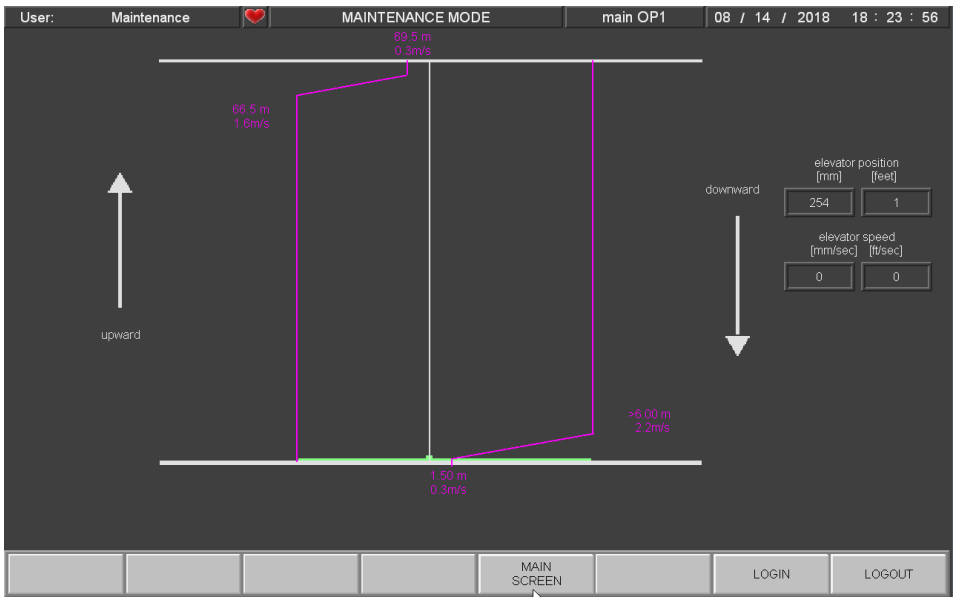
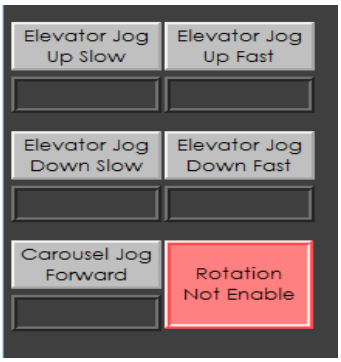


Figure5-21: Speed/Position

5.2.1.5 Jog Functions

Like descript in the Jog Section the required jog function needs to be selected by pressing the select button on the touch panel. Are the jog function selected and the present switch pressed the indicator light on the push button Ride Start on OP1 will blink 1/2s on 1/2s off. By pressing the push button Ride Start on OP1 the jog function will be executed. To stop the present switch needs to be released. To start again the sequence as descript before needs to be done again.



5.2.1.5.1 Elevator Jog UP Slow

The elevator will drive in direction up and will stop at the programmed ride limit.

5.2.1.5.2 Elevator Jog UP Fast

The elevator will drive in direction up and will stop at the programmed ride limit.

5.2.1.5.3 Elevator Jog DOWN Slow

The elevator will drive in direction down and will stop at the entry position.

5.2.1.5.4 Elevator Jog DOWN Fast

The elevator will drive with in direction down and will stop at the entry position.

5.2.1.5.5 Carousel Jog FORWARD Slow

The carousel rotates forward.

5.2.1.6 Faults

By pressing the selector button Faults a new main screen will appear where the fault history is logged. Each fault has a date, a fault number and a description of the fault.

Figure5-22: Overview Faults

5.2.1.7 Trouble Shoot

By pressing the selector button Trouble Shoot a new main screen will appear where the last fault with his fault category is logged.

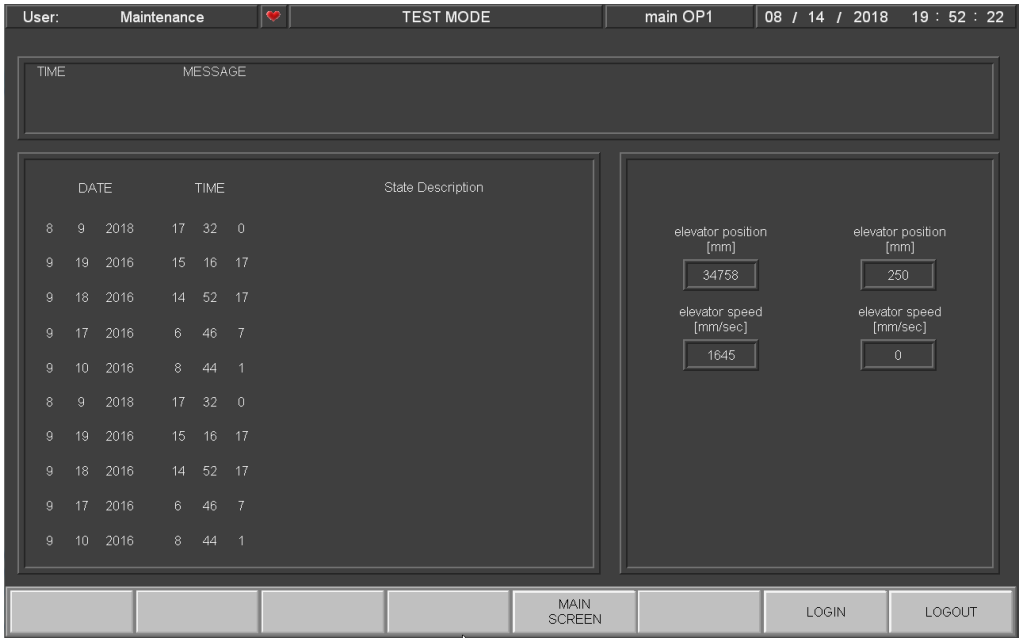


Figure5-23: troubleshoot

5.2.1.8 Statistics

By pressing the selector button Statistics a new main screen will appear where amount of automatic cycles overall and program wise is displayed.

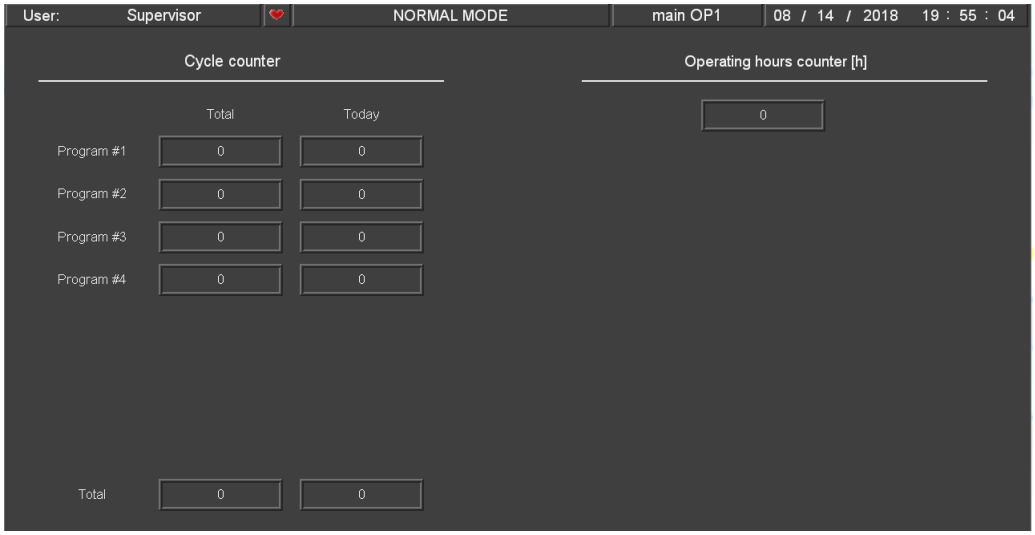


Figure5-24: Statistics

5.2.1.9 Lights

By pressing the selector button Lights a new main screen will appear. On this screen there are select buttons provided to turn the decoration light for the ride on. There is also information provided about the status of the inputs and outputs for the light control.

Figure5-25: Lights window

5.2.1.10 Initializing the absolute encoder

If the absolute encoder needs to be initialized, there will show up a message in the message section when the operating mode maintenance is changed into normal mode. Therefore the elevator needs to be driven up into the middle of the tower in maintenance jog mode and bring it back down into entry position. The encoder is initialized.

Figure5-26: Elevator not initialized

5.2.2 Controlled by OP10

This operating mode is provided for maintenance people to do work on the tower, to inspect cables, wheels spools at the tower. To activate the operation mode following steps need to be done.

- The selector switch at OP1 needs to be ON and the key switch Panel Enable needs to be in the position OFF.
- The selector switch at RCC in the technical room needs to be disabled and locked.
- The OP10 needs to be taken out of its rack.
- At the backside of the OP10 there is a switch. Be sure it is always on also during charging procedure.
- Pull the emergency push button out and press push buttons 7&8 at the same time for three seconds. The status light should come on in solid green.
- The OP10 is now active
- To reset the ride press the push button reset (takes about 10 seconds)
- Now the jog function for elevator and carousel are available

CAUTION:

- **Maintenance people have to make sure that other people are informed that they are working on the tower.**
- **It is not allowed to use the catcher without the safety rings and the little platforms as an elevator for the maintenance and erecting stuff.**

5.2.2.1 Elevator Jog Down Slow

The Jog down slow will stop at the entry position of the ride.

5.2.2.2 Elevator Jog Up Slow

The Jog up slow will stop at the upper position of the ride.

5.2.2.3 Carousel Jog Slow

The carousel Jog Slow enables the maintenance to inspect the functionality of the carousel

5.3 OPERATION MODE TEST MODE

Select with the operating mode key switch „Test Mode“, the screen will change into Test mode.
On the left side of the main screen the different tests can be selected

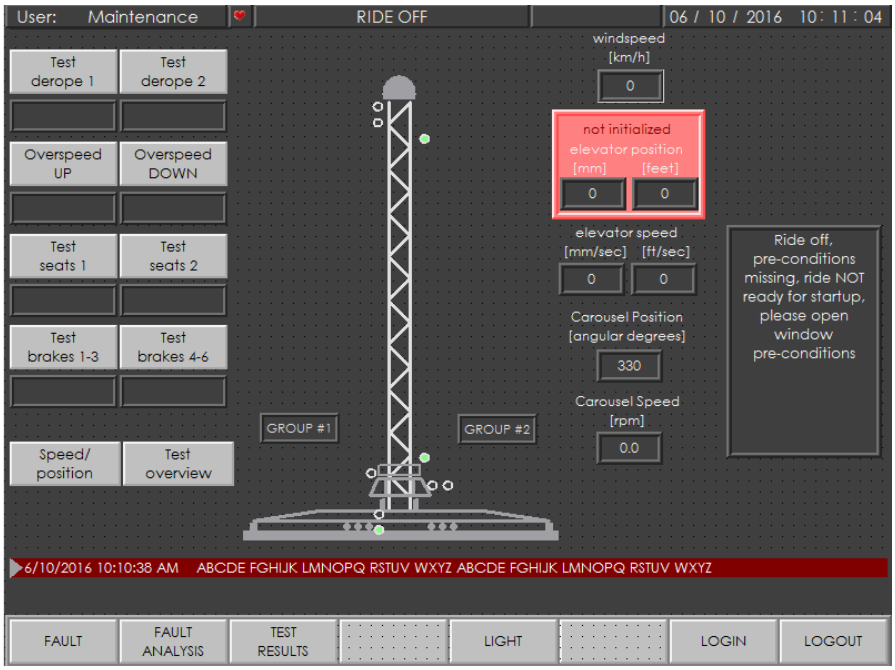


Figure5-27: Test Mode

On the right side there is a select button called Test overview. By pressing this button a popup window will appear and shows for each test when it needs to be done again and as well the status message will change when test is been executed or done.

Attention: All tests must be done without the PCU. Locking mechanism stays open

Figure5-28: Test overview

To view the results of the past and actual test there is a select button in the footer provided called test results. By pressing this select button a new main screen will appear and gives the option to select the different test by pressing them. The test result will be shown, and also if the test passed or failed. The test results need to be logged and compared with the previous ones. Are there changes between them it needs to be verified what caused the changes and make a troubleshooting on the causing equipments.

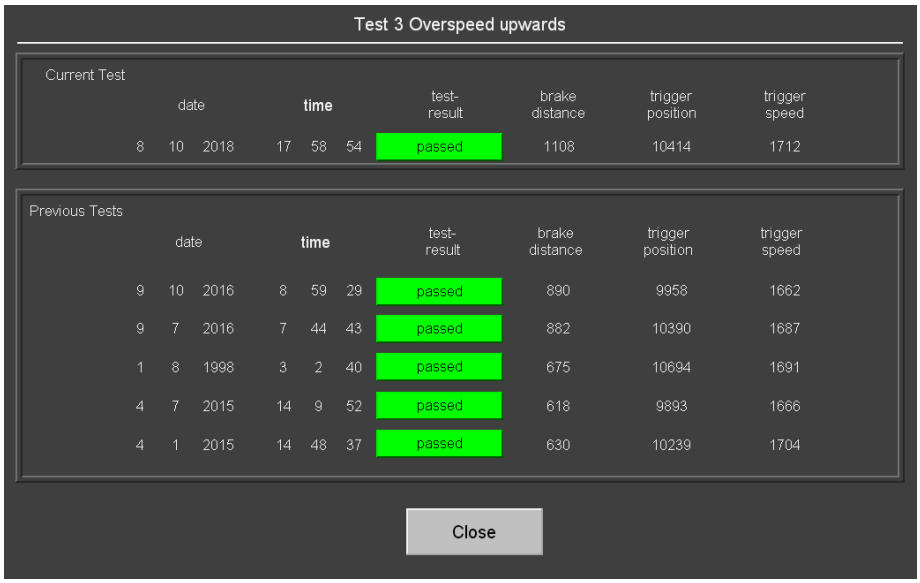


Figure5-29: Test Results

To start a test the elevator needs to be in the entry position and the select button on the touch screen for the required test needs to be pressed. Are the test function selected and the present switch pressed and hold the indicator light on the push button Ride Start on OP1 will blink 1/2s on 1/2s off, and will be executed by pressing the push button ride start on OP1. By releasing the present switch the test function will stop. The provided tests are descripting below.

Daily Tests: Test Seat Cylinder left; Test Seat Cylinder right; Test derope

Weekly Tests: Over speed UP; Over speed DOWN

Monthly Tests: Test brakes 1-4

5.3.1 Over Speed Elevator Up

The elevator will drive up and an e-stop will be triggered at the height of approximately 15m. Check the fault message and the test result. Reset the ride by pressing the push button Acknowledge on OP1 and take the ride back to entry position in Maintenance Mode by using the Jog function.

5.3.2 Over Speed Elevator Down

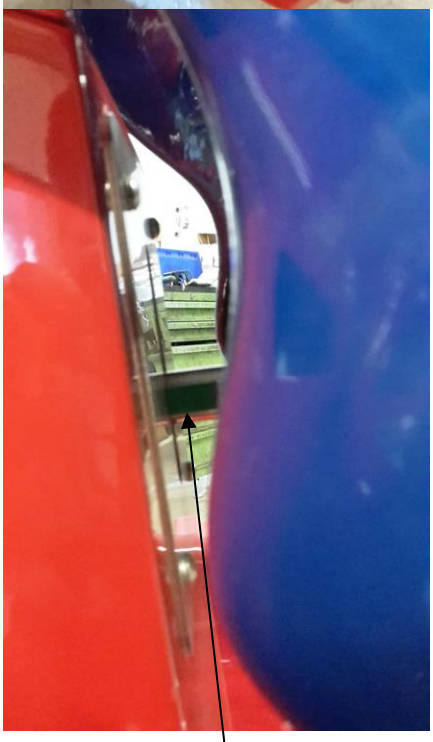
The elevator will drive up on a defined high and then it stops and moves back down. The e-stop will be triggered at the height of approximately 28m. Check the fault message and the test result. Reset the ride by pressing the push button Acknowledge on OP1 and take the ride back to entry position in Maintenance Mode by using the Jog function.

5.3.3 Test Seat Cylinder

Every day, two seats needs to be checked with the restraint test unit. Choose each day other seats, so after 15 days all seats are tested.
The results of the tests must to be logged in a separate document.

Test results:

- **Green Area:** the cylinder is OK
- **Yellow Area:** the restraint unit needs to be inspected (for leaks, mechanical defects, corrosion). If necessary, the test needs to be repeated. If the test index is again in the yellow area, the restraint unit needs to be exchanged
- **Red Area:** the seat needs to be disabled and the restraint unit needs to be exchanged before the seat can be used again



5.3.3.1 Test Seat Cylinder Right

Therefore following steps need to be done:

- PCU needs to be in entry position
- Open the restraints and put the restraint test unit into the seat
- Close all restraints
- Check the color marking. If it is centric in the green area, the test can be started. Should this not be the case, the restraint needs to be closed even harder or the test unit needs to be newly placed in the seat.
- Go immediate to the main panel and select the touch button “Test Seat Cylinder Right”. Press the foot pedal and start the test with the green "Ride Start" button, now you can release the foot pedal. A timer of 5 minutes is starting.
- Only the right cylinder is locked
- While the timer is running, check the other seats by pulling the restraints
- After the time it will shine “Done” under the touch button.
- Check the fault message and the test result

5.3.3.2 Test Seat Cylinder Left

Therefore following steps need to be done:

- PCU needs to be in entry position
- Open the restraints and put the restraint test unit into the seat
- Close all restraints
- Check the color marking. If it is centric in the green area, the test can be started. Should this not be the case, the restraint needs to be closed even harder or the test unit needs to be newly placed in the seat.
- Go immediate to the main panel and select the touch button “Test Seat Cylinder Left”. Press the foot pedal and start the test with the green "Ride Start" button, now you can release the foot pedal. A timer of 5 minutes is starting.
- Only the left cylinder is locked
- While the timer is running, check the other seats by pulling the restraints
- After the time it will shine “Done” under the touch button
- Check the fault message and the test result

5.3.4 Test Derope 1

The elevator is in load/unload position. Activate the derope switching strip by hand (both sensors need to be switched). Check the fault message and the test result.

5.3.5 Test Motorbrake 1

The test will be done only with the catcher. The elevator will drive up to 45m and comes back with 1.4m/s. Only motor brake 1 will be activated and the elevator stops. The other brakes are deactivated and will only activated when the tested brake does not stop the elevator. Check the fault message and the test result. Reset the ride in maintenance mode by pressing the push button Acknowledge on OP1 and take the ride back to entry position by using the Jog function.

5.3.6 Test Motorbrakes 2-4

See chapter above (Test Motorbrake 1). For each brake a separate test needs to be done.

5.4 NORMAL MODE

5.4.1 Single Operator

It is possible to change in operation mode normal from two operators to single operator. Therefore the key switch “maintenance enable” needs to be turned on. Like descript below the operation sequence will be descript for two operator mode. In single operator mode just a few things change which will be explained as follows.

5.4.2 Start the ride

Press and hold the foot pedal. To start, press the start button. After starting, the foot pedal can be released.

5.4.3 Program Selection

There are eight different automatic cycles prepared which can just be selected by supervisor or maintenance. They need to acknowledge their appearance with the key switch “Maintenance enable” or “Supervisor enable”. By pressing the select button “Program Selection” a popup window will appear where the different automatic cycles can be selected.

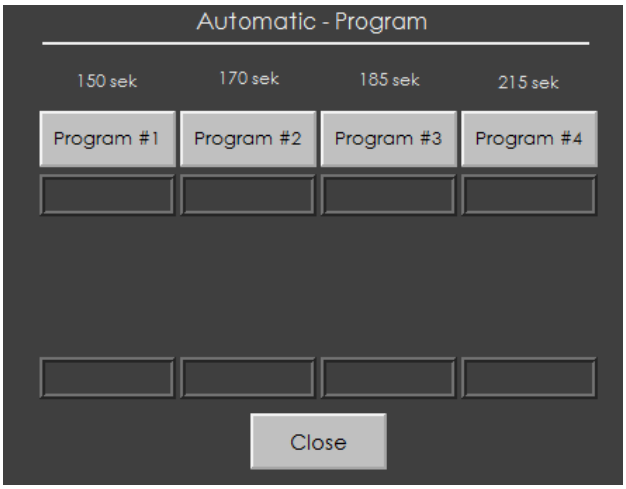


Figure5-30: program selection

5.4.4 Operating Sequence

The ride will be left by the maintenance people in normal mode in the entry position. There should be no faults pending.

- The operator needs to turn the main panel OP1 with the key switch panel enable on.
- By pressing the push button “Unlock Restraints” at the OP1 or OP2 the restraints will be energized for 2 minutes.
- By pressing the push button “Unlock Restraints” again at the OP1 or OP2 the power to the restraint release will be de-energized.
- Operators can now load the PCU with the guests
- Operator need to verify restraints are locked by push/pull proceed (close restraints and pull on it).
- After all restraints are closed the ride is ready to start and the push buttons “Ride Start” at OP1 and “Start Enable” at OP2 are blinking 1/2s on and 1/2s off.
- Before starting the automatic cycle operators need to ensure that the entry area is cleared and all customers are comfortable.
- The operator at the remote operator panel indicates that from his side everything is Ok for starting the ride, by pressing and holding the push button start enable at OP2.
- The operator at the main panel will see his indicator light at the push button ride start flashing 1/10s on and 9/10s off. After he also has ensured that everything is OK on his side he needs to press the push button ride start.
- The automatic cycle will start now and both operators can released the buttons.
- In case if a rider feels uncomfortable and the ride has already been started the operators can stop the ride by pressing the push button ride stop on OP1 or OP2.
- By prosecuting the same procedure as before for starting the automatic cycle the ride will start going down in direction load/unload position.
- In case of a malfunction of the ride the ride can be stopped by pressing the mushroom emergency stop button on OP1 and OP2
- In case of a fault the ride will stop and maintenance needs to be called to reset the fault.

- When the elevator reaches the position before releasing the PCU, the “Release” push button starts blinking. By pressing the “Release” push button the elevator continues going up slow till the catcher releases the PCU.
- When the PCU arrives the load/unload position the operator can open the restraints and unload riders
- Now the procedure will start from the beginning

5.5 OPERATION MODE EVACUATION MODE

After a fault has pending on the ride and the maintenance has reset the ride. The maintenance has to activate evacuation mode by switching the “operating mode” key switch from normal mode to evacuation mode. The maintenance has to be at the ride all time while evacuation mode is active. Now the operators can start the evacuation. To operate in Evacuation mode the "Start Enable" push button on OP2 and the "Ride Start" push button at OP1 need to be pressed all time long, until the ride stops.

Depending on the different conditions the ride will straight come down if the PCU is above the load/unload position. Is the PCU close to the load/unload position first the elevator will go up before lowering again to load/unload position. After the guests are unloaded the maintenance will need to set up ride for Normal Mode.

Single or dual Operation is also available in Evacuation Mode

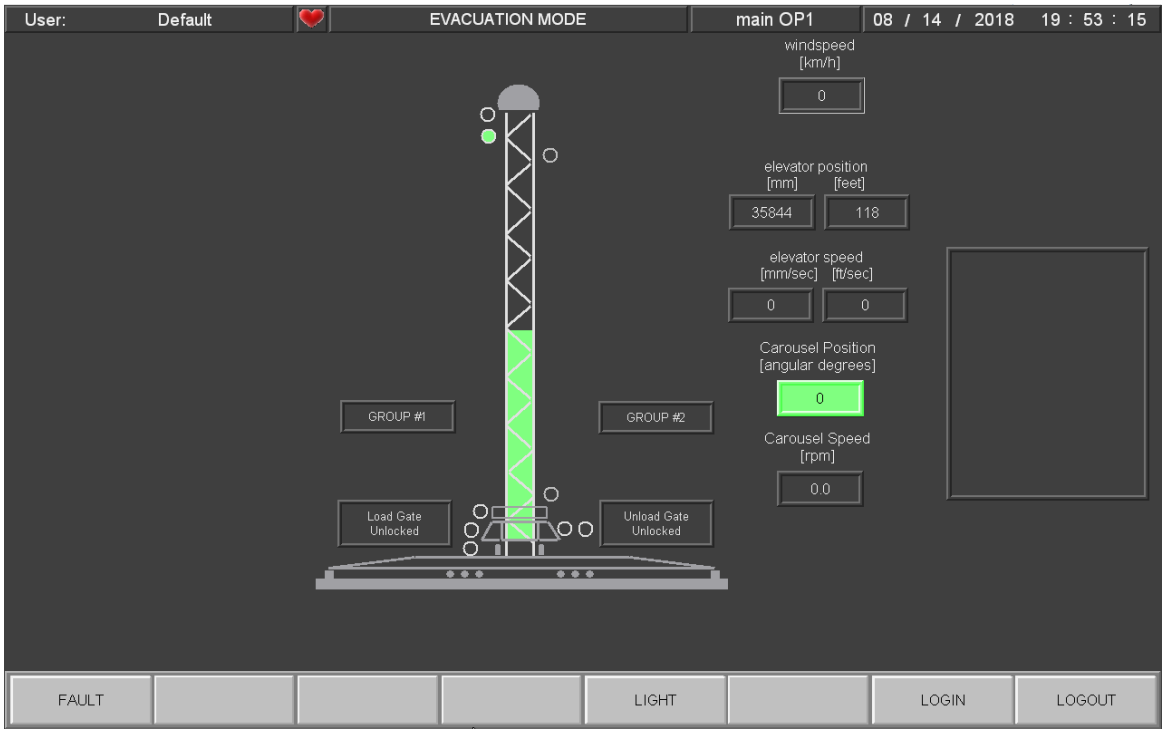


Figure5-31: Evacuation mode

5.6 UNPOWERED EVACUATION

There are two options for unpowered evacuation:

a. Open motorbrakes if gear and mechanical system are ok
b. Manual release the gondola in case the gear is damaged

5.6.1 Evacuation by open motorbrakes

Open motorbrakes 1 and 2 and leave they open
Open motorbrake 3 by hand, gondola moves down, control the speed with the hand handle
Take care and make sure that the brakes will be not too hot. Make stops and change between brakes 1,2 and 3,4 with opening, to prevent an overheating of the brakes.

5.6.2 Evacuation by manual release

At first, fix the catcher on two sides like the pictures below. The catcher may not take a movement upwards.

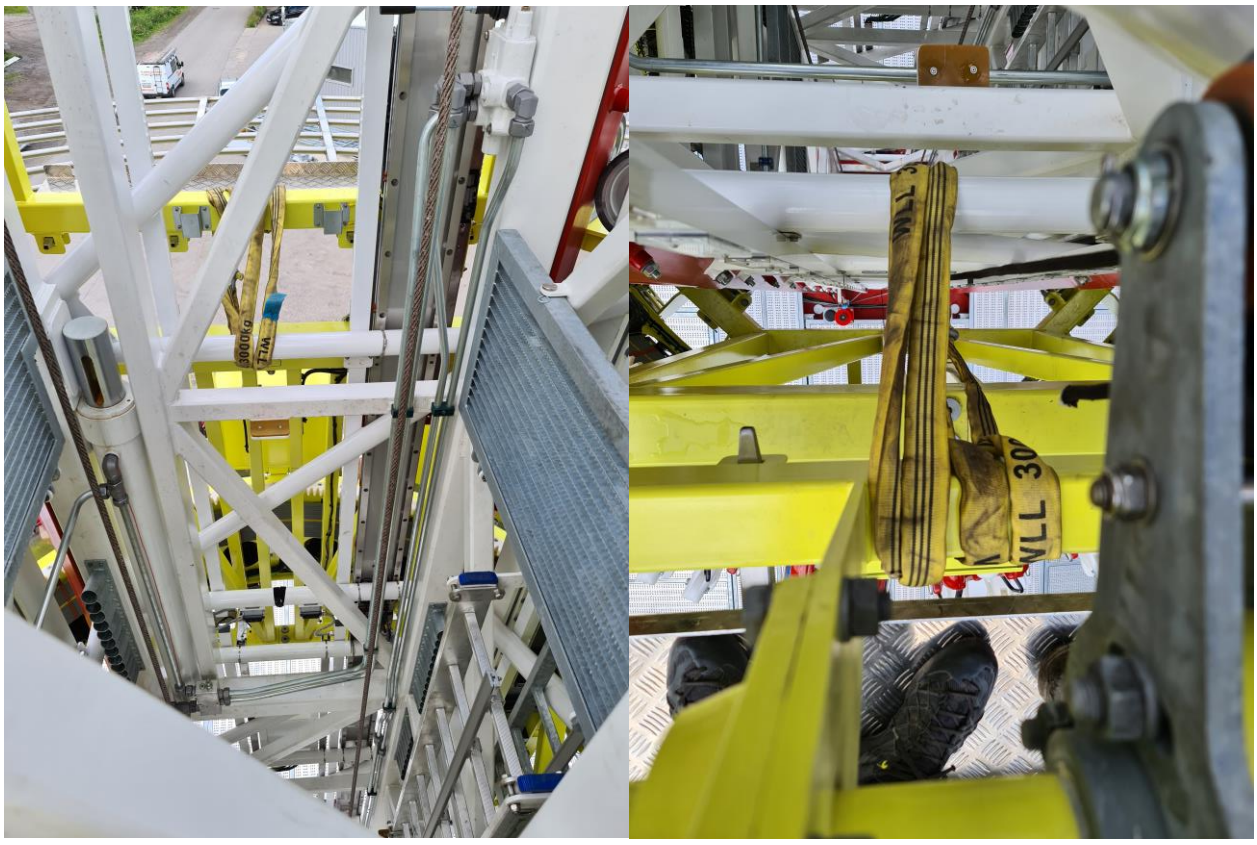


Figure 5-32 Fixing the catcher

Fix a rope on the release mechanism outside the tower. On the bottom end of the tower, mount a pulley.
To release the gondola now, it needs a strong pull on the rope.
Attention: the gondola moves down, make sure all peoples are in a safety distance!!!!

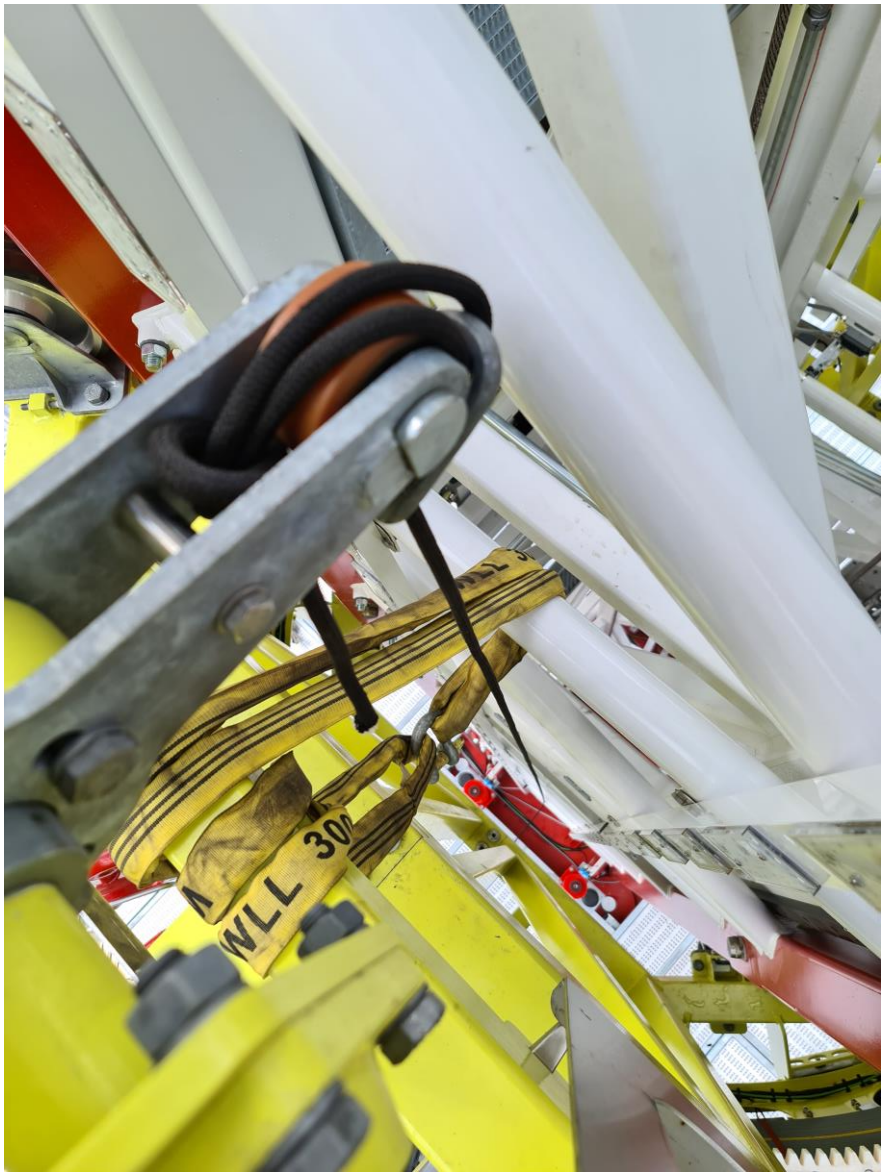


Figure 5-33 Rope on the release mechanism

Figure 5-34 Pulley on the bottom side of tower

Figure 5-35 Release gondola by pulling the rope

6 MAINTENANCE AND SERVICE

6.1 DAILY PRE-OPERATION CHECKPOINTS AND PROCEDURES

Prior to each day's activities, a thorough equipment check must be completed using the supplied checklist (Appendix A). It also should be noted that this procedure must be given utmost attention in order to minimize the possibility of an adverse outcome.
We allow for inspection frequency to be based upon time or cycle number. These break down as follows:

- Daily or 250 cycles
- Weekly or 1,500 cycles
- Monthly or 6,000 cycles
- Annually (all annual checks must be performed each year, even if the cycle count is less than 72,000)

6.1.1 Site Inspection

2. ***Load/Unload*:** Check and make sure all appropriate supplies are available for Certified Operator.
3. ***Fencing*:** All in place and will deter spectators from entering into the defined area.
4. ***Safety, Prohibitory and Restrictive signs***

6.1.2 Helpful Tips for a Thorough Inspection

Note the difference between mentally checking something and physically checking something. In activities such as inspections, the individual can become complacent in the methods they are using. It is imperative that we are able to break this cycle by concentrating on what it is that we are inspecting. Therefore, confirm all check procedures one at a time. Do not rush through these procedures. Make sure you are not pre-occupied. Finally, do not put your signature on the Daily Inspection Log unless you are certain that you have completed the inspection with your full attention and that all items have been checked and the equipment is in safe operating condition. If you feel that you are not fully competent with this task consult your superior immediately!

6.2 CHECKLIST

Maintenance Manual - Freefall Park with tilt seats

Month:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Gondola																															
O Steel structure - corrosion, damage, cracks, deformation, …																															
O Seats - fastening, damage, cracks, …																															
O Fastening of the Seats on the tilt unit structure																															
O Tilt unit steel structure - corrosion, damage, cracks, deformation, …																															
O Tilt unit guidances and guide wheels - fastening, wear, deformation, function																															
O Tilt unit cover and decoration lights - fastening, damage, cracks, function																															
O Bolt connections - pay attention to loose bolts, corrosion																															
O Fastening of the brake magnets (see manual Intrasys)																															
O Clean brake magnets (metal shavings, ...)																															
O Brake magnets - damage, deformation (magnets must NOT touching the brake fins)																															
O Greasing the pin for the catcher hook monthly																															
O Polyamid blocks (emergency guide blocks) - fastening, adjustment and wear																															
O Guide wheels - adjustment, fastening and wear (noises from bearings, wheel tread)																															
O Greasing the guide wheels monthly																															
O Connection of the gondola parts																															
O Limit switches on the harness - mounting and function																															
O Big gearing - fastening, wear																															
O Gear wheel and Drive Motor - fastening, wear, right adjustment																															
O Gear oil - replacement every 2 years																															
O Safety cylinders Hoerbiger - single function test - (seat cylinder test documentation)																															
O Safety cylinders Hoerbiger - fastening and leakage																															
O Shoulder harness - mounting and damages																															
O Electric slip ring parts, brushes - fastening, function, wiring, demage, wear …																															
O Entry height to the seats																															
O Electric boxes and wiring - condition and fastening																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Tower																															
O Steel structure - corrosion, damage, cracks, deformation, …																															
O Bolt connections - pay attention to loose bolts, corrosion																															
O Ladder and fall protection rail - conditon and fastening																															
O Guide rails - condition, adjustment, lining up, fastening, corrosion, …																															
O Brake fins - condition, adjustment, lining up, fastening, corrosion, …																															
O Bolt connections on the brake fins - retorque the bolt connections yearly (see manual Intrasys)																															
O Tower top decoration - condition, fastening, corrosion, lights, …																															
O Limit switches in / on the tower - fastening and function																															
O Cable sheaves - fastening, light and smooth running, no abnormal noises,....																															
O Rope guides - right adjustment and wear																															
O Bearings cable sheaves - greasing the bearings monthly																															
O Puffers Tower Top - fastening, function, leakage, limit swich, ...																															
O Puffer Tower Bottom - fastening, function, leakage, limit switch, …																															
O Release Rail Tower Top - fastening, condition, …																															
O Electric slip rings on the tower - fastening, adjustment, wiring, condition, …																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Catcher																															
O Steel structure - corrosion, damage, cracks, deformation, …																															
O Release mechanism - fastening, function, wear, corrosion, …																															

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
O	Symmetric Release of both hooks																															
O	Release mechanism - greasing monthly																															
O	Rubber puffers - condition and fastening																															
O	Guide wheels - adjustment, fastening and wear (noises from bearings, wheel tread)																															
O	Steel cable attachment - damage, cracks, corrosion, …																															
O	Steel cables - condition, damage, equal tension (+/- 50kg)																															
O	Brushes and cables from slip ring system - damage, cracks, deformation, wear																															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Winch and Steel Cables																															
O	Winch - fastening																															
O	Winch drum - wear																															
O	Steel structure - corrosion, damage, cracks, deformation, …																															
O	Slewing - fastening, wear, abnormal noises, …																															
O	Slewing and gear wheels - gear spray																															
O	Slewing - greasing																															
O	Gear boxes - oil level and leakage																															
O	1. Oil change after app. 100 operation hours																															
O	Oil change every 2 years																															
O	Steel cable fastenings on the winch																															
O	Guide wheels for steel cables on the winch - condition, fastening, wear,…																															
O	Steel Cables - over the whole length - broken wires, damage, wear, corrosion, …																															
O	Steel cables - equal tension of both cables (+/- 50kg)																															
O	Operation brakes on the motor, function and wear																															
O	Brake test monthly																															
O	Rotary counter, limit switches, rope limit switch - fastening, condition, function, …																															
O	Electric wiring on the winch																															
O	Electric boxes - fastening, condition, …																															
O	Steel cable replacement - after app. 260.000 ride cycles or 10 years																															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Elektric																															
O	Limit switches, electric junction boxes, rotary counters - fastening and condition																															
O	Air Condition for main electric cabinet (heating system for the winter saison)																															
O	Function test of the ride																															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Fences and Gates																															
O	Steel structure - corrosion, damage, cracks, deformation, …																															
O	Gates - function test																															
	Test Operation																															
O	Test operation without passengers must be performed before starting operation.																															
	Safety equipment																															
O	Extinguisher																															
O	Climbing harness with fall stopper unit																															

Attention: Take care that you leave no material (spare parts, etc.) and / or tools on the ride after repair or service work.

The undersigned is the person responsible for having controlled the equipment according to the maintenance and check-list. Repairs have to be written down and entered into a list.

Place / Date:

…… **Signature:**

7 TROUBLESHOOT

7.1 RIDE REACTIONS

Depending on the fault category there are three different stop sequences.

- E-Stop (1): cuts immediately the power to the elevator and the carousel and is closing the safety brake and the motor brake.
- Zone-Stop(2):stops the motion of the causing device through a controlled stop
- Warning(3): with a warning pending the ride cycle will finish, but will not allow to start a new cycle

7.2 FAULT LIST

Below each fault is listed.

Fault from the Safety task are called FSF and the ones from the Standard task are called STF.

FSF[0].0; =G01+MCC-CON6.1, main contactor 1 [480VAC supply incoming power] not off	E-Stop
FSF[0].1; =G01+MCC-CON6.1, main contactor 1 [480VAC supply incoming power] not on	E-Stop
FSF[0].2; =G01+MCC-CON6.2, main contactor 2 [480VAC supply incoming power] not off	E-Stop
FSF[0].3; =G01+MCC-CON6.2, main contactor 2 [480VAC supply incoming power] not on	E-Stop
FSF[1].0; =G02+RCC-CON34.1, safety contactor [120VAC-B, ride ON/OFF] not off	E-Stop
FSF[1].1; =G02+RCC-CON34.1, safety contactor [120VAC-B, ride ON/OFF] not on	E-Stop
FSF[1].2; =G02+RCC-CON35.1, safety contactor [120VAC-C, E-STOP channel A] not off	E-Stop
FSF[1].3; =G02+RCC-CON35.1, safety contactor [120VAC-C, E-STOP channel A] not on	E-Stop
FSF[1].4; =G02+RCC-CON35.2, safety contactor [120VAC-C, E-STOP channel B] not off	E-Stop
FSF[1].5; =G02+RCC-CON35.2, safety contactor [120VAC-C, E-STOP channel B] not on	E-Stop
FSF[2].0; =G03+JB40-CON94.1, safety contactor [24VDC-B, JB40, ON/OFF] not off	E-Stop
FSF[2].1; =G03+JB40-CON94.1, safety contactor [24VDC-B, JB40, ON/OFF] not on	E-Stop
FSF[2].2; =G03+JB40-CON94.1, safety contactor [24VDC-B, JB40, ON/OFF] not on at start	E-Stop
FSF[50].1; =G05+RCC-PLC41:1, Safety IO Module communication fault	E-Stop
FSF[50].11; =G05+RCC-PLC41:1, Safety IO Module input fault	E-Stop
FSF[50].2; =G05+RCC-PLC41:2, Safety IO Module communication fault	E-Stop
FSF[50].12; =G05+RCC-PLC41:2, Safety IO Module input fault	E-Stop
FSF[50].6; =G05+RCC-PLC41:6, Safety IO Module communication fault	E-Stop
FSF[50].16; =G05+RCC-PLC41:6, Safety IO Module output fault	E-Stop
FSF[51].1; =G05+MCC-PLC8:1, Safety IO Module communication fault	E-Stop
FSF[51].11; =G05+MCC-PLC8:1, Safety IO Module input fault	E-Stop
FSF[51].2; =G05+MCC-PLC8:2, Safety IO Module communication fault	E-Stop
FSF[51].12; =G05+MCC-PLC8:2, Safety IO Module input fault	E-Stop
FSF[51].3; =G05+MCC-PLC8:3, Safety IO Module communication fault	E-Stop
FSF[51].13; =G05+MCC-PLC8:3, Safety IO Module input fault	E-Stop

FSF[51].7; =G05+MCC-PLC8:7, Safety IO Module communication fault	E-Stop
FSF[51].17; =G05+MCC-PLC8:7, Safety IO Module output fault	E-Stop
FSF[51].8; =G05+MCC-PLC8:8, Safety IO Module communication fault	E-Stop
FSF[51].18; =G05+MCC-PLC8:8, Safety IO Module output fault	E-Stop
FSF[51].9; =G05+MCC-PLC8:9, Safety IO Module communication fault	E-Stop
FSF[51].19; =G05+MCC-PLC8:9, Safety IO Module output fault	E-Stop
FSF[52].1; =G05+OP1-PLC286:1, Safety IO Module communication fault	E-Stop
FSF[52].11; =G05+OP1-PLC286:1, Safety IO Module input fault	E-Stop
FSF[52].2; =G05+OP1-PLC286:2, Safety IO Module communication fault	E-Stop
FSF[52].12; =G05+OP1-PLC286:2, Safety IO Module input fault	E-Stop
FSF[53].1; =G05+JB20-PLC73:1, Safety IO Module communication fault	E-Stop
FSF[53].11; =G05+JB20-PLC73:1, Safety IO Module input fault	E-Stop
FSF[53].2; =G05+JB20-PLC73:2, Safety IO Module communication fault	E-Stop
FSF[53].12; =G05+JB20-PLC73:2, Safety IO Module input fault	E-Stop
FSF[53].3; =G05+JB20-PLC73:3, Safety IO Module communication fault	E-Stop
FSF[53].13; =G05+JB20-PLC73:3, Safety IO Module input fault	E-Stop
FSF[53].4; =G05+JB20-PLC73:4, Safety IO Module communication fault	E-Stop
FSF[53].14; =G05+JB20-PLC73:4, Safety IO Module input fault	E-Stop
FSF[53].5; =G05+JB20-PLC73:5, Safety IO Module communication fault	E-Stop
FSF[53].15; =G05+JB20-PLC73:5, Safety IO Module input fault	E-Stop
FSF[53].6; =G05+JB20-PLC73:6, Safety IO Module communication fault	E-Stop
FSF[53].16; =G05+JB20-PLC73:6, Safety IO Module input fault	E-Stop
FSF[53].8; =G05+JB20-PLC73:8, Safety IO Module communication fault	E-Stop
FSF[53].18; =G05+JB20-PLC73:8, Safety IO Module output fault	E-Stop
FSF[54].1; =G05+JB40-PLC95:1, Safety IO Module communication fault	E-Stop
FSF[54].11; =G05+JB40-PLC95:1, Safety IO Module input fault	E-Stop
FSF[54].2; =G05+JB40-PLC95:2, Safety IO Module communication fault	E-Stop
FSF[54].12; =G05+JB40-PLC95:2, Safety IO Module input fault	E-Stop
FSF[54].4; =G05+JB40-PLC95:4, Safety IO Module communication fault	E-Stop
FSF[54].14; =G05+JB40-PLC95:4, Safety IO Module output fault	E-Stop
FSF[54].5; =G05+JB40-PLC95:5, Safety IO Module communication fault	E-Stop
FSF[54].15; =G05+JB40-PLC95:5, Safety IO Module input fault	E-Stop
FSF[56].1; =G05+JB90-PLC133:1, Safety IO Module communication fault	Warning
FSF[56].11; =G05+JB90-PLC133:1, Safety IO Module input fault	Warning
FSF[56].2; =G05+JB90-PLC133:2, Safety IO Module communication fault	Warning
FSF[56].12; =G05+JB90-PLC133:2, Safety IO Module input fault	Warning
FSF[56].3; =G05+JB90-PLC133:3, Safety IO Module communication fault	Warning
FSF[56].13; =G05+JB90-PLC133:3, Safety IO Module input fault	Warning
FSF[56].4; =G05+JB90-PLC133:4, Safety IO Module communication fault	Warning
FSF[56].14; =G05+JB90-PLC133:4, Safety IO Module input fault	Warning
FSF[56].5; =G05+JB90-PLC133:5, Safety IO Module communication fault	Warning
FSF[56].15; =G05+JB90-PLC133:5, Safety IO Module input fault	Warning
FSF[56].6; =G05+JB90-PLC133:6, Safety IO Module communication fault	Warning
FSF[56].16; =G05+JB90-PLC133:6, Safety IO Module input fault	Warning
FSF[56].7; =G05+JB90-PLC133:7, Safety IO Module communication fault	Warning
FSF[56].17; =G05+JB90-PLC133:7, Safety IO Module output fault	Warning
FSF[57].1; =G05+JB91-PLC152:1, Safety IO Module communication fault	Warning

FSF[57].11; =G05+JB91-PLC152:1, Safety IO Module input fault	Warning
FSF[57].2; =G05+JB91-PLC152:2, Safety IO Module communication fault	Warning
FSF[57].12; =G05+JB91-PLC152:2, Safety IO Module input fault	Warning
FSF[57].3; =G05+JB91-PLC152:3, Safety IO Module communication fault	Warning
FSF[57].13; =G05+JB91-PLC152:3, Safety IO Module input fault	Warning
FSF[57].4; =G05+JB91-PLC152:4, Safety IO Module communication fault	Warning
FSF[57].14; =G05+JB91-PLC152:4, Safety IO Module input fault	Warning
FSF[57].5; =G05+JB91-PLC152:5, Safety IO Module communication fault	Warning
FSF[57].15; =G05+JB91-PLC152:5, Safety IO Module input fault	Warning
FSF[57].6; =G05+JB91-PLC152:6, Safety IO Module communication fault	Warning
FSF[57].16; =G05+JB91-PLC152:6, Safety IO Module input fault	Warning
FSF[57].7; =G05+JB91-PLC152:7, Safety IO Module communication fault	Warning
FSF[57].17; =G05+JB91-PLC152:7, Safety IO Module input fault	Warning
FSF[57].8; =G05+JB91-PLC152:8, Safety IO Module communication fault	Warning
FSF[57].18; =G05+JB91-PLC152:8, Safety IO Module output fault	Warning
FSF[58].1; =G05+JB92-PLC171:1, Safety IO Module communication fault	Warning
FSF[58].11; =G05+JB92-PLC171:1, Safety IO Module input fault	Warning
FSF[58].2; =G05+JB92-PLC171:2, Safety IO Module communication fault	Warning
FSF[58].12; =G05+JB92-PLC171:2, Safety IO Module input fault	Warning
FSF[58].3; =G05+JB92-PLC171:3, Safety IO Module communication fault	Warning
FSF[58].13; =G05+JB92-PLC171:3, Safety IO Module input fault	Warning
FSF[58].4; =G05+JB92-PLC171:4, Safety IO Module communication fault	Warning
FSF[58].14; =G05+JB92-PLC171:4, Safety IO Module input fault	Warning
FSF[58].5; =G05+JB92-PLC171:5, Safety IO Module communication fault	Warning
FSF[58].15; =G05+JB92-PLC171:5, Safety IO Module input fault	Warning
FSF[58].6; =G05+JB92-PLC171:6, Safety IO Module communication fault	Warning
FSF[58].16; =G05+JB92-PLC171:6, Safety IO Module input fault	Warning
FSF[58].7; =G05+JB92-PLC171:7, Safety IO Module communication fault	Warning
FSF[58].17; =G05+JB92-PLC171:7, Safety IO Module output fault	Warning
FSF[59].1; =G05+JB19-PLC56:1, Safety IO Module communication fault	E-Stop
FSF[59].11; =G05+JB19-PLC56:1, Safety IO Module input fault	E-Stop
FSF[59].2; =G05+JB19-PLC56:2, Safety IO Module communication fault	E-Stop
FSF[59].12; =G05+JB19-PLC56:2, Safety IO Module input fault	E-Stop
FSF[59].4; =G05+JB19-PLC56:4, Safety IO Module communication fault	E-Stop
FSF[59].14; =G05+JB19-PLC56:4, Safety IO Module output fault	E-Stop
FSF[5].0; =G06+OP1-SS288.1, selector switch [ride on/off] not active	E-Stop
FSF[5].1; =G06+OP1-SS288.1, selector switch [ride on/off] not ok	E-Stop
FSF[5].2; =G06+RCC-SS43.3, selector switch [OP10] active	E-Stop
FSF[5].3; =G06+RCC-SS43.3, selector switch [OP10] not ok	E-Stop
FSF[5].4; =G06+RCC-S61.3, key switch [erecting mode] active	E-Stop
FSF[5].5; =G06+RCC-S61.3, key switch [erecting mode] not ok	E-Stop
FSF[5].8; =G06+OP1-FTS288.3, foot pedal [OP1] active	Warning
FSF[5].9; =G06+OP1-FTS288.3, foot pedal [OP1] not ok	Warning
FSF[5].13; =G06+OP1-SS289.1, key switch [panel enable] not ok	Warning
FSF[5].14; =G06+OP1-PBL289.2, illum. push button [ride start] always on	Warning
FSF[5].16; =G06+OP1-SS289.3, key switch [operating mode] not ok	E-Stop
FSF[5].17; SW, operating mode [change during drive] not ok	E-Stop

FSF[5].21; =G06+OP10-PBOP10.2, push button [OP10, jog up] not ok	Warning
FSF[5].22; =G06+OP10-PBOP10.1, push button [OP10, jog down] not ok	Warning
FSF[5].23; =G06+OP10-PBOP10.3, push button [OP10, spare] not ok	Warning
FSF[5].24; =G06+OP10-PBOP10.4, push button [OP10, jog carousel forward] not ok	Warning
FSF[5].25; =G06+OP10-PBOP10.5, push button [OP10, horn] not ok	Warning
FSF[5].26; =G06+OP10-PBOP10.6, push button [OP10, reset] not ok	Warning
FSF[6].0; =G06+RCC-ESTOP43.1, emergency push button [RCC] pressed	E-Stop
FSF[6].1; =G06+RCC-ESTOP43.1, emergency push button [RCC] not ok	E-Stop
FSF[6].2; =G06+JB20-ESTOP75.1, emergency push button [JB20] pressed	E-Stop
FSF[6].3; =G06+JB20-ESTOP75.1, emergency push button [JB20] not ok	E-Stop
FSF[6].4; =G06+JB40-ESTOP96.1, emergency push button [JB40] pressed	E-Stop
FSF[6].5; =G06+JB40-ESTOP96.1, emergency push button [JB40] not ok	E-Stop
FSF[6].8; =G06+OP1-ESTOP288.2, emergency push button [OP1] pressed	E-Stop
FSF[6].9; =G06+OP1-ESTOP288.2, emergency push button [OP1] not ok	E-Stop
FSF[6].10; =G06+OP2-ESTOP295.1, emergency push button [OP2] pressed	E-Stop
FSF[6].11; =G06+OP2-ESTOP295.1, emergency push button [OP2] not ok	E-Stop
FSF[6].12; =G06+OP10-ESTOP_OP10, emergency push button [OP10] pressed	E-Stop
FSF[6].13; =G06+OP10-ESTOP_OP10, emergency push button [OP10] not ok	E-Stop
FSF[11].0; =E01+MCC-CON11.1, safety contactor 1 [elevator, motorsupply] not off	E-Stop
FSF[11].1; =E01+MCC-CON11.1, safety contactor 1 [elevator, motorsupply] not on	Z-Stop
FSF[11].2; =E01+ECR-MOT17.1, motor thermo [elevator motor 1-4] not ok	E-Stop
FSF[11].3; =E01+MCC-DU12.1, drive unit 1 [elevator, motor brake open signal] not off	Z-Stop
FSF[11].4; =E01+MCC-DU12.1, drive unit 1 [elevator, motor brake open signal] not on	Z-Stop
FSF[11].5; =E01+MCC-CON19.1, safety contactor [elevator drive unit 1, STO] not off	E-Stop
FSF[11].6; =E01+MCC-CON19.1, safety contactor [elevator drive unit 1, STO] not on	Z-Stop
FSF[11].10; =E01+JB19-CON59.1, safety contactor [elevator, motor brake 1] not off	E-Stop
FSF[11].11; =E01+JB19-CON59.1, safety contactor [elevator, motor brake 1] not on	Z-Stop
FSF[11].12; =E01+ECR-BR59.1, limit switch [elevator, motor brake 1] not open	Z-Stop
FSF[11].13; =E01+ECR-BR59.1, limit switch [elevator, motor brake 1] not closed	Z-Stop
FSF[11].14; =E01+ECR-BR59.1, limit switch [elevator, motor brake 1] wear not ok	Z-Stop
FSF[11].30; SW, brake test [motor brake 1] active	Z-Stop
FSF[11].31; SW, brake test [motor brake 1, zero speed missing] not ok	Z-Stop
FSF[15].0; =E01+MCC-CON13.1, safety contactor 2 [elevator, motorsupply] not off	E-Stop
FSF[15].1; =E01+MCC-CON13.1, safety contactor 2 [elevator, motorsupply] not on	Z-Stop
FSF[15].3; =E01+MCC-DU14.1, drive unit 2 [elevator, motor brake open signal] not off	Z-Stop
FSF[15].4; =E01+MCC-DU14.1, drive unit 2 [elevator, motor brake open signal] not on	Z-Stop
FSF[15].5; =E01+MCC-CON19.2, safety contactor [elevator drive unit 2, STO] not off	E-Stop
FSF[15].6; =E01+MCC-CON19.2, safety contactor [elevator drive unit 2, STO] not on	Z-Stop
FSF[15].10; =E01+JB19-CON59.2, safety contactor [elevator, motor brake 2] not off	E-Stop
FSF[15].11; =E01+JB19-CON59.2, safety contactor [elevator, motor brake 2] not on	Z-Stop
FSF[15].12; =E01+ECR-BR59.2, limit switch [elevator, motor brake 2] not open	Z-Stop
FSF[15].13; =E01+ECR-BR59.2, limit switch [elevator, motor brake 2] not closed	Z-Stop
FSF[15].14; =E01+ECR-BR59.2, limit switch [elevator, motor brake 2] wear not ok	Z-Stop
FSF[15].30; SW, brake test [motor brake 2] active	Z-Stop
FSF[15].31; SW, brake test [motor brake 2, zero speed missing] not ok	Z-Stop
FSF[16].0; =E01+MCC-CON15.1, safety contactor 3 [elevator, motorsupply] not off	E-Stop
FSF[16].1; =E01+MCC-CON15.1, safety contactor 3 [elevator, motorsupply] not on	Z-Stop

FSF[16].3; =E01+MCC-DU16.1, drive unit 3 [elevator, motor brake open signal] not off	Z-Stop
FSF[16].4; =E01+MCC-DU16.1, drive unit 3 [elevator, motor brake open signal] not on	Z-Stop
FSF[16].5; =E01+MCC-CON19.3, safety contactor [elevator drive unit 3, STO] not off	E-Stop
FSF[16].6; =E01+MCC-CON19.3, safety contactor [elevator drive unit 3, STO] not on	Z-Stop
FSF[16].10; =E01+JB19-CON59.3, safety contactor [elevator, motor brake 3] not off	E-Stop
FSF[16].11; =E01+JB19-CON59.3, safety contactor [elevator, motor brake 3] not on	Z-Stop
FSF[16].12; =E01+ECR-BR59.3, limit switch [elevator, motor brake 3] not open	Z-Stop
FSF[16].13; =E01+ECR-BR59.3, limit switch [elevator, motor brake 3] not closed	Z-Stop
FSF[16].14; =E01+ECR-BR59.3, limit switch [elevator, motor brake 3] wear not ok	Z-Stop
FSF[16].30; SW, brake test [motor brake 3] active	Z-Stop
FSF[16].31; SW, brake test [motor brake 3, zero speed missing] not ok	Z-Stop
FSF[17].0; =E01+MCC-CON17.1, safety contactor 4 [elevator, motorsupply] not off	E-Stop
FSF[17].1; =E01+MCC-CON17.1, safety contactor 4 [elevator, motorsupply] not on	Z-Stop
FSF[17].3; =E01+MCC-DU18.1, drive unit 4 [elevator, motor brake open signal] not off	Z-Stop
FSF[17].4; =E01+MCC-DU18.1, drive unit 4 [elevator, motor brake open signal] not on	Z-Stop
FSF[17].5; =E01+MCC-CON19.4, safety contactor [elevator drive unit 4, STO] not off	E-Stop
FSF[17].6; =E01+MCC-CON19.4, safety contactor [elevator drive unit 4, STO] not on	Z-Stop
FSF[17].10; =E01+JB19-CON62.1, safety contactor [elevator, motor brake 4] not off	E-Stop
FSF[17].11; =E01+JB19-CON62.1, safety contactor [elevator, motor brake 4] not on	Z-Stop
FSF[17].12; =E01+ECR-BR62.1, limit switch [elevator, motor brake 4] not open	Z-Stop
FSF[17].13; =E01+ECR-BR62.1, limit switch [elevator, motor brake 4] not closed	Z-Stop
FSF[17].14; =E01+ECR-BR62.1, limit switch [elevator, motor brake 4] wear not ok	Z-Stop
FSF[17].30; SW, brake test [motor brake 4] active	Z-Stop
FSF[17].31; SW, brake test [motor brake 4, zero speed missing] not ok	Z-Stop
FSF[13].0; =E03+ES1-PRS79.1, Ind. limit switch (NO) [catcher, dockingposition1] not active	E-Stop
FSF[13].1; =E03+ES1-PRS79.1, Ind. limit switch (NO) [catcher, dockingposition1] not ok	E-Stop
FSF[13].2; =E03+ES1-PRS79.2, Ind. limit switch (NO) [catcher, dockingposition2] not active	E-Stop
FSF[13].3; =E03+ES1-PRS79.2, Ind. limit switch (NO) [catcher, dockingposition2]not ok	E-Stop
FSF[13].4; =E03+ES9-PRS97.1, Ind. limit switch (NC) [catcher, position monitoring top] not active	Z-Stop
FSF[13].5; =E03+ES9-PRS97.1, Ind. limit switch (NC) [catcher, position monitoring top] not ok	Z-Stop
FSF[13].6; =E03+ES2-PRS79.3, Ind. limit switch (NC) [catcher, position monitoring bottom] not	Z-Stop
FSF[13].7; =E03+ES2-PRS79.3, Ind. limit switch (NC) [catcher, position monitoring bottom] not ok	Z-Stop
FSF[13].8; =E03+ET1-PRS98.1-7, Ind. limit switch (NO) [shock absorber, top retracted] not ok	E-Stop
FSF[13].10; =E03+ET1-PRS98.2-8, Ind. limit switch (NO) [shock absorber, top extended] not active	E-Stop
FSF[13].11; =E03+ET1-PRS98.2-8, Ind. limit switch (NO) [shock absorber, top extended] not ok	E-Stop
FSF[13].13; =E03+EB1-B89.1, absolute encoder [elevator, area top] position invalid	Z-Stop
FSF[13].14; =E03+EB1-B89.1, absolute encoder [elevator, area bottom] position invalid	Z-Stop
FSF[13].15; =E03+EB1-B89.1, absolute encoder [elevator, position] frozen	Z-Stop
FSF[13].16; =E03+EB1-B89.1, absolute encoder [elevator, position] position jump	Z-Stop
FSF[13].17; SW, limit position bottom not ok	E-Stop
FSF[13].18; SW, compare [absolute encoder] not ok	E-Stop
FSF[13].20; SW, elevator direction [command up, feedback down] incorrect	E-Stop
FSF[13].21; SW, elevator direction [command down, feedback up] incorrect	E-Stop
FSF[13].22; SW,elevator speed [safety area,upwards, high speed area] exceeded	E-Stop
FSF[13].23; SW,elevator speed [safety area,upwards, decel area] exceeded	E-Stop
FSF[13].24; SW,elevator speed [safety area,upwards, positioning area] exceeded	E-Stop
FSF[13].25; SW,elevator speed [safety area,downwards, high speed area] exceeded	E-Stop

FSF[13].26; SW,elevator speed [safety area,downwards, decel area] exceeded	E-Stop
FSF[13].27; SW,elevator speed [safety area,downwards, positioning area] exceeded	E-Stop
FSF[13].30; =E03+ECR-LS69.1, switching rail 1 (NC) [elevator, derope] active	E-Stop
FSF[13].31; =E03+ECR-LS69.2, switching rail 2 (NC) [elevator, derope] active	E-Stop
FSF[14].0; =E03+ES1-PRS78.1-7, Ind. limit switch (NO) [shock absorber, bottom retracted] not ok	E-Stop
FSF[14].1; =E03+ES1-PRS78.1-7, Ind. limit switch (NO) [shock absorber, bottom retracted]	E-Stop
FSF[14].2; =E03+ES1-PRS78.2-8,Ind. limit switch (NO) [shock absorber, bottom extended] not ok	E-Stop
FSF[14].3; =E03+ES1-PRS78.2-8, Ind. limit switch (NO) [shock absorber, bottom extended] not active	E-Stop
FSF[14].4; =E03+ESL-PRS118.1, Ind. limit switch [docking mechanism] not ok	E-Stop
FSF[14].5; =E03+ESL-PRS118.1, Ind. limit switch [docking mechanism] impropertly flagged	E-Stop
FSF[14].6; SW, catcher not released	E-Stop
FSF[14].7; SW, emergency end position top reached	E-Stop
FSF[14].8; SW, emergency end position top reached	E-Stop
FSF[14].9; =E03+ES1-PRS78.1, Ind. limit switch (NO) [shock absorber, bottom retracted] not ok	Warning
FSF[14].10; =E03+ES1-PRS78.3, Ind. limit switch (NO) [shock absorber, bottom retracted] not ok	Warning
FSF[14].11; =E03+ES1-PRS78.5, Ind. limit switch (NO) [shock absorber, bottom retracted] not ok	Warning
FSF[14].12; =E03+ES1-PRS78.7, Ind. limit switch (NO) [shock absorber, bottom retracted] not ok	Warning
FSF[14].13; =E03+ES1-PRS78.2, Ind. limit switch (NO) [shock absorber, bottom extended] not ok	Warning
FSF[14].14; =E03+ES1-PRS78.4, Ind. limit switch (NO) [shock absorber, bottom extended] not ok	Warning
FSF[14].15; =E03+ES1-PRS78.6, Ind. limit switch (NO) [shock absorber, bottom extended] not ok	Warning
FSF[14].16; =E03+ES1-PRS78.8, Ind. limit switch (NO) [shock absorber, bottom extended] not ok	Warning
FSF[14].17; =E03+ET1-PRS98.1, Ind. limit switch (NO) [shock absorber, top retracted] not ok	Warning
FSF[14].18; =E03+ET1-PRS98.3, Ind. limit switch (NO) [shock absorber, top retracted] not ok	Warning
FSF[14].19; =E03+ET1-PRS98.5, Ind. limit switch (NO) [shock absorber, top retracted] not ok	Warning
FSF[14].20; =E03+ET1-PRS98.7, Ind. limit switch (NO) [shock absorber, top retracted] not ok	Warning
FSF[14].21; =E03+ET1-PRS98.2, Ind. limit switch (NO) [shock absorber, top extended] not ok	Warning
FSF[14].22; =E03+ET1-PRS98.4, Ind. limit switch (NO) [shock absorber, top extended] not ok	Warning
FSF[14].23; =E03+ET1-PRS98.6, Ind. limit switch (NO) [shock absorber, top extended] not ok	Warning
FSF[14].24; =E03+ET1-PRS98.8, Ind. limit switch (NO) [shock absorber, top extended] not ok	Warning
FSF[14].29; =E03+ET1-SNSR97.2, shaft force sensor [pulley rope 1] tension not ok	Warning
FSF[14].30; =E03+ET1-SNSR97.3, shaft force sensor [pulley rope 2] tension not ok	Warning
FSF[14].31; =E03+ET1-SNSR97.2-3, shaft force sensor [pulley rope 1/2] compare not ok	Warning
FSF[21].0; =C01+MCC-CON25.1, safety contactor [carousel, motor supply] not off	E-Stop
FSF[21].1; =C01+MCC-CON25.1, safety contactor [carousel, motor supply] not on	Z-Stop
FSF[21].3; =C01+MCC-DU26.1, Frequency Drive [Carousel, motor brake open signal] not off	Z-Stop
FSF[21].4; =C01+MCC-DU26.1, Frequency Drive [Carousel, motor brake open signal] not on	Z-Stop
FSF[21].5; =C01+MCC-CON25.2, safety contactor [Carousel, motor brake] not off	E-Stop
FSF[21].6; =C01+MCC-CON25.2, safety contactor [Carousel, motor brake] not on	Z-Stop
FSF[21].7; =SW, safety contactor [Carousel, motor] on at release	E-Stop
FSF[21].8; =C01+MCC-CON26.1, safety contactor [Carousel drive unit, STO] not off	E-Stop
FSF[21].9; =C01+MCC-CON26.1, safety contactor [Carousel drive unit, STO] not on	Z-Stop
FSF[23].0; =C03+ESL-PRS120.1, Proximity Switch (NO) [Carousel, Speed/Position, Channel 1] always	Z-Stop
FSF[23].1; =C03+ESL-PRS120.1, Proximity Switch (NO) [Carousel, Speed/Position, Channel 1] always	Z-Stop
FSF[23].2; =C03+ESL-PRS120.2, Proximity Switch (NO) [Carousel, Speed/Position, Channel 2] always	Z-Stop
FSF[23].3; =C03+ESL-PRS120.2, Proximity Switch (NO) [Carousel, Speed/Position, Channel 2] always	Z-Stop
FSF[40].0; =S00+JB20-CON81.1, safety contactor [unlock seats, circuit A_1] not off	Z-Stop
FSF[40].1; =S00+JB20-CON81.1,safety contactor [unlock seats, circuit A_1] not on	Z-Stop

FSF[40].2; =S00+JB20-CON81.2, safety contactor [unlock seats, circuit A_2] not off	Z-Stop
FSF[40].3; =S00+JB20-CON81.2, safety contactor [unlock seats, circuit A_2] not on	Z-Stop
FSF[40].4; =S00+JB20-CON81.3, safety contactor [unlock seats, circuit B_1] not off	Z-Stop
FSF[40].5; =S00+JB20-CON81.3, safety contactor [unlock seats, circuit B_1] not on	Z-Stop
FSF[40].6; =S00+JB20-CON81.4, safety contactor [unlock seats, circuit B_2] not off	Z-Stop
FSF[40].7; =S00+JB20-CON81.4, safety contactor [unlock seats, circuit B_2] not on	Z-Stop
FSF[40].8; =S00+JB20-CON159.1,safety contactor [crowbar] not off	Z-Stop
FSF[40].9; =S00+JB20-CON159.1,safety contactor [crowbar] not on	Z-Stop
FSF[41].0; =S00+JB90-CON136.2,safety contactor [open seats agree 1/2] not off	Warning
FSF[41].1; =S00+JB90-CON136.2,safety contactor [open seats agree 1/2] not on	Warning
FSF[41].2; =S00+JB92-Q176.1,safety contactor [open seats agree 3/4] not off	Warning
FSF[41].3; =S00+JB92-Q176.1,safety contactor [open seats agree 3/4] not on	Warning
FSF[41].4; =S00+JB91-CON159.1,safety contactor [crow bar] not off	Z-Stop
FSF[41].5; =S00+JB91-CON159.1,safety contactor [crow bar] not on	Z-Stop
FSF[41].6; =S00+JB90-CON135.1,safety contactor [supply 400VAC cylinder seats group 1] not off	Z-Stop
FSF[41].7; =S00+JB90-CON135.1,safety contactor [supply 400VAC cylinder seats group 1]] not on	Z-Stop
FSF[41].8; =S00+JB91-CON156.1,safety contactor [supply 400VAC cylinder seats group 2] not off	Z-Stop
FSF[41].9; =S00+JB91-CON156.1,safety contactor [supply 400VAC cylinder seats group 2] not on	Z-Stop
FSF[41].10; =S00+JB92-CON175.1,safety contactor [supply 400VAC cylinder seats group 3] not off	Z-Stop
FSF[41].11; =S00+JB92-CON175.1,safety contactor [supply 400VAC cylinder seats group 3] not on	Z-Stop
FSF[43].1; =S01+EPCU-PRS1, Ind. limit switch [seat 1, monitoring] not ok	Warning
FSF[43].2; =S02+EPCU-PRS1, Ind. limit switch [seat 2, monitoring] not ok	Warning
FSF[43].3; =S03+EPCU-PRS1, Ind. limit switch [seat 3, monitoring] not ok	Warning
FSF[43].4; =S04+EPCU-PRS1, Ind. limit switch [seat 4, monitoring] not ok	Warning
FSF[43].5; =S05+EPCU-PRS1, Ind. limit switch [seat 5, monitoring] not ok	Warning
FSF[43].6; =S06+EPCU-PRS1, Ind. limit switch [seat 6, monitoring] not ok	Warning
FSF[43].7; =S07+EPCU-PRS1, Ind. limit switch [seat 7, monitoring] not ok	Warning
FSF[43].8; =S08+EPCU-PRS1, Ind. limit switch [seat 8, monitoring] not ok	Warning
FSF[43].9; =S09+EPCU-PRS1, Ind. limit switch [seat 9, monitoring] not ok	Warning
FSF[43].10; =S10+EPCU-PRS1, Ind. limit switch [seat 10, monitoring] not ok	Warning
FSF[43].11; =S11+EPCU-PRS1, Ind. limit switch [seat 11, monitoring] not ok	Warning
FSF[43].12; =S12+EPCU-PRS1, Ind. limit switch [seat 12, monitoring] not ok	Warning
FSF[43].13; =S13+EPCU-PRS1, Ind. limit switch [seat 13, monitoring] not ok	Warning
FSF[43].14; =S14+EPCU-PRS1, Ind. limit switch [seat 14, monitoring] not ok	Warning
FSF[43].15; =S15+EPCU-PRS1, Ind. limit switch [seat 15, monitoring] not ok	Warning
FSF[43].16; =S16+EPCU-PRS1, Ind. limit switch [seat 16, monitoring] not ok	Warning
FSF[43].17; =S17+EPCU-PRS1, Ind. limit switch [seat 17, monitoring] not ok	Warning
FSF[43].18; =S18+EPCU-PRS1, Ind. limit switch [seat 18, monitoring] not ok	Warning
FSF[43].19; =S19+EPCU-PRS1, Ind. limit switch [seat 19, monitoring] not ok	Warning
FSF[43].20; =S20+EPCU-PRS1, Ind. limit switch [seat 20, monitoring] not ok	Warning
FSF[43].21; =S21+EPCU-PRS1, Ind. limit switch [seat 21, monitoring] not ok	Warning
FSF[43].22; =S22+EPCU-PRS1, Ind. limit switch [seat 22, monitoring] not ok	Warning
FSF[43].23; =S23+EPCU-PRS1, Ind. limit switch [seat 23, monitoring] not ok	Warning
FSF[43].24; =S24+EPCU-PRS1, Ind. limit switch [seat 24, monitoring] not ok	Warning
FSF[43].25; =S25+EPCU-PRS1, Ind. limit switch [seat 25, monitoring] not ok	Warning
FSF[43].26; =S26+EPCU-PRS1, Ind. limit switch [seat 26, monitoring] not ok	Warning
FSF[43].27; =S27+EPCU-PRS1, Ind. limit switch [seat 27, monitoring] not ok	Warning

FSF[43].28; =S28+EPCU-PRS1, Ind. limit switch [seat 28, monitoring] not ok	Warning
FSF[43].29; =S29+EPCU-PRS1, Ind. limit switch [seat 29, monitoring] not ok	Warning
FSF[43].30; =S30+EPCU-PRS1, Ind. limit switch [seat 30, monitoring] not ok	Warning
FSF[44].1; =S01+EPCU-PRS1, Ind. limit switch [seat 1, monitoring] not locked	Warning
FSF[44].2; =S02+EPCU-PRS1, Ind. limit switch [seat 2, monitoring] not locked	Warning
FSF[44].3; =S03+EPCU-PRS1, Ind. limit switch [seat 3, monitoring] not locked	Warning
FSF[44].4; =S04+EPCU-PRS1, Ind. limit switch [seat 4, monitoring] not locked	Warning
FSF[44].5; =S05+EPCU-PRS1, Ind. limit switch [seat 5, monitoring] not locked	Warning
FSF[44].6; =S06+EPCU-PRS1, Ind. limit switch [seat 6, monitoring] not locked	Warning
FSF[44].7; =S07+EPCU-PRS1, Ind. limit switch [seat 7, monitoring] not locked	Warning
FSF[44].8; =S08+EPCU-PRS1, Ind. limit switch [seat 8, monitoring] not locked	Warning
FSF[44].9; =S09+EPCU-PRS1, Ind. limit switch [seat 9, monitoring] not locked	Warning
FSF[44].10; =S10+EPCU-PRS1, Ind. limit switch [seat 10, monitoring] not locked	Warning
FSF[44].11; =S11+EPCU-PRS1, Ind. limit switch [seat 11, monitoring] not locked	Warning
FSF[44].12; =S12+EPCU-PRS1, Ind. limit switch [seat 12, monitoring] not locked	Warning
FSF[44].13; =S13+EPCU-PRS1, Ind. limit switch [seat 13, monitoring] not locked	Warning
FSF[44].14; =S14+EPCU-PRS1, Ind. limit switch [seat 14, monitoring] not locked	Warning
FSF[44].15; =S15+EPCU-PRS1, Ind. limit switch [seat 15, monitoring] not locked	Warning
FSF[44].16; =S16+EPCU-PRS1, Ind. limit switch [seat 16, monitoring] not locked	Warning
FSF[44].17; =S17+EPCU-PRS1, Ind. limit switch [seat 17, monitoring] not locked	Warning
FSF[44].18; =S18+EPCU-PRS1, Ind. limit switch [seat 18, monitoring] not locked	Warning
FSF[44].19; =S19+EPCU-PRS1, Ind. limit switch [seat 19, monitoring] not locked	Warning
FSF[44].20; =S20+EPCU-PRS1, Ind. limit switch [seat 20, monitoring] not locked	Warning
FSF[44].21; =S21+EPCU-PRS1, Ind. limit switch [seat 21, monitoring] not locked	Warning
FSF[44].22; =S22+EPCU-PRS1, Ind. limit switch [seat 22, monitoring] not locked	Warning
FSF[44].23; =S23+EPCU-PRS1, Ind. limit switch [seat 23, monitoring] not locked	Warning
FSF[44].24; =S24+EPCU-PRS1, Ind. limit switch [seat 24, monitoring] not locked	Warning
FSF[44].25; =S25+EPCU-PRS1, Ind. limit switch [seat 25, monitoring] not locked	Warning
FSF[44].26; =S26+EPCU-PRS1, Ind. limit switch [seat 26, monitoring] not locked	Warning
FSF[44].27; =S27+EPCU-PRS1, Ind. limit switch [seat 27, monitoring] not locked	Warning
FSF[44].28; =S28+EPCU-PRS1, Ind. limit switch [seat 28, monitoring] not locked	Warning
FSF[44].29; =S29+EPCU-PRS1, Ind. limit switch [seat 29, monitoring] not locked	Warning
FSF[44].30; =S30+EPCU-PRS1, Ind. limit switch [seat 30, monitoring] not locked	Warning
FSF[46].1; =S01+EPCU-SOL1, Tilt cylinder [seat 1] not retracted	Warning
FSF[46].2; =S01+EPCU-SOL1, Tilt cylinder [seat 1] not extended	Warning
FSF[46].3; =S02+EPCU-SOL1, Tilt cylinder [seat 2] not retracted	Warning
FSF[46].4; =S02+EPCU-SOL1, Tilt cylinder [seat 2] not extended	Warning
FSF[46].5; =S03+EPCU-SOL1, Tilt cylinder [seat 3] not retracted	Warning
FSF[46].6; =S03+EPCU-SOL1, Tilt cylinder [seat 3] not extended	Warning
FSF[46].7; =S04+EPCU-SOL1, Tilt cylinder [seat 4] not retracted	Warning
FSF[46].8; =S04+EPCU-SOL1, Tilt cylinder [seat 4] not extended	Warning
FSF[46].9; =S05+EPCU-SOL1, Tilt cylinder [seat 5] not retracted	Warning
FSF[46].10; =S05+EPCU-SOL1, Tilt cylinder [seat 5] not extended	Warning
FSF[46].11; =S06+EPCU-SOL1, Tilt cylinder [seat 6] not retracted	Warning
FSF[46].12; =S06+EPCU-SOL1, Tilt cylinder [seat 6] not extended	Warning
FSF[46].13; =S07+EPCU-SOL1, Tilt cylinder [seat 7] not retracted	Warning
FSF[46].14; =S07+EPCU-SOL1, Tilt cylinder [seat 7] not extended	Warning

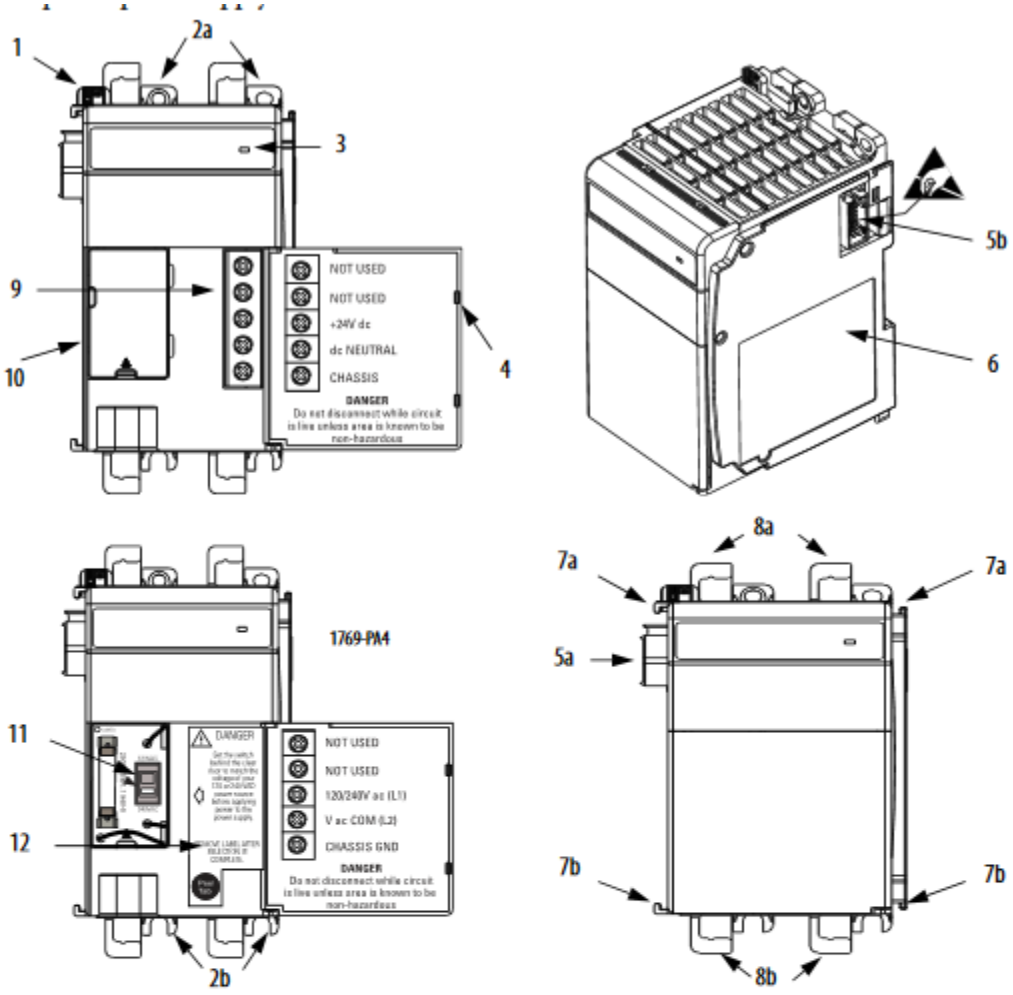
FSF[46].15; =S08+EPCU-SOL1, Tilt cylinder [seat 8] not retracted	Warning
FSF[46].16; =S08+EPCU-SOL1, Tilt cylinder [seat 8] not extended	Warning
FSF[46].17; =S09+EPCU-SOL1, Tilt cylinder [seat 9] not retracted	Warning
FSF[46].18; =S09+EPCU-SOL1, Tilt cylinder [seat 9] not extended	Warning
FSF[46].19; =S10+EPCU-SOL1, Tilt cylinder [seat 10] not retracted	Warning
FSF[46].20; =S10+EPCU-SOL1, Tilt cylinder [seat 10] not extended	Warning
FSF[46].21; =S11+EPCU-SOL1, Tilt cylinder [seat 11] not retracted	Warning
FSF[46].22; =S11+EPCU-SOL1, Tilt cylinder [seat 11] not extended	Warning
FSF[46].23; =S12+EPCU-SOL1, Tilt cylinder [seat 12] not retracted	Warning
FSF[46].24; =S12+EPCU-SOL1, Tilt cylinder [seat 12] not extended	Warning
FSF[46].25; =S13+EPCU-SOL1, Tilt cylinder [seat 13] not retracted	Warning
FSF[46].26; =S13+EPCU-SOL1, Tilt cylinder [seat 13] not extended	Warning
FSF[46].27; =S14+EPCU-SOL1, Tilt cylinder [seat 14] not retracted	Warning
FSF[46].28; =S14+EPCU-SOL1, Tilt cylinder [seat 14] not extended	Warning
FSF[46].29; =S15+EPCU-SOL1, Tilt cylinder [seat 15] not retracted	Warning
FSF[46].30; =S15+EPCU-SOL1, Tilt cylinder [seat 15] not extended	Warning
FSF[47].1; =S16+EPCU-SOL1, Tilt cylinder [seat 16] not retracted	Warning
FSF[47].2; =S16+EPCU-SOL1, Tilt cylinder [seat 16] not extended	Warning
FSF[47].3; =S17+EPCU-SOL1, Tilt cylinder [seat 17] not retracted	Warning
FSF[47].4; =S17+EPCU-SOL1, Tilt cylinder [seat 17] not extended	Warning
FSF[47].5; =S18+EPCU-SOL1, Tilt cylinder [seat 18] not retracted	Warning
FSF[47].6; =S18+EPCU-SOL1, Tilt cylinder [seat 18] not extended	Warning
FSF[47].7; =S19+EPCU-SOL1, Tilt cylinder [seat 19] not retracted	Warning
FSF[47].8; =S19+EPCU-SOL1, Tilt cylinder [seat 19] not extended	Warning
FSF[47].9; =S20+EPCU-SOL1, Tilt cylinder [seat 20] not retracted	Warning
FSF[47].10; =S20+EPCU-SOL1, Tilt cylinder [seat 20] not extended	Warning
FSF[47].11; =S21+EPCU-SOL1, Tilt cylinder [seat 21] not retracted	Warning
FSF[47].12; =S21+EPCU-SOL1, Tilt cylinder [seat 21] not extended	Warning
FSF[47].13; =S22+EPCU-SOL1, Tilt cylinder [seat 22] not retracted	Warning
FSF[47].14; =S22+EPCU-SOL1, Tilt cylinder [seat 22] not extended	Warning
FSF[47].15; =S23+EPCU-SOL1, Tilt cylinder [seat 23] not retracted	Warning
FSF[47].16; =S23+EPCU-SOL1, Tilt cylinder [seat 23] not extended	Warning
FSF[47].17; =S24+EPCU-SOL1, Tilt cylinder [seat 24] not retracted	Warning
FSF[47].18; =S24+EPCU-SOL1, Tilt cylinder [seat 24] not extended	Warning
FSF[47].19; =S25+EPCU-SOL1, Tilt cylinder [seat 25] not retracted	Warning
FSF[47].20; =S25+EPCU-SOL1, Tilt cylinder [seat 25] not extended	Warning
FSF[47].21; =S26+EPCU-SOL1, Tilt cylinder [seat 26] not retracted	Warning
FSF[47].22; =S26+EPCU-SOL1, Tilt cylinder [seat 26] not extended	Warning
FSF[47].23; =S27+EPCU-SOL1, Tilt cylinder [seat 27] not retracted	Warning
FSF[47].24; =S27+EPCU-SOL1, Tilt cylinder [seat 27] not extended	Warning
FSF[47].25; =S28+EPCU-SOL1, Tilt cylinder [seat 28] not retracted	Warning
FSF[47].26; =S28+EPCU-SOL1, Tilt cylinder [seat 28] not extended	Warning
FSF[47].27; =S29+EPCU-SOL1, Tilt cylinder [seat 29] not retracted	Warning
FSF[47].28; =S29+EPCU-SOL1, Tilt cylinder [seat 29] not extended	Warning
FSF[47].29; =S20+EPCU-SOL1, Tilt cylinder [seat 30] not retracted	Warning
FSF[47].30; =S20+EPCU-SOL1, Tilt cylinder [seat 30] not extended	Warning
STF[0].1; =G01+MCC-CB2.2, circuit breaker [480VAC supply 1, phase monitoring] tripped	E-Stop

STF[0].2; =G01+MCC-CR2.2, control relay [480VAC supply 1, phase monitoring] not ok	E-Stop
STF[0].4; =G01+MCC-CB2.7, circuit breaker [480VAC supply 2, phase monitoring] tripped	E-Stop
STF[0].5; =G01+MCC-CR2.7, control relay [480VAC supply 2, phase monitoring] not ok	E-Stop
STF[0].6; =G01+MCC-CB2.3, circuit breaker [480VAC supply, drive unit 1-2] tripped	E-Stop
STF[0].7; =G01+MCC-CB2.6, circuit braker [480VAC supply, drive unti 3-4] tripped	E-Stop
STF[0].8; =G01+MCC-CB4.4, motor protection switch [480VAC supply, drive unit carousel] tripped	E-Stop
STF[0].9; =G01+MCC-CB4.1, motor protection switch [480VAC supply, drive unit 1] tripped	Warning
STF[0].10; =G01+MCC-CB4.2, motor protection switch [480VAC supply, drive unit 2] tripped	E-Stop
STF[0].11; =G01+MCC-CB5.1, motor protection switch [480VAC supply, drive unit 3] tripped	E-Stop
STF[0].12; =G01+MCC-CB5.2, motor protection switch [480VAC supply, drive unit 4] tripped	E-Stop
STF[0].13; =G01+MCC-CB2.8, trafo protection switch [400VAC supply, catcher/sled/PCU] tripped	E-Stop
STF[0].14; =G01+MCC-CB4.3, motor protection switch [480VAC supply, motorbrakes elevator]	E-Stop
STF[0].15; =G01+MCC-FU1.1.2, surge arresters [480VAC inlet 1 and 2] not ok	E-Stop
STF[1].1; =G02+RCC-CB32.1, circuit braker [120VAC-A permanent, MCC/RCC] tripped	E-Stop
STF[1].2; =G02+RCC-CB32.2, circuit braker [120VAC-A permanent, tower] tripped	E-Stop
STF[1].3; =G02+RCC-CB32.3, circuit braker [120VAC-B_ON/OFF, MCC/RCC] tripped	E-Stop
STF[1].4; =G02+RCC-CB32.4, circuit braker [120VAC-C E-STOP, MCC/RCC] tripped	E-Stop
STF[1].5; =G02+JB20-CB71.1, circuit braker [120VAC-A permanent, JB40] tripped	E-Stop
STF[2].0; =G03+RCC-CB36.1, circuit braker [24VDC-A permanent, MCC/JB20] tripped	E-Stop
STF[2].1; =G03+RCC-CB36.4, circuit braker [24VDC-A permanent, PLC/encoder] tripped	E-Stop
STF[2].2; =G03+RCC-CB36.2, circuit braker [24VDC-A permanent, MCC/RCC] tripped	E-Stop
STF[2].3; =G03+RCC-CB36.3, circuit braker [24VDC-A permanent, OP1/JB19] tripped	E-Stop
STF[2].4; =G03+RCC-CB37.1, circuit braker [24VDC-B ON/OFF, MCC/RCC/JB19] tripped	E-Stop
STF[2].5; =G03+RCC-CB37.2, circuit braker [24VDC-B ON/OFF, JB20] tripped	E-Stop
STF[2].6; =G03+RCC-CB38.1, circuit braker [24VDC-C E-STOP, MCC/RCC] tripped	E-Stop
STF[2].7; =G03+RCC-CB38.2, circuit braker [24VDC-C E-STOP, JB20] tripped	E-Stop
STF[2].8; =G03+RCC-PWS36.1, power supply [24VDC-A permanent] not ok	E-Stop
STF[2].9; =G03+RCC-PWS37.1, power supply [24VDC-B ON/OFF] not ok	E-Stop
STF[2].10; =G03+RCC-PWS38.1, power supply [24VDC-C E-STOP] not ok	E-Stop
STF[2].11; =G03+JB81-PWS115.1, power supply [24VDC-A permanent, buffer module] not ready	Warning
STF[2].12; =G03+JB81-PWS115.1, power supply [24VDC-A permanent, buffer module] buffering	Warning
STF[2].13; =G03+RCC-PWS36.4, power supply [24VDC-A permanent, PLC/encoder] not ok	E-Stop
STF[2].14; =G03+JB40-CB93.1, circuit braker [24VDC-A permanent, JB40] tripped	Warning
STF[2].15; =G03+JB40-CB94.1, circuit braker [24VDC-B ON/OFF, JB40] tripped	E-Stop
STF[2].16; =G03+JB40-PWS93.1, power supply [24VDC-A permanent, JB40] not ok	E-Stop
STF[3].0; =S00+JB90-CB136.2, circuit breaker [open seats 1-15 circuit 1] tripped	Warning
STF[3].1; =S00+JB90-CB136.3, circuit breaker [open seats 1-15 circuit 2] tripped	Warning
STF[3].2; =S00+JB90-CB140.1-10, circuit breaker [tilt cylinder, seats 1-10] tripped	Warning
STF[3].3; =S00+JB92-CB176.2, circuit breaker [open seats 16-30 circuit 1] tripped	Warning
STF[3].4; =S00+JB92-CB176.3, circuit breaker [open seats 16-30 circuit 2] tripped	Warning
STF[3].5; =S00+JB91-CB146.1-10, circuit breaker [tilt cylinder, seats 11-20] tripped	Warning
STF[3].6; =S00+JB92-CB180.1-10, circuit breaker [tilt cylinder, seats 21-30] tripped	Warning
STF[3].7; =S00+JB90-CB135.1, circuit breaker [400VAC, supply seat cylinders 1-10] tripped	Warning
STF[3].8; =S00+JB91-CB156.1, circuit breaker [400VAC, supply seat cylinders 11-20] tripped	Warning
STF[3].9; =S00+JB92-CB175.1, circuit breaker [400VAC, supply seat cylinders 21-30] tripped	Warning
STF[3].10; =S00+JB91-CB156.2, circuit breaker [230VAC, supply battery charger] tripped	Warning
STF[4].0; =G06+OP1-PBL290.5, illum. push button [release gondola] always on	Warning

STF[4].1; =G06+OP1-PBL290.6, illum. push button [unload gate] always on	Warning
STF[4].2; =G06+OP1-PBL290.1, illum. push button [acknowledge] always on	Warning
STF[4].3; =G06+OP1-PBL290.2, illum. push button [ride stop] always on	Warning
STF[4].4; =G06+OP1-PBL290.4, illum. push button [restraints] always on	Warning
STF[4].10; =G06+OP2-PBL295.2, push button [agreement start] always on	Warning
STF[4].11; =G06+OP2-PBL295.4, push button [restraints] always on	Warning
STF[4].12; =G06+OP2-PBL295.3, push button [ride stop] always on	Warning
STF[4].13; SW, wind speed is too high	Warning
STF[4].14; =G06+OP1-PBL290.7, illum. push button [load gate] always on	Warning
STF[4].31; =G06+WatchDog not ok	Warning
STF[11].0; =E01+MCC-DU12.1, drive unit 1 [elevator, status] not ok	E-Stop
STF[11].1; =E01+MCC-DU12.1, drive unit 1 [elevator, ethernet communication] not ok	E-Stop
STF[11].2; =E01+MCC-DU12.1, drive unit 1 [elevator, position compare] not ok	Z-Stop
STF[11].7; SW, supply drive unit 1 not ok	E-Stop
STF[11].8; SW, supply drive unit not ok (reverse direction)	E-Stop
STF[11].9; =E01+ECR-RES11.2.3, thermo protection (brake resistors drive unit 1) not ok	E-Stop
STF[11].12; =E01+MCC-CB20.1, motor protection switch (fans brake resistors) tripped	Warning
STF[11].13; =E01+MCC-CB20.2, motor protection switch (foreced ventilations elevator) tripped	Warning
STF[15].0; =E01+MCC-DU14.1, drive unit 2 [elevator, status] not ok	E-Stop
STF[15].1; =E01+MCC-DU14.1, drive unit 2 [elevator, ethernet communication] not ok	E-Stop
STF[15].7; SW, supply drive unit 2 not ok	E-Stop
STF[15].9; =E01+ECR-RES13.2.3, thermo protection (brake resistors drive unit 2) not ok	E-Stop
STF[16].0; =E01+MCC-DU16.1, drive unit 3 [elevator, status] not ok	E-Stop
STF[16].1; =E01+MCC-DU16.1, drive unit 3 [elevator, ethernet communication] not ok	E-Stop
STF[16].7; SW, supply drive unit 3 not ok	E-Stop
STF[16].9; =E01+ECR-RES15.2.3, thermo protection (brake resistors drive unit 3) not ok	E-Stop
STF[17].0; =E01+MCC-DU18.1, drive unit 4 [elevator, status] not ok	E-Stop
STF[17].1; =E01+MCC-DU18.1, drive unit 4 [elevator, ethernet communication] not ok	E-Stop
STF[17].7; SW, supply drive unit 4 not ok	E-Stop
STF[17].9; =E01+ECR-RES17.2.3, thermo protection (brake resistors drive unit 4) not ok	E-Stop
STF[21].0; =C01+MCC-DU26.1, drive unit [carousel, status] not ok	E-Stop
STF[21].1; =C01+MCC-DU26.1, drive unit [carousel, ethernet communication] not ok	E-Stop
STF[21].2; SW, safety contactor [carousel, brake] on at release]	E-Stop
STF[21].3; =C01+MCC-CB25.2, motor protection switch [motor brake carousel] tripped	E-Stop
STF[21].4; =C01+MCC-FU25.1, thermo relay [brake resistor carousel] not ok	E-Stop
STF[41].0; =L01+LCC-F9.5, circuit braker [deco top, aviation light] triggered	Warning

7.3 COMPONENT DISPLAY ANDINDICATORS

7.3.1 Allen Bradley 1769-PA4 Power Supply



Power Supply Components

Item	Description
1	Bus lever (with locking function)
2a	Upper panel mounting tabs
2b	Lower panel mounting tabs
3	Status Indicator
4	Power supply door with terminal identification label
5a	Movable bus connector with female pins
5b	Stationary bus connector with male pins

Power Supply Components (Continued)

Item	Description
6	Nameplate label
7a	Upper tongue-and-groove slots
7b	Lower tongue-and-groove slots
8a	Upper DIN rail latches
8b	Lower DIN rail latches
9	Terminal block with fingersafe cover
10	Fuse housing cover for replaceable fuse
11	120V AC or 240V AC line input power selector switch (PA4 only)
12	Removable selector switch label (PA4 only)

Install an I/O Expansion Power Supply

Compact I/O Expansion Power Supplies are suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments (Pollution degree 2[(1)]) and to circuits that do not exceed Over Voltage Category II[(2)] (IEC 60664-1).[(3)]

Disconnect the Power

WARNING: Remove power before removing or inserting this power supply from the 1769 I/O system. When you remove or insert a power supply with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- Sending an erroneous signal to your system's field devices, causing unintended machine motion.
- Causing an explosion in a hazardous environment.

Electrical arcing causes excessive wear to contacts on both the power supply and its mating connector. Worn contacts may create electrical resistance.

7.3.2 Allen Bradley 1769-L33ERMS Compact Guard Logix

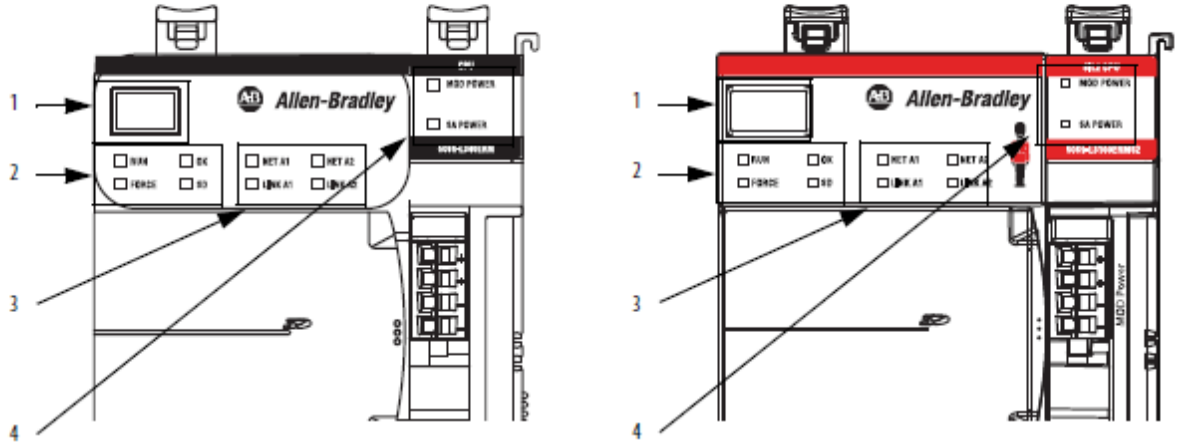
Status Indicators

The CompactLogix™ 5380 and Compact GuardLogix® 5380 controllers have a four-character scrolling status display, controller status indicators, EtherNet/IP™ network status indicators, and power indicators.

Status Display and Indicators

Figure 69 shows the status display and indicators on CompactLogix 5380 and Compact GuardLogix 5380 controllers.

Figure 69 - Status Display and Indicators



Item	Description
1	4-Character Scrolling Status Display, see page 301
2	Controller Status Indicators, see page 306
3	EtherNet/IP™ Status Indicators, see page 308
4	Power Status Indicators, see page 309

General Status Messages

Applies to these controllers:
CompactLogix 5380
Compact GuardLogix 5380 SIL 2
Compact GuardLogix 5380 SIL 3

The scrolling messages that are described in this table are typically indicated upon powerup, powerdown, and while the controller is running to show the status of the controller.

Message	Interpretation
No message is indicated	The controller is Off. Check the MOD POWER status indicator to see if power is applied to the system. Check the OK indicator to determine if the controller is powered and to determine the state of the controller.
Identity Mismatch - Contact Tech Support	This product's identity has been modified from its original production state and the integrity of the product has been compromised. This could be the result of unauthorized modifications made to the product or the product may not be a genuine Rockwell Automation product. This product should not be placed into service.
TEST	The controller is conducting power-up tests.
CHRG	The embedded energy storage circuit is charging.
PASS	Power-up tests have completed successfully.
Saving...Do Not Remove SD Card	The controller is about to save an image to the SD card.
SAVE	A project is being saved to the SD card. For more information, see SD Indicator on page 307. Let the save operation complete before you: • Remove the SD card. • Disconnect the power. **IMPORTANT**: Do not remove the SD card while the controller is saving to the SD card. Let the save complete without interruption. If you interrupt the save, data corruption or loss can occur.
One of the following: • LOAD • Loading . . . Do Not Remove SD Card	A project is being loaded from the SD card. For more information, see SD Indicator on page 307. Let the load operation complete before doing the following: • Remove the SD card • Disconnect the power **IMPORTANT**: Do not remove the SD card while the controller is loading from the SD card. Let the load complete without interruption. If you interrupt the load, data corruption or loss can occur.
UPDT	A firmware update is being conducted from the SD card upon powerup. For more information, see SD Indicator on page 307. If you do not want the firmware to update upon powerup, change the Load Image property of the controller.
Rev *XX.xxx*	The firmware major and minor revision of the controller.
5069-L3xxx	The controller catalog number and series.
Link Down	Message appears when an Ethernet port does not have a network connection. Message scrolls continuously during operation. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each link, that is, Link A1 and Link A2. The link name appears before the information.
Link Disabled	Message appears when you have disabled an Ethernet port. Message scrolls continuously during operation. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each link, that is, Link A1 and Link A2. The link name appears before the information.
DHCP-00:00:XX:XX:XX:XX	Message appears when the controller is set for DHCP, but not configured on a network. The message shows the MAC address of the controller. Message scrolls continuously during operation if no IP address is set. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for Port A1 and Port A2. The port name appears before the information.

Message	Interpretation
Ethernet Port Rate/ Duplex State	The current port rate and duplex state when an Ethernet port has a connection. Message scrolls continuously during operation. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for each link, that is, Link A1 and Link A2. The link name appears before the information.
IP Address	The IP address of the controller. Appears on powerup and scrolls continuously during operation. If the IP address is not yet set, the MAC address appears. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for Port A1 and Port A2. The port name appears before the information.
Duplicate IP - 00:00:XX:XX:XX:XX	Message appears when the controller detects a device with the same IP address on the network. The message shows the MAC address of the device with the duplicate IP address. Message scrolls continuously during operation. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for Port A1 and Port A2. The port name appears before the information.
DHCP-Address Lost	The controller communicated with the DHCP server to renew the IP address. The server either did not reply or did not renew the IP address. The controller continues to operate, but with no Ethernet connectivity out of this port. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for Port A1 and Port A2. The port name appears before the information.
IP Address/Mask/ Gateway/DNS Invalid	The DHCP server responded with an unusable combination. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for Port A1 and Port A2. The port name appears before the information.
IP Address Invalid	The IP Address that is used in the port configuration is not valid. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for Port A1 and Port A2. The port name appears before the information.
Mask Invalid	The Subnet/Network Mask used in the port configuration is not valid. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for Port A1 and Port A2. The port name appears before the information.
Gateway Invalid	The Gateway Address that is used in the port IP configuration is not valid. **IMPORTANT**: When the controller operates in Dual-IP mode, this information is provided for Port A1 and Port A2. The port name appears before the information.
DNS Invalid	The DNS used in the port IP configuration is not valid.
No Project	No project is loaded on the controller. To load a project: • Use the Studio 5000 Logix Designer® application to download the project to the controller • Use an SD card to load a project to the controller
Project Name	The name of the project that is loaded on the controller.
BUSY	The I/O modules that are associated with the controller are not yet fully powered. Let powerup and I/O module self-testing complete.
Corrupt Certificate Received	The security certificate that is associated with the firmware is corrupted. Go to http://www.rockwellautomation.com/support/ and download the firmware revision to which you are trying to update. Replace the firmware revision that you have previously installed with that posted on the Technical Support website.
Corrupt Image Received	The firmware file is corrupted. Go to http://www.rockwellautomation.com/support/ and download the firmware revision to which you are trying to update. Replace the firmware revision that you have previously installed with that posted on the Technical Support website.
Backup Energy HW Failure - Save Project	A failure with the embedded storage circuit has occurred, and the controller is incapable of saving the program in the event of a powerdown. If you see this message, save your program to the SD card before you remove power and replace the controller.
Backup Energy Low - Save Project	The embedded storage circuit does not have sufficient energy to enable the controller to save the program in the event of a powerdown. If you see this message, save your program to the SD card before you remove power and replace the controller.
Flash in Progress	A firmware update that is initiated via ControlFLASH™ or AutoFlash software is in progress. Let the firmware update complete without interruption.

Message	Interpretation
Firmware Installation Required	The controller is using boot firmware, that is, revision 1.xxx, and requires a firmware update. The Compact GuardLogix SIL3 controller also shows "Firmware Installation Required", when the controller and the internal safety partner have incompatible firmware. Update the module to correct firmware version.
SD Card Locked	An SD card that is locked is installed.
Download in Progress	An active download is occurring
Aborting Download	An active download is being canceled. This can be due to a user initiated cancel, a download failure, or connection loss.

Compact GuardLogix Status Messages

Applies to these controllers:
Compact GuardLogix 5380 SIL 2
Compact GuardLogix 5380 SIL 3

The Compact GuardLogix 5380 controller display can show these scrolling messages.

Table 36 - Safety Status Messages

Message	Interpretation
No Safety Signature	Safety Task is in Run mode without a safety signature. Generate a safety signature.
Safety Unlocked	The controller is in Run mode with a safety signature, but is not safety-locked. Safety lock the controller.
Safety Task Inoperable	The safety logic is invalid. For example, a watchdog timeout occurred, or memory is corrupt. For a Compact GuardLogix 5380 SIL3 controllers, a mismatch occurred between the primary controller and the safety partner.
Safety Partner Missing	For Compact GuardLogix 5380 SIL3 controllers, the safety partner is missing or unavailable.

Fault Messages

Applies to these controllers:
CompactLogix 5380
Compact GuardLogix 5380 SIL 2
Compact GuardLogix 5380 SIL 3

If the controller displays a fault, these messages can appear on the status display.

Table 37 - Fault Messages

Message	Interpretation
Major Fault T*XX*:C*XX message*	A major fault of Type *XX* and Code *XX* has been detected. For example, if the status display indicates Major Fault T04:C42 Invalid JMP Target, a JMP instruction is programmed to jump to an invalid LBL instruction.
I/O Fault Local:*X* #*XXXX message*	An I/O fault has occurred on a module in the local chassis. The slot number and fault code are indicated along with a brief description. For example, I/O Fault Local:3 #0107 Connection Not Found indicates that a connection to the local I/O module in slot three is not open. Take corrective action specific to the type of fault indicated.

Table 37 - Fault Messages (Continued)

Message	Interpretation
I/O Fault *ModuleName #XXXX message*	An I/O fault has occurred on a module in a remote chassis. The name of the faulted module is indicated with the fault code and brief description of the fault. For example, I/O Fault My_Module #0107 Connection Not Found indicates that a connection to the module named My_Module is not open. Take corrective action specific to the type of fault indicated.
I/O Fault *ModuleParent:X #XXXX message*	An I/O fault has occurred on a module in a remote chassis. The parent name of the module is indicated because no module name is configured in the I/O Configuration tree of Logix Designer application. In addition, the fault code is indicated with a brief description of the fault. Take corrective action specific to the type of fault indicated.
X I/O Faults	I/O faults are present and *X* = the number of I/O faults present. If there are multiple I/O faults, the controller indicates that the first fault reported. As each I/O fault is resolved, the number of indicated faults decreases and the I/O Fault message indicates the next reported fault. Take corrective action specific to the type of fault indicated.

For details about major recoverable faults and I/O fault codes, see the Logix 5000 Major, Minor, and I/O Fault Codes Programming Manual, publication 1756-PM014.

Major Fault Messages

Applies to these controllers:
CompactLogix 5380
Compact GuardLogix 5380 SIL 2
Compact GuardLogix 5380 SIL 3

The Major Fault T*XX*:C*XX message* on the controller status display indicates major faults.

This manual links to Knowledgebase Article *Logix 5000 Controller Fault Codes* for fault codes. Download the spreadsheet from this public article.

You might be asked to login to your Rockwell Automation web account, or create an account if you do not have one. You do not need a support contract to access the article.

For suggested recovery methods for major faults, see the Logix 5000 Major, Minor, and I/O Fault Codes Programming Manual, publication 1756-PM014.

I/O Fault Codes

Applies to these controllers:
CompactLogix 5380
Compact GuardLogix 5380 SIL 2
Compact GuardLogix 5380 SIL 3

The controller indicates I/O faults on the status display in one of these formats:

- I/O Fault Local:*X #XXXX message*
- I/O Fault *ModuleName #XXXX message*
- I/O Fault *ModuleParent:X #XXXX message*

The first part of the format is used to indicate the location of the module with a fault. How the location is indicated depends on your I/O configuration and the properties of the module that are specified in the Studio 5000 Logix Designer application.

The latter part of the format, #XXXX message, can be used to diagnose the type of I/O fault and potential corrective actions.

This manual links to Knowledgebase Article *Logix 5000 Controller Fault Codes* for fault codes. Download the spreadsheet from this public article.

You might be asked to login to your Rockwell Automation web account, or create an account if you do not have one. You do not need a support contract to access the article.

For suggested recovery methods for I/O faults, see the Logix 5000 Major, Minor, and I/O Fault Codes Programming Manual, publication 1756-PM014.

Controller Status Indicators

Applies to these controllers:
CompactLogix 5380
Compact GuardLogix 5380 SIL 2
Compact GuardLogix 5380 SIL 3

The controller status indicators display the state of the controller.

IMPORTANT	Safety Consideration
	Status indicators are not reliable indicators for safety functions. Use them only for general diagnostics during commissioning or troubleshooting. Do not attempt to use status indicators to determine operational status.

RUN Indicator

The RUN indicator shows the current mode of the controller.

To change the controller mode, you can use the mode switch on the front of the controller or the Controller Status menu in the Logix Designer application.

Table 38 - RUN Indicator

State	Description
Off	The controller is in Program or Test mode.
Steady green	The controller is in Run mode.

FORCE Indicator

The Force indicator shows if I/O forces are enabled on the controller.

Table 39 - FORCE Indicator

State	Description
Off	No tags contain I/O force values.
Solid yellow	I/O forces are enabled. If any I/O force values exist, they are active. **IMPORTANT:** Use caution if you change any force values. In this state, the changes take effect immediately.
Flashing yellow	I/O forces exist in the application, but are not active because I/O forces are not enabled. **IMPORTANT:** Use caution if you enable I/O forces. All existing I/O force values take effect immediately.

SD Indicator

The SD indicator shows if the SD card is in use.

Table 40 - SD Indicator

State	Description
Off	No activity is occurring with the SD card.
Flashing green	The controller is reading from or writing to the SD card. **IMPORTANT**: Do not remove the SD card while the controller is reading or writing. Let the read/write complete without interruption. If you interrupt the read/write, data corruption or loss can occur.
Solid green	
Flashing red	One of the following exists: • The SD card does not have a valid file system. • The SD card drew excessive current and power has been removed from the card.
Solid red	The controller does not recognize the SD card.

OK Indicator

The OK indicator shows the state of the controller.

Table 41 - OK Indicator

State	Description
Off	No power is applied.
Flashing red	One of the following exists: • The controller requires a firmware update. Typically, the controller is in its out-of-box state when a firmware update is required. If a firmware update is required, the 4-character display indicates Firmware Installation Required. For more information on how to update firmware, see Upload from the Controller on page 95. • A firmware update is in progress. If a firmware update is in progress, the 4-character display indicates Flash in Progress. For more information on how to update firmware, see Upload from the Controller on page 95. • The controller has a major fault. The fault can be recoverable or nonrecoverable. If the fault is nonrecoverable, the program has been cleared from the controller memory. If a fault has occurred, the 4-character display shows information about the fault, for example, the Type and Code. For details about major faults, see the following: – The fault descriptions in the General Status Messages that begin on page 301. – Logix 5000 Major, Minor, and I/O Fault Codes Programming Manual, publication 1756-PM014. • All user tasks, that is, standard and safety, are stopped.
Solid red	One of the following: • The controller is completing power-up diagnostics. • The controller is depleting its residual stored energy upon powerdown. • The controller is powered, but is inoperable. • The controller is loading a project to nonvolatile memory. • The controller is experiencing a Hardware Preservation Fault due to a high internal module temperature. In this condition, only the status indicator receives power. Once the controller cools down to an acceptable temperature, full power is applied.
Solid green	The controller is operating normally.

EtherNet/IP Status Indicators

Applies to these controllers:
CompactLogix 5380
Compact GuardLogix 5380 SIL 2
Compact GuardLogix 5380 SIL 3

The EtherNet/IP indicators show the state of the controller Ethernet ports and network communication activity.

NET A1 and NET A2 Indicators

The NET A1 and NET A2 indicators show the state of the Ethernet port.

Table 42 - NET A1 and NET A2 Indicators

State	Description
Off	One of the following: • The controller is not configured, or does not have an IP address. • The port is administratively disabled. • The EtherNet/IP mode is Linear/DLR mode. In this case, the NET A2 indicator is off. The NET A1 indicator remains on.
Flashing green	The controller has an IP address, but no active connections are established.
Steady green	The controller has an IP address and at least one established active connection.
Steady red	Duplicate IP address or invalid configuration.

LINK A1 and LINK A2 Indicators

The LINK A1 and LINK A2 indicators show the state of the EtherNet/IP links.

Table 43 - LINK A1 and LINK A2 Indicators

State	Description
Off	The link is down. One or more of these conditions exists: • Ethernet cables are not properly connected at both ends. That is, the cables are not properly connected the controller Ethernet port and to the connected device. • No link exists on the port. For example, the connected device is not powered. • The port is administratively disabled. • LINK A2 only: – The controller is the active ring supervisor in a DLR network, and the ring is not broken. This is normal operation. – The controller is the active ring supervisor in a DLR network and has detected a rapid ring fault.
Flashing green	All of these conditions exist: • The port is enabled. • A link exists. That is, the cable is properly connected to an enabled controller Ethernet port on to another device. • There is **activity** on the port.
Steady green	All of these conditions exist: • The port is enabled. • A link exists. That is, the cable is properly connected to an enabled controller Ethernet port on to another device. • There is **no activity** on the port.

Power Status Indicators

Applies to these controllers:
CompactLogix 5380
Compact GuardLogix 5380 SIL 2
Compact GuardLogix 5380 SIL 3

The power status indicators show the status of module power and sensor/actuator power, known as MOD Power and SA Power, respectively.

MOD Power Indicator

Table 44 describes the MOD Power indicator on a CompactLogix 5380 and Compact GuardLogix 5380 controller.

Table 44 - MOD Power Indicator

State	Description
Off	Module Power is not present
Steady green	Module Power is present(1)

(1) Although unlikely, it is possible that there is enough Module Power present for the indicator to turn steady green but the power is not valid. Valid power is 18…32V DC to operate a CompactLogix 5380 system. If the system does not power up and operate successfully, Module Power can be invalid.
If Module Power is invalid, we recommend that you make sure that the external power supply is working correctly, properly sized for your application and that all wiring is correct.

SA Power Indicator

Table 45 describes the SA Power indicator on a CompactLogix 5380 and Compact GuardLogix 5380 controller.

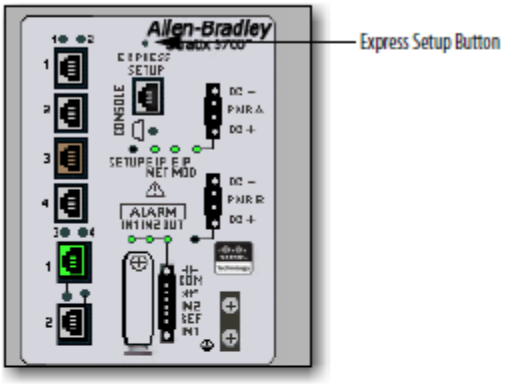
Table 45 - SA Power Indicator

State	Description
Off	One of the following: • Sensor Actuator Power is not present • Status of Sensor Actuator power is unknown
Steady green	Sensor Actuator Power is present(1)

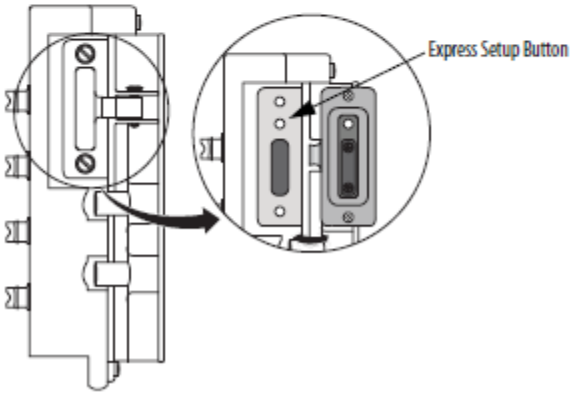
(1) Although unlikely, it is possible that there is enough Sensor/Actuator Power present for the indicator to turn steady green but the power is not valid. Valid power is 18…32V DC in applications that require DC voltage and 18…240V AC in applications that require AC voltage.
If Sensor/Actuator Power is invalid, we recommend that you make sure that the external power supply is working correctly, properly sized for your application and that all wiring is correct.

7.3.3 Switch Stratix 5700

Stratix 5700 Switch



ArmorStratix 5700 Switch

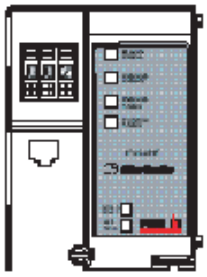


Indicator	Status	Description
Setup	The Setup status indicator shows the status of the initial setup of the switch.	
	Off	The switch is configured as a managed switch.
	Solid green	The switch is in initial setup.
	Flashing green	The switch is in initial setup, fault recovery, or initial setup is incomplete.
	Solid red	The switch failed to start initial setup or recovery because there is no available switch port to connect to the management station. Disconnect a device from a switch port, then press the Express Setup button on the switch.
EIP Net	The EIP Net status indicator shows the network status of the switch.	
	Off	Power to the switch is off or is not properly connected.
	Solid green	The switch has an established CIP connection to one or more attached devices.
	Flashing green	The switch has an IP address but the switch does not have an established connection to one or more attached devices.
	Flashing red	One or more connections to attached devices have timed out.
	Solid Red	The switch has detected that its IP address is already in use by another device in the network.
	Flashing green and red	The switch is running its power-on self-test (POST).
EIP Mod	The EIP Mod status indicator shows the status of the switch.	
	Off	Power to the switch is off or is not properly connected.
	Solid green	The switch is operating properly.
	Flashing green	The switch is not configured. For example, the switch does not have an IP address configured.
	Flashing red	The switch has detected a recoverable system fault.
	Solid red	The switch has detected a nonrecoverable system fault.
	Flashing green and red	The switch is running its power-on self-test (POST).
DC_A/PWR A DC_B/PWR B	The power status indicators show the status of power to the switch.	
	Off	Power to the switch is off or is not properly connected.
	Solid green	Power is present on the associated circuit.
	Solid red	Power is not present on the associated circuit, and the switch is configured for dual-input power.
Alarm IN1 Alarm IN2	The alarm input status indicators show the status of the alarm inputs.	
	Off	Alarm input is not configured.
	Solid green	Alarm input is configured; no alarm detected.
	Flashing red	Major alarm detected.
	Solid red	Minor alarm detected.
Alarm Out	The alarm out status indicators show the status of the alarm output.	
	Off	Alarm Out is not configured, or the switch is off.
	Solid green	Alarm Out is configured; no alarm is detected.
	Flashing red	The switch has detected a major alarm.

Mode	Status	Description
Status	In Status mode, the port status indicators show the connection and activity status of the port. Status mode is the default mode.	
	Off	No link present on the port.
	Solid green	Port link; no activity.
	Flashing green and off	Link is active and healthy.
	Alternating green and amber	There is a fault or error on the link.
	Solid amber	The port is disabled.
Duplex	In Duplex mode, the port status indicators show the Duplex mode (Full-duplex or Half-duplex) of the ports. The 10/100/1000 ports operate only in Full-duplex mode.	
	Off	The port is not operating.
	Solid amber	The port is operating in Half-duplex mode.
	Solid green	The port is operating in Full duplex mode.
Speed	In Speed mode, the port status indicators show the operating speed of the ports.	
	Off	The port is not operating.
	Solid amber	The port is operating at 10 Mbps.
	Solid green	The port is operating at 100 Mbps.
	Flashing green	The port is operating at 1000 Mbps.
Power	In Power mode, the port status indicators show the status of PoE on switch models with PoE capability.	
	Off	PoE is disabled on the port.
	Solid green	PoE is enabled on the port. The switch port is providing power.
	Flashing green and amber	PoE is denied because it exceeds the power capacity of the switch.
	Flashing amber	PoE is denied because it exceeds the configured power limit for the switch port.

7.3.4 Allen Bradley 1734-AENT Point I/O - Ethernet Adapter

Interpret the Status Indicators



ATTENTION

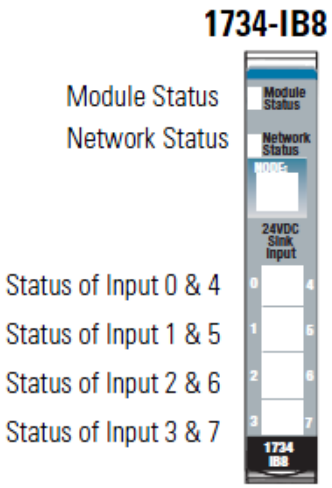
You must use series C POINT I/O modules with the 1734-AENT adapter. Series A or B POINT I/O modules will not work with this adapter.

Indication	Probable Cause	Recommended Action
Module Status		
Off	No power applied to device	Apply power to the device.
Flashing Red/Green	LED cycle power test (module self-test) present.	None
Solid Green	Device is operating normally.	None
Flashing Red	Recoverable fault has occurred: Firmware (NVS) update present. Address switches changed.	 Complete firmware update. Verify address switches.
Solid Red	Unrecoverable fault has occurred: Self-test failure present (checksum failure, or ramtest failure at cycle power). Firmware fatal error present.	Replace adapter.

Indication	Probable Cause	Recommended Action
Network Activity		
Off	No link established.	Verify network cabling, and correct, as needed.
Flashing Green/Off	Transmit or receive activity present.	None
Steady Green	Link established.	None
Network Status		
Off	Device not initialized. The module does not have an IP address.	Apply power to device, verify IP address, and correct, as needed.
Flashing Green	No CIP connections present. Device has an IP address, but no CIP connections are established.	None
Solid Green	CIP connections present. Device online and has an IP address, and CIP connections are established.	None
Flashing Red	One or more CIP connections has timed-out.	Check for I/O module failure and controller operation, and correct, as needed.
Solid Red	Duplicate IP address detected.	Verify IP address setting and correct, as needed.
Flashing Red/Green	The module is performing a self-test (only occurs during cycle power test).	None
POINTBus Status		
Off	Device not powered - check module status indicator.	Apply power to device.
Flashing Red/Green	LED cycle power test present.	None
Flashing Red	Recoverable fault occurred: • At cycle power the number of expected modules does not equal the number of modules present • A module is missing • Node fault (I/O connection timeout) occurred.	• Configure chassis size. • Check for missing module and reinstall as needed. • Check for I/O module failure and correct as needed.
Solid Red	Unrecoverable fault occurred - the adapter is bus off.	1. Cycle power to device. 2. If condition persists, replace device.
Flashing Green	Firmware (NVS) update in progress.	None
Solid Green	Adapter online with connections established (normal operation, Run mode).	None
System Power		
Off	Not active; field power is off or dc-dc converter problem present.	1. Verify power is on, and apply power if needed. 2. Verify backplane power not exceeded, and correct. 3. Replace 1734-AENT module.
Green	System power is on; dc-dc converter is active (5V).	None
Field Power		
Off	Not active; field power is off.	Apply field power.
Green	Power is on; 24V is present.	None

7.3.5 Allen Bradley 1734-IB8 digital Input module

Troubleshoot with the Indicators

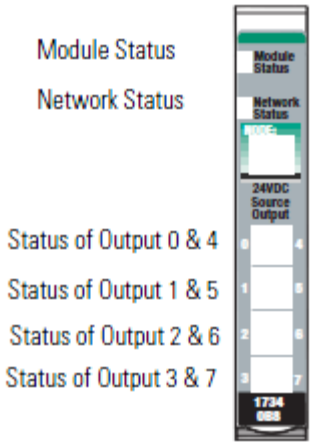


Indication	Probable Cause
Module Status	
Off	No power applied to device
Green	Device operating normally
Flashing Green	Device needs commissioning due to configuration missing, incomplete or incorrect.
Flashing Red	Recoverable fault.
Red	Unrecoverable fault may require device replacement
Flashing Red/Green	Device is in self-test
Indication	**Probable Cause**
Network Status	
Off	Device is not on line - Device has not completed dup_MAC_id test. - Device not powered - check module status indicator
Flashing Green	Device is on line but has no connections in the established state.
Green	Device on-line and has connections in the established state.
Flashing Red	One or more I/O connections in timed-out state
Red	Critical link failure - failed communication device. Device detected error that prevents it communicating on the network.
Flashing Red/Green	Communication faulted device - the device has detected a network access error and is in communication faulted state. Device has received and accepted an Identify Communication Faulted Request - long protocol message.
Indication	**Probable Cause**
I/O Status	
Off	Input is in the off state
Yellow	Input is in the on state

7.3.6 Allen Bradley 1734-OB8 digital Output module

Troubleshooting with the Indicators

1734-OB8

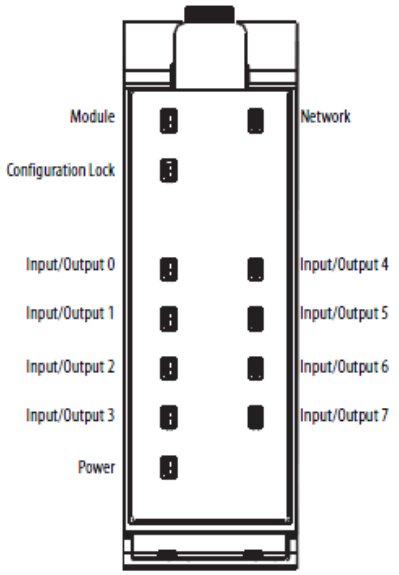


Indication	Probable Cause
Module Status	
Off	No power applied to device
Green	Device operating normally
Flashing Green	Device needs commissioning due to configuration missing, incomplete or incorrect.
Flashing Red	Recoverable fault.
Red	Unrecoverable fault may require device replacement
Flashing Red/Green	Device is in self-test

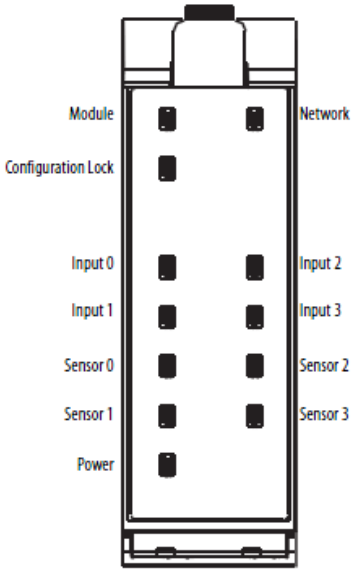
Indication	Probable Cause
Network Status	
Off	Device is not on-line - Device has not completed dup_MAC_id test. - Device not powered - check module status indicator
Flashing Green	Device is on-line but has no connections in the established state.
Green	Device on-line and has connections in the established state.
Flashing Red	One or more I/O connections in timed-out state
Red	Critical link failure - failed communication device. Device detected error that prevents it communicating on the network.
Flashing Red/Green	Communication faulted device - the device has detected a network access error and is in communication faulted state. Device has received and accepted an Identify Communication Faulted Request - long protocol message.

Indication	Probable Cause
I/O Status	
Off	All outputs inactive
Yellow	One or more output is active and under control

7.3.7 Allen Bradley 1734-I/OB8S safety Input/Output Module



1734-IB8S or 1734-OB8S



1734-IE4S

Module

Indicator		Description	Recommended Action
MS	Off	No power is applied to the module.	Apply power to this connector.
	Solid green	The module is operating normally.	None.
	Solid red	The module detected an unrecoverable fault.	Cycle power to the module. If problem persists, replace the module.
	Flashing green	Device is in the Idle or Standby state.	Configure the module and establish connection.
	Flashing red	The module has detected a recoverable fault.	Cycle power to the module or reset the module.
		User-initiated firmware update is in progress.	Wait for firmware update to complete.
	Flashing red and green	Module is not configured.	Reconfigure the module. For additional information, inspect Network Status indicator.
		The module is performing its power-cycle diagnostic tests.	Wait for the module to complete its power-cycle diagnostics.

Network Status

Indicator		Description	Recommended Action
NS	Off	The module is not online with the network or there is no power.	Verify your network is working properly.
	Flashing green	Module online with no connections in established state.	Verify your network and module configuration.
		The module identified the communication rate of the network but no connections are established.	
	Solid green	Module online with connections in established state. The module is operating normally.	None.
	Flashing red	One or more I/O connections is in timed-out state.	Verify your network and module configuration.
		A user-initiated firmware update is in progress.	Wait for firmware update to complete.
	Solid red	Critical link failure. The module detected an error that prevents it from communicating on the network, such as a duplicate node address.	Cycle power to the module. Check node addressing.

Configuration Lock

Indicator		Description	Recommended Action
LK(1)	Off	No configuration or configured by a GuardLogix originator.	Validate configuration by a network configuration tool, such as RSNetWorx software.
		Invalid configuration data.	
	Solid yellow	Locked.	None.
		Valid configuration, locked by a network configuration tool, such as RSNetWorx software.	
	Flashing yellow	Not locked.	None.
		Valid configuration by a network configuration tool, such as RSNetWorx software.	

(1) Not applicable when used with GuardLogix controllers.

Power

Indicator		Description	Recommended Action
PWR	Off	No field power applied.	Apply field power.
	Green	Normal condition, field power supplied and within specification.	None.
	Yellow	Field power out of specification.	The module is configured to use sensor power, and either the sensor is drawing too much current (short in the wiring or sensor), or the sensor is not drawing any current (broken wire or sensor). Check your connectors, wiring, and voltages.

1734-IE4S Sensor Power

Indicator		Description	Recommended Action
S0…S3	Off	Sensor power is not used.	None.
	Green	Sensor power is used.	None.
	Red	Over-current or under-current sensor power fault.	Check connectors, wiring, and power supply.

1734-IE4S Safety Analog Input Status

Indicator		Description	Recommended Action
0…3(1)	Off	Safety analog input is not used or the module is being configured.	Reconfigure the channel, if desired.
	Yellow	Safety analog input is configured for use and no faults exist.	None.
	Red	A fault has been detected in the analog input signal path.	Check the fault code in the module using one of the data assemblies that contains the Fault Reason. See Appendix B for details. Check configuration, field wiring, and devices. If no problem found, replace module.
	Flashing red	A fault has been detected in the partner input signal path of a dual-input configuration.	Check the field wiring and verify your configuration for the partner circuit. If no problem found, replace module.

(1) Indicator behavior in Tachometer mode facilitates machine setup and troubleshooting. When the tachometer signal is below the configured OFF threshold, the indicator is off. When the tachometer signal is above the ON threshold, the indicator is yellow. Status indicator behavior during normal operation is dependent upon the module update rate and is not intended to indicate the actual tachometer input. When the input rate is above 30 Hz, the status indicator will be solid yellow. When the input rate is below 30 Hz, the status indicator will be flashing yellow as the signal turns on and off.

1734-IB8S Safety Input Status

Indicator		Description	Recommended Action
0…7	Off	Safety input is off, or module is being configured.	Turn the safety input on or reconfigure the channel, if desired.
	Yellow	Safety input is on.	None.
	Red	A fault in the external wiring or input circuit has been detected.	Check configuration, field wiring, and devices. If no problem found, replace module.
	Flashing red	A fault in the partner input circuit of a dual-input configuration has been detected.	Check the field wiring and verify your configuration for the partner circuit. If no problem found, replace module.

1734-OB8S Safety Output Status

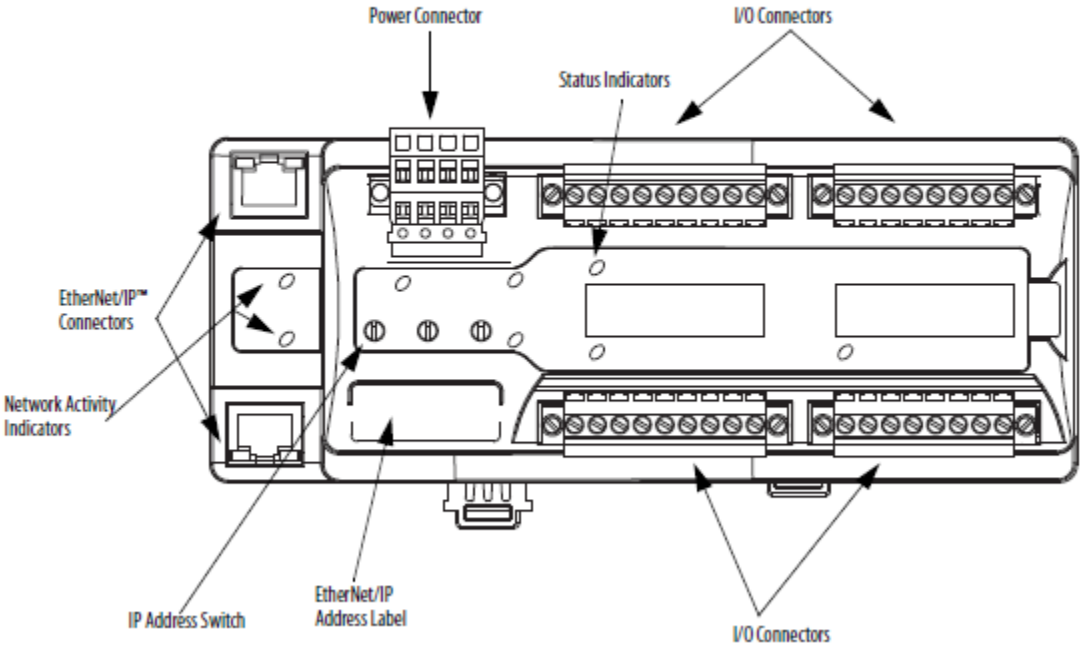
Indicator		Description	Recommended Action
0…7	Off	Safety output is off, or module is being configured.	Turn the safety output on or reconfigure the channel, if desired.
	Yellow	Safety output is on.	None.
	Red	A fault in the output circuit has been detected.	Check the circuit wiring and end device. If no problem found, replace module.
		The tag values in a dual output configuration do not have the same value.	Make sure logic is driving tag values to the same state (off or on).
	Flashing red	A fault in the partner output circuit of a dual-output configuration has been detected.	Check the circuit wiring and end device of the partner. If no problem found, replace module.

7.3.8 Allen Bradley 1791ES-IB16 Absolut Encoder Input Module

Identify Major Parts of the Module

See Figure 1 for module identification.

Figure 1 - 1791ES-IB2SSIR Module Connections and Indicators



Monitoring and Troubleshooting

Status Indicators

The status indicators represent the state of the module as described in the following table.

Table 12 - Status Indicator Descriptions

Indicator	Status	Description
Module Status	Off	No power applied or severe power overvoltage.
	Green	The module is operating normally.
	Red	The module detected a major unrecoverable fault (MNRF).
	Flashing Red/Green	The module is performing POST (power on self test), which completes within 30 s.
	Flashing Green	The module is unconfigured. Module needs commissioning due to missing, incomplete, or incorrect configuration
		The module is idle.
	Flashing Red	The module has detected a major recoverable fault.
		User-initiated firmware update is in progress.
Network Status	Off	The device is not initialized, or the module does not have an IP address.
	Green	The device is online, has an IP address, and CIP™ connections are established.
	Red	The module has detected that its IP address is already in use.
	Flashing Red/Green	The module is performing a power on self test (POST).
		The module has received the proposed UNID and is waiting for the TUNID.
	Flashing Green	The device has an IP address, but no CIP connections are established.
	Flashing Red	One or more connections have timed out.
		User-initiated firmware update is in progress.
Network link status (Link1 and Link2)	Off	No link established.
	Green	Link established on indicated port at 100 Mbps.
	Flashing Green	Link activity present on indicated port at 100 Mbps.
	Yellow	Link established on indicated port at 10 Mbps.
	Flashing Yellow	Link activity present on indicated port at 10 Mbps.
Power Status	Off	No power is applied or severe power overvoltage.
	Green	Power is applied.

Table 12 - Status Indicator Descriptions

Indicator	Status	Description
Feedback (Channel 0, Channel 1) Status	Off	The input is off, or the channel is configured for not used.
	Yellow	The input is on.
	Red	A fault in the external wiring or internal input circuit detected.
	Flashing Red	A fault in the partner input circuit of a dual-feedback configuration detected.

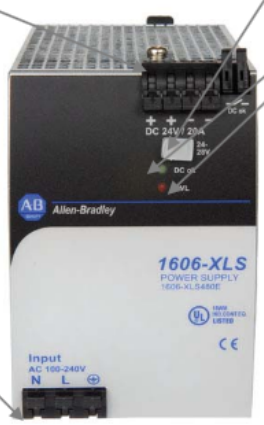
7.3.9 Allen Bradley DC power supply

Output Terminals
Quick-connect spring-clamp terminals, no tools required
+ Positive output pole
- Negative output pole
Dual pins per pole

DC ok Relay contact (NO-contact)

480W Continuous power / 720W Peak power

Input Terminals
Quick-connect spring-clamp terminals, no tools required
N … Neutral input
L … Line (hot) input
⏚ … PE (Protective Earth)
See chapter 14 "Terminals and Wiring" to choose appropriate wire gauges



Output voltage potentiometer
(multi turn potentiometer)
Open the flap to tune the output voltage.
Factory setting: 24.1V

DC-ok LED (green)
Overload LED (red)

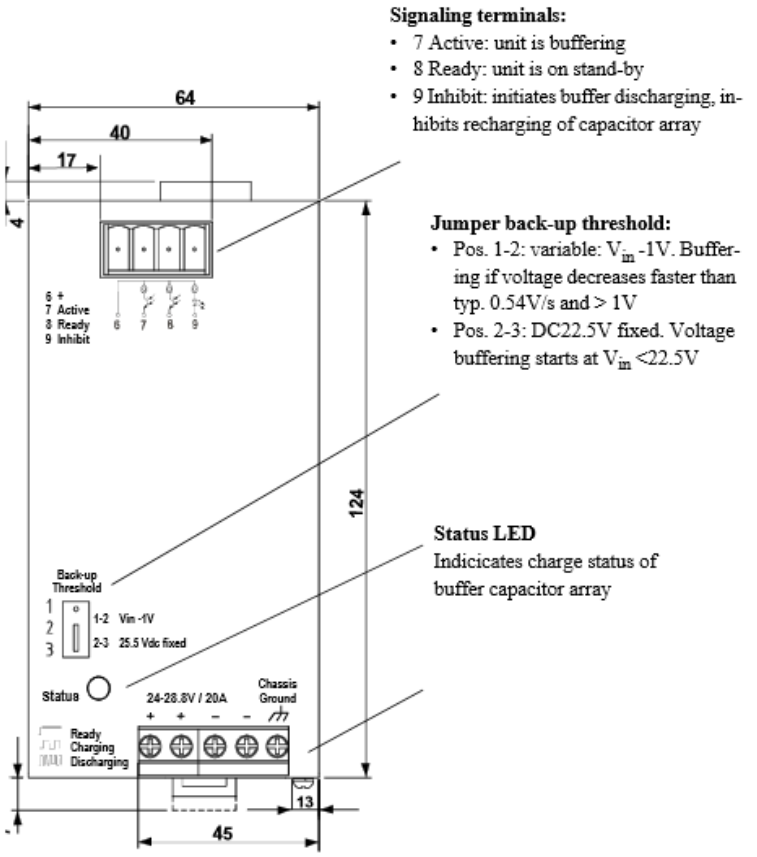
	Overload LED	DC-ok LED	DC-ok contact
Normal mode	OFF	ON	Closed
Power-Boost mode	OFF	ON	Closed
Overload (V_{OUT} > 90%)	OFF	ON	Closed
Overload (V_{OUT} < 90%)	*)	OFF	Open
Short-circuit (V_{OUT} = ca. 0V)	*)	OFF	Open
Over- temperature	*)	OFF	Open
No input power	OFF	OFF	Open

DC-ok LED and DC-ok contact function synchronized

*) Up to 4s of overloading, the power supply delivers continuous output current. After this, the output power is reduced to nearly zero for approx. 17s before a new start attempt is automatically performed. If the overload has been cleared, the device will operate normally. If the overload still exists, the output current will be delivered for 2 to 4s (depending on the overload) again followed by a 17s rest time. This cycle is repeated as long as the overload exists.

The red overload LED is permanently on when the overload current is continuously flowing. During the 17s rest period, the red LED is flashing with a frequency of approx. 1.3Hz.

7.3.10Allen Bradley Puffer Module

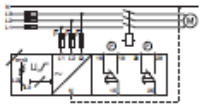


Front Elements, Operating Indicators and Elements

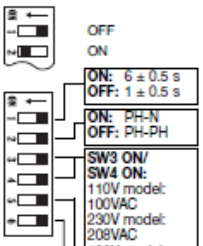
⊕	Positive power in/out (twice)
⊖	Negative power in/out (twice)
Chassis Ground ⏚	Possibility to connect housing to ground
'Back-up Threshold'	
• Jumper pos. 2-3 (or missing)	Backup voltage: DC 22.5V fixed
• Jumper pos. 1-2	Backup voltage, variable: V_{in} -1V; backup activation on drop faster than typ. 0.54V/s and >1V
LED 'Status'	
• Off	Buffers are discharged, no external voltage or external voltage <22.5V
• Flashes (1.25Hz)	Buffer capacitors are charging
• On	Unit ready for operation, buffer is fully charged Unit is buffering
• Flashes (10Hz)	

7.3.11Phase sequence relais

813S-V3-230V
813S-V3-400V
813S-V3-480V
813S-V3-690V



F=250mA (*)



ENGLISH

1 Connections

Connect the 3-phase power supply and the neutral (if present) taking care of the sequence. Connect the relay outputs according to the ratings. Automatic screwdriver can be used (max torque 0.5 Nm).
(*) Suggested size for the mains protection against short circuits on the terminals blocks, in any case to be coordinated with the upstream protections.

Keep power OFF while connecting!

2 Setting of function and input range

Adjust the input range setting the DIP switches 3 and 4. Select the desired function setting the DIP switches 1 to 2 and 5 to 6. To access the DIP switches open the plastic cover using a screwdriver as shown on the left.
SW1 selects the power-ON delay (inhibit of alarm at the power-ON): 1s or 6s. SW2 selects the measuring mode: phase-phase (monitoring only delta voltages) or phase-neutral voltage (monitoring both delta and star voltages). SW5 selects the mode of the relay outputs: 2xSPDT (relays operate independently each connected to a single set point) or 1xDPDT (relays operate together). SW6 selects the function: over + under voltage or asymmetry + tolerance (tolerance 10% means that the input can be within 90% and 110% of the nominal voltage).

Do not open the DIP-switches cover if the Power Supply is ON

3 Mechanical mounting

Hang the device to the DIN-Rail being sure that the spring closes. Use a screwdriver to remove the product as shown in figure.

4 Startup and adjustment

Check if the input range is correct. Turn the power ON. The bicoloured LED (⇦/AL) is green. Adjust the delay (DELAY 1, DELAY 2), upper (◜) and lower (◟) level [or asymmetry (ASY) and tolerance ({ }] knobs to the desired value. Provided that the phases are all present in the proper sequence, the working mode is well explained by the following examples.

DEUTSCH

1 Anschlüsse

Das Drehstromkabel und das Erdkabel (falls vorhanden) unter Einhaltung der Reihenfolge anschliessen. Den Relais-Ausgang entsprechend den angegebenen Belastungswerten anschliessen.
Automatischer Schraubendreher kann benutzt werden (Drehmoment max. 0,5 Nm).
(*) Vorgeschlagene Sicherungsgröße für die wichtigsten Schutz gegen Kurzschluss an den Klemmen, muss mit dem vorgelagerten Schutz koordiniert werden.

Achten Sie beim Anschluß auf Spannungsfreiheit!

2 Einstellung der Eingangsleistung sowie der Funktion.

Die gewünschte Leistung mit Hilfe der DIP-Schalter 3 und 4 einstellen. Die Funktion mit Hilfe der DIP-Schalter 1 bis 2 und 5 bis 6 auswählen. Um Zugang zu den DIP-Schaltern zu bekommen, die Klappe mit Hilfe eines Schraubenziehers - wie in der Illustration gezeigt - öffnen. Mit SW1 wird der Verzug beim Start gewählt (die Funktion des Relais wird beim Start untersagt): 1s oder 6s. Mit SW2 wird die Masseinheit gewählt: Phase-Phase (kontrolliert lediglich die verketteten Spannungen) oder aber Phase-Mittelleiter (kontrolliert sowohl die verketteten als auch die Sternspannungen). Mit SW5 wird die Funktionsweise der Relaisausgänge gewählt: 2xSPDT (die Relais funktionieren unabhängig voneinander, jedes ist an eine einzelne Leistung angeschlossen) oder 1xDPDT (die Relais funktionieren zusammen). Mit SW6 wird zwischen folgenden Funktionen gewählt: Über- und Unterspannung oder Asymmetrie und Toleranz (eine Toleranz von 10% besagt, daß die Eingangsspannung zwischen 90% und 110% der Nennspannung schwanken kann).

Achtung! Gerät vor dem Öffnen der DIP-Schalterabdeckung spannungsfrei Schalten

3 Montage

Befestigen Sie das Relais auf der DIN-Schiene und achten Sie darauf, daß die Befestigungsfeder eingerastet ist. Benutzen Sie einen Schraubendreher, um das Relais wieder zu entfernen, wie im nebenstehenden Bild gezeigt.

4 Einschalten und Einstellungen

Die Richtigkeit der Leistung kontrollieren. Dem Instrument Strom zuführen. Das zweifarbige LED (⇦/AL) ist grün. Die Verzugs (DELAY 1, DELAY 2), Über (◜)- und Unter (◟)-spannungsdrehknöpfe [beziehungsweise Asymmetrie (ASY) und Toleranz ({)-Drehknöpfe] auf den gewünschten Wert einstellen. Ausgehend davon, daß die

"UL notes"

- For Canadian application, these devices shall be supplied by a secondary circuit, which is not directly derived from the primary circuit and where the short-circuit limit between conductors or between conductors and ground is 1500 VA or less: the short-circuit volt ampere limit is the product of the open circuit voltage and the short circuit ampere. For other applications additional consideration shall be evaluated in the final use.
- "Use 60 or 75°C copper (CU) conductor and wire size No. 30-14 AWG, stranded or solid".
- "Terminal tightening torque of 4.4 Lb-In".
- Being these devices Overvoltage Category III they are: "For use in a circuit where devices or system, including filters or air gaps, are used to control overvoltages at the maximum rated impulse withstand voltage peak of 6.0 kV. Devices or system shall be evaluated using the requirements in the Standard for Transient Voltage Surge Suppressors, UL 1449 and shall also withstand the available short circuit current in accordance with UL 1449".

Example 1: 2xSPDT relays, over and undervoltage monitoring.
Both relays and their respective yellow LEDs operate as long as the input voltage is within the set upper (◜) and lower (◝) set points. When one or more phases drops below the lower set point for more than the specific set delay time (DELAY 2) the second relay and the upper yellow LED turn OFF, the bicoloured LED (flashing 2 Hz during the delay time) turns red. When one or more phases exceeds the upper set point for more than the specific set delay time (DELAY 1) the first relay and the lower yellow LED turn OFF, the bicoloured LED (flashing 2 Hz during the delay time) turns red.

Example 2: 1xDPDT relay, asymmetry and tolerance monitoring.
Both relays and their respective yellow LEDs operate as long as the input asymmetry is within the set limits (ASY) and the input voltages are within the set tolerance (◟◞). When the asymmetry exceeds the set limit for more than the specific set delay (DELAY 1) both relays and yellow LEDs turn OFF (provided that they aren't already OFF), the bicoloured LED (flashing 2 Hz during the delay time) turns red. When one or more phases leave the allowed range (◟◞ =nom. voltage - tolerance to nom. voltage + tolerance) for more than the specific set delay time (DELAY 2) both relays and yellow LEDs turn OFF (provided that they aren't already OFF), the bicoloured LED (flashing 2 Hz during the delay time) turns red. If the phase sequence is wrong or one phase is lost both the output relays release immediately (only 200 ms delay occurs). This failure is indicated by the bicoloured LED which flashes 5 Hz as long as the alarm condition is occurring.

5 Important

Should you require information about installation, operation or maintenance of the product that is not covered in this instruction document, contact your local Rockwell Automation sales office or Allen-Bradley distributor. The information in this document is not considered binding on any product family.

Phasen in der richtigen Reihenfolge vorliegen, wird der Betrieb des Instruments gut durch die beiden folgenden Beispiele erklärt.

Beispiel 1: 2 SPDT Relais, Kontrolle der Über- sowie der Unterspannung.
Beide Relais und die jeweiligen gelben LEDs bleiben solange eingeschaltet, bis sich sämtliche Phasen zwischen der Unter (◝)- und der Über (◜)- spannungsschwelle halten. Sobald eine oder mehrere der Phasen länger als für die jeweilige Verzugszeit (DELAY 2) die Unterspannungsschwelle unterschreiten, schalten sich das erste Relais und das untere gelbe LED ein und das zweifarbige LED (das während der Verzugszeit mit einer 2-Hz Frequenz blinkt) leuchtet rot auf. Sobald eine oder mehrere der Phasen länger als für die jeweilige Verzugszeit (DELAY 1) die Überspannungsschwelle überschreiten, schalten sich das erste Relais und das untere gelbe LED ein und das zweifarbige LED (das während der Verzugszeit mit einer 2-Hz Frequenz blinkt) leuchtet rot auf.

Beispiel 2: Ein DPDT-Relais, Kontrolle der Asymmetrie und der Toleranz.
Beide Relais und die jeweiligen gelben LEDs bleiben solange eingeschaltet, bis sich die Asymmetrie unterhalb des eingestellten Werts (ASY) hält und sich die Spannungen innerhalb der eingegebenen Toleranz (◟◞) halten Sobald die Asymmetrie den eingestellten Wert länger als für die Verzugszeit (DELAY 1) überschreitet, schalten sich das Relais und das gelbe LED aus; das rote LED (das während der Verzugszeit mit einer 2-Hz-Frequenz blinkt) leuchtet auf. Sobald eine oder mehrere Phasen länger als für die jeweilige Verzugszeit (DELAY 2) aus dem eingestellten Toleranzbereich (◟◞ = Nennspannung minus Toleranz- Nennspannung plus Toleranz) heraustreten, schalten sich beide Relais sowie die gelben LEDs aus. Das rote LED (das während der Verzugszeit mit einer 2-Hz-Frequenz blinkt) leuchtet auf. Wenn die Phasensequenz falsch ist oder wenn eine Phase fehlt, schalten sich das Relais und das gelbe LED sofort aus (es gibt nur einen Verzug von 200 ms). Dieser Zustand wird durch das rote LED gemeldet, das mit einer Frequenz von 5 Hz blinkt, bis der Alarmzustand permanent wird.

5 Wichtig

Sollten Sie Informationen über Installation, Betriebsarten oder Wartung des Produkts, die nicht in dieser Installationshinweise abgedeckt sind, wenden Sie sich zu Ihrem lokalen Rockwell Automation-Vertriebsbüro oder Allen-Bradley-Distributor. Die Informationen in diesem Dokument sind nicht verbindlich für jedes Produkt Familie.

7.3.12Pilz PSEN cs1.1p

2 Error code

The "Safety Gate" and "Input" LEDs send flash signals; an error code can be established from the number and sequence. The "Power/Fault" LED illuminates red.

Each error code is indicated by three short flashes of the "Input" or "Safety Gate" LED. After a longer pause, the LED will then flash at one second intervals. The number of LED flashes corresponds to a digit in the error code. The error code can consist of up to 3 digits. The digits are separated by a longer period without flashing. The entire sequence is constantly repeated.

Number of flashes	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Decimal error code	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 0

LED	Error	Remedy
LEDs unlit.	Supply voltage is missing, too low, wrongly connected	Connect supply voltage: A1 - +24 VDC and A2 – 0 VDC
"Input" LED flashes yellow.	Partial operation in the input circuit	Open both channels of the input circuit.
"Power/Fault" LED illuminates red.	Error message	Read error codes for fault diagnostics
"Safety Gate" or "Input" LEDs flash a code and "Power/Fault" LED illuminates red.	For error codes see table below	See table below

Example:

Error code 1,4,1:

Flash frequency of the "Safety Gate" or "Input" LED

Meaning of flash frequency:

	Flash frequency	Meaning
I	3 times, short	Code for error message
II	Once, for one second each	Code for 1st digit
III	4 times, for one second each	Code for 2nd digit
IV	Once, for one second each	Code for 3rd digit
V	3 times, short	Code for error message repeated

Table of error codes

Error code Decimal	Number of flashes	Description	Remedy
1.4.1	3x short – 1x long – 4x long – 1x long – 3x short	At least one of the two safety outputs 12 and 22 have voltage applied during system run-up	Check the wiring of safety outputs 12 and 22, rectify the wiring error
1.12	3x short – 1x long – 12x long – 3x short	During operation, short circuit between safety output 12 and 0 VDC	Rectify wiring error at safety output 12
1.13	3x short – 1x long – 12x long – 3x short	During operation, short circuit between safety output 22 and 0 VDC	Rectify wiring error at safety output 22
14	3x short – 14x long – 3x short	During operation, short circuit between safety output 12 and 24 VDC	Rectify wiring error at safety output 12
15	3x short – 15x long – 3x short	During operation, short circuit between safety output 22 and 24 VDC	Rectify wiring error at safety output 22
4.10.7	3x short– 4x long, 10x long, 7x long– 3x short	2 actuators are within the sensor's response range.	Remove one of the actuators from the response range; comply with the actuator's max. approach speed.

Other flashing codes signal an internal error. Remedy: Change device.

7.3.13SEW MOVIDRIVE frequency converter

Operation

Operating Displays

7-segment display

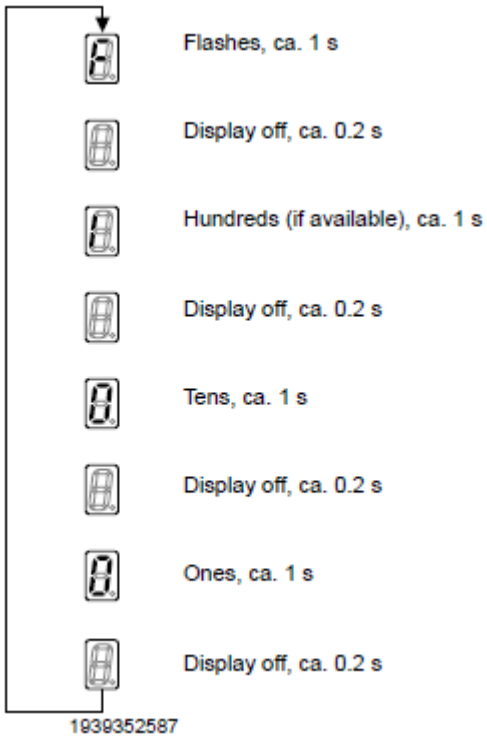
The7-segment display shows the operating condition of MOVIDRIVE®and in the event of an error, an error or warning code.

7-segmentdisplay	Unitstatus (highbytein statusword1)	Meaning
0	**0**	24Voperation(inverternotready)
1	**1**	Controllerinhibitactive
2	**2**	Noenable
3	**3**	Standstillcurrent
4	**4**	Enable
5	**5**	n-control
6	**6**	M-control
7	**7**	Holdcontrol
8	**8**	Factorysetting
9	**9**	Limitswitchcontacted
A	**10**	Technologyoption
c	**12**	IPOS$^{plus®}$referencetravel
d	**13**	Flyingstart
E	**14**	Calibrateencoder
F	**Errornumber**	Errorindicator(flashing)
H	**Statusdisplay**	Manualmode
t	**16**	Inverteriswaitingfordata
U	**17**	"STO"active
²(blinkingdot)	-	IPOS$^{plus®}$programisrunning
Flashingdisplay	-	STOPviaDBG60B
1... 9	-	RAMdefective

Error messages and list of errors

Error message via 7-segment display

The fault code is shown in a 7-segment display. The following display sequence is used (e.g.faultcode100):



Following a reset or if the error code resumes the value"0", the display switches to the operating display.

Sub error code–display

The sub error code is displayed in MOVITOOLS®Motion Studio(asofversion4.50) or in the DBG60B keypad.

16.2.3 Error list

The factory set error response is listed in the "Response P" column. (P) indicates that the response is programmable (via *P83_error response* or with IPOS$^{plus®}$). In the event of error 108, (P) indicates that the response can be programmed via *P555 DCS error response* In the event of error 109, (P) indicates that the response can be programmed via *P556 DCS alarm response*

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
00	No error					
01	Overcurrent	Immediate disconnection	0	Output stage	• Short circuit at output • Motor too large • Defective output stage • External power supply Current converter • Ramp limit is deactivated and set ramp time is too short • Defective phase module • Supply voltage 24 V or 24V generated from it is instable • Interruption or short circuit on the signal lines from the phase modules	• Rectify the short circuit • Connect a smaller motor • Contact SEW Service for advice if the output stage is defective. • Activate P138 and/or increase ramp time
			1	V_{CE} monitoring or undervoltage monitoring of the gate driver		
			5	Inverter remains in hardware current limit		
			6	V_{CE} monitoring or undervoltage monitoring of the gate driver or overcurrent of the current converter. ..Phase U		
			7	..Phase V		
			8	..Phase W		
			9	..Phases U and V		
			10	..Phases U and W		
			11	..Phases V and W		
			12	..Phases U and V and W		
			13	Voltage supply Current converter in mains operation		
			14	MFE signal lines		
03	Ground fault	Immediate disconnection	0	Ground fault	Ground fault • in the motor lead • in the inverter • in the motor	• Eliminate ground fault • Consult SEW Service
04	Brake chopper	Immediate disconnection	0	DC link voltage too high in 4Q operation	• Too much regenerative power • Braking resistor circuit interrupted • Short circuit in the braking resistor circuit • Brake resistance too high • Brake chopper is defective	• Extend deceleration ramps • Check supply cable to braking resistor • Check technical data of braking resistor • Replace MOVIDRIVE® if the brake chopper is defective
			1			
06	Line phase failure	Immediate disconnection	0	DC link voltage periodically too low	• Phase failure • Inadequate line voltage quality	• Check the line cable • Check configuration of the supply system. • Check supply (fuses, contactor)
			3	Line frequency fault		
			4	-		
07	DC link overvoltage	Immediate disconnection	0	DC link voltage too high in 2Q operation	DC link voltage too high	• Extend deceleration ramps • Check supply cable to the braking resistor • Check technical data of braking resistor
			1			
			2	DC link voltage too high in 4Q operation .. .. Phase U		
			3	.. Phase V		
			4	.. Phase W		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
08	Speed monitoring	Immediate disconnection (P)	0	Inverter in current limit or in slip limit	• Speed controller or current controller (in VFC operating mode without encoder) operating at setting limit due to mechanical overload or phase failure in the power supply or motor. • Encoder not connected correctly or incorrect direction of rotation. • n_{max} is exceeded during torque control. • In operating mode VFC: Output frequency ≥ 150 Hz • In operating mode V/f: Output frequency ≥ 600 Hz	• Reduce load • Increase deceleration time (P501 or P503). • Check encoder connection, swap A/A and B/B pairs if necessary • Check encoder voltage supply • Check current limitation • Extend ramps if necessary • Check motor cable and motor • Check line phases
			3	"Actual speed" system limit exceeded. Speed difference between ramp setpoint and actual value for 2×ramp time higher than expected slip.		
			4	Maximum rotating field speed exceeded. Maximum rotating field frequency (with VFC max. 150 Hz and V/f max 600 Hz) exceeded.		
09	Startup	Immediate disconnection	0	Startup missing	Inverter has not been started up for the selected operating mode.	Perform startup for the required operating mode.
			1	Wrong operating mode selected		
			2	Wrong encoder type or defective encoder card		
10	IPOS-ILLOP	Emergency stop	0	Invalid IPOS command	• Incorrect command detected during IPOS$^{plus®}$ program execution. • Incorrect conditions during command execution.	• Check the content of the program memory and, if necessary, correct. • Load the correct program into the program memory. • Check program sequence (→ IPOS$^{plus®}$ manual)
11	Over-temperature	Emergency stop (P)	0	Heat sink temperature too high or temperature sensor defective	• Thermal overload of inverter • Temperature sensor of a phase module faulty. (size 7)	• Reduce load and/or ensure adequate cooling. • Check fan. • If F-11 is issued even though the temperatures is obviously not too high, this indicates a faulty temperature sensor of the phase module. Replace the phase module (Size 7)
			3	Overtemperature switched-mode power supply		
			6	Heat sink temperature too high or temperature sensor defective. ..Phase U (size 7)		
			7	..Phase V (size 7)		
			8	..Phase W (size 7)		
13	Control signal source	Immediate disconnection	0	Control signal source not available, e.g. control signal source fieldbus without fieldbus card	Control signal source not defined or defined incorrectly.	Set correct control signal source (P101).

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
14	Encoder	Immediate disconnection	0	Encoder not connected, defective encoder, defective encoder cable	• Encoder cable or shield not connected correctly • Short circuit/broken encoder wire • Encoder defective	Check encoder cable and shield for correct connection, short circuit and broken wire.
			25	Encoder error X15 – Speed range exceeded. Encoder at X15 turns faster than 6542 rpm.		
			26	Encoder error X15 – Card is defective. Error in the quadrant evaluation.		
			27	Encoder error – encoder connection or encoder is defective		
			28	Encoder error X15 – Communication error RS485 channel.		
			29	Encoder error X14 – Communication error RS485 channel.		
			30	Unknown encoder type at X14/X15		
			31	Plausibility check error Hiperface® X14/X15 Increments have been lost.		
			32	Encoder error Hiperface® X15 Hiperface® encoder at X15 signals error		
			33	Encoder error Hiperface® X14 Hiperface® encoder at X14 signals error		
			34	Encoder error X15 resolver. Encoder connection or encoder is defective.		
17	System malfunction	Immediate disconnection	0	"Stack overflow" error	Inverter electronics disrupted, possibly due to effect of EMC.	• Check grounding and shielding and improve, if necessary. • Consult SEW Service if the error reoccurs.
18			0	"Stack underflow" error		
19			0	"External NMI" error		
20			0	"Undefined opcode" error		
21			0	"Protection fault" error		
22			0	"Illegal word operand access" error		
23			0	"Illegal instruction access" error		
24			0	"Illegal external bus access" error		
25	EEPROM	Rapid stop	0	Read or write error on EEPROM power section	Access to the EEPROM of the memory card has failed	• Activate factory settings, perform reset and reset parameters. • Contact SEW service if the error occurs again. • Replace memory card.
			11	NV memory read error NV-RAM inside the unit		
			13	NV memory chip card System module defective		
			14	NV memory chip card Memory card defective		
			16	NV memory initialization error		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
26	External terminal	Emergency stop (P)	0	External terminal	Read in external error signal via programmable input.	Eliminate respective cause; reprogram terminal if necessary.
27	No limit switches	Emergency stop	0	Both limit switches missing or open circuit	• Open circuit/both limit switches missing. • Limit switches are swapped over in relation to direction of rotation of motor	• Check wiring of limit switches. • Swap over limit switch connections. • Reprogram terminals
			2	Limit switch reversed		
			3	Both limit switches are active simultaneously		
28	Fieldbus Timeout	Rapid stop (P)	0	"Fieldbus timeout" error	No communication between master and slave within the projected response monitoring.	• Check communications routine of the master • Extend fieldbus timeout time (P819) or deactivate monitoring
			2	Fieldbus card does not boot		
29	Limit switch contacted	Emergency stop	0	Hardware limit switch approached	A limit switch was reached in IPOS$^{plus®}$ operating mode.	• Check travel range. • Correct user program.
30	Emergency stop Timeout	Immediate disconnection	0	Time violation stop emergency stop rate	• Drive overloaded • Emergency stop ramp too short.	• Check configuration • Extend emergency stop ramp
31	TF/TH sensor tripped	No response (P)	0	Thermal motor protection error	• Motor too hot, TF/TH has triggered • TF/TH of the motor not connected or connected incorrectly • MOVIDRIVE® connection and TF/TH connection on motor interrupted	• Let motor cool off and reset error • Check connections/link between MOVIDRIVE® and TF/TH. • If a TF/TH is not connected: Jumper X10:1 with X10:2. • Set P835 to "No response".
32	IPOS index overflow	Emergency stop	0	IPOS program defective	Programming principles violated leading to system internal stack overflow	Check and correct the IPOS$^{plus®}$ user program (see IPOS$^{plus®}$ manual).
33	Setpoint source	Immediate disconnection	0	Setpoint source not available, e.g. control signal source fieldbus without fieldbus card	Setpoint source not defined or defined incorrectly.	Set correct setpoint source (P100).
34	Ramp Timeout	Immediate disconnection	0	Time violation rapid stop ramp	Time of downward ramps exceeded, e.g. due to overload.	• Extend the downwards ramps • Eliminate overload
35	Operating mode	Immediate disconnection	0	Operating mode not available	• Operating mode not defined or defined incorrectly • P916 was used to set a ramp function that is needed by a MOVIDRIVE® unit in technology version. • P916 was used to set a ramp type that does not match the selected technology function. • P916 was used to set a ramp type that does not match the selected synchronization time (P888).	• Use P700 or P701 to set correct operating mode. • Use MOVIDRIVE® in technology version (..OT). • From the "Startup → Select technology function..." menu, select the technology function that matches P916. • Check the settings of P916 and P888
			1	Wrong assignment operating mode - hardware		
			2	Wrong assignment operating mode - technology function		
36	Option missing	Immediate disconnection	0	Hardware is missing or not permitted.	• Type of option card not allowed • Setpoint source, control signal source or operating mode not permitted for this option card • Incorrect encoder type set for DIP11B.	• Use correct option card • Set correct setpoint source (P100) • Set correct control signal source (P101) • Set correct operating mode (P700 or P701) • Set the correct encoder type
			2	Encoder slot error.		
			3	Fieldbus slot error.		
			4	Expansion slot error.		
37	System watchdog	Immediate disconnection	0	Error "watchdog overflow system"	Error while executing system software	Consult SEW Service.

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
38	System software	Immediate disconnection	0	"System software" error	System malfunction	Consult SEW Service.
39	Reference travel	Immediate disconnection (P)	0	"Reference travel" error	• The reference cam is missing or does not switch • Limit switches are connected incorrectly • Reference travel type was changed during reference travel	• Check reference cam • Check limit switch connection • Check reference travel type setting and required parameters.
40	Boot synchronization	Immediate disconnection	0	Timeout at boot synchronization with option.	• Error during boot synchronization between inverter and option. • Synchronization ID not/ incorrectly transmitted	Install a new option card if this error reoccurs.
41	Watchdog option	Immediate disconnection	0	Error – Watchdog timer from/to option.	• Error in communication between system software and option software • Watchdog in the IPOS$^{plus®}$ program • An application module without the application version has been loaded in a MOVIDRIVE® B unit • The wrong technology function has been set if an application module is used	• Consult SEW Service. • Check IPOS program • Check whether the unit has been activated for the application version (P079) • Check the selected technology function (P078)
			17	Watchdog IPOS error		
42	Lag error	Immediate disconnection (P)	0	Positioning lag error	• Encoder connected incorrectly • Acceleration ramps too short • P component of positioning controller too small • Incorrectly set speed controller parameters • Value of lag error tolerance too small	• Check encoder connection • Extend ramps • Set P component to higher value • Reset speed controller parameters • Increase lag error tolerance • Check wiring of encoder, motor and line phase. • Check whether mechanical system components can move freely or if they are blocked
43	RS485 timeout	Rapid stop (P)	0	Communication timeout at RS485 interface	Error during communication via interface RS485	Check RS485 connection (e.g. inverter - PC, inverter - DBG60B). If necessary, contact SEW Service.
44	Unit utilization	Immediate disconnection	0	Unit utilization error	• Unit utilization (IxT value) > 125%	• Decrease power output • Extend ramps • If suggested actions not possible, use larger inverter. • Reduce load
			8	UL monitoring error		
45	Initialization	Immediate disconnection	0	General error during initialization	• No parameters set for EEPROM in power section, or parameters set incorrectly. • Option card not in contact with backplane bus.	• Restore factory settings Consult SEW Service if the error still cannot be reset. • Insert the option card correctly.
			3	Data bus error during RAM check		
			6	CPU clock error.		
			7	Error in the current evaluation.		
			10	Error when setting flash protection		
			11	Data bus error during RAM check		
			12	Parameter setting error synchronous operation (internal synchronous operation)		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
46	System bus 2 timeout	Rapid stop (P)	0	Timeout system bus CAN2	Error during communication via system bus 2.	Check system bus connection.
47	System bus 1 timeout	Rapid stop (P)	0	Timeout system bus CAN1	Error during communication via system bus 1.	Check system bus connection.
48	Hardware DRS	Immediate disconnection	0	Hardware synchronous operation	**Only with DRS11B:** • Encoder signal from master/ synchronous encoder faulty. • Hardware required for synchronous operation is faulty.	• Check encoder signals of master/synchronous encoder. • Check encoder wiring. • Replace synchronous operation card.
57	"TTL encoder"	Immediate disconnection	512	X15: Error in amplitude control	• Encoder cable or shield not connected correctly • Short circuit/broken encoder wire • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection, short circuit and broken wire. • Replace the encoder • Providing for EMC measures
			16896	X14: Error in amplitude control		
			514	X15: Incorrectly set numerator/denominator values	Incorrect numerator/denominator values	Correct the numerator/denominator values
			16898	X14: Incorrectly set numerator/denominator values		
58	"Sin/cos encoder"	Immediate disconnection	512	X15: Error in amplitude control	• Encoder cable or shield not connected correctly • Short circuit/broken encoder wire • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection, short circuit and broken wire. • Replace the encoder • Providing for EMC measures
			514	X15: Track signal error		
			16896	X14: Error in amplitude control		
			16897	X14: Initialization		
			16898	X14: Track signal error		
			513	X15: Initialization	Encoder defective	Replace the encoder
			515	X15: Incorrectly set numerator/denominator values	Incorrect numerator/denominator values	Correct the numerator/denominator values
			16899	X:14 Incorrect numerator/ denominator values		
59	"Encoder communication"	Rapid stop	1	X15: Track signal error	• Encoder cable or shield not connected correctly • Short circuit/broken encoder wire • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection, short circuit and broken wire. • Replace the encoder • Providing for EMC measures
			16	X15: Data line fault		
			64 – 576	X15: RS485 communication		
			1088 – 1388	X15: EnDat communication		
			16385	X14: Track signal error		
			16400	X14: Data line fault		
			16448 – 16832	X14: RS485 communication		
			17472 – 17772	X14: EnDat communication		
			2	X15: Incorrect calibration of encoder	Incorrect encoder calibration or mechanical offset to motor	Delivery condition + new startup
			16386	X15: Incorrect calibration of encoder		
			1024	X15: Clocking and/or data line not connected	Clocking and/or data line not connected	Connect clocking and/or data line
			17408	X14: Clocking and/or data line not connected		
77	IPOS control word	No response (P)	0	Invalid control word IPOS	**Only in IPOS$^{plus®}$ operating mode:** • An attempt was made to set an invalid automatic mode (via external controller). • P916 = BUS RAMP is set.	• Check serial connection to external control. • Check write values of external control. • Set correct value for P916.

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
78	IPOS SW limit switch	No response (P)	0	Software limit switch reached	**Only in IPOS$^{plus®}$ operating mode:** Programmed target position is outside travel range delimited by software limit switches.	• Check the user program • Check position of the software limit switches
79	Hardware configuration	Immediate disconnection	0	Deviating hardware configuration when replacing the memory card	The following items do not match anymore after having replaced the memory card: • Power rating • Nominal voltage • Variant identification • Unit series • Application or standard version • Option cards	Ensure identical hardware or restore factory setting (parameter = factory setting).
80	RAM test	Immediate disconnection	0	"RAM test" error	Internal unit fault, RAM defective.	Consult SEW Service.
81	Start condition	Immediate disconnection	0	Start condition error with VFC hoist	**Only in "VFC hoist" operating mode:** The motor could not be supplied with the correct amount of current during the pre-magnetizing time: • Rated motor power too small in relation to rated inverter power. • Motor cable cross section too small. **Only for operation with a linear motor (as of firmware 18):** • The drive has been set to "Enable" although the commutation offset between linear motor and linear encoder is not known. This means that the inverter cannot set the current indicator correctly.	• Check startup data and perform new startup, if necessary. • Check connection between inverter and motor. • Check cross section of motor cable and increase if necessary. • Perform commutation travel in the "No enable" state and then switch to "Enable" once the inverter has acknowledged in status word bit 25 that commutation was successful.
82	Open output	Immediate disconnection	0	Output open with VFC hoist	**Only in "VFC hoist" operating mode:** • Two or all output phases interrupted. • Rated motor power too small in relation to rated inverter power.	• Check connection between inverter and motor. • Check startup data and perform new startup, if necessary.
84	Motor protection	Emergency stop (P)	0	"Motor temperature simulation" error	• Motor utilization too high. • I_N-U_L monitoring 1 triggered • P530 set later to "KTY"	• Reduce load. • Extend ramps. • Observe longer pause times. • Check P345/346 • Select a larger motor
			2	Wire breakage Temperature sensor		
			3	No thermal motor model available		
			4	UL monitoring error		
			11	Temperature sensor short circuit		
86	Memory module	Immediate disconnection	0	Error in connection with memory module	• No memory card • Memory card defective	• Tighten knurled screw • Insert and secure memory card • Replace memory card • Load delivery status and parameter set
			2	Hardware card detection wrong memory card		
87	Technology function	Immediate disconnection	0	Technology function selected with standard unit	A technology function was activated in a standard version.	Disable technology function

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
88	Flying start	Immediate disconnection	0	"Flying start" error	**Only in VFC n-CTRL operating mode:** Actual speed > 6000 rpm with the inverter enabled.	Inverter not enabled before actual speed is ≤ 6000 rpm.
92	DIP encoder problem	Error display (P)	1	Stahl WCS3 dirt problem	Encoder signals a fault	Possible cause: Encoder is dirty → clean encoder
93	DIP encoder error	Emergency stop (P)	0	Fault "Absolute encoder"	The encoder signals an error, e.g. power failure. • Connection cable between the encoder and DIP11B does not meet the requirements (twisted pair, shielded). • Cycle frequency for cable length too high. • Permitted max. speed/ acceleration of encoder exceeded. • Encoder defective.	• Check absolute encoder connection. • Check connection cables. • Set correct cycle frequency. • Reduce maximum traveling velocity or ramp. • Replace the absolute encoder.
94	EEPROM checksum	Immediate shut-off	0	Power section parameters	Inverter electronics disrupted, possibly due to effect of EMC or a defect.	Send unit in for repair.
			5	Control unit data		
			6	Power section data		
			7	Invalid version of the configuration data set		
95	DIP plausibility error	Emergency stop (P)	0	Validity check of absolute position	No plausible position could be determined. • Incorrect encoder type set. • IPOS$^{plus®}$ travel parameter set incorrectly. • Numerator/denominator factor set incorrectly. • Zero adjustment performed. • Encoder defective.	• Set the correct encoder type. • Check IPOS$^{plus®}$ travel parameters. • Check traveling velocity. • Correct numerator/denominator factor. • After zero adjustment reset. • Replace the absolute encoder.
97	Copy error	Immediate disconnection	0	Parameter set upload is/ was faulty	• Memory card cannot be written or read. • Error during data transmission	• Repeat copying process • Restore default setting (P802) and repeat copying process
			1	Download of parameter set to unit cancelled.		
			2	Not possible to adopt parameters. Not possible to adopt parameters from memory card.		
98	CRC error	Immediate disconnection	0	"CRC via internal flash" error	Internal unit error Flash memory defective	Send unit in for repair.
99	IPOS ramp calculation	Immediate disconnection	0	"Ramp calculation" error	**Only in IPOS$^{plus®}$ operating mode:** Positioning ramp is sinusoidal or square and an attempt is made to change ramp times and traveling velocities with enabled inverter.	Rewrite the IPOS$^{plus®}$ program so that ramp times and traveling velocities can only be altered when the inverter is inhibited.
100	Vibration warning	Display error (P)	0	Vibrations diagnostics warning	Vibration sensor warning (→ "DUV10A" operating instructions).	Determine cause of vibrations. Continue operation until F101 occurs.
101	Vibration error	Rapid stop (P)	0	Vibration diagnostics error	Vibration sensor reports error.	SEW-EURODRIVE recommends that you remedy the cause of the vibrations immediately
102	Oil aging warning	Display error (P)	0	Oil aging warning	Error message from the oil aging sensor	Schedule oil change.
103	Oil aging error	Display error (P)	0	Oil aging error	Error message from the oil aging sensor	SEW-EURODRIVE recommends that you change the gear unit oil immediately.

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
104	Oil aging over-temperature	Display error (P)	0	Oil aging overtemperature	Overtemperature signal from the oil aging sensor	• Let oil cool down • Check if the gear unit cools properly
105	Oil aging ready signal	Display error (P)	0	Oil aging ready signal	Oil aging sensor is not ready for operation	• Check voltage supply of oil aging sensor • Check and, if necessary, replace the oil aging sensor
106	Brake wear	Display error (P)	0	Brake wear error	Brake lining worn	Replace brake lining (→ "Motors" operating instructions).
107	Line components	Immediate disconnection	1	For regeneration only: No feedback signal from main contactor.	Defective main contactor	• Check main contactor • Check control cables.
108	DCS error	Immediate stop/malfunction (P)	0	DCS error		
			1	Error during transfer of configuration data to the monitoring unit.	Interruption in connection during program download	Send the configuration files again
			2	Configuration data for software version of the subassembly is invalid.	Subassembly configured with incorrect software version of the programming interface.	Configure subassembly with permitted version of the programming interface. Then switch subassembly off and on again.
			3	Unit was programmed with incorrect programming interface.	Program or configuration data was loaded into the unit with an incorrect programming interface.	Check the design of the subassembly. Configure again with a valid programming interface. Then switch the unit off and on again.
			4	Faulty reference voltage.	• Supply voltage of the subassembly is defective. • Faulty component in the subassembly	• Check supply voltage • Switch unit off and on again
			5			
			6	Faulty system voltage.		
			7			
			8	Faulty test voltage		
			9			
			10	Faulty DC 24 V voltage supply		
			11	Ambient temperature of the unit is not in the defined range.	Temperature at the place of operation is not in the permitted range.	Check the ambient temperature.
			12	Plausibility error for position changeover	For the position changeover, ZSC, JSS or DMC is permanently activated.	• Check ZSC activation • Check JSS activation • Check DMC activation (only for monitoring via position)
			13	Faulty switching of the LOSIDE driver DO02_P / DO02_M	Short circuit of the output.	Check wiring at the output.
			14	Faulty switching of the HISIDE driver DO02_P / DO02_M		
			15	Faulty switching of the LOSIDE driver DO0_M		
			16	Faulty switching of the HISIDE driver DO0_P		
			17	Faulty switching of the LOSIDE driver DO01_M		
			18	Faulty switching of the HISIDE driver DO01_P		

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Rapid stop/ warning (P)	0	DCS alarm		
			1	Communication error at the CAN interface of the inverter	The DCS21B/31B option does not receive any valid data from the inverter.	• Check hardware connection to the inverter • Check version of the inverter
			2 3	Plausibility error digital input at pulse P1	No pulse1 voltage present at binary input DI1	• Check configuration of the DI1 digital input according to configuration and wiring diagram • Check wiring
			4 5	Plausibility error digital input at pulse P2		• Check configuration of the DI2 binary input according to configuration and wiring diagram • Check wiring
			6 7	Pulse 1 plausibility error at binary input DI3		• Check configuration of the DI3 binary input according to configuration and wiring diagram • Check wiring
			8 9	Pulse 1 plausibility error at binary input DI4		• Check configuration of the DI4 binary input according to configuration and wiring diagram • Check wiring
			10 11	Pulse 1 plausibility error at binary input DI5		• Check configuration of the DI5 binary input according to configuration and wiring diagram • Check wiring
			12 13	Pulse 1 plausibility error at binary input DI6		• Check configuration of the DI6 binary input according to configuration and wiring diagram • Check wiring
			14 15	Pulse 1 plausibility error at binary input DI7		• Check configuration of the DI7 binary input according to configuration and wiring diagram • Check wiring
			16 17	Pulse 1 plausibility error at binary input DI8		• Check configuration of the DI8 binary input according to configuration and wiring diagram • Check wiring

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Rapid stop/ warning (P)	18 19	Pulse 2 plausibility error at binary input DI1	No pulse 2 voltage present at binary input DI1.	• Check configuration of the DI1 digital input according to configuration and wiring diagram • Check wiring
			20 21	Pulse 2 plausibility error at binary input DI2		• Check configuration of the DI2 binary input according to configuration and wiring diagram • Check wiring
			22 23	Pulse 2 plausibility error at binary input DI3		• Check configuration of the DI3 binary input according to configuration and wiring diagram • Check wiring
			24 25	Pulse 2 plausibility error at binary input DI4		• Check configuration of the DI4 binary input according to configuration and wiring diagram • Check wiring
			26 27	Pulse 2 plausibility error at binary input DI5		• Check configuration of the DI5 binary input according to configuration and wiring diagram • Check wiring
			28 29	Pulse 2 plausibility error at binary input DI6		• Check configuration of the DI6 binary input according to configuration and wiring diagram • Check wiring
			30 31	Pulse 2 plausibility error at binary input DI7		• Check configuration of the DI7 binary input according to configuration and wiring diagram • Check wiring
			32 33	Pulse 2 plausibility error at binary input DI8		• Check configuration of the DI8 binary input according to configuration and wiring diagram • Check wiring
			34 35	Plausibility error in the speed recording	The difference between the two speed sensors is higher than the configured speed cut-off threshold.	• Check track again with the data of the encoder configuration. • Check the velocity sensor • Use the SCOPE function to set speed signals so that they are congruent
			36 37	Plausibility error in the position acquisition	The difference between the two position sensors is higher than the configured value.	• Check track with the configured data of the encoder setting • Check position signal • Are all signals connected correctly to the 9-pin encoder connector? • Check the encoder connector for correct wiring. Is the jumper between pin 1 and pin 2 on the 9-pin encoder connector closed (SSI absolute encoder)? • Use the SCOPE function to set positions signals so that they are congruent

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Rapid stop/ warning (P)	38 39	Plausibility error incorrect position range	The current position is outside the configured range.	• Check track with the configured data of the encoder setting • Check position signal, correct offset if necessary • Use the SCOPE function to read off the position and set in ratio to the configured values
			40 41	Plausibility error incorrect speed.	The current speed exceeds the configured maximum speed.	• The drive moves outside the permitted and configured speed range • Check configuration (max. velocity set) • Analyze the speed development using the SCOPE function
			42 43	Configuration error: Acceleration	The current acceleration is outside the configured acceleration range.	• Check encoder type and configuration (SSI/incremental) • Check the encoder connection/wiring • Check polarity of the encoder data • Check function of the encoder
			44 45	Plausibility error in encoder interface (A3401 = encoder 1 and A3402 = encoder 2).	The wiring of the encoder does not correspond to the configured data.	• Check encoder type and configuration (SSI/incremental) • Check the encoder connection/wiring • Check polarity of the encoder data • Check function of the encoder
			46 47	Encoder supply voltage error (A3403 = encoder 1 and A3404 = encoder 2)	Encoder voltage supply is outside the defined range (min. DC 20 V / max. DC 29 V).	• Overload in the supply voltage of the encoder; internal fuse has triggered • Check supply voltage of the DCS21B/31B option
			48 49	Reference voltage error	The reference voltage input of the encoder system is outside the defined range.	Check reference voltage input of the encoder system.
			50 51	Difference level RS485 driver 1 (error INC_B or SSI_CLK) faulty	No encoder connection, incorrect encoder type.	Check the encoder connection.
			52 53	Difference level RS485 driver 2 (error INC_A or SSI_DATA) faulty.		
			54 55	Incremental counter deviation		
			56 57	Plausibility error in encoder interface (A3401 = encoder 1 and A3402 = encoder 2)	The wiring of the encoder does not correspond to the configured data.	• Check encoder type and configuration (SSI/incremental) • Check the encoder connection/wiring • Check polarity of the encoder data • Check function of the encoder

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
109	DCS alarm	Rapid stop/ warning (P)	58	Plausibility error SIN/COS encoder connection.	Incorrect encoder type connected.	• Check encoder connection • Check the encoder connection (jumper between pin 1 and pin2)
			59			
			60	Plausibility error SSI encoder connection		
			61			
			62		Phase error of the incremental or sin/cos encoder.	• Check encoder connection • Replace the defective encoder
			63			
			64	Plausibility error - SSI encoder connection.	Connected encoder type does not correspond to the configuration.	• Check encoder connection • Check connected encoder
			65			
			66	Plausibility error - SSI listener encoder connection		
			67			
			68	Faulty switching of the LOSIDE driver DO2_M	DC 0 V short circuit at the output.	Check wiring at the output.
			69	Faulty switching of the HISIDE driver DO2_P		
			70	Faulty switching of the LOSIDE driver DO0_M		
			71	Faulty switching of the HISIDE driver DO0_P		
			72	Faulty switching of the LOSIDE driver DO1_M		
			73	Faulty switching of the HISIDE driver DO1_P		
			74	Undervoltage test watchdog for LOSIDE driver	DC 0 V short circuit at on of the DC 0 V outputs.	Check wiring at the outputs.
			75	Undervoltage test watchdog for HISIDE driver	DC 24 V short circuit at on of the DC 24 V outputs.	
			76	CCW and CW monitoring (in DMC module) activated simultaneously	Multiple activation.	Only one direction of rotation can be activated in the DMC module.
			77			
			78	CCW and CW monitoring range of the OLC activated simultaneously		
			79			
			80	CCW and CW monitoring (in JSS module) was activated simultaneously		
			81			
			82	Timeout error MET.	Input element with time monitoring is faulty.	• Check wiring of input element • Input element faulty
			83	Time monitoring start signal for confirmation button.		
			84	Timeout error MEZ.	Two-hand operation with time monitoring is faulty.	
			85	Time monitoring for two-hand button.		
			86	EMU1 monitoring error	Faulty monitoring of the external disconnection channel	• Check hardware connections • Pick-up or release time too short • Check switching contacts
			87			
			88	EMU2 monitoring error		
			89			
110	"Ex-e protection" error	Emergency stop	0	Duration of operation below 5 Hz exceeded	Duration of operation below 5 Hz exceeded	• Check configuration • Shorten duration of operation below 5 Hz
113	Analog input open circuit	No response (P)	0	AI1 analog input open circuit	AI1 analog input open circuit	Check wiring
116	"Timeout MOVI-PLC" error	Rapid stop/ warning	0	MOVI-PLC® communication timeout		• Check startup • Check wiring

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
122	"Absolute encoder option"	Immediate disconnection	2	X15: Unknown encoder type	Connected encoder type unknown	Replace the encoder
			16386	X14: Unknown encoder type		
			1	X15: Plausibility check	• Encoder cable or shield not connected correctly • Short circuit/broken encoder wire • Encoder defective • EMC interference	• Check encoder cable and shield for correct connection, short circuit and broken wire. • Replace the encoder • Providing for EMC measures
			33	X15: Analog voltages not within tolerance		
			41 – 45	X15: RS485 communication		
			60	X15: Analog voltages not within tolerance		
			63	X15: Position error, excessive speed, unable to generate position		
			256	X15: Voltage dip		
			257	X15: Clocking or data line interrupted		
			258	X15: Change of position		
			261	X15: No high level present		
			513	X15: Plausibility check		
			768	X15: PDO timeout		
			770	X15: Change of position		
			16385	X14: Plausibility check.		
			16417	X14: Analog voltages not within tolerance		
			16444	X14: Analog voltages not within tolerance		
			16447	X14: Position error, excessive speed, unable to generate position		
			16425 – 16429	X14: RS485 communication		
			16640	X14: Voltage dip		
			16641	X14: Clocking or data line interrupted		
			16642	X14: Change of position		
			16645	X14: No high level present		
			16897	X14: Plausibility check		
			17152	X14: PDO timeout		
			17154	X14: Change of position		
			34 – 40	X15: Internal encoder error	Internal encoder error	Replace the encoder
			46 – 50	X15: Internal encoder error		
			64 – 67	X15: Internal encoder error		
			514 – 544	X15: Internal encoder error		
			772 – 774	X15: Internal encoder error		
			16418 – 16424	X14: Internal encoder error		
			16430 – 16434	X14: Internal encoder error		
			16448 – 16451	X14: Internal encoder error		
			16898 – 16928	X14: Internal encoder error		
			17156 – 17158	X14:Internal encoder error		

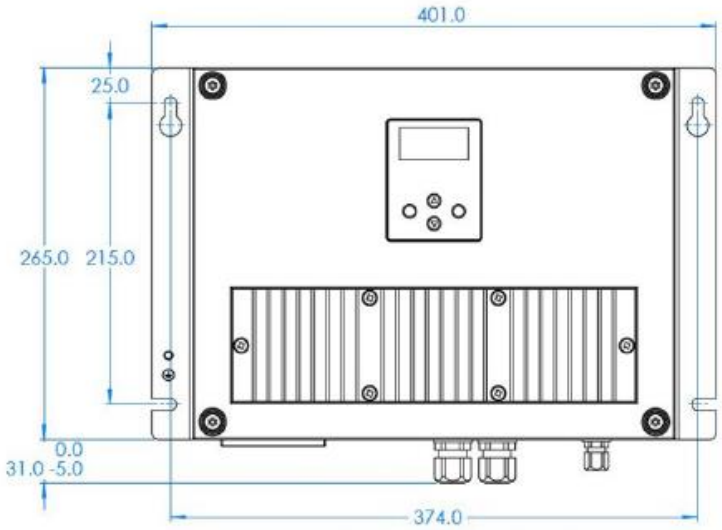
Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
122	"Absolute encoder option"	Immediate disconnection	61	X15: Critical transmitter current	Soiled, transmitter broken	Replace the encoder
			16445	X14: Critical transmitter current		
			62	X15: Critical encoder temperature	Encoder temperature too high	Reduce motor and ambient temperature
			16446	X14: Critical encoder temperature		
			259	X15: Insufficient clock frequency	Incorrect encoder parameterization	Check encoder parameterization
			260	X15: Encoder signals programmable error		
			576	X15: Internal encoder warning		
			769	X15: Encoder signals programmable error		
			16643	X14: Insufficient clock frequency		
			16644	X14: Encoder signals programmable error		
			16960	X14: Internal encoder warning		
			17153	X14: Encoder signals programmable error		
			771	X15: Emergency signal		
			17155	X14: Emergency signal		
123	Positioning interruption	Emergency stop (P)	0	Error "Positioning/Positioning interruption"	Target monitoring when interrupted positioning process is resumed. Target would be overrun.	Perform positioning process without interruption until it is complete.
124	Ambient conditions	Emergency stop (P)	1	Permitted ambient temperature exceeded	Ambient temperature > 60°C	• Improve ventilation and cooling conditions • Improve air supply to the control cabinet; check filter mats.

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
196	Power section	Immediate disconnection	1	Discharge resistor	Discharge resistor overload	Observe waiting time for power on/off
			2	Hardware ID precharge/ discharge control	Incorrect precharge/discharge control variant	• Consult SEW Service • Replace precharge/discharge control
			3	Inverter coupling PLD Live	Defective inverter coupling	• Consult SEW Service • Replace inverter coupling
			4	Inverter coupling reference voltage	Defective inverter coupling	• Consult SEW Service • Replace inverter coupling
			5	Power section configuration	Different phase modules installed in the unit	• Inform SEW service. • Check and replace phase modules
			6	Control unit configuration	Control unit line inverter or motor inverter incorrect	Replace or correctly assign the control unit of line and motor inverter.
			7	Communication power section control unit	No communication	Check control unit installation.
			8	Communication precharge/discharge control inverter coupling	No communication	• Check wiring • Consult SEW Service
			10	Communication power section control unit	The inverter coupling does not support protocol	Replace inverter coupling
			11	Communication power section control unit	Faulty communication with inverter coupling at power-up (CRC error).	Replace inverter coupling
			12	Communication power section control unit	Inverter coupling uses protocol that does not match control unit	Replace inverter coupling
			13	Communication power section control unit	Faulty communication with inverter coupling during operation: More than once per second a CRC error.	Replace inverter coupling
			14	Control unit configuration	Missing PLD functionality for EEPROM data set size 7.	Replace control unit
			15	Inverter coupling error	Inverter coupling processor has signaled internal error.	• Consult SEW service if the error reoccurs • Replace inverter coupling
			16	Inverter coupling error: PLD version incompatible		Replace inverter coupling
			17	Precharge/discharge control error	Precharge/discharge control processor has signaled internal error	• Consult SEW service if the error reoccurs • Replace precharge/discharge control

Error			Suberror			
Code	Designation	Response (P)	Code	Designation	Possible cause	Measure
			18	Defective DC link fan	The DC link fan is faulty.	• Consult SEW Service • Check whether DC link choke fan is connected or faulty
			19	Communication power section control unit	Faulty communication with inverter coupling during operation: More than once per second an internal error.	• Consult SEW Service if the error reoccurs. • Replace inverter coupling
			20	Communication power section control unit	The control unit has not sent any messages to the inverter coupling for a while.	• Consult SEW Service if the error reoccurs. • Replace inverter coupling
			21	Uz measurement implausible phase R	Defective phase module	Consult SEW service if the error reoccurs
			22	Uz measurement implausible phase S		
			23	Uz measurement implausible phase T		
197	Power supply	Immediate disconnection	1	Line overvoltage (motor inverter only at start of precharging process)	Inadequate line voltage quality.	• Check supply (fuses, contactor) • Check configuration of the supply system
			2	Line undervoltage (only with line inverter)		
199	DC link charging	Immediate disconnection	4	Precharging was aborted	Unable to charge DC link.	• Precontrol overload • Connected DC link capacity too high • Short circuit in the DC link; check DC link connection in case of several units.

7.3.14Victron Skylla Battery charger

Skylla-IP65



4. Operation

4.1. Battery charging

After applying mains power and remote shut down is not active, the display will show the following:

All icons of the screen will be visible to check the correct functioning of the display.

- The back lighting of the display is ON.
- Next the firmware version number will be displayed.
- Finally, the actual state is displayed on the screen:
- By using Voltage sensing, the actual battery voltage is shown.

Output Voltage	13.9 60 A	Charge current
Battery charger mode	Charging Bulk	State of charge
	When the mains plug is blinking, the mains voltage is below normal and the charger is reducing the maximum charge current.	

- By using Voltage sensing, the actual battery voltage is shown.

4.2. Seven stage charge curve for lead-acid batteries

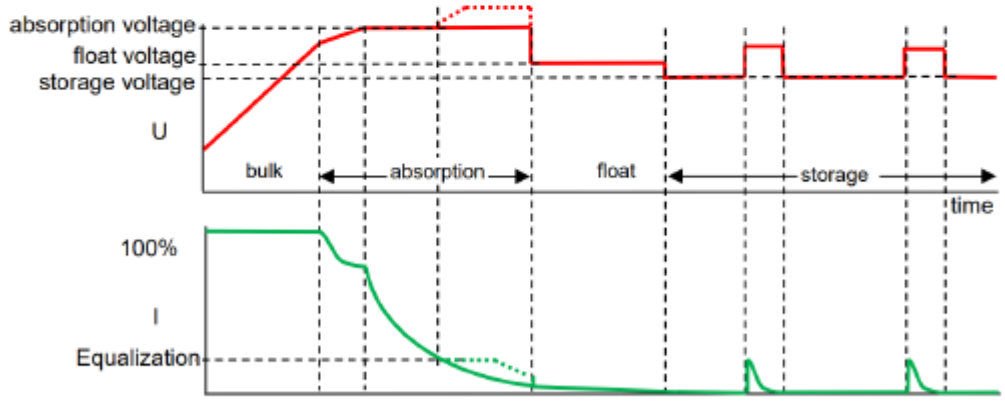


Figure 3 Voltage and current during different states in battery charging.

4.2.1. Bulk

Entered when the charger is started or when the battery voltage falls below 13.2 V / 26.4 V (due to a heavy load) during at least 1 minute. Constant current is applied until gassing voltage is reached (14.4 V / 18.8 V).

4.2.2. Battery Safe

If absorption voltage is set higher than 14.4 V / 18.8 V, the rate of voltage increase beyond 14.4 V / 18.8 V is limited to 7mV/14mV per minute, in order to prevent excessive gassing.

4.2.3. Absorption

After the absorption voltage has been reached, the charger operates in constant voltage mode.

In case of adaptive charging, the absorption time is dependent on the bulk time, see section 3.2.

4.2.4. Automatic equalization

If automatic equalization has been set to 'on', the absorption period is followed by a second voltage limited constant current period: see section 3.3. This feature will charge VRLA batteries to the full 100 %, and prevent stratification of the electrolyte in flooded batteries.

Alternatively, manual equalization can be applied.

4.2.5. Float

After float charge the output voltage is reduced to storage level. This level is not sufficient to compensate for slow self-discharge of the battery, but will limit water loss and corrosion of the positive plates to a minimum when the battery is not used.

4.2.6. Storage

After float charge the output voltage is reduced to storage level. This level is not sufficient to compensate for slow self-discharge of the battery, but will limit water loss and corrosion of the positive plates to a minimum when the battery is not used.

4.2.7. Weekly battery 'refresh'

Once a week the charger will enter Repeated Absorption-mode during one hour to 'refresh' (i. e. to fully charge) the battery

4.3. Four stage charge curve for Lithium Iron Phosphate (LiFePo4) batteries

4.3.1. Bulk

Entered when the charger is started, or when the battery voltage falls below 13,5 V / 27,0 V (due to a heavy load) during at least 1 minute. Constant current is applied until absorption voltage is reached (14.2 V / 28.4 V).

4.3.2. Absorption

After the absorption voltage has been reached, the charger operates in constant voltage mode. The recommended absorption time is 2 hours.

4.3.3. Storage

After absorption charge the output voltage is reduced to storage level. This level is not sufficient to compensate for slow selfdischarge of the battery, but will maximize service life.

4.3.4. Weekly battery 'refresh'

Once a week the charger will enter Repeated Absorption-mode during one hour to 'refresh' (i. e. to fully charge) the battery.

5. Maintenance

This charger does not require any specific maintenance. However an annual check of the battery and mains connections is recommended.

Keep the charger dry, clean and free of dust.

6. Troubleshooting

Problem	Possible cause	Solution
Charger does not function	The mains is not ok	Measure mains: 120 - 240 VAC
	Input or output fuses are defective	Return product to your dealer
The battery is not fully charged	A bad battery connection	Check battery connection
	The wrong battery type has been selected in the menu.	Select correct battery type in the menu.
	Cable losses too high	Use cables with larger cross section. Use external voltage sensing.
The battery is being overcharged	The wrong battery type has been selected in the menu.	Select correct battery type in the menu.
	A battery cell is defective.	Replace battery
Battery temperature too high	Overcharging or too fast charging	Connect external temperature sensor
Error in display	See section 9	Check all charging equipment. Check cables and connections.

7. Temperature Compensation

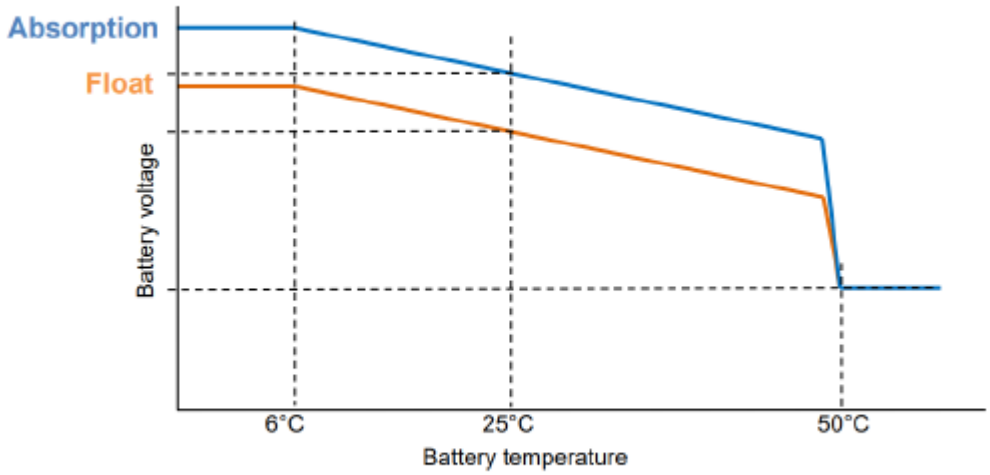


Figure 4 Temperature compensation graph for float and absorption voltages.

8. Specifications

Skylla-IP65	12/70	24/35
Input voltage (VAC)	120 – 240	
Input voltage range (VAC) (1)	90 – 265	
Maximum AC input current	12	
Frequency (Hz)	45-65	
Power factor	0,98	
Charge voltage 'absorption' (VDC) (2)	See table	See table
Charge voltage 'float' (VDC) (2)	See table	See table
Charge voltage 'storage' (VDC) (2)	See table	See table
Charge current main batt. (A) (3)	70	35
Charge current starter batt. (A) (4)	3	4
Charge curve, lead-acid	7 stage adaptive	
Recommended battery capacity (Ah)	350-700	150-350
Charge curve, Li-Ion	2 stage, with on-off control or VE.Can bus control	
Temperature sensor	Yes	
Power supply function	Yes	
Remote on-off port	Yes (can be connected to a Li-Ion BMS)	
CAN bus communication port	Two RJ45 connectors, NMEA2000 protocol	
Remote alarm relay	DPST AC rating: 240 VAC/4A DC rating: 4A up to 35 VDC, 1 A up to 60 VDC	
Forced cooling	Yes	
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature	
Operating temp. range	-20 to 60 °C (full output current up to 40 °C)	
Humidity (non-condensing)	max 95 %	
ENCLOSURE		
Material & Colour	steel; blue, RAL 5012	
Battery-connection	M6 bolts	
Mains connection	screw-clamp 6 mm² (AWG 10)	
Protection category	IP65	
Weight kg (lbs)	6 (14)	
Dimensions hxwxd incl. glands in mm in inches	401 x 375 x 265 (16 x 15 x 10.5)	
STANDARDS		
Safety	EN 60335-1, EN 60335-2-29	
Emission	EN 55014-1, EN 61000-6-3, EN 61000-3-2	
Immunity	EN 55014-2, EN 61000-6-1, EN 61000-6-2, EN 61000-3-3	

1) Output current will gradually reduce below 110 V to 50 % @ 100 V

2) Depending upon battery type as selected in the setup menu.

3) Maximum current up to 40 °C (100 °F) ambient. Output current will reduce to 60 % at 50 °C, and to 40 % at 60 °C.

4) Depending upon state of charge of starter battery

9. Error indication

Error nr	Description	Possible cause	Solution
1	battery temperature too high	Overcharging or fast charging	Check air flow near the battery Improve cooling of environment. The charger stops automatically and will resume once the battery has cooled down
2	battery voltage too high	Wiring mistake, or another charger is over charging	Check all charging equipment. Check cables and connections
3, 4, 5	temp. sense error	Wiring mistake or temperature sensor broken	Check the temperature sensor wiring and if that doesn't help replace the temperature sensor
6, 7, 8, 9	voltage sense error	Wiring mistake	Check the voltage sensor wiring.
17	charger temperature too high	The heat generated by the charger cannot be removed	Check air flow of the cabinet. Improve cooling of environment. The charger stops automatically and will resume once the charger has cooled down.
18	Internal error		Contact your dealer
20	charger bulk time expired	After 10 hours of bulk charging, the battery voltage has still not reached the absorption voltage.	Possible cell failure or higher charge current needed.
24	Fan failure	This error indicates that the fan is powered on but the circuit does not measure any current draw by the fan. Most likely the fan is either broken or obstructed.	Contact your dealer
34	Internal error		Contact your dealer
37	No input voltage (only for the three output version)	Mains removed or ac-input fuse blown	Check mains availability and fuse.
65	charger disappeared during operation	One of the other chargers with which this charger was synchronizing has disappeared during operation	To clear the error, switch the charger off and back on.
66	Incompatible device	The charger is being paralleled to another charger that has different settings and/or a different charge algorithm	Make sure all settings are the same and update firmware on all chargers to the latest version.
67	BMS connection lost	Connection to the BMS lost	Check the VE.Can bus cabling. When the charger needs to operate in standalone mode again, go to the setup menu #31 (BMS Present) and set to N.
113, 114	Internal error		Contact your dealer
115		Communication error	Check wiring and terminators
116, 117, 118	Internal error		Contact your dealer
119	Settings invalid		Restore defaults in the setup menu #62.

7.3.15Victron Battery protector

Operation

There are 4 possible error modes, indicated by the 7 segment display:

- E 1 Short circuit detected
- E 2 Over load or over temperature
- E 3 Under voltage
- E 4 Over voltage

After 5 minutes the error is no longer displayed to reduce current consumption.

The decimal point of the 7 segment display is used for status indication:

- On solid: the BP attempts to activate the output
- Flash every 5s: output is active
- Flashing every 2s in Li-ion mode: output 'connecting'

Remote control and short circuit

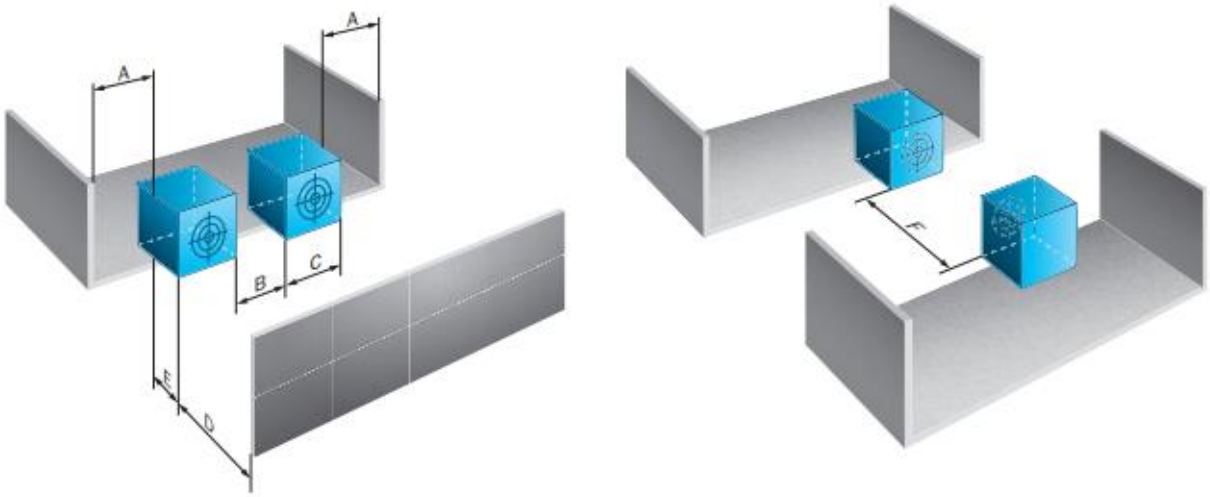
- The BP will connect the load 1 second after closing the remote contact.
- The BP will disconnect the load immediately when the remote contact is opened.
- When in Li-ion mode the BP will connect the load 30 seconds after the remote input of the BP has been pulled high by the VE.Bus BMS. This delay increases to 3 minutes in case of frequent switching.
- In case of a short circuit, the BP will attempt to connect the load every 5 seconds. After two attempts the display will show E 1 (short circuit detected).

Programming table

7 segment display	Under voltage shut down 12V / 24V system	Under voltage restart 12V / 24V system
0	10,5V / 21V	12V / 24V
1	10V / 20V	11,5V / 23V
2	9,5V / 19V	11,5V / 23V
3	11,25V / 22,5V	13,25V / 26,5V
4	11,5V / 23V	13,8V / 27,6V
5	10,5V / 21V	12,8V / 25,6V
6	11,5V / 23V	12,8V / 25,6V
7	11,8V / 23,6V	12,8V / 25,6V
8	12V / 24V	13V / 26V
9	10V / 20V	13,2V / 26,4V
A	Buzzer or LED mode	
b	Relay mode	
C	Li-ion mode	

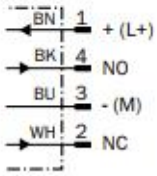
7.3.16 Inductive proximity switch IQ40-20

Installation note



Connection diagram

Cd-009

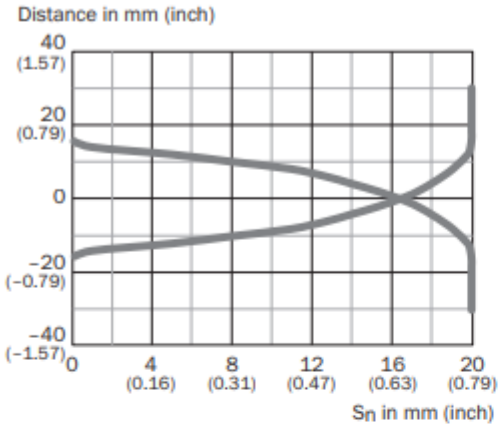


Installation note

Remark	Associated graphic see "Installation"
A	0 mm
B	40 mm
C	40 mm
D	60 mm
E	0 mm
F	70 mm

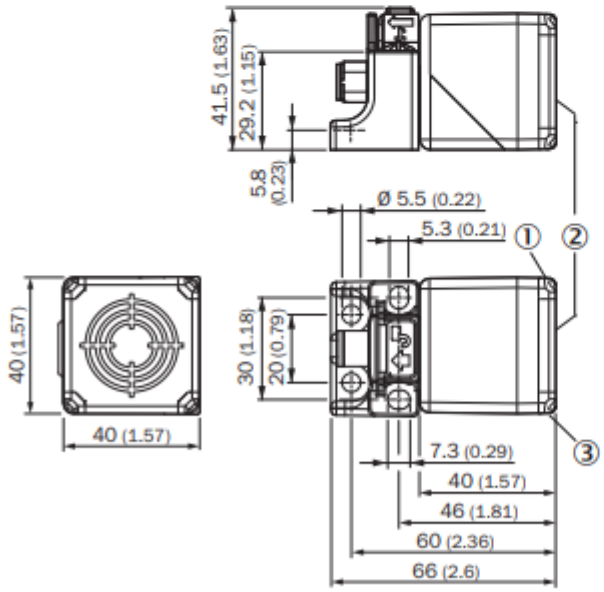
Characteristic curve

IQ40-20Bxxxxx



Dimensional drawing (Dimensions in mm (inch))

IQG Short-body housing



① LED output state, yellow
② Sensing face
③ Operational status LED, green

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To Whom It May Concern

Date: 01/19/2022

Re: Shoulder restraint system - Orlando Drop Tower Serial Number - FT/EUR/1163

The seat and shoulder restraint system on the Orlando Drop Tower is a category 5 system. It has 2 independent locking devices, and the shoulder restraints are monitored.

It is no need for an extra safety or seat belt because the seat and restraint system fulfil more than the requirements.

All parts of this ride are built to meet German TUV standards.

Yours Sincerely

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