SAFEDOCK®

Manual

SAFEGATE GROUP

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SAFEDOCK®

CHAPTERS AND APPENDICES

CONTENTS

CONFIGURATION SUMMARY

The manual includes chapters/appendices with descriptions for available product options as follows:

- **General Options** - common to most gates/sites.
- **More Options** - specific to gates/sites.

***Note**: Some information may not be relevant to a specific gate/site. You can also check with project or site management for options included in the specific configuration for a gate/site.*

The table is a guide to some of the product options available. The configuration summary column can be used as a reference guide to find option information relevant for a specific gate/site.

Product Options	**Configuration Summary**
General Options	
Operator Panel	Softkey ***Note**: For 30-key Operator Panel information see Manual version 1.5 or earlier.*
Pilot Display Type	**T1** -42. **T2** -18, or -24. **T3** -9 or -15. ***Note**: For other type information see Manual version 1.8 or earlier.*
Closing Rate Distance	**No digital countdown** (closing rate bar only) from 15 m (as default) or **Digital countdown** (including closing rate bar) configurable from max 30m or 98ft. **Note:** *For type 3 is dig countdown available from max 20m.*
Safedock Maintenance Tool - SMT	Yes or No
More Options	
Battery backup (UPS)	Yes or No
Camera	Yes or No
Safedock Log Viewer – SLV	Yes or No
Adjacency Rules (Superior System)	Yes or No
Operation & Maintenance Modes/Operator Panel Key Switches	Yes or No

WARRANTY

Project Warranty
The Contractor (Safegate Group or subsidiary Company) hereby warrants that there shall be no significant failure or substantial reduction in performance in the following product or system, the performance criteria for which are as contained within the Project Contract.
This Warranty shall commence on a specific date, and end on a specific date according to the Project Contract.

The Contractor warrants to the Principal (Customer, agent or sub-contractor) that all work performed and all goods supplied by the Contractor under the above mentioned Project Contract will be:

- at least of the quality and to the standard required by the Contract; and
- of good workmanship and new and of merchantable quality; and
- fit for the purpose or purposes for which they are required

Project Managers
Member of the Safegate Group
Subsidiary Company

Product/System Warranty
Safegate Group guarantees that the performance of the Safegate Group product/system, when sold by Safegate Group or its licensed representatives, meets the requirements of and is in compliance with standards:

- ICAO Annex 14 - Aerodromes Volume I - Aerodrome Design and Operations - 4th Edition July 2004 [5.3.24 Visual Docking guidance System].

***Note**: For more information, contact Safegate for compliance with other standards.*

Any defect in design, material or workmanship, which may occur during proper and normal use over a period covered by the warranty stipulated in the contract, will be replaced by Safegate Group according the conditions for the project in question. Operational failure resulting from improper installation, damage due to user/operator error, airport maintenance equipment are not considered a result of proper use and is beyond the scope of the warranty.

Any 3rd party products installed or integrated with functionality in a Safegate system without prior consent or support from Safegate causes the warranty to become invalid, as the design specifications can longer be guaranteed.

The above constitutes the limits of Safegate Group liabilities concerning the Safegate Group products/systems.

Product Leaders
Member of the Safegate Group
Subsidiary Company

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HISTORY

Version	Date	Description
1.0	January 2008	First Release (Single type option)
1.1	July 2008	Projects (All type options)
1.2	January 2009	Projects (All type options)
1.3	May 2009	General update
1.4	October 2009	Feature update
1.5	January 2010	Feature update
1.6	June 2010	Feature update
1.7	November 2010	Minor update
1.8	April 2011	General update
1.9	June 2011	T2 T3 LED update
1.10	April 2012	Drawings update
1.10.1	October2012	Images update
1.10.2	May 2009	INSTALLATION, OP_Pilots_Guidelines and Drawings update
2.0	Dec 2013	SOS & SMT implementation + General update
2.1	Feb 2014	SMT upgrade + Minor update
2.2	April 2014	SMT upgrade + Minor update
2.3	June 2014	SMT upgrade + Minor update
2.4	September 2014	SMT upgrade + Minor update
2.5	October 2014	SMT upgrade + Minor update
2.6	November 2014	Minor updates
2.7	February 2015	SMT upgrade + Minor update

INTRODUCTION

This manual has been compiled to give the reader an understanding of installation, operation and maintenance (IOM) procedures of the Safedock system, with a focus on safety and efficiency.

The manual includes chapters/appendices with contents for quick access to information as follows:

Introduction
Information about configuration options, warranty, copyright, version history, original documents used to create this manual, a general contents list for quick access to information. Contents are also included at the beginning of each of the main chapters for quick access to information. Safety Information including Laser Safety Information, abbreviations, and a glossary of terms,
***Note**: It is important to read the General and Laser Safety Information.*

Chapter 1 – System Description
A system overview of the constituent system parts with a detailed technical description. A description of system architecture and the components involved.

Chapter 2 – Installation
Guidance to system installation engineers with references to software programming instructions, calibration procedures and cross references to the Maintenance chapter.

Chapter 3 – Operation
A description of procedures used for system operation and itemized docking.
For example, an Operation Procedures Appendix (with instructions to pilots) gives an explanation of signs and signals in a Safedock system. A Features Appendix provides information about the optional operational features in the system.

Chapter 4 – Maintenance
A system designed to minimize maintenance downtime. The maintenance of equipment is described at assembly level only. For example, if a fault is traced to a defective circuit board, the complete circuit board is replaced. No provision is made in this manual for repair at component level. The chapter also includes high-level maintenance procedures and fault diagnosis information (Appendix B Safedock Log Viewer).

Chapter 5 – Drawings
This chapter contains drawings and parts lists.

***Note**: Check with project or site management for Safedock options included in the specific configuration for a gate/site.*

SAFETY INFORMATION

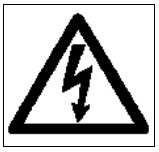
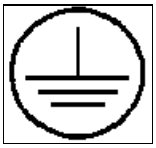
Safedock system is an Advanced Visual Docking Guidance System, an aircraft parking aid for airport and aircraft safety and efficiency. The design is according to strict airport industry standards for the safety of, and use by authorised airport personnel.

***Note**: The appendix document, Chapter 3 Operation – Appendix A, Operation Procedures must be distributed to all airlines using the system.*

Airport Operations, Maintenance and other Authorised Personnel
This information is a summary of the safety requirements on operation and maintenance personnel based on general electrical and laser safety precautions.
***Note**: It is very important for authorised personnel to study this section before any operation or maintenance work on the system is commenced.*

Safedock system should only be used by airport operations and maintenance personnel who have been properly trained in the use of the system. Safegate takes no responsibility for incorrect use of the system. All warnings contained in the text of this manual must be strictly observed.

Airport operations and maintenance personnel are strongly advised to observe the following symbols and safety advisories.

Symbol	Safety Advisory
	Safedock system contains electrical circuits and laser emitting devices, which may be hazardous to operators and maintenance personnel, if proper safety precautions are not observed. Only properly trained personnel should open enclosures or attempt to perform maintenance on these devices. Personnel are cautioned to read and thoroughly understand this manual before attempting to service this device.
	Safedock system contains 100 - 230 VAC electrical circuits that may be hazardous to operators or maintenance personnel if proper safety procedures are not observed. Remove power before attempting to service this device. Power may be turned off at the main disconnect circuit breaker inside the Display cabinet or at the breaker panel supplying AC power to the unit. ***CAUTION**: SOME SYSTEMS ARE SUPPLIED WITH A REMOTE UPS, WHICH MAY CONTINUE TO SUPPLY POWER TO THE SYSTEM, EVEN WHEN THE BREAKER AT THE SUPPLY PANEL IS SWITCHED OFF. BE SURE TO REMOVE ALL POWER, BEFORE SERVICING THIS EQUIPMENT.*
	A chassis ground connection is provided inside the cabinet. Be sure to follow all applicable codes in making chassis ground connections.

Symbol	Safety Advisory
	**Laser Safety Information** Safedock system is a Class 1 laser product, which means that it is safe under foreseeable conditions of operation, including the use of optical instruments for intra beam viewing. The Laser Scanning Unit compartment of the Pilot Display unit contains a Laser Range Finder, which is a Class 1M laser product. A Class 1M laser product is safe under foreseeable conditions of operation, but may be hazardous, if the user employs optical instruments within the beam, e.g. binoculars or telescope.
	Invisible Laser Radiation The laser output from this system is within Class 1 limits (USA FDA 21 CFR 1040.10 – 11 and IEC 60825-1, 2nd Edition: 2007) as long as the range finder is installed and operated as specified by Safegate. If operated in any other fashion than described, the range finder is capable of emitting radiation up to Class 1M limits.
	Eye Safety 1. Safegate accepts no liability for the misuse of its equipment or for the consequences of this misuse. 2. Safegate recommends that eye safety procedures be followed in accordance with ANSI Z136.1 – 1993 or IEC 60825-1 during maintenance. 3. The laser beam exiting the window of the Safedock enclosure is within Class 1 limit for eye safety, when the product is operated as specified by Safegate. 4. To provide eye safety the user is advised to treat this laser unit as a Class 1 M laser product. Class 1 M denotes lasers or laser systems that can produce a hazard if viewed through light collecting optics such as binoculars. For the laser the following values apply: • Pulse width ~ 10 ns • Wavelength 905 nm 5. If the laser by any reason should be switched on and used outside the docking system, safety procedures may include, but are not necessarily limited to the following: • Do not stare into the laser beam. • Do not view the beam with binoculars or other devices that collect light. • Do not point the laser at people. ***CAUTION***: *DO NOT POINT THE LASER RANGE FINDER AT THE SUN.*

GLOSSARY OF TERMS

Term	Description
Active state	The Safedock system is scanning the stand area for an approaching aircraft.
Alphanumeric display/ Text display	The upper portion of the Pilot Display. It is used as a text display capable of displaying alphanumeric characters.
Safedock Maintenance Tool	A software system run on a PC connected to the Safedock system. It is used to maintain and configure the Safedock
Azimuth display	The middle portion of the Pilot Display. It is used to indicate the lateral position of the aircraft relative to the centreline.
Block-Off transaction/ Chock-Off transaction	A message sent from Superior System to FIDS when an aircraft has left the stand. The message can be used for billing purposes.
Block-On transaction/ Chocks-On transaction	A message sent from Superior System to FIDS when an aircraft has reached the stop position. The message can be used for billing purposes.
Calibration control	A procedure performed periodically around the clock. It verifies that the system is in operation condition.
Capturing/ Capture Mode	The Safedock system is scanning the stand area for an approaching aircraft.
Chocks-On	A visual message meant for the pilot allowing him/her to know that t the chocks has been applied to the nose wheel. .
Closing rate display	The lower portion of the Pilot Display. It is used to indicate the distance remaining to the stop position for the approaching aircraft.
Control Unit	The processing centre for the Safedock system. It is mounted in the same cabinet as the Pilot Display unit.
Docking Guidance System	A system providing visual information to the pilot about an aircraft's position relative the centreline and stop position. It acts as an aid for the pilot to manoeuvre the aircraft to the correct parking position.
Docking log/Safedock log	Each Safedock system will retain a number of logs of the latest docking procedures. These docking logs can be downloaded using the Maintenance PC, or be automatically downloaded to a Superior System.
Docking procedure	The procedure by which a Safedock system leads an incoming aircraft to the predefined stop position. It consists of aircraft selection by operator, system self-test, Capture, Tracking and aircraft verification.
Laser Range Finder/ LRF	A measuring device using laser pulses to measure the distance to an object.
Laser Scanning Unit/ Laser Unit	A device made up of a Laser Range Finder and two mirrors mounted on stepper motors. The device uses the two mirrors to direct the laser pulses from the LRF in two dimensions, resulting in a three-dimensional scan of the stand area.
Pilot Display Unit	The Safedock system uses a display consisting several 8x8 dot 'light emitting diode' boards to display text, azimuth and closing rate information to the pilots.
Maintenance PC	A PC used to run the Safedock Maintenance Tool. It can be a portable PC connected locally to a Safedock system, or a stationary PC connected to the units via LAN or through Superior System.

Term	Description
Operators Panel/ Operators Control Panel	The operator panel is the primary source for operator input to the Safedock system. It consists of an LCD display for status information and function keys for operator input.
Scheduled Docking	A pre-planned incoming flight, consisting of Aircraft type, flight number, stand and scheduled/estimated/actual time of arrival. Superior System can use this information to initiate the docking procedure at the appropriate stand. The Scheduled docking will be presented at the Safedock system, for approval by the Marshal or handling agent.
Stand configuration file	A complete configuration for a Safedock system can be stored on disk in a stand configuration file. This file can be used to review and/or to document the stand configuration. The file can also be used to restore the configuration for a in case of a hardware breakdown.
Stand Setup/ Stand configuration	The process of configuring a stand for operation. This process includes defining the centreline to use and selecting the aircraft types and their stop positions.
Superior System	Gate Operating System or SafeControl – Apron Management System.
Tracking/ Tracking Mode	The Safedock system has found an incoming aircraft, and is in the process of leading it to the predefined stop position.
Walk test	A test procedure used to verify the operation of a Safedock system.

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CHAPTER 1
SYSTEM DESCRIPTION
CONTENTS

1. EQUIPMENT AND SYSTEM DESCRIPTION

1.1 BRIEF SYSTEM ARCHITECTURE

The figure 1.1 is an overview of the Safedock system and the following section is a brief description of the system and its sub units.

1. The Safedock main unit consists of a real time Pilot Display Unit, a Control Unit and a Laser Scanning Unit. All these are housed in the same cabinet, except for the T1S model where the Laser Scanning Unit is in a separate enclose.
2. The system also includes an Operator Panel, comprising an LCD display screen and an “Emergency-Stop” push-button, or optionally a ‘Clear Gate’ button. The Operator Panel is mounted at apron level, or in the cabin of the Passenger Boarding Bridge (PBB).
3. The Laser Scanning Unit is based on 3D- measuring technology to execute a safe docking procedure, when an aircraft approaches a terminal stand. The Laser Range Finder (LRF) transmits distance data from the approaching or departing aircraft to the Control Unit for processing.
4. The Control Unit transmits processed data results for presentation on the Pilot Display Unit, the Operator Panel and to the Superior System (GOS/ SafeControl-Apron Management System).

1.2 DESIGN OBJECTIVES

Important design factors are:

- Commonality of components to reduce customer stock of essential spares.
- Analysis for successful long-term operation.
- Knowledge of aircraft characteristics and the recognition of the unique factors in any airport requirement, responding in a highly cost effective technology.
- Human-Machine-Interfaces of the Safedock system has been designed in co-operation with customers and end-users, and has been developed from the experience of systems, previously delivered, with the objective to achieve a high degree of safety, guidance readability and operational efficiency.

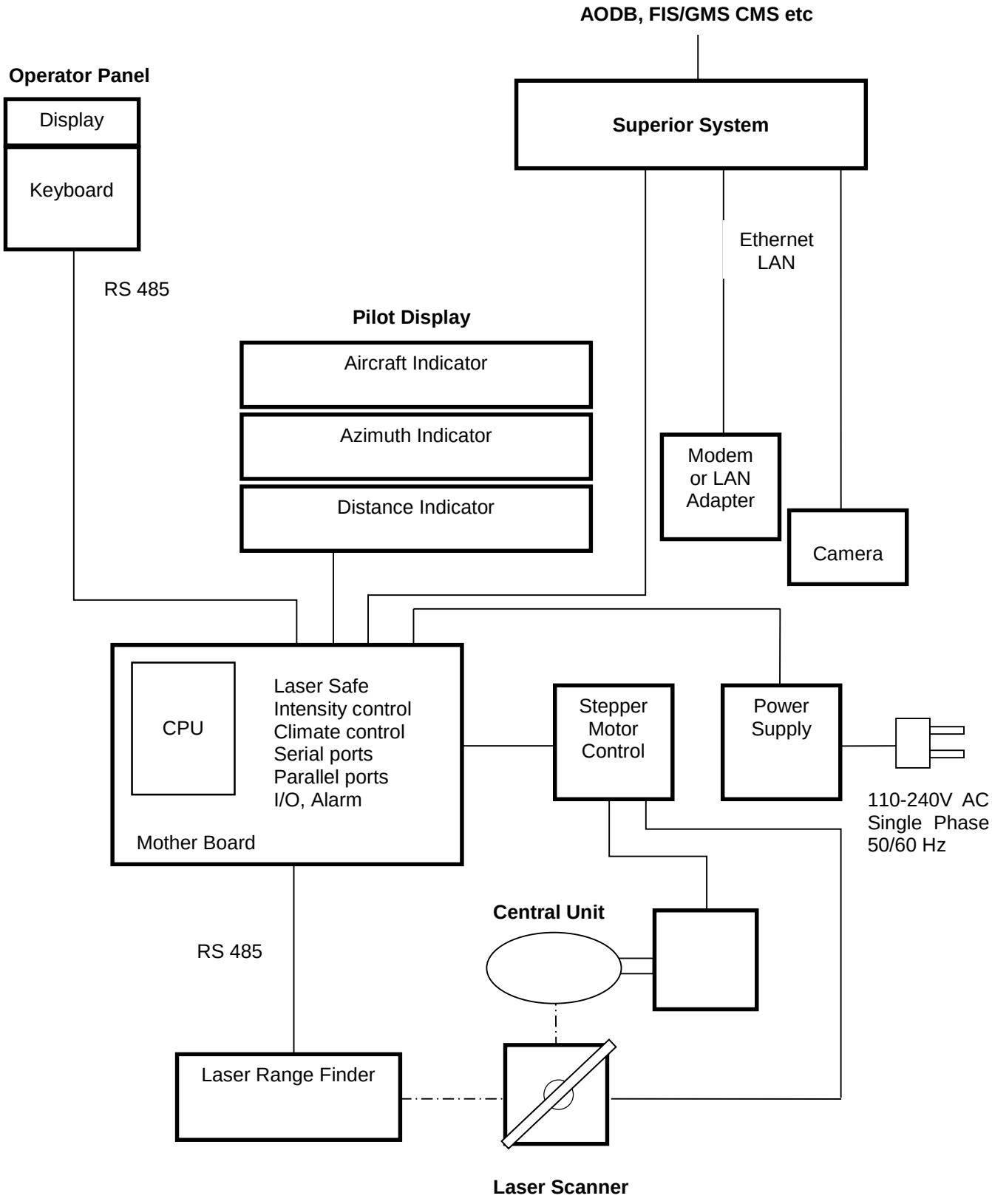
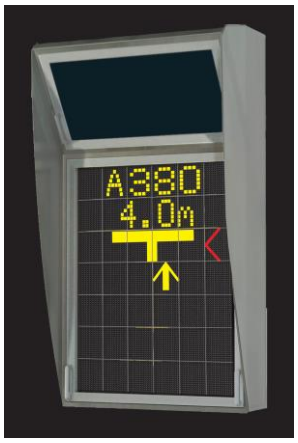


FIGURE 1.1 SAFEDOCK SYSTEM OVERVIEW

1.3 SAFEDOCK SYSTEM SUB-UNITS

1.3.1 Pilot Display Unit



The Pilot Display incorporates three different indicators for alphanumeric, azimuth and closing rate information, clearly visible from both pilot positions in the aircraft cockpit.

The Pilot Display comprises a set of LED (light emitting diode) indicators, yellow and red indicator boards, each housing a processor board connected in series to the Control Unit.

The upper rows are used for alphanumeric information, the next row for azimuth information and the lower section for closing rate information.

1.3.1.1 Alphanumeric Information

The alphanumeric display, shown in yellow, will present information such as abbreviations for Aircraft type, Airport code and Flight number. Special guiding text information is also displayed to the pilot during the docking phase.

1.3.1.2 Azimuth Guidance Indicators

The azimuth guidance indicator, often displayed as red arrows, gives information on how to steer the aircraft. A yellow vertical arrow shows the actual position of the aircraft in relation to the centreline.

1.3.1.3 Closing Rate Indicator

The closing rate indicator, shown in yellow, comprises of a number of horizontal elements, building a vertical column, the centre-line symbol. Each element represents for T3 0.7, T2 0.4 and T1 0.3 metres. Other resolutions are possible.

1.3.1.4 Legibility of Displayed Information

The displayed information is readable in direct sunlight, reflections and back-light.

This is achieved through the use of automatic adjustment of LED light intensity and dark coloured LED-boards.

1.3.2 Control Unit

The Control Unit, located with, or inside the Safedock unit, comprises a motherboard with a microprocessor unit, and two stepper motor drive boards. It continuously monitors and controls the operation of the docking guidance system.

The Control Unit is designed for real time processing of measured distances, handling of communication lines, stepper motors, temperature control, display's light intensity control and safety control of the Laser Range Finder.

Software and parameters are stored in non-volatile memory.

Communication to the Superior System is by means of an Ethernet connection built in at the Control Unit.

1.3.3 Laser Scanning Unit

The Laser Scanning Unit comprises the following sub-units:

- Laser Range Finder
- Vertical scanning mirror and stepper motor
- Horizontal scanning mirror and stepper motor

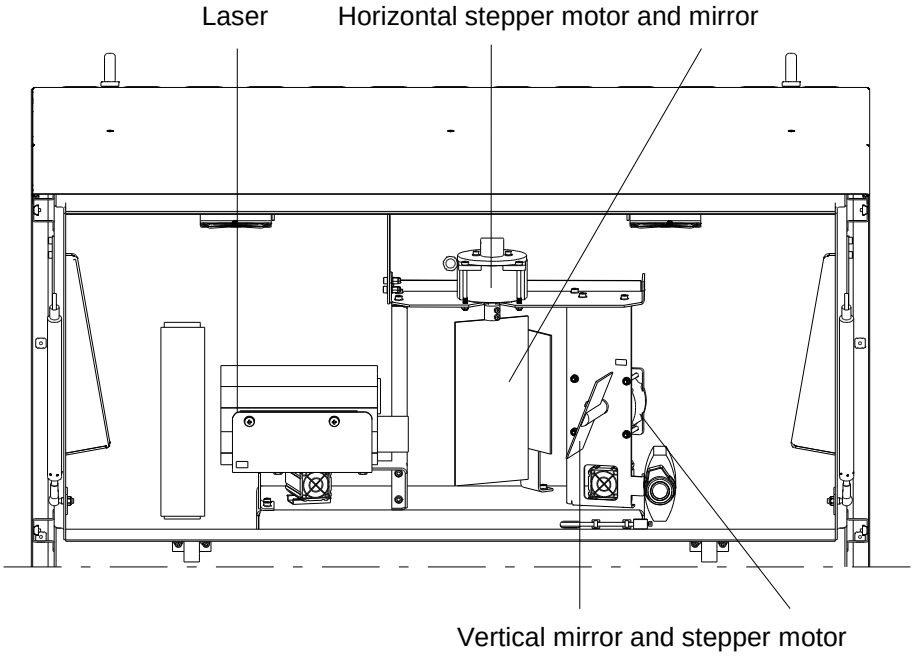


FIGURE 1.2 - SAFEDOCK T1 LASER SCANNING UNIT

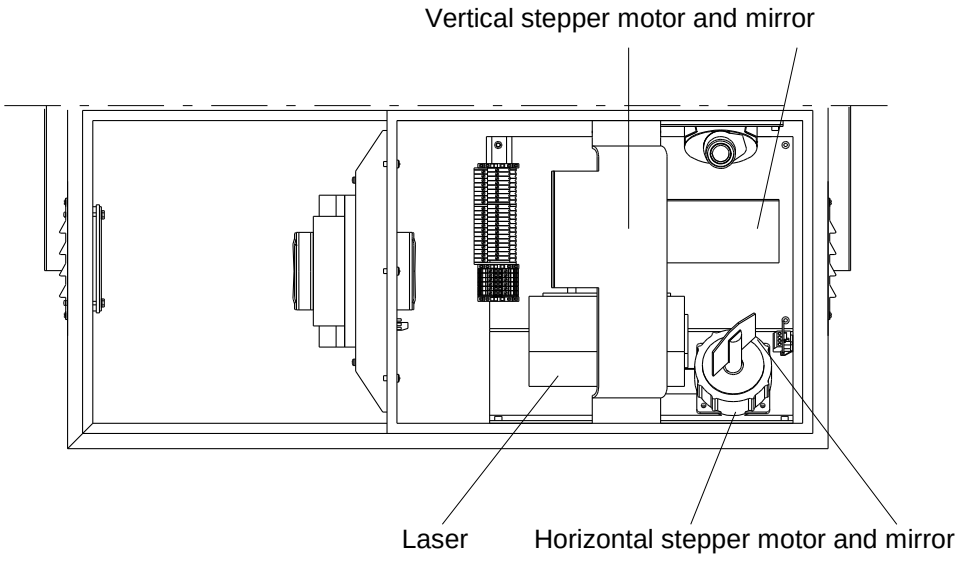


FIGURE 1.3 - SAFEDOCK T2/3 LASER SCANNING UNIT

The Laser Scanning Unit is housed in the lower part of the Safedock unit for model T2 & T3, and for T1 in the upper part. It is based on 3D-technology and consists of a Laser Range Finder, comprising both a transmitting and a receiving lens. The unit also incorporates a fixed mirror used with the calibration procedure to facilitate an accurate setting of the Safedock system.

WARNING! INVISIBLE LASER RADIATION.
THE LASER OUTPUT FROM THIS SYSTEM IS WITHIN CLASS 1 LIMITS (USA FDA 21 CFR 1040.10 – 11 AND IEC 60825-1:2007) AS LONG AS THE RANGE FINDER IS INSTALLED AND OPERATED AS SPECIFIED BY SAFEGATE. IF OPERATED IN ANY OTHER FASHION THAN DESCRIBED, THE RANGE FINDER IS CAPABLE OF EMITTING RADIATION UP TO CLASS 1M LIMITS.

1.3.3.1 Functional Description

When a docking process has been started, the Laser Range Finder transmits infrared pulses, scanning both vertically and horizontally via a stepper motor controlled mirror system, to detect an approaching aircraft.

The distance to the aircraft is determined by the elapsed time, taken for the infrared pulse to be transmitted and received by the Range Finder. The Control Unit, which handles the positioning of the scanning mirrors, uses the distance values, obtained from the Laser, to determine the location of the aircraft, in relation to its required stop position.

1.3.3.2 Laser Scanning Area

During capturing mode the scanning area is 20 degrees in a horizontal plane. When an aircraft has been captured, the laser will follow the aircraft in a tracking area according to the Safedock unit type described in following figures.

Vertical plane (side/front views)	Horizontal plane (side/front views)

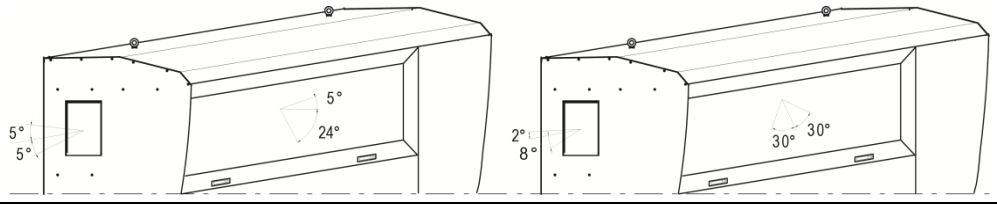


FIGURE 1.4 - SAFEDOCK T1 LASER SCANNING AREA

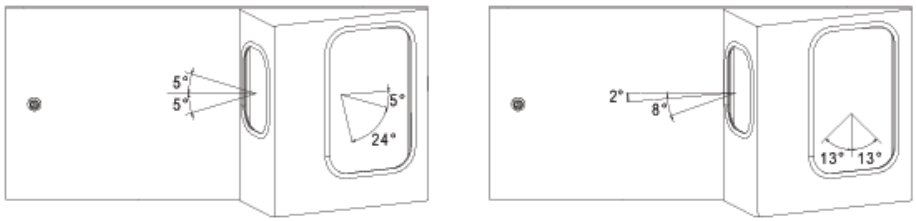


FIGURE 1.5 - SAFEDOCK T2/3 LASER SCANNING AREA

1.3.3.3 Mirrors and Stepper Motors

This part of the system comprises a vertical and a horizontal mirror assembly, each controlled by a stepper motor. See Figure 1.2.

1.3.4 Power Unit

Required power supply: 115/230VAC ±10%, 50/60Hz

The Power Unit generates DC 24V to the Control Unit, the Pilot Display Unit, the Laser Scanning Unit, and to the Operator Panel. The system has surge arrestors built in.

1.3.5 Battery Backup Unit (Option)

Optionally a battery unit can be installed to back up power line failures to finish off begun operations. Lead-AGM batteries are used, and the maximum capacity is 7.2 Ah. The battery unit is interfaced with the Power Unit above and charges automatically.

1.3.6 Temperature Control System

The laser system in the cabinet includes a Climate Control System, comprising a ventilated double wall and de-icing/anti-condensation heater.

Optionally the Pilot Display Unit also has a heater to prevent moisture on the window during cold weather.

1.3.7 Operator Panel

The Operator Panel is used to control the Safedock system from a location close to the Aircraft Loading Bridge.

The Operator Panel, controlled by an embedded microprocessor unit, is connected to the Control Unit by a RS485 communication line. Power, 24 VDC, is supplied from the Safedock main unit.

The interface to the Aircraft Loading Bridge is via the Operator Panel printed circuit board, having the input/output ports for that purpose.

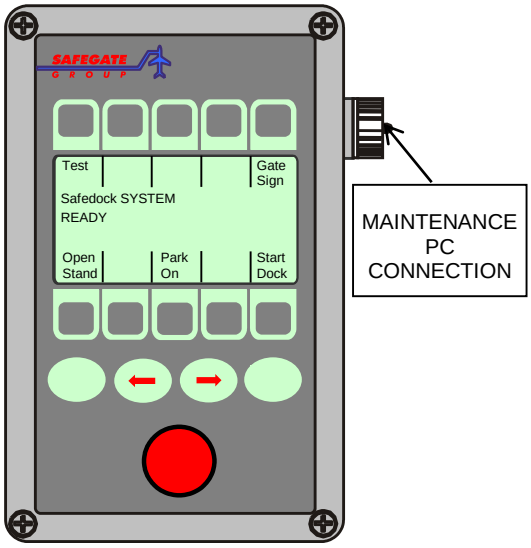


FIGURE 1.6 - OPERATOR PANEL (SOFTKEY)

1.3.7.1 Physical Description

The Operator Panel consists of a keyboard with 14 push buttons (4 fixed function keys and 10 context sensitive keys), and a liquid crystal display (LCD). The LCD indicates systems modes of operation, lead text for the context sensitive keys, and gives also diagnostic/error information. The Operator Panel display is backlit.

1.3.7.2 Service Outlets

At the right side of the Operator Panel a connector for a PC serial port, RS485, is installed. This can be used with a Maintenance PC for the local configuration and calibration of each individual Safedock unit.

1.3.7.3 "Emergency-Stop" Button or "Clear Gate" Button

The Operator Panel has an "Emergency-Stop" push-button that is connected to the Safedock Control Unit by a separate line. Optionally a "Clear Gate" button can be installed instead of the "Emergency-Stop" button.

1.3.7.4 Other Pilot Messages

Input ports, 16 in total, are also used for activating messages to the Pilot, after docking has been completed. Such messages are: CHOCKS ON/OFF; PCA ON/OFF; 400Hz ON/OFF etc.

1.4 OPERATION

1.4.1 The Docking Process

This is a brief description of the Safedock system operation. For a detailed description, see Chapter 3 OPERATION.

a) The individual Safedock unit is operated from the Operator Panel at apron level or from the Superior System. From the Superior System all connected systems can be individually controlled and monitored.

b) In the Safedock system a number of aircraft types are configured by a set of parameters such as the nose profile etc. At start of docking an aircraft type is assigned by the operator. During the docking procedure the corresponding parameters of the actual aircraft are measured by the laser equipment. Captured data are compared to the safety profile of the assigned aircraft. If the safety margins are not correct, the message "ID FAIL" will be displayed on the Pilot Display and the docking process will be aborted.

c) The system operates in three modes (see below):
   (i) Calibration check
   (ii) Capturing
   (iii) Tracking

1.4.1.1 Calibration Check

The docking process starts when an aircraft type is selected from the Operator Panel or, optionally, from the Superior System and connected external systems. While the system is idle, a calibration check is done every once per 30 minutes. If the recent calibration check has been successful the docking procedure will start immediately. If not, a calibration check will commence before the docking process starts. If any error occurs, a report will be transmitted. For more information, see Chapter 4 MAINTENANCE.

The calibration check is performed according to the sequence as in the figure below.

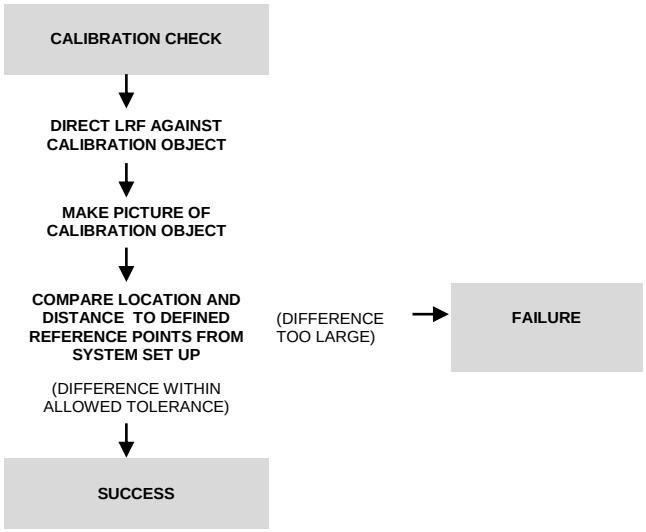


FIGURE 1.7 - CALIBRATION CHECK SEQUENCE

***Note**: The Laser Range Finder (LRF) transmits distance data from the approaching or departing aircraft to the Safedock Control Unit (CU) for processing.*

1.4.1.2 Capturing

After successful calibration check, the system is automatically switched over to the capturing mode for distance data collection. In this mode the laser is scanning the pre-defined docking area to detect an approaching aircraft. The laser is also performing a check to make sure that the aircraft actually can be guided to its defined stop position without being obstructed by any foreign objects.

1.4.1.3 Tracking

When an aircraft is detected and its approximate position is confirmed, the system switches to tracking mode.

The Safedock system checks the graphical profile of the approaching aircraft and compares it to the corresponding parameters of the selected aircraft. If there is no mismatch between these parameters, the docking process will continue by measuring the aircraft nose position. As many aircraft have similar profiles, all types cannot be discriminated. However a safety margin is checked from measurements of the approaching aircraft's geometry. If the safety margin is too small, the display will show **STOP ID FAIL**, and the docking procedure will be automatically interrupted.

The Safedock measures the position of the aircraft in relation to aircraft stand centre-line and the defined stop position for the particular aircraft type. During the tracking process the relative position of the aircraft is displayed on the Pilot Display unit, clearly visible from the whole cockpit area.

1.4.2 Safety with the Docking Procedure

Safedock system safety with the docking procedure is based on the approaching aircraft type as identified according to the type selected at start-of-docking. An acceptable physical safety margin between airport stand area equipment such as the Passenger Boarding Bridge (PBB) and the aircraft is also fundamental in a Safedock docking procedure (For more information, see Chapter 3 OPERATION § 5.3.1 Start of Docking with Interlocking Stands).

1.4.2.1 Risk factors and Safedock solutions:

1. Operator error: the wrong aircraft type is selected or the operator does not observe that wrong aircraft type is approaching the stand.
   - Safedock aircraft identification and verification monitors the incoming aircraft type and displays information if the safety margin is too small, for example **STOP ID FAIL**.
2. Pilot(s) error: the pilots do not observe the wrong aircraft type on the docking system display.
   - Safedock aircraft identification and verification monitors the incoming aircraft type and displays information if the safety margin is too small, for example **STOP ID FAIL**.
3. When the approaching aircraft type does not correspond to the type selected at the start of docking, the docking system must detect or analyse the risk involved. The pilots are in this case instructed with a message to stop the docking procedure and wait for manual assistance.
   - Safedock aircraft identification and verification monitors the incoming aircraft type and displays information if the safety margin is too small, for example **STOP ID FAIL**.
4. Obstruction in the apron area for example PBB out of position or positioned for an incorrect aircraft type.
   - Safedock monitors the stand area for the selected aircraft type and displays information if there is an obstruction, for example **Gate Blocked** or **STOP ID FAIL**.
5. Fuel/water/sewage pits/foreign objects debris (FOD).
   - Safedock equipped with the surveillance camera option can monitor the stand area; however the aircraft docking procedures are also to be monitored by airport ground personnel on the apron.

1.4.2.2 Aircraft Safety Check

Aircraft Safety Check is based on differences in aircraft geometrical characteristics, for identification and verification in profiles, such as nose height and location of engines.

1.4.2.3 Performance

From a test run at Copenhagen International Airport with 200 docking events, the following results were verified:

- Accuracy for engine position: $\pm$ 1.1 m (confidence of 99.7 %)
- Accuracy of the nose height measurement: $\pm$ 0.5 m

Limiting factors are:

- reflectivity of the aircraft surface
- speed of the aircraft
- aircraft turning, alignment to centreline
- low visibility
- ground level variations

1.4.2.4 Discrimination Criteria

Nose Height

The measured nose height must be within the tolerance limits ± 0.5 m of the nose height of the selected aircraft type.

Nose-to-engine Distance

The measured nose-to-engine distance must be within the tolerance limits –1m to +3m from the nose-to-engine distance of the selected aircraft type.

Otherwise the system will show **STOP/ID FAIL** when the aircraft is 15 meters from the stop position.

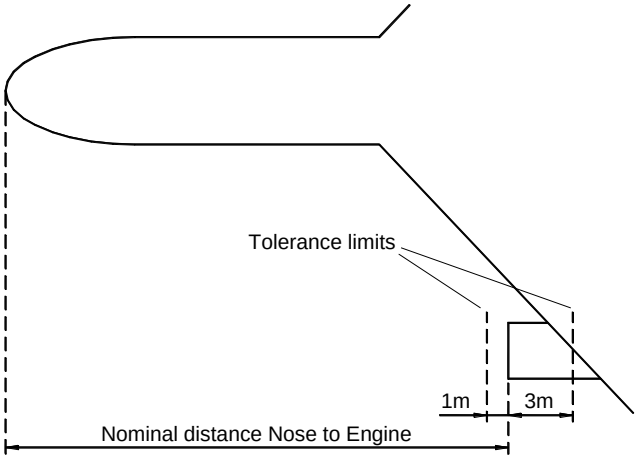


FIGURE 1.8 – DISCRIMINATION CRITERIA

1.4.2.5 Docking Other Aircraft Types (than the type selected)

If another aircraft type than the selected type is accepted by the Safedock system into the stand, it is stopped with the nose at the same position where the selected type is to stop (alternatively **ID FAIL** is shown, if the previous nose criteria is not met).

The safety margin in this case (the *Safety Margin Other Aircraft or A/C*) is calculated as shown.

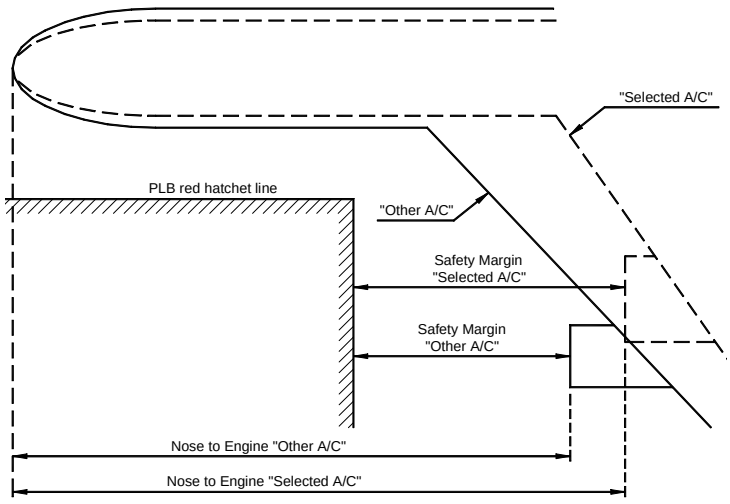


FIGURE 1.9 – DOCKING CALCULATION

Safety Margin Other A/C (worst case) =

Safety Margin Selected A/C – Tolerance – Measuring accuracy

Example

Safety Margin	3 metre
Tolerance	1 metre
Measuring accuracy	1.1 metre

Conclusion

The safety margin is therefore be 0.9 m or greater, depending on the layout of stopping positions where the basic safety margin is 3m (to a fixed obstacle) or greater for all aircraft, stopped at the correct stop position.

1.4.2.6 Practical Aspects

If another aircraft type than the type selected is accepted into the stand (discrimination criteria is not met), there is a risk to the normal parking position and stop position accuracy.

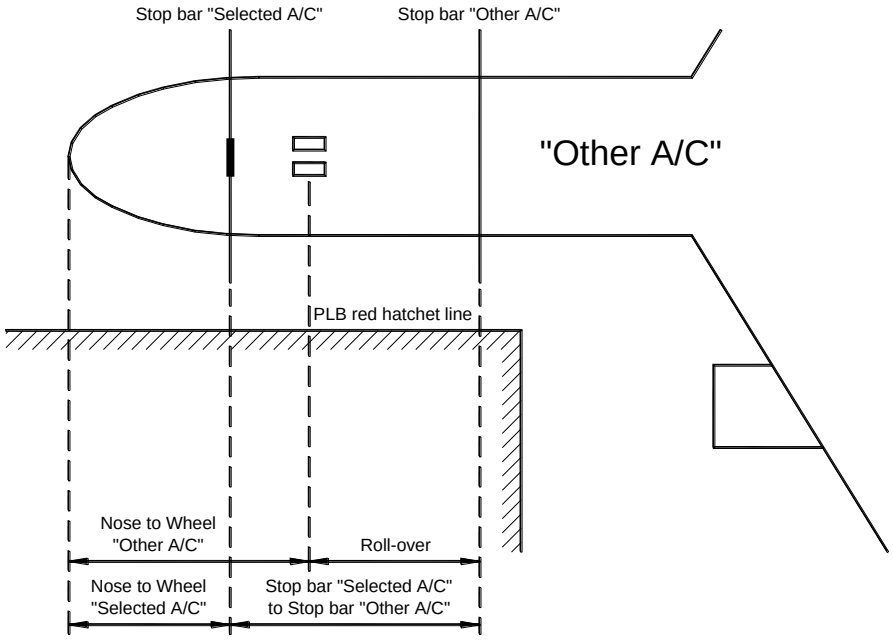


FIGURE 1.10 – PRACTICAL ASPECTS

The deviation, “roll-over”, from the normal stopping position is calculated as follows:

Roll-over = (Stopbar Other A/C-to-Stopbar Selected A/C) + (Nose-to-wheel Selected A/C) – (Nose-to-wheel Other A/C)

The calculation illustrates the result from a docking procedure, where the aircraft discrimination criteria does not result in a **STOP/ID FAIL** message, as the geometrical deviation was too small to be detected.

2. INTERFACES TO OTHER SYSTEMS

The diagram below describes the general Safedock interfaces to external systems. These might be:

a) Superior System (GOS/ SafeControl – Apron Management System) and related systems, such as FIDS/GMS and Central Maintenance Systems
b) Maintenance PC
c) GBMS (optional, an external maintenance system)
d) AGL (optional)
e) Passenger Loading Bridge/PBB (optional)

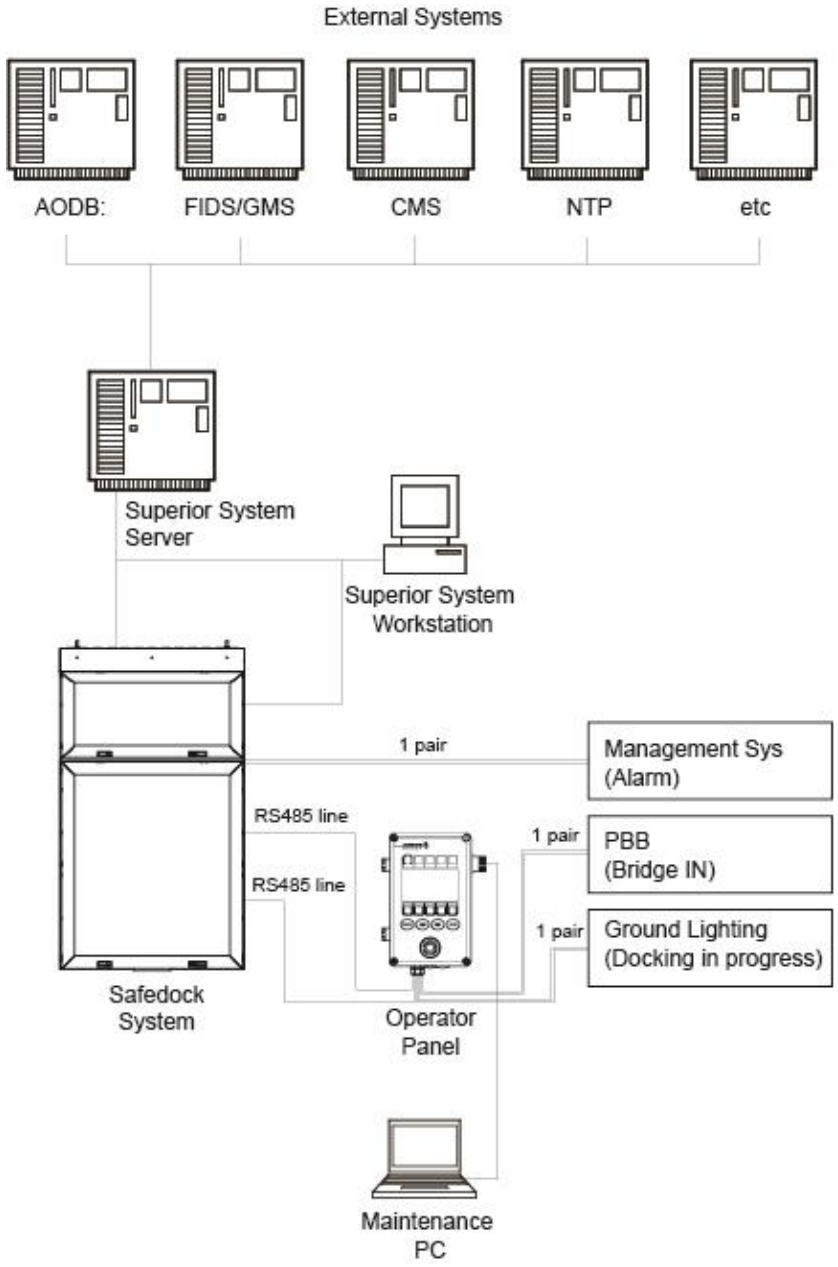


FIGURE 1.11 - INTERFACE STRUCTURE

2.1 SYSTEM AVAILABILITY/LINE REPLACEABLE UNITS

The table below contains all Line Replaceable Units (LRU) used in the Safedock system. For more information, see Chapter 5 DRAWINGS.

2.1.1.1 Availability and Reliability General Definitions

The availability of a product depends on the following factors of an LRU:

MTBF = Mean Time Between Failures

MTTR = Mean Time To Repair

MLDT = Mean Waiting Time for Recourses

MDT = Mean Down Time (MTTR + MLDT)

2.1.2 Reliability of Reparability of Line Replaceable Units

The calculated MTBF and MTTR figures are according to the table below. Units are in hours.

The table includes selected key components from Safedock system.

***Note**: This information is subject to change. For more information, see www.safegate.com or contact Safegate.*

Line Replaceable Unit	QTY	MTBF	MTTR
Control Unit Board	1	120 000	0.7
Motor Control Board	2	120 000	0.4
LED Board	9-42	400 000*	0.4
Laser Range Finder	1	120 000	0.4
Stepper Motor	2	150 000	0.4
Power Supply	1	120 000	0.4
Operator Panel Board (Softkey)	1	80 000	0.4

Note: *A certain degree of redundancy has been given in these figures.*

2.1.3 Reliability Calculation

For a typical Safedock system the below total MTBF_Safedock figure is calculated, not considering the fact that the system has a built-in temperature control system and that the system operation duty-cycle is only some 10 %.

1/MTBF_Safedock = 1/MTBF_Cu + 1/MTBF_Cpu + 2/MTBF_Mcb + 9/MTBF_Led + 1/MTBF_Laser + 2/MTBF_Motor + 1/MTBF_Power + 1/MTBF_OPanel

Values according to the table above give MTBF_Safedock = 9 600 hours.

This value does not correspond to the statistical value, found during a four year period of time. So, if we consider the following facts, a less conservative MTBF figure is being calculated.

- The Laser Range Finder is only switched on during 10% of time. A factor 10 is used for the calculation.
- Figures for the Operator Panel are calculated according to MIL-HDBK-27F. Only a few operations per hour are made. A factor of 4 will be used for the calculation.

- The system will be available for docking even if one LED display board has failed, unless it is one of the two azimuth guidance boards. This will increase operational reliability with a factor of 4.5.
- The Safedock system is temperature controlled, which will increase reliability with a factor 1.5.

1.5/MTBF_Safedock = 1/MTBF_Cu + 1/MTBF_Cpu + 2/MTBF_Mcb + 2/MTBF_Led + 0.1/MTBF_Laser + 2/MTBF_Motor + 1/MTBF_Power + 0.25/MTBF_OPanel

Using this formula, **considering operating temperature and duty cycle**, the calculated MTBF figure for the Safedock system would be **24 800 hours**.

2.1.4 Technical Availability

Suppose that continuous operation is 24 hours a day, and Mean Down Time (MDT) is 6 hours. Then, according to the formula A_0 = MTBF/MTBF+MDT, operational availability would be > 99.9%.

3. TECHNICAL DATA

3.1 PERFORMANCE

Stop position accuracy	0.1 m
Stop position distance	2 - 65 m (T1), 8 – 50 m (T2), 8 – 50 m (T3)

***Note**: This depends on configuration.*

Azimuth accuracy	0.2°
Azimuth distance	up to 110 m, depending on configuration
Display type	High intensity LED
Display visibility angle	approximately 110° (T1), 24° (T2/3)
Display visibility distance	approximately 160 m (T1/2), 80 m (T3)

***Note**: This depends on configuration, display number of characters.*

Display number of characters	Up to 168 (T1), 24 (T2), 16 (T3)

***Note**: This depends on configuration, LEDs.*

LED configuration (typical module totals)	42 (T1), 18, 24 (T2), 9, 15 (T3)
Maximum separation - two centre lines	30° (T1), 18° (T2/3)

3.2 SAFEDOCK UNITS DIMENSIONS AND WEIGHTS

3.2.1 Safedock Main Unit

T1 Main Unit

Dimensions, (built-in sun cover)	1858,5 x 1079 x 752+85,5 mm (H x W x D)

***Note**: Height x Width x Depth.*

Weight	140-150 kg (308-331 lbs)

***Note**: This depends on configuration.*

Mounting rails/clamps upper-lower distances 1449 mm

T2 Main Unit

Dimensions, (without sun cover)	1520 x 900 x 422 mm (H x W x D)
Dimensions, (with sun cover attached)	1547 x 958 x 650 mm (H x W x D)
Weight (depending on configuration)	100-110 kg (220-243 lbs)

Mounting rails/clamps upper-lower distances 1046 mm

T3 Main Unit

Dimensions, (without sun cover)	1370x 600 x 422 mm (H x W x D)
Dimensions, (with sun cover attached)	1396 x 656 x 650 mm (H x W x D)
Weight (depending on configuration)	90-100 kg (198-220 lbs)

Mounting rails/clamps upper-lower distances 896 mm

3.2.2 Operator Panel

Dimensions	260 x 160 x 90 mm (H x W x D)
Weight	2 kg / 4.4 lbs

***Note:** For more information, or more specific hardware configuration options see Chapter 5 DRAWINGS.*

3.3 SUB UNIT CHARACTERISTICS

3.3.1 Power Unit

Power Requirements	100-115/100-230 VAC, 50/60Hz, +-10% fluctuation.

***Note**. UL certification tested with 100-115 VAC 60Hz*

Maximum power consumption (Depending on configuration)	T1: 1000 W T2: 520 W T3: 400 W

3.3.2 Control Unit

Microprocessor	ETX CPU module
Alarm system interface	Relay contact, potential free
Power Requirements	24 V

3.3.3 Laser Scanning System

Laser Type:	GaAs semiconductor
Wave Length:	0.9 ± 0.1 μm
Beam Width:	approximately 30 mm in diameter
Beam Divergence:	5 mrad maximum (full angle of circular beam)
Laser Class:	Class 1
Serial Interface:	RS485, 19200 Baud

3.3.4 Operator Panel (OP softkey)

Micro controller:	Rabbit 2000
LCD Display	240 x128 pixel; subdivided into 2 lines of 5 soft-keys and 3 lines of 20 characters for text; backlit.
Serial Interface	RS485 (to Safedock Main Unit)
Keyboard	14 keys (10 soft keys + 4 fixed function)
PBB Interface	24 VDC, Opto coupled Input
AGL Interface (lead-in light)	Relay contact, potential free

3.3.5 Conduit Entry Points (cable glands, nuts, holes)

Safedock (power supply/control) glands:	diameter is 9-13 mm.
Safedock (OP communication) nut:	diameter is 9-13 mm.
Safedock communication (option such as GOS):	diameter is 4-8 mm.
Operator Panel (Safedock communication) nut:	diameter is 8-13 mm.
Operator Panel (option such as PBB) extra holes:	diameter is 20.5 mm.

For more information, see Chapter 2 INSTALLATION or Chapter 5 DRAWINGS.

3.4 ENVIRONMENTAL LIMITS

3.4.1 Dust and Water Protection

Protection against dust and water meets ICAO requirements of IP 54 (IEC 6 052 9).

Safedock Display Unit:	IP54 (T1/T2/3)
Laser Unit:	IP54 (T1/T2/3)
Operator Panel (Option/softkey):	IP 65

***Note**: UL certification only tested for IPX4.*

3.4.1.1 IP classification

Classification of degree of protection provided by enclosure is according to IEC 529, IPXX. The IEC (International Electrotechnical Committee) is the world's leading organization that prepares and publishes International Standards for all electrical, electronic and related technologies. The IEC designation consists of the letters IP (ingress protection) followed by two numerals. The first characteristic numeral indicates the degree of protection provided by the enclosure with respect to persons and solid foreign objects entering the enclosure. The second characteristic numeral indicates the degree of protection provided by the enclosure with respect to the harmful ingress of water.

3.4.2 Installation Environment

The Safedock system is intended to be installed outside, and at an altitude not exceeding 2000m above sea level.

3.4.3 Temperature and Humidity Limits

The Safedock system withstands relatively extreme temperature and humid atmosphere without any adverse effects (corrosion or change of characteristics due to the absorption of humidity).

Ambient Temperature –25°C to +50 and +55°C when cooling aid option is included

***Note:** Ambient temperature down to -40°C excluding the operator panel*

Storage Temperature –20°C to +60°C

Relative Humidity (Operational):

- 95% with a maximum temperature of 35°C
- 60% with a maximum temperature above 35°C

Relative Humidity (Storage):

- 75% with a maximum temperature of 60°C

***Note:** The Safedock unit is equipped with internal heating and scanning window-defrosting elements to ensure proper cold weather operation. The unit can also be equipped with an internal cooling device (option) to ensure proper warm weather operation.*

3.4.4 Storage

It is recommended that units are kept in the shipping box and in a dry covered storage area until installed for operation.

3.4.5 Wind Load

The Safedock system is designed to resist damage in wind speed up to 44 m/s (no active operation).

3.4.6 Snow Load

The Safedock system is designed for a snow load up to 1000 N/m^2.

3.4.7 Brightness

Environmental brightness range from direct sunshine down to an average luminance of at least 10 lux with a uniformity ratio (average to minimum) of not more than 4 to 1 measured at 2 m height.

3.4.8 Vibration

The Safedock system is tested according to IEC 68-2-64 to meet a level of satisfactory function at acceleration of 0.1G within the frequency range 10 - 100Hz.

3.4.9 Acoustic Sound and Noise

The Safedock system is tested to meet a sound level not exceeding 45 dBA, relative a sound reference pressure of $2x10^{-5}$ Pa.

***Note**: This information may be subject to change for T1 with a Supercooler option.*

3.4.10 Pollution Limits

Tested to pollution degree 2 (IEC 664)

3.4.11 Installation Over-voltage Limits

Tested to Category II (IEC 664)

3.5 ELECTROMAGNETIC COMPATIBILITY

3.5.1 General

The Safedock system is tested to fulfil all relevant requirements for EMI/EMC immunity as stated by FCC part 15 (47 CFR Part 15).

Also, the Safedock system is tested to fulfil all relevant requirements for EMC immunity as stated by EMC Directive 89/336/EEC and standards as in next section.

3.5.2 Generic Standards

EN 50081-1:1992	Generic Emission Standard; Part 1: Residential, Commercial & Light Industry Environment
EN 50082-2:1995	Generic Immunity Standard Part 2: Industrial Environment

3.5.3 Basic Standards

ENV 50140	EMC - Basic Immunity Standard Radiated RF electromagnetic fields immunity test
ENV 50204	EMC - Basic Immunity Standard Radiated RF electromagnetic fields immunity test (pulse modulated)
EN 61000-4-4	EMC, Part 4: Testing & measurement techniques.
Sect 4:	Transient immunity test
EN 61000-4-2	EMC, Part 4: Testing & measurement techniques.
Sect 2:	Electrostatic discharge immunity test.

3.5.4 Product Family Standards

EN 55022	Limits and methods of measurement of radio interference characteristics of information technology equipment.
EN 55024	Immunity requirements for information technology and communications equipment. Only parts as Surges, Voltage Dips and Voltage Interruptions is tested.

CHAPTER 2
INSTALLATION
CONTENTS

WARNING! INVISIBLE LASER RADIATION

THE LASER OUTPUT FROM THIS SYSTEM IS WITHIN CLASS 1 LIMITS (USA FDA 21 CFR 1040.10 – 11 AND IEC 60825-1:2007) AS LONG AS THE RANGE FINDER IS INSTALLED AND OPERATED AS SPECIFIED BY SAFEGATE.

IF OPERATED IN ANY OTHER FASHION THAN DESCRIBED, THE RANGE FINDER IS CAPABLE OF EMITTING RADIATION UP TO CLASS 1M LIMITS.

CLASS 1 M DENOTES LASERS OR LASER SYSTEMS THAT CAN PRODUCE A HAZARD IF VIEWED THROUGH LIGHT COLLECTING OPTICS SUCH AS BINOCULARS.

1. SCOPE

Installation of the Safedock System is performed in three phases and often by three different personnel categories:

1. Mechanical installation
2. Electrical installation
3. System configuration

Note: *This document is focused on the mechanical and electrical installations with system configuration, for example software set-up procedures briefly described with references to other sections or chapters in the manual.*

1.1 INSTALLATION SCHEDULE

The schedule presented in the table below should be used with the appropriate installation drawings.

Item	Task
1	Attach the support fixture to the wall or mast
2	Mount the Safedock Unit on the support fixture
3	Install the Operator Panel
4	Mount the calibration plate
5	Install interconnecting cables
6	Connect a PC, with the Safedock Maintenance Tool, SMT, to the Operator Panel and perform the following: - Calibrate the Safedock and define a centreline - Set operating parameters - Configure the Stand
7	Carry out a functional check of the system

Note*: It is recommended to paint permanent or temporary centreline(s) and stop-position(s) on the apron before a Safedock installation, to aid proper alignment, calibration and configuration.*

1.2 REQUIRED TOOLS AND EQUIPMENT

Tools and equipment needed for the installation are according to the table below:

Hand Tools	Equipment
Screwdrivers, standard sizes	Lap top PC computer, with SMT software
Pliers: regular, needle nose and diagonal	Multi-meter (U, I, R)
Adjustable end wrenches	Portable lift for 1 to 2 people:
Wire strippers	- Lifting height for standard installation: minimum 6 m (17 feet)
Level	Light crane:
	- Lift capacity: 150 kg/300 lbs.
Tape measure, > 10 m	- Lifting height for standard installation: 10 m (33 feet)

2. INSTALLATION CONSIDERATIONS

2.1 MOUNTING HEIGHT

Minimum mounting height, recommended, is 4.0 metres. This figure depends on the following factors:

- Maximum vehicle height on the service road
- Maximum nose height of the aircraft to be docked to the particular stand

Maximum mounting height, recommended, is 8.0 metres. This figure depends on the following factors:

- Minimum nose height of the aircraft to be docked to the particular stand
- Maximum pilot eye viewing angle towards display is 15 degrees

Note: *The minimum distance to the stop-position for a particular aircraft depends on the maximum downward viewing angle allowed. For more information, see § 2.2 Stop-Position.*

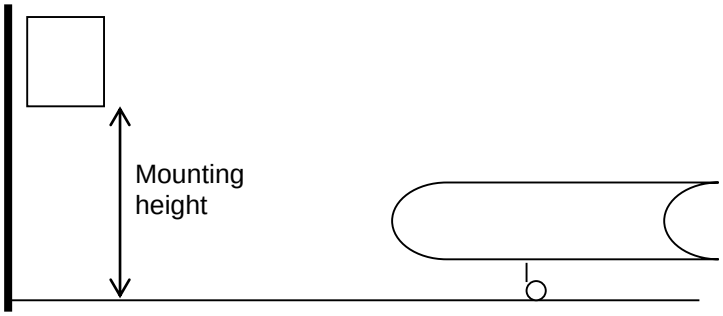


FIGURE 2.1 MOUNTING HEIGHT

Note: *A Safedock unit overlooking a PBB or walkway may have operational constraints, which requires an adjusted mounting height and/or re-positioning of aircraft stop-positions to create an obstacle free scanning area.*

2.2 STOP-POSITION

The longest recommended stop-position is 65.0 metres (T1) or 50 metres (T2/3). Within this distance the lateral accuracy is ± 0.2 metre. If the clip distance is 100 metres, 23 metres of tracking on the centreline are available for aircraft verification.

The shortest recommended stop-position is 2.0 metres (T1) or 8 metres (T2/3), but the angle to the aircraft nose shall never be more than 24 degrees, according to the picture below.

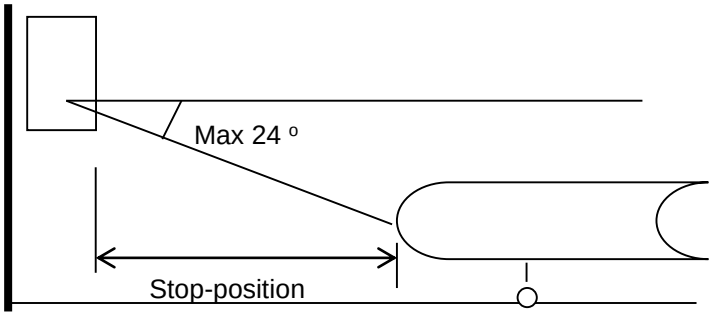


FIGURE 2.2 STOP-POSITION

Note: *A stop-position must be less than a 24 degree angle from the Laser Scanning unit to the aircraft nose. A high mounting height may limit the shortest allowed stop-position. The shortest recommended stop-position may be as close as twice the difference between the mounting height and the aircraft nose height, but never shorter than 2.0 metres (T1) or 8 metres (T2/3).*

For nose-distances that are set at the edge or outside the recommended range, it is important to always review each Safedock position individually for correct operation.

For the T1 model, having its Pilot display below the Laser Scanning unit must careful attention be paid in conjunction with short stop-position distances. Consideration of pilot viewing angle and vertical operational sector of the laser to see the nose at stop-position must be proven to be fulfilled. If not, can either the T1 model be ordered as a "split" assembly in 2 separate enclosures, Pilot display and Laser Scanning unit, or reconsideration of the gate layout and it's stop-positions be made.

2.3 CENTRELINES

The Safedock system can handle up to three centrelines, convergent or parallel. For an accurate guidance the centrelines must be placed within the laser's aircraft scanning range of the system. The limits for centreline position are defined according to the image below. The display reading sector is ± 55 degrees (for all models).

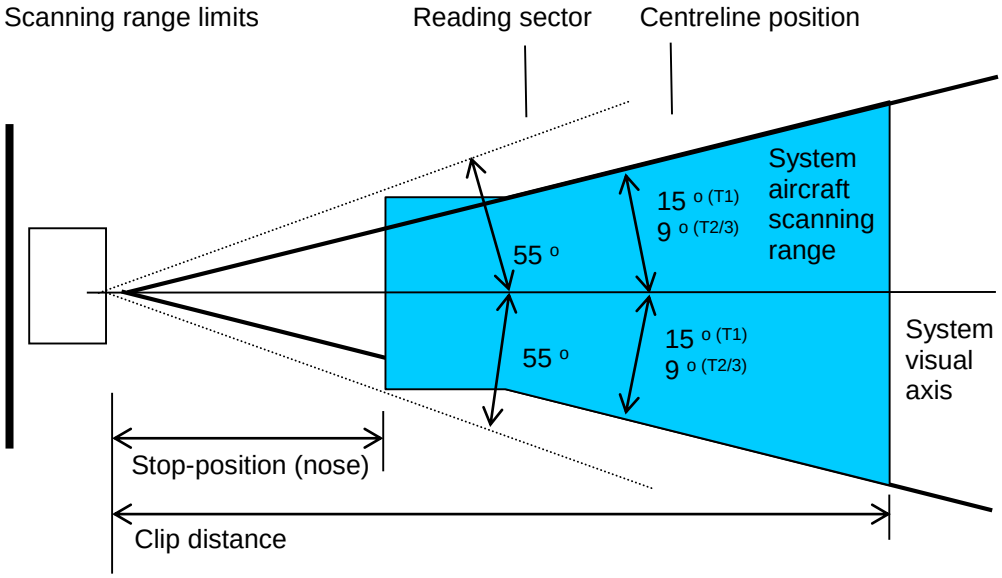


FIGURE 2.3 CENTRELINES

Note: *The nose of aircraft while at stop-position must be within the scanning range. It is recommended that the Pilot Display is in view for both pilot and co-pilot to allow docking from both positions.*

2.3.1 Aircraft Safety Check

For systems using the “Aircraft Safety Check” feature, the engine of the aircraft must be within a ± 30 degrees view area of the system. The aircraft must have been aligned to the centreline for at least 4 seconds, when more than 15 metres remain to the stop-position. Failure to obtain this condition will lead to an ID-FAIL situation.

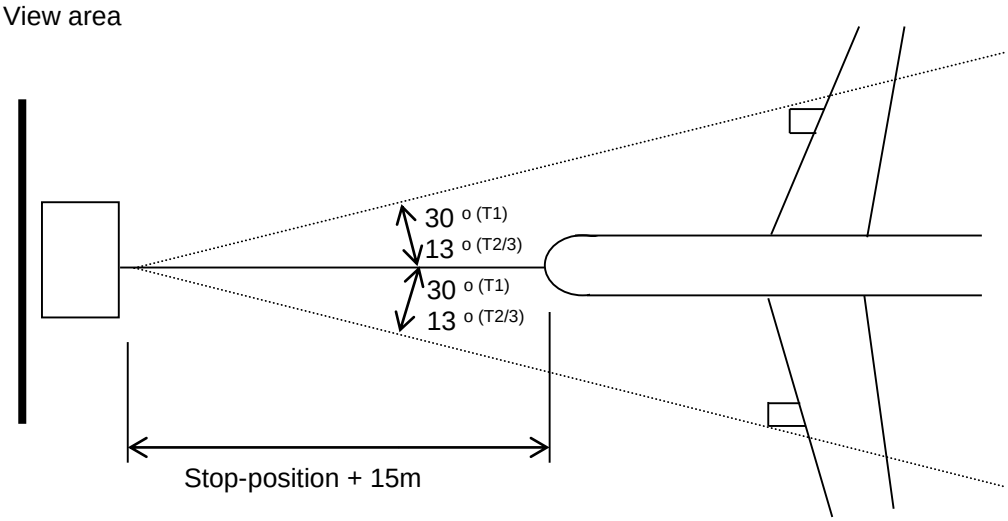


FIGURE 2.4 AIRCRAFT SAFETY CHECK

2.4 TRACKING

When the Safedock system successfully locates an approaching aircraft within the far clip distance, tracking with azimuth guidance starts. The system can give azimuth guidance to a fuel truck, but it will eventually end with an ID fail. Therefore, azimuth guidance begins when the system acquires a lock onto an object (possibly but not necessarily an aircraft).

Identification (or verification) is the next part of the process, independent from tracking, where the physics of the incoming aircraft is verified vs. the physics of the aircraft expected. It is recommended to consider where aircraft tracking is to be started based on the following:

1. Distances to the countdown area, to stop-position(s) and the Safedock unit.
2. A frontal view of the approaching aircraft from the Safedock unit which is unobstructed (laser scanning view).
3. The distance from the Safedock unit from which the incoming aircraft will appear while entering the stand area.
4. Presence of service roads and/or crossing taxiways.

For more information, see 4A Stand Configuration Utility, § 4.5 Centreline.

***Note**: The Safedock system is capable of tracking an approaching aircraft from a distance of 110 m. However in most cases, the distance depends on site configuration, such as the approach to gate.*

2.5 CURVED CENTRELINE

For a curved centreline, the angle between the optical axis of the system and the approaching aircraft may not exceed 20 degrees.

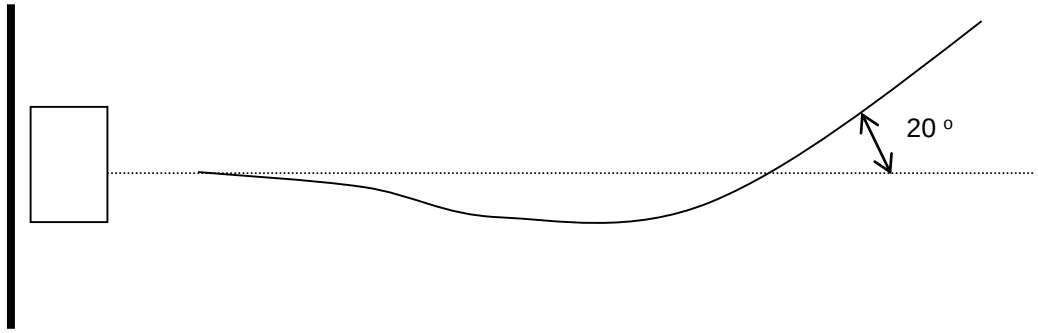


FIGURE 2.5 CURVED CENTRELINE

2.6 FREE SPACE ON THE APRON

Foreign obstacles might disturb the docking process. Therefore a specified area between the Safedock unit and the approaching aircraft must be cleared before the docking is started.

During the docking process, the system is tracking the aircraft nose and the vertical scan is ± 5 degrees. The level of this scanning sector depends on laser height, aircraft position and aircraft size. High vehicles on a service road must not enter this sector once the Safedock system has been started.

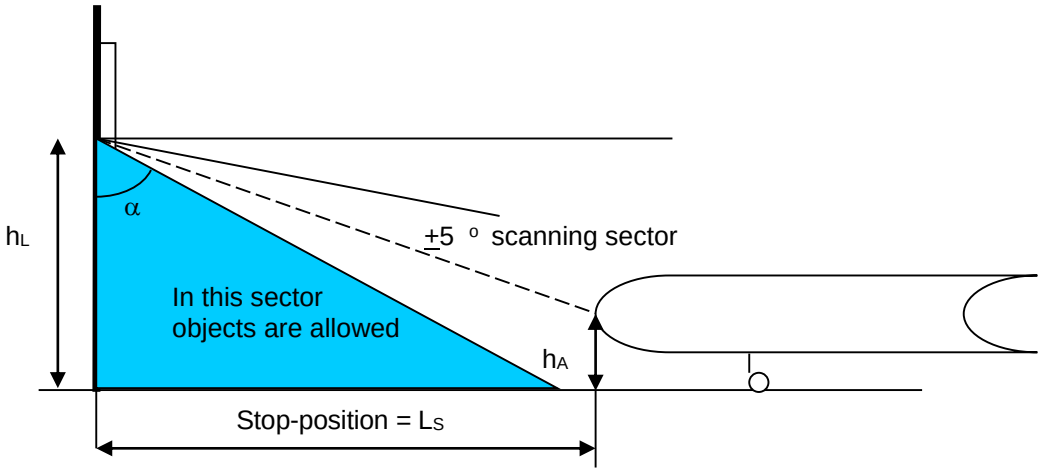


FIGURE 2.6 FREE SPACE ON APRON

From the illustration above, the angle α is calculated as it follows:

$\alpha = \text{arctg}\ L_S / (h_L - h_A) - 5$

This is the maximum angle for a sector where foreign objects are allowed.

2.7 VIEWING RANGE

The Safedock unit must have an unobstructed view of the aircraft nose throughout the docking procedure. For additional features (such as ID-verification) to work properly, the viewing range must be extended so that it covers the particular needs of the feature.

The system supports sideways clipping on both sides of the centreline. Using this feature, the system can be instructed to ignore objects beyond the side clipping limits, such as the Passenger Boarding Bridge (PBB). However, the side clipping should never be used to reduce the view of the system below what is specified in the sections below.

2.7.1 System without ID-Verification

A system without ID-verification will only need an unobstructed view to the nose of the aircraft in order to operate properly. Thus, the sideways clipping limits can be set as close to the centreline as defined by the width of the widest aircraft intended for docking at the stand. The minimum clipping angle to each side of the centreline can be defined by finding a line from the Safedock unit to a point half the aircraft width from the centreline at the stop-position (nose) for the aircraft.

Stand area, top view:

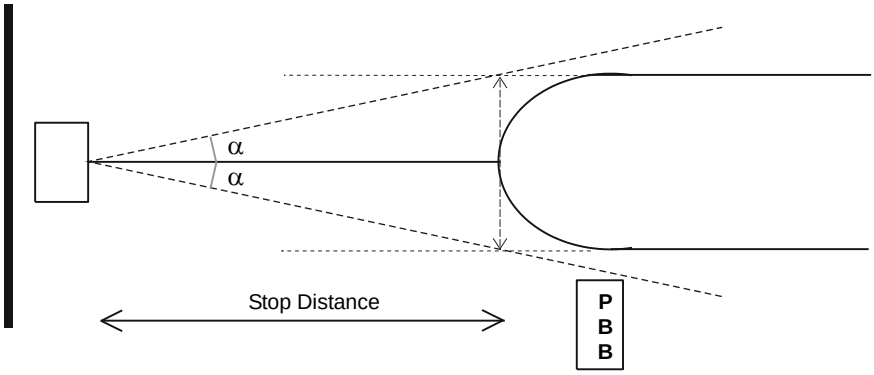


FIGURE 2.7 VIEWING RANGE WITHOUT ID

The minimum viewing range is defined by finding the aircraft that needs the widest view according to:

α = ArcTan((aircraftWidth/2) / aircraftNosePos)

Example: A B777-200 with stop-position (nose) 30m from the Safedock unit

aircraftWidth = 6.2m

aircraftNosePos = 30.0m

α = ArcTan(3.1 / 30.0) = 5.9°

The minimum viewing range without ID-verification is 5.9 degrees to either side of the centreline.

Note: *A system using a centreline that is not perpendicular to the mounting of the Safedock unit will require a wider viewing range as the entire nose of the aircraft must be fully visible throughout the docking procedure.*

2.7.2 System with ID-Verification

A Safedock system that uses the extended ID-verification feature needs a larger viewing range, as it must be able to find the location of the aircraft engine. The system will always prefer the away-from-bridge side engine in the verification procedure, unless this engine is found to be beyond the side clip limit. If the engine is found to be beyond the side clip, the system will attempt to find the engine on the other side.

Thus, one side (normally the bridge side) can use the same limit as for the above case. The view on the side selected for engine measurement, must be extended to allow the system a clear view of the engine.

Stand area, top view:

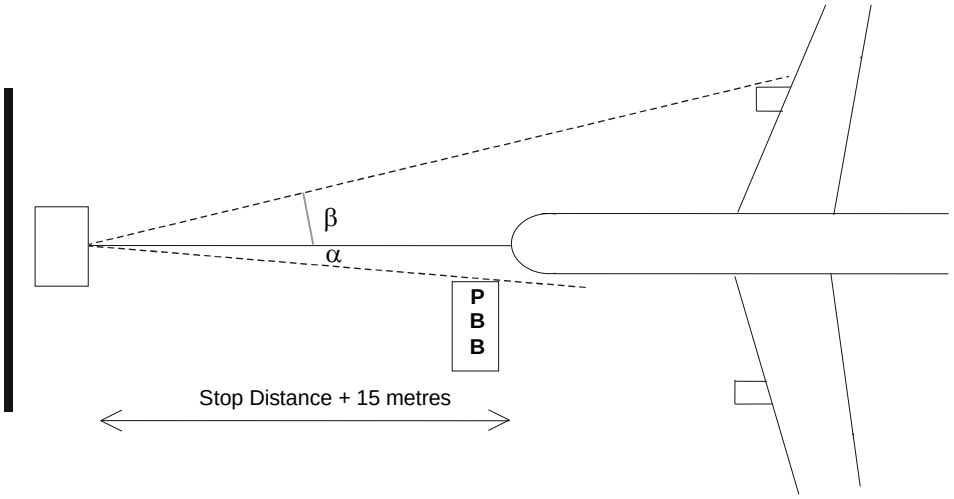


FIGURE 2.8 VIEWING RANGE WITH ID

The minimum viewing range that allows engine measurement is defined by finding the aircraft that needs the widest view according to:

$$\beta = \text{ArcTan}(\text{engineToCentre} / (\text{aircraftNosePos} + 15 + \text{engineToNose}))$$

Example: A B777-200 with stop-position (nose) 30m from the Safedock unit

aircraftNosePos = 30.0m

engineToCenter = 9.7m

engineToNose = 20.3m

β = ArcTan(9.7 / (30.0 + 15.0 + 20.3)) = 8,44°

The minimum viewing range with ID-verification is 8.4 degrees away from bridge and 5.9 degrees towards the bridge.

3. MECHANICAL INSTALLATION

This section provides installation engineers with instructions on how to install the Safedock system. Each installation is unique due to location, sighting and mounting of the equipment as well as local engineering practices.

Every installation should refer to a set of drawings for the proposed site. To install the system safely and efficiently, the drawings and the information in this manual are to be used. The installation must be carried out in accordance with NEC (if applicable) and other local electrical codes.

3.1 INSTALLATION PROCEDURE

3.1.1 General

The way in which the Safedock unit is installed varies from airport to airport. For example, it may be mounted on the wall of the terminal building, or on a mast, situated away from the terminal building.

When installed, the Safedock unit is usually mounted from 4 to 8 metres (12 to 24 feet, related to bottom edge of the unit) above ground. The actual mounting height depends on local conditions and the type of aircraft that will be docked to the terminal gate, taking for example into consideration if it is a wide-bodied or narrow-bodied aircraft. Where possible, the Safedock unit should be mounted such as it is centred over the aircraft stand centreline.

All Safedock units mounted to the terminal-wall at the same approximate height should use a sightline on the building, for example x-metres above ground, as the grading can vary from gate-to-gate. This is for aesthetic purposes only and at this stage, there is the flexibility to do so.

CAUTION: WHEN DETERMINING THE MOUNTING HEIGHT, THE POSSIBLE PRESENCE OF HIGH VEHICLES ON THE SERVICE ROAD IN FRONT OF THE DOCKING SYSTEM SHALL BE TAKEN INTO CONSIDERATION. SEE CHAPTER 2 INSTALLATION § 2.1 MOUNTING HEIGHT.

Clamp fasteners (5 ½” or 139.7 mm diameter) for attaching and mounting the Safedock unit to a support fixture, are included in the installation package. For T2/T3, there is also a tilt bracket included in the installation package allowing the cabinet (Pilot Display) to be directed slightly downwards avoiding most sun reflection from the display surface. For T1, there is no need for a tilt bracket as the angle is built-in with the display door.

A support fixture, for example a 5 ½” or 139.7 mm diameter pole, is not supplied as standard as local requirements may differ. Furthermore, fasteners and fixtures must often be furnished locally, since local building codes and engineering practices vary.

The figure below shows the Safedock unit rear view examples and the mounting hardware for a typical support fixture for mounting the unit.

Note: *For more information, for example Safedock types with other/more specific configuration options, see Chapter 5 DRAWINGS.*

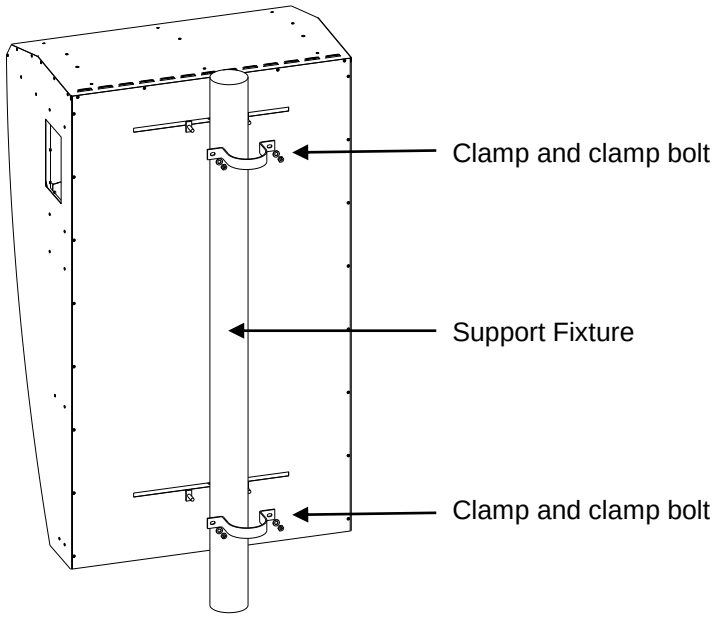


FIGURE 2.9 SAFEDOCK T1 INSTALLATION MATERIAL

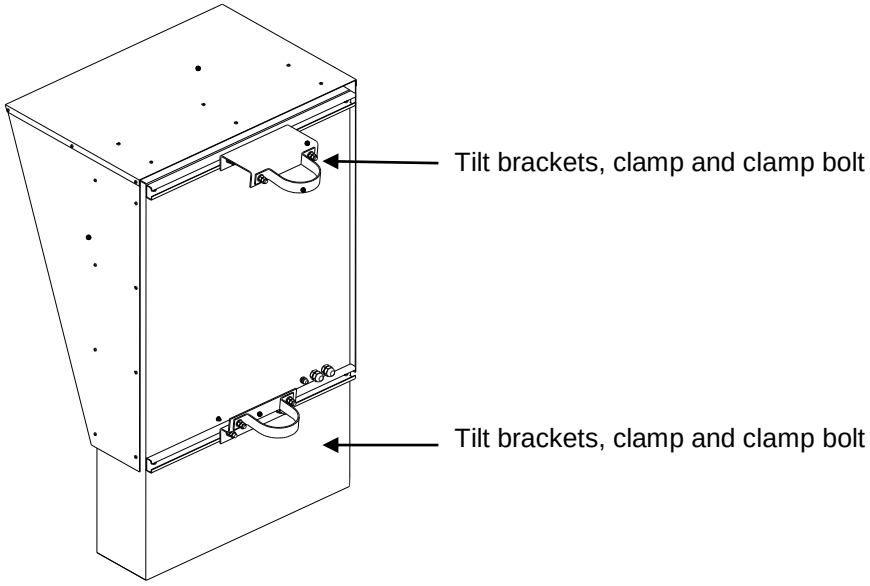


FIGURE 2.10 SAFEDOCK T2/3 INSTALLATION MATERIAL

3.1.2 Height Calculation

The installation height depends on the actual situation at each stand:

- The laser view toward aircraft must be unobstructed. Possible obstructions may include a PBB or vehicles on a service road.
- The aircraft at the stop-position must be visible in vertical range of the laser view. The aircraft types (mix) to be used and the range of stop-positions (to nose) affect the mounting height.
- Comfortable pilot view angles towards the Safedock unit throughout the docking must be considered.

If no acceptable mounting height at the desired position can be used, an alternative location for the Safedock may be necessary, for example a free standing pole.

Note: *It is important to always check with the Project Manager for the location, height and alignment requirements, for each Safedock installation.*

The following variables may be used as a guideline for height calculation:

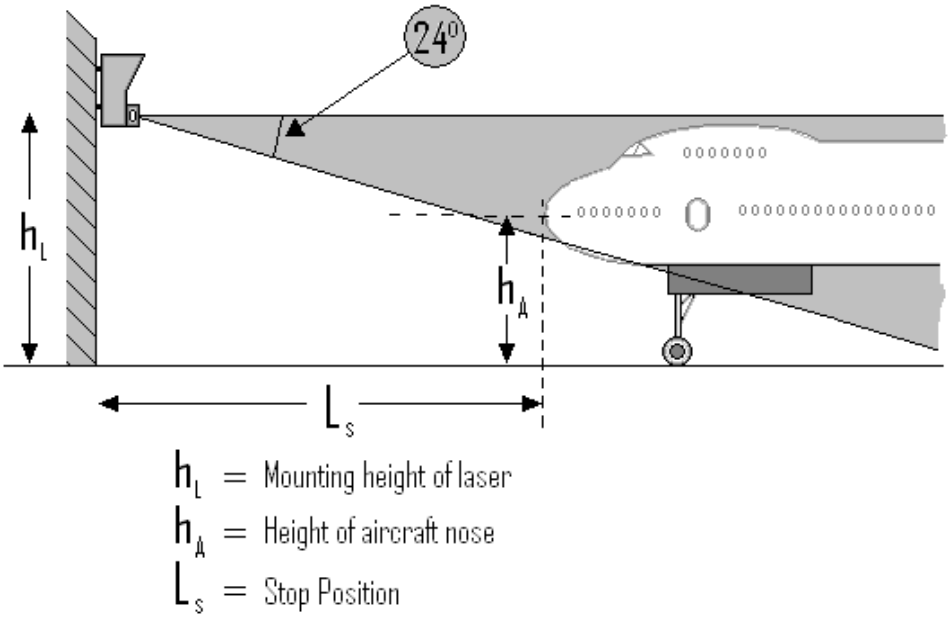


FIGURE 2.11 HEIGHT CALCULATION

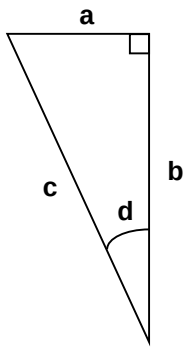
General recommendations:

- Mounting height of laser from 4 to 8 metres.
- Height of aircraft nose(s) are less than the height of laser.
- Stop-position(s) from 2 to 65 metres (T1) or 8 to 50 metres (T2/3).

3.1.3 Offset Calculation

The Safedock installation can also be installed according to an offset calculation, depending on the actual situation at each stand.

Note: *It is important to fulfil requirements for an offset installation calculation as described in the table below. The Safedock unit angle of alignment (perpendicular or other) must also be carefully considered in relation to the centreline, for example for system aircraft identification on approach to the stand.*

Offset Calculation	
The following calculation is for an offset installation: **a = b/6, not > 5 m** The following are variables used in the calculation: **a** - Maximum offset mounting distance **b** - Closest stop-position with **reference to aircraft nose** (distance from Safedock to aircraft nose at stop), **b** is also the extension of the centre line. **c** - Straight line between aircraft nose and Safedock, centre of Safedock view. **d** - 10 degrees is the maximum angle between centreline and Safedock unit centre of view.	 FIGURE 2.12 OFFSET CALCULATION

3.1.4 Mounting of Support Fixture

A support fixture is required for the Safedock unit to be attached to with clamps, for example a steel pipe Ø139.7 mm or 5 ½" in diameter. Clamps are supplied for these dimensions.

Make sure the support fixture is positioned according to recommendations, for example up to 3 parallel or convergent centrelines at:

- ± 15 degrees, minimum 2 metres to maximum 65 metres (T1) or
- ± 9 degrees, minimum 8 metres to maximum 50 metres (T2/3)

from the aircraft nose stop-position, at an angle of maximum 24 degrees from the unit to aircraft nose stop-position.

The support fixture shall be checked as described below:

a) Using a level, check that the support fixture is vertical.

b) Tighten all fasteners that hold the support fixture in place, for example to the wall or mast.

3.1.4.1 Maximum Allowable Deflection in Mounting

The table below is a guideline to deflection when mounting on a support fixture.

Deflection Guideline

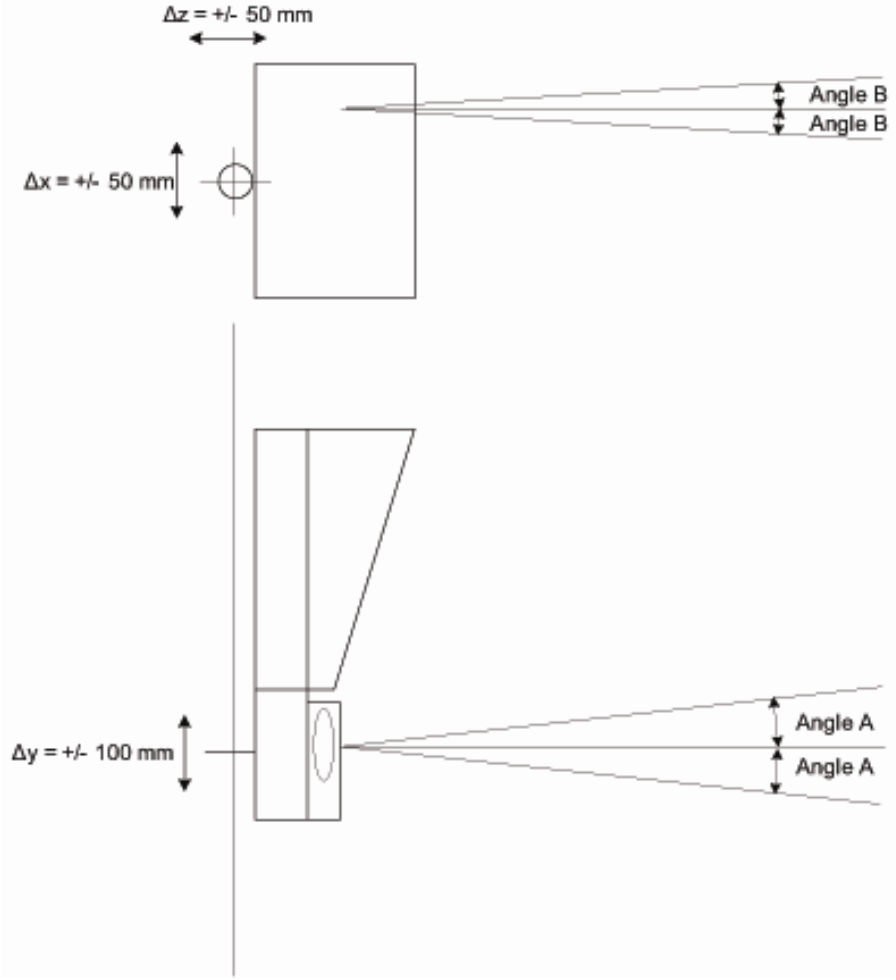


FIGURE 2.13 DEFLECTION GUIDELINE

Distance from display to stopping position (m)	Max. allowable angle		
	A (degrees)	For practical reasons B (degrees)	For safety reasons* B (degrees)
10	0,8	0,6	(2,8)
20	0,5	0,3	(1,4)
30	0,4	0,2	(0,9)
40	0,3	0,1	(0,7)
50	0,3	0,1	(0,6)
60	0,2	0,1	(0,5)

***Note**: * Results in an azimuth measurement error of 0.5 m. Only allowed during extreme conditions, such as during maximum wind gusts.*

3.1.5 Installation of the Safedock Unit

(a) Check with the Project Manager for the exact height and alignment for every installation, as the stand requirements may differ. For example, verify alignment if mounted off-centre or if more than one centreline are to be used.

(b) Attach appropriate lifting straps to the unit at suitable positions.

- For T1, use a lifting strap and lift the unit via the build in eyebolt at the top. Lift carefully and do not jerk the unit while lifting.

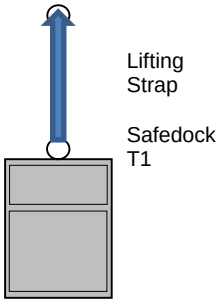


FIGURE 2.14 T1 LIFT EXAMPLE

- For T2/3, use a lifting strap with load support from underneath:
  - Place a lifting strap around the sides/bottom of the unit.
  - Attach the sunshade sides as temporary lifting strap holding plates to the unit (side brackets/upper) to secure the lifting strap in place.

***Note**: Do not install the entire T2/3 sunshade until after the unit is fastened to the support fixture, to avoid lift damage!*

FIGURE 2.15 T2/3 LIFT EXAMPLE

(c) Lift the unit into position using a crane.

(d) Position 2 clamp bolts in each rail, so that they are on opposite sides of the centre bolt hole in rail.

(e) Fasten the unit to the support fixture with the **clamps**. The clamps (supplied) are for a steel pipe Ø139.7 mm or 5 ½" in diameter.

***Note:** Tilt brackets (supplied for T2/3) are required if the pilot display is in direct sunlight at sunrise/sunset.*

(f) Using a level, check that the sides of the unit are vertical.

(g) **Conduit** cable entry points (power and control wiring).

(h) For T2/3: Assemble the **sunshade** and attach it to the unit using the M5 x 20 stainless steel screws and lock washers.

***Note:** Install the T2/3 sunshade after the unit is fastened to the support fixture, to avoid damage when lifting!*

(i) For T1: Make sure all screws for the factory mounted sun shades are firm and tight.

3.1.6 Installation of the Operator Panel

The Operator Panel is enclosed in a standard aluminium box and can be installed as it follows:

- Mount it on flat surfaces or posts using standard mounting equipment and fasteners.
- It can also be mounted on a pulpit, as the display provides a 6 o'clock view.

Note: *Mount at normal shoulder height for best display readability.*

The figure below shows the positions of the mounting holes, located on the rear of the Operator Panel. Conduit cable entry points ("Dead man grip" or "Emergency Stop" button) are located on the bottom of the Operator Panel.

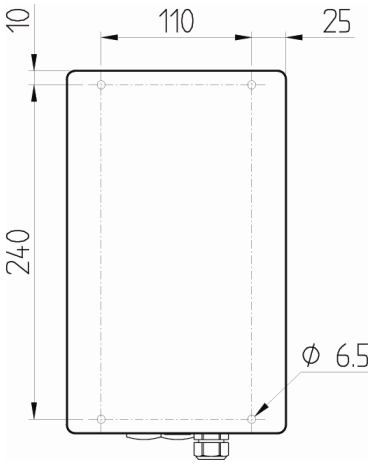


FIGURE 2.16 OPERATOR PANEL MOUNTING HOLES

Note: *Measurements are in mm.*

3.1.7 Calibration Check (Auto Calibration)

A Safedock system must be configured with two reference points. The system checks the calibration automatically for each docking or at regular intervals, according to the references and system settings. If fixed equipment at the aircraft stand cannot be used to obtain reference points (for example a fixed PBB section), a calibration plate can be installed to obtain reference points.

3.1.7.1 Reference Points

Reference points to fixed equipment may be used for a calibration check. For more information, see Chapter 4A Stand Configuration Utility § 4.4.

3.1.7.2 Reference Points Using a Calibration Plate

A calibration plate can be installed to obtain reference points. It can be mounted within the forward or the side scanning areas.

The table below lists the scanning angles of the Safedock unit for the forward and the side scanning areas.

Scanning Area	Vertical Scanning Angle	Horizontal Scanning Angle
Forward area	+15°; -24° + means upward	+30°; -30° (T1) or +13°; -13° (T2/T3)
Side area	+ 5°; - 5 °	+2°; +8° (forward)

The calibration plate must also be mounted at least 3 metres from the Safedock unit, and there should not be any objects behind it for at least two metres.

The calibration plate must be sized as per below table for good performance. The minimum distance for the calibration plate is 3m from the Safedock unit. The maximum distance for the calibration plate is 30m.

Recommended minimum dimensions of a calibration plate:

Distance	Size
3-10m	0.3m
10-20m	0.4m
20-25m	0.5m
25-30m	0.6m

The calibration plate must be located within the Safedock unit's field of vision.

The field of vision is:

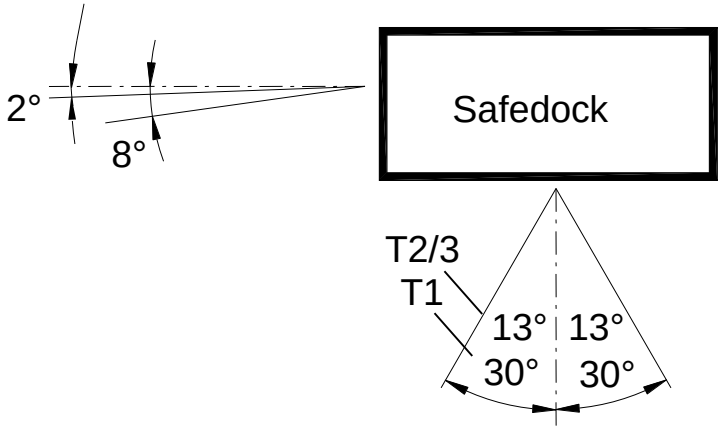


FIGURE 2.17 CALIBRATION CHECK

4. ELECTRICAL INSTALLATION

4.1 GENERAL

Cables for powering and operating the Safedock system must be run between the various sub-units of the system.

It is also recommended to use UPS to avoid any power-down while a docking procedure commences, which is a critical time.

A power budget, for UPS sizing requirements, should include typical idle current/KVA requirement and the maximum during docking.

The figure below gives an overview on how the different sub-units are to be connected.

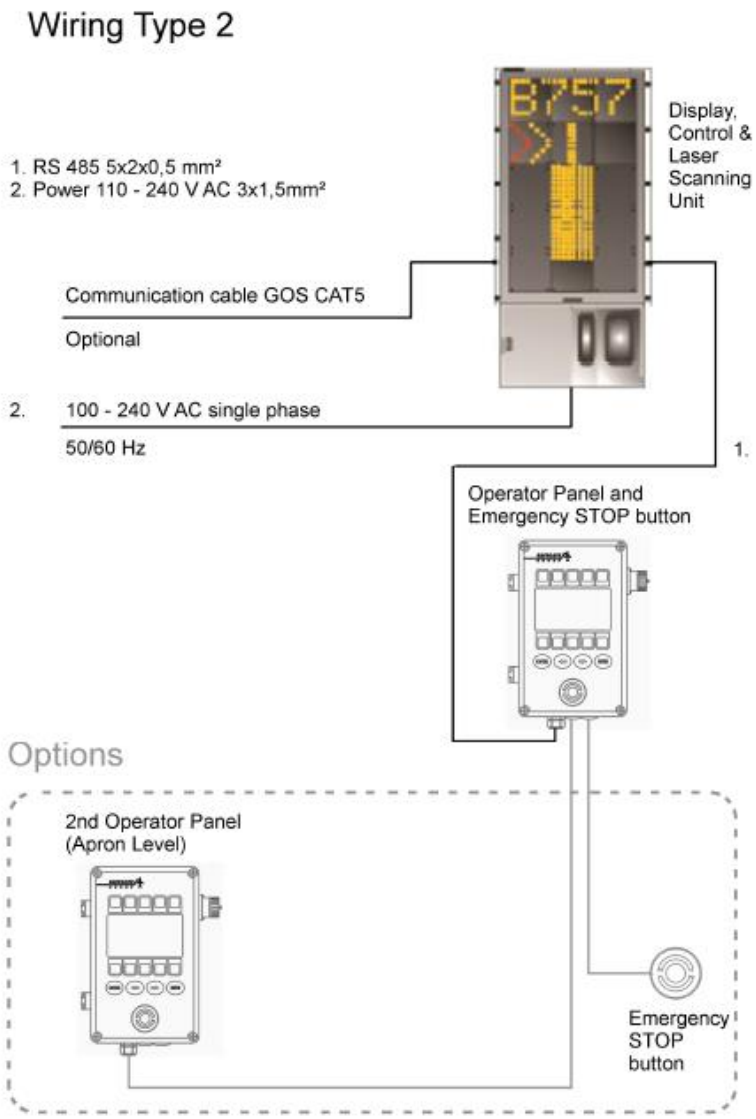


FIGURE 2.18 SAFEDOCK SYSTEM INTERCONNECTION CABLES

Note: *GOS/SAM is an optional system that may not exist at your airport.*

4.2 EARTHING THE SAFEDOCK HOUSING

It is supposed that the support fixture, used for mounting the Safedock unit, is connected to construction ground/earth for the current drain from lighting induced voltage surges. Alternatively, a copper cable of minimum 25 mm^2 connected to earth, must be available.

The Safedock unit shall be connected to earth (the earth connection point is delivered by a third party), using an “earth bonding strap” with a conductor area of 25 mm^2, which shall be connected to the ground point on the rear of the Safedock housing.

4.3 SAFEDOCK CONNECTION TO MAINS

The mains supply should be routed from its conduit entry point via the routing channel to the pole circuit breaker (mains disconnect device). Route it away from other conductors and components. A cable, 3 x 1.5 mm^2, shall be used (or dimensions acc to local standard). It shall be connected to the Safedock unit or see Chapter 5 DRAWINGS. The protect earth (PE) wire shall be connected to chassis directly, as it enters the cabinet, to the yellow/green terminal. The cable inside the cabinet shall be as short as possible.

The PE/cable gland hole is located at the rear/lower area, in the Safedock unit, as in the figure.

Note*: If the PE hole is not used, it is important to seal it using the rubber plug/bolt supplied in the Operator Panel package.*

FIGURE 2.19 PE EXAMPLE

4.3.1 Main Switch Specification

A main switch shall be installed near the Safedock unit and shall be easily accessed by service personnel. The switch should have following specifications:

- Minimum Voltage Rating: 240 VAC
- Minimum Amperage Rating: 10 A
- Disconnects all phases and neutral simultaneously
- Marked/labelled as the main switch for the Safedock system

4.4 CONNECTION OF COMMUNICATION LINES

4.4.1 General

The following signals, associated with the Operator Panel, are to be connected to the Safedock main unit:

- 24 VDC power.
- Operator Panel communication lines.
- Emergency Stop line.
- Dead-man-switch line (option).
- Maintenance COM line.

Note: *It is recommended that the support fixture, used for mounting the Operator Panel, to be connected to construction ground/earth for the current drain from lightning induced voltage surges. Alternatively a copper cable, minimum 25 mm^2, connected to earth, should be available. The screws used for fastening the Operator Panel to the support fixture shall give the electrical connection to earth.*

4.4.2 Communication Cable

A CAT 5 network patch cable shall be used for connection to Superior System. The cable length to nearby located network switch shall not exceed the current network standard.

4.4.3 Cable Requirements, Solutions and Glands

For the connection of the Operator Panel, a shielded twisted-pair (STP) cable, 6 x 2 x 0.5 mm^2 or 20 AWG, shall be used, thus with 2 spare pairs. The cable area is needed especially for the power supply. The cable should have a braided shield to obtain optimal noise immunity.

Note: *Check with the Project Manager for any field-wiring diagrams that may override these instructions and/or include any additional work.*

4.4.3.1 Cable Solutions

Cabling may depend on local supply or alternative requirements. It is recommended to discuss alternative cable category requirements with Safegate, as communication problems may arise in the field. Communication is dependent on the quality/category of the cable used. A general guideline is to use a cable with a length as short as possible (less than 100m) and with at least 2 spare wires, for example if any I/O points are connected into the Operator Panel, as in Safedock/PBB interlocks.

4.4.3.2 Cable Glands

The Operator Panel unit includes three Ø20.5 mm holes, one with a cable gland for connection to the Safedock unit and two plugged holes for other connection options, if required.

The Safedock unit includes two Ø20.5 mm holes with cable glands, one for connection to the Operator Panel and one for power. There is also one Ø12.5 mm hole with a cable gland, for communication to Superior System or other external systems.

In summary, the connection between the Operator Panel and the Safedock unit is designed with pre-drilled Ø20.5 mm holes with cable glands in each respective unit, for a cable between 8 mm and 13 mm in diameter.

4.4.4 Cable Connection to Operator Panel, Emergency and Chocks Button

The cable shall be connected to terminals in the Operator Panel.

Note: *It is important to connect all shields to the Operator Panel housing. The shield wire must be as short as possible. Alternatively EMC type cable glands shall be used for connecting cable shields directly to the chassis.*

The line/pair for the external “Chocks On” button, if used, shall be installed according to sites specific drawings. Even an additional “Emergency Stop” button may be included, and this shall be installed in series with the emergency stop button circuitry of the Operator Panel.

Cables to the external “Emergency Stop” or “Chocks On” buttons shall also be shielded. The shield shall be connected to the Operator Panel housing.

4.4.5 Cable Connection to Safedock Unit

The cable from the Operator Panel shall be connected to terminals in the Safedock unit according to the drawings.

Note: *It is important to connect the shields directly to the chassis, where it enters the Safedock housing - or to a ground terminal. Alternatively EMC type cable glands shall be used for connecting cable shields directly to the chassis.*

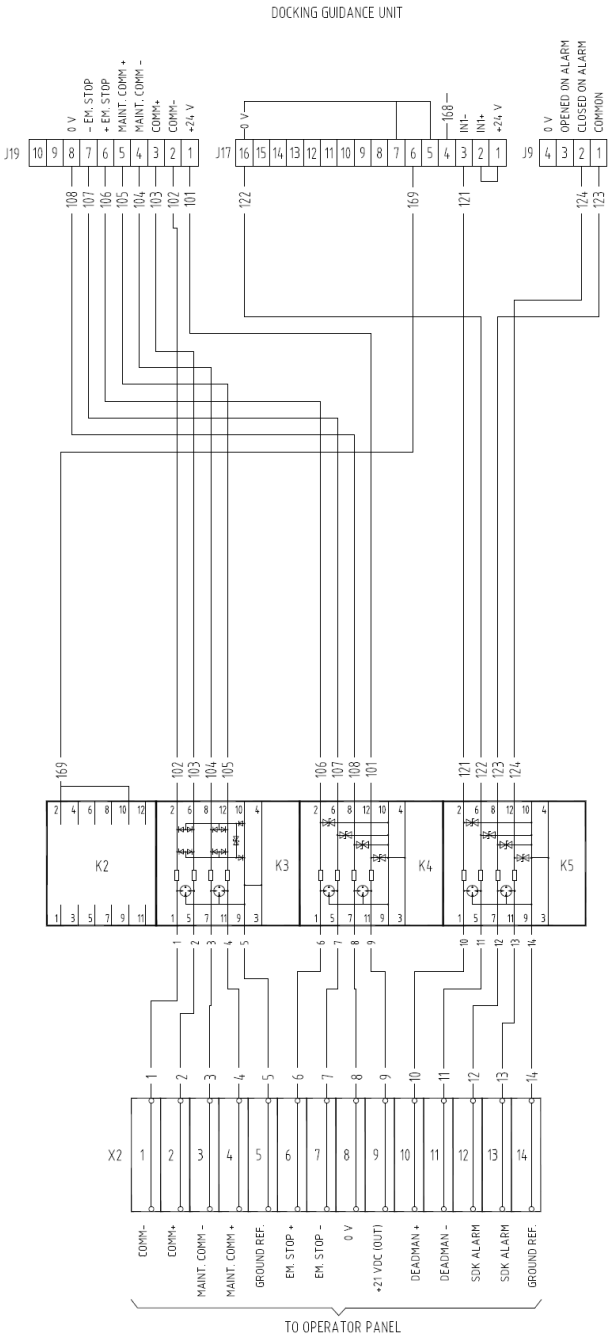


FIGURE 2.20 CONNECTION OPTIONS - SAFEDOCK SIDE

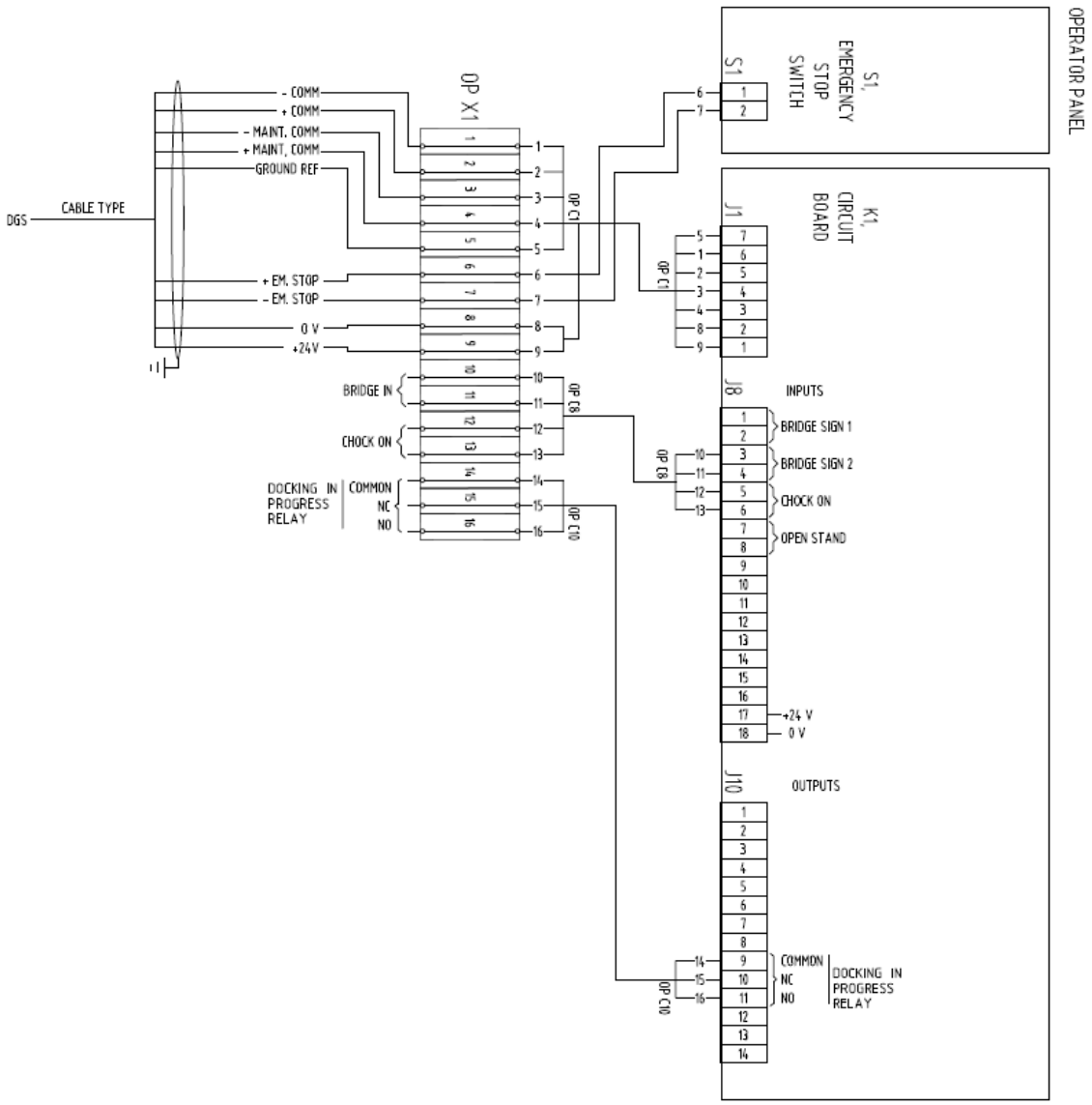


FIGURE 2.21 CONNECTION OPTIONS - OPERATOR PANEL SIDE

4.5 OTHER CONNECTIONS (OPTIONS)

4.5.1 PBB Interlock

The Operator Panel can be connected to a Passenger Boarding Bridge (PBB) for interlock functionality. For example if the PBB is in a safe position/parked away from aircraft approach to gate area then a docking procedure can be started using the Operator Panel. Otherwise, if the PBB is not in a safe position there is a damage risk obstruction and a docking cannot be started.

And the other way around, when the docking procedure is started can the PBB be prevented from moving until the docking procedure has ended (aircraft parked).

***Note*:** *It is assumed that the PBB in question is capable to signal PBB location safe as well as to make use of the signal from Safedock that docking is in progress.*

It is recommended to use shielded twisted pair cabling (2x2x0.5 mm^2) for the connection, 2 dry contacts (potential free contacts) with the shield connected to the Operator Panel housing.

5. SYSTEM CONFIGURATION

5.1 GENERAL

After the installation of the Safedock unit, Operator Panel(s) and calibration plate, the system must be set-up to meet the demands or characteristics of the particular stand.

The set-up procedure at each stand is carried out using the Safedock Maintenance Tool. The Safedock Maintenance Tool can also be used to document each stand set-up. A copy per installed stand shall be stored for the customer's approval during commissioning. The file shall also be maintained throughout the system life cycle.

For configuration and commissioning guidelines and in-depth description of these software utilities, see Chapter 4 MAINTENANCE and 4A Stand Configuration Utility.

5.2 CONFIGURATION PHASES

The Safedock system is set up by the following procedures:

- If applicable, define network details (IP settings). See Chapter 4 Maintenance
- Setting and definition of functionality
- Defining the gate area
- Setting calibration check points
- Configuration (setting aircraft types and their stop-positions and so on)
- Defining the centreline(s)
- Removing Echoes from Fixed Object
- Storing Stand Configuration Files

5.3 PREPARATION

This information is for airport Operations and Maintenance personnel to use as a reference for configuration and/or commissioning of a Safedock system, via an Operator Panel and a maintenance computer, at a stand with a single centreline. Text and image references may not depict the actual system being configured and commissioned.
***Note:** If any error occurs during system configuration and commissioning you can find supporting information in Chapter 4 MAINTENANCE § 5. Troubleshooting.*

5.3.1 Prepare the Stand for Aircraft Stop-positions

Aircraft stop-positions are specific to each stand due to a number of different variables, for example aircraft type, PBB type and centreline length.

It is recommended for airport personnel to prepare each stand for Safedock configuration and commissioning works with stop distance/ aircraft type information from design drawings or actual aircraft dockings at the stand:

- Enter stand/gate, stop distance, aircraft type information in the table below, for future reference.
- Make sure ground markings are painted along the centreline for the aircraft type stop-positions to be used at the specific stand.
- This information is to be made available for Safegate and/or other airport personnel before commissioning or changing configuration settings in a Safedock system.

Aircraft Stop-Positions

Stand/Gate Name/Number:

Stop Distance - *nose wheel (unless noted)*	**Aircraft Type(s)**	**Stop Distance** - *nose wheel (unless noted)*	**Aircraft Type(s)**

Note: *If notes are made on this page, please forward a copy to site management for safe keeping.*

5.3.2 Prepare the Maintenance Computer

The following are required for a local connection to a Safedock system via an Operator Panel (supplied by Safegate, if requested):

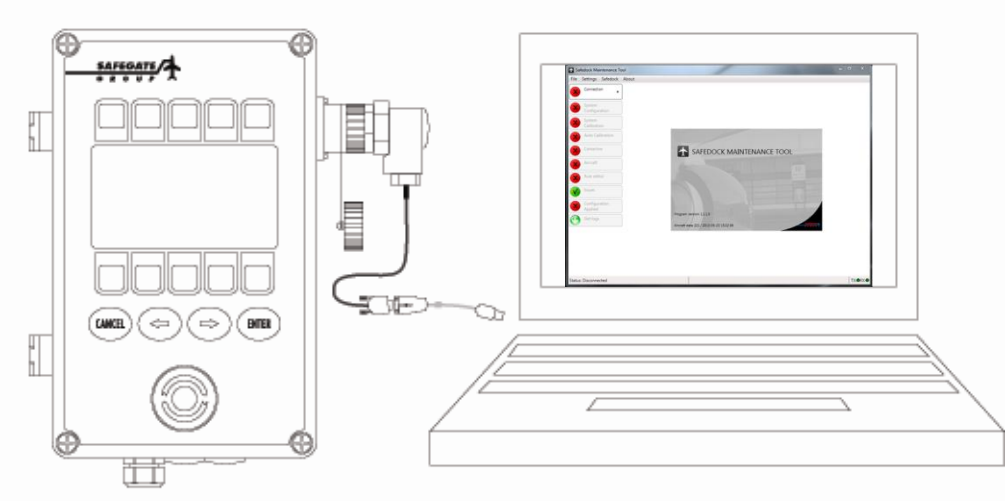
- **Maintenance Computer** – a portable computer
- **Configuration Software** – Safedock Maintenance Tool (SMT)
- **Communication Cable** – a cable with an Operator Panel service outlet connector
- **Interface Converter** – USB to RS-232-485 adaptor, if required

Make sure that the Safedock configuration software (SMT) is installed on the computer, supplied on the software CD.
***Note**: If a Maintenance Computer is supplied by Safegate, the software is pre-installed.*

Make sure the laptop battery is fully charged before use in the field (airside).

5.3.3 Connect the Maintenance Computer to Operator Panel

a) Connect the communication cable to the Operator Panel service outlet.
b) Connect the cable to the computer, via the interface converter USB adaptor, if required.



5.4 COMMUNICATION

5.4.1 Configuration of Ethernet Converter Build In on Control Card

If communication to Superior System is required, each Safedock must be given an IP address and the corresponding network parameters.

This is manually edited directly in the Operator Panel under the Test menu. See Chapter 2A Operator Panel Softkey Setup.

5.4.2 Configuration of Camera (Option/Axis M1144L)

Each camera must be configured uniquely to its Safedock (IP Address, Subnet mask etc.). Two programs are required to configure the camera: **Axis IP_Installer** and a web browser (it is recommended to use **Internet Explorer**).

A LAN connection must also be available between the computer and the camera; it is recommended to use an Ethernet Cross-over cable is used between computer and the camera.

The software to configure the M1144L camera does not need to be installed. It can be run from the directory: *Software/Common/Axis/IpUtility.exe*.

Camera set up and tools to configure:
http://www.axis.com/files/manuals/um_m1144_l_45408_en_1206.pdf

CHAPTER 2 INSTALLATION - APPENDIX A
OPERATOR PANEL SOFTKEY SETUP (OPTION)
CONTENTS

***Note**: This page is blank for convenient double-sided printing.*

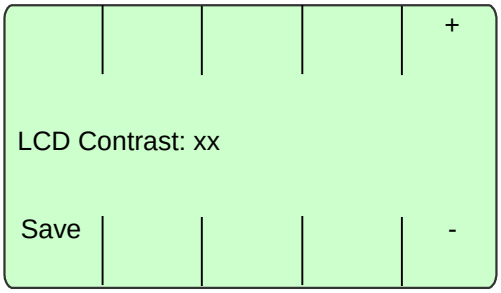
1. SCOPE

This document explains different setup procedures for a Softkey Operator Panel.

Configuration of the Operator Panel requires the power to the unit to be cut. An exception is for contrast adjustment, which can be adjusted while Safedock software is running.

2. CONTRAST ADJUSTMENT

The display contrast can be adjusted when the system is in “Emergency Stop” mode. Press the right arrow button to access the contrast adjustment menu and the display shows the following:



Use **+/-** keys to adjust the contrast; when the contrast is adjusted, the current value is be shown, replacing the **Emergency Stop** message. When the contrast is as desired, press the **Save** key to store the value to non-volatile storage.

If there are multiple Operator Panels connected to the same Safedock system, they all display the same text. However, each unit is managed separately; for example a contrast change only affects the unit on which keys are being pressed and settings are saved.

***Note**: It is not recommended to adjust the contrast for multiple Operator Panel units at the same time, as the text on all units is the result of the last key press, no matter which Operator Panel unit key is pressed. In other words, the Operator Panel unit which sends the last key press is in control of the contrast change menu for all Operator Panels. If the Safedock system receives commands from alternating Operator Panel units, it only requests and displays the current contrast value without making any changes.*

For more information, see § 4 Extra Operator Panel (option) in this chapter.

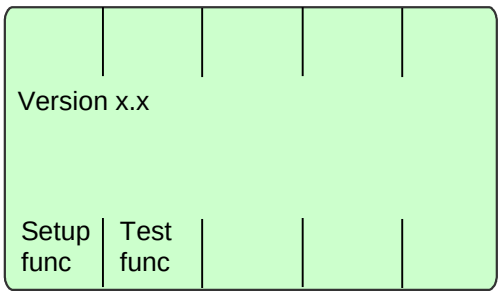
3. NAVIGATING MENUS

3.1 ENTERING SETUP MODE

To enter the setup menus:

(a) Open the Operator Panel box and disconnect the J1 connector, to power off the unit. If J2 is connected, it must also be disconnected until the setup is completed.

(b) Press and hold the **CANCEL** button and reconnect J1.
The display shows the setup main menu with version info and two keys: **Setup func** and **Test func**.



(c) Release the **CANCEL** button.

***Note**: When the setup is completed, J2 may be reconnected.*

3.2 EXITING SETUP MODE

When all the settings are completed, the Operator Panel is put back into operation by pressing the **ENTER** key from the setup main menu.

3.3 ACCESSING SETUP FUNCTIONS AND NAVIGATING THE MENUS

(a) While in the setup main menu, press the **Setup func** key to access the setup functions.

(b) Press a designated key to access the desired setup function.

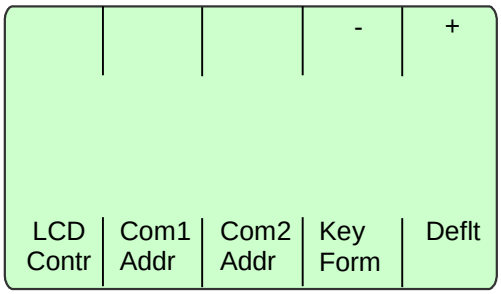
(c) Press the **CANCEL** button to leave a setup function and return to the setup function menu.

3.4 RETURNING TO SETUP MAIN MENU AND SAVING SETTINGS

Press the **CANCEL** button to return to the setup main menu. If the current menu is the setup functions menu, the unit prompts to save the settings or not. Press **YES** to save or **NO** to discard any changes made.

3.5 SETUP FUNCTION PARAMETERS

Following parameters are available to be set up in the Operator Panel unit:



Press a designated key to select a parameter and then use the **+** and **–** keys to modify each parameter.

3.5.1 LCD Contrast

The default value is 25. Adjust the contrast as required so that the background is not too dark and the display texts are easy to read.

3.5.2 Com1 Address

A communication Com1 address is used for Operator Panel to Safedock communication. Valid addresses use variables: 1-4 (the default value is set to 1).

Note: *Each Operator Panel must have its own unique address. Using the same address in two or more units (extra Operator Panels) connected to a Safedock system gives unpredictable results. This parameter only affects Operator Panel units with software version 1.2 or later.*
For more information, see section 4 Extra Operator Panel (option) in this Chapter.

3.5.3 Com2 Address (not in use)

Note*: The Com2 address is not currently in use or supported by software.*

3.5.4 Key Form

There are three key forms available in the Operator Panel unit software. Key form two must be used as it shows information texts for selection using adjacent softkeys, as intended in the software design.

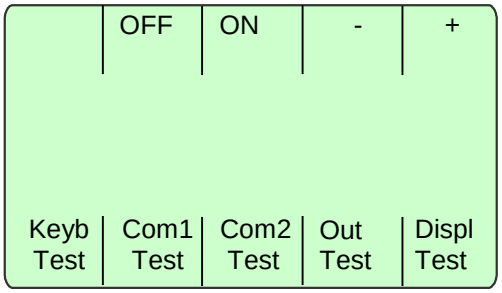
Note*: Do not use key form zero or one as they wrongly give an impression of a touch display. If key form is changed, the selected key form is not shown until the Setup functions menu is shown.*

3.5.5 Default

The **Deflt** key sets all parameters to their default values as follows:
LCD contrast = 25. Com1 address = 1, Com2 address = 1 and Key form = 2.

3.6 TEST FUNCTIONS

There are several test functions available to diagnose an Operator Panel unit as follows:



3.6.1 Keyboard Test

If **Keyb Test** is selected, press each key to verify a unique number appears in the display.

Note*: The* ***CANCEL*** *key does not display a number, it returns to the test functions menu.*

3.6.2 Com1 Test

If **Com1 Test** is selected, the display shows data sent and received on Com 1 (J1). The sent (out) and received (in) character must always be the same.

***Note**: Com1 Test can only be performed when the Safedock software is not running as Safedock data interferes with the test. A connection to the Loader using SMT is required before starting this test.*

3.6.3 Com2 Test (not in use)

***Note**: Com2 test is not currently in use or supported by software.*

3.6.4 Output Test

Connect a cable specifically designed for testing the outputs to connector J9 to test outputs 1-6. Connect the cable to J10 for test of outputs 7-11. Use the **+/-** keys to select the output and then the **On**/**Off** keys to toggle the current output.

To test output 12 (Maintenance relay), using an ohm-meter connected to J1 pin 3 and J3 pin 1. Toggle the output and verify that the ohm-meter indicates this.

The status of output 13 (heater) is indicated by LED D17 on the circuit board. Toggle the output and verify that the LED is lit only when the output is active.

3.6.5 Input Test

The input test is automatically enabled. Whenever a change is detected on the inputs the display shows the current status of all inputs.

To test the inputs, connect to the outputs with a specific cable design. To test inputs 0 to 7, connect the cable between J9 and J8. This makes outputs 1-5 control inputs 0-4 and output 6 controls all three inputs 5, 6 and 7.

Connect the cable between J9 and J7 to test inputs 8 – 15. This makes outputs 1-5 control inputs 8-12 and output 6 controls input 13, 14 and 15.

3.6.6 Display Test

If selected, a pattern appears in the display.

3.6.7 Temperature Sensor

When entering the test functions menu the temperature measurement from a sensor appears on the display, for example **Temp: 26**. To test this sensor, chill IC11 and check the temperature value in the display falls.

4. EXTRA OPERATOR PANEL (OPTION)

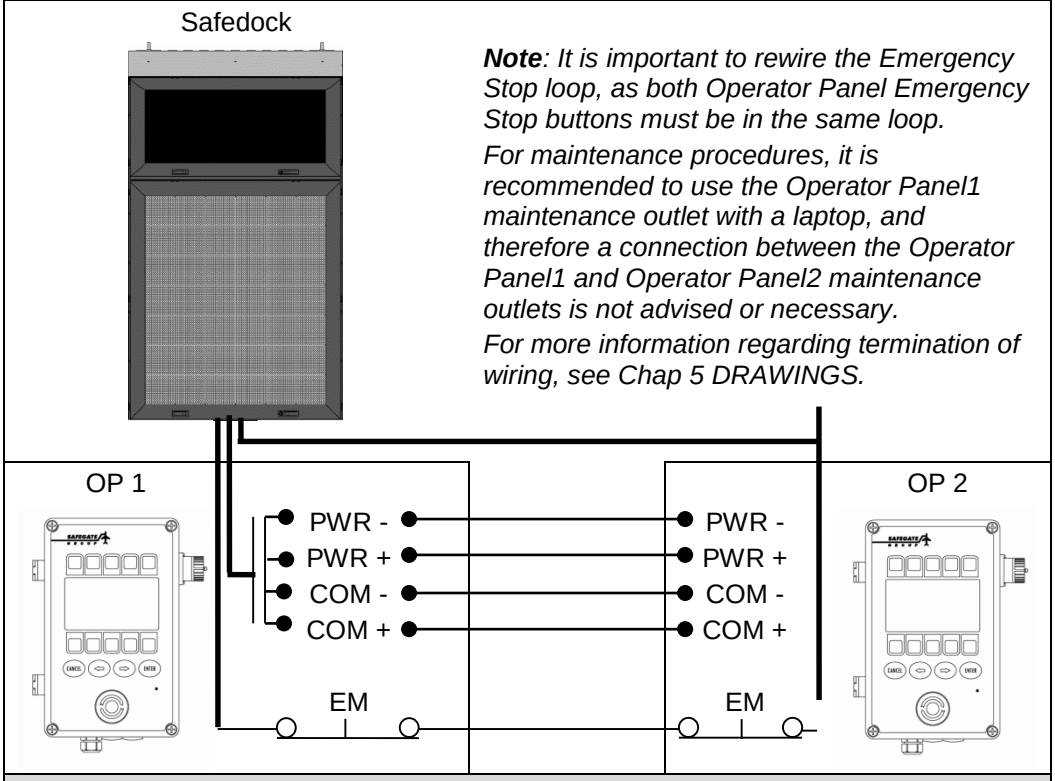
The Operator Panel can be connected to an extra Operator Panel, to control Safedock from another place.

The extra Operator Panel must also be set with a unique Com1 address. For example, if Operator Panel1 Com1 address is 1 (default) then Operator Panel2 Com1 address is to be set to 2.

***Note**: The system only accepts input via the first Operator Panel (Com1 address 1). Outputs on all connected Operator Panels are always in the same state.*

Connect and set and extra Operator Panel as follows:

Connect an Operator Panel (Operator Panel1) to an extra Operator Panel (Operator Panel2)



***Note**: It is important to rewire the Emergency Stop loop, as both Operator Panel Emergency Stop buttons must be in the same loop.*

For maintenance procedures, it is recommended to use the Operator Panel1 maintenance outlet with a laptop, and therefore a connection between the Operator Panel1 and Operator Panel2 maintenance outlets is not advised or necessary.

For more information regarding termination of wiring, see Chap 5 DRAWINGS.

Set the Operator Panel2 COM1 address in menu software

From Operator Panel2, change the comm. address (default set as 1) to **2** as follows:

(a) Disconnect the power.
(b) Press and hold down the **CANCEL** key whilst re-connecting power, to access the set-up menu.
(c) Press **Set up Func**.
(d) Press **Com1 addr**.
(e) Press the **+** key (upper right) to change current address (from default, 1) to **2**.
(f) Press **CANCEL**.
(g) Press **CANCEL** again.
(h) Confirm to change the setting.
(i) Press **ENTER** to return the Operator Panel to operation.

5. OPERATION AND MAINTENANCE MODES

The Safedock system can be equipped with several operation/ maintenance mode options, if required. Modes are set via key switches built into the Operator Panel.

5.1 OPERATION MODES

The Safedock system operation modes include:

- **REMOTE** – Aircraft related commands are only allowed from Superior System. The test menu on a local Operator Panel is blocked. The Operator Panel does not allow any aircraft related commands, such as Park On and Start Docking.
- **OFF** – Both Operator Panel and Superior System commands are blocked.
- **LOCAL** – Aircraft related commands are only allowed from the local Operator Panel. All incoming commands from Superior System are ignored.

***Note**: The operation mode status appears in the Operator Panel and is reported to Superior System.*

5.2 MAINTENANCE MODE

The Safedock system includes a normal or a special maintenance mode:

- **NORMAL** – The system is not in maintenance mode.
- **MAINT.** – The system is in maintenance mode, but remains fully functional for local operations. Only maintenance status is reported to the Superior System.

***Note**: Maintenance mode status appears in the Operator Panel.*

5.3 SET AN OPERATION OR MAINTENANCE MODE

From the Operator Panel, use a key to set a mode.

a. For operation modes, use the right key:
REMOTE – turn left.
OFF – vertical position.
LOCAL – turn right.

b. For maintenance modes, use the left key:
NORMAL – vertical position.
MAINT. – turn right.

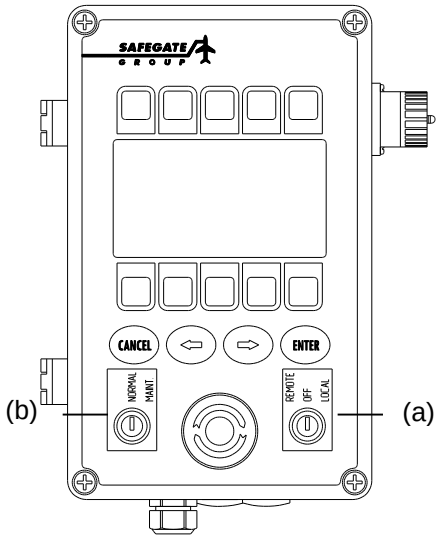


FIGURE 2A.1 OPERATOR PANEL MODES

CHAPTER 3
OPERATION
CONTENTS

1. INTRODUCTION

This document is describing the general operation of the Safedock system. Illustrations are given for a generic system or a variation on this, which means that they may deviate slightly from the system actually delivered.

1.1 SYSTEM OVERVIEW

The Safedock system is designed to provide fast and safe guidance during the aircraft's approach into the stand area. It is based on laser scanning and distance measuring technology, and it tracks the lateral and longitudinal position of the aircraft. This 3-dimensional technique ensures that the pilot is provided with the correct stop indication for the aircraft.

All necessary information, such as azimuth guidance, distance to stop, aircraft type, etc. is shown on an alphanumeric LED display that is clearly visible for both pilots.

Each individual Safedock system is controlled from the local Operator Panel or from Superior System (Option). From Superior System all connected Safedock systems can be individually controlled and monitored.

The Superior System is also the gateway to the airports database system, FIS, which optionally provides information on scheduled and active flights.

1.2 OPERATIONAL STATES

The Safedock system has the following possible operational states and also a maintenance mode:

1. READY- the system is idling, waiting for a command; Stand can be cleared.
2. SCHEDULED - an initiate-docking command has been received from Superior System, if applicable.
3. PREPARED - an initiate-docking command has been received from Superior System (if applicable) and the stand has been cleared.
4. ACTIVE - docking has been started:
   (i) Self-test
   (ii) Scanning for aircraft
   (iii) Tracking aircraft
   (iv) Aircraft check
5. PARKED - the docking procedure has been completed.

During the maintenance mode, the following functions can be performed:

1. Program Load
2. Stand Configuration and Calibration
3. Dump of Safedock configuration data
4. Dump of Safedock docking log

2. OPERATING DETAILS

2.1 THE DOCKING PROCEDURE IN REGULAR CONDITIONS

The following section is a step-by-step description of a docking routine, how it is started, performed and completed. Some figure examples are given below with different Safedock display variations illustrated.

1. The docking procedure can be activated from any one of the following three options:
   (i) Safedock operator selecting the aircraft type to be docked from the Operators Panel.
   (ii) Remote selection of aircraft type by operator from the Superior System. The selection can require confirmation at the local Operator Panel, or directly activate the docking procedure (option).
   (iii) Automatic selection of stand and aircraft type, via Superior System, based on FIS flight information available to Superior System by means of a database interface. The selection can require confirmation at the local Operator Panel, or directly activate the docking procedure (option).
2. At start of docking an aircraft type is assigned. A profile for the selected aircraft has previously been set up using parameters such as nose outline, height and optionally engine position. During the docking procedure the laser equipment measures the corresponding parameters of the actual aircraft. The captured data are compared to a safety profile of the assigned aircraft. If the safety margin related to the aircraft type concerned is too small, the docking procedure will be aborted with an **ID Fail** condition.
3. (Option) Before a docking procedure is activated, the operator must confirm his action by pressing a four-digit password. When the password is confirmed the system is activated.
4. Before the docking can be commenced, a self-test is carried out by the Safedock system. The correct position and distance of 2 reference points is checked. A failed test will abort the docking procedure with a **Calibration Fail** condition.
5. (Option) The apron area is also checked for foreign objects, using the **Apron scan** feature. If any blocking objects are detected, the docking procedure will be paused with an **Apron blocked** condition (showing the message **APRON BLOCKED** on the Operator Panel and **WAIT APRON** on the Pilot Display). The docking procedure will resume when the blocking object leaves the area.
6. The selected aircraft type is then shown on the Pilot Display and on the Operator Panel. The pilot display will show a **WELCOME** indicator, consisting of floating arrows on the closing rate display indicating that the system is ready for docking. The laser scanning unit is now activated. In bad weather conditions, the downgrade mode shows **AIRCRAFT TYPE** and **SLOW** and the floating arrows are disabled. This is a message to the pilot to take extra care. The “closing rate” bar will light up, as is normal, when the aircraft is detected by the system.
7. When the laser scanning unit is activated, the Operator Panel will show the aircraft type and status **ACTIVE**. The system is now scanning for an approaching aircraft.
8. The pilot display will switch to “Lead in” mode, consisting of closing rate and azimuth guidance indication. When the aircraft is caught by the laser, usually > 50 metres before the stop-position. The Operator Panel will now show **TRACKING**.

9. During the approach the aircraft type assigned will be verified by the Safedock system. When the aircraft type has been verified, the Operator Panel will show **IDENTIFIED**.
10. If the aircraft speed exceeds the configured maximum value, the message **SLOW** will be displayed to the pilot. The speed limit is configurable per aircraft type out to 10m prior to the stop-position, fixed at 3m/s out to 20m and 4m/s outside 20m. Software configuration options are further described in *Chapter 4A Stand Configuration Utility*.
11. The closing rate indicator will indicate the distance to go by shortening distance bar from a distance of 15m prior to stop-position as the aircraft approaches.
12. If aircraft type verification is not established within 15 metres from the stop-position, the docking procedure will be aborted with an **ID FAIL** condition.
13. When the stop-position is reached, the Pilot Display will show **STOP**, with a red stop symbol. All closing rate LED indicators will extinguish.
14. As long as the aircraft keeps moving the **STOP** message remains on the display. When the aircraft has been standing still for a configurable period of time, the message on the Pilot Display will change from **STOP** to **OK** – or **TOO FAR**, if the roll distance is larger than the configured value. This will also be indicated on the Operator Panel.
15. After a configurable period of time, the status will change to **PARKED** which is displayed on the Operator Panel.

2.2 THE DOCKING PROCEDURE IN ABNORMAL CONDITIONS

If an object is blocking the view from the Safedock laser scanning unit toward the stop-position of the selected aircraft type, the system will be unable to perform the docking procedure. When an object is detected between the laser scanning unit and the stop-position, the system will halt the docking procedure and display a **GATE BLOCK** warning and a **WAIT** message. When the blocking object is removed, the docking procedure will be resumed.

When objects are detected close to the Safedock system and its laser window the system will halt the docking procedure and display a **VIEW BLOCK** warning and **WAIT** message. When the disturbing objects are removed, for example by cleaning the laser window, or when the aircraft is found approaching, the docking procedure will be resumed.

If an unrecoverable error occurs during a docking procedure, a **SBU** (Safety Back Up) condition exists. In this case an alternate method to guide aircraft to the stop-position must be used, as the docking procedure cannot be completed. SBU stop conditions are:

1. A hardware failure
2. Aircraft far off the centreline and less than 2m to the stop-position.
3. View from laser scanning unit to aircraft blocked with less than 2m to the stop-position.

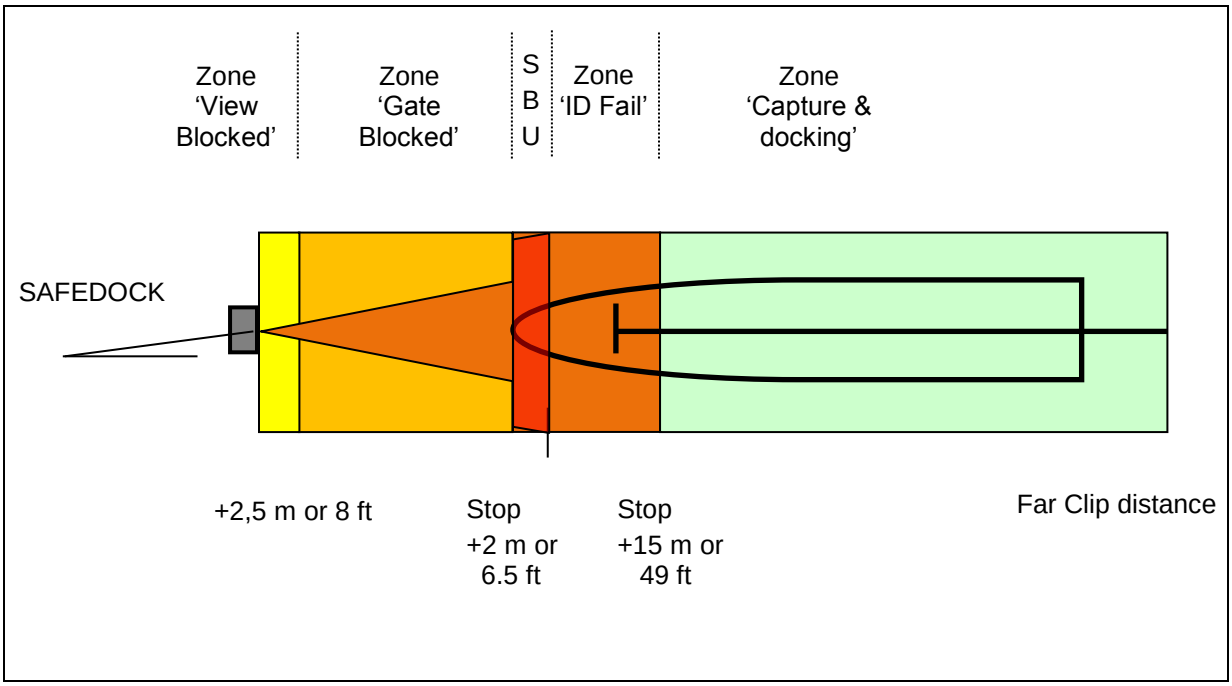


FIGURE 3.1 – CRITICAL ZONES

(Option)

Note: *The SBU event can occur after the pilot has got the* ***STOP*** *message, but the aircraft is still rolling. In this case a manual* ***Park On*** *command must be done in order to complete the docking sequence with a* ***Blocks On*** *message to Superior System and external systems.*

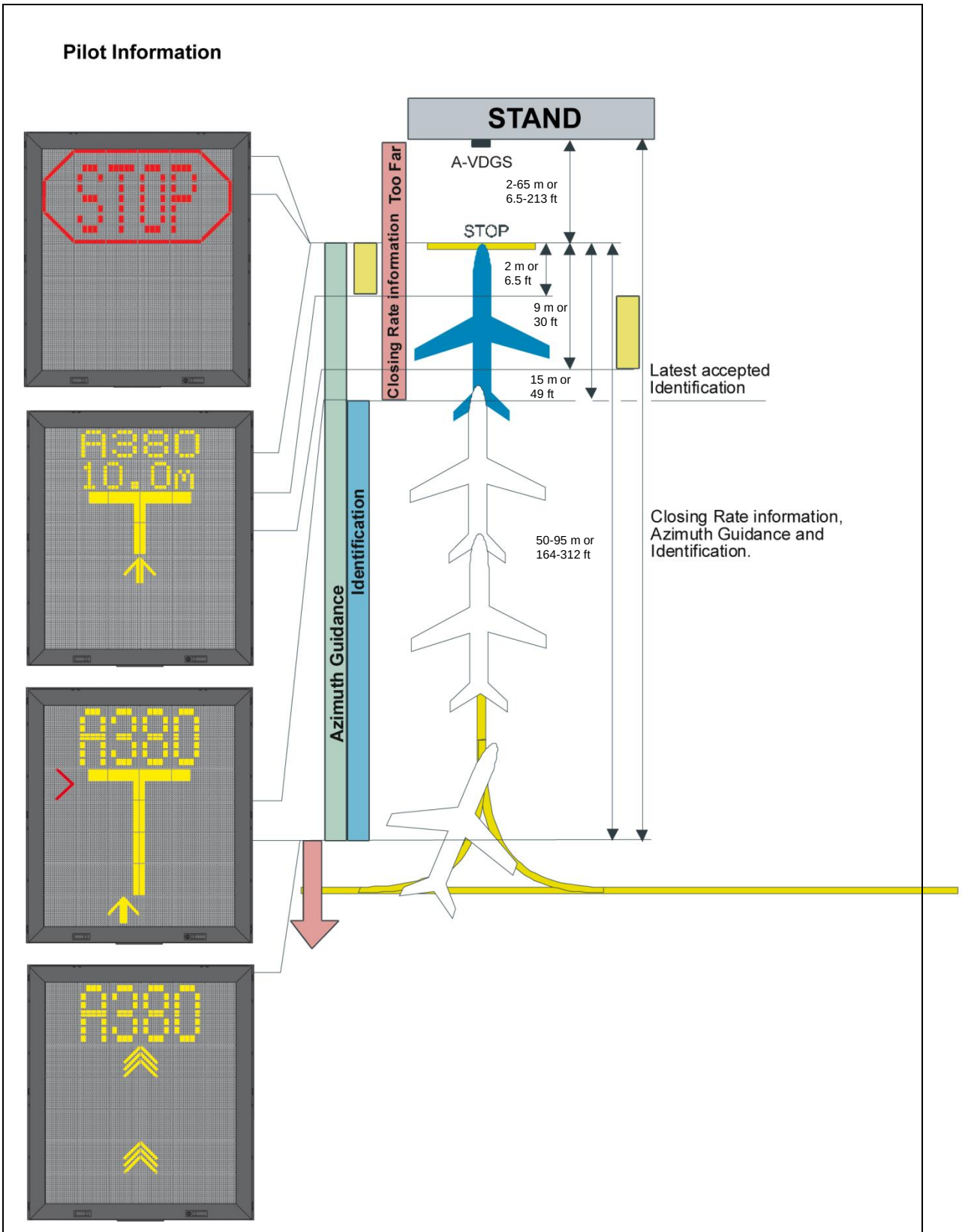


FIGURE 3.2 – THE DOCKING PROCEDURE (OPTION/TYPE 1 DISPLAY)

2.3 DOCKING SAFETY FEATURES

2.3.1 Test Functions Before Docking

Errors and their solutions are described in *Chapter 4 MAINTENANCE.*

1. When the Safedock system is started, a built-in error detection program checks the system for correct operation.
2. If an error should occur within the system, at initial start-up, the Pilot Display will show **ERROR or ERR depending on display type (see below figure 3.3).** . The type of the system error will be shown on the Operator Panel in clear text. The Safedock cannot be activated, if the system is not fully functional.

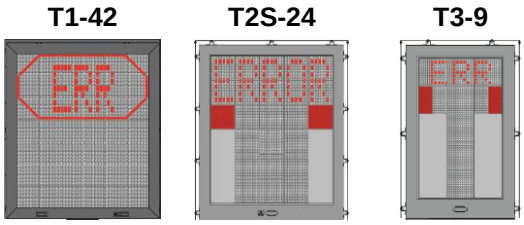


FIGURE 3.3 – ERROR

3. If a fault occurs, after the system has been activated, and an aircraft is approaching the terminal stand, the Pilot Display will show a **STOP** message.

A detailed list of error messages and their appropriate rectification procedures are included in *Chapter 4 MAINTENANCE, § 5. Troubleshooting.*

4. The figure below is an example of an error displayed on the Operator Panel.

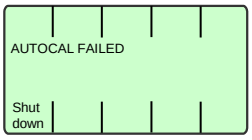


FIGURE 3.4 – ERROR MESSAGE AT OPERATOR PANEL

2.3.2 Aircraft Profile Check

During the docking procedure the nose profile of the approaching aircraft is roughly checked with the nose of the aircraft selected at start-of-docking.

1. If the aircraft nose profile has not been verified within 15 metres of the stop-position, the Pilot Display will show **STOP/ID FAIL**.
2. The figure below illustrates the message **ID FAILED** on the Operator Panel.

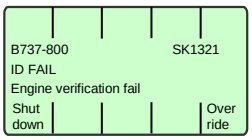


FIGURE 3.5 – OP STATUS INFORMATION

3. (Option) The docking procedure can be restarted with engine verification temporarily suspended by using the **Override** function.

2.3.3 Continuous Test Procedure

The system undertakes a continuous self-test procedure, even when the system is in the idle mode. If an error occurs during the continuous test procedure, the error will be registered in the Error Log.

The system automatically performs auto calibration test at regular time intervals (every thirty minutes). Before the Safedock system gets activated, it checks if the latest auto calibration test was successful or not. If successful, the system starts-up without performing a new test, thus, reducing start-up time. If unsuccessful, a new auto calibration test is performed before the system is activated. If the test is not passed, the system will not be activated, and an error message will be displayed on the Operator Panel, Pilot Display and Superior System, if connected.

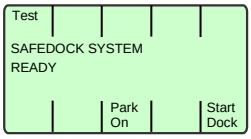
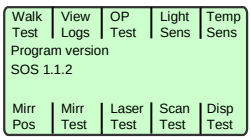
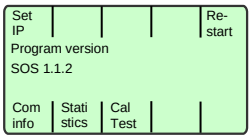
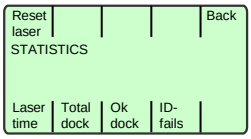
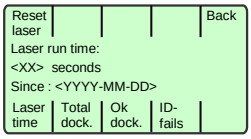
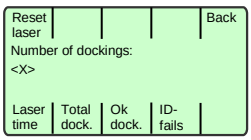
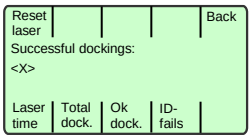
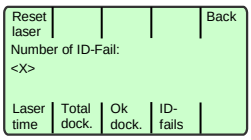
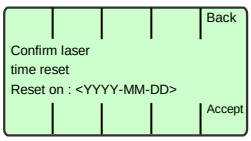
2.3.4 Indication of Power Failure

In case of a power failure, the Pilot Display turns black and the docking procedure is interrupted. If the option of UPS is included, the current on-going docking procedure commences (max 20min) and **Blocked by UPS** is displayed in the Operator Panel.

2.4 SAFEDOCK STATISTICS

Safedock (software version 0.9.01 or later) includes some basic statistics, for example events such as the number of dockings or “ID fail” messages and more.
Statistics are viewed using the Operator Panel.

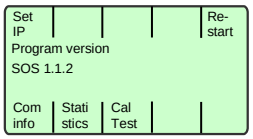
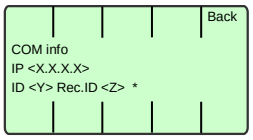
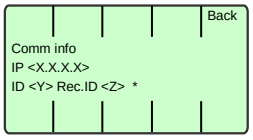
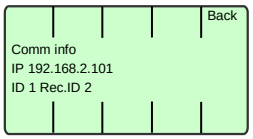
2.4.1 View Safedock Statistics

From the Operator Panel, select **Test** key.	 FIGURE 3.6 – OPERATOR PANEL TEST
Press the right arrow button → for the next Test menu page**.**	 FIGURE 3.7 – OPERATOR PANEL TEST MENU
Select **Statistics**.	 FIGURE 3.8 – OPERATOR PANEL STATISTICS
From the **Statistics** menu, press the softkey for the specific statistics you'd like to see.	 FIGURE 3.9 – OPERATOR PANEL STATISTICS
Select **Laser time** for run time in seconds.	 FIGURE 3.10 – OPERATOR PANEL LASER TIME
Select **Total dock** for the number of dockings.	 FIGURE 3.11 – OPERATOR PANEL TOTAL DOCKINGS
Select **Ok dock** for the number of successful dockings.	 FIGURE 3.12 – OPERATOR PANEL SUCCESSFUL DOCKINGS
Select **Id fails** for the number of aircraft identification problems.	 FIGURE 3.13 – OPERATOR PANEL ID FAIL EVENTS
Select **Reset laser** and **Confirm** to reset the laser time. ***Note**: This operation is to be performed whenever a laser unit is replaced.*	 FIGURE 3.14 – OPERATOR PANEL CONFIRM

2.5 SUPERIOR SYSTEM CONNECTIVITY STATUS

Safedock can display Superior System connectivity status.

2.5.1 View Superior System Connectivity Status and Activity

From the Test menu, press he right arrow button → Select **Com Info**.	 FIGURE 3.15 – OPERATOR PANEL SUPERIOR SYSTEM CONNECTIVITY
The IP field displays the IP address of the Safedock system. The ID field indicates the communication ID for the system. The Rec.ID field indicates the ID on incoming communication data from the superior system (if available).	 FIGURE 3.16 – OPERATOR PANEL SUPERIOR SYSTEM CONNECTIVITY STATUS
If Superior System communication data is received, an animation cycle repeats with symbols appears (to show there is activity): **/** then **-** then **** then **I** (appear repeatedly) or until **Back** is selected.	 FIGURE 3.17 – OPERATOR PANEL SUPERIOR SYSTEM CONNECTIVITY ACTIVITY
When Safedock receives communication data from Superior System but the address is incorrect, for example the ID is configured to another COMM ID, **Rec.ID** is the (incorrect) address of the data received from Superior System.	 FIGURE 3.18 – OPERATOR PANEL SUPERIOR SYSTEM CONNECTIVITY ADDRESS

3. TECHNICAL DESCRIPTION

The Safedock system uses a scanning Laser Distance Meter (LDM) to measure the location of an approaching aircraft. Information of the aircraft position relative to the pre-selected stop-position is presented by means of a display to both pilots.

3.1 SYSTEM UNITS

The Safedock system consists of five major system units:

1. Control Unit
2. Laser Scanning Unit
3. Operator Panel
4. Display Unit
5. Superior System Interface

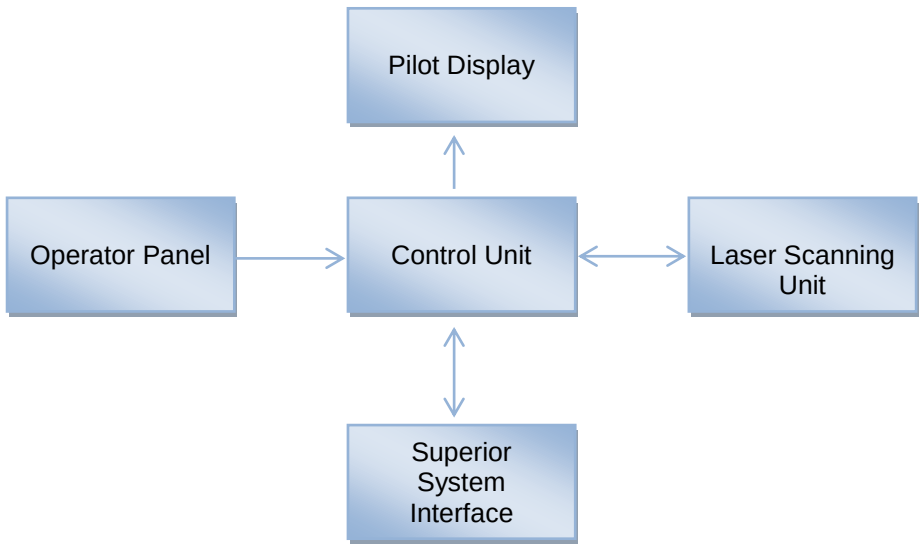


FIGURE 3.19 – SAFEDOCK SYSTEM SUB-UNITS

3.1.1 Control Unit

The Control Unit is the processing heart of the Safedock system. It will accept user input commands from the Safedock Operator Panel or via the Superior System Interface.

Alphanumeric information and aircraft position data are presented on the Pilot Display. The control unit is also responsible for positioning of the mirrors in the Laser Scanning Unit and processing of the distance data provided by the Laser Scanning Unit. The Control Unit maintains a database of information about the aircraft types configured for docking by the system and their stop-positions.

3.1.2 Laser Scanning Unit

The Laser Scanning Unit comprises a Laser Distance Meter (LDM) and two mirrors mounted on the shafts of motors.

The LDM uses laser pulses to measure the distance to any object the laser beam is directed toward. The motor mounted mirrors are used to direct the laser beam in the horizontal and vertical plane, respectively. This design gives the system the ability to make a 3-dimensional scan of the stand area.

3.1.3 Operator Panel

The Operator Panel is the primary source of user input to the system. It comprises a 14 key keyboard and a LCD display.

The keyboard is divided into 10 menu selection keys and 4 special function keys. The menu selection keys are also used for numeric input, such as user verification of commands. The display is used to give the operator visual feedback of the systems operation.

3.1.4 Pilot Display

The Pilot Display is constructed using a set of Light Emitting Diode matrices. The display is divided into two parts:

- The top part is used as an alphanumeric display capable of displaying one or two lines of text.
- The lower part of the display is used to indicate the aircraft's position relative to the centreline and the stop-position during a docking procedure.

3.1.5 Superior System Interface (Option)

The Superior System Interface is the optional link between the Safedock system and a central control and monitoring system, the Superior System. It is also used as a gateway to other external systems and to receive information about scheduled arrivals and departures from FIS.

Different types of information can be presented on the Pilot Display: flight number, estimated time, next/previous port-of-call and time remaining to departure. The information about a scheduled arrival can be also presented on the Operator Panel for easy activation of the docking procedure.

The Safedock system uses the Superior System Interface to report **Block-ON/OFF** times to the central control system for statistics and billing purposes. All Safedock events and errors will also be sent to the central system, where they will be stored in a log file.

3.2 PERFORMANCE CHARACTERISTICS

3.2.1 Scanning Area

Safedock (Options)	***Type 1***	***Type 2/3***
Horizontal range during capturing mode:	± 10°	± 10°
Horizontal range during docking:	± 30°	± 13°

The vertical scanning range is relative to the Safedock system horizon.

Vertical scanning range above the horizon:	± 15°	+ 5°
Vertical scanning range under the horizon:	- 24°	- 24°

3.2.2 Guidance Performance

Azimuth Accuracy:	± 0.2°
Stop Position Accuracy:	± 0.1 m

3.2.3 Display Unit

Visibility/Readability CAT3A:	160m (T1/2) 80m (T3)
Display Type:	Alphanumeric, LED

3.3 ELECTRICAL SUPPLY

The Safedock system is power supplied from the 115/230VAC mains, using an internal power supply unit to generate the 24 VDC power used by the system.

3.4 OPERATION

This section is a brief description of the Safedock system operation. A detailed description of the operating procedures is found in the Chapter 3 Appendix A Operating Procedures.

1. In the Safedock system a number of aircraft types are defined by a set of parameters such as: nose, height and optionally aircraft geometry. At start of docking the operator assigns an aircraft. During a docking procedure the laser equipment measures the corresponding parameters of the actual aircraft.
2. The individual Safedock system is operated from the Operator Panel at apron level or from the Superior System. From Superior System all connected systems can be individually controlled and monitored.
3. During the docking process, the system operates in three modes: Calibration Check, Scanning and Tracking.

3.4.1 Calibration Check

The docking procedure starts when an aircraft type is selected from the Operator Panel or from the Superior System/FIS. If the previous automatic auto calibration test was not successful, then the system automatically makes a new calibration check which must be successful, before the system changes over into Scanning mode. If this test is not successful, the error message **AUTOCAL FAILED** appears on the Operator Panel and **STOP** on the Pilot Display (for information on diagnose and rectification, see *Chapter 4 MAINTENANCE, § 5. Troubleshooting.*

3.4.2 Scanning

After successful calibration check, the system is switched over to the Scanning mode for distance data collection. In this mode the laser is scanning the pre-defined docking area to detect an approaching aircraft. When an aircraft is detected, and its approximate position is confirmed, the system switches to Tracking mode.

3.4.3 Tracking

The Safedock system checks the nose height and optionally the outline of the approaching aircraft and compares it to the corresponding parameters of the selected aircraft. If there is no mismatch between these parameters, the docking process will continue by measuring the aircraft nose position. As many aircraft have similar profiles, all types cannot be discriminated. However a safety margin is always checked from measurements of the approaching aircraft's geometry, if this option has been included.

If the safety margin is too small, the display will show **STOP ID FAIL**, and the docking procedure will be automatically interrupted. The Safedock system measures the position of the aircraft in relation to aircraft stand centreline and the defined stop-position for the particular aircraft type. During the tracking process the relative position of the aircraft is displayed on the Pilot Display, clearly visible for both pilots from the aircraft cockpit.

4. SOFTWARE PROGRAMMES

4.1 DEVELOPMENT ENVIRONMENT

Software development has been done using C++ compiler on a Microsoft Windows PC platform.

4.2 SOFTWARE ITEMS

Software items and the actual versions being used are apparent from the Software Configuration List. How to handle and install these items is described in Chapter 4 MAINTENANCE.

The following software items are related to the Safedock system:

System parts:

1. SgBoot.rta.- start-up process for the system software.
2. SgShell.rtb - automated shell process for the software system.
3. Loader.rtb - fallback program loader process of the Safedock System.
4. SgApp.rtb - main application of the Safedock. This software item controls the Safedock System, i.e. laser measuring equipment, Pilot Display, Operator Panel and interfaces to external systems.
5. <various>.edb - system data including the system calibration and configuration data, aircraft physics database and configuration history.
6. Folder: Profiles - a folder containing a set of data files with aircraft physical profiles, one for each aircraft type used by the system.
7. Folder: Dgs<various> - folders containing log files from the system.

Supporting tools:

8. SMT.exe - maintenance software package for Safedock. The software is executed on the Superior System for making Program Load, Parameter Load, Calibration and Stand Configuration etc. It can also be used locally on a maintenance PC, connected to the Operator Panel's service outlet or via the network.
9. SLV - utility program, Safedock Log Viewer is used to view log files from the system.

4.3 SOFTWARE FUNCTIONS

This section is a brief description of functions performed by software.

1. Acquisition of data from:
   (i) Laser Distance Meter
   (ii) Motor Position
   (iii) Operator Control Panel (commands)
   (iv) Superior System (commands)
2. Output data to:
   (i) Laser Scanning Unit (scanner positions)
   (ii) Display Unit (guidance information)
   (iii) Operator Control Panel (status information)
   (iv) Superior System (status information)
3. Menu-driven man-machine interface
4. Real time calculation and presentation of parameters such as:
   (i) Aircraft type verification
   (ii) Tracking positioning
   (iii) Closing Rate data
   (iv) Azimuth Guidance data

5. Calibration Control function
6. Storage of data
   (i) Aircraft parameters
   (ii) Stand parameters
   (iii) Log files etc

4.4 SOFTWARE FLOWCHART

The software state diagram on next page illustrates the docking process from state READY to state PARKED.

The different states are described in the following table.

State	Description
IN OPERATION	The system is available for normal operation.
READY	The system is idling and awaiting a command.
MAINTENANCE	The system is taken out of operation for maintenance purpose.
SCHEDULED	A docking procedure has been initiated by Superior System and the system is awaiting confirmation by the local operator.
PREPARED	A docking procedure has been initiated by Superior System and the operator has cleared the stand. The system is awaiting activation.
ABORT SCHEDULED DOCKING	The local operator has aborted the docking, suggested by Superior System.
DOCKING	A docking procedure has been started.
TESTING	A system self-test is performed. This test includes verification of configured parameters, aircraft profile and data. It also includes an extensive test of the system hardware and a calibration check.
ERROR	An error has been encountered during system self-test.
ACTIVE	The system is active and scanning the stand area for an approaching aircraft.
DOCKING	An aircraft has been detected approaching the stand area.
TRACKING	The system is tracking an incoming aircraft. The aircraft is continuously compared to a set of stored parameters, attempting to verify the type of the incoming aircraft.
ID VERIFIED	The system is tracking an incoming aircraft. The aircraft type has been verified within specified limits.
ABORT DOCKING	An operator has aborted the docking procedure.
ID FAILED	The aircraft is closer than 15m to the stop-position, and has not been identified.
SBU STOP	A non-recoverable error has occurred during the docking due to one of the following causes: • Aircraft too far off centreline close to the stop-position. • System failure. • Hardware failure.
PARKED	The aircraft is parked at the stop-position. The system will continually scan for departure of the aircraft.
EMERGENCY STOP	The Emergency-Stop function has been activated. The system is unavailable for further operation until the Emergency-Stop function is deactivated. The system will revert to the ready state upon release of the Emergency-Stop button. Optionally, the system can be configured to resume the last docking procedure upon release of Emergency-Stop button.

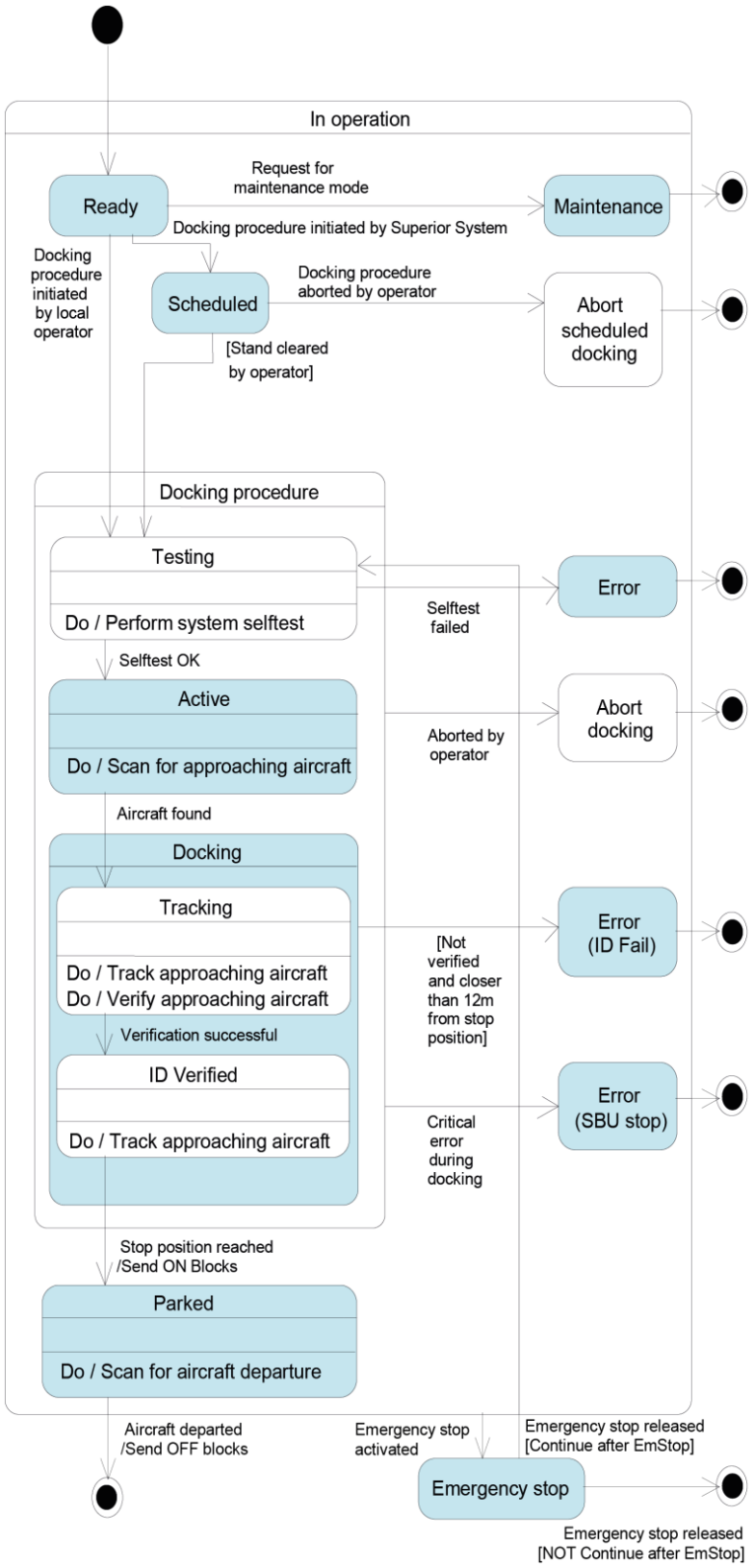


FIGURE 3.20 – SOFTWARE FLOWCHARTS

4. SAFETY PROCEDURES

4.1 CHECK OF ACCESS RIGHTS

For security reasons, Safedock commands can be password restricted, if required.

WARNING! PASSWORD INFORMATION SHALL ONLY BE GIVEN TO AUTHORIZED PERSONNEL. IT IS ADVISED TO NEVER KEEP CODES IN WRITING THAT COULD BE ASSOCIATED WITH THE SYSTEM.

4.2 DISCREPANCIES FROM THE DESCRIBED DOCKING ROUTINE

WARNING! IF THE PILOT DISPLAY UNIT OR THE OPERATOR PANEL INDICATES ANYTHING OTHER THAN WHAT IS DESCRIBED IN THE DOCKING ROUTINE, THE OPERATOR MUST ACTIVATE THE EMERGENCY-STOP BUTTON TO PREVENT DAMAGE TO THE AIRCRAFT, GROUND EQUIPMENT OR INJURY TO PERSONNEL.

REASONS FOR SPURIOUS INDICATIONS ON EITHER DISPLAY MUST BE RECTIFIED BEFORE THE DOCKING PROCEDURE CAN RECOMMENCE.

The following should be checked during the docking procedure:

A. When the **Aircraft Type** is shown on the Operator Panel and Pilot Display unit, the Safedock system is ready for docking.
B. Ensure that the **Aircraft Type** displayed is the same as the actual aircraft type approaching the stand.
C. When the aircraft turns from the taxiway onto the terminal stand centreline, ensure the Operator Panel message changes from **ACTIVE** to **TRACKING**, and then to **IDENTIFIED** as the aircraft approaches the gate.
D. Ensure the Pilot Display indicates the azimuth lateral position and the closing rate LED indicators are activated.
E. As the aircraft is approaching the stop-position, ensure the closing rate LED indicators are gradually turned off from the bottom.
F. When the aircraft has reached the stop-position, ensure the Operator Panel shows **DOCKING OK** and the Pilot Display shows **STOP** (in red).

4.3 GENERAL WARNING

The Safedock system has a built-in error detection program to inform the aircraft pilot of impending dangers during the docking procedure.

WARNING! IF THE PILOT IS UNSURE OF THE INFORMATION BEING SHOWN ON THE PILOT DISPLAY UNIT, HE MUST IMMEDIATELY STOP THE AIRCRAFT AND OBTAIN FURTHER INFORMATION FOR CLEARANCE.

GROUND OPERATORS SHALL PRESS THE EMERGENCY-STOP BUTTON IF, FOR ANY REASON, THERE IS A NEED TO INFORM THE PILOT TO STOP THE AIRCRAFT.

4.4 MANUAL EMERGENCY-STOP

When an Emergency-Stop button is operated, the Operator Panel will show **EMERGENCY-STOP** and the alphanumeric display will indicate **STOP**.

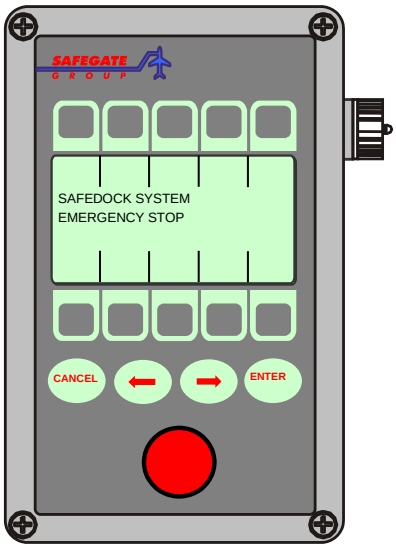


FIGURE 3.21 – OPERATOR PANEL EMERGENCY STOP BUTTON

4.5 ITEMS TO CHECK BEFORE ENTERING THE STAND AREA

The Safedock system has a built-in error detection program to inform the aircraft pilot of impending dangers from large objects within the docking area during the docking procedure.

WARNING! THE PILOT SHALL NOT ENTER THE GATE AREA, UNLESS THE DOCKING SYSTEM IS SHOWING THE VERTICAL RUNNING ARROWS.

THE PILOT MUST NOT PROCEED BEYOND THE BRIDGE CAB, UNLESS THESE ARROWS HAVE BEEN REPLACED BY THE CLOSING RATE BAR.

ADDITIONALLY, THE PILOT SHALL NOT ENTER THE STAND AREA UNLESS THE AIRCRAFT TYPE AND ANY OTHER DISPLAYED INFORMATION IS CORRECT FOR THE AIRCRAFT THEY ARE DOCKING.

4.6 THE SBU MESSAGE

The message **STOP SBU** means that docking has been interrupted and has to be resumed by manual guidance. DO NOT RESUME DOCKING UNDER SAFEDOCK GUIDANCE!

4.7 ERRORS OR MALFUNCTIONS

If for any reason the Safedock system fails or reports an error, please take note of any details that may have caused the problem and report the error and supporting details to the appropriate maintenance personnel.

4.8 CHECKS BY GROUND PERSONNEL FOR AIRCRAFT DOCKING

Below there are some general checks that the head Marshall or ground crew should perform as a part of the aircraft docking procedure when using the Safedock system:

1. The Gate/Docking area cleared of obstacles prior to aircraft arrival.
2. The Safedock unit view is not obstructed by vehicles or other equipment.
3. The Passenger Boarding Bridge is safely parked away from the approaching aircraft.
4. The selected aircraft type and sub-type are shown on Operator Panel and Pilot Display and correct for the arriving aircraft. If not, abort the current aircraft selection and re-activate for the proper aircraft type.
5. Be ready to press the **Emergency-Stop** button if an unsafe condition should arise during the aircraft docking.

5. STAND ADJACENCY RULES

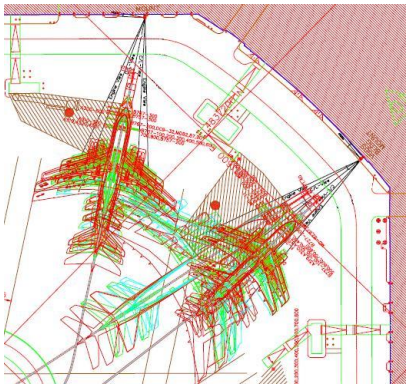
Standalone Safedock operations can be enhanced with a Superior System to further improve safety and efficiency.

Safedock units connected in a Superior System network with adjacent gate status provide:

- Overall status for connected gates.
- Information based upon aircraft already parked or actively scheduled and awaiting to be parked at adjacent gates.
- An awareness of specific aircraft types parked at each gate compared to adjacent gates.
- Adjacent gate information and rules determine if each Safedock can park a selected aircraft type at the target gate.
- Rules/decisions for Safedock operation.

Superior System manages gate adjacency rules with an Interlock function.

<table>
<tr><th>Superior System Interlock function</th><th>Image examples</th></tr>
<tr><td>(a) Gate layout outline

The example is for aircraft types allowed to park at a gate:
<table>
<tr><th>Stand</th><th>Left</th><th>Right</th></tr>
<tr><td>Aircraft type</td><td>Any</td><td>Narrow bodied</td></tr>
<tr><td>Aircraft type</td><td>None (Blocked)</td><td>Wide bodied</td></tr>
</table>
If a wide bodied aircraft is docked to the right and airport personnel request to start a docking to the left for any aircraft, the Superior System generates an adjacency conflict and messages block the request in workstation and Operator Panel views.</td><td> 
FIGURE 3.22 - GATE LAYOUT</td></tr>
<tr><td>(b) Superior System workstation view

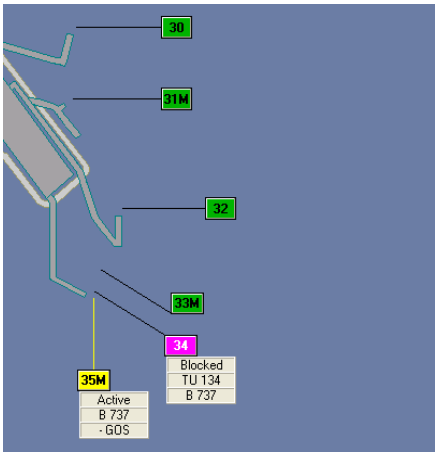
A docking request is started when airport personnel select an aircraft type, either from a Superior System workstation or locally from an operator panel. The Superior System then performs an interlock evaluation for the aircraft type, the status of adjacent stands and decides if a docking is to be allowed or not (Blocked).
The interlock evaluation is based on a series of blocking rules, which are configured for each stand. As a docking request is started, all the rules for the stand are evaluated, and the request is allowed or denied accordingly. If Superior System is unavailable as a docking request starts, Safedock asks the local operator for a manual confirmation to start the docking procedure. If no rules are specified for the selected stand, the docking is always allowed.</td><td> 

FIGURE 3.23 - SUPERIOR SYSTEM WS VIEW</td></tr>
</table>

(c) Operator Panel display

Airport personnel can start an aircraft docking locally at the gate, from an Operator Panel, or from a Superior System workstation.

When an aircraft docking is started, the selected aircraft type detail is provided for Superior System. Superior System checks adjacent gate status for aircraft parked or actively awaiting to be parked and any adjacency rules imposed on the selected aircraft type.

If the rules do not allow for an aircraft type to dock, the docking request is denied and an information message appears, for example

- in Superior System: **Blocked** with stand and aircraft information
- in the Operator Panel display:
  INTERLOCKED BY:
  <Aircraft type> **AT** <Stand>.

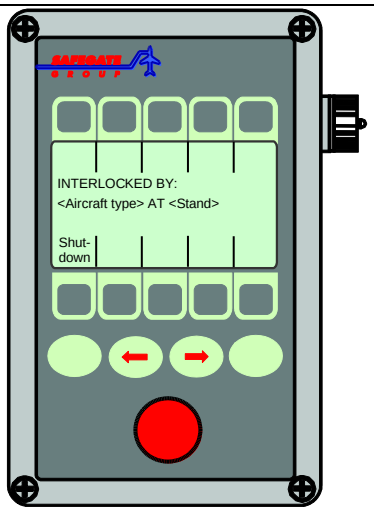


FIGURE 3.24 - OPERATOR PANEL INTERLOCKED

***Note**: This page is blank for convenient double-sided printing.*

CHAPTER 3 OPERATION – APPENDIX A
OPERATING PROCEDURES
CONTENTS

***Note**: This page is blank for convenient double-sided printing.*

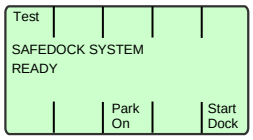
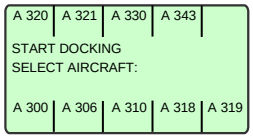
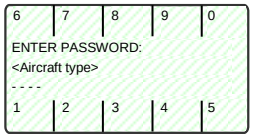
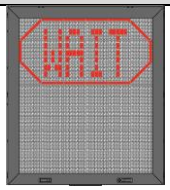
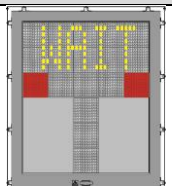
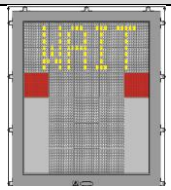
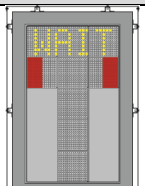
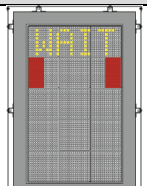
The following description covers both the local control procedures of Safedock and the optional operation of Safedock on commands from Superior System.

For security reasons some Safedock systems are configured with a password feature for the authorisation of commands. For more information, *see Chapter 4A Stand Configuration Utility.*

1. LOCAL START OF DOCKING – REGULAR CONDITIONS

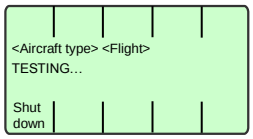
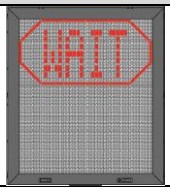
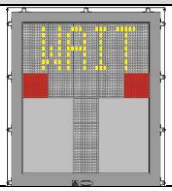
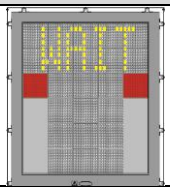
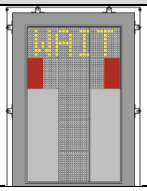
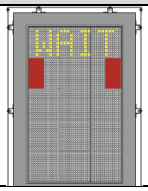
1.1 AIRCRAFT DOCKING ACTIVATION

Description	Position
Aircraft docking activation is performed at the Operator Panel. When the Safedock system is ready to operate, the panel will show: **SAFEDOCK SYSTEM** followed by a status message. If the status is **READY**, the docking procedure can be initiated by pressing the **Start Dock** key. A **START DOCKING** message appears, followed by the option **SELECT AIRCRAFT**. *Instructions to Operators:* • Determine aircraft for docking: ○ Press the desired aircraft type key. ○ Press the exact sub-type key, if required (press left-right arrows to show all listed sub-types). ***Note:*** *If operator passwords are enabled, enter the 4-digit password to continue the aircraft docking activation with the help of the 0-9 digits on the switch cover.*	Gate area: Empty (The aircraft is on the ground en route to gate).

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
System Idle menu  Start Docking menu  					

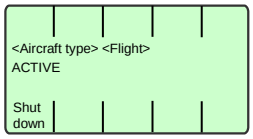
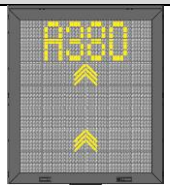
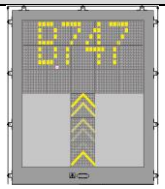
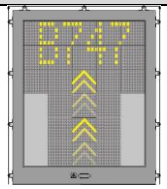
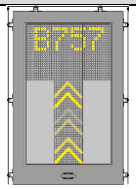
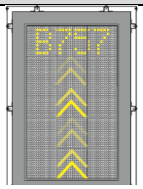
1.2 SELF-TEST

Description	Position
After selecting the aircraft for docking, a self-test and reference point check is carried out by the Safedock system to confirm docking accuracy. Failing the self-test will result in an error code displayed in text format on the Operator Panel and an **ERR x** on the Pilot Display. Failing the reference point check will result in an **AUTOCAL ERROR** or **ERR 3**.	Gate area: Empty (The aircraft is on the ground en route to gate).

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

1.3 CAPTURE

Description	Position
The system is activated and in Active mode, scanning for an approaching aircraft and this is indicated by floating arrows. **WARNING! THE PILOT MUST NOT PROCEED BEYOND THE BRIDGE, UNLESS THE ARROWS HAVE BEEN SUPERSEDED BY THE CLOSING RATE BAR.** *Instructions to Operators:* • Check that the correct aircraft type is displayed on the Pilot Display. The lead-in line is to be followed. ***Note**: If the Safedock system is still in Active mode when the aircraft nose reaches the Passenger Boarding Bridge cab, press the Emergency-Stop button immediately!*	Gate area: Empty (The aircraft is on the ground en route to gate).

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

1.4 TRACKING

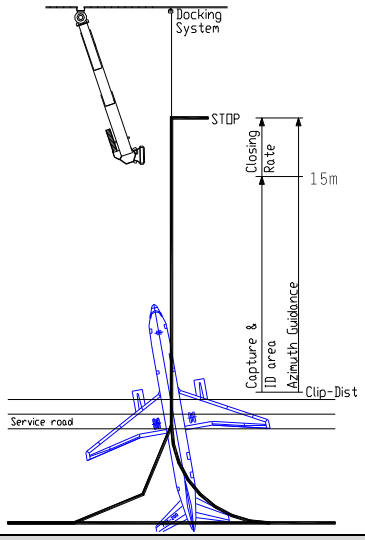
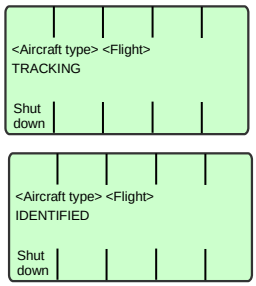
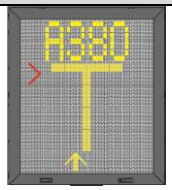
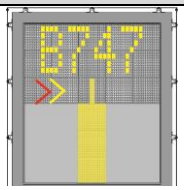
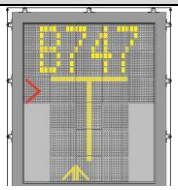
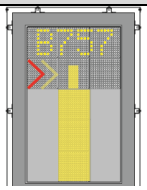
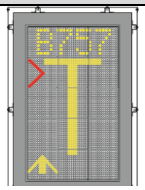
Description	Position
The system has captured the aircraft and is actively tracking and verifying it. The floating arrows are replaced by a yellow centreline indicator and floating arrow. • A flashing red and/or yellow arrow indicates the direction to turn for azimuth guidance. • The yellow arrow indicates the aircraft position in relation to the centreline. • The centreline "distance-to-go" indicator changes from floating arrows to a filled closing-rate bar. The closing-rate bar shrinks as the aircraft nears its configured stop-position. *Instructions to Operators:* • Check that the correct aircraft type is displayed on the Pilot Display. When the selected and the verified aircraft type match, the message **IDENTIFIED** appears on the Operator Panel display.	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

1.5 CLOSING RATE

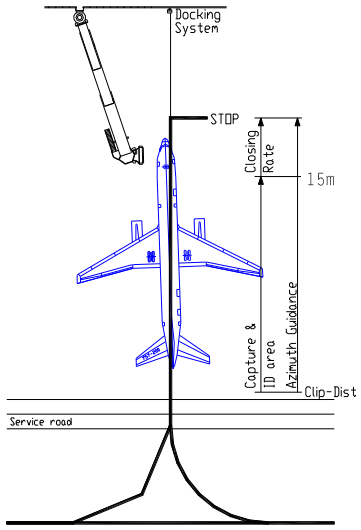
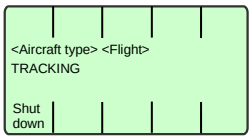
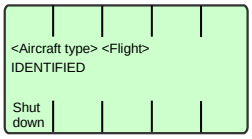
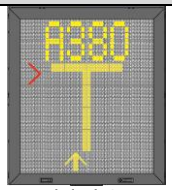
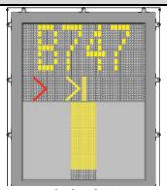
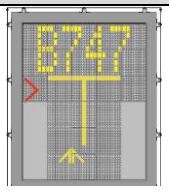
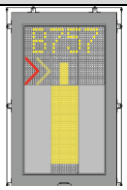
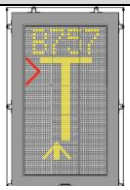
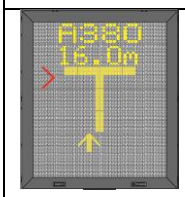
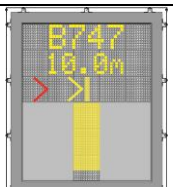
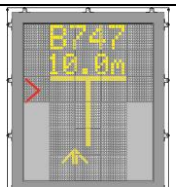
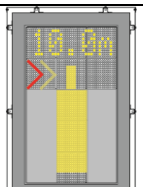
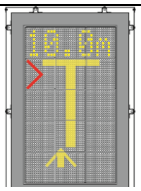
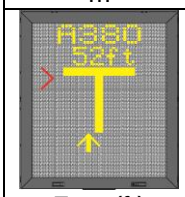
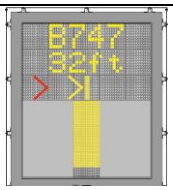
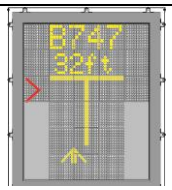
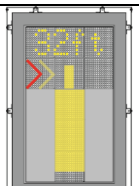
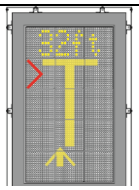
Description	Position
The closing rate is the final countdown from a specific distance to the stop-position. A yellow vertical closing rate bar/centreline indicator appears, optionally with a digital countdown indication, depending on the configuration. The closing rate bar showing the distance from stop-position consists of a number of rows representing the remaining distance to go. Each row turns off in steps, beginning 15m from the stop-position as the aircraft approaches, illustrating a shrinking bar from the bottom. As the last row turns off, less than the interval for one row remains until the message **STOP** appears. A digital countdown (option) shows the distance to stop numerically, with intervals depending on the configuration requirements. The image example illustrates the aircraft in the closing rate distance from stop-position, slightly left of the centreline. The red arrow indicates the direction to steer.	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
 	 No Digital Count	 No Digital Count	 NDC	 NDC	 NDC
	 m	 m	 m	 m	 m
	 Feet (ft)	 ft	 ft	 ft	 ft

1.6 ALIGNED TO CENTRE

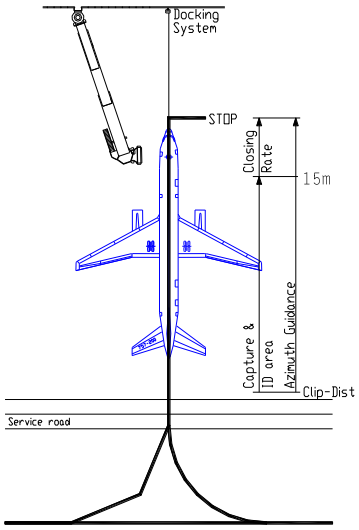
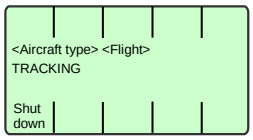
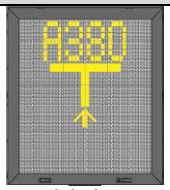
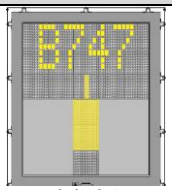
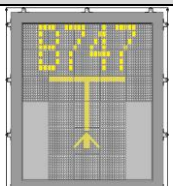
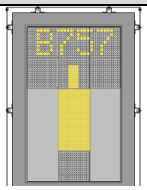
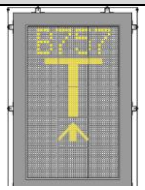
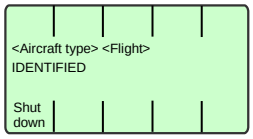
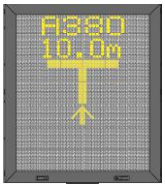
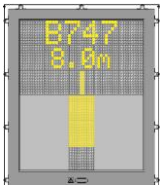
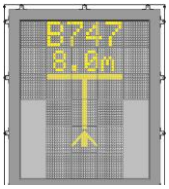
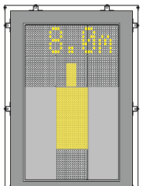
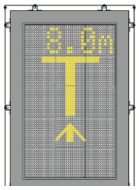
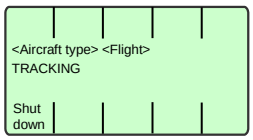
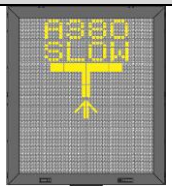
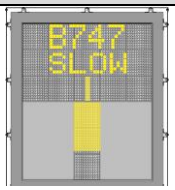
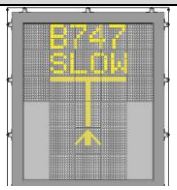
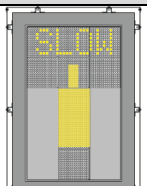
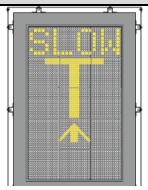
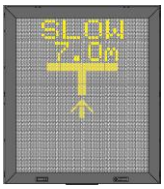
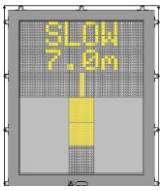
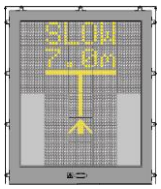
Description	Position
The aircraft is at the displayed distance from the stop-position. The absence of any direction arrow indicates an aircraft on the centreline.	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					
	No Digital Count	No Digital Count	NDC	NDC	NDC
					
	m	m	m	m	m

1.7 SLOW (DECREASE SPEED)

Description	Position
The Safedock system is configured with a slowdown active zone. The limit speed for slow down indication is configurable per aircraft type in the 0-10m range from the stop-position, with a default setting of 2m/s. The limits further out are fixed:10-20m 3m/s; more than 20m 4m/s ***Note:*** *A speed of 2 m/s is approximately 7 km/h, 4 mph or 3 knots.* If the aircraft is approaching faster than the accepted speed, the system will show **SLOW** as a warning to the pilots.	Aircraft continues approach into gate.

Image Operator Panel	Image Pilot Display				
	T1-42	**T2-18**	**T2S-24**	**T3-9**	**T3-15**
	 No Digital Count	 No Digital Count	 NDC	 NDC	 NDC
	 m	 m	 m		

1.8 AZIMUTH GUIDANCE

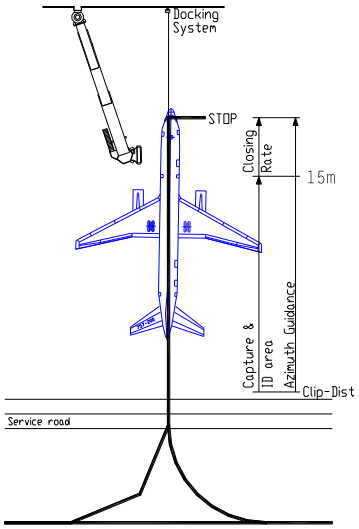
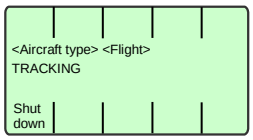
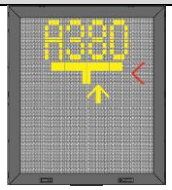
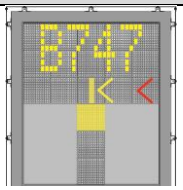
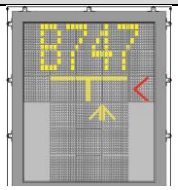
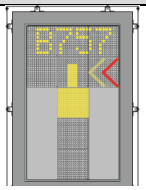
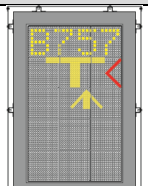
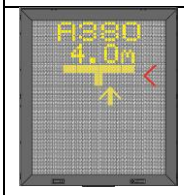
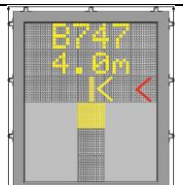
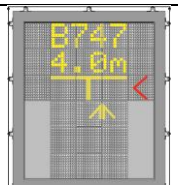
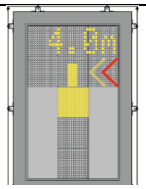
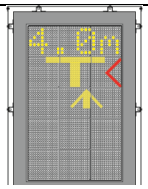
Description	Position
The aircraft is at the displayed distance from the stop-position. If the aircraft is not aligned to centre, a yellow arrow indicates an aircraft's position to the centreline, and a red flashing arrow indicates the direction to turn.	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
	 No Digital Count	 No Digital Count	 NDC	 NDC	 NDC
	 m	 m	 m	 m	 m

1.9 STOP POSITION REACHED

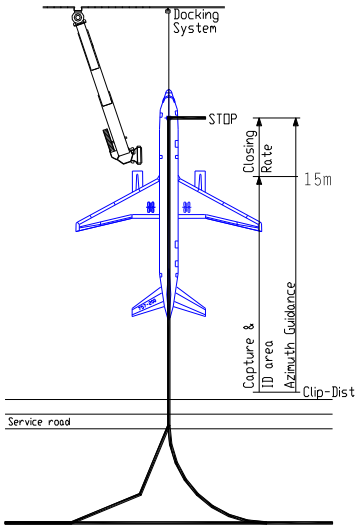
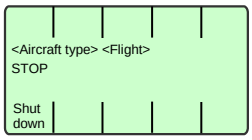
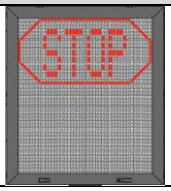
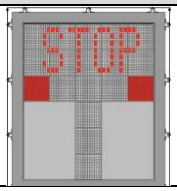
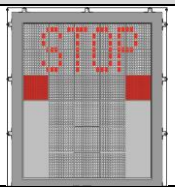
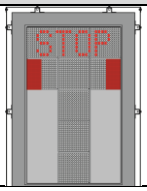
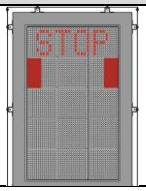
Description	Position
When the correct stop-position is reached, the Pilot Display will show **STOP** with a red border or with red lights. If the aircraft is found standing still but has not reached the intended stop-position, a **Stop Short** condition occurs (see § 2.4 Stop Short in this Chapter).	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

1.10 DOCKING COMPLETED

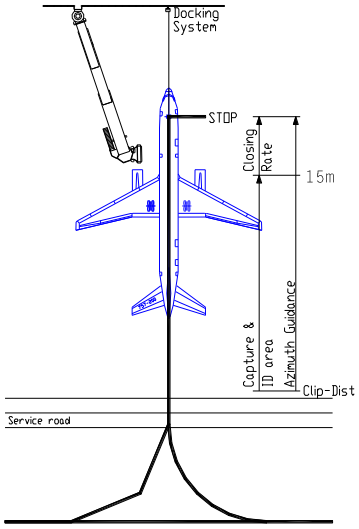
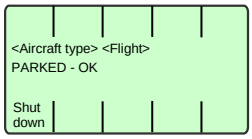
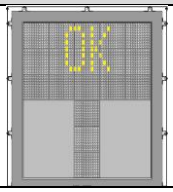
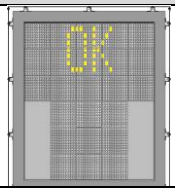
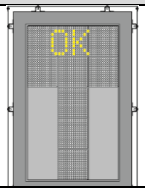
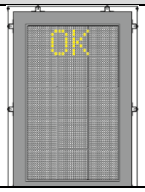
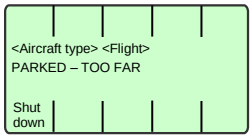
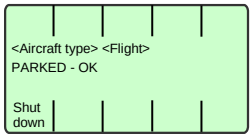
Description	Position
When the aircraft has parked, the message **OK** will be displayed. If the aircraft rolls too far past the stop-position, the message **TOO FAR** appears (see § 2.3 Overshoot in this Chapter). After a configurable period of time the status on the Operator Panel will change to **PARKED**. ***Note:*** *If a docking procedure cannot automatically come to a* ***PARKED*** *state, the Marshal can manually set this with the help of the* ***PARK ON*** *command (It is required for enabling the following PARK-OFF procedure) (for more information, see § 1.12 PARK ON in this Chapter).*	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					
					
					

1.11 STATUS INFO

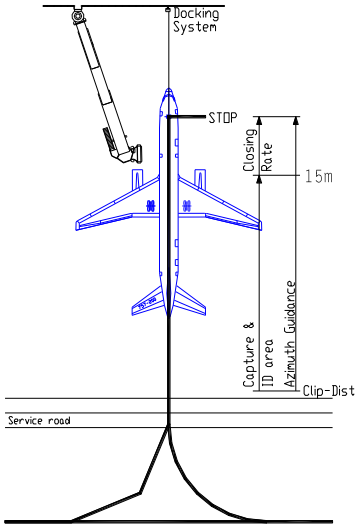
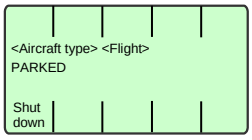
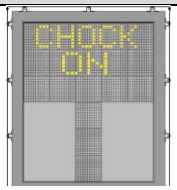
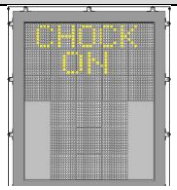
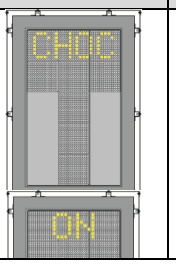
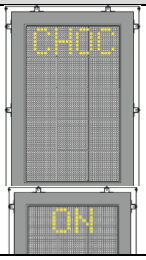
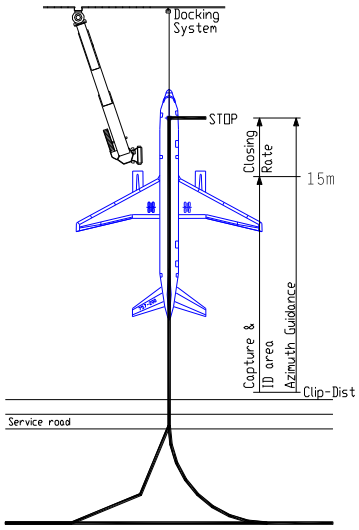
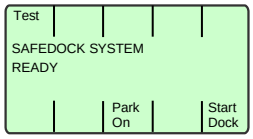
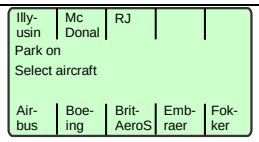
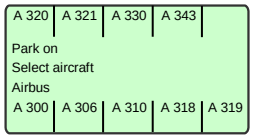
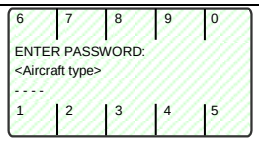
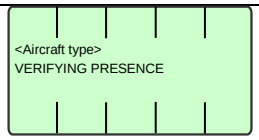
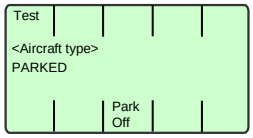
Description	Position
If the Safedock system is provided with optional support of **CHOCKS ON**, **GPU On** (for Ground Power Unit or 400Hz), **PCA ON** (for PC-Air) or other status messages, they will be displayed on the Pilot Display upon Operator Panel key selection, external button or actual sensed conditions (if connected) after the aircraft reaches the stop-position and is parked. The **CHOCKS ON** status is provided via button press on the Operator Panel or a separate button. Status messages will be displayed one after the other and continue until a programmed timeout expires.	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

1.12 PARK ON

Description	Position
If a docking procedure cannot automatically come to a **PARKED** state, the Marshal can manually set this from the Operator Panel. (It is required for enabling the following PARK-OFF procedure.) The sequence is started with the Safedock system in the quiescent state and the Operator Panel showing the message **SAFEDOCK SYSTEM READY**. *Instructions to Operators:* To initiate the operation press **Park On** key. Determine aircraft for docking: i. Press the desired aircraft type key. ii. Press the exact sub-type key, if required (press left-right arrows to show all listed sub-types). iii. (option) Enter the 4-digit operation-level password System enters **Parked** state: i. The system verifies that an object matching the selected aircraft is present at the stand.	

ii. Check that the **PARKED** message is displayed on the Operator Panel display	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
(a) 					
(b) (i) 					
(b) (ii) 					
(c) 					
(d) (i) 					
(d) (ii) 					

1.13 PARK OFF

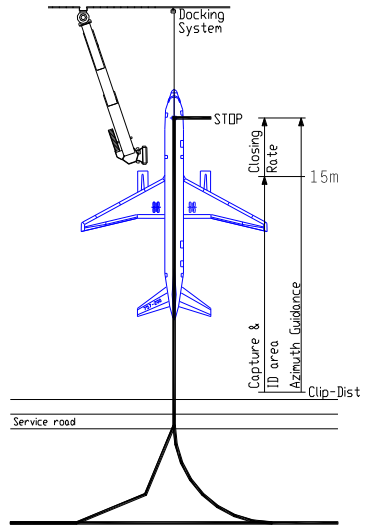
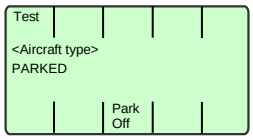
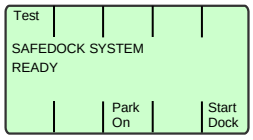
Description	Position
When an aircraft has departed, a **PARK OFF** command may be given by the Marshal, if the Safedock system by any reason did not detect the departure of the aircraft automatically and came to a **READY** state. The sequence is started with the Operator Panel showing the **PARKED** message. *Instructions to Operators:* (a) To initiate the operation press **Park Off** key (b) (option) Enter the 4-digit operation-level password (c) Check that the **SAFEDOCK SYSTEM READY** message is displayed on the Operator Panel display.	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
(a) 					
(b) 					
(c) 					

2. LOCAL START OF DOCKING – ABNORMAL CONDITIONS

If an object is blocking the view from the Safedock laser scanning unit toward the stop-position of the selected aircraft type, the system will be unable to perform the docking procedure. When an object is detected between the laser scanning unit and the stop-position, the system will halt the docking procedure and display a **GATE BLOCK** warning message. When the blocking object is removed, the docking procedure will be resumed.

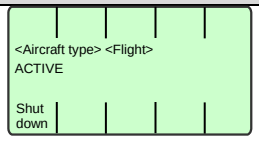
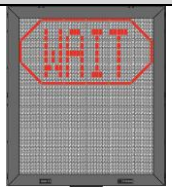
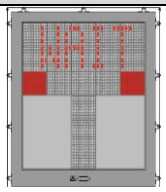
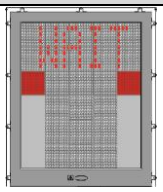
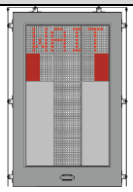
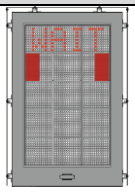
If an unrecoverable error occurs during a docking procedure, a SBU (Safety Back Up) condition exists. In this case an alternate method to guide aircraft to the stop-position must be used, as the docking procedure cannot be completed. SBU stop conditions are:

(a) The aircraft is far off the centreline and less than 2m to the stop-position.
(b) The view from the laser scanning unit to the aircraft is blocked with less than 2m to the stop-position.
(c) A hardware failure has occurred.

WARNING! AN OBJECT MUST NEVER BE PLACED IN FRONT OF THE SAFEDOCK UNIT AND CLOSER THAN 1.5 METRES TO THE LASER WINDOW. SUCH AN OBJECT WOULD VIOLATE PROPER DOCKING PERFORMANCE!

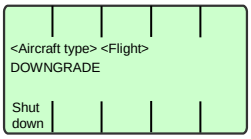
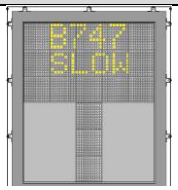
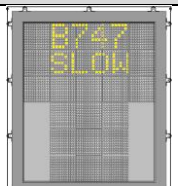
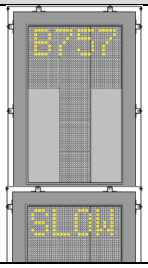
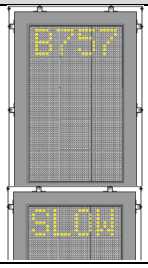
2.1 LOST AIRCRAFT DETECTION

Description	Position
If the detected aircraft is lost during docking, before 15m to stop-position, the display shows **WAIT**. The docking continues as soon as the system detects the aircraft again. During penetration into the stand, the aircraft geometry is checked. If, for any reason, aircraft verification is not made 15m before the stop-position, the Pilot Display shows **STOP** and **WAIT**. ***Note**: This may only be a system event and not a fault. The system requires time for safety checks, apron sweeps, aircraft capture and ID checks before the closing rate to stop-position (to analyse the possible cause of the incident, see § 2.5.2 Event or Fault Diagnosis in this Chapter).*	Aircraft stops and waits as directed by the Pilots Display.

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

2.2 BAD WEATHER CONDITIONS

Description	Position
During heavy fog, rain or snow, the visibility for the docking system can be reduced. When the system is activated and in Capture mode, the Pilot Display disables the floating arrows and shows **SLOW** and the Aircraft type. As soon as the system detects the approaching aircraft, the vertical closing-rate bar appears. If the system has been configured in this mode, to make a shortened ID verification (check of engine position excluded), the aircraft symbol blinks to give attention. ***Note**: THE PILOT MUST NOT PROCEED BEYOND THE BRIDGE, UNLESS THE CLOSING-RATE BAR IS SHOWN. Failing this, the ground operator must press the Emergency-Stop button to abort the docking.*	Aircraft proceeds into the gate area at a reduced speed as directed by the Pilot Display.

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

2.3 OVERSHOOT

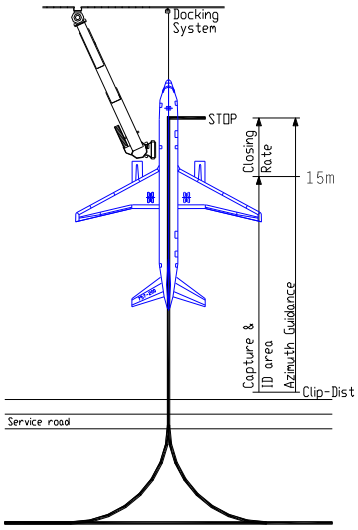
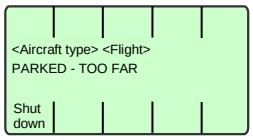
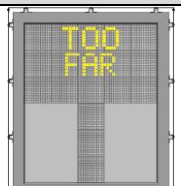
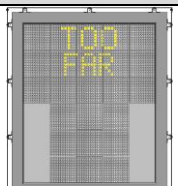
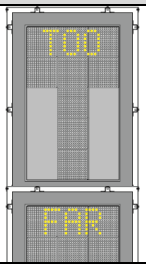
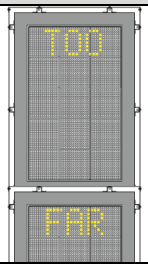
Description	Position
If the aircraft overshoots the stop-position with a configurable distance, the Pilot Display displays **STOP** (with RED border/bars) followed by **TOO FAR** after the aircraft comes to a complete stop.	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

2.4 STOP SHORT

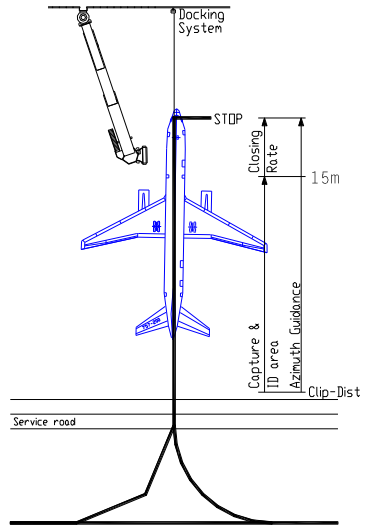
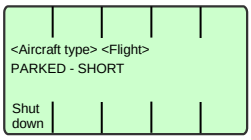
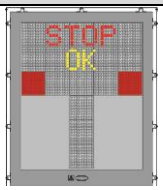
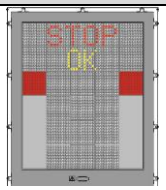
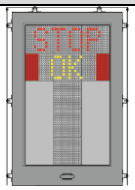
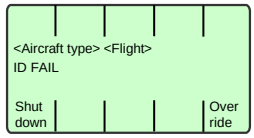
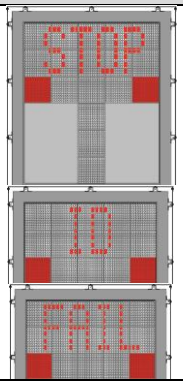
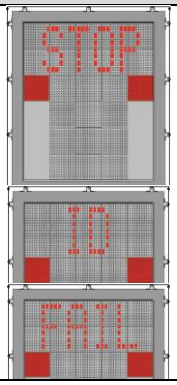
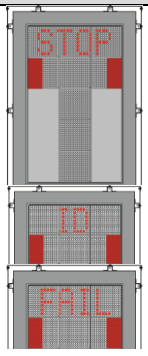
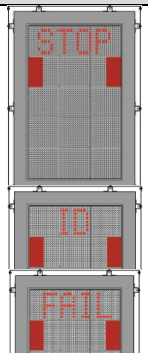
Description	Position
If the aircraft is found standing still, within a configurable distance up to 5 m short of the stop-position, the message **STOP** and **OK** will be shown after a configurable amount of time.	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

2.5 FAILED AIRCRAFT VERIFICATION (ID FAIL)

Description	Position
After capture of the aircraft, its geometry is checked against a stored profile. If, for any reason, aircraft verification is not confirmed 15m before the stop-position, the Pilot Display will show **STOP** followed by **ID FAIL**. Below there is a list of errors that can be displayed on the Operator Panel and a short description: • **Geometry failed** - Geometry check failed within ID Fail limit • **Nose height failed** - Nose height check failed • **Engine verification** - Engine verification failed • **Profile failed** - Profile check failed • **Lost track** - Lost track close to stop ***Note**: (option) Docking can be resumed without verification; however it is important to follow the information below. Alternatively, the aircraft shall be marshalled-in or towed-in to the gate.* **WARNING! THE PILOT MUST NOT PROCEED BEYOND THE BRIDGE WITHOUT MANUAL GUIDANCE, UNLESS THE WAIT MESSAGE HAS BEEN SUPERSEDED BY THE CLOSING RATE BAR.** ***Note**: This may be a system event or a fault (to analyse the possible cause of the incident, see § 2.5.2 Event or Fault Diagnosis in this Chapter).*	Gate area: Empty (aircraft is on the ground en route to gate).

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

2.5.1 Override ID FAIL

The override function is designed to resolve an aircraft verification problem during an active docking procedure.

WARNING! THE OVERRIDE FUNCTION GIVES THE OPERATOR RESPONSIBILITY FOR AIRCRAFT VERIFICATION, AS A TEMPORARY SOLUTION TO AN EVENT/FAULT RECOGNISED BY THE SYSTEM.

When using the override function, these instructions must be followed:

- Make sure the stand area is clear of any obstructions such as vehicles, apron or other objects which may obstruct the aircraft, including wings or engines.
- Check for the correct stop-position (ground markings).

- Observe the aircraft docking.
- Make sure pilots approach at a cautious speed.
- Be prepared to push the “Emergency-Stop” button, if required or unsure. If the “Emergency-Stop” button is pushed, arrange for the aircraft to be marshalled-in or towed-in to the gate.
- After a docking is complete, always diagnose/resolve an **ID FAIL** message as soon as possible.

2.5.2 Event or Fault Diagnosis

The system requires time for safety checks, apron sweeps, aircraft capture and ID checks before the closing rate to stop-position appears on the Pilot Display.

Examples of events are:

- The aircraft was selected too late.
- An incorrect aircraft type was selected.
- An incorrect aircraft was on approach to the wrong gate.
- There was a temporary obstruction (such as a service vehicle).

Frequent events may also be due to configuration or hardware problems.

- Check log files as soon as possible after an **ID FAIL** to interpret the cause of the message.
- Resolve the cause of an **ID FAIL** message (event or fault) before future aircraft docking.

Diagnosis/resolution of an event/fault improves:

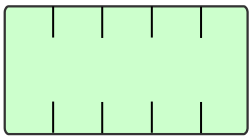
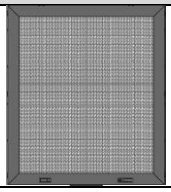
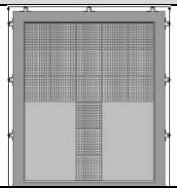
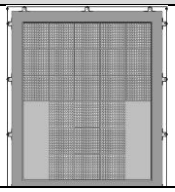
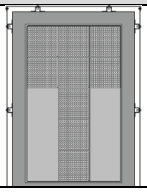
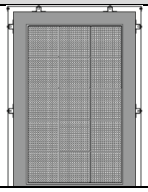
- operational efficiency (future docking procedures)
- safety (understand/avoid potential risks)
- maintenance (pro-active troubleshooting)

For more information, see:

- the Maintenance, Troubleshooting or Configuration sections
- the Safedock Manual
- www.safegate.com or contact support.

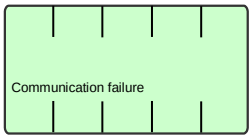
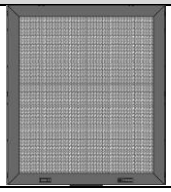
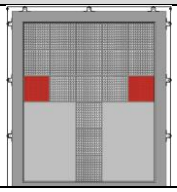
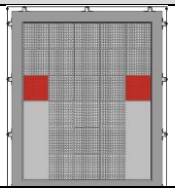
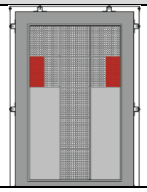
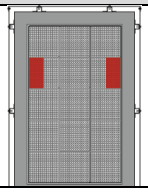
2.6 POWER FAILURE

Description	Position
In case of a power failure, the display will be completely black. A manual backup procedure must be used for docking guidance.	Aircraft stops and waits as directed by Airport Authorities.

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

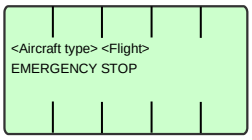
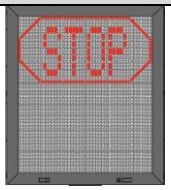
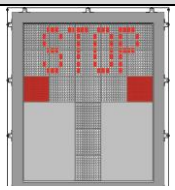
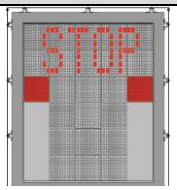
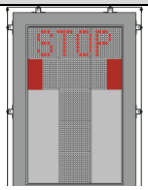
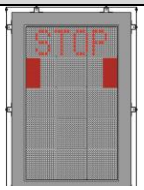
2.7 SYSTEM BREAKDOWN

Description	Position
In case of a severe system failure, the display will go black (T1), except for a red stop indicator (T2/3). A manual backup procedure must be used for docking guidance.	Aircraft stops and waits as directed by Airport Authorities.

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

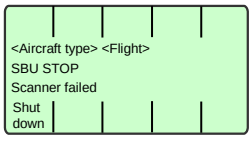
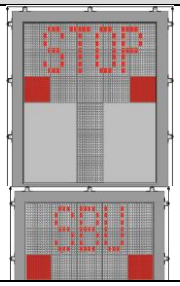
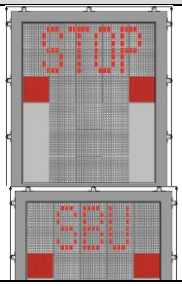
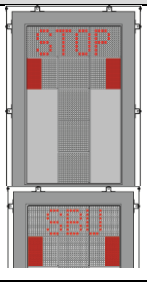
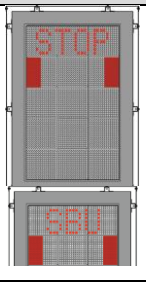
2.8 EMERGENCY-STOP

Description	Position
When the Emergency-Stop button on the Operator Panel is activated, the Pilot Display shows **STOP** (with red border/bars). ***Note**: Additional Emergency-STOP buttons (other than that on the Operator Panel) may be connected to the system at the apron level.*	Aircraft stops and waits as directed by Airport Authorities.

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

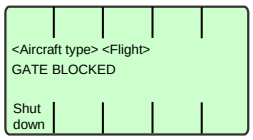
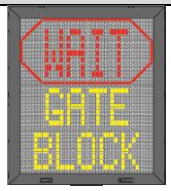
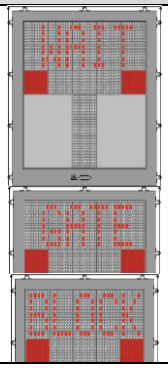
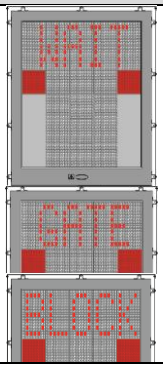
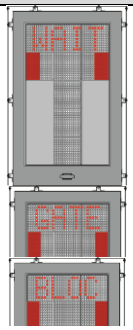
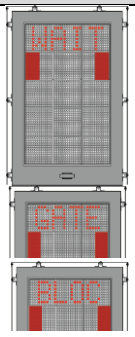
2.9 SBU STOP

Description	Position
Any unrecoverable error during the docking procedure generates a Safety Backup (SBU) condition. The display shows the text **STOP**. A manual backup procedure must be used for docking guidance. Below there is a list of errors that can be displayed on the Operator Panel and a short description: • **No scan request** - Geometry check failed within ID Fail limit • **Scan failed** - Scanning attempt failed • **Scan too slow** - No scanning reply within reasonable time • **Positioning error** - Mirror positioning error • **Scanner not ready** - Scanner not ready • **Lost track** - Lost track close to stop • **Too far from CL** - Too far from centreline	Aircraft stops and waits as directed by the Pilot Display.

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

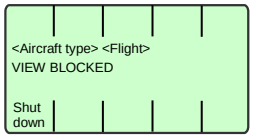
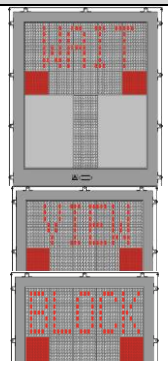
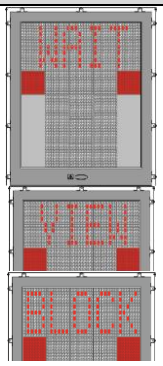
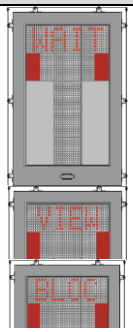
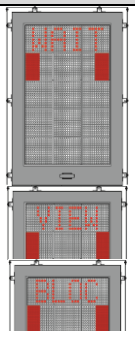
2.10 GATE BLOCKED

Description	Position
If an object is found to be blocking the view from the Safedock unit towards the aircraft, and closer than the stop-position, this will be reported as a blocking object and the Pilot Display enters a **WAIT** state. **WARNING! THE PILOT MUST NOT PROCEED BEYOND THE BRIDGE WITHOUT MANUAL GUIDANCE, UNLESS THE WAIT MESSAGE HAS BEEN SUPERSEDED BY THE CLOSING RATE BAR.**	Aircraft stops and waits as directed by the Pilot Display.

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

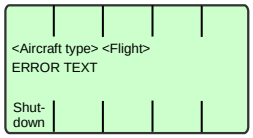
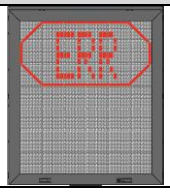
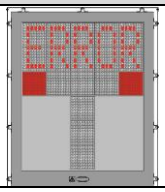
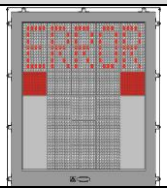
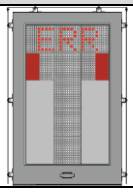
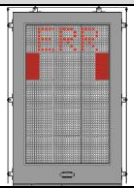
2.11 VIEW BLOCKED

Description	Position
If the view towards the approaching aircraft is hindered, for example by dirt on the Pilot Display window (<2.5 m to the laser), the Safedock system reports a **VIEW BLOCK** condition. Once the system is able to see the aircraft through the dirt, the message is replaced with a closing rate display. **WARNING! THE PILOT MUST NOT PROCEED BEYOND THE BRIDGE WITHOUT MANUAL GUIDANCE, UNLESS THE WAIT MESSAGE HAS BEEN SUPERSEDED BY THE CLOSING RATE BAR.**	Aircraft stops and waits as directed by the Pilot Display.

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

2.12 CONFIGURATION ERROR

Description	Position
Any error related to system configuration that occurs during the docking operation generates an error message in the Operator Panel and an error in the Pilots Display. If it occurs during docking, the red/Stop bars will also light-up (generally an SBU-Stop in such cases). Below there is a list of errors that can be displayed on the Operator Panel and a short description: • **Aircraft data** - Failed to load aircraft data • **Centreline data** - Nose height check failed • **Centreline points** - Failed to create aiming points along centreline • **Ground data** - Failed to create ground level data • **System integrity** - System integrity failure • **Apron scan data** - Failed to load apron scan data • **Walk-test required** - Walk-test required • **Clip too short** - Clip too short	Aircraft stops and waits as directed by the Pilot Display (if the error occurs during docking).

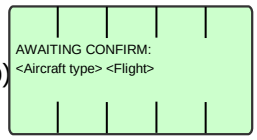
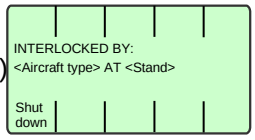
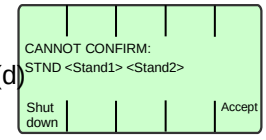
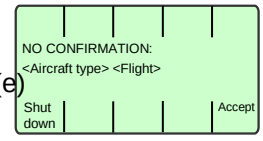
Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
					

2.13 REMOTE START OF DOCKING – FROM SUPERIOR SYSTEM (OPTION)

Basic docking procedures are complemented with Superior System. All basic docking commands can be controlled remotely via Superior System or locally, if required.

2.13.1 Start of Docking with Interlocking Stands

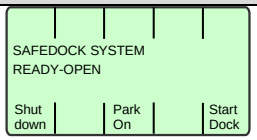
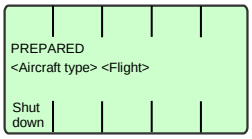
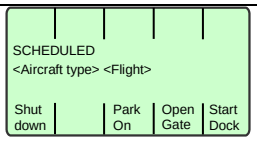
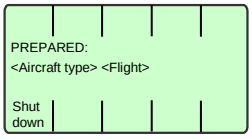
Description	Position
A docking procedure can be preceded by a check for one or more interlocking adjacent stands. If this option is enabled, the following steps will take place: (a) Any steps performed before the docking normally starts will be performed as before. (b) When the docking is about to start, the system will ask for confirmation from Superior System. If the system receives a confirmation the docking will start normally. The message **Awaiting Confirm** will be shown, when the request is sent to Superior System. (c) If there are any interlocking adjacent stands, the docking will be halted, and the information about the first interlocking stand will be shown. This blockade cannot be overridden. (d) If Superior System is unable to verify the state of one or more stands, the first two stands will be shown. This blockade can be overridden by pressing the **Accept** key. (e) If the system is unable to contact Superior System for confirmation, a message is shown. The docking can be initiated, without Superior System confirmation, by pressing the **Accept** key.	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
(b) 					
(c) 					
(d) 					
(e) 					

2.13.2 Start of Docking with Activation

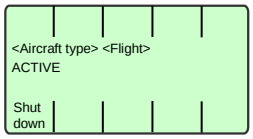
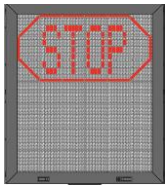
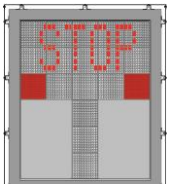
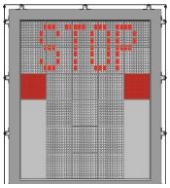
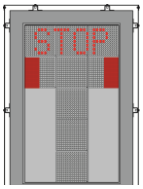
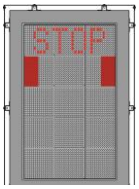
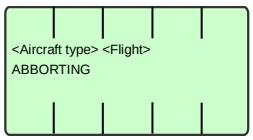
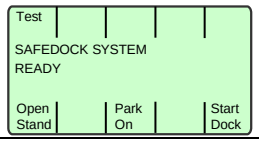
2.13.2.1 Preparing a Docking

Description	Position
A docking procedure is prepared by sending the aircraft information to Safedock, and to have the Safedock operator confirming that the stand is ready to accept an aircraft. (a) If the Safedock operator confirms the stands readiness before the aircraft information is available: i. When the Safedock operator confirms the stands readiness by pressing the **Open Stand** key, the message **Ready-Open** will be displayed on the Operator Panel. ***Note**: A system set in the Ready-Open state automatically returns to a Ready state after 30 minutes.* ii. When the scheduled flight information is made available from the Superior System the message **Prepared** will be displayed on the Operator Panel. iii. The system is now awaiting activation of the docking procedure. The only operation available to the local operator at this time is to abort the prepared flight. The activation command must come from the Superior System. (b) If the aircraft information is made available from the Superior System before the Safedock operator confirms the stands readiness: i. When the scheduled flight information is made available from the Superior System the message **Scheduled** will be displayed on the Operator Panel. ii. When the Safedock operator confirms the stands readiness by pressing the **Open Gate** key, the message **Prepared** will be displayed on the Operator Panel. If the Safedock operator presses the **Start Dock** key, the docking procedure will be started for the scheduled flight. iii. The system is now awaiting activation of the docking procedure. The only operation available to the local operator at this time is to abort the prepared flight. The activation command must come from the Superior System.	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
(a) (i)  (a) (ii) 					
(b) (i)  (b) (ii) 					

2.13.2.2 Docking Abort Command

Description	Position
The Safedock operator may abort the scheduled/prepared docking, when the operator understands that the approaching aircraft is not according to the type assigned. (a) The **Abort docking** command is initiated by pressing the **Shutdown** key. (b) The message **ABORTING** will appear on the Operator Panel and **STOP** on the Pilot Display. (c) Now a new docking process can be started as described in § 1 Local Start of Docking – Regular Conditions (or § 2 Local Start of Docking – Abnormal Conditions, if applicable).	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
(a) 					
(b) 					
(c) 					

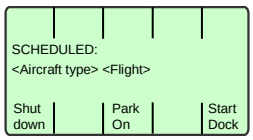
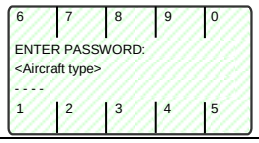
2.14 REMOTE START OF DOCKING – FROM FIDS (OPTION)

Basic docking procedures are complemented with both Superior System and FIDS. All dockings can be managed and controlled based on information from FIDS as well as basic docking commands controlled remotely via Superior System or locally, if required.

***Note**: <Flight> indicated in the windows below, will be displayed at Safedock only if available from FIS, and if docking is not started locally.*

2.14.1 The Schedule Command

Description	Position
Normally scheduled flights are inserted into the Superior System database by FIS. At a time prior to arrival a **Scheduled** command will be issued to Safedock system from Superior System. (a) When the Superior System has initiated docking for a scheduled flight, the Operator Panel will display a **SCHEDULED** message. (b) The operator now has two options: to abort or confirm the docking process. (c) The docking of the scheduled flight is confirmed by the Marshal pressing the **Start Dock** key. This operation requires an operation-level password, (if configured, option). (d) (Option) A correct password will start a docking.	

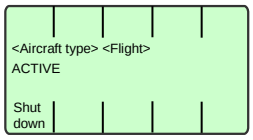
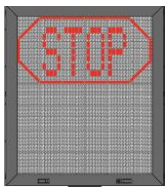
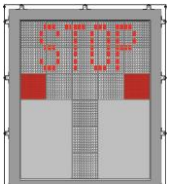
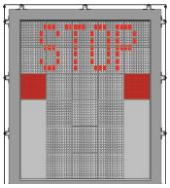
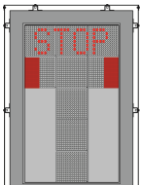
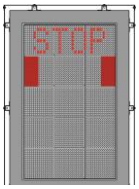
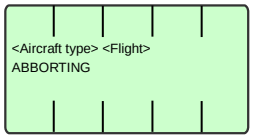
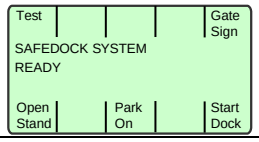
Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
(a) 					
(c) 					

2.14.2 Automatic Docking

Normally scheduled flights are inserted into the Superior System database by FIS. At a configured time prior to arrival, the docking procedure can be set to start automatically.

2.14.3 Docking Abort Command

Description	Position
The Safedock operator may abort the scheduled/prepared docking, when he understands that the approaching aircraft is not according to the type assigned. (a) The **Abort docking** command is initiated by pressing the **Shutdown** key. (b) The message **ABORTING** will appear on the Operator Panel and **STOP** on the Pilot Display. (c) Now a new docking process can be started as described in § 1 Local Start of Docking – Regular Conditions (or § 2 Local Start of Docking – Abnormal Conditions, if applicable).	

Image Operator Panel	Image Pilot Display				
	T1-42	T2-18	T2S-24	T3-9	T3-15
(a) 					
(b) 					
(c) 					

CHAPTER 3 OPERATION - APPENDIX B
SAFEDOCK FEATURES (OPTIONS)
CONTENTS

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1. SAFEDOCK OPTIONS

This Appendix is a summary of all optional operational features, available with the Safedock system. In sections describing a feature, it is usually stated that the Safedock system “is equipped” or “is configured” in a particular way. However, not all these statements may be relevant for a particular customer system. They are merely options and/or alternatives.

A Safedock system normally includes only the features that are specified for a particular customer’s requirements. This appendix covers all features and options that may be delivered in a system, and is a subset of Chapter 3 OPERATION.

For more information, contact site or project management, Safegate or see *www.safegate.com*.

The features described are related to the following categories:

(a) Data entry
(b) Displayed information during docking
(c) Centreline
(d) Safety procedures
(e) Interaction with optional or external equipment
(f) Apron Scan (for T1 only).

2. DATA ENTRY

To control the Safedock system, the following options for manual data entry are available:

(a) User passwords
(b) System access
(c) The 'Open Stand' command

2.1 PASSWORD ENTRY

The Safedock system can be equipped to use password protection for operations.

How to create users and passwords is described in Chapter 4A Stand Configuration Utility.

Safedock system would require a four-digit password at the following commands:

(a) Local Start-of-Docking (by assigning an aircraft type)
(b) Local Park ON or Park OFF (creating Blocks On and Blocks Off transactions)
(c) Confirmation of a Scheduled Flight Start-of-Docking Command from Superior System
(d) Diagnostic Test Procedure (requires a maintenance operator password; will be described elsewhere)

Activities that do not require a password are:

(a) Emergency Stop
(b) Shutdown
(c) Chocks On message to pilot

2.1.1 Operator Password

The system can be configured with operator level password protection. The Safedock system will then require all operator interactions except Shutdown and Emergency-Stop to be confirmed using a four-digit confirmation code. The confirmation codes are configurable per Safedock system. Password configuration is described in Chapter 4A Stand Configuration Utility.

2.2 SYSTEM ACCESS

The system can be configured to require activation of a hardware signal in order to allow local operation of the system. This hardware signal can for instance be generated by a key switch or a card-swipe access control system.

2.3 THE "OPEN STAND" COMMAND

The **Open Stand** command is issued by a local operator to acknowledge that the stand area is empty and ready to accept an aircraft. This command can be used to accept a scheduled docking, initiated by the Superior System, or to set the stand status to **Free-Open**, allowing remote start of a docking procedure from a Superior System. The **Open Stand** command can be assigned to a button on the Operator Panel or to an external button.

A system set in the **Ready-Open** state automatically returns to a **Ready** state after 30 minutes.

3. PARK OFF SCAN

Once every minute (unless changed by a connected Superior System) while in **PARKED** status the system will perform a Park OFF scan.

During the Park OFF scan, the system will try to match the profile for the currently parked aircraft with the aircraft in front of the system. If the system doesn't see any aircraft, it performs a Park OFF operation. Note that parking vehicles, such as a truck, might cause the system to consider the aircraft being still present.

4. DISPLAYED INFORMATION DURING AND AFTER DOCKING

Displayed information during the docking procedure is related to variants of the following functions:

(a) Slow
(b) Digital Closing Rate
(c) Chocks On
(d) Chocks Off
(e) Stand Sign
(f) PCA/GPU status

4.1 DIGITAL CLOSING RATE (OPTION)

The Safedock system can be equipped/ configured to display the distance remaining to the stop-position using a digital distance display.

The digital distance display is only active for the last part of the docking procedure. On a two-line text display, the aircraft type will be displayed on the top line and the distance to stop, on the bottom line. On a single-line display, the aircraft type will be replaced by the distance-to-stop information.

4.2 CHOCK ON (OPTION)

The Safedock system can be equipped/configured to use the display to give a **CHOCK ON** message to the pilot, when the chocks have been placed on the wheels.

The message can be activated either from the Operator Panel, or from an external switch mounted at apron level. The message will remain on the display for a configurable period of time (default: 2 minutes).

4.3 CHOCK OFF (OPTION)

The Safedock system can be equipped/configured to use the display to give a **CHOCK OFF** message to the pilot, when the chocks have been removed from the wheels.

The **CHOCK OFF** message uses the same activation method as the **CHOCK ON** message. The two messages will alternate on pressing the dedicated button. The duration of the message is as for the **CHOCK ON** message.

4.4 STAND SIGN

The display of the Safedock system can be utilised as a general-purpose Stand Sign display between docking procedures.

The information that can be displayed includes: *Stand ID*, *Current Time* and alternating *Time/Stand ID*.

4.5 PCA/GPU STATUS

The Safedock system can be equipped to present text messages on the Pilot Display in response to hardware signals. This can be used to give for instance information messages on connection/disconnection of PCA and GPU systems.

The messages will remain on the display for a configurable period of time.

5. UNINTERRUPTABLE POWER SUPPLY

The Safedock system can be equipped with an Uninterruptable Power Supply (UPS) unit. The purpose and capacity of UPS is to finish off initiated activities (only) during loss of main power.

The UPS is designed to keep the system running for at least 20 minutes without external power when fully charged.

When the system is running on UPS, the following conditions apply:

- Any docking operation in progress is allowed to continue to completion.
- An information message will be displayed – **Blocked by UPS**
- No more docking operation can be activated until mains power is restored.
- After running on UPS while Safedock is idle is the default setting 5 min.

6. CENTRELINE

6.1 MULTIPLE CENTRELINES

The Safedock system is configured to use multiple centrelines. Up to three centrelines per system can be defined and used. The centrelines need not be parallel. The centreline to be used is determined individually per aircraft type. This configuration is described in Chapter 4A Stand Configuration Utility.

6.2 CURVED CENTRELINES

The Safedock system is configured to also use curved centrelines. Up to three centrelines per system can be defined and used. The centreline to be used is determined individually per aircraft type. This configuration is described in Chapter 4A Stand Configuration Utility.

7. AIRCRAFT SAFETY CHECK

The Safedock system includes the Aircraft Safety Check feature, which is a further enhancement of its safety performance. Aircraft geometry is analysed by means of a true 3D measuring technique, thus bringing safety risk to a minimum.

When a particular aircraft type has been assigned with the start-of-docking command, and another type of aircraft is approaching the stand in reality, there is a risk for a collision with fixed ground equipment, the Passenger Boarding Bridge or the terminal building. However, several mistakes should have been made before such an accident would occur:

- the correct type of aircraft has not been assigned by the operator
- the pilot has not discovered that an incorrect aircraft type is displayed on the docking system
- the incoming aircraft geometry differs from the assigned one in a negative and dangerous way

With the Aircraft Safety Check feature the approaching aircraft's geometry is analysed and compared to parameters of the aircraft type that was assigned with the start-of-docking command.

If the aircraft geometry has not been verified within 15 metres from the stop-position, the Pilot Display will show **STOP/ID FAIL**.

As the requirements for permitting the aircraft to enter the stand are more restricted by a Safedock system using this feature, the **STOP/ID FAIL** message may be shown also if the aircraft is approaching diagonally or too fast.

7.1 EXTENDED ID FAIL LIMIT

Each aircraft can individually be configured to use an extended ID Fail limit of up to 25 metres to the stop-position. This option is described in more details in Chapter 4A Stand Configuration Utility § 4.7.1.

8. INTERACTION WITH EXTERNAL EQUIPMENT

The following operational features are available as options:

(a) Dead Man's Grip
(b) Bridge In Position
(c) Alarm Signal
(d) Docking in Progress Signal
(e) Push-Back Data Transmission

8.1 DEAD MAN'S GRIP

The Safedock system can be equipped to use a 'dead man' grip function. This function forces the operator of the Safedock system to keep a switch depressed throughout the docking process, when the aircraft is present. If the 'dead man' switch is deactivated at any time during the docking procedure, and the aircraft is present, the docking will be aborted, displaying **ABORTING/DEADMANS GRIP RELEASED** on the Operator Panel and **STOP** on the Pilot Display, as if the operator had activated the "OFF" key.

Once the aircraft has reached the stop-position, the operator can release the 'dead man' switch without affecting the operation of the system. If the 'dead man' grip is released before the aircraft appears at the stand, Safedock will display **WAIT** until the 'dead man' grip is pressed again.

8.2 STAND EQUIPMENT INTERLOCK

The Safedock system can be configured to require confirmation from relevant stand equipment such as PBB, fuel pits etc. in order to prevent hazardous situations. If any equipment is found to be in the incorrect position, the message **Stand Equipment Interlock** will be displayed on the Operator Panel and a warning message on the Pilot Display. The confirmation can be enabled per aircraft type at the stand. The equipment interlock logic is configurable per aircraft type, allowing for any combination of bridge settings at a single stand.

8.3 ALARM SIGNAL

The Safedock system can be equipped with a potential free alarm output for connection to an external alarm system. The alarm output will be activated on any error detected by the Safedock system. Alternatively, a Superior System can be used to collect error messages from the Safedock systems and forward them to a central alarm handling system.

8.4 DOCKING IN PROGRESS SIGNAL

The Safedock Operator Panel is equipped with a potential free output used to indicate that a docking procedure is in progress. A "docking in progress" signal can be used by external systems when there's a need to know that a docking procedure is activated.

(a) A light control system can use the "docking in progress" signal to automatically activate the lead-in lights at the stand when a docking procedure is activated.
(b) The bridge control system can use the "docking in progress" signal to inhibit any outward movement of the bridge during a docking procedure.

8.5 PUSHBACK DATA TRANSMISSION

The Safedock system can be equipped with a feature to track an aircraft during the pushback procedure. The distance information gathered during pushback is forwarded

to a ground radar system (via Superior System), allowing the radar system to start tracking the aircraft, where it would normally be unable to track because of the radar shadow in the proximity of the terminal building.

8.5.1 Manual Activation

The bridge operator can start the pushback procedure manually by activating the **Park ON/OFF** button.

8.5.2 Automatic Activation

The bridge and GPU supply systems are connected to the Safedock system, allowing the Safedock system to automatically start the pushback procedure when it detects that the bridge is retracted and the GPU supply is disconnected.

9. APRON SCAN

The purpose of the apron scan functionality is to enhance normal Safedock T1 A-VDGS stand safety verification by scanning the stand area for unidentified or foreign objects. The function detects and locates objects before a docking is about to be initiated and an aircraft arrives at the stand. This automated functionality also minimizes the risk of human error by ensuring that the stand is clear from objects before opening it for a docking procedure.

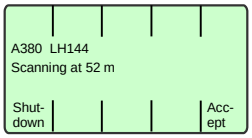
Note: This function is applicable for T1 model only.

9.1 APRON SCAN OPERATION

The apron scan function is designed for two different phases of the docking: during start-up and capture.

9.1.1 Operation during Start-up

When the docking is initialized, the system performs a full and detailed scan of the specified scan area. The sequence starts at a distance away from the stand towards the taxiway. It then works its way in closer to the stop position. The current position of the scan appears in both the Pilot Display and Operator Panel.

Pilots Display	Operator Panel
	

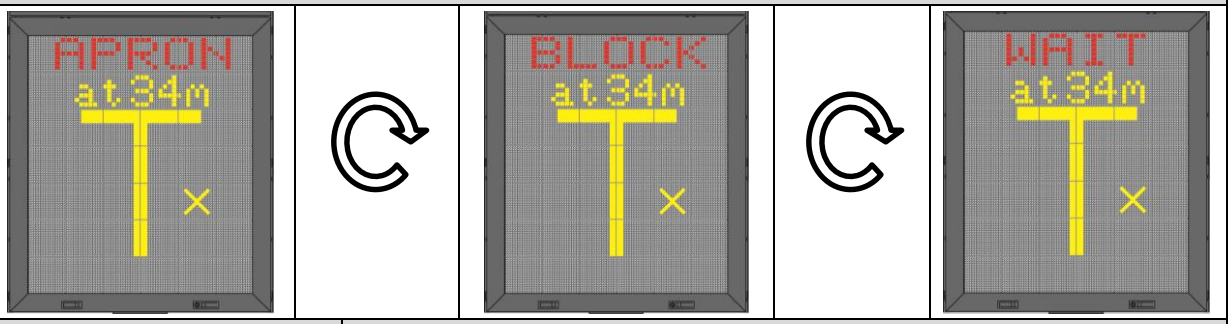
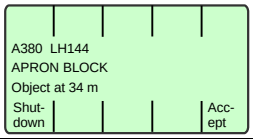
If any object is detected, the system locks on to it and continues to track it until it is removed or disappears. When the system locks on to an object, this is communicated to the ground crew and pilots in the Pilot Display and Operator Panel as in the figures below.

When the object is removed, the scan re-starts and continues until it manages to scan the apron without object detection. If an object detection occur during the apron scan, two different options become available for selection in the Operator Panel:

- **Shut Down**: press to shut down the docking.
- **Accept**: press to accept the existence of the detected object in the area and the scan aborts (an override) and the docking sequence starts without any further scan being performed.

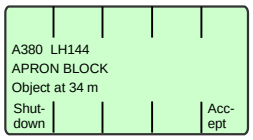
***Note**: These functions are also available even if no object is detected so the scan can be aborted (accept object) to speed up the start of the docking.*

WARNING! RESPONSIBILITY FOR USE OF THE ACCEPT FUNCTION MUST BE GIVEN BY AN AUTHORIZED PERSON.

Pilot Display example	
	
Operator Panel example	**Description**
	An object is detected 34.0 meters from the Safedock, in the approximate position of the X, in reference to the centreline. The message APRON BLOCK and WAIT alternates in the Pilot Display and APRON BLOCK Object at 34 m appears on the Operator Panel.

9.1.2 Operation during Capture

During capture mode, the system is waiting for the aircraft to arrive and it shows the ***Welcome in*** screen in the Pilot Display. During this period, the defined area will be scanned with a lower scanning rate, as the main focus now is to detect an incoming aircraft. If an object is detected, this is communicated in the same way as the initial scan.

Operator Panel example	
There are two different options available in the Operator Panel: • **Shut Down**: Press the softkey to shut down the docking. • **Accept**: Press the softkey to accept the detected object and abort the scan for the docking sequence to start without any further scan being performed.	

9.2 APRON SCAN SPECIFICATIONS

9.2.3 Scan area

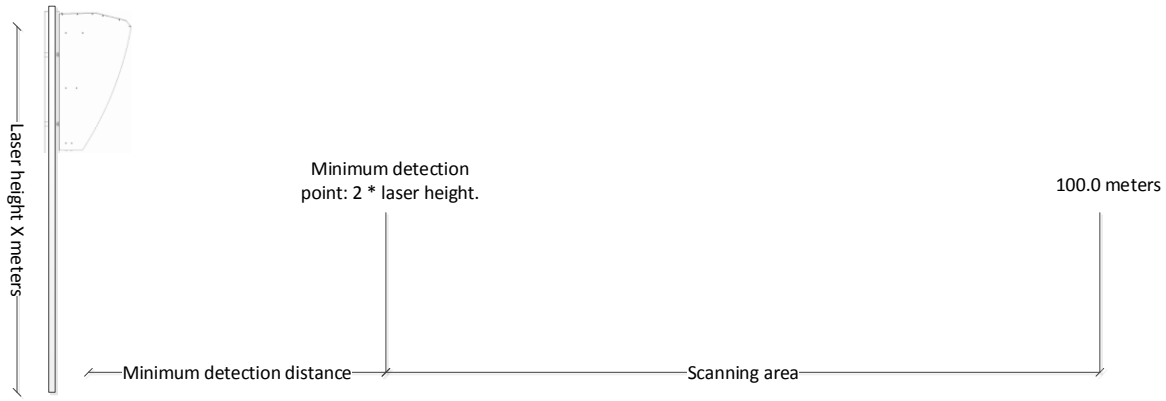
The areas where the apron scan functionality is available for use are defined as: the Primary scanning area and the Secondary scanning area.

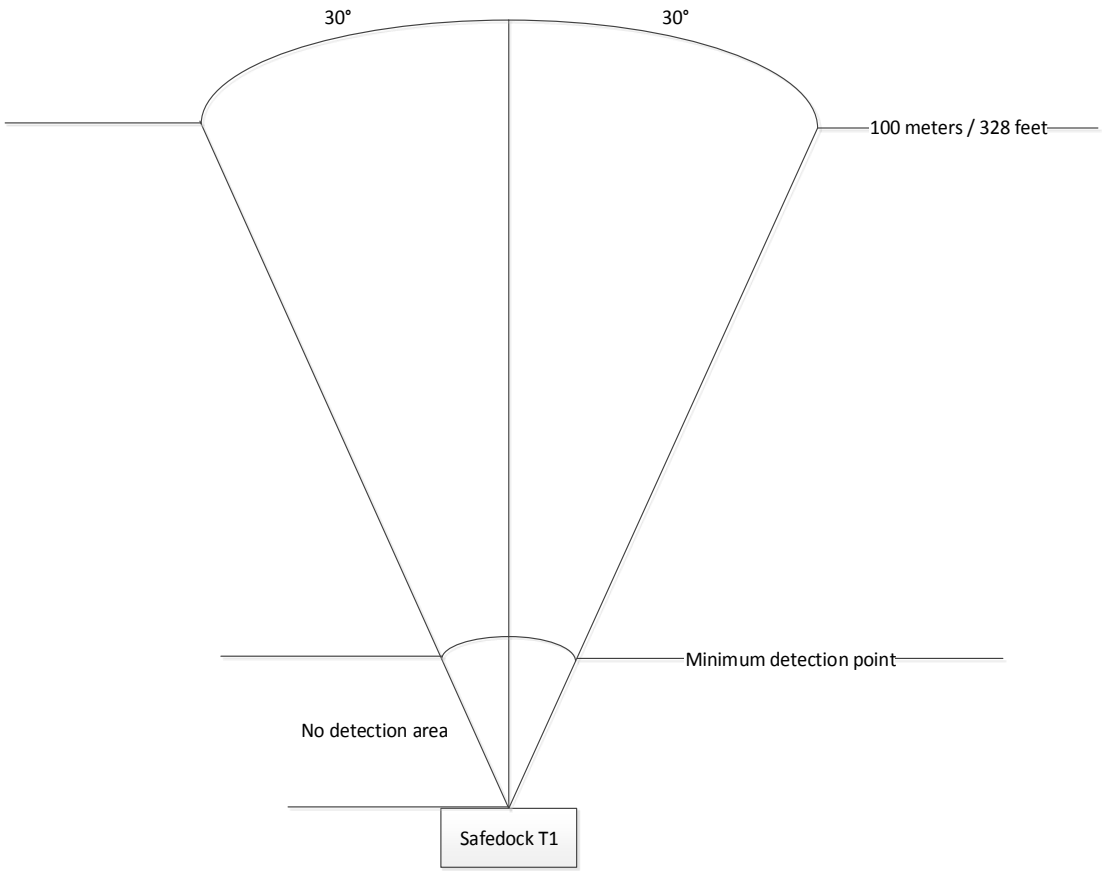
During operation, the area being scanned corresponds the area from the nose position of the expected aircraft type when parked and further out. The boundaries from the stop position and further out, length and width are defined in the Safedock Maintenance Tool per configured centreline.

The minimum detection distance is twice the laser height. For example, for a laser installed at 6 meters above ground this will be equal to a minimum detection distance of 12 meters. Objects closer than the minimum detection distance cannot be detected.

The primary scanning area is defined by the minimum detection point and the by maximum recommended stop position with +- 30° from Safedock center of view.

Image examples





9.2.4 Operational scan

A scan is only done in the area between the configured nose stop-position for the selected aircraft type and the configured clip distance or 100 m, whichever is the shortest.

9.2.5 Scan sequence

A full scan is performed during the start-up of a docking.

A reduced scan is performed when the system is in capture mode, while waiting for the aircraft to arrive to the gate.

9.2.6 Detectable object size

Object size detection in primary area:

- Full scan during start-up, before Safedock goes to **ACTIVE**: 1.0 m x 1.0 m.
- Reduced scan during capture, before **TRACKING**: 1.0 m x 1.0 m.

Object size in secondary area:

- Full scan during start-up, before Safedock goes to **ACTIVE**: 1.5 m x 1.5 m.
- Reduced scan during capture, before **TRACKING**: 1.5 m x 1.5 m.

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CHAPTER 4
MAINTENANCE
CONTENTS

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1. INTRODUCTION

1.1 SCOPE

This document is a description of the maintenance of an individual Safedock system, being a part of the parking system at an airport. In this perspective the main tool for stand set-up and Safedock configuration is a laptop computer, which can be connected to each docking system at the apron.

The description includes:

(a) Safedock set-up
(b) Planned maintenance
(c) Corrective maintenance
(d) Troubleshooting
(e) Replacement of malfunctioning units

When Safedock units are integrated with a Superior System, any Maintenance Workstation on the LAN can be used as a configuration tool.

2. SAFEDOCK SET-UP

The Safedock system has to be set up and configured at mainly the following events:

(a) After initial installation at a stand (configuration and calibration)
(b) After certain corrective activities/ maintenance (recalibration)
(c) After the system by some reason has been forced out of its position (recalibration)
(d) When a centreline is changed or added (calibration)
(e) When a new aircraft type is added (configuration)
(f) When a stop-position is changed (configuration)

2.1 SET-UP PROCEDURES

The Safedock system is set up by the following procedures:

(a) Defining centrelines
(b) Verifying a centreline definition
(c) Setting calibration check points
(d) Configuration (setting aircraft types and their stop-positions and so on)
(e) Removing echoes from fixed object
(f) Storing stand configuration files
(g) Set-up validation, the Walk-Test

For carrying out these procedures, please refer to Chapter 4A Stand Configuration Utility.

3. PLANNED MAINTENANCE

The Safedock system has been specifically designed to minimise maintenance downtime. The following maintenance schedules detail the maintenance requirements on a weekly, monthly, six monthly and twelve monthly basis. The system does not require any further scheduled maintenance, as proving operations are always done automatically prior to any start-of-docking procedure.

Before commencing maintenance the following precautions must be considered:

CAUTION: PROTECTION AGAINST ELECTROSTATIC DISCHARGE

The transfer of static electricity causes electrostatic discharge (ESD) damage when electronic components are handled. It's essential to protect components from electrostatic discharge to avoid damage and extra costs in connections with service and production. Therefore:

(a) All ESD- sensitive materials must be stored in ESD- safe area.
(b) All ESD- sensitive components must be stored in protective packages.
(c) Apply a conductive band around your wrist and connect it to ground before touching any electronic component.

WARNING! ISOLATE THE POWER SUPPLY PRIOR TO UNDERTAKING ANY MAINTENANCE ACTIVITY!

IF A BATTERY BACKUP IS INSTALLED, ALSO THE 24-VOLT DC CURRENT TO THE ELECTRONICS HAS TO BE SWITCHED OFF!

3.1 MAINTENANCE SCHEDULE

Planned or preventive maintenance per time interval is carried out according to the maintenance task lists below. Time intervals are:

(a) Per week
(b) Per month
(c) Per six months
(d) Per year

3.2 WEEKLY CHECK

3.2.1 Laser Unit Windows

(a) Inspect the Laser Scanning unit cabinet front/side windows and Operator Panel for cleanliness.
(b) Clean as required with mild soap and water and a soft rag.

3.3 MONTHLY CHECK

3.3.1 Display Unit Front Glass

(a) Inspect the Pilot Display unit front glass cover and Operator Panel for cleanliness.
(b) Clean as required with mild soap and water and a soft rag.

3.4 SIX MONTHLY CHECK

3.4.1 Laser Scanning Unit Door

(a) Examine the Laser Scanning unit door seal for signs of perishing and security of attachment.

(b) Renew carefully the seal if required. Use a sharp knife and clean with alcohol after removal. Adapt a new rubber gasket, closed cell type (EPDM-SBR), size 15 x 5 mm, available from Safegate.

3.4.2 Laser Scanning Unit Mirrors

(a) Examine the Laser Scanning unit calibration and scanning mirrors for signs of dust, or damage.

(b) Renew mirror if required.

(c) Clean the laser lenses and mirrors with a camera lens cleaning wipe and alcohol.

3.4.3 Operator Panel Emergency-Stop Buttons and Keys

(a) Check the correct function of all Emergency-Stop buttons. Ensure that the Pilot Display indicates **STOP** when the Emergency-Stop button is pressed.

(b) For stands with multiple Emergency-Stop buttons, the above test shall be performed individually for each button.

(c) For adjacent system that share common Emergency-Stop buttons, ensure that both systems Pilots Displays indicates **STOP** when the Emergency-Stop button is pressed.

(d) Check there are no visible signs of wear on the Operator Panel cover (film) and check all keys react with a normal press. For example, press all keys: softkeys (option/function), scroll left/right, CANCEL and ENTER.
***Note**: Press the **Back** softkey before confirming any option/function selection*.

3.4.4 Temperature Sensor

- Check the function of the Temperature Sensor, using the Operator Panel **Test** utility.

3.5 ANNUAL CHECK

3.5.1 Pilot Display/ Laser Unit

(a) Vacuum clean the inside of the Pilot Display unit.

(b) Check fans in the system to make sure they are running properly. Every five year the fans shall be exchanged. Refer to purchase information below.

(c) For T1 only. Change the filters at the air in- and outlets for the display ventilation. Note: the local environments and level of dust may require more or less frequent exchange intervals of these filters.

(d) If the system is equipped with a Battery Backup unit, the batteries must be exchanged every five year. Contact Safegate or see the Spare Parts list.

4. CORRECTIVE MAINTENANCE

The Safedock system has a built-in diagnostic test program that is activated prior to any start-of-docking command. Errors are reported with a code, identifying the kind of fault. Corrective maintenance of the Safedock system is carried out on the basis of these reports.

4.1 FAULT FINDING AND RECTIFICATION

Possible causes of each error and the recommended actions to be taken are presented in § Troubleshooting in this Chapter.

During rectification the procedures described in § 6 Replacement of Malfunctioning Units shall be followed.

4.2 TEST EQUIPMENT

The test equipment used for the set-up of the Safedock system is the Server of the Safedock Central Computer System, provided that the connection to Superior System is established. The software SMT.EXE shall be used for this purpose.

An alternative is to use any laptop computer, which shall be connected to the service outlet of the Operator Panel. Note that the service outlet is an RS-485 port, which means that an interface converter must be used, when connecting to the RS-232 COM port of the laptop computer.

Optionally, a laptop computer can also be connected to a 10BaseT/RJ-45 outlet in the Pilot Display unit. This option also gives the computer access to the Central Configuration Database.

4.3 DIAGNOSTIC TEST FUNCTIONS

The Safedock is equipped with a set of test/ diagnostics functions. To access these functions from the Operator Panel main menu, select **Test** key, enter a password (if configured) and press ENTER. A menu containing all available test functions will then be presented.

Pressing the softkey associated with the desired test function activates the test function. The arrow keys can be used to switch between menu pages. Pressing the **CANCEL** key will bring the system back to normal operation.

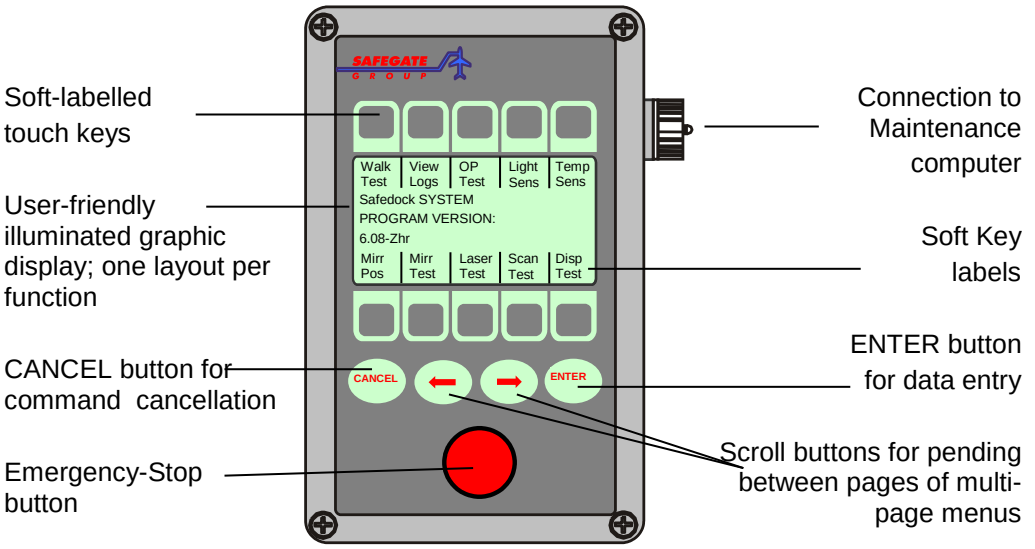


FIGURE 4.1 – OPERATOR PANEL OVERVIEW

The available test and set-up functions are according to the following sections.

4.3.1 Mirror Position Detector Test

This function is used to test the Stepper Motor Driver circuit. If it is functioning properly and the mirrors are in correct position, **OK** will be displayed. Otherwise **FAIL** will be displayed.

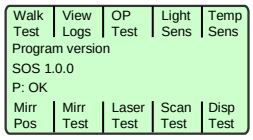


FIGURE 4.2 – MIRROR POSITION DETECTOR TEST

4.3.2 Mirror Test

This function is used to test the home positions for the mirrors.

Both mirrors will be sent to their home positions and a message will display the result.

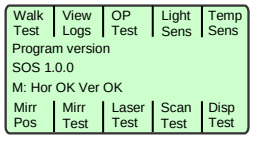


FIGURE 4.3 – MIRROR TEST

4.3.3 Laser Test

This function is used to test for range data from the LRF and mirror motion detection.

A laser scan operation will be performed using each of the mirrors and a message will display the result.

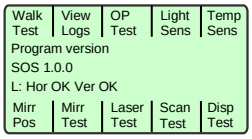


FIGURE 4.4 – LASER TEST

4.3.4 Scan Test

This function is used to test the entire scanner subsystem with mirrors, LRF and monitoring functions.

A full scan operation will be performed using each of the mirrors and a message will display the result including monitor time indicators for each mirror.

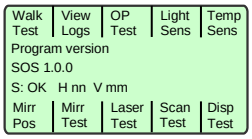


FIGURE 4.5 – SCAN TEST

The time indicators for the mirrors, nn and mm, shall be in the range 100 – 600.

4.3.5 Display Test

There are three available tests for the Pilot display: Board test, Address test and Line test.

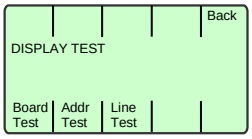


FIGURE 4.6 – DISPLAY TEST

(a) Board Test

This is an automatic test. Each LED board of the Pilot Display will be tested one by one, and the result will be displayed at the Operator Panel. If any LED board is found to be faulty, it will be displayed as a major or minor (individual LEDs) error with its id ‘RC’ where R is row number and C is column number:

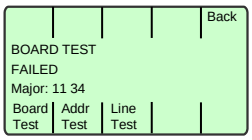


FIGURE 4.7 – BOARD TEST

(b) Addr Test

In address test, a unique character is displayed on each of the display boards, starting with ‘A’ at the top left and continuing in sequence left-to-right and top-to-bottom.

Thus the addressing of the boards can be checked:

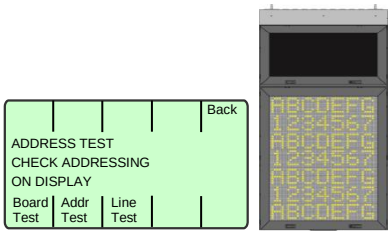


FIGURE 4.8 – ADDRESS TEST

(c) Line Test

The line test is used to light up all the LED's on the display boards, one line at a time. This allows for visual inspection of the individual LED's.

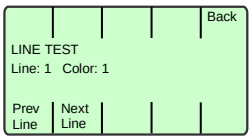


FIGURE 4.9 – LINE TEST

Use the **Prev Line** and **Next Line** keys to step through the lines of the display.

4.3.6 Walk-Test

Walk-test is a system wide test function that exercises all the major features of the Safedock system. It is used to verify the operation of the system, and shall be performed whenever a modification to the system has been made.

In walk-test, an entire docking procedure is performed, docking a person walking in along the centreline in place of an aircraft. When walk-test is activated, a stop-position must be chosen by selecting one of the configured aircraft types. The stop-position for walk-test will be the nose wheel position for the selected aircraft type. In this way, walk-test can be used both to verify the operation of the system, and the configured stop-positions for each aircraft type.

The procedure for performing a walk-test is:

(a) Enter system **TEST** functions and select **WALK TEST**.

If the configuration has been updated for individual aircraft types, the system will suggest an aircraft type to be tested. Walk-test for the suggested aircraft type can be started by pressing the **ENTER** button.

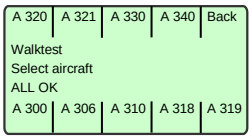


FIGURE 4.10 – WALK TEST

At every entrance to the walk-test function the system will continue to suggest aircraft types until all updated aircraft types have been tested successfully.

The test of any aircraft type's stop-position can be done as described below:

(b) Select an aircraft type using the aircraft selection menu. The selected aircraft type will determine the stop-position for walk-test.

(c) Walk to the start position for 'walk-test', which should be at least 20 metres from the stop-position along the centreline.

(d) Walk toward the system, following the centreline. The system will activate azimuth guidance and closing rate display, as soon as the person is seen by the system.

(e) Follow the guidance information provided by the system, verifying that it closely matches the centreline.

(f) When **STOP** is given, verify that the stop-position matches the desired stop-position (nose wheel position) for the selected aircraft type.

(g) After a successful walk-test the system will automatically terminate the test functions and return to normal operation without further user input.

***Note**: No **SLOW** or **TOO FAR** messages are available during walk-test. As walk-test is looking for a person, a much smaller object than an aircraft, it cannot reliably be used in adverse weather conditions such as rain or snow.*

4.3.7 View Logs

This function is used to display data about the latest docking procedures.

Data from the latest docking procedures are stored on non-volatile memory, and are available for later review.

- The date/ time and aircraft, for the latest logged docking will be displayed as below:

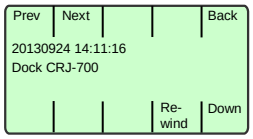


FIGURE 4.11 – NAVIGATE AMONG STORED LOGS

The **Prev** and **Next** keys can be used to navigate among the stored logs. The **Down** key displays the next line of the log sequence while the **Rewind** key is used to restart the sequence from the beginning. The **Back** key can be used to get back to the test function menu.

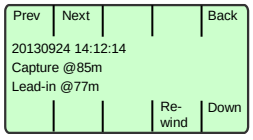


FIGURE 4.12 – DOCKING EVENT

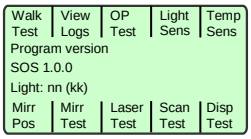
- Use the **Down** key to go through the events that have been saved for this docking. Data saved are: aircraft type, date/time, error during docking, speed at the last slow message, capture distance, ID-verified distance, stop distance, and roll after stop.
- The **Rewind** key will provide a jump back to the beginning of the selected docking.
- By pressing the **CANCEL** button, the test is aborted.

4.3.8 Operator Panel Test

Test of the inputs on the Operator Panel(s) can be performed. The statuses of the 16 digital inputs of the selected operator are displayed as 1 or 0. Use the **Prev Panel** and **Next Panel** keys to select which panels input should be displayed.

4.3.9 Light Sensor Test

This test function is used to check the function of the light sensor that controls the intensity of the Safedock display.



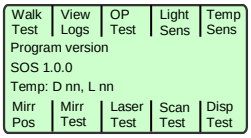
'kk' is the light intensity measured, and 'nn' is the control parameter used.

(3 < nn < 99; 0 < kk < 60000).

FIGURE 4.13 – LIGHT SENSOR TEST

4.3.10 Temperature Sensor Test

This test function is used to check the temperature of the display unit (D) and the scanner unit (L). The display shows the measured temperature, according to the format below:



'nn' is the temperature, in degrees Celsius.

FIGURE 4.14 – TEMPERATURE

4.3.11 Comm info

This test indicates the status of the communication with the superior system.

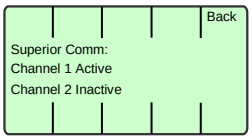


FIGURE 4.15 – COMM INFO

4.3.12 Statistics

This function displays some basic statistics about the system operation.

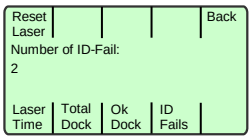


FIGURE 4.16 – STATISTICS

The keys **Laser Time**, **Total Dock**, **Ok Dock** and **ID Fails** switch between the different statistics.
The function **Reset Laser** is used to reset the running time counter for the laser unit. This time should be reset whenever the laser unit is replaced in the system.

4.3.13 Cal Test

This key will activate the system calibration procedure and report the result.

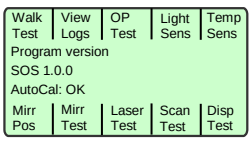


FIGURE 4.17 – CAL TEST

4.3.14 Set IP

The Set IP function is used to inspect and modify the network settings for the system.

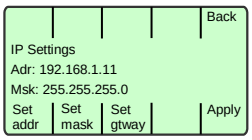


FIGURE 4.18 – IP SETTINGS

Press the Set xxx key to modify the IP-address, network mask and Gateway address respectively.

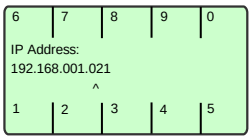


FIGURE 4.19 – IP ADDRESS SETTING

Enter new digits for the setting. The input position is marked by an input cursor, ^. Move the input cursor with the ← and → keys. Confirm the new setting by pressing **ENTER**.

Activate the modified setting for the system by pressing the **Apply** key. The system will restart using the new settings.

4.3.15 Restart

The restart function can be used to restart the Safedock system.

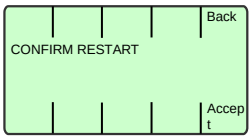


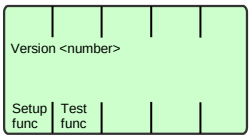
FIGURE 4.20 – RESTART

Press **Accept** to confirm the restart operation, press **CANCEL** or **Back** to resume normal operation.

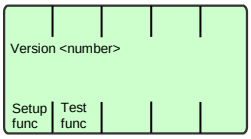
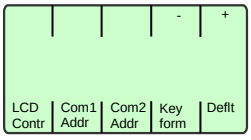
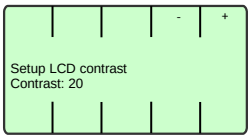
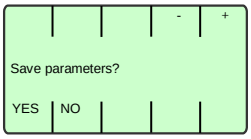
4.4 OPERATOR PANEL SETUP AND TEST FUNCTIONS MENU

The Operator Panel includes a setup and test functions menu for adjusting settings in the Operator Panel.

The menu is accessed as the unit or system is powered on by simultaneously pressing and holding the Operator Panel **Cancel** button until the menu appears.

The Operator Panel is restarted in the unit as follows: (a) Open the Operator Panel front panel. (b) Remove the J1 connector. (c) Press and hold the **CANCEL** button. (d) Insert the J1 connector. Alternatively, the Safedock system including Operator Panel can be powered off/on using the main switch in the display unit. This would require two people, one to turn off/on the display unit and one to press and hold the Operator Panel unit.	 FIGURE 4.21 – OP J1 CONNECTOR
(e) Release the **CANCEL** button when the firmware version and the two soft key menus appear.	 FIGURE 4.22 – OP SETUP/TEST FUNCTIONS

4.4.1 Operator Panel Contrast Intensity Adjustment

(a) Restart the Operator Panel to access the setup and test functions menu. (b) Release the **CANCEL** button when the firmware version and two soft key menus appear. (c) Press Setup func key.	 FIGURE 4.23 – OP SETUP/TEST FUNCTIONS
(d) Press the **LCD contr** key.	 FIGURE 4.24 – OP LCD CONTRAST
(e) Adjust the contrast using the **+** or **-** buttons (upper right). (f) Press **CANCEL** button (twice) to exit.	 FIGURE 4.25 – OP LCD CONTRAST SETTING
(g) Press **YES** key to save changes. (h) Press **ENTER** button to exit the setting menu and return to normal operation.	 FIGURE 4.26 – OP SAVE PARAMETERS

5. TROUBLESHOOTING

All Safedock systems complete a factory acceptance test (FAT) before shipping; however some error messages may appear during configuration and commissioning due to unforeseen reasons.

If a malfunction occurs within a Safedock system, error numbers appear on the Pilot Display and their equivalent error messages appear on the Operator Panel display. Some error messages may appear in abbreviated form on the Pilot Display, depending on the Safedock type and/or size of Pilot Display installed at the stand. Faults can be diagnosed and rectified from error messages.

5.1 FAULT EVALUATION

It is important to evaluate an error in a logical order, for example:

1. **An airport operations event** - see Chapter 3 OPERATION or Chapter 4 MAINTENANCE.
2. **Routine maintenance** - see Planned or Corrective Maintenance sections in this Chapter.
3. **Cabling fault** - see Chapter 2 INSTALLATION or Chapter 5 DRAWINGS.
4. **A configuration problem** - see Chapter 2 INSTALLATION.
5. **Component fault** - see Errors and Warnings and Replacement sections in this Chapter.
6. **Support** - see Support information in this Chapter.

***Note**: Some error messages appear for 10 seconds and then disappear from the display. The operator may then attempt a new or continue a docking procedure. The error is saved in the event log.*

5.2 ERRORS AND WARNINGS

PD – OP messages, symptom	*Possible cause*	*Action to rectify*
ERROR - Failed to load aircraft data		
The requested aircraft data could not be loaded.	Aircraft data missing in configuration or unknown configuration id sent from superior system.	Add the aircraft to the configuration or adjust the configuration of the superior system.
ERROR – Centerline data		
Failed to load centerline data	Corrupted centreline defined.	Contact Safegate Support.
ERROR – Centerline points		
Failed to load centreline points.	No centreline points defined.	Define centreline points.
ERROR – Ground data		
The calibration does not contain a valid ground data profile.	The system has not been calibrated.	Perform a system calibration.
ERROR - System integrity		
One or more parts the system configuration and/or hardware is inoperable. Refer to log files for details.	Configuration not complete.	Complete the configuration-
	Temperature out of allowed range.	Make sure the system has adequate/functioning cooling/heating.
ERROR - Apron scan data		
Apron scan data is invalid.	Configuration not complete.	Complete the configuration.

PD – OP messages, symptom	*Possible cause*	*Action to rectify*
ERROR - Clip too short		
The clip distance is set to a distance that is shorter than the current stop position plus ID-fail limit.	Badly configured system.	Correct the configuration.
ERROR - Prepare timeout		
Stand equipment interlock signalling not functioning.	Internal error	Contact Safegate Support.
STOP / ID / FAIL – ID FAIL		
The docking has been halted due to aircraft identification failure. The operator panel may show one of the following additional reasons for the error: - Geometry failed: The approaching aircraft does not the expected geometry. - Nose height failed: Measured nose height outside allowed limits. - Engine verification: Verification of engine position failed. - Profile failed: Horizontal/vertical profile matching failed. - Lost Track: Lost aircraft inside ID-fail distance, but outside two meters from the stop position.	Incorrect aircraft type selected on the docking system.	Press 'OFF' to abort the docking and select the correct aircraft type to initiate a new docking procedure.
	The laser scanning unit field of view is impaired.	Clean the mirrors and windows of the scanning unit.
	The laser scanning unit field of view is blocked by an object.	Move the object out of view (the docking area at the stand).

PD – OP messages, symptom	*Possible cause*	*Action to rectify*
STOP / SBU – SBU STOP		
Safety Backup behaviour. Common error message for issues that may require human intervention or restarted docking procedure after visual inspection of the stand area. The operator panel may show one of the following additional reasons for the error: - No scan request: Scanner subsystem has not received a scan order within the required timeframe. - Scan failed: The scanner subsystem was unable to perform a scan. - Scan too slow: The scanner subsystem did not deliver a scan within the required timeframe. - Positioning error: The scanner subsystem could not bring the mirrors to their respective home position. - Scanner not ready: The scanner subsystem could not active the LRF inside the required timeframe. - Lost Track: Lost aircraft within two meters from the stop position. - Too far from CI: The aircraft is more than 5dm offset from the centreline at a distance of 2m from stop position.		
STOP - AUTOCAL FAILED		
Auto calibration failed.	No auto calibration configured	Configure auto calibration.
	Object obstructing the view to the calibration plate.	Remove the object.
ERROR - EM-STOP CIRCUIT		
The emergency stop circuit test has failed when starting a docking procedure. The system prevents a docking procedure from starting.	The emergency stop circuit is shorted to ground.	Check the emergency stop circuit.
	The Control Unit is malfunctioning.	Replace the Control Unit.

PD – OP messages, symptom	*Possible cause*	*Action to rectify*
WAIT – Stand equipment interlock		
The bridge or other stand equipment is not in a safe position and may obstruct the aircraft approach.	Incorrect Passenger Boarding Bridge position for aircraft type. PBB is not fully retracted. Pits are open.	Correct the passenger boarding bridge position. Close pits.
WAIT > GATE > BLOCK – GATE BLOCKED		
The normal view of the Laser Scanning Unit is impaired by an obstruction in the aircraft docking area. The docking procedure re-commences automatically as soon as the obstruction is cleared from the docking area. ***Note**: The Pilot Display cycles the messages* **WAIT**, **GATE** *and* **BLOCK** *until the docking area is cleared or the docking is aborted.*	The docking area is obstructed.	Clear the docking area.
WAIT > VIEW > BLOCK – VIEW BLOCKED		
The system is unable to see through the forward window. The docking procedure will abort. ***Note**: The Pilot Display cycles the messages* **WAIT**, **VIEW**, **BLOCK**.	Dirty window/mirrors.	Clean the window/mirrors.
	The check area is obstructed by a reflecting or low-visibility object.	Remove the obstruction. For more information, see Chapter 4A Stand Configuration Utility.
	The Laser Range Finder is malfunctioning.	Replace the Laser Range Finder.
WAIT > APRON > BLOCK – APRON BLOCKED		
An enhanced view of the Laser Scanning Unit is impaired by an obstruction in the docking (apron scan) area. The docking procedure re-commences automatically as soon as the obstruction is cleared from the docking area. ***Note**: The Pilot Display cycles the messages* **WAIT**, **APRON** *and* **BLOCK** *until the apron area is cleared or the docking is aborted.*	**Note**: This error is only possible, if the optional function APRON SCAN is installed. The docking (apron area) is obstructed.	Clear the docking (apron) area.

PD – OP messages, symptom	*Possible cause*	*Action to rectify*
ERROR - WALKTEST REQUIRED		
A walk-test is required by the system.	The configuration for the stand has been modified since the last walk-test procedure was performed.	Perform a walk-test procedure to verify the current configuration at the stand.
FAIL- Pri Surge FAIL		
The build in monitoring function over the surge arrestors on the primary side is indicating a fail. ***Note**: This **FAIL** does not impede the operational capacity of the VDGS, it simply makes the operator aware of the status and that it is highly recommended to take a look into the arrestors by the maintenance team.*	The arrestor is consumed due to a voltage peak from the source of incoming power.	Check on the arrestors and change the plug in module when consumed
FAIL- Sec Surge FAIL		
The build in monitoring function over the surge arrestors on the secondary side is indicating a fail. ***Note**: This **FAIL** does not impede the operational capacity of the VDGS, it simply makes the operator aware of the status and that it is highly recommended to take a look into the arrestors by the maintenance team.*	The arrestor is consumed due to a voltage peak.	Check on the arrestors and change the plug in module when consumed
FAIL- Display Vent FAIL (T1 only)		
The build in monitoring function over the display ventilation fan(s) is indicating a fail. ***Note**: This **FAIL** does not impede the operational capacity of the VDGS, it simply makes the operator aware of the status and that it is highly recommended to take a look into the display fan assembly by the maintenance team.*	The fan(s) does not operate when it it is supposed to.	Check the functionality of the fan in relation to the temperature. Note: The switching point of an active fan is default set to 40 degrees but subject to individual adjustments.

6. REPLACEMENT OF MALFUNCTIONING UNITS

This chapter describes the disassembly, inspection and the assembly of Safedock units. The following figures show the different types of Safedock units.

WARNING: TO PREVENT ELECTRIC SHOCK, ISOLATE THE POWER SUPPLY PRIOR TO UNDERTAKING ANY MAINTENANCE WORK WITHIN THE UNIT. IF A BATTERY BACKUP IS INSTALLED, ALSO THE 24-VOLT DC CURRENT TO THE ELECTRONICS HAS TO BE SWITCHED OFF!

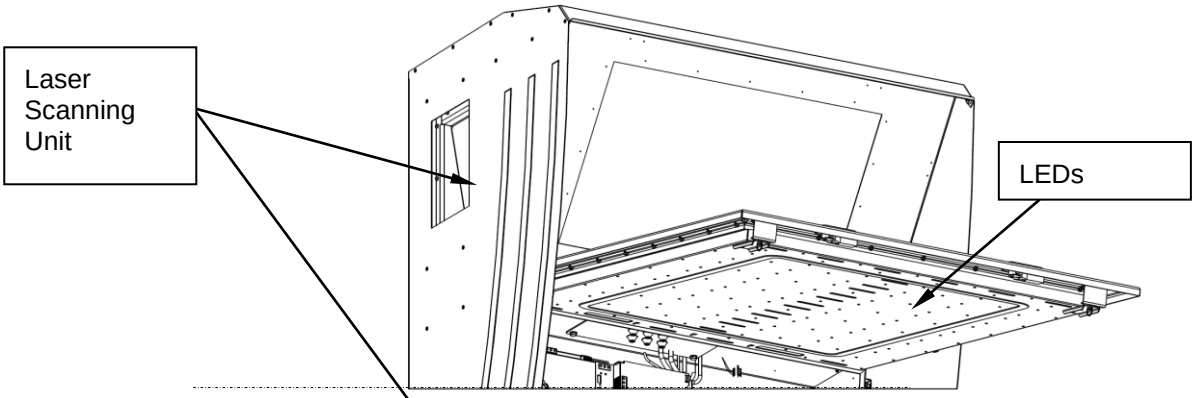


FIGURE 4.27 OVERVIEW SAFEDOCK UNIT TYPE 1 LASER UNIT

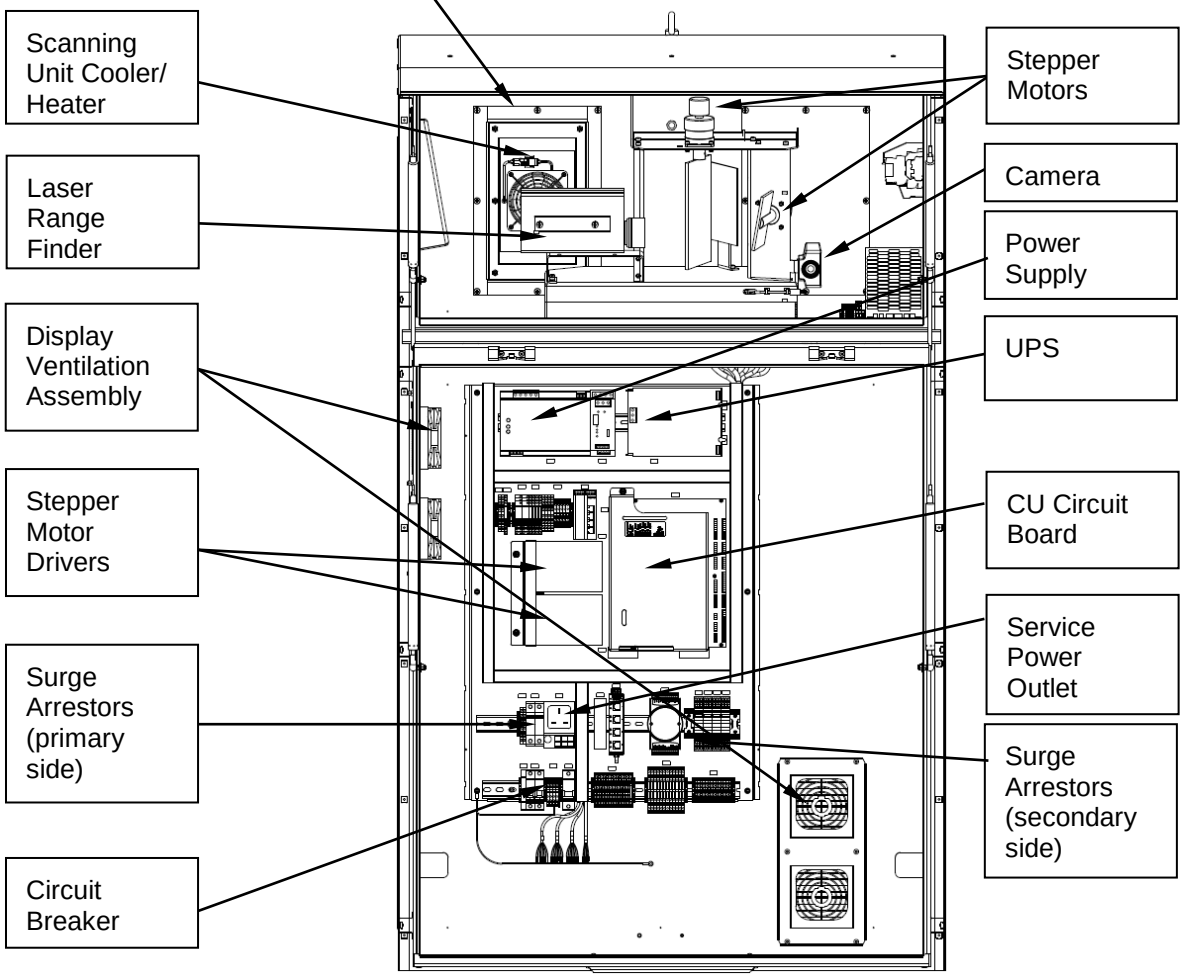


FIGURE 4.28 – OVERVIEW SAFEDOCK UNIT TYPE 1 OPEN

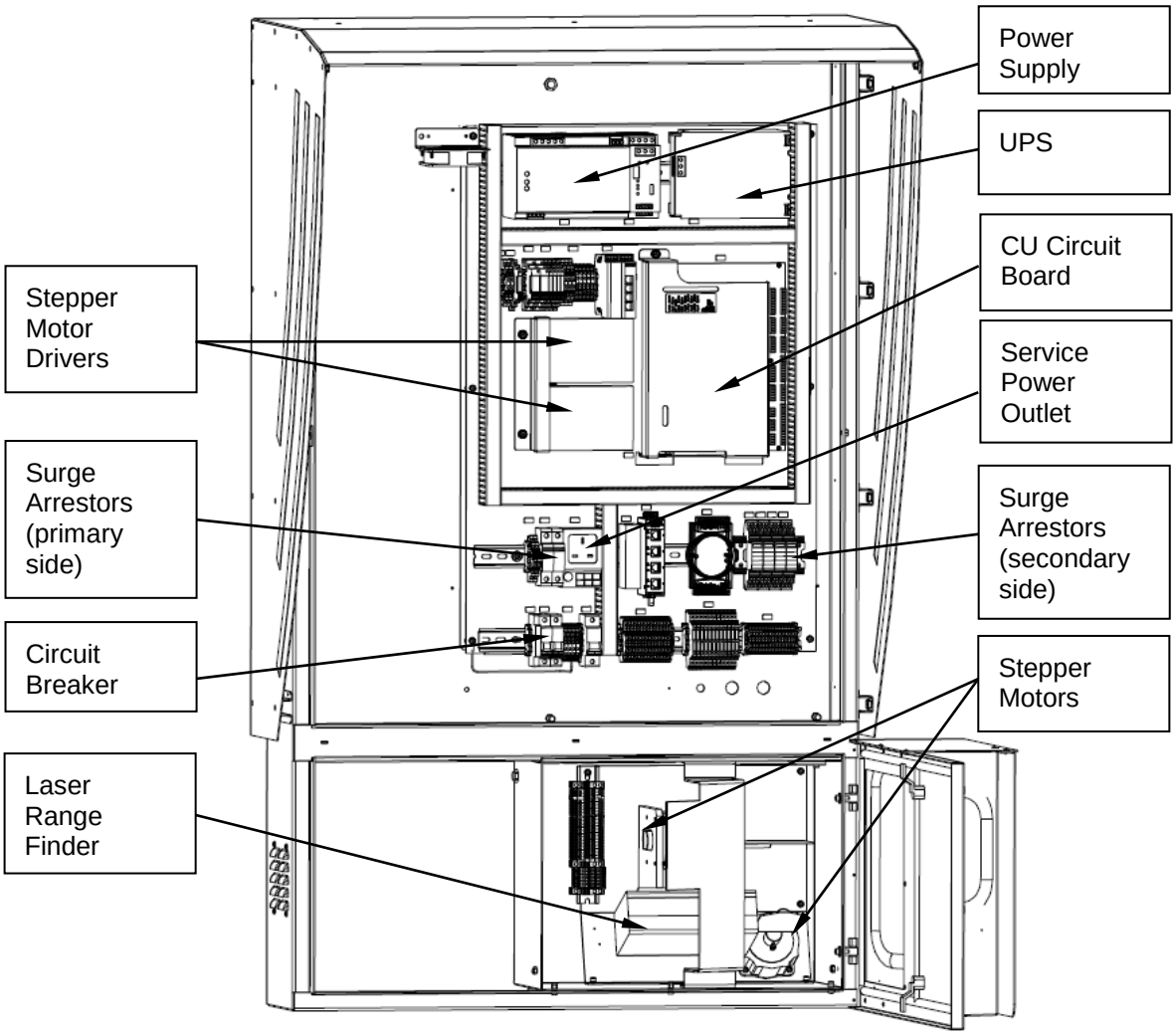


FIGURE 4.29 – OVERVIEW SAFEDOCK UNIT TYPE 2

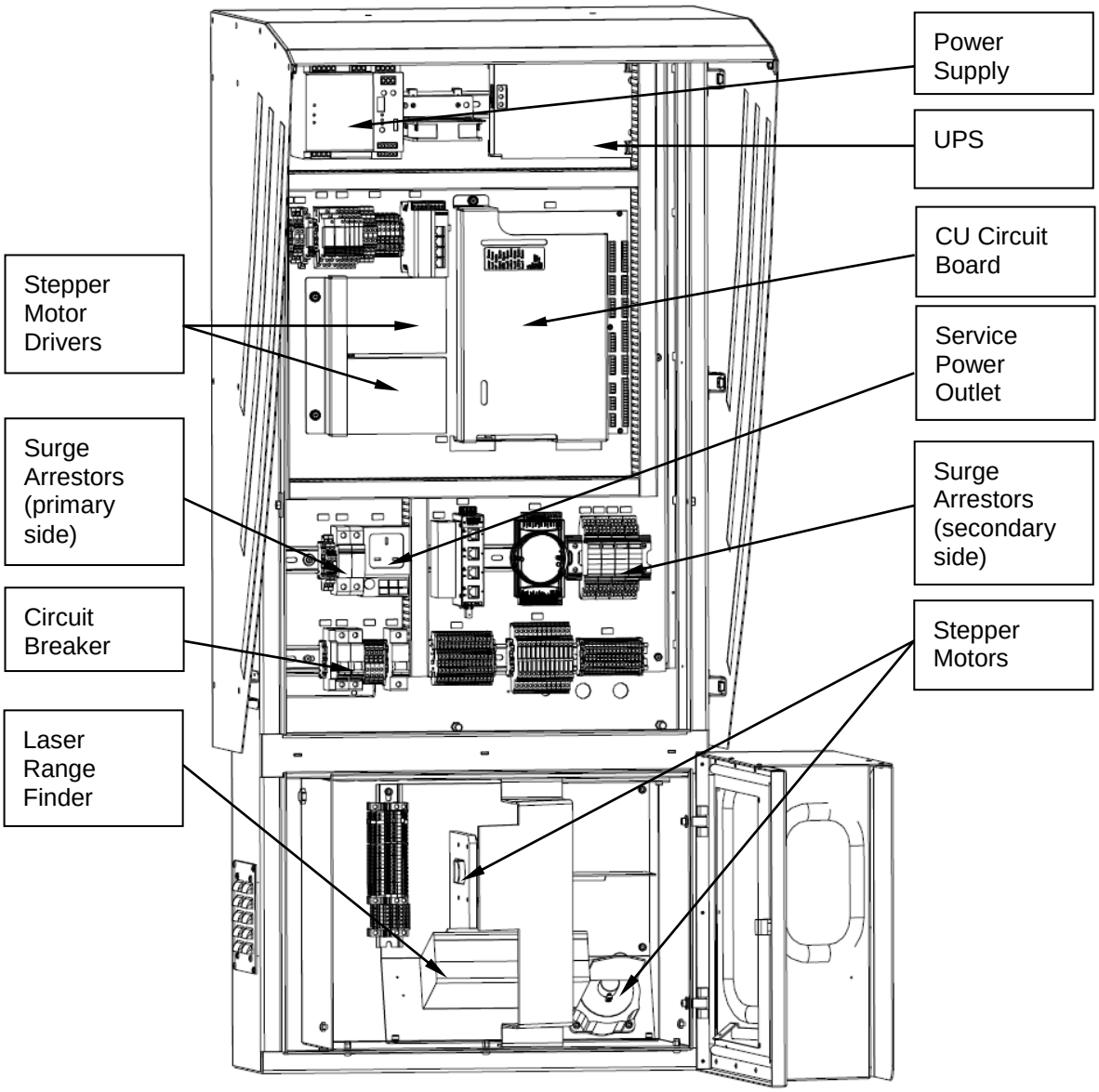


FIGURE 4.30 – OVERVIEW SAFEDOCK UNIT TYPE 3

6.1 RENEWAL OF STEPPER MOTOR

6.1.1 Motor Disassembly

The figure below illustrates the positions of the two stepper motors of the Laser Scanning Unit.

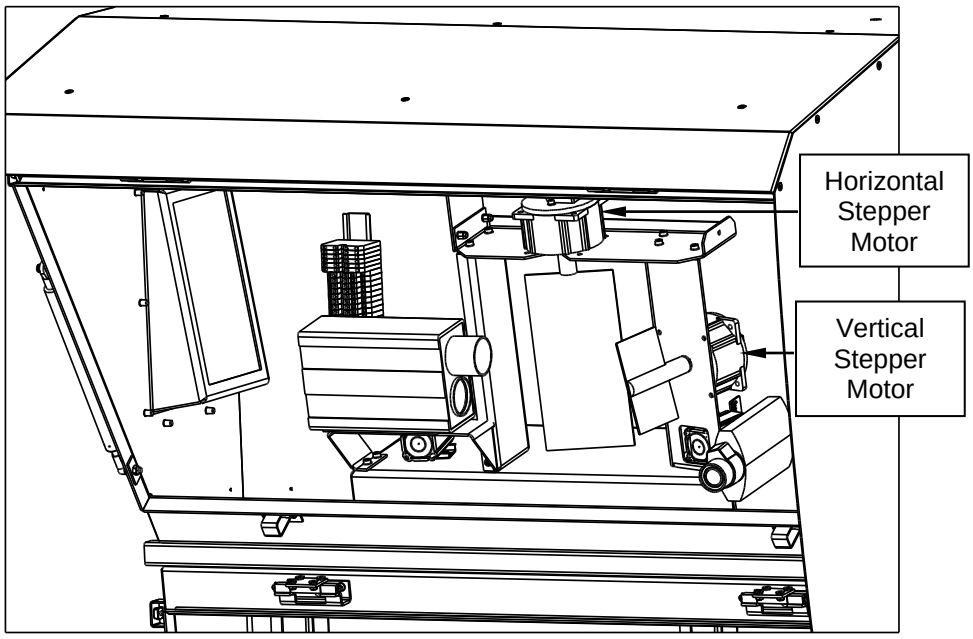


FIGURE 4.31 – SAFEDOCK T1 STEPPER MOTORS OF LASER SCANNING UNIT

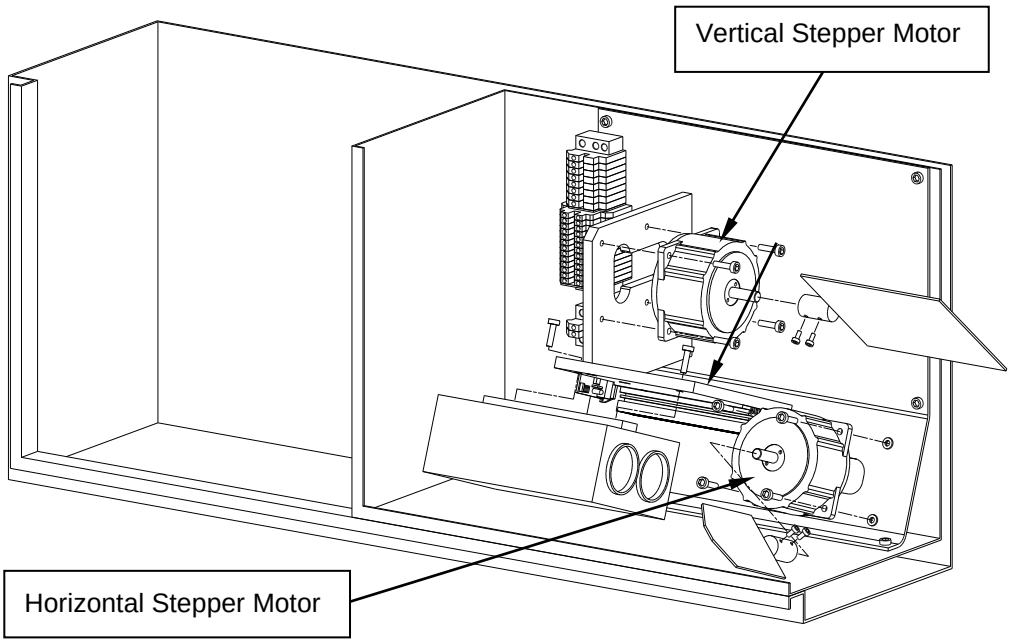


FIGURE 4.32 – SAFEDOCK T 2/3 STEPPER MOTORS OF LASER SCANNING UNIT

(a) Switch OFF the main power switch.

(b) To gain entry to the Laser Scanning Unit, undo the cabinet lock and open the hinged door.

(c) Turn off the power in the system

(d) Loosen the two 3-mm socket head screws, on the axle adapter, which secures the scanning mirror (smaller) to the motor drive shaft (stem).

(e) Carefully withdraw the scanning mirror, complete with axle adapter, from the motor drive shaft. Place the scanning mirror in a suitable place to avoid damage.

(f) Loose the four 4-mm socket head screws, which secure the stepper motor to the motor bracket.

(g) Carefully remove the stepper motor from the bracket.

(h) Disconnect the stepper motor electrical leads (13 cables) at the terminal block (strip) situated in the laser unit cabinet. Disconnect the cable connector to the motor position sensor located on the back of the stepper motor.

6.1.2 Inspection

(a) Inspect the scanning mirror assembly for signs of damage. Renew if required.

(b) Inspect the Laser Range Finder lenses for cleanliness. Clean as required.

(c) Inspect the two scanning mirrors, and the calibration mirror, for cleanliness. Clean as required.

(d) Inspect the Laser Scanning Unit cabinet, front and side windows for cleanliness. Clean as required.

(e) Ensure the Laser Scanning Unit cabinet is free of all extraneous material.

***Note**: The items covered in step b to d inclusive must be free of grease, dirt and moisture. Only anti-static cleaning materials should be used.*

The cables from the stepper motor are colour coded for connection.
The checklist in the table below can be used as a guideline:

Stepper motor wiring, numbering and colour codes				
Cable No.	*Terminal No. on connector:* *Strip 1*	*Strip 2*	*Cable colour codes*	Check ✓*for correct connection*
Cables from the Stepper Motor				
1	59	72	BROWN	☐
2	60	73	BROWN/WHITE	☐
3	61	74	RED	☐
4	62	75	RED/WHITE	☐
5	63	76	ORANGE	☐
6	64	77	ORANGE/WHITE	☐
7	65	78	YELLOW	☐
8	66	79	YELLOW/WHITE	☐
Cables from the Black Box behind the Stepper Motor				
9	67	80	BROWN	☐
10	68	81	YELLOW	☐
11	69	82	GREEN	☐
12	70	83	GREY	☐
13	71	84	WHITE	☐

6.1.3 Assembly

(a) Connect the stepper motor electrical connections to the terminal block (make sure to follow the colour codes).

(b) Connect the connector to the motor position sensor.

(c) Fit the new stepper motor to the bracket and secure in position with the four socket head screws.

(d) Switch on mains/system power, observe the stem on the stepper motor. It rotates for a few seconds and stop. Once the stem stops rotating, turn mains/system power off again.

(e) Install the mirror on the stem of the motor, such that the clear side of the mirror faces the laser unit. The mirror shall be installed at an angle of 45 degrees not necessarily aligning the mounting screws with the bevel on the stem.

(f) Secure the axle adapter to the motor drive shaft, by tightening the two socket head cap screws.

(g) Close the cabinet door and secure using the lock.

(h) Switch ON the mains/system power.

The system must be set up again: defining and verifying the centrelines, setting calibration check points and making a new backup of the Stand configuration file. Please refer to Chapter 4A Stand Configuration Utility.

6.1.4 Testing

(a) Verify the centreline definition according to Chapter 4A Stand Configuration Utility.

(b) If the centreline definition points are not correct, the system must be set up again. This means: defining and verifying the centrelines, setting calibration check points and making a new backup of the Stand configuration file. Please refer to Chapter 4A Stand Configuration Utility.

(c) Perform a Walk Test procedure.

6.2 RENEWAL OF CALIBRATION MIRROR

6.2.1 Mirror Disassembly

The calibration mirror is mounted on a bracket, situated above the laser range finding unit, see the figure below.

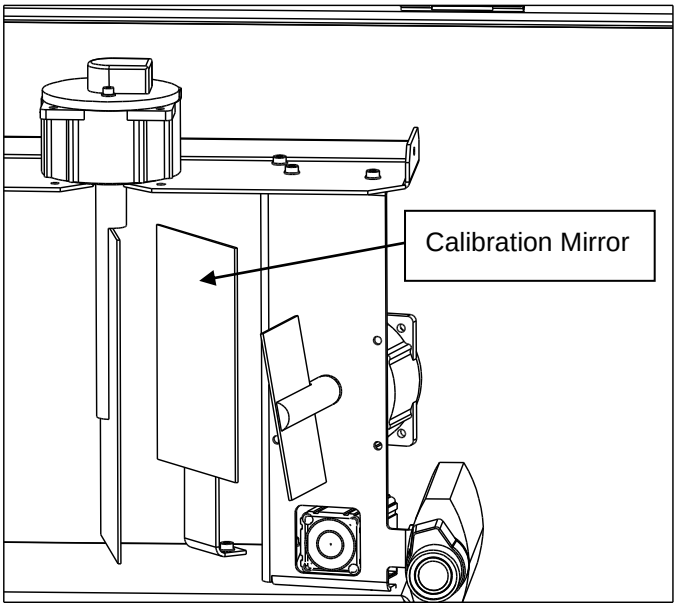


FIGURE 4.33 – SAFEDOCK T1 CALIBRATION MIRROR

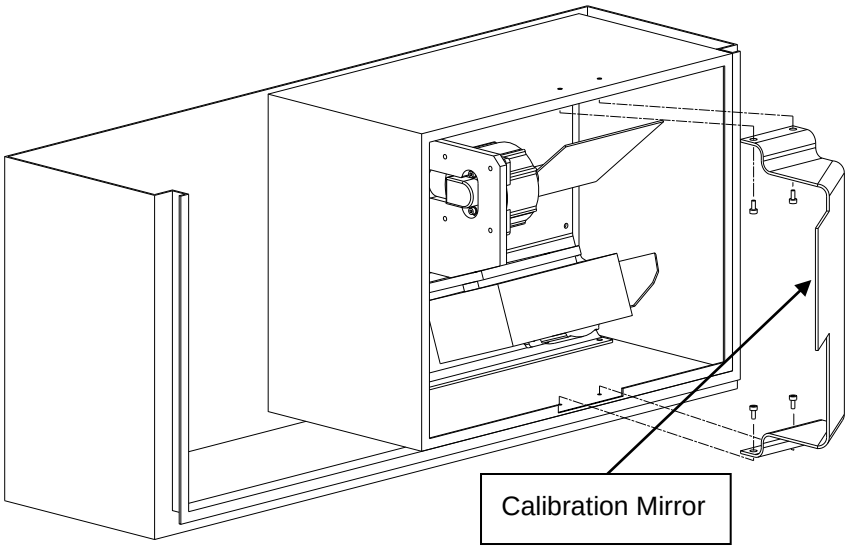


FIGURE 4.34 – SAFEDOCK T2/3 CALIBRATION MIRROR

(a) Switch power OFF and isolate the power supply unit.

(b) To gain entry to the Laser Scanning Unit, undo the cabinet lock, and open the hinged door.

(c) Loosen the four 5-mm socket head screws, which secure the calibration mirror bracket.

(d) Remove the bracket from the Laser Scanning Unit.

(e) Carefully remove the calibration mirror from the bracket using a sharp knife or chisel. If needed, heat the backside to dissolve the tape on the back of the mirror.

(f) Remove the remaining tape from the bracket.

***Note**: If the calibration mirror is being renewed because it has been broken, ensure no mirror fragments are left in the cabinet. Any mirror fragments left in the cabinet could affect the operation of the Laser Scanning Unit.*

6.2.2 Inspection

Carry out an internal inspection of the Laser Scanning Unit assembly as detailed in § 6.1.2 Inspection, item (b) to (e).

6.2.3 Assembly

CAUTION: EACH MIRROR ASSEMBLY IS MADE OF FRAGILE MATERIAL. USE EXTREME CARE WHEN LOCATING THE MIRROR ASSEMBLY TO AVOID DAMAGE OR BREAKAGE!

(a) Carefully position the calibration mirror on its mounting and secure in position using the 3M mounting tape.

(b) Ensure the mirror is free of fingerprints, grease, dust and moisture.

(c) Close the cabinet door and secure using the lock.

6.2.4 Testing

(a) Switch power ON.

(b) Verify the centreline definition according to Chapter 4A Stand Configuration Utility.

(c) If the centreline definition points are not correct, the system must be set up again. This means: defining and verifying the centrelines, setting calibration check points and making a new backup of the Stand configuration file. Please refer to Chapter 4A Stand Configuration Utility.

(d) Perform a walk-test procedure.

6.3 RENEWAL OF SCANNING MIRROR

6.3.1 Mirror Disassembly

The figure below illustrates the assembly of the two mirrors for horizontal and vertical scanning direction.

The small mirror is used for the horizontal scan on T2/T3, vertical scan for T1.

The large mirror is used for the vertical scan on T2/T3, horizontal scan for T1.

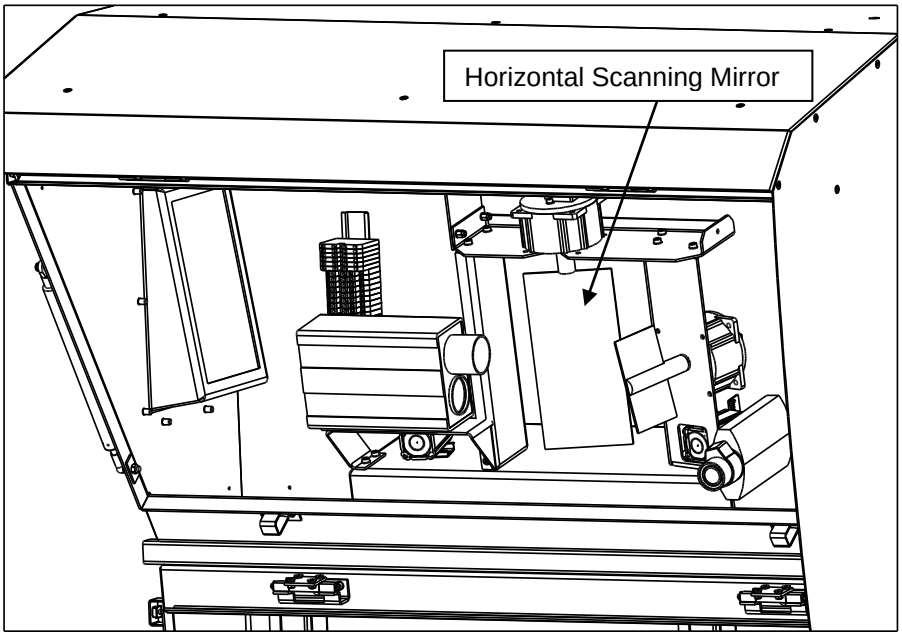


FIGURE 4.35 – SAFEDOCK T1 SCANNING MIRRORS

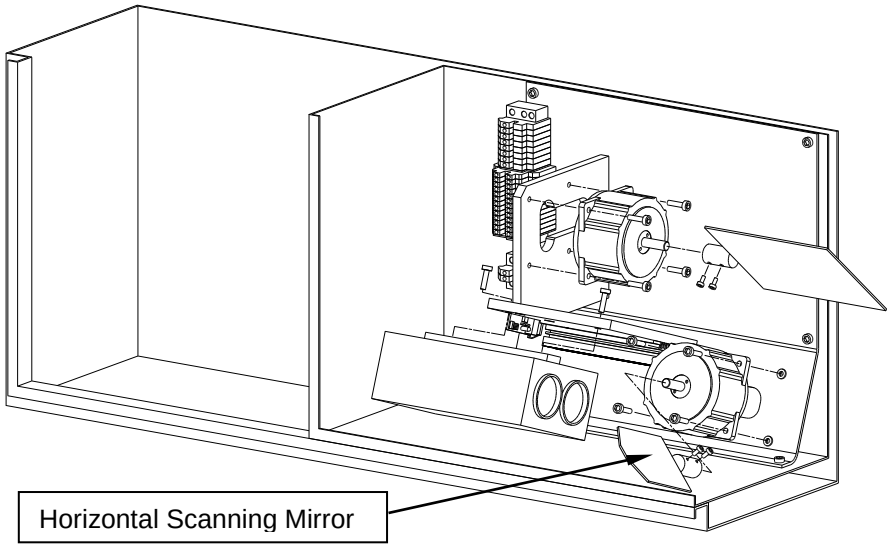


FIGURE 4.36 – SAFEDOCK T 2/3 SCANNING MIRRORS

(a) Switch power OFF and isolate the power supply unit.

(b) To gain entry to the Laser Scanning Unit, undo the cabinet lock, and open the hinged door.

(c) Loosen the two 3-mm socket head screws on the axle adapter, which secure the scanning mirror to the motor drive shaft.

(d) Carefully withdraw the scanning mirror, complete with axle adapter, from the motor drive shaft.

***Note**: If the scanning mirror is being renewed because it has broken, ensure no mirror fragments are left in the cabinet. Any mirror fragments left in the cabinet could affect the operation of the laser scanning system.*

6.3.2 Inspection

Carry out an internal inspection of the Laser Scanning Unit assembly as detailed in § 6.1.2 Inspection, items (b) to (e).

6.3.3 Assembly

CAUTION: EACH MIRROR ASSEMBLY IS MADE OF FRAGILE MATERIAL. USE EXTREME CARE WHEN LOCATING THE MIRROR ASSEMBLY TO AVOID DAMAGE OR BREAKAGE.

(a) Carefully locate the new scanning mirror, complete with axle adapter, on the motor drive shaft.

(b) Secure the axle adapter to the motor drive shaft, by tightening the two socket head cap screws.

6.3.4 Testing

(a) Reconnect the power supply to the Laser Scanning Unit and switch ON.

(b) Verify the centreline definition according to Chapter 4A Stand Configuration Utility.

(c) If the centreline definition points are not correct, the system must be set up again. This means: defining and verifying the centrelines, setting calibration check points and making a new backup of the Stand configuration file. Please refer to Chapter 4A Stand Configuration Utility.

(d) Perform a walk-test procedure.

6.4 RENEWAL OF LASER RANGE FINDER

6.4.1 Range Finder Disassembly

The figure below illustrates the position of the Laser Range Finder.

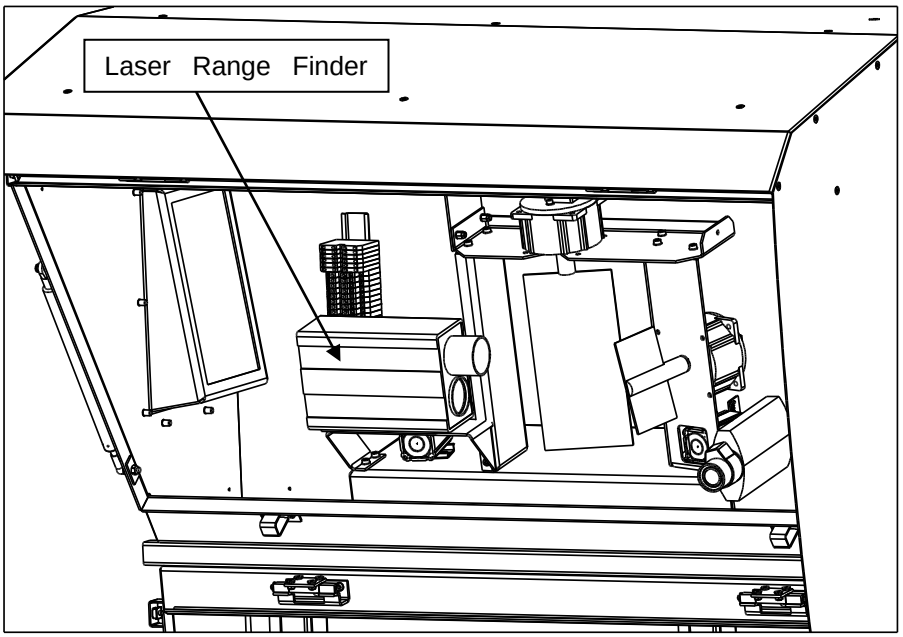


FIGURE 4.37 – SAFEDOCK T1 LASER RANGE FINDER

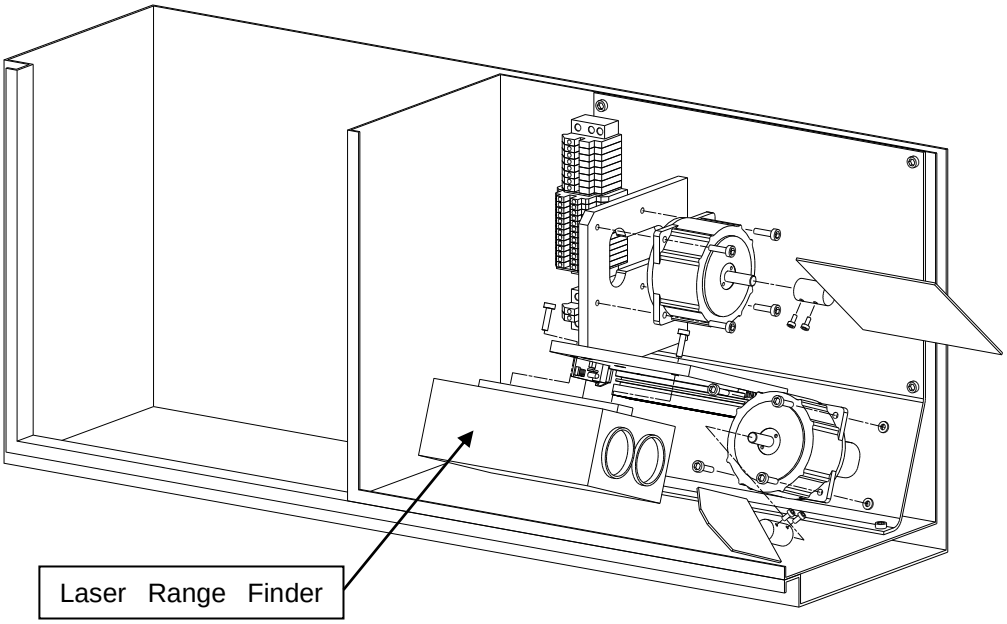


FIGURE 4.38 – SAFEDOCK T2/3 LASER RANGE FINDER

(a) Switch OFF and isolate the power supply.

(b) To gain entry to the Laser Scanning Unit, undo the cabinet lock and open the hinged door.

(c) Disconnect the Laser Range Finder electrically by pulling out the green connector from the terminal block.

(d) Remove the two socket head cap screws, which secure the Laser Range Finder to the bracket.

(e) Lift the Laser Range Finder clear of the bracket.

6.4.2 Inspection

Carry out an internal inspection of the Laser Scanning Unit assembly as detailed in § 6.1.2 Inspection, items (b) to (e).

6.4.3 Assembly

(a) Locate the new Laser Range Finder and secure to the bracket with the two socket head cap screws.

(b) Connect the Laser Range Finder's electrical leads to the terminal block.

(c) Close the cabinet door and secure using the locks.

6.4.4 Testing

(a) Reconnect the power supply to the Laser Scanning Unit and switch ON.

(e) Verify the centreline definition according to Chapter 4A Stand Configuration Utility.

(f) If the centreline definition points are not correct, the system must be set up again. This means: defining and verifying the centrelines, setting calibration check points and making a new backup of the Stand configuration file. Please refer to Chapter 4A Stand Configuration Utility.

(b) Perform a walk-test procedure.

6.4.5 Reset Laser Statistics

***Note**: This operation is to be performed whenever a laser unit is replaced.*

(a) From the Operator Panel, select **Test**.

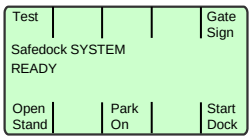


FIGURE 4.39 – OP TEST

(b) From the **Test** menu, press the right arrow for the next page and select **Statistics**.

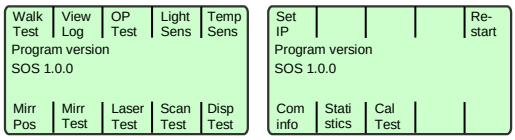


FIGURE 4.40 – OP STATS

(c) From the **Statistics** menu, select **Reset laser** and then **Confirm** to reset the laser time.

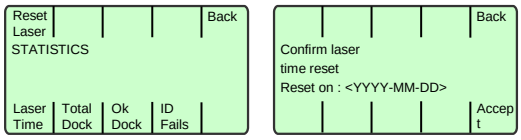


FIGURE 4.41 – OP RESET LASER

6.4.6 Scan Test

A LASER SCAN ERROR may be caused by one of the following components: stepper motor, stepper motor card, laser or CU card. The following steps may help to diagnose which of the components is at fault:

(a) Move one of the mirrors gently by hand. When moving it the LED named LASER SAFE should light up as an indication of that the stepper motor sensor is detecting a movement. There should be some resistance when moving the mirror by hand. If not, the Stepper Motor Driver is possibly broken. Swap the 2 Stepper Motor Drivers to check if the problem moves to the other stepper motor.

(b) If the LED does not light up, then there is a problem with the cable between the stepper motor and the CU board, or the stepper motor itself.

6.5 RENEWAL OF CONTROL UNIT

6.5.1 Preparations before Maintenance

***Note**: Stand set-up parameters, such as configuration data, calibration values and aircraft data, are stored in a non-volatile memory of the control unit.*

A DISK COPY OF THE STAND SET-UP PARAMETERS SHALL PREVIOUSLY HAVE BEEN MADE AT THE SAFEDOCK INSTALLATION/SET-UP PHASE AT EACH STAND.

THIS PROCEDURE HAS BEEN DONE FOR FACILITATING THE EXCHANGE OF THE CONTROL UNIT IN CASE OF AN ERROR, AND FOR MAKING RESTORATION OF SOFTWARE AND SET-UP PARAMETERS EASIER AFTER THE EXCHANGE OF HARDWARE.

THE APPLICABLE STAND SET-UP FILE SHALL BE LOADED INTO THE MAINTENANCE PC ACCORDING TO INSTRUCTIONS IN CHAPTER 4A STAND CONFIGURATION UTILITY.

6.5.2 Dumping Stand Set-Up Parameters from the Control Unit

If the stand parameter back-up file is not available, the procedure described in Chapter 4A Stand Configuration Utility can be carried out to secure the Stand set-up parameters, if possible.

(a) Connect the Maintenance PC, loaded with the Safedock Maintenance software, called SMT.EXE, to the connector at the right side of the Operator Panel.

(b) Dumping the CU memory contents to the PC will be done automatically, as soon communication between the CU and the PC is established. To make a disk copy, use the function “SAVE” in the Safedock Stand Configuration Dialogue Box. The current configuration will be saved onto disk in the maintenance PC.

If a faulty Control Unit does not allow you to dump its memory contents, the set-up and calibration procedure has to be done manually again as described in the Chapter 4A Stand Configuration Utility.

6.5.3 Control Unit Disassembly

The figure below illustrates the position of the Safedock Control Unit/CU.

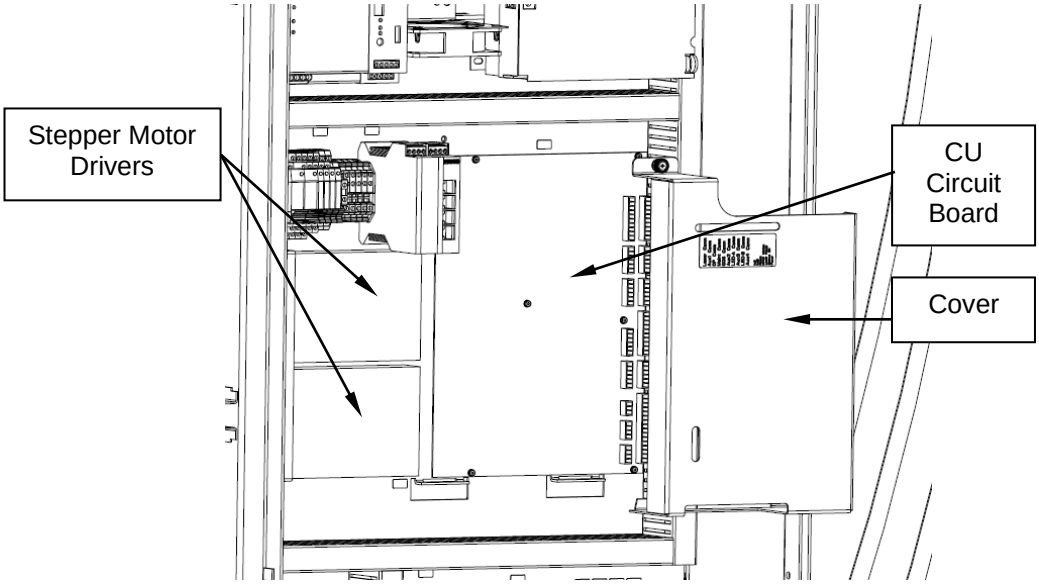


FIGURE 4.42 – SAFEDOCK T1, T2 AND T3 CONTROL UNIT

Renewal of Control Unit/Carrier Board

This information is a basic step-by-step guide for authorized personnel to replace a Control Unit (CU) Carrier Board.

Safedock T1/2/3 (system design from Spring 2008) - CU circuit includes a docking board (connections) and a carrier board (CPU).

Before you start

(a) If possible, use the Safedock Maintenance program (SMT) to save the configuration file.
***Note**: For more information, see the Chapter 4A Stand Configuration Utility.*

WARNING: DANGER OF ELECTRIC SHOCK!

(b) ISOLATE THE POWER SUPPLY PRIOR TO UNDERTAKING ANY MAINTENANCE!

(c) IF A BATTERY BACKUP IS INSTALLED, THE DC CURRENT TO ELECTRONICS MUST ALSO BE SWTICHED OFF.

***Note**: Standard tools are required such as screwdrivers and Allen keys.*

Removal

Carrier board (SG590524-000)

(a) Open the Safedock Pilot Display cabinet and set the Safedock power switch to **OFF**.

(b) Locate the protective cover for the CU-circuit board assembly and remove it.

(c) Remove the carrier board.

(d) Return the (old) CU-circuit boards to Safegate.

Renewal

(a) Position the Carrier Board-CPU assembly over the mating contacts and stand offs on the docking board and press until contacts are seated and locking tabs on the stand-offs click into place.

(b) Re-install the protective cover.

(c) Power up the system and install and configure the software for the Safedock system, if required.

***Note**: The new CU-circuit board requires version 8 or higher to run properly.*

Image examples

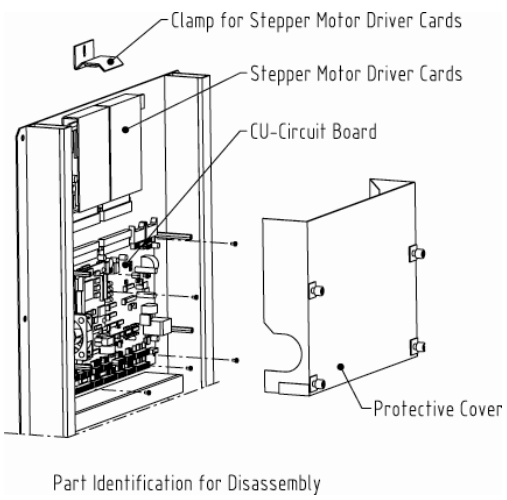


FIGURE 4.43 – CU PARTS

Testing

(a) Verify the system starts up correctly: Operator Panel contact is re-established and the emergency stop function is operational.

(b) If it was possible to save the configuration file using the Safedock Maintenance program (SMT) then the configuration can be loaded to the system once again.
If not, a new configuration is required according to the manual.

(c) Perform a walk-test procedure.

Renewal of Control Unit/Docking Board

This information is a basic step by step guide for authorized personnel to replace a Control Unit (CU) Docking Board.

Safedock T1/2/3 (system design from Spring 2008) - CU circuit includes a docking board (connections) and a carrier board (CPU).

Before you start

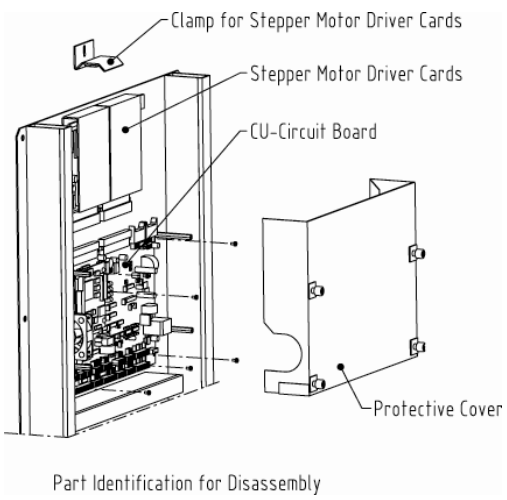
(a) If possible, use the Safedock Maintenance program (SMT) to the configuration file.
***Note**: For more information, see the Chapter 4A Stand Configuration Utility.*

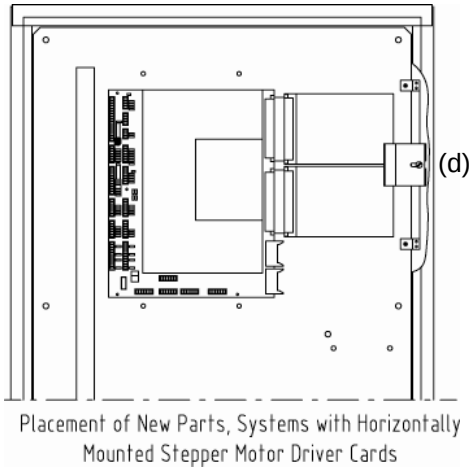
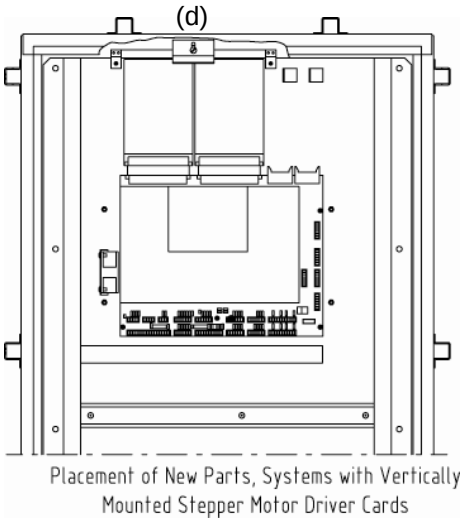
WARNING: DANGER OF ELECTRIC SHOCK!

(b) ISOLATE THE POWER SUPPLY PRIOR TO UNDERTAKING ANY MAINTENANCE!

(c) IF A BATTERY BACKUP IS INSTALLED, THE DC CURRENT TO ELECTRONICS MUST ALSO BE SWTICHED OFF.

***Note**: Standard tools are required such as screwdrivers and Allen keys.*

Removal	Image examples
Docking board (SG590562-000) (a) Open the Safedock Pilot Display cabinet and set the Safedock power switch to **OFF**. (b) Locate the protective cover for the CU-circuit board assembly and remove it. (c) Disconnect all wiring from the docking board. (d) Undo the clamp fasteners holding the stepper motor driver cards in place. Remove the stepper motor driver cards by pulling them away from the CU-circuit board. (e) Remove the carrier board. (f) Remove the docking board by removing the six fasteners holding it in place on the stand-offs. ***Note**: Be careful not to loosen the stand-offs, as it can be difficult to re-tighten them without loosening the mounting plate.* (g) Return the (old) board to Safegate.	 FIGURE 4.44 – CU PARTS

Renewal	Image examples
(a) Fasten the new docking board in place on the stand-offs. (b) Position the Carrier Board-CPU assembly over the mating contacts and stand offs on the docking board and press until contacts are seated and locking tabs on the stand-offs click into place. (c) Re-install the stepper motor driver cards. (d) Position the extension assembly on the edge of the mounting plate so it is centred to the stepper motor driver cards, and then tighten the set screws on the extension plate. (e) If the stepper motor driver cards are mounted horizontally, use the clamp and screw supplied with the spare part to fasten the clamp.	 FIGURE 4.45 – CU PLACEMENT HORIZONTAL
If the stepper motor driver cards are mounted vertically, attach and fasten the original clamp. ***Note**: If an extension assembly exists in the system, it must be re-used with the clamp.* (f) Re-connect all wiring. (g) Re-install the protective cover. (h) Set the Safedock power switch set to **ON** (i) Power up the system and install and configure the software for the Safedock system, if required. ***Note**: The new CU-circuit board requires version 8 or higher to run properly.*	 FIGURE 4.46 – CU PLACEMENT VERTICAL

Testing
(a) Verify the system starts up correctly: Operator Panel contact is re-established and the emergency stop function is operational. (b) If it was possible to save the file using the Safedock Maintenance program (SMT) then the configuration can be loaded to the system once again. If not, a new configuration is required according to the manual. (c) Perform a walk-test procedure.

Renewal of Control Unit with a CU Board Upgrade Kit

This information is a basic step by step guide for authorized personnel to replace a Control Unit (CU) circuit board.

Safedock T1/2/3 (system design from Spring 2008) - CU circuit includes a docking board (connections) and a carrier board (CPU).

Safedock T2/3 (SG590125-000/older system design to Spring 2008) **-** CU-circuit single board (connection and CPU). ***Note****: This design is now obsolete.*

- CU Board Upgrade Kit (SG590399-001-01) includes:
  - A docking board and a carrier board.
  - Extension plate, clamp and screw for some systems, if required.

Note*: The CU Board Upgrade Kit requires software version 8.0 or higher.*

Before you start

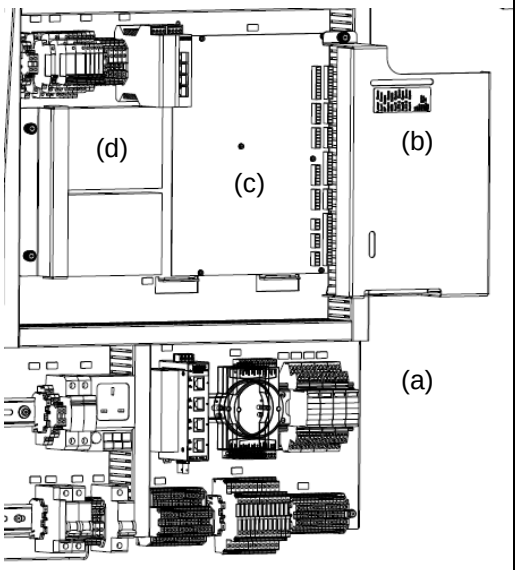
(a) If possible, use the Safedock Maintenance program (SMT) to save the configuration file.
Note*: For more information, see the Chapter 4A Stand Configuration Utility.*

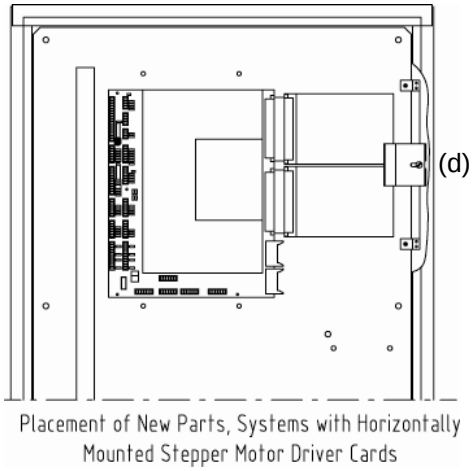
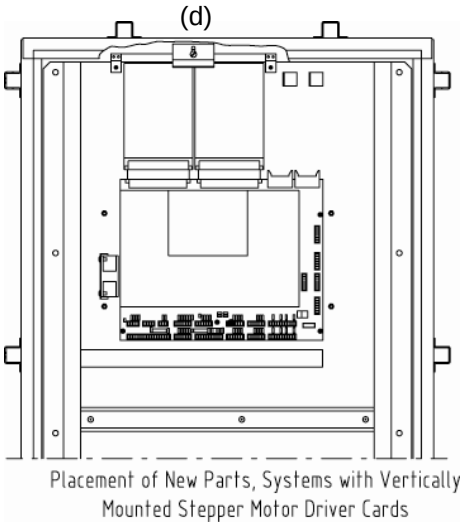
WARNING: DANGER OF ELECTRIC SHOCK!

(b) ISOLATE THE POWER SUPPLY PRIOR TO UNDERTAKING ANY MAINTENANCE!

(c) IF A BATTERY BACKUP IS INSTALLED, THE DC CURRENT TO ELECTRONICS MUST ALSO BE SWTICHED OFF.

Note*: Standard tools are required such as screwdrivers and Allen keys.*

Removal	Image examples
CU-circuit board (SG590125-000) (a) Open the Safedock Pilot Display cabinet and set the Safedock power switch to **OFF**. (b) Locate the protective cover for the CU-circuit board assembly and remove it. (c) Disconnect all wiring from the CU-circuit board. (d) Undo the clamp fasteners holding the stepper motor driver cards in place. ***Note****: If a welded stud is used as the clamp fastener, carefully twist the stud to break it off.* (e) Remove the stepper motor driver cards by pulling them upwards from the CU-circuit board. (f) Remove the CU-circuit board by removing the six fasteners holding it in place on the stand-offs. ***Note****: Be careful not to loosen the stand-offs, as it can be difficult to re-tighten them without loosening the mounting plate.* (g) Return the (old) board to Safegate.	 FIGURE 4.47 – CU REMOVAL

Renewal	Image examples
CU Board Upgrade Kit (SG590399-001-01) (a) Fasten the new docking board in place on the stand-offs. (b) Position the Carrier Board-CPU assembly over the mating contacts and stand offs on the docking board and press until contacts are seated and locking tabs on the stand-offs click into place. (c) Re-install the stepper motor driver cards. (d) Position the extension assembly on the edge of the mounting plate so it is centred to the stepper motor driver cards, and then tighten the set screws on the extension plate. (e) If the stepper motor driver cards are mounted horizontally, use the clamp and screw supplied with the spare part to fasten the clamp. If the stepper motor driver cards are mounted vertically, attach and fasten the original clamp. ***Note**: If an extension assembly exists in the system, it must be re-used with the clamp.* (f) Re-connect all wiring. (g) Re-install the protective cover. (h) Set the Safedock power switch set to **ON** (i) Power up the system and install and configure the software for the Safedock system, if required. ***Note**: The new CU-circuit board requires version 8 or higher to run properly.*	 FIGURE 4.48 – CU PLACEMENT HORIZONTAL  FIGURE 4.49 – CU PLACEMENT VERTICAL

Testing
(a) Verify the system starts up correctly: Operator Panel contact is re-established and the emergency stop function is operational. (b) If it was possible to save the configuration file using the Safedock Maintenance program (SMT) then the configuration can be loaded to the system once again. If not, a new configuration is required according to the manual. (c) Perform a walk-test procedure.

6.6 RENEWAL OF POWER SUPPLY

6.6.1 Power Supply Disassembly

The figure below illustrates the position of the Safedock power supply.

WARNING: DANGER OF ELECTRIC SHOCK! ISOLATE THE POWER SUPPLY PRIOR TO UNDERTAKING ANY MAINTENANCE!

IF A BATTERY BACKUP IS INSTALLED, ALSO THE 24 VOLT DC CURRENT TO THE ELECTRONICS HAS TO BE SWITCHED OFF!

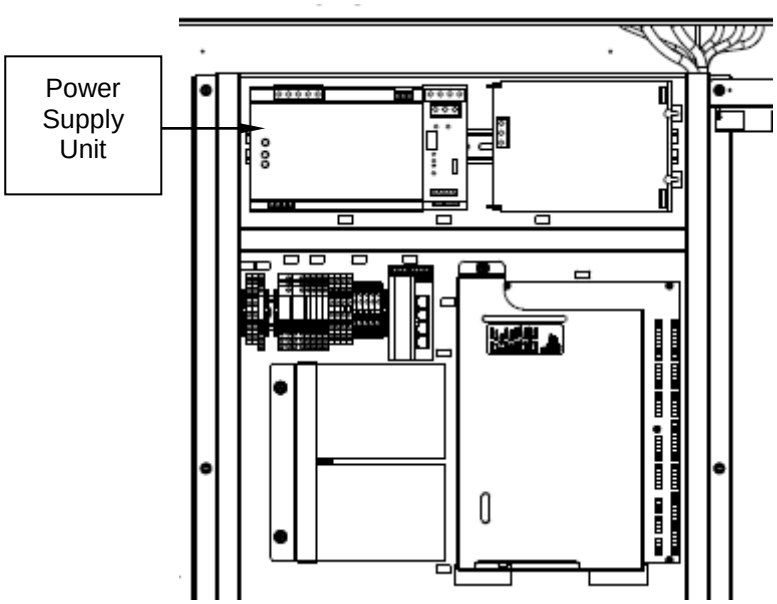


FIGURE 4.50 – SAFEDOCK T1, T2 AND T3 POWER SUPPLY

Renewal of Power Supply Unit

This information is a basic step by step guide for authorised personnel to replace a power supply unit.
***Note**: For more information, see Chapter 4A Stand Configuration Utility.*

Before you start

WARNING: DANGER OF ELECTRIC SHOCK!

(a) ISOLATE THE POWER SUPPLY PRIOR TO UNDERTAKING ANY MAINTENANCE!

(b) IF A BATTERY BACKUP IS INSTALLED, THE 24 VOLT DC CURRENT TO ELECTRONICS MUST ALSO BE SWTICHED OFF.

***Note**: Tools required are a standard flat blade screwdriver and an electrical flat blade screwdriver.*

Removal

(a) Open the Safedock Pilot Display cabinet and locate the lower DIN rail.

(b) Locate the Safedock power switch and set to **OFF**.

(c) Locate the power supply unit.

(d) Disconnect primary and secondary cables from the unit.

(e) Use a standard flat blade screwdriver to release the spring latch under the unit.

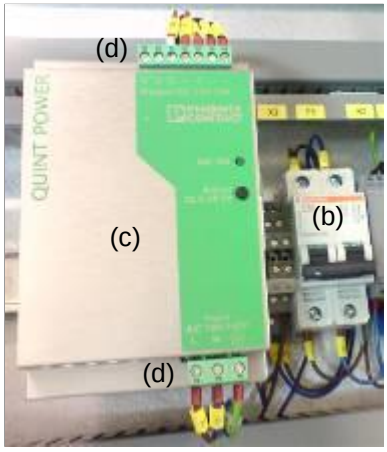


FIGURE 4.51 – POWER SUPPLY RELEASE REMOVAL

Renewal

(a) Locate the upper DIN rail in the Safedock Pilot Display cabinet.

(b) Carefully place the new power supply unit into position.

(c) Apply gradual pressure until the spring latch catches on the DIN rail.

(d) Connect primary cables to the power unit.

(e) Set the Safedock power switch set to **ON**.

(f) Adjust the secondary voltage with a small screwdriver for 24VDC

(g) Connect secondary cables to the power unit.

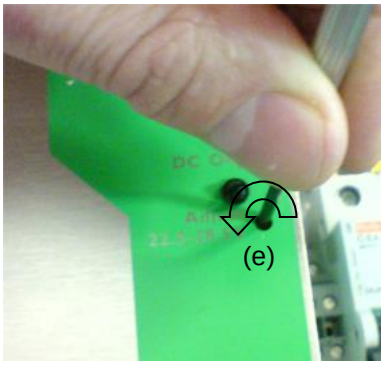


FIGURE 4.52 – POWER SUPPLY ADJUST

Testing

(a) With the power supply **ON**, measure 115/230VAC (primary side) and 24 VDC ±1 (secondary side).

(b) Verify the system starts up correctly:
Operator Panel contact is re-established and the emergency stop function is operational.
***Note**: For more information, see Chapter 3 OPERATION.*

6.7 RENEWAL OF STEPPER MOTOR DRIVERS

6.7.1 Stepper Motor Driver Disassembly

The figure below illustrates the position of the two motor control boards, connected directly to the Control Unit.

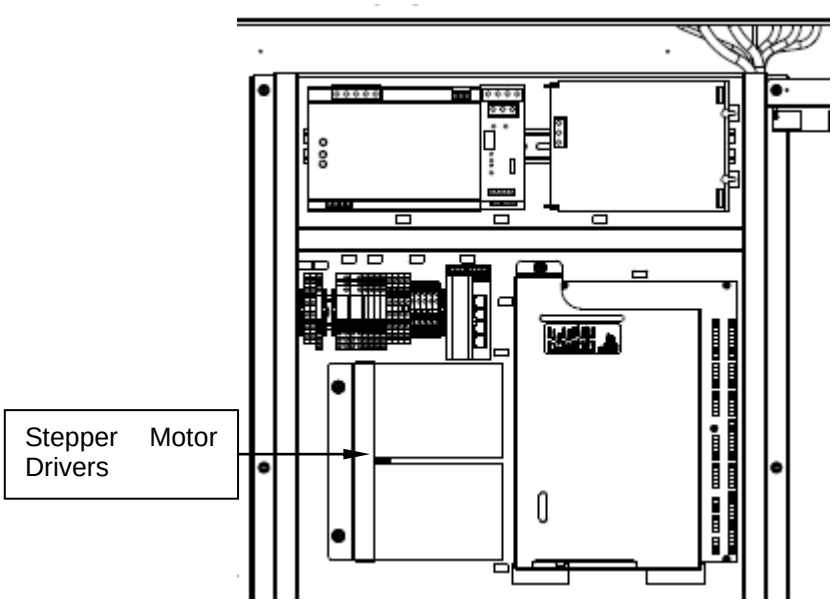


FIGURE 4.53 – T1 STEPPER MOTOR DRIVERS

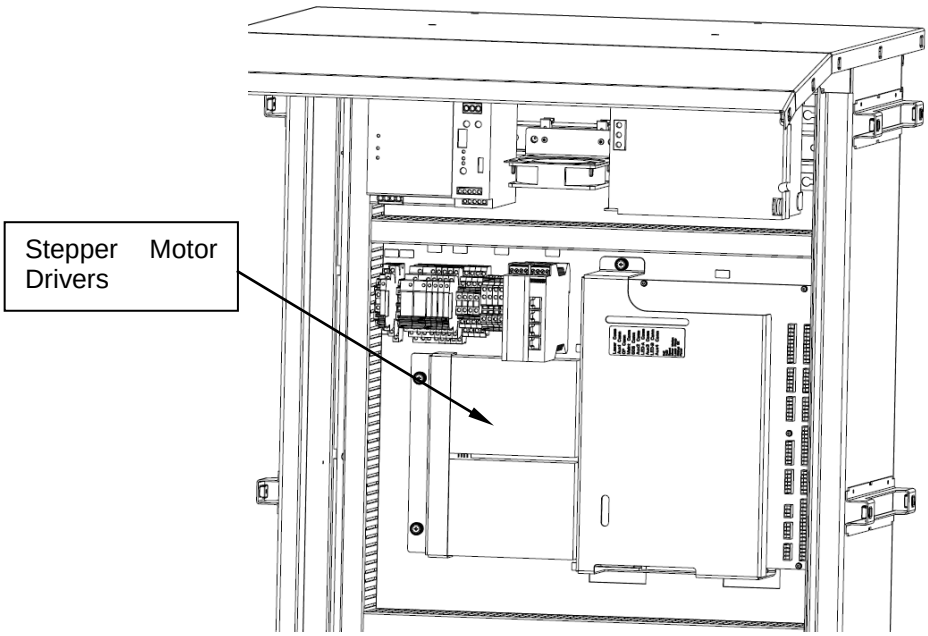


FIGURE 4.54 – T2/3 STEPPER MOTOR DRIVERS

WARNING! DANGER OF ELECTRIC SHOCK. THE ELECTRICAL CONNECTIONS MAY BE LIVE. DO NOT PLACE ANY TOOL INSIDE THE CONTROL RACK.

(a) Switch power OFF and isolate the power supply unit.

(b) To gain access to the motor control boards, loosen the four self-retaining screws, on top of the cover plate, which secures the protective cover plate.

(c) Withdraw the motor control board. The two motor boards are equivalent.

6.7.2 Assembly

(a) Ensure the DIP switch positions, located on the control boards, and are set correctly. The switch settings have to correspond with the setting of the removed control board.

(b) Carefully insert and locate the motor control board. Tighten the screw.

(c) Fit and secure the protective cover plate, using the four self-retaining screws.

6.7.3 Testing

(a) Switch **ON** power to the system.

(b) Start a docking procedure. The system will perform a calibration control and a self-test.

(c) If the system fails during the calibration control test, undertake a new calibration procedure, according to Chapter 4A Stand Configuration Utility.

6.8 RENEWAL OF LED MODULE

6.8.1 LED Module Disassembly

The figure below illustrates the LED matrix boards' connection to the mounting plate.

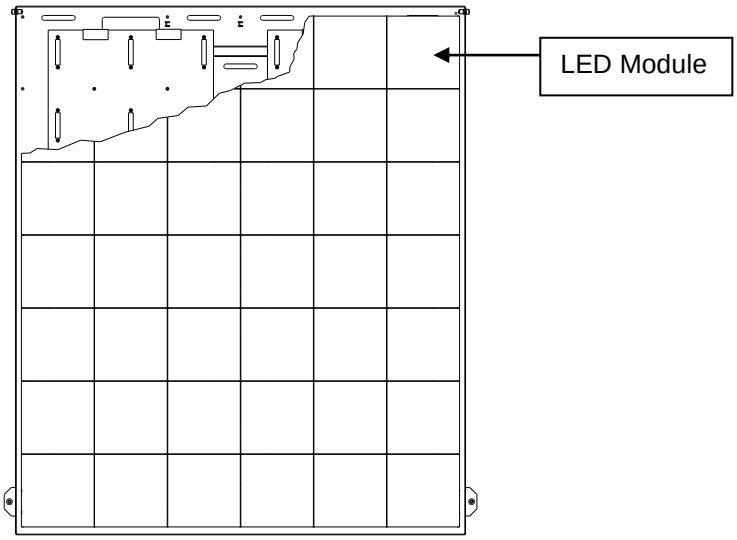


FIGURE 4.55 – SAFEDOCK T1 LED MODULE

***Note**: The front glass is hinged at the top of the display unit.*

(a) To gain access to the inside of the display unit, undo and lift the front glass of the cabinet.

(b) Switch **OFF** and isolate the power supply.

(c) Undo the two lock devices on the outer end of the front glass and let down the plate with the LED modules on.

(d) Carefully remove the defective LED module.

6.8.2 Inspection

(a) Inspect the front glass for cleanliness. Clean as required.

(b) Inspect the cabinet for extraneous material. Clean as required.

6.8.3 Assembly

(a) Insert the new LED module.

(b) Carefully close the front glass and secure.

6.8.4 Testing

(a) Switch power **ON**.

(b) Run the display test from the Operator Panel to verify the function of the new board as follows. Push the **Test** key and select **Display Test** and activate **Address test**. The display shows now the alphabet with one letter on each module. Check if the right letter is displayed on the modules.

6.9 RENEWAL OF OPERATOR PANEL FILM (SOFTKEY)

Renewal of Operator Panel Film (Softkey)

This information is a basic step by step guide for authorized personnel to replace an old type, a damaged or worn film on the front cover, with a new one.

Before you start

WARNING: DANGER OF ELECTRIC SHOCK!

(a) ISOLATE THE POWER SUPPLY PRIOR TO UNDERTAKING ANY MAINTENANCE!

(b) IF A BATTERY BACKUP IS INSTALLED, THE 24 VOLT DC CURRENT TO ELECTRONICS MUST ALSO BE SWTICHED OFF.

***Note**: Tools required are No. 1, 2 Phillips and flat blade screwdrivers, a knife, white spirits and a cleaning cloth.*

Removal

(a) **Pilot Display**: Locate the power switch on the lower DIN rail and set to **OFF**.

(b) **Operator Panel**: Loosen the screws of the cover and open it.

FIGURE 4.56 –OP FILM

(c) Disconnect the film cable and maintenance cable connectors from the circuit board inside the Operator Panel.

(d) Disconnect the Emergency-Stop button and cabling from the inside of the cover as follows:

- Loosen the terminal screw.
- Release the terminal clamp.
- Pull the Emergency-Stop button away from the cover.

***Note**: Keep the Emergency-Stop button and terminal screw in a safe place until the film is replaced.*

FIGURE 4.57 – OP FILM CONNECTION

(e) On the Operator Panel front, lift up a corner of the film using a knife.

(f) Carefully start to cut at the film (bottom layer) adhesive and simultaneously detach the film.
***Note**: The film is layered, be careful not to split the layers when cutting/detaching it. When approximately half of the film is released from the surface, it may be possible to detach the rest of the film, without cutting.*

(g) During removal of the film, pull the film cable out through the upper hole in the cover.
Clean the exposed front cover metal surface thoroughly with white spirits on a cleaning cloth until all remaining adhesive is removed.

FIGURE 4.58 – OP FILM REMOVAL

Renewal

(a) Remove all protective coverings from the new film to expose the adhesive surface.

(b) Carefully feed the film cable through the exposed upper hole in the front cover.

(c) Carefully place the upper area of the film according to the contours for the film on the cover surface.

(d) Slowly even out from the top of the film downwards, making sure no air bubbles exist. Continue until the entire film is in place at the bottom.

(e) Wipe over the film surface with a dry clean cloth.
***Note**: If the new film does not have a pre-cut Emergency-Stop button hole, locate the approximate centre of the hole by pressing on the film, or use the old film as a template to find it.*
Make neat incisions (horizontal, vertical and diagonal) with a knife from the centre of the hole to the contour to create sections to cut away. Carefully cut away the sections to expose the hole.

(f) Place the Emergency-Stop button in position.

(g) Whilst holding the Emergency-Stop button in position, open the front cover and clamp the Emergency-Stop button terminal in the place on the inside.
Fasten the terminal with the screw.

(h) Connect the film and Maintenance connectors to the circuit board on the inside of the cover.

(i) Close the cover and secure the screws.

(j) **Pilot Display**: Locate the lower DIN rail and set the power switch set to **ON**.

FIGURE 4.59 – OP FILM RENEWED

Testing

(a) Verify the system starts up correctly: Operator Panel contact is re-established and the Emergency-Stop button function is operational.

***Note**: For more information, see Chapter 3 OPERATION.*

6.10 RENEWAL OF SURGE ARRESTORS

Renewal of surge arrestor (primary or secondary side)

This information is a basic step by step guide for authorized personnel to replace an old type, a damaged or worn film on the front cover, with a new one.

Before you start

WARNING: DANGER OF ELECTRIC SHOCK!

(a) ISOLATE THE POWER SUPPLY PRIOR TO UNDERTAKING ANY MAINTENANCE!

(b) IF A BATTERY BACKUP IS INSTALLED, THE 24 VOLT DC CURRENT TO ELECTRONICS MUST ALSO BE SWTICHED OFF.

***Note**: No tools required*

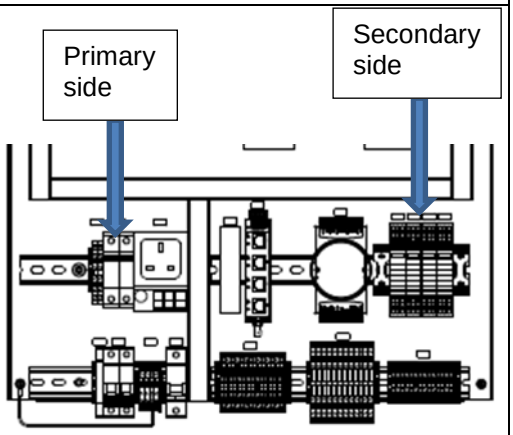
Removal

(a) **Pilot Display**: Open the display door and locate the arrestors subject to exchange, primary or secondary

(b) Unplug the corresponding module failing from the socket, by pulling it towards you,

(c) Insert a new spare module

(d) Re-energise the system.



Testing

(a) Verify the FAIL message to disappear when starting a docking procedure.

6.11 RENEWAL OF DISPLAY FAN AND/OR FILTER (T1 ONLY)

Renewal of display Fan/Filter

This information is a basic step by step guide for authorized personnel to replace display fan or filter.

Before you start

WARNING: DANGER OF ELECTRIC SHOCK!

(a) ISOLATE THE POWER SUPPLY PRIOR TO UNDERTAKING ANY MAINTENANCE!

(b) IF A BATTERY BACKUP IS INSTALLED, THE 24 VOLT DC CURRENT TO ELECTRONICS MUST ALSO BE SWTICHED OFF.

***Note**: Tools required: alen key, srcrewdriver*

Removal

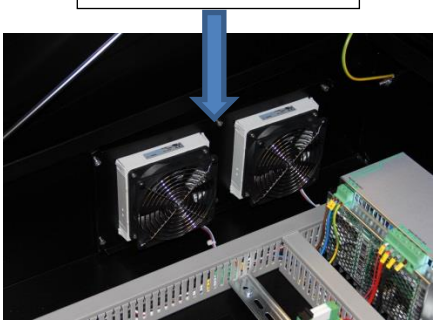
(a) **Pilot Display:** Open the display door and locate the fan assembly including filters (air outlet) and/or the filter assembly (air inlet) subject to the renewal

(b) Use the alen key to unscrew the mounting plate for the assembly

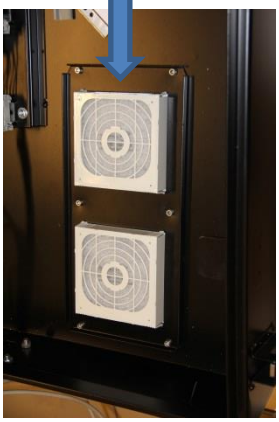
(c) In case of filter exchange, open the now exposed filter cassette and remove the old filter and replace with a new

(d) In case of fan exchange, disconnect the cabling to the fan and use the screwdriver to dismount the fan. Re install a new fan and re-connect the cabling, re-insert the mounting plate and tighten the alen screws.

Fan/filter assembly.
Air outlet.



Filter assembly.
Air intlet.



Testing in case of fan exchange

(a) Verify the Fan operation in relation to the temperature and the disappearance of **FAIL** message in operator panel.
***Note:** The switching point of an active fan is default set to 40 degrees but subject to individual adjustments.*

7. SUPPORT

Our experienced engineers are available for support and service at all times, 24 hour/7 days a week. They are part of a dynamic organization making sure the entire Safegate Group is committed to minimal disturbance for airport operations.

Safegate Support	
Safegate knows that our equipment is used in one of the busiest industries in the world, where down-time costs money and creates delays for airlines and their passengers. As one of the world's leading suppliers of airport systems, Safegate is committed to ensuring that our customers are able to get the most out of your equipment, regardless of the location or the time of day. For this reason, Safegate has established the Safegate Support service. Safegate Support is a unique service provided by Safegate to our customers, free of charge during the warranty period or as a service contract. Any time of day, any day of the year, a Safegate engineer is on standby to answer questions and assist with any problems that may arise. Qualified technical assistance is just a phone call or an e-mail away, 24-7 worldwide. ✉ support@safegate.com ☎ +46 40 699 1740	 FIGURE 4.60 – SAFEGATE SUPPORT

7.1 SAFEGATE WEBSITE

The Safegate Website, www.safegate.com, offers information regarding our airport solutions, products, company, news, links, downloads, references, contacts and more. ***Note**: There is also a **Client/Partner login** area for the latest information and updates, if available.*

7.2 RE-CYCLING

7.2.1 Local Authority Re-cycling

The disposal of Safegate products is to be made at an applicable collection point for the recycling of electrical and electronic equipment. The correct disposal of equipment prevents any potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling. The recycling of materials helps to conserve natural resources. For more detailed information about recycling of products, contact your local authority city office.

7.2.2 Safegate Re-cycling

Safegate is fully committed to environmentally-conscious manufacturing with strict monitoring of our own processes as well as supplier components and sub-contractor operations. Safegate offers a re-cycling program for our products to all customers worldwide, whether or not the products were sold within the EU.

Safegate products and/or specific electrical and electronic component parts which are fully removed/separated from any customer equipment and returned will be accepted for our recycling program.

All items returned must be clearly labelled as follows:

- **For ROHS/WEEE Re-cycling**
- Sender contact information (Name, Business Address, Phone number).
- Main Unit Serial Number.

Safegate will continue to monitor and update according for any future requirements for EU directives as and when EU member states implement new regulations and or amendments. It is our aim to maintain our compliance plan and assist our customers.
***Note**: For more information, see www.safegate.com, or contact Safegate Support via email at support@safegate.com or phone +46 40 699 1740.*

7.2.3 Packaging

All packaging shipped with products should be properly marked for recycling per GB 18455-2001 Packaging recycling Mark. Responsible and sustainable recovery of packaging products is therefore of paramount importance, and with the right actions, it contributes to a sustainable environment based on a best effort basis.

All packaging and boxes are to be re-cycled according to local authority regulations.

- **Cardboard -** Used cardboard packaging is to be flattened for delivery to a local authority re-cycling site and onward delivery to, for example, a paper mill for re-cycling/reuse as a new product.
- **Plywood box** - Used plywood boxes are to be flattened for delivery to a local authority re-cycling site and onward delivery to, for example, a materials recovery facility (MRF) where the box is to be grinded down, while the steel is separated from the Plywood, using an electromagnet. The steel is then sent to a steel mill where it is melted down and reused as a new product. Plywood spillage is burned in a controlled environment, for example a combined heat power plant where the extracted energy is reused in the municipality's energy system with high efficiency, such as in the electricity network.
  ***Note**: If plywood is burned in an uncontrolled environment, the amount of CO2 released is the same as the amount of CO2 from the atmosphere through photosynthesis. Wood is a source of bio-energy, in contrast to fossil fuel, and does not contribute to global warming. The concentration of the restricted substances in the waste gas from Plywood is also below the limit.*

  Nefab Packaging Sweden AB has an Environmental Management System certified according to ISO 14001. For more information see www.nefab.com.

7.3 SPARE PARTS

For a complete and updated list of spare parts for Safedock system, please see *www.safegate.com* or contact Safegate for assistance with ordering spare parts.

CHAPTER 4 MAINTENANCE - APPENDIX A
STAND CONFIGURATION UTILITY
(SAFEDOCK MAINTENANCE TOOL)
CONTENTS

1. SCOPE

This is a presentation of the Safedock Maintenance Tool (SMT) describing the procedures of how to configure and calibrate a Safedock system.

2. LICENSE INSTALLATION AND SELECTION

To start, the application requires at least one license file to be present in the license folder. If more than one license file is present, the application will present a list of available licenses and let the user choose one to use until next restart. If only a single license is present it will be used without questions to the user.

All license files are branded with the name of the airport they belong to and also information about inherence to a specific terminal etc. This information is displayed in the title bar of the application.

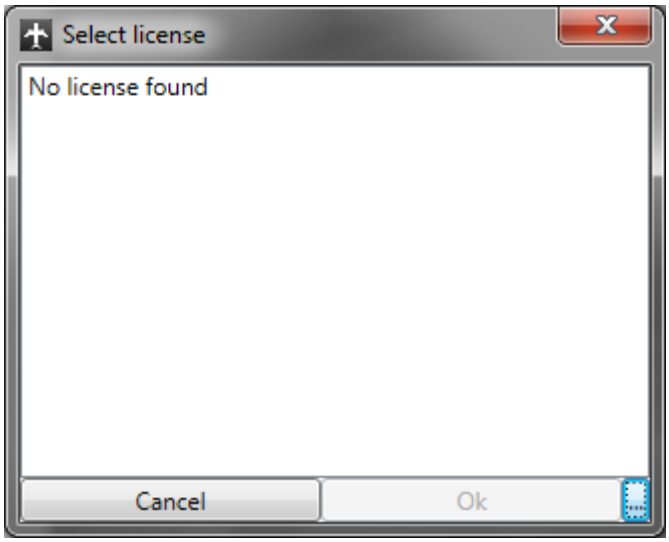


FIGURE 4A.1 – LICENSE SCREEN

If no license is found, the license folder can be accessed via the button in the lower right corner of the dialog. Simply copy the license file you have obtained into the license folder and restart SMT.

Use the File > Open data directory menu to access the license folder when a single license is installed and the license dialog isn't displayed during application start.

3. SOFTWARE OVERVIEW

On the left side each task that needs to be performed is represented by a red, yellow or green marker, where the colours have the following meanings:

- Green – OK
- Red – Incomplete
- Yellow – Intermediate (configuration may need to be applied to system before continuing)

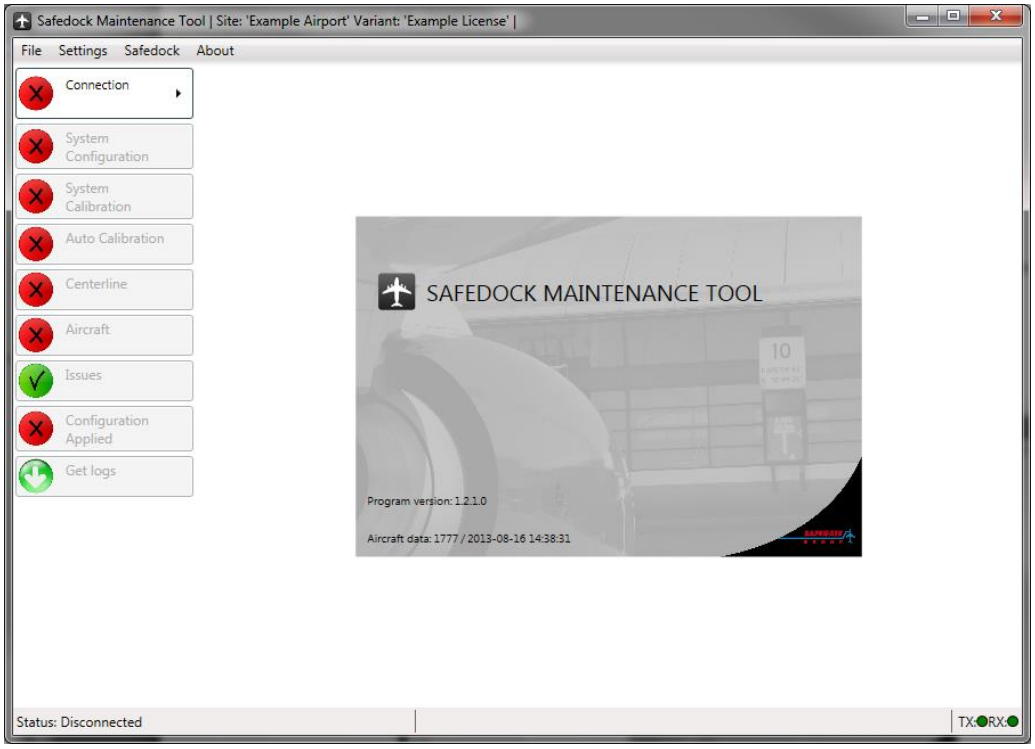


FIGURE 4A.2 – SMT START SCREEN

The tasks needed may vary based on the configuration. The details for each task presented here may not always correspond to what you see on your screen. The license you are using may also affect the layout of the application. When clicking on each task a view with corresponding settings will appear. It is recommended to perform the tasks top to bottom.

4. SOFTWARE DESCRIPTION

4.1 CONNECTION

SMT can connect using either a serial line or a network connection. To connect, click the right-arrow to open the connection settings, select/enter information as required and press the “Connect” button. Network adresses can be entered either as DNS-names (if such are available) or IP-numbers (only IPv4 is supported).

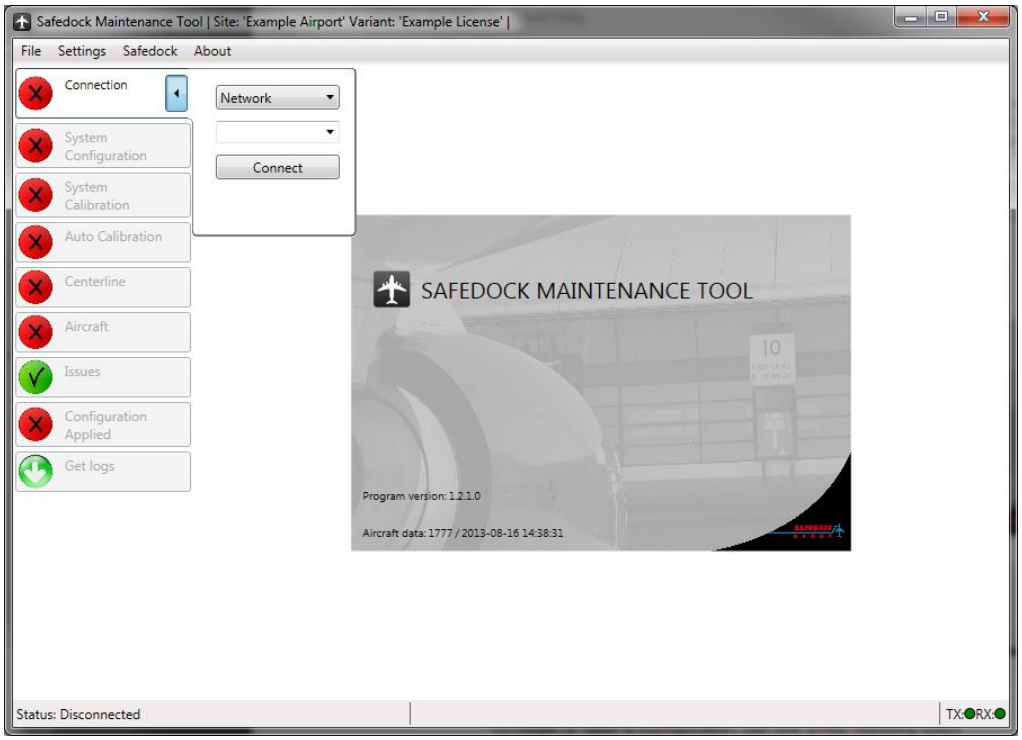


FIGURE 4A.3 - CONNECTION FEATURE

4.1.1 Creating a New Configuration/ Opening an Existing Configuration

To create or open a configuration, use one of the following ways

- Connect to a Safedock system to download a configuration.
- Open an existing configuration using the “File / Load” menu.
- Create a new configuration using the “File / New” menu. Using this option you will also need to select the template to use for schematics in the new configuration.

You need to have a configuration open to access most parts of the application. Some parts will be disabled when not connected to a Safedock system.

When connecting to a system without an existing configuration, a dialog will appear that prompts for a selection of one of the possible actions.

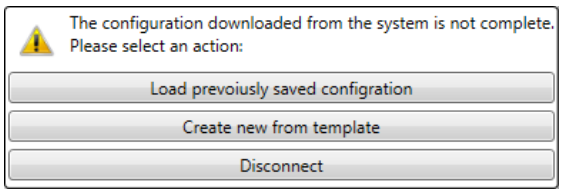


FIGURE 4A.4 – CONFIGURATION DOWNLOAD SCREEN

4.2 SYSTEM CONFIGURATION

SMT comes with a series of features that can be adjusted to your needs. The availability of these features depends on both the version of the Safedock system and also the license in use.

You must apply the configuration to the system after changing the type of scanner being used, otherwise the system calibration will be invalid; this is indicated by the yellow icon on the left side.

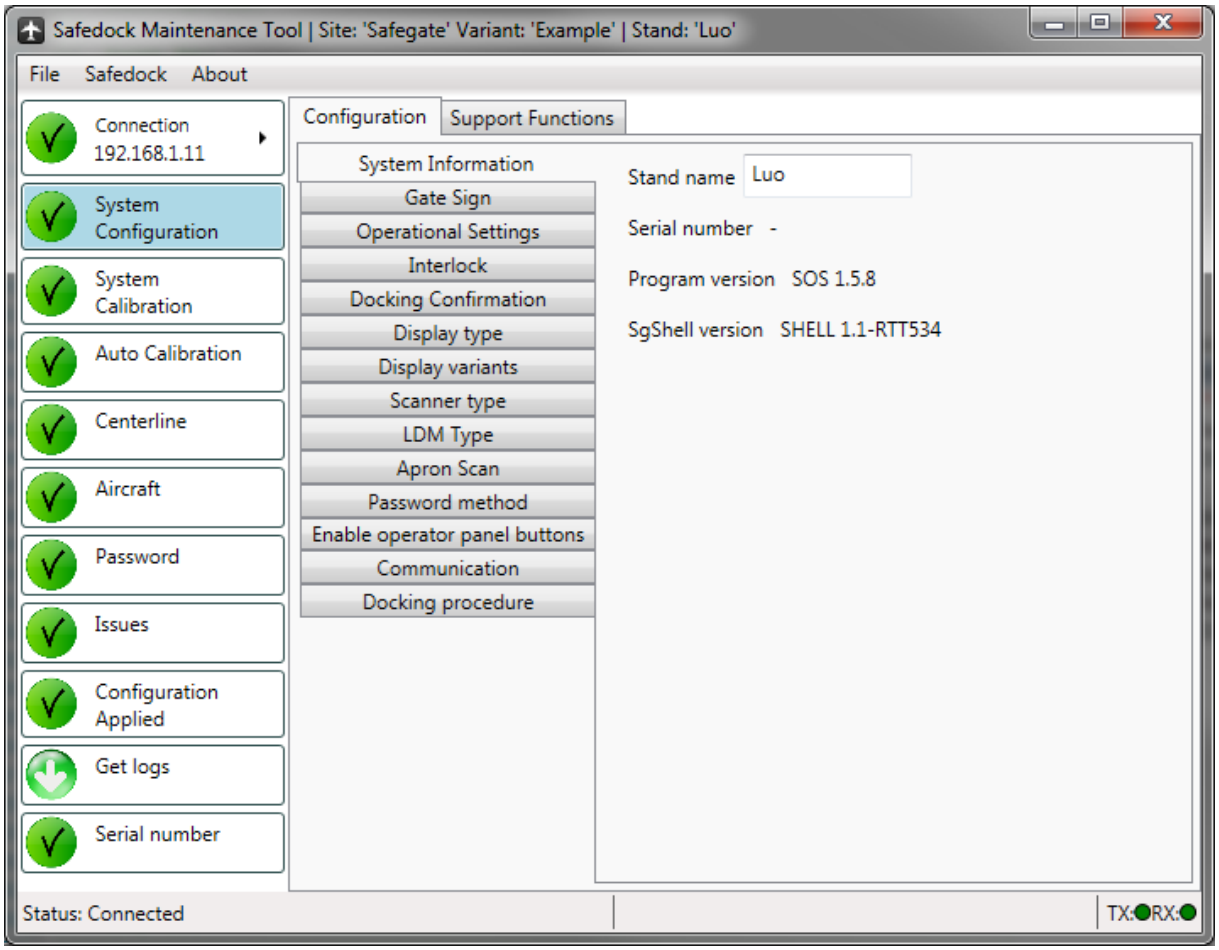


FIGURE 4A.5 - SMT – SYSTEM CONFIGURATION

Some settings may display a confirmation dialog asking you to accept changing the setting. This is done to prevent accidental activation/deactivation of a feature that may have a negative impact on other features in the system.

4.2.1 System Information

- Stand name: This setting specifies the name of the stand, and will be reported to the Superior System.
- Program version: Shows the version of the software that wrote the currently used configuration template, whether loaded from disk or directly from a system.

4.2.2 Gate Sign

Different type of gate related information can be enabled on the Pilot Display:

- Allow off: If checked, the display can be blanked. This is also the default mode for the Pilot Display.
- Allow sign: If checked, the texts entered in parameters Line 1 & Line 2 can be shown on the first and second line of the display (if available).
- Allow time: If checked, the display can show the Current Time.
- Allow alternating time/gate sign: The display can show alternating Current Time/Stand ID and Stand No.
- Large font (if supported by display): The display will show double-sized text instead of two texts on two lines.

4.2.3 Operational Settings

- Use Prepared: The default scheduling procedure is changed to an alternative, site specific procedure. The message appears when the scheduled flight information is made available for the Safedock system. The system is then awaiting activation of the docking procedure. The only operation available to the local operator at this time is to abort the prepared flight. The activation command must come from the Superior System.
- Use pushback tracking: The system tracks the aircraft during pushback and reports the distance to the superior system. Requires activation either from the operator panel, superior system or via input signalling.
- Do park-off checks also when pushback tracking is used: Normally when pushback operations are used, the park-off scans are not required. However, depending on the operational procedures it may be desired to use them. Use this option to alternate between the modes.
- Send approach track data: Depending on the level of integration with other systems, it may be desired by the superior system to receive positional information of an approaching aircraft.
- Report nose wheel position instead of nose position: Selecting this option results in the nose wheel position being sent instead of the nose position during approach and pushback.
- Max Open Gate Duration: The maximum time the system remains in the open state before going back to ready state.
- ‘Start docking’ as start menu: If checked, the start docking menu will be displayed when the system is idle instead of the normal root menu.
- Revert to ready and clear RIDS if communication to superior system is lost: Depending on the requirements, it may be desired to prevent out-dated data from being used by an operator when the communication to the superior system is lost. If this option is selected, the system will revert from the states Scheduled and Prepared to the Ready state and clear any RIDS texts one minute after loss of communication is discovered. This option is only applicable if SAM is the superior system.
- Blocking amplitude: The amplitude value to use for filtering of echoes within the view blocked limit.

  Unexpected **VIEW BLOCK** messages can be caused by internal reflections within the enclosure. A calibration picture facing the area where the aircraft type is expected to appear should be taken to identify the echoes and a right click on the echo seen as a yellow mark will give the amplitude. The value that should be inserted is the echo amplitude + 5. Maximum value that can be used is 60.
- Use UPS: This option should be set if the system is equipped with internal Uninterruptible Power Supply unit.

4.2.4 Interlock

- Use Superior System Interlock: This activates a blocking scheme, whereby two adjacent Safedock systems will lock each other out, allowing only one of the systems to be active at a time, or allow for operational use up to a pre-defined size of aircraft depending on the aircraft parked at adjacent stand. This feature is normally used only where two centrelines are located too close to each other to allow them both to be used at the same time. Requires appropriate configuration of the superior system.
- Request Interlock Timeout: The maximum time to wait for an answer from the Superior system when requesting permission to start a docking. If the specified time is exceeded, the operator will be presented with an option to manually confirm or to abort the docking.

4.2.5 Docking Confirmation

- Use Docking Confirmation via Superior System: When a docking is started, a confirmation request is sent to the superior system. If the requested aircraft matches what the superior system has in its flight schedule, the docking is started, otherwise the operator is presented with a menu where (s)he can select either the aircraft type previously selected or the one provided by the superior system.
- Request Docking Timeout: The maximum time to wait for an answer from the Superior System when requesting permission to start a docking. If the specified time is exceeded, the operator will be presented with an option to manually confirm select the aircraft or to abort the docking.
- Flight Information System: The label that should be used for the FIS system on the Operator Panel when presenting the options to the operator.

4.2.6 Display Type

- Display type: Different types of Pilot Display can be specified (if the license permits). Select the one matching the actual hardware in the system.

4.2.7 Display Variants

- Use digital countdown: If checked, the system will display a digital countdown of the distance to go on the Pilot Display. The distances specify during which ranges the different steps are used for digital countdown.
- Use countdown in feet: If selected, digital countdown will be displayed using feet instead of meters.

4.2.8 Scanner Type

Currently, only one scanner type is available:

- LRFScanner: This is the scanner that uses stepper motors and a Laser Range Finder.

4.2.9 Apron Scan

- Perform apron scan: If checked, the system will perform a scan of the area in front of the system (as defined in the apron scan configuration), notifying the operator or the Superior System if any blocking object is found.
- Detection height: The minimum height of objects to be detected. Lowering this value increases the time it takes to scan the defined area.
- Ground margin: The height relative to the ground that the system will ignore items below, used to compensate for irregularities in the apron.

4.2.10 Modbus Interface

Safedock can communicate with up to four external equipment devices, such as a PBB, using Modbus/TCPIP.

- Channel 1-4: If checked, Safedock will act as a TCP/IP client and Modbus master, connecting to the Modbus server specified by the parameter *IP Address* on port *Port number* with a poll update frequency as specified by the *Poll time* parameter.
- Please note that additional configuration is required to enable the functionality; please contact Safegate Support for further information.

4.2.11 LDM Type (Laser Distance Meter)

- LD3 LDM: Should be checked if a digital LDM is mounted.
- LD90 LDM: Should be checked if an analogue LDM is mounted.

Note: *The LMD type of must be correctly set for system proper operation.*

4.2.12 Communication

- SAM (SafeControl - Apron Management) Communication Channel 1 & 2:
  - SAM Communication Mode: Specifies if SOS shall work as server or client.
  - SAM server IP (Client mode only): Specifies the IP address of the SAM server. Has no effect if mode is Server.
  - Port number: Specifies the port number to connect to (as client) or listen on (as server).
- Legacy GOS ID: Identifier for the system when connected to a GOS system. Must be unique among all systems connected to the same GOS.
- Legacy GOS communication mode: Specifies the communication mode for the connection to the GOS server. If the standard serial line converter is used, i.e. a “Tibbo” (connected to connector J11), the setting ‘Serial’ shall be used.

4.2.13 Password Method

- No password: No password protection for operator and/or maintenance operations is used.
- Pincode: A four-digit password for operator and/or maintenance operations is required.

4.2.14 Enable Operator Panel Buttons

- Open gate: Enables a local operator to acknowledge that the Stand area is empty and ready to accept an aircraft. This command can be used to accept a scheduled docking, initiated by the Superior System, or to set the stand status to ‘Free Open’, allowing remote start of a docking procedure.
- Chocks on: Enables a local operator to send a message to the pilot that the ground personnel has put the chocks on the wheels and the docking procedure is completed. This option must not be enabled at the same time as “Chocks on/off”.
- Chocks on/off: Same as “Chock on”, but also allows the operator to signal Chocks off. This option must not be enabled at the same time as “Chocks on”.
- ID-override: Enables a local operator to override an ID-Fail condition.
- Legacy GOS comm info: Specifies whether the button for opening menu page with information about GOS communications activity should be enabled on the operator panel.
- Superior comm info: Specifies whether the button for opening menu page with information about Superior communications activity should be enabled on the operator panel.

4.2.15 Log Settings

- Maximum total log size: Specifies the maximum amount of megabyte the docking logs may occupy before the system starts to delete the oldest files to allow new logs to be saved.

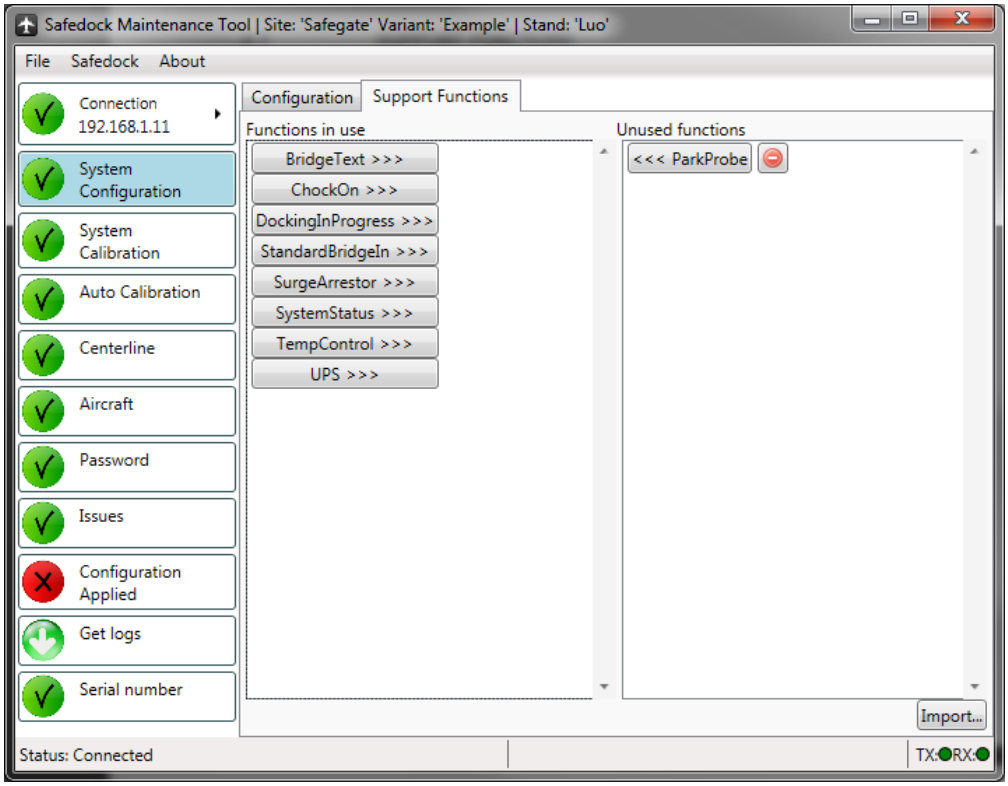
4.2.16 Docking Procedure

- Use rolling arrows in downgrade: If checked, the system will allow the rolling arrows to be displayed even in downgrade mode; by default the system is preventing this type of signal in downgrade mode.
- Use engine verification: If checked, the system will perform engine verification on the approaching aircraft, unless specifically disabled for a particular aircraft.
- Standstill time: The time (in seconds) that the aircraft must be at a standstill before the docking is considered complete.
- Ok message time: The time (in seconds) that the **OK** message will be displayed.
- Too far message time: The time (in seconds) that the **TOO FAR** message will be displayed.
- Stop short detection distance: Maximum distance from the stop-position at which the system may consider the docking completed if the aircraft is at a standstill. Must be > 0 to enable the function.
- Stop short detection time: The time (in seconds) that the aircraft must be at a standstill before the docking is considered finished if the aircraft stops before the stop-position. Must be > 0 to enable the function. Stop short message time: The time (in seconds) that the **STOP SHORT** message will be displayed.
- ID-Fail message time: The time (in seconds) that the **ID FAIL** message will be displayed. During this time, it is possible to restart the docking without engine identification check, using the “ID-override” button.

4.3 SUPPORT FUNCTIONS

This view enables adding, removing and importing support functions into the configuration. The left side lists those that are in use and the right side those that are unused and that can be entirely removed from the configuration. By clicking on the buttons with the arrows, they can be moved between the two lists.

When a function is removed, new ones may appear since the last function that used them was just removed.



4.3.1 Updating support functions

A support function may be updated by first moving it to the list of unused functions, the deleting all functions in that list until there are none left. Then, using the Import-button, import the function and move it to the list of used functions.

4.4 SYSTEM CALIBRATION

This step prepares the configuration of the system regarding the stand area in front of the Safedock unit. It is important to be thorough while calibrating the system because everything relies on the calibration being correct. All values in this view are relative to the position of the laser, meaning that if the system is mounted with a laser height of 5m; the ground will thus be at -5m relative to the laser.

4.4.1 Preferred Calibration Procedure

1. Enter the horizontal height and the vertical width, in degrees, for the area to scan. A value of ten is a good starting point. Note that the area you define here is what you will have available during centreline definition later in the setup procedure. Make sure that you cover enough of the area; otherwise you will have to redo this step. Likewise, if you will be using the “Apron Scan” feature, the entire area to be scanned must be seen in the final image.
2. Enter the horizontal and vertical centre, in degrees, of the area to scan. These are normally close to zero, but will differ from system to system depending on

how the mirrors are mounted on the axis of the mirror motor. Negative values are to the left/up, positive to the right/down, from the system point of view.

3. Press the “Start Scan” button and wait for the application to build an image of the defined area. While the image is being built, a counter will indicate how many scans there are left until completion.
4. You can choose to show the scanned image in a multi-colour scale (when “Distance” is selected) and the in a blue-white gradient scale (when “Amplitude” is selected), see figures below.

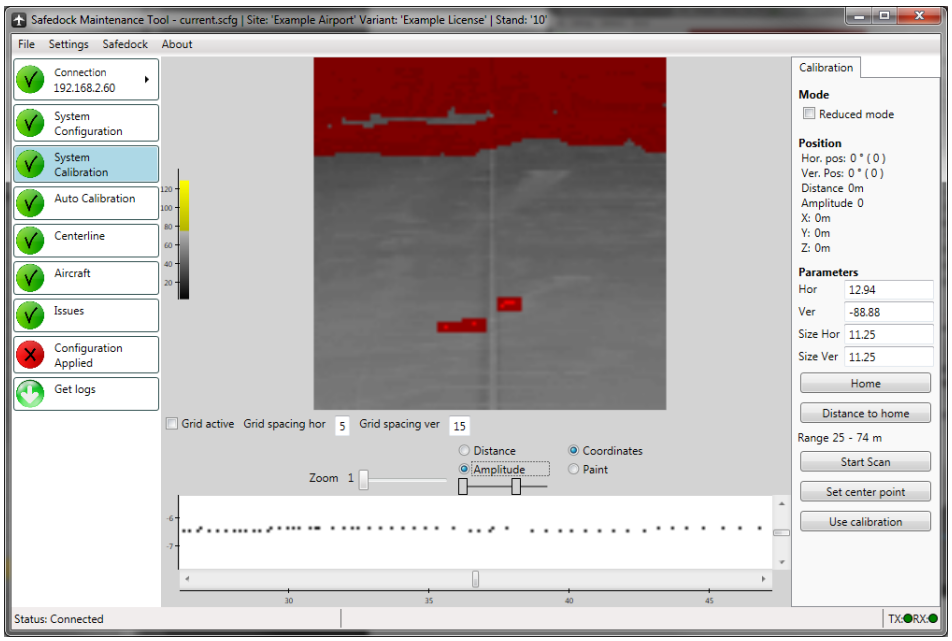


FIGURE 4A.6 - SYSTEM CALIBRATION FEATURE – COLOUR SCREEN

5. Next, use the paint tool (“Paint” button) to mask/hide those areas in the image that should not be considered as the ground. Use left-click to mask and right-click to erase the mask.
6. When all non-ground areas have been masked, press the button “Use Calibration”. A dialog will be displayed, asking for confirmation.
7. Verify that the point-graph (with a white background) in the lower part of the window accurately represents the silhouette of the area in the middle of the newly masked image. In most cases, the points should form a straight line.

4.4.2 Alternate Calibration Procedure

If conditions are such that they prevent the system from obtaining a good image of the apron, an alternate method for calibration can be used. The procedure is as follows:

1. Check the “Reduced mode” checkbox on the right side (this disables the Paint-option).
2. Press and hold **Ctrl** and left-click along the centreline (use reflexes while scanning the image if it is not visible). For each click, a new marker will be placed. Two markers are sufficient in most cases but if there are slopes or rises in the apron you should place one marker on each top/bottom.
    a. When the first marker is placed, a second marker in a different colour is placed to the right. This marker shall be moved to the side as far away as possible from the centre of the image, while still being placed on an area where there is ground and within the inner and outermost marker. Again, use reflexes if needed.

3. Press the “Save Calibration” button.
4. Verify that the silhouette of the apron corresponds to the imaginary line between the placed markers. Only a single point will be displayed for each marker.

Note: *This method cannot be used if Apron Scan is activated.*

4.4.3 Feature Buttons

Apart from the button “Start Scan” and “Use Calibration” there are several buttons for this feature that can be used:

- Home – can be used to send the mirrors to their home position. Used when adjusting the mirrors on their axis.
- Distance to home – used to measure the distance from the mirrors current position to their home position.
- Set centre point – click this, then click in the image to acquire a new image centred on the clicked point.

4.5 AUTO CALIBRATION

Auto calibration or “automatic calibration check” is a safety measure used to make sure that the hardware is OK or that the system has not been moved out of its original position since being commissioned.

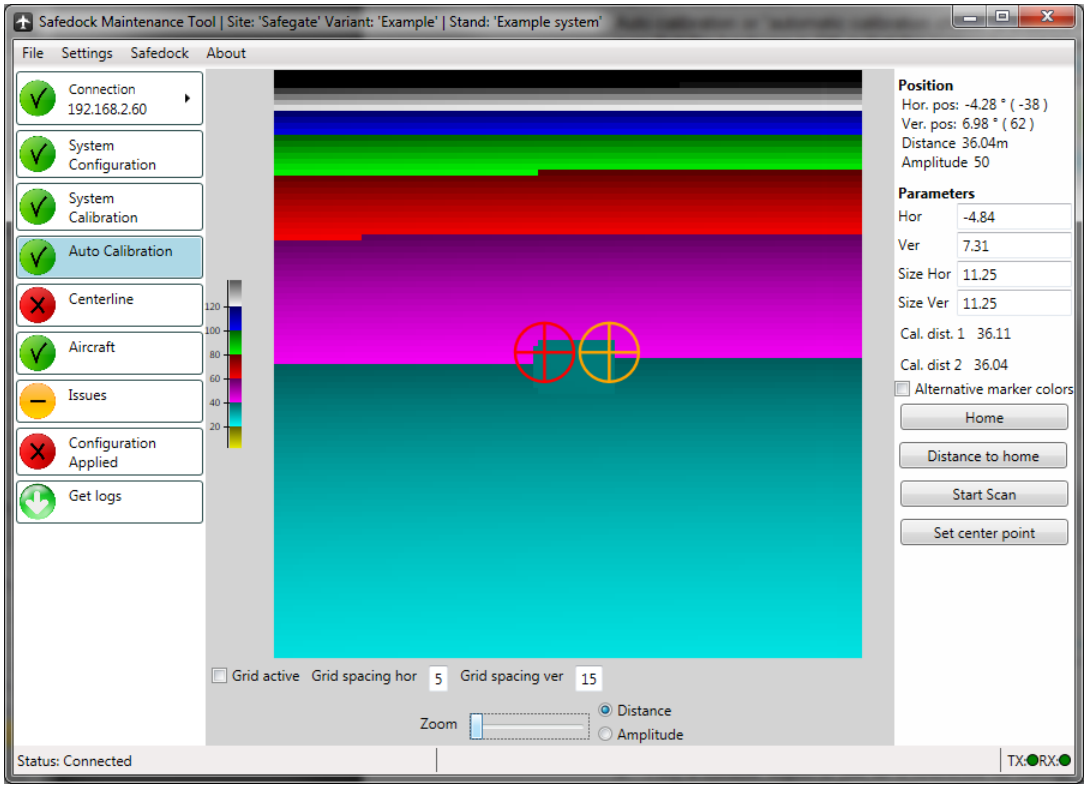


FIGURE 4A.7 - SMT – AUTO CALIBRATION FEATURE

The procedure to setup the auto calibration is following:

1. Enter fitting values for the *Hor*, *Ver*, *Size Hor* and *Size Ver* settings so that the system looks in the desired direction.
2. Acquire a new image by using “Start Scan”.

3. Find a suitable object to use as a reference for calibration. It should be a flat surface located at least 3m from the system and preferably with its edges within the view.
4. Press and hold **Ctrl** and left-click near the edge of the object to set the first reference point. Now press and hold **Ctrl** and right-click at another point near (but not on) the edge of the object to set the second reference point.

When the system verifies the calibration, it looks at these two reference points and compares the stored distances to the acquired ones, and if they differ more than 2dm, the system will report an error. Since it is the distance that is compared, it is important to set the reference points at different sides of the object, and even better at opposite corners if possible. If there are no edges available, the points should at least be set at different distances if possible.

You can test the calibration points using the test function on the Operator Panel once the configuration has been applied.

4.6 CENTRELINE

Here you can define the layout of each centreline by placing markers along the centreline in an image.

On the left side of this feature's window you can see the calibration image where you define your centreline area. On the right side you can see a top view of the calibration image (to the left) where any object with a height of >0.5m is displayed in red.

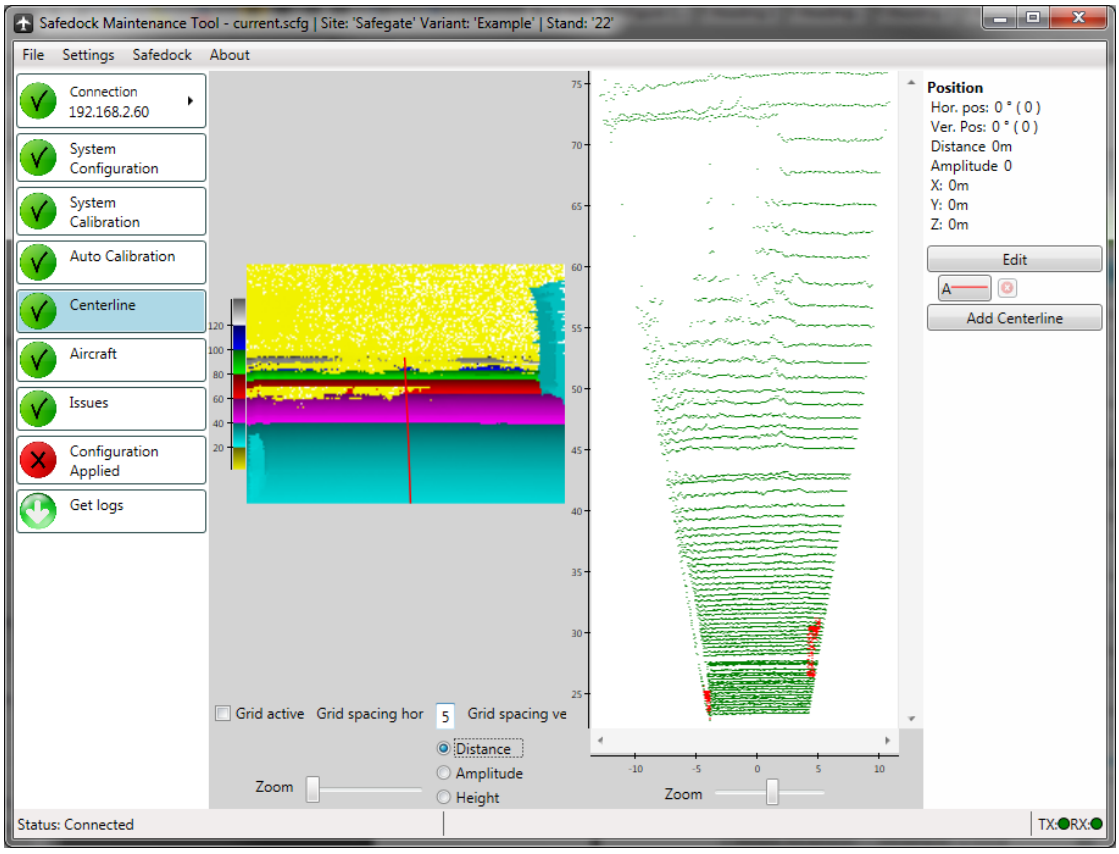


FIGURE 4A.8 - CENTRELINE FEATURE - DISTANCE

To define a centreline, follow the steps below:

1. Click on the appropriate centreline button on the right side, then press the “Edit” button.
2. Press and hold **Ctrl** and left-click along the centreline to place the centreline markers. If the apron is flat and the centreline is straight, two markers should be sufficient. If the centreline is curved or if the apron has slopes, place additional markers on the top/bottoms along the centreline. The closest marker should be placed at or very near the inner most stop-position and the outer most marker should be placed near the clip distance. To remove a marker, right-click on the marker and choose “Remove marker”.

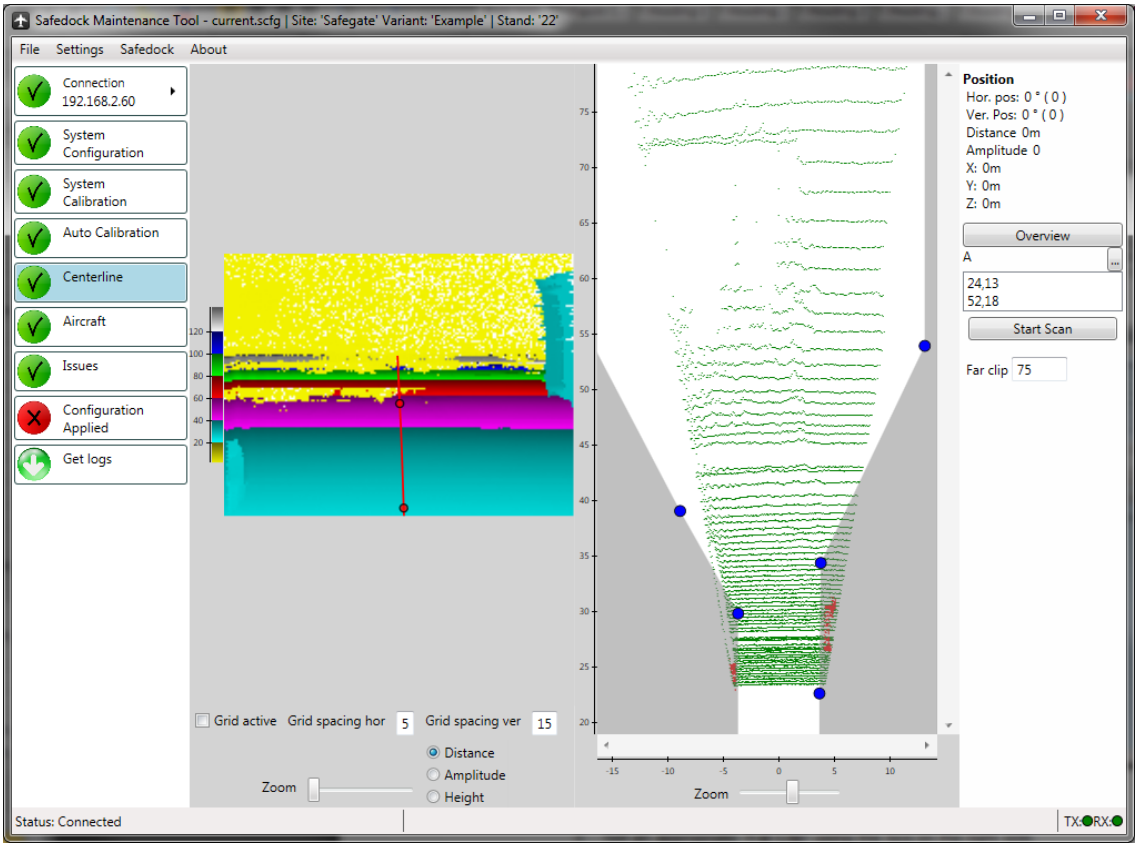


FIGURE 4A.9 - CENTRELINE FEATURE - AMPLITUDE

3. Set an appropriate “Far Clip” using the box on the right side.
4. Use the same approach as when placing the centreline markers as when you set the left and right clip using the top view. Clicking in the left third of the top view adds a marker to the left side clip and clicking in the right third of the top view adds a marker to the right clip. The clip markers can be moved into the middle third after they are added to either the right or the left clip. Keep in mind where the engines of the aircrafts on the current centreline will be so that you do not set the clip too tight, causing the engines to be clipped which may prevent dockings from completing.
5. When done, click the “Overview” button and repeat the above steps for any additional centrelines.
6. Use the buttons to add/remove centrelines. Up to a total of three can be configured.

4.7 APRON SCAN

Apron Scan configuration is done once for each centerline. The goal is to tell the system which area should be scanned and which should not. Please note that a proper apron scan setup can only be achieved using a high quality image (taken during the system calibration) of the area in front of the system. Images with lots of drop-outs or objects that are not normally present during docking should not be used. The procedure is as follows:

1. Click the button that corresponds to the centerline for which to configure apron scan.
2. Click the “Edit” button
3. **Ctrl**-click on the ground to the left of the image center to add the first marker.
4. Add a second marker to the left of the image center.
5. Adjust the markers so that the areas which should not be scanned are grayed out. Please take the perspective into consideration when placing the makers. You may add more markers as needed, for example to work around a stationary object, but keep in mind that the system cannot see through these objects.
6. Repeat step 3 for the right side of the centerline. There must be at least one marker on each side of the image center; otherwise the application will mark the apron scan setup as invalid.
7. Enter a far clip, i.e. the maximum distance to which the apron scan will perform the scan.

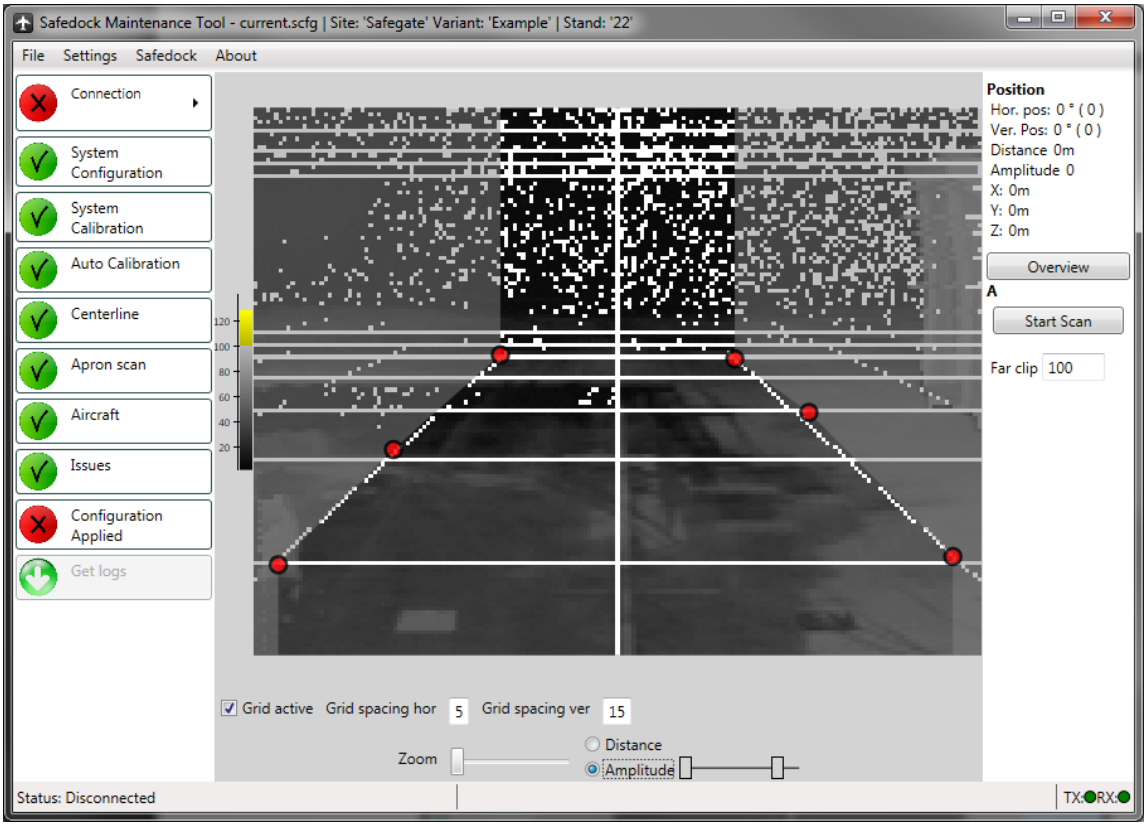


FIGURE 4A.10 - APRON SCAN FEATURE

4.8 AIRCRAFT

Here you can configure the centrelines, stop-positions and Operation Panel menu layout.

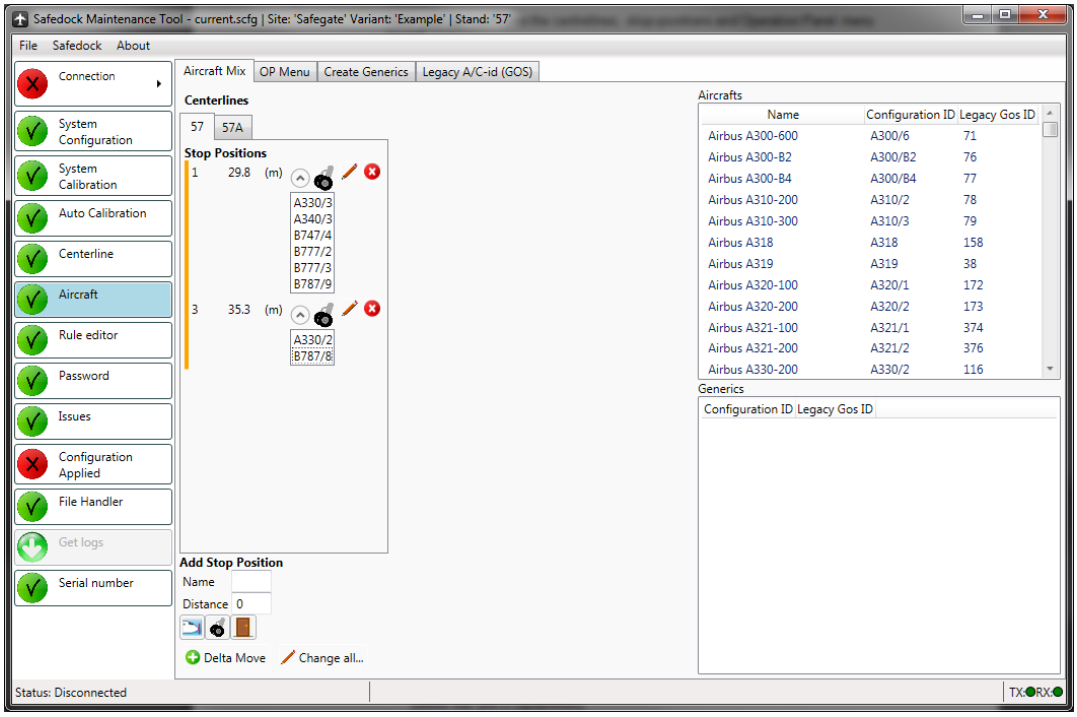


FIGURE 4A.11 – AIRCRAFT FEATURE

On the left is where the centrelines and stop-positions are shown. The middle part displays the properties for the currently selected aircraft. On the right, the list of available aircrafts and generic aircrafts is displayed.

- Centrelines: The system supports up to three centrelines, depending on the used license.
  - Stop Positions: A visual representation of the different configured stop-positions on the currently selected centreline. The icon represents the selected stop-position reference.
  - Add Stop Position: Enter a name and a distance for a new stop-position, then press one of the three stop reference-buttons to add the new stop-position.
  - Delta Move: Opens a dialog window where you enter a distance to which all stop-positions will be adjusted by. Negative values will decrease the distance to stop-position and positive values will increase it.
- Aircraft Menu: The aircraft selection menu, as it will appear on the Operator Panel (within the unit's capabilities).
- Aircrafts: The list of available aircraft profiles.
- Generics: The list of generic aircraft profiles created by a user.

4.8.4 Changing multiple settings on multiple aircrafts

Below the centreline/stop positions, there is a button labelled “Change all…”. Pressing this button brings up the dialog to change one or many settings on one or many aircrafts at the same time.

On the left the available settings are shown, on the right the available aircrafts sorted by centreline & stop position. Clicking the checkbox on the same lines as the stop position name will (de)select all aircrafts on that position.

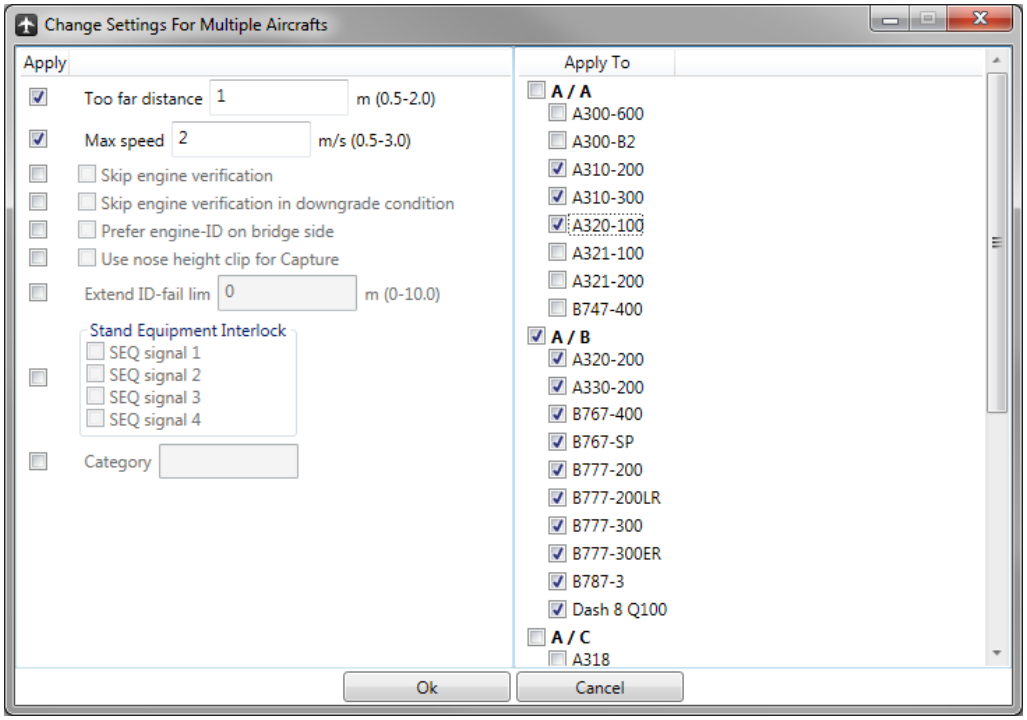


FIGURE 4A.12 – SMT START SCREEN

To change a setting, first check the corresponding “Apply” checkbox, then set the desired value for that setting. Once all settings are as desired, select the aircrafts to which these settings should be applied. Press the Ok-button to apply, or Cancel to cancel any edits.

Settings that do not have the “Apply”-checkbox checked, are left untouched on the selected aircrafts.

4.8.1 Aircraft Settings

- Configuration id: The ID used to identify this specific aircraft configuration. This ID, together with the Tag (see below), makes up the unique identification value used to specify one among many instances of the same aircraft type.
- Display Texts
  - Operator text: The text referring to the aircraft’s identity that is displayed in the Operator Panel.
  - Operator key: The text that is displayed on the Operator Panel soft key (when choosing between different aircrafts in the menu). Use the character ^ to specify a line break. Maximum ten characters (excluding a single ^).
  - Pilot display: The text that is shown on the Pilot Display when the docking is initiated and the system is waiting for an aircraft.

- Docking procedure:
  - Too far distance: The maximum distance the aircraft may have travelled past the stop-position before the system will signal a **TOO FAR** condition.
  - Max speed: The maximum speed the aircraft may approach the system with before the system signals a **SLOW** sign.
  - Skip engine verification: If checked, the engine verification is not performed for this aircraft instance.
  - Skip engine verification in downgrade condition: If checked, the engine verification is not performed for this aircraft instance during downgrade conditions.
  - Prefer engine-ID on bridge side: By default engine-ID performs the check on the side away from the bridge. Activating this option makes the system to prefer the bridge-side engine instead. This can be used if the approach is such that this option makes it easier for the system to perform the check.
  - Extend ID-fail limit: Can be used to extend with up to 10m the minimum distance to the stop-position for the activation of the **ID-FAIL** message.
- Aircraft configuration:
  - Category: Used for, among other things, BridgeIn logic. Enter one or more “categories” (separated by a comma) where the particular aircraft should be included in. These categories are then available for use in the schematics.
  - Tag: Used to make aircraft instances unique by entering one or more tags. These are used to find a specific aircraft configuration instance when dockings are started from SafeControl – Apron Management system. For example, to specify an aircraft configuration instance with winglets, “WL” (without quotes) is entered.

4.8.2 Creating a Stop Position on a Centreline

At the bottom left there are fields and buttons used to create a new stop-position on the currently selected centreline. First, enter a distance in meters, and then give it a name. Press then the stop reference button (nose, nose wheel or door) that matches your needs to create a new stop-position with the newly entered values. Following aspects are to be considered:

- Each stop position must be uniquely named, per centreline.
- There can be only one stop-position with a specific distance and reference.
- The shortest distance that is accepted is 4.0m.
- A stop-position can be adjusted individually using the “pen” button and deleted using the red “X” button. Stop reference cannot be changed.
- All stop-positions can be moved by a certain distance using the button “Delta Move”. Enter a positive or a negative value to move the positions away from or closer to the system.

4.8.3 Adding an Aircraft to a Stop Position

An aircraft can be added to a stop-position by using drag-and-drop from the list of available aircrafts and generic aircrafts on the right side.

4.8.4 Modifying Content in Aircraft Menu

In addition to the standard operator panel, the system also supports a 54-key extension panel. The image below shows the editor for both panels; the left side is the standard panel with the extension panel to the right. Both editors use drag-and-drop operations to place an aircrafts on the appropriate place.

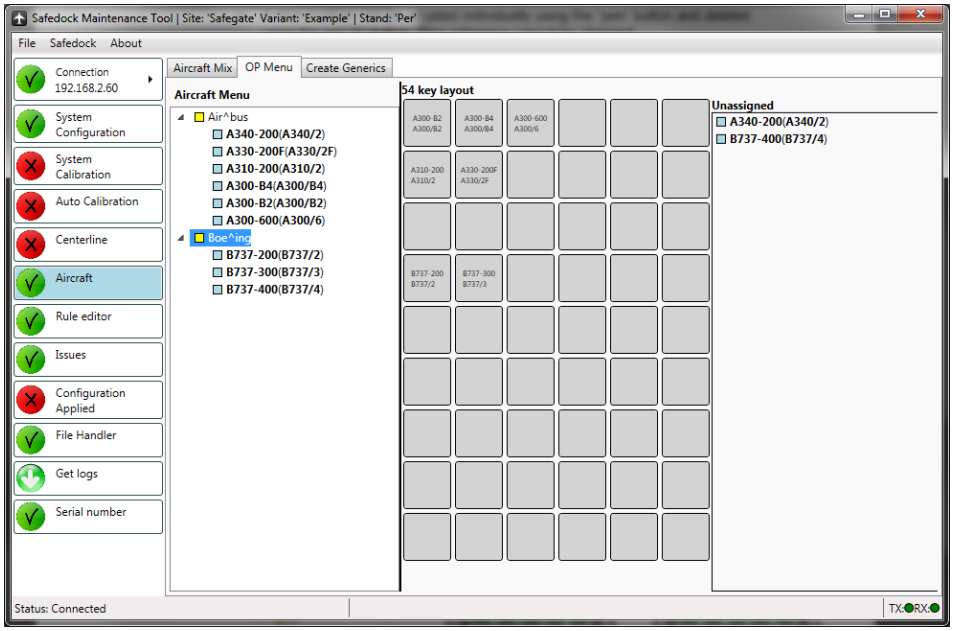


FIGURE 4A.13 – EDITOR FOR OPERATOR AND EXTENSION PANELS

4.8.4.1 Customizing the menu layout on the standard panel

- To add a folder, right-click in the Aircraft Menu window (do not mark any of the existing folders) and choose “Add folder”.
- To add an aircraft to an existing folder, drag and drop the aircraft onto the folder. If a folder is not empty, you can directly drag the item you want to move onto another item within the target folder.
- To delete or rename an item in the list, right-click and choose “Remove” or “Rename”.
- Items in the menu can be sorted using drag-and-drop.
- To move an item above a folder, press and hold the **Shift**-key first.

4.8.5 Customizing the Operator Panel Layout

The Aircraft Menu shows the aircraft types that will be available for direct selection from the Operator Panel. The correspondence between the two is shown in the figure below:

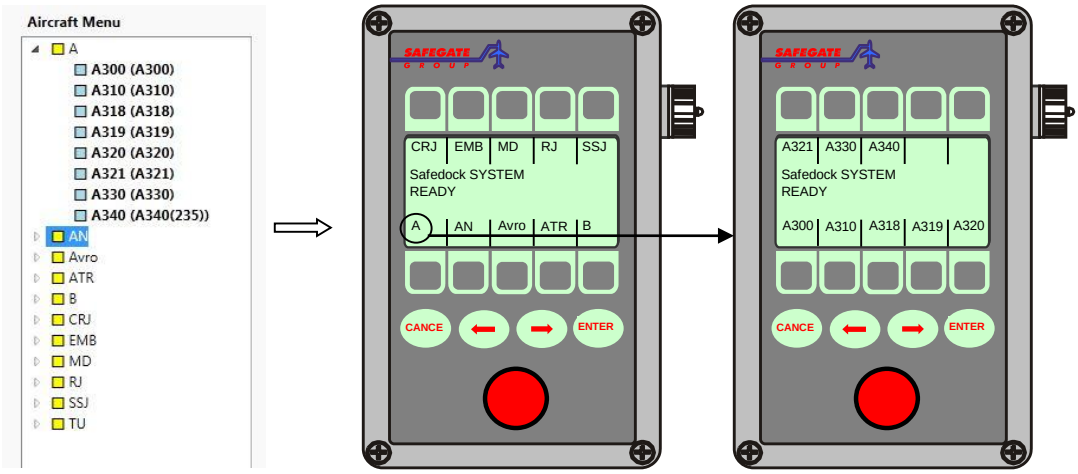


FIGURE 4A.14 - THE CORRESPONDENCE BETWEEN THE AIRCRAFT MENU AND OERATOR PANEL

On the Operator Panel display you can see ten items (folders/aircrafts) at a time. The first position (for the first item and the 11th item) will appear in the left lower corner and the last position (for the 10th item and 20th item) will appear in the right upper corner. There can be up to 10 pages with 10 items on each page.

4.8.6 Creating Generic Aircrafts

A generic aircraft is an aircraft that has been created from multiple aircraft types. These generics are used to group similar aircrafts into a single type. The main usage for a generic is to reduce the number of choices available for the operator when starting a docking. However, this leads to a reduced accuracy in aircraft identification.

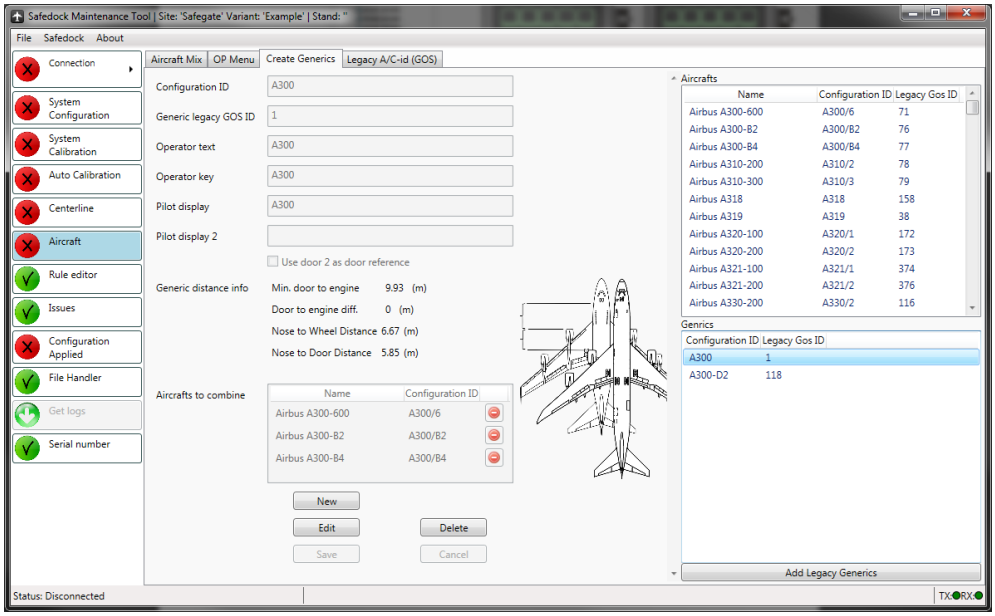


FIGURE 4A.15 - AIRCRAFT FEATURE - GENERICS

To create a generic aircraft follow the steps below:

1. Click on the tab “Generics” (to the right of “Aircraft”) on the top left of the window.
2. Press “New”, a dialog pops up asking for a unique configuration id.
3. Enter the new configuration id and click Ok. Note: this cannot be changed at a later time.
4. Enter the Generic Legacy GOS ID, if available for this type.
5. Enter operator text, key and pilot display texts.
6. Drag and drop the aircrafts to be included in the generic type from the list with available aircrafts to the “Aircrafts to combine” box.
7. If the selected aircrafts have different nose-to-nose wheel or nose-to-door distances, sliders will be shown helping to adjust these values for this generic type. To make the user aware of the fact that the difference between the door and an engine varies between the selected aircrafts, the application will mark the distance in yellow if the difference is >3m or in orange if the difference is >5m.

   Note: *only aircrafts with the same nose height and nose geometry can be use used. When “Use door 2 as door reference” is checked, the door-to-door-2 distance of all aircrafts must be within +/-2 dm.*

8. Press the “Save” button.

You can now use the generic as any other aircraft in the “Aircraft” tab.

4.8.6.1 Legacy Generics

In older versions of Safedock, there were several generic aircraft types that are not included in today's normal set of aircrafts. However, it may still be desirable to use those aircrafts. Therefore, they are provided via the "Add Legacy Generics" button.

Pressing this button will switch the view of the generics to a list of available generics that can be imported into the current configuration. Check those you want to import and press the "Add Selected" button. Pressing "Cancel" will bring you back to the original view without adding any generics.

Note that the list of available generics is filtered so that it only shows aircrafts which Legacy GOS Id is not already present in the configuration.

4.8.7 Legacy A/C-id (GOS)

This tab shows a list of all aircrafts (column 1) and their GOS-ids (column2) available in the old version of Safedock together with the name (column 3) of the profile in the current configuration that matches (through GOS id) and the configuration id (column 4) that goes with it.

Password

The Safedock system can be equipped to use password protection for operator and/or maintenance (remote) operations.

More specific, the system would require a four-digit password at the following commands:

(a) Local Start of Docking (by assigning an aircraft type)

(b) Local Park ON or Park OFF (creating Blocks On and Blocks Off transactions)

(c) Confirmation of a Scheduled Flight Start-of-docking Command from Superior System

(d) Aircraft Loading Bridge Lock Override (if installed)

(e) Diagnostic Test Procedure (requires a maintenance operator password)

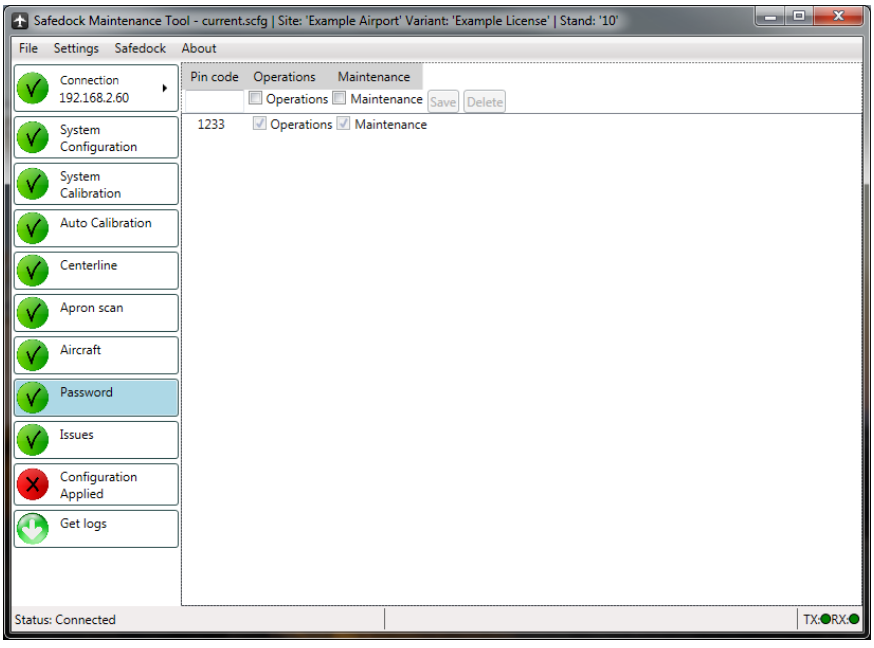


FIGURE 4A.16 - PASSWORD FEATURE

4.9 ISSUES

The application looks for certain conditions, such as missing and out-dated profiles, in the configuration. If any of the conditions are met, this view will present the user with an item for each detected issue.

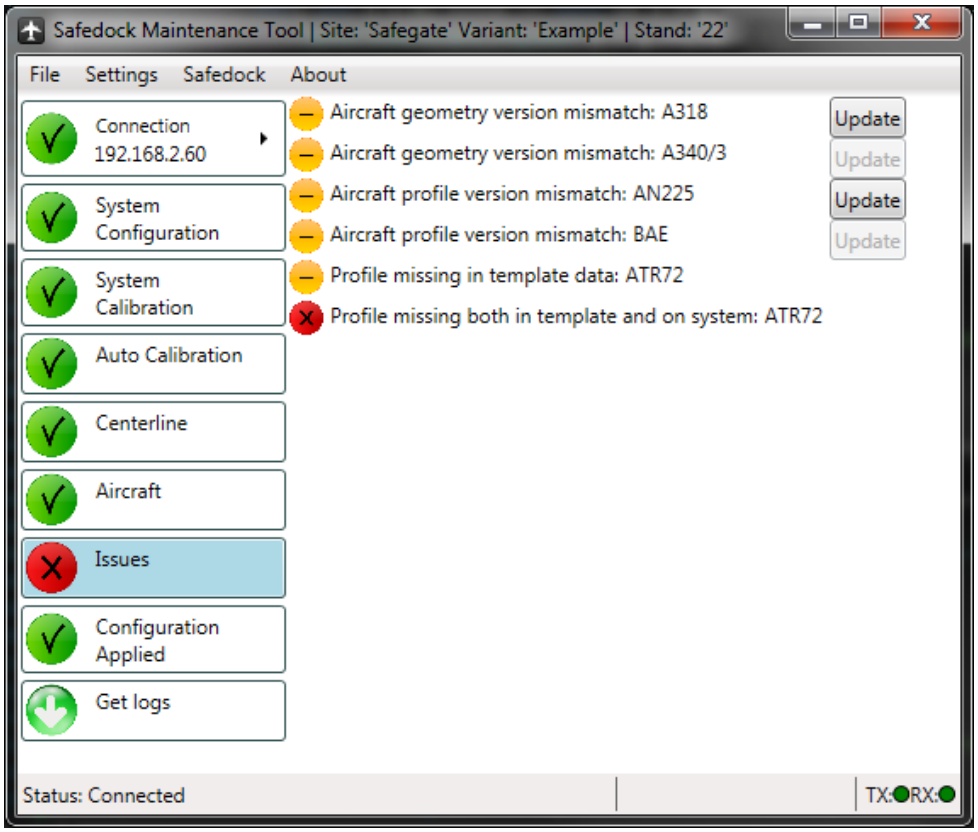


FIGURE 4A.17 - ISSUES FEATURE

There are two was to handle an issue:

1. By using the “Update” button. Pressing this button will update the used profile and/or aircraft data to the most recent version available.
2. Adjusting the configuration so that the issue conditions no longer are met, i.e. removing an aircraft.
3. Leave as-is, i.e. opting not to update. This does not work for issues marked with a red symbol as they must be resolved before applying a configuration.

Some issues have a disabled “Update button”, meaning that the data used by the system is more recent than that available in the template data – an item can never be made to use an older version of the data.

Issues marked with a green symbol are auto-resolved by the application when the configuration is applied.

Hint: Try right-clicking on a button for an issue; some issue types may be accepted in bulk using the menu that is shown when right-clicking.

4.10 CONFIGURATION APPLIED

Here you can see the configuration history of the system, send a new configuration to the system and also set the time of the system.

To apply a new configuration, enter a comment in the upper box and press the “Apply” button. The application will then upload the configuration to the system and update its history file with the entered comment and current computer & user name.

To set the time, simply click the “Set time” button.

The system automatically saves the last five applied configurations. These can be retrieved by selecting an earlier configuration in the history and pressing the “Get previous configuration” button.

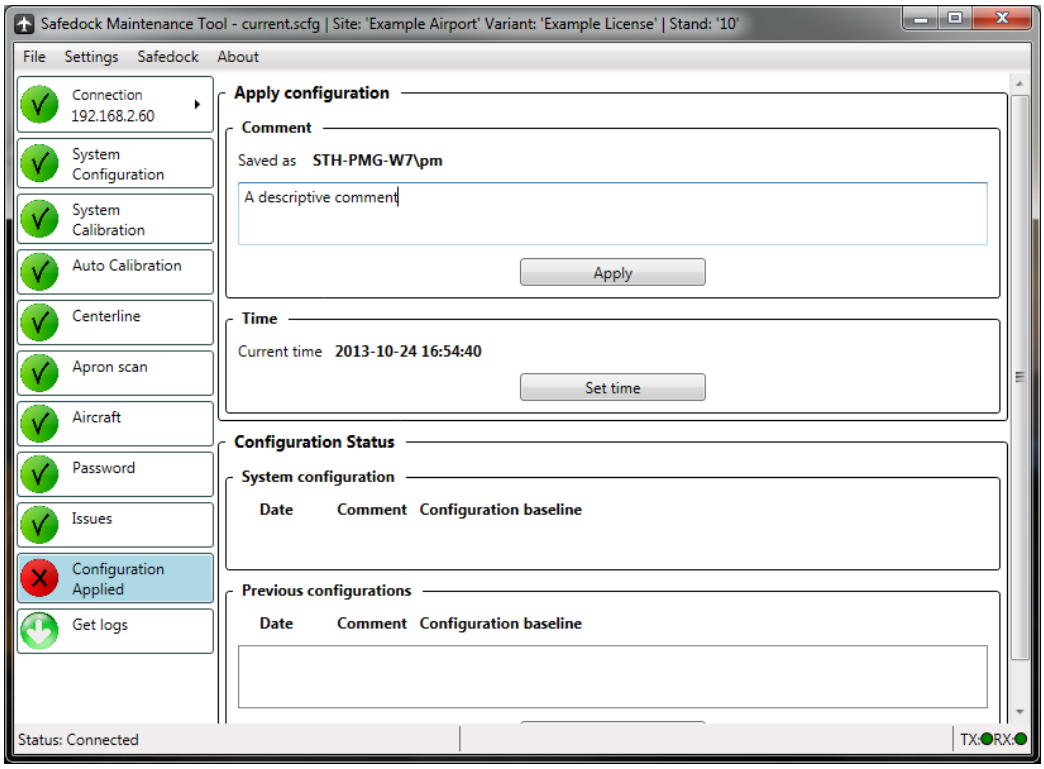


FIGURE 4A.18 - CONFIGURATION APPLIED FEATURE

4.11 GET LOGS

This view is used to select docking- and short-logs for retrieval to the local computer. You can either use standard **Ctrl** and **Shift** selection or use the quick-selection buttons to select the desired log files. Once selected press the button “Get selected files” to start the retrieval process. The logs are saved in the folder <installation dir>\Logs\<stand name>. This folder can easily be opened by pressing the button labelled “Open log directory”.

The button “Create support archive” retrieves the selected logs (always at least the last two days) and also additional files. Additionally, the entire configuration is archived together with the downloaded files in a single file named <date> <time><stand name>.sarc in the same directory as the log files.

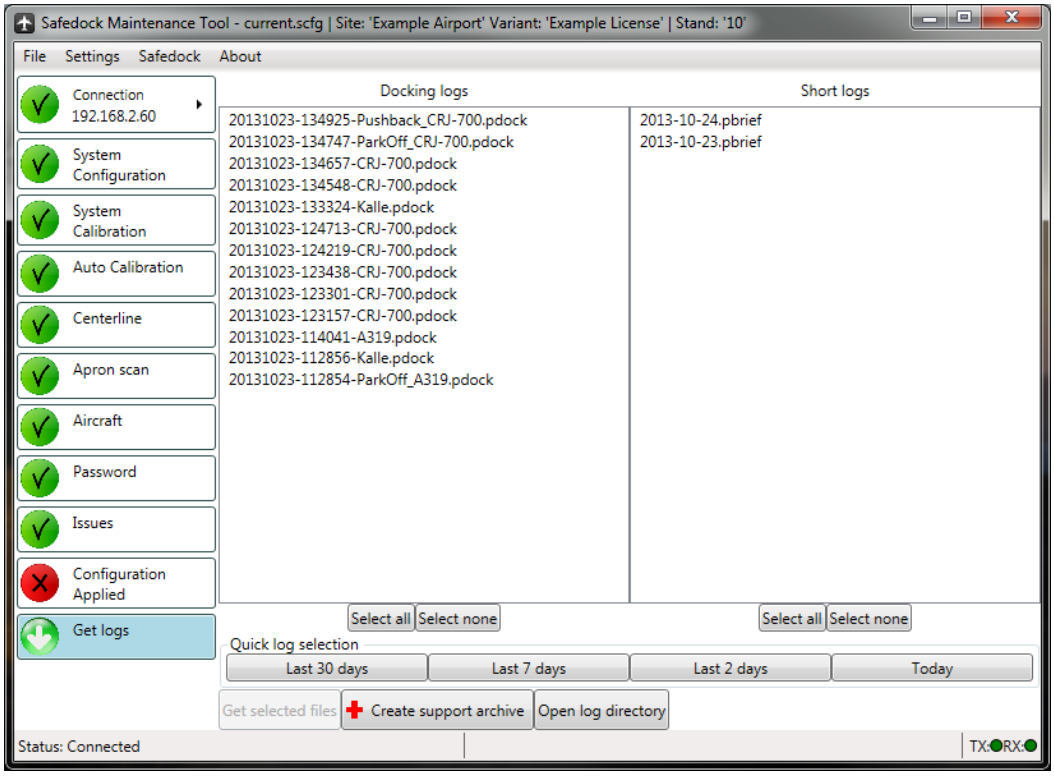


FIGURE 4A.19 - GET LOGS FEATURE

4.12 UPDATING THE SYSTEM

Occasionally you may want to update the software/data files in the system. This is done through the menu option **Safedock** -> **Apply update**. When clicked, you are asked to select an update (.spkg) package provided by Safegate. Once selected, press the Open button and a message will show you the purpose of the update package and also ask for permission to continue.

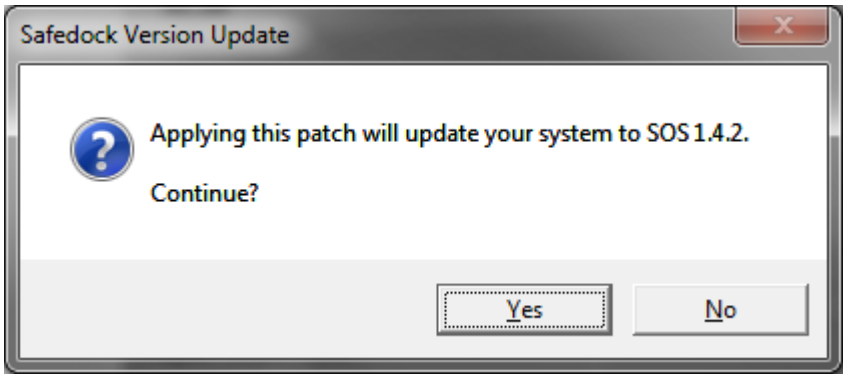


FIGURE 4A.20 – VERSION UPDATE SCREEN

Press "Yes" to continue with the update and no to cancel. If you continue, the application will upload and apply the update. Please note that the system will be restarted at the end of the update, resulting in a lost connection message

5. IMPORTING CONFIGURATIONS

5.1.1 Importing Aircraft Mix, Features and Rules

Using the menu File > Import… parts of an existing SOS configuration can be imported into the current configuration (imported items will replace existing items). This is useful when a configuration has been prepared beforehand.

When used, a dialog box is presented, asking for the source configuration. When selected, more options appear.

Select those items that are to be replaced in the current configuration.

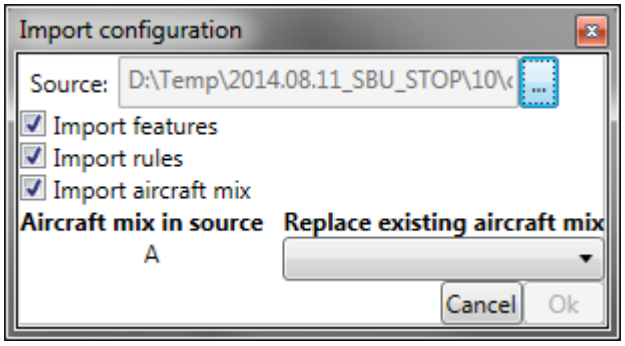


FIGURE 4A.21 – IMPORT CONFIGURATION

When importing the aircraft mix, you have to select which centerline the source items are to be put on. When there are more centerlines in the source than the current configuration, an option “*new*” gets available in the drop down box. This allows you to add new centrelines but the total number cannot exceed three.

5.1.2 Importing Legacy Configuration

Using the menu File > Import Legacy Configuration, a configuration from an older Safedock can be imported. The items that are imported are aircrafts, stop positions and operator menu (menu-based version only).

The behaviour for creations of new centerlines are the same as when importing a modern configuration.

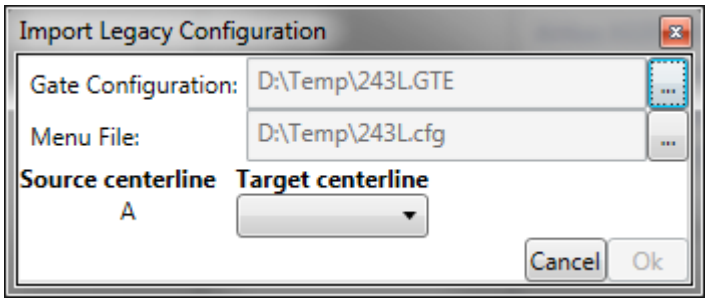


FIGURE 4A.22 – IMPORT LEGACY CONFIGURATION

When the configuration has been selected, the application will search for a matching menu file and if found, ask if it shall be used as a source for the import.If no match is found, you can select one manually.

Upon completion, a message informing of the result is displayed.

CHAPTER 4 MAINTENANCE - APPENDIX B

SAFEDOCK LOG VIEWER

CONTENTS

***Note**: This page is blank for convenient double-sided printing.*

1. INTRODUCTION

The Safedock Log Viewer (SLV) is a tool that can be used to explore the content of log files from the Safedock system.

SLV can be used to view both Safedock docking logs from individual docking operations and event logs from the system.

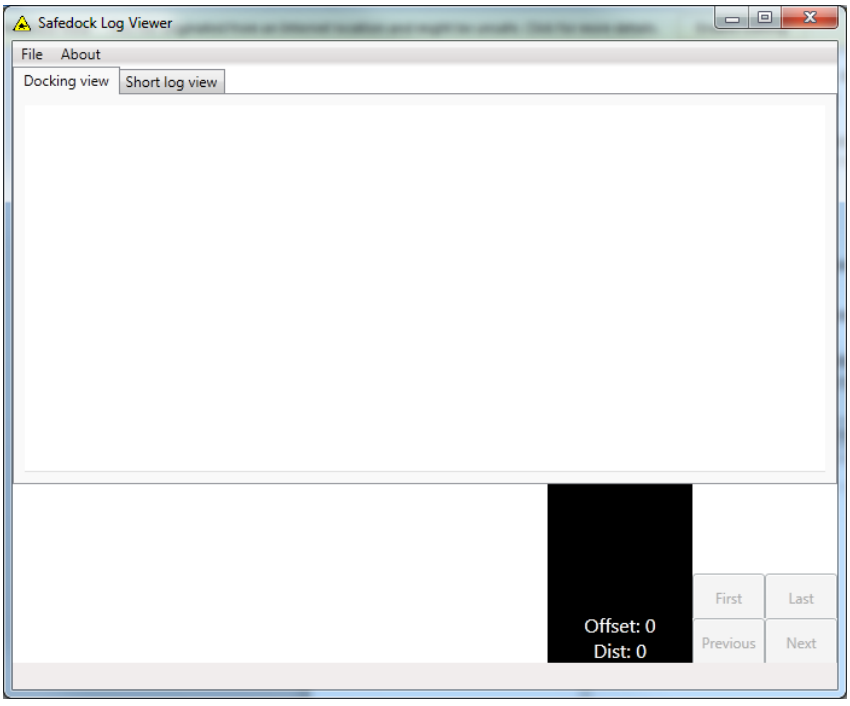
2. OVERVIEW

The SLV tool consists of 3 views: two at the upper side and one at the bottom side.

The upper side includes:

- Docking view - a graphical representation of a docking procedure, with important events highlighted.
- Short log view - a text representation of events from a docking operation or from the system, depending of what type of file is currently active.

The bottom side includes a mimic of the Pilot Display and a set of buttons that can be used to navigate through events in the docking view.



3. DOCKING VIEW

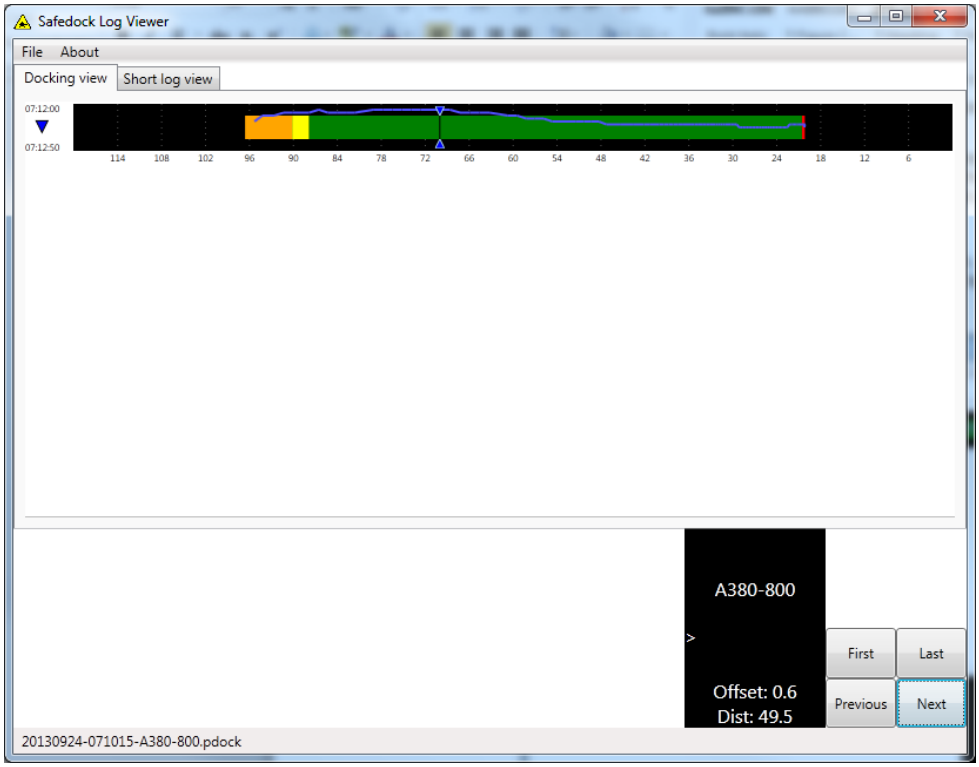
The docking view is a graphical representation of the docking procedure.

3.1 DOCKING VIEW

In the docking view, each capture and tracking activity is represented in a range bar with events. Each range bar starts with a time field where the upper time indication shows when capture was achieved, and the lower time indication shows when the tracking was ended.

Between the time markers there is a track selection button. If there are multiple tracks, this button can be used to position the mimic panel to the beginning of the desired track.

Each range bar has a distance scale that indicates the distance from the Safedock to the tracked object. The distances are indicated in meters.



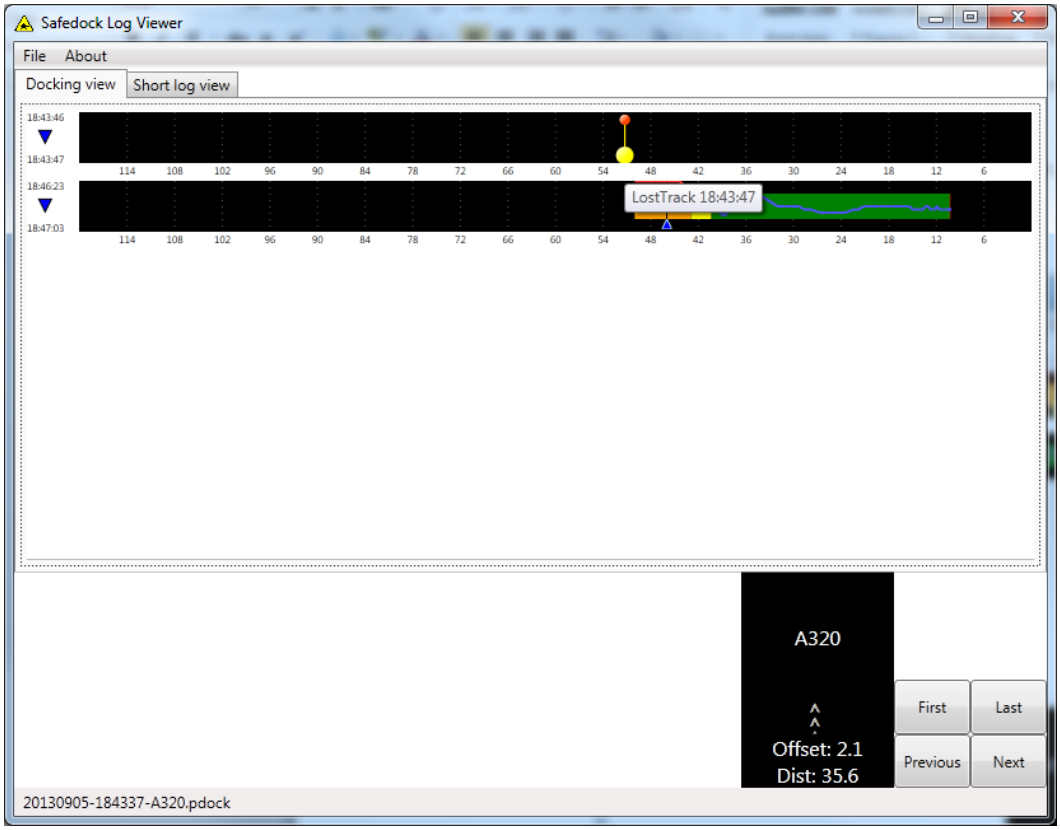
The range bar includes a tracking indicator. This is a multi-colored bar that represents the position of a tracked object. The color indicates the state of the tracking procedure for that distance. The color indications are:

- Orange - Acquisition phase. Tracking but no guidance given.
- Yellow - Early Guidance phase. Tracking and giving active guidance. Object not verified.
- Green - Late Guidance phase. Tracking and giving active guidance. The object has been verified as a good match for the selected aircraft type.
- Red - Stop indication given to pilot.

Together with the tracking indicator one can also see a position track, which is a line that indicates the tracked objects sideways position relative to the configured centreline. The edge of the tracking indicator represents an offset of 0.5m from the centreline.

3.2 EVENT INDICATOR

Special events that occur during the tracking will be marked with 'balloons' surrounding the track. Specific information about the event can be seen as a 'tooltip' by placing the mouse cursor over the balloon.



3.3 MIMIC PANEL

The mimic panel is located below the docking track view, and can be used to step through the track data to examine individual steps of the docking procedure. It consists of a view of the Pilot Display and a set of buttons to step through the track data.

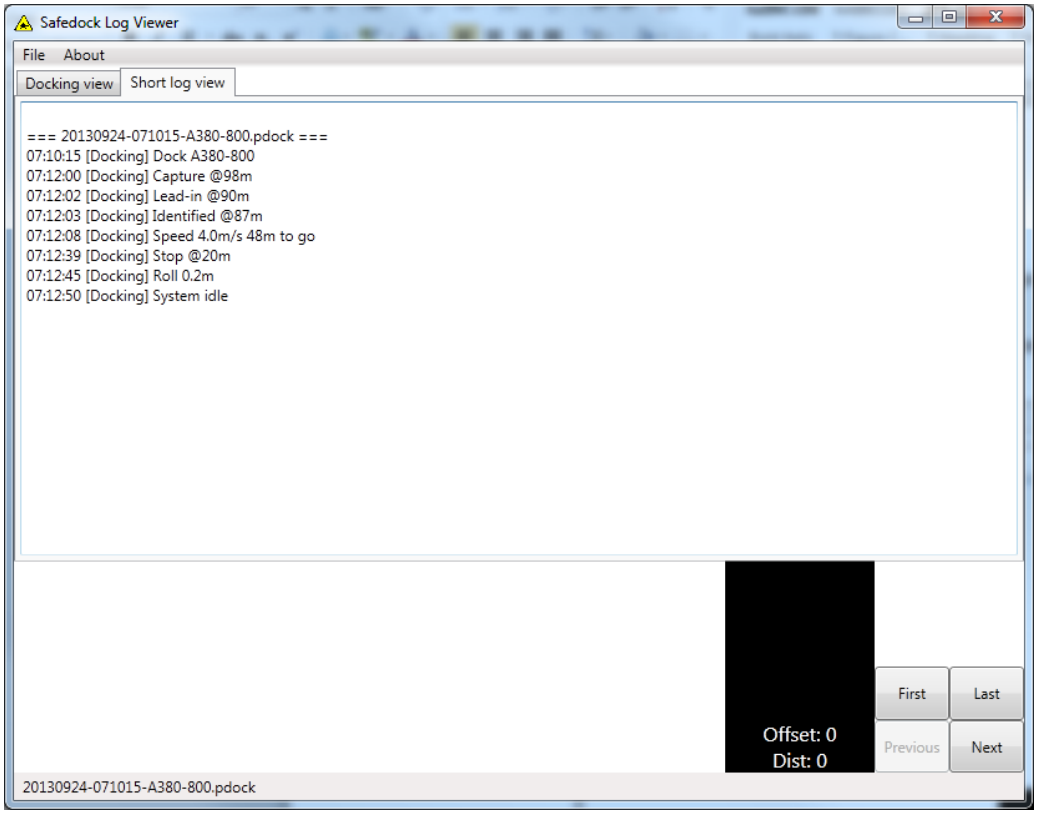
The tracks in the docking view will show a cursor formed by two opposing vertical arrows connected by a line. This cursor indicates the tracker position that is presented in the mimic panel.

The mimic panel will indicate what information was presented to the pilot at each given instance of the docking procedure. This includes: information messages, offset from the centreline and distance to go to the configured stop position.

4. SHORT LOG VIEW

The short log view is a textual representation of all the major events that occur in a docking operation.

Each line in the shortlog represents a specific event, with timestamp.



SAFEDOCK
DRAWINGS
LIST

Drawing Title	Drawing Number
590131 - Stepper Motor Card	*SG590131-001-01_RVB
590137 - Temperature Card, COMPONENT AND PARTS LIST	SG590137-000_RVB
590222 - Cable Entry Cover Plate (3 hole) ASSEMBLY	SG590222-001-01
590222 - Cable Entry Cover Plate	SG590222-201-01
590222 - Cable Entry Cover Plate (3 hole with gasket)	SG590222-202-01
590253 – Safedock T1 Cabinet	SG590253-002-01_RVB
590253 – Safedock T1S Cabinet	SG590253-219-01_RVB
590255 - HEATER	SG590255-106-01_RVA
590255 - LIGHT SENSOR ASSEMBLY	SG590255-108-01_RVB
590255 – COMMUNICATION CABLE	SG590255-109-01_RVB
590255 – SCANNING MOTOR	SG590255-111-01
590255 – OPTICAL ENCODER CABLE	*SG590255-112-01_RVC
590255 – LASER RANGE FINDER ASSEMBLY	SG590255-113-01_RVE
590255 – Adapter Scanning Motor	SG590255-116-01_RVA
590255 – Standard Cooling Assembly for T1/T1S	SG590255-200-01_RVA
590256 - T1 Display 42 CARD	SG590256-001-01_RVA
590258 – PATCH CABLE	*SG590258-101-01_RVC
590259 - T1 Supercooler	SG590259-001-01_RVC
590261 - T1 Installation Hardware	SG590261-001-01
590263 – X3 Terminal Block	SG590263-001-01_RVE
590264 - T1 Ventilation Assm	SG590264-100-01_RVC
590264 – T1 Ventilation Filter Assm	SG590264-101-01_RVA
590264 – Filter Adapter Plate	SG590264-200-01_RVA
590266 - Utility Outlet	*SG590266-001-01_RVA
590268 – CONTROL CABLE	SG590268-101-01
590268 – CONTROL CABLE	SG590268-102-01
590268 – CONTROL CABLE	SG590268-103-01
590268 – POWER CABLE	SG590268-111-01
590281 - Cabinet, T2	SG590281-001-01
590360 - Cabinet, T3	SG590360-001-01
590399 - CU Replacement Kit	SG590399-001-01
590405 - Laser Cooling Fan COMPONENT PART LIST	SG590405-000-01_RVD
590405 - Laser Cooling Fan	SG590405-001-01_RVC
590405 - BRACKET	SG590405-200-01
590479 - Ventilation Fan, T2 & T3 COMPONENT PART LIST	*SG590479-001-01_RVE
590486 - Defroster Assembly, T2-T3 COMPONENT PART LIST	SG590486-000-01_RVA
590486 - Defroster Assembly, T2-T3	SG590486-001-01

Drawing Title	Drawing Number
590487 - Calibration Mirror	SG590487-001-01_RVA
590495 - Soft Key Operator Panel COMPONENT PART LIST	SG590495-010-01_RVG
590495 - Soft Key Operator Panel ASSEMBLY CONNECTION	SG590495-011-01_RVD
590495 - Soft Key Operator Panel INSTALLATION	SG590495-015-01_RVE
590512 - Scanner Heating Element	SG590512-001-01_RVA
590525 - Softkey OP-Panel with Deadman COMPONENT PART	SG590525-000-01_RVB
590525 - Softkey OP-Panel with Deadman ASSEMBLY	SG590525-001-01_RVB
590525 - Softkey OP-Panel with Deadman INSTALLATION	SG590525-005-01_RVB
590543 - Supercooler, T2	*SG590543-001-01_RVD
590543 – COOLING UNIT	SG590543-100-01_RVC
590543 – COOLING UNIT COMPONENT PART LIST	SG590543-100-02_RVB
590543 - Supercooler, COVER	SG590543-200-01_RVB
590543 - Supercooler, GASKET	SG590543-201-01_RVA
590543 - Supercooler, FILTER	SG590543-202-01
590553 - Supercooler, T3	*SG590553-001-01_RVC
590553 - COOLING UNIT	SG590553-100-01
590553 - COOLING UNIT COMPONENT PART LIST	SG590553-100-02
590553 - Supercooler, COVER	SG590553-200-01_RVA
590553 - Supercooler, GASKET	SG590553-201-01
590553 - Supercooler, FILTER	SG590553-202-01
590559 - Scanning Assembly, T2-T3 Heated COMPONENT PART	*SG590559-000-01_RVB
590559 - Scanning Assembly, T2-T3 CONNECTION	*SG590559-001-01_RVA
590559 - Scanning Assembly, T2-T3	*SG590559-004-01_RVA
590559 - Scanning MOTOR	*SG590559-101-01_RVA
590559 – OPTICAL ENCODER CABLE	*SG590559-201-01.RVA
590560 - Scanning Assembly, T2-T3 Non-heated COMPONENT	*SG590560-000-01_RVB
590560 - Scanning Assembly	*SG590560-001-01_RVA
590606 - Gate Sign, T1	SG590606-001-01
590606 - Gate Sign, T1 CONNECTION	SG590606-004-01
590606 - Gate Sign, T1 REFLECTOR MOUNTING PLATE	SG590606-200-01_RVA
590606 - Gate Sign, T1 LAMP HOLDER BRACKET	SG590606-201-01
590606 - Gate Sign, T1 CABINET	SG590606-202-01
590606 - Gate Sign, T1 REFLECTOR LAMP ASSEMBLY	SG590606-203-01
590606 - Gate Sign, T1 REFLECTOR LAMP ASSY CONNECTION	SG590606-203-02
590611 - Network Switch, 4x RJ45 & 1x ST	*SG590611-001-01_RVE
590616 - Heater LED Display	*SG590616-001-01_RVD
590619 - T2 Display gen.2	*SG590619-001-01_PC
590619 - T2 Display gen.2 LIGHT SENSOR ASSEMBLY	*SG590619-101-01
590619 - T2 Display gen.2 MOUNTING PLATE	*SG590619-200-01_PA
590620 - T3 Display gen.2	*SG590620-001-01_PE
590620 - T3 Display gen.2 MOUNTING PLATE	*SG590620-200-01_PA

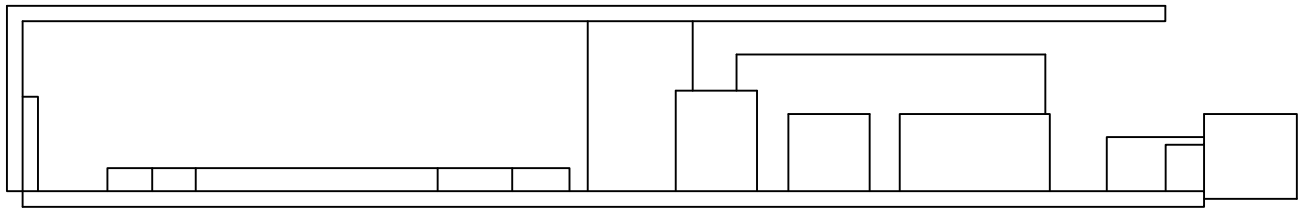
Drawing Title	Drawing Number
590621 - Control & Power Assembly	*SG590621-001-01_RVU
590621 – DGS Connection Diagram	SG590621-004-01_RVO
590621 – DGS Connection Diagram (Options)	SG590621-004-02_RVO
590621 – CONTROL CABLE VERTICAL SCANNING MOTOR	*SG590621-101-01
590621 – CONTROL CABLE HORIZONTAL SCANNING MOTOR	*SG590621-102-01
590621 – CONTROL CABLE LASER RF - TEMP SENSOR	*SG590621-103-01
590621 – POWER CABLE DEFROSTER/HEATER/LASER COOL	*SG590621-104-01
590621 – POWER CABLE WIRING ASSEMBLY	*SG590621-105-01
590621 – POWER CABLE WIRING ASSEMBLY	*SG590621-106-01
590621 – POWER CABLE WIRING ASSEMBLY	*SG590621-107-01
590621 – POWER CABLE WIRING ASSEMBLY	*SG590621-108-01_RVC
590621 – POWER CABLE WIRING ASSEMBLY	*SG590621-110-01
590621 – WIRING ASSEMBLY DISPLAY POWER	*SG590621-112-01
590621 – WIRING ASSEMBLY DISPLAY POWER T1/T2	*SG590621-113-01
590621 – COMMUNICATION CABLE LED DISPLAY	*SG590621-114-01
590621 – WIRING ASSEMBLY	*SG590621-115-01
590621 – CONTROL CABLE	*SG590621-116-01
590621 – CONTROL CABLE HORIZONTAL SCANNING MOTOR T1	*SG590621-117-01
590621 – CONTROL CABLE LASER T1	*SG590621-118-01_RVC
590621 – COMMUNICATION CABLE LED DISPLAY T2/T3	*SG590621-119-01
590621 – WIRING ASSEMBLY	*SG590621-120-01
590621 – Control Cable C1, T1	SG590621-125-01_RVA
590621 – Control Cable C2, T1	SG590621-126-01_RVA
590621 – Multi Cable C21, T1	SG590621-127-01_RVA
590621 – Multi Cable C23, T1S	SG590621-128-01_RVA
590621 – Multi Cable C24, T1S	SG590621-129-01_RVA
590621 – Control Cable C25, T1S	SG590621-130-01_RVA
590621 – Control Cable C26, T1S	SG590621-131-01_RVA
590621 – Power Cable, T1/T1S	SG590621-132-01_RVA
590621 – MOUNTING PLATE	*SG590621-203-01_PA
590621 – LABEL CU BOARD LED	*SG590621-205-01
590623 – COMMUNICATION ASSEMBLY I/O MODULE	SG590623-001-01_RVC
590626 – X9 Terminal Block	SG590626-001-01_RVA
590980 - T1 Assembly	*SG590980-001-01_RVE
590981 – T1S Assembly	SG590981-001-01_RVD

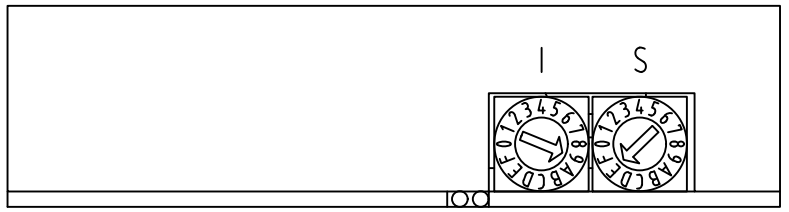
Drawing Title	Drawing Number
590982 - T2 Assembly	*SG590982-001-01_RVE
590984 - T3 Assembly	*SG590984-001-01_RVE

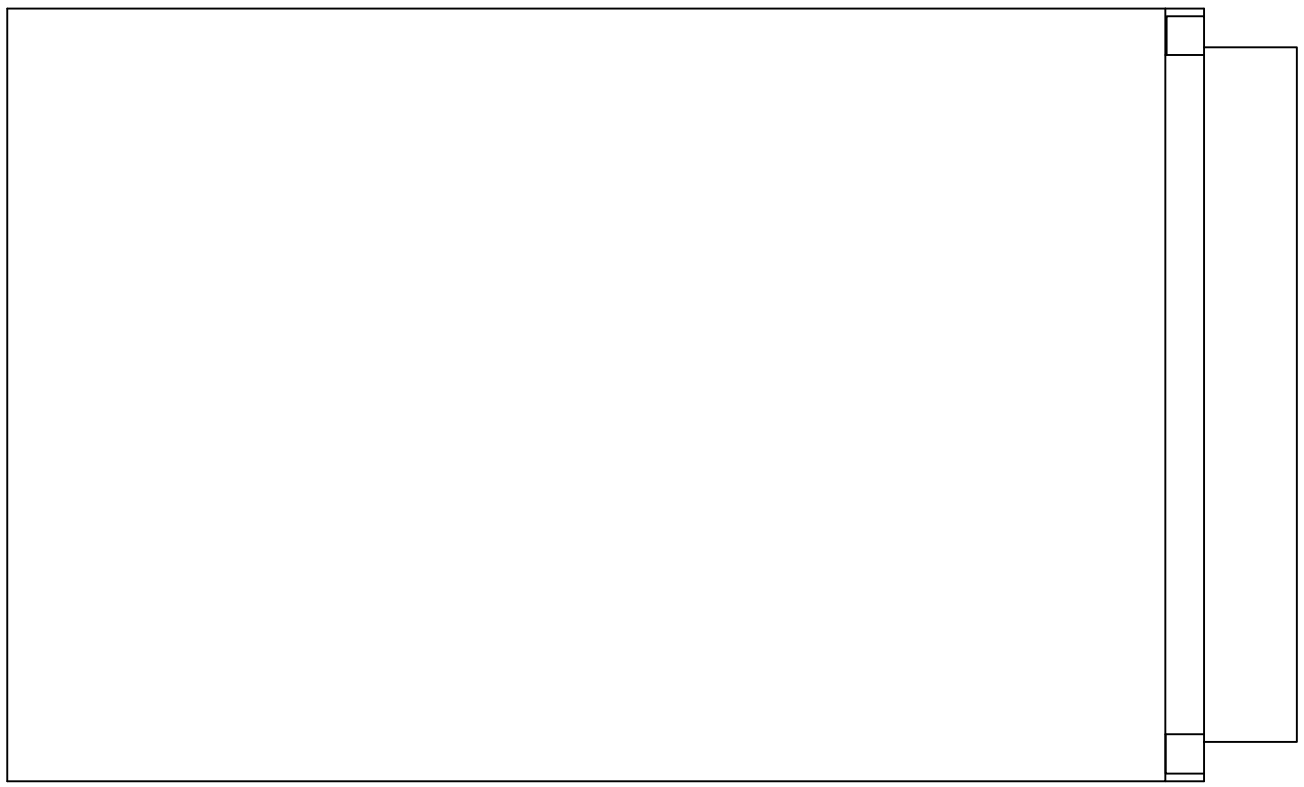
Drawing Title	Drawing Number
ACCESSORIES	
590221 - U-CLAMP AND FASTENERS FOR Ø139.7 MM POLE	SG590221-001-01
590353 - SDK3 INSTALLATION HARDWARE FOR Ø143 MM POLE	SG590353-001-01
590353 - CLAMP FOR Ø143 MM POLE	SG590353-201-01
590354 - SDK3 INSTALLATION HARDWARE T3 FOR Ø275 MM POLE - SUN SHADE PANELS	SG590354-001-01
590354 - CLAMP FOR Ø275 MM POLE	SG590354-201-01
590354 - UPPER TILT BRACKET FOR Ø275 MM POLE	SG590354-202-01
590354 - PROFILE	SG590354-203-01
590354 - BRACE	SG590354-204-01
590354 - LOWER TILT BRACKET FOR Ø275 MM POLE	SG590354-205-01
590355 - SUPPORT FIXTURE ASSEMBLY	SG590355-001-01
590355 - SUPPORT FIXTURE	SG590355-201-01
590355 – CROSS MEMBER	SG590355-202-01
590355 - U-CLAMP	SG590355-203-01
590356 - SDK3 INSTALLATION HARDWARE FOR Ø139.7 MM - SUN SHADE PANELS	SG590356-001-01
590483 - INSTALLATION HARDWARE, T2-T3 ON Ø140 MM POLE	SG590483-001-01
590496 - CALIBRATION TARGET	SG590496-001-01
590507 - USB MAINTENANCE INTERFACE	SG590507-001-01
590507 - MAINTENANCE INTERFACE CABLE	SG590507-100-01_RVA
590515 – LOWER TILT BRACKET	SG590515-204-01
590515 – UPPER TILT BRACKET	SG590515-211-01
590515 – PROFILE	SG590515-212-01
590515 – BRACE	SG590515-213-01
590533 - CENTERLINE TARGET	SG590533-001-01_RVA
590533 - TARGET ANGLE	SG590533-200-01
590547 - CAMERA MOUNTING ASSEMBLY	SG590547-001-01
590547 - CAMERA MOUNTING BRACKET	SG590547-200-01
590547 - RAIL	SG590547-201-01
590547 - PLATE	SG590547-202-01
590547 – EXTERNAL CAMERA INSTALLATION	SG590547-203-01
590556 - SDK SUPPORT FOR WIBE MAST	SG590556-001-01
590556 - CROSS MEMBER	SG590556-201-01
590556 - CLAMP PLATE	SG590556-202-01

Drawing Title	Drawing Number
590557 - U-CLAMP FOR Ø100 MM PIPE	SG590557-001-01
590561 - U-CLAMP FOR Ø214 MM PIPE	SG590561-001-01
590595 - U-CLAMP – FOR Ø6 IN PIPE	SG590595-001-01

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
		STEPPER MOTOR DRIVE CIRCUIT, EDM-453			EDM-452-00	PORTESCAP, SWITZERLAND	EDM-452-00	API PORTESCAP SCANDINAVIA AB, SWEDEN







NOTE:
SETTINGS FOR ROTORY
SWITCHES I & S
I = 9
S = E

Revision	Description	Date	Drawn by:	Checked by:	Approved
B	DIP-switch settings shown graphically	2002.09.05	G.O.		
A	Parts List updated	2002.05.08	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	
G.O.	2002-03-05		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

STEPPER MOTOR DRIVER CIRCUIT
FOR SCANNING MOTORS

Drawing No.	Rev.	Sheet	Scale
SG590131-001-01	B	1 of 1	1:1

SG590137-000

DEFROSTER ASSEMBLY

REVISIONS
B. File format changed from dwg to xls: R1 alternative resistor added ; By: G.O.: Date: 2009-02-26 .

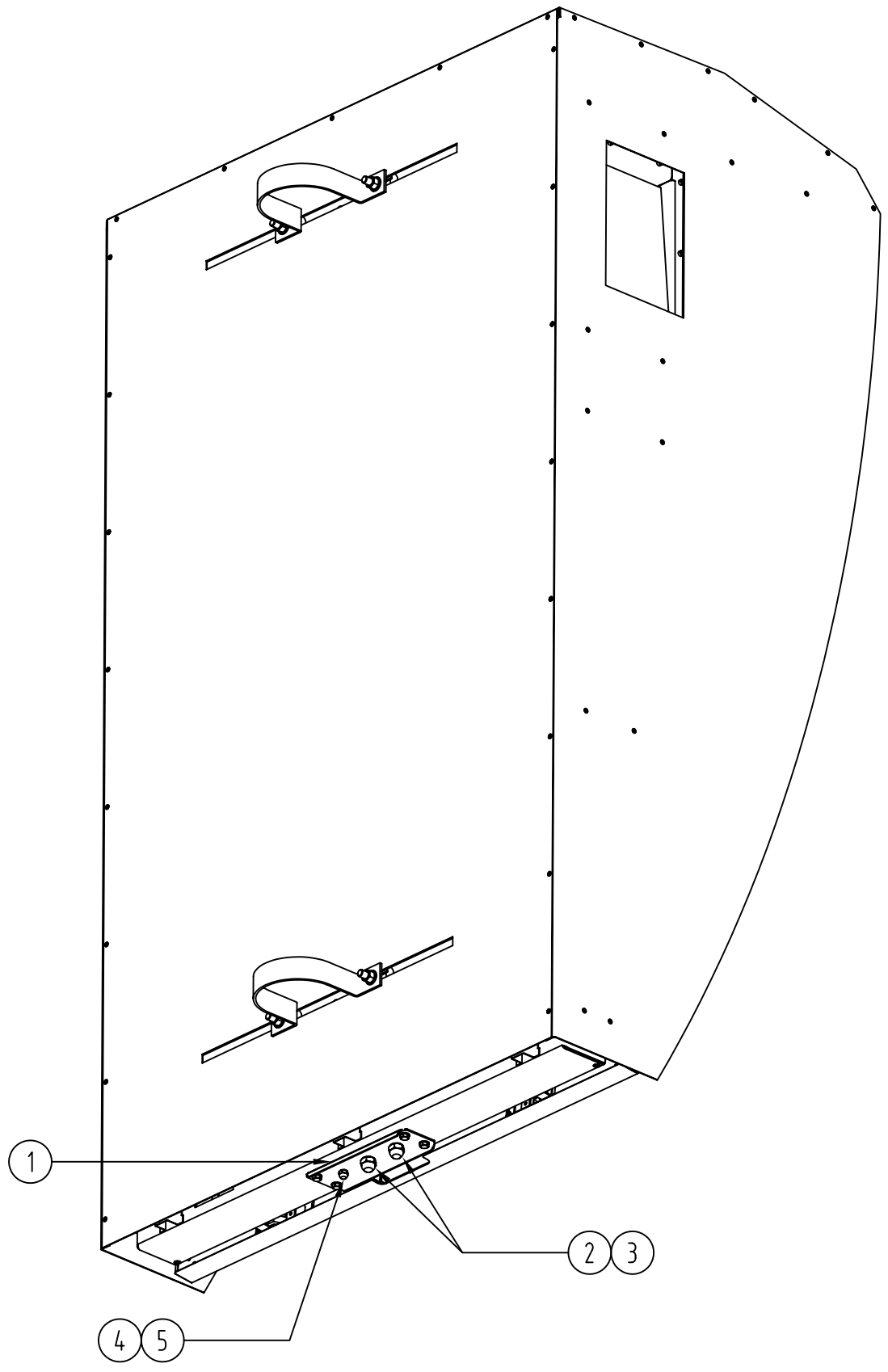
ASSMBLY LEVEL DOCUMENT LIST

SG590137-000.xls	PARTS LIST
GERBER_SG590137-100-R1.zip	GERBER FILE
PCB_SG590137-100-REV1.pdf	PCB FILE
SCH_SG590137-100-REV1.pdf	SCHEMATIC FILE
SG590137-100_R1.pcb	
SG590137-100_R1.sch	

COMPONENT AND PARTS LIST

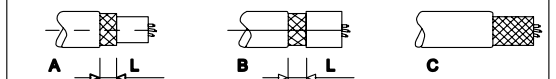
POSITION	QUANTITY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PROD. NO.	MANU. PART NO.	MANUFACTURER	SUPPLIER'S. PART NO.	SUPPLIER
	1	PRINTED CIRCUIT BOARD	SG590137-100					
B1	1	JUMPER						
B2	1	JUMPER						
C1	1	CAPACITOR, POLYESTER, 0.1 µF, 63 V					511012	BEJOKEN
C2	1	CAPACITOR, TANTAL, 47 µF, 10 V					67-762-15	ELFA
J1	1	CONNECTOR			MSTB2,5/4-5,08	PHOENIX CONTACT		
R1	1	RESISTOR, 1.2 kOhm, ±1 %, alt. 1.21 kOhm						
R2-R4	3	RESISTOR, 5,1 kOhm, ±1 %						
R5	1	RESISTOR, 3.3 kOhm, ±1 %						
R6	1	RESISTOR, 2.2 kOhm ±1 %						
U1	1	DIGITAL THERMOMETER AND THERMOSTAT						

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE ENTRY COVER PLATE	SG590222-201-01					
2	2	CABLE GLAND, RUTAB EMC PERFECT			50.620M/EMV	RUTAB, SWEDEN	1476023	AHLSELL, SWEDEN
3	2	JAM NUT, RUTAB EMC, M20			50.220MPOT	RUTAB, SWEDEN	1476513	AHLSELL, SWEDEN
4	1	CABLE GLAND, RUTAB EMC EEX II			221284	RUTAB, SWEDEN	1476041	AHLSELL, SWEDEN
5	1	JAM NUT, RUTAB EMC, M12			50.212MPOT	RUTAB, SWEDEN	1476511	AHLSELL, SWEDEN



INSTALLATION INSTRUCTIONS
CABLE GLAND - ITEM 4

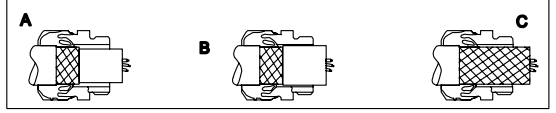
3 WAYS TO PREPARE CABLE



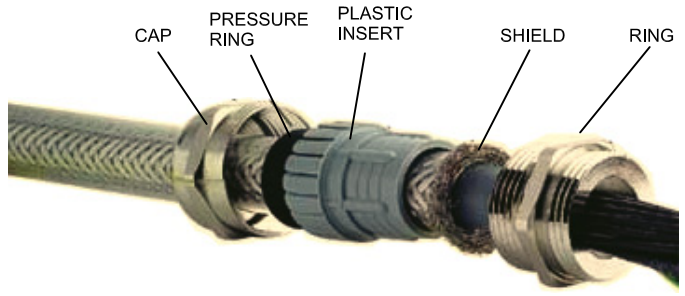
PG	7	9	11	13	16	21	29	36	42	48
ISO	10	12	16	20	25	32	40	50	63	
L	8	9	9	9	10	10	12	14	14	14

MINIMUM LENGTH OF INSULATION REMOVAL

3 METHODS OF INSTALLING CABLE WITHOUT DISASSEMBLING CABLE GLAND



INSTALLATION INSTRUCTIONS
CABLE GLAND - ITEM 2



Assembly Instructions
1.) Remove approx. 10mm of the cable's insulation and expose the shield
2.) Guide the cable through the cable gland cap, the pressure ring and the plastic insert.
3.) Bend the shield outward approx. 90°.
4.) Press the shield bac ove the plastic insert.
5.) Using the plastic insert, push the cable into the base until the shield bottoms in the base.
6.) Push the cap over the plastic insert and tighten thoroughly.

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

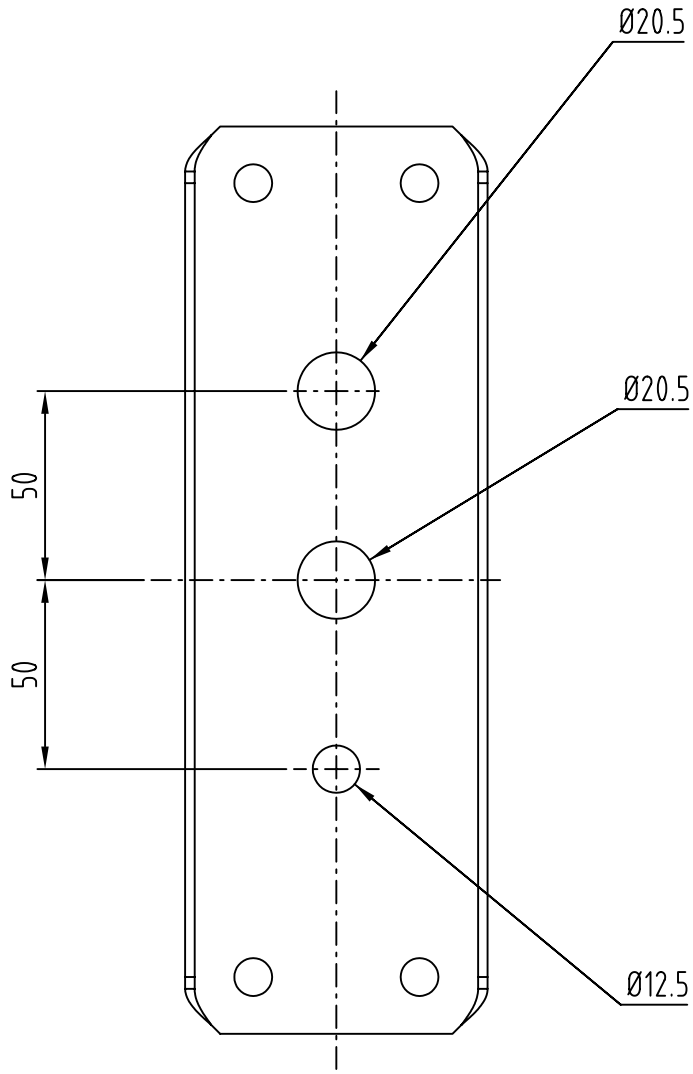
Drawn by:	Date drawn:	Checked by:
G.O.	2009-02-19	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

CABLE ENTRANCE COVER PLATE ASSM.

Drawing No.	Rev.	Sheet	Scale
SG590222-001-01		1 of 1	

Revision	Description	Date	Drawn by:	Checked by:	Approved



		COVER PLATE	NPP 913798		
Item No	Qty.	Name	Description	Dimensions	Remark

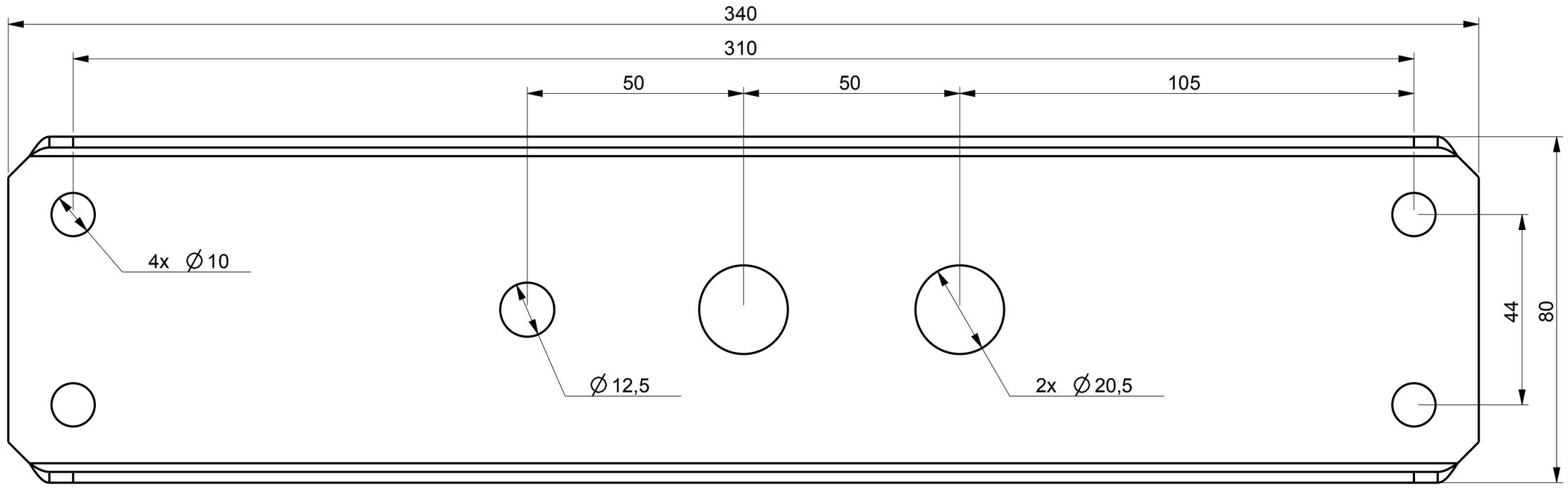
SAFEGATE GROUP

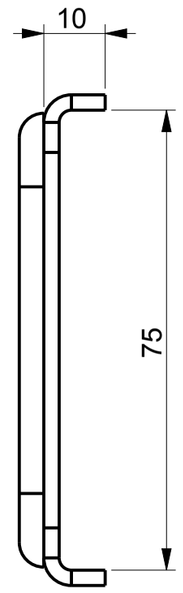
Safegate International AB
MALMÖ, SWEDEN

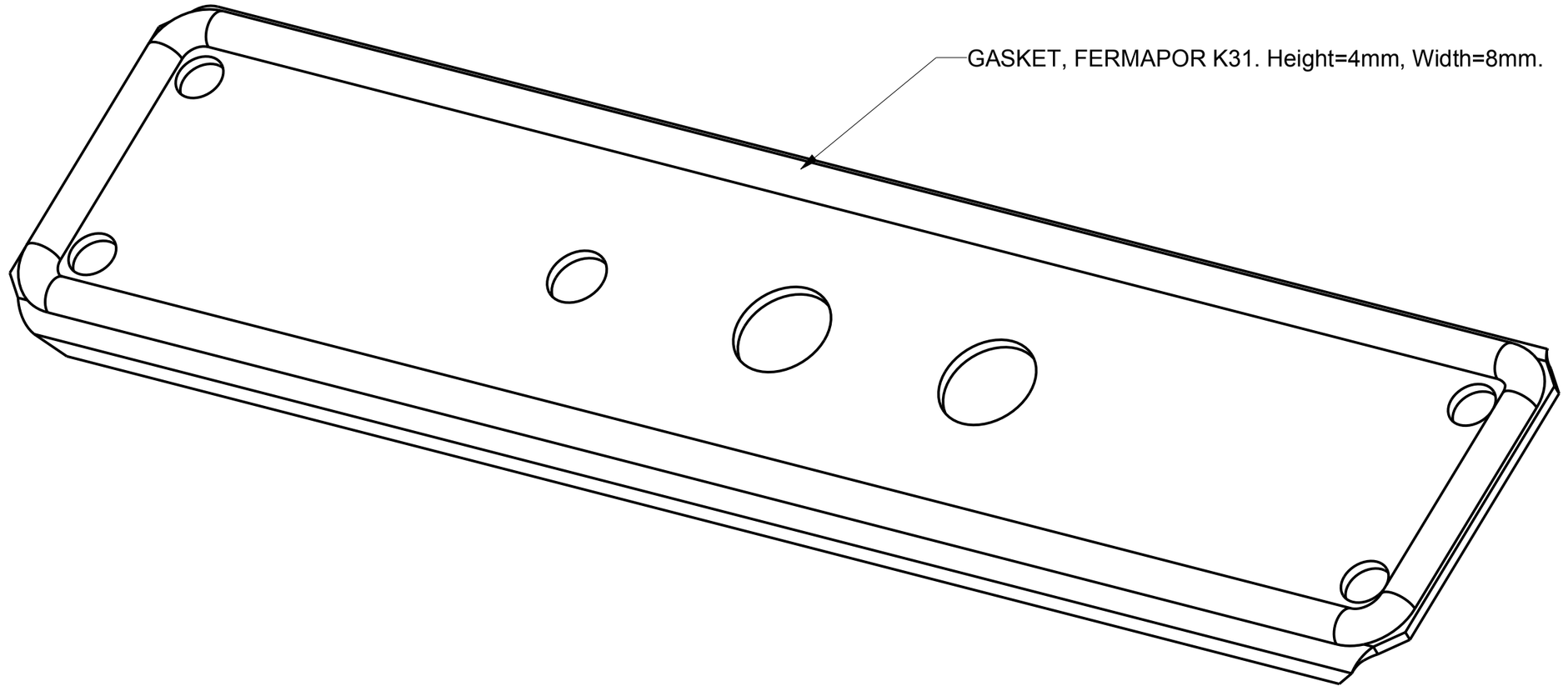
Unless otherwise indicated, all tolerances are according to	ISO-2768-c	Sharp Edges R = 0.5
Surface Coating		Weight

CABLE ENTRY COVER PLATE

Drawn by:	Date drawn:	Checked by:				
G.O.	2009.02.19					
App. by:	Date approved:	Project No.:	Drawing No. SG590222-201-01	Rev.	Sheet 1 of 1	Scale 1:2



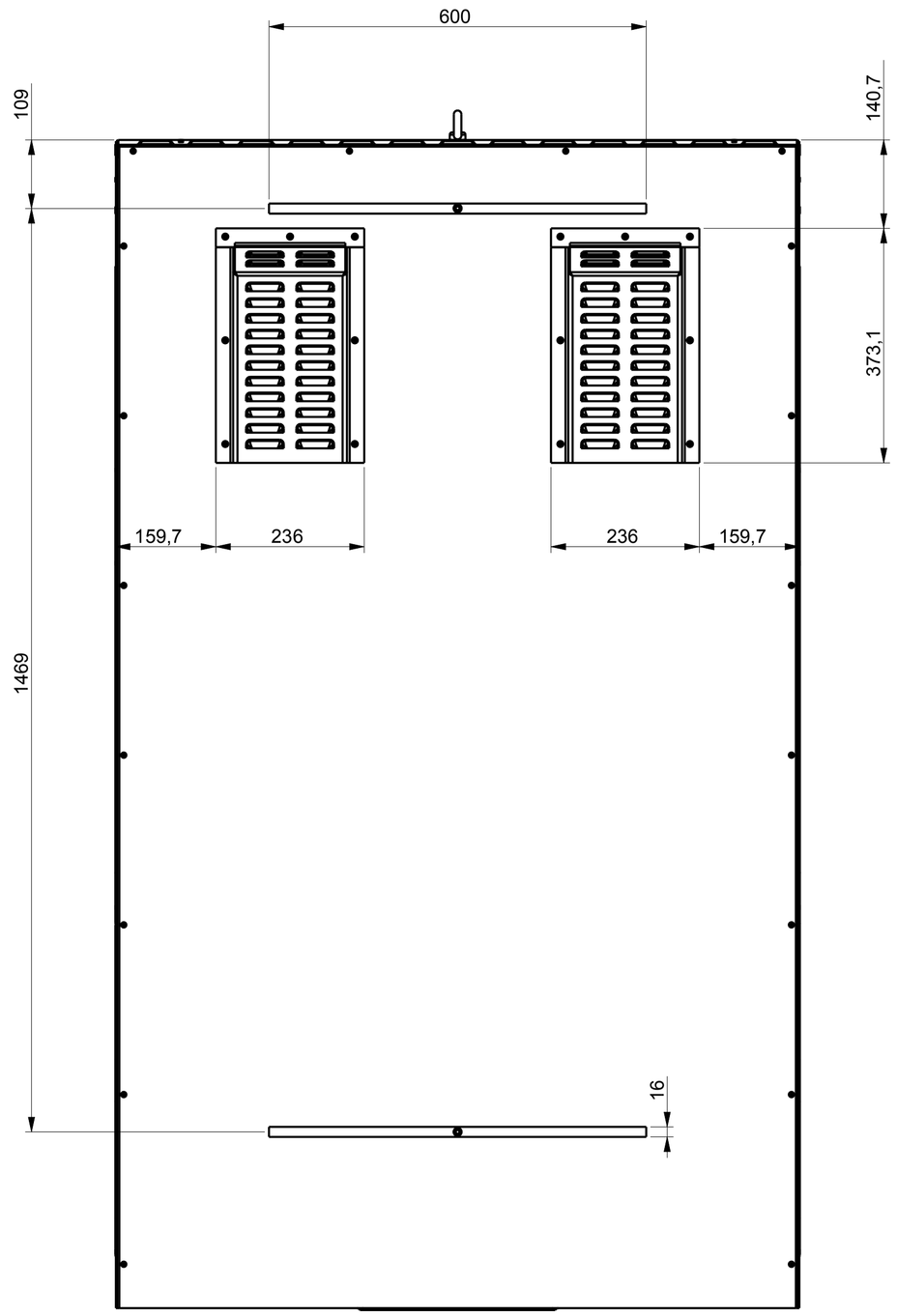


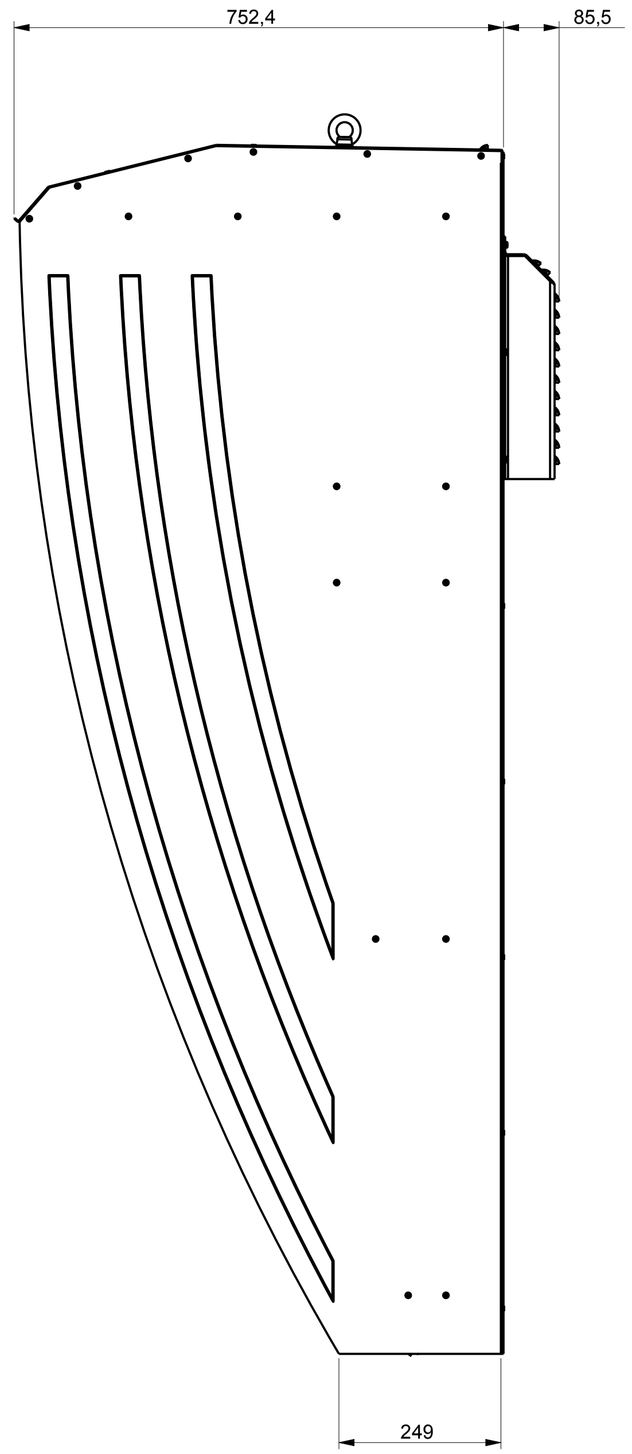


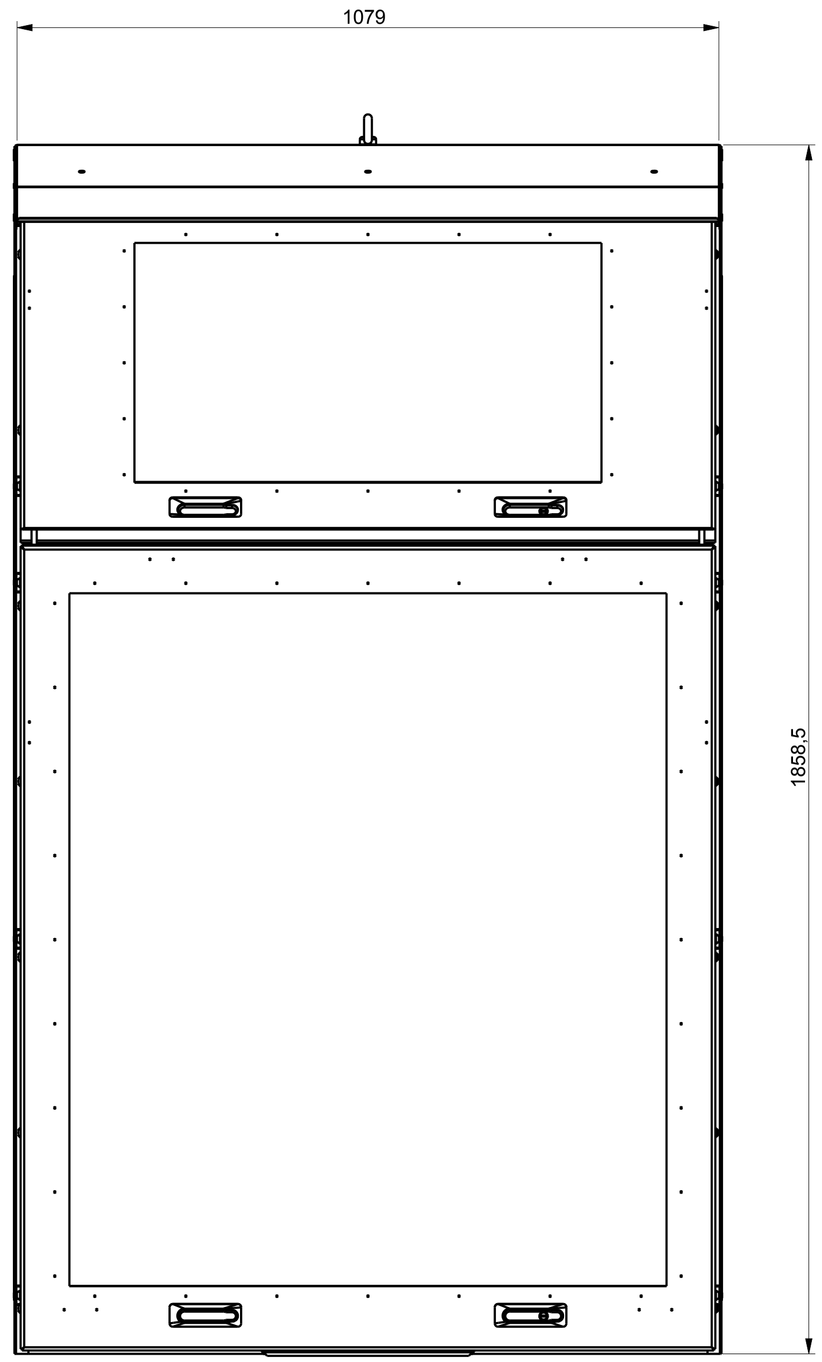
Issue No.	Issue date	Issue by	Issue checked by	Issue text

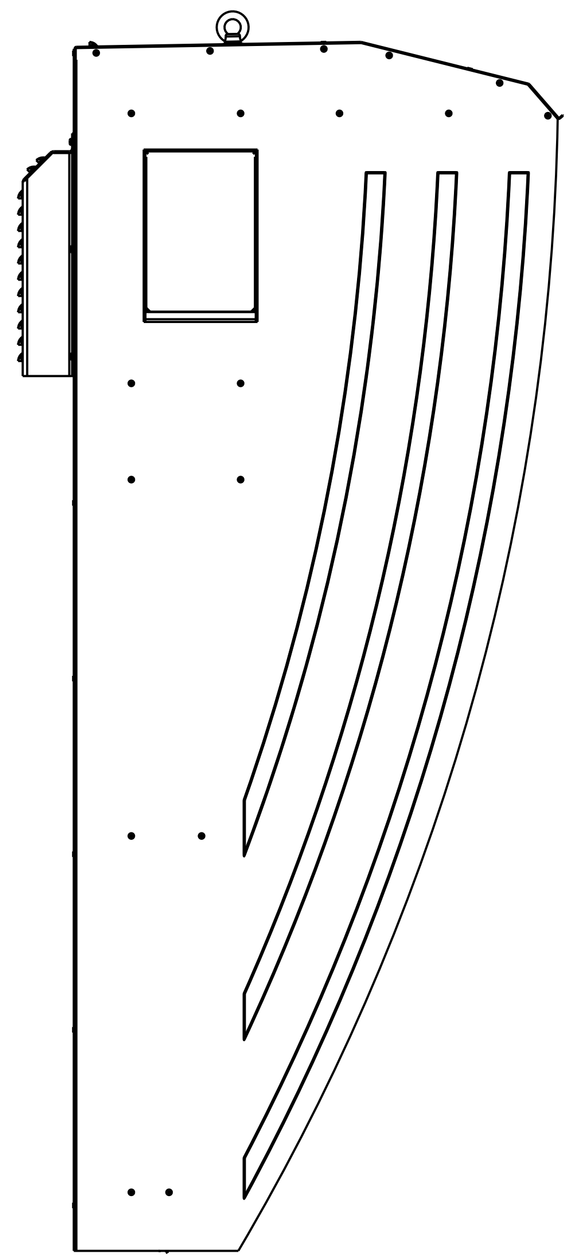
THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Drawn by: K JOHANSSON	Date drawn: 2013-12-19	Gen. tolerance			
Approved by:	Date approved:	Surface treatment: RAL 9005			
		Basic material: EN AW 1050A H14			
		Info			
Project No.	Drawing No. SG590222-202-01	Description: Cable Entry Cover Plate (3 holes)			
		Rev.	Scale 1,000	Size A2	Sheet 1 (1)







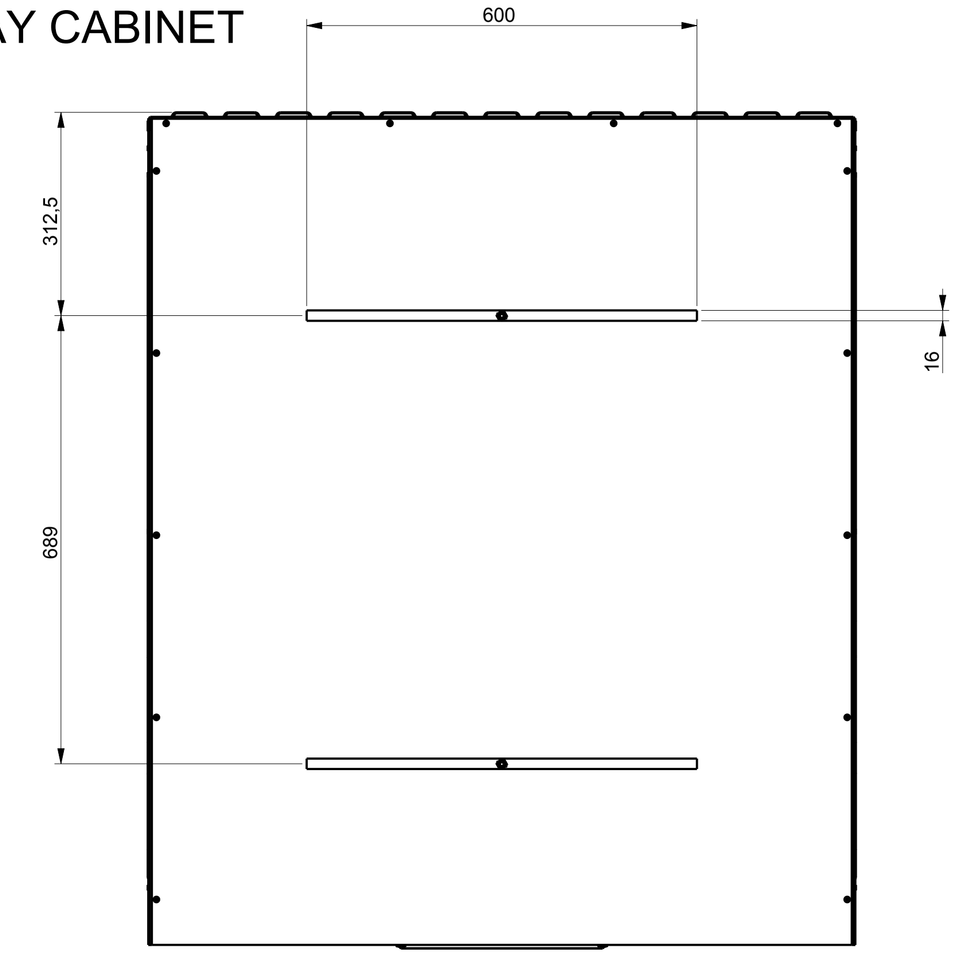


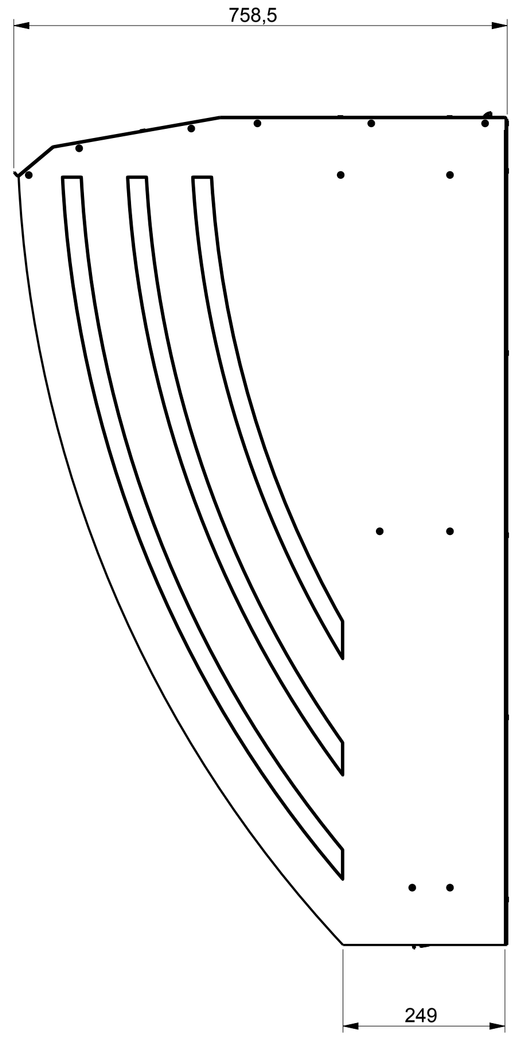
B	2014-10-01	V.N.		Drawing updated with new T1 Cabinet and additional dimensions.
A	2013-06-26	K.J.		Dimensions for the slots on the back of the cabinet added.
Issue No.	Issue date	Issue by	Issue checked by	Issue text

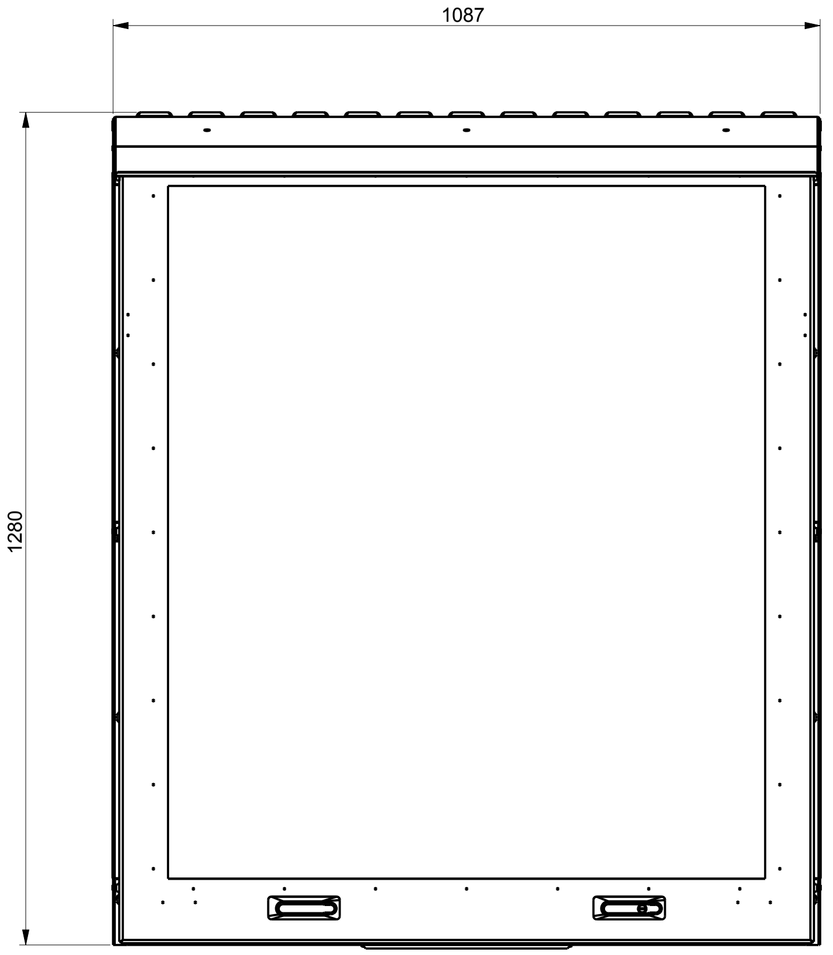
THORN lemair Lighting
IDMAN
SAFEGATE PROOF

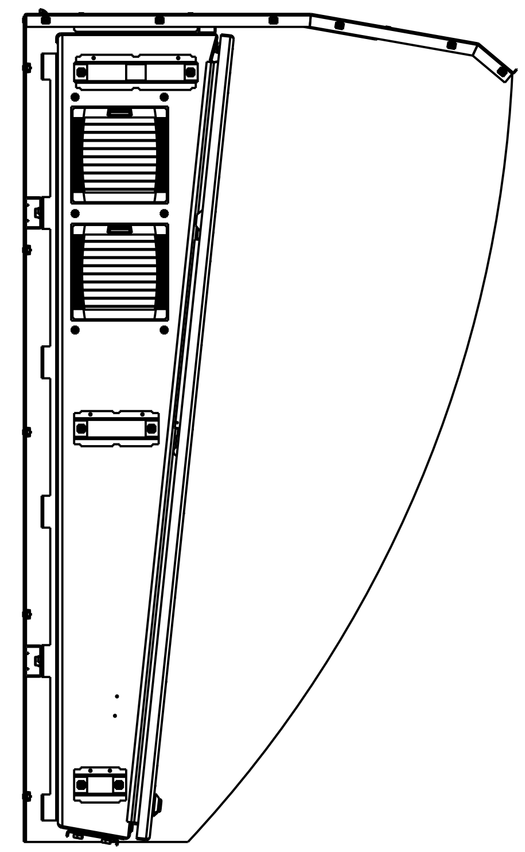
Gen. tolerance		
Surface treatment		
Basic material		
Info		
Drawn by: G.O.	Date drawn: 2008-05-27	Description: SAFEDOCK T1 CABINET
Approved by:	Date approved:	
Project No.	Drawing No. SG590253-002-01	Rev. B / Scale / Size A1 / Sheet 1 (1)

DISPLAY CABINET

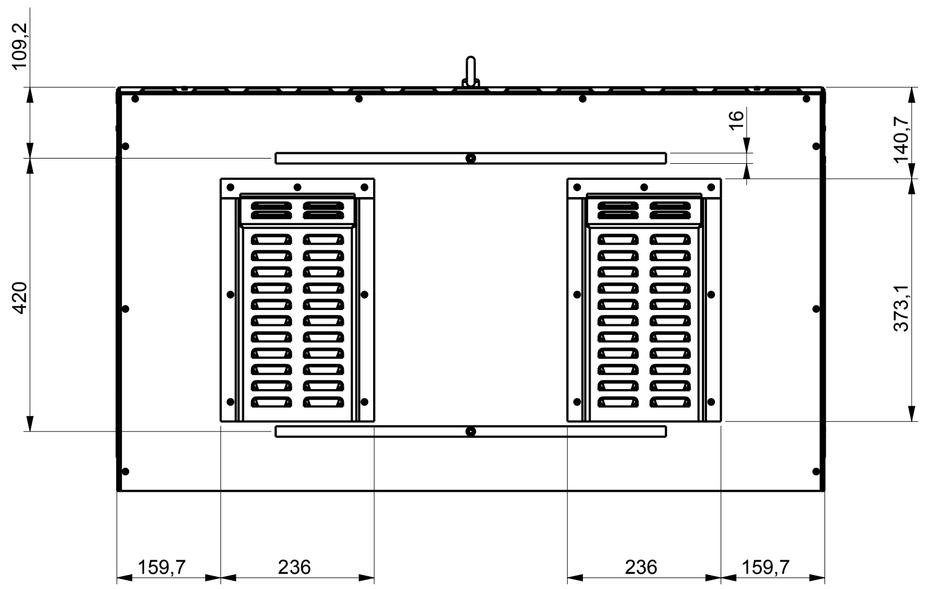


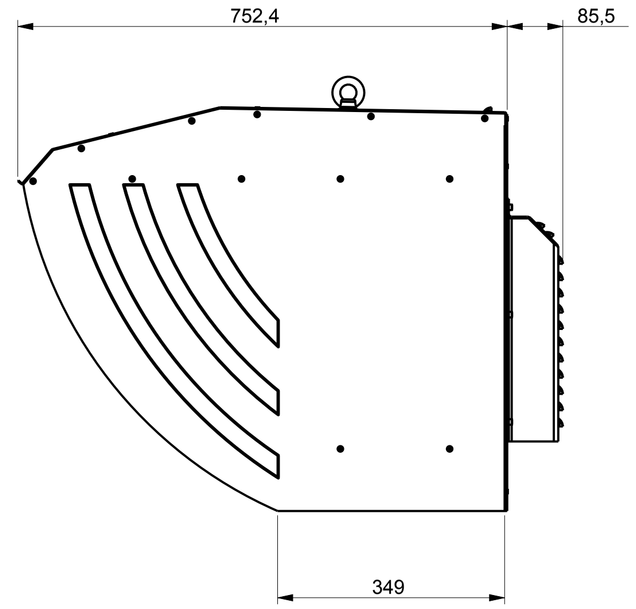


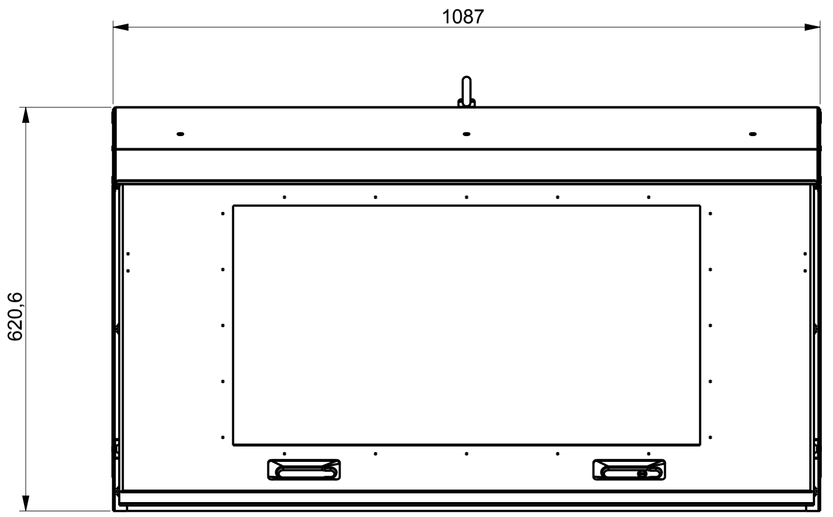


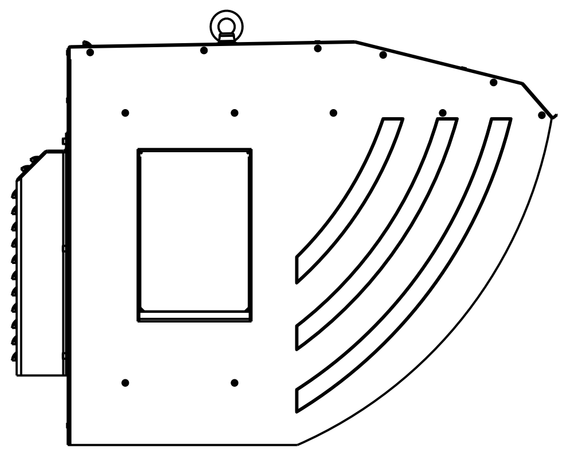


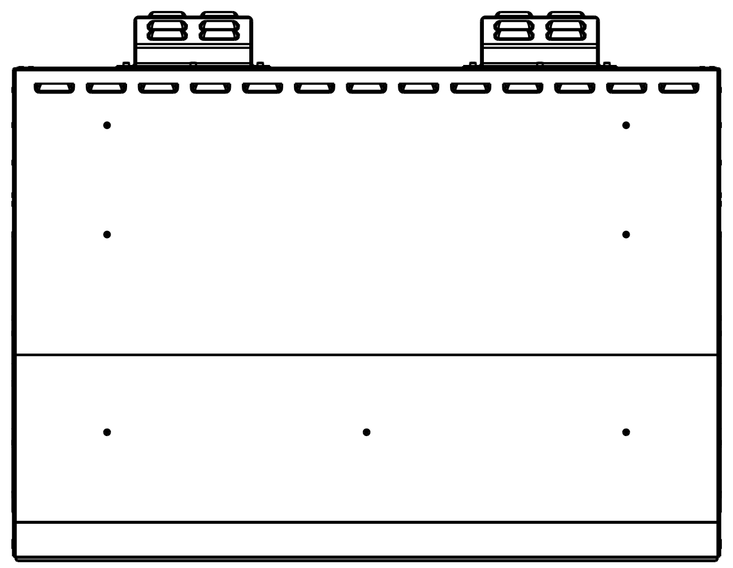
LASER CABINET











Issue No.	Issue date	Issue by	Issue checked by	Issue text
B	2014-11-24	VN		Drawing updated with new T1S Cabinet and additional dimensions.

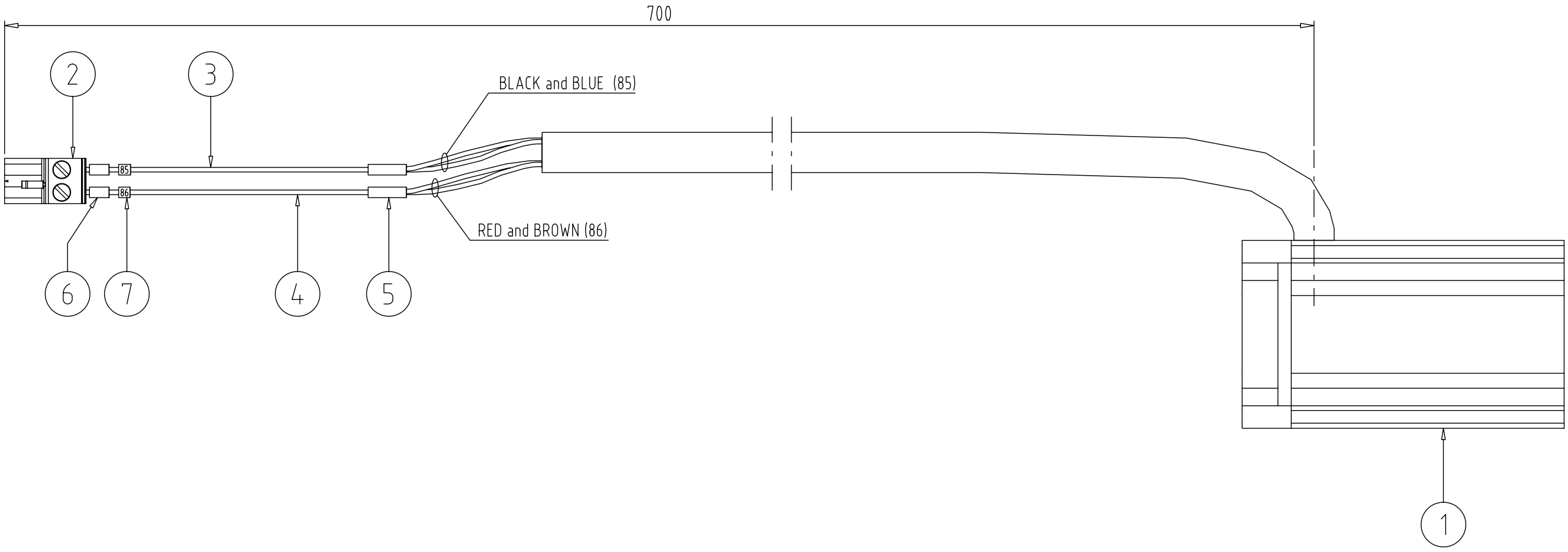
THORN EMEA | LEVITON
IDMAN
SAFEGATE GROUP

Drawn by: A.S.	Date drawn: 2013-10-29	Gen. tolerance	
Approved by:	Date approved:	Surface treatment	
Project No.	Drawing No. SG590253-219-01	Basic material	
		Info	

Description: SAFEDOCK T1S CABINET

Rev.	Scale	Size	Sheet
B		A1	1 (1)

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	HEATER, CIRRUS C40/1-60W-24V-DC-24V-0-0-1-0				DBK		OEM ELECTRONICS
2	1	CONNECTOR, MSTB 2,5/2-ST-5,08			1757019	PHOENIX CONTACT		
3		ELECTRICAL WIRE, UL1007/1569, BLACK, AWG 20			3053 BLACK	ALPHA WIRE	5522909	ELFA
4		ELECTRICAL WIRE, UL1007/1569, RED, AWG 20			3053 RED	ALPHA WIRE	5522925	ELFA
5	2	BUTT SPLICE, SK1525					4822909	ELFA
6	2	BOOTLACE FERRUL, H 0.5/14					9026060000	WEIDMÜLLER
7		WIRE MARKERS, NUMBERING ACCORDING TO ILLUSTRATION			PA02	PARTEX		



Revision	Description	Date	Drawn by:	Checked by:	Approved
A	WIRE NUMBER 85-21 CHANGED TO 85	2008-05-23	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:
G.O.	2008.03.16	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to ISO-2768-C

Sharp Edges R = 0.5

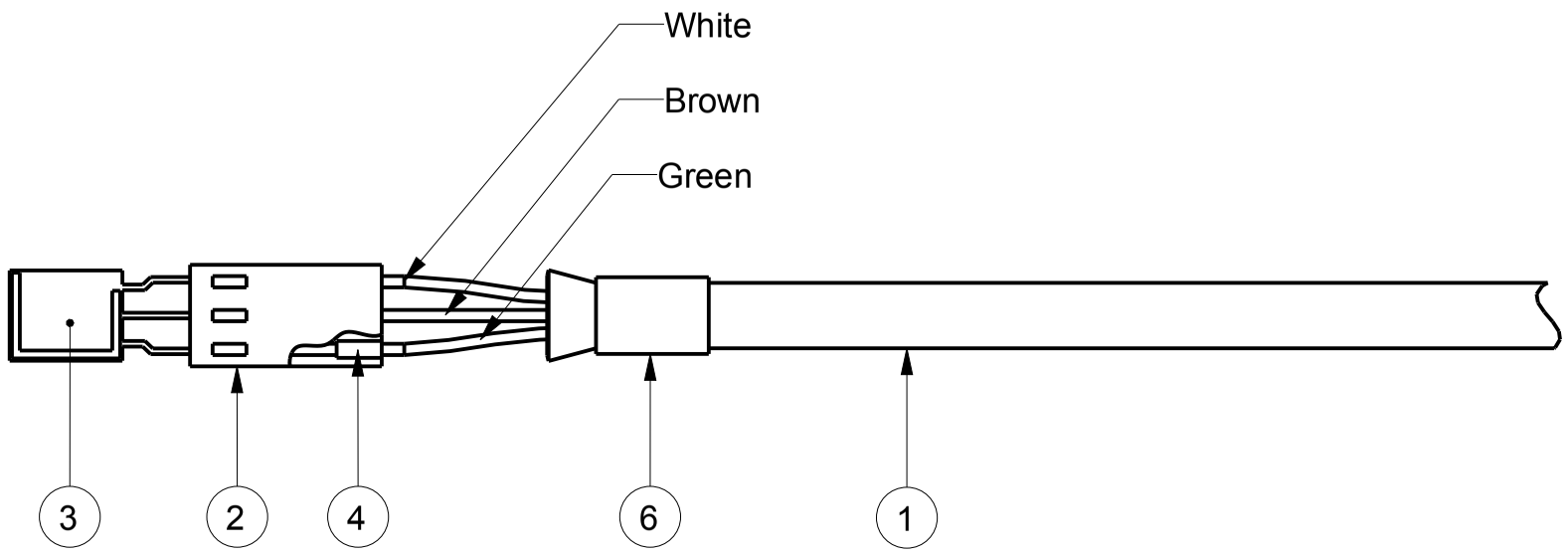
Surface Coating

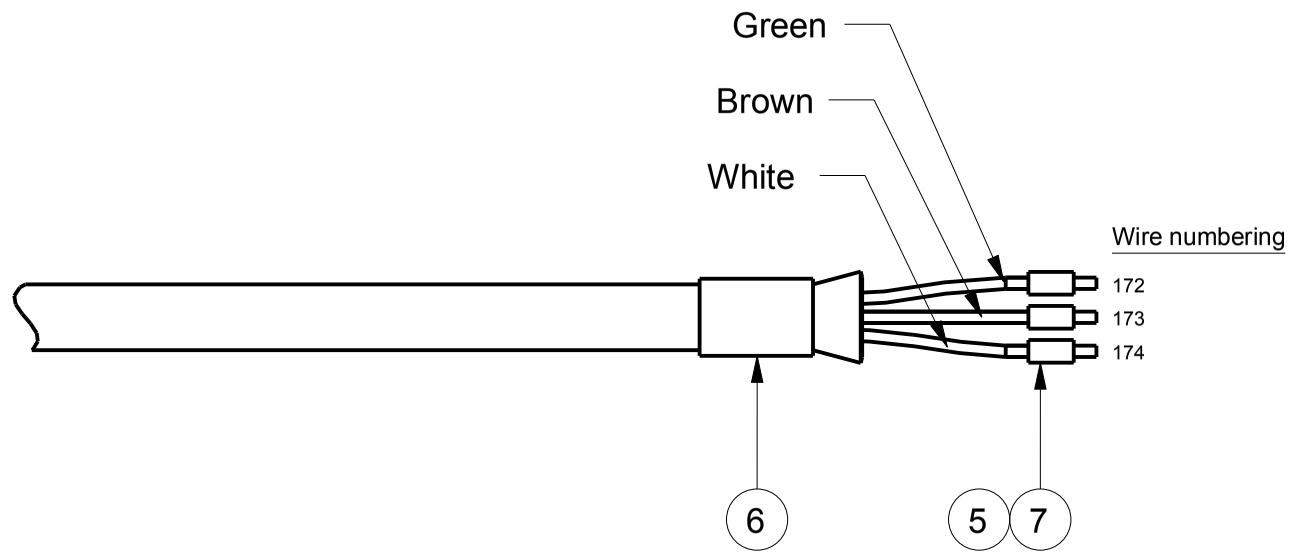
Weight

HEATER

Drawing No.	Rev.	Sheet	Scale
SG590255-106-01	A	1 of 1	NONE

POS	QTY	DESCRIPTION	STD/OPT	T1/T1S/T2/T3	DRW. NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NO.	SUPPLIER
1	1	CABLE, LIVY, 3x0.34 mm², L=800 mm	Standard	T1/T1S				7852030	NOVUM
2	1	CONTACT	Standard	T1/T1S		0-925366-3	AMP, USA		
3	1	LIGHT SENSOR	Standard	T1/T1S		TSL235R	TAOS, USA		
4	3	CRIMP TERMINALS	Standard	T1/T1S		1-141708-1	AMP, USA		
5	3	CRIMP TERMINALS, H 0.34/12	Standard	T1/T1S		9025790000	WEIDMÜLLER		
6	2	SHRINK WRAP, L=20 mm	Standard	T1/T1S				55-070-25	ELFA
7		WIRE MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION	Standard	T1/T1S		PA02	PARTEX		



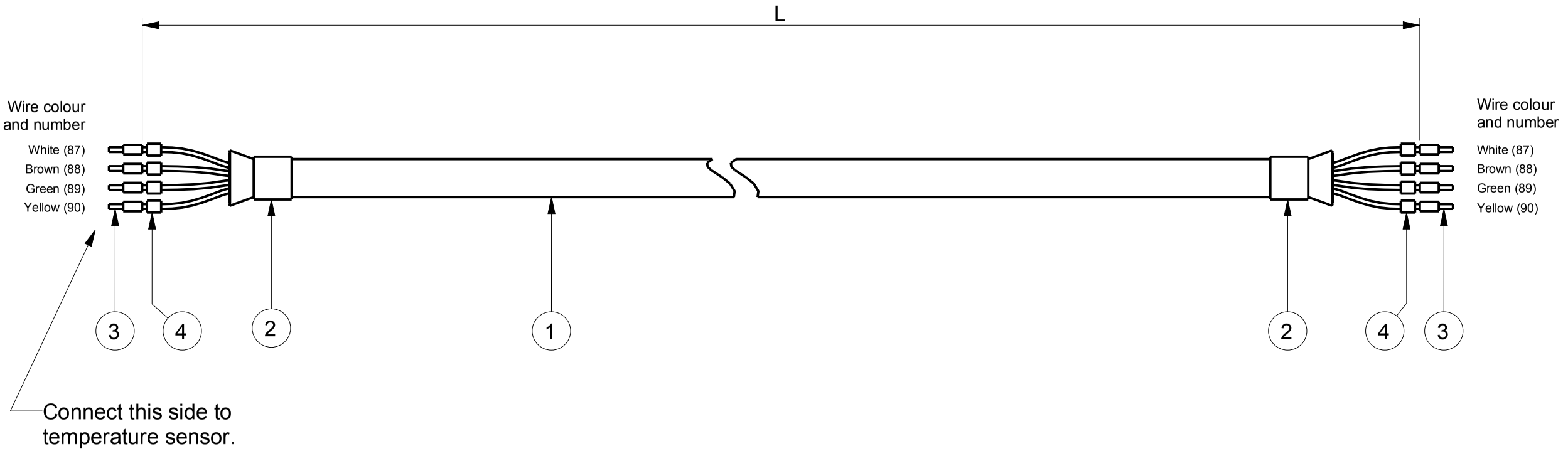


Rev.	Issue date	Issue by	Issue checked by	Issue text
B	2014-09-30	V.N.		Cable updated to fit new T1 Cabinet.
A	2012-04-03	A.S.		Item 1 changed, valid for both T1 and T1 Split.

THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Drawn by: G.O.	Date drawn: 2008-03-15	Gen. tolerance	
Approved by:	Date approved:	Surface treatment	
		Basic material	
		Info	
Project No.	Drawing No. SG590255-108-01	Description: LIGHT SENSOR ASSEMBLY K16, T1/T1S	
Rev. B	Scale 1,500	Size A3	Sheet 1 (1)

POS	QTY	DESCRIPTION	STD/OPT	T1/T1S/T2/T3	DRW. NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NO.	SUPPLIER
1	1	CABLE, LIVY, 4x0.34 mm², L=800 mm	Standard	T1/T1S					
2	2	SHRINK WRAP, L=20 mm	Standard	T1/T1S				55-070-25	ELFA
3	8	BOOTLACE FERRULE, H0.34/12	Standard	T1/T1S				9025790000	WEIDMÜLLER
4		WIRE MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION	Standard	T1/T1S		PA02	PARTEX		



Rev.	Issue date	Issue by	Issue checked by	Issue text
B	2014-09-30	V.N.		Cable updated to fit new T1 Cabinet.
A	2012-04-03	A.S.		Item 1 changed, now valid for both T1 and T1 Split.

THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Drawn by: G.O.	Date drawn: 2008-03-15	Gen. tolerance	
Approved by:	Date approved:	Surface treatment	
Project No.	Drawing No. SG590255-109-01	Basic material	
		Info	

Description
C20 CABLE ASSEMBLY TEMPERATURE SENSOR, T1/T1S

Rev.	Scale	Size	Sheet
B	1,000	A3	1 (1)

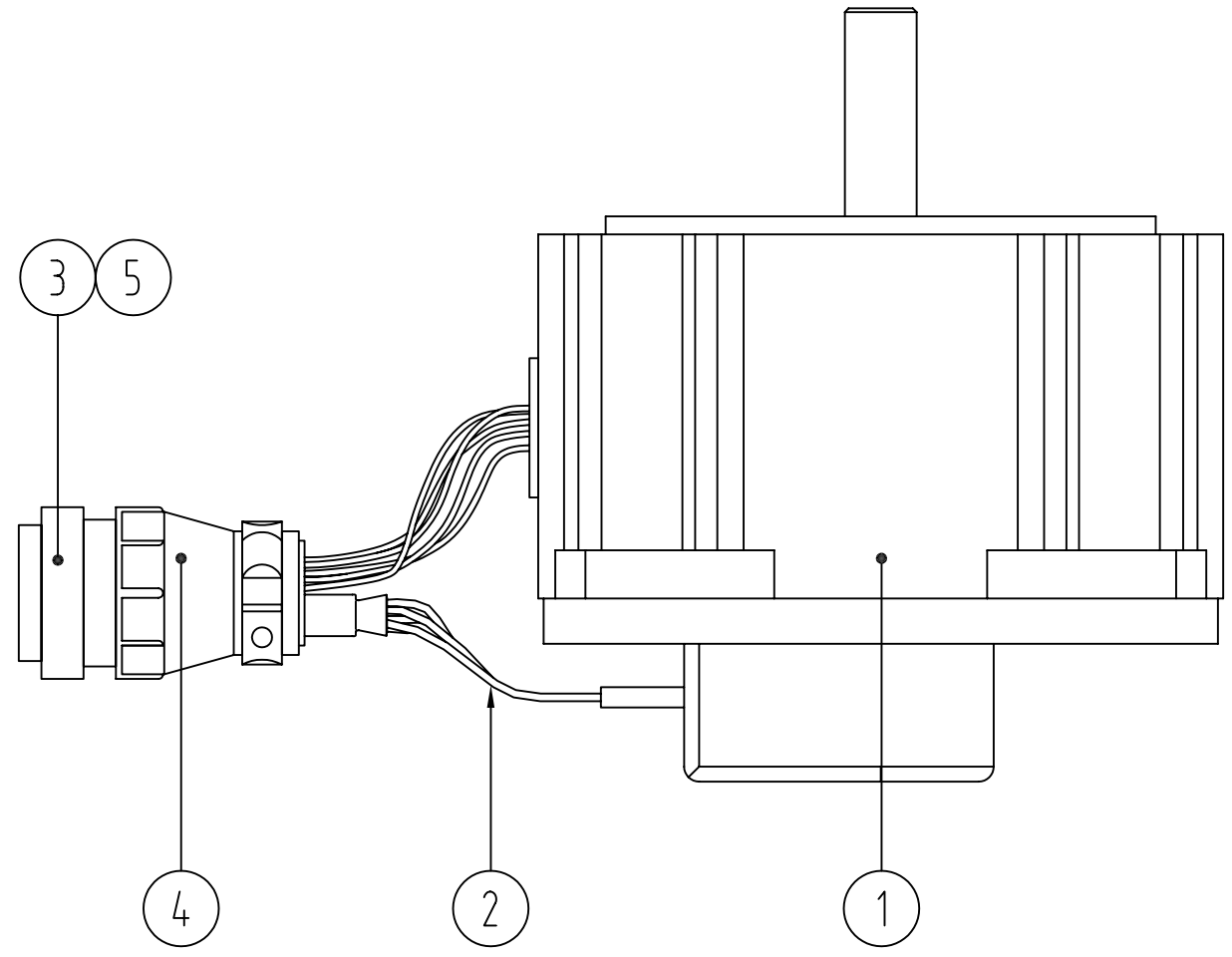
Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	STEPPER MOTOR, P850		2014800002	ESCAP			
2	1	OPTICAL ENCODER CABLE	SG590255-112-01					
3	1	PLUG FOR SOCKET CONTACTS			182642-1	AMP	4450045	ELFA
4	1	CABLE CLAMP WITH STRAIN RELIEF			182655-1	AMP	4450433	ELFA
5	13	SOCKET, TIN PLATED			163088-1	AMP	4450722	ELFA

PIN NUMBER ASSIGNMENT FOR WIRES

PLUG FOR SOCKET CONTACTS

BROWN (PIN 1)	STEPPER MOTOR
BROWN/WHITE (PIN 2)	
RED (PIN 3)	
RED/WHITE (PIN 4)	
ORANGE (PIN 5)	
ORANGE/WHITE (PIN 6)	
YELLOW (PIN 7)	
YELLOW/WHITE (PIN 8)	

BROWN (PIN 9)	OPTICAL ENCODER
YELLOW (PIN 10)	
GREEN (PIN 11)	
GRAY (PIN 12)	
WHITE (PIN 13)	



Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2008.09.30				

Unless otherwise indicated, all tolerances are according to

Sharp Edges

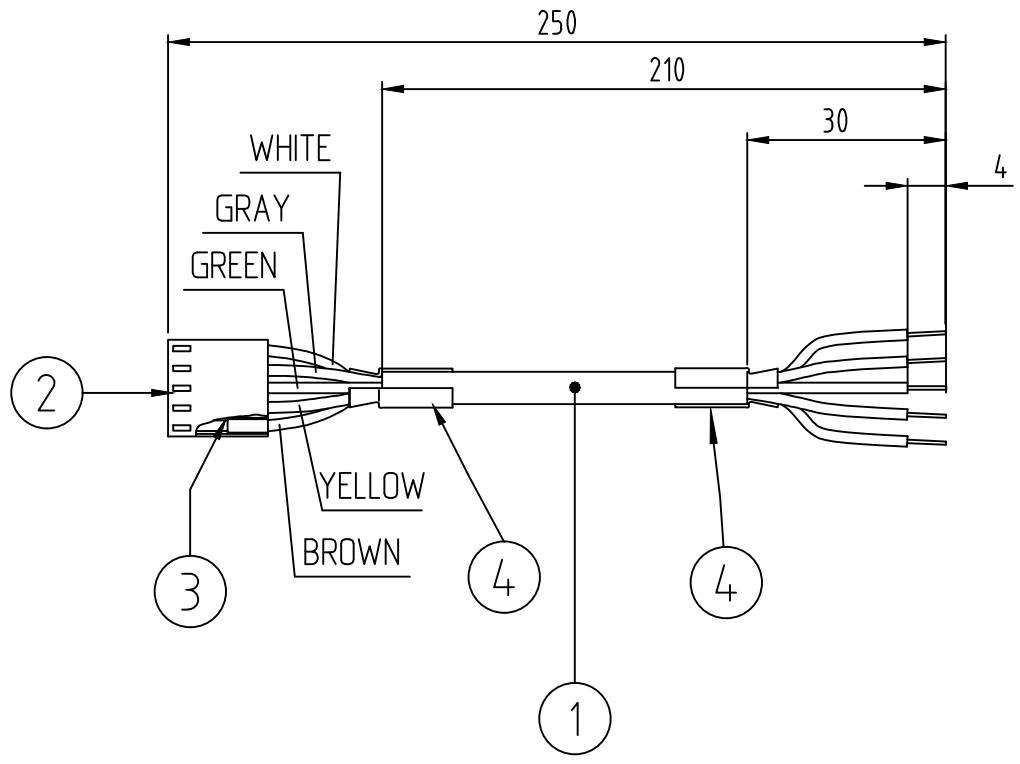
Surface Coating

Weight

SCANNING MOTOR

Drawing No.	Rev.	Sheet	Scale
SG590255-111-01		1 of 1	1:1

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, LiYY, 5x0.34						
2	1	CONTACT HOUSING			0-925366-5	AMP		
3	5	CRIMP TERMINALS			1-141708-1	AMP		
4	2	SHRINK WRAP, L = 20 mm						



Revision	Description	Date	Drawn by:	Checked by:	Approved
C	lenght for cable updated	2012.01.23	A.S		
B	BOM and drawing changed	2012.01.20	A.S		
A	Cable length added, drawing number added	2010.05.25	A.S		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:
G.O.		
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to ISO-2768-c

Sharp Edges R = 0.5

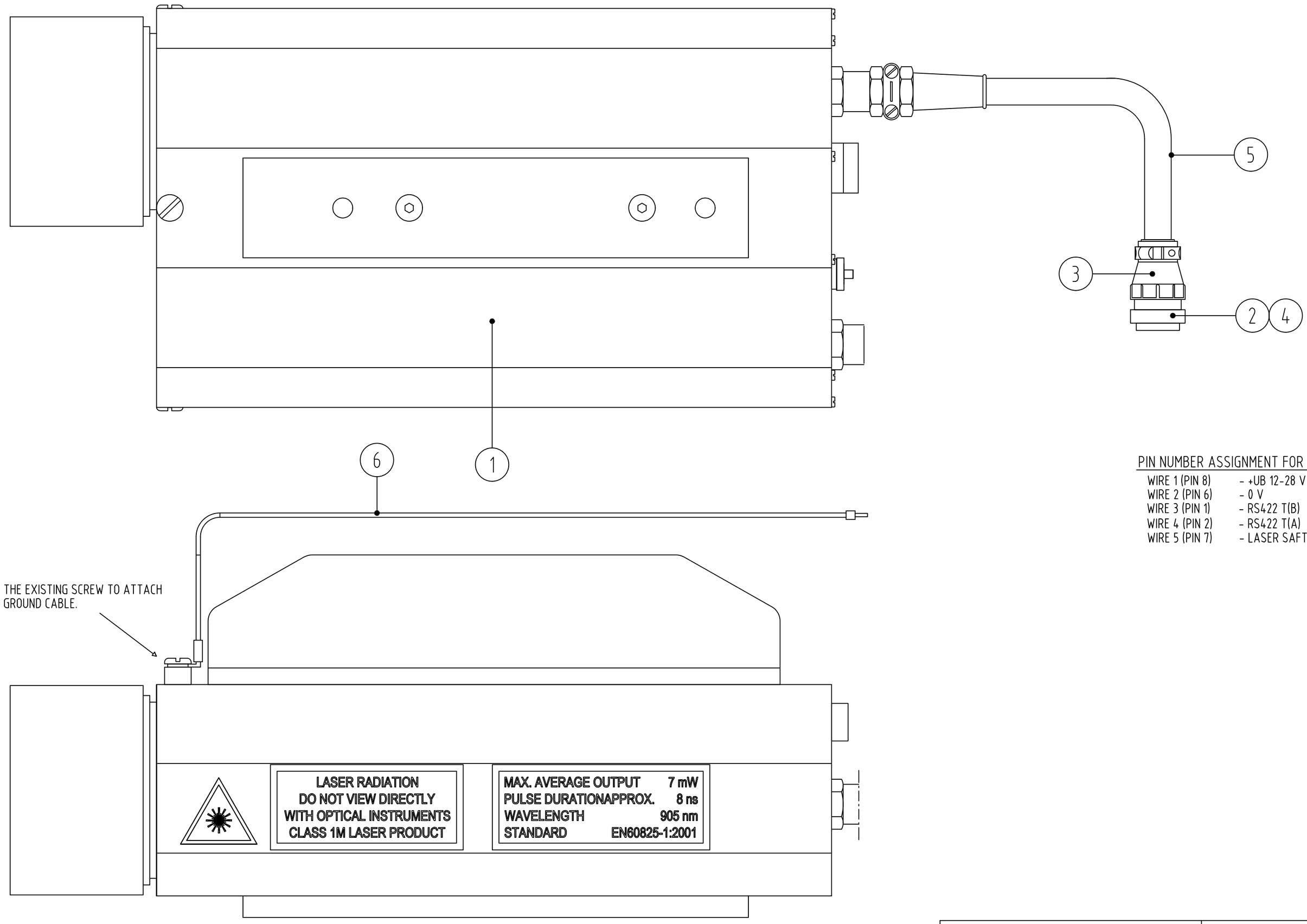
Surface Coating

Weight

OPTICAL ENCODER CABLE T1

Drawing No.	Rev.	Sheet	Scale
SG590255-112-01	C	1 of 1	

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	LASER RANGE FINDER			LD3-06AT	RIEGL		
2	1	PLUG FOR SOCKET CONTACTS			182645-1	AMP	4450029	ELFA
3	1	CABLE CLAMP WITH STRAIN RELIEF			182663-1	AMP	4450425	ELFA
4	6	SOCKET, TIN PLATED			163088-1	AMP	4450722	ELFA
5	1	CABLE LENGTH 300mm						
6	1	GROUND CABLE	SG590255-121-01					



PIN NUMBER ASSIGNMENT FOR WIRES

WIRE 1 (PIN 8)	- +UB 12-28 V DC
WIRE 2 (PIN 6)	- 0 V
WIRE 3 (PIN 1)	- RS422 T(B)
WIRE 4 (PIN 2)	- RS422 T(A)
WIRE 5 (PIN 7)	- LASER SAFTY LOCK

Revision	Description	Date	Drawn by:	Checked by:	Approved
E	Positioning of ground cable updated.	2014.01.03	K.J		
D	Ground cable (6) added.	2013.07.30	K.J		
C	Connection pin3 removed (PE)	2013.03.11	A.S		
B	Note for cable added	2010.05.25	A.S		
A	Note for pin number assignments updated with wire function.	2009.02.17	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to | Sharp Edges
Surface Coating | Weight

LASER RANGE FINDER ASSEMLBY

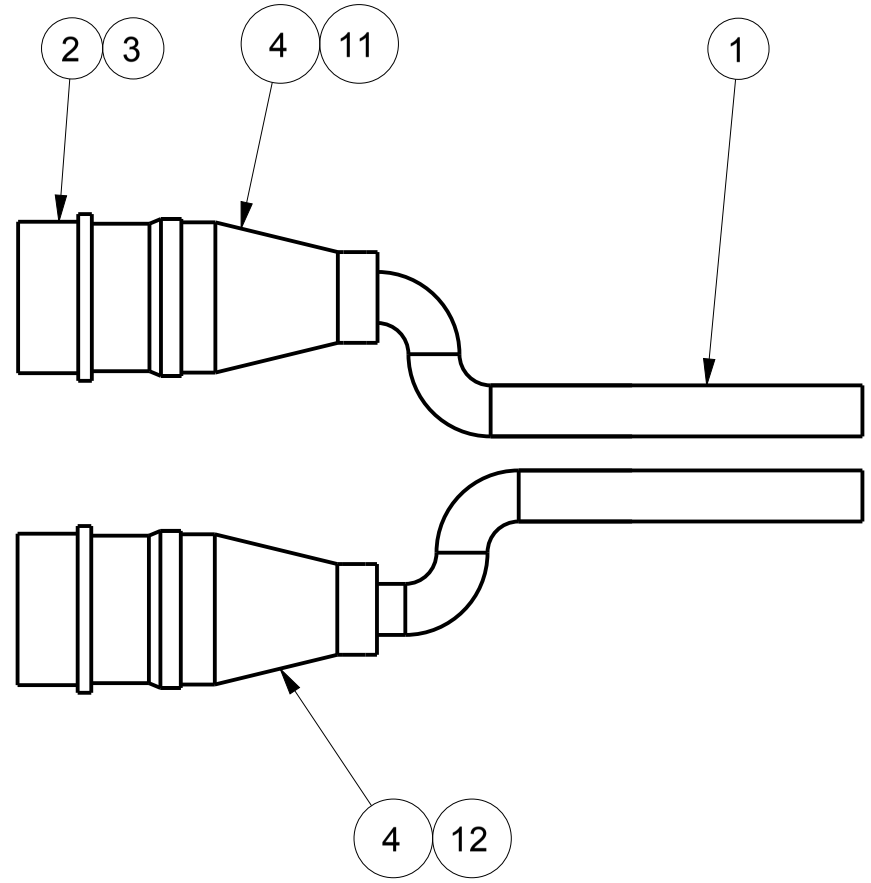
Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2008.09.30				

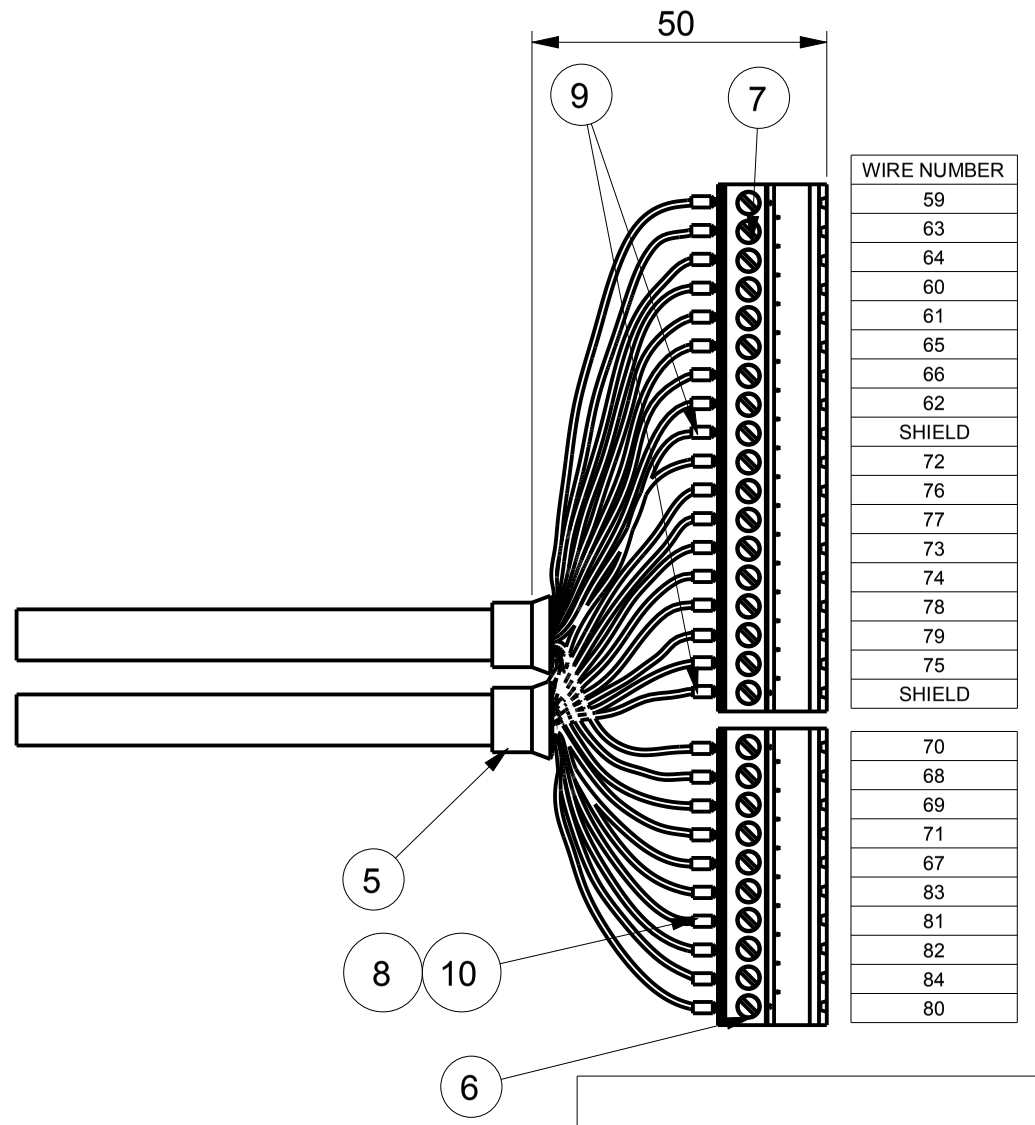
Drawing No.	Rev.	Sheet	Scale
SG590255-113-01	E	1 of 1	1:1

ITEM	QTY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PRODUCT NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NUMBER	SUPPLIER
1	2	CABLE, LIYCY, 13x0.25, L=200 (It is ok to use a standard cable with more wires)		T1/T1S				
2	2	RECEPTICLE FOR PIN CONTACTS		T1/T1S	183077-1	TE CONNECTIVITY		
3	26	PIN CONTACT		T1/T1S	163086-1	TE CONNECTIVITY		
4	2	CABLE CLAMP WITH STRAIN RELIEF		T1/T1S	182655-1	TE CONNECTIVITY		
5	2	HEAT SHRINKABLE TUBING, Ø9.5, BLACK		T1/T1S	FIT-300-3/4	ALPHA WIRE	55-062-09	ELFA, SWEDEN
6	1	CONNECTOR, IC2.5/10-ST-5.08		T1/T1S	1786255	PHOENIX CONTACT		
7	1	CONNECTOR, IC2.5/18-ST-5.08		T1/T1S	1786336	PHOENIX CONTACT		
8	26	BOOTLACE FERRULE, h0.12/12		T1/T1S			9025780000	WEIDMULLER
9	2	BOOTLACE FERRULE, h1.5/14		T1/T1S			9026090000	WEIDMULLER
10		WIRE MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION		T1/T1S	PA02	PARTEX		
11	1	LABEL, YELLOW, Text: V, 15x8		T1/T1S			21302G	TECHNOTRADE
12	1	LABEL, YELLOW, Text: H, 15x8		T1/T1S			21302G	TECHNOTRADE

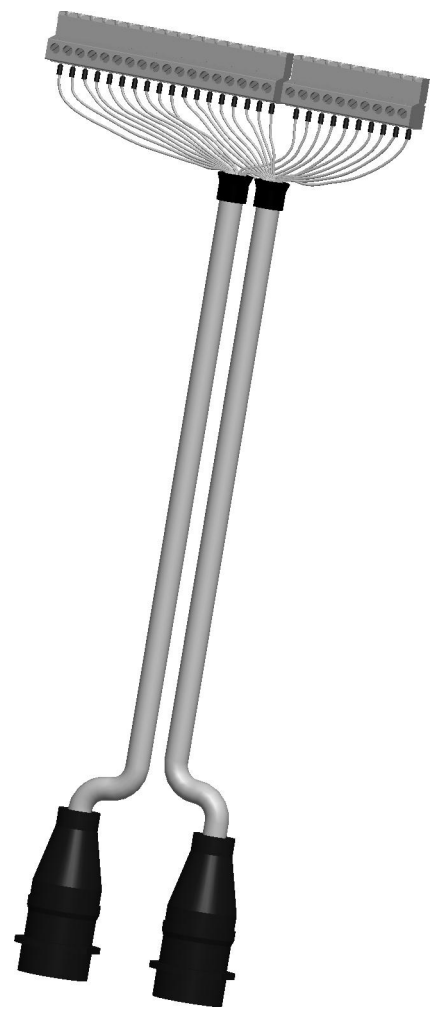
VERTICAL SCANNING MOTOR	
PIN NUMBER	WIRE NUMBER
1	59
2	60
3	61
4	62
5	63
6	64
7	65
8	66
9	67
10	68
11	69
12	70
13	71

HORIZONTAL SCANNING MOTOR	
PIN NUMBER	WIRE NUMBER
1	72
2	73
3	74
4	75
5	76
6	77
7	78
8	79
9	80
10	81
11	82
12	83
13	84





WIRE NUMBER
59
63
64
60
61
65
66
62
SHIELD
72
76
77
73
74
78
79
75
SHIELD
70
68
69
71
67
83
81
82
84
80



Rev.	Issue date	Issue by	Issue checked by	Issue text
A	2014-05-20	VN		Production release. Drawing valid for both T1 and T1S.

THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Gen. tolerance

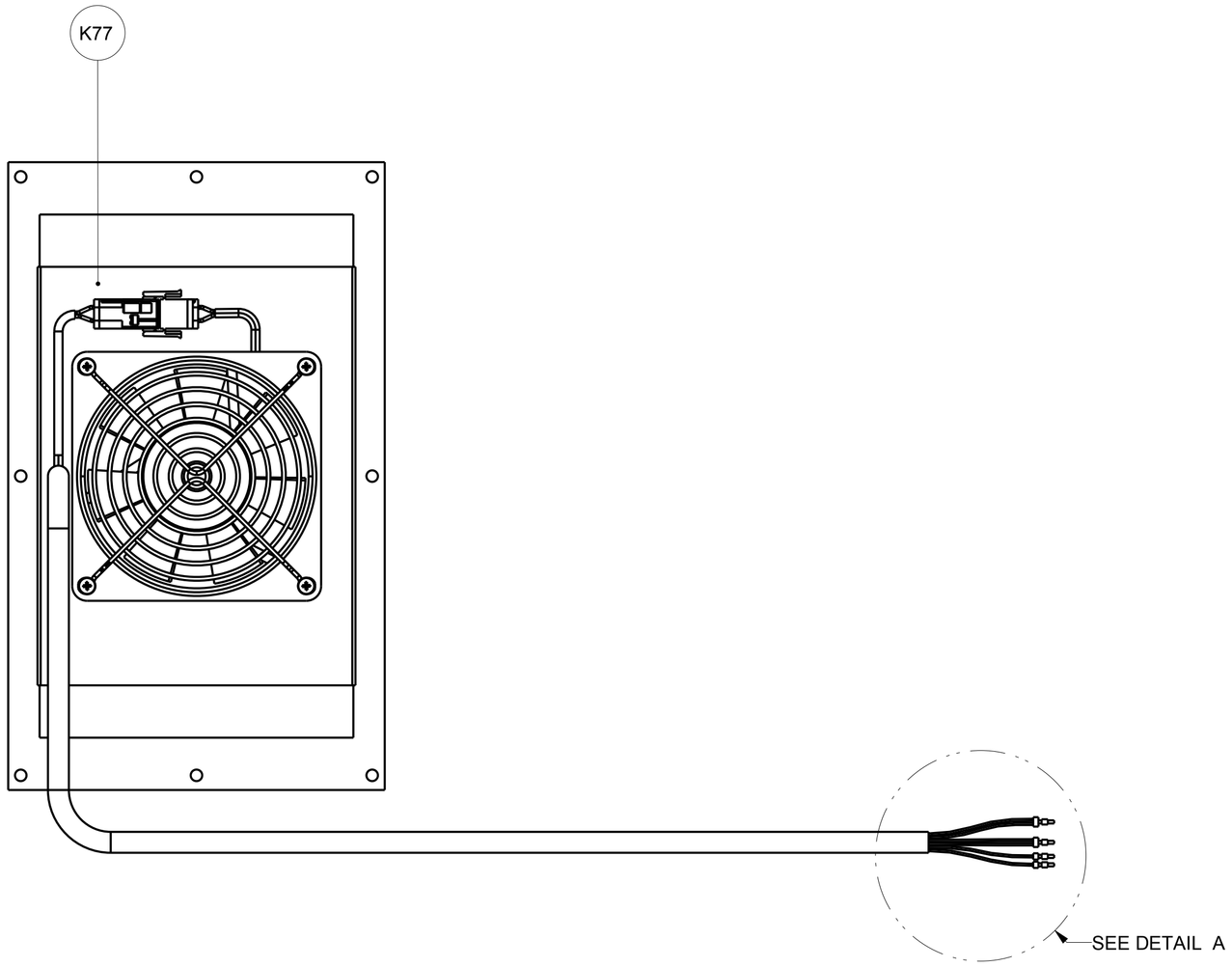
Surface treatment

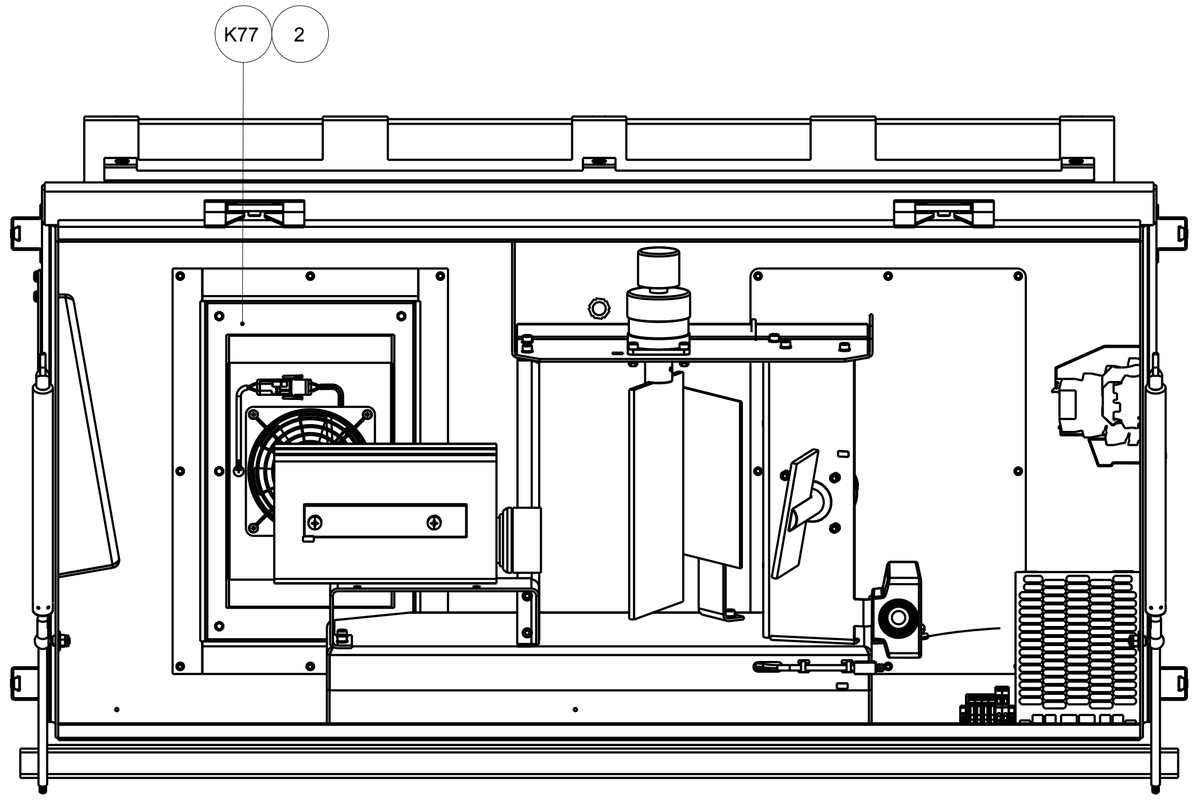
Basic material

Info

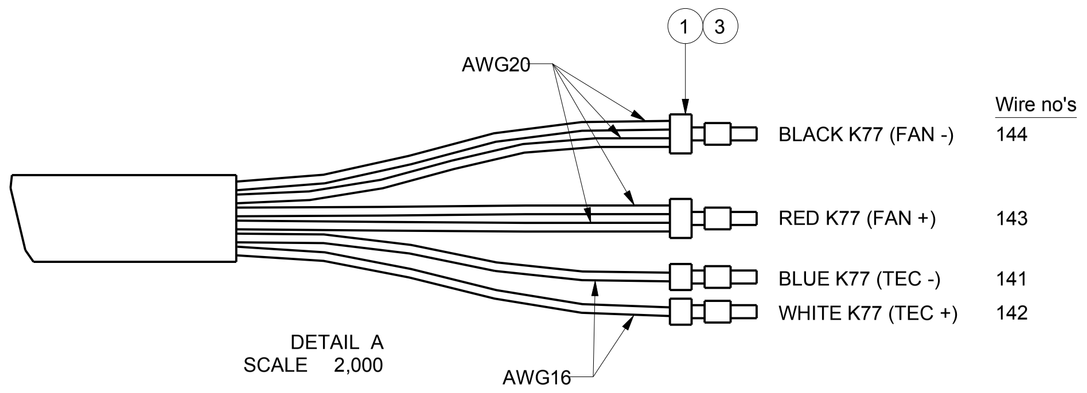
Drawn by:	Date drawn:	Description
A. Strandberg	2012-11-28	ADAPTER SCANNING MOTOR C15 T1/T1S
Approved by:	Date approved:	
Project No.	Drawing No.	Rev. / Scale / Size / Sheet
	SG590255-116-01	A / NA / A3 / 1(1)

POS	QTY	DESCRIPTION	STD/OPT	T1/T1S/T2/T3	DRW. NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NO.	SUPPLIER
K77	1	THERMO ELECTRIC COOLER/WARMER, 24 VDC	Standard	T1/T1S		CTA305-0005-02	MARLOW INDUSTRIES INC		
1	4	CRIMP FERRULE, H1.5/14	Standard	T1/T1S		9019120000	WEIDMÜLLER		
2	1	COMPONENT IDENTIFIER LABEL, YELLOW, 15x8 mm, TEXT: K77	Standard	T1/T1S					
3		WIRE MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION	Standard	T1/T1S					
4		CABLE TIE, 71x1.8, BLACK	Standard	T1/T1S					





COMPONENT PLACEMENT IN DOCKING GUIDANCE UNIT
PARTIAL FRON VIEW, DOOR REMOVED



DETAIL A
SCALE 2,000

NOTE:

USE CABLE TIES TO SECURE THE CABLES INSIDE SCANNER COMPARTMENT.
PLACE COMPONENT IDENTIFIER LABEL ON THE BACK OF THE WALL, ABOVE COMPONENT.

Issue No.	Issue date	Issue by	Issue checked by	Issue text

THORN EMI CEIA IDMAN SAFEGATE GROUP

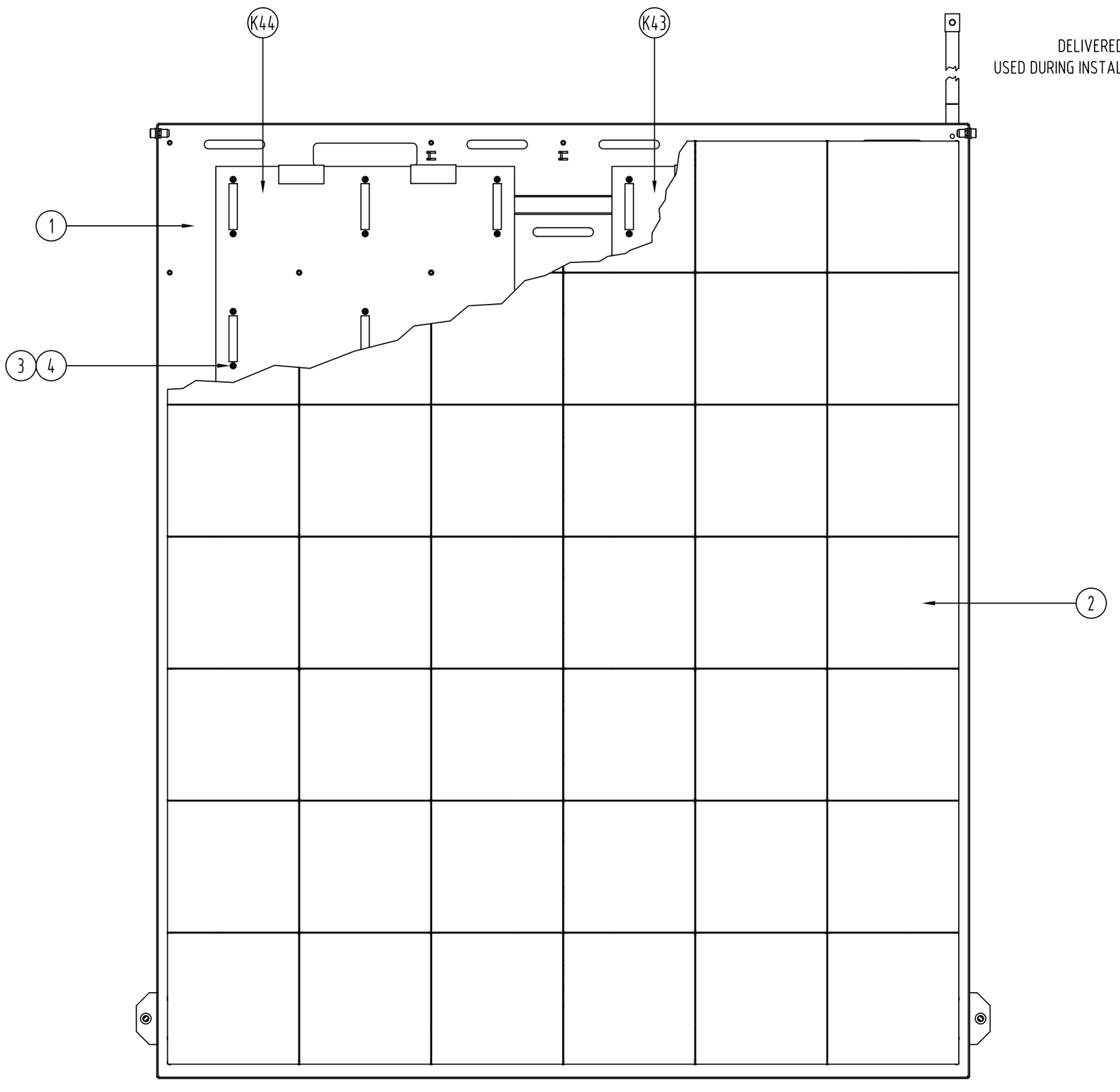
Gen. tolerance
Surface treatment
Basic material
Info

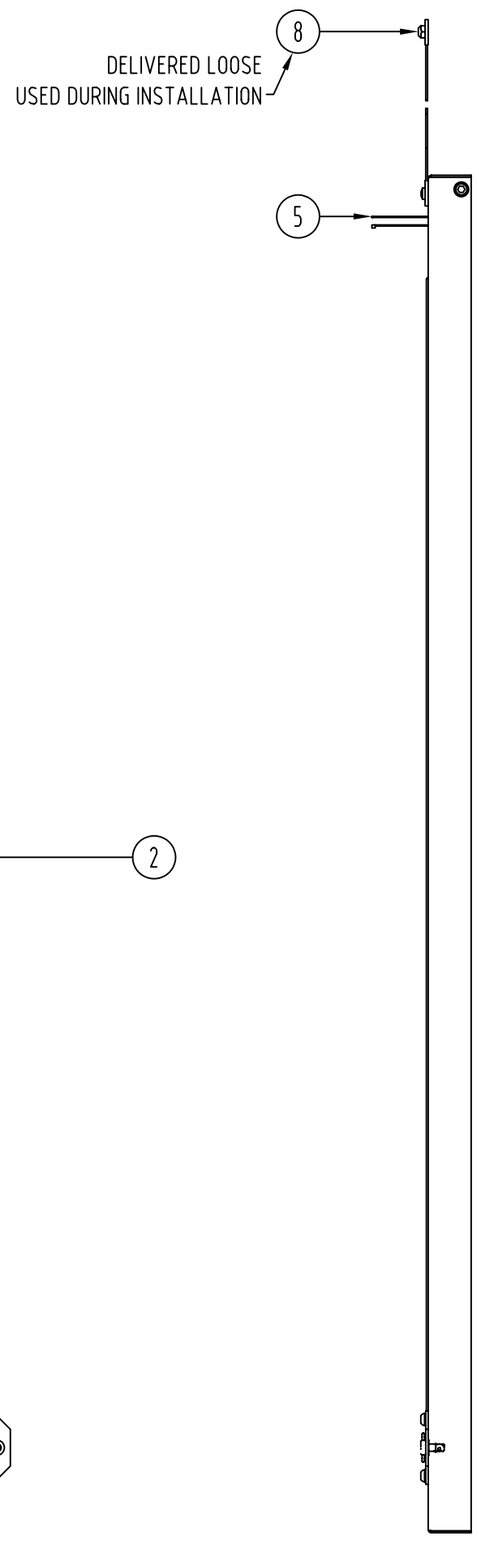
Drawn by: V. NORELL	Date drawn: 2014-09-19
Approved by:	Date approved:
Project No.	Drawing No. SG590255-200-01

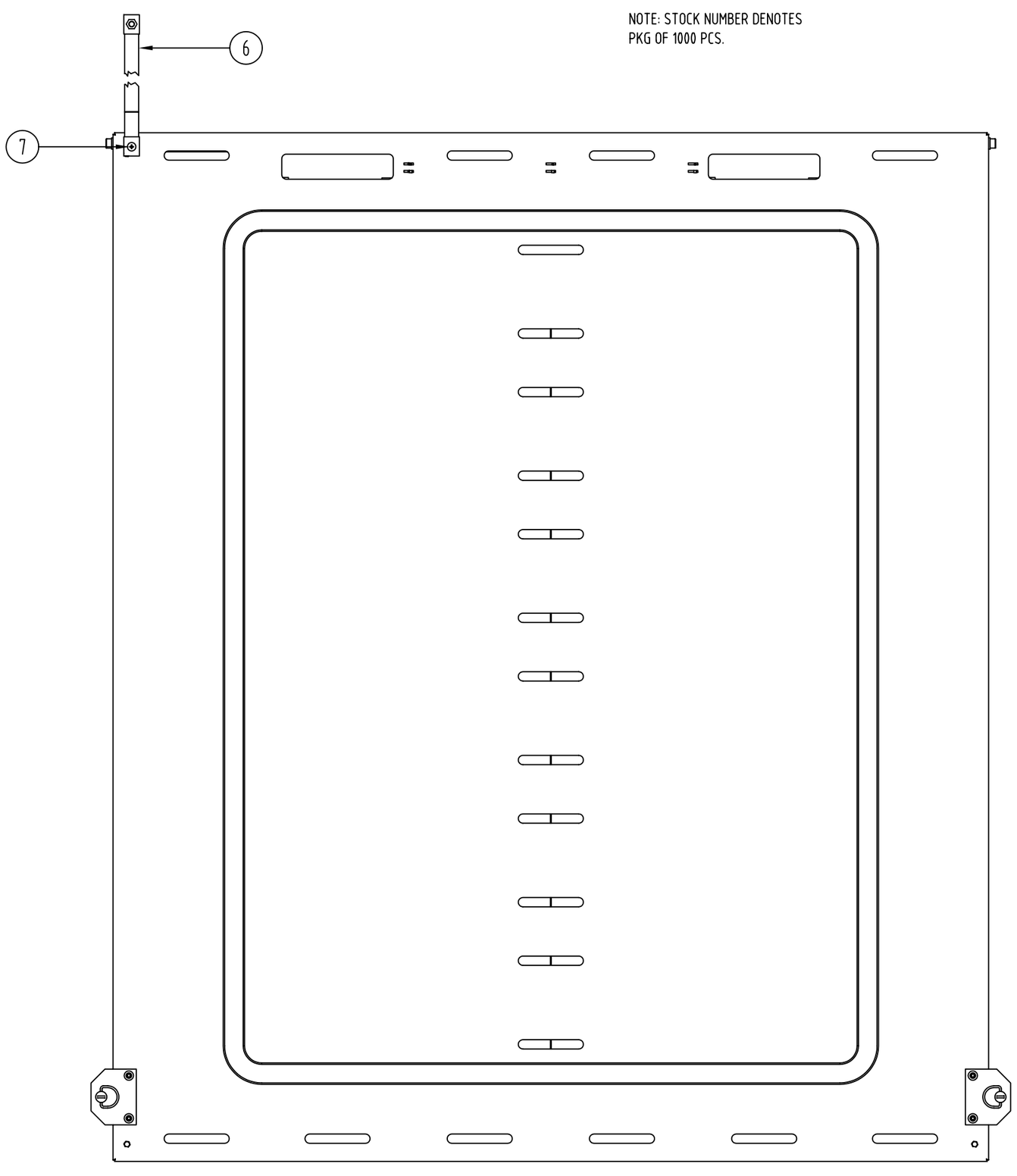
Description: STANDARD COOLING ASSEMBLY FOR T1/T1S

Rev.	Scale	Size	Sheet
A	0,500	A1	1 (1)

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
K43-K44	2	BACKPLANE PCB	SG590572-100					
1		DISPLAY MOUNTING PLATE	NPP 912755					
2	42	DISPLAY PCB, YELLOW/RED		590570				
3	84	SCREW, MRT M3x6, ZINC PLATED						
4	84	FLAT WASHER, BRB 3.2x8x0.4, ZINC PLATED						
5	3	CABLE TIE, 100x2,5, BLACK					55-157-21, SEE NOTE	ELFA
6	1	GROUND STRAP, 16 mm^2, 200 mm					55-097-57	ELFA, SWEDEN
7	1	SHEET METAL SCREW, RSX-Z ST5,5x13, ZINC PLATED						
8	1	LOCKNUT, M6, ZINC PLATED						







NOTE: STOCK NUMBER DENOTES
PKG OF 1000 PCS.

Revision	Description	Date	Drawn by:	Checked by:	Approved
A	Items 6 thru 8 added. Back view added	2008.07.01	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to

Sharp Edges

Surface Coating

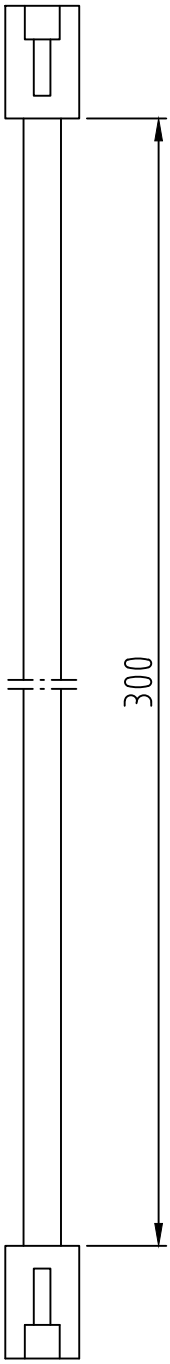
Weight

DISPLAY, 42 CARD

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2008.03.25				

Drawing No.	Rev.	Sheet	Scale
SG590256-001-01	A	1 of 1	1:5

Revision	Description	Date	Drawn by:	Checked by:	Approved
C	Length changed	2011-11-18	A.S		



Item No	Qty.	Name	Description	Dimensions	Remark
2	2	MODULAR PLUG, RJ45	4269593		ELFA
1	1	CABLE, CAT5	5576509		ELFA

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to

Sharp Edges

Surface Coating

Weight

PATCH CABLE

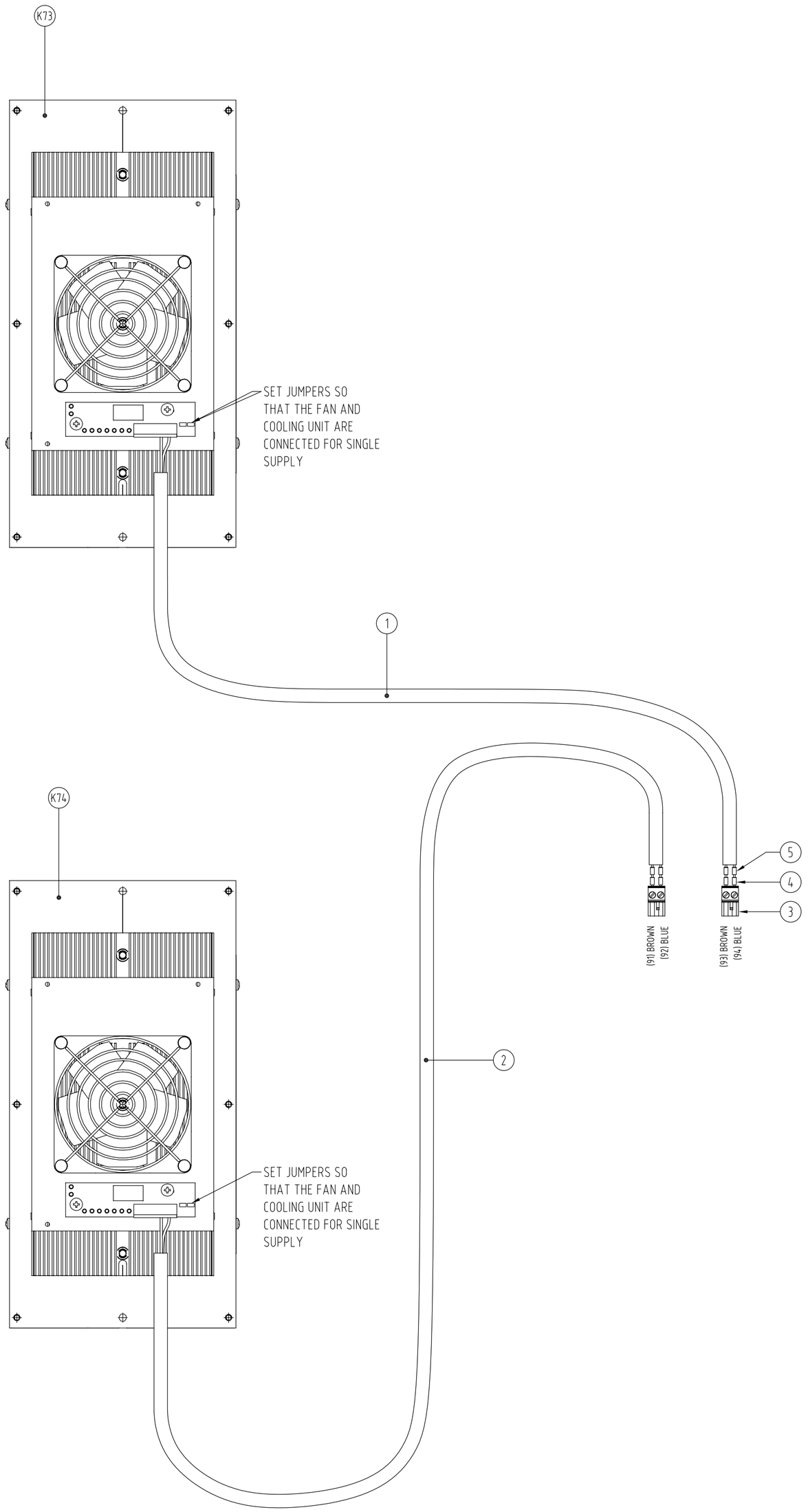
Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2008-05-18				

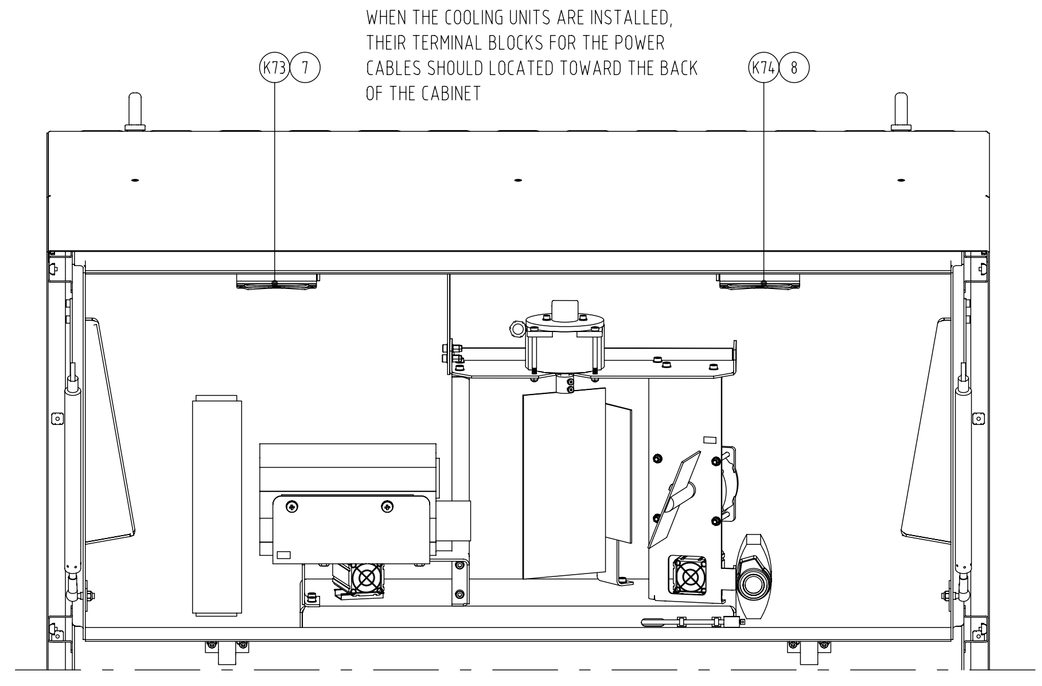
Drawing No.	Rev.	Sheet	Scale
SG590258-101-01	C	1 of 1	

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
K73-K74	2	AIR TO AIR COOLING UNIT			AA-100-24-23-00-10	LAIRD TECHNOLOGIES, SWEDEN		
1	1	CABLE, H0FVV-F, 2 X 0,75, GRAY, L = 800					55-609-25	ELFA AB, SWEDEN
2	1	CABLE, H0FVV-F, 2 X 0,75, GRAY, L = 1420					55-609-25	ELFA AB, SWEDEN
3	2	CONNECTOR, MSTB 2,5/2-ST-5,08					1757019	PHOENIX CONTACT, SWEDEN
4	8	CRIMP FERRULE, H 0.75/14					9026070000	WEIDMULLER, SWEDEN
5		WIRE MARKERS, PA02, OR EQV.			PA02	PARTEX, SWEDEN		
6	5	CABLE TIE, 71x1,8, BLACK					55-028-10, SEE NOTE 2	ELFA, SWEDEN
7	1	COMPONET IDENTIFIER LABEL, YELLOW, 15x8mm, TEXT: K73					21302G	TECHNOTRADE SCANDINAVIA AB, SWEDEN
8	1	COMPONET IDENTIFIER LABEL, YELLOW, 15x8mm, TEXT: K74					21302G	TECHNOTRADE SCANDINAVIA AB, SWEDEN

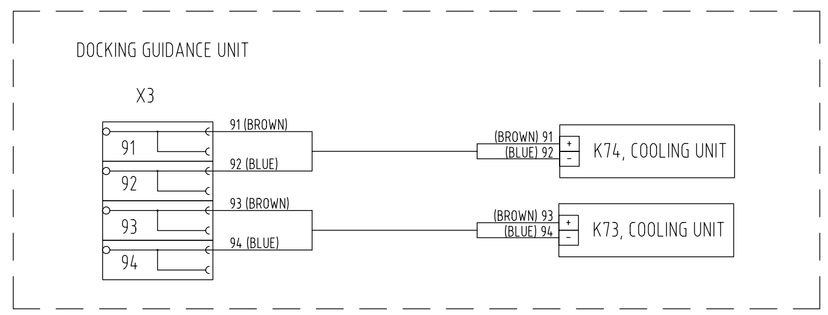
NOTE 1: PLACE IDENTIFIER LABELS ON BACK WALL OF CABINET UNDER RESPECTIVE UNIT.

NOTE 2: STOCK NUMBER REFERS TO A PACKAGE OF 1000 PIECES.





COMPONET PLACEMENT IN DOCKING GUIDANCE UNIT PARTIAL FRONT VIEW, DOOR REMOVED



CONNECTION DIAGRAM

Revision	Description	Date	Drawn by:	Checked by:	Approved
A	Wire numbering changed for K74; connection diagram changed, note for cooling unit installation added	2008.07.02	G.O.		

SAFEGATE GROUP

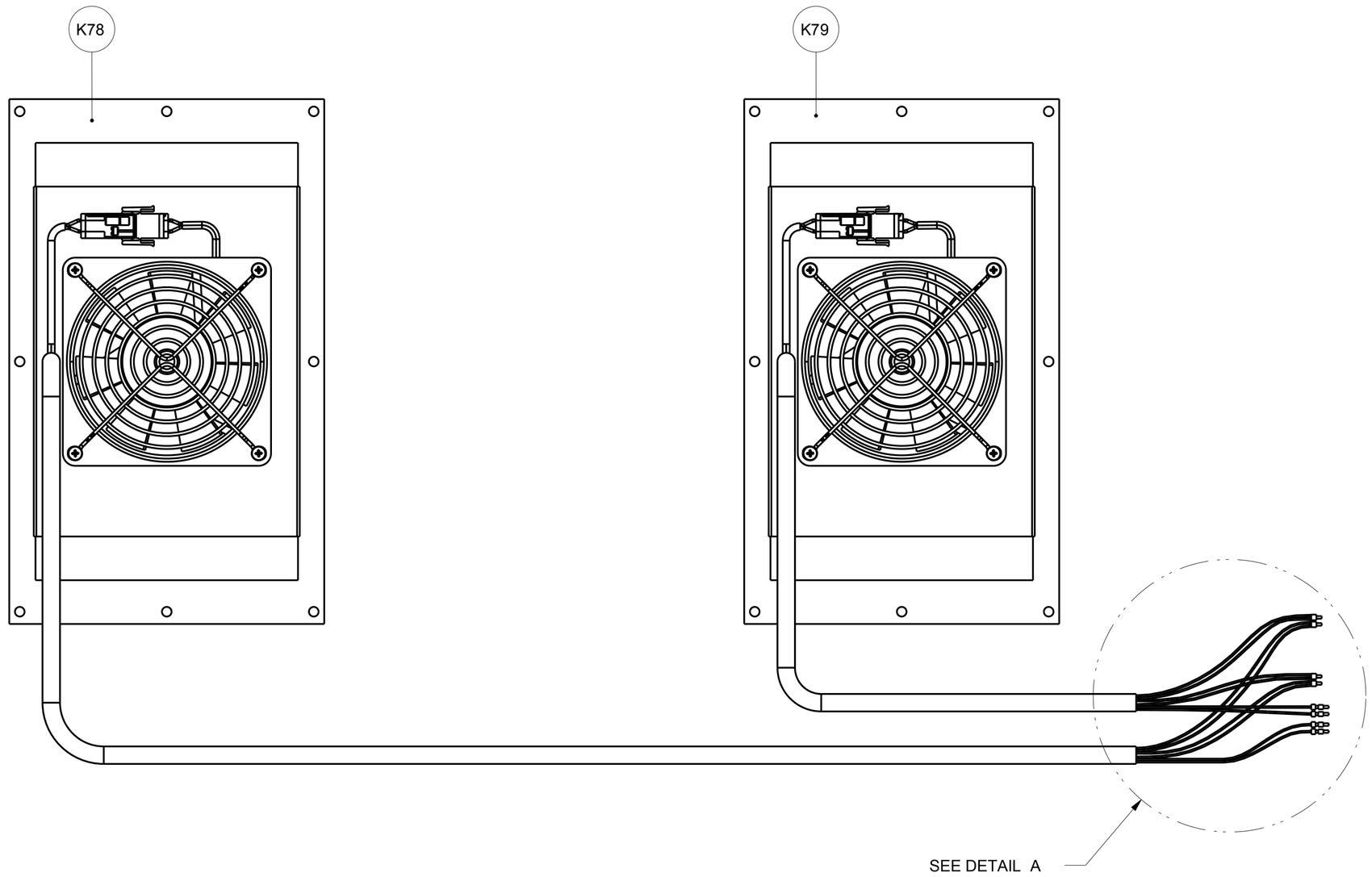
Safegate International AB
MALMÖ, SWEDEN

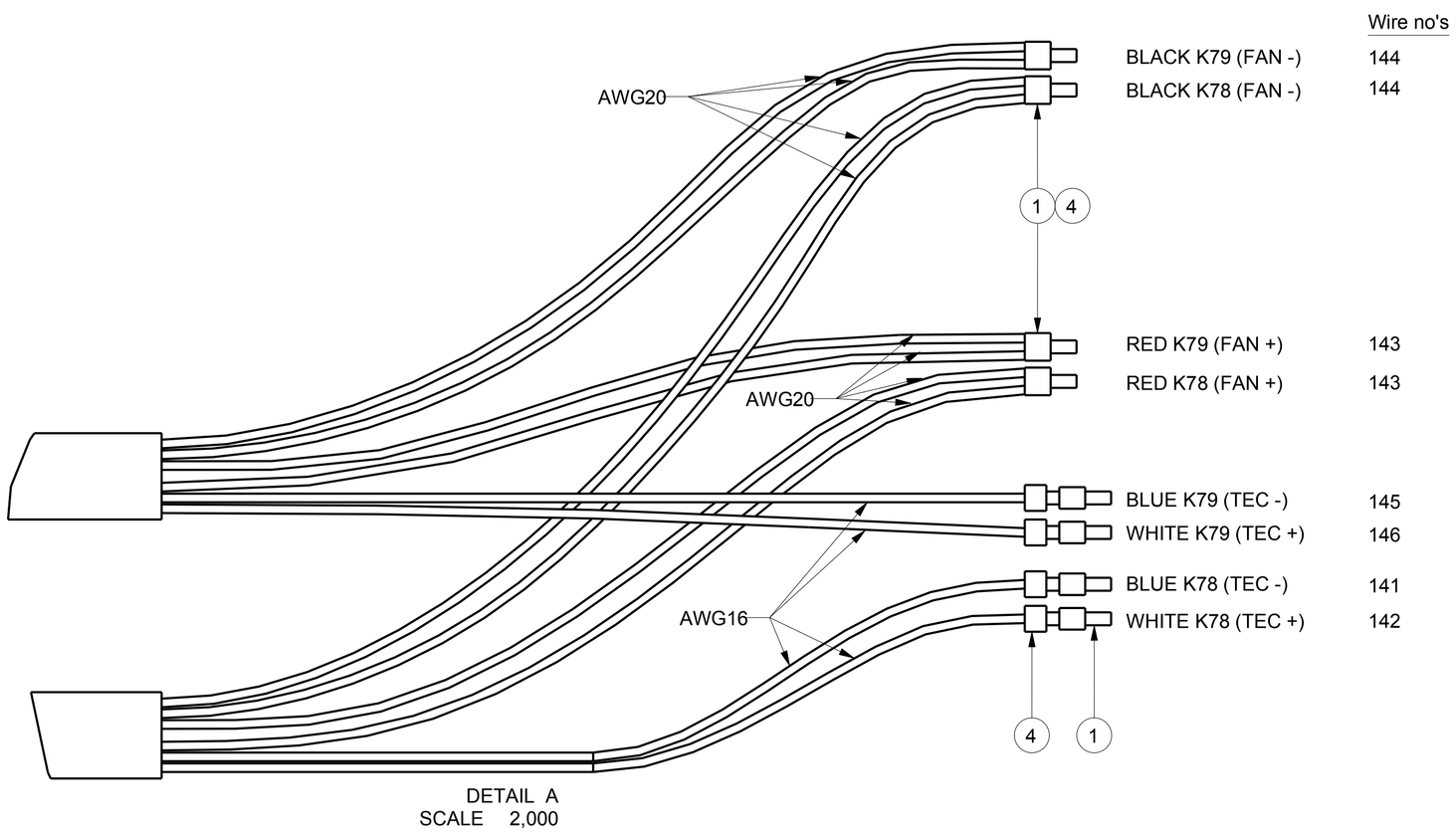
Unless otherwise indicated, all tolerances are according to | Sharp Edges
Surface Coating | Weight

COOLING ASSEMBLY
FOR T1

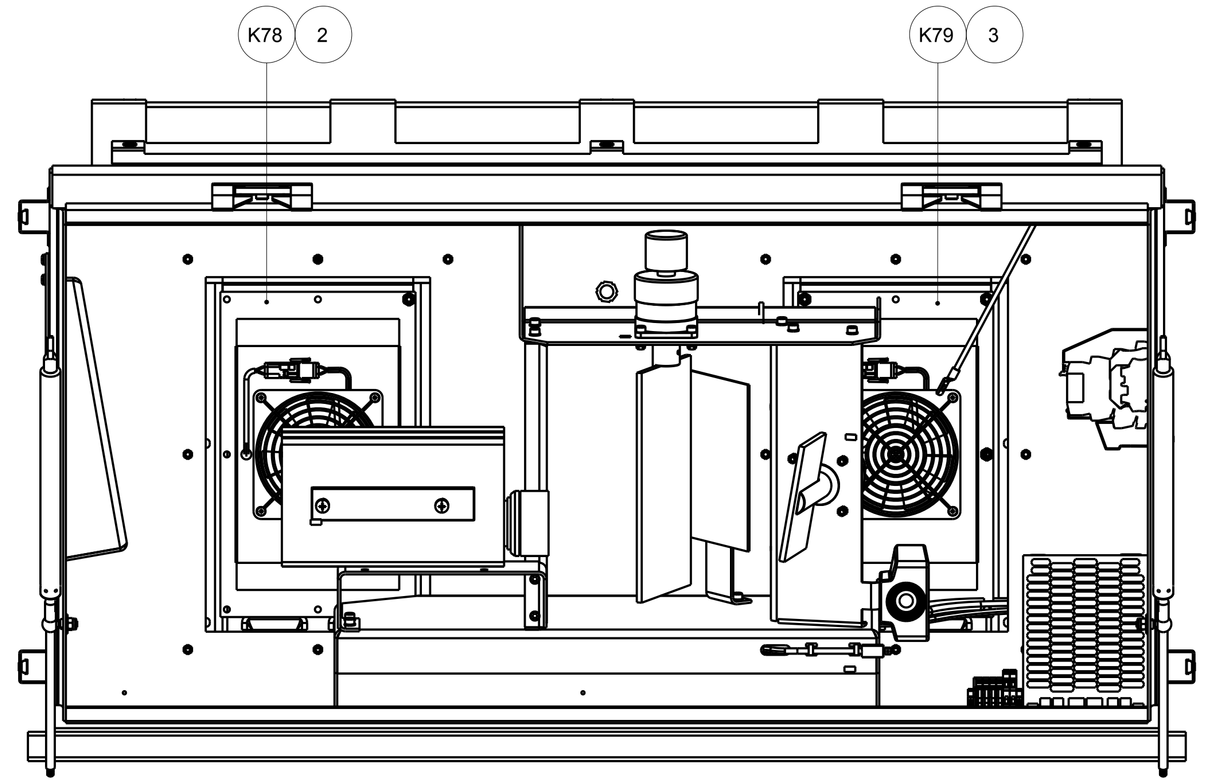
Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:	Drawing No.	Rev.	Sheet	Scale
G.O.	2008-05-20					SG590259-001-01	A	1 of 1	1:2

POS	QTY	DESCRIPTION	STD/OPT	T1/T1S/T2/T3	DRW. NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NO.	SUPPLIER
K78	1	THERMO ELECTRIC COOLER/WARMER, 24 VDC	Standard	T1/T1S		CTA305-0004-02	MARLOW INDUSTRIES INC.		
K79	1	THERMO ELECTRIC COOLER/WARMER, 24 VDC	Standard	T1/T1S		CTA305-0004-02	MARLOW INDUSTRIES INC.		
1	8	CRIMP FERRULE, H 1.5/14	Standard	T1/T1S		9019120000	WEIDMÜLLER		
2	1	COMPONENT IDENTIFIER LABEL, YELLOW, 15x8 mm, TEXT: K78	Standard	T1/T1S					
3	1	COMPONENT IDENTIFIER LABEL, YELLOW, 15x8 mm, TEXT: K79	Standard	T1/T1S					
4		WIRE MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION	Standard	T1/T1S					
5		CABLE TIE, 71x1.8, BLACK	Standard	T1/T1S					





DETAIL A
SCALE 2,000



COMPONENT PLACEMENT IN DOCKING GUIDANCE UNIT
PARTIAL FRONT VIEW, DOOR REMOVED

NOTE:

USE CABLE TIES TO SECURE THE CABLES INSIDE SCANNER COMPARTMENT.
PLACE COMPONENT IDENTIFIER LABELS ON THE BACK OF THE WALL, ABOVE COMPONENTS.

C	2014-09-16	V.N.		Drawing updated with new TECs - K78, K79
B	2012-10-05	A.S.		Wire numbering changed for K73 and K74.
Issue No.	Issue date	Issue by	Issue checked by	Issue text

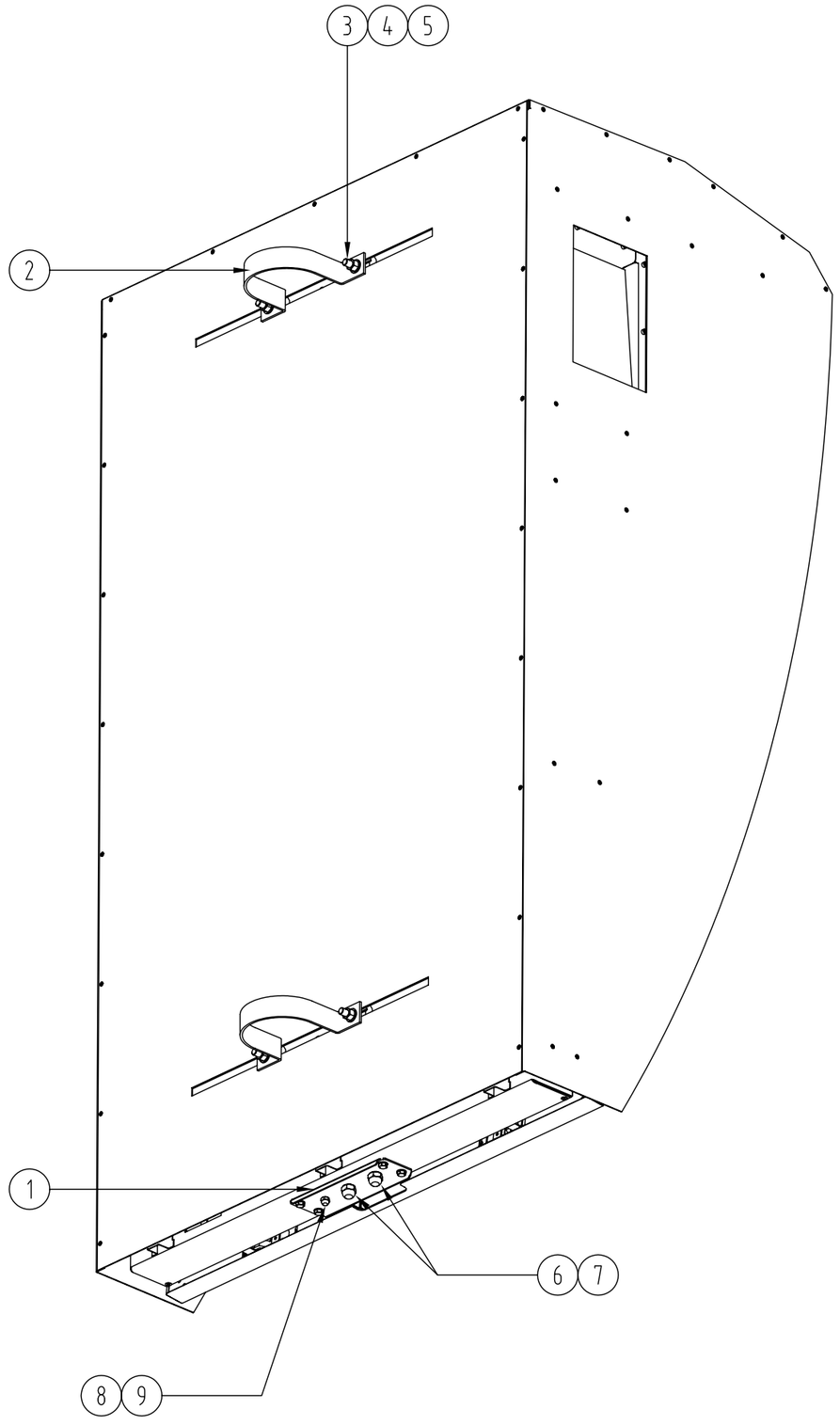
THORN Active Lighting
IDMAN
SAFEGATE GROUP

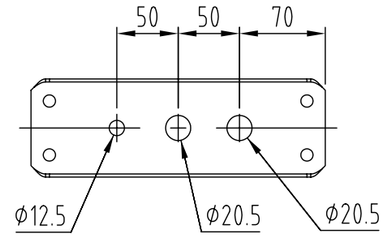
Gen. tolerance	
Surface treatment	
Basic material	
Info	
Drawn by: G.O.	Date drawn: 2008-05-20
Approved by:	Date approved:
Project No.	Drawing No. SG590259-001-01

Description: ENHANCED COOLING ASSEMBLY FOR T1/T1S

Rev.	Scale	Size	Sheet
C	0,500	A1	1 (1)

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	COVER PLATE (DELIVERED AS PART OF CABINET ASSEMBLY)	NPP 913798					
2	2	CLAMP	AT 605283					
3	4	T-BOLT AND NUT, HS 50/30 - fv - M12 x 40			12-1769	HALFAN, GERMANY		SIFVERT SKRUV, SWEDEN
4	4	NUT, ISO 4032, M12, GALVANIZED						
5	4	WASHER, DIN 125 13x24x2.5, GALVANIZED						
6	2	CABLE GLAND, RUTAB EMC PERFECT			50.620M/EMV	RUTAB, SWEDEN	1476023	AHLSELL, SWEDEN
7	2	JAM NUT, RUTAB EMC, M20			50.220MPOT	RUTAB, SWEDEN	1476513	AHLSELL, SWEDEN
8	1	CABLE GLAND, RUTAB EMC EEX II			221284	RUTAB, SWEDEN	1476041	AHLSELL, SWEDEN
9	1	JAM NUT, RUTAB EMC, M12			50.212MPOT	RUTAB, SWEDEN	1476511	AHLSELL, SWEDEN

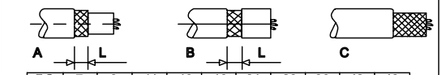




HOLE PATTERN IN
ITEM 1, COVER PLATE
FOR CABLE GLANDS

INSTALLATION INSTRUCTIONS
CABLE GLAND - ITEM 7

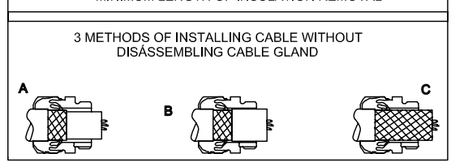
3 WAYS TO PREPARE CABLE



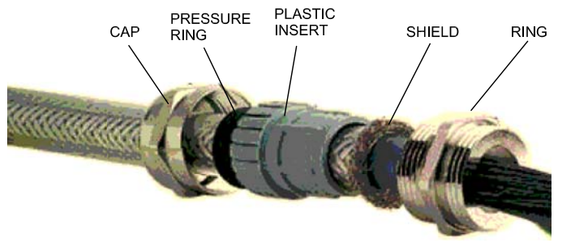
PG	7	9	11	13	16	21	29	36	42	48
ISO	10	12	16	20	25	32	40	50	63	
L	8	9	9	9	10	10	12	14	14	14

MINIMUM LENGTH OF INSULATION REMOVAL

3 METHODS OF INSTALLING CABLE WITHOUT DISASSEMBLING CABLE GLAND



INSTALLATION INSTRUCTIONS
CABLE GLAND - ITEM 5



Assembly Instructions
1.) Remove approx. 10mm of the cable's insulation and expose the shield
2.) Guide the cable through the cable gland cap, the pressure ring and the plastic insert.
3.) Bend the shield outward approx. 90°.
4.) Press the shield bac ove the plastic insert.
5.) Using the plastic insert, push the cable into the base until the shield bottoms in the base.
6.) Push the cap over the plastic insert and tighten thoroughly.

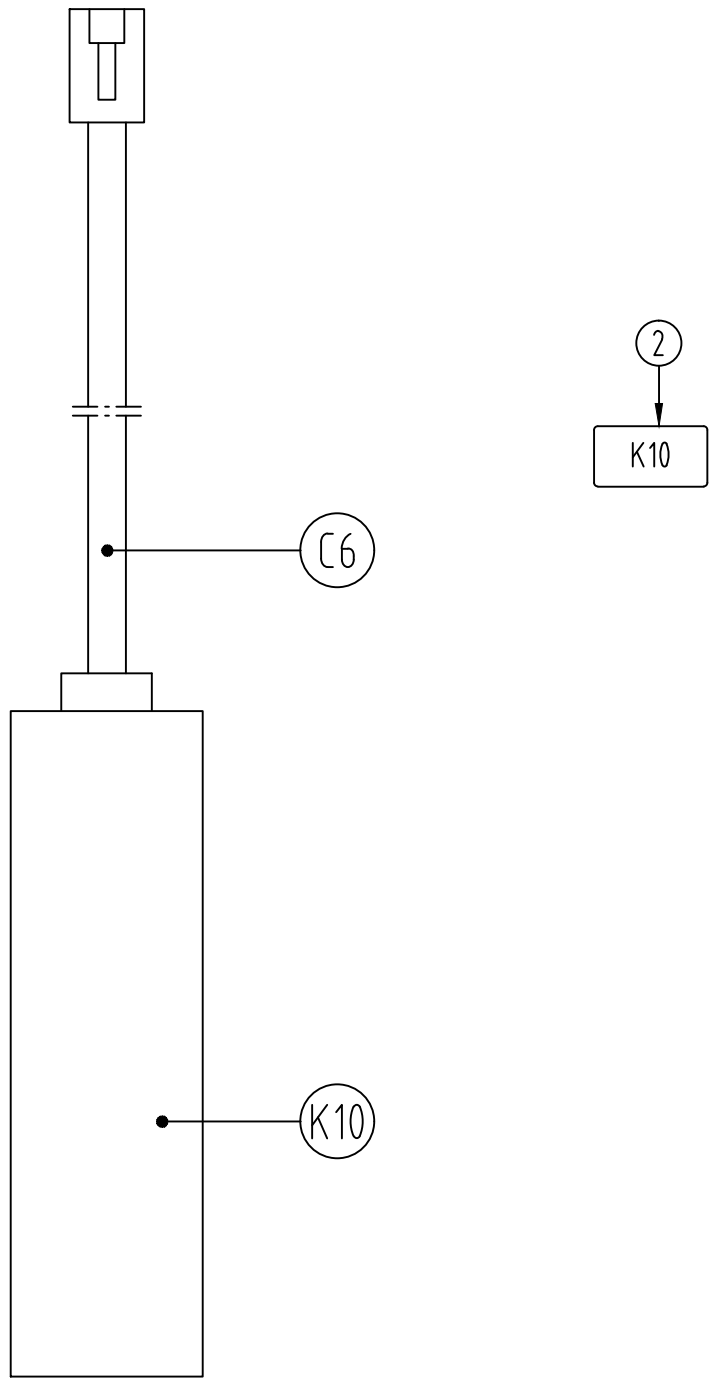
Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to			Sharp Edges
Surface Coating			Weight
INSTALLATION HARDWARE FOR T1 NOTE: ALL ASSEMBLY PERFORMED ON SITE			
Drawn by: G.O.	Date drawn: 2008-05-20	Checked by:	
App. by:	Date approved:	Project No.:	Drawing No. SG590261-001-01 / Rev. / Sheet 1 of 1 / Scale

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	2	END BRACKET, CLIPFIX 35-5					3022276	PHOENIX CONTACT, SWEDEN
2	1	COMPONET IDENTIFIER LABEL, YELLOW, 15x8mm, TEXT: K10					21302G	TECHNOTRADE SCANDINAVIA AB, SWEDEN
C6	1	PATCH CABLE	SG590258-101-01					
K10	1	CAT 6 TRANSIENT FILTER, D-LAN-CAT.6+					2881007	PHOENIX CONTACT, SWEDEN



Revision	Description	Date	Drawn by:	Checked by:	Approved
A	Drawing Changed	2011.11.04	A.S.		

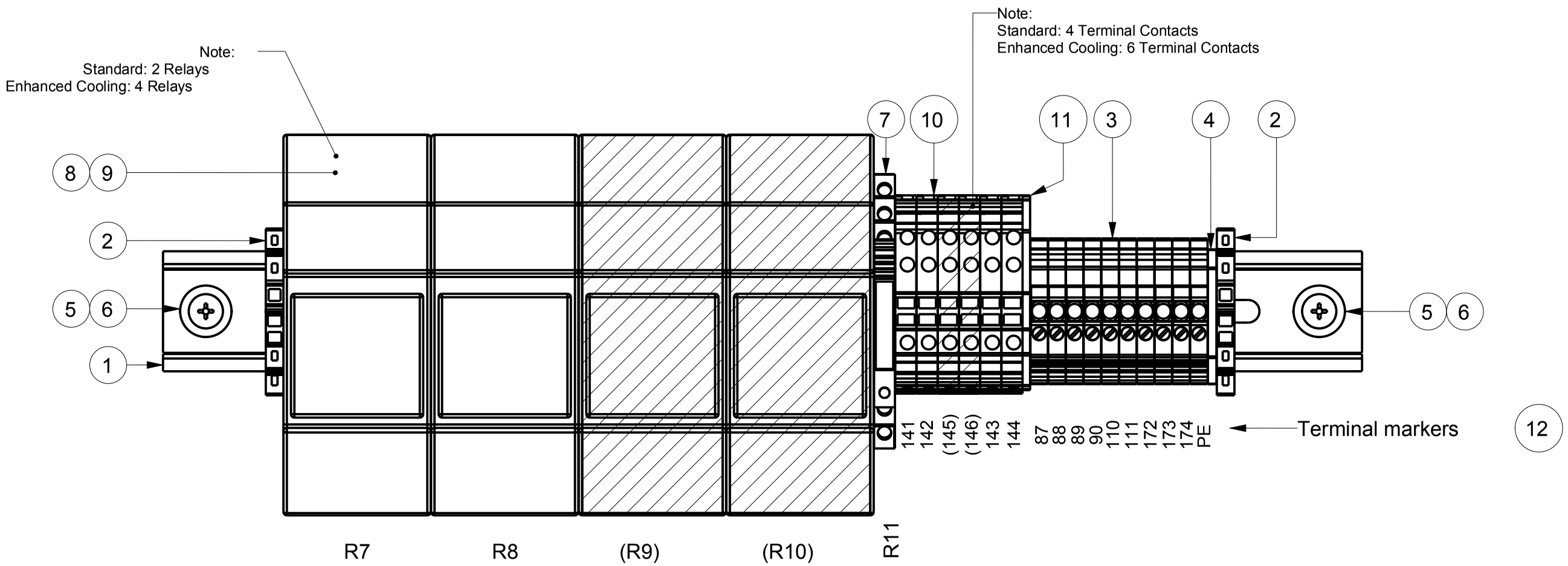
SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to			Sharp Edges
Surface Coating			Weight
CAT6 FILTER			
Drawn by: G.O.	Date drawn: 2008-05-18	Checked by:	
App. by:	Date approved:	Project No.:	

Drawing No.	Rev.	Sheet	Scale
SG590262-001-01	A	1 of 1	

POS	QTY	DESCRIPTION	STD/OPT	T1/T1S/T2/T3	DRW. NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NO.	SUPPLIER
1	1	DIN RAIL, 350 mm	Standard	T1/T1S	SG590621-211-01		PHOENIX CONTACT		
2	2	END BRACKET, CLIPFIX 35-5	Standard	T1/T1S		3022276	PHOENIX CONTACT		
3	10	TERMINAL CONTACT, UK 3-MSTB-5,08	Standard	T1/T1S		3002034	PHOENIX CONTACT		
4	1	COVER, 2.5 mm	Standard	T1/T1S		3002047	PHOENIX CONTACT		
5	2	SCREW, ISO7045, M5x12, ZINC PLATED	Standard	T1/T1S					
6	2	WASHER, ISO7089, 5.3x15x1, ZINC PLATED	Standard	T1/T1S					
7	1	RELAY MODULE, PLC-RSC-24UC/21	Standard	T1/T1S		2966184	PHOENIX CONTACT		
8a	2	RELAY SOCKET, RIF-4-BPT/3X21	Standard	T1/T1S		2900961	PHOENIX CONTACT		
8b	4	RELAY SOCKET, RIF-4-BPT/3X21	SC	T1/T1S		2900961	PHOENIX CONTACT		
9a	2	RELAY, REL-PR2-24DC/2X21	Standard	T1/T1S		2903698	PHOENIX CONTACT		
9b	4	RELAY, REL-PR2-24DC/2X21	SC	T1/T1S		2903698	PHOENIX CONTACT		
10a	4	TERMINAL CONTACT, UT 4-TWIN	Standard	T1/T1S		3044364	PHOENIX CONTACT		
10b	6	TERMINAL CONTACT, UT 4-TWIN	SC	T1/T1S		3044364	PHOENIX CONTACT		
11	1	END COVER, D-UT 2,5/4-TWIN	Standard	T1/T1S		3047141	PHOENIX CONTACT		
12		TERMINAL MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION	Standard	T1/T1S					

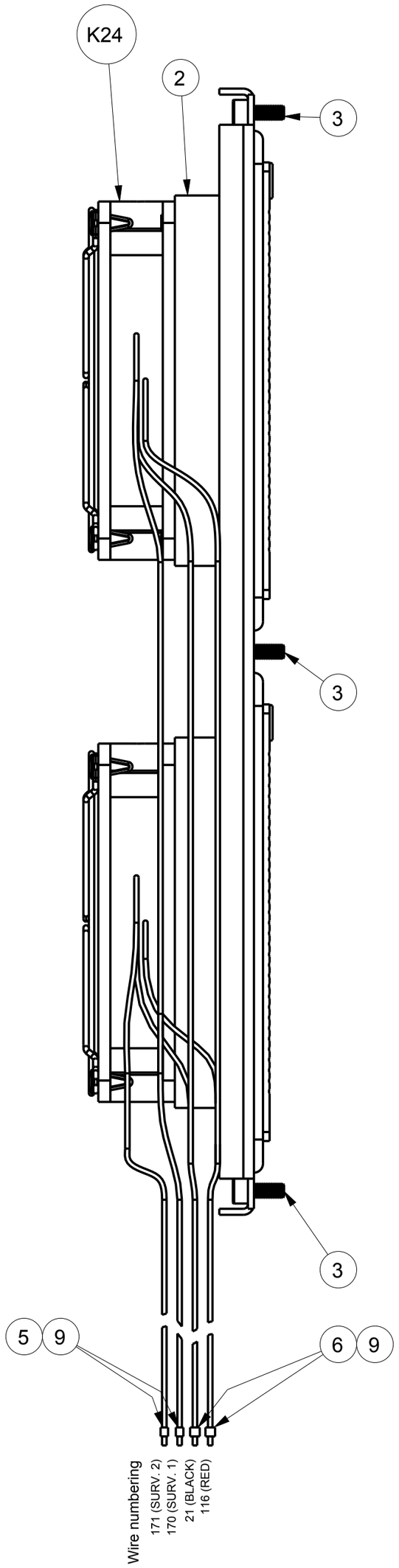


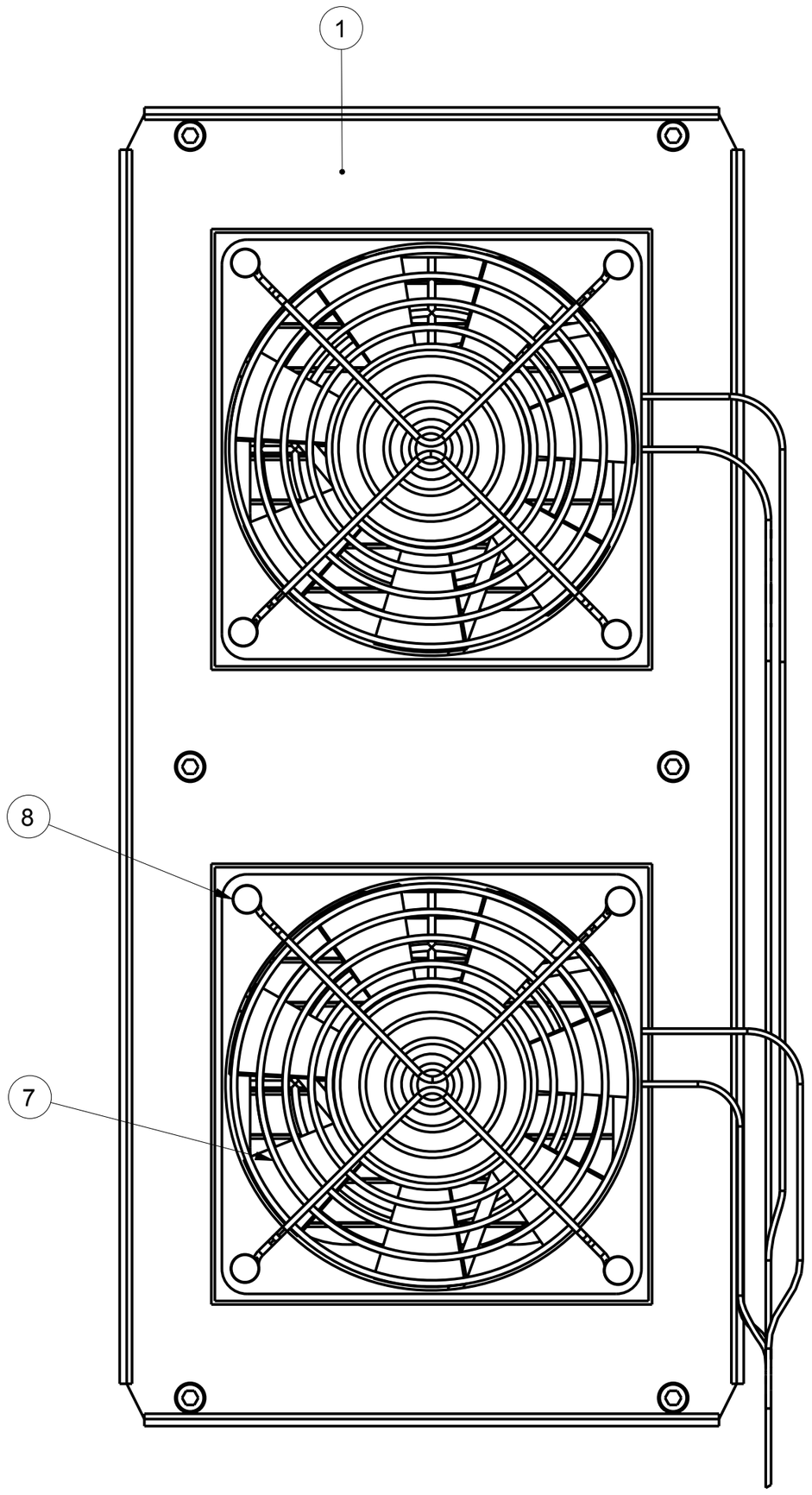
Rev.	Issue date	Issue by	Issue checked by	Issue text
E	2014-10-10	VN		Components added, changed to fit new release of T1.
D	2014-01-08	KJ		Items 8 and 9 added.
C	2012-08-30	AS		Item 7 renumbered.
B	2008-02-03	GO		Quantity for item 3 changed, items 9&10 renumbered to 6&7
A	2008-09-21	GO		Quantity for item 3 changed.

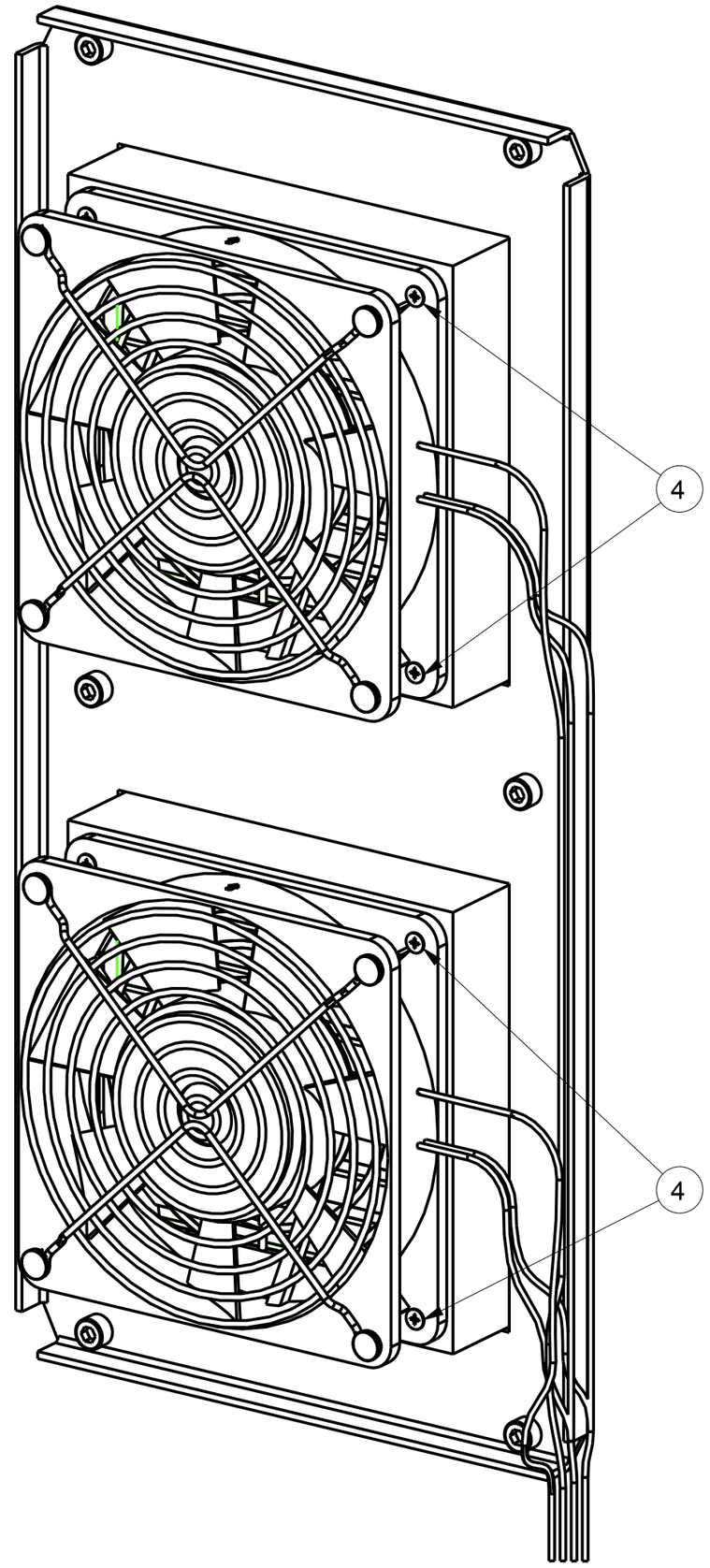
THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

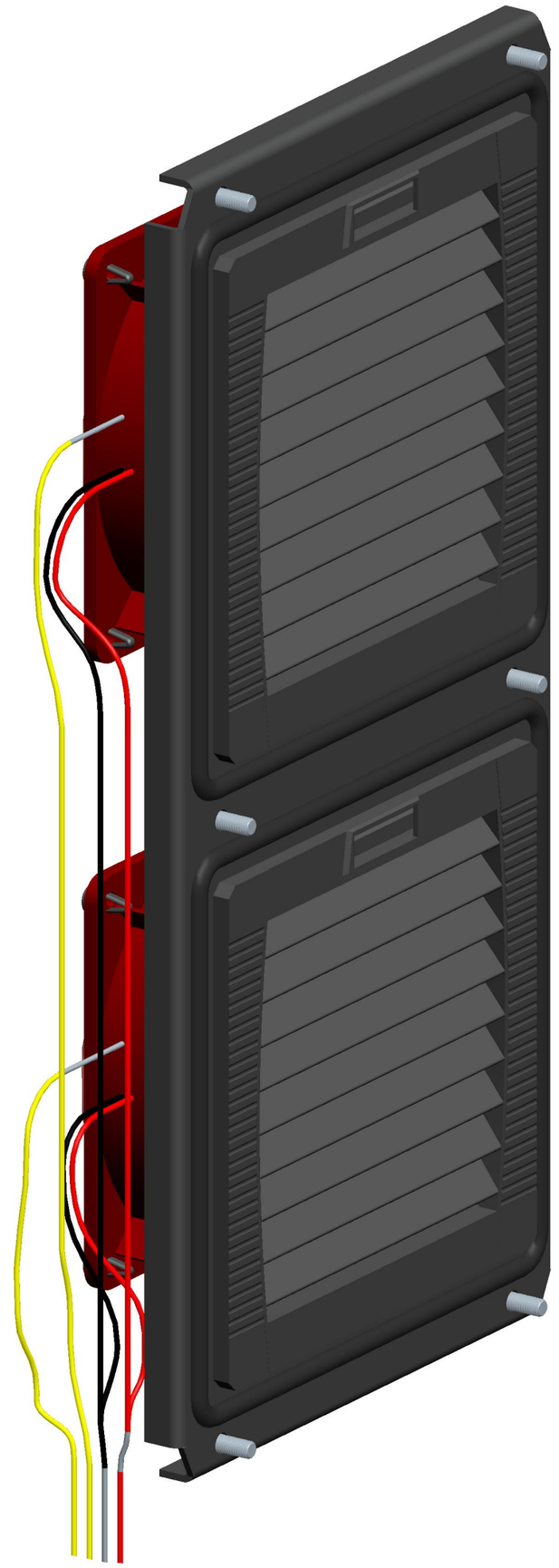
Drawn by: G.O.	Date drawn: 2008-05-19	Gen. tolerance			
Approved by:	Date approved:	Surface treatment			
Project No.	Drawing No. SG590263-001-01	Basic material			
		Info			
Description: X3 TERMINAL BLOCK ASSEMBLY FOR T1/T1S		Rev. E	Scale NO SCALE	Size A3	Sheet 1 (1)

POS	QTY	DESCRIPTION	STD/OPT	T1/T1S/T2/T3	DRW. NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NO.	SUPPLIER
K24	2	FILTER FAN, 119x119 mm, 24 VDC	Standard	T1/T1S		4414F/2L	EBM-PAPST		
1	1	FILTER ADAPTER PLATE	Standard	T1/T1S	SG590264-200-01				
2	2	FILTER ASSEMBLY	Standard	T1/T1S		PFA20000	PFANNENBERG		
3	6	M5x12, DIN912/ISO4762, A2	Standard	T1/T1S					
4	8	ST2.9x13, ISO7050 C-Z, ZINC PLATED	Standard	T1/T1S					
5	2	CRIMP LUG, H0.25/12	Standard	T1/T1S		9025780000	WEIDMÜLLER		
6	1	CRIMP LUG, H1.5/14	Standard	T1/T1S		9026090000	WEIDMÜLLER		
7	2	FAN GUARD	Standard	T1/T1S				735-991	FARNELL
8	8	PLASTIC RIVET	Standard	T1/T1S					
9		WIRE MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION	Standard	T1/T1S		PA02	PARTEX		







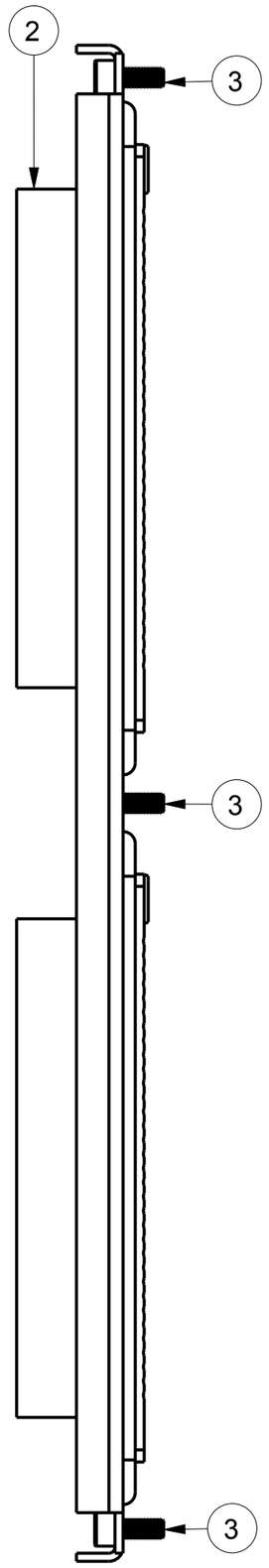


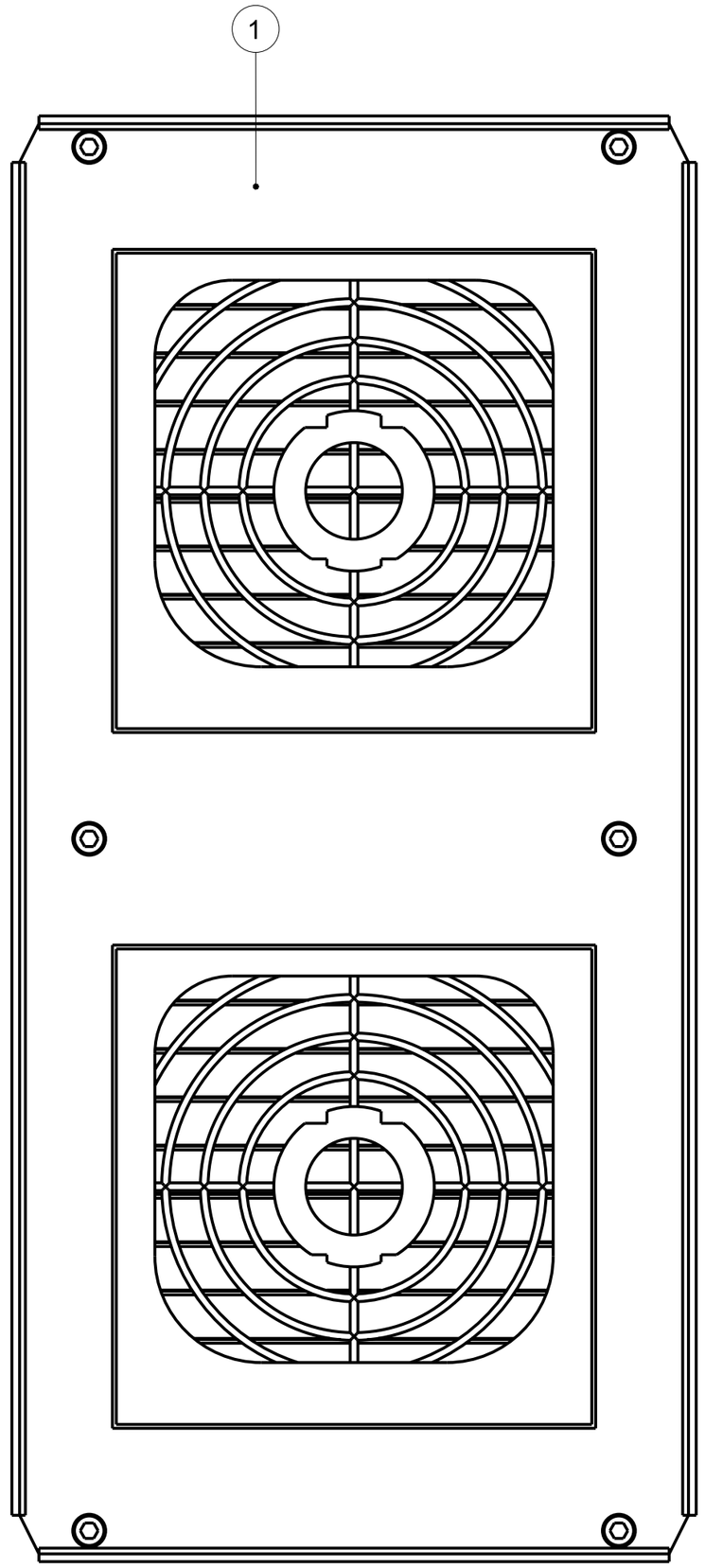
Issue No.	Issue date	Issue by	Issue checked by	Issue text
C	2014-09-30	V.N.		COMPONENTS AND PLACEMENT CHANGED TO FIT NEW T1.
B	2009-02-19	G.O.		REFERENCE ADDED FOR DRW. FOR CABINET MOD.
A	2008-06-26	G.O.		ITEMS 7-9 ADDED, ASSEMBLY NOTE ADDED.

THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Gen. tolerance	
Surface treatment	
Basic material	
Info	
Drawn by: V. NORELL	Date drawn: 2014-09-09
Approved by:	Date approved:
Description	VENTILATION FAN ASSEMBLY T1/T1S, DISPLAY
Project No.	Drawing No. SG590264-100-01
Rev. C	Scale NO SCALE
Size A2	Sheet 1 (1)

POS	QTY	DESCRIPTION	STD/OPT	T1/T1S/T2/T3	DRW. NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NO.	SUPPLIER
1	1	FILTER ADAPTER PLATE	Standard	T1/T1S	SG590264-200-01				
2	2	FILTER ASSEMBLY	Standard	T1/T1S		PFA20000	PFANNENBERG		
3	6	M5x12, DIN912/ISO4762, A2	Standard	T1/T1S					



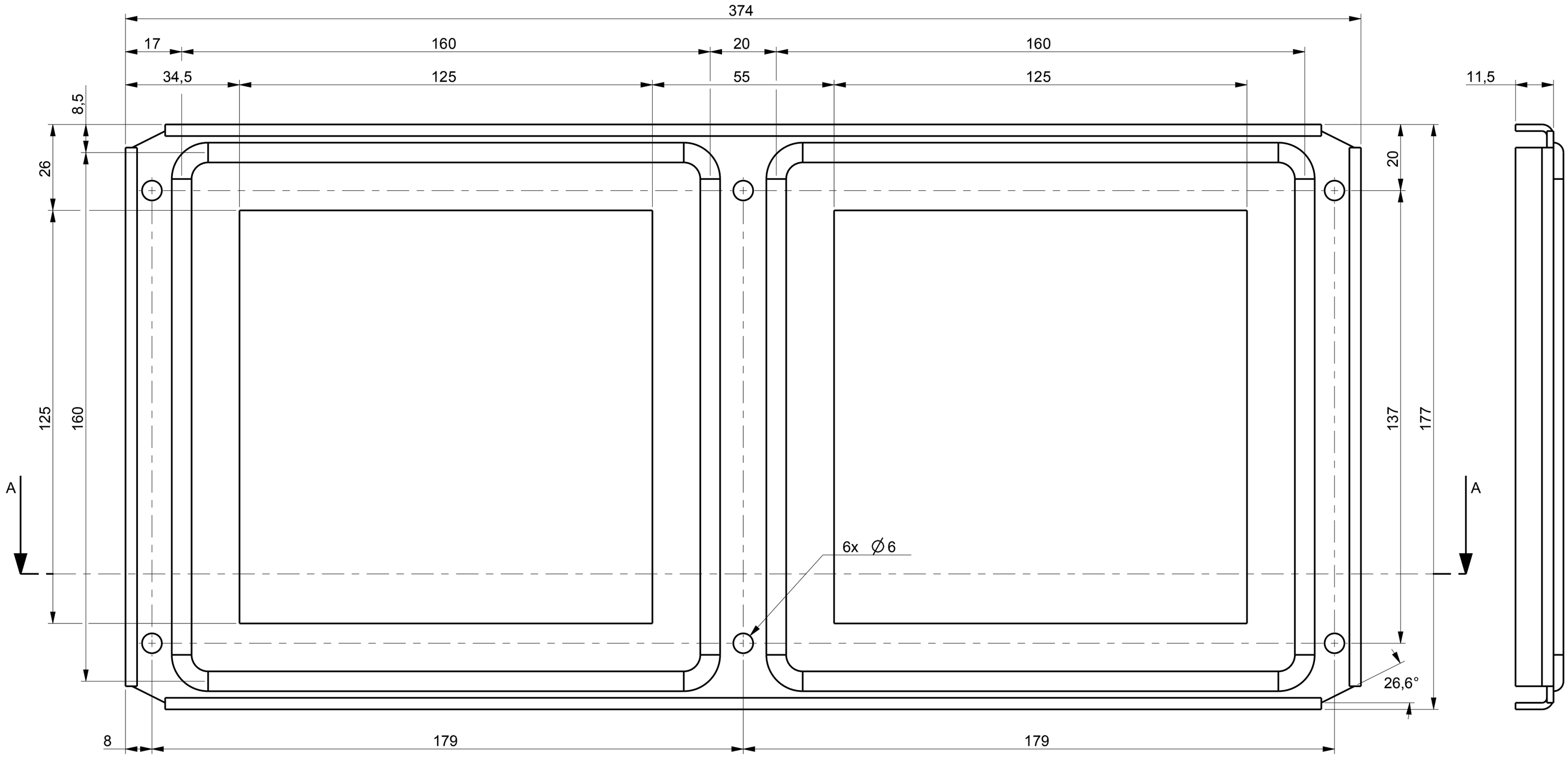


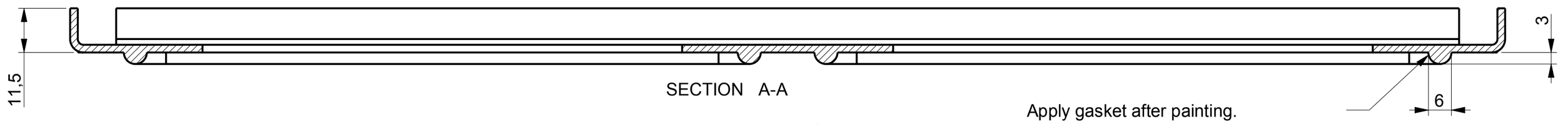
Issue No.	Issue date	Issue by	Issue checked by	Issue text

THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Drawn by: V. NORELL	Date drawn: 2014-09-23
Approved by:	Date approved:
Project No.	Drawing No. SG590264-101-01

Gen. tolerance			
Surface treatment			
Basic material			
Info			
Description: VENTILATION FILTER ASSEMBLY T1/T1S, DISPLAY			
Rev. A	Scale 0,666	Size A2	Sheet 1 (1)





SECTION A-A

Apply gasket after painting.
Gasket material: Fermapor K31 (A-9320-2-VP/B-4)

SCALE 0,500

Paint note:
- Powder coating - RAL9005, glossiness 20, smooth structure, matt
Manufacturer: Promal

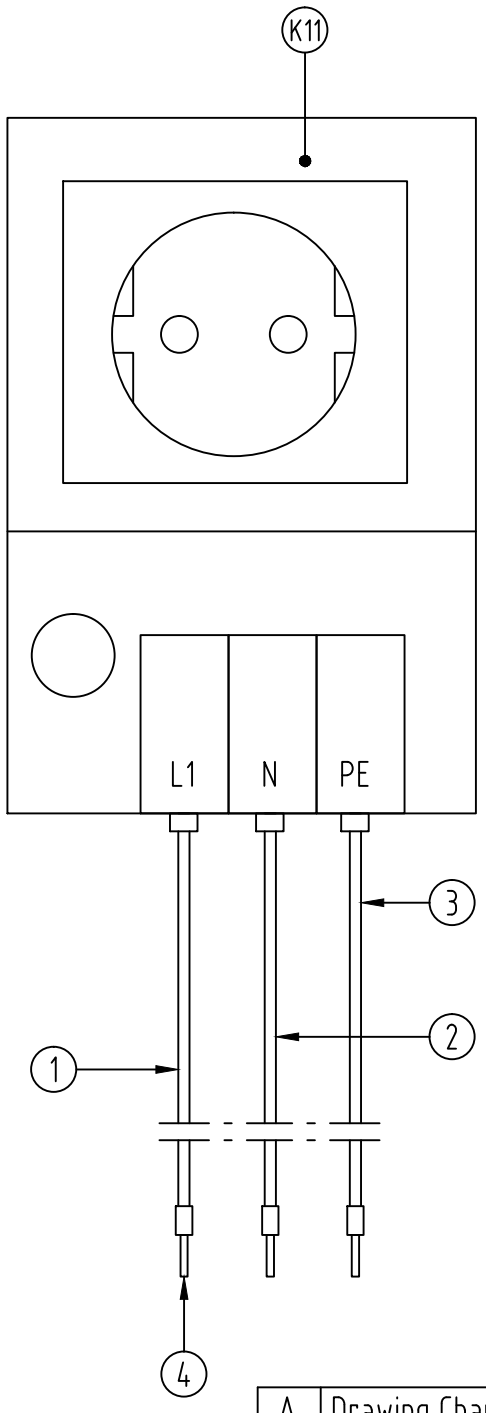
Issue No.	Issue date	Issue by	Issue checked by	Issue text

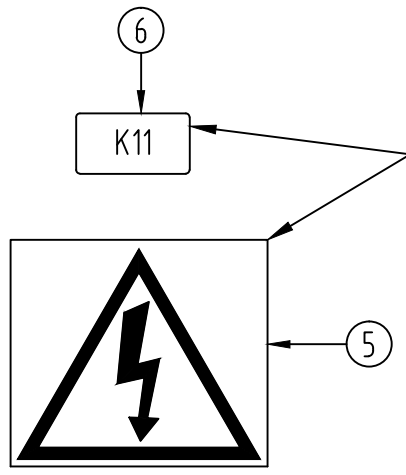
THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Gen. tolerance	EN ISO 2768-1 m
Surface treatment	See paint note.
Basic material	EN AW 1050A-H14 T=2 mm
Info	No sharp edges.

Drawn by: V. NORELL	Date drawn: 2014-08-27	Description: FILTER ADAPTER PLATE T1/T1S, DISPLAY			
Approved by:	Date approved:				
Project No.	Drawing No. SG590264-200-01	Rev. A	Scale 1,000	Size A2	Sheet 1 (1)

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	MAINS WIRE, UL 1015, BROWN, AWG 16					5526017	ELFA AB, SWEDEN
2	1	NEUTRAL WIRE, UL 1015, BLUE, AWG 16					5526066	ELFA AB, SWEDEN
3	1	GND WIRE, UL 1015, YELLOW/GREEN, AWG 16					5526082	ELFA AB, SWEDEN
4	3	CRIMP LUG, H2.5/14					9026100000	WEIDMÜLLER, SWEDEN
5	1	WARNING LABEL, SHOCK HAZARD					PLD-56	PANDUIT NORDIC, SWEDEN
6	1	COMPONET IDENTIFIER LABEL, YELLOW, 15x8mm, TEXT: K11					21302G	TECHNOTRADE SCANDINAVIA AB, SWEDEN
K11	1	POWER OUTLET FUSE, SD 035, DIN STYLE			03500.0-00	STEGO ELEKTRONIK, GERMANY	03500.0-00	STEGO NORDEN, SWEDEN
K11	1	POWER OUTLET FUSE, SD 035, French Model			03501.0-00	STEGO ELEKTRONIK, GERMANY	03501.0-00	STEGO NORDEN, SWEDEN
K11	1	POWER OUTLET FUSE, SD 035, Brittish Style			03503.0-00	STEGO ELEKTRONIK, GERMANY	03503.0-00	STEGO NORDEN, SWEDEN
K11	1	POWER OUTLET FUSE, SD 035, US Style			03504.0-00	STEGO ELEKTRONIK, GERMANY	03504.0-00	STEGO NORDEN, SWEDEN





Revision	Description	Date	Drawn by:	Checked by:	Approved
A	Drawing Changed and BOM changed	2011.11.04	A.S.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	
G.O.	2009.03.10		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to

Sharp Edges

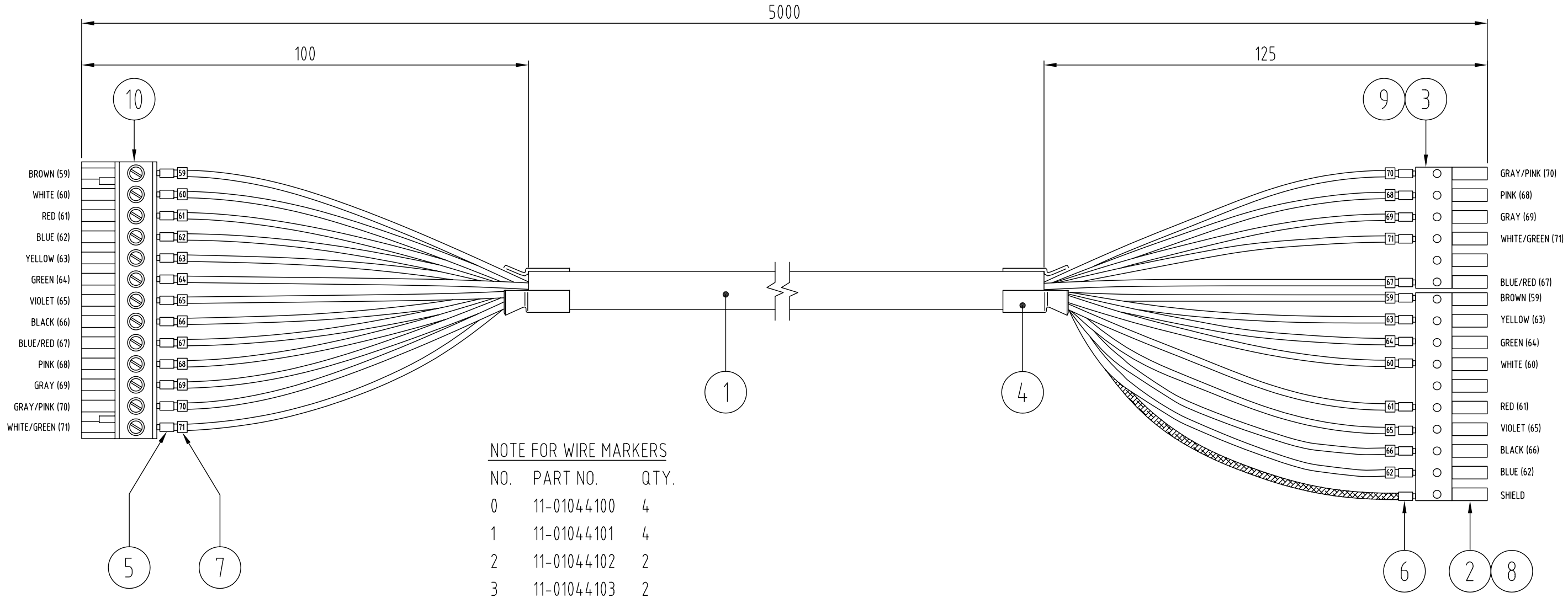
Surface Coating

Weight

UTILITY OUTLET

Drawing No.	Rev.	Sheet	Scale
SG590266-001-01	A	1 of 1	1:1

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, CYLIYCY, 8 x 2 x 0.25						
2	1	CONNECTOR, MC1.5/10-ST-3.81			1803659	PHOENIX CONTACT, GERMANY	1803659	PHOENIX CONTACT, SWEDEN
3	1	CONNECTOR, MC1.5/6-ST-3.81			1803617	PHOENIX CONTACT, GERMANY	1803617	PHOENIX CONTACT, SWEDEN
4	2	HEAT SHRINKABLE TUBING, Ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA, SWEDEN
5	26	CRIMP LUG, H 0.25/12			9025780000	WEIDMÜLLER, GERMANY	9025780000	WEIDMÜLLER, SWEDEN
6	1	CRIMP LUG, H 1.5/14			9026090000	WEIDMÜLLER, GERMANY	9026090000	WEIDMÜLLER, SWEDEN
7		WIRE MARKERS, PARTEX PA02			SEE NOTE	WEIDMÜLLER, GERMANY	SEE NOTE	WEIDMÜLLER, SWEDEN
8	1	LABEL, SK 3,81/2,8: SO, TEXT: J22			0805056	PHOENIX CONTACT, GERMANY	0805056	PHOENIX CONTACT, SWEDEN
9	1	LABEL, SK 3,81/2,8: SO, TEXT: J13			0805056	PHOENIX CONTACT, GERMANY	0805056	PHOENIX CONTACT, SWEDEN
10	1	CONNECTOR, MSTB 2,5/13-ST-5,08			1757129	PHOENIX CONTACT, GERMANY	1757129	PHOENIX CONTACT, SWEDEN



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
0	11-01044100	4
1	11-01044101	4
2	11-01044102	2
3	11-01044103	2
4	11-01044104	2
5	11-01044105	4
6	11-01044106	22
7	11-01044107	6
8	11-01044108	2
9	11-01044109	4

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2008.09.10				

Unless otherwise indicated, all tolerances are according to

Sharp Edges

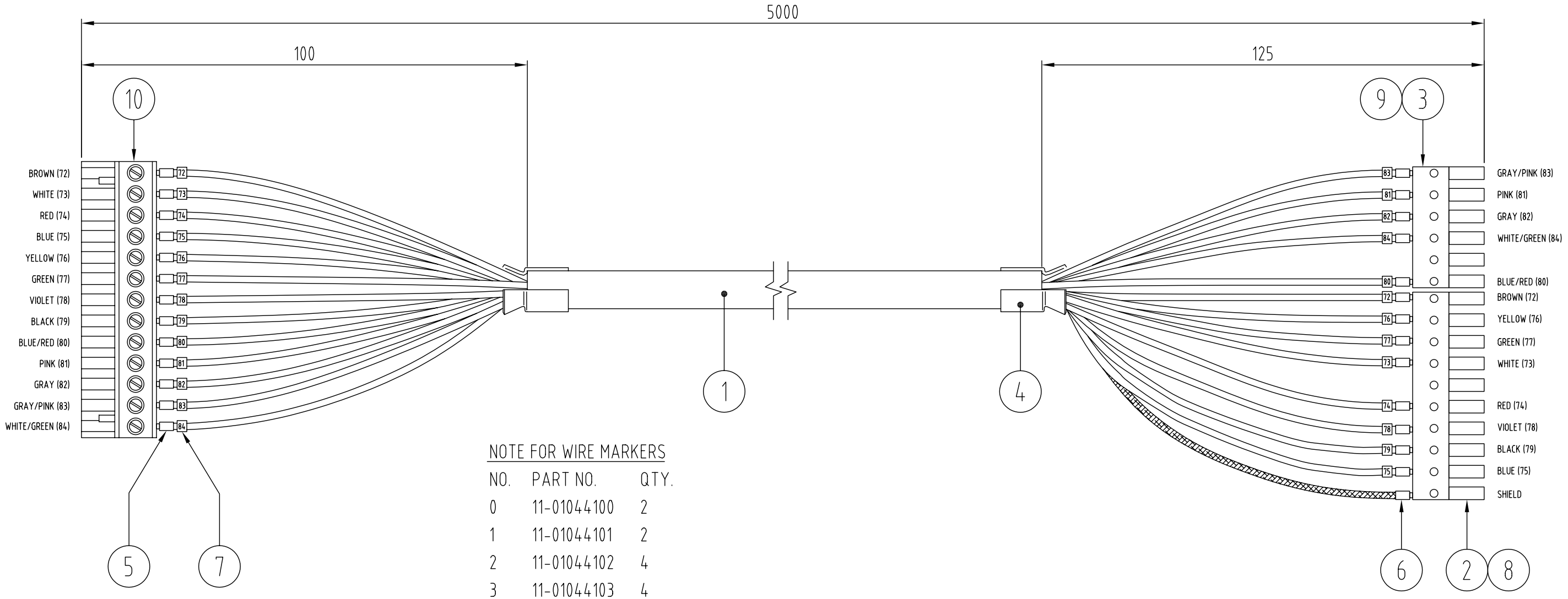
Surface Coating

Weight

CONTROL CABLE

Drawing No.	Rev.	Sheet	Scale
SG590268-101-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, CYLIYCY, 8 x 2 x 0.25						
2	1	CONNECTOR, MC1.5/10-ST-3.81			1803659	PHOENIX CONTACT		
3	1	CONNECTOR, MC1.5/6-ST-3.81			1803617	PHOENIX CONTACT		
4	2	HEAT SHRINKABLE TUBING, Ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA, SWEDEN
5	26	BOOTLACE FERRULE, H 0.25/12					9025780000	WEIDMÜLLER
6	1	BOOTLACE FERRULE, H 1.5/14					9026090000	WEIDMÜLLER
7		WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
8	1	LABEL, SK 3,81/2,8: SO, TEXT: J15			0805056	PHOENIX CONTACT		
9	1	LABEL, SK 3,81/2,8: SO, TEXT: J20			0805056	PHOENIX CONTACT		
10	1	CONNECTOR, MSTB 2,5/13-ST-5,08			1757129	PHOENIX CONTACT		



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
0	11-01044100	2
1	11-01044101	2
2	11-01044102	4
3	11-01044103	4
4	11-01044104	4
5	11-01044105	2
6	11-01044106	2
7	11-01044107	18
8	11-01044108	12
9	11-01044109	2

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

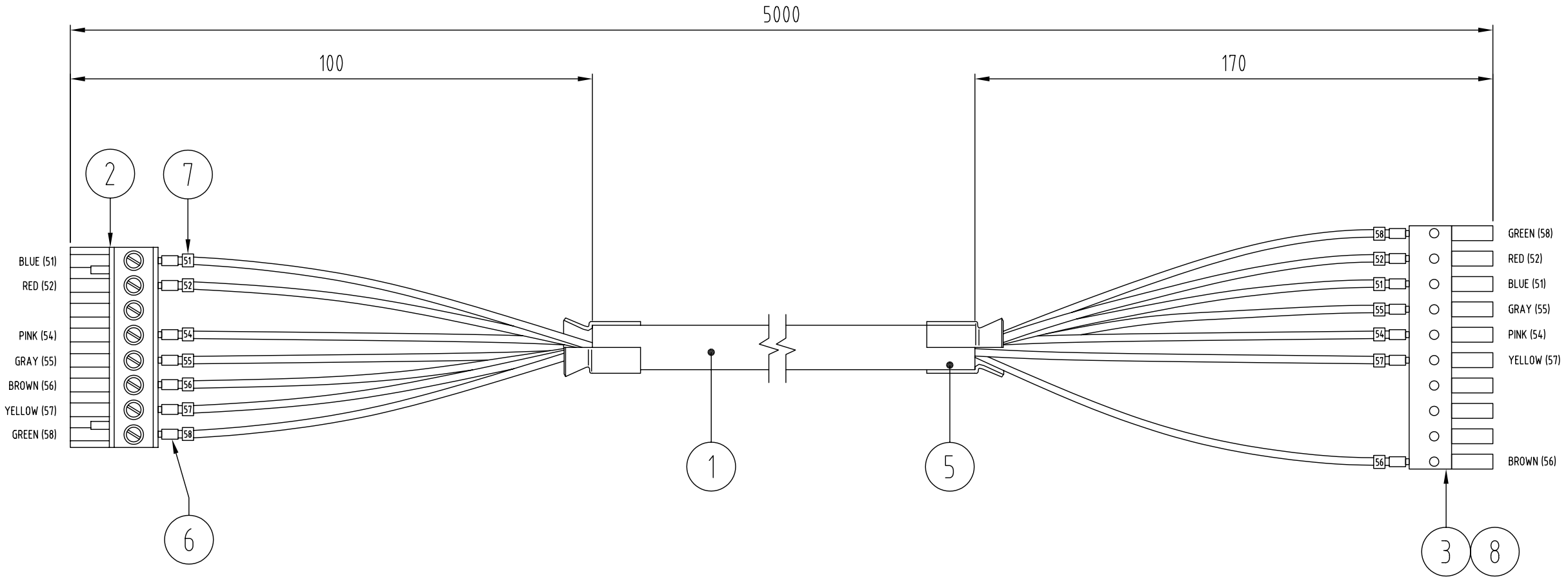
Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2008.09.10				

Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

CONTROL CABLE

Drawing No.	Rev.	Sheet	Scale
SG590268-102-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, LIYCY, 4 x 2 x 0.25						
2	1	CONNECTOR, MSTB 2,5/8-ST-5,08			1757077	PHOENIX CONTACT		
3	1	CONNECTOR, MC1.5/10-ST-3.81			1803659	PHOENIX CONTACT		
5	2	HEAT SHRINKABLE TUBING, Ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA, SWEDEN
6	14	BOOTLACE FERRULE, H 0.25/12					9025780000	WEIDMÜLLER
7		WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
8	1	LABEL, SK 3,81/2,8: SO, TEXT: J28			0805056	PHOENIX CONTACT		



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
1	11-01044101	2
2	11-01044102	2
4	11-01044104	2
5	11-01044105	16
6	11-01044106	2
7	11-01044107	2
8	11-01044108	2

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

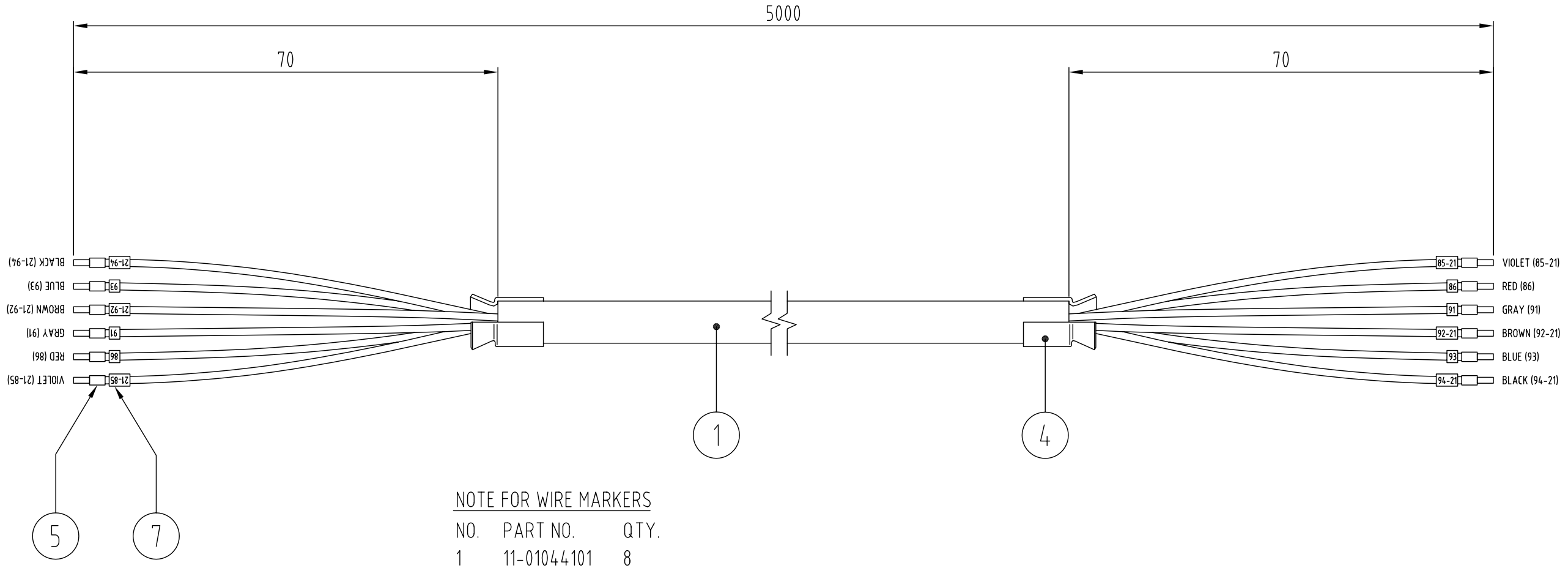
Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2008.09.10				

Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

CONTROL CABLE

Drawing No.	Rev.	Sheet	Scale
SG590268-103-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, ÖLFLEX CLASSIC 100 8G0,75			0010 027	LAPP KABEL		
2	2	HEAT SHRINKABLE TUBING, Ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA, SWEDEN
3	12	BOOTLACE FERRULE, H 0.75/14					9026070000	WEIDMÜLLER
4		WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
1	11-01044101	8
2	11-01044102	8
3	11-01044103	2
4	11-01044104	2
5	11-01044105	4
6	11-01044106	2
8	11-01044108	4
9	11-01044109	8

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	
G.O.	2008.09.10		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to

Sharp Edges

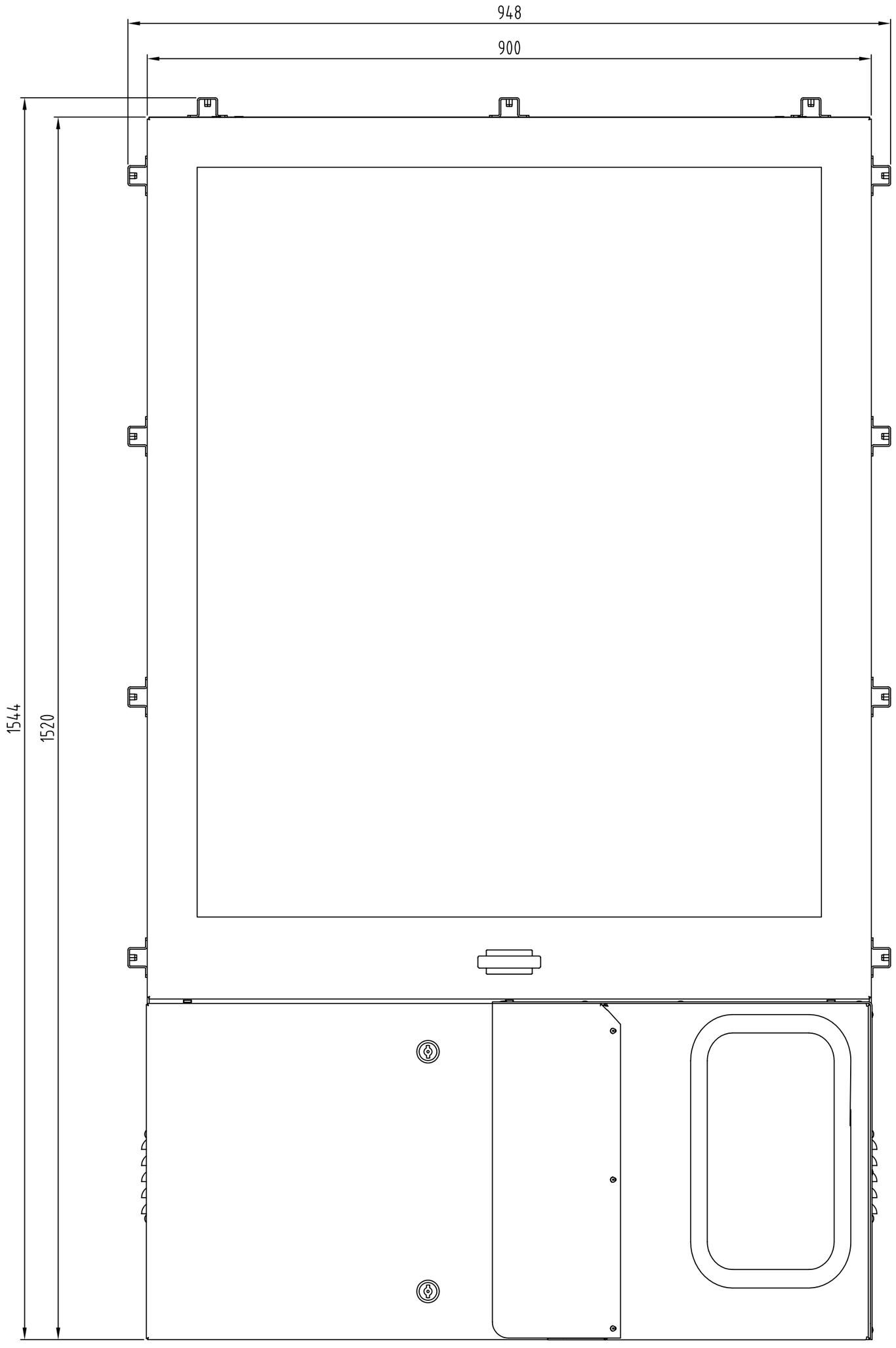
Surface Coating

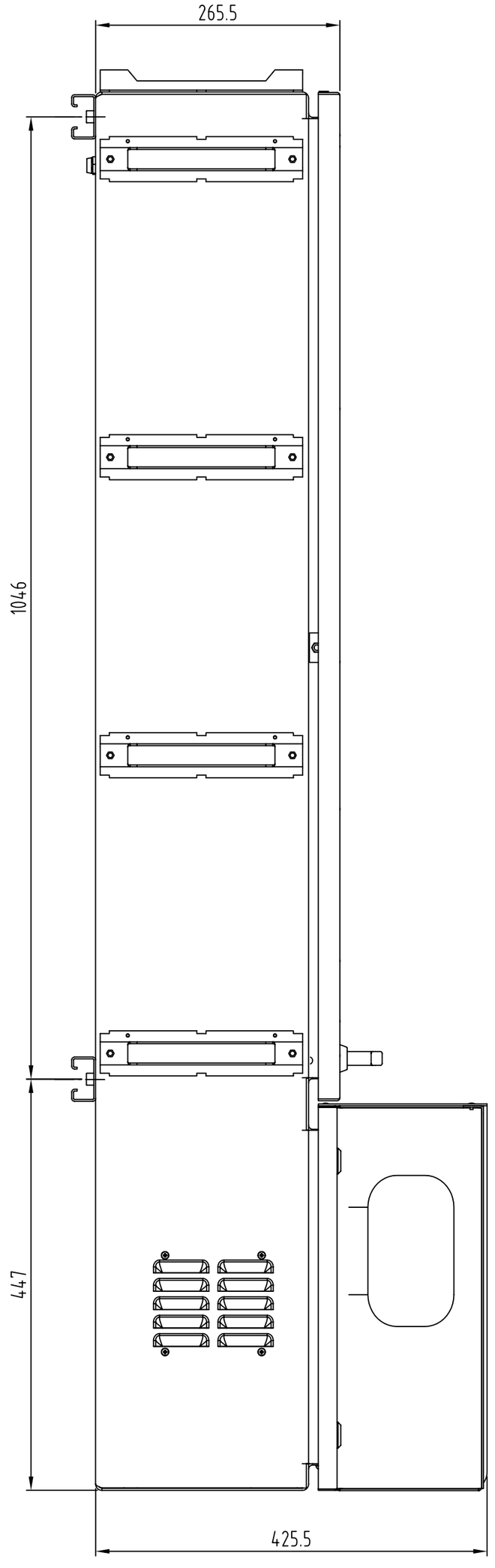
Weight

POWER CABLE

Drawing No.	Rev.	Sheet	Scale
SG590268-111-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
		Enclosure, T2			915889, Rev. 1	NPP		





Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to

Sharp Edges

Surface Coating

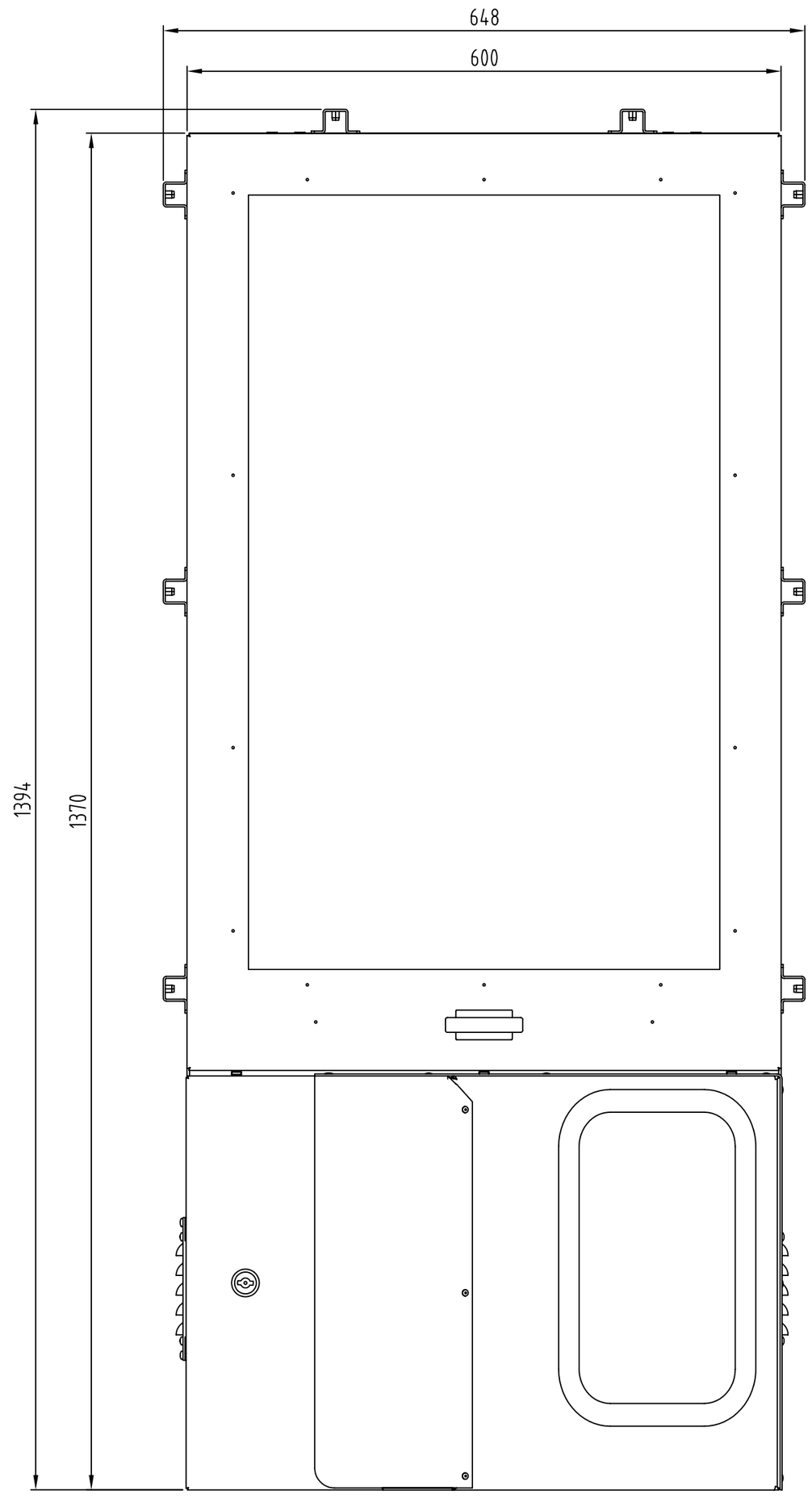
Weight

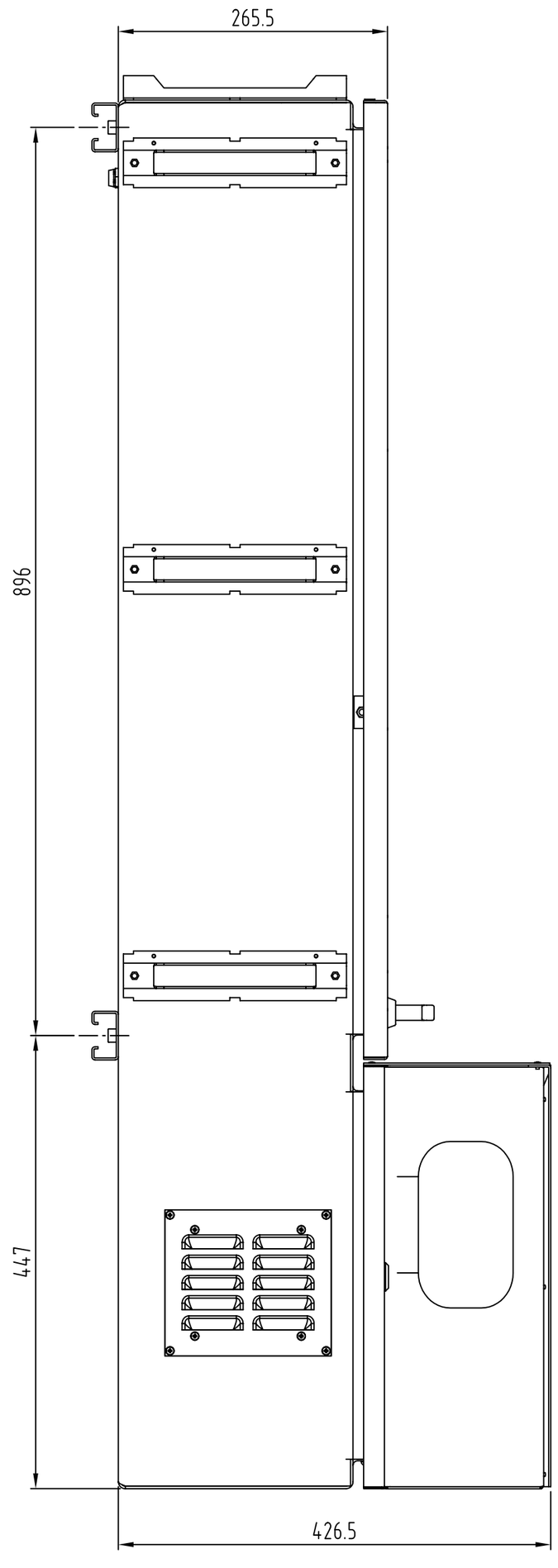
ENCLOSURE
FOR T2 SIZE DOCKING GUIDANCE UNIT

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2008.12.11				

Drawing No.	Rev.	Sheet	Scale
SG590281-001-01		1 of 1	1:5

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
		ENCLOSURE, T3			916350, Rev.0	NPP		





Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:
G.O.	2008.12.11	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to

Sharp Edges

Surface Coating

Weight

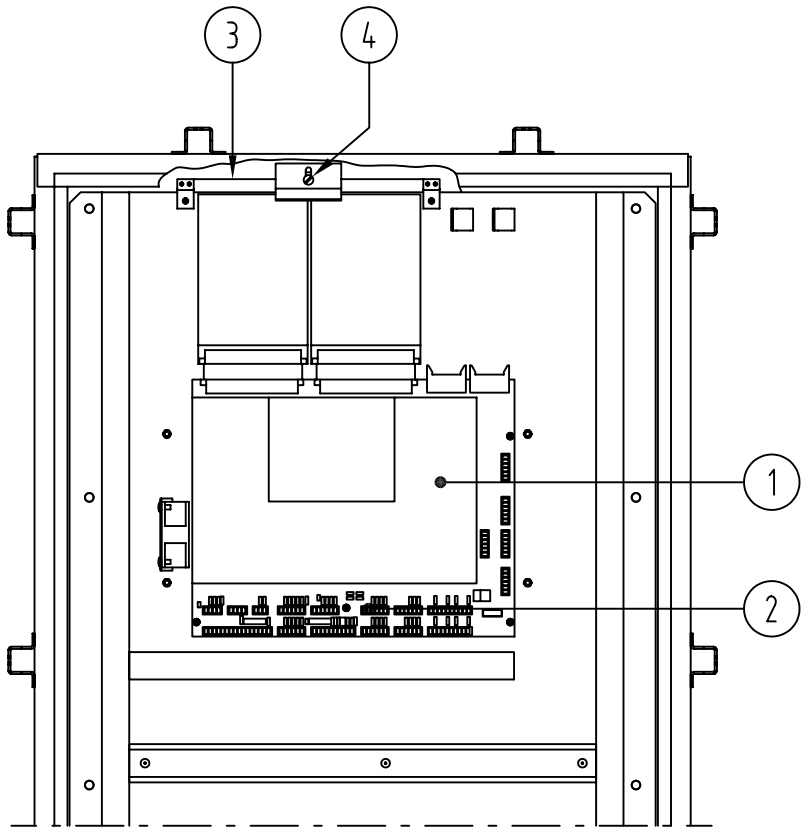
ENCLOSURE
FOR T3 SIZE DOCKING GUIDANCE UNIT

Drawing No.	Rev.	Sheet	Scale
SG590360-001-01		1 of 1	1:5

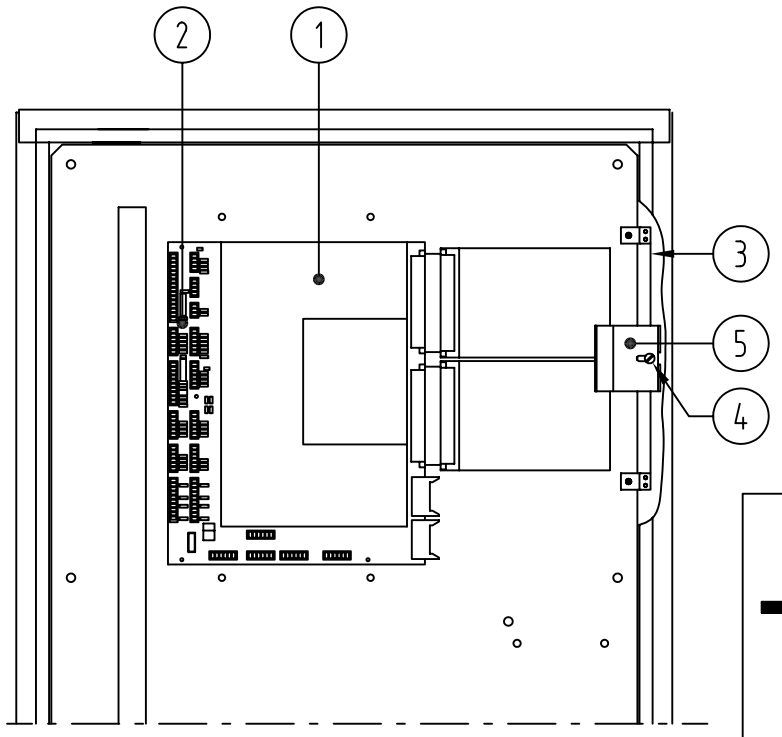
Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CARRIER BOARD AND CPU ASSEMBLY	SG590524-000					
2	1	DOCKING BOARD	SG590562-000					
3	1	EXTENSION ASSEMBLY	SG590399-201-01					
4	1	SCREW, LKCS, M4x12, ZINC PLATED						
5	1	HOLD DOWN BRACKET	SG590399-205-01					

Instructions for replacing CU-circuit board, SG590125-000, with model SG590524-000

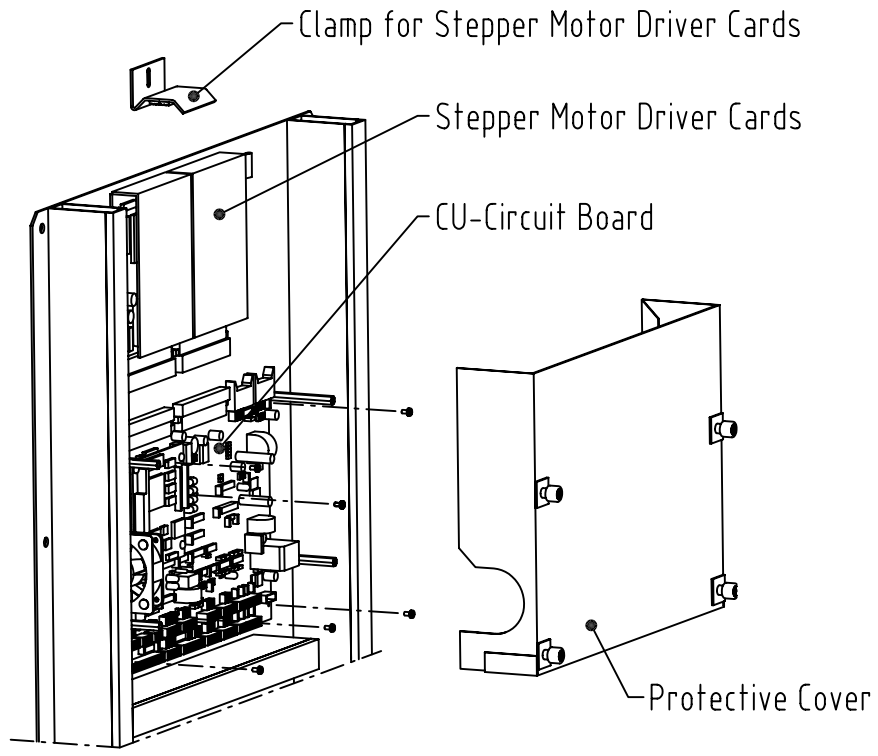
1. If possible, download and save the existing configuration of the system using the SD-Config tool. This will make configuration of the new board easier.
2. With power off, remove the protective cover for the CU-circuit board assembly.
3. Disconnect all wiring from the CU-circuit board.
4. Remove the clamp that holds the stepper motor driver cards in place by undoing the fastener that holds it in place.
5. Remove the stepper motor driver cards by pulling them upwards from the CU-circuit board.
6. On model where there is a welded stud that is used as the fastening point for the clamp for the stepper motor driver cards, carefully break the stud off. This is best done by using a twisting force on the stud.
7. Remove the CU-circuit board by removing the six fasteners that hold it in place on the stand-offs. Note: Be care not to loosen the stand-offs as it can be difficult to re-tighten them without loosening the mounting plate.
8. Fasten the new docking board in place on the stand-offs.
9. Position the Carrier Board-CPU assembly over the mating contacts and stand-offs on the docking board and press until the contacts are seated and the locking tabs on the stand-offs make a clicking sound.
10. Re-install the stepper motor driver cards.
11. Position the extension assembly on the top edge of the mounting plate so that is centered above the stepper motor driver cards, and then tighten the set screws on the extension plate.
12. For systems, where the stepper motor driver cards are mounted vertically, attach the original clamp to the extension assembly; for other systems, use the clamp that supplied with the kit. Use the screw that is supplied with the replacement kit to do this.
13. Re-connect all wiring.
14. Re-install the protective cover.
15. Power up the system and install and configure the software for the docking system. Note: The new CU-circuit board requires software version 8 or higher to run properly.



Placement of New Parts, Systems with Vertically Mounted Stepper Motor Driver Cards



Placement of New Parts, Systems with Horizontally Mounted Stepper Motor Driver Cards



Part Identification for Disassembly

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:
G.O.	2008.11.10	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to | Sharp Edges

Surface Coating | Weight

CU-REPLACEMENT KIT
WITH EXTENSION PLATE ASSEMBLY
FOR REPLACEMENT OF CU-CIRCUIT BOARD ASSEMBLY 590125

Drawing No.	Rev.	Sheet	Scale
SG590399-001-01		1 of 1	

SG590405-000-01

COOLING FAN FOR RIEGL LASER RANGE FINDER

PRODUCT CONFIGURATION FILE, PRODUCT 590405

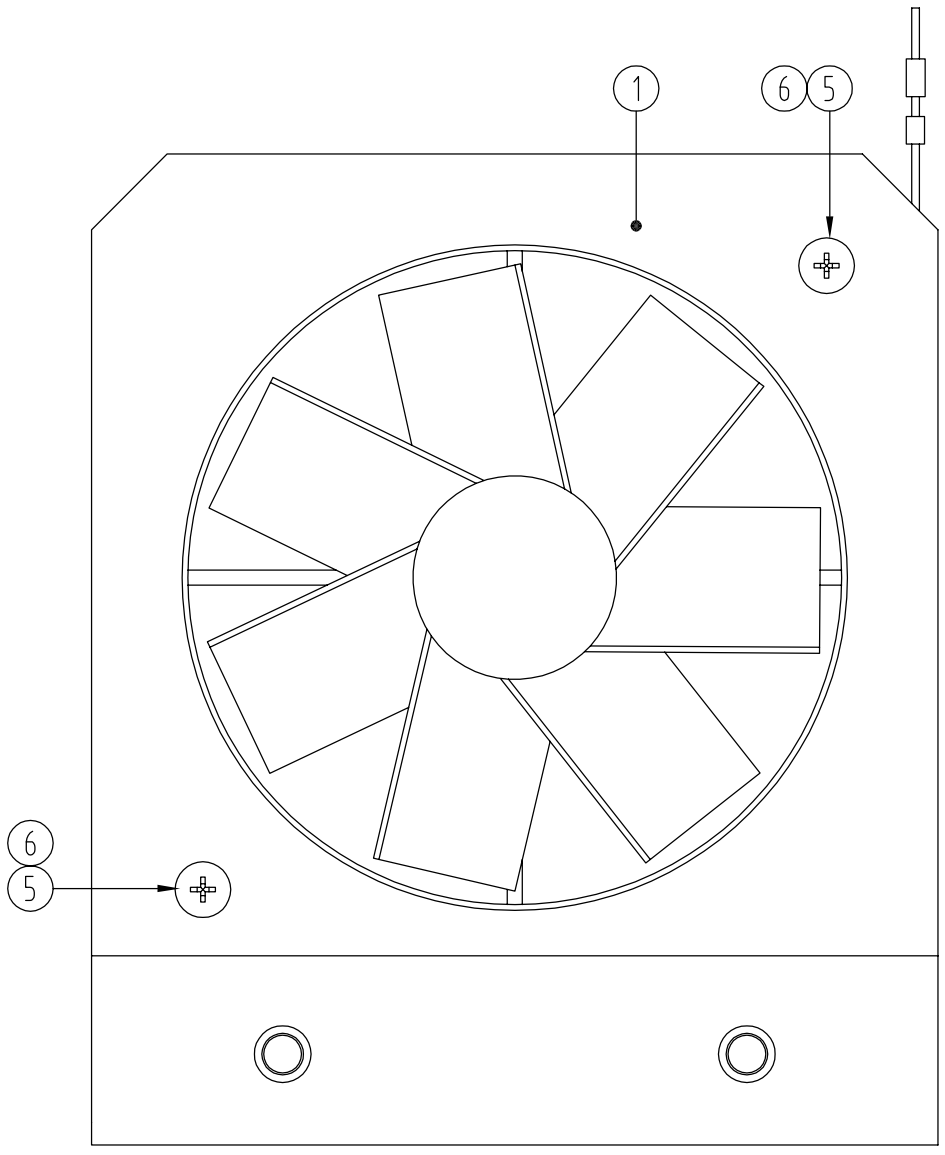
REVISIONS
B. ITEM 8 ADDED. BY: G.O. DATE: 2003-03-20
C. ITEM 8 CHANGED. ITEM 9 ADDED BY: G.O. DATE: 2004.03.08
D. ITEMS 2 & 3 CHANGED, ITEM 10 ADDED. BY: G.O., DATE: 2006.09

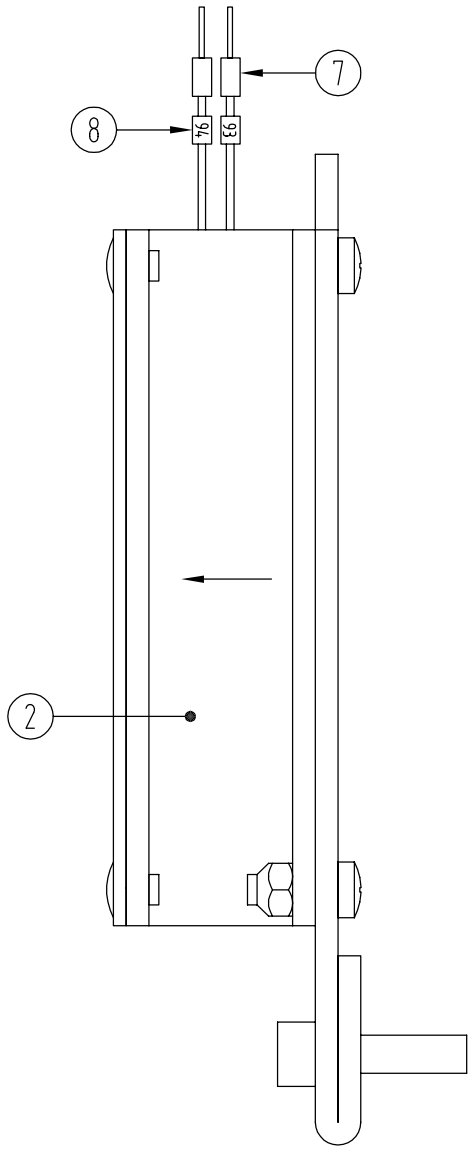
ASSMBLY LEVEL DOCUMENT LIST

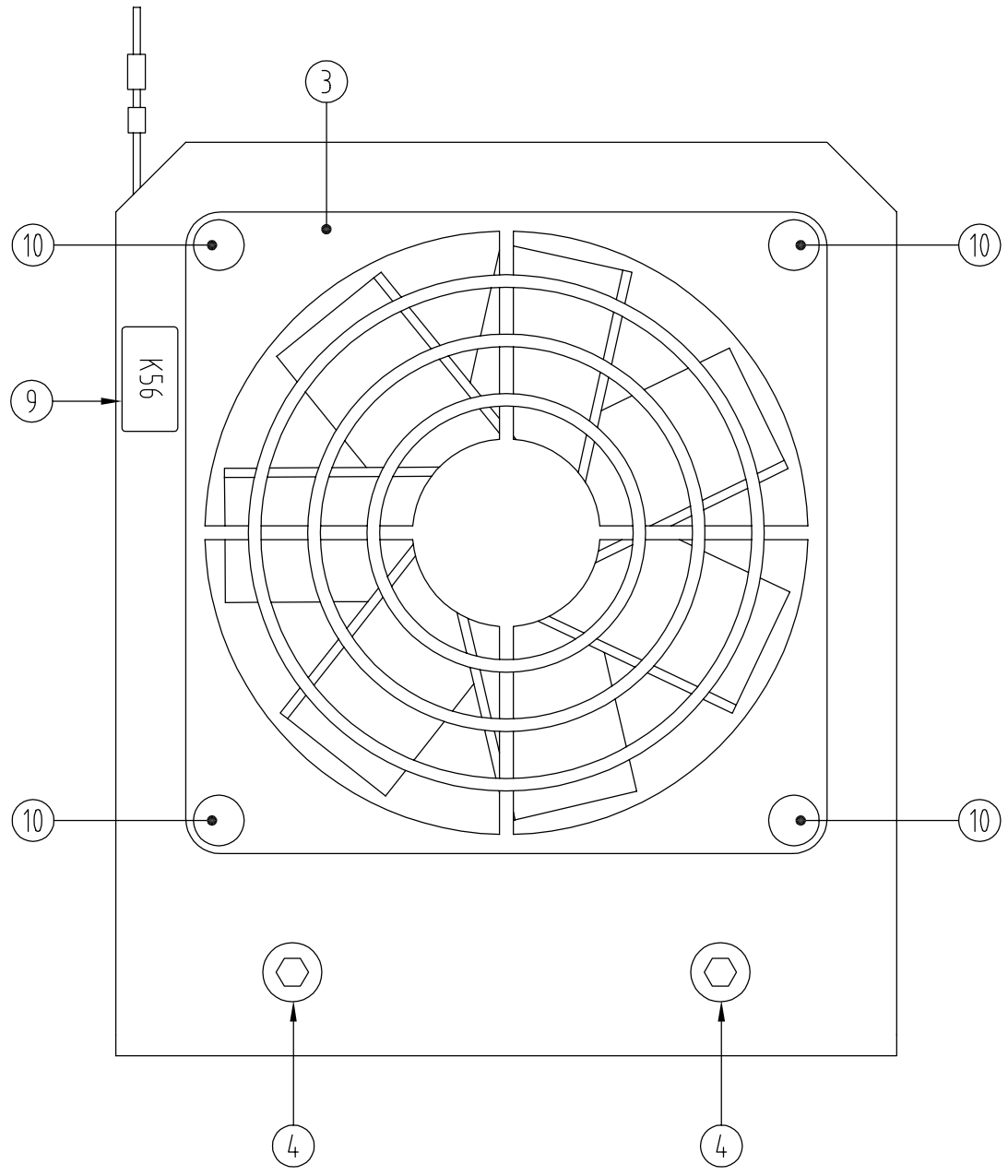
SG590405-000-01	PRODUCT CONFIGURATION FILE
SG590405-001-01	PRODUCT ASSEMBLY AND COMPONENT PLACEMENT

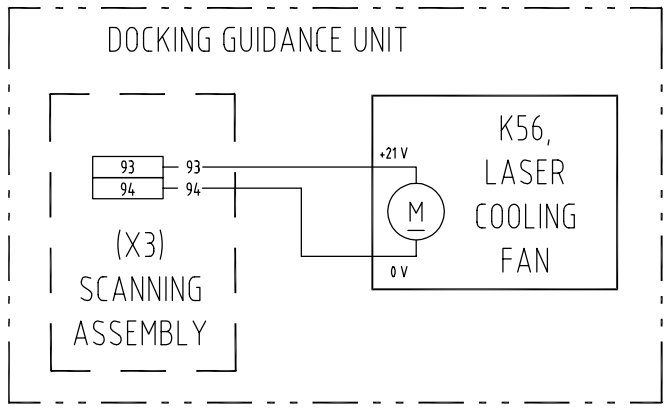
COMPONENT AND PARTS LIST

POSITION	QUANTITY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PROD. NO.	MANU. PART NO.	MANUFACTURER	SUPPLIER'S. PART NO.	SUPPLIER
1	1	BRACKET	SG590405-200-01					
2	1	FAN, 92x92, 24 VDC			3414NGH	PAPST GERMANY	9600450	FARNELL SWEDEN
3	1	FINGER GUARD, LZ23K					1171817	FARNELL SWEDEN
4	1	ALLEN HEAD SCREW, ISO 4762, M5 x 20 ZINK PLATED					MC6S M5 x 20 8.8 fzb	BIX SWEDEN
5	2	SCREW, ISO-7045, M4x12, ZINK PLATED					MRX-Z 4x12 4.8 fzb	BIX SWEDEN
6	2	LOCKNUT, ISO 7040, M4, ZINK PLATED					DIN 985 M4 fzb	BIX SWEDEN
7	2	CRIMP LUG, H0.25/12			9025780000	WEIDMÜLLER, GERMANY	9025780000	WEIDMÜLLER, SWEDEN
8		WIRE MARKERS						
	1	PARTEX PA02, TEXT: 3			11-01044103	WEIDMÜLLER, GERMANY	11-01044103	WEIDMÜLLER, SWEDEN
	1	PARTEX PA02, TEXT: 4			11-01044104	WEIDMÜLLER, GERMANY	11-01044104	WEIDMÜLLER, SWEDEN
	2	PARTEX PA02, TEXT: 9			11-01044109	WEIDMÜLLER, GERMANY	11-01044109	WEIDMÜLLER, SWEDEN
9	1	COMPONET IDENTIFIER LABEL, YELLOW, 15x8mm, TEXT: K56					21302G	TECHNOTRADE SCANDINAVIA AB SWEDEN
10	4	RIVIT, PLASTIC			094 0330 699 01	SKIFFY THE NETHERLANDS		BUFAB-BIX SWEDEN

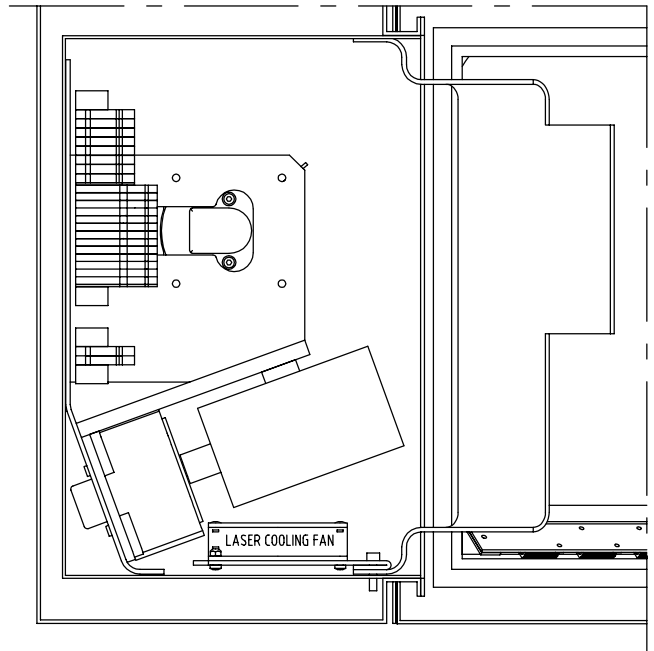








CONNECTION DIAGRAM



PLACEMENT IN SAFEDOCK

NOTE: ALLEN HEAD SCREW, ITEM 4, ARE USED FOR INSTALLATION, AND ARE DELIVERED LOOSE.

Revision	Description	Date	Drawn by:	Checked by:	Approved
C	Item 10 added.	2006.09.25	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by: G.O.	Date drawn: 2001-10-15	Checked by:	
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to

Sharp Edges

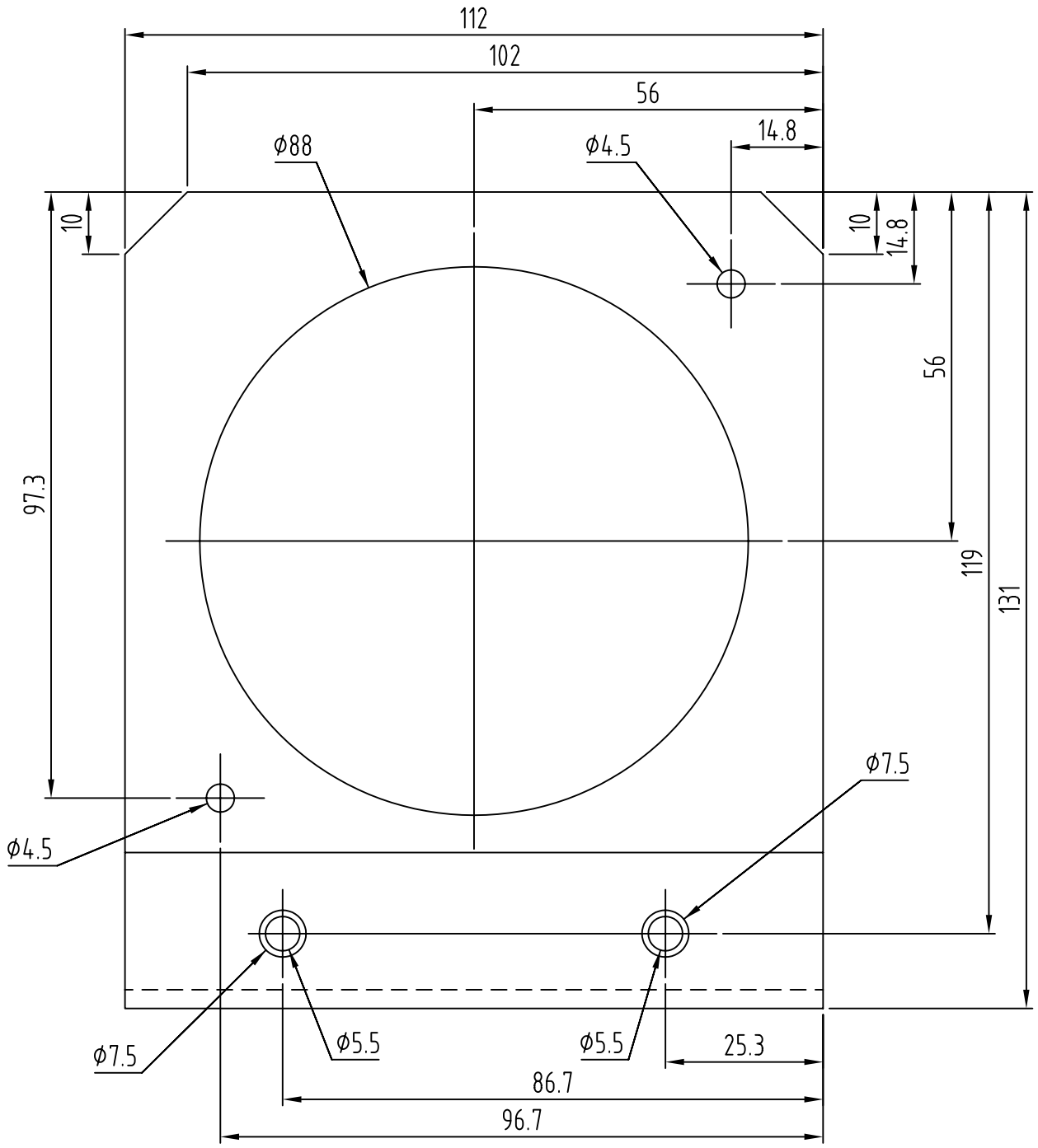
Surface Coating

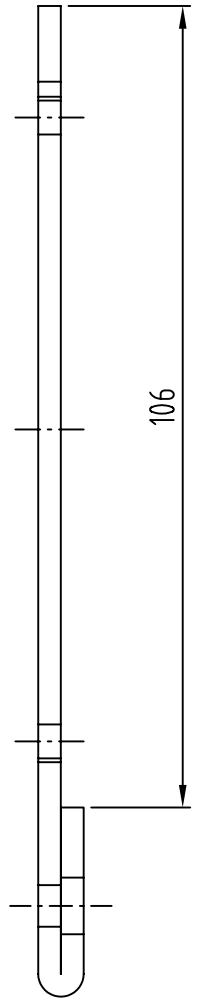
Weight

COOLING FAN
FOR RIEGL LASER RANGE FINDER

Drawing No.	Rev.	Sheet	Scale
SG590405-001-01	C	1 of 1	1:1

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
		ALUMINUM SHEET, EN1050-H14, t = 3	SG590405-200-01					





Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	
G.O.	2001-10-12		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to ISO-2768-m

Sharp Edges R = 0.5

Surface Coating

Weight

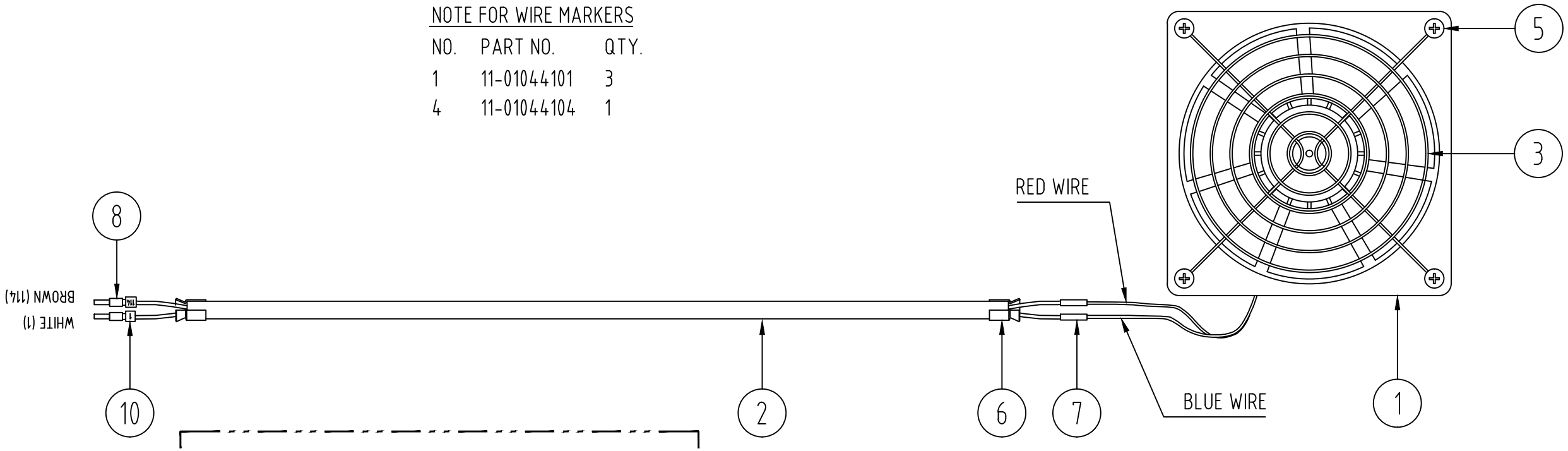
BRACKET
COOLING FAN FOR RIEGL LASER RANGE FINDER

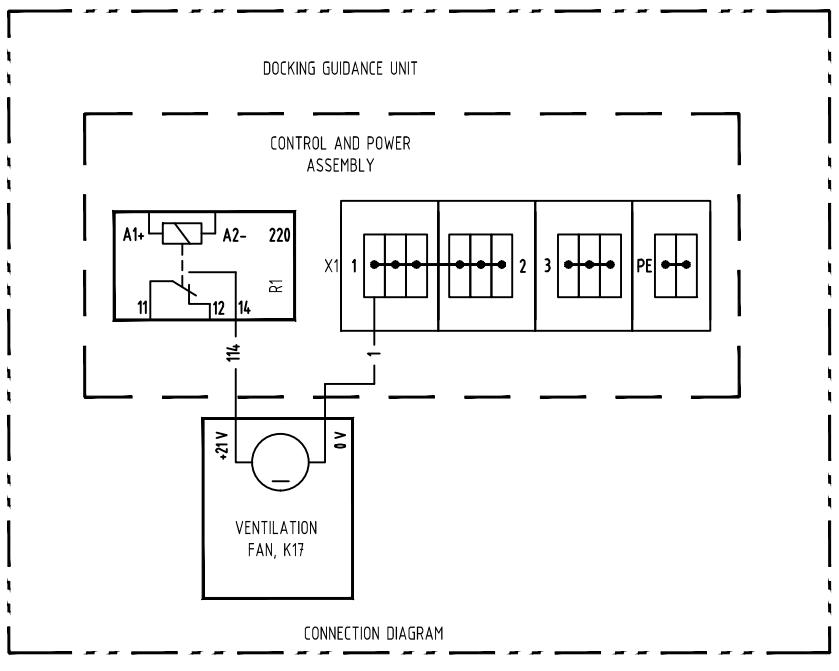
Drawing No.	Rev.	Sheet	Scale
SG590405-200-01		1 of 1	1:1

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	FAN, 119x119, 24 V DC			4314U	EBM-PAPST, GERMANY	337-3317 9600175	RS COMPONENTS, SWEDEN FARNELL, SWEDEN
2	1	ELECTRICAL CABLE, LIYY, 2x0.34, L = 1900mm					7852020	AB NOVUM, SWEDEN
3	1	FINGER GUARD, METAL					735-991	FARNELL, SWEDEN
4	4	MOUNTING CLIP			LZ212	PAPST, GERMANY	311-1623	FARNELL, SWEDEN
5	4	SCREW, ISO 7049, ST3.5x9.5, STAINLESS STEEL						FARNELL, SWEDEN
6	2	HEAT SHRINKABLE TUBING, Ø6.4, BLACK			FIT-221-1/4	ALPHA WIRE	5507009	ELFA, SWEDEN
7	2	CRIMP SPLICE, TINNED COPPER, PVC, GREEN					48-212-45	ELFA, SWEDEN
8	2	CRIMP LUG, H 0.34/12			9025790000	WEIDMÜLLER, GERMANY	9025790000	WEIDMÜLLER, SWEDEN
9	1	LABEL, YELLOW, 15x8, TEXT: K17					21302G	TECHNOTRADE, SWEDEN
10		WIRE MARKERS, PARTEX PA02			SEE NOTE	WEIDMÜLLER, GERMANY	SEE NOTE	WEIDMÜLLER, SWEDEN

NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
1	11-01044101	3
4	11-01044104	1





Revision	Description	Date	Drawn by:	Checked by:	Approved
E	Cable length changed, drawing now valid for T2 and T3	2011.10.18	A.S.		
D	FAN MODEL, ITEM 1 AND AIR FLOW DIRECTION CHANGED	2007.10.18	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:
G.O.	2003.03.07	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to

Sharp Edges

Surface Coating

Weight

VENTILATION FAN

Drawing No.	Rev.	Sheet	Scale
SG590479-001-01	E	1 of 1	NO SCALE

SG590486-000-01

DEFROSTER ASSEMBLY

REVISIONS

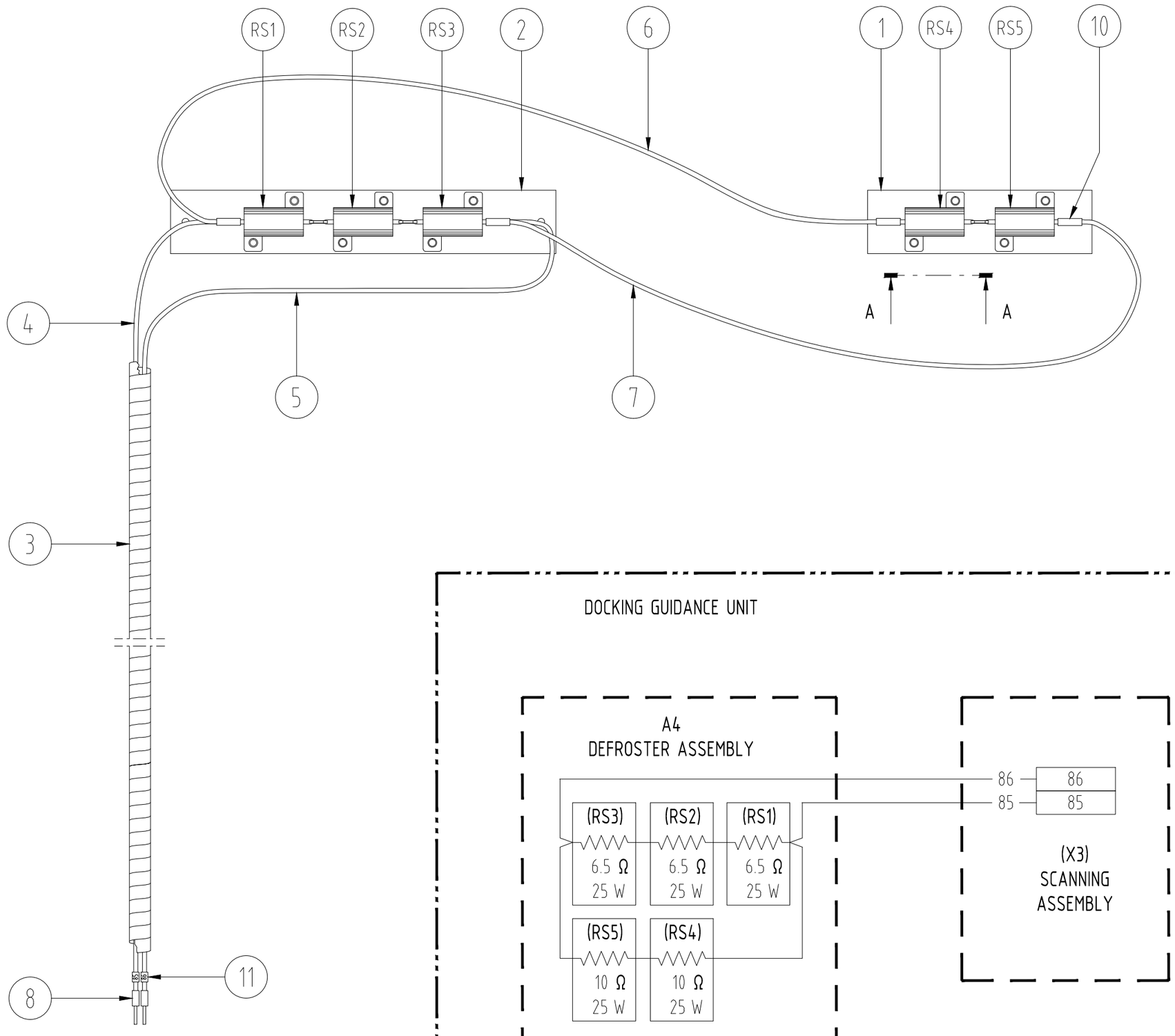
A. Items 4 thru 7 changed. By: G.O. Date: 2004.09.21

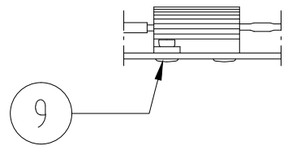
ASSMBLY LEVEL DOCUMENT LIST

SG590486-000-01	PRODUCT CONFIGURATION FILE
SG590486-001-01	COMPONENT PLACEMENT AND CONNECTION DIAGRAM

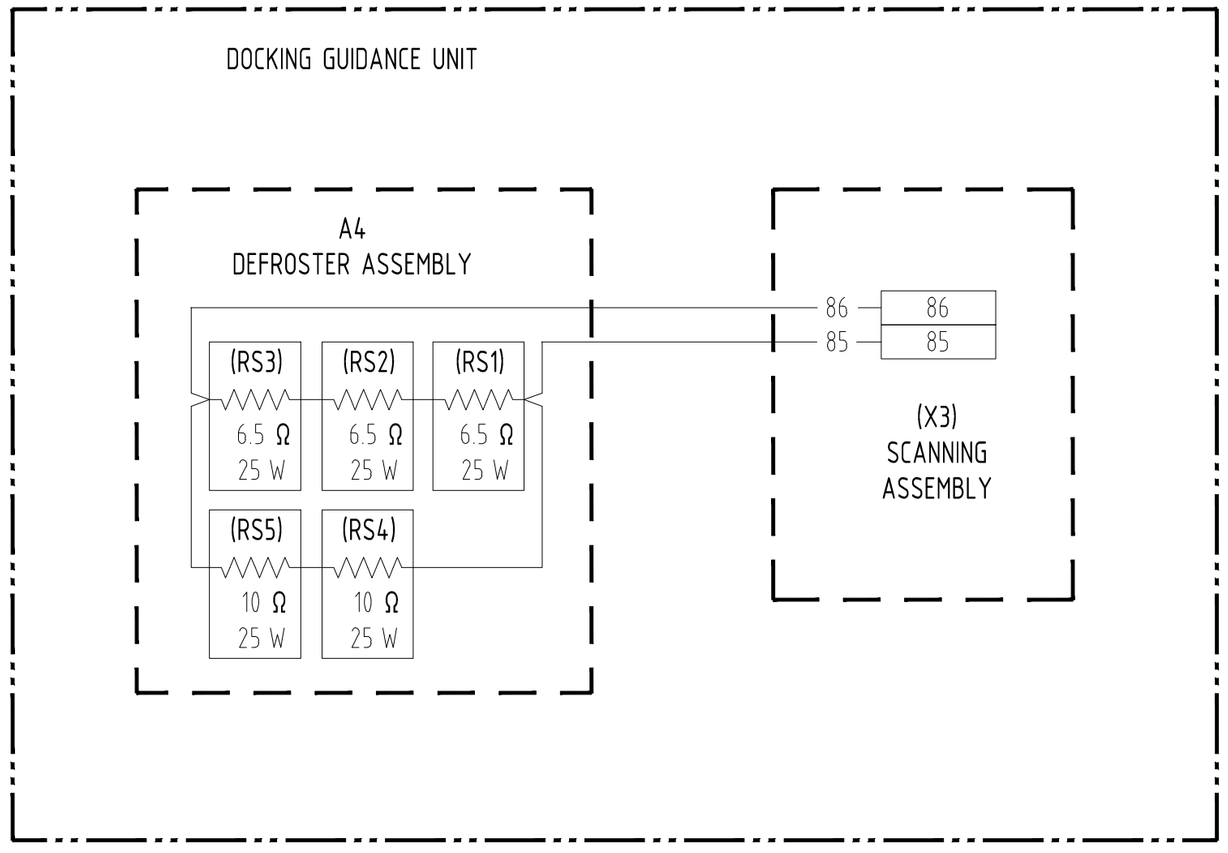
COMPONENT AND PARTS LIST

POSITION	QUANTITY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PROD. NO.	MANU. PART NO.	MANUFACTURER	SUPPLIER'S. PART NO.	SUPPLIER
RS1-RS3	3	POWER RESISTOR, 6.5 Ohm, 25 W			HS25 6R8 J	ARCOL, ENGLAND		
RS4-RS5	2	POWER RESISTOR, 10 Ohm, 25 W			HS25 10R J	ARCOL, ENGLAND		
1	1	DEFROSTER PLATE	AT 606373					
2	1	DEFROSTER PLATE	AT 606103					
3	1	SPIRAL WIRE GUARD, DIA. 10 mm					E 29 933 10	AHLSELL, SWEDEN
4	1	WIRE, UL1007/1569, AWG 20, BLACK, L = 820 mm			3053 BLACK	ALPHA WIRE, USA	5522909	BEJOKEN, SWEDEN
5	1	WIRE, UL1007/1569, AWG 20, BLACK,L = 1000 mm			3053 BLACK	ALPHA WIRE, USA	5522909	BEJOKEN, SWEDEN
6	1	WIRE, UL1007/1569, AWG 20, BLACK,L = 350 mm			3053 BLACK	ALPHA WIRE, USA	5522909	BEJOKEN, SWEDEN
7	1	WIRE, UL1007/1569, AWG 20, BLACK,L = 350 mm			3053 BLACK	ALPHA WIRE, USA	5522909	BEJOKEN, SWEDEN
8	2	CRIMP LUG, H 0,5/14			9026060000	WEIDMÜLLER, GERMANY	9026060000	WEIDMÜLLER, SWEDEN
9	14	POP RIVIT, AL/AC, BLACK, 3,2 X 8						
10	4	SHRINK WRAP, L = 15					55-070-25	ELFA, SWEDEN
11		WIRE MARKERS						
	1	PARTEX PA02, TEXT: 5			11-01044105	WEIDMÜLLER, GERMANY	11-01044105	WEIDMÜLLER, SWEDEN
	1	PARTEX PA02, TEXT: 6			11-01044106	WEIDMÜLLER, GERMANY	11-01044106	WEIDMÜLLER, SWEDEN
	2	PARTEX PA02, TEXT: 8			11-01044108	WEIDMÜLLER, GERMANY	11-01044108	WEIDMÜLLER, SWEDEN
12	1	CABLE TIE MOUNT, BLACK					55-140-96	TECHNOTRADE SWEDEN
13	1	CABLE TIE, 71x1.8, NATURAL			PLT.6SM-C0	PANDUIT, USA	5502828	ELFA, SWEDEN
14	1	LABEL, YELLOW, 15x8, TEXT: R1-R3					21302G	TECHNOTRADE SWEDEN
15	1	LABEL, YELLOW, 15x8, TEXT: R4-R5					21302G	TECHNOTRADE SWEDEN

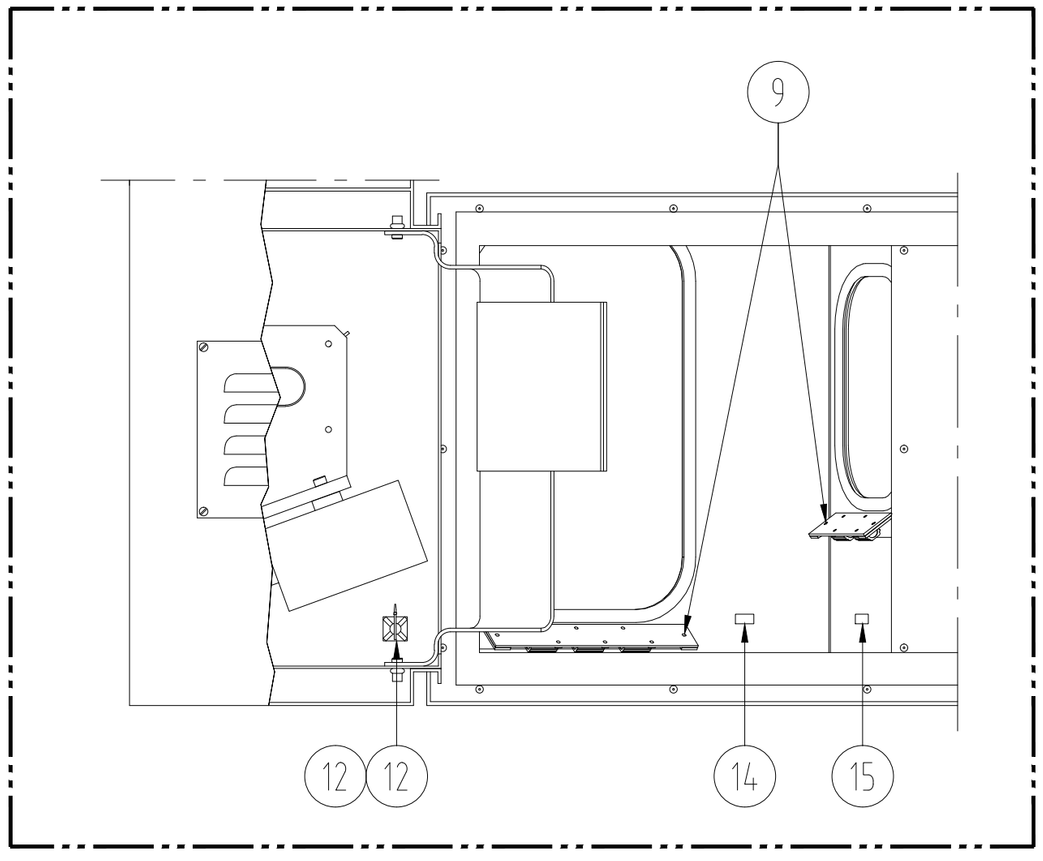




VIEW A-A



CONNECTION DIAGRAM



COMPONENT PLACEMENT
IN SAFEDOCK

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to

Sharp Edges

Surface Coating

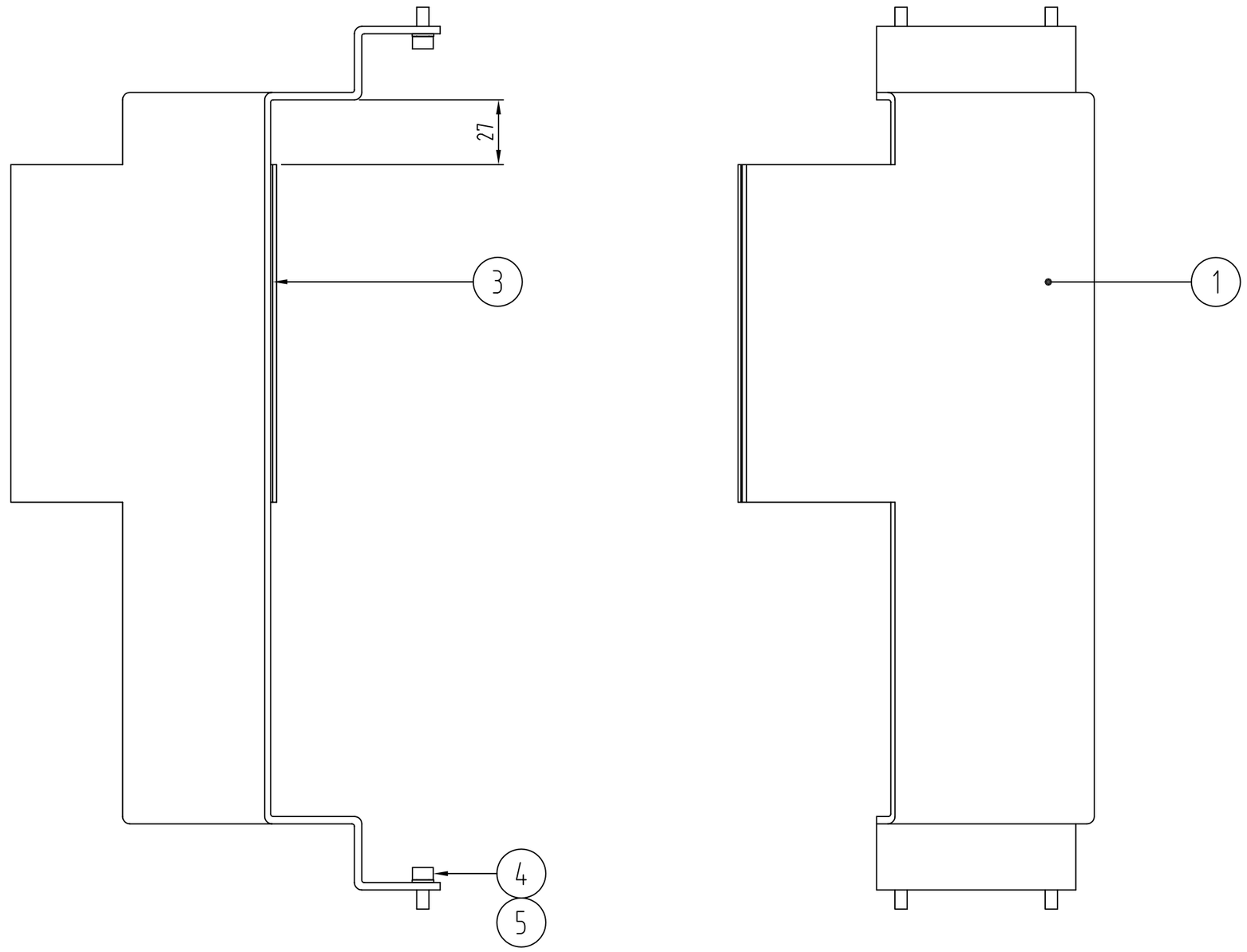
Weight

DEFROSTER ASSEMBLY

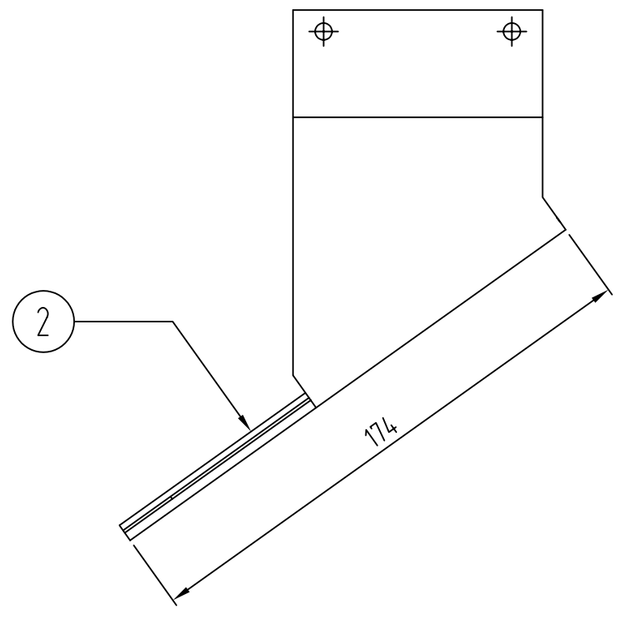
Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2003.03.19				

Drawing No.	Rev.	Sheet	Scale
SG590486-001-01		1 of 1	1:2

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	BRACKET	AT 601492					
2	1	DIELECTRIC MIRROR, 138x174x2				SEE NOTE		
3		DOUBLE-SIDED TAPE, 19 mm			4246	3M, SWEDEN		
4	4	SCREW, ISO 4762, M5x12, ZINC PLATED						
5	4	LOCK WASHER, DIN 127, 9.2x5.1x1.2, ZINC PLATED						



NOTE: DIELECTRIC MIRROR
OPTIMIZED FOR 910 nm
Si & Si02 REFLECTIVE COATING
SUPPIER: SPECTROGON



Revision	Description	Date	Drawn by:	Checked by:	Approved
A	ITEM 3 CHANGED	2008-06-02	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to ISO-2768-c | Sharp Edges R = 0.5

Surface Coating | Weight

CALIBRATION MIRROR

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2003.03.19				

Drawing No.	Rev.	Sheet	Scale
SG590487-001-01	A	1 of 1	1:2

SG590495-010-01

SOFT KEY OPERATOR PANEL

PRODUCT CONFIGURATION FILE,

REVISIONS
E. Terminal contact (OP X1) + cables added. By: K.J. Date 2013-07-18
F. OP C1, OP C8, OP C10 updated. By: K.J. Date 2014-01-09
G. OP C1, C8, C10 updated. OP CS1, OP CP1 added. Terminal markers added. By: K.J. Date 2014-02-12

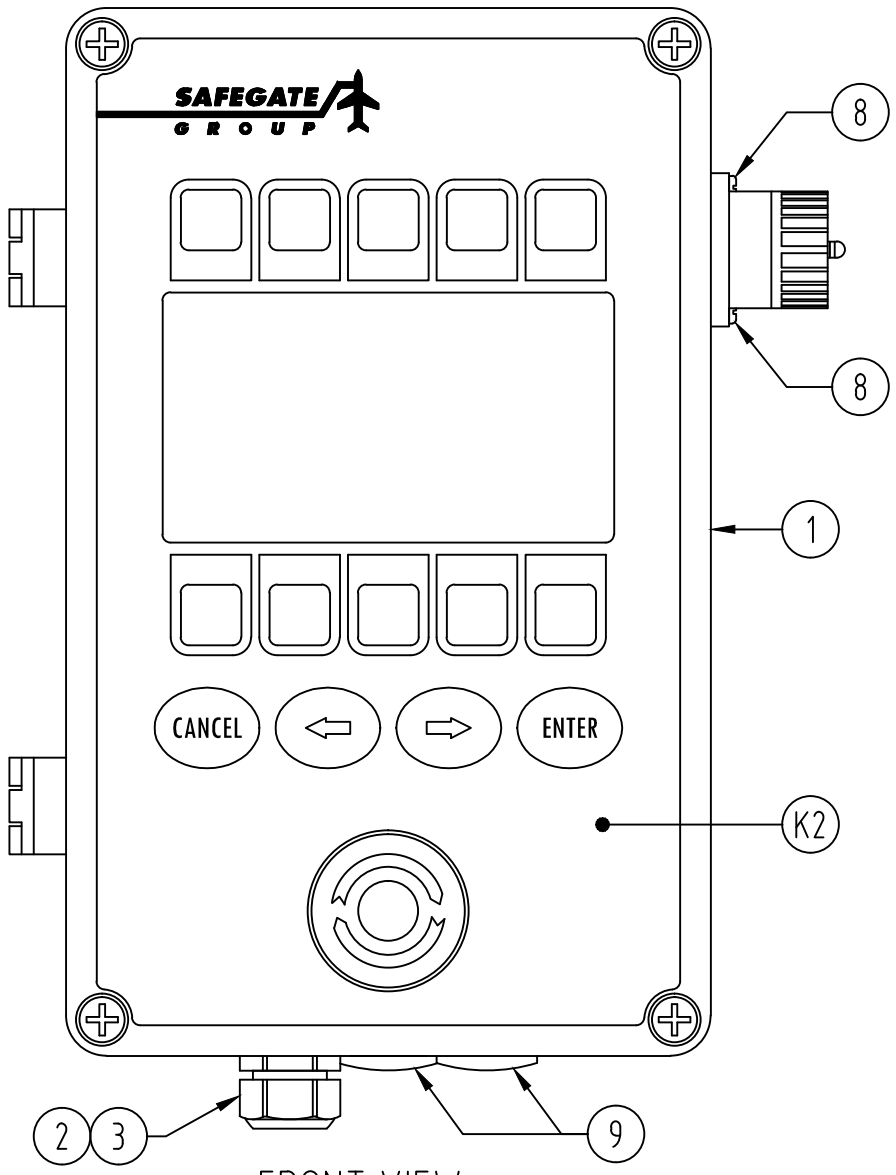
ASSMBLY LEVEL DOCUMENT LIST

SG590495-010-01	PRODUCT CONFIGURATION FILE
SG590495-011-01	ASSEMBLY AND CONNECTION DIAGRAM
SG590495-015-01	INSTALLATION DIAGRAM

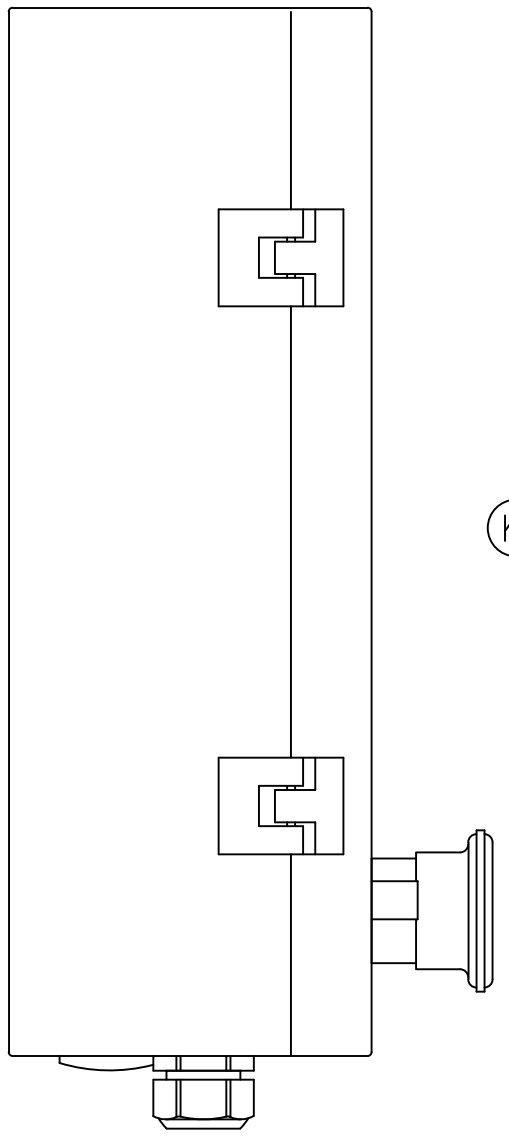
COMPONENT AND PARTS LIST

POSITION	QUANTITY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PROD. NO.	MANU. PART NO.	MANUFACTURER	SUPPLIER'S. PART NO.	SUPPLIER
K1	1	CIRCUIT BOARD	SG590495-000-01					
K2	1	SOFT KEY TOUCH PAD			18071, Rev. A1	STEEL GRAPH, SWEDEN		
P1	1	CONNECTOR, EITHER OF FOLLOWING						
		FEMALE CONNECTOR, CA3GD, 4 POLE			932321-100	HIRSCHMANN Electronics GmbH & Co. KG GERMANY	662279	BEJOKEN AB SWEDEN
		FEMALE CONNECTOR, C16-1 TYPE, 4 POLE			T3111-000	AMPHENOL GERMANY	4456158	ELFA SWEDEN
	1	PROTECTION CAP, EITHER OF FOLLOW						
		CA 00 SD 4			831531-100	HIRSCHMANN Electronics GmbH & Co. KG GERMANY	662285	BEJOKEN AB SWEDEN
		C16-1 TYPE			T6483-000	AMPHENOL GERMANY	4456455	ELFA SWEDEN
S1	1	EMERGENCY STOP SWITCH ASSEMBLY			XB4BS542	SCHNEIDER ELECTRIC, SWEDEN	XB4BS542	SCHNEIDER ELECTRIC, FRANCE
	1	NORMALLY OPEN CONTACT			ZBE-101	SCHNEIDER ELECTRIC, SWEDEN	ZBE-101	SCHNEIDER ELECTRIC, FRANCE
OP X1	16	TERMINAL CONTACT			1401019	PHOENIX CONTACT, SWEDEN	1401019	PHOENIX CONTACT, SWEDEN
	2	END STOP E/MBK			1401637	PHOENIX CONTACT, SWEDEN	1401637	PHOENIX CONTACT, SWEDEN
		TERMINAL MARKER, TML (EX5)R, 1-16			5503732	PHOENIX CONTACT, SWEDEN	5503732	PHOENIX CONTACT, SWEDEN
OP C1	1	CABLE OP C1	SG590495-301-01					
OP C8	1	CABLE OP C8	SG590495-302-01					
OP C10	1	CABLE OP C10	SG590495-303-01					
OP CS1	1	CABLE OP CS1	SG590495-304-01					
OP CP1	1	CABLE OP CP1	SG590495-305-01					
1	1	ALUMINIUM ENCLOSURE	SG590495-200-01					
2	1	CABLE GLAND POLYAMID M20, CABLE DIAMETER 8-13mm.			AHLSELL		14 761 13	AHLSELL, SWEDEN
3	1	JAM NUT POLYAMID M20			AHLSELL		14 765 33	AHLSELL, SWEDEN
4	4	STAND OFF, M3 X 20					DSS M3050X20	BIX, SWEDEN
5	4	SCREW, ISO 2009, M3 X 6, ZINC PLATED						
6	4	NUT, ISO 4032, M3						
7	4	WASHER, DIN 125, 3.2 X 6 X 0.5						
8	2	SCREW, ISO 1207, M3 X 10, STAINLESS STEEL						
9	2	PLUG, GRAY, POLYETHYLEN, M20					1470181	AHLSELL, SWEDEN
10	1	SCREW, DIN 7985, M6 X12, ZINC PLATED						
11	1	TERMINAL BLOCK MOUNTING RAIL	SG590495-300-01					
12	2	SCREW,CROSS RECESSED PAN, STEEL, M5X12, DIN 7500						
13	12	CABLE TIE, 71X1,8, BLACK	SG590495-400-01					

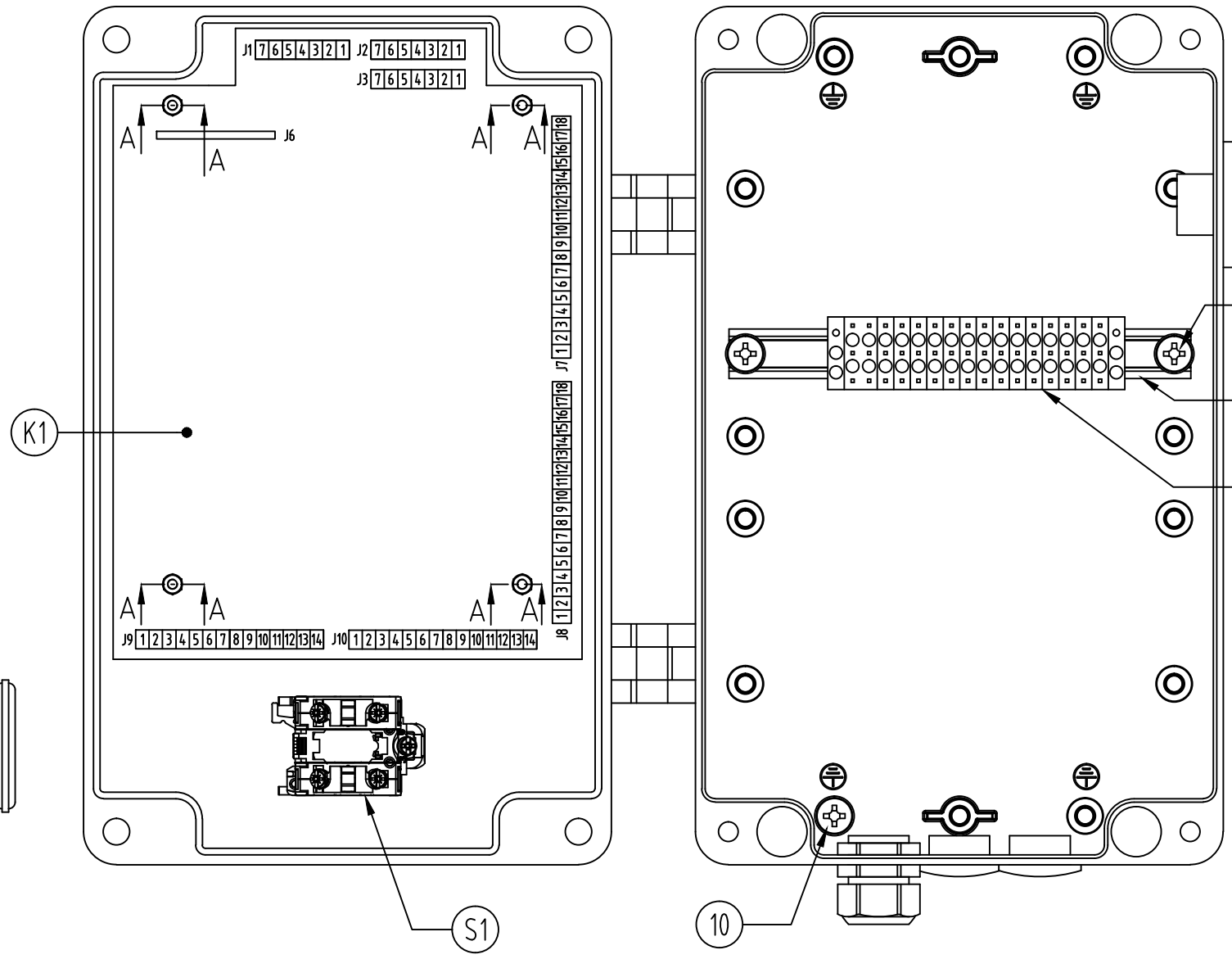
File Name: SG590495-010-01_RVG



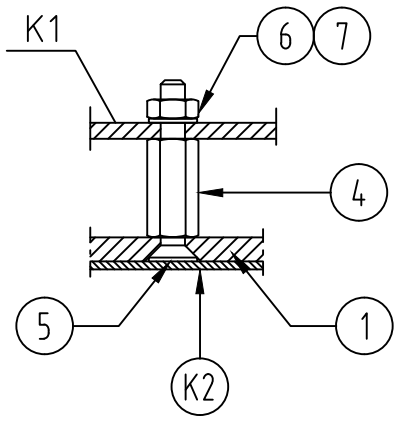
FRONT VIEW



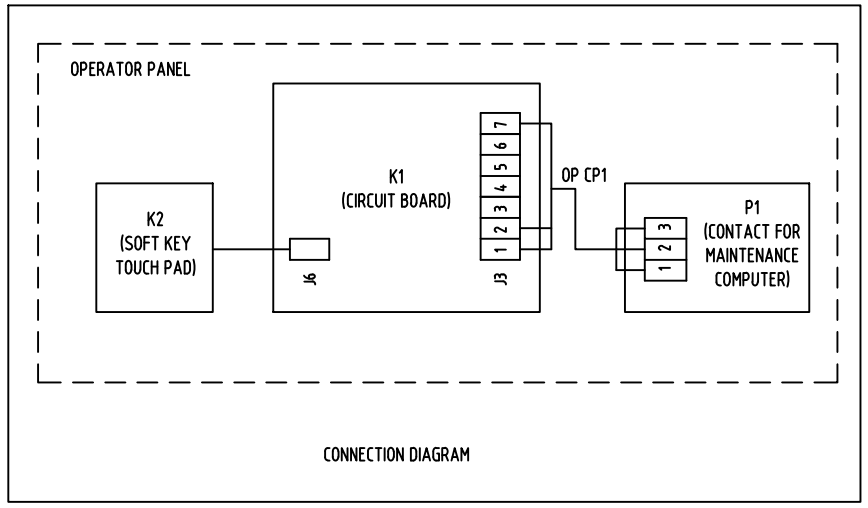
LEFT SIDE VIEW



FRONT VIEW, HOUSING OPENED



SECTION A, SCALE 1:1



CONNECTION DIAGRAM

Revision	Description	Date	Drawn by:	Checked by:	Approved
D	OP X1 position changed.	2014.02.13	K.J.		
C	Terminal Block (OP X1) added.	2013.07.15	K.J.		
B	Item S1 changed.	2005.02.11	G.O.		
A	Items 11 and 12 added	2004.04.28	G.O.		

SAFEGATE GROUP

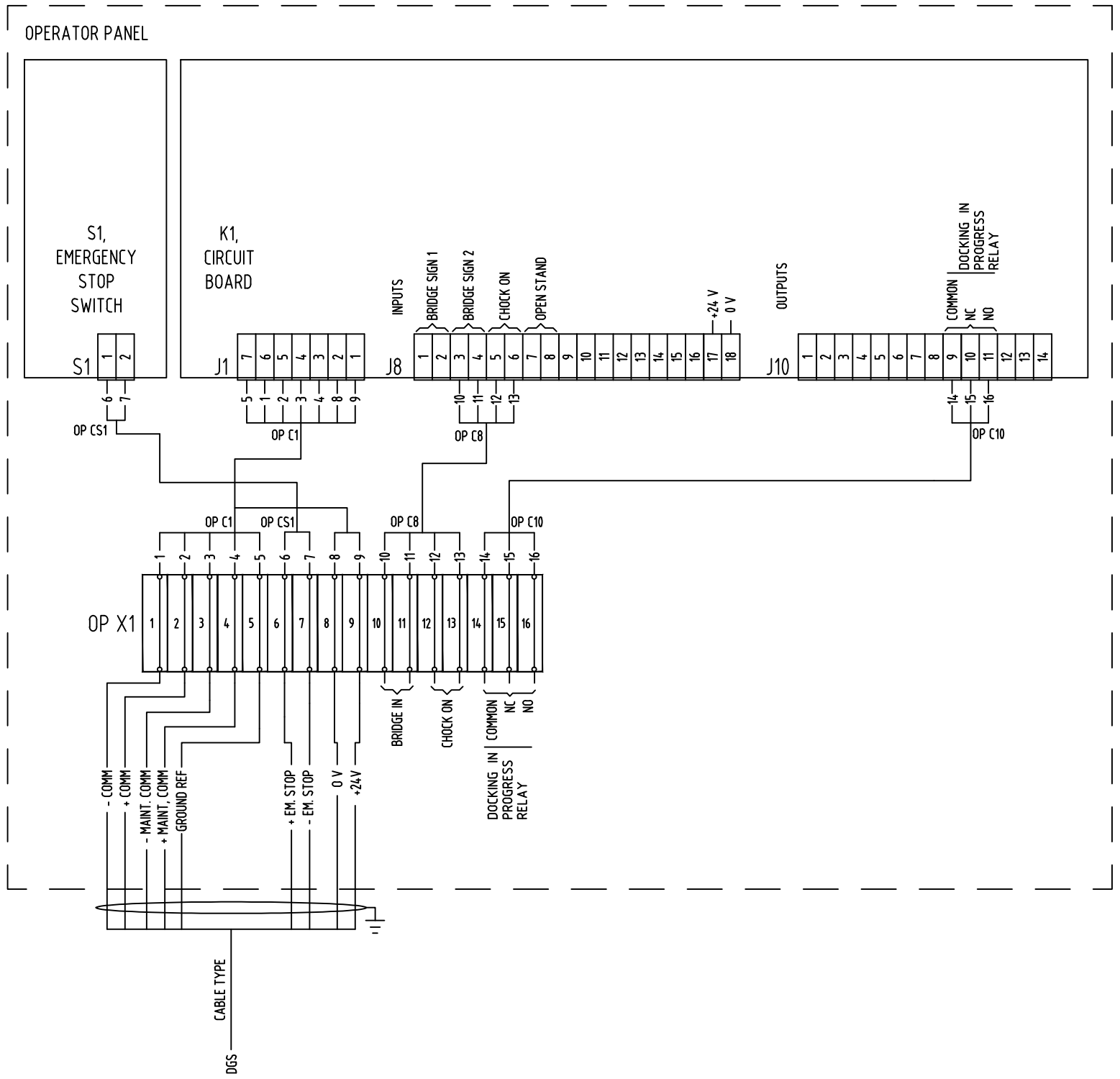
Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to			Sharp Edges
Surface Coating			Weight
Drawn by: G.O.	Date drawn: 2003.11.14	Checked by:	
App. by:	Date approved:	Project No.:	

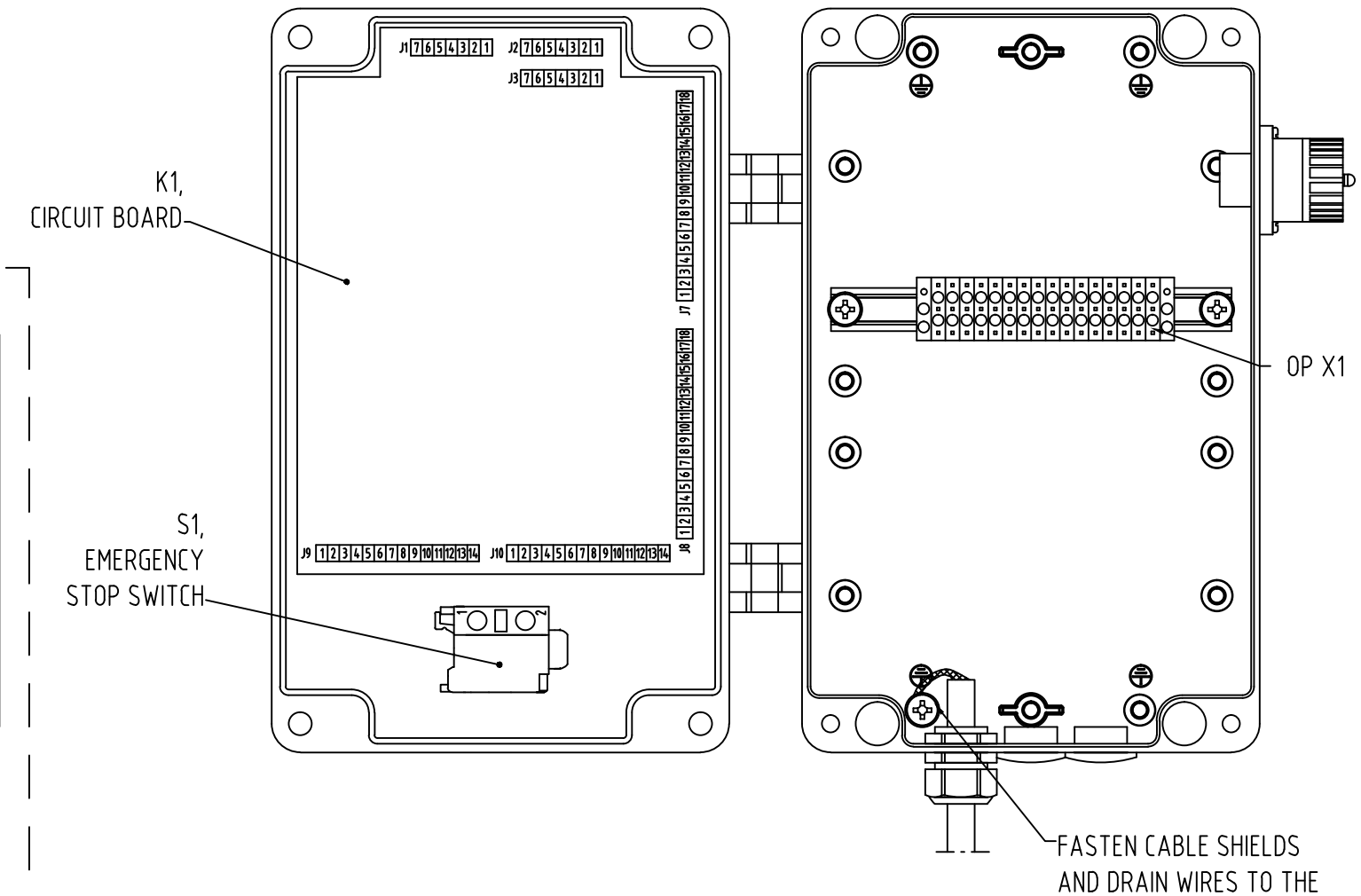
SOFT KEY OPERATOR PANEL

ASSEMBLY AND CONNECTION DIAGRAM

Drawing No.	Rev.	Sheet	Scale
SG590495-011-01	D	1 of 1	-



OPERATOR PANEL, FRONT VIEW WITH COVER OPEN



Revision	Description	Date	Drawn by:	Checked by:	Approved
E	OP X1 position changed. Cable OP CS1 added.	2014.02.13	K.J.		
D	Terminal Block (X1) added.	2013.07.15	K.J.		
C	Connection Diagram changed	2011.02.28	A.S.		
B	Connection Diagram changed	2009.01.08	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by: G.O.	Date drawn: 2004-05-11	Checked by:	
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to

Sharp Edges

Surface Coating

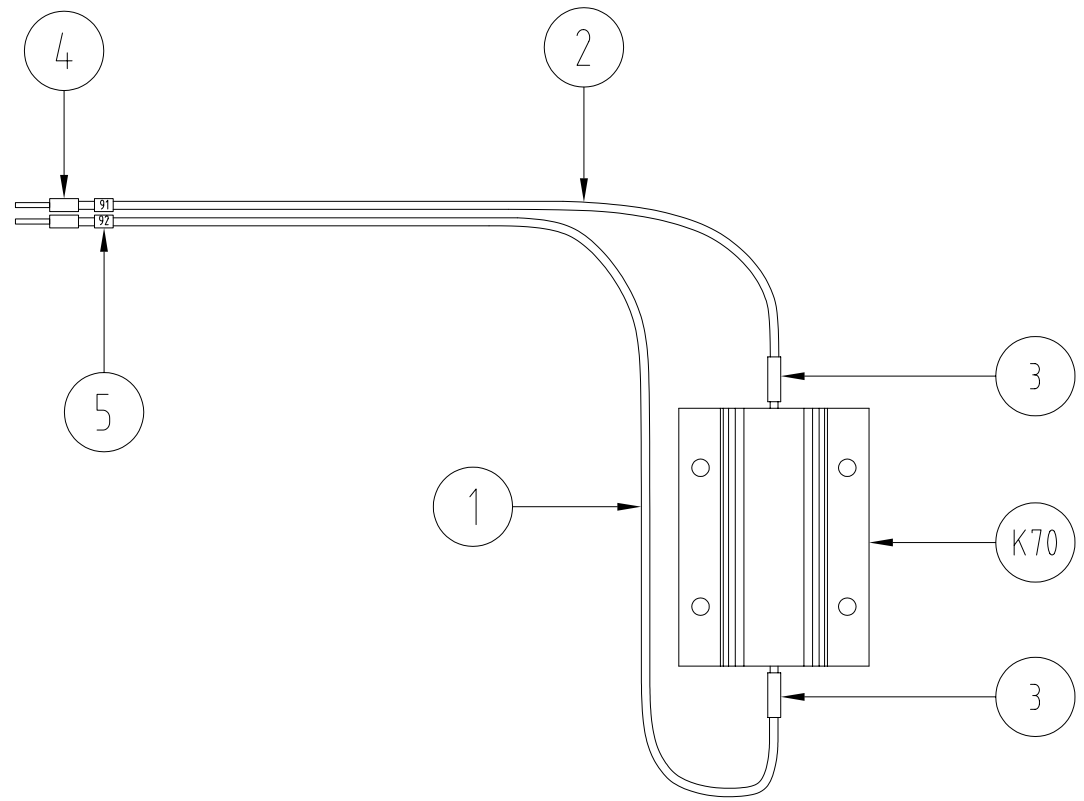
Weight

SOFT KEY OPERATOR PANEL

INSTALLATION DIAGRAM

Drawing No.	Rev.	Sheet	Scale
SG590495-015-01	E	1 of 1	

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
K70		POWER RESISTOR, 10 Ohm, 100 W					60-681-26	ELFA, SWEDEN
1	1	WIRE, UL 1007/A569, AWG 20, L = 270 mm, BLACK			3053 BLACK	ALPHA WIRE, USA	55-229-09	ELFA, SWEDEN
2	1	WIRE, UL 1007/A569, AWG 20, L = 120 mm, BLACK			3053 BLACK	ALPHA WIRE, USA	55-229-09	ELFA, SWEDEN
3	2	SHRINK WRAP, L = 15					55-070-25	ELFA, SWEDEN
4	2	CRIMP LUG, H 0,5/14			9026060000	WEIDMÜLLER, GERMANY	9026060000	WEIDMÜLLER, SWEDEN
5		WIRE MARKERS						
	1	PARTEX PA02, TEXT: 1					11-01044101	WEIDMÜLLER, SWEDEN
	1	PARTEX PA02, TEXT:2					11-01044102	WEIDMÜLLER, SWEDEN
	2	PARTEX PA02, TEXT: 9					11-01044109	WEIDMÜLLER, SWEDEN



Revision	Description	Date	Drawn by:	Checked by:	Approved
A	Items 1 and 2 changed	2004-09-20	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2004-01-19				

Unless otherwise indicated, all tolerances are according to

Sharp Edges

Surface Coating

Weight

HEATING ELEMENT
FOR SCANNING ASSEMBLY

Drawing No.	Rev.	Sheet	Scale
SG590512-001-01	A	1 of 1	NO SCALE

SG590525-000-01

PRODUCT CONFIGURATION FILE,

SOFT KEY OPERATOR PANEL

REVISIONS
A. Item K2 Changed. Terminal contact (OPX1) + cables added. By K.J. Date 2013-12-03
B. OP X1 position changed, cables added. By: K.J. Date 2014-02-24

ASSMBLY LEVEL DOCUMENT LIST

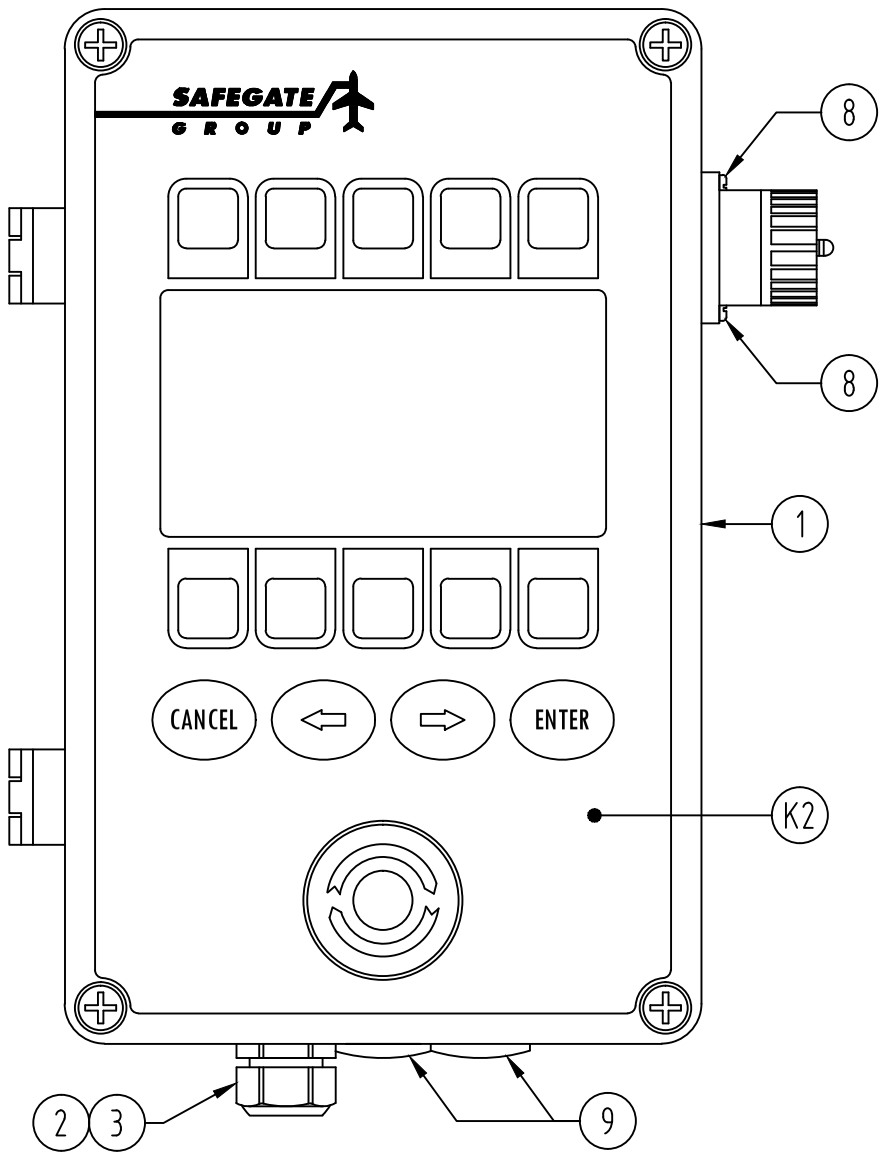
SG590525-000-01	PRODUCT CONFIGURATION FILE
SG590525-001-01	ASSEMBLY AND CONNECTION DIAGRAM
SG590525-005-01	INSTALLATION DIAGRAM

COMPONENT AND PARTS LIST

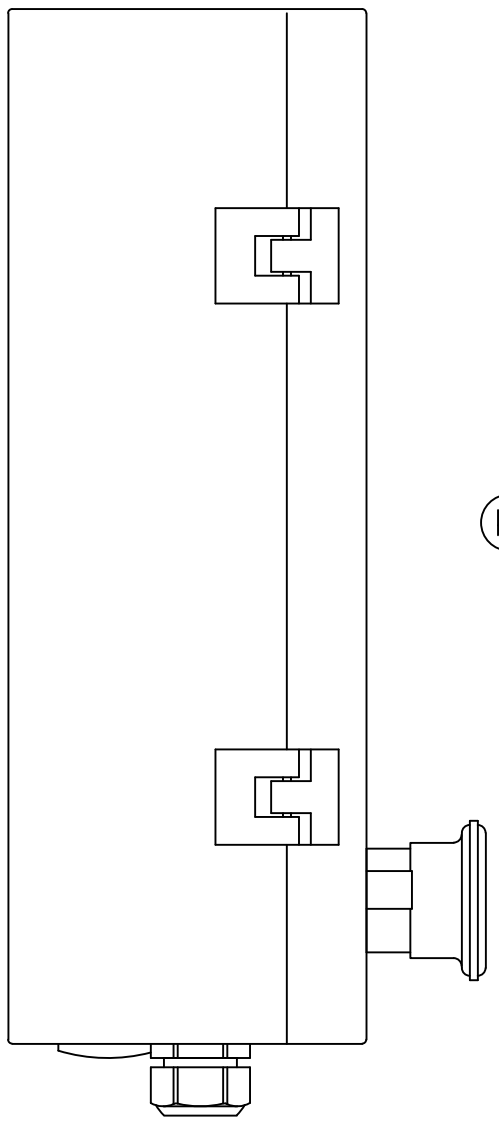
POSITION	QUANTITY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PROD. NO.	MANU. PART NO.	MANUFACTURER	SUPPLIER'S. PART NO.	SUPPLIER
K1	1	CIRCUIT BOARD	SG590495-000-01					
K2	1	SOFT KEY TOUCH PAD			18071, Rev. A1	STEELGRAPH, SWEDEN		
P1	1	CONNECTOR, EITHER OF FOLLOWING						
		FEMALE CONNECTOR, CA3GD, 4 POLE			932321-100	HIRSCHMANN Electronics GmbH & Co. KG GERMANY	662279	BEJOKEN AB SWEDEN
		FEMALE CONNECTOR, C16-1 TYPE, 4 POLE			T3111-000	AMPHENOL GERMANY	4456158	ELFA SWEDEN
	1	PROTECTION CAP, EITHER OF FOLLOW						
		CA 00 SD 4			831531-100	HIRSCHMANN Electronics GmbH & Co. KG GERMANY	662285	BEJOKEN AB SWEDEN
		C16-1 TYPE			T6483-000	AMPHENOL GERMANY	4456455	ELFA SWEDEN
S1	1	SWITCH ASSEMBLY, DEAD MAN			XB4-BC21	SCHNEIDER ELECTRIC, SWEDEN	XB4-BC21	SCHNEIDER ELECTRIC, FRANCE
OP X1	16	TERMINAL CONTACT			1401019	PHOENIX CONTACT, SWEDEN	1401019	PHOENIX CONTACT, SWEDEN
	2	END STOP E/MBK			1401637	PHOENIX CONTACT, SWEDEN	1401637	PHOENIX CONTACT, SWEDEN
		TERMINAL MARKER, TML (EX5)R, 1-16			5503732	PHOENIX CONTACT, SWEDEN	5503732	PHOENIX CONTACT, SWEDEN
OP C1	1	CABLE OP C1	SG590495-301-01					
OP C8	1	CABLE OP C8	SG590495-302-01					
OP C10	1	CABLE OP C10	SG590495-303-01					
OP CS1	1	CABLE OP CS1	SG590495-304-01					
OP CP1	1	CABLE OP CP1	SG590495-305-01					
1	1	ALUMINIUM ENCLOSURE	SG590495-200-01					
2	1	CABLE GLAND, POLYAMID, M20, CABLE DIAMETER 8-13mm.			AHLSELL		14 761 13	AHLSELL, SWEDEN
3	1	JAM NUT, POLYAMID, M20			AHLSELL		14 765 33	AHLSELL, SWEDEN
4	4	STAND OFF, M3 X 20					DSS M3050X20	BIX, SWEDEN
5	4	SCREW, ISO 2009, M3 X 6, ZINC PLATED						
6	4	NUT, ISO 4032, M3						
7	4	WASHER, DIN 125, 3.2 X 6 X 0.5						

8	2	SCREW, ISO 1207, M3 X 10, STAINLESS STEEL						
9	2	PLUG, GRAY, POLYETHYLEN, M20					1470181	AHLSELL, SWEDEN
10	1	SCREW, DIN 7985, M6 X12, ZINC PLATED						
11	1	TERMINAL BLOCK MOUNTING RAIL	SG590495-300-01					
12	2	SCREW, CROSS RECESSED PAN, STEEL, M5X12, DIN 7500						
13	12	CABLE TIE, 71X1,8, BLACK	SG590495-400-01					

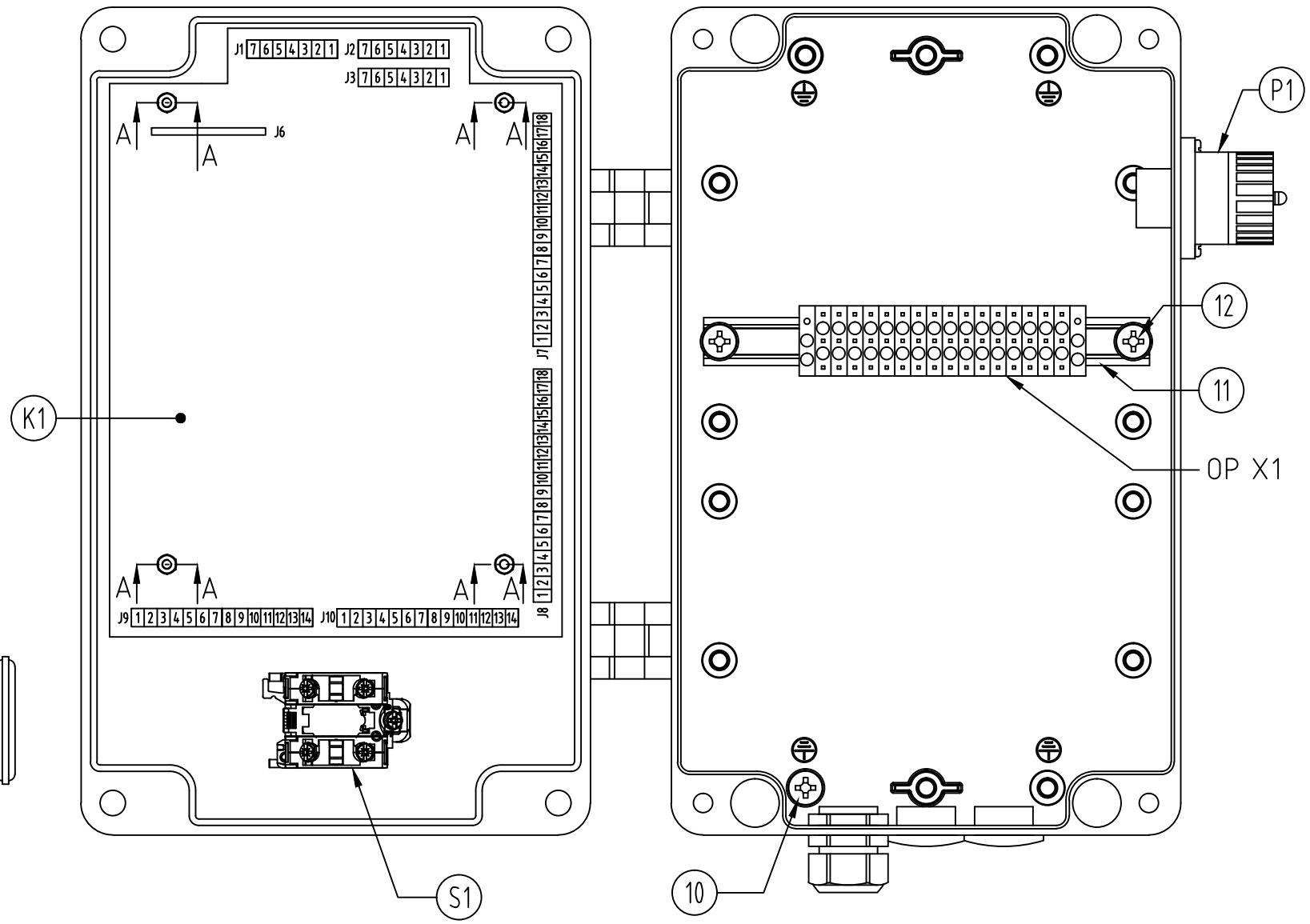
Note: Part number refers to package of 100 pcs.



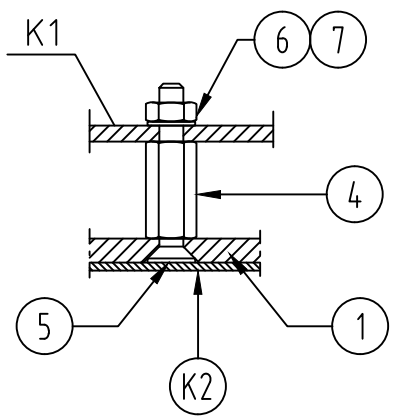
FRONT VIEW



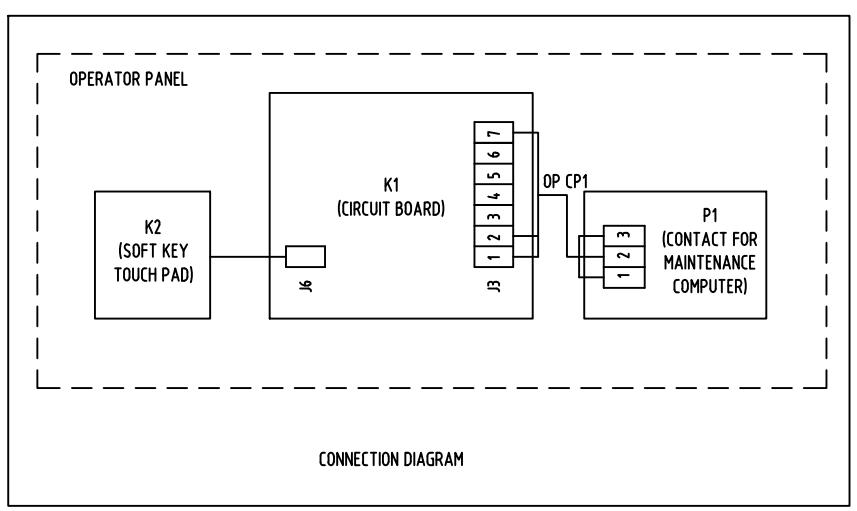
LEFT SIDE VIEW



FRONT VIEW, HOUSING OPENED



SECTION A



Revision	Description	Date	Drawn by:	Checked by:	Approved
B	Terminal Block (OP X1) position changed. Cable CP1 added.	2014.02.24	K.J.		
A	Terminal Block (OP X1) added.	2013.12.03	K.J.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	
G.O.	2004.11.03		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to

Sharp Edges

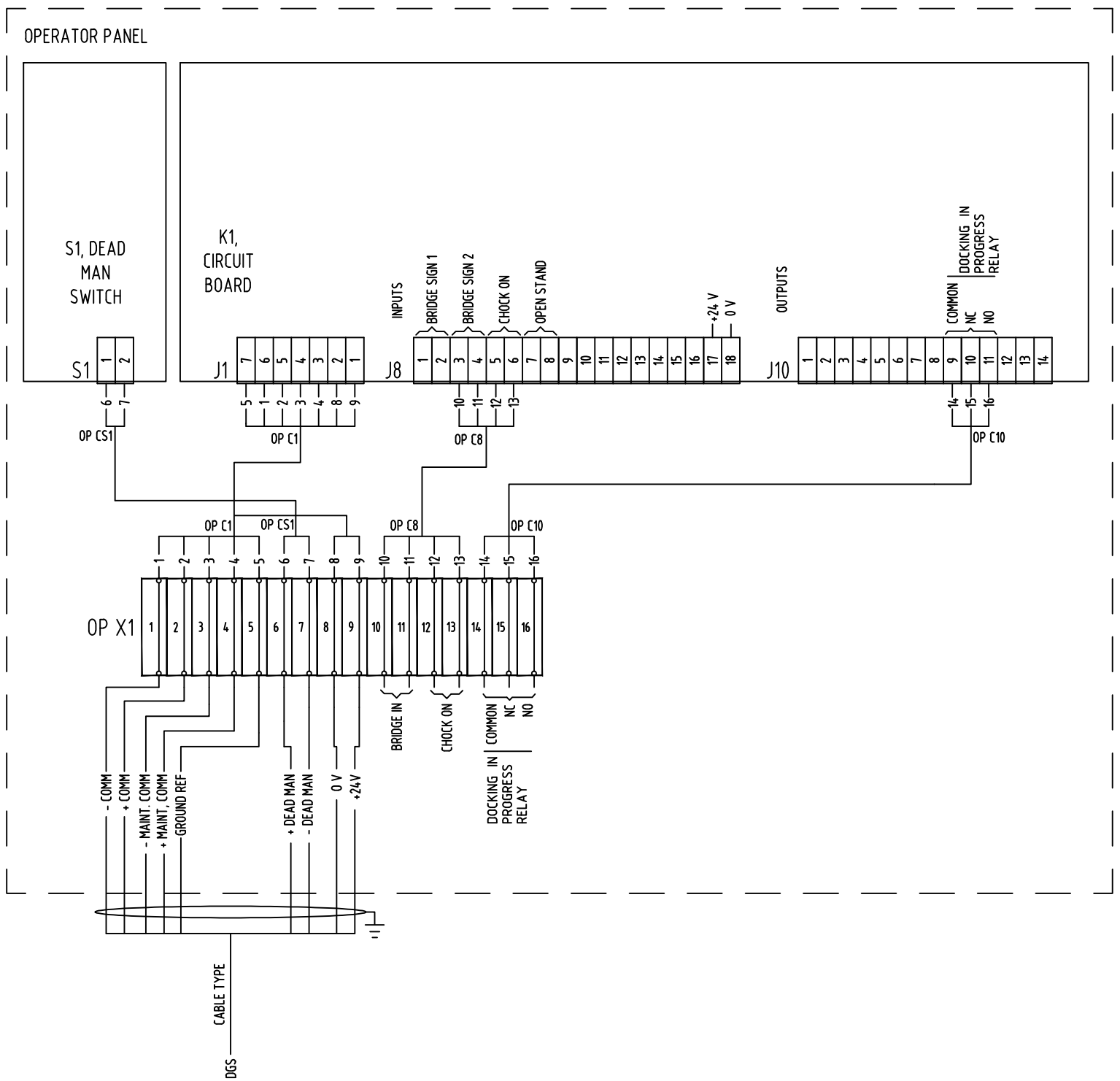
Surface Coating

Weight

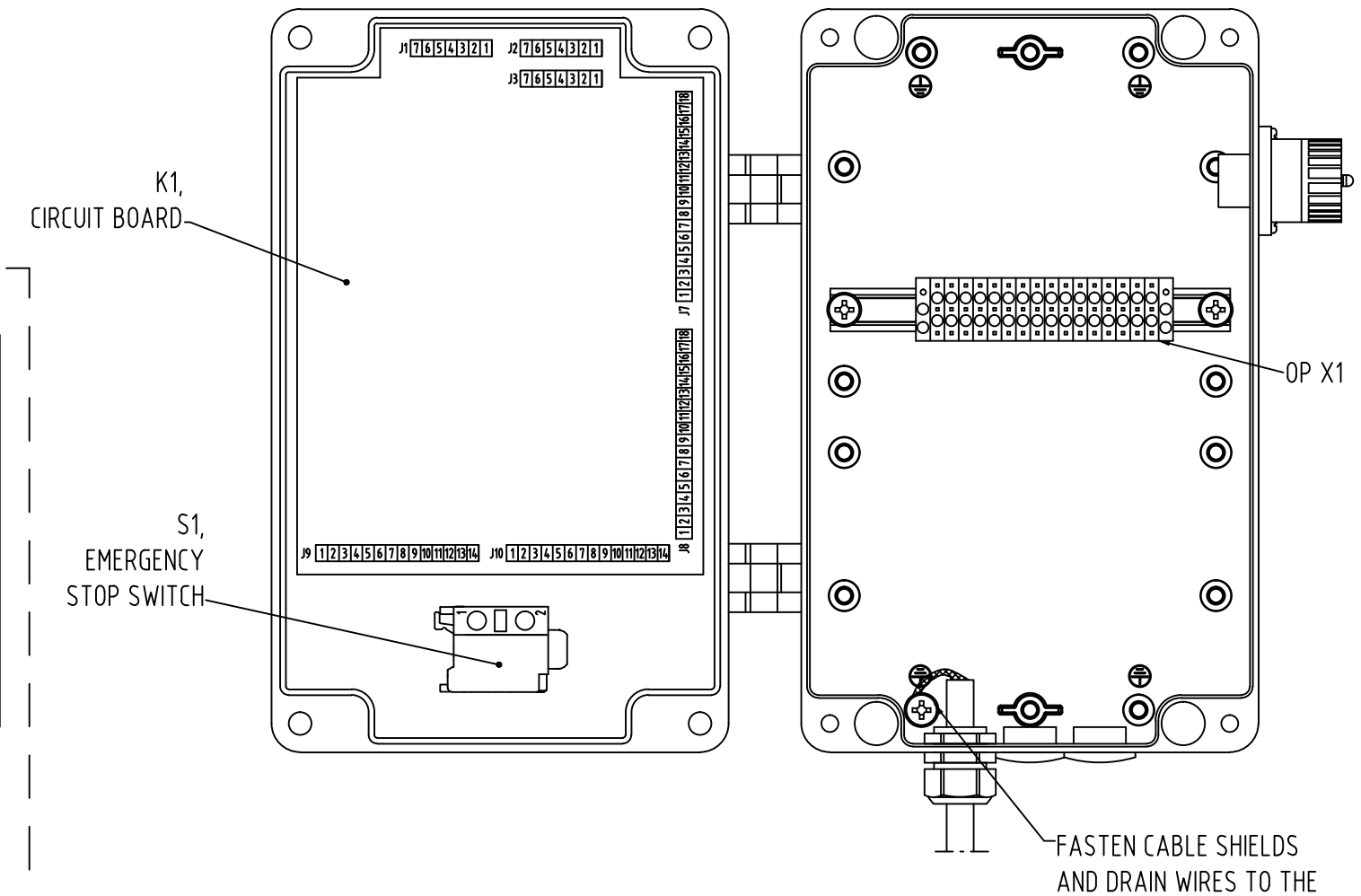
SOFT KEY OPERATOR PANEL
WITH DEAD MAN SWITCH

ASSEMBLY AND CONNECTION DIAGRAM

Drawing No.	Rev.	Sheet	Scale
SG590525-001-01	B	1 of 1	



OPERATOR PANEL, FRONT VIEW WITH COVER OPEN



Revision	Description	Date	Drawn by:	Checked by:	Approved
B	Terminal Block (OP X1) position changed. Cables added.	2014.02.24	K.J.		
A	Terminal Block (X1) added. J8 and J10 added in diagram.	2013.12.03	K.J.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by: G.O.	Date drawn: 2004-11-03	Checked by:	
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to | Sharp Edges

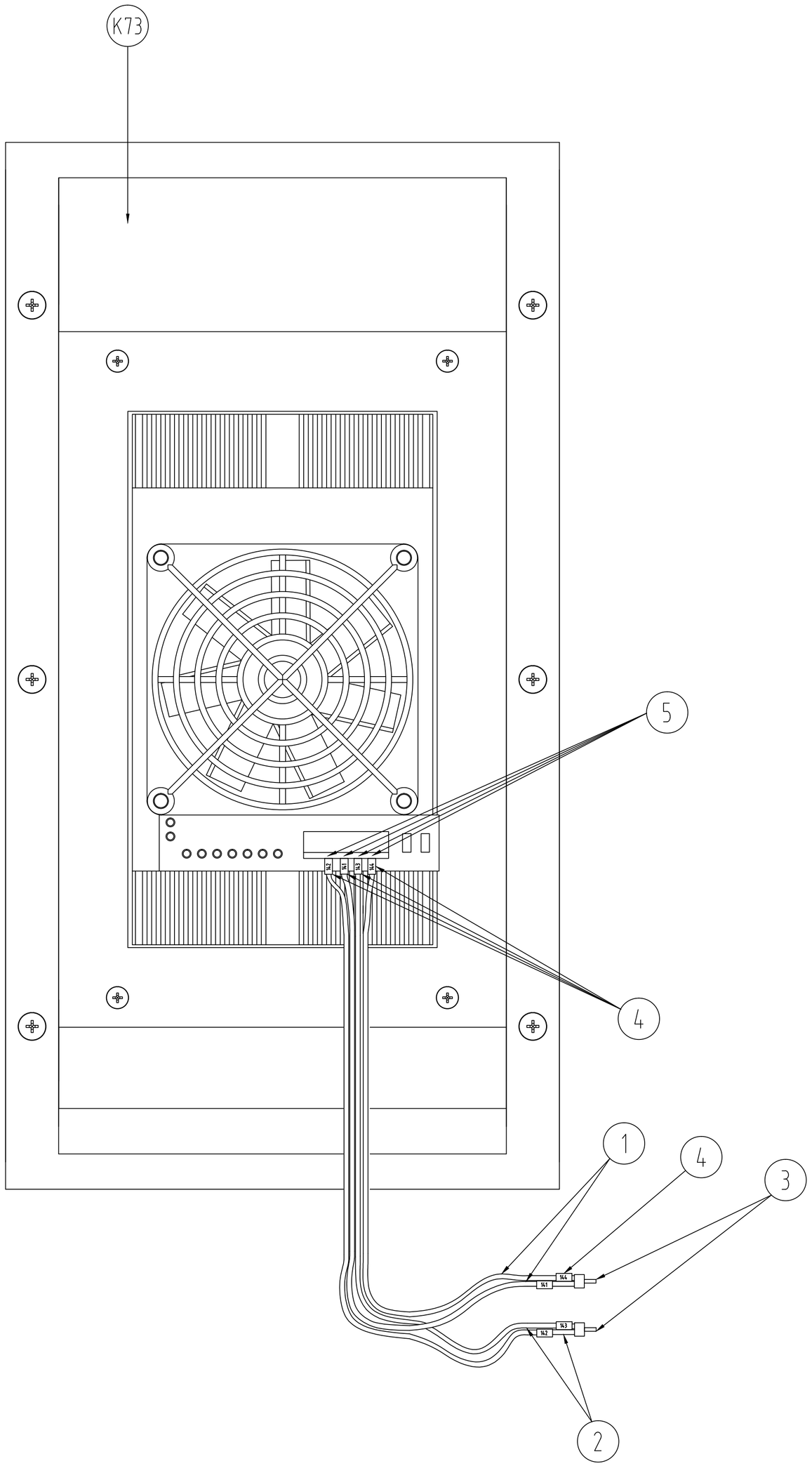
Surface Coating | Weight

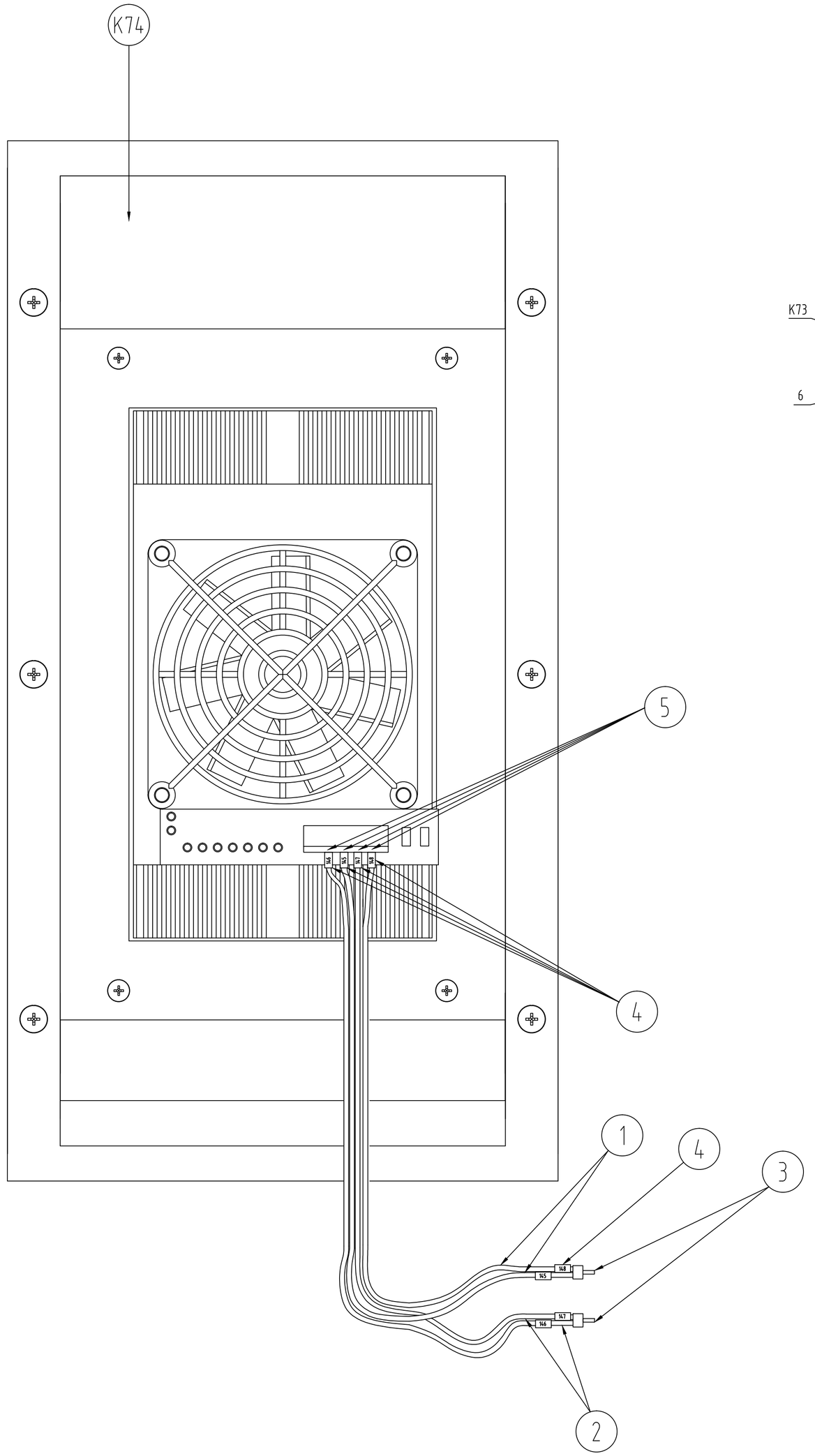
SOFT KEY OPERATOR PANEL
WITH DEAD MAN SWITCH

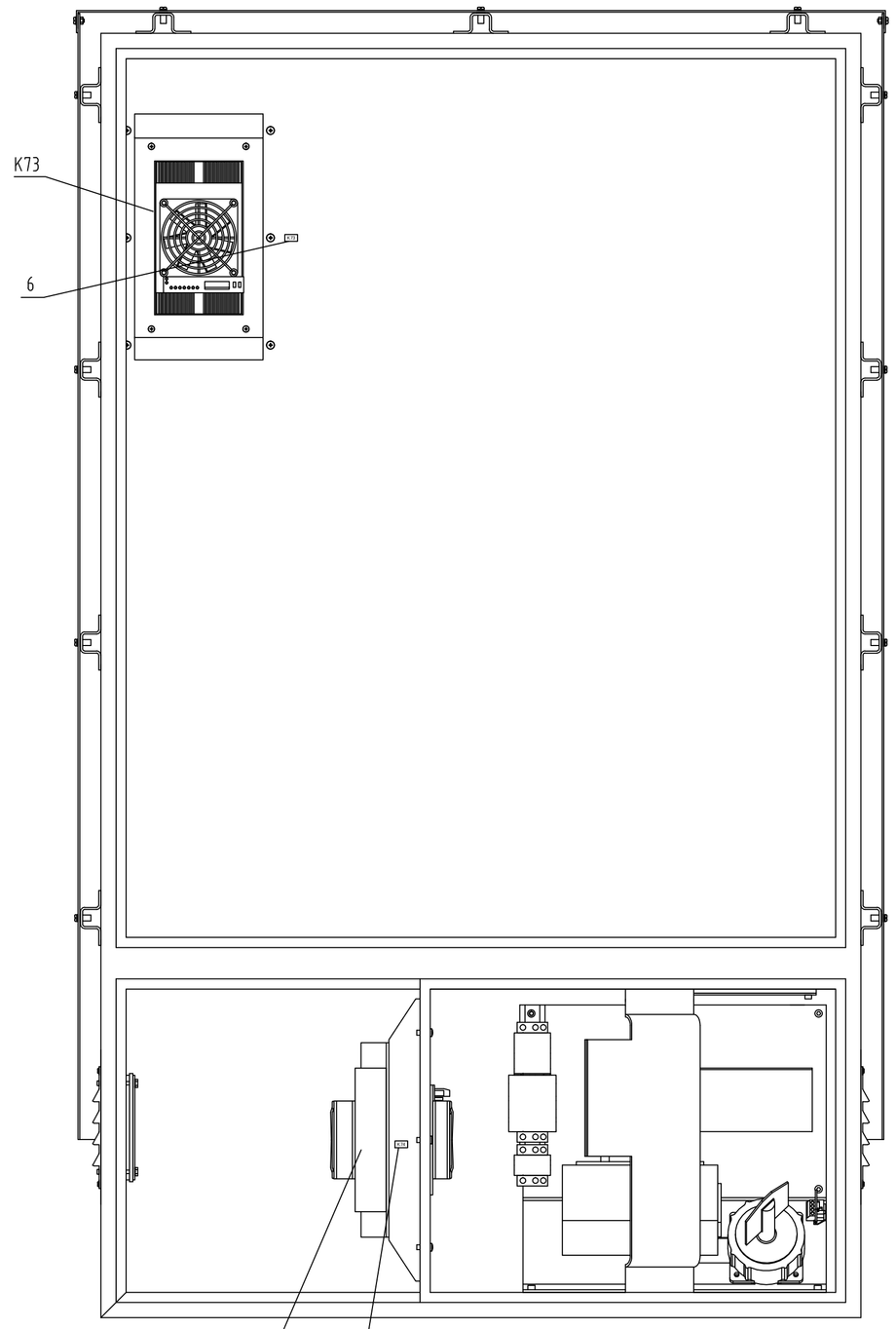
INSTALLATION DIAGRAM

Drawing No.	Rev.	Sheet	Scale
SG590525-005-01	B	1 of 1	

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	4	WIRE, UL1007/1569, AWG 20, BLACK						
2	4	WIRE, UL1007/1569, AWG 20, RED						
3	4	CRIMP LUG, H 2x0.5						
4	4	WIRE MARKERS, PARTEX PA02						
5	4	CRIMP LUG, H 0.5/14						
K73-K74	2	COOLING UNIT	SG590543-100-01					
6	1	COMPONET IDENTIFIER LABEL, YELLOW, 15x8mm, TEXT: K73					21302G	TECHNOTRADE SCANDINAVIA AB, SWEDEN
7	1	COMPONET IDENTIFIER LABEL, YELLOW, 15x8mm, TEXT: K74					21302G	TECHNOTRADE SCANDINAVIA AB, SWEDEN







COMPONET PLACEMENT IN
DOCKING GUIDANCE UNIT

Revision	Description	Date	Drawn by:	Checked by:	Approved
D	Cable changed	2011.01.22	A.S.		
C	Drawing and BOM changed	2011.11.17	A.S.		
B	T2 changed, possition for T2 changed	2011.03.22	A.S.		
A	Connection for K73 and K74 changed	2005.09.14	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

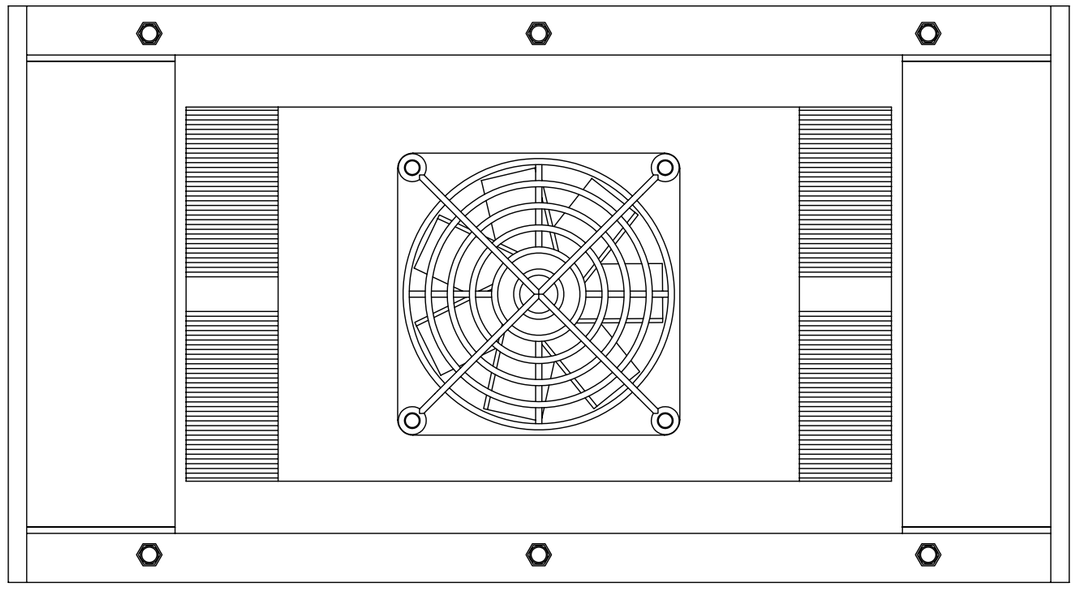
Unless otherwise indicated, all tolerances are according to | Sharp Edges
Surface Coating | Weight

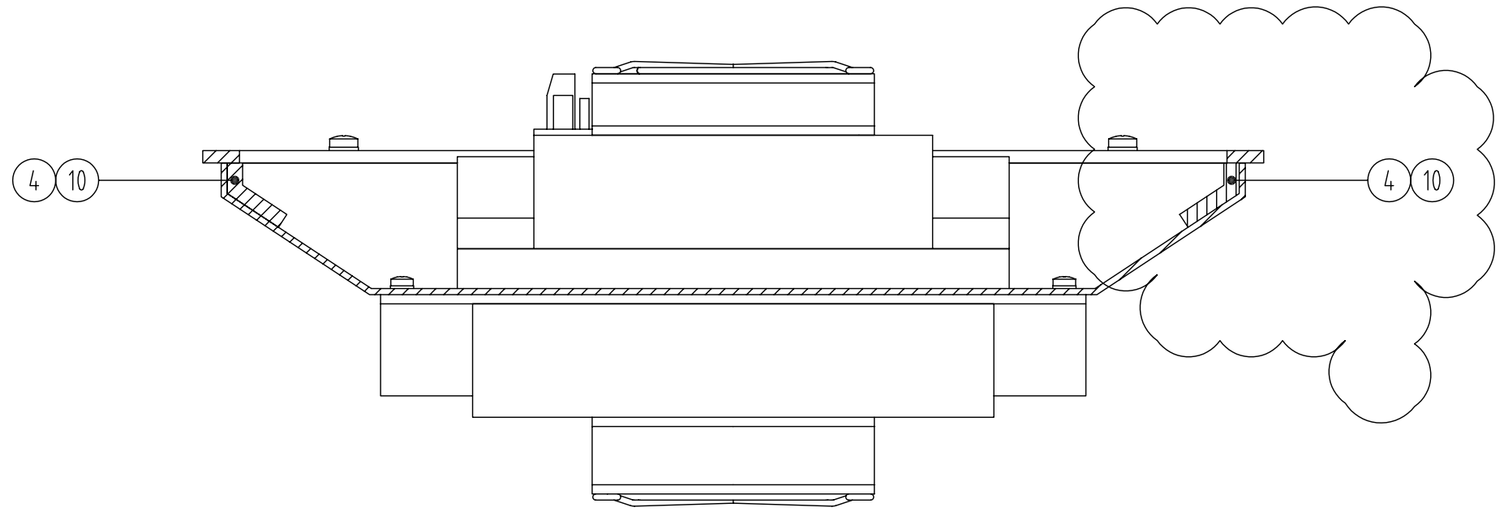
COOLING ASSEMBLY, T2

Drawn by:	Date drawn:	Checked by:
G.O.	2005.08.17	

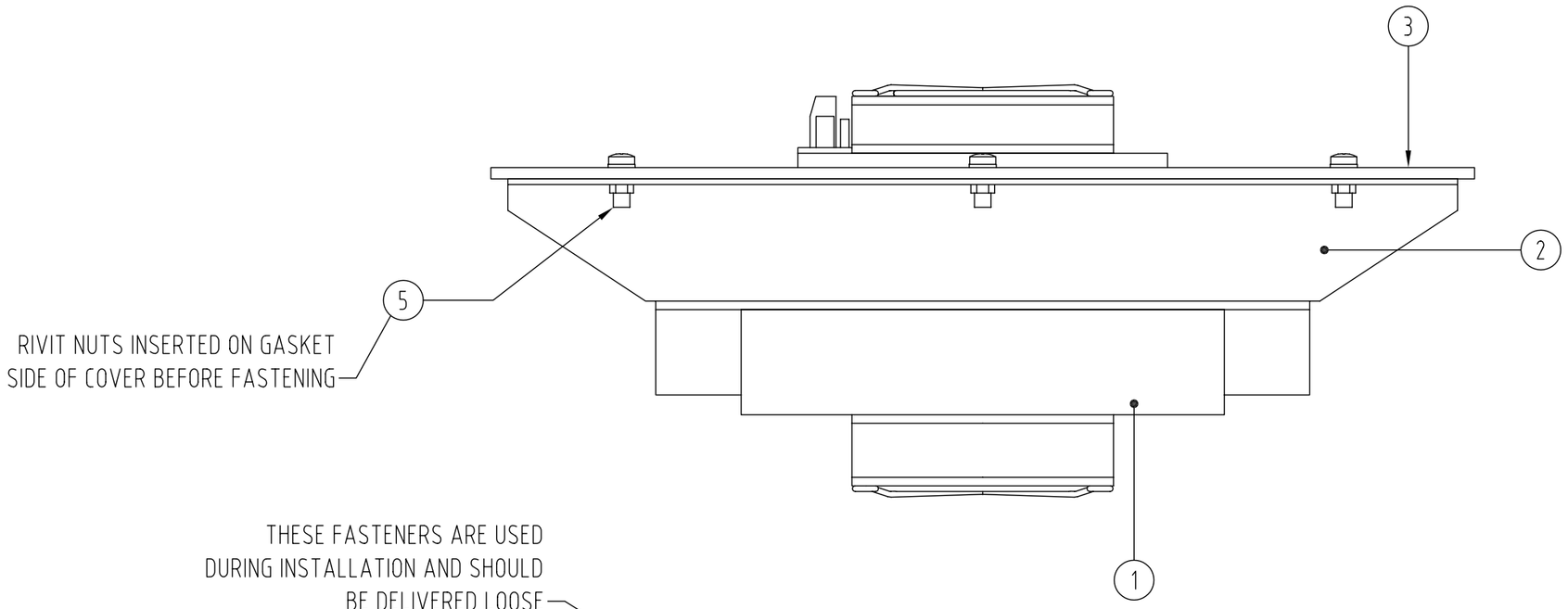
App. by:	Date approved:	Project No.:

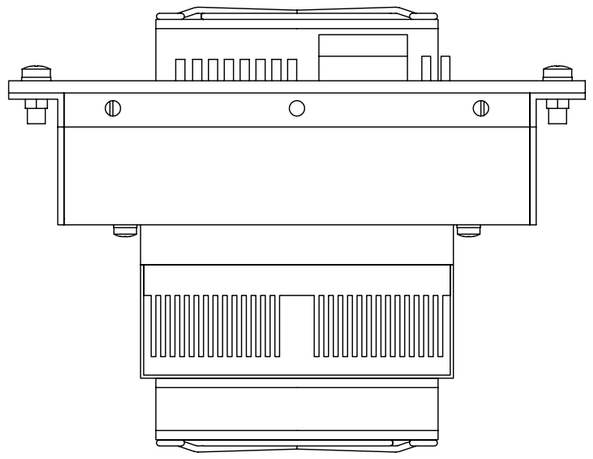
Drawing No.	Rev.	Sheet	Scale
SG590543-001-01	D	1 of 1	1:2

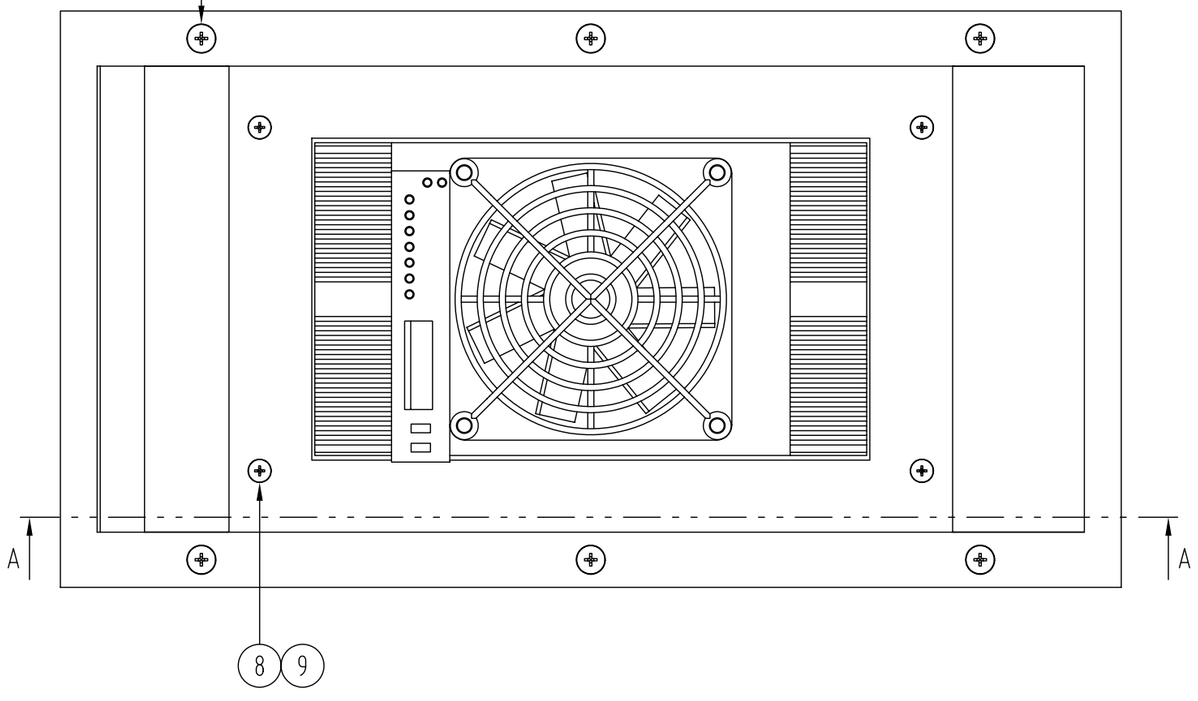




SECTION A-A







Revision	Description	Date	Drawn by:	Checked by:	Approved
C	Extra filter, Item 4, added.	2007.08.06	G.O.		
B	Section A-A added	2006.11.09	G.O.		
A	Views uppdated to reflect change of supercooler model	2005.09.13	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:
G.O.	2005.08.17	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to | Sharp Edges

Surface Coating | Weight

COOLING UNIT

SEE SG590543-100-02 FOR PARTS LIST

Drawing No.	Rev.	Sheet	Scale
SG590543-100-01	C	1 of 1	1:2

SG590543-100-02

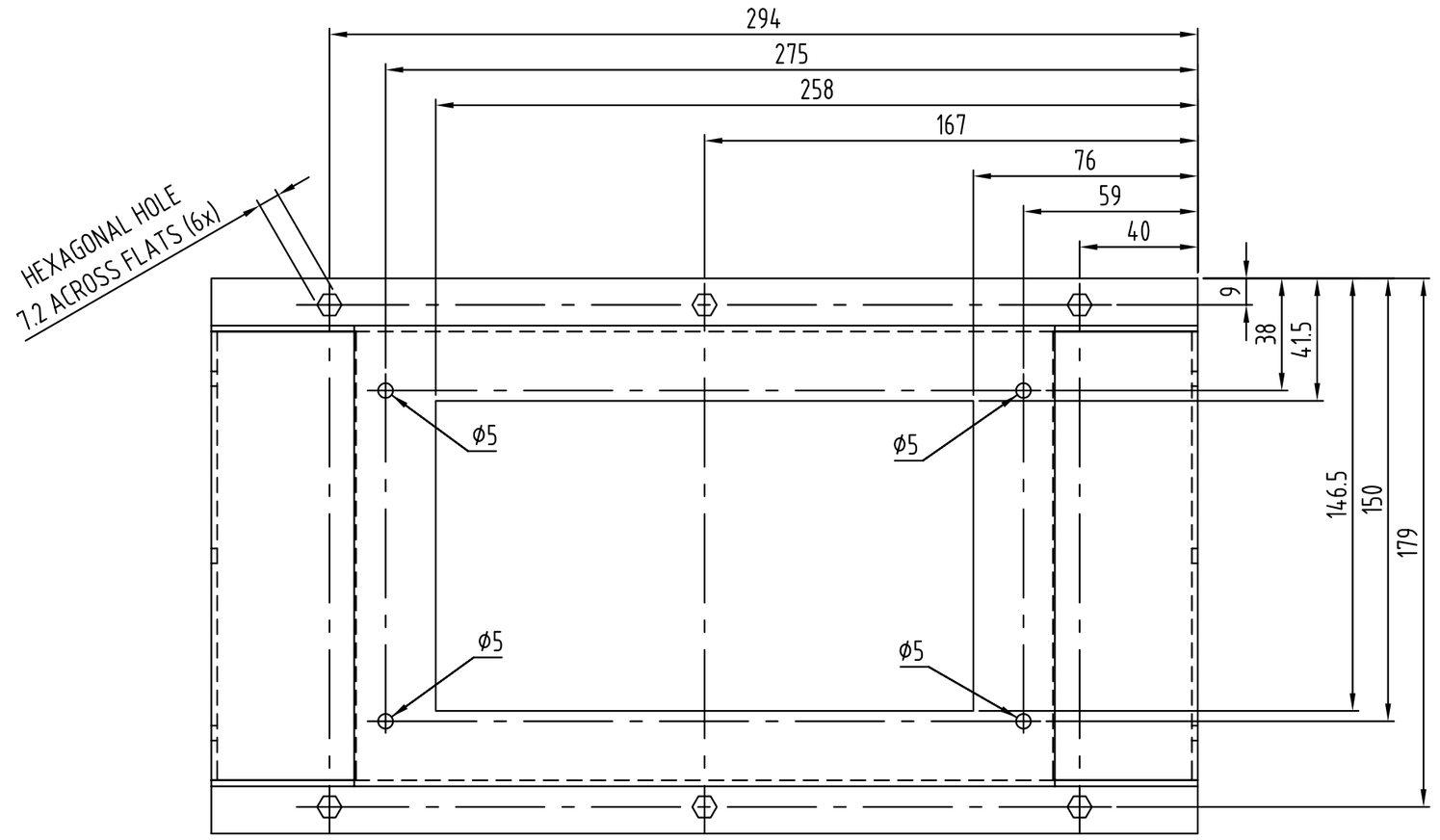
COOLING UNIT

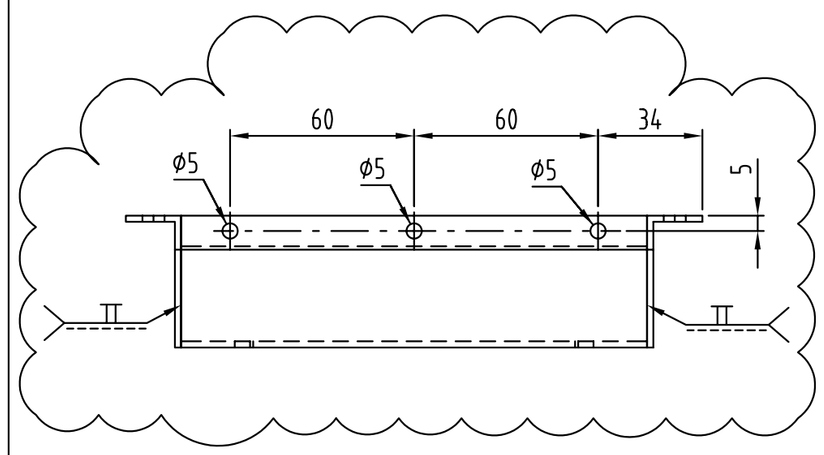
REVISIONS
A. Item 1, Part No. Changed. By: G.O. Date: 2005.09.14
B. Item 4, Quantity changed. By: G.O. Date 2007.08.06

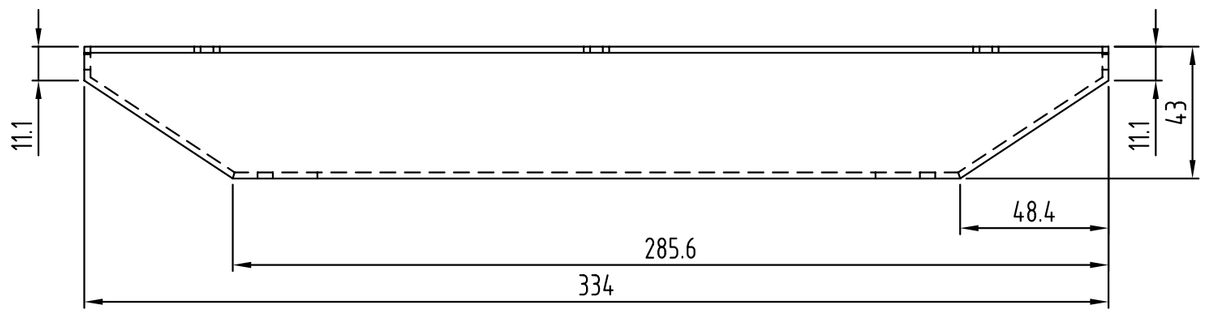
COMPONENT AND PARTS LIST FOR SG590543-100-01

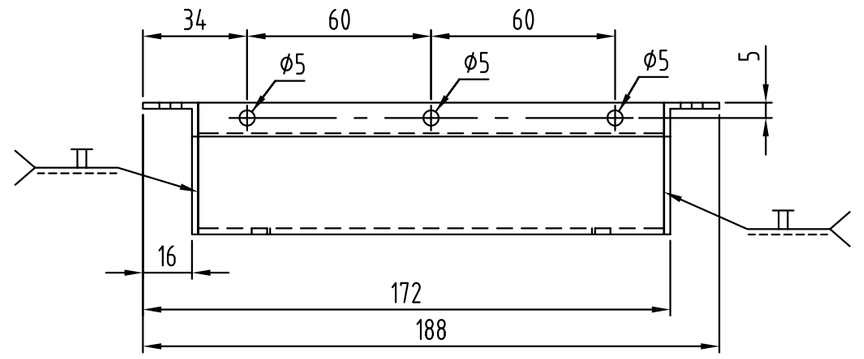
POSITION	QUANTITY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PROD. NO.	MANU. PART NO.	MANUFACTURER	SUPPLIER'S. PART NO.	SUPPLIER
1	1	THERMOELECTRIC COOLER, 24 V, 58W AIR TO AIR			AA-060-24-23-00-10	SUPERCOOL AB, SWEDEN	AA-060-24-23-00-10	SUPERCOOL AB, SWEDEN
2	1	COOING UNIT COVER	SG590543-200-01					
3	1	GASKET	SG590543-201-01					
4	2	FILTER	SG590543-202-01					
5	6	RIVIT NUT. M5, CLOSED, HEXAGONAL, STAINLESS STEEL						
6	6	SCREW, DIN-7985, M5x16, STAINLESS STEEL						
7	6	LOCKWASHER, DIN 127B,5.1x9.2x1.2, STAINLESS STEEL						
8	4	SCREW, DIN-7985, M4x12, STAINLESS STEEL						
9	4	LOCKWASHER, DIN 127B, 4.1x7.6x0.9, STAINLESS STEEL						
10		SPRAY ADHESIVE, TYPE 76 (See Note)				3M		

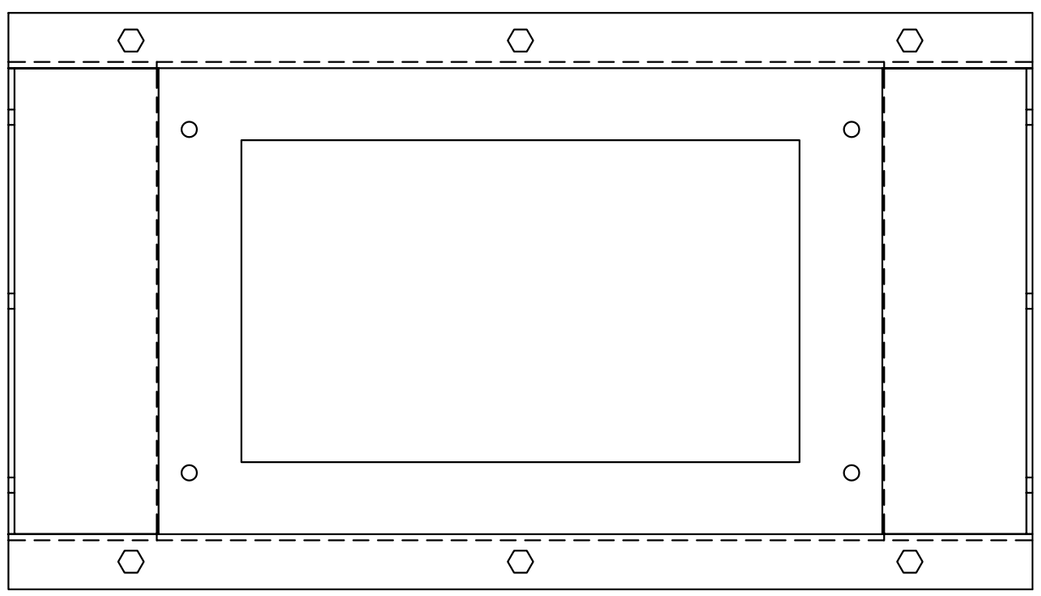
Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
		ALUMINUM SHEET, EN1050-14, t = 2						











PAINT NOTES:
PAINT: POWDER PAINT
INTERPON D2000, COLOR: VENUS OR
INTERPON 810, RAL COLORS
COLOR SPECIFIED WITH ORDER
MANUFACTURER: AKZO NOBEL POWDER COATINGS
BEFORE PAINTING, THE PART SHALL BE COATED
WITH BONDERITE NT CONVERSION COATING.
APPLICATION OF THE CONVERSION COAT SHALL
FOLLOW THE PRETREATMENT PROCESS SPECIFIED
BY THE CONVERSION COATING MANUFACTURER,
HENKEL TECHNOLOGIES.

Revision	Description	Date	Drawn by:	Checked by:	Approved
B	Three Ø5 holes added	2007.08.06	G.O.		
A	PAINT NOTE ADDED	2006.03.10	G.O.		

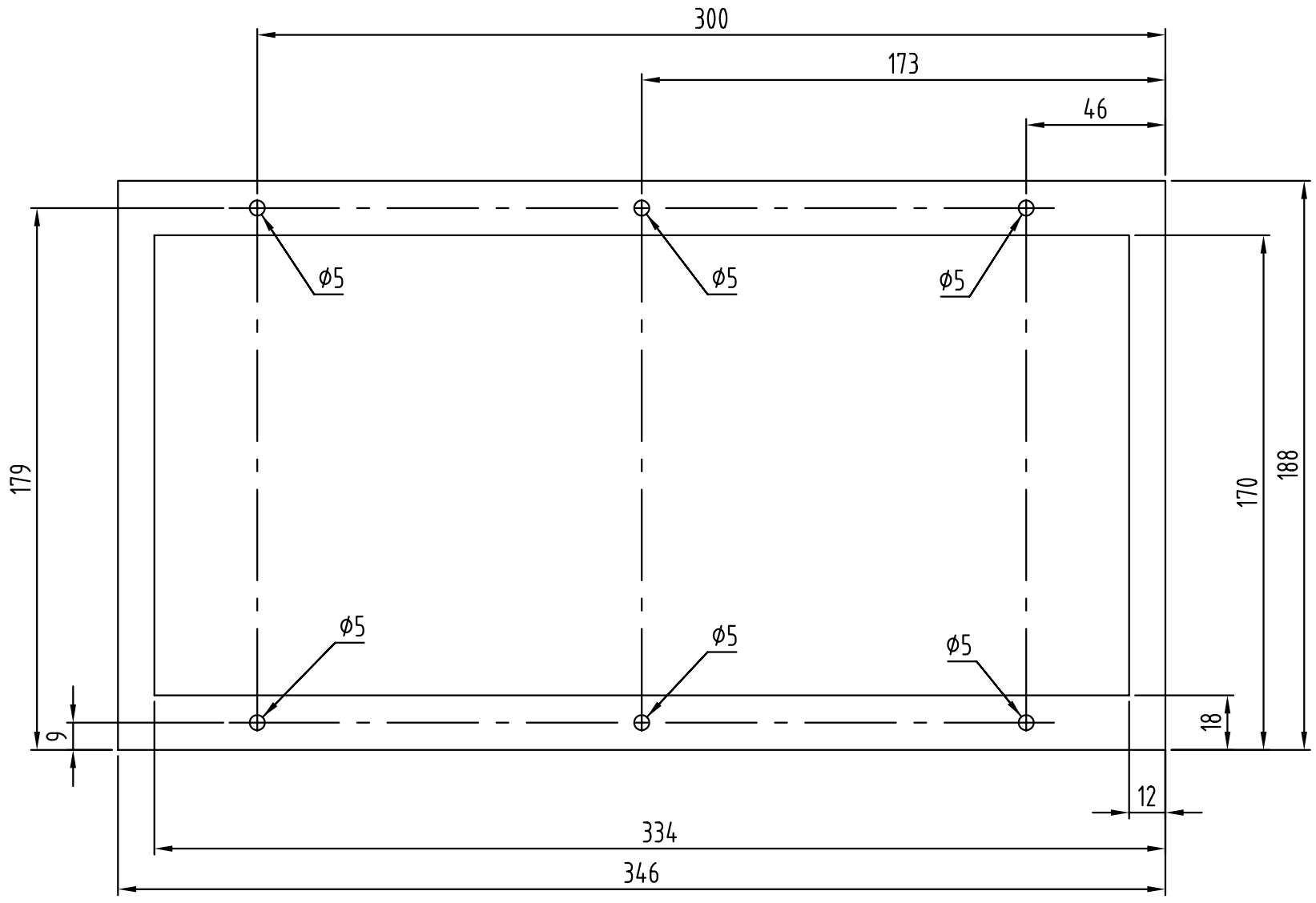
SAFEGATE GROUP
Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to ISO-2768-m
Sharp Edges R = 0.5
Surface Coating
Weight

COVER
FOR SUPERCOOLER

Drawn by:	Date drawn:	Checked by:	Drawing No.	Rev.	Sheet	Scale
G.O.	2005.08.16		SG590543-200-01	B	1 of 1	1:2
App. by:	Date approved:	Project No.:				

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
		FOAM RUBBER, CLOSED CELL EPDM-SBR, t = 4			1722	NATIONAL GUMMI, SWEDEN	1722	NATIONAL GUMMI, SWEDEN



Revision	Description	Date	Drawn by:	Checked by:	Approved
A	Hanging dimension corrected	2005.08.23	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2005.08.16				

Unless otherwise indicated, all tolerances are according to ISO-2768-m

Sharp Edges

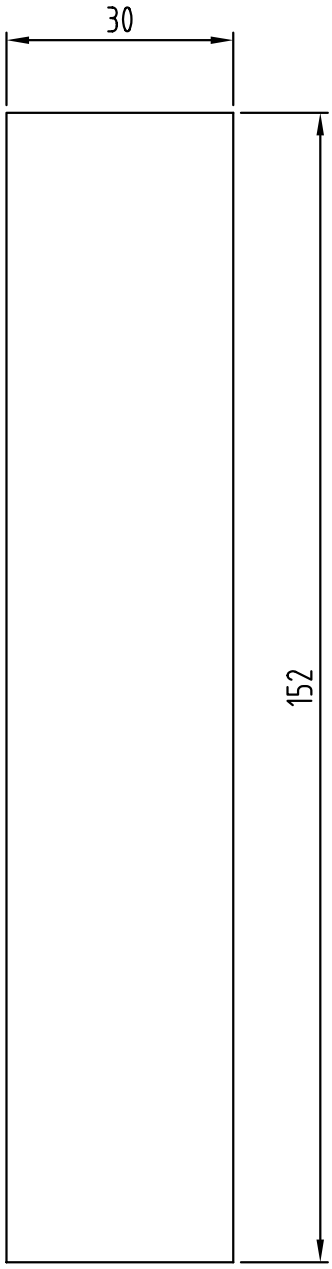
Surface Coating

Weight

GASKET
SUPERCOOLER COVER

Drawing No.	Rev.	Sheet	Scale
SG590543-201-01	A	1 of 1	1:1

Revision	Description	Date	Drawn by:	Checked by:	Approved



MANUFACTURER:
RITTAL SCANDINAVIA AB
PACKAGE OF 5
SIZE: 176x176

		FILTER MATERIAL	SK3181.100		SEE NOTE
Item No	Qty.	Name	Description	Dimensions	Remark

Unless otherwise indicated, all tolerances are according to ISO-2768-c

Sharp Edges

Surface Coating

Weight

SAFEGATE GROUP

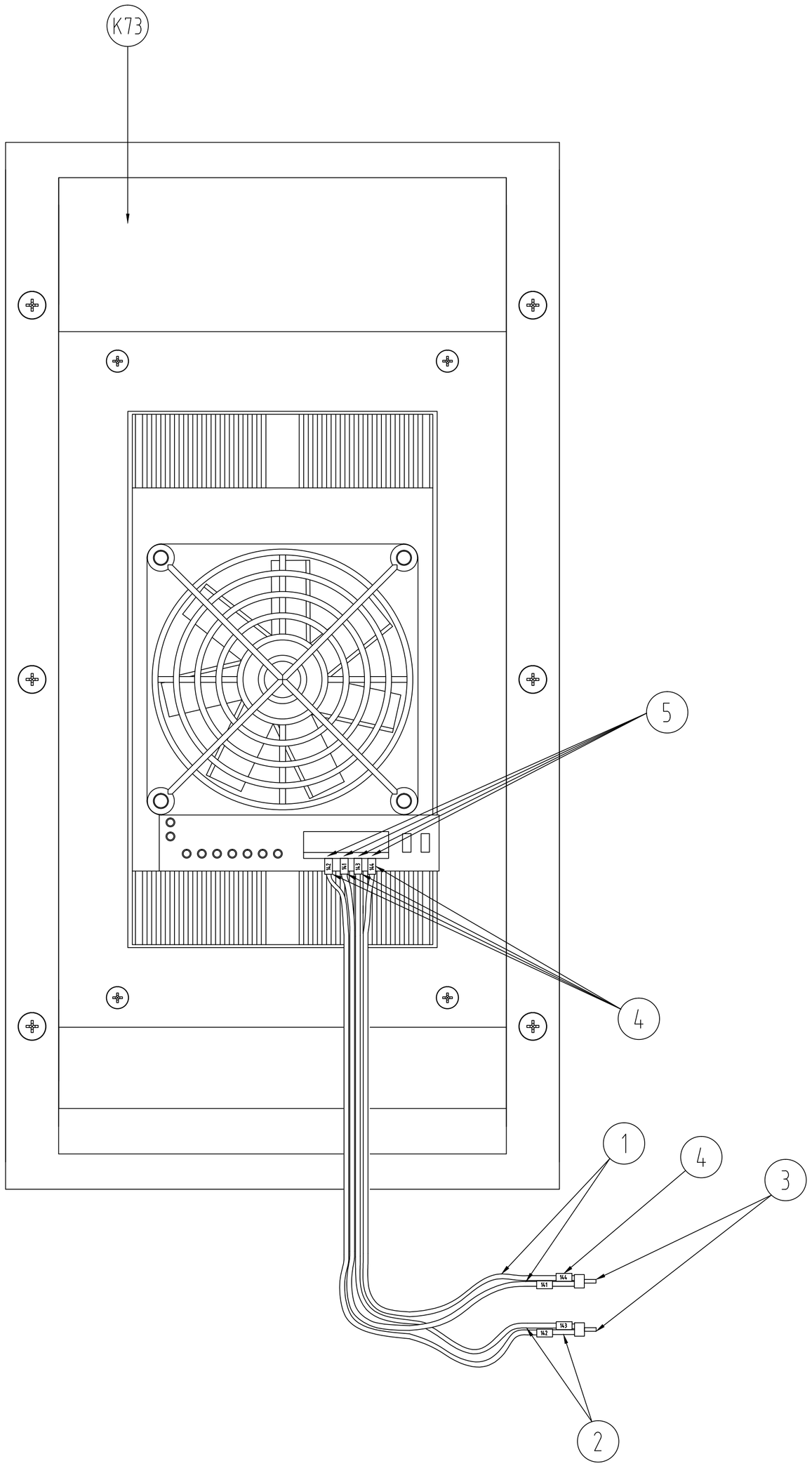
Safegate International AB
MALMÖ, SWEDEN

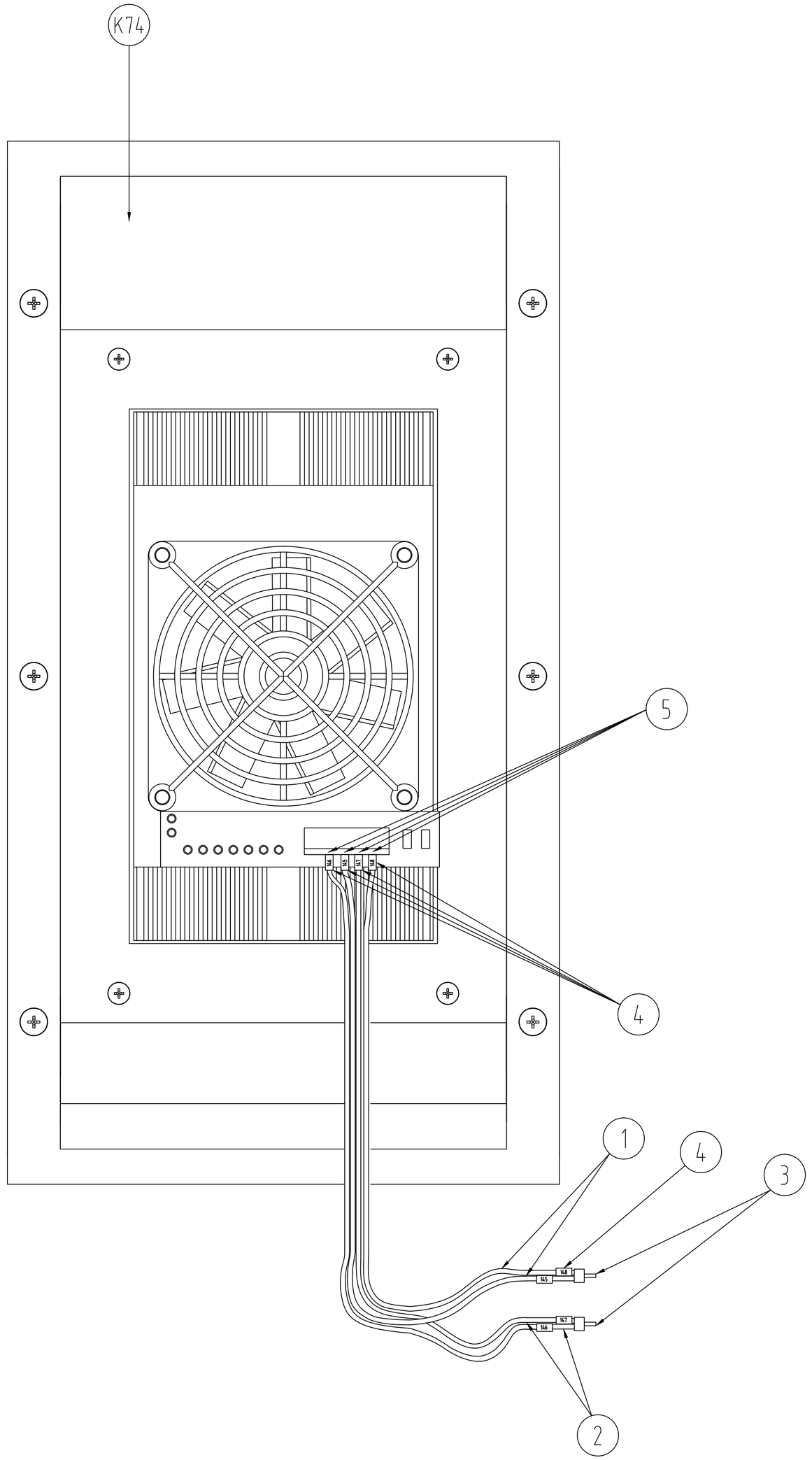
FILTER
COOLING UNIT

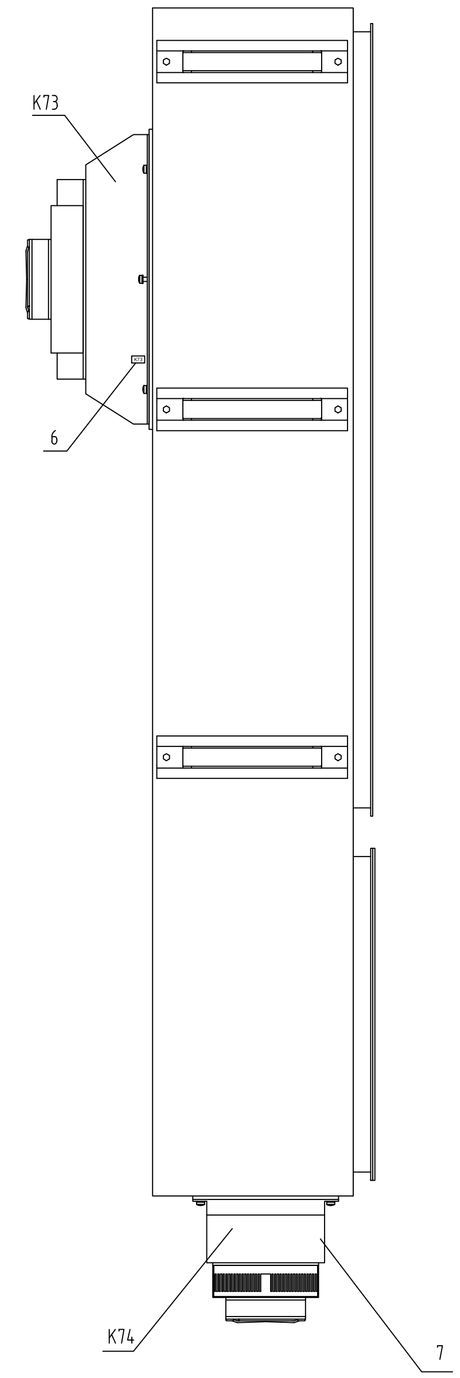
Drawn by:	Date drawn:	Checked by:	
G.O.	2005.08.17		

App. by:	Date approved:	Project No.:	Drawing No.	Rev.	Sheet	Scale
			SG590543-202-01		1 of 1	1:1

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	4	WIRE, UL1007/1569, AWG 20, BLACK						
2	4	WIRE, UL1007/1569, AWG 20, RED						
3	4	CRIMP LUG, H 2x0.5						
4	4	WIRE MARKERS, PARTEX PA02						
5	4	CRIMP LUG, H 0.5/14						
K73-K74	2	COOLING UNIT	SG590553-100-01					
6	1	COMPONET IDENTIFIER LABEL, YELLOW, 15x8mm, TEXT: K73					21302G	TECHNOTRADE SCANDINAVIA AB, SWEDEN
7	1	COMPONET IDENTIFIER LABEL, YELLOW, 15x8mm, TEXT: K74					21302G	TECHNOTRADE SCANDINAVIA AB, SWEDEN







COMPONET PLACEMENT IN
DOCKING GUIDANCE UNIT

Revision	Description	Date	Drawn by:	Checked by:	Approved
C	Cable changed	2011.01.24	A.S.		
B	Drawing and BOM changed	2011.11.17	A.S.		
A	Connection for K73 and K74 changed	2005.09.14	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

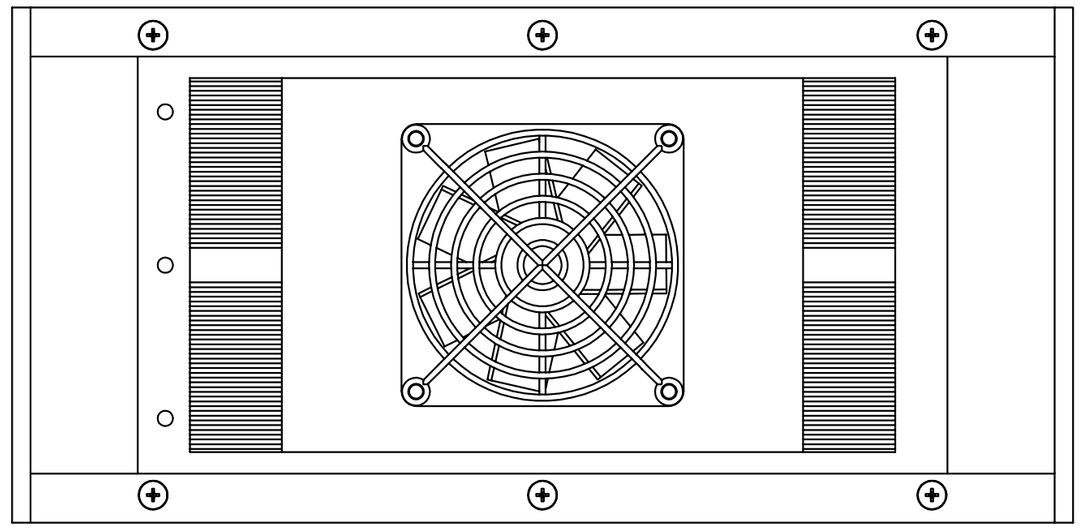
Unless otherwise indicated, all tolerances are according to — Sharp Edges

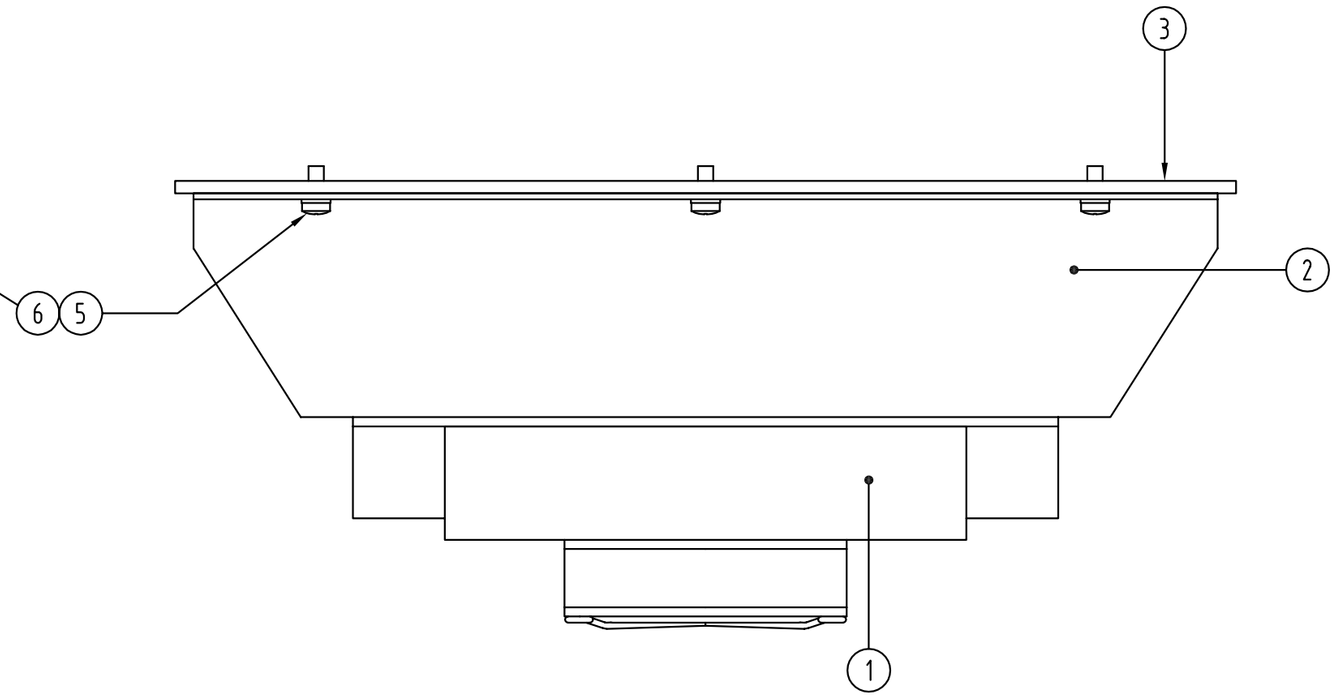
Surface Coating — Weight

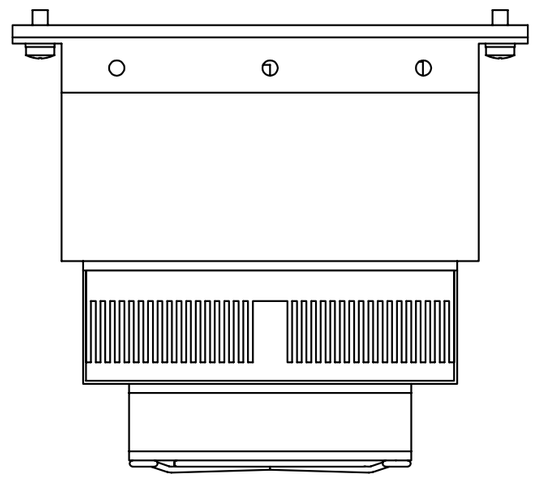
COOLING ASSEMBLY, T3

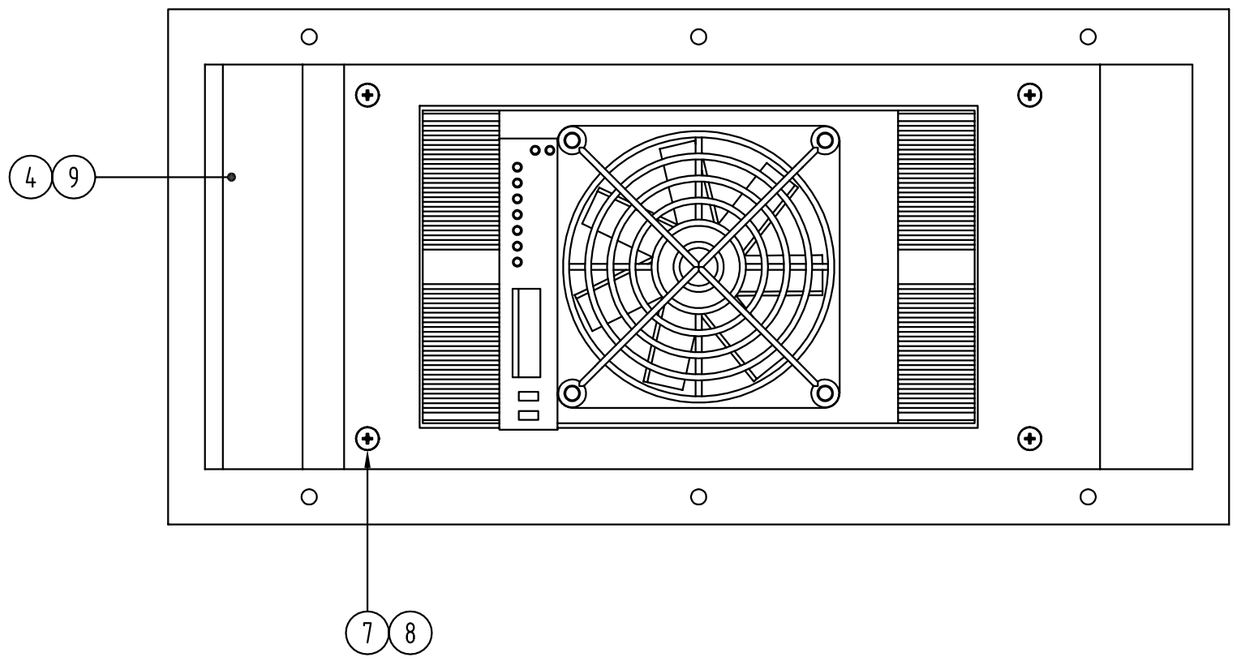
Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2005.08.17				

Drawing No.	Rev.	Sheet	Scale
SG590543-001-01	C	1 of 1	









Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to | Sharp Edges

Surface Coating | Weight

COOLING UNIT
FOR SAFEDOCK 3
SEE SG590543-100-02 FOR PARTS LIST

Drawn by:	Date drawn:	Checked by:	
G.O.	2005.11.15		
App. by:	Date approved:	Project No.:	

Drawing No.	Rev.	Sheet	Scale
SG590553-100-01		1 of 1	1:2

SG590553-100-02

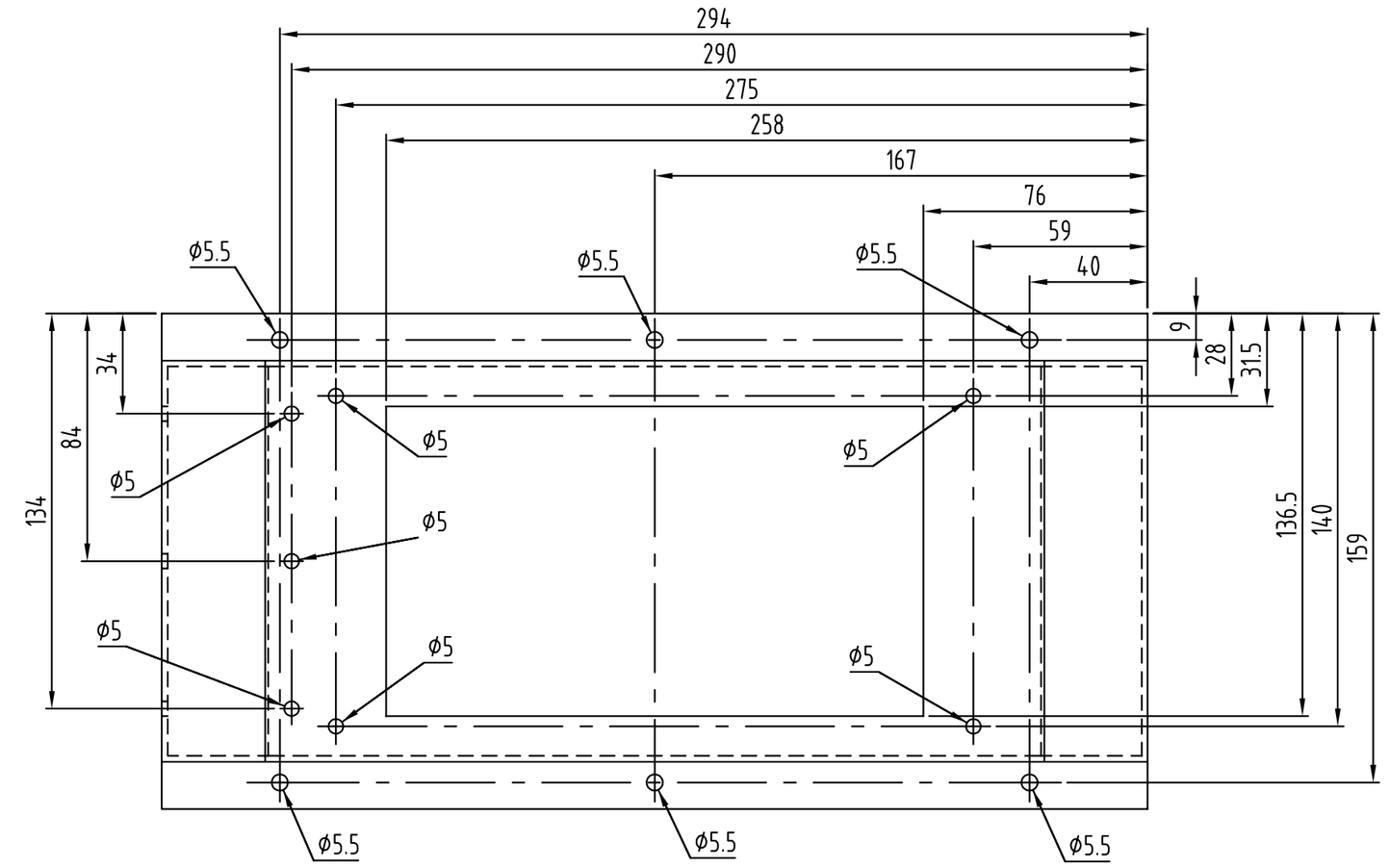
COOLING UNIT, FOR SAFEDOCK 3

REVISIONS

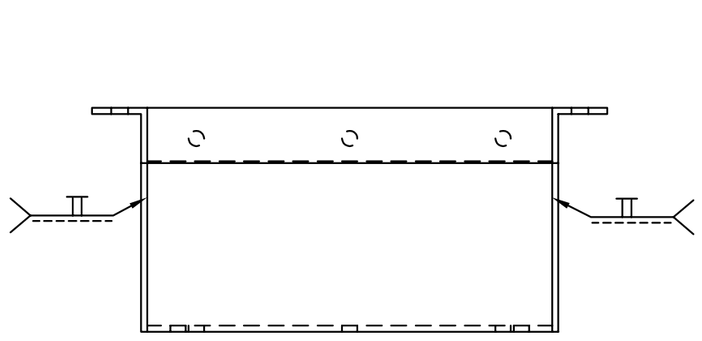
COMPONENT AND PARTS LIST FOR SG590553-100-01

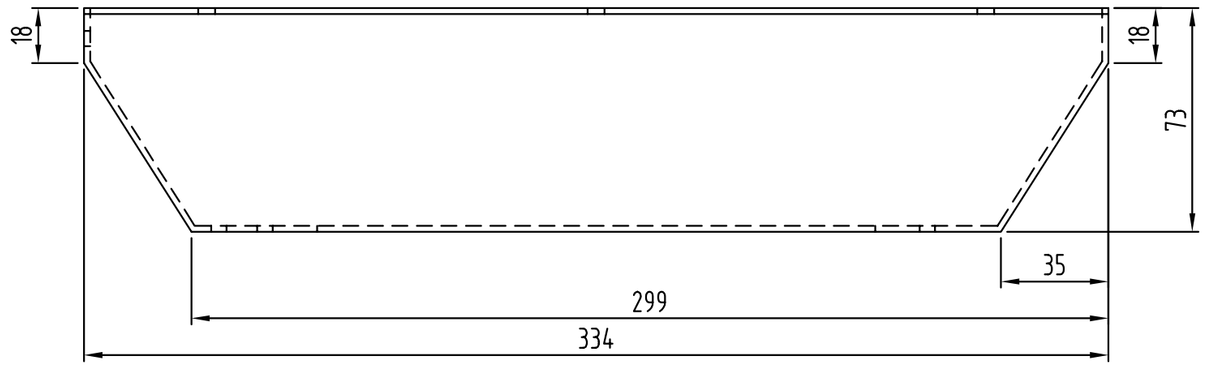
POSITION	QUANTITY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PROD. NO.	MANU. PART NO.	MANUFACTURER	SUPPLIER'S. PART NO.	SUPPLIER
1	1	THERMOELECTRIC COOLER, 24 V, 58W AIR TO AIR			AA-060-24-23-00-10	SUPERCOOL AB, SWEDEN	AA-060-24-23-00-10	SUPERCOOL AB, SWEDEN
2	1	COOING UNIT COVER	SG590553-200-01					
3	1	GASKET	SG590553-201-01					
4	1	FILTER	SG590553-202-01					
5	6	SCREW, DIN-7985, M5x16, STAINLESS STEEL						
6	6	LOCKWASHER, DIN 127B,5.1x9.2x1.2, STAINLESS STEEL						
7	4	SCREW, DIN-7985, M4x12, STAINLESS STEEL						
8	4	LOCKWASHER, DIN 127B, 4.1x7.6x0.9, STAINLESS STEEL						
9		SPRAY ADHESIVE, TYPE 76 (See Note)				3M		

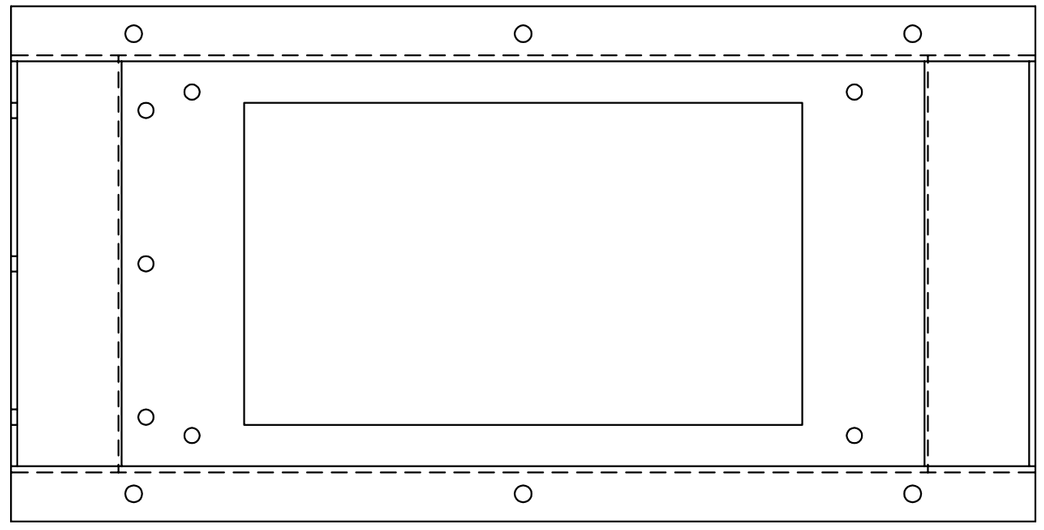
Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
		ALUMINUM SHEET, EN1050-14, t = 2						

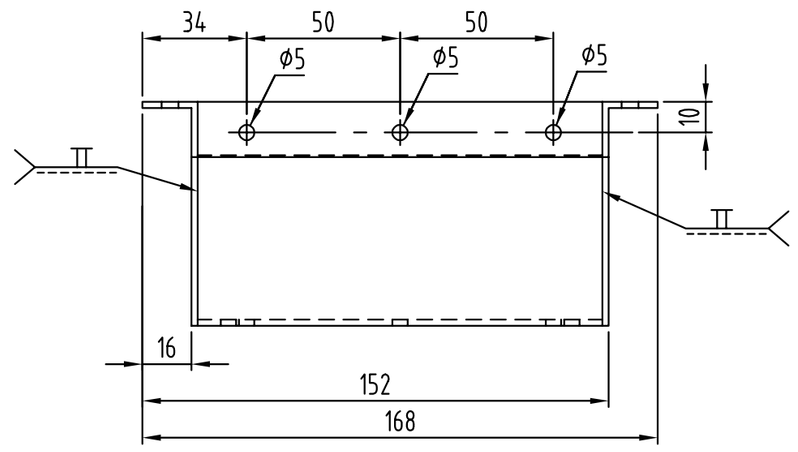


PAINT NOTES:
PAINT: POWDER PAINT
INTERPON D2000, COLOR: VENUS OR
INTERPON 810, RAL COLORS
COLOR SPECIFIED WITH ORDER
MANUFACTURER: AKZO NOBEL POWDER COATINGS
BEFORE PAINTING, THE PART SHALL BE COATED
WITH BONDERITE NT CONVERSION COATING.
APPLICATION OF THE CONVERSION COAT SHALL
FOLLOW THE PRETREATMENT PROCESS SPECIFIED
BY THE CONVERSION COATING MANUFACTURER,
HENKEL TECHNOLOGIES.









Revision	Description	Date	Drawn by:	Checked by:	Approved
A	PAINT NOTE CHANGED	2006.03.10	G.O.		

SAFEGATE GROUP
Safegate International AB
MALMÖ, SWEDEN

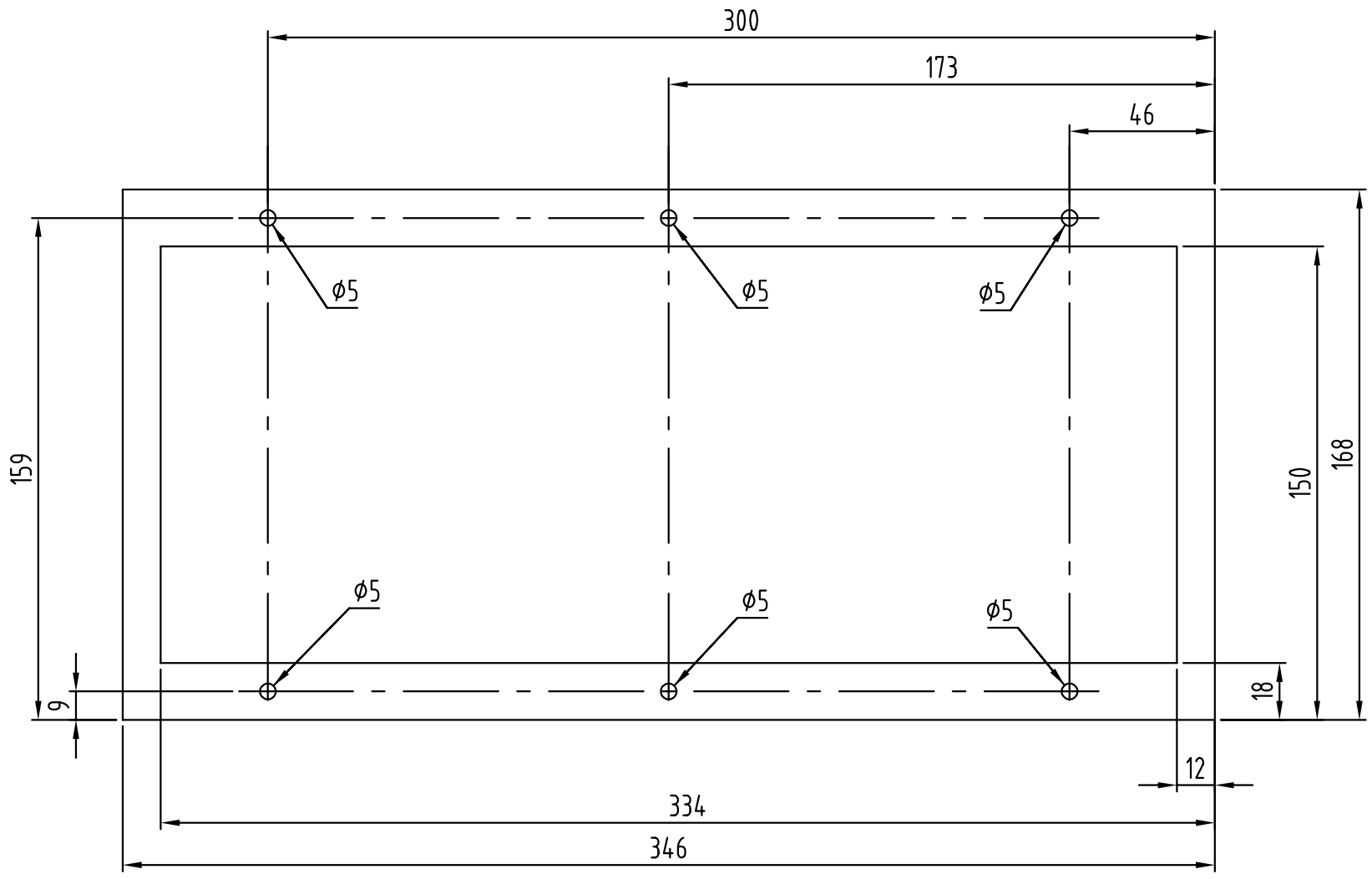
Unless otherwise indicated, all tolerances are according to ISO-2768-m
Sharp Edges R = 0.5
Surface Coating
Weight

COVER FOR SUPERCOOLER
FOR SUPERCOOLER
FOR SAFEDOCK 3

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2005.11.15				

Drawing No.	Rev.	Sheet	Scale
SG590553-200-01	A	1 of 1	1:2

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
		FOAM RUBBER, CLOSED CELL EPDM-SBR, t = 4			1722	NATIONAL GUMMI, SWEDEN	1722	NATIONAL GUMMI, SWEDEN



Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	
G.O.	2005.11.15		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to ISO-2768-m

Sharp Edges

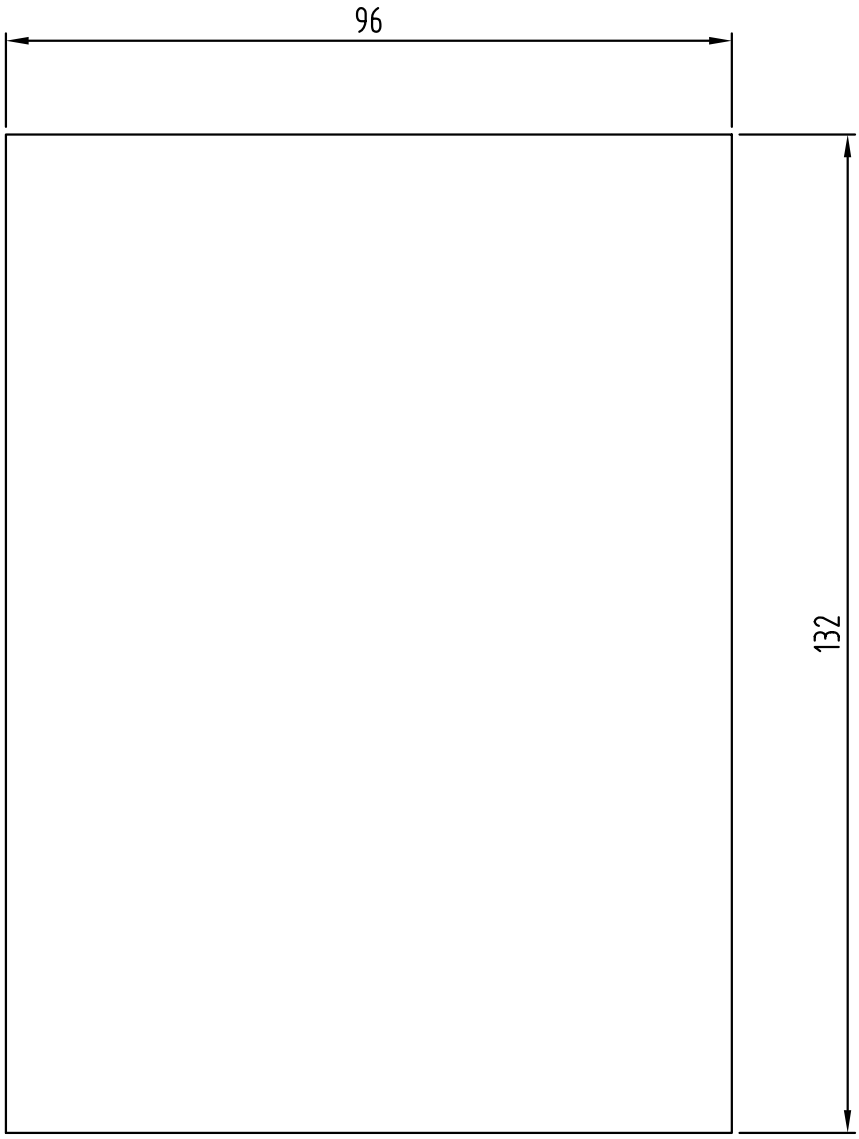
Surface Coating

Weight

GASKET
SUPERCOOLER COVER, FOR SDK3

Drawing No.	Rev.	Sheet	Scale
SG590553-201-01		1 of 1	1:1

Revision	Description	Date	Drawn by:	Checked by:	Approved



MANUFACTURER:
RITTAL SCANDINAVIA AB
PACKAGE OF 5
SIZE: 176x176

		FILTER MATERIAL	SK3181.100		SEE NOTE
Item No	Qty.	Name	Description	Dimensions	Remark

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to	ISO-2768-c
Surface Coating	

Sharp Edges

Weight

FILTER
COOLING UNIT, FOR SDK3

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:	Drawing No.	Rev.	Sheet	Scale
G.O.	2005.11.15					SG590553-202-01		1 of 1	1:1

SG590559-000-01

SCANNING ASSEMBLY WITH 24 V HEATER

REVISIONS
B. Item M2's drawing number changed. Quantity of items 15 and 16 changed By: A.S., Date: 2012-01-17

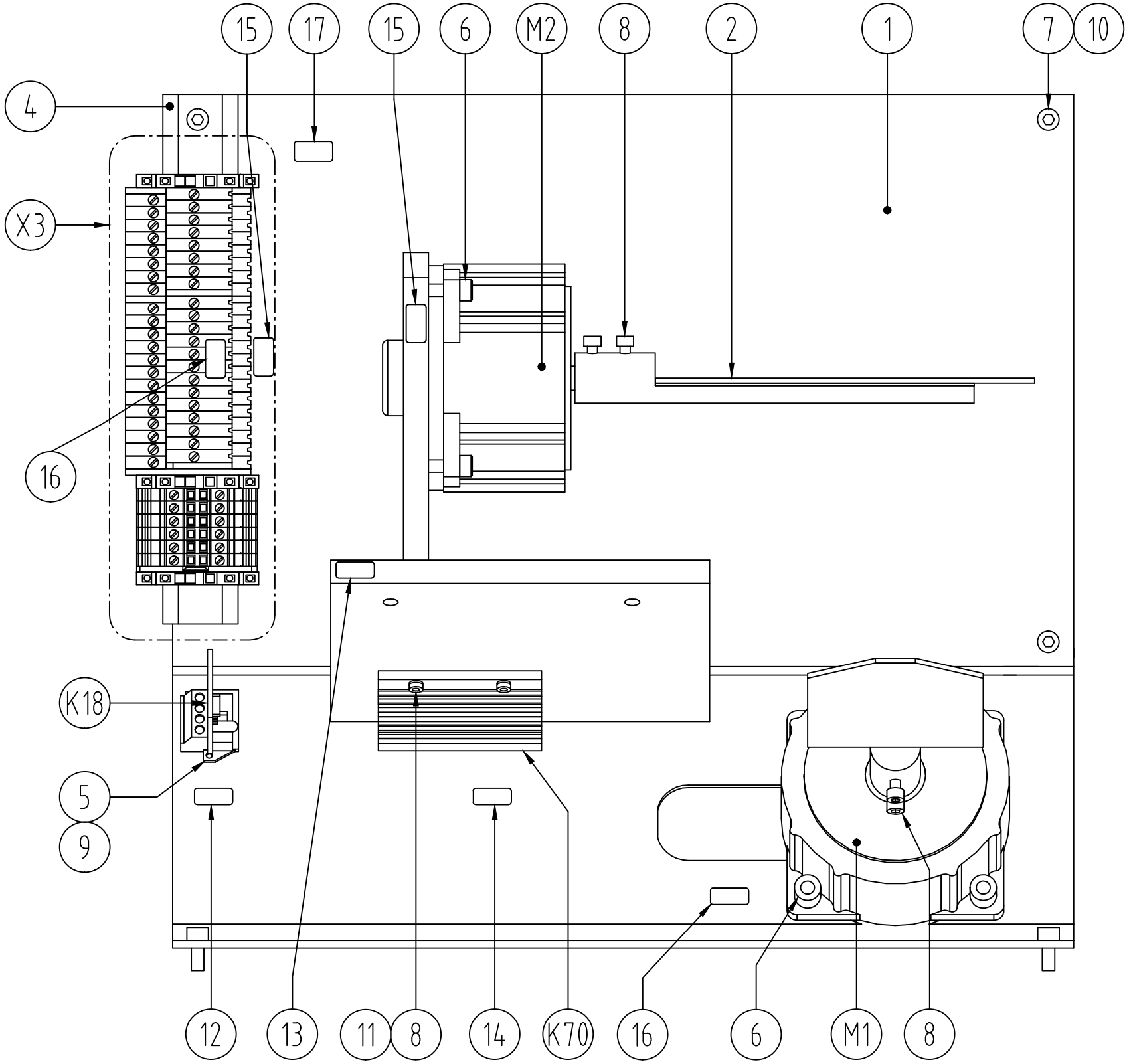
ASSMBLY LEVEL DOCUMENT LIST

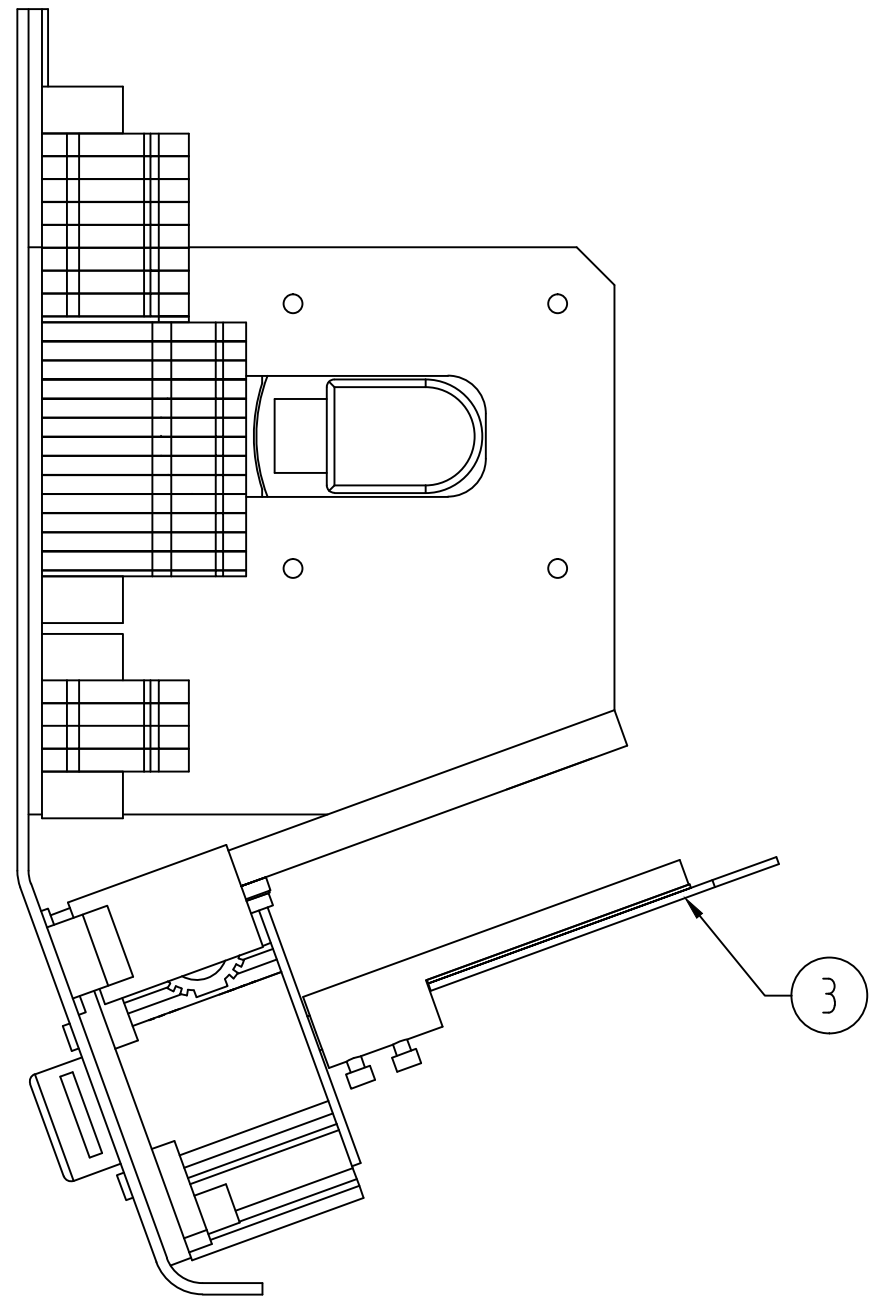
SG590559-000-01	PRODUCT CONFIGURATION FILE
SG590559-001-01	COMPONENT PLACEMENT
SG590559-004-01	CONNECTION DIAGRAM

COMPONENT AND PARTS LIST

POSITION	QUANTITY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PROD. NO.	MANU. PART NO.	MANUFACTURER	SUPPLIER'S. PART NO.	SUPPLIER
K18	1	TEMPERATURE SENSOR	SG590137-000					
K70	1	HEATING ELEMENT	SG590512-001-01					
M1	1	HORIZONTAL SCANNING MOTOR	SG590559-101-01					
M2	1	VERTICAL SCANNING MOTOR	SG590559-101-01					
X3		CONNECTION HARDWARE AS FOLLOWS						
	20	UKK 3-MSTB-5,08			2770888	PHOENIX CONTACT, GERMANY	2770888	PHOENIX CONTACT, SWEDEN
		TERMINAL MARKERS, ZB5,08, NO.S51, 52, 54 - 72			0809803	PHOENIX CONTACT, GERMANY	0809803	PHOENIX CONTACT, SWEDEN
	1	UKK 3-MSTB-5,08-PE			1876615	PHOENIX CONTACT, GERMANY	1876615	PHOENIX CONTACT, SWEDEN
		TERMINAL MARKER, ZB5,08, NO. 53			0809803	PHOENIX CONTACT, GERMANY	0809803	PHOENIX CONTACT, SWEDEN
	6	UT 2,5			3044076	PHOENIX CONTACT, GERMANY	3044076	PHOENIX CONTACT, SWEDEN
		TERMINAL MARKER, ZB5, NO.S 85 - 86, 91-94			1050017	PHOENIX CONTACT, GERMANY	1050017	PHOENIX CONTACT, SWEDEN
	1	D-UKK 3-MSTB-5,08			2770891	PHOENIX CONTACT, GERMANY	2770891	PHOENIX CONTACT, SWEDEN
	1	DP-UKK 3-MSTB-5,08			2770600	PHOENIX CONTACT, GERMANY	2770600	PHOENIX CONTACT, SWEDEN
	1	DG-UKK 3-MSTB-5,08			2770613	PHOENIX CONTACT, GERMANY	2770613	PHOENIX CONTACT, SWEDEN
	1	D-UT 2,5/10			3047028	PHOENIX CONTACT, GERMANY	3047028	PHOENIX CONTACT, SWEDEN
	3	CLIPFIX 35-5			1201442	PHOENIX CONTACT, GERMANY	1201442	PHOENIX CONTACT, SWEDEN
1	1	MOUNTING FIXTURE	AT 601462					
2	1	LARGE SCANNING MIRROR	AT 606323					
3	1	SMALL SCANNING MIRROR	AT 600794					
4	1	DIN MOUNTING RAIL, NX 35/7,5-AL, L = 215			0801704	PHOENIX CONTACT, GERMANY	0801704	PHOENIX CONTACT, SWEDEN
5	1	TERMINAL BLOCK, MSTBU 2,5/4-STD-5,08			1824146	PHOENIX CONTACT, GERMANY	1824146	PHOENIX CONTACT, SWEDEN
6	8	SCREW, ALLEN HEAD, ISO 4762, M5 x 20H						
7	6	SCREW, ISO 4762, M5x12, ZINC PLATED						
8	8	SCREW, ISO 4762, M4x8H, ZINC PLATED						
9	2	SCREW, ISO 7045, M2x6H, ZINK PLATED						

POSITION	QUANTITY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PROD. NO.	MANU. PART NO.	MANUFACTURER	SUPPLIER'S. PART NO.	SUPPLIER
10	6	LOCK WASHER, DIN 127, 9.2x5.1x1.2, ZINC PLATED						
11	4	LOCK WASHER, DIN 127, 7.6x4.1x0.9						
12	1	LABEL, YELLOW, Text: K18, 15x8					21302G	TECHNOTRADE SWEDEN
13	1	LABEL, YELLOW, Text: K19, 15x8					21302G	TECHNOTRADE SWEDEN
14	1	LABEL, YELLOW, Text: K70, 15x8					21302G	TECHNOTRADE SWEDEN
15	2	LABEL, YELLOW, Text:M1, 15x8					21302G	TECHNOTRADE SWEDEN
16	2	LABEL, YELLOW, Text:M2, 15x8					21302G	TECHNOTRADE SWEDEN
17	1	LABEL, YELLOW, Text: X3, 15x8					21302G	TECHNOTRADE SWEDEN





Revision	Description	Date	Drawn by:	Checked by:	Approved
A	Extra items 15 and 16 added	2012.01.17	A.S		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	
G.O.	2006.05.10		
App. by:	Date approved:	Project No.:	

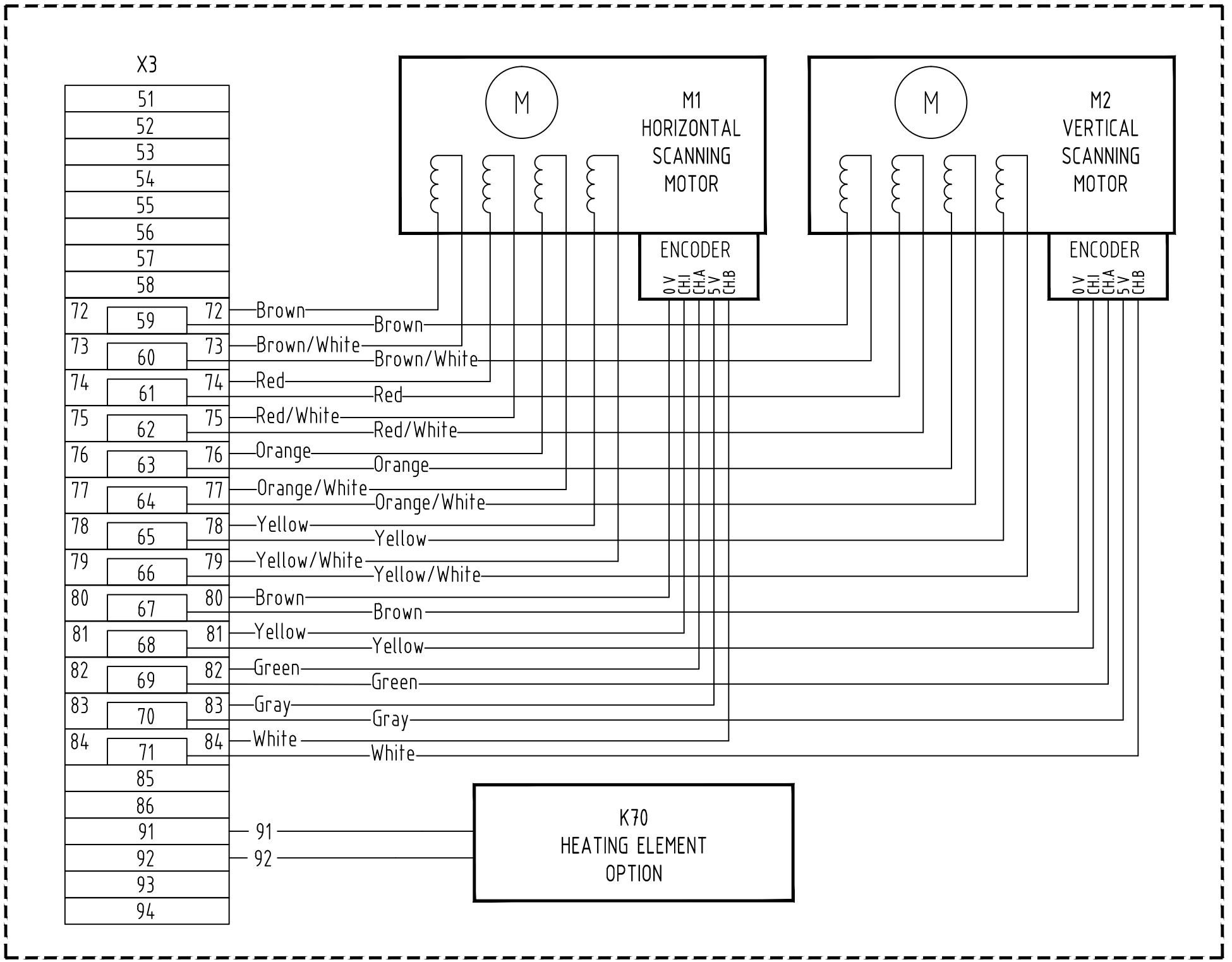
Unless otherwise indicated, all tolerances are according to | Sharp Edges

Surface Coating | Weight

SCANNING ASSEMBLY WITH 24 V HEATER

FOR CONNECTION DIAGRAM SEE SG590559-004-01
COMPONENT AND PARTS PLACEMENT

Drawing No.	Rev.	Sheet	Scale
SG590559-001-01	A	1 of 1	1:2



Revision	Description	Date	Drawn by:	Checked by:	Approved
A	Number replaced with collor coding, K70 option added	2012.01.17	A.S		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to			Sharp Edges
Surface Coating			Weight

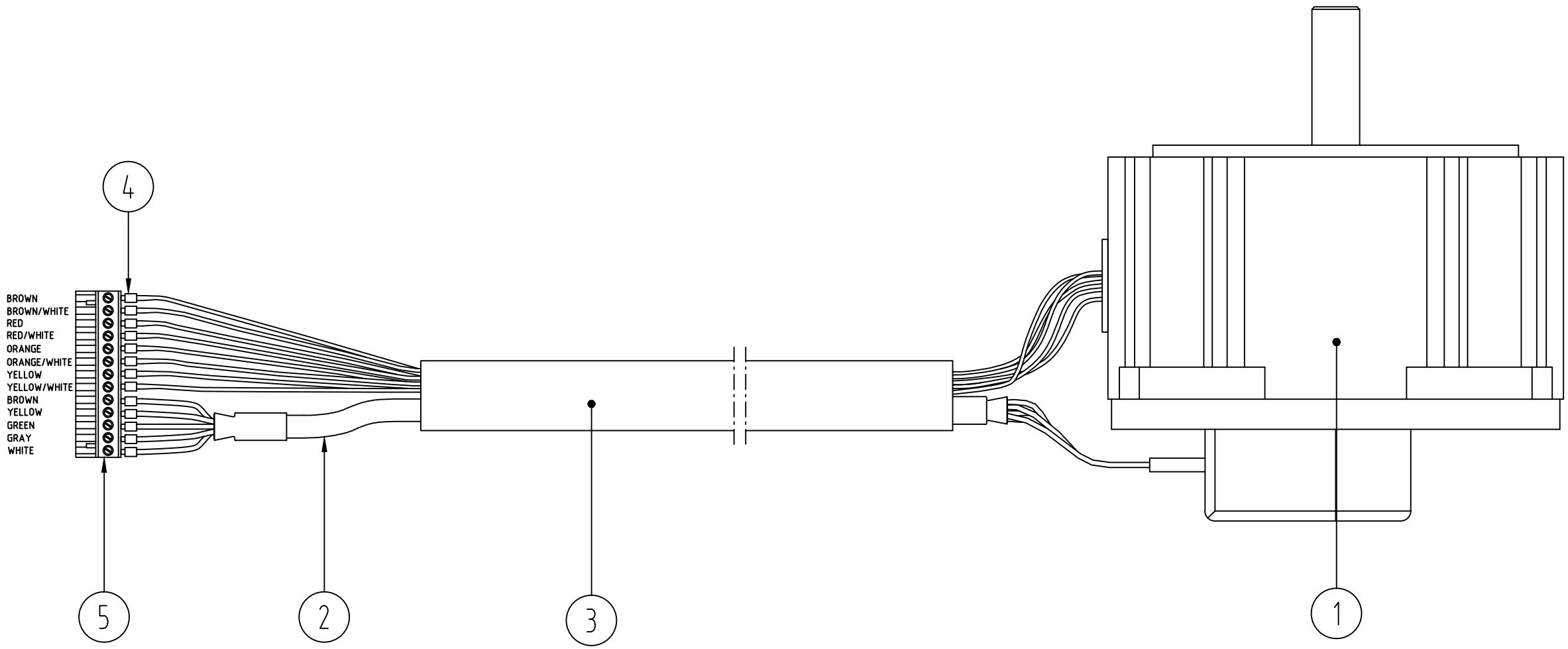
SCANNING ASSEMBLY

CONNECTION DIAGRAM

Drawn by:	Date drawn:	Checked by:	
G.O.	2006.05.09		

App. by:	Date approved:	Project No.:	Drawing No.	Rev.	Sheet	Scale
			SG590559-004-01	A	1 of 1	

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	STEPPER MOTOR, P850			2014800002	ESCAP		
2	1	OPTICAL ENCODER CABLE	SG590559-201-01					
3	1	CABLE GUARD, L = 250 mm			SHR 08 - 6NB	RICHCO		
4	8	CRIMP TERMINAL					31-1348	BEJOKEN
5	1	CONTACT, MSTB2,5/13-ST-5,08			1757129	PHOENIX CONTACT		



Revision	Description	Date	Drawn by:	Checked by:	Approved
A	Number for cable removed, BOM changed	2012.01.17	A.S		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2006.05.10				

Unless otherwise indicated, all tolerances are according to

Sharp Edges

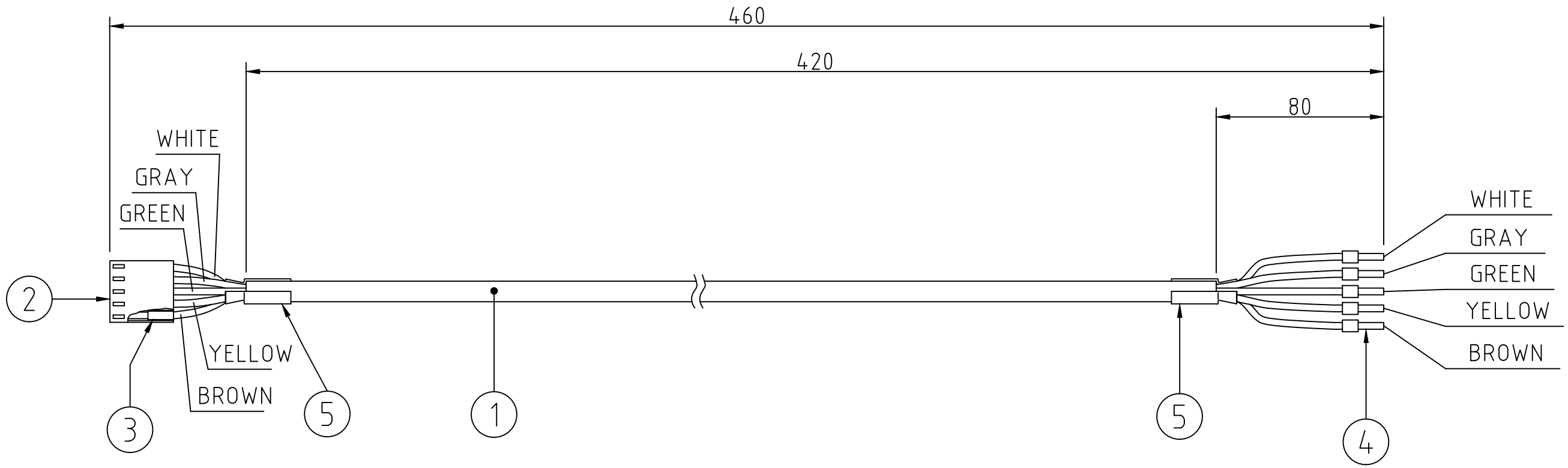
Surface Coating

Weight

SCANNING MOTOR

Drawing No.	Rev.	Sheet	Scale
SG590559-101-01	A	1 of 1	1:1

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, LIYY 5X0X0.34mm2						
2	1	CONTACT			0-925366-5	AMP		
3	5	CRIMP TERMINAL			1-141708-1	AMP		
4	5	CRIMP TERMINAL					31-1348	BEJOKEN
5	2	SHRINK WRAP, L=20mm			55-070-25			ELFA



Revision	Description	Date	Drawn by:	Checked by:	Approved
A	Cable changed from 7 to 5 leads	2012.01.24	AS		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:
A.S.	2012.01.17	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to | Sharp Edges

Surface Coating | Weight

OPTICAL ENCODER CABLE T2/T3

Drawing No.	Rev.	Sheet	Scale
SG590559-201-01	A	1 of 1	1:1

SG590560-000-01

SCANNING ASSEMBLY

REVISIONS
B. Item M2's drawing number changed. Quantity of items 15 and 16 changed By: A.S., Date: 2012-01-17

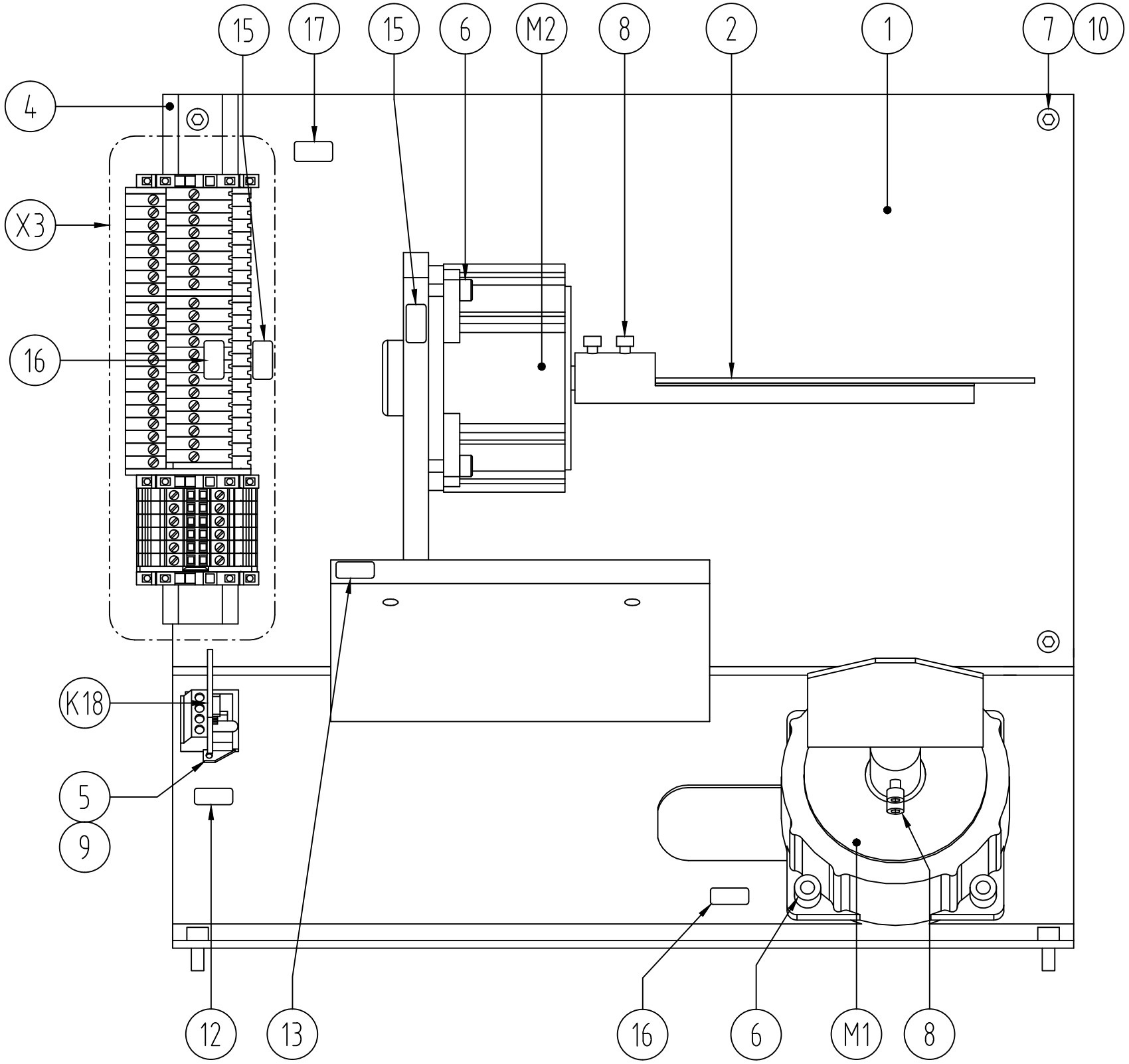
ASSMBLY LEVEL DOCUMENT LIST

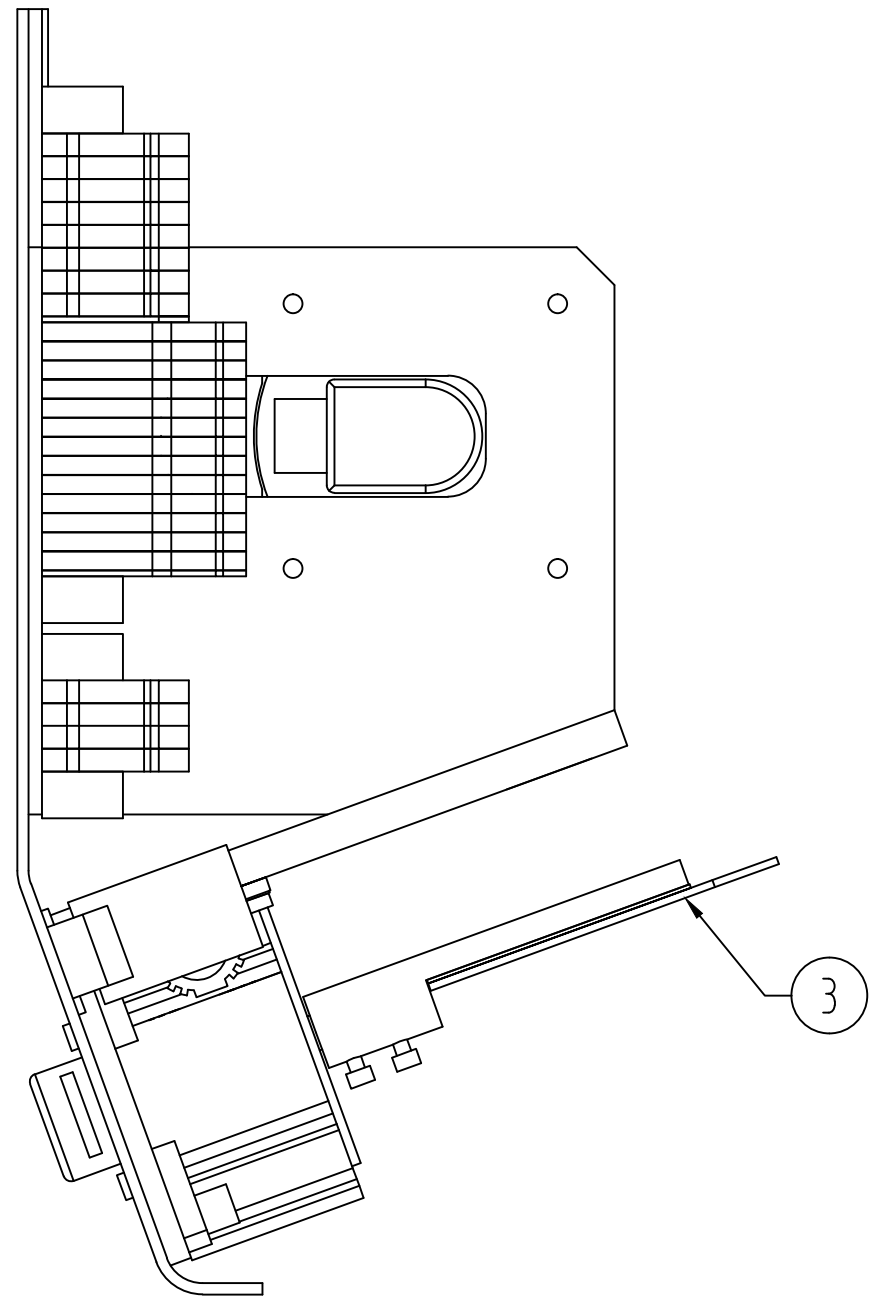
SG590560-000-01	PRODUCT CONFIGURATION FILE
SG590560-001-01	COMPONENT PLACEMENT
SG590560-004-01	CONNECTION DIAGRAM

COMPONENT AND PARTS LIST

POSITION	QUANTITY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PROD. NO.	MANU. PART NO.	MANUFACTURER	SUPPLIER'S. PART NO.	SUPPLIER
K18	1	TEMPERATURE SENSOR	SG590137-000					
M1	1	HORIZONTAL SCANNING MOTOR	SG590559-101-01					
M2	1	VERTICAL SCANNING MOTOR	SG590559-101-01					
X3		CONNECTION HARDWARE AS FOLLOWS						
	20	UKK 3-MSTB-5,08			2770888	PHOENIX CONTACT, GERMANY	2770888	PHOENIX CONTACT, SWEDEN
		TERMINAL MARKERS, ZB5,08, NO.S51, 52, 54 - 72			0809803	PHOENIX CONTACT, GERMANY	0809803	PHOENIX CONTACT, SWEDEN
	1	UKK 3-MSTB-5,08-PE			1876615	PHOENIX CONTACT, GERMANY	1876615	PHOENIX CONTACT, SWEDEN
		TERMINAL MARKER, ZB5,08, NO. 53			0809803	PHOENIX CONTACT, GERMANY	0809803	PHOENIX CONTACT, SWEDEN
	6	UT 2,5			3044076	PHOENIX CONTACT, GERMANY	3044076	PHOENIX CONTACT, SWEDEN
		TERMINAL MARKER, ZB5, NO.S 85 - 86, 91-94			1050017	PHOENIX CONTACT, GERMANY	1050017	PHOENIX CONTACT, SWEDEN
	1	D-UKK 3-MSTB-5,08			2770891	PHOENIX CONTACT, GERMANY	2770891	PHOENIX CONTACT, SWEDEN
	1	DP-UKK 3-MSTB-5,08			2770600	PHOENIX CONTACT, GERMANY	2770600	PHOENIX CONTACT, SWEDEN
	1	DG-UKK 3-MSTB-5,08			2770613	PHOENIX CONTACT, GERMANY	2770613	PHOENIX CONTACT, SWEDEN
	1	D-UT 2,5/10			3047028	PHOENIX CONTACT, GERMANY	3047028	PHOENIX CONTACT, SWEDEN
	3	CLIPFIX 35-5			1201442	PHOENIX CONTACT, GERMANY	1201442	PHOENIX CONTACT, SWEDEN
1	1	MOUNTING FIXTURE	AT 601462					
2	1	LARGE SCANNING MIRROR	AT 606323					
3	1	SMALL SCANNING MIRROR	AT 600794					
4	1	DIN MOUNTING RAIL, NX 35/7,5-AL, L = 215			0801704	PHOENIX CONTACT, GERMANY	0801704	PHOENIX CONTACT, SWEDEN
5	1	TERMINAL BLOCK, MSTBU 2,5/4-STD-5,08			1824146	PHOENIX CONTACT, GERMANY	1824146	PHOENIX CONTACT, SWEDEN
6	8	SCREW, ALLEN HEAD, ISO 4762, M5 x 20H						
7	6	SCREW, ISO 4762, M5x12, ZINC PLATED						
8	4	SCREW, ISO 4762, M4x8H, ZINC PLATED						
9	2	SCREW, ISO 7045, M2x6H, ZINK PLATED						
10	6	LOCK WASHER, DIN 127, 9.2x5.1x1.2, ZINC PLATED						

POSITION	QUANTITY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PROD. NO.	MANU. PART NO.	MANUFACTURER	SUPPLIER'S. PART NO.	SUPPLIER
12	1	LABEL, YELLOW, Text: K18, 15x8					21302G	TECHNOTRADE SWEDEN
13	1	LABEL, YELLOW, Text: K19, 15x8					21302G	TECHNOTRADE SWEDEN
15	2	LABEL, YELLOW, Text:M1, 15x8					21302G	TECHNOTRADE SWEDEN
16	2	LABEL, YELLOW, Text:M2, 15x8					21302G	TECHNOTRADE SWEDEN
17	1	LABEL, YELLOW, Text: X3, 15x8					21302G	TECHNOTRADE SWEDEN





Revision	Description	Date	Drawn by:	Checked by:	Approved
A	Extra items 15 and 16 added	2012.01.17	A.S		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	
G.O.	2006.05.10		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to

Sharp Edges

Surface Coating

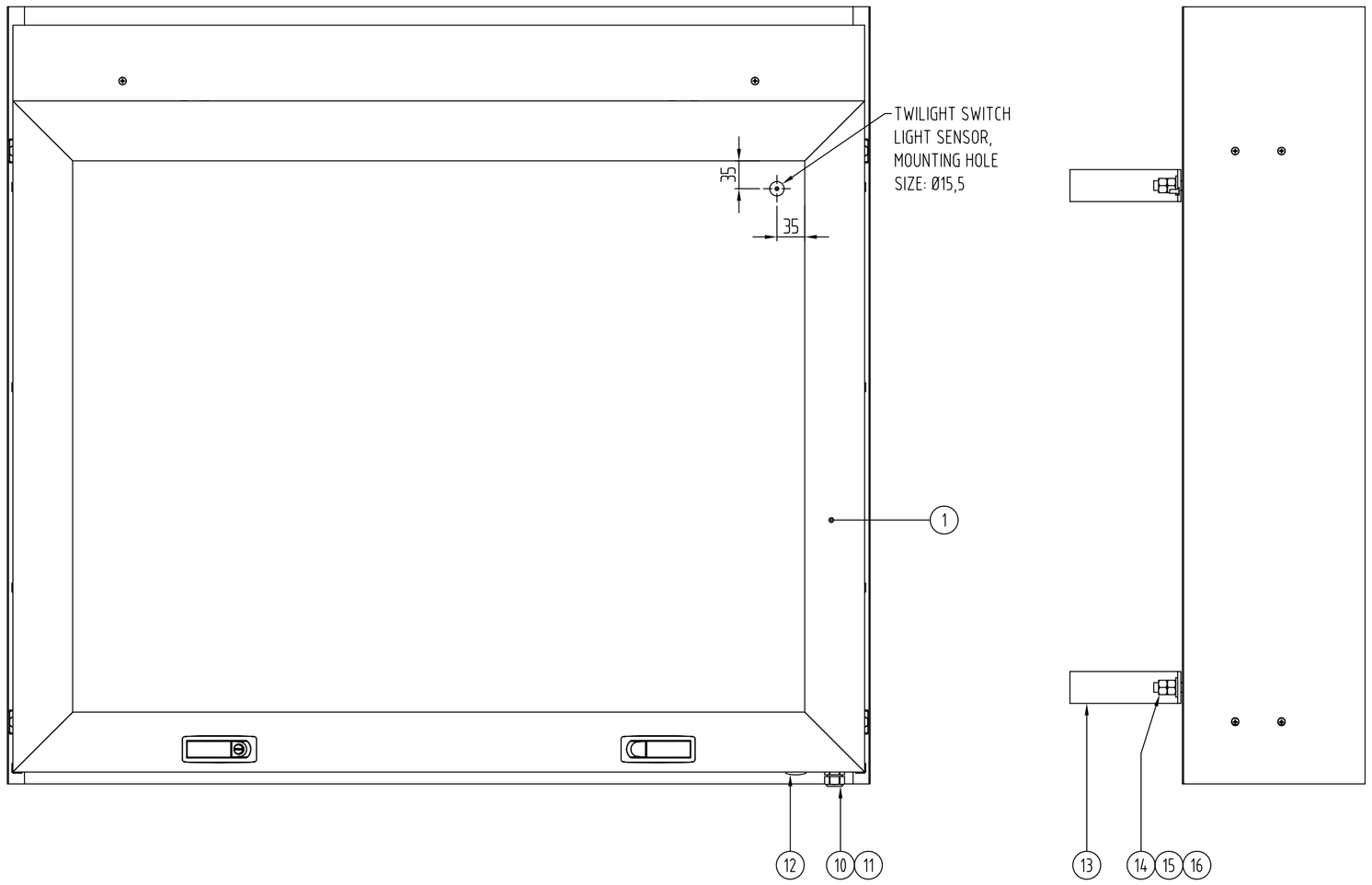
Weight

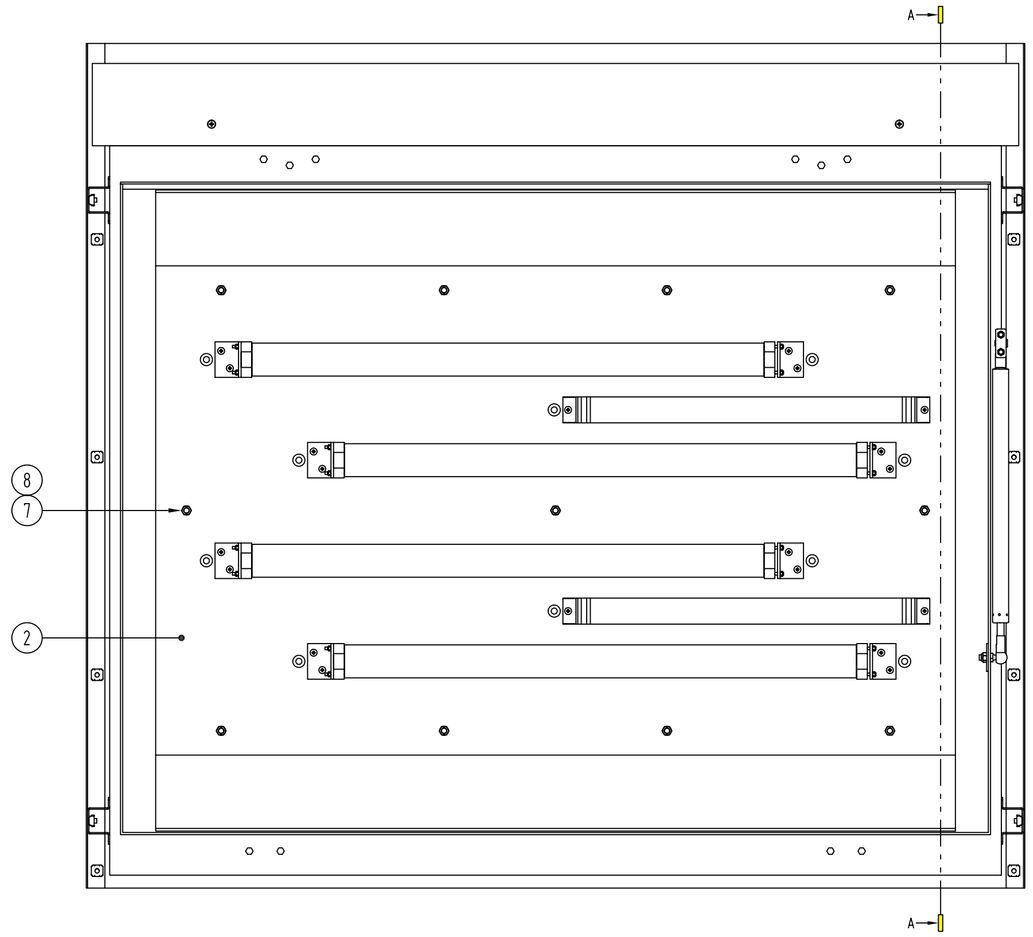
SCANNING ASSEMBLY

FOR CONNECTION DIAGRAM SEE SG590559-004-01
COMPONENT AND PARTS PLACEMENT

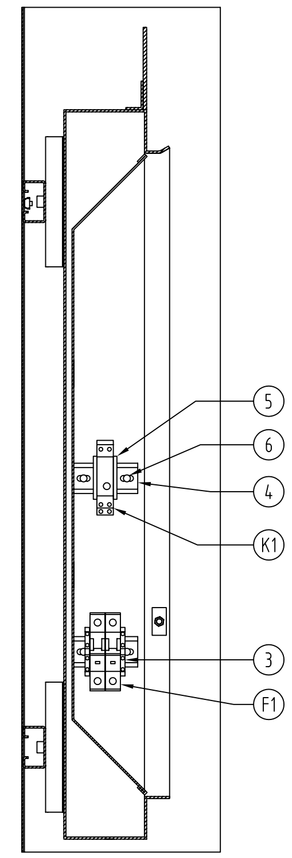
Drawing No.	Rev.	Sheet	Scale
SG590560-001-01	A	1 of 1	1:2

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CIRCUIT BREAKER, C60N, 6A-TYPE C			24447	MERLIN GERIN/SCHNEIDER ELECTRIC		
1	1	TWILIGHT SWITCH, LUNA 108			108 0 700	THEBEN		
1	1	CABINET ASSEMBLY	SG590606-202-01					
2	1	REFLECTOR AND LAMP ASSEMBLY	SG590606-203-01					
3	2	GROUND TERMINAL, UDK3.PE, OR EQUIV.			2775456	PHOENIX CONTACT		
4	2	DIN RAIL	SG590606-204-01					
5	2	CLIPFIX 35-5 OR EQUIV.			3022276	PHOENIX CONTACT		
6	4	BLIND POP-RIVET, 3,2x8LF, ALUMINIUM/STEEL, OR EQUIV.						
7	11	LOCKNUT, DIN 982, M6, ZINC PLATED						
8	11	NUT, DIN 934, M6, ZINC PLATED						
10	1	CABLE GLAND, M20, NYLON					1476113 OR EQUIV.	AHLSELL
11	1	JAM NUT, M20, NYLON					1476533 OR EQUIV.	AHLSELL
12	1	PLUG, GRAY, POLYETHYLEN					1470181 OR EQUIV.	AHLSELL
13	2	CLAMP	AT 605283					
14	4	T-BOLT AND NUT, HS 50/30 - fv - M12 x 40			12-1769	HALFAN, GERMANY		SIFVERT SKRUV, SWEDEN
15	8	NUT, ISO 4032, M12, GALVANIZED						
16	4	WASHER, DIN 125 13x24x2.5, GALVANIZED						
-		WIRING MATERIALS AS FOLLOWS						
		ELECTRICAL WIRE, H05V-K, 0,5 mm2, BROWN, TOTAL LENGTH: 700 mm						
		ELECTRICAL WIRE, H05V-K, 0,5 mm2, BLUE, TOTAL LENGTH: 600 mm						
		ELECTRICAL WIRE, H05V-K, 0,5 mm2, YELLOW/GREEN, TOTAL LENGTH: 550 mm						
	5	BOOTLACE FERRULE, 2x0,5 mm2					48-236-13 OR EQUIV.	ELFA
	2	BOOTLACE FERRULE, 0,5 mm2					48-315-66 OR EQUIV.	ELFA

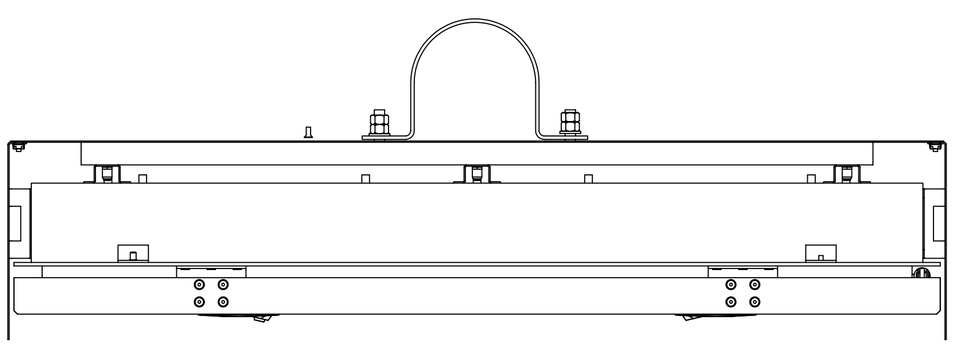




FRONT VIEW, DOOR REMOVED



SECTION A-A



Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

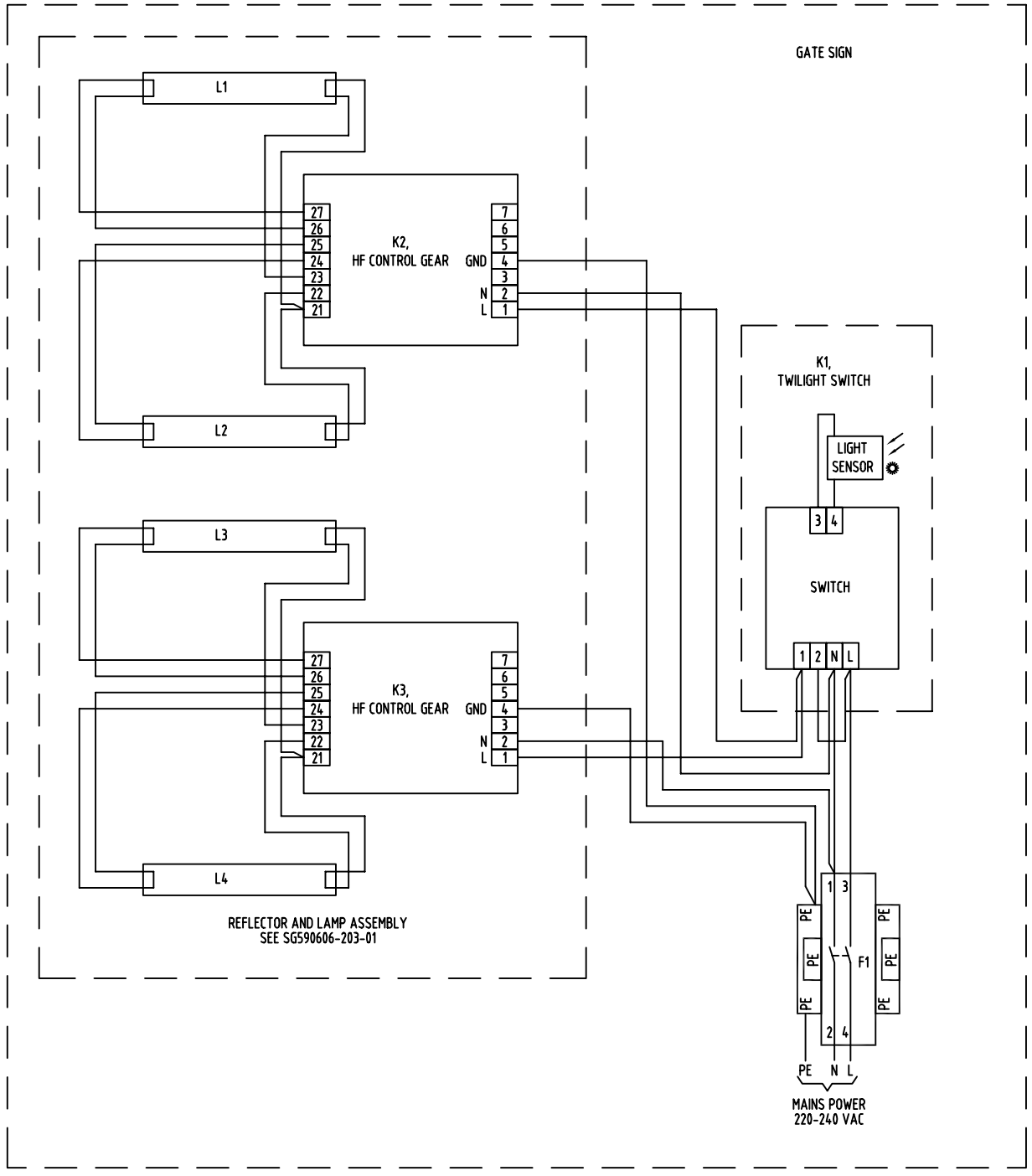
Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according fo — Sharp Edges
Surface Coating — Weight

GATE SIGN
FOR T1 DOCKING GUIDANCE SYSTEM

SEE SG590606-004-01 FOR CONNECTION DIAGRAM

Drawn by:	Date drawn:	Checked by:				
G.O.	2009.04.05					
App. by:	Date approved:	Project No.:	Drawing No.	Rev.	Sheet	Scale
			SG590606-001-01		1 of 1	1:5



Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

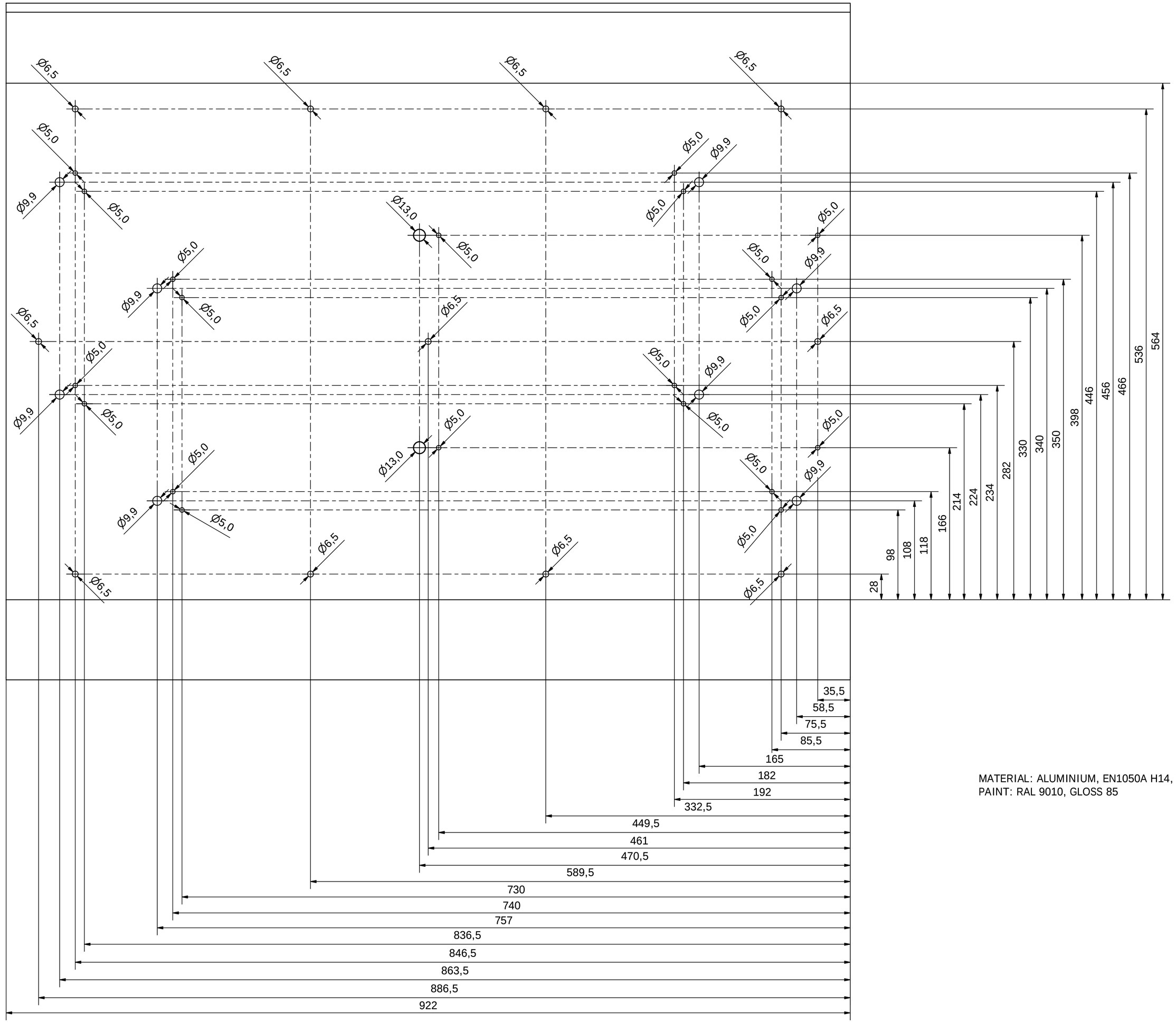
Drawn by:	Date drawn:	Checked by:	
G.O.	2009.04.03		
App. by:	Date approved:	Project No.:	

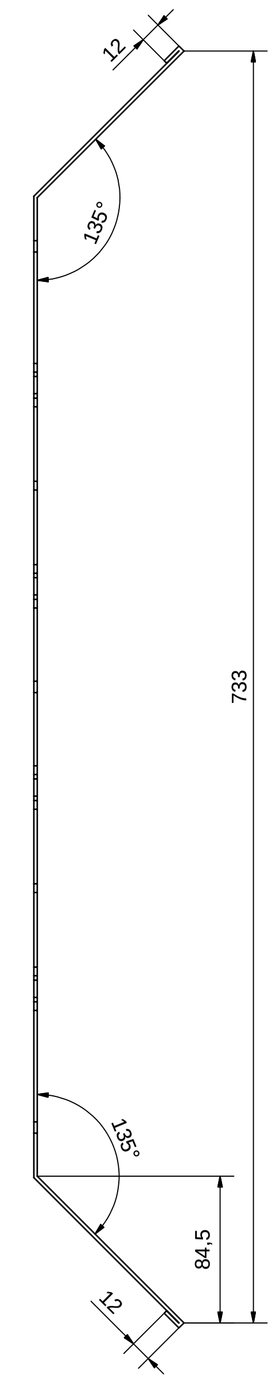
Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

GATE SIGN
FOR T1 DOCKING GUIDANCE SYSTEM
CONNECTION DIAGRAM

SEE SG590606-001-01 FOR ASSEMBLY

Drawing No.	Rev.	Sheet	Scale
SG590606-004-01		1 of 1	





MATERIAL: ALUMINIUM, EN1050A H14, T = 2
PAINT: RAL 9010, GLOSS 85

Revision	Description	Date	Drawn by:	Checked by:	Approved
A	Holes Ø13 were Ø9,9, Dim 449,5 was 446,5, Dim 470,5 was 462,5	2009.04.20	G.O.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to

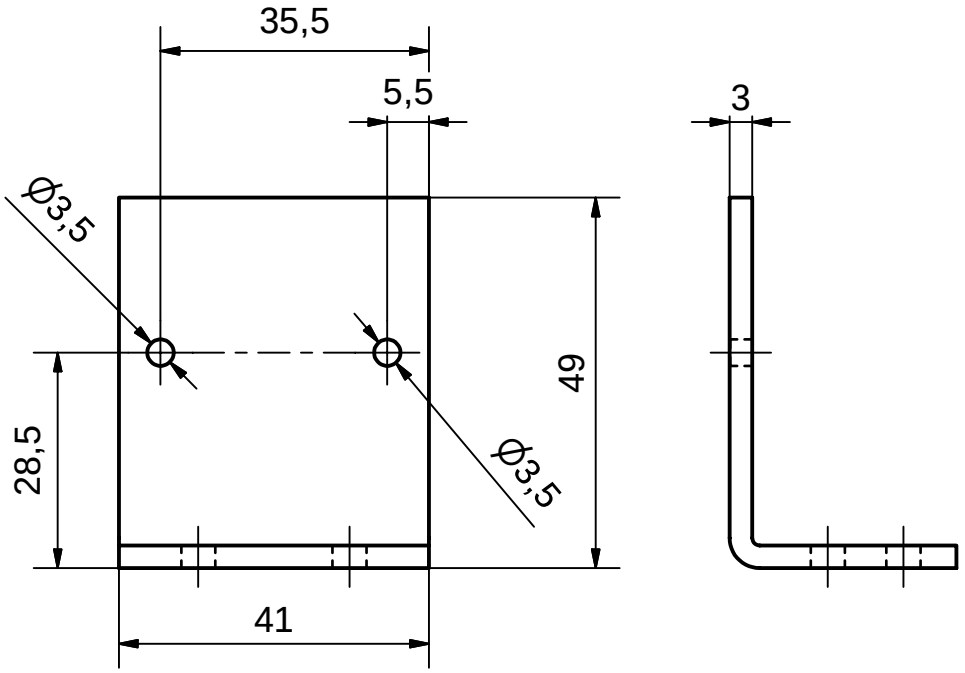
Sharp Edges

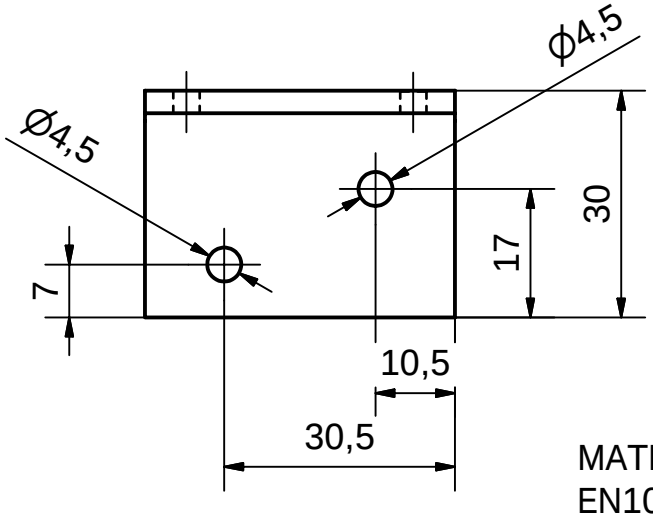
Surface Coating

Weight

REFLECTOR/MOUNTING PLATE

Drawn by:	Date drawn:	Checked by:	Drawing No.	Rev.	Sheet	Scale
G.O.	2008-06-04		SG590606-200-01	A	1 of 1	1:2.5
App. by:	Date approved:	Project No.:				





MATERIAL: ALUMINIUM SHEET,
EN1050A H14

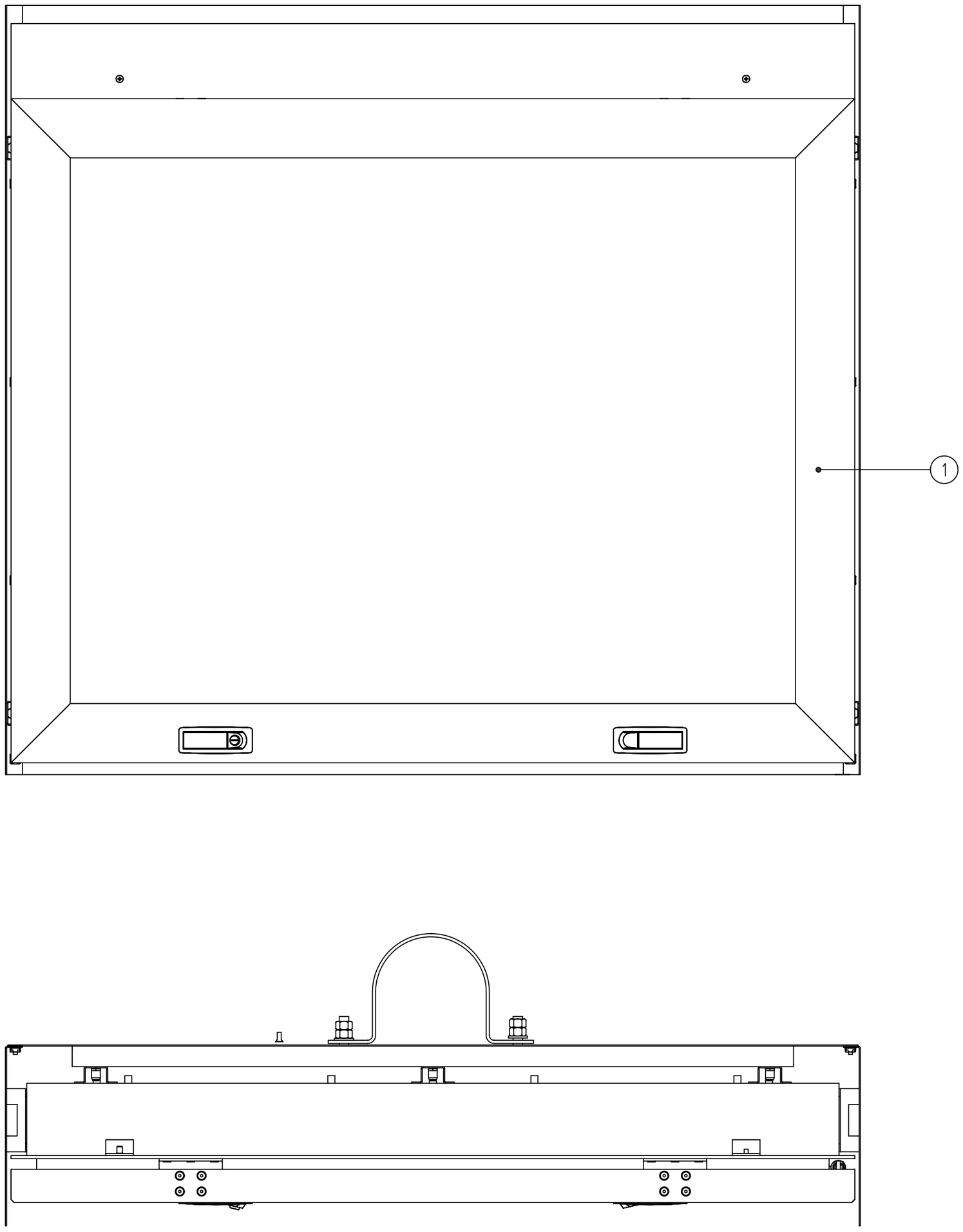
SAFEGATE GROUP

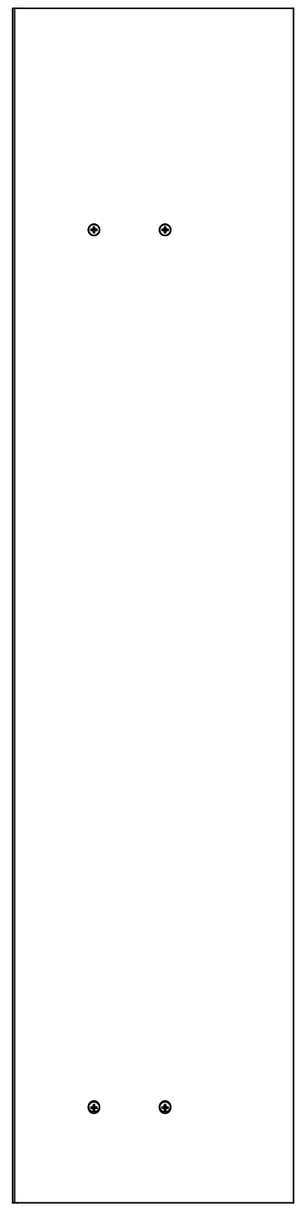
Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to					Sharp Edges	
Surface Coating					Weight	
LAMP HOLDER BRACKET						
Drawn by: G.O.	Date drawn: 2008-06-04	Checked by:				
App. by:	Date approved:	Project No.:	Drawing No. SG590606-201-01	Rev.	Sheet 1 of 1	Scale 1:1

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	ENCLOSURE	NPP 914686					

NOTES:
1. THE POLYCARBONATE SIGN FRONT THAT IS INSTALLED IN THE DOOR, NPP DRAWING 501368, NEEDS TO BE ORDERED SEPARATELY THROUGH A-SKYLT AND DELIVERED TO NPP PRIOR TO ASSEMBLY.
A FULL SCALE DRAWING OF THE LEGEND FOR THE SIGN FRONT IN PDF-FILE FORMAT NEEDS TO ACCOMPANY THE ORDER.
2. THE SUNSHADE PANELS ARE TO BE DELIVERED UN-ATTACHED TO THE CABINET ASSEMBLY.





Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
G.O.	2009.04.21				

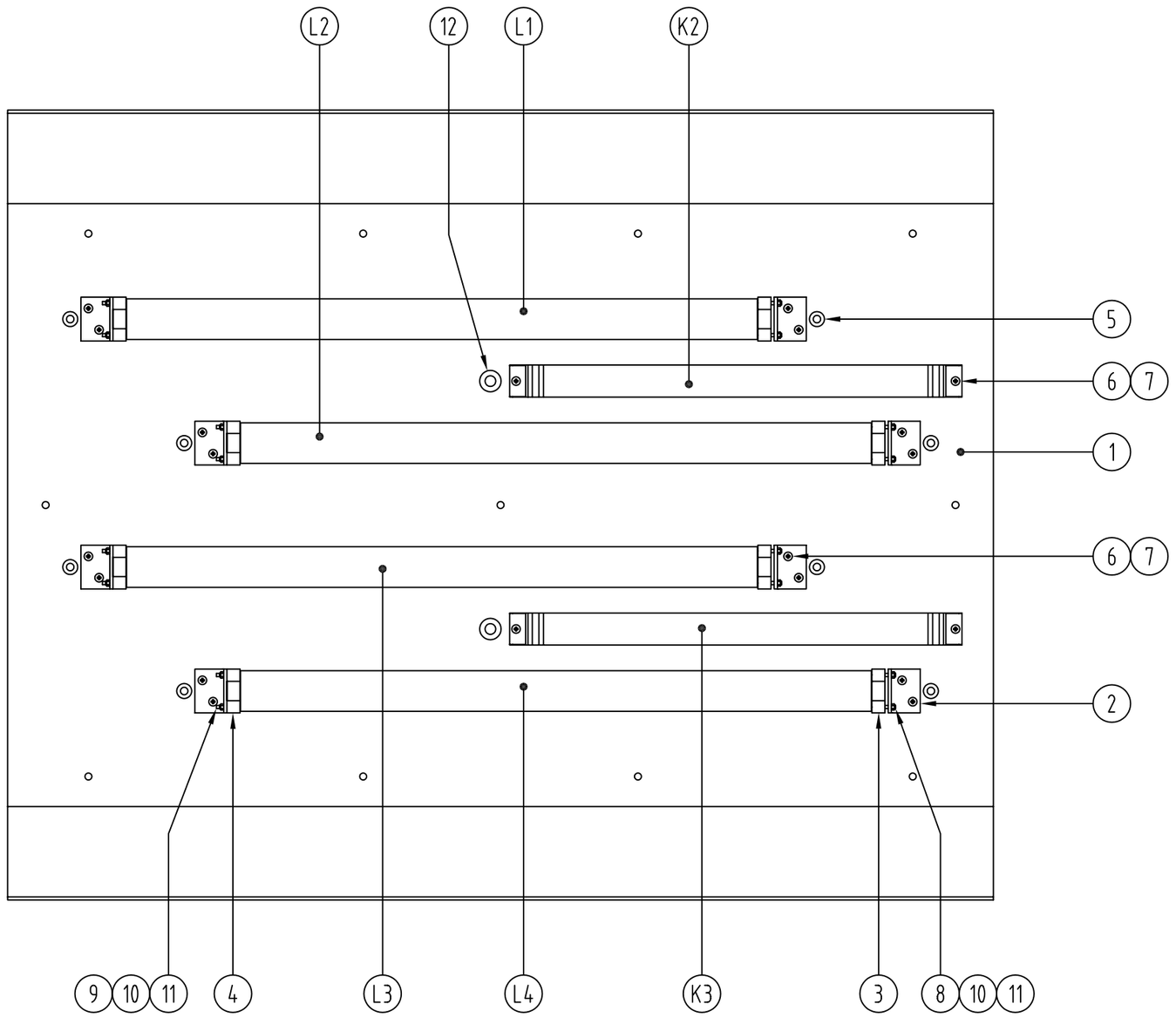
Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

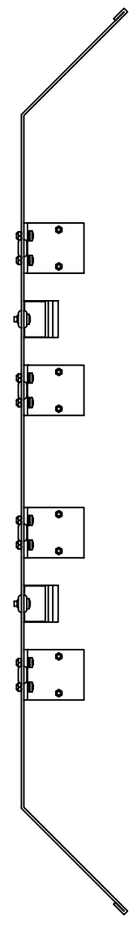
CABINET
T1 GATE SIGN

Drawing No.	Rev.	Sheet	Scale
SG590606-202-01		1 of 1	1:5

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
L1-L4	4	FLUORESCENT LAMP, MASTER TL-D SUPER 80 16W/840 1SL, OR EQUIV.			631473 40	PHILIPS		
K2-K3	2	HF CONTROL GEAR, QTi 2x14/24/21/39				OSRAM	33-551-53	ELFA
1	1	REFECTOR/MOUNTING PLATE	SG590606-200-01					
2	8	LAMPHOLDER BRACKET	SG590606-201-01					
3	4	LAMPHOLDER, 46101			101647	VOSSLOH-SCHWABE		
4	4	LAMPHOLDER, 46100			101643	VOSSLOH-SCHWABE		
5	8	RUBBER GROMMET, 7.0x14					55-005-33	ELFA
6	20	SCREW, DIN7985, M4x10, ZINC PLATED						
7	20	LOCKNUT, DIN 985, M4, ZINC PLATED						
8	8	SCREW, DIN7985, M3x25, ZINC PLATED						
9	8	SCREW, DIN7985, M3x16, ZINC PLATED						
10	16	LOCK WASHER, DIN 6798A, 3.7x7x0.5, ZINC PLATED						
11	16	NUT, DIN 934, M3, ZINC PLATED						
12	2	RUBBER GROMMET, 10x15,7					55-005-41	
-		ELECTRICAL WIRE, H05V2-U, 0,5mm2, TOTAL LENGTH = 8,8 m, OR EQUIV.					55-316-78	ELFA

NOTE: THE ELECTRICAL WIRING IS TO BE RUN BETWEEN THE ELECTRONIC CONTROL GEAR AND THE LAMP HOLDERS ON THE BACK SURFACE OF THE REFLECTOR/MOUNTING PLATE .
ANCHOR THE WIRES AWAY FROM PROTRUDING SCREWS/NUTS WITH TAPE AT SEVERAL POINTS TO PREVENT THE WIRES FROM BEING PINCHED WHEN THE ASSEMBLY IS INSTALLED IN THE CABINET.





Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP
Safegate International AB
MALMÖ, SWEDEN

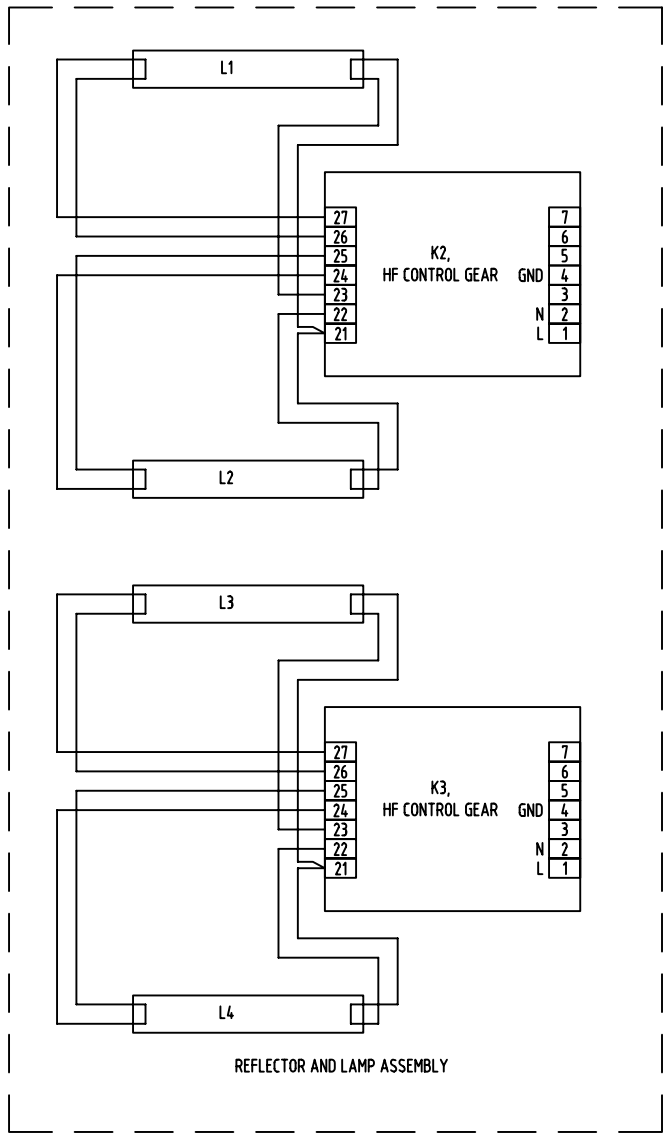
Drawn by:	Date drawn:	Checked by:
G.O.	2009.04.05	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to | Sharp Edges
Surface Coating | Weight

REFLECTOR AND LAMP ASSEMBLY

SEE SG590606-203-02 FOR CONNECTION DIAGRAM

Drawing No.	Rev.	Sheet	Scale
SG590606-203-01		1 of 1	1:5



REFLECTOR AND LAMP ASSEMBLY

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	
G.O.	2009.04.05		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

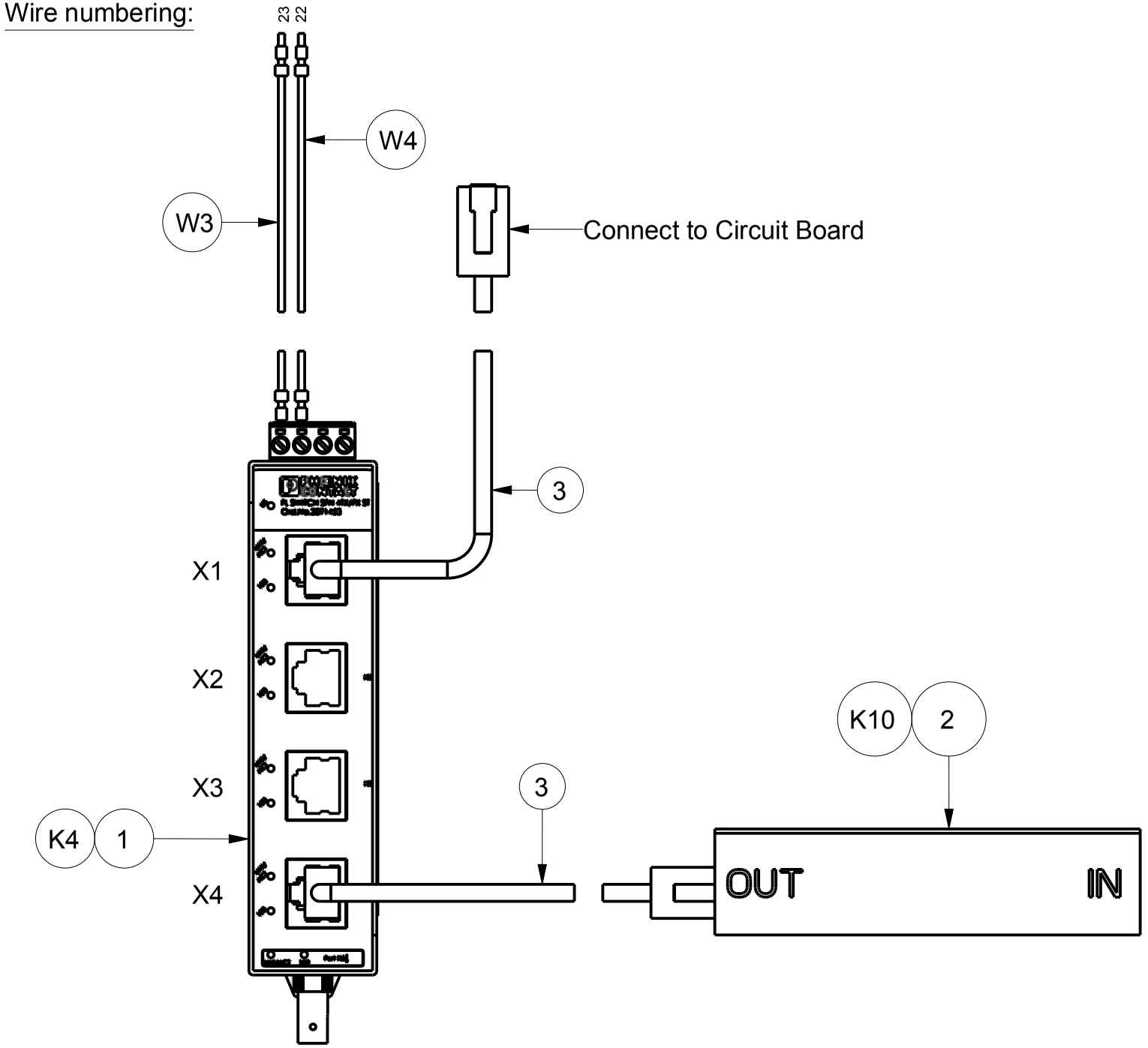
REFLECTOR AND LAMP ASSEMBLY
CONNECTION DIAGRAM

SEE SG590606-203-01 FOR ASSEMBLY

Drawing No.	Rev.	Sheet	Scale
SG590606-203-02		1 of 1	

POS	QTY	DESCRIPTION	STD/OPT	T1/T1S/T2/T3	DRW. NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NO.	SUPPLIER
1	1	COMPONENT IDENTIFIER LABEL, YELLOW 15x8 mm, TEXT: K4	Option (NS)	All					
2	1	COMPONENT IDENTIFIER LABEL, YELLOW 15x8 mm, TEXT: K10	Option (NS)	All					
3	2	PATCH CABLE CAT5	Option (NS)	All	SG590258-101-01				
K4	1	NETWORK SWITCH, FL SWITCH SFN 4TX/FX ST	Option (NS)	All		2891453	PHOENIX CONTACT		
K10	1	CAT6 TRANSIENT FILTER, D-LAN-CAT.6+	Option (NS)	All		2881007	PHOENIX CONTACT		
W3		WIRE, UL1007/1569, AWG 20, RED, L=400	Option (NS)	All		3053 RED	ALPHA WIRE	55-229-25	ELFA
	2	CRIMP LUG H0.5/14	Option (NS)	All		9026060000	WEIDMÜLLER		
		WIRE MARKERS, MARKING - 23	Option (NS)	All		PA-02	PARTEX		
W4		WIRE, UL1007/1569, AWG 20, BLACK, L=400	Option (NS)	All		3053 BLACK	ALPHA WIRE	55-229-09	ELFA
	2	CRIMP LUG H0.5/14	Option (NS)	All		9026060000	WEIDMÜLLER		
		WIRE MARKERS, MARKING - 22	Option (NS)	All		PA-02	PARTEX		

Wire numbering:



Rev.	Issue date	Issue by	Issue checked by	Issue text
E	2014-09-16	V.N.		Filter (K10) now included in NS option.
D	2011-11-11	A.S.		Connection diagram removed.

THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Drawn by: G.O.	Date drawn: 2008-11-23
Approved by:	Date approved:
Project No.	Drawing No. SG590611-001-01

Gen. tolerance

Surface treatment

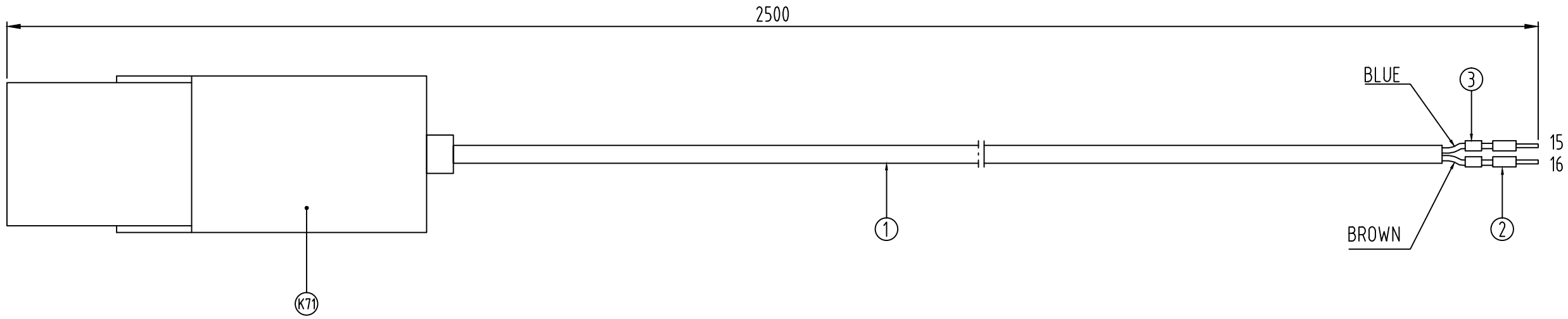
Basic material

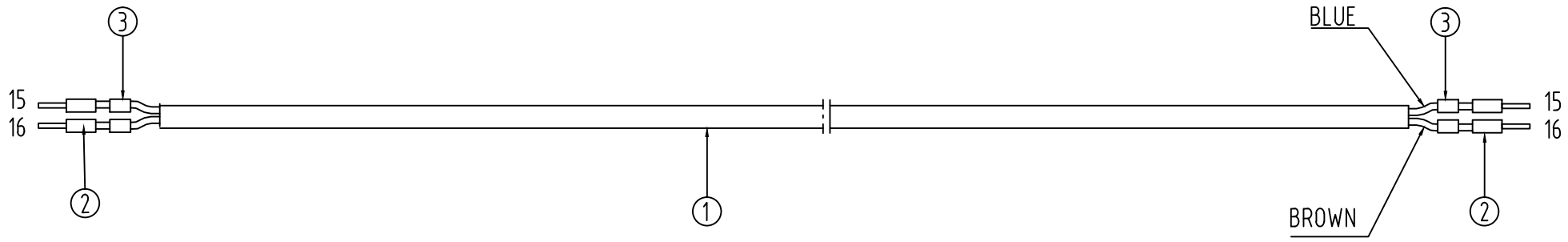
Info

Description
NETWORK SWITCH - OPTION (NS)
T1/T1S/T2/T3

Rev.	Scale	Size	Sheet
E	NO SCALE	A3	1 (1)

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
K71	1	HEATING ELEMENT, 110-230 V AC, 50 W			3105.340	RITTAL, GERMANY		
1	1	Ölflex Control 3G1,0mm^2, L = 2300 mm		T2			281803	Miltronic AB, SWEDEN
1	1	Ölflex Control 3G1,0mm^2, L = 2100 mm		T3			281803	Miltronic AB, SWEDEN
2	4	INSULATED FERRULE, E2512-BLUE					48-303-60	ELFA, SWEDEN
3	4	WIRE MARKERS, PARTEX PA02/3			SEE NOTE 1	WEIDMÜLLER GmbH & Co., GERMANY	SEE NOTE 1	WEIDMÜLLER, SWEDEN





NOTE 1

MARK BOTH ENDS OF EACH WIRE ACCORDING TO THE NUMBERING SHOWN ABOVE.

SYMBOL	MANF. PART NO.	SUPPLIERS STOCK NO.
1	11-01040101	2980401
5	11-01040105	2980405
6	11-01040106	2980406

Revision	Description	Date	Drawn by:	Checked by:	Approved
D	BOM changed now valid for T2 and T3	2011.11.11	A.S		
C	Unmounted cable added	2011.10.04	A.S		
B	Unmounted cable added	2011.05.04	A.S		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
A.S.	2010.09.23				

Unless otherwise indicated, all tolerances are according to

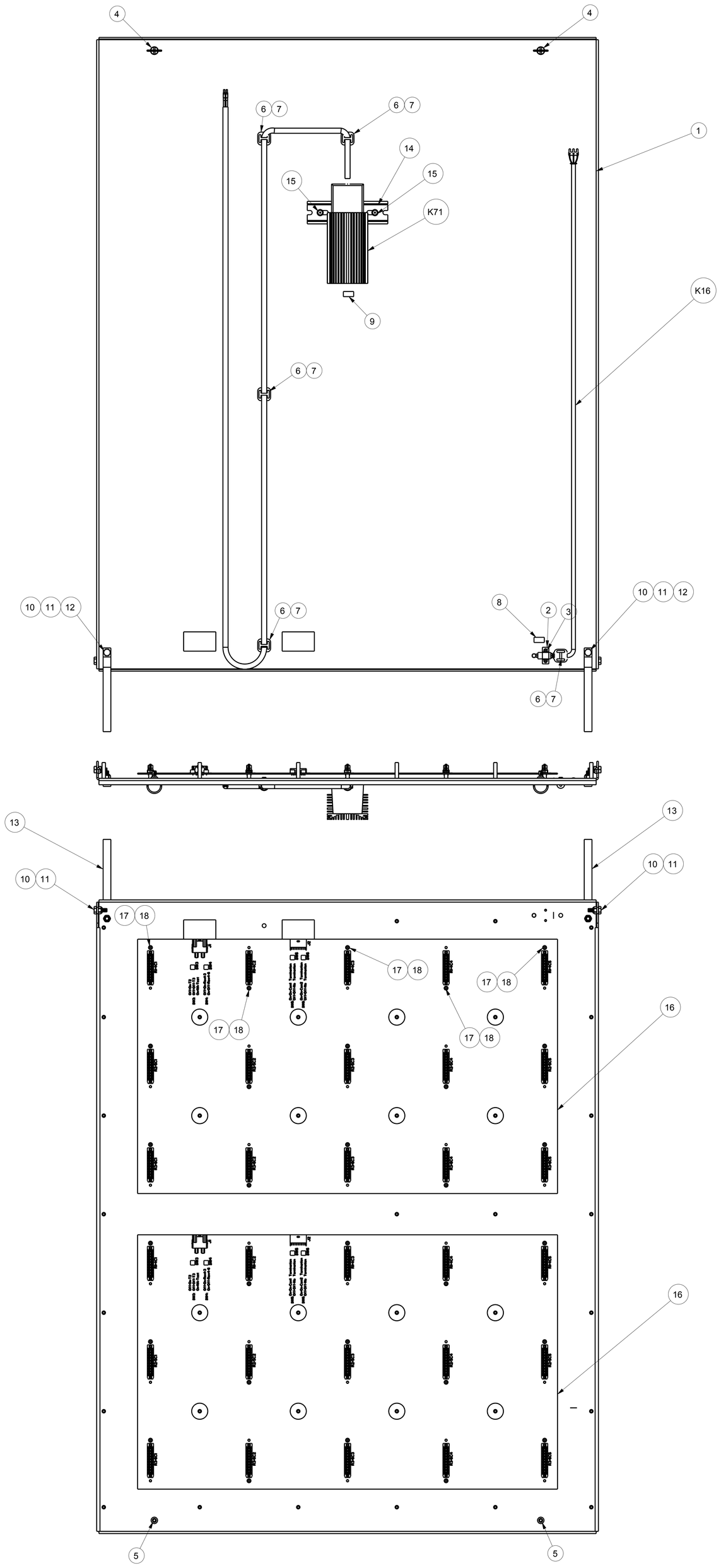
Sharp Edges

Surface Coating

Weight

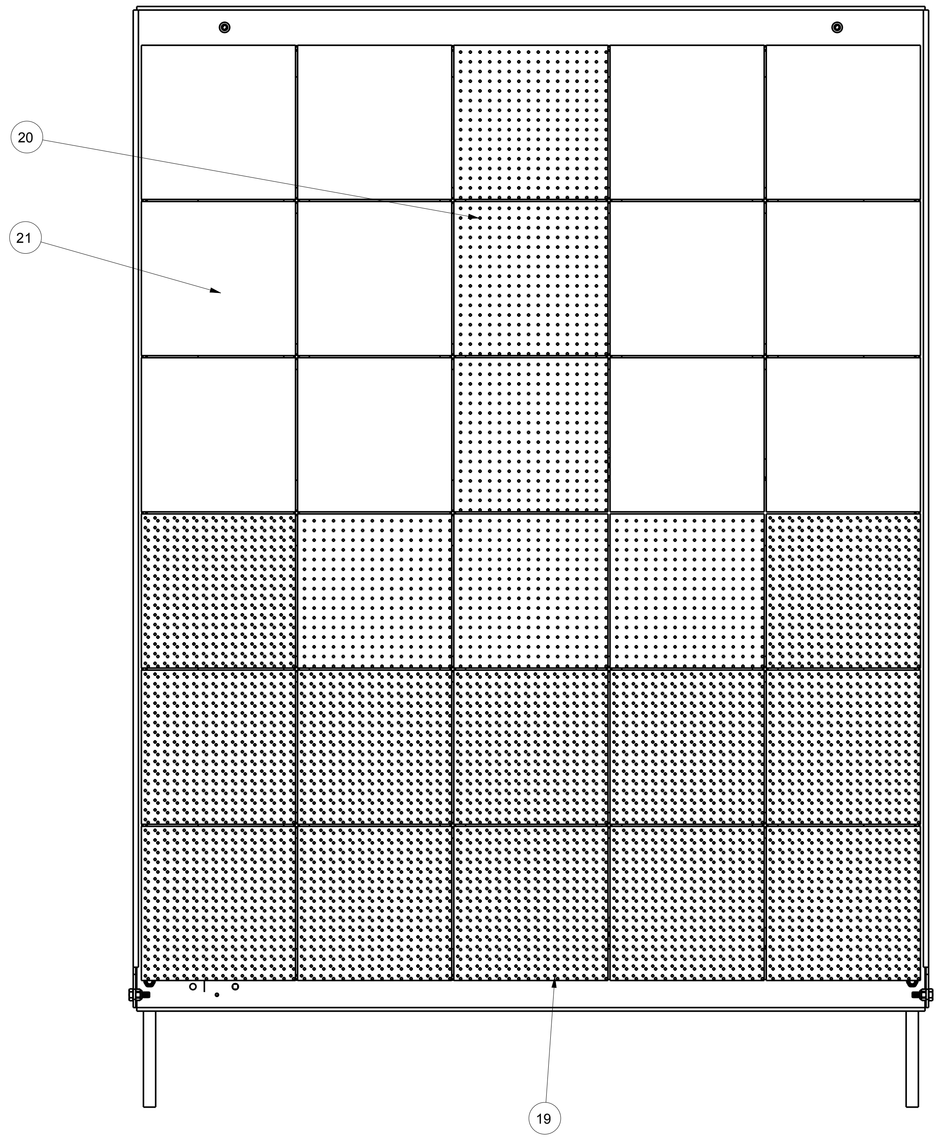
HEATER FOR LED DISPLAY

Drawing No.	Rev.	Sheet	Scale
SG590616-001-01	D	1 of 1	

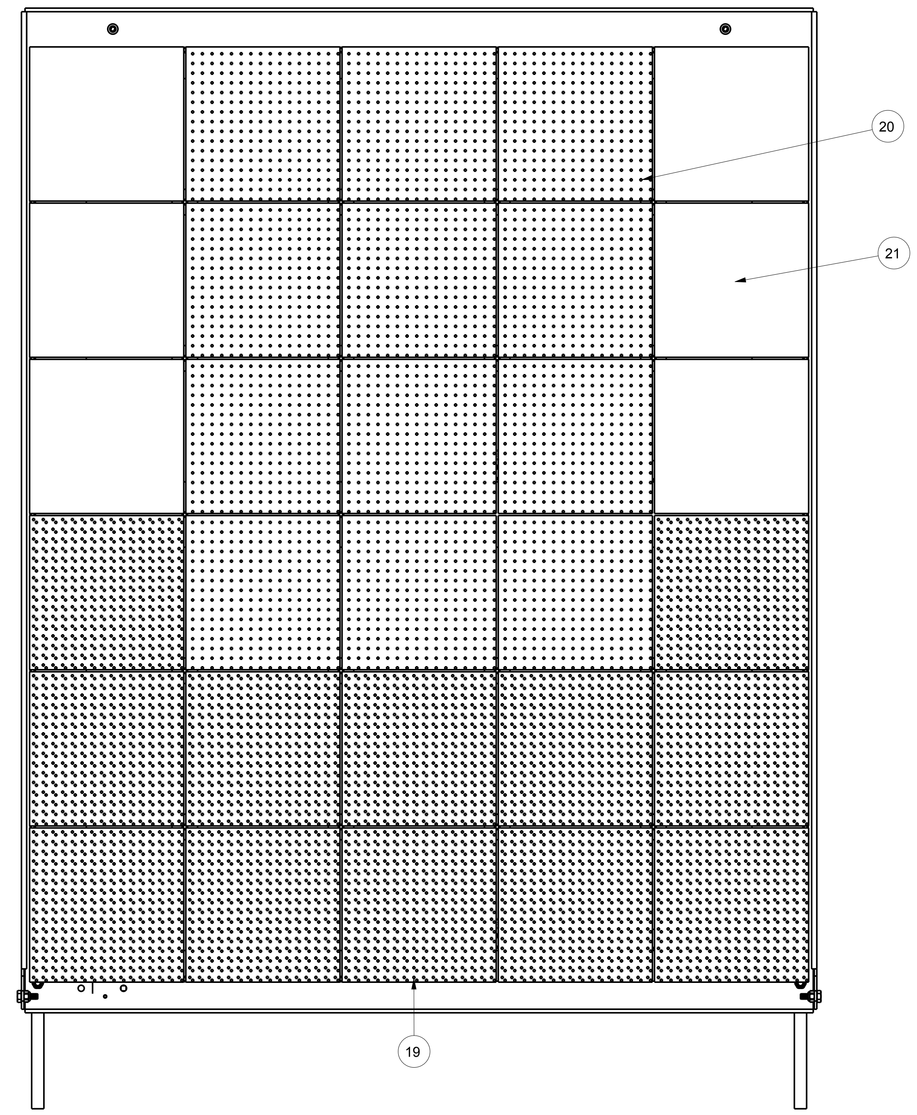


Position	Quantity	Description	Drawing Number	Model	Manufacturer	Supplier's. Part No.	Supplier
K16	1	Light Sensor Assembly	SG590619-101-01	ALL			
K71	1	Heater Assembly	SG590616-001-01	ALL			
1	1	Mounting Plate	SG590619-200-01	ALL			
2	1	Cable Clamp		ALL		310018	Bejoken AB
3	2	Screw, ISO7049, ST2.9x13, zink plated		ALL			
4	2	1/4 Turn Fastener		ALL		316411190	Aero Material
5	2	Washer		ALL		326100040	Aero Material
6	5	Anchor, SCF1, Snap-On, For Quick Tie		ALL		1516442	Ahlsell
7	5	Quick Tie, T18R, Black, 104x2,5		ALL		1516055	Ahlsell
8	1	Label, Yellow, Text: K16, 15x8		ALL		21302	Technotrade
9	1	Label, Yellow, Text: K71, 15x8		ALL		21302	Technotrade
10	4	Bolt, ISO 4017, M6x16, Zinc Plated		ALL			
11	4	Lock Nut, DIN 985, M6, Zinc Plated		ALL			
12	2	Lock Washer, DIN 6798A, AZ 6,4		ALL			
13	2	Ground Strap, A=16, L=200		ALL		55-097-57	ELFA
14	1	DIN RAIL, NS 35/7,5 PERF	SG590616-100-01	ALL			
15	2	Popnit BIG HEAD 3,2x7,9		ALL			
16	2	Back Plane PCB		ALL			
17	30	M3x8 DIN 7984, Zink Plated		ALL			
18	30	Lock Washer, M3 DIN 6798		ALL			
19	10	LED PCB Y-R, 16x16		ALL		SGA908-210656LF	
20	6	LED PCB Y, 16x16		T2-18		SGA908-211289LF	
21	12	LED PCB, BLIND		T2-18		SGA908-211356LF	
20	12	LED PCB Y, 16x16		T2-24		SGA908-211289LF	
21	6	LED PCB, BLIND		T2-24		SGA908-211356LF	

T2-18



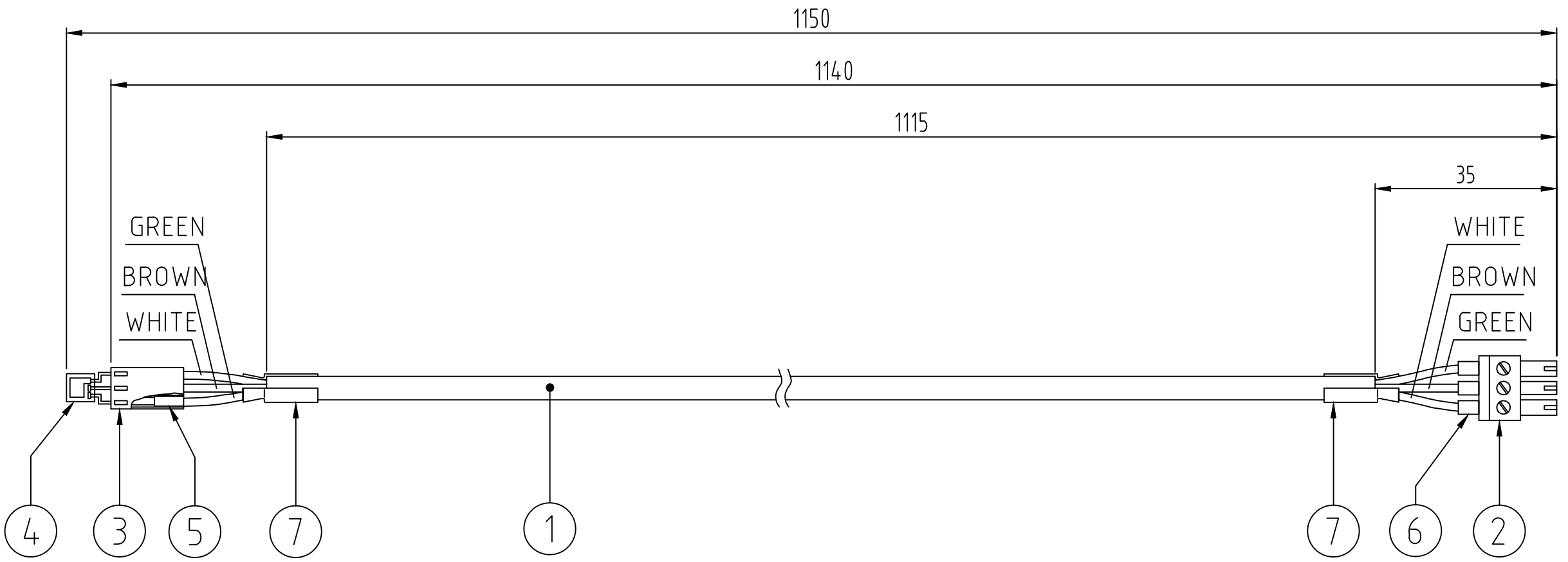
T2-24



PC	2011-02-10	A.S		Numbers for LED-pcbs added
PB	2011-12-07	K.J		BOM changed.
Issue No.	Issue date	Issue by	Issue checked by	Issue text

Drawn by: A.Strandberg
Approved by:
Date drawn: 2011.10.10
Date approved:
Project No.
Drawing No. 590619-001-01
Gen. tolerance
Surface treatment
Basic material
Info
Description: DISPLAY T2
Rev. PC | Scale 0,333 | Size A0 | Sheet 1 (1)

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, LIYY, 3x0.34mm^2					7852030	NOVUM, SWEDEN
2	1	CONTACT, MC 1.5/3-ST-3.81			1803581	PHOENIX CONTACT. GERMANY	1803581	PHOENIX CONTACT. SWEDEN
3	1	CONTACT			0-925366-3	AMP, USA		
4	1	LIGHT SENSOR			TSL235R	TAOS, USA		
5	3	CRIMP TERMINALS			1-141708-1	AMP, USA		
6	3	CRIMP TERMINALS, H 0.34/12			9025790000	WEIDMULLER, GERMANY	9025790000	WEIDMULLER, SWEDEN
7	2	SHRINK WRAP, L = 20					55-070-25	ELFA, SWEDEN



Revision	Description	Date	Drawn by:	Checked by:	Approved

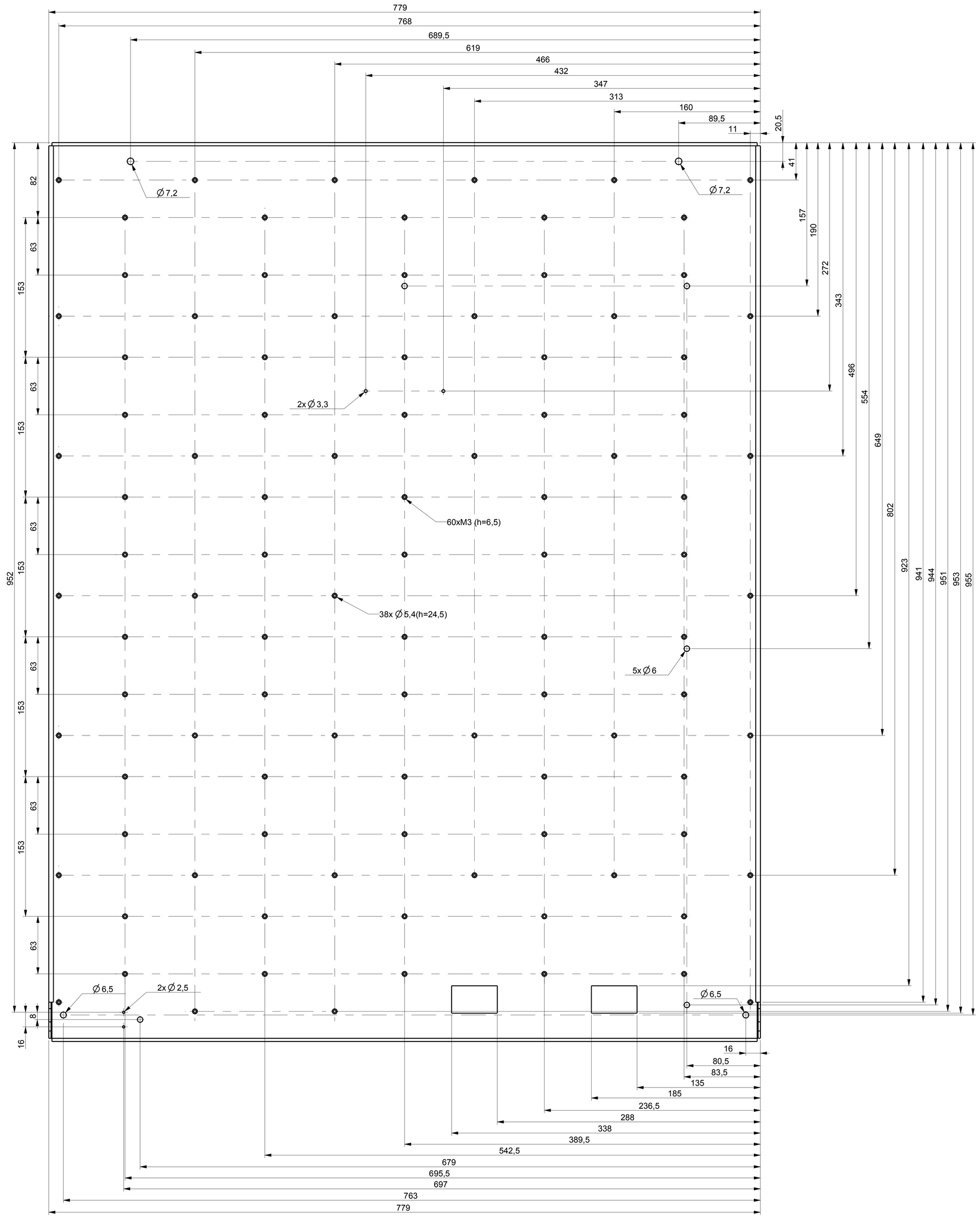
SAFEGATE GROUP

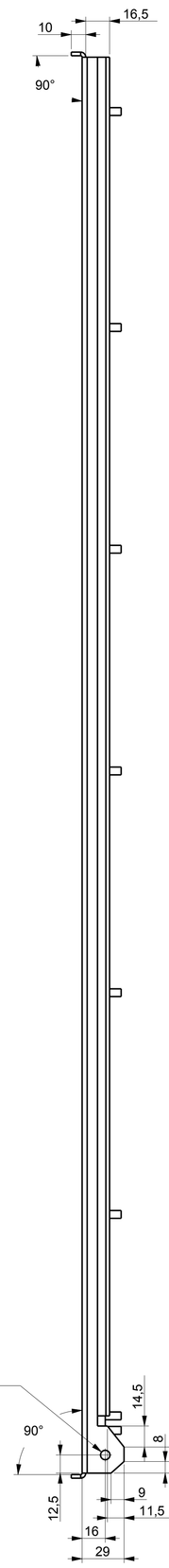
Safegate International AB
MALMÖ, SWEDEN

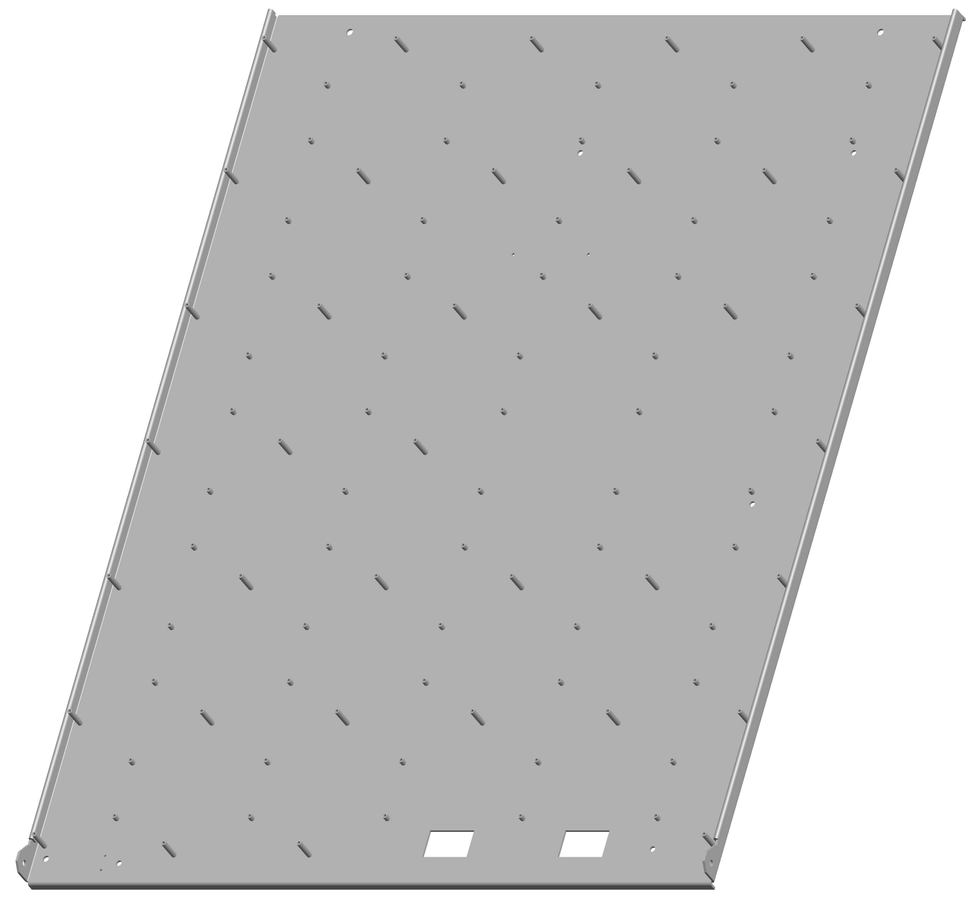
Drawn by:	Date drawn:	Checked by:	Unless otherwise indicated, all tolerances are according to	Sharp Edges
A.S.	2011.09.04		Surface Coating	Weight

LIGHT SENSOR ASSEMBLY
T2/T3

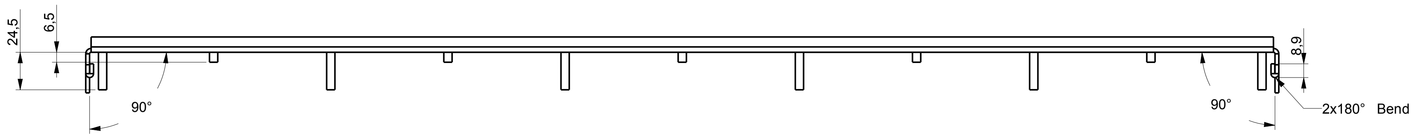
App. by:	Date approved:	Project No.:	Drawing No.	Rev.	Sheet	Scale
			SG590619-101-01		1 of 1	NONE







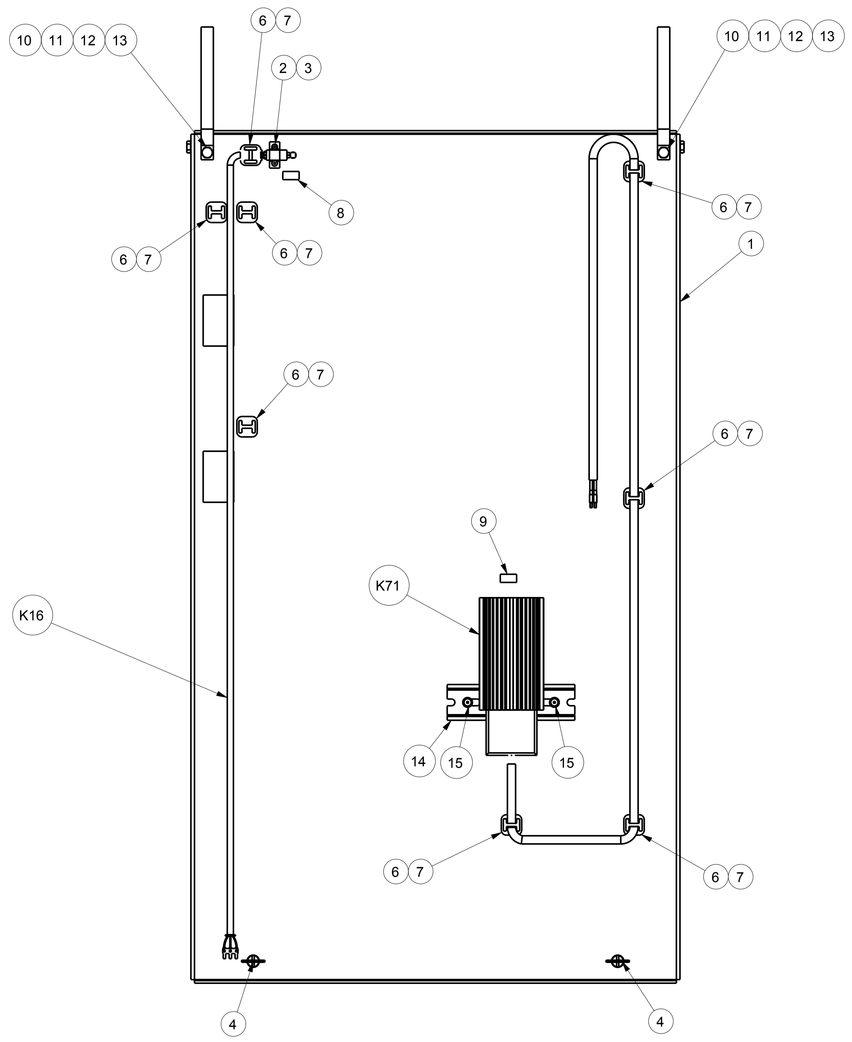
SCALE 0,333

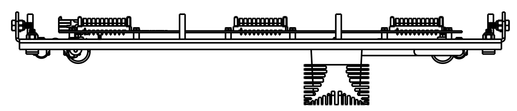


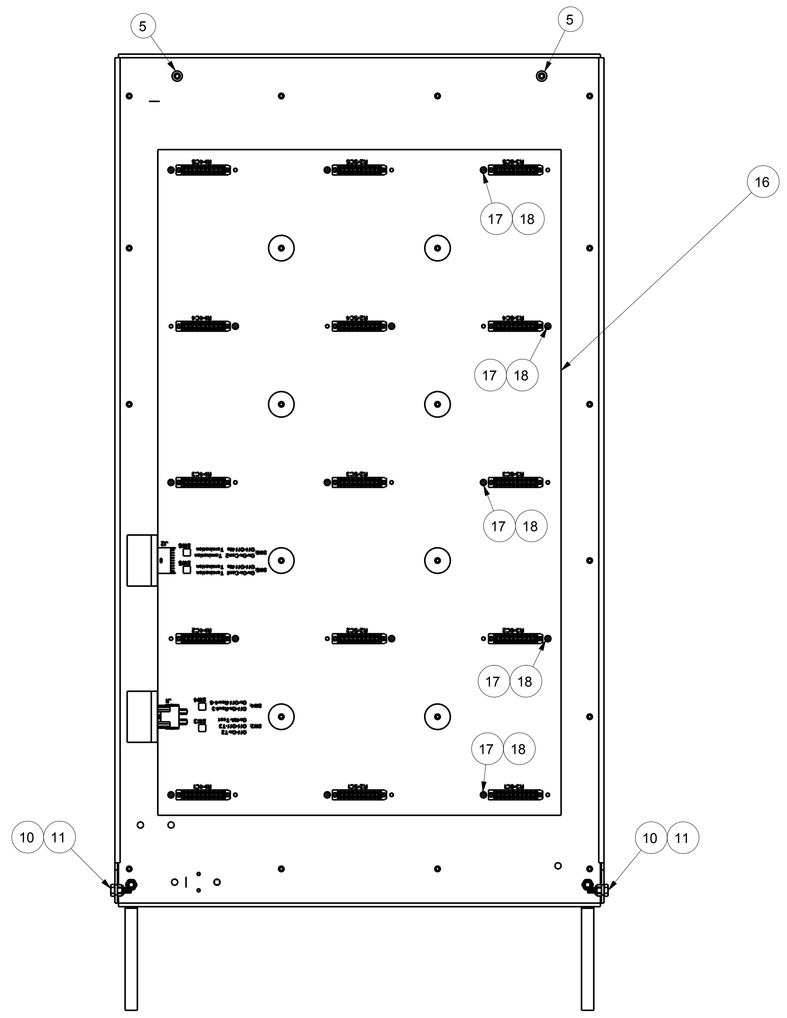
Issue No.	Issue date	Issue by	Issue checked by	Issue text

THORN lighting
EDMAN

Gen. tolerance: ISO-2765-m
Surface treatment: RAL 9017
Basic material: Aluminium Sheet EN1050-H14 t=2,5
Info: Sharp Edges R=0,5
Drawn by: A.Strandberg
Approved by:
Date drawn: 2011.07.22
Date approved:
Description: MOUNTING_PLATE_T2
Project No.
Drawing No.: 590619-200-01
Rev.: PA
Scale: 0,500
Size: A0
Sheet: 1 (1)

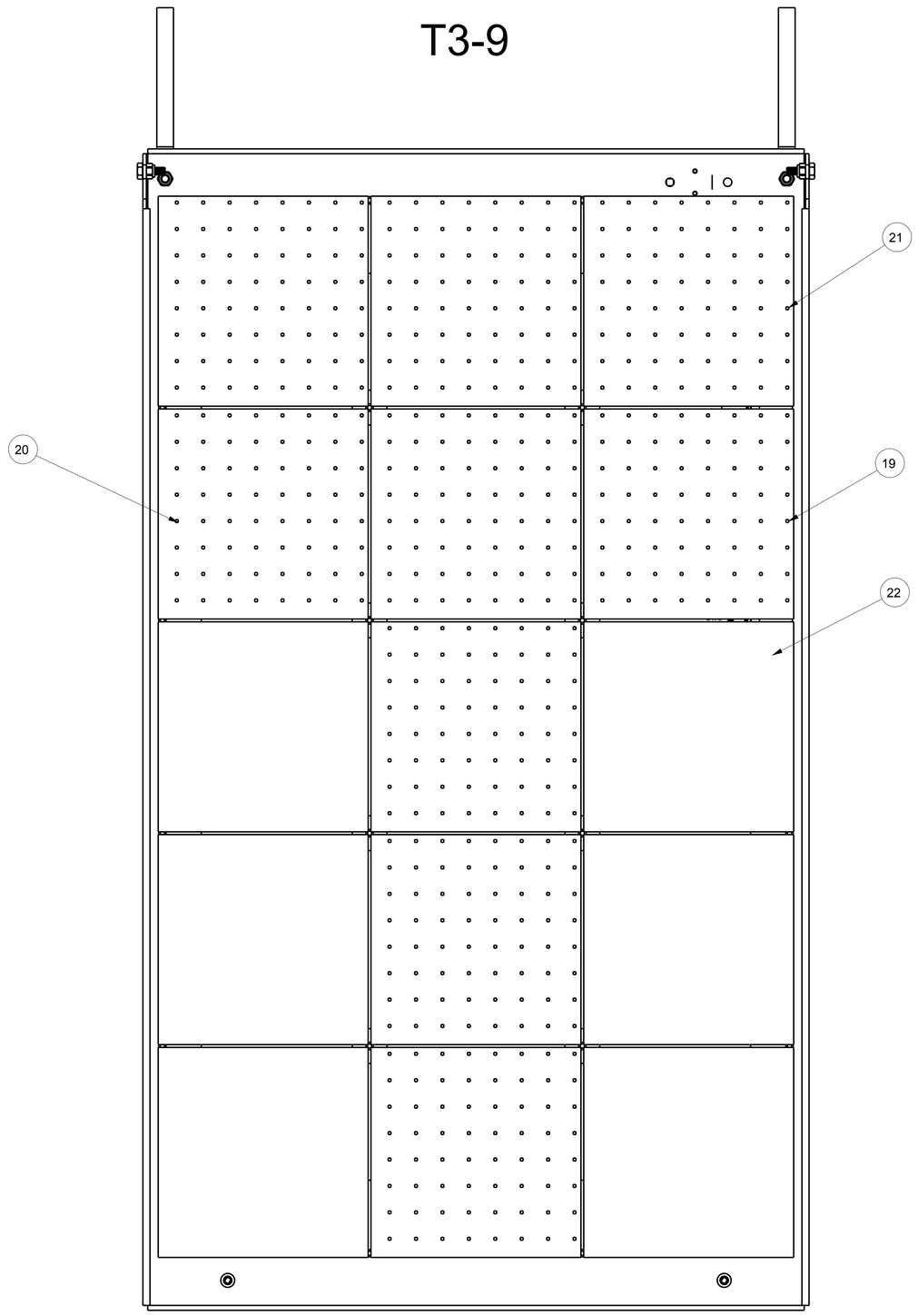






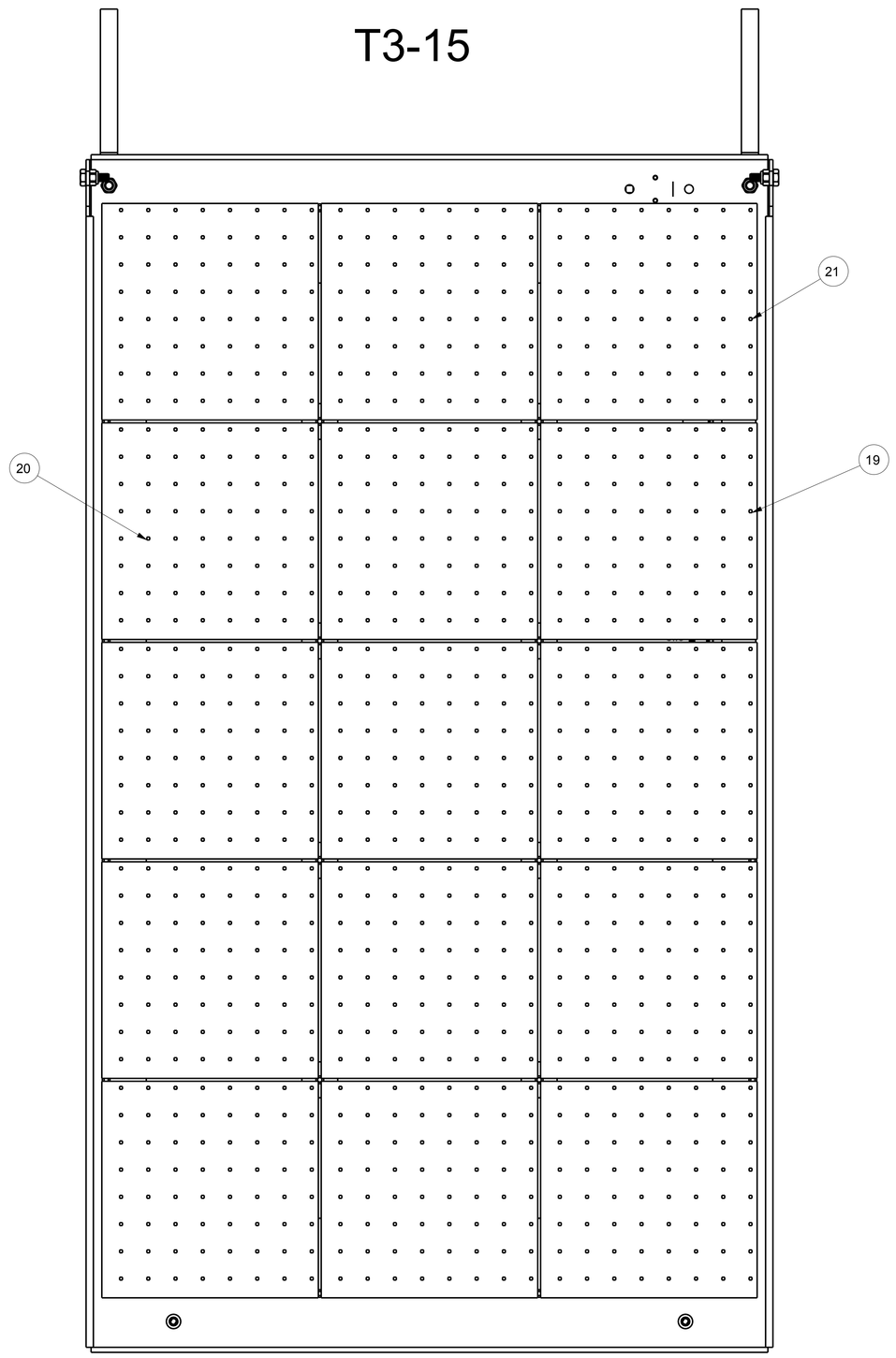
Position	Quantity	Description	Drawing Number	Model	Manufacturer	Supplier's. Part No.	Supplier
K16	1	Light Sensor Assembly	SG590619-101-01	ALL			
K71	1	Heater Assembly	SG590616-001-01	ALL			
1	1	Mounting Plate	SG590620-200-01	ALL			
2	1	Cable Clamp		ALL		310018	Bejoken AB
3	2	Screw,ISO7049, ST2.9x13, zink plated		ALL			
4	2	1/4 Turn Fastener		ALL		316411190	Aero Material
5	2	Washer		ALL		326100040	Aero Material
6	8	Anchor, SCFI, Snap-On, For Quick Tie		ALL		1516442	Ahlsell
7	8	Quick Tie, T18R, Black, 104x2,5		ALL		1516055	Ahlsell
8	1	Label, Yellow, Text: K16, 15x8		ALL		21302	Technotrade
9	1	Label, Yellow, Text: K71, 15x8		ALL		21302	Technotrade
10	4	Bolt, ISO 4017, M6x16, zink plated		ALL			
11	4	Lock Nut, Din 985, M6, zink plated		ALL			
12	2	Lock Washer		ALL			
13	1	Ground Strap, A=16, L=200		ALL			
14	1	DIN RAIL, NS 35/7,5 PERF	SG590616-100-01	ALL		55-097-57	ELFA
15	2	Popnit BIG HEAD, 3,2x7,9		ALL			
16	1	Back Plane, PCB		ALL			
17	15	M3x8, DIN 7984, Zink Plated		ALL			
18	15	Lock Washer, M3, DIN 6798		ALL			
19	1	LED PCB, Half Y Left, Half R Right, 8x8		ALL		SGA908-211291LF	
20	1	LED PCB, Half Y Right, Half R Left, 8x8		ALL		SGA908-211292LF	
21	7	LED PCB, Y, 8x8		T3-9		SGA908-210658LF	
22	6	LED PCB, BLIND		T3-9		SGA908-211356LF	
21	13	LED PCB, Y, 8x8		T3-15		SGA908-210658LF	

T3-9



SCALE 0,500

T3-15



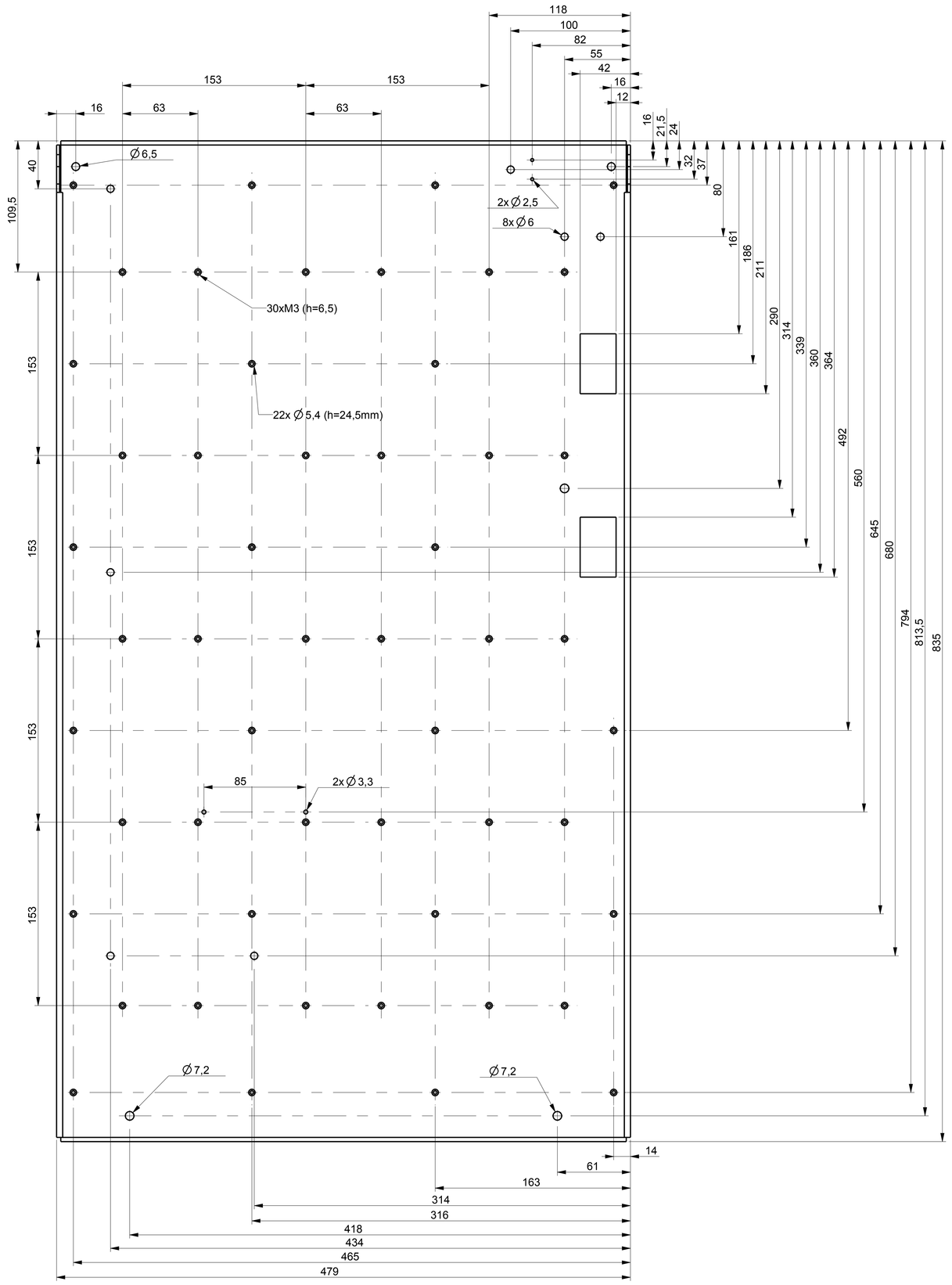
SCALE 0,500

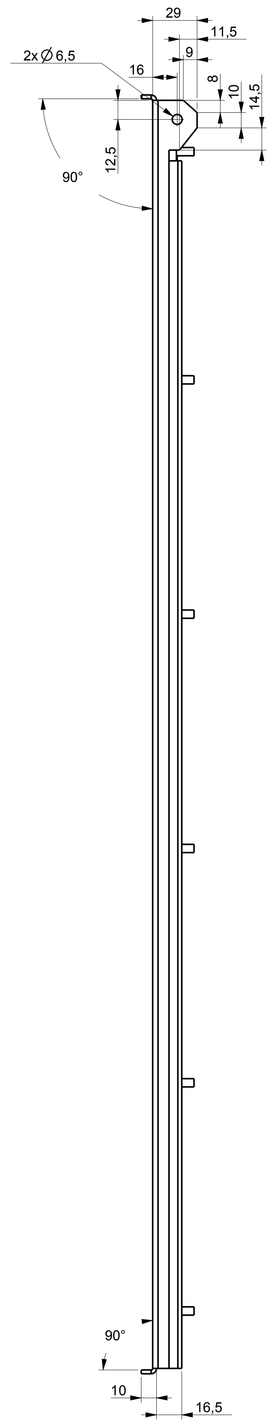
Issue No.	Issue date	Issue by	Issue checked by	Issue text
PE	2012-02-10	A.Strandberg		Number for LED-pcbs added
PD	2011-12-08	K.Johansson		BOM changed
PC	2011-11-15	A.Strandberg		BOM changed
PB	2011-10-21	A.Strandberg		Type of LED pcb for possition 20 changed

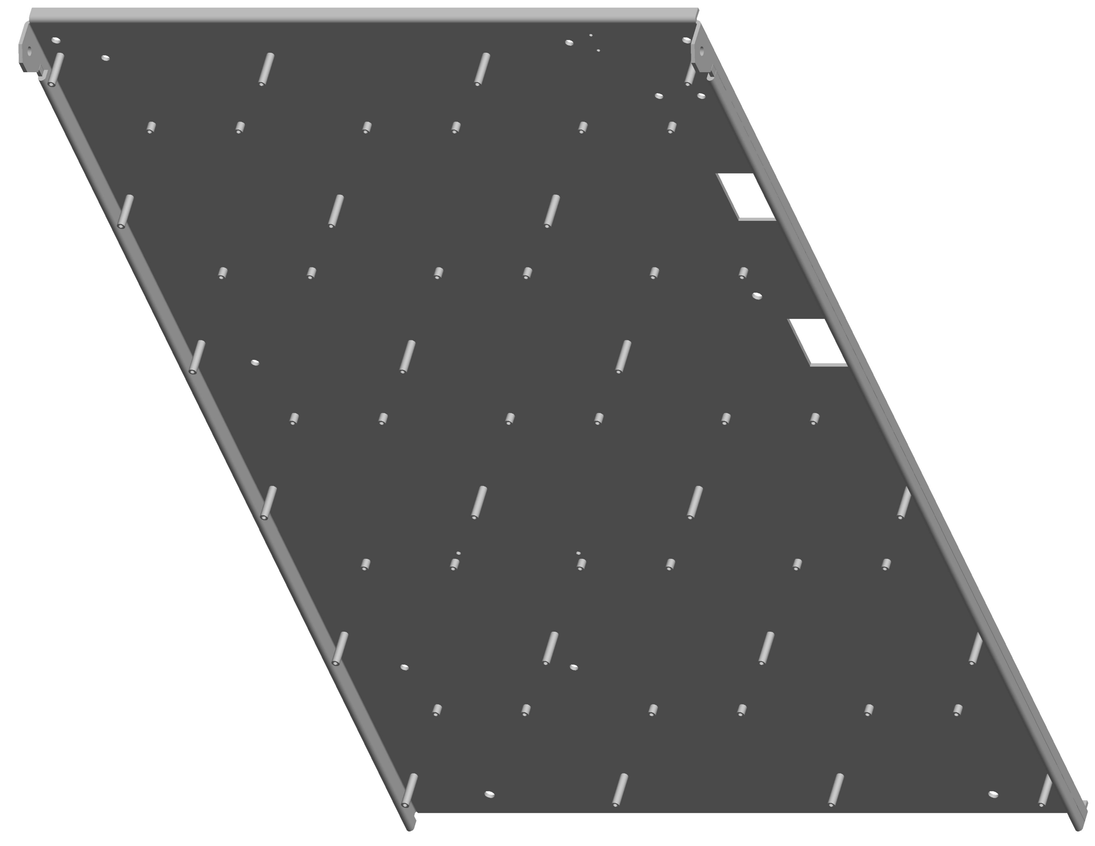
Drawn by: A.Strandberg
Approved by:
Date drawn: 2011.10.18
Date approved:
Project No.
Drawing No. 590620-001-01

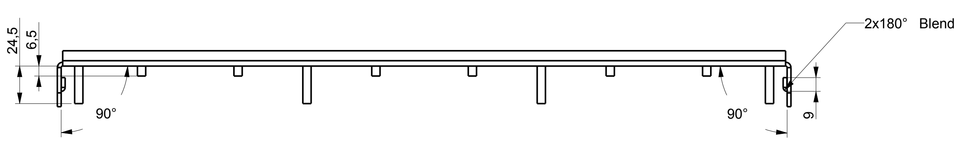
Gen. tolerance
Surface treatment
Basic material
Info
Description: DISPLAY T3

Rev. PE | Scale 0,333 | Size A0 | Sheet 1 (1)





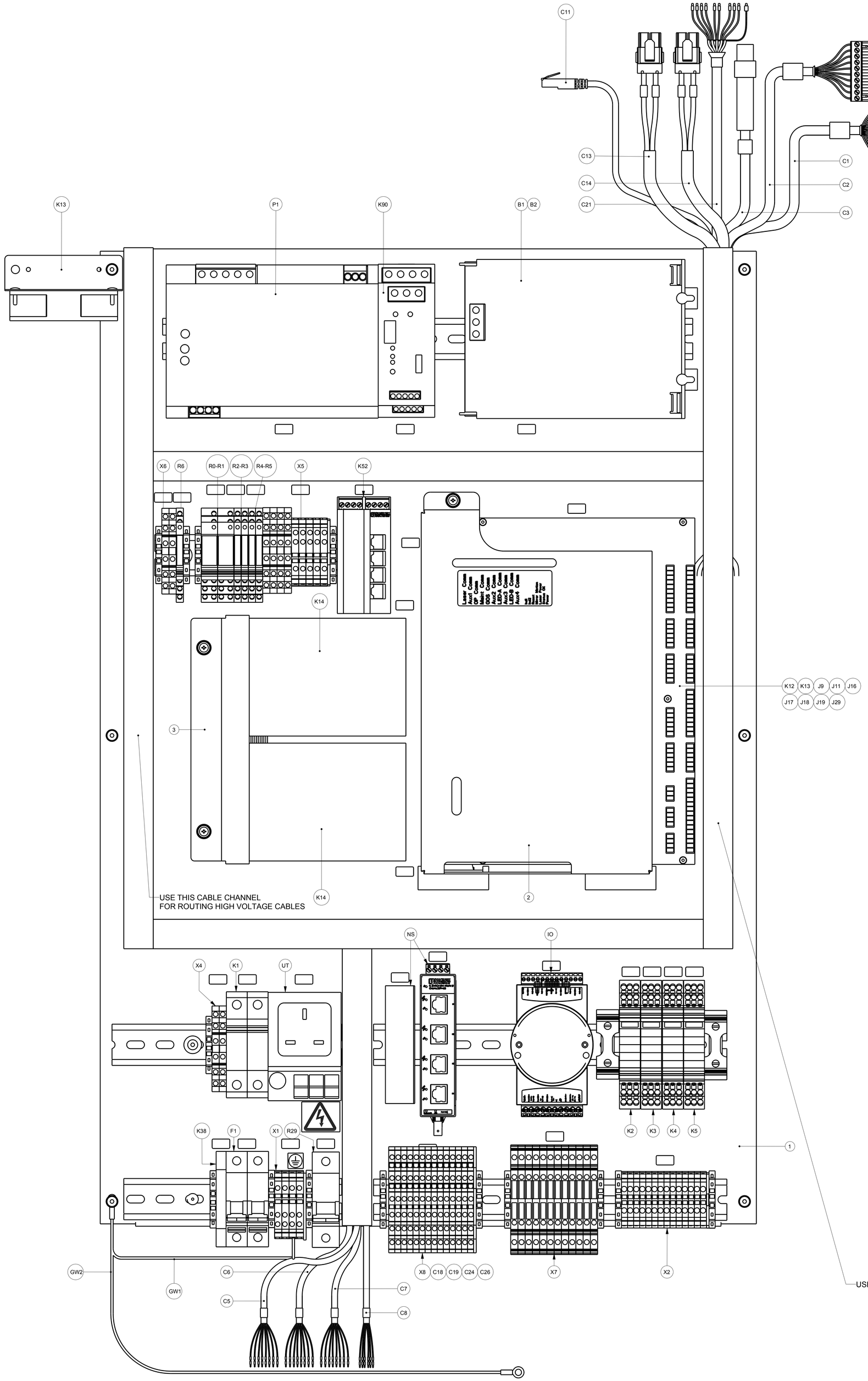




Issue No.	Issue date	Issue by	Issue checked by	Issue text					

THORN
Entrance Systems
IDMAN

Drawn by: A.Strandberg	Date drawn: 2011.07.25	Gen. tolerance: ISO-2765-m			
Approved by:	Date approved:	Surface treatment: RAL 9017			
		Basic material: Aluminum Sheet EN1050-H14 t=2,5			
		Info: Sharp Edges R=0,5			
Project No.	Drawing No. SG590620-200-01	Description: Mounting Plate T3			
		Rev. PA	Scale 0,500	Size A0	Sheet 1 (1)



Item	Quantity	Description/Ratings	Standard/Option	T1/T1S/T2/T3	Drawing No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock No.	Supplier
B1	1	UPS-BAT/VRLA/24DC/7,2AH	Option (UPS)	T1/T2/T3		2320319	PHOENIX CONTACT		
B2	1	QUINT-ADAPTER/4	Option (UPS)	T1/T2/T3		2866857	PHOENIX CONTACT		
C11	1	COMMUNICATION CABLE	Standard	T1/T1S	SG590621-114-01				
	1	COMMUNICATION CABLE	Standard	T2/T3	SG590621-119-01				
C13	1	POWER CABLE ASSM., DISPLAY	Standard	T1/T1S/T2/T3	SG590621-112-01				
C14	1	POWER CABLE ASSM., DISPLAY	Standard	T1/T1S/T2	SG590621-113-01				
C1	1	CONTROL CABLE	Standard	T1	SG590621-125-01				
C18	1	CONTROL CABLE	Standard	T1S	SG590621-123-01				
C2	1	CONTROL CABLE	Standard	T1	SG590621-126-01				
C19	1	CONTROL CABLE	Standard	T1S	SG590621-124-01				
C3	1	CONTROL CABLE	Standard	T1	SG590621-118-01				
C26	1	CONTROL CABLE	Standard	T1S	SG590621-131-01				
C21	1	MULTI CABLE	Standard	T1	SG590621-127-01				
C24	1	MULTI CABLE	Standard	T1S	SG590621-129-01				
C5	1	CONTROL CABLE	Standard	T2/T3	SG590621-101-01				
C6	1	CONTROL CABLE	Standard	T2/T3	SG590621-102-01				
C7	1	CONTROL CABLE	Standard	T2/T3	SG590621-103-01				
C8	1	POWER CABLE	Standard	T2/T3	SG590621-104-01				
F1	1	CIRCUIT BREAKER	Standard	T1/T1S/T2/T3		MG24522	SCHNEIDER ELECTRIC		
J9	1	WIRING ASSEMBLY	Standard	T1/T1S/T2/T3	SG590621-105-01				
J11	1	WIRING ASSEMBLY	Standard	T1/T1S/T2/T3	SG590621-106-01				
J16	1	WIRING ASSEMBLY	Standard	T1/T1S/T2/T3	SG590621-107-01				
J17	1	WIRING ASSEMBLY	Standard	T1/T1S/T2/T3	SG590621-108-01				
J18	1	WIRING ASSEMBLY	Standard	T1/T1S/T2/T3	SG590621-110-01				
J19	1	WIRING ASSEMBLY	Standard	T1/T1S/T2/T3	SG590621-115-01				
J29	1	WIRING ASSEMBLY	Standard	T1/T1S/T2/T3	SG590621-120-01				
K1		OVERVOLTAGE PROTECTOR							
	1	VAL-MS-230/1+1-FM	Standard	T1/T1S/T2/T3		2804432	PHOENIX CONTACT		
K2		OVERVOLTAGE PROTECTOR							
	1	PT-IQ-PTB-PT	Standard	T1/T1S/T2/T3		2801296	PHOENIX CONTACT		
	1	END STOP E/ME TBUS NS35 GY	Standard	T1/T1S/T2/T3		2713780	PHOENIX CONTACT		
K3		OVERVOLTAGE PROTECTOR							
	1	PT-IQ-5-HF-5DC-PT	Standard	T1/T1S/T2/T3		2801291	PHOENIX CONTACT		
K4-K5		OVERVOLTAGE PROTECTOR							
	2	PT-IQ-4X1-24DC-PT	Standard	T1/T1S/T2/T3		2801271	PHOENIX CONTACT		
	1	END STOP E/ME TBUS NS35 GY	Standard	T1/T1S/T2/T3		2713780	PHOENIX CONTACT		
K12	1	SAFEDOCK CONTROL UNIT	Standard	T1/T1S/T2/T3	SG590587				
K14	2	STEPPER MOTOR DRIVE CIRCUIT	Standard	T1/T1S/T2/T3	SG590131-001-01				
K90	1	QUINT-UPS/24DC/24DC/40	Option (UPS)	T1/T1S/T2		2320241	PHOENIX CONTACT		
	1	QUINT-UPS/24DC/24DC/20	Option (UPS)	T3		2320238	PHOENIX CONTACT		
R0-R1		RELAYS							
	2	PLC RELAY, PLC-RSC-24DC/21HC	Standard	T2/T3		2967620	PHOENIX CONTACT		
		BRIDGE, FB ST 500-PLC RD	Standard	T2/T3		2966786	PHOENIX CONTACT		
		TERMINAL MARKER, ZB 10, SO/CMS R0-R1	Standard	T2/T3		1050525	PHOENIX CONTACT		
R2-R3		RELAYS							
	2	PLC RELAYS, PLC-RSC-24DC/21	Standard	T2/T3		2966171	PHOENIX CONTACT		
		BRIDGE, FB ST 500-PLC RD	Standard	T2/T3		2966786	PHOENIX CONTACT		
		TERMINAL MARKER, ZB 6, SO/CMS R2-R3	Standard	T2/T3		1050499	PHOENIX CONTACT		
R4-R5		RELAYS							
	2	PLC RELAYS, PLC-RSC-24DC/21	Standard	T1/T1S/T2/T3		2966171	PHOENIX CONTACT		
		BRIDGE, FB ST 500-PLC RD	Standard	T1/T1S/T2/T3		2966786	PHOENIX CONTACT		
		TERMINAL MARKER, ZB 6, SO/CMS R4-R5	Standard	T1/T1S/T2/T3		1050499	PHOENIX CONTACT		
	1	END STOP, CLIPFIX 35-5	Standard	T1/T1S/T2/T3		3022276	PHOENIX CONTACT		
R6		RELAYS							
	1	PLC RELAY, PLC-RSC-24DC/21	Option (Heater)	T2/T3		2966171	PHOENIX CONTACT		
		TERMINAL MARKER, ZB 6, SO/CMS R6	Option (Heater)	T2/T3		1050499	PHOENIX CONTACT		
	1	END STOP, CLIPFIX 35-5	Option (Heater)	T2/T3		3022276	PHOENIX CONTACT		
P1	1	QUINT-PS/1AC/24DC/40	Standard	T1/T2		2866789	PHOENIX CONTACT		
	1	QUINT-PS/1AC/24DC/20	Standard	T3		2866776	PHOENIX CONTACT		
X1		X1, TERMINAL CONTACT GROUP							
	1	TERMINAL CONTACT, UT 4-TWIN	Standard	T1/T1S/T2/T3		3044364	PHOENIX CONTACT		
	1	TERMINAL CONTACT, UT 4-TWIN BU	Standard	T1/T1S/T2/T3		3044500	PHOENIX CONTACT		
	2	TERMINAL CONTACT, UT 4-TWIN PE	Standard	T1/T1S/T2/T3		3044380	PHOENIX CONTACT		
	1	END, COVER, D-UT 2,5/4-TWIN	Standard	T1/T1S/T2/T3		3047141	PHOENIX CONTACT		
	2	END STOP, CLIPFIX 35-5	Standard	T1/T1S/T2/T3		3022276	PHOENIX CONTACT		
		TERMINAL MARKER, ZB 6, LGS:L1, N, PE,PE	Standard	T1/T1S/T2/T3		1051414	PHOENIX CONTACT		
X2		TERMINAL CONTACT GROUP							
	14	TERMINAL CONTACT, UT 2,5	Standard	T1/T1S/T2/T3		3044076	PHOENIX CONTACT		
	1	END, COVER, D-UT 2,5/10	Standard	T1/T1S/T2/T3		3047028	PHOENIX CONTACT		
	2	END STOP, CLIPFIX 35-5	Standard	T1/T1S/T2/T3		3022276	PHOENIX CONTACT		
		TERMINAL MARKER, ZB 5, NOS, 1-14	Standard	T1/T1S/T2/T3		1050017	PHOENIX CONTACT		
X4		TERMINAL CONTACT GROUP							
	2	TERMINAL CONNECTOR, DIKD 1,5-PV	Standard	T1/T1S/T2/T3		2715092	PHOENIX CONTACT		
	1	END STOP, CLIPFIX 35-5	Standard	T1/T1S/T2/T3		3022276	PHOENIX CONTACT		
		TERMINAL MARKER, ZB 6, LGS:L1, N	Standard	T1/T1S/T2/T3		1051414	PHOENIX CONTACT		
X5		TERMINAL CONTACT GROUP							
	4	TERMINAL CONTACT, UT 4-TWIN	Standard	T1/T1S/T2/T3		3044364	PHOENIX CONTACT		
	1	TERMINAL CONTACT, UT 4-TWIN-PE	Standard	T1/T1S/T2/T3		3044380	PHOENIX CONTACT		
	1	END, COVER, D-UT 2,5/4-TWIN	Standard	T1/T1S/T2/T3		3047141	PHOENIX CONTACT		
	2	BRIDGE, PBS 2-6	Standard	T1/T1S/T2/T3		3030336	PHOENIX CONTACT		
		TERMINAL MARKER, ZB 6, NOS, 24-27	Standard	T1/T1S/T2/T3		1051016	PHOENIX CONTACT		
		TERMINAL MARKER, ZB 6, LGS: PE	Standard	T1/T1S/T2/T3		1051414	PHOENIX CONTACT		
	3	TERMINAL CONNECTOR, DIKD 1,5-PV	Standard	T1/T1S/T2/T3		2715092	PHOENIX CONTACT		
		TERMINAL MARKER, ZB 6, NOS, 21-23	Standard	T1/T1S/T2/T3		1051016	PHOENIX CONTACT		
	1	END STOP, CLIPFIX 35-5	Standard	T1/T1S/T2/T3		3022276	PHOENIX CONTACT		
X6		TERMINAL CONTACT GROUP							
	2	TERMINAL CONNECTOR, DIKD 1,5-PV	Option (Heater)	T2/T3		2715092	PHOENIX CONTACT		
	1	END STOP, CLIPFIX 35-5	Option (Heater)	T2/T3		3022276	PHOENIX CONTACT		
		TERMINAL MARKER, ZB 6, LGS:L1, N	Option (Heater)	T2/T3		1051414	PHOENIX CONTACT		
....		WIRING MATERIALS FOR ITEMS NOT SPECIFIED ELSEWHERE							
		MAINS WIRE: UL 1007/1569, AWG 16, BROWN	Standard	T1/T1S/T2/T3					
		NEUTRAL WIRE: UL 1007/1569, AWG 16, BLUE	Standard	T1/T1S/T2/T3					
		GROUND WIRE: UL 1007/1569, AWG 16, YELLOW/GREEN	Standard	T1/T1S/T2/T3					
		WIRE WITH END MARKING: (22-24) UL 1007/1569, AWG 20, BLACK	Standard	T1/T1S/T2/T3					
		WIRES WITH END MARKINGS: (23-26), (115-115), (120-120), (129-129) UL 1007/1569, AWG 20, RED	Standard	T1/T1S/T2/T3					
		WIRES WITH END MARKINGS: (125-125), ELECTRICAL WIRE, UL 1007/1569, AWG 16, BLACK	Standard	T1/T1S/T2/T3					
		WIRES WITH END MARKINGS: (127-127), UL 1007/1569, AWG 16, RED	Standard	T1/T1S/T2/T3					
		WIRES WITH END MARKINGS: (25-25), (118-118), (130-130) UL 1063, AWG 12, BLACK	Standard	T1/T1S/T2/T3					
		WIRES WITH END MARKINGS: (27-27), (117-117), (119-119) UL 1063, AWG 12, RED	Standard	T1/T1S/T2/T3					
		BOOTLACE FERRULE FOR AWG 20 WIRE: H 0,5/14	Standard	T1/T1S/T2/T3				9026060000	WEIDMÜLLER
		BOOTLACE FERRULE FOR AWG 16 WIRE: H 1,5/14	Standard	T1/T1S/T2/T3				9026090000	WEIDMÜLLER
		BOOTLACE FERRULE FOR TWO AWG 16 WIRES: H 2x1,5	Standard	T1/T1S/T2/T3				9004410000	WEIDMÜLLER
		BOOTLACE FERRULE FOR AWG 12 WIRE: H 4/18 (WIRES FROM Power supple, ups and battery)	Standard	T1/T1S/T2/T3				9019210000	WEIDMÜLLER
		WIRE MARKERS: PARTEX PA02 OR EQV. NUMBERS AS PER CONNECTION DIAGRAM	Standard	T1/T1S/T2/T3					
GW1		GROUND WIRE	Standbard	T1/T1S/T2/T3	SG590621-121-01				
GW2		GROUND WIRE	Standard	T1/T1S	SG590621-122-01				
1		CONTROL & POWER MOUNTING PLATE	Standard	T1/T1S/T2/T3	SG590621-203-01				
1		CONTROL & POWER MOUNTING PLATE	Option (SC)	T3	SG590621-206-01				
2		CU-COVER	Standard	T1/T1S/T2/T3	48000372				
3		STEPPER MOTOR CARD HOLDER	Standard	T1/T1S/T2/T3	SG590621-208-01				
NS	1	NETWORK SWITCH, 4 RJ45 PORTS AND 1 FIBER OPTIC WITH ST CONTACT	Option (NS)	T1/T1S/T2/T3	SG590611-001-01				
	1	DIN RAIL MOUNTING BRACKET	Option (NS)	T1/T1S		5503655	PHOENIX CONTACT	5503655	PHOENIX CONTACT, SWEDEN
	1	FILTER, CAT6	Option (NS)	T1/T1S/T2/T3	SG590262-001-01				
UT(x)	1	UTILITY OUTLET	Option (UT)	T1/T1S/T2/T3	SG590266-001-01				
K52	1	PoE SWITCH, FL PSE 2TX	Option (CM)	T1/T1S/T2/T3	SG590612-001-01	FL PSE 2TX	PHOENIX CONTACT	FL PSE 2TX	PHOENIX CONTACT, SWEDEN
IO	1	I/O MODULE	Option (IO)	T1/T1S/T2/T3	SG590623-001-01				
R29	1	RELAY, Z7-R230/SO	Option (IO)	T1/T1S/T2/T3		3290758	GYCOM		
K38	1	AUXILIARY CONTACT, C60 3A AT 415V	Option (IO)	T1/T1S/T2/T3		26924	SCHNEIDER ELECTRIC	26924	SCHNEIDER ELECTRIC
X7		CONNECTION HARDWARE AS FOLLOWS							
	12	TERMINAL CONNECTOR, KNIFE DISCONNECT TYPEUDMTK 5-P/P	Option (IO)	T1/T1S/T2/T3		3101087	PHOENIX CONTACT	3101087	PHOENIX CONTACT, SWEDEN
	2	END STOP, CLIPFIX 35-5	Option (IO)	T1/T1S/T2/T3		3022276	PHOENIX CONTACT	3022276	PHOENIX CONTACT, SWEDEN
		TERMINAL MARKERS, AB +, NO.S 201-224	Option (IO)	T1/T1S/T2/T3		1051016	PHOENIX CONTACT	1051016	PHOENIX CONTACT, SWEDEN
K6	1	CONVERTER, RS232 - RS485, 10-30VDC	Option (PBB)	T1/T1S/T2/T3	SG590585-001-01	485LDRC9	B&B ELECTRONICS		
K13	1	FAN, DISPLAY CABINET ASSM.	Standard	T2/T3	SG590625-001-01	3414NG	EBMPAPST		
F2	2	CIRCUIT BREAKER	Option (UL with SC)	T2/T3		9926251905	WEIDMULLER		
X8		CONNECTION HARDWARE AS FOLLOWS							
	14	TERMINAL CONTACT, UT 2,5-3L	Standard	T1S		3214259	PHOENIX CONTACT	3214259	PHOENIX CONTACT, SWEDEN
	1	END COVER, D-UT 2,5-3L	Standard	T1S		3214314	PHOENIX CONTACT	3214314	PHOENIX CONTACT, SWEDEN
	2	END STOP, CLIPFIX 35-5	Standard	T1S		3022276	PHOENIX CONTACT	3022276	PHOENIX CONTACT, SWEDEN
		TERMINAL MARKERS, ZB 5, 51-52, 56-84, 87-90, 110-111, 172-174 + SHIELDS.	Standard	T1S		1050004	PHOENIX CONTACT	1050004	PHOENIX CONTACT, SWEDEN

Issue No.	Issue date	Issue by	Issue checked by	Issue text
U	2014-10-22	V. Norell		Cables C1 and C2 changed and updated with new drawing numbers. K13 removed for T1/T1S.
T	2014-03-07	K.Johansson		Option (F) removed and the filter is now included in Option (NS).
S	2013-12-17	A.Strandberg		Part number K2 changed
R	2013-11-13	K.Johansson		K6 removed. Rearranging of components. Mounting bracket (NS) added. CU Cover updated.
Q	2013-09-30	K.Johansson		F1 changed from MG24447 to MG24522 (10A)
P	2013-07-25	A.Strandberg		K1-K5 are new. Option EC removed. Correction of K14 drw nr.

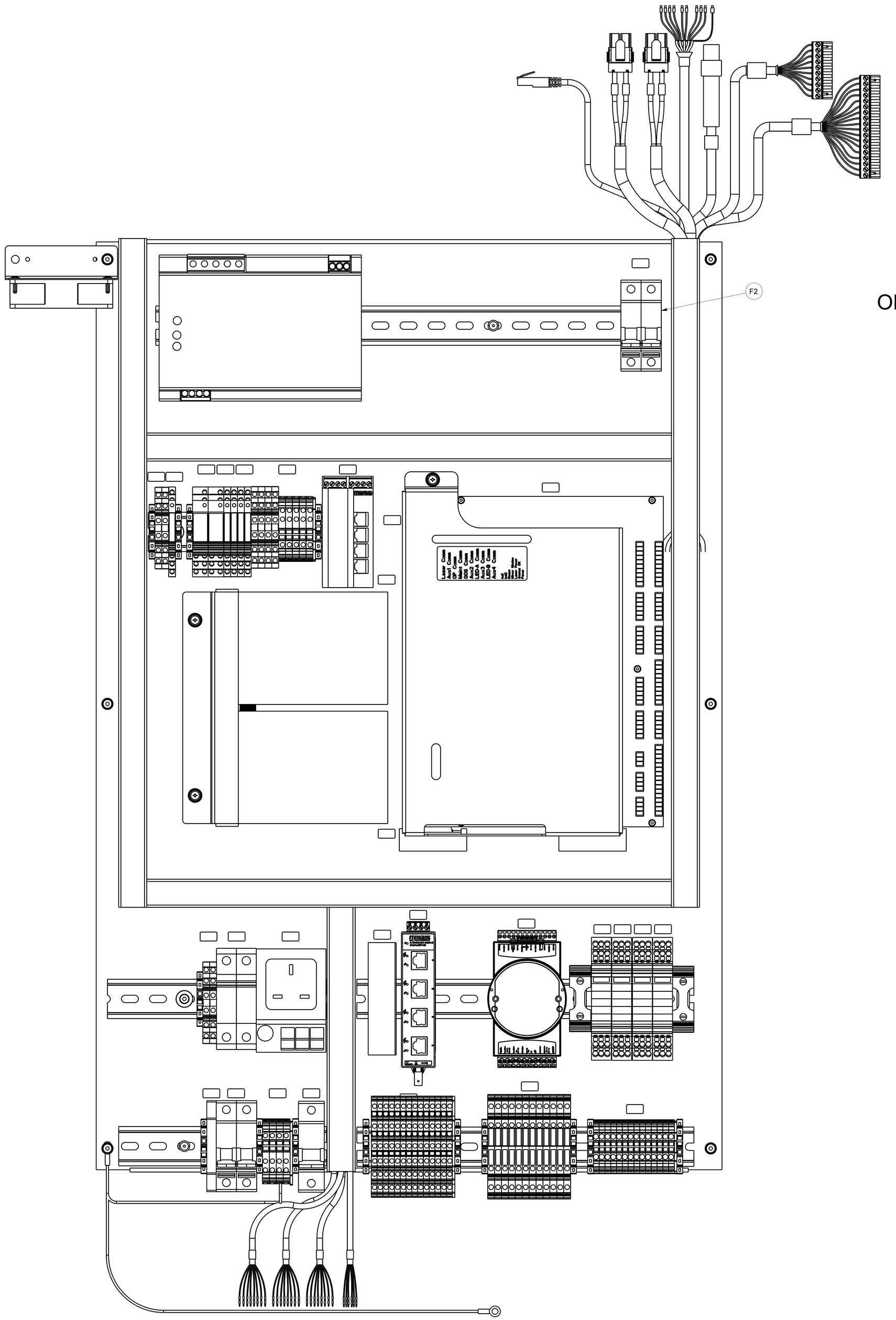
THORN EMMAIR

Drawn by: A. Strandberg
Approved by:
Project No.

Date drawn: 2011-08-23
Date approved:
Drawing No. SG590621-001-01

Gen. tolerance
Surface treatment
Basic material
Info
Description: CONTROL_AND_POWER_ASSEMBLY

Rev. U | Scale 0,700 | Size A0 | Sheet 1 (2)



ONLY FOR UL CABINETS WITH SUPER COOLERS

Issue No.	Issue date	Issue by	Issue checked by	Issue text

THORN EMOTION DOMAIN

Drawn by:	Date drawn:	Gen. tolerance	
Approved by:	Date approved:	Surface treatment	
Project No.	Drawing No. SG590621-001-01	Basic material	
	Rev.	Info	
	Scale 0,700	Size A0	Sheet 2 (2)

Description: CONTROL_AND_POWER_ASSEMBLY

SA(x) SCANNING ASSEMBLY

T1 STEPPER MOTOR ASSEMBLY

M1 VERTICAL SCANNING MOTOR

M2 HORIZONTAL SCANNING MOTOR

ENCODER

T1S STEPPER MOTOR ASSEMBLY

T1S CONTROL AND POWER ASSEMBLY

X8

T2/T3 STEPPER MOTOR ASSEMBLY

X3

T1/T1S

T2/T3

K19 LASER RANGE FINDER

K18 TEMPERATURE SENSOR

K19 LASER RANGE FINDER T2/T3

C25 (T1S)

C3 (T1)

C26

C7 (T2/T3)

C3 (T1) / C26 (T1S)

X3 (T1/T1S)

R7

R8

R11

C23

C23 (T1S)

C21 (T1)

C24

T1S CONTROL AND POWER ASSEMBLY

D(x) DISPLAY

K44, BACK PLANE PCB

K43, BACK PLANE PCB

X9 (T1/T1S)

P2 POWER UNIT, T1

T1

K16 LIGHT SENSOR

K77, COOLER

K18 TEMPERATURE SENSOR

T2/T3

K16 LIGHT SENSOR

FROM X4

C21 (T1)
C24(T1S)

C11

CP(x) CONTROL AND POWER ASSEMBLY

K12, CONTROL UNIT

J1

J2

K14, VERTICAL STEPPER MOTOR DRIVE CIRCUIT

K15, HORIZONTAL STEPPER MOTOR DRIVE CIRCUIT

T2/T3

R0

R1

R2

R3

R4

R5

X5

POWER UNIT

X4

K1

K2

K3

K4

K5

K17, FAN

FN(x) T2/T3 LASER VENTILATION

K13, FAN

DISPLAY CIRCULATION T2/T3

K24, FAN

T1 FAN DISPLAY VENTILATION

MAIN POWER (IN)

TO OPERATOR PANEL

DOCKING GUIDANCE SYSTEM

Revision	Description	Date	Drawn by:	Checked by:	Approved
O	Connections and components for updated T1 added.	2014.10.17	V.N.		
N	Connections for retrofit fan and cooler T1 added.	2014.04.29	K.J.		
M	Cable 169 changed from plint 2 to 12 for K2.	2013.12.17	A.S.		
L	Changed incoming power connection, option UT and I/O.	2013.07.19	A.S.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to

Sharp Edges

Surface Coating

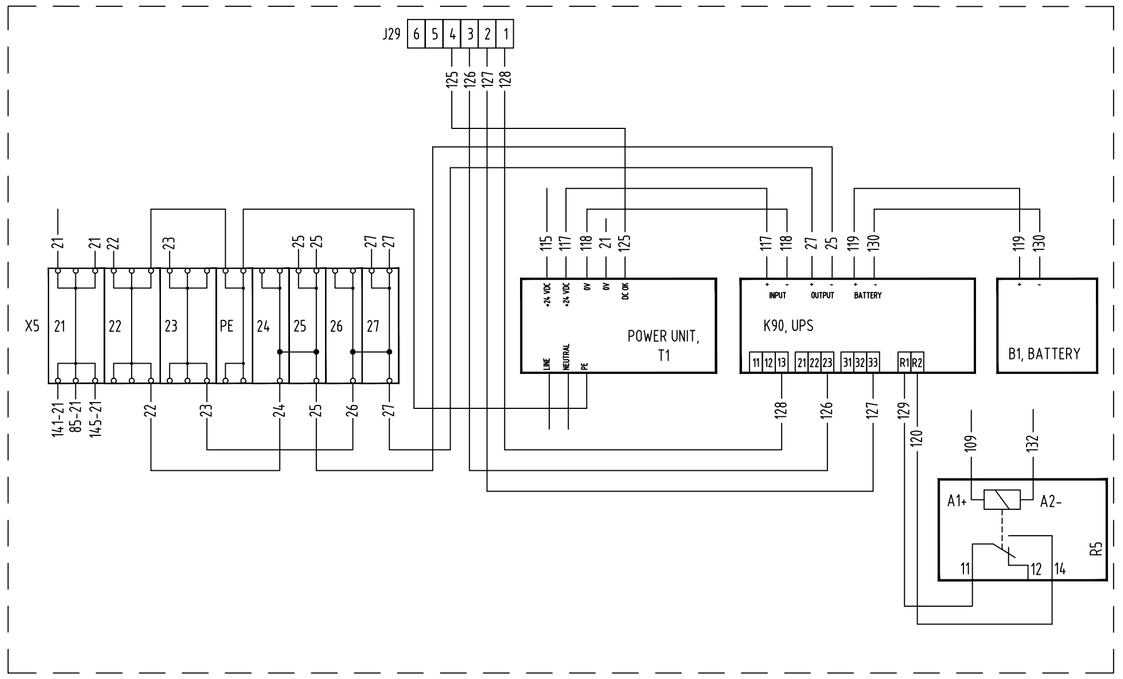
Weight

DOCKING GUIDANCE SYSTEM

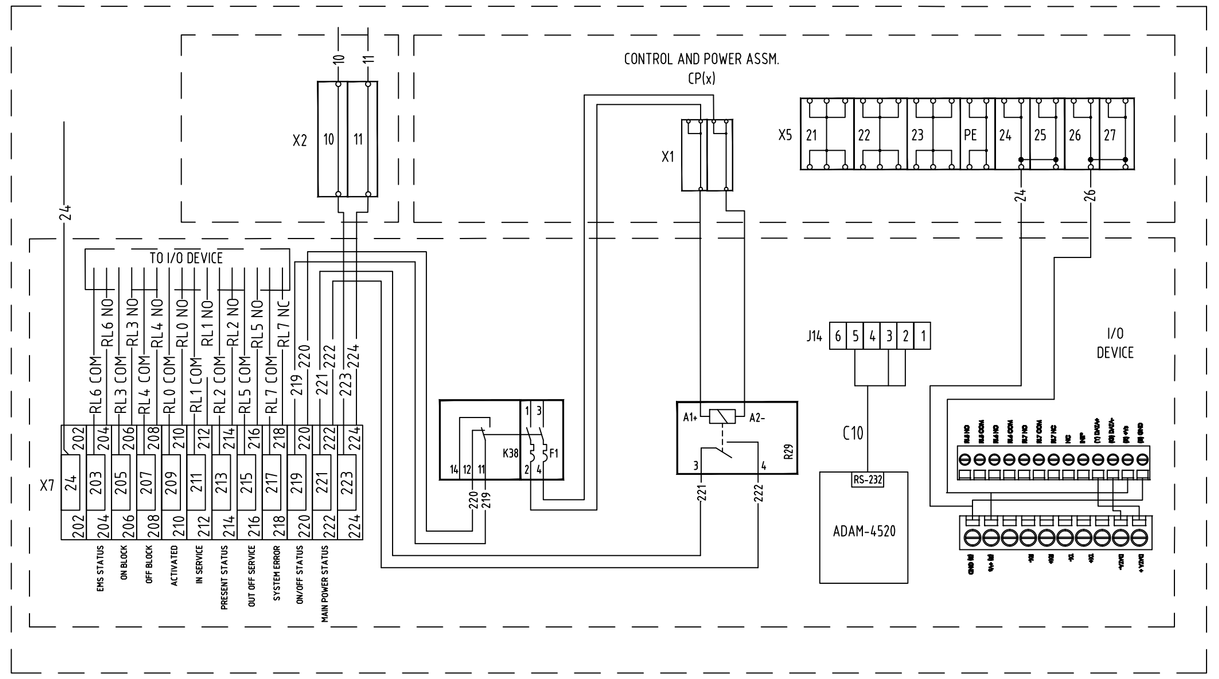
CONNECTION DIAGRAM
FOR COMPONENT PLACEMENT SEE SG590621-001-01

Drawn by:	Date drawn:	Checked by:
A.S.	2011-11-17	
App. by:	Date approved:	Project No.:

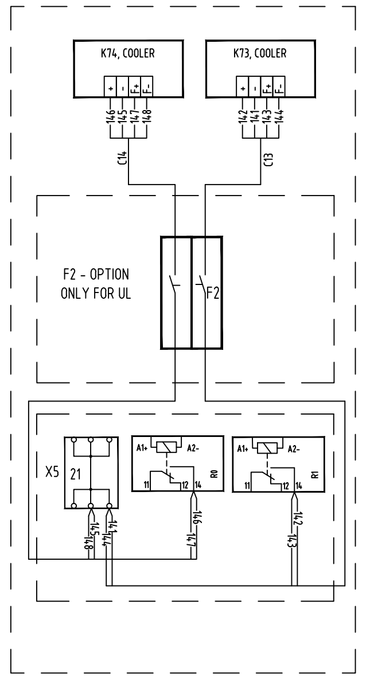
Drawing No. SG590621-004-01 | Rev. 0 | Sheet 1 of 2 | Scale



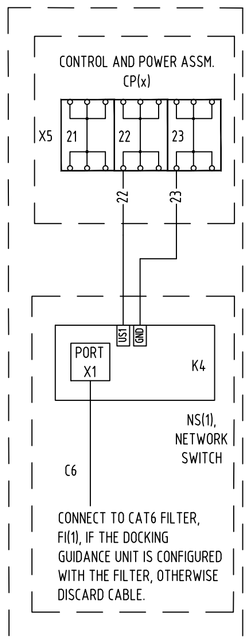
CONNECTION DIAGRAM FOR UPS



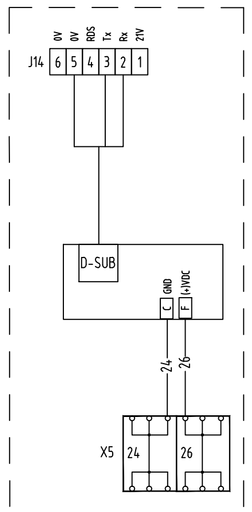
CONNECTION DIAGRAM FOR I/O MODULE



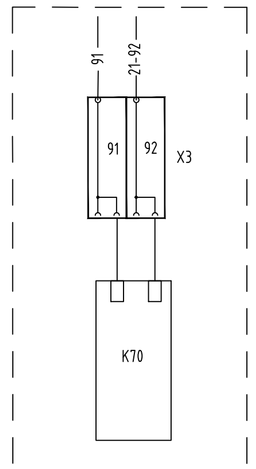
CONNECTION DIAGRAM FOR SUPERCOOLERS T2/T3



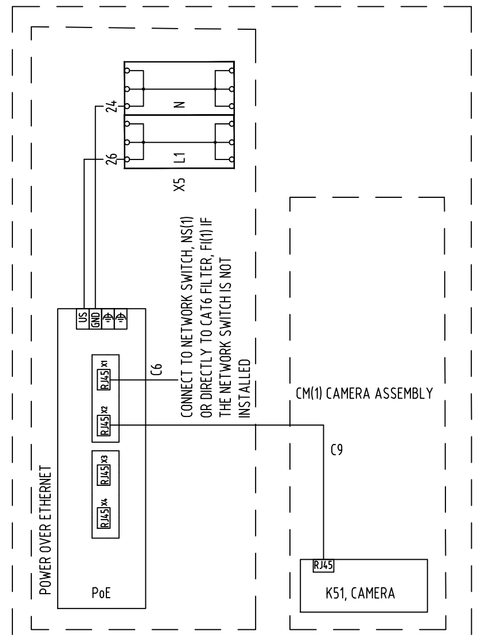
CONNECTION DIAGRAM FOR NS(1)



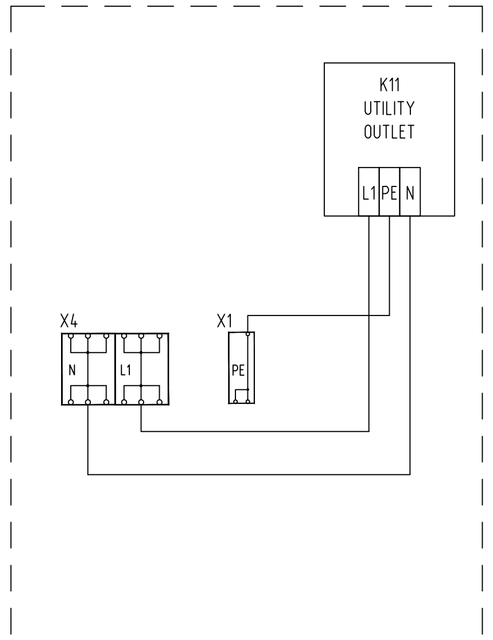
CONNECTION DIAGRAM FOR PBB SERIAL INTERFACE



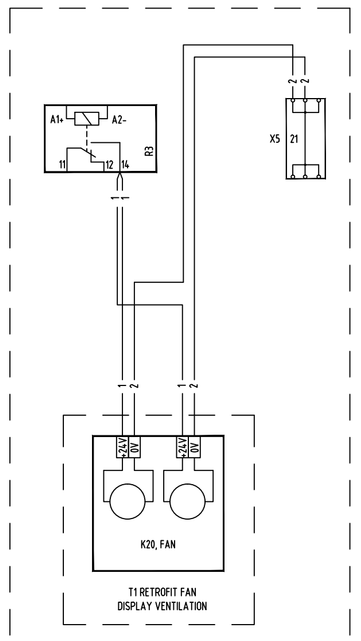
T2/T3 CONNECTION DIAGRAM FOR LASER HEATER



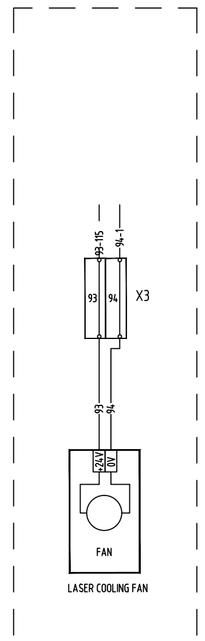
CONNECTION DIAGRAM FOR CM(1)



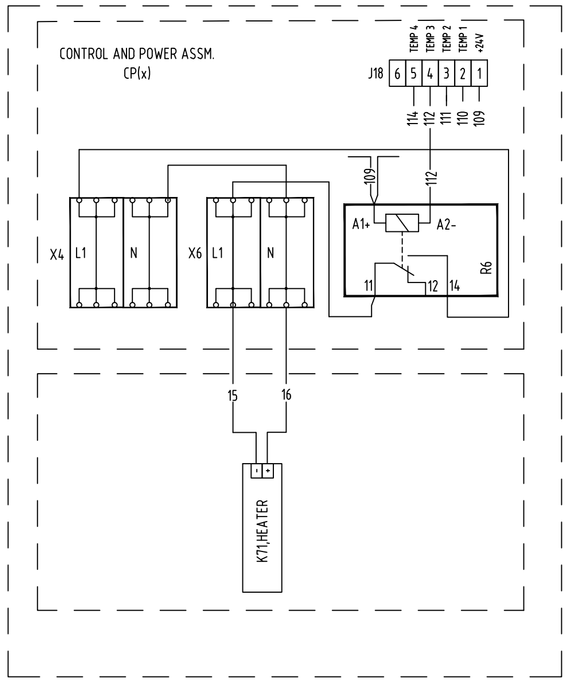
CONNECTION DIAGRAM FOR UT(x)



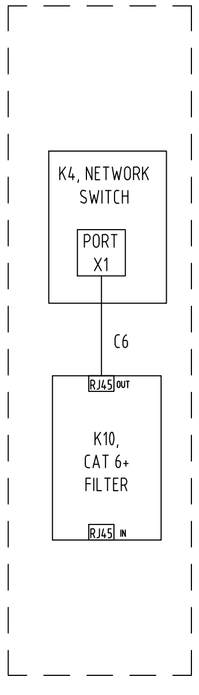
CONNECTION DIAGRAM FOR RETROFIT FAN IN T1 CABINET



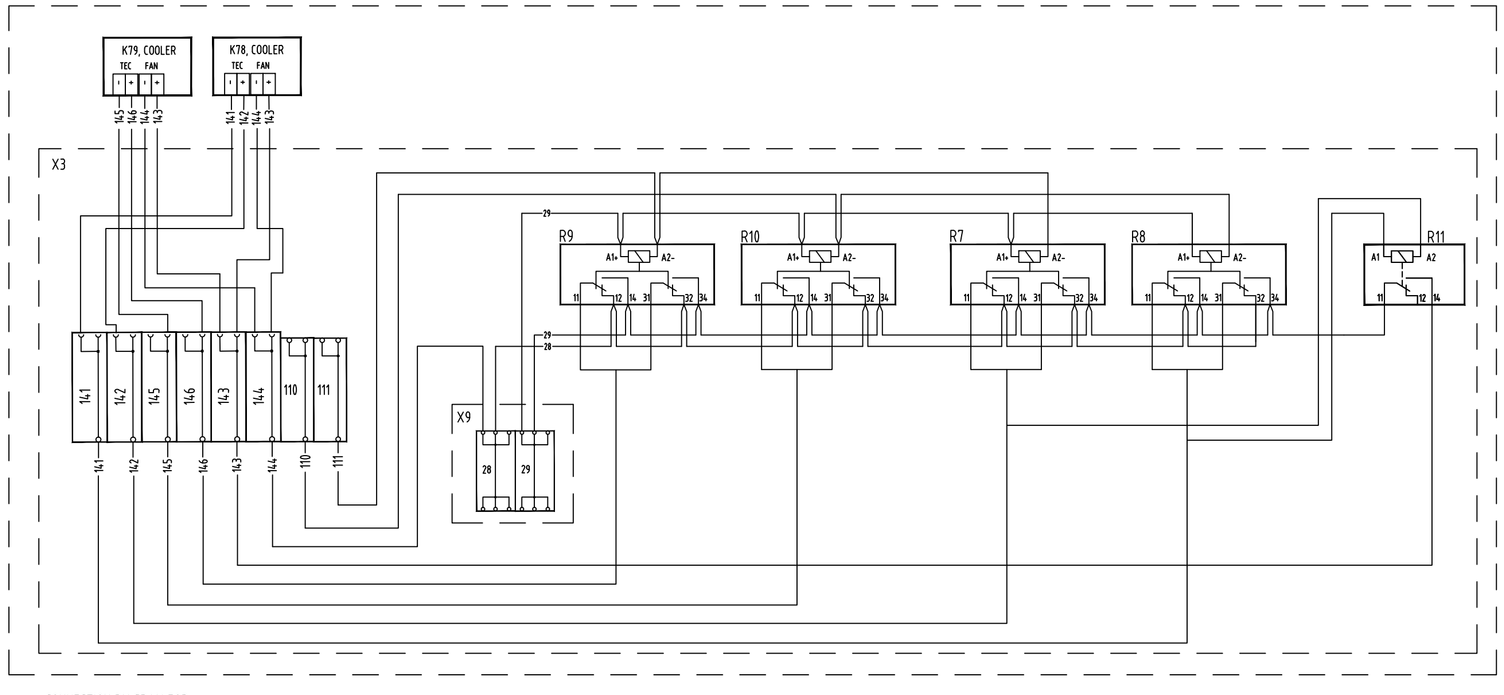
CONNECTION DIAGRAM FOR LASER COOLING FAN T2/T3



CONNECTION DIAGRAM FOR HEATER OPTION



CONNECTION DIAGRAM FOR FI(x)



CONNECTION DIAGRAM FOR SUPERCOOLERS T1

Revision	Description	Date	Drawn by:	Checked by:	Approved
O	Connections and components for updated T1 added.	2014.10.17	V.N.		
N	Connections for retrofit fan and cooler T1 added.	2014.04.29	K.J.		
M	Cable 169 changed from plint 2 to 12 for K2.	2013.12.17	A.S.		
L	Changed K1-K5, option UT and I/O. Wiring K19 changed.	2013.07.19	A.S.		

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Surface Coating | Weight

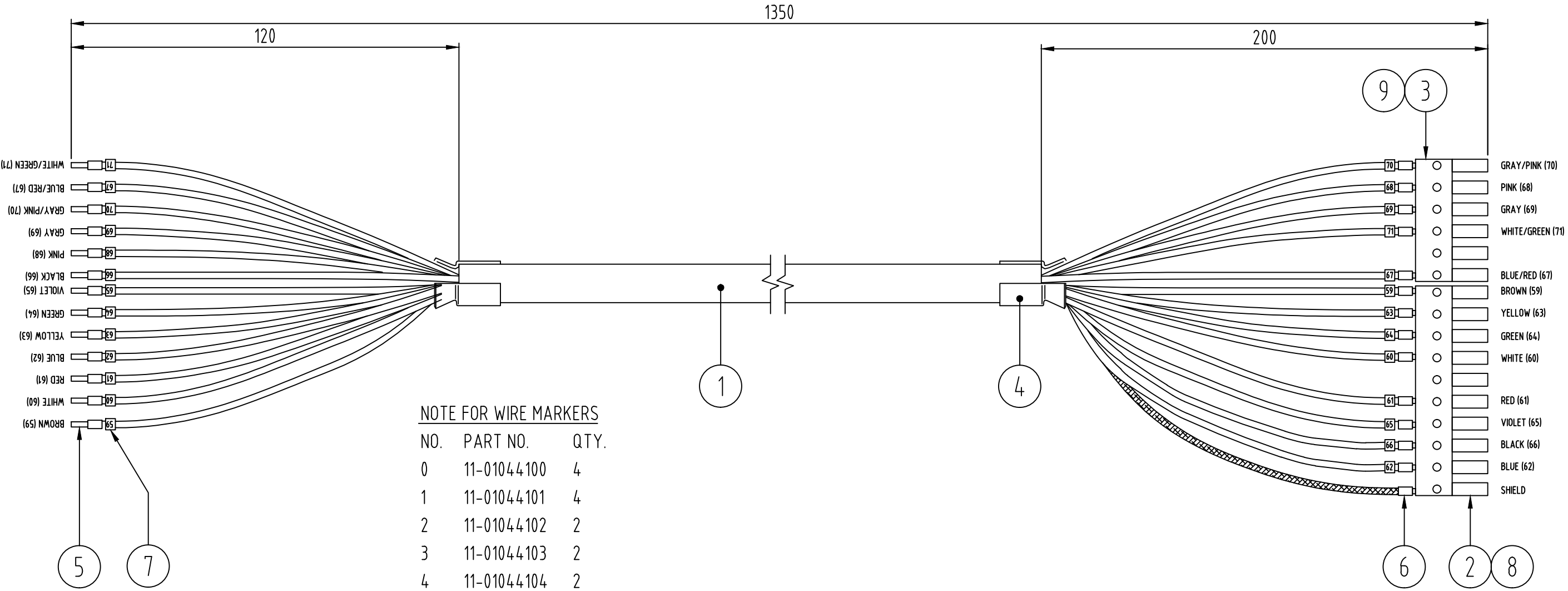
DOCKING GUIDANCE SYSTEM

CONNECTION DIAGRAM FOR OPTIONS
FOR COMPONENT PLACEMENT SEE SG590621-001-01

Drawn by:	Date drawn:	Checked by:	
A.S.	2011-11-17		
App. by:	Date approved:	Project No.:	

Drawing No.	Rev.	Sheet	Scale
SG590621-004-02	DA	2 of 2	

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, CYLIYCY, 8 x 2 x 0.25						
2	1	CONNECTOR, MC1.5/10-ST-3.81			1803659	PHOENIX CONTACT, GERMANY	1803659	PHOENIX CONTACT, SWEDEN
3	1	CONNECTOR, MC1.5/6-ST-3.81			1803617	PHOENIX CONTACT, GERMANY	1803617	PHOENIX CONTACT, SWEDEN
4	2	HEAT SHRINKABLE TUBING, Ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA, SWEDEN
5	26	CRIMP LUG, H 0.25/12			9025780000	WEIDMÜLLER, GERMANY	9025780000	WEIDMÜLLER, SWEDEN
6	1	CRIMP LUG, H 1.5/14			9026090000	WEIDMÜLLER, GERMANY	9026090000	WEIDMÜLLER, SWEDEN
7		WIRE MARKERS, PARTEX PA02			SEE NOTE	WEIDMÜLLER, GERMANY	SEE NOTE	WEIDMÜLLER, SWEDEN
8	1	LABEL, SK 3,81/2,8: SO, TEXT: J22			0805056	PHOENIX CONTACT, GERMANY	0805056	PHOENIX CONTACT, SWEDEN
9	1	LABEL, SK 3,81/2,8: SO, TEXT: J13			0805056	PHOENIX CONTACT, GERMANY	0805056	PHOENIX CONTACT, SWEDEN



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
0	11-01044100	4
1	11-01044101	4
2	11-01044102	2
3	11-01044103	2
4	11-01044104	2
5	11-01044105	4
6	11-01044106	22
7	11-01044107	6
8	11-01044108	2
9	11-01044109	4

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

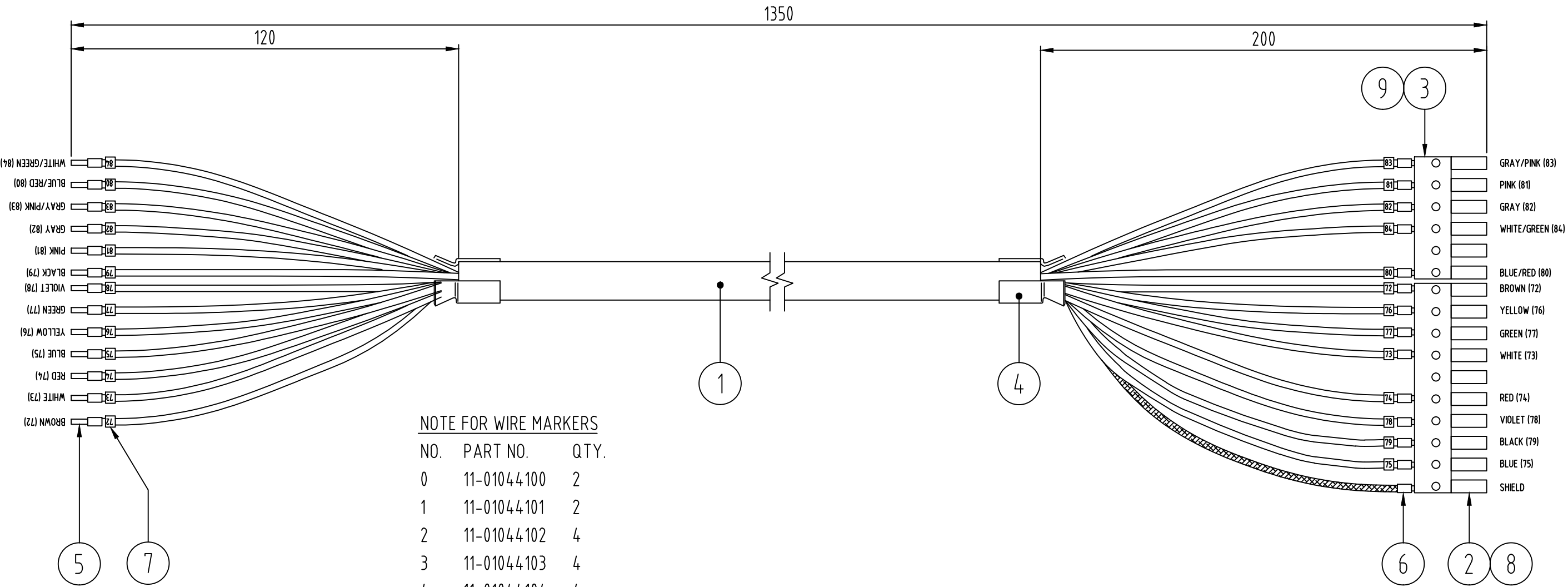
Unless otherwise indicated, all tolerances are according to			Sharp Edges
Surface Coating			Weight

CONTROL CABLE
CU / VERTICAL SCANNING MOTOR, T2/T3

Drawn by:	Date drawn:	Checked by:	
A.S.	2011-11-16		
App. by:	Date approved:	Project No.:	

Drawing No.	Rev.	Sheet	Scale
SG590621-101-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, CYLIYCY, 8 x 2 x 0.25						
2	1	CONNECTOR, MC1.5/10-ST-3.81			1803659	PHOENIX CONTACT, GERMANY	1803659	PHOENIX CONTACT, SWEDEN
3	1	CONNECTOR, MC1.5/6-ST-3.81			1803617	PHOENIX CONTACT, GERMANY	1803617	PHOENIX CONTACT, SWEDEN
4	2	HEAT SHRINKABLE TUBING, Ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA, SWEDEN
5	26	CRIMP LUG, H 0.25/12			9025780000	WEIDMÜLLER, GERMANY	9025780000	WEIDMÜLLER, SWEDEN
6	1	CRIMP LUG, H 1.5/14			9026090000	WEIDMÜLLER, GERMANY	9026090000	WEIDMÜLLER, SWEDEN
7		WIRE MARKERS, PARTEX PA02			SEE NOTE	WEIDMÜLLER, GERMANY	SEE NOTE	WEIDMÜLLER, SWEDEN
8	1	LABEL, SK 3,81/2,8: SO, TEXT: J15			0805056	PHOENIX CONTACT, GERMANY	0805056	PHOENIX CONTACT, SWEDEN
9	1	LABEL, SK 3,81/2,8: SO, TEXT: J20			0805056	PHOENIX CONTACT, GERMANY	0805056	PHOENIX CONTACT, SWEDEN



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
0	11-01044100	2
1	11-01044101	2
2	11-01044102	4
3	11-01044103	4
4	11-01044104	4
5	11-01044105	2
6	11-01044106	2
7	11-01044107	18
8	11-01044108	12
9	11-01044109	2

Revision	Description	Date	Drawn by:	Checked by:	Approved

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Safegate International AB
MALMÖ, SWEDEN

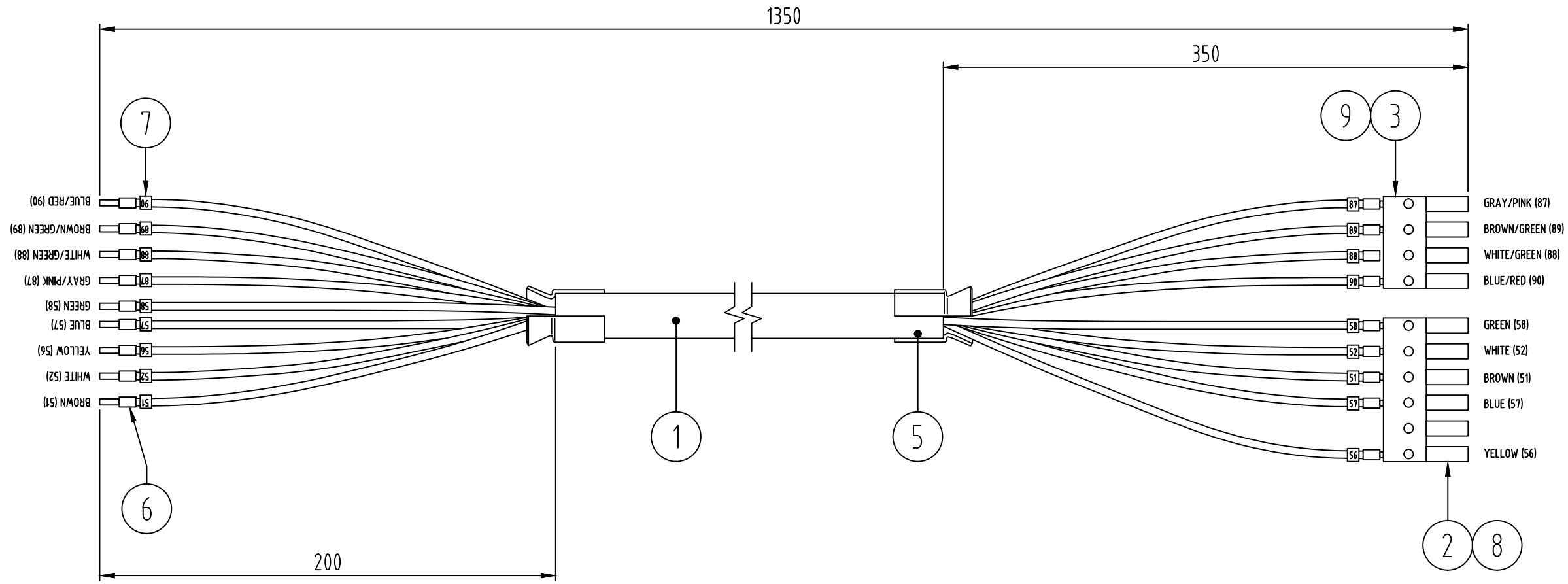
Unless otherwise indicated, all tolerances are according to | Sharp Edges
Surface Coating | Weight

CONTROL CABLE
CU / HORIZONTAL SCANNING MOTOR, T2/T3

Drawn by:	Date drawn:	Checked by:	
A.S.	2011-11-16		
App. by:	Date approved:	Project No.:	

Drawing No.	Rev.	Sheet	Scale
SG590621-102-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, CYLIYCY, 8 x 2 x 0.25						
2	1	CONNECTOR, MC1.5/6-ST-3.81			1803617	PHOENIX CONTACT, GERMANY	1803617	PHOENIX CONTACT, SWEDEN
3	1	CONNECTOR, MC1.5/4-ST-3.81			1803594	PHOENIX CONTACT, GERMANY	1803594	PHOENIX CONTACT, SWEDEN
5	2	HEAT SHRINKABLE TUBING, Ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA, SWEDEN
6	18	CRIMP LUG, H 0.25/12			9025780000	WEIDMÜLLER, GERMANY	9025780000	WEIDMÜLLER, SWEDEN
7		WIRE MARKERS, PARTEX PA02			SEE NOTE	WEIDMÜLLER, GERMANY	SEE NOTE	WEIDMÜLLER, SWEDEN
8	1	LABEL, SK 3,81/2,8: SO, TEXT: J12			0805056	PHOENIX CONTACT, GERMANY	0805056	PHOENIX CONTACT, SWEDEN
9	1	LABEL, SK 3,81/2,8: SO, TEXT: J8			0805056	PHOENIX CONTACT, GERMANY	0805056	PHOENIX CONTACT, SWEDEN



NOTE FOR WIRE MARKERS

NO.	PART NO.	Q.TY.
0	11-01044100	4
2	11-01044102	2
5	11-01044105	10
6	11-01044106	2
7	11-01044107	4
8	11-01044108	10
9	11-01044109	4

Revision	Description	Date	Drawn by:	Checked by:	Approved

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Safegate International AB
MALMÖ, SWEDEN

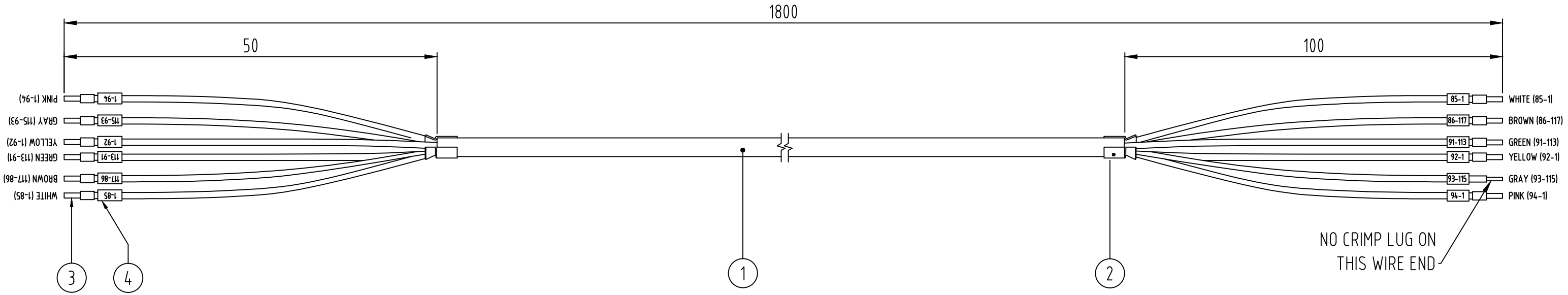
Drawn by:	Date drawn:	Checked by:
A.S.	2011-11-16	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

CONTROL CABLE
CU / LASER RANGE FINDER - TEMP. SENSOR, T2/T3

Drawing No.	Rev.	Sheet	Scale
SG590621-103-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, LIYY, 6 x 0.5					7853060	AB NOVUM, SWEDEN
2	2	HEAT SHRINKABLE TUBING, Ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA, SWEDEN
3	11	CRIMP LUG, H 0.5/14			9026060000	WEIDMÜLLER, GERMANY	9026060000	WEIDMÜLLER, SWEDEN
4		WIRE MARKERS, PARTEX PA02			SEE NOTE	WEIDMÜLLER, GERMANY	SEE NOTE	WEIDMÜLLER, SWEDEN



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
-	11-01044561	12
1	11-01044101	20
2	11-01044102	2
3	11-01044103	4
4	11-01044104	2
5	11-01044105	4
6	11-01044106	2
7	11-01044107	2
8	11-01044108	4
9	11-01044109	8

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to

Sharp Edges

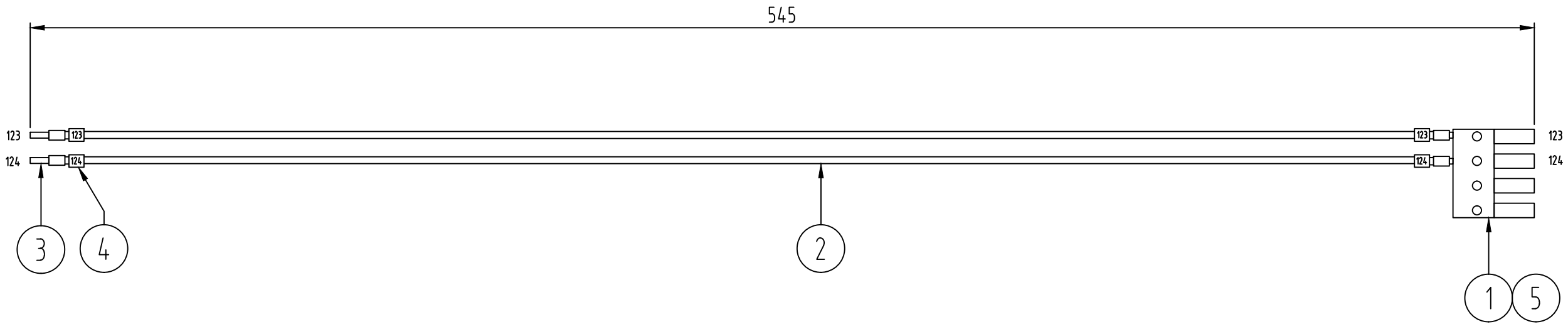
Surface Coating

Weight

POWER CABLE
DEFROSTER / HEATER/ LASER COOLING FAN, T2/T3

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:	Drawing No.	Rev.	Sheet	Scale
A.S.	2011-11-16					SG590621-104-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CONNECTOR, MC1.5/4-ST-3.81			1803594	PHOENIX CONTACT		
2		ELECTRICAL WIRE, UL1007/1569, RED, AWG 20						
3	4	BOOTLACE FERRULE, H 0.5/14					9026060000	WEIDMÜLLER
4		WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
5	1	LABEL, SK 3,81/2,8: SO, TEXT: J9			0805056	PHOENIX CONTACT		



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
1	11-01044101	4
2	11-01044102	4
3	11-01044103	2
4	11-01044104	2

Revision	Description	Date	Drawn by:	Checked by:	Approved

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Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	
A.S.	2011-11-16		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to

Sharp Edges

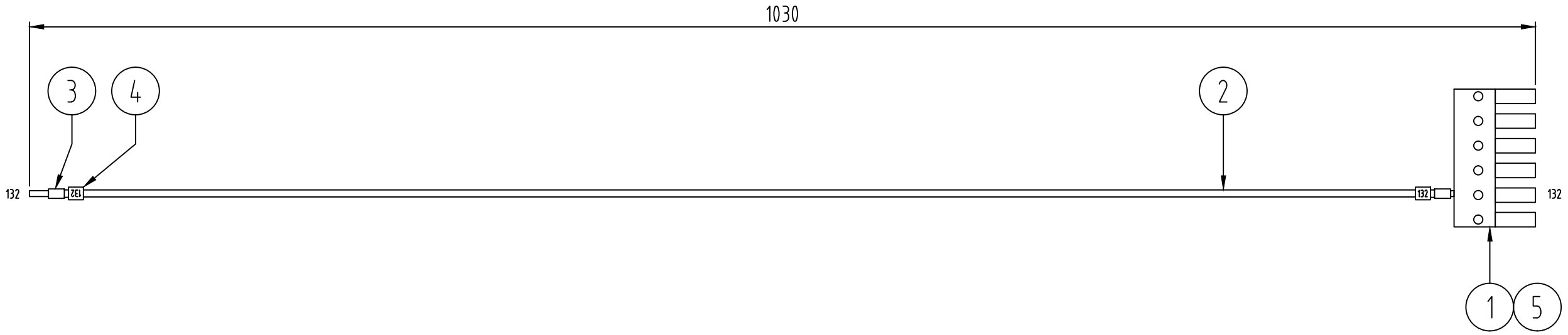
Surface Coating

Weight

WIRING ASSEMBLY

Drawing No.	Rev.	Sheet	Scale
SG590621-105-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CONNECTOR, MC1.5/6-ST-3.81			1803617	PHOENIX CONTACT		
2		ELECTRICAL WIRE, UL1007/1569, RED, AWG 20						
3	2	BOOTLACE FERRULE, H 0.5/14					9026060000	WEIDMÜLLER,
4		WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER,
5	1	LABEL, SK 3,81/2,8: SO, TEXT: J11			0805056	PHOENIX CONTACT,		



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
1	11-01044101	2
2	11-01044102	2
3	11-01044103	2

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	
A.S.	2011-11-16		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to

Sharp Edges

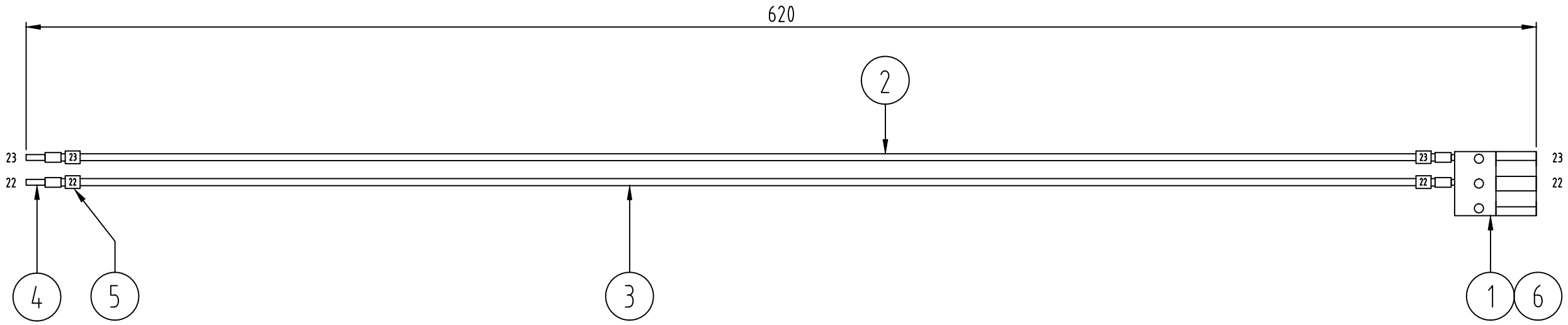
Surface Coating

Weight

WIRING ASSEMBLY

Drawing No.	Rev.	Sheet	Scale
SG590621-106-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CONNECTOR, MSTB 2.5/3-ST-5.08			1757022	PHOENIX CONTACT		
2	1	ELECTRICAL WIRE, UL1007/1569, AWG 16, RED						
3	1	ELECTRICAL WIRE, UL1007/1569, AWG 16, BLACK						
4	4	BOOTLACE FERRULE, H 1.5/14					9026090000	WEIDMÜLLER
5		WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
6	1	LABEL, SK 5.08/3,8: SO, TEXT: J16			0805085	PHOENIX CONTACT		



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
2	11-01044102	6
3	11-01044103	2

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

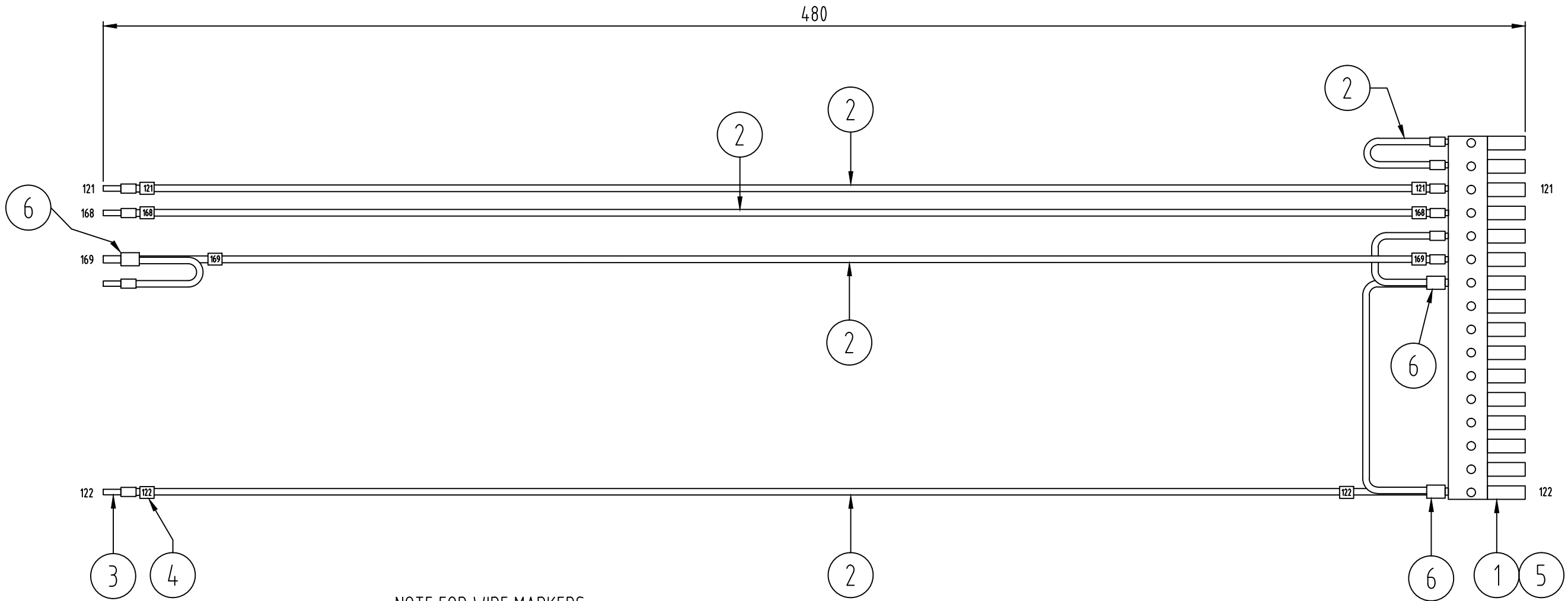
Drawn by:	Date drawn:	Checked by:	
A.S	2011-11-11		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

WIRING ASSEMBLY

Drawing No.	Rev.	Sheet	Scale
SG590621-107-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CONNECTOR, MC1.5/16-ST-3.81			1803714	PHOENIX CONTACT		
2		ELECTRICAL WIRE, UL1007/1569, RED, AWG 20						
3	10	BOOTLACE FERRULE, H 0.5/14					9026060000	WEIDMÜLLER
4		WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
5	1	LABEL, SK 3,81/2,8: SO, TEXT: J17			0805056	PHOENIX CONTACT		
6	3	TWIN WIRE FERRULE, H 0.5/14 ZH OR					9037200000	WEIDMÜLLER



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
1	11-01044101	10
2	11-01044102	6
6	11-01044106	4
9	11-01044108	2
9	11-01044109	2

Revision	Description	Date	Drawn by:	Checked by:	Approved
C	Item (6) changed to twin wire end ferrule.	2014-02-07	K.J.		
B	Wire (168) to K1 added.	2013-12-18	A.S.		
A	Wire (169) to K2 added. Wire (122) updated.	2013-11-28	K.J.		

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Drawn by:	Date drawn:	Checked by:
A.S.	2011-11-16	
App. by:	Date approved:	Project No.:

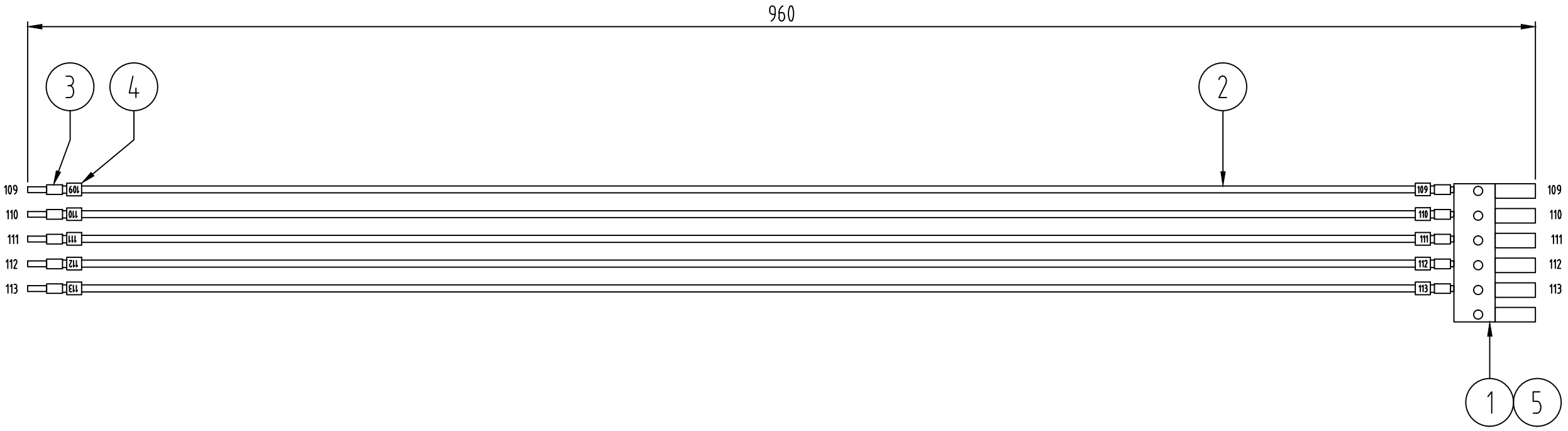
Unless otherwise indicated, all tolerances are according to | Sharp Edges

Surface Coating | Weight

WIRING ASSEMBLY

Drawing No.	Rev.	Sheet	Scale
SG590621-108-01	C	1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CONNECTOR, MC1.5/6-ST-3.81			1803617	PHOENIX CONTACT		
2		ELECTRICAL WIRE, UL1007/1569, RED, AWG 20						
3	10	BOOTLACE FERRULE, H 0.5/14					9026060000	WEIDMÜLLER
4		WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
5	1	LABEL, SK 3,81/2,8: SO, TEXT: J18			0805056	PHOENIX CONTACT		



NOTE FOR WIRE MARKERS

NO.	PART NO.	Q.TY.
0	11-01044100	4
1	11-01044101	20
2	11-01044102	2
3	11-01044103	2
9	11-01044109	2

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

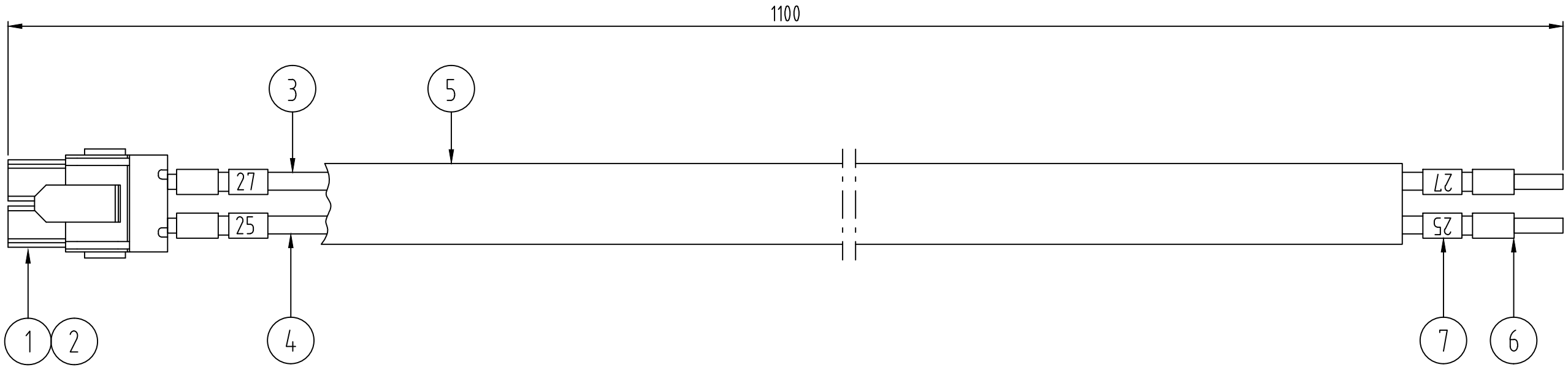
Drawn by:	Date drawn:	Checked by:	
A.S.	2011-11-16		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

WIRING ASSEMBLY

Drawing No.	Rev.	Sheet	Scale
SG590621-110-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	RECEPTICLE HOUSING, MINI FIT SR.,10 mm PITCH,			42816-0212	MOLEX		
2	2	TERMINAL, MINI FIT SR., 10 mm PITCH			42815-0012	MOLEX		
3	1	ELECTRICAL WIRE, RK (H07V-K), 4 mm2, RED					0309832	SELGA, SWEDEN
4	1	ELECTRICAL WIRE, RK (H07V-K), 4 mm2, BLACK					0309822	SELGA, SWEDEN
5	1	PVC TUBING, I.D. 8.38, BLACK, L = 1040					55-062-41	ELFA.SWEDEN
4	4	BOOTLACE FERRULE, 4 mm2					48-303-78	ELFA, SWEDEN
7		WIRE MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION			PA-1	PARTEX, SWEDEN		



Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	
A.S.	2011-11-16		
App. by:	Date approved:	Project No.:	

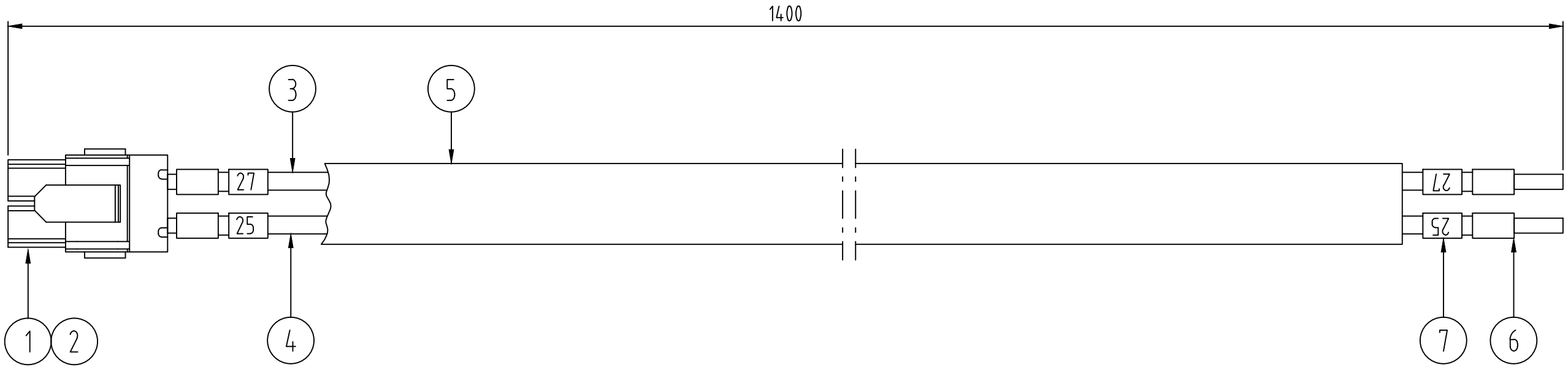
Unless otherwise indicated, all tolerances are according to | Sharp Edges

Surface Coating | Weight

WIRING ASSEMBLY
DISPLAY POWER

Drawing No.	Rev.	Sheet	Scale
SG590621-112-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	RECEPTICLE HOUSING, MINI FIT SR.,10 mm PITCH,			42816-0212	MOLEX		
2	2	TERMINAL, MINI FIT SR., 10 mm PITCH			42815-0012	MOLEX		
3	1	ELECTRICAL WIRE, RK (H07V-K), 4 mm2, RED					0309832	SELGA, SWEDEN
4	1	ELECTRICAL WIRE, RK (H07V-K), 4 mm2, BLACK					0309822	SELGA, SWEDEN
5	1	PVC TUBING, I.D. 8.38, BLACK, L = 1340					55-062-41	ELFA.SWEDEN
4	4	BOOTLACE FERRULE, 4 mm2					48-303-78	ELFA, SWEDEN
7		WIRE MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION			PA-1	PARTEX, SWEDEN		



Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
A.S	2011-11-16				

Unless otherwise indicated, all tolerances are according to

Sharp Edges

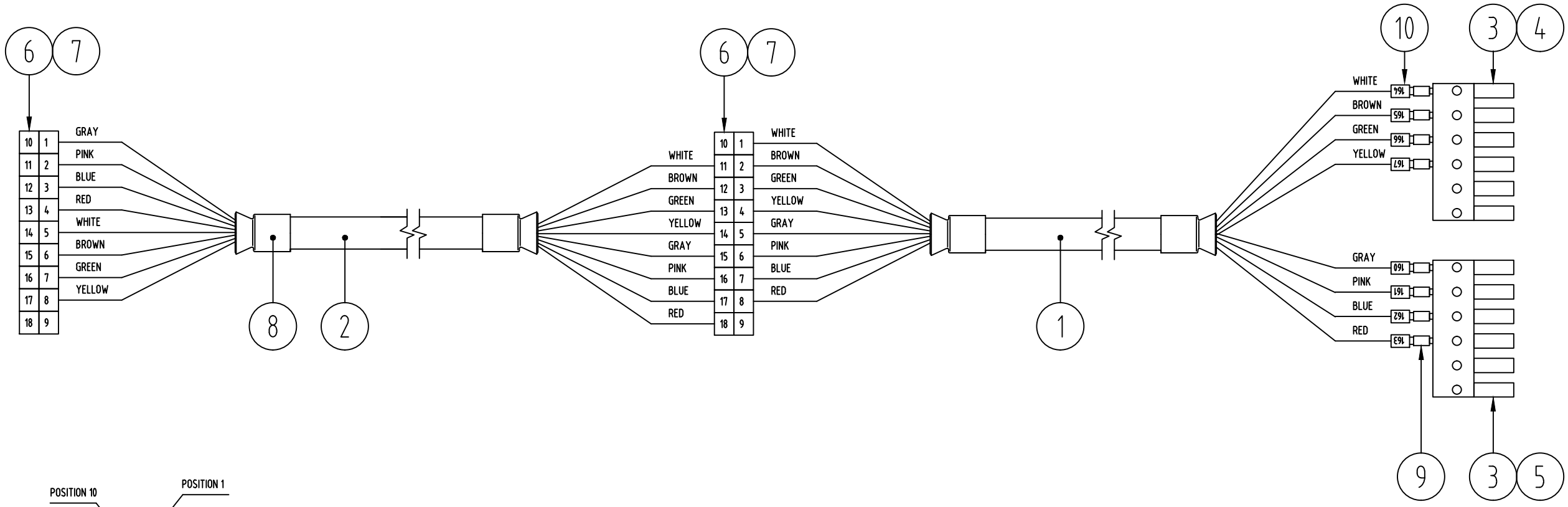
Surface Coating

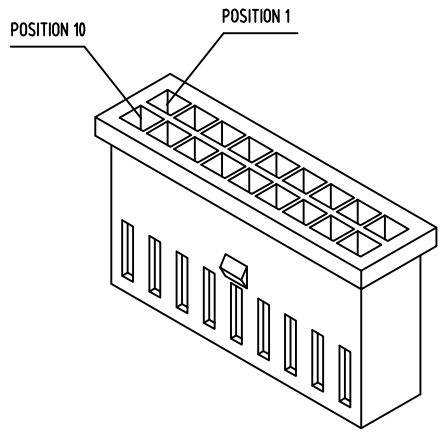
Weight

WIRING ASSEMBLY
DISPLAY POWER, T1/T2

Drawing No.	Rev.	Sheet	Scale
SG590621-113-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, LIYCY, 4 x 2 x 0.25, L = 1100						
2	1	CABLE, LIYCY, 4 x 2 x 0.25, L = 750						
3	2	CONNECTOR, MC1.5/6-ST-3.81					1803617	PHOENIX CONTACT, SWEDEN
4	1	LABEL, SK 3,81/2,8: SO, TEXT: J27					0805056	PHOENIX CONTACT, SWEDEN
5	1	LABEL, SK 3,81/2,8: SO, TEXT: J24					0805056	PHOENIX CONTACT, SWEDEN
6	2	CONNECTOR HOUSING, AMPMODU MOD. II, DOUBLE ROW			280513	TYCO ELECTRONICS		
7	24	CRIMP TERMINAL, .100 AMPMODU			187270-1	TYCO ELECTRONICS		
8	4	HEAT SHRINKABLE TUBING, Ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA, SWEDEN
9	8	BOOTLACE FERRULE, H 0.25/12					9025780000	WEIDMÜLLER, SWEDEN
10		WIRE MARKERS, NUMBERS AS SHOWN ON ILLUSTRATION			PA02	PARTEX		





ITEM 6, CONTACT ORIENTAION
AND TERMINAL POSITIONS

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

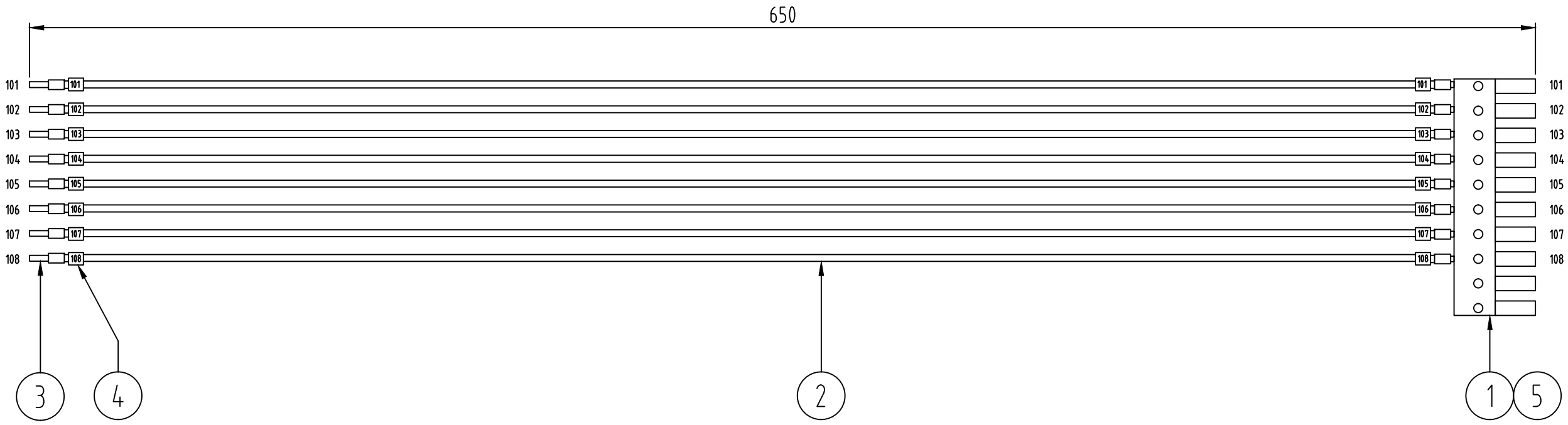
Drawn by:	Date drawn:	Checked by:	
A.S.	2011-11-06		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

COMMUNICATION CABLE
LED DISPLAY FOR T1

Drawing No.	Rev.	Sheet	Scale
SG590621-114-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CONNECTOR, MC1.5/10-ST-3.81			1803659	PHOENIX CONTACT		
2	8	ELECTRICAL WIRE, UL1007/1569, RED, AWG 20						
3	16	BOOTLACE FERRULE, H 0.5/14					9026060000	WEIDMÜLLER
4		WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
5	1	LABEL, SK 3,81/2,8: SO, TEXT: J19			0805056	PHOENIX CONTACT, GERMANY	0805056	PHOENIX CONTACT, SWEDEN



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
0	11-01044100	8
1	11-01044101	9
2	11-01044102	2
3	11-01044103	2
4	11-01044104	2
5	11-01044105	2
6	11-01044106	2
7	11-01044107	2
8	11-01044108	2

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

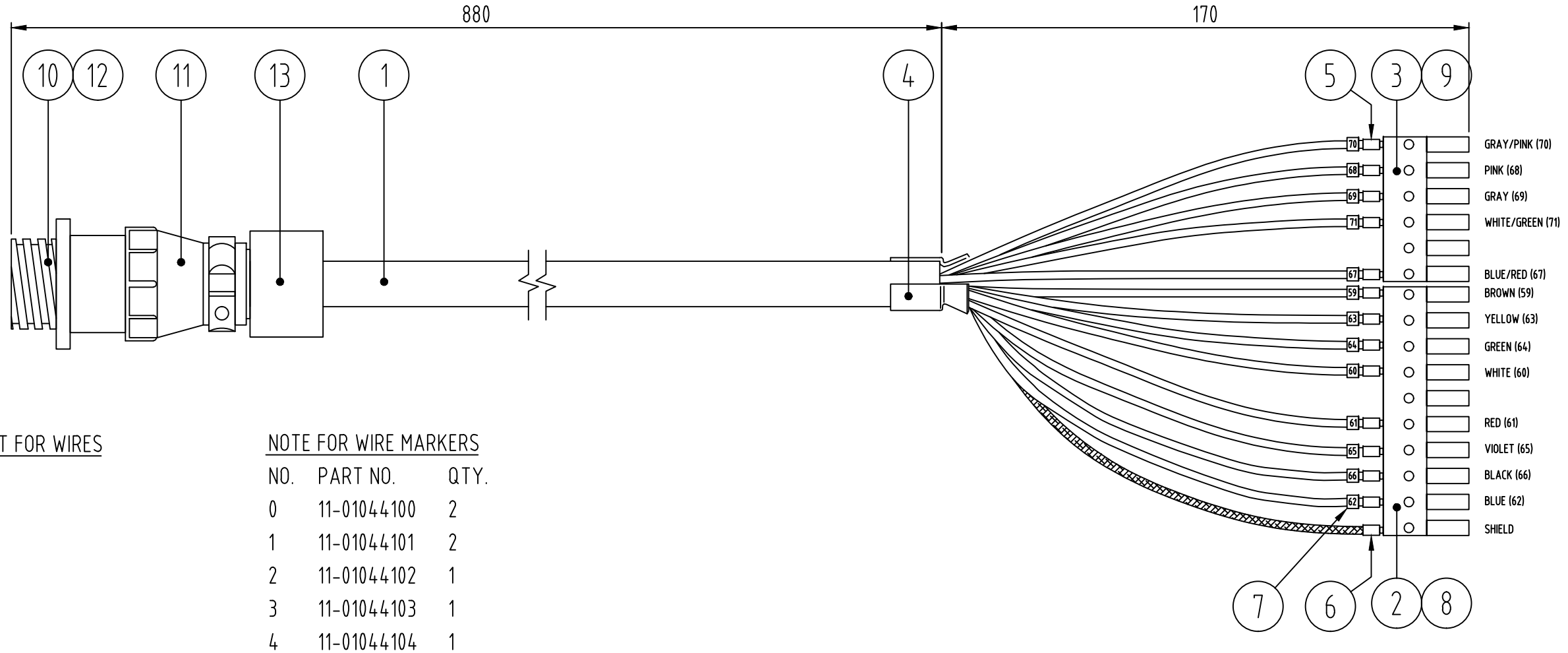
Drawn by:	Date drawn:	Checked by:	
A.S.	2011-11-16		
App. by:	Date approved:	Project No.:	

Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

WIRING ASSEMBLY

Drawing No.	Rev.	Sheet	Scale
SG590621-115-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, CYLICYCY, 8 x 2 x 0.25						
2	1	CONNECTOR, MC1.5/10-ST-3,81			1803659	PHOENIX CONTACT		
3	1	CONNECTOR, MC1.5/6-ST-3,81			1803617	PHOENIX CONTACT		
4	2	HEAT SHRINKABLE TUBING, ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA
5	13	BOOTLACE FERRULE, H 0.12/12					9025780000	WEIDMÜLLER
6	1	BOOTLACE FERRULE, H 1,5/14					9026090000	WEIDMÜLLER
7		WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
8	1	LABEL, SK 3,81/2,8: SO, TEXT: J22					SEE NOTE	WEIDMÜLLER
9	1	LABEL, SK 3,81/2,8: SO, TEXT: J13					SEE NOTE	WEIDMÜLLER
10	1	RECEPTICLE FOR PIN CONTACTS			183077-1	AMP	4457909	ELFA
11	1	CABLE CLAMP WITH STRAIN RELIEF			182655-1	AMP	4450433	ELFA
12	13	PIN CONTACT			163086-1	AMP	4450714	ELFA
13	1	STAR-TEC FERRITE RING			74271221	WÜRTH ELEKTRONIK		



PIN NUMBER ASSIGNMENT FOR WIRES

BROWN (PIN 1)
WHITE (PIN 2)
RED (PIN 3)
BLUE (PIN 4)
YELLOW (PIN 5)
GREEN (PIN 6)
VIOLET (PIN 7)
BLACK (PIN 8)
BLUE/RED (PIN 9)
PINK (PIN 10)
GRAY (PIN 11)
GRAY/PINK (PIN 12)
WHITE/GREEN (PIN 13)

NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
0	11-01044100	2
1	11-01044101	2
2	11-01044102	1
3	11-01044103	1
4	11-01044104	1
5	11-01044105	2
6	11-01044106	11
7	11-01044107	6
8	11-01044108	1
9	11-01044109	2

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP
Safegate International AB
MALMÖ, SWEDEN

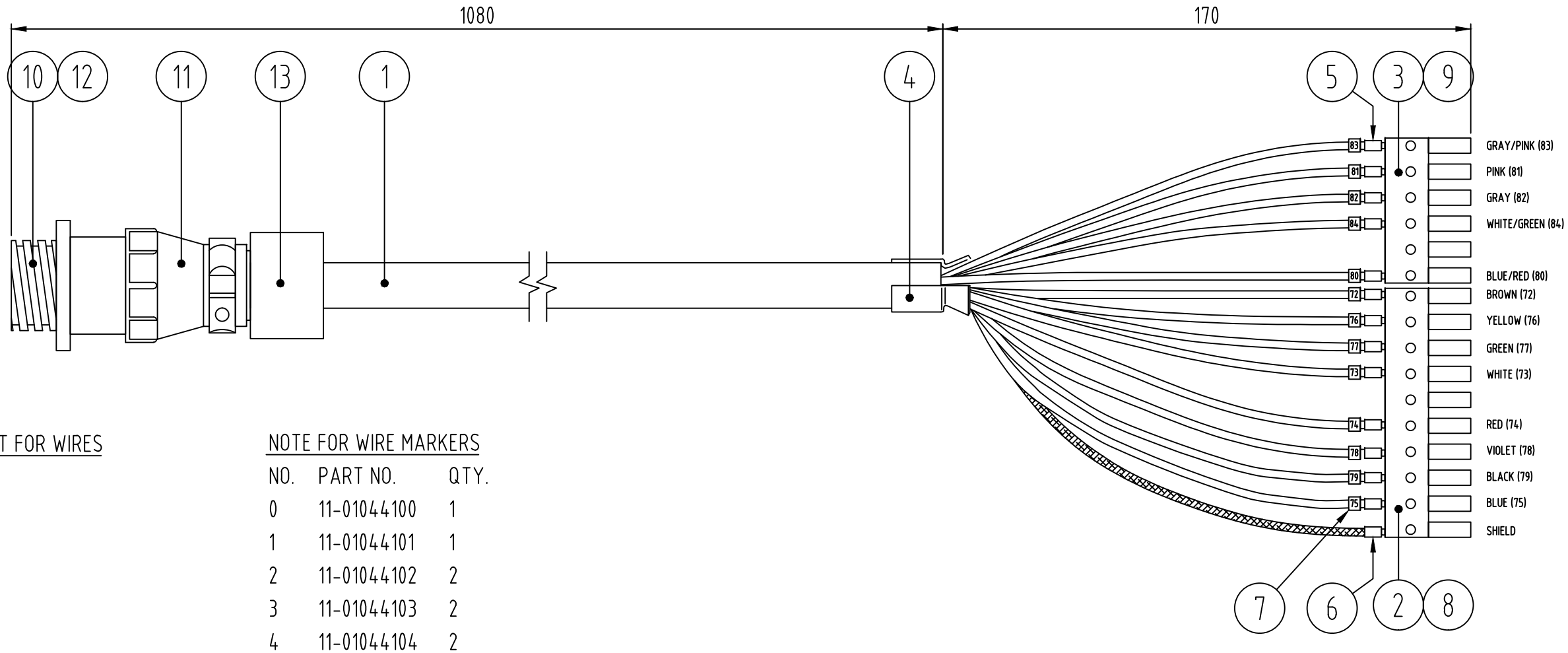
Unless otherwise indicated, all tolerances are according to | Sharp Edges
Surface Coating | Weight

CONTROL CABLE
VERTICAL SCANNING MOTOR, T1

Drawn by:	Date drawn:	Checked by:	
A.S.	2011-11-16		
App. by:	Date approved:	Project No.:	

Drawing No.	Rev.	Sheet	Scale
SG590621-116-01		1 of 1	

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, CYLICYCY, 8 x 2 x 0.25						
2	1	CONNECTOR, MC1.5/10-ST-3,81			1803659	PHOENIX CONTACT		
3	1	CONNECTOR, MC1.5/6-ST-3,81			1803617	PHOENIX CONTACT		
4	2	HEAT SHRINKABLE TUBING, ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA
5	13	BOOTLACE FERRULE, H 0.12/12					9025780000	WEIDMÜLLER
6	1	BOOTLACE FERRULE, H 1,5/14					9026090000	WEIDMÜLLER
7		WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
8	1	LABEL, SK 3,81/2,8: SO, TEXT: J15					SEE NOTE	WEIDMÜLLER
9	1	LABEL, SK 3,81/2,8: SO, TEXT: J20					SEE NOTE	WEIDMÜLLER
10	1	RECEPTICLE FOR PIN CONTACTS			183077-1	AMP	4457909	ELFA
11	1	CABLE CLAMP WITH STRAIN RELIEF			182655-1	AMP	4450433	ELFA
12	13	PIN CONTACT			163086-1	AMP	4450714	ELFA
13	1	STAR-TEC FERRITE RING			74271221	WÜRTH ELEKTRONIK		



PIN NUMBER ASSIGNMENT FOR WIRES

BROWN (PIN 1)
WHITE (PIN 2)
RED (PIN 3)
BLUE (PIN 4)
YELLOW (PIN 5)
GREEN (PIN 6)
VIOLET (PIN 7)
BLACK (PIN 8)
BLUE/RED (PIN 9)
PINK (PIN 10)
GRAY (PIN 11)
GRAY/PINK (PIN 12)
WHITE/GREEN (PIN 13)

NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
0	11-01044100	1
1	11-01044101	1
2	11-01044102	2
3	11-01044103	2
4	11-01044104	2
5	11-01044105	1
6	11-01044106	1
7	11-01044107	9
8	11-01044108	6
9	11-01044109	1

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

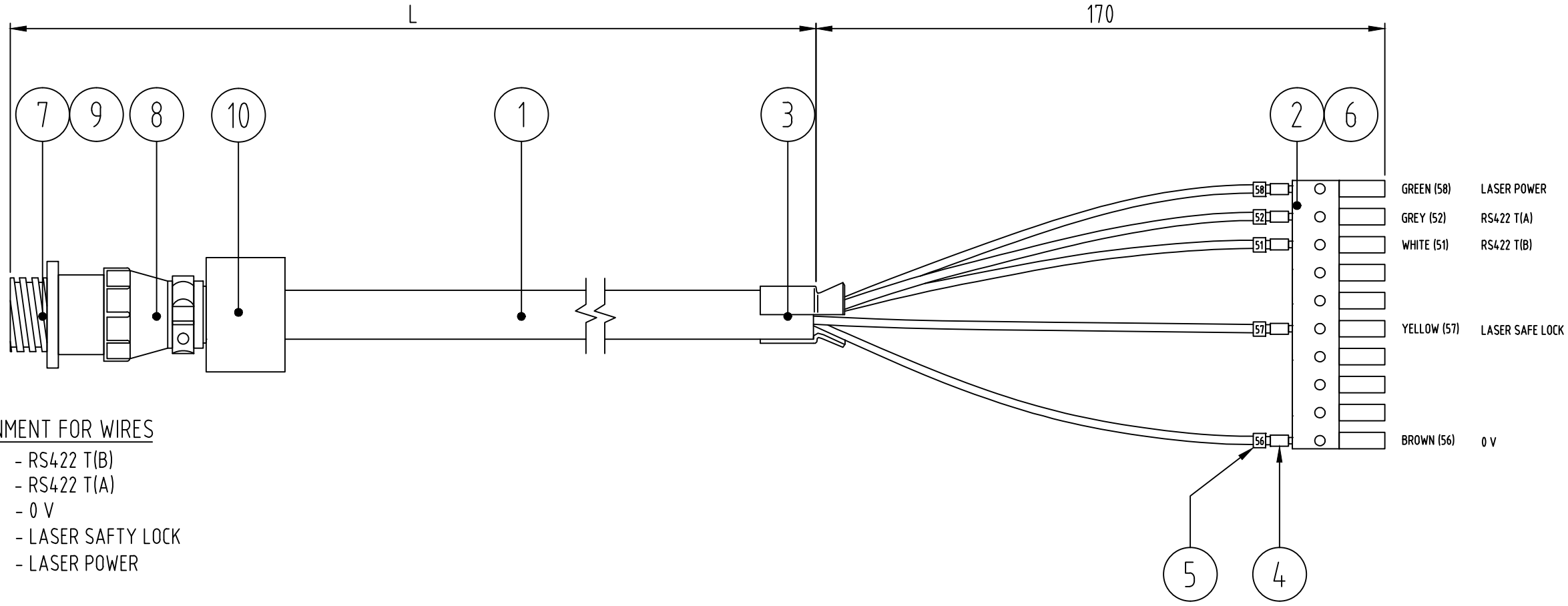
Drawn by:	Date drawn:	Checked by:
A.S.	2011-11-16	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

CONTROL CABLE
HORIZONTAL SCANNING MOTOR, T1

Drawing No.	Rev.	Sheet	Scale
SG590621-117-01		1 of 1	

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, LIYCY, 5 x 0.25, L=1080		T1 STANDARD				
2	1	CONNECTOR, MC1.5/10-ST-3,81			1803659	PHOENIX CONTACT		
3	1	HEAT SHRINKABLE TUBING, ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA
4	5	BOOTLACE FERRULE, H 0.25/12					9025780000	WEIDMÜLLER
5	5	WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
6	1	LABEL, SK 3,81/2,8: SO, TEXT: J28			0805056	PHOENIX CONTACT		
7	1	RECEPTICLE FOR PIN CONTACTS			183079-1	AMP	4457891	ELFA
8	1	CABLE CLAMP WITH STRAIN RELIEF			182663-1	AMP	4450425	ELFA
9	7	PIN CONTACT			163086-1	AMP	4450714	ELFA
10	1	STAR-TEC FERRITE RING			74271221	WÜRTH ELEKTRONIK		



PIN NUMBER ASSIGNMENT FOR WIRES

WHITE (PIN 1) - RS422 T(B)
GREY (PIN 2) - RS422 T(A)
BROWN (PIN 6) - 0 V
YELLOW (PIN 7) - LASER SAFTY LOCK
GREEN (PIN 8) - LASER POWER

Revision	Description	Date	Drawn by:	Checked by:	Approved
C	Not valid for T1S. For T1S cable, see drw SG590621-130-01	2014.10.23	V.N.		
B	Wiring changed.	2013.07.30	K.J		
A	Item 1 changed, Now valid for both T1 and T1S	2012.03.20	A.S.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:
A.S.	2011-11-11	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to

Sharp Edges

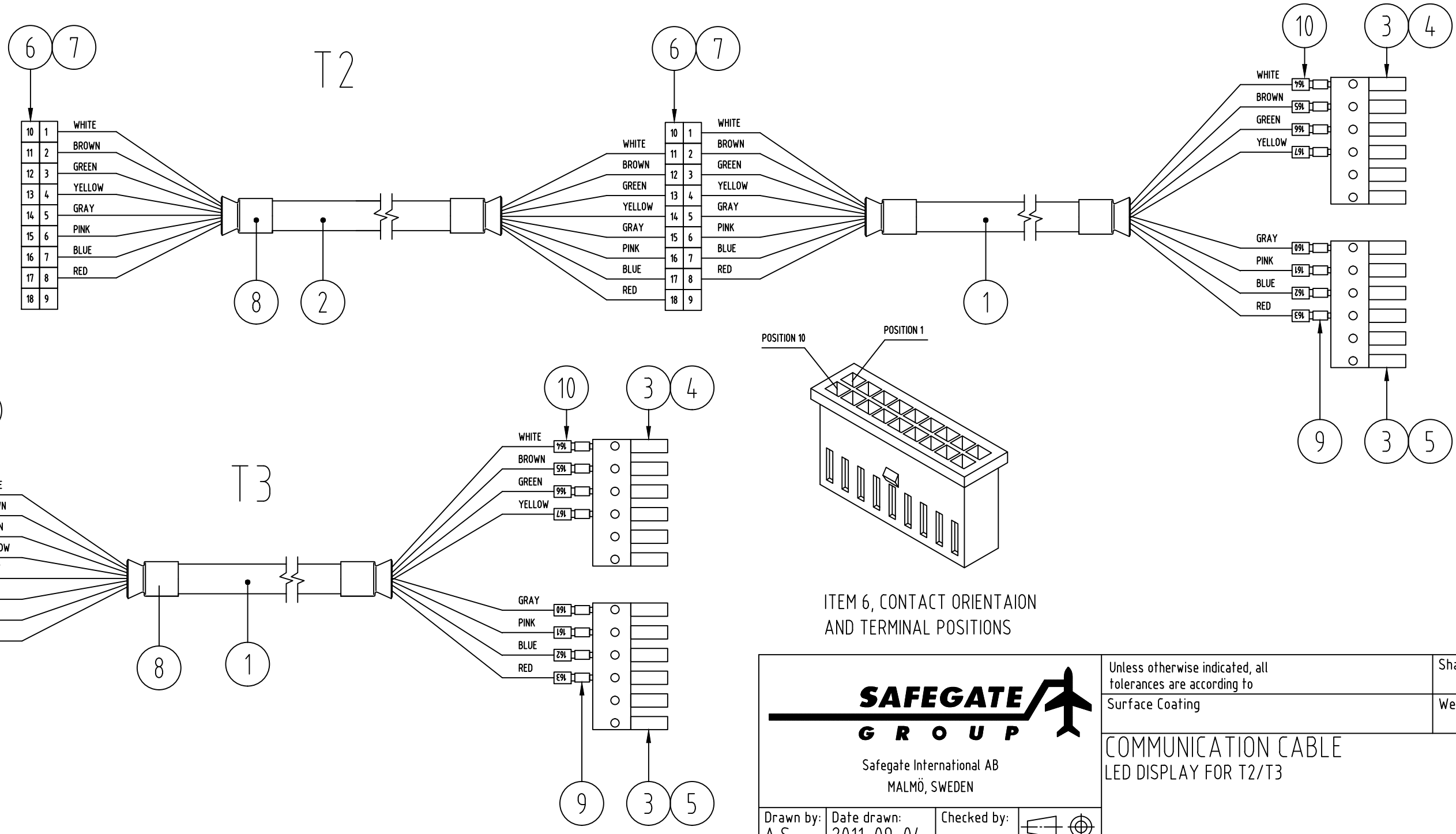
Surface Coating

Weight

CONTROL CABLE
LASER, T1

Drawing No.	Rev.	Sheet	Scale
SG590621-118-01	C	1 of 1	

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, LIYCY, 4 x 2 x 0.25, L = 1100						
2	1	CABLE, LIYCY, 4 x 2 x 0.25, L = 750						
3	2	CONNECTOR, MC1.5/6-ST-3.81					1803617	PHOENIX CONTACT, SWEDEN
4	1	LABEL, SK 3,81/2,8: SO, TEXT: J24					0805056	PHOENIX CONTACT, SWEDEN
5	1	LABEL, SK 3,81/2,8: SO, TEXT: J27					0805056	PHOENIX CONTACT, SWEDEN
6	2	CONNECTOR HOUSING, AMPMODU MOD. II, DOUBLE ROW			280513	TYCO ELECTRONICS		
7	24	CRIMP TERMINAL, .100 AMPMODU			187270-1	TYCO ELECTRONICS		
8	4	HEAT SHRINKABLE TUBING, Ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA, SWEDEN
9	8	BOOTLACE FERRULE, H 0.25/12					9025780000	WEIDMÜLLER, SWEDEN
10		WIRE MARKERS, NUMBERS AS SHOWN ON ILLUSTRATION			PA02	PARTEX		



ITEM 6, CONTACT ORIENTAION
AND TERMINAL POSITIONS

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

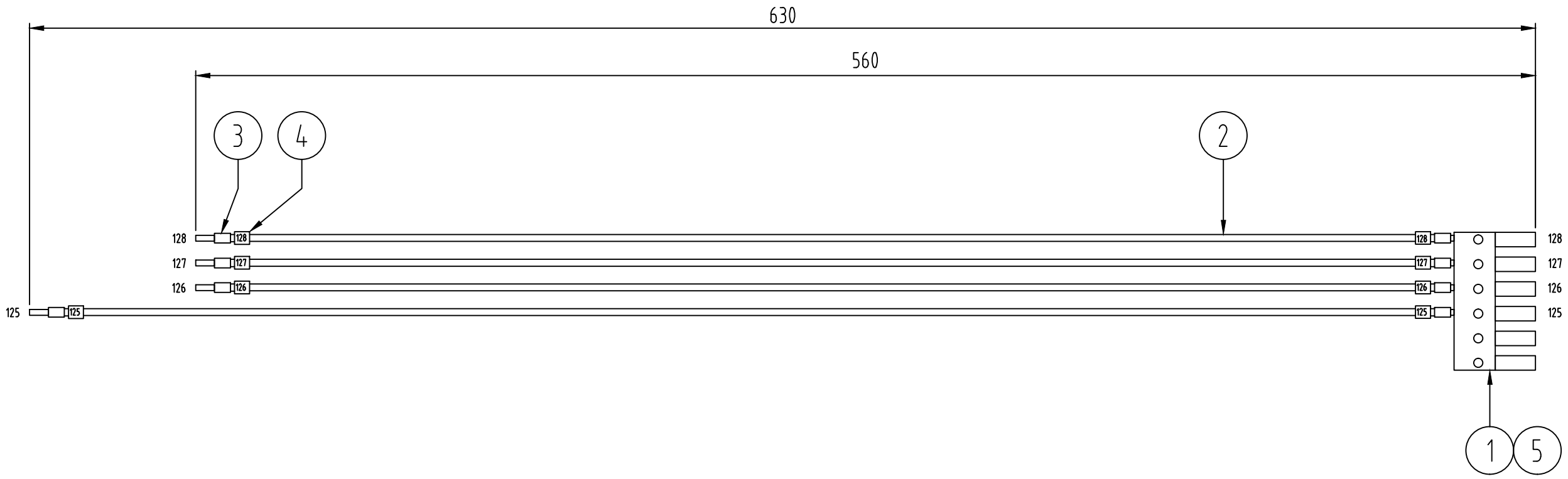
Safegate International AB
MALMÖ, SWEDEN

Unless otherwise indicated, all tolerances are according to			Sharp Edges
Surface Coating			Weight
Drawn by: A.S.	Date drawn: 2011-09-04	Checked by:	
App. by:	Date approved:	Project No.:	

COMMUNICATION CABLE
LED DISPLAY FOR T2/T3

Drawing No.	Rev.	Sheet	Scale
SG590621-119-01		1 of 1	NO SCALE

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CONNECTOR, MC1.5/6-ST-3.81			1803617	PHOENIX CONTACT		
2		ELECTRICAL WIRE, UL1007/1569, RED, AWG 20						
3	8	BOOTLACE FERRULE, H 0.5/14					9026060000	WEIDMÜLLER
4		WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
5	1	LABEL, SK 3,81/2,8: SO, TEXT: J29			0805056	PHOENIX CONTACT		



NOTE FOR WIRE MARKERS

NO.	PART NO.	QTY.
1	11-01044101	8
2	11-01044102	8
5	11-01044105	2
6	11-01044106	2
7	11-01044107	2
8	11-01044108	2

Revision	Description	Date	Drawn by:	Checked by:	Approved

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

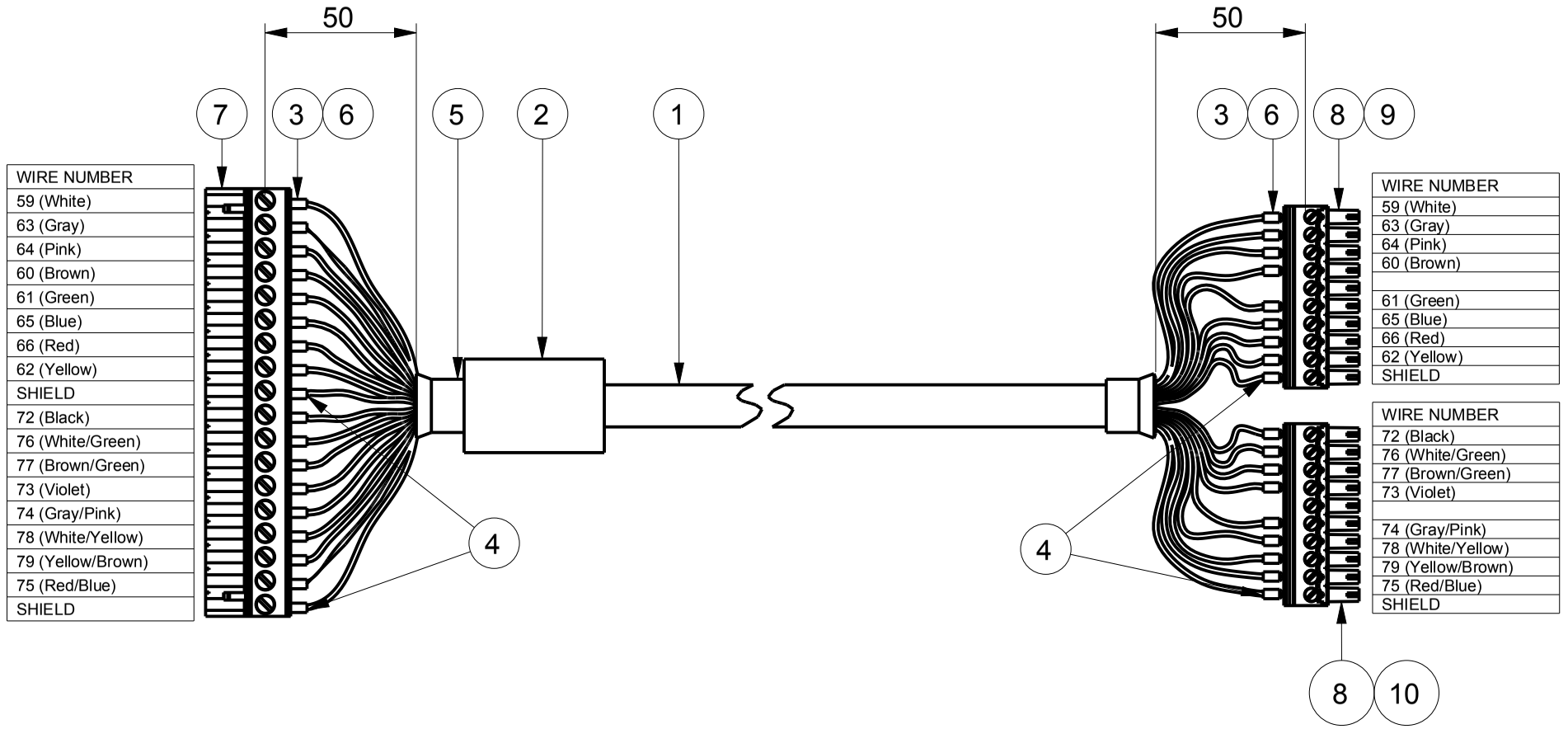
Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
A.S.	2011-11-16				

Unless otherwise indicated, all tolerances are according to	Sharp Edges
Surface Coating	Weight

WIRING ASSEMBLY

Drawing No.	Rev.	Sheet	Scale
SG590621-120-01		1 of 1	NO SCALE

ITEM	QTY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PRODUCT NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NUMBER	SUPPLIER
1	1	CABLE, LIYCY, 16x0.25, L=1200		T1				
2	1	STAR-TEC FERRITE RING		T1	74271221	WURTH ELEKTONIK		
3	32	BOOTLACE FERRULE, h0.12/12		T1	9025780000	WEIDMULLER		
4	4	BOOTLACE FERRULE, h1.5/14		T1	9026090000	WEIDMULLER		
5	2	HEAT SHRINKABLE TUBING, Ø9.5, BLACK		T1	FIT-300-3/4	ALPHA WIRE	55-062-09	ELFA, SWEDEN
6	32	WIRE MARKERS, NUMBERING AS SHOWN IN ILLUSTRATION		T1	PA02	PARTEX		
7	1	CONNECTOR, MSTB 2,5/18-ST-5,08		T1	1757174	PHOENIX CONTACT		
8	2	CONNECTOR, MC 1,5/10-ST-3,81		T1	1803659	PHOENIX CONTACT		
9	1	LABEL, SK 3.81/2.8: SO, TEXT: J22		T1	0825122	PHOENIX CONTACT		
10	1	LABEL, SK 3.81/2.8: SO, TEXT: J15		T1	0825122	PHOENIX CONTACT		



WIRE NUMBER
59 (White)
63 (Gray)
64 (Pink)
60 (Brown)
61 (Green)
65 (Blue)
66 (Red)
62 (Yellow)
SHIELD
72 (Black)
76 (White/Green)
77 (Brown/Green)
73 (Violet)
74 (Gray/Pink)
78 (White/Yellow)
79 (Yellow/Brown)
75 (Red/Blue)
SHIELD

WIRE NUMBER
59 (White)
63 (Gray)
64 (Pink)
60 (Brown)
61 (Green)
65 (Blue)
66 (Red)
62 (Yellow)
SHIELD

WIRE NUMBER
72 (Black)
76 (White/Green)
77 (Brown/Green)
73 (Violet)
74 (Gray/Pink)
78 (White/Yellow)
79 (Yellow/Brown)
75 (Red/Blue)
SHIELD

Rev.	Issue date	Issue by	Issue checked by	Issue text

THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

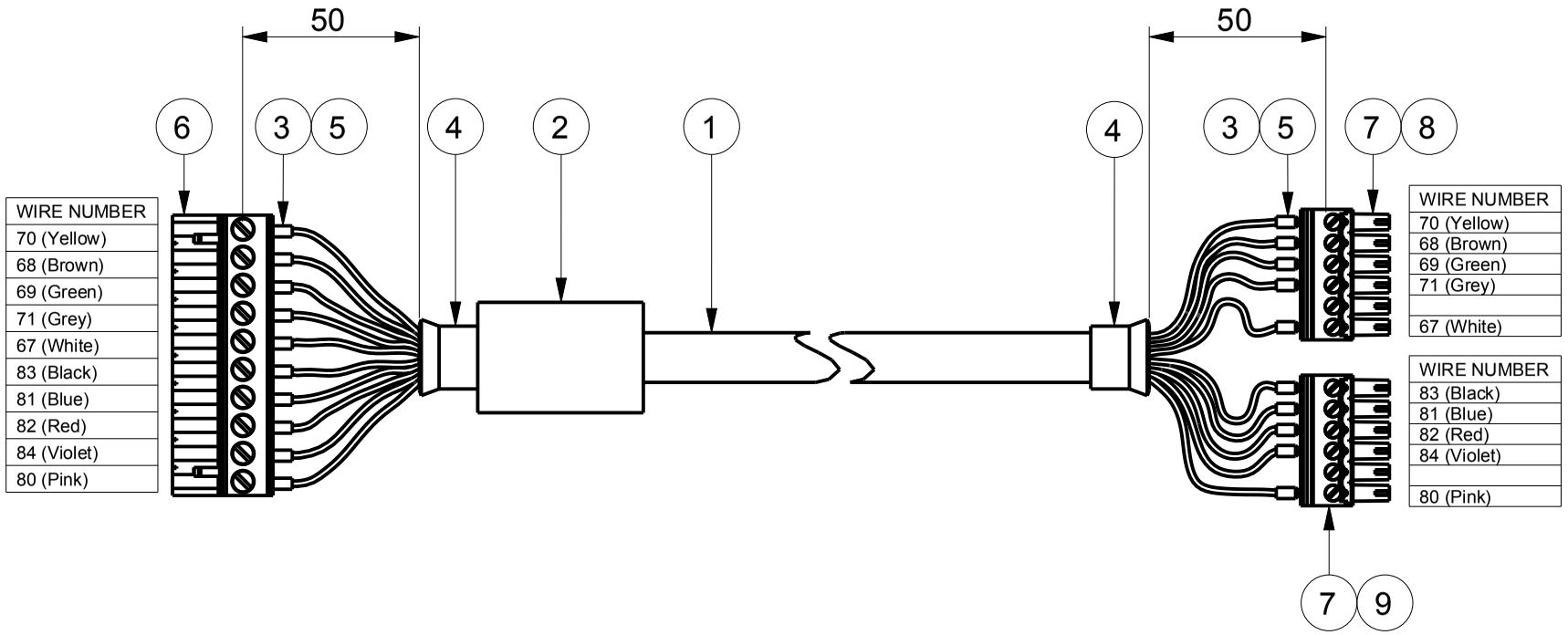
Gen. tolerance	
Surface treatment	
Basic material	
Info	

Drawn by: V. NORELL	Date drawn: 2014-05-20
Approved by:	Date approved:
Project No.	Drawing No. SG590621-125-01

Description
CONTROL CABLE C1
T1

Rev.	Scale	Size	Sheet
A	NA	A3	1(1)

ITEM	QTY	DESCRIPTION/RATINGS	DRAWING NO.	SAFEGATE PRODUCT NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NUMBER	SUPPLIER
1	1	CABLE, LIYCY, 10x0.25, L=1200		T1				
2	1	STAR-TEC FERRITE RING		T1	74271131	WURTH ELEKTONIK		
3	20	BOOTLACE FERRULE, h0.12/12		T1	9025780000	WEIDMULLER		
4	2	HEAT SHRINKABLE TUBING, Ø9.5, BLACK		T1	FIT-221-3/8	ALPHA WIRE	55-071-08	ELFA, SWEDEN
5	20	WIRE MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION		T1	PA02	PARTEX		
6	1	CONNECTOR, MSTB 2,5/10-ST-5,08		T1	1757093	PHOENIX CONTACT		
7	2	CONNECTOR, MC 1,5/6-ST-3,81		T1	1803617	PHOENIX CONTACT		
8	1	LABEL, SK 3.81/2.8: SO, TEXT: J13		T1	0825122	PHOENIX CONTACT		
9	1	LABEL, SK 3.81/2.8: SO, TEXT: J20		T1	0825122	PHOENIX CONTACT		



Rev.	Issue date	Issue by	Issue checked by	Issue text

THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Gen. tolerance

Surface treatment

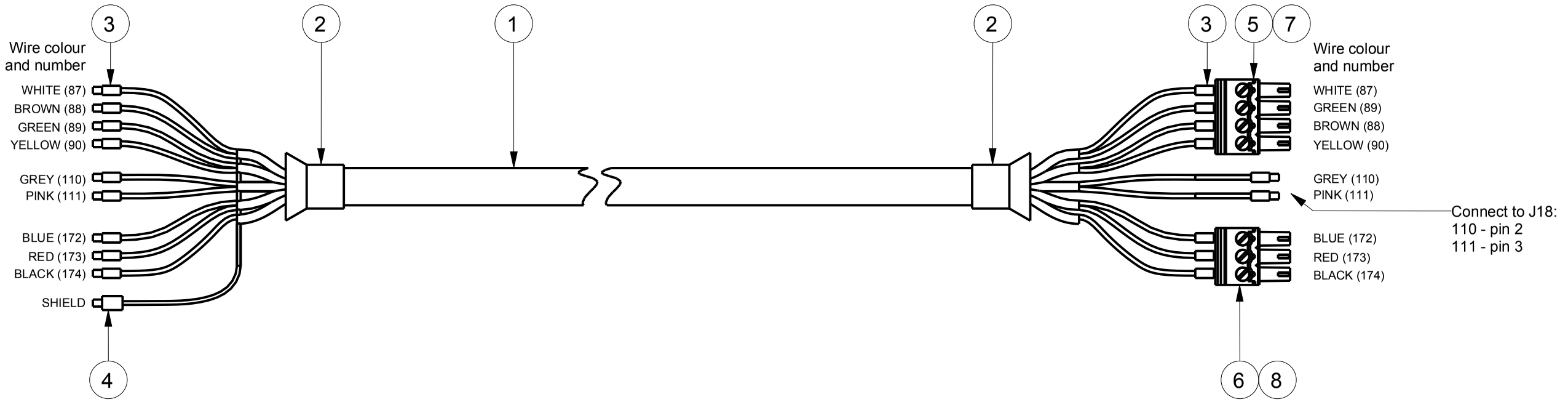
Basic material

Info

Drawn by:	Date drawn:	Description
V. NORELL	2014-05-20	CONTROL CABLE C2 T1
Approved by:	Date approved:	

Project No.	Drawing No.	Rev.	Scale	Size	Sheet
	SG590621-126-01	A	NA	A3	1(1)

POS	QTY	DESCRIPTION	STD/OPT	T1/T1S/T2/T3	DRW. NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NO.	SUPPLIER
1	1	CABLE, LI-YDYCYP 6x2x0.25, L=1700 mm	Standard	T1					
2	2	HEAT SHRINKABLE TUBING, Ø19.1 mm, BLACK	Standard	T1		FIT-221-3/4BLACK 4	ALPHA WIRE	55-073-06	ELFA
3	18	CRIMP LUG, H 0.25/12	Standard	T1					
4	1	CRIMP LUG, H 1.5/14	Standard	T1					
5	1	TERMINAL CONTACT, MC 1,5/4-ST-3,81	Standard	T1		1803594	PHOENIX CONTACT		
6	1	TERMINAL CONTACT, MC 1,5/3-ST-3,81	Standard	T1		1803581	PHOENIX CONTACT		
7	1	TERMINAL MARKER, SK 3,81/2,8: SO, TEXT: J8	Standard	T1		0825122	PHOENIX CONTACT		
8	1	TERMINAL MARKER, SK 3,81/2,8: SO, TEXT: J10	Standard	T1		0825122	PHOENIX CONTACT		
9		WIRE MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION	Standard	T1		PA02	PARTEX		



Rev.	Issue date	Issue by	Issue checked by	Issue text

THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Drawn by: V. NORELL	Date drawn: 2014-09-08
Approved by:	Date approved:
Project No.	Drawing No. SG590621-127-01

Gen. tolerance

Surface treatment

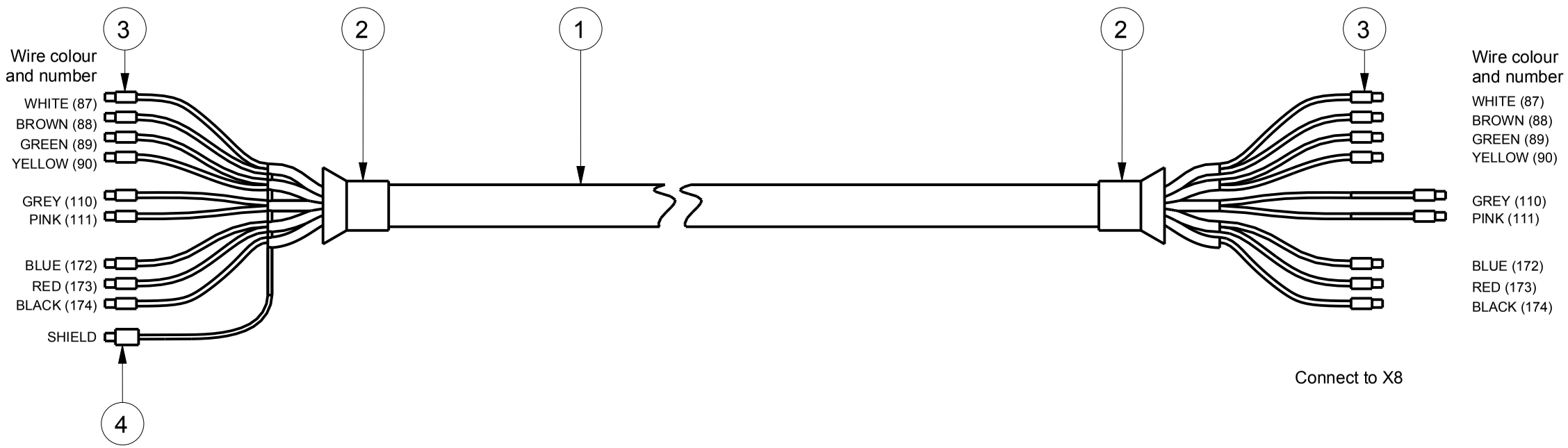
Basic material

Info

Description
MULTI CABLE C21
T1

Rev.	Scale	Size	Sheet
A	1,000	A3	1 (1)

POS	QTY	DESCRIPTION	STD/OPT	T1/T1S/T2/T3	DRW. NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NO.	SUPPLIER
1	1	CABLE, LI-YDYCYP 6x2x0.25, L=5000 mm	Standard	T1S					
2	2	HEAT SHRINKABLE TUBING, Ø19.1 mm, BLACK	Standard	T1S		FIT-221-3/4BLACK 4	ALPHA WIRE	55-073-06	ELFA
3	18	CRIMP LUG, H 0.25/12	Standard	T1S					
4	1	CRIMP LUG, H 1.5/14	Standard	T1S					
5		WIRE MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION	Standard	T1S					



Rev.	Issue date	Issue by	Issue checked by	Issue text

THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Drawn by: V. NORELL	Date drawn: 2014-10-23
Approved by:	Date approved:
Project No.	Drawing No. SG590621-128-01

Gen. tolerance

Surface treatment

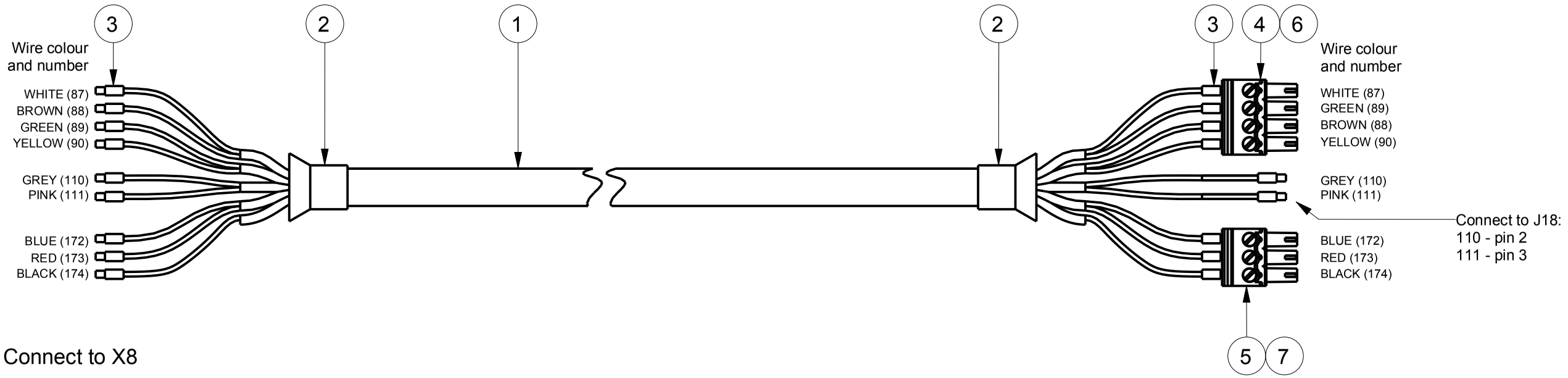
Basic material

Info

Description
MULTI CABLE C23
T1S

Rev.	Scale	Size	Sheet
A	1,000	A3	1 (1)

POS	QTY	DESCRIPTION	STD/OPT	T1/T1S/T2/T3	DRW. NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NO.	SUPPLIER
1	1	CABLE, LIYCY, 10x0.25, L=1200 mm	Standard	T1S					
2	2	HEAT SHRINKABLE TUBING, Ø9.5 mm, BLACK	Standard	T1S		FIT-221-3/8BLACK 4	ALPHA WIRE	55-071-08	ELFA
3	18	CRIMP LUG, H 0.25/12	Standard	T1S					
4	1	TERMINAL CONTACT, MC 1,5/4-ST-3,81	Standard	T1S		1803594	PHOENIX CONTACT		
5	1	TERMINAL CONTACT, MC 1,5/3-ST-3,81	Standard	T1S		1803581	PHOENIX CONTACT		
6	1	TERMINAL MARKER, SK 3,81/2,8: SO, TEXT: J8	Standard	T1S		0825122	PHOENIX CONTACT		
7	1	TERMINAL MARKER, SK 3,81/2,8: SO, TEXT: J10	Standard	T1S		0825122	PHOENIX CONTACT		
8		WIRE MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION	Standard	T1S		PA02	PARTEX		



Connect to X8

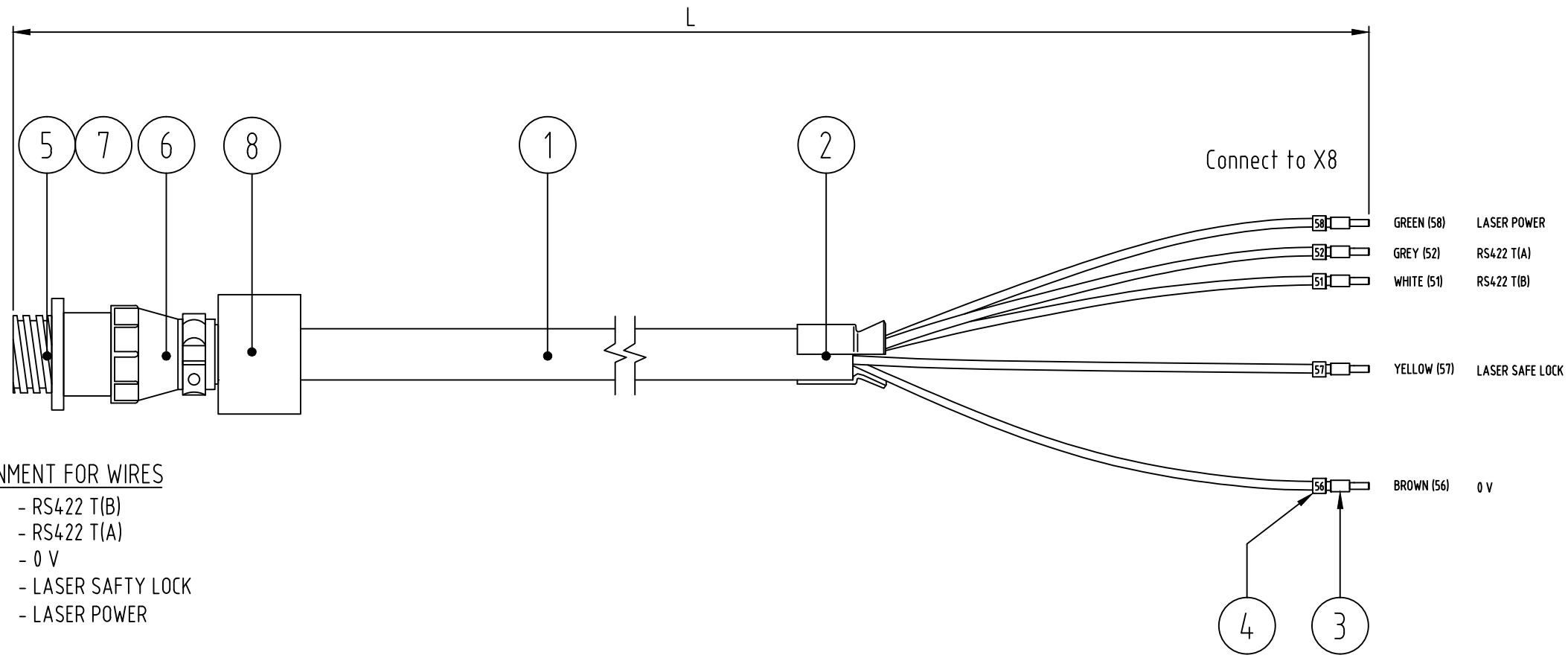
Rev.	Issue date	Issue by	Issue checked by	Issue text

THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Gen. tolerance	
Surface treatment	
Basic material	
Info	

Drawn by: V. NORELL	Date drawn: 2014-10-23	Description: MULTI CABLE C24 T1S, Plint-MB			
Approved by:	Date approved:				
Project No.	Drawing No. SG590621-129-01	Rev. A	Scale 1,000	Size A3	Sheet 1 (1)

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, LIYCY, 5 x 0.25, L=5000		T1 SPLIT				
2	1	HEAT SHRINKABLE TUBING, ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA
3	5	BOOTLACE FERRULE, H 0.25/12					9025780000	WEIDMÜLLER
4	5	WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
5	1	RECEPTICLE FOR PIN CONTACTS			183079-1	AMP	4457891	ELFA
6	1	CABLE CLAMP WITH STRAIN RELIEF			182663-1	AMP	4450425	ELFA
7	7	PIN CONTACT			163086-1	AMP	4450714	ELFA
8	1	STAR-TEC FERRITE RING			74271221	WÜRTH ELEKTRONIK		



PIN NUMBER ASSIGNMENT FOR WIRES

WHITE (PIN 1) - RS422 T(B)
GREY (PIN 2) - RS422 T(A)
BROWN (PIN 6) - 0 V
YELLOW (PIN 7) - LASER SAFTY LOCK
GREEN (PIN 8) - LASER POWER

Revision	Description	Date	Drawn by:	Checked by:	Approved
A	New drawing for T1S	2014.10.23	V.N.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

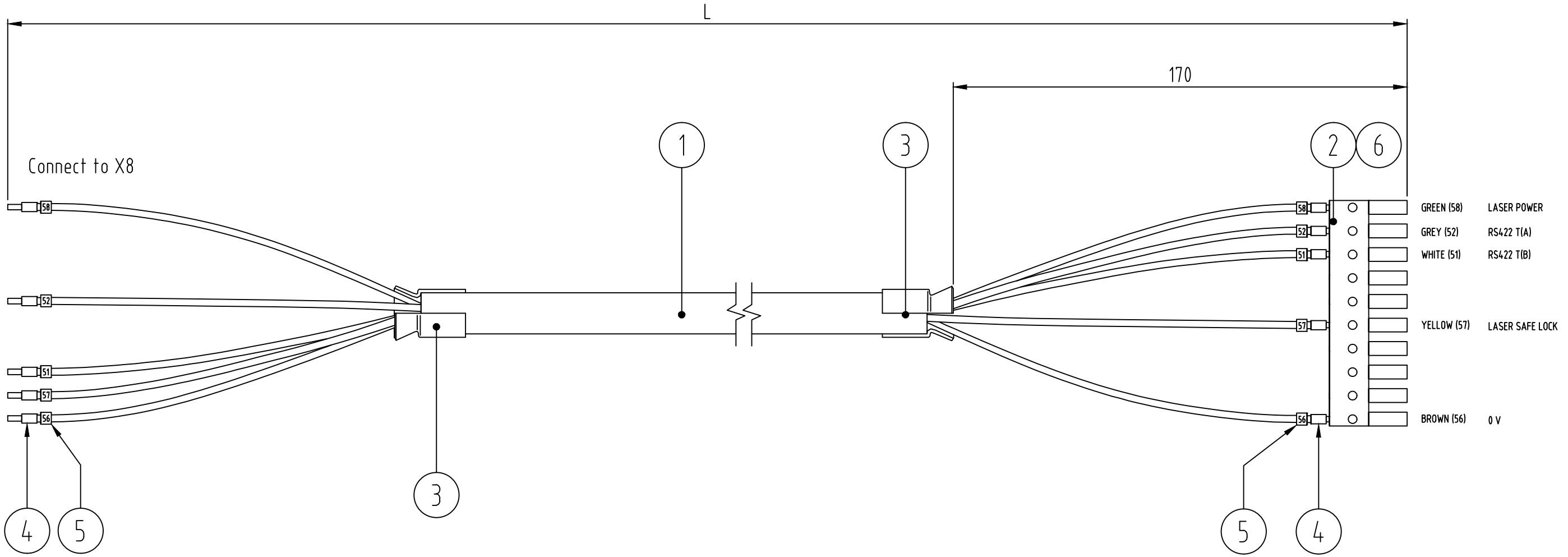
Drawn by:	Date drawn:	Checked by:
V.N.	2014-10-23	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to | Sharp Edges
Surface Coating | Weight

CONTROL CABLE
LASER, T1S
C25

Drawing No.	Rev.	Sheet	Scale
SG590621-130-01	A	1 of 1	

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, LIYCY, 5 x 0.25, L=1200		T1 SPLIT				
2	1	CONNECTOR, MC1.5/10-ST-3,81			1803659	PHOENIX CONTACT		
3	2	HEAT SHRINKABLE TUBING, ⌀9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA
4	10	BOOTLACE FERRULE, H 0.25/12					9025780000	WEIDMÜLLER
5	10	WIRE MARKERS, PARTEX PA02					SEE NOTE	WEIDMÜLLER
6	1	LABEL, SK 3,81/2,8: SO, TEXT: J28			0805056	PHOENIX CONTACT		



Revision	Description	Date	Drawn by:	Checked by:	Approved
A	New laser cable for T1S.	2014.10.23	V.N.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:
V.N.	2014-10-23	
App. by:	Date approved:	Project No.:

Unless otherwise indicated, all tolerances are according to

Sharp Edges

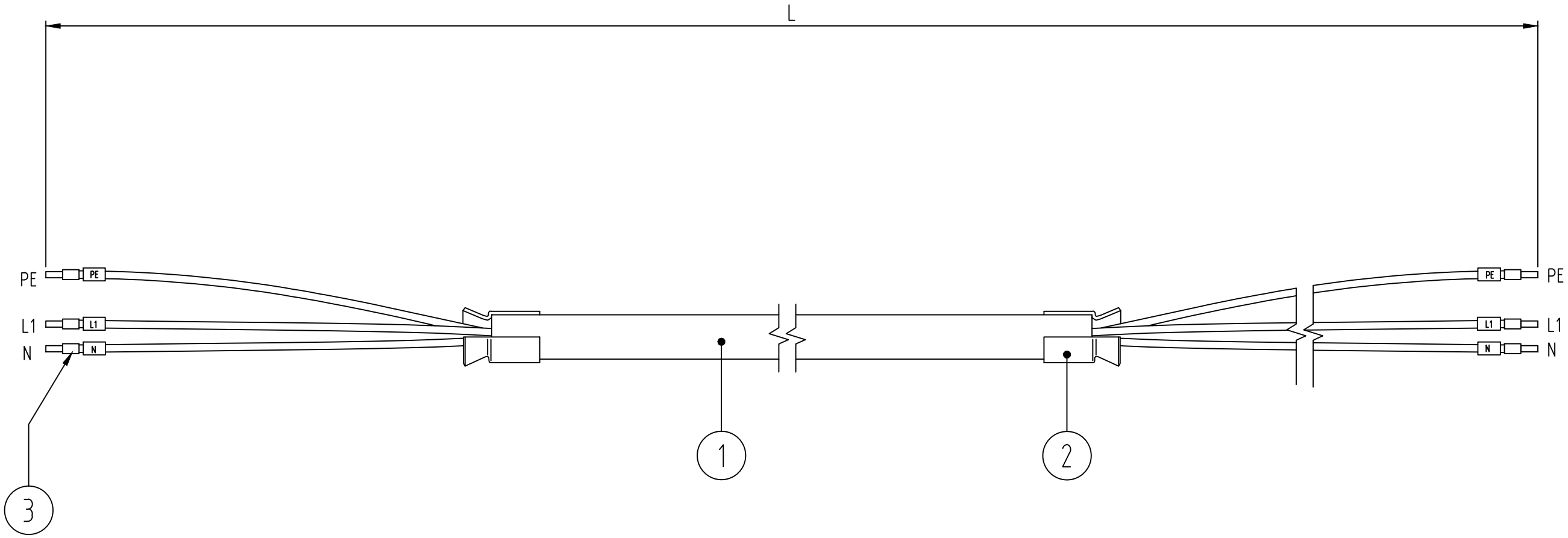
Surface Coating

Weight

CONTROL CABLE
LASER, T1S
C26, Plint-MB

Drawing No.	Rev.	Sheet	Scale
SG590621-131-01	A	1 of 1	

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	1	CABLE, ÖLFLEX TRAY II 3G1,5, L=1700		T1 Standard	2216 030	LAPP GROUP		
1	1	CABLE, ÖLFLEX TRAY II 3G1.5, L=5000		T1 SPLIT	2216 030	LAPP GROUP		
2	2	HEAT SHRINKABLE TUBING, Ø9.5, BLACK			FIT-221-3/8	ALPHA WIRE	5507108	ELFA, SWEDEN
3	6	BOOTLACE FERRULE, H 1.5/16						
4		WIRE MARKERS, PARTEX PA02						



Revision	Description	Date	Drawn by:	Checked by:	Approved
A	New power cable for T1/T1S	2014.10.24	V.N.		

SAFEGATE GROUP

Safegate International AB
MALMÖ, SWEDEN

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:
V.N.	2014-10-24				

Unless otherwise indicated, all tolerances are according to

Sharp Edges

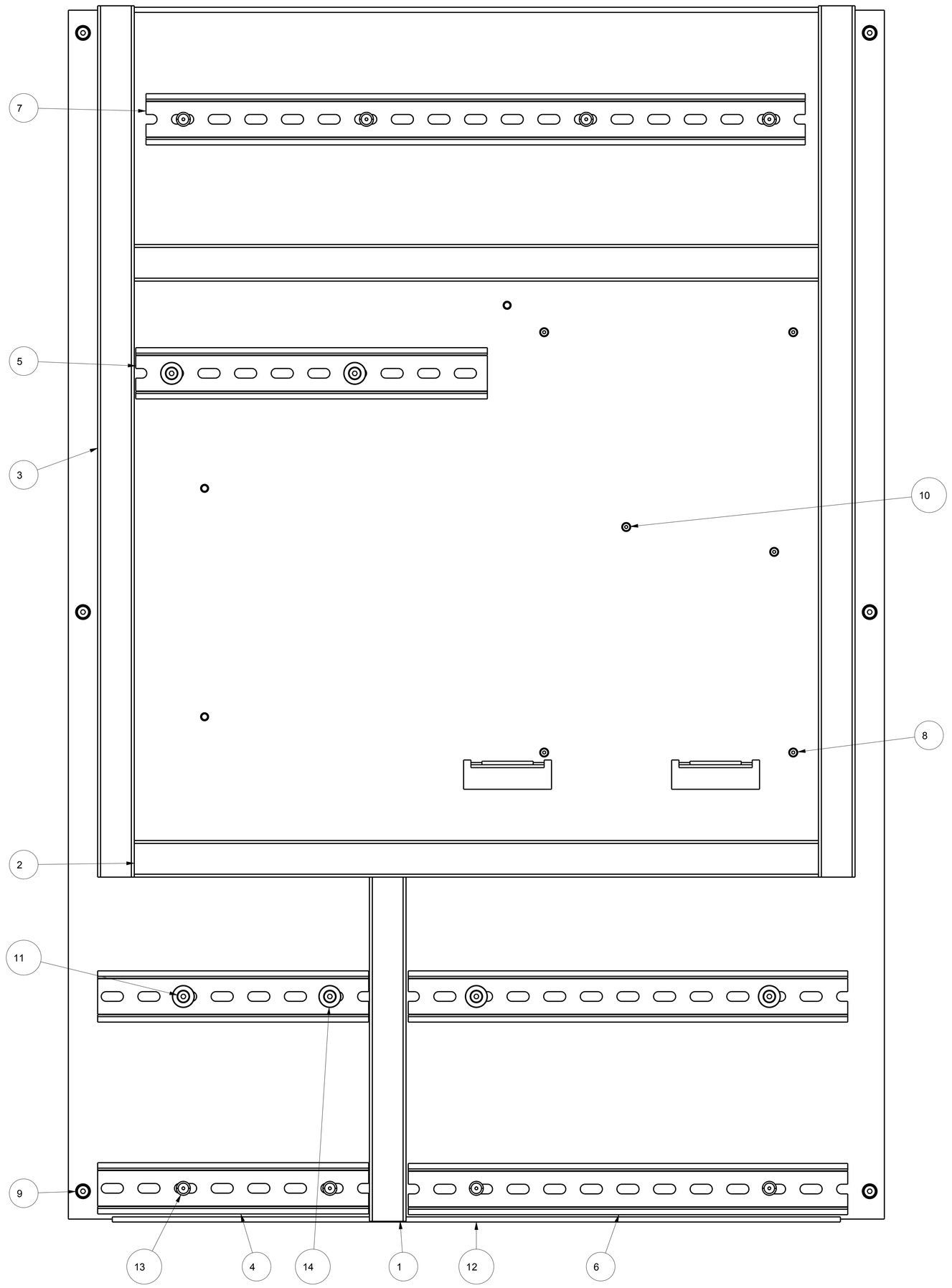
Surface Coating

Weight

POWER CABLE
T1/T1S
Scanner cabinet

Drawing No.	Rev.	Sheet	Scale
SG590621-132-01	A	1 of 1	NO SCALE

Position	Quantity	Description	Material	Drawing No.	Size	Manu. Part No.	Manufacturer	Supplier's Part	Supplier
1	1	CABLE_CHANNEL_235MM	Plastic		L=235mm	T1-E 25x60 G	IBOCO	2990122	AHLSELL
2	2	CABLE_CHANNEL_467MM	Plastic		L=467mm	T1-E 25x60 G	IBOCO	2990122	AHLSELL
3	2	CABLE_CHANNEL_595MM	Plastic		L=595mm	T1-E 25x60 G	IBOCO	2990122	AHLSELL
4	2	DIN_RAIL_185MM	Steel	SG590621-200-01	NS35/7,5 L=185mm				
5	1	DIN_RAIL_240MM	Steel	SG590621-204-01	NS35/7,5 L=240mm				
6	2	DIN_RAIL_300MM	Steel	SG590621-201-01	NS35/7,5 L=300mm				
7	1	DIN_RAIL_450MM	Steel	SG590621-202-01	NS35/7,5 L=450mm				
8	6	LOCK_WASHER_M3	Zinc Plated		3.2x6x1.2				
9	6	LOCK_WASHER_M5	Zinc Plated		5.1x9x1.5				
10	6	M3X8_DIN_7985	Zinc Plated		M3x8				
11	12	M5X10_DIN7984	Zinc Plated		M5x10				
12	1	MOUNTING_PLATE	Aluminum	NPP 912748					
13	8	POPNIT_BIG_HEAD_3_2	Zinc Plated		Ø 3.2x7.9 head=9.5				
14	6	WASHER_LARGE_M5			5.3x15x1.2mm				



Issue No.	Issue date	Issue by	Issue checked by	Issue text

Gen. tolerance

Surface treatment

Basic material

Info

Drawn by: A.Strandberg

Date drawn: 2011.08.31

Approved by:

Date approved:

Description: Mounting Plate

Project No.

Drawing No. SG590621-203-01

Rev. PA

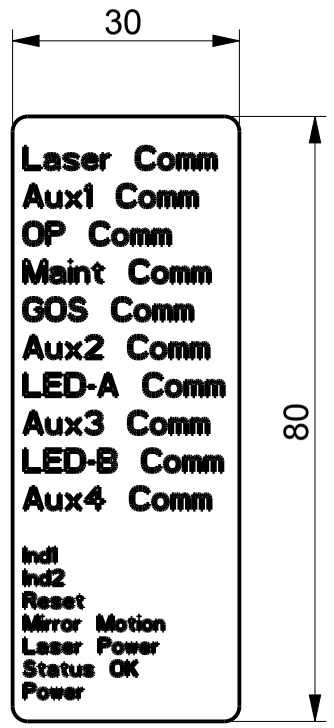
Scale 0,667

Size A0

Sheet 1 (1)

Item No.	Quantity	Name	Description	Dimensions	Remark
		B-588VINYL FILM, WHITE	76576	80x30mm	BRADY

USE CU LABEL FILE,
SG590254-205-01, FOR GLOBALMARK
LABEL PRINTER TO CREATE LABEL



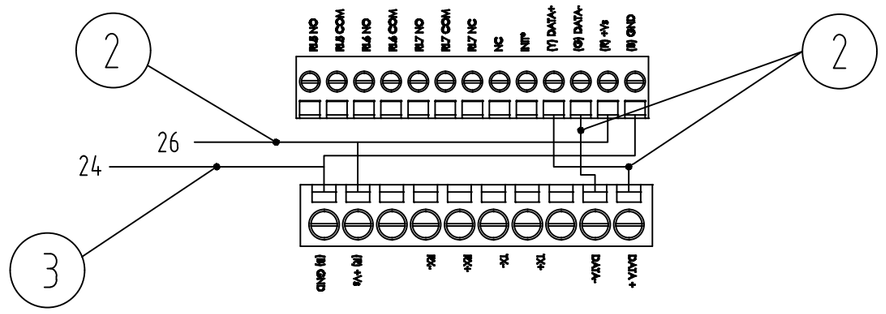
Rev.	Issue date	Issue by	Issue checked by	Issue text

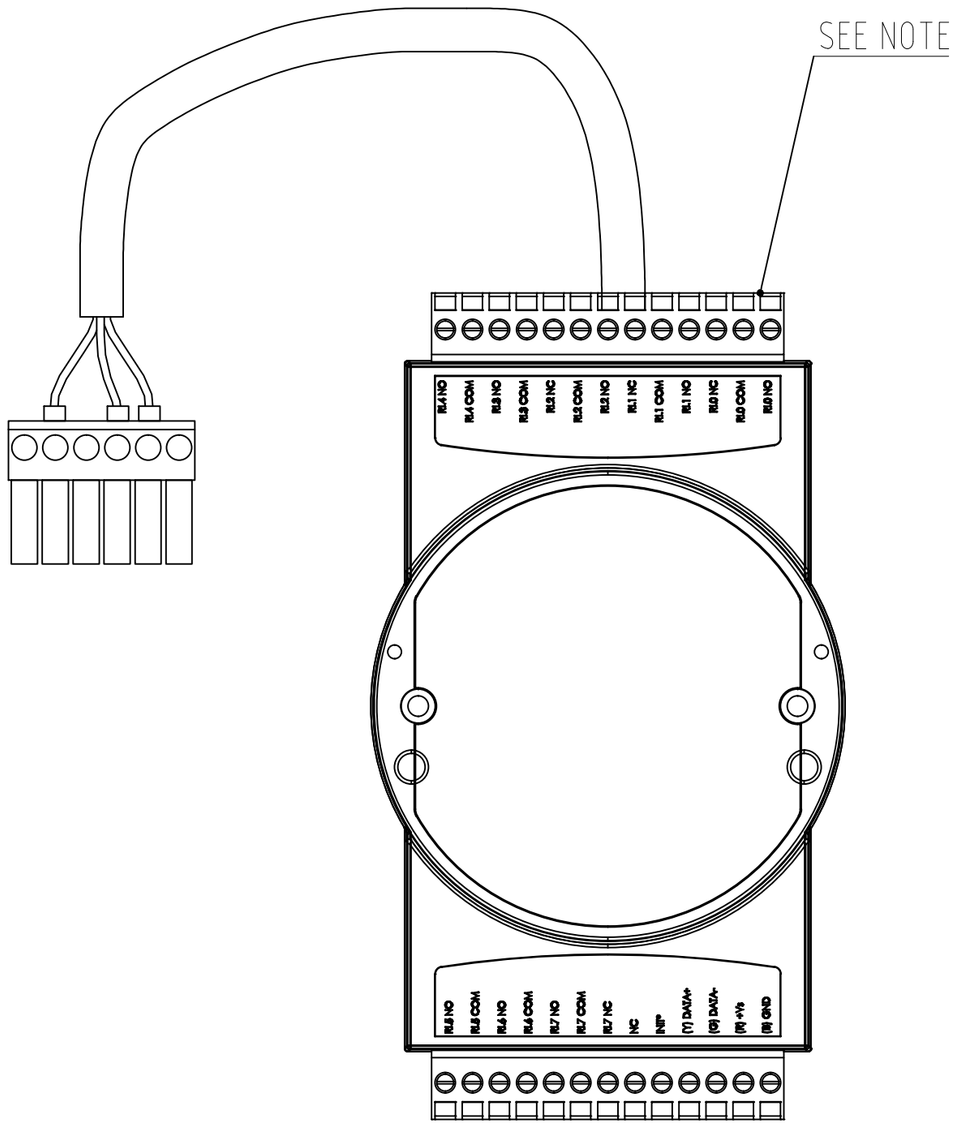
THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

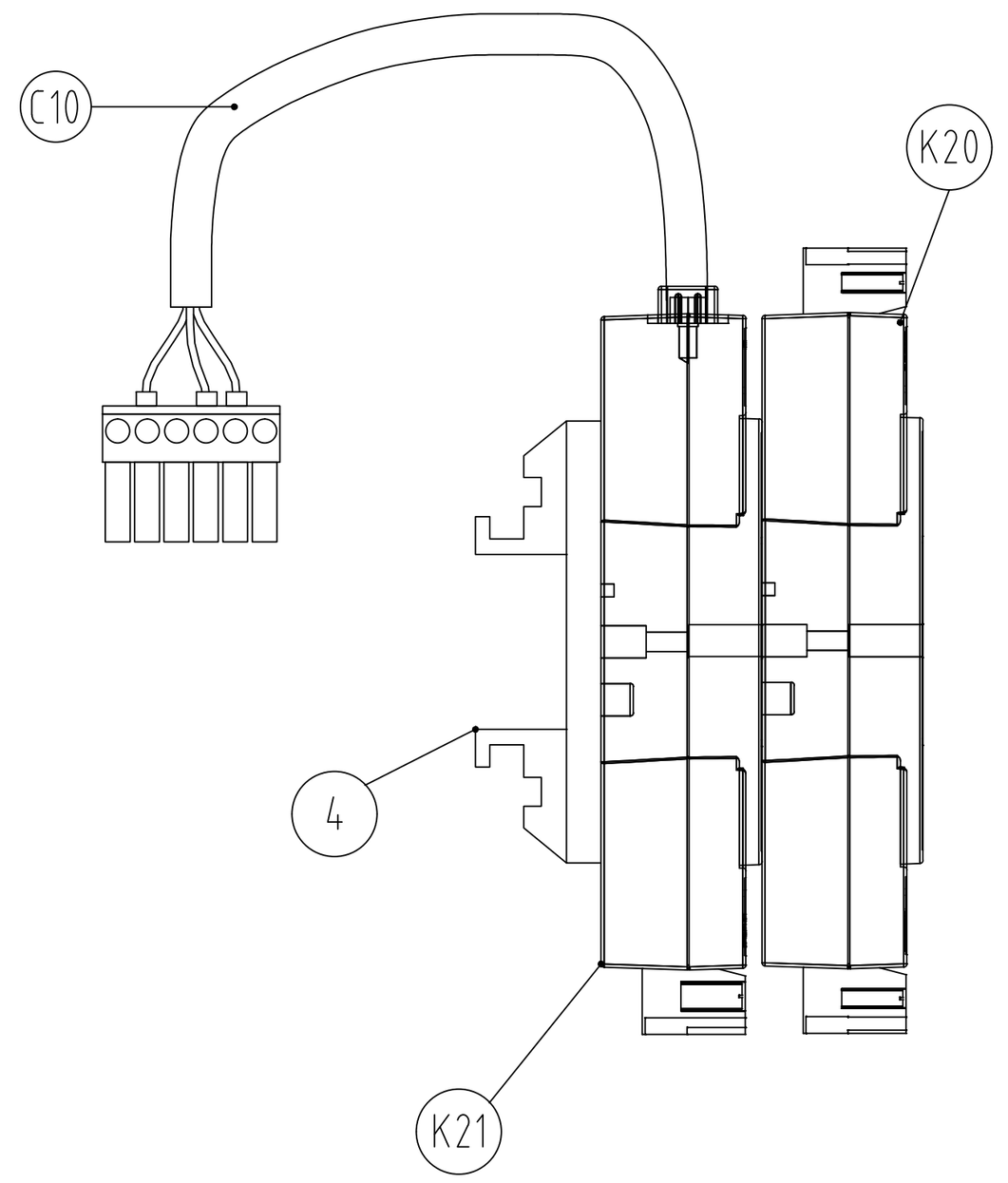
Drawn by: K JOHANSSON	Date drawn: 2012-08-07	Gen. tolerance			
Approved by:	Date approved:	Surface treatment			
		Basic material			
		Info			
Project No.	Drawing No. SG590621-205-01	Rev.	Scale 1,000	Size A3	Sheet 1 (1)

Description
LABEL
CU-BOARD LED's

Item	Quantity	Description/Ratings	Drawing No.	Safegate Product No.	Manufacturer's Part No.	Manufacturer	Supplier's Stock Number	Supplier
1	2	COMPONENT LABEL, YELLOW, 15x8mm, TEXT: K20 and K21					21302G	TECHNOTRADE SCANDINAVIA AB, SWEDEN
K20	1	8-ch Relay Output Module with Modbus			ADAM-4068-BE	Advantech		
K21	1	RS-232 to RS-422/485 Converter			ADAM-4520-EE	Advantech		
C10	1	COMMUNICATION CABLE	SG590623-100-01					
2	3	WIRE, UL1007/1569, AWG20, RED						
3	1	WIRE, UL1007/1569, AWG20, BLACK						
4	1	DIN RAIL CLAMP (Comes with ADAM-4520)						
-		WIRING MATERIALS						
		CRIMP LUG, H 0.5/14					9026060000	WEIDMÜLLER, SWEDEN
		WIRE MARKERS, PARTEX PA02, MARKING					-	WEIDMÜLLER, SWEDEN







NOTE 1

On active signal, a loop between NO and COM is created for that Telay (RL).
Example: When the system reports Active, a loop between RL0 COM and RL0 NO is created.

RL0	Actived
RL1	In Service
RL2	Present Status
RL3	On Block
RL4	Off Block
RL5	Out Off Service
RL6	EMS Status
RL7	System OK

Revision	Description	Date	Drawn by:	Checked by:	Approved
C	ADAM-4520-D2E replaced with ADAM-4520-EE	20141127	V.N		
B	RL6 and RL7 changed	20120403	A.S		
A	RL6 changed	20120308	A.S		

SAFEGATE GROUP
Safegate International AB
MALMÖ, SWEDEN

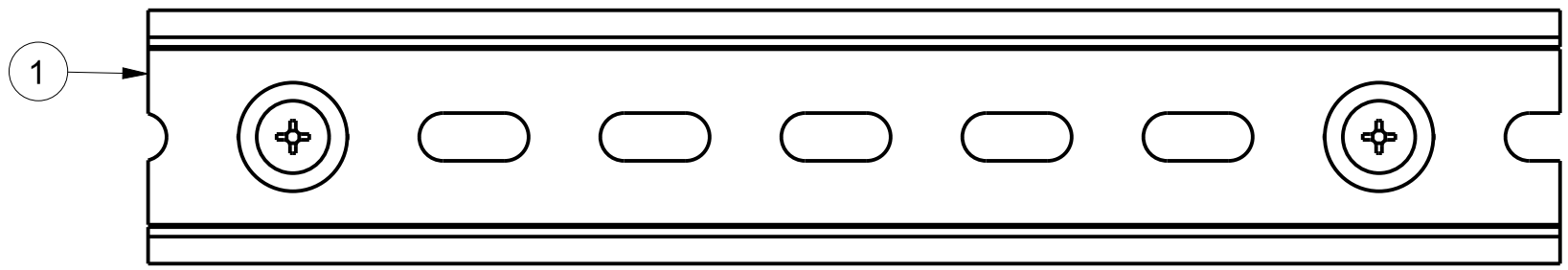
Drawn by: A.S | Date drawn: 2012-02-21 | Checked by:
App. by: | Date approved: | Project No.:

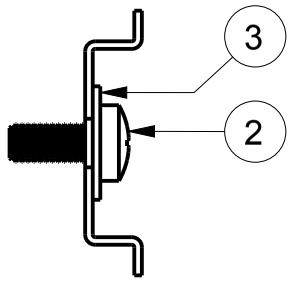
Unless otherwise indicated, all tolerances are according to | Sharp Edges
Surface Coating | Weight

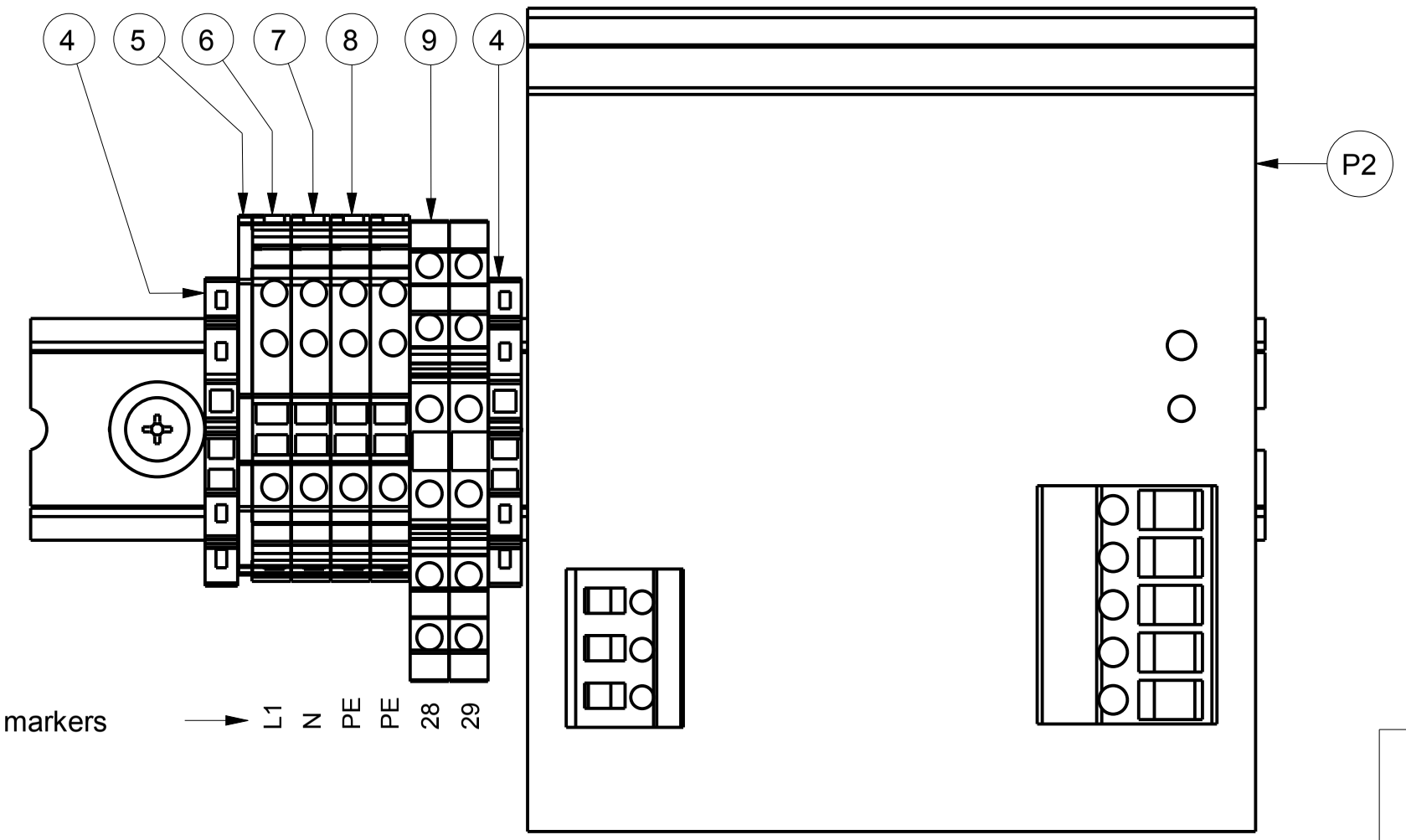
COMMUNICATION ASSEMBLY
I/O Module

Drawing No. SG590623-001-01 | Rev. C | Sheet 1 of 1 | Scale

POS	QTY	DESCRIPTION	STD/OPT	T1/T1S/T2/T3	DRW. NO.	MANUFACTURER'S PART NO.	MANUFACTURER	SUPPLIER'S STOCK NO.	SUPPLIER
P2	1	POWER SUPPLY, TRIO-PS/1AC/24DC/20	Standard	T1/T1S		2866381	PHOENIX CONTACT		
1	1	DIN RAIL, 195 mm	Standard	T1/T1S	SG590621-207-01		PHOENIX CONTACT		
2	2	SCREW, M5x12, ISO7045, A2	Standard	T1/T1S					
3	2	WASHER, 5.3x15x1, ISO7089, A2	Standard	T1/T1S					
4	2	END BRACKET, CLIPFIX 35-5	Standard	T1/T1S		3022276	PHOENIX CONTACT		
5	1	END COVER, D-UT 2,5/4-TWIN	Standard	T1/T1S		3047141	PHOENIX CONTACT		
6	1	TERMINAL CONTACT, UT 4-TWIN	Standard	T1/T1S		3044364	PHOENIX CONTACT		
7	1	TERMINAL CONTACT, UT 4-TWIN BU	Standard	T1/T1S		3044500	PHOENIX CONTACT		
8	2	TERMINAL CONTACT, UT 4-TWIN PE	Standard	T1/T1S		3044380	PHOENIX CONTACT		
9	2	TERMINAL CONTACT, DIKD 1,5-PV	Standard	T1/T1S		2715092	PHOENIX CONTACT		
10		TERMINAL MARKERS, NUMBERING AS SHOWN ON ILLUSTRATION	Standard	T1/T1S					







Rev.	Issue date	Issue by	Issue checked by	Issue text

THORN Airfield Lighting
IDMAN
SAFEGATE GROUP

Drawn by: V. NORELL	Date drawn: 2014-08-27	Description: X9 TERMINAL BLOCK ASSEMBLY FOR T1/T1S
Approved by:	Date approved:	
Project No.	Drawing No. SG590626-001-01	Rev. A / Scale 1,000 / Size A3 / Sheet 1 (1)

Gen. tolerance

Surface treatment

Basic material

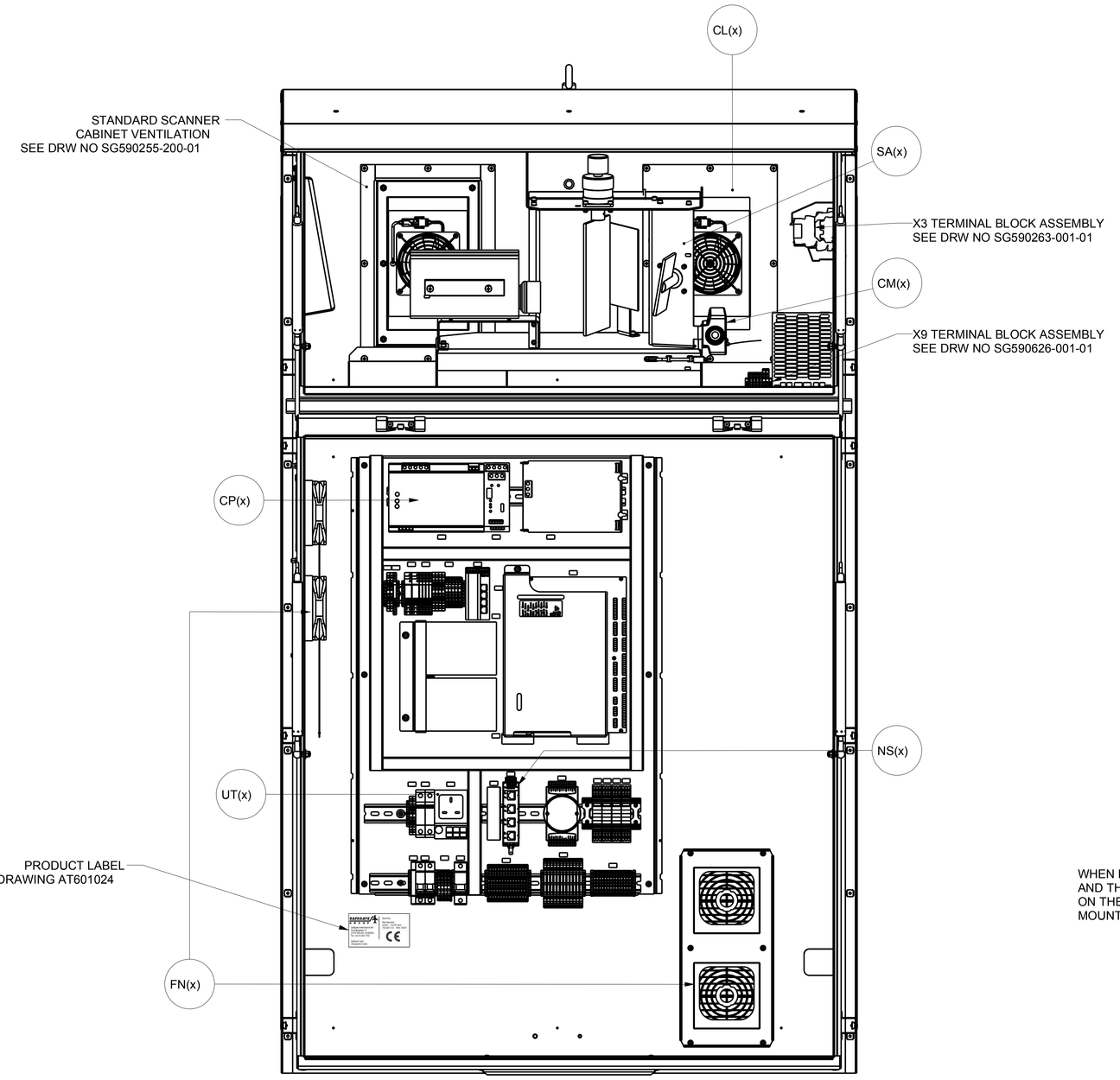
Info

FIG. 1, CABLE PLACEMENT, LED DISPLAY

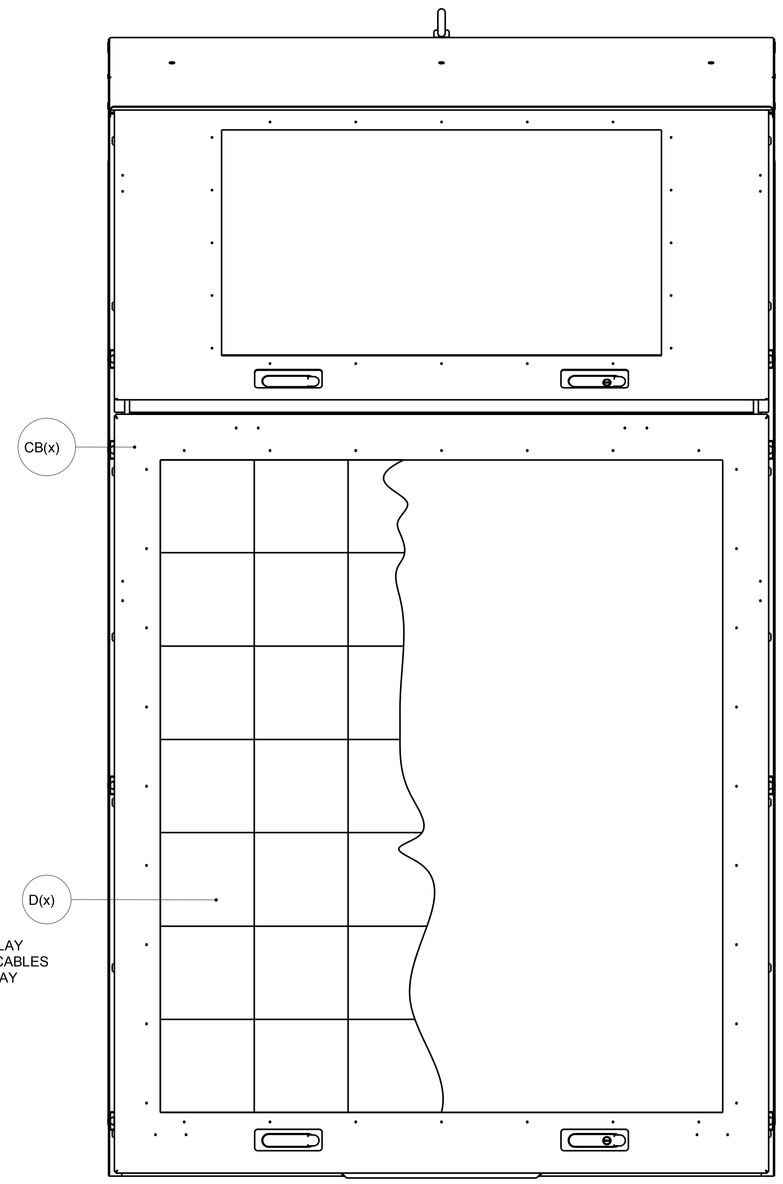
CONFIGURATION KEY

USE THE SYSTEM'S CONFIGURATION CODE
TO DETERMINE THE SYSTEM ASSEMBLY.

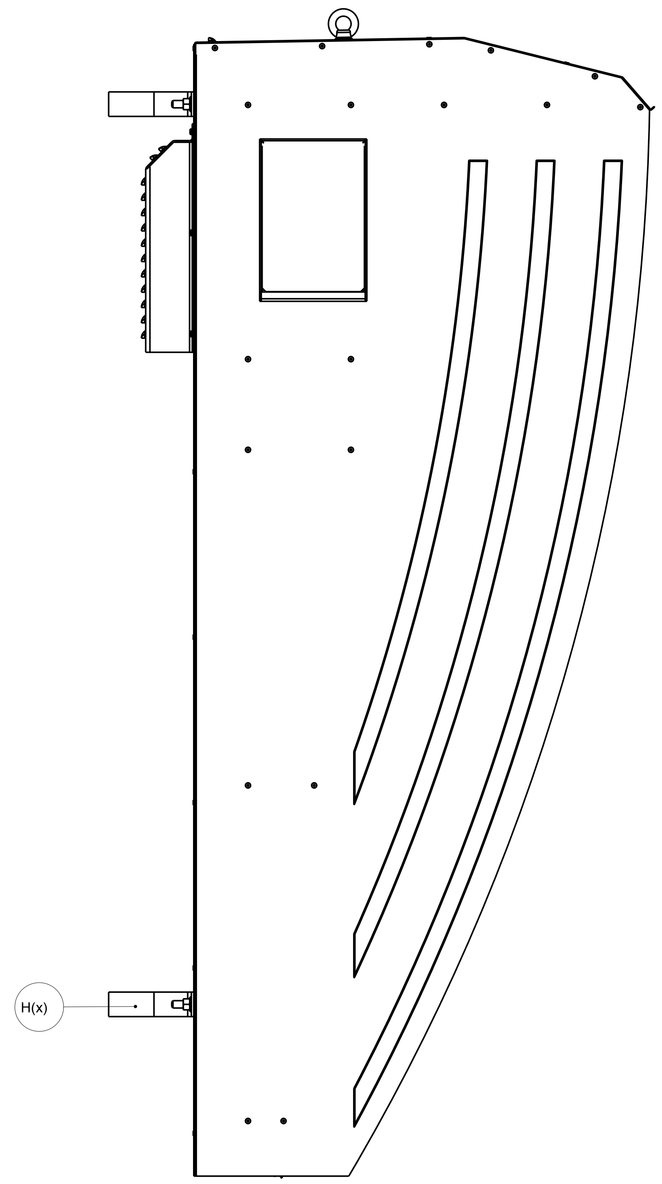
Designation	Code (x)	Item	Type	Drawing No.
T1-				
CB(x)	1	Cabinet	Standard	SG590253-002-01
CL(x)	1	Cooling	Cooler Assembly	SG590259-001-01
CM(x)	1	Camera	Axis M1144-L	SG590612-001-01
CP(x)	1	Control & Power	w/o UPS	SG590621-001-01
	2		w/ UPS	SG590621-001-01
D(x)	1	Display	1-42	SG590256-001-01
FN(x)	1	Vent. Assembly	Standard	SG590264-100-01
H(x)	1	Installation Hardware	For ø139.7 Pole	SG590221-001-01
NS(x)	1	Network Switch & Filter	Standard	SG590611-001-01
SA(x)	1	Scan. Assm.	Standard	SG590255-001-01
UT(x)	1	Utility Outlet	DIN (Schuko)	SG590266-001-01
	2		British Standard	SG590266-001-01
	3		U.S. Standard	SG590266-001-01
	4		French Standard	SG590266-001-01



FRONT VIEW, DOORS REMOVED



WHEN INSTALLING CABLES BETWEEN THE LED DISPLAY AND THE CONTROL & POWER ASSEMBLY, RUN THE CABLES ON THE OUTSIDE BACK SURFACE OF THE LED DISPLAY MOUNTING PLATE. SEE FIG. 1 AT TOP OF DRAWING.



Issue No.	Issue date	Issue by	Issue checked by	Issue text
E	2014-11-11	V.N.		New camera, M1144-L replaces M1113.
D	2014-09-18	V.N.		Design change of cabinet, FI(x) removed.
C	2013-11-14	K.J.		Tibbo removed. New layout. NS updated.
B	2011-11-17	A.S.		Configuration key changed and updated.
A	2011-03-22	A.S.		Configuration key changed and updated.

THORN EUROLUX
IDMAN
SAFEGATE

Drawn by: G.O.
Date drawn: 2009-03-08
Approved by:
Date approved:
Project No.
Drawing No.: SG590980-001-01

Gen. tolerance
Surface treatment
Basic material
Info

Description
T1 DOCKING GUIDANCE SYSTEM
COMPONENT PLACEMENT AND CONFIGURATION KEY
SEE DRAWING SG590621-004-01 FOR CONNECTION DIAGRAM

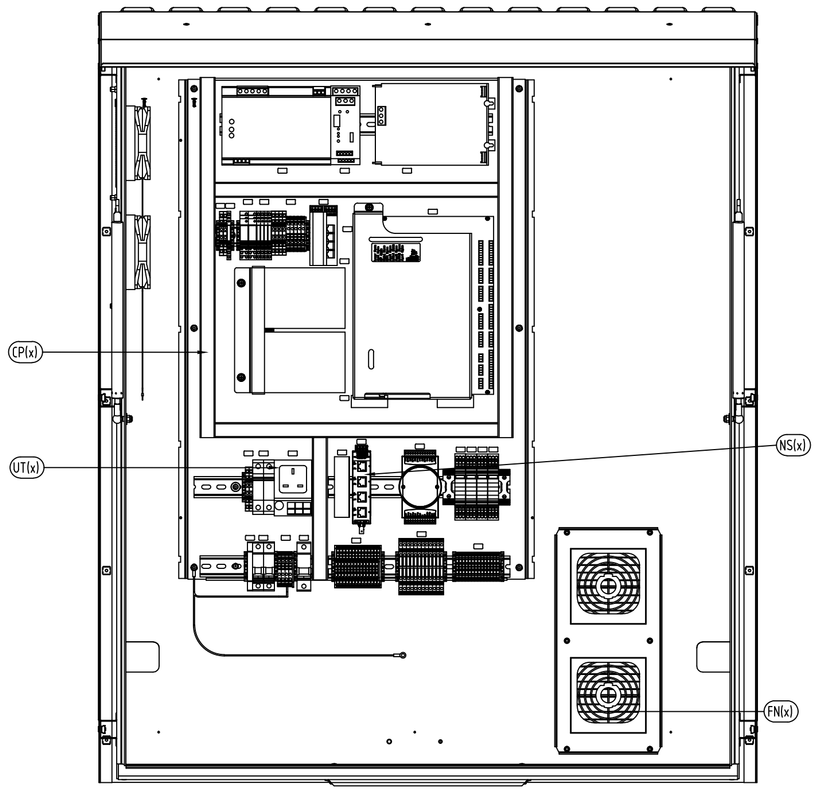
Rev.	Scale	Size	Sheet
E	0,200	A0	1 (1)

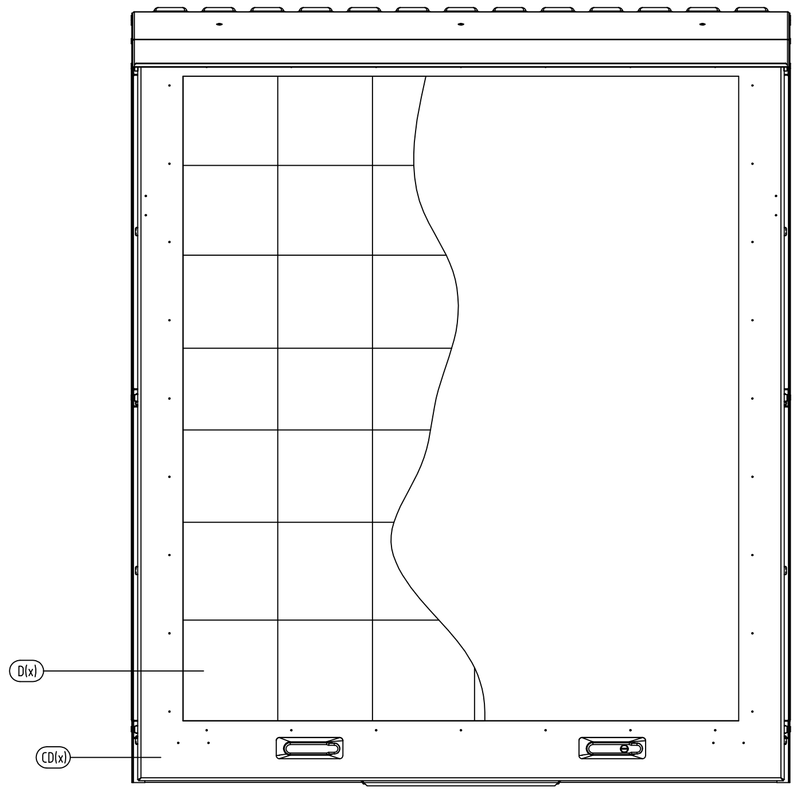
USE THE PRODUCT CONFIGURATION CODE TO DETERMINE WHICH ITEMS ARE INCLUDED IN THE DOCKING GUIDANCE UNIT

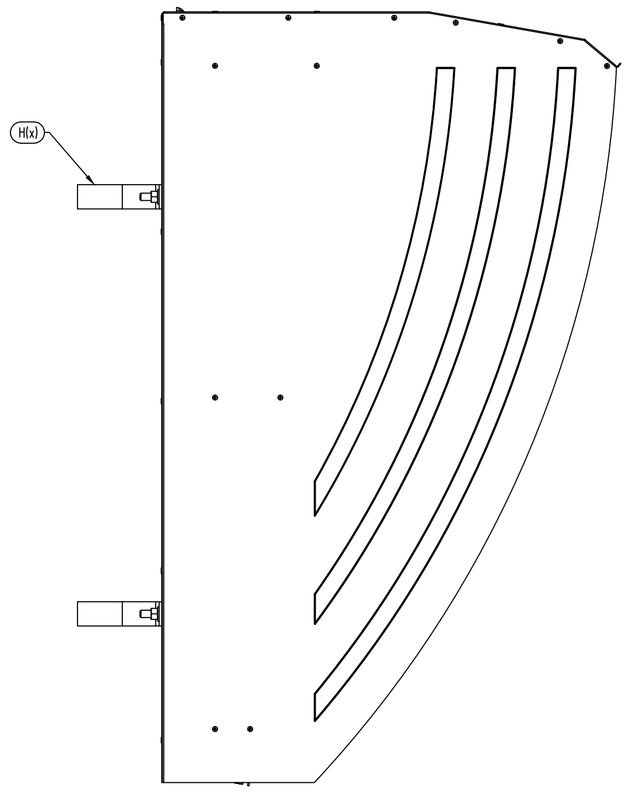
CONFIGURATION KEY

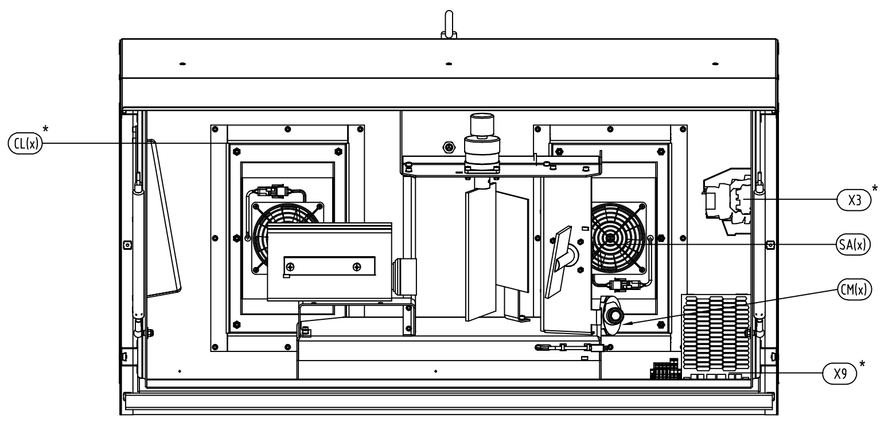
USE THE SYSTEM'S CONFIGURATION CODE TO DETERMINE THE SYSTEM ASSEMBLY.

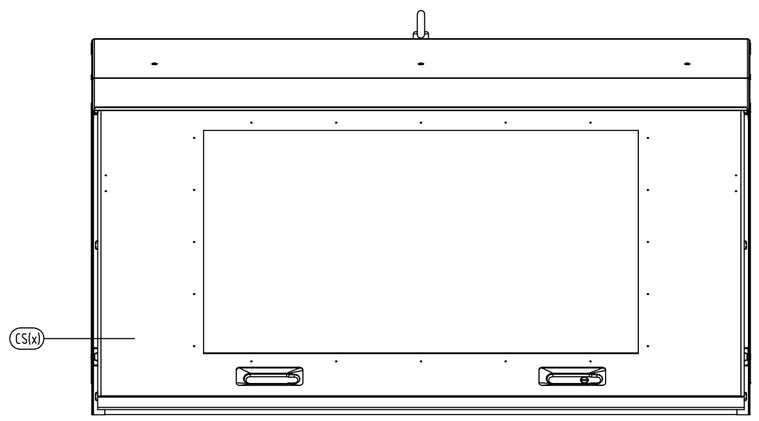
Designation	Code (x)	Item	Type	Drawing No.
T1S-				
CA(x)	1	Cable Assembly	Standard	SG590270-000-01
CD(x)	1	Display Cabinet	Standard	SG590253-213-01
CL(x)	1	Cooling	Supercooler Assembly	SG590259-001-01
CM(x)	1	Camera	Axis M1144-L	SG590612-001-01
CP(x)	1	Control & Power	Standard	SG590621-001-01
CS(x)	1	Scanner Cabinet	Standard	SG590253-217-01
D(x)	1	Display	1-42	SG590256-001-01
NS(x)	1	Network Switch	Standard	SG590611-01-01
FN(x)	1	Vent. Assembly	Standard	SG590264-001-01
H(x)	1	Installation Hardware	For ø139.7 Pole	SG590253-218-01
SA(x)	1	Scanner Assembly	Standard	SG590255-001-01
UT(x)	1	Utility Outlet	DIN (Schuko)	SG590266-001-01
	2		British Standard	SG590266-001-01
	3		U.S. Standard	SG590266-001-01
	4		French Standard	SG590266-001-01

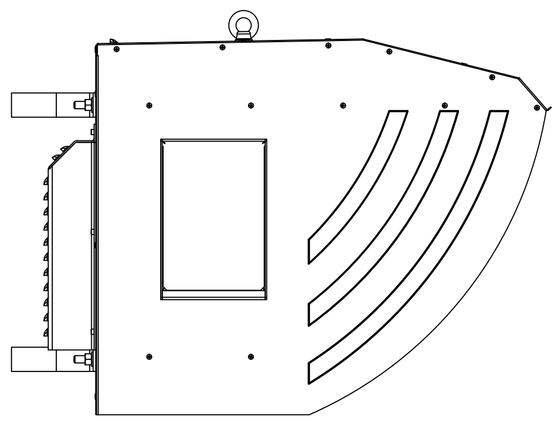












FRONT VIEW, DOORS REMOVED

*Note:
X3 Terminal Block: Drw. no. SG590263-001-01
X9 Terminal Block: Drw. no. SG590627-001-01
Standard Scanner Cabinet Ventilation Drw. no.: SG590255-200-01

Rev	Description	Date	Drawn by:	Checked by:	Approved
D	New design, new camera, FI option included in NS option.	2014.11.11	V.N.		
C	New control and power assembly. NS updated.	2013.11.14	K.J.		
B	Drawing number for connection diagram changed	2013.05.17	A.S.		
A	Configuration key changed and updated	2011.03.16	A.S.		

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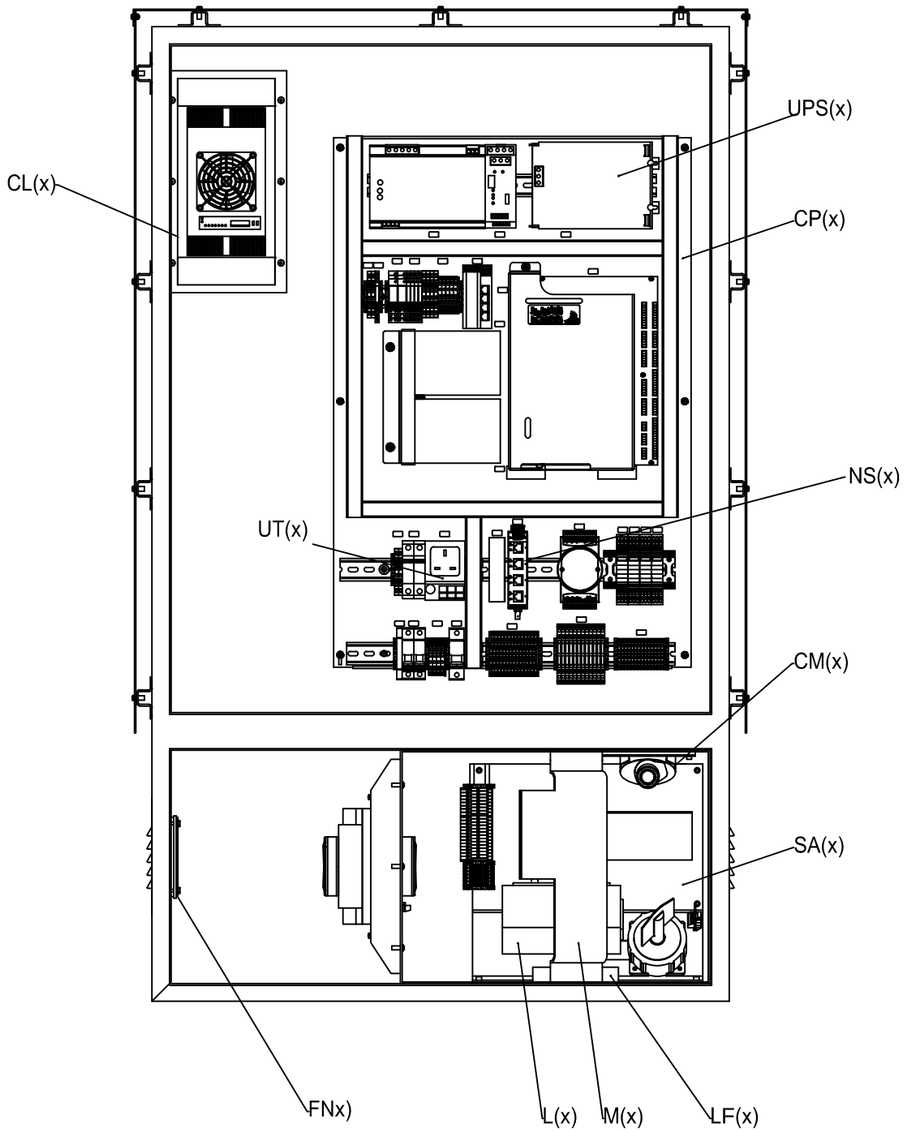
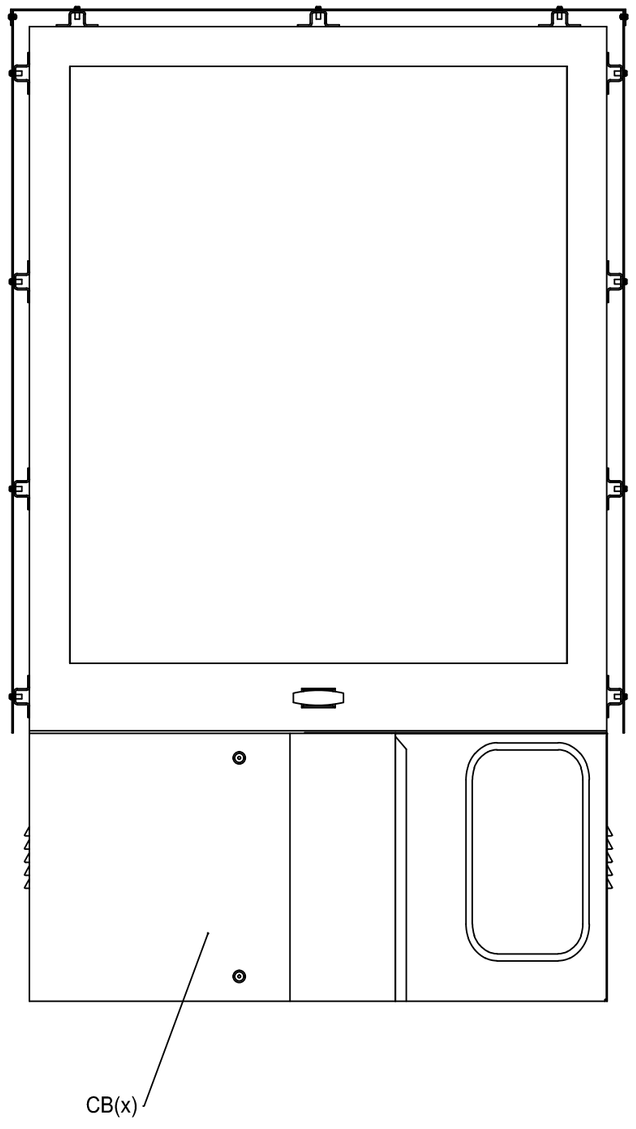
MALMÖ, SWEDEN

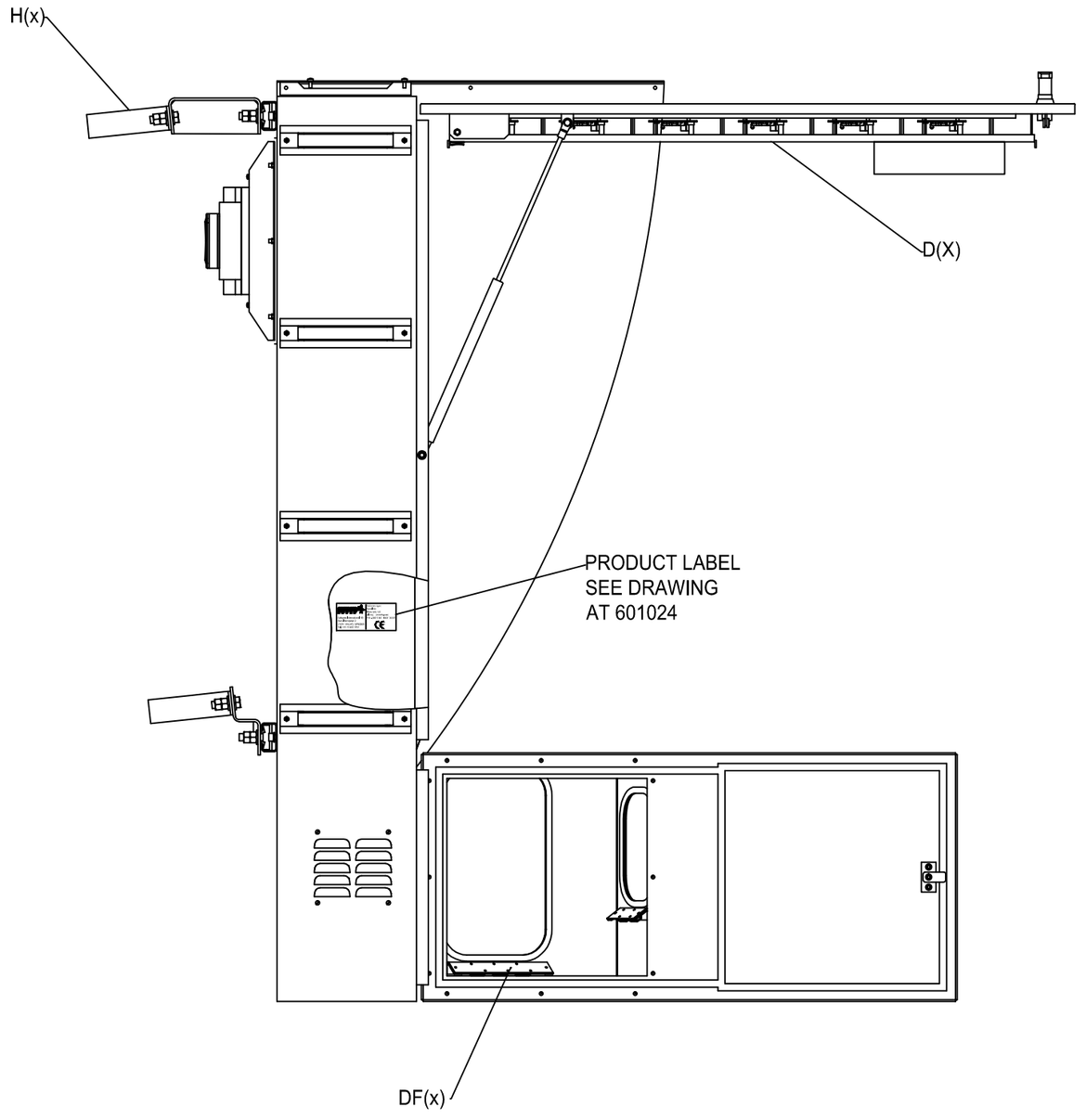
Unless otherwise indicated, all tolerances are according to
Surface Coating
Sharp Edges
Weight

T1S DOCKING GUIDANCE SYSTEM
COMPONENT PLACEMENT AND CONFIGURATION KEY
SEE DRAWING SG590621-004-01 FOR CONNECTION DIAGRAM

Drawn by:	Date drawn:	Checked by:	App. by:	Date approved:	Project No.:	Drawing No.	Rev.	Sheet	Scale
G.O.	2009-09-30					SG590981-001-01	D	1 of 1	NO SCALE







CONFIGURATION KEY

USE THE SYSTEM'S CONFIGURATION CODE
TO DETERMINE THE SYSTEM ASSEMBLY.

Designation	Code (x)	Item	Type	Drawing No.
T2-				
CB(x)	1	Cabinet	Standard	SG590281-001-01
	2		Adapted for Supercooler	SG590282-001-01
CL(x)	1	Cooling	Supercooler Assembly	SG590543-001-01
CM(x)	1	Camera	Axis M1144-L	SG590612-001-01
CP(x)	1	Control & Power	Standard	SG590621-001-01
D(x)	1	Display	2-18, w/heater	SG590466-000-01
	2		2-18	SG590467-000-01
	3		2-24, w/heater	SG590468-000-01
	4		2-24	SG590469-000-01
	1	Display V2.0	2-18, w/heater	SG590619-001-01
	2		2-18	SG590619-001-01
	3		2-24, w/heater	SG590619-001-01
	4		2-24	SG590619-001-01
DF(x)	1	Defroster Assembly	Heaters for scanning windows	SG590486-000-01
FN(x)	1	Vent. Assembly	Standard	SG590479-001-01
H(x)	1	Installation Hardware	For Ø 139,7 Pole	SG590483-001-01
L(x)	1	Laser Range Finder	LE90-3AT/98	SG590114-000-01
LF(x)	1	Laser Cooling Fan	Standard	SG590405-000-01
M(x)	1	Calibration Mirror	Standard	SG590487-001-01
NS(x)	1	Network Switch	4 RJ45 ports and 1 fiber optic port with ST contact	SG590611-001-01
SA(x)	1	Scanning Assembly	w/heater	SG590559-000-01
	2		w/o heater	SG590560-000-01
UPS(x)	1	Uninterrupt-able Power Supply	Standard	SG590621-001-01
UT(x)	1	Utility Outlet	DIN (Schuko)	SG590266-001-01
	2		British Standard	SG590266-001-01
	3		U.S. Standard	SG590266-001-01
	4		French Standard	SG590266-001-01

Revision	Description	Date	Drawn by:	Checked by:	Approved
E	Camera M1144-L replaces M1113. FI opt included in NS opt.	2014.11.11	V.N.		
D	Tibbo removed. New layout.	2013.11.15	K.J.		
C	Drawing number for connection diagram changed	2013.05.17	A.S.		
B	Configuration key changed	2011.03.22	A.S.		
A	Configuration key changed	2010.10.19	A.S.		

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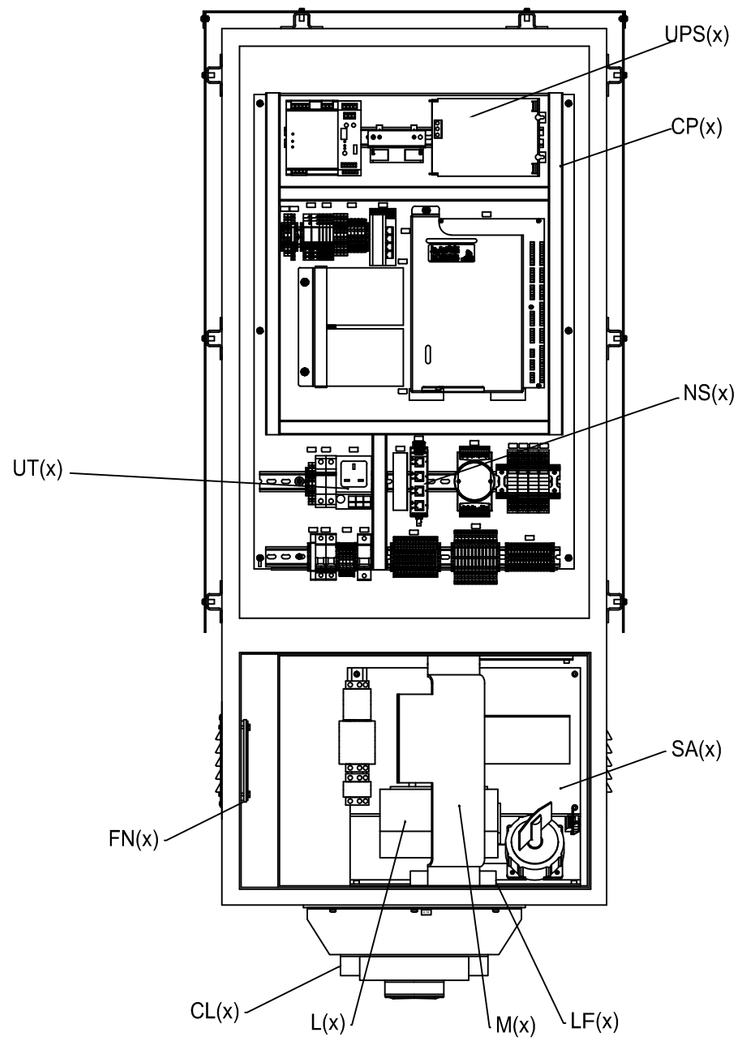
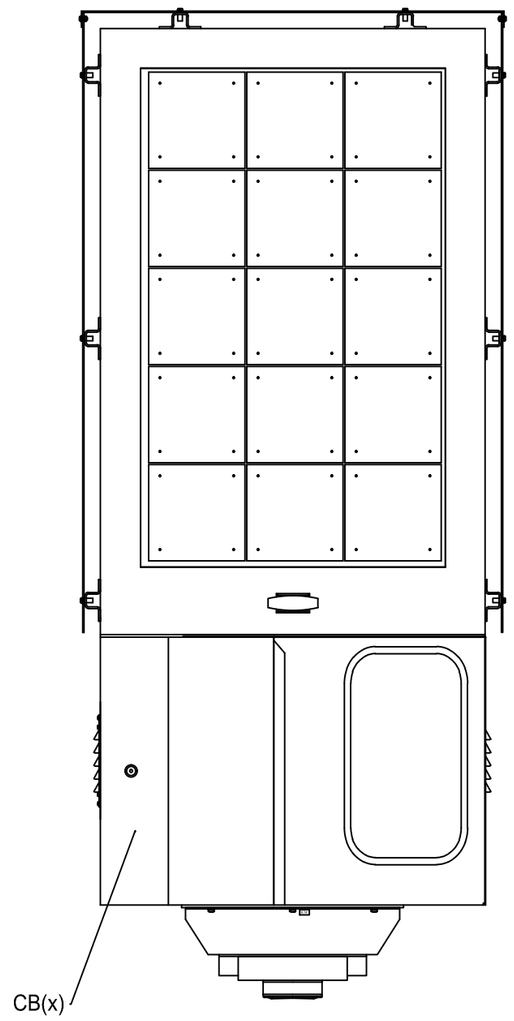
Surface Coating | Weight

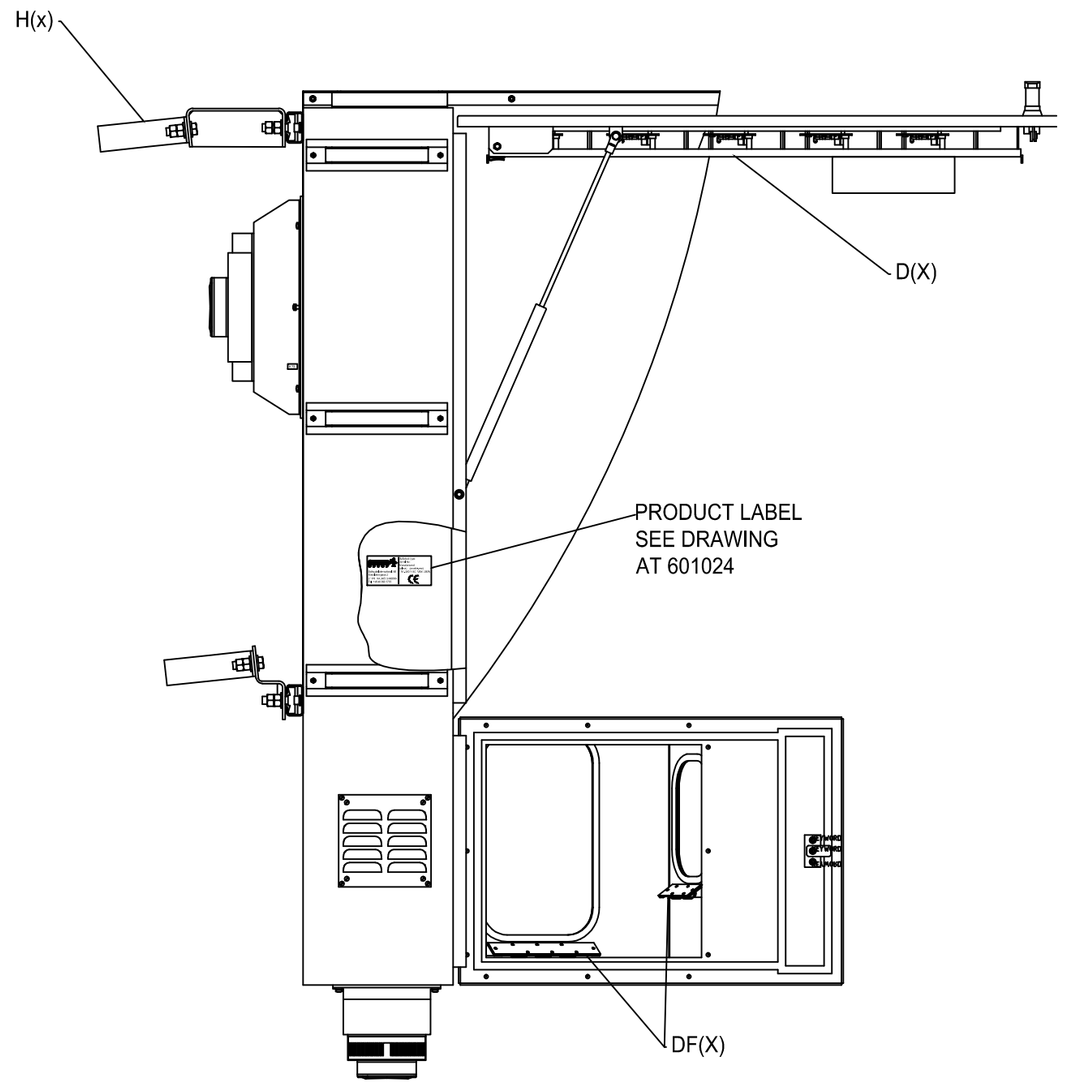
T2 DOCKING GUIDANCE SYSTEM
COMPONENT PLACEMENT AND CONFIGURATION KEY
SEE SG590621-001-01 FOR CONNECTION DIAGRAM

Drawn by:	Date drawn:	Checked by:		
G.O.	2009.03.01			
App. by:	Date approved:	Project No.:		

Drawing No.	Rev.	Sheet	Scale
SG590982-001-01	E	1 of 1	







CONFIGURATION KEY

USE THE SYSTEM'S CONFIGURATION CODE
TO DETERMINE THE SYSTEM ASSEMBLY.

Designation	Code (x)	Item	Type	Drawing No.
T3-				
CB(x)	1	Cabinet	Standard	SG590360-001-01
	2		Adapted for Supercooler	SG590361-001-01
CL(x)	1	Cooling	Supercooler Assembly	SG590553-001-01
CP(x)	1	Control & Power	Standard	SG590621-001-01
D(x)	1	Display	3-9, w/heater	SG590472-000-01
	2		3-9 w/o heater	SG590503-000-01
	3		3-15, w/heater	SG590473-000-01
	4		3-15, w/o heater	SG590504-000-01
	1	Display V2.0	3-9, w/heater	SG590620-001-01
	2		3-9 w/o heater	SG590620-001-01
	3		3-15, w/heater	SG590620-001-01
	4		3-15, w/o heater	SG590620-001-01
DF(x)	1	Defroster Assembly	Heaters for scanning windows	SG590486-000-01
FN(x)	1	Vent. Assembly	Standard	SG590479-001-01
H(x)	1	Install. Hardware	For Ø 139,7 Pole	SG590483-001-01
L(x)	1	Laser Range Finder	LE90-3AT/98	SG590114-000-01
LF(x)	1	Laser Cooling Fan	Standard	SG590405-000-01
M(x)	1	Calibration Mirror	Standard	SG590487-001-01
NS(x)	1	Network Switch	4 RJ45 ports and 1 fiber optic port with ST contact	SG590611-001-01
SA(x)	1	Scan. Assm.	w/heater	SG590559-000-01
	2		w/o heater	SG590560-000-01
UPS(x)	1	Uninterrupt-able Power Supply	Standard	SG590621-001-01
UT(x)	1	Utility Outlet	DIN (Schuko)	SG590266-001-01
	2		British Standard	SG590266-001-01
	3		U.S. Standard	SG590266-001-01
	4		French Standard	SG590266-001-01

Revision	Description	Date	Drawn by:	Checked by:	Approved
E	Camera option removed. FI option is now included in NS.	2014.11.11	V.N.		
D	Tibbo removed. New layout.	2013.11.15	K.J.		
C	Drawing number for connection diagram changed	2013.05.17	A.S.		
B	Configuration key changed and updated	2011.11.17	A.S.		
A	Configuration key changed and updated	2011.03.22	A.S.		

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Surface Coating | Weight

T3 DOCKING GUIDANCE SYSTEM
COMPONENT PLACEMENT AND CONFIGURATION KET
SEE DRAWING SG590621-004-01 FOR CONNECTION DIAGRAM

Drawn by:	Date drawn:	Checked by:		
G.O.	2009-03-05			
App. by:	Date approved:	Project No.:	Drawing No.	Rev. / Sheet / Scale
			SG590984-001-01	E / 1 of 1 /

Check in to the future

How many aircraft can your airport handle today?
Can this number be increased without adverse effects on the airport's safety level?
It is a known fact that traffic volume will rise in the foreseeable future. More movements will demand monitoring of the entire airport. Requirements will be sharpened and the development of an integrated system controlling not only ground movements but also air traffic close to the airport is of the highest interest.
The International Civil Aviation Organization (ICAO) already describes A-SMGCS, Advanced Surface Movement Guidance and Control System, as the answer to the future modern airport need to control the entire airport space in one superior system.
To a larger extent than today's systems, A-SMGCS will rely on automated processes to give both pilots and traffic controllers exact information about positions and directions. Safegate Group delivers complete A-SMGCS solutions already, as well as all vital parts relating to it.
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SAFEGATE GROUP

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