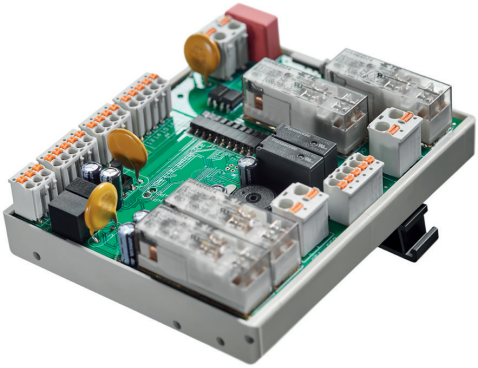
Kübler

Manual

PSU01 (Position Supervisor Unit incl. Ants LES01)

english



SIL3 Functional Safety EN 81

CANopen LIFT © cia

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1. Abbreviations used

Ants LES01	Ants LES (Linear Encoder Safe, Generation 1)
PSU01	Position Supervisor Unit
UCM	Unintended Car Movement

2. Symbols used / Warnings and safety information

DANGER	This symbol, together with the signal word „Danger“, indicates immediately imminent threat to life and health of persons. The non-compliance with this warning will lead to death or severe injuries.
WARNING	This symbol, together with the signal word „Warning“, indicates a potential danger to life and health of persons. The non-compliance with this warning may lead to death or severe injuries.
CAUTION	This symbol, together with the signal word „Caution“, indicates a potential danger to life and health of persons. The non-compliance with this warning may lead to slight or minor injuries.
NOTICE	Useful hints and recommendations, as well as information, for efficient and trouble-free operation.

3. Parametrization

With the PSU01 you have 2 possibilities for parametrization. There is the PSU01 manufacturer specific CANopen parametrization possibility and the parametrization via CANopen Lift control (417). In either way a common knowledge of CANopen is required to use this document.

3.1 CANopen 417 Parametrization

The parametrization of the Ants Safe Evaluation Unit (PSU01) can be done according to CANopen 417 (Version 2.2) as shown below. We highly recommend reading the guideline for the installation process thoroughly.
Note 1 PSU01 does neither support blind floors nor adjustment of already learned stop positions.

3.1.1 Installation Process

The table 1 shows a step by step guide to parameterize PSU01 according to CANopen 417 with some steps in between, which are not implemented in the protocol yet. Those steps must be installed according to the manufacturer specific protocol (for more details see table 2).
The table shows the required steps in the necessary order. Every step is described with function, mode, action part and a description of what is happening. Default values are also presented, as some steps are optional. In PSU01 Feedback is indicated if on success a restart is done, or if the state of the PSU01 is changed. The detailed state of the PSU01 can be read from object 2006 and respectively pre-commissioning mode (PM) configuration mode (CM) and teaching mode (TM).
In case of error while parametrizing, e.g. a step cannot be completed, we recommend reading the manufacturer section, to check the state of the PSU01 in more detail. We added a chapter frequently asked questions, where you also may find the solution to your problem.
It is possible at any time to read the current state of PSU01 by reading object 2006.

Table 1: Recommended Installation Process

Step	Step name	M	Action	Description	Default	PSU01 Feedback
0	(optional) factory reset	CM	after reading 63E2 index 2 send control word back	PSU01 resets to factory settings.	-	restart
1	(optional) set Length Door zone	CM	write value to Object 63E8 index 1 or 2	The value of the door length can be set by writing the value to index 1 or index 2. One value will be set for both leveling and re-leveling door zone sizes. On success the PSU01 saves and restarts to same state.	4 cm	restart

2	(optional) define inspection limit Mode	CM	not specified in 417	Optional: Set inspection limit mode according to manufacturer specific programming, e.g. upper and lower inspection limit, only upper or lower inspection limit, no inspection limit, but wiring of inspection mode, no inspection limit and no wiring. Please see table 2 Value for inspection limit offset is fixed at 1200 mm offset from end limit position.	both inspection end limits are activated	restart
3	(optional) set speed	CM	not specified in 417	Optional: Set nominal speed according to manufacturer specific programming. Please see table 2.	5 m/s	restart
4	set upper end limit switch	CM	write “SETL” (4C544553h) to object 63EA index 02	Enter normal mode via PSU safety control object 63E2 index 06.	-	state = 61450
5	set lower end limit switch	CM	write “SETL” (4C544553h) to object 63EA index 01	Sets the lower end-limit of the elevator to the current position by writing “SETL” to the object.	-	restart, state = 61454
6	set retardation limit switches	CM	not specified in 417	Set retardation limits according to manufacturer specific programming. Please see table 2.	-	restart, state = 61458
7	define stops	CM	write “SETF” (46544553h) to object 63ED index 01-200 *	Sets a stop to the current position of the elevator. You may set stops in any order, PSU01 will sort them automatically according to the value of the position **.	-	
8	revisit stops	TM	revisit stops	To confirm stops each defined stop has to be revisited at least once more and stand still for at least 1 sec. (by stopping there) and the elevator must not stop on any other undefined stop. PSU01 changes to state 61474 as soon as one stop is revisited.	-	state = 61474
9	onfirm stops	TM	enter normal mode via PSU safety control object 63E2 index 06	Tells PSU01 to finalize the definition of all stops. On success PSU01 changes to normal operation. For further information please see chapter table 2.	-	restart, state = 61483

Note 2 * Index number is irrelevant, PSU01 sets a new stop and sorts them according the absolute position.
Note 3 ** You will not be able to adjust floor positions, so be sure that the position is final.
Note 4 You have to do step 4 and 5 (set upper and end limit switches) within 15 min, otherwise already learned positions of limit switches will be lost.
Note 5 You have to do steps 7 to 9 (define and confirm steps) within 8h, otherwise already learned positions will be lost.

4. CANopen Manufacturer Specific Parameterization

4.1 Overview

The parametrization of the Ants-Save Evaluation Unit (PSU01) is done by writing commands to SDO 2006h and reading its state back from the very same SDO. The PSU01 follows the state diagram (see figure 1), where the number in the header of each state represents the reference number of the respective state, which can be red from 2006h.

The “Command(...)” markings refer to possible commands which can be issued in the respective states. The Commands are simply numbers written to the SDO 2006h. E.g. reading 61443 from that SDO means you are in the state: “set length of door zone”. There you may store a value as 1000 + length of door zone (e.g. 1200 for a 200 mm door zone length), which sets the door zone respectively and reboots the PSU01 or setting the SDO to 9 whiles being in the very same state, triggers the command “SetUpperLimit”. For a detailed description of the possible commands, please see Table 2.

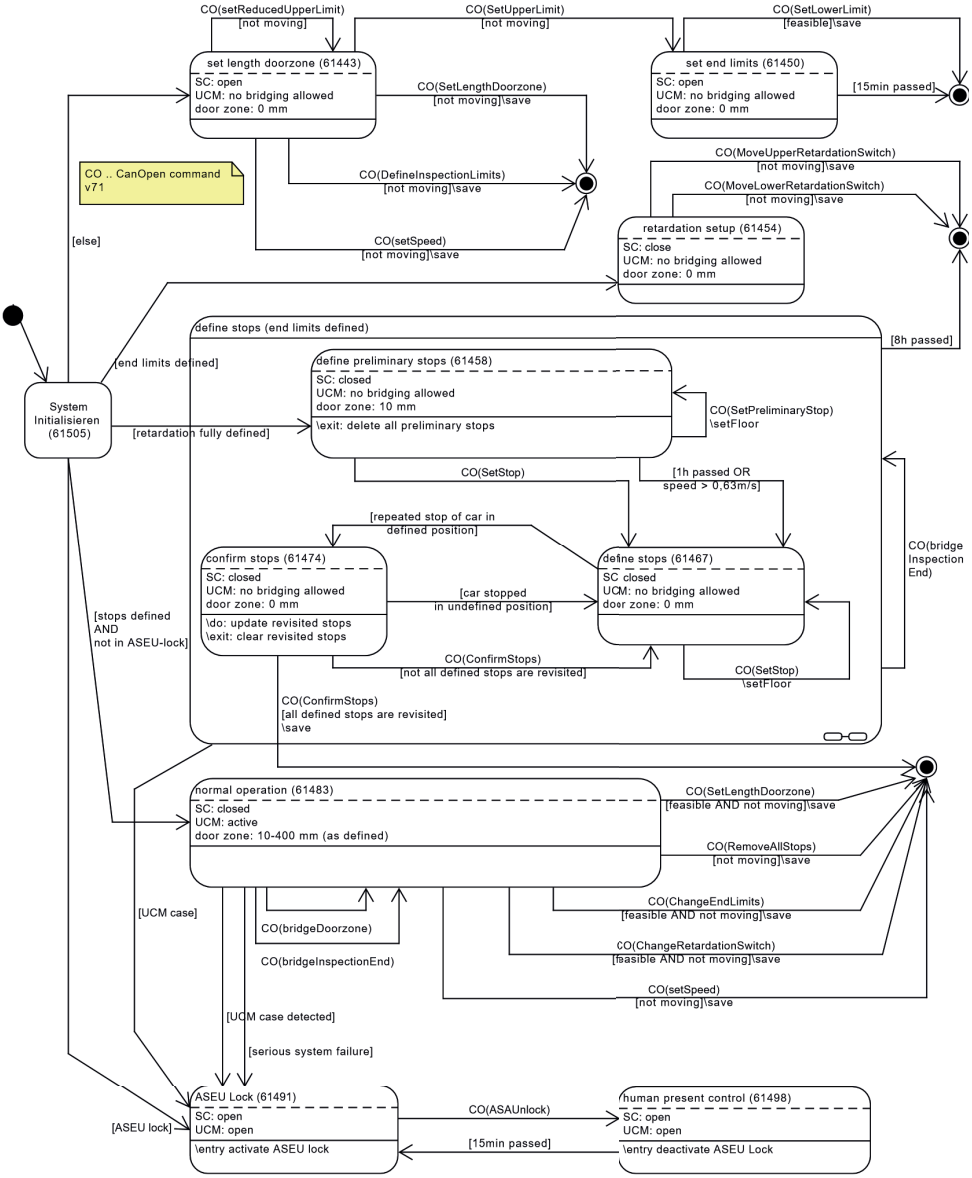
After each persistent writing of parameters indicated as “save”, the PSU01 restarts and performs consistency checks and is available for further parametrization after that. A Startup confirmation can be red from SDO 2004h. The PSU01 parameters can be red back from the Object 2005h and its sub indices. It may take however up to 500ms for that object to be up to date. For immediate feedback, we recommend reading out SDO 2006h (current state) and SDO 2004h (errors and confirmations). For a detailed description of all relevant SDOs we refer to table 3.

4.2 Door Bridging

Door bridging can be done by the command “bridge door zone”. It is possible to enquire door bridging on running-in, re-leveling and fast start for a specific stop. Door bridging on running-in can only be enquired outside desired stop.
Door bridging while re-leveling is only possible with 0.3 m/s speed, when faster UCM is detected. The elevator must deactivate door bridging if not desired anymore. Otherwise UCM is detected. Fast start is only possible within 2 cm from flush zone possible. It is automatically deactivated on the car leaving the zone.

4.3 State Diagramm

Figure 1: PSU01 State Diagram



4.4 Possible Commands to Program PSU01

Table 2: Possible commands to program PSU01 using SDO 2006h

Command Name	Number	Description
FactoryReset (not in Figure)	1	This command can be issued at any time and resets the PSU01 to factory values. On success PSU01 resets values and restarts to state “set length door zone”.
Restart System (not in Figure)	2	This command can be issued at any state, except “human present control” and restarts the PSU01 and associated safety timers. This can be usefully to explicitly perform a diagnosis and relays check in full knowledge of the elevator control. Otherwise these checks are performed after a predefined time delay automatically and the switching safety circuits might confuse the elevator control.
SetPreliminaryStop	4	Sets a stop preliminarily at the current position. This means a 10 mm door zone is provided whilst in that state. This can be used by elevator controls in teaching mode. It can be skipped by programming a final stop using the SetStop-command. On success PSU01 sends the respective confirmation (which can be red from 2004h) and beeps and stays in the state. Note, that this state is offered as help during teaching of the elevator control unit. If the car moves faster than 0,63 m/s or after one hour, that state is automatically left, and all preliminary stops are removed.
SetStop	5	Sets a final stop at the current position. This can only be undone through a power cycle which will delete all stops so far. So be sure that this position is final. On success PSU01 sends the respective confirmation (which can be red from 2004h) and beeps and switches to the respective state. Note that all preliminary stops are deleted once exiting state “define preliminary stops” and no door zones (via relays) are provided anymore.
ConfirmStops	6	Tells PSU01 to finalize the definition of all stops. This can only be achieved, after each defined stop (form command 5) is revisited at least once more (by stopping there) and the elevator did not stop on any other undefined stop. On failure it writes the respective error (which can be red from 2004h) and beeps and stays in the state. On success PSU01 saves the stops permanently and restarts to state “normal operation”.
PSU01Unlock	7	Resets the PSU01 to normal mode once in state “PSU01 lock”. This must be confirmed additionally with a power cycle of the PSU01, to assure the presence of a person. On success PSU01 restarts to state “normal operation” otherwise it stays in the locked mode.

SetLowerLimit	8	Sets the lower end-limit of the elevator to the current position. On success PSU01 saves and restarts to state “define preliminary stops”. On failure it writes the respective error (which can be red from 2004h) and beeps and stays in the state.
SetUpperLimit	9	Sets the upper end-limit of the elevator to the current position. On success PSU01 moves to state “set end limits”.
RemoveAllStops	10	This command removes all programmed stops und resets the PSU01 to state “define preliminary stops”, conserving end-limit positions only.
BridgeInspectionEnd	12	This command tells PSU01 to close the circuit, so the control will be able to move the car outside the inspection end limit. That is only possible during the states „define-stops“ and „normal operation“ and only if the car is only max. 10 cm beyond the inspection end limit switch.
SetReducedUpperLimit	19	Sets a temporary upper end limit switch exactly 1500 [mm] above the momentarily position (for elevators with reduced shaft-head) e.g. if the car is on position 10000 [mm] the upper end limit will be temporarily saved on position 11500 [mm]. The position is saved permanently if the car is stopped at the same position or above within 15 minutes.
DefineInspectionLimits	30-34	Tells PSU01 by sending the command: 30: no inspection end limits, 31: only upper inspection end limit, 32: only lower inspection end limit, 33: upper and lower inspection end limits 34: no upper nor lower inspection end limit but wiring of inspection is done. Those commands are only possible when in state „set length doorzone“ (SetLengthDoorzone).
SetLengthDoorzone	1010-1400	Sets the length of the door zone to the written value minus 1000. On success PSU01 saves and restarts to state “set length door zone”. The zone is centered around each stop.
ChangeEndLimits	9000-11000	Moves the end limit switches towards each other. The number l=9000−10000 moves the lower end limit switch by l −9000 [mm] upwards (eg. l =9034 means: 34 mm upwards). The number u=10000−11000 moves the upper end limit switch by u −10000 [mm] downwards (e.g. u =10117 means: 117 mm downwards). See also table 3, 2005h index 3-4). The switches cannot be moved over an existing stop. On success the system restarts with the newly defined end limit switches.
MoveRetardationSwitch upwards	13000-13999	Moves the retardation switches towards each other. The number l=13000−13999 moves the lower retardation switch by l −13000 [cm] upwards (e.g. l =13176 means: 176 cm upwards). The switches can only be moved within end limit switch positions. On success the system restarts with the newly defined switches. Retardation switches must be set in retardation setup state and can be moved in normal operation.

MoveRetardationSwitch downwards	14000-14999	Moves the retardation switches towards each other. The number u=14000−14999 moves the upper retardation switch by u −14000 [cm] downwards (e.g. u =14077 means: 77 cm downwards). The switches can only be moved within end limit switch positions. On success the system restarts with the newly defined switches. Retardation switches must be set in retardation setup state and can be moved in normal operation.
*setSpeed		Please see table relevant Manufacturer SDOs 2005 index 18

4.5 Relevant Manufacturer SDOs

Table 3: Relevant Manufacturer SDOs and their meaning

SDO	Description
2004h	Cyclic error and confirmation array (see table 4).
2004h index 0	Object length set to 8. Do not alter.
2004h index 1	Reading: number of items in cyclic buffer (max: 1000). Resets the internal current error/ confirmation readout number to the most recent. Writing: sets the internal current error/confirmation readout number to this value. Valid range [1-1000].
2004h index 2	Reading: returns the information of the internal current error/confirmation readout number whereas millions count the number itself, thus e.g.: 12000050 means 12th item in cyclic buffer with error number 50. Successive reading of that index reduces the internal current readout counter by one enabling iterative readout of all information's. Writing: no effect.
2004h index 3	Reading: returns the time since power on in seconds when the current error/confirmation happened. Writing: no effect.
2004h index 4-5	Reading: returns the condition 1-2 and 3-4 respectively of the current error/confirmation (see table 2). Writing: no effect.
2004h index 6	Reading: overall count of errors/confirmations since power on. Writing: no effect.
2004h index 7-8	Reserved. Do not alter.
2005h	Read Only (except index 6). Returns the parameterization of the PSU01. Position values are always (raw) absolute without correction of the position value offered in SDO 2003h. The latter only affects the position value gained from SDO 6383h and its corresponding TPDO 263 (COB-ID 396). Note this SDO might have delayed values up to 500ms.
2005h index 0	Length of array.
2005h index 1	Release CRC of the software.
2005h index 2	Length of door zone in mm.
2005h index 3	Position of upper end limit.

2005h index 4	Position of lower end limit.
2005h index 5	Number of stops.
2005h index 6	Writing: indexes the stop required [1 – saved stops]. Reading: returns the position of the stop indexed by the previous write operation. Note: stops are in chronological order.
2005h index 7	0... UCM module not installed, 1. UCM module installed.
2005h index 8	PSU01 status bits: bit 0: reserved bit 1: reserved, bit 2: upper end limit, bit 3: lower end limit, bit 4: UCM, bit 5: door zone, bit 6: flush zone bit 7-11: reserved, bit 12: door bridging active bit 13: in retardation switch, bit 14: in inspection end limit, bit 15: overspeed detected, others: reserved.
2005h index 9	Current time in seconds since power up.
2005h index 11-14	Position of first 4 stops. (development only)
2005h index 15	Writing: Bit: 0 door bridging pre-leveling Bit 1: door bridging re-leveling Bit 2: door bridging fast start Bit 3-15:number of stops e.g. 9 = 1001b demands door bridging for pre-leveling for stop number 1
2005h index 16	Reading: returns position of upper retardation switch
2005h index 17	Reading: returns position of lower retardation switch
2005h index 18	Writing: Sets the nominal speed of the elevator in mm/s. Possible parameter range is 100−5000. This can be done any time. On success PSU01 restarts.
2006h	Reading: current system state number of PSU01 (see figure 1) Writing: sending respective command to PSU01 (see table 2). Commands not applicable in the current state are ignored.

4.6 Error Handling and Confirmation Codes

SDO 2004h offers a cyclic buffer for accessing the last errors / confirmations (i.e. events). PSU01 keeps track of an internal readout number of that buffer. Most recent events have higher numbers. The information corresponding to that readout number can be accessed by reading from 2004h index 2-5. The internal readout number can be set by writing to 2004h index 1. Reading from that very same index has the side effect of setting the internal readout index to its most recent event. Repeated reading from 2004h index 2 has the side effect of decrementing the internal readout number to offer simple successive event extraction in LIFO semantics. We recommend reading once index 1 to gain the maximum count within the buffer and resetting to most recent event. After that cyclic read index 2 to gain the respective error / confirmation code (and after that corresponding information's stored in index 3-5 if required) until the stack is red. For a detailed description of all relevant SDOs we refer to table 3.

Table 4: Error and confirmation codes

Error/Confirmation Number	Description
1	An UCM-case was detected.
3-7, 17, 18	Internal error. The device is defect.
10-11, 16	Internal error. Please restart PSU01. If the error reoccurs, the device is defect.
12	Timeout: no new position. Please check if ASE is connected correctly and restart PSU01.
13	24 VDC not correct.
50	Lower end-limit not below upper end-limit
51	Maximum number of possible stops reached. Error condition 1-2 indicate the maximum number of stops.
52	Elevator is moving.
53	Stop position not possible (e.g. overlapping with another stop or outside elevator limit)
54	Confirmation of all stops not possible, because not all stops were revisited. Error condition 1-2 indicates one position which had not been revisited.
55	Timeout within the state machine model. Error condition 1-2 tells which timeout: 1. from “set end limits”, 2. from “define stops”.
70	A (preliminary) stop has been written. Confirmation condition 1-2 indicate the position which has been written.
100	PSU01 restarted.
101	PSU01 restarts because it performs its periodic relays test.
102	PSU01 resets to factory settings.
2xx	Errors reported from Ants Safe Encoder (Ants LES01).

5. FAQ

1. PSU01 remains in state 61505 System initialize This indicates that PSU01 is not getting any positions. Please check if the Ants Safe Encoder is proper installed (straight) and the tape is correctly inserted.

2. PSU01 is peeping 5 times while Ants is moving. This indicates that the tape is inserted upside down. Please be sure to mount the tape with the topside up.

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