

APPLICATION NOTE	AN-Lift2-0011v100EN
Unlocking Safety Gear function	

Inverter type	FRENIC-Lift (LM2A)
Software version	0400 (or later)
Required options	Speed feedback option
Related documentation	INR-SI47-1909a-E
Author	Carlos Arjona
Use	Public, web
Date	01/12/2021
Version	1.0.0
Languages	English


1. Introduction

In case that lift speed reaches a value 1.2 times rated speed, there is a mechanic device (safety gear) which mechanically locks the lift car to the guides. By means of this device, in case of a car uncontrolled movement, lift car is safely locked in order to avoid crashes.

In the other hand, it is quite difficult to unlock car from a safety gear lock. In some cases a hoist is needed.

The aim of “Unlocking Safety Gear” function is to electrically unlock the car from a safety gear lock. Inverter will generate current pulses in order to force an abrupt reaction of the motor. The abrupt reaction of the motor will unlock the safety gear.

As torque cannot be correctly monitored in case of open loop, this function is only available in case of closed loop. With a wrong setting at the control mode, this function will never be executed.

 CAUTION	<p>This function cannot be used unlimited times. If after 2 or 3 trials car is not unlocked, unlock the car by means of mechanic devices (i.e. hoist).</p> <p>An unlimited use of this function can lead an inverter failure.</p>
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2. Setting

Before to start this function, it is needed to set a list of parameters. With them, the sequence will be adjusted to the necessities of the installation. The parameters related to this function are described in Table 1.

Table 1. Parameters related to Unlocking Safety Gear function.

Function	Name	Factory setting	Units	Range/symbol	Comments
E01 to E08, E98 and E99	Command assignment [X1] to [X8], [FWD] and [REV]	Depends of terminal	-	118 (1118) <i>ULSG</i>	Function activation by digital input. Unlocking safety gear function will start giving RUN command by <i>FWD</i> or <i>REV</i> .
L101	Operation	0	-	0: Disable 1: Enable	Function activation by parameter. Unlocking safety gear function will start giving RUN command by <i>FWD</i> or <i>REV</i> .
L102	Level	140	%	10 to 200	This value is a percentage of the inverter rated current.
L103	Pulse time	0.5	s	0.1 to 2.0	Time that inverter will apply the current of the value set on L102.
L104	Rest time	0.2	s	0.1 to 1.0	Time between two consecutive pulses.
L105	Pulse	3	Times	1 to 5	Number of pulses that inverter will generate after L101 is enabled and RUN command is given.
L106	Speed limit	10% (of F03)	%	0 to 20	Speed limit to avoid car crash after unlocking. Percentage of F03.

3. Operation

This chapter is divided in two examples, depending if the function is activated by parameter L101 or by a digital input. To set a digital input for this function does not cancel the activation by parameter.

In both cases, direction of RUN command (FWD or REV) is important. Safety gear can lock the car against up or down direction movement. Depending on the mechanical installation, motor and/or inverter's setting up or down direction can mean FWD or REV (or vice versa). Even these premises, FWD or REV command will be always decided by end user, as they might know which the appropriate direction to unlock the car is.

On the other hand, keep in mind that down direction unlocking will be difficult, taking in account that ropes cannot move the car down.

First example of operation is shown on Figure 1. In below case, function is activated by means of setting L101 = 1. For details of the sequence for the activation of this parameter refer to the following chapter.

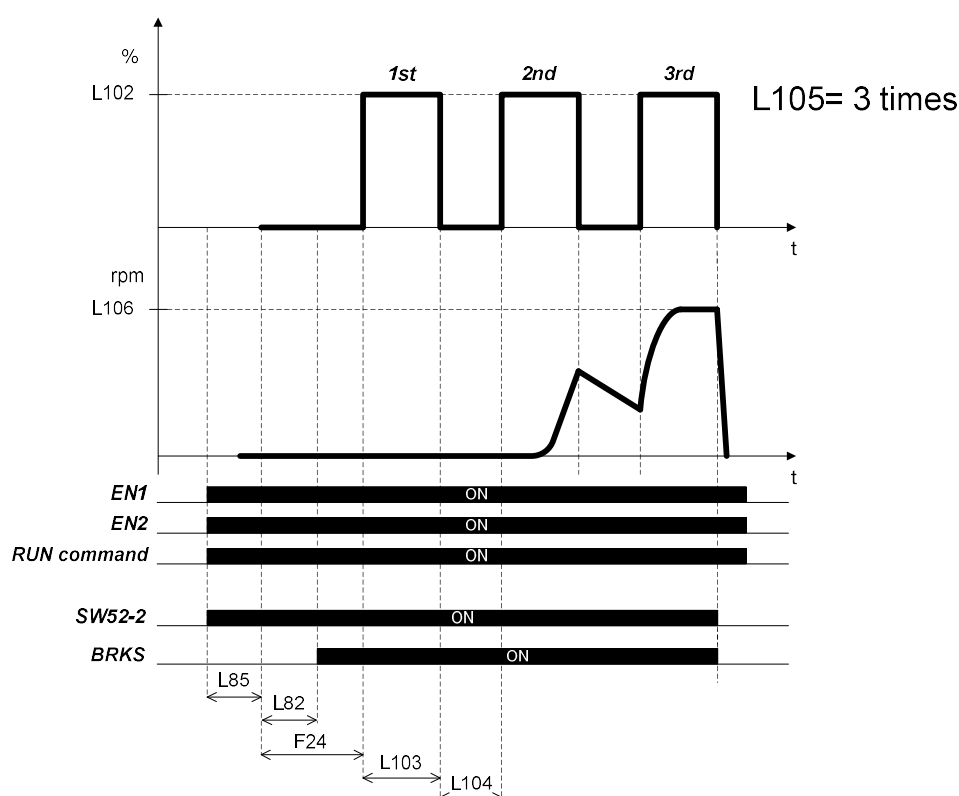


Figure 1. Unlocking safety gear function diagram when L101=1

As it is shown on Figure 1, in order to start “Unlocking Safety Gear” function, RUN command and *EN1&EN2* signals have to be activated. As soon as these signals are activated an automatic process starts. After main contactors are closed and brake is released (F24 time is expired), inverter generates a current pulses in order to force an abrupt reaction of the motor. In this example, inverter generates three pulses because of the setting on parameter L105. Each pulse will have duration of the time set on L103 parameter. Between current peaks, inverter will wait L104 time.

This function is performing a torque control by means of a speed limit. Speed is limited by means of parameter L106. In this way, inverter prevents a fast car speed movement as soon as car is unlocked.

Even reaching L106 limit, operation will continue until finishing the cycle. It will be always customer decision to stop the cycle by removing RUN command. As this function is as well dependant on *EN1&EN2* terminal, in case of emergency, function will be interrupted.

A second example of operation is shown in Figure 2. In this case, operation is activated by means of X1 (E01=118). In this procedure, setting of L101 is kept to value 0.

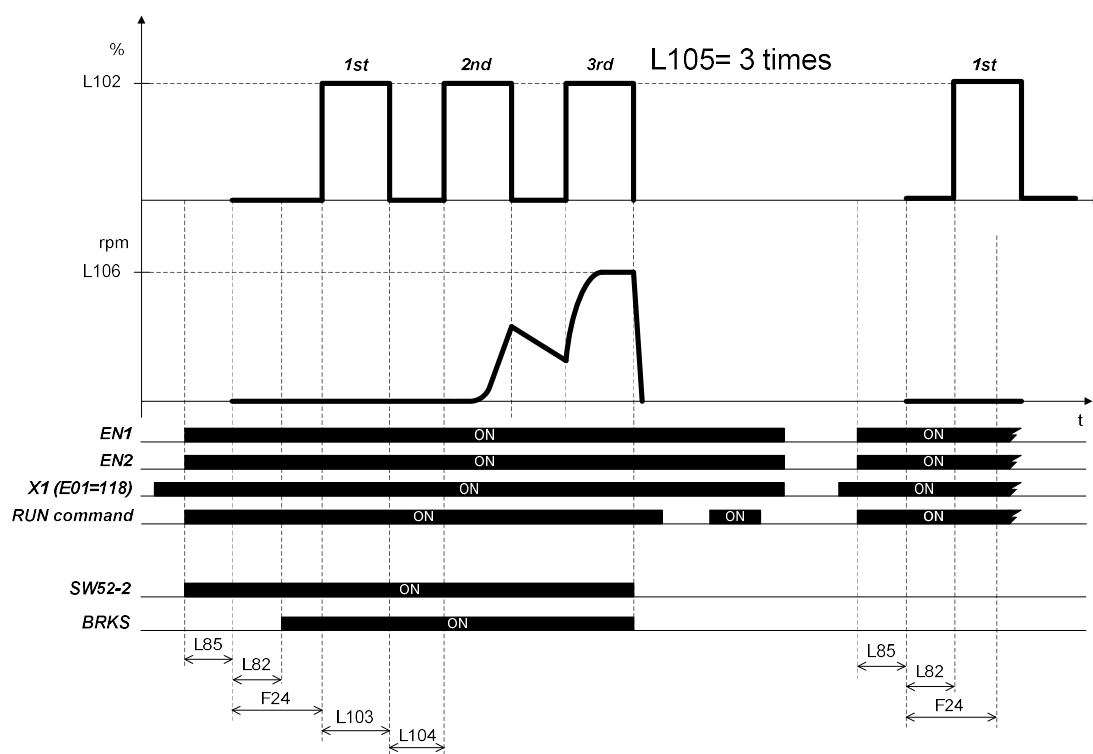


Figure 2. Unlocking safety gear function diagram by means of digital input (L101=0)

In case of Figure 2, operation is started by digital input *X1* (function *ULSG*). Operation cannot start while *EN* & *RUN* command signals are not active. Even *EN* & *RUN* command signals are coming later, operation starts without giving any error.

As it is shown in Figure 2, operation will not be permitted until *X1* is not removed.

RUN command is understood as *FWD* or *REV*. So inverter will apply a torque in the direction of *RUN* command given. In other words, if car is locked while moving in *REV* direction, torque may be applied in *FWD* direction in order to unlock safety gear. In this case, please active *FWD* as a *RUN* command. In the opposite case, if car is locked while moving in *FWD* direction, apply a torque in *REV* direction.

If *RUN* command is given by the keypad or by means of communications, this signal will go automatically to OFF as soon as pulses sequence is finished. If *RUN* command is given by terminals, *RUN* command has to be kept until the end of the operation. If *RUN* command is removed before finishing, sequence will start from the beginning next *RUN* command.

4. Sequence for activation by parameter

In order to activate “Unlocking Safety Gear” function by means of parameters (L101), process shown in Figure 3 has to be followed. Once the function has finished, the value at parameter L101 is turned back to 0.

PRG>2>1>L101	
ULSG Op. Sel.	0

0 ~ 1	
Def.	0
Store	0



PRG>2>1>L101	
ULSG Op. Sel.	1

0 ~ 1	
Def.	0
Store	0



PRG>2>1>L101	
ULSG Op. Sel.	1

START BY RUN COMMAND	

RUN command ON

PRG>2>1>L101	
ULSG Op. Sel.	1

⌘ EXECUTING...	

Function is ended

PRG>2>1>L101	
ULSG Op. Sel.	1

CLOSE BY RUN COMMAND OFF	

RUN command OFF

PRG>2>1	
L1: Lift	
02	ULSG Level
03	ULSG Duty
04	ULSG Interval
05	ULSG Pulse
06	ULSG Spd lim.

Use arrows on the keypad to select between Disable or Enable

Press FUNC/DATA key to validate value selected on previous step.

RUN command can be given by means of keypad buttons, terminals or communications.

Turn the RUN command OFF. In case of keypad or communications operation, RUN command will be automatically turned OFF after finishing process.

Figure 3. Sequence for Unlocking Safety Gear function activation by parameter L101.

5. Operation via communications

Some customers may operate the inverter by means of communications. ULSG function is available by means of communications as well.

In case of using input terminals function (*ULSG*), input terminal will be activated virtually by means of Operation Command (S06). In this case, operation by physical input terminals will not be available for safety.

In case of activating the function by means of parameter L101, a special frame (format 21) has to be used. In Figure 4 this frame is shown, and note that it is same format frame than pole tuning and auto tuning.

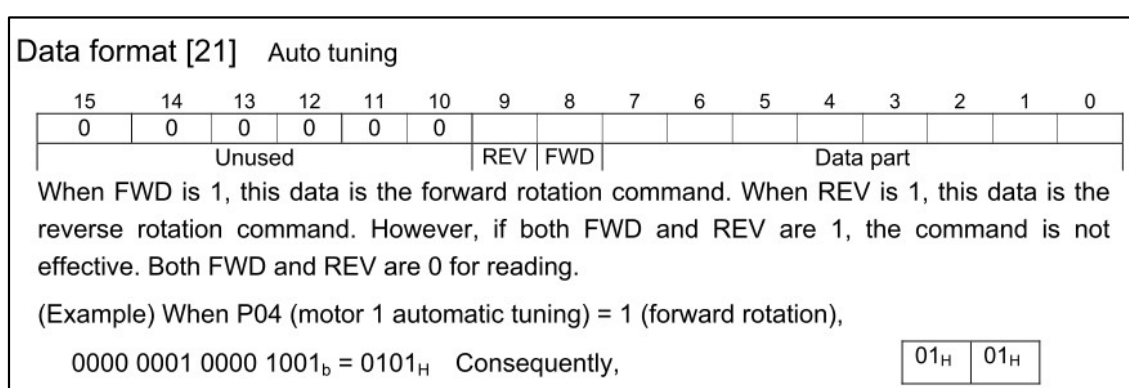


Figure 4. Data format of L101 parameter.

6. Conclusion

By means of “Unlocking Safety Gear” function, end user will be able to release safety gear lock without necessity of a hoist.

7. Document history

Version	Changes applied	Date	Written	Checked	Approved
1.0.0	First version	01/12/2021	C. Arjona	J. Alonso	J. Català