Fuji Electric

APPLICATION NOTE	AN-Lift-0019v116EN
Brake checking signal for UCM compliance (EN81-1 + A3)	

Inverter type	FRENIC-Lift
Software version	Software version 1750/1751 and later
Required options	Not needed
Related documentation	INR-SI47-1038b-E_FRENIC Lift_Instruction Manual.pdf INR-SI47-1068b-E_Lift_Reference Manual.pdf INR-SI47-1092b-E_Lift_Multifunction Keypad panel Instruction Manual.pdf
Author	Jaume Alonso
Use	Public, web
Date	10/04/2012
Version	1.1.6
Languages	English

1. Introduction.

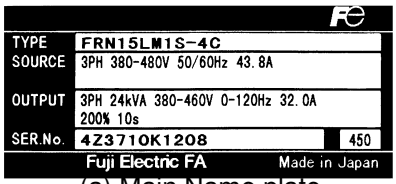
From January 2012 lift standard EN 81-1:1998+A3:2009 has to be applied. A3 addendum is related to Unintended Car Movement (UCM).

In case of electrical traction lifts, one possible solution to fulfill the new A3 addendum of the EN81-1 standard, is to use the two brakes certified according to this standard and additionally monitor their status individually, by using one limit switch for each brake that detects the actual brake status (released or applied). If the detected brake status is not correct the operation of the elevator must be prevented.

On this application note, it is explained how to program and use a specific function for brake monitoring signal (BRKE1, BRKE2).

2. How to recognize inverters which UCM function available.

Basically, all standard family of FRENIC-Lift inverter (European version), with the software number mentioned on the description of the document (or later versions), will have this function available. There are two name plates on the inverter where inverter type is written. Both name plates are shown in figure 1.



(a) Main Name plate

(b) Sub Name plate

Figure 1. Inverter name plate.

The position where each name plate is placed is shown on figures 2, 3 and 4.

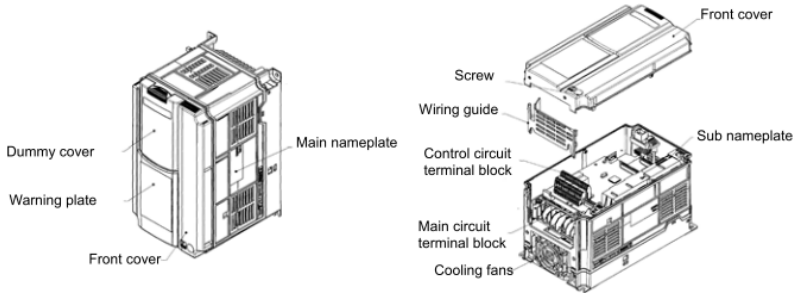


Figure 2. Name plate position in FRN4.0LM1S-4□□ and FRN2.2LM1S-7□□.

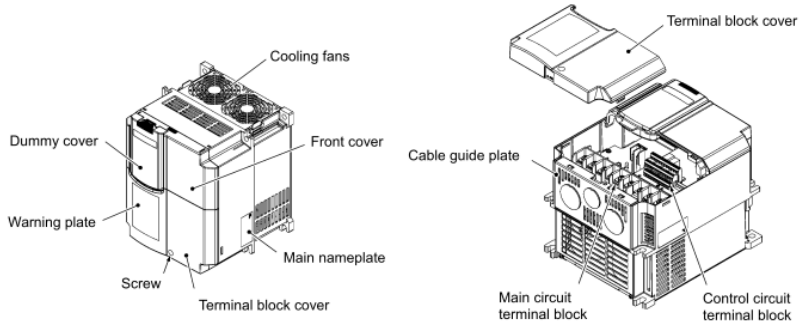


Figure 3. Name plate position in FRN5.5LM1S-□□□~ FRN22LM1S-□□□.

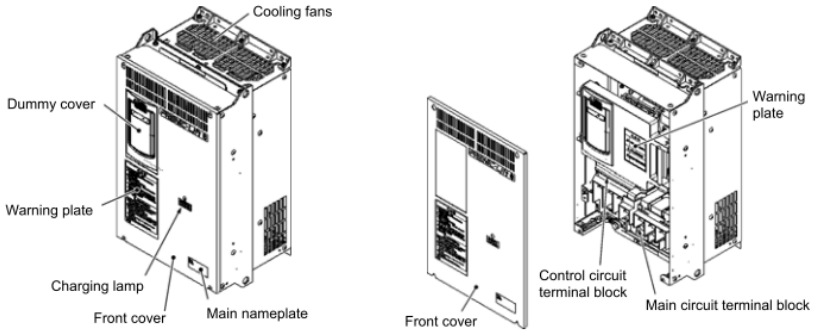
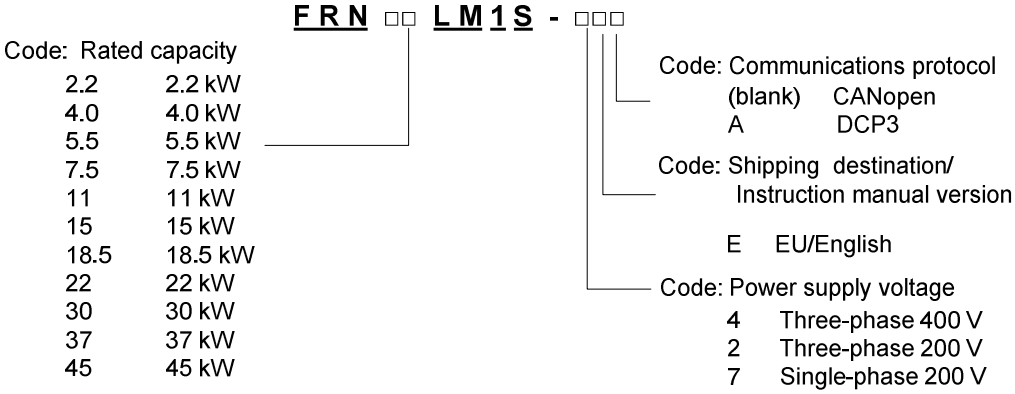
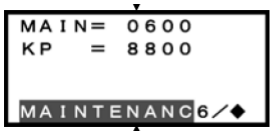


Figure 4. Name plate position in FRN30LM1S-4□□~ FRN45LM1S-4□□.

So, according to this, FRENIC-Lift types which include this function can be recognized by the below type code.



Software version can be checked on Menu 5 (MAINTENANCE) on page 6/7 as it is shown on figure 5.



Software version of the inverter (MAIN)

Figure 5. Page 6 of Menu 5 (MAINTENANCE) on TP-G1-ELS.

Software version depends on the communications protocol. On the table 1, it is shown from which software version this function is available depending on the inverter type.

Table 1. Software version depending on inverter type.

Software version	Inverter type
1750	-□E
1751	-□EA

As mentioned before, software can be updated, so this number might be different. In this case, software version will have a higher number. For numbers showed in table 1 and higher numbers this function will be included as described on this manual.

3. FRENIC-Lift basic diagram

On the figure 6, it is shown a basic diagram of the inverter.

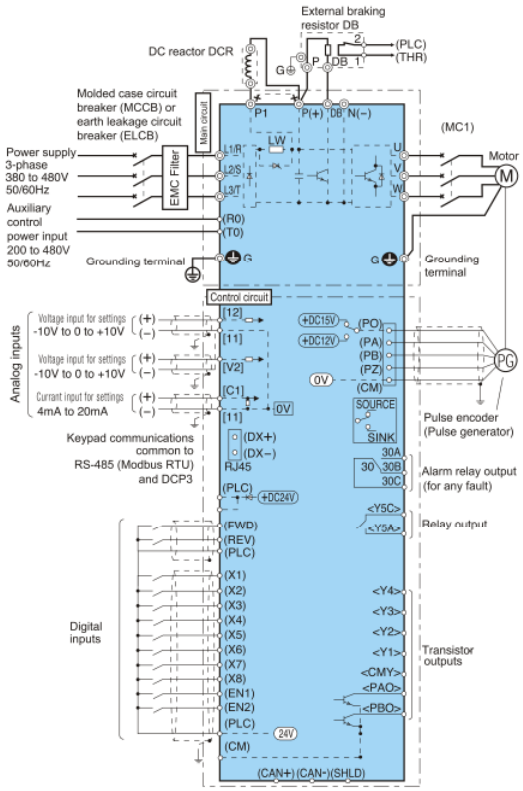


Figure 6. Basic diagram of the inverter.

4. Description of the function and parameters.

The parameters and functions related are shown in table 2:

Table 2. Parameters and functions related to UCM function.

Parameter	Name	Setting range	Symbol	Unit	Default setting
E01 to E08, E98 and E99	Command Assignment [X1] to [X8], [FWD] and [REV]	0 to 112 (1000 to 1112) 111(1111): Check Brake Control 1	***BRKE1***	-	-
		112(1112): Check Brake Control 2	***BRKE2***	-	-
E20 to E24, and E27	Signal Assignment to [Y1] to [Y4], [Y5A/C], [30A/B/C]	0 to 116 (1000 to 1116) 57(1057): Brake Control	***BRKS***	-	-
H95	bbE alarm reset	0 to 255	-	-	0
H96	Check brake control select	0 to 1	-	-	0
L84	Brake control (Brake check time)	0.00 to 10.00 s	-	s	0.00

This function is not active in factory default settings. It means that this function has to be activated. The parameter used to activate this function is H96. The functionality of H96 is explained below.

a) When H96 = 0

Even BRKE1 and BRKE2 functions are correctly programmed and wired, monitoring function for UCM is not active.
BRKE function can be used. For additional information, please, refer to FRENIC-Lift Reference Manual.

b) When H96 = 1

Brake monitoring operation is performed by BRKE1 and BRKE2 according to UCM. When BRKE1 or BRKE2 status mismatches, timer of brake check time (L84) starts. bbE alarm is generated when BRKE1 or BRKE2 function remain in a mismatching condition during brake check time (L84). During lift travel, alarm is not issued, alarm is generated as soon as BRKS function is OFF and L84 timer passes. For additional details, please refer to chapter “5. Function behavior”.

5. Function behaviour.

On the following figures, each possible scenario using BRKE1 and BRKE2 functions are explained.

a) Brake feedback is abnormal at starting

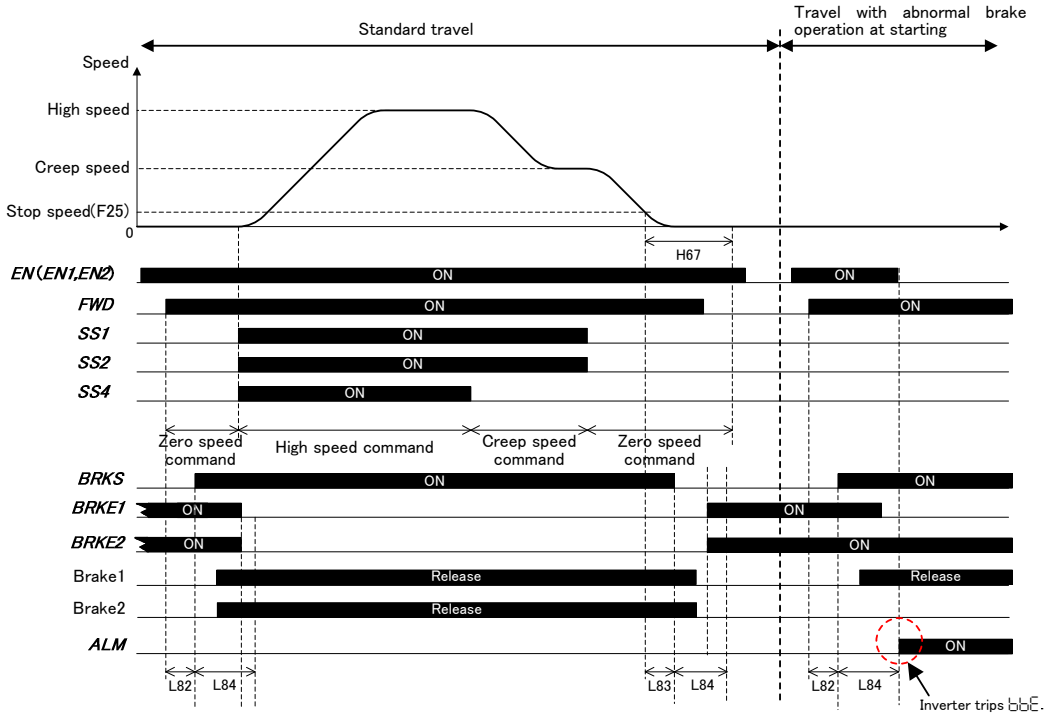


Figure 7. bbE alarm at starting.

b) Brake feedback is abnormal at stopping

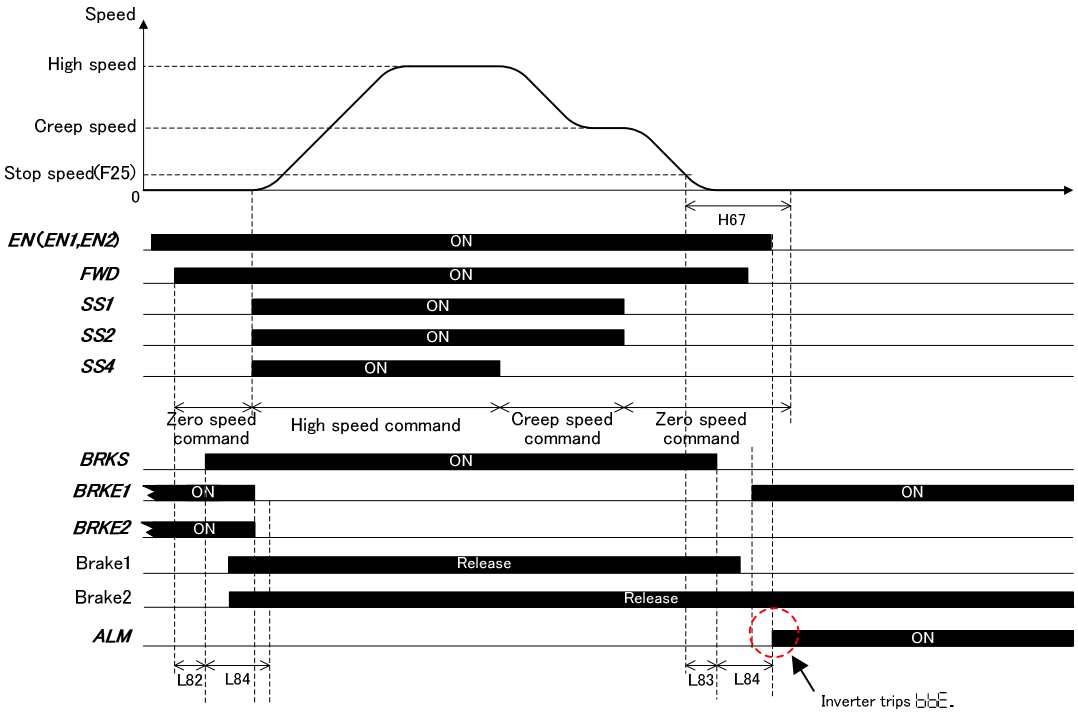


Figure 8. bbE alarm at stopping.

c) Brake feedback is abnormal during travel

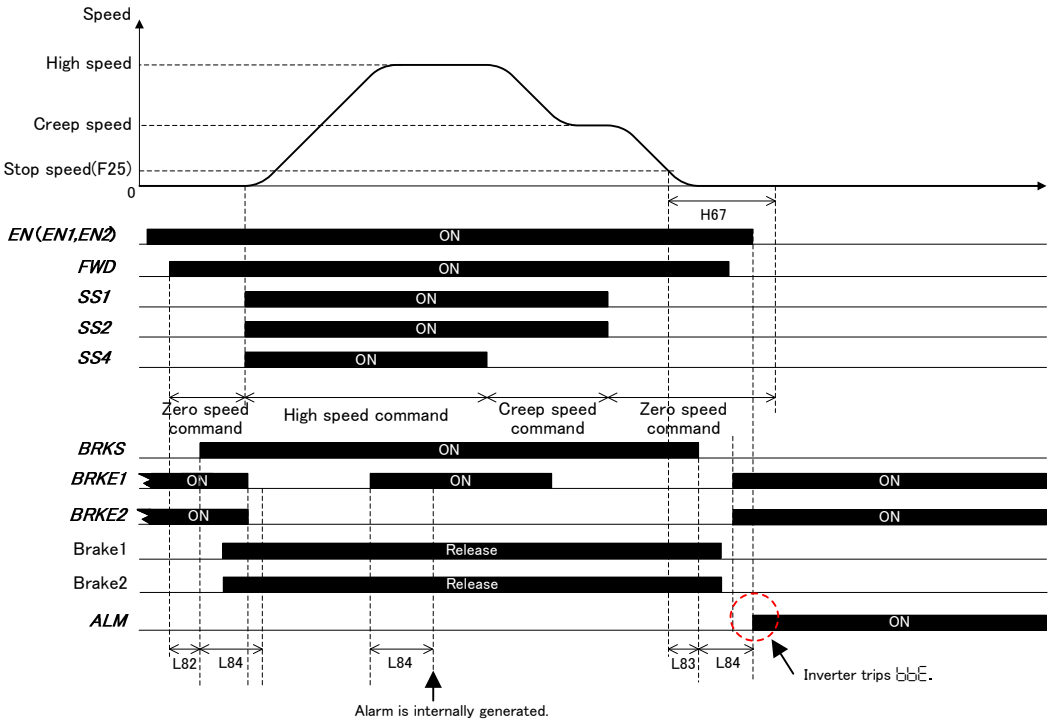


Figure 9. bbE alarm at stopping because BRKE1 signal is missing.

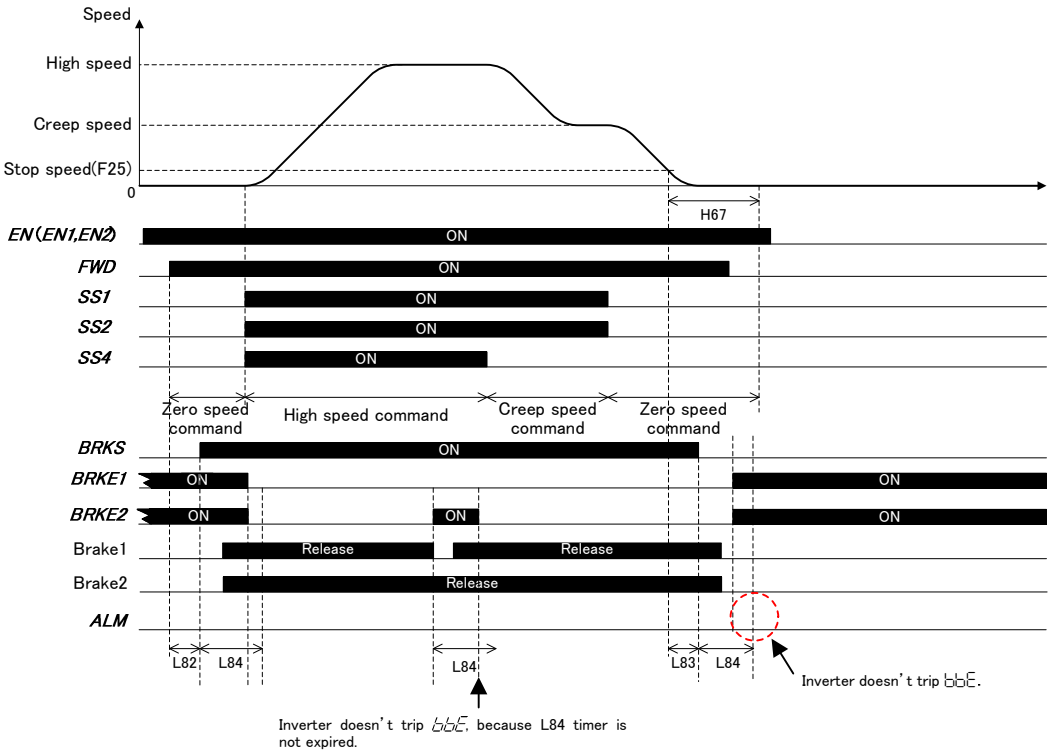


Figure 10. bbE alarm does not appear at stopping even BRKE2 signal was missing.

d) Brake feedback is abnormal when motor is stopped

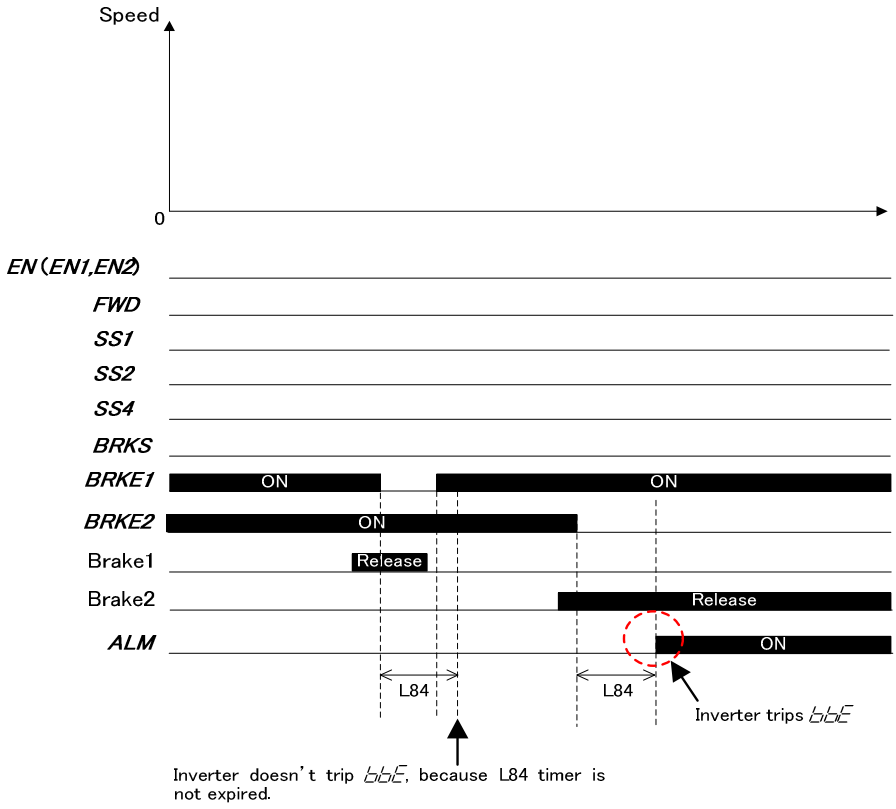


Figure 11. bbE alarm at motor stopped.

6. Example of wiring and setting.

Figure 12 shows an example of connection. On this example, there is a motor with two brakes (brake 1 and brake 2). Each brake has a normally closed switch; it means that when brake is closed, switch is closed. In this case terminal X6 is programmed with function BRKE1 and X7 is programmed with function BRKE2.

Additionally, a relay output (Y5A/C) is programmed to control the brake with the function BRKS.

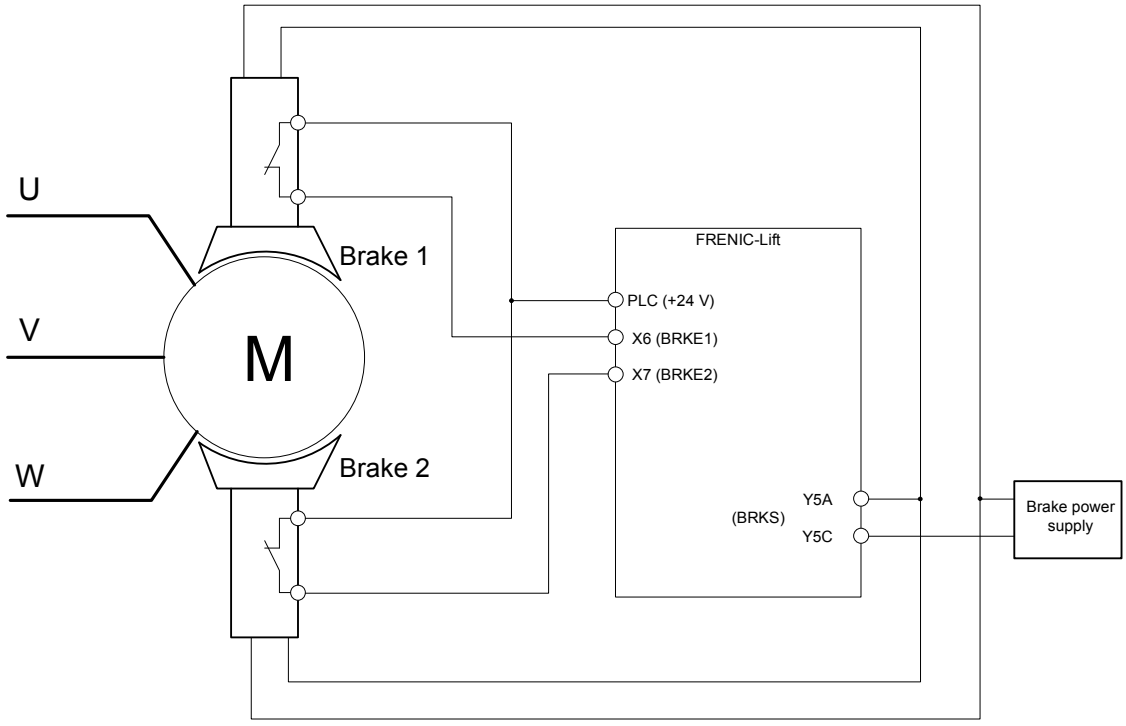


Figure 12. Example of monitoring and control of the brake done by the inverter.

According to figure 12, related parameters have to be set as described in table 3.

Table 3. Parameters setting according to figure 12 example.

Parameter	Name	Setting
E06	Terminal [X6]	111
E07	Terminal [X7]	112
H96	Check brake control select	1
L84	Brake control (Brake check time)	1.00 s

7. Alarm reset and alarm messages related.

As explained before, there is a specific alarm for this function. Also, on the existing alarm Er6, a SUB code is added. In table 4, additional information for each alarm is shown.

Table 4. Alarm and SUB codes.

Alarm message displayed	SUB code	Description	Possible causes
Er6	14	H96 is set to 1 but some settings related are missing.	Check that BRKE1 function is correctly set. Check that BRKE2 function is correctly set. Check that BRKS function is correctly set.
bbE	11	BRKE1 signal is abnormal.	Check status of micro switch in brake 1. Check status of brake 1 and its power supply. Check status of inverter input/output related to brake 1. Check L84 time.
	12	BRKE2 signal is abnormal.	Check status of micro switch in brake 2. Check status of brake 2 and its power supply. Check status of inverter input/output related to brake 2. Check L84 time.

Because bbE alarm blocks the inverter according to UCM, it cannot be reset following the standard procedure. Additionally bbE alarm cannot be auto reset by the inverter (H04, H05), neither can be reset by switching OFF and switching ON inverter's power supply.

In order to reset the alarm, following procedure has to be done:

1. Set parameter H95 to 111. Cursor can be moved by SHIFT button.
2. Push FUNC/DATA button. H95 reverts to 0 automatically.
3. Push PRG button until main screen is shown. In main screen bbE alarm is shown.
4. Push RESET button.

bbE can only be reset after the cause of the problem has been fixed.

8. Function test procedure.

According to the standard, each time that a new lift is tested, this function has to be also tested. On the following charts, it is explained how to test the function. In order to make the chart more understandable, as a reference it is taken the example shown on figure 12. In case of using a NO contactor, test has to be done removing the cable from the terminal.

TEST OF BRKE1 FUNCTION

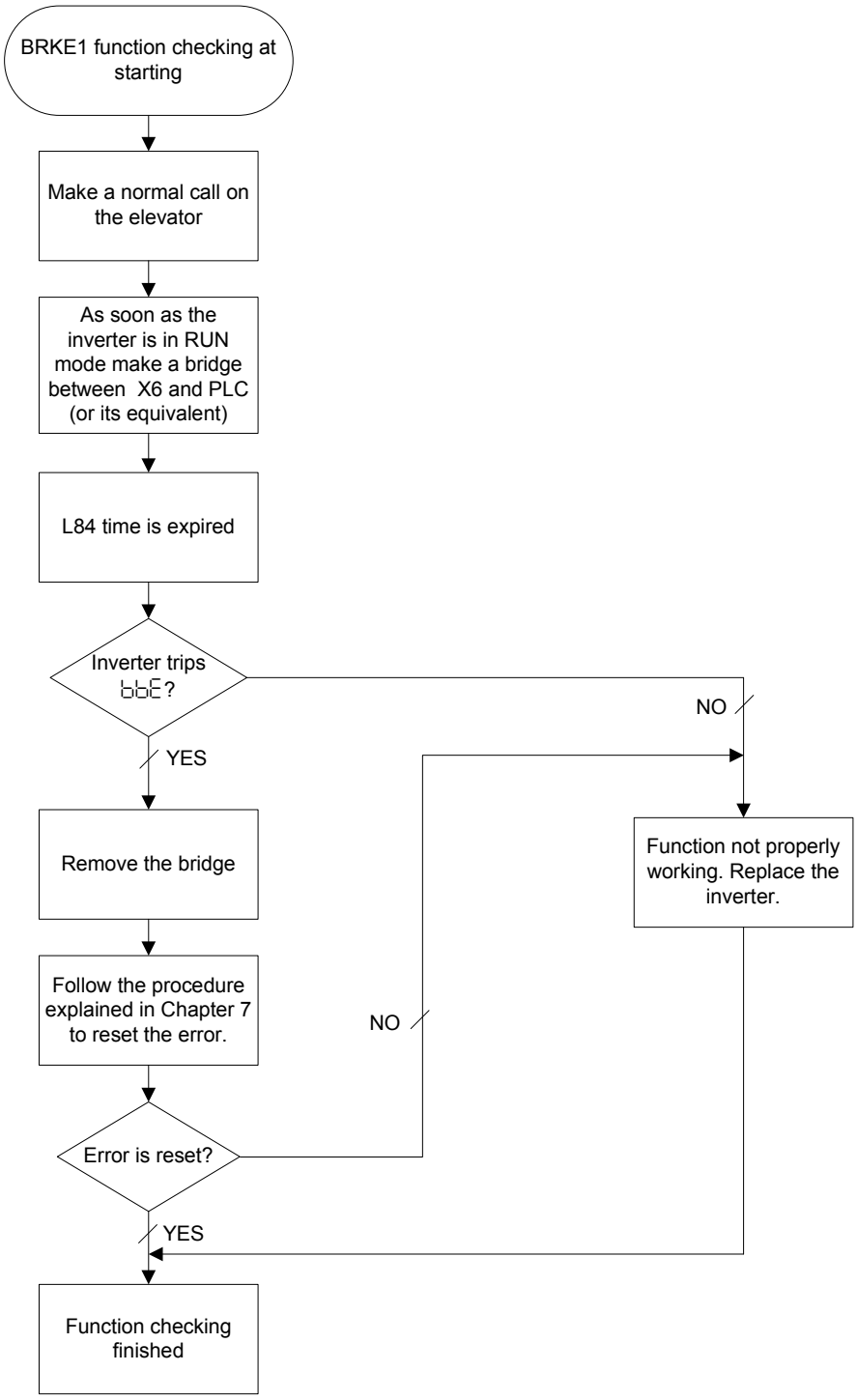


Figure 13. Test of BRKE1 function at starting.

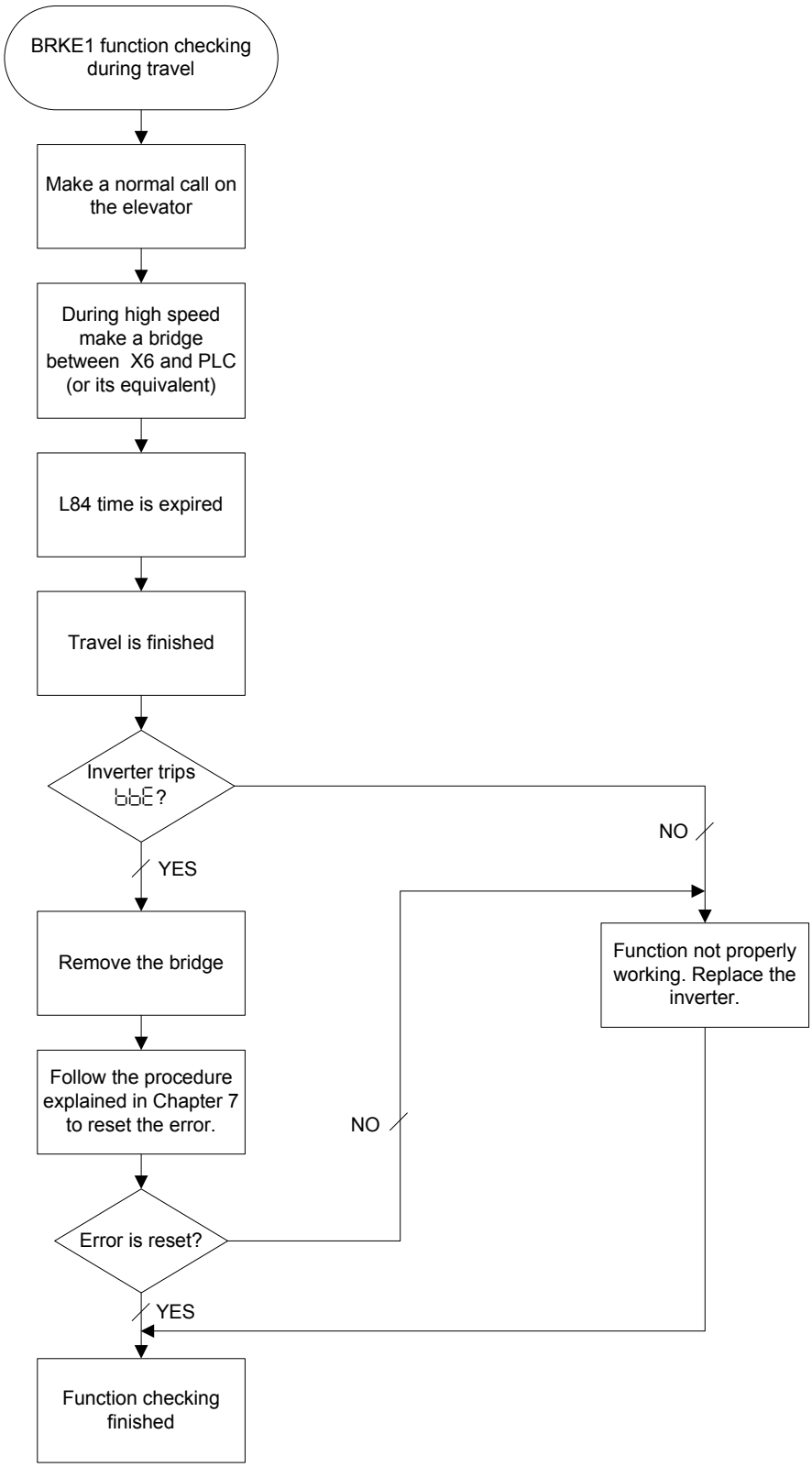


Figure 14. Test of BRKE1 function during normal travel.

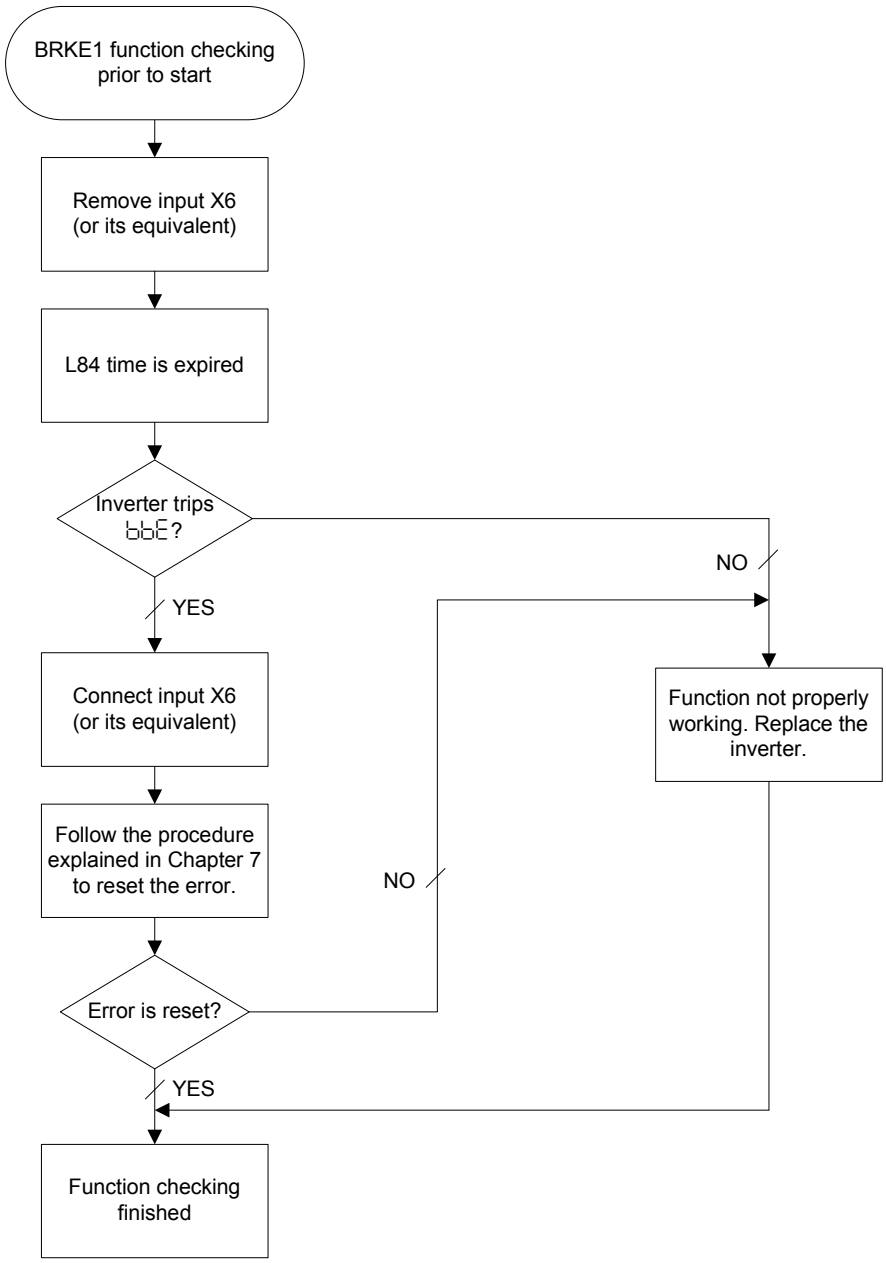


Figure 15. Test of BRKE1 function prior to start.

TEST OF BRKE2 FUNCTION

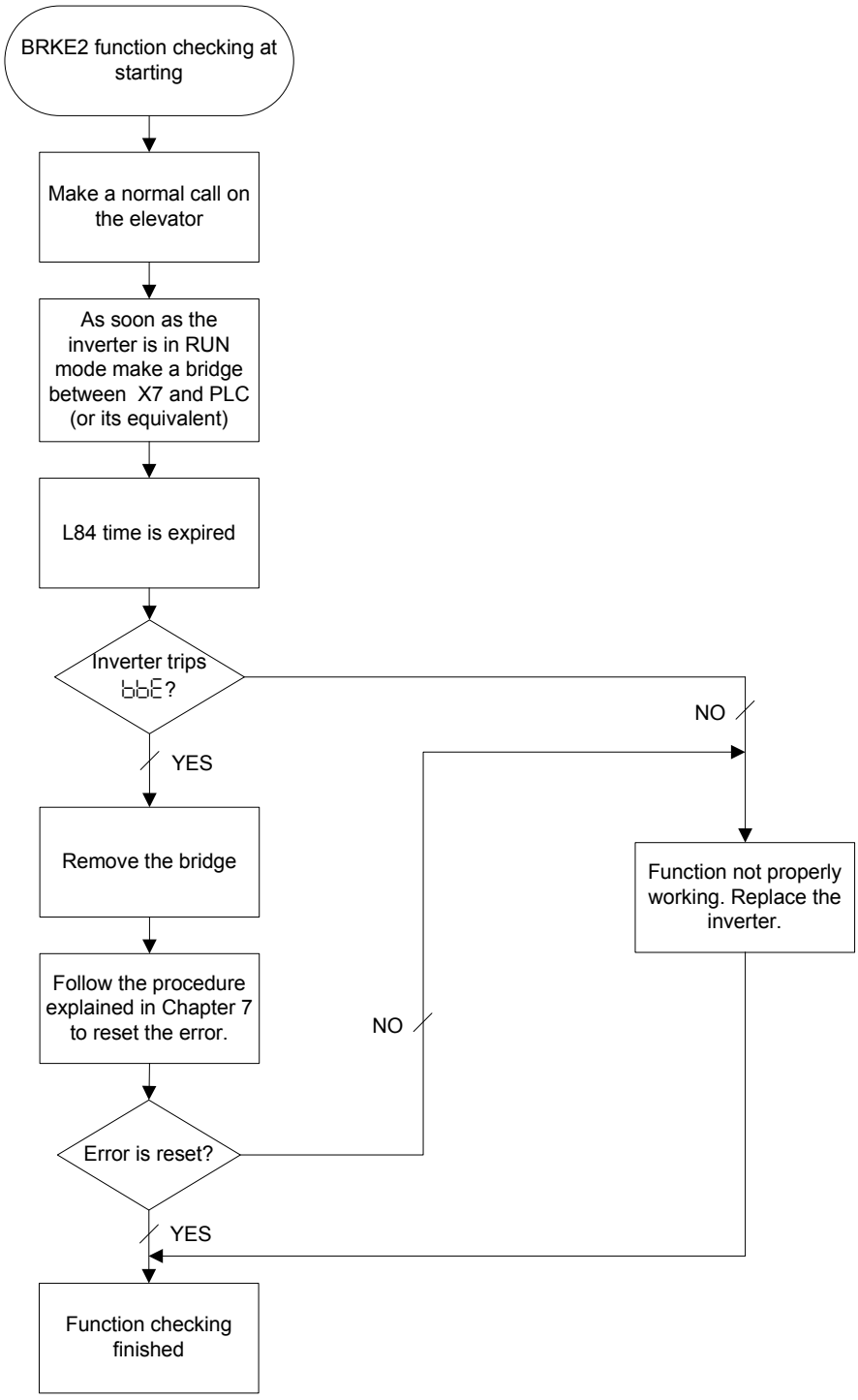


Figure 16. Test of BRKE2 function at starting.

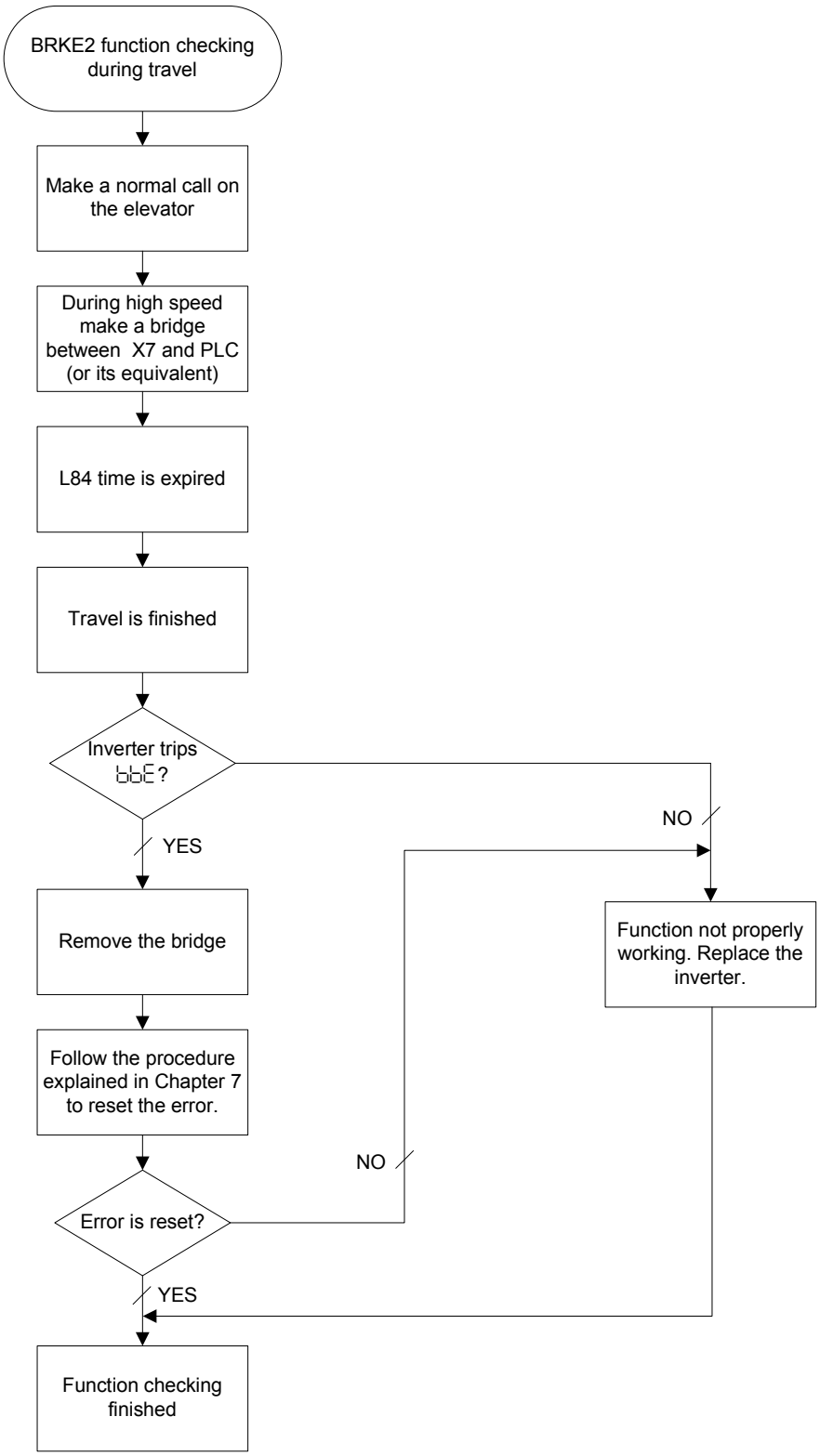


Figure 17. Test of BRKE2 function during normal travel.

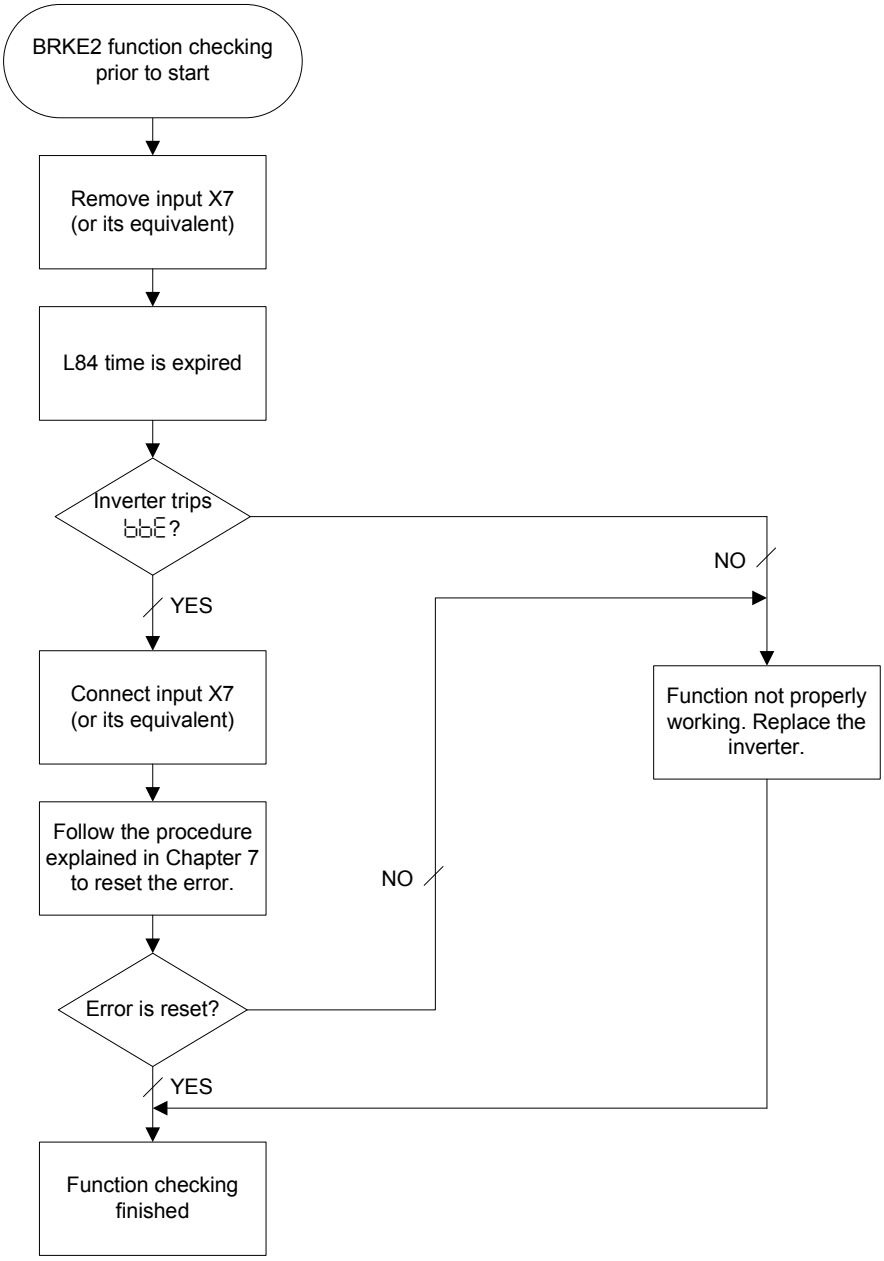


Figure 18. Test of BRKE2 function prior to start.

9. Conclusion.

On this application note it is explained:

- How to use correctly FRENIC-Lift function related to UCM (EN81-1 + A3).
- How to recognize inverters which are provided with this function.
- How to test this function by the end user.

With this function, and using a motor with brake certified according to EN81-1 + A3, FRENIC-Lift can be used in an elevator in order to fulfil the requirements related to UCM.

In case of lifts with pre opening doors and/or re-levelling function, additional functional safety functions might be needed which will be implemented installing additional components.

10. Document history.

Version	Changes applied	Date	Written	Checked	Approved
1.0.0	First version	05/01/2012	J. Alonso		
1.0.1	Some small changes	05/01/2012	J. Alonso	D. Bedford	D. Bedford
1.1.0	Chapter 2, 3 and 8 are added according to IMQ recommendations.	10/01/2012	J. Alonso	D. Bedford	
1.1.1	Last sentence on conclusions modified.	16/01/2012	J. Alonso	D. Bedford	
1.1.2	Sub codes have been changed.	24/01/2012	J. Alonso	D. Bedford	
1.1.3	Figure 14 and figure 16 are modified.	03/02/2012	J. Alonso	D. Bedford	M. Belloli
1.1.4	Small text errors corrected.	10/04/2012	J. Alonso		
1.1.5	EN1 and EN2 signals are modified on figures from 7 to 11. Fuji Electric logo updated.	27/08/2012	J. Alonso	J. Català	J. Català
1.1.6	Figures 15 and 18 are added according to Liftinstituut recommendations. Small text corrections.	02/01/2013	J. Alonso	J. Català	W. Visser