Inspection and Test Report

for Kollmorgen Lift Control MPK400/MPK411

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Initial Electrical Test of the Lift Control System by the Lift Installer
in accordance with BS7671:2008

Please note:
The manufacturing process of the Kollmorgen control system includes a test procedure, which is carried out in accordance with VDE0660 Part 600 and incorporates elements of the initial electrical test as laid out in DIN VDE 0100 Part 600. The initial electrical test must only be carried out by an authorised and competent person as defined in BS7671:2008. Every control system must be tested on site throughout the installation and on completion. This inspection and test report is intended to help with the documentation of test results. Please complete and tick as required.

Lift Details

Date of the Test: ____________

Site Reference: ____________ Controller No.: ________ Year of Manufacture: ____________

Customer Lift Ref. No.: ____________ Groups only: Lift No. ____ of ____

Lift Company: ____________ Name of Tester: ____________

1 General (Record of Nominal Data)

Automatic Disconnection of the Supply in acc. with 4.3 ☑ = i.O.

				Trip Characteristic						
1.0	Earthing System ☐ TNC ☐ TNC-S ☐ IT	☐ TT	Trip Characteristic					Fuse Ratings	i.O. = ☑
	Overcurrent Protective Device / RCD / Insulation Mon. Device	Legende	NH	Z	B	C	gl	Nominal / Trip	
1.1	Nominal / trip current: Power circuit	F1A-1C	☐	☐	☐	☐	☐	__A / __A	☐
1.2	Nominal / trip current: Control circuit	F1	☐	☐	☐	☐	☐	__A / __A	☐
1.3	Nominal / trip current: Safety circuit	F3	☐	☐	☐	☐	☐	__A / __A	☐
1.4	Nominal / trip current: Lift car circuit	F90	☐	☐	☒	☐	☐	10A / 50A	☐
1.5	Nominal / trip current: Shaft & machine room circuit	F99	☐	☐	☐	☐	☐	__A / __A	☐
1.6	Nominal / trip current: Door operator 1 circuit	F40A	☐	☐	☐	☐	☐	__A / __A	☐
1.7	Nominal / trip current: Door operator 2 circuit	F40B	☐	☐	☐	☐	☐	__A / __A	☐
1.8	Nominal / trip current: Machine brake circuit	F7	☐	☐	☐	☐	☐	__A / __A	☐
1.9*			☐	☐	☐	☐	☐	__A / __A	☐
1.10*			☐	☐	☐	☐	☐	__A / __A	☐

* = available for additions

Typ Z = 3,5 x I-Nenn, Typ B = 5 x I-Nenn, Typ C = 10 x I-Nenn, Typ D = 15 x I-Nenn *1

2 Visual Inspection (Inspection of the Complete Lift Control System with Power Disconnected)

		OK= ☑	Comments
2.0	A visual inspection of the control system does not show any safety relevant issues:	☐	
2.1	Correct selection and installation of components and cable (installation, fitting, protection class, protection against direct contact, labelling and cable installation/termination):	☐	
2.2	All screw terminals and connections to components are correctly tightened following transport:	☐	
2.3	Main isolator (labelling and lock-off facility present):	☐	
2.4	Safe accessibility of switch gear (adequate space for hand operation):	☐	
2.5	Earthing conductor and connections: correct equipotential bonding of all lift system components:	☐	
2.6	Safety measures for inverters: Protection of the inverter supply carried out in accordance with manufacturer's instructions, required disconnection time achieved via Zs (if RCD then type B):	☐	
2.7	SELV / PELV requirements fulfilled (and separate from other circuits):	☐	
2.8	Protective covers, documentation, data plates and safety notices are present:	☐	
2.9	Manufacturers' instructions, warnings and safety requirements have been adhered to:	☐	

Z_S = Earth fault loop impedance

3 Checks ⚠ Follow Manufacturers' Instructions

		OK= ☑	Comments
3.1	Test RCD (if present) by activating the test button:	☐	mA
3.2	Test insulation monitoring device (if present) by activating the test button:	☐	mA
3.3	Test motor overload protection (if present) by activating the test button: Thermal overload	☐	set to ____A
3.4*		☐	

4 Tests (Use Test Instruments in accordance with EN 61557) ⚠ Follow Safety Instructions

Please Note:

⚠ **Disconnect! Carry out insulation resistance tests only with the supply disconnected.**

⚠ **For testing in TNC systems temporarily disconnect the PE-N link in the distribution board.**

⚠ Check the battery charge of the test instruments.

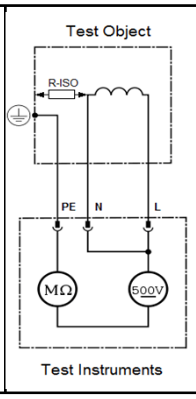
Disconnect the supplies to the door operator(s) and inverter(s). The safety circuit must be made (closed). Measure circuits with contactor contacts in sections.

Select the correct test voltage:	250V for SELV ≤ 50V U_N	Ins. Res. ≥0,5MΩ
	500V for line voltage ≤ 500V	Ins. Res. ≥1,0MΩ

Measure insulation resistance between each line conductor and the circuit protective or earthing conductor.

⚠ Reinstate the PE-N link after the insulation resistance test. ☐ **Link has been reinstated**

When testing circuits with electronic components present, L and N need to be linked! →



4.1 Isolationswiderstand (R-ISO) Messung zwischen Außenleitern und PE ⚠ Freischalten OK = ☑ Comments

				OK	Comments
4.1.1	Insulation resistance	Control system main supply	X0: PE-N/L1/L2/L3	☐	____MΩ
		Machine	X0: PE-U/V/W	☐	____MΩ
4.1.2	Insulation resistance safety circuit	(safety circuit must be closed for the test)	X1: PE-7	☐	____MΩ
4.1.3	Insulation resistance lighting cct.	Lighting/sockets: lift car and shaft	X1: PE-L4/L5	☐	____MΩ
		Lighting/sockets: machine room	X1: PE-L7/L8	☐	____MΩ
4.1.4	*			☐	____MΩ

* = available for additions

4.2 Earth Fault Loop Impedance (ZS) Test Line Conductors and PE OK = ☑ Comments

ZS = sum of the supply impedance and final circuit resistance [ZS = Ze + (R1 + R2)] *4

				OK	Comments
4.2.1	Earth fault loop impedance	Control system main supply	X0: PE-N/L1/L2/L3	☐	_____Ω
	(doesn't work between drive - motor)	Motor (PE minimum csa 10mm²)	X0: PE-U/V/W	☐	_____Ω
4.2.2	Safety circuit	(safety circuit must be closed for the test) Expect 0,25Ω per landing contact.	B2A: Z_S≤ 21Ω	☐	_____Ω
4.2.3	Other circuits	Lighting/sockets: lift car and shaft	with B10A	☐	_____Ω
		Lighting/sockets: machine room	Z_S≤ 4,2Ω	☐	_____Ω
4.2.4	*			☐	_____Ω

*4 = Compare the ZS measurements with the maximum permissible values in Table 4.2.6. In case of frequenzy drives - motor this is not possible, because there is up to 12kHz switching frequency. Make sure the ground connection to the motor is <0,1Ω.

4.2.5	Achievement of the Safety Objective in TNS Systems.	
⚠	Where Z_S values are too high, the maximum disconnection times must be reduced through additional measures. This can be achieved e.g. with a type B RCD 30mA or additional equipotential bonding.	Z_S≤ U0/Ia

Max. Disconnection Times in TN-Systems according to BS7671:2008

Circuit	Nom. Voltage	Disconnection Time
Final circuits (sockets or fixed appliances) up to 32A	≤230V~	0,4s
	≤400V~	0,2s
Supplies exceeding 32A	≤400V~	5,0s

Protection potential equalization = potential equalization (old name).

4.2.6 Source: BS7671:2008 Earth Fault Loop Impedance (ZS) Tables 41.2, 41.3 and 41.4 for TN Systems

Maximum Earth Fault Loop Impedance (ZS) for (gG) fuses to BS 88-2.2 and BS 88-6

Nominal current fuses [A]	6	10	16	20	25	32	40	50	63	80	100	125	100	125	160	200	A
0.4s disconnection time	-	-	8,52	5,11	2,7	1,77	1,44	1,04	-	-	-	-	-	-	-	-	Ω
5,0s disconnection time	-	-	13,5	7,42	4,18	2,91	2,3	1,84	1,35	1,04	0,82	0,57	0,42	0,33	0,25	0,19	Ω

Maximum Earth Fault Loop Impedance (ZS) for circuit breakers with 0.4s disconnection time according to BS EN 60898

Nominal current circuit breake	6	10	16	20	25	32	40	50	63	80	100	125	160	200	125	160	A
Charakteristik B	7,67	4,6	2,87	2,3	1,84	1,44	1,15	0,92	0,73	0,57	0,46	0,37	-	-	-	-	Ω
Charakteristik C	3,83	2,3	1,44	1,15	0,92	0,72	0,57	0,46	0,36	0,29	0,23	0,18	-	-	-	-	Ω

Most of the test instruments will show the tipp current automaticly during the loop imdedance margement. With this information the disconnection time Can also be determind.

4.3 Check Automatic Disconnection of the Supply by way of Earth Fault Loop Impedance and Trip Characteristic

Maximum Earth Fault Loop Impedance (ZS) for circuit breakers with disconnection time ≤ 5 s with U0 of 230V													
Nominal circuit breakers [A]	**2**	**4**	**6**	**10**	**16**	**20**	**25**	**32**	**35**	**40**	**50**	**63**	**A**	**ZS = (Uo - U)/I-Last**
Charakteristik B	7,67	4,6	2,87	2,3	1,84	1,44	1,15	0,92	0,73	0,57	0,46	0,37	**Ω**	**ZS(m) ≤ 2/3 x (Uo/Ia)**
Charakteristik C	3,83	2,3	1,44	1,15	0,92	0,72	0,57	0,46	0,36	0,29	0,23	0,18	**Ω**	

Example: a final circuit (pit socket) has a no-load voltage of 233V. After connecting a 500W lamp the voltage reduces to 229V with a current of 2.2A. Check whether a B10A MCB can be used. ITrip = 5 x 10A = 50A

ZS = (233v -229V) / 2,2A = 1,82Ω   ZS(m) = 2/3 x (233V / 50A) = 3Ω   ZS < ZS(max) = suggested MCB is suitable.

*1= this review have to be done for all under 1.1 - 1:10 existing circuits and documented there in the right column

4.4 Earth Continuity (Guide: Earthing Conductor <1Ω, Main Protective Bonding Conductors < 0,1Ω) i.O.= ☑ Comments

4.4.1	Controller PE to motor (PE minimum csa = 10mm²) Check connections with all following points 4.3.X Check for continuity	☐	
4.4.2	Controller PE to Protection Class 1 equipment Brake coil, forced cooling, lighting, ... (Protection Class1 = protective conductor required for exposed-conductive-parts)	☐	
4.4.3	Controller PE to car top connection box Measure resistance between car gate and landing door frame with car doors open.	☐	
4.4.4	Car top socket PE to door operator	☐	
	Car top socket PE to car Check for continuity	☐	
4.4.5	Car top socket PE to car top control (Protection Class 1)	☐	
4.4.6	EMC compliant installation of motor and data cables, i.e. segregation. Adequate earthing of cable screens in accordance with enclosed recommendations using special clamps.	☐	Requirement in inverter systems!

Minimum cross sectional area (csa) for main protective bonding conductors = 10mm²

5 Voltage Measurements

5.1	Incoming L1 - L2	VAC	☐	Incoming L3 - N	VAC	☐	Control X1: 200 - 500	VDC
5.2	Incoming L1 - L3	VAC	☐	Control X1: 1 - N	VAC	☐	Group XG1: 207 - 507	VDC
5.3	Incoming L1 - N	VAC	☐	Car lighting X1: L5 - N4	VAC	☐	Car X11: 201 - 501	VDC
5.4	Incoming L2 - N	VAC	☐	Shaft lighting X1: L7 - N6	VAC	☐	•	V___
5.5	Check the Voltage drop		☑	(approximate 400V-Net 4% ≤ 16V)		☑	(approximate 230V-Net 4% ≤ 9,2V)	

Determine the voltage drop using the diagramme in Appendix D.

6 Phase Rotation Test of Control System Main Supply OK= ☑ Comments

6.1	Clockwise phase rotation present	☐	

7 Functional Test OK= ☑ Comments

7.1	Machine, locks and safety decives have been tested functionally:	☐	
7.2	The safety requirements have been followed:	☐	
7.3*		☐	

* = available for additions

Comments* Details of test instruments used (and serial numbers)

*All detected faults or missing components must be corrected to ensure that the control system complies with the requirements.

Date | Tester signature

EMC Information / Recommendations for Inverter Controlled Systems

Electromagnetic shielding and EMC-compatible wireing

The earthing of the shielding and the quality of the connection to the shielding affect the over all-effect of the electromagnetic shielding!

1. Connect the shielding to the Earth Potential as shown in Figure 1 keeping the cables as short as possible.

2. Segregate high voltage and high current cables (Motor cable, Brake Resistor cable) from signal cables (Encoder cable, Bus cable) as far as possible >10 cm distance.

3. Cross disturbed cables (Motor cable) in a 90° angle with undisturbed cables (Signal Cables).

4. Connect the EMC protection decives shown in the electrical drawings to disturbing sources such as (Contactors, Brakes, Door operators etc.)

5. Do <u>not</u> mount the brake resistor to the housing of the VVVF inverter or the control cabinet.

6. Connect the shielding with maximal surface to Ground Potential (see Figure 2, 3 and 4)

7. Ensure that the slope resistance of the shielding is not higher than 0.3 Ohm.

8. Do not conduct potential equalisation currents via the shielding. Separate potential equalisation cables are mandatory inbetween the different installation components!

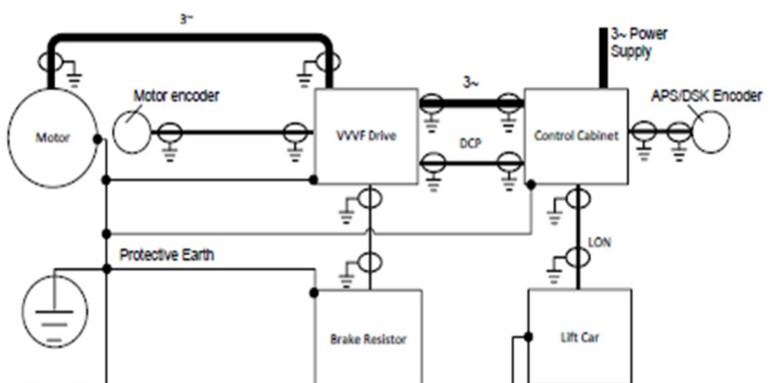
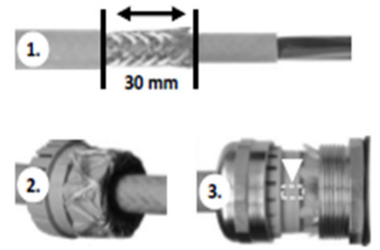


Figure 1



1. Remove the shell of 30 mm
2. Cover the shielding over the platic element
3. Put the plastic element into the fitting.
   Mind the track (see arrow)!

Figure 2

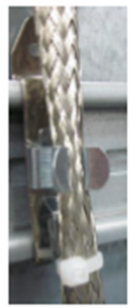


Figure 3

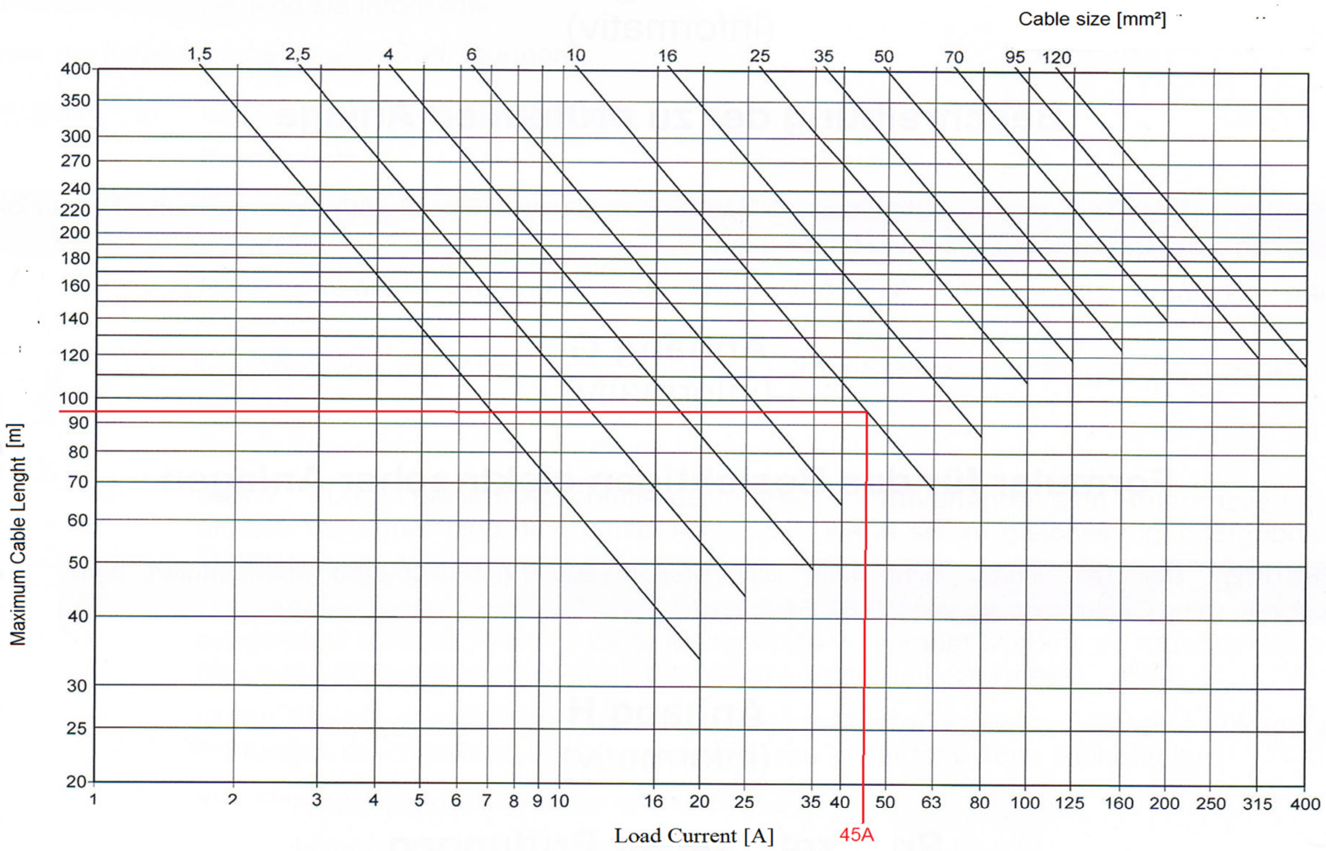
Figure 4

Appendix D - Diagramme for Determining Voltage Drop

Source: DIN VDE0100Part600

Use the cable cross sectional area in conjunction with cable length, conductor temperature and the design current to check whether the applicable voltage drop is acceptable.

The diagramme shows the maximum permissible cable length, based on a 400V 3-phase supply and 55°C conductor temperature, and the resulting 4% voltage drop in relation to the design current.



Note: The diagramme is not suitable for determining the current-carrying capacity of cables.

The indicated values are applicable to 3-phase 400V AC supplies. For single phase 230V AC supplies, divide the cable length by 2.

Example: The design current of a consumer is 45A and the supply length from the substation to the machine room is 70m. A 5x10mm² cable was used for the installation, protected with 50A.
Question: Is the voltage drop acceptable? ==> Yes, according to the diagramme it is suitable up to 95m.

To check the result, calculate the voltage drop: = √3 x l x I-Nenn x cos/ Kappa x A

= 1,73 x 70m x 45A x 0,9 / 56 x10mm² = 8,82V