INGENIEURGESELLSCHAFT FÜR AUTOMATISIERUNGS- UND COMPUTERTECHNIK

Testing laboratory for climatic, mechanical and corrosive environmental stress

Deutscher Akkreditierungs	RTIFICATE of QU	ALIT	Y TEST
DAP-PL-3439.00	Test report - No. 979	90.01	/ 13
Client	MEDER electronic AG Robert-Bosch-Straße 4 78244 Singen		
Equipment under test	MK02/4-1A66C-500W		
	ArtNo.	222471	3054
	Date	13.03.2	013
	Quantity	2 Samp	les (#1.1 and #1.2)
Purpose	Tests for the certification of th	e degre	e of protection IP67
	according to the standards and	d to the	demands of the client.
Test program	Protection against access to hazardous parts	d to the IP6X	demands of the client. according to the IEC 60529
Test program	Protection against access to hazardous parts Protection against solid foreign objects	d to the IP6X IP6X	demands of the client. according to the IEC 60529 according to the IEC 60529
Test program	Protection against access to hazardous parts Protection against solid foreign objects Protection against immersion	IP6X IP6X IP6X IPX7	demands of the client. according to the IEC 60529 according to the IEC 60529 according to the IEC 60529
Test program	Protection against access to hazardous parts Protection against solid foreign objects Protection against immersion 03 April to 05 April 2013	IP6X IP6X IP6X IPX7	demands of the client. according to the IEC 60529 according to the IEC 60529 according to the IEC 60529
Test program Test period Realization / results	Protection against access to hazardous parts Protection against solid foreign objects Protection against immersion 03 April to 05 April 2013 see page 2 to 4	d to the IP6X IP6X IPX7	demands of the client. according to the IEC 60529 according to the IEC 60529 according to the IEC 60529

**Test result** The tests were carried out according to the specifications of the standards and to the demands of the client.

> The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

> > Berliner Volksbank

(BLZ 100 900 00) 830 184 1028

Commerzbank AG (BLZ 100 800 00) 04 004 292 00

The further evaluation will be done by the client.

to-

Dipl.-Ing. R. Lein Head of test lab / test manager

Berlin, 18 April 2013

Sitz der Gesellschaft: Berlin Amtsgericht Berlin Charlottenburg HRB 38393 Ust-ID-Nr.: DE 137 190 620 Geschäftsführer: Dipl.-Ing. Werner Zuchhold, Dipl.-Ing. Bernd Rhiemeier



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M.Eng. M. Sommerfeld Test engineer

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# 1 <u>Purpose</u>

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The tests for the certification of the *degrees of protection IP67* for the two *MK02/4-1A66C-500W* were performed according to the specifications of the current standards and to the demands of the client.

# 2 Equipment under test (E.U.T.)

MK02/4-1A66C-500W	
ArtNo.	2224713054
Date	13.03.2013
Quantity	2 Samples (#1.1 and #1.2)

# 3 Basics

# 3.1 Demands of the client

# 3.2 Used standards

IEC 60529:1989 + A1:1999 DIN EN 60529; VDE 0470-1:2000-09 "Degrees of protection provided by enclosures (IP code)"

# 4 Test program

### **4.1** <u>Degree of protection IP6X (protection against access to hazardous parts)</u> according to the IEC 60529 § 13.2

Before the dust test, the *protection against access to hazardous parts IP6X* shall be verified using a standardized wire. The access probe  $\emptyset$  1.0 mm (force 1 N) must not penetrate the housing at any point.

### 4.2 Degrees of protection tests IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

For the *dust test IP6X* the standard demands the use of vacuum. If no vacuum can be applied, because the EUT is a one piece cast, the VDE states that the substitute water test with a subsequent insulation measurement test can be performed instead.

EUTnot in functionEUT positionhorizontal lying

### Substitute water test for coated /cast specimens

The EUT will be placed in water for approx. 24 h at a depth of 20 cm. If after the test the insulation resistance remains unchanged, then the form closure of the casting compound is rendered. It can be then assumed that dust with vacuum would not be able to penetrate the specimen.

Insulation resistance measurement (measurement parameters 500 V DC, 1 minute) Before and after the high pressure steam jets test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

### Visual inspection

After the test IP6X the EUT will be examined externally for damage and any other alterations.



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# 4.3 Immersion test IPX7 (temporary submersion)

according to the IEC 60	J529 § 14.2.7
EUT EUT position	not in function horizontal lying
Test device Water depth Boundary condition	dip tank 1 m the lowest point of the sample must be located
Water temperature	1m below the water surface must not differ by more than 5 K from that of the sample
Test duration	30 min

### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

Before and after the immersion test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

#### Visual inspection

After the test IPX7 the EUT will be examined externally for damage and any other alterations.

# 5 Realization

### The tests for the degree of protection IP67 for the two MK02/4-1A66C-500W,

were carried out according to the test program (sections 4.1 to 4.3), in compliance with the specifications of the current standards and with the demands of the client.

#### Visual inspection

After the tests IP6X (substitute test with long term submersion) and IPX7 (immersion test), the specimens were examined for external damage and any other alterations.

#### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

According to the demands of the client, the insulation resistances of the EUT were measured before and after the substitute test with long term submersion and the high pressure steam jets test.

For this, the following test setup was realized:

- two connecting lines were bridged with the shielded cable and measured against the sensor housing

The measurements were done with 500 VDC.

### Acceptance criteria

The **protection against access to hazardous parts IP6X** is proven when a test wire (Ø 1 mm, force 1 N) cannot penetrate the housing of the specimen.

The protection against solid foreign objects IP6X (dust tight) is satisfactory,

if at the end of the test no visible dust deposits are detected inside the housing of the specimen.

The *protection against temporary immersion IPX7* is considered proven if after the completion of the test no water has penetrated into the sample, or if it has it is in a quantity such that it does not impair the proper functioning or safety of the equipment.

Name	Туре	Serial No.	Maker	Remarks
Rigid IEC-steel wire	P 10.27	5011594	PTL	Access to hazardous parts test IP6KX
Dipping basin	-	-	AUCOTEAM	Substitute test for IP6X
Dip tank	TB 500L	-	AUCOTEAM	Immersion test IPX7
Portable compact tester	91-4A	0000035268	ELABO	Insulation resistance measurement

### Measurement and test devices



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# 6 <u>Results</u>

The tests for the certification of the *degrees of protection IP67* for the two *MK02/4-1A66C-500W* with

- Protection against access to hazardous parts IP6X
- Protection against solid foreign objects IP6X
- Protection against immersion IPX7

neither mechanical damages nor any other changes of the specimen were determined.

# 6.1 Protection against access to hazardous parts IP6X

according to the IEC 60 529 § 13.2

The standardized test wire (Ø 1 mm, force 1 N) could not penetrate into the three housings.

# 6.2 Degrees of protection test IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IP6X	Insulation resistance after the test IP6X	Results
#1.1	533 V DC > 999,99 MOhm	533 V DC > 999,99 MOhm	ок
#1.2	537 V DC > 999,99 MOhm	536 V DC > 999,99 MOhm	ок

# 6.3 Immersion test IPX7 (temporary submersion)

according to the IEC 60529 § 14.2.7

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IPX7	Insulation resistance after the test IPX7	Results
#1.1	533 V DC > 999,99 MOhm	535 V DC > 999,99 MOhm	ок
#1.2	536 V DC > 999,99 MOhm	532 V DC > 999,99 MOhm	ОК

The tests were carried out according to the specifications of the standards and to the demands of the client.

The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

The further evaluation will be done by the client.

The results of the tests refer only to the above mentioned equipment under test. This report, or individual pages of this test report, may only be copied following the written consent of the testing laboratory. This test report No. 9790.01 / 13 includes 4 pages and 1 appendix – Pictures.



# appendix to test report-No. 9790.01 / 13 page 1 / 2

# **Pictures**



picture 1 MK02/4-1A66C-500W - #1.1 and #1.2 with test wire (Ø 1 mm, 1N) before the protection against hazardous parts IP6X



picture 3 MK02/4-1A66C-500W - #1.1 during the insulation resistance measurement before and after the tests IP6X and IPX7



picture 5 MK02/4-1A66C-500W - #1.1 and #1.2 in the dip tank at a depth of 20 cm during the test IP6X (substitute test)



picture 2 MK02/4-1A66C-500W with test wire (Ø 1 mm, 1N) on the EUT (#1.1) during the protection against hazardous parts IP6X



picture 4 MK02/4-1A66C-500W - #1.2 during the insulation resistance measurement before and after the tests IP6X and IPX7



picture 6 MK02/4-1A66C-500W - #1.1 and #1.2 without visible external damage after the test IP6X (substitute test)



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Picture 7 MK02/4-1A66C-500W - #1.1 and #1.2 mounted on a test frame after the immersion test IPX7



Picture 8 MK02/4-1A66C-500W - #1.1 and #1.2 in the dip tank at a depth of 1 m after the immersion test IPX7



Picture 9 MK02/4-1A66C-500W - #1.1 and #1.2 mounted on a test frame after the immersion test IPX7



Picture 10 MK02/4-1A66C-500W - #1.1 and #1.2 without visible external damage after the immersion test IPX7

AUCOTEAM INGENIEURGESELLSCHAFT FÜR AUTOMATISIERUNGS- UND COMPUTERTECHNIK

Testing laboratory for climatic, mechanical and corrosive environmental stress

	ERTIFICATE of QUALITY TEST			
DAP-PL-3439.00	Test report - No. 9790.04 / 13			
Client	MEDER electronic AG Robert-Bosch-Straße 4 78244 Singen			
Equipment under test	MK11-1A66B-500W			
	ArtNo.	911266	1054	
	Date	13.03.2	013	
	Quantity	2 Samp	les (#4.1 and #4.2)	
Purpose	Tests for the certification of th	e degre	e of protection IP67	
	according to the standards an	d to the	demands of the client.	
Test program	according to the standards an Protection against access to hazardous parts	d to the IP6X	demands of the client. according to the IEC 60529	
Test program	according to the standards and Protection against access to hazardous parts Protection against solid foreign objects	d to the IP6X IP6X	demands of the client. according to the IEC 60529 according to the IEC 60529	
Test program	according to the standards and Protection against access to hazardous parts Protection against solid foreign objects Protection against immersion	d to the IP6X IP6X IP6X IPX7	demands of the client. according to the IEC 60529 according to the IEC 60529 according to the IEC 60529	
Test program Test period	according to the standards and Protection against access to hazardous parts Protection against solid foreign objects Protection against immersion 03 April to 05 April 2013	d to the IP6X IP6X IP6X IPX7	demands of the client. according to the IEC 60529 according to the IEC 60529 according to the IEC 60529	
Test program Test period Realization / results	according to the standards and Protection against access to hazardous parts Protection against solid foreign objects Protection against immersion 03 April to 05 April 2013 see page 2 to 4	d to the IP6X IP6X IPX7	demands of the client. according to the IEC 60529 according to the IEC 60529 according to the IEC 60529	

**Test result** The tests were carried out according to the specifications of the standards and to the demands of the client.

> The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

> > Berliner Volksbank

(BLZ 100 900 00) 830 184 1028

Commerzbank AG (BLZ 100 800 00) 04 004 292 00

The further evaluation will be done by the client.

to-

Dipl.-Ing. R. Lein Head of test lab / test manager

Berlin, 18 April 2013

Sitz der Gesellschaft: Berlin Amtsgericht Berlin Charlottenburg HRB 38393 Ust-ID-Nr.: DE 137 190 620 Geschäftsführer: Dipl.-Ing. Werner Zuchhold, Dipl.-Ing. Bernd Rhiemeier



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# 1 <u>Purpose</u>

test report-No. 9790.04 / 13 page 2 / 4

The tests for the certification of the *degrees of protection IP67* for the two *MK11-1A66B-500W* were performed according to the specifications of the current standards and to the demands of the client.

# 2 Equipment under test (E.U.T.)

MK11-1A66B-500W	
ArtNo.	9112661054

 Date
 13.03.2013

 Quantity
 2 Samples (#4.1 and #4.2)

# 3 Basics

# 3.1 Demands of the client

# 3.2 Used standards

IEC 60529:1989 + A1:1999 DIN EN 60529; VDE 0470-1:2000-09 "Degrees of protection provided by enclosures (IP code)"

# 4 Test program

### **4.1** <u>Degree of protection IP6X (protection against access to hazardous parts)</u> according to the IEC 60529 § 13.2

Before the dust test, the *protection against access to hazardous parts IP6X* shall be verified using a standardized wire. The access probe  $\emptyset$  1.0 mm (force 1 N) must not penetrate the housing at any point.

### 4.2 Degrees of protection tests IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

For the *dust test IP6X* the standard demands the use of vacuum. If no vacuum can be applied, because the EUT is a one piece cast, the VDE states that the substitute water test with a subsequent insulation measurement test can be performed instead.

EUTnot in functionEUT positionhorizontal lying

### Substitute water test for coated /cast specimens

The EUT will be placed in water for approx. 24 h at a depth of 20 cm. If after the test the insulation resistance remains unchanged, then the form closure of the casting compound is rendered. It can be then assumed that dust with vacuum would not be able to penetrate the specimen.

Insulation resistance measurement (measurement parameters 500 V DC, 1 minute) Before and after the high pressure steam jets test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

### Visual inspection

After the test IP6X the EUT will be examined externally for damage and any other alterations.



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# 4.3 Immersion test IPX7 (temporary submersion)

according to the IEC of	JJ29 § 14.2.7
EUT EUT position	not in function horizontal lying
Test device Water depth Boundary condition	dip tank 1 m the lowest point of the sample must be located
Water temperature	1m below the water surface must not differ by more than 5 K from that of the sample
Test duration	30 min

### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

Before and after the immersion test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

### Visual inspection

After the test IPX7 the EUT will be examined externally for damage and any other alterations.

# 5 Realization

### The tests for the degree of protection IP67 for the two MK11-1A66B-500W,

were carried out according to the test program (sections 4.1 to 4.3), in compliance with the specifications of the current standards and with the demands of the client.

#### Visual inspection

After the tests IP6X (substitute test with long term submersion) and IPX7 (immersion test), the specimens were examined for external damage and any other alterations.

#### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

According to the demands of the client, the insulation resistances of the EUT were measured before and after the substitute test with long term submersion and the high pressure steam jets test.

For this, the following test setup was realized:

- two connecting lines were bridged with the shielded cable and measured against the sensor housing

The measurements were done with 500 VDC.

### Acceptance criteria

The *protection against access to hazardous parts IP6X* is proven when a test wire  $(\emptyset \ 1 \ \text{mm}, \text{ force } 1 \ \text{N})$  cannot penetrate the housing of the specimen.

The protection against solid foreign objects IP6X (dust tight) is satisfactory,

if at the end of the test no visible dust deposits are detected inside the housing of the specimen.

The *protection against temporary immersion IPX7* is considered proven if after the completion of the test no water has penetrated into the sample, or if it has it is in a quantity such that it does not impair the proper functioning or safety of the equipment.

Name	Туре	Serial No.	Maker	Remarks
Rigid IEC-steel wire	P 10.27	5011594	PTL	Access to hazardous parts test IP6KX
Dipping basin	-	-	AUCOTEAM	Substitute test for IP6X
Dip tank	TB 500L	-	AUCOTEAM	Immersion test IPX7
Portable compact tester	91-4A	0000035268	ELABO	Insulation resistance measurement

### Measurement and test devices



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# 6 <u>Results</u>

The tests for the certification of the *degrees of protection IP67* for the two *MK11-1A66B-500W* with

- Protection against access to hazardous parts IP6X
- Protection against solid foreign objects IP6X
- Protection against immersion IPX7

neither mechanical damages nor any other changes of the specimen were determined.

# 6.1 Protection against access to hazardous parts IP6X

according to the IEC 60 529 § 13.2

The standardized test wire (Ø 1 mm, force 1 N) could not penetrate into the three housings.

# 6.2 Degrees of protection test IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IP6X	Insulation resistance after the test IP6X	Results
#/ 1	536 V DC	536 V DC	OK
<i>π</i> <b>-</b> .ι	> 999,99 MOhm	> 999,99 MOhm	ON
#10	535 V DC	533 V DC	OK
#4.Z	> 999,99 MOhm	> 999,99 MOhm	UK

# 6.3 Immersion test IPX7 (temporary submersion)

according to the IEC 60529 § 14.2.7

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IPX7	Insulation resistance after the test IPX7	Results
#4.1	536 V DC > 999,99 MOhm	533 V DC > 999,99 MOhm	ок
#4.2	533 V DC > 999,99 MOhm	533 V DC > 999,99 MOhm	ОК

The tests were carried out according to the specifications of the standards and to the demands of the client.

The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

The further evaluation will be done by the client.

The results of the tests refer only to the above mentioned equipment under test. This report, or individual pages of this test report, may only be copied following the written consent of the testing laboratory. This test report No. 9790.04 / 13 includes 4 pages and 1 appendix – Pictures.



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# **Pictures**



picture 1 MK11-1A66B-500W - #4.1 and #4.2 with test wire (Ø 1 mm, 1N) before the protection against hazardous parts IP6X



picture 3 MK11-1A66B-500W - #4.1 during the insulation resistance measurement before and after the tests IP6X and IPX7



picture 5 MK11-1A66B-500W - #4.1 and #4.2 in the dip tank at a depth of 20 cm during the test IP6X (substitute test)



picture 2 MK11-1A66B-500W with test wire (Ø 1 mm, 1N) on the EUT (#4.1) during the protection against hazardous parts IP6X



picture 4 MK11-1A66B-500W - #4.2 during the insulation resistance measurement before and after the tests IP6X and IPX7



picture 6 MK11-1A66B-500W - #4.1 and #4.2 without visible external damage after the test IP6X (substitute test)



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Picture 7 MK11-1A66B-500W - #4.1 and #4.2 mounted on a test frame after the immersion test IPX7



Picture 8 MK11-1A66B-500W - #4.1 and #4.2 in the dip tank at a depth of 1 m after the immersion test IPX7



Picture 9 MK11-1A66B-500W - #4.1 and #4.2 mounted on a test frame after the immersion test IPX7



Picture 10 MK11-1A66B-500W - #4.1 and #4.2 without visible external damage after the immersion test IPX7

INGENIEURGESELLSCHAFT FÜR AUTOMATISIERUNGS- UND COMPUTERTECHNIK

Testing laboratory for climatic, mechanical and corrosive environmental stress

	RTIFICATE of QU	ALIT	Y TEST	
DAP-PL-3439.00	Test report - No. 9790.03 / 13			
Client	MEDER electronic AG Robert-Bosch-Straße 4 78244 Singen			
Equipment under test	MK11/M8-1A66B-500W			
	ArtNo.	911826	6054	
	Date	13.03.2013		
	Quantity	2 Samp	les (#3.1 and #3.2)	
Purpose	Tests for the certification of the degree of protection IP67 according to the standards and to the demands of the client.			
Test program	Protection against access to hazardous parts	IP6X	according to the IEC 60529	
	Protection against solid foreign objects	IP6X	according to the IEC 60529	
	Protection against immersion	IPX7	according to the IEC 60529	
Test period	03 April to 05 April 2013			
Realization / results	see page 2 to 4			
Total number of pages	6 (incl. 1 appendix)			

Test result

The tests were carried out according to the specifications of the standards and to the demands of the client.

The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

Berliner Volksbank

(BLZ 100 900 00) 830 184 1028

Commerzbank AG (BLZ 100 800 00) 04 004 292 00

The further evaluation will be done by the client.

to-

Dipl.-Ing. R. Lein Head of test lab / test manager

Berlin, 18 April 2013

Sitz der Gesellschaft: Berlin Amtsgericht Berlin Charlottenburg HRB 38393 Ust-ID-Nr.: DE 137 190 620 Geschäftsführer: Dipl.-Ing. Werner Zuchhold, Dipl.-Ing. Bernd Rhiemeier



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# 1 <u>Purpose</u>

# test report-No. 9790.03 / 13 page 2 / 4

The tests for the certification of the *degrees of protection IP67* for the two *MK11/M8-1A66B-500W* were performed according to the specifications of the current standards and to the demands of the client.

# 2 Equipment under test (E.U.T.)

MK11/M8-1A66B-500W
--------------------

ArtNo.	9118266054
Date	13.03.2013
Quantity	2 Samples (#3.1 and #3.2)

# 3 Basics

# 3.1 Demands of the client

# 3.2 Used standards

IEC 60529:1989 + A1:1999 DIN EN 60529; VDE 0470-1:2000-09 "Degrees of protection provided by enclosures (IP code)"

# 4 Test program

### **4.1** <u>Degree of protection IP6X (protection against access to hazardous parts)</u> according to the IEC 60529 § 13.2

Before the dust test, the *protection against access to hazardous parts IP6X* shall be verified using a standardized wire. The access probe  $\emptyset$  1.0 mm (force 1 N) must not penetrate the housing at any point.

### 4.2 Degrees of protection tests IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

For the *dust test IP6X* the standard demands the use of vacuum. If no vacuum can be applied, because the EUT is a one piece cast, the VDE states that the substitute water test with a subsequent insulation measurement test can be performed instead.

EUTnot in functionEUT positionhorizontal lying

### Substitute water test for coated /cast specimens

The EUT will be placed in water for approx. 24 h at a depth of 20 cm. If after the test the insulation resistance remains unchanged, then the form closure of the casting compound is rendered. It can be then assumed that dust with vacuum would not be able to penetrate the specimen.

Insulation resistance measurement (measurement parameters 500 V DC, 1 minute) Before and after the high pressure steam jets test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

### Visual inspection

After the test IP6X the EUT will be examined externally for damage and any other alterations.



test report-No. 9790.03 / 13 page 3 / 4

# 4.3 Immersion test IPX7 (temporary submersion)

according to the IEC 60	J529 § 14.2.7
EUT EUT position	not in function horizontal lying
Test device Water depth Boundary condition	dip tank 1 m the lowest point of the sample must be located
Water temperature	1m below the water surface must not differ by more than 5 K from that of the sample
Test duration	30 min

### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

Before and after the immersion test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

#### Visual inspection

After the test IPX7 the EUT will be examined externally for damage and any other alterations.

# 5 Realization

### The tests for the degree of protection IP67 for the two MK11/M8-1A66B-500W,

were carried out according to the test program (sections 4.1 to 4.3), in compliance with the specifications of the current standards and with the demands of the client.

#### Visual inspection

After the tests IP6X (substitute test with long term submersion) and IPX7 (immersion test), the specimens were examined for external damage and any other alterations.

### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

According to the demands of the client, the insulation resistances of the EUT were measured before and after the substitute test with long term submersion and the high pressure steam jets test.

For this, the following test setup was realized:

- two connecting lines were bridged with the shielded cable and measured against the sensor housing

The measurements were done with 500 VDC.

### Acceptance criteria

The *protection against access to hazardous parts IP6X* is proven when a test wire (Ø 1 mm, force 1 N) cannot penetrate the housing of the specimen.

The protection against solid foreign objects IP6X (dust tight) is satisfactory,

if at the end of the test no visible dust deposits are detected inside the housing of the specimen.

The *protection against temporary immersion IPX7* is considered proven if after the completion of the test no water has penetrated into the sample, or if it has it is in a quantity such that it does not impair the proper functioning or safety of the equipment.

Name	Туре	Serial No.	Maker	Remarks
Rigid IEC-steel wire	P 10.27	5011594	PTL	Access to hazardous parts test IP6KX
Dipping basin	-	-	AUCOTEAM	Substitute test for IP6X
Dip tank	TB 500L	-	AUCOTEAM	Immersion test IPX7
Portable compact tester	91-4A	0000035268	ELABO	Insulation resistance measurement

### Measurement and test devices



test report-No. 9790.03 / 13 page 4 / 4

# 6 <u>Results</u>

The tests for the certification of the *degrees of protection IP67* for the two *MK11/M8-1A66B-500W* with

- Protection against access to hazardous parts IP6X
- Protection against solid foreign objects IP6X
- Protection against immersion IPX7

neither mechanical damages nor any other changes of the specimen were determined.

# 6.1 Protection against access to hazardous parts IP6X

according to the IEC 60 529 § 13.2

The standardized test wire (Ø 1 mm, force 1 N) could not penetrate into the three housings.

# 6.2 Degrees of protection test IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IP6X	Insulation resistance after the test IP6X	Results
#3.1	533 V DC > 999,99 MOhm	533 V DC > 999,99 MOhm	ок
#3.2	536 V DC > 999,99 MOhm	537 V DC > 999,99 MOhm	OK

# 6.3 Immersion test IPX7 (temporary submersion)

according to the IEC 60529 § 14.2.7

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IPX7	Insulation resistance after the test IPX7	Results
#3.1	533 V DC > 999,99 MOhm	535 V DC > 999,99 MOhm	ок
#3.2	537 V DC > 999,99 MOhm	535 V DC > 999,99 MOhm	ОК

The tests were carried out according to the specifications of the standards and to the demands of the client.

The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

The further evaluation will be done by the client.

The results of the tests refer only to the above mentioned equipment under test. This report, or individual pages of this test report, may only be copied following the written consent of the testing laboratory. This test report No. 9790.03 / 13 includes 4 pages and 1 appendix – Pictures.



### appendix to test report-No. 9790.03 / 13 page 1 / 2

# **Pictures**



picture 1 MK11/M8-1A66B-500W - #3.1 and #3.2 with test wire (Ø 1 mm, 1N) before the protection against hazardous parts IP6X



picture 3 MK11/M8-1A66B-500W - #3.1 during the insulation resistance measurement before and after the tests IP6X and IPX7



picture 5 MK11/M8-1A66B-500W - #3.1 and #3.2 in the dip tank at a depth of 20 cm during the test IP6X (substitute test)



picture 2 MK11/M8-1A66B-500W with test wire (Ø 1 mm, 1N) on the EUT (#3.1) during the protection against hazardous parts IP6X



picture 4 MK11/M8-1A66B-500W - #3.2 during the insulation resistance measurement before and after the tests IP6X and IPX7



picture 6 MK11/M8-1A66B-500W - #3.1 and #3.2 without visible external damage after the test IP6X (substitute test)



### appendix to test report-No. 9790.03 / 13 page 2 / 2



Picture 7 MK11/M8-1A66B-500W - #3.1 and #3.2 mounted on a test frame after the immersion test IPX7



Picture 8 MK11/M8-1A66B-500W - #3.1 and #3.2 in the dip tank at a depth of 1 m after the immersion test IPX7



Picture 9 MK11/M8-1A66B-500W - #3.1 and #3.2 mounted on a test frame after the immersion test IPX7



Picture 10 MK11/M8-1A66B-500W - #3.1 and #3.2 without visible external damage after the immersion test IPX7

INGENIEURGESELLSCHAFT FÜR AUTOMATISIERUNGS- UND COMPUTERTECHNIK

Testing laboratory for climatic, mechanical and corrosive environmental stress

	RTIFICATE of QU	ALIT	Y TEST	
DAP-PL-3439.00	Test report - No. 9790.02 / 13			
Client	MEDER electronic AG Robert-Bosch-Straße 4 78244 Singen			
Equipment under test	MK11/S8-1A66B-500W			
	ArtNo.	911926	6054	
	Date	13.03.2	013	
	Quantity	2 Samp	les (#2.1 and #2.2)	
Purpose	Tests for the certification of the degree of protection IP67 according to the standards and to the demands of the client.			
Test program	Protection against access to hazardous parts	IP6X	according to the IEC 60529	
	Protection against solid foreign objects	IP6X	according to the IEC 60529	
	Protection against immersion	IPX7	according to the IEC 60529	
Test period	03 April to 05 April 2013			
Realization / results	see page 2 to 4			
Total number of pages	6 (incl. 1 appendix)			

**Test result** The tests were carried out according to the specifications of the standards and to the demands of the client.

The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

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The further evaluation will be done by the client.

Dipl.-Ing. R. Lein Head of test lab / test manager

Berlin, 18 April 2013

Sitz der Gesellschaft: Berlin Amtsgericht Berlin Charlottenburg HRB 38393 Ust-ID-Nr.: DE 137 190 620 Geschäftsführer: Dipl.-Ing. Werner Zuchhold, Dipl.-Ing. Bernd Rhiemeier



AUCOTEAM GmbH Storkower Straße 115 a 10407 Berlin Telefon: (030) 4 21 88 - 0 Telefax: (030) 4 23 27 09 http://www.aucoteam.de

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# 1 <u>Purpose</u>

test report-No. 9790.02 / 13 page 2 / 4

The tests for the certification of the *degrees of protection IP67* for the two *MK11/S8-1A66B-500W* were performed according to the specifications of the current standards and to the demands of the client.

# 2 Equipment under test (E.U.T.)

MK11/S8-1A66B-500W	
ArtNo.	9119266054
Date	13.03.2013
Quantity	2 Samples (#2.1 an

2 Samples (#2.1 and #2.2)

# 3 Basics

# 3.1 Demands of the client

# 3.2 Used standards

IEC 60529:1989 + A1:1999 DIN EN 60529; VDE 0470-1:2000-09 "Degrees of protection provided by enclosures (IP code)"

# 4 Test program

### **4.1** <u>Degree of protection IP6X (protection against access to hazardous parts)</u> according to the IEC 60529 § 13.2

Before the dust test, the *protection against access to hazardous parts IP6X* shall be verified using a standardized wire. The access probe  $\emptyset$  1.0 mm (force 1 N) must not penetrate the housing at any point.

### 4.2 Degrees of protection tests IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

For the *dust test IP6X* the standard demands the use of vacuum. If no vacuum can be applied, because the EUT is a one piece cast, the VDE states that the substitute water test with a subsequent insulation measurement test can be performed instead.

EUTnot in functionEUT positionhorizontal lying

### Substitute water test for coated /cast specimens

The EUT will be placed in water for approx. 24 h at a depth of 20 cm. If after the test the insulation resistance remains unchanged, then the form closure of the casting compound is rendered. It can be then assumed that dust with vacuum would not be able to penetrate the specimen.

Insulation resistance measurement (measurement parameters 500 V DC, 1 minute) Before and after the high pressure steam jets test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

### Visual inspection

After the test IP6X the EUT will be examined externally for damage and any other alterations.



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# 4.3 Immersion test IPX7 (temporary submersion)

according to the IEC 60	J529 § 14.2.7
EUT EUT position	not in function horizontal lying
Test device Water depth Boundary condition	dip tank 1 m the lowest point of the sample must be located
Water temperature	1m below the water surface must not differ by more than 5 K from that of the sample
Test duration	30 min

### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

Before and after the immersion test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

#### Visual inspection

After the test IPX7 the EUT will be examined externally for damage and any other alterations.

# 5 Realization

# The tests for the degree of protection IP67 for the two MK11/S8-1A66B-500W,

were carried out according to the test program (sections 4.1 to 4.3), in compliance with the specifications of the current standards and with the demands of the client.

#### Visual inspection

After the tests IP6X (substitute test with long term submersion) and IPX7 (immersion test), the specimens were examined for external damage and any other alterations.

#### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

According to the demands of the client, the insulation resistances of the EUT were measured before and after the substitute test with long term submersion and the high pressure steam jets test.

For this, the following test setup was realized:

- two connecting lines were bridged with the shielded cable and measured against the sensor housing

The measurements were done with 500 VDC.

### Acceptance criteria

The *protection against access to hazardous parts IP6X* is proven when a test wire  $(\emptyset \ 1 \ \text{mm}, \text{ force } 1 \ \text{N})$  cannot penetrate the housing of the specimen.

The protection against solid foreign objects IP6X (dust tight) is satisfactory,

if at the end of the test no visible dust deposits are detected inside the housing of the specimen.

The *protection against temporary immersion IPX7* is considered proven if after the completion of the test no water has penetrated into the sample, or if it has it is in a quantity such that it does not impair the proper functioning or safety of the equipment.

Name	Туре	Serial No.	Maker	Remarks
Rigid IEC-steel wire	P 10.27	5011594	PTL	Access to hazardous parts test IP6KX
Dipping basin	-	-	AUCOTEAM	Substitute test for IP6X
Dip tank	TB 500L	-	AUCOTEAM	Immersion test IPX7
Portable compact tester	91-4A	0000035268	ELABO	Insulation resistance measurement

### Measurement and test devices



test report-No. 9790.02 / 13 page 4 / 4

# 6 <u>Results</u>

The tests for the certification of the *degrees of protection IP67* for the two *MK11/S8-1A66B-500W* with

- Protection against access to hazardous parts IP6X
- Protection against solid foreign objects IP6X
- Protection against immersion IPX7

neither mechanical damages nor any other changes of the specimen were determined.

# 6.1 Protection against access to hazardous parts IP6X

according to the IEC 60 529 § 13.2

The standardized test wire (Ø 1 mm, force 1 N) could not penetrate into the three housings.

# 6.2 Degrees of protection test IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IP6X	Insulation resistance after the test IP6X	Results
#2 1	537 V DC	535 V DC	OK
	> 999,99 MOhm	> 999,99 MOhm	UN
# <u>2</u> 2	535 V DC	539 V DC	OK
#Z.Z	> 999,99 MOhm	> 999,99 MOhm	UK

# 6.3 Immersion test IPX7 (temporary submersion)

according to the IEC 60529 § 14.2.7

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IPX7	Insulation resistance after the test IPX7	Results
#2.1	535 V DC > 999,99 MOhm	533 V DC > 999,99 MOhm	ок
#2.2	539 V DC > 999,99 MOhm	535 V DC > 999,99 MOhm	ОК

The tests were carried out according to the specifications of the standards and to the demands of the client.

The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

The further evaluation will be done by the client.

The results of the tests refer only to the above mentioned equipment under test. This report, or individual pages of this test report, may only be copied following the written consent of the testing laboratory. This test report No. 9790.02 / 13 includes 4 pages and 1 appendix – Pictures.



### appendix to test report-No. 9790.02 / 13 page 1 / 2

### **Pictures**



picture 1 MK11/S8-1A66B-500W - #2.1 and #2.2 with test wire (Ø 1 mm, 1N) before the protection against hazardous parts IP6X



picture 3 MK11/S8-1A66B-500W - #2.1 during the insulation resistance measurement before and after the tests IP6X and IPX7



picture 5 MK11/S8-1A66B-500W - #2.1 and #2.2 in the dip tank at a depth of 20 cm during the test IP6X (substitute test)



picture 2 MK11/S8-1A66B-500W with test wire (Ø 1 mm, 1N) on the EUT (#2.1) during the protection against hazardous parts IP6X



picture 4 MK11/S8-1A66B-500W - #2.2 during the insulation resistance measurement before and after the tests IP6X and IPX7



picture 6 MK11/S8-1A66B-500W - #2.1 and #2.2 without visible external damage after the test IP6X (substitute test)



### appendix to test report-No. 9790.02 / 13 page 2 / 2



Picture 7 MK11/S8-1A66B-500W - #2.1 and #2.2 mounted on a test frame after the immersion test IPX7



Picture 8 MK11/S8-1A66B-500W - #2.1 and #2.2 in the dip tank at a depth of 1 m after the immersion test IPX7



Picture 9 MK11/S8-1A66B-500W - #2.1 and #2.2 mounted on a test frame after the immersion test IPX7



Picture 10 MK11/S8-1A66B-500W - #2.1 and #2.2 without visible external damage after the immersion test IPX7

AUCOTEAM INGENIEURGESELLSCHAFT FÜR AUTOMATISIERUNGS- UND COMPUTERTECHNIK

Testing laboratory for climatic, mechanical and corrosive environmental stress

	RTIFICATE of QU	ALIT	Y TEST	
DAP-PL-3439.00	Test report - No. 9790.06 / 13			
Client	MEDER electronic AG Robert-Bosch-Straße 4 78244 Singen			
Equipment under test	MK21P-1A66B-500W			
	ArtNo.	921266	1054	
	Date	13.03.2013		
	Quantity	2 Samp	les (#6.1 and #6.2)	
Purpose	Tests for the certification of th according to the standards an	e degre d to the	e of protection IP67 demands of the client.	
Test program	Protection against access to hazardous parts	IP6X	according to the IEC 60529	
	Protection against solid foreign objects	IP6X	according to the IEC 60529	
	Protection against solid foreign objects Protection against immersion	IP6X IPX7	according to the IEC 60529 according to the IEC 60529	
Test period	Protection against solid foreign objects Protection against immersion 03 April to 05 April 2013	IP6X IPX7	according to the IEC 60529 according to the IEC 60529	
Test period Realization / results	Protection against solid foreign objects Protection against immersion 03 April to 05 April 2013 see page 2 to 4	IP6X IPX7	according to the IEC 60529 according to the IEC 60529	

**Test result** The tests were carried out according to the specifications of the standards and to the demands of the client.

> The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

> > Berliner Volksbank

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The further evaluation will be done by the client.

to-

Dipl.-Ing. R. Lein Head of test lab / test manager

Berlin, 18 April 2013

Sitz der Gesellschaft: Berlin Amtsgericht Berlin Charlottenburg HRB 38393 Ust-ID-Nr.: DE 137 190 620 Geschäftsführer: Dipl.-Ing. Werner Zuchhold, Dipl.-Ing. Bernd Rhiemeier



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M.Eng. M. Sommerfeld Test engineer

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# 1 <u>Purpose</u>

test report-No. 9790.06 / 13 page 2 / 4

The tests for the certification of the *degrees of protection IP67* for the two *MK21P-1A66B-500W* were performed according to the specifications of the current standards and to the demands of the client.

# 2 Equipment under test (E.U.T.)

MK21P-1A66B-500W	
ArtNo.	9212661054
Date	13.03.2013
Quantity	2 Samples (#6.1 and #6.2)

# 3 Basics

# 3.1 Demands of the client

### 3.2 Used standards

IEC 60529:1989 + A1:1999 DIN EN 60529; VDE 0470-1:2000-09 "Degrees of protection provided by enclosures (IP code)"

# 4 Test program

### **4.1** <u>Degree of protection IP6X (protection against access to hazardous parts)</u> according to the IEC 60529 § 13.2

Before the dust test, the *protection against access to hazardous parts IP6X* shall be verified using a standardized wire. The access probe  $\emptyset$  1.0 mm (force 1 N) must not penetrate the housing at any point.

### 4.2 Degrees of protection tests IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

For the *dust test IP6X* the standard demands the use of vacuum. If no vacuum can be applied, because the EUT is a one piece cast, the VDE states that the substitute water test with a subsequent insulation measurement test can be performed instead.

EUTnot in functionEUT positionhorizontal lying

### Substitute water test for coated /cast specimens

The EUT will be placed in water for approx. 24 h at a depth of 20 cm. If after the test the insulation resistance remains unchanged, then the form closure of the casting compound is rendered. It can be then assumed that dust with vacuum would not be able to penetrate the specimen.

Insulation resistance measurement (measurement parameters 500 V DC, 1 minute) Before and after the high pressure steam jets test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

### Visual inspection

After the test IP6X the EUT will be examined externally for damage and any other alterations.



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# 4.3 Immersion test IPX7 (temporary submersion)

according to the IEC of	JJ29 § 14.2.7
EUT EUT position	not in function horizontal lying
Test device Water depth Boundary condition	dip tank 1 m the lowest point of the sample must be located
Water temperature	1m below the water surface must not differ by more than 5 K from that of the sample
Test duration	30 min

### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

Before and after the immersion test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

### Visual inspection

After the test IPX7 the EUT will be examined externally for damage and any other alterations.

# 5 Realization

### The tests for the degree of protection IP67 for the two MK21P-1A66B-500W,

were carried out according to the test program (sections 4.1 to 4.3), in compliance with the specifications of the current standards and with the demands of the client.

#### Visual inspection

After the tests IP6X (substitute test with long term submersion) and IPX7 (immersion test), the specimens were examined for external damage and any other alterations.

#### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

According to the demands of the client, the insulation resistances of the EUT were measured before and after the substitute test with long term submersion and the high pressure steam jets test.

For this, the following test setup was realized:

- two connecting lines were bridged with the shielded cable and measured against the sensor housing

The measurements were done with 500 VDC.

### Acceptance criteria

The **protection against access to hazardous parts IP6X** is proven when a test wire (Ø 1 mm, force 1 N) cannot penetrate the housing of the specimen.

The protection against solid foreign objects IP6X (dust tight) is satisfactory,

if at the end of the test no visible dust deposits are detected inside the housing of the specimen.

The *protection against temporary immersion IPX7* is considered proven if after the completion of the test no water has penetrated into the sample, or if it has it is in a quantity such that it does not impair the proper functioning or safety of the equipment.

Name	Туре	Serial No.	Maker	Remarks
Rigid IEC-steel wire	P 10.27	5011594	PTL	Access to hazardous parts test IP6KX
Dipping basin	-	-	AUCOTEAM	Substitute test for IP6X
Dip tank	TB 500L	-	AUCOTEAM	Immersion test IPX7
Portable compact tester	91-4A	0000035268	ELABO	Insulation resistance measurement

### Measurement and test devices



test report-No. 9790.06 / 13 page 4 / 4

# 6 <u>Results</u>

The tests for the certification of the *degrees of protection IP67* for the two *MK21P-1A66B-500W* with

- Protection against access to hazardous parts IP6X
- Protection against solid foreign objects IP6X
- Protection against immersion IPX7

neither mechanical damages nor any other changes of the specimen were determined.

# 6.1 Protection against access to hazardous parts IP6X

according to the IEC 60 529 § 13.2

The standardized test wire (Ø 1 mm, force 1 N) could not penetrate into the three housings.

# 6.2 Degrees of protection test IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IP6X	Insulation resistance after the test IP6X	Results
#6.1	533 V DC > 999.99 MOhm	537 V DC > 999.99 MOhm	ОК
#6.2	536 V DC > 999,99 MOhm	535 V DC > 999,99 MOhm	OK

# 6.3 Immersion test IPX7 (temporary submersion)

according to the IEC 60529 § 14.2.7

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IPX7	Insulation resistance after the test IPX7	Results
#6.1	537 V DC > 999,99 MOhm	536 V DC > 999,99 MOhm	ок
#6.2	535 V DC > 999,99 MOhm	536 V DC > 999,99 MOhm	ОК

The tests were carried out according to the specifications of the standards and to the demands of the client.

The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

The further evaluation will be done by the client.

The results of the tests refer only to the above mentioned equipment under test. This report, or individual pages of this test report, may only be copied following the written consent of the testing laboratory. This test report No. 9790.06 / 13 includes 4 pages and 1 appendix – Pictures.



### appendix to test report-No. 9790.06 / 13 page 1 / 2

# **Pictures**



picture 1 MK21P-1A66B-500W - #6.1 and #6.2 with test wire (Ø 1 mm, 1N) before the protection against hazardous parts IP6X



picture 3 MK21P-1A66B-500W - #6.1 during the insulation resistance measurement before and after the tests IP6X and IPX7



picture 5 MK21P-1A66B-500W - #6.1 and #6.2 in the dip tank at a depth of 20 cm during the test IP6X (substitute test)



picture 2 MK21P-1A66B-500W with test wire (Ø 1 mm, 1N) on the EUT (#6.1) during the protection against hazardous parts IP6X



picture 4 MK21P-1A66B-500W - #6.2 during the insulation resistance measurement before and after the tests IP6X and IPX7



picture 6 MK21P-1A66B-500W - #6.1 and #6.2 without visible external damage after the test IP6X (substitute test)



### appendix to test report-No. 9790.06 / 13 page 2 / 2



Picture 7 MK21P-1A66B-500W - #6.1 and #6.2 mounted on a test frame after the immersion test IPX7



Picture 8 MK21P-1A66B-500W - #6.1 and #6.2 in the dip tank at a depth of 1 m after the immersion test IPX7



Picture 9 MK21P-1A66B-500W - #6.1 and #6.2 mounted on a test frame after the immersion test IPX7



Picture 10 MK21P-1A66B-500W - #6.1 and #6.2 without visible external damage after the immersion test IPX7

AUCOTEAM INGENIEURGESELLSCHAFT FÜR AUTOMATISIERUNGS- UND COMPUTERTECHNIK

Testing laboratory for climatic, mechanical and corrosive environmental stress

	RTIFICATE of QU	ALIT	Y TEST	
DAP-PL-3439.00	Test report - No. 9790.05 / 13			
Client	MEDER electronic AG Robert-Bosch-Straße 4 78244 Singen			
Equipment under test	MK26-1A66B-500W			
	ArtNo. 926266054		054	
	Date	13.03.2013		
	Quantity	2 Samp	les (#5.1 and #5.2)	
Purpose	Tests for the certification of th according to the standards an	e degree d to the	e of protection IP67 demands of the client.	
Test program	Protection against access to hazardous parts	IP6X	according to the IEC 60529	
	Protection against solid foreign objects	IP6X	according to the IEC 60529	
	Protection against immersion	IPX7	according to the IEC 60529	
Test period	03 April to 05 April 2013			
Realization / results	see page 2 to 4			
Total number of pages	6 (incl. 1 appendix)			

**Test result** The tests were carried out according to the specifications of the standards and to the demands of the client.

> The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

> > Berliner Volksbank

(BLZ 100 900 00) 830 184 1028

Commerzbank AG (BLZ 100 800 00) 04 004 292 00

The further evaluation will be done by the client.

to-

Dipl.-Ing. R. Lein Head of test lab / test manager

Berlin, 18 April 2013

Sitz der Gesellschaft: Berlin Amtsgericht Berlin Charlottenburg HRB 38393 Ust-ID-Nr.: DE 137 190 620 Geschäftsführer: Dipl.-Ing. Werner Zuchhold, Dipl.-Ing. Bernd Rhiemeier



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M.Eng. M. Sommerfeld Test engineer

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# 1 <u>Purpose</u>

test report-No. 9790.05 / 13 page 2 / 4

The tests for the certification of the *degrees of protection IP67* for the two *MK26-1A66B-500W* were performed according to the specifications of the current standards and to the demands of the client.

# 2 Equipment under test (E.U.T.)

MK26-1A66B-500W	
ArtNo.	926266054
Date	13.03.2013
Quantity	2 Samples (#5.1 and #5.2)

# 3 Basics

# 3.1 Demands of the client

# 3.2 Used standards

IEC 60529:1989 + A1:1999 DIN EN 60529; VDE 0470-1:2000-09 "Degrees of protection provided by enclosures (IP code)"

# 4 Test program

### **4.1** <u>Degree of protection IP6X (protection against access to hazardous parts)</u> according to the IEC 60529 § 13.2

Before the dust test, the *protection against access to hazardous parts IP6X* shall be verified using a standardized wire. The access probe  $\emptyset$  1.0 mm (force 1 N) must not penetrate the housing at any point.

### 4.2 Degrees of protection tests IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

For the *dust test IP6X* the standard demands the use of vacuum. If no vacuum can be applied, because the EUT is a one piece cast, the VDE states that the substitute water test with a subsequent insulation measurement test can be performed instead.

EUTnot in functionEUT positionhorizontal lying

### Substitute water test for coated /cast specimens

The EUT will be placed in water for approx. 24 h at a depth of 20 cm. If after the test the insulation resistance remains unchanged, then the form closure of the casting compound is rendered. It can be then assumed that dust with vacuum would not be able to penetrate the specimen.

Insulation resistance measurement (measurement parameters 500 V DC, 1 minute) Before and after the high pressure steam jets test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

### Visual inspection

After the test IP6X the EUT will be examined externally for damage and any other alterations.



test report-No. 9790.05 / 13 page 3 / 4

# 4.3 Immersion test IPX7 (temporary submersion)

according to the IEC of	JJ29 § 14.2.7
EUT EUT position	not in function horizontal lying
Test device Water depth Boundary condition	dip tank 1 m the lowest point of the sample must be located
Water temperature	1m below the water surface must not differ by more than 5 K from that of the sample
Test duration	30 min

### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

Before and after the immersion test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

### Visual inspection

After the test IPX7 the EUT will be examined externally for damage and any other alterations.

# 5 Realization

### The tests for the degree of protection IP67 for the two MK26-1A66B-500W,

were carried out according to the test program (sections 4.1 to 4.3), in compliance with the specifications of the current standards and with the demands of the client.

#### Visual inspection

After the tests IP6X (substitute test with long term submersion) and IPX7 (immersion test), the specimens were examined for external damage and any other alterations.

#### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

According to the demands of the client, the insulation resistances of the EUT were measured before and after the substitute test with long term submersion and the high pressure steam jets test.

For this, the following test setup was realized:

- two connecting lines were bridged with the shielded cable and measured against the sensor housing

The measurements were done with 500 VDC.

### Acceptance criteria

The *protection against access to hazardous parts IP6X* is proven when a test wire  $(\emptyset \ 1 \ \text{mm}, \text{ force } 1 \ \text{N})$  cannot penetrate the housing of the specimen.

The protection against solid foreign objects IP6X (dust tight) is satisfactory,

if at the end of the test no visible dust deposits are detected inside the housing of the specimen.

The *protection against temporary immersion IPX7* is considered proven if after the completion of the test no water has penetrated into the sample, or if it has it is in a quantity such that it does not impair the proper functioning or safety of the equipment.

Name	Туре	Serial No.	Maker	Remarks
Rigid IEC-steel wire	P 10.27	5011594	PTL	Access to hazardous parts test IP6KX
Dipping basin	-	-	AUCOTEAM	Substitute test for IP6X
Dip tank	TB 500L	-	AUCOTEAM	Immersion test IPX7
Portable compact tester	91-4A	0000035268	ELABO	Insulation resistance measurement

### Measurement and test devices



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# 6 <u>Results</u>

The tests for the certification of the *degrees of protection IP67* for the two *MK26-1A66B-500W* with

- Protection against access to hazardous parts IP6X
- Protection against solid foreign objects IP6X
- Protection against immersion IPX7

neither mechanical damages nor any other changes of the specimen were determined.

# 6.1 Protection against access to hazardous parts IP6X

according to the IEC 60 529 § 13.2

The standardized test wire (Ø 1 mm, force 1 N) could not penetrate into the three housings.

# 6.2 Degrees of protection test IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IP6X	Insulation resistance after the test IP6X	Results
#5 1	536 V DC	536 V DC	OK
#5.1	> 999,99 MOhm	> 999,99 MOhm	UN
<i>μ</i> ε Ο	533 V DC	539 V DC	OK
#9.Z	> 999,99 MOhm	> 999,99 MOhm	UK

# 6.3 Immersion test IPX7 (temporary submersion)

according to the IEC 60529 § 14.2.7

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IPX7	Insulation resistance after the test IPX7	Results
#5.1	536 V DC > 999,99 MOhm	536 V DC > 999,99 MOhm	ок
#5.2	539 V DC > 999,99 MOhm	533 V DC > 999,99 MOhm	ок

The tests were carried out according to the specifications of the standards and to the demands of the client.

The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

The further evaluation will be done by the client.

The results of the tests refer only to the above mentioned equipment under test. This report, or individual pages of this test report, may only be copied following the written consent of the testing laboratory. This test report No. 9790.05 / 13 includes 4 pages and 1 appendix – Pictures.



### appendix to test report-No. 9790.05 / 13 page 1 / 2

# **Pictures**



picture 1 MK26-1A66B-500W - #5.1 and #5.2 with test wire (Ø 1 mm, 1N) before the protection against hazardous parts IP6X



picture 3 MK26-1A66B-500W - #5.1 during the insulation resistance measurement before and after the tests IP6X and IPX7



picture 5 MK26-1A66B-500W - #5.1 and #5.2 in the dip tank at a depth of 20 cm during the test IP6X (substitute test)



picture 2 MK26-1A66B-500W with test wire (Ø 1 mm, 1N) on the EUT (#5.1) during the protection against hazardous parts IP6X



picture 4 MK26-1A66B-500W - #5.2 during the insulation resistance measurement before and after the tests IP6X and IPX7



picture 6 MK26-1A66B-500W - #5.1 and #5.2 without visible external damage after the test IP6X (substitute test)



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Picture 7 MK26-1A66B-500W - #5.1 and #5.2 mounted on a test frame after the immersion test IPX7



Picture 8 MK26-1A66B-500W - #5.1 and #5.2 in the dip tank at a depth of 1 m after the immersion test IPX7



Picture 9 MK26-1A66B-500W - #5.1 and #5.2 mounted on a test frame after the immersion test IPX7



Picture 10 MK26-1A66B-500W - #5.1 and #5.2 without visible external damage after the immersion test IPX7

AUCOTEAM INGENIEURGESELLSCHAFT FÜR AUTOMATISIERUNGS- UND COMPUTERTECHNIK

Testing laboratory for climatic, mechanical and corrosive environmental stress

	RTIFICATE of QU	ALIT	Y TEST	
DAP-PL-3439.00	Test report - No. 9790.07 / 13			
Client	MEDER electronic AG Robert-Bosch-Straße 4 78244 Singen			
Equipment under test	MK27-1A66B-500W			
	ArtNo.	927266	054	
	Date	26.03.2013		
	Quantity	2 Samp	les (#7.1 and #7.2)	
Purpose	Tests for the certification of the degree of protection IP67 according to the standards and to the demands of the client.			
Test program	Protection against access to hazardous parts	IP6X	according to the IEC 60529	
	Protection against solid foreign objects	IP6X	according to the IEC 60529	
	Protection against immersion	IPX7	according to the IEC 60529	
Test period	03 April to 05 April 2013			
Realization / results	see page 2 to 4			
Total number of pages	6 (incl. 1 appendix)			

**Test result** The tests were carried out according to the specifications of the standards and to the demands of the client.

> The insulation resistance of the specimens remained unchanged after the tests IP6X and IPX7.

> > Berliner Volksbank

(BLZ 100 900 00) 830 184 1028

Commerzbank AG (BLZ 100 800 00) 04 004 292 00

The further evaluation will be done by the client.

to-

Dipl.-Ing. R. Lein Head of test lab / test manager

Berlin, 18 April 2013

Sitz der Gesellschaft: Berlin Amtsgericht Berlin Charlottenburg HRB 38393 Ust-ID-Nr.: DE 137 190 620 Geschäftsführer: Dipl.-Ing. Werner Zuchhold, Dipl.-Ing. Bernd Rhiemeier



AUCOTEAM GmbH Storkower Straße 115 a 10407 Berlin Telefon: (030) 4 21 88 - 0 Telefax: (030) 4 23 27 09 http://www.aucoteam.de

4. Somuell

M.Eng. M. Sommerfeld Test engineer

W.tuv.c TÜVRheinla 0.0910095



# 1 <u>Purpose</u>

# test report-No. 9790.07 / 13 page 2 / 4

The tests for the certification of the *degrees of protection IP67* for the two *MK27-1A66B-500W* were performed according to the specifications of the current standards and to the demands of the client.

# 2 Equipment under test (E.U.T.)

MK27-1A66B-500W	
ArtNo.	927266054
Date	26.03.2013
Quantity	2 Samples (#7.1 and #7.2)

# 3 Basics

### 3.1 Demands of the client

### 3.2 Used standards

IEC 60529:1989 + A1:1999 DIN EN 60529; VDE 0470-1:2000-09 "Degrees of protection provided by enclosures (IP code)"

# 4 Test program

### **4.1** <u>Degree of protection IP6X (protection against access to hazardous parts)</u> according to the IEC 60529 § 13.2

Before the dust test, the *protection against access to hazardous parts IP6X* shall be verified using a standardized wire. The access probe  $\emptyset$  1.0 mm (force 1 N) must not penetrate the housing at any point.

### 4.2 Degrees of protection tests IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

For the *dust test IP6X* the standard demands the use of vacuum. If no vacuum can be applied, because the EUT is a one piece cast, the VDE states that the substitute water test with a subsequent insulation measurement test can be performed instead.

EUTnot in functionEUT positionhorizontal lying

### Substitute water test for coated /cast specimens

The EUT will be placed in water for approx. 24 h at a depth of 20 cm. If after the test the insulation resistance remains unchanged, then the form closure of the casting compound is rendered. It can be then assumed that dust with vacuum would not be able to penetrate the specimen.

Insulation resistance measurement (measurement parameters 500 V DC, 1 minute) Before and after the high pressure steam jets test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

### Visual inspection

After the test IP6X the EUT will be examined externally for damage and any other alterations.



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# 4.3 Immersion test IPX7 (temporary submersion)

according to the IEC of	JJ29 § 14.2.7
EUT EUT position	not in function horizontal lying
Test device Water depth Boundary condition	dip tank 1 m the lowest point of the sample must be located
Water temperature	1m below the water surface must not differ by more than 5 K from that of the sample
Test duration	30 min

### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

Before and after the immersion test, the EUT will undergo an insulation resistance measurement according to the specifications of the client.

### Visual inspection

After the test IPX7 the EUT will be examined externally for damage and any other alterations.

# 5 Realization

### The tests for the degree of protection IP67 for the two MK27-1A66B-500W,

were carried out according to the test program (sections 4.1 to 4.3), in compliance with the specifications of the current standards and with the demands of the client.

#### Visual inspection

After the tests IP6X (substitute test with long term submersion) and IPX7 (immersion test), the specimens were examined for external damage and any other alterations.

#### Insulation resistance measurement (measurement parameters 500 V DC, 1 minute)

According to the demands of the client, the insulation resistances of the EUT were measured before and after the substitute test with long term submersion and the high pressure steam jets test.

For this, the following test setup was realized:

- two connecting lines were bridged with the shielded cable and measured against the sensor housing

The measurements were done with 500 VDC.

### Acceptance criteria

The *protection against access to hazardous parts IP6X* is proven when a test wire  $(\emptyset \ 1 \ \text{mm}, \text{ force } 1 \ \text{N})$  cannot penetrate the housing of the specimen.

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if at the end of the test no visible dust deposits are detected inside the housing of the specimen.

The *protection against temporary immersion IPX7* is considered proven if after the completion of the test no water has penetrated into the sample, or if it has it is in a quantity such that it does not impair the proper functioning or safety of the equipment.

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Portable compact tester	91-4A	0000035268	ELABO	Insulation resistance measurement

### Measurement and test devices



test report-No. 9790.07 / 13 page 4 / 4

# 6 <u>Results</u>

The tests for the certification of the *degrees of protection IP67* for the two *MK27-1A66B-500W* with

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# 6.2 Degrees of protection test IP6X – Substitute test with long term submersion

according to the VDE-regulation and as agreed upon with the client

The insulation resistance of the specimens was unchanged after the test.

The following insulation resistance values were recorded before and after the water tightness test:

EUT No.	Insulation resistance before the test IP6X	Insulation resistance after the test IP6X	Results
#7 1	533 V DC	532 V DC	0K
#1.1	> 999,99 MOhm	> 999,99 MOhm	UK
#7 O	536 V DC	535 V DC	OK
#1.Z	> 999,99 MOhm	> 999,99 MOhm	UK

# 6.3 Immersion test IPX7 (temporary submersion)

according to the IEC 60529 § 14.2.7

The insulation resistance of the specimens was unchanged after the test.

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### appendix to test report-No. 9790.07 / 13 page 1 / 2

# **Pictures**



picture 1 MK27-1A66B-500W - #7.1 and #7.2 with test wire (Ø 1 mm, 1N) before the protection against hazardous parts IP6X



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### appendix to test report-No. 9790.07 / 13 page 2 / 2



Picture 7 MK27-1A66B-500W - #7.1 and #7.2 mounted on a test frame after the immersion test IPX7



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Picture 10 MK27-1A66B-500W - #7.1 and #7.2 without visible external damage after the immersion test IPX7