ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

Combined power and signal input connector specially designed for servo motors.

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- 1.2 Recommended method of mounting
- 1.3 Ratings and characteristics
- 1.4 Normative references
- 1.5 Ordering information / Part list

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ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

1. General information

1.1 Scope

This specification defines a motor connector including max. 4 high power contacts and up to 12 signal contacts. The connector is specially designed for servo drives. Signal and power connectors are integrated in a metal housing. The design allows maximum of power by minimum size.

1.2 Recommended method of mounting

The connector housing is fixed with 4 screws on the housing of the servo drive. Maximum 2 signal connectors including 6 contacts each could be used for signal input lines. They are fixed in guide slots inside the housing. 4 power contacts (3+PE) are available for the power supply. According to application, different contact types and sizes could be used. Housing with grounding feature is available optionally for high voltage application.

1.3 Ratings and characteristics

Wire sizes:	Power contacts:	
	Cable side (socket)	0,6 mm² - 1,5 mm²
	Motor side (pin)	0,25 mm² - 1,5 mm²
	Signal contacts:	
	Cable side (socket)	0,08 mm² - 1,0 mm²
	Motor side (pin)	0,08 mm² - 0,5 mm²
Voltage proof *(Dielectric strength)*	Contact/contact > 640 Vr.m.s Contact/shield > 640 Vr.m.s	
Current rating (at 80°C)	Power contacts 10 A Signal contacts 2 A *For detailed information, please see derating curve.*	
Insulation resistance	5000 MΩ	
Climatic category	-25/125/56	
Water tightness	IP65 (CR sealing *) / IP67 (FKM sealing) ** please ask customer service for detailed information*	

1.4 Normative references (the issue of the specification will not be updated)

DIN EN 61984
IEC 60068
IEC 60352
IEC 60512
IEC 60529
VG 95373

1.5 Ordering information / Part list

For ordering information please contact customer service.

ITT

PRODUCT SPECIFICATION

Cm2 - Motor Connector
(high voltage version)

CAS21050E

HOUSING ORDER CODE

CM2-HV	-	B	L	W	C	1	-	2	0	-	1	1	1	1	-	0

Designation
CM2-HV

Housing / Shielding Barrier
1 with earth clip
0 without earth clip

Fixing screws
W With 4 screws
0 Without screws

Cover
1 With cover
0 Without cover

Sealing Class / Material
1 IP65 (CR black) *
2 IP 67 (FKM green)

Plating
0 Unplated
1 Light chromated

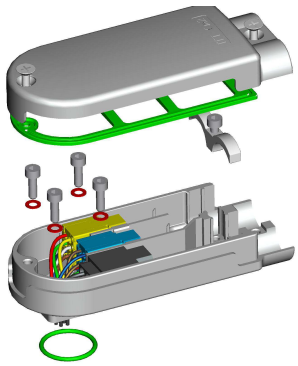
Power connector
0 Coding 0 (version with earth clip)
1 Coding 1 (version without earth clip)

Signal Coding 0 (red) [optional]
0 Without Insulator
1 With insulator

Signal Coding 1 (blue)
0 Without Insulator
1 With insulator

Signal Coding 2 (yellow)
0 Without Insulator
1 With insulator

Modification VS Code
0 no code
1 TBD



Contact Motor Side	Required	Packaging Unit	Order Number
D-Sub signal pin / 0,25-0,5 mm²	12 x	5,000 per reel	980-2000-945
(D-Sub signal pin / 0,08-0,2 mm²)	(12 x)	5,000 per reel	980-2000-946
Power pin / 0,25 – 0,5 mm²	4	100	430-8565-300
*Power pin / 0,6 – 1,5 mm²	4	100	430-8565-3xx

* Please contact customer service for more information (reserved for future use)

CABLE SIDE ORDER CODE

Cable Power Cable Signal Insulator

CM2-HV	-	P	1	-	S	1	-	1	-	1	1	1	1	-	0

Designation
CM2-HV

Power

Cable diameter
0 Without Power Line
1 Cable diameter 6.1 -7.0 mm
2 Cable diameter 7.1 – 8.0 mm

Signal

Cable diameter
0 Without Signal Line
1 Cable diameter 6.1-7.0 mm
2 Cable diameter 7.1 – 8.0 mm

Sealing Class / Material
1 IP65 (CR black) *
2 IP 67 (FKM green)

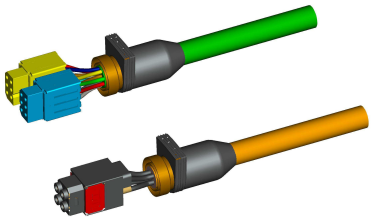
Power connector
0 Coding 0 (version with earth clip)
1 Coding 1 (version without earth clip)

Signal Coding 0 (red) [optional]
0 Without Insulator
1 With insulator

Signal Coding 1 (blue)
0 Without Insulator
1 With insulator

Signal Coding 2 (yellow)
0 Without Insulator
1 With insulator

Modification VS Code
0 no code
1 TBD



Contact Cable Side		Required	Packaging Unit	Order Number
Signal Socket:	1 mm Skt. / 0,14-1,0 mm²	max 12 x	100	980-8681-150
(Signal Socket opt.)	1 mm Spring wire (opt.)*	max 12 x	100	980-8681-023
Power Socket:	0,6mm² -1,5 mm²	3	100	031-8565-301
Power Earth Socket:	0,6 mm² - 1,5 mm²	1	100	031-8565-302

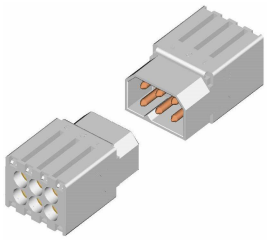
* Please contact customer service for more information (reserved for future use)

ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

2 Technical information

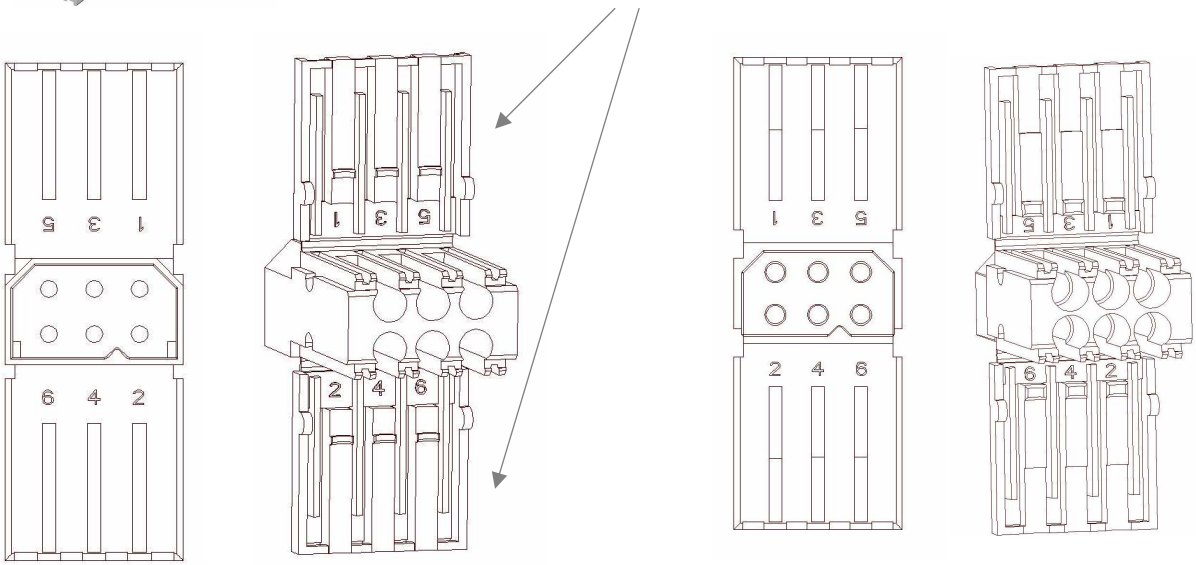
2.1 Mechanical coding and locking

Signal connector



Connectors are mechanically and colour coded. 3 coding versions are available actually. Every connector could take 6 signal contacts. Contact locking was realised by closing insulator cover, which is connected via a flexible film hinge.
These techniques allow easy contact assembly and removal without a tool.

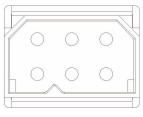
Flexible film hinge



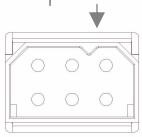
Insulator Pin

Insulator Socket

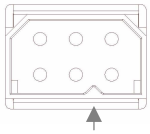
Coding Versions:



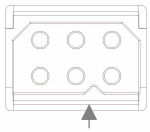
Coding: 0
Colour: red



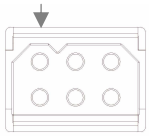
Coding: 1
Colour: blue



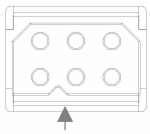
Coding 2
Colour: yellow



Coding: 0
Colour: red



Coding: 1
Colour: blue



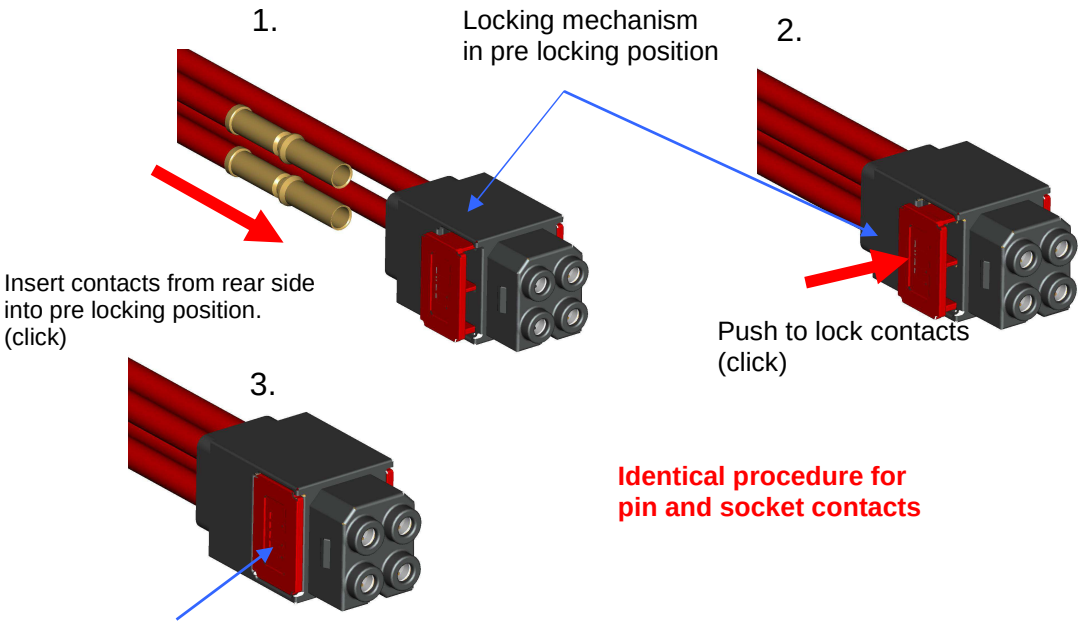
Coding: 2
Colour: yellow

ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

Power connector

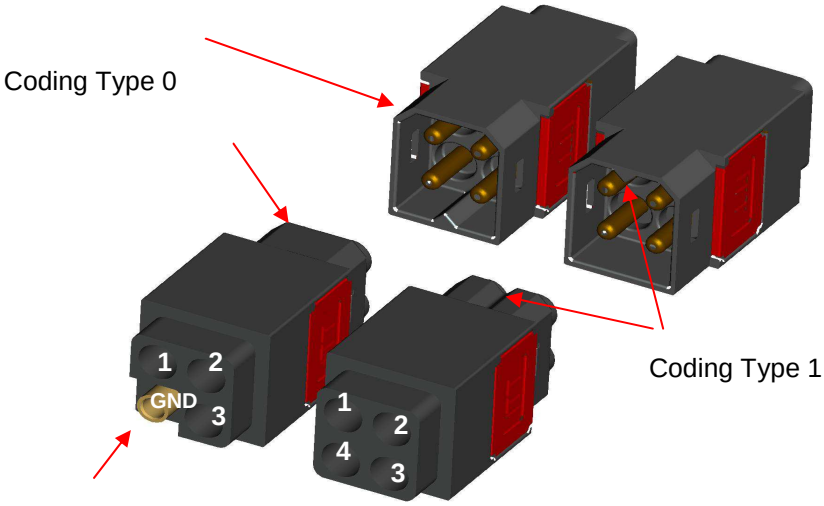
The power connector is mechanically coded to prevent wrong connection.

Connector is fixed in the metal housing through special guide bars to prevent disconnection during operation.



Identical procedure for pin and socket contacts

Coding Versions:
2 coding versions are available.
Coding depends on voltage rating:
Type 0 / version for ground contact / housing with earth clip.
Type 1 / version without grounding feature, for housing without earth clip.



Earth contact
(optional for high voltage application)

worked on:	checked:	Standard:	DCR Status:	Date of DCR:
TJ	GWE	-	A4885W	TJ 12.01.2015

ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

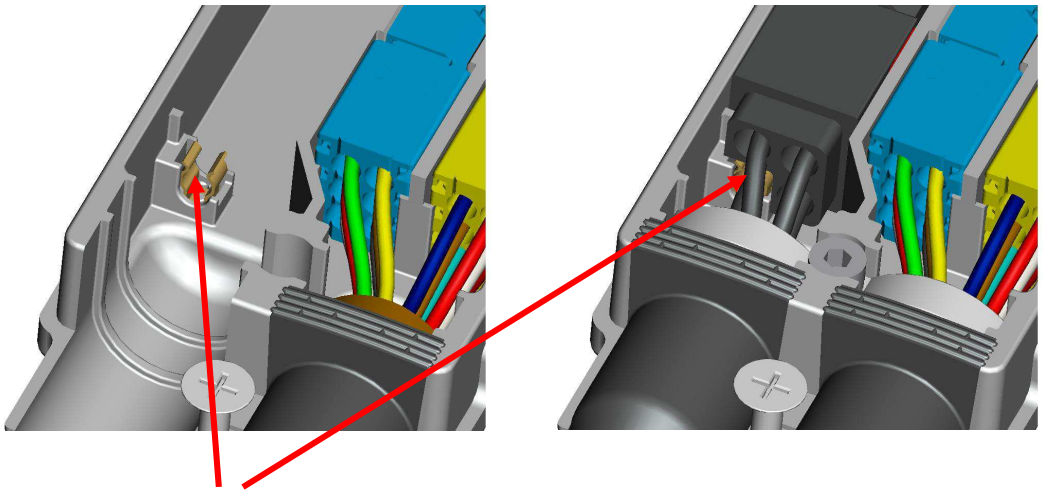
2.2 Surveys of styles and variants

Variable grounding:

Low-Voltage without grounding feature.
High-Voltage with grounding feature.

Table 1

Style “A”	Style “B”
High voltage version < 640 V 3 + PE Power 12 x Signal Housing with grounding clip	High current / low voltage version: < 48 V 4 x Power 12 Signal Without grounding clip



Style A: With grounding feature (show above picture)

Style B: without grounding feature (not shown)

ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

2.3 Information on application

Mounting position:
The connectors can be mounted in the vertical and horizontal position.

2.4 Shielding and grounding

Shielding 50 dB 10 kHz – 100 MHz.

Grounding:
Power connector including grounding feature:
A metal clip inside the connector housing makes the electrical contact between housing and earth contact ;(not required for style B)

2.5 Materials

- Insulators: PA
- Housing: Zinc die cast
  - Sealing: FKM (CR optional)
- Crimp Sleeve: Brass
- Contacts: Copper alloy

2.6 *Mass (weight)*
Weight of complete connector equipped with power connectors and 3 signal connectors (without cables): approx 120g

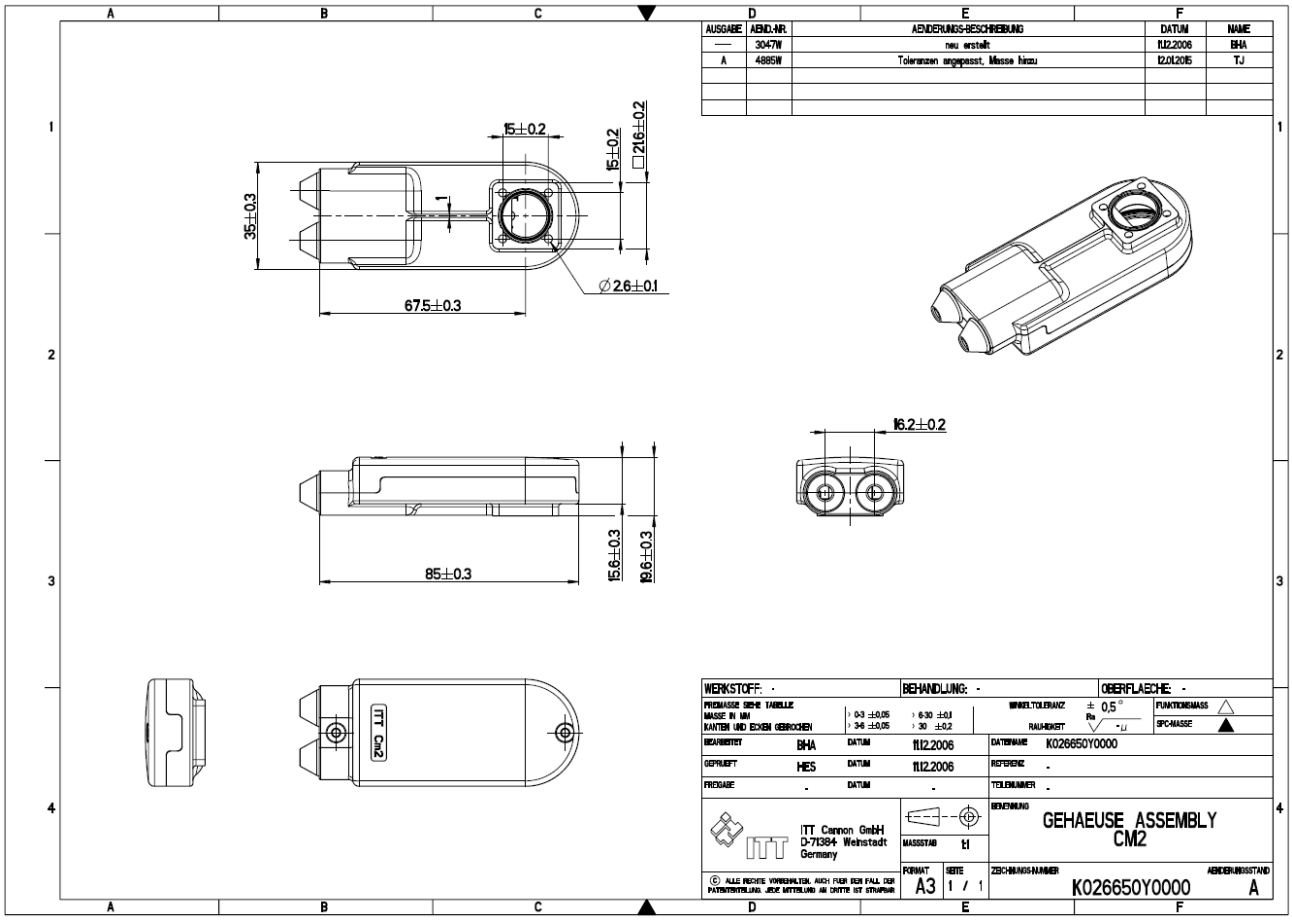
ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

3. Dimensional information

3.1 General

Connectors must not concur to depictions shown; only specific dimensions must be adhered to.

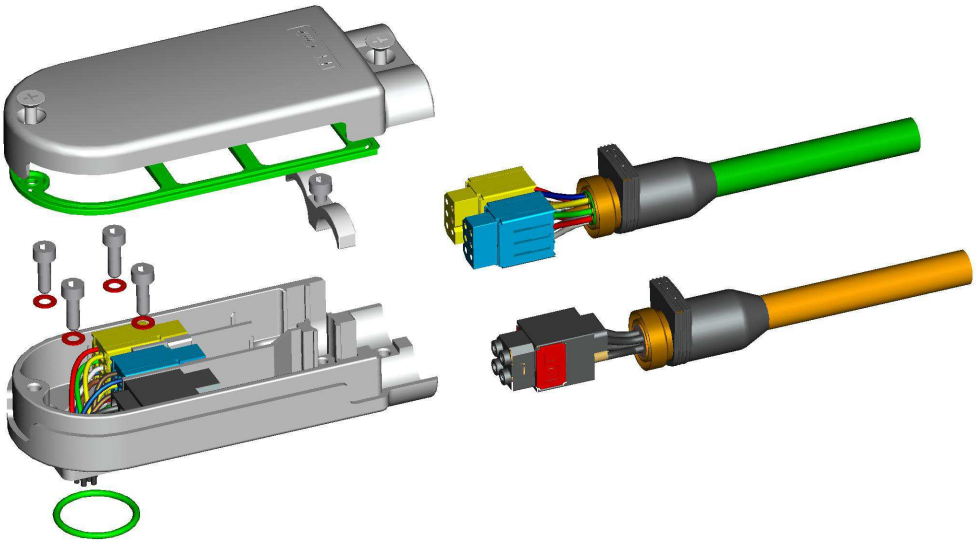
3.2 Common dimensions

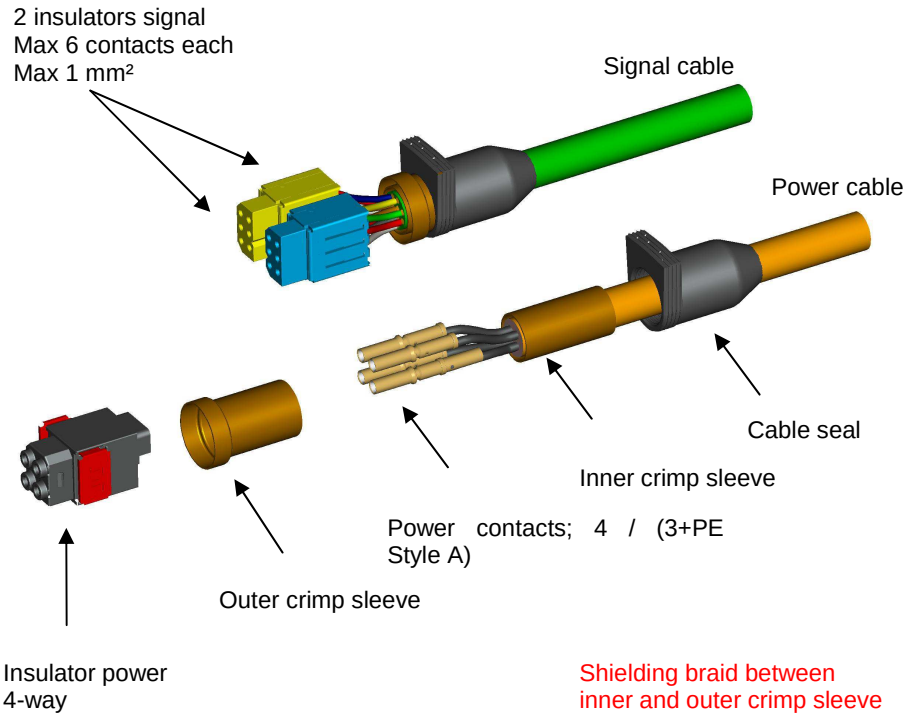


worked on:	checked:	Standard:	DCR Status:	Date of DCR:
TJ	GWE	-	A4885W	TJ 12.01.2015

ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

3.3 Axonometric projection:





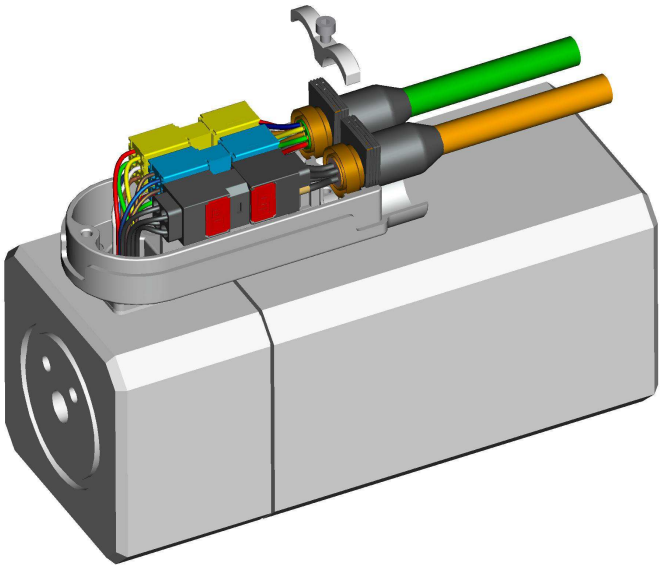
worked on:	checked:	Standard:	DCR Status:	Date of DCR:
TJ	GWE	-	A4885W	TJ 12.01.2015

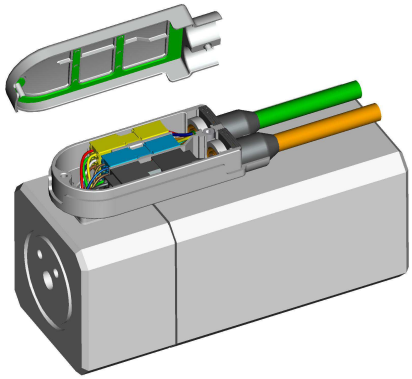
ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

3.4 Mating Information

3.4.1 Insulator assembly

Signal and power connector should be mounted together before they could be assembled into the housing. Guide slots inside the housing will fix the insulators in the right position.
Cover sealing will press the insulators against the cavity to avoid movement during operation.





3.4.2 Cable assembly

Crimp sleeves including cables are fixed inside the housing, by using a special cable clamp.

Screw: M 2,5 x 10 mm (DIN912)

Cable diameter / Signal: 6.0 mm – 8.0 mm

Cable diameter / Power 6.0 mm – 8,0 mm

Details for cable assembly see CAS 25040E

3.4.3 Mounting of the connector

Details please see CAS 25040E

ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

4. Characteristics

All mentioned characteristics are related to completely assembled connectors including sealing parts for housing and cover.

4.1 Climatic category

Table 7

Performance Level *)	Climatic Category according to	Category Temperature	
	IEC 60068 part 1	min(°C)	max(°C)
0	-25/125/56	-25	+125

	Damp Heat, steady state	
Temp.	rel. humidity	days
°C	%	
40	95	56

*) has to meet the required mating cycles and the climatic requirements

4.2 Electrical Characteristics

4.2.1 Air Clearance and Creepage Distance

Clearance and Creepage distance are in practice, reductions in clearance and creepage distances may occur due to the conductive pattern of the printed board and/or the wiring used and should be taken into account.

Table 8

Minimum Clearance and creepage distance (mm)		
	Style	MIN
Signal line <---> housing	clearance and creepage distance	1,5 mm
Signal line <---> signal	clearance and creepage distance	1,5 mm
Power line <---> housing	clearance and creepage distance	4,5 mm
Power line <---> earth contact	clearance and creepage distance	4,5 mm

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4.2.2 Voltage proof
Test according to IEC 60512-2, Test 4a

- Test between adjacent power contacts and between all power contacts in parallel against shield.
- Test between min. 5 adjacent couples of signal contacts and all signal contacts in parallel against shield.
- Test between all power contacts in parallel and all signal contacts in parallel

Table 9

Voltage proof at sea level	**Impulse withstanding voltage 1,2/50µs (kV)**	**RMS withstanding voltage (kV)**
Signal line		
contact/contact V r.m.s.	---	0,5
contact/shield V r.m.s.	---	0,5
Power line		
Contact/contact V r.m.s.	4,8	2,21
Contact / housing (shielding) V r.m.s.	4,8	2,21
1 Signal versus power line		
Contact/contact V r.m.s.	4,8	2,21

The test shall not cause breakdown or flashover.

ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

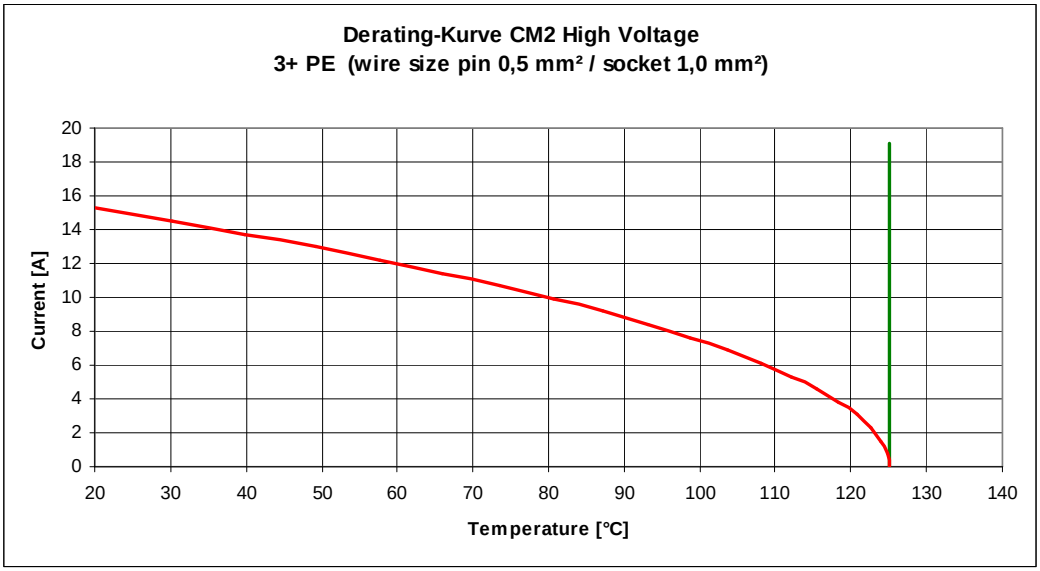
4.2.3 Current carrying capacity

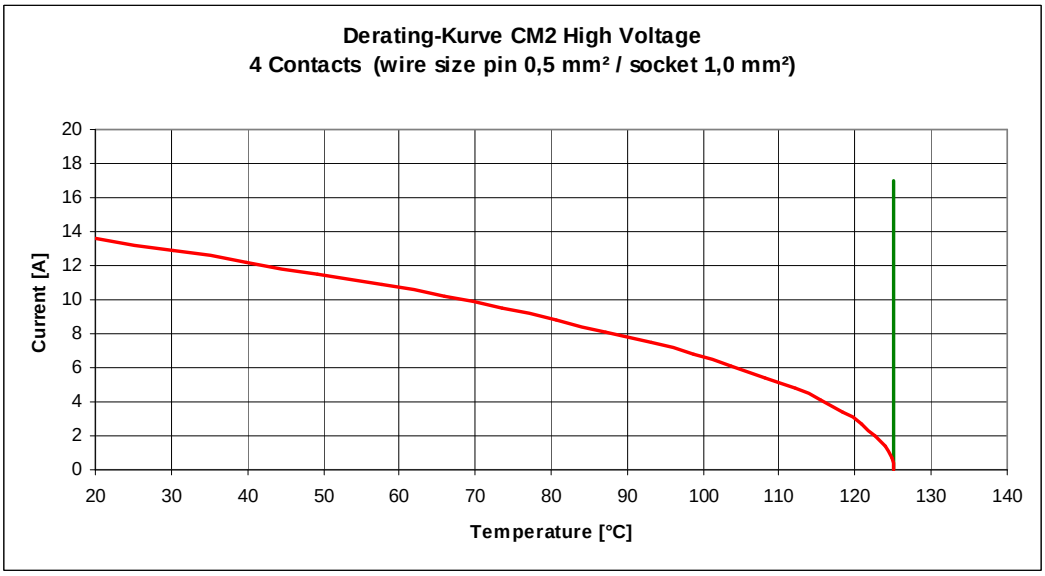
Test according to IEC 60512 test 5b

Test conditions:

	No. of contacts:	Wire size:	Current load:
Signal:	2	0,5 mm²	1 A
	10	0,14 mm²	200 mA
Power:	3+PE	Pin: 0,5 mm² Socket: 1,0 / 1,5 mm²	see derating

Measurement of temperature rise close to point of contact with the power contacts equally loaded (except earth contact)





worked on:	checked:	Standard:	DCR Status:	Date of DCR:
TJ	GWE	-	A4885W	TJ 12.01.2015

ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

4.2.4 *Contact resistance*
Test according to IEC 60512, Test 2b

Measurement of all power contacts including earth contact and min. 6 signal contacts. For intermediate and final measurements the same contacts shall be selected as for the initial measurement.

The contact resistance must not exceed the values in the table below.

Table 10

Contact type:	Contact resistance max., initially	Contact resistance max. After mechanical or climatic aging
Signal contact	10 mΩ	10 mΩ or 50% over initial value
Power contact	5 mΩ	5 mΩ or 50% over initial value

4.2.5 *Insulation resistance*
Test according to IEC 60512-2, Test 3a, Method A

- Measurement between adjacent power contacts and between all power contacts in parallel against shield, but without earth contact.
- Measurement between min. 5 adjacent couples of signal contacts and all signal contacts in parallel against shield
- Measurement Voltage and insulation resistance requirement according to table below.

Voltage proof at sea level	**Test voltage (V DC)**	**Insulation resistance min. (MOhm) at 25°C**	**Insulation resistance min. (MOhm) at 85°C**
Signal line			
contact/contact	100	5000	100
contact/shield	100	5000	100
Power line			
Contact/contact	500	5000	100
Contact / housing (shielding)	500	5000	100

4.2.6 Provision for earthing
Test according to IEC 60512 test 2b and EN 61984 para. 6.5.3 and 7.3.12

Measurement according to IEC 60512 test 2b (dry circuit conditions).

Resistance between earth contact and all accessible metal parts max 0,1 Ohm.

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4.2.7 Shielding effectiveness

Test according to VG95373 part 40

Performed with separate samples, equipped with a single wire in central position.
Frequency range: 30 kHz-100 MHz

Attenuation min. 50 dB

4.3 Mechanical characteristics and test conditions

4.3.1 Total mating/ unmating force
Test according to IEC 60512-7, Test 13b
Table 12

Connector type	F max
Signal connector with 6 contacts	20 N
Power connector with 4 contacts(3+PE)	20 N

4.3.2 Polarisation

Test according to IEC 60512, test no. 13e

The connector halves must not be mateable or damaged when the specified mating force is applied in following combinations:
- mating in any wrong position
- mating between different codings

Connector type	Mating force
Signal connector with 6 contacts	NA[1)]
Power connector with 4 contacts(3+PE)	30 N

1) Visual coding by colour of housings

4.3.3 Vibration

Sinusoidal vibration
Test according to IEC 60068-2-6

Frequency range	2-2000Hz
Amplitude	0,75mm
Acceleration	200m/s²
Duration/ axis	24h
No. of axis*	3

In 3 perpendicular directions versus the connector axis

Mounting conditions for vibration test:

Cable fixation 150 mm behind housing.

Electrical continuity during vibration test:
Supervision of contact resistance of 4 power contacts and min. 6 signal contacts with each group of contacts connected in series.
Contact resistance not higher than 10 Ohms for longer 1 µs for each group of contacts. The resistance does not include the wire resistance.

4.3.4 Shock

Half sine shock test according to IEC 60068-2-27
Test Ea: Shock

Acceleration	500m/s²
Duration	11ms
No. of shocks per directions	3
No. of directions*	6

* In 3 perpendicular directions versus the connector axis

Test setup for shock test:

See para. 4.3.3 „Vibration“

Electrical continuity during shock test:
Supervision of contact resistance of 4 power contacts and min. 6 signal contacts with each group of contacts connected in series.
Contact resistance not higher than 10 Ohms for longer 1 µs for each group of contacts. The resistance does not include the wire resistance.

4.3.5 Mechanical operation

Test according to IEC 60512-5, Test 9a

Speed of insertion and withdrawal: 0,01 m/s
Rest time in unmated position: approx. 30s

Table 14

	No. of mating cycles
Signal connector	50
Power connector Au	50

ITT	PRODUCT SPECIFICATION **Cm2 - Motor Connector** (high voltage version)	**CAS21050E**

4.3.6 Durability of marking

Test according to IEC 60068-2-70, Test Xb

Marking must be according to EN 61984 para. 6.2

Test piston: size 1
Test liquid: water
Test force: 5N
No. of cycles: 10

After the specified test the marking must be readable.

4.3.7 Provisions for earthing: first make last break
(Not required)

4.3.8 Terminations

Test according to IEC 60352-2

The test shall be performed with single crimped contacts of each type and each termination size with the applicable wire sizes. For each of the different configurations 10 samples shall be tested. The contacts must withstand the cable retention force according to IEC 60352-2

4.3.9 Contact retention in insert

Test according to IEC 60512, test no. 15a

The force specified below is applied with a suitable punch (damage must be avoided) to the mating side of the contacts. The connector inserts must be removed from the housing for this test. Alternatively the test can be performed with separate inserts.

Connector type	Force	No. of contacts per specimen
Power connector	30 N	4
Signal connector	20 N	6

There must not be an axial displacement, which is likely to impair normal function.

4.3.10 Cable clamp resistance

Test according to IEC 60512 test 17c (pull test) and 17d (torsion test) and EN 61984
Test forces and requirements according to EN 61984 para. 6.17
For pull test and torsion test separate samples shall be used.

4.3.11 Mechanical strength impact

Test according to IEC 60512 test 7b
For insulators at cable side only:
Drop height: 750mm
Drop cycles: 8
Positions in 45° steps, one cycle per position

Parts used for protection against electric shock shall not be damaged. A reduction of clearances and creepage distances is not allowed. Damage, which could affect normal function, shall not occur.

4.3.12 Water tightness

Test according to IEC 60529, protection degree IP65 CR- sealing / IP 67 FKM-sealing.

Test with minimal and maximal cable diameter
Mounting flange of housing screwed onto closed adapter.

After test water must not occur inside connector housing.

4.3.13 Degree of protection
Test according to EN 61984 para. 6.4.1 and 7.3.6.2

Test with test finger according to IEC 60529 para. 5

The required clearances and creepage distances shall be ensured between all live parts of power connector and the test finger.

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4.4 Climatic characteristics

4.4.1 Cold

Test according to IEC 60512 test 11j

Temperature: -25°C

Test duration:

Test condition A	2h
Test condition B	6h

No damage shall occur which could impair normal use.

4.4.2 Dry heat

Test according to IEC 60512 test 11i

Temperature: 125°C

Test duration:

Test condition A	12h
Test condition B	7d

No damage shall occur which could impair normal use.

4.4.3 Flowing mixed gas corrosion

Test according to IEC 60512 test 11g

Gas concentration: SO2: 0,5 ppm; H2S: 0,1 ppm
Temperature: 25°C
Humidity: 75% r.h.
Duration: 4 days

No damage shall occur which could impair normal use.

4.4.4 Damp heat, cyclic

Test according to IEC 60352 test 11m

Upper temperature: 40°C
Total no. of cycles: 5

No damage shall occur which could impair normal use.

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4.4.5 Electrical load and temperature

Test according to IEC 60512 test 9b

Temperature: 80°C
Duration: 1000 h
Current load in accordance with to para. 4.2.3

There shall be no defects, which could impair function.

4.4.6 Damp heat, steady state

Test according to IEC 60512 test 11c

Temperature: 40°C
Humidity: 95% r.h.
Duration: 56 days

There shall be no corrosion of metal parts.

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5. Test schedule

The test schedule is based on IEC 60512-1

5.1 General

The test schedule shows all tests and the order in with they shall be carried out as well as the requirements to be met.

Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions for testing as specified in IEC 60068-1

Unless otherwise specified, mated sets of connectors shall be tested. Care shall be taken to keep a particular combination of connectors together during the complete test sequence, i.e. when unmated is necessary for a certain test, the same connectors as before shall be mated again for the subsequent tests

In the following test schedule, a complete connector, consisting of housing, power and signal connectors connected to a cable is called a “specimen”.

The following number of specimen is necessary for the entire inspection and test sequence.

Table 16 Number of test specimens

Performance Level		0
		Number of specimens
Test group	A	4[1)]
“	B	4
"	C	1 [2)]
"	D	4
"	E	4
"	F	4
"	G	4
"	H	

1) 4 additional samples per test for test no. A8.1, A8.2, A9
2) One per wire size

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Mechanical test group A

1	2	3	4	5	6	7	8
Test phase	**Designation or title**	**IE 60512 test no.**	**Test according to**	**Severity or conditions**	**Measurement to be performed**		**Requirements**
					Designation or title	**IEC 60512 test no.**	
A1				Any existing cover shall be removed, if required	Visual and dimensional examination	1a, 1b	
A2	Durability of marking		4.3.6	With the naked eye	Vísual examination	1a	Markings acc. to 4.3.6
A3	Polarisation	13e	4.3.2	Test force: 20N	Visual examination	1a	No damage likely to impair function
A4	Provisions for earthing		4.2.6 4.3.7	NA	First make last break	1a	4.2.6 4.3.7
A6	Terminations		4.3.8				4.3.8
A7	Contact retention in insert	15a	4.3.9	Test load: Power connector 30N Signal connector 20N		1a	4.3.9
					Visual examination		No axial displacement likely to impair normal operation
A8.1	Cable clamp resistance to cable pull	17c	4.3.10	With cables having the largest and smallest diameter suitable for clamping specified in para: 3.2.7. Any existing covers associated with the cable anchorage shall be mounted as specified	Visual examination	1a	4.3.10 and EN 61984 para. B 6.17
A8.2	Cable clamp resistance to cable torsion	17d	4.3.10		Visual examination	1a	4.3.10 and EN61984 para. 6.17
A9	Mechanical strength impact	7b	4.3.11	Dropping height: - 750 mm for specimens of mass ≤ 250g. Dropping cycles: 8 Positions in 45° steps, one cycle per position.			4.3.11
					Visual examination	1a	Parts used for protection against electric shock shall not be damaged. A reduction of clearances and creepage distances is not allowed.

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Service life test group B

1	2	3	4	5	6	7	8
Test phase	**Designation or title**	**IE 60512 test no.**	**Test according to**	**Severity or conditions**	**Measurement to be performed**		**Requirements**
					Designation or title	**IEC 60512 test no.**	
B1	Initial measurement (contact resistance)		4.2.4	Power connector: 4 contacts incl. earthing contact signal connector: 6 contacts	Contact resistance	2b	4.2.4 Power contact: Max 5 mΩ signal contact: max 10mΩ
B2	Mechanical operation	9a	4.3.5	Number of operating cycles: 50	Visual examination	1a	4.3.5 No damage shall occur which could impair normal use
B3	Final measurement		4.2.4	Power connector: 4 contacts incl. earthing contact signal connector: 6 contacts	Contact resistance	2b	The change of contact resistance shall be no more than 50% of the reference value or ≤5 mΩ. The higher value is permissible.
			4.2.2 a) or b)	4.2.2	a) Impulse withstand voltage		4.2.2 There shall be no breakdown or flashover
					b) Voltage proof	4a	

Thermal test group C

1	2	3	4	5	6	7	8
Test phase	**Designation or title**	**IE 60512 test no.**	**Test according to**	**Severity or conditions**	**Measurement to be performed**		**Requirements**
					Designation or title	**IEC 60512 test no.**	
C1	Current carrying capacity	5b	4.2.3	Signal contacts equally load according 4.2.3	Temperature rise	5b	4.2.3

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Climatic test group D

1	2	3	4	5	6	7	8
Test phase	**Designation or title**	**IE 60512 test no.**	**Test according to**	**Severity or conditions**	**Measurement to be performed**		**Requirements**
					Designation or title	**IEC 60512 test no.**	
D1	Initial measurement (contact resistance)		4.2.4	Power connector: 4 contacts incl. earthing contact signal connector: 6 contacts	Contact resistance	2b	4.2.4 Power contact: Max 5 mΩ signal contact: max 10mΩ
D2	Cold	11j	4.4.1	Test temperature: -25°C Test condition: A			4.4.1
					Visual examination	1a	No damage shall occur which could impair normal use
D3	Dry heat	11i	4.4.2	Test temperature: 125°C Upper limiting temperature specified for the specimen Test duration: 7 days			4.4.2
					Visual examination	1a	No damage shall occur which could impair normal use
D4	Flowing mixed gas corrosion	11g	7.3.13	Test 1- Specimen mated			4.4.3
			7.3.13	Test 2 – Specimen mated			No damage shall occur which could impair normal use
D5	Final measurement		4.2.4	Power connector: 4 contacts incl. earthing contact signal connector: 6 contacts	Contact resistance	2b	The change of contact resistance shall be no more than 50% of the reference value or ≤5 mΩ. The higher value is permissible.
			4.2.2 a) or b)	4.2.2	a) Impulse withstand voltage		4.2.2 There shall be no breakdown or flashover
					b) Voltage proof	4a	

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Degree of protection, test group E

1	2	3	4	5	6	7	8
Test phase	**Designation or title**	**IE 60512 test no.**	**Test according to**	**Severity or conditions**	**Measurement to be performed**		**Requirements**
					Designation or title	**IEC 60512 test no.**	
E1	Degree of protection		4.3.14	Enclosed connectors. Test finger pressed with 20N against the surfaces			Required clearances and creepage distances shall be ensured between all live parts and the test finger 4.3.14
E2	Provision for earthing		4.2.6	Resistance between accessible metal parts and the earthing contact			4.2.6 Resistance between earth contact and accesable metal parts max 0,1Ω
E3	Final measurement		4.2.4	Power connector: 4 contacts incl. earthing contact signal connector: 6 contacts	Contact resistance	2b	The change of contact resistance shall be no more than 50% of the reference value or ≤5 mΩ. The higher value is permissible.
			4.2.2	a) or b)	a) Impulse withstand voltage		4.2.2 There shall be no breakdown or flashover
					b) Voltage proof	4a	
E4	Degree of protection IP code (water tightness)		4.3.12	IPX7			4.3.12

worked on:	checked:	Standard:	DCR Status:	Date of DCR:
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Test group F

1	2	3	4	5	6	7	8
Test phase	**Designation or title**	**IEC 60512 test no.**	**Test according to**	**Severity or conditions**	**Measurement to be performed**		**Requirements**
					Designation or title	**IEC 60512 test no.**	
F1				Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operations.
F2			4.2.4		Contact resistance	2a	4.2.4
F3			4.2.7	30 kHz-100MHz	Shielding effective-ness		min 50dB
F4			4.2.5		insulation resistance	3a	min 5000 MΩ
F5			4.2.2	RMS withstanding voltage	Voltage proof	4a	No voltage breakdown or flashover
F6	Vibration, sinusoidal	6d	4.3.3	10-2000 Hz; 200m/s²	Electrical continuity	2c	Electrical continuity ≤ 1 µs R_D max. 10 Ω
F7	Shock	6c	4.3.4	Half sine, acceleration 50g, duration 11ms,	Electrical continuity	2c	Electrical continuity ≤ 1 µs R_D max. 10 Ω
F8	Rapid change of tempera- ture (two chamber method)	11d		Test Na; duration: 30 min. Temperature: -25 / 125°C			No damage shall occur, which could impair function
F9			4.2.5		Insulation resistance	3a	min 5000MΩ
F10			4.2.2	RMS withstanding voltage	Voltage proof	4a	No voltage breakdown or flashover
F11				Unmated connectors	Visual examination	1a	there shall be no damage which could impair normal function
F 12	Climatic sequence	11a					X
F12.1	Dry heat	11i	4.4.2	Test condition A unloaded duration: 12h recovery time: 2h	insulation resistance (hot)	3a	85°C / 100MΩ there shall be no damage which could impair normal function
F12.2	Damp heat cyclic first cycle	11m	4.4.4	Upper temperature 40°C, recovery time: 2h variance 2			there shall be no damage which could impair normal function

worked on:	checked:	Standard:	DCR Status:	Date of DCR:
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Test group F, continued

1	2	3	4	5	6	7	8
Test phase	**Designation or title**	**IEC 60512 test no.**	**Test according to**	**Severity or conditions**	**Measurement to be performed**		**Requirements**
					Designation or title	**IEC 60512 test no.**	
F12.3	Cold	11j	4.4.1	Test condition B -25°C; 6h recovery time: 2h			there shall be no damage which could impair normal function
F12.4	Damp heat, cyclic remaining (5) cycles	11m	4.4.4	Upper temperature 40°C, recovery time: 2h variance 2			There shall be no damage, which could impair normal function.
F13			4.2.5		Insulation resistance	3a	4.2.5 Min 5000MΩ
F 14			4.2.4		Contact resistance	2a	4.2.4
F15			4.2.7	30 kHz-100MHz	Shielding effectiveness		min 50dB
F 16				4.2.2 RMS withstanding voltage	Voltage proof	4a	No voltage breakdown or flashover
F17				unmated connectors	Visual examination	1a	There shall be no damage that would impair normal operation

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Test group G

1	2	3	4	5	6	7	8
Test phase	**Designation or title**	**IEC 60512 test no.**	**Test according to**	**Severity or conditions**	**Measurement to be performed**		**Requirements**
					Designation or title	**IEC 60512 test no.**	
G1				Unmated connectors	Visual examination	1a	There shall be no defects that would impair normal operations.
G2			4.2.4		Contact resistance	2a	4.2.4 Power contact: max 5mΩ Signal contact max 10mΩ
G3			4.2.7	30 kHz-100MHz	Shielding effective-ness		min 50dB
G4			4.2.5		Insulation resistance	3a	4.2.5 min 5000mΩ
G5			4.2.2	RMS withstanding voltage	Voltage proof	4a	No voltage breakdown or flashover
G6	total mating and unmating force	13b	4.3.1				4.3.1 max 20N
G7	Mechanical operation	9a	4.3.5	50 cycles			There shall be no defects that would impair normal operations.
G8	Electrical load and tem-perature	9b	4.2.3 4.4.5	85°C, 1000h, current load according to derating curve			There shall be no defects that would impair normal operations
G9			4.2.5		Insulation resistance	3a	4.2.5 min 5000MΩ
G10			4.2.4		Contact resistance	2a	4.2.4
G11			4.2.7	30 kHz-100MHz	Shielding effectiveness		min 50dB
G12			4.2.5		Voltage proof	4a	No voltage breakdown or flashover
G13				unmated connectors	Visual examination	1a	There shall be no damage that would impair normal operation

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Test group H

1	2	3	4	5	6	7	8
Test phase	**Designation or title**	**IE 60512 test no.**	**Test according to**	**Severity or conditions**	**Measurement to be performed**		**Requirements**
					Designation or title	**IEC 60512 test no.**	
H1					Visual examination	1a	There shall be no damage that would impair normal operation
H2	Provisions for earthing		4.2.6		Resistance between accesable metal parts and earth contact		4.2.6 max 0,1 Ohm
H3	Damp Heat, steady state	11c	4.4.6	40°C, 95%r.h.,56days			4.4.6
H4	Provisions for earthing		4.2.6		Resistance between accesable metal parts and earth contact		4.2.6 max 0,1 Ohm
H5					Visual examination	1a	There shall be no damage that would impair normal operation