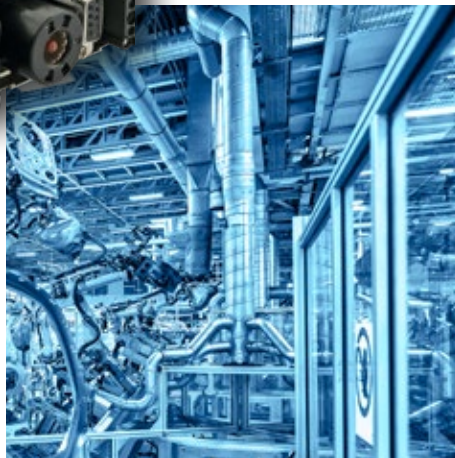


# heavy | mate<sup>®</sup>

## Heavy Duty Connectors



# Note from the CEO



## Ladies and Gentlemen,

For over 75 years Amphenol has enjoyed success as the interconnection technology provider of choice to industry-leading companies around the world. One of our key strategic areas of focus has been and is the Industrial market. Our organization works with leading manufacturers across a wide range of applications - including Energy Generation & Distribution, Transportation, Heavy Equipment, Factory Automation, Wireless Outdoor, ChipCard Readers - enabling smarter, faster and better technologies to connect products to customer solutions.

The Industrial market footprint of Amphenol covers over facilities in more than 12 different European countries and more than 30 countries worldwide. Our successful expansion into new regions as well as new industrial applications is a direct reflection of our agile, entrepreneurial management team and our unwavering commitment to execute Amphenol's strategies for the benefit of our customers, shareholders and employees.

Thank you for partnering with Amphenol. Our entire organization is at your service.

A handwritten signature in black ink, appearing to read 'R. Adam Norwitt'. The signature is fluid and stylized, with a large initial 'R'.

R. Adam Norwitt  
President and CEO, Amphenol Corporation

# Make use of the best

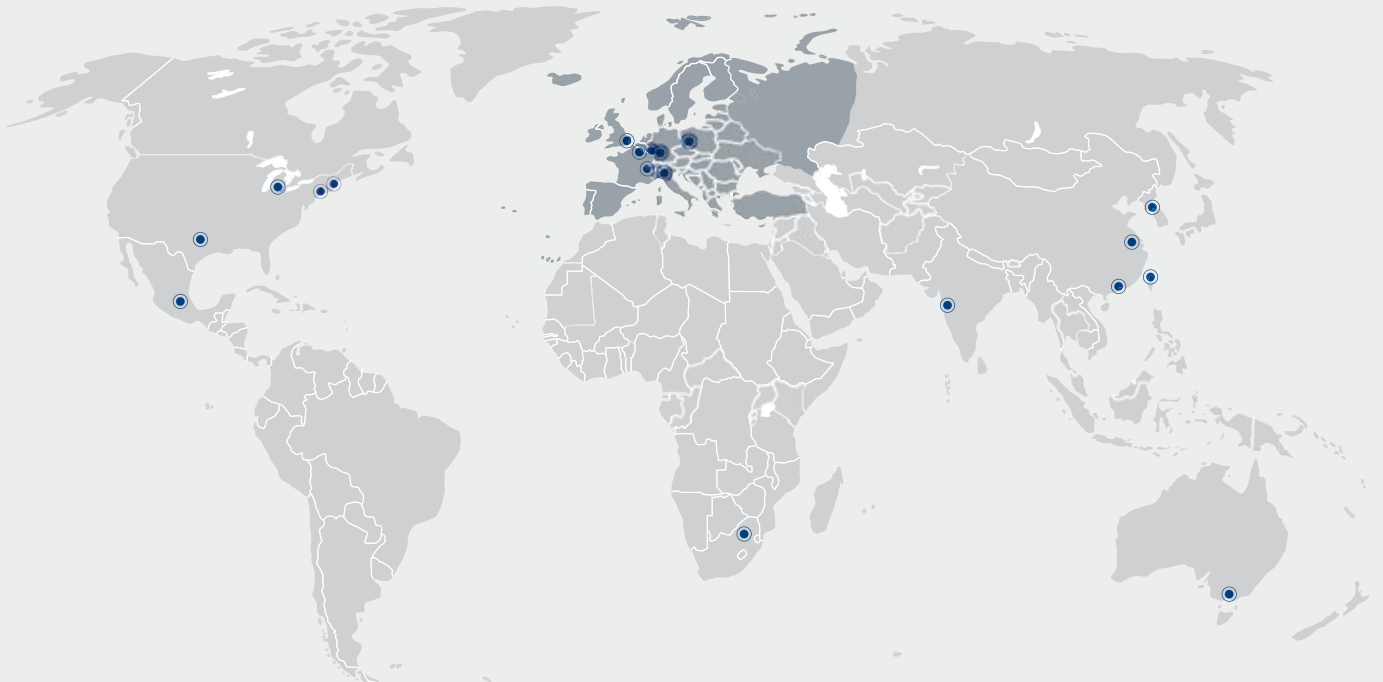
## Use our global resources

“Think global, act local!” Independently from where you are in Europe, we offer you our global expertise and great variety of products and technologies. And in comfort with your personal contact. Our numerous European offices are your access to our global resources.

### ● OUR OFFICES IN EUROPE AND WORLDWIDE

---

FRANCE	CHINA	AUSTRALIA	SOUTH AFRICA
GERMANY	KOREA	MEXICO	INDIA
UNITED KINGDOM	TAIWAN	USA	ITALY





SECURITY, RELIABILITY AND COMFORTABLE SERVICE FROM ONE SOURCE.

# More time for important things: benefit from our service and diversity

Enjoy security, reliability and comfortable service from one source. INDUSTRIAL@AMPHENOL offers one of the most individual and most diversified service programmes in the market – exclusively for industrial customers. Access all possibilities of the Amphenol group through your personal expert adviser.



## WIDE PRODUCT RANGE

Take advantage of a choice of Amphenol products. Our broad product portfolio offers individual solutions from more than 85 member companies in the global Amphenol group.



## EXCLUSIVENESS AND FLEXIBILITY

One face to the customer: every inquiry is handled on an individual service level by your personal key account service partner. This ensures maximum transparency and best-in-class flexibility in the whole process.



## QUALITY

Interconnect systems need reliability, speed and flawless data transmission. We continuously test and guarantee the required standard in our products – and also in our personal services.



## INDIVIDUAL SOLUTIONS

Your project requires an individual solution that is not available off-the-shelf? As your think tank and discussion partner we provide engineering support and solution-oriented development for your tailor-made Amphenol product.



## SPEED AND AVAILABILITY

Smart and intelligent processes are the secret behind our service programme. Flexible planning and distribution, perfect logistics and highest availability are our key factors for best customer service.



## GLOBAL KEY ACCOUNT SERVICE

Our key account service is your individual entrance to global know-how, products and services. More than 85 Amphenol companies around the world offer an extensive range of technologies and products. We offer access to our worldwide resources through one individual contact person.

# heavy|mate<sup>®</sup> is a Modular Metal Connector Line

## What is heavy|mate<sup>®</sup> ?

heavy|mate<sup>®</sup> is a modular connector line, consisting of:

- Hoods & Housings
- Inserts
- Contacts

## Why heavy|mate<sup>®</sup> ?

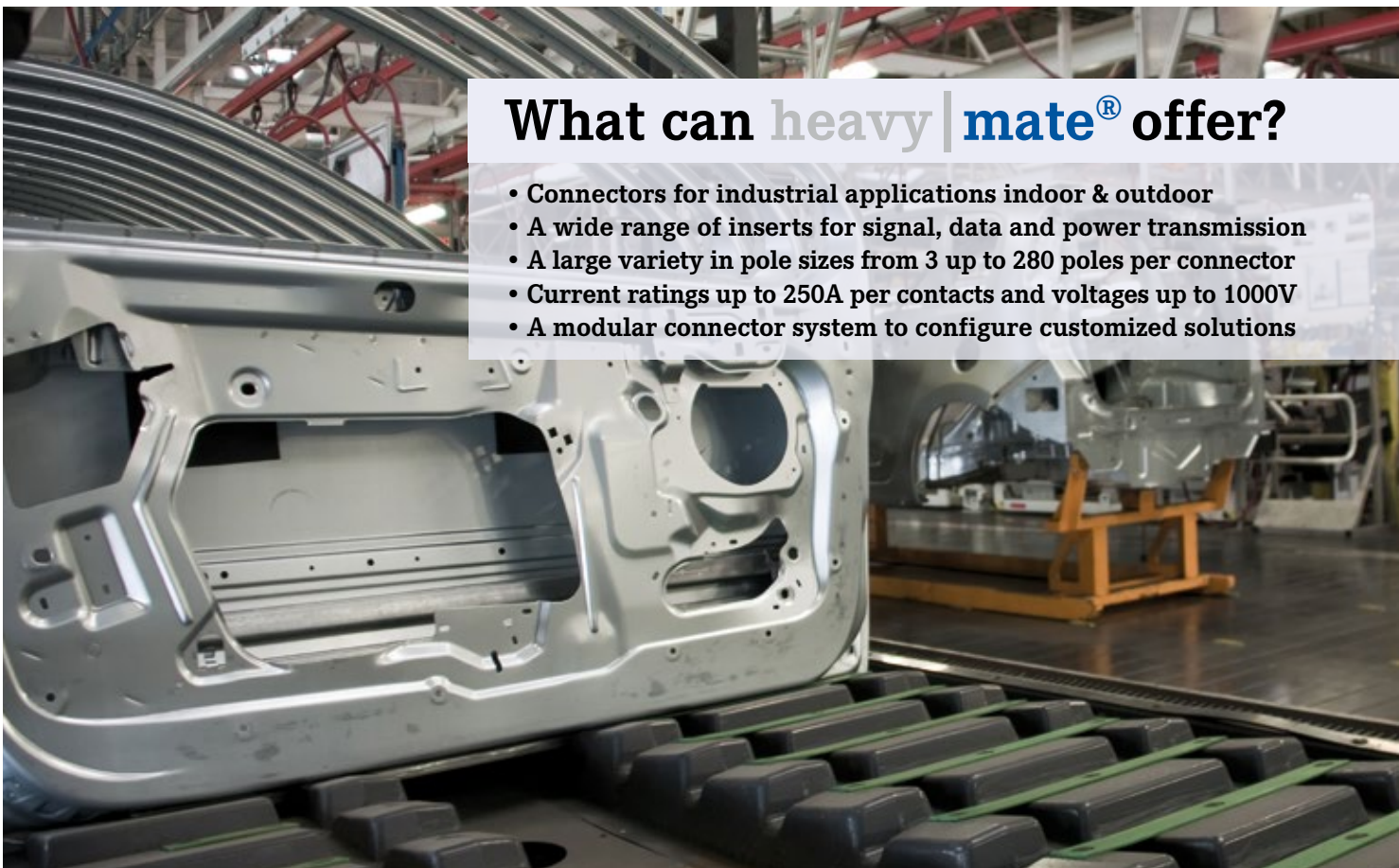
- Connections in harsh industrial environment
- Robust design necessary
- High number of poles or different kinds of signals transmitted
- Very good EMC protection required
- Power and signal transmission outdoor
- Very safe locking system required

# for Applications in Industrial Environments.



## Major product features

- Interconnections for power, signal and data
- Good costs
- Voltage up to 1000V
- VDE, UL, CSA approvals
- Vibration proof
- High pole sizes
- IP65 to IP69K
- Corrosion resistance
- Robust



## What can heavy | **mate**<sup>®</sup> offer?

- Connectors for industrial applications indoor & outdoor
- A wide range of inserts for signal, data and power transmission
- A large variety in pole sizes from 3 up to 280 poles per connector
- Current ratings up to 250A per contacts and voltages up to 1000V
- A modular connector system to configure customized solutions

# How to select a solution with series heavy | mate®.

## Theory

- Select an insert that meets your requirements.
- Choose the related contacts if not included in inserts.
- Choose related housings.
- Choose related cable gland.
- If you are interested in a cable assembly, please ask us.

## Practice 1

### Requirements

- 250V
- 5A
- 60 contacts
- Termination: crimp

### Solution

- Check: Make a pre-selection on the overview page of the series, s. p. 10/11  
Possible series: heavy | mate® D, DD and M
  - Check: Details on the overview pages of the sub-series, see pages 22, 38, 154
- All 3 variants are possible; Selection heavy | mate® D
- Check: Contact inserts on the detail page of the sub-series  
Selection: C146 10A064 000 2
  - Check: Contacts on the same double page  
Selection: VN01 016 0002 1
  - Check: Housings via crosslink at contact inserts  
Selection: C146 21R024 600 8
  - Check: Gland bushing via crosslink at housings  
Selection: VN16 320 0126X





## Practice 2

### Requirements

- 3 x 400V; 50A; 6mm<sup>2</sup> wire gauge
- 8 x 250V; 8A; 1.5mm<sup>2</sup> wire gauge
- 5 x 400V; 15A; 4mm<sup>2</sup> wire gauge

### Solution

- **Check:** Make a pre-selection on the overview page of the series, see pages 10/11  
Possible series: heavy | **mate**<sup>®</sup> M
- **Check:** How 16 contacts can be realized, see modules overview on page 130  
Possible selection: a) 1 x 20 contacts  
b) 2 x 10 contacts  
c) 1 x 10 contacts + 2 x 5 contacts  
d) 1 x 3 contacts + 1 x 5 contacts + 1 x 10 contacts
- **Check:** Technical parameters / solution, see detail pages of the modules on page 166  
Possible selection: a) not possible due to voltage  
b) not possible due to voltage  
c) not possible due to current  
d) POSSIBLE
- **Check:** Choose matching contact, see detail page of the modules on page 166  
Possible selection: a) C146 A03 001 E8 - VN01 036 0002 1C  
b) C146 A05 001 E8 - VN01 025 0033 1C  
c) C146 A10 001 E8 - VN01 016 0027 1C
- **Check:** Choose matching frame, see frames on page 166  
Solution: C146 P10 001 G8
- **Check:** Choose matching housing, see housings on page 214  
Solution: C146 21R010 600 8

# Make your selection out of the heavy | mate<sup>®</sup> series!

Characteristic Series	Voltage						Current					
	250V	400V	500V	690V	830V	1000V	10A	16A	35A	80A	100A	200A
A (page 14)	●	●					●	●				
D (page 22)	●						●					
DD (page 38)	●						●					
E (page 44)	●	●	●				●	●				
EE (page 62)	●	●	●				●	●				
EEE (page 68)	●	●	●				●	●				
E / FE / KO (page 74)	●	●					●					
F (page 80)	●	●	●	●	●	●	●	●	●	●	●	●
HSE (page 132)	●	●					●	●	●			
HvE (page 136)	●	●	●	●			●	●				
K (page 144)	●	●	●	●	●		●	●	●	●		
M (page 154)	●	●	●	●	●	●	●	●	●	●	●	●
Q (page 198)	●	●	●	●			●	●	●			

Number of contacts	Termination				Characteristic	Series
	Crimp	Screw	Tension spring	Push in		
3 / 4 / 10 / 16		●			A (page 14)	A
7 / 8 / 15 / 25 / 40 / 64	●				D (page 22)	D
24 / 42 / 72 / 108	●				DD (page 38)	DD
6 / 10 / 16 / 24	●	●	●	●	E (page 44)	E
10 / 18 / 32 / 46	●				EE (page 62)	EE
40 / 64	●				EEE (page 68)	EEE
6 / 10 / 16 / 24		●			E / FE / KO (page 74)	E / FE / KO
1 / 2 / 3 / 4 / 6 / 7 / 2x4 / 8 / 12 / 17 / 20 / 36	●				F (page 80)	F
6		●			HSE (page 132)	HSE
3+2 / 6+2 / 10+2 / 16+2		●			HvE (page 136)	HvE
4/0 / 4/2 / 6/36 / 4/8 / 8/24	●	●			K (page 144)	K
1 / 2 / 3 / 4 / 5 / 10 / 20 / 2x4	●			●	M (page 154)	M
5 / 4/2 / 7 / 8 / 12 / 17	●				Q (page 198)	Q

# The highlights of the series heavy|mate®.

## Contact technology

- Turned contacts, which correspond to the market standard.
- Turned female contacts of copper for higher current-carrying capacity – specifically for the modular system heavy|mate® M.
- Radsok contact technology: These are laminated contacts with very low transition resistance, suitable for high current applications.
- Stamped contacts with high performance for semi-automatic processing at great cost savings.
- Selectively coated gold plating stamped contacts offer great savings.



## Housings

Surface coatings available in two versions: Standard or High-End with a salt mist resistance up to 500 hours.

Flexible cable entry in different positions – possible on request.

Robust metal levers in 1 and 2 locking-lever-system.

Quality EMC solutions.

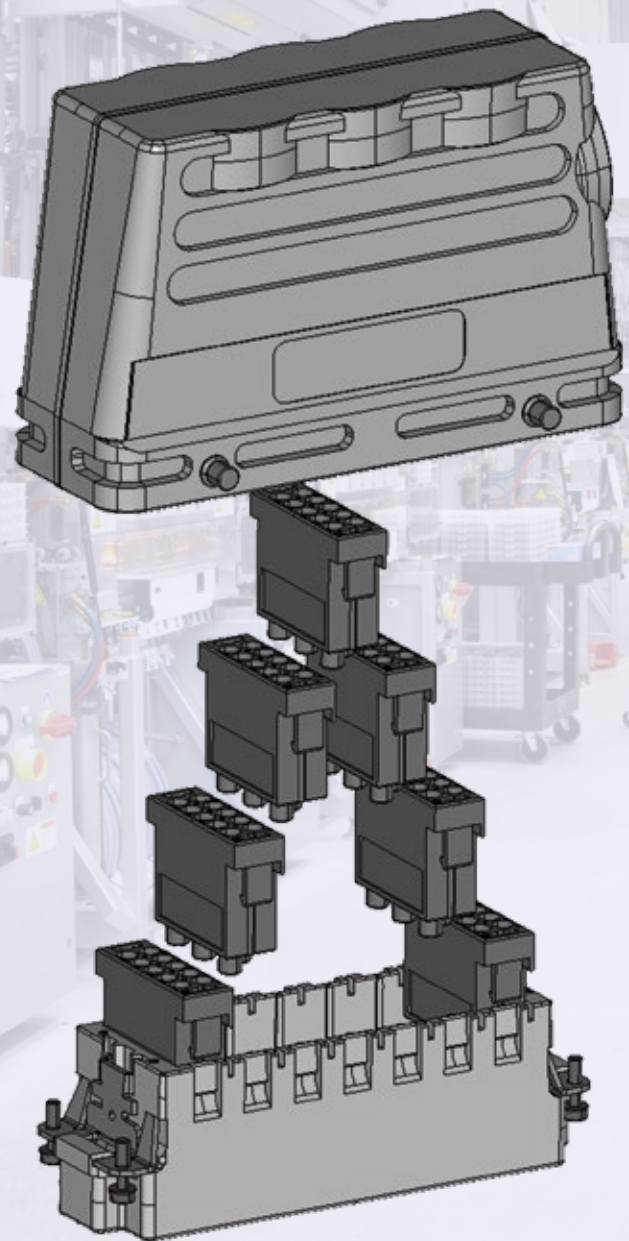
Tightness classes in IP65, IP67 or IP68 or IP69K!



# Modular system

With the new series heavy|mate® F Amphenol offers a new modular system that is compatible with the market leader. With the series heavy|mate® M Amphenol offers a system with many benefits:

- More module slots in the connector.
- Large selection of contact-safe male contacts
- Stamped contacts and the Radsok contact technology
- Great cost savings potential




The background of the entire page is a dynamic industrial scene. In the upper portion, there's a close-up of a mechanical assembly with various components like bolts and a green gauge. Below this, a large area is filled with bright, glowing sparks from a welding or grinding process, creating a sense of intense activity and heat. The lighting is a mix of cool blues and warm oranges, giving it a high-tech, industrial feel.

# heavy | mate<sup>®</sup> A

- Rated voltage 250 / 400 V
- Rated current 10 A ... 16 A
- Termination: screw
- Number of contacts: 3, 4, 10, 16, 32



Approvals, Testhouse	Characteristics	Approval-Number
UL 	600 V	E 63093

**General information**

- For series heavy|mate® A connectors may be engaged or disengaged when live but without electrical load. If these connectors are used as plug and socket device, the load shall be reduced to 10 % of the rated current.

- Low and high profile housing for heavy|mate® A series inserts for 10 and 16 contacts.

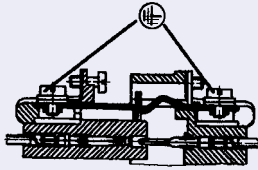


**No standard for this series, but:**

- Interchangeable with other makes
  - a) contact insert to contact insert
  - b) contact insert to housing 10 & 16 contacts

Housings are designed according to DIN EN 175 301 - 801

**First-to-mate last-to-break protective ground contact**



**Range of housings**

Size A3/4



Size A10



Size A16





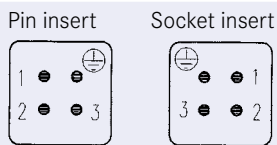
## heavy|mate® A Characteristics contact inserts

General Characteristics	Standard	Value			
Number of contacts		3/4 + ⊕	10 + ⊕	16 + ⊕	32 + ⊕
Termination technique		screw			
Wire gauge		0.5 - 1.5 mm <sup>2</sup> (AWG 20 - 16) <sup>1)</sup>	0.5-2.5 mm <sup>2</sup> (AWG 20 - 14)		
Tightening torque		0.3 Nm	0.5 Nm		
Max. wire diameter		3.6 mm	4.6 mm		
Flammability	UL 94	V-0			
Electrical Characteristics					
Rated voltage	IEC 60664-1	230 V (L-E) 400 V (E-E) (UL 600 V)	250 V (UL 600 V)		
Rated impulse withstand voltage	IEC 60664-1	4 kV			
Rated Current T <sub>amp</sub> = 40 °C		10 A	16 A		
Current carrying capacity	IEC 60512-5-2	see derating curves			
Installation (overvoltage) category	IEC 60664-1	III			
Material group	IEC 60664-1	III b			
Contact resistance	IEC 60512-2-1	≤ 5 mΩ			
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω			
Pollution degree	IEC 60664-1	3			
Climatical Characteristics					
Climatic category	IEC 60068-1	40 / 125 / 21			
Upper temperature	IEC 60512-11-9	+ 125 °C			
Lower temperature	IEC 60512-11-10	- 40 °C			
Mechanical Characteristics					
IP-degree of protection pin insert <sup>2)</sup>	IEC 60529	unmated IP00, mated IP20			
IP-degree of protection socket insert <sup>2)</sup>	IEC 60529	unmated IP20, mated IP20			
Weight pin insert		13 g	48 g	68 g	136 g
Weight socket insert		13 g	52 g	73 g	146 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles			
Materials					
Insert		PA			
Colour insert		Grey			
Contacts		CuZn (brass)			
Contact plating		Ag (silver)			

A

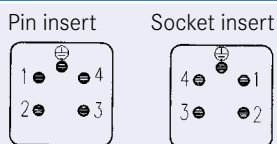
Description	Part Number	Drawing	Figure
<b>Contact insert 3 + ⊕</b>			
Pin insert for screw termination	C146 10A003 002 4		
Socket insert for screw termination	C146 10B003 002 4		

**Pin layout**

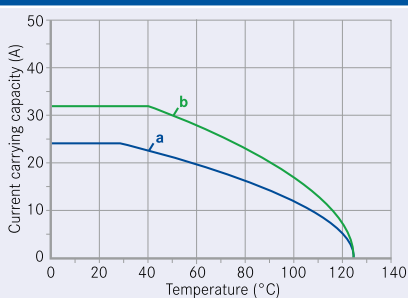


Description	Part Number	Drawing	Figure
<b>Contact insert 4 + ⊕</b>			
Pin insert for screw termination	C146 10A004 002 4		
Socket insert for screw termination	C146 10B004 002 4		

**Pin layout**



**Derating curves**

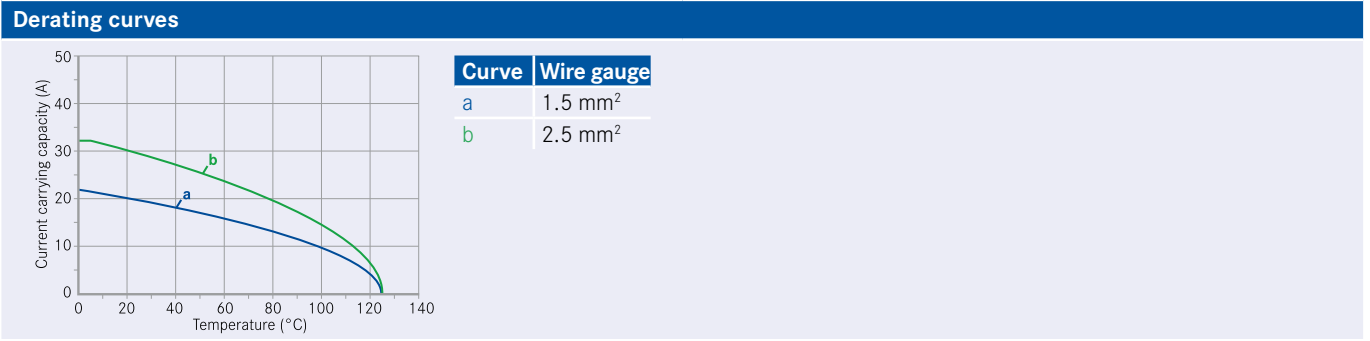


Curve	Wire gauge
a	1.5 mm <sup>2</sup>
b	2.5 mm <sup>2</sup>

Description	Part Number	Drawing	Figure
<b>Contact insert 10 + ⊕</b>			
Pin insert for screw termination	C146 10A010 002 4		
Pin insert with wire protection for screw termination	C146 10A010 102 4		
Socket insert for screw termination	C146 10B010 002 4		
Socket insert with wire protection for screw termination	C146 10B010 102 4		

A

Pin layout		Assembly instruction	
Pin insert	Socket insert	Panel cut out (insert)	



Description	Part Number	Drawing	Figure
<b>Contact insert 16 + ⊕</b>			
Pin insert for screw termination	C146 10A016 002 4		
Pin insert with wire protection for screw termination	C146 10A016 102 4		
Socket insert for screw termination	C146 10B016 002 4		
Socket insert with wire protection for screw termination	C146 10B016 102 4		

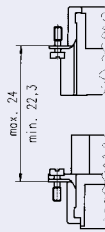
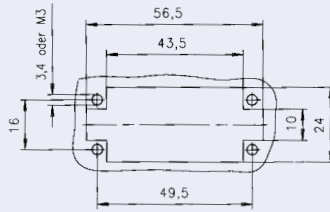
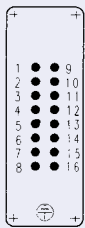
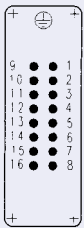
**Pin layout**

**Assembly instruction**

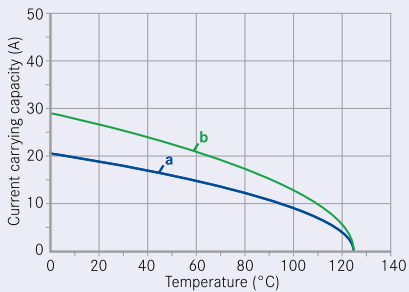
Pin insert

Socket insert

Panel cut out (insert)



**Derating curves**



Curve	Wire gauge
a	1.5 mm <sup>2</sup>
b	2.5 mm <sup>2</sup>

Description	Part Number	Drawing	Figure
<b>Contact insert 32 + ⊕</b>			
Pin insert for screw termination	C146 10A016 002 4 (1 - 16) + C146 10A016 004 4 (17 - 32)		
Pin insert with wire protection for screw termination	C146 10A016 102 4 (1 - 16) + C146 10A016 104 4 (17 - 32)		
Socket insert for screw termination	C146 10B016 002 4 (1 - 16) + C146 10B016 004 4 (17 - 32)		
Socket insert with wire protection for screw termination	C146 10B016 102 4 (1 - 16) + C146 10B016 104 4 (17 - 32)		

A

Pin layout		Assembly instruction	
Pin insert	Socket insert	Panel cut out (insert)	





# heavy | mate<sup>®</sup> D

- Rated voltage 250 V
- Rated current 10 A ... 16 A
- Termination: crimp
- Number of contacts: 7, 8, 15, 25, 40,  
50, 64, 128
- HL3 acc. DIN 45545: R22/23



D



Approvals, Testhouse	Characteristics	Approval-Number
UL 	600 V	E 63093
CSA 	600 V	48932

**General information**

- Contact inserts without crimp contacts, crimping tools see separate catalogue „Tools“.
- Contacts must be ordered separately, processing instructions see catalogue „Tools“.
- We recommend using the high profile housings / hoods for the heavy|mate® D inserts.
- Connectors series heavy|mate® D may be engaged or disengaged when live but without electrical load.  
If these connectors are mated or unmated under load, the load shall be reduced to 10 % of the rated current.
- For contact inserts for turned contacts, guide pins and guide socket are recommended (see page 290).
- By using contact inserts with two PE-connections without hoods, it is necessary to connect the facing of each PE-connection.
- If connectors are mounted in non conductive housings both protective earthing terminals shall be mounted.



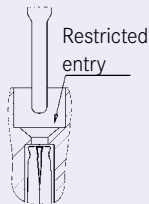
**Standardised connectors according to DIN EN 175 301 - 801 (DIN 43652)**

Interchangeable with all other products which are according to the standard.

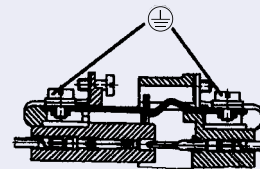
- a) Contact insert to contact insert 15-, 25-, 40-, 64- way
- b) Contact insert to housing 15-, 25-, 40-, 64- way

**High protection against mismatching**

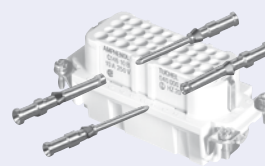
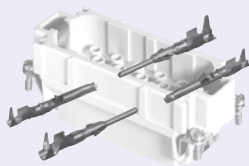
- Socket inserts with funnel shaped contact entry avoids mismatching with stamped contacts.



**First-to-mate last-to-break protective ground contact**



**Contact inserts for stamped contacts and for turned contacts**



**Range of housings**

**Size A3/4**



**Size A10**



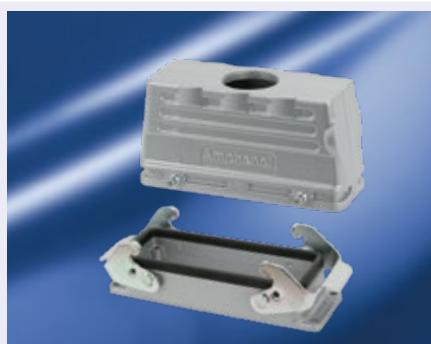
**Size A16**



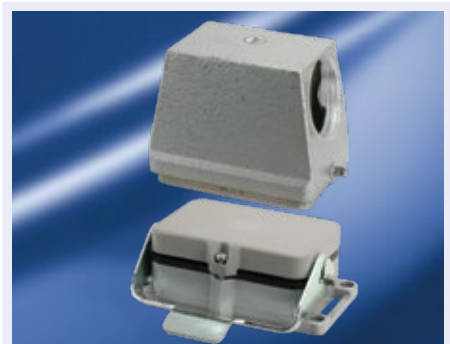
**Size E16**



**Size E24**



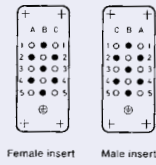
**Size E48**





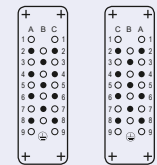
Modified contact arrangement for rated voltages of 400 V

(15) → 7 + ⊕



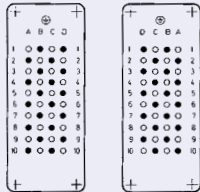
Female insert Male insert

(25) → 11 + ⊕



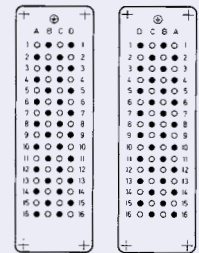
Female insert Male insert

(40) → 20 + ⊕



Female insert Male insert

(64) → 32 + ⊕



Female insert Male insert

- full load contact
- unoccupied

Removal of contacts, front releas

stamped pin contacts  
all turned contacts



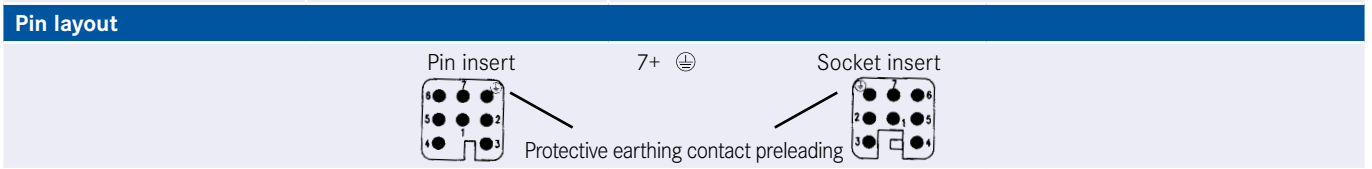
stamped socket contacts



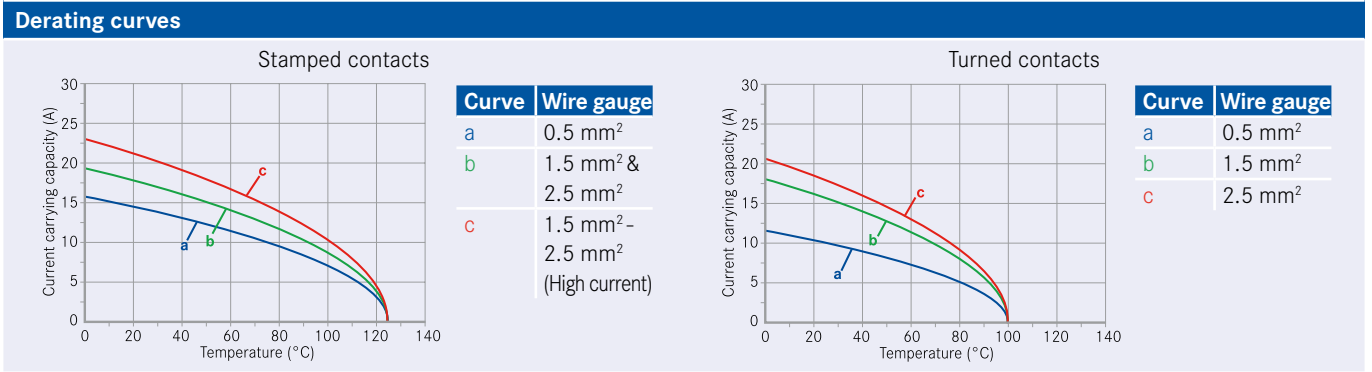
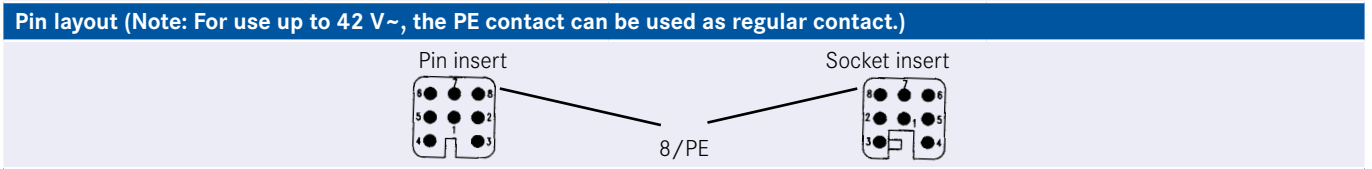
## heavy|mate® D Characteristics contact inserts

General Characteristics	Standard	Value						
Number of contacts		7+ <sup>⊕</sup> 8-Pol	15 + <sup>⊕</sup>	25 + <sup>⊕</sup>	40 + <sup>⊕</sup>	50+ <sup>⊕</sup> 2x25	64 + <sup>⊕</sup>	128 + <sup>⊕</sup> 2x64
Contact arrangement	DIN EN 175 301-801 (DIN 43652)		•	•	•		•	
Termination technique		crimp						
Wire gauge		0.14 mm <sup>2</sup> - 2.5 mm <sup>2</sup> (AWG 26 - 14)						
Max. wire diameter		4.1 mm						
Flammability	UL 94	V-0						
Electrical Characteristics								
Rated voltage <sup>1)</sup>	IEC 60664-1	250 V (400 V~ <sup>2)</sup> ) (UL/CSA 600V) <sup>1)</sup>						
Rated impulse withstand voltage	IEC60664-1	4 kV						
Rated Current T <sub>u</sub> = 40 °C		16 A	10 A					
Current carrying capacity	IEC 60512-5-2	see derating curves						
Installation (overvoltage) category	IEC 60664-1	III						
Material group	IEC 60664-1	III a						
Contact resistance		≥ 5 m Ω						
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω						
Pollution degree	IEC 60664-1	3						
Climatical Characteristics								
Climatic category	IEC 60068-1	40/125/21						
Upper temperature	IEC 60512-11-9	+ 125°C						
Lower temperature	IEC 60512-11-10	- 40°C						
Mechanical Characteristics								
IP-degree of protection pin insert	IEC 60529	unmated IP00, mated IP20						
IP-degree of protection socket insert	IEC 60529	unmated IP20, mated IP20						
Weight pin insert		8 g	28 g	34 g	53 g	68 g	65 g	130 g
Weight socket insert		8 g	30 g	38 g	64 g	76 g	82 g	164 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles						
Materials								
Insert	IEC 60664-1	PBT	PC					
Colour insert	IEC 60664-1	grey						
Contacts		CuZn (brass)						
Contact plating		Ag (Silver) / Au (Gold)						

Description	Part Number	Drawing	Figure
<b>Contact insert 7 + ⊕</b>			
Pin insert for stamped crimp contacts	C146 10A007 000 2		
Socket insert for turned crimp contacts	C146 10A007 500 2		
Socket insert for stamped crimp contacts	C146 10B007 000 2		
Socket insert for turned crimp contacts	C146 10B007 500 2		



Description	Part Number	Drawing	Figure
<b>Contact insert 8 contacts, 42 V~ in metal housings/250 V in thermoplastic housings (Please order contacts separately, see page 34)</b>			
Pin insert for stamped crimp contacts	C146 10A008 000 2		
Pin insert for turned crimp contacts	C146 10A008 500 2		
Socket insert for stamped crimp contacts	C146 10B008 000 2		
Socket insert for turned crimp contacts	C146 10B008 500 2		



**Description** | **Part Number** | **Drawing** | **Figure**

**Contact insert 15 + ⊕ (Please order contacts separately, see page 34)**

Pin insert for stamped crimp contacts	C146 10A015 000 2		
Pin insert for turned crimp contacts	C146 10A015 500 2		
Socket insert for stamped crimp contacts	C146 10B015 000 2		
Socket insert for turned crimp contacts	C146 10B015 500 2		

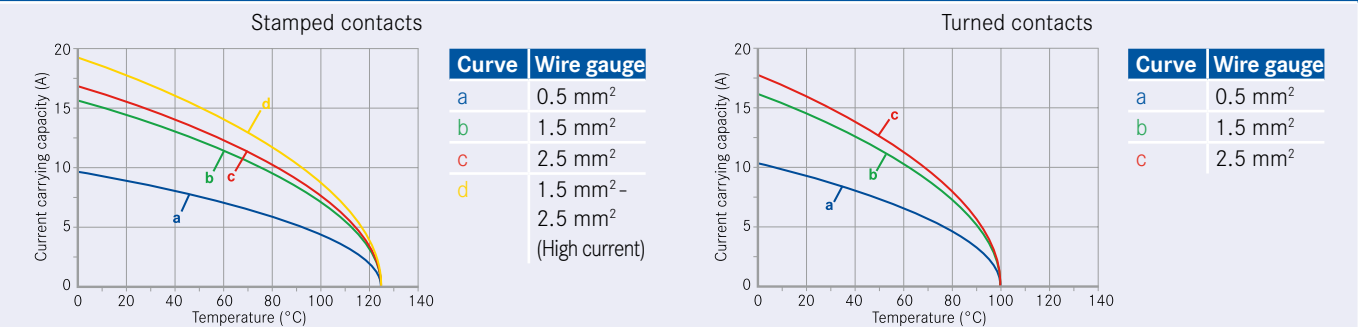
**Contact insert 15 + ⊕, 2 x PE-termination (Please order contacts separately, see page 34)**

Pin insert for stamped crimp contacts	C146 10A015 060 2		
Socket insert for stamped crimp contacts	C146 10B015 060 2		

**Pin layout** | **Assembly instruction**

<p>Pin insert</p>	<p>Socket insert</p>	<p>Panel cut out (insert)</p>
-------------------	----------------------	-------------------------------

**Derating curves**



**Description** | **Part Number** | **Drawing** | **Figure**

**Contact insert 25 + ⊕ (Please order contacts separately, see page 34)**

Pin insert for stamped crimp contacts	C146 10A025 000 2		
Pin insert for turned crimp contacts	C146 10A025 500 2		
Socket insert for stamped crimp contacts	C146 10B025 000 2		
Socket insert for turned crimp contacts	C146 10B025 500 2		

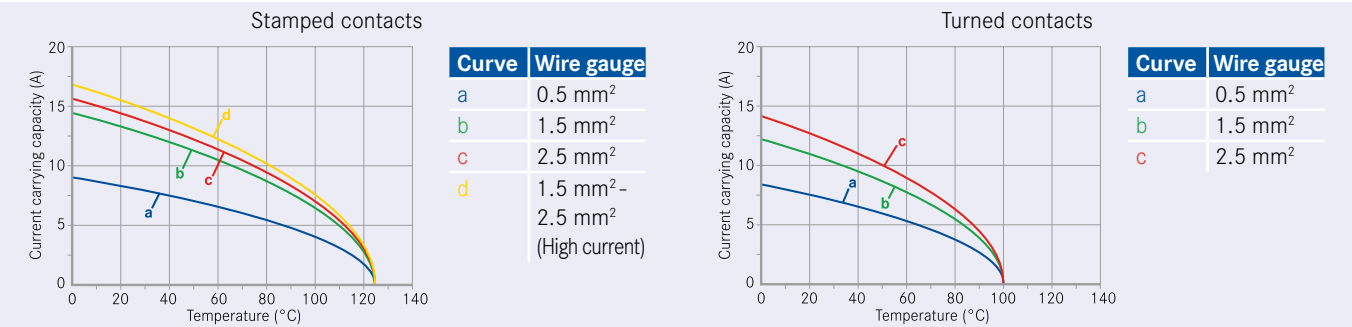
**Contact insert 25 + ⊕ , 2 x PE-termination (Please order contacts separately, see page 34)**

Pin insert for stamped crimp contacts	C146 10A025 060 2		
Socket insert for stamped crimp contacts	C146 10B025 060 2		

**Pin layout** | **Assembly instruction**

<p>Pin insert</p>	<p>Socket insert</p>	<p>Panel cut out (insert)</p>
-------------------	----------------------	-------------------------------

**Derating curves**



**Description** | **Part Number** | **Drawing** | **Figure**

**Contact insert 40 + ⊕ (Please order contacts separately, see page 34)**

Pin insert for stamped crimp contacts	C146 10A040 000 2		
Pin insert for turned crimp contacts	C146 10A040 500 2		
Socket insert for stamped crimp contacts	C146 10B040 000 2		
Socket insert for turned crimp contacts	C146 10B040 500 2		

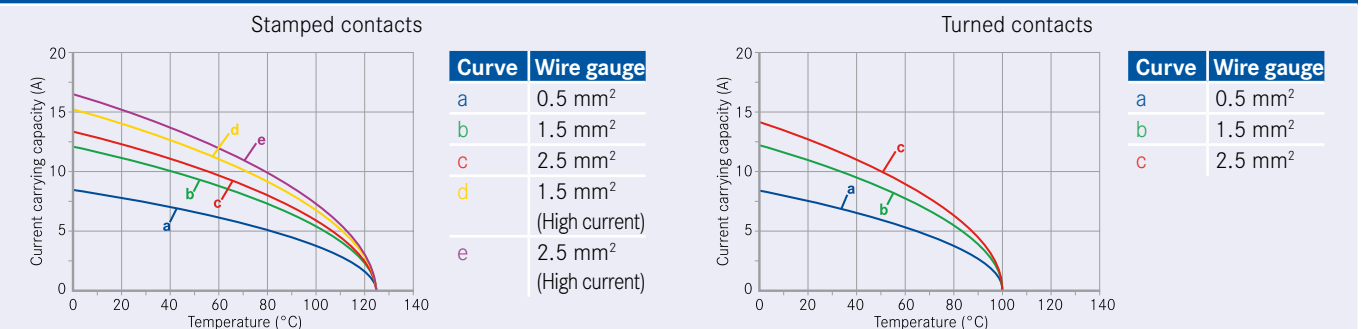
**Contact insert 40 + ⊕, 2 x PE-termination (Please order contacts separately, see page 34)**

Pin insert for stamped crimp contacts	C146 10A040 060 2		
Socket insert for stamped crimp contacts	C146 10B040 060 2		

**Pin layout** | **Assembly instruction**

Pin insert	Socket insert	Panel cut out (insert)	

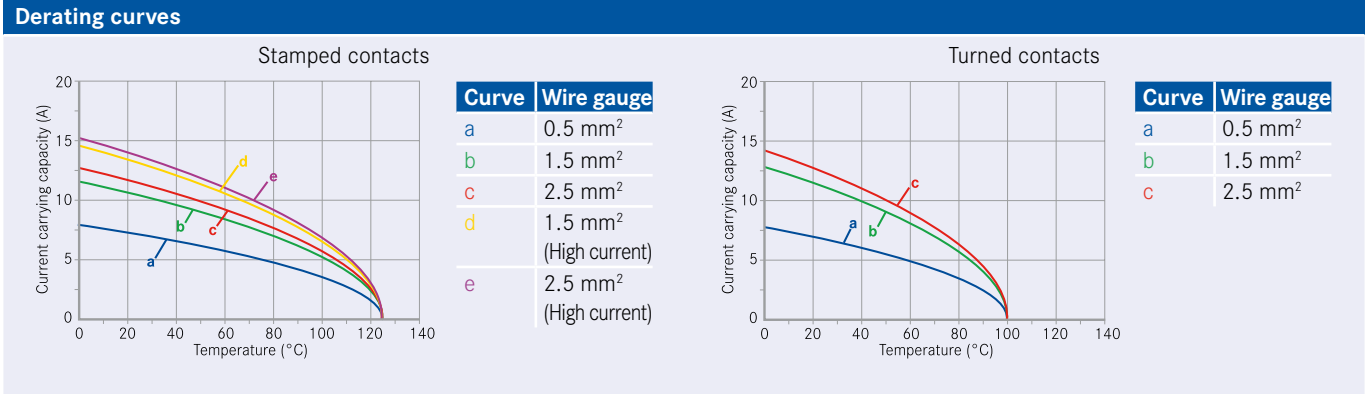
**Derating curves**



Description	Part Number	Drawing	Figure
<b>Contact insert 50 + ⊕ (Please order contacts separately, see page 34)</b>			
Pin insert for stamped crimp contacts	C146 10A025 000 2 + C146 10A025 005 2		
Pin insert for turned crimp contacts	C146 10A025 500 2 + C146 10A025 505 2		
Socket insert for stamped crimp contacts	C146 10B025 000 2 + C146 10B025 005 2		
Socket insert for turned crimp contacts	C146 10B025 500 2 + C146 10B025 505 2		

D

Pin layout	Assembly instruction
<p>Pin insert</p> <p>Socket insert</p>	<p>Panel cut out (insert)</p>



**Description** | **Part Number** | **Drawing** | **Figure**

**Contact insert 64 + ⊕ (Please order contacts separately, see page 34)**

Pin insert for stamped crimp contacts	C146 10A064 000 2		
Pin insert for turned crimp contacts	C146 10A064 500 2		
Socket insert for stamped crimp contacts	C146 10B064 000 2		
Socket insert for turned crimp contacts	C146 10B064 500 2		

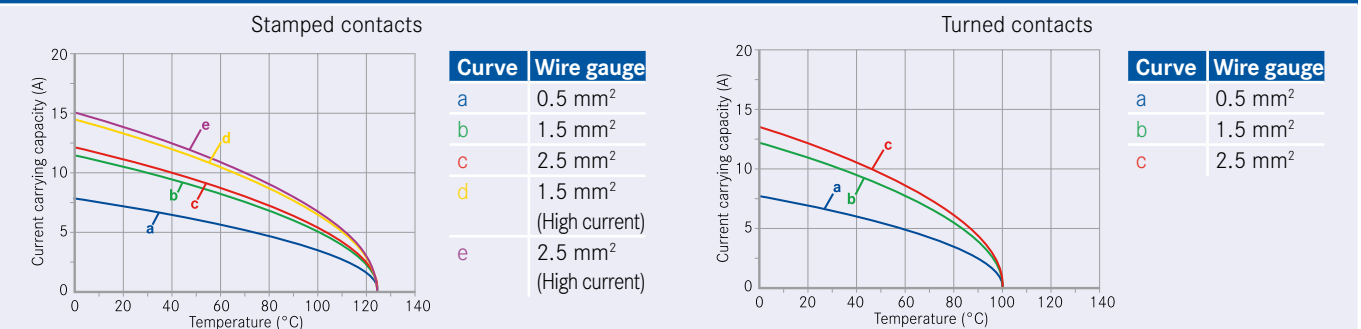
**Contact insert 64 + ⊕, 2 x PE-termination (Please order contacts separately, see page 34)**

Pin insert for stamped crimp contacts	C146 10A064 060 2		
Socket insert for stamped crimp contacts	C146 10B064 060 2		

**Pin layout** | **Assembly instruction**

Pin insert	Socket insert	Panel cut out (insert)	

**Derating curves**

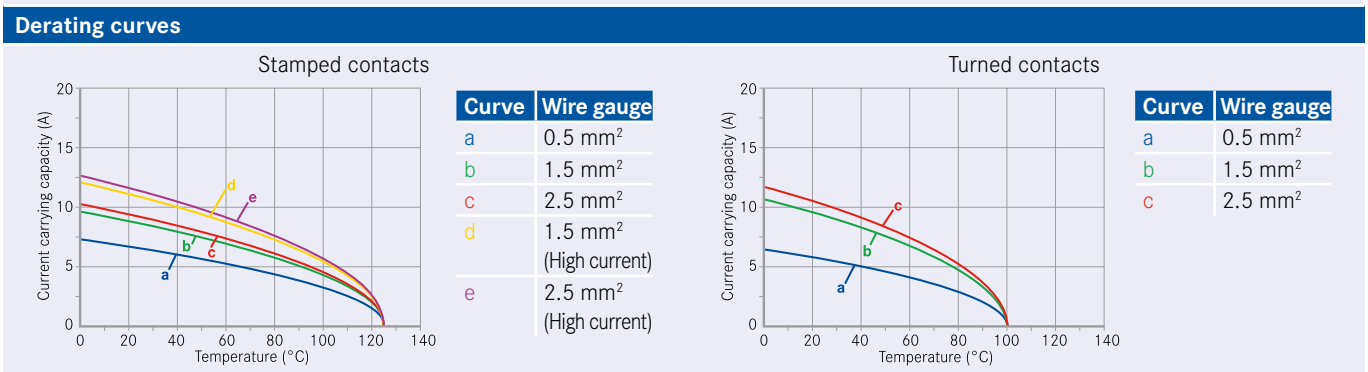




Description	Part Number	Drawing	Figure
<b>Contact insert 128 + Ⓟ (Please order contacts separately, see page 34)</b>			
Pin insert for stamped crimp contacts	C146 10A064 000 2 + C146 10A064 005 2		
Pin insert for turned crimp contacts	C146 10A064 500 2 + C146 10A064 505 2		
Socket insert for stamped crimp contacts	C146 10B064 000 2 + C146 10B064 005 2		
Socket insert for turned crimp contacts	C146 10B064 500 2 + C146 10B064 505 2		

D

Pin layout		Assembly instruction	
Pin insert	Socket insert	Panel cut out (insert)	



Large range of wire gauges

VN01 016 0003 1C



VN01 016 0002 1C



VN01 016 0005 1C



Gas-tight (coldwelding)

0.14

0.25

0.5

0.5

1.0

1.5

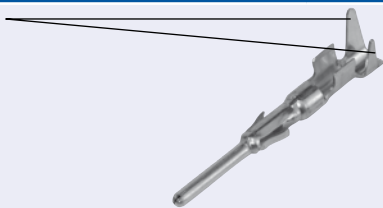
1.5

2.5



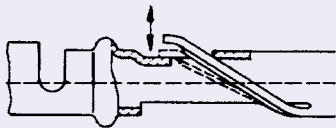
Stamped crimp contacts with insulation crimp, to absorb mechanical stress from the crimped connection

Insulation grip

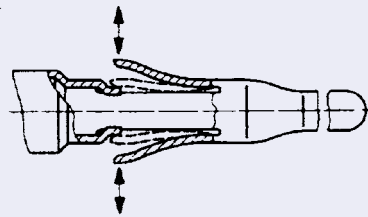


Mechanical retention spring stop on Socket and Pin contact

Socket contact

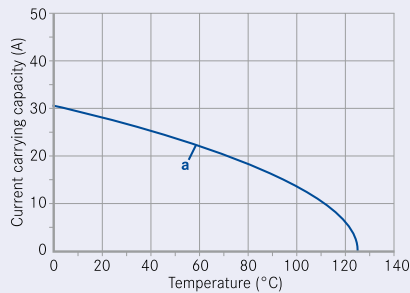


Pin contact

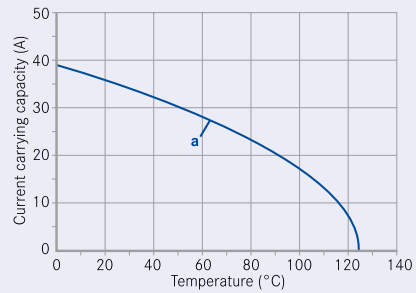


High current carrying capacity

Example single contact



Curve a: 2.5 mm<sup>2</sup> Standard contact. wire gauge



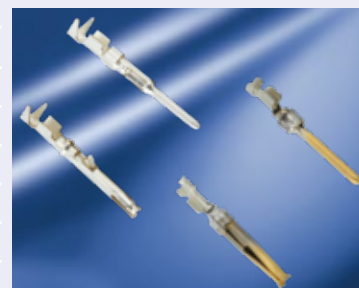
Curve a: 2.5 mm<sup>2</sup> High current contact, wire gauge

Stamped crimp contacts		
<b>Electrical Characteristics</b>		
Contact resistance	IEC 60512-2-1	≤ 5 m Ω
<b>Climatical Characteristics</b>		
Upper temperature	IEC 60512-11-9	+ 125 °C
Lower temperature	IEC 60512-11-10	- 40 °C
<b>Mechanical Characteristics</b>		
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
<b>Materials</b>		
Pin contact		CuZn (brass)
Socket contact		CuSn (tin bronze)
Contact plating		Ag (silver) / Au (gold)
Turned crimp contacts		
<b>Electrical Characteristics</b>		
Contact resistance	IEC 60512-2-1	≤ 5 m Ω
<b>Climatical Characteristics</b>		
Upper temperature	IEC 60512-11-9	+ 100 °C
Lower temperature	IEC 60512-11-10	- 40 °C
<b>Mechanical Characteristics</b>		
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
<b>Materials</b>		
Pin contact		CuZn (brass)
Socket contact		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	

**Stamped single contacts**

silver plating standard	0.14 - 0.5 mm <sup>2</sup>	26 - 20	100	VN01 016 0003 1	VN02 016 0003 1
	0.5 - 1.5 mm <sup>2</sup>	20 - 16	100	VN01 016 0002 1	VN02 016 0002 1
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	VN01 016 0005 1	VN02 016 0005 1
silver plating high current	0.5 - 1.5 mm <sup>2</sup>	20 - 16	100	VN01 016 0015 1	VN02 016 0015 1
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	VN01 016 0016 1	VN02 016 0016 1
gold plating standard	0.14 - 0.5 mm <sup>2</sup>	26 - 20	100	VN01 016 0003 2	VN02 016 0003 2
	0.5 - 1.5 mm <sup>2</sup>	20 - 16	100	VN01 016 0002 2	VN02 016 0002 2
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	VN01 016 0005 2	VN02 016 0005 2



**Stamped Contacts on reel for hand crimp tools**

silver plating standard	0.14 - 0.5 mm <sup>2</sup>	26 - 20	200	ZN01 016 0003 1	ZN02 016 0003 1
	0.5 - 1.5 mm <sup>2</sup>	20 - 16	200	ZN01 016 0002 1	ZN02 016 0002 1
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	ZN01 016 0005 1	ZN02 016 0005 1
silver plating high current	0.5 - 1.5 mm <sup>2</sup>	20 - 16	200	ZN01 016 0015 1	ZN02 016 0015 1
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	ZN01 016 0016 1	ZN02 016 0016 1
gold plating standard	0.14 - 0.5 mm <sup>2</sup>	26 - 20	200	ZN01 016 0003 2	ZN02 016 0003 2
	0.5 - 1.5 mm <sup>2</sup>	20 - 16	200	ZN01 016 0002 2	ZN02 016 0002 2
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	ZN01 016 0005 2	ZN02 016 0005 2



**Stamped contacts on reel for crimp machines contact feeding left hand side**

silver plating standard	0.14 - 0.5 mm <sup>2</sup>	26 - 20	2000	TN01 016 0003 1	TN02 016 0003 1
	0.5 - 1.5 mm <sup>2</sup>	20 - 16	2000	TN01 016 0002 1	TN02 016 0002 1
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	2000	TN01 016 0005 1	TN02 016 0005 1
silver plating high current	0.5 - 1.5 mm <sup>2</sup>	20 - 16	2000	TN01 016 0015 1	TN02 016 0015 1
	1.5 - 2.5 mm <sup>2</sup>	18 - 14	2000	TN01 016 0016 1	TN02 016 0016 1
gold plating standard	0.14 - 0.5 mm <sup>2</sup>	26 - 20	2000	TN01 016 0003 2	TN02 016 0003 2
	0.5 - 1.5 mm <sup>2</sup>	20 - 16	2000	TN01 016 0002 2	TN02 016 0002 2
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	2000	TN01 016 0005 2	TN02 016 0005 2



**Tools for stamped crimp contacts**

Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0,14 - 2.5 mm <sup>2</sup>	-	-	FG 0300 146 1
Service crimping tool	0.14 - 0.5 mm <sup>2</sup> 0.5 - 1.5 mm <sup>2</sup>	-	-	TA 0100 146
Crimping tool for single contacts	0.14 - 0.5 mm <sup>2</sup>	TA 0001 146 000 1	TA 0000 202	TA 0000 or TA 0500
	0.5 - 1.5 mm <sup>2</sup>	TA 0002 146 000 1	TA 0000 163	
	1.5 - 2.5 mm <sup>2</sup>	TA 0007 146 000 3	TA 0000 141	

Further tools see catalogue "Tools"

# heavy|mate® D Turned crimp contacts

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned crimp contacts single contact</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	20 - 16	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16 - 15	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	20 - 16	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16 - 15	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	
<b>Tools</b>						
Description	for wire gauge	Part Number				
		Contact locator	Crimping dies	Tool		
Removal tool for contacts	-	-	-	FG 0300 146 1		
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 2.5 mm <sup>2</sup>	TA 0010 146 000 1	TA 0000 184	TA 0000 or TA 0500		
4-Indent crimping tool	0.14 - 2.5 mm <sup>2</sup>	-	-	TB 0400 146		
Further tools see catalogue "Tools"						

D



A high-speed train is shown from a front-quarter perspective, traveling along a track. The train is white with orange and blue accents. Above the train, a complex network of overhead power lines and support poles is visible, extending into the distance. The background consists of green trees and a clear sky.

# heavy | mate<sup>®</sup> DD

- Rated voltage 250 V
- Rated current 10 A
- Termination: crimp
- Number of contacts: 24, 42, 72, 108
- HL3 acc. EN 45545: R22/23

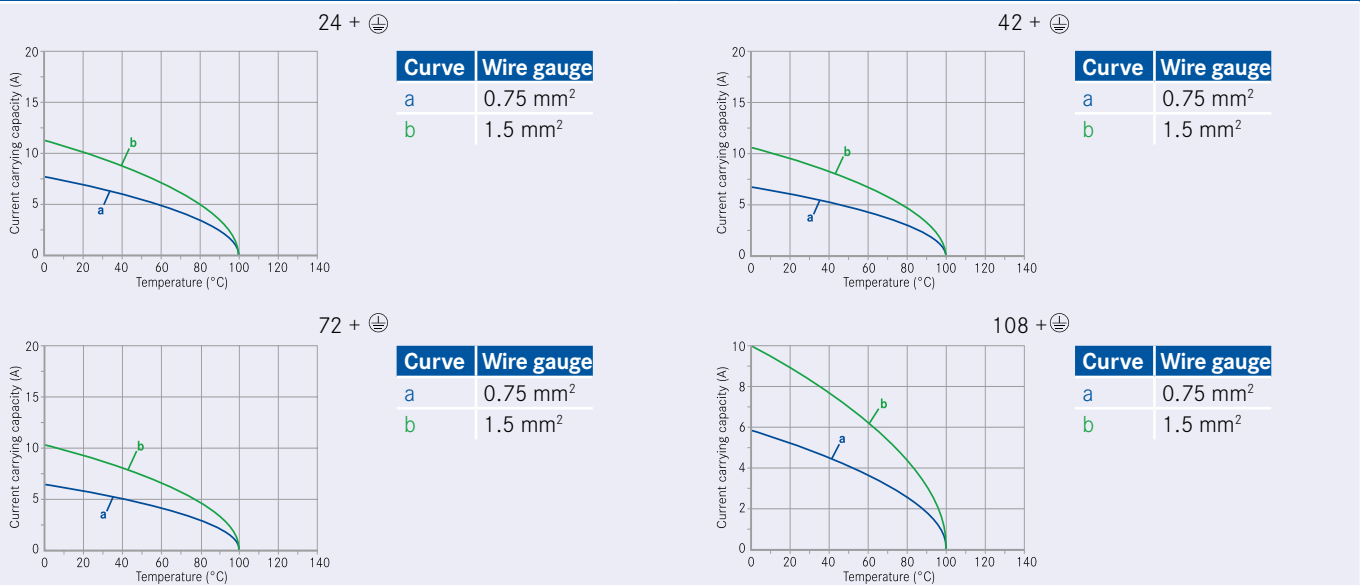


DD

Approvals, Testhouse	Characteristics	Approval-Number
UL 	600 V, 8,5 A	E 63093
CSA 	600 V	E 63093

General Characteristics		Standard	Value			
Number of contacts			24 + ⊕	42 + ⊕	72 + ⊕	108 + ⊕
Termination technique			crimp, PCB (in combination with PCB-adaptor)			
Wire gauge			0.14 mm <sup>2</sup> - 2.5 mm <sup>2</sup> (AWG 26 - 14)			
Max. wire diameter			3.7 mm			
Flammability	UL 94		V-0			
Electrical Characteristics						
Rated voltage	IEC 60664-1		250 V (UL/CSA 600 V)			
Rated impulse withstand voltage	IEC 60664-1		4 kV			
Rated Current T <sub>u</sub> = 40 °C			10 A			
Current carrying capacity	IEC 60512-5-2		see derating curves			
Installation (overvoltage) category	IEC 60664-1		III			
Material group	IEC 60664-1		III b			
Contact resistance	IEC 60512-2-1		≤ 5 m Ω			
Insulation resistance	IEC 60512-3-1		≥ 10 <sup>10</sup> Ω			
Pollution degree	IEC 60664-1		3			
Climatical Characteristics						
Climatic category	IEC 60068-1		40 / 125 / 21			
Upper temperature	IEC 60512-11-9		+ 125 °C			
Lower temperature	IEC 60512-11-10		- 40 °C			
Mechanical Characteristics						
IP-degree of protection pin insert <sup>1)</sup>	IEC 60529		unmated IP00, mated IP20			
IP-degree of protection socket insert <sup>1)</sup>	IEC 60529		unmated IP20, mated IP20			
Weight pin insert			44 g	50 g	63 g	86 g
Weight socket insert			41 g	50 g	67 g	88 g
Mechanical operation	IEC 60512-9-1		> 500 mating cycles			
Materials						
Insert			PC			
Colour insert			grey			
Contacts			CuZn (brass)			
Contact plating			Ag (silver) / Au (gold)			

**Derating curves**





Description	Part Number	Drawing	Figure
<b>Contact insert 24 + ⊕ I Size E 6 (Please order contacts separately, see page 43) Housings from page 226</b>			
Pin insert 24 + ⊕	C146 10A024 000 9		
Socket insert 24 + ⊕	C146 10B024 000 9		
<b>Contact insert 42 + ⊕ I Size E 10 (Please order contacts separately, see page 43) Housings from page 228</b>			
Pin insert 42 + ⊕	C146 10A042 000 9		
Socket insert 42 + ⊕	C146 10B042 000 9		
<b>Contact insert 72 + ⊕ I E 16 (Please order contacts separately, see page 43) Housings from page 235</b>			
Pin insert 72 + ⊕*	C146 10A072 000 9		
Socket insert 72 + ⊕*	C146 10B072 000 9		

DD

**Description** | **Part Number** | **Drawing** | **Figure**  
**Contact insert 108 +  $\oplus$  | Size E 24 (Please order contacts separately, see page 43) Housings from page 241**

Pin insert 108 + $\oplus$ *	C146 10A108 000 9		
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Socket insert 108 + $\oplus$ *	C146 10B108 000 9		
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**Contact insert 216 +  $\oplus$  | Size E 48 (Please order contacts separately, see page 43) Housings from page 249**

Pin insert 216 + $\oplus$ *	C146 10A108 000 9 + C146 10A108 005 9		
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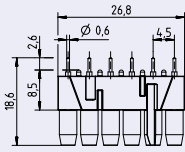

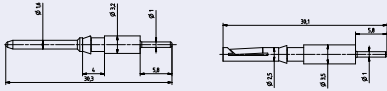

Socket insert 216 + $\oplus$ *	C146 10B108 000 9 + C146 10B108 005 9		
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**Pin layout** | **Assembly instruction**

<p>Pin insert</p> <p>X = 4 ( 24 pol. )          7 ( 42 pol. )          12 ( 72 pol. )          18 ( 108 pol. )</p>	<p>Socket insert</p>	<p>Panel cut out (insert)</p> <table border="1"> <thead> <tr> <th>Pol</th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>35</td> <td>44</td> </tr> <tr> <td>42</td> <td>48</td> <td>57</td> </tr> <tr> <td>72</td> <td>69</td> <td>77.5</td> </tr> <tr> <td>108</td> <td>95</td> <td>104</td> </tr> </tbody> </table>	Pol	A	B	24	35	44	42	48	57	72	69	77.5	108	95	104
Pol	A	B															
24	35	44															
42	48	57															
72	69	77.5															
108	95	104															

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned crimp contacts single contact 1.6mm</b>						
silver plating	0.14 - 0,37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1,0 mm <sup>2</sup>	20 - 16	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16 - 15	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	
gold plating	0.14 - 0,37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	20 - 16	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16 - 15	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	

DD

Description	Part number	Dawing	Figure
PCB adaptor 6 pole (for all inserts DD series)	C146 10B006 300 15		
PCB-contact gold plating (100 Pieces)	VN01 016 0057 3C VN02 016 0057 3C		

Tools for turned crimp contacts				
Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 2.5 mm <sup>2</sup>	-	-	FG 0300 146 1
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 2.5 mm <sup>2</sup>	TA 0010 146 0001	TA 0000 184	TA 0000 or TA 0500
4-Indent crimping tool	0.14 - 2.5 mm <sup>2</sup>	-	-	TB 0400 146
Further tools see catalogue "Tools"				





## heavy | mate<sup>®</sup> E

- Rated voltage 500 V
- Rated current 16 A
- Termination: screw, crimp, tension spring, push-in
- Numbers of contacts: 6, 10, 16, 24, 48
- HL3 acc. EN 45545: R22/23



E

Approvals, Testhouse	Characteristics	Approval-Number
UL 	600 V	E 63093
CSA 	600 V	48932

**General information**

- Contact inserts without crimp contacts (Contact inserts with crimp termination).
- Connectors series heavy|mate® E may be engaged or disengaged when live but without electrical load. If these connectors are mated or unmated under load, the load shall be reduced to 10 % of the rated current.
- Crimping tools and processing instructions see separate catalogue „Tools“.
- Low and high profile housings are usable.
- If wire ferrule are used, screw terminals without wire protection are preferred.



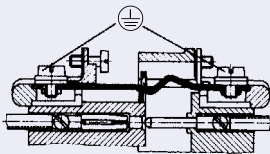
**No standard for this series, but:**

Interchangeable with other products

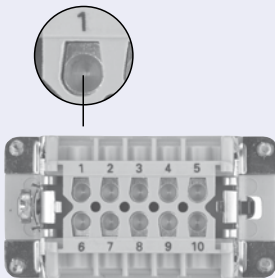
- a) contact insert to contact insert 6-, 10-, 16-, 24- way
- b) contact insert to housing 6-, 10-, 16-, 24- way

Housings are designed according to DIN EN 175 301 - 801

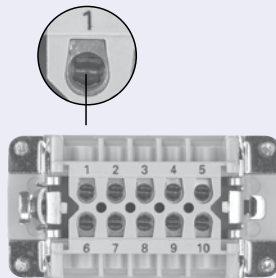
**First-to-mate last-to-break protective ground contact**



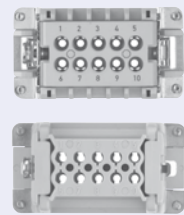
**Contact inserts for screw termination, screw termination with wire protection and for crimp termination**



Screw termination



Screw termination with wire protection



Crimp termination

**Range of housings**

**Size E6**



**Size E10**



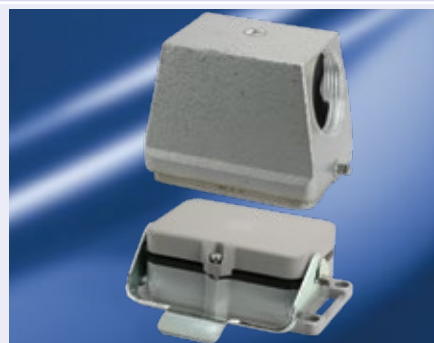
**Size E16**



**Size E24**



**Size E48**



General Characteristics	Standard	Value				
Number of contacts		6 + ⊕	10 + ⊕	16 + ⊕	24 + ⊕	48 + ⊕
Termination technique		crimp / screw / tension spring / push-in				
Wire gauge		0.14 - 4 mm <sup>2</sup> / push-in 0.14 - 2.5 mm <sup>2</sup> (AWG 26 - 12) / (AWG 26 - 14)				
Tightening torque		0.5 Nm				
Max. wire diameter		4.6 mm				
Flammability	UL 94	V-0				
Electrical Characteristics						
Rated voltage	IEC 60664-1	500 V (UL/CSA 600 V)				
Rated impulse withstand voltage	IEC 60664-1	6 kV				
Rated current T <sub>amp</sub> = 40 °C		16 A				
Current carrying capacity	IEC 60512-5-2	see derating curves				
Installation (overvoltage) category	IEC 60664-1	III				
Material group	IEC 60664-1	III b				
Contact resistance	IEC 60512-2-1	< 5 mΩ				
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω				
Pollution degree	IEC 60664-1	3				
Climatical Characteristics						
Climatic category	IEC 60068-1	40 / 125 / 21				
Upper temperature	IEC 60512-11-9	+ 125 °C				
Lower temperature	IEC 60512-11-10	- 40 °C				
Mechanical Characteristics						
IP-degree of protection pin insert <sup>1)</sup>	IEC 60529	unmated IP00, mated IP20				
IP-degree of protection socket insert <sup>1)</sup>	IEC 60529	unmated IP20, mated IP20				
Weight:						
Pin insert crimp (for stamped contacts)		33 g	39 g	45 g	55 g	110 g
Socket insert crimp (for stamped contacts)		33 g	39 g	49 g	62 g	124 g
Pin insert screw		43 g	57 g	78 g	105 g	210 g
Socket insert screw		43 g	57 g	78 g	106 g	212 g
Mechanical operation	IEC 60512-9-1	> 500 mating cycles				
Materials						
Insert		PC				
Colour insert		grey				
Contacts		CuZn (brass)				
Contact plating		Ag (silver) / Au (gold)				

Description	Part Number	Drawing	Figure
<b>Screw termination</b>			
Pin insert for screw termination	C146 10A006 002 1		
Pin insert with wire protection for screw termination	C146 10A006 102 1		
Socket insert for screw termination	C146 10B006 002 1		
Socket insert with wire protection for screw termination	C146 10B006 102 1		
<b>Tension spring</b>			
Pin insert with Tension spring	C146 10A006 400 1		
Pin insert with Tension spring	C146 10B006 400 1		
<b>Push-in</b>			
Pin insert with push-in connection	C146 10A006 600 1		
Socket insert with push-in connection	C146 10B006 600 1		



**Description** | **Part Number** | **Drawing** | **Figure**

**Stamped crimp contacts (Please order contacts separately, see page 58)**

Pin insert for stamped crimp contacts	C146 10A006 000 1		
--	-------------------	--	--

Socket insert for stamped crimp contacts	C146 10B006 000 1		
---	-------------------	--	--

**Turned crimp contacts (Please order contacts separately, see page 58)**

Pin insert for turned crimp contacts	C146 10A006 500 1		
---	-------------------	--	--

Socket insert for turned crimp contacts	C146 10B006 500 1		
--	-------------------	--	--

**Pin layout** | **Assembly instruction**

<p>Pin insert</p>	<p>Socket insert</p>	<p>Panel cut out (insert)</p>	
-------------------	----------------------	-------------------------------	--

**Derating curves**

<p>Stamped contacts</p>	<p>Turned contacts</p>	<p>Screw termination</p>
Curve a: 1.5 mm <sup>2</sup> wire gauge		Curve b: 2.5 mm <sup>2</sup> wire gauge

Description	Part Number	Drawing	Figure
<b>Screw termination</b>			
Pin insert for screw termination	C146 10A010 002 1		
Pin insert with wire protection for screw termination	C146 10A010 102 1		
Socket insert for screw termination	C146 10B010 002 1		
Socket insert with wire protection for screw termination	C146 10B010 102 1		
<b>Tension spring</b>			
Pin insert with Tension spring	C146 10A010 400 1		
Socket insert with Tension spring	C146 10B010 400 1		
<b>Push-in</b>			
Pin insert with push-in connection	C146 10A010 600 1		
Socket insert with push-in connection	C146 10B010 600 1		

**Description** | **Part Number** | **Drawing** | **Figure**

**Stamped crimp contacts (Please order contacts separately, see page 58)**

Pin insert for stamped crimp contacts	C146 10A010 000 1		
Socket insert for stamped crimp contacts	C146 10B010 000 1		

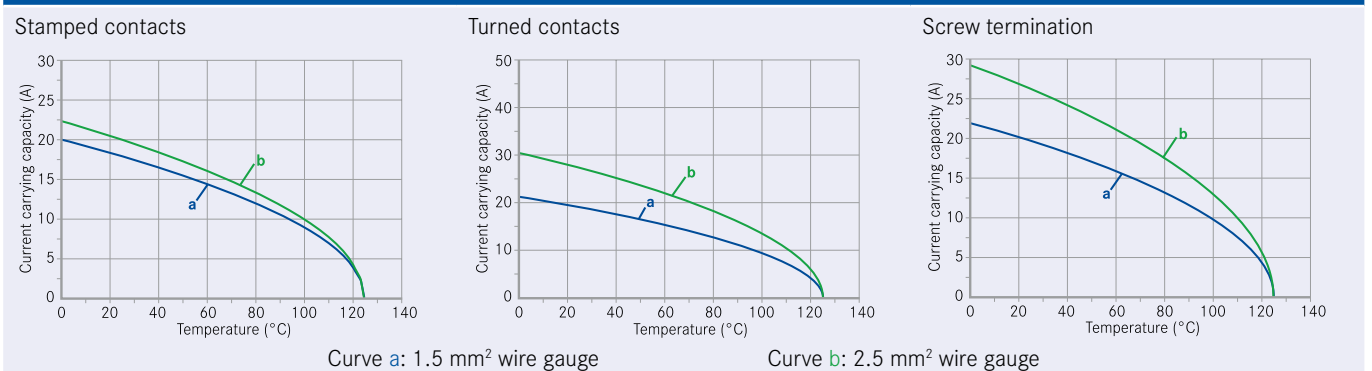
**Turned crimp contacts (Please order contacts separately, see page 58)**

Pin insert for turned crimp contacts	C146 10A010 500 1		
Socket insert for turned crimp contacts	C146 10B010 500 1		

**Pin layout** | **Assembly instruction**

<p>Pin insert</p>	<p>Socket insert</p>	<p>Panel cut out (insert)</p>
-------------------	----------------------	-------------------------------

**Derating curves**



Description	Part Number	Drawing	Figure
<b>Screw termination</b>			
Pin insert for screw termination	C146 10A016 002 1		
Pin insert with wire protection for screw termination	C146 10A016 102 1		
Socket insert for screw termination	C146 10B016 002 1		
Socket insert with wire protection for screw termination	C146 10B016 102 1		
<b>Tension spring</b>			
Pin insert with Tension spring	C146 10A016 400 1		
Socket insert with Tension spring	C146 10B016 400 1		
<b>Push-in</b>			
Pin insert with push-in connection	C146 10A016 600 1		
Socket insert with push-in connection	C146 10B016 600 1		

**Description** | **Part Number** | **Drawing** | **Figure**

**Stamped crimp contacts (Please order contacts separately, see page 58)**

Pin insert for stamped crimp contacts	C146 10A016 000 1		
--	-------------------	--	--

Socket insert for stamped crimp contacts	C146 10B016 000 1		
---	-------------------	--	--

**Turned crimp contacts (Please order contacts separately, see page 58)**

Pin insert for turned crimp contacts	C146 10A016 500 1		
---	-------------------	--	--

Socket insert for turned crimp contacts	C146 10B016 500 1		
--	-------------------	--	--

**Pin layout** | **Assembly instruction**

Pin insert	Socket insert	Panel cut out (insert)

**Derating curves**

<p>Stamped contacts</p>	<p>Turned contacts</p>	<p>Screw termination</p>
Curve a: 1.5 mm <sup>2</sup> wire gauge		Curve b: 2.5 mm <sup>2</sup> wire gauge

Description	Part Number	Drawing	Figure
<b>Screw termination</b>			
Pin insert for screw termination	C146 10A024 002 1		
Pin insert with wire protection for screw termination	C146 10A024 102 1		
Socket insert for screw termination	C146 10B024 002 1		
Socket insert with wire protection for screw termination	C146 10B024 102 1		
<b>Tension spring</b>			
Pin insert with Tension spring	C146 10A024 400 1		
Socket insert with Tension spring	C146 10B024 400 1		
<b>Push-in</b>			
Pin insert with push-in connection	C146 10A024 600 1		
Socket insert with push-in connection	C146 10B024 600 1		

**Description**      **Part Number**      **Drawing**      **Figure**

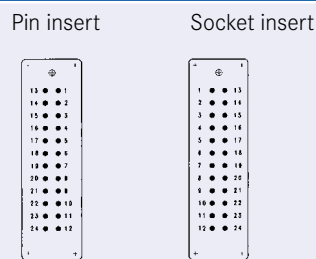
**Stamped crimp contacts (Please order contacts separately, see page 58)**

Pin insert for stamped crimp contacts	C146 10A024 000 1		
Socket insert for stamped crimp contacts	C146 10B024 000 1		

**Turned crimp contacts (Please order contacts separately, see page 58)**

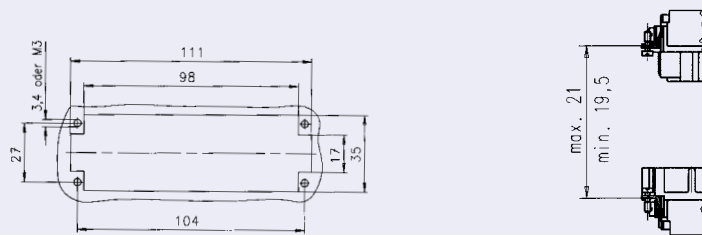
Pin insert for turned crimp contacts	C146 10A024 500 1		
Socket insert for turned crimp contacts	C146 10B024 500 1		

**Pin layout**



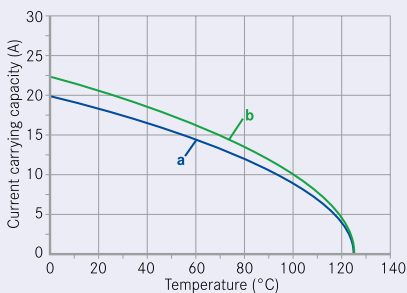
**Assembly instruction**

Panel cut out (insert)

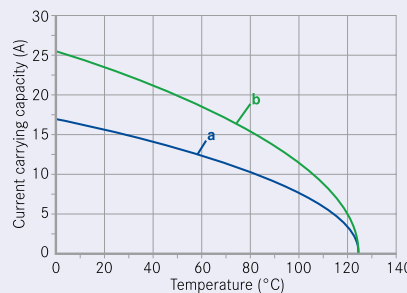


**Derating curves**

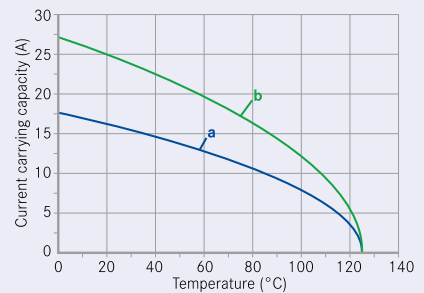
Stamped contacts



Turned contacts



Screw termination



Curve a: 1.5 mm<sup>2</sup> wire gauge

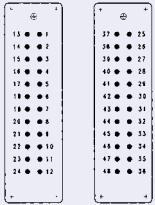
Curve b: 2.5 mm<sup>2</sup> wire gauge

Description	Part Number	Drawing	Figure
<b>Screw termination</b>			
Pin insert for screw termination	C146 10A024 002 1 + C146 10A024 002 1		
Pin insert with wire protection for screw termination	C146 10A024 102 1 + C146 10A024 102 1		
Socket insert for screw termination	C146 10B024 002 1 + C146 10B024 002 1		
Socket insert with wire protection for screw termination	C146 10B024 102 1 + C146 10B024 102 1		
<b>Stamped crimp contacts (Please order contacts separately, see page 58)</b>			
Pin insert for stamped crimp contacts	C146 10A024 000 1 + C146 10A024 000 1		
Socket insert for stamped crimp contacts	C146 10B024 000 1 + C146 10B024 000 1		
<b>Turned crimp contacts (Please order contacts separately, see page 58)</b>			
Pin insert for turned crimp contacts	C146 10A024 500 1 + C146 10A024 500 1		
Socket insert for turned crimp contacts	C146 10B024 500 1 + C146 10B024 500 1		

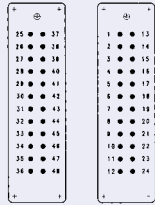


Pin layout

Pin insert

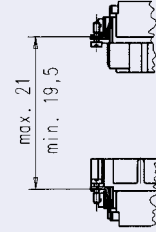
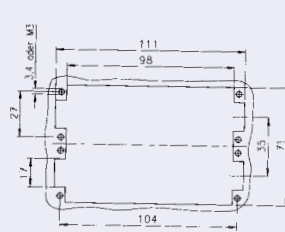


Socket insert



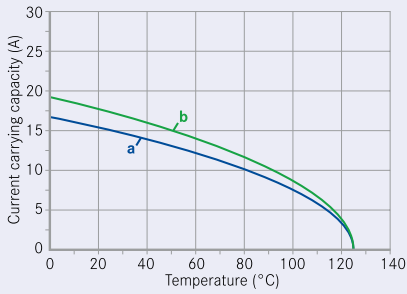
Assembly instruction

Panel cut out (insert)

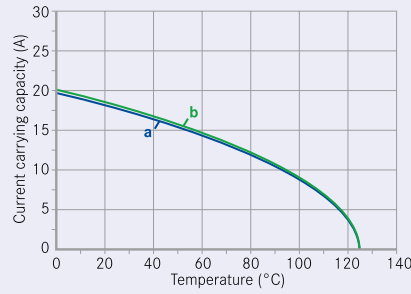


Derating curves

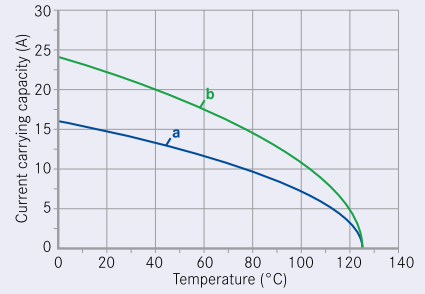
Stamped contacts



Turned contacts



Screw termination



Curve a: 1.5 mm<sup>2</sup> wire gauge

Curve b: 2.5 mm<sup>2</sup> wire gauge

E

Large range of wire gauges

VN01 025 0001 1C



VN01 025 0010 1C



Gas-tight (coldwelding)

0.5

1.0

1.5

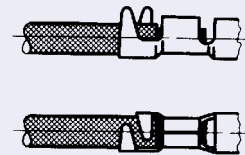
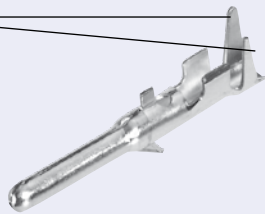
1.5

2.5



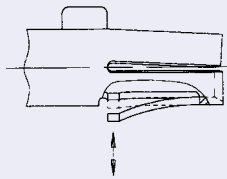
Stamped crimp contacts with insulation crimp, to absorb mechanical stress from the crimped connection

Insulation grip

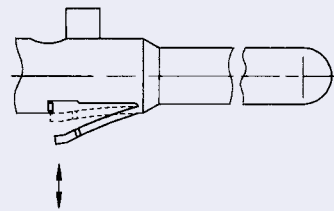


Mechanical retention spring stop on socket and pin contact

Socket contact

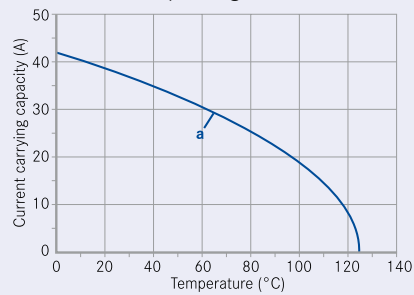


Pin contact



High current carrying capacity

Example single contact




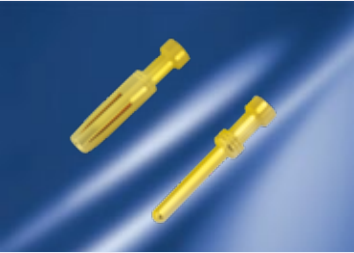
Curve a: 2.5 mm<sup>2</sup> wire gauge

Stamped crimp contacts		
<b>Electrical Characteristics</b>		
Contact resistance	IEC 60512-2-1	< 5 m Ω
<b>Mechanical Characteristics</b>		
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
<b>Materials</b>		
Pin contact		CuZn (brass)
Socket contact		CuSn (tin bronze)
Contact plating		Ag (silver) / Au (gold)
Turned crimp contacts		
<b>Electrical Characteristics</b>		
Contact resistance	IEC 60512-2-1	≤ 5 m Ω
<b>Climatical Characteristics</b>		
Upper temperature	IEC 60512-11-9	+ 125 °C
Lower temperature	IEC 60512-11-10	- 40 °C
<b>Mechanical Characteristics</b>		
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
<b>Materials</b>		
Pin contact		CuZn (brass)
Socket contact		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

## heavy|mate® E Stamped crimp contacts

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Stamped single contacts</b>						
silver plating	0.5 - 1.5 mm <sup>2</sup>	20 - 16	100	VN01 025 0001 101	VN02 025 0001 101	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	VN01 025 0010 101	VN02 025 0010 101	
	2.5 - 4 mm <sup>2</sup>	14 - 12	100	VN01 025 0043 1	VN02 025 0043 1	
gold plating	0.5 - 1.5 mm <sup>2</sup>	20 - 16	100	VN01 025 0001 102	VN02 025 0001 102	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	VN01 025 0010 102	VN02 025 0010 102	
	2.5 - 4 mm <sup>2</sup>	14 - 12	100	VN01 025 0043 2	VN02 025 0043 2	
<b>Stamped Contacts on reel for hand crimp tools</b>						
silver plating	0.5 - 1.5 mm <sup>2</sup>	20 - 16	200	ZN01 025 0001 1	ZN02 025 0001 1	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	ZN01 025 0010 1	ZN02 025 0010 1	
gold plating	0.5 - 1.5 mm <sup>2</sup>	20 - 16	200	ZN01 025 0001 2	ZN02 025 0001 2	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	ZN01 025 0010 2	ZN02 025 0010 2	
<b>Stamped contacts on reel for crimp machines contact feeding left hand side</b>						
silver plating	0.5 - 1.5 mm <sup>2</sup>	20 - 16	2000	TN01 025 0001 1	TN02 025 0001 1	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	2000	TN01 025 0010 1	TN02 025 0010 1	
	2.5 - 4 mm <sup>2</sup>	14 - 12	2000	TN01 025 0043 1	TN02 025 0043 1	
<b>Tools for turned crimp contacts</b>						
Description	for wire gauge	Part Number				
		Contact locator	Crimping dies	Tool		
Removal tool for contacts	0.5 - 4.0 mm <sup>2</sup>	-	-	FG 0200 146 1		
Crimping tool for stamped single contacts	0.5 - 1.5 mm <sup>2</sup>	TA 0004 146 0001	TA 0000 163	TA 0000 or TA 0500		
	1.5 - 2.5 mm <sup>2</sup>	TA 0005 146 0003	TA 0000 141			
	2.5 - 4.0 mm <sup>2</sup>	TA 0003 146 0001	TA 0000 121			
Further tools see catalogue "Tools"						

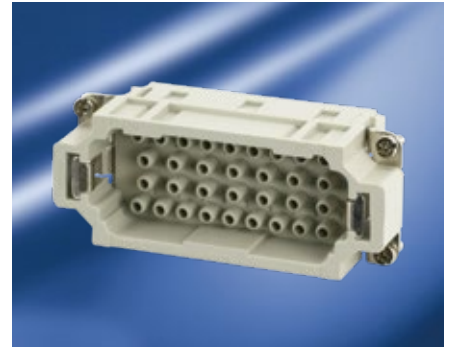
# heavy|mate® E Turned crimp contacts

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned crimp contacts single contact</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	22 - 26	100	VN01 025 0055 1C	VN02 025 0055 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 1C	VN02 025 0035 1C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 1C	VN02 025 0036 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 1C	VN02 025 0037 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 1C	VN02 025 0038 1C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 1C	VN02 025 0039 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	22 - 26	100	VN01 025 0055 2C	VN02 025 0055 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 2C	VN02 025 0035 2C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 2C	VN02 025 0036 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 2C	VN02 025 0037 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 2C	VN02 025 0038 2C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 2C	VN02 025 0059 2C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 2C	VN02 025 0039 2C	
	<b>Tools for turned crimp contacts</b>					
Description	for wire gauge	Part Number				
		Contact locator	Crimping dies	Tool		
Removal tool for contacts	0.14 - 4.0 mm <sup>2</sup>	-	-	FG 0300 146 7		
Standard crimping tool and accessories for 4-indent crimping	0.14 - 0.37 mm <sup>2</sup>	TA 0010 146 000 6	TA 0000 144	TA 0000 or TA 0500		
	0.5 - 2.5 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124			
	3.0 - 4.0 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124			
4-indent crimping tool	0.14 - 4.0 mm <sup>2</sup>	-	-	TB 0600 146		
Further tools see catalogue "Tools"						



E

# heavy | mate<sup>®</sup> EE

- Rated voltage 500 V
- Rated current 16 A
- Termination: crimp
- Numbers of contacts: 10, 18, 32, 46
- HL3 acc. EN 45545: R22/23

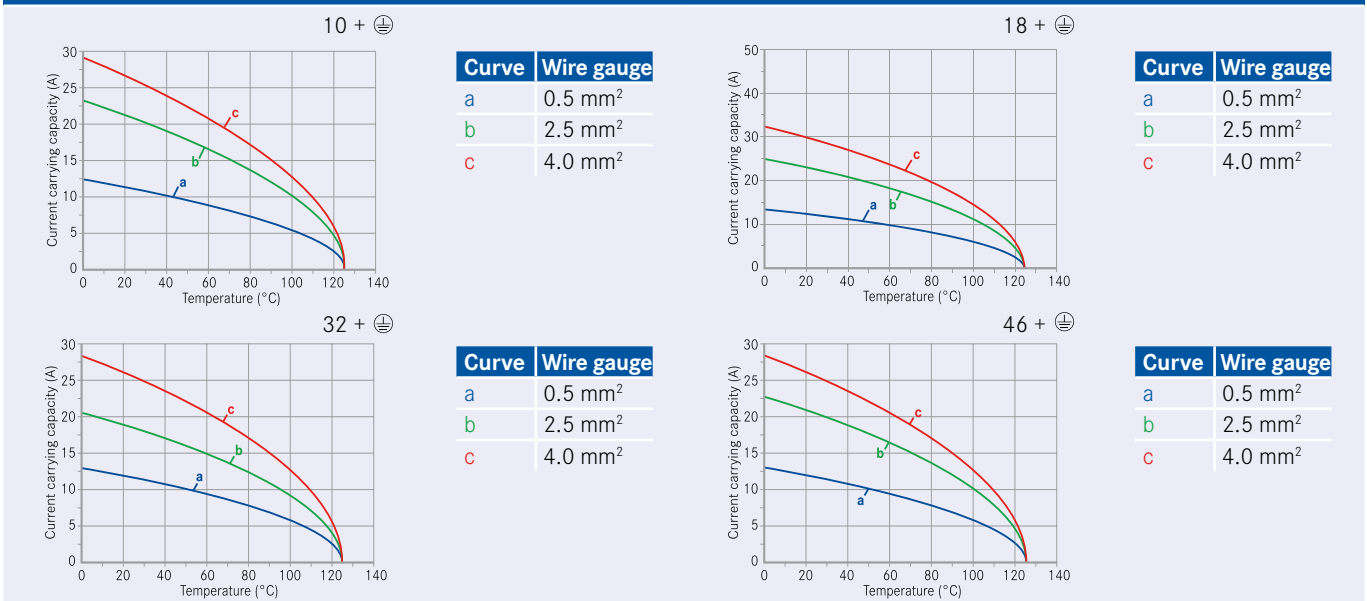


EE

Approvals, Testhouse	Characteristics	Approval-Number
UL 	600 V	E 63093
CSA 	600 V	E 63093

General Characteristics	Standard	Value			
Number of contacts		10 + ⊕	18 + ⊕	32 + ⊕	46 + ⊕
Termination technique		crimp			
Wire gauge		0.14 mm <sup>2</sup> - 4.0 mm <sup>2</sup> (AWG 26 - 12)			
Max. wire diameter		4.8 mm			
Flammability	UL 94	V-0			
Electrical Characteristics					
Rated voltage	IEC 60664-1	500 V (UL / CSA 600 V)			
Rated impulse withstand voltage	IEC 60664-1	8 kV			
Rated Current T <sub>u</sub> = 40 °C		16 A			
Current carrying capacity	IEC 60512-5-2	see derating curves			
Installation (overvoltage) category	IEC 60664-1	III			
Material group	IEC 60664-1	III b			
Contact resistance	IEC 60512-2-1	≤ 5 m Ω			
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω			
Pollution degree	IEC 60664-1	3			
Climatical Characteristics					
Climatic category	IEC 60068-1	40 / 125 / 21			
Upper temperature	IEC 60512-11-9	+ 125 °C			
Lower temperature	IEC 60512-11-10	- 40 °C			
Mechanical Characteristics					
IP-degree of protection pin insert	IEC 60529	unmated IP00, mated IP20			
IP-degree of protection socket insert	IEC 60529	unmated IP20, mated IP20			
Weight pin insert		55g	60g	63g	80g
Weight socket insert		55g	70g	85g	80g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles			
Materials					
Insert		PC			
Colour insert		grey			
Contacts		CuZn (brass)			
Contact plating		Ag (silver) / Au (gold)			

Derating-Kurven





Description	Part Number	Drawing	Figure
<b>Contact insert 10 + ⊕   Size E 6 (Please order contacts separately, see page 67) Housings from page 226</b>			
Pin insert 10 + ⊕	C146 10A010 500 10		
Socket insert 10 + ⊕	C146 10B010 500 10		

Pin layout	Assembly instruction
<p>Pin insert</p> <p>Socket insert</p>	<p>Panel cut out (insert)</p>

EE

Description	Part Number	Drawing	Figure
<b>Contact insert 18 + ⊕   Size E 10 (Please order contacts separately, see page 67) Housings from page 228</b>			
Pin insert 18 + ⊕	C146 10A018 500 10		
Socket insert 18 + ⊕	C146 10B018 500 10		


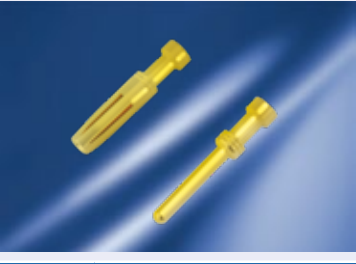
Pin layout	Assembly instruction
<p>Pin insert</p> <p>Socket insert</p>	<p>Panel cut out (insert)</p>

Description	Part Number	Drawing	Figure
<b>Contact insert 32 + ⊕   Size E 16 (Please order contacts separately, see page 67) Housings from page 235</b>			
Pin insert 32 + ⊕	C146 10A032 500 10		
Socket insert 32 + ⊕	C146 10B032 500 10		

Pin layout	Assembly instruction
<p>Pin insert</p> <p>Socket insert</p>	<p>Panel cut out (insert)</p>

Description	Part Number	Drawing	Figure
<b>Contact insert 46 + ⊕   Size E 24 (Please order contacts separately, see page 67) Housings from page 235</b>			
Pin insert 46 + ⊕	C146 10A046 500 10		
Socket insert 46 + ⊕	C146 10B046 500 10		

Pin layout	Assembly instruction
<p>Pin insert</p> <p>Socket insert</p>	<p>Panel cut out (insert)</p>

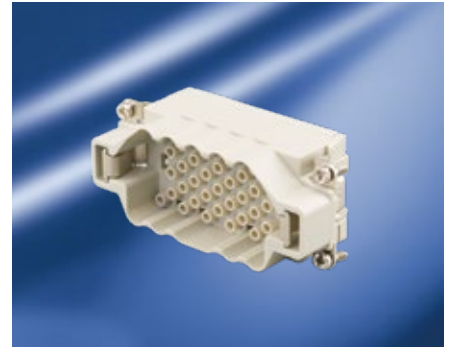
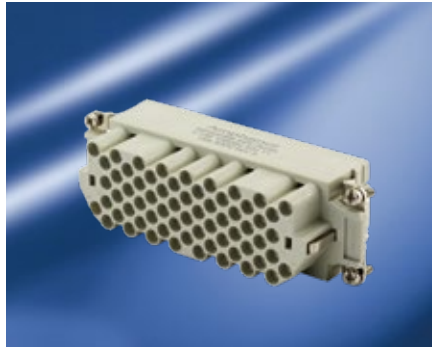
Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned crimp contacts single contact 2.5mm</b>						
silver plating	0.14 mm <sup>2</sup> - 0.37 mm <sup>2</sup>	26-22	100	VN01 025 0055 1C	VN02 025 0055 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 1C	VN02 025 0035 1C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 1C	VN02 025 0036 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 1C	VN02 025 0037 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 1C	VN02 025 0038 1C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 1C	VN02 025 0059 1C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 1C	VN02 025 0039 1C	
gold plating	0.14 mm <sup>2</sup> - 0.37 mm <sup>2</sup>	26-22	100	VN01 025 0055 2C	VN02 025 0055 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 2C	VN02 025 0035 2C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 2C	VN02 025 0036 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 2C	VN02 025 0037 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 2C	VN02 025 0038 2C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 2C	VN02 025 0059 2C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 2C	VN02 025 0039 2C	
<b>Tools for turned crimp contacts</b>						
Description	for wire gauge	Part Number				
		Contact locator	Crimping dies	Tool		
Removal tool for contacts	0.14 - 4.0 mm <sup>2</sup>	-	-	FG 0300 146 7		
Standard crimping tool and accessories for 4-indent crimping	0.14 - 0.37 mm <sup>2</sup>	TA 0010 146 000 6	TA 0000 144	TA 0000 or		
	0.5 - 2.5 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	TA 0500		
	3.0 - 4.0 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124			
4-indent crimping tool	0.14 - 4.0 mm <sup>2</sup>			TB 0600 146		
Further tools see catalogue "Tools"						

EE





# heavy | mate<sup>®</sup> EEE

- Rated voltage 500 V
- Rated current 16 A
- Termination: crimp
- Numbers of contacts: 40, 64
- HL3 acc. EN 45545: R22/23

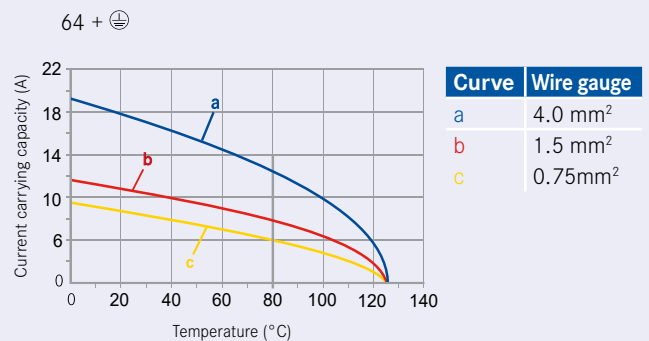
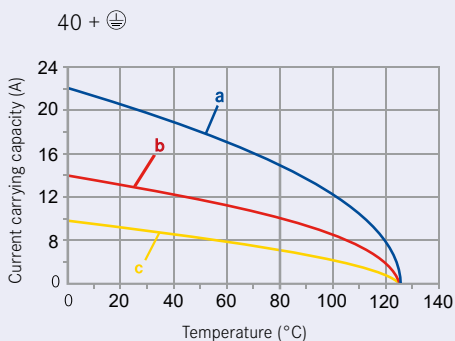


EEE

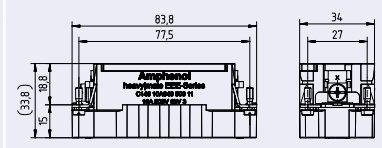

Approvals, Testhouse	Characteristics	Approval-Number
UL 	in preparation	in preparation
CSA 	in preparation	in preparation

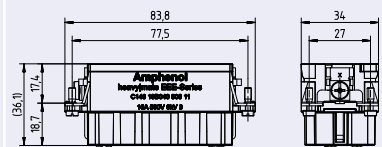

General Characteristics		Standard	Value	
Number of contacts			40 + ⊕	64 + ⊕
Termination technique			crimp	
Wire gauge			0.14 mm <sup>2</sup> - 4.0 mm <sup>2</sup> (AWG 26 - 12)	
Max. wire diameter			4.6 mm	
Flammability	UL 94		V-0	
Electrical Characteristics				
Rated voltage	IEC 60664-1		500 V	
Rated impulse withstand voltage	IEC 60664-1		6 kV	
Rated Current T <sub>u</sub> = 40 °C			16 A	
Current carrying capacity	IEC 60512-5-2		see derating curves	
Installation (overvoltage) category	IEC 60664-1		III	
Material group	IEC 60664-1		III b	
Contact resistance	IEC 60512-2-1		≤ 5 mΩ	
Insulation resistance	IEC 60512-3-1		≥ 10 <sup>10</sup> Ω	
Pollution degree	IEC 60664-1		3	
Climatical Characteristics				
Climatic category	IEC 60068-1		40 / 125 / 21	
Upper temperature	IEC 60512-11-9		+ 125 °C	
Lower temperature	IEC 60512-11-10		- 40 °C	
Mechanical Characteristics				
IP-degree of protection pin insert	IEC 60529		unmated IP00, mated IP20	
IP-degree of protection socket insert	IEC 60529		unmated IP20, mated IP20	
Weight pin insert			56 g	69 g
Weight socket insert			69 g	87 g
Mechanical operation	IEC 60512-9-1		≥ 500 mating cycles	
Materials				
Insert			PC	
Colour insert			grey	
Contacts			CuZn (brass)	
Contact plating			Ag (silver) / Au (gold)	

**Derating curves**

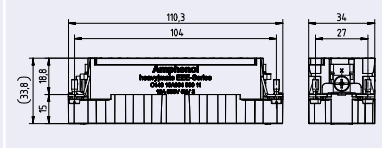



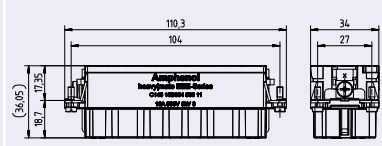
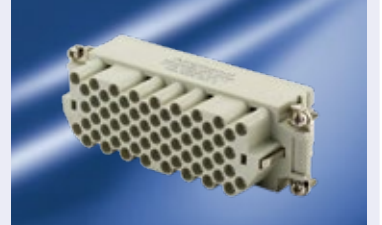
**Description** | **Part Number** | **Drawing** | **Figure**  
**Contact insert 40 + ⊕ I Size E 16 (Please order contacts separately, see page 72) Housings from page 235**

Pin insert 40 + ⊕	C146 10A040 500 11		
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Socket insert 40 + ⊕	C146 10B040 500 11		
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**Description** | **Part Number** | **Drawing** | **Figure**  
**Contact insert 64 + ⊕ I Size E 24 (Please order contacts separately, see page 72) Housings from page 24 1**

Pin insert 64 + ⊕	C146 10A064 500 11		
-------------------	--------------------	---	--

Socket insert 64 + ⊕	C146 10B064 500 11		
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EEE

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned crimp contacts single contact</b>						
silver plating	0.14 mm <sup>2</sup> - 0.37 mm <sup>2</sup>	26-22	100	VN01 025 0055 1C	VN02 025 0055 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 1C	VN02 025 0035 1C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 1C	VN02 025 0036 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 1C	VN02 025 0037 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 1C	VN02 025 0038 1C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 1C	VN02 025 0059 1C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 1C	VN02 025 0039 1C	
gold plating	0.14 mm <sup>2</sup> - 0.37 mm <sup>2</sup>	26-22	100	VN01 025 0055 2C	VN02 025 0055 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 2C	VN02 025 0035 2C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 2C	VN02 025 0036 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 2C	VN02 025 0037 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 2C	VN02 025 0038 2C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 2C	VN02 025 0059 2C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 2C	VN02 025 0039 2C	
<b>Tools for turned crimp contacts</b>						
Description	for wire gauge	Part Number				
		Contact locator	Crimping dies	Tool		
Removal tool for contacts	0.14 - 4.0 mm <sup>2</sup>	-	-	FG 0300 146 7		
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 0.37 mm <sup>2</sup>	TA 0010 146 000 6	TA 0000 144	TA 0000 or		
	0.5 - 2.5 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	TA 0500		
	3.0 - 4 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124			
4-Indent crimping tool	0.14 - 0.37 mm <sup>2</sup>	-	-	TB 0600 146		
Further tools see catalogue "Tools"						





EEE

The background of the image shows a large industrial factory or warehouse. In the foreground, there is a large, light-colored industrial machine, possibly a welding power source, with various cables and hoses connected to it. In the background, there are several large, teal-colored industrial machines, likely automated welding or cutting equipment, arranged in a line. The ceiling is high with exposed steel beams and several industrial lights hanging from it. The floor is concrete with yellow safety markings.

# heavy | mate<sup>®</sup> E / FE / KO

- Rated voltage 500 V
- Material contacts: iron-constantan
- Rated current 10 A
- Number of contacts: 6, 10, 16, 24
- HL3 acc. EN 45545: R22/23



E / FE /  
KO

**Connectors with iron (FE) and constantan (CO) contacts**

are basically used in measuring and control circuits to serve as interface between FE/CO thermocouples and control unit, i. e. temperature control of moulds in injection moulding machines. Through the use of FE/CO connectors in the thermocouple circuit the measuring results are more accurate, thus the tolerance of the temperature control is much narrower.

Amphenol's Industrial Connectors with iron (FE) an Constantan (CO) contacts are used to connect FE/CO thermocouples with electronic signal amplifiers in measuring and control circuits, i. e. for temperature control of moulding machines.

**Errors with various combinations**

The connection of unlike metals (FE/Brass and CO/Brass) generate thermoelectric voltage errors in the measuring circuit caused by the flow from iron wire to the brass contact or by temperature changes at the contact elements.

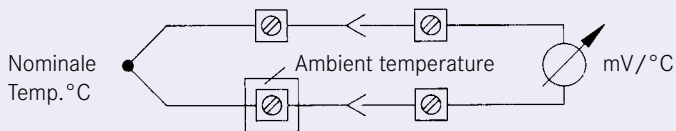
Nominal Temp.	Contact Material	without Thermo Contacts		with Thermo Contacts	
		MS/FE	MS/KO	FE/FE	KO/KO
100 °C		+ 4 %	- 16 %	- 4 %	- 2 %
200 °C		+ 2.5 %	- 8 %	- 3 %	- 1.5 %
300 °C		+ 1.3 %	- 12.7 %	- 1.3 %	0 %
400 °C		+ 1.5 %	- 4.5 %	- 1.0 %	0 %

By using FE/CO contacts respectively these deviations will be minimized.

**Material / Temperature Range**

Temperatur range	Material/measurement procedure
< 150 °C	any/Resistance measurement
150 °C - 450 °C	FE-CO (iron/Constantan)
450 °C - approx. 1000 °C	Ni/Cr-Ni (Nickel/Chrome/Nickel)

**Temperature changes cause errors**



## heavy|mate® E / FE / KO Characteristics contact inserts

General Characteristics	Standard	Value			
Number of contacts		6 + ⊕	10 + ⊕	16 + ⊕	24 + ⊕
Termination technique		screw			
Wire gauge		0.5 mm <sup>2</sup> - 2.5 mm <sup>2</sup> (AWG 20 - 14)			
Max. wire diameter		4.6 mm			
Flammability	UL 94	V-0			
Electrical Characteristics					
Rated voltage	IEC 60664-1	500 V			
Rated impulse withstand voltage	IEC 60664-1	6 kV			
Rated current T <sub>amp</sub> = 40 °C		16 A			
Installation (overvoltage) category	IEC 60664-1	III			
Material group	IEC 60664-1	III b			
Contact resistance	IEC 60512-2-1	≤ 10 m Ω			
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω			
Pollution degree	IEC 60664-1	3			
Climatical Characteristics					
Climatic category	IEC 60068-1	40 / 100 / 21			
Upper temperature	IEC 60512-11-9	+ 100 °C			
Lower temperature	IEC 60512-11-10	- 40 °C			
Mechanical Characteristics					
IP-degree of protection pin insert <sup>1)</sup>	IEC 60529	unmated IP00, mated IP20			
IP-degree of protection socket insert <sup>1)</sup>	IEC 60529	unmated IP20, mated IP20			
Weight pin insert		45 g	60 g	78 g	105 g
Weight socket insert		45 g	60 g	78 g	105 g
Mechanical operation	IEC 60512-9-1	≥ 100 mating cycles			
Materials					
Insert		PC			
Colour insert		grey			
Contacts		iron; gal cd 4 constantan = without plating			
Contact plating					

E / FE /  
KO

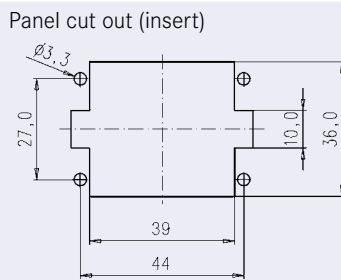
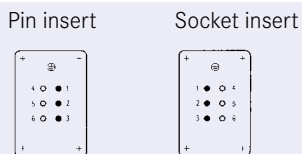
Description	Part Number	Drawing	Figure
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**Contact insert 6 + ⊕ with iron-constantan contacts I Size E6, Housings from page 226**

Pin insert with wire protection	C146 10A006 810 1		
Socket insert with wire protection	C146 10B006 810 1		

**Pin layout**

**Assembly instruction**



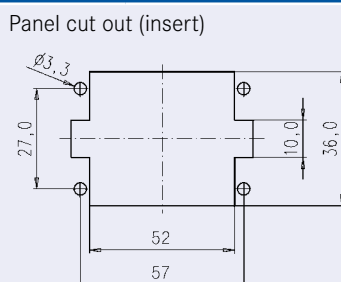
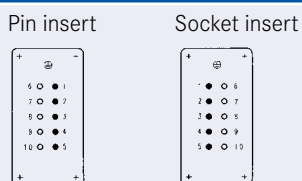
Description	Part Number	Drawing	Figure
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**Contact insert 10 + ⊕ with iron-constantan contacts I Size E10, Housings from page 228**

Pin insert with wire protection	C146 10A010 810 1		
Socket insert with wire protection	C146 10B010 810 1		

**Pin layout**

**Assembly instruction**



Description	Part Number	Drawing	Figure
<b>Contact insert 16 + ⊕ with iron-constantan contacts I Size E16, from page 235</b>			
Pin insert with wire protection	C146 10A016 810 1		
Socket insert with wire protection	C146 10B016 810 1		

Pin layout		Assembly instruction
<p>Pin insert</p>	<p>Socket insert</p>	<p>Panel cut out (insert)</p>

E / FE / KO

Description	Part Number	Drawing	Figure
<b>Contact insert 24 + ⊕ with iron-constantan contacts I Size E24, Housings from page 241</b>			
Pin insert with wire protection	C146 10A024 810 1		
Socket insert with wire protection	C146 10B024 810 1		

Pin layout		Assembly instruction
<p>Pin insert</p>	<p>Socket insert</p>	<p>Panel cut out (insert)</p>





# heavy | mate<sup>®</sup> F

- **Modular connector**
- **Compatible with market standard**
- **Rated voltage up to 1000 V**
- **Rated current up to 325 A**
- **Numbers of contacts: 1 - 108**
- **HL3 acc. EN 45545: R22/23**





F

Approvals, Testhouse	Characteristics	Approval-Number
UL 	see technical characteristics	E 63093
CSA 	see technical characteristics	E 63093

## General information

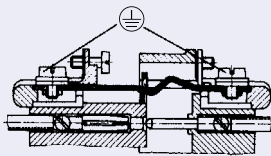
- Modules inserts without crimp contacts, crimping tools see separate catalogue “Tools”.
- Contacts must be ordered separately, processing instructions see catalogue “Tools”.
- Connectors series heavy|mate® F may be engaged or disengaged when live but without electrical load.  
If these connectors are mated or unmated under load, the load shall be reduced to 10 % of rated current.
- We recommend using the high profile housings / hoods for the heavy|mate® F inserts.
- Empty modul spaces have to be filled with blind modules.
- Torque for PE connection 1.2 Nm



## Advantages of the system

- No standard but interchangeable with competitive products.
- Housings are designed according to DIN EN 175 301 801
- Simply connecting of the modules and frames.

## First-to-mate last-to-break protective ground contact



## Range of housings

Size E6



Size E10



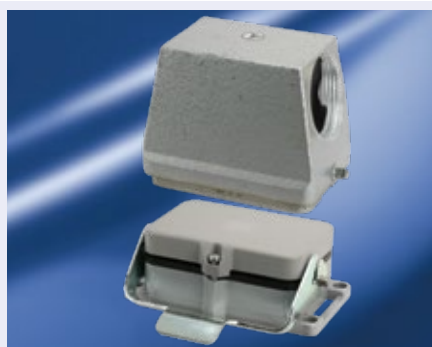
Size E16



Size E24



Size E48



### Requirements

- 3 x 400V; 50A; 6mm<sup>2</sup> wire gauge
- 8 x 250V; 8A; 1.5mm<sup>2</sup> wire gauge
- 5 x 400V; 15A; 4mm<sup>2</sup> wire gauge

### Solution

#### 1. Check how 16 contacts can be realized; see modules overview on page 84

Possible selection:

- a) 1 x 17 contacts
- b) 2 x 12 contacts
- c) 1 x 6 contacts + 1 x 12 contacts
- d) 1 x 3 contacts + 1 x 6 contacts + 1 x 12 contacts

#### 2. Check technical parameters / solution, see detail pages of the modules from page 96

Possible selection:

- a) not possible due to voltage
- b) not possible due to voltage
- c) not possible due to current
- d) POSSIBLE

#### 3. Choose matching contact, see detail page of the modules on page 96

Possible selection:

- a) 3 contacts = C146 10A003 600 15 → contacts = VN01 040 0013 1C
- b) 6 contacts = C146 10A006 600 15 → contacts = VN01 025 0039 1C
- c) 12 contacts = C146 10A012 600 15 → contacts = VN01 016 0027 1C

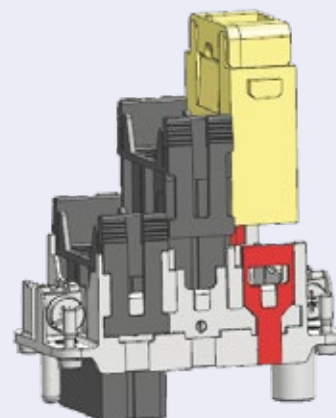
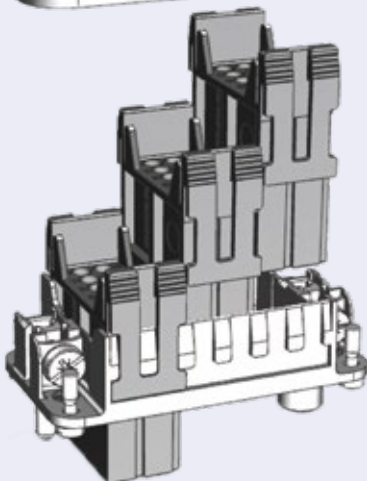
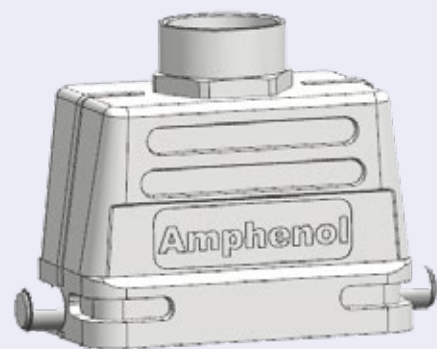
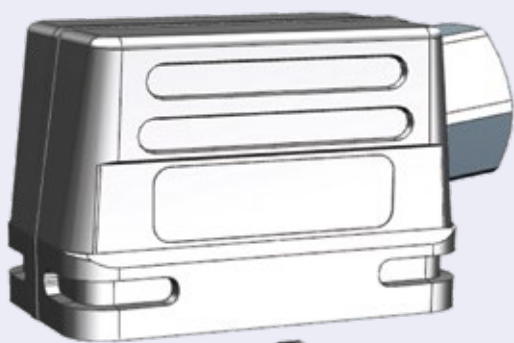
#### 4. Choose matching frame, see frames on page 92

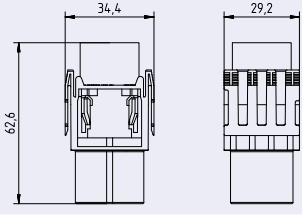

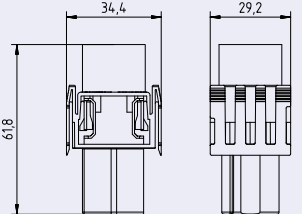

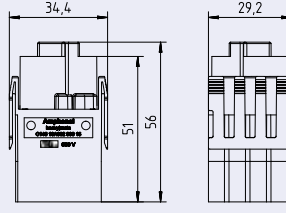

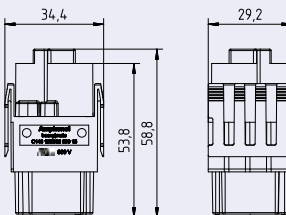

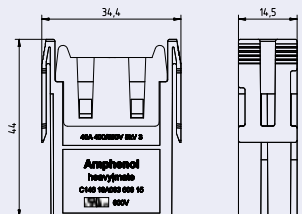

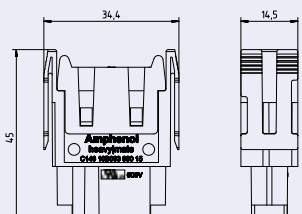

Solution: C146 10P10 000 15

#### 5. Choose matching housing, see housings on page 228

Solution: C146 21R010 600 8

### Schematic construction



Description	Part Number	Drawing	Figure
<b>1 contacts module, 1000V, details see page 96*</b>			
Pin module 1 contact	C146 10A001 600 15		
Socket module 1 contact	C146 10B001 600 15		
<b>2 contacts module, 1000V, details see page 98</b>			
Pin module 2 contacts	C146 10A002 600 15		
Socket module 2 contacts	C146 10B002 600 15		
<b>3 contacts module, details see page 100</b>			
Pin module 3 contacts	C146 10A003 600 15 C146 10A003 601 15		
Socket module 3 contacts	C146 10B003 600 15 C146 10B003 601 15		

Description	Part Number	Drawing	Figure
<b>3+4 contacts module, 830 V, details see page 102*</b>			
Pin module 3+4 contacts	C146 10A007 600 15		
Socket module 3+4 contacts	C146 10B007 600 15		
<b>4 contacts module, 830 V, details see page XXX</b>			
Pin module 4 contacts	C146 10A004 600 15		
Socket module 4 contacts	C146 10B004 600 15		

Description	Part Number	Drawing	Figure
<b>6 contacts module, 500 V, details see page 106</b>			
Pin module 6 contacts	C146 10A006 600 15		
Socket module 6 contacts	C146 10B006 600 15		
<b>8 contacts module, 400 V, details see page 108</b>			
Pin module 8 contacts	C146 10A008 600 15		
Socket modules 8 contacts	C146 10B008 600 15		
<b>12 contacts module, 250 V, details see page 110</b>			
Pin module 12 contacts	C146 10A012 600 15		
Socket module 12 contacts	C146 10B012 600 15		

Description	Part Number	Drawing	Figure
<b>17 contacts module, 160 V, details see page 112</b>			
Pin module 17 contacts	C146 10A017 600 15		
Socket module 17 contacts	C146 10B017 600 15		
<b>20 contacts module, 500 V, details see page 114</b>			
Pin module 20 contacts	C146 10A020 600 15		
Socket module 20 contacts	C146 10B020 600 15		
<b>36 contacts module, 250 V, details see page 120</b>			
Pin module 36 contacts	C146 10A036 600 15		
Socket module 36 contacts	C146 10B036 600 15		

F

Description	Part Number	Drawing	Figure
<b>Adaptor modules, details see page 122</b>			
Adaptor modules for Gigabit- and Megabit pin contact carrier	C146 10A001 800 15		
Adaptor modules for Gigabit- and Megabit socket contact carrier 8 pole	C146 10B001 800 15		
<b>Gigabit contact carrier 8 pole, CAT7, details see page 123*</b>			
Pin contact carrier - without shieldconnection to the frame - with shieldconnection to the frame	C146 10A008 901 15 C146 10A008 902 15		
Socket contact carrier - without shieldconnection to the frame - with shieldconnection to the frame	C146 10B008 901 15 C146 10B008 902 15		
<b>Megabit contact carrier 8 pole, CAT5e, details see page 124 *</b>			
Pin contact carrier - without shieldconnection to the frame - with shieldconnection to the frame	C146 10A008 905 15 C146 10A008 906 15		
Socket contact carrier - without shieldconnection to the frame - with shieldconnection to the frame	C146 10B008 905 15 C146 10B008 906 15		



Description	Part Number	Drawing	Figure
<b>D-Sub module, details see page 128*</b>			
Pin module D-Sub 9 contacts	C146 10A009 600 15		
Socket module D-Sub 9 contacts	C146 10B009 600 15		

Description	Part Number	Drawing	Figure
<b>Adaptor modules, details see page 116</b>			
Adaptor modules for Quintax- and Coax pin contact carrier	C146 10A002 800 15		
Adaptor modules for Quintax- and Coax socket contact carrier	C146 10B002 800 15		
<b>Quintax contact carrier, CAT5e, 50 V, details see page 116</b>			
Pin contact carrier 4 pole	C146 10A004 901 15		
Socket contact carrier 4 pole	C146 10B004 901 15		
<b>Coax contact carrier, 50 Ω, details see page 118</b>			
Pin contact carrier 1 pole	C146 10A001 902 15		
Socket contact carrier 1 pole	C146 10B001 902 15		

Description	Part Number	Drawing	Figure
<b>Coax contact carrier 75 Ω, details see page 118</b>			
Pin contact carrier 1 pole	C146 10A001 901 15		
Socket contact carrier 1 pole	C146 10B001 901 15		
<b>Blind modules, details see page 130*</b>			
Blind module with centering function**	C146 10H000 600 15		
Blind module standard	C146 10H000 601 15		

F

Description	Part Number	Drawing	Figure
<b>Frame for 2 modules   Size E6   Housings from page 226</b>			
Frame for 2 pin modules	C146 10P06 000 15		
Frame for 2 socket modules	C146 10S06 000 15		
<b>Frame for 3 modules   Size E10   Housings from page 228</b>			
Frame for 3 pin modules	C146 10P10 000 15		
Frame for 3 socket modules	C146 10S10 000 15		
<b>Frame for 4 modules   Size E16   Housings from page 235</b>			
Frame for 4 pin modules	C146 10P16 000 15		
Frame for 4 socket modules	C146 10S16 000 15		

Description	Part Number	Drawing	Figure
<b>Frame for 6 modules   Size E24   Housings from page 24 1</b>			
Frame for 6 pin modules	C146 10P024 000 15		
Frame for 6 socket modules	C146 10S024 000 15		

Delivery form	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Cable lug for earth connection</b>						
Cable lug	10 - 16 mm <sup>2</sup>	8 - 6	1	N15 043 0003 003		

Clamp 1 under screw is approved for wires up to 6 mm<sup>2</sup> (with wire end sleeve). For wires 10 - 16 mm<sup>2</sup> please use clamp 2 with cable lug.

F

Description	Part Number	Drawing	Figure
<b>Multiframe for 2 modules   Size E6   Housings from page 226</b>			
Frame for 2 pin modules	C146 10P006 100 15		
Frame for 2 socket modules	C146 10S006 100 15		
<b>Multiframe for 3 modules   Size E10   Housings from page 228</b>			
Frame for 3 pin modules	C146 10P010 100 15		
Frame for 3 socket modules	C146 10S010 100 15		
<b>Multiframe for 4 modules   Size E16   Housings from page 235</b>			
Frame for 4 pin modules	C146 10P016 100 15		
Frame for 4 socket modules	C146 10S016 100 15		

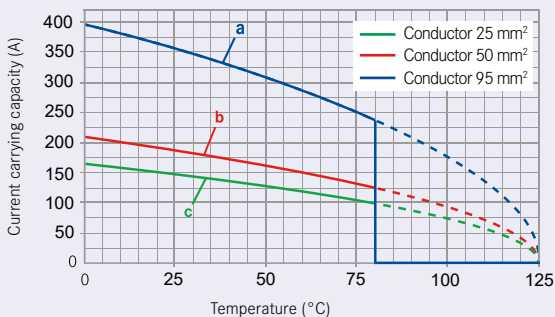
# heavy|mate® F Multiframes: can also be assembled with competitors modules

Description	Part number	Drawing	Figure		
<b>Multiframes for 6 modules   Size E24   Housings from page 24 1</b>					
Multiframe for 6 pin modules	C146 10P024 100 15				
Multiframe for 6 socket modules	C146 10S024 100 15				
<b>Locking device   used for modules from competitors</b>					
Locking device 10 Pieces	VN 09 146 0019 X				
Supplied as	for wire gauge	AWG	Pieces	Part Number	Figure
<b>Cable lug for earth connection</b>					
Cable lug	10 - 16 mm <sup>2</sup>	8 - 6	1	N 15 043 0003 003	
Clamp 1 under screw is approved for wires up to 6 mm <sup>2</sup> (with wire end sleeve). For wires 10 - 16 mm <sup>2</sup> please use clamp 2 with cable lug.					

F

General Characteristics	Standard	Value
Number of contacts		1
Termination technique		crimp
Wire gauge		25 - 95 mm <sup>2</sup> (AWG 4 - 000)
Max. wire diameter		20 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	1000 V
Rated impulse withstand voltage	IEC 60664-1	8 kV
Rated Current T <sub>u</sub> = 40 °C		325 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category		40 / 125 / 21
Upper temperature		+125°C
Lower temperature		-40°C
Mechanical Characteristics		
IP-degree of protection pin module		unmated IP00, mated IP20
IP-degree of protection socket module		unmated IP20, mated IP20
Weight pin module		18 g
Weight socket module		15 g
Mechanical operation		≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver)

**Derating curves**

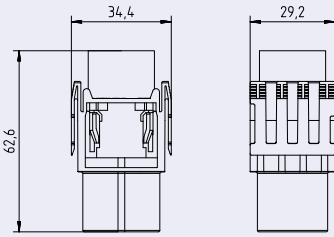

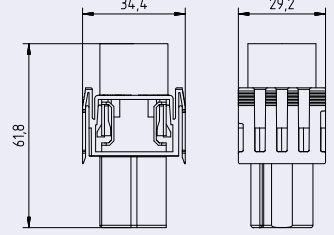





**General requirements**

- Due to reduced cross sections at PE contacts of frames, the PE contact has to be additionally protected against short circuits by using a protection circuit offering a sufficiently short breaking time (<0.25s).
- Parts to be used as connectors, not as plug devices (connector with breaking capacity). Do not mate under current or voltage!



# heavy|mate® F 1 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>1 contacts module (Please order contacts separately)</b>			
Pin module	C146 10A001 600 15		
Socket module	C146 10B001 600 15		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 10 mm crimp contacts</b>						
Single contact	25 mm <sup>2</sup>	4	1	N01 100 5099 001	N02 100 6119 002	
	35 mm <sup>2</sup>	2	1	N01 100 6000 001	N02 100 6120 002	
	50 mm <sup>2</sup>	1	1	N01 100 6001 001	N02 100 6121 002	
	70 mm <sup>2</sup>	0	1	N01 100 6002 001	N02 100 6122 002	
	95 mm <sup>2</sup>	0	1	N01 100 6003 001	N02 100 6123 002	
<b>Cable lug for earth connection</b>						
Single contact	16 mm <sup>2</sup>	6	1	N15 043 0003 003		

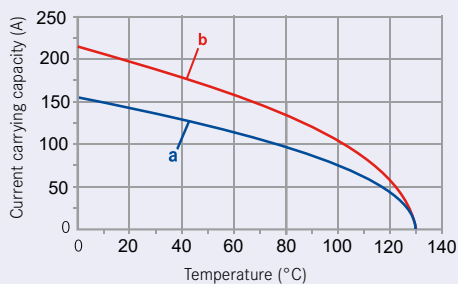
## Tools

Description	for wire gauge	Part number		
		Contact locator	Crimping dies	Tool
Crimping dies	25 mm <sup>2</sup>	-	TE 0600 042	**
	35 mm <sup>2</sup>	-	TE 0600 022	**
	50 mm <sup>2</sup>	-	TE 0500 103	**
	70 mm <sup>2</sup>	-	TE 0500 201	**
	95 mm <sup>2</sup>	-	TE 0500 301	**

\* = For use in pneumatic crimping tool EK12042L by Klauke or AHPW 400C by Neko.  
Further tools see catalogue "Tools".

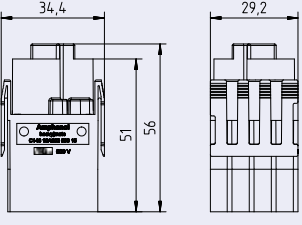

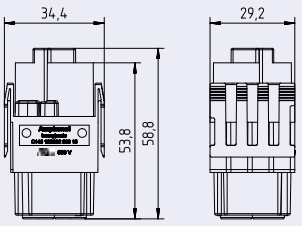

General Characteristics	Standard	Value
Number of contacts		2
Termination technique		crimp
Wire gauge		10 - 35 mm <sup>2</sup> (AWG 8-2)
Max. wire diameter		13 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	1000 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	8 kV
Rated Current T <sub>u</sub> = 40 °C		100 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category		40 / 125 / 21
Upper temperature		+125°C
Lower temperature		-40°C
Mechanical Characteristics		
IP-degree of protection pin module		unmated IP00, mated IP20
IP-degree of protection socket module		unmated IP20, mated IP20
Weight pin module		18 g
Weight socket module		22 g
Mechanical operation		≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver)



**Derating curves**



Curve	Wire gauge
a	25 mm <sup>2</sup>
b	35 mm <sup>2</sup>

# heavy|mate® F 2 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>2 contacts module (Please order contacts separately)</b>			
Pin module 2 contacts	C146 10A002 600 15		
Socket module 2 contacts	C146 10A002 600 15		

Supplied as	for wire gauge	AWG	Part Number		Figure
			Pin contact	Socket contact	
<b>Turned 8 mm crimp contact single contact</b>					
silver plating	10 mm <sup>2</sup>	8	N 01 080 0003 1	N 02 080 0003 1	
	16 mm <sup>2</sup>	6	N 01 080 0004 1	N 02 080 0004 1	
	25 mm <sup>2</sup>	4	N 01 080 0005 1	N 02 080 0005 1	
	35 mm <sup>2</sup>	2	N 01 080 0006 1	N 02 080 0006 1	
<b>Cable lug for earth connection</b>					
Single contact	10 - 16 mm <sup>2</sup>	8 - 6	N15 043 0003 003		

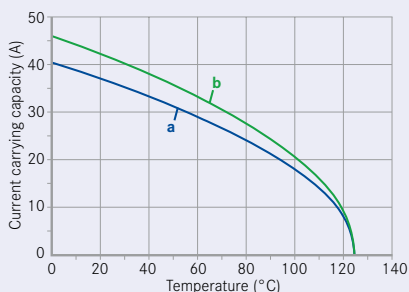
## Tools

Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	10 - 35 mm <sup>2</sup>	-	-	FG 03000 146 6000
Crimping tool	10 mm <sup>2</sup>	-	-	TB0002
	16 mm <sup>2</sup>	-	TE 0600 062	*
	25 mm <sup>2</sup>	-	TE 0600 042	*
	35 mm <sup>2</sup>	-	TE 0600 022	*

\* = For use in pneumatic crimping tool EK12042L by Klauke or AHPW 400C by Neko.  
Further tools see catalogue "Tools".

General Characteristics	Standard	Value
Number of contacts		3
Termination technique		crimp
Wire gauge		1.5 - 10.0 mm <sup>2</sup> (AWG 16 - 8)
Max. wire diameter		5.2 / 6.4 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	400 V (conductor - earth) 690 V (conductor - conductor)
Rated impulse withstand voltage	IEC 60664-1	6 kV
Rated Current T <sub>u</sub> = 40 °C		40 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		13 g
Weight socket module		13 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver)

**Derating curves**



Curve	Wire gauge
a	4 mm <sup>2</sup>
b	6 mm <sup>2</sup>
c	10 mm <sup>2</sup>

# heavy|mate® F 3 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>3 contacts module (Please order contacts separately)</b>			
Pin module 3 contacts for wire gauge 1.5 - 6 mm <sup>2</sup> for wire gauge 1.5 -10 mm <sup>2</sup>	C146 10A003 600 15 C146 10A003 601 15		
Socket module 3 contacts for wire gauge 1.5 - 6 mm <sup>2</sup> for wire gauge 1.5 - 10 mm <sup>2</sup>	C146 10B003 600 15 C146 10B003 601 15		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 4 mm crimp contacts single contact</b>						
silver plating	1.5 mm <sup>2</sup>	16	100	VN01 040 0010 1C	VN02 040 0010 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 040 0011 1C	VN02 040 0011 1C	
	4 mm <sup>2</sup>	12	100	VN01 040 0012 1C	VN02 040 0012 1C	
	6 mm <sup>2</sup>	10	100	VN01 040 0013 1C	VN02 040 0013 1C	
	10 mm <sup>2</sup>	8	100	VN01 040 0015 1C	VN02 040 0015 1C	

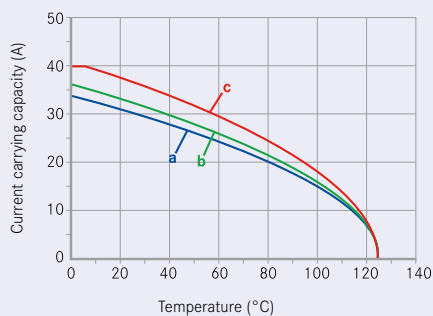
F

<b>Tools for 4 mm<sup>2</sup> turned contacts</b>					
Description	for wire gauge	Part Number			
		Contact locator	Crimping dies	Tool	
Removal tool for contacts	1.5 - 10 mm <sup>2</sup>	-	-	FG 0300 146 5000	
4-Indent crimping tool	1.5 - 10 mm <sup>2</sup>	-	-	TB 0700 146	
Further tools see catalogue "Tools"					

## heavy|mate® F Characteristics 3+4 contacts module

Brief information		
High contact density, receptable- and cable side finger proof.		
General Characteristics	Standard	Value
Number of contacts		3 + 4
Termination technique		crimp
Wire gauge		Power: 1.5 - 6 mm <sup>2</sup> (AWG 16 - 10) Signal: 0.14 - 2.5 mm <sup>2</sup> (AWG 26 - 14)
Max. wire diameter		Power: 6.4 mm, Signal 3.7 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	Power: 830 V Signal: 690 V (conductor-earth) 830 V (conductor-earth)
Rated impulse withstand voltage	IEC 60664-1	8 kV
Rated Current T <sub>u</sub> = 40 °C		Power: 40 A, Signal: 10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 10
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP20, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		12 g
Weight socket module		9 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating power		Ag (silver)
Contact plating signal		Ag (silver) / Au (gold)

### Derating curves



Curve	Wire gauge
a	4 mm <sup>2</sup>
b	6 mm <sup>2</sup>
c	10 mm <sup>2</sup>

# heavy|mate® F 3+4 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>GigaBit module</b>			
Pin module 3+4 contacts	C146 10A007 600 15		
Socket module 3+4 contacts	C146 10B007 600 15		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	

<b>Turned 4 mm crimp contacts single contact</b>						
silver plating	1.5 mm <sup>2</sup>	16	100	VN01 040 0010 1C	VN02 040 0010 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 040 0011 1C	VN02 040 0011 1C	
	4 mm <sup>2</sup>	12	100	VN01 040 0012 1C	VN02 040 0012 1C	
	6 mm <sup>2</sup>	10	100	VN01 040 0013 1C	VN02 040 0013 1C	
	10 mm <sup>2</sup>	8	100	VN01 040 0015 1C	VN02 040 0015 1C	

<b>Turned 1.6 mm crimp contacts single contact</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	

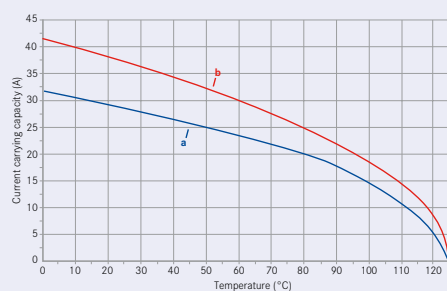
## Tools for 4 mm<sup>2</sup> turned contacts

Description	for wire gauge	Part number		
		Contact locator	Test pin	Tool
Removal tools for signal contacts	0.14 - 2,5 mm <sup>2</sup>	-	-	FG 0300 146 1
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 2,5 mm <sup>2</sup>	TA 0010 146 0001	TA 0000 184	TA 0000 or TA 0500
4-Indent crimping tool	0.14 - 2,5 mm <sup>2</sup>	-	-	TB 0400 146
4-Indent crimping tool	1.5 - 10 mm <sup>2</sup>	-	-	TB 0700 146

Further tools see catalogue "Tools"

General Characteristics	Standard	Value
Number of contacts		4
Termination technique		crimp
Wire gauge		1.5 - 6.0 mm <sup>2</sup> (AWG 16-10)
Max. wire diameter		5.2 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	830 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	8 kV
Rated Current T <sub>u</sub> = 40 °C		40 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP20, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		13 g
Weight socket module		10 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver)

**Derating curves**



Curve	Wire gauge
a	4.0 mm <sup>2</sup>
b	6.0 mm <sup>2</sup>



# heavy|mate® F 4 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>4 contacts module (Please order contacts separately)</b>			
Pin module 4 contacts	C146 10A004 600 15		
Socket module 4 contacts	C146 10B004 600 15		

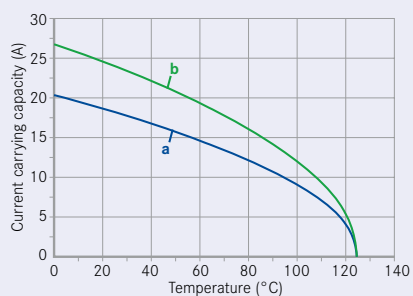
Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 4 mm crimp contacts single contact</b>						
silver plating	1.5 mm <sup>2</sup>	16	100	VN01 040 0010 1C	VN02 040 0010 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 040 0011 1C	VN02 040 0011 1C	
	4 mm <sup>2</sup>	12	100	VN01 040 0012 1C	VN02 040 0012 1C	
	6 mm <sup>2</sup>	10	100	VN01 040 0013 1C	VN02 040 0013 1C	

F

<b>Tools for 4 mm<sup>2</sup> turned contacts</b>					
Description	for wire gauge	Part Number			Tool
		Contact locator	Test pin		
Removal tool for contacts	1.5 - 6mm <sup>2</sup>	-	-		FG 0300 146 5000
4-Indent crimping tool <sup>1)</sup>	1.5 - 6mm <sup>2</sup>	-	-		TB 0700 146
Further tools see catalogue "Tools"					

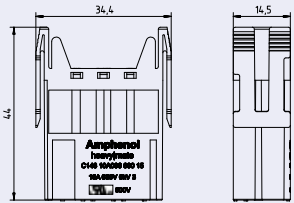

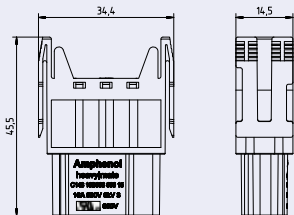

General Characteristics	Standard	Value
Number of contacts		6
Termination technique		crimp
Wire gauge		0.14 - 4.0 mm <sup>2</sup> (AWG 26-12)
Max. wire diameter		4.6 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	630 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	6 kV
Rated Current T <sub>u</sub> = 40 °C		16 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP00, mated IP20
Weight pin module		10 g
Weight socket module		10 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

**Derating curves**



Curve	Wire gauge
a	1.5 mm <sup>2</sup>
b	2.5 mm <sup>2</sup>

# heavy|mate® F 6 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>6 contacts module (Please order contacts separately)</b>			
Pin module 6 contacts	C146 10A006 600 15		
Socket module 6 contacts	C146 10B006 600 15		

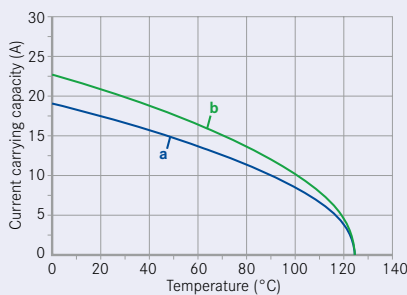
Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 2.5 mm crimp contacts single contact</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 025 0055 1C	VN02 025 0055 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 1C	VN02 025 0035 1C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 1C	VN02 025 0036 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 1C	VN02 025 0037 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 1C	VN02 025 0038 1C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 1C	VN02 025 0059 1C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 1C	VN02 025 0039 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 025 0055 2C	VN02 025 0055 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 2C	VN02 025 0035 2C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 2C	VN02 025 0036 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 2C	VN02 025 0037 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 2C	VN02 025 0038 2C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 2C	VN02 025 0059 2C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 2C	VN02 025 0039 2C	

F

<b>Tools for turned contacts</b>				
Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 4.0 mm <sup>2</sup>	-	-	FG 0300 146 7
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 0.37 mm <sup>2</sup>	TA 0010 146 000 6	TA 0000 144	TA 0000 or TA 0500
	0.5 - 2.5 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	
	3.0 - 4.0 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	
4-Indent crimping tool	0.14 - 4.0 mm <sup>2</sup>	-	-	TB 0600 146
Further tools see catalogue "Tools"				

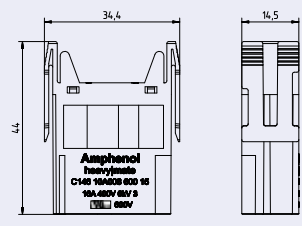

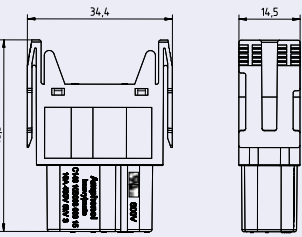

General Characteristics	Standard	Value
Number of contacts		8
Termination technique		crimp
Wire gauge		0.14 - 4.0 mm <sup>2</sup> (AWG 26-12)
Max. wire diameter		4.6 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	400 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	6 kV
Rated Current T <sub>u</sub> = 40 °C		16 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		9 g
Weight socket module		10 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

**Derating curves**



Curve	Wire gauge
a	1.5 mm <sup>2</sup>
b	2.5 mm <sup>2</sup>

# heavy|mate® F 8 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>8 contacts module (Please order contacts separately)</b>			
Pin module 8 contacts	C146 10A008 600 15		
Socket module 8 contacts	C146 10B008 600 15		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 2.5 mm crimp contacts single contact</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 025 0055 1C	VN02 025 0055 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 1C	VN02 025 0035 1C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 1C	VN02 025 0036 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 1C	VN02 025 0037 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 1C	VN02 025 0038 1C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 1C	VN02 025 0059 1C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 1C	VN02 025 0039 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 025 0055 2C	VN02 025 0055 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 2C	VN02 025 0035 2C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 2C	VN02 025 0036 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 2C	VN02 025 0037 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 2C	VN02 025 0038 2C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 2C	VN02 025 0059 2C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 2C	VN02 025 0039 2C	

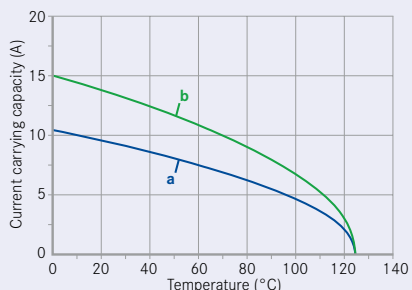
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<b>Tools for turned contacts</b>				
Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 4.0 mm <sup>2</sup>	-	-	FG 0300 146 7
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 0.37 mm <sup>2</sup>	TA 0010 146 000 6	TA 0000 144	TA 0000 or TA 0500
	0.5 - 2.5 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	
	3.0 - 4.0 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	
4-Indent crimping tool	0.14 - 4.0 mm <sup>2</sup>	-	-	TB 0600 146

Further tools see catalogue "Tools"

General Characteristics	Standard	Value
Number of contacts		12
Termination technique		crimp, PCB (in combination with PCB adaptor)
Wire gauge		0.14 - 2.5 mm <sup>2</sup> (AWG 26-14)
Max. wire diameter		3.7 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	250 V (conductor - earth) 400 V (conductor - conductor) (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	4 kV
Rated Current T <sub>u</sub> = 40 °C		10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP00, mated IP20
Weight pin module		11 g
Weight socket module		11 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

Derating curves



Curve	Wire gauge
a	1.0 mm <sup>2</sup>
b	1.5 mm <sup>2</sup>

# heavy|mate® F 12 contacts module + crimp contacts

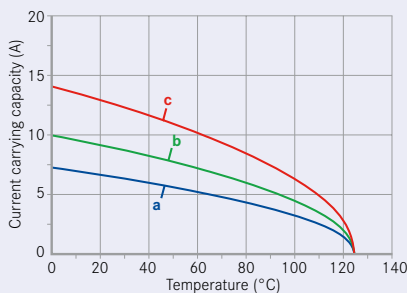
Description	Part Number	Drawing	Figure			
<b>12 contacts module (Please order contacts separately)</b>						
Pin module 12 contacts	C146 10A012 600 15					
Socket module 12 contacts	C146 10B012 600 15					
<b>6 contacts PCB adaptor</b>						
PCB Adaptor 6 contacts	C146 10B006 300 15					
PCB contact gold plating (100 Pieces)	VN01 016 0057 3C					
	VN02 016 0057 3C					
Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned crimp contacts single contact</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	
<b>Tools for turned contacts</b>						
Description	for wire gauge	Contact locator	Part Number		Tool	
Removal tool for contacts	0.14 - 2.5 mm <sup>2</sup>	-	-	-	FG 0300 146 1	
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 2.5 mm <sup>2</sup>	TA 00100 146 0001	-	TA 0000 184	TA 0000 or TA 0500	
4-Indent crimping tool	0.14 - 2.5 mm <sup>2</sup>	-	-	-	TB 0400 146	
Further tools see catalogue "Tools"						

F

# heavy|mate® F Characteristics 17 contacts module

General Characteristics	Standard	Value
Number of contacts		17
Termination technique		crimp
Wire gauge		0.14 - 2.5 mm <sup>2</sup> (AWG 26 - 14)
Max. wire diameter		3.7 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	160 V (UL/CSA 250 V)
Rated impulse withstand voltage	IEC 60664-1	2.5 kV
Rated Current T <sub>u</sub> = 40 °C		10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		9 g
Weight socket module		11 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

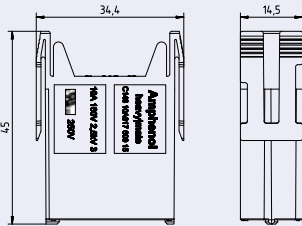

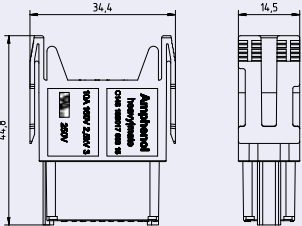

## Derating curves



Curve	Wire gauge
a	0.5 mm <sup>2</sup>
b	1.0 mm <sup>2</sup>
c	1.5 mm <sup>2</sup>



# heavy|mate® F 17 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>17 contacts module (Please order contacts separately)</b>			
Pin module 17 contacts	C146 10A017 600 15		
Socket module 17 contacts	C146 10B017 600 15		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned crimp contacts single contact</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	

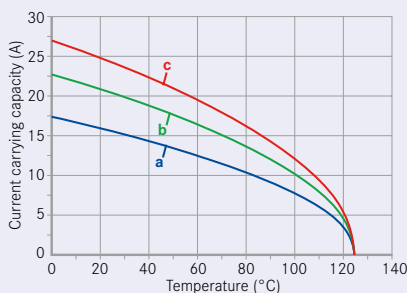
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<b>Tools for turned contacts</b>				
Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 2.5 mm <sup>2</sup>	-	-	FG 0300 146 1
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 0.5 mm <sup>2</sup>	TA 00100 146 0001	TA 0000 184	TA 0000 or TA 0500
4-Indent crimping tool	0.14 - 0.5 mm <sup>2</sup>	-	-	TB 0400 146
Further tools see catalogue "Tools"				

# heavy|mate® F Characteristics 20 contacts module

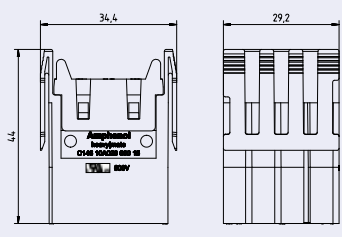

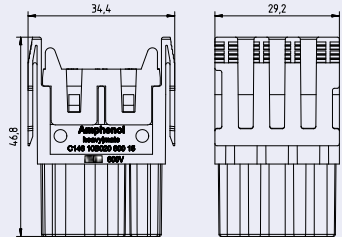

General Characteristics	Standard	Value
Number of contacts		20
Termination technique		crimp
Wire gauge		0.14 - 4.0 mm <sup>2</sup> (AWG 26 - 12)
Max. wire diameter		4.6 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	500 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	6 kV
Rated Current T <sub>u</sub> = 40 °C		16 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		18 g
Weight socket module		23 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

## Derating curves



Curve	Wire gauge
a	1.5 mm <sup>2</sup>
b	2.5 mm <sup>2</sup>
c	4.0 mm <sup>2</sup>

# heavy|mate® F 20 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>20 contacts module (Please order contacts separately)</b>			
Pin module 20 contacts	C146 10A020 600 15		
Socket module 20 contacts	C146 10B020 600 15		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 2.5 mm crimp contacts single contact</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 025 0055 1C	VN02 025 0055 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 1C	VN02 025 0035 1C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 1C	VN02 025 0036 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 1C	VN02 025 0037 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 1C	VN02 025 0038 1C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 1C	VN02 025 0059 1C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 1C	VN02 025 0039 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 025 0055 2C	VN02 025 0055 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 2C	VN02 025 0035 2C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 2C	VN02 025 0036 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 2C	VN02 025 0037 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 2C	VN02 025 0038 2C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 2C	VN02 025 0059 2C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 2C	VN02 025 0039 2C	

Tools for turned contacts				
Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 4.0 mm <sup>2</sup>	-	-	FG 0300 146 7
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 0.37 mm <sup>2</sup>	TA 0010 146 000 6	TA 0000 144	TA 0000 or TA 0500
	0.5 - 2.5 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	
	3.0 - 4.0 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	
4-Indent crimping tool	0.14 - 4.0 mm <sup>2</sup>	-	-	TB 0600 146
Further tools see catalogue "Tools"				

**Brief information**

CAT 5e for Ethernet acc. ISO/IEC 11801, for 10/100/1000 MBit/s data rate.

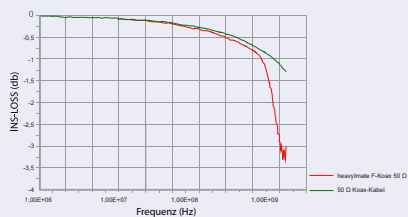
General Characteristics	Standard	Value
Number of contacts		4 + shielding   1
Termination technique		crimp
Wire gauge		0.14 - 2.5 mm <sup>2</sup> (AWG 26 - 14)
Max. wire diameter		3 - 9.5 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	50 V (UL/CSA 50 V)
Rated impulse withstand voltage	IEC 60664-1	0.8 kV
Rated current T <sub>u</sub> =40°C		10 A
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance		≤ 10 <sup>10</sup> mΩ
Category of connection	IEC 11801 ANSI/TIA/EIA-568-C2	CAT5e
Data rate		max. 1 GBit/s
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 100 / 21
Upper temperature	IEC 60512-11-9	+100°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection module		unmated IP00, mated IP20
IP-degree of protection socket module		unmated IP00, mated IP20
Weight pin contact carrier		50 g
Weight socket contact carrier		40 g
Weight pin module		13 g
Weight socket module		15 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Au (gold)
Contact insert		PA
Colour contact insert		black
Shielding		Zink alloy
Cable clamp		Zink alloy

Description		Part number	Drawing		Figure	
<b>Adaptor modules</b>						
Pin module	C146 10A002 800 15					
Socket module	C146 10B002 800 15					
<b>Quintax contact carrier 4-contacts (Please order contacts separately)</b>						
Pin contact carriers 4 contacts	C146 10A004 901 15					
Socket contact carriers 4 contacts	C146 10B004 901 15					
Potential balance spring Pin module (2 Pieces)	for standard frames: N 18 146 0011 for multi frames: N 18 146 0021					
Potential balance spring Socket module (2 Pieces)	for standard frames: N 18 146 0012 for multi frames: N 18 146 0022					
Supplied as	for wire gauge	AWG	Pieces	Part number		Figure
				Pin contact	Socket contact	
<b>Turned 1.6 mm crimp contacts</b>						
Single contact	0.14 – 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 – 1.0 mm <sup>2</sup>	18	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	
Further tools see catalogue "Tools"						

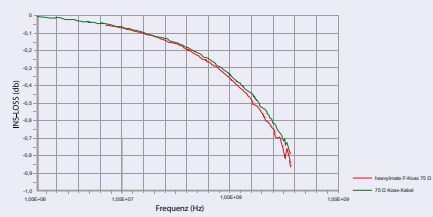
General Characteristics	Standard	Value
Number of contacts		1 + shielding
Termination technique		crimp
Wire gauge		0.14 - 4.5mm <sup>2</sup> (AWG 26 - 12)
Max. wire diameter		3 - 9.5 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	50 V (UL/CSA 50 V)
Rated impulse withstand voltage	IEC 60664-1	0.8 kV
Screening effectiveness		see curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	III b
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category		40 / 100 / 21
Upper temperature		+100°C
Lower temperature		-40°C
Mechanical Characteristics		
IP-degree of protection pin contact carrier	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket contact carrier	IEC 60529	unmated IP20, mated IP20
Weight pin contact carrier		28 g
Weight socket contact carrier		28 g
Weight pin module		13 g
Weight socket module		15 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Au (gold)
Contact insert		PC
Colour contact insert		grey
Shielding		Cu alloy
Cable clamp		Cu alloy

Curves

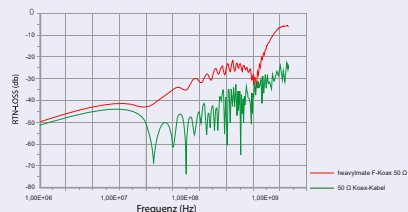
50 Ω INS



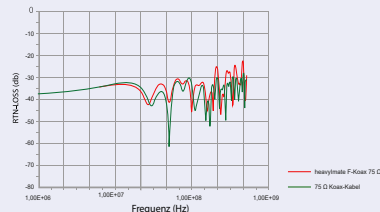
75 Ω INS



50 Ω RTN



75 Ω RTN



Description	Part number	Drawing	Figure
<b>Adaptor modules</b>			
Pin module	C146 10A002 800 15		
Socket module	C146 10B002 800 15		

**Coax - contact carrier (Please order contacts separately)**

Pin contact carrier 1 contact 50 Ω Pin contact carrier 1 contact 75 Ω	C146 10A001 902 15 C146 10A001 901 15		
Socket contact carrier 1 contact 50 Ω Socket contact carrier 1-Pol 75 Ω	C146 10B001 902 15 C146 10B001 901 15		

F

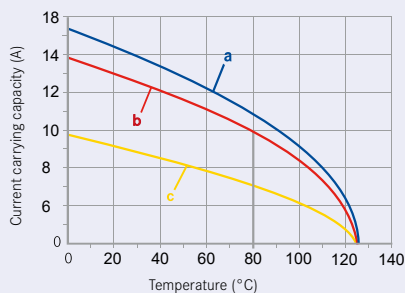
Supplied as	for wire gauge	AWG	Pieces	Part number		Figure
				Pin contact	Socket contact	
<b>Turned 2.5 mm crimp contacts (for Coax - contact carrier 1 contact 50 Ω)</b>						
gold plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 025 0055 2C	VN02 025 0055 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 2C	VN02 025 0035 2C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 2C	VN02 025 0036 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 2C	VN02 025 0037 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 2C	VN02 025 0038 2C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 2C	VN02 025 0059 2C	
4.0 mm <sup>2</sup>	12	100	VN01 025 0039 2C	VN02 025 0039 2C		
<b>Turned 2.5 mm crimp contacts (for Coax - contact carrier 1 contact 75 Ω)</b>						
gold plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	

**Brief information**

High contact density, receptable- and cable side finger proof.

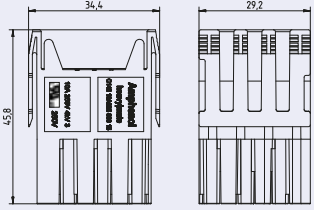

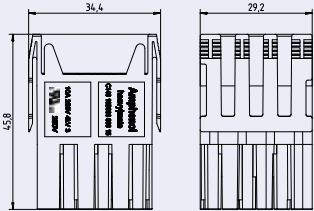

General Characteristics	Standard	Value
Number of contacts		36 (18 x Pin, 18 x Socket)
Termination technique		crimp, PCB (in combination with PCB Adaptor)
Wire gauge		0.14 - 2.5mm <sup>2</sup> (AWG 26 - 14)
Max. wire diameter		3.7 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	250 V (UL/CSA 250 V)
Rated impulse withstand voltage	IEC 60664-1	4 kV
Rated Current T <sub>u</sub> = 40 °C		10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 10
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP20, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		21 g
Weight socket module		21 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Insert / module		PA
Colour insert / module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

**Derating curves**






Curve	Wire gauge
a	1.5 mm <sup>2</sup>
b	1.0 mm <sup>2</sup>
c	0.5 mm <sup>2</sup>




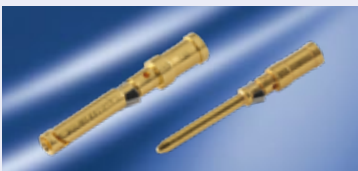
Description	Part number	Drawing	Figure
<b>36 contacts module (Please order contacts separately)</b>			
Pin module 36 contacts	C146 10A036 600 15		
Socket module 36 contacts	C146 10B036 600 15		

**PCB Adaptor 6 contacts**

PCB Adaptor 6 contacts	C146 10B006 300 15		
PCB contact	VN01 016 0057 3C		
	VN02 016 0057 3C		

Supplied as	for wire gauge	AWG	Pieces	Part number		Figure
				Pin contact	Socket contact	

**Turned crimp contacts single contact**

silver plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	20 - 16	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16 - 15	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	20 - 16	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16 - 15	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	

**Tools for turned contacts**

Description	for wire gauge	Part number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 2.5 mm <sup>2</sup>	-	-	FG 0300 146 1
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 2.5 mm <sup>2</sup>	TA 0010 146 0001	TA 0000 184	TA 0000 or TA 0500
4-Indent crimping tool	0.14 - 2.5 mm <sup>2</sup>	-	-	TB 0400 146

Further tools see catalogue "Tools"

**Brief information**

CAT7 for Ethernet acc. ISO/IEC 11801, up to 10 GBit/s data rates.

General Characteristics	Standard	Value
Number of contacts		8 + shielding
Termination technique		crimp
Wire gauge		0.09 - 0.52 mm <sup>2</sup> (AWG 28 - 20)
Max. wire diameter		1x5 - 12 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	50 V
Rated impulse withstand voltage	IEC 60664-1	0.8 kV
Rated Current T <sub>u</sub> = 40 °C		10 A
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	III b
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Category of connection	IEC 11801 ANSI/TIA/EIA-568-C2	CAT7
Data rate		max. 10 GBit/s
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 85 / 21
Upper temperature	IEC 60512-11-9	+85°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin contact carrier	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket contact carrier	IEC 60529	unmated IP20, mated IP20
Weight pin contact carrier		34 g
Weight socket contact carrier		36 g
Weight pin module		6 g
Weight socket module		4 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Au (gold)
Contact insert		PC
Colour contact insert		grey
Shielding		Cu alloy
Cable clamp (separate Part number)		Cu alloy

# heavy|mate® F Adaptor modules + GigaBit contact carrier + crimp contacts

Description	Part Number	Drawing	Figure
<b>Adaptor modules</b>			
Pin module	C146 10A001 800 15		
Socket module	C146 10B001 800 15		

## GigaBit-contact carrier\* (contacts & cable clamps please order separately)

Pin contact carrier - without shield connection to the frame - with shield connection to the frame	C146 10A008 901 15			
	C146 10A008 902 15			
Socket contact carrier - without shield connection to the frame - with shield connection to the frame	C146 10B008 901 15			
	C146 10B008 902 15			

Supplied as	for wire gauge	AWG	Pieces	Part number		Figure
				Pin contact	Socket contact	
<b>Turned 1.0 mm crimp contacts</b>						
gold plating	0.09 - 0.25 mm <sup>2</sup>	28 - 24	100	VN01 010 0066 2C	VN02 010 0066 2C	
	0.13 - 0.33 mm <sup>2</sup>	26 - 22	100	VN01 010 0067 2C	VN02 010 0067 2C	
	0.25 - 0.52 mm <sup>2</sup>	24 - 20	100	VN01 010 0068 2C	VN02 010 0068 2C	

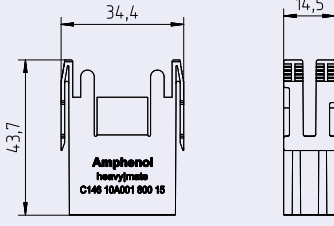
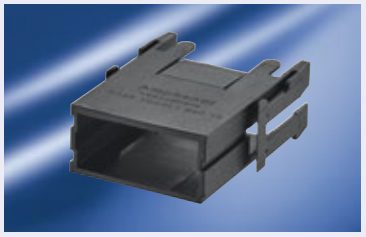
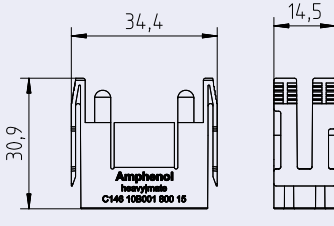

## Tools for turned contacts

Description	for wire gauge	Part number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.09 mm <sup>2</sup> - 0.52 mm <sup>2</sup>	-	-	17 D 438 SP
4-Indent crimping tool for turned contacts	0.09 mm <sup>2</sup> - 0.52 mm <sup>2</sup>	-	-	TB 0300 146

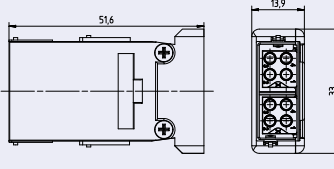
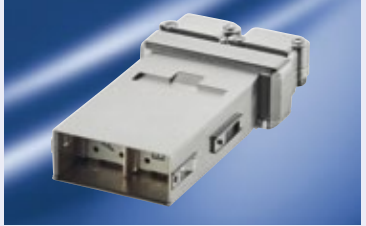
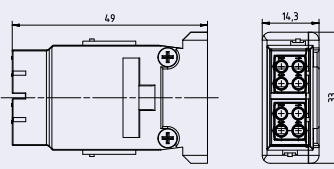

Further tools see catalogue "Tools"

## heavy|mate® F Characteristics Adaptor module + MegaBit-contact carrier

Brief information		
Cat5e for Ethernet acc. ISO/IEC 11801, up to 1 GBit/s data rate.		
General Characteristics	Standard	Value
Number of contacts		8 + shielding
Termination technique		crimp
Wire gauge		0.14 - 2.5 mm <sup>2</sup> (AWG 26 - 14)
Max. wire diameter		2x5 - 12 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	50 V
Rated impulse withstand voltage	IEC 60664-1	0.8 kV
Rated Current T <sub>u</sub> = 40 °C		10 A
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	III b
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Category of connection	IEC 11801 ANSI/TIA/EIA-568-C2	CAT5e
Data rate		max 1 GBit/s
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 85 / 21
Upper temperature	IEC 60512-11-9	+85°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin contact carrier	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket contact carrier	IEC 60529	unmated IP20, mated IP20
Weight pin contact carrier		41 g
Weight socket contact carrier		44 g
Weight pin module		6 g
Weight socket module		4 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Au (gold)
Contact insert		PC
Colour contact insert		grey
Shielding		Cu alloy
Cable clamp (separate part number)		Cu alloy


Description	Part number	Drawing	Figure
<b>Adaptor modules*</b>			
Pin module	C146 10A001 800 15		
Socket module	C146 10B001 800 15		

**MegaBit-contact carrier\* (contacts & cable clamps please order separately)**

Pin contact carrier - without shield connection to the frame - with shield connection to the frame	C146 10A008 905 15		
	C146 10A008 906 15		
Socket contact carrier - without shield connection to the frame - with shield connection to the frame	C146 10B008 905 15		
	C146 10B008 906 15		

Supplied as	for wire gauge	AWG	Pieces	Part number		Figure
				Pin contact	Socket contact	

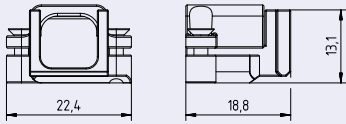

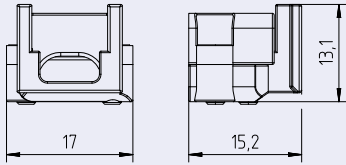

**Turned 1.6 mm crimp contacts**

gold plating	0.14 – 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 – 1.0 mm <sup>2</sup>	20-16	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16-15	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	

**Tools**

Description	for wire gauge	Part number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 2.5 mm <sup>2</sup>	-	-	FG 0300 146 1
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 2.5 mm <sup>2</sup>	TA 0010 146 0001	TA 0000 184	TA 0000 or TA 0500
4-Indent crimping tool	0.14 - 2.5 mm <sup>2</sup>	-	-	TB 0400 146

Further tools see catalogue "Tools"

Description	Part number	Drawing	Figure
<b>Cable clamps for GigaBit contact carrier</b>			
Cable clamp 5 - 7 mm Cable clamp 7 - 10 mm Cable clamp 10 - 12 mm	N 16 146 0011 N 16 146 0012 N 16 146 0013		
<b>Cable clamps for MegaBit contact carrier</b>			
Cable clamp 5 - 7 mm Cable clamp 7 - 10 mm Cable clamp 10 - 12 mm	N 16 146 0021 N 16 146 0022 N 16 146 0023		



F

General Characteristics	Standard	Value	
Number of contacts		9	15
Termination technique		crimp	
Wire gauge		0.09 - 0.52 mm <sup>2</sup> (AWG 28 - 20)	0.09 - 0.25 mm <sup>2</sup> (AWG 28-24)
Clamping range		2x 3.8 - 6.8mm	
Max. wire diameter		2.3 mm	1.6 mm
Flammability	UL94	V-0	
Electrical Characteristics			
Rated voltage	IEC 60664-1	500 V	
Rated impulse withstand voltage	IEC 60664-1	0.8 kV	
Rated Current T <sub>u</sub> = 40 °C		5 A	
Current carrying capacity			
Installation (overvoltage) category	IEC 60664-1	III	
Material group	IEC 60664-1	I	
Contact resistance	IEC 60512-2-1	≤ 5 mΩ	
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω	
Pollution degree	IEC 60664-1	3	
Climatical Characteristics			
Climatic category	IEC 60068-1	40 / 85 / 10	
Upper temperature	IEC 60512-11-9	+85°C	
Lower temperature	IEC 60512-11-10	-40°C	
Mechanical Characteristics			
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20	
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20	
Weight pin module 9 contacts		35 g	
Weight socket module 9 contacts		34 g	
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles	
Material			
Module		PA	
Colour module		black	
Contacts		CuZn (brass)	
Contact plating		Au (gold)	
Material		PC	
Shielding		Cu alloy	
Cable clamp		Stainless steel	
Derating curves			



# heavy|mate® F D-Sub module + crimp contacts

Description	Part Number	Drawing	Figure
<b>D-Sub module</b>			
Adaptor module (Please order contact inserts separately)	C146 10H001 800 15		
Pin module 9 contacts (Please order contact inserts separately)	C146 10A009 600 15		
Socket module 9 contacts (Please order contact inserts separately)	C146 10B009 600 15		

## Contact inserts D-Sub 15 contacts\* (Please order contacts separately)

Pin insert	C146 10A015 901 15		
Socket insert	C146 10B015 901 15		

Supplied as	for wire gauge	AWG	Part Number		Figure
			Pin contact	Socket contact	

## Punched crimp contacts, gold plating

1.0 mm crimp contacts for D-Sub 9 contacts	0.09 - 0.25 mm <sup>2</sup>	28 - 24	VN01 010 0166 2 C	VN02 010 0166 2 C	
	0.25 - 0.5 mm <sup>2</sup>	24 - 20	VN01 010 0168 2 C	VN02 010 0168 2 C	
0.8 mm crimp contacts for D-Sub 15 contacts	0.09 - 0.25 mm <sup>2</sup>	28 - 24	VN01 008 0066 2 C	VN02 008 0066 2 C	

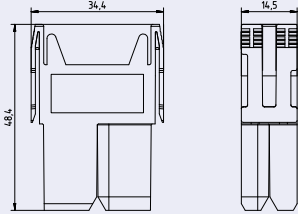

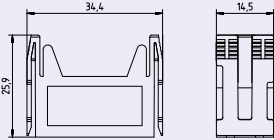

## Tools for turned contacts

Description	for wire gauge	Part number		
		Contact locator	Crimping dies	Tools
Removal tool for contacts	0.09 - 0.5 mm <sup>2</sup>	-	-	17 D 438 SP
Crimping tools	0.09 - 0.5 mm <sup>2</sup>	-	-	TA 0200 146

**Brief information**

Modules with centering function allow the use of the modular system in rack and panel applications without housing. The modules align a floating frame so that modules can be plugged central. For optimal function two modules must be used in the frame.

<b>Climatical Characteristics</b>		
Climatic category	IEC 60068-1	40/ 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
<b>Mechanical Characteristics</b>		
Weight blind module with centering function		9 g
Weight blind module standard		6 g
Mechanical operation	IEC 60512-9-1	≥500 mating cycles
<b>Materials</b>		
Contact module		PA
Colour contact module		black

Description	Part Number	Drawing	Figure
<b>Blind module</b>			
Blind module with centering function	C146 10H000 600 15		
Blind module standard	C146 10H000 601 15		

The image shows a large industrial testing chamber, likely for high-voltage or high-current applications. The chamber is constructed from blue-painted metal panels and is enclosed with safety glass. A computer monitor is mounted on the front panel, displaying a software interface. The chamber is supported by a black metal stand with four legs. The floor is made of perforated metal plates, and there are yellow safety lines on the ground. The background shows a typical industrial setting with overhead lights and a ceiling structure.

# heavy | mate<sup>®</sup> HSE

- Rated voltage 400 V
- Rated current 42 A
- Termination: screw
- Number of contacts: 6

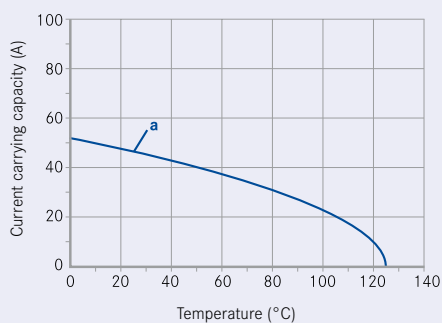


HSE

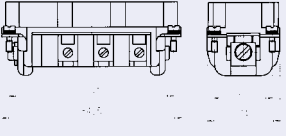

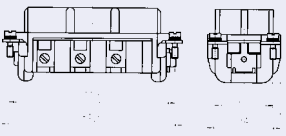

Approvals, Testhouse	Characteristics	Approval-Number
UL 	600 V	E 63093
CSA 	600 V	48932

General Characteristics	Standard	Value
Number of contacts		6 + ⊕
Termination technique		screw
Wire gauge		0.5 - 6.0 mm <sup>2</sup> (AWG 20 - 10)
Max. wire diameter		6.4 mm
Flammability	UL 94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	400 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	6 kV
Rated current T <sub>amp</sub> = 40 °C		42 A
Rated current	IEC 60512-5-2	see Derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	II
Contact resistance	IEC 60512-2-1	≤ 1 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+ 125 °C
Lower temperature	IEC 60512-11-10	- 40 °C
Mechanical Characteristics		
IP-degree of protection pin insert <sup>1)</sup>	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket insert <sup>1)</sup>	IEC 60529	unmated IP20, mated IP20
Weight pin insert		80 g
Weight socket insert		80 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Contact insert		PA
Colour contact insert		black
Contacts		CuZn (brass)
Contact plating		Ag (silver)

**Derating curves**



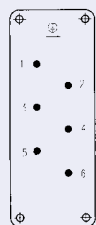
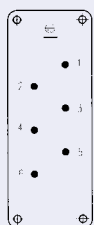
Curve a: 6 mm<sup>2</sup> screw contact

Description	Part Number	Drawing	Figure
<b>Contact insert 6 + ⊕</b>			
Pin insert with wire protection for screw termination	C146 10A006 102 5		
Socket insert with wire protection for screw termination	C146 10B006 102 5		

**Pin layout**

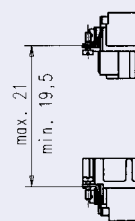
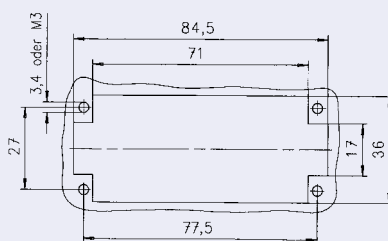
Pin insert

Socket insert



**Assembly instruction**

Panel cut out (insert)







## heavy | mate<sup>®</sup> HvE

- Rated voltage 660 V
- Rated current 16 A
- Termination: screw
- 2 delayed mating contacts
- Number of contacts: 3, 6, 10, 16, 32
- HL3 acc. EN 45545: R22/23 (3 - 10 contacts)





HvE

Approvals, Testhouse	Characteristics	Approval-Number
UL 	see technical characteristics	E 63093
CSA 	see technical characteristics	E 63093

### Construction of connectors Type HVE

Connectors of heavy|mate® HVE series only connect with counter parts of heavy|mate HVE series.

The connectors of series heavy|mate® HVE are based on series heavy|mate® E with the following deviations:

### Inserts

The HVE-inserts with 3, 6 and 10 contacts are basically the same as the 10, 16 and 24-contacts inserts of series heavy|mate® E. However they are only partly loaded with contacts and have two delayed mating pilot duty contacts.

Only type 16 HVE has special inserts with a different contact arrangement. The mounting dimensions are however identical with the 24 contacts version of heavy|mate® E.

The delayed mating contacts are intended for switching a relay coil for electrically locking in order to have unloaded socket contacts in an unmated condition.

If connectors without breaking capacity are used as connectors with breaking capacity the electrical power data must be reduced in accordance with the manufacturer's specification. These specifications are available from the manufacturer.

heavy|mate® E inserts with pin contacts are not intermatable with heavy|mate® HVE inserts with socket contacts due to

- two empty contact holes are closed at 3, 6 and 10 contact inserts.
- the 16 contacts HVE insert has a different contact arrangement.

### Housings: (made of aluminium)

heavy|mate® E housings with an inside insulation (plastic foil) are used for the 16-contacts insert.

The inside barriers at the narrow sides preventing mounting of 660 V-inserts in 400 V housings are removed and the 16-contacts insert is now mountable.

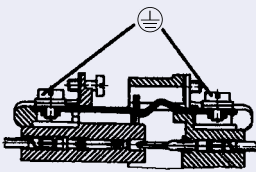
### No standard for this series, but:

Intermateable and exchangeable with other makes

- Contact insert to contact insert
- Contact insert to housing 6, 10, 16, 24 pin

Housings are designed according to  
DIN EN 175 301-801

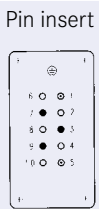
### First-to-mate last-to-break protective ground contact



General Characteristics	Standard	Value			
Number of contacts		3	6	10	16
Termination technique		screw			
Wire gauge		0.5 - 2.5 mm <sup>2</sup>			
Max. wire diameter		4.6 mm			
Flammability	UL 94	V-0			
Electrical Characteristics					
Rated voltage	IEC 60664-1	660 V	660 V (UL/CSA 600 V)		
Rated impulse withstand voltage	IEC 60664-1	6 kV			
Rated Current T <sub>u</sub> = 40 °C		16 A			
Current carrying capacity	IEC 60512-5-2	see derating curves			
Installation (overvoltage) category	IEC 60664-1	III			
Material group	IEC 60664-1	III b	II		
Contact resistance	IEC 60512-2-1	≤ 5 mΩ			
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω			
Pollution degree	IEC 60664-1	3			
Climatical Characteristics					
Climatic category	IEC 60068-1	40/125/21			
Upper temperature	IEC 60512-11-9	+ 125°C			
Lower temperature	IEC 60512-11-10	- 40°C			
Mechanical Characteristics					
IP-degree of protection pin insert <sup>1)</sup>	IEC 60529	unmated IP00, mated IP20			
IP-degree of protection socket insert <sup>1)</sup>	IEC 60529	unmated IP20, mated IP20			
Weight pin insert		49 g	63 g	81 g	107 g
Weight socket insert		49 g	63 g	81 g	107 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles			
Materials					
Insert		PC	PA		
Colour insert		grey	black		
Contacts		CuZn (brass)			
Contact plating		Ag (silver)			

Description	Part Number	Drawing	Figure
<b>Contact insert 3 + ⊕ + 2 (delayed mating contacts)</b>			
Pin insert with wire protection for screw termination	C146 10A003 102 3		
Socket insert with wire protection for screw termination	C146 10B003 102 3		

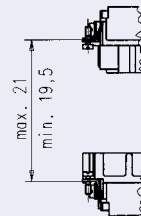
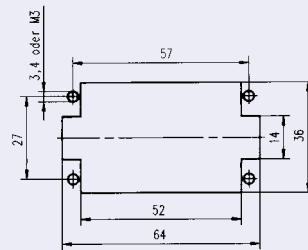
**Pin layout**



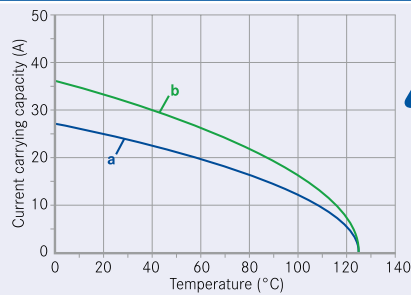
- Working contact
- ◐ Mating contact
- Without contact

**Assembly instruction**

Panel cut out (insert)



**Derating curves**



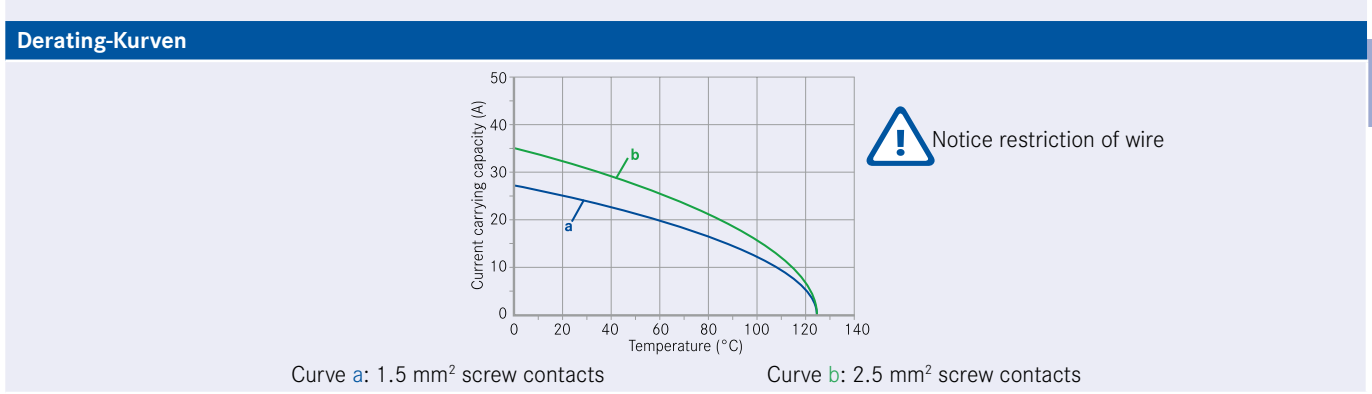
Notice restriction of wire

Curve a: 1.5 mm<sup>2</sup> screw contacts

Curve b: 2.5 mm<sup>2</sup> screw contacts

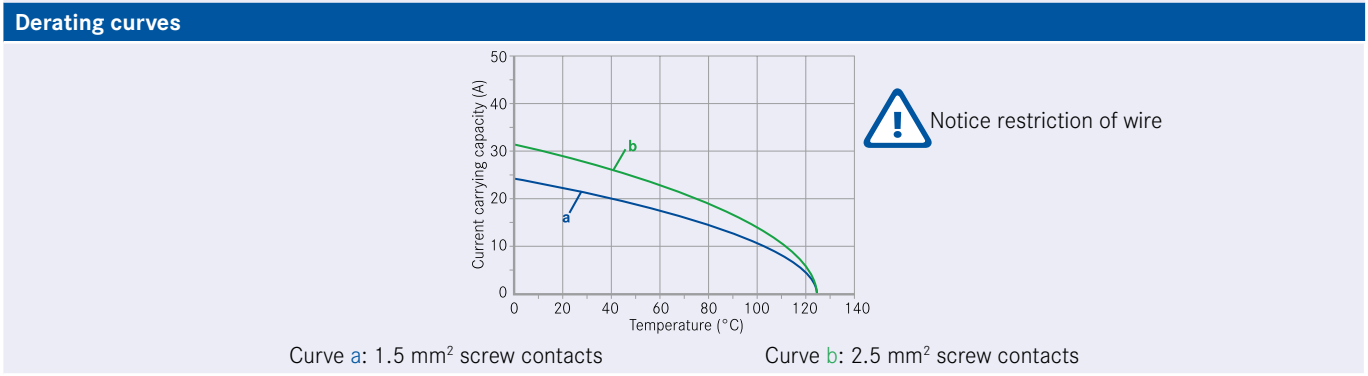
Description	Part Number	Drawing	Figure
<b>Contact insert 6 + ⊕ + 2 (delayed mating contacts)</b>			
Pin insert with wire protection for screw termination	C146 10A006 102 3		
Socket insert with wire protection for screw termination	C146 10B006 102 3		

Pin layout		Assembly instruction	
Pin insert	Socket insert	Panel cut out (insert)	
<ul style="list-style-type: none"> <li>● Working contact</li> <li>◐ Mating contact</li> <li>○ Without contact</li> </ul>			



Description	Part Number	Drawing	Figure
<b>Contact insert 10 + ⊕ + 2 (delayed mating contacts)</b>			
Pin insert with wire protection for screw termination	C146 10A010 102 3		
Socket insert with wire protection for screw termination	C146 10B010 102 3		

Pin layout		Assembly instruction	
Pin insert	Socket insert	Panel cut out (insert)	



Description	Part Number	Drawing	Figure
<b>Contact insert 16 + ⊕ + 2 (delayed mating contacts)</b>			
Pin insert with wire protection for screw termination	C146 10A016 102 3		
Pin insert without wire protection for screw termination	C146 10A016 002 3		
Socket insert with wire protection for screw termination	C146 10B016 102 3		
Socket insert without wire protection for screw termination	C146 10B016 002 3		

Pin layout		Assembly instruction	
Pin insert	Socket insert	Panel cut out (insert)	
	<ul style="list-style-type: none"> <li>● Working contact</li> <li>○ Mating contact</li> </ul>		

### Derating curves

Current carrying capacity (A)

Temperature (°C)

Curve a: 1.5 mm<sup>2</sup> screw contacts

Curve b: 2.5 mm<sup>2</sup> screw contacts

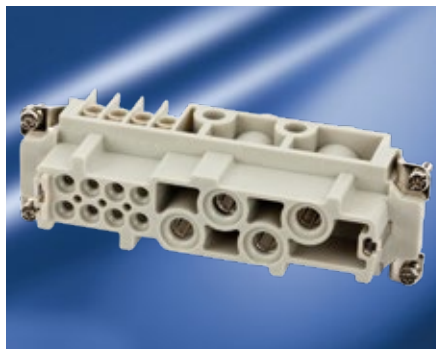
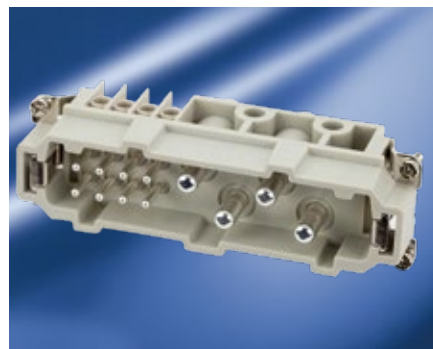
Notice restriction of wire





# heavy | mate<sup>®</sup> K

- Power + signal as mixed arrangement
- Rated voltage up to 830 V
- Termination: screw, crimp
- HL3 acc. EN 45545: R22/23



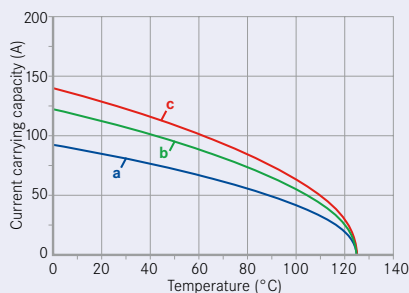


K

Approvals, Testhouse	Characteristics	Approval-Number
UL 	see technical characteristics	E 63093
CSA 	see technical characteristics	E 63093

General Characteristics	Standard	Value	
Number of contacts		4+0+ ⊕ (4 Power)	4+2+ ⊕ (4 Power + 2 Signal)
Termination technique		screw	
Wire gauge		1.5 - 16 mm <sup>2</sup> (AWG 16 - 6)	Power: 1.5 - 16 mm <sup>2</sup> (AWG 16 - 6) Signal: 0.5 - 2.5 mm <sup>2</sup> (AWG 20 - 14)
Max. wire diameter		11 mm	Power: 11 mm, Signal: 4.8 mm
Flammability	UL94	V-0	
Electrical Characteristics			
Rated voltage	IEC 60664-1	830 V (UL/CSA 600 V)	Power: 830 V (UL/CSA 600 V) Signal: 400 V (UL/CSA 300 V)
Rated impulse withstand voltage	IEC 60664-1	8 kV	Power: 8 kV Signal: 6 kV
Rated Current T <sub>v</sub> = 40 °C		80 A	Power: 80 A Signal: 16 A
Current carrying capacity	IEC 60512-5-2	see derating curves	
Installation (overvoltage) category	IEC 60664-1	III	
Material group	IEC 60664-1	III b	
Contact resistance	IEC 60512-2-1	≤ 5 mΩ	
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω	
Pollution degree	IEC 60664-1	3	
Climatical Characteristics			
Climatic category	IEC 60068-1	40 / 125 / 21	
Upper temperature	IEC 60512-11-9	+125°C	
Lower temperature	IEC 60512-11-10	-40°C	
Mechanical Characteristics			
IP-degree of protection pin insert <sup>1)</sup>	IEC 60529	unmated IP00, mated IP20	
IP-degree of protection socket insert <sup>1)</sup>	IEC 60529	unmated IP20, mated IP20	
Weight pin insert		109 g	114 g
Weight socket insert		108 g	113 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles	
Materials			
Insert		PC	
Colour insert		grey	
Contacts		CuZn (brass)	
Contact plating		Ag (silver)	

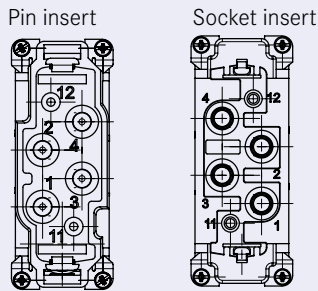
### Derating Kurven



Curve	Wire gauge
a	10 mm <sup>2</sup>
b	16 mm <sup>2</sup>
c	Single contacts with 16 mm <sup>2</sup>

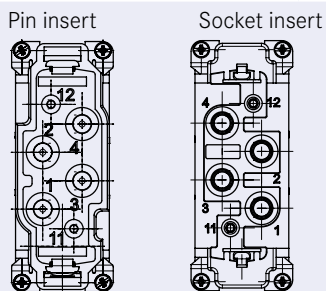
Description	Part Number	Drawing	Figure
<b>Contact insert 4 + ⊕</b>			
Pin insert 4 + ⊕	C146 10A004 100 13		
Socket insert 4 + ⊕	C146 10B004 100 13		

**Pin layout**



Description	Part Number	Drawing	Figure
<b>Contact insert 4+2+ ⊕</b>			
Pin insert 4+2+ ⊕	C146 10A006 100 13		
Socket insert 4+2+ ⊕	C146 10B006 100 13		

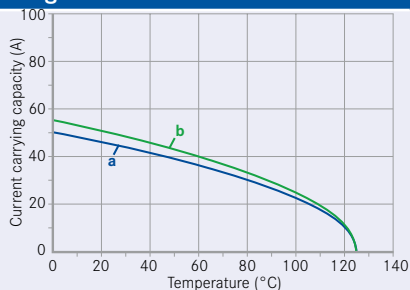
**Pin layout**



K

General Characteristics	Standard	Value
Number of contacts		6 + 36 + ⊕ (6 Power + 36 Signal)
Termination technique		crimp
Wire gauge		1.5 – 6.0mm <sup>2</sup> (AWG 16 – 10) 0.14 – 2.5mm <sup>2</sup> (AWG 26 – 14)
Max. wire diameter		Power: 5.2 mm, Signal: 3.7 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	Power: 690 V, Signal: 160 V (UL/CSA 600 V, 300 V)
Rated impulse withstand voltage	IEC 60664-1	Power: 8.0 kV, Signal: 2.5 kV
Rated Current T <sub>u</sub> = 40 °C		Power: 40 A, Signal: 10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	III b
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin insert	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket insert	IEC 60529	unmated IP20, mated IP20
Weight pin insert		65 g
Weight socket insert		74 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Insert		PC
Colour insert		grey
Contacts		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

**Derating curves**



Curve	Wire gauge
a	6 mm <sup>2</sup> with signal-contacts 1.5 mm <sup>2</sup>
b	6 mm <sup>2</sup>

Description	Part Number	Drawing	Figure
<b>Contact insert 6 + 36 + ⊕ (Please order contacts separately)</b>			
Pin insert 6 + 36 + ⊕	C146 10A042 500 13		
Socket insert 6 + 36 + ⊕	C146 10B042 500 13		

**Pin layout**



Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	

**Turned 4 mm crimp contacts**

silver plating	1.5 mm <sup>2</sup>	16	100	VN01 040 0010 1C	VN02 040 0010 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 040 0011 1C	VN02 040 0011 1C	
	4 mm <sup>2</sup>	12	100	VN01 040 0012 1C	VN02 040 0012 1C	
	6 mm <sup>2</sup>	10	100	VN01 040 0013 1C	VN02 040 0013 1C	

**Turned 1.6 mm crimp contacts**

silver plating	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	20-16	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16-15	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	

**Tools for 4 mm<sup>2</sup> turned contacts**

Description	for wire gauge	Part Number		
		Contact locator	Calibration pin	Tool
Removal tool for contacts	1.5 - 6 mm <sup>2</sup>	-	-	FG 0300 146 5000
4-indent crimping tool	1.5 - 6 mm <sup>2</sup>	-	-	TB 0700 146

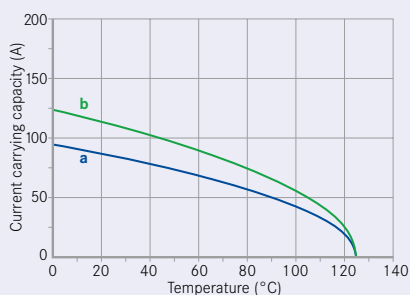
**Tools for turned contacts**

Description	for wire gauge	Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 2.5 mm <sup>2</sup>	-	-	FG 0300 146 1
Standard crimping tool and accessories for 4-indent crimping	0.14 - 2.5 mm <sup>2</sup>	TA 0010 146 000 1	TA 0000 184	TA 0000 or TA 0500
4-indent crimping tool	0.14 - 2.5 mm <sup>2</sup>	-	-	TB 0400 146

Further tools see catalogue "Tools"

General Characteristics	Standard	Value
Number of contacts		4+8 + ⊕ (4 Power + 8 Signal)
Termination technique		screw
Wire gauge		Power: 1.5 - 16 mm <sup>2</sup> (AWG 16 - 6) Signal: 0.5 - 2.5 mm <sup>2</sup> (AWG 20 - 14)
Max. wire diameter		Power: 11 mm, Signal: 4.8 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	Power: 400 V, Signal: 400 V (UL/CSA 600 V, 660 V)
Rated impulse withstand voltage	IEC 60664-1	8 kV
Rated Current T <sub>u</sub> = 40 °C		Power: 80 A, Signal: 16 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	III b
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin insert <sup>1)</sup>	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket insert <sup>1)</sup>	IEC 60529	unmated IP20, mated IP20
Weight pin insert		147 g
Weight socket insert		148 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Insert		PC
Colour insert		grey
Contacts		CuZn (brass)
Contact plating		Ag (silver)

**Derating curves**

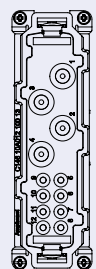


Curve	Wire gauge
a	10 mm <sup>2</sup>
b	16 mm <sup>2</sup>

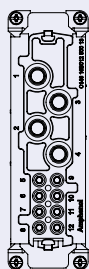
Description	Part Number	Drawing	Figure
<b>Contact insert 4+8+ ⊕</b>			
Pin insert 4+8+ ⊕	C146 10A012 100 13		
Socket insert 4+8+ ⊕	C146 10B012 100 13		

**Pin layout**

Pin insert

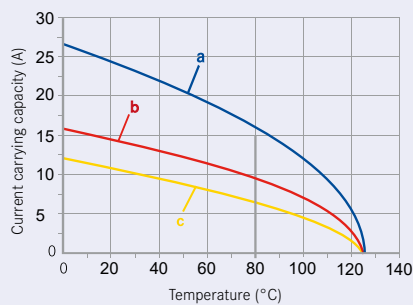


Socket insert



General Characteristics	Standard	Value
Number of contacts		8+24+ ⊕ (8 Power + 24 Signal)
Termination technique		crimp
Wire gauge		Power: 0.5 - 4 mm <sup>2</sup> (AWG 20 - 12) Signal: 0.14 - 2.5 mm <sup>2</sup> (AWG 26 - 14)
Max. wire diameter		Power: 4.6 mm, Signal 3.7 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	Power: 230 V (conductor-earth), 400 V (conductor-earth) Signal: 160 V
Rated impulse withstand voltage	IEC 60664-1	Power: 4 kV, Signal: 2,5 kV
Rated Current T <sub>u</sub> = 40 °C		Power: 16 A, Signal: 10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	III b
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin insert <sup>1)</sup>	IEC 60529	unmated IP00, mated IP20 unmated IP20, mated IP20
IP-degree of protection socket insert <sup>1)</sup>	IEC 60529	IP20
Weight pin insert		51 g
Weight socket insert		57 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Material		
Insert		PC
Colour insert		grey
Contacts		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

**Derating curves**



Curve	Wire gauge
a	2.5 mm <sup>2</sup>
b	4.0 mm <sup>2</sup>
c	4.0 mm <sup>2</sup>



Description	Part Number	Drawing	Figure
<b>Contact insert 8+24+ ⊕ (Please order contacts separately)*</b>			
Pin insert 8+24+ ⊕	C146 10A032 500 13		
Socket insert 8+24+ ⊕	C146 10B032 500 13		

Supplied as	for wire gauge	AWG	Pieces	Part number		Figure
				Pin contact	Socket contact	
<b>Turned 4 mm crimp contacts</b>						
silver plating	1.5 mm <sup>2</sup>	16	100	VN01 040 0010 1C	VN02 040 0010 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 040 0011 1C	VN02 040 0011 1C	
	4 mm <sup>2</sup>	12	100	VN01 040 0012 1C	VN02 040 0012 1C	
	6 mm <sup>2</sup>	10	100	VN01 040 0013 1C	VN02 040 0013 1C	
<b>Turned 1,6 mm crimp contacts</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	20-16	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16-15	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	

<b>Tools for 4 mm turned contacts</b>						
Description	for wire gauge	Part number			Tool	
		Contact locator	Test pin			
Removal tool for contacts	1.5 - 6 mm <sup>2</sup>	-	-	-	FG 0300 146 5000	
4-Indent crimping tool	1.5 - 6 mm <sup>2</sup>	-	-	-	TB 0700 146	

<b>Tools for 1.6 mm turned contacts</b>						
Description	for wire gauge	Part number			Tool	
		Contact locator	Crimping dies			
Removal tool for contacts	0.14 - 2.5 mm <sup>2</sup>	-	-	-	FG 0300 146 1	
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 2.5 mm <sup>2</sup>	TA 0010 146 0001	TA 0000 184	-	TA 0000 or TA 0500	
4-Indent crimping tool	0.14 - 2.5 mm <sup>2</sup>	-	-	-	TB 0400 146	




Further tools see catalogue "Tools"

A large industrial crimping machine, the heavy|mate M model, is shown in a factory setting. The machine is grey and white, with multiple modules and a control panel. It is used for crimping wires onto terminals. The machine is mounted on a stand and has a control panel with various buttons and indicators. The background shows a clean, industrial environment with other equipment and a white floor.

# heavy | mate<sup>®</sup> M

- Modular connector
- More module slots than heavy|mate<sup>®</sup> F and market standard
- Rated voltage 63 - 1000 V
- Rated current 5 A ... 320 A
- Termination: crimp



Approvals, Testhouse	Characteristics	Approval-Number
VDE 	See technical characteristics	56 79 ÜG
UL 	See technical characteristics	E 63093
CSA 	See technical characteristics	48932

M

## General information

- Modules inserts without crimp contacts, crimping tools see separate catalogue "Tools".
- Contacts must be ordered separately, processing instructions see catalogue "Tools".
- Connectors series heavy|mate® M may be engaged or disengaged when live but without electrical load. If these connectors are mated or unmated under load, the load shall be reduced to 10 % of rated current.

- We recommend using the high profile housings / hoods for the heavy|mate® M inserts.
- Empty modul spaces have to be filled with blind modules.
- Torque for PE connection 1.8 Nm

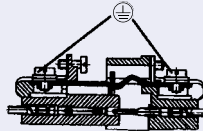


## Advantages of the system

- High combination possibilities
- Possibility of inverse configuration
- Rated voltage up to 1000 V
- Low cost

## First-to-mate last-to-break protective ground contact

Minimum wire size 0.5 mm<sup>2</sup>



## Modules



## Frames



## Range of housings



### Requirements

- 3 x 400V; 50A; 6mm<sup>2</sup> wire gauge
- 8 x 250V; 8A; 1.5mm<sup>2</sup> wire gauge
- 5 x 400V; 15A; 4mm<sup>2</sup> wire gauge

### Solution

#### 1. Check how 16 contacts can be realized; see modules overview on page 158

Possible selection:

- a) 1 x 20 contacts
- b) 2 x 10 contacts
- c) 1 x 10 contacts+ 2 x 5 contacts
- d) 1 x 3 contacts + 1 x 5 contacts + 1 x 10 contacts

#### 2. Check technical parameters / solution, see detail pages of the modules on page 166

Possible selection:

- a) not possible due to voltage
- b) not possible due to voltage
- c) not possible due to current
- d) POSSIBLE

#### 3. Choose matching contact, see detail page of the modules on page 166

Possible selection:

- a) 3 contacts = C146 A03 001 E8 → contacts = VN01 036 0002 1C
- b) 5 contacts = C146 A05 001 E8 → contacts = VN01 025 0033 1C
- c) 10 contacts = C146 A10 001 E8 → contacts = VN01 016 0027 1C

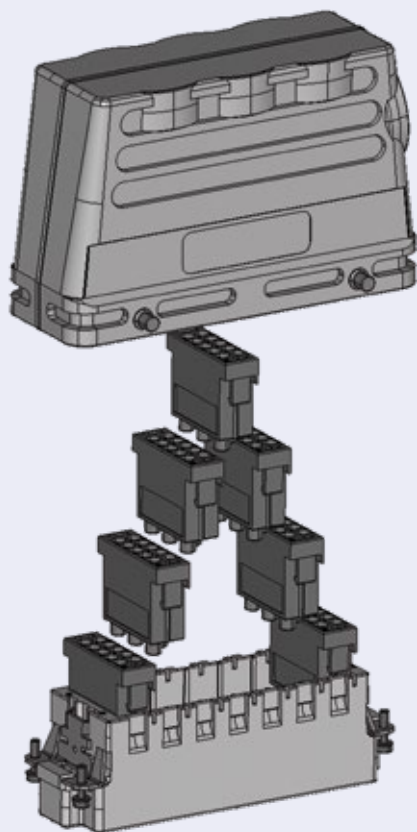
#### 4. Choose matching frame, see frames on page 166

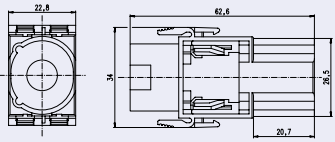

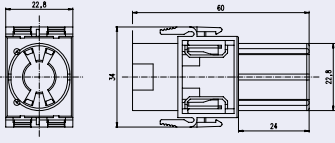

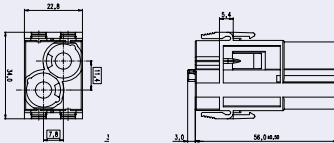

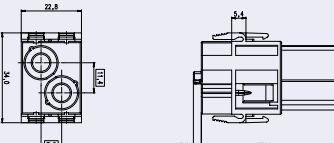

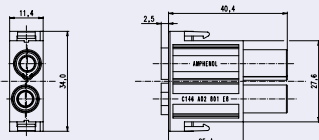

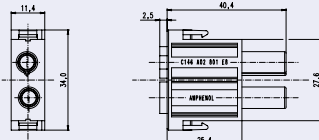

Solution: C146 P10 001 G8

#### 5. Choose matching housing, see housings from page 228

Solution: C146 21R010 600 8

### Schematic construction



Description	Part Number	Drawing	Figure
<b>1 contact module, 1000 V, Details see page 166</b>			
Pin module 1 contact	C146 A01 001 E8		
Socket module 1 contact	C146 B01 004 E8		
<b>2 contacts module, 1000 V, Details see page 168</b>			
Pin module 2 contacts	C146 A02 001 E8		
Socket module 2 contacts	C146 B02 001 E8		
<b>2 contacts module, 1000 V, Details see page 170</b>			
Pin module 2 contacts	C146 A02 801 E8		
Socket module 2 contacts	C146 B02 801 E8		

Description	Part Number	Drawing	Figure
<b>3 contacts module, 1000 V, Details see page 172</b>			
Pin module 3 contacts	C146 A03 801 E8		
Socket module 3 contacts	C146 B03 801 E8		
<b>3 contacts module, 690 V, Details see page 174</b>			
Pin module 3 contacts	C146 A03 001 E8		
Socket module 3 contacts	C146 B03 001 E8		
<b>4 contacts module, 630 V, Details see page 176</b>			
Pin module 4 contacts	C146 A04 002 E8		
Socket module 4 contacts	C146 B04 002 E8		

Description	Part number	Drawing	Figure
<b>5 contacts module für stanced contacts, 1000 V, Details see page 178</b>			
Pin module 5 contacts	C146 D04 001 E8 (4-Pol) C146 D05 001 E8 (4 + ⊕) C146 D05 801 E8 (5-Pol)		
Socket module 5 contacts	C146 C04 001 E8 (4-Pol) C146 C05 001 E8 (4 + ⊕) C146 C05 801 E8 (5-Pol)		
<b>5 contacts module for turned contacts, 400 V, Details see page 180</b>			
Pin module 5 contacts	C146 A05 001 E8		
Socket module 5 contacts	C146 B05 001 E8		
<b>10 contacts module for stanced contacts, 400 V, Details see page 182</b>			
Pin module 10 contacts	C146 D10 001 E8		
Socket module 10 contacts	C146 C10 001 G8		



Description	Part number	Drawing	Figure
<b>10 contacts module for stanced contacts, 400 V, Details see page 184</b>			
Pin module 10 contacts	C146 A10 001 E8		
Socket module 10 contacts	C146 B10 001 E8		
<b>20 contacts module, 63 V, Details see page 186</b>			
Pin module 20 contacts	C146 A20 001 G8		
Socket module 20 contacts	C146 B20 001 G8		
<b>3 contacts module for Coax-contacts, Details see page 188</b>			
Pin module 3 contacts	C146 A03 501 E8		
Socket module 3 contacts	C146 B03 501 E8		

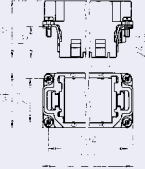

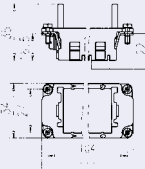

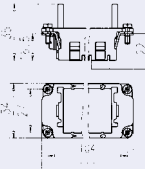

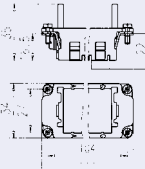

M


Description	Part Number	Drawing	Figure
<b>RJ45 module, Details see page 191</b>			
Pin module RJ45	C146 E12 001 E8		
Socket module RJ45	C146 F12 001 G8		
<b>Pneumatic module, 1 or 2 connections, Details see page 193</b>			
Pin module	C146 G01 014 G8 (2.5 mm) C146 G01 024 G8 (4.0 mm) C146 G02 014 G8 (2.5 mm) C146 G02 024 G8 (4.0 mm)		
Socket module	C146 H01 034 G8 (2.5 mm) C146 H01 044 G8 (4.0 mm) C146 H02 034 G8 (2.5 mm) C146 H02 044 G8 (4.0 mm)		
<b>Shielded Quintax - module, details see on page 195</b>			
Pin module	C146 A08 102 E8 C146 A05 100 G8		
Socket Module	C146 B08 102 E8 C146 B05 100 G8		



M

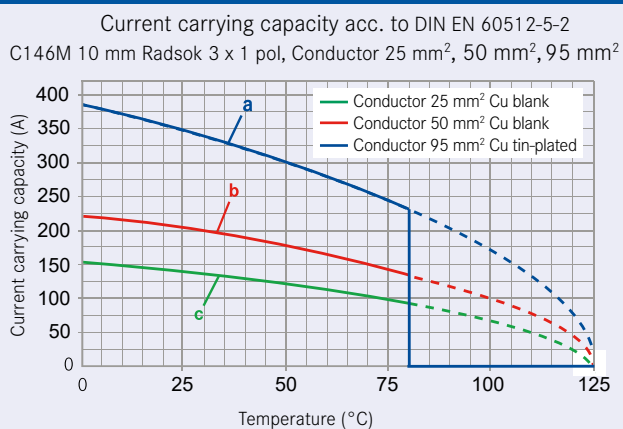
Description	Part Number	Drawing	Figure
<b>Frame for 2 modules   Size E6   Housings from page 226</b>			
Frame for 2 pin modules	C146 P06 001 G8 C146 P06 002 G8 (2 x PE)		
Frame for 2 socket modules	C146 S06 001 G8 C146 S06 002 G8 (2 x PE)		
<b>Frame for 3 modules   Size E10   Housings from page 228</b>			
Frame for 3 pin modules	C146 P10 001 G8 C146 P10 002 G8 (2 x PE)		
Frame for 3 socket modules	C146 S10 001 G8 C146 S10 002 G8 (2 x PE)		
<b>Frame for 5 modules   Size E16   Housings from page 235</b>			
Frame for 5 pin modules	C146 P16 001 G8 C146 P16 002 G8 (2 x PE)		
Frame for 5 socket modules	C146 S16 001 G8 C146 S16 002 G8 (2 x PE)		

Description	Part Number	Drawing	Figure
<b>Frame for 7 modules   Size E24   Housings from page 241</b>			
Frame for 7 pin modules Positions A-G	C146 P24 001 G8 C146 P24 002 G8 (2 x PE)		
Frame for 7 pin modules Positions T-Z	C146 P24 101 G8 C146 P24 102 G8 (2 x PE)		
Frame for 7 socket modules Positions A-G	C146 S24 001 G8 C146 S24 002 G8 (2 x PE)		
Frame for 7 socket modules Positions T-Z	C146 S24 101 G8 C146 S24 102 G8 (2 x PE)		

Supplied as	for wire gauge	AWG	Pieces	Part Number	Figure
<b>Cable lug for earth connection</b>					
Single contact	10 - 16 mm <sup>2</sup>	8 - 6	1	N15 043 0003 003	

General Characteristics	Standard	Value
Number of contacts		1
Termination technique		crimp
Wire gauge		25 - 95 mm <sup>2</sup> (AWG 4 - 000)
Max. wire diameter		20 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	1000 V
Rated impulse withstand voltage	IEC 60664-1	8 kV
Rated Current T <sub>u</sub> = 40 °C		320 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	II
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP20, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		10 g
Weight socket module		20 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver)

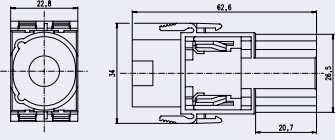

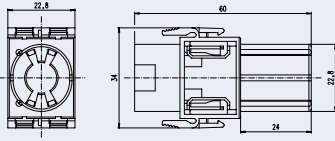

### Derating Curves





### General requirements

- Due to reduced cross sections at PE contacts of frames, the PE contact has to be additionally protected against short circuits by using a protection circuit offering a sufficiently short breaking time (<0.25s).
- Parts to be used as connectors, not as plug devices (connector with breaking capacity). Do not mate under current or voltage!

# heavy|mate® M 1 contact module + crimp contacts

Description	Part Number	Drawing	Figure
<b>1 contact module (Please order contacts separately)</b>			
Pin module 1 contact	C146 A01 001 E8		
Socket module 1 contact	C146 B01 004 E8		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 10 mm crimp contacts</b>						
Single contact	25 mm <sup>2</sup>	4	1	N01 100 5099 001	N02 100 6119 002	
	35 mm <sup>2</sup>	2	1	N01 100 6000 001	N02 100 6120 002	
	50 mm <sup>2</sup>	1	1	N01 100 6001 001	N02 100 6121 002	
	70 mm <sup>2</sup>	00	1	N01 100 6002 001	N02 100 6122 002	
	95 mm <sup>2</sup>	000	1	N01 100 6003 001	N02 100 6123 002	
<b>Cable lug for earth connection</b>						
Single contact	10 - 16 mm <sup>2</sup>	8 - 6	1	N15 043 0003 003		

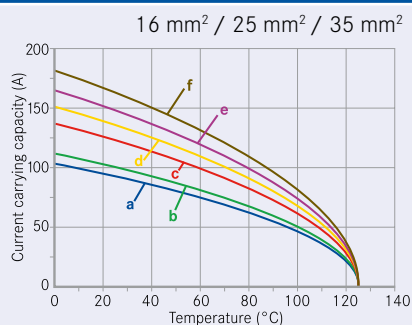
## Tools

Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Crimping dies	25 mm <sup>2</sup>	-	TE 0600 042	*
	35 mm <sup>2</sup>	-	TE 0600 22	*
	50 mm <sup>2</sup>	-	TE 0500 103	*
	70 mm <sup>2</sup>	-	TE 0500 201	*
	95 mm <sup>2</sup>	-	TE 0500 301	*

\*hydraulic crimping tool EK12042 by Klauke or AHPW 400C by Neko .  
Further tools see catalogue "Tools"

General Characteristics	Standard	Value
Number of contacts		2
Termination technique		crimp
Wire gauge		16 - 35 mm <sup>2</sup> (AWG 6 - 2)
Max. wire diameter		12.8 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	1000 V
Rated impulse withstand voltage	IEC 60664-1	8 kV
Rated Current T <sub>u</sub> = 40 °C		150 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	II
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP20, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		19 g
Weight socket module		20 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver)

### Derating Curves

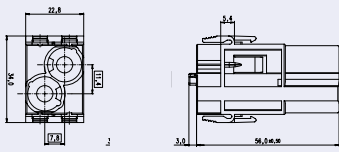

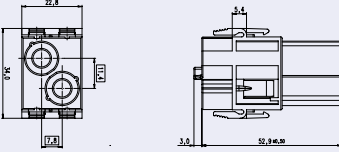





### General requirements

- Due to reduced cross sections at PE contacts of frames, the PE contact has to be additionally protected against short circuits by using a protection circuit offering a sufficiently short breaking time (<0.25s).
- Parts to be used as connectors, not as plug devices (connector with breaking capacity). Do not mate under current or voltage!



# heavy|mate® M 2 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>2 contacts module (Please order contacts separately)</b>			
Pin module 2 contacts	C146 A02 001 E8		
Socket module 2 contacts	C146 B02 001 E8		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 6 mm crimp contacts</b>						
Single contact	16 mm <sup>2</sup>	6	1	N01 060 0007 1	N02 060 6117 001	
	25 mm <sup>2</sup>	4		N01 060 0004 1	N02 060 6114 001	
	35 mm <sup>2</sup>	2		N01 060 0008 1	N02 060 6118 001	
<b>Cable lug for earth connection</b>						
Single contact	10 - 16 mm <sup>2</sup>	8 - 6	1	N15 043 0003 003		

## Tools

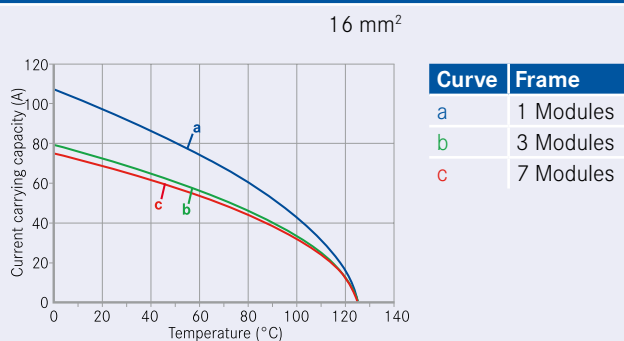
Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Crimping dies	16 mm <sup>2</sup>	-	TE 0600 062	*
	25 mm <sup>2</sup>	-	TE 0600 042	*
	35 mm <sup>2</sup>	-	TE 0600 022	*

\*Hydraulic crimping tool EK12042 by Klauke or AHPW 400C by Neko .  
Further tools see catalogue "Tools"

M

General Characteristics	Standard	Value
Number of contacts		2
Termination technique		crimp
Wire gauge		16 (AWG 6)
Max. wire diameter		8.6 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	1000 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	8 kV
Rated Current $T_u = 40\text{ °C}$		65 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	II
Contact resistance	IEC 60512-2-1	$\leq 5\text{ m}\Omega$
Insulation resistance	IEC 60512-3-1	$\geq 10^{10}\ \Omega$
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP20, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		8 g
Weight socket module		8 g
Mechanical operation	IEC 60512-9-1	$\geq 500$ mating cycles
Materials		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver)

### Derating curves



### General requirements

- Due to reduced cross sections at PE contacts of frames, the PE contact has to be additionally protected against short circuits by using a protection circuit offering a sufficiently short breaking time (<0.25s).
- Parts to be used as connectors, not as plug devices (connector with breaking capacity). Do not mate under current or voltage!

# heavy|mate® M 2 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>2 contacts module (Please order contacts separately)</b>			
Pin module 2 contacts	C146 A02 801 E8		
Socket module 2 contacts	C146 B02 801 E8		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 3.6 mm crimp contacts</b>						
Single contact	16 mm <sup>2</sup>	6	100	VN01 036 0021 1C	VN02 036 0021 1C	
<b>Cable lug for earth connection</b>						
Single contact	10 - 16 mm <sup>2</sup>	8 - 6	1	N 15 043 0003 003		

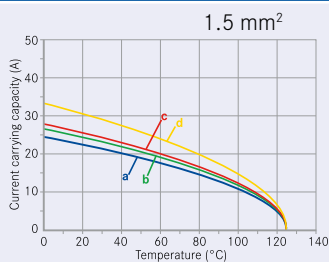
M

Tools				
Description	for wire gauge	Contact locator	Part Number	
			Crimping dies	Tool
Crimping dies	16 mm <sup>2</sup>	-	TE 0600 063	*
Removal tool for contacts	16 mm <sup>2</sup>	-	FG 0300 146 3	*
Removal tool for modules	-	-	FG 1000 146	*

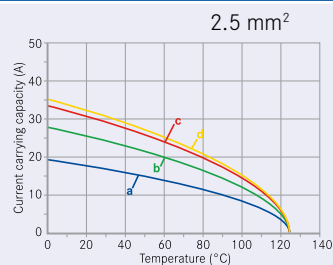
\*hydraulic crimping tool EK 60/22-L by Klauke or AHPW 300 by Neko .  
Further tools see catalogue "Tools"

General Characteristics	Standard	Value
Number of contacts		3
Termination technique		crimp
Wire gauge		1.5 - 10 mm <sup>2</sup> (AWG 16 - 8)
Max. wire diameter		7.2 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	1000 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	8 kV
Rated Current T <sub>u</sub> = 40 °C		50 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	II
Contact resistance	IEC 60512-2-1	≤ 5mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module		unmated IP20, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		8 g
Weight socket module		8 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver)

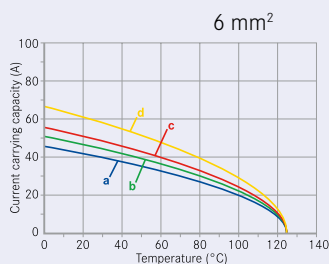
**Derating Curves**



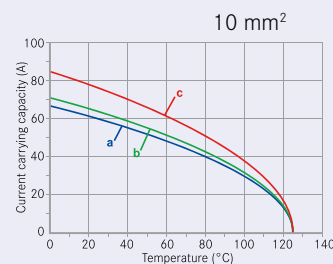
Curve	Frame
a	7 Modules
b	3 Modules
c	2 Modules
d	1 Modules



Curve	Frame
a	7 Modules
b	3 Modules
c	2 Modules
d	1 Modules



Curve	Frame
a	5-7 Modules
b	3 Modules
c	2 Modules
d	1 Modules



Curve	Frame
a	3-7 Modules
b	2 Modules
c	1 Modules

# heavy|mate® M Characteristics 3 contacts module

Description	Part number	Drawing	Figure
<b>Modul 3 contacts (Please order contacts separately)</b>			
Pin module 3 contacts	C146 A03 801 E8		
Socket module 3 contacts	C146 B03 801 E8		

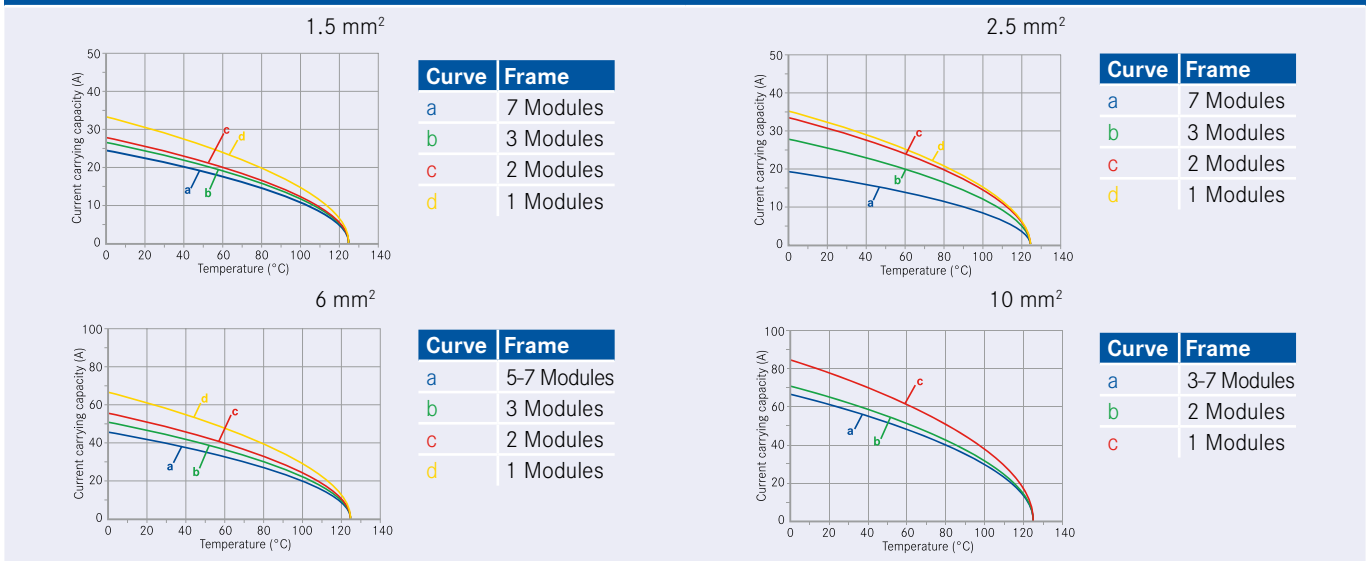
Supplied as	for wire gauge	AWG	Pieces	Part number		Figure
				Pin contact	Socket contact	
<b>Turned 3.6 mm crimp contacts (All contacts 2 mm first-to-mate to other modules)</b>						
silver plating	1.5 mm <sup>2</sup>	16	100	VN01 036 0004 1C	VN02 036 0004 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 036 0005 1C	VN02 036 0005 1C	
	4.0 mm <sup>2</sup>	12	100	VN01 036 0001 1C	VN02 036 0001 1C	
	6.0 mm <sup>2</sup>	10	100	VN01 036 0002 1C	VN02 036 0002 1C	
	10.0 mm <sup>2</sup>	8	100	VN01 036 0003 1C	VN02 036 0003 1C	
<b>Cable lug for earth connection</b>						
Single contact	10 - 16 mm <sup>2</sup>	8 - 6	1	N 15 043 0003 003		

## Tools

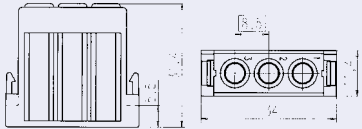

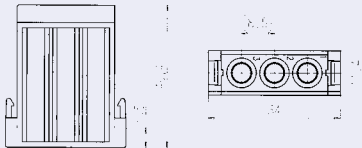

Description	for wire gauge	Part number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	1.5 - 10.0 mm <sup>2</sup>	-	-	FG 0300 146 3
Lösewerkzeug für Module	-	-	-	FG 1000 146
Standard crimping tool and accessories for 4-Indent crimping	1.5 - 2.5 mm <sup>2</sup> 4 - 6 mm <sup>2</sup>	TA 0010 146 000 5 TA 0010 146 000 4	TA 0000 144 TA 0000 124	TA 0000 or TA 0500
4-Indent crimping tool	1.5 - 10.0 mm <sup>2</sup>	-	-	TB 0100 148
Further tools see catalogue "Tools"				

General Characteristics	Standard	Value
Number of contacts		3
Termination technique		crimp
Wire gauge		1.5 - 10 mm <sup>2</sup> (AWG 16 - 8)
Max. wire diameter		7.2 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	630 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	8 kV
Rated Current T <sub>u</sub> = 40 °C		40 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	II
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		7 g
Weight socket module		9 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver)

**Derating Curves**



# heavy|mate® M 3 contacts module + crimp contacts

Description	Part number	Drawing	Figure
<b>3 contacts module (Please order contacts separately)</b>			
Pin module 3 contacts	C146 A03 001 E8		
Socket module 3 contacts	C146 B03 001 E8		

Supplied as	for wire gauge	AWG	Pieces	Part number		Figure
				Pin contact	Socket contact	
<b>Turned 3.6 mm crimp contacts</b>						
silver plating	1.5 mm <sup>2</sup>	16	100	VN01 036 0004 1C	VN02 036 0004 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 036 0005 1C	VN02 036 0005 1C	
	4.0 mm <sup>2</sup>	12	100	VN01 036 0001 1C	VN02 036 0001 1C	
	6.0 mm <sup>2</sup>	10	100	VN01 036 0002 1C	VN02 036 0002 1C	
	10.0 mm <sup>2</sup>	8	100	VN01 036 0003 1C	VN02 036 0003 1C	
<b>Cable lug for earth connection</b>						
Single contact	10 - 16 mm <sup>2</sup>	8 - 6	1	N 15 043 0003 003		

## Tools

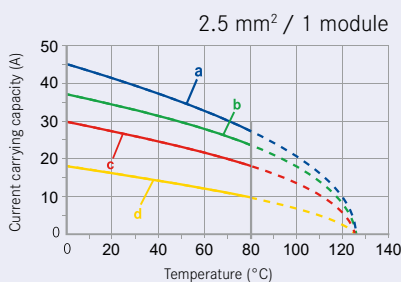
Description	for wire gauge	Part number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	1.5 - 10.0 mm <sup>2</sup>	-	-	FG 0300 146 3
Removal tool for modules	-	-	-	FG 1000 146
Standard crimping tool and accessories for 4-Indent crimping	1.5 - 2.5 mm <sup>2</sup> 4 - 6 mm <sup>2</sup>	TA 0010 146 000 5 TA 0010 146 000 4	TA 0000 144 TA 0000 124	TA 0000 or TA 0500
4-Indent crimping tool	1.5 - 10.0 mm <sup>2</sup>	-	-	TB 0100 148

Further tools see catalogue "Tools"

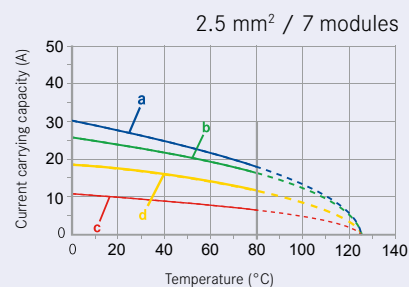
# heavy|mate<sup>®</sup> M Characteristics 4 contacts module for turned contacts

General Characteristics	Standard	Value
Number of contacts		4
Termination technique		crimp
Wire gauge		0.5 - 4 mm <sup>2</sup> (AWG 26 - 12)
Max. wire diameter		4.6 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	630 V
Rated impulse withstand voltage	IEC 60664-1	8 kV
Rated Current T <sub>u</sub> = 40 °C		25 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	I
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		9 g
Weight socket module		8 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

## Derating curves




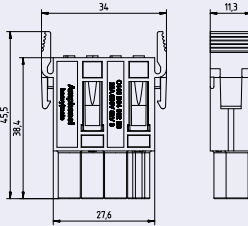

Curve	Wire gauge
a	4.0 mm <sup>2</sup>
b	2.5 mm <sup>2</sup>
c	1.5 mm <sup>2</sup>
d	0.5 mm <sup>2</sup>



Curve	Wire gauge
a	4.0 mm <sup>2</sup>
b	2.5 mm <sup>2</sup>
c	1.5 mm <sup>2</sup>
d	0.5 mm <sup>2</sup>



# heavy|mate® M 4 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>4 contacts module (Please order contacts separately)</b>			
Pin module 4 contacts	C146 A04 002 E8		
Socket module 4 contacts	C146 B04 002 E8		

Supplied as	for wire gauge	AWG	Pcs.	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 3.6 mm crimp contacts single contact</b>						
silver plated	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 025 0055 1C	VN02 025 0055 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 1C	VN02 025 0035 1C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 1C	VN02 025 0036 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 1C	VN02 025 0037 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 1C	VN02 025 0038 1C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 1C	VN02 025 0059 1C	
gold plated	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 025 0055 2C	VN02 025 0055 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 2C	VN02 025 0035 2C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0036 2C	VN02 025 0036 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 2C	VN02 025 0037 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 2C	VN02 025 0038 2C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 2C	VN02 025 0059 2C	
4.0 mm <sup>2</sup>	12	100	VN01 025 0039 2C	VN02 025 0039 2C		

M

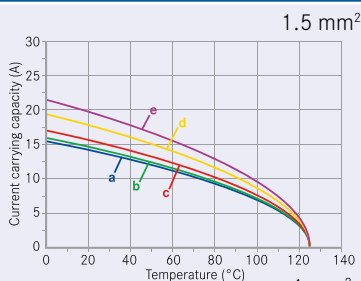
Tools for turned contacts				
Description	for wire gauge	Part number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 4.0 mm <sup>2</sup>	-	-	FG 0300 146 7
Standard crimping tool and accessories for 4-indent crimping	0.14 - 0.37 mm <sup>2</sup>	TA 0010 146 000 6	TA 0000 144	TA 0000 or TA 0500
	0.5 - 2.5 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	
	3.0 - 4.0 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	
4-indent crimping tool	0.14 - 4.0 mm <sup>2</sup>	-	-	TB 0600 146

Further tools see catalogue "Tools"

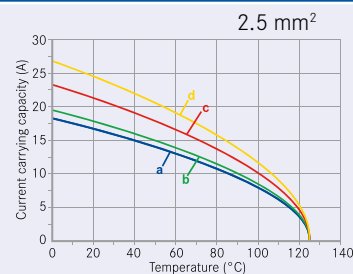
# heavy|mate<sup>®</sup> M Characteristics 4 contacts, 4 + ⊕ , 5 contacts module

General Characteristics	Standard	Value
Number of contacts		4 / 4 + ⊕ / 5
Termination technique		crimp
Wire gauge		0.5 - 4 mm <sup>2</sup> (AWG 20 - 12)
Max. wire diameter		4.6 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	1000 V
Rated impulse withstand voltage	IEC 60664-1	8 kV
Rated Current T <sub>u</sub> = 40 °C		16 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	II
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module		unmated IP20, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		8 g
Weight socket module		7 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Module		PA
Colour module		black
Pin contacts		CuZn (brass)
Socket contact		CuSn (bronze)
Contact plating		Ag (silver) / Au (gold)

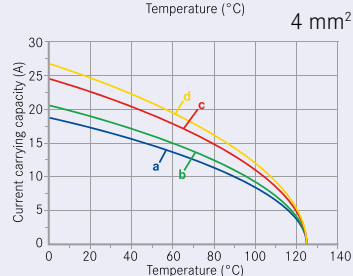
## Derating Curves



Curve	Frame
a	7 Modules
b	5 Modules
c	3 Modules
d	2 Modules



Curve	Frame
a	7 Modules
b	3-5 Modules
c	2 Modules
d	1 Modules



Curve	Frame
a	7 Modules
b	5 Modules
c	3 Modules
d	1+2 Modules

# heavy|mate® M 4 contacts, 4 + ⊕ , 5 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>4 contacts, 4 + ⊕ , 5 contacts module, PE contact 2 mm first-to-mate (Please order contacts separately)</b>			
Pin module	C146 D04 001 E8 (4 pol) C146 D05 001 E8 (4 +PE) C146 D05 801 E8 (5 pol)		
Socket module	C146 C04 001 E8 (4 pol) C146 C05 001 E8 (4 + PE) C146 C05 801 E8 (5 pol)		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	

### Stamped single contacts

silver plating	0.5 - 1.5 mm <sup>2</sup>	20 - 16	100	VN01 025 0001 101	VN02 025 0001 101	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	VN01 025 0010 101	VN02 025 0010 101	
	2.5 - 4.0 mm <sup>2</sup>	14 - 12	100	VN01 025 0043 1	VN02 025 0043 1	
gold plating	0.5 - 1.5 mm <sup>2</sup>	20 - 16	100	VN01 025 0001 102	VN02 025 0001 102	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	VN01 025 0010 102	VN02 025 0010 102	
	2.5 - 4 mm <sup>2</sup>	14 - 12	100	VN01 025 0043 2	VN02 025 0043 2	

### Stamped Contacts on reel for hand crimp tools

silver plating	0.5 - 1.5 mm <sup>2</sup>	20 - 16	200	ZN01 025 0001 1	ZN02 025 0001 1	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	ZN01 025 0010 1	ZN02 025 0010 1	
gold plating	0.5 - 1.5 mm <sup>2</sup>	20 - 16	200	ZN01 025 0001 2	ZN02 025 0001 2	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	ZN01 025 0010 2	ZN02 025 0010 2	

### Contacts on reel for crimp machines contact feeding left hand side

silver plating	0.5 - 1.5 mm <sup>2</sup>	20 - 16	2000	TN01 025 0001 1	TN02 025 0001 1	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	2000	TN01 025 0010 1	TN02 025 0010 1	
	2.5 - 4 mm <sup>2</sup>	12	2000	TN01 025 0043 1	TN02 025 0043 1	

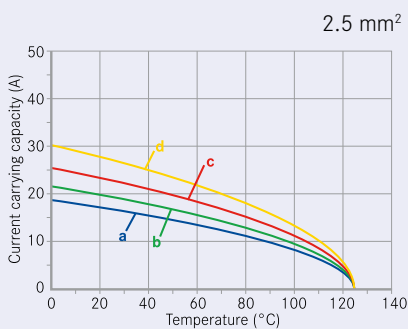
### Tools

Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.5 - 4.0 mm <sup>2</sup>	-	-	FG 0200 146 1
Crimping tool for single contacts	0.5 - 1.5 mm <sup>2</sup>	TA 0004 146 000 1	TA 0000 163	TA 0000 or TA 0500
	1.5 - 2.5 mm <sup>2</sup>	TA 0005 146 000 3	TA 0000 141	
	2.5 - 4.0 mm <sup>2</sup>	TA 0003 146 000 1	TA 0000 121	

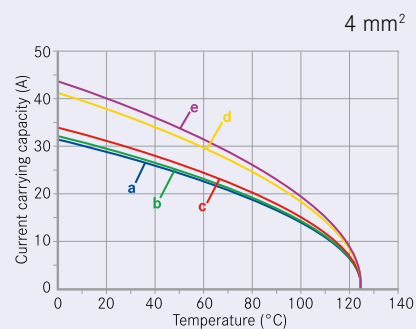
Further tools see catalogue "Tools"

# heavy|mate<sup>®</sup> M Characteristics 5 contacts module for turned contacts

General Characteristics	Standard	Value
Number of contacts		5
Termination technique		crimp
Wire gauge		0.5 - 4 mm <sup>2</sup> (AWG 20 - 12)
Max. wire diameter		4.8 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	400 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	6 kV
Rated Current T <sub>u</sub> = 40 °C		20 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	II
Contact resistance	IEC 60512-2-1	≤ 5mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP00, mated IP20
Weight pin module		5 g
Weight socket module		9 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Ag (silver)
Derating curves		

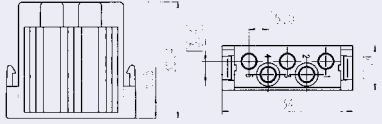

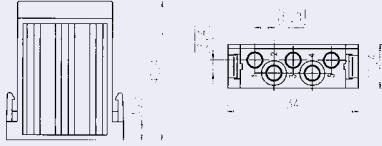



Curve	Frame
a	7 Modules
b	5 Modules
c	3 Modules
d	1+2 Modules



Curve	Frame
a	7 Modules
b	5 Modules
c	3 Modules
d	2 Modules
e	1 Modules

# heavy|mate® M 5 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>5 contacts module (Please order contacts separately)</b>			
Pin module 5 contacts	C146 A05 001 E8		
Socket module 5 contacts	C146 B05 001 E8		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 2.5 mm crimp contacts</b>						
silver plating	0.5 mm <sup>2</sup>	20	100	VN01 025 0029 1C	VN02 025 0029 1C	
	0.75 - 1.0 mm <sup>2</sup>	18	100	VN01 025 0030 1C	VN02 025 0030 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0031 1C	VN02 025 0031 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0032 1C	VN02 025 0032 1C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0033 1C	VN02 025 0033 1C	

## Tools

Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.5 - 4.0 mm <sup>2</sup>	-	-	FG 0300 146 4
Removal tool for modules	-	-	-	FG 1000 146
Standard crimping tool and accessories for 4-Indent crimping	0.5 - 2.5 mm <sup>2</sup> 4.0 mm <sup>2</sup>	TA 0010 146 000 2 TA 0010 146 000 3	TA 0000 144 TA 0000 124	TA 0000 or TA 0500
4-Indent crimping tool	0.5 - 4.0 mm <sup>2</sup>	-	-	TB 0100 146

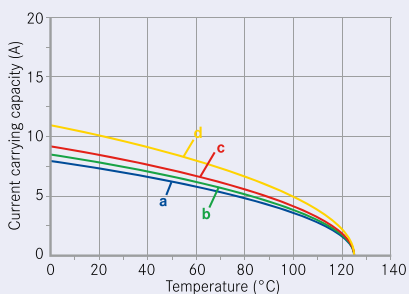
Further tools see catalogue "Tools"

M

# heavy|mate<sup>®</sup> M Characteristics 10 contacts module

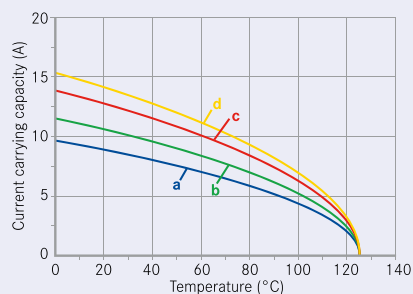
General Characteristics	Standard	Value
Number of contacts		10
Termination technique		crimp
Wire gauge		0.14 - 2.5 mm <sup>2</sup> (AWG 26 - 14)
Max. wire diameter		3.7 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	250 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	6 kV
Rated Current T <sub>u</sub> = 40 °C		10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	II
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module		Unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	Unmated IP20, mated IP20
Weight pin module		7 g
Weight socket module		8 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Module		PA
Colour module		black
Pin contacts		CuZn (brass)
Socket contacts		CuSn (bronze)
Contact plating		Ag (silver)
Derating curves		

0.5 mm<sup>2</sup>





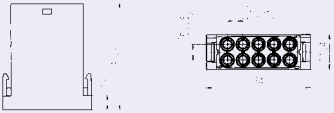

Curve	Frame
a	5-7 Modules
b	3 Modules
c	2 Modules
d	1 Modules

1.5 mm<sup>2</sup>



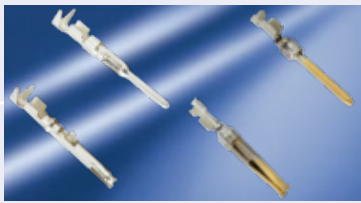
Curve	Frame
a	5-7 Modules
b	3 Modules
c	2 Modules
d	1 Modules

# heavy|mate® M 10 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>10 contacts module (Please order contacts separately)</b>			
Pin module 10 contacts	C146 D10 001 E8		
Socket module 10 contacts	C146 C10 001 G8		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	

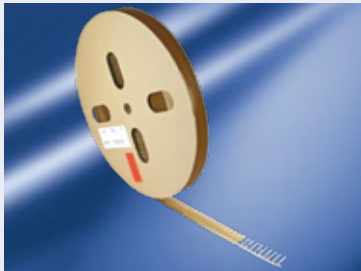
### Stamped 1.6 mm crimp contacts

silver plating	0.14 - 0.5 mm <sup>2</sup>	26 - 20	100	VN01 016 0003 1	VN02 016 0003 1	
	0.5 - 1.5 mm <sup>2</sup>	20 - 16	100	VN01 016 0002 1	VN02 016 0002 1	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	VN01 016 0005 1	VN02 016 0005 1	
gold plating	0.14 - 0.5 mm <sup>2</sup>	26 - 20	100	VN01 016 0003 2	VN02 016 0003 2	
	0.5 - 1.5 mm <sup>2</sup>	20 - 16	100	VN01 016 0002 2	VN02 016 0002 2	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	VN01 016 0005 2	VN02 016 0005 2	

### Stamped Contacts on reel for hand crimp tools

silver plating Standard	0.14 - 0.5 mm <sup>2</sup>	26 - 20	200	ZN01 016 0003 1	ZN02 016 0003 1	
	0.5 - 1.5 mm <sup>2</sup>	20 - 16	200	ZN01 016 0002 1	ZN02 016 0002 1	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	ZN01 016 0005 1	ZN02 016 0005 1	
silver plating High current	0.5 - 1.5 mm <sup>2</sup>	20 - 16	200	ZN01 016 0015 1	ZN02 016 0015 1	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	ZN01 016 0016 1	ZN02 016 0016 1	
gold plating Standard	0.14 - 0.5 mm <sup>2</sup>	26 - 20	200	ZN01 016 0003 2	ZN02 016 0003 2	
	0.5 - 1.5 mm <sup>2</sup>	20 - 16	200	ZN01 016 0002 2	ZN02 016 0002 2	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	100	ZN01 016 0005 2	ZN02 016 0005 2	

### Stamped Contacts on reel for crimp machines contact feeding left hand side

silver plating Standard	0.14 - 0.5 mm <sup>2</sup>	26 - 20	2000	TN01 016 0003 1	TN02 016 0003 1	
	0.5 - 1.5 mm <sup>2</sup>	20 - 16	2000	TN01 016 0002 1	TN02 016 0002 1	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	2000	TN01 016 0005 1	TN02 016 0005 1	
silver plating High current	0.5 - 1.5 mm <sup>2</sup>	20 - 16	2000	TN01 016 0015 1	TN02 016 0015 1	
	1.5 - 2.5 mm <sup>2</sup>	18 - 14	2000	TN01 016 0016 1	TN02 016 0016 1	
gold plating Standard	0.14 - 0.5 mm <sup>2</sup>	26 - 20	2000	TN01 016 0003 2	TN02 016 0003 2	
	0.5 - 1.5 mm <sup>2</sup>	20 - 16	2000	TN01 016 0002 2	TN02 016 0002 2	
	1.5 - 2.5 mm <sup>2</sup>	16 - 14	2000	TN01 016 0005 2	TN02 016 0005 2	

### Tools

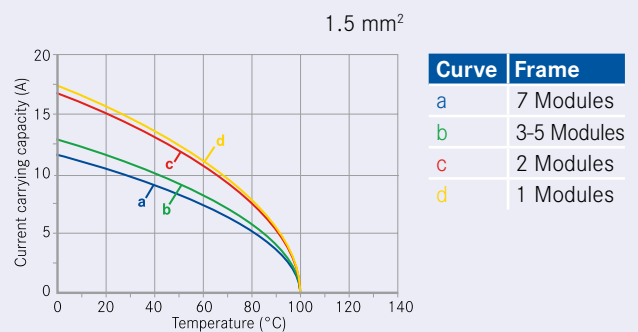
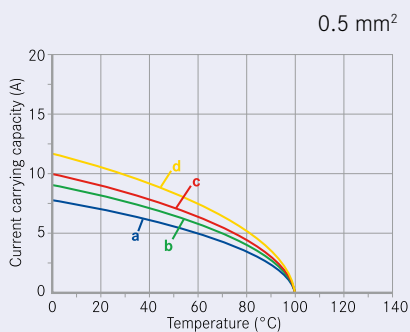
Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 2.5 mm <sup>2</sup>	-	-	FG 0300 146 1
Removal tools for modules	-	-	-	FG 1000 146
Crimping tool for single contacts	0.14 - 0.5 mm <sup>2</sup>	TA 0001 146 000 1	TA 0000 202	TA 0000 or TA 0500
	0.5 - 1.5 mm <sup>2</sup>	TA 0002 146 000 1	TA 0000 163	
	1.5 - 2.5 mm <sup>2</sup>	TA 0007 146 000 3	TA 0000 141	

Further tools see catalogue "Tools"

# heavy|mate<sup>®</sup> M Characteristics 10 contacts module

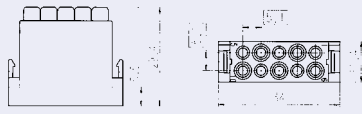

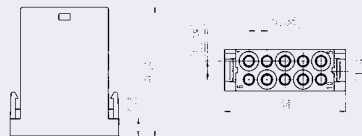

General Characteristics	Standard	Value
Number of contacts		10
Termination technique		crimp
Wire gauge		0.14 - 2.5 mm <sup>2</sup> (AWG 26 - 14)
Max. wire diameter		3.7 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	250 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	6 kV
Rated Current T <sub>u</sub> = 40 °C		10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	II
Contact resistance	IEC 60512-2-1	≤ 5m Ω
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin insert module	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		7 g
Weight socket module		8 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Insert / module		PA
Colour insert / module		black
Pin contacts		CuZn (brass)
Contact plating		Ag (silver)



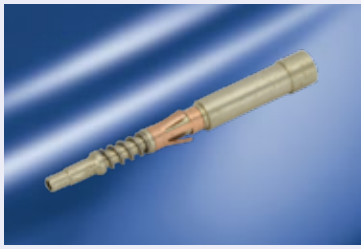
## Derating curves





# heavy|mate® M 10 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>10 contacts module (Please order contacts separately)</b>			
Pin module 10 contacts	C146 A10 001 E8		
Socket module 10 contacts	C146 B10 001 E8		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 1.6 mm crimp contacts crimp contact</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	20 - 16	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16 - 15	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	20 - 16	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16 - 15	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	
<b>FO contacts</b>						
single contact	1.0 mm POF	-	10	VN01 016 0040 8 X	VN02 016 0040 8 X	

M

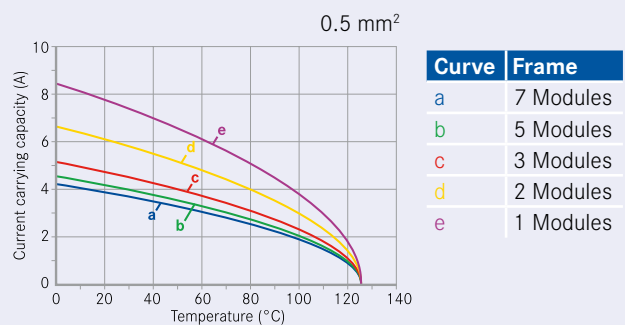
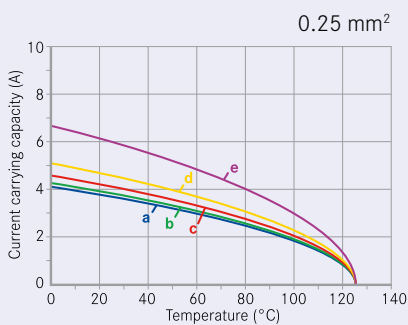
Tools				
Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 2.5 mm <sup>2</sup>	-	-	FG 0300 146 1
Removal tool for modules	-	-	-	FG 1000 146
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 2.5 mm <sup>2</sup>	TA 0010 146 000 1	TA 0000 184	TA 0000 or TA 0500
4-Indent crimping tool	0.14 - 2.5 mm <sup>2</sup>	-	-	TB 0400 146
Crimping tool for FO contacts	1.0 mm POF/FO	-	-	TB 0500 146

Further tools see catalogue "Tools"

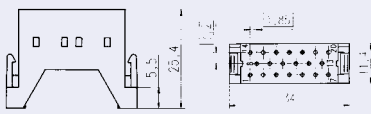

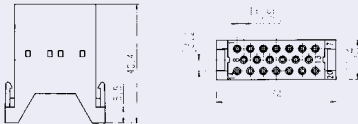

# heavy|mate<sup>®</sup> M Characteristics 20 contacts module




General Characteristics	Standard	Value
Number of contacts		20
Termination technique		crimp
Wire gauge		0.09 - 0.5 mm <sup>2</sup> (AWG 28 - 20)
Max. wire diameter		2 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	63 V (UL/CSA 50 V)
Rated impulse withstand voltage	IEC 60664-1	4 kV
Rated Current T <sub>u</sub> = 40 °C		4 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	II
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20
Weight pin module		5 g
Weight socket module		7 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Au (gold)

## Derating curves



# heavy|mate® M 20 contacts module + crimp contacts

Description	Part Number	Drawing	Figure
<b>20 contacts module (Please order contacts separately)</b>			
Pin module 20 contacts	C146 A20 001 G8		
Socket module 20 contacts	C146 B20 001 G8		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Stamped 1.0 mm crimp contacts</b>						
gold plating	0.09 - 0.14 mm <sup>2</sup>	28 - 26	100	VN01 010 0130 2	VN02 010 0130 2	
	0.25 - 0.50 mm <sup>2</sup>	24 - 20	100	VN01 010 0131 2	VN02 010 0131 2	
<b>Stamped Contacts on reel for hand crimp tools</b>						
gold plating	0.09 - 0.14 mm <sup>2</sup>	28 - 26	350	ZN01 010 0130 2	ZN02 010 0130 2	
	0.25 - 0.50 mm <sup>2</sup>	24 - 20	350	ZN01 010 0131 2	ZN02 010 0131 2	
<b>Stamped contacts on reel for crimp machines contact feeding left hand side</b>						
gold plating	0.09 - 0.14 mm <sup>2</sup>	28 - 26	2000	TN01 010 0130 2	TN02 010 0130 2	
	0.25 - 0.50 mm <sup>2</sup>	24 - 20	2000	TN01 010 0131 2	TN02 010 0131 2	

## Tools

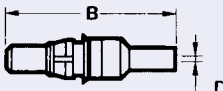
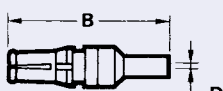
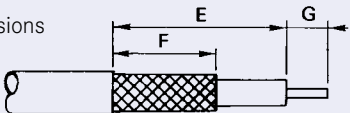
Description	for wire gauge	Part Number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.09 - 0.50 mm <sup>2</sup>	-	-	17D 438 SP
Removal tool for modules	-	-	-	FG 1000 146
Standard crimping tool	0.09 - 0.50 mm <sup>2</sup>	-	-	TA 0200 146

Further tools see catalogue "Tools"

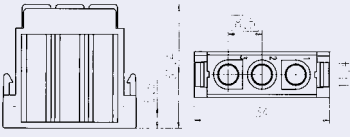

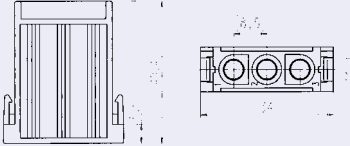

# heavy|mate<sup>®</sup> M Characteristics 3 contacts coax module

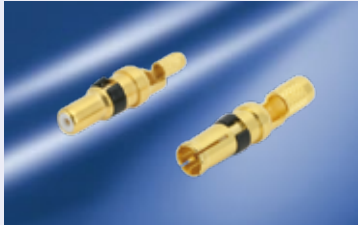

General Characteristics	Standard	Value
Number of contacts		3
Termination technique		crimp, solder
Max. wire diameter		7.2 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	250 V
Rated impulse withstand voltage		8 kV
Rated Current $T_u = 40\text{ °C}$		0.5 A
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	II
Contact resistance	IEC 60512-2-1	$\leq 2.7\text{ m}\Omega$
Insulation resistance	IEC 60512-3-1	$\geq 10^{10}\ \Omega$
Impedance		50 $\Omega$
Working frequency		0 - 2 GHz
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket module	IEC 60529	unmated IP00, mated IP20
Weight pin module		7 g
Weight socket module		9 g
Mechanical operation	IEC 60512-9-1	$\geq 500$ mating cycles
Materials		
Module		PA
Colour module		redbrown
Contacts		CuZn (brass), CuSn (bronze)
Contact plating		Au (gold)

## Contact dimensions ( Figure without crimp ferrule)

	Part Number	B	D	E	F	G
Pin contact 	17 DM 537 401	18 <sup>1)</sup>	1.6	4.6	4.3	1.9
Socket contact 	17 DM 537 421	18 <sup>1)</sup>	1.6	5.1	4.4	1.9
	17 DM 537 405	23.6 <sup>2)</sup>	3.2	9.5	7.9	2
Stripping dimensions 	17 DM 537 425	23.6 <sup>2)</sup>	3.2	9.5	7.9	2

# heavy|mate<sup>®</sup> M 3 contacts coax module + crimp contacts

Description	Part Number	Drawing	Figure
<b>3 contacts coax module (Please order contacts separately)</b>			
Pin module 3 contacts coax	C146 A03 501 E8		
Socket module 3 contacts coax	C146 B03 501 E8		

Supplied as	for wire gauge	Pieces	Part Number		Figure
			Pin contact	Socket contact	
<b>Coax contacts</b>					
	RG 179, 316	1	17 DM 537 401	17 DM 537 421	
	RG 58	1	17 DM 537 405	17 DM 537 425	
<b>FO contacts</b>					
single contact	50 - 62.5 / 125 μm Glass fiber	10	VN01 036 0022 X	VN02 036 0022 X	

<b>Tools</b>						
Description	for cable size	6-hex-size in mm			Part Number	
					Crimping dies	Tool
Removal tool for contacts	RG 58, 179, 316	-	-	-	-	FG 0300 146 3
Removal tool for modules	-	-	-	-	-	FG 1000 146
Crimping tool for single contacts	RG 58	5.4	(6.5)	(1.7)	TA 0000 401	TA 0000 or TA 0500
	RG 179, 316	3.25	(4.5)	(1.7)	TA 0000 402	TA 0000 or TA 0500
Crimping tool for FO contacts	50 - 62.5 / 125 μm	-	-	-	-	TB 0800 146
Further tools see catalogue "Tools"						

M

**Brief information**

- For integration of standard RJ45 components
- Worldwide real-time access on machines and facilities
- Easy assembly through the use of standard RJ45 components
- One connector for power, signal and data transmission
- 4 additional power crimp contacts
- Time- and money saving through the use of similar active- and passive components
- Unitary transmission protocol in the office- and production environment.
- Meets CAT 5 for Ethernet acc. ISO/IEC 11801, suitable for 10/100/1000 Mbps transfer rate

General Characteristics	Standard	Value module	Value RJ45
Number of contacts		4	8
Termination technique		crimp, solder	mate
Wire gauge		0.14 - 2.5mm <sup>2</sup>	-
Max. wire diameter		3.7 mm	-
Flammability	UL 94	V-0	V - 0
Electrical Characteristics			
Rated voltage	IEC 60664-1	250 V AC	125 V AC
Rated impulse withstand voltage	IEC 60664-1	6 kV	1.8 kV
Current carrying capacity	IEC 60512-5-2	13 A <sup>1)</sup>	1.5 A
Installation (overvoltage) category	IEC 60664-1	III	III
Material group	IEC 60664-1	II	II
Contact resistance	IEC 60512-2-1	≤ 5 mΩ	≤ 20 mΩ
Insulation resistance	IEC 60512-3-1	10 <sup>10</sup> Ω	5 <sup>9</sup> Ω
Pollution degree	IEC 60664-1	3	3
Climatical Characteristics			
Climatic category	IEC 60068-1	40 / 125 / 21	20 / 8 / 21
Upper temperature	IEC 60512-11-9	+ 125 °C	+ 80 °C
Lower temperature	IEC 60512-11-10	-40 °C	- 20 °C
Mechanical Characteristics			
IP-degree of protection pin module	IEC 60529	unmated IP00, mated IP20	
IP-degree of protection socket module	IEC 60529	unmated IP20, mated IP20	
Weight pin module		12 g	
Weight socket module		26 g	
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles	
Materials			
Module		PA	
Colour module		black	
Contacts		CuZn (brass)	
Contact plating		Ag (silver) / Au (gold)	Au (gold)

# heavy|mate® M RJ45 module + crimp contacts

Description	Part Number	Drawing	Figure
<b>RJ 45 module (Please order contacts separately)</b>			
Pin module RJ45	C146 E12 001 E8		
Socket module RJ 45	C146 F12 001 G8		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 1.6 mm single contacts</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	20 - 16	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16 - 15	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26 - 22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	20 - 16	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16 - 15	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	

<b>Tools</b>				
Description	for wire gauge	Part number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	-	-	-	FG 0300 146 1
Removal tool for module	-	-	-	FG 1000 146
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 2.5 mm <sup>2</sup>	TA 0010 146 0001	TA 0000 184	TA 0000 or TA 0500
4-Indent crimping tool	0.14 - 2.5 mm <sup>2</sup>	-	-	TB 0400 146

Further tools see catalogue "Tools"

**Brief information**

- Power, signal and pneumatic within a single connector
- Very stable brass contacts
- Pneumatic socket contacts with barrier, closes when the connector is open
- Available with single or double connections
- Connection for 2.5 mm or 4 mm PTFE (Teflon)-tubes
- Tubes can be disassembled from the terminations

General Characteristics	Standard	Value module	Value RJ45
Number of contacts		1	2
Termination technique		tube termination	
Wire gauge		2.5mm <sup>2</sup> / 4 mm <sup>2</sup>	2.5mm <sup>2</sup> / 4 mm <sup>2</sup>
Max. wire diameter		9.1 mm	
Flammability	UL 94	V-0	
Operating pressure		8 bar with PTFE tube	
Operating path		4.0 mm	
Locking		locking on one side	
Pneumatic tube		only use PTFE tubes <sup>1)</sup>	
Climatical Characteristics			
Climatic category	IEC 60068-1	20 / 100 / 21	
Upper temperature	IEC 60512-11-9	+ 100 °C	
Lower temperature	IEC 60512-11-10	- 20 °C	
Mechanical Characteristics			
Weight pin module		10 g	15 g
Weight socket module		17 g	26 g
Mechanical operation		≥ 5000 mating cycles	
Materials			
Module		PA	
Colour module		black	
Contacts		Brass MS 58	



Description	Part Number	Drawing	Figure
<b>Pneumatic module</b>			
Pin module 1 contact	C146 G01 014 G8 (2.5 mm)		
	C146 G01 024 G8 (4.0 mm)		
Socket module 1 contact	C146 H01 034 G8 (2.5 mm)		
	C146 H01 044 G8 (4.0 mm)		
Pin module 2 contacts	C146 G02 014 G8 (2.5 mm)		
	C146 G02 024 G8 (4.0 mm)		
Socket module 2 contacts	C146 H02 034 G8 (2.5 mm)		
	C146 H02 044 G8 (4.0 mm)		

**Kurzinformationen**

CAT 5e for Ethernet acc. ISO/IEC 11801, for 10/100/1000 MBit/s data rates.

General Characteristics	Standard	Value
Number of contacts		4 + shielding
Termination technique		crimp
Wire gauge		0.14 - 2.5 mm <sup>2</sup> (AWG 26 - 14)
Max. wire diameter		
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	50 V
Rated impulse withstand voltage	IEC 60664-1	0.8 kV
Rated Current T <sub>v</sub> = 40 °C		10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	IIIb
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance		≤ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin module		unmated IP00, mated IP20
IP-degree of protection socket module		unmated IP20, mated IP20
Weight pin module		23 g
Weight socket module		25 g
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Module		PA
Colour module		black
Contacts		CuZn (brass)
Contact plating		Au (gold)
Contact insert		PC
Colour contact insert		grey
Shielding		Zink alloy
Cable clamp		Zink alloy

Description	Part Number	Drawing	Figure
<b>Adaptor modules and Quintax-contact carriers (Please order contacts separately)</b>			
Pin module	C146 A08 102 E8		
Quintax pin contact carriers 4 contacts	C146 A05 100 G8		
Socket module	C146 B08 102 E8		
Quintax socket contact carriers 4 contacts	C146 B05 100 G8		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 1.6mm crimp contacts</b>						
gold plating	0.14 – 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 – 1.0 mm <sup>2</sup>	20-16	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16-15	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	

<b>Tools</b>					
Description	for wire gauge	Part Number			Tool
		Contact locator	Crimping dies		
Removal tool for contacts	0.14 - 0.37 mm <sup>2</sup>	-	-	-	FG 0300 146 1
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 2.5 mm <sup>2</sup>	TA 0010 146 0001	TA 0000 184		TA 0000 or TA 0500
4-Indent crimping tool	0.14 - 2.5 mm <sup>2</sup>	-	-		TB 0400 146
Further tools see catalogue "Tools"					

Contact size	Part Number	Figure
Removal tool for modules	FG 1000 146	
Blank modules	C146 A00 001 E8 (pin) C146 B00 001 E8 (socket)	
Assembly angle	C146 10Z001 001 8	
Strain relief	C146 10Z002 001 8	





M

A close-up photograph of industrial machinery. The main components are painted a vibrant blue. In the foreground, there's a large blue valve with a black handwheel. To its right, a silver pressure gauge is mounted on a blue pipe. Above the gauge, a large, cylindrical, silver-colored component, possibly a filter or a tank, is visible. The background shows more of the machinery, including another valve with a handwheel. The overall scene is brightly lit, highlighting the metallic textures and the blue paint.

# heavy | mate<sup>®</sup> Q

- Compact design
- Even in a metal housing
- Rated voltage up to 690 V
- Numbers of contacts: 5, 4/2, 7, 8, 12, 17
- HL3 acc. EN 45545: R22/23

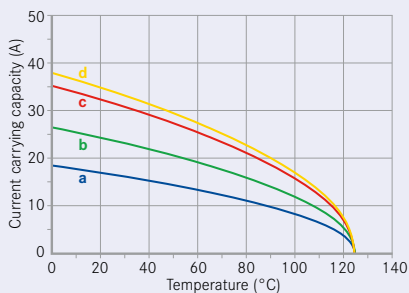


Approvals, Testhouse	Characteristics	Approval-Number
UL 	see technical characteristics	E 63093
CSA 	see technical characteristics	E 63093



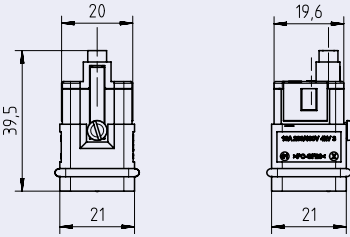

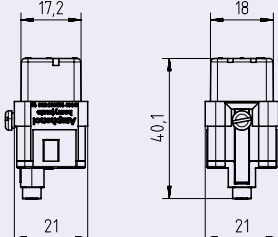

General Characteristics	Standard	Value
Number of contacts		5 + ⊕
Termination technique		crimp
Wire gauge		0.5 – 4.0 mm <sup>2</sup> (AWG 20 -12)
Max. wire diameter		4.6 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	400 V (conductor – conductor) 230 V (conductor – earth) (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	6 kV
Rated Current T <sub>u</sub> = 40 °C		16 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	III b
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40/125/21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin insert	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket insert	IEC 60529	unmated IP20, mated IP20
Weight pin insert		16 g
Weight socket insert		18 g
Mechanical operation	IEC 60512-9-1	≥500 mating cycles
Material		
Insert		PC
Colour insert		grey
Contacts		CuZn (brass)
Contact plating		Ag (silver) /Au (gold)

**Derating curves**

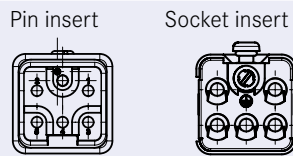


Curve	Wire gauge
a	1.0 mm <sup>2</sup>
b	1.5 mm <sup>2</sup>
c	2.5 mm <sup>2</sup>
d	4.0 mm <sup>2</sup>





Description	Part Number	Drawing	Figure
<b>Contact insert 5 +PE (Please order contacts separately)</b>			
Pin insert 5 contacts	C146 10A005 500 12		
Socket insert 5 contacts	C146 10B005 500 12		

**Contact arrangement**



Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	

**Turned 2.5 mm crimp contacts single contact**

silver plating	0.14-0.37 mm <sup>2</sup>	22-26	100	VN01 025 0055 1C	VN02 025 0055 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 1C	VN02 025 0035 1C	
	0.75-1.0 mm <sup>2</sup>	18	100	VN01 025 0036 1C	VN02 025 0036 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 1C	VN02 025 0037 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 1C	VN02 025 0038 1C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 1C	VN02 025 0059 1C	
gold plating	0.14-0.37 mm <sup>2</sup>	22-26	100	VN01 025 0055 2C	VN02 025 0055 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 2C	VN02 025 0035 2C	
	0.75-1.0 mm <sup>2</sup>	18	100	VN01 025 0036 2C	VN02 025 0036 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 2C	VN02 025 0037 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 2C	VN02 025 0038 2C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 2C	VN02 025 0059 2C	
4.0 mm <sup>2</sup>	12	100	VN01 025 0039 2C	VN02 025 0039 2C		

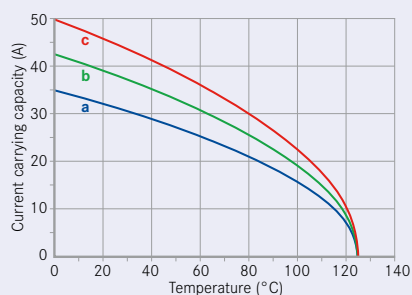
**Tools for turned contacts**

Description	for wire gauge	Part number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 4.0 mm <sup>2</sup>	-	-	FG 0300 146 7
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 0.37 mm <sup>2</sup>	TA 0010 146 000 6	TA 0000 144	TA 0000 or TA 0500
	0.5 - 2.5 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	
	3.0 - 4.0 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	
4-Indent crimping tool	0.14 - 4.0 mm <sup>2</sup>	-	-	TB 0600 146

Further tools see catalogue "Tools"

General Characteristics	Standard	Value
Number of contacts		4 + 2 + ⊕
Termination technique		crimp
Wire gauge		Power: 1.5 - 6 mm <sup>2</sup> (AWG 16 - 10) Signal: 0.14 - 2.5 mm <sup>2</sup> (AWG 26 - 14)
Max. wire diameter		Power: 5.2 mm, Signal: 3.7 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	Power: 400 V (conductor - earth) 690 V (conductor - conductor) Signal: 250 V (UL/ CSA 600, 250 V)
Rated impulse withstand voltage	IEC 60664-1	Power: 6 kV / 4 kV, Signal: 4 kV
Rated Current T <sub>u</sub> = 40 °C		Power: 40 A, Signal: 10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	III b
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40/125/21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin insert	IEC 60529	unmated IP20, mated IP20
IP-degree of protection socket insert	IEC 60529	unmated IP20, mated IP20
Weight pin insert		22 g
Weight socket insert		18 g
Mechanical operation	IEC 60512-9-1	≥500 mating cycles
Material		
Insert		PC
Colour insert		grey
Contacts		CuZn (brass)
Contact plating		Ag (silver), Au (gold)

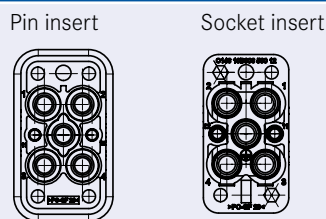
### Derating curves



Curve	Wire gauge
a	2.5 mm <sup>2</sup>
b	4 mm <sup>2</sup>
c	6 mm <sup>2</sup>

Description	Part Number	Drawing	Figure
<b>Contact insert 4 + 2 + ⊕ (Please order contacts separately)</b>			
Pin insert	C146 10A006 500 12		
Socket insert	C146 10B006 500 12		

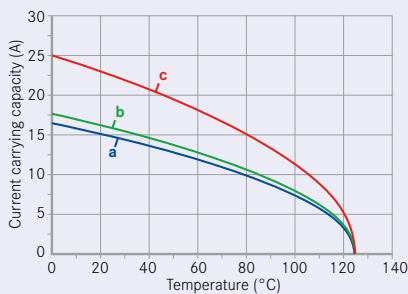
**Contact arrangement**



Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 4 mm crimp contacts</b>						
silver plating	1.5 mm <sup>2</sup>	16	100	VN01 040 0010 1C	VN02 040 0010 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 040 0011 1C	VN02 040 0011 1C	
	4 mm <sup>2</sup>	12	100	VN01 040 0012 1C	VN02 040 0012 1C	
	6 mm <sup>2</sup>	10	100	VN01 040 0013 1C	VN02 040 0013 1C	
<b>Turned 1.6 mm crimp contacts</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	20-16	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16-15	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	20-16	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16-15	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	

General Characteristics	Standard	Value
Number of contacts		7 + ⊕
Termination technique		crimp
Wire gauge		0.14 – 2.5 mm <sup>2</sup> (AWG 26 – 14)
Max. wire diameter		4.6 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	400 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	6 kV
Rated Current T <sub>u</sub> = 40 °C		10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	III b
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40/125/21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin insert	IEC 60529	unmated IP 00, mated IP20
IP-degree of protection socket insert	IEC 60529	unmated IP 20, mated IP20
Weight pin insert		16 g
Weight socket insert		16 g
Mechanical operation	IEC 60512-9-1	≥500 mating cycles
Material		
Insert		PC
Colour insert		grey
Contacts		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

**Derating curves**



Curve	Wire gauge
a	0.75 mm <sup>2</sup>
b	1.5 mm <sup>2</sup>
c	2.5 mm <sup>2</sup>

Description	Part Number	Drawing	Figure
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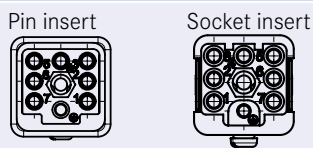
**Contact insert 7 +PE (Please order contacts separately)**

Pin insert 7 contacts	C146 10A007 500 12		
Socket insert 7 contacts	C146 10B007 500 12		

**Coding element**

Pin insert (10 pieces)	VN17 059 0001 X	
Socket insert (10 Pieces)	VN17 059 0002 X	

**Contact arrangement**



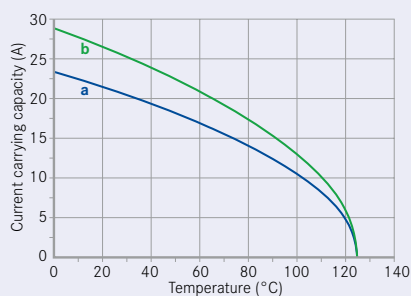
Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	

**Turned 1.6 mm crimp contacts**

silver plating	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	20-16	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16-15	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	20-16	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16-15	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	

General Characteristics	Standard	Value
Number of contacts		8 + ⊕
Termination technique		crimp
Wire gauge		0.5 - 4.0 mm <sup>2</sup> (AWG 20 - 12)
Max. wire diameter		4.6 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	500 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	6 kV
Rated Current T <sub>u</sub> = 40 °C		16 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	III b
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40/125/21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin insert	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket insert	IEC 60529	unmated IP20, mated IP20
Weight pin insert		18 g
Weight socket insert		17 g
Mechanical operation	IEC 60512-9-1	≥500 mating cycles
Material		
Insert		PC
Colour insert		grey
Contacts		Cu-alloy
Contact plating		Ag (silver) / Au (gold)

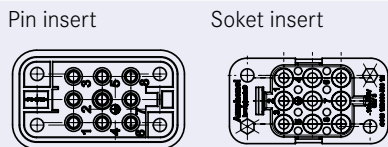
**Derating curves**



Curve	Wire gauge
a	1.5 mm <sup>2</sup>
b	2.5 mm <sup>2</sup>

Description	Part Number	Drawing	Figure
<b>Contact insert 8 + ⊕ (Please order contacts separately)</b>			
Pin insert 8 contacts	C146 10A008 500 12		
Socket insert 8 contacts	C146 10B008 500 12		

**Contact arrangement**



Supplied as	for wire gauge	AWG	Pieces	Part number		Figure
				Pin contact	Socket contact	

**Turned 2.5 mm crimp contacts**

silver plating	0.14-0.37 mm <sup>2</sup>	22-26	100	VN01 025 0055 1C	VN02 025 0055 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 1C	VN02 025 0035 1C	
	0.75-1.0 mm <sup>2</sup>	18	100	VN01 025 0036 1C	VN02 025 0036 1C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 1C	VN02 025 0037 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 1C	VN02 025 0038 1C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 1C	VN02 025 0059 1C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 1C	VN02 025 0039 1C	
gold plating	0.14-0.37 mm <sup>2</sup>	22-26	100	VN01 025 0055 2C	VN02 025 0055 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 025 0035 2C	VN02 025 0035 2C	
	0.75-1.0 mm <sup>2</sup>	18	100	VN01 025 0036 2C	VN02 025 0036 2C	
	1.5 mm <sup>2</sup>	16	100	VN01 025 0037 2C	VN02 025 0037 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 025 0038 2C	VN02 025 0038 2C	
	3.0 mm <sup>2</sup>	-	100	VN01 025 0059 2C	VN02 025 0059 2C	
	4.0 mm <sup>2</sup>	12	100	VN01 025 0039 2C	VN02 025 0039 2C	

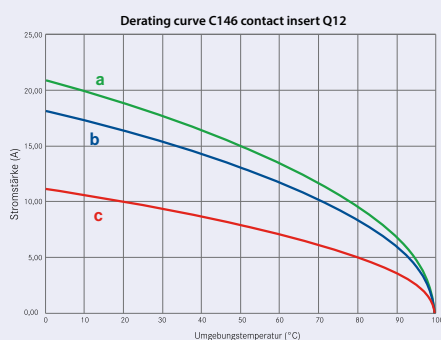
**Tools for turned contacts**

Description	for wire gauge	Part number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	0.14 - 4.0 mm <sup>2</sup>	-	-	FG 0300 146 7
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 0.37 mm <sup>2</sup>	TA 0010 146 000 6	TA 0000 144	TA 0000 or TA 0500
	0.5 - 2.5 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	
	3.0 - 4.0 mm <sup>2</sup>	TA 0010 146 000 7	TA 0000 124	
4-Indent crimping tool	0.14 - 4.0 mm <sup>2</sup>	-	-	TB 0600 146

Further tools see catalogue "tools"

General Characteristics	Standard	Value
Number of contacts		12 + ⊕
Termination technique		crimp
Wire gauge		0.14 - 2.5 mm <sup>2</sup> (AWG 26 - 14)
Max. wire diameter		3.7 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	400 V (UL/CSA 600 V)
Rated impulse withstand voltage	IEC 60664-1	6 kV
Rated Current T <sub>u</sub> = 40 °C		10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	III b
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40/125/21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin insert	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket insert	IEC 60529	unmated IP20, mated IP20
Weight pin insert		12 g
Weight socket insert		15 g
Mechanical operation	IEC 60512-9-1	≥500 mating cycles
Material		
Insert		PC
Colour insert		grey
Contacts		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

### Derating curves

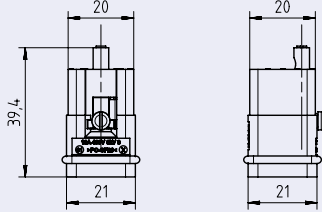



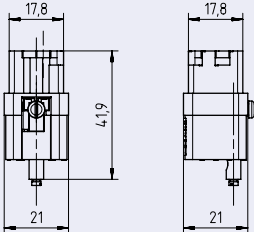

Curve	Wire gauge
a	2.5 mm <sup>2</sup>
b	1.5 mm <sup>2</sup>
c	0.75 mm <sup>2</sup>




Description	Part Number	Drawing	Figure
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**Contact insert 12 + ⊕ (Please order contacts separately)**

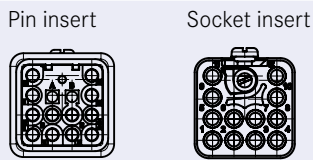
Pin insert 12 contacts	C146 10A012 500 12		
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Socket insert 12 contacts	C146 10B012 500 12		
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**Coding element**



Coding element (10 Pieces)	VN17 028 0001 X		
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**Contact arrangement**



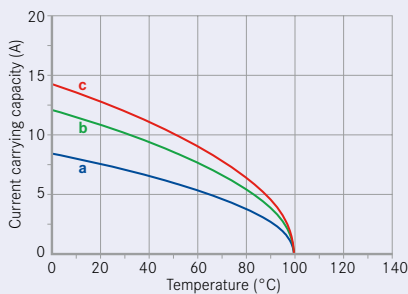
Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	

**Turned 1.6 mm crimp contacts**

silver plating	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	20-16	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16-15	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	20-16	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16-15	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	

General Characteristics	Standard	Value
Number of contacts		17 + ⊕
Termination technique		crimp
Wire gauge		0.14 – 2.5 mm <sup>2</sup> (AWG 26 – 14)
Max. wire diameter		3.7 mm
Flammability	UL94	V-0
Electrical Characteristics		
Rated voltage	IEC 60664-1	250 V (UL/CSA 250 V)
Rated impulse withstand voltage	IEC 60664-1	4 kV
Rated Current T <sub>u</sub> = 40 °C		10 A
Current carrying capacity	IEC 60512-5-2	see derating curves
Installation (overvoltage) category	IEC 60664-1	III
Material group	IEC 60664-1	III b
Contact resistance	IEC 60512-2-1	≤ 5 mΩ
Insulation resistance	IEC 60512-3-1	≥ 10 <sup>10</sup> Ω
Pollution degree	IEC 60664-1	3
Climatical Characteristics		
Climatic category	IEC 60068-1	40/125/21
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C
Mechanical Characteristics		
IP-degree of protection pin insert	IEC 60529	unmated IP00, mated IP20
IP-degree of protection socket insert	IEC 60529	unmated IP20, mated IP20
Weight pin insert		16 g
Weight socket insert		14 g
Mechanical operation	IEC 60512-9-1	≥500 mating cycles
Material		
Insert		PC
Colour insert		grey
Contacts		CuZn (brass)
Contact plating		Ag (silver) / Au (gold)

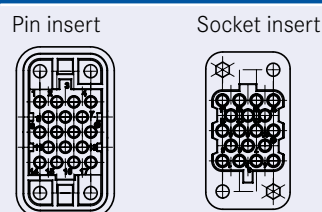
**Derating curves**



Curve	Wire gauge
a	0.5 mm <sup>2</sup>
b	1 mm <sup>2</sup>
c	1.5 mm <sup>2</sup>

Description	Part Number	Drawing	Figure
<b>Contact insert 17 + ⊕ (Please order contacts separately)</b>			
Pin insert 17 contacts	C146 10A017 500 12		
Socket insert 17 contacts	C146 10B017 500 12		

**Contact arrangement**



Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Pin contact	Socket contact	
<b>Turned 1.6 mm crimp contacts single contact</b>						
silver plating	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 1C	VN02 016 0024 1C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 1C	VN02 016 0025 1C	
	0.75 - 1.0 mm <sup>2</sup>	20-16	100	VN01 016 0026 1C	VN02 016 0026 1C	
	1.5 mm <sup>2</sup>	16-15	100	VN01 016 0027 1C	VN02 016 0027 1C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 1C	VN02 016 0028 1C	
gold plating	0.14 - 0.37 mm <sup>2</sup>	26-22	100	VN01 016 0024 2C	VN02 016 0024 2C	
	0.5 mm <sup>2</sup>	20	100	VN01 016 0025 2C	VN02 016 0025 2C	
	0.75 - 1.0 mm <sup>2</sup>	20-16	100	VN01 016 0026 2C	VN02 016 0026 2C	
	1.5 mm <sup>2</sup>	16-15	100	VN01 016 0027 2C	VN02 016 0027 2C	
	2.5 mm <sup>2</sup>	14	100	VN01 016 0028 2C	VN02 016 0028 2C	

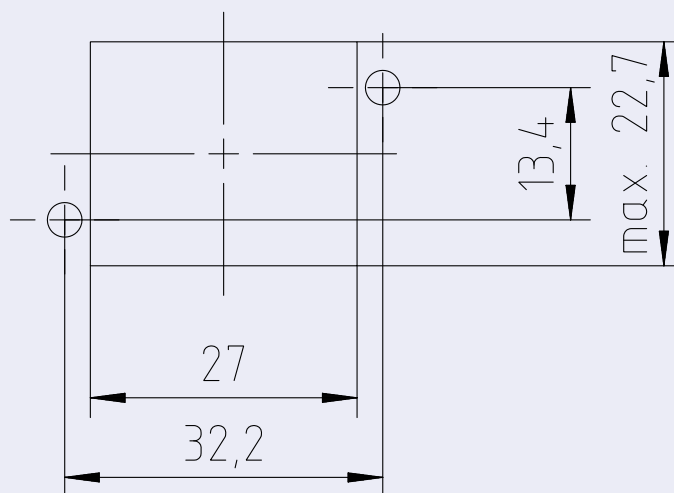
**Tools for turned contacts**

Description	for wire gauge	Part number		
		Contact locator	Crimping dies	Tool
Removal tool for contacts	-	-	-	FG 0300 146 1
Standard crimping tool and accessories for 4-Indent crimping	0.14 - 2.5 mm <sup>2</sup>	TA 0010 146 0001	TA 0000 184	TA 0000 or TA 0500
4-Indent crimping tool	0.14 - 2.5 mm <sup>2</sup>	-	-	TB 0400 146

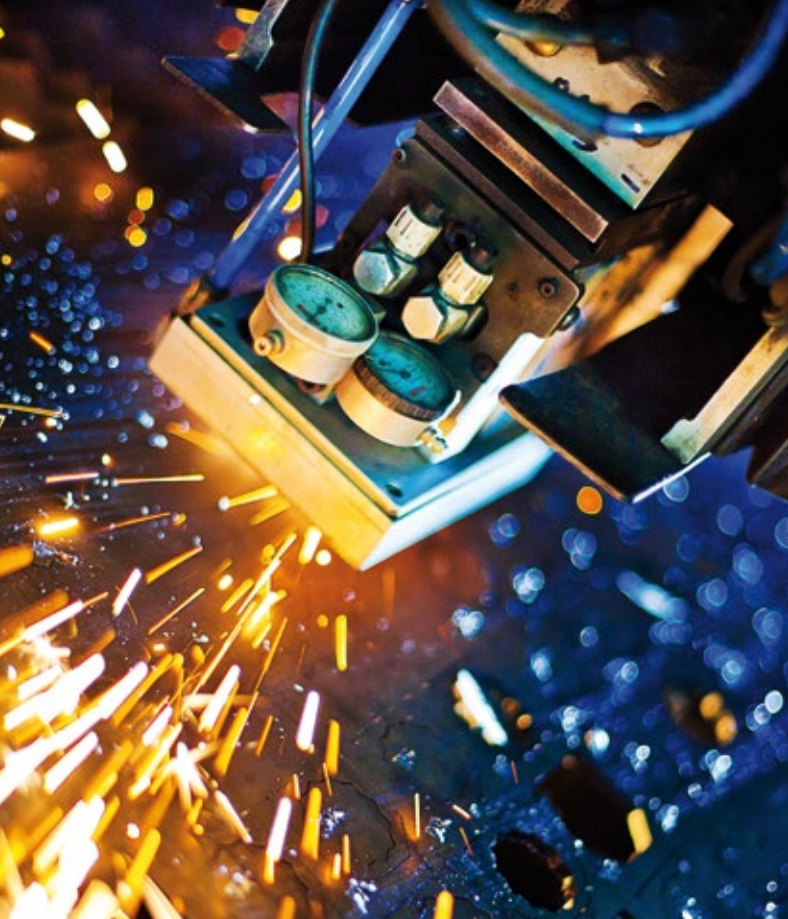
Further tools see catalogue "Tools"

General Characteristics	Standard	Value
Protection class housing		IP65
Locking system	DIN EN 175 301-801 (DIN 43 652)	locking levers
Salt mist resistance	IEC 60512-11-6:2002	>500h
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Temperature range	IEC 60068-1	- 40 °C / + 125 °C
Upper temperature	IEC 60512-11-9	+ 125 °C
Lower temperature	IEC 60512-11-10	- 40 °C
Mechanical Characteristics		
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials thermoplastic housing		
Housings		PA
Rubber gasket		NBR
Locking lever		PA
Colour		black
Materials metal housing		
Housings		Cu-alloy
Rubber gasket		NBR
Locking lever		Steel / zinc coated
Colour		grey

**Panel cut out**



Description	Clamp range	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry thermoplastic		C146 10R008 606 12		
Hood top entry metal, only for Q8 and Q17		C146 10R008 650 12		
Hood side entry metal, only for Q8 and Q17		C146 10R008 550 12		
<b>Housings</b>				
Housing thermoplastic		C146 10F008 001 12		
Housing metal		C146 30F008 001 12		
<b>Glands for thermoplastic housing</b>				
Gland bushing 10 Pieces	4 - 6.5 mm 5 - 8 mm 6.5 - 9.5 mm 7 - 10.5 mm 9 - 13 mm 11.5 - 15.5 mm	VN16 250 0020 X VN16 250 0021 X VN16 250 0022 X VN16 250 0023 X VN16 250 0024 X VN16 250 0025 X		
<b>Glands for metal housings</b>				
Gland bushing 10 Pieces	11 - 18 mm	VN16 250 0133 X		



# heavy | mate<sup>®</sup> Housings

## Available Types

- **Standard-Housings IP65** see page 216
- **Housings in IP67** see page 254
- **Housings in IP68** see page 262
- **EMC-Housings** see page 270
- **Corrosion resistant Housings** see page 278





#### General information

- The connectors of our **heavy|mate®** series are designed for use in machine tools, general electric installations and applications as well as for industrial control and other electrical equipment. Other applications than the above mentioned are in the responsibility of the user.
- For cable to cable connections a suitable cable clamp has to be used.
- The indicated dimensions with the panel cut-outs represent reference values and are in the concrete application with products to be co-ordinated.
- The sealing area of the housing has to be level and free of burrs.
- Housings in accordance with DIN EN 175 301 - 801 (DIN 43 652) .

Range of housings

Size A3/4



Size A10



Size A16



Size A32



Size E6



Size E10



Size E16



Size E24



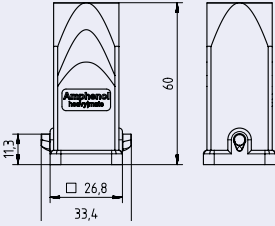

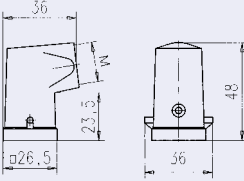

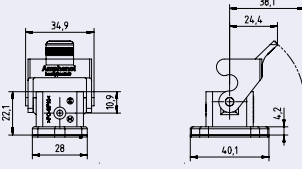

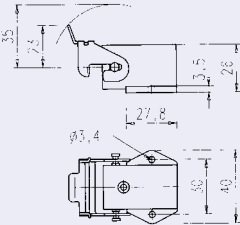

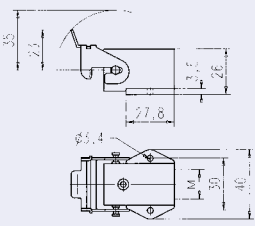

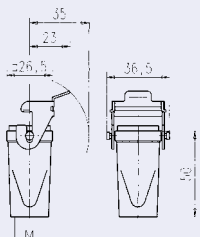

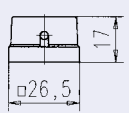

Size E48

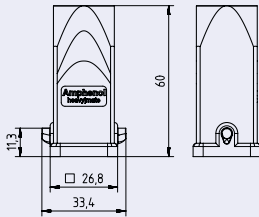

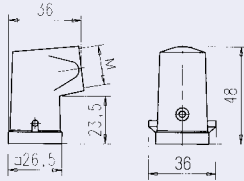

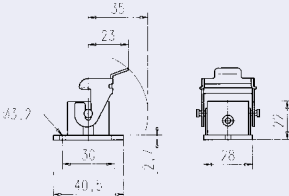

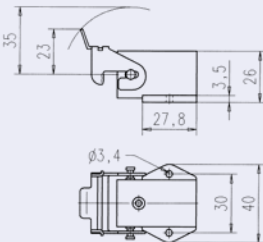

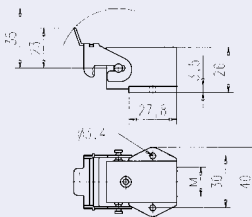

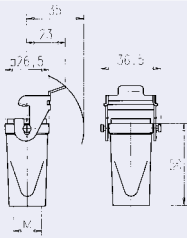

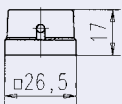





## heavy|mate® Housings standard Characteristics

General Characteristics	Standard	Value
Protection class housing		IP65
Protection class spring cover locked unlocked spring loaded		IP65 IP54
Locking system	DIN EN 175 301-801 (DIN 43 652)	1 central lever 1 lever 2 levers
Tightening torque (for screws used at housings and hoods)		1.0 Nm recommendation: M4 screw
Fire protection railway	EN 45545	HL3 acc. R22/23
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 100 / 21
Temperature range	IEC 60068-1	- 40 °C / + 125 °C
Upper temperature	IEC 60512-11-9	+ 100 °C
Lower temperature	IEC 60512-11-10	- 40 °C
Mechanical Characteristics		
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Metal housing E6 - E48	DIN EN 175 301-801 (DIN 43 652)	Aluminium die cast alloy
Colour metal housing E6 - E48		grey, similar RAL 9006
Thermoplastic housing A3/4		PC
Colour thermoplastic housing A3/4		grey, similar RAL 9006
Metal housing A3/4		Cu-alloy
Colour metal housing A 3/4		grey, similar RAL 9006
Protective cover		PA
Rubber gasket		NBR
Locking lever		steel / zinc coated
Plating metal housing		powder coated

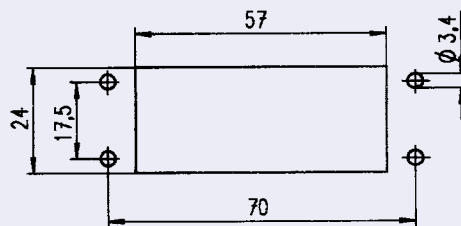
Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	20	C146 10R003 600 4 C146 10R003 601 4 (black design)		
Hood side entry	20	C146 10R003 500 4		
<b>Housings</b>				
Housing bulkhead mounting with gasket	-	C146 10F003 000 4 C146 10F003 001 4 (black design)		
Housing bulkhead end mounting with gasket	-	C146 10F003 004 4		
Housing single side entry with gland bushing	20	C146 10N003 500 4		
Hood cable to cable coupling	20	C146 10R003 804 4		
<b>Protective cover (only in connection with Pin insert)</b>				
Cover for housings	-	C146 10Z003 100 4		

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	20	C146 30R003 600 4		
Hood side entry	20	C146 30R003 500 4		
<b>Housings</b>				
Housing bulkhead mounting with gasket	-	C146 30F003 000 4		
Housing bulkhead end mounting - with gasket - with foam rubber sealing (2 mm)	- -	C146 30F003 004 4 C146 30F003 104 4		
Housing single side entry with gland bushing	20	C146 30N003 500 4		
Hood cable to cable coupling	20	C146 30R003 804 4		
<b>Protective cover (only in connection with Pin insert)</b>				
Cover for housings	-	C146 30Z003 100 4		

Description	M	Part Number	Drawing	Figure	
<b>Hoods</b>					
Hood top entry low profile	20	C146 21R010 650 4			
	25	C146 21R010 600 4			
Hood top entry high profile	20	C146 21R015 650 2			
	25	C146 21R015 600 2			
Hood side entry low profile	20	C146 21R010 550 4			
	25	C146 21R010 500 4			
Hood side entry high profile	20	C146 21R015 550 2			
	25	C146 21R015 500 2			
<b>Housings</b>			<b>h</b>		
Hood coupling application low profile	20	C146 21R010 854 4	47.5		
	25	C146 21R010 804 4	47.5		
Hood coupling application high profile	20	C146 21R015 854 2	59		
	25	C146 21R015 804 2	59		
Housing bulkhead mounting with gasket	-	C146 10F015 000 2			
Housing bulkhead mounting with spring cover with gasket	-	C146 10F015 003 2			

Description	M	Part Number	Drawing	Figure
<b>Housings</b>				
Housing single side entry	25	C146 10N015 500 2	<p>1 closed if single entry</p>	
Housing double side entry	25	C146 10N015 600 2		
Housing with spring cover single side entry	25	C146 10N015 806 2	<p>1 closed if single entry</p>	
Housing with spring cover double side entry	20 25	C146 10N015 607 2 C146 10N015 606 2		
<b>Protective cover</b>				
Cover for housings	-	C146 10Z015 100 2		

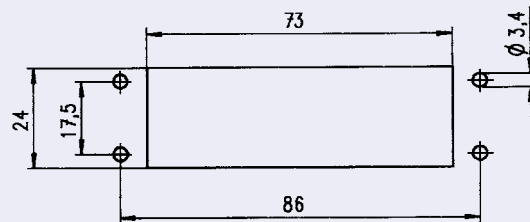
**Panel cut out for bulkhead mounting**

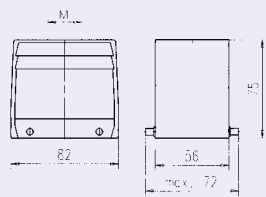

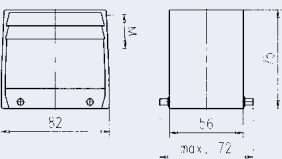

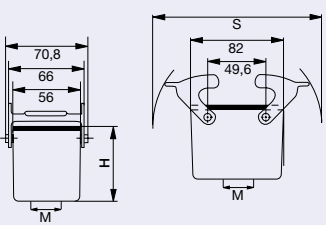

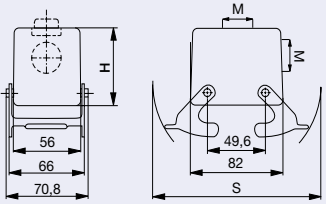



Description	M	Part Number	Drawing	Figure	
<b>Hoods</b>					
Hood top entry low profile	20	C146 21R016 650 4			
	25	C146 21R016 600 4			
Hood top entry high profile	20	C146 21R025 650 2			
	25	C146 21R025 600 2			
Hood side entry low profile	20	C146 21R016 550 4			
	25	C146 21R016 500 4			
Hood side entry high profile	20	C146 21R025 550 2			
	25	C146 21R025 500 2			
<b>Housings</b>			<b>h</b>		
Hood coupling application low profile	20	C146 21R016 854 4	52.5		
	25	C146 21R016 804 4	52.5		
Hood coupling application high profile	20	C146 21R025 854 2	65		
	25	C146 21R025 804 2	65		
Housing bulkhead mounting with gasket	-	C146 10F025 000 2			
Housing bulkhead mounting with spring cover with gasket	-	C146 10F025 003 2			

Description	M	Part Number	Drawing	Figure
<b>Housings</b>				
Housing single side entry	25	C146 10N025 500 2	<p>1 closed if single entry</p>	
Housing double side entry	20 25	C146 10N025 601 2 C146 10N025 600 2		
Housing with spring cover single side entry	25	C146 10N025 806 2	<p>1 closed if single entry</p>	
Housing with spring cover double side entry	20 25	C146 10N025 607 2 C146 10N025 606 2		
<b>Protective cover</b>				
Cover for housings	-	C146 10Z025 100 2		

**Panel cut out for bulkhead mounting**

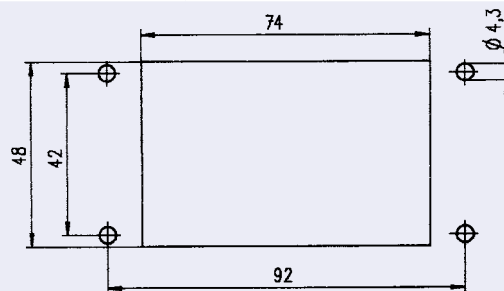


Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	25 32 40	C146 21R032 650 4 C146 21R032 600 4 C146 21R032 601 4		
Hood side entry	25 32 40	C146 21R032 550 4 C146 21R032 500 4 C146 21R032 501 4		
Hood coupling application	25 32 40	C146 21R032 852 4 C146 21R032 802 4 C146 21R032 803 4		
Hood side entry	25 32	C146 21R032 552 4 C146 21R032 502 4		

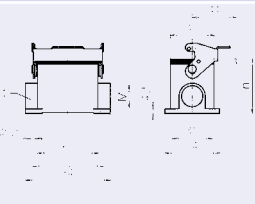

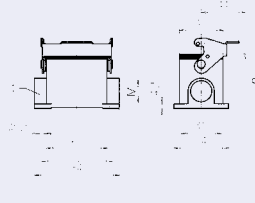

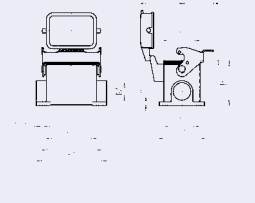

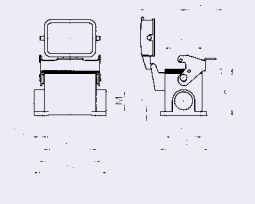

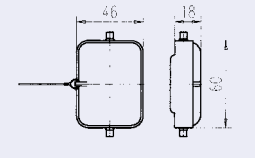

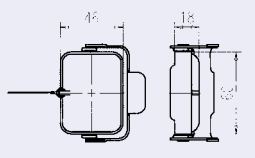



Description	M	Part Number	Drawing	Figure
<b>Housings</b>				
Housing bulkhead mounting with gasket	-	C146 10F032 000 4		
Housing single side entry	25 32	C146 10N032 550 4 C146 10N032 500 4		
Housing double side entry	25 32	C146 10N032 650 4 C146 10N032 600 4		

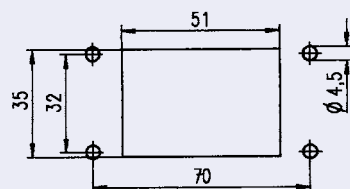
Panel cut out for bulkhead mounting





Description	M	Part Number	Drawing	Figure	
<b>Hoods</b>					
Hood top entry low profile	16	C146 21R006 656 1			
	20	C146 21R006 606 1			
Hood top entry high profile	25	C146 21R006 656 8			
	32	C146 21R006 606 8			
Hood side entry low profile	20	C146 21R006 506 1			
	25	C146 21R006 507 1			
Hood side entry high profile	25	C146 21R006 556 8			
	32	C146 21R006 506 8			
<b>Housings</b>			<b>h</b>		
Hood coupling application low profile	20	C146 21R006 804 1	52		
Hood coupling application high profile	25	C146 21R006 854 8	70		
Housing bulkhead mounting with gasket	-	C146 10F006 000 1			
Housing bulkhead mounting with thermoplastic spring cover with gasket	-	C146 10F006 003 1			
Housing bulkhead mounting with metal spring cover with gasket	-	C146 30F006 003 1			

Description	M	Part Number	Drawing	Figure	
<b>Housings</b>					
Housing single side entry low profile	20	C146 10N006 803 1	57		
Housing single side entry high profile	32 25	C146 10N006 802 2 C146 10N006 803 2	74 74		
1 closed if single entry					
Housing double side entry low profile	20	C146 10N006 603 1	57		
Housing double side entry high profile	25 32	C146 10N006 603 2 C146 10N006 602 2	74 74		
1 closed if single entry					
Housing with spring cover single side entry low profile	20 25	C146 10N006 807 1 C146 10N006 806 1	57 57		
Housing with spring cover single side entry high profile	25 32	C146 10N006 807 2 C146 10N006 806 2	74 74		
1 closed if single entry					
Housing with spring cover double side entry low profile	20	C146 10N006 607 1	57		
Housing with spring cover double side entry high profile	25 32	C146 10N006 607 2 C146 10N006 606 2	74 74		
<b>Protective cover</b>					
Cover for housings	-	C146 10Z006 100 1			
Cover for hoods	-	C146 10Z006 200 1			

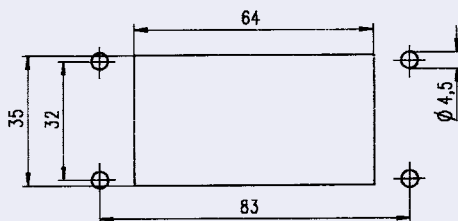
**Panel cut out for bulkhead mounting**



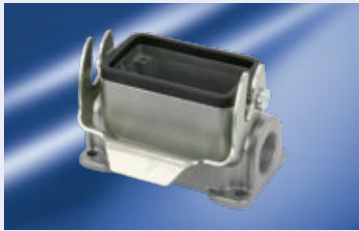



Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	20	C146 21R010 650 1		
	25	C146 21R010 600 1		
Hood top entry high profile	25	C146 21R010 650 8		
	32	C146 21R010 600 8		
Hood side entry low profile	20	C146 21R010 550 1		
	25	C146 21R010 500 1		
Hood side entry high profile	25	C146 21R010 550 8		
	32	C146 21R010 500 8		
<b>Housings</b>			<b>h</b>	
Hood coupling application low profile	20	C146 21R010 852 1		
	25	C146 21R010 802 1		
Hood coupling application high profile	25	C146 21R010 852 8		
	32	C146 21R010 802 8		
Housing bulkhead mounting with gasket	-	C146 10F010 000 1		
Right-angled housing with gasket	-	C146 10F010 090 1		

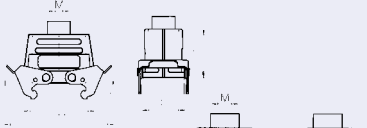

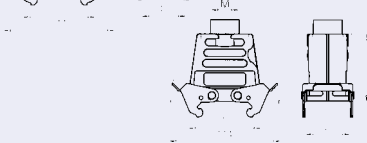

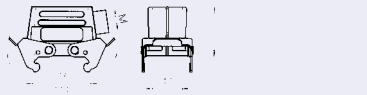

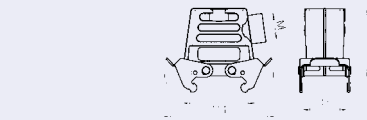



Description	M	Part Number	Drawing	Drawing
<b>Housings</b>			<b>h</b>	
Housing single side entry low profile	20	C146 10N010 501 1	57	
	25	C146 10N010 500 1	57	
Housing single side entry high profile	25	C146 10N010 501 2	74	
	32	C146 10N010 500 2	74	
			Screw plug for one cable entry	
Housing double side entry low profile	20	C146 10N010 601 1	57	
	25	C146 10N010 601 2	74	
Housing double side entry high profile	32	C146 10N010 600 2	74	

**Panel cut out for bulkhead mounting**





Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	20 25 32	C146 21R010 656 1 C146 21R010 606 1 C146 21R010 607 1		
Hood top entry high profile	25 32 40	C146 21R010 656 8 C146 21R010 606 8 C146 21R010 607 8		
Hood side entry low profile	20 25	C146 21R010 556 1 C146 21R010 506 1		
Hood side entry high profile	25 32	C146 21R010 556 8 C146 21R010 506 8		
<b>Housings</b>			<b>h</b>	
Hood coupling application low profile	20 25 32	C146 21R010 854 1 C146 21R010 804 1 C146 21R010 805 1		
Hood coupling application high profile	25 32 40	C146 21R010 854 8 C146 21R010 804 8 C146 21R010 805 8		
Housing bulkhead mounting with gasket	-	C146 10F010 001 1		
Housing bulkhead mounting with thermoplastic spring cover with gasket	-	C146 10F010 003 1		
Housing bulkhead mounting with metal spring cover with gasket	-	C146 30F010 003 1		

Description	M	Part Number	Drawing	Figure
<b>Housings</b>				
Housing single side entry low profile	20	C146 10N010 803 1	57	
Housing single side entry high profile	25 32	C146 10N010 803 2 C146 10N010 802 2	74 74	
			1 closed if single entry	
Housing double side entry low profile	20	C146 10N010 603 1	57	
Housing double side entry high profile	25	C146 10N010 603 2	74	
			1 closed if double entry	
Housing with spring cover single side entry low profile	20	C146 10N010 807 1	57	
Housing with spring cover single side entry high profile	25 32	C146 10N010 807 2 C146 10N010 806 2	74 74	
			1 closed if single entry	
Housing with spring cover double side entry low profile	20	C146 10N010 607 1	57	
Housing with spring cover double side entry high profile	25 32	C146 10N010 607 2 C146 10N010 606 2	74 74	

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	20	C146 21R010 652 1		
Hood top entry high profile	25 32	C146 21R010 652 8 C146 21R010 602 8		
Hood side entry low profile	20	C146 21R010 552 1		
Hood side entry high profile	25 32	C146 21R010 552 8 C146 21R010 502 8		
<b>Housings</b>				
Housing with spring cover with gasket	-	C146 10F010 002 1		

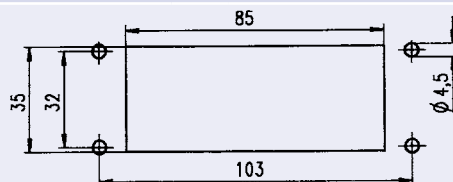


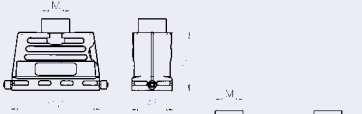

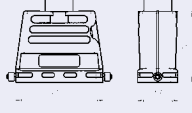
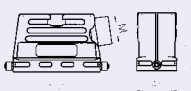

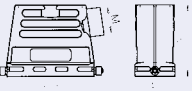
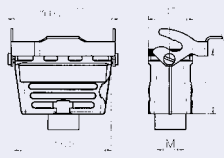

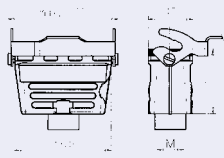

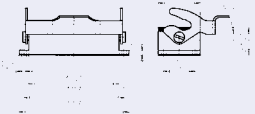

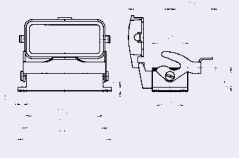

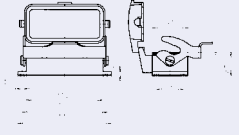

Description	M	Part Number	Drawing	Figure
<b>Housings</b>				
Housing single side entry low profile	20	C146 10N010 509 1	57	
Housing single side entry high profile	32	C146 10N010 508 2	74	
				1 closed if single entry
Housing double side entry low profile	20	C146 10N010 609 1	57	
Housing double side entry high profile	25	C146 10N010 609 2	74	
				1 closed if single entry
Housing with spring cover single side entry low profile	20	C146 10N010 805 1	57	
Housing with spring cover single side entry high profile	32	C146 10N010 804 2	74	
				1 closed if single entry
Housing with spring cover double side entry low profile	20	C146 10N010 605 1	57	
Housing with spring cover double side entry high profile	32	C146 10N010 604 2	74	




Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood 2 top entry high profile	25	C146 10R010 902 8		
<b>Protective cover (only in connection with Pin insert)</b>				
Cover for housings	-	C146 10Z010 100 1		
Cover for hoods	-	C146 10Z010 200 1		
<b>Further special housings on request.</b>				

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	25 32 32	C146 21R016 650 1 C146 21R016 600 1 C146 23R016 600 1 (black design)		
Hood top entry high profile	25 32 32	C146 21R016 600 8 C146 21R016 601 8 C146 23R016 600 8 (black design)		
Hood side entry low profile	25 32	C146 21R016 550 1 C146 21R016 500 1		
Hood side entry high profile	32 40	C146 21R016 500 8 C146 21R016 501 8		
<b>Housings</b>			<b>h</b>	
Hood coupling application low profile	25 32	C146 21R016 852 1 C146 21R016 802 1		
Hood coupling application high profile	32 40	C146 21R016 802 8 C146 21R016 803 8	76 76 	
Housing bulkhead mounting with gasket	-	C146 10F016 000 1		
Housing single side entry low profile	25	C146 10N016 500 1	64 	
Housing single side entry high profile	32	C146 10N016 500 2	77 	
			1 closed if single entry	
Housing double side entry low profile	25	C146 10N016 600 1	64 	
Housing double side entry high profile	25 32	C146 10N016 601 2 C146 10N016 600 2	77 77 	

**Panel cut out for bulkhead mounting**







Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	25	C146 21R016 656 1		
	32	C146 21R016 606 1		
Hood top entry high profile	32	C146 21R016 606 8		
	40	C146 21R016 607 8		
Hood side entry low profile	25	C146 21R016 556 1		
	32	C146 21R016 506 1		
Hood side entry high profile	32	C146 21R016 506 8		
	40	C146 21R016 507 8		
<b>Housings</b>			<b>h</b>	
Hood coupling application low profile	25	C146 21R016 854 1		
	32	C146 21R016 804 1		
Hood coupling application high profile	32	C146 21R016 804 8		
	40	C146 21R016 805 8		
Housing bulkhead mounting with gasket	-	C146 10F016 001 1		
Housing bulkhead mounting with thermoplastic spring cover with gasket	-	C146 10F016 003 1		
Housing bulkhead mounting with metal spring cover with gasket	-	C146 30F016 003 1		

Description	M	Part Number	Drawing	Figure
<b>Housings</b>				
Housing single side entry low profile	25	C146 10N016 802 1	64	
Housing single side entry high profile	32	C146 10N016 802 2	77	
Housing double side entry low profile	25	C146 10N016 602 1	64	
Housing double side entry high profile	25 32	C146 10N016 603 2 C146 10N016 602 2	77 77	
Housing with spring cover single side entry low profile	25	C146 10N016 806 1	64	
Housing with spring cover single side entry high profile	32	C146 10N016 806 2	77	
Housing with spring cover double side entry low profile	25	C146 10N016 606 1	64	
Housing with spring cover double side entry high profile	25 32	C146 10N016 607 2 C146 10N016 606 2	77 77	

1 closed if single entry

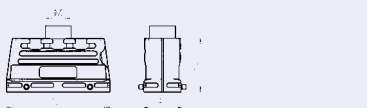

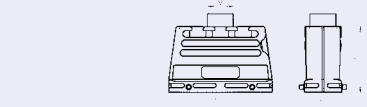

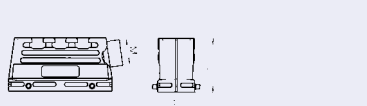

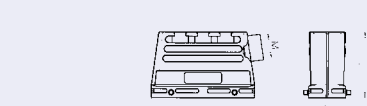



1 closed if single entry

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	25	C146 21R016 652 1		
	32	C146 21R016 602 1		
Hood top entry high profile	32	C146 21R016 602 8		
	40	C146 21R016 603 8		
Hood side entry low profile	25	C146 21R016 552 1		
	32	C146 21R016 502 1		
Hood side entry high profile	32	C146 21R016 502 8		
	40	C146 21R016 503 8		
<b>Housings</b>				
Housing bulkhead mounting with spring cover with gasket	-	C146 10F016 002 1		

Description	M	Part Number	Drawing	Figure
<b>Housings</b>				
Housing single side entry low profile	25	C146 10N016 508 1	64	
Housing single side entry high profile	32	C146 10N016 508 2	77	
			1 closed if single entry	
Housing double side entry low profile	25	C146 10N016 608 1	64	
Housing double side entry high profile	32	C146 10N016 608 2	77	
Housing with spring cover single side entry low profile	25	C146 10N016 804 1	64	
Housing with spring cover single side entry high profile	32	C146 10N016 804 2	77	
			1 closed if single entry	
Housing with spring cover double side entry low profile	25	C146 10N016 604 1	64	
Housing with spring cover double side entry high profile	32	C146 10N016 604 2	77	

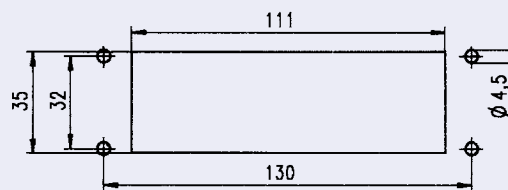
Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood 2 top entry high profile	25 32	C146 10R016 910 8 C146 10R016 902 8		
<b>Protective cover (only in connection with Pin insert)</b>				
Cover for housings	-	C146 10Z016 100 1		
Cover for hoods	-	C146 10Z016 200 1		
<b>Central lever / Hoods</b>				
Hood top entry	32	C146 36R016 602 8		
Hood side entry high profile	32	C146 36R016 502 8		
<b>Central lever / Housings</b>				
Housing with central lever bulkhead mounting	-	C146 36F016 000 1		
<b>Further special housings on request.</b>				



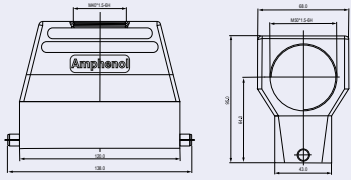



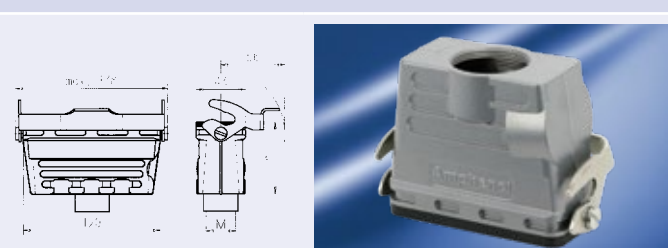
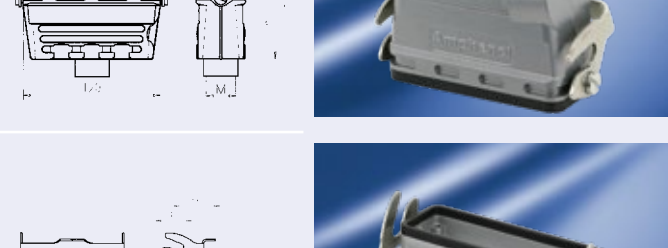
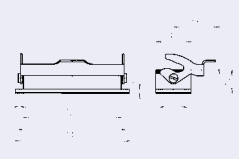
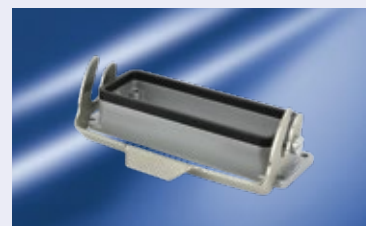
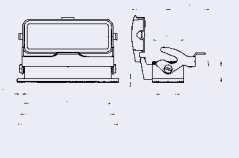

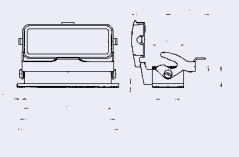

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	25 32 20	C146 21R024 650 1 C146 21R024 600 1 C146 21R024 700 1		
Hood top entry high profile	32 40	C146 21R024 600 8 C146 21R024 601 8		
Hood side entry low profile	25 32	C146 21R024 550 1 C146 21R024 500 1		
Hood side entry high profile	32 40	C146 21R024 500 8 C146 21R024 501 8		
Hood top entry	50	on request		
Hood side entry	50	on request		





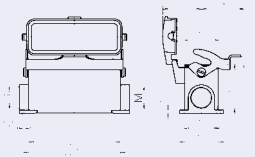

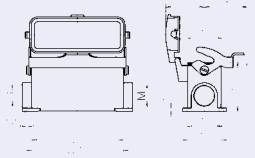

Description	M	Part Number	Drawing	Figure
<b>Housings</b>			<b>h</b>	
Hood	25	C146 21R024 852 1	62	
coupling application low profile	32	C146 21R024 802 1	62	
Hood	32	C146 21R024 802 8	76	
coupling application high profile	40	C146 21R024 803 8	76	
Housing -bulkhead mounting with gasket - foam rubber sealing (2 mm)	-	C146 10F024 000 1		
	-	C146 10F024 100 1		
Housing single side entry low profile	25	C146 10N024 500 1	64	
Housing single side entry high profile	32	C146 10N024 500 2	80	
			1 closed if single entry	
Housing double side entry low profile	25	C146 10N024 600 1	64	
Housing double side entry high profile	25 32	C146 10N024 601 2 C146 10N024 600 2	80 80	

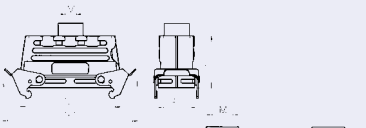

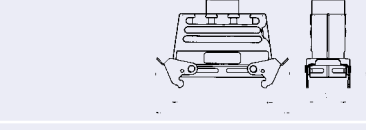
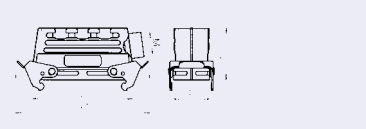

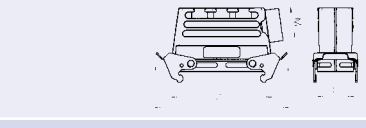
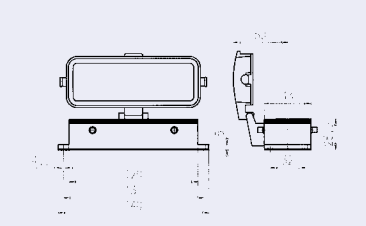

**Panel cut out for bulkhead mounting**

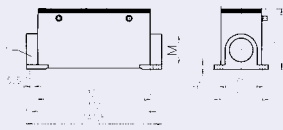

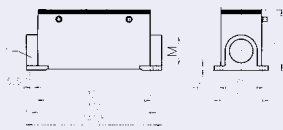

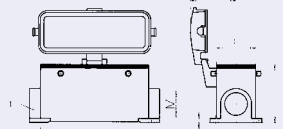

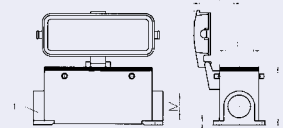



Description	M	Part Number	Drawing	Figure	
<b>Hoods</b>					
Hood top entry low profile	25	C146 21R024 656 1			
	32	C146 21R024 606 1			
Hood top entry high profile	32	C146 21R024 606 8			
	40	C146 21R024 607 8			
Hood side entry low profile	25	C146 21R024 556 1			
	32	C146 21R024 506 1			
Hood side entry high profile	32	C146 21R024 506 8			
	40	C146 21R024 507 8			
Hood top entry side entry high profile	50	C146 21R024 916 9			
	40				

Description	M	Part Number	Drawing	Figure
<b>Housings</b>			<b>h</b>	
Hood coupling application low profile	25	C146 21R024 854 1	62	
	32	C146 21R024 804 1	62	
Hood coupling application high profile	32	C146 21R024 804 8	76	
	40	C146 21R024 805 8	76	
Housing bulkhead mounting with gasket	-	C146 10F024 001 1		
Housing bulkhead mounting with thermoplastic spring cover with gasket	-	C146 10F024 003 1		
Housing bulkhead mounting with metal spring cover with gasket	-	C146 30F024 003 1		

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Housing single side entry low profile	25	C146 10N024 802 1	64 	
Housing single side entry high profile	32	C146 10N024 802 2	80 1 closed if single entry	
Housing double side entry low profile	25	C146 10N024 602 1	64 	
Housing double side entry high profile	32	C146 10N024 602 2	80	
Housing with spring cover single side entry low profile	25	C146 10N024 806 1	64 	
Housing with spring cover single side entry high profile	32	C146 10N024 806 2	80 1 closed if single entry	
Housing with spring cover double side entry low profile	25	C146 10N024 606 1	64 	
Housing with spring cover double side entry high profile	32	C146 10N024 607 2 C146 10N024 606 2	80 80	

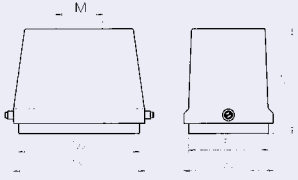
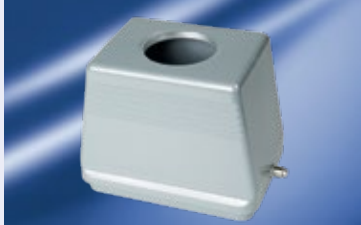
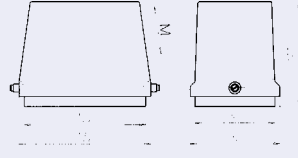

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	25	C146 21R024 652 1		
	32	C146 21R024 602 1		
Hood top entry high profile	32	C146 21R024 602 8		
	40	C146 21R024 603 8		
Hood side entry low profile	25	C146 21R024 552 1		
	32	C146 21R024 502 1		
Hood side entry high profile	32	C146 21R024 502 8		
	40	C146 21R024 503 8		
<b>Housings</b>				
Housing bulkhead mounting with spring cover with gasket	-	C146 10F024 002 1		

Description	M	Part Number	Drawing	Figure
<b>Housings</b>				
Housing single side entry low profile	25	C146 10N024 508 1	64 	
Housing single side entry high profile	32	C146 10N024 508 2	80 1 closed if single entry	
Housing double side entry low profile	25	C146 10N024 608 1	64 	
Housing double side entry high profile	32	C146 10N024 608 2	80	
Housing with spring cover single side entry low profile	25	C146 10N024 804 1	64 	
Housing with spring cover single side entry high profile	32	C146 10N024 804 2	80 1 closed if single entry	
Housing with spring cover double side entry low profile	25	C146 10N024 604 1	64 	
Housing with spring cover double side entry high profile	32	C146 10N024 604 2	80	

**heavy|mate® Special housings** Size E24 for 2 lever locking system and central lever locking

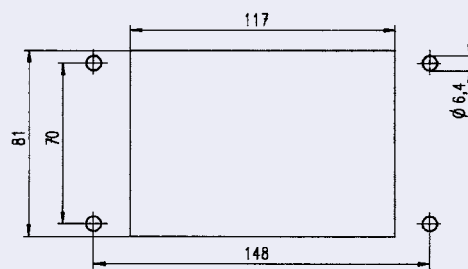
Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood 2 top entry high profile	32 40	C146 10R024 903 8 C146 10R024 908 8		
<b>Protective cover (only in connection with Pin insert)</b>				
Cover for housings	-	C146 10Z024 100 1		
Cover for hoods	-	C146 10Z024 200 1		
<b>Central lever / Hoods</b>				
Hood top entry	40	C146 36R024 601 8		
Hood side entry high profile	40	C146 36R024 501 8		
<b>Central lever / Housings</b>				
Hood with central lever and gasket	-	C146 36F024 000 1		



Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	40	C146 21R048 607 1		
	50	C146 21R048 608 1		
Hood side entry	40	C146 21R048 507 1		
	50	C146 21R048 508 1		

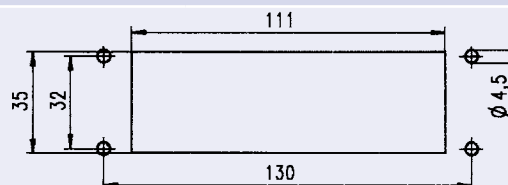
Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Housing bulkhead mounting with gasket	-	C146 10F048 001 1		
Housing bulkhead mounting with spring cover with gasket	-	C146 10F048 003 1		
Housing single side entry	40	C146 10N048 803 1		
Housing with spring cover	40	C146 10N048 807 1		

**Panel cut out for bulkhead mounting**



Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	25	C146 10R024 650 3		
	32	C146 10R024 600 3		
Hood side entry low profile	25	C146 10R024 550 3		
	32	C146 10R024 500 3		
<b>Housings</b>				
Hood coupling application low profile	25	C146 10R024 852 3		
	32	C146 10R024 802 3		
Housing bulkhead mounting with gasket	-	C146 10F024 000 3		
Housing single side entry low profile	25	C146 10N024 500 3	<p>1 closed if single entry</p>	
Housing double side entry low profile	25	C146 10N024 600 3		

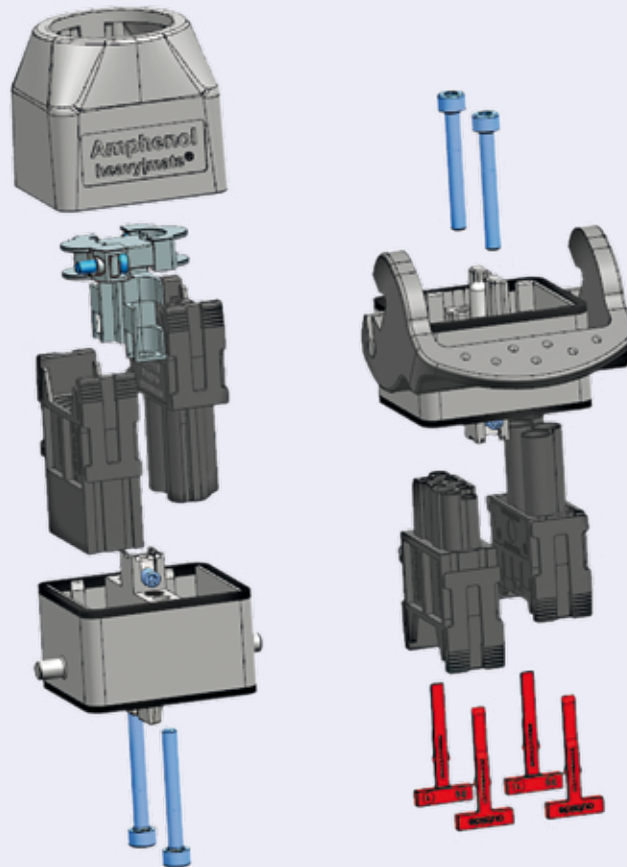
**Panel cut out for bulkhead mounting**

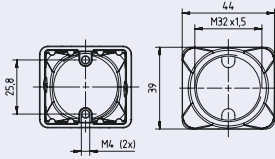
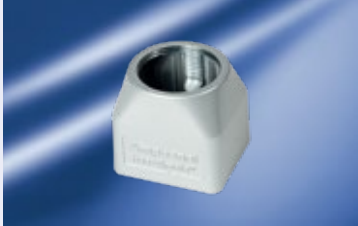
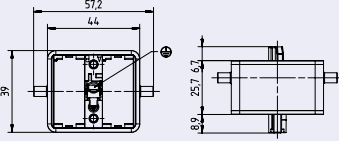

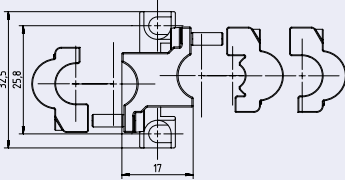

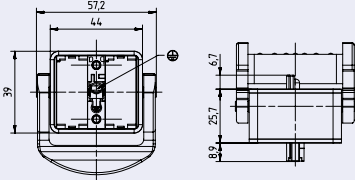

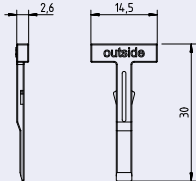

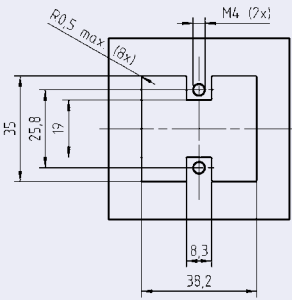


## heavy|mate® Twin Housings Series F | Characteristics

General Characteristics	Standard	Value
Entry		M32 top entry
Protection class housing		IP65
Number of modules		2
Number of contacts		up to 2 x 17 + ⊕
Wire Gauge		1.0 – 6 mm <sup>2</sup> (AWG 18 - 10)
Tightening torque		Mounting screw Housing: 3.2 Nm Hood and carrier hood: 5 Nm Clamping screw: 1.2 Nm
Locking system		locking levers
Climatical Characteristics		
Climatic category		40 / 100 / 21
Upper temperature		+ 100 °C
Lower temperature		- 40 °C
Mechanical Characteristics		
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Housings		Zinc die cast alloy
Colour housings		grey
Rubber gasket		HNBR
Surface		nickel plated

### Schematic construction



Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood	32	C146 21R002 600 15		
Carrier hood	-	C146 21R002 000 15		
Shielding frame	-	C146 G05 003 G15		
<b>Housings</b>				
Housing bulkhead mounting incl. 2 safety pins	-	C146 10F002 000 15		
<b>Accessories</b>				
Safety pin (10 Pieces)	-	VN09 146 0013 X		
<b>Panel cut out for bulkhead mounting</b>				
				

# heavy | mate<sup>®</sup> Housings

- Housings in IP67

## heavy|mate® Housings IP67 Characteristics

General Characteristics	Standard	Value
Protection class housing		IP67
Locking system	DIN EN 175 301-801 (DIN 43 652)	2 locking levers
Tightening torque (for screws used at housings and hoods)		1 Nm recommendation: M4 screw
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 100 / 21
Upper temperature	IEC 60512-11-9	+ 100 °C
Lower temperature	IEC 60512-11-10	- 40 °C
Mechanical Characteristics		
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Metal housings E6 - E24	DIN EN 175 301-801 (DIN 43 652)	Aluminium die cast alloy
Colour metal housing E6 - E24		grey - similar RAL 9006
Thermoplastic housings A3/4		PC
Colour thermoplastic housings A3/4		grey - similar RAL 7032/9005
Metal housing A3/4		Zinc die cast alloy
Colour metal housing A3/4		grey - similar RAL 9006
Rubber gasket		CR
Locking lever		steel / zinc coated
Surface		powder coating

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	20 20	C146 10R003 600 4 C146 10R003 601 4 (black design)		
<b>Housings</b>				
Housing bulkhead mounting with gasket	- -	C146 10F003 000 4 C146 10F003 001 4 (black design)		

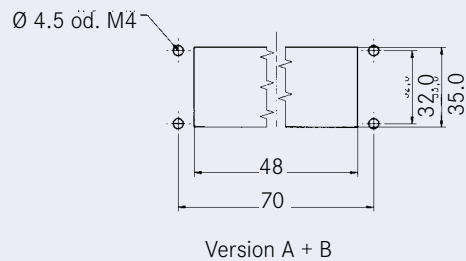


Description	M	Part number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	20	C146 30R003 600 4		
<b>Housings</b>				
Housing bulkhead mounting with gasket	-	C146 30F003 000 4		

# heavy|mate® Housings IP67 Size E6

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	16	C146 21R006 656 1		
	20	C146 21R006 606 1		
Hood top entry high profile	25	C146 21R006 656 8		
	32	C146 21R006 606 8		
Hood side entry low profile	20	C146 21R006 506 1		
	25	C146 21R006 507 1		
Hood side entry high profile	25	C146 21R006 556 8		
	32	C146 21R006 506 8		
<b>Housings</b>			<b>L1</b>	<b>L2</b>
Housing bulkhead mounting	-	C146 67F006 000 8	70	80

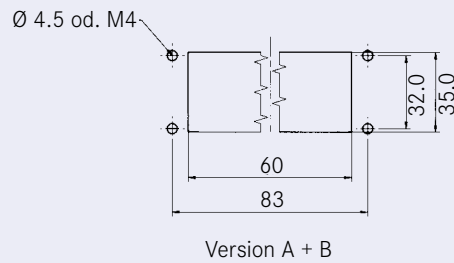
## Panel cut out for bulkhead mounting



# heavy|mate® Housings IP67 Size E10

Description	M	Part Number	Drawing	Figure	
<b>Hoods</b>					
Hood top entry low profile	16	C146 21R010 650 1			
	20	C146 21R010 600 1			
Hood top entry high profile	25	C146 21R010 650 8			
	30	C146 21R010 600 8			
Hood side entry low profile	20	C146 67R010 550 1			
	25	C146 21R010 500 1			
Hood side entry high profile	25	C146 21R010 550 8			
	32	C146 21R010 500 8			
<b>Housings</b>			<b>L1</b>	<b>L2</b>	
Housing bulkhead mounting		C146 67F010 000 8	83	93	

## Panel cut out for bulkhead mounting



# heavy|mate® Housings IP67 Size E16

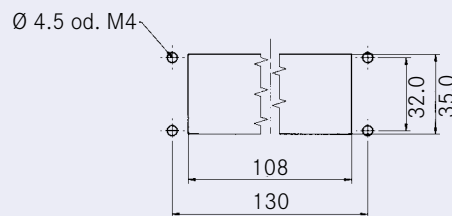
Description	M	Part Number	Drawing	Figure	
<b>Hoods</b>					
Hood top entry low profile	25	C146 21R016 650 1			
	32	C146 21R016 600 1			
Hood top entry high profile	32	C146 21R016 600 8			
	40	C146 21R016 601 8			
Hood side entry low profile	25	C146 21R016 550 1			
	32	C146 21R016 500 1			
Hood side entry high profile	32	C146 21R016 500 8			
	40	C146 21R016 501 8			
<b>Housings</b>			<b>L1</b>	<b>L2</b>	
Housing bulkhead mounting	C146 21F016 000 8	103	113		
<b>Panel cut out for bulkhead mounting</b>					
<p>Version A + B</p>					

# heavy|mate® Housings IP67 Size E24

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	25	C146 21R024 650 1		
	32	C146 21R024 600 1		
	20	C146 21R024 700 1		
Hood top entry high profile	32	C146 21R024 600 8		
	40	C146 21R024 601 8		
Hood side entry low profile	25	C146 21R024 550 1		
	32	C146 21R024 500 1		
Hood side entry high profile	32	C146 21R024 500 8		
	40	C146 21R024 501 8		

<b>Housings</b>		L1	L2		
Housing bulkhead mounting	C146 67F024 000 8	130	140		

## Panel cut out for bulkhead mounting



Version A + B



# heavy | mate<sup>®</sup> Housings

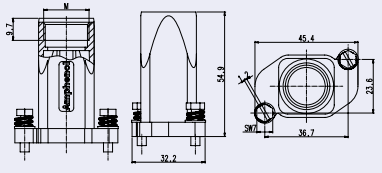

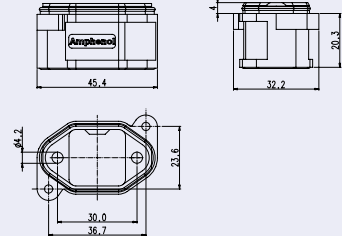

- Housings IP68 / 69K

## heavy|mate® Housings IP68 / IP69K Characteristics

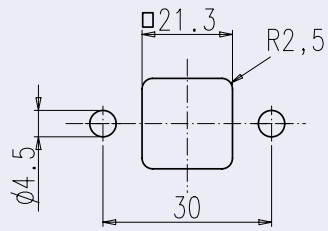
General Characteristics	Standard	Value
Protection class housing		IP68 / IP69K
Locking system		2 x screw M4 / M6
Tightening torques for locking screws		4.0 Nm
Tightening torque (for screws used at housings and hoods)		40 Nm recommendation: M4 / M6
Fire protection railway	EN 45545	HL3 acc. R22/23
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 125 / 21
Temperature range	IEC 60068-1	- 40 °C / + 125 °C
Upper temperature	IEC 60512-11-9	+ 125 °C
Lower temperature	IEC 60512-11-10	- 40 °C
Mechanical Characteristics		
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Housings		Aluminium die cast alloy
Colour housings		black – similar to RAL 9005
Rubber gasket		Silicon
Locking lever		stainless steel
Surface		powder coating

**Brief information**

Please remove the sealing on the socket insert before assembling the insert to the IP68 / 69K housings size A3/4.

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	20 25	C146 68R003 600 4 C146 68R003 601 4		
<b>Housings</b>				
Housing bulkhead mounting		C146 68F003 000 4		

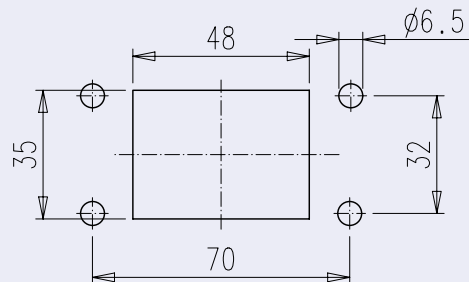
**Panel cut out for bulkhead mounting**





Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	32	C146 68R006 600 8		
	40	C146 68R006 601 8		
	25	C146 68R006 650 8		
Hood side entry	32	C146 68R006 500 8		
	40	C146 68R006 501 8		
	25	C146 68R006 550 8		
<b>Housings</b>				
Housing bulkhead mounting	-	C146 68F006 001 1		
Housing bulkhead mounting easy mount	-	C146 68F006 011 1		
Housing	40	C146 68N006 500 2		
<b>Protective cover</b>				
Protective cover for housings	-	C146 68Z006 100 1		

**Panel cut out for bulkhead mounting**

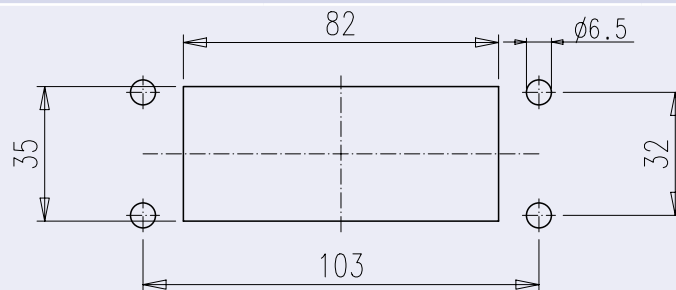


Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	32	C146 68R010 600 8		
	40	C146 68R010 601 8		
	25	C146 68R010 650 8		
Hood side entry	32	C146 68R010 500 8		
	40	C146 68R010 501 8		
	25	C146 68R010 550 8		
<b>Housings</b>				
Housing bulkhead mounting	-	C146 68F010 001 1		
Housing bulkhead mounting easy mount	-	C146 68F010 011 1		
Housing	32	C146 68N010 500 2		
<b>Protective cover</b>				
Protective cover for housings	-	C146 68Z010 100 1		
<b>Panel cut out for bulkhead mounting</b>				

# heavy|mate® Housings IP68 / IP69K Size E16

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	32	C146 68R016 600 8		
	40	C146 68R016 601 8		
	25	C146 68R016 650 8		
Hood side entry	32	C146 68R016 500 8		
	40	C146 68R016 501 8		
	25	C146 68R016 550 8		
<b>Housings</b>				
Housing bulkhead mounting	-	C146 68F016 001 1		
Housing bulkhead mounting easy mount	-	C 146 68F016 011 1		
Housing	40	C146 68N016 501 2		
<b>Protective cover</b>				
Protective cover for housings	-	C146 68Z016 100 1		

## Panel cut out for bulkhead mounting



Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	32	C146 68R024 600 8		
	40	C146 68R024 601 8		
	25	C146 68R024 650 8		
Hood side entry	32	C146 68R024 500 8		
	40	C146 68R024 501 8		
	25	C146 68R024 550 8		
<b>Housings</b>				
Housing bulkhead mounting	-	C146 68F024 001 1		
Housing bulkhead mounting easy mount	-	C146 68F024 011 1		
Housing	40	C146 68N024 501 2		
<b>Protective cover</b>				
Protective cover for housing	-	C146 68Z024 100 1		
<b>Panel cut out for bulkhead mounting</b>				



# heavy | mate<sup>®</sup> Housings

- EMC-Housings

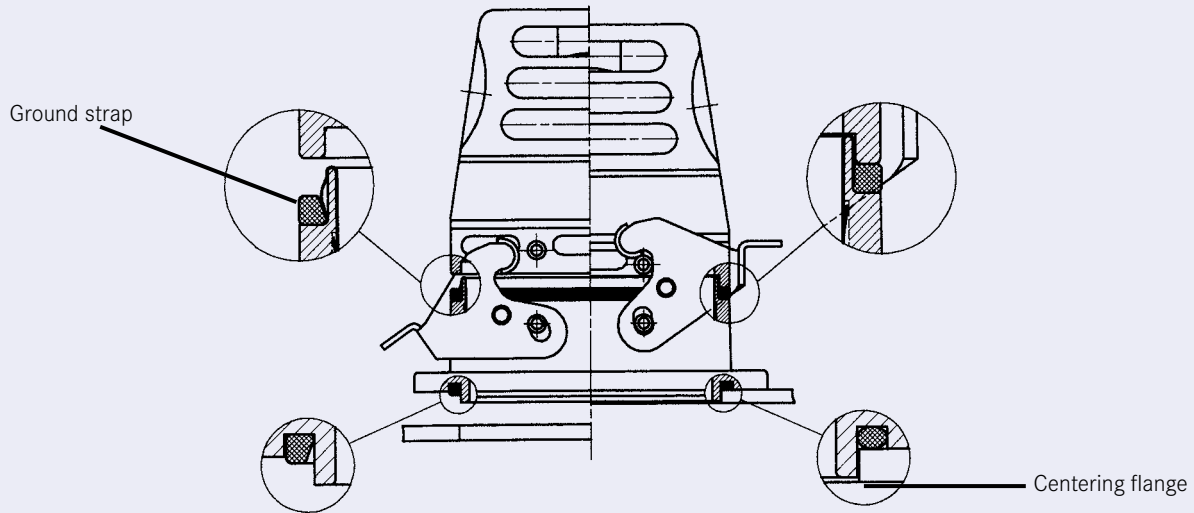


**General information**

- conductive surface
- standard locking levers
- same housing dimensions like standard housings
- two housing sizes
- with or without ground strap
- high attenuation
- protection class IP65
- mating cycles > 500



**Concept**



**Range of housings in two housing sizes**

Version A Standard flange without ground strap	Version B Standard flange with ground strap	Version C Centering flange with ground strap

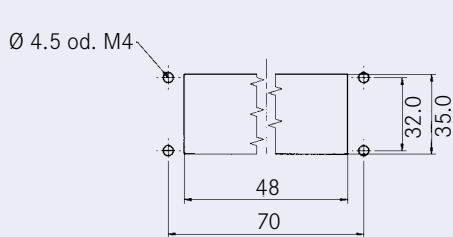
General Characteristics	Standard	Value
Protection class housing		IP65
Locking system		2 locking levers
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 100 / 21
Upper temperature	IEC 60512-11-9	+ 100 °C
Lower temperature	IEC 60512-11-10	- 40 °C
Mechanical Characteristics		
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Housings		Aluminium die cast alloy
Colour housings		grey – similar to RAL 9006
Rubber gasket		CR
Locking lever		steel / zinc coated
Surface		conducting special surface

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	PG 11	C146 11R003 600 4		
Hood side entry	20	C146 11R003 500 4		
<b>Housings</b>				
Hood cable to cable coupling	20	C146 11R003 804 4		
Housing bulkhead mounting		C146 11F003 000 4		
Housing bulkhead mounting with spring cover		C146 11F003 003 4		
Housing		C146 11N003 500 4		

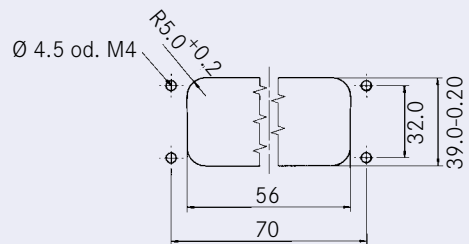


Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	20	C146 11R006 606 1		
	25	C146 11R006 607 1		
Hood top entry high profile	25	C146 11R006 656 8		
	32	C146 11R006 606 8		
Hood side entry low profile	16	C146 11R006 556 1		
	20	C146 11R006 506 1		
	25	C146 11R006 507 1		
Hood side entry high profile	25	C146 11R006 556 8		
	32	C146 11R006 506 8		
<b>Housings</b>				
Housing bulkhead mounting Version A Standard flange without ground strap		C146 11F006 901 8		
Housing bulkhead mounting Version B Standard flange with ground strap		C146 11F006 902 8		
Housing bulkhead mounting Version C Centering flange with ground strap		C146 11F006 001 8		

**Panel cut out for bulkhead mounting**



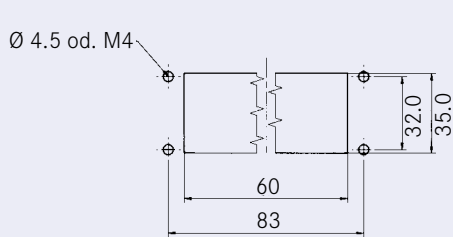
Version A + B



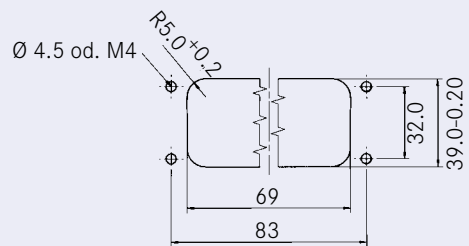
Version C

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	20 25 32	C146 11R010 650 1 C146 11R010 600 1 C146 11R010 601 1		
Hood top entry high profile	25 32 40	C146 11R010 650 8 C146 11R010 600 8 C146 11R010 601 8		
Hood side entry low profile	20 25	C146 11R010 550 1 C146 11R010 500 1		
Hood side entry high profile	25 32	C146 11R010 550 8 C146 11R010 500 8		
<b>Housings</b>				
Housing bulkhead mounting Version A Standard flange without ground strap		C146 11F010 901 8		
Housing bulkhead mounting Version B Standard flange with ground strap		C146 11F010 902 8		
Housing bulkhead mounting Version C Centering flange with ground strap		C146 11F010 000 8		

**Panel cut out for bulkhead mounting**



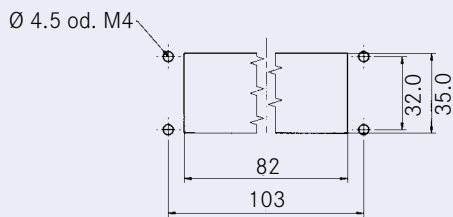
Version A + B



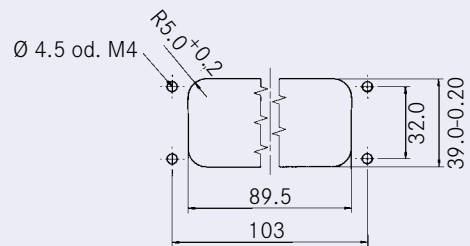
Version C

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	25	C146 11R016 650 1		
	32	C146 11R016 600 1		
Hood top entry high profile	25	C146 11R016 650 8		
	32	C146 11R016 600 8		
	40	C146 11R016 601 8		
Hood side entry low profile	25	C146 11R016 550 1		
	32	C146 11R016 500 1		
Hood side entry high profile	25	C146 11R016 550 8		
	32	C146 11R016 500 8		
	40	C146 11R016 501 8		
<b>Housings</b>				
Housing bulkhead mounting Version A Standard flange without ground strap		C146 11F016 901 8		
Housing bulkhead mounting Version B Standard flange with ground strap		C146 11F016 902 8		
Housing bulkhead mounting Version C Centering flange with ground strap		C146 11F016 000 8		

**Panel cut out for bulkhead mounting**



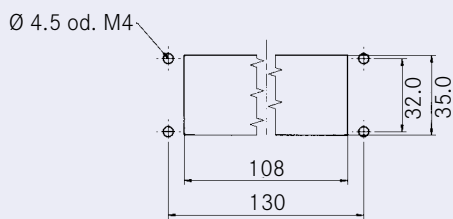
Version A + B



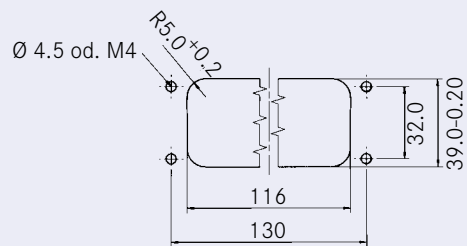
Version C

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry low profile	25	C146 11R024 650 1		
	32	C146 11R024 600 1		
Hood top entry high profile	25	C146 11R024 650 8		
	32	C146 11R024 600 8		
	40	C146 11R024 601 8		
Hood side entry low profile	25	C146 11R024 550 1		
	32	C146 11R024 500 1		
Hood side entry high profile	25	C146 11R024 550 8		
	32	C146 11R024 500 8		
	40	C146 11R024 501 8		
<b>Housings</b>				
Housing bulkhead mounting Version A Standard flange without ground strap		C146 11F024 901 8		
Housing bulkhead mounting Version B Standard flange with ground strap		C146 11F024 902 8		
Housing bulkhead mounting Version C Centering flange with ground strap		C146 11F024 000 8		

**Panel cut out for bulkhead mounting**



Version A + B



Version C



A photograph of an offshore wind farm in the ocean. The image shows several white wind turbines in the distance and a close-up of a turbine's nacelle and hub in the foreground. The sky is clear and blue, and the water is a deep blue.

# heavy | mate<sup>®</sup> Housings

- Corrosion resistant Housings

## heavy|mate® Housings corrosion resistant Characteristics + Notes

General Characteristics	Standard	Value
Protection class housing		IP65
Locking system		2 locking levers
Salt mist resistance	IEC 60512-11-6:2002	>500h
Climatical Characteristics		
Climatic category	IEC 60068-1	40 / 100 / 21
Upper temperature	IEC 60512-11-9	+ 100 °C
Lower temperature	IEC 60512-11-10	- 40 °C
Mechanical Characteristics		
Mechanical operation	IEC 60512-9-1	≥ 500 mating cycles
Materials		
Housings		Aluminium die cast alloy
Colour housings		grey – similar to RAL 9005
Rubber gasket		NBR
Locking lever		steel / special coated
Surface		conducting special surface

### General information

500h salt mist resistance can be achieved when using a plastic cable gland.

When a metal cable gland is required, we recommend to use additionally our special studs on the hoods to achieve this value.

Order codes are:

[N16 025 0112 5 X](#) Metal stud M25 corrosion resistant

[N16 032 0112 5 X](#) Metal stud M32 corrosion resistant

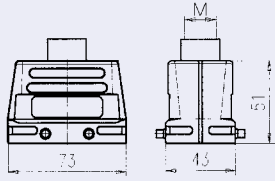

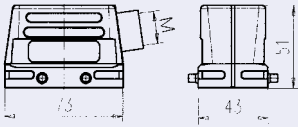

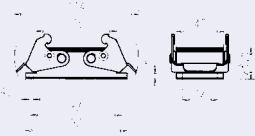

[N16 040 0112 5 X](#) Metal stud M40 corrosion resistant

# heavy|mate® Housings corrosion resistant Size E6

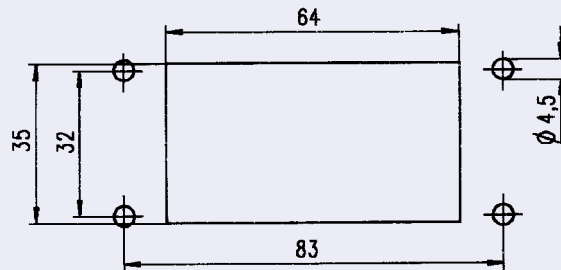
Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	25	C146 50R006 607 1		
Hood side entry	25	C146 50R006 507 1		
<b>Housings</b>				
Housing bulkhead mounting		C146 50F006 000 1		
<b>Panel cut out for bulkhead mounting</b>				



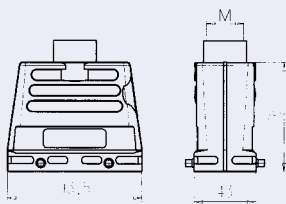

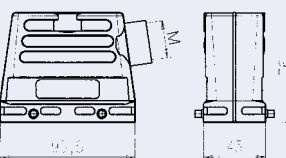

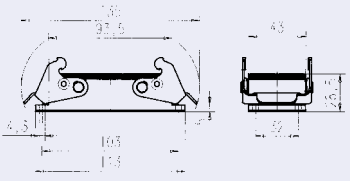

# heavy|mate® Housings corrosion resistant Size E10

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	25	C146 50R010 600 1		
Hood side entry	25	C146 50R010 500 1		
<b>Housings</b>				
Housing bulkhead mounting		C146 50F010 000 1		

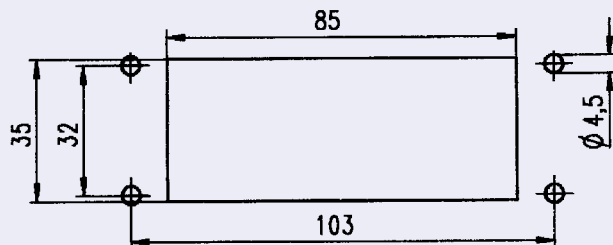
## Panel cut out for bulkhead mounting



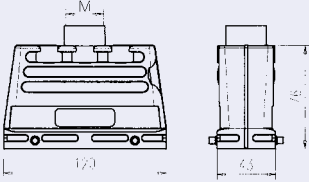

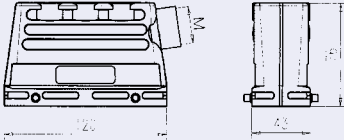

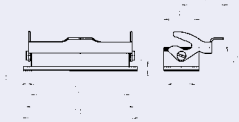

# heavy|mate® Housings corrosion resistant Size E16

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	32	C146 50R016 600 8		
Hood side entry	32	C146 50R016 500 8		
<b>Housings</b>				
Housing bulkhead mounting		C146 50F016 000 1		

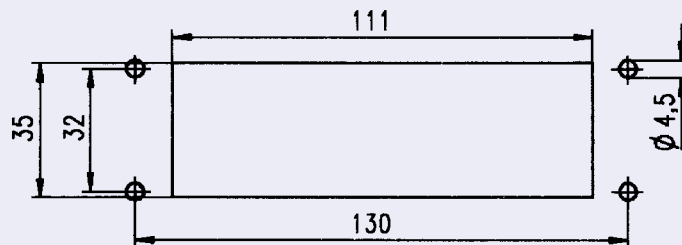
## Panel cut out for bulkhead mounting



# heavy|mate® Housings corrosion resistant Size E24

Description	M	Part Number	Drawing	Figure
<b>Hoods</b>				
Hood top entry	40	C146 50R024 601 8		
Hood side entry	40	C146 50R024 501 8		
<b>Housings</b>				
Housing bulkhead mounting		C146 50F024 000 1		

## Panel cut out for bulkhead mounting



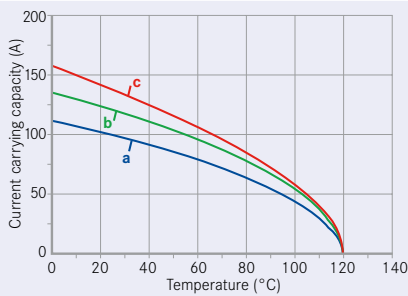


# heavy | mate<sup>®</sup> Accessories

- Wallbushing universal port
- Gland bushings
- Key pin and locking devices
- Foam rubber sealing
- Label for CSA regulation
- Shielding lever
- Wall brackets
- Tolerance compensation system

General Characteristics	Standard	Value
Number of contacts		1
Termination technique		crimp
Wire gauge		10 - 25 mm <sup>2</sup> (Radsok)
Termination technique ( wall and cable lug)		screw
Wall thickness		1.5 - 6 mm
Dimensions of wall cutout		Ø 31.5 mm ± 0.2 without burr
Torque when mounting the WBC		6Nm ± 3%
Mechanical and Electrical Characteristics		
Protection class (side wall to side wall)	IEC 60 529	IP67
Protection class (Radsokseite)	IEC 60 529	IP20
Rated voltage	IEC 61140 cl. 6	≤ 60 V DC / ≤ 25 V AC
Contact resistance	IEC 60512; test 1	≤ 0.2 mΩ
Climatical Characteristics		
Upper temperature	IEC 60512-11-9	+125°C
Lower temperature	IEC 60512-11-10	-40°C

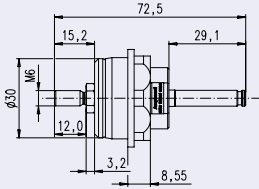

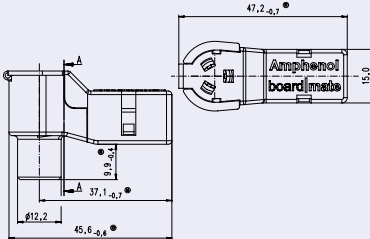

#### Derating Curves




Curve	Wire gauge
a	10 mm <sup>2</sup>
b	16 mm <sup>2</sup>
c	25 mm <sup>2</sup>

#### Pluggable equipotential bonding with Wallbushing universal port

The Wallbushing universal port is a pluggable grounding system. Based on the two patented Wallbushing and Radsok technologies, the Wallbushing universal port enables a practical equipotential bonding, which need not be time consuming hardwired. For this purpose, only standard tools are needed, even for the most one-sided montage. The click |fit technology is furthermore vibration-proofed and VDE approved as a grounding connection.

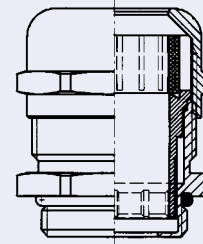
Description	Part Number	Drawing	Figure
<b>Wallbushing Connector universal port</b>			
Wallbushing Connector universal port 6 mm	C360 10D001 002 2		
Housings for 6mm Radsok for 10 - 16 mm <sup>2</sup>	C360 G01 141 E2		
Housings for 6 mm Radsok for 25 mm <sup>2</sup>	C360 G01 341 E2		

Supplied as	for wire gauge	AWG	Pieces	Part Number		Figure
				Socket contact	for housings	
<b>6 mm Radsok contacts</b>						
Single contact	10 - 16 mm <sup>2</sup>		50	N02 060 6164 002	C360 G01 141 E2	
	25 mm <sup>2</sup>		50	N02 060 6165 002	C360 G01 341 E2	

<b>Tools</b>						
Description	for wire gauge	Contact locator		Part Number		Tool
Electro hydraulic crimping tool						TE0500 / Klaue Part Number: EK 12042L
Crimping dies N02 060 6164 002	10 mm <sup>2</sup> 16 mm <sup>2</sup>					TE0500 - 081 TE0500 - 061
Crimping dies N02 060 6165 002	25 mm <sup>2</sup>					TE0500 - 041
Further tools see catalogue "Tools"						

**Assembly instructions for metric clamp**

- The cable jacket should be removed as far as the underside of the cable clamping; the wire netting is then to be cut down a little further and subsequently must be formed into a circular rim. The protective jacket can remain attached to the cable provided that it passes through the lower opening of the clamp.
- On assembly, while screwing the cable clamp, the circular rim has to be pushed through and pressed on the fins commutator on the base of the underside and settle into a depression. By doing this the EMC security will remain.
- Tightening torque of the gland bushing:



Description	M	Part Number	Drawing	Figure
<b>Gland bushing IP54 (Attention: not usable for hoods without stud / -30°C up to +120°C)</b>				
Thermoplast clamp with variable inner diameter 10 Pieces	20	VN16 200 0113 X		
Metal with variable inner diameter 10 Pieces	20	VN16 200 0114 X		
	25	VN16 250 0114 X		
	32	VN16 320 0114 X		
	40	VN16 400 0114 X		
50	VN16 500 0114 X			
Cable clamp without gasket 5 Pieces	16	VN16 160 0102 V		
	20	VN16 200 0102 V		
	25	VN16 250 0102 V		
	32	VN16 320 0102 V		
Cable clamp without gasket 5 Pieces	20	VN16 200 0103 V		
	25	VN16 250 0103 V		
	32	VN16 320 0103 V		
Stud <sup>1)</sup>	16	N16 016 0112 1		
	20	N16 020 0112 1		
	25	N16 025 0112 1		
	32	N16 032 0112 1		
	40	N16 040 0112 1		



Description	Clamping range ø in mm	A in mm	M	Part Number	Drawing	Figure
<b>Gland bushing IP67 (Material PA / - 20 °C + 80 °C)</b>						
Gland bushing with vibration protection 10 Pieces	4 - 10	20	16	VN16 160 0127 X		
	6 - 12	24	20	VN16 200 0127 X		
	9 - 16	28	25	VN16 250 0127 X		
	10 - 21	36	32	VN16 320 0127 X		
	16 - 28	46	40	VN16 400 0127 X		
Plugs brass nickel-plated with recess and o-ring 10 Pieces			20	VN16 020 0113 1 X		
			25	VN16 025 0113 1 X		
			32	VN16 032 0113 1 X		
			40	VN16 040 0113 1 X		

Description	Clamping range F in mm	H in mm	L in mm	M	Part Number	Drawing	Figure
<b>Gland bushing IP68 (Material CuZn / - 30 °C + 120 °C)</b>							
Gland bushing 10 Pieces	5,5 - 10	22	5,5	16	VN16 160 0133 X		
	8 - 13	24	6	20	VN16 200 0133 X		
	11 - 18	29	7	25	VN16 250 0133 X		
	15 - 21	30	8	32	VN16 320 0133 X		
	19 - 27	34	8	40	VN16 400 0133 X		

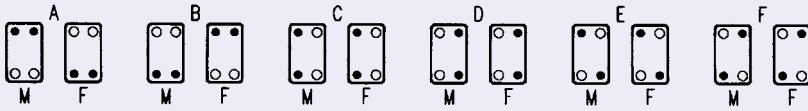
Description	Clamping range F in mm	M	Part Number	Drawing	Figure
<b>EMC gland bushing IP68 (Material CuZn / PA / - 30 °C + 120 °C)</b>					
Gland bushing EMV 10 Pieces	5.5 - 10	16	VN16 160 0126 X		
	8 - 13	20	VN16 200 0126 X		
	11 - 18	25	VN16 250 0126 X		
	15 - 21	32	VN16 320 0126 X		
	19 - 27	40	VN16 400 0126 X		

# heavy|mate® Key pins and lockings

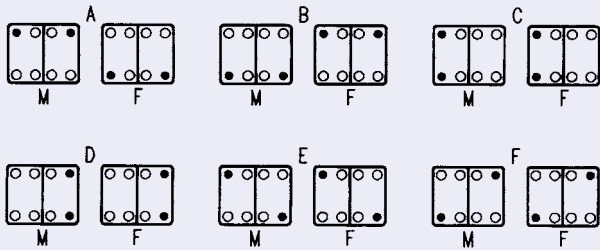
Description	L	Part Number	Drawing	Figure
Key pin with lock washer 10 Pieces		VN17 050 0004 1		
Key pin with lock washer 100 Pieces		VN17 050 0004 101		
Locking pin for inserts heavy mate® F 10 Stück		VN13 040 0014 1 X		
Guide pin 10 Pieces		VN13 040 0009 1 X		
Guide pin for inserts heavy mate® F 10 Stück		VN13 040 0012 1 X		
Guide socket 10 Pieces		VN13 040 0008 1 X		
Guide socket for inserts heavy mate® F 10 Stück		VN13 040 0013 1 X		
Locking screw for contact inserts heavy mate® D 15, D 25, A 10, A 16 20 Pieces	20	VN03 030 0021 1 XX		
Locking screw for contact inserts heavy mate® D 40, D 64, E, M, H 20 Pieces	17	VN03 030 0020 1 XX		
Locking set 10 Pieces		VN03 030 3000 X		

**Polarization system with key pin**

**For housings with one contact insert**



**For housings with two contact inserts**

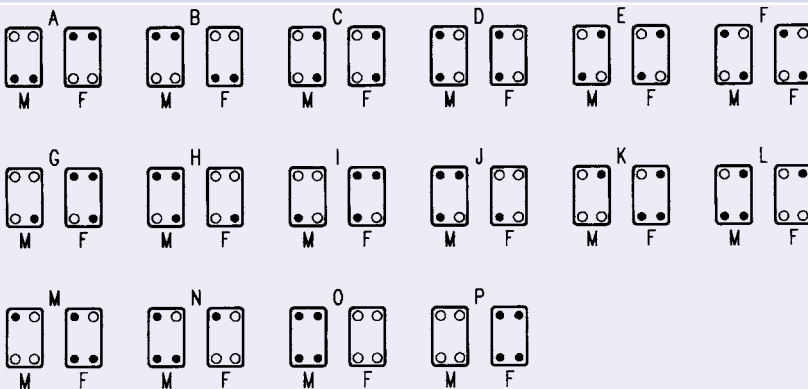


**Descriptions**

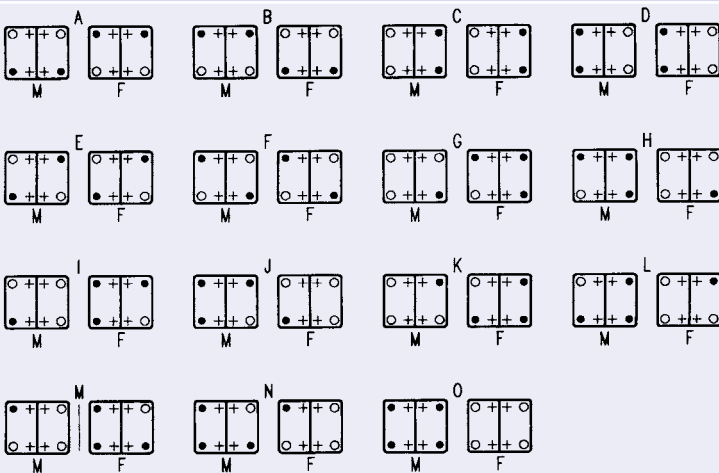
- Key pin
- Locking screw
- M Pin insert
- F Socket insert

**Polarization system with guide pin and guide socket**

**For housings with one contact insert**

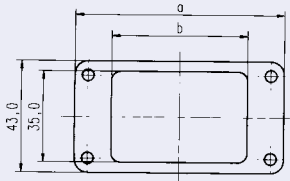

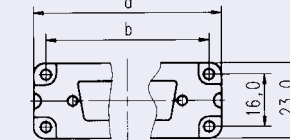

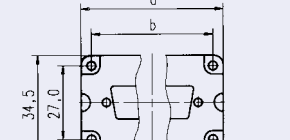

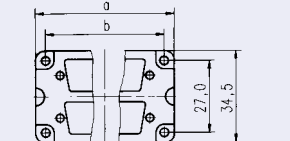

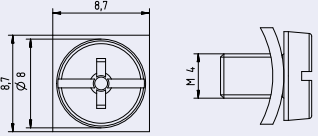




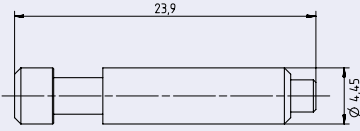

**For housings with two contact inserts**



**Descriptions**

- Guide pin
- Guide socket
- + Locking screw
- M Pin insert
- F Socket insert


Description	Size	Part Number	a	b	D-Sub	Drawing	Figure
Foam rubber sealing 2 mm	E6	N06 080 0003 1	80	70			
	E10	N06 080 0003 2	93	83			
	E16	N06 080 0003 3	113	103			
	E24	N06 080 0003 4	140	130			
Adaptor for D-Sub set Plastic	E10	C146 N32 015 G2	57	49.5	15	 <p>2 x adaptor 4 x M3 x 6.5 8 x M3 x 14</p>	
	E16	C146 N32 025 G2	57	49.5	25		
Adaptor for D-Sub set Plastic	E6	C146 N32 009 G1	51.5	44	9	 <p>2 x adaptor 4 x M3 x 6.5 8 x M3 x 14</p>	
	E6	C146 N32 015 G1	51.5	44	15		
	E10	C146 N32 025 G1	64.5	57	25		
	E16	C146 N32 037 G1	85	77.5	37		
	E16	C146 N32 050 G1	85	77.5	50		
Adaptor for D-Sub set Plastic	E6	C146 N33 009 G1	51.5	44	9	 <p>2 x adaptor 4 x M3 x 6.5 8 x M3 x 14</p>	
	E6	C146 N33 015 G1	51.5	44	15		
	E10	C146 N33 025 G1	64.5	57	25		
	E16	C146 N33 037 G1	85	77.5	37		
	E16	C146 N33 050 G1	85	77.5	50		
PE-Screw + washer	M4	VN03 040 0001 X	-	-	-		
Label for CSA application 50 Pieces	VN07 045 0001 L						

Description	Part number	Drawing	Figure
<b>Coding element</b>			
Coding element	N17 045 0001		

# heavy|mate® Removal tools

Kontaktdurchmesser	Part number	Figure
1.0 mm	17D 438 SP	
1.6 mm	FG 0300 146 1	
2.5 mm turned, with clip	FG 0300 146 4	
2.5 mm turned, without clip	FG 0300 146 7	
2.5 mm, stamped	FG 0200 146 1	
3.6 mm	FG 0300 146 3	
4 mm	FG 0300 146 5000	
8 mm	FG 0300 146 6000	

# heavy|mate<sup>®</sup> Accessories Cable lug for earth connection

Supplied as	for wire gauge	AWG	Pieces	Part number	Figure
<b>Cable lug for earth connection</b>					
Cable lug	6 mm <sup>2</sup> 10 mm <sup>2</sup>		20	VN15 006 0009 Z VN15 010 0007 Z	
Single contact	10 - 16 mm <sup>2</sup>	8 - 6	1	N 15 043 0003 003	

Clamp 1 under screw is approved for wires up to 6 mm<sup>2</sup> (with wire end sleeve). For wires 10 - 16 mm<sup>2</sup> please use clamp 2 with cable lug.

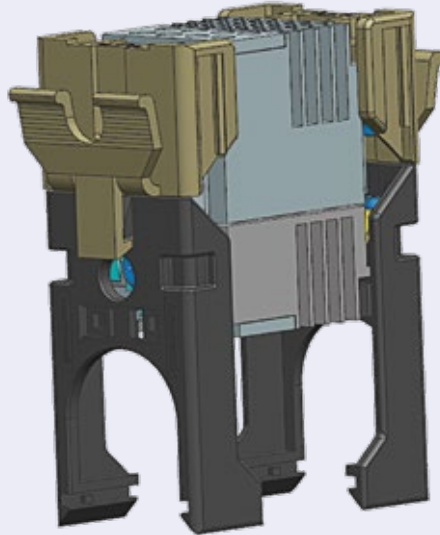
Description	Part Number	Drawing	Figure
<b>Shielding levers for contact inserts</b>			
Shielding lever for contact inserts Size E6	N 25 006 0012		
Shielding lever for contact inserts Size E10	N 25 010 0012		
Shielding lever for contact inserts Size E16	N 25 016 0012		
Shielding lever for contact inserts Size E24	N 25 024 0011		
<b>Shielding levers for module frames heavy   mate F</b>			
Shielding lever for module frames Size E6	N 25 006 2001		
Shielding lever for module frames Size E 10	N 25 010 0001		
Shielding lever for module frames Size E16	N 25 016 0001		
Shielding lever for module frames Size E24	N 25 024 000 1		



Wall brackets

Accessories for use of heavy|mate® contact inserts without housing, for example on mounting rails in control cabinets.

Figure



Description	Part Number	Drawing	Figure
Coupling	N 09 146 0006		
Wall bracket	N 09 146 0007		
Wall bracket	N 09 146 0008		
Mounting rail adaptor	N 09 146 000 9		

Mounting rail adaptor fits to hat rail 35 mm x 7.5 mm und 35 mm x 15 mm acc. EN 50022 / DIN EN 60715

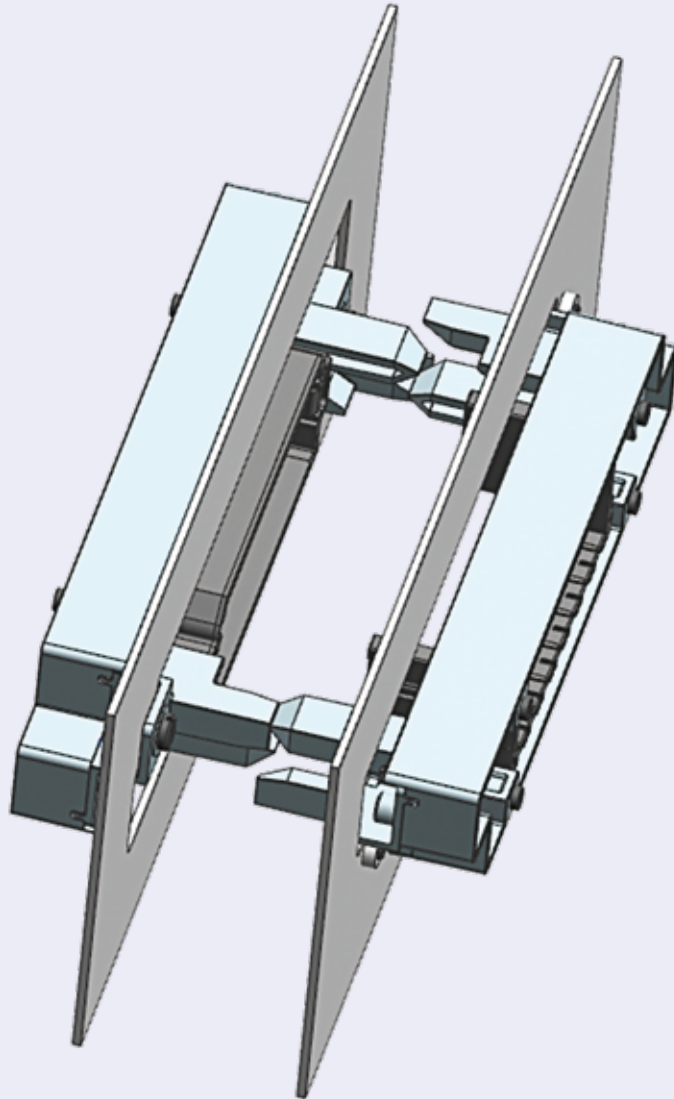
**Characteristics**

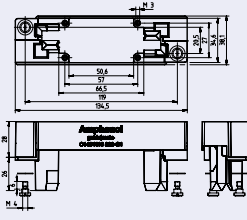
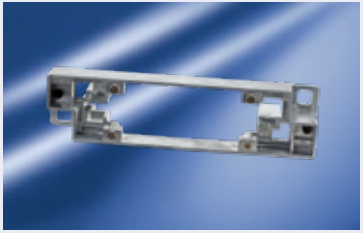
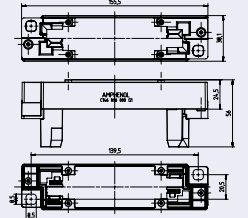

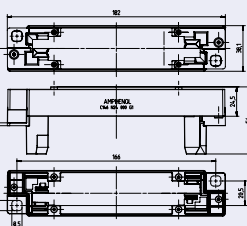

- heavy|mate® inserts can be used in blind mate applications
- tolerance compensation of 3 mm in any direction possible
- can be used with module frame & monoblocs
- very good price-performance ratio

**Applications**

- Motor control centers
- Modular UPS
- Inverter
- Charging stations
- Slip rings

**Figure**

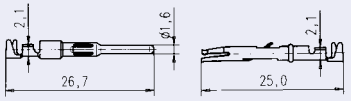
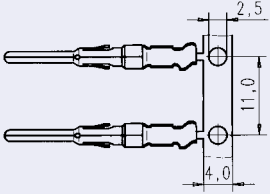

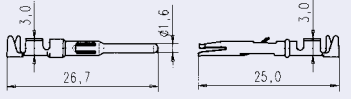
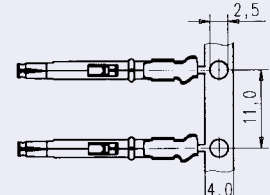

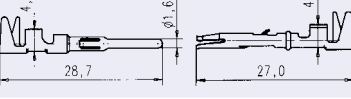
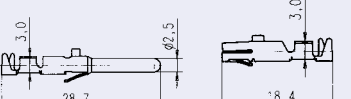
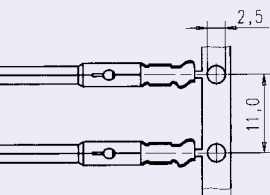

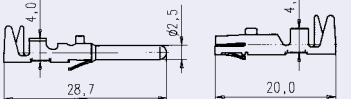
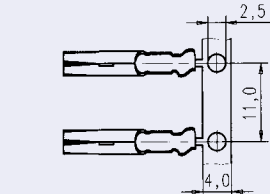

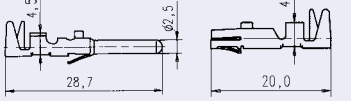
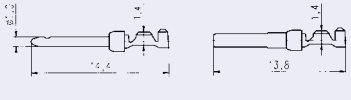
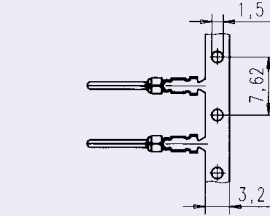

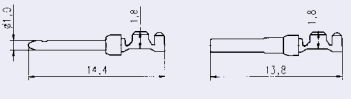
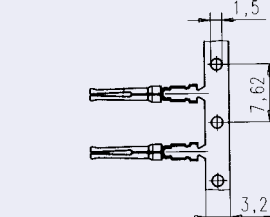
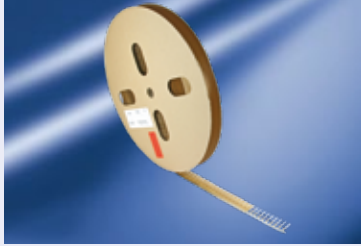


Description	Part Number	Drawing	Figure
Frames for tolerance compensation system Size E10	C146 N10 000 G1		
Frames for tolerance compensation system Size E16	C146 N16 000 G1		
Frames for tolerance compensation system Size E24	C146 N24 000 G1		



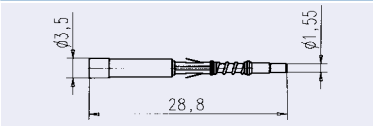







# heavy | mate<sup>®</sup> Information

- Drawings contacts
- Safety classification
- Technical information

Series	Drawing single contact	Drawing contacts on reel	Figure		
heavy mate® D, M	.N01 016 0003 1 .N02 016 0003 1 				
	.N01 016 0002 1 .N02 016 0002 1 .N01 016 0015 1 <sup>1)</sup> .N02 016 0015 1 <sup>1)</sup> 				
	.N01 016 0005 1 .N02 016 0005 1 .N01 016 0016 1 <sup>1)</sup> .N02 016 0016 1 <sup>1)</sup> 				
heavy mate® E, M	.N01 025 0001 1 .N02 025 0001 1 				
	.N01 025 0010 1 .N02 025 0010 1 				
	.N01 025 0043 1 .N02 025 0043 1 				
heavy mate® M	.N01 010 0130 2 .N02 010 0130 2 				
	.N01 010 0131 2 .N02 010 0131 2 				

# heavy|mate® Information Drawings turned contacts

Series	Part Number	Wire gauge	B	Identific.	Drawing	Figure	
heavy mate® <b>D, DD, M</b> 100 Pieces	VN01 016 0024 1C	0.14 - 0.37	2.6	1	.N01 016 002X 		
	VN01 016 0025 1C	0.5	2.6	2			
	VN01 016 0026 1C	0.75 - 1.0	2.6	3			
	VN01 016 0027 1C	1.5	3.0	4			
	VN01 016 0028 1C	2.5	3.2	5			
	VN02 016 0024 1C	0.14 - 0.37	2.6	1	.N02 016 002X 		
	VN02 016 0025 1C	0.5	2.6	2			
	VN02 016 0026 1C	0.75 - 1.0	2.6	3			
	VN02 016 0027 1C	1.5	3.0	4			
	VN02 016 0028 1C	2.5	3.2	5			
heavy mate® <b>E, EE</b> 100 Pieces	VN01 025 0055 1C	0.14 - 0.37	2.7	no slot	.N01 025 003X 		
	VN01 025 0035 1C	0.5	2.6	no slot			
	VN01 025 0036 1C	0.75 - 1.0	2.6	1 slot			
	VN01 025 0037 1C	1.5	3.0	2 slots			
	VN01 025 0038 1C	2.5	3.45	3 slots			
	VN01 025 0059 1C	3.0	3.7	1 big slot			
	VN01 025 0039 1C	4.0	4.0	no slot			
	VN02 025 0055 1C	0.14 - 0.37	2.7	no slot	.N02 025 003X 		
	VN02 025 0035 1C	0.5	2.6	no slot			
	VN02 025 0036 1C	0.75 - 1.0	2.6	1 slot			
	VN02 025 0037 1C	1.5	3.0	2 slots			
	VN02 025 0038 1C	2.5	3.45	3 slots			
	VN02 025 0059 1C	3.0	3.7	1 big slot			
	VN02 025 0039 1C	4.0	4.0	no slot			
heavy mate® <b>F, K, Q</b> 100 Pieces	VN01 040 0010 1C	1.5	3	slot 1, 2			
	VN01 040 0011 1C	2.5	3.5	slot 1, 2, 3			
	VN01 040 0012 1C	4	4.1	no slot			
	VN01 040 0013 1C	6	5	slot 1			
	VN01 040 0015 1C	10	5.65	slot 2, 3			
	VN02 040 0010 1C	1.5	3	slot 1, 2			
	VN02 040 0011 1C	2.5	3.5	slot 1, 2, 3			
	VN02 040 0012 1C	4	4.1	no slot			
	VN02 040 0013 1C	6	5	slot 1			
	VN02 040 0015 1C	10	5.65	slot 2, 3			
heavy mate® <b>M</b> 100 Pieces	VN01 025 0029 1C	0.5	2.6		.N01 025 00XX 		
	VN01 025 0030 1C	0.75 - 1.0	2.6				
	VN01 025 0031 1C	1.5	3.0				
	VN01 025 0032 1C	2.5	3.45				
	VN01 025 0033 1C	4.0	3.9				
	VN02 025 0029 1C	0.5	2.6		.N02 025 00XX 		
	VN02 025 0030 1C	0.75 - 1.0	2.6				
	VN02 025 0031 1C	1.5	3.0				
	VN02 025 0032 1C	2.5	3.45				
	VN02 025 0033 1C	4.0	3.9				
	VN01 036 0004 1C	1.5	3	2 slots	.N01 036 000X 		
	VN01 036 0005 1C	2.5	3.45	3 slots			
	VN01 036 0001 1C	4.0	3.9	no slot			
	VN01 036 0002 1C	6.0	4.6	1 slot			
VN01 036 0003 1C	10.0	5.9	2 slots				
VN01 036 0021 1C	16.0	8.3	no slot				
VN02 036 0004 1C	1.5	3	2 slots	.N02 036 000X 			
VN02 036 0005 1C	2.5	3.45	3 slots				
VN02 036 0001 1C	4.0	3.9	no slot				
VN02 036 0002 1C	6.0	4.6	1 slot				
VN02 036 0003 1C	10.0	5.9	2 slots				
VN02 036 0021 1C	16.0	8.3	no slot				

Series	Part Number	Drawing single contact	Figure
heavy mate® M, FO	N01 016 0040 8		
	N02 016 0040 8		
heavy mate® M, Coax	17 DM 537 421		
	17 DM 537 401		
	17 DM 537 425		
	17 DM 537 405		





Style	enclosed	unenclosed	earthing contact	cable clamp	finger safety mated
Hood with pin insert	●		●		●
Pin insert		●	●		
Hood with socket insert	●		●		●
Socket insert		●	●		
Coupling housing with pin insert	●		●		●
Coupling housing with socket insert	●		●		●
Housing with pin insert	●		●		●
Housing with socket insert	●		●		●

If not otherwise stated the contact inserts have to be mounted in metallic conductive housings resp. on bars or mounting boards to complete the protective earth grounding.

finger safety unmated	hand back safety mated	connetor with breaking capacity <sup>1)</sup>	rewirable	Cable clamp		Style
				with <sup>2)</sup>	without <sup>3)</sup>	
	●	●	●	●	●	Hood with pin insert
		●	●	4)	●	Pin insert
●	●	●	●	●	●	Hood with socket insert
		●	●	4)	●	Socket insert
		●	●	●	●	Coupling housing with pin insert
●	●	●	●	●	●	Coupling housing with socket insert
	●	●	●	●	●	Housing with pin insert
●	●	●	●	●	●	Housing with socket insert



**General technical information**

- The safety of connectors/connectors with braking capacity (CBC) depends on the right selection of products, the correct installation and a proper assembly.
- Decisions for the application of connectors are the requirements of the equipment specifications. This is especially the case for the definition of the rated voltage and the related clearances and creepage distances.
- All rated data for the connectors listed in this catalogue is based on overvoltage category III and pollution degree 3 (machine tool application).
- All technical data is specified for connectors, which are not under load when mated or disconnected. If in special cases connectors can be used in the sense of plug and socket devices (connector with breaking capacity), this is mentioned in the brief information of the particular section.
- Correct mounting will protect against electrical shock when mating the connectors.
- If connectors are mounted in non conductive housings both protective earthing terminals shall be mounted.
- A detailed connector glossary can be found at the end of this catalogue.
- All mentioned excerpts of standards are for general information only. For specific cases the valid original standards have to be consulted.
- Test methods acc. IEC 60512 comply with test methods acc. DIN EN 60512 or DIN IEC 60512. IEC 60664-1 complies with DIN VDE 0110-1
- On screw terminations with wire protection as well as on protective earth contacts the usage of wire end sleeves are recommended.
- Tightening torque of mounting screws (M3 screws on PE contact): 1.2 – 1.8 Nm
- For mounting the housings size A10, A16 and E xx a M4 cheese head screw acc. to DIN xx (class min. 8.8) is recommended, tightening torque of the M4 screw 1.0 Nm.
- Recommended tightening torque for PE connection screw: 1.8 Nm
- Termination cross-section for PE contact max. 6 mm<sup>2</sup> (AWG10), for bigger cross-sections (10-16 mm<sup>2</sup> / AWG8-6) use cable lug N 15 043 0003 003
- Heavy|mate D, DD, E, EE, EEE, F, K and Q are according EN45545 class R22/R23:HL3
- The max. allowed insulation diameter depends on the contacts insert, for the specific limit see customer drawing/catalogue page
- When connecting the PE you have to pay attention that the PE is connected properly
- Requirements on panel cut outs on customer machine:
  - Flatness: max. 0.2mm
  - no sharp edges allowed
  - chamfer on sharp edges 0.2 x 45°
  - general tolerance ISO 2768-fH



**Termination methods: Screw connection**

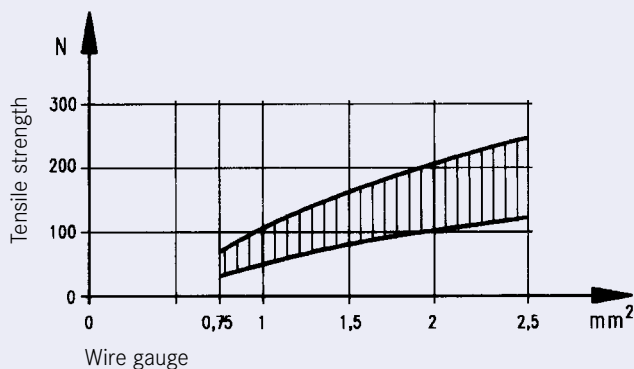
Screw clamps are designed acc. to EN 60999-1/VDE 0609. Chart 1 below shows the screw size depending on wire size and the required clamping and testing torque.

**Chart 1**

<b>Wire size (mm<sup>2</sup>)</b>	1	1.5	2.5	4	6	10
<b>Screw size</b>	M 2.6	M 3	M 3	M 3.5	M 4	M 4
<b>Test torque (Ncm)</b>	40	50	50	80	120	120

Diagram 1 below shows the range of tensile strength for a screw connection with a clamp screw M3, fastened with a torque of 50 Ncm, depending on the wire size.

**Diagram 1**



**Crimp connection**

A crimp connection is a non-detachable electrical connection between a wire and a crimp contact produced with the crimp technology. Precise crimping dies are matched to the crimp barrel and the wire size and a defined deformation results in a reliable electrical connection. There are open barrels (stamped contacts) and closed crimp barrels (turned contacts).

The main advantages of crimp connections are:

- Efficient termination of contacts.
- Reproduceable electrical and mechanical figures by a constant crimp quality.  
(A detailed description of the crimp technology can be found in our catalogue "tools").

The requirements for crimp connections are defined in DIN EN 60352-2.

An important point for the quality of a crimp connection is the achieved tensile strength of the termination. Measuring the tensile strength is a practicable means for quality control purposes. Chart 2 below shows the required minimum tensile strength for open and closed barrels according to the wire size.

**Chart 2: Tensile strength for crimp connections**

Wire size		Tensile strength
mm <sup>2</sup>	AWG <sup>1)</sup>	N
0.05	30	6
0.08	28	11
0.12	26	15
0.14		18
0.22	24	28
0.25		32
0.32	22	40
0.5	20	60
0.75		85
0.82	18	90
1.0		108
1.3	16	135
1.5		150
2.1	14	200
2.5		200
3.3	12	275
4.0		310
5.3	10	355
6.0		360
8.4	8	370
10.0		380

**Cross reference AWG - mm<sup>2</sup>**

The chart below allows a cross reference between American Wire Gauge (AWG) and metric wire sizes (mm<sup>2</sup>).

**Chart 3**

AWG	Wire composition	Leiter-Ø	Wire size	AWG	Wire composition	Leiter-Ø	Wire size	
30	1 x 0.25	0.25 mm	0.05 mm <sup>2</sup>	20	1 x 0.81	0.81 mm	0.52 mm <sup>2</sup>	
	7 x 0.10	0.36 mm	0.06 mm <sup>2</sup>		7 x 0.32	0.97 mm	0.56 mm <sup>2</sup>	
28	1 x 0.32	0.32 mm	0.08 mm <sup>2</sup>	18	19 x 0.20	1.02 mm	0.62 mm <sup>2</sup>	
	7 x 0.13	0.38 mm	0.09 mm <sup>2</sup>		1 x 1.02	1.02 mm	0.79 mm <sup>2</sup>	
26	1 x 0.40	0.40 mm	0.13 mm <sup>2</sup>	16	19 x 0.25	1.27 mm	0.96 mm <sup>2</sup>	
	7 x 0.16	0.48 mm	0.14 mm <sup>2</sup>		19 x 0.29	1.44 mm	1.23 mm <sup>2</sup>	
24	19 x 0.10	0.51 mm	0.15 mm <sup>2</sup>	14	19 x 0.36	1.80 mm	1.95 mm <sup>2</sup>	
	1 x 0.51	0.51 mm	0.21 mm <sup>2</sup>	12	19 x 0.46	2.29 mm	3.09 mm <sup>2</sup>	
	7 x 0.20	0.61 mm	0.23 mm <sup>2</sup>	10	37 x 0.40	3.10 mm	4.60 mm <sup>2</sup>	
22	19 x 0.13	0.64 mm	0.24 mm <sup>2</sup>	8	133 x 0.29	4.0 mm	8.80 mm <sup>2</sup>	
	1 x 0.64	0.64 mm	0.33 mm <sup>2</sup>		6	133 x 0.36	5.5 mm	13.5 mm <sup>2</sup>
	7 x 0.25	0.76 mm	0.36 mm <sup>2</sup>					
	19 x 0.16	0.81 mm	0.38 mm <sup>2</sup>					

It has to be noted that wires of the same AWG number but with different composition have slightly different mm<sup>2</sup>.

Chart 4: Composition and Dimensions of Copper Wires

Wire Size	Wire Composition	Wire diameter
0.09 mm <sup>2</sup>	12 x 0.10	0.48 mm
0.14 mm <sup>2</sup>	18 x 0.10	0.50 mm
0.25 mm <sup>2</sup>	14 x 0.15	0.70 mm
0.34 mm <sup>2</sup>	7 x 0.25	0.78 mm
0.5 mm <sup>2</sup>	16 x 0.20	1.0 mm
0.75 mm <sup>2</sup>	24 x 0.20	1.2 mm
1.0 mm <sup>2</sup>	32 x 0.20	1.4 mm
1.5 mm <sup>2</sup>	30 x 0.25	1.6 mm
2.5 mm <sup>2</sup>	35 x 0.30	2.2 mm
4.0 mm <sup>2</sup>	56 x 0.30	2.8 mm
6.0 mm <sup>2</sup>	19 x 0.64	3.4 mm
10 mm <sup>2</sup>	19 x 0.80	4.3 mm

**Current carrying capacity**

The current carrying capacity of a connector is shown by a derating curve. The curve shows the currents that the connector can carry continuously and simultaneously through all its contacts. The curve is determined by testing following the standard DIN EN 60512. The upper temperature is limited by the contact and insulation material used. The sum of the ambient temperature and the temperature created by the current flow may not exceed the upper temperature. This means that the current carrying capacity has no fixed value but decreases with increasing ambient temperatures.

As a general example it can be said that a given connector which can carry 16A through all its contacts at 40°C ambient temperature can carry less, e.g. 12A, at an ambient temperature of 80°C. On the other hand it is often the case that not all contacts carry the whole rated current, which means that some single contacts may carry a higher current than that according to the derating curve. These currents have to be defined by testing.

Diagram 3: Typical derating curve

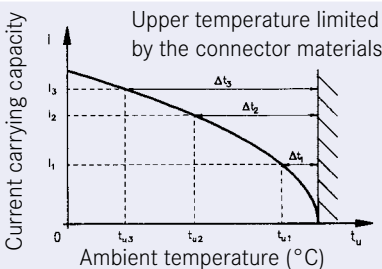
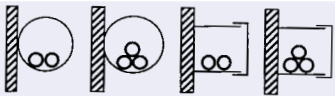
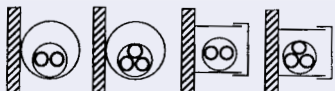




Chart 5: Current carrying capacity of copper wires in (A)

Installation type	Wire size (mm <sup>2</sup> )	0.25	0.34	0.5	0.75	1	1.5	2.5	4	6	10
 B1 Wires in conduits and installation channels		-	-	-	7.6	10.4	13.5	18.3	25	32	44
 B2 Cables and conductors in conduits or installation channels		-	-	-	-	9.6	12	16.5	23	29	40
 C Cables and conductors along walls		4.0	5.0	7.1	9.1	11.7	15.2	21	28	36	50
 E Cables and conductors on plank		4.0	5.0	7.1	9.1	11.5	16.1	22	30	37	52

Description according to DIN EN 60204 for PVC insulated copper wires with a working temperature of +40C. For other requirements,

such as for other temperatures, mountings, or wires corresponding correction factors are used (see next page).

**Reduction values**

The values in chart 5 are based on an ambient temperature of 40 °C. For other ambient temperatures the values have to be adjusted using the correction values of chart 6 below.

For installations with many cables and conductors under load the current carrying capacity is reduced according to the two following charts 7 and 8.

**Chart 6**

Ambient temperature (°C)	Correction value
30	1.15
35	1.03
40	1.00
45	0.91
50	0.82
55	0.71
60	0.58

**Chart 7: Reduction values for accumulated conductors**

Installation type	Number of cables and conductors / pairs under load			
	2	4	6	9
Threephase cable and conductor				
B1 and B2	0.80	0.85	0.87	0.86
C	0.65	0.75	0.78	0.76
E-one row	0.57	0.72	0.75	0.72
E-multi row	0.50	0.70	0.73	0.88
DC conductor (pair), independent of installation type	1.0	0.76	0.64	0.43

**Chart 8: Reduction values for multicore cable and conductors up to 10mm²**

Number of conductors (pairs) under load	AC (conductor > 1 mm²)	DC (Pairs 0.2 to 0.75 mm²)
5	0.75	0.52
7	0.65	0.45
10	0.55	0.39
24	0.40	0.27

Conductors of control circuits generally do not need a reduction.

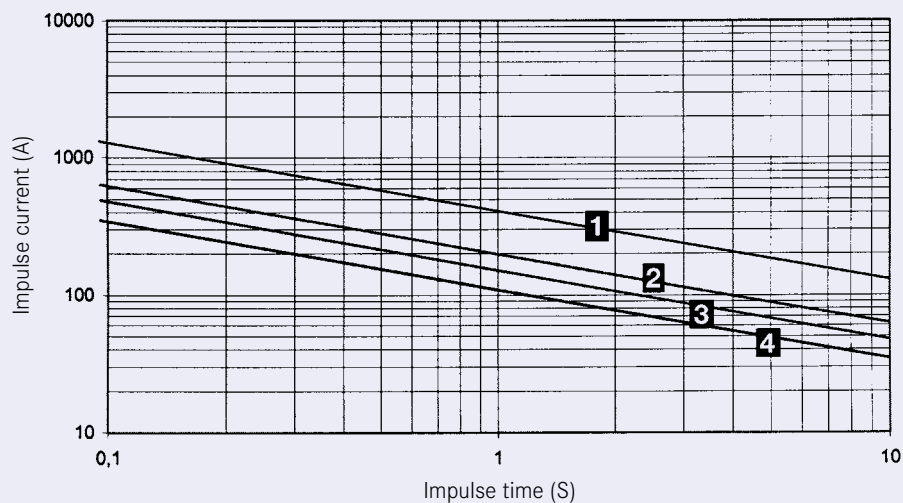
**Impulse current carrying capacity**

A surge can happen to a connector and its contacts by an impulse current, e.g. through a short circuit in the system or by switching operations. The short-timed high current heat cannot be transferred outside fast enough so the contacts are stressed by the high temperature which in the worst case can lead to a local weld.

The robust design of our connectors prevents most damage by impulse currents.

The diagram 4 below can be used as a guideline.

**Chart 4: Impulse current carrying capacity of single contacts**



Curve No.	Connector style	Curve No.	Connector style
1	heavy mate® E or A with screw contact	3	heavy mate® S with stamped crimp contact
2	heavy mate® E with stamped crimp contact	4	heavy mate® D with stamped crimp contact

**Voltage grading of connectors**

**General**

Clearances and creepage distances are the base for voltage grading of connectors. Valuation and dimensioning of clearances and creepage distances have changed since the introduction of insulation coordination.

Insulation coordination comprises the selection of the electrical insulation performances of the equipment, taking into account the expected use and its environment.

The following standards apply for this:

IEC 60664-1/10.92  
Insulation coordination for equipment within low-voltage systems

DIN VDE 0110-1/4.97  
Isolationskoordination für elektrische Betriebsmittel in Niederspannungsanlagen

**Clearances**

The clearance is the shortest distance in air between two conductive parts. An important point for the dimensioning of clearances is the determination of the overvoltage category. The above standard specifies the possible overvoltages into the four following categories:

**Overvoltage category I**

Equipment intended for the use in appliances or parts of installations in which no overvoltage can occur. Examples are low-voltage equipments.

**Overvoltage category II**

Equipment intended for the use in installations or parts of it in which lightning overvoltages do not need to be considered, but switching overvoltages generated by the equipment do need to be considered. Examples are household appliances.

**Overvoltage category III**

Equipment intended for the use in installations or parts of it in which lightning overvoltages do not need to be considered, however switching overvoltages generated by the equipment, and for cases where the reliability and the availability of the equipment or its dependent circuits are subject to special requirements. Examples are protecting means, switches and sockets.

**Overvoltage category IV**

Equipment intended for the use in installations or parts of it in which lightning overvoltage has to be considered. Examples are electricity meters, overcurrent protection switches.

Once the overvoltage category has been defined the rated impulse withstand voltage can be selected for the equipment based on the nominal voltage of the supply system and the overvoltage category using chart 9 below:

**Chart 9**

Nominal voltage of the supply system in V (based on IEC 60038)	Rated impulse voltage in kV for overvoltage category			
	IV	III	II	I
Three phase systems				
230/400 277/480	6	4	2.5	1.5
400/690	8	6	4	2.5
1000	12	8	6	4

After the rated impulse withstand voltage has been selected the pollution degree must be defined taking the expected pollution around the equipment into account.

The following four degrees of pollution are established:

**Pollution degree 1**

No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.

**Pollution degree 2**

Only non-conductive pollution occurs except occasionally a temporary conductivity caused by condensation is to be expected.

**Pollution degree 3**

Conductive pollution occurs or dry non-conductive pollution occurs which becomes conductive due to condensation which is to be expected.

**Pollution degree 4**

The pollution generates persistent conductivity caused by conductive dust or by rain or snow.



It has to be noted that for a connector or plug and socket devise with a degree of protection of min. IP54 the parts inside the enclosure may be dimensioned for a lower pollution degree. This also applies to mated connectors which enclosure is ensured through the connector housing and which may only be disengaged for test and maintenance purposes.

When impulse withstand voltage and the pollution degree are defined the minimum clearances can be selected from chart 10.



Chart 10

Impulse withstand voltage in kV	Minimum clearances in air in mm up to 2000 m above sea level							
	Case A (non homogeneous field)				Case B (homogeneous field)			
	Pollution degree				Pollution degree			
	1	2	3	4	1	2	3	4
0.33	0.01	0.2	0.8	1.6	0.01	0.2	0.8	1.6
0.40	0.02				0.02			
0.50	0.04				0.04			
0.60	0.06				0.06			
0.80	0.10				0.1			
1.0	0.15				0.15			
1.2	0.25	0.25			0.2			
1.5	0.5	0.5			0.3	0.3		
2.0	1.0	1.0	1.0		0.45	0.45		
2.5	1.5	1.5	1.5		0.6	0.6		
3.0	2	2	2	2	0.8	0.8		
4.0	3	3	3	3	1.2	1,2	1.2	
5.0	4	4	4	4	1.5	1.5	1.5	
6.0	5.5	5.5	5.5	5.5	2	2	2	2
8.0	8	8	8	8	3	3	3	3
10	11	11	11	11	3.5	3.5	3.5	3.5
12	14	14	14	14	4.5	4.5	4.5	4.5
15	18	18	18	18	5.5	5.5	5.5	5.5
20	25	25	25	25	8	8	8	8
25	33	33	33	33	10	10	10	10
30	40	40	40	40	12.5	12.5	12.5	12,5
40	60	60	60	60	17	17	17	17
50	75	75	75	75	22	22	22	22
60	90	90	90	90	27	27	27	27
80	130	130	130	130	35	35	35	35
100	170	170	170	170	45	45	45	45

When defining the minimum clearances for connectors generally the values of the inhomogeneous field can be chosen or the required clearance has to be defined by a voltage test.

**Creepage distances**

The creepage distance is the shortest distance along the surface of the insulating material between two conductive parts. For the dimensioning of the creepage distance the following factors are taken into account: the rated voltage, the pollution degree and the tracking formation of the insulating material.

The materials are separated into four groups according to their CTI values (Comparative Tracking Index):

- Material group I 600 ≤ CTI
- Material group II 400 ≤ CTI < 600
- Material group IIIa 175 ≤ CTI < 400
- Material group IIIb 100 ≤ CTI < 175

The minimum creepage distances can be selected from chart 11.

Chart 11

U-eff Rated vol- tage U in V	Min. creepage distance in mm														
	Printed circuits			Other devices											
	Pollution degree		Pollution degree 2					Pollution degree 3				Pollution degree 4			
	1	2	Material group				Material group				Material group				
	2)	3)	2)	I	II	IIIa	IIIb	I	II	IIIa	IIIb	I	II	IIIa	IIIb
10	0.025	0.04	0.08	0.4	0.4	0.4		1	1	1		1.6	1.6	1.6	
12.5	0.025	0.04	0.09	0.42	0.42	0.42		1.05	1.05	1.05		1.6	1.6	1.6	
16	0.025	0.04	0.1	0.45	0.45	0.45		1.1	1.1	1,1		1.6	1.6	1.6	
20	0,025	0.04	0.11	0.48	0.48	0.48		1.2	1.2	1.2		1.6	1.6	1.6	
25	0,025	0.04	0.125	0.5	0.5	0.5		1.25	1.25	1.25		1.7	1.7	1.7	
32	0.025	0.04	0.14	0.53	0.53	0.53		1.3	1.3	1.3		1.8	1.8	1.8	
40	0.025	0.04	0.16	0.56	0.8	1.1		1.4	1.6	1.8		1.9	2.4	3	
50	0.025	0.04	0.18	0.6	0.85	1.2		1.5	1.7	1.9		2	2.5	3.2	
63	0.04	0.063	0.2	0.63	0.9	1.25		1,6	1.8	2		2.1	2.6	3.4	
80	0.063	0.1	0.22	0.67	0.95	1.3		1.7	1.9	2.1		2.2	2.8	3.6	
100	0.1	0.16	0.25	0.71	1	1.4		1.8	2	2.2		2.4	3.0	3.8	
125	0.16	0.25	0.28	0.75	1.05	1.5		1.9	2.1	2.4		2.5	3.2	4	
160	0.25	0.4	0.32	0.8	1.1	1.6		2	2.2	2.5		3.2	4	5	
200	0.4	0.63	0.42	1	1.4	2		2.5	2.8	3.2		4	5	6.3	
250	0.56	1	0.56	1.25	1.8	2.5		3.2	3.6	4		5	6.3	8	
320	0.75	1.6	0.75	1.6	2.2	3.2		4	4.5	5		6.3	8	10	
400	1	2	1	2	2.8	4		5	5.6	6.3		8	10	12.5	
500	1.3	2.5	1.3	2.5	3.6	5		6.3	7.1	8.0		10	12.5	16	
630	1.8	3.2	1.8	3.2	4.5	6.3		8	9	10		12.5	16	20	
800	2.4	4	2.4	4	5.6	8		10	11	12.5		16	20	25	
1000	3.2	5	3.2	5	7.1	10		12.5	14	16		20	25	32	
1250			4.2	6.3	9	12.5		16	18	20		25	32	40	
1600			5.6	8	11	16		20	22	25		32	40	50	
2000			7.5	10	14	20		25	28	32		40	50	63	
2500			10	12.5	18	25		32	36	40		50	63	80	
3200			12.5	16	22	32		40	45	50		63	80	100	
4000			16	20	28	40		50	56	63		80	100	125	
5000			20	25	36	50		63	71	80		100	125	160	
6300			25	32	45	63		80	90	100		125	160	200	
8000			32	40	56	80		100	110	125		160	200	250	
10000			40	50	71	100		125	140	160		200	250	320	

Connectors in this catalogue are allocated to fixed rated voltages which apply to the machine building industry. In case of other applications the above chart can be used to determine other rated voltages.

**Degree of protection**

Electrical connector devices have to be protected for safety reasons from outside influences like dust, foreign objects, direct contact, moisture and water. This protection is provided on industrial connectors by the housing latching devices and sealed cable entries. The degree of protection depends on the type of intended use. The standard IEC 60529 and/or DIN EN 60529 has specified the degree of protection and divided them into several classes.

The degree of protection is indicated in the following way: IP65  
 Code letters (Internat. Protection) \_\_\_\_\_  
 1st charact. numeral (degree of protection against access to hazardous parts and against solid foreign objects)  
 2nd charact. numeral (degree of protection against ingress of water)  
 The following charts 12 an13 give an overview about all protection degrees.

Chart 12			Chart 13		
1st charact. numeral	Brief description	Definition	2nd charact. numeral	Brief description	Definition
0	Non-protected	–	0	Non-protected	–
1	Protected against access to hazardous parts with the back of a hand. Protected against solid foreign objects of $\geq 50\text{mm } \varnothing$ .	The probe, sphere of $50\text{mm } \varnothing$ , shall not fully penetrate and shall have adequate clearance from hazardous parts.	1	Protected against vertically falling water drops	Vertically falling drops shall have no harmful effects.
2	Protected against access to hazardous parts with a finger. Protected against solid foreign objects of $\geq 12,5\text{mm } \varnothing$ .	The jointed test finger of $12\text{mm } \varnothing$ , $80\text{mm}$ length, shall have adequate clearance from hazardous parts. The probe, sphere of $12,5\text{mm } \varnothing$ , shall not fully penetrate.	2	Protected against vertically falling water drops when enclosure tilted up to $15^\circ$	Vertically falling drops shall have no harmful effects when the enclosure is tilted at any angle up to $15^\circ$ .
3	Protected against access to hazardous parts with a tool. Protected against solid foreign objects of $\geq 2,5\text{mm } \varnothing$ .	The probe of $2,5\text{mm } \varnothing$ shall not penetrate at all.	3	Protected against spraying water	Water sprayed at any angle up to $60^\circ$ shall have no harmful effects.
4	Protected against access to hazardous parts with a wire. Protected against solid foreign objects of $\geq 1\text{mm } \varnothing$ .	The probe of $1\text{mm } \varnothing$ shall not penetrate at all.	4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects.
5	Protected against access to hazardous parts with a wire. Dust-protected.	The probe of $1\text{mm } \varnothing$ shall not penetrate. Intrusion of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the device or to impair safety.	5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects.
6	Protected against access to hazardous parts with a wire. Dust-tight.	The probe of $1\text{mm } \varnothing$ shall not penetrate. No intrusion of dust.	6	Protected against powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects.
			7	Protected against the effects of temporary immersion in water	Intrusion of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water for 30 min. in 1 m depth.
			8	Protected against the effects of continuous immersion in water	Intrusion of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7.
			9K <sup>1)</sup>	Protected against water during high pressure/steam jet cleaning	Water projected in powerful jets with high pressure and heat against the enclosure from any direction shall have no harmful effects.

**Cable**

For the termination of all Amphenol-industrial connectors we recommend the use of commercially available high flexible cable acc. to VDE or other local specifications. Our connectors are designed to fit these cables especially as far as number of conductors and cable diameters are concerned.

When selecting cables care must be taken that the cables do not affect (solvent) the connector or preserve an existing fire resistance.

**Sealing**

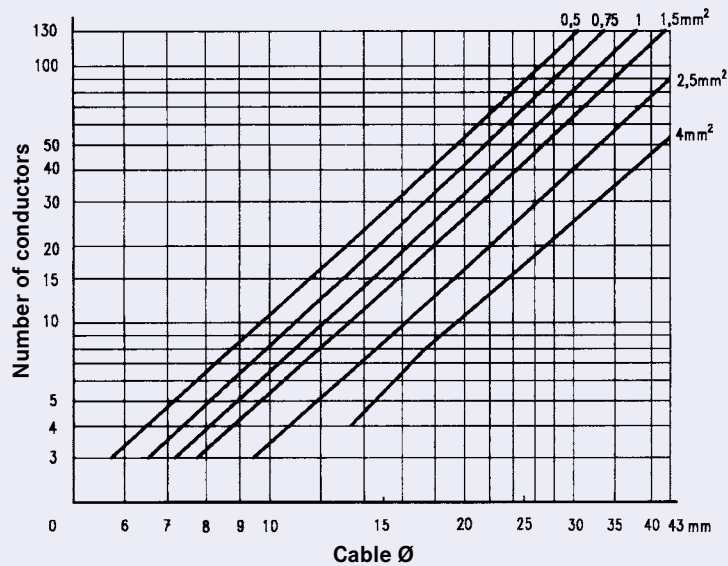
The sealing of the cable entries of all Amphenol-industrial connectors is with gland bushings. All sealings are made from Neoprene which has a good resistance against grease, oil and gasoline.

**Selection of gland bushings**

Beside glands with a fixed inside diameter which equals the number, there are also glands with variable inside diameters available (so-called onion glands). The inside diameter of these glands can be adjusted to the outside cable diameter by cutting out the smaller rings.

The selection of the appropriate gland bushing depends on the cable diameter (cable composition) can be made using the following diagram 5 (see page 309).

**Diagram 5**



<p><b>American Wire Gauge (AWG)</b></p> <p>System of numerical designations for wire sizes, based on specified ranges of cross-sectional areas.</p> <p>Starts with 4/0 (000) at the largest size, going to 3/0, 2/0, 1/0, 1, 2, and up to 40 and beyond for the smallest size. A step of one AWG number corresponds to a reduction of cross-sectional area of appr. 20 %.</p>	<p><b>Contact</b></p> <p>The conductive element in a connector which mates with a corresponding element to provide an electrical path.</p>
<p><b>Attenuation</b></p> <p>A reduction of power. Occurs naturally when waves travel through lines, wave guides, or media such as air or water. Is produced additionally by imperfections in electrical or optical connections (attenuation in fibre optics), e. g. contact resistance, mismatch, etc.</p>	<p><b>Contact resistance</b></p> <p>The electrical resistance of a mated set of contacts under specified conditions. Tested according to tests 2a, 2b, 2c, of IEC 60 512 -2/ DIN EN 60 512-2.</p>
<p><b>Bulkhead connector</b></p> <p>Connector designed to be inserted into a panel cutout from the rear of the panel, thus forming part of the barrier between two spaces. Back-mounted.</p>	<p><b>Contact size</b></p> <p>The designation used to differentiate one contact from another. It may be denoted by one of the following numbering systems:</p> <ul style="list-style-type: none"> <li>• numbering system: assigned numbers used to denote the size of the contact and its related conductor accommodation (e. g. in AWG units),</li> <li>• current rating system: the related current-carrying capacity is used to denote the size of the contact,</li> <li>• cross-sectional area system: reference is made to the cross-sectional area of the maximum conductor accommodation to denote the size of the contact, e. g. in mm<sup>2</sup>.</li> </ul>
<p><b>Clearance</b></p> <p>The shortest distance in air between two conductive parts, see IEC 60664.</p>	<p><b>Creepage distance</b></p> <p>The shortest distance along the surface of the insulating material between two conductive parts. The longer the distance, the less the risk of arc damage or tracking. Minimum creepage distances are specified according to the rated voltage and the applicable pollution degree and Comparative Tracking Index.</p>
<p><b>Climatic stability</b></p> <p>General term describing the behavior of components under various climatic conditions, e. g. high and low temperatures, tropical climate, high humidity, moist heat, fungus, atmospheric conditions (industrial atmosphere), reduced air pressure, etc. Climatic conditions for test purposes are explained in IEC 60068, DIN 46 040.</p>	<p><b>Crimped connection</b></p> <p>A solderless connection made by crimping. IEC 60352-2 / DIN IEC 60352 Part 2.</p>
<p><b>Connector</b></p> <p>A component which terminates conductors for the purpose of providing connection and disconnection to a suitable mating component which shall not be engaged or disengaged when live. Depending on the fastening to a cabinet, panel, rack etc. or a cable, they are classified as fixed or free connectors. A connector comprises one or more contacts and a housing which may have a separate connector insert and a separate outer housing or shell.</p>	<p><b>Derating curve</b></p> <p>The method for determining derating is specified in IEC 60 512-3. Here the combination of ambient temperature (Tu) and the current (I) leading to the same maximum allowable temperature (Tb) at the hottest point of the connector are plotted.</p>
<p><b>Connector housing</b></p> <p>The part of a connector into which the insert and the contacts are assembled. It may function as part of the locking mechanism.</p>	<p><b>DIN</b></p> <p>Deutsches Institut für Normung. A German standards organization.</p>
<p><b>Connector insert</b></p> <p>An insulating element designed to support and position contacts in a connector housing.</p>	<p><b>Electromagnetic interference (EMI)</b></p> <p>General term describing the undesirable effects of the immission or emission of radio frequency fields.</p> <p>In connectors electromagnetic interference is prevented by shielding. Shielded connectors normally provide means to connect the screens of attached cables.</p>
<p><b>Connector life</b></p> <p>The number of mating cycles prior to abrasion of the conductive contact surface and which does not result in a significant rise of the contact resistance. Tests according to test 9a of ICE 60512-5 / DIN EN 60512 Part 5.</p>	<p><b>Funnel entry (restricted entry C146 D series)</b></p> <p>Flared or widened entrance to a conductor barrel permitting easier insertion of the conductor.</p>

<p><b>Insertion or withdrawal force</b></p> <p>The force required to fully insert or withdraw a set of mated connectors without the effect of coupling, locking or similar devices. The insertion force is usually greater than the withdrawal force.</p>	<p><b>Material group</b></p> <p>Classification of insulation materials according to their CTI values (CTI = Comparative Tracking Index)</p>
<p><b>Insulation grip</b></p> <p>The area of a crimp contact that has been reshaped around the insulation of the conductor by compression during the crimping operation.</p>	<p><b>Overvoltage category</b></p> <p>A numeral defining a transient overvoltage condition. Overvoltage categories I, II, III and IV are used.</p>
<p><b>Insulation resistance</b></p> <p>The resistance of the insulation between two conductive elements, in particular, the resistance between two contacts or between a contact and a metallic housing or shield. Tested according to test 3a of IEC 60512-2 / DIN IEC 60512 Part 2.</p>	<p><b>Connector with braking capacity (CBC)</b></p> <p>A component which may be engaged or disengaged in normal use, when live or under load. Note: In the sense of this document the term - live- is used if contacts are under voltage not necessarily with a current flowing across the contacts. The term - load - is used if a current is flowing across the contacts.</p>
<p><b>Intermateable</b></p> <p>Two connectors are intermateable when they are capable of being connected electrically and mechanically but without regard to their performance and intermountability.</p>	<p><b>Rated current</b></p> <p>A current value assigned by the manufacturer which the connector or PSD can carry continuously (without interruption) and simultaneously through all its contacts wired with the largest conductor preferably at an ambient temperature of 40 °C without the upper temperature being exceeded.</p>
<p><b>Locator</b></p> <p>In a crimping tool the device used for positioning a crimp contact or terminal end.</p>	<p><b>Shield, shielding</b></p> <p>Shielding of internal or external electric fields by means of a plane with a uniform electric potential, formed by metal shells or metallic layers on the inside or outside of plastic shells. The shield is normally connected to the shielding braid of the cable and/or chassis ground.</p>
<p><b>Locking lever</b></p> <p>A mechanical locking device operated by actuating a lever, designed to hold two mated connectors together. Typically the lever can only be fully locked if the two connectors are correctly mated.</p>	<p><b>Terminal block</b></p> <p>An assembly of terminals in a housing or body of insulating material to facilitate interconnection between multiple conductors. Also called terminal strip or barrier blocks if the terminals are separated by an insulation barrier.</p>
<p><b>Mating cycle</b></p> <p>One mating cycle comprises one insertion and one withdrawal operation. Term used in the definition of connector life.</p>	<p><b>Wire range</b></p> <p>The range of wire cross sections which is compatible with the dimensions the terminals of the contact (wire barrel). The wire range is expressed in mm<sup>2</sup> or in AWG numbers.</p>

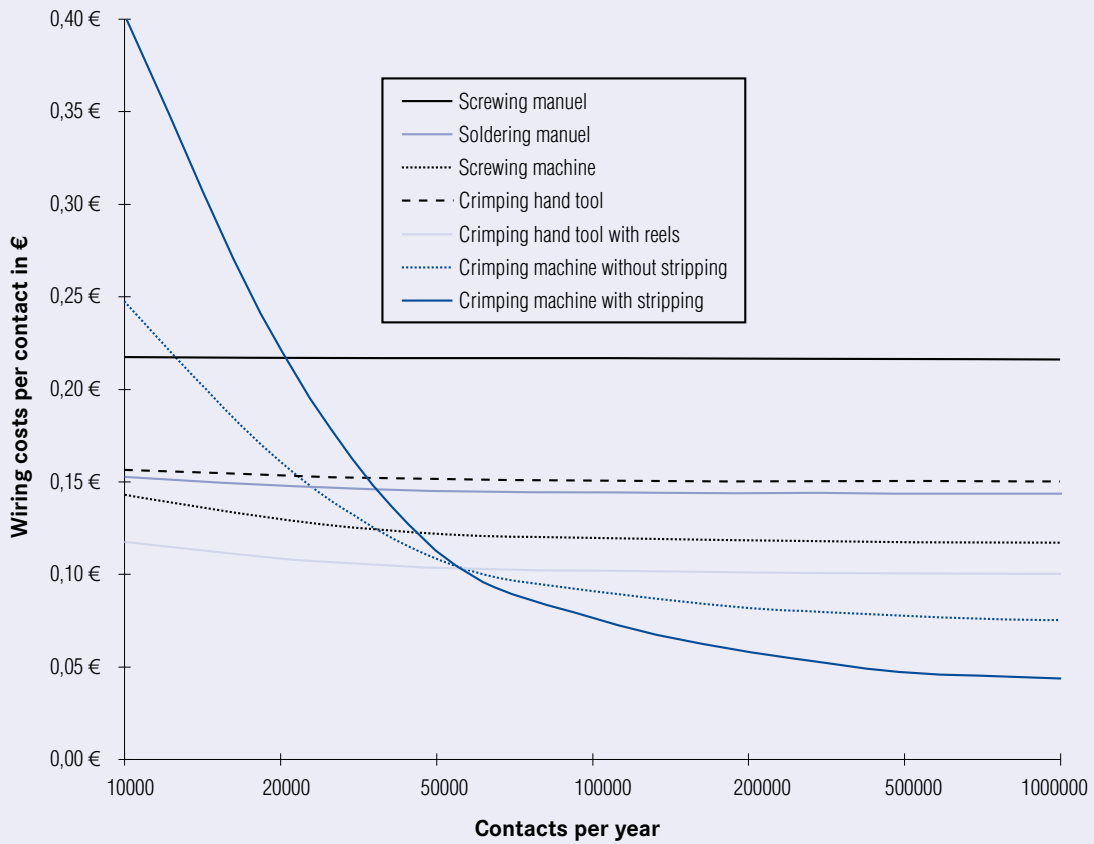
Stamped crimp contacts series C146, stripping length						
Termination crimp [mm <sup>2</sup> ]	Wire gauge		Insulation diameter of the wire [mm]	Min. stripping length [mm]	Contact Part Number	Series
	mm <sup>2</sup>	AWG				
0.09 - 0.25	0.09 - 0.25	28 - 24	0.7 - 1.6	2.3 + 0.4	N01 010 0130 2 N02 010 0130 2	heavy   mate® M heavy   mate® M
0.14 - 0.5	0.14	26	1.0 - 2.0	3.0 + 0.5	N01 016 0003 N02 016 0003	heavy   mate® D/M
	0.25	24-22				heavy   mate® D/M
	0.5	20				
0.25 - 0.5	0.25	24-22	1.6 - 2.0	2.3 + 0.4	N01 010 0131 2 N02 010 0131 2	heavy   mate® M
	0.5	20				heavy   mate® M
0.5 - 1.5	0.5	20	1.8 - 2.8	3.5 + 1.0	N01 016 0002 N02 016 0002 N01 016 0015 N02 016 0015 N01 025 0001 N02 025 0001	heavy   mate® D/M
	0.75	20 - 18				heavy   mate® D/M
	1.0	18 - 16				heavy   mate® D
	1.5	16 - 15				heavy   mate® D
						heavy   mate® E/M
1.5 - 2.5	1.5	16 - 15	2.5 - 3.5	3.5 + 1.0	N01 016 0005 N02 016 0005 N01 016 0016 N02 016 0016 N01 025 0010 N02 025 0010	heavy   mate® D/M
	2.5	14				heavy   mate® D/M
						heavy   mate® D
						heavy   mate® D
						heavy   mate® E/M
2.5 - 4.0	2.5	14	3.3 - 4.2	3.5 + 1.0	N01 025 0043 N02 025 0043	heavy   mate® M
	4.0	12				heavy   mate® M





Time saving through the introduction of stamped contacts

Wiring costs of different contacts



Break Even at about 60.000 contacts per year

General conditions	
Maturity (Depreciation)	5 years
Interest	8 %
Maintenance	5 %
Hourly wages	20 €

Non binding declarations are based on experienced values.

# heavy|mate® Summary of Part Numbers

Part Number	Page	Part Number	Page	Part Number	Page	Part Number	Page
17 D 438 SP	123, 129, 187, 294	C146 10A016 000 1	53	C146 10B003 601 15	84, 101	C146 10B016 810 1	79
C146 10A001 600 15	84, 97	C146 10A016 002 1	52	C146 10B004 002 4	18	C146 10B017 500 12	211
C146 10A001 800 15	88, 123, 125	C146 10A016 002 3	143	C146 10B004 100 13	147	C146 10B017 600 15	87, 113
C146 10A001 901 15	91, 119	C146 10A016 002 4	20, 21	C146 10B004 600 15	85, 105	C146 10B018 500 10	65
C146 10A001 902 15	90, 119	C146 10A016 004 4	21	C146 10B004 901 15	90, 117	C146 10B020 600 15	87, 115
C146 10A002 600 15	84, 99	C146 10A016 102 1	52	C146 10B005 500 12	201	C146 10B024 000 1	55, 56
C146 10A002 800 15	90, 117, 119	C146 10A016 102 3	143	C146 10B006 000 1	49	C146 10B024 000 9	41
C146 10A003 002 4	18	C146 10A016 102 4	20, 21	C146 10B006 002 1	48	C146 10B024 002 1	54, 56
C146 10A003 102 3	140	C146 10A016 104 4	21	C146 10B006 100 13	147	C146 10B024 102 1	54, 56
C146 10A003 600 15	84, 101	C146 10A016 400 1	52	C146 10B006 102 1	48	C146 10B024 400 1	54
C146 10A003 601 15	84, 101	C146 10A016 500 1	53	C146 10B006 102 3	141	C146 10B024 500 1	55, 56
C146 10A004 002 4	18	C146 10A016 600 1	52	C146 10B006 102 5	135	C146 10B024 600 1	54
C146 10A004 100 13	147	C146 10A016 810 1	79	C146 10B006 300 15	111, 121	C146 10B024 810 1	79
C146 10A004 600 15	85, 105	C146 10A017 500 12	211	C146 10B006 400 1	48	C146 10B025 000 2	29, 31
C146 10A004 901 15	90, 117	C146 10A017 600 15	87, 113	C146 10B006 500 12	203	C146 10B025 005 2	31
C146 10A005 500 12	201	C146 10A018 500 10	65	C146 10B006 500 1	49	C146 10B025 060 2	29
C146 10A006 000 1	49	C146 10A020 600 15	87, 115	C146 10B006 600 1	48	C146 10B025 500 2	29, 31
C146 10A006 002 1	48	C146 10A024 000 1	55, 56	C146 10B006 600 15	86, 107	C146 10B025 505 2	31
C146 10A006 100 13	147	C146 10A024 000 9	41	C146 10B006 810 1	78	C146 10B032 500 10	66
C146 10A006 102 1	48	C146 10A024 002 1	54	C146 10B007 000 2	27	C146 10B032 500 13	153
C146 10A006 102 3	141	C146 10A024 002 1	56	C146 10B007 500 12	205	C146 10B036 600 15	87, 121
C146 10A006 102 5	135	C146 10A024 102 1	54, 56	C146 10B007 500 2	27	C146 10B040 000 2	30
C146 10A006 400 1	48	C146 10A024 400 1	54	C146 10B007 600 15	85, 103	C146 10B040 060 2	30
C146 10A006 500 12	203	C146 10A024 500 1	55, 56	C146 10B008 000 2	27	C146 10B040 500 11	71
C146 10A006 500 1	49	C146 10A024 600 1	54	C146 10B008 500 12	207	C146 10B040 500 2	30
C146 10A006 600 1	48	C146 10A024 810 1	79	C146 10B008 500 2	27	C146 10B042 000 9	41
C146 10A006 600 15	86, 107	C146 10A025 000 2	29, 31	C146 10B008 600 15	86, 109	C146 10B042 500 13	149
C146 10A006 810 1	78	C146 10A025 005 2	31	C146 10B008 901 15	88, 123	C146 10B046 500 10	66
C146 10A007 000 2	27	C146 10A025 060 2	29	C146 10B008 902 15	88, 123	C146 10B064 000 2	32, 33
C146 10A007 500 12	205	C146 10A025 500 2	29, 31	C146 10B008 905 15	88, 125	C146 10B064 005 2	33
C146 10A007 500 2	27, 85	C146 10A025 505 2	31	C146 10B008 906 15	88, 125	C146 10B064 060 2	32
C146 10A007 600 15	103	C146 10A032 500 10	66	C146 10B009 600 15	89, 129	C146 10B064 500 11	71
C146 10A008 000 2	27	C146 10A032 500 13	153	C146 10B010 000 1	51	C146 10B064 500 2	32, 33
C146 10A008 500 12	207	C146 10A036 600 15	87, 121	C146 10B010 002 1	50	C146 10B064 505 2	33
C146 10A008 500 2	27	C146 10A036 600 15	87	C146 10B010 002 4	19	C146 10B072 000 9	41
C146 10A008 600 15	86, 109	C146 10A040 000 2	30	C146 10B010 102 1	50	C146 10B108 000 9	42
C146 10A008 901 15	88, 123	C146 10A040 060 2	30	C146 10B010 102 3	142	C146 10B108 005 9	42
C146 10A008 902 15	88, 123	C146 10A040 500 11	71	C146 10B010 102 4	19	C146 10F002 000 15	253
C146 10A008 905 15	88, 125	C146 10A040 500 2	30	C146 10B010 400 1	50	C146 10F003 000 4	218, 256
C146 10A008 906 15	88, 125	C146 10A042 000 9	41	C146 10B010 500 10	65	C146 10F003 001 4	218, 256
C146 10A009 600 15	89, 129	C146 10A042 500 13	149	C146 10B010 500 1	51	C146 10F003 004 4	218
C146 10A010 000 1	51	C146 10A046 500 10	66	C146 10B010 600 1	50	C146 10F006 000 1	226
C146 10A010 002 1	50	C146 10A064 000 2	32, 33	C146 10B010 810 1	78	C146 10F006 003 1	226
C146 10A010 002 4	19	C146 10A064 005 2	33	C146 10B012 100 13	151	C146 10F008 001 12	213
C146 10A010 102 1	50	C146 10A064 060 2	32	C146 10B012 500 12	209	C146 10F010 000 1	228
C146 10A010 102 3	142	C146 10A064 500 11	71	C146 10B012 600 15	86, 111	C146 10F010 001 1	230
C146 10A010 102 4	19	C146 10A064 500 2	32, 33	C146 10B015 000 2	28	C146 10F010 002 1	232
C146 10A010 400 1	50	C146 10A064 505 2	33	C146 10B015 060 2	28	C146 10F010 003 1	230
C146 10A010 500 10	65	C146 10A072 000 9	41	C146 10B015 500 2	28	C146 10F010 090 1	228
C146 10A010 500 1	51	C146 10A108 000 9	42	C146 10B015 901 15	129	C146 10F015 000 2	220
C146 10A010 600 1	50	C146 10A108 005 9	42	C146 10B016 000 1	53	C146 10F015 003 2	220
C146 10A010 810 1	78	C146 10B001 600 15	84, 97	C146 10B016 002 1	52	C146 10F016 000 1	235
C146 10A012 100 13	151	C146 10B001 800 15	88, 123, 125	C146 10B016 002 3	143	C146 10F016 001 1	236
C146 10A012 500 12	209	C146 10B001 901 15	91, 119	C146 10B016 002 4	20, 21	C146 10F016 002 1	238
C146 10A012 600 15	86, 111	C146 10B001 902 15	90, 119	C146 10B016 004 4	21	C146 10F016 003 1	236
C146 10A015 000 2	28	C146 10B002 600 15	84, 99	C146 10B016 102 1	52	C146 10F016 003 1	236
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