NICOMATIC

CREATIVE
INTERCONNECT
SOLUTIONS

EN 4165 QUALIFIED

OPTIMUS

EN 4165 BY NICOMATIC & CUSTOMIZED SOLUTIONS

MODULAR – COMPACT - ROBUST – SEALED

FROM FULL STANDARD TO FULL CUSTOM

CONNECT
FURTHER

OUR CORE VALUE

FAMILIAR OR NEW TO THE PRODUCT LINE, DISCOVER NICOMATIC SOLUTIONS, BEYOND PERFOR-MANCE.

TOGETHER WE'LL FIND THE BEST SOLUTION

WE ARE NICOMATIC

Creative interconnect solutions provider

SUMMARY

MODULAR BY NATURE

NICOMATIC

CREATIVE INTERCONNECT SOLUTIONS

PROTECT WHAT MATTERS

EN 4165

MEET THE STANDARD

Recognized for over 30 years for its miniaturized rectangular connectors, it is a natural progression for Nicomatic to now expand its product range further with a new connector, still rectangular, but this time standardised to address increasingly harsh environments. Our modular solutions meet the EN4165 standard and are also developed in accordance with the ARINC 809 committee, which is a standard developed for the civil aviation market. Branded under the Optimus name, our connectors are compliant with EN 4165 standards (details available on our website).

INDUSTRY LEADING LEAD TIMES

THINK ABOUT ...

OUTSIDE THE BOX RACK & PANEL

A modular solution optimized for PCB and panel connection in weight and space constrained applications.

RECTANGULAR I/O
Based on EN4165 standard / Sealing / EMI protection

FULLY INTERMATEABLE & INTERCHANGEABLE
With existing EN 4165 solutions

PCB ADAPTED
Direct connection to mother board / Efficient PCB fixing

SPACE SAVING
Slim fit & high density compared to circular connectors

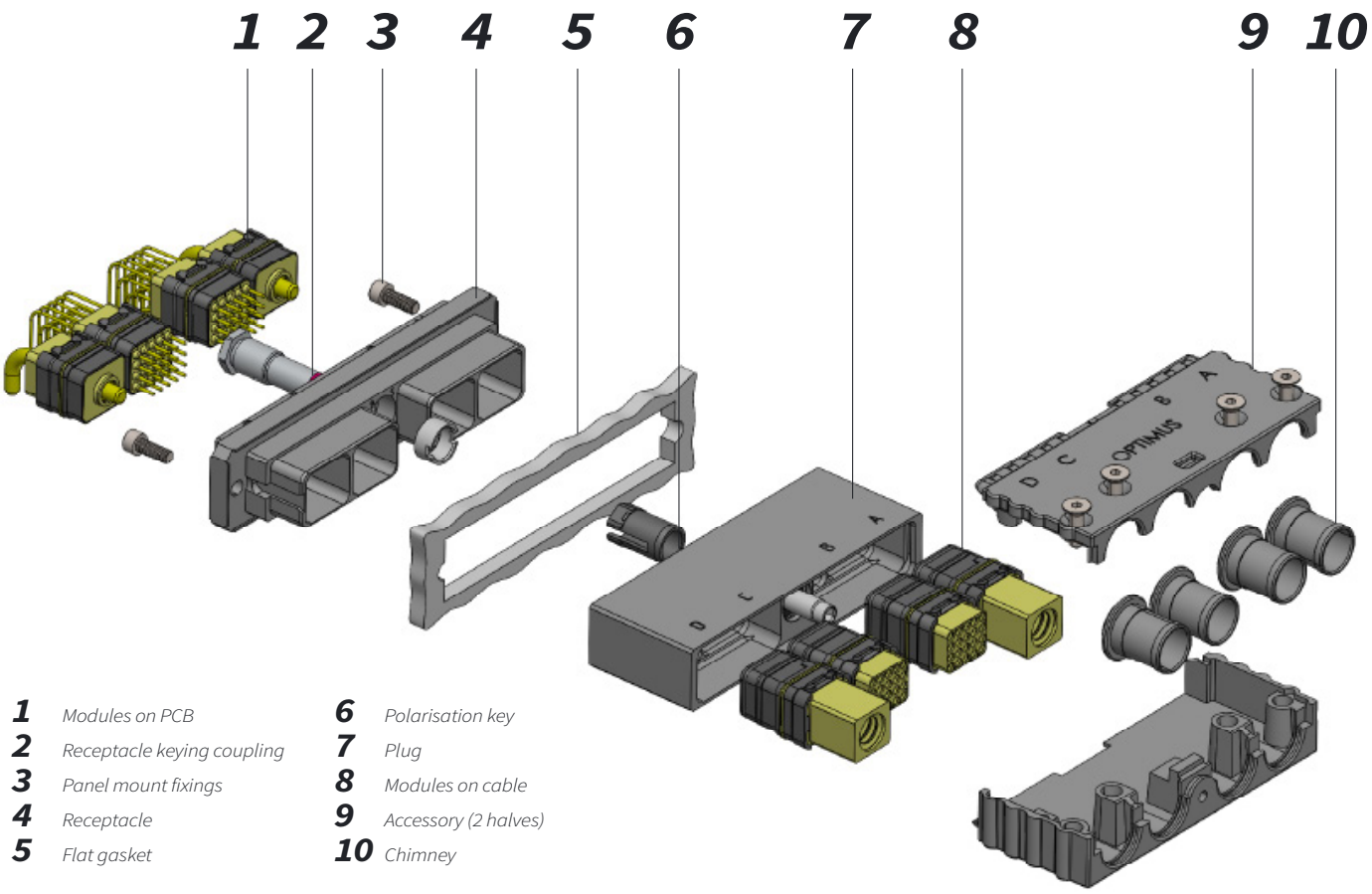
STACKABLE
Possibility to pile up connectors

RACK & PANEL
Robust blind mating / Re-alignment

EASY MAINTENANCE
Removable contacts and modules

AS / EN 9100
Aerospace quality standards

→ ANATOMY OF A STANDARD EN 4165



1 *Modules on PCB*
2 *Receptacle keying coupling*
3 *Panel mount fixings*
4 *Receptacle*
5 *Flat gasket*
6 *Polarisation key*
7 *Plug*
8 *Modules on cable*
9 *Accessory (2 halves)*
10 *Chimney*

Main applications

EN 4165 STANDARD / Harsh environment requirements

→ CIVIL AEROSPACE

EN 4165 norm

Modularity

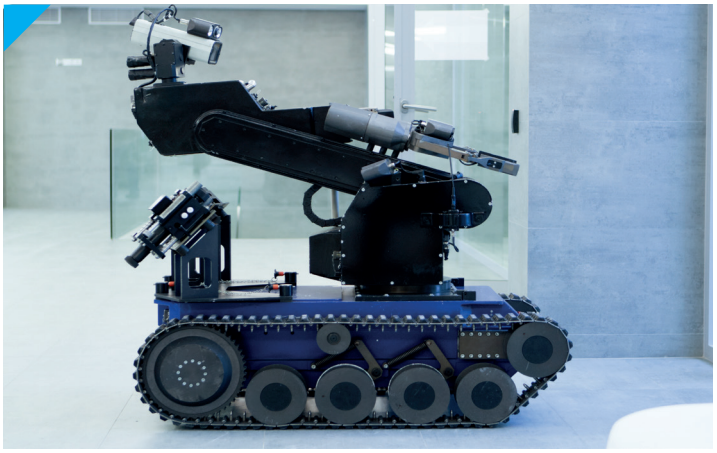
Easy maintenance

→ MILITARY VEHICLES

Robustness *Data reliability* *Modularity*

→ DEFENCE AVIONICS

High vibration *Space saving* *Modularity*



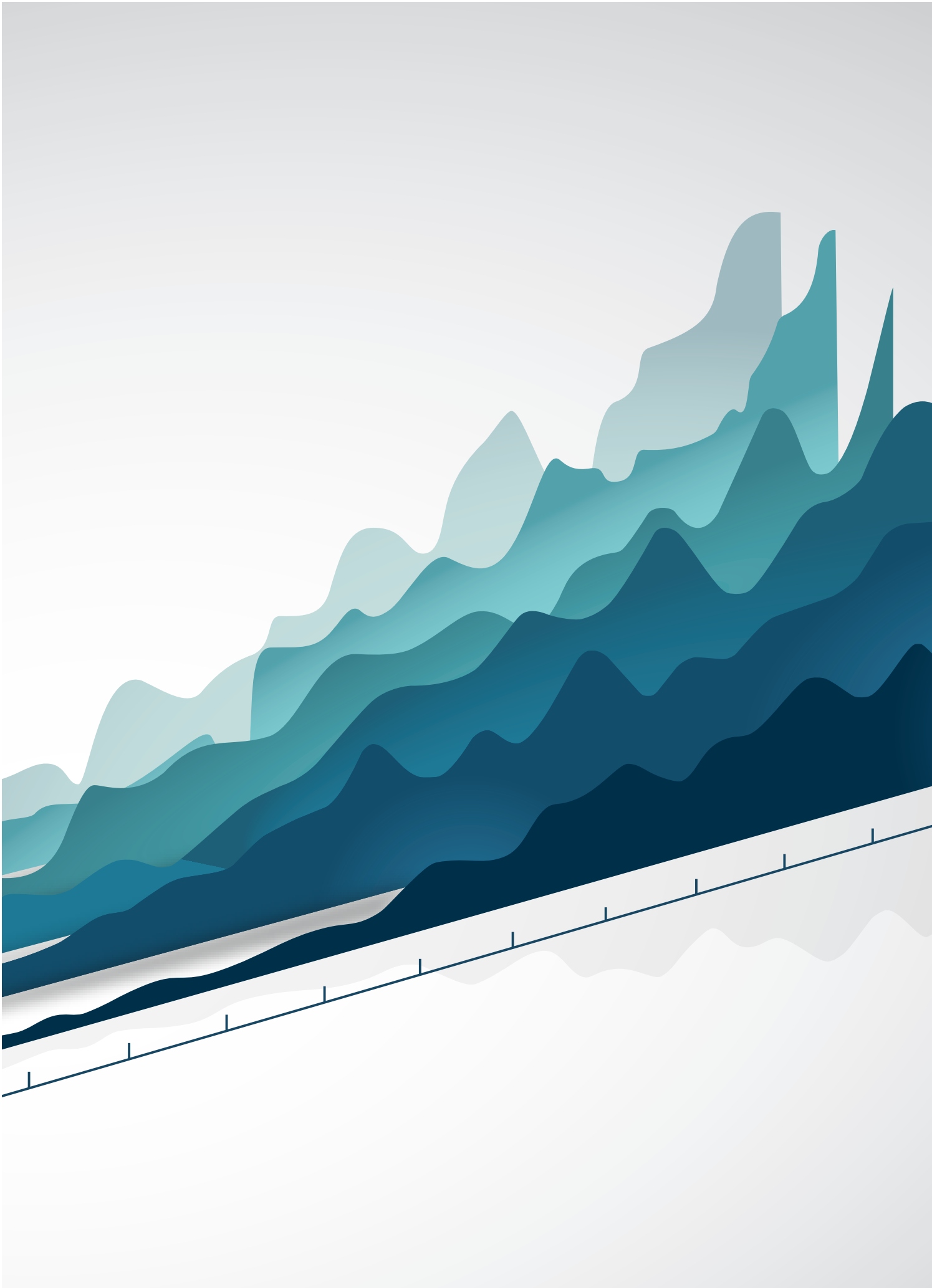
→ ROBOTICS

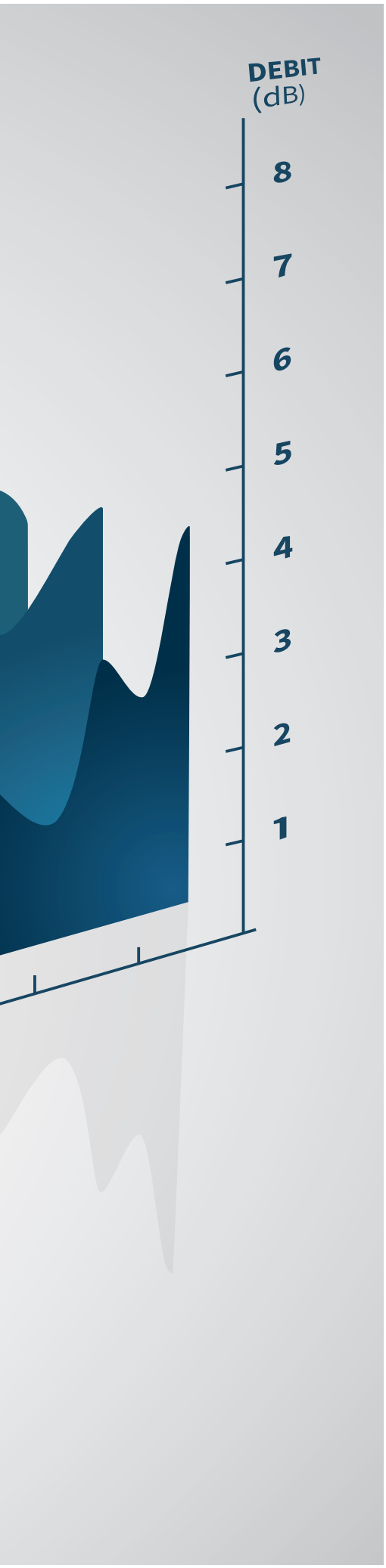
Shock resistance *Space saving* *Modularity*

YOUR APPLICATION DOESN'T APPEAR?

WE HAVE THE SOLUTION

EN 4165_OPTIMUS IS A HIGHLY VERSATILE CONNECTOR





PRODUCT SPECS

ACCORDING TO

EN 4165 PERFORMANCES

ALL OUR ENGINEERS SUPPORT YOU

We bring you concrete tips. Saving time, more gains, less stress.

TIPS

Performance	Results
Electrical performance requirements	
Contact resistance low level *EN2591-201*	For shunted modules 8 mΩ initial Rc < 12 mΩ after test
Contact resistance @ rated current *EN2591-202*	For shunted modules, In = 5A : 8 mΩ initial Rc < 12 mΩ after test
Discontinuity of contacts in the microsecond range *EN2591-204* *Method B*	Standard contact: ≤ 1 µs
Electrical continuity of the shell *EN2591-205*	*- Between mated connectors:* Class F: 1 mΩ initial; 2 mΩ after test Class W: 2.5 mΩ initial; 5 mΩ after test *- Between shell and grounding contacts: 10 mΩ initial; 20 mΩ after test* *- Between end of chimney and backshell:* Class F: 2 mΩ initial; 4 mΩ after test Class W: 2.5 mΩ initial; 5 mΩ after test *- Between backshell and plug (or receptacle):* Class F: 1 mΩ initial; 2 mΩ after test Class W: 2.5 mΩ initial; 5 mΩ after test
Insulation resistance *EN2591-206* *Method A*	– @ Ambient temperature: 5 000 MΩ (unmated connectors); – @ Maximum operating temperature: 1 000 MΩ (unmated connectors); – After tests EN 2591-314, and during EN 2591-324: 1 000 MΩ (mated connectors); – After tests EN 2591-315: 1 000 MΩ (unmated connectors) except conductive fluids; – During tests EN 2591-301: 100 MΩ (mated connectors).
Temperature rise due to rated current *EN2591-208*	Applicable for shunted modules only: In = 5 A and Δθ°C ≤ 40 °C

Surface transfer impedance *EN2591-212* *Initial and after tests ; connector mated with accessories*	1 Khz	1 Mhz	10 Mhz	100 Mhz
	5 mΩ	10 mΩ	20 mΩ	150 mΩ

Shielding effectiveness from 100 MHz to 1 GHz *EN2591-213* *Initial and after tests ; connector mated with accessories*	Frequency Mhz	Minimum attenuation (dB) Classes J, M, F and W
	100	50
	200	45
	300	45
	400	40
	800	35
	1 000	30

Lightning strike, current and voltage pulse *EN2591-214* *Not applicable for class C*	Classes F and W: Current pulse F

Voltage proof *EN2591-207* *Method A*	Max. leakage current	Pressure	Connectors Mated V r.m.s.	Connectors Unmated V r.m.s.
	2 MA	Sea level	(size 22) 1 300 (other) 1 500	(size 22) 1 300 (other) 1 500
		12,1 kPa (15 000 m)	1 000	600
		4,7 kPa (21 000 m)	1 000	400
		1,1 kPa (30 000 m)	1 000	200

Mechanical performance requirements	
Engagement of contacts *EN2591-216*	Applicable ≥ 1,27 mm (only for standard contact)
Transverse load (external bending moment) *EN2591-404*	2 and 4 modules classes F, W Torque N.m Force rear plug: 50; Torque N.m rear accessory: 14
Mechanical endurance *EN2591-406* *The rate shall not exceed five cycles/min.*	Number of mating and unmating operations: 500
Durability of contact retention system and seals (Maintenance ageing) *EN2591-407*	Applicable 50 cycles insertion/extraction for contacts in shunted modules

Mating and Unmating forces *EN2591-408* *Screw plug: Method A*	a) Mating and unmating of pairs of connectors			
	Housing size	Coupling torque N .m ± 0,1	Uncoupling torque N .m min.	Uncoupling torque N .m max.	Overtightening torque N.m ± 0,1
	2 modules	1,1	0,7	1,7	3,00
	4 modules	1,3	0,7	2,2	3,00
	b/ Self-locking system on the plugs only. The rotation torque of the coupling device in the uncoupling direction shall not be < 0,01 N.m during a 360° rotation. The ratio between the torque (uncoupling direction/coupling direction) shall not be less than 1,25.				

Performance	Results
Contact retention in insert *EN2591-409* *Preload: 1 daN* *Displacement <0.3 mm during and afetr application load*	Contact size 22: Axial load 44N Contact size 20: Axial load 67N Contact size16: Axial load 110N Contact size 12: Axial load 110N Contact size 8: Axial load 110N
Holding force of grounding spring system *EN2591-413* *Not applicable on accessories and on push-pull latching mechanism*	Gauge retention force, models W and F 2 modules: min 5 / max10 4 modules: min 10 / max 20
Stability of male contact in module *EN2591-419*	Contact size 22: Permitted deflection mm: 0.76 _ Force daN: 1.2 Contact size 20: Permitted deflection mm: 1.37 _ Force daN: 2.4 Contact size 16: Permitted deflection mm: 1.91 _ Force daN: 4.9 Contact size 12: Permitted deflection mm: 1.91 _ Force daN: 4.9 Contact size 8: Permitted deflection mm: 2.54 _ Force daN: 9.7
Use of tools *EN2591-506*	Force to be applied on tool: 13 N
Environmental performance requirements	
Endurance @ temperature *EN2591-301* *Method B, test under load*	Temperature: 175 °C Duration: 1 000 h
Climatic sequence *EN2591-302* *EN2591-309 Dry Heat* *EN2591-310 Cold* *EN2591-311 Low air pressure* *EN2591-321 - Damp heat, cyclic test*	Minimum temperature: (- 55 ± 2) °C Maximum temperature: (175 ± 2) °C
Cold / low pressure and damp heat *EN2591-303*	Five cycles. Minimum temperature: (- 55 ± 2) °C
Rapid change of temperature *EN2591-305*	TA: 175 °C +5 -0 TB: -55 °C +0 -5
Salt mist *EN2591-307*	Classes W, J, M and C - 50 cycles of mating and unmating at a rate five cycles/min; - exposed to the salt mist: - mated for 452 h*, - then unmated for 48 h*; - subjected to 200 cycles of mating and unmating at the rate five cycles/min Model F * mated for 96h
Sand and Dust *EN2591-308*	Wind velocity in the duct: (3,5 ± 0,5) m/s 1 cycle
Air leakage *EN2591-312* *Method A*	Differential pressure: 100 kPa Maximum leakage flow: 4 cm3/h/module
Immersion at low air pressure *EN2591-314*	Module size: #16 — Contact P/N: M39029/76, M39029/78 — Insulation resistance: 1 Ω min. at 250 V — Leakage current: 2 mA max. at 750 V Module size: #12 — Contact P/N: M39029/28, M39029/27 — Insulation resistance: 1 GΩ min. at 500 V — Leakage current: 2 mA max. at 1 000 V Module size: #8 — Contact P/N: EN3155-068, EN3155-069 — Insulation resistance: 1 GΩ min. at 500 V — Leakage current: 2 mA max. at 1 000 V
Fluid resistance *EN2591-315*	Table 39
Flammability *EN2591-317* *Connectors mated. Method A*	Test applicable
Interfacial sealing *EN2591-324*	Pressure 1,1 kPa
Shock *EN2591-402* *Method A*	Severity 100 Number of shocks: one each way for each of the three directions (i.e. six shocks in total)
Sinusoidal and random vibration *EN2591-403* *Method B*	Figure 3 and Table 2, level G Duration: 8 h/axe on the three axis
Magnetic permeability *EN2591-513*	< 2
Mould growth *Method A*	Duration: 28d, Growth: 0; No prior washing; No surface etching

Best-in class sealing
As per EN2591

MODULE
Secured manufacturing

A READY-TO-PLUG SEALED COMPONENT

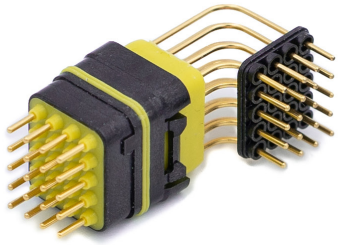
Reliable connection

The module is at the heart of Optimus solutions: in a single component, it concentrates several high level functions for optimal performance in harsh environments.

Injected in one single operation, which increases reliability and the repeatability of the process, the silicone performs 3 main functions: the interfacial seal ensures a seal between mated modules and reduces arcing; the peripheral seal enables sealing between the module and its shell cavity; the rear grommet will compress around the wires and avoid any liquid ingress from the harnesses. But that's not all: the module features moulded thermoplastic clips for high class contact retention, and an optimized module retention clip that makes the module able to fit in any adapted cavity: whether it is inside a standard Optimus, shell or directly in your equipment structure!

→ SOME OF OUR AVAILABLE MODULES

01-08 : 1 contact size 8
04-12 : 4 contacts size 12
08-16 : 8 contacts size 16
12-20 : 12 contacts size 20
20-22 : 20 contacts size 22
30-23 : 30 contacts size 23
99-01 : 5 contacts size 22 + 6 contact size 16
99-10 : 8 contacts size 20 + 2 contact size 16
01Q28 : Quadrax



→ CODIFICATION RULES

MODULES ON CABLE
AS39029/57 AND /58 AND EN3155 CONTACT COMPLIANT

	Series	Nbr-Size	Sealing	Polarization	Contact
	A	x-x	**1:** without **2:** with	**N, A, B, C, D**	**A:** w/o male contact **B:** w/o female contact **M:** with male contact **F:** with female contact
OPT	A	20-22	2	N	F
EN 4165	A	20-22	2	N	F

MODULES ON PCB

	Series	Nbr-Size	Sealing	Polarization	Gender	Type	PCB thickness	Plating
OPT	A	x-x	**1:** without **2:** with	**N, A, B, C, D**	**P:** pin **S:** socket	**Y:** straight **V:** bended 90°	**3:** 3.2 mm	**G:** gold **T:** tin RoHS
	A	20-22	2	N	P	V		

Shells
2 and 4 cavities
ALUMINIUM & COMPOSITE

ADAPTED SURFACE TREATMENT

Black Nickel: 96 hours Salt Spray .
Olive Green Cadmium: 500 hours salt Spray.

ALUMINIUM SHELL

Optimus receptacles and plugs are machined in aluminium 6061, the recommended alloy for aeronautical application.

COMPOSITE SHELL

Looking for light weight solutions: check out our composite shells.

→ CODIFICATION RULES

	Surface Treatment	Type	Series	Nbr cavities	Polarization nut	Polarization nut position	Optional design for nut device	Panel gasket
RECEPTACLE	**F:** alu+black nickel **W:** alu+cadmium **N:** alu+nickel **M:** composite nickel **J:** composite cadmium	**0:** stackable **7:** flange **0S:** short stackable **7S:** short flange	**A**	**2:** 2 cavities **4:** 4 cavities	**A:** standard black **0:** without **1** to **6:** w, colour code	**0:** not mounted **1** to **6:** mounted	**None:** std design **A:** w. hex. groove for nut **B:** w. captive nut	**U:** w/o **M:** w. conductive elastomer **S:** Non conductive elastomer
EN 4165	F	0	A	2	1	1		
OPT	F	0	A	2	1	1	A	U

	Surface Treatment	Type	Series	Nbr cavities	Reverse fixing	Polarization nut	Polarization nut position
PLUG	**F:** alu+black nickel **W:** alu+cadmium **N:** alu+nickel **M:** composite nickel **J:** composite cadmium	**6:** standard **9:** rack / rack reversed	**A**	**2:** 2 cavities **4:** 4 cavities	**Omit:** Standard **R:** only for rack reversed configuration	**A:** standard black **0:** without **1 to 6:** w, colour code	**0:** not mounted **1** to **6:** mounted
EN 4165	F	6	A	2		A	0
OPT	F	6	A	2		A	0

TIPS

Nicomatic also offers a large range of accessories, including backshells, covers, cable clamps and others: consult us to get the best combination for your need.

LINKING TECHNOLOGY AND PEOPLE

Meeting the highest quality standards is a lifelong commitment for our company. Certified to EN 9100 and ISO 9001 since 2009, both our organisation and our quality system are continuously improved, driven by a network of men and women committed to always delivering the best service to our customers.

At the heart of this system is a dedication to innovation and performance optimisation. With the adoption of EN 4165, Nicomatic has mastered the challenge of combining state-of-the-art industrialisation within an agile and learning ecosystem. The know-how and commitment of our employees have enabled us to meet this challenge with ease. Our standard Optimus solutions are qualified and certified* according to the EN 4165 standard.

**Further details can be found at nicomatic.com*

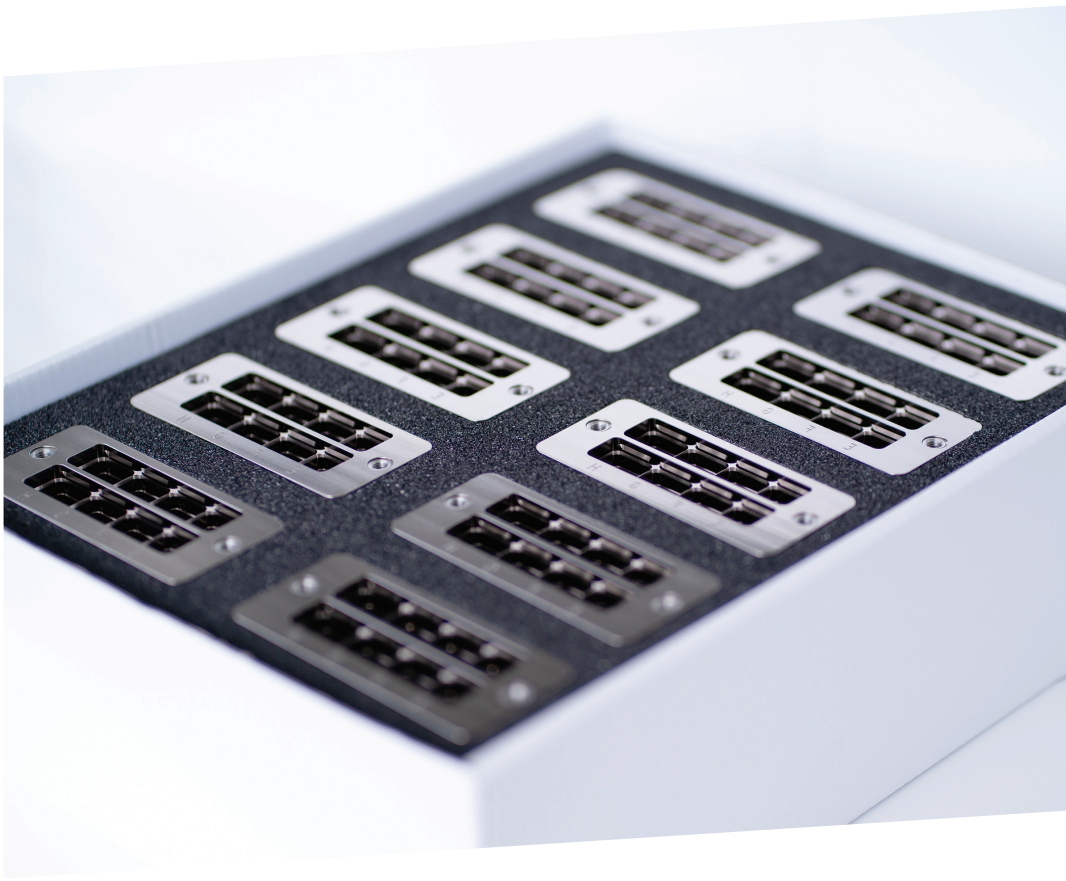
CONNECTION
EMOTION
HUMAN TO HUMAN

Overmolding capabilities, Nicomatic production site

QUALITY
REPEATABILITY
PRODUCTIVITY

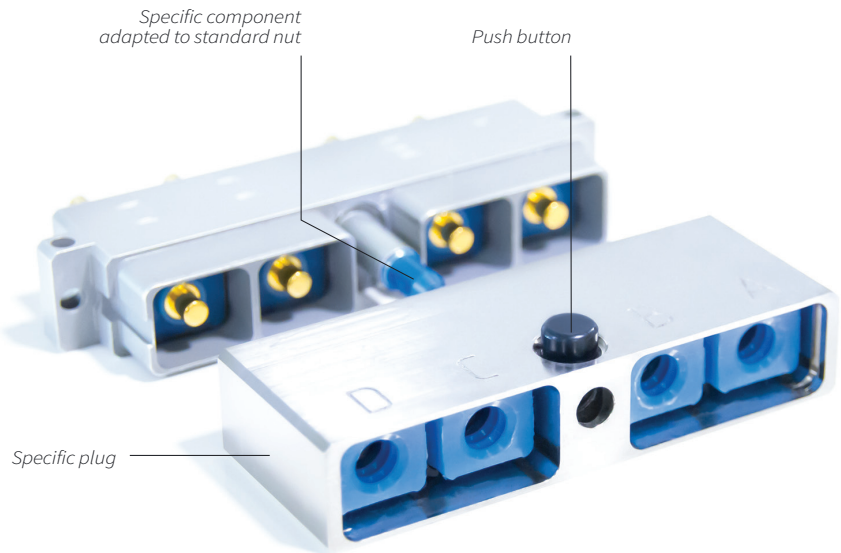
OPTIMUS | EXPLORING THE SPECIFIC

Particularly agile, autonomous in all techniques, Nicomatic continues to support you with many standard components that deliver a customised solution: Optimus, the superlative form of the Latin word bonus, the origin of the word “bon” meaning good in French, therefore honours its French origin and will delight those who remember “Transformers”: its uniqueness lies here, since the number of possible combinations is infinite.



Standard cavities but custom shells...

→ ...INNOVATIVE TOUCH



Nicomatic innovates and brings its special touch in I/O rectangular connectors:

- Mate/Unmate without using any tool
- Nicomatic kit : Plug + Nut Component, adapted to any standard EN 4165 receptacle
- Easier to operate in a handy and timely manner
- Saves assembly and maintenance time

Example of application: when connection/ disconnection cycles are high or when using the connector for test phases.

CREATIVE INTERCONNECT SOLUTIONS

With over 40 years of experience, Nicomatic combines a proven track record and continuous innovation.

We provide solutions for defense, security, energy, space, civil avionics, and many other applications, respecting our core values based on service, quality and close relationship with our customers.

HUMAN FACTOR

is the key to success.

We promote initiative and responsibility,
We encourage creativity & reactivity,
To better meet your needs and anticipate your requirements.

Ready to join our team ?

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