

May 2019

AVNET[®] ABACUS

HIGH VOLTAGE AK FAMILY OVERVIEW



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Why HV AK Products?

Market environment
and value proposition

Portfolio Overview

Portfolio scope

Technical Overview & Part Numbers

AK
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Pass-throughs

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The Challenge

A standardized interconnection system for high voltage products

Cost competitive solutions for growing volumes of hybrid and electric vehicles.

Meeting specific technical requirements regarding vibrations and temperature for hybrid vehicles.

The Solution

Presenting the High Voltage AK family.

A standard interface meeting the more demanding requirements of hybrid vehicles.

In addition, the AK family is a cost-effective solution for the quickly increasing high voltage transportation market.



Robust features, meaningful benefits

Compatible solution with a standard interface

- Recognized and proven AK LV214 & LV215 standard
- Available versions
 - AK Class 1
 - AK Class 4
 - AK Pass-through
- Fully compatible with other supplier's solutions

Higher Robustness

- According to LV214 standard
 - Vibrations up to severity 3 (engine profile)
 - Temperature severity 4 (-40 to 140°C)
- Designed with innovative cable strain relief for higher vibrations

Designed for high volume applications

- Cost-effective solution
 - Simplified ferrule designs
 - Designed for an easier cable assembly which creates faster processes and high quality repeatability
- Able to meet high volume applications
 - High installed capacity
 - Resulting in a flexible service with a valued reactivity

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Versatility of application

HV PTC Heater

AC/DC inverter

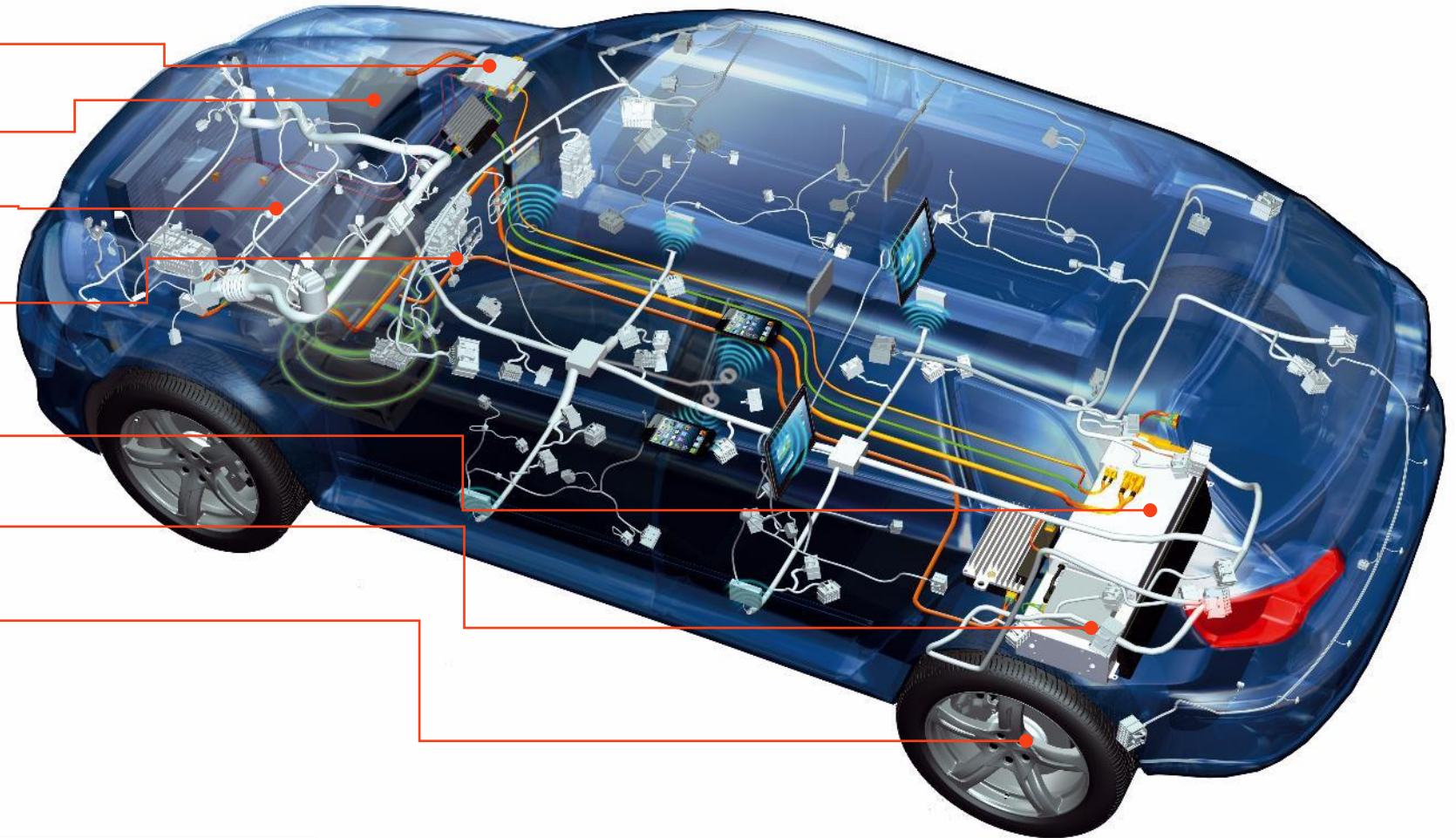
Front e-motors

HV Air-conditioning

HV Battery

On-board charger

In-wheel e-motors



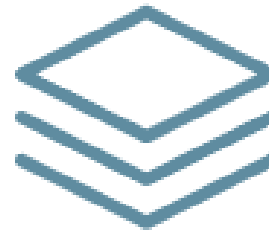
A wide family range

Connectors

- AK Class 1 female connectors
 - 2 way Female Connector HVIL pass-through
 - 2 way Female Connector HVIL Shunt
 - 3 way Female Connector without HVIL
- AK Class 4
 - 2 way header connector
 - 2 way Female Connector

Pass-through

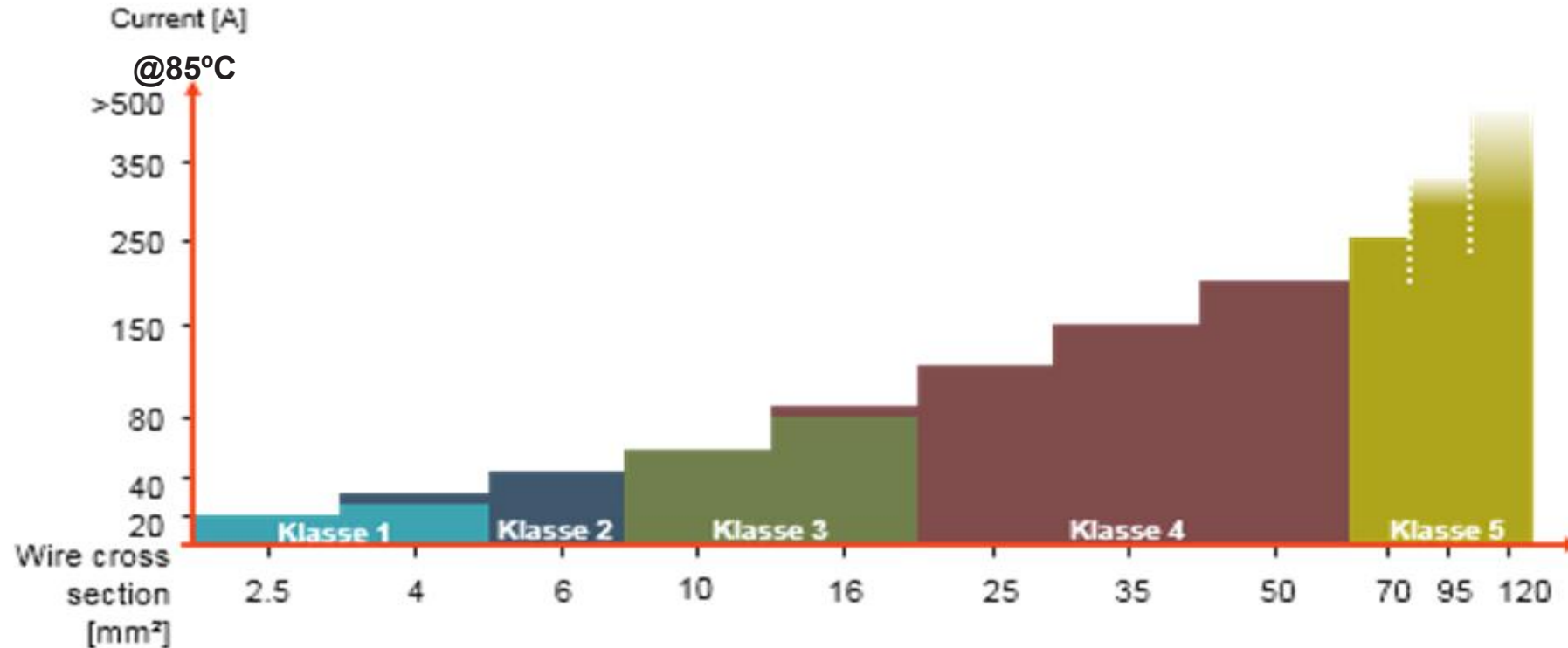
- 1 way
- 2 way
- 3 way



Accessories

- Unique **cable strain relief** for high vibration applications
- Shielding ferrules
- Single-wire seals

AK Standard HV Connector Classification AVNET ABACUS



AK Class 1 Series



Key features & benefits

- Standard AK interface
- High robustness against vibrations
- Multiple layouts & HVIL options in the same interface
- 2 & 3 way connector, 280 terminal system and 0,64 HVIL
 - 2-way with shunt on female
 - 2-way with in-line HVIL
 - 3-way without HVIL
- Connector according AK interface specification and LV215 latest revision
- Finger proof/touch safe
- Multicore shielded cable for wiring simplification
- Fully interchangeable with other AK supplier sources

Performance characteristics

Sealing protection	IP67, IP6K9K
Temperature range (up to)	-40°C to +140°C ; LV215 Level 4
Vibration performance (up to)	LV215 Level 2
Max Current	32A @ 85°C
Max Voltage	1000V DC



Application: High voltage auxiliary modules such as Air conditioning, PTC heaters, Inverts, On-board-chargers

Part numbers, specifications, dimensions and performance data in this document are for general references only and are subject to change without notice. To verify product information, please contact an Aptiv representative.

AK Class 4 Series



Key features & benefits

- High operating temperature
- High robustness against vibrations
- Header compatible with both Straight & Right angle female connector
- Connector and header design according to AK interface specification and LV215 latest revision
- Individual shielded cables
- Fully interchangeable with other AK supplier sources

Performance characteristics

Sealing protection (up to)	IP67, IP6K9K
Temperature range (up to)	-40°C to +140°C ; LV215 Level 4
Vibration performance (up to)	LV215 Level 3
Max Current	180A @ 140°C
Max Voltage	600V AC ; 1000V DC



**Application: High voltage / high current modules:
inverter, battery, junction box, power electric box**

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AK Pass-Through 1, 2 & 3 way Series

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Key features & benefits

- Very compact dimensions
- High robustness against vibrations
- Ring terminal is bolted to device
- Cables are 360° individually shielded
- High voltage panel mount system
- Fully interchangeable with other AK supplier sources

Performance characteristics

Sealing protection (up to)	IP67, IP6K9K
Temperature range (up to)	-40°C to +140°C ; LV215 Level 4
Vibration performance (up to)	LV215 Level 3
Max Current	200A @ 140°C depending on cable choice
Max Voltage	1000V DC
Available configurations	1, 2, 3 way



**Application: High voltage / high current modules:
inverter, battery, junction box, power electric box**

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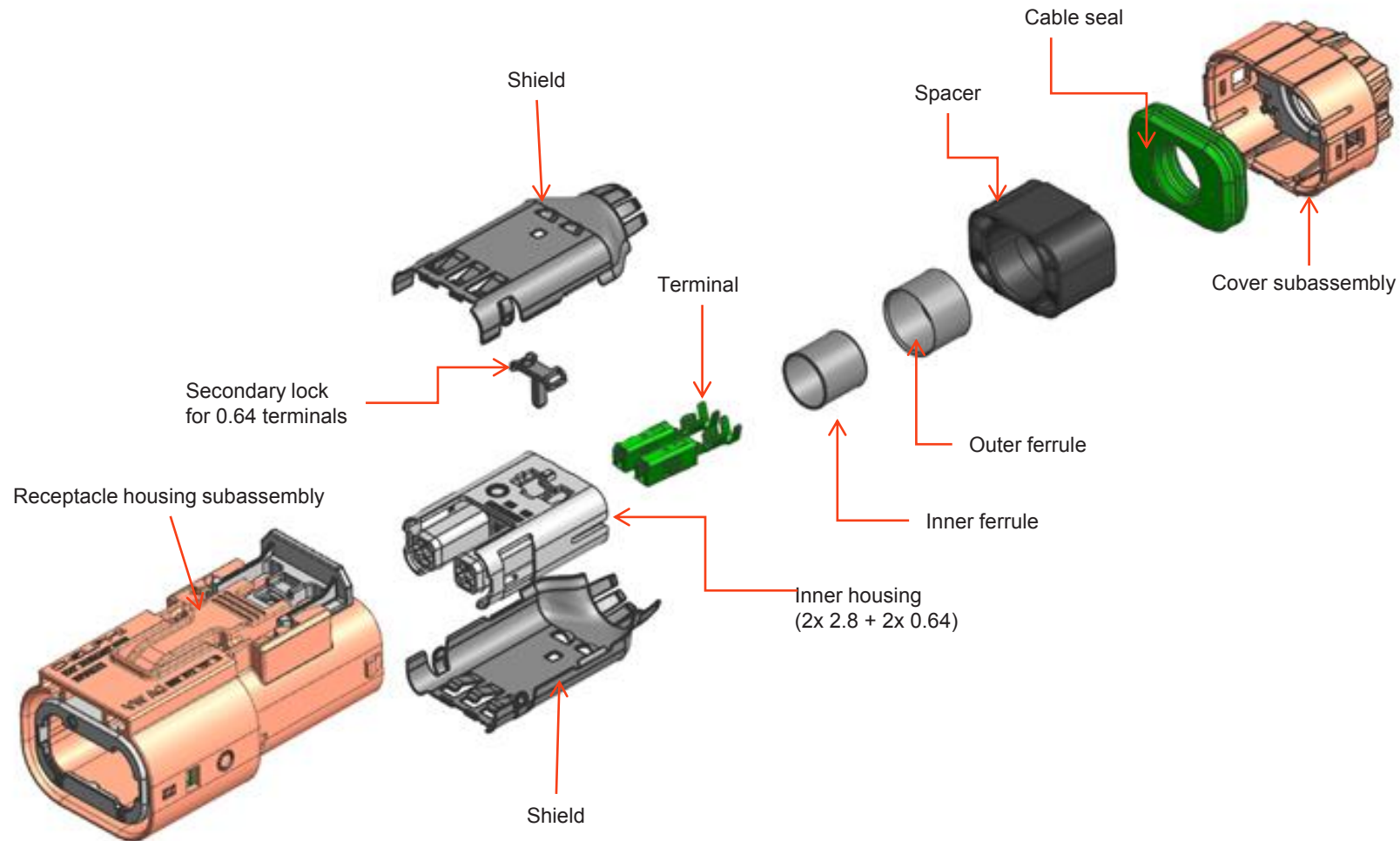
AK Class 1

AK Class 4

AK Pass-throughs

AK Class 1 exploded view

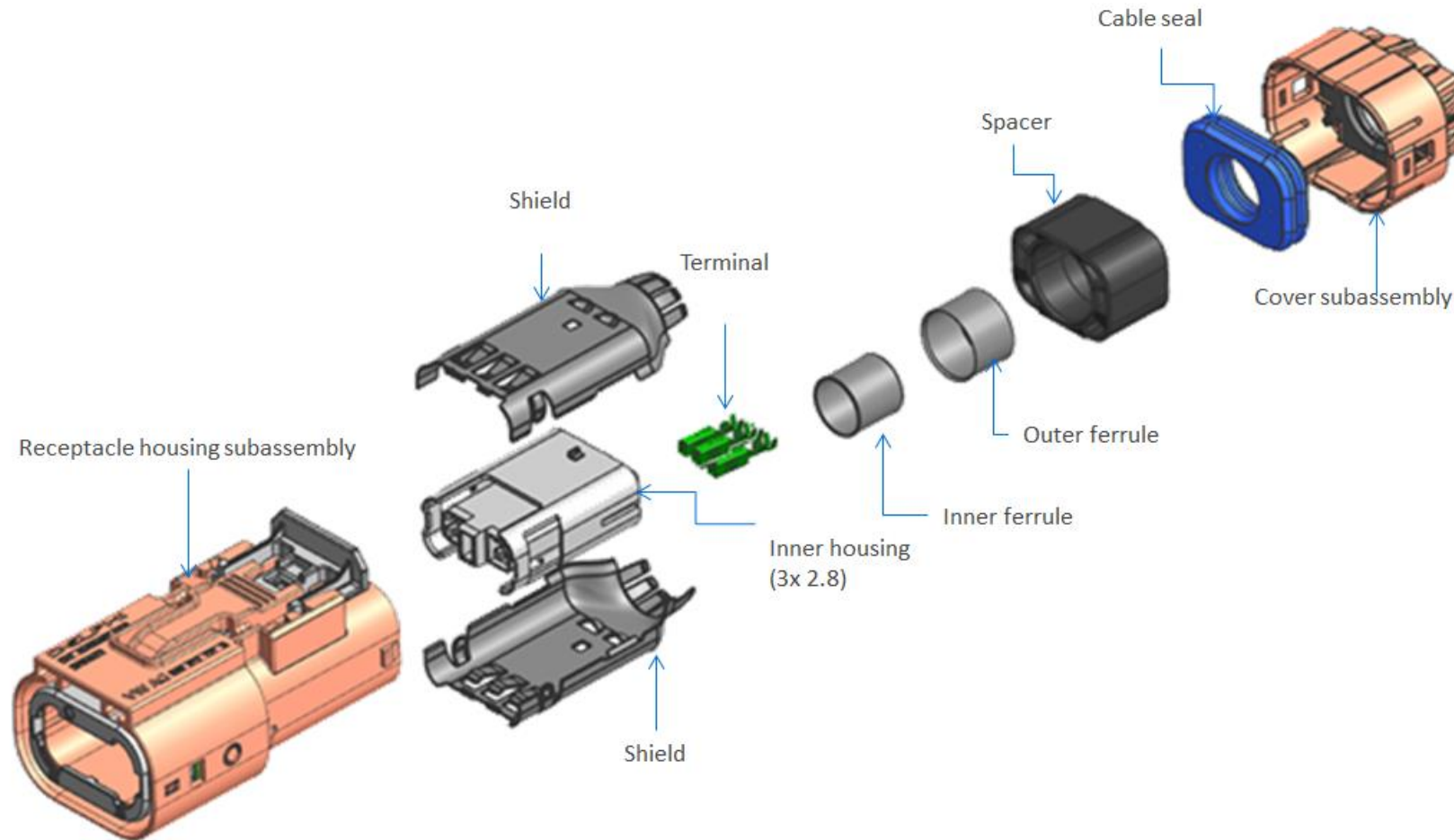
Connector 2 way



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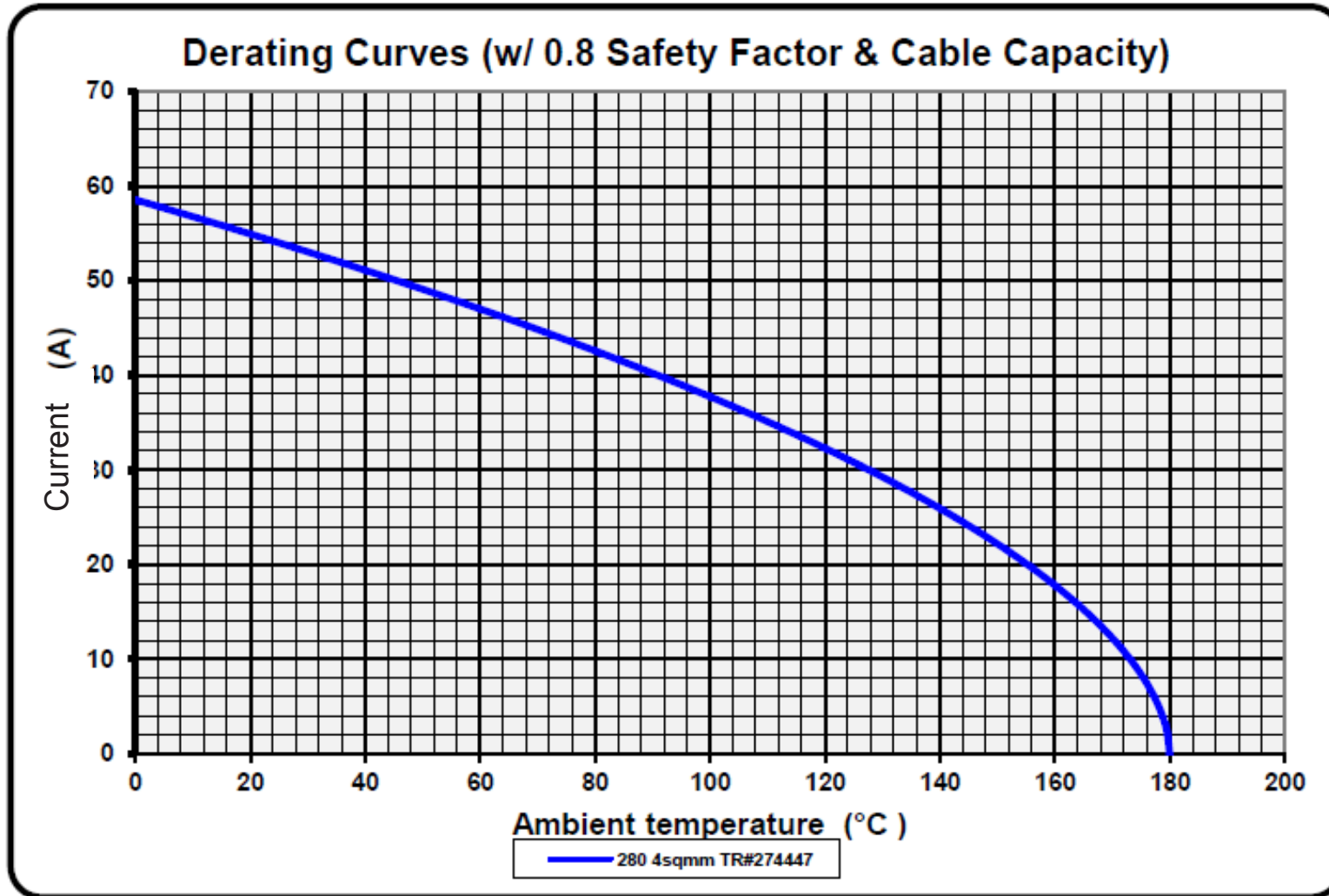
AK Class 1 exploded view

Connector 3 way



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AK Class 1 derating curve



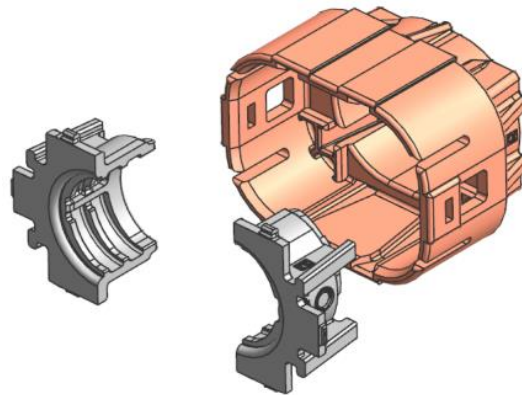
Part numbers, specifications, dimensions and performance data in this document are for general references only and are subject to change without notice. To verify product information, please contact an Aptiv representative.

AK Class 1 technology

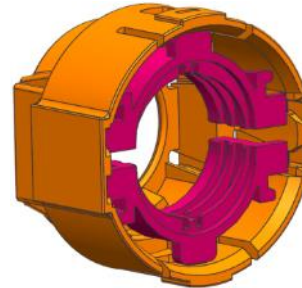
Cable strain relief innovations

Benefits

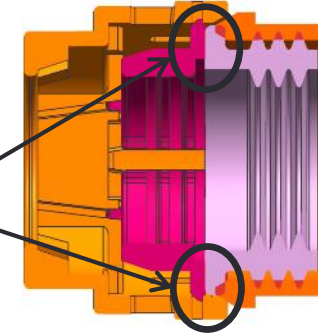
- Aptiv Patented cable squeezer :
 - increases the reliability of the cable sealing
 - provides more robust anti-vibration performance



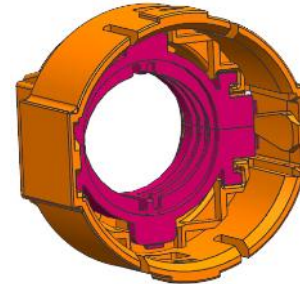
Pre-
Position



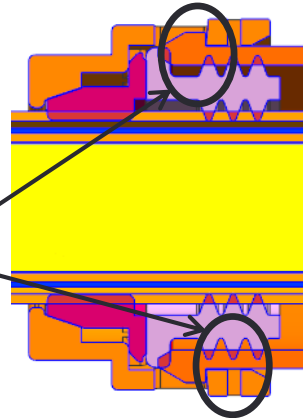
Lock of
Pre-position



Final
Position
置




Squeeze
cable to
fixture it



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AK Class 1 part numbers


2 way Female Connector HVIL pass-through

AK Class 1 2 way Female Connector HVIL pass-through	Description	Part Number	BOM
	Female connector outer housing Code A	33372017	1
	Female connector outer housing Code B	33372014	1
	Female connector outer housing Code C	33372016	1
	Female connector outer housing Code D	33372015	1
	Female connector outer housing Code E	35061103	1
	Inner Housing, 2Way	35174511	1
	DCK 2.8 female terminal 4 mm ²	33522728	2
	DCK 2.8 female terminal 2.5 mm ²	33514302	2
	Duo twin 0,64 male terminal 0,5 mm ² (HVIL pass-through version only)	33504709	2
	Spacer	35174268	1
	Shielding	35174446	2
	Cable Seal for 2 x 4.0 mm ²	35174508	1
	Inner ferrule	35174280	1
	Outer ferrule	35174278	1
TPA (Terminal Position Assurance)	35174513	1	
ASM Strain Relief for 2 x 4.0 + 2 x 0.5 mm ²	35174510	1	

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AK Class 1 part numbers


2 way Female Connector HVIL Shunt

AK Class 1 2 way Female Connector HVIL Shunt	Description	Part Number	BOM
	Female connector outer housing Code A	33372017	1
	Female connector outer housing Code B	33372014	1
	Female connector outer housing Code C	33372016	1
	Female connector outer housing Code D	33372015	1
	Female connector outer housing Code E	35061103	1
	Inner housing 2-way HVIL shunt	35174509	1
	DCK 2.8 female terminal 4 mm ²	33522728	2
	DCK 2.8 female terminal 2.5 mm ²	33514302	2
	Spacer	35174268	1
	Shielding	35174446	2
	ASM Strain Relief for 2 x 4.0 mm ²	35174507	1
	Cable Seal for 2 x 4.0 mm ²	35174508	1
	Inner ferrule	35174280	1
	Outer ferrule	35174278	1

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AK Class 1 part numbers

3 way Female Connector without HVIL

AK Class 1 3 way Female Connector without HVIL	Description	Part Number	BOM
	Female connector outer housing Code A	33372017	1
	Female connector outer housing Code B	33372014	1
	Female connector outer housing Code C	33372016	1
	Female connector outer housing Code D	33372015	1
	Female connector outer housing Code E	35061103	1
	Inner Housing, 3 Way	35174448	1
	DCK 2.8 female terminal 4 mm ²	33522728	2
	DCK 2.8 female terminal 2.5 mm ²	33514302	2
	Spacer	35174268	1
	Shielding	35174446	2
	ASM Strain Relief for 3 x 2.5 mm ²	35174249	1
	Cable Seal for 3 x 2.5 mm ²	35174250	1
	Inner ferrule	35174280	1
Outer ferrule	35174278	1	

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Design features

&

Part Numbers

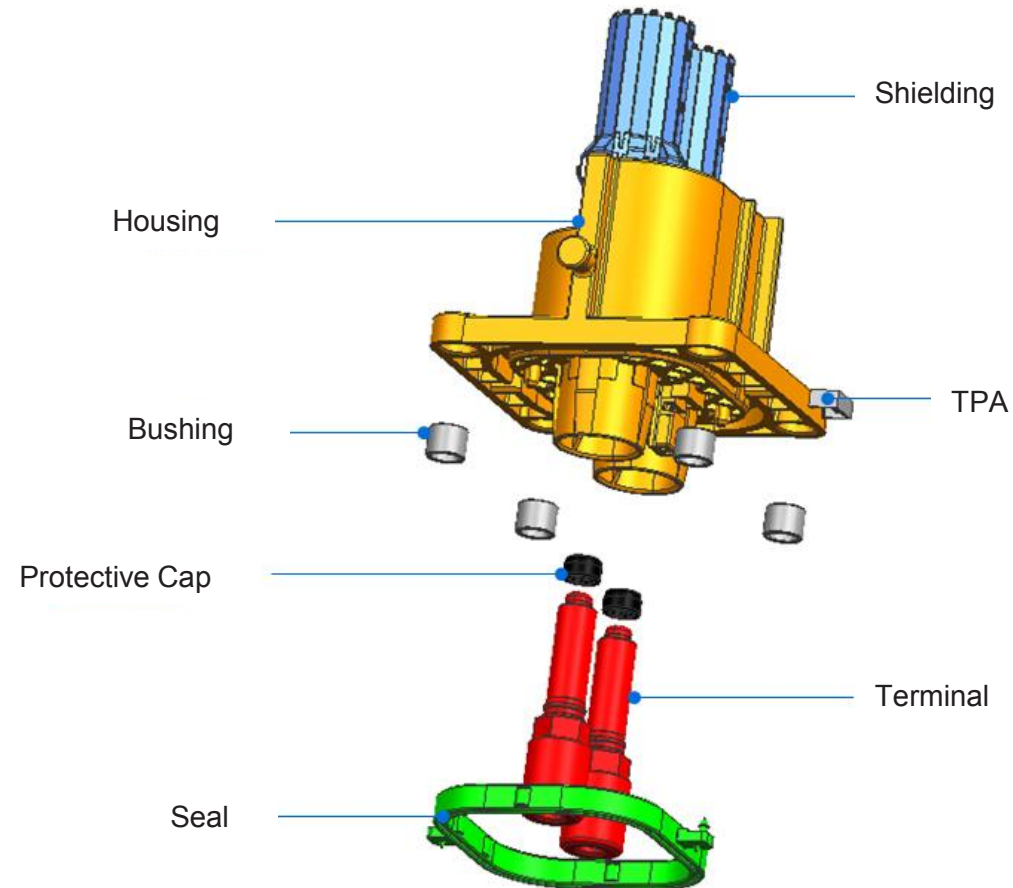
AK
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AK Class 4 exploded view

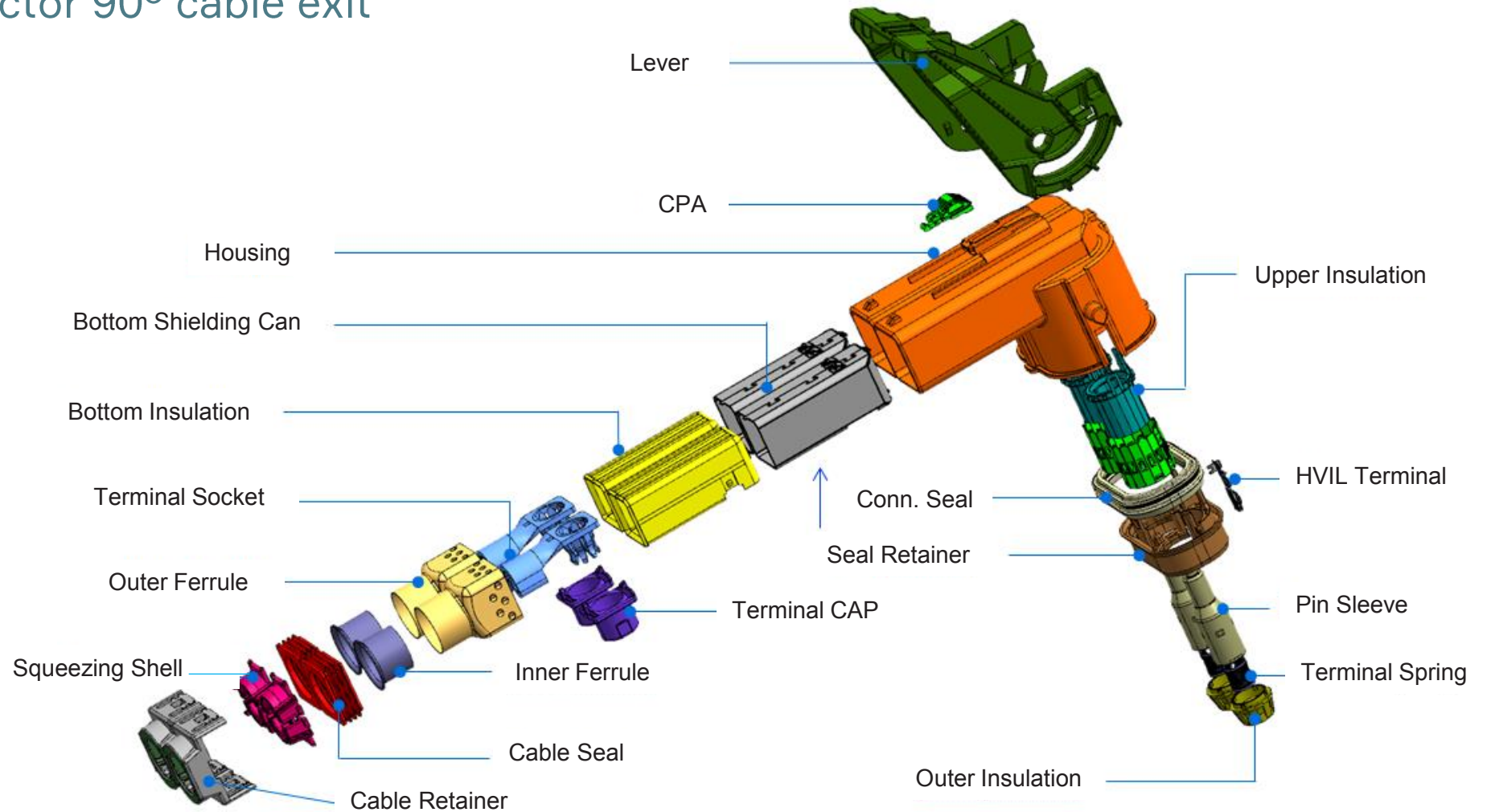
Male Header



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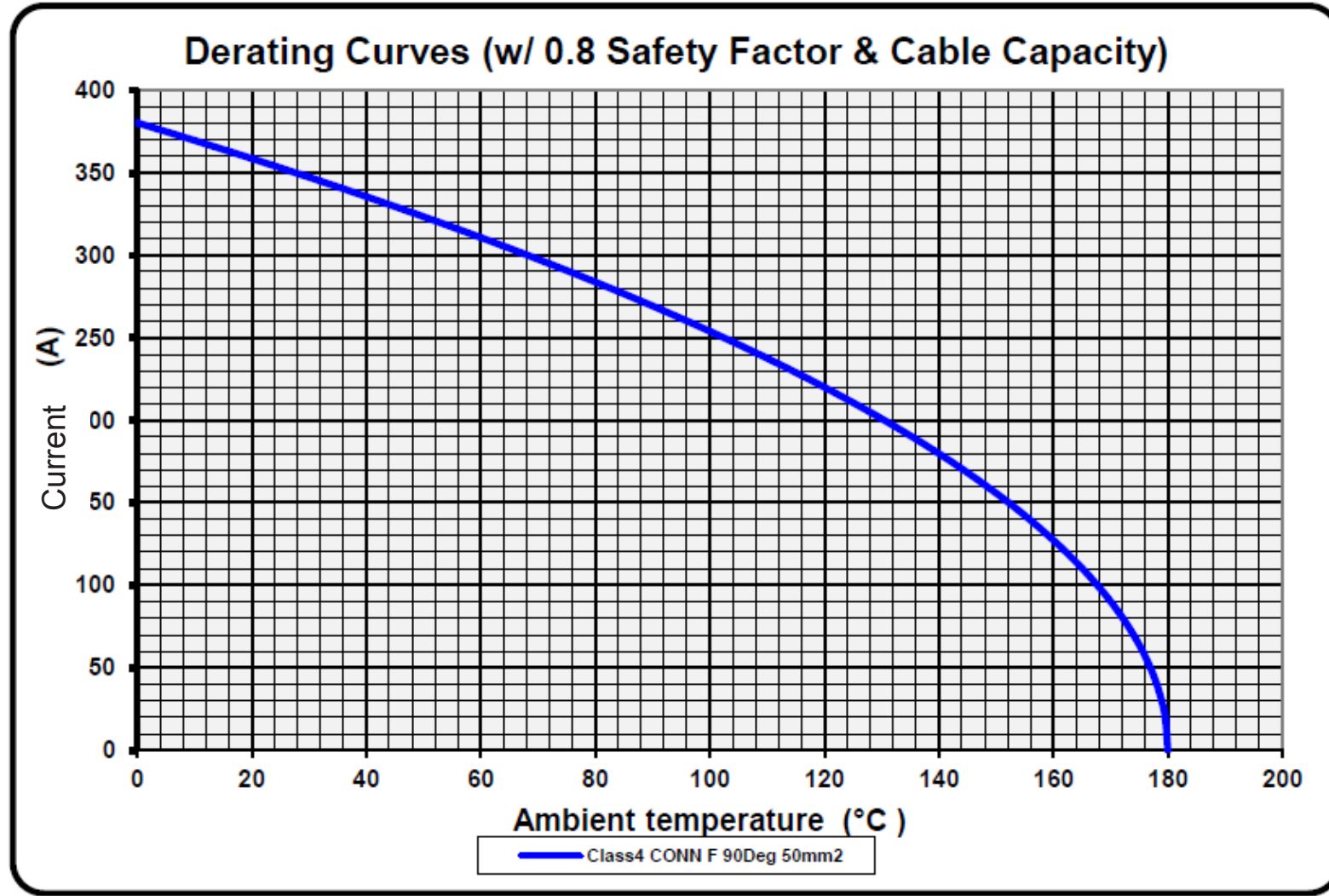
AK Class 4 exploded view

Female connector 90° cable exit



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AK Class 4 derating Curve



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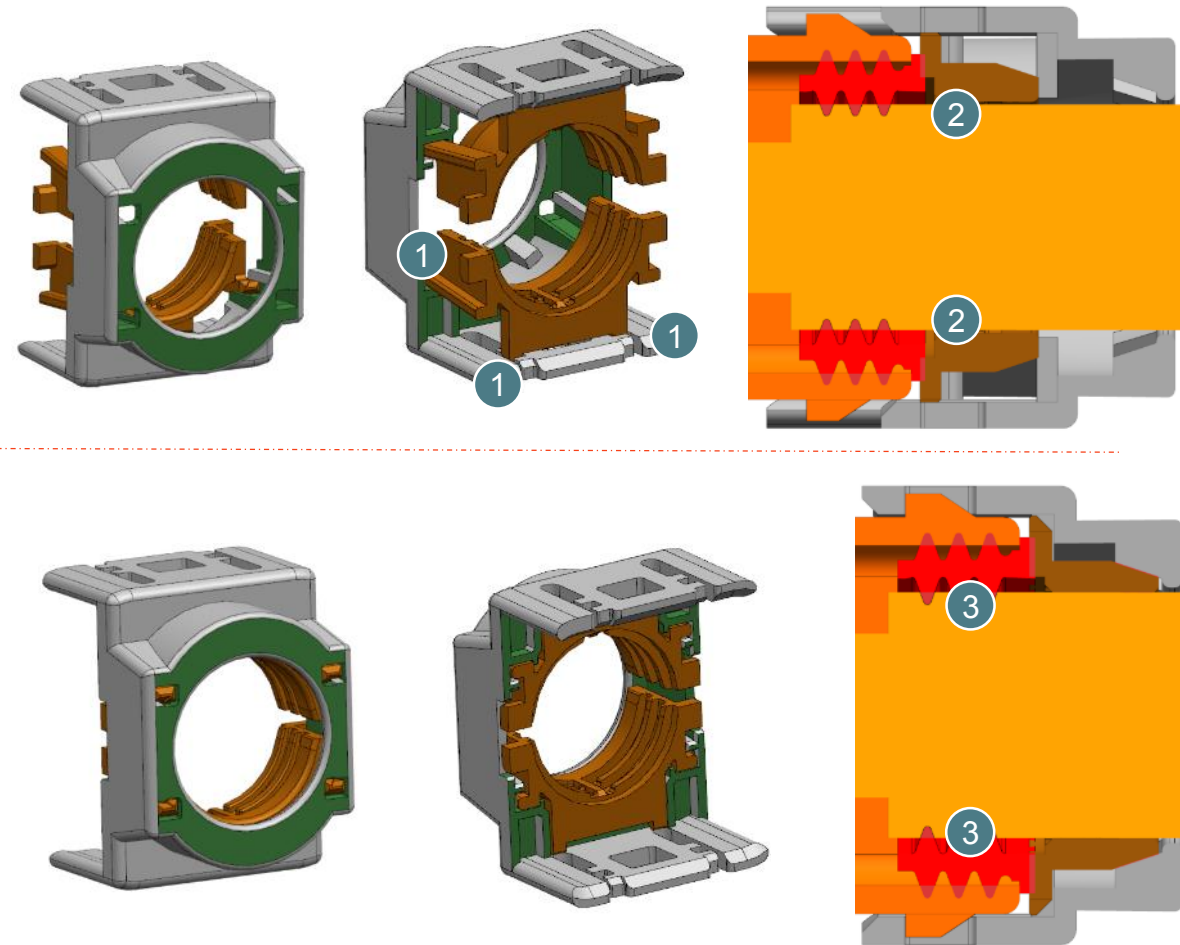
AK Class 4 technology

Cable Strain Relief innovations

Benefits

- Higher product robustness against vibrations

- 1 Lock for Pre-position
- 2 Keep gap on pre-position
- 3 Squeeze cable on final position



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AK Class 4 technology

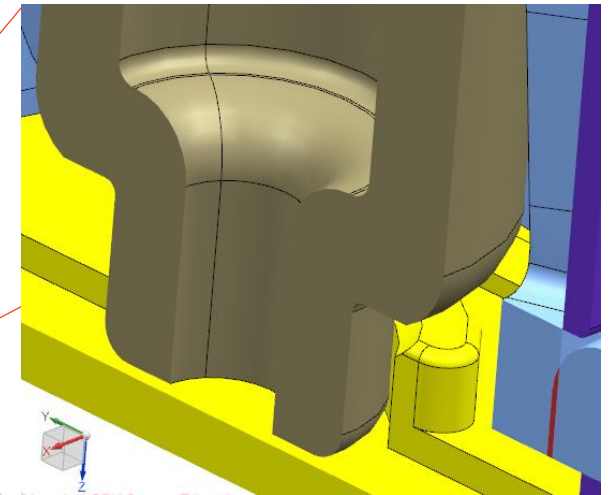
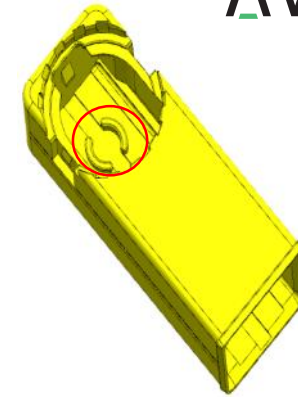
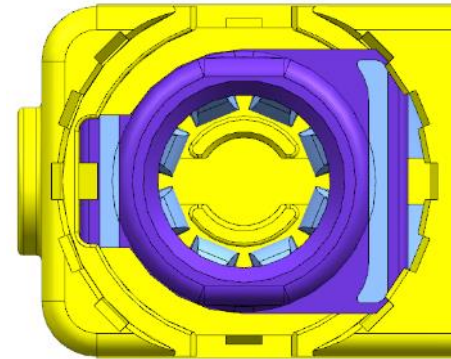
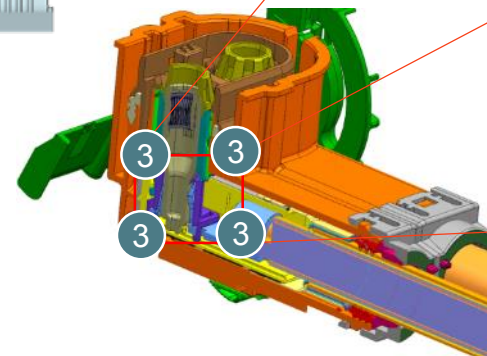
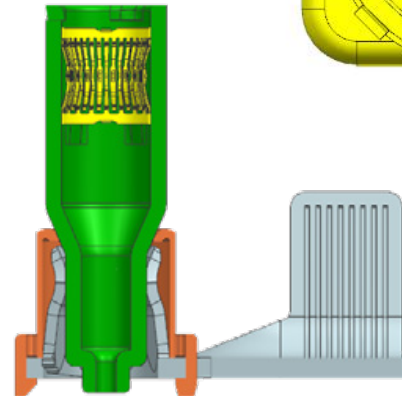
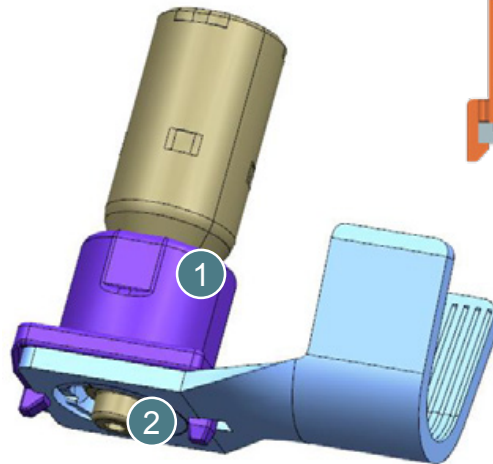
Terminal positioning innovations

AVNET ABACUS

Benefits

- Higher product robustness against vibrations

- 1 Terminal CAP
- 2 Terminal can be waggled along X,Y axis without fixed structure
- 3 Add the structure to fix the terminal after inserting.




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AK Class 4 part numbers


2 way Header Connector

AK Class 4 Header Connector	Description	Part Number	BOM
	AK4 2 Way Pin Header-Code A UL HB	35166503	1
	AK4 2 Way Pin Header-Code B UL HB	35166504	1
	AK4 2 Way Pin Header-Code C UL HB	35166505	1
	AK4 2 Way Pin Header-Code D UL HB	35166506	1
	AK4 2 Way Pin Header-Code A UL V0	33351454	1
	AK4 2 Way Pin Header-Code B UL V0	33351455	1
	MCON 1.2 Male terminal (TE)		1418760-3

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AK Class 4 part numbers

2 way Female Connector

AK Class 4 Female Connector	Description	Part Number	BOM	
	AK Class 4 female Code A	33355781	1	
	AK Class 4 female Code B	33355782	1	
	AK Class 4 female Code C	33355783	1	
	AK Class 4 female Code D	33355784	1	
	Outer insulation	35172730	2	
	Active Female Terminal	35172744	2	
	25 mm ²	Crimp Female Terminal 25mm	35172741	2
		Inner Ferrule 25mm ²	35172724	2
		Outer Ferrule 25mm ² - Ni plated	35172727	2
		ASM Strain Relief 25 mm ²	35172735	2
		Cable Seal 25mm ²	35172732	2
	35 mm ²	Crimp Female Terminal 35/50mm ²	35172742	2
		Inner Ferrule 35mm ²	35172725	2
		Outer Ferrule 35mm ² , Ni plated	35172728	2
		ASM Strain Relief 35 mm ²	35172736	2
		Cable Seal 35mm ²	35172733	2
	50 mm ²	Crimp Female Terminal 35/50mm ²	35172742	2
		Inner Ferrule for 50mm ²	35172726	2
		Outer Ferrule 50mm ² , Ni plated	35172729	2
		ASM Strain Relief 50 mm ²	35172737	2
Cable Seal 50mm ²		35172734	2	

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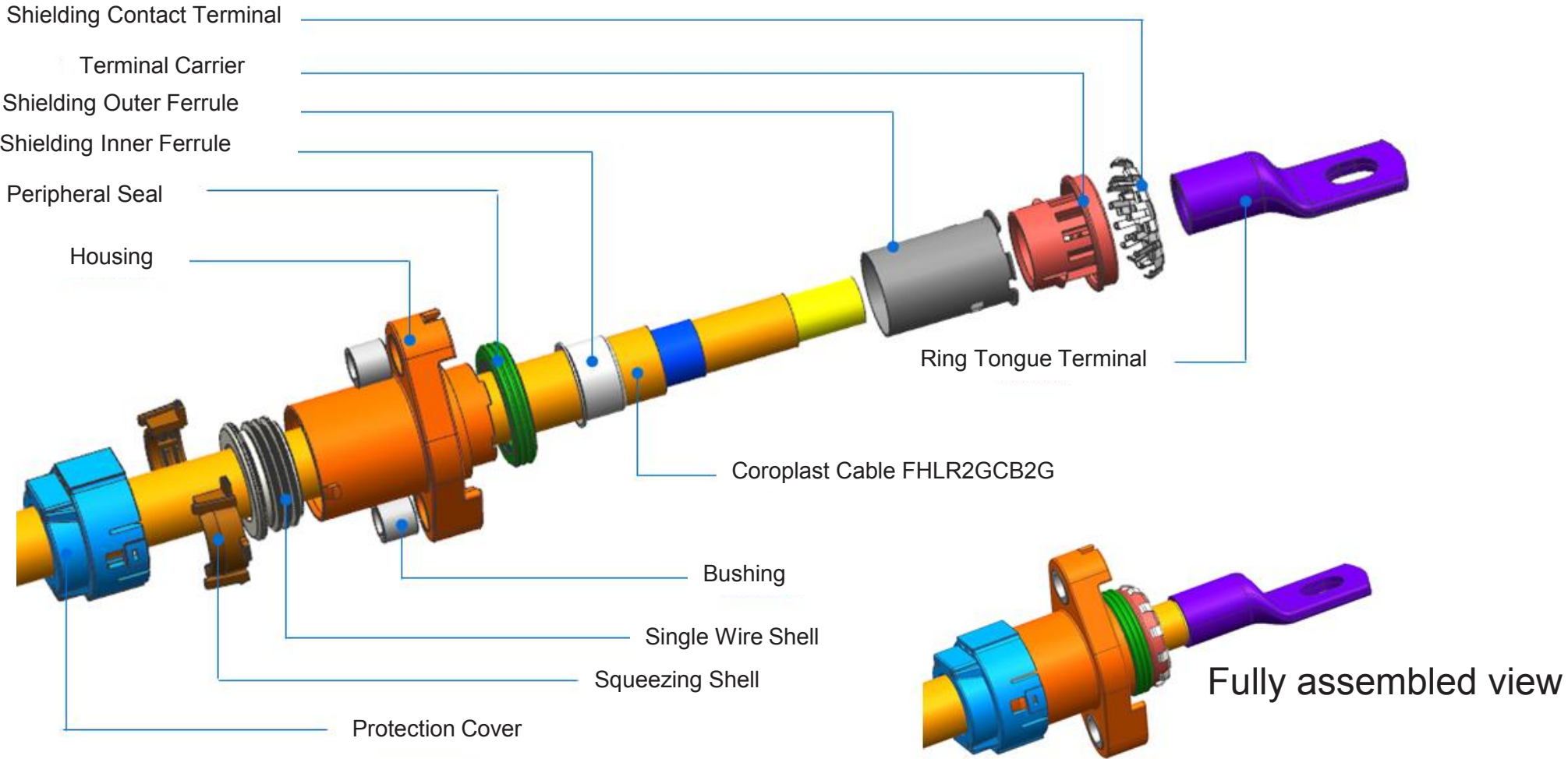
Technical Overview & Part Numbers

AK Class 1

AK Class 4

AK Pass-throughs

AK pass-through exploded view



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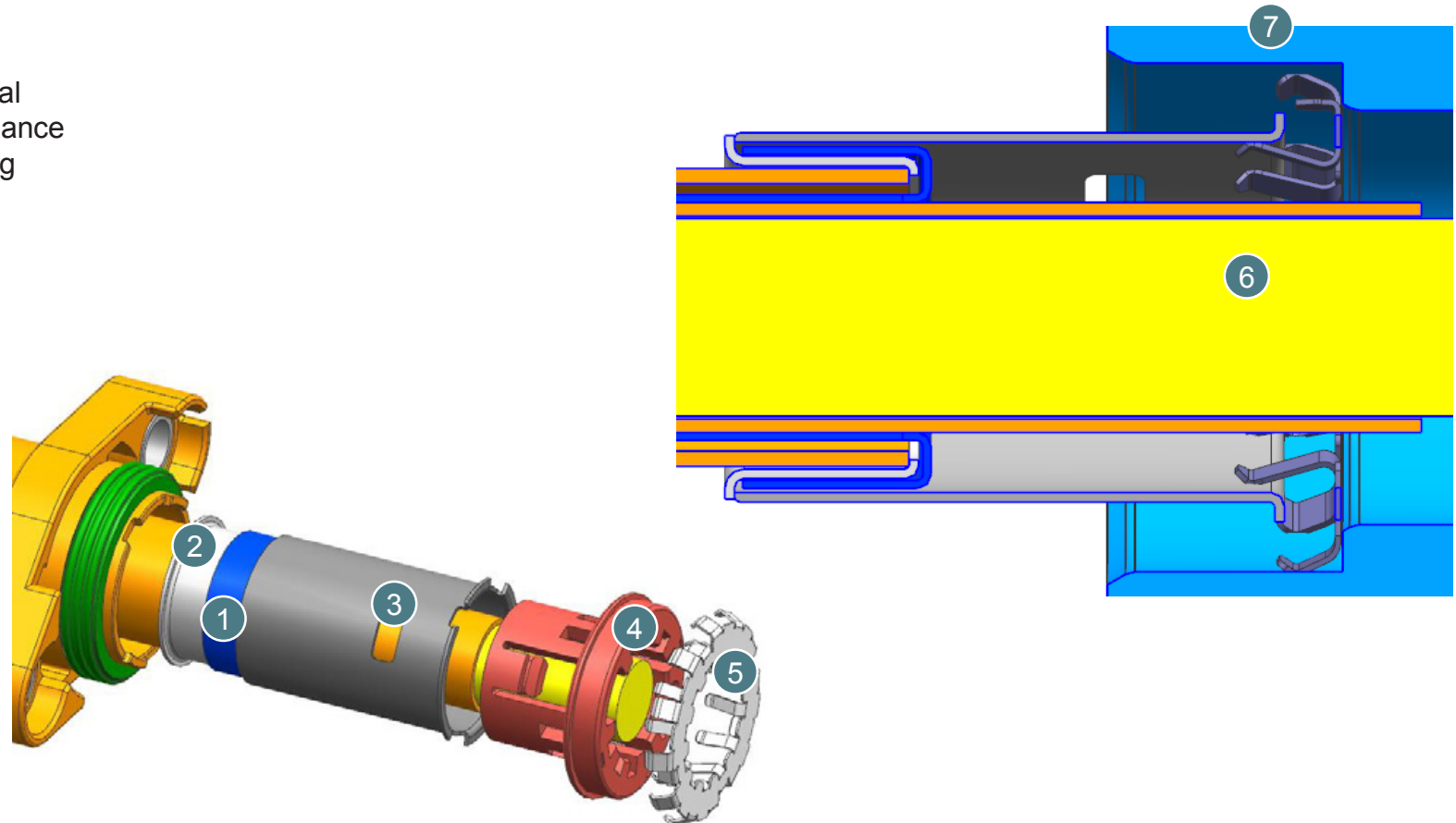
AK pass-through technology

Ferrule innovations

Benefits

- Aptiv Patented 360° shielding contact terminal
 - Ensure high level of shielding performance
 - Ease the shielding process and routing

- 1 Cable shielding
- 2 Shielding Inner Ferrule
- 3 Outer Ferrule
- 4 Terminal Carrier
- 5 Shielding contact terminal
- 6 12 Contact points with inner ferrule
- 7 12 Contact points with metal device



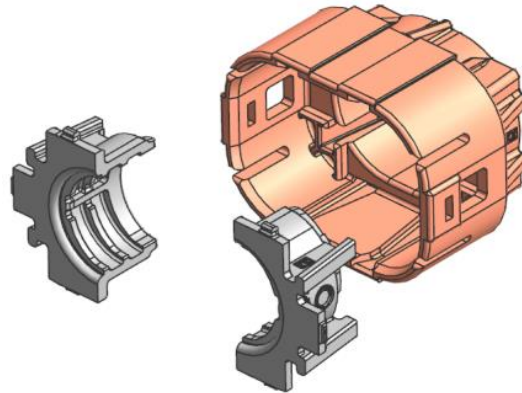
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AK pass-through technology

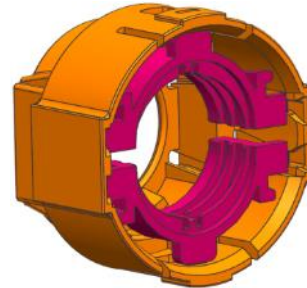
Cable strain relief innovations

Benefits

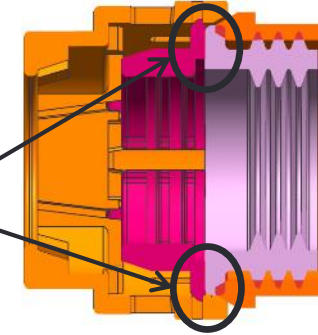
- Aptiv Patented cable squeezer :
 - increases the reliability of the cable sealing
 - provides more robust anti-vibration performance



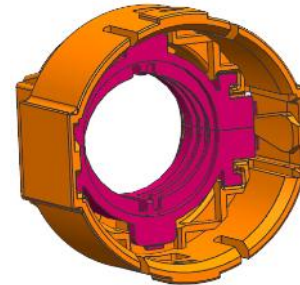
Pre-Position



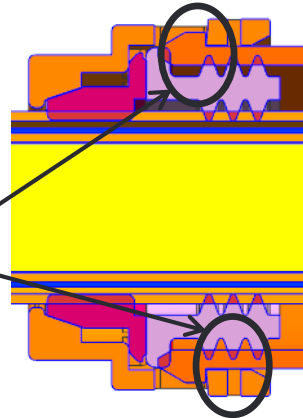
Lock of Pre-position



Final Position
置




Squeeze cable to fixture it



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AK Pass-through part numbers


1 way

AK pass-through 1 way	Description	Part Number	BOM
	ASM AK pass-through 1-way Code A	33340524	1
	ASM AK pass-through 1-way Code B	35066699	1
	Peripheral Seal	35116341	1
	ASM Shielding Inner Ferrule	35172747	1
	16 mm ² Single Wire Seal for 16 mm ² cable	33340537	1
	16 mm ² Protection Cover Assembly for 16mm ²	33340542	1
	16 mm ² Shielding Outer Ferrule for 16 mm ² cable	33340554	1
	25 mm ² Single Wire Seal for 25 mm ² cable	35172739	1
	25 mm ² Protection Cover Assembly for 25 mm ² cable	33340541	1
	25 mm ² Shielding Outer Ferrule for 25 mm ² cable	35172745	1
	35 mm ² Single Wire Seal for 35 mm ² cable,	35172738	1
	35 mm ² Protection Cover Assembly for 35 mm ² cable	33340540	1
	35 mm ² Shielding Outer Ferrule for 35 mm ² cable	35172743	1
	50 mm ² Single Wire Seal for 50 mm ² cable,	33340534	1
	50 mm ² Protection Cover Assembly for 50 mm ² cable	33340539	1
50 mm ² Shielding Outer Ferrule for 50 mm ² cable	33340551	1	

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AK Pass-through part numbers


2 way

AK pass-through 2 way	Description	Part Number	BOM	
 <p>16 – 50 mm configurations available</p>	ASM AK pass-through 2-way	33340525	1	
	Peripheral Seal	35116341	2	
	ASM Shielding Inner Ferrule	35172747	2	
	16 mm ²	Single Wire Seal for 16 mm ² cable	33340537	2
		Protection Cover Assembly for 16mm ²	33340542	2
		Shielding Outer Ferrule for 16 mm ² cable	33340554	2
	25 mm ²	Single Wire Seal for 25 mm ² cable	35172739	2
		Protection Cover Assembly for 25 mm ² cable	33340541	2
		Shielding Outer Ferrule for 25 mm ² cable	35172745	2
	35 mm ²	Single Wire Seal for 35 mm ² cable,	35172738	2
		Protection Cover Assembly for 35 mm ² cable	33340540	2
		Shielding Outer Ferrule for 35 mm ² cable	35172743	2
	50 mm ²	Single Wire Seal for 50 mm ² cable,	33340534	2
Protection Cover Assembly for 50 mm ² cable		33340539	2	
Shielding Outer Ferrule for 50 mm ² cable		33340551	2	

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AK Pass-through part numbers

3 way

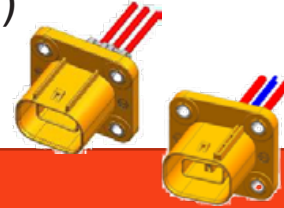
AK pass-through 3 way	Description	Part Number	BOM	
 <p data-bbox="122 1106 591 1139">16 – 50 mm configurations available</p>	ASM AK pass-through 3-way	33340526	1	
	Peripheral Seal	35116341	3	
	ASM Shielding Inner Ferrule	35172747	3	
	16 mm ²	Single Wire Seal for 16 mm ² cable	33340537	3
		Protection Cover Assembly for 16mm ²	33340542	3
		Shielding Outer Ferrule for 16 mm ² cable	33340554	3
	25 mm ²	Single Wire Seal for 25 mm ² cable	35172739	3
		Protection Cover Assembly for 25 mm ² cable	33340541	3
		Shielding Outer Ferrule for 25 mm ² cable	35172745	3
	35 mm ²	Single Wire Seal for 35 mm ² cable,	35172738	3
		Protection Cover Assembly for 35 mm ² cable	33340540	3
		Shielding Outer Ferrule for 35 mm ² cable	35172743	3
	50 mm ²	Single Wire Seal for 50 mm ² cable,	33340534	3
		Protection Cover Assembly for 50 mm ² cable	33340539	3
		Shielding Outer Ferrule for 50 mm ² cable	33340551	3

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Roadmap

2019

AK Class 1 header
(2 & 3 ways)



Q1

Q2

Q3

Q4

Available NOW:

- AK Class 1 female connector (2 & 3 ways)
- AK Class 4 header and right angle female (2 ways)
- AK Pass-through (1, 2 & 3 ways)

AK Class 4 straight female
connector (2 ways)



Key takeaway points

- **Standard AK interface** well recognized on the automotive and commercial vehicle market.
- Perfect for design in activities and **fully interchangeable with other suppliers**
- Wide inventory can be **fully available**
- **All crimping and assemble tooling** for these products are available at Aptiv

Thank you.