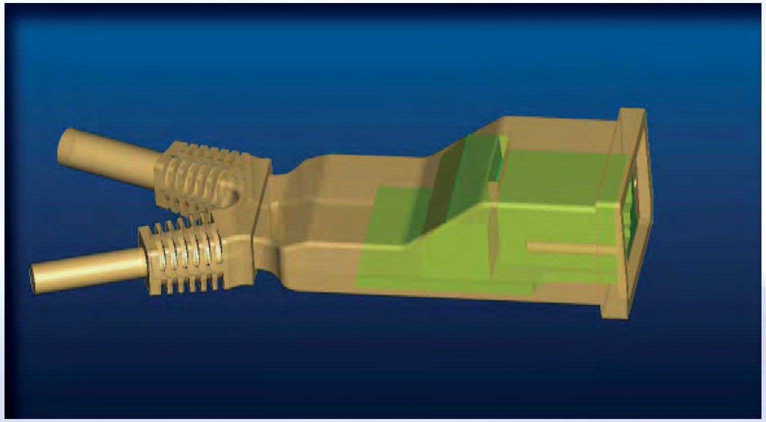
MECATRONIC
SOLUTIONS & SERVICE

Hot Melt & Jet Melt Technology

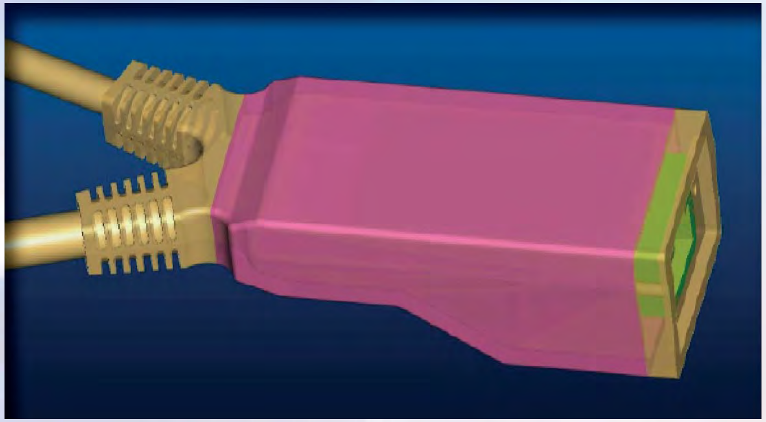
photobook v.3.0

SPLITTER

Two shots Product

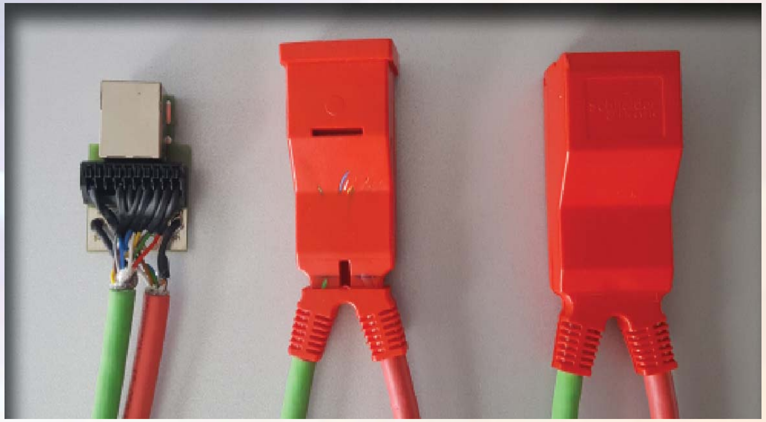


1st Shot

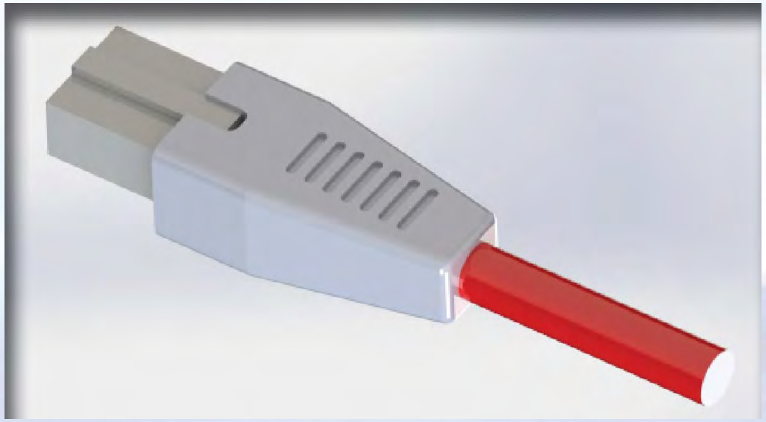


2nd Shot

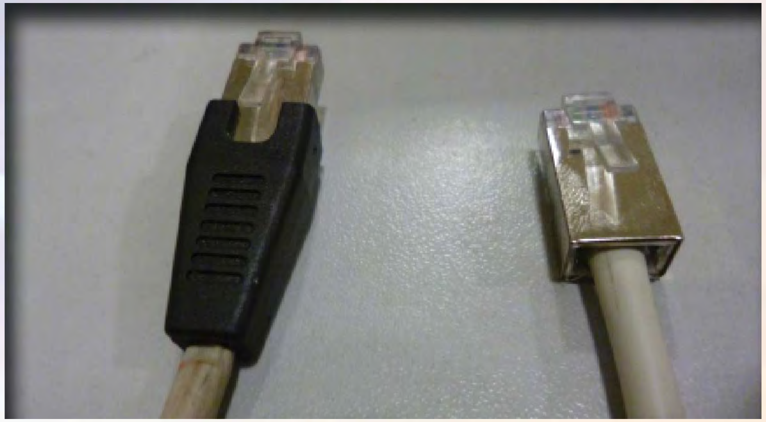
2nd Cavity 1st Cavity



RJ45 CONNECTOR



Two cavities mold - Horizontal Injection



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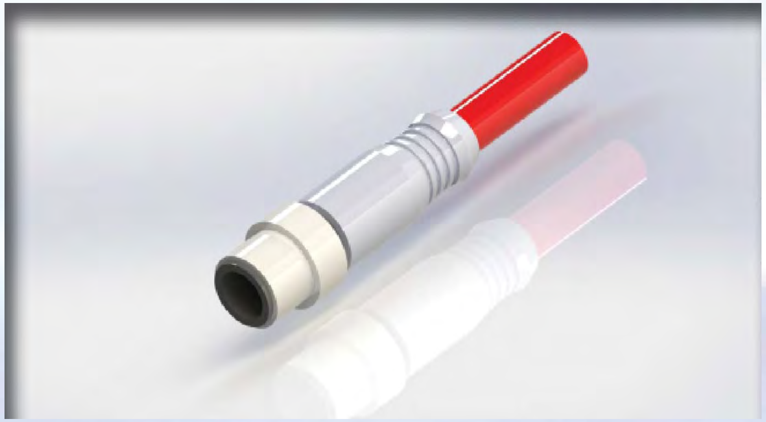
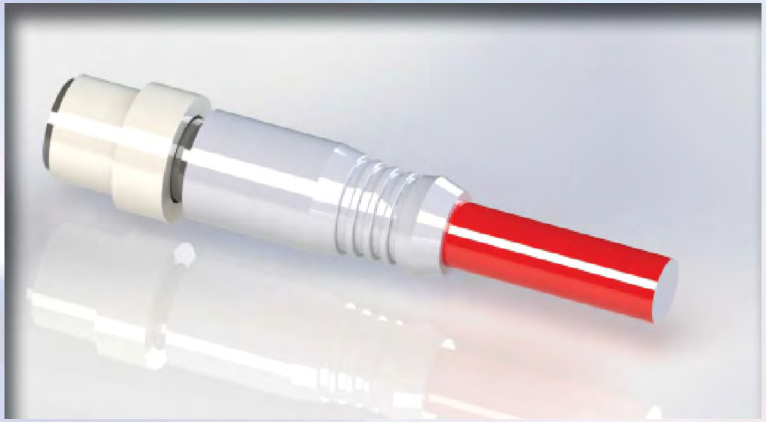
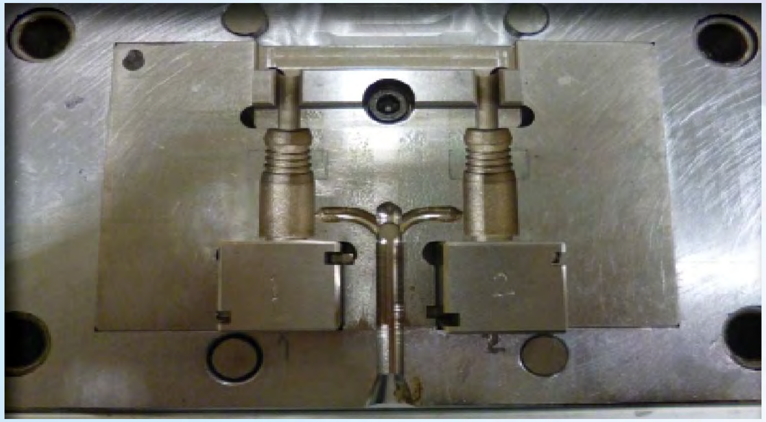
M12 CONNECTOR
MALE AND FEMALE

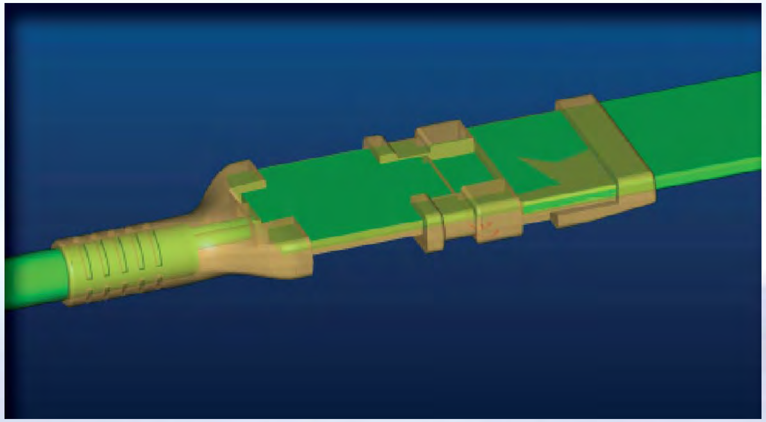




Two cavities mold - Horizontal Injection



ROUND JUNCTION & FLAT CABLE



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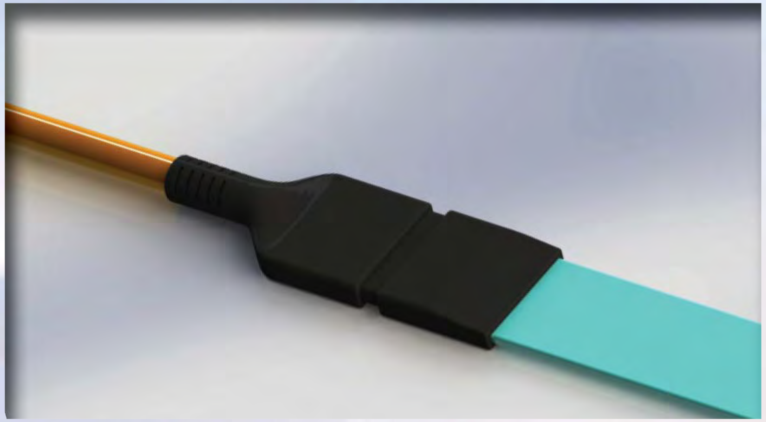
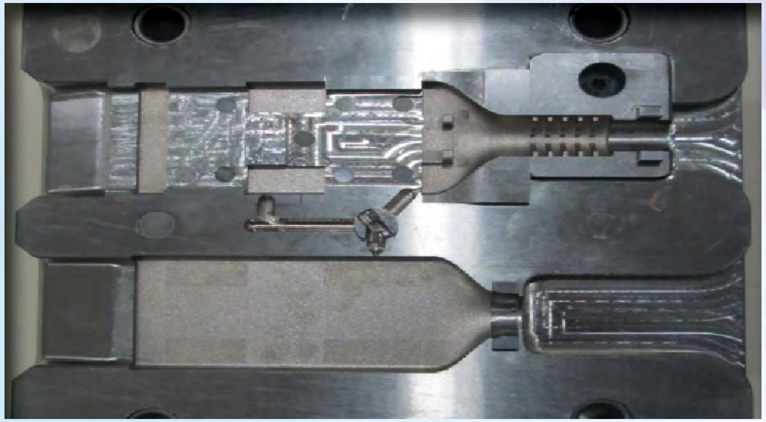
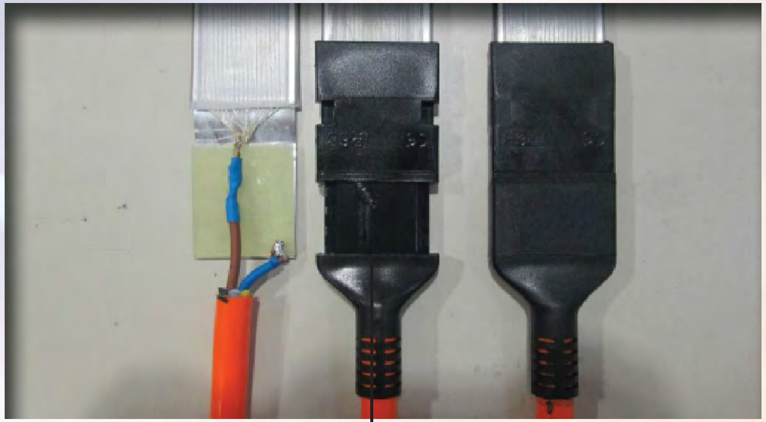


2nd Shot





Assembling 1st Shot 2nd Shot

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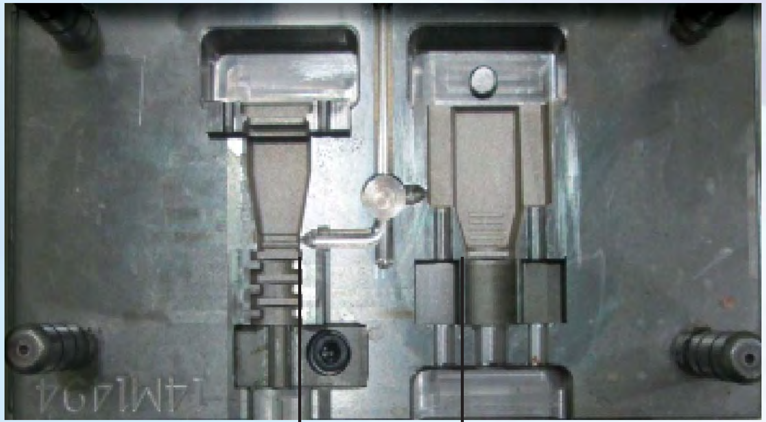
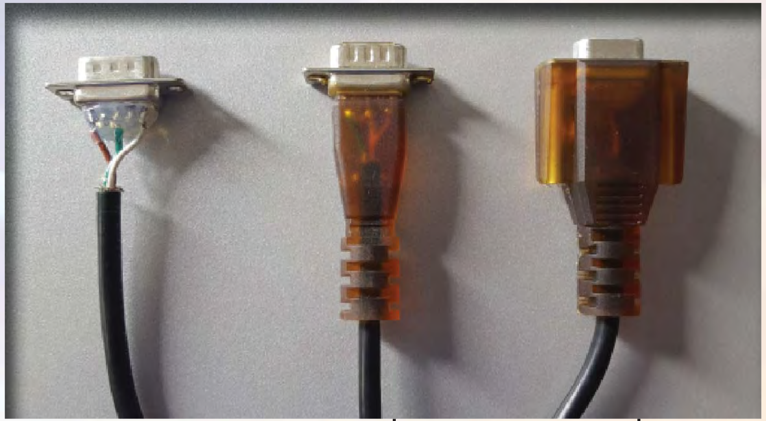
SUB-D 9 POLES CONNECTOR

Two cavities mold - Horizontal Injection

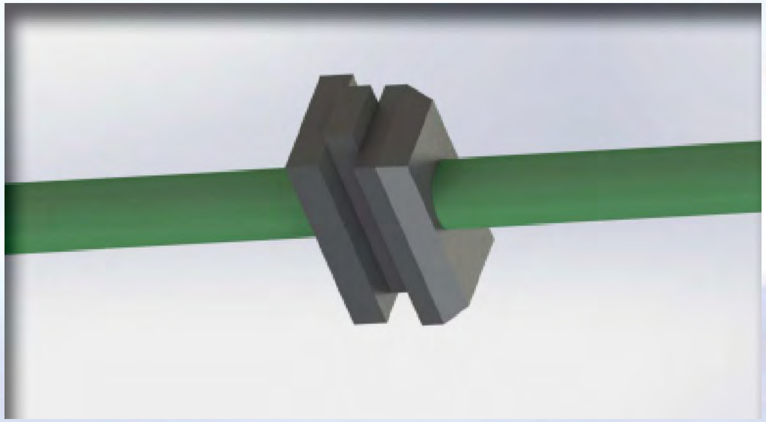


1st Cavity 2nd Cavity

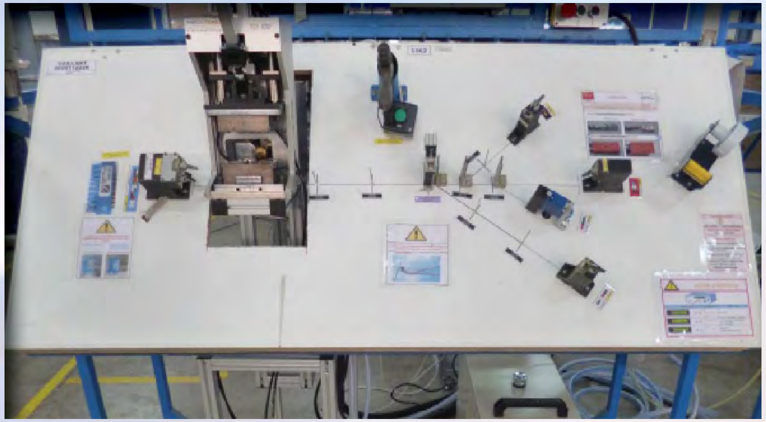


Assembling 1st Shot 2nd Shot

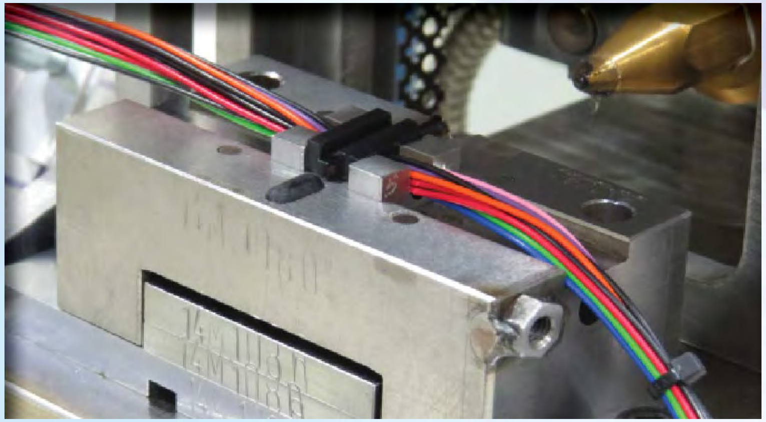
CABLE STOP

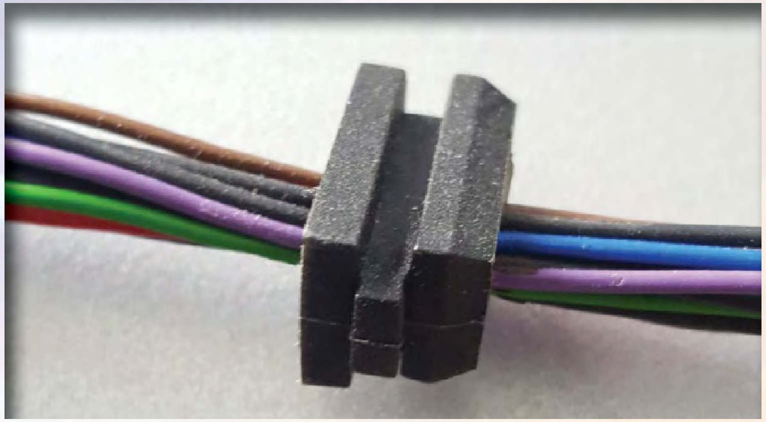


One Cavity mold - Horizontal Injection



Injection molding on assembling table





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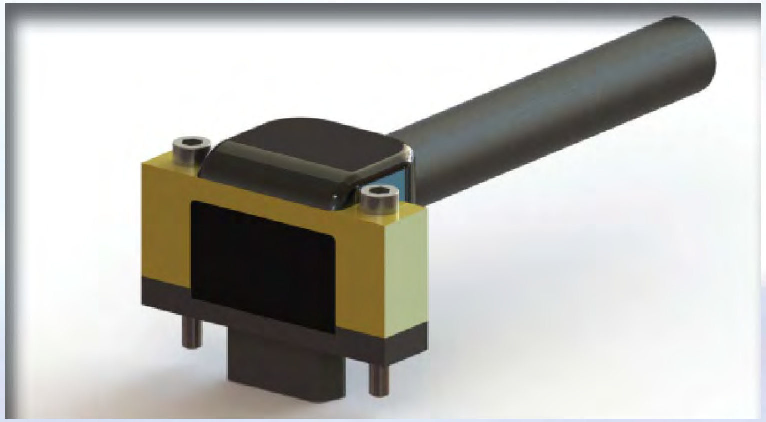
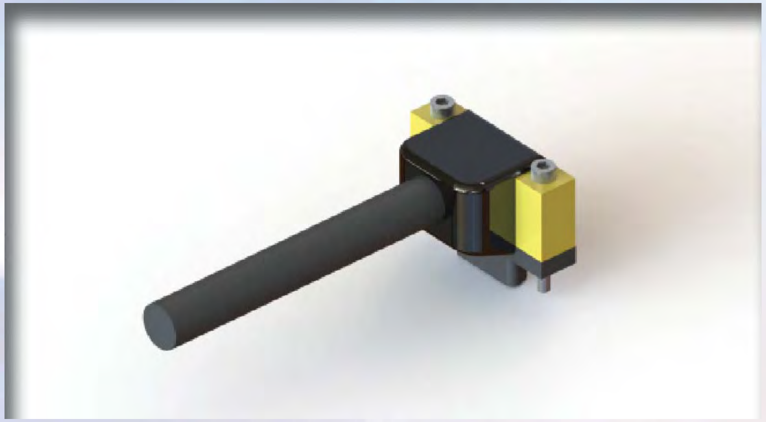
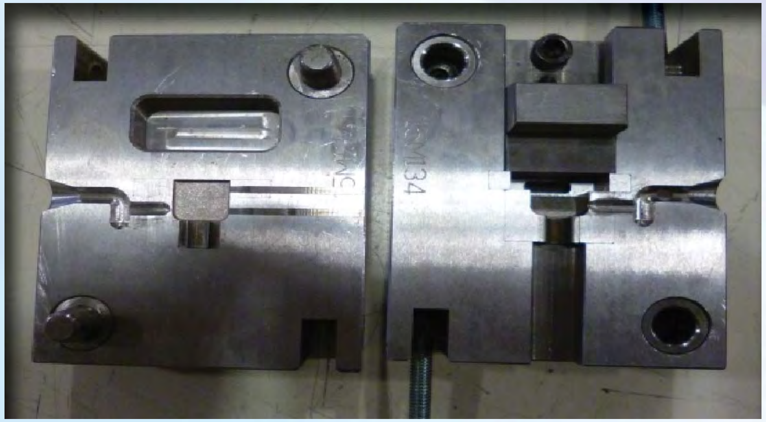
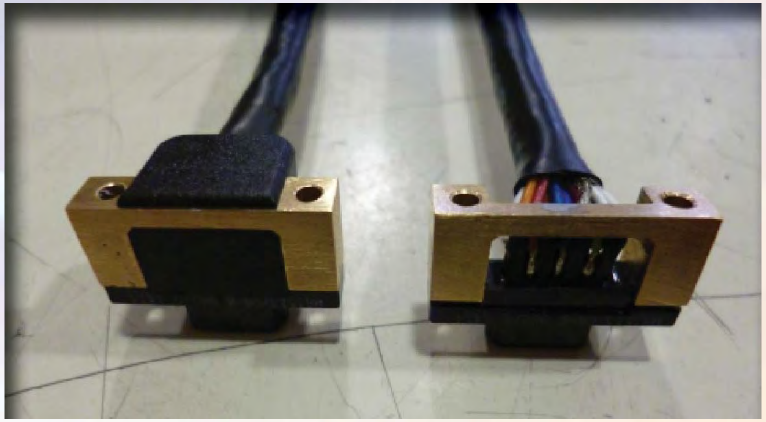
MICRO-D METAL SHELL CONNECTOR





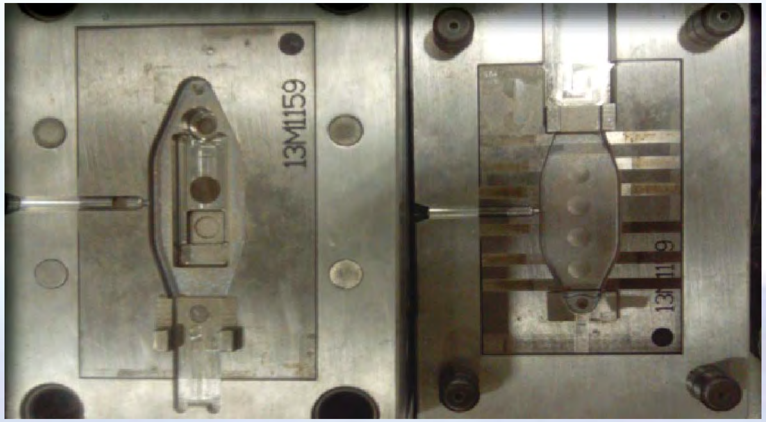




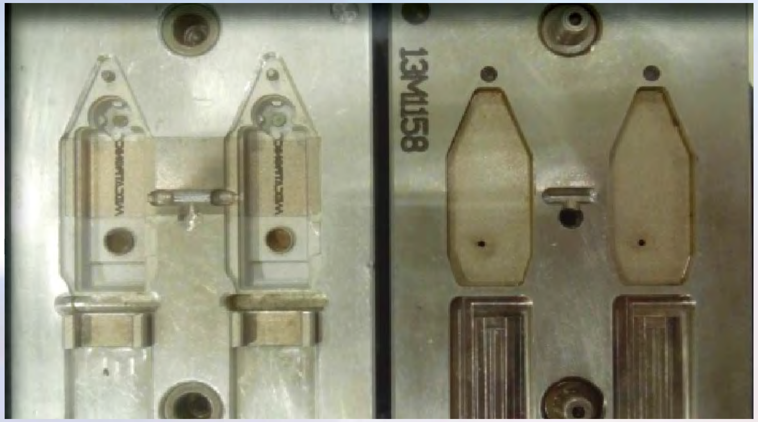
Manual Injection mold

LED PENDRIVE

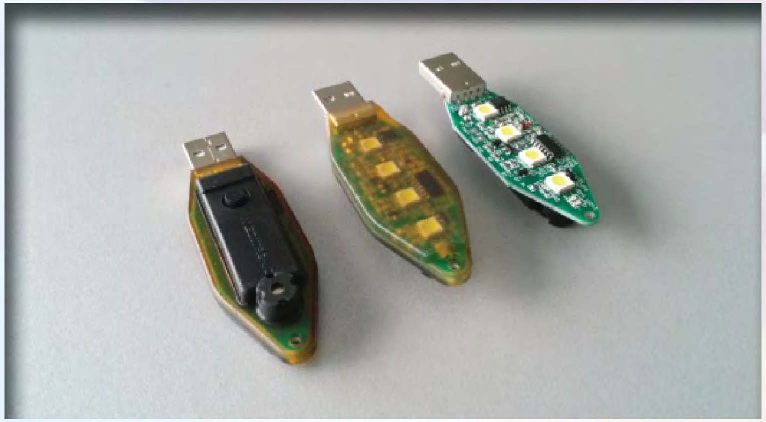
Two side
double shot injection



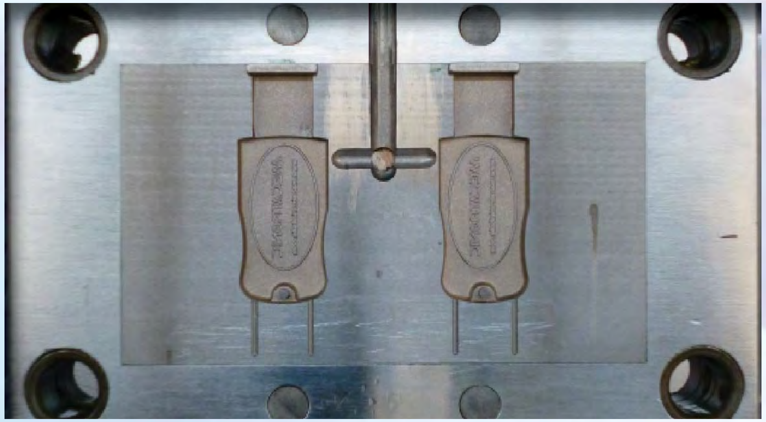
Mold 1 - One cavity, Horizontal Injection
First Shot



Mold 2 - Two cavities, Vertical Injection
Final Shot



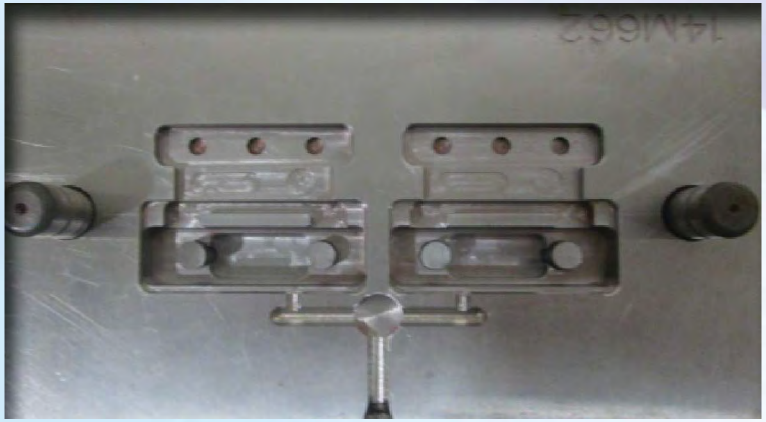
USB PENDRIVE

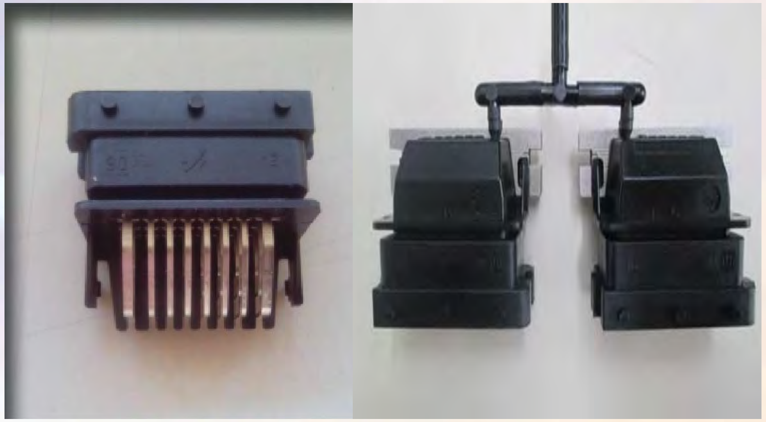


Two cavities mold - Horizontal Injection

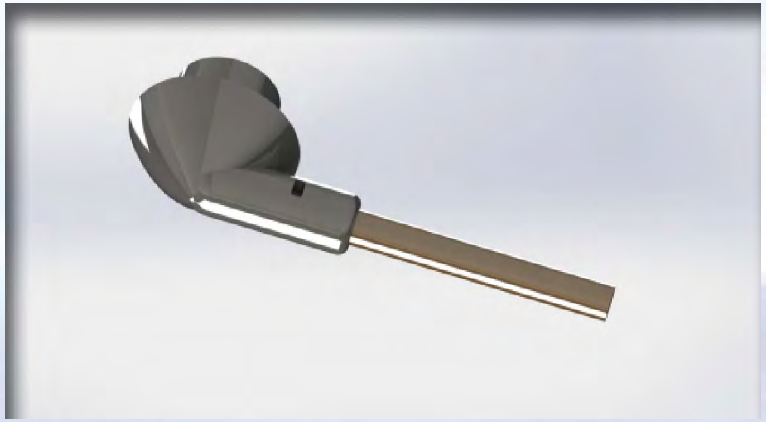
PBT-GF-15 CONNECTOR

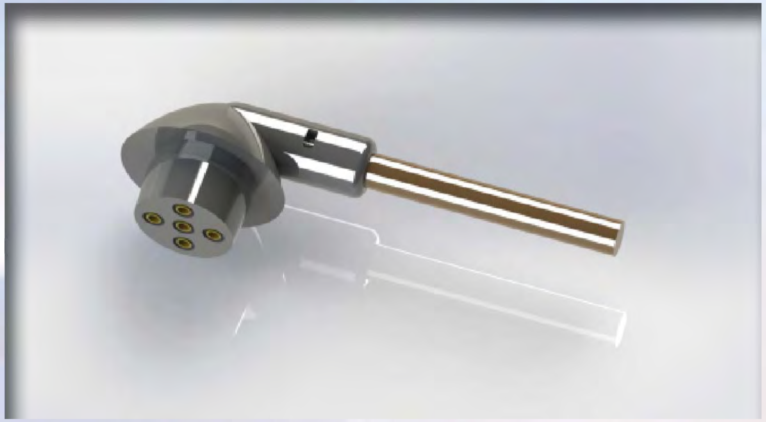
Two cavities mold - Horizontal Injection



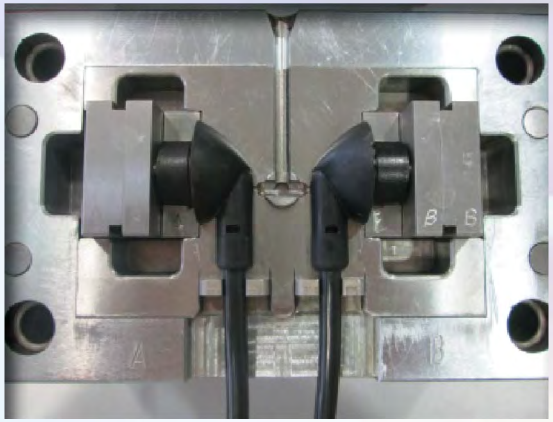


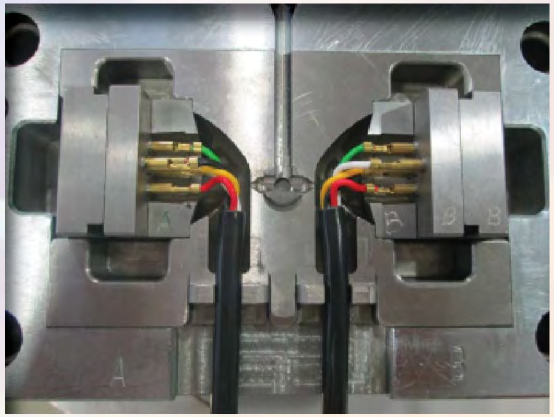
CONNECTOR PIPE





Two cavities mold - Horizontal Injection





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UTG14AC CONNECTOR

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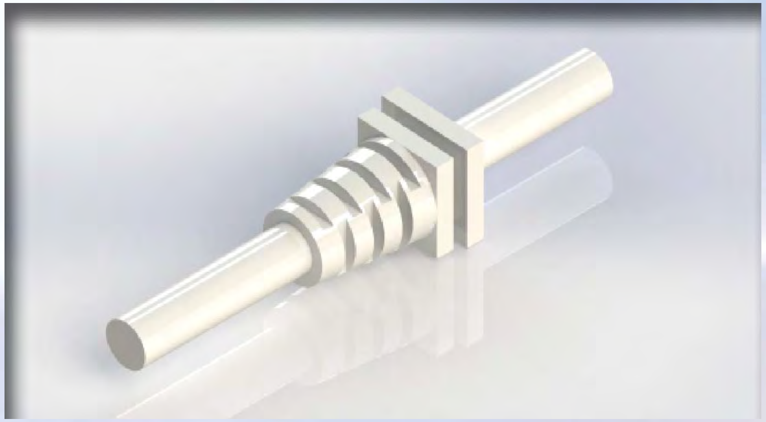
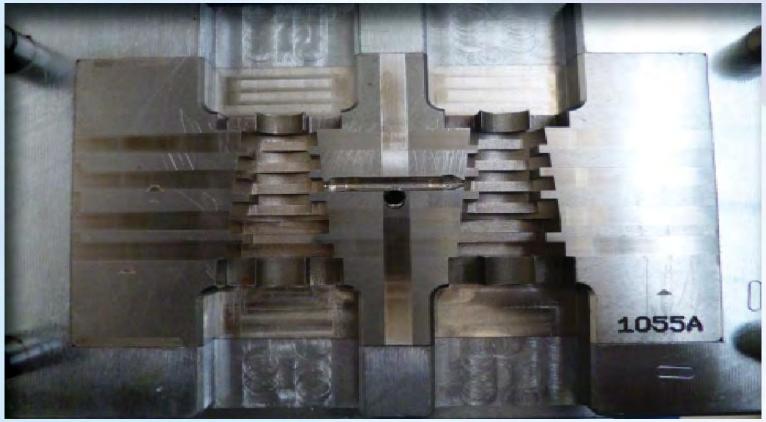
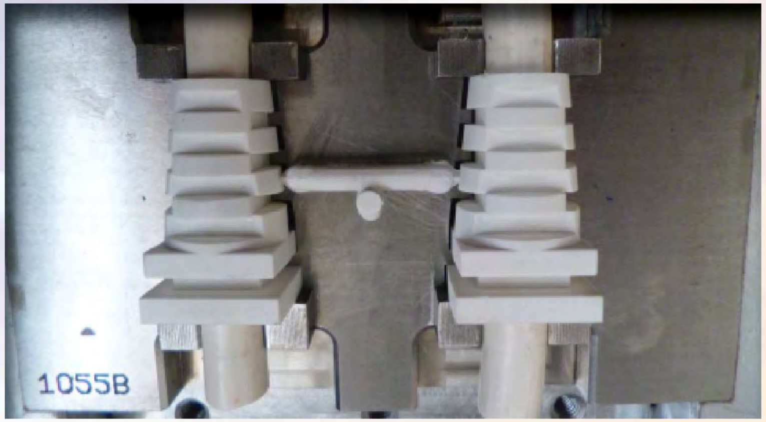
CABLE STOP

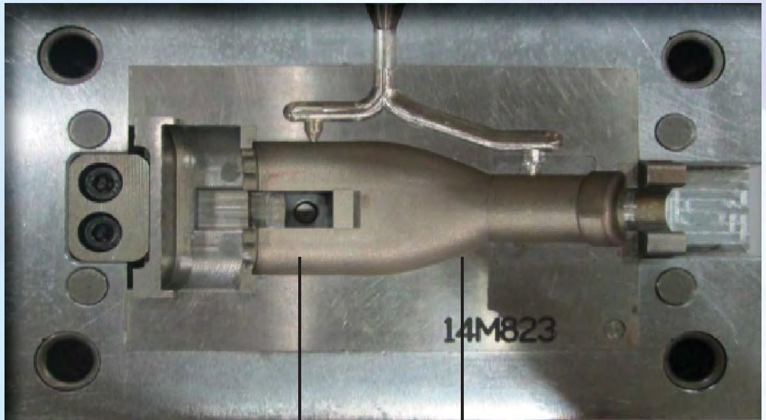


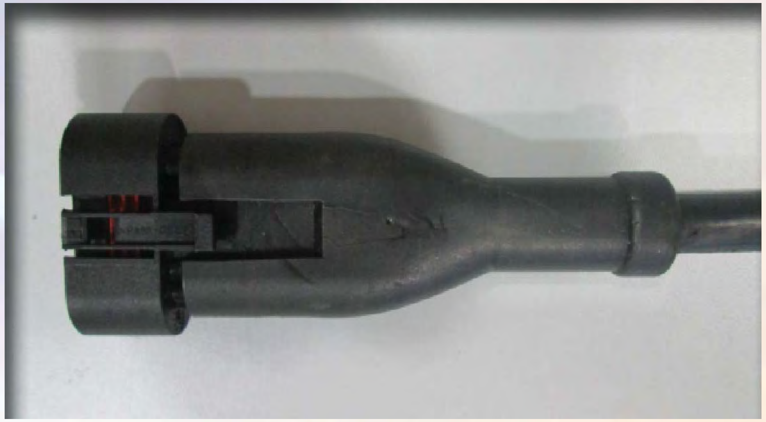
Two cavities mold - Vertical Injection





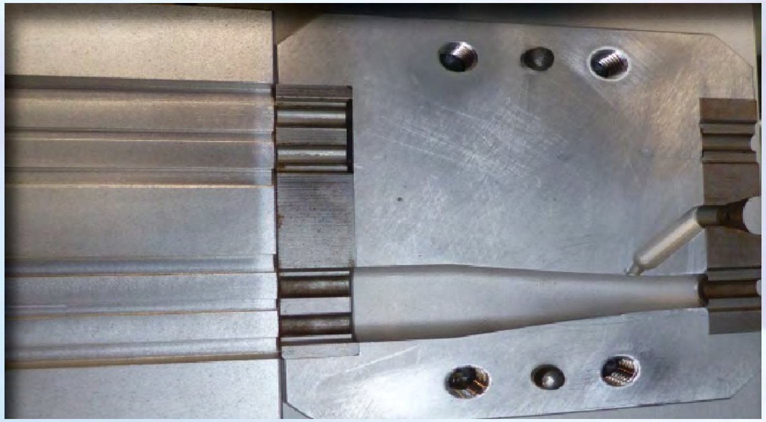
PA66 - GF - 25 CONNECTOR





One cavity mold - Horizontal Injection

Y JUNCTION



One cavity mold - Horizontal Injection

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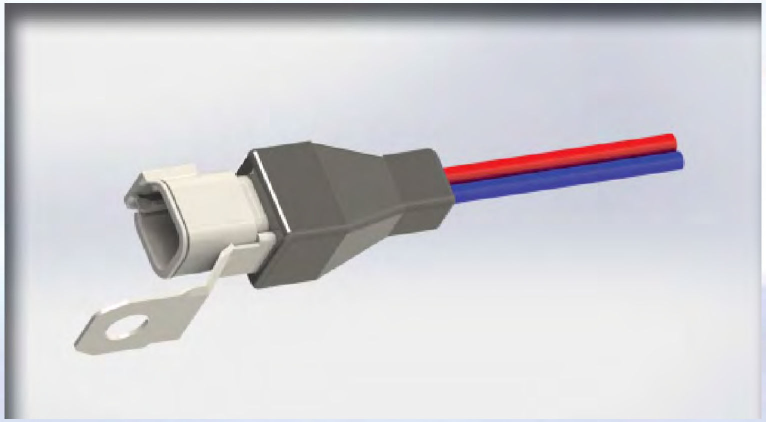
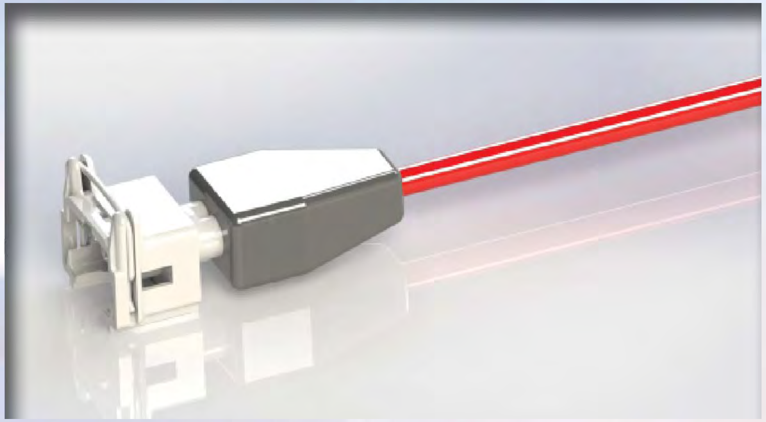
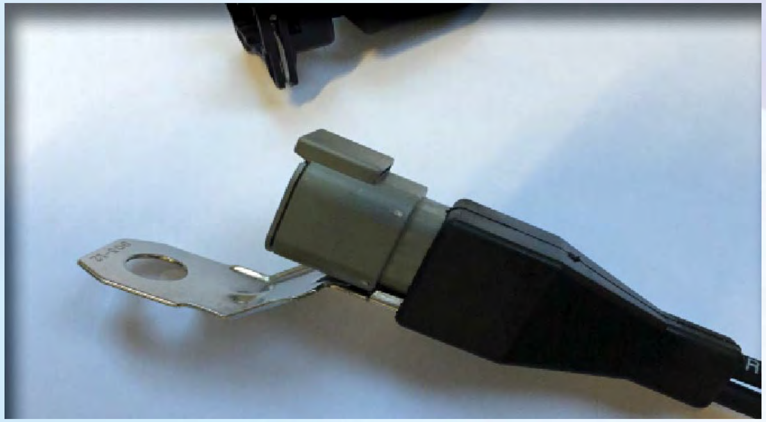
DTM - JPT CONNECTOR







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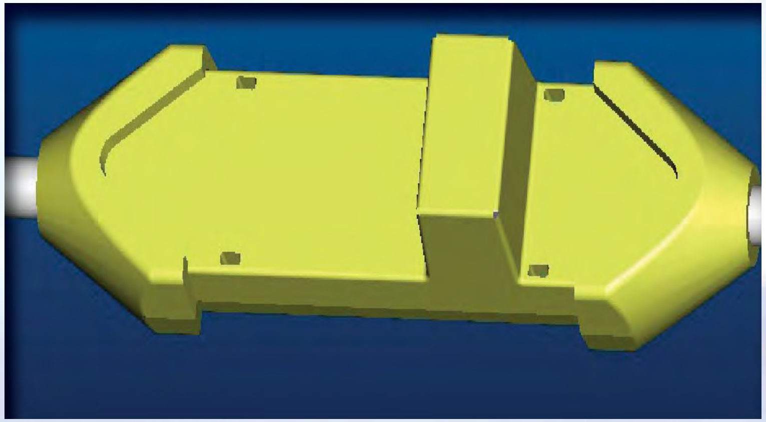
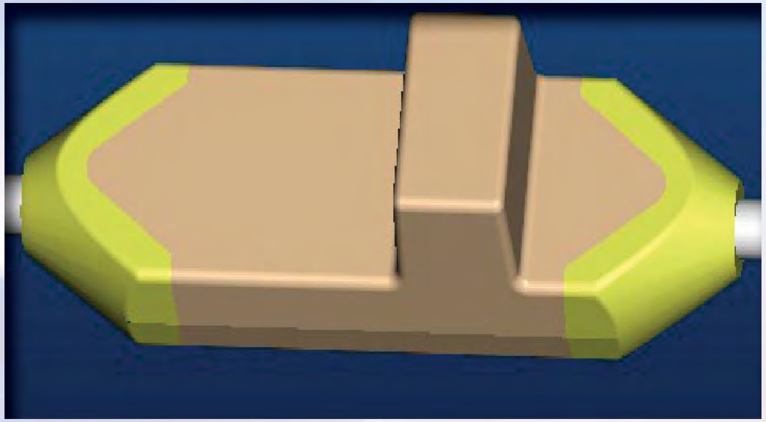
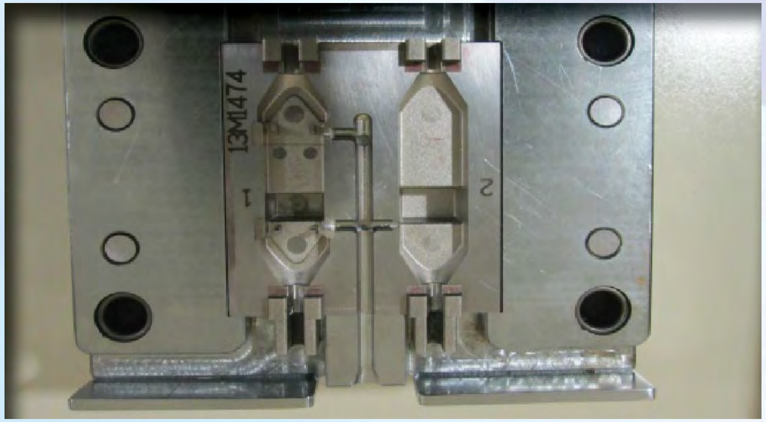
USB-HUB REPEATER

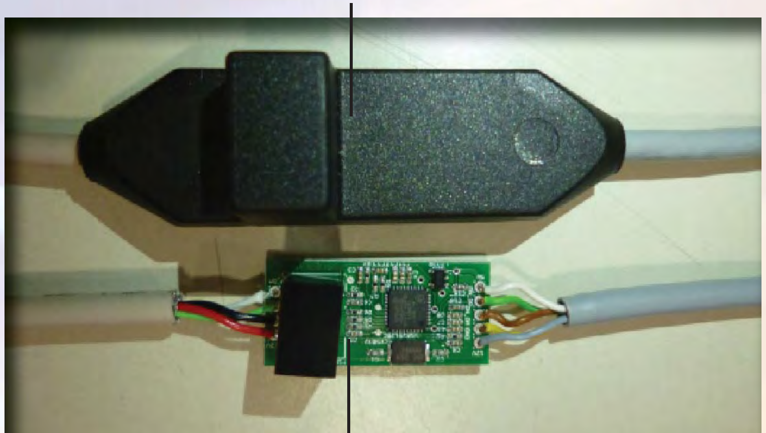




Two cavities mold - Horizontal Injection

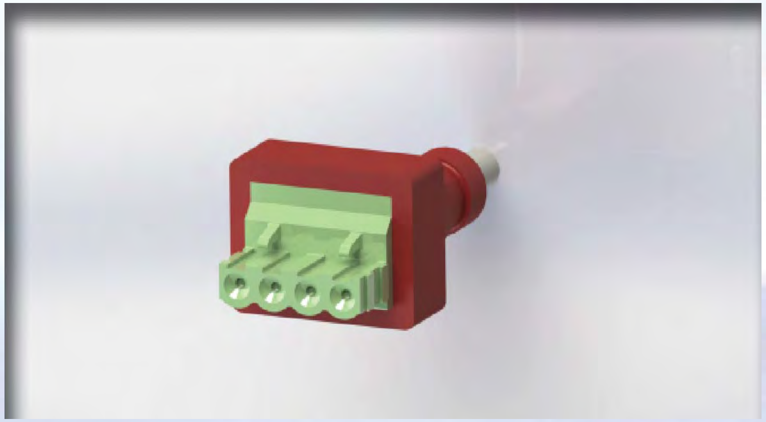
2nd Shot

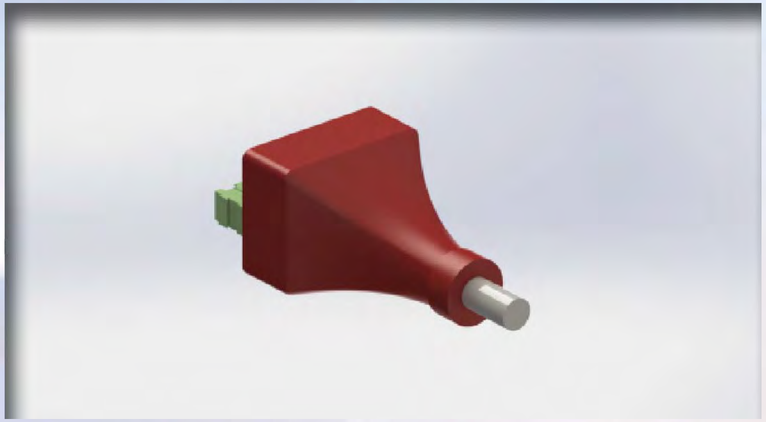




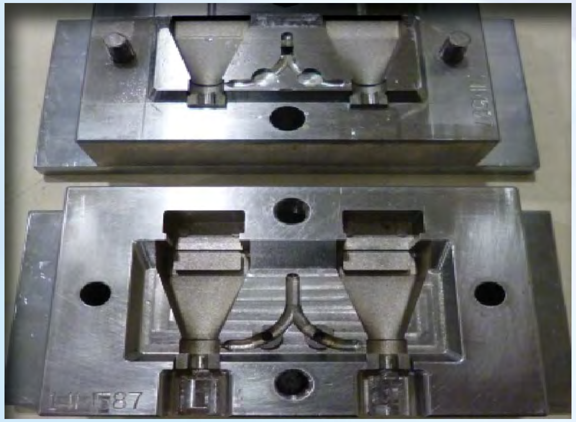
PCB

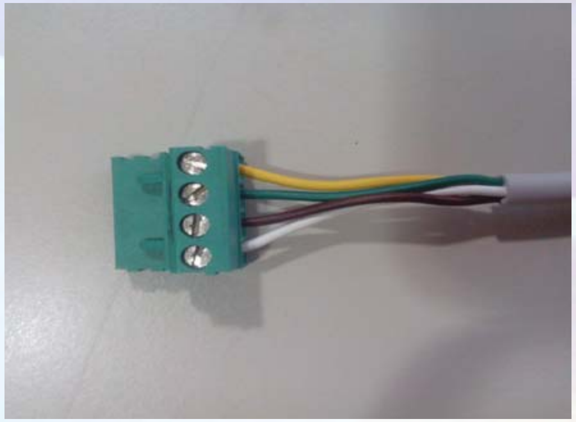
CIF040M5 CONNECTOR

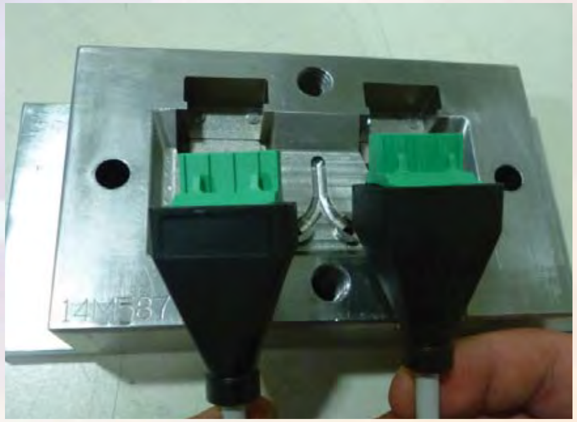




Two cavities mold - Vertical Injection







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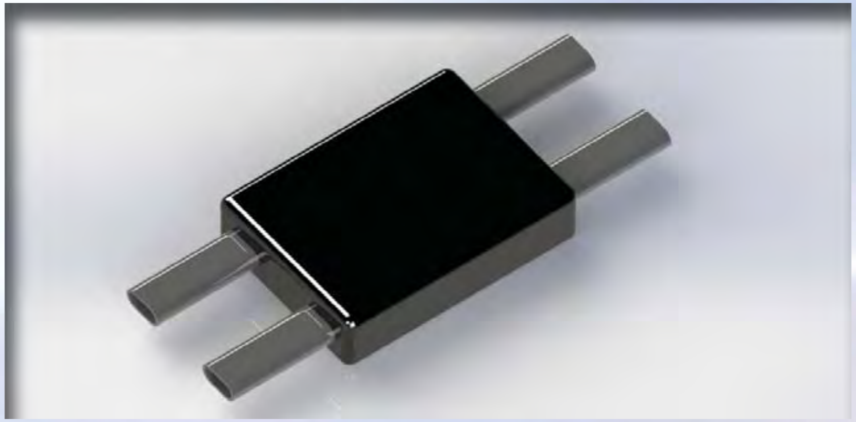
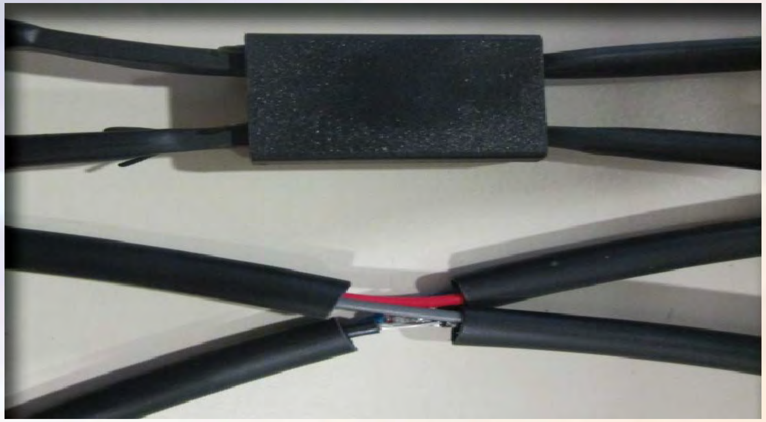
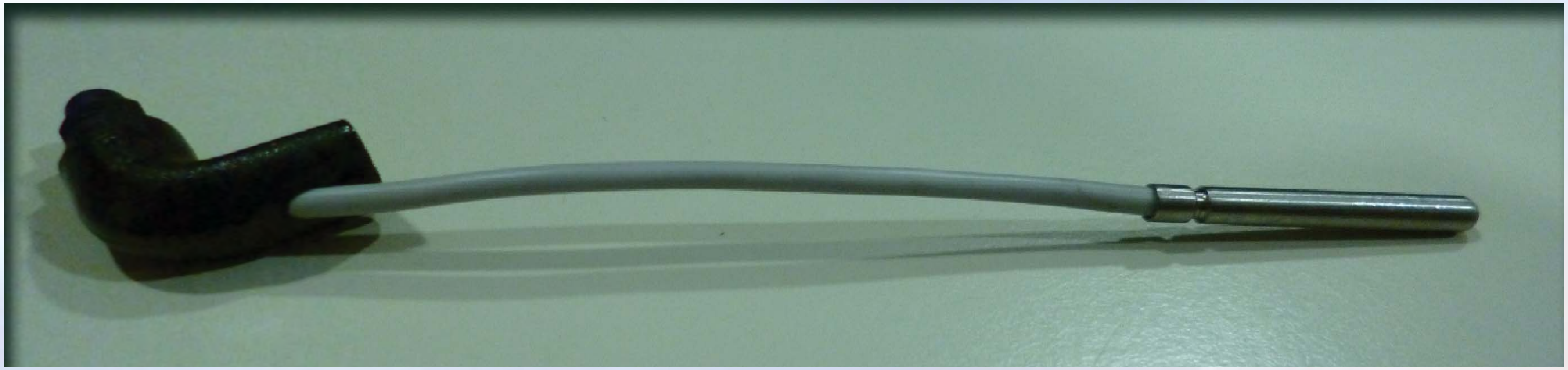
4 WAY JUNCTION

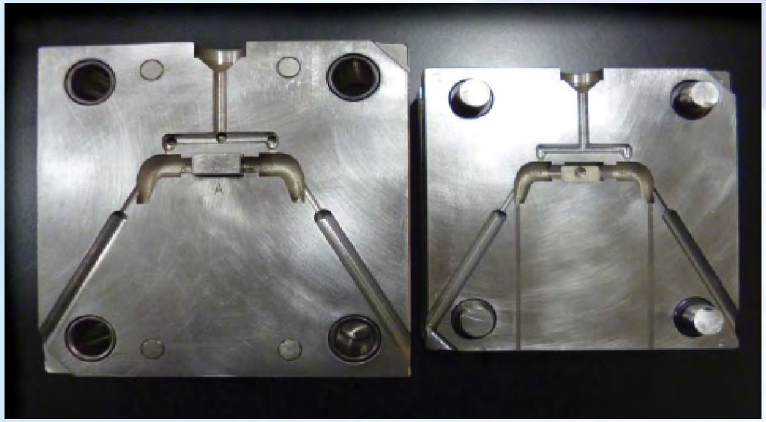


One cavity mold - Horizontal Injection



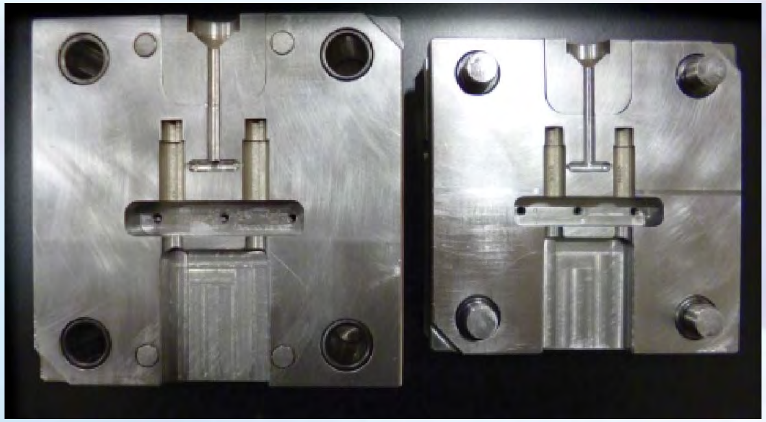
SMALL PIPE CONNECTOR





Two cavities mold - Horizontal Injection

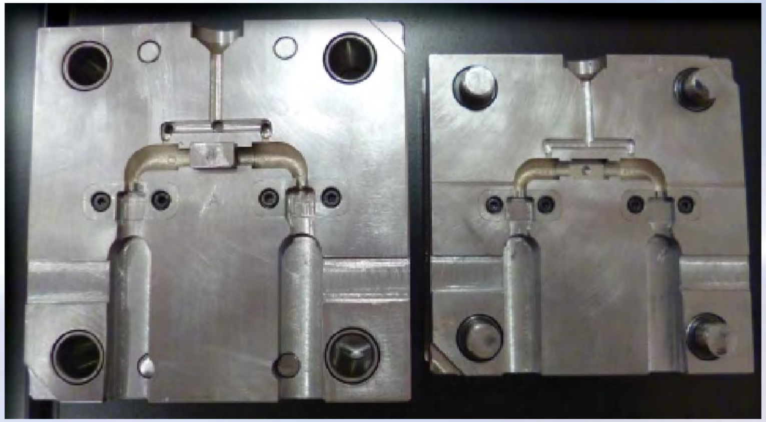
MINIATURE CONNECTOR



Two cavities mold - Horizontal Injection

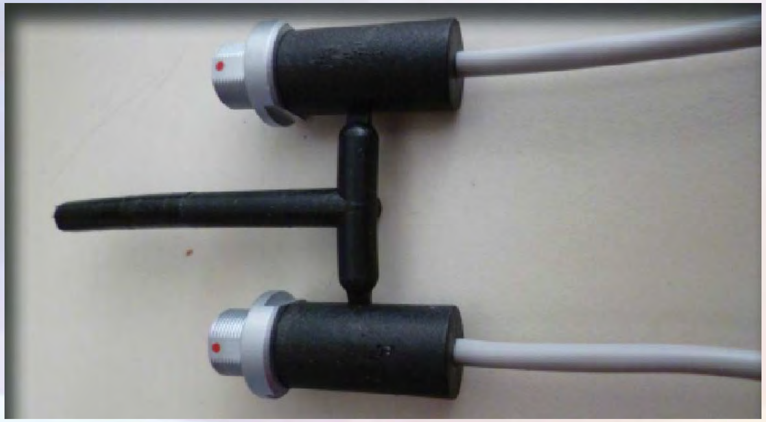
MECATRONIC

SMALL PIPE CONNECTOR



Two cavities mold - Horizontal Injection

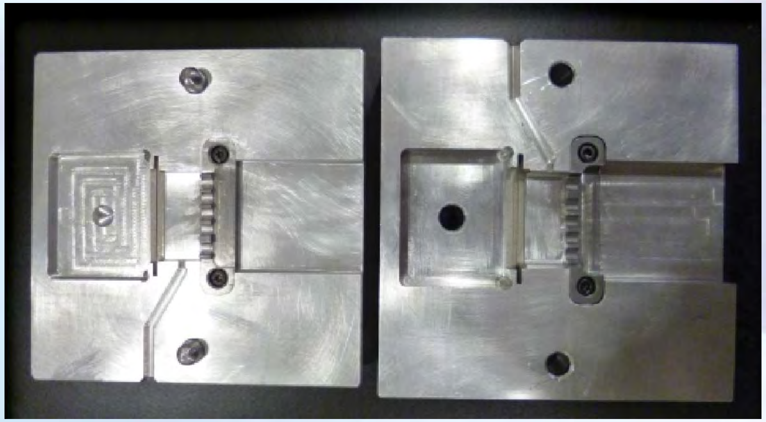
MINI CONNECTOR



Two cavities mold - Horizontal Injection

MECATRONIC

5W5 CONNECTOR INSULATION



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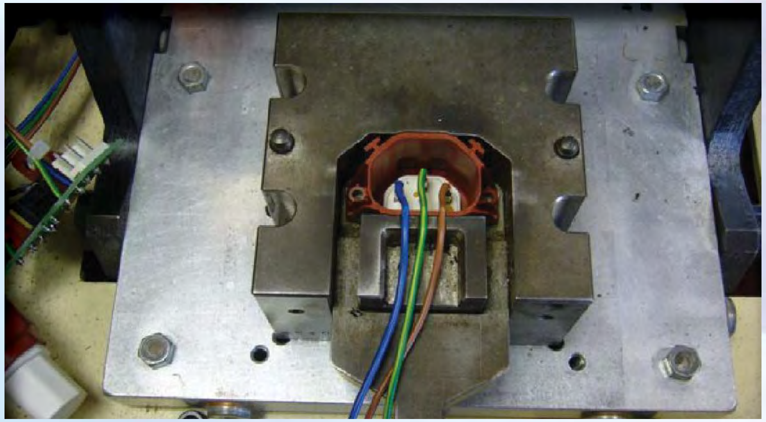
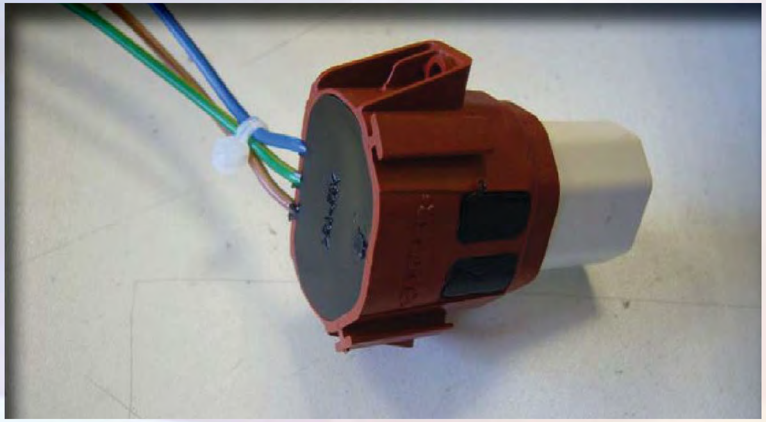
LED LIGHTS INSULATION

3 POLES FILLING CONNECTOR





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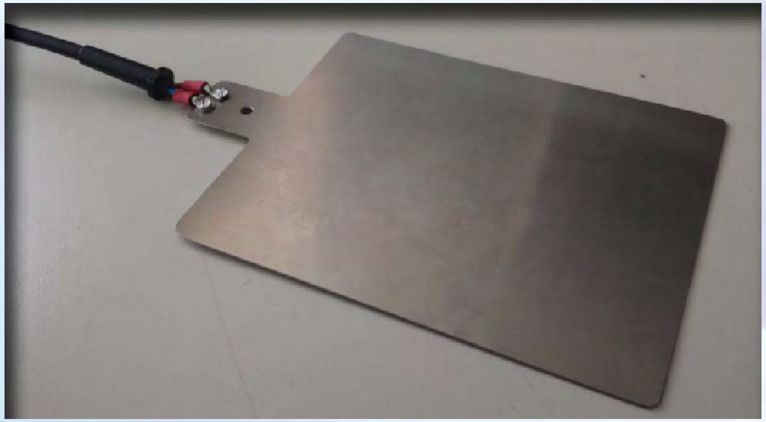
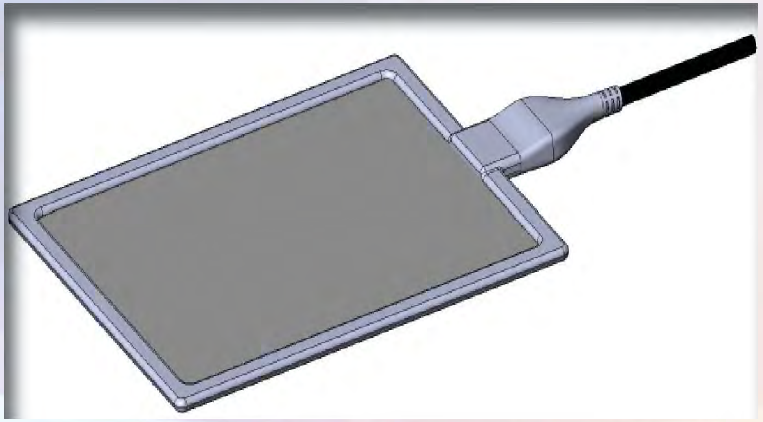
STEEL PLATE OVERMOLDING





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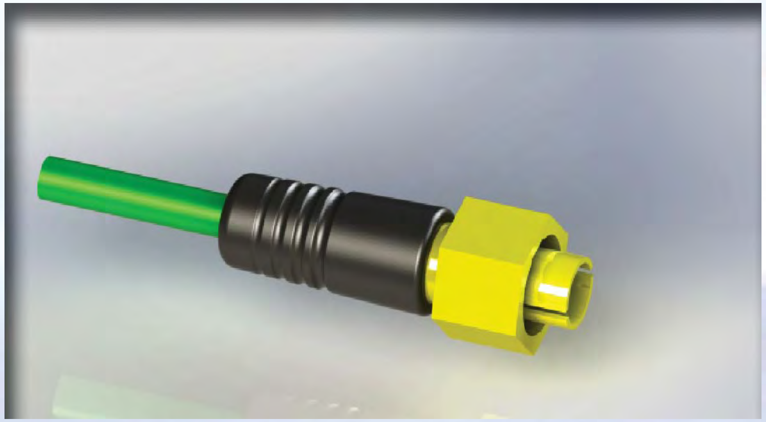
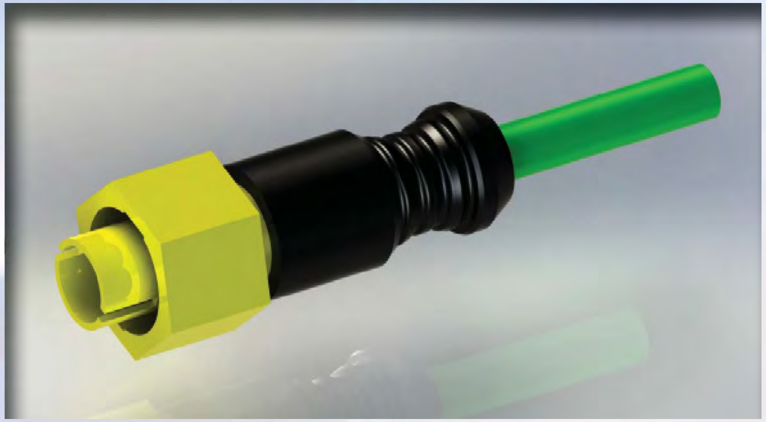
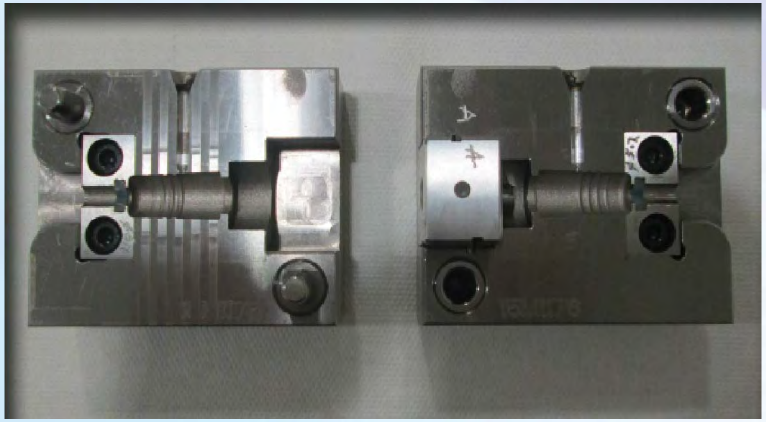
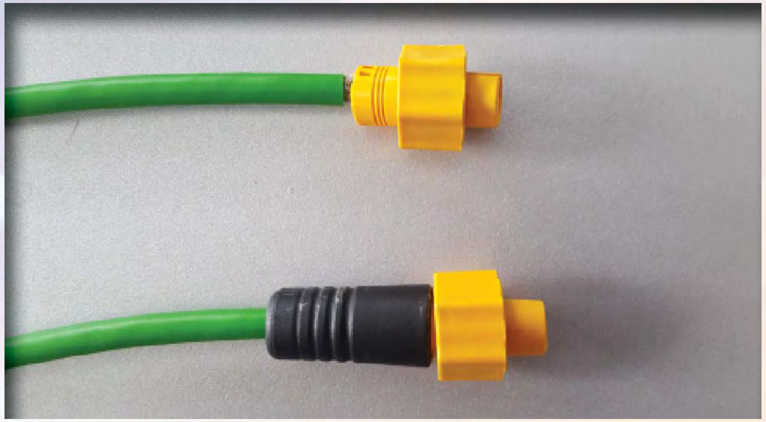
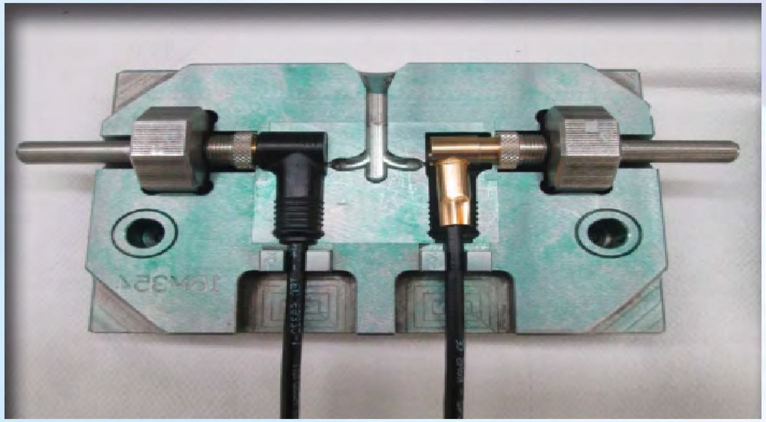
TM 2000 CONNECTOR

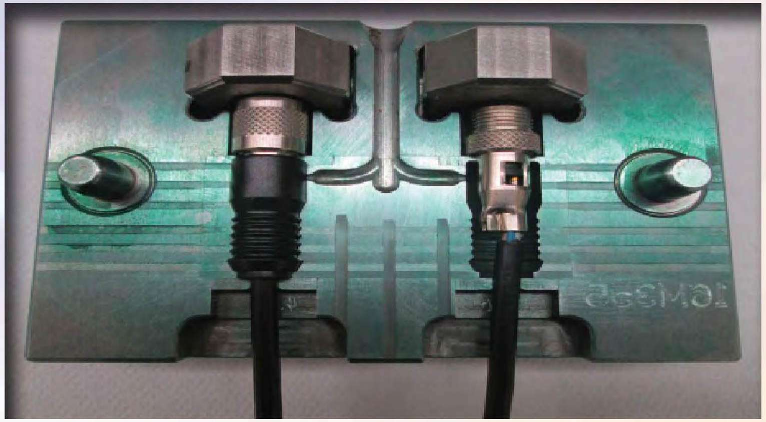





M12 CONNECTORS

M12 Connector - 90° Version

M12 Connector - 180° Version

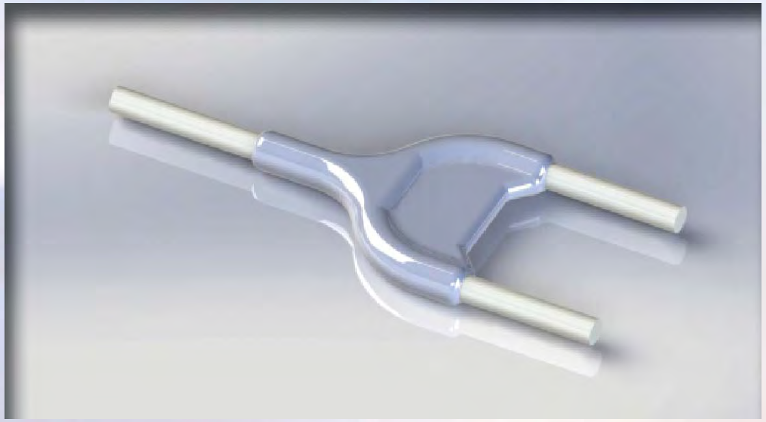


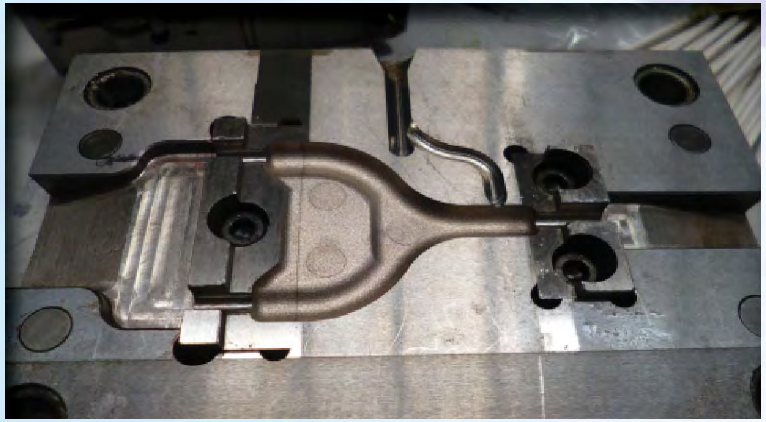


POWER CONNECTOR

Two cavities mold - Vertical Injection

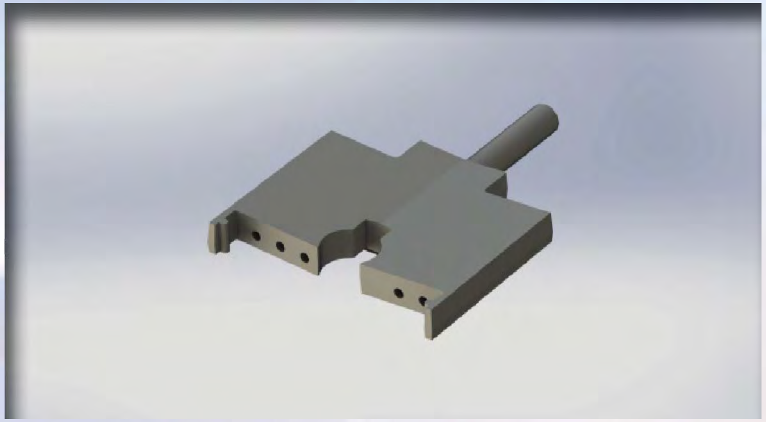
Y JUNCTION

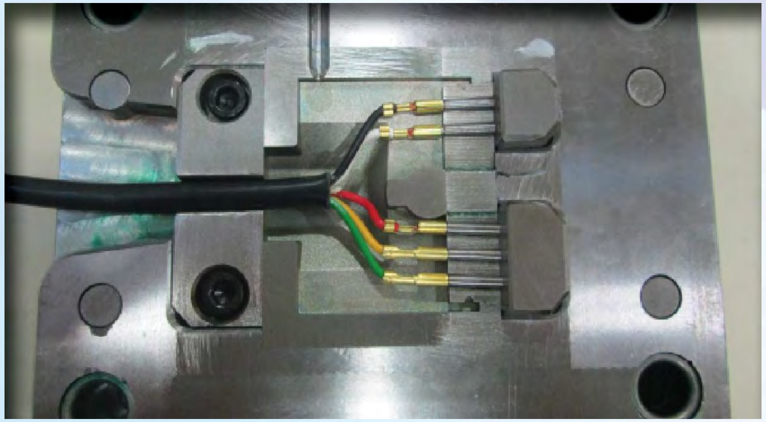




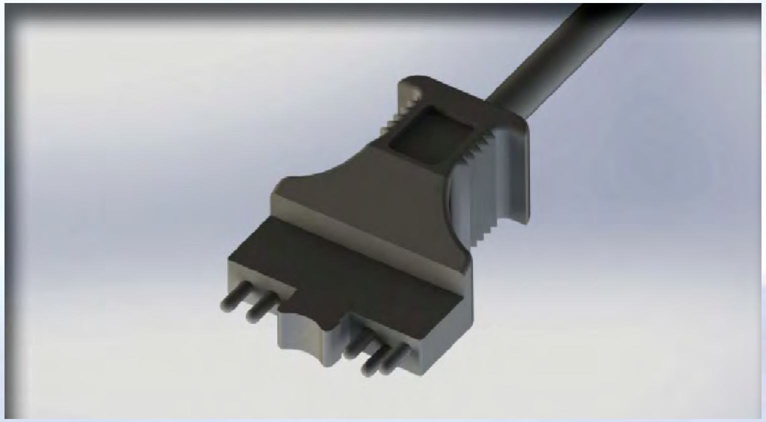
One Cavity mold - Horizontal Injection

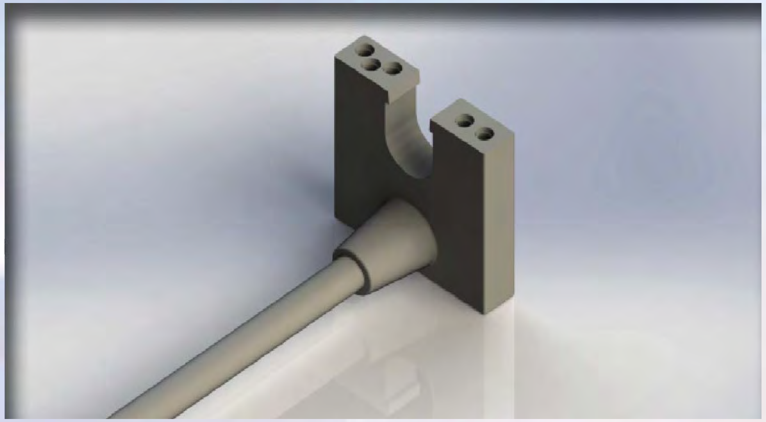
MECATRONIC 5 POLES FEMALE CONNECTOR

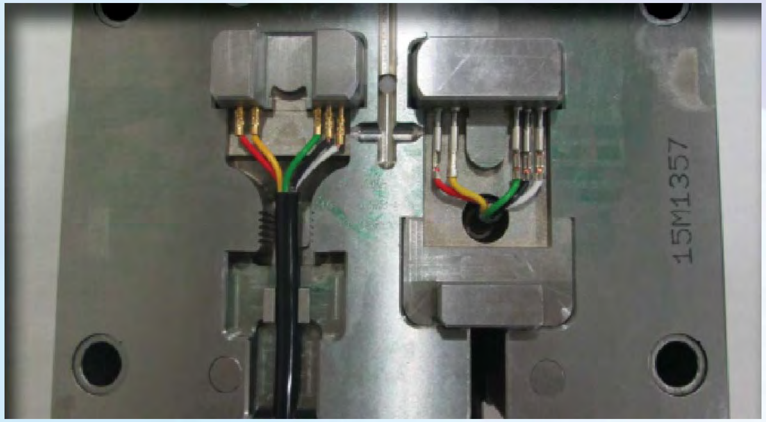


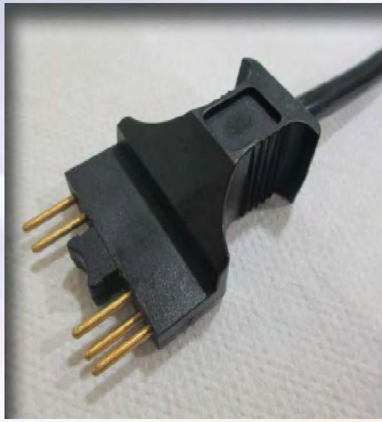


5 POLES CONNECTOR
MALE AND FEMALE



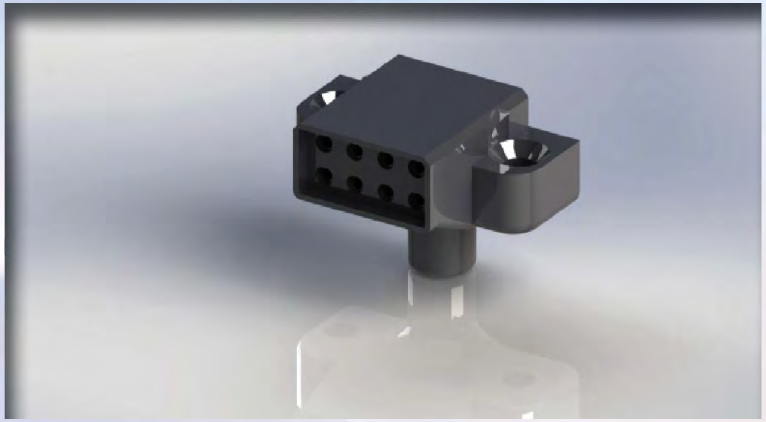


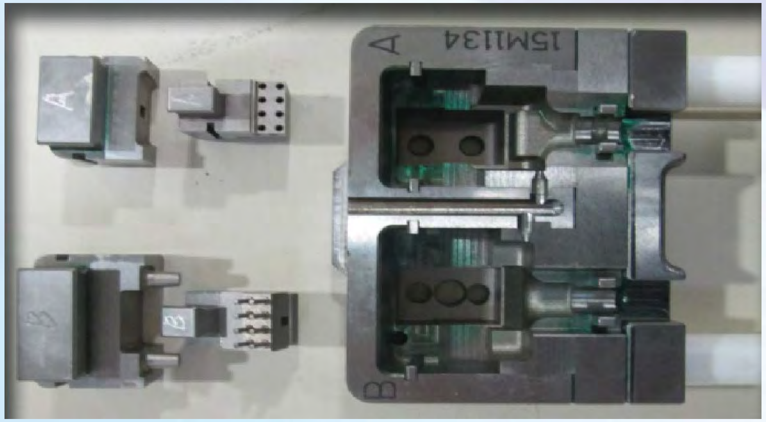


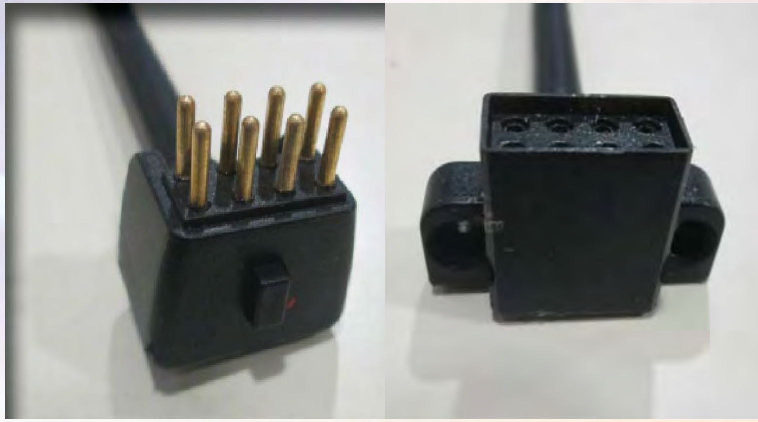


MECATRONIC

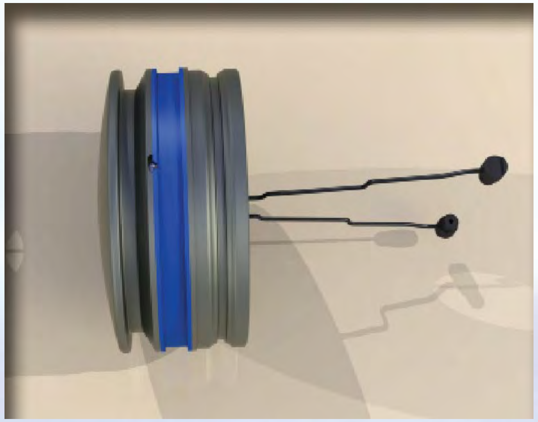
8 POLES CONNECTOR
MALE AND FEMALE



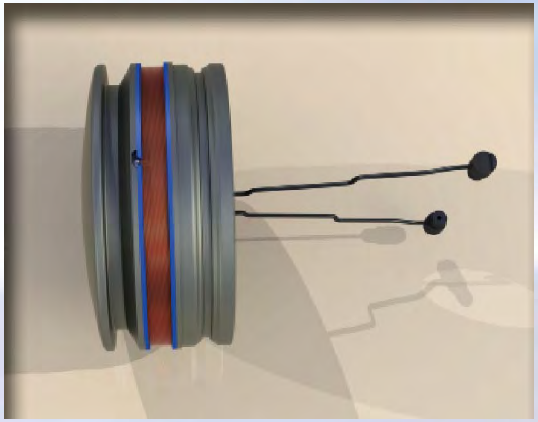




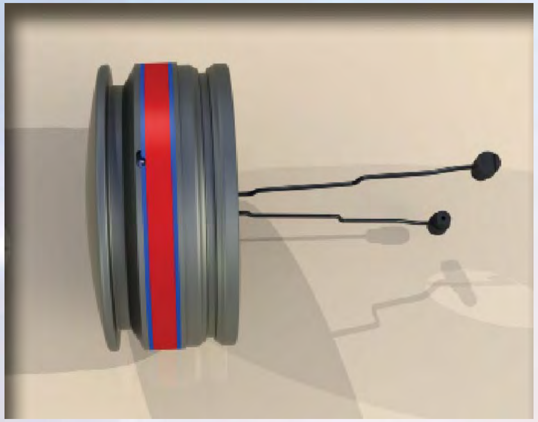
ARMY APPLICATION



1st Shot



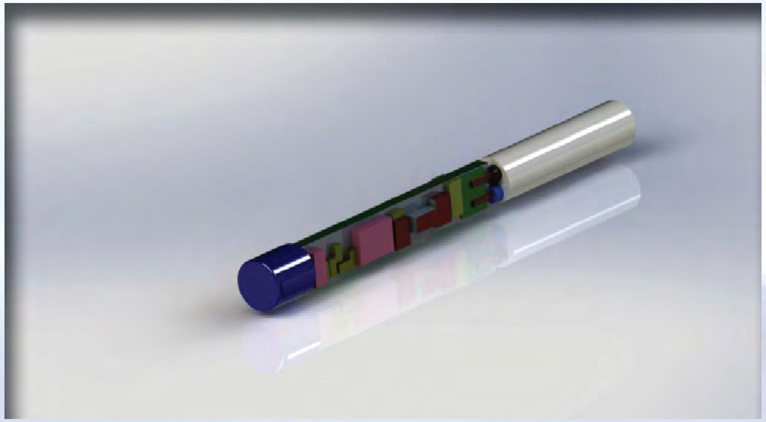
Winding emailed cable

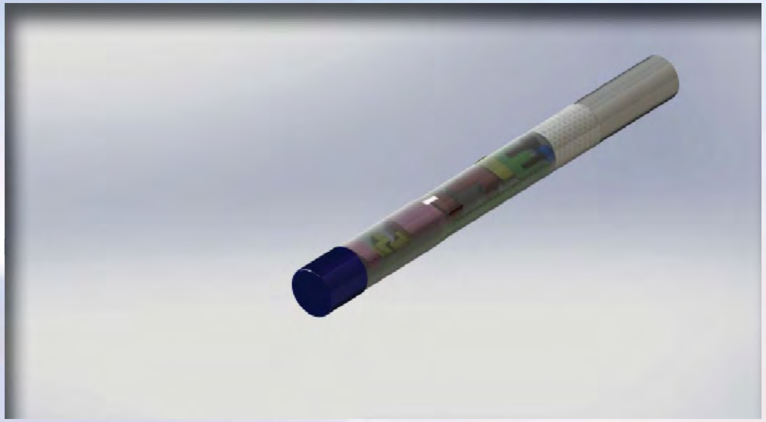


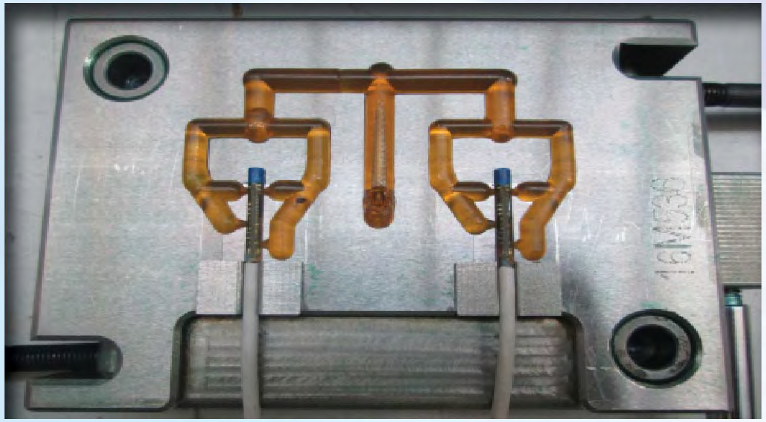
2nd Shot

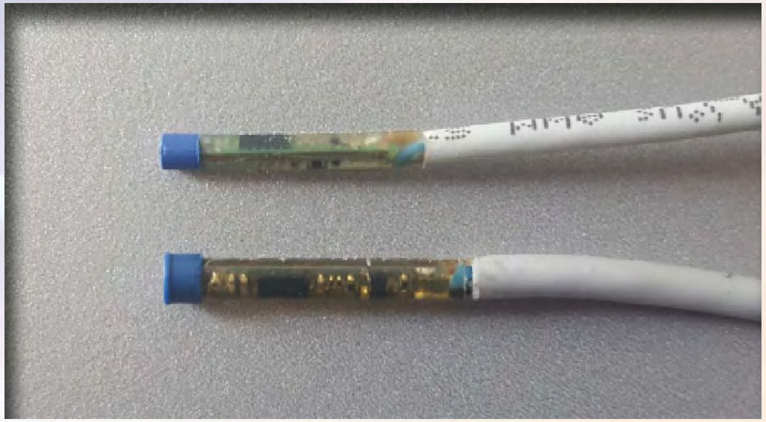
MECATRONIC

INDUCTIVE SENSORS
Ø3 AND Ø4

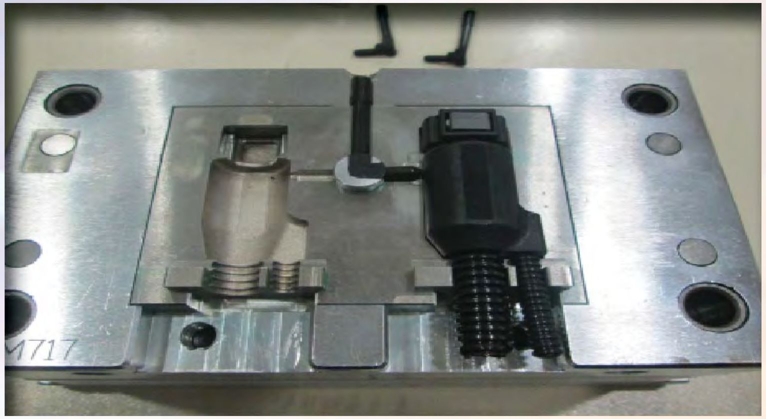








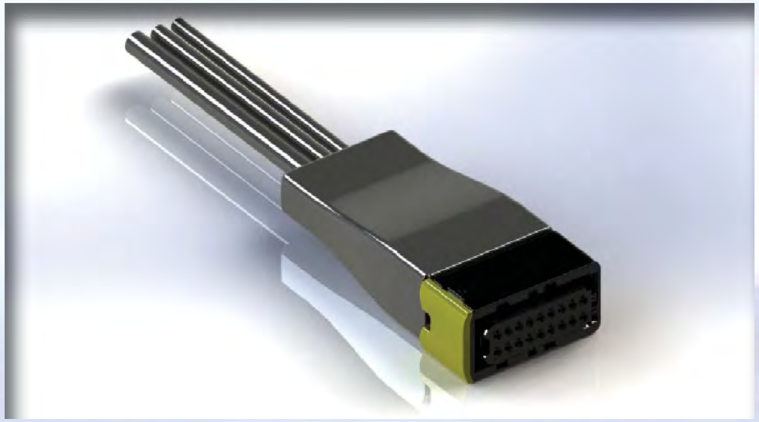
AD BLUE CONNECTOR

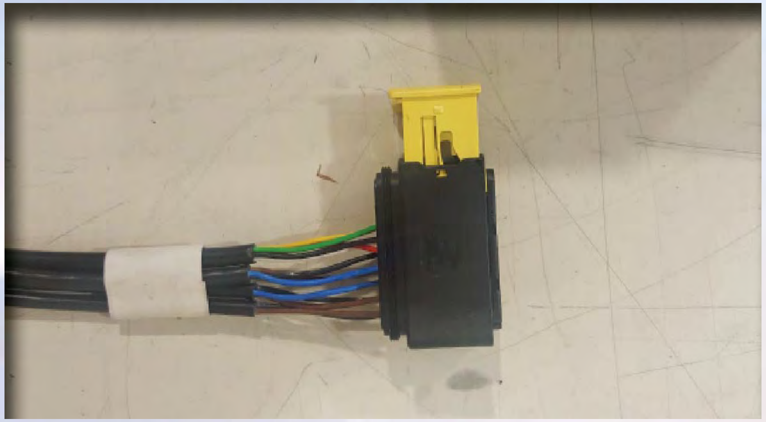


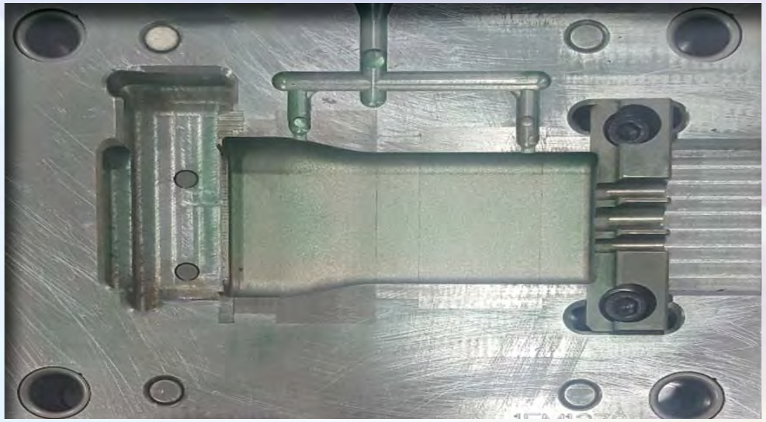
Two cavities mold - Horizontal Injection

MECATRONIC

TYCO 1-1563759
18 POLES CONNECTOR
FEMALE

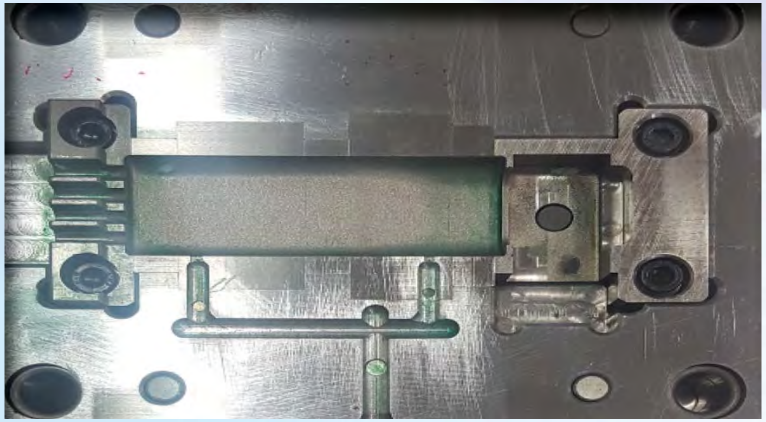


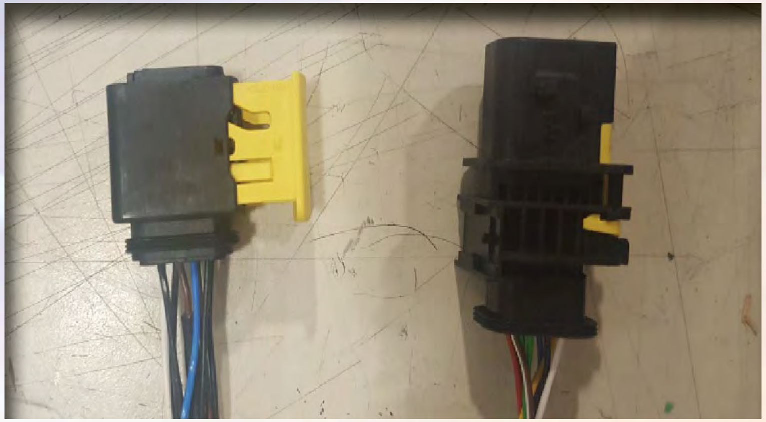




One cavity mold - Horizontal Injection

TYCO 1-1564512
8 POLES CONNECTOR
MALE AND FEMALE

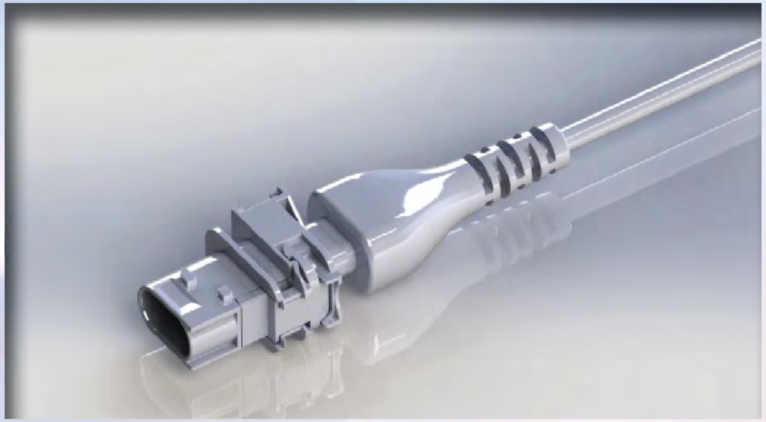


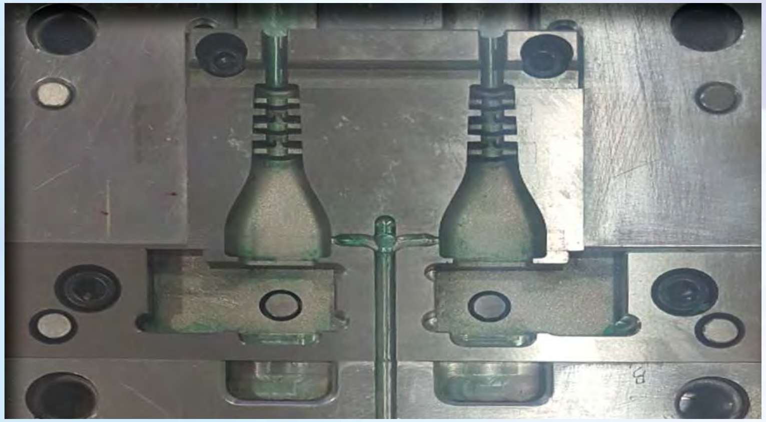


One cavity mold - Horizontal Injection

MECATRONIC

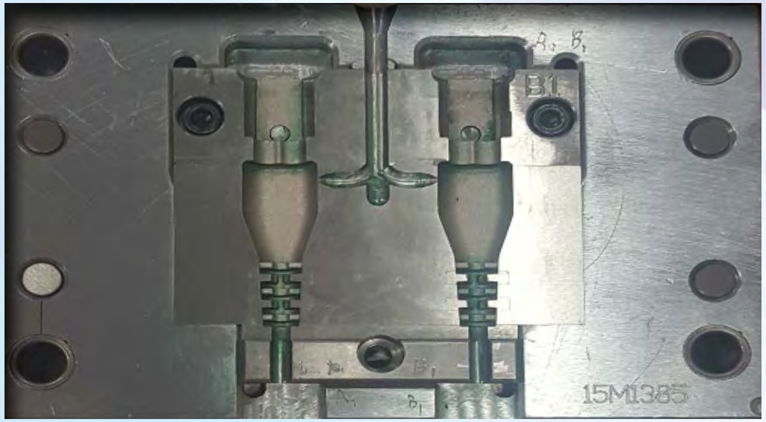
TYCO 1-1418448
3 POLES CONNECTOR
MALE AND FEMALE





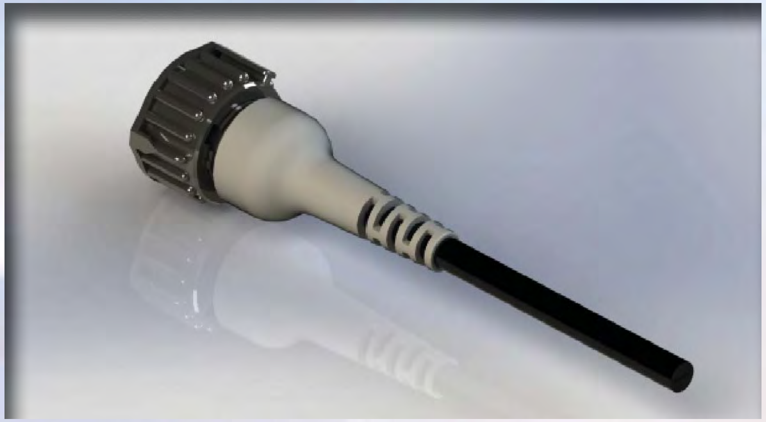
Two cavities mold - Horizontal Injection

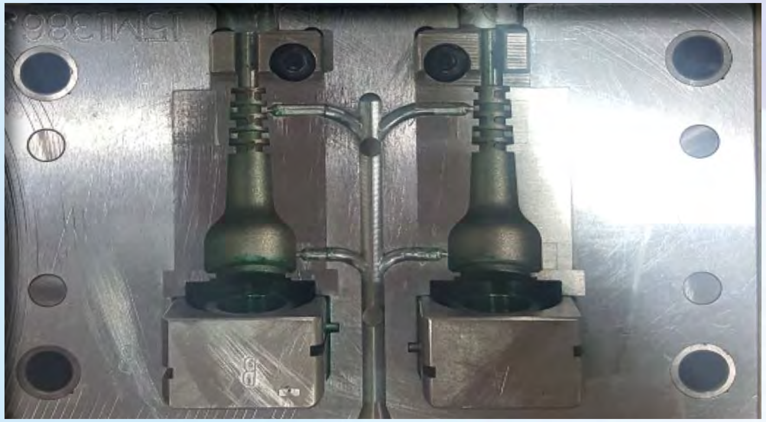
TYCO 1-282080
2 POLES CONNECTOR
MALE AND FEMALE



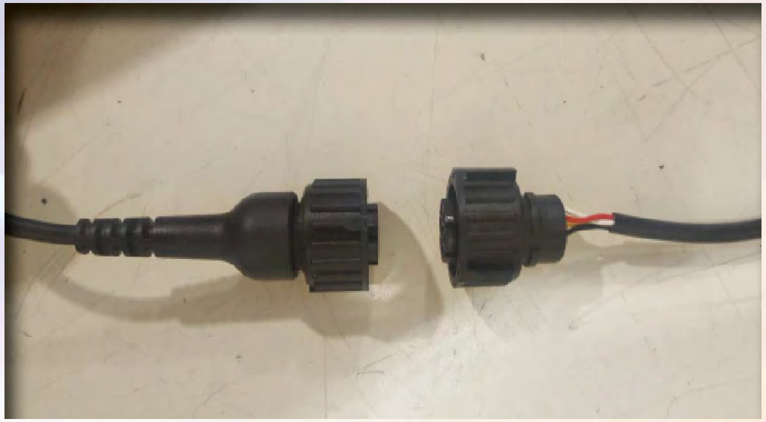
Two cavities mold - Horizontal Injection

TYCO 967650-1
7 POLES CONNECTOR
FEMALE

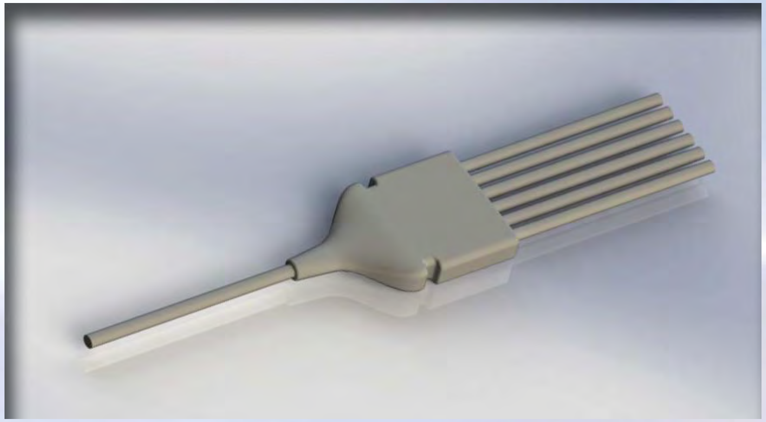


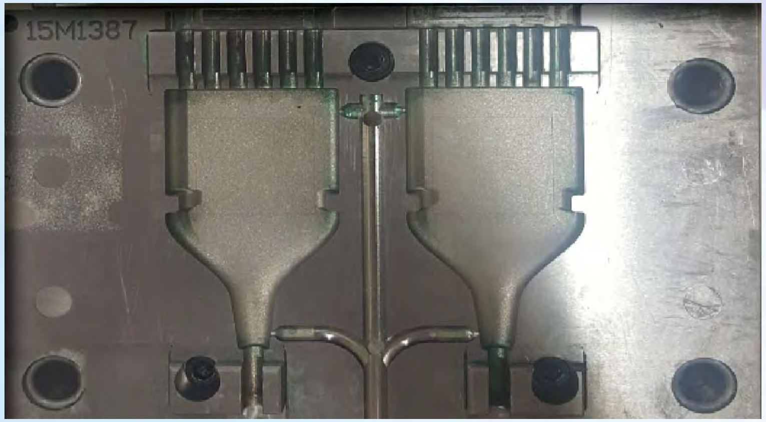


Two cavities mold - Horizontal Injection



6 - 1 JUNCTION

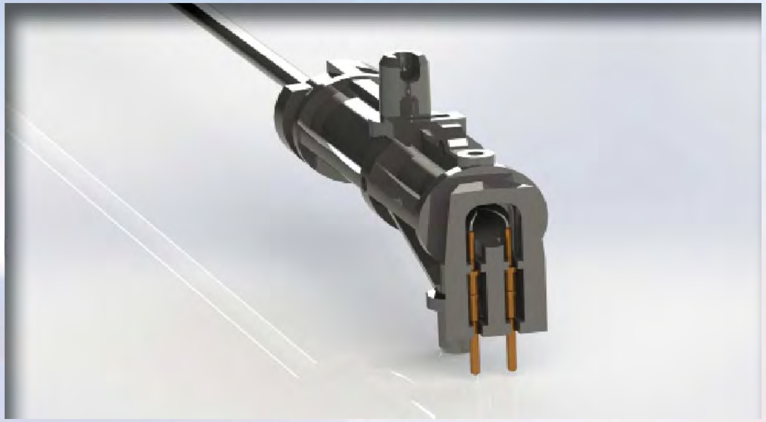


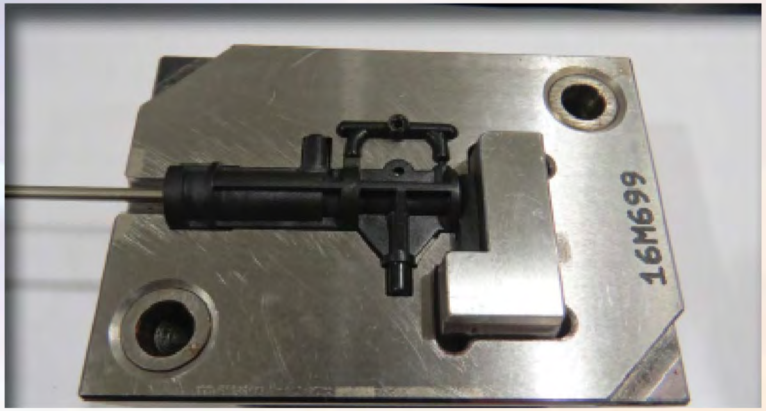


Two cavities mold - Horizontal Injection

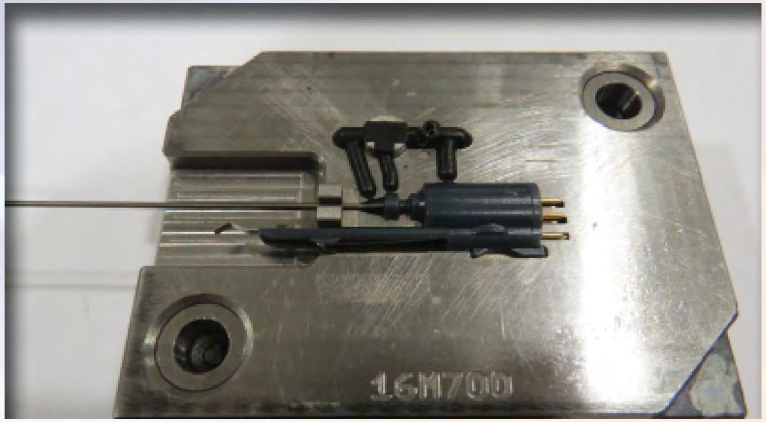
MECATRONIC

SENSOR POTTING EX.1



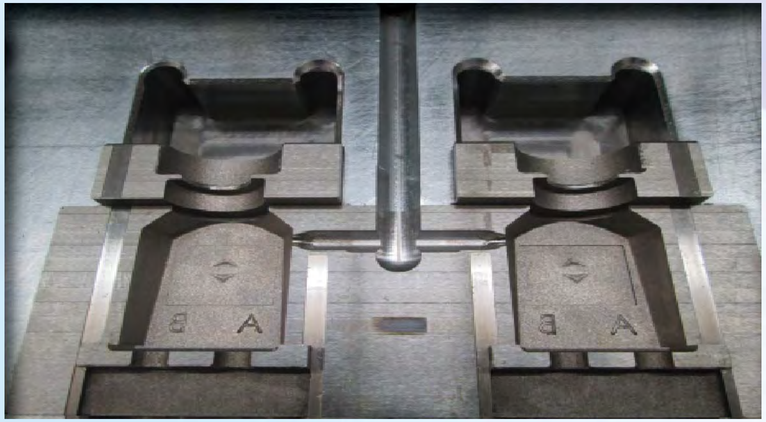


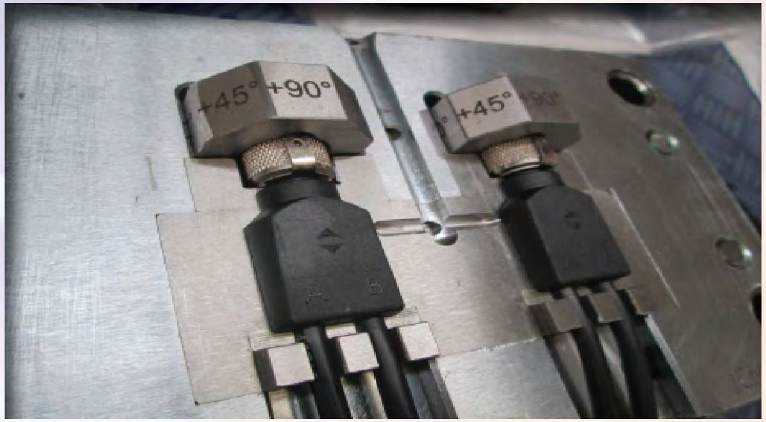
SENSOR POTTING EX.2



MECATRONIC

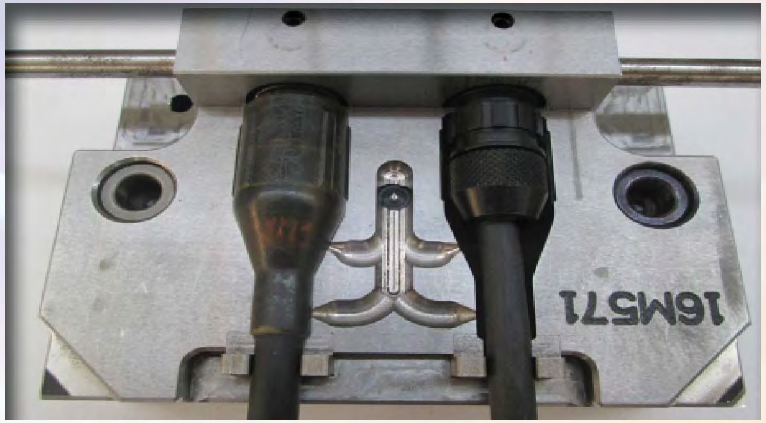
M12 DOUBLE CABLE EXIT



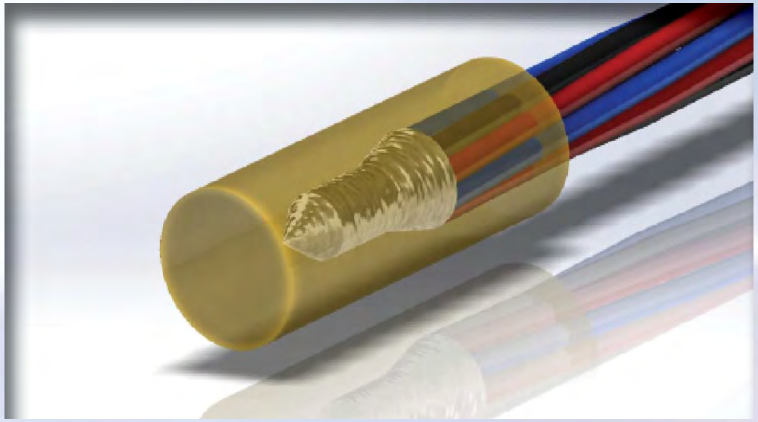


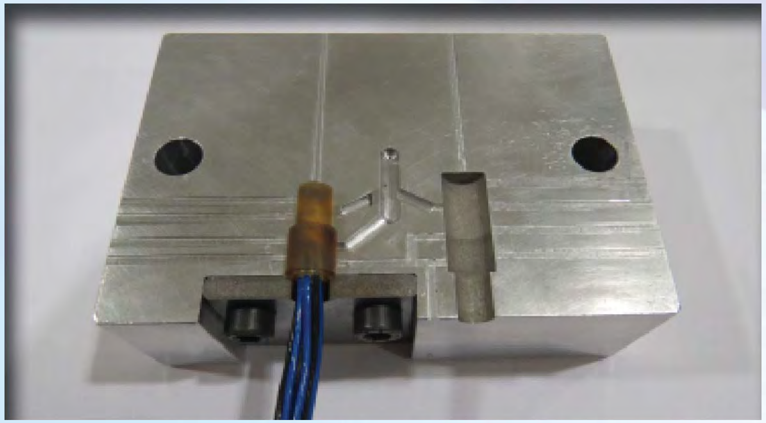
MECATRONIC

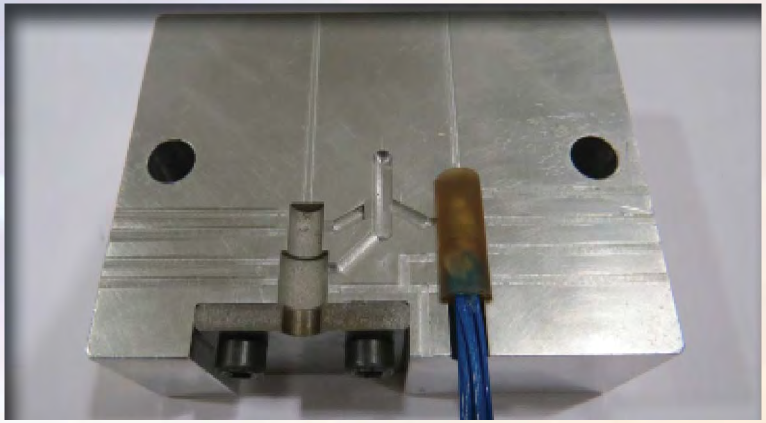
OVERMOULDING
NF7 CONNECTOR



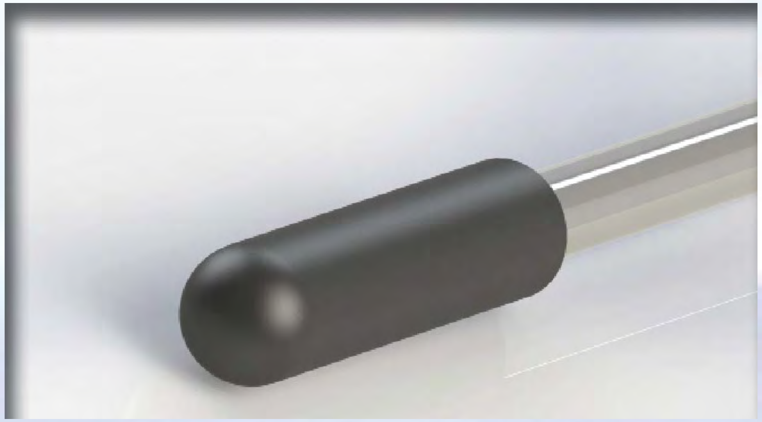
SOLDERING PROTECTION OVERMOULDING

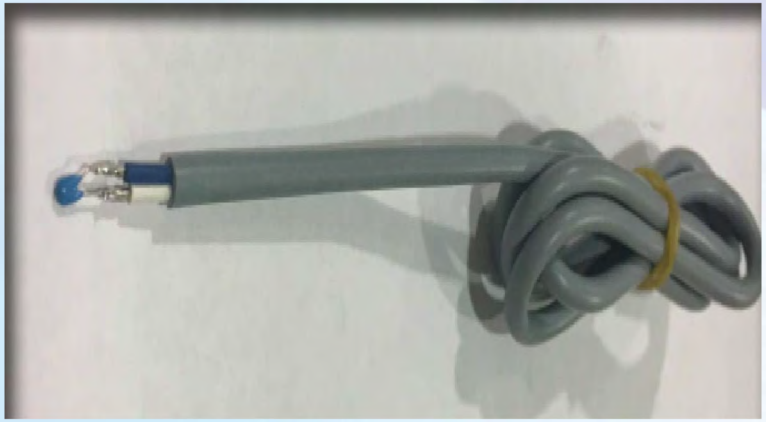


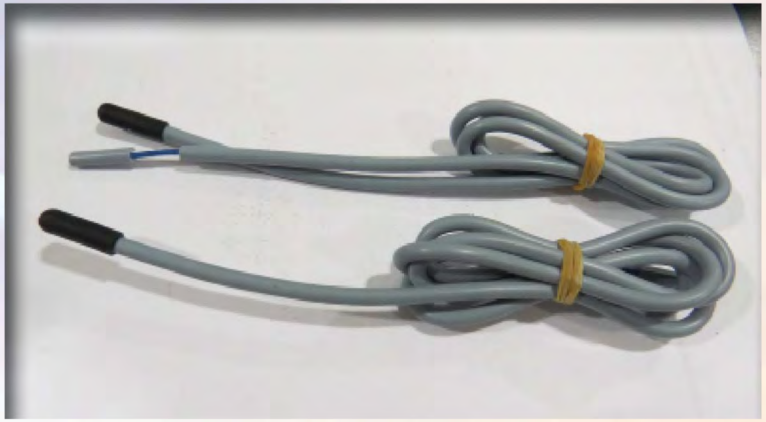




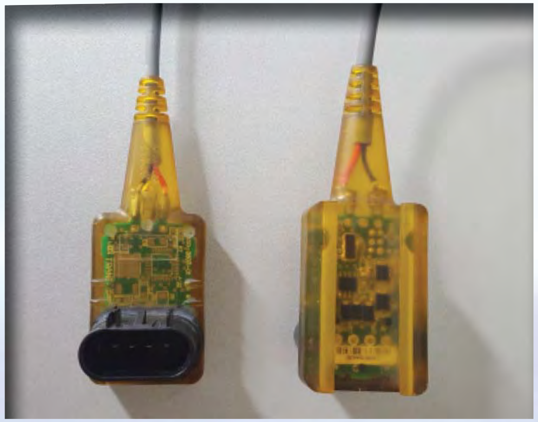
NTC SENSOR OVERMOULDING





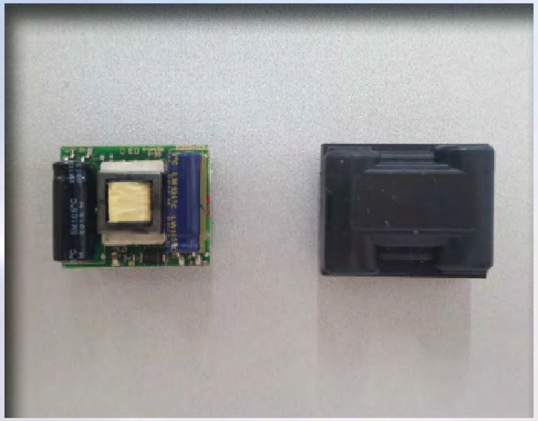


VARIUS EXAMPLES

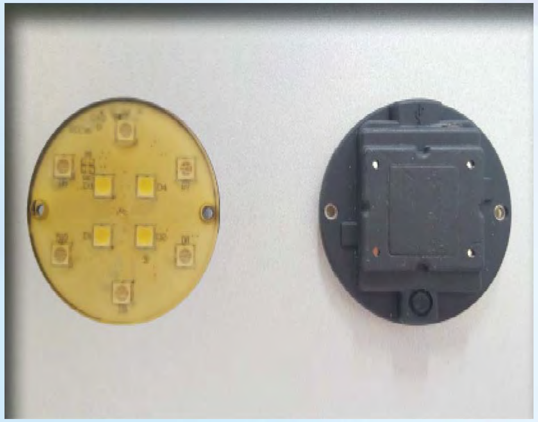


Motor drive

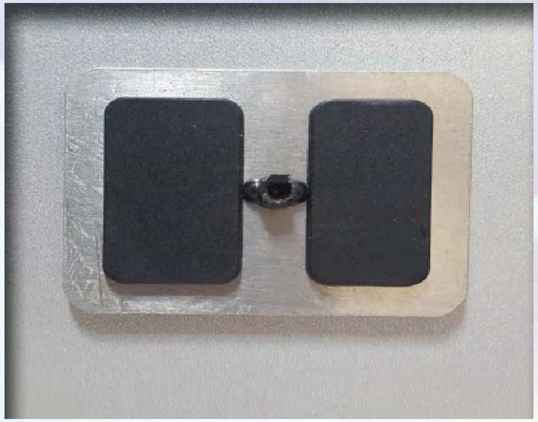
Transmitter



Switching PCB



Led Lighthing



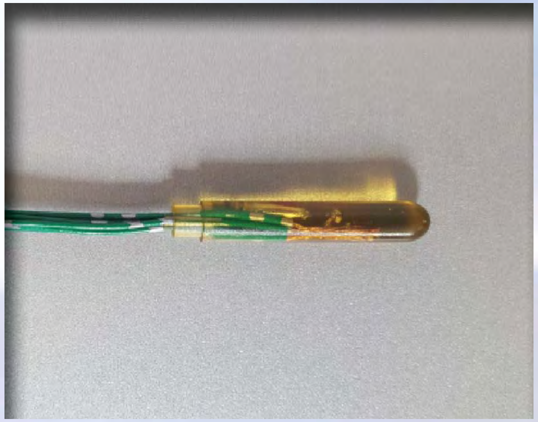
High adesion hotmelt materials on metal

Antenna

MECATRONIC

VARIUS EXAMPLES

Sensors



Sealing

What is Low Pressure Molding ?

- Unique solution to encapsulate, seal and protect electronics parts in a single step fast processing

- Half way between classical plastic injection and resin potting

- Provides freedom to design unique products at high productivity and with low cost tools.

- Use high performance and environmental friendly polymers

LPM core advantages

Encapsulate delicate components without damages

Improved productivity since no chemical reaction and single-component resin. Cycles time from 10 to 50 seconds.

A wide range of resins to promote a solution fitting with thermal, mechanical and electrical requirements of the molded part

Not toxic and renewable polyamide resins

LPM competitive advantages vs.

Conformal coating

Small area/specific component molding possibility

Better mechanical and temperature resistance

Potting

Immediate handling of molded parts

Non hazardous resins

1K material = no mixing errors

Lower amount of material needed

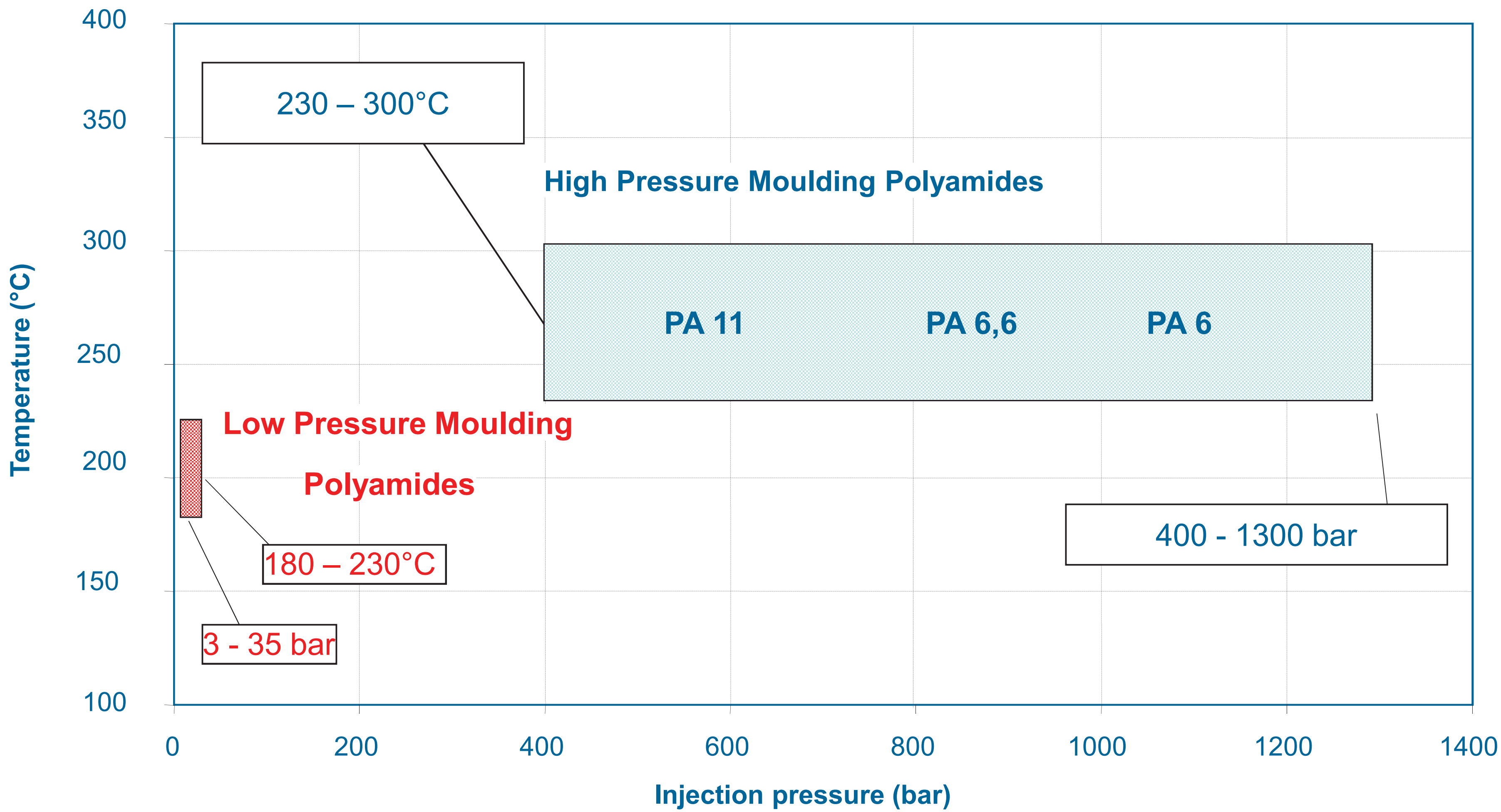
High pressure molding

Tools cost = flexibility on lots size (possibility of small production lots)

Protection of electronics parts during the process (lower pressure and temperature)

High demanding application (design & resistance)

LPM process window vs. HPM



Why polyamide for molding ?

Sustainability

- Natural feed stocks
- Improved End-of-Life management (Recycling) of finished articles

Specific Attributes

- Low temperature flexibility
- Good resistance to non polar fluids (oil, alkali, …)
- Electrical insulation
- Non flammability
- High temperature resistance

Process compatibility

- Low viscosity enables low process pressure
- Low cycle times due to thermoplastic properties (Non reactive chemistry)
- High temperature resistance
- 1K product -> no mixing errors / immediate set

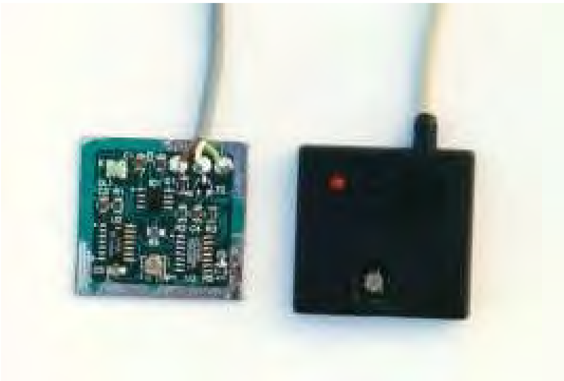
GREEN in motion®

BOSTIK's excellence in polyamide (PA)

Bostik was a pioneer in the use of polyamide based resins for applications in the field of automotive electronics in the 80's

Wide resin range segmented by market and produced on a dedicated plant in France

LPM Success Factors



Appropriate Mould Design

Quality Moulding

Adapted equipment and process parameters

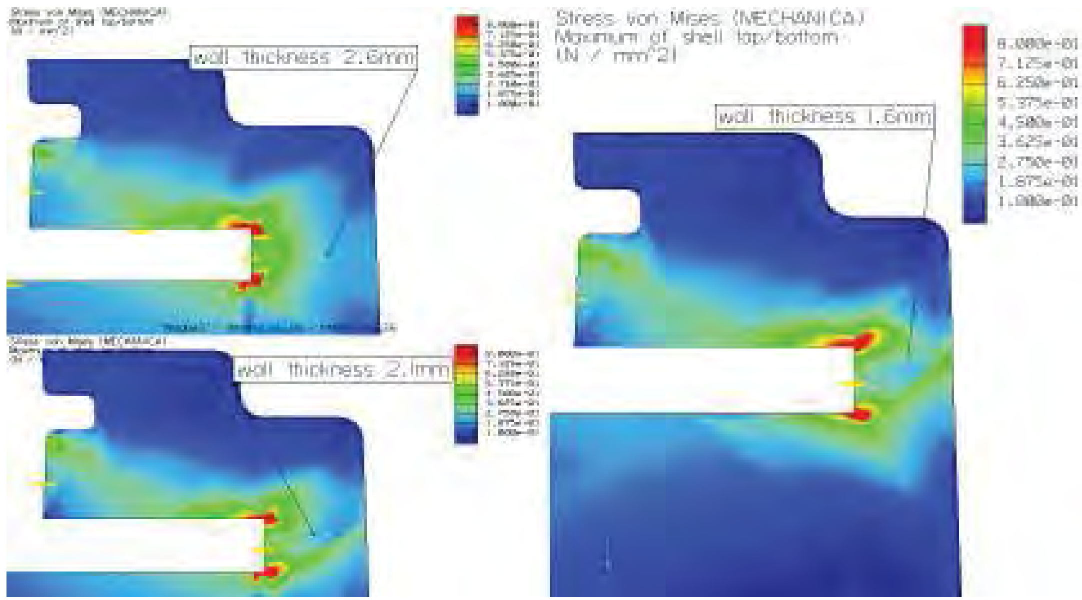
Adequate Hot Melt

LPM Best practices

<u>Appropriate mould design / process parameters:</u>

The use of simulation software (<u>Moldflow</u>, <u>Simpoe</u>, …) is a standard in plastic part conception and should be considered in the same way for LPM

Modelling the residual stress of injected parts (hereunder an example extracted from Mechanica) helps to improve the part design



LPM Best practices

Adequate hotmelt / process parameters

As almost every plastic material Thermelt PA are hygroscopic and need then to be dried before their use.

Helios systems; DRI-AIR Industries, Inc; SHINI PLASTICS TECHNOLOGIES, INC.; Simar; Conair - Plastics Auxiliaries Equipment; Comet Plastic Equipment

Feeding channel recycling

Unless the following advices are being scrupulously follow we don’t recommend to recycle the material from the feeding channel

- Cut the material in particles of the same size than that of the initial pellets
- Don’t exceed the amount of 5% of recycled material
- Dry the recycled material before mixing it with material pellets
- Ensure an homogeneous mix before filling the tank unit

Bostik’s feedback

Main issues encountered → cracking

Root causes are numerous and generally linked with different misses all along the project development

- Initial technical requirements identification (ageing tests, chemical agents in contact with the part, ….)
- Part conception/design (residual stress in the part, …)
- Injection process parameters (material flow → welding lines, mold temperature → impact on residual stress, ….)

A worldwide presence with dedicated networks and partnerships for multi purpose applications

Thermelt material range

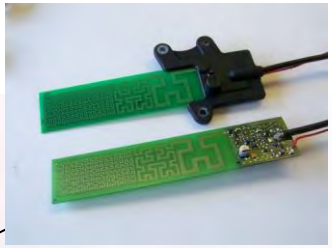
The following slides will present the material that have to be promoted for each new project, in accordance with:

- the main technical requirement of each market
- the feedback and experience accumulated for years
- our will to simplify the product range to be more relevant

Bostik's Thermelt Product Range for Automotive

Automotive: applications at a glance

Various cables and wires



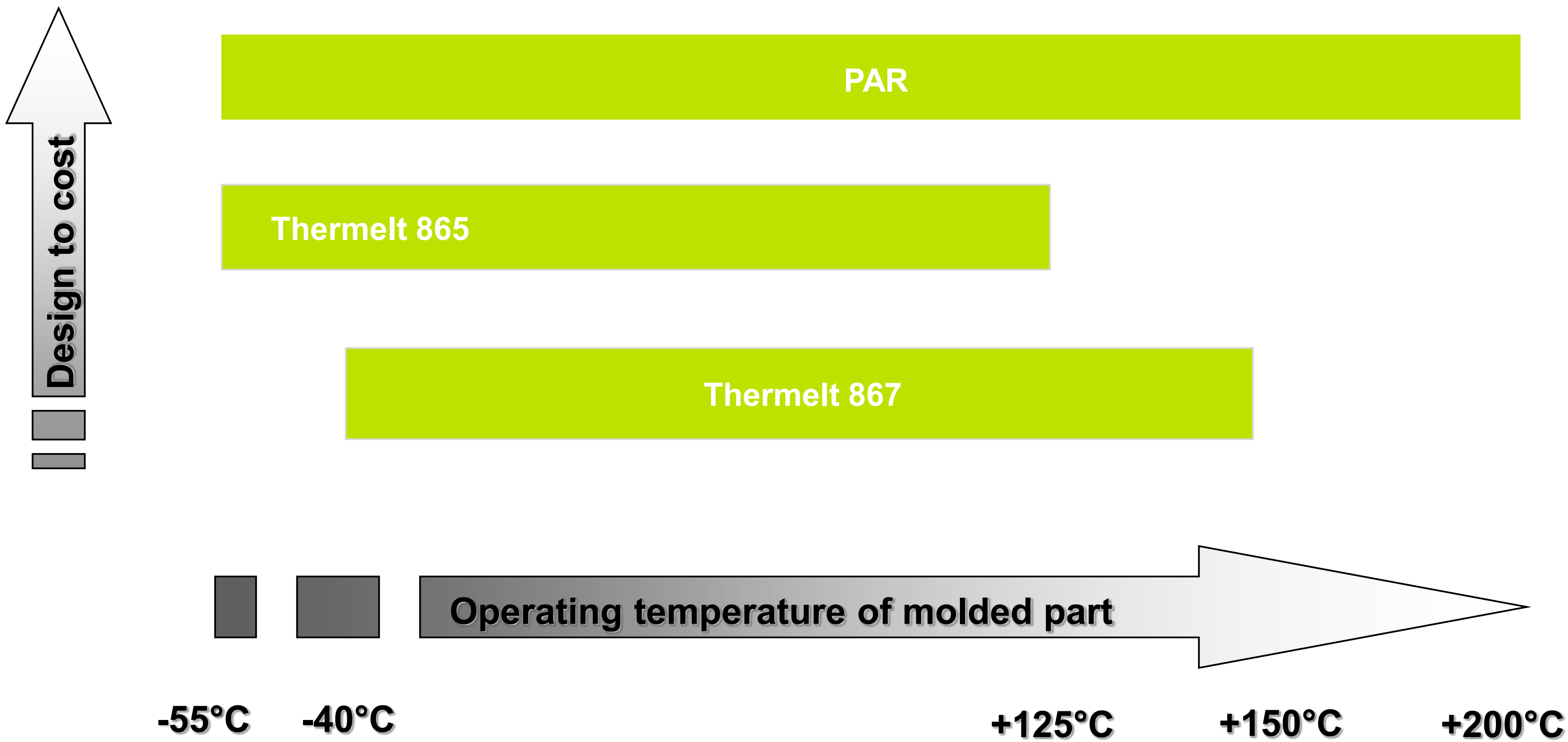
Multi purpose car antenna (GSM, GPS, radio)

Sensitive door controller device

Seat belt fastening sensor

Under hood electronic devices

Automotive range overview



Material choice criteria vs. technical requirements

Localization of the part	Underhood	Interior	Exterior
Maximum temperature resistance required	150°C	125°C	125°C
Expected functionality	Chemical resistance - salty fog - UV resistance - thermal choc resistance - water tightness		
Material recommendation	PAR 1000	Th 865 (low temperature resistance) - Th 867	

Available colors : PAR 1000 → natural and black in 2.5kg bags

Th 867 → natural, black, blue*, green*

Th 865 → natural and black

Bostik's Thermelt Product Range for Industrial

Material choice criteria vs. technical requirements

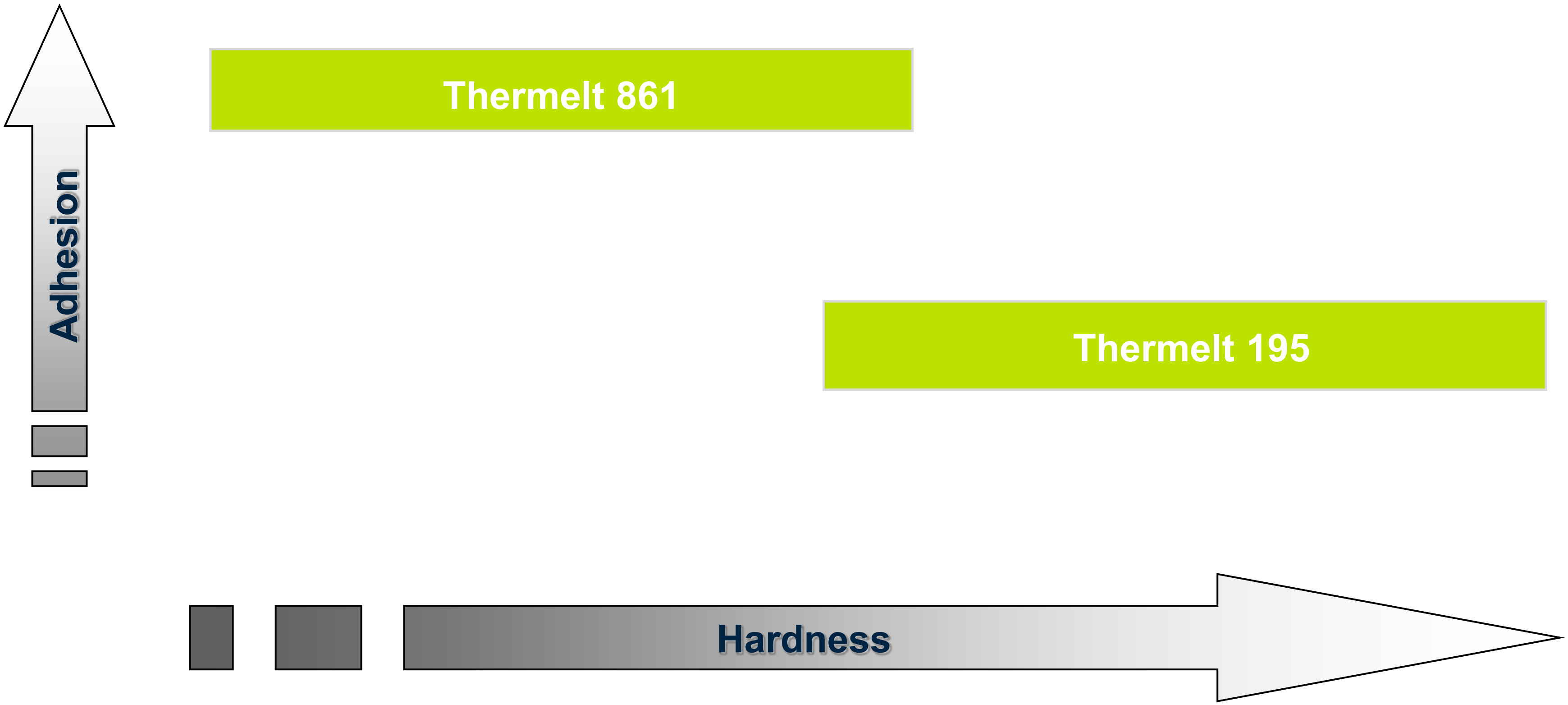
Localization of the part	Indoor	Outdoor
Maximum temperature resistance required	125°C	125°C
Expected functionality	Adhesion - hardness	UV resistance – moisture resistance
Material recommendation	Th 861 – Th 195	Th 858 – Th 868

Available colors : Th 195* & Th 858** → natural and black**, orange*

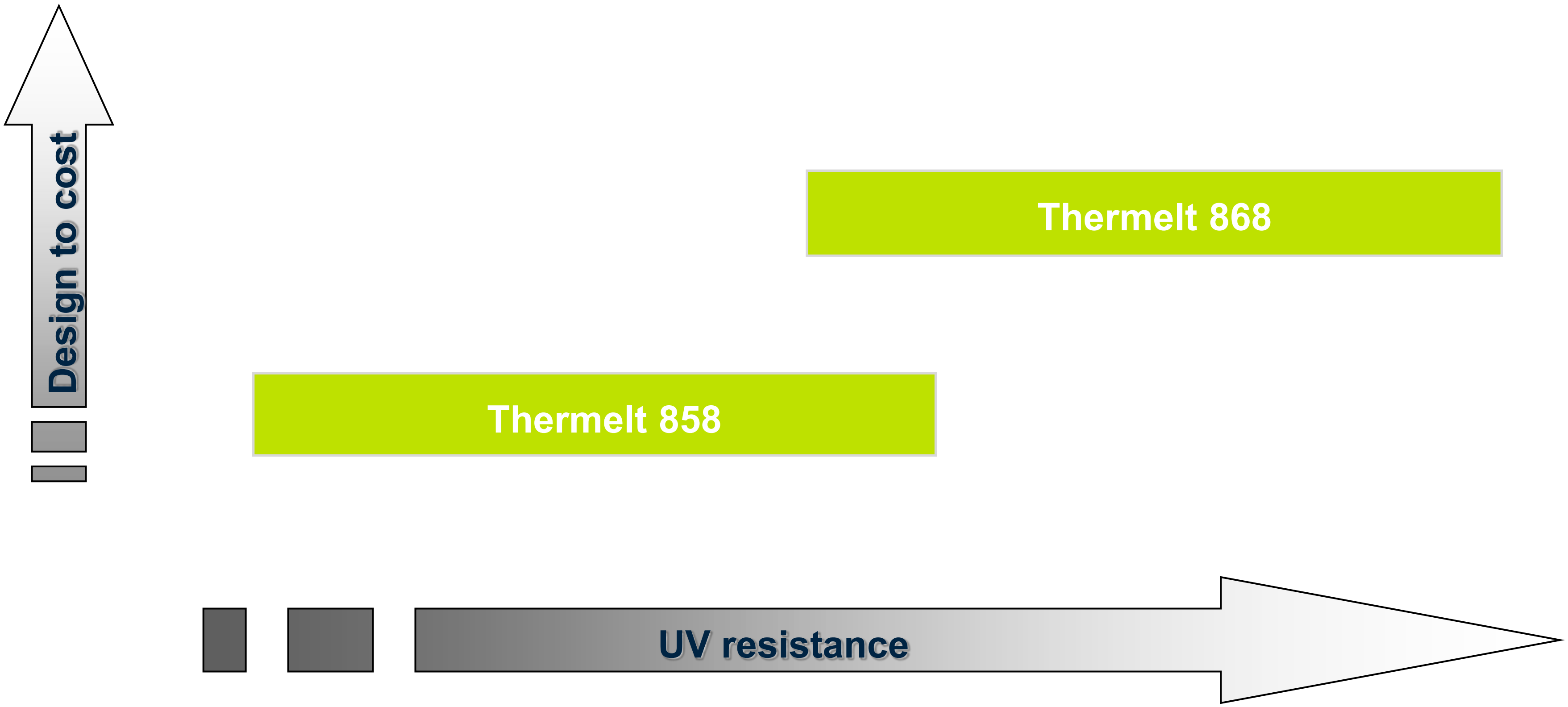
Th 861 → natural, black, blue*, red*, green*, grey*

Th 868 → natural, black, grey, white

Material selection



Material selection



Bostik's Thermelt Specialties Product Range

Material selection

Thermelt 866

Maximum temperature resistance	120°C
Material specificity	Enhanced adhesion on PES, PC and others demanding substrates

Thermelt 817R

Maximum temperature resistance	125°C
Material specificity	Low viscosity

Thermelt 892

Maximum temperature resistance	140°C
Material specificity	High hardness and mechanical properties

Available colors : natural and black

UV Protected Thermelt Range

UV Protected Thermelt Range

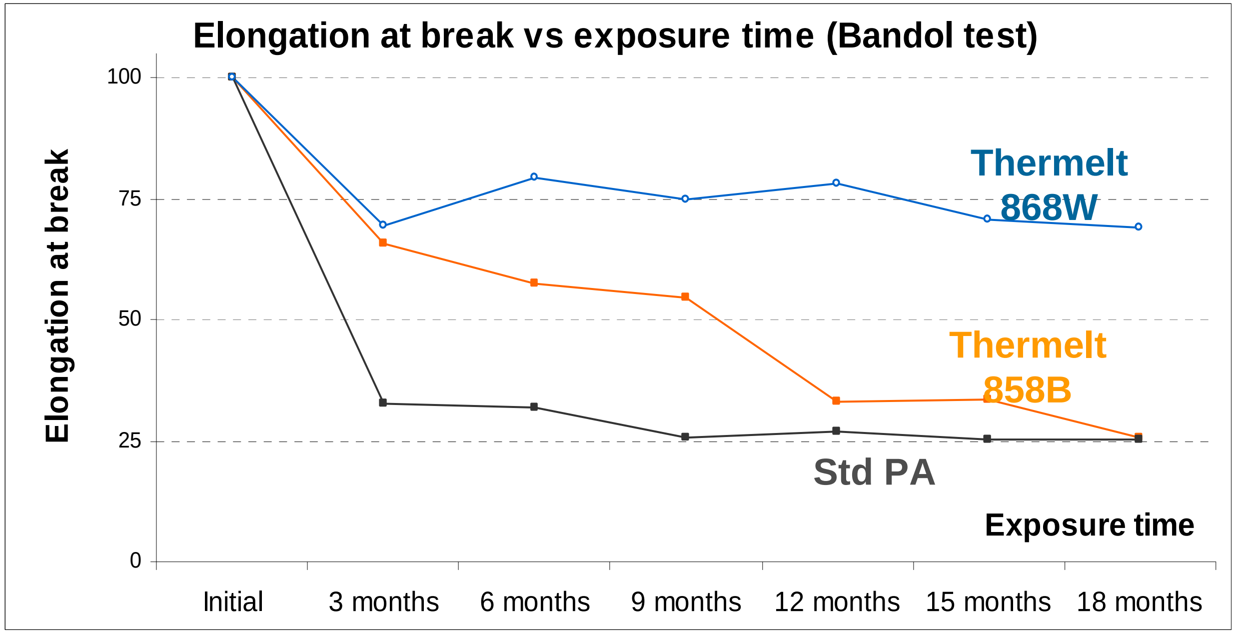
- **LPM protected Electronic devices may be used in extreme conditions**
  - **UV exposure during outdoor use can adversely affect the material properties**
  - **Bostik has developed a range of UV protected product for these specific uses (outdoor, solar applications etc …).**
- **Extensive Testing was performed at the Test Station for Natural Aging in Bandol (France)**
  - **Reference for polymer climatic ageing (automotive, construction ..)**
  - **UV + weathering, according to ISO 877**
  - **Bandol is considered as representative of the Mediterranean climate due to relative humidity and average sun exposure = 3000 h/year**
  - **Our samples were tested in the most aggressive temperate climate conditions (45° face to south exposition**

Samples exposure conditions charts :

	Maximum	Minimum	Average
Temperature (°C)	42	-10	15,5
Rainfall level (mm)	1545	480	1012
Relative humidity (%)	100	10	61
Solar energy annual level (GJ/m²)	6,7	6,1	6,4

UV protected Thermelt Range

Products	Description	Color	Operating temperature range *	Viscosity (mPa.s) @ 210℃	Softening point (℃)	Hardness		Tg (℃)	UL 94
						Shore A	Shore D		
Thermelt 868	Specific formulation with very high UV resistance for applications such as solar panel	White Amber	- 40 / + 125	3000	160	89	35	- 33	V0
Thermelt 858 UV	Th 858 with enhanced UV resistance for UV exposed molded parts	Black Amber	- 40 / + 150	7000	183	98	44	- 27	V0



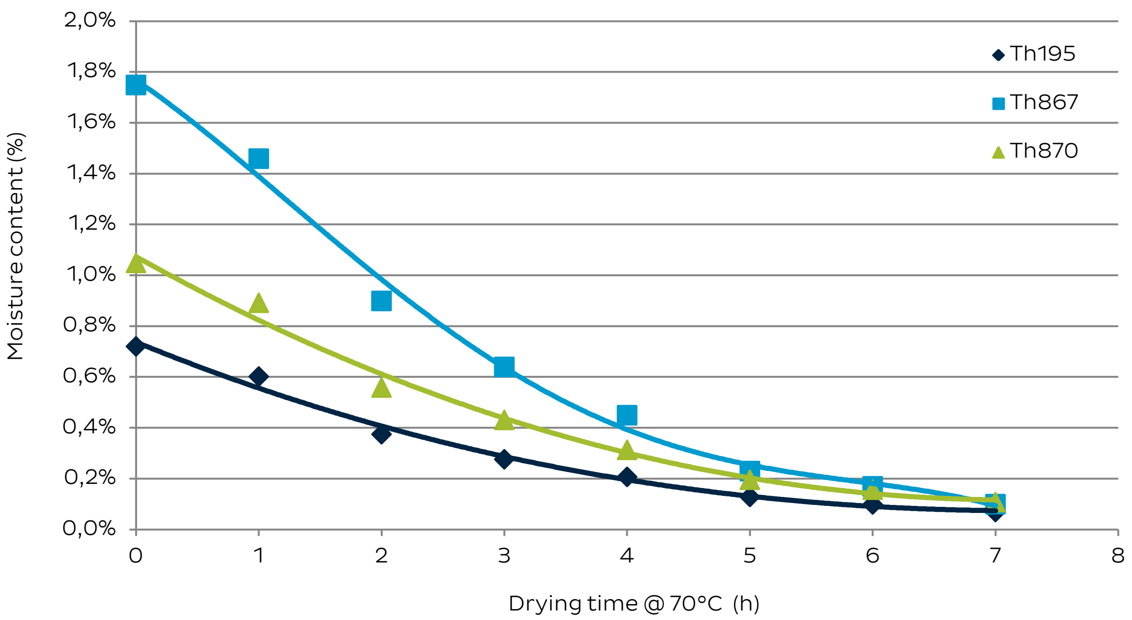
* Without external strain

- **For std PA, loss of more than 50% after 3 months**
- **For UV protected PA, similar loss occurs after 12 months**
- **For TH 868W, loss does not exceed 30% after 18 months**

NB : Average energetic irradiation level : 200 W/m²/month

Bostik SMART Technology Centre – Venette (FRANCE)

<u>Drying effect on Thermelt polyamides</u>



Internal evaluation:

1) *1kg of each reference was first stored at 23°C – 100% humidity during 2 days (severe condition)*
2) *Samples were then dried in a standard oven at 70°C – Moisture content was measured every hour (weighting method with desiccator apparatus)*

Bostik SA
Adresse postale : Immeuble "Le Jade" – 253, avenue du Président Wilson – 93211 La Plaine Saint-Denis Cedex
Société anonyme au capital de 81 123 810 € - 332 110 097 RCS Bobigny
Siège social : 253, avenue du Président Wilson – 93210 La Plaine Saint Denis
A company of TOTAL
www.bostik.com

THERMELT® HMPA AND MOISTURE

Smart news

Context

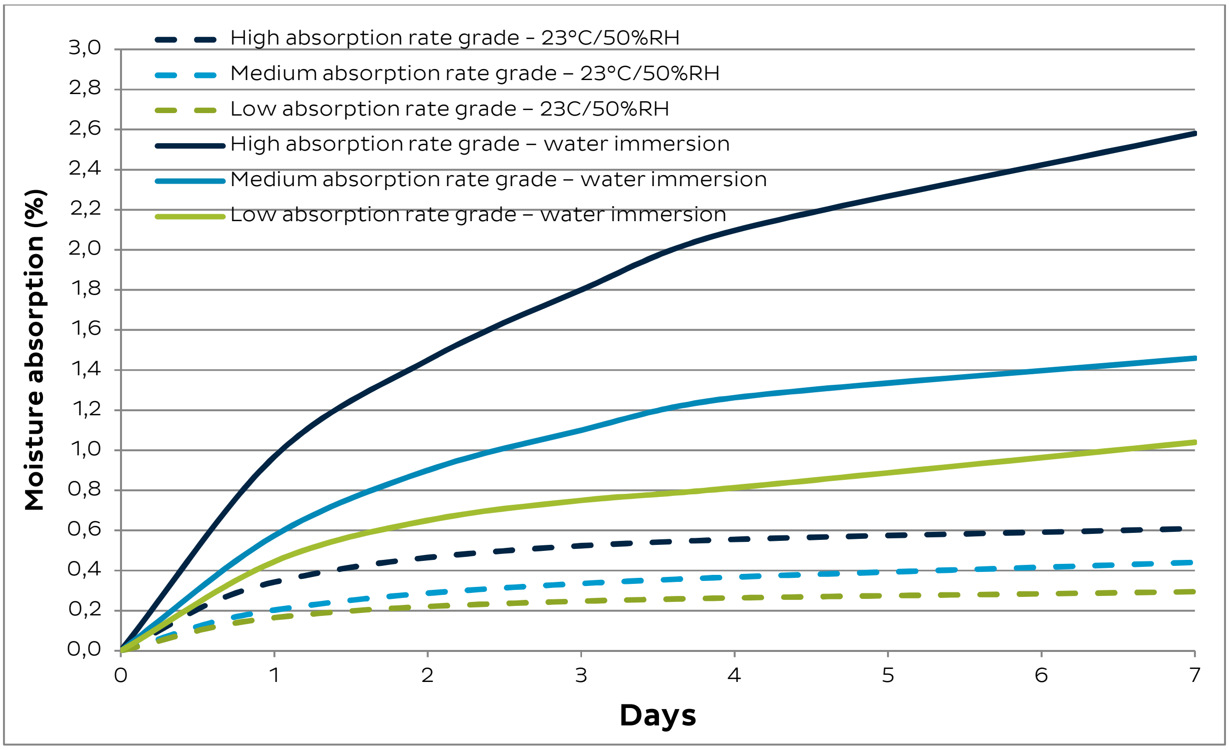
Our purpose with this document is to explain and demonstrate the chemical interactions between water and our polymer before and during their use, and to advise basic rules and simple ways to identify problems that could occur.
Indeed, moisture in the granules, even if it is only surface condensation, can cause problems in parts molded with engineering polymers.
Many kinds of undesirable effects can occur, including processing problems, poor surface on molded parts, or loss of mechanical properties.
Unfortunately it is seldom possible to establish whether there is moisture present by means of visual examination alone.

Polyamide being one of the most hygroscopic plastic materials in common use, the moisture content of molding resins is particularly important because of its direct effect on molding, on mechanical properties, on the viscosity of the melt and on the appearance of the molded parts.
This shows why all plastic processors have to realize the importance of proper drying for molding high quality products.

1. Moisture absorption rate of HMPA

The absorption rate depends on their chemical family and formulation.

The charts hereunder show the moisture absorption rate of different grades of HMPA resin vs. time and conditions of exposure.



2. Effect of humidity rate during process

The table hereunder shows the effect on viscosity

Sample	Moisture content (%)	Brookfield viscosity (220°C, 50 RPM) after 5 min
Dried material 2 days@70°C	**0.0**	**3.1 Pa.s**
« Wet » material (immersed 7 days in water)	**2.6**	**2.0 Pa.s**

OK

Viscosity specifications (Pa.s)
3.0 – 4.0

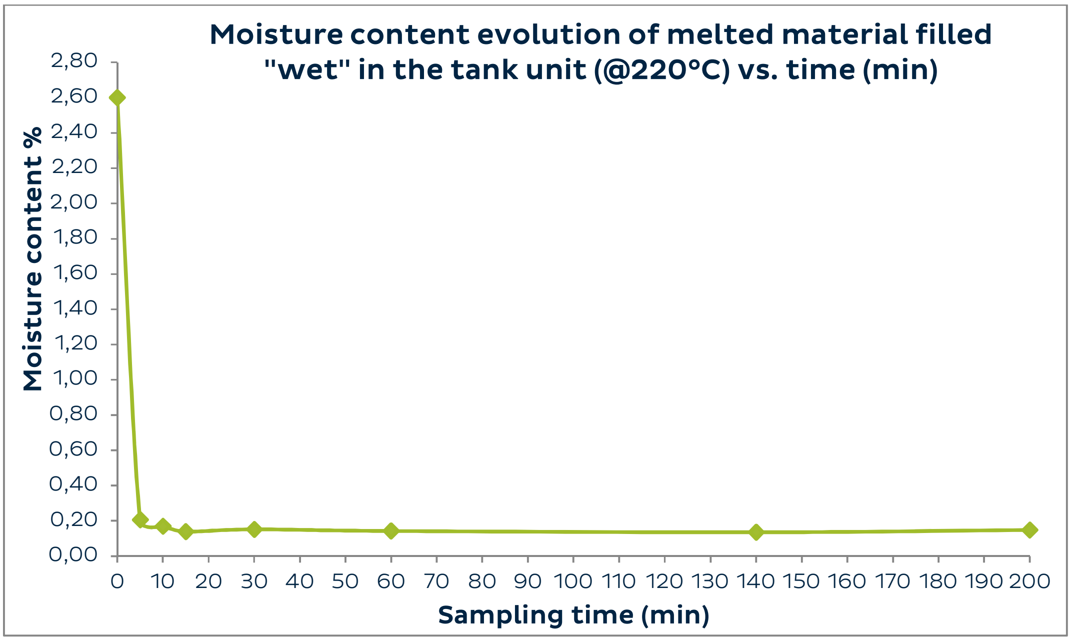
NOK

Conclusion:

Those results show that:

- The viscosity specifications are set up for dried material.
- An "undried" material is then "out of specifications" and its flowability is modified impacting the injection process

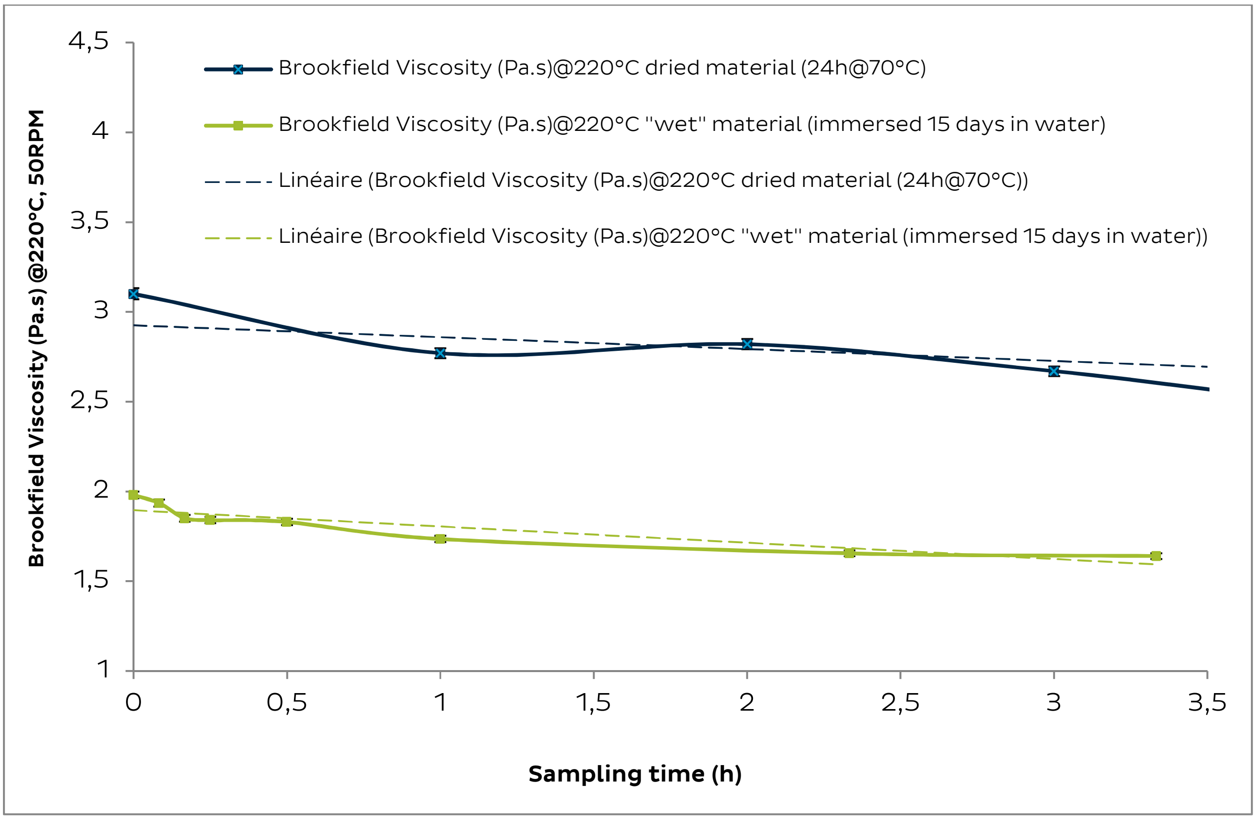
The chart hereunder evaluates the moisture content of a material introduced "wet" in a melter.



Conclusion:

Those results clearly demonstrate that a material poured with moisture in the tank unit is dried when getting out of the nozzle.

The chart hereunder shows the viscosity evolution of dried and undried material introduced in a melter



Conclusion:

Those results clearly demonstrate that:

- The viscosity evolution is the same (slight decrease with time) for dried and "wet" material
- Even if the material has dried in the melter its viscosity remains out of the specifications

3. Effect of humidity rate and temperature on polymer chains

The table hereunder sums up the results of GPC measurement done with different melting conditions.

Parameters :

- Pellets dried (2 days @ 70°C)
- Pellets immersed in water (7 days in water @ RT)
- Tank unit (melting capacity of 2 kg/h)
- GPC analysis (Bostik internal method)

Sample	Mw* (g/mol)	Variation (%)
Dried material 2 days @70°C (pellet)	20100	-
Pre dried material melted @ 200°C during 8h	19900	-1
Pre dried material melted @ 220°C during 8h	18900	-6
Wet material melted @ 220°C during 3h	15700	-22

*As with other molecules, a polymer's size may also be expressed in terms of molecular weight

Conclusion:

Those results clearly demonstrate that:

- choosing the right temperature settings in the tank unit helps to preserve the polymer (Mw after 8h @ 200°C is less affected than Mw after 8h @ 220°C)
- the combination of temperature and too high initial moisture's content of the polymer is the worst case (-20% on Mw after 3h@220°C)
- there is a direct link between the viscosity of a material and his molecular weight/chains length

4. Drying Plastic Materials

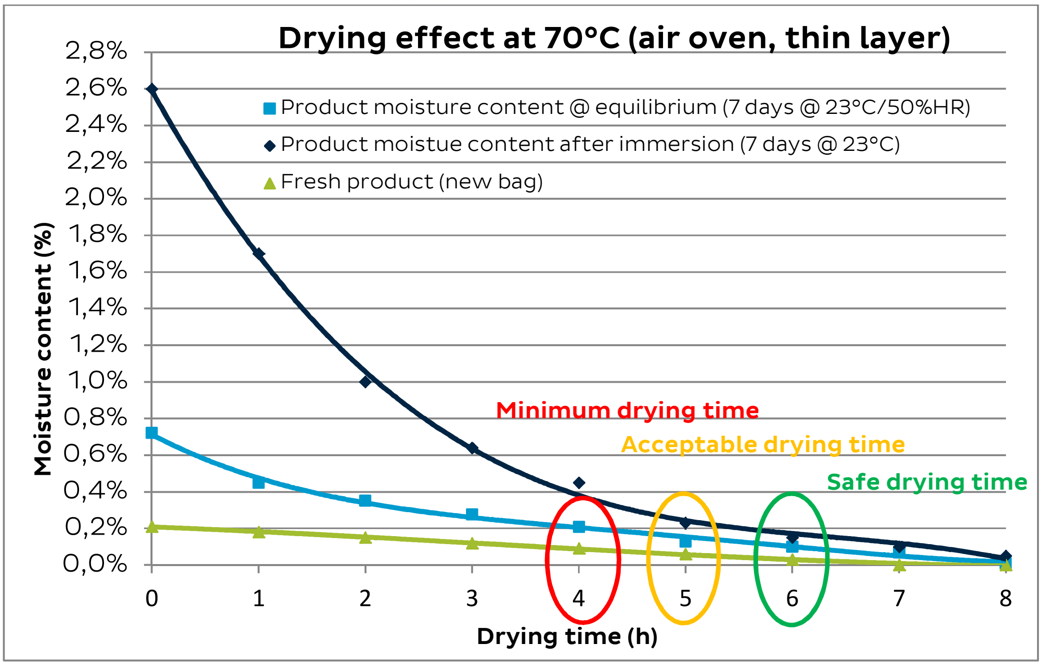
Most engineering polymers require the moisture in the granules to be below a certain maximum level for processing. The need for drying depends mainly on how sensitive the raw material is to water.

How to Dry

We recommend the use of dedicated drying systems such as hot air driers or dehumidified-air drier systems.

However it is possible to use a simple air oven to dry the material

The chart hereunder shows some typical drying time for "wet", at moisture equilibrium or fresh material



The adequate drying time with an air oven depend on the initial moisture content of the resin

Measuring Moisture Content

Moisture in the granules can be measured with commercially available measuring instruments, e.g. with a moisture analyzer or with the Karl-Fischer titration method.

The table hereunder shows usual methods used to measure water content:

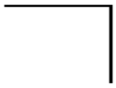
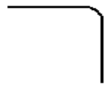
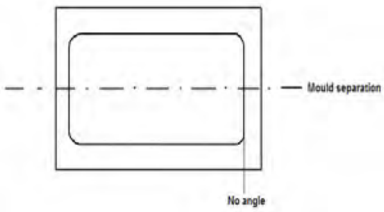
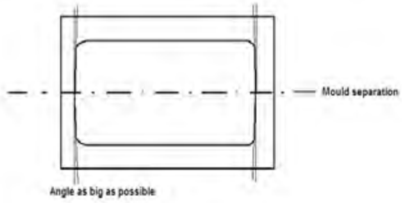
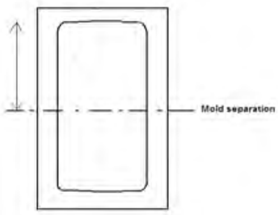
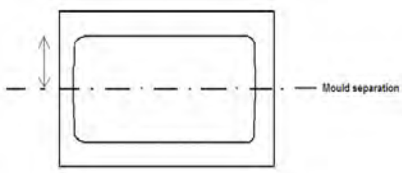
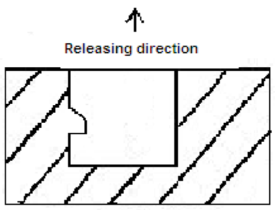
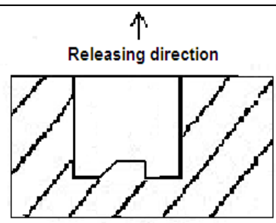
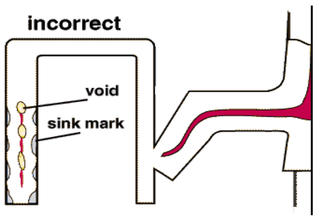
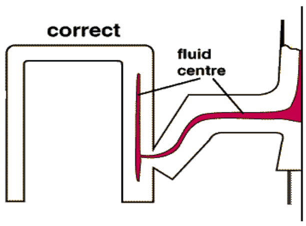
Method	**Principle**	**Determination**	**Key points**	**Time result**
Moisture Analyzer	Loss of weight	Moisture	Quick method and simple procedure ➡ easy handling, easy cleaning (disposable sample pans) Suitable for production ➡ large sample volumes possible, one instrument only (less investment)	5 – 30 min
Karl Fischer titration	Chemical reaction	Water	Selective determination of water content Down to 1 ppm ➡ very accurate ➡ needs specific reagents ➡ use and storage of chemical reagents, need of analytical balance in addition to titrator	5 – 30 min

To eliminate sources of error, the sample should be taken from well down in the hopper, and should be sealed in an appropriate container.

Special heat-sealable sachets coated with PE and aluminum are suitable, as well as laboratory-type glass containers that can be hermetically sealed.

MOLD DESIGN GUIDELINE

In order to avoid troubles with overmolded parts (especially when releasing), check that the conception (mold + part) took account of these few advices.

<table>
<tr><th>Classic High Pressure Molding design
(try to avoid it if not needed)</th><th>More appropriate design for Low Pressure Molding</th></tr>
<tr><td>Right angle in the corner of parts </td><td>Round angle
(0.3 to 0.5 mm) </td></tr>
<tr><td>No releasing angle 
</td><td>Releasing angle
(1° at least) 
</td></tr>
<tr><td>High thickness from the mold separation to the top of the part 
</td><td>Maximum area parallel to the mold separation (lower thickness) 
</td></tr>
<tr><td>Back cuts 
</td><td>No back cuts 
</td></tr>
<tr><td colspan="2">Design parts as symmetric as possible and avoid big thickness variations on a same small area</td></tr>
<tr><td colspan="2">Take an attentive look on the tolerance of the parts you want to mold : the adhesive flows through holes that are bigger than 0.05 mm.</td></tr>
<tr><td colspan="2">Be careful for the dimension and position of the runner (Ø 5- 7 mm) and the injection point (Ø 2-4 mm).</td></tr>
<tr><td>Injection from Inadequate point 
</td><td>Injection in the maximum wall thickness area 
</td></tr>
</table>

GUIDANCE TO REMOVE THE MOST USUAL MOULDING PROBLEMS

Defects founded	Sources	Actions
Lack of material	Bad feeding	Check filter Check hose, head and the level of the resin in the melting tank.
	Injection time too short	Increase the injection time.
	Injection temperature too low	Increase the injection temperature.
Excess of material	Injection time too long	Reduce the injection time.
	injection temperature too high	Reduce the injection temperature.
Bubbles	Lack of material	See above: "lack of material".
	Defect of the piece which to be overmolded.	Suppress one-eyed holes Increase the injection rate (increase the air pressure) Make a second injection.
	Design of mould	Limit the thickness fluctuation to reduce the post-shinkrage.
Chains of micro bubbles	Defect of the pump feeding (cavitation)	Check the cleanness of the melting tank (clean if necessary and provide a preventive action), reduce pump rate.
	Moisture in the material	Dry in an oven (at 60°C from 12 to 24h according to the moisture rate), decrease working rate.
Weld line	Mould temperature too low	Increase the mould cooling temperature.
	Injection temperature too low	Increase the injection temperature.
	Injection rate	Increase the pump rate and / or increase the injection pressure.
Sink mark	Injection pressure too low	Increase the pump rate and / or increase the injection pressure.
	Resin weight slightly too low	Increase the resin weight or make a second injection.
	Entrapped air	Check the position, the number and the diameter of the vents Increase the injection rate (air pressure and / or pump rate).
Bad adhesion on the substrates	Bad compatibility resin / substrates	Use appropriate resin
	Process temperatures too low	Increase temperatures of the different zones.
	Cooling rate too quick	Increase the mould cooling temperature.
	Cooling time too short	Increase the cooling time.
Bad tightness	Deficient adhesion on substrates.	Optimize process temperatures Use appropriate resin.

The parameters must be changed step by step according to experience plans

Bostik smart adhesives

HOTMELT POLYAMIDE RANGE

Thermelt®

MOULDING OF CONNECTORS AND ELECTRONIC COMPONENTS

Standard molding resins	High strength/hardness
Higher adhesion	Curable resins

PRODUCT PROPERTIES - (typical values) Updated : 27/07/18 - 30

THERMELT		**861**	**868**	**195**	**858 B**
Field of application		Industrial			
Special features		Adhesion +	UV protected +	Hardness & temperature resistance	UV protected & temperature resistance
Limit temperatures for use (*)	[°C]	-40/+125	-40/+125	-20/+150	-40/+150
Application temperature	[°C]	190/210	190/210	210/230	210/230
Softening point (Cup & Ball)	[°C]	160	161	***200***	**180**
Brookfield viscosity	[Pa.s] at [°C]	3,6 200	3,3 200	4,6 232	4,4 220
Yield strength (**)	[Mpa]	4,1	4,1	10,2	7,2
Elongation at break (**)	[%]	310	220	580	340
Shore hardness (instant)	D	38	39	***56***	49
Glass transition temperature	[°C]	-30	-30	- 30	-30
Moisture absorption (immersed 14 days)	[%]	2,8	2,6	1,2	1,9
UL 94 flammability test		Natural and black = V0	Natural and white = V0	Natural and black = V2	Black = V0
Electrical properties					
Transversal resistivity (500V)	[Ω.cm]	10^{12}	*10^{11}*	*10^{11}*	$1{,}4.10^{11}$
Dielectric rigidity (23°C)	[kV/mm]	20	*19*	*~19*	20
Relative permitivity (23°C)	50 Hz	5,6	*5*	*N.D*	5,6
Thermal properties					
	HDT B [°C]	37	39	51	43
	Vicat A120 [°C]	43	45	***88***	***77***
Thermal conductivity @ 23°C	[W/m.°K]	~0.2	~0.2	~0.2	~0.2
@ 180°C	[W/m.°K]	~0.6	~0.6	~0.6	~0.6
α coefficient of linear expansion	[ppm/°K]	200 - 300	200 - 300	200 - 300	200 - 300

N.D = not determined

(*) To be determined according to service and/or testing conditions; if needed consult Bostik s.a..

(**) Perform on dried material @ 23°C, average value

HOTMELT POLYAMIDE RANGE

MOULDING OF CONNECTORS AND ELECTRONIC COMPONENTS

Standard molding resins	High strength/hardness
Higher adhesion	Curable resins

PRODUCT PROPERTIES – (typical values) Updated: 27/07/18 - 30

		THERMELT	865	867	PAR1000	PAR1002
Field of application			Automotive			
Special features			Adhesion +	Versatility	High temperature resistance	High & Low temperature resistance
Limit temperatures for use (*)	[°C]		-55/+120	-40/+150	**-40/+200**	**-55/+200**
Application temperature	[°C]		190/210	200/220	180/200	180/190
Softening point (Cup & Ball)	[°C]		157	183	161	144
Brookfield viscosity	[Pa.s] at [°C]		3,1 210	3,7 220	1,5 177	1,5 190
Yield strength (**)	[Mpa]		3,1	6,0	4,3	2,0
Elongation at break (**)	[%]		320	300	130	120
Shore hardness (instant)	D		31	45	37	20
Glass transition temperature	[°C]		-50	-30	-25	-
Moisture absorption (immersed 14 days)	[%]		3,0	2,8	2,6	-
UL 94 flammability test			Natural and black = V0	Natural and black = V0	N.C.	N.C.
Electrical properties						
Transversal resistivity (500V)	[Ω.cm]		$2,8.10^{11}$	$2,9.10^{12}$	*10^{11}*	*10^{11}*
Dielectric rigidity (23°C)	[kV/mm]		18	20	*~19*	*~19*
Relative permitivity (23°C)	50 Hz		5,7	5,6	*N.D*	*N.D*
Thermal properties						
	HDT B [°C]		34	43	38	-
	Vicat A120 [°C]		31	63	48	-
Thermal conductivity @ 23°C	[W/m.°K]		~0.2	~0.2	~0.2	~0.2
@ 180°C	[W/m.°K]		~0.6	~0.6	~0.6	~0.6
α coefficient of linear expansion	[ppm/°K]		200 - 300	200 - 300	200 - 300	200 - 300

N.C = not compliant N.D = not determined

(*) To be determined according to service and/or testing conditions; if needed consult Bostik s.a..
(**) Perform on dried material @ 23°C, average value

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Bostik smart adhesives

HOTMELT POLYAMIDE RANGE

Thermelt

MOULDING OF CONNECTORS AND ELECTRONIC COMPONENTS

Standard molding resins	High strength/hardness
Higher adhesion	Curable resins

PRODUCT PROPERTIES - (typical values) Updated: 27/07/18 - 30

THERMELT		866	817 R	892 B
Field of application		Specialties		
Special features		Adhesion ++	Low viscosity	Hardness +
Limit temperatures for use (*)	[°C]	-25/+115	-15/+125	-20/+140
Application temperature	[°C]	180/210	180/210	200/230
Softening point (Cup & Ball)	[°C]	155	170	173
Brookfield viscosity	[Pa.s] at [°C]	3,2 190	***0,6*** ***205***	4,3 200
Yield strength (**)	[Mpa]	2,3	5,9	9,5
Elongation at break (**)	[%]	530	100	530
Shore hardness (instant)	D	30	49	***53***
Glass transition temperature	[°C]	-30	-	-35
Moisture absorption (immersed 14 days)	[%]	2,2	-	-
UL 94 flammability test		N.R	Natural = V0	Natural and black = V0
Electrical properties				
Transversal resistivity (500V)	[Ω.cm]	*10^{11}*	10^{12}	10^{12}
Dielectric rigidity (23°C)	[kV/mm]	*~19*	18	19
Relative permitivity (23°C)	50 Hz	*6*	7,9	4,0
Thermal properties				
	HDT B [°C]	-	39	47
	Vicat A120 [°C]	-	45	69
Thermal conductivity @ 23°C	[W/m.°K]	~0.2	~0.2	~0.2
@ 180°C	[W/m.°K]	~0.6	~0.6	~0.6
α coefficient of linear expansion	[ppm/°K]	200 - 300	200 - 300	200 - 300

N.R. = not rated N.D = not determined

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(**) Perform on dried material @ 23°C, average value

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HOTMELT POLYAMIDE RANGE

MOULDING OF CONNECTORS AND ELECTRONIC COMPONENTS

Standard molding resins	High strength/hardness
Higher adhesion	Curable resins

PRODUCT PROPERTIES - (typical values) Updated: 27/07/18 - 30

		867 HV B	861 HV B	
	THERMELT	**867 HV B**	**861 HV B**	
Field of application		Electronics		
Special features		High mechanical performences	High mechanical performences	
Limit temperatures for use (*)	[°C]	- 50/+150	- 30/+125	
Application temperature	[°C]	210/230	210/230	
Softening point (Cup & Ball)	[°C]	175-190	155-166	
Brookfield viscosity	[Pa.s] at [°C]	10-14 220	10-14 200	
Yield strength (**)	[Mpa]	**7,8**	5,4	
Elongation at break (**)	[%]	**450**	**500**	
Shore hardness (instant)	D	32	22	
Glass transition temperature	[°C]	-35	-30	
Moisture absorption (immersed 14 days)	[%]	2,8	2,8	
UL 94 flammability test		V0	V0	
<u>Electrical properties</u>				
Transversal resistivity (500V)	[Ω.cm]	*10^{11}*	*10^{11}*	
Dielectric rigidity (23°C)	[kV/mm]	*19*	*19*	
Relative permitivity (23°C)	50 Hz	*N,D*	*N,D*	
<u>Thermal properties</u>				
	HDT B [°C]	-	-	
	Vicat A120 [°C]	57	36	
Thermal conductivity @ 23°C	[W/m.°K]	~0.2	~0.2	
@ 180°C	[W/m.°K]	~0.6	~0.6	
α coefficient of linear expansion	[ppm/°K]	200 - 300	200 - 300	

N.R. = not rated N.D = not determined

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(**) Perform on dried material @ 23°C, average value

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HOTMELT POLYAMIDE RANGE

MOULDING OF CONNECTORS AND ELECTRONIC COMPONENTS

CHEMICAL RESISTANCE **ISO 16750-5**

Fluid	Mechanical test	Contact with fluid	Ageing time/ temperature	TH 195	TH 892	TH 858	TH 867 HV	TH 867
Reference	Maximum Strength (Mpa)	None	23°C 0 min	13,2	9,5	8,1	7,8	6,1
	Elongation at break (%)			580	530	340	450	300
Windscreen Washer	Maximum Strength	Dipping	23°C 2 hours	+++++	+++	+++++	+++++	++++
	Elongation at break			+++++	+++	+++++	+++++	+++++
Engine oil	Maximum Strength	Dipping	80°C 22 hours	+++++	++++	+++++	+++++	+++++
	Elongation at break			++++	+++	++++	++++	+++
Brake fluid	Maximum Strength	Dipping	80°C 22 hours	++++	++++	+++++	+++	+++
	Elongation at break			++	-	-	+	-
Battery Fluid	Maximum Strength	Dipping	23°C 22 hours	+++	+++++	+++++	++++	+++++
	Elongation at break			+++	+++++	++++	++++	++++
Denatured Alcohol	Maximum Strength	Dipping	23°C 10 min	+++++	+++++	+++++	++++	+++++
	Elongation at break			+++++	+++++	+++++	++++	+++
Urea	Maximum Strength	Dipping	80°C 22 hours	+++++	+++++	+++++	+++++	+++++
	Elongation at break			+++++	+++++	+++++	+++++	++++
Gasoline unleaded	Maximum Strength	Dipping	23°C 10 min	+++++	++++	+++++	++++	+++++
	Elongation at break			+++++	+++++	+++++	++++	+++++
Antifreeze Fluid	Maximum Strength	Dipping	80°C 22 hours	+++++	+++++	+++++	+++++	+++++
	Elongation at break			+++	++++	++++	++++	+++
Diesel fuel	Maximum Strength	Dipping	80°C 22 hours	+++++	+++++	+++++	+++++	+++++
	Elongation at break			++++	++++	+++++	++++	++

Loss			Loss		
+++++	Very good	< 10%	++	Damaged	< 40%
++++	Good	< 20%	+	Heavily damaged	< 50%
+++	Reasonable	< 30%	-	Out	> 50%

HOTMELT POLYAMIDE RANGE

MOULDING OF CONNECTORS AND ELECTRONIC COMPONENTS

CHEMICAL RESISTANCE **ISO 16750-5**

Fluid	Mechanical test	Contact with fluid	Ageing time/ temperature	TH 817R	TH 861HV	PAR 1000	TH 861	TH 868
Reference	Maximum Strength (Mpa)	None	23°C 0 min	5,9	5,4	4,3	4,1	4,1
	Elongation at break (%)			100	500	130	310	220
Windscreen Washer	Maximum Strength	Dipping	23°C 2 hours	+++++	+++++	+++++	+++++	+++++
	Elongation at break			++	++++	++++	++++	++++
Engine oil	Maximum Strength	Dipping	80°C 22 hours	++++	+++++	+++++	+++++	+++++
	Elongation at break			+++++	-	+++	+	-
Brake fluid	Maximum Strength	Dipping	80°C 22 hours	++++	++++	++++	++	+++++
	Elongation at break			+	+	++	-	+
Battery Fluid	Maximum Strength	Dipping	23°C 22 hours	+++++	+++++	+++++	+++++	++++
	Elongation at break			++	-	+++++	++	-
Denatured Alcohol	Maximum Strength	Dipping	23°C 10 min	+++++	+++++	++++	+++++	+++++
	Elongation at break			-	++	+++++	++	++
Urea	Maximum Strength	Dipping	80°C 22 hours	+++++	+++++	+++++	+++++	+++++
	Elongation at break			+++++	++	+++++	+++	++
Gasoline unleaded	Maximum Strength	Dipping	23°C 10 min	+++++	+++++	+++++	+++++	+++++
	Elongation at break			+++++	+++++	+++++	+++++	+++++
Antifreeze Fluid	Maximum Strength	Dipping	80°C 22 hours	+++++	+++++	+++++	+++++	+++++
	Elongation at break			+++++	+	+++++	+++	+
Diesel fuel	Maximum Strength	Dipping	80°C 22 hours	++++	+++++	+++++	+++++	+++++
	Elongation at break			-	+	++++	+	+

Loss					Loss
+++++	Very good	< 10%	++	Damaged	< 40%
++++	Good	< 20%	+	Heavily damaged	< 50%
+++	Reasonable	< 30%	-	Out	> 50%

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MOULDING OF CONNECTORS AND ELECTRONIC COMPONENTS

CHEMICAL RESISTANCE **ISO 16750-5**

Fluid	Mechanical test	Contact with fluid	Ageing time/ temperature	TH 869	TH 865	TH 866	PAR 1002	
Reference	Maximum Strength (Mpa)	None	23°C 0 min	4	3	2,3	2	
	Elongation at break (%)			360	200	530	120	
Windscreen Washer	Maximum Strength	Dipping	23°C 2 hours	+++++	+++++	+++++	++++	
	Elongation at break			+++++	++++	+++++	+++++	
Engine oil	Maximum Strength	Dipping	80°C 22 hours	+++++	+++++	+++++	+++++	
	Elongation at break			++	++	+	+++++	
Brake fluid	Maximum Strength	Dipping	80°C 22 hours	+++	++	++++	+++++	
	Elongation at break			-	-	-	+++++	
Battery Fluid	Maximum Strength	Dipping	23°C 22 hours	++++	+++++	++++	+++++	
	Elongation at break			++	++++	+	+++++	
Denatured Alcohol	Maximum Strength	Dipping	23°C 10 min	+++++	+++++	++++	++++	
	Elongation at break			+++++	++++	++	+++++	
Urea	Maximum Strength	Dipping	80°C 22 hours	+++++	+++++	+++++	+++++	
	Elongation at break			+++	+++	++	+++++	
Gasoline unleaded	Maximum Strength	Dipping	23°C 10 min	+++++	+++++	+++++	+++++	
	Elongation at break			+++++	+	+++	+++++	
Antifreeze Fluid	Maximum Strength	Dipping	80°C 22 hours	+++++	+++++	+++++	+++++	
	Elongation at break			+++	++	+	+++++	
Diesel fuel	Maximum Strength	Dipping	80°C 22 hours	+++++	+++++	+++++	+++++	
	Elongation at break			-	+	++	+++	

Loss					Loss
+++++	Very good	< 10%	++	Damaged	< 40%
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HOTMELT POLYAMIDE RANGE

MOULDING OF CONNECTORS AND ELECTRONIC COMPONENTS

ADHESION CAPABILITY Updated : 27/07/18 - 30

	THERMELT	861	195	868	858
Substrates					
Metals (2) (AL/Cu-alloys + steel)		A	B	A	A
Glas (2)		A	C	A	A
Ceramic (2)		A	C	A	A
PVC	Polyvinylchloride (soft + hard)	A	-	A	A
ABS	Acrylonitrile butadiene styrene	A	-	A	A
PPO	Polyphenylenoxyde	B	-	B	B
PA	Polyamides	A	-	A	B
PP	Polypropylene (1)	B	-	B	-
EP	Polyepoxyd resins	B	-	B	B
PE	Polyethylene (1)	B	-	B	-
PC	Polycarbonates	A	-	A	B
PETP	Polyethylene terephtalate	B	-	B	B
PBTP	Polybutylene terephthalate	B	-	B	B
PS	Polystyrene	C	-	C	C
PUR	Polyurethanes	C	-	C	C

Remarks : (1) : with Corona or flaming pretreatment.
(2) : preheating of substrate necessary.

Rating : A = excellent
B = good
C = acceptable
-: poor adhesion

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Bostik smart adhesives

HOTMELT POLYAMIDE RANGE

Thermelt

MOULDING OF CONNECTORS AND ELECTRONIC COMPONENTS

ADHESION CAPABILITY Updated : 27/07/18 - 30

	THERMELT	865	867	PAR1000	PAR1002
Substrates					
Metals (2) (AL/Cu-alloys + steel)		A	A	A	A
Glas (2)		A	A	A	A
Ceramic (2)		A	A	A	A
PVC	Polyvinylchloride (soft + hard)	A	A	A	A
ABS	Acrylonitrile butadiene styrene	A	A	A	A
PPO	Polyphenylenoxyde	A	B	B	B
PA	Polyamides	A	B	B	B
PP	Polypropylene (1)	B	-	B	B
EP	Polyepoxyd resins	B	B	B	B
PE	Polyethylene (1)	B	-	B	B
PC	Polycarbonates	A	B	B	B
PETP	Polyethylene terephtalate	B	B	B	B
PBTP	Polybutylene terephthalate	B	B	B	B
PS	Polystyrene	C	C	C	C
PUR	Polyurethanes	C	C	C	C

Remarks : (1) : with Corona or flaming pretreatment.
(2) : preheating of substrate necessary.

Rating : A = excellent
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-: poor adhesion

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Bostik smart adhesives

HOTMELT POLYAMIDE RANGE

Thermelt

MOULDING OF CONNECTORS AND ELECTRONIC COMPONENTS

ADHESION CAPABILITY

Updated : 27/07/18 - 30

	THERMELT	817	866	892
Substrates				
Metals (2) (AL/Cu-alloys + steel)		A	A	B
Glas (2)		B	A	C
Ceramic (2)		B	A	C
PVC	Polyvinylchloride (soft + hard)	B	A	-
ABS	Acrylonitrile butadiene styrene	B	A	-
PPO	Polyphenylenoxyde	A	B	-
PA	Polyamides	B	B	-
PP	Polypropylene (1)	-	B	-
EP	Polyepoxyd resins	B	B	-
PE	Polyethylene (1)	-	B	-
PC	Polycarbonates	C	A	-
PETP	Polyethylene terephtalate	C	A	-
PBTP	Polybutylene terephthalate	C	A	-
PS	Polystyrene	C	C	-
PUR	Polyurethanes	C	C	-

Remarks : (1) : with Corona or flaming pretreatment.
(2) : preheating of substrate necessary.

Rating : A = excellent
B = good
C = acceptable
-: poor adhesion

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