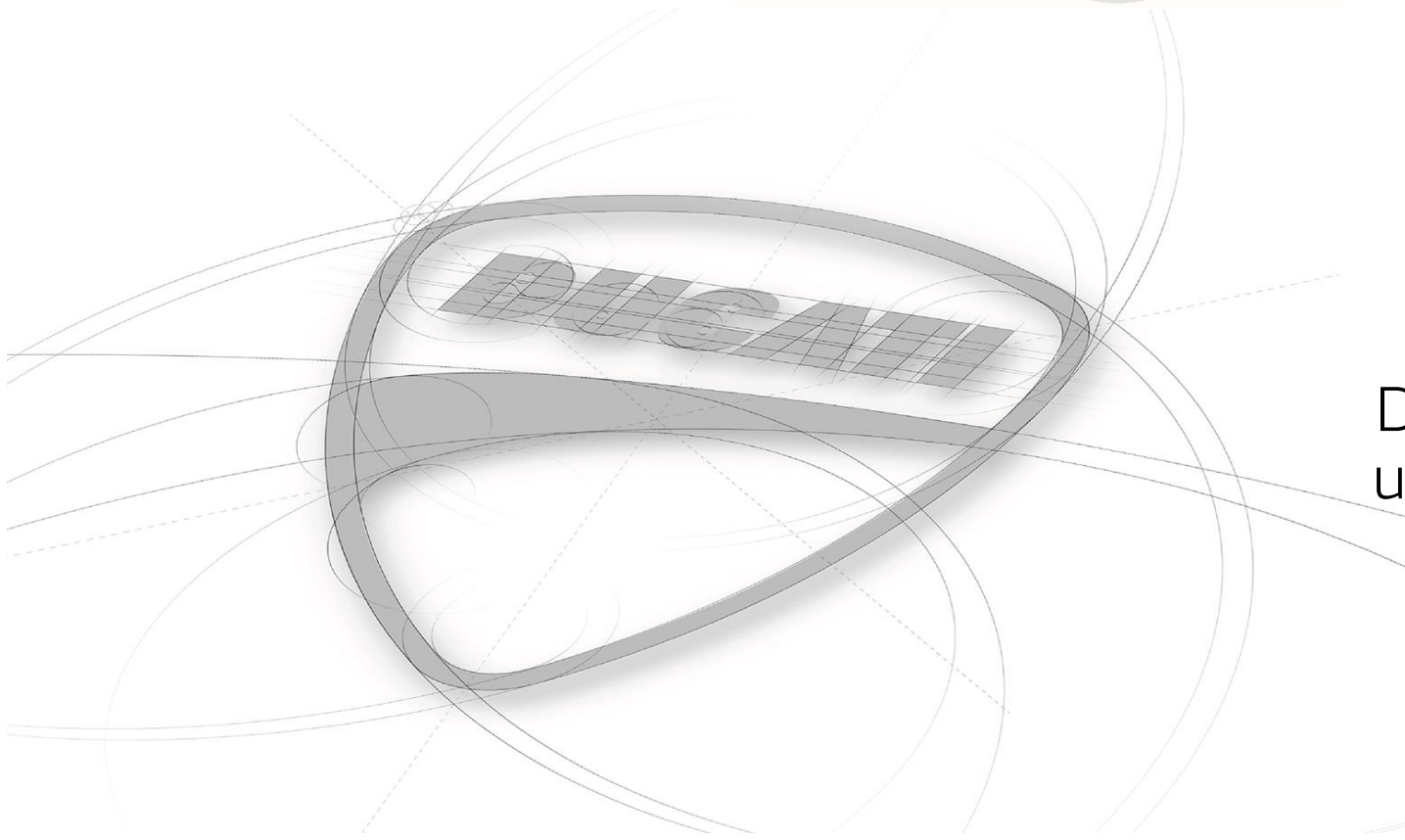
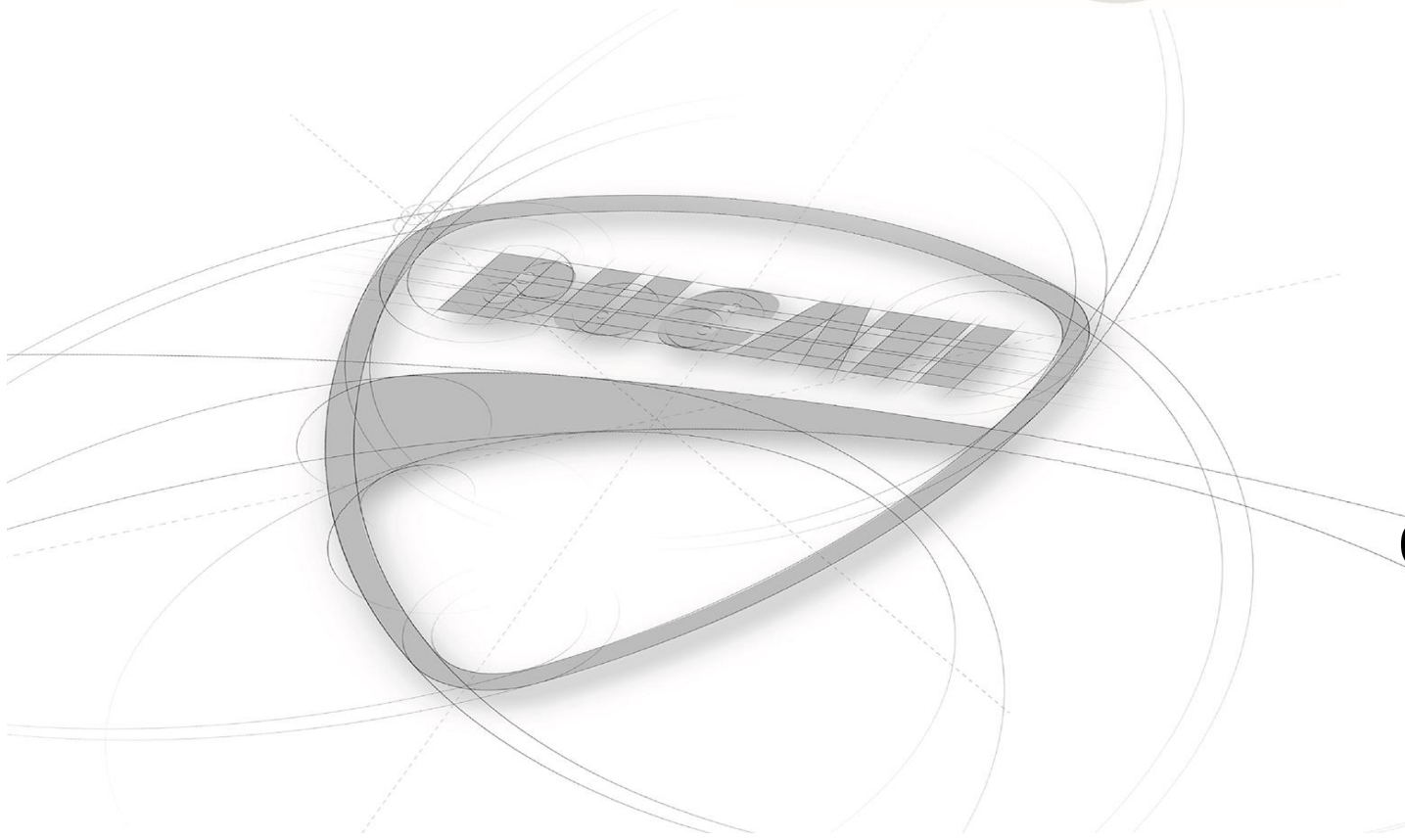




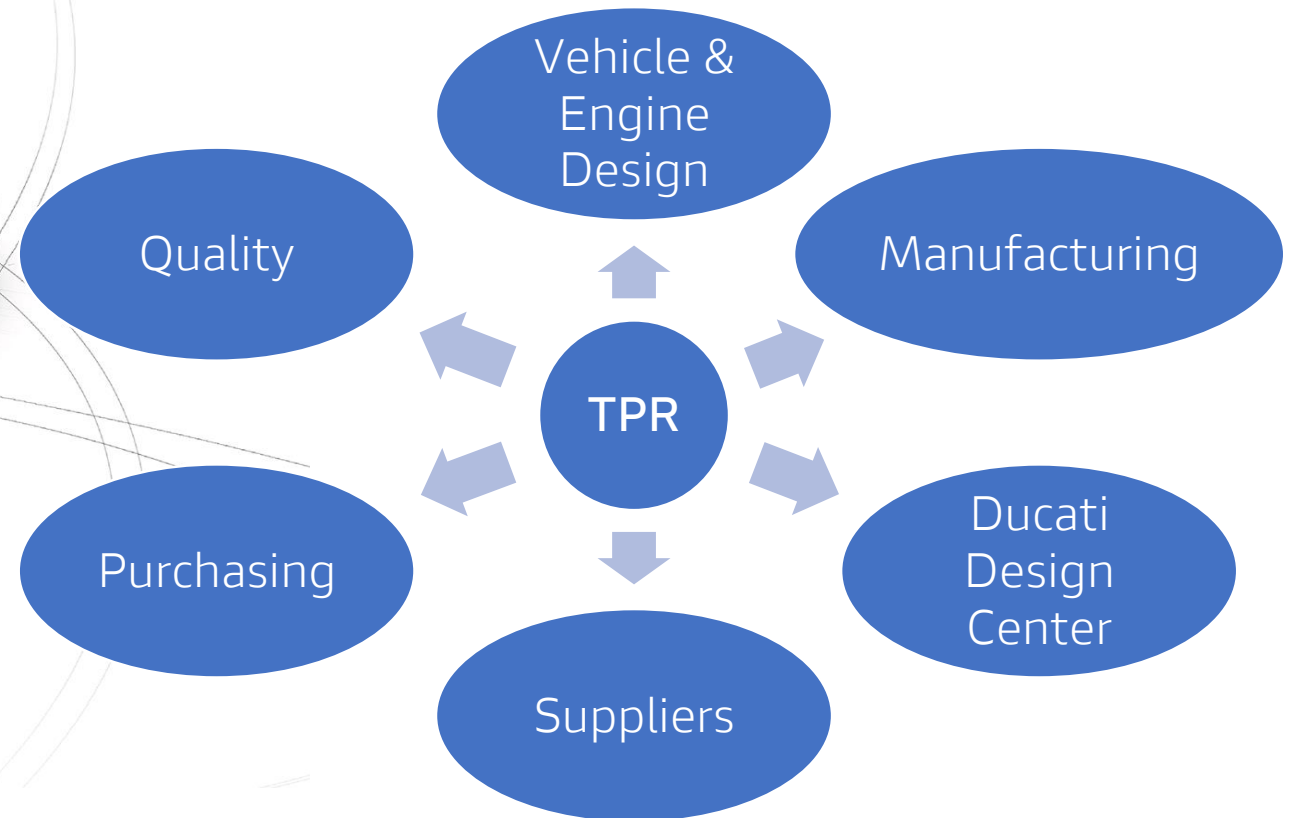
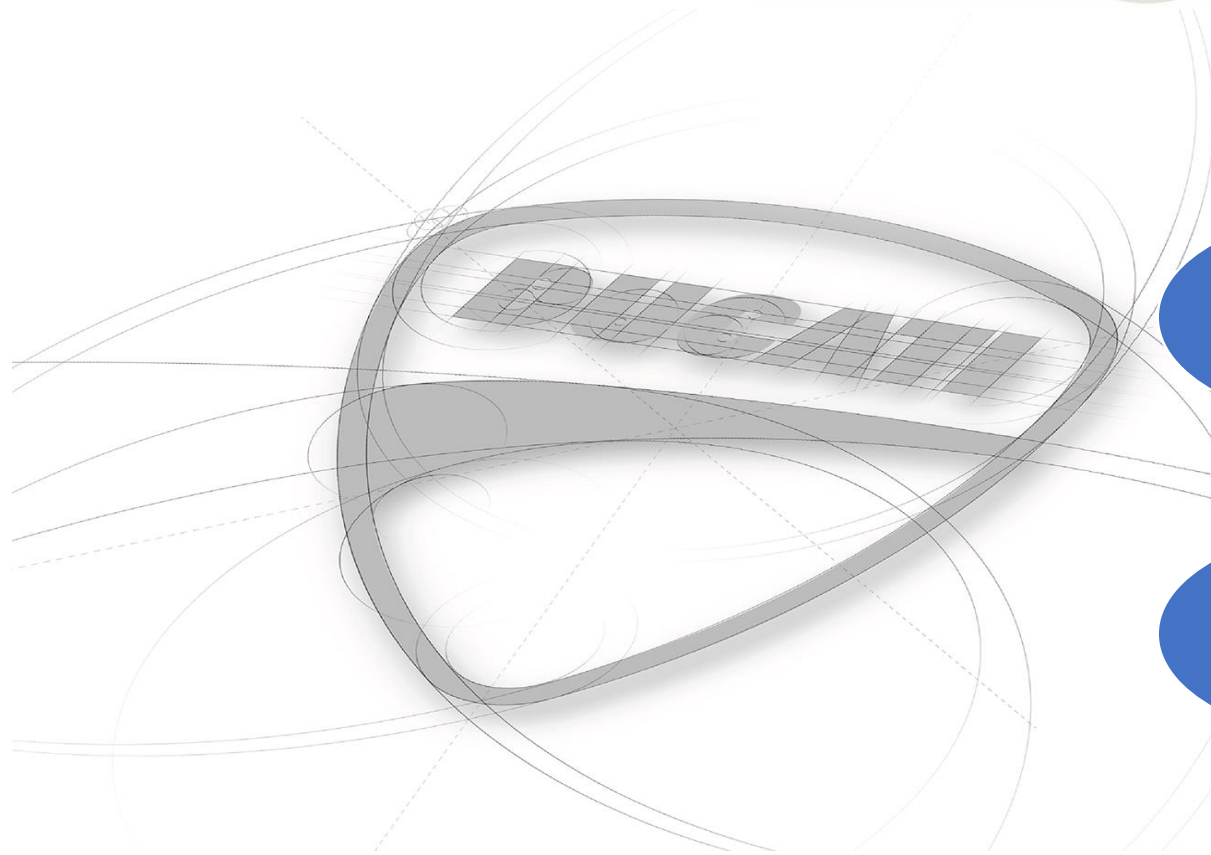
Metal Replacement

Difficoltà e vantaggi nell'utilizzo di un polimero tecnico in componenti strutturali di una moto



Nicolò Compostella

Processes Technologies Manager
&
Global Sourcing Project Manager





STYLE



SOPHISTICATION



PERFORMANCE



TRUST





Italy



Main Production Plant:
Borgo Panigale, Bologna

Site surface: 114,873 m²
Built surface: 71,657 m²



Thailand



Assembly Plant:
Amphur Pluakdaeng Rayong

Site surface: 40,000 m²
Built surface: 20,500 m²



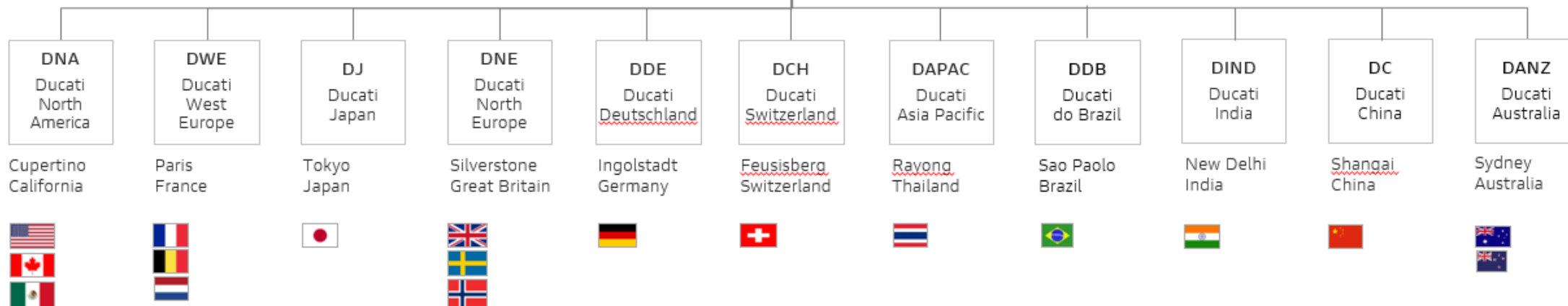
Brazil [Dafra]
Service Provider

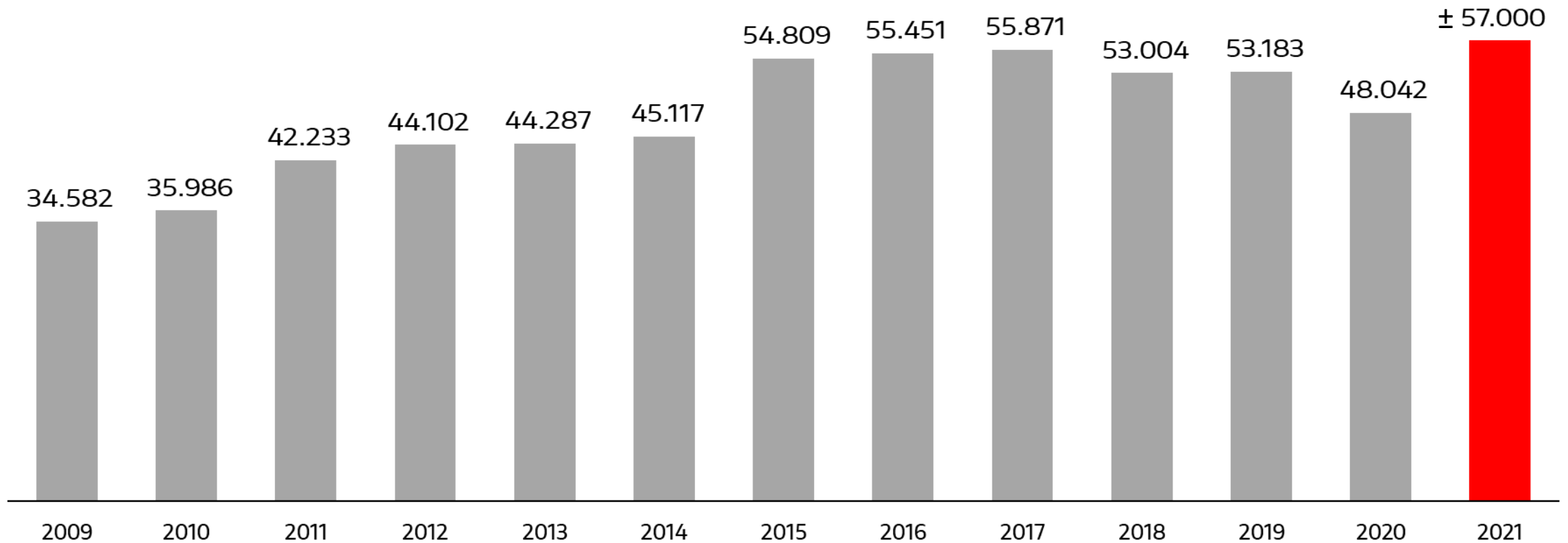


CKD Assembly Plant:
Manaus

Ducati Motor Holding

Headoffice and main plant
Bologna, Italy





8th edition

Smart
PLASTICS

10/11
NOV
2021

MUSEO
ALFA
ROMEO
ARESE



MONSTER



MULTISTRADA



PANIGALE



STREETFIGHTER



SUPERMOTO



CORSE



plast PLAST:DESIGN

COMPONENTI E PRODOTTI DI MATERIE PLASTICHE - PLASTIC PRODUCTS AND COMPONENTS



8th edition

Smart PLASTICS

10/11
NOV
2021

MUSEO
ALFA
ROMEO
ARESE



DARK PRO, 1100 cc



PRO, 1100 cc



SPORT PRO, 1100 cc



NIGHTSHIFT



DESERT SLED



ICON DARK



ICON

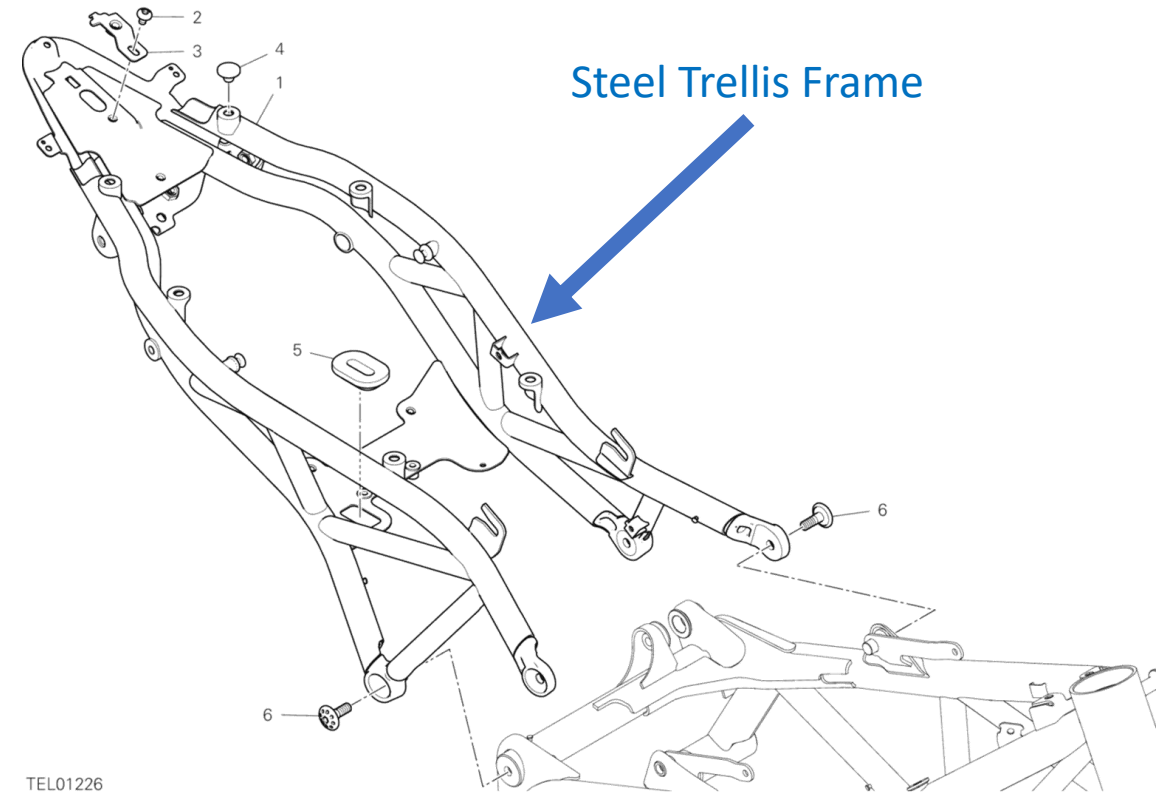


ICON

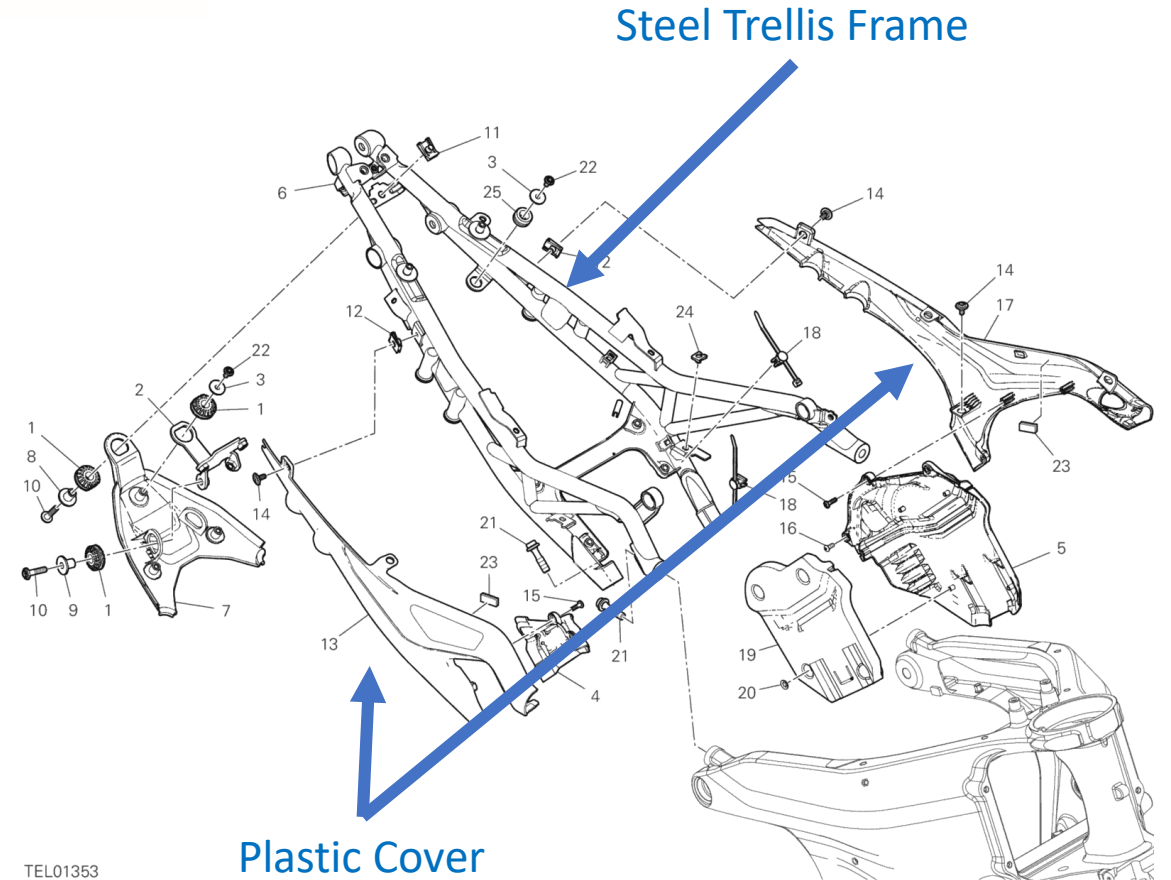


E-Scrambler

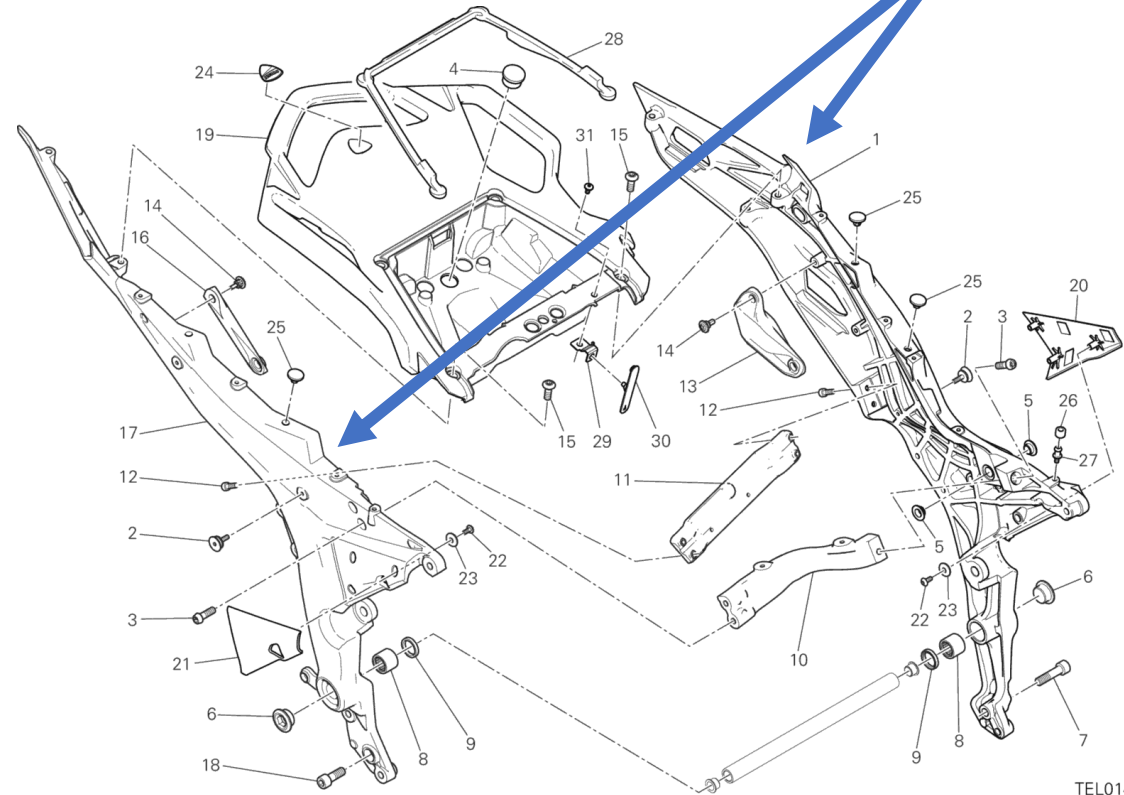




TEL01226



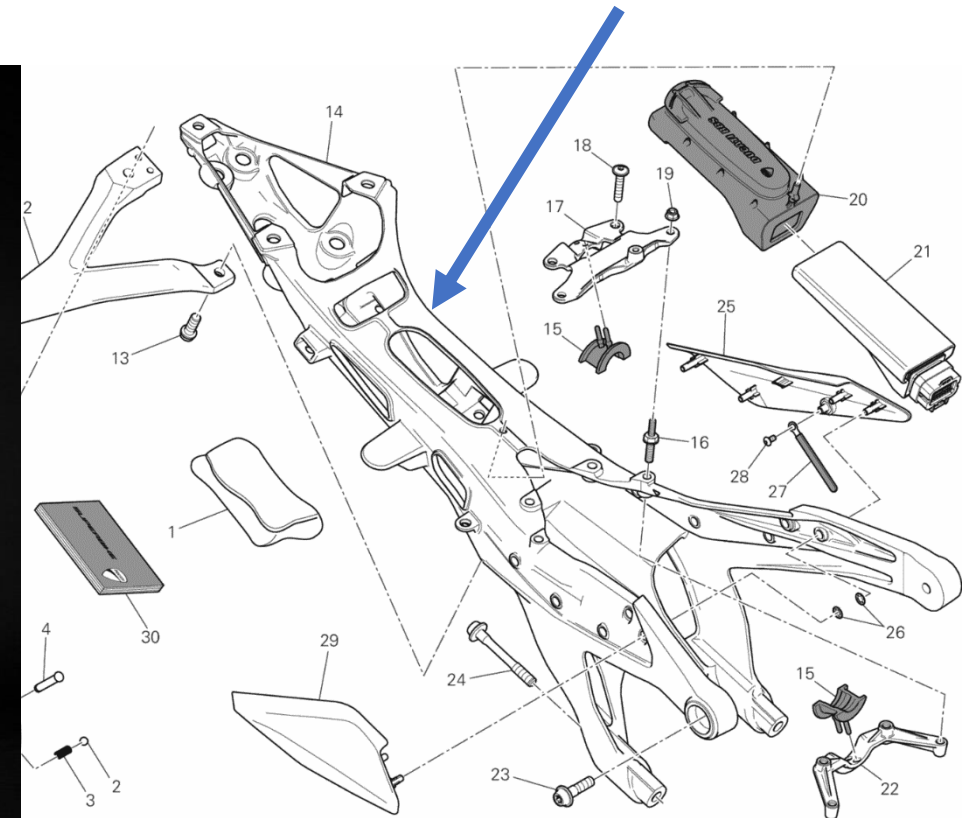
Alluminum Casting Frames



TEL01423



Alluminum Casting Frame

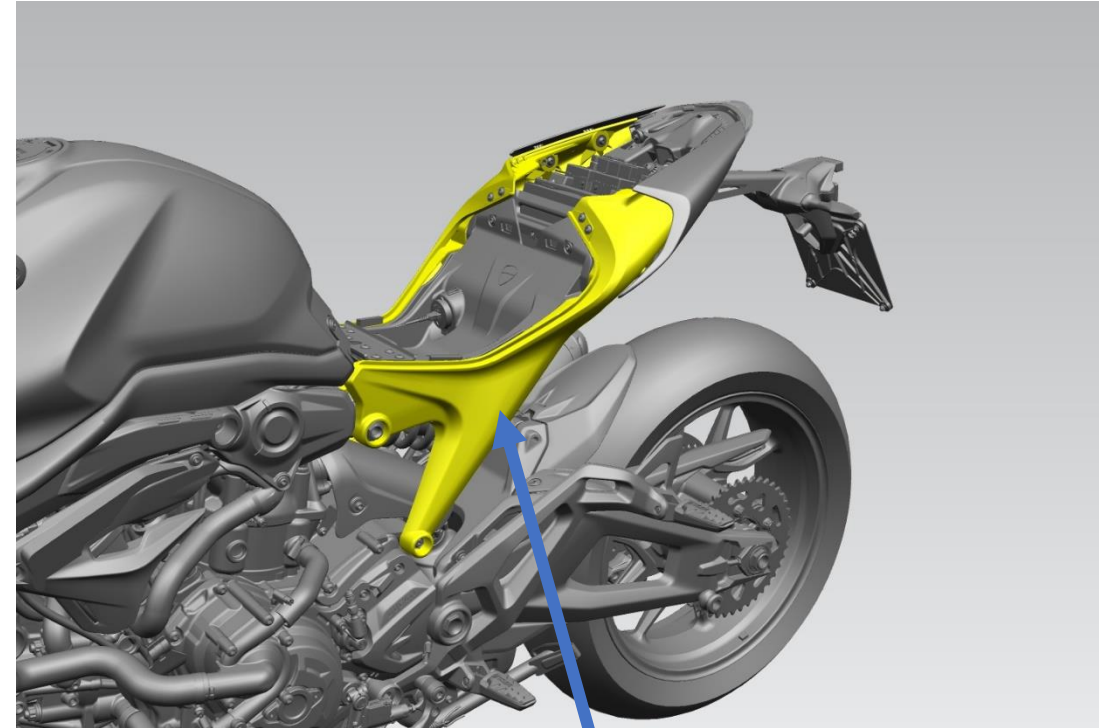


CFRP Frames



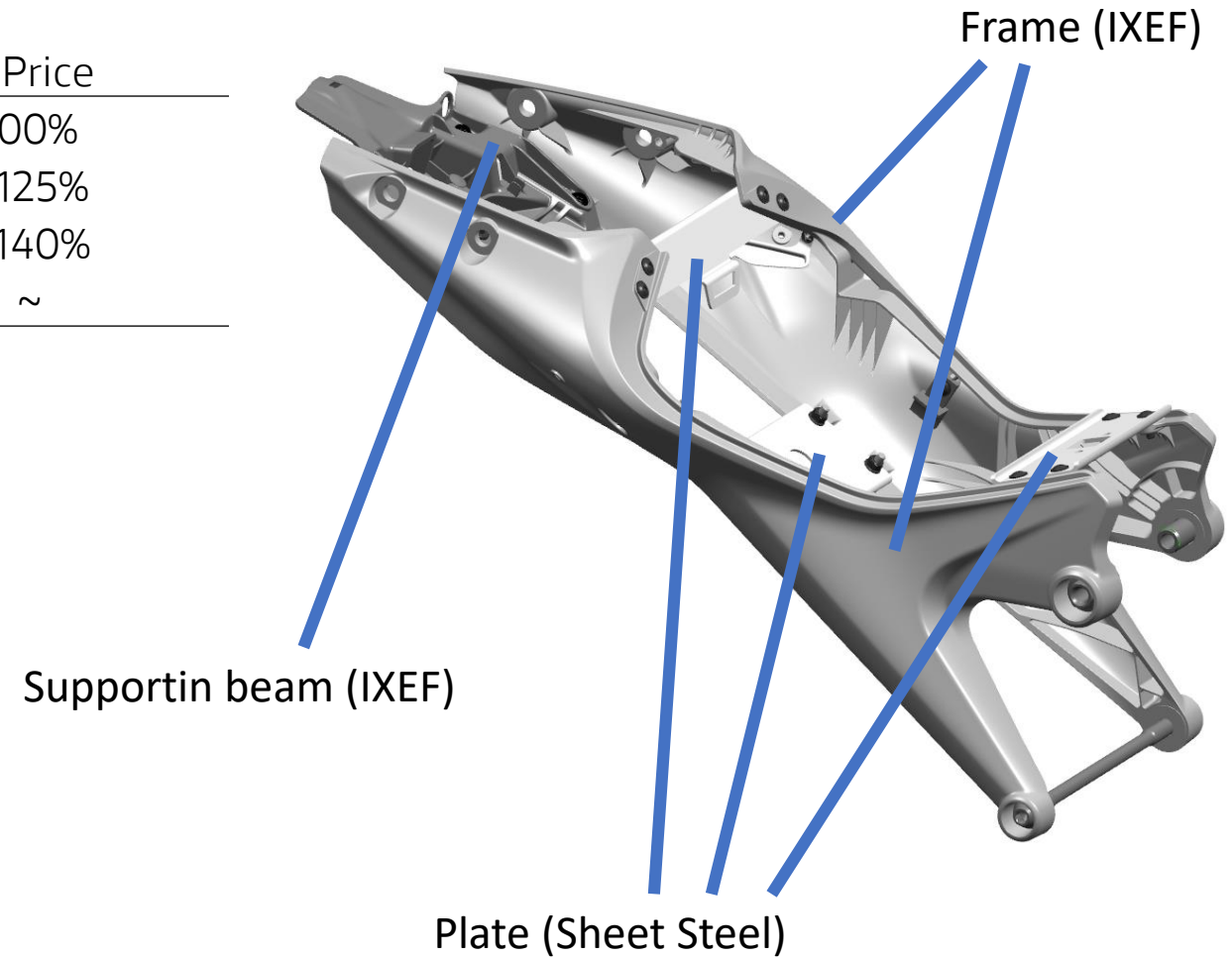
Glass Fiber Reinforced Polymer

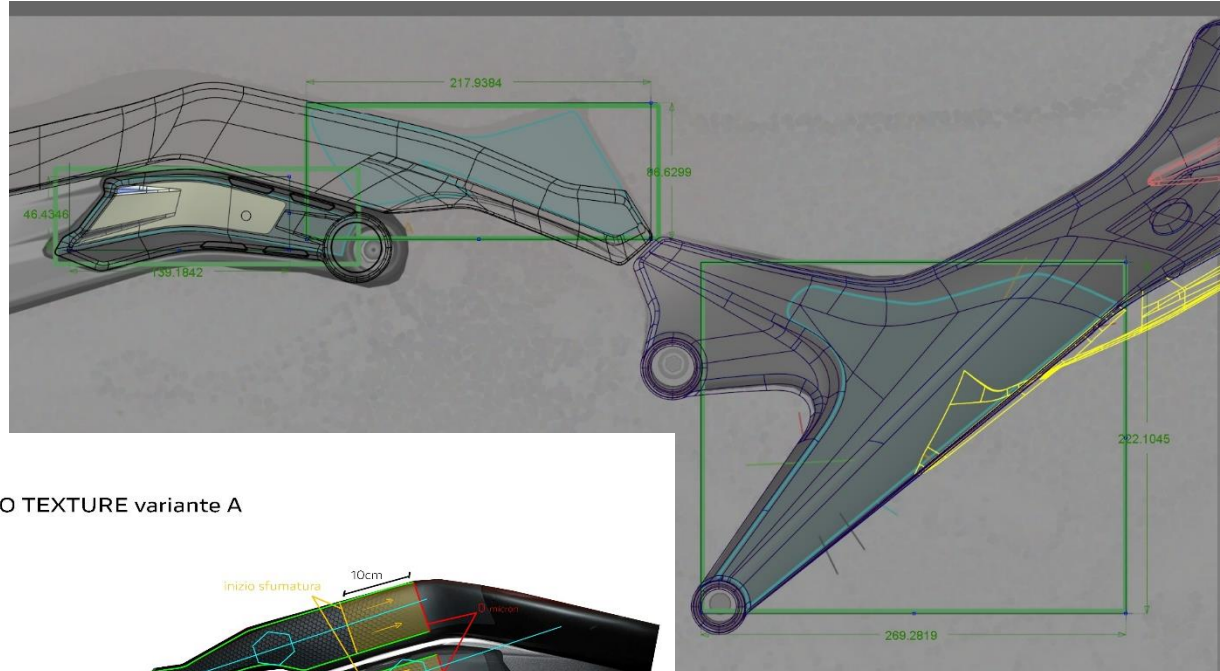




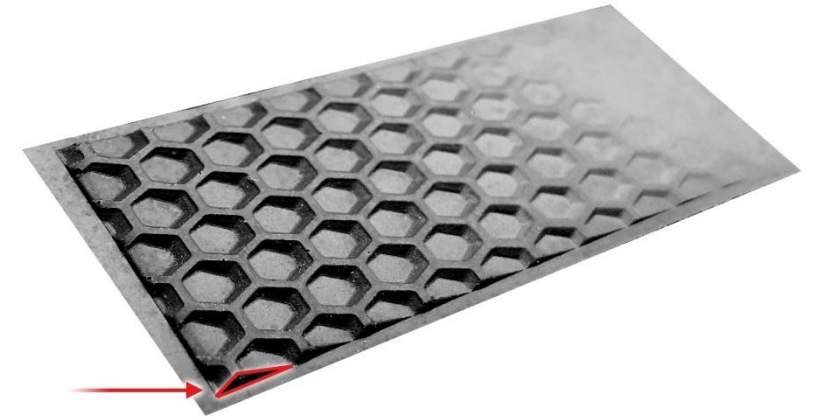
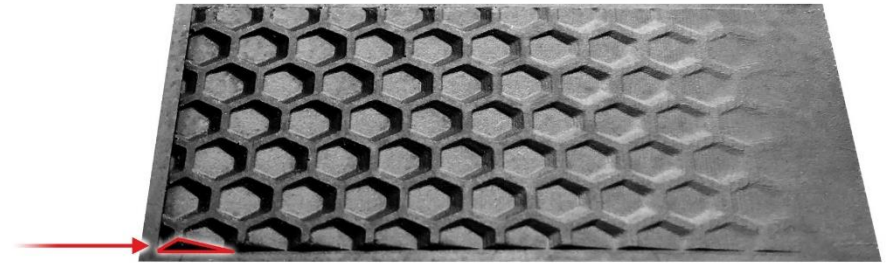
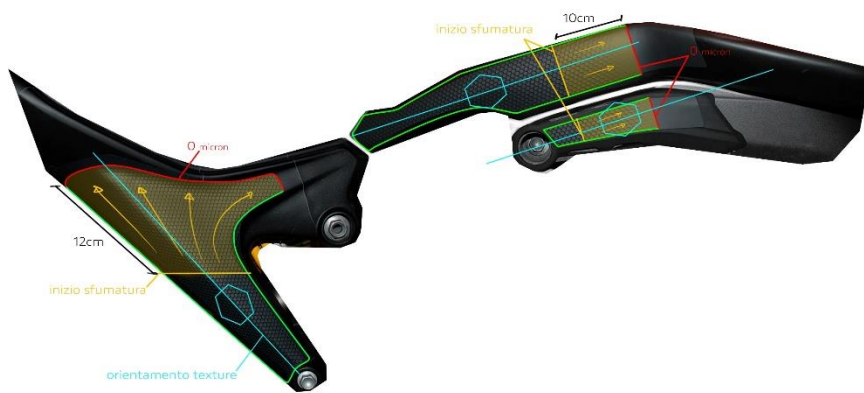
PARA IXEF 1025

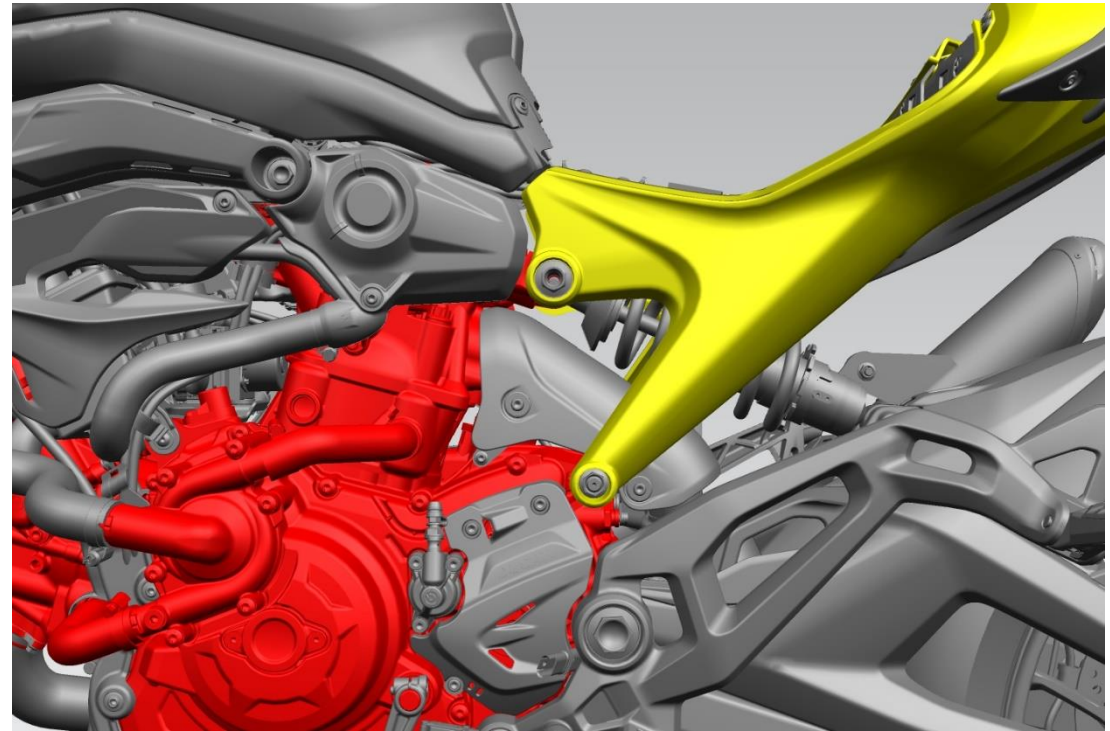
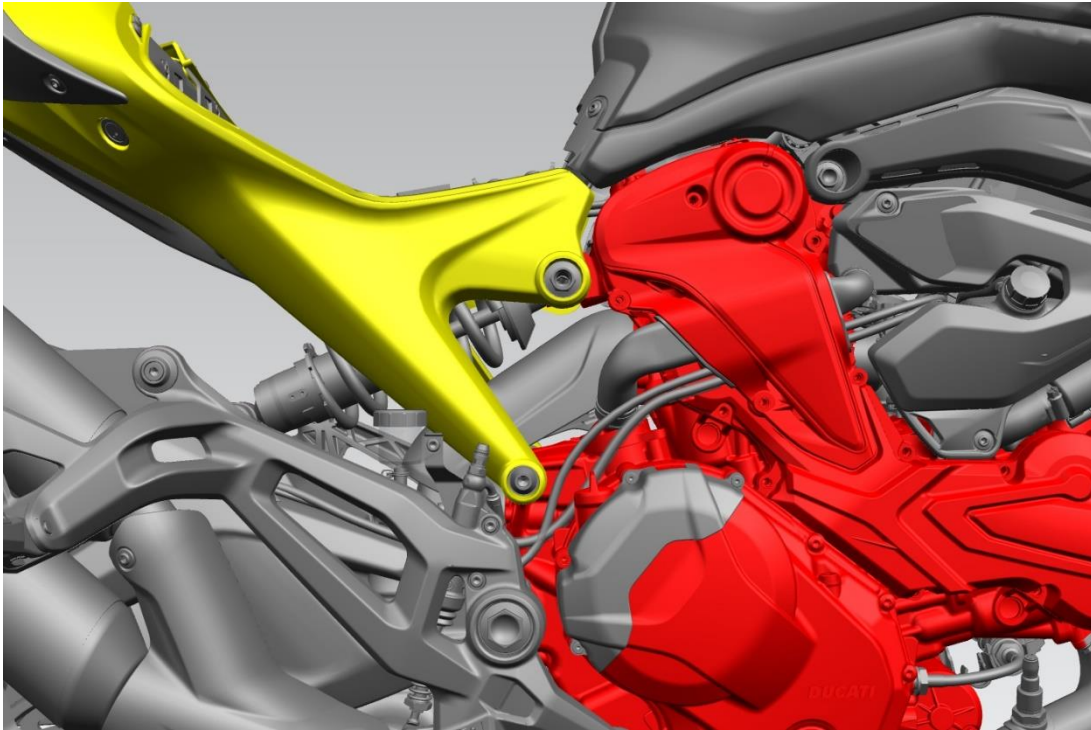
Tecnology	Δ Weight	Δ Price
Trellis frame	100%	100%
Casting (die, s. 3,5mm)	-20%	+125%
Casting (die, s. 4,5mm)	-3%	+140%
Technopolimer	-25%	~

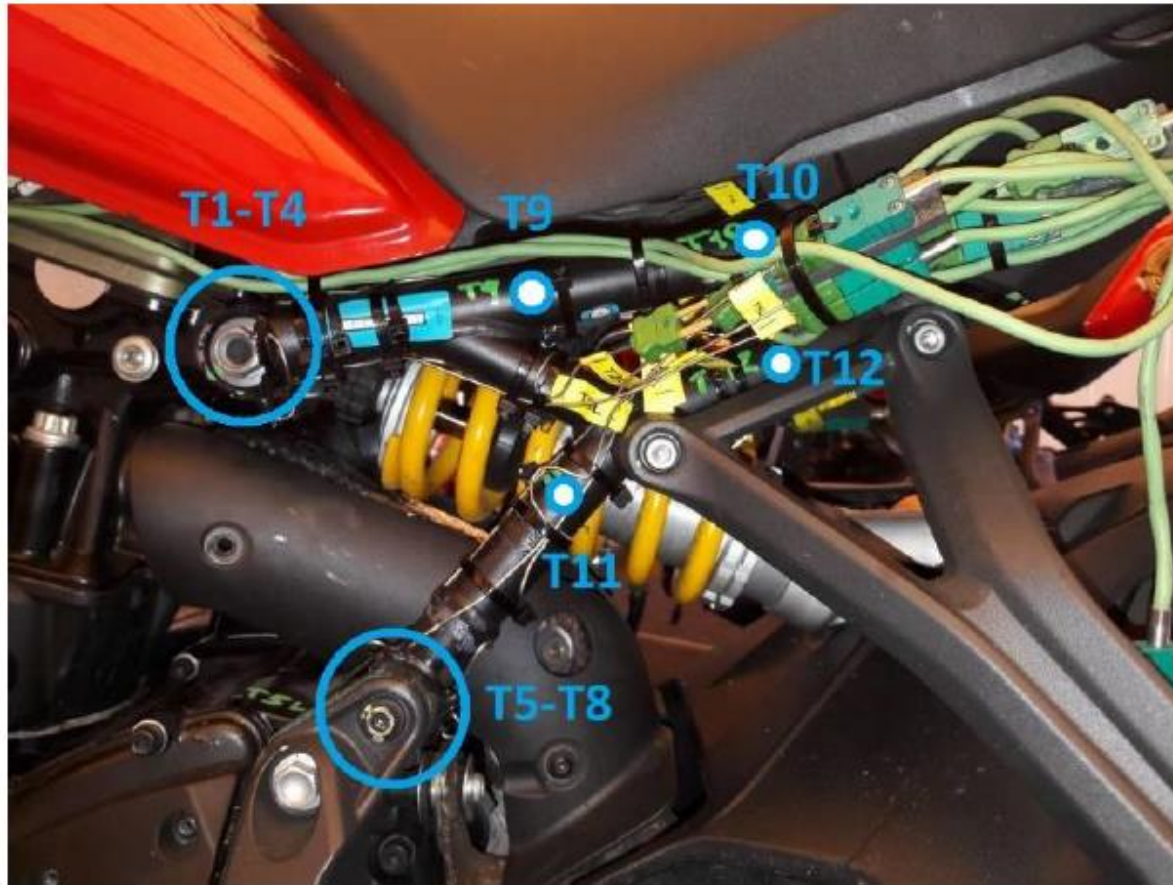


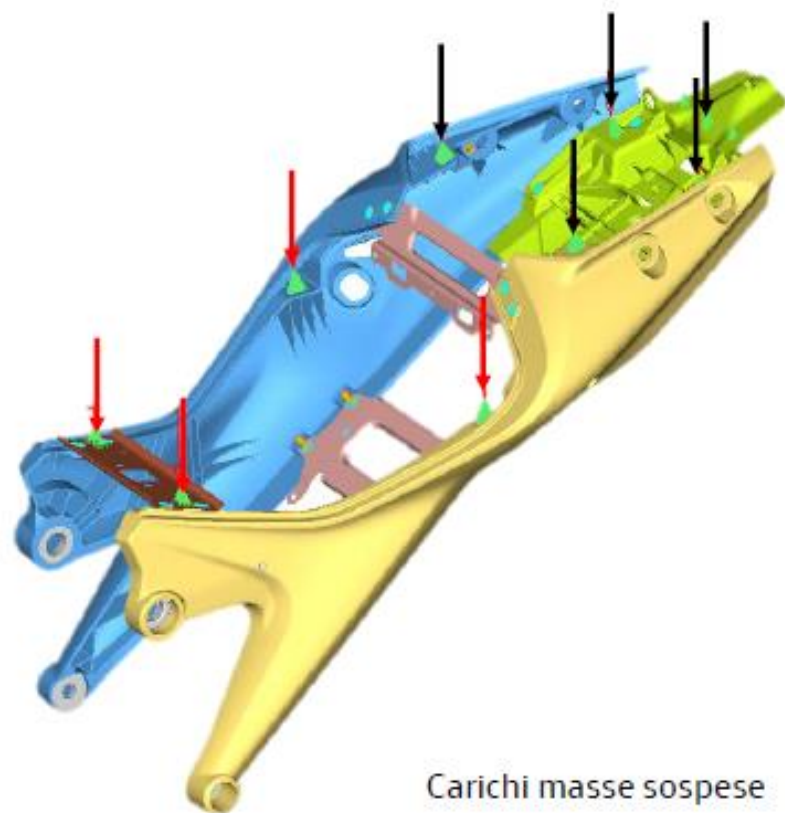


ORIENTAMENTO TEXTURE variante A

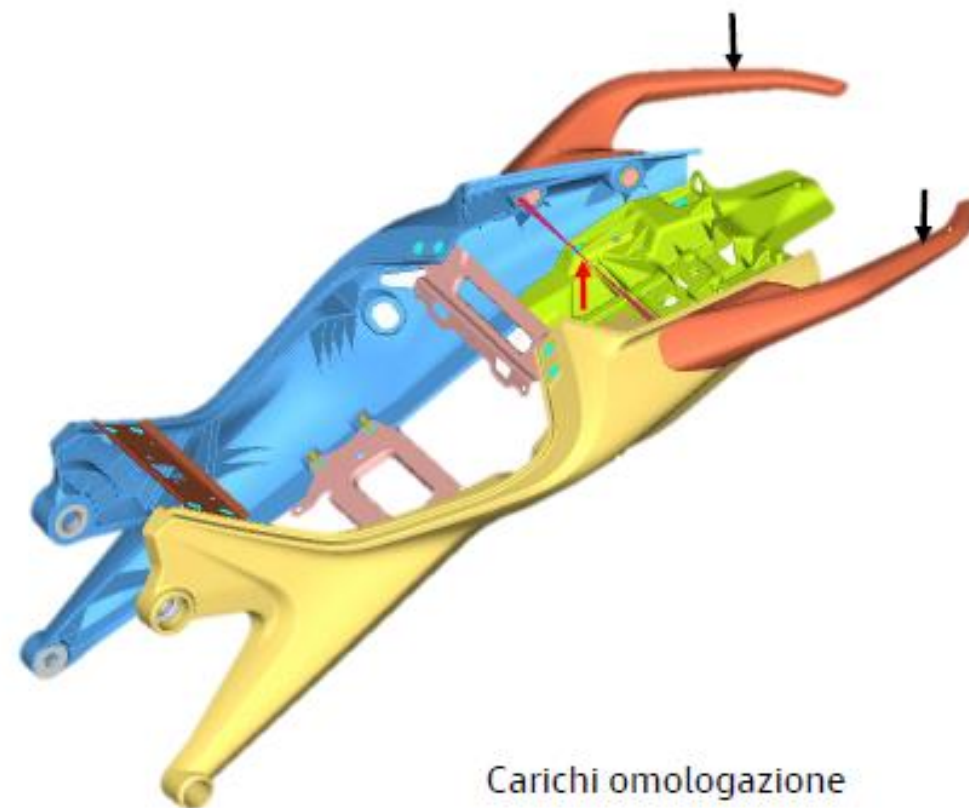








Carichi masse sospese



Carichi omologazione

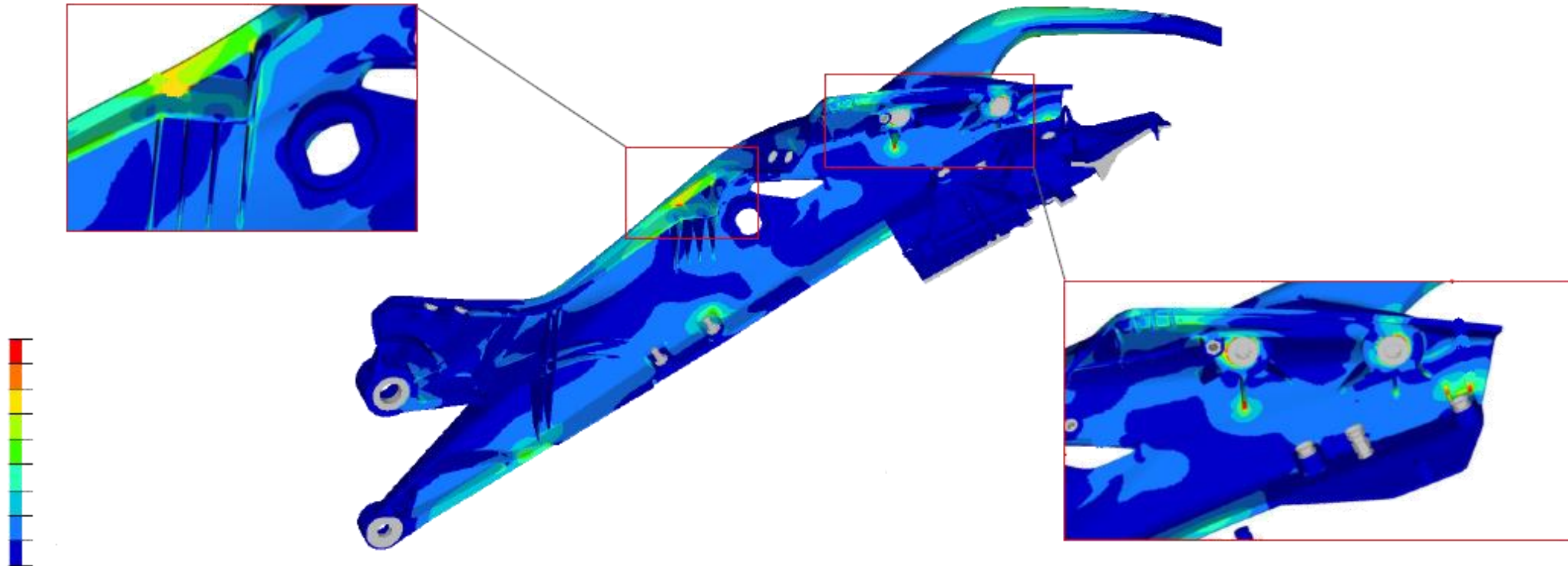


Figure 13: Tensile creep of IXEF 1022 with 2 mm thickness at 120 °C

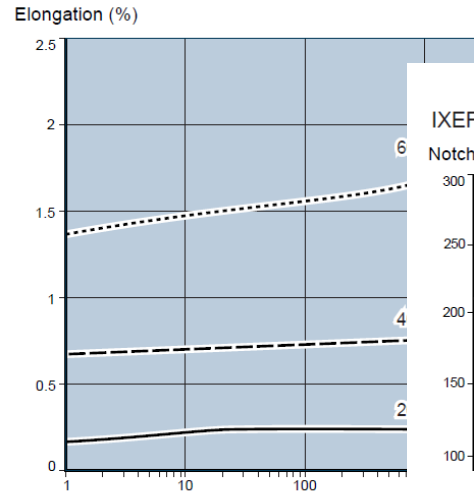


Figure 11: IZOD impact strength of IXEF 1022 (DAM) as a function of temperature

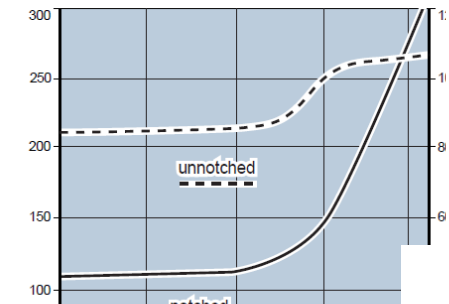


Figure 10: Flexural properties of IXEF 1022 (DAM) as a function of temperature

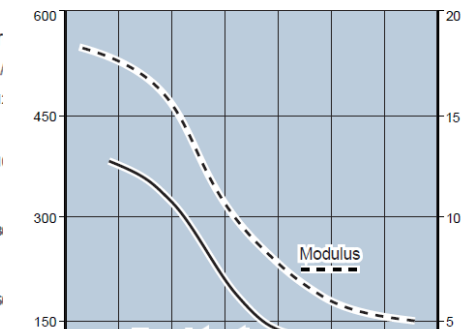


Figure 20: Water content of IXEF (1022, 1032, 1622) at equilibrium as a function of relative humidity

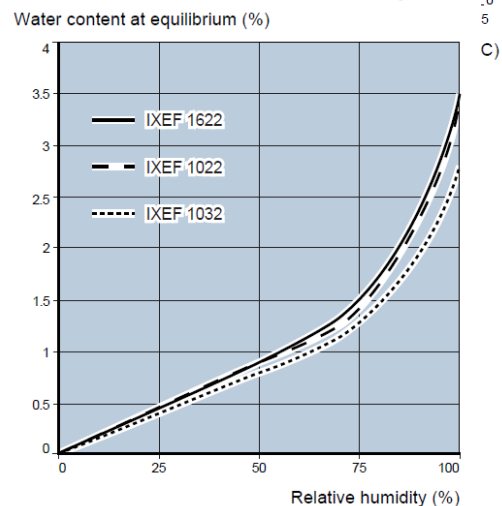
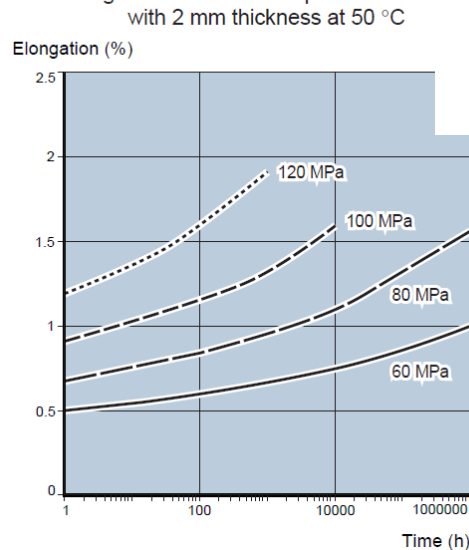
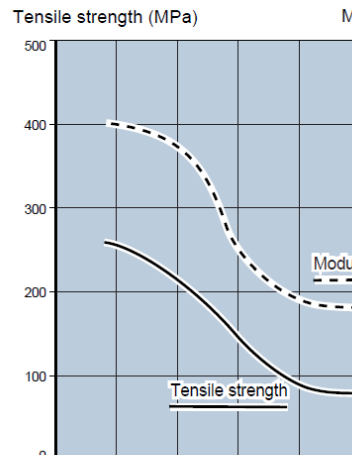
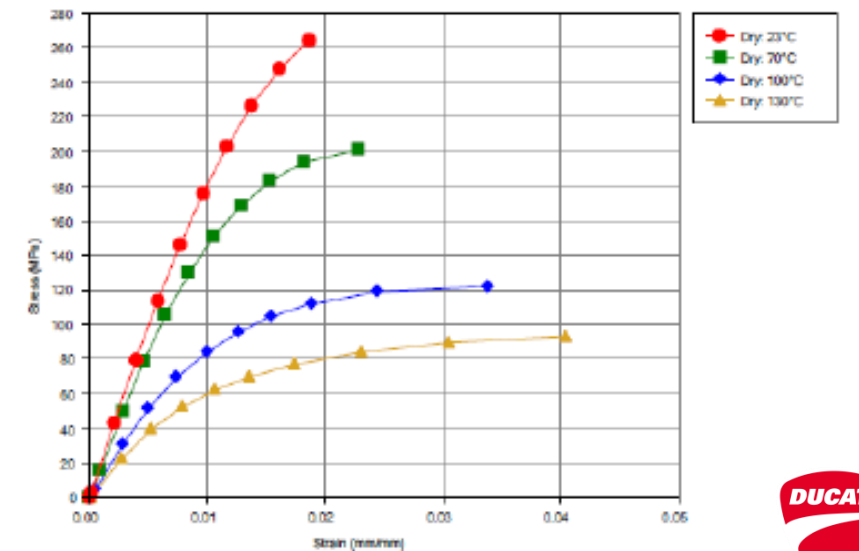
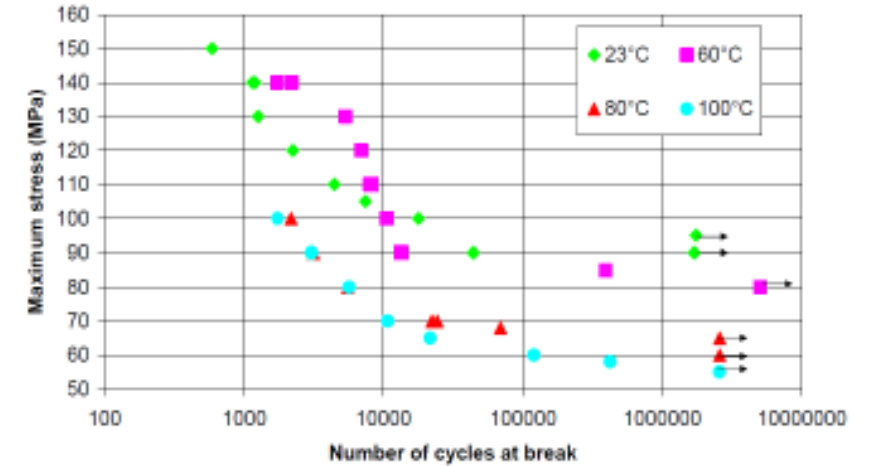
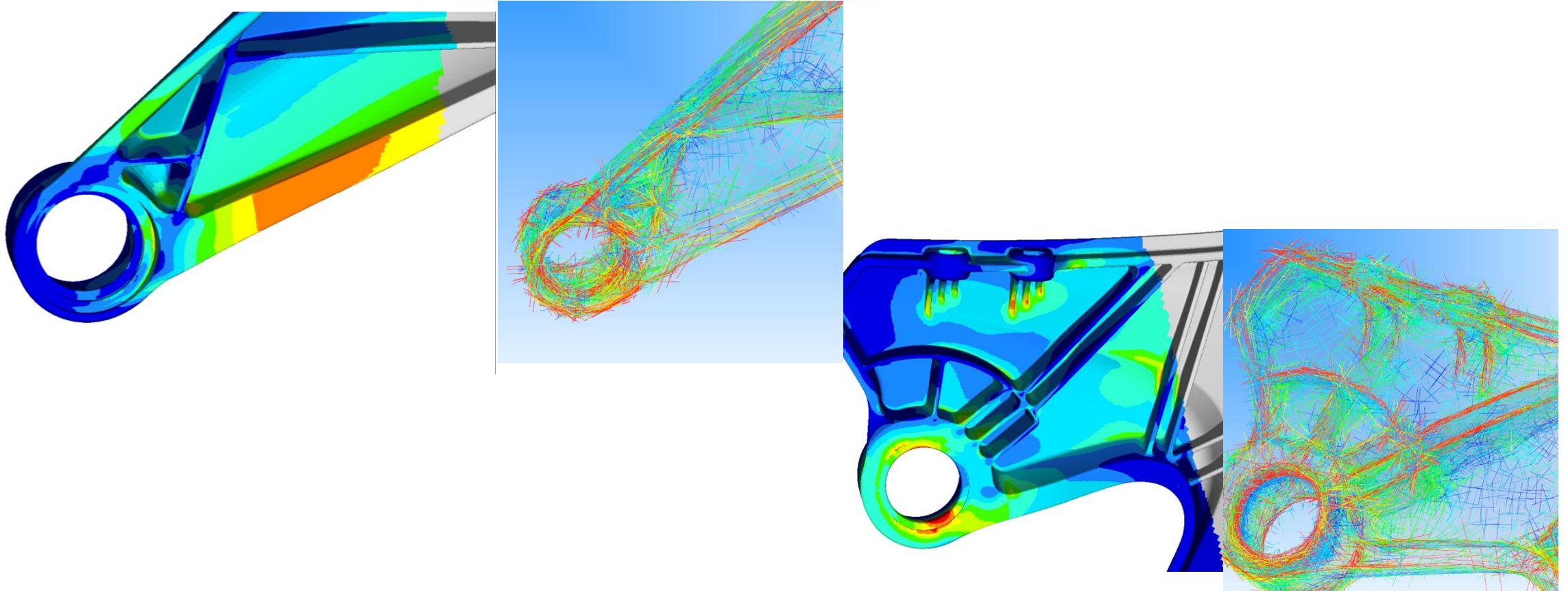


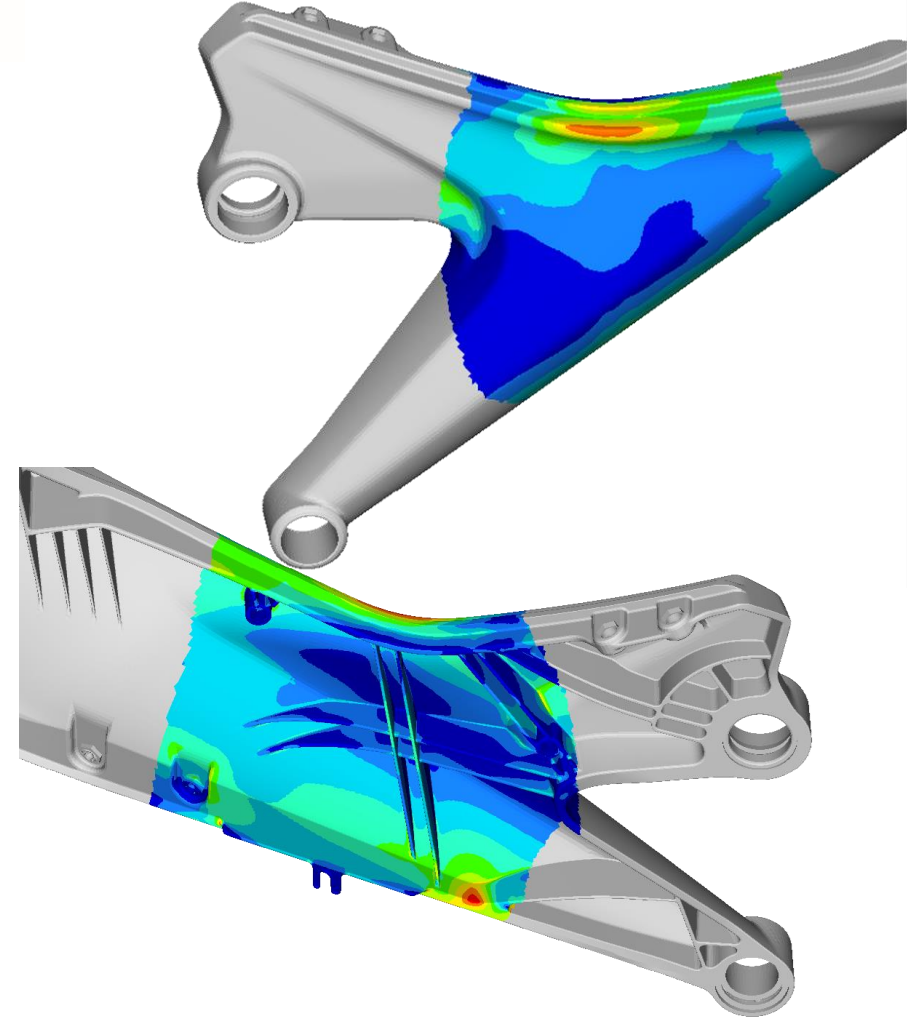
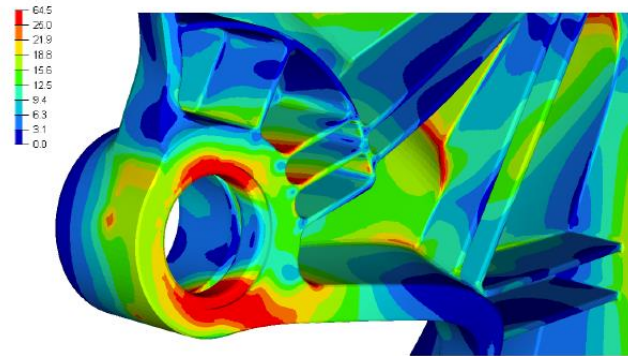
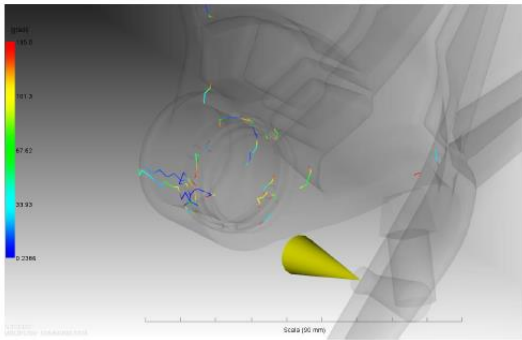
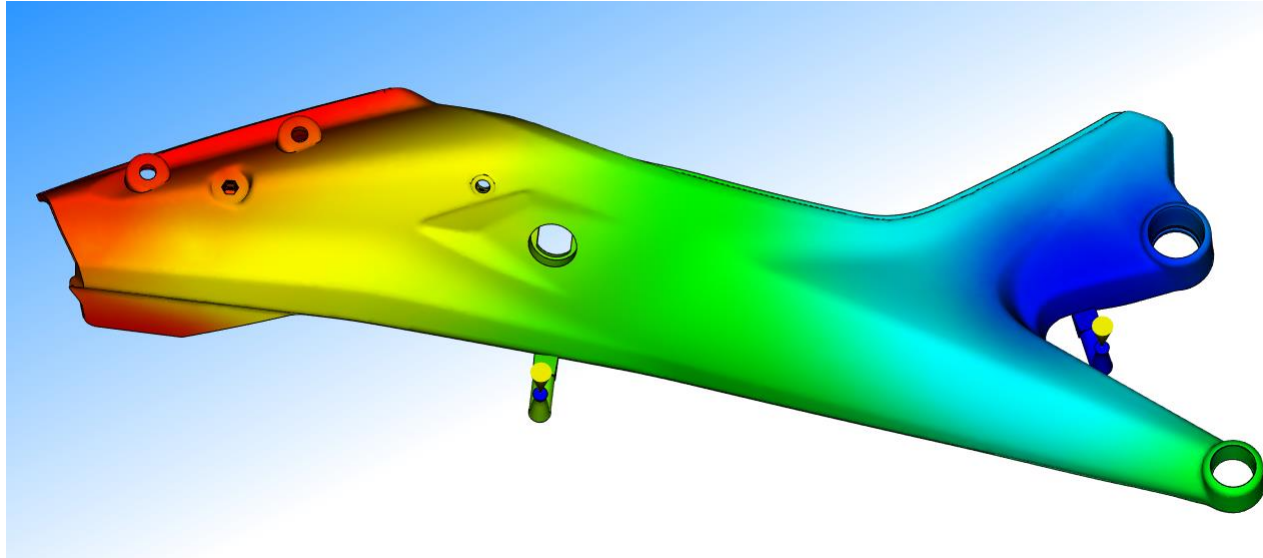
Figure 7: Tensile properties IXEF 1022 (DAM) as a function of temperature

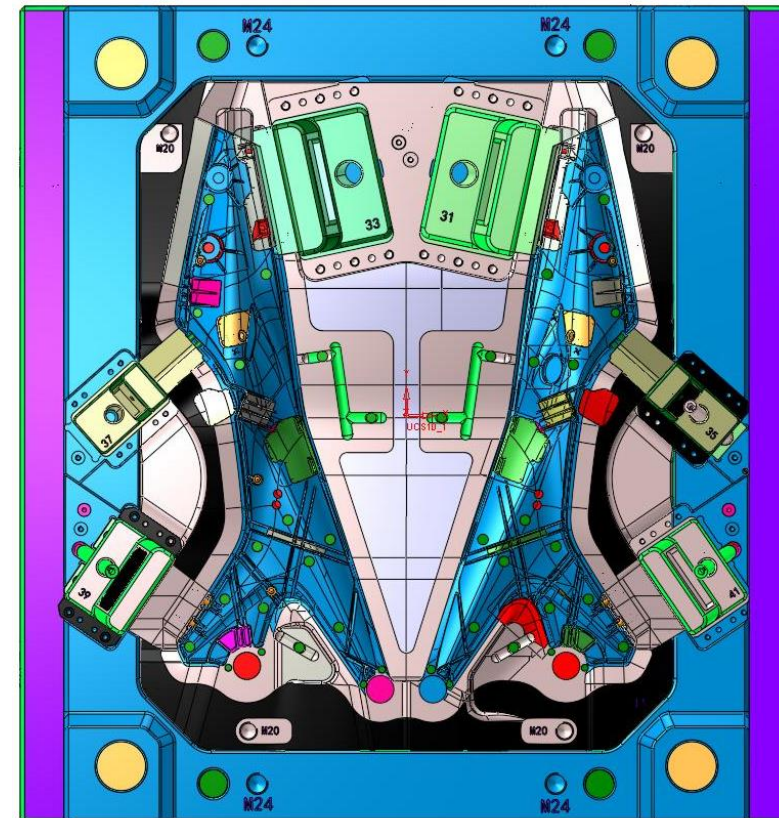
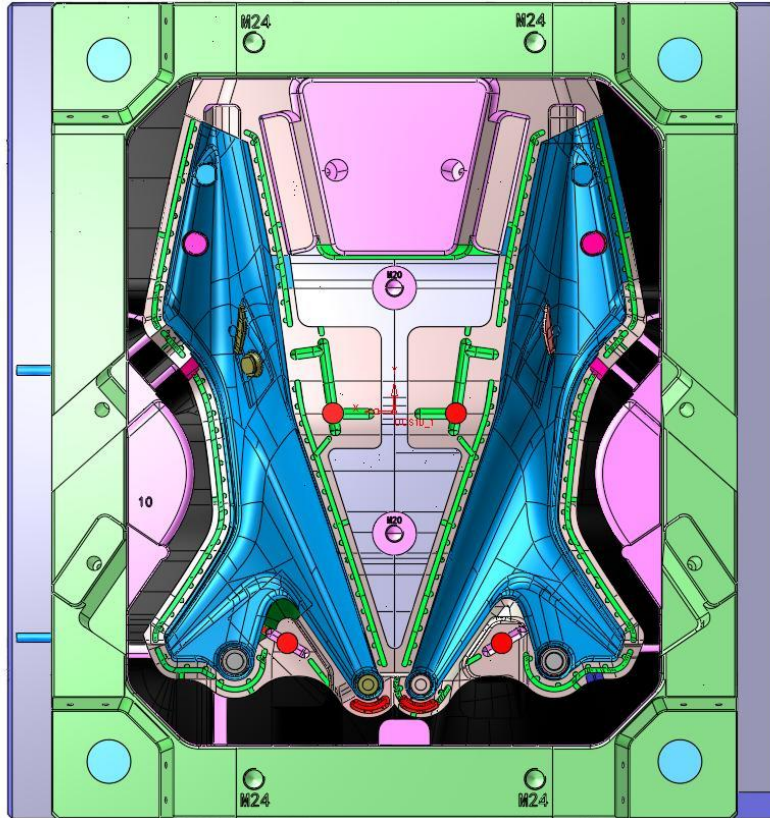


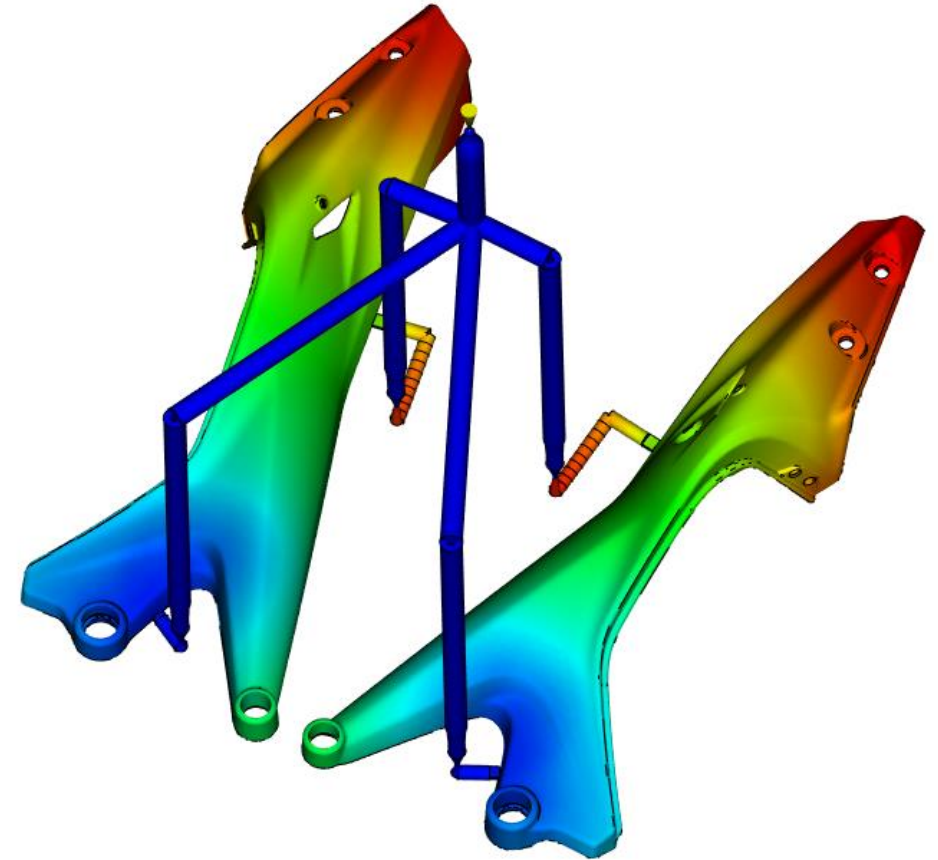
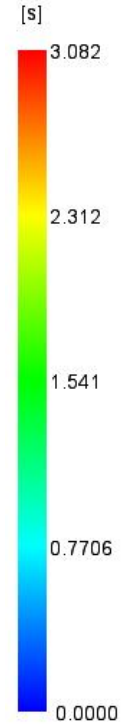
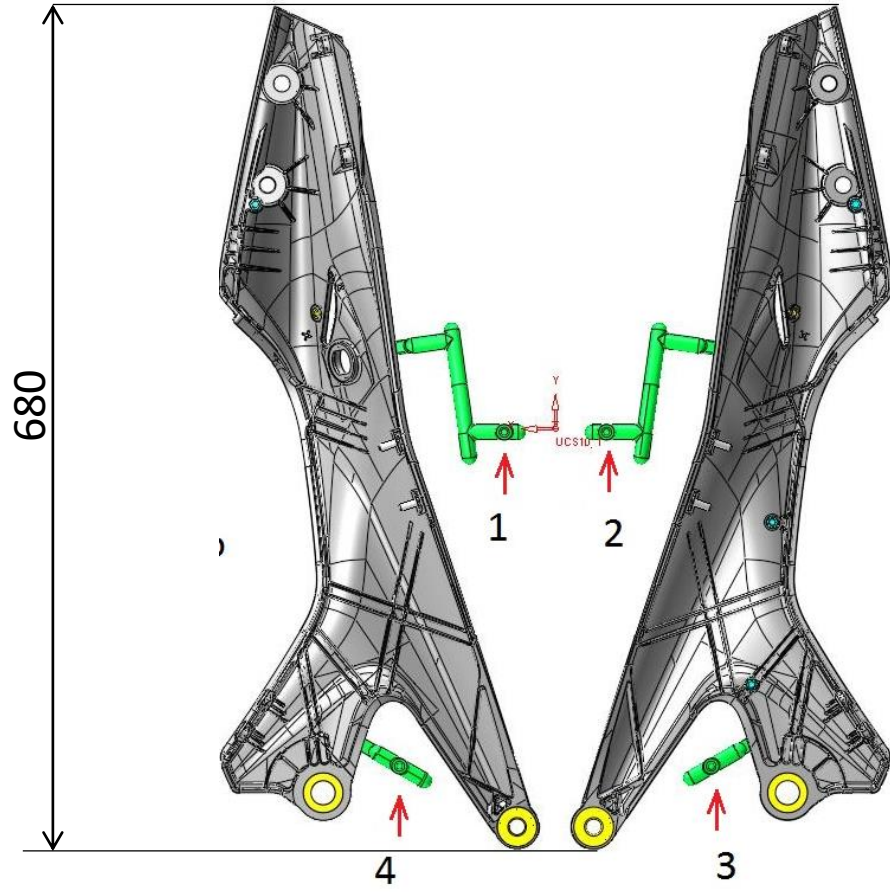
Tensile fatigue on IXEF1022
Sinus - 10Hz - Load control - R = 0.1











Test da eseguire presso il fornitore

- Scansione 3D
- Rilievo dimensionale
- Esame radioscopico

Test da eseguire presso Ducati

- Banco a fatica
- Banco a fatica a caldo
- Prova in pista
- Accumulo kilometrico su strada

Test da eseguire presso il fornitore

- Scansione 3D
- Rilievo dimensionale
- Esame radioscopico

Test da eseguire presso Ducati

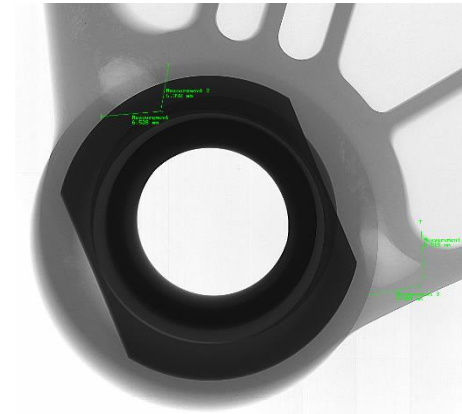
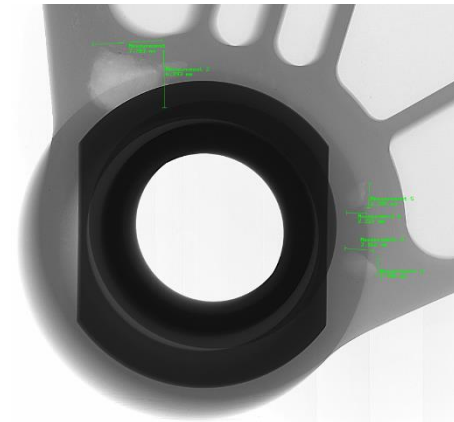
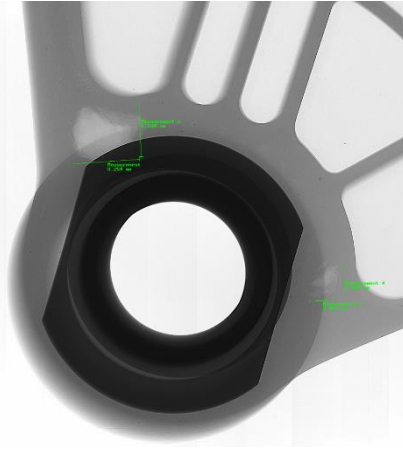
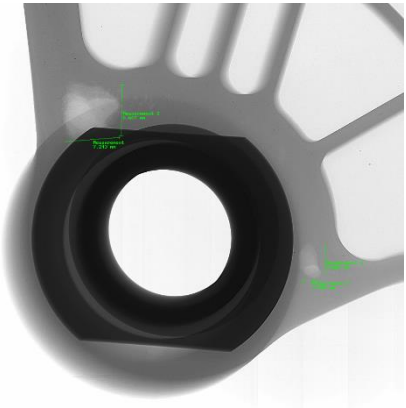
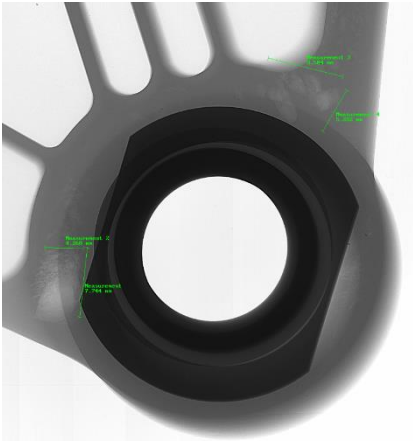
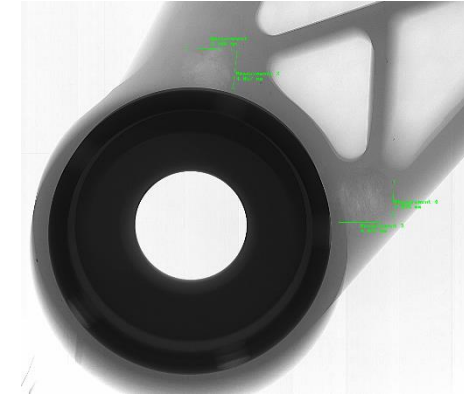
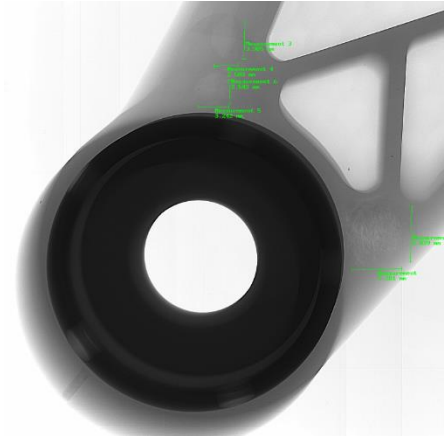
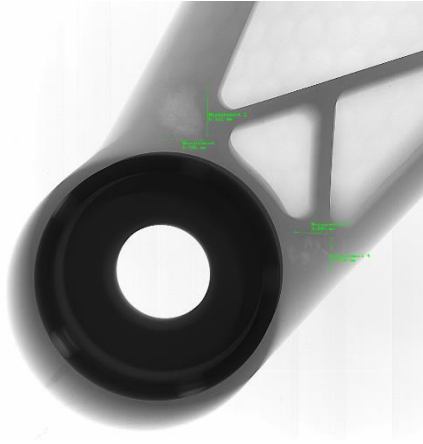
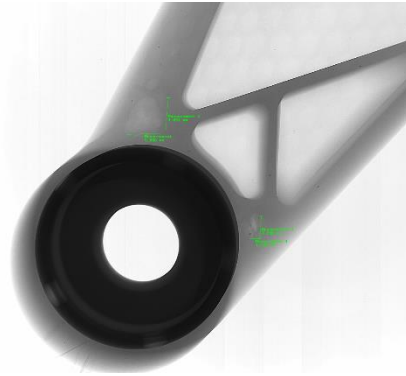
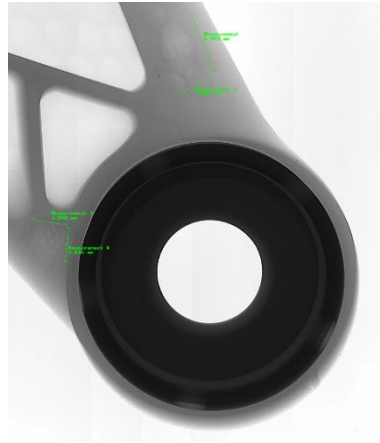
- Banco a fatica
- Banco a fatica a caldo
- Prova in pista
- Accumulo kilometrico su strada

Test da eseguire presso il fornitore

- Scansione 3D
- Rilievo dimensionale
- **Esame radioscopico**

Test da eseguire presso Ducati

- Banco a fatica
- **Banco a fatica a caldo**
- Prova in pista
- Accumulo kilometrico su strada



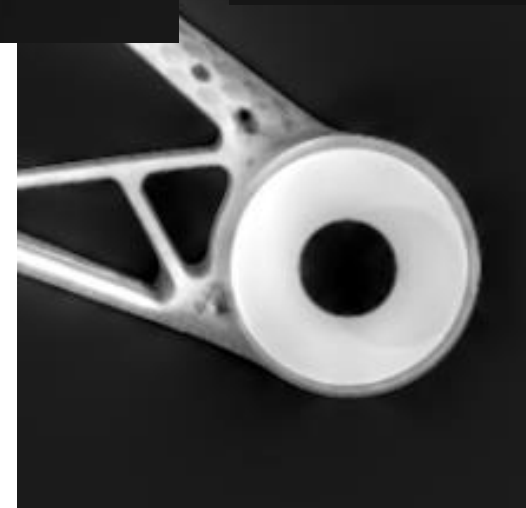
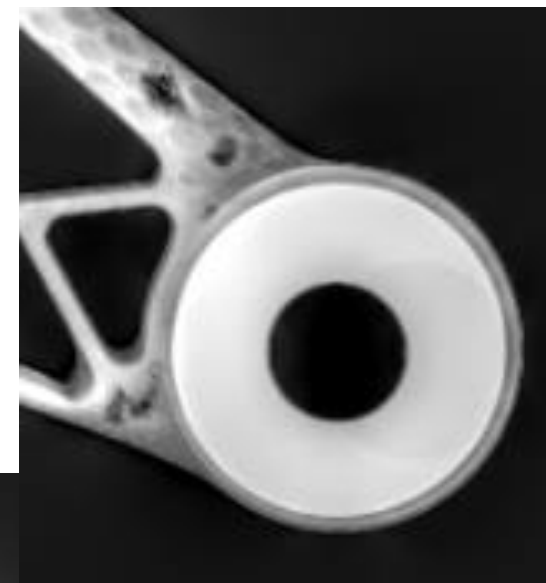
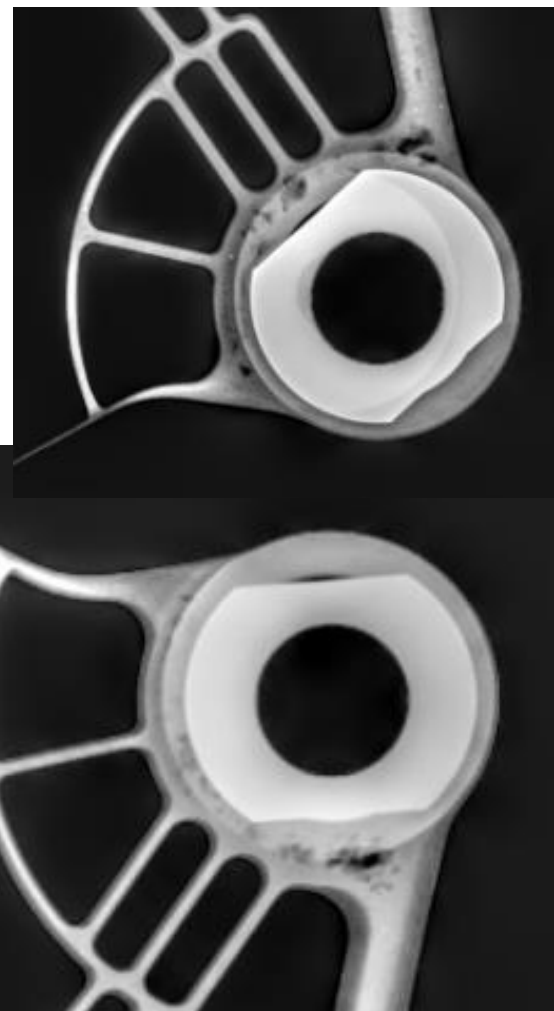
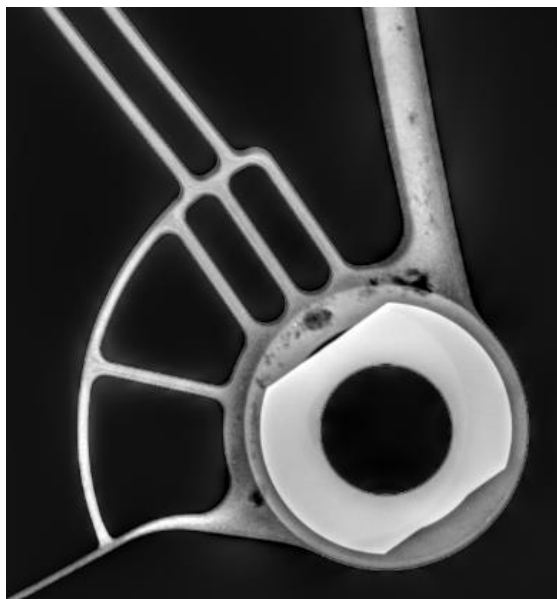


TABLE 6 - MAXIMUM PERMISSIBLE RADIOGRAPHIC SEVERITY LEVELS FOR DISCONTINUITIES IN ALUMINUM CASTINGS IN ACCORDANCE WITH ASTM E 155 AND ASTM E 2422 [3] [4] [5] [6]

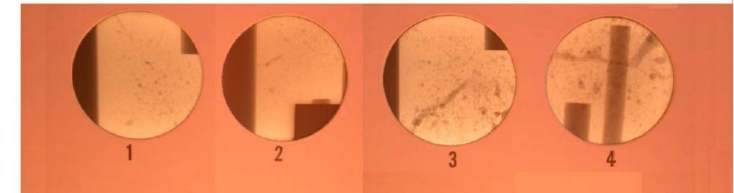
Discontinuity	Grade A Inch		Grade B Inch		Grade C Inch		Grade D Inch	
	1/4	3/4	1/4	3/4	1/4	3/4	1/4	3/4
Gas Holes	None	None	1	1	2	2	5	5
Gas Porosity, Round	None	None	1	1	3	3	7	7
Gas Porosity, Elongated	None	None	1	2	3	4	5	5
Shrinkage Cavity	None	None	1	3 ^[2]	2	4 ^[2]	3	5 ^[2]
Shrinkage Sponge	None	None	1	1	2	2	4	3
Foreign Material, Less Dense	None	None	1	1	2	2	4	4
Foreign Material, More Dense	None	None	1	1	2	1	4	3
Cracks [1]	----- None -----							
Cold Shuts [1]	----- None -----							
Surface Irregularity [1]	----- Not to exceed drawing tolerance -----							
Core Shift [1]	----- Not to exceed drawing tolerance -----							

Notes:

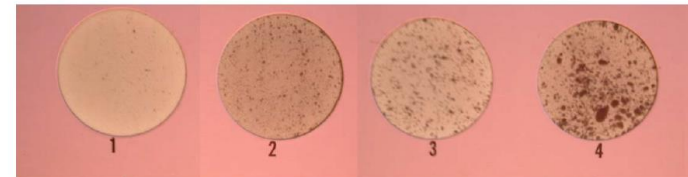
ALUMINUM - Category B (Cold Fill) - 1/8"



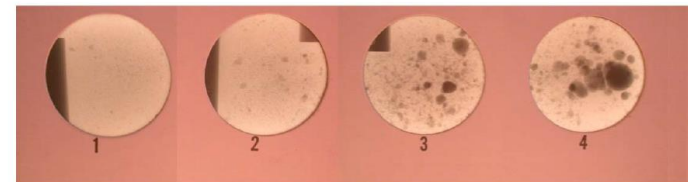
ALUMINUM - Category C (Shrinkage) - 5/8"

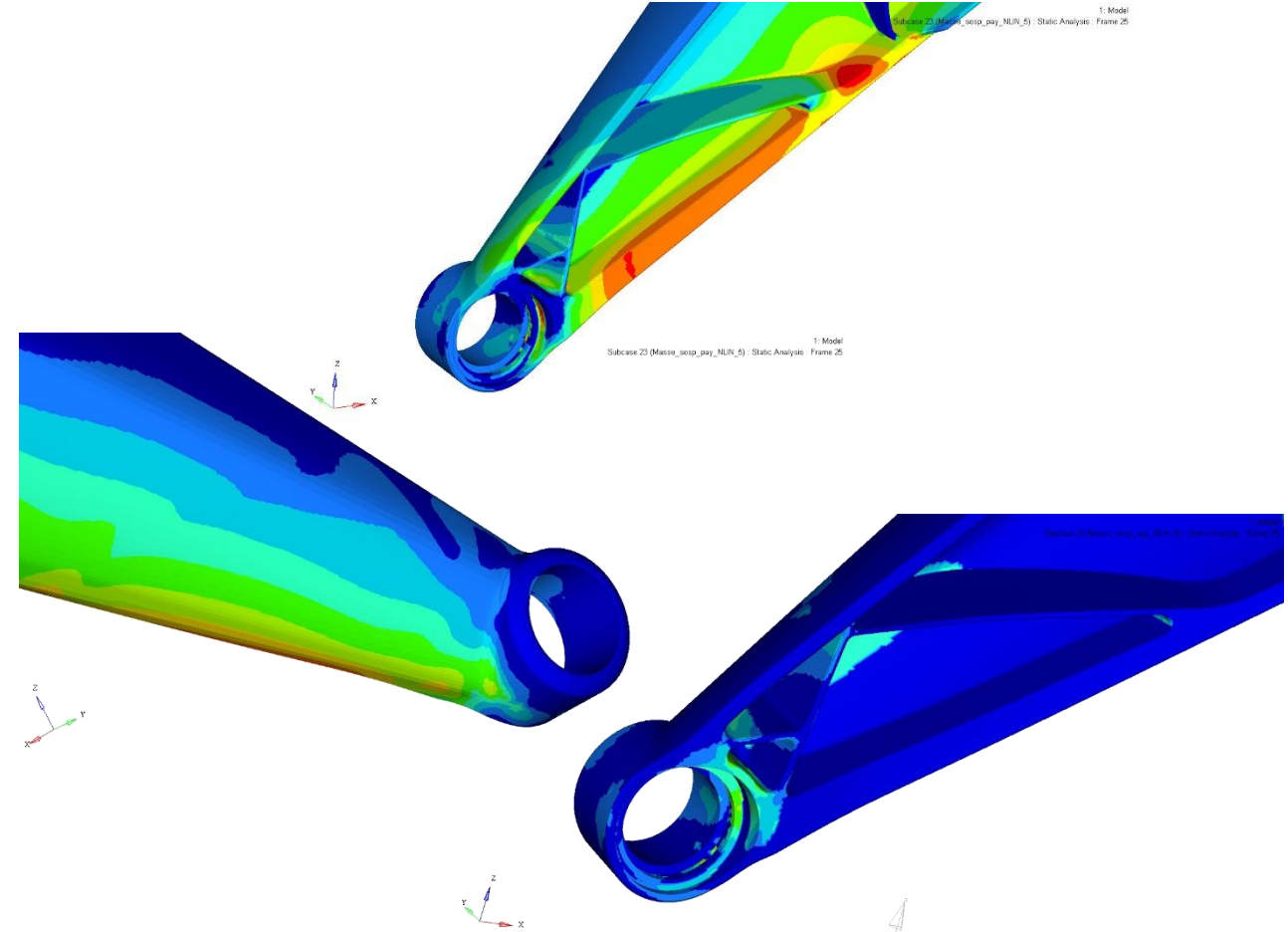
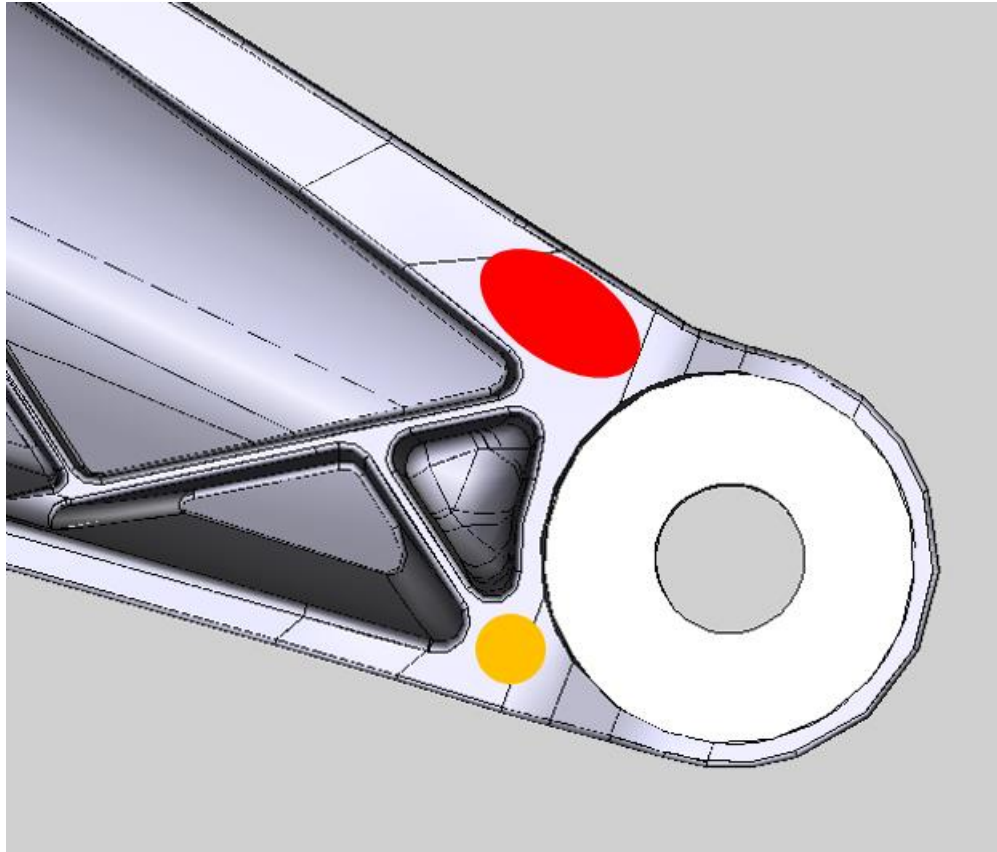


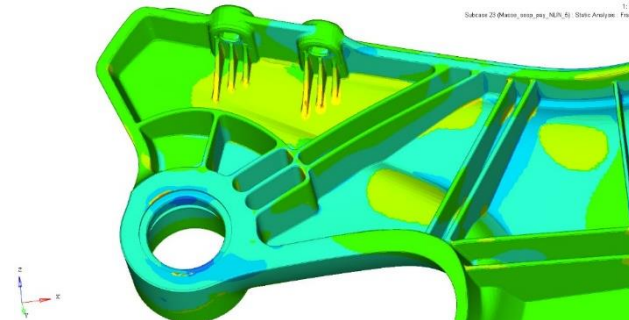
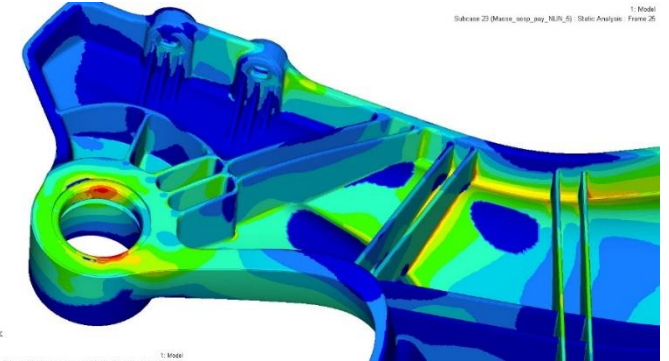
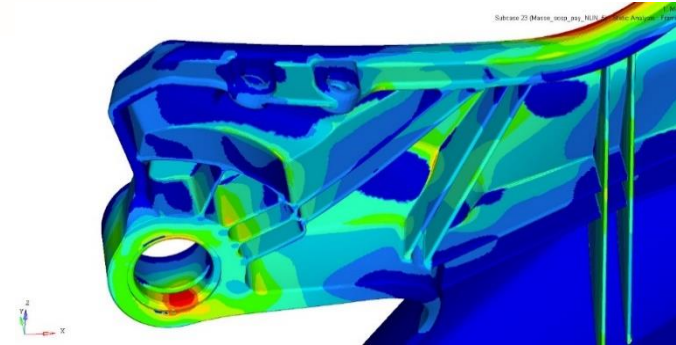
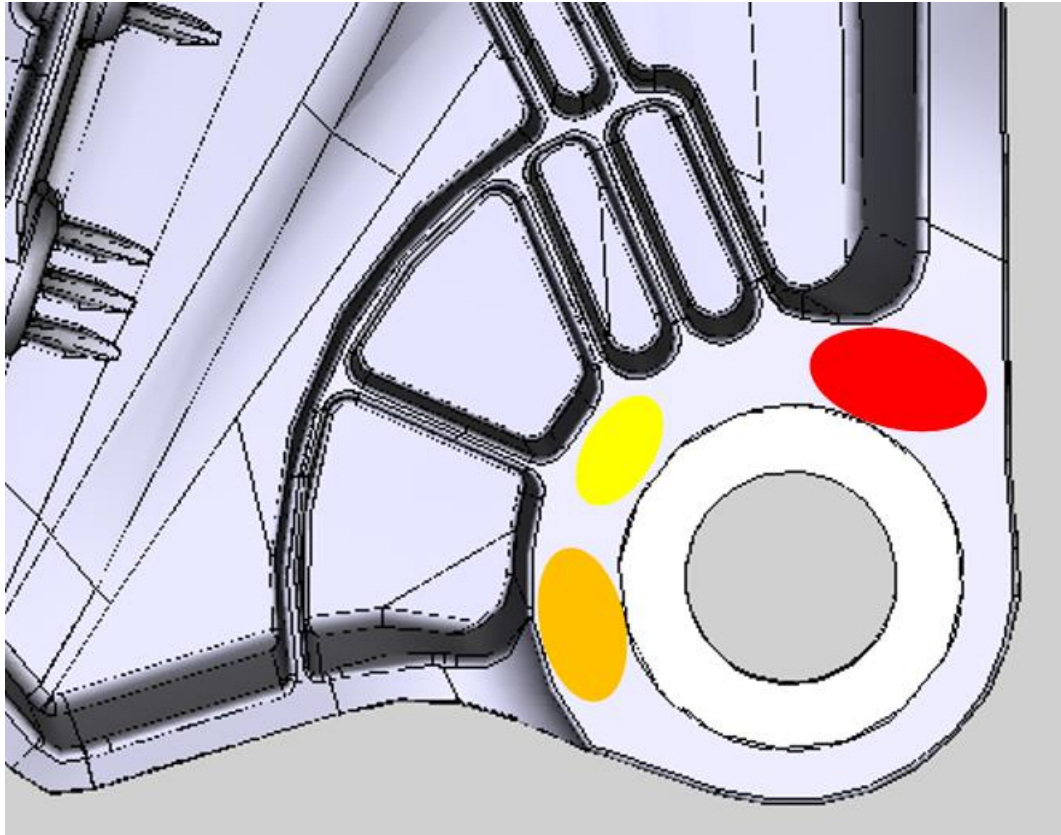
ALUMINUM - Category



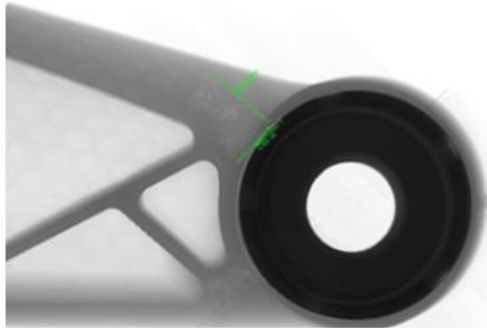
ALUMINUM - Category A (Porosity) - 5/8"





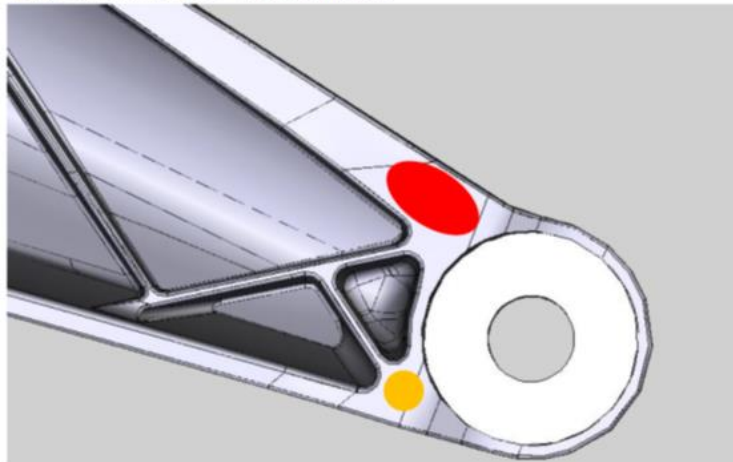


Moldflow versus reality

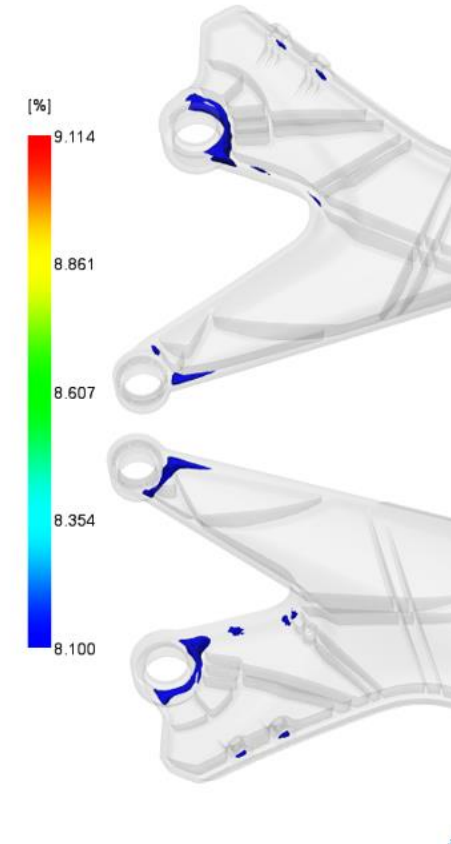


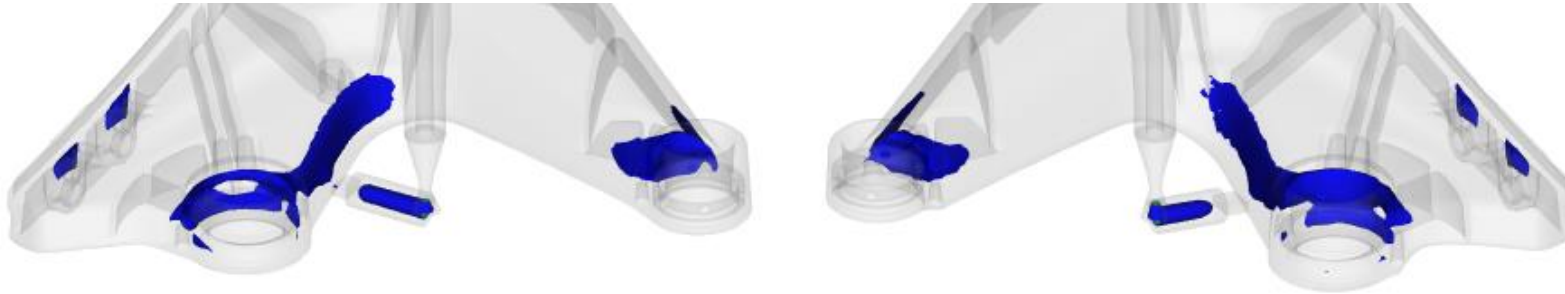
We compare the voids data and pictures we received from the customer to the predictions of volumetric shrinkage by Moldflow (using the processing data from customer).

Telaioetto Posteriore Dx – Attacco inferiore

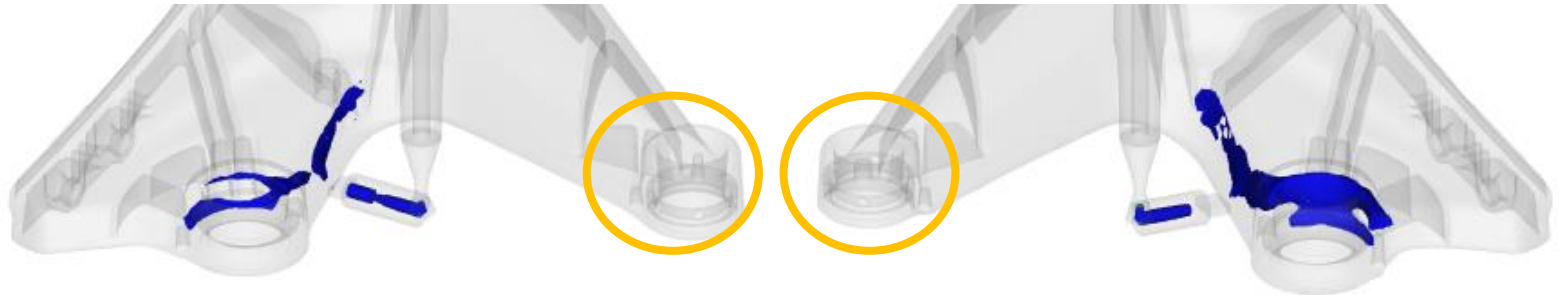


- Red area: high frequencies
- Orange area: medium frequencies
- Yellow area: low frequencies





Parametri collaudo

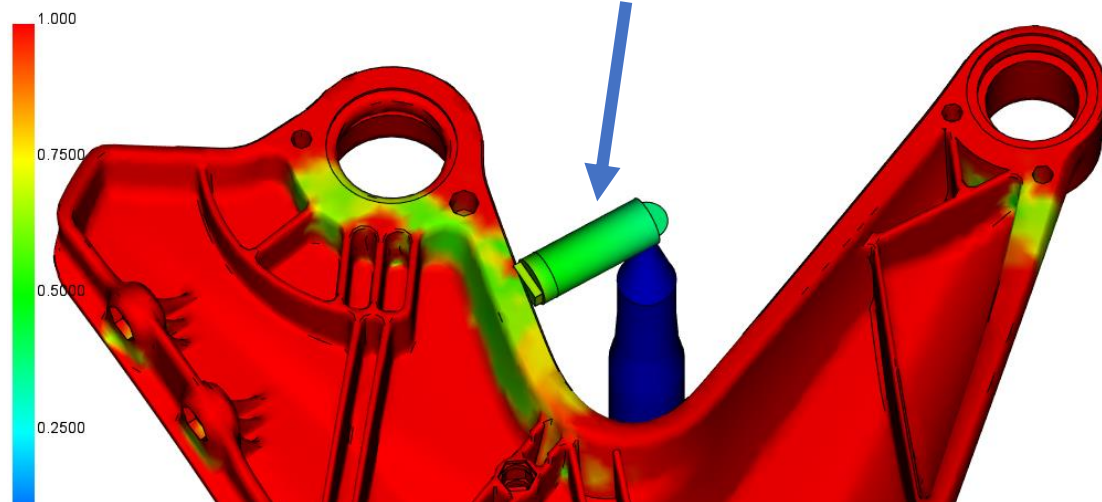


+10s mantenimento

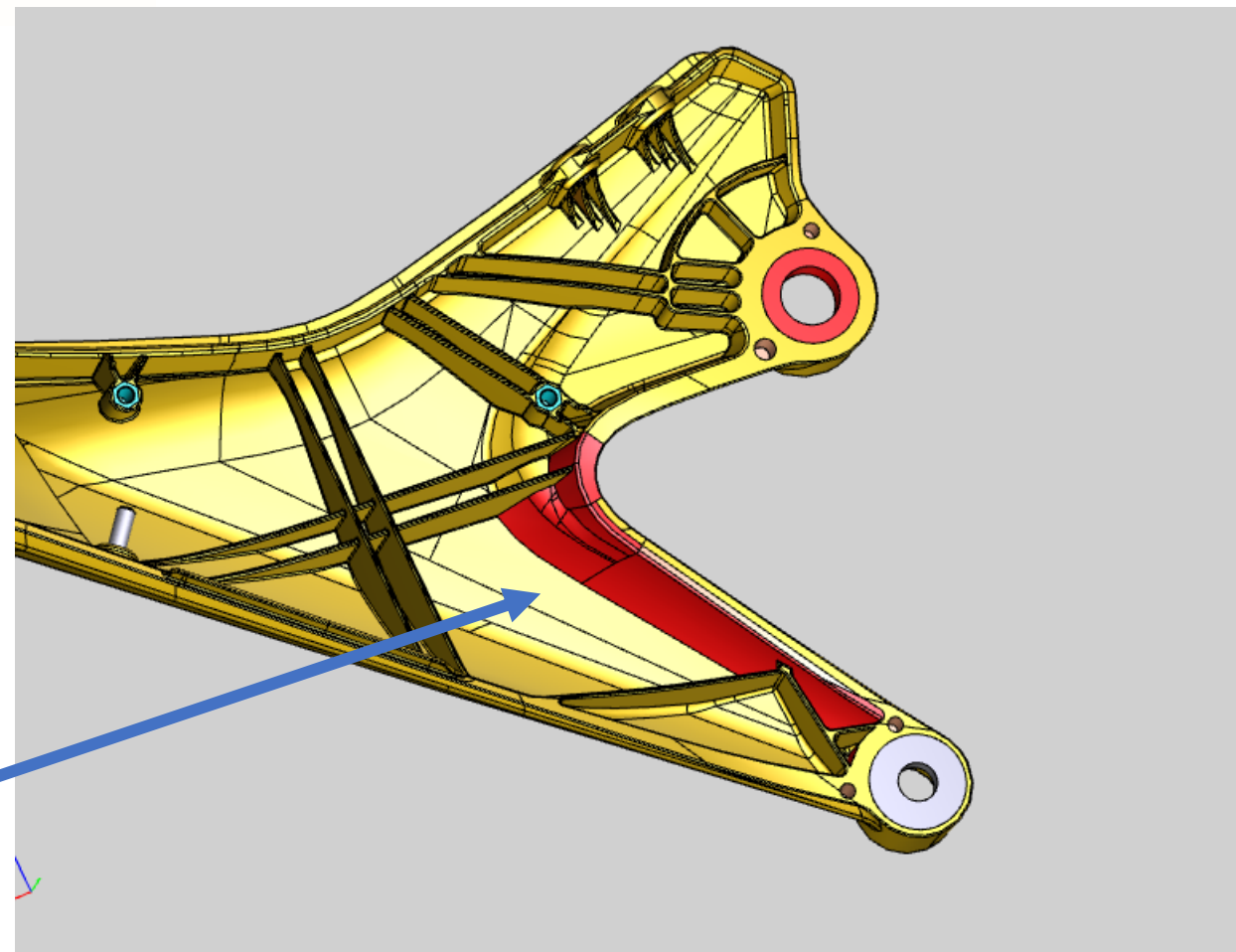


+15s mantenimento

Spessore gate
aumentato di 1 mm per
evitare il congelamento



Spessore parte per facilitare
l'alimentazione



Superiore B	Etichette di colonna				
	KO	limite	OK	Totale compless	
		0,00%	60,00%	40,00%	100
		16,92%	54,62%	28,46%	100
		2,00%	18,00%	80,00%	100
		7,14%	21,43%	71,43%	100
		0,00%	42,55%	57,45%	100
		13,43%	53,73%	32,84%	100
		19,35%	58,06%	22,58%	100
		5,56%	74,07%	20,37%	100
		3,45%	65,52%	31,02%	100
		5,95%	54,00%	41,05%	100
		1,00%	45,00%	55,00%	100
		7,72%	51,00%	41,28%	100

Conteggio di Attacco Inferiore A		Etichette di colonna		
Etichette di riga	KO	limite	ok	Totale complessivo
(vuoto)		0,00%	0,00%	100,00%
23-mar		2,31%	26,92%	70,77%
26-mar		0,00%	0,00%	100,00%
27-mar		0,00%	14,29%	85,71%
29-mar		0,00%	4,26%	95,74%
30-mar		0,00%	20,90%	79,10%
31-mar		0,00%	0,00%	100,00%
01-apr		0,00%	0,00%	100,00%
02-apr		0,00%	0,00%	100,00%
06-apr		0,54%	1,62%	97,84%
08-apr		0,00%	1,00%	99,00%
Totale complessivo		0,56%	8,01%	91,43%



SERIALE	MD	RX nuovo	TEST DELIBERA	ESITO TEST DELIBERA	RX POST TEST	NOTE
DX 13 - SX 21	ed 1.0		Masse sospese 10x cicli	nessuna segnalazione	nessuna variazione difetti pre-esistenti	
	ed 1.0	X	Masse sospese a caldo (100°C)	nessuna segnalazione	X	
DX 21 - SX 13	ed 1.0		Shaker interrotto a 2000 km per rottura T29	rottura vedere 162_RLB	X	
	ed 1.0		Nardò + shaker 2600 km T12	nessuna segnalazione	X	
	ed 1.0		Shaker 4000 km	nessuna segnalazione	X	
DX 16 - SX 22	ed 2.0	X	Masse sospese 10X cicli	nessuna segnalazione	nessuna variazione difetti pre-esistenti	RLB_264_2021
		X	Accumulo + Masse Sospese (10X cicli) T14	nessuna segnalazione	nessuna variazione difetti pre-esistenti	
		X	Sviluppo Gomme 1725 km T26	nessuna segnalazione	nessuna variazione difetti pre-esistenti	

[illegible]

17.1. PIANO DI CONTROLLO

17.1. CONTROL PLAN

Tipologia di Test Test Type		Frequenza - Frequency				Note Remarks
		AVAnserie (Prima Prova Stampo) AVA-Series (Mould First Test)	PRE-Serie (Seconda Prova Stampo) PRE-series (Mould Second Test)	SERIE - SERIES		
				SOP (Primi 1.000 particolari) (First 1.000 Parts)	Produzione Successiva (*) Following Production (*)	
Flusso di processo Process Flow	§ 5	Richiesto Request	Richiesto ⁽²⁾ Request ⁽²⁾	Richiesto ⁽²⁾ Request ⁽²⁾		
Materiale Material	§ 9	Richiesto Request	Richiesto ⁽²⁾ Request ⁽²⁾	Richiesto ⁽²⁾ Request ⁽²⁾		
MDS	§ 9.2		Richiesto Request	Richiesto ⁽²⁾ Request ⁽²⁾		
Report simulazione di stampaggio Moulding simulation report	§ 10	Richiesto Request	Richiesto ⁽²⁾ Request ⁽²⁾	Richiesto ⁽²⁾ Request ⁽²⁾		
Controllo del Peso Weight Check	§ 11.1	100%	Almeno 10 Pezzi At least 10 Pieces	1 Pezzo - Piece (Solo in caso di modifiche - Only in Case of Changes)	1 pezzo ad inizio lotto per ogni stampo in produzione 1 piece at beginning of batch each moul in production	==
Controllo Dimensionale Completo Full Dimensional Check	§ 11.2	1 Pezzo - Piece	1 Pezzo - Piece	1 Pezzo - Piece (Solo in caso di modifiche - Only in Case of Changes)	1 Pezzo - Piece (All'anno - Each Year)	==
Controllo Dimensionale: Quote "I" Dimensional Check: "I" Items	§ 11.2	==	50 Pezzi - Pieces (Cp-Cpk - Cp-Cpk)	1 Pezzo - Piece	1 Pezzo - Piece (Inizio lotto - Batch Beginning)	==
Controllo Conformità di Forma Shape Compliance Check	§ 11.3	1 Pezzo - Piece	1 Pezzo - Piece (Solo in caso di modifiche - Only in Case of Changes)	1 Pezzo - Piece (Solo in caso di modifiche - Only in Case of Changes)	==	==
Collaudo In Dima (se prevista) Dimensional Check with JIG (if any)	§ 11.4	100%	100%	10%	10%	==
Caratteristiche Estetiche Aesthetical Characteristics	§ 12.1	100%	100%	100%	100%	==
Conformità Strutturale Structural Compliance	§ 12.2	Classe CF1: 100% Classe A: 100%	Classe CF1: 100% Classe A: 10%	Classe CF1: 10% Classe A: /	Classe CF1: 10 Pezzi INIZIO LOTTO - Pieces start of batch Classe A: /	==
Verifica delle Saldature Checks on Welding	§ 12.3	5 Pezzi - Pieces	5 Pezzi - Pieces	1 Pezzo - Piece	1 Pezzo - Piece (All'anno - Each Year)	==
Verifica Inserti Metallici Filettati Checks on Threaded Metallic Inserts	§ 12.4	5 Pezzi - Pieces	5 Pezzi - Pieces	1 Pezzo - Piece	1 Pezzo - Piece (All'anno - Each Year)	==
Verifica delle Tensioni Residue Checks on Residual Stress	§ 12.5	1 Pezzo - Piece	1 Pezzo - Piece	1 Pezzo - Piece	1 Pezzo - Piece (All'anno - Each Year)	==
Verifica della Resistenza agli Agenti Atmosferici Weather Agents Resistance Test	§ 12.6	1 Pezzo - Piece	1 Pezzo - Piece ⁽²⁾	1 Pezzo - Piece ⁽²⁾	==	==
Verifica della resistenza agli agenti chimici Chemical Products Resistance Test	§ 12.7	1 Pezzo - Piece	1 Pezzo - Piece ⁽²⁾	1 Pezzo - Piece ⁽²⁾	==	==
Verifica del Co-Stampaggio Co-moulding Check	§ 12.8	5 Pezzi - Pieces	5 Pezzi - Pieces	1 Pezzo - Piece	1 Pezzo - Piece (All'anno - Each Year)	==

17.1. PIANO DI CONTROLLO

17.1. CONTROL PLAN

Tipologia di Test Test Type		Frequenza - Frequency				Note Remarks
		AVAnserie (Prima Prova Stampo) AVA-Series (Mould First Test)	PRE-Serie (Seconda Prova Stampo) PRE-series (Mould Second Test)	SERIE - SERIES		
				SOP (Primi 1.000 particolari) (First 1.000 Parts)	Produzione Successiva (*) Following Production (*)	
Flusso di processo Process Flow	§ 5	Richiesto Request	Richiesto ⁽²⁾ Request ⁽²⁾	Richiesto ⁽²⁾ Request ⁽²⁾		
Materiale Material	§ 9	Richiesto Request	Richiesto ⁽²⁾ Request ⁽²⁾	Richiesto ⁽²⁾ Request ⁽²⁾		
MDS	§ 9.2		Richiesto Request	Richiesto ⁽²⁾ Request ⁽²⁾		
Report simulazione di stampaggio Moulding simulation report	§ 10	Richiesto Request	Richiesto ⁽²⁾ Request ⁽²⁾	Richiesto ⁽²⁾ Request ⁽²⁾		
Controllo del Peso Weight Check	§ 11.1	100%	Almeno 10 Pezzi At least 10 Pieces	1 Pezzo - Piece (Solo in caso di modifiche - Only in Case of Changes)	1 pezzo ad inizio lotto per ogni stampo in produzione 1 piece at beginning of batch each mould in production	==
Controllo Dimensionale Completo Full Dimensional Check	§ 11.2	1 Pezzo - Piece	1 Pezzo - Piece	1 Pezzo - Piece (Solo in caso di modifiche - Only in Case of Changes)	1 Pezzo - Piece (All'anno - Each Year)	==
Controllo Dimensionale: Quote "I" Dimensional Check: "I" Items	§ 11.2	==	50 Pezzi - Pieces (Cp-Cpk - Cp-Cpk)	1 Pezzo - Piece	1 Pezzo - Piece (Inizio lotto - Batch Beginning)	==
Controllo Conformità di Forma Shape Compliance Check	§ 11.3	1 Pezzo - Piece	1 Pezzo - Piece (Solo in caso di modifiche - Only in Case of Changes)	1 Pezzo - Piece (Solo in caso di modifiche - Only in Case of Changes)	==	==
Collaudo in Dima (se prevista) Dimensional Check with JIG (if any)	§ 11.4	100%	100%	10%	10%	==
Caratteristiche Estetiche Aesthetical Characteristics	§ 12.1	100%	100%	100%	100%	==
Conformità Strutturale Structural Compliance	§ 12.2	Classe CF1: 100% Classe A: 100%	Classe CF1: 100% Classe A: 10%	Classe CF1: 10% Classe A: /	Classe CF1: 10 Pezzi INIZIO LOTTO - Pieces start of batch Classe A: /	==
Verifica delle Saldature Checks on Welding	§ 12.3	5 Pezzi - Pieces	5 Pezzi - Pieces	1 Pezzo - Piece	1 Pezzo - Piece (All'anno - Each Year)	==
Verifica Inserti Metallici Filettati Checks on Threaded Metallic Inserts	§ 12.4	5 Pezzi - Pieces	5 Pezzi - Pieces	1 Pezzo - Piece	1 Pezzo - Piece (All'anno - Each Year)	==
Verifica delle Tensioni Residue Checks on Residual Stress	§ 12.5	1 Pezzo - Piece	1 Pezzo - Piece	1 Pezzo - Piece	1 Pezzo - Piece (All'anno - Each Year)	==
Verifica della Resistenza agli Agenti Atmosferici Weather Agents Resistance Test	§ 12.6	1 Pezzo - Piece	1 Pezzo - Piece ⁽²⁾	1 Pezzo - Piece ⁽²⁾	==	==
Verifica della resistenza agli agenti chimici Chemical Products Resistance Test	§ 12.7	1 Pezzo - Piece	1 Pezzo - Piece ⁽²⁾	1 Pezzo - Piece ⁽²⁾	==	==
Verifica del Co-Stampaggio Co-moulding Check	§ 12.8	5 Pezzi - Pieces	5 Pezzi - Pieces	1 Pezzo - Piece	1 Pezzo - Piece (All'anno - Each Year)	==

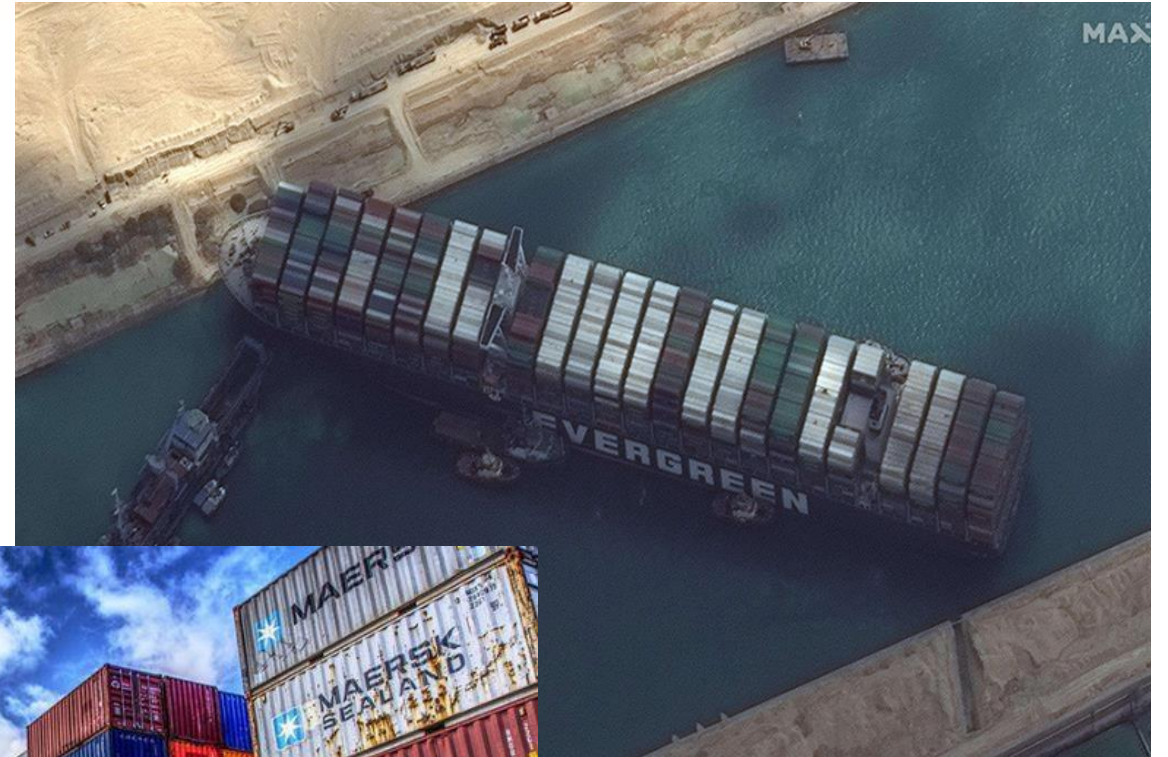


Figure 13: Tensile creep of IXEF 1022 with 2 mm thickness at 120 °C

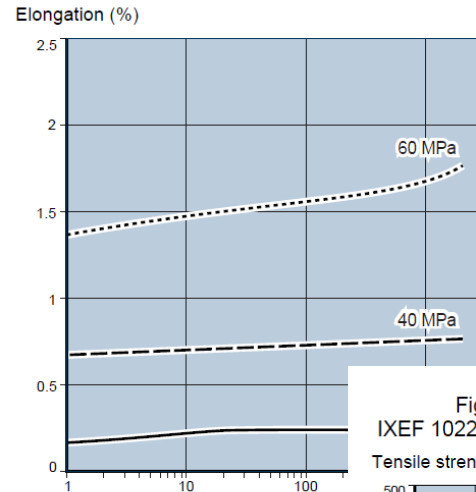


Figure 12: Tensile creep of IXEF 1022 with 2 mm thick

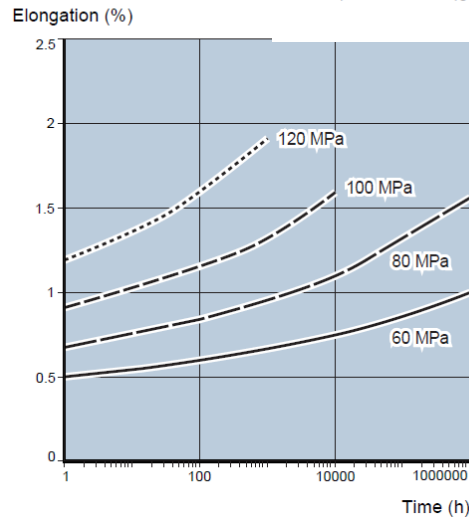


Figure 11: IZOD impact strength of IXEF 1022 (DAM) as a function of temperature

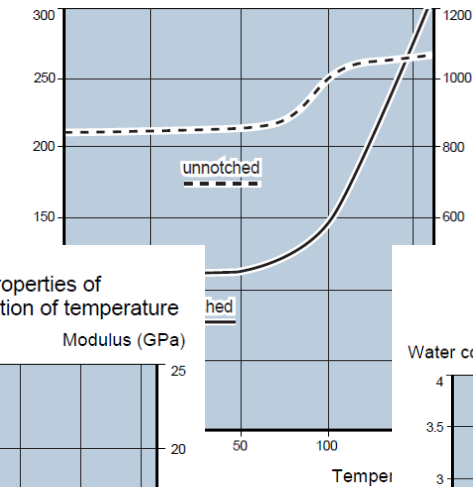


Figure 7: Tensile properties of IXEF 1022 (DAM) as a function of temperature

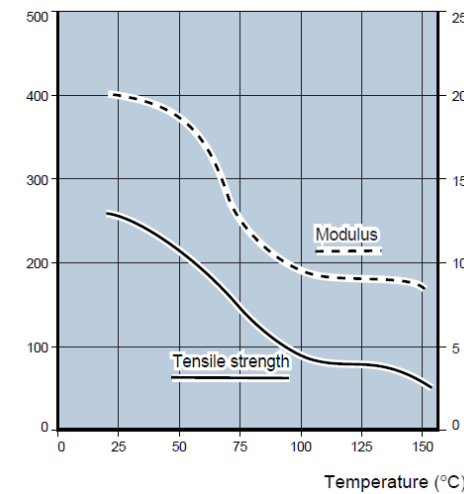


Figure 10: Flexural properties of IXEF 1022 (DAM) as a function of temperature

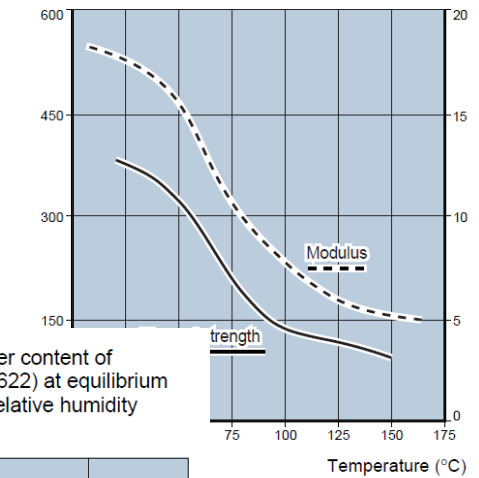
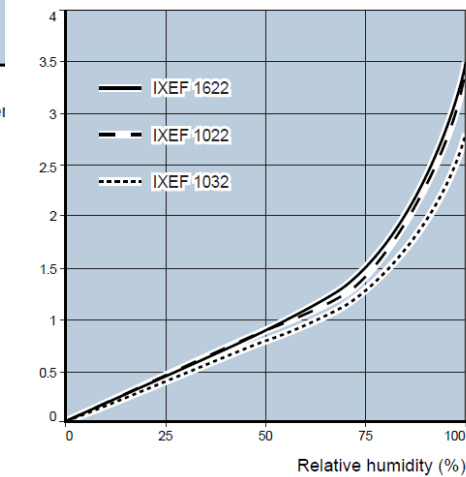
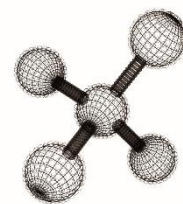


Figure 20: Water content of IXEF (1022, 1032, 1622) at equilibrium as a function of relative humidity



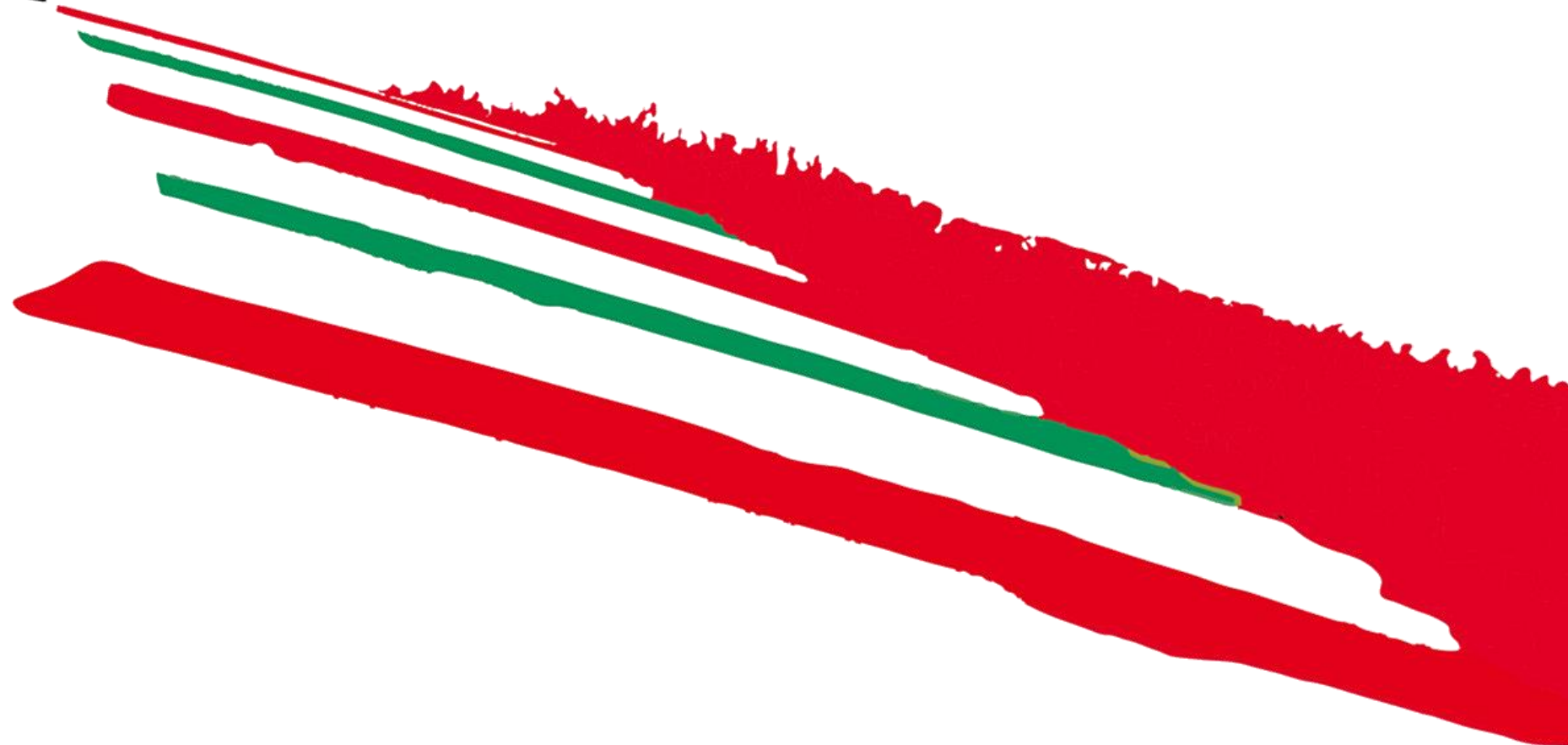


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