

TEREZ[®] HT | HT2 | HT2E

FOR THE HIGHEST STANDARDS IN METAL REPLACEMENT
AT HIGH OPERATING TEMPERATURES



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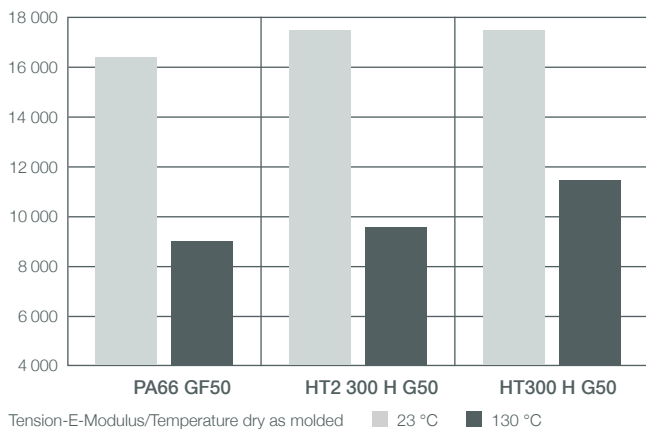
TEREZ® HT | HT2 | HTE

Metal replacement at high operating temperatures

The subject of metal replacement already engages the plastics industry for many years; this is because the use of plastic instead of metal implies economical and ecological benefits. Plastics offer weight reduction, freedom of design, sustainability, and last but not least high stiffness and strength values. Also operation temperatures up to 230 °C can be achieved.

The TER Plastics Polymer Group has a comprehensive product portfolio around the topic of metal replacement. This includes technical and high-performance polymers. The new product series TEREZ® HT/HT2/HTE were designed for high mechanical requirements in combination with high operating temperatures. The product is based on PA6T and PA10T, respectively.

Comparing material stiffness and temperature influence



The determined level of stiffness at 23 °C and 130 °C shows the superiority of the TEREZ® HT series at high temperatures.

The reasons that speak for our products are as varied as their uses:

- Lower material costs
- No / less rework required
- Resistance to corrosion
- Excellent abrasion and sliding properties
- Weight reduction
- Sustainability
- Freedom of design
- High stiffness and strength values

TEREZ® HT for high temperature application

The product line TEREZ® HT has a melting point of 315 °C and thus the best conditions for high temperature applications. Excellent creep resistance is already given starting at an ambient temperature of 100 °C.

TEREZ® HT2 with balanced properties

The product line TEREZ® HT2 provides a balance of properties in terms of mechanical features, thermal stability, and processability. Mold temperatures up to 120 °C are sufficient.

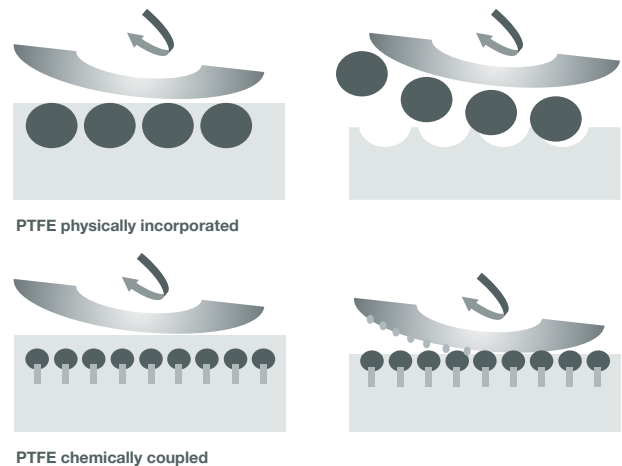
TEREZ® HTE to promote sustainability

Due to the low densities, processing temperatures and an usually unnecessary post processing the product lines TEREZ® HT/HT2/HTE provide a valuable contribution to sustainability. The concept of sustainability is particularly supported by the product range TEREZ® HTE. This contains a bio-based content and is also characterized by minimal moisture absorption and high dimensional stability.

Tribological modifications

In combination with PTFE excellent tribological properties with the product lines TEREZ® HT/HT2/HTE can be achieved. The coefficient of friction and wear are significantly reduced. For this, the PTFE is chemically coupled with the PPA, resulting in constant sliding properties and an extended life cycle.

Self-lubricating effects by PTFE modifying



For the highest standards in metal replacement at high operating temperatures



Standard values of the materials at 23 °C	Test method	Unit
Mechanical properties		
Charpy impact notched 23 °C	ISO 179-1eA	kJ/m ²
Charpy impact resistance 23 °C	ISO 179-1eU	kJ/m ²
Tensile-E-Modulus	ISO 527-1,-2	MPa
Elongation at break	ISO 527-1,-2	%
Tensile stress at break	ISO 527-1,-2	MPa
Thermal Properties		
HDT 0,45 MPa	ISO 75-1,-2	°C
HDT 1,81 MPa	ISO 75-1,-2	°C
Melting temperature (DSC)	ISO 11357-1,-3	°C
Vicat B/50	ISO 306	°C
Electrical properties		
CTI - Comparative tracking index	IEC 60112	V
Electric strength	IEC 60243-1	kV/mm
Volume resistivity	IEC 60093	Ohm·m
Surface resistivity	IEC 60093	Ohm
Classification of flammability		
Flammability at thickness h	UL 94	class
Tested sample thickness	UL 94	mm
General features		
Density	ISO 1183	kg/m ³
Water absorption, water at 23 °C	ISO 62	%
Moisture absorption, 23 °C, 50 % (r.m).	ISO 62	%

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TEREZ® HT 300 H G30	TEREZ® HT 300 H G30 TF15	TEREZ® HT 300 H G40	TEREZ® HT 300 H G50	TEREZ® HT 300 H G60
dry / conditioned	dry / conditioned	dry / conditioned	dry / conditioned	dry / conditioned
9 / 9	10 / 11	15 / 15	13 / 13	15 / 15
50 / 50	55 / 55	70 / 70	80 / 80	85 / 85
11000 / 11000	10700 / 10000	14500 / 14000	17500 / 17000	20500 / 20000
2 / 2	2 / 2	2 / 2	2 / 2	2 / 2
185 / 170	185 / 180	220 / 210	250 / 225	260 / 235
dry	dry	dry	dry	dry
295	300	295	300	300
280	280	285	285	285
315	315	315	315	315
245	245	250	250	250
550	550	550	550	550
30	30	30	30	30
1E12	1E12	1E12	1E12	1E12
1E13	1E13	1E13	1E13	1E13
HB	HB	HB	HB	HB
1,6	1,6	1,6	1,6	1,6
1,42	1,46	1,53	1,65	1,75
2,5	1,8	2,3	2	1,6
0,21	0,165	0,18	0,15	0,12

TEREZ® HT2 300 H G30	TEREZ® HT2 300 H G30 TF15	TEREZ® HT2 300 H G40	TEREZ® HT2 300 H G50	TEREZ® HT2 300 H G60
dry / conditioned	dry / conditioned	dry / conditioned	dry / conditioned	dry / conditioned
9 / 10	10 / 11	13 / 13	14 / 15	16 / 16
75 / 80	80 / 85	80 / 85	85 / 85	85 / 85
9200 / 9000	9800 / 9800	14000 / 13500	17500 / 17000	21500 / 20000
3 / 3;5	3 / 3	2;5 / 2;5	2 / 2	2 / 2
190 / 185	195 / 195	220 / 210	250 / 240	260 / 250
dry	dry	dry	dry	dry
245	255	255	255	255
235	245	245	245	245
295	295	295	295	295
235	240	240	240	240
600	600	600	600	600
33	33	33	33	33
1E12	1E12	1E12	1E12	1E12
1E13	1E13	1E13	1E13	1E13
HB	HB	HB	HB	HB
1,6	1,6	1,6	1,6	1,6
1,37	1,41	1,51	1,6	1,68
5	3,9	4,2	3,5	2,8
1,1	0,88	0,96	0,9	0,64

TEREZ® HTE 300 H G30	TEREZ® HTE 300 H G30 TF15	TEREZ® HTE 300 H G40	TEREZ® HTE 300 H G50	TEREZ® HTE 300 H G60
dry / conditioned	dry / conditioned	dry / conditioned	dry / conditioned	dry / conditioned
8 / 8	10 / 11	14 / 14	14 / 15	16 / 16
45 / 40	65 / 65	65 / 65	85 / 85	85 / 85
9200 / 8700	9400 / 9400	13000 / 12500	16000 / 15500	20500 / 19500
3 / 3	2;4 / 2;4	2 / 2	2 / 2	2 / 2
160 / 150	175 / 175	210 / 200	250 / 240	260 / 250
dry	dry	dry	dry	dry
275	286	295	300	300
255	266	280	285	285
285	285	285	285	285
235	245	245	250	250
600	600	600	600	600
30	30	30	30	30
1E12	1E12	1E12	1E12	1E12
1E13	1E13	1E13	1E13	1E13
HB	HB	HB	HB	HB
1,6	1,6	1,6	1,6	1,6
1,32	1,36	1,43	1,55	1,65
2,1	1,65	1,8	1,5	1,2
0,105	0,09	0,09	0,07	0,06

PROCESSING GUIDELINES

Recommended Screw Design

TEREZ® HT/HT2/HTE grades can be processed on all standard injection molding machines. The commercially available universal screws can be used with non-return valves. The L/D ratio should be 18 - 24 D and the compression ratio 2,5 - 3,5 : 1. For the processing of high-fiber reinforced TEREZ® HT/HT2/HTE the use of wear-proof screws and cylinders is recommended.

Recommended Temperature Settings

At least three separately controllable heating zones should be able of reaching cylinder temperatures up to 360 °C. A separate nozzle heating is necessary. The cylinder flange must be temperature-controlled.

During processing an open nozzle can be used as it is aerodynamic and durable due to its construction. However, should molten material drool out of the nozzle, needle valve nozzles have been proven in practice.

Processing Temperatures

Product	Unreinforced	GF, GK, GF, MF
HT	320 - 345 °C	330 - 345 °C
HT2	310 - 330 °C	310 - 330 °C
HTE	300 - 330 °C	300 - 330 °C

The maximum peripheral speed of the screw is 0.3 m/s.

General Processing Data

The values given are guide values, with increased filling the higher values should be aimed for. For drying, we recommend using only a desiccant dryer, preferably.

		TEREZ® HT 300	TEREZ® HT2 300	TEREZ® HTE 300
Hopper	°C	80 - 95	80 - 95	80 - 95
Zone 1 / 2	°C	315 - 325	290 - 300	310 - 325
Zone 3 / 4	°C	325 - 340	310 - 330	330 - 340
Nozzle	°C	325 - 335	320 - 330	330 - 350
Melt	°C	315 - 325	285 - 295	290 - 315
Cavity wall	°C	135 - 180	70 - 120	135 - 160
Drying	°C / h	120 / 4 - 8	120 / 4 - 8	120 / 4 - 8
Molding pressure, spec.	bar	300 - 800	300 - 800	300 - 800
Back pressure	bar	2 - 7	2 - 7	2 - 7
Injection speed		high	high	high

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Mold Wall Temperatures

Product	Mold Temperature
HT	140 - 180 °C
HT2	70 - 120 °C
HTE	140 - 160 °C

Higher mold temperatures result in lower stress injection molded parts, better finishes, better embedding of glass fibers and/or glass beads, higher degrees of crystallinity and lower-shrinkage. The hoses and fittings used for mold temperature control must be designed to the required temperatures.

Pre-drying Condition

Basically, a desiccant dryer should be used. For molded parts with very demanding surfaces a residual moisture content of $\leq 0.05\%$ is recommended. For the production of mechanically and optically perfect injection molded parts, we recommend a pre-drying at 120 °C for at least 4 - 8 hours. With an open container (wet granules) the pre-drying time can be extended up to 16 hours.

Time	Temperature
4 - 8 h	120 °C

Instructions for cleaning injection units

For cleaning using polypropylene, the unit can be flushed with low MFI PP. Commercial cleaning granules can also be used.

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