HyGEARS® V5

Hygears the gear processor®

Updates / Recent Changes Claude Gosselin, Ph.D., P.Eng.

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HyGEARS update - 04 October 2021 - Build 500.00 - 464

1) In HyGEARS V 5.0, the 3D graphics sub-system has been completely overhauled and is now controlled by the graphics chip on your computer. This results not only in significantly faster 3D displays, but especially in much better hidden lines removal and surface rendering. Note that this applies only to 3D Child Windows.

The paragraphs below describe the mouse and touchpad movements that can be used to control the display.

2) To render a Child Window active, you need to click in any area where no material is displayed.

3) Clicking on any element of the display in a 3D Child Window, the element becomes semi-transparent. This is very useful to allow seeing some details that would otherwise not be visible.

For example, figure below, seeing through the gear member.



As another example, figure below, seeing through the Face Mill cutter blades.



4) In 3D Child Windows, to <u>**rotate the display</u>**, the left mouse button is clicked while moving the mouse. Note that to rotate the display, HyGEARS requires a *pivot point* attached to the model; this means that there must be part of the model sitting at the center of the Child Window.</u>



5) In 3D Child Windows, to <u>Zoom In / Out the display</u>, the mouse scroll wheel is rotated or, on a touch pad, two fingers are slid up (Zoom In) or down (Zoom Out). The In / Out zooming movement depends on how your computer is configured for scrolling actions.



Alternately, the Zoomed area may be selected by drawing a **zooming rectangle** around the region of interest. The **zooming rectangle** is initiated by clicking the left mouse button and holding the Ctrl key at the same time. The mouse pointer then changes to a + and the *zooming rectangle* is displayed in solid lines as the mouse is moved.



Finally, the "Ctrl +" or "Ctrl I" keyboard combinations **Zoom In** the display by 20%, while "Ctrl -" or "Ctrl U" keyboard combinations **Zoom Out** the display by 20%.

6) In 3D Child Windows, to <u>**Pan the display</u>**, the center mouse button is clicked while moving the mouse in any direction.</u>



7) In 3D Child Windows, to <u>*Reset the display*</u>, i.e. to center the model in the Child Window and fit it within the Child Window borders, the Ctrl Z (^Z) keyboard combination is used.





HyGEARS update - 09 January 2023 - Build 500.10 - 465

1) In 5Axis, the Lock on Tool (^L) option is now available for Face Milling and Coniflex tools. When this feature is selected for these tools, HyGEARS will focus on a point at tooth mid-face width.



2) In 5Axis, when Chamfering at Toe / Heel with an End Mill tool, the Tool Pivot field is now enabled to allow the optimization of the chamfered edge. The Tool Pivot can be a + or – angle.

Since the tooth flanks can be selected individually, this allows tailoring the chamfering operation to the specific depth and angle that is required to obtain even chamfers on both tooth flanks.

Output Format	Stock Food				
	Rei	qd. Sugg. Actual		·	
Use Actual Tooth	# Steps 11	[11] - Start 0	Steps		
CSV Format	# Bottomland Pts 0	End 11	🗌 Tgt.Pts		
	# Facewidth Pts 11	Bottom Up			
Include Operation Switches	Retract Factor 2.0)			
Include Start Positions	Moving Contact Pt	- Over Run 0.0000			
	Constant D-Radius				
No Comments	Roughing	Fillet Stock 0.000			
Coordinates Only	rio dgi ni g	Flank Stock 0.000			
Work Coordinates	Clearance [mm]	Indexing Sequence			
TCP (Mazak)	Toe 0.000	Skip # /1 Start (Gap 1		
· · · · · · · · · · · · · · · · · · ·	Heel 0.000	Mirror End G	iap 10		
utting Cycle					
	Convex [IB]	Concave [OB]			
Slot by Slot Eank by Elank	O None	O None			
	O Toe -> H	eel -> Toe -> He	eel -> Toe		
O Fillet-Root Tool Tilt	0.00 O Heel > 7	be -> Heel O Heel -> T	oe -> Heel		
Tooth Flank Tool Pivot Combined	-20 loe -> H	Con	eel		
	Fixed Fixed	Shape-Toe	hape-Toe		
Chamfer Tool Side Depth	0.05	O OB-IB OS	hape-Heel		
Chamfer Tool End	0.500 Convex [IB] O Rock Me	[babe]		
S Length	O Concave	Plunge G	eneration		
Chamfer Toe Chamfer Heel S Length Pivot A.	90 O Both Flar				

3) In 5Axis, when Chamfering Tip with an End Mill tool, the Tool Pivot and Tool Tilt fields are now activated to allow the optimization of the chamfered edges.

The Tool tilt and Pivot can be + or – angles. Since the tooth flanks can be selected individually, this allows tailoring the chamfering operation to the specific depth and angle that is required to obtain even chamfers on both tooth tips.





4) In 5Axis, when using a Face Mill cutter, if the DXF option has been purchased, the [DXF] button becomes enabled and the section of the Face Mill cutter can be exported as a DXF file. HyGEARS now allows imposing the # of points that will be used for the Edge Radius and the Cutting Edge.

lachine/Tool Cycle	Cycling Time	e/Power Arbor	Face Mill	Operation	Process	
Face Mill Details	Name	Gleason 4.5 in		Gleasor	n 4.5 in	Export
	Tool ID: TLU ID:	1 0		Clear	Save Del	ete DYF DXF
Body Diameter	120.0000					
Body Height	70.0300					
Blade Depth	10.0000					11-14-1
Cutter Gaging	0.0000				Tool	Holder
Number of Blades	12					
Tooth Depth	5.9588	Tool Length]			
Point Width	1.4943					
Tool Length	80.0300	-		Body Diameter		• 1
Cutter Holder						Body Height
≝ [™] #Pts C	utter Blade D	XF - Pinion	Tool Center Poi	× \		
Blade Ed	lge Rad.	25	*		Blade I	Depth
Cutter Ed	lge	100		-		
		01		e 500.0	Cutting 125	.0

5) In 5Axis, when the Retract Factor is deemed too small (< 2), HyGEARS now reddens the Retract Factor input field and a Tool Tip is displayed when the mouse hovers over. This is in replacement of the older method where an exclamation mark was displayed.

🔹 5Axis CnC - Gear [Finishing] 16x72-Face-PlungeGen.HyG - [mm] 🛛 🗙							
Machine/Tool Cycle Metrics Cy	cling Time/Power Arbor	End Mill Operation Process					
Output Format	Stock-Feed # Steps 21	Sugg. Actual					
CSV Format Preset ABC Angles Include Operation Switches Include Short Header	# Bottomland Pts # Facewidth Pts Retract Factor	ning: Low Retract Factor: Risk of collision !					
Include Start Positions Explicit Indexing No Comments	Moving Contact Pt Constant D-Radius Roughing	Over Run 0.0000 Finish Stock 0.000 Rough Stock 0.000					
Coordinates Only Work Coordinates TCP (Fanuc)	Clearance [mm] Toe 0.000 Heel 0.000	Indexing Sequence Skip # /1 Start Gap Mirror End Gap 72					
Cutting Cycle							
 Slot by Slot Flank by Flank 	Left None Toe -> Hee	Right None Toe Toe -> Heel -> Toe					
 Fillet-Root Tool Tilt Tooth Flank Combined 	0.00						
 Chamfer Tool Side Chamfer Tool End Chamfer Toe Chamfer Heel Depth Chamf A. 	0.100 O IB-OB OSh 0.000 O IB-OB OSh 0.000 Plunge Ger 0.000 VCut Toe-H	ape-Heel OB-IB OShape-Heel OB-					
Sa	ve Output Apply	+/- Anim Ok Cancel					

6) In 5Axis, if the Skip # input field is such that indexing from tooth gap to tooth gap is more than 30 degrees, HyGEARS reddens the Skip # input field and displays a Tool Tip when the mouse hovers over the field.

When the Output is issued, a warning will be displayed.



achine/Tool Cycle Metrics Cy	cling Time/Power Arbor End Mill Operation Process
Output Format Use Actual Tooth CSV Format Preset ABC Angles Include Operation Switches Include Short Header Include Start Positions Explicit Indexing No Comments	Stock-Feed Reqd. Sugg. Actual # Steps 21 [-1] Start 5 Steps # Bottomland Pts 0 End 21 21 Tgt.Pts # Facewidth Pts 9 Bottom Up Bottom Up Tgt.Pts Retract Factor 15 Over Run 0.0000 Constant D-Radius Finish Stock 0.000
Co Warning: there is a risk TCP (Fanuc)	of collision with a Toe arbor when indexing ! Toe 0.000 Skip # 15 Start Gap 1 Heel 0.000 Mirror End Gap 72
 Slot by Slot Flank by Flank Fillet-Root Tooth Flank Combined Chamfer Tool Side Chamfer Toe Chamfer Heel 	Left Right None None Toe -> Heel -> Toe Toe -> Heel 0.00 Toe -> Heel 0.000 Heel -> Toe Heel -> Toe Heel -> Toe 0.000 IB-0B OShape-Toe 0.100 IB-0B OShape-Heel 0.000 Rock Me [babe] 0.000 Plunge Generation 0.000 VCut Toe-Heel

7) In 5Axis, when a Face Mill, Coniflex or CoSIMT tool is used, the calculated Surface Meters info is given on the Cycling Time/Power tab.

Machine/Tool Cycle Metrics	Cycling Time/Power Arbor CoSIMT Operation Pro	cess
Cycle Times		
		-
1	Cycling Time	1
Concave-OB		-
Line:	2.50 [sec]	
Face:	60.06 [sec]	
Plunge:	1.37 [sec]	
Retract:	0.68 [sec]	
Return:	0.00 [sec]	
Flank:	64.16 [sec]	
Total/Slot:	64.16 [sec]	
Indexing:	0.52 [sec]	
# Slots:	31	
Operation:	33.42 [min]	
Surface Meters:	6.851 [m]/Insert	
Cutting Feed:	108.00 [in/min]	
Plunge Feed:	60.00 [in/min]	
Rapid Move Feed:	120.00 [in/min]	
Tool RPM:	810.00	
 I	Power Required	1
Matl const Kc:	2500.0	-
Cut depth ap:	0.108 [in]	
Cut width ae:	0.127 [in]	
Table feed:	108.00 [in/min]	

The Surface Meters is the distance covered by an insert to complete the job at task. Given the Face Mill, Coniflex or CoSIMT blade inserts are typically good for 20 to 30 surface meters, one can get an estimate of the tool life expectancy and thus plan accordingly.

8) In 5Axis, on the Process page, the [Summ] function now adds the Cycle and Coords data, which respectively inform on the used cutting cycle and whether Machine or Work coordinates are used.

Summa	ary - CnC Process "Gear-CoSIMT/BN"				-		×
File Edi	t						
PROCESS:	"Gear-CoSIMT/BN" - Gear : v00	1046.HyG [in]				HyGEARS	×5
Sea#	1	2	3	4		NySEARS THE SEAR PRO	0000000
							- 1
OpID OpName Machine	72 2G: MPass 90CoSIMT [1-8/8] DMG 65 - 840D [CoSIMT-REX]	73 3G: CSlot 90CoSIMT [2-5/5] DMG 65 - 840D [CoSIMT-REX]	74 4G: Fillet IB 4BN [1-4/5] DMG 65 - 840D	75 5G: Fillet OB 4BN [1-4/5] DMG 65 - 840D			- 1
Target	Flank	Fillet	Fillet	Fillet			- 1
Cycle	Multi Pass	Toe-Heel-Toe Center Slot	OB/Left Toe-Heel-Toe	OB/Right Toe-Heel-Toe			- 1
Coords	Work	Work	Work	Work			- 1
1001	COSIMI	COSIMI	EndM	EndM			- 1
DLen	-0.0596	-0.0596	N/A	N/A			- 1
ToolName	SAU_220263K7_DI	340_220263R7_D1	4mm_BPI_KEX	4mm_DM_REA			- 1
in On	SOMM INVOLUTE	SOMM INVOLUE	AMM BM				- 1
Dia	3 5433	3 5433	0 1570	0 1570			- 1
ApxLoc	11,1432	11.4323	11.4323	11.4323			- 1
#Steps	8	5	5	5			- 1
Start	1	2	i	1			- 1
End	8	5	4	4			- 1
ToeClr	0.900	0.900	0.300	0.300			- 1
HeelClr	1.000	1.000	0.250	0.250			- 1
Gaps	1->31	1->31	1->31	1->31			- 1
Stock	+0.0060	-0.0100	-0.0080	-0.0080			- 1
RapidMove	120.0	120.0	1000.0	1000.0			- 1
Plunge	60.0	60.0	1000.0	1000.0			- 1
Feedl	108.0	108.0	72.5				- 1
Feed2	108.0	108.0	72.5				- 1
Feed3				72.5			- 1
Feed4				72.5			- 1
RPM	810	810	14500	14500			- 1
VC	751.4	751.4	596.0	596.0			
12	0.0121	0.0121	0.0013	0.0013			- 1
TIWE[.]	33.4	5.0	0.1	0.0			- 1
Est.Time	0.85 H						-

9) When doing Reverse Engineering (RE) in the Corr-RE display mode, it is frequent that several iterations of RE are required to attain a specific result; up to now this meant that the user had to make one RE selection, click [Apply] and then [Ok] such that the internal data structure was updated, and then re-enter [RE] for another pass.

To avoid this repetitive action, the [Update] button has been added to the RE selection window: the [Update] button copies the current set of machine settings to the data structure of the member being RE. Thus, one can make a given selection for RE, click on the [Apply] button to calculate as required, and then click on the [Update] button to save the calculated machine settings state before making a new iteration with a different selection and without having to exit the RE selection window.





10) When creating a New Geometry (Hypoid gears only), the pinion's and gear's Pitch Angle can now be imposed. This can be useful in some cases where the pinion shaft has a Toe spigot (to support a bearing) which could be hit by the Face Mill cutter.

It can also be useful to impose the Gear member's pitch angle for HRH (High Ratio Hypoid) gears.

Note that not any value for the pitch angles can be used, and it is recommended to first run the HyGEARS New Geometry without imposing the pitch angles, look at the obtained values, and re-run the New Geometry using values slightly different from those that came out by default.

🎳 New	Geometry Definition - [mm] [do	l.mm.ss]	×
General	Cutter Units		
Geriera	Blank Data Blank Data Backlash FCrown to Xp Zero Front Angle Outside Diameter(Heel) Face Angle Root Angle Pitch Angle Whole Depth @@Mid-F @@Heel Bore Diameter Min Bore to Root @Toe	Pinion Gear 0.135 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 Clear	
	Linear Units		
	Angular Units	Deg.Min.Sec 🗸	
	Cutter Units	ln v	
		Import < <back next="">> C</back>	Cancel

11) When creating a New Geometry – Straight Bevel Gear (Generated), the lengthwise crowning entered is now the desired value rather than a given value / 5 [mm] face width.

eneral Cut	ter Units				
	21110	Pinion	Gear		
/-					
I. Error (uRa	id)	0			
Helix Angle		0.0000			
ressure Ang	gle	22.5000			
engthwise (Crowning (mm	0.00500	0.00500		
Thickness @	P Mid-Face	7.5015	4.5198		
Thickness @	PHeel	0.0000	0.0000		
Point Width [mm]		0	0		
Edge Radius	; [mm]	1.300	1.700		
Profile Curva	ture [Toe]	0.000	0.000		
Profile Curva	ture [Heel]	0.000	0.000		
			Clear		
Switches		Pinion Process	Gear Process		
Bal. Stre	ength	Generated	Generated		
Differen	tial Gears	O Duplex Helical	O Duplex Helical		
Develop	Geom.	O Modified Roll	O Non Generated		
G G. Len.	Crown.	Simplex I	O Helixform VP		
🔽 Auto Da	amping	Cyclo-Palloid	- Fixed Seturig		
Use dat	a as is	O Cyclo-Milling			

12) In the New Geometry input window, the Geometry Source File can now be either a ZG-Hypoid ND file or a KISSSoft text file, both of which will be read to populate the New Geometry window.

- The ZG-Hypoid ND file is a special output file of the ZGH-Suite software (from ZG-Hypoid, <u>www.ZG-Hypoid.de</u>) which can iterate through a series of gear dimensions (module, tooth count, spiral angle, etc.) to find the "optimal" combination for a given task; the results of this "optimal" combination are saved in a text file that is read by HyGEARS to populate the New Geometry window and HyGEARS will then generate the appropriate machine settings and cutter definition to obtain the desired micro-geometry. For the time being, this applies only to bevel gears;
- KISSSoft can output its calculation results in a text file that can be read by the New Geometry window; the KISSSoft output file is scanned to populate the input fields of the New Geometry window. This applies to spur, helical, face, straight bevel and spiral bevel gears.

13) When calling either the Pinion or Gear Summary Editor, HyGEARS now displays what is the status of the summary being edited.

It can be:

- [Nominal]: this member has not seen any closed loop (Corrective Machine Settings);
- [Corr #...]: this member has seen at least 1 closed loop iteration, and the current closed loop summary being edited is #...

	M Machine Hi Order	lelical	ng Film-Iv		
Misc				 fumil 	
# Teeth	🞳 Pinion "hypoid-	12x60x213-01_	Corr.hyg"	- [mm] [D.dec]	2
Module / mn	Blank Cutter Top	Rem Machine	Hi Order	Other Operating	Rim-Material Bear
Part #	Dinion (Dinishin		Dumlar	Halical	
Tooth			Duplex	nelical	🔾 [in] 🛛 [mm]
Tooth Hand	# Teeth	12		Outer CD	68 1711
Face Width	Module / mn	2.13000 / 1.	64655	Pinion Offset	26.0000
Addendum	Part #			Pitch Diameter	38.3055
Dedendum	Tooth			Blank	
Add. Angle	Tooth Hand	Left		Pitch Angle	16.3170
Ded. Angle	Face Width	26.9700		Face Angle	19.6500
Front Angle	Addendum	3.5221		Root Angle	15.5326
Back Angle	Dedendum	1.5679		P.Apex to Xp	4.7100
	Add. Angle	3.3330		F.Apex to Xp	3.3800
	Ded. Angle	0.7844		R.Apex to Xp	2.3407
	Front Angle	0.0000		Outside Diameter	45.9600
	Back Angle	0.0000		FCrown to Xp	34.9901

14) HyGEARS now allows "Drag and Drop" of HyG files on any empty area of the Parent Window. When doing so, if there is already a HyG geometry active, HyGEARS asks to save it prior to opening the dropped HyG file.



HyGEARS then proceeds to open the dropped HyG file and defaults to TCA mode.



15) HyGEARS now offers the High Ratio Hypoid gears option – i.e. HRH gears – which are defined as having a pinion with 5 teeth or less and/or a gear ratio larger than 10:1.

HRH gears are created the same way as regular hypoid gears; if the Duplex Helical process is used (which is the preferred approach), the resulting gear set will have:

- the same cutter Diameters,
- the same cutter Blade angles,
- and the same cutter Point Width,

therefore, exactly the same cutters which is a cost advantage when manufacturing.

Names											
Geometry Name	Test-1 Hypoi	d		_					1		
Directory	E:\VB					(IB) G	Gear (Of	3)			
Geometry Source File	Hypoide.lst					Phoenix					
Types						THUCHIX					
Geometry Type	Hypoid			~					inion	Gear	
Material	AGMA A-2			~					mon	0.051	
Pinion Tooth Hand	Left			~					00	0.000	
Tooth Taper	Duplex			~		0.	381				
Misc						0	0		00	0.000	
Power [Kw] / Torque [N-m]	0.03		0.5727			0.000	0.000			0	
Pinion Speed (RPM)	500.00	-		_		0.000	0.000	_		0	
Number of Teeth [Pinion - Gear]	2	30.000	60			0	0		000	0.0000	
Module/Pitch Diameter	1.333333	1	80.0000			0				0	
Gear Tooth Face Width / mn	8.000	1	0.41045			12	2.000		00	0.000	
Shaft Angle	90.0000				Clear				00	0.000	
Depth Factor (Gear)	3.500	AGMA	/ ISO —		(Gear Proc	ess		00	0.000	
Addendum Factor (Gear)	0.110	O AG	MA			Genera	ited			Clear	
Clearance Factor	0.125					Duplex	Helical				
Offset	26.000				9	Non Ge	enerated	VP			
) Fixed S	Setting		14.0		
	(Invest) (e a De sal	Nester						g.Min.Se	*C	
	Import	< <back< td=""><td>Next>></td><td>Cancel</td><td></td><td></td><td></td><td></td><td></td><td>~</td><td></td></back<>	Next>>	Cancel						~	

As usual, HyGEARS outputs a New Geometry Summary, and in the case of HRH gears, it is important to follow the recommended values for spiral angle and cutter diameter because of the sensitivity.

😴 New Geometry Report			×
Item	Value	Suggested	Status
Pinion Offset [mm]	26.000	> 8.000 < 20.000	Modify
Cutter Diameter [mm]	50.800	~ 50.445	Modify
Pinion Spiral Angle (°)	70.000	> 66.011 < 68.011	Modify
		Ok	lifu Canacl
		UK MOC	iny Cancel

For example, the 2x60 gear set described in the above pictures results in the following TCA and dimensions.





We can see that the Contact Patterns (CP) are well centered on the gar tooth flank, and that the 26 mm pinion offset results in a pinion almost at the ID of the gear. We therefore have a situation similar to a Spiroid gear set.

One potential issue however is that the Toe ID on the pinion is less than 4 mm, as shown below, and therefore less than 2 tooth depths. The design pinion spiral angle is 65 degrees.



As shown above, typically, the pinion in HRH gears has a very small tooth number, and therefore the ID at Toe can be very small. At this time, the [only] way to increase the Toe ID on the pinion is by increasing the

spiral angle. Increasing the pinion spiral angle to 70 degrees yields a 5 mm Toe ID, with the same kinematics.



Increasing again the pinion spiral angle to 73 degrees yields an even better result with a Toe ID of nearly 6 mm (some 2.5 times the tooth depth at Heel) with excellent kinematics, as shown below.





However, increasing again the pinion spiral angle would not give correct kinematics and therefore a practical upper limit would be around 73 degrees.

Note that while increasing the pinion spiral angle results in a larger Toe ID, which is essential for structural strength, it also decreases efficiency since it results in more sliding. Thus the gear engineer must carefully balance each aspect and will likely make several trials to obtain an acceptable design.

Gear ratios of up to 100:1 can be reached by carefully selecting the combination of pinion offset, sum of pressure angles, pinion spiral angle and cutter diameter. However, not every combination will yield acceptable results and the gear engineer may have to make a few trials. For example, the above 2x60 gear set is changed to 1x60, with the same module and cutter diameter; however, the spiral angle must be increased to 82 degrees to yield an acceptable Toe ID on the pinion, as is shown below.





16) KIMoS Kip files: HyGEARS can now read and save spiral bevel gear geometries as KIMoS Kip files.

In fact, KIMoS Kip files are simple Zip files with the extension changed from "Zip" to "Kip". This means that a Kip file, once renamed Zip, can be read with apps such as RAR and WinZip; its content and tree structure can also be viewed in Windows as shown below.

📮 grind 🛛 🗙	+			-		×
⊕ New ~ 🔏 🗘 🗋 0	A) & ŵ ît s	iort -> 🗮 View -> 🐻 Extract a	all			
\leftarrow \rightarrow \checkmark \uparrow \blacksquare « 11x43-D660 »	11x43D660.zip > KIMoS5 > 00	001 > grind ~ C	2 Search grind			
✓ 🚋 11x43D660.zip	Name	Туре	Compressed size	Password	Size	
V 🚞 KIMoS5	contur1.dat	DAT File	1 KB	No		
✓ ¹ 00001	contur2.dat	DAT File	1 KB	No		
늘 grind	问 eing2.dat	DAT File	3 KB	No		
> 🧾 11x44 D290	💹 g_onm.dat	DAT File	50 KB	No		1
> 📒 12x30 D400Final	💹 g_o_rnm.dat	DAT File	1 KB	No		
> 🔁 13x33 - RootProblem	GEARING.TXT	Text Document	1 KB	No		- 1
> 13x33 D400	geomgear.dat	DAT File	1 KB	No		- 1
12x26 Eormato	geompin.dat	DAT File	1 KB	No		- 1
	ggond.dat	DAT File	2 KB	No		
> 🚺 14x28 Spiral w CoSIMT	p_onm.dat	DAT File	51 KB	No		1
> 📩 14x28D355 - CMM Tests - May 20	p_o_rnm.dat	DAT File	1 KB	No		- 1
늘 14x32 D355	/// pgond.dat	DAT File	2 KB	No		- 1
> 늘 14x34-Spiral-DRadComp	sollmes1.dat	DAT File	6 KB	No		
14x35 DH SBevel	sollmes2.dat	DAT File	6 KB	No		
> 15x34d290	sollmes3.dat	DAT File	6 KB	No		
16x62 Cycle Dallaid	sollmes4.dat	DAT File	6 KB	No		
ioxos Cyclo Pallold						
16 items						

If the required KIMoS In/Out option has been purchased, when HyG gear sets are "Save As", the "KIMoS 5 (*.kip)" file type is added to the list as shown below.

🞳 Save Geometry					×
$\leftarrow \rightarrow \checkmark \uparrow$	<mark>─</mark> ≪ ZG → 2x6	0-HR	v C	Q Search 2	x60-HRH_m1.33
Organize 👻 Ne	w folder				≣ • 👔
🚞 Repositorie	5		Name	^	Date modified
🚞 SPRO4			hrh_2x60_d2_80_	m1-33-cg-2.kip	2022-12-31 9:
🚞 Spro4drv			_		
🚞 Spro63					
SProDrv+					
🚞 SproSPP-BL	Jp				
File <u>n</u> ame:	HRH_2x60_d2_80_m1-3	3-CG	-2.kip		~
Save as <u>t</u> ype:	KIMoS 5 (*.kip)				~
 Hide Folders 	HyGEARS 5.0 (*.HyG) Becal (*.kgd) Becal Point Cloud (*.cld) Klingelnberg ND (*.nd)				

If this option is selected, HyGEARS then asks which way the Kip file is to be created. Finish is the default.

🗳 KIMoS KIP Export X			
O Rough) Black		
O Deep	◯ Lapped		
Finish	 Assembled 		
Grind			
	OK Cancel		

Once confirmed by clicking on [Ok], the Kip file is created in the same folder as that of the current HyG file and a confirmation is given on-screen.



17) In the LTCA [Load] window, the "Oi Data" tab has been added where it is easier to do "what if" scenarios. As can be seen below, most fields are self-explanatory, but the 2 following options do require a bit of info.

🖉 Load Sharing X				
Data Material OI Data E/P Links				
Use the Flash Temperature for Oil Film Thickness O.00 Use the Linear Load model for Oil Film Thickness				
Oil Type	ISO 220	~		
Oil Temp.	180.00	[F]		
Friction Coeff.	0.0200			
Surf. Finish (P)	32.0000	[uin]		
Surf. Finish (G)	32.0000	[uin]		
Pinion RPM	1000.00			
		Apply OK Cancel		

• Use the Flash Temperature for Oil Film Thickness: by default, until now, HyGEARS assumed that the Flash T affects the oil viscosity and pressure-viscosity coefficient, both of which enter in the oil film thickness equation; however, not all references in the literature agree on this and the choice is now given to use, or not, the Flash T, and if used, to what extent it is used, hence the input field where the % of the Flash T to be used is entered, which ranges from 0% to 100%.

• Use the Linear Load Model for Oil Film Thickness: by default, for spiral bevel gears, HyGEARS uses an elliptic non-linear load distribution model along the major axis of any instant contact ellipse; if the extent of the contact pattern under load is large enough, or if the relative curvature is deemed small enough, the Linear Model can be used instead where it is assumed that the load distribution along an instant line of contact is linear.