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1. INTRODUCTION

This is the user manual which describes the main controls and procedures to get started with the software. Additionally refer to IDEA StatiCa support for the <u>Checkbot</u> available at <u>https://www.ideastatica.com/support-center/checkbot-bulk-bim-workflows</u>.

Idea4Straus7 is a BIM tool to manage and synchronize structural details (connections and members) imported to IDEA Statica directly from Straus7 using an automatic link. This software automatically import the geometry, the forces and moments for several load cases from the global model to IdeaStatica.

This version of the Software is able to manager connections and members from Straus7:

Connection \rightarrow imports selected node to application IDEA StatiCa Connection.

Member \rightarrow imports selected beam to application IDEA StatiCa Member.



This version of the software work with:

- Version 21.1. of IDEA StatiCa
- Version R3.1.1 of Straus7





2. TERMS OF USE

2.1 COPYRIGHTS

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2.2 USE THE SOFTWARE

The program has been carefully tested and used before release it, some benchmarks are shown in the following. In using the software, however, the user accepts and understands that is only a tool and no warranty is expressed or implied by the developers or the distributors on the accuracy or the reliability of the program. The user must explicitly understand the assumptions of the program and must independently verify the results.





3. CONVENTIONS AND THEORETICAL BACKGROUND

3.1 IDEA CONNECTION INTERNAL FORCES APPLICATION

3.2 GLOBAL COORDINATE SYSTEM

All coordinate systems used are right-handed:



Fig. 1 Righ hand rule.

X-axis of global coordinate system is horizontal and leads from left to right. Y-axis of global coordinate system is horizontal and leads backward. Z-axis of global coordinate system is vertical and leads upwards.



Fig. 2 Idea coordinate system of the a beam element - Local coordinate system of 1D member.





Each 1D member is defined with begin and end node. Each 1D member has local coordinate system, which origin is in begin node of member. Local x axis of 1D member is identical with member axis and is oriented from being to end node of 1D member. Local Y axis of member is horizontal in general and local z axis leads upwards.

Coordinate system of cross-sections



Cross-section has reference axes y (horizontal) and z (vertical). Principal axes of cross-section are marked with u and v. If reference axes are identical with main central axes of cross-section, only reference axes are drawn.





3.3 CONVENTION OF INTERNAL FORCES ON 1D MEMBERS

3.3.1 IDEA CONNECTION FORCES AND MOMENTS CONVENTIONS



Internal forces on 1D members perform following actions:

- positive bending moment My causes tension in cross-section fibers with negative z-coordinate.
- positive bending moment Mz causes tension in fibers with negative y-coordinate
- positive torsional moment Mx acts about x-axis of 1D member.
- positive axial force N acts in direction of x-axis of member and causes tension in cross-section fibers.
- positive shear force Vz acts in direction of z-axis of cross-section.
- positive shear force Vy acts in direction of y-axis of cross-section.

3.3.2 STRAUS7 INTERNAL FORCES AND MOMENTS CONVENTIONS

- In each plane, a positive shear force shears the N1 side of the beam towards the positive side of the axis.
- In each plane, a positive bending moment generates compressive fibre stress on the positive side of the axis.
- Positive Axial Force: Tension
- Negative Axial Force: Compression
- The convention for torque is a right hand moment about the 3 axis.





3.4 INTERNAL FORCES AND MOMENT

3.5 DEFAULT LOCAL AXIS

3.5.1 **"H" MEMBERS**



Fig. 3 IDEA StatiCa



Fig. 4 Straus7





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3.5.2 "C" MEMBERS



Fig. 5 IDEA StatiCa



Fig. 6 Straus7





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3.5.3 "L" MEMBERS WITH NON EQUAL LEGS













3.5.4 "L" MEMBERS WITH EQUAL LEGS



Fig. 9 IDEA StatiCa





Fig. 10 Straus7





4. HOW TO USE THE STRAUS7 BIM LINK

4.1 USER INTERFACE

User interface window is shown in the picture below:







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About button, define the version some main information about the Software:







4.2 EXPORT CONNECTIONS

4.2.1 IDEASTATICA CHECKBOT

In the following the IDEA StatiCa Ceckbot is linked together with Straus7 to export connections and members through the software.

The following Straus7 FE model is used as a reference model:



Run the Idea4Straus7 application. A wizard window is opened:

Click on	Sfoglia file Straus7	and select .st7 FE model file path:
		Select Straus7.st7 file patch
Idea4Straus7 File Strumenti Informazioni		×
Sfoglia file Straus	IIIZE StatiC	Ca [®] connection
Esegui Checkb	Tutti i nedi	Nodiattivi Tutte le membrature >
EISEK	O	







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🛃 Idea4Straus7 File Strumenti Informazioni		×
/=== Stati	Ca [®] connection	
Sfoglia file Straus7		
Sfoglia risultati Straus7		
Tutti i nodi	Nodi attivi Tutte le membrature	Tutte le membrature attive
Esegui Checkbot		
Esporta modello IDEA		
	Copen	×
	\leftarrow \rightarrow \checkmark \uparrow \blacksquare \Rightarrow This PC \Rightarrow Local Disk (C:) \Rightarrow IdeaRS	ン O Search IdeaRS ク
	Organize New folder	8== • II ?
	Steel frame with angular Name	Date modified Type
	Steel Framed Structure	29-Jan-20 12:21 AM ST7 File
	OneDrive	
	S This PC	
	JD Objects	
AIGERA	A360 Drive	
EISEKO	Desktop	
	File name: Steel Framed Structure.st7	✓ St7 file (*.st7)
		Open Cancel

Click on

Sfoglia risultati Straus7...

and select .st7 FE model result file path:







Now the list of FE available connections and members appear:

From this menu is possible to choose the members and connection to be exported from Straus7:

Connection 107 Member 10

	📕 🖃 Sta	ntiCa° a	CONNECTION			
Sfoglia file Straus7	C:\IdeaRS\Steel Framed Structure_R3	3.1.1.st7				
Sfoglia risultati Straus7	C:\ldeaRS\Steel Framed Structure_R3	3.1.1.LSA				_
	Tutti i nodi		Nodi attivi	Tutte le membrature	Tutte	le membrature attiv
Esegui Checkbot	1	^		1	^	
Esporta modello IDEA	2			2		
	3			3		
	4			4		
	5	»		5	»	
	7	"		7	"	
	8			8		
	9			9		
	10			10		
	11			11		
	12			12		
	13			13		
	14			14		
	15			15		
	17			17		
	18	~		18		





Connection position in the Straus7 model:



Member position in the Straus7 model:







Now the Ceckbot button will be clicked:

\times

A folder for the Ceckbot resulting file is requested:

Select Folder			
\leftarrow \rightarrow \checkmark \uparrow \blacksquare \rightarrow This PC \rightarrow Local Disk (C	::) > IdeaRS	・ ひク Search IdeaRS	
Organize 🔻 New folder		III - 🥐	
A360 Drive	^ Name	× ,	
💻 Desktop	📙 test111		
Documents	📙 test110		
🖊 Downloads	📜 test109		
Music	📜 test108		
Pictures	L test107		
Videos	Lest106		
Local Disk (C)	test105		
	test104		
	Lest103		
I Google Drive (G:)	test102		
🐓 Network	Lest101		
	 ✓ < 	>	
E-Id-m tost111			
Polder:			
		Select Folder Cancel	

And the IDEA Ceckbot will run:







The Ceckbot windows will start start. Then, the following steps should be followed:

Calculate yesterday's estimate	a [®] Checkbot *	Checkbot	_ 🗆 🗙
\frown	Nuovo progetto		
(<)	File Step 1		
Apri	Notice progetto test111		
Νυονο	C:\ldeaF Tipo progetto C:\ldeaF	Calcestruzzo	
Impostazioni	Impostazioni		
Informazioni	Codice di progetto	•	
Licenze		Step 2	
Esci			
		K	
	Crea	a progetto	
Support Center	Novità		
Tutorials FAQ Webinars	10.02.2022 Hollow structural section (HSS) connections – what m Loved by architects, dreaded by manufacturers. Connecti steel sections can be a real nightmare but when successfi they manage to civilize the coldness of steel structures.	09.02.2022 Code-check of steel members with buckling problems We all face challenges, calculating architectural or engineering piec ully designed, it is one of them. Complex beams with stability issues. Unknown buckling lengths, connection stiffness. Various load configs. Openir haunches, stiffeners. Yet we love these challenges, we waste time b solving them.	ces of ngs. y

The Ceckbot pops up and you select the desired Design code. Now the windows will change for the next step:

	tatiCa®	Checkb	ot			(Checkbot						_	
Connessioni Member	+ Nodi ➡ Membra ► Conness Etic	, Å→ SCL ature ioni hette	Calcola Articolo	File Elimina	Carichi C Sync	Materiali > < <> Unisci Divid o strutturale	e ∰Impostazioni ≣=Conversion		l Mx /y My /z Mz	Risultati -	Ţ	Scala Estremo	1,00 Estremi locali	* *
List of project iten	ns	ŵ	दि Q (⊕ C [х л с м 🎔	Solie	do Trasparente Fil	di ferro						
There are n in the proje Make a sele in the 3rd p app and im joints or me	o items ect. ection oarty port embers.							B						
Support Center		Novità												
Tutorials FAQ Webinars		10.02.2022 Hollow structu Loved by archit steel sections ca they manage to	ral section (HS ects, dreaded by an be a real nigh o civilize the cold	(S) connection of manufacturer tmare but whe ness of steel st	ns – what m. s. Connectior en successfull tructures.	ns of hollow y designed,	09.02.2022 Code-check of steel m We all face challenges, ci art is one of them. Com ouckling lengths, conner aounches, stiffeners. Yet solving them.	alculating s plex beam ction stiffn we love th	with bu architec s with s less. Var hese ch	tekling problems tural or engineeri stability issues. Un rious load configs. allenges, we wast	ng pieces of known Openings, e time by			
Codice di proget	tto : EN												Straus7 R3.1.1	





4.2.2 EXPORT CONNECTIONS

Click con "Connections" to filter the connections:

//=/==] StatiCa	e [®] Checkbe	ot	C	heckbot		_ 🗆 🗙
Calculate yesterday's estimates		습 File	Materiali			
Connessioni + Nodi	⇒ SCL brature essioni	C Apri Elimina C Ripristina Calcola Atricolo corrente	Carichi C Sync Modello strutturale	Conversion	Image: marked black of the state of the	▼ Scala 1,00 ↓ ↓ Estremo Estremi locali ▼
List of project items			Solid	n Trasparente Fil	di ferro	
There are no item in the project. Make a selection in the 3rd party app and import joints or members	5.				B.	
Support Center	Novità					
Tutorials FAQ Webinars	10.02.2022 Hollow structu Loved by archit steel sections ca they manage to	tral section (HSS) connectio ects, dreaded by manufacture and be a real nightmare but wh o civilize the coldness of steel s	ns – what m C rs. Connections of hollow M en successfully designed, a tructures. b h so	9.02.2022 Code-check of steel m Ve all face challenges, ca rt is one of them. Comp uckling lengths, connec aunches, stiffeners. Yet olving them.	embers with buckling problems alculating architectural or engineering olex beams with stability issues. Unkn tion stiffness. Various load configs. O we love these challenges, we waste ti	pieces of own penings, me by
Codice di progetto : EN						Straus7 R3.1.1 -

All the selected connections are shown:

Calculate yesterday	tatiCa [®] Checkbo	Dt File	Materiali	Checkbot				_ _ ×
<mark>≌Connessioni</mark> ⊨Member Importa	+ Nodi ↓ SCL ➡ Membrature ▲ Connessioni Etichette	Calcola Articolo corrente	Carichi Sync Unisci Divi Modello strutturale	> Impostazioni de acconversion Opzioni	I N Mx Vy My Vz Mz	Risultati DEAD	▼ Scala Estremo Estrem	1,00 🗘 ni locali 👻
List of project ite Connessi 12 13 107	ms î		Sol	ido Trasparente Fil		O7 [Connessione] Apr Properties Name Nado Connected members Connection point Carichi Classe di risultati Carichi	 Load update 107 107 85, 86, 133, 240, 43 [10,50; -3,00; 3,00] Tutte le SLU Fond 	Ripristina 78, 526, 552, 5
Support Center	Novità							
Tutorials FAQ Webinars	10.02.2022 Hollow structu Loved by archite steel sections they manage to	ral section (HSS) connection cts. dreaded by manufacturer in be a real nightmare but civilize the coldness of steel s	ns – what m rs. Connections of hollow en successfully designed, tructures.	09.02.2022 Code-check of steel m We all face challenges, c art is one of them. Com buckling lengths, conne haunches, stiffeners. Yet solving them.	aculating archited alculating archited plex beams with s ction stiffness. Var we love these ch	ckling problems tural or engineering pieces of tability issues. Unknown rious load configs. Openings. allenges. we waste time by	of .	
Codice di proge	etto : EN						Straus	7 R3.1.1 📲





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Export for the connection:



IDEA StatiCa Connection application will start:







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4.2.3 EXPORT MEMBERS (AND CONNECTIONS)

Click con "Member" to filter the members:

//=/=/=/ StatiCa	Checkbo	ot	Cl	heckbot		_ 🗆 🗙
Calculate yesterday's estimates		습 File	Materiali			
Connessioni + Nodi Member Conn	, ↓→ SCL brature essioni	Apri Elimina	Carichi >< <> Sync Unisci Divide	Impostazioni	Image: Non-Ward Stress Non-Ward Stress Vy My Vz Mz	Scala 1,00 + Estremo Estremi locali +
List of project items			Solide	n Trasparente Fil	di ferro	
There are no item in the project. Make a selection in the 3rd party app and import joints or members	5.				B.	
Support Center	Novità					
Tutorials FAQ Webinars	10.02.2022 Hollow structu Loved by architu steel sections ca they manage to	tral section (HSS) connection ects. dreaded by manufacture an be a real nightmare but wh o civilize the coldness of steel s	ns – what m Cr. rs. Connections of hollow keine successfully designed, ar structures. bu ha	02.2022 ode-check of steel m 'e all face challenges, ca t is one of them. Comp Jackling lengths, connec Junches, stiffeners. Yet Jiving them.	embers with buckling problems ilculating architectural or engineering pieces of blex beams with stability issues. Unknown tion stiffness. Various load configs. Openings, we love these challenges, we waste time by	
Codice di progetto : EN						Straus7 R3.1.1 -

All the selected members are shown:

Calculate yesterday's estimates	e [®] Checkbot	File	Materiali	Checkbot					_ _ ×
Connessioni ☆ Mem Member Importa	, , , , , , , , , , , , , , , , , , ,	Apri Elimina Ripristina Calcola Articolo corrente	Carichi C Sync Modello struttur	<> @Impost Divide ≣ ≉Conver	azioni sion	N Mx F Vy My Vz Mz	Risultati DEAD	Scala Scala Estremo Est mento 1D	1,00 🗘 remi locali 🔻
List of project items Connessioni 12 13 107 Members 10				Solido Trasparent	e Fil di ferro) 10 • •	[Substructure] Properties Name Analyzed member Connessioni Carichi Classe di risultati	Apri Load updat 10 10 10, 12, 13 107, 12, 13 i Tutte le SLU Fond	e Ripristina
Support Center	Novità								
Tutorials FAQ Webinars	10.02.2022 Hollow structural Loved by architects steel sections can b they manage to civ	I section (HSS) connection s, dreaded by manufacture be a real nightmare but wi vilize the coldness of steel	ons – what m ers. Connections of hollo nen successfully designed structures.	09.02.2022 Code-check of We all face challe , art is one of ther buckling lengths haunches, stiffen solving them.	steel members nges, calculatin, n. Complex bea connection stif ers. Yet we love	s with buck g architectu ms with sta fness. Vario these chall	tling problems ral or engineering pie bility issues. Unknowi us load configs. Oper enges, we waste time	eces of n nings, e by	
Codice di progetto : EN								Str	aus7 R3.1.1





Export for the beam:

// /St	atiCa®	Checkbo	ot			C	heckbot						_ 🗆 🗙
Calculate yasterday's	estimates			File		Materiali							
Connessioni Member Importa	 Hodi ➡ Membratu ➡ Connession Etiche 	, ♪→ SCL re hi tte	Calcola Apri	Elimina Corrente	Carichi	>< <> Unisci Divide o strutturale	Impostazioni ■*Conversion Opzioni	0	N Mx Vy My Vz Mz	Risultati DEAD	, ↓.	Scala Estremo Estr	1,00 🖕 emi locali 🔻
List of project item	ıs	ŵ	لم Q •	÷с;	к 7 к 3 🎔	Solid	o Trasparente Fil	di ferr	·o 1	0 [Substructure]	Apri	Load update	e Ripristina
 Connession 12 13 107 Members 10 	i		*				*			 Properates Jame Analyzed mer Connessioni Carichi Classe di risult 	10 nbers 10 10: tati Tu	7, 12, 13 itte le SLU Fonc	ı v
Support Center	Nc	vità											
Tutorials FAQ Webinars	10. Ha Lov ste the	02.2022 Ilow structu red by archite el sections ca y manage to	ral section (HS ects, dreaded by n be a real nigh civilize the cold	S) connection r manufacturer tmare but whe ness of steel st	ns – what m. rs. Connection en successfull tructures.	Co ns of hollow W y designed, ar bu ha sc	0.02.2022 ode-check of steel m le all face challenges, ca t is one of them. Comp uckling lengths, connec aunches, stiffeners. Yet living them.	ember alculatir plex bea ction sti we love	rs with bu ng archite ams with iffness. Va e these ch	uckling problems ctural or engineering stability issues. Unkn rious load configs. O nallenges, we waste ti	pieces of own penings, me by		
Codice di progett	to : EN											Stra	nus7 R3.1.1

IDEA StatiCa Member application will start:

IIII StatiCa® Me	ember			test112								_	
Calculate yesterday's estimates	File	Progetto	Verifica	Relazione	М	ateriali							
► Undo ○ Redo Impostazioni Calcola	Verifica deformazione	Deformazione Usum	Ux Uy	Uz Membratu	re Pias	stre SCL	Carico i	Nodo	Ope	erazione			
	7 -	MNA	6 . K I.	Turnet	tichett	e	10	Nuc	OVO				
	и Г		Solido	Trasparente	Tutto	e le SLU Fond	(Carico]				Lopia E	limina
					>	85 / Inizio	-2739,2	77,3	-10,6	0,0	0,0	0,0	^
						86 / Fine	1200,4	-173,2	-4,2	0,0	14,4	258,7	
-8,1,3						133 / Inizio	-37,6	0,0	43,1	0,0	0,0	0,0	
1050,1	-0,70		240			240 / Fine	-2004,5	1,6	97,9	0,0	10,2	-2,0	
-1.3,5 3.7			478			478 / Inizio	379,3	-0,2	-124,9	0,0	-54,3	0,3	
,9 1,1 ⁾¹ 43,	-0,5 3		526			526 / Fine	1990,6	0,0	0,3	0,0	0,0	0,0	
(+0,7 ²),4 +1,1 ⁻³	1		552			552 / Inizio	-273,2	-0,4	-1,3	0,0	1,3	-1,3	
-2,7	ŕ		9			555 / Fine	-331,1	0,1	-0,9	0,0	1,4	0,0	
-1,4,5			137	.		9 / Inizio	2967,3	58,3	-6,6	0,0	0,0	0,0	
		1,3	184,0,01, 3,2 258,7,4	, ,		137 / Fine	-2,7	0,0	43,1	0,0	0,0	0,0	
		4371	519-203			184 / Fine	196,1	-2,0	65,0	0,0	-86,0	1,1	
			183	,5		400 / Inizio	-1505,4	-1,1	-67,2	0,0	-10,1	-0,7	
	ູດ,ິດ	1,1	0,3,334			519 / Inizio	1628,9	0,0	0,3	0,0	0,0	0,0	
			11 0,00,69,2 138			533 / Fine	236,3	0,1	-2,4	0,0	-4,7	-0,5	
			185			534 / Fine	-252,6	-0,4	-1,5	0,0	-2,0	1,4	
			401		<	44 / 5:	F7F7	70.0	10		0.1	4007	>
			C04										







4.3 SUPPORTED SECTIONS

The following sections are supported for export from Straus7:



Where the section is not supported, and equivalent rod bar is applied and this can be changed later in the IdeaConnection Designer, in short there are no limits for the applications.





5. **BENCHMARKS**



IDEA BIM









5.2 TEST – FORCES - PORTAL FRAME







5.3 TEST – FORCES - CONTINUOUS BEAM

5.3.1 STRAUS7



Bending moment:













Shear Force







5.3.2 IDEA BIM







5.3.3 IDEA CONNECTION







	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
>	HEM240 / End	46.6	0.0	3.6	0.0	-7.6	0.0
	HEM240 / End	1.8	0.0	-30.3	0.0	-26.6	0.0
	HEM240 / End	-1.8	0.0	-16.3	0.0	-19.0	0.0

Description LC1

Values in disabled cells are not taken into account in CBFEM analysis. Members can be loaded only by that components of internal forces which are defined in member "Model type".

Unbalanced forces

X	Y	Z	Mx	My	Mz
[kN]	[kN]	[kN]	[kNm]	[kNm]	[kNm]
0.0	0.0	0.0	0.0	-15.2	0.0







Bending moment:



Axial force:









5.4 TEST – 3D TRUSS FRAME

The following 3D frame is considered:







5.4.1 LOCAL AXIS



Local axis 2 and Z are aligned: OK.







5.4.2 BENDING MOMENTS











5.4.3 AXIAL FORCES

Check erection roof: Linear Static Analysis "C:\Users\rober\Desktop\TEST_EXPORT_STRAUS7\Check erection roof.LSA"



Forces are compliant with Straus7.





0.0

0.0

0.0

0.0

0.0

0.0

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5.4.1 NODAL UNBALANCED FORCES

