

November 2021 technet GmbH, Pestalozzistraße 8, 70563 Stuttgart, Germany

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### 1 Installing

- Please note that installing Easy Release 2022 will not overwrite an older (2021, 2020, ...) existing installation of Easy. You can use Easy 2022 and an older release of Easy on the same computer.
- Easy Release 2022 requires a new password!

#### 2 System Requirements

Operating systems:

- Windows 11 (current service pack) 64-bit
- Windows 10 (current service pack) 64-bit
- Windows 8.1 (current service pack) 64-bit
- Windows 8 (current service pack) 64-bit
- Windows 7 (current service pack) 64-bit

Minimum Hardware:

• A graphic card with an OpenGL accelerator is strongly recommended.

### 3 Licensing

Easy2022 requires the latest drivers for the protection plug. If you receive the following error message when starting the program, you must install the provided Sentinel driver on your computer and, if necessary, on a license server.



#### 4 EasyShell

Settings dialog for program Repgen.

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### 5 Digital wind tunnel - EasyDWT

- Log file EasyDwt.log in Easy project folder
- Residual graph for residual p



- Option: first order discretization scheme for U (more stable but less accurate calculation)
- Resume the solver: Continue the calculation with changed parameters
- Run-out length factor: Influences the size of the area in lee side of the buildings
- Min/max refinement: Reduces cells count on surfaces

	Min:	Max:
Refinement:	2	2

- Larger transition area between refinement steps.
- Relaxation factors (can be lowered if residuals break out)

Relaxation factors	
p:	0.3
U:	0.7
k/ε/ω:	0.7

• Mean pressure: Create mean results from non-stable simulations

Mean pressure Iter: 50



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Completion of the missing triangles is optional
 Complete missing triangles

0.05

Matching tolerance between OpenFoam an Easy mesh can be set

Matching threshold:

Better integration in EasyShell: Modifies LOAD.INP and LOAD.STA

#### 6 BeamEditor

New load type: buoyancy

🗹 Buoyancy	P0:	1.000000	dP:	1.000000	1.0000
	Pkt-No:		🗌 Onl	y below	

Considers the buoyancy load depending on the height.

## 7 Program CabVol

The CabVol programme is used to connect a cable or an entire cable net with a membrane. The cable net is usually only connected to the membrane with lugs, which means that all elements of a cable receive the same force in every load case. In the case of a cable net, this naturally applies to the cable elements between the nodes.

The same cable forces are realised with the help of a rol-file; in the rol-file, a cable element with 3 points and 2 cable elements always ensures the same forces in the two sections of cable and thus, in the case of continuous rol-elements, the same force results in the entire cable.



Membrane surface with a cable and rol-elements



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#### New input parameters in CabVol:

Parameter	Setting	Description
ISS	yes	All cable and rol-elements are given the stiffness EA.
ISS	no	All cable and rol- elements retain their stiffness from the EINZ-files.
ISF	yes	All cable and rol-elements get the prestress FORCE.
ISF	no	All cable and rol- elements retain their prestress from the EINZ-files.
NU85		Point numbers for the new T-elements.
NU45		Point numbers for the new intermediate points
ITRENN	yes	The membrane surface is made 'deformable' (in a sense, separated) at the ropes to obtain realistic deformations. The presence of an angle file is important, because the angular sizes are also affected by the 'separation'.
ITRENN	no	Without separation.
I3DLIN	yes	The plane points of the EINZ-file are placed perpendicular to the surface.
I3DLIN	no	If the points of the rope net are already on the surface it is not necessary.
IPOSCAB	Attached to surface	This method is automatically applied to the programmes Statik, StatikD, Volstan and VolstaD. Only in the Beam and Beamd programmes does this parameter have an effect. Be careful when using it: the cables can also fall down if they are placed on the wrong side of the membrane.

Start Up Parameters		
Description	Кеу	Value
To cut links from EINZ-file	ICUT	
<ul> <li>Cable and roll-element status</li> </ul>	ICM	elastically
Create t-elements from boundary points	ITRAN	
Cut distance	VMAX	0.05
Set Stiffness for cable- and roll-elements	ISS	Yes
Stiffness	EA	6666
Set Prestress for cables and roll elements	ISF	Yes
No (Prestress from EINZ-file)		0
Yes		۲
Prestress	FORCE	10
Create extensions	IVERL	
Horizontal distance for extensions	SHOR	2.0
Vertical distance for extensions	DHOEHE	-3.0
More information	IPRT	
Computer zero	EPS	1.0E-08
Point number new t-elements	NU85	8500000
Point number new intermediate points	NU45	4500000
Line separates net	ITRENN	
Uplift of EINZ-points on surface	I3DLIN	
Position of Cables	IPOSCAB	attached to surface
below surface		0
1		Hide unimportant parameters

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#### 8 Program Sphere

The Sphere program generates spheres or spherical calottes purely parametrically. It is used especially for the generation of biogas domes.

Parameter	Description
IMODE	Calculation mode (full sphere or spherical calotte).
HORR	Radius of the spherical calotte (generally this is not the radius of the sphere).
HEIGHT	Height of the dome.
NRING	Number of latitude circles.
NMERI	Number of longitudinal circles (meridians).
IDOUBLE	Single or double triangles.
PINN	Operating internal pressure.
VADD	Additional volume.
РАТМ	Atmospheric pressure.
RADP	Radius of the polar ring.
MEMBRI	With or without inner membrane.

The Sphere program has the following input parameter:



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		Start Up Parameters			
Value	Кеу	Description			
Spheric	IMODE	Calculation mode			
0		- Sphere			
۲		Spherical cap (biogas)			
10.0	HORR	Radius (horizontal)			
8.0	HEIGHT	Height of the sphere			
16	NRING	Number of rings			
64	NMERI	Number of meridians			
	IDOUBLE	Double triangles			
0.25	PINN	Internal pressure			
0.0	VADD	Additional volume			
100.0	PATM	Atmosperic pressure			
0.1	RADP	Polar radius			
No	MEMBRI	<ul> <li>Inner Membrane</li> </ul>			
0.50	DELTA	Distance to outer membrane (top)			
0.50	DELTAR	Distance to outer membrane (bottom)			
0.50	PINN2	Internal pressure			
	ICON	Contact in BeamD			
0.0	RADPI	Polar radius inner membrane			
U.U		Polar radius inner membrane			
u	Hide				

The Sphere program writes the data files, as can be seen below:

File name	Description
Sphere.ein	Structure
Sphere.dre	Corresponding triangles.
Sphere.eck	corresponding polylines.
Sphere.inp	Input for the static calculation (internal pressure, volume, p*V).
Sphere.las	Internal pressure loads.



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Use	Кеу	Value File e	xtension I/O
	INI	EASY .INI	•
	OUTPUT	SPHERE .OUT	
	EINA	SPHERE .EIN	
	DREIA	SPHERE .DRE	
	ECKENA	SPHERE .ECK	
	INPUTA	SPHERE .INP	
	INPUTA		portant startup

Below you can see the result of a sphere calculation in the graphical editor GED. Above it was said that this task is to be assigned to the first method. This can now be easily checked by calculating a form finding with the external internal pressure loads. The result of this calculation corresponds exactly to the geometry Sphere.ein.



Biogas dome with internal pressure loads

Thus, the following control can be calculated. Start Fofin with Sphere.ein and Sphere.las. Fofin.ein and Sphere.ein are identical.

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### 9 EasyTailor

- Main menu changed: "Calculation Parameter..." is now in "Options"
- "Second Boundary Adjustment": Repeats the boundary adjustment after the compensation.
   In the case of large compensation and rotated strips, this option can be useful to obtain equal boundary lengths.



## 10 GED

New menu item "File/Add/Angle File..."

## 11 FormEdit

Associated Boundaries

A boundary can be assigned more than one time in the new version. This means that structures like the one shown in the picture are now possible. The middle ring is associated with the upper and lower boundary and is in force equilibrium.





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#### • Mesh generation with associated boundaries

In the previous version, the radial mesh was calculated incorrectly in the case of decentered centers of gravity. This error has been corrected (wrong on the left, correct on the right).



#### • Calculation Parameters

The parameters for the calculation programs have been extended or cleaned up. In addition, a calculation is now started after changing a parameter depending on the setting "Edit/Automatic update".

$\boxdot$ Parameters: Enclosed outer boundaries					
Parameters: Meshes					
Description Value					
Merging Tolerance 1.0E-5					
Eliminating Tolerance 1.0E-5					
Defaults					
Parameters: Combined partial nets					
Parameters: Formfinding					
Description Value					
Max. outer iterations 1					
Max. inner iterations 200					
Stop criterion 0.1					
⊞ Kind of calculation Linear					
Defaults					
Parameters: Volume Formfinding					
⊕ Parameters: Surface Elements					

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### 12 Brep2Easy

Improvements in cut calculation (mesh - boundary line).