IFC-Viewer Digital Twin - User Guide

A comprehensive guide for using the Digital Twin IFC Viewer application.

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Getting Started

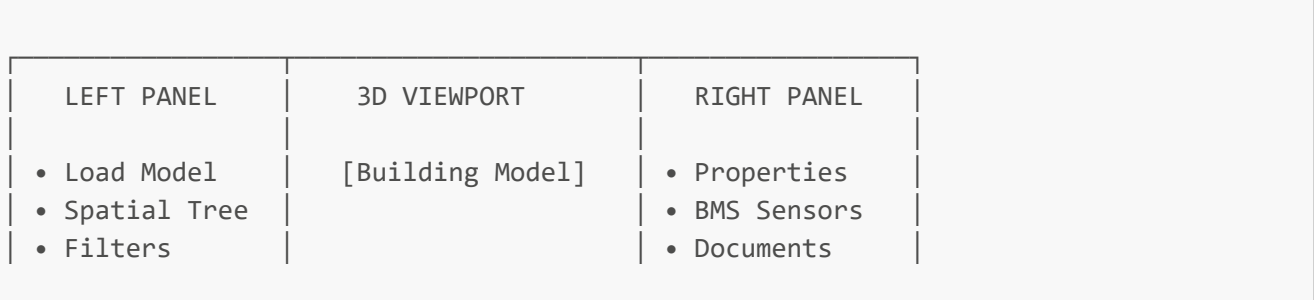
When you open the application, the **OfficeBuilding_complete_2024.ifc** model loads automatically. This is a complete office building with MEP (Mechanical, Electrical, Plumbing) systems including:

- HVAC equipment (Fan Coil Units, VRF systems)
- Ventilation (Air terminals, Exhaust valves, Axial fans)
- Heating (Trench heating convectors)
- Plumbing (Roof drains)

Wait a few seconds for the model to fully load. You'll see the 3D building appear in the central viewport.

Interface Overview

The interface has three main areas:



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| • Systems       |                        |                  |
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                          [Floating Toolbar]
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- **Left Panel**: Model loading, spatial navigation, filters, MEP systems
- **3D Viewport**: Interactive 3D view of the building
- **Right Panel**: Properties, sensor data, and documents for selected elements
- **Floating Toolbar**: Navigation, measurement, clipping, and visibility tools

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Navigation Controls

Mouse Controls

Action	Control
Rotate	Left-click + drag
Pan	Right-click + drag (or Middle-click + drag)
Zoom	Scroll wheel

Camera Modes (Floating Toolbar → Navigation)

1. **Orbit Mode** (default)
    - Click the **Orbit** button
    - Rotate around the model freely
    - Best for general exploration
2. **First Person Mode**
    - Click the **First Person** button
    - Use WASD keys to move through the building
    - Mouse to look around
    - Great for interior walkthroughs
3. **Plan Mode**
    - Click the **Plan** button
    - Top-down orthographic view
    - Ideal for floor plan navigation

Try It: Exploring the Building

1. Use the scroll wheel to **zoom out** and see the whole building
2. Hold **left-click and drag** to rotate and view from different angles
3. Click **First Person** in the toolbar, then use **W/A/S/D** to walk inside

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Selecting Elements

Click on any element in the 3D view to select it. Selected elements are highlighted in blue.

Try It: Select Equipment

1. Zoom into the building's interior
2. Look for ceiling-mounted equipment (fan coil units appear as rectangular boxes)
3. **Click on a fan coil unit** to select it
4. Notice the highlight and the right panel updating

Multi-Selection

- Elements in the same group can be selected together through the Systems tree

Hover Preview

- Move your mouse over elements to see a **hover highlight** (semi-transparent blue glow)
- This helps identify elements before clicking

Viewing Properties

When you select an element, the **Properties** panel (right side) displays:

- **Name**: Element name from the IFC file
- **GlobalId (GUID)**: Unique identifier
- **IFC Type**: Category (e.g., IFCUNITARYEQUIPMENT, IFCDUCTSEGMENT)
- **Custom Properties**: Manufacturer data, dimensions, etc.

Try It: View Fan Coil Properties

1. Select a **ceiling fan coil unit** (rectangular equipment on the ceiling)
2. In the Properties panel, you'll see:
    - Name: "Kapmann_FanCoil_Ceiling: 1250x495_TopConnection (FCU-01)"
    - Type: IFCUNITARYEQUIPMENT
    - Various property sets with technical specifications

BMS Sensor Data

The Building Management System (BMS) panel shows **real-time sensor data** for monitored equipment.

Sensor Types Available

Icon	Sensor Type	Unit
🌡	Temperature	°C
💧	Humidity	%
👥	Occupancy	people

Icon	Sensor Type	Unit
	CO2	ppm
	Energy	kWh
	Lighting	%
	Airflow	m^3/h
	Pressure	kPa

Status Indicators

- **Green** = Normal operation
- **Yellow/Orange** = Warning (approaching threshold)
- **Red** = Alarm (threshold exceeded)

Try It: View Sensor Data for Equipment

Example 1: Fan Coil Unit (FCU-01)

1. Find and select a ceiling fan coil unit
2. The BMS panel shows:
    - Temperature sensor (current room/supply temp)
    - Airflow sensor (m^3/h)
    - Energy consumption (kWh)
3. Watch values update every 5 seconds (simulated)

Example 2: VRF Outdoor Unit

1. Look for the large outdoor unit (usually on roof or exterior)
2. Select the **Clivet VRF** equipment
3. View sensors:
    - Temperature
    - Energy consumption
    - Pressure readings

Example 3: Trench Heating

1. Find the floor-level heating equipment
2. Select the **Kampmann HK320** trench heater
3. View temperature and energy data

Viewing Historical Charts

1. Select monitored equipment
2. Click on a **sensor card** in the BMS panel
3. A chart appears showing the last 24 hours of readings
4. The chart shows time-based patterns (values vary throughout the day)

Equipment Documents

Documents linked to IFC elements are displayed in the **Documents** panel.

Document Types

- **Specifications** - Technical data sheets
- **Manuals** - Operation and installation guides
- **Reports** - Inspection and maintenance reports
- **Certificates** - Compliance certificates
- **Maintenance** - Service records

Try It: View Equipment Specifications

Example 1: Fan Coil Specification

1. Select any **fan coil unit** (FCU-01 through FCU-06)
2. In the Documents panel, you'll see:
    - "Kampmann Fan Coil Specifikacija"
3. Click **View** to open the PDF in a modal
4. Click **Download** to save locally

Example 2: VRF System Documentation

1. Select the **Clivet VRF outdoor unit**
2. View the "Clivet MV6i-500 Specifikacija" document

Example 3: Trench Heating

1. Select the **Kampmann HK320** trench heater
2. View the "Kampmann HK320 Specifikacija" PDF

Uploading New Documents

1. Select an element
2. In the Documents panel, click **Upload Document**
3. Fill in:
    - Display name
    - Document type (Manual, Specification, etc.)
    - Created date
    - Description (optional)
4. Choose a file (PDF, images, etc.)
5. Click **Upload**

Measurement Tools

Access measurement tools from the **Floating Toolbar** → **Measurement** section.

Length Measurement

1. Click the **Length** button (📏)
2. Click a **starting point** on the model
3. Click an **ending point**
4. The distance appears as a dimension line
5. Continue adding measurements as needed
6. Click **Clear** to remove all measurements

Area Measurement

1. Click the **Area** button
2. Click points to define a polygon
3. The area is calculated and displayed
4. Click **Clear** to remove

Try It: Measure a Room

1. Enable **Length** measurement
2. Click on one corner of a room
3. Click on the opposite corner
4. The distance is shown in meters
5. Use multiple measurements to get room dimensions

Clipping & Sectioning

Create section cuts to see inside the building.

Creating a Clipping Plane

1. Click **Create Plane** in the Clipping toolbar section
2. Click on a surface to place the clipping plane
3. The model is cut at that location
4. Drag the plane handle to adjust position

Managing Clipping Planes

- **Toggle Visibility**: Click the eye icon to show/hide a plane
- **Delete Plane**: Click the delete button to remove a plane
- **Delete All**: Remove all clipping planes at once

Try It: Section Through a Floor

1. Click **Create Plane**
2. Click on a floor slab
3. The building is sectioned horizontally
4. Drag the plane to move the section cut up/down
5. This reveals the MEP systems inside

Visibility Controls

Control element visibility from the **Floating Toolbar** → **Visibility** section.

Ghost Mode

1. Select elements you want to focus on
2. Click **Ghost** button
3. Non-selected elements become semi-transparent
4. Click again to disable ghosting

Isolate

1. Select elements
2. Click **Isolate**
3. Only selected elements are visible
4. Everything else is hidden

Hide

1. Select elements
2. Click **Hide**
3. Selected elements become invisible

Show All

- Click **Show All** to restore visibility of all elements

Try It: Isolate MEP Systems

1. Go to the **Systems** panel (left side)
2. Select all fan coil units from the tree
3. Click **Isolate**
4. Only the fan coils are visible
5. Click **Show All** to restore

2D Views

Generate floor plans and elevations from the model.

Floor Plans

1. Click **Floor Plans** in the 2D Views toolbar section
2. Select a floor level from the dropdown
3. The view switches to a 2D plan view
4. Navigate as usual (pan, zoom)
5. Click **Exit 2D** to return to 3D

Elevations

1. Click **Elevations**

2. Select a direction (North, South, East, West)
3. View the building elevation
4. Click **Exit 2D** to return

Saved Views

1. Position the camera as desired
2. Click **Save View**
3. Access saved views from the dropdown
4. Click a saved view to restore that camera position

Filtering Elements

Use the **Filter Panel** (left side) to find specific elements.

Filter by Category

1. Open the Filter panel
2. Select a category filter (e.g., "IFCDUCTSEGMENT")
3. Click **Apply Filter**
4. Only matching elements are selected/highlighted

Filter by Attribute

1. Choose "Attribute" filter type
2. Select an attribute (e.g., "Name")
3. Choose an operator:
    - **Contains**: Partial match
    - **Equals**: Exact match
    - **Regex**: Regular expression
4. Enter a value (e.g., "Kampmann")
5. Click **Apply**

Filter Modes

- **Inclusive (OR)**: Any condition matches
- **Exclusive (AND)**: All conditions must match

Try It: Find All Kampmann Equipment

1. Add an Attribute filter
2. Set: Name → Contains → "Kampmann"
3. Apply the filter
4. All Kampmann equipment is selected

Systems Tree

The **Systems** panel (left side) shows MEP equipment grouped by system type.

Navigating Systems

1. Expand the "Systems" tree
2. Equipment is grouped by type:
    - Fan Coil Units
    - Air Terminals
    - Exhaust Valves
    - VRF Equipment
    - Etc.
3. Click on items to select them in the 3D view

Try It: Select All Fan Coils

1. Open the Systems tree
2. Find the "Fan Coil" group
3. Click on the group header to select all
4. All fan coil units highlight in the 3D view

Loading Your Own Models

Load IFC File

1. In the left panel, click **Load IFC**
2. Select an .ifc file from your computer
3. Wait for processing (may take time for large files)
4. The model appears in the viewport

Load Fragment File

For faster loading of previously processed models:

1. Click **Load Fragment**
2. Select a .frag file
3. The model loads immediately

Tips for Large Models

- Fragment files load faster than IFC
- Close other applications for better performance
- Use clipping planes to reduce visible geometry

Keyboard Shortcuts

Key	Action
W/A/S/D	Move (First Person mode)
Scroll	Zoom in/out

Key	Action
Escape	Deselect / Exit current tool

Equipment Reference: Sample Model

The default **OfficeBuilding_complete_2024.ifc** includes these monitored elements:

HVAC Equipment

Element	GUID	Sensors	Documents
Kampmann HK320 Trench Heater	2Z6LRLJyP8pPa$Guk37Xtu	Temperature, Energy	Specification PDF
Clivet VRF Outdoor Unit	2Z6LRLJyP8pPa$Guk37Xt0	Temperature, Energy, Pressure	Specification PDF
Fan Coil FCU-01	2Z6LRLJyP8pPa$Guk37Xt1	Temperature, Airflow, Energy	Specification PDF
Fan Coil FCU-02	2Z6LRLJyP8pPa$Guk37Xt2	Temperature, Airflow, Energy	Specification PDF
Fan Coil FCU-03	2Z6LRLJyP8pPa$Guk37Xt3	Temperature, Airflow, Energy	Specification PDF
Fan Coil FCU-04	2Z6LRLJyP8pPa$Guk37XmN	Temperature, Airflow, Energy	Specification PDF
Fan Coil FCU-05	2Z6LRLJyP8pPa$Guk37XmO	Temperature, Airflow, Energy	Specification PDF
Fan Coil FCU-06	2Z6LRLJyP8pPa$Guk37Xpb	Temperature, Airflow, Energy	Specification PDF

Ventilation

Element	GUID	Sensors	Documents
Exhaust Valve EXH-01	2Z6LRLJyP8pPa$Guk37Xp4	Airflow	NW 100 Spec
Exhaust Valve EXH-02	2Z6LRLJyP8pPa$Guk37XCp	Airflow	NW 100 Spec
Exhaust Valve EXH-03	2Z6LRLJyP8pPa$Guk37XCC	Airflow	NW 100 Spec
Exhaust Valve EXH-04	2Z6LRLJyP8pPa$Guk37XCD	Airflow	NW 100 Spec
Supply Terminal SUP-01	2Z6LRLJyP8pPa$Guk37Xp5	Airflow, Temperature	Klimaoprema OAH1 Spec
Supply Terminal SUP-02	2Z6LRLJyP8pPa$Guk37XDs	Airflow, Temperature	Klimaoprema OAH1 Spec

Element	GUID	Sensors	Documents
Axial Fan FAN-01	2Z6LRLJyP8pPa$Guk37Xp6	Airflow, Energy	—
Axial Fan FAN-02	2Z6LRLJyP8pPa$Guk37XDv	Airflow, Energy	—

Plumbing

Element	GUID	Sensors	Documents
Roof Drain RD-01	2Z6LRLJyP8pPa$Guk37XCX	Pressure	Geberit Pluvia 125 Spec
Roof Drain RD-02	2Z6LRLJyP8pPa$Guk37XCZ	Pressure	Geberit Pluvia 125 Spec
Roof Drain RD-03	2Z6LRLJyP8pPa$Guk37XCa	Pressure	Geberit Pluvia 125 Spec

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Troubleshooting

Model Not Loading

- Wait up to 30 seconds for large models
- Check browser console for errors (F12)
- Try refreshing the page

Slow Performance

- Use clipping planes to reduce visible geometry
- Hide non-essential elements
- Close other browser tabs

Sensors Not Showing

- Only pre-configured equipment has BMS data
- Check the Equipment Reference table above
- Custom-uploaded models won't have sensor data by default

Documents Not Found

- Documents are stored in browser IndexedDB
- Clearing browser data removes uploaded documents
- Pre-configured documents load automatically on first use

Tips & Best Practices

1. **Use Systems Tree** for quick access to MEP equipment
2. **Ghost Mode** helps focus on selected equipment while keeping context
3. **Create Clipping Planes** to see equipment inside walls/ceilings
4. **First Person Mode** is great for client presentations
5. **Save Views** for commonly accessed camera positions
6. **Check Sensor History** to understand equipment behavior over time

This guide is for the IFC-Viewer Digital Twin Application v1.0.0