Expand your perspectives!

Discover the leading camera system
for machine interiors.

Insights in sight.

At Rotoclear, we've made it our business to overcome the limits of the senses. Our products create clear insights into your machining processes where you would otherwise be unable to see through liquids or particles.

$\longrightarrow$ Clear insights for continuous improvement

Whether it's self-cleaning spinning windows or high-tech cameras: Rotoclear's optical solutions accelerate start-up, help prevent collisions and enable you to continuously optimize processes.
This is because the newly acquired visual information provides the basis for valuable insights for making your processes safer, more reliable and more efficient.

In this brochure, you will learn how the Rotoclear C2, the leading camera system for machine interiors helps to optimize your processes.

You will also get important information on how to configure and install the product – as well as information on the appropriate accessories.

What is the Rotoclear C2?

The Rotoclear C2 is the world's leading camera system for machine interiors.

⟶ 4K views from revolutionary perspectives

Whether you're looking for a clear view from the perspective of the tool or an overview of the machine interior, self-cleaning Rotoclear C2 cameras create 4K views from revolutionary perspectives – even under the harshest conditions. The intelligent control unit enables not only intuitive control with zoom feature, but also the evaluation of saved videos and photos.

⟶ The hardware and software behind it all

With HDMI, USB and Ethernet connections as well as TCP/IP and RTSP protocols, the control unit provides all the interfaces for necessary to stream, save and share image data with ease. The clever software also forms the basis for intuitive camera control.

⟶ What the Rotoclear C2 offers you

Our camera system provides users with new information for optimizing your machining processes. You can also easily share this valuable image information with others. The Rotoclear C2 also forms the essential basis for automated image analysis.

All the benefits
at a glance

The Rotoclear C2 provides more than just clear insights into all machining processes. We have summarized the key benefits for you.

⟶ ### Brand new visual
information

The revolutionary perspectives of the Rotoclear C2 provide users with brand-new insights into the machining processes of their machine tools.
This visual information provides a foundation on which to better understand, monitor and optimize processes.

⟶ ### Production process
communication

Transparency creates trust: share image data with customers, partners and experts with ease in order to create transparency and communicate the special features of each production process.

⟶ ### Basis for continuous
improvement

Optimization requires knowledge: if you want to make your machining processes more reliable and efficient, you first need to identify the potential for optimization.
The essential basis for this? Detailed visual information about the machining process – from multiple perspectives.

⟶ ### Increased flexibility

Digitizing image data offers another key benefit: you no longer have to be on-site to obtain clear insights into the production process.
The option to monitor and analyse processes remotely simplifies organisation, provides employees with more freedom and ensures maximum flexibility.

⟶ ### Greater future security

The prerequisite for more automation? Automated image analysis of production processes.
With its high-resolution images and both simple and flexible integration into all IT environments, our camera system offers the best basis for this.

The hardware features
of the Rotoclear C2

Always a clear view

The high-speed spinning window in front of the camera lens always ensures a clear view of all machining processes, even in the presence of coolant and flying chips. For perfect lighting conditions, we have also installed premium Waldmann lighting in our camera heads specially developed for this application.

High-resolution images

The camera head provides a live stream resolution of up to 4K with 60 frames per second. But the images can also be scaled down to lower resolutions and refresh rates such as HD and FullHD. In both cases, you still have crystal-clear images, even in zoom mode. Recording is possible in FullHD and HD.

Selection of connection options

Whether HDMI, USB or Ethernet cable, our control units offer all the conventional connection options for fast and reliable transmission of image data – and integration of the system into the in-house network.

Flexible installation options

Whether you want to place the cameras in front of the wall, in the wall or on the ceiling: with numerous options for quick and easy installation, we offer all the options for an individually optimized camera setup.

Tool, top or side view

The Rotoclear C2 cameras can be mounted at the top (top view), on the side (side view) of the working space or directly on the motor spindle (tool view). For clear views from revolutionary perspectives.

Alignment sensor for mobile installation

Currently, only the Rotoclear C2 offers you images directly from the perspective of the cutting tool. To enable this revolutionary perspective, we installed an alignment sensor. It detects the movement of the camera head and can compensate for it.
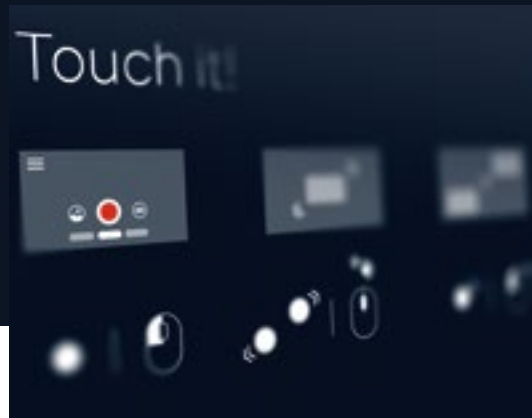
Extremely compact camera head

The camera head of the Rotoclear C2 impresses with its small dimensions. This not only allows the camera to be installed in many more places inside the machine, it's compact design also results in significantly fewer chip nests.

The software features
of the Rotoclear C2

Intuitive control

The Rotoclear C2 impresses with its simple user interface. The control is completely intuitive and also works via gestures on touchscreens. For example, you can easily enlarge and move part of an image directly on the screen by swipe zoom, and thus observe machining details at any time.


Double perspective

Observe the process from two perspectives at the same time? No problem. If two camera heads are connected to the control unit, machining can be observed simultaneously from above and from the perspective of the tool, for example.

Remote insights

Wherever you are in the world, whatever client you are using: the simple transmission allows you to view your image data remotely and flexibly at any time. The Rotoclear C2 not only enables remote analysis – it also makes process monitoring more flexible.
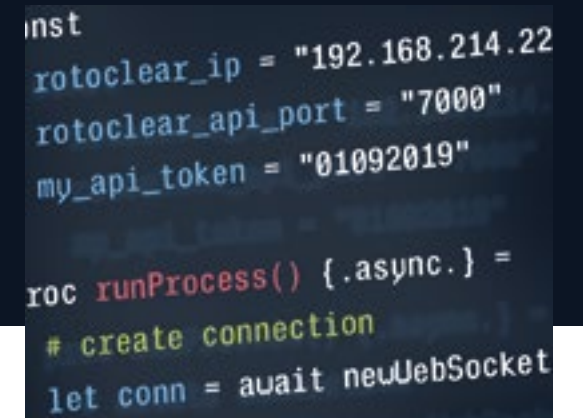

API interfaces

Do you want to implement new camera functions tailored specifically to your machine? No problem. Our API interfaces provide all the options you need to do this.
For example, you can control the camera directly from your software application or automatically integrate image information into your program workflows.


Streaming & recording

The digital image data can be streamed live via HDMI, TCP/IP or RTSP and can also be recorded in HD and FullHD at any time, making them ideal for process optimization as well as for sales and marketing purposes.
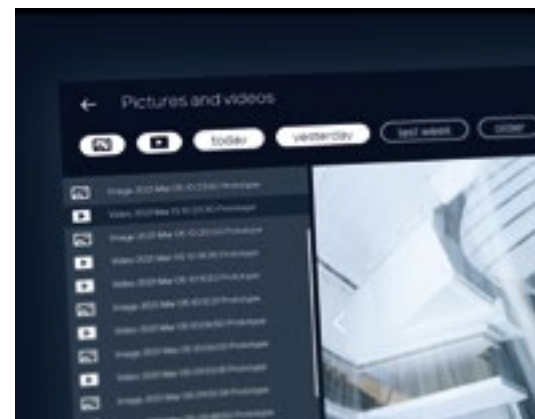
Media gallery

You can easily manage saved recordings using the media gallery. Besides a file list of all photos and videos, a preview function, delete functions and meta information, the gallery gives you the option of filtering image and video files by date.
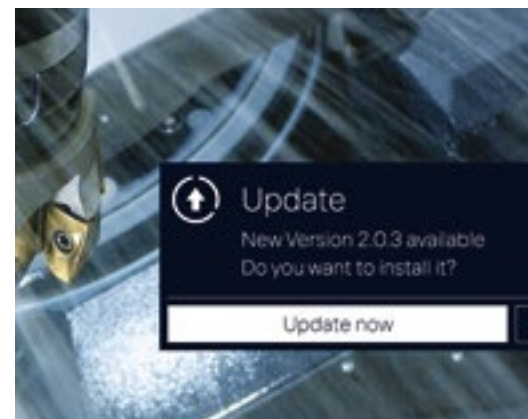
Software updates

In the spirit of continuous improvement, the software of the Rotoclear C2 is always under continuous development. We provide the updates to our customers as downloads or online updates. So you always stay up to date!

Outlook on the options

With its hardware and software features, the Rotoclear C2 already offers many options for observing and optimizing machining processes.

In addition, the camera system is also the essential basis for implementing further valuable functions in the context of automation and process optimization in the future. This is because the C2 platform can supply other intelligent systems with visual information via the API interface. Here are some examples of what the Rotoclear C2 could make possible in the future.

⟶ ## Chip nest detection

Chip nests can easily impair machining processes. In combination with an intelligent system behind it, the Rotoclear C2 could in the future automatically detect chip nests, inform users immediately through information on the screen or even directly initiate cleaning cycles.

⟶ ## Tool check

Every tool has a limited service life. Together with an AI in the background, the Rotoclear C2 could in the future detect the condition of the tool – and indicate in good time when a tool replacement is due.

⟶ ## Automated, event-based recording

With additional sensors, unusual events in the machine tool could be detected automatically – and a recording of these events could be triggered fully automatically. A feature like this would of course be particularly exciting when it comes to analyzing the causes of crashes.

⟶ ## Simulation comparison

Machining processes are often simulated to prevent crashes. But this simulation only helps if it really reflects the machining process in reality. In combination with automated image evaluation, the Rotoclear C2 could enable fully automatic simulation comparison in the future – and thus significantly help to optimize machining processes even further.

And what are your ideas?

The use cases mentioned here are just a few examples of what the Rotoclear C2 will make possible in the future. Think about it: What functions could the camera system perform in the context of your machine in the future? What would take you further?

We are already looking forward to your ideas. Write to us or give us a call. We are always happy to hear from you.

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info@rotoclear.com

Two-time award winner!

In 2020, our camera system won two Red Dot design awards in one fell swoop: The Rotoclear C2 not only convinced the jury in terms of product design, but also won the prize in the "Innovative Product" category.

Discover the Rotoclear C2 online
online ⟶ rotoclear.com/en/C2

reddot winner 2020
product design

reddot winner 2020
innovative product

Configuration of the optimal perspective

Whether from the machine ceiling downwards, from the side or very close up from the perspective of the tool itself: The Rotoclear C2 enables a whole range of revolutionary perspectives. You decide which ones make the most sense for your machine.
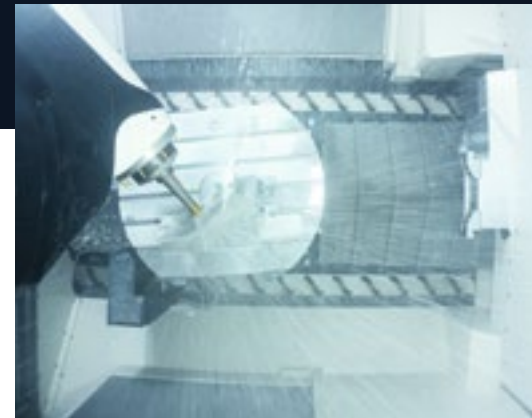
Tool View

Observe the machining process up close? The Rotoclear C2 is the only camera system in the world that allows the installation of a camera head directly on the tool spindle.

→ The benefits

This perspective allows the user to always keep a close eye on the tool – and thus gain uniquely detailed insights into the machining process.

→ Our tip

The integration of this camera perspective should be considered when configuring the machine. If you are interested, contact your machine manufacturer about the Tool View option.

Top View

The perspective from the machine ceiling downwards with the entire machine room in view is the perfect complement to the Tool View perspective.

→ The benefits

Top View enables the user to stay oriented, as reference points and automation components remain in view in addition to the overall process.

→ Our tip

If you consistently align the camera on an X, Y or Z axis, orientation becomes even easier for users.

Side View

The Side View of the machining processes can be useful in various cases: On the one hand, users can always keep an eye on the tool change. On the other hand, the side view is also a good alternative if Tool View installation is not possible.

→ The benefits

The view from the side enables detailed imaging without losing sight of the immediate surroundings (such as the tool changer).

→ Our tip

If you retrofit the Rotoclear C2 in your machine, the Side View perspective is also the perfect alternative to be as close as possible to the machining process from the outside.

→ Single vs. dual package

You decide to what extent you need two of these perspectives at the same time: When configuring your C2 setup, you can in fact choose between one and two camera heads (see also page 23).

Selection of focus and data cable

As a modular system, the Rotoclear C2 allows you to determine the optimal perspective as well as select the right focus and the perfect length of your data cable.

The right focus

To protect the camera as best as possible from the harsh conditions inside the machine, we have encapsulated the camera head. This requires a preset focus. When configuring your setup, you can choose between camera heads with different focal ranges, depending on application.

⟶   Focus at close range

The F1 lens has a focus range of 200 to 500 mm and is therefore used wherever the camera is close to the action, e.g. in the case of the Tool View perspective.

⟶   Focus at far range

The focus range of the F2 lens is 500 to 3,000 mm. It is used when the camera needs to have a larger area in view, e.g. in the case of the Top View perspective.

⟶   Two lenses for close and far range

You can also equip your camera head with two different lenses (and thus two focus ranges). This means that you always remain flexible with regard to the location and perspective of your camera head.

The right data cable

Our data cables ensure data transmission that is as fast as it is reliable. They are resistant to cooling lubricants, suitable for drag chains and specially designed for the harsh conditions in the machine tool.
Since we don't know your exact machine setup, you can choose between two different lengths of data cables at Rotoclear:

⟶   10 m (standard)

⟶   20 m

⟶   Individual focus or focal length desired?

You have your own requirements regarding the focus range of the camera head?
No problem. Just get in touch with us. We will also adjust the focus according to your individual wishes.
Whether telephoto or fish eye: If required, we will also be happy to find a lens with an individual focal length for you and install it in your camera head.

⟶   Configure your C2 kit online.

With our online configurator, you can quickly and easily put together your optimal C2 kit. You will be guided step by step through the various selection options.

Try it out now.

rotoclear.com/en/C2-configurator

Integration of the control unit

The Rotoclear C2 control unit has a power supply connection, two interfaces for the camera head, an HDMI port, four USB ports and an Ethernet interface.

→ ## Mounting the control unit

The control unit is typically installed in a control cabinet, For top-hat rail mounting, you can use the pre-mounted top-hat rail clip.

→ ## Integration in individual control systems

In many cases, the user interface of the Rotoclear C2 can also be integrated directly into your own machine control system – as is currently already the case at DMG MORI, for example.
The system can also be connected to other systems or software applications via the integrated API.

→ ## Connection with an Ethernet network

The system can be connected to a network or connected directly to the computer via a direct Ethernet connection.

Network option

Direct connection option
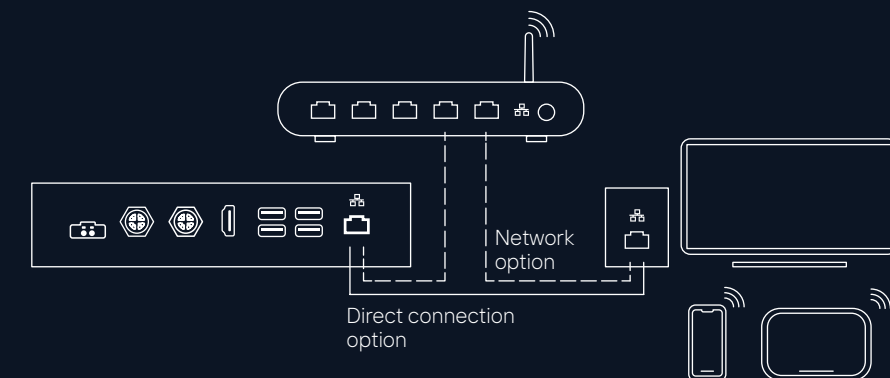
→ ## Connection with HDMI

In addition, the system also works independently. In this case, a monitor or touch display is connected directly to the control unit via an HDMI cable.

Touch option

Mouse option
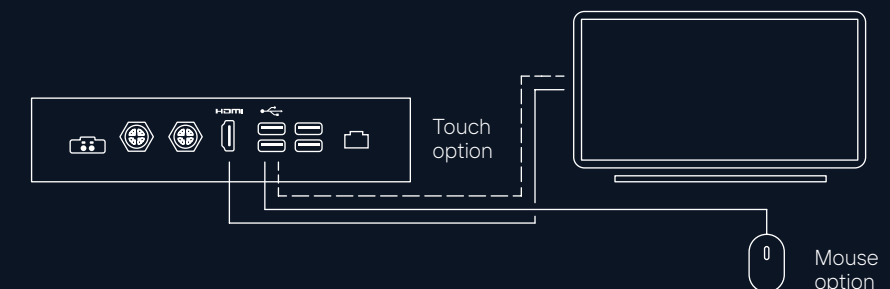
→ **More Details about installation and integration?**

Details on installation and setup, as well as many other valuable tips, can be found in the Rotoclear C2 operating manual.

Download now.

rotoclear.com/en/C2-downloads

All technical data at a glance

Whether installation dimensions, connection media or scope of delivery: This is where you will find all technical data for the Rotoclear C2. In addition, if you have any questions about dimensions and details, please feel free to contact us at any time.
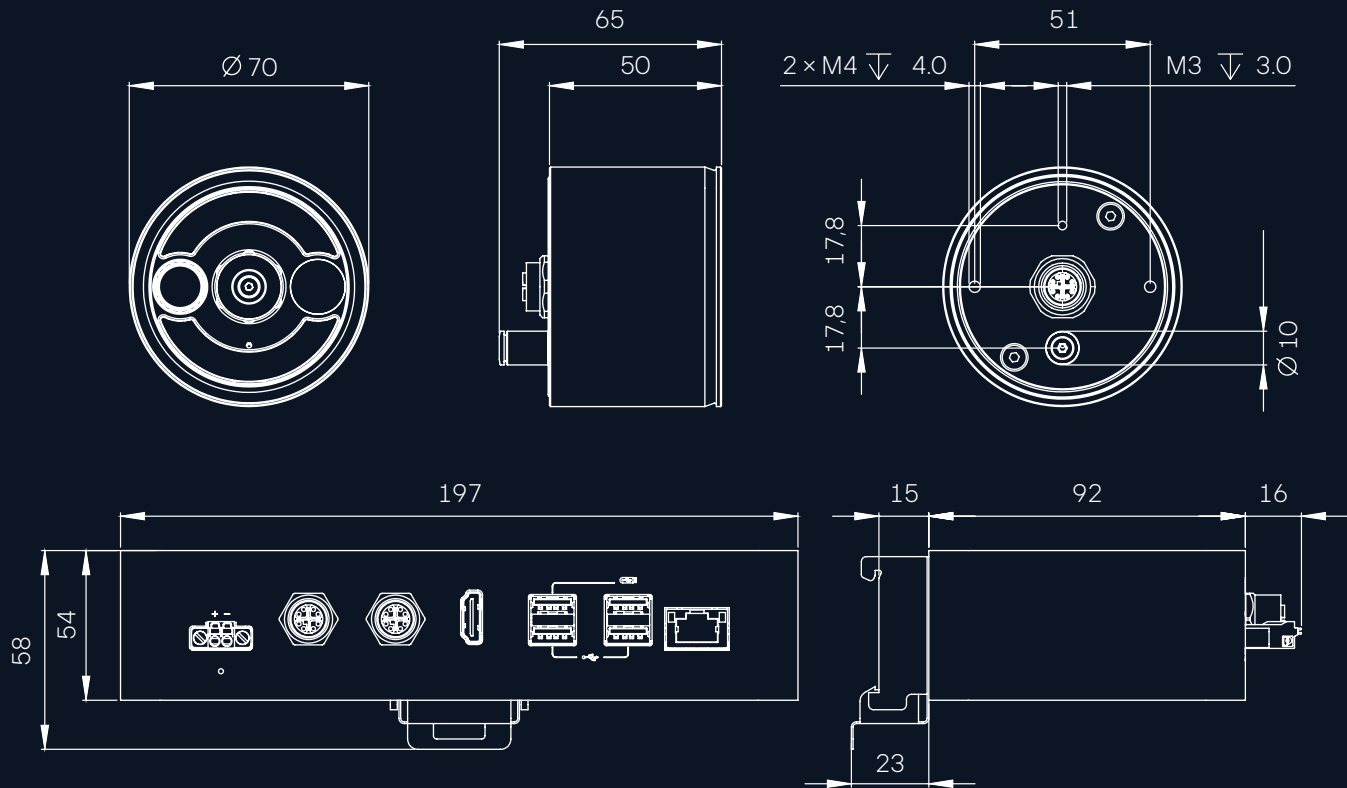
⟶ CAD data?

Do you need CAD data to include the Rotoclear C2 in your design?
Just write to us. We will be happy to send you access to the relevant data on request.

⟶ Connection media

The Rotoclear C2 requires power and sealing air for operation.
Power   24 VDC
Sealing air   1,150 – 1,400 mbar (absolute)

⟶ Scope of delivery

Depending on whether you want one or two perspectives on your machining processes, we offer two packages: The single package includes one camera head with matching accessories. The dual package includes two camera heads plus accessories.

	Single	Dual
Camera head	1 ×	2 ×
Sealing air line	1 ×	2 ×
Plug connector for sealing air	1 ×	2 ×
Data cable	1 ×	2 ×
Sealing ring	1 ×	2 ×
Covering cap	1 ×	2 ×
Control unit	1 ×	1 ×
Top-hat rail clip	1 ×	1 ×
PCB plug connector	1 ×	1 ×
Suction cup	1 ×	1 ×
Power cable	1 ×	1 ×

⟶ Installation dimensions

⌀ 70   65   50   51   2 × M4 ⤓ 4.0   M3 ⤓ 3.0   17,8   17,8   17,8   ⌀ 10
197   15   92   16   58   54   23

Illustration 1:1

Always a clear view due to fast rotating window.

Compact housing withstands the toughest conditions.

Premium lighting for optimal image quality.

Smart installation options.

ROTO CLEAR

The ball mount

The ball mount is the most elegant installation option for your camera heads: The camera is installed inside the sheet metal wall and is thus discreetly integrated into the interior of the machine.

⟶   Installation of the ball mount

With the help of the supplied installation adapter, the ball mount can be easily inserted at the desired location in the sheet metal wall or ceiling. The intelligent fastening system allows you to carry out the complete assembly from the machine's working space.
The data cable and the hose for sealing air are routed through the ball mount to the outside and thus run completely outside the working space.

⟶   Benefits of the ball mount

The camera head can be swiveled ±20° and rotated 360° in the ball mount. Since in the ball mount it only protrudes minimally into the working space, hardly any chip nests occur here.
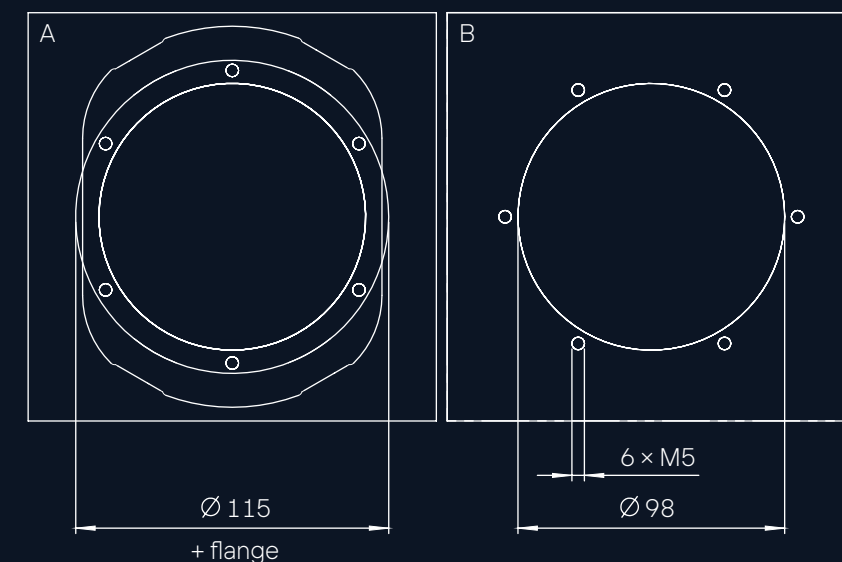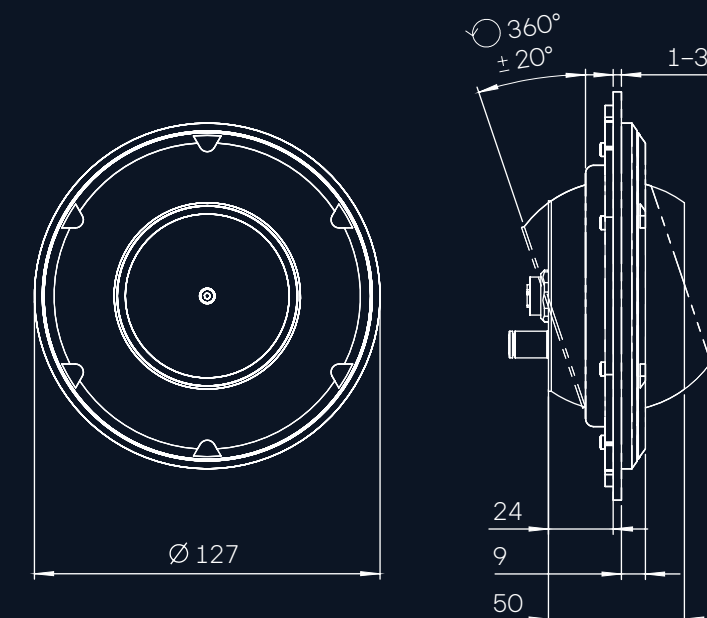
The flex arm mount

In the case of the flex arm mount, the camera head is installed on a ball joint arm at the front so that it extends further into the space. The flex arm can be built into the sheet metal wall, mounted in front of the wall or simply and flexibly held in place by a magnet.
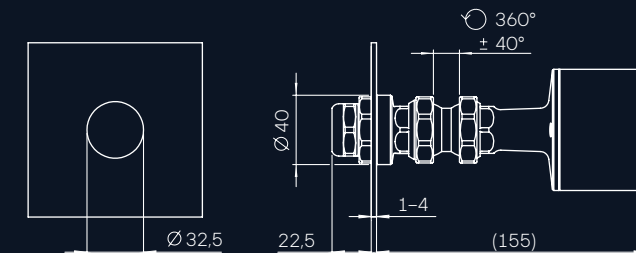
⟶ ## Benefits of the flex arm mount

Since the flex arm can be swiveled ±20° at each of its joints and rotated 360°, it makes it even easier for you to set the optimal perspective of the camera head. In addition, the arm ensures that the distance to the process being observed is reduced.

Our tip: Additional flex joints in the arm can make positioning even more flexible and bring the camera head even closer to the machining process.

⟶ ### Through-wall mounting

For sheet metal installation, first a hole is drilled in the sheet metal wall and then the flex arm mount is screwed directly to the wall. This allows you to route the data cable and the sealing air hose through the sheet metal wall to the outside: This means that both run completely outside the working space.

⟶ ### Pre-wall mounting

In the case of pre-wall mounting, the flex arm mount is seated on a foot that is screwed into place in front of the wall on the inside of the machine. Here, the data cable and sealing air hose initially run inside the working space. An optional protective hose can enclose them up to the wall penetration.
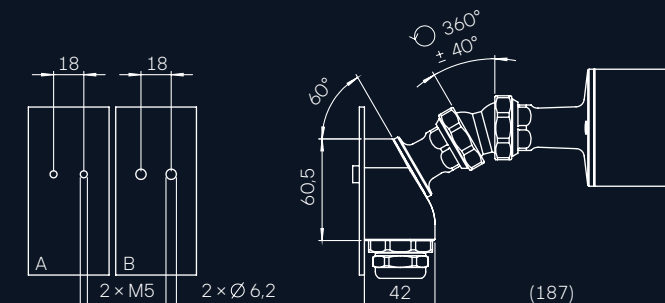
⟶ ### Magnetic mounting

The magnetic flex arm mount is perfect for temporary installation or for finding the perfect position of the camera head in the interior. Here, the camera head is simply attached to any position on the sheet metal wall with the help of a strong magnet.
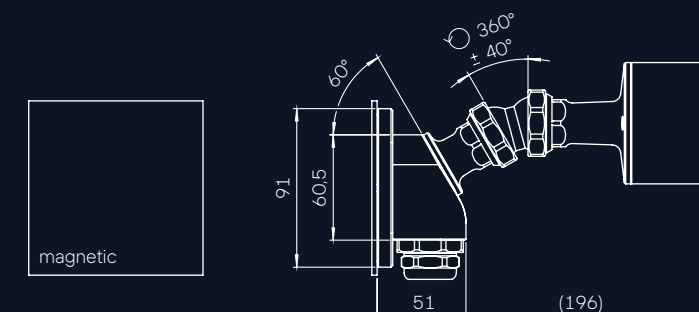
Mounting directly on the spindle head

Mounting directly on the spindle allows all processes to be observed from the perspective of the tool (Tool View). Only the Rotoclear C2 offers you this revolutionary perspective.

→ ## Benefits of spindle mounting

Mounting on the spindle allows you to observe the machining processes at close range: the tool always remains in full view. This means that you will not miss a single detail of the machining process.

→ ## Installation

The space-saving and robust design of the camera head allows it to be mounted directly on the headstock in many machine solutions. Ideally, the machine manufacturer should plan for this integration when designing the machine.
Therefore, if you are interested, please contact your machine manufacturer directly. We will be happy to provide support for integration at any time.

50° horizontal
(96° vertical)
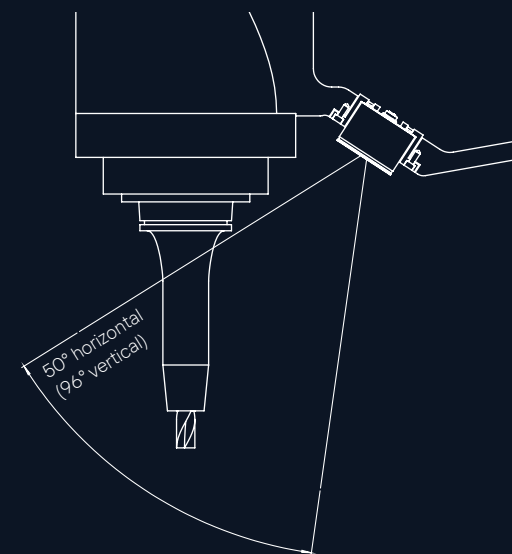
→ ### Individual mounting options

Of course, you can also attach the camera head to an individually developed mounting beyond the options presented here. Simply use the holes on the back of the camera head for this.

Questions? Just get in touch with us.

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