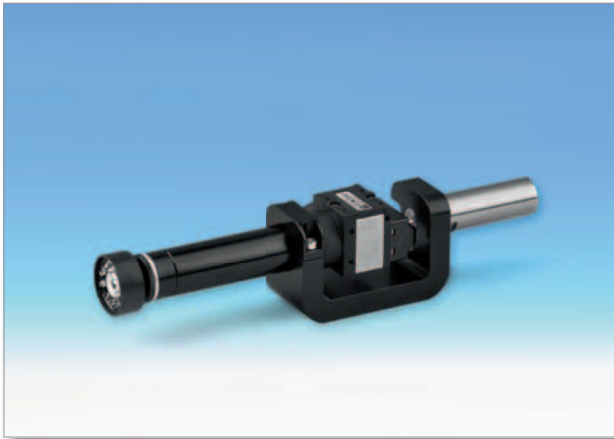


# M

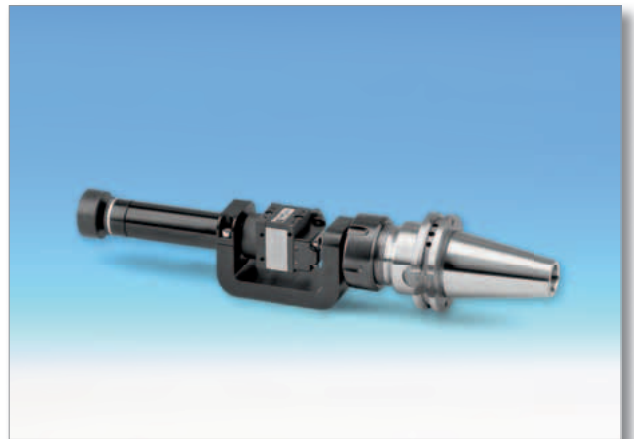
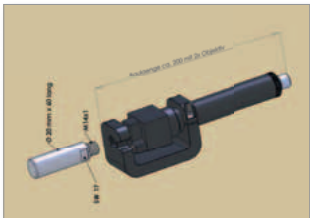
## Machine microscope CV-VZM-USB and CV-VZM-Z-USB



In order to measure XY distances within the workspace of modern CNC processing machines, sinker and wire EDM machines, rotation centres, etc., the small, easy-to-handle USB camera system is the ideal solution. Examine and measure intricate details without having to wire components - particularly useful in limit ranges. The USB 2.0 camera with 1600 x 1200 pixels offers excellent image quality. The 2x lens (for further magnification, see matrix) has a working distance of approx. 35 mm. The viewing field spans approx. 3 mm horizontally

and enables optical magnification of approx. 70x on a 24" screen.

The viewing fields and magnification or working distances can be adjusted using a range of tubes and lenses. The aluminium support (anodized) is equipped with a 20 mm diameter precision shaft (custom-made devices available if requested). We recommend the use of mounts with collect chucks.



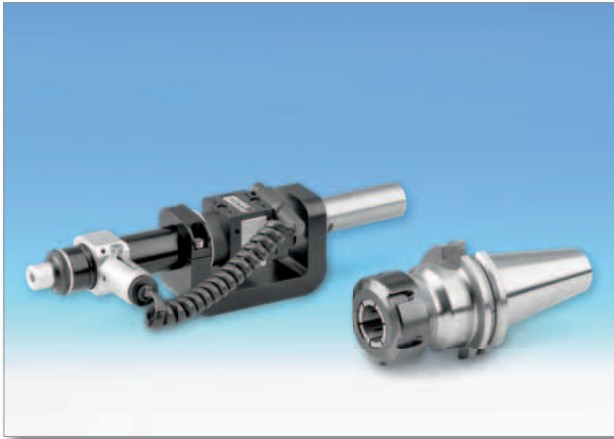
Since January 2011 we offer the VZM in an additional variant, i.e. as a video centring microscope. In this model, the camera as well as the lens is adjusted on the centre of the mounting shaft. This ensures that the optical centre stays in the middle when the video microscope is rotated (CV-VZM-Z-USB). In this model it is not possible to change the magnification. The desired magnification must be indicated when ordering.



The camera system can be used as basic version in connection with the Metric BE (localiser crosshair display only). Distance measurements can now be carried out using the machine's measuring systems. In combination with the Metric Standard or Metric Plus software, measurements such as distance, angle, radius and surface area are also possible within the viewing field. Connection to Excel also ensures quick and easy logging of images and measuring values. Functions, such as the DXF overlay module, facilitate controlling the device. As a practical example, here are two images of a

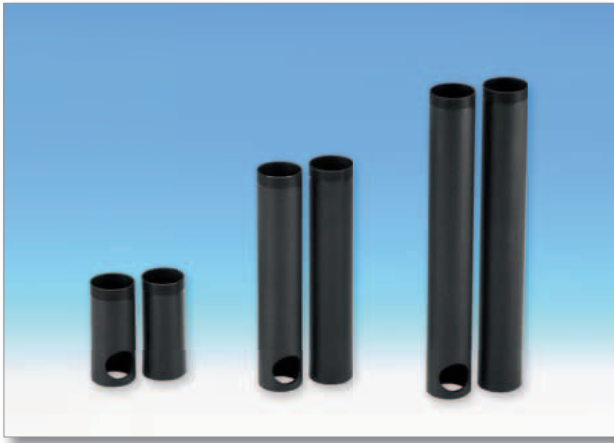


CV-VZM-USB operated in a DMC 70eVolution CNC processing centre.



The parts are illuminated perfectly through a ring light with 9 LEDs arranged at an angle of 30°. The LED ring light is supplied with electricity via the camera. For extremely reflective surfaces or depth measurements, the CV-VZM-USB systems can be delivered alternatively or additionally with coaxial lighting. Depth measurements must be taken with the 20x and 30x lenses or with the M-Apo Plan 20x (and higher) lenses. These lenses have a correspondingly lower depth of field.

## Components and special lenses



The USB camera system with 120 mm long tube and CV-O-020 lens (2x optical magnification) is provided as a standard feature. Naturally other configurations can also be ordered. The descriptions below list the available tubes, lenses and illumination units to put this system together to meet your specific requirements or to allow additional magnification factors or fields of view and change the overall length. The matrix below simplifies putting the components together.

### **Tubes:**

The tubes are available in lengths of 40 mm to 120 mm. Two types are available: Standard tube, e.g. length 40 mm Order No. CV-040 or, tubes with lateral hole for coaxial illumination, e.g. CV-K-080. The characters at the end of the order number describe the length of the tube.



### **Illumination units:**

The standard version has an LED ring light with 9 LED's at an angle of 30°. As an alternative or in addition (in combination with CV-K tubes) the CV-Coax-USB coaxial light can be used. This light is reflected into the optical path by a mirror, eliminating annoying reflections when working with highly reflective material. Moreover it is necessary to use this type of illumination if you are planning to use 15x, 2k0x or 30x lenses or any of the lenses from the M-Plan Apo series. The power is supplied by the USB 2.0 camera.

**The CV-O-200 lens or an M-Plan Apo lens with magnification factor of 20x or higher as a minimum requirement for depth measurements in the micron range.**

## Lenses:



The standard lenses for the CV-VZM are equipped with a screw thread. Optical magnification factors from 2x to 30x in combination with the various tubes offer a very wide range of fields of view and magnification factors (see Matrix for technical data).

### *Matrix for CV-VZM machine video microscope*

The field of view is specified in the horizontal direction. The magnification factor is based on a 24" screen (measured diagonally). All length dimensions are in mm. The USB 2.0 camera has a resolution of 1600 x 1200 Pixels (1/2" Chip). The system length does not include the 20 mm locking pin. Divide the visible area in microns by 1600 to determine the pixel size.

Tube	Lens	2x	3x	4x	6x	10x	15x	20x	30x
<b>CV-40</b>	Working distance mm	85	30	26	15	7	10	8	5
	Field of view mm	12.3	5.5	3.7	2.1	1.2	0.75	0.55	0.35
	Magnification	35	78	116	205	358	573	782	1229
	System length mm	120	125	120	130	130	132	135	137
<b>CV-50</b>	Working distance mm	63	26	25	14	7	10	7	5
	Field of view mm	8	4.2	2.9	1.7	1	0.65	0.47	0.3
	Magnification	54	102	148	253	430	662	915	1433
	System length mm	130	135	130	140	140	142	145	147
<b>CV-60</b>	Working distance mm	53	22	23	13	7	10	7	5
	Field of view mm	6	3.3	2.5	1.5	0.9	0.57	0.4	0.28
	Magnification	72	130	172	287	478	754	1075	1536
	System length mm	140	145	140	150	150	152	155	157

Tube	Lens	2x	3x	4x	6x	10x	15x	20x	30x
<b>CV-70</b>	Working distance mm	47	20	22	13	7	10	7	5
	Field of view mm	4.8	2.7	2.1	1.3	0.78	0.5	0.38	0.23
	Magnification	90	159	205	331	551	860	1132	1870
	System length mm	150	155	150	160	160	162	165	167
<b>CV-80</b>	Working distance mm	42	9	21	13	7	10	7	5
	Field of view mm	4	2.4	1.86	1.2	0.7	0.46	0.33	0.2
	Magnification	108	179	231	358	614	935	1303	2150
	System length mm	160	165	160	170	170	172	175	177
<b>CV-90</b>	Working distance mm	39	17	20	12	7	10	7	5
	Field of view mm	3.4	2.1	1.6	1.06	0.6	0.4	0.3	0.2
	Magnification	126	205	269	406	717	1075	1433	2150
	System length mm	170	175	170	180	180	182	185	187
<b>CV-100</b>	Working distance mm	37	16	20	12	6	10	7	4
	Field of view mm	2.9	1.7	1.46	0.97	0.57	0.38	0.28	0.18
	Magnification	148	253	295	443	754	1132	1536	2389
	System length mm	180	185	180	190	190	192	195	197
<b>CV-110</b>	Working distance mm	35	15	19	11	6	9	6	4
	Field of view mm	2.6	1.6	1.3	0.9	0.5	0.35	0.26	0.18
	Magnification	165	269	331	478	860	1229	1654	2389
	System length mm	190	195	190	200	200	202	205	207
<b>CV-120</b>	Working distance mm	33	14	18	11	6	9	6	4
	Field of view mm	2.4	1.5	1.2	0.82	0.5	0.33	0.23	0.17
	Magnification	179	287	358	524	860	1303	1870	2529
	System length mm	200	205	200	210	210	212	215	217

### Special lenses:



Since the CV-O series lenses with higher magnification factor provide only short working intervals, special lenses are available that allow working distances of 57 mm (3.7 mm visible area) to 6 mm (visible area 0.09 mm) at high magnification factors. This increases the overall length of the system by up to 80 mm. The M Plan Apo (Apochromatic) is an excellent optical system with flat, chromatic, aberration-free image over the entire field of vision.

### *Matrix for M-Plan Apo lenses*

The field of view is specified in the horizontal direction. The magnification factor is based on a 24" screen (measured diagonally). All length dimensions are in mm. The USB 2.0 camera has a resolution of 1600 x 1200 Pixels (1/2" Chip). The system length does not include the 20 mm locking pin. Divide the visible area in microns by 1600 to determine the pixel size.

The technical data for the M-Plan Apo lenses as well as the field of view, numerical aperture and magnification factor on the screen are listed in the matrix below:

Tube	Lens	5x	10x	20x	50x	100x
	<b>Numerical aperture</b>	<b>0.14</b>	<b>0.28</b>	<b>0.42</b>	<b>0.55</b>	<b>0.70</b>
<b>CV-40</b>	Working distance mm	57	44	24	15	6
	Field of view mm	3.7	2.0	0.9	0.4	0.21
	Magnification	115	215	475	1075	2050
	System length mm	175	175	190	190	200
<b>CV-50</b>	Working distance mm	54	41	23	13	6
	Field of view mm	3.3	1.7	0.8	0.35	0.18
	Magnification	130	250	535	1220	2390
	System length mm	185	185	200	200	210
<b>CV-60</b>	Working distance mm	51	39	22	13	6
	Field of view mm	2,9	1.5	0.75	0.31	0.16
	Magnification	145	285	580	1385	2685
	System length mm	195	195	210	210	220
<b>CV-70</b>	Working distance mm	50	38	21	13	6
	Field of view mm	2.6	1.35	0.68	0.28	0.14
	Magnification	165	315	630	1535	3070
	System length mm	205	205	220	220	230
<b>CV-80</b>	Working distance mm	49	37	21	12	6
	Field of view mm	2.4	1.25	0.6	0.25	0.13
	Magnification	180	345	715	1720	3300
	System length mm	215	215	230	230	240
<b>CV-90</b>	Working distance mm	48	36	21	12	6
	Field of view mm	2.2	1.15	0.55	0.23	0.115
	Magnification	195	370	780	1870	3740
	System length mm	225	225	240	240	250
<b>CV-100</b>	Working distance mm	47	36	21	12	6
	Field of view mm	2	1.05	0.5	0.21	0.11
	Magnification	215	410	860	2050	3900
	System length mm	235	235	250	250	260
<b>CV-110</b>	Working distance mm	46	36	20	12	6
	Field of view mm	1.9	0.95	0.45	0.20	0.10
	Magnification	225	450	955	2150	4300
	System length mm	245	245	260	260	270
<b>CV-120</b>	Working distance mm	45	35	20	12	6
	Field of view mm	1.75	0.8	0.42	0.18	0.09
	Magnification	245	535	1020	2385	4475
	System length mm	255	255	270	270	280

