

OPERATING INSTRUCTIONS HANDLING COMPONENTS

Gripper GPL

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1 Important information

1.1 EU - conformance (to EU Directive on Machines, Appendix II A)

Regulations and standards taken into account:

- EU Directive on Machines 89/392/EEC, 91/368/EEC

Manufacturer:

Montech AG, Gewerbestrasse 12 CH-4552 Derendingen

Tel. +41 32 681 55 00, Fax +41 32 682 19 77

1.2 Product description and purpose

Grippers type GPL can be used in all applications where workpieces have to be regularly gripped externally or internally for the purpose of transport (handling).

Under all circumstances the load limits given under "Technical data" must be complied with.

1.3 Dangers

The use of Grippers types GPL in installations is only permissible when they are secured by Movable, separating protective devices as per EN 292-2. Failure to comply with this rule can result in injury, e.g. squeezing of the fingers.

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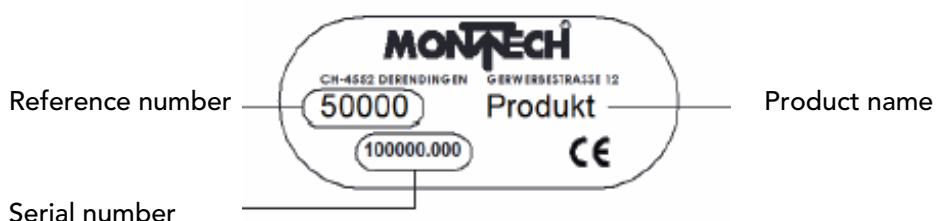
1.4 Additional information

The aim of the present User Manual is to enable users to employ Grippers types GPL correctly and safely. Should further information be required in relation to your particular application, please contact the manufacturer.

When reordering User Manuals, it is essential to quote the reference number, the product name and serial number.

This document can be obtained from our homepage www.montech.com.

Fig. 1-1: Nameplate



Montech AG
Management



U. D. Wagner



C. Wullschleger

1.5 Validity of the User Manual

Our products are continually updated to reflect the latest state of the art and practical experience. In line with product developments, our User Manuals are continually updated.

Every User Manual has an order number (e.g. BA-100032) and an edition number (e.g. 03/2006). The order number and the addition number are shown on the title page.

The article number and the date of edition are evident on the title page.

1.6 Technical data GPL

Size	GPL-30-1	GPL-40-1	GPL-45-2	GPL-60-2	GPL-75-2
Gripping distance (total stroke of the jaws) [mm]	2-30	12-40	11-45	26-60	41.75
Clamping distance opening/closing adjustable	yes	yes	yes	yes	yes
Closing and opening time at 3/6 bar 1) [s]	0.18/ 0.1	0.22/ 0.12	0.44/ 0.25	0.6/ 0.32	0.76/ 0.36
Piston diameter [mm]	16	16	25	25	25
Gripping force F_S [N]	See diagrams of gripping force				
Moment of inertia J_z [kgcm ²]	3.5	4.4	16.4	21.5	29.1
Repeatability 2) [mm]	±0.03	±0.03	±0.04	±0.04	±0.04
Operating pressure [bar]	3-6				
Own weight [kg]	0.44	0.46	1.04	1.12	1.26
Actuating medium	Compressed air filtered to 5µm, oiled or unoled Dew point <6°C				
Pneumatic connection plug-in	For hose ø4mm				
Speed regulation	Adjustable exhaust air throttle				
End position control (open/closed) 3)	By inductive proximity switches				
Distance measuring system (option) 4)	Shaft encoder				
Ambient: Temperature [°C]	10-50				
Rel. Atmospheric humidity	<95% (without condensation)				
Purity of the air	Normal workshop atmosphere				
Warranty period	2 years from the date of delivery				
Maintenance	Maintenance-free				
Installation position	Arbitrary				
Material	aluminium, steel, plastic				
Noise level [dBA]	<62				

- 1) Measured at maximum stroke.
- 2) Difference between gripped end positions of 100 successive strokes.
- 3) See accessories
- 4) See special accessories

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Special accessories:

Shaft encoder add-on kit GPL-...-1	49004
Shaft encoder add-on kit GPL-...-2	49005
– Incremental encoder, pluggable 5 Volt	506686
– Incremental encoder, pluggable 24 Volt	508126
– Cable to 506686 L = 10m	507512
– Cable to 508126 L = 10m	508129

Accessories:

– Inductive proximity switch PNP	508842
Ø 6,5mm with LED, proof against short circuit and wrong polarity, with a switching clearance of 2mm and a cable 2m long	
– Pluggable	508843

Connecting cable to pluggable proximity switches

– Cable length 5m, with angles socket at one end	504929
– Cable length 10m, with angled socket at one end	507529
– Cable length 5m, with straight socket at one end	504610
– Cable length 10m, with straight socket at one end	507528

1.7 Gripping force diagrams GPL

Fig. 1-2: Gripping force diagram GPL-30 / GPL-40-1

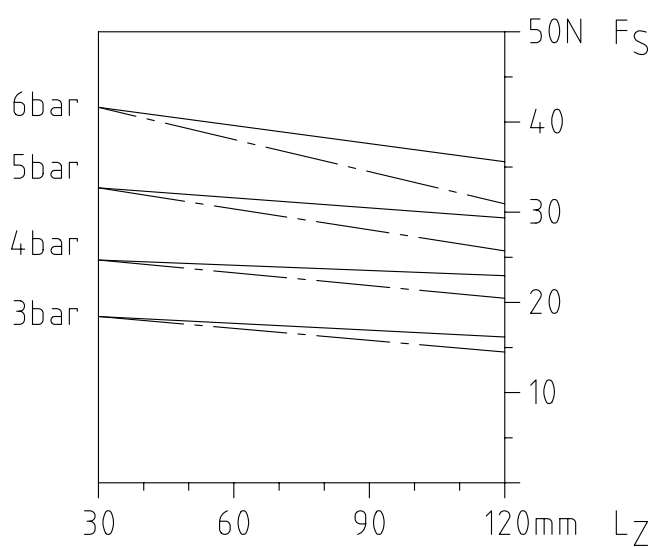
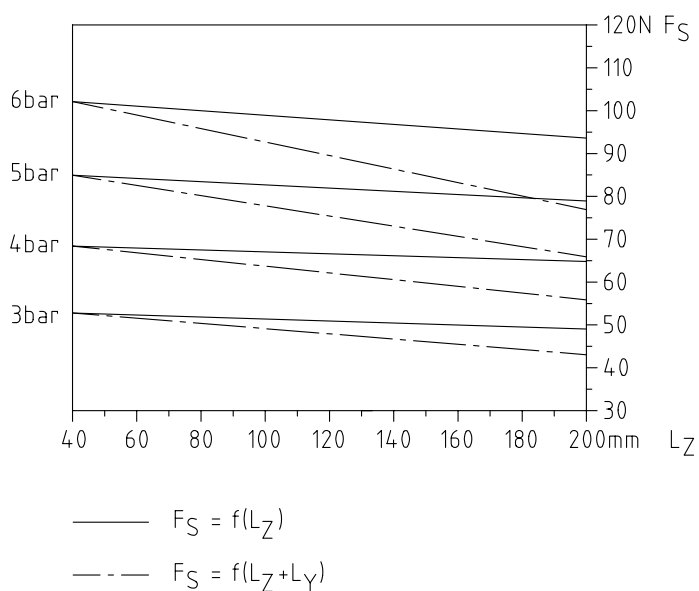


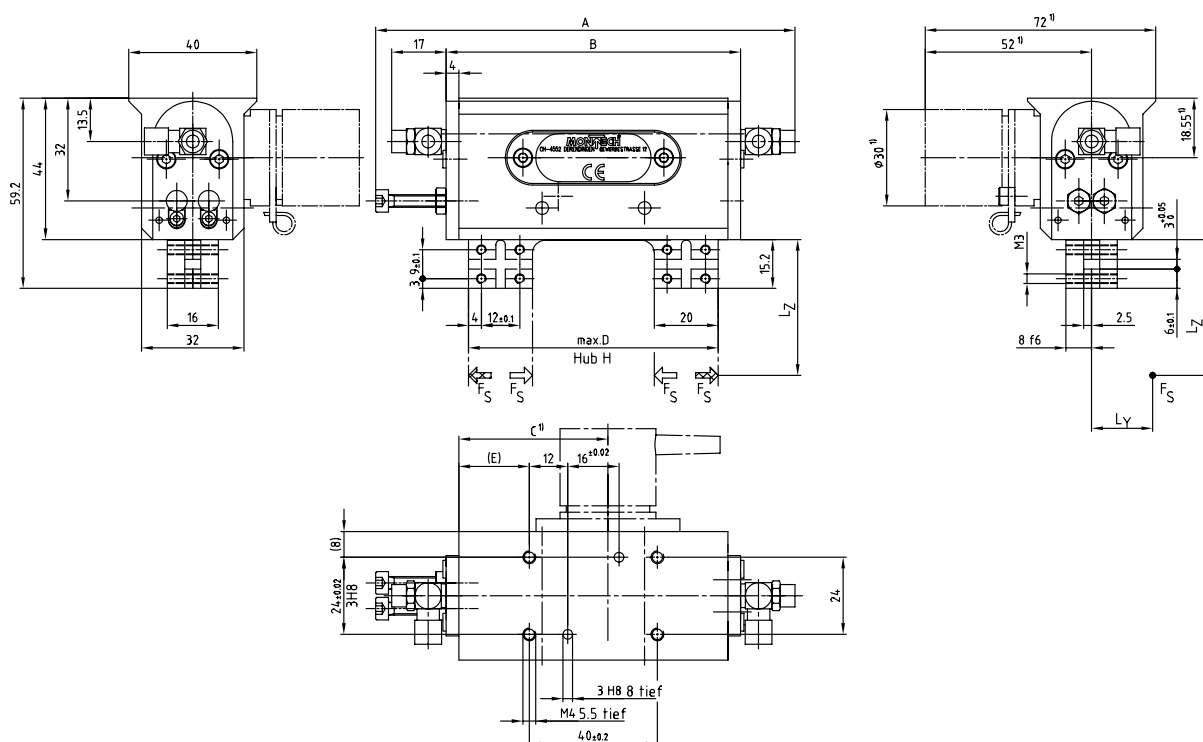
Fig. 1-3: Gripping force diagram GPL-45 / GPL-60 / GPL-75-2



F_s = Gripping force per gripping fingers

1.8 Dimension sheet size GPL-30 / GPL-40-1

Fig. 1-4: Dimension sheet size GPL-30 / GPL-40-1



	H	A	B	C	D	E
GPL-30-1	30	131	92	46.55	78	22
GPL-40-1	40	141	102	51.55	88	27

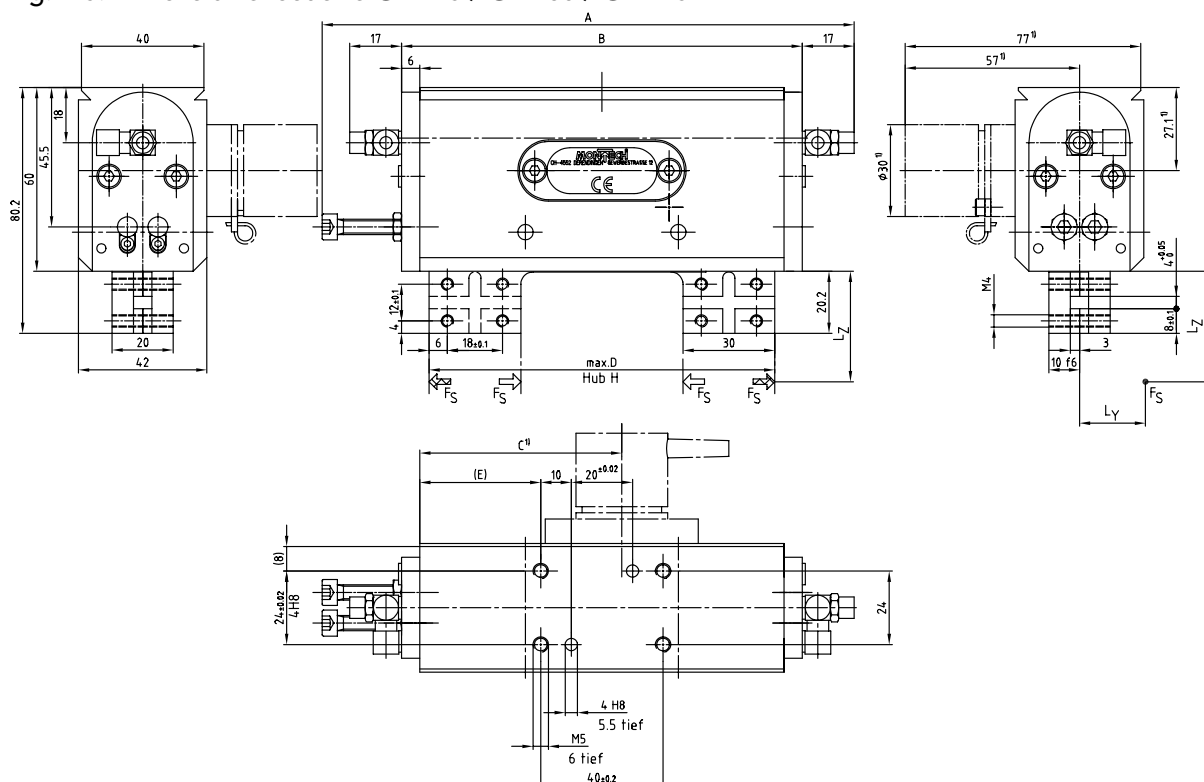
1) With incremental encoder (special accessories)

Article number GPL-30-1 47759

Article number GPL-40-1 47776

1.9 Dimension sheet size GPL-45 / GPL-60 / GPL-75-2

Fig. 1-5: Dimension sheet size GPL-45 / GPL-60 / GPL-75-2



	H	A	B	C	D	E
GPL-45-2	45	174	131	66	113	39.5
GPL-60-2	60	189	146	73.5	128	47
GPL-75-2	75	204	161	81	143	54.5

1) With incremental encoder (special accessories)

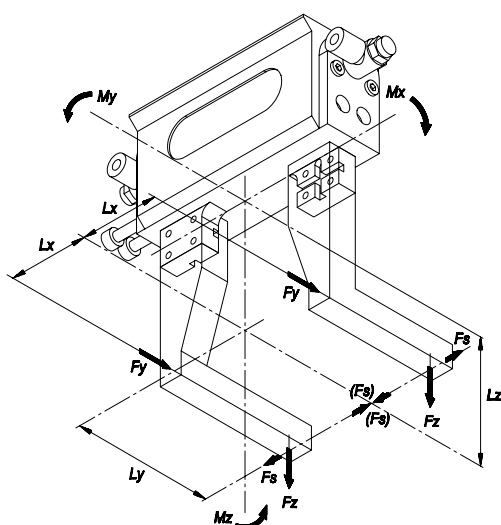
Article number GPL-45-2 47736

Article number GPL-60-2 47783

Article number GPL-75-2 48168

1.10 Load calculations

Fig. 1-6: Load calculations



		GPL-...-1	GPL-...-2
$F_{s \text{ perm.}}$	[N]	See diagrams of gripping force	
$F_{v \text{ perm.}}$	[N]	7.5	15
$F_{z \text{ perm.}}$	[N]	70	120
$L_{x \text{ perm.}}$	[mm]	55	75
$L_{v \text{ perm.}}$	[mm]	90	160
$L_{z \text{ perm.}}$	[mm]	120	200
$(L_x + L_v)_{\text{perm.}}$	[mm]	90	160
$(L_v + L_z)_{\text{perm.}}$	[mm]	120	200
$(L_z + L_x)_{\text{perm.}}$	[mm]	120	200
$M_{x \text{ perm.}} = F_v \cdot L_z + F_z \cdot L_v$	[Nmm]	7000	22000
$M_{v \text{ perm.}} = F_s \cdot L_z + F_z \cdot L_x$	[Nmm]	9000	37000
$M_{z \text{ perm.}} = F_s \cdot L_y + F_y \cdot L_x$	[Nmm]	4000	23000

F_s : Gripping force [N] (see diagrams of gripping force)

F_y, F_z : Acting forces [N]

L_x, L_y, L_z : Distance of force [mm]

M_x, M_y, M_z : Existing moments [Nmm]

With cooperation of M_x, M_y and M_z , each moment may reach its permissible maximum.

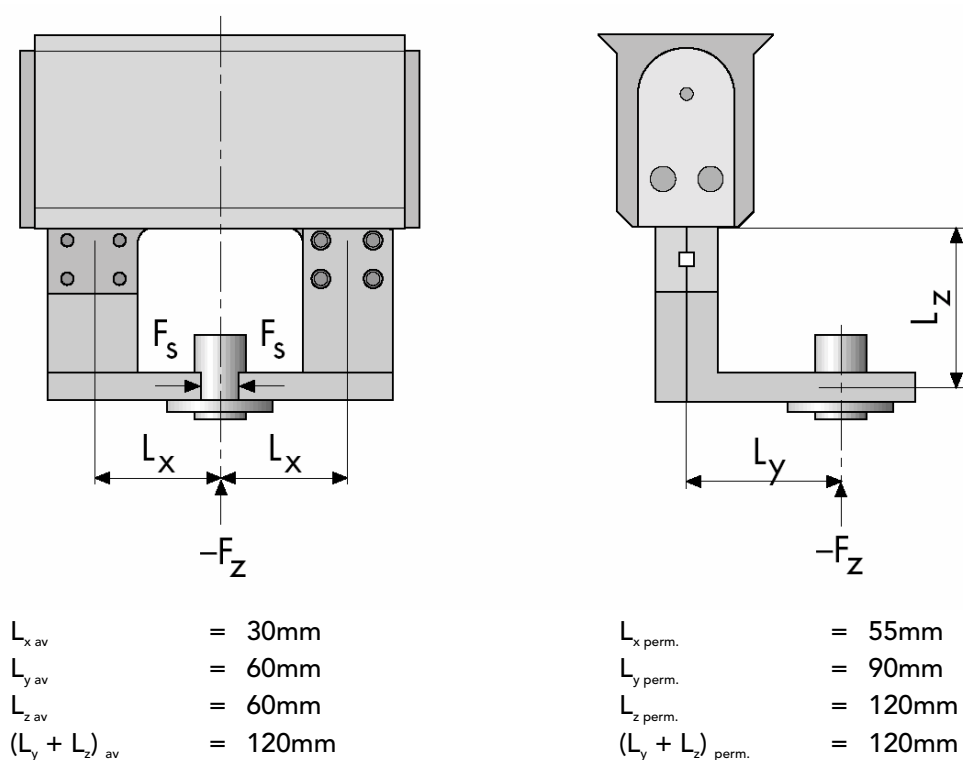
1.11 Sample calculation

Gripper type: GPL-30-1

The part is clamped in right-angled fingers and pressed in.

Operating pressure = 6 bar

Fig. 1-7: Sample calculation



F_s (gripping force diagram) 31N

$$-F_z \text{ av} = 20\text{N} (0.5 \cdot \text{press-in force})$$

$$F_{z \text{ perm.}} = \pm 70\text{N}$$

$$\begin{aligned} M_{x \text{ av}} &= (0 \cdot 60) + (-20 \cdot 60) = -1200\text{Nmm}, & M_{x \text{ perm.}} &= \pm 7000\text{Nmm} \\ M_{y \text{ av}} &= (31 \cdot 60) + (-20 \cdot 30) = 1260\text{Nmm}, & M_{y \text{ perm.}} &= 9000\text{Nmm} \\ M_{z \text{ av}} &= (31 \cdot 60) + (0 \cdot 30) = 1860\text{Nmm}, & M_{z \text{ perm.}} &= 4000\text{Nmm} \end{aligned}$$

2 Installation

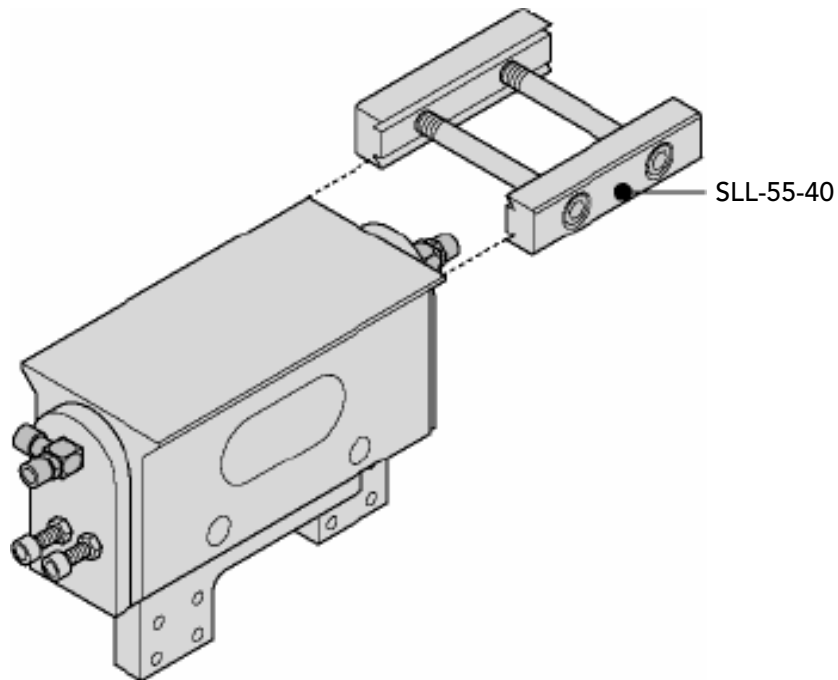
2.1 Installation position

The installation position of the GPL gripper is arbitrary.

2.2 Mounting

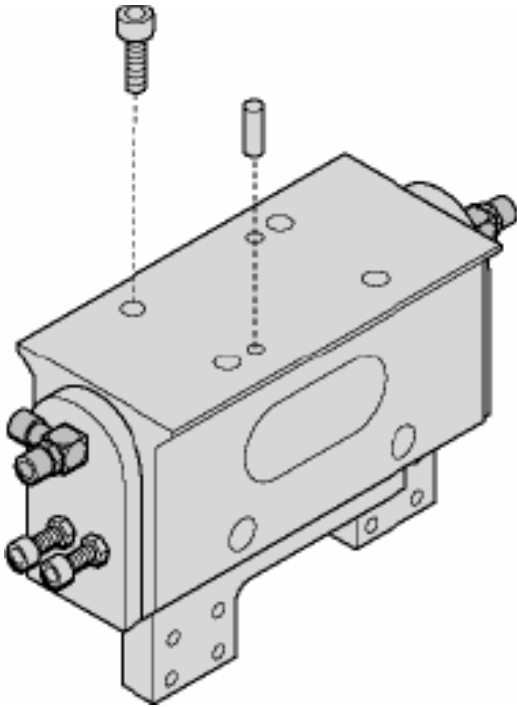
The GPL grippers are mounted quickly and easily on their housing with the QUICK-SET mounting system.

Fig. 2-1: Mounting GPP with QUICK-SET



If no QUICK-SET components are used, the GPP can be mounted by direct screwing and pinning.

Fig. 2-2: Mounting of GPP by screwing and pinning



For drilling template for screwing and pinning, see dimension sheets in Fig.1-4 and 1-5.

2.3 Supply of compressed air

To secure the gripping force, for example in the event of an emergency stop, we recommend using the stop valve.

Stop valve Article number 46582

Fig. 2-3: Wiring diagram stop valve

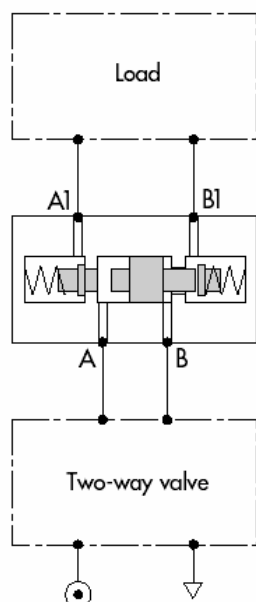
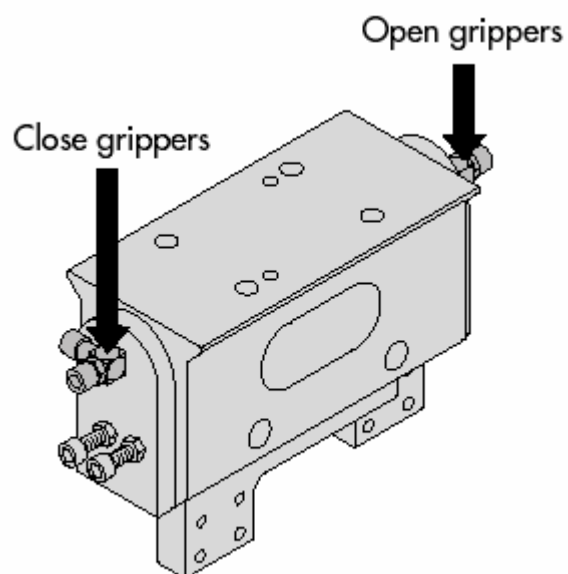
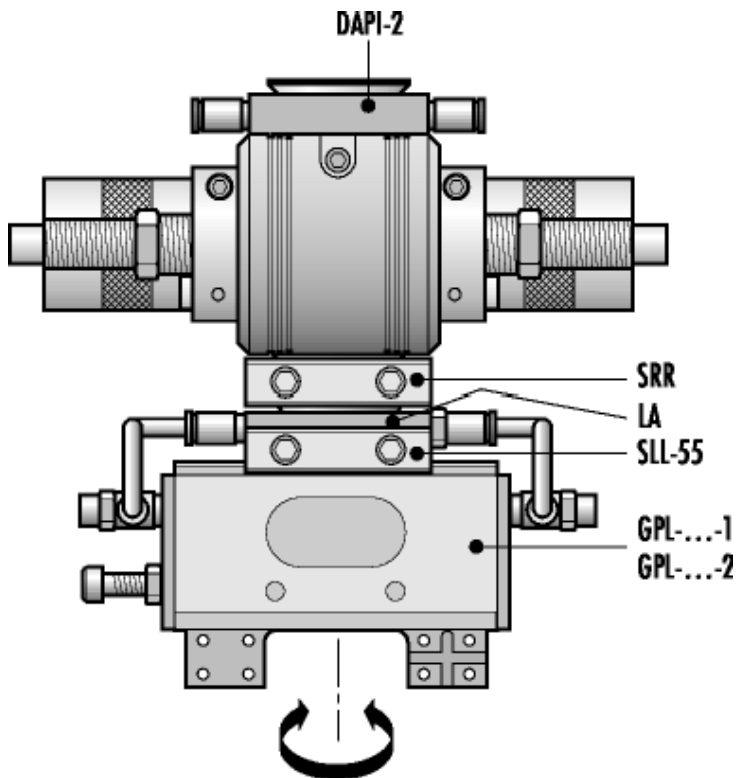


Fig. 2-4: Supply of compressed GPL



GPL gripper, mounted on rotary drive with internal compressed air supply DAPI

Fig. 2-5: Internal supply of compressed air



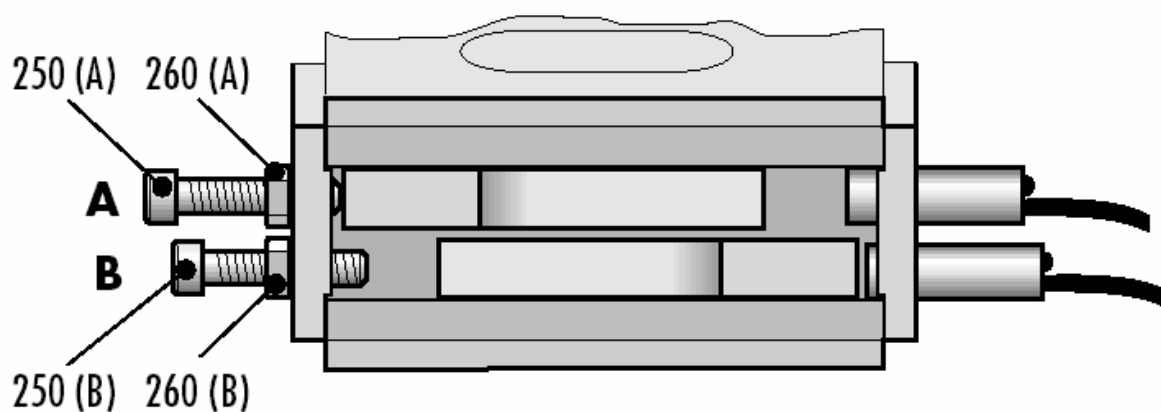
2.4 Setting the end stops

The two end positions «Gripper open» (A) and «Gripper closed» (B) are set with the bolts 250 and the nuts 260.

Setting procedure for «Gripper open»

- Loosen nut 260 (A).
- Open gripper in pressureless state.
- Set stop position with bolt 250 (A).
- Secure stop position by tightening the nut 260 (A).

Fig. 2-6: Setting the end stops



Setting procedure for «Gripper closed»

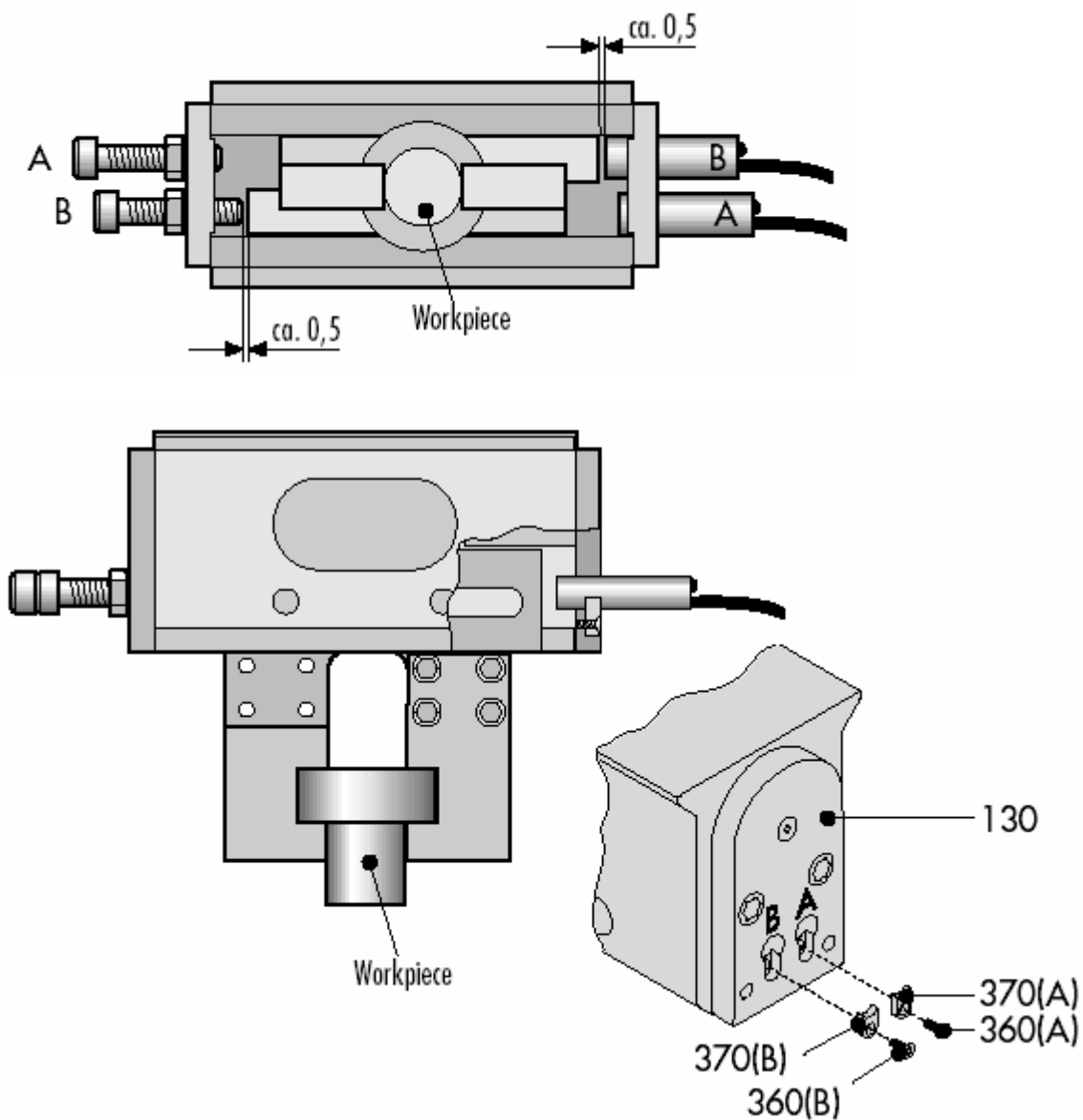
- Loosen nut 260 (B).
- Close gripper in pressureless state.
- Set stop position with bolt 250 (B).
- Secure stop position by tightening the nut 260 (B).

2.5 Setting the proximity switches

Gripper open (A) and gripper closed (B)

The proximity switches used must have a switching distance S_n of 2 mm, be designed for flush mounting and have a housing 6.5mm in diameter.

Fig. 2-7: (The figure shows the «external gripping» version)



Setting procedure for «external gripping» gripper (Fig. 2-7):

- Close gripper (atmospheric pressure) until gripping fingers touch the workpiece.
- Set stop B (gripper closed) so that there is a distance of about 0.5 mm between gripping jaw and stop when the gripping fingers touch the workpiece (Fig. 2-7).
- Plug the proximity switch B into the plate (130) up to the end stop. When the proximity switch is electrically connected, the LED lights up.
- Withdraw the proximity switch until there is a gap of approx. 0.5 mm between the gripper jaw and the proximity switch.
- Secure the proximity switch by tightening the screw 360 (B).
- Plug the proximity switch A into the plate (130) up to the end stop. When the proximity switch is electrically connected, the LED lights up.
- Open the gripper up to the set stop A (atmospheric pressure).
- Withdraw the proximity switch until there is a gap of approx. 0.5 mm between the gripper jaw and the proximity switch.
- Secure the proximity switch by tightening the screw 360 (A).

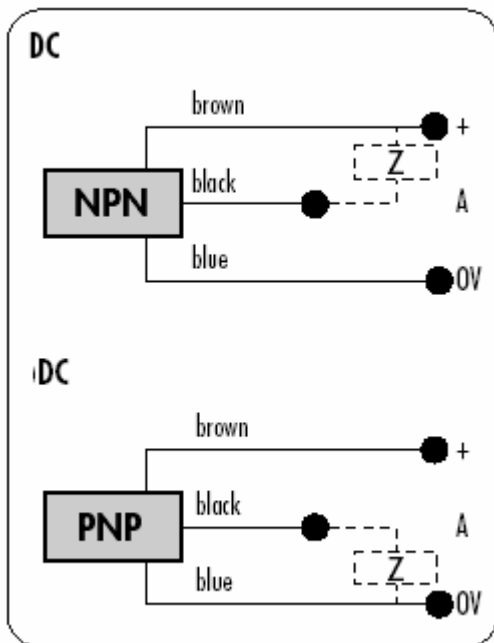
Setting procedure for «internal gripping» grippers (Fig. 2-7):

- Open the gripper (atmospheric pressure) until the gripping fingers touch the workpiece.
- Set stop A (gripper open) so that there is a distance of about 0.5 mm between gripping jaw and stop when the gripping fingers touch the workpiece.
- Plug the proximity switch A into the plate (130) up to the end stop. When the proximity switch is electrically connected, the LED lights up.
- Withdraw the proximity switch until there is a gap of approx. 0.5 mm between the gripper jaw and the proximity switch.
- Secure the proximity switch by tightening the screw 360 (A).
- Plug the proximity switch B into the plate (130) up to the end stop. When the proximity switch is electrically connected, the LED lights up.
- Close gripper up to the set stop B (atmospheric pressure).
- Withdraw the proximity switch until there is a gap of approx. 0.5 mm between the gripper jaw and the proximity switch.
- Secure the proximity switch by tightening the screw 360 (B).



In the two end positions formed by the stops A and B, the gripping jaws must not touch the proximity switch sleeves 1(A) and 1(B), respectively.

Fig. 2-8: Electrical connections of the proximity switches

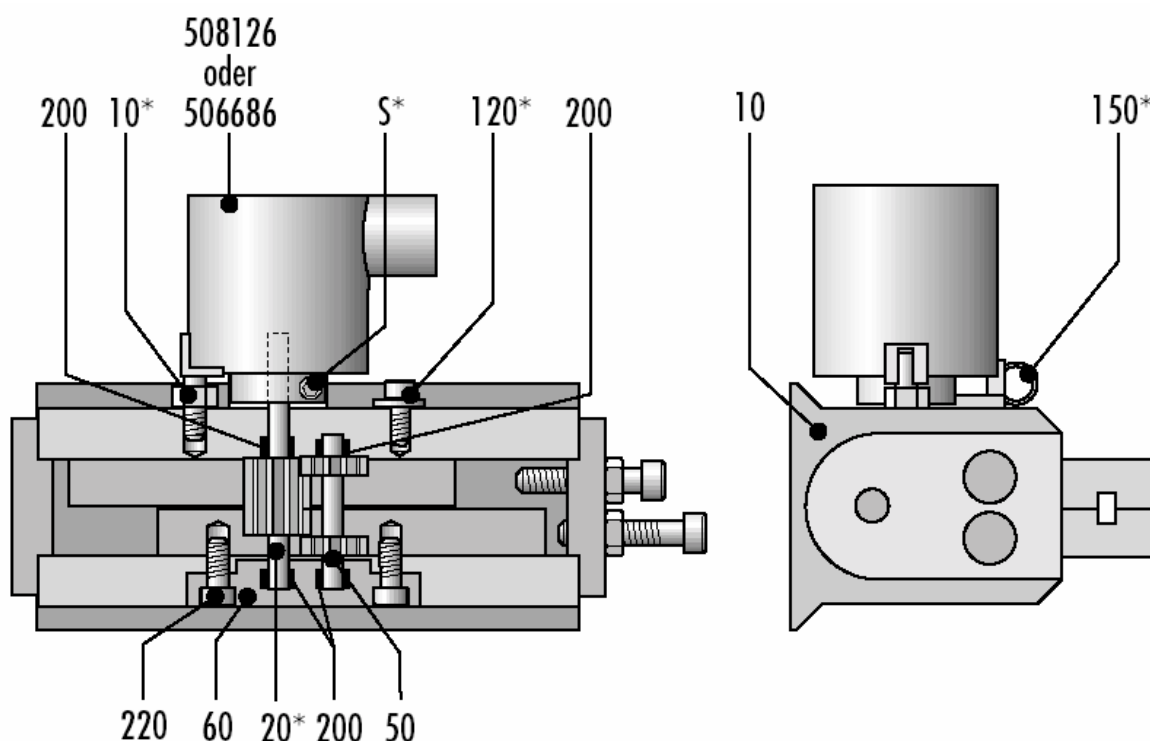


2.6 Installation of the shaft encoder

With the «shaft encoder» add-on kit 49004 for GPL-...-1 and 49005 for GPL-...-2, the grippers are equipped for continuous scanning of the gripping jaw position.

The item numbers marked with an * refer to the shaft encoder add-on kit GPL-1 or GPL-2.

Fig. 2-9: Shaft encoder



Replacing pinion shaft 1 (Fig. 2-9 + Fig. 4-1)

- Loosen the two bolts (220).
- Remove bearing cover (50) together with pinion shafts through the opening in the casing (10) by pressing on those shaft ends of the two pinion shafts (20 + 40) which are opposite the bearing cover.
- Replace pinion shaft 1 (40) by pinion shaft 1 (20*). Remove bearing (200) from the pinion shaft (40) and mount in the correct position on pinion shaft 1 (20*).
- Install pinion shaft 1 (20*) and pinion shaft 2 (50) with the correctly positioned bearings (200) in the casing (10).
- Insert bearing cover (60) and tighten the two bolts (220).

Mounting the shaft encoder holder (Fig. 2-9 + Fig. 4-1)

- Screw positioning pin (10*) into the threaded hole (on proximity switch side next to the projecting pinion shaft (20*)) in the housing (10) and tighten.
- Mount cable tie (150*) by means of cheese-head screw (120*) on the housing (10).

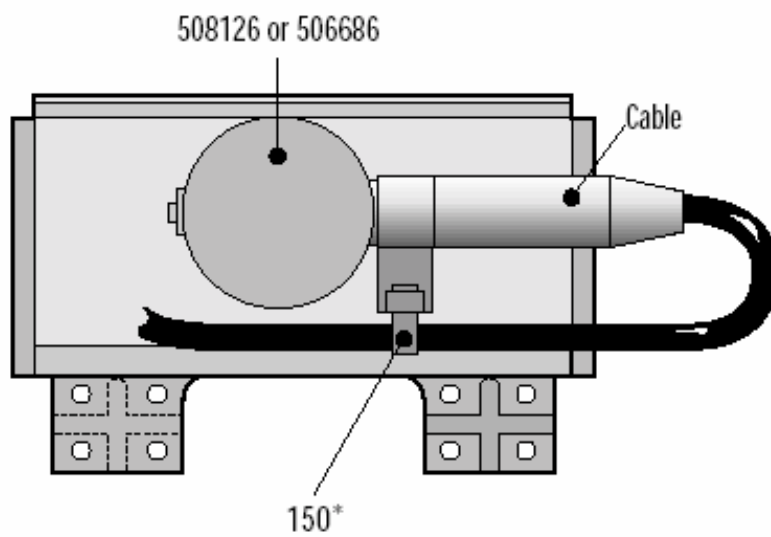
Mounting the shaft encoder (Fig. 2-9 + Fig. 4-1)

- Mount encoder (508126 or 506686) on the shaft end of the pinion shaft 1 (20*) and push on the shaft end towards the housing (10). During this, turn the encoder so that the positioning pin (10*) is inserted into the groove provided.
- Secure the shaft encoder on the pinion shaft 1 (20*) by tightening the screw (S*) in the clamping ring (Distance between housing (10) and clamping ring approx. 1mm).

Tension relief for the shaft encoder cable (Fig. 2-10 + Fig.4-1)

- Lay the cable according to Fig. 2-10 and fix with cable tie (150*).

Fig. 2-10: Tension relief for the shaft encoder cable



Technical data for «incremental shaft encoder»

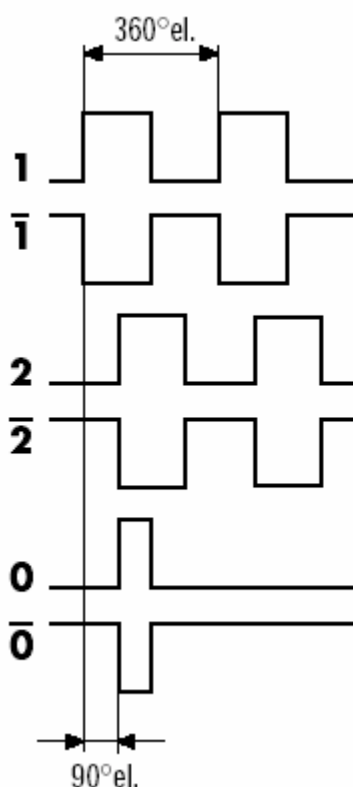
- 500 pulse/revolution, resolution 0.114mm/pulse for GPL-1 and 0.163mm/pulse for GPL-2. (Based on the total stroke).
- 2 square-wave signals electrically offset 90°.
- 1 reference signal per revolution.
- All signals with inversion (only incremental encoder 506686).

Output signal

Signal 2 lagging behind signal 1 on rotation in counterclockwise direction (view onto the shaft), i.e. with gripper closing.

Technical data for incremental shaft encoder 506686

Fig. 2-11: Connections encoder



Connections		
Signal	Wire colour	
	inkr.encoder 506686	inkr.encoder 508126
1	green	green
$\bar{1}$	red	–
2	yellow	yellow
$\bar{2}$	blue	–
0	pink	pink
$\bar{0}$	gray	–
+V _s Volt	brown	brown
0 Volt	white	white

Voltage supply:

Current consumption without load:

Output circuit:

Output level:

5 VDC ±10%

typ. 60mA

Antivalent Line-Driver, EIA-Standard RS 422

U_{High} = 3.8V at $I_{\text{High typ.}}$ = 20mA

U_{Low} = 0.4V at $I_{\text{Low max.}}$ = 20mA

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Electrical data for incremental encoder 508126

Voltage supply:	10-30 VDC		
Current consumption without load:	typ. 60mA (at 24 VDC)		
Output circuit:	Push-pull, protection against short circuits		
Output level:	With R_L zu 0V:	$U_{\text{High typ.}}$	= 20.8V
		$U_{\text{Low max.}}$	= 0.2V
	With R_L zu $+V_s$:	$U_{\text{High min.}}$	= 22V
		$U_{\text{Low typ.}}$	= 2.3V

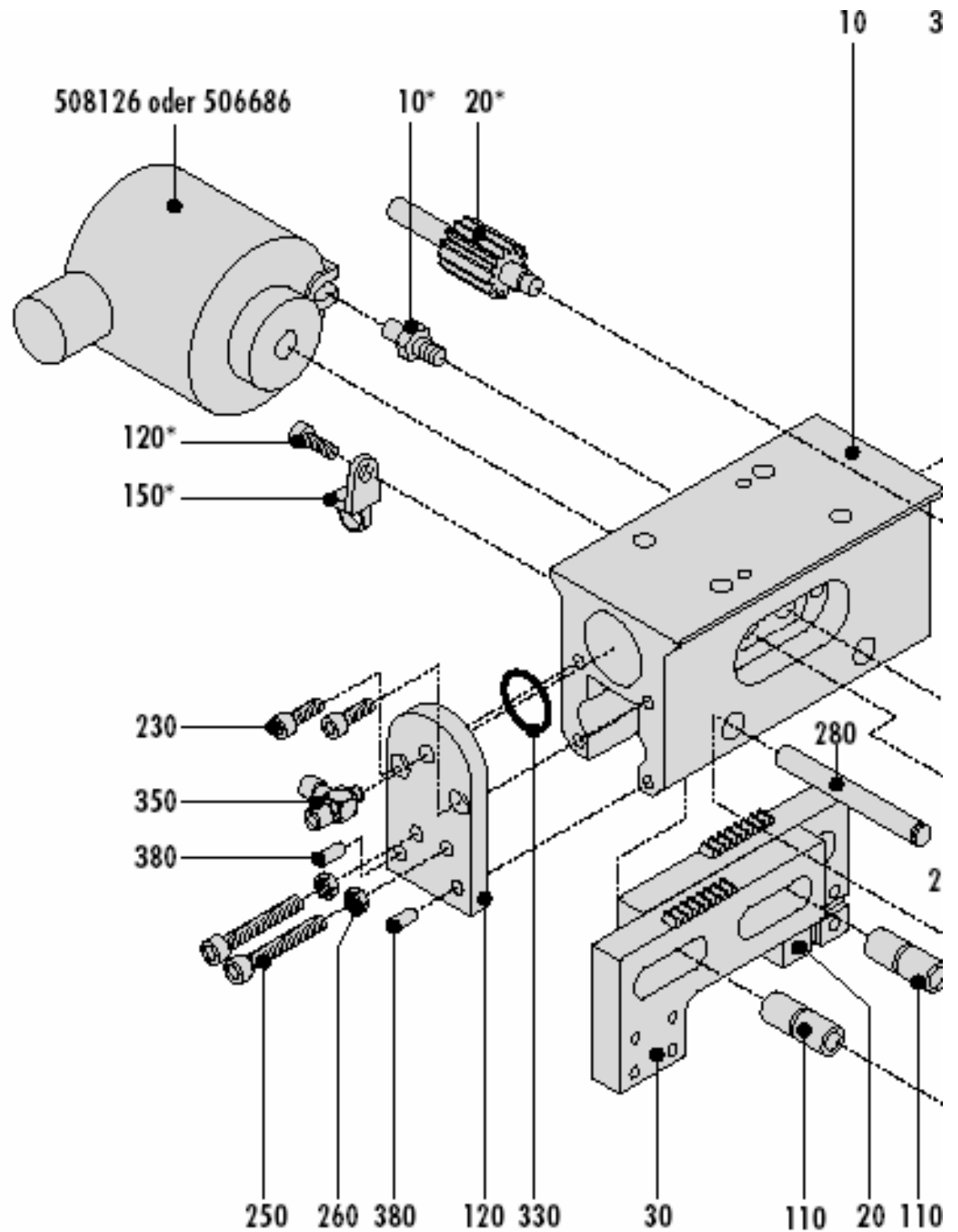
3 Maintenance

The GPL is generally maintenance-free up to 5Mio. We recommend the following preventative maintenance to ensure optimum performance of the unit:

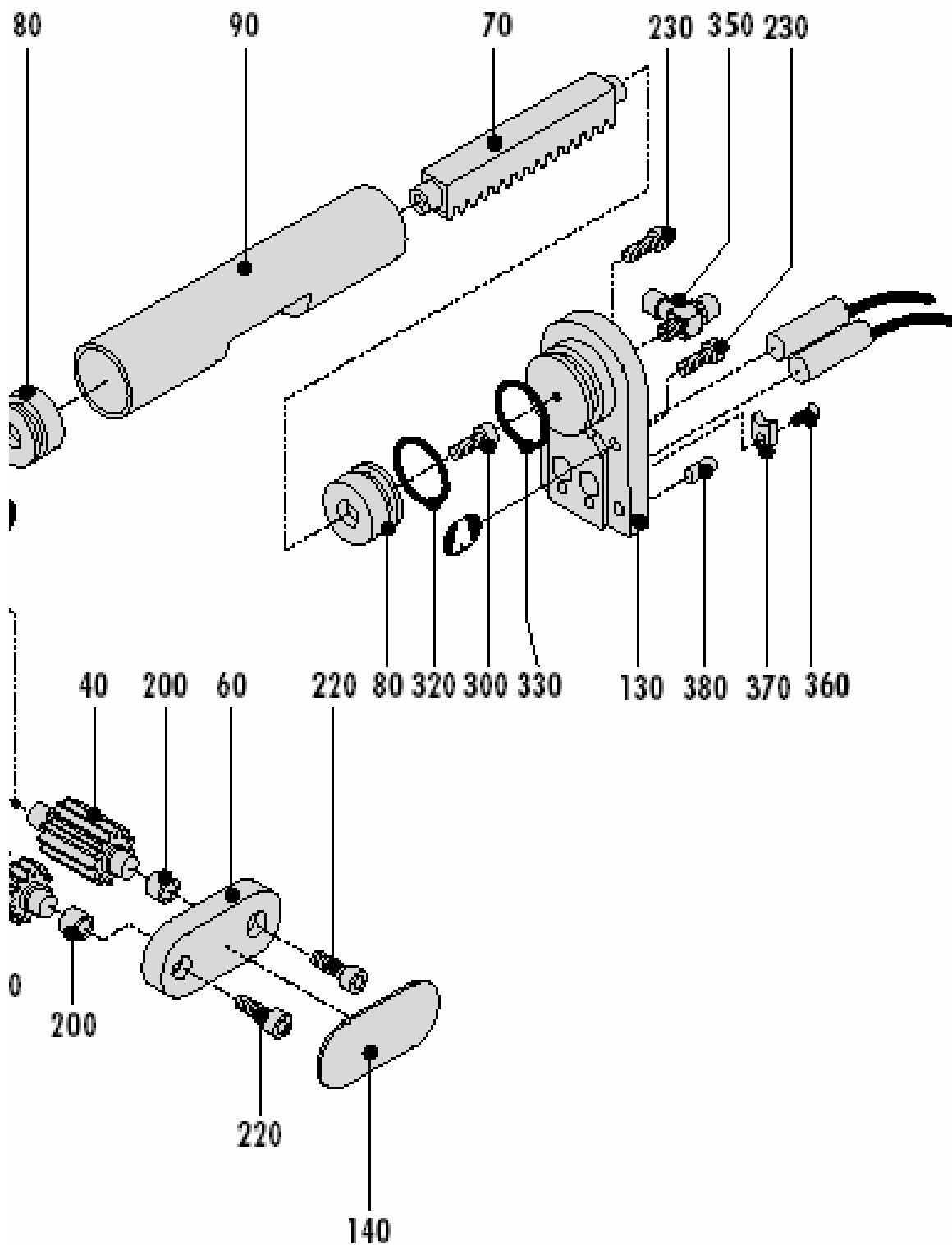
- Periodic cleaning of the unit, particularly the mechanical guide.
- Inspection of the seals, possible replacement
- Lubricate with Paraliq P460 (Montech article no. 504721), particularly the mechanical guide

4 Spare part GPL

Fig. 4-1: Drawing GPL



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4.1 Spare parts GPL-Gripper

Pos.	Designation	Ref. No.					Material
		30-1	40-1	45-2	60-2	75-2	
10	Casing GPP...	49061	49062	49063	49064	49065	Aluminium
20*	Gripping jaw left	48764	48766	48768	48770	48772	Steel
30*	Gripping jaw right	48765	48767	48769	48771	48773	Steel
40*	Pinion shaft 1	48074	48074	48080	48080	48080	Steel
50*	Pinion shaft 2	48077	48077	48083	48083	48083	Steel
60	Bearing cover	48659	48659	47725	47725	47725	Aluminium
70*	Toothed rack	47890	47891	47893	47892	48166	Steel
80	Piston	47747	47747	47724	47724	47724	POM
90	Cylinder tube	47752	47780	47729	47787	48167	Steel
110	Roller	46904	46904	46874	46874	46874	Steel
120	Stop plate	47749	47749	47726	47726	47726	Aluminium
130	Plate	48169	48169	48170	48170	48170	Aluminium
140	Type plate	41620	41620	41620	41620	41620	Various
200*	Sliding bearing	505572	505572	-	-	-	Various
200*	Grooved ball bearing	-	-	505571	505571	505571	Steel
220	Machine screw	501602	501602	501603	501603	501603	Steel
230	Machine screw	501604	501604	501620	501620	501620	Steel
250	Machine screw	501626	501626	501644	501644	501644	Steel
260	Hex nut	501999	501999	502000	502000	502000	Steel
280	Cylindrical pin	505309	505309	502057	502057	502057	Steel
300	Machine screw	506056	506056	506056	506056	506056	Steel
320*	Piston packing	504971	504971	504973	504973	504973	NBR
330*	O-ring	501233	501233	503114	503114	503114	NBR
350	Non-return throttle valve	505023	505023	505023	505023	505023	Brass
360*	Clamping screw	47904	47904	47904	47904	47904	Steel
370*	Clamping block	47906	47906	47906	47906	47906	Steel
380	Cylindrical pin	502108	502108	502122	502122	502122	Steel

* All this articles are available as spare parts.

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4.2 Spare parts shaft encoder add-on kit

Pos.	Designation	Ref. No		Material
		GPL-1	GPL-2	
10	Positioning pin	49003	49003	Steel
20*	Pinion shaft 1	48085	48087	Steel
30	Machine screw	501601	501601	Steel
40	Cable tie	505885	505885	Plastic

* All this articles are available as spare parts.

5 Environmental compatibility and disposal

Material used

- Aluminium
- Steel
- Brass
- Acrylonitrile-butadiene rubber (NBR as per ISO 1629)
- Polyoxymethylene (Polyacetal) (POM)
- Paraffinic mineral oil, synthetic hydrocarbon

Surface treatment

- Anodic oxidation of aluminium
- Blackening of steel
- Surface hardening of alloyed structural steels

Shaping processes

- Machining of aluminium, POM, brass, plastic and steel
- Moulding of NBR gaskets
- Profile pressing of aluminium

Emissions during operation

- None

When the devices are operated with oiled air we recommend that the exhaust air be returned to the atmosphere through an oil filter or separator.

Disposal

Grippers that are no longer serviceable should not be disposed of as complete units, but dismantled into their parts which can be recycled according to the material of which they are made. The kind of material used for every part is shown in the spare parts list. Material that cannot be recycled should be disposed of appropriately.

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MONTECH AG
Gewerbestrasse 12, CH-4552 Derendingen
Fon +41 32 681 55 00, Fax +41 32 682 19 77
info@montech.com, www.montech.com