LUBRICATION SYSTEM FOR RACKS AND PINIONS

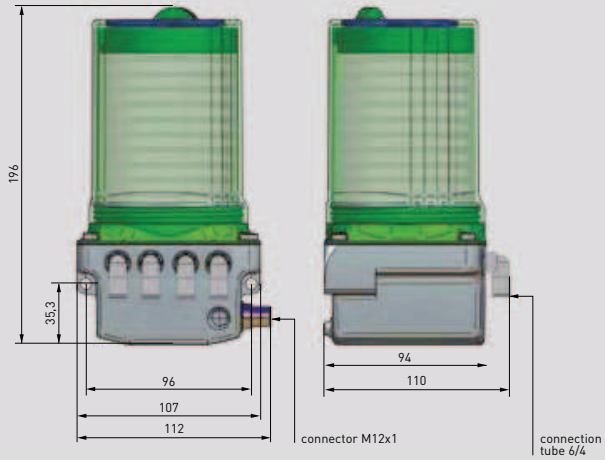
Delivery and support by Herion Schmiersysteme GmbH, Puchheim, Germany, www.herion-schmiersysteme.de

FlexxPump 400 DLS:

- Automatic and pulse-controlled relubrication-unit
- Direct controlled and error-monitoring by PLC
- Compact piston-pump (1 or 2 pump-bodies)
- Grease up to NLGI. 3 (with solid particles)
- Up to 4 outlets; max. 16 lubrication-points
- Different quantities of lubricant and lubrication intervals
- Operating pressure: up to 70 bar (1015 psi)
- 400 cc lubricant in bellow / cartridge
- Low weight and minimal current consumption
- Perfect for a combined relubrication of:
  - Racks/pinions drives; open gears
  - Linear guideways
  - Ball screw nuts
  - (Ball) bearings
  - Slewing rings

TECHNICAL DATA

Dimensions		112 x 196 x 94 [mm] B x H x T
Weight (excl. lubricant)		1120 g
Function principle		Piston pump
Volume of reservoir	Grease (types 400)	400 cc in bellow / cartridge
	Oil (types 500)	500 ml (direct filling)
Delivered volume per stroke/pulse	1 outlet	1 x 0.15 cc types: 401/501
	2 outlets	2 x 0.15 cc types: 402/422/502/522
	3 outlets	3 x 0.15 cc types: 403/503
	4 outlets	4 x 0.15 cc types: 404/504



Number of pump cycles per cartridge 400 cc		~ 2700
Operating pressure		Up to 70 bar (1015 psi)
Lubricant	Oil or grease	Up to NLGI. 3 (with solid particles)
Operation temperature		- 25 °C...+ 70 °C
Number of outlets		Up to 4; right-angled and pivotable
Number of lubrication points		Up to 16 * / **
Connection		PA-tube; Ø T=6x4
Operating voltage		24V DC (by cable)
Connecting plug		M12 x 1, 4-pole
Current consumption at 24V DC		$I_{max} \leq 350$ mA
Installation position	Grease	Any
	Oil	Upright
Control	Integrated external	Microelectronic PLC
Pressure monitoring		Integrated, electronic
Fill level monitoring		Integrated, reed contact
Error-signal	PLC	Sophisticated: reservoir empty/back-pressure/internal error
	Optical	Optional: LED-Connector 90° (134-002-014 / -015)
IP class		IP 65
Material housing		Zinc, polyamide

* by using Splitters up to 16 lubrication-points;
** by using progressive-distributors > 16 lubrication-points.

LUBRICATION OF PINIONS AND RACKS

Lubrication of open spur gear drives and racks

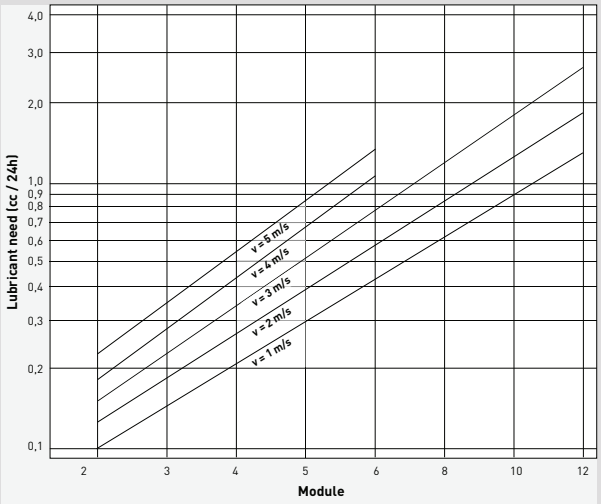
For open gears systems in open drives, an automatic lubrication supply should be prefered. Exceptions are possible, in the case of very small modules, slow speed < 1m/s and little travel one-time manual lubrication is adequate here. Therefore, we offer adhering grease Herion F01 (or F 02 for an application in the food industry (with H1-approval)).

Automatic relubrication with polyurethane foamed pinions

A far better technical solution to relubricate the tooth system is an automatic and continuous spreading of the lubricant with polyurethane foamed pinions, which are brought into contact with the drive gear or rack. The lubrication pinion does not transmit a torque – it only carries the grease to that part of the open gear system it touches.

The necessary relubrication amounts for different tooth systems with different running conditions is shown in the diagram below. Conditions for the validity of the values shown in the table below are the use of a suitable Herion polyurethane foamed pinion and a proper lubricant like Herion F01 or F02.

Lubricant need for lubrication with PU lubrication pinion



Lubrications & Lubrication tubes

Standard grease for open gears and bearings

Grease Herion F01

- Based on lithium/calcium complex with extreme pressure additives, which are combined with the soap structure so that an optimum adhesiveness to the metal surface is possible.
- Heat-resistant, good corrosion protection attributes, contains no solid components.

Operative ranges:

- Had been developed as special grease for high loaded open gears.
- Due to the high temperature properties usable for a wide range of applications, where high temperatures and high loads exist.
- Also recommended for ball bearings and roller bearings as well as for slide bearings/bushes and open gears.
- Temperature range -30 °C to +150 °C.

Description	Part No.
Individual cartridge for FlexxPump, pre-filled with 400 cm³ grease Herion F01	000-101-104
Grease Herion F01, 1 kg tin	000-101-210
Grease Herion F01, 400 cc, standard cartridge	000-101-220
Tube 6x4; pre-filled with grease Herion F01; sold by meter	134-003-001
Tube 6x4, sold by meter	134-001-001
Tube 6x4; transparent; only for oil, sold by meter	134-004-002

Other lubricants (e.g. greases with H1-approval (F 02) or with solid particles (graphite) F 05: on demand! Further tubes (e.g. suitable for drag chains): on request!

PU LUBRICATION PINION

Technical specification lubrication pinion
The Herion lubrication pinions are made of open cellular polyurethane foam (temperature range -30 °C....+150 °C) and from Module 3 are constructed from several segments.

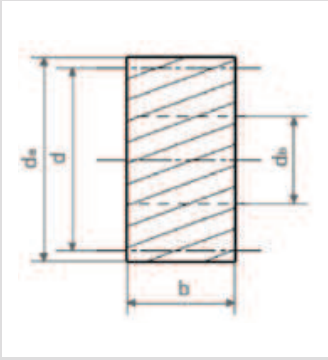
Choice of the correct lubrication pinion has to be decided by the design, if the lubrication pinion should be mounted on a rack or drive pinion. The mounting on the drive pinion should be prefered, because the distribution of lubrication is better than a lubrication of the rack.

Using lubrication pinions of an open-cellular polyurethane foam material ensures an optimal supply of the open gear system over long distances. The material stores the lubricant and delivers it in smallest quantities.

This avoids over-lubrication as well as wear (as a consequence of insufficient lubrication).

PU lubrication pinion helical

- Helical; LH
- Helix angle 19° 31´42´´
- Material: open-cellular polyurethane foam

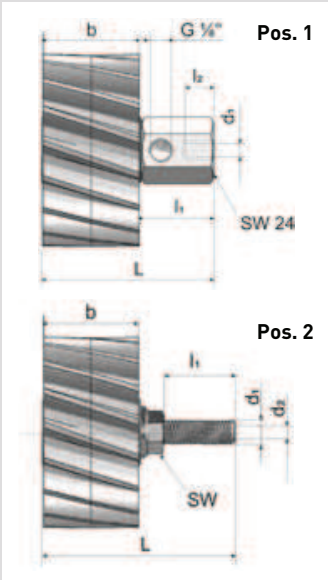


Module	z	da	d	db	b	Part No.
2.0	17	40.1	36.1	12.0	20.0	132-020-017
3.0	17	60.1	54.1	12.0	30.0	132-030-017
4.0	17	80.2	72.2	12.0	40.0	132-040-017

Mounting axes for PU lubrication pinions

- **Pos. 1:** Right-angled; connection for lubrication: radial
- **Pos. 2:** Straight; connection for lubrication: axial
- Material: steel

Other PU lubrication pinions and mounting axes in our huge stock program!
Special design (all parameters changeable): on request!



Module	L	l1	l2	d1	Connection	b	M (kg)	Part No.	Pos.
2.0	51.0	30.0	10	M 8	G 1/8"	20	0.14	133-020-001	1
3.0	61.0	30.0	10	M 8	G 1/8"	30	0.17	133-030-001	1
4.0	71.0	30.0	10	M 8	G 1/8"	40	0.20	133-040-001	1
2.0	61.0	30.0	-	M 10	M 6	20	0.08	133-020-002	2
3.0	71.0	30.0	-	M 10	M 6	30	0.11	133-030-002	2
4.0	81.0	30.0	-	M 10	M 6	40	0.14	133-040-002	2

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TUBE-CONNECTION FOR MOUNTING AXES

Application:
Connection between lubrication points and plastic tubes from relubrication systems (FlexxPump 400/500).

Technical data:
- Working pressure: max. 80 bar
- Working temperature: 30° C...+100° C
- Fluid: Oil, grease
- Material: nickel-plated brass 58, NBR, stainless steel

Features:
- Full flow for the fluid
- Very simple seal function through integrated O-rings with own seal
- Can be inserted and extracted with one hand
- Straight connectors with integrated hexagon socket
- All rotary elbow male adaptors can be rotated under pressure

Other tube-connectors at stock!

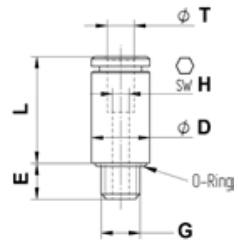
Straight tube-connectors

Thread G	Tube outer Ø T	AF	E	H	L	D	Part No.
M6	6 x 4	-	4	2.5	18.5	11	134-000-001
G 1/8"	6 x 4	11	6	4	18	-	134-000-002

Right-angled tube-connectors, pivoted under pressure

Thread G	Tube outer Ø T	AF	E	D	A	L	Part No.
M6	6 x 4	9	5	11	21	16	134-001-001
G 1/8"	6 x 4	13	6	11	21	20	134-001-002

AF: Width across flats · **H:** Hexagon socket



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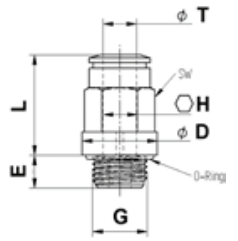

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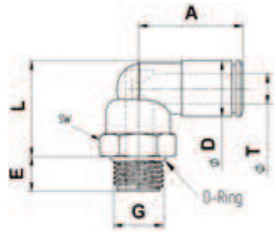


134-001-001
134-001-002

- Long standing experience and know-how of transmission technology and lubrication
- Reviewed and proven quality „made in Germany"
- Conceptual design, dimensioning and calculation of the relubrication amounts for the respective application
- CAD-datasets for design and documentation
- Standard parts in stock
- Wide selection of accessoires and connectors (in stock)
- Pre-finished, pre-filled and de-aerated components (on request)
- Installation Service on site (on request)
- Special design & own engineering; all parameters chosen freely, fast delivery and attractive prices - also for low quantities (on request).

Herion Schmiersysteme GmbH I Lilienthalstr. 1 I 82178 Puchheim
Tel +49 89 / 871819-52 I Fax +49 89 / 871819-54
mail@herion-schmiersysteme.de I www.herion-schmiersysteme.de

ASSEMBLY INSTRUCTION PINION

- To keep the gearbox securely in position, the installation of the pinion should take place before mounting the motor.
- During assembly place the gearbox vertically, gearbox output shaft pointing upwards.
- Prior to assembly the output shaft and the mounting parts have to be degreased and cleaned.
- Evenly warm the pinion up to 80 °C, in order to achieve sufficient expansion.
- Carefully put the pinion on the gearbox output shaft and slide it into position with little force.
- Mount the disc and tighten the screw with screw tightening torque. Screw locking medium Loctite 243.

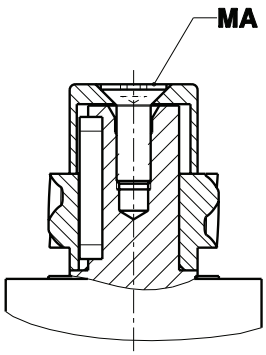
If the pinion jams during mounting, the tapped hole in the front face of the output shaft can be used.

High mounting forces caused by mounting presses must not be transferred through the gearbox output shaft to avoid any damage.

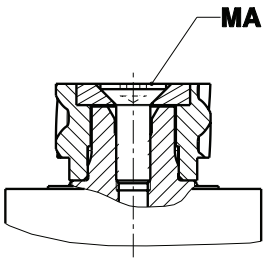
Data for the pinion mounting

Gearbox size	Screw type	MA
	ISO 10642 (DIN 7991)	(Nm)
050	M5 / 8.8	5.5
100	M8 / 8.8	22
200	M12 / 8.8	73
300	M16 / 8.8	184
04	M20 / 8.8	372
05	M20 / 8.8	372

MPRN



MPRW



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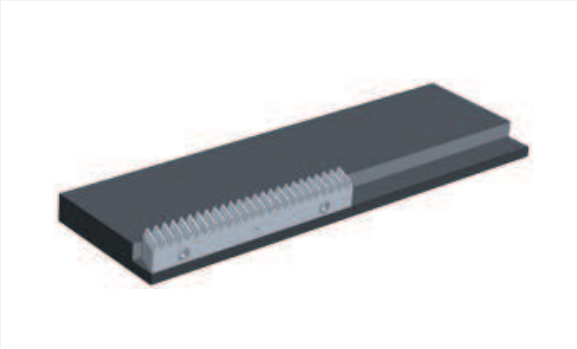
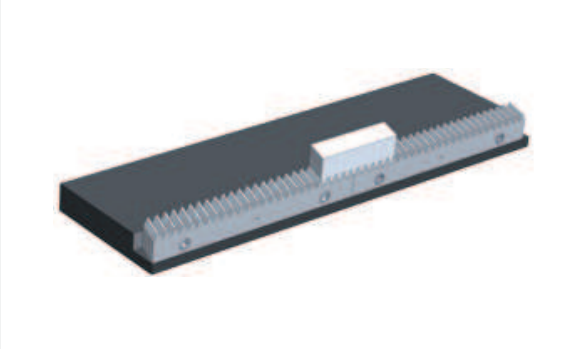
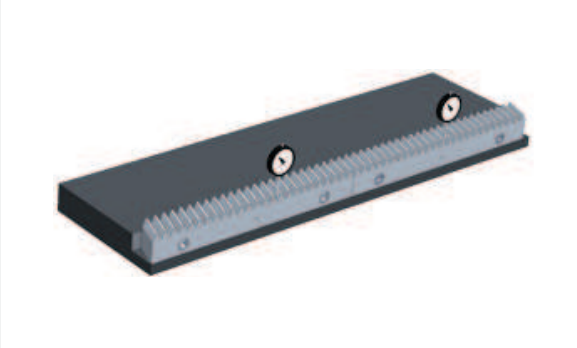
ASSEMBLY INSTRUCTION RACKS



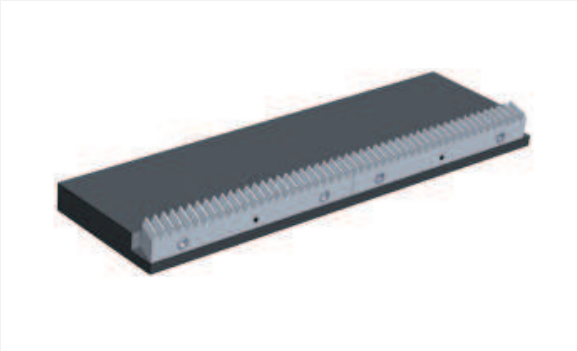
- Positioning and fixing of the rack (e.g. with screw clamps).
- Fixing of the rack with screws according to the defined torque.



- Connect another rack by means of a mounting piece (for mounting pieces, please see page 35).
- Fixing of the rack with screws according to the defined torque.

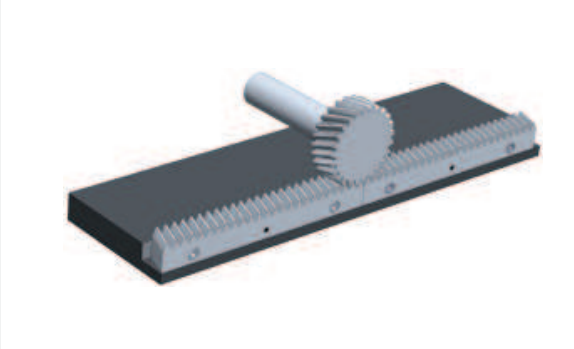


- After assembly, check the parallelism of the racks to each other and the transition from one to the other rack.
- Likewise, the correct alignment of the racks must be checked.



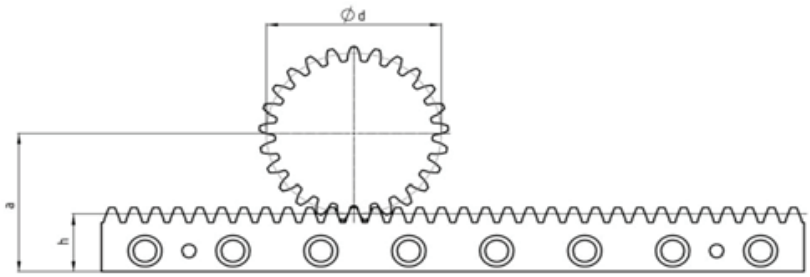
- Following the check, ream the register pins and pin the racks.

CENTER DISTANCE RACKS



The center distance a is determined by the distance between the center of the pinion to the back surface of the rack using the following formula:

$$a = \frac{z \cdot m}{2 \cdot cos\beta} + x \cdot m + h$$



a = Running center distance
z = Number of teeth
m = Module
β = Helix angle
x = Addendum modification
h = Height of pitch line to the back surface

Mounting pieces
Mounting pieces, helical teeth
Material: steel 1.0503 [C45]
Helix angle 19°31´42´´left hand

Mounting pieces for racks – quality 5

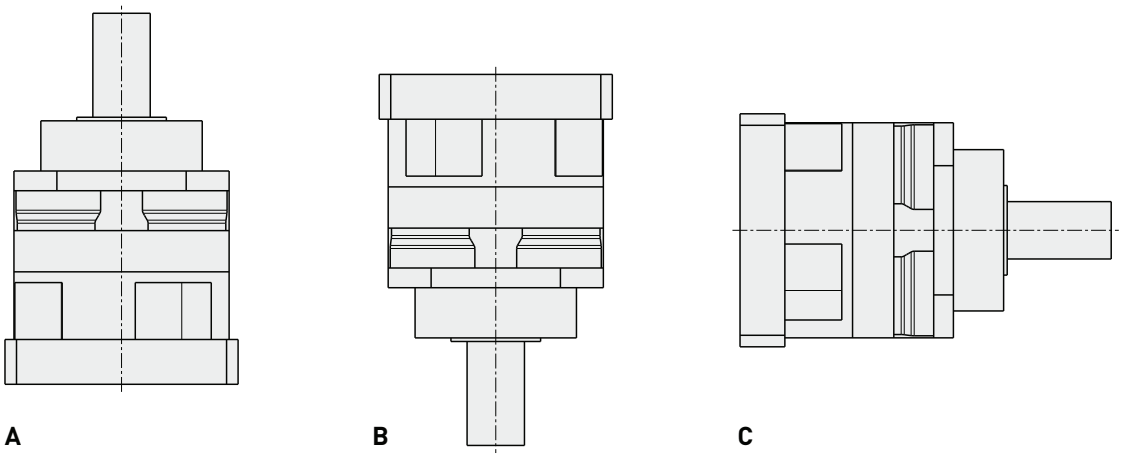
Module	L1	b	Part No.
2	200	24	143-020-002
3	200	29	143-030-002
4	200	39	143-040-002

Mounting pieces for racks – quality 6

Module	L1	b	Part No.
2	200	24	143-020-003
3	200	29	143-030-003

RECOMMENDED OILS FOR GEARBOXES

Note: The following specifications are valid for gearboxes MPRW 04, MPRW 05
Mounting position: (Side under)



Lubrication
The planetary gearboxes are always oil-lubricated, and are supplied filled with oil. In our works the gearboxes are filled with a synthetic poly-alpha-olefin-based gear oil. The viscosity is 150 cSt. The quantity of oil filled is suitable for the mounting position specified in the order. If the oil quantity is unknown when the order is placed, the quantity suitable for vertical mounting position A is filled.

Subsequent change of mounting position
If it is necessary to change the mounting position later, the oil should always be completely drained from the gearbox for safety reasons. Then fill with oil according to our specifications (see following table) in line with the new mounting position. One of the recommended oils should be used for this (see table below).

Oil quantities for mounting position (cc)

	A		B		C	
Ratio	3 - 10	12 - 100	3 - 10	12 - 100	3 - 10	12 - 100
MPRW 04	550	800	550	800	200	350
MPRW 05	800	1400	800	1400	600	850

Recommended oils

Mobil	Optimol
Mobil SHC 629	Optigear Synthetic A 150

Or equivalent oils from other manufacturers.

CAUTION! Do not mix mineral and/or synthetic oil grades. This could damage the gearbox.

FORMULAE SYMBOLS AND INDICES

Designation	Unit	Symbol
Force	N	F
Ratio	-	i
Backlash	arcmin	j
Inertia	$kgcm^2$	J
Running noise	dB(A)	L_{PA}
Mass	kg	m
Rotary speed	min^{-1}	n
Efficiency	%	η
Torque	Nm	T
Screw tightening torque	Nm	MA
Length	mm	L,l
Diameter	mm	D, d
Centre distance, system	mm	AS
Overall length, system	mm	LS
Tooth width, pinion	mm	B1S
Tooth width, rack	mm	B2S
Outside diameter, pinion	mm	DAS
Outer diameter, bushing	mm	DNS
Reference diameter, pinion	mm	DS
No. of teeth pinion / rack		z
Speed	m/min	v

Designation	Indices
Permissible value	perm
Input	1
Output	2
Acceleration	b
Average	m
Minimum	min
Maximum	max
Nominal	N
Emergency stop	ES
Radial	r
Circumference	u

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INQUIRY AND ORDER FORM

The ordering party is responsible for testing and sizing the drive as well as mounting it in the machine. Since not all the relevant parameters are available, this order cannot be checked for correctness by the companies WMH Herion and Wilhelm Vogel Antriebstechnik.

Customer / Company

Country

Customer number

Contact person

Street

Phone

Fax

Postal code

e-mail

City

Date

☐ **Inquiry**

☐ **Order**

☐ **Please contact me**

Custom design:

☐ **Yes**

☐ **No**

Please note: if you answer "yes", please fill in additional information on page 39.

Validity of data is hereby confirmed:

Company stamp and signature:

Name in print

City

Date

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Customer drawing:

Quantity:

Details of the system:

Precision:
- ☐ High Precision (MPRW)
- ☐ Precision (MPRN)

Gearbox size:

Ratio:

Load values for the overall system:

Travel speed [m/min]:

Tangential force [N]:

If the value for tangential force is not available, please specify the following values so that it can be calculated:

Mass [kg]:

Acceleration [m/s²]:

Process force [N]:

Mounting position of the rack:
- ☐ Vertical
- ☐ Horizontal

Friction coefficient in the guide [-]:

Further details of the gearbox:

Runtime h/day:

Starts/h:

Operating mode:

Ambient temperature: °C

Ambient air:
- ☐ Pure, free of particles
- ☐ Paper and textile fibres
- ☐ Dust
- ☐ Gas
- ☐ Other particles

Lubrication:
- ☐ Grease
- ☐ Oil
- ☐ mineral
- ☐ synthetic
- ☐ For use in the food industry

Side under:

Motor data:

Motor type:

Power [kW]:

Speed [min^{-1}]:

Shaft (d x l):

Pitch circle Ø (e1):

Centring Ø (b1):

Motor mounting (s2):

Square dimension (a1):

Details of the pinion:

Module:

No. of teeth:

Version for splined shaft connection ☐

Version for keyway connection ☐

Pre-mounted ☐ Loose ☐

Details of the rack:

Module:

Part No.:

Quantity:

Application area / Usage

Comment / Supplementary information / Requirements

Recorded by

Date

Return fax to Mr /Mrs

Fax

Return info per e-mail to

Your stamp:

VOGEL
ANTRIEBSTECHNIK

Wilhelm Vogel GmbH Antriebstechnik
Stattmannstr. 1 · 72644 Oberboihingen · Germany
Telefon +49 7022 / 60 01-0
Fax Distribution +49 7022 / 60 01-250
Fax Purchasing +49 7022 / 60 01-444
info@vogel-antriebe.de · www.vogel-antriebe.de

WMH Herion
part of your drive

WMH Herion Antriebstechnik GmbH
Stanglmühle 9-11 · 85283 Wolnzach · Germany
Telefon +49 8442 / 96 99-0
Telefax +49 8442 / 96 99-288
info@wmh-herion.de
www.wmh-herion.de