

ANDANTEX



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Instruction Book
of
Gear Segments

Version 1.5



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1. Installation Material

If screws, nuts and further components are damaged during service and maintenance, they need to be replaced. It is not allowed to reuse units which are damaged or not full working. It is only permitted to use recommended standard parts or parts which correspond to the quality specifications of the manufacturer as spare parts.

Contact surfaces, threads and through bore-holes must be cleared properly before units can be installed. Check bolted connections on a regular basis.

Cheese Head Screws (ISO 4762/DIN 912)

Module	Cheese Head Screws ISO 4762-12.9	Article No.	Fastening Torque [Nm]
1,5	M5x20	20074956	9
2	M6x30	20074991	15,4
3	M8x35	20074992	37,3
4	M8x45	20028926	37,3
5	M12x55	20074993	126
6	M16x70	20074994	310
8	M20x90	20074995	604
10	M30x120	20074996	2077

The stated torque specifications for headless screws and nuts are calculated values, based on the following requirements:

- VDI 2230 (edition 02/2003)
- Coefficient of friction for threads and bearing surfaces $\mu = 0,10$
- 90 percent utilization of the elastic limit

The coefficient of friction μ_{total} is severely influenced by the lubrication. Thus surfaces without finishing treatment are deemed to be (screws and nuts):

- $\mu_{\text{total}} = 0,10$ when lubricated with Molykote
- $\mu_{\text{total}} = 0,14$ when oiled slightly

Cylinder Pin with Internal Screw Thread (DIN 7979)

Module	Cylinder Pin DIN 7979 Form D	Article No.
1,5	6x30	20070673
2	6x36	20074997
3	8x45	20074998
4	8x55	20074999
5	12x80	20075001
6	16x100	20075002
8	20x120	20075003
10	20x140	20075004

Taper Pin with Internal Screw Thread (DIN 7978)

Module	Taper Pin DIN 7978 Form A	Article No.
1,5	6x30	20075005
2	6x36	20075006
3	8x45	20075007
4	8x55	20075008
5	12x80	20075009
6	16x100	20075010
8	20x120	20075011
10	20x140	20075012

2. Tools and Appliances

2.1 Tools

- Dial gauge 0,01
- Magnetic measuring stand
- Mounting unit
- Screw clamp
- Metering roller or measuring balls
- Screw-bonding (Loctite 243)
- Reamer
- Spotting paste (WMH Article No. 20061472)
- Core drill
- Oil rubber
- Magnetic drill
- Torque wrench
- Hammer

2.2 Metering Roller

Module	Metering Roller Diameter	Article No.
1	1,70 mm	20037640
1,5	2,70 mm	20037641
1,591	2,70 mm	20037641
2	3,35 mm	20037642
2,5	4,20 mm	20037643
3	5,30 mm	20037646
3,183	5,30 mm	20037646
4	6,70 mm	20037647
5	8,35 mm	20068369
6	10,55 mm	20068370
8	14,00 mm	20062610
10	16,71 mm	20062612

The theoretic diameter of the metering roller is due to:

$$D_m = \frac{(m \cdot \pi)}{2 \cdot \cos(\alpha)}$$

Metering rollers which are in contact near the pitch line are chosen. As an alternative, common cylinder pins that correspond to the tolerance class IT6 can be used.

3. Installation

3.1 Preparation of the Mounting Surfaces

To guarantee a high coefficient of friction and an optimal fastening the below-mentioned criteria must be achieved:

- All seats must be metallic bright
- Surfaces must be free of paint and lubrication solvent
- Seats must be free of antidegradants
- The rack and the machine base must have the same temperature
- Locating surfaces and seats must be planed with a whetstone

Metering rollers/Measuring balls

- For spur-toothed segments use metering rollers
- For skew-toothed segments use measuring balls

3.2 Installation

1. Place the first segment (if at hand) on the drive hub and align it along the spigot
2. Fix the segment with two screws at the outer ends
3. Place the dial gauge on an irremovable unit of the machine/frame with its magnet foot and align the bulging disc of the measuring sensor vertically along the rotational axis
4. Turn the drive hub with the segment around the rotational axe and determine and record the roll or ball dimensions on the first (A), the middle (B), and the last (C) tooth gap



5. Fill in the measured value in the Excel-calculation sheet “gear segments”

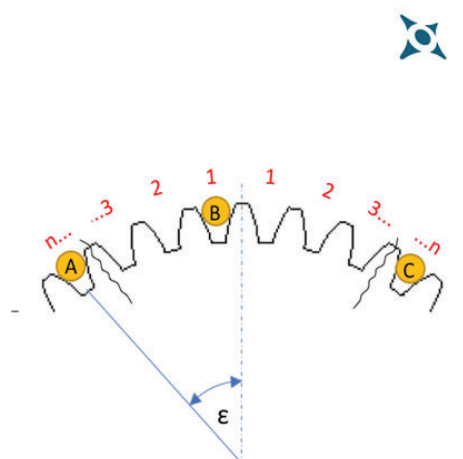
Module	m	10 [mm]
Teeth (Amount)	z	300 [mm]
Measuring Roller Diameter	D_{M}	16 [mm]
Pressure Angle	α	20 [°]
Helix Angle	β	0 [°]
Profile Shift	x	0 [mm]
Quality		5
Pitch Diameter	d	3000 [mm]
Roll Dimension Radius		1509,769 [mm]

Symmetry	<div> <div></div> <div> <div></div> <div> <div></div> <div></div> </div> </div> </div>	<div> <div></div> <div> <div></div> <div></div> </div> </div>
Angle	ϵ	18,60 [°]

Actual Value Dial Gauge		Tooth Space Nr.
Point A	0,2000 [mm]	16
Point B	0,0000 [mm]	1
Point C	0,0400 [mm]	16
Difference	-0,2000 [mm]	

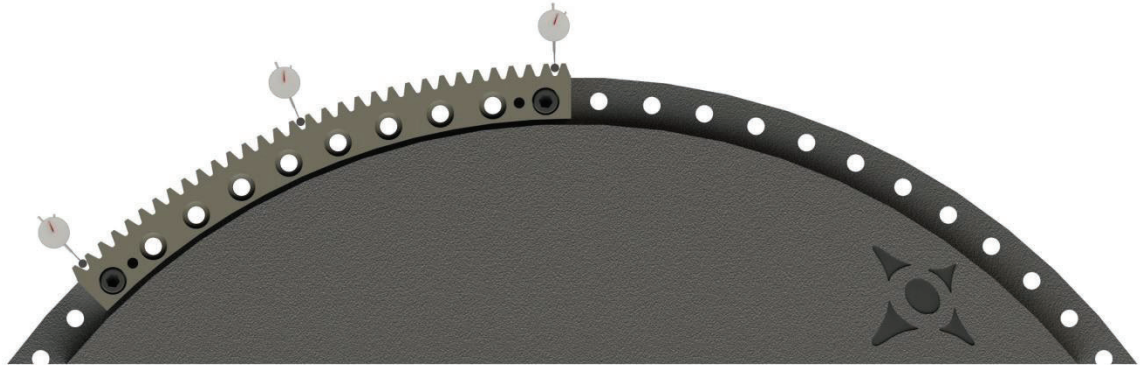
Actual Value Dial Gauge		[mm]
Point A		2,2941 [mm]
Point B		2,2941 [mm]
Point C		2,2941 [mm]

Concentricity Deviation	Fr^*_s	19,75 [μ m]
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The theoretic correction value can differ from the actual value, due to a large reference circle diameter, a short segment angle and gear tooth tolerances.

6. Align the segment to the target values of the roll or ball dimensions (A), (B) and (C), which you can read off the calculation sheet.

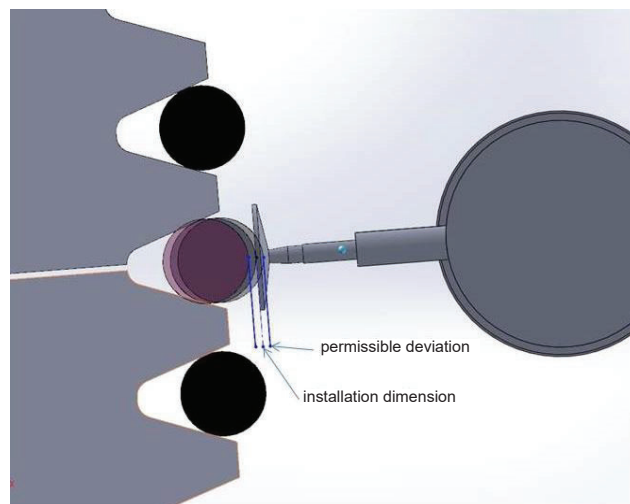
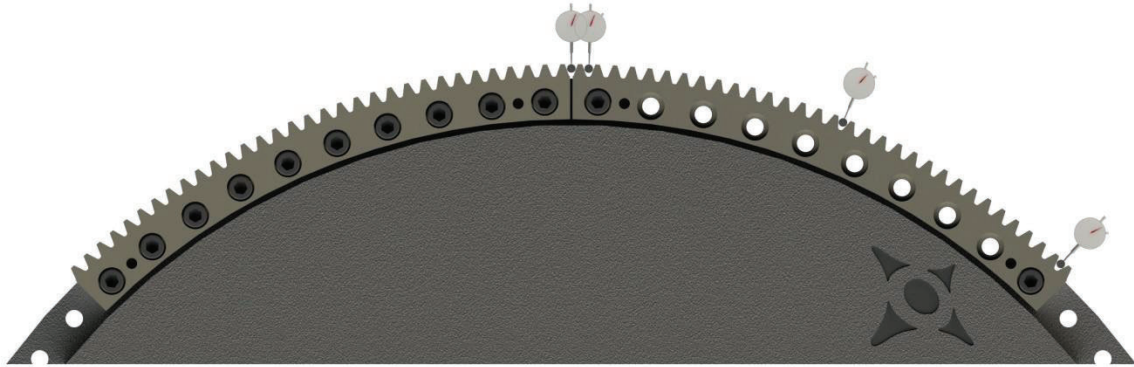


A correct installation of the first segment is extremely important, as the concentricity of the rotational axis is adjusted to it.

7. Screw the adjusted segment with a torque.



8. Fix the next segment on the outer ends and align it by the help of a dial gauge. Adjust the mounting gap then. Therefore, the accepted irregularity at the mounting gap in the specified width must be minded.

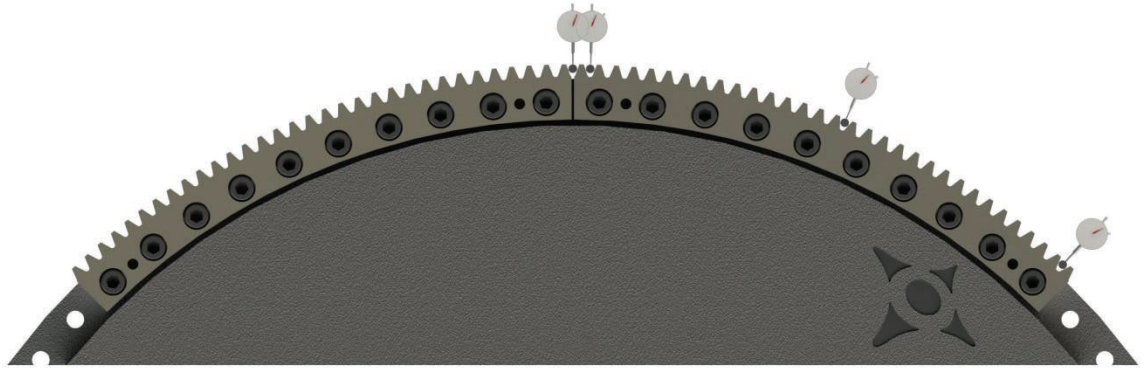


Permissible deviation of roll dimensions

	Axial run-out due to DIN 3962 T1 [μm]										Roll dimension irregularity at the mounting gap [μm]									
	Module		until 6				More than 6 until 10				until 6				More than 6 until 10					
	Quality		6	7	8	10	6	7	8	10	6	7	8	10	6	7	8	10		
Pitch circle diameter	Pitch circle-Ø																			
	more than	10																		
	until	50	11	16	18	36	16	32	40	80	11	15	22	49	14	16	25	55		
	m.t.	50																		
	until	125	12	16	22	40	20	36	50	100	12	16	22	55	14	19	27	62		
	m.t.	125																		
	until	280	12	18	25	40	22	40	56	110	12	16	25	55	15	19	27	62		
	m.t.	280																		
	until	560	14	20	28	45	28	45	63	125	14	19	27	62	15	22	30	69		
	m.t.	560																		
	until	1000	16	20	32	45	28	50	71	140	15	22	27	62	15	22	34	77		
	m.t.	1000																		
	until	1600	16	22	36	50	32	56	80	160	16	22	30	69	16	25	34	77		
	m.t.	1600																		
	until	2500	18	25	40	56	36	63	90	160	16	25	34	77	19	27	38	87		
	m.t.	2500																		
	until	4000	20	28	40	63	40	63	90	180	19	27	38	87	22	30	44	98		
	m.t.	4000																		
	until	6300	22	32	45	71	45	71	100	200	22	30	44	98	25	34	44	110		
	m.t.	6300																		
	until	10000	25	36	50	80	50	80	110	220	25	34	49	110	27	38	49	124		

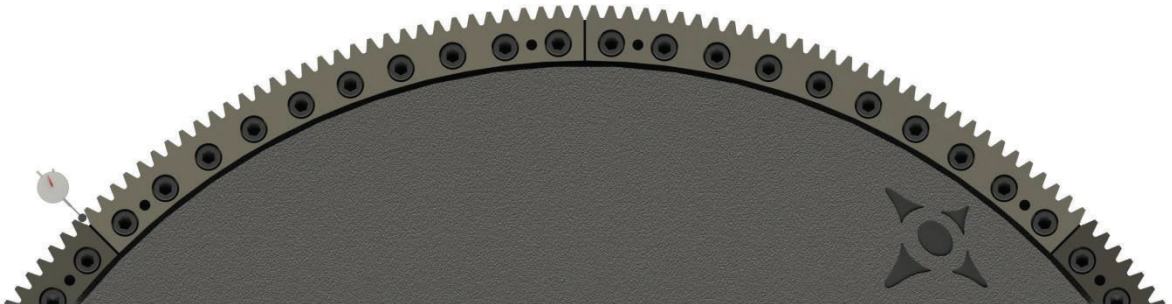
For segments with a pitch circle diameter of more than 10.000 mm, the values for a pitch circle diameter in the range between 6.300 mm and 10.000 mm can be used for the permissible deviation in the roll dimension, in particular for the concentricity deviation according to DIN 3962 and the roll dimension deviation at the assembly gap, as in DIN 3962 no more values are given for larger pitch circle diameters.

9. Screw the adjusted segment with a torque.

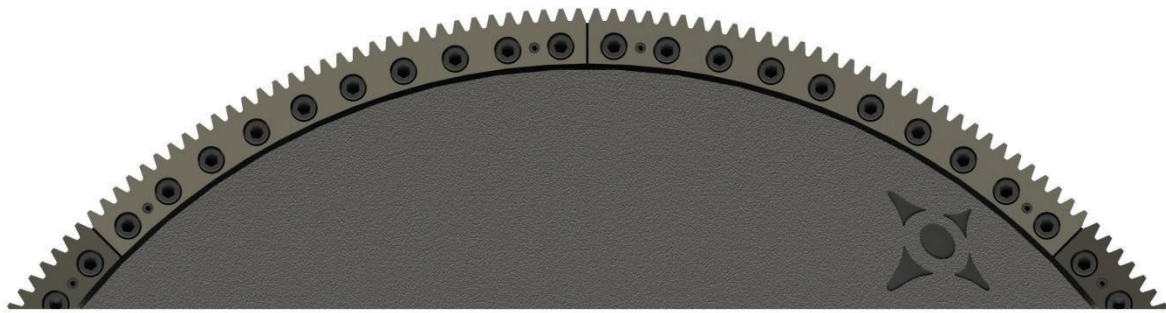


10. Install all further segments like it is explained in step 7 and 8.
11. Determine the gear rings' roll or ball dimensions of the last tooth gap with a dial gauge and record the result.

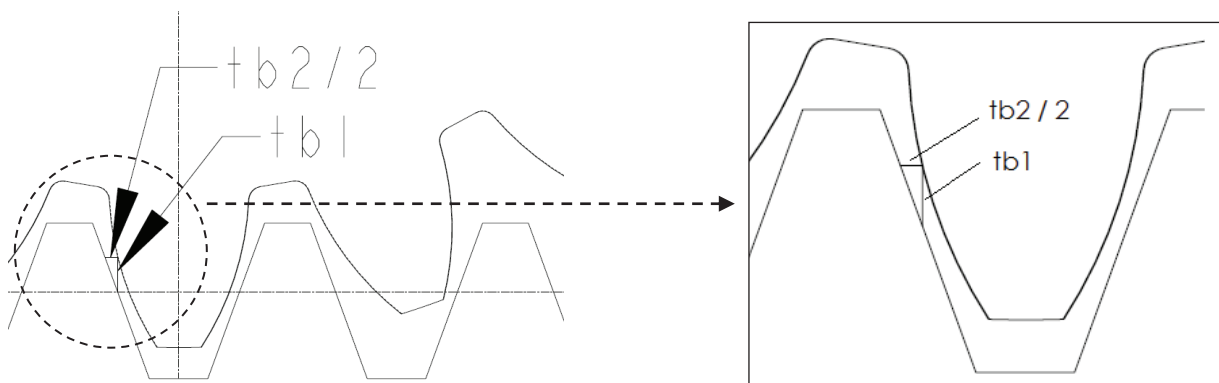
If a difference in roll or ball dimensions occurs when adjusting the last segment of the gear ring, it must be split consistently on all mounting gaps, so that the roll or ball dimensions are equal for all segments. The axial run-out must be checked on the whole perimeter.



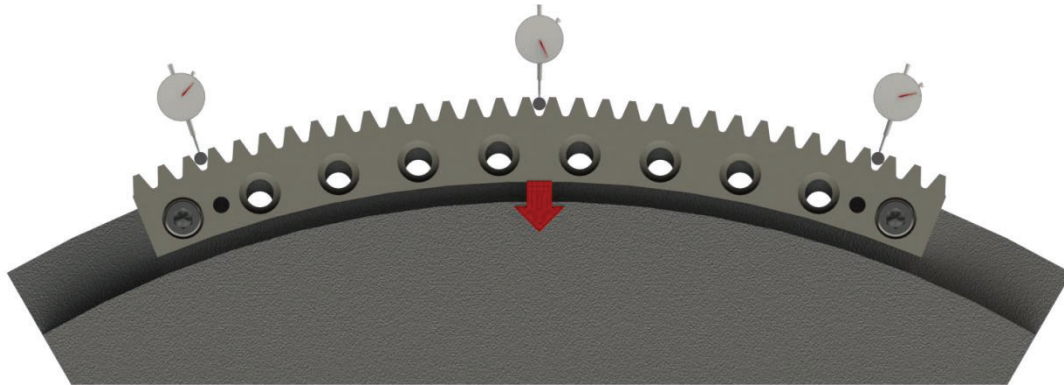
12. Drill holes for the aligning pins are reamed after the check. Clean the fitting holes and pin the gear segments. It is recommended to use pins with an internal screw thread (due to DIN 7979, DIN 7978).



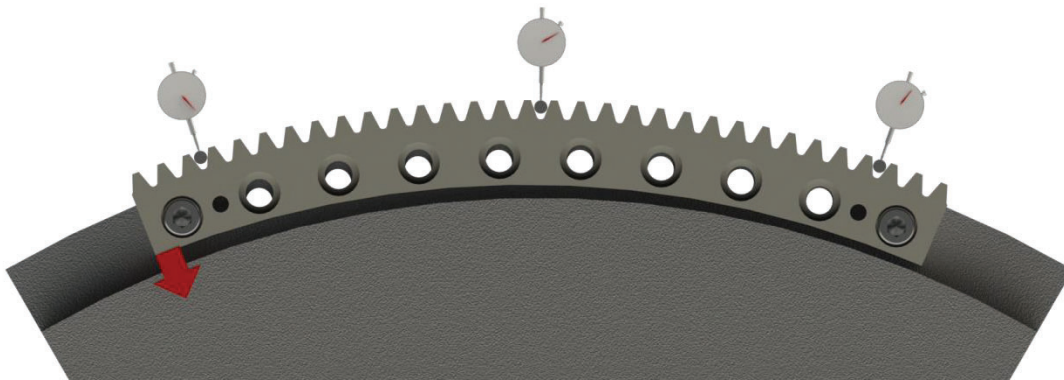
- 13.** Find the highest point of the gearing and mark it. Adjust the gear backlash at the gear rings' highest position. Guide value for a gear backlash $0,03 \dots 0,04 \times$ module. Adjust the driving pinion with enough clearance. To eliminate a clamping gearing, check if a smooth operation is possible.



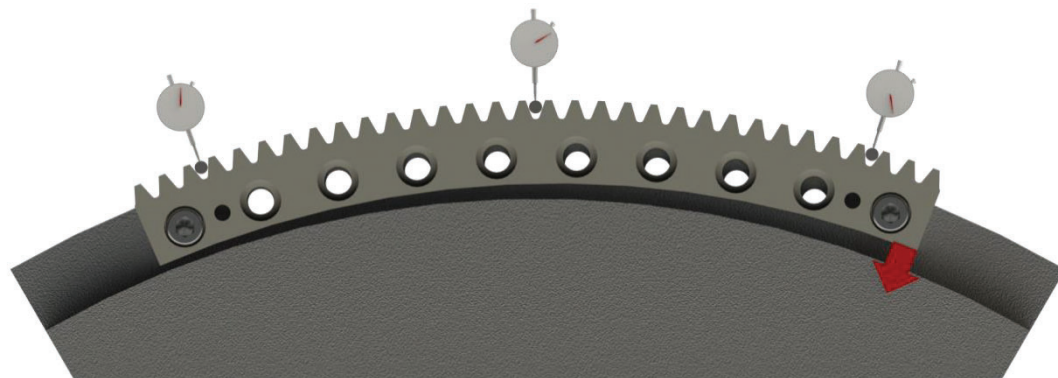
Potential Installation Errors



Wrong dimensions between axes:
Pull the segment to the midpoint



Wrong angle:
Turn the segment anti-clockwise



Wrong angle:
Turn the segment clockwise

4. Lubrication

A continuous lubrication via a lubricating pinion is recommended.

Product description Grease

Common grease for open gearing

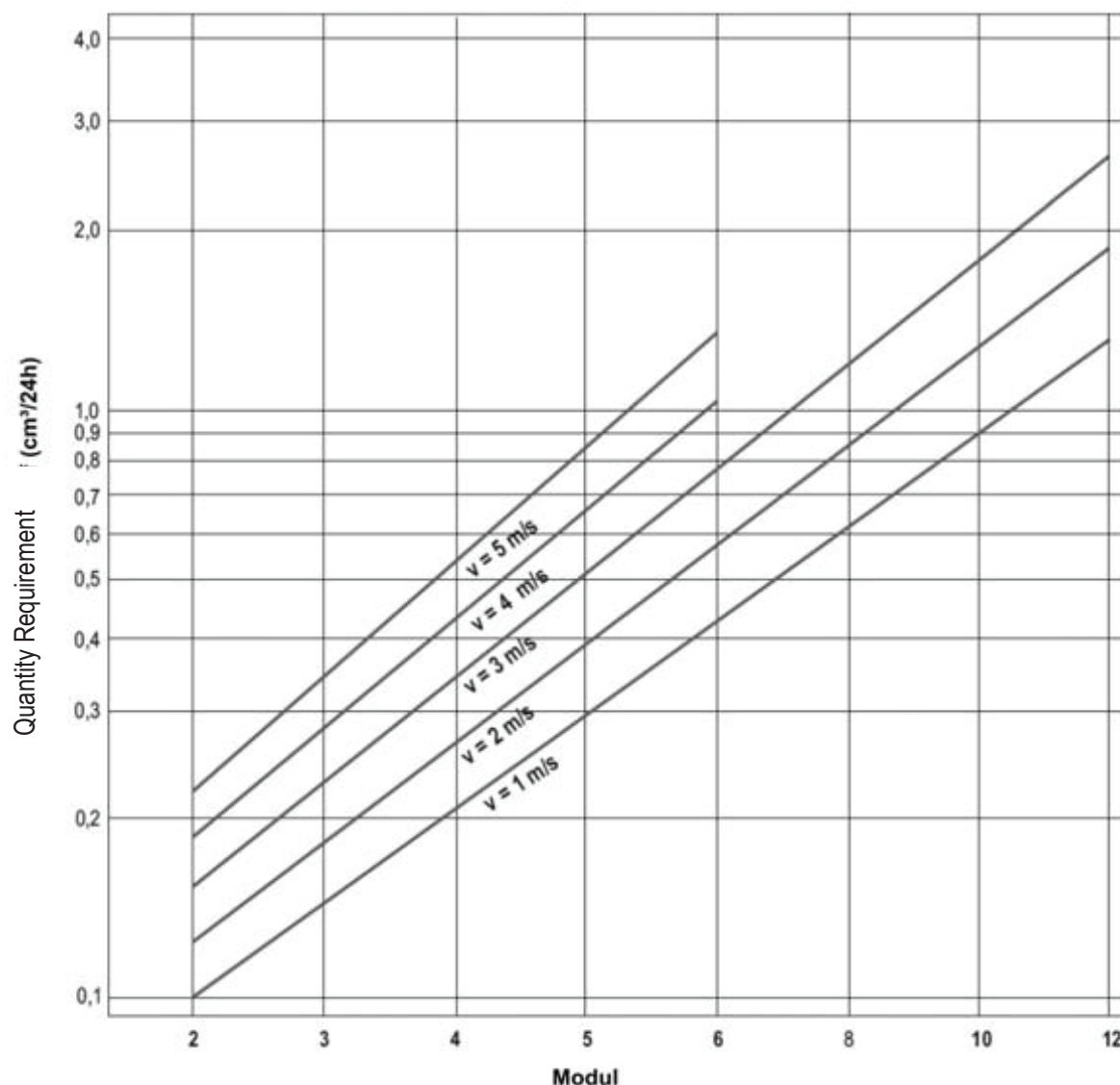
- Lithium/calcium-complex with Extreme-pressure additives, which are combined with a soap structure so that an optimum adhesiveness to the metal surfaces is achieved.
- It is heat-resistant, has a high protection against corrosion and is free of solid lubricants.

Application area:

- It is developed as lubricant for highly loaded open gearing
- As a result of its high temperature properties is suitable for a wide range of applications with high temperature and severe load conditions.
- Operating temperature range lies between -30°C and +150°C

Lubrication of Open Gearing:

Quantity Requirement for Lubricating with PU Lubrication Pinions



Attention! The disposal of old grease needs to be in an environmentally responsible way due to laws and regulations.

Attention!

Components need to be provided with anticorrosive coating immediately after cleaning.

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.