Vacuum Feedthroughs

Vacuum Feedthroughs

Rotary Feedthroughs ISO-KF / ISO-K

FRH DN 16 – DN 63

Properties

- For transmitting high torque
- With FPM shaft seal and ball bearings

Selection Data

Vacuum connection		DN 16 ISO-KF	DN 25 ISO-KF	DN 40 ISO-KF	DN 63 ISO-K
Feedthrough / seal		FPM	FPM	FPM	FPM
Shaft measure	mm	Ø5	Ø8	Ø12	Ø20

Ordering Information

Type	FRH016-H	FRH025-H	FRH040-H	FRH063-H
Part No.	214-300	214-302	214-304	214-306 [2]

Specifications

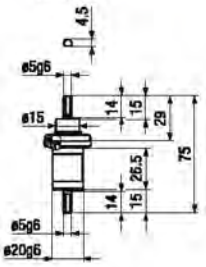
Transferable torque	Nm	1.5	6	25	100
Rotational speed [1]	rpm	1500	1000	750	500
Idling torque under vacuum	Ncm	≤3	≤4	≤5	≤10
Starting torque under vacuum	Ncm	≤6	≤8	≤10	≤20
Shaft load vacuum sided					
Radial force	N	60	150	250	500
Axial force	N	30	50	60	100
Service life	Revolutions	20 000 000	20 000 000	20 000 000	10 000 000
Tightness, static	mbar l/s	1×10^{-9}	1×10^{-9}	1×10^{-9}	1×10^{-9}
Pressure (absolute)		1×10^{-9} mbar ... 1 bar			
Operating temperature	°C	50			
Bakeout temperature	°C	110			
Materials exposed to process media		Stainless steel 420/1.4021 Aluminum 6082 Elastomer FPM			
Weight	kg	0.1	0.2	0.6	2

[1] When a reduced service life is acceptable, the rotation can be increased by up to a factor of two
[2] Centering ring / CR / aluminum Part No. 212-251 / FPM / stainless steel Part No. 212-281 not included in delivery

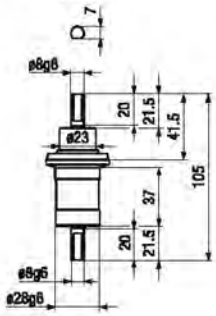
FRH DN 16 – DN 63 (continued)

Dimensions

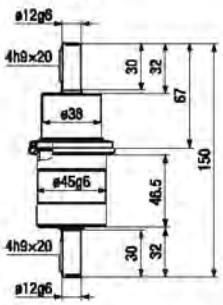
FRH016-H



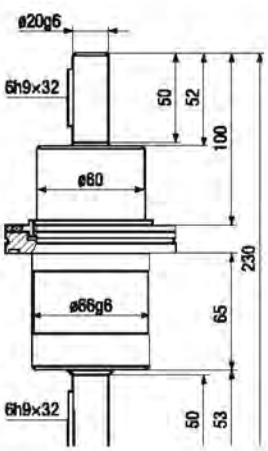
FRH025-H



FRH040-H



FRH063-H



Rotary Feedthroughs CF

FRU DN 16 – DN 40

Properties

- Bellow sealed
- All-metal version
- For very demanding vacuum requirements

Selection Data

Vacuum connection		DN 16 CF-F	DN 40 CF-F	DN 40 CF-F
Feedthrough / seal		bellow	bellow	bellow
Shaft connection	mm	4	8	12

Ordering Information

Type	**FRU016-H**	**FRU040-N**	**FRU040-L**
Part No.	**214-310**	**214-312**	**214-314**

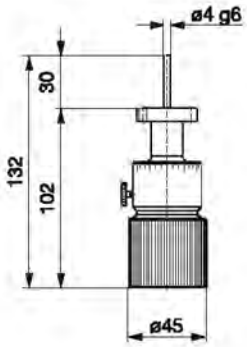
Specifications

Transferable torque				
Dynamic	Nm	0.4	4	10
Dynamic, at 300°C	Nm	0.2	2	2
Static	Nm	0.2	3	5
Rotational speed	rpm	200	1000	500
At max. torque	rpm		500	300
Shaft load vacuum sided				
Radial force	N	10	60	100
Axial force	N	5	20	30
Service life	Revolutions	1 000 000	2 000 000	1 000 000
Scale division	Degree	10	–	–
Tightness	mbar l/s		5×10^{-11}	
Pressure (absolute)			1×10^{-10} mbar ... 2 bar	
Operating temperature	°C		300	
Bakeout temperature	°C		300	
Materials exposed to process media		304L/1.4306 304/1.4301 –/2.4360	304L/1.4306 304/1.4301	304L/1.4306 304/1.4301 303/1.4305
Weight	kg	0.3	1.5	3.0

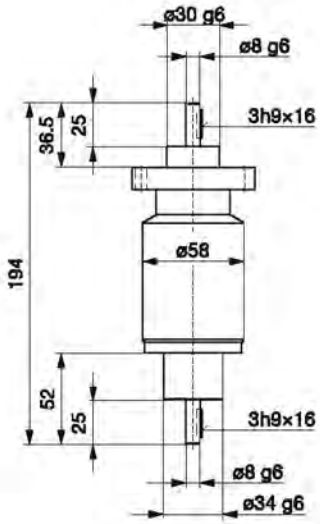
FRU DN 16 – DN 40 (continued)

Dimensions

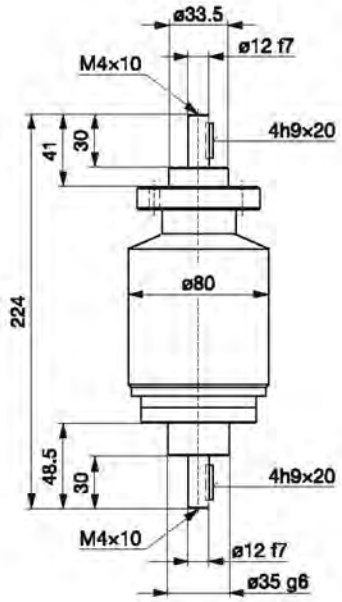
FRU016-H



FRU040-N



FRU040-L



Rotary/Linear Motion Feedthroughs ISO-KF

FCH DN 16 – DN 40

Properties

- Two FPM shaft seals
- Direct push/pull and rotary actuation
- With locking ring and optional anti-rotation device

Selection Data

Vacuum connection		DN 16 ISO-KF	DN 25 ISO-KF	DN 40 ISO-KF
Feedthrough/seal		FPM	FPM	FPM
Shaft connection		M 3 / Ø 5mm	M 4 / Ø 8mm	M 6 / Ø 12mm
Travel	mm	50	100	150

Ordering Information

Type		FCH016-H	FCH025-H	FCH040-H
Rotary/linear feedthrough	Part No.	214-320	214-322	214-324
Anti-rotation device	Part No.	214-072	214-073	214-074

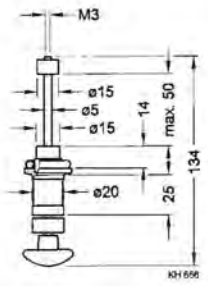
Specifications

Shaft load				
Radial force at max.travel	N	10	15	30
Torsion torque	Nm	2	8	20
Tightness, static	mbar l/s		1×10^{-9}	
Pressure (absolute)			1×10^{-8} mbar ... 1bar	
Operating temperature	°C		50	
Bakeout temperature	°C		110	
Materials exposed to process media			Stainless steel 304/1.4301 Aluminum 6082	
Weight	kg	0.1	0.2	0.3

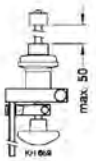
FCH DN 16 – DN 40 (continued)

Dimensions

FCH016-H

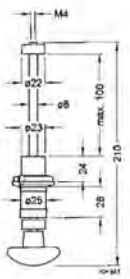


Feedthrough

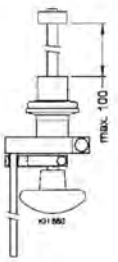


Anti-rotation device

FCH025-H

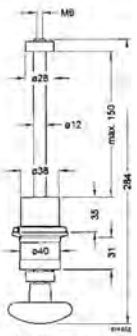


Feedthrough

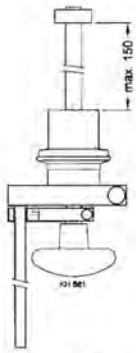


Anti-rotation device

FCH040-H



Feedthrough



Anti-rotation device

Linear Motion Feedthroughs CF

FPU DN 16 – DN 40

Properties

- With bellows for more demanding vacuum requirements
- Direct push and pull actuation
- High accuracy adjustment using micrometer screw

Selection Data

Vacuum connection		DN 16 CF-R	DN 40 CF-R	DN 16 CF-R	DN 40 CF-R
Feedthrough/seal		Bellow	Bellow	Bellow	Bellow
Shaft connection		M4x16 mm	M6x10 mm, Ø10 mm	M4x16 mm	M6x10mm, Ø10 mm
Actuator		Manual	Manual	Micrometer screw	Micrometer screw
Travel	mm	25	50	20	50

Ordering Information

Type	FPU016-H	FPU040-H	FPU016-Z	FPU040-Z
Part No.	214-330	214-332	214-334	214-336

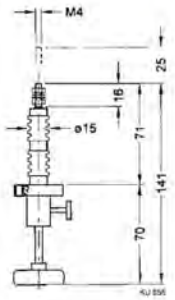
Specifications

Travel per revolution	mm			0.5	1
Scale division	mm	5	10	0.01	0.005
Shaft load					
Radial force at max.	N	20	100	20	100
Axial force vacuum	N	85	140	185	440
Axial force against atm	N	100	200	200	500
Torsion torque	Nm	0.2	0.5	0.2	0.5
Tightness	mbar l/s			5×10^{-11}	
Pressure (absolute)				1×10^{-10} mbar ... 2 bar	
Bakeout temperature					
Feedthrough	°C	300	300	300	300
Micrometer screw	°C			100	100
Materials exposed to process media				stainless steel 304L/1.4306 stainless steel 316Ti/1.4571	
Weight	kg	0.15	0.75	0.25	1

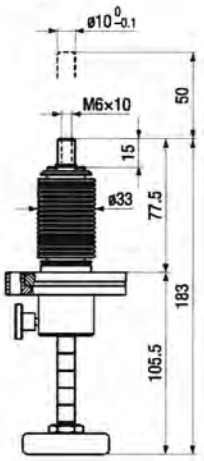
FPU DN 16 – DN 40 (continued)

Dimensions

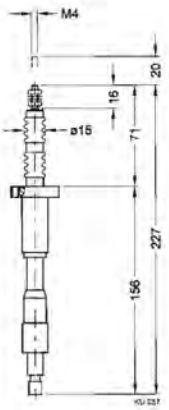
FPU016-H



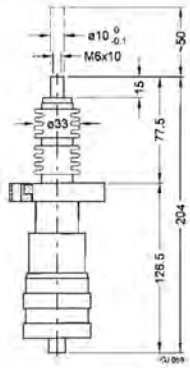
FPU040-H



FPU016-Z



FPU040-Z



Electrical Feedthroughs

DN 16 ISO-KF

Selection Data

Vacuum connection		DN 16 ISO-KF	DN 16 ISO-KF	DN 16 ISO-KF
Number of feedthroughs		4	9	9
Voltage per pole	V	50	50	50
Current per pole	A	1	2	2

Ordering Information

Feedthrough	**214-111**	**214-112**	**214-113**
Connector: vacuum side	–	–	**214-191**
Connector: atmospheric side	**214-171**	**214-172**	**214-172**

Specifications

Connection				
Vacuum side		Solder connection	Solder connection	Connector
Atmospheric side		Connector	Connector	Connector
Diameter of connecting wire	mm	0.6	1.2	1.2
Tightness	mbar l/s		1×10^{-9}	
Pressure (absoluts)			1×10^{-8} mbar ... 2.5 bar	
Bakeout temperature (feedthrough and connector)	°C		130	
Housing			Stainless steel 303/1.4305	
Insulator			PEEK / Araldite	
Seal			FPM	
Contacts (feedthrough and connector)			Gold-plated brass / bonze / inox	

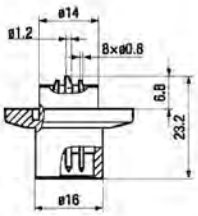
DN 16 ISO-KF (continued)

Dimensions

214-111

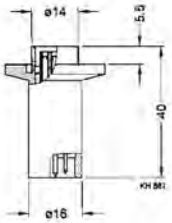
Feedthrough

214-112



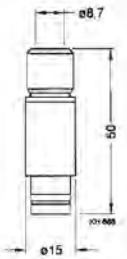
Feedthrough

214-113



Feedthrough

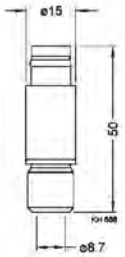
214-191



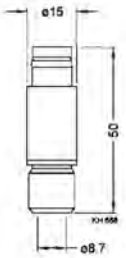
Connector:
vacuum side

214-171

214-172



214-172



Connector:
air side

Electrical Feedthroughs

DN 40 ISO–KF

Selection Data

Vacuum connection		DN 40 ISO - KF	DN 40 ISO - KF	DN 40 ISO - KF	DN 40 ISO - KF
Number of feedthroughs		7	7	4	1
Voltage per pole	V	380	380	800	6000
Current per pole	A	16	16	16	25

Ordering Information

Feedthrough	**214-121**	**214-122**	**214-123**	**214-131**
Connector: vacuum side	**–**	**214-193**	**214-194**	**–**
Connector: atmospheric	**214-174**	**214-174**	**214-175**	**214-180**

Specifications

Connection					
Vacuum side		solder connection	connector	connector	bolted connection
Atmospheric side		connector	connector	connector	connector
Diameter of connecting wire	mm	1.8	1.8	2.5	5
Test voltage	kV/HZ	–	–	–	15/50
Pressure (absolute)			1×10^{-8} mbar ... 2.5bar		
Bakeout temperature (feedthrough and connector)	°C		130		
Housing			stainless steel 303/1.4305		
Insulator			PTFE/Araldite		
Seal			FPM		
Contact (feedthrough and connector)		Gold-plated bronze	Gold-plated bronze	Gold-plated bronze	Nickel-plated brass

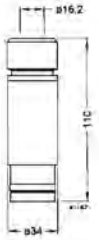
DN 40 ISO KF (continued)

Dimensions

214-193

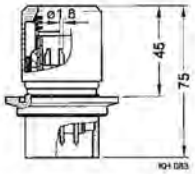
Connector:
vacuum side

214-194



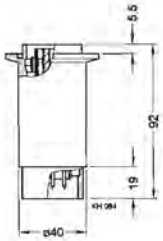
Connector:
vacuum side

214-121



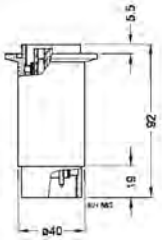
Feedthrough

214-122



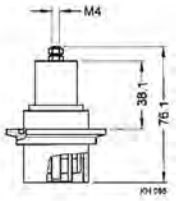
Feedthrough

214-123



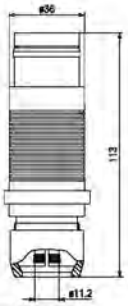
Feedthrough

214-131



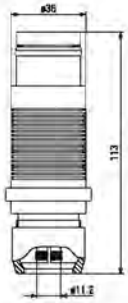
Feedthrough

214-174



Connector:
air side

214-174

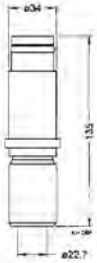


Connector:
air side

214-175

Connector:
air side

214-180



Connector:
air side

Electrical Feedthroughs

DN 16 CF-F

Selection Data

Vacuum connection		DN 16 CF-F
Number of feedthroughs		1
Voltage per pole	kV	0.3
Current per pole	A	120

Ordering Information

Feedthrough	**214-126**
Connection piece: vacuum side	**214-195**
Connector: atmospheric side	**214-176**

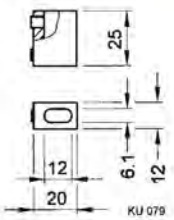
Specifications

Bakeout temperature	°C	400
Tightness	mbar l/s	5×10^{-11}
Pressure (absolute)		1×10^{-10} mbar ... 2 bar
Flange		Stainless steel 304L/1.4306
Conductor		OF-copper 2.0040
Insulator		Aluminum oxide ceramic Al_2O_3
Weight		0.15
Connection piece: vacuum side		2
Current max.	A	100
Bakeout temperature	°C	400
Material		Stainless steel 304/1.4301
Connector: atmospheric side	Pieces	2
Current max.	A	100
Insulated, for use up to	V (ac) / V (dc)	Not insulated
Bakeout temperature	°C	150
Contact		Silver-plated brass

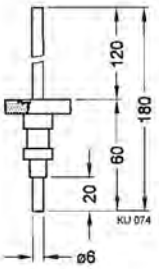
DN 16 CF–F (continued)

Dimensions

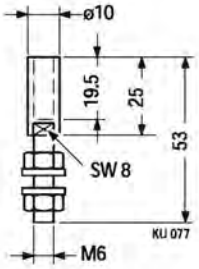
214-195



214-126



214-176



Electrical Feedthroughs

DN 40 CF-F

Selection Data

Vacuum connection		DN 40 CF-F	DN 40 CF-F	DN 40 CF-F	DN 40 CF-F	DN 40 CF-F
Number of feedthroughs		1	1	2	4	9
Voltage per pole	kV	0.3	1	4	1	1
Current per pole	A	70	200/1000 [1]	150	8	8

1) With water-cooling

Ordering Information

Feedthrough	**214-136**	**214-127**	**214-128**	**214-116**	**214-117**
Connection piece: vacuum side	**214-195**	**214-196**	**214-195**	**214-192**	**214-198**
Connector: atmospheric side	**214-176**	**214-177**	**214-176**	**214-173**	**214-181**
Connector: atm. side, H_2O cooled	–	**214-178**	–	–	–

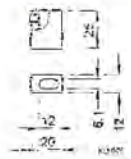
Specifications

Bakeout temperature	°C			400		
Tightness	mbar l/s			5×10^{-11}		
Pressure (absolute)				1×10^{-10} mbar ... 2 bar		
Flange		304L	304L	304L	304L	304L
Conductor		OFC 2.0040	OFC 2.0040	OFC 2.0040	304/1.4301	304/1.4301
Insulator		Al_2O_3	Al_2O_3	Al_2O_3	Al_2O_3	Al_2O_3
Weight		0.15	0.5	0.45	0.3	0.5
Connection piece: vacuum side		2	1	2	5	10
Current	A	20	1000[1]	100	12	12
Bakeout temperature	°C	400	400	400	400	400
Material		304/1.4301	2.0060	304/1.4301	304/1.4301	304/1.4301
Connector: atmospheric side	Pieces	2	1	2	5	10
Current max.	A	100	250	100	25	25
Insulated, for use up to	V (ac) / V (dc)	Not Insulated	30/60	30/60	30/60	30/60
Bakeout temperature	°C	150	150	50	50	50
Contact		Silver-plated brass	Silver-plated brass	Silver-plated brass	Gold-plated brass	Gold-plated brass

DN 40 CF (continued)

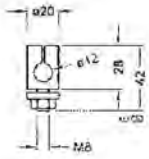
Dimensions

214-195



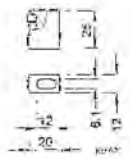
Connector vacuum side

214-196



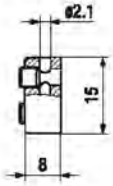
Connector vacuum side

214-195



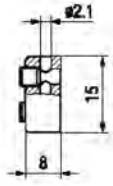
Connector vacuum side

214-182



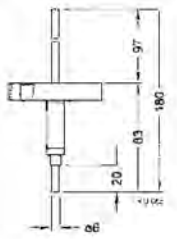
Connector vacuum side

214-196



Connector vacuum side

214-136

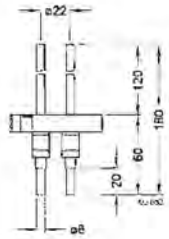


Feedthrough

214-127

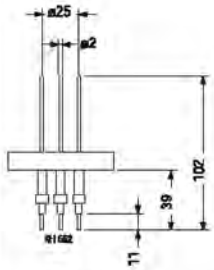
Feedthrough

214-128



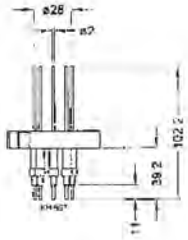
Feedthrough

214-116



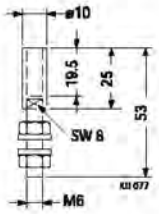
Feedthrough

214-117



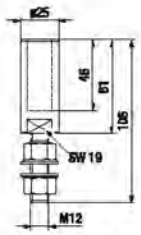
Feedthrough

214-176



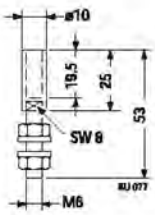
Connector air side

214-177



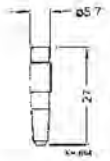
Connector air side

214-176



Connector air side

214-173

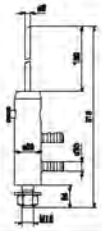


Connector air side
With soldered joint

214-181

Connector air side
With soldered joint

214-178



With water-proof [1]		
Current max.	A	1000
Not insulated, for use up to		24
Bakeout temperature	°C	120
Contact		Silver-plated brass

High Current Feedthrough

DN 40 ISO-KF

Properties

- Selection of three electrodes
- Slide into mounted feedthrough
- Current connection with water cooling

Selection Data

Vacuum connection		DN 40 ISO-KF
Number of feedthroughs		1
Voltage	V	100
Current	A	250/1500 [1]

[1] With water cooling

Ordering Information

Feedthrough with O-ring KF40	**214-141**
Current connection with water cooling [2]	**214-145**
Straight electrode	**214-142**
Angle electrode	**214-143**

[2] Not insulated

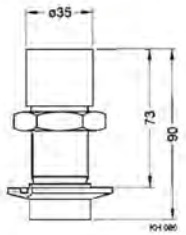
Specifications

Tightness	mbar l/s	1×10^{-9}
Pressure (absolute)		1×10^{-8} mbar ... 2.5 bar (max. 10 bar with external centering ring)
Bakeout temperature	°C	110
Housing		aluminum 6082
Insulator		thermoplast and thermoset
Seal		FPM

DN 40 ISO KF (continued)

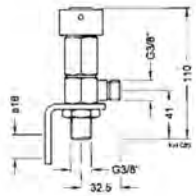
Dimensions

214-141



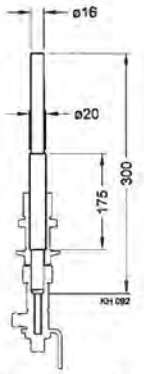
Feedthrough

214-145



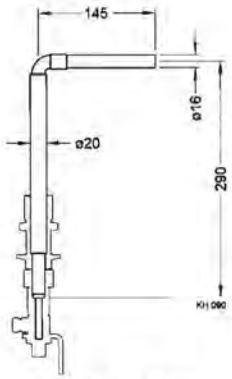
Current connection
with water cooling
copper/brass

214-142



Electrodes copper/brass

214-143



Electrodes copper/brass

Coaxial Feedthroughs ISO-KF / CF-F

BNC / MHV DN 16 – 40

Properties

- Based on MIL-C-39012A
- Voltage up to 5 kV DC
- With atmospheric connector

Selection Data

Vacuum connection	DN 16 ISO-KF	DN 16 ISO-KF	DN 16 CF-F	DN 16 CF-F	DN 40 CF-F
Number of feedthroughs	1	1	1	1	3

Ordering Information

Type	BNC	MHV	BNC	MHV	MHV
Part No.	214-151	214-152	214-155	214-156	214-157

Specifications

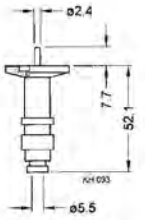
Voltage						
AC, 50 Hz	kV	0.35	3.5	0.35	3.5	3.5
DC	kV	0.5	5	0.5	5	5
Current	A	3	3	3	3	3
Frequency	MHz	150		150		
Impedance	Ω	50-60		50-60		
Insulation resistance at 20°C	Ω	10^{10}	10^{10}	10^{10}	10^{10}	10^{10}
Tightness	mbar l/s	1×10^{-9}	1×10^{-9}	1×10^{-10}	1×10^{-10}	1×10^{-10}
Pressure (absolute) [1]		1×10^{-8} mbar to 2.5 bar	1×10^{-8} mbar to 2.5 bar	1×10^{-10} mbar to 10 bar	1×10^{-10} mbar to 10 bar	1×10^{-10} mbar to 10 bar
Housing, flange, conductor		stainless steel	stainless steel	stainless steel	stainless steel	stainless steel
Feedthrough, seal		Al_2O_3	Al_2O_3	Al_2O_3	Al_2O_3	Al_2O_3
Bakeout temperature						
With connector	°C	50	50	50	50	50
Without connector	°C	200	200	400	400	400
Standart connection						
Atmospheric connector		UG 88/U	UG 932/U	UG 88/U	UG 932/U	UG 932/U
Cable		RG 58/U	RG 59/U	RB 58/U	RG 59/U	RG 59/U
Weight	kg	0.1	0.1	0.14	0.14	0.5

[1] Pressure at 400°C : 2 bar

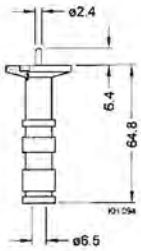
BNC / MHV DN 16 – 40 (continued)

Dimensions

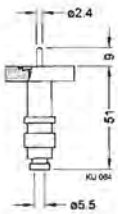
214-151



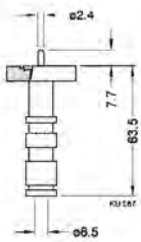
214-152



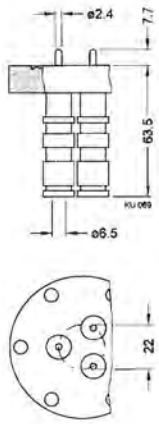
214-155



214-156



214-157



Vacuum Feedthroughs

Metal–Ceramic Connections

Properties

- High grade materials allow repeated bakings up to 400°C

Selection Data

Voltage [1]		3 kV	2 kV	5 kV	10 kV

Ordering Information

Part No.		214-161	214-162	214-163	214-164

Specifications

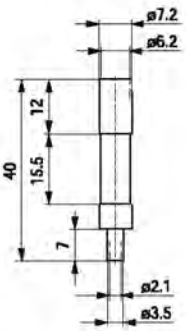
Insulator		Al_2O_3	Al_2O_3	Al_2O_3	Al_2O_3
Connection					
a		Fe-Ni	Ni-Co	Ni-Co	Fe-Ni
b		Fe-Ni	stainless steel 304/1.4301	stainless steel 304/1.4301	stainless steel 304/1.4301
Bakeout temperature	°C	400	400	400	400
Tightness	mbar l/s	5×10^{-11}	5×10^{-11}	5×10^{-11}	5×10^{-11}
Weight	g	5	12	25	90

[1] Based on VDE 0110 for air and surface-leakage in atmosphere on both sides. Higher values up to factor two are admissible in pressures $<10^{-4}$ mbar.

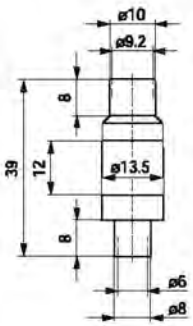
Metal–Ceramic Connections (continued)

Dimensions

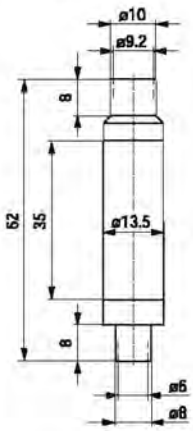
214-161



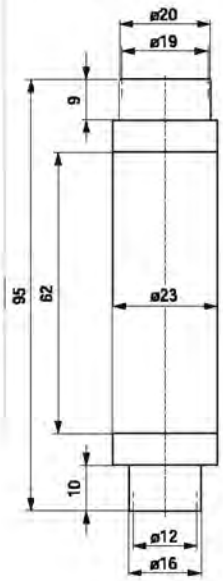
214-162



214-163



214-164



Liquid Feedthroughs ISO-KF / CF-F

DN 40

Properties

- For H_2O and LN_2
- Thermically insulated
- Specially suited for very hot and very cold applications

Selection Data

Vacuum connection		DN 40 ISO-KF	DN 40 CF-F
Feedthrough/seal		Welded	Welded
Tube dimensions	mm	Ø 8 x 1	Ø 8 x 1
Number of tubes		2	2

Ordering Information

Part No.	214-101	214-102

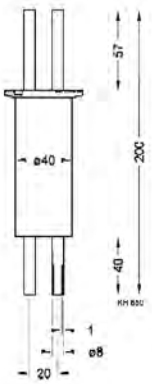
Specifications

Tightness	mbar l/s	1×10^{-9}	1×10^{-10}
Pressure		10^{-8} mbar ... 10 bar	10^{-9} mbar ... 10 bar
Temperature range	°C	-200 ... +150	-200 ... +400
Material		Stainless steel 304/1.4301	Stainless steel 304/1.4301
Weight	kg	0.3	0.3

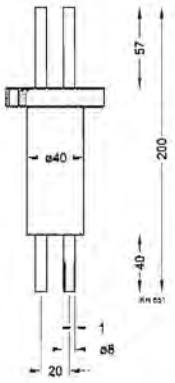
DN 40 (continued)

Dimensions

214-101

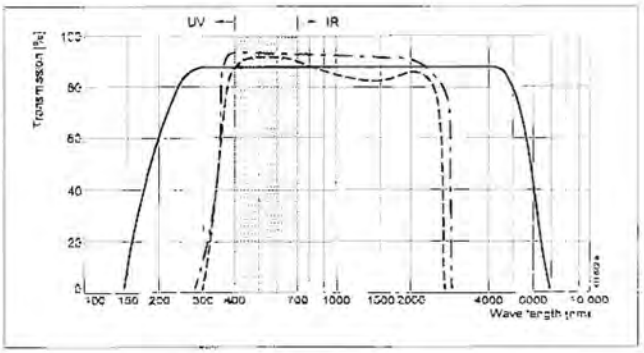


214-102



Viewports

DN 16 – DN 50 ISO-KF



Average transmittance curve
- Sapphire
- Kodial
- Borosilicate

Properties

- Wide viewing angle

Selection Data

Vacuum connection		DN16 ISO-KF	DN 25 ISO-KF	DN 40 ISO-KF	DN 50 ISO-KF
Window		borosilicate glass			
Seal		FPM			
Flange		aluminum 6082/3.2315			
Bakeout temperature	°C	150			

Ordering Information

Part No.	214-002	214-003	214-004	214-005

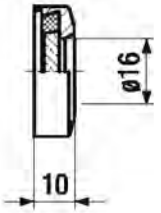
Specifications

Tightness	mbar l/s	1×10^{-8}			
Pressure (absolute)		1×10^{-8} mbar ... 4 bar			
Max. at 150°C	bar	3			
Window thickness	mm	3.8			
Weight	g	15	20	30	50

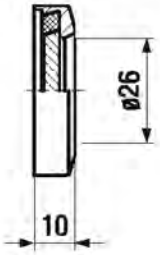
DN 16 – DN 50 ISO-KF - continued

Dimensions

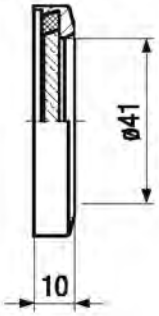
214-002



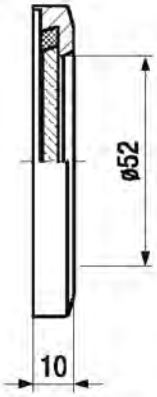
214-003



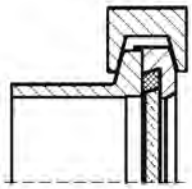
214-004

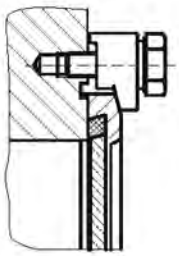


214-005



Mounting

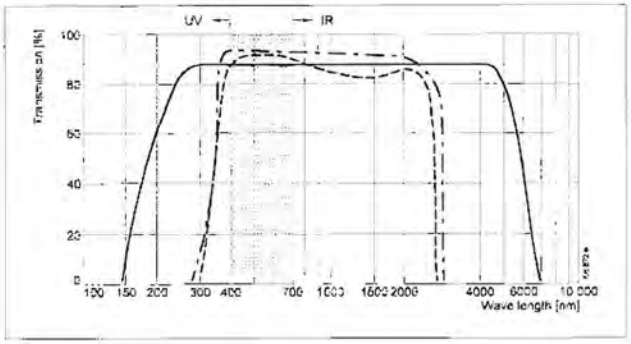




Claws, screws and clamping ring not included

Viewports

DN 63 – DN 160 ISO-K



Average transmittance curve

——— Sapphire

—·— Kodial

– – – Borosilicate

Properties

- Wide viewing angle
- 2011/65/EU RoHS compliant

Selection Data

Vacuum connection		DN 63 ISO-K	DN 100 ISO-K	DN 160 ISO-K
Window			Borosilicate glass	
Seal			FPM	
Flange			Aluminum 6082	
Bakeout temperature	°C		150	

Ordering Information

Part No.		214-006	214-007	214-008

Specifications

Tightness	mbar l/s		1×10^{-9}	
Pressure (absolute)			1×10^{-8} mbar ... 2 bar	
Max. at 150°C	bar		1	
Window thickness	mm	6	8	10
Weight	kg	0.2	0.3	0.4

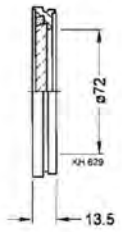
1) Claws not included

DN 63 – DN 160 ISO-K (continued)

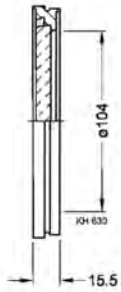
Dimensions

[mm]

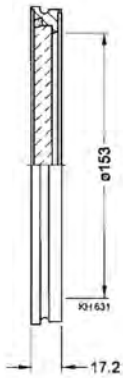
214-006



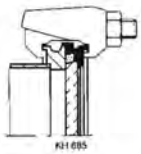
214-007



214-008

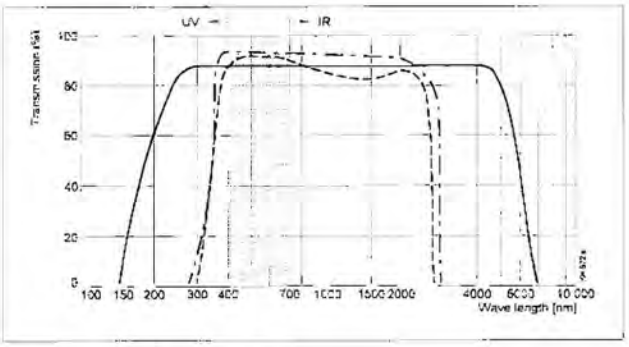


Mounting



Viewports

DN 16 – DN 160 CF



Average transmittance curve
—— Sapphire
—·— Kodial
– – – Borosilicate

Properties

- Protection window
- With Fe-Ni alloy as transition material

Selection Data

Vacuum connection		DN 16 CF-F	DN 40 CF-F	DN 40 CF-F	DN 63 CF-F	DN 100 CF-F	DN 160 CF-F
Window		Kodial glass	Kodial glass	Sapphire glass	Kodial glass	Kodial glass	Kodial glass
Seal		Iron/nickel					
Flange		Stainless steel 304/1.4301					
Bakeout temperature	°C	400					

Ordering Information

Viewport		**214-021**	**214-022**	**214-032**	**214-023**	**214-024**	**214-025**
Bolt set		**213-416**	**Standard**	**Standard**	**Standard**	**Standard**	**Standard**

Specifications

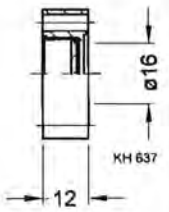
Tightness	mbar l/s	5×10^{-11}					
Pressure (absolute)							
Min.	mbar	1×10^{-10}					
Max.	bar	2					
Max. at 400°C	bar	1					
Window thickness	mm	1.5	3	3	3.5	6	8
Weight	kg	0.04	0.24	0.35	0.85	1.4	2.8

DN 16 – DN 160 CF (continued)

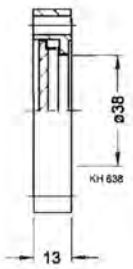
Dimensions

[mm]

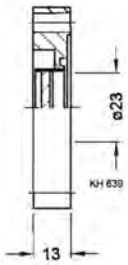
214-021



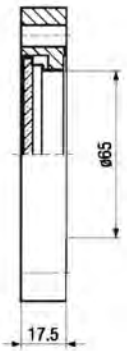
214-022



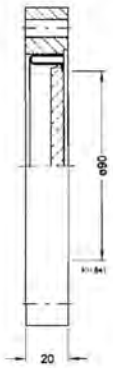
214-032



214-023

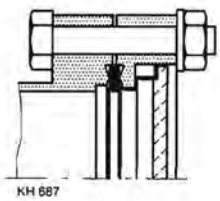


214-024



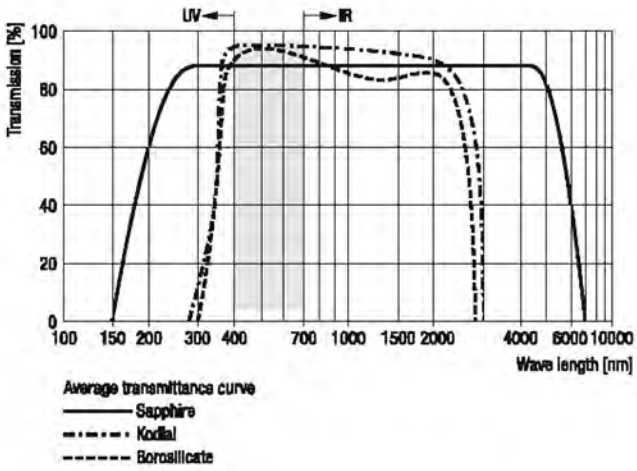
214-025

Mounting



Viewports

DN 63 – DN 160 ISO-F



Properties

- Wide viewing angle

Selection Data

Vacuum connection		DN 63 ISO-F	DN 100 ISO-F	DN 160 ISO-F
Window			Borosilicate glass	
Seal			FPM	
Flange			Black anodized aluminum 6082	
Centering ring			Aluminum 6082	
Snap ring			Stainless steel 304/1.4301	
Bakeout temperature	°C		150	

Ordering Information

Viewport [1)]	Part No.	**214-016**	**214-017**	**214-018**
Protective glass, 5 pcs.	Part No.	**214-046**	**214-047**	**214-048**

1) Claws, bolts, nuts and washer included

Specifications

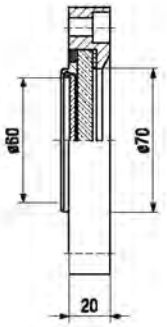
Tightness	mbar l/s		1×10^{-9}	
Pressure (absolute)			1×10^{-8} mbar ... 2 bar	
Max. at 150°C	bar		1	
Window thickness	mm	7.5	11	15
Protective glass thickness	mm	2.3	2.3	2.3
Weight	kg	0.8	1.4	3

DN 63 – DN 160 ISO-F (continued)

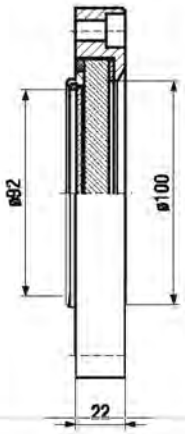
Dimensions

[mm]

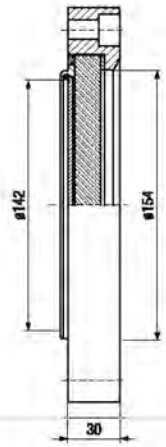
214-016



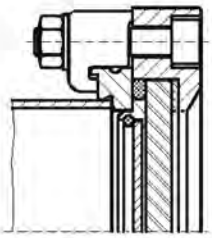
214-017



214-018



Mounting



Vacuum Feedthroughs

Vacuum Ball Bearings

Properties

- Especially suited for clean vacuum applications and extreme residual gas requirements
- With shields (non-rubbing seals)
- With dry lubrication
- Bearing clearance

Selection Data

Service life[1] (revolutions)		> 20 Mio.
Pressure (absolute)	mbar	1×10^{-12} ... 1×10^{-2}
Operating temperature[2]	°C	-200 ... +300
Material		
Inner ring, outer ring, balls	AISI/DIN	Stainless steel – /1.4037
Cage	AISI/DIN	Stainless steel 430 / 1.4016
Coating (dry lubrication)		
Inner ring, outer ring, cage		Wolfratherm®

[1] At half load and >1000 rpm
[2] At -200°C reduction of tenacity

Ordering Information

Type	624	605	626	608	6000	6001
Part No.	214-211	214-212	214-213	214-214	214-215	214-216

Specifications

Rotational speed at							
20°C	rpm	5000	4000	3000	2500	2000	1500
300°C	rpm	1500	1500	1000	800	500	300
Load capacity [1]							
Static load rating (Co)	N	400	400	800	1000	1500	2000
Dynamic load rating (C)	N	50	50	100	150	200	250
Axial load		<<C	<<C	<<C	<<C	<<C	<<C
Fit according to ISO		G6 / f6	G6 / f6	G6 / f6	G6 / f6	G6 / f6	G6 / f6
Weight	g	3	4	8	13	20	25

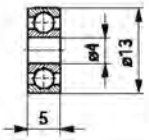
[1] At 20°C; half value at 300°C

Vacuum Ball Bearings (continued)

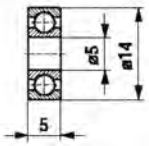
Dimensions

[mm]

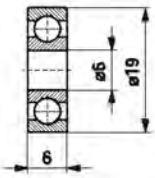
214-211



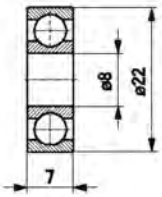
214-212



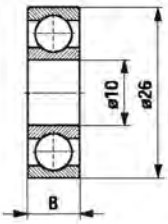
214-213



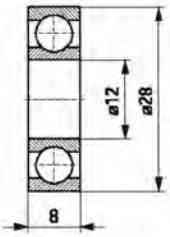
214-214



214-215



214-216



Vacuum Feedthroughs

Lubricants and Sealing Materials

High Temperature Lubricant

- Prevents seizing of stainless steel screw connections at atmosphere even at high temperatures
- Remains fully effective for at least 10 bakeout cycles

Selection Data

Temperature resistance	1000°C
In packages of	28 g

Ordering Information

Type	**C 100**
Part No.	**214-231**

Sealing Material

- For sealing small leaks

Selection Data

Temperature resistance	°C	-40 – 200
Version		Paste
In packages of	g	100

Ordering Information

Type	**Rhodosil 340**
Part No.	**214-233**

Lubricants and Sealing Materials (continued)

Vacuum Grease/Oil

- For sliding elastomer seals
- Low vapor pressure
- Good adhesiveness

Selection Data

Temperature resistance	°C	10 – 30	-40 – 200	-20 – 200	-60 – 300	-60 – 300
Vapor pressure at						
20°C	mbar	$<10^{-8}$	$<5 \times 10^{-7}$	$<10^{-12}$	$<10^{-12}$	$<10^{-12}$
100°C	mbar		$<7 \times 10^{-6}$	$<10^{-7}$	$<10^{-7}$	$<10^{-7}$
In packages of		25 g	50 g	10 g	30 g	10 ml
Material		Mineral grease	Silicon grease	Fluorinated grease	Fluorinated grease with MoS_2	Fluorinated oil

Ordering Information

Type	Apezon M	Dow Corning	FU 090	FM 090	OL 090
Part No.	214-236	214-237	214-238	214-239	214-240

Characteristics

Lubricity	Very good	Good	Good	Good/very good	Good
Resistance to					
Oxidation		Very good	Very good	Very good	Very good
Chemicals		Good	Very good	Very good	Very good
Thermal decomposition		Very good	Good	Good	Good