

$H_2$

H<sub>2</sub> HYDROGEN POWER  
CLEAN ENERGY OF THE FUTURE

Hydrogen  $H_2$

HYDROGEN BALL VALVES



**MHA ZENTGRAF**  
FlowControl Technology



## $H_2$ Ready

In the future, hydrogen will make a significant contribution to sustainability and environmental protection. For example, in e-mobility as an alternative fuel in fuel cells or in the production of green steel.

With years of experience in the gas sector, **MHA ZENTGRAF** has developed ball valves and flow control solutions for the complete hydrogen process chain: Hydrogen generation, transport and mobile pipelines as well as compression and dispenser stations. Pressure ratings up to 1000 bar are realized.

Since 2020 **MHA ZENTGRAF** has been a member of the German Hydrogen and Fuel Cell Association.



# MHA ZENTGRAF

## Your sustainable partner

Sustainability not only needs innovative products but also a sustainable partner. You can rely on **MHA ZENTGRAF** as your reliable supplier to build up a sustainable partnership. What makes **MHA** a sustainable partner?



### Environment

- ISO14001 certified
- RoHS und REACH compliant products
- Recyclable packaging material
- Lead free carbon steel
- Raw materials from certified european sources

Our ball valves are used in renewable energy and innovative systems like:

- Wind turbines
- Hydropower plants
- CO<sub>2</sub> extraction systems



### Global

- 4 branch offices worldwide
- Customer support in all time zones



### Risk management

- Private owned company
- Manufacturing sites at multiple locations



### Certified quality

- ISO 9001 certified
- DNV/GL type approval
- ABS design assessment
- VdS certified



### Innovative

- Supplier for customized solutions
- 15% engineers and scientists



### Digital

- ERP controlled production
- Digitally supported test cert. creation
- EDI-ready for customers



### Fast & flexible

- High level of manufacturing depth
- Customized products and processes
- Over 30000 products on stock

# Key features of **MHA** ball valves in hydrogen applications



## Size reduction

Ball valves have a significant advantage compared to other types of valves:

Full flow cross section in open position! A DN13 ½" ball valve has a Cv value of 22 gal / min. This Cv value can only be reached with sizes of approx. DN32 (1 ¼") at other valve types, e.g. globe or needle valves. In addition, ball valves can be used to achieve a high degree of leakage free closure.



## Temperature range

- Materials suitable for temperatures from -40 °C up to +140 °C
- Temperature range acc. ISO 19880-3 is specified as -40 °C / +85 °C



## Leakage

Internal and external leakage acc. DIN EN 12266 leakage rate A and the TPED standard for ball valves, ISO 23826



## Lubricants and cleaning

- Oil and grease free products through ultrasonic cleaning
- Assembly of valves without additional lubrication at all wetted surfaces

## Metallic materials

- Due to its high resistance against hydrogen embrittlement, 316-Series stainless steels (1.4404, 1.4571) are used whenever possible.
- If higher material strength is required, e.g. for stems, balls or trunnions, high strength austenitic stainless steels with particular resistance to strain-induced phase transformations, such as A286 (1.4980) and Nitronic-50®, are used. Duplex or Martensitic grades are avoided.



## Pressure testing

- Pressure testing acc. DIN EN 12266-1 and DIN EN 14246 with test gas (nitrogen + helium)
- Static and Cyclic high pressure gas testing with air ( $\leq 550$  bar) or nitrogen (up to 1000 bar) in the temperature range from -40 °C to +85 °C
- Valve endurance tests acc. to ISO 19880-3 and ISO 23826 (actuation at full  $\Delta P$ ,  $-40$  °C  $\leq T \leq +85$  °C) carried out inhouse during development and on customer request

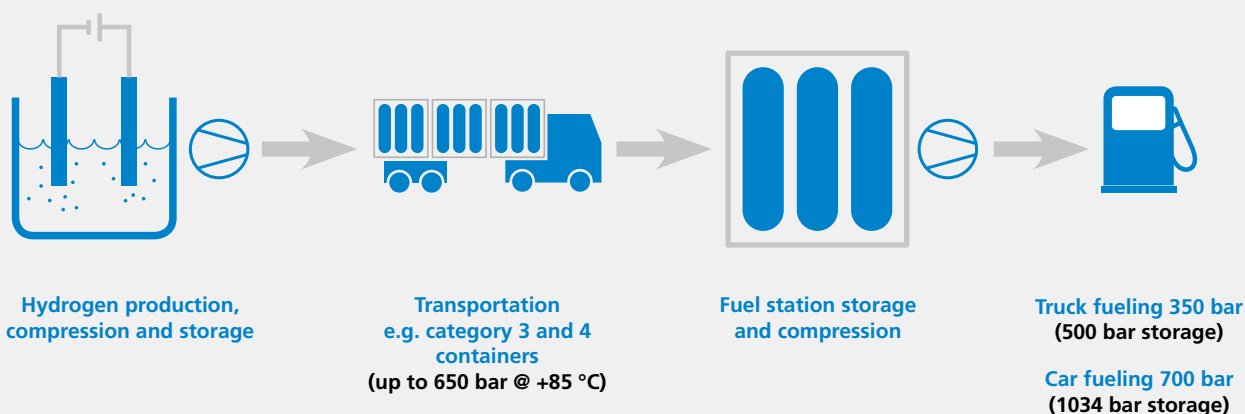


## Sealing materials

- All sealing materials chosen to prevent damages through explosive decomposition (e.g. NORSOK M-710)
- Sealing materials acc. DIN EN ISO 11114-2 for hydrogen usage
- Special attention is paid to low temperature seal performance



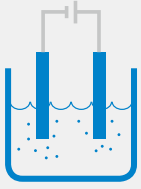
# The right product for your hydrogen application



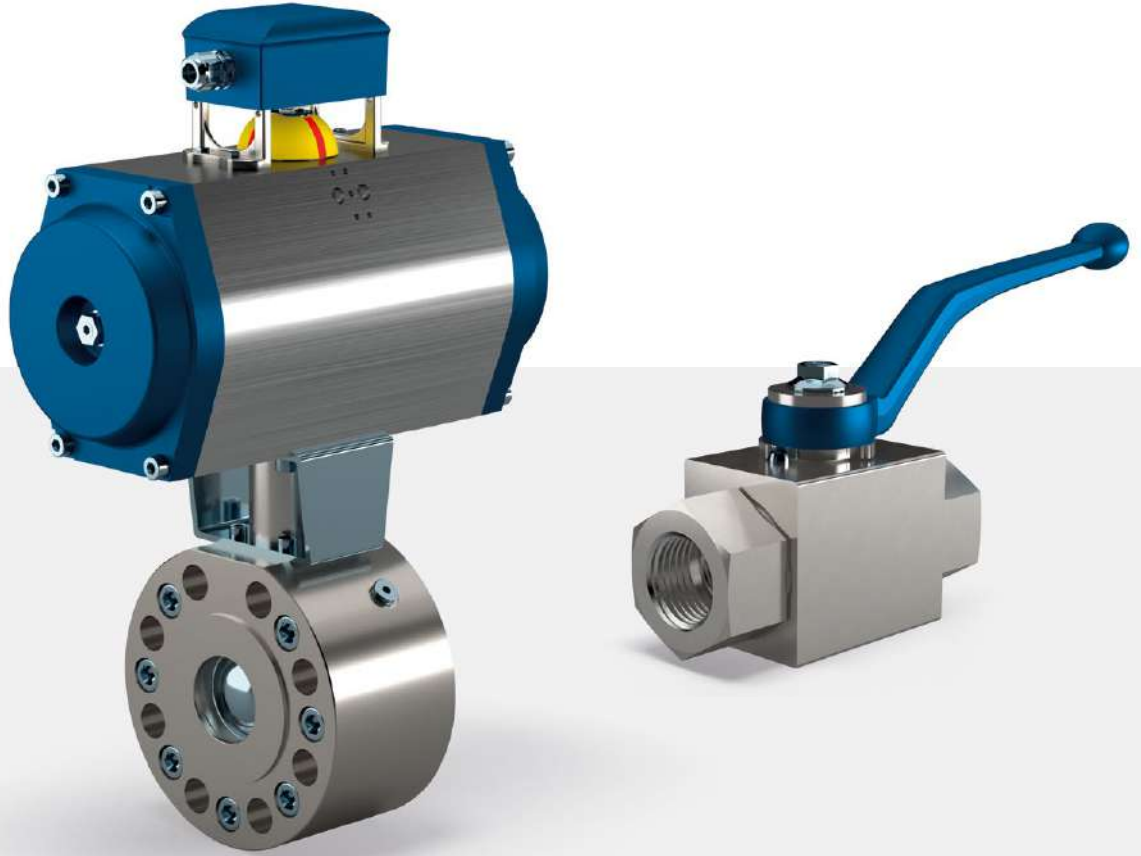
Our products can be used in the complete hydrogen process chain - hydrogen generation, transport and mobile pipelines as well as compression and fueling stations. We also pay attention to your specific application conditions to offer you the technically and economically best solution.







# Hydrogen production



## H<sub>2</sub> production

This application includes systems e.g. for electrolysis or power-to-gas systems. Of course, ball valves from **MHA ZENTGRAF** can also be used at these lower pressure applications.

Larger nominal widths of up to 4" can also be offered to ensure maximum flow capacity. A leakage rate A according to DIN EN 12266 is guaranteed even at larger nominal diameters.

Our valves are available with either threaded or flange connection according your specification. On request accessories like limit switches, locking devices or fully automated valves are available.

# Transport applications & fueling systems for hydrogen



## HFKH500

### Transport and fueling up to 500 bar

Gas transport and fueling applications set higher requirements for ball valves. At 350 bar fueling, system pressures up to 500 bar occur during compression and storage. Considering the temperature influence, a Type 3 Technology Cylinder for example is designed for system pressures of approximately 480 bar. During transport, vibrations and weather influences can put heavy strain on the system equipment. Additionally, valves for such kind of applications are actuated more frequently because filling and drain processes are carried out regularly.

For use as a maintenance valve, with occasional operations, we recommend our proven ball valves with gas seat system using hydrogen-compatible materials.

For ball valves with higher operation frequencies up to 500 bar, we offer our new HFKH500. Our ball valves are designed for switching under full differential pressure. On request, our ball valves can be supplied as a complete unit with assembled and tested actuator. These ball valves already meet the endurance requirements of the new ISO 23826 and can probably be used for TPED-relevant areas starting Q2 2023.



# Transport & fueling systems for hydrogen



## HFKH650

### Transport and storage up to 650 bar

Higher compression of hydrogen during transport and storage improves the efficiency of the systems, saves installation space and, last but not least, reduces costs. Considering the temperature influence, State of the Art Type 4 Technology Cylinders are designed for pressures up to 650 bar.

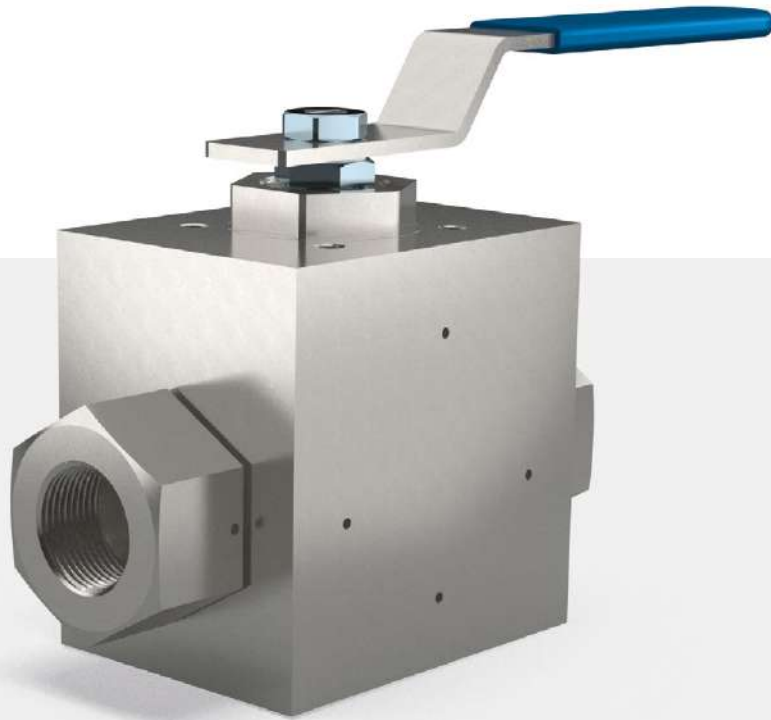
With the new HFKH650 ball valve, **MHA** offers a reliable solution for this kind of application. Additionally, it has a torque-optimized design so it can be conveniently switched by hand even at full differential pressure.

The new ball valve series already meets the endurance requirements of the new ISO 23826 standard and can probably be used for TPED-relevant applications starting Q2 2023.





# Hydrogen dispenser stations



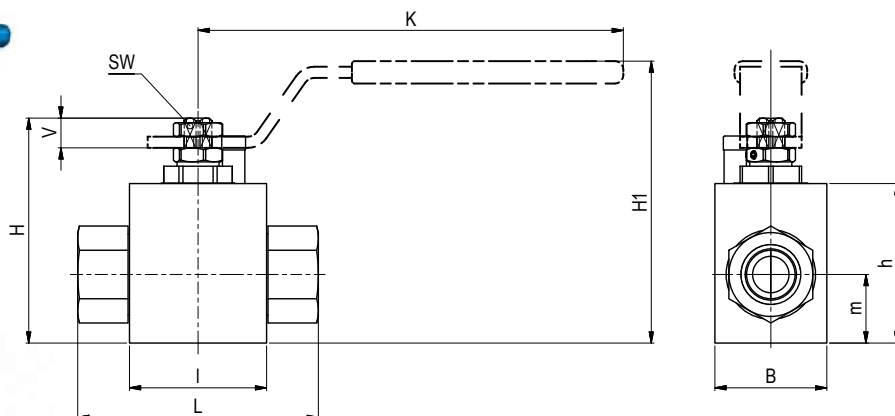
## HFKH1000

### H<sub>2</sub> fueling at pressures up to 1034 bar

At 700 bar fueling of passenger cars, hydrogen is compressed and stored at pressures up to 1034 bar. Latest developments reveal a tendency to 700 bar technology also for commercial vehicles such as trucks and busses.

ISO 19880-3 Standard (Gaseous Hydrogen – Fueling Stations – Part 3: Valves) differs between valves for maintenance (Class B) and operation (Class A) purpose. While Class B Valves are only meant to withstand 100 cycles of operation at room temperature, Class A Valves shall withstand 102000 cycles (100000 at RT, 1000 at -40 °C and another 1000 at +85 °C) without losing integrity of the seal system. **MHA** aims to qualify its HFKH1000 valve acc. to ISO 19880-3, Class A.

To enable up to 102000 actuations under full differential pressure, the HFKH1000 trunnion valve was designed with special attention to reduced wear and friction. This ensures a maximal level of reliability and sustainability even under harshest conditions.



#### AVAILABLE SIZES

DN8 (3/8"), DN13 (1/2"), DN25 (1")

#### CONNECTIONS

DIN ISO 228 Female thread, ANSI B1.20.1 NPT Female thread, SAE J514/ISO/DIS11926-1 Female thread, DIN 2353 / ISO 8343-1 Heavy series, others on request

#### ACCESSORIES ON REQUEST

- Locking devices
- Actuators
- Mounting holes
- Position switches
- Combinations
- Detent

#### MATERIAL CODE DESCRIPTION

Materials	44g8
Body	1.4571
Ball	1.4571 / Nitronic-50®
Stem	Nitronic-50®
Ball seats	PEEK
Body and stem sealing	FKM / PTFE*
Tmin / Tmax	-40°C / +85°C*

\*Others on request.

#### GENERAL DIMENSIONS

Type	L	B	H	h	m	Vmin	SW	K	H1	Lever
HFKH500-DN8	42	38	69,4	46	16,5	11	8	152	89,4	St
HFKH500-DN13	49	40	80,4	57	24,5	11	8	152	100,4	St
HFKH500-DN25	83,5	70	119,5	93	35	13,5	12	202	142	St

## HFKH500 also available as automated version

Your ball valve shall be automated? No problem! Upon request, you can have your ball valve equipped with a pneumatic, electric or hydraulic actuator. By adding accessories such as limit switch boxes or solenoid valves, the actuators can be individually adapted to your control technology. Even 3-position solutions for e.g. multi-way ball valves can be realized.

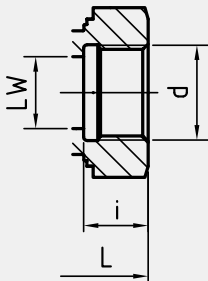
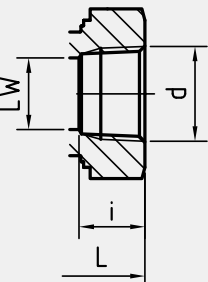
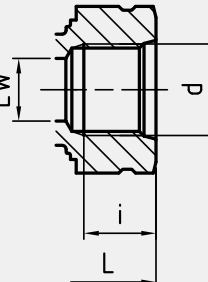
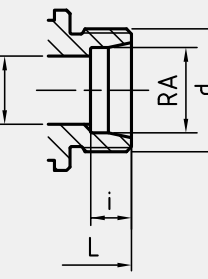
We adapt the drive design individually to your application. When sizing actuators, we pay attention to apply the appropriate safety factors so that a smooth operation of your system will be guaranteed at all times.



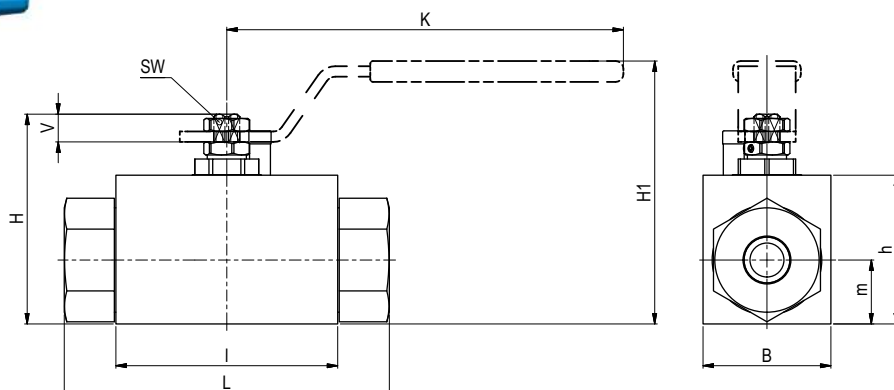
# Block ball valve Stainless Steel

## HFKH500

**H<sub>2</sub>** Ready

CONNECTION TYPE	DIMENSIONS						ORDER CODE PER MATERIAL COMBINATION		
DIN ISO 228 FEMALE THREAD	Type	LW	L	i	d	Weight [Kg]	PN [bar]	44g8	
	HFKH500-DN8-G 1/4	8	69,6	14	G 1/4	0,67	500	on request	
	HFKH500-DN13-G 1/2	13	86	16,3	G 1/2	1,15	500	on request	
	HFKH500-DN25-G 1	25	130,7	20	G 1	5,16	500	on request	
ANSI B1.20.1 NPT FEMALE THREAD	Type	LW	L	i	d	Weight [Kg]	PN [bar]	44g8	
	HFKH500-DN8-1/4" NPT	8	71,6	13,7	1/4" NPT	0,67	500	on request	
	HFKH500-DN13-1/2" NPT	13	86	17	1/2" NPT	1,16	500	on request	
	HFKH500-DN25-1" NPT	25	130,7	21,6	1" NPT	5,18	500	on request	
SAE J514/ISO/DIS11926-1 FEMALE THREAD	Type	LW	L	i	d	Weight [Kg]	PN [bar]	44g8	
	HFKH500-DN8-9/16" UNF	8	75,6	13	9/16"-18 UNF	0,73	500	on request	
	HFKH500-DN13-3/4" UNF	13	86	15	3/4"-16 UNF	1,16	500	on request	
	HFKH500-DN25-1 5/16" UN	25	130,7	20	1 5/16"-12 UN	5,13	500	on request	
DIN 2353 / ISO 8343-1 HEAVY SERIES	Type	LW	RA	L	i	d	Weight [Kg]	PN [bar]	
	HFKH500-DN8-12S	8	12	78,6	7,5	M 20x1,5	0,67	500	on request
	HFKH500-DN13-16S	13	16	89,6	8,5	M 30x2	1,12	500	on request
	HFKH500-DN25-30S	25	30	137,9	13,5	M 42x2	4,77	500	on request

Please note the pressure ratings of the tube connections!



#### AVAILABLE SIZES

DN8 (3/8"), DN13 (1/2"), DN25 (1")

#### CONNECTIONS

DIN ISO 228 Female thread, ANSI B1.20.1 NPT Female thread, SAE J514/ISO/DIS11926-1 Female thread, DIN 2353 / ISO 8343-1 Heavy series, C&T medium Pressure, others on request

#### ACCESSORIES ON REQUEST

- Locking devices
- Actuators
- Mounting holes
- Position switches
- Combinations
- Detent

#### MATERIAL CODE DESCRIPTION

Materials	44g8
Body	1.4571
Ball	1.4571 / Nitronic-50®
Stem	Nitronic-50®
Ball seats	PEEK
Body and stem sealing	FKM / PTFE*
Tmin / Tmax	-40°C / +85°C*

\*Others on request.

#### GENERAL DIMENSIONS

Type	L	B	H	h	m	Vmin	SW	K	H1	Lever
HFKH650-DN8	75,5	38	69,4	46	16,5	11	8	152	89,4	St
HFKH650-DN13	85	49	80,4	57	24,5	11	8	152	100,4	St
HFKH650-DN25	120	78	123,5	97	39	13,5	12	202	146	St

### HFKH650 also available as automated version

Your ball valve shall be automated? No problem! Upon request, you can have your ball valve equipped with a pneumatic, electric or hydraulic actuator. By adding accessories such as limit switch boxes or solenoid valves, the actuators can be individually adapted to your control technology. Even 3-position solutions for e.g. multi-way ball valves can be realized.

We adapt the drive design individually to your application. When sizing actuators, we pay attention to apply the appropriate safety factors so that a smooth operation of your system will be guaranteed at all times.



# Block ball valve Stainless Steel

## HFKH650

**H<sub>2</sub>** Ready

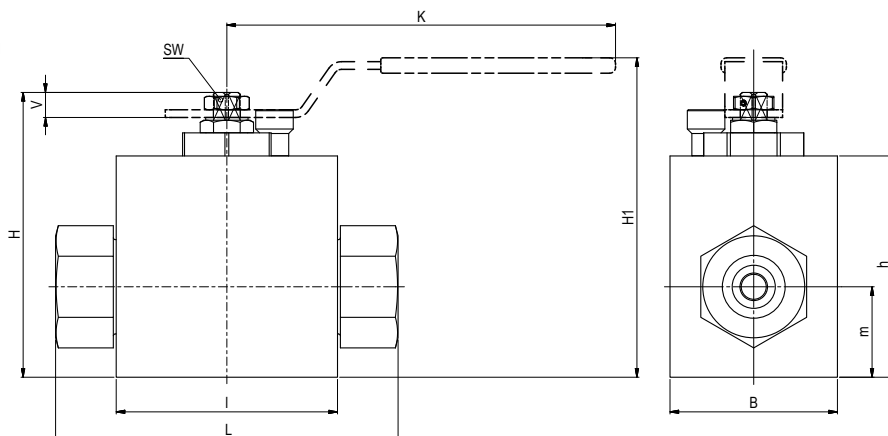
CONNECTION TYPE	DIMENSIONS							ORDER CODE PER MATERIAL COMBINATION			
DIN ISO 228 FEMALE THREAD	Type	LW	L	i	d	Weight [Kg]		PN [bar]	44g8		
	HFKH650-DN8-G 1/4	8	105,1	14	G 1/4	1,34		650	on request		
	HFKH650-DN13-G 1/2	13	124,6	16,3	G 1/2	2,35		650	on request		
	HFKH650-DN25-G 1	25	159,6	20	G 1	7,83		650	on request		
ANSI B1.20.1 NPT FEMALE THREAD	Type	LW	L	i	d	Weight [Kg]		PN [bar]	44g8		
	HFKH650-DN8-1/4" NPT	8	105,1	13,7	1/4" NPT	1,34		650	on request		
	HFKH650-DN13-1/2" NPT	13	124,6	17	1/2" NPT	2,36		650	on request		
	HFKH650-DN25-1" NPT	25	159,6	21,6	1" NPT	7,85		650	on request		
SAE J514/ISO/DIS11926-1 FEMALE THREAD	Type	LW	L	i	d	Weight [Kg]		PN [bar]	44g8		
	HFKH650-DN8-9/16" UNF	8	105,1	13	9/16"-18 UNF	1,33		650	on request		
	HFKH650-DN13-3/4" UNF	13	124,6	15	3/4"-16 UNF	2,36		650	on request		
	HFKH650-DN25-1 5/16" UN	25	159,6	20	1 5/16"-12 UN	7,81		650	on request		
DIN 2353 / ISO 8343-1 HEAVY SERIES	Type	LW	RA	L	i	d	Weight [Kg]	PN [bar]	44g8		
	HFKH650-DN8-12S	8	12	113,1	7,5	M 20x1,5	1,29	650	on request		
	HFKH650-DN13-16S	13	16	128,6	8,5	M 30x2	2,19	650	on request		
	HFKH650-DN25-30S	25	30	179,6	13,5	M 42x2	7,71	650	on request		
C&T MEDIUM PRESSURE	Type	LW	L	i	d	d1	d2	l	Weight [Kg]	PN [bar]	44g8
	HFKH650-DN8-9/16" C&T	8	121,1	11,2	13/16-16UN	7,8	12,7	19,1	1,37	650	on request
	HFKH650-DN13-1" C&T	13	164,6	20,6	1 3/8-12UNF	14,3	22,4	33,3	2,65	650	on request
	HFKH650-DN25-1 1/2" C&T	25	219,6	25,4	1 7/8-12UNF	23,8	35	40,5	9,30	650	on request

Please note the pressure ratings of the tube connections!

# Block ball valve Stainless Steel

HFKH1000

$H_2$  Ready



## AVAILABLE SIZES

DN8 (3/8"), DN13 (1/2")

## CONNECTIONS

C&T medium Pressure, others on request

## ACCESSORIES ON REQUEST

- Locking devices
- Actuators
- Mounting holes
- Position switches
- Combinations
- Detent

## MATERIAL CODE DESCRIPTION

Materials	44m8
Body	1.4571
Trunnion	Nitronic-50®
Ball seats	PEEK
Body and stem sealing	FKM / PTFE*
Tmin / Tmax	-40°C / +85°C*

\*Others on request.

## GENERAL DIMENSIONS

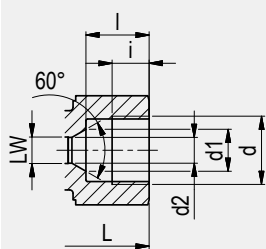
Type	I	B	H	h	m	Vmin	SW	K	H1	Lever
HFKH1000-DN8	96	87	146	115	47	11	11	202	166	St
HFKH1000-DN13	105	87	146	115	47	11	11	202	166	St

## CONNECTION TYPE

## DIMENSIONS

## ORDER CODE PER MATERIAL COMBINATION

### C&T MEDIUM PRESSURE



Type	LW	L	i	d	d1	d2	I	Weight [Kg]
HFKH1000-DN8-9/16" C&T	8	139	11,2	13/16-16UN	7,8	12,7	19,1	8,91
HFKH1000-DN13-1" C&T	13	168	20,6	1 3/8-12UNF	14,3	22,4	33,3	9,63

PN [bar]	44m8
1034	on request
1034	on request

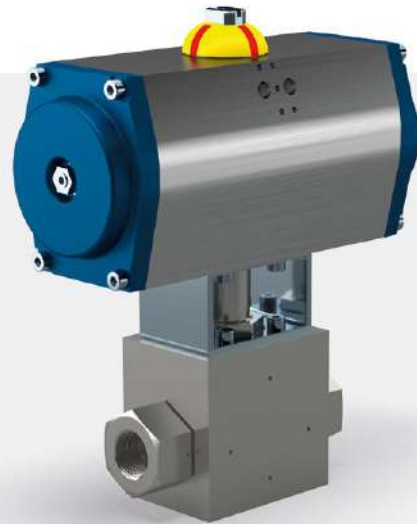
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