

LPU-S

Hydraulic Data for Single-Acting Spring Operated Actuator



The LPU – (Local Power Unit) comprehends an integrated electro-hydraulic system for remote control of valves and actuators and is especially developed to be bulkhead mounted or mounted directly on valve actuators, primarily onboard ships.

The LPU-S version is used with single-acting actuators for controlling spring closing⁽¹⁾ of valves.

- Modular design in lightweight materials for safer and easier assembly and maintenance
- Main hydraulic block S acting as rack for the modular design
- Control block S being the heart of the hydraulic functionality
- Built-in quick closing function for single acting actuators
- Easy mounting of feedback (DPI) from outside the LPU
- Automatic bleeder enabling free installation of the unit in all directions without the need for repositioning the bleeder
- Variable pump enabling easy speed adjustment for different actuator sizes (200 - 1500 ml/minutes)
- Plug connection enabling safe work environment and ease of installation
- Separate speed adjustment for opening and closing of single acting actuators
- Safe oil filling from portable hand pump
- Safe hand pump functionality for safe operation without risk of draining oil out of the unit
- Option for low oil level switch warning (Elite)

1) LPU with FailClose (FC) actuators are mainly described in this PDS.
For FailOpen (FO) actuators, OPEN and CLOSE (A and B) must be exchanged.

Description

The LPU-S is designed to control spring closing or spring opening actuators by mounting either directly on actuator or remotely on bulkhead. Oil pressure is used for opening the valve by pressing the springs together. Closing valve by means of mechanical springs.

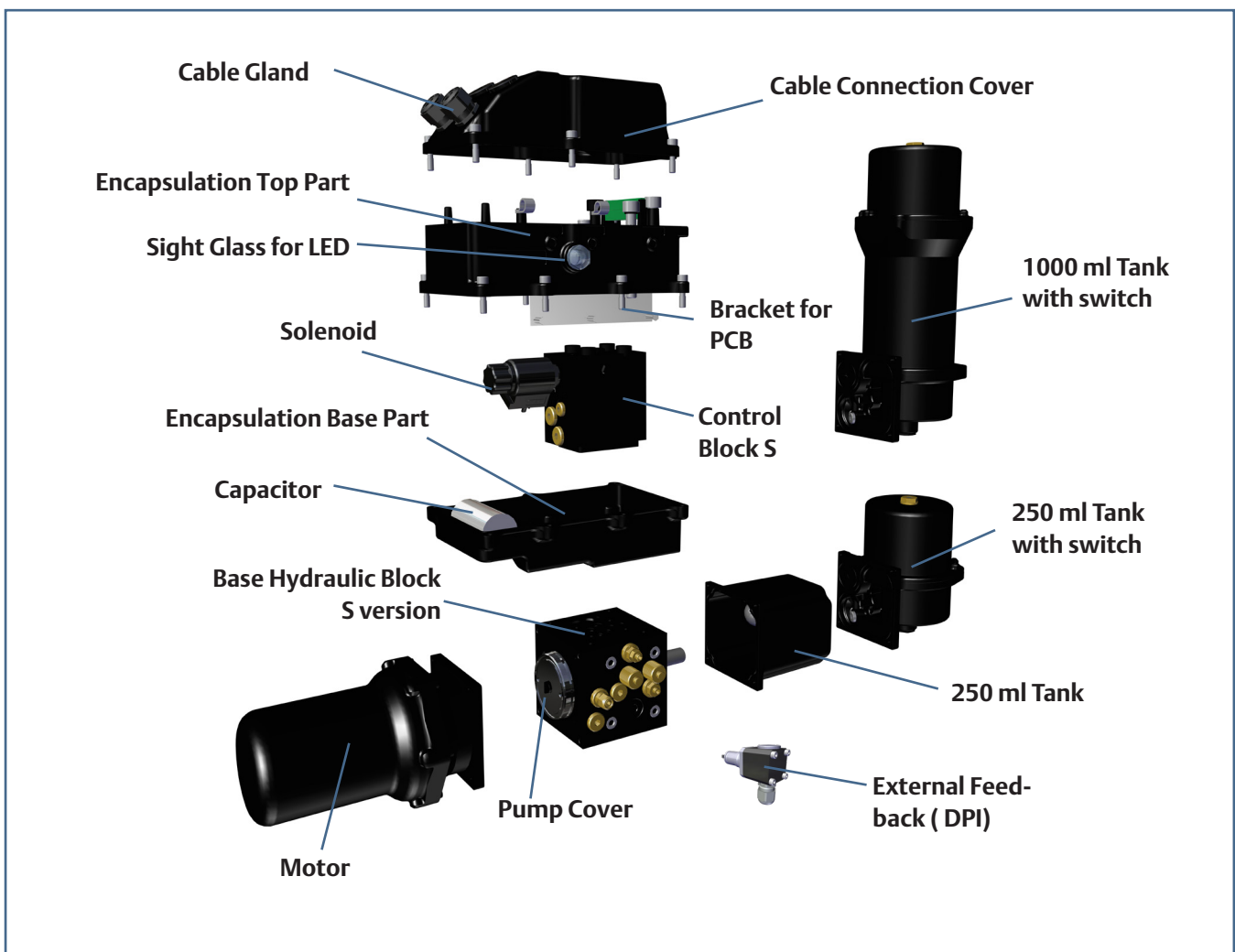
In the modular design of the LPU the Base Hydraulic Block acts as the rack and the Control Block as the heart of the hydraulic function. For LPU-S these blocks are named Base Hydraulic Block S and Control Block S.

The LPU standard versions comes with several electrical alternatives with different levels of possibilities and functions, such as LPU Basic, Plus, Elite and P-NET. For further information about the different versions, please see separate PDS.

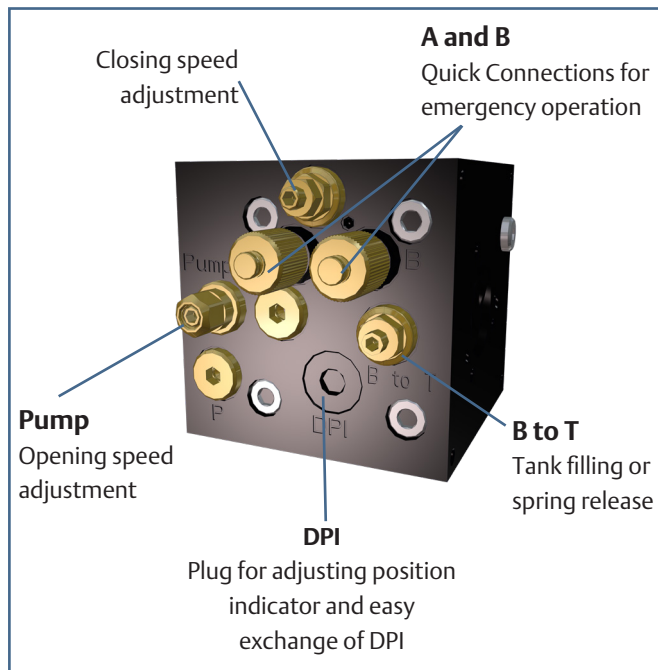
Note!

The LPU-S has a built-in quick closing function and therefore does not need an external QC-Block. For fast closing of LPU-S, see section about Quick Closing Function.

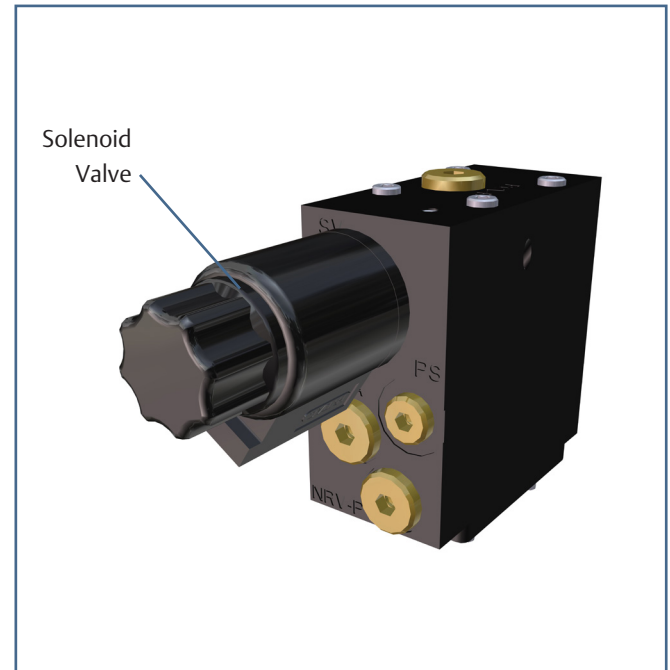
LPU-S Modules Overview



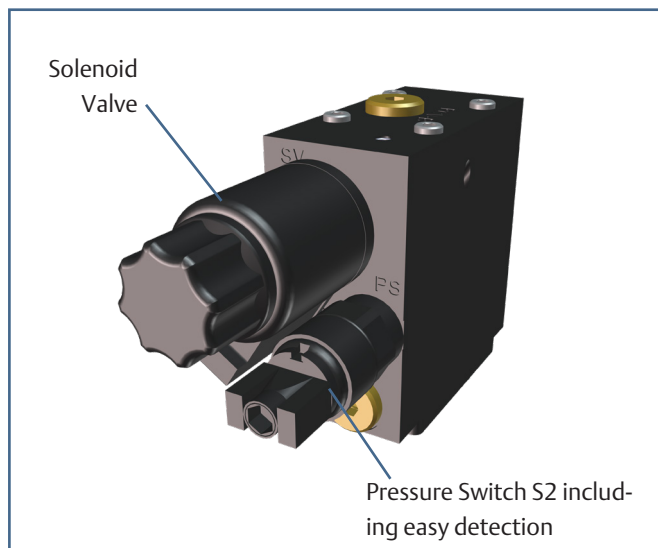
Base Hydraulic Block S (S)



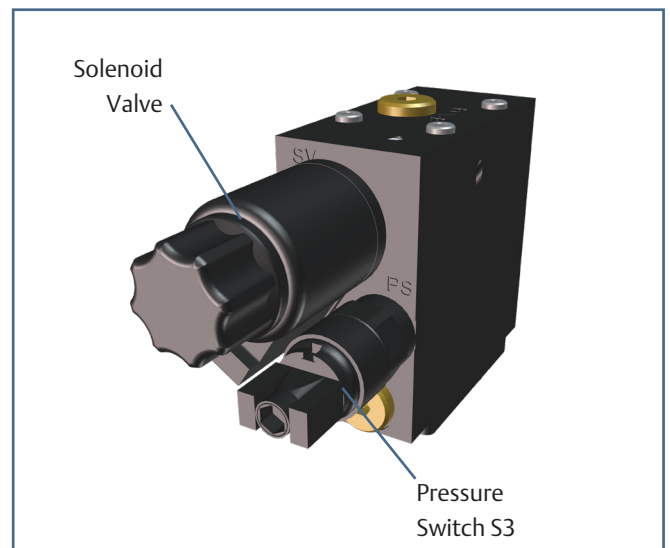
Control Block S (S1)



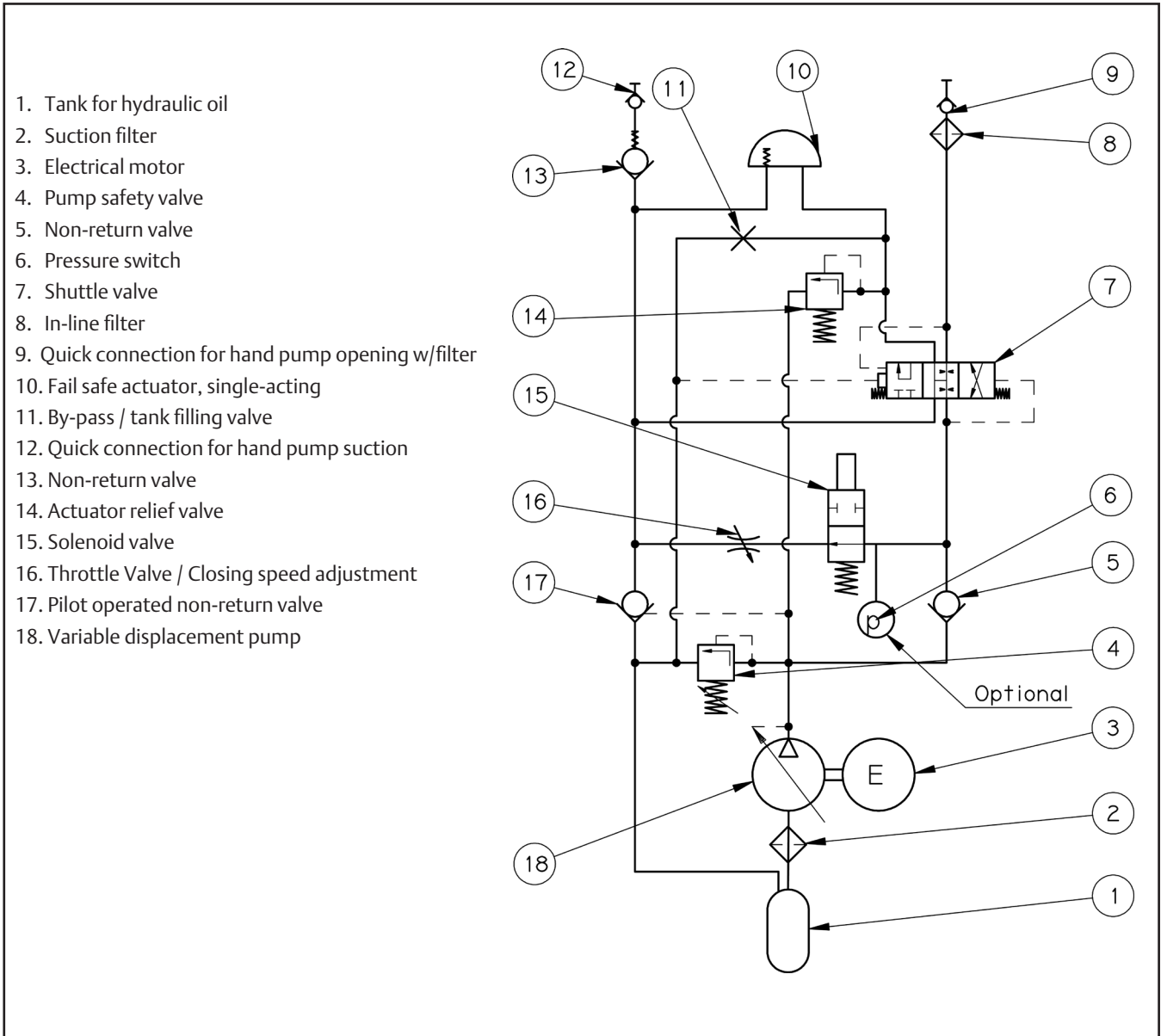
Control Block S with Pressure Switch (S2) Elite



Control Block S with Pressure Switch (S3) P-net



Hydraulic Diagram for LPU-S (single-acting actuator)



Operation LPU-S (Fail Close)

To move the valve towards open, the motor (3) is activated. The oil is led from tank through the pump and through the non-return valve (5), directly to the actuator B port. To prevent the oil from flowing back to tank, the solenoid valve (15) must be energized. When the valve is fully open, the pressure rises to 150 bar which causes the pump safety valve (4) to open and the oil flows back to tank. The motor is de-energized. The actuator is now hydraulically locked in position by the solenoid valve.

In case of a major increase of temperature, the pressure may rise. This will not cause any problems because of the safety valve (14) which will open at approximately 225 bar.

The valve can be stopped (and hydraulically locked) in any intermediate position simply by de-energizing the motor.

If the pressure drops while valve is fully open due to a minor leakage in the solenoid valve or due to temperature variations, the pressure switch (6) (optional) will detect this. The motor may then be activated for some seconds in order to keep up the pressure, and prevent the valve from leaving the open position. This may take place automatically.

To move the valve towards closed, the solenoid valve is de-energized. The springs then move the valve, pressing the oil back from the actuator B port, through the throttle valve (16) and the solenoid valve (15) to the LPU tank.

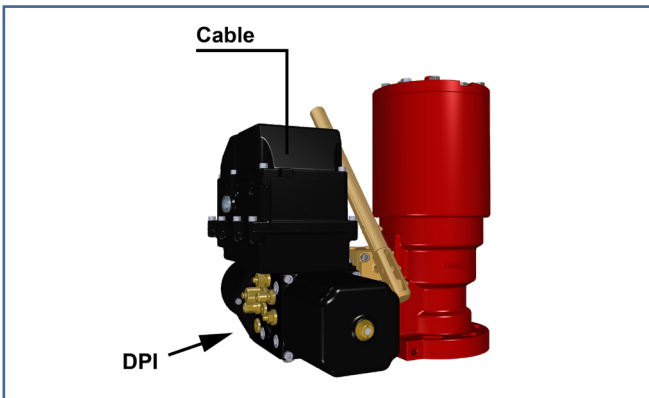
Emergency Operation

Options for Single Acting Actuators

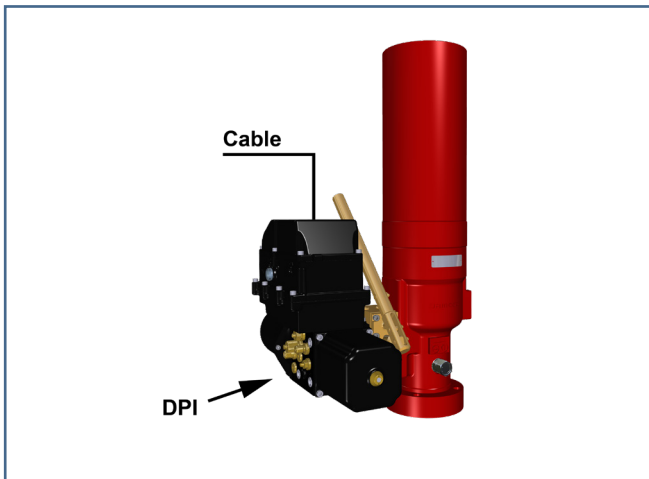
Direct Mounted LPU with Handpump

DPI Feedback

Direct mounted LPU (BA) with LPU handpump permanently mounted at actuator BRCF or KF for emergency operation with DPI feedback. See below.

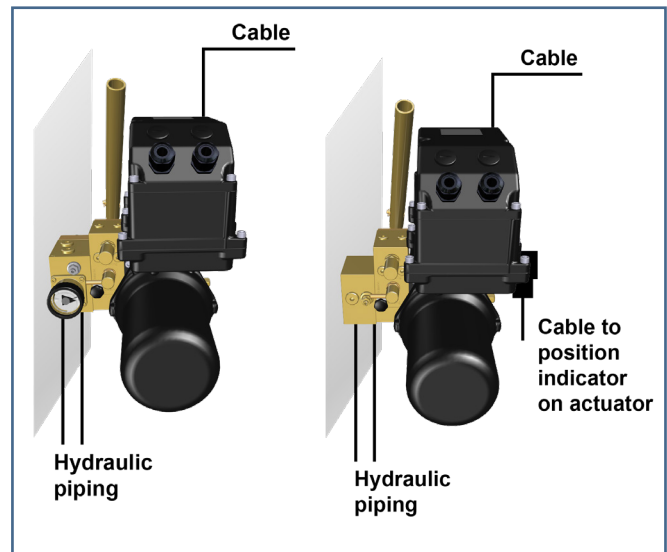


Direct mounted LPU (BA) permanently mounted at actuator KF for emergency operation with DPI feedback. See below.



Bulkhead Mounted LPU with Handpump

The bulkhead mounted LPU (BB) and LPU handpump with pipe connection to actuator BRCF or KF can be emergency operated with the below options.



Bulkhead mounted LPU with HP and VPI feedback (left) and external (DPI) feedback at actuator (right).

Note!

- All LPU-S are equipped with quick connections for Emergency operation by Portable handpump.
- All spring loaded actuators can be emergency operated to set the valve in safe position by opening the actuator bypass valve manually, releasing the spring package
- All Plus and Elite units can be locally operated by magnets whenever power to the unit is intact 230 VAC and 24 VDC
- There is no option to have a separate Handpump bulkhead mounted (HP should always be mounted either with Actuator or with LPU)

For more information please read the Reference Manual!

Hydraulic Functions

LPU-S Quick Closing Function

Background

A fast closing is demanded in case of power loss or ESD.

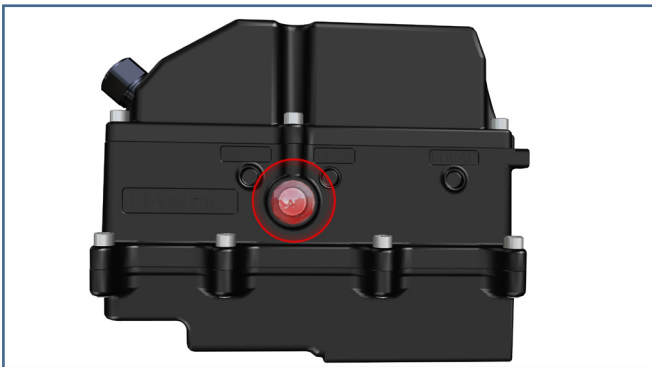
Solution

The built-in quick closing function is used to block flow back to the LPU tank during closing and to control oil flow directly back to actuators A-port.

Benefits

- Better control of oil flow within the LPU-S due to the blocking function of oil back to the actuator during closing
- Faster and safer closing time due to a larger closing oil flow feasibility and hence speed and safety is increased

Feedback Adjustment Function



Background

It will be of advantage to adjust position feedback without opening the electrical compartment.

Solution

Activating the ADJUST function (Plus and Elite) the internal LED will help adjusting position indicator by use of a combination of LED light and blinking. Position indicator can thus be adjusted to the right level.

Benefits

- Easy adjustment of position indicator without opening cover of LPU

Control Block Function

Background

The control block ensures proper remote and emergency functions for opening and closing of valve and especially the fail-close function.

Solution

The control block is equipped with functions to ensure remote control and emergency handling. Contains quick closing function to allow faster closing of valves.

When activating motor and solenoid valve the actuator/valve will open. When valve is fully opened motor will be stopped, but solenoid valve is still activated to keep valve in open position. When de-activating solenoid valve the valve will close due to internal springs in actuator.

When emergency operating by handpump the passage to solenoid valve is blocked and opening of actuator by means of handpump will then be possible. Return oil from actuator will be led back to handpump, so no oil is added to LPU system during emergency operation.

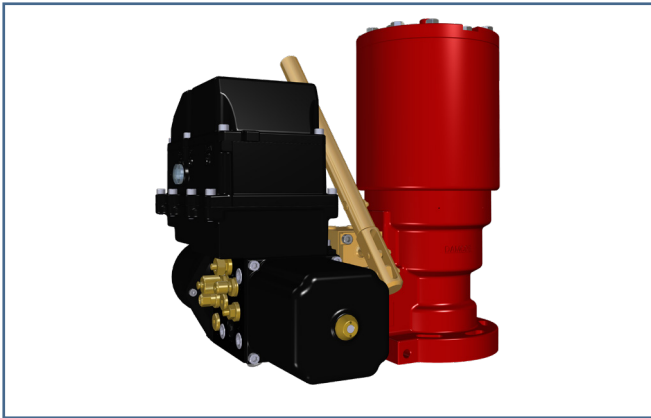
When closing valve after emergency opening this can be done in 3 ways: Turn portable handpump direction valve to close or open by-pass valve at actuator or LPU or start remote opening for few seconds and then remotely close the valve.

Contains quick closing function to allow faster closing of valves.

Benefits

- Remote operation by activating/deactivating motor and solenoid valve.
- Emergency opening by use of firmly mounted handpump or portable handpump
- Valve closing after emergency opening by use of handpump, by-pass valve or remote operation
- No risk of oil emptying due to incorrect handling of emergency operation
- Possibility of pressure switch to ensure “keep-open function” or “keep-close function”
- Release valve to avoid major pressure increase due to heating of oil

Safe Handpump Function



Background

The LPU is developed with several safety functions and equipment to secure a smooth and safe use at all times, following regulations and handling instructions.

A firmly mounted handpump is used for emergency operation. A portable handpump is used for emergency operation or filling of oil into LPU and Actuator.

Solution

All LPUs are provided with quick connections for connection of a portable hand pump for emergency operation of the valve.

Benefits

- Quick connections on front of the LPU for the portable handpump
- The firmly mounted HP-LPU can be used with all single-acting Damcos actuators such as BRFC and KF actuators
- The firmly mounted handpump offers fast emergency operation without need of any other remote facilities
- Safe operating of portable handpump without draining the LPU for oil
- Portable handpump can be used for filling oil into LPU and Actuator

Auto Bleeder Function



Background

The bleeder function is necessary when oil is filled into the LPU and hence the position of the bleed valve was of utmost importance in earlier installations. Depending on orientation of the LPU the bleed valve was repositioned to the highest point involving extra steps at installation and service.

Solution

For the new LPU the automatic bleeder function is redesigned and will enable free installation of the LPU in all directions without disassemble the bleeder. This will ease the installation and reduce the number of opening points and hence minimize the risk of introducing dirt into the system.

Benefits

- No repositioning of the bleed valve due to automatic bleeder function - independent of installation orientation
- Reduced risk of introducing dirt into the system

Operation Speed at Different Actuators

Closing Speed

Closing speed is adjusted at throttle valve in front of the LPU. Closing speed is dependent on valve torque and oil viscosity.

Intermediate Positions

The LPU-S is mostly used for on/off controls, but intermediate positions will be possible as well. If intermediate position during opening is requested the LPU-motor is simply stopped when the correct position is reached.

Approximate minimum operating time (seconds) for actuator equipped with LPU-S						
Actuator	Oil displacement (ml)	Small Pump		Large Pump		Minimum closing time (sec) ⁽²⁾⁽³⁾
		Minimum opening time (sec) ⁽¹⁾		Minimum opening time (sec) ⁽¹⁾		
		50 Hz	60 Hz	50 Hz	60 Hz	
BRCF 125	26	4	4	2	2	2
BRCF 250	50	8	6	4	3	2
BRCF 500	102	16	14	8	7	2
BRCF 1000	209	34	28	17	14	2
BRCF 2000	400	N/A ⁽⁴⁾	N/A ⁽⁴⁾	32	27	3
BRCF 4000	800	N/A	N/A	64	53	6
BRCF 8000	1600	N/A	N/A	128	106	13
BRCF 16000	3100	N/A	N/A	248	206	25
KF 65	21	12	2	1	1	2
KF/KFR 125	82	6	6	3	3	2
KF/KFR 250	428	1N/A	N/A	17	14	3

(1) Opening time for BRCF actuators are based on a running torque corresponding to 22% of the actuator end opening torque and are approximate values.

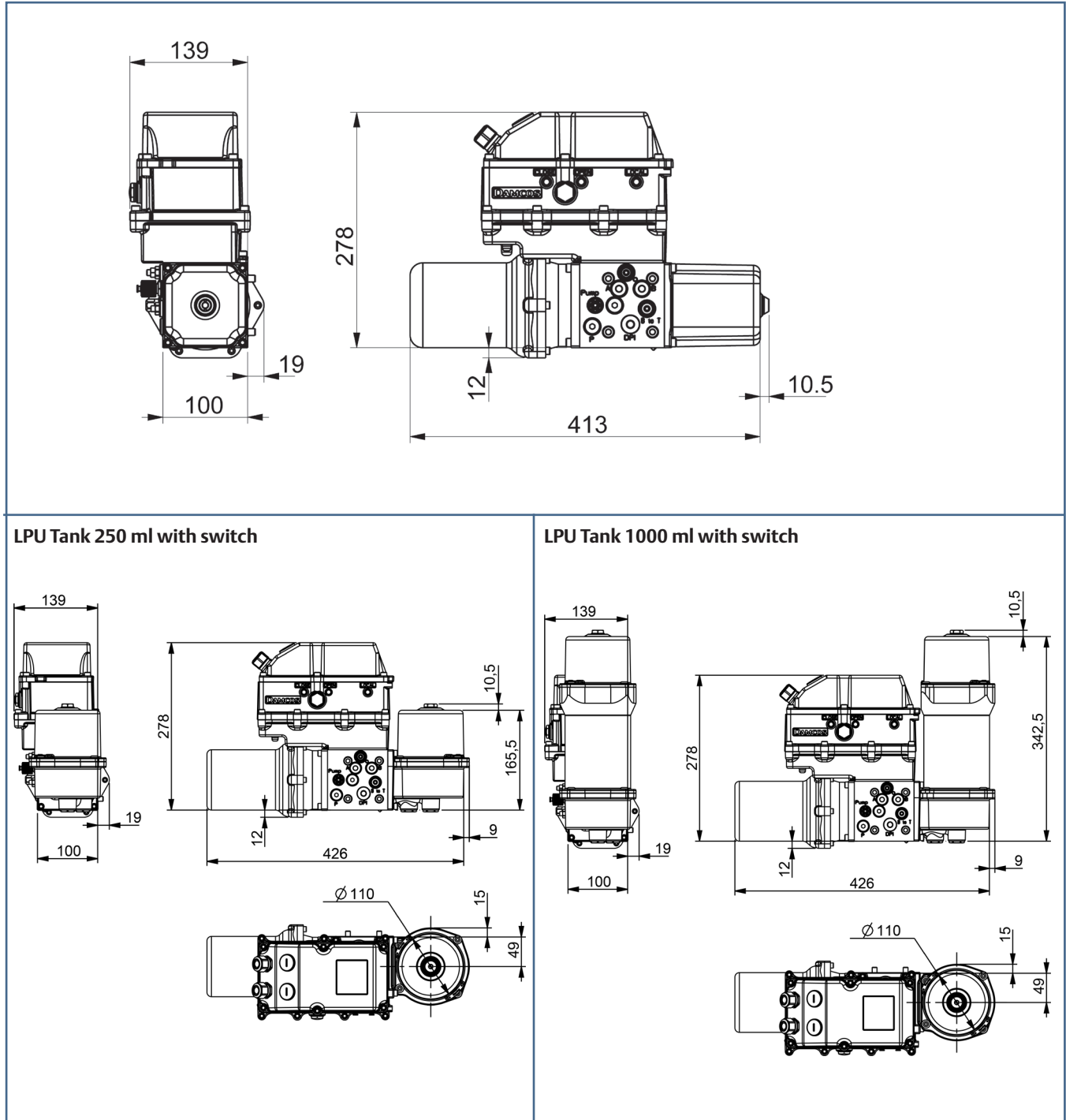
(2) Closing time for BRCF, KF and KFR are depending on required closing torque/thrust, oil viscosity and possible pipe dimensioning.

(3) For the actuator alternative for fail open (FO) functionality the closing data is for opening and vice versa.

(4) BRCF 2000 can be driven by the small pump if it is mounted on a larger valve or longer operation time can be accepted.

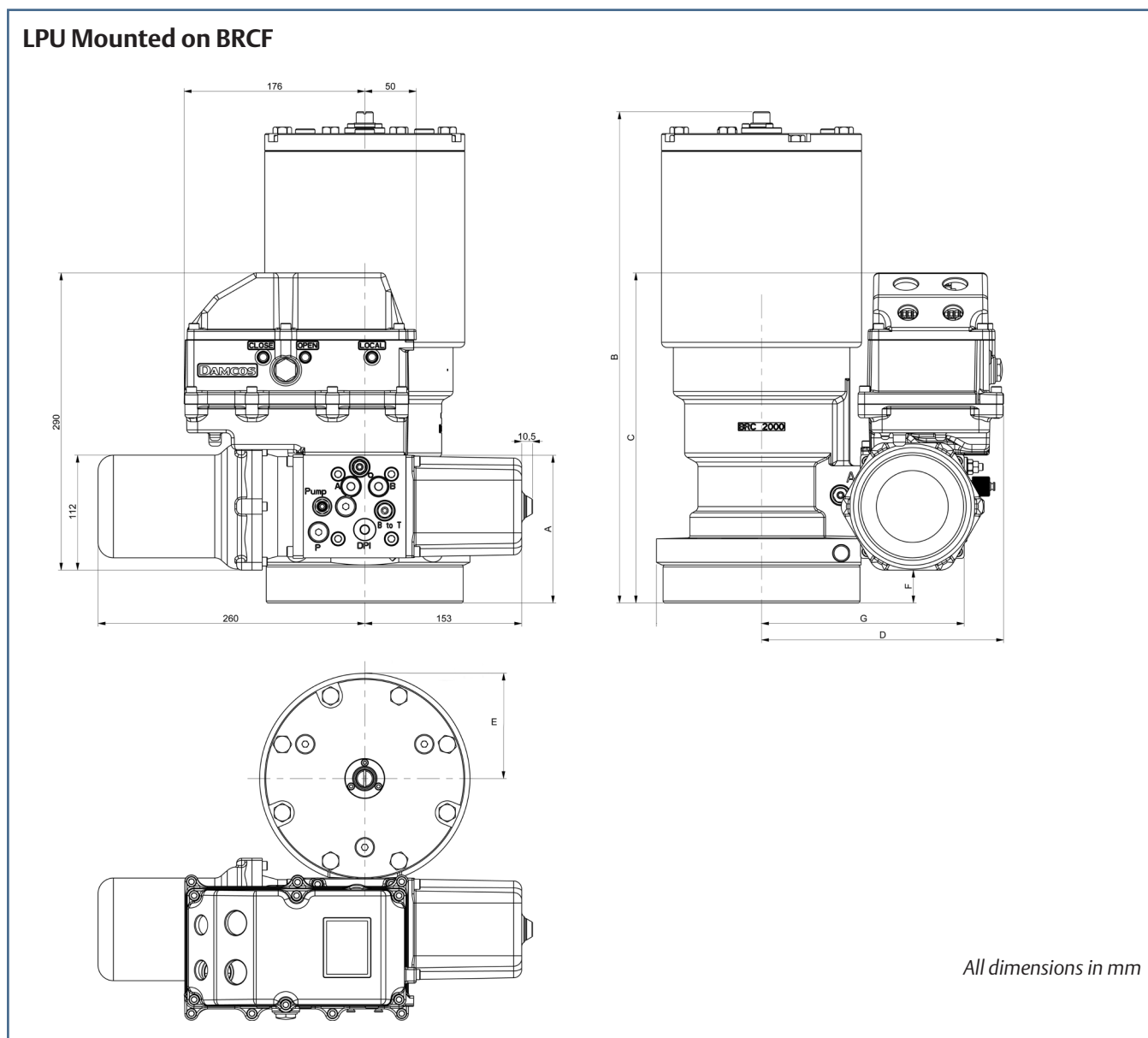
Technical Data

Main Dimensions

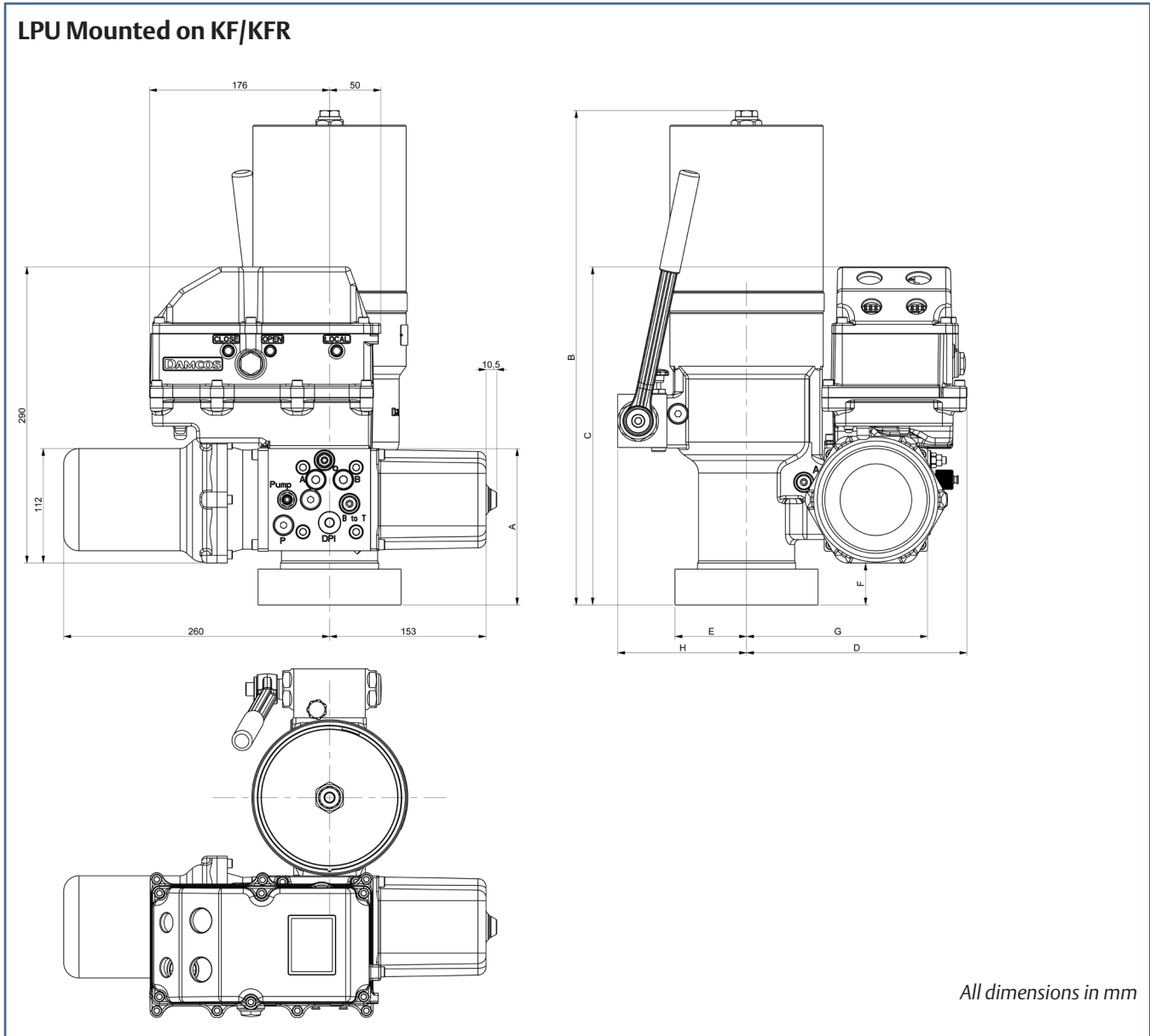


All dimensions in mm

Mounting on Actuator - Dimensions



Dimension BRCF Sizes								
Actuator	A	B	C	D	E	F	G	H
BRCF 125	116.5	244	294.5	192	48	4.5	153.5	20.5
BRCF 250	121	296	299	199	59	9	160.5	23
BRCF 500	124.5	349	302.5	212	66	12.5	173.5	23
BRCF 1000	133	405	311	224	80	21	185	28
BRCF 2000	144	479	322	236	102.5	32	197.5	37
BRCF 4000	153	597	331	264	129	41	225	40
BRCF 8000	172.5	763.5	350	297	157	60.5	257.5	44
BRCF 16000	182.5	1009	360	320	178.5	91	280.5	60



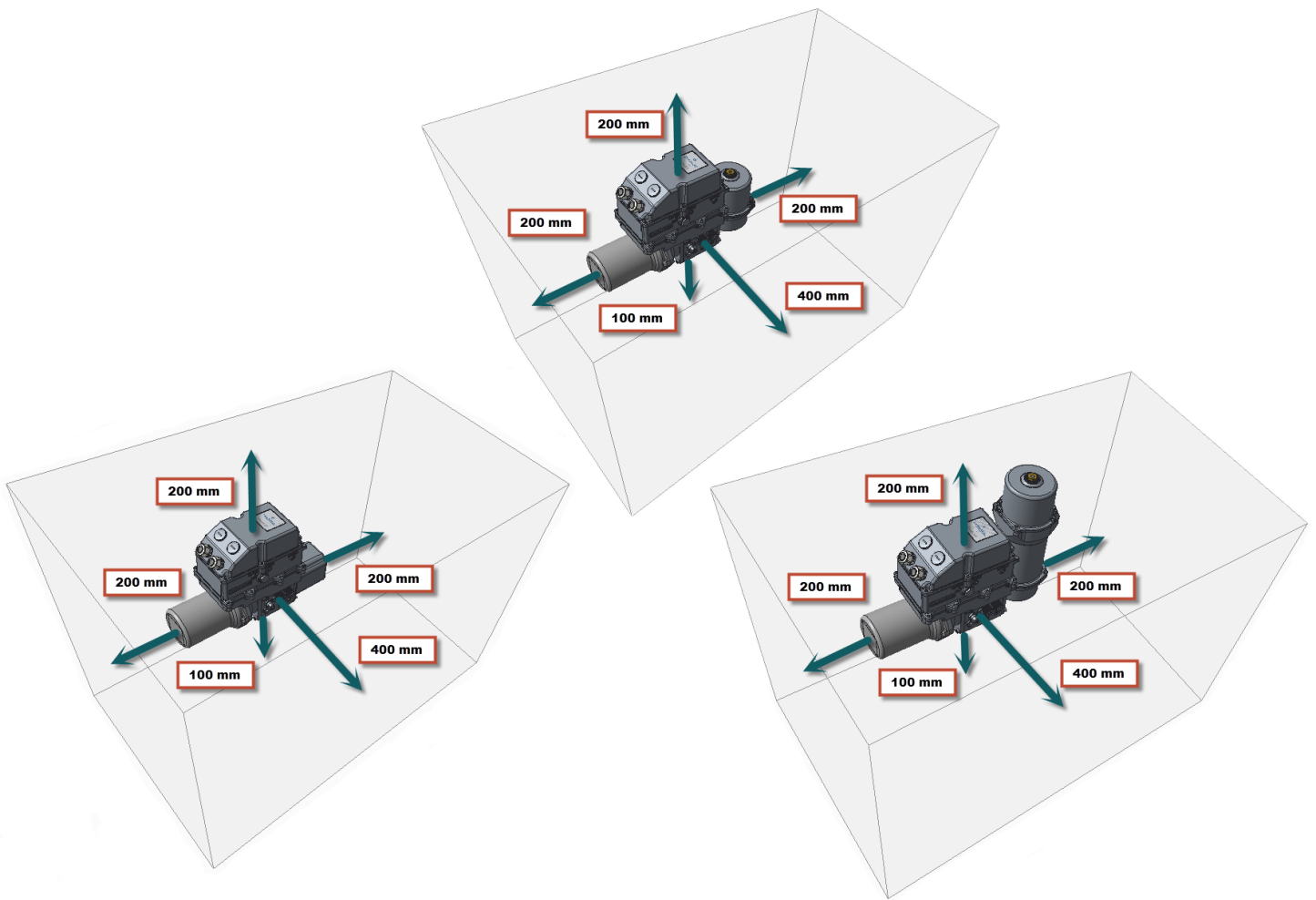
Dimension KF/KFR Sizes								
Actuator	A	B	C	D	E	F	G	H ⁽¹⁾
KF 65	115.5	231	293	185.5	38	3.5	147	NA
KF/KFR125	123	366	300.5	187.5	45	11	149	100
KF/KFR250	153	645	330.5	215.5	70	41	177	126
KF/KFR 250/150	153	484	330.5	215.5	70	41	177	126

(1) Only for KFR

Note!

The picture shows the LPU with a KFR actuator.

Service Space Recommendations



About Emerson's Marine Solutions

Emerson is a world-leading provider of marine solutions with engineering excellence, decades of industry experience and global presence supporting any ship anywhere. All marine systems and solutions are designed especially for the harsh marine environments, engineered and manufactured in-house by our skilled teams of marine engineers. Emerson is well-known in the industry and has more than 50 years' experience with a large installed base and covers well-known marine brands such as Rosemount, Micro Motion and Damcos. Supporting marine customers from a global network of sales and service hubs along the maritime highway.

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