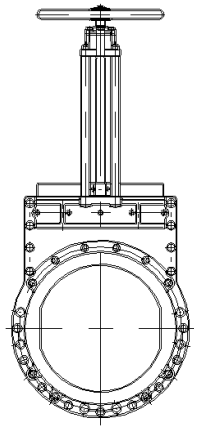
Operating Instructions

ERU Knife Gate Valve K1

DN 350 - 600



1 General

The technical data of the order are binding for the type of design. Modifications can only be considered if they are specified to us in time before starting production. Every ERHARD valve is checked for completeness, performance, and tightness before leaving the factory.

In case of non-compliance with these Operating Instructions, we cannot be made liable for any damages or troubles resulting thereof. We reserve the right to technical modifications as against the data and representations contained in these Operating Instructions in case this should be necessary for improving the valves.

2 Safety Aspects ⚠

ERHARD valves and penstocks are reliable and designed to the state of the art. However, these valves can be a danger when handled by untrained staff in an inexpert manner or when they are not used in accordance with their duty and purpose. Whoever in the user's works is engaged in mounting, dismantling or remounting, operation and service (inspection, maintenance, repair) of the valves, is supposed to have read and understood the complete Operating Instructions. The user is recommended to have the persons involved confirm this fact in writing in each particular case.

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If no competent staff is available for such a work, an expert fitter from the manufacturer has to be charged with it.

When using the valves, observe the approved technical rules, e.g. DIN standards, DVGW prints, VDI rules, VDMA standards, etc. For valves which must be supervised, relevant laws and regulations, e.g. trading regulations, regulations for prevention of accidents, steam boiler regulations, regulations for gas mains under high pressure, regulations for combustible liquids as well as technical regulation works TRD, SR, TRG, TRbF, TRGL, TRAC, UVV, AD instructions etc. are applicable as well as the local safety regulations and rules for prevention of accidents.

Before removing safety devices and/or carrying out work on the valve or penstock, the pipe section must be made pressureless and harmless, e.g. by closing the valves and emptying the pipes. Unauthorized, erroneous and unexpected operation of the valve has to be avoided.
If work is carried out in the vicinity of the valve or penstock, which leads to soiling (concrete work, masonry, painting, sandblasting), the valve or penstock must be covered effectively.

In case, according to the safety regulations for technical equipment (DIN 31000 and following) as well as the relevant rules for prevention of accidents (UVV), it is necessary to restrict the access to the moving range of the weight-loaded levers.
Access to the moving range of the valve gate of ERU Knife Gate Valves K1 with piston or electric actuator has to be restricted by protection devices. Effective protective devices have to be installed by the customer.
On request, we will supply suitable protective covers.

3 Design Features and Range of Application

3.1. Type and design

3.1.1 ERU Knife Gate Valve K1 **according to drawing 3E 60 795**
with non-rising stem
Designed for operating devices, e.g. handwheel, extension stem, chain wheel drive, operating key

Prod. No.: 4605 .... PN 4
4615 .... PN 6
4655 .... PN 10

3.1.2 ERU Knife Gate Valve K1 **acc. to drawings 3E 60 796 and 3E 60 797**
with rising stem
Designed for automatic operation by means of piston or electric actuator.

Prod. No.: 4607 .... PN 4
4617 .... PN 6
4657 .... PN 10

3.2 Range of application

ERU Knife Gate Valves K1 are wafer-type single door gate valves with short-face-to-face dimension according to EN 558-1, basic series 20 (former DIN 3202, part 3, series K1). ERU Knife Gate Valves K1 are suitable for “ON-OFF” operation. If they are equipped with a regulating orifice, ERU Knife Gate Valves K1 are also suitable for regulating purposes.

Nom. size DN	Nom.press. PN	Hydrostat. test pressure for		Max. admissible working pressure in bars at a working temperature of max. 80° C	
		Body	Seat		Prod. No.
350	10	15	10	10	4655....; 4657....
400 - 600	6	9	6	6	4615....; 4617....
400 - 600	4	6	4	4	4605....; 4607....

4 Performance, Mode of Operation

The solid gate slides between the two body components. It seals on its periphery against a steel-reinforced elastomer U-shaped profile. The front sides of the gate are ensured to the outside on both sides by means of readjustable transverse seals.

The gate valves are tested for tightness and resistance to DIN EN 12266 and DIN EN 1074 at the manufacturer’s plant. They are tight in both flow directions.

5 Transport

Transport has to be carried out carefully. Inexpert handling may cause damages to the valve. Prior to mounting, such damages are to be repaired in an appropriate manner.

Valves too heavy to be handled manually have to be transported by means of lifting gears suitable for the weight involved, e.g. broad belts. They have to be placed around the body, e.g. between the two connecting flanges. Valves with eyebolts or lugs have to be suspended at these devices in an appropriate manner.
It is not allowed to attach the lifting gears to the handwheel, the stem, the gearbox case or to the flange holes which would be contrary to the relevant safety regulations.

6 Installation into the pipeline ⚠

Remove all packing material from the valve. Prior to installation, check the pipeline for impurities and foreign bodies and clean it if necessary.

ATTENTION: For valves with an arrow showing the flow direction, this direction must be observed! It is important that all around the valve there is free access for operation and maintenance. For outdoor installation, the customer has to protect the valve against the direct effects of the weather.

During installation of the valve, the distance between the pipe flanges should exceed the valve face-to-face dimension by at least 20 mm. Thus, the raised faces will not be damaged and the gaskets can be inserted. Steel-reinforced rubber seals are recommended for use as flange gaskets (consider resistance to flow medium and temperature).

The mating pipe flanges must be plain-parallel and concentric.
Tighten the connecting bolts evenly (without distortion) and crosswise. The pipeline mustn't by any means be pulled up to the valve.
If the distance between the flanges is too large for the valve, use thicker gaskets to cover the difference.

ERU Knife Gate Valves K1 are
a) clamped between two flanges of the pipeline (wafer type) or
b) screwed to the end flange of the pipeline as end-of-line valves.

When installing the valve into the pipeline, the special flange drilling configuration has to be observed for this type of valve. One part of the screws connects the pipe flange with the body. The other part is placed along the body from pipe flange to pipe flange.

7 Commissioning

Prior to commissioning the stem and the stem nut have to be greased.
(Recommended lubricant: see Section 10 "Maintenance")
After installation, check the valve for smooth operation and move it over the whole travel (OPEN-CLOSED) by means of the operating gear.
(Attention: When valve is equipped with electric actuator, see also Section 11 "Design with mounted electric actuator" and Section 11.2 "Commissioning of the Electric Actuator").
When valve is equipped with handwheel, the valve gate touches the bearing hub in open position.
For design with electric actuator or piston actuator a clearance will remain visible (after-running).
The transverse seals have been set (pre-loaded) to the nominal pressure at the factory. They can be adjusted to the actual operating pressure: By slackening the counternuts and bolts the preload of the seal is reduced.

CAUTION ! Flow medium may escape. Wherever toxic or caustic fluids are handled, wear protective clothing (goggles).

As soon as any slight leakage is discovered, make the transverse seals tight by uniformly tightening the bolts.

Firmly tighten counternuts. By this adaptation to the actual operating conditions the operating force is reduced and the service life of the transverse seal is increased.

If disturbing sluggishness of motion continues to be noticed, check whether the valve has been compressed too hard between the flanges of the pipeline. Slacken the full-length flange bolts evenly and re-check smooth operation of each one.
See also Section "Trouble-shooting by customer".

8 Inadmissible Modes of Operation

For inspection or maintenance work the valve - or parts of it - may only be dismantled if the pipe section in which it is installed has been isolated and made pressureless. If work is carried out in the vicinity of the valves, leading to soiling (concrete work, masonry, painting, sandblasting) the valves have to be covered effectively.

If the ERU Knife Gate Valves K1 are equipped with EPDM profile seals, the EPDM parts must not come into contact with oil or grease since EPDM swells. For the recommended lubricant see Section “Maintenance”.

ERU Knife Gate Valves K1 of this type are not suitable for regulating service. For explicitly regulating operation use special types, e.g. with regulating orifice.

Extending the operating elements by, for example, levers or similar items is not allowed, **danger of damage!**

Jogging operation with ERU Knife Gate Valves K1 with electric actuator is not allowed in end position or if objects are jammed in the pipeline.

9 Storage

Do not store the valves outdoors. During the storage period, the valves have to be protected against outside influences and impurities, e.g. by covering them with a tarpaulin. Store valves standing on their feet. Store valves without feet flat on their connecting flange by means of intermediate boards.

If long-time storage is required, the place of storage should be selected in such a way that the following conditions are met: frost-protected - cool - dry - dust-free - dark (for elastomer UV-light is inadmissible). If it is impossible to comply with these conditions, the valves must be packed to meet these requirements, e.g. they have to be welded in dark foil.

Store ERU Knife Gate Valves K1 in closed position. Rubber-coated components, as e.g. the U-shaped sealing element between the body parts, have to be protected against direct solar radiation. Avoid the effects of radiant heat, e.g. from radiators.

10 Maintenance

ERU Knife Gate Valves K1 should be moved regularly at short intervals (every half year) over the whole travel (OPEN-CLOSED). Depending on the flow medium and the local conditions at the site of application, the maintenance interval must be reduced or may be extended. If a leakage is then found at the gate seal, uniformly re-tension the screws of the transverse seal on both sides (see “Commissioning”). Should it no longer be possible to retighten the transverse seal, replace these sealing elements. For installation see special repair instructions.

Examine valve gate and stem regularly for contamination, clean if necessary and treat with lubricant (rub-in a thin layer).
Depending on the installation conditions, regularly regrease ERHARD Knife Gate Valves K1 which are equipped with grease nipples in the area of the stem bearing assembly.

Recommended lubricant: KLÜBERSYNTH VR69-252
Messrs. Klüber Lubrication, Munich

10.2 Trouble-shooting by customer:

Trouble	Possible Causes	Remedy
Leakage at the transverse seal	Too little preloading Possibly higher operating pressure than set	Readjustment of the transverse seal: see Section "7. Commissioning".
	Wearing of the PTFE packing cords	Replace packing cords
	Contamination (deposit) on the gate	With valve in open position: clean and grease gate on both sides
Leakage at the gate end-face	Preloading of the upper body screws	Retighten body screws on built-in valve
Leakage at the body periphery	Preloading of the body screws	First of all tighten full-length screws from flange to flange and, as far as within reach, body screws. If this does not prove to be successful, replace U-shaped sealing element.
Leakage in the closed position	Contamination of the gate Defective U-shaped sealing element.	Clean and grease gate Replace U-shaped sealing element.
Excessive operating forces	Seizing of the gate on one side	Slacken preloading of transverse seal on both sides. Pre-load anew uniformly on both sides so that the gate moves centrically.
	Excessive preloading of transverse seal	Slacken transverse seal, see "Commissioning".
	Contamination (deposit) on the gate	With open gate valve: clean and grease the gate on both sides
	Threaded bush or stem collar running dry. Collar bush and stem collar bearing	Regrease thread. Regrease at the grease nipple.
Operation blocked	Residues of flow medium are hardened	Pipe section pressureless. Clean and grease all accessible surfaces of gate and stem. Slacken transverse seal on both sides. Slightly unscrew upper body screws. Knock at the valve with a rubber mallet trying to operate the valve. If you are not successful: remove, dismantle, clean, replace damaged parts.

11 Design with mounted electric actuator

Type:	with rising stem	**acc. to drawing 3E 60 796**
Prod. No.:	4607 ..12	
	4617 ..12	
	4657 ..12	

The instructions of Sections 2 to 10 of these Operating Instructions are applicable.

The electric actuator is concentrically mounted on the yoke of the ERU Knife Gate Valve K1. The stem of the knife gate valve is moved in vertical direction (OPEN-CLOSED) by means of the threaded bush of the electric actuator. The standard type of the ERU Knife Gate Valve K1 electric actuator's are equipped with:
Torque and travel switches with 1 break and 1 make contact for each direction of rotation
Blinker contact for indication of motor operation
Heating in the switchgear compartment
Thermal switch in the motor winding

ERU Knife Gate Valve K1 are switched-off in a travel-dependent way in both limit positions.

The switching points of the travel limit switches are set during the factory tightness test at pressure rating in such a way that the setting avoids the gate's clamping or running against the upper mechanical limit stop of the yoke due to motor after-running. The torque switches act as safety switches, e.g., in intermediate positions.

If the valve is supplied without mounted electric actuator, the travel limit switches have to be set after mounting the electric actuator.
See Section 11.2 "Commissioning of Electric Actuator"
Section "Resetting the travel switches".

Please observe the relevant safety rules (VDE/TAB etc.) and the instructions of the electric actuator's manufacturer concerning transport, storage and commissioning.

Electrical connection has to be effected according to Operating Instructions as well as wiring and terminal diagrams of the electric actuator's manufacturer (travel, torque and thermal switches, heating, motor). Before installation, the insulating resistance of the motor must be measured. If it is lower than 500 K-ohms, this shows that the winding is moist. The motor has to be removed in order to be dried up and it must be heated by means of a hot-air fan or in a heating chamber: max. admissible temperature 100°C.

11.1 Jogging and emergency-hand operation

A t t e n t i o n :
If a foreign body is jammed in when operating the valve, the torque switch for the corresponding direction responds and switches off the motor.

The time lag between response of the torque switch and disconnection of the motor from the network depends on the signal delay. If another closing order is given in the original direction, without having moved the valve sufficiently in the opposite direction,

the torque will increase. If this procedure is repeated several times, the torque will accumulate. The valve and its operating elements are not designed for such an emergency and might be damaged.

We explicitly draw your attention to the fact that such "jogging operation" is inadmissible.
Jogging operating is admissible under the following conditions:
If the torque switch responds in intermediate position, the valve must first be moved in the opposite direction until the torque switch completely returns to its original position. Only now the valve may be moved again in the direction in which the disturbance occurred. Proceeding this way, you will obtain torques corresponding to the torques set at the torque switch. Moreover, the foreign matter can come off and be flushed out of the seating zone.
Operation by emergency handwheel:

If the valve is operated by means of the handwheel of the electric actuator, the torque switches do not provide any safety function.

If a foreign body is jammed with the valve being in intermediate position, excessive operating force - particularly in case of high gear reduction - might be damaging to the drive components. Therefore, we draw your attention to the following fact:
If any resistance is detected during emergency handwheel operation, some turns must be made in the opposite direction before the handwheel is turned again in the direction in which the disturbance occurred (flush out the foreign body). Continue operation with utmost care, in no case using excessive force. If need be, repeat flushing operation.

11.2 Commissioning of the Electric Actuator

For commissioning the valve the Operating Instructions of the electric actuator's manufacturer are applicable, too.

1. Move the ERU Knife Gate Valve K1 manually to intermediate position.
2. Check the gate movement and thus the direction of rotation of the actuator by short electrical starting.

   Valve is closing = CLOCKWISE direction of actuator rotation
   Valve is opening = ANTI-CLOCKWISE direction of actuator rotation

3. In case of wrong direction of rotation, change poles of motor connection.
4. Check direction of rotation by short electrical starting.
5. Check correct switching sequence of the torque switches in "Open-Close" direction by manual operation.
6. Change poles if necessary.
7. Move the valve over the whole travel only if the direction of rotation for closing the valve is CLOCKWISE.

In case of wrong direction of rotation, travel and torque switches are ineffective!

Resetting the travel switches:

1. Move the valve manually into "OPEN" end position.
2. Return by a travel of approx. 5mm.
3. Adjust the "OPEN" travel switch according to the Operating Instructions of the electric actuator's manufacturer.
4. Move the valve manually into "Closed" end position.
5. Adjust the "CLOSED" travel switch according to the Operating Instructions of the electric actuator's manufacturer.

If these measures proposed by us are not observed, we cannot be made liable for any damages resulting thereof.

12 Design with mounted piston actuator (double-acting)

Type:	with piston rod	**acc. to drawing 3E 60 797**
Prod. No.:	4607 ..20	
	4617 ..20	
	4657 ..20	

The instructions of Sections 2 to 10 of these Operating Instructions are applicable.

The piston actuator is concentrically mounted on the yoke of the ERU Knife Gate Valve K1. By means of the piston rod the pressurized piston moves the gate in vertical direction (OPEN-CLOSED).
The end positions are limited by stop of the piston (piston nuts) at the mounting flange or cylinder cover. The piston actuator is suitable for compressed air, compressed water, and compressed oil. If compressed water is used, more maintenance is necessary due to the properties of the water.
For change-over (Open-Closed), we recommend to use manually or electromagnetically operated 5/2-way valves. The outlets of these valves have to be equipped with throttles so that the operating speed can be controlled or adapted to the operating conditions.

Operating limits for the standard type

DN	Max. working pressure (bar) PN	Required supply pressure (bar) P	Max. working pressure (bar) PN	Required supply pressure (bar) P	Max. working pressure (bar) PN	Required supply pressure (bar) P
350	-	-	-	-	10	6 - 8
400	4	5 - 6	6	6 - 8	10	8
500	4	5 - 6	6	6 - 8	10	8
600	4	5 - 6	6	6 - 8	10	8

13 Parts Lists and Drawings

In column "E/V" the parts are marked as follows:

- Spare parts or sets of spare parts, e.g. E1 = spare part set No. 1

or

- Wearing parts or sets of wearing parts, e.g. V1 = wearing-part set No. 1

Parts List for drawing: 3E 60795
ERU Knife Gate Valve K1 with chain-wheel drive, handwheel, square muff, square cap

Part	Description	Qty.	E / V		Part	Description	Qty.	E / V
1	Body component	2			20	Stem	1	E
2	U-shaped sealing element, complete	1	V1		21	Flanged bearing	1	
3	Straight pin	*)			22	Bush	1	
4	Compressor	2			23	Washer	3	
5	Packing cord, square	4	V1		24	Hexagon screw	3	
6	Profile rubber	2	V1		25	Washer	4	
7	Gate	1			26	Hexagon nut	4	
8	Washer	*)			27	Handwheel	1	
9	Hexagon screw	*)			28	Washer	1	
10	Hexagon nut	*)			29	Hexagon screw	1	
11	Hexagon screw	*)			30	Square cap	1	
12	Hexagon nut	*)			31	Close-tolerance grooved pin	1	
13	Washer	*)			32	Square muff	1	
14	Stem nut	1	E		33	Straight grooved pin	2	
15	Hexagon screw	2			34	Chain wheel	1	
16	Stud bolt	4			35	Chain guide	1	
17	Bearing hub	1			36	Collar washer	1	
18	Scraper ring	2	V		37	Straight grooved pin	1	
19	Axial grooved ball bearing	2			38	Hexagon screw	1	

*) quantity is variable depending on the nominal diameter DN

DN	L	H_1	H_2	H_3	H_4	D_1	D_2	D_3	D_4	C	Sq.cap
350	78	905	919	976	927	505	400	342	307	26	24
400	102	1002	1016	1073	1024	561	400	342	307	26	24
500	127	1250	1265	1324	1277	666	500	412	377	35	27
600	154	1428	1442	1502	1455	780	500	412	377	35	27

Drawing 3E 60795
ERU Knife Gate Valve K1 with chain-wheel drive, handwheel, square muff, square cap

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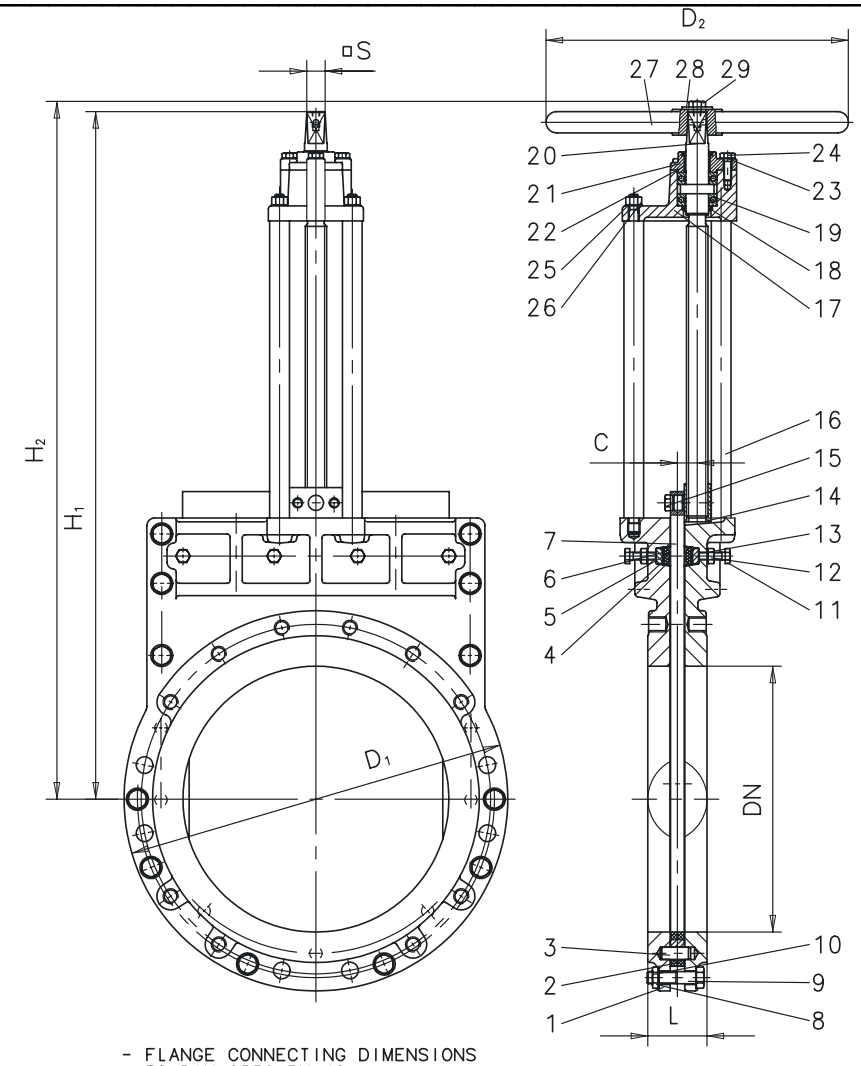
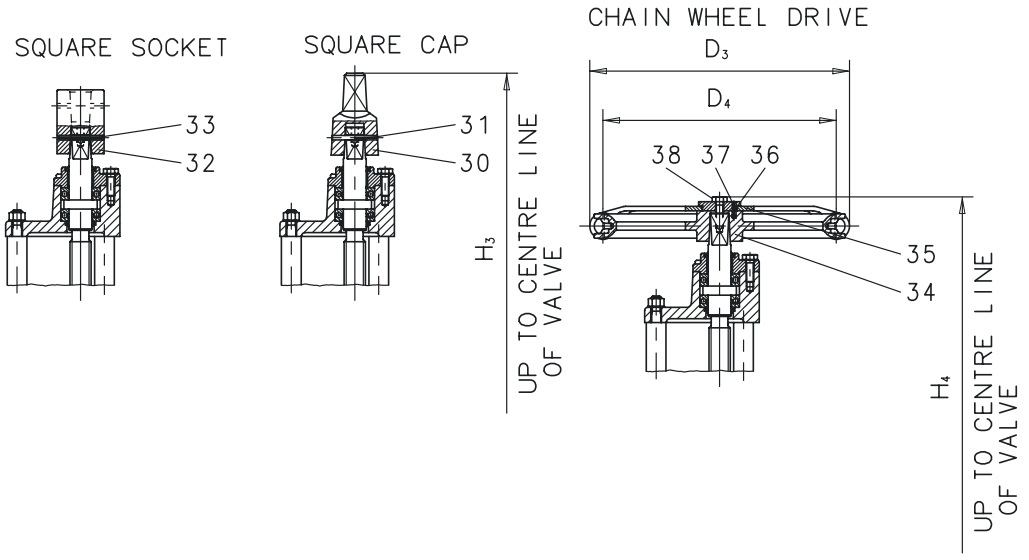


- FLANGE CONNECTING DIMENSIONS TO DIN 2532 PN 10
- CONNECTING ELEMENTS FOR FLANGE CONNECTION TO DRAWING 4E131899
- FACE-TO-FACE DIMENSION EN558-1, BASIC SERIES 20 FORMER DIN3202, PART 3, SERIES K1



Parts list for drawing: 3E 60796
ERU Knife Gate Valve K1 with electric actuator

Part	Description	Qty.	E / V		Part	Description	Qty.	E / V
1	Body component	2			13	Washer	*)	
2	U-shaped sealing element, complete	1	V1		14	Yoke	1	
3	Straight pin	*)			15	Bush	1	
4	Compressor	2			16	Stem	1	E
5	Packing cord, square	4	V1		17	Bolt	*)	
6	Profile rubber	2	V1		18	Locking washer	*)	
7	Gate	1			19	Washer	4	
8	Washer	*)			20	Cylindrical screw	4	
9	Hexagon screw	*)			21	Electric actuator	1	
10	Hexagon nut	*)			22	Washer	4	
11	Hexagon screw	*)			23	Cylindrical screw	4	
12	Hexagon nut	*)						

*) quantity is variable depending on the nominal size DN

DN	L	H_1	D_1	d	Travel	Turns/ Travel	Adjusted torque Nm	
							OPEN	CLOSED
350	78	808	505	TR 36 x 6-LH	350	58	120	110
400	102	908	561	TR 28 x 5-LH	400	80	120	110
500	127	1118	666	TR 30 x 6-LH	500	83	120	110
600	154	1322	780	TR 36 x 6-LH	600	100	160	150

DN	Electric actuator EMG	D_3	E_4	E_5	E_6	E_7	H_3	Closing/Opening time in seconds at the following speeds of electr.actuator of N =					
								16	25 [2)]	32	40 [1)]	50	80
350	D 120-A/F10 (max. 120 NM)	200	243	346	129	205	1226	217	139	108	87	69	43
400							1426	300	192	150	120	96	60
500							1736	313	240	156	125	100	63
600	D 200-A/F14 (max. 120 NM)	250					2040	375	288	188	150	120	75

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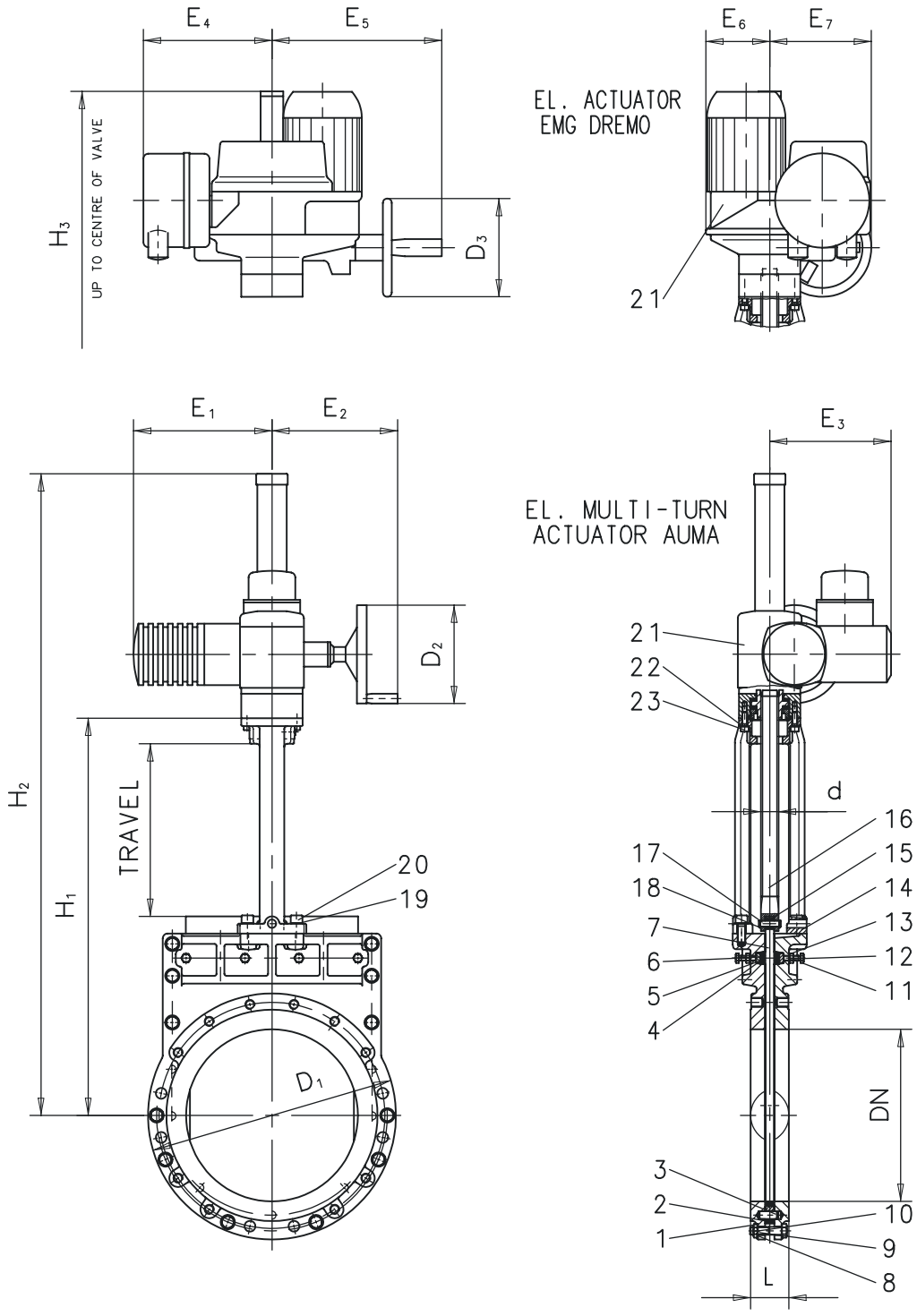
DN	Electric actuator AUMA	D_3	E_1	E_2	E_3	H_2	Closing/Opening time in seconds at the following speeds of electr.actuator of N =					
							16	**22** [2)]	**32**	**45** [1)]	**63**	**90**
350	SA 10.1 - A/10 (max. 120 NM)	200	282	256	247	1305	217	158	108	77	55	38
400						1405	300	218	150	107	76	53
500						1715	313	227	156	111	80	55
600	SA14.1-A/F14 (max. 250 NM)	315	385	325	285	2075	375	273	188	133	95	67

Preferred series

1) for standard actuator

2) for regulating actuator

Drawing 3E 60796
ERU Knife Gate Valve K1 with electric actuator



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-FLANGE CONNECTING DIMENSIONS
TO DIN 2532 PN10

-CONNECTING ELEMENTS FOR
FLANGE CONNECTION
TO DRAWING 4E131899

-FACE-TO-FACE DIMENSION EN558-1,
BASIC SERIES 20, FORMER DIN3202,
PART 3, SERIES K1

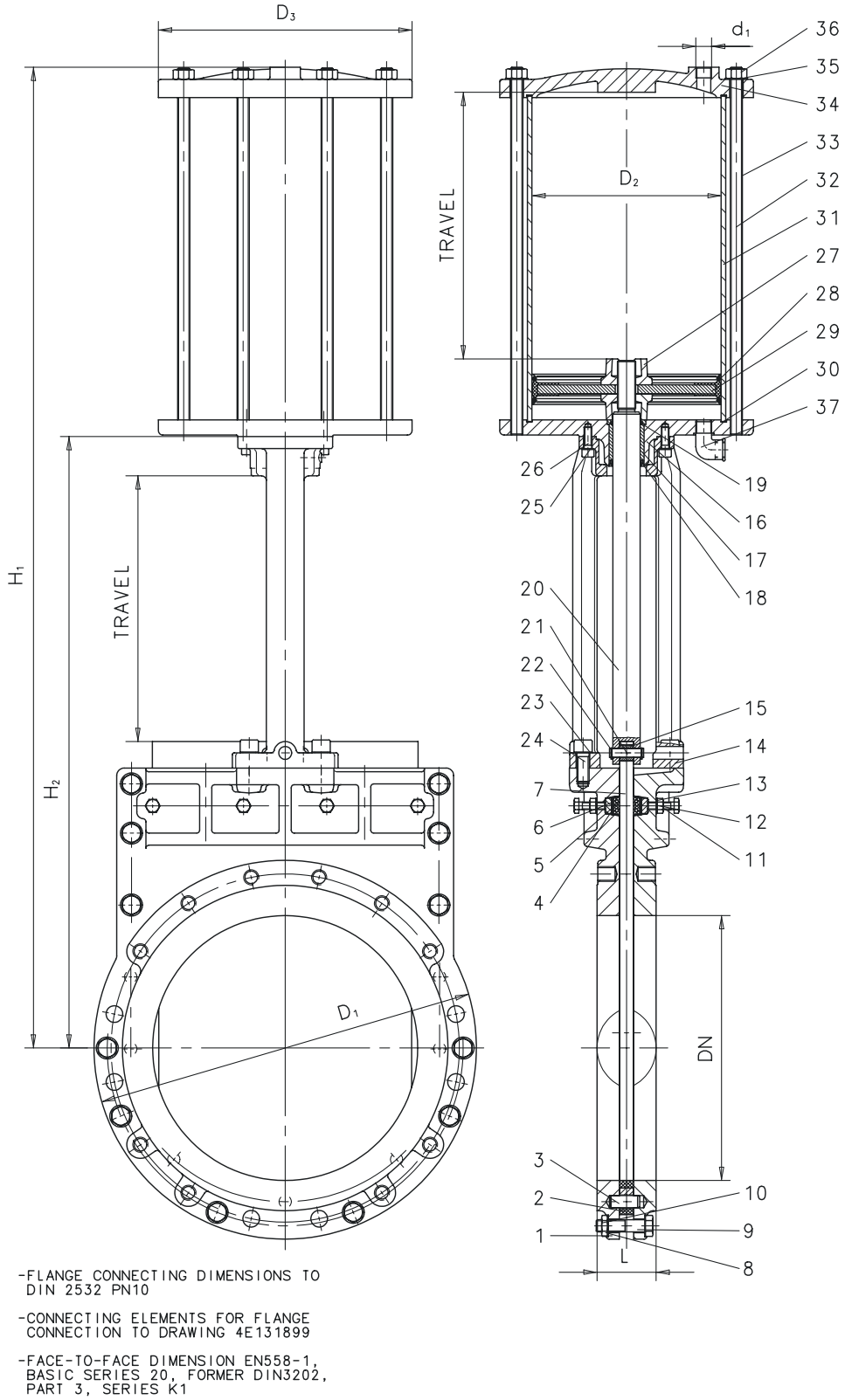
Parts list for drawing: 3E 60797
ERU Knife Gate Valve K1 with piston actuator

Part	Description	Qty.	E / V		Part	Description	Qty.	E / V
1	Body component	2			20	Piston rod	1	E
2	U-shaped sealing element, complete	1	V1		21	Bolt	*)	
3	Straight pin	*)			22	Locking washer	*)	
4	Compressor	2			23	Washer	4	
5	Packing cord, square	4	V1		24	Cylindrical screw	4	
6	Profile rubber	2	V1		25	Washer	4	
7	Gate	1			26	Cylindrical screw	4	
8	Washer	*)			27	Piston nut	2	
9	Hexagon screw	*)			28	Double cup collar A	1	V2
10	Hexagon nut	*)			29	Centering ring	1	
11	Hexagon screw	*)			30	Gasket	2	V2
12	Hexagon nut	*)			31	Tube cylinder	1	
13	Washer	*)			32	Threaded bolt	8	
14	Yoke	1			33	Sleeve	8	
15	Bush	1			34	Cylinder cover	1	
16	Mounting flange	1			35	Washer	8	
17	Collar bush	1			36	Hexagon nut	8	
18	Scraper ring	1			37	Angular fitting	1	
19	0-ring	1	V2					

*) quantity is variable depending on the nominal size DN

DN	L	H_1	H_2	D_1	D_2	D_3	d_1	Cylinder volume litres
350	78	1296	808	505	250	335	G 1/2	17.5
400	102	1446	908	561	250	335	G 1/2	19.8
500	127	1756	1118	666	250	335	G 1/2	27
600	154	2095	1322	780	300	395	G 1/2	38

Drawing 3E 60797
ERU Knife Gate Valve K1 with piston actuator



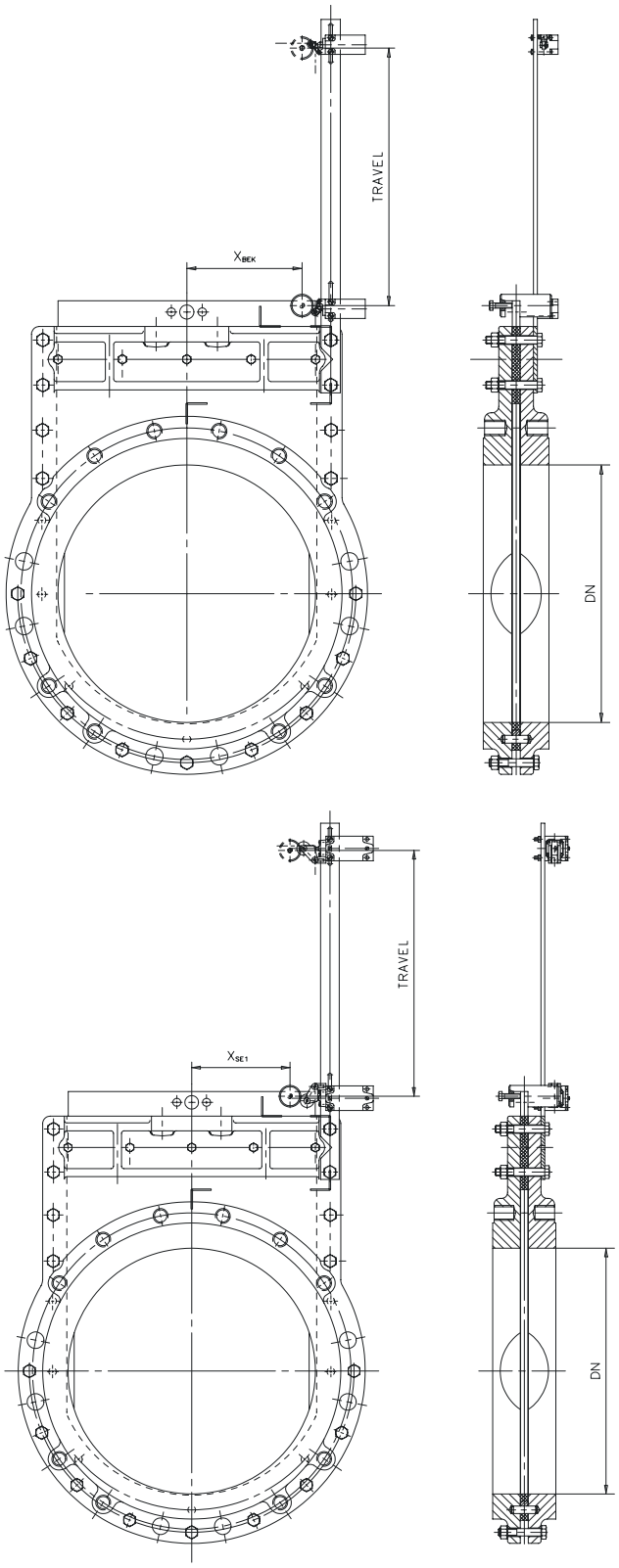
-FLANGE CONNECTING DIMENSIONS TO DIN 2532 PN10

-CONNECTING ELEMENTS FOR FLANGE CONNECTION TO DRAWING 4E131899

-FACE-TO-FACE DIMENSION EN558-1, BASIC SERIES 20, FORMER DIN3202, PART 3, SERIES K1

Drawing 2E 42038

ERU Knife Gate Valve K1 with mounted limit switches Siemens SE1 and Bernstein BEK



DN	X_{SE1}	X_{BEK}
350	260	278
400	210	230
500	160	180
600	138	157

Dimensions X_{SE1} and X_{BEK} are only approximate dimensions and are not binding for safe operation of the limit switches