Highly Flexible Couplings
ELPEX Series

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General information

Overview

ELPEX couplings are highly torsionally flexible and free of torsional backlash. Because of their low torsional stiffness and damping capacity, ELPEX couplings are especially suitable for coupling machines with a very non uniform torque pattern. ELPEX couplings are also suitable for connecting machines with high shaft misalignment.

Standard ELPEX coupling types are designed as shaft-shaft connections or flange-shaft connections. Application-related types can be implemented on request.

Benefits

The ELPEX coupling is suitable for horizontal and vertical mounting positions or mounting at any required angle. The coupling parts can be arranged as required on the shafts to be connected.

The split flexible rings can be changed without having to move the coupled machines.

The flexible rings are mounted without backlash and give the coupling progressive torsional stiffness, i.e. torsional stiffness increases in proportion to coupling load.

The ELPEX coupling is especially suitable for reversing operation or operation with changing directions of load.

The coupling is delivered preassembled. The flexible rings are completely assembled. On the type ENG, the coupling halves have to be bolted together after the hub has been mounted. On the type EFG, after mounting the coupling hub, only the outer flange has to be connected to the machine.

Outer flanges with different connection dimensions are available for the type EFG.

If the flexible rings are irreparably damaged or worn, the metal parts can rotate freely against one another, they are not in contact with one another.

Application

The ELPEX coupling is available in 9 sizes with a nominal torque of between 1600 Nm and 90000 Nm. The coupling is suitable for ambient temperatures of between -40 °C and +80 °C.

The ELPEX coupling is frequently used for high-quality drives which have to guarantee very long service life in harsh operating conditions. Examples of applications are mill drives in the cement industry, marine main and secondary drives or drives on large excavators powered by an electric motor or diesel engine.

Design

Design and function

The ELPEX coupling's transmission characteristic is determined essentially by the flexible rings. The flexible rings are manufactured from a natural rubber mixture with a multiply fabric lining. The flexible rings are split so that they can be changed without having to move the coupled machines.

The flexible rings are fastened to the hub with a clamping ring and to the outer flange with a clamping ring, using pins and bolts.

On the type EFG, the outer flange is designed with connection dimensions for connection to e.g. a diesel engine flywheel. On ENG types, the outer flange is fitted to a second hub part, which then enables the shaft-shaft connection.

Materials:

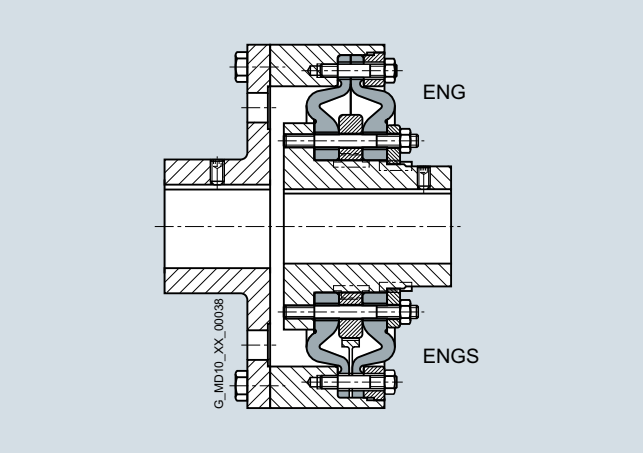
	Type	
	Cast iron	Steel
Hub part 1	Grey cast iron EN-GJL-250	Steel
Hub part 2	Steel	Steel
Retaining ring, outer ENG, ENGS	Grey cast iron EN-GJL-250	Steel
Outer flange EFG, EFGS	Grey cast iron EN-GJL-250	Steel

Flexible ring materials:

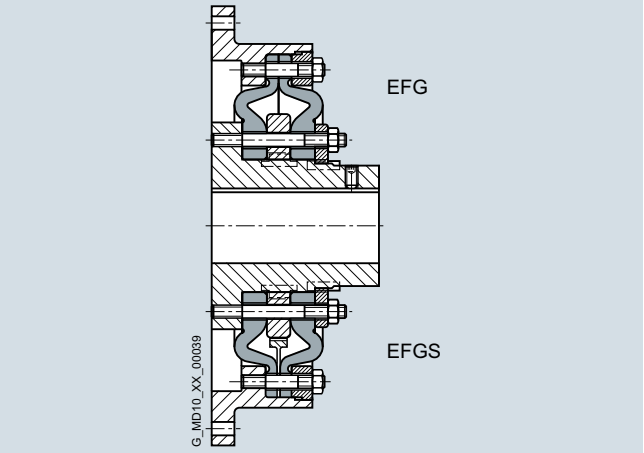
Material/ description	Hardness	Identification	Ambient temperature
Natural rubber	70 ShoreA	Size - 2	-40 °C ... +80 °C

ELPEX coupling types

Type	Description
ENG	Coupling as shaft-shaft connection
EFG	Coupling as flange-shaft connection
ENGS	as ENG with fail-safe device
EFGS	as EFG with fail-safe device



Types ENG/ENGS



Types EFG/EFGS

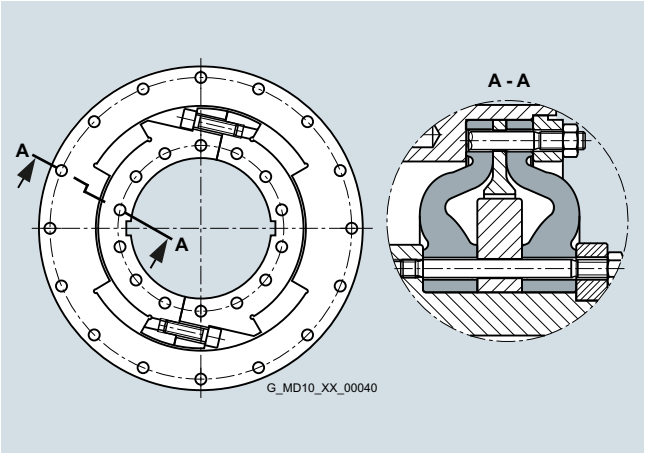
Further application-specific coupling types are available. Dimension sheets for and information on these are available on request. The following versions have already been implemented a number of times:

- ELPEX coupling with brake drum, brake disk or flywheel mass
- ELPEX coupling with axial backlash limiter
- ELPEX coupling with adapter
- ELPEX coupling in combination with a safety slip clutch
- ELPEX coupling for engaging/disengaging during standstill
- ELPEX coupling as part of a coupling combination

Fail-safe device of ELPEX coupling

Types ENGS and EFGS are provided with a fail-safe device. In normal operation the torsion angle of the flexible rings is smaller than the gap between the cams. In normal operation there is no metal-metal contact.

If the flexible rings fail, cams transmit the torque from the inner part and outer part. These enable the coupling to be used in emergency mode for a short time. This option is frequently required e.g. in the case of marine drives.



Fail-safe device

General information

Configuration

The ELPEX coupling is especially suitable for rough operation. An application factor different from that in catalog section 3 is therefore sufficient for all applications. In the case of machines which excite torsional vibration, Siemens urgently recommends carrying out a torsional vibration calculation or measuring the coupling load occurring in the drive.

Coupling selection

Coupling load in continuous operation

The operating principles of the driving and driven machines are divided into categories and the application factor FB derived from these in accordance with DIN 3990-1.

Application factor FB	Torque characteristic of the driven machine		
Torque characteristic of the driving machine	uniform with moderate shock loads	non uniform	very rough
Electric motors, hydraulic motors, gas and water turbines	1.0	1.3	1.4
Internal combustion engines	1.3	1.4	1.6

Examples of torque characteristic in driven machines:
- uniform with moderate shock loads: generators, fans, blowers
- non uniform: reciprocating compressors, mixers, conveyor systems
- very rough: crushers, excavators, presses, mills

Temperature factor FT		Temperature T_a on the coupling				
Coupling	Elastomer material	-40 °C to -30 °C	-30 °C to +50 °C	to 60 °C	to 70 °C	to 80 °C
ELPEX	NR	1.1	1.0	1.25	1.40	1.60

NR: Natural rubber mixture

Select size with: $T_{KN} \geq T_N \cdot FB \cdot FT$

Coupling load at maximum and overload conditions

The maximum torque is the highest load acting on the coupling in normal operation.
Maximum torques at a frequency of up to 25 times an hour are permitted and must be lower than the maximum coupling torque. Examples of maximum torque conditions are: Starting operations, stopping operations or usual operating conditions with maximum load.

$$T_{Kmax} \geq T_{max} \cdot FT$$

Overload torques are maximum loads which occur only in combination with special, infrequent operating conditions.
Examples of overload torque conditions are: Motor short circuit, emergency stop or blocking because of component breakage. Overload torques at a frequency of once a month are permitted and must be lower than the maximum overload torque of the coupling. The overload condition may last only a short while, i.e. fractions of a second.

$$T_{KOL} \geq T_{OL} \cdot FT$$

Coupling load due to dynamic torque load

Applying the frequency factor FF, the dynamic torque load must be lower than the coupling fatigue torque.

Dynamic torque load

$$T_{KW} \geq T_W \cdot FT \cdot FF \cdot \frac{0.6}{FB - 1.0}$$

Frequency of the dynamic torque load
$f_{err} \leq 10$ Hz frequency factor FF = 1.0

Frequency of the dynamic torque load
$f_{err} > 10$ Hz frequency factor FF = $\sqrt{(f_{err} / 10\ Hz)}$

Checking the maximum speed:

The following must apply to all load situations: $n_{Kmax} \geq n_{max}$

Checking permitted shaft misalignment and restorative forces

For all load situations the actual shaft misalignment must be less than the permitted shaft misalignment.

Checking bore diameter, mounting geometry and coupling design

The check must be made on the basis of the dimension tables. On request, couplings with adapted geometry can be provided.

Checking shaft-hub connection

Please refer to catalog section 3 for instructions.

Checking temperature and chemically aggressive environment

The permitted coupling temperature is specified in the Temperature Factor FT table. In the case of chemically aggressive environments, please consult the manufacturer.

Technical data

Power ratings

Size	Rated torque	Maximum torque	Overload torque	Fatigue torque	Dynamic torsional stiffness for 100 % capacity utilization	Stiffness		Permitted shaft misalignment at speed n = 1500 rpm		
						Axial	Radial	Axial	Radial	Angle
	T_{KN}	T_{Kmax}	T_{KOL}	T_{KW}	C_{Tdyn}	C_a	C_r	ΔK_a	ΔK_r	ΔK_w
	Nm	Nm	Nm	Nm	kNm/rad	N/mm	N/mm	mm	mm	Degree
270	1600	4800	6400	640	22.0	660	770	2.2	2.2	0.2
320	2800	8400	11200	1120	38.0	780	910	2.6	2.6	0.2
375	4500	13500	18000	1800	63.0	970	1130	3	3	0.2
430	7100	21300	28400	2840	97.0	1160	1350	3.4	3.4	0.2
500	11200	33600	44800	4480	155	1410	1630	3.8	3.8	0.2
590	18000	54000	72000	7200	240	1710	1990	4.2	4.2	0.2
690	28000	84000	112000	11200	365	2060	2390	4.6	4.6	0.2
840	45000	135000	180000	18000	685	2570	2990	5	5	0.2
970	90000	270000	360000	36000	1100	3020	3510	5.5	5.5	0.2

The damping coefficient is Ψ = 1.1

Torsional stiffness

The dynamic torsional stiffness is load-dependent and increases in proportion to capacity utilization. The values specified in the selection table apply to a capacity utilization of 100 %. The following table shows the correction factors for different rated loads.

$C_{Tdyn} = C_{Tdyn\ 100\ \%} \cdot FKC$

	Capacity utilization T_N / T_{KN}						
	20 %	50 %	60 %	70 %	80 %	100 %	200 %
Correction factor FKC	0.3	0.56	0.65	0.74	0.82	1	1.9

Torsional stiffness also depends on the ambient temperature and the frequency and amplitude of the torsional vibration excitation. More precise torsional stiffness and damping parameters on request.

With elastic couplings the manufacturing process of the rubber elements and their aging primarily influence the rigidity value C_{Tdyn}. For this reason calculation must be made with a tolerance for the dynamic rigidity of ± 20 %. The specified damping coefficient Ψ is a minimum value with the result that the damping performance of the coupling corresponds at least to the specified value.

Permitted shaft misalignment

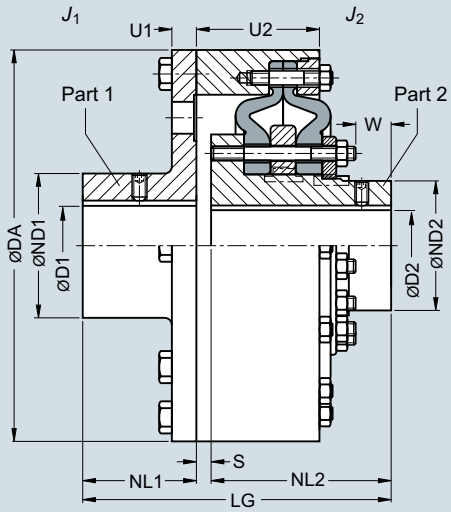
The permitted shaft misalignment depends on the operating speed. As the speed increases, lower shaft misalignment values are permitted. The following table shows the correction factors for different speeds.
The maximum speed for the respective coupling size must be noted!

$\Delta K_{perm} = \Delta K_{1500} \cdot FKV$

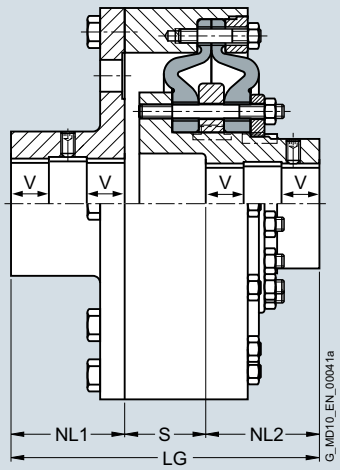
	Speed in rpm			
	500	1000	1500	3000
Correction factor FKV	1.6	1.25	1.0	0.7

Types ENG/ENGS

Selection and ordering data



Sizes 270 ... 430



Sizes 500 ... 970

Size	Rated torque	Max. speed		Dimensions in mm Keyway DIN 6885														Mass moment of inertia		Article No. with order codes for bore diameter and tolerances (article number without "-Z") – selection in catalog part 3	Weight
	T_{KN}	Type																			
		Cast iron	Steel	D1		D2		DA	ND1	ND2	NL1	NL2	S	U1	U2	LG	W	J_1	J_2		m
	Nm	rpm	rpm	min.	max.	min.	max.											kgm²	kgm²		kg
270	1600	3000	4250	45	80	45	70	270	128	94	80	155	10	14	86	245	42	0.21	0.037	**2LC0200-3A ■■■ -0AA0**	29
320	2800	2500	3600	55	100	55	85	320	160	115	100	180	6	16	97.5	286	48	0.49	0.082	**2LC0200-4A ■■■ -0AA0**	50
375	4500	2100	3100	65	115	65	105	375	184	143	120	205	10	18	111.8	335	62	1.0	0.21	**2LC0200-5A ■■■ -0AA0**	80
430	7100	1900	2650	75	130	75	120	430	208	165	140	235	8	22	126	383	68	2.0	0.37	**2LC0200-6A ■■■ -0AA0**	113
500	11200	1600	2300	90	150	90	150	500	240	202	160	160	112	25	139.7	432	80	3.9	0.85	**2LC0200-7A ■■■ -0AA0**	174
590	18000	1360	2000	100	140	100	170	590	224	230	190	190	130	28	162.7	510	95	8.2	1.7	**2LC0200-8A ■■■ -0AA0**	254
				140	180				288									8.4		**2LC0200-8A ■■■ -0AA0**	284
690	28000	1200	1650	110	140	110	200	690	224	278	220	220	140	32	175.6	580	102	16.3	3.7	**2LC0201-0A ■■■ -0AA0**	350
				140	180				288									16.8		**2LC0201-0A ■■■ -0AA0**	370
				180	210				336									16.9		**2LC0201-0A ■■■ -0AA0**	385
840	45000	1000	1350	140	180	140	240	840	288	340	280	280	125	42	231	685	105	49	11	**2LC0201-1A ■■■ -0AA0**	700
				180	220				352									50		**2LC0201-1A ■■■ -0AA0**	725
970	90000	850	1180	160	200	160	280	970	320	390	350	350	167	70	290	867	137	104	26	**2LC0201-2A ■■■ -0AA0**	1265
				200	240				384									106		**2LC0201-2A ■■■ -0AA0**	1310
				240	280				448									110		**2LC0201-2A ■■■ -0AA0**	1350
				280	320				512									115		**2LC0201-2A ■■■ -0AA0**	1410

Type	• ENG cast iron	**F**
	• ENG steel	**L**
	• ENGS cast iron	**G**
	• ENGS steel	**M**
ØD1:	• Without finished bore – Without order codes	**1**
	• Without finished bore from size 590 for 2nd diameter range D1 – Without order codes	**2**
	• Without finished bore from size 690 for 3rd diameter range D1 – Without order codes	**3**
	• Without finished bore for size 970 for 4th diameter range D1 – Without order codes	**4**
	• With finished bore – With order codes for diameter and tolerance (article number without **"-Z"**)	**9**
ØD2:	• Without finished bore – Without order codes	**1**
	• With finished bore – With order codes for diameter and tolerance (article number without **"-Z"**)	**9**

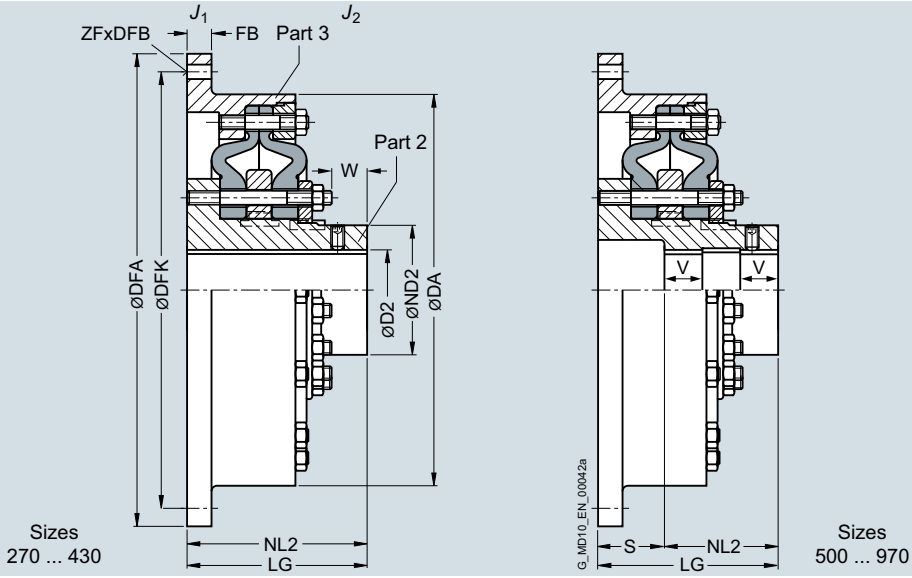
The hub diameter of the component part is assigned according to the diameter of the finished bore. Where bore diameters overlap, the component with the smaller hub diameter is always selected.

Weights and mass moments of inertia apply to cast iron version with maximum bore.
From size 500, the bores D1 and D2 are each provided with a recess of D = +1 mm halfway along the hub. V ≈ 1/3 NL

Ordering example:
ELPEX coupling ENG, size 690, cast iron version, bore ØD1 = 180H7 mm with keyway to DIN 6885 and set screw, the hub diameter ND1 = 288 mm is thus assigned; bore ØD2 200H7 mm, with keyway to DIN 6885 and set screw, the hub diameter ND2 = 278 mm is thus assigned.

Article No.:
2LC0201-0AF99-0AA0
L2B+M2D

Selection and ordering data



Size	Rated torque	Max. speed n_{Kmax}		Dimensions in mm Keyway DIN 6885								Flange connection dimensions [1]					Mass moment of inertia		Article No. with order codes for bore diameter and tolerances (article number without **"-Z"**) – selection in catalog part 3	Weight
		Type																		
	T_{KN}	Cast iron	Steel	D2		DA	ND2	NL2	S	LG	W	DFA	DFK	FB	ZF	DFB	J_1	J_2		m
	Nm	rpm	rpm	min.	max.												kgm²	kgm²		kg
270	1600	3000	4250	45	70	270	94	155	–	155	42	466.7_{g7} [1]	438.2 [1]	12	8	13	0.47	0.037	**2LC0200-3A ■ 2 ■ -0AA0**	27
												325_{i6}	300		8	14	0.16		**2LC0200-3A ■ 1 ■ -0AA0**	19
320	2800	2500	3600	55	85	320	115	180	–	180	48	517.5_{g7} [1]	489 [1]	14	8	13	0.87	0.082	**2LC0200-4A ■ 2 ■ -0AA0**	42
												392_{i6}	360		8	18	0.39		**2LC0200-4A ■ 1 ■ -0AA0**	33.5
375	4500	2100	3100	65	105	375	143	205	–	205	62	571.5_{g7} [1]	542.9 [1]	16	6	17	1.5	0.21	**2LC0200-5A ■ 2 ■ -0AA0**	65
												448_{i6}	415		8	18	0.78		**2LC0200-5A ■ 1 ■ -0AA0**	53
430	7100	1900	2650	75	120	430	165	235	–	235	68	673.1_{g7} [1]	641.4 [1]	20	12	17	3.4	0.37	**2LC0200-6A ■ 2 ■ -0AA0**	100
												515_{i6}	475		8	22	1.5		**2LC0200-6A ■ 1 ■ -0AA0**	78
500	11200	1600	2300	90	150	500	202	160	100	260	80	673.1_{g7} [1]	641.4 [1]	20	12	17	4.0	0.85	**2LC0200-7A ■ 2 ■ -0AA0**	150
												585_{i6}	545		10	22	2.7		**2LC0200-7A ■ 1 ■ -0AA0**	140
590	18000	1350	2000	100	170	590	230	190	120	310	95	733.4_{g7} [1]	692.2 [1]	24	12	21	7.0	1.7	**2LC0200-8A ■ 2 ■ -0AA0**	200
												692_{i6}	645		10	26	6.0		**2LC0200-8A ■ 1 ■ -0AA0**	190
690	28000	1200	1650	110	200	690	278	220	130	350	102	890_{g7} [1]	850 [1]	24	32	17	15	3.7	**2LC0201-0A ■ 2 ■ -0AA0**	270
												800_{i6}	750		12	26	11		**2LC0201-0A ■ 1 ■ -0AA0**	250
840	45000	1000	1350	140	240	840	340	280	115	395	105	1105_{g7} [1]	1060 [1]	30	32	21	46	11	**2LC0201-1A ■ 2 ■ -0AA0**	530
												960_{i6}	908		16	30	32		**2LC0201-1A ■ 1 ■ -0AA0**	470
970	90000	850	1180	160	280	970	390	350	155	505	137	1385_{g7} [1]	1320 [1]	35	24	31	130	26	**2LC0201-2A ■ 2 ■ -0AA0**	1050
												1112_{i6}	1051		16	35	76		**2LC0201-2A ■ 1 ■ -0AA0**	920

Type	• EFG cast iron	**B**
	• EFG steel	**J**
	• EFGS cast iron	**C**
	• EFGS steel	**K**
ØD2:	• Without finished bore – Without order codes	**1**
	• With finished bore – With order codes for diameter and tolerance (article number without **"-Z"**)	**9**

The hub diameter of the component part is assigned according to the diameter of the finished bore. Where bore diameters overlap, the component with the smaller hub diameter is always selected.

Weights and mass moments of inertia apply to cast iron version with maximum bore.
From size 500, the bores D1 and D2 are each provided with a recess of D = +1 mm halfway along the hub. V ≈ 1/3 NL

Notice: The application factor FB in the coupling selection section must be noted.

Ordering example:
ELPEX EFG coupling, size 430, steel version,
bore ØD1 = 100H7 mm with keyway to DIN 6885 and set screw, flange to SAE J620d size 21 with DFA = 673.5g7 mm.

Coupling balanced G6.3 in accordance with the half parallel key standard.
Article No.:
2LC0200-6AJ29-0AA0-Z
M1N+W02

[1] The top line of the flange connection dimensions in accordance with the SAE J620d or DIN 6288 standards.

Spare and wear parts

Selection and ordering data

Flexible rings

The flexible rings are wear parts. The service life depends on the operating conditions.

Size	Article No. Flexible rings for a coupling	Weight kg	Types EFG, ENG Flexible ring screw connection set of pins and bolts	Types EFGS, ENGS Flexible ring screw connection set of pins and bolts
270	**2LC0200-3XV00-0AA0**	1.6	**2LC0200-3XU00-0AA0**	**2LC0200-3XW00-0AA0**
320	**2LC0200-4XV00-0AA0**	2.6	**2LC0200-4XU00-0AA0**	**2LC0200-4XW00-0AA0**
375	**2LC0200-5XV00-0AA0**	4.4	**2LC0200-5XU00-0AA0**	**2LC0200-5XW00-0AA0**
430	**2LC0200-6XV00-0AA0**	6.8	**2LC0200-6XU00-0AA0**	**2LC0200-6XW00-0AA0**
500	**2LC0200-7XV00-0AA0**	9.4	**2LC0200-7XU00-0AA0**	**2LC0200-7XW00-0AA0**
590	**2LC0200-8XV00-0AA0**	18	**2LC0200-8XU00-0AA0**	**2LC0200-8XW00-0AA0**
690	**2LC0201-0XV00-0AA0**	36	**2LC0201-0XU00-0AA0**	**2LC0201-0XW00-0AA0**
840	**2LC0201-1XV00-0AA0**	68	**2LC0201-1XU00-0AA0**	**2LC0201-1XW00-0AA0**
970	**2LC0201-2XV00-0AA0**	120	**2LC0201-2XU00-0AA0**	**2LC0201-2XW00-0AA0**