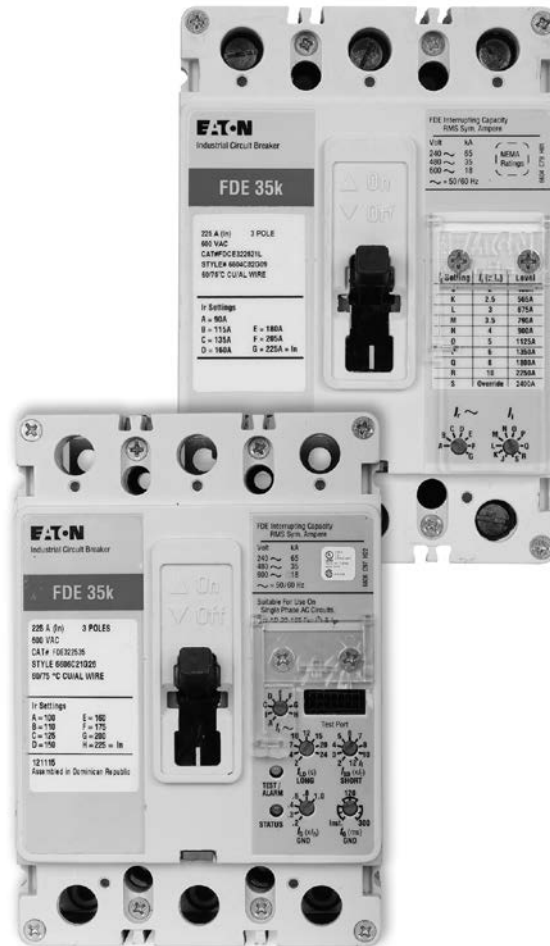


FD-Frame circuit breakers with 210+ and 310+ electronic trip unit technology



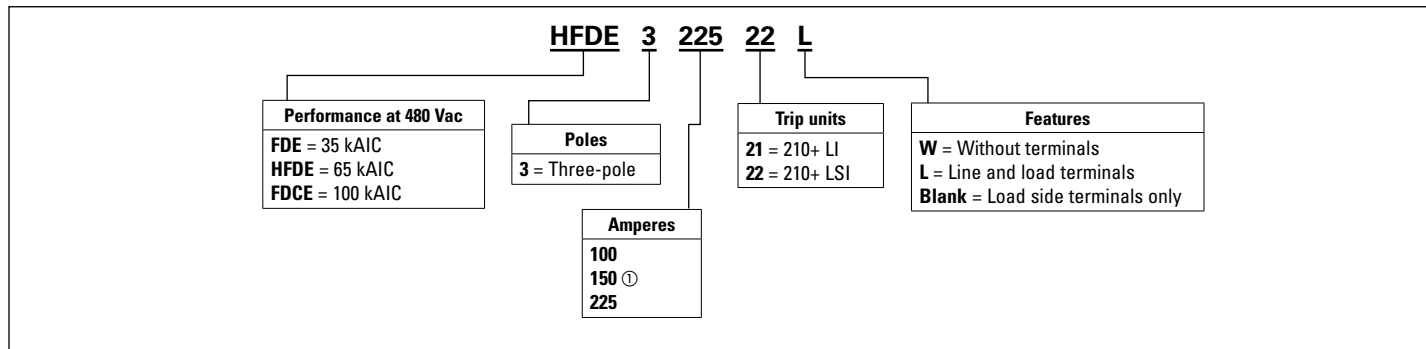
Product description

- The Series C® F-Frame breaker features 210+ or 310+ electronic trip units, in addition to thermal-magnetic trip units. F-Frame electronic breakers offer protection options to meet basic overload protection requirements or for more advanced systems requiring ground fault protection or system coordination. The F-Frame breaker is NEMA®, UL®, and CSA® listed
- The FDE 210+ features LI or LSI protection settings with two simple adjustment knobs for setting up protection parameters
- The FDE 310+ features LS, LSI, LSG, or LSIG protection settings with additional curve shaping options for more coordination capabilities. In addition, the 310+ trip unit offers the additional option of zone selective interlocking (ZSI) for improved system uptime and faster fault clearing times in coordinated systems

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Table 1. FD-Frame circuit breakers with 210+ electronic trip unit technology



① 150 A version available in LI version only for 210+.

Table 2. FD-Frame circuit breakers with 310+ electronic trip unit technology

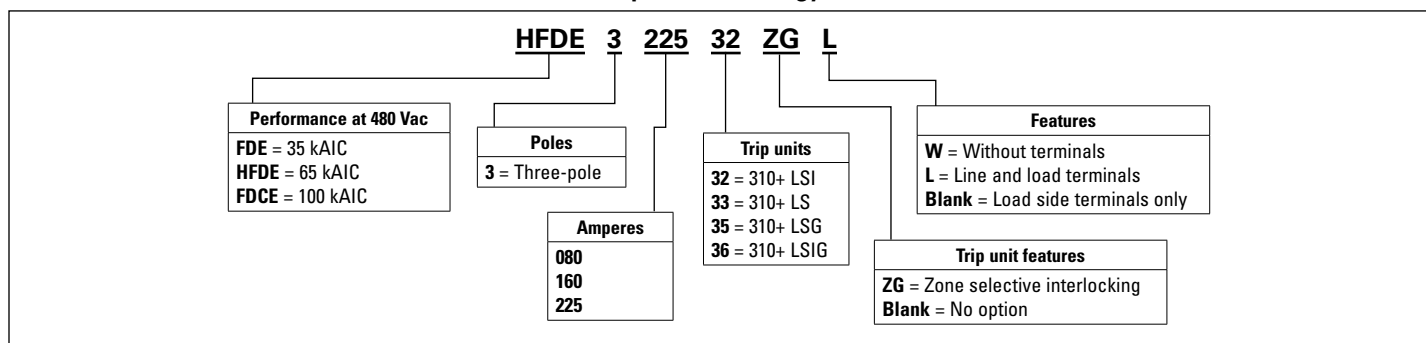


Table 3. 210+ electronic trip units amperage settings

Circuit breaker type	Frame	Ratings
FDE, HFDE, FDCE	225	100, 110, 125, 150, 175, 200, 225
FDE, HFDE, FDCE	150	70, 80, 90, 100, 110, 125, 150
FDE, HFDE, FDCE	100	40, 50, 60, 70, 80, 90, 100

Table 4. 310+ electronic trip units amperage settings

Circuit breaker type	Frame	Ratings
FDE, HFDE, FDCE	225	100, 110, 125, 150, 160, 175, 200, 225
FDE, HFDE, FDCE	160	60, 70, 80, 90, 100, 125, 150, 160
FDE, HFDE, FDCE	80	15, 20, 30, 40, 50, 60, 70, 80

Product selection

Table 5. Types FDE, HFDE, and FDCE 210+ electronic circuit breakers with non-interchangeable trip units

See 210+ adjustability specifications on Page 7.

Maximum ampere rating	Digitrip RMS 210+ trip unit only	
	Standard	Optional
	LI adjustable instantaneous Catalog number	LSI adjustable short time pickup and delay Catalog number
35 kAIC at 480 Vac / 18 kAIC at 600 Vac		
100	FDE310021	FDE310022
150	FDE315021	①
225	FDE322521	FDE322522
65 kAIC at 480 Vac / 25 kAIC at 600 Vac		
100	HFDE310021	HFDE310022
150	HFDE315021	①
225	HFDE322521	HFDE322522
100 kAIC at 480 Vac / 25 kAIC at 600 Vac ②		
100	FDCE310021	FDCE310022
150	FDCE315021	①
225	FDCE322521	FDCE322522

① 150 A not available with LSI trip unit; entire range is covered by 100 A and 225 A frames.

② Contact the product line for availability.

Table 6. FDE 310+ electronic breaker with zone selective interlocking

Ampere rating	LSI with ZSI	LSIG with ZSI
	Catalog number	Catalog number
35 kAIC at 480 Vac / 18 kAIC at 600 Vac		
80	FDE308032ZG	FDE308036ZG
160	FDE316032ZG	FDE316036ZG
225	FDE322532ZG	FDE322536ZG
65 kAIC at 480 Vac / 25 kAIC at 600 Vac		
80	HFDE308032ZG	HFDE308036ZG
160	HFDE316032ZG	HFDE316036ZG
225	HFDE322532ZG	HFDE322536ZG
100 kAIC at 480 Vac / 25 kAIC at 600 Vac		
80	FDCE308032ZG	FDCE308036ZG
160	FDCE316032ZG	FDCE316036ZG
225	FDCE322532ZG	FDCE322536ZG

Table 7. Types FDE, HFDE, and FDCE 310+ electronic circuit breakers with non-interchangeable trip units

See 310+ adjustability specifications on Page 7.

Maximum ampere rating	Digitrip RMS 310+ Trip Unit Only					
	Standard LS	Optional LSI	LSG	LSIG	Neutral CT for LSG and LSIG	Compact neutral CT for LSG and LSIG
	Adjustable short time pickup with I ² t short delay ramp Catalog number	Independently adjustable short time pickup and delay Catalog number	Adjustable short time pickup with I ² t short delay and ground fault protection Catalog number	Independently adjustable short time pickup and ground fault protection Catalog number		
35 kAIC at 480 Vac / 18 kAIC at 600 Vac						
80	FDE308033	FDE308032	FDE308035	FDE308036	CTF080	CTFD080
160	FDE316033	FDE316032	FDE316035	FDE316036	CTF160	CTFD160
225	FDE322533	FDE322532	FDE322535	FDE322536	CTF225	CTFD225
65 kAIC at 480 Vac / 25 kAIC at 600 Vac						
80	HFDE308033	HFDE308032	HFDE308035	HFDE308036	CTF080	CTFD080
160	HFDE316033	HFDE316032	HFDE316035	HFDE316036	CTF160	CTFD160
225	HFDE322533	HFDE322532	HFDE322535	HFDE322536	CTF225	CTFD225
100 kAIC at 480 Vac / 25 kAIC at 600 Vac						
80	FDCE308033	FDCE308032	FDCE308035	FDCE308036	CTF080	CTFD080
160	FDCE316033	FDCE316032	FDCE316035	FDCE316036	CTF160	CTFD160
225	FDCE322533	FDCE322532	FDCE322535	FDCE322536	CTF225	CTFD225

Accessories selection guide and ordering information

Line and load terminals

Line and load terminals provide wire connecting capabilities for specific ranges of continuous current ratings and wire types. Except as noted, terminals comply with UL 486A and UL 486B standards. Unless otherwise specified, F-Frame circuit breakers are factory equipped with load terminals only.

Ordering information

F-Frame circuit breakers and molded-case switches have load terminals only as standard equipment. When standard line-end terminals (same as standard load-end terminals) are required, add Suffix L to the circuit breaker catalog number. When non-standard or optional line and/or load terminals are required, order by style number. Specify if factory installation is required.

Table 8. Line and load terminals

Maximum breaker amperes	Terminal body material	Wire type	AWG wire range	Metric wire range mm ²	Package of three terminals
					Catalog number
Standard pressure type terminals					
100	Steel	Cu/Al	14–1/0	2.5–50	3T100FB
225	Aluminum	Cu/Al	4–4/0	25–95	3TA225FD
Optional pressure terminals					
50	Aluminum	Cu/Al	14–4	2.5–25	3TA50FB
100	Aluminum	Cu/Al	14–1/0	2.5–50	3TA100FD
200	Stainless steel	Cu	4–4/0	25–95	3T150FB
225	Copper	Cu	4–4/0	25–95	3T225FD
225	Aluminum	Cu/Al	6–300 kcmil	16–150	3TA225FDK ①

① Includes terminal shield kit. Adds approximately 3.00 inches (76.2) to breaker height. Available for use on three-pole breaker only.

Internal accessories

FDE breakers can be fitted with alarm switches, auxiliary switches, alarm/auxiliary switch combinations, a shunt trip, a UVR, and some specific combinations of these devices.

On FDE breakers, the right pole accessory pocket is always occupied by the trip actuation device for the electronic trip unit, and is limited to an additional single auxiliary switch (1a/1b).

The left pole of the breaker may be used for one additional accessory, an alarm switch, an auxiliary switch, combination alarm/auxiliary switches, a shunt trip, or a UVR.

The following tables list the options available for auxiliary and alarm switches for electronic breakers.

In addition, F-Frame circuit breakers are factory sealed, therefore, UL requires that internal accessories be installed at the factory. Internal accessories are UL listed for factory installation. Specifically on FDE breakers, Eaton does not recommend field installation of internal accessories, even when local codes and standards permit and/or UL listing is not required.

Alarm switch

Table 9. F-Frame with electronic trip unit alarm switch options—factory installed ①

Number of contacts (make and break)	Mounting location (pole)	Connection type and location			
		18-inch (457.2 mm) pigtail leads			Terminal block
		Same side	Rear ②	Opposite side	Same side
		Suffix number	Suffix number	Suffix number	Suffix number
1	Left	B01	B02	B03	B04
2	Left	B09	B10	—	B011

① F-Frame circuit breakers are factory sealed. UL requires that internal accessories be installed at the factory. Internal accessories are UL listed for factory installation under E7819. Where local codes and standards permit and UL listing is not required, internal accessories can be field installed; however, this is not recommended for FDE breakers. Accessory installation should be done before the circuit breaker is mounted and connected.

② Standard mounting location and standard pigtail lead exit location.

Auxiliary switch

Table 10. F-Frame with electronic trip unit auxiliary switch options—factory installed ①

Number of contacts (make and break)	Mounting location (pole)	Connection type and location			
		18-inch (457.2 mm) pigtail leads			Terminal block
		Same side	Rear ②	Opposite side	Same side
		Suffix number	Suffix number	Suffix number	Suffix number
Breaker Type FDE 310+/210+					
1	Left	A01	A02	A03	A04
	Left	A15	A16	A17	—
Breaker Type FDE 310+/210+					
2	Left	A09	A10	—	A11
	Left	A21	A22	—	—
Breaker Type FDE 310+/210+					
1	Right	A30	A31	A32	—
	Right	A33	A34	A35	—

① F-Frame circuit breakers are factory sealed. UL requires that internal accessories be installed at the factory. Internal accessories are UL listed for factory installation under E7819. Where local codes and standards permit and UL listing is not required, internal accessories can be field installed; however, this is not recommended for FDE breakers. Accessory installation should be done before the circuit breaker is mounted and connected.

② Standard mounting location and standard pigtail lead exit location.

Auxiliary switch and alarm switch combination

Table 11. F-Frame with electronic trip unit auxiliary switch and alarm switch combination options ①②

Mounting location (pole)	Connection type and location		
	18-inch (457.2 mm) pigtail leads		Terminal block
	Same side	Rear ③	Same side
	Suffix number	Suffix number	Suffix number
Left	C01	C02	C03

① F-Frame circuit breakers are factory sealed. UL requires that internal accessories be installed at the factory. Internal accessories are UL listed for factory installation under E7819. Where local codes and standards permit and UL listing is not required, internal accessories can be field installed; however, this is not recommended for FDE breakers. Accessory installation should be done before the circuit breaker is mounted and connected.

② Auxiliary switch and alarm switch combination options (Cxx) are not available on FDE 310+ with LSG or LSI trip units due to exit wire limitations. To obtain both features, order a left mounting alarm switch and right mounting auxiliary switch (A30-A32). The Cxx options are available with non-ground fault trip units on FDE 210+ and 310+ (LI, LS, LSI).

③ Standard mounting location and standard pigtail lead exit location.

Shunt trip

Table 12. F-Frame shunt trip ①

Voltage rating (AC frequency = 50/60 Hz)	Factory installed				Field installation kit ②	
	Connection type and location					
	18-inch (457.2 mm) pigtail leads ③			Terminal block	Pigtail leads	Terminal block
	Same side	Rear ④	Opposite side	Same side		
	Suffix number	Suffix number	Suffix number	Suffix number	Catalog number	Catalog number
Left-pole mounting AC/DC ratings						
12–24 Vac or Vdc	S01	S02	S03	S04	SNT1LP03K	SNT1LT03K
48–127 Vac or 48–60 Vdc ⑤	S05	S06	S07	S08	SNT1LP08K	SNT1LT08K
208–380 Vac or 110–127 Vdc	S09	S10	S11	S12	SNT1LP12K	SNT1LT12K
415–600 Vac or 220–250 Vdc	S13	S14	S15	S16	SNT1LP18K	SNT1LT18K

① F-Frame circuit breakers are factory sealed. UL requires that internal accessories be installed at the factory. Internal accessories are UL listed for factory installation under E7819. Where local codes and standards permit and UL listing is not required, internal accessories can be field installed; however, this is not recommended for FDE breakers. Accessory installation should be done before the circuit breaker is mounted and connected.

② Not listed with Underwriters Laboratories, for field installation.

③ Pigtail wire size: 18 AWG (0.82 mm²).

④ Standard pigtail lead exit location.

⑤ 120 Vac marked suitable for ground fault protection devices.

Low energy shunt trip

Table 13. F-Frame low energy shunt trip ①

Mounting positions (pole)	Factory installed			Field installed		
	Connection type and location					
	18-inch (457.2 mm) pigtail leads			Terminal block		
	Same side	Rear ③	Opposite side	Same side	Pigtail leads	Terminal block
Suffix number	Suffix number	Suffix number	Suffix number	Catalog number	catalog number	
Left	N01	N02	N03	N04	LST1LPK	LST1LTK

① Cutoff provisions required in control circuit.

② UL Listed for field installation under E64983.

③ Standard mounting location—leads exit rear of breaker.

Undervoltage release mechanism

Table 14. F-Frame factory-installed undervoltage release mechanism

Voltage rating (AC freq. = 50/60 Hz)	Connection type and location			
	18-inch pigtail leads			Terminal block
	Same side	Rear ①	Opposite side	Same side
	Suffix number	Suffix number	Suffix number	Suffix number
Left-pole mounting AC ratings				
12 Vac	U01	U02	U03	U04
24 Vac	U05	U06	U07	U08
48 Vac	U37	U38	U39	U40
60 Vac	U97	U98	U99	U100
110–127 Vac	U13	U14	U15	U16
208–240 Vac	U17	U18	U19	U20
380–480 Vac	U21	U22	U23	U24
525–600 Vac	U25	U26	U27	U28
Left-pole mounting DC ratings				
12 Vdc	U29	U30	U31	U32
24 Vdc	U33	U34	U35	U36
48 Vdc	U37	U38	U39	U40
60 Vdc	U97	U98	U99	U100
110–127 Vdc	U41	U42	U43	U44
220–250 Vdc	U45	U46	U47	U48

① Standard pigtail lead exit location.

Table 15. F-Frame field-installed undervoltage release mechanism

Voltage rating (AC freq. = 50/60 Hz)	Field installation kits ①	
	Pigtail leads	Terminal block
Catalog number	Catalog number	Catalog number
Left-pole mounting AC ratings		
12 Vac	UVH1LP02K	UVH1LT02K
24 Vac	UVH1LP03K	UVH1LT03K
48 Vac	UVH1LP22K	UVH1LT22K
60 Vac	UVH1LP24K	UVH1LT24K
110–127 Vac	UVH1LP08K	UVH1LT08K
208–240 Vac	UVH1LP11K	UVH1LT11K
380–480 Vac	UVH1LP15K	UVH1LT15K
525–600 Vac	UVH1LP18K	UVH1LT18K
Left-pole mounting DC ratings		
12 Vdc	UVH1LP20K	UVH1LT20K
24 Vdc	UVH1LP21K	UVH1LT21K
48 Vdc	UVH1LP22K	UVH1LT22K
60 Vdc	UVH1LP24K	UVH1LT24K
110–127 Vdc	UVH1LP26K	UVH1LT26K
220–250 Vdc	UVH1LP28K	UVH1LT28K

① Not UL listed for field installation.



CTF225



CTFD225

Table 16. 210+ and 310+ electronic trip unit accessories

Description	210+	310+	Catalog number
Electronic portable test kit	■	■	MTST230V
Trip unit tamper protection wire seal	■	■	5108A03H01
External neutral sensor (80 A) ①		■	CTF080
External neutral sensor (160 A) ①		■	CTF160
External neutral sensor (225 A) ①		■	CTF225
Compact external neutral sensor (80 A) ①		■	CTFD080
Compact external neutral sensor (160 A) ①		■	CTFD160
Compact external neutral sensor (225 A) ①		■	CTFD225
Breaker-mount cause-of-trip indication		■	TRIP-LED
Breaker-mount ammeter module		■	DIGIVIEW
Remote-mount ammeter module		■	DIGIVIEWR06

① Required for four-wire systems if neutral protection is desired; sold separately.

Specifications

Table 17. FDE 210+ and 310+ specifications

Description	FD Frame	
	Digitrip RMS 210+	Digitrip RMS 310+
Breaker type		
Frame designation	FD	FD
Frames available (A)	100, 150 ①, 225	80, 160, 225
Continuous current range (A)	40–225	15–225
Ground fault pickup (A)	N/A	16–225
Interrupting capacities at 480 Vac (kAIC)	35, 65, 100	35, 65, 100
100% rated	No	No
Protection		
Ordering options	LI, LSI	LS, LSI, LSG, LSIG
Arcflash Reduction Maintenance System™ (or Maintenance Mode)	No	No
Interchangeable trip unit	No	No
High load alarm (suffix B20)	No	No (LED only)
Ground fault alarm with trip (suffix B21)	No	No
Ground fault alarm, no trip (suffix B22)	No	No
Zone selective interlocking (suffix ZG)	No	LSI, LSIG
Cause of trip indication	No	Yes (modules) ②
Thru-cover accessories	No	No
Test kit available	Yes	Yes

① 150 A frame only available on LI version.

② External modules include TRIP-LED, DIGIVIEW, and DIGIVIEWR06.

Table 18. FDE 210+ adjustability specifications

210+ settings	FD Frame		
	100 A	150 A	225 A
I_c = continuous current or long delay pickup (amperes) (all 210+)	I_c		
	A	40	70
	B	50	80
	C	60	90
	D	70	100
	E	80	110
	F	90	125
	G (= I_n)	100	150
	I_i (x I_n) = Instantaneous pickup (210+ LI version)	I_i	100
J–2x		200	300
K–2.5x		250	375
L–3x		300	450
M–3.5x		350	525
N–4x		400	600
O–5x		500	750
P–6x		600	900
Q–8x		800	1200
R–10x		1000	1500
S–12x ①		1200	1800
Fixed instantaneous override (all 210+)		2400	2400
I_{sd} (x I_i) / t_{sd} = SD profile ② (210+ LSI version)		I_{sd} / t_{sd}	100
	J	2x / 150	N/A
	K	2x / 300	N/A
	L	2x / I^2t	N/A
	M	4x / Inst	N/A
	N	4x / 150	N/A
	O	4x / I^2t	N/A
	P	6x / Inst	N/A
	Q	6x / 300	N/A
	R	10x / 150	N/A
	S	10x / 300	N/A

① S setting for 225 A LI version is set to instantaneous override.

② SD profile includes a short delay pickup (xlr) and short delay time (milliseconds) on a single switch.

Table 19. FDE 310+ adjustability specifications

310+ settings	FD Frame		
	80 A	160 A	225 A
I_c = continuous current or long delay pickup (amperes) (all 310+)	I_c		
	A	15	60
	B	20	70
	C	30	80
	D	40	90
	E	50	100
	F	60	125
	G	70	150
	H (= I_n)	80	160
t_l = long delay time (seconds) (all 310+)	Position 1	2	2
	Position 2	4	4
	Position 3	7	7
	Position 4	10	10
	Position 5	12	12
	Position 6	15	15
	Position 7	20	20
	Position 8	24	24
	I_{sd} (x I_i) = short delay pickup (all 310+)	Position 1	2x
Position 2		3x	3x
Position 3		4x	4x
Position 4		5x	5x
Position 5		6x	6x
Position 6		7x	7x
Position 7		8x	8x
Position 8		10x	10x
Position 9		12x	12x
t_{sd} = short delay time I^2t (milliseconds) (LS, LSG)	Fixed	67 @10x	67 @10x
t_{sd} = short delay time flat (milliseconds) (LSI, LSIG)	Position 1	Inst	Inst
	Position 2	120	120
	Position 3	300	300
I_g = ground fault pickup (amperes) (LSG, LSIG)	Position 1	16	32
	Position 2	24	48
	Position 3	32	64
	Position 4	48	96
	Position 5	64	128
	Position 6	80	160
t_g = ground fault delay time (milliseconds) (LSG, LSIG)	Position 1	Inst	Inst
	Position 2	120	120
	Position 3	300	300
Independently Adjustable Instantaneous (I_i) setting	①		
Maintenance Mode pickup (2.5 x I_n) (amperes)	②		

① Not available for FD. Independently adjustable I_i setting available in LG, NG, and RG ALSI and ALSIG trip units.

② Maintenance Mode not available for FD frames. It is available for KD, LD, MDL, LG, NG, and RG.

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Publication No. MZ012005EN / Z17244
October 2015



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