Heidenhain
LC 115 // LC 185
LC 195F // LC 195M // LC 195P // LC 195S

LC 415 // LC 485
LC 495F // LC 495M // LC 495P // LC 495S
Absolute Linear Encoders

Datasheet

Subject to change without notice.

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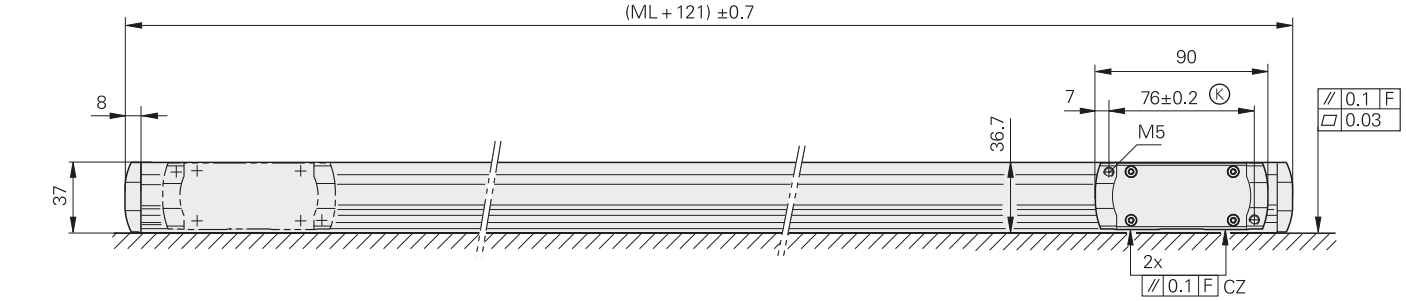
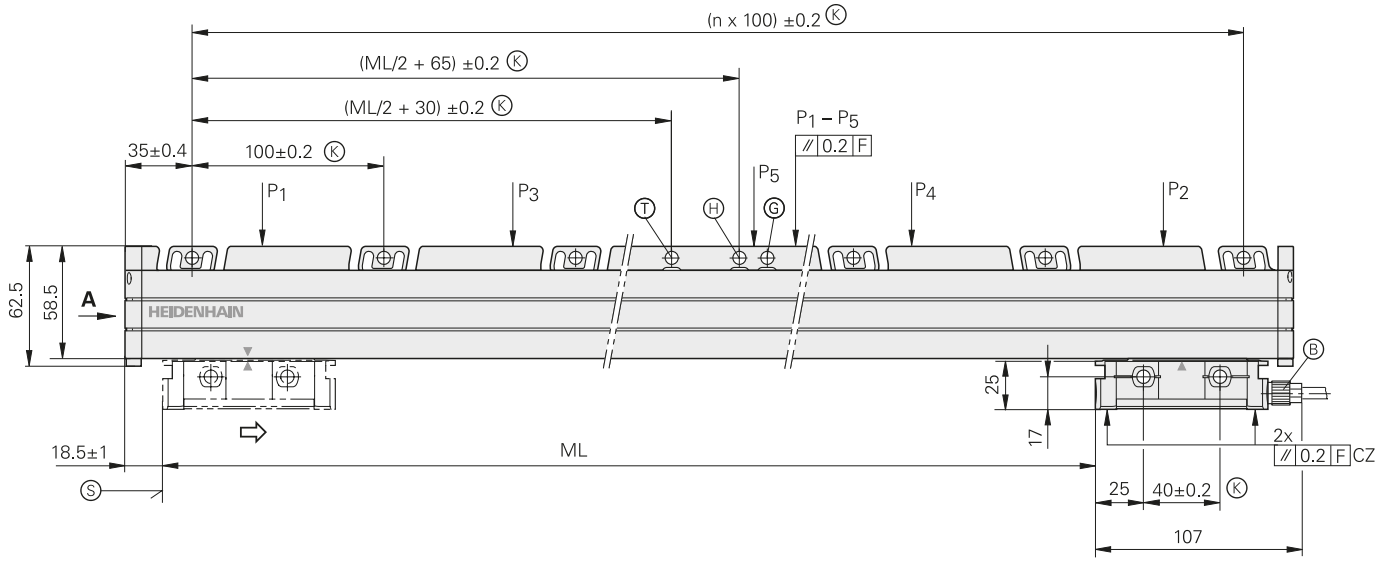
Automation

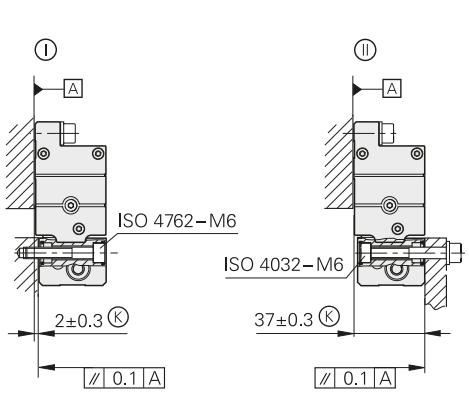
LC 1x5 series

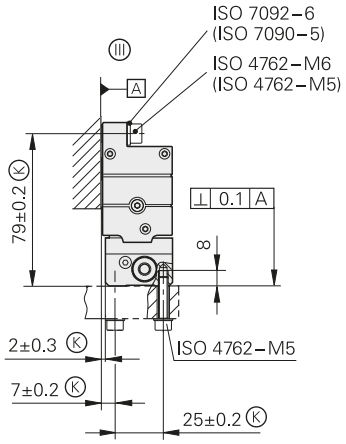
Absolute linear encoders with full-size scale housing

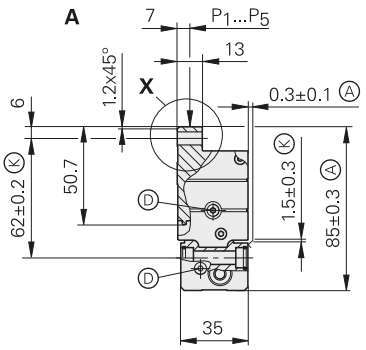
- **High vibration resistance**
- **Reclining mounting possible**
- **High reliability through double sealing lips**

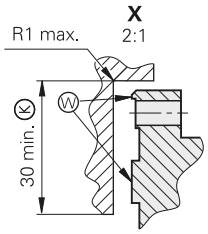












mm

Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm

Ⅰ, Ⅲ,
Ⅲ = Mounting options
F = Machine guideway
P = Gauging points for alignment
Ⓚ = Required mating dimensions
Ⓐ = Alternative mating dimensions
Ⓑ = Cable connection usable at either end
Ⓓ = Compressed-air connection usable at either end
Ⓣ = Mechanical fixed point (to be preferred)
Ⓗ = Mechanical fixed point compatible to predecessor model
Ⓖ = Mechanical fixed point (coincides with the spacing interval of 100 mm)
Ⓢ = Beginning of measuring length ML (= 20 mm absolute)
Ⓦ = Mating surfaces
⇨ = Direction of scanning unit motion for output signals in accordance with interface description

Specifications	LC 115 (Functional Safety)	LC 115	LC 185
Measuring standard Coefficient of linear expansion	DIADUR glass scale with absolute track and incremental track, grating period 20 µm $\alpha_{therm} \approx 8 \times 10^{-6}$ K^{-1}		
Accuracy grade*	±3 µm up to 3040 mm measuring length; ±5 µm		
Measuring length ML* in mm	140 240 340 440 540 640 740 840 940 1040 1140 1240 1340 1440 1540 1640 1740 1840 2040 2240 2440 2640 2840 3040 3240 3440 3640 3840 4040 4240		
Functional safety for applications up to	• SIL-2 according to EN 61 508 • Category 3, PL "d" according to EN ISO 13 849-1:2008	–	
PFH	15×10^{-9}; *ML > 3040 mm:* 25×10^{-9} (up to 6000 m above sea level)	–	
Safe position[1]	*Encoder:* ±550 µm; *ML > 3040 mm:* ±2050 µm (safety-related meas. step SM = 220 µm)	–	
	Mechanical connection: fault exclusions for loosening of the housing and scanning unit (page 21)		
Interface	EnDat 2.2		
Ordering designation	EnDat22		EnDat02
Measuring step *At ± 3 µm* *With ±5 µm*	0.001 µm 0.010 µm		0.005 µm 0.010 µm
Clock freq. (calc. time t_{cal})	≤ 16 MHz (≤ 5 µs)		≤ 2 MHz (≤ 5 µs)
Incremental signals	–		~ 1 V_{PP} (20 µm)
Cutoff frequency –3 dB	–		≥ 150 kHz
Electrical connection	Separate adapter cable (1 m/3 m/6 m/9 m) connectable at either end of mounting block		
Cable length	≤ 100 m[2]		≤ 150 m[2]
Voltage supply	DC 3.6 V to 14 V		
Power consumption (max.)	*3.6 V:* ≤ 1.1 W; *14 V:* ≤ 1.3 W		
Traversing speed	≤ 180 m/min (max. acceleration in measuring direction ≤ 100 m/s^2)		
Required moving force	≤ 4 N		
Vibration 55 Hz to 2000 Hz *effecting the* **Shock** 11 ms	*Housing:* ≤ 200 m/s^2 (EN 60068-2-6) *Scanning unit:* ≤ 200 m/s^2 (EN 60068-2-6) ≤ 300 m/s^2 (EN 60068-2-27)		
Operating temperature	0 °C to 50 °C		
Protection EN 60529[3]	IP 53 when installed according to instructions in the brochure, IP 64 with sealing air from DA 400		
Mass	0.55 kg + 2.9 kg/m measuring length		

***** Please select when ordering
[1] Further tolerances may occur in subsequent electronics after position value comparison (contact manufacturer)
[2] With HEIDENHAIN cable; clock frequency ≤ 8 MHz
[3] In the application the LC must be protected from the intrusion of particles and liquids

LC 1x5 series

Absolute linear encoders with full-size scale housing

- **High vibration resistance**
- **Reclining mounting possible**
- **High reliability through double sealing lips**

Specifications	LC 195 S (Functional Safety)	LC 195 S
Measuring standard Coefficient of linear expansion	DIADUR glass scale with absolute track and incremental track, grating period 20 µm $\alpha_{therm} \approx 8 \times 10^{-6}\ K^{-1}$	
Accuracy grade*	±3 µm up to 3040 mm measuring length; ±5 µm	
Measuring length ML* in mm	140 240 340 440 540 640 740 840 940 1040 1140 1240 1340	
Functional safety for applications up to	• SIL-2 according to EN 61 508 • Category 3, PL "d" as per EN ISO 13 849-1:2008	–
PFH	25×10^{-9}; *ML > 3040 mm:* 40×10^{-9} (up to 1000 m above sea level)	–
Safe position[1]	*Encoder:* ±550 µm; *ML > 3040 mm:* ±2050 µm (safety-related measuring step SM = 220 µm)	–
	Mechanical connection: fault exclusions for loosening of the housing and scanning unit (page 21)	
Interface	DRIVE-CLiQ	
Ordering designation	DQ01	
Measuring step *With ±3 µm* *With ±5 µm*	 0.001 µm 0.010 µm	
Clock freq. (calc. time t_{cal})	–	
Electrical connection	Separate adapter cable (1 m/3 m/6 m/9 m) connectable at either end of mounting block	
Cable length	≤ 30 m[2]	
Voltage supply	DC 10 V to 28.8 V	
Power consumption (max.)	*10 V:* ≤ 1.5 W; *28.8 V:* ≤ 1.7 W	
Traversing speed	≤ 180 m/min (max. acceleration ≤ 100 m/s²)	
Required moving force	≤ 4 N	
Vibration 55 Hz to 2000 Hz *effecting the* **Shock** 11 ms	*Housing:* ≤ 200 m/s² (EN 60068-2-6) *Scanning unit:* ≤ 200 m/s² (EN 60068-2-6) ≤ 300 m/s² (EN 60068-2-27)	
Operating temperature	0 °C to 50 °C	
Protection EN 60529[3]	IP 53 when installed according to instructions in the brochure, IP 64 with sealing air from DA 400	
Mass	0.55 kg + 2.9 kg/m measuring length	

***** Please select when ordering

[1] Further tolerances may occur in subsequent electronics after position value comparison (contact the subsequent electronics manufacturer)

[2] Larger cable lengths upon request

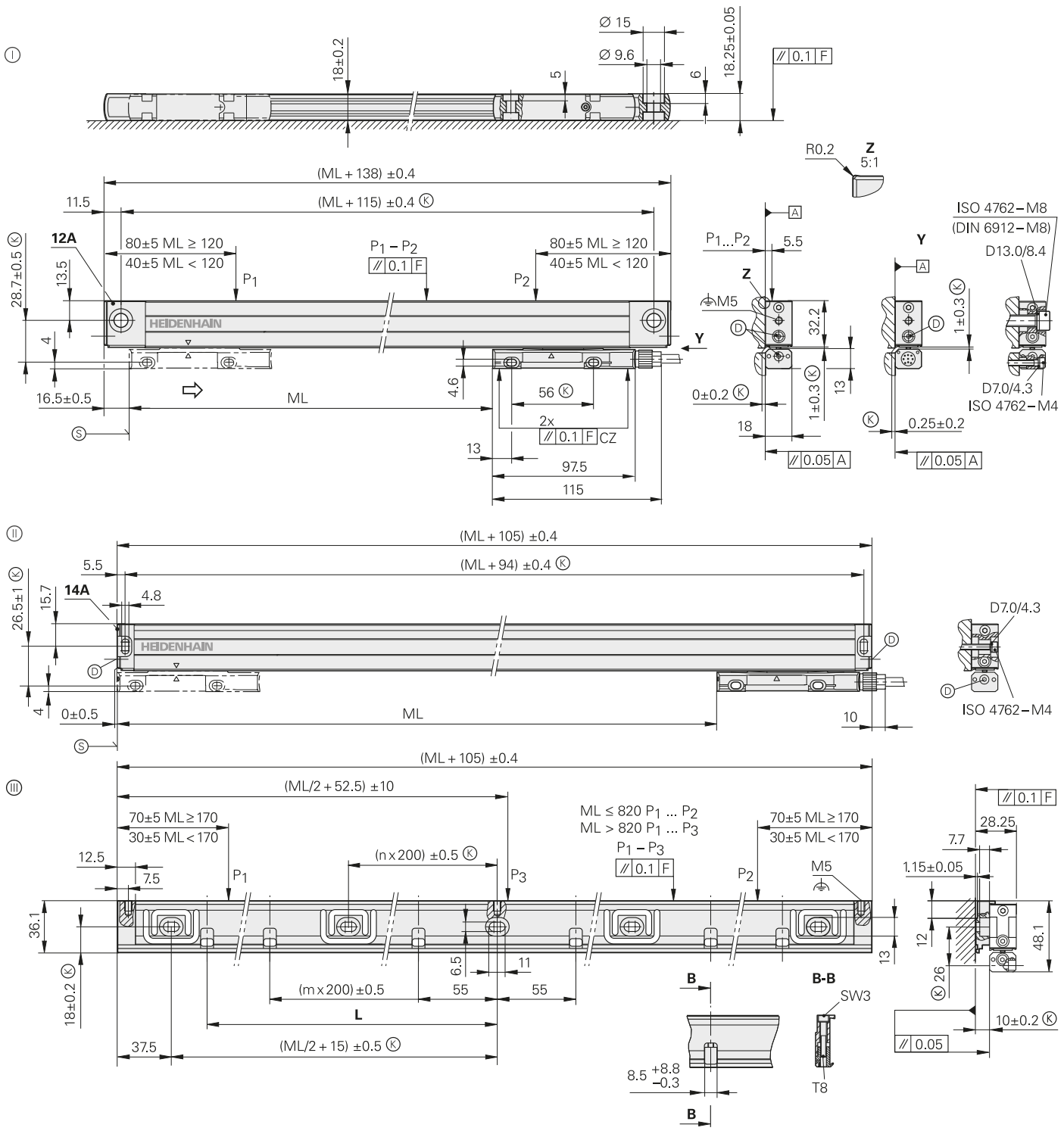
[3] In the application the LC must be protected from the intrusion of particles and liquids

	LC 195 F	LC 195 M	LC 195 P
		±3 µm up to 2040 mm measuring length; ±5 µm	±3 µm up to 3040 mm measuring length; ±5 µm
	1440 1540 1640 1740 1840 2040	2240 2440 2640 2840 3040 3240	3440 3640 3840 4040 4240
	Fanuc Serial Interface/αi interface	Mitsubishi high speed interface	Panasonic serial interface
	Fanuc05	Mit03-04	Pana01
	αi Interface/α Interface 0.00125 µm/0.010 µm 0.0125 µm/0.050 µm	0.001 µm 0.010 µm	
	≤ 50 m	≤ 30 m	≤ 50 m
	DC 3.6 V to 14 V		
	3.6 V: ≤ 1.1 W; *14 V:* ≤ 1.3 W		

LC 4x5 series

Absolute linear encoders with slimline scale housing

- **For limited installation space**



ML	70	120	170	220	270	320	370	420	470	520	570	620	670	720	770	820	920	1020	1140	1240	1340	1440	1540	1640	1740	1840	2040
L	37.5	55	75	100	115	140	175	200	225	250	275	300	325	350	375	400	450	500	555	610	655	710	760	810	855	910	1010

mm

Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm

Ⓘ = End block 12A; mounting with and without mounting spar
Ⓘⓘ = End block 14A; for mounting with mounting spar
(specifications are restricted if attached directly with M4 screws)
Ⓘⓘⓘ = MSL 41 mounting spar
F = Machine guideway
P = Gauging points for alignment
Ⓚ = Required mating dimensions
Ⓓ = Compressed air inlet
Ⓢ = Beginning of measuring length ML (= 20 mm absolute)
⇨ = Direction of scanning unit motion for output signals in accordance with interface description

Specifications	LC 415 (Functional Safety)	LC 415	LC 485
Measuring standard Coefficient of linear expansion	DIADUR glass scale with absolute track and incremental track, grating period 20 µm $\alpha_{therm} \approx 8 \times 10^{-6}\ K^{-1}$ (mounting mode ①/⑪); *with mounting spar:* $\alpha_{therm} \approx 9 \times 10^{-6}\ K^{-1}$ (mounting mode ⑪)		
Accuracy grade*	± 3 µm, ± 5 µm		
Measuring length ML* in mm	Mounting spar* or clamping elements* up to ML 1240 optional, necessary as of ML 1340 70 120 170 220 270 320 370 420 470 520 570 620 670 720 770 820 920 1020 1140 1240 1340 1440 1540 1640 1740 1840 2040		
Functional safety for applications up to	• SIL-2 according to EN 61 508 • Category 3, PL "d" according to EN ISO 13 849-1:2008	–	
PFH	≤ 15×10^{-9} (up to 6000 m above sea level)	–	
Safe position[1]	*Encoder:* ±550 µm (safety-related measuring step SM = 220 µm)	–	
	Mechanical connection: fault exclusions for loosening of the housing and scanning unit (page 21)		
Interface	EnDat 2.2		
Ordering designation	EnDat22		EnDat02
Measuring step *At ± 3 µm* *With ±5 µm*	0.001 µm 0.010 µm		0.005 µm 0.010 µm
Clock frequency (calculation time t_{cal})	≤ 16 MHz (≤ 5 µs)		≤ 2 MHz (≤ 5 µs)
Incremental signals	–		⌒ 1 V_{PP} (20 µm)
Cutoff frequency –3 dB	–		≥ 150 kHz
Electrical connection	Separate adapter cable (1 m/3 m/6 m/9 m) connectable on mounting block		
Cable length	≤ 100 m[2]		≤ 150 m[2]
Voltage supply	DC 3.6 V to 14 V		
Power consumption (max.)	*3.6 V:* ≤ 1.1 W; *14 V:* ≤ 1.3 W		
Traversing speed	≤ 180 m/min (max. acceleration in measuring direction ≤ 100 m/s^2)		
Required moving force	≤ 5 N		
Vibration 55 Hz to 2000 Hz *effecting the* **Shock** 11 ms	*Scanning unit:* ≤ 200 m/s^2 (EN 60068-2-6) *Housing without mounting spar:* ≤ 100 m/s^2 (EN 60068-2-6) *Housing with mounting spar, and cable outlet at right:* ≤ 150 m/s^2, *left:* ≤ 100 m/s^2 (EN 60068-2-6) ≤ 300 m/s^2 (EN 60068-2-27)		
Operating temperature	0 °C to 50 °C		
Protection EN 60529[3]	IP 53 when installed according to instructions in the brochure, IP 64 with sealing air from DA 400		
Mass	*Encoder:* 0.2 kg + 0.55 kg/m measuring length; *mounting spar:* 0.9 kg/m		

***** Please select when ordering
[1] Further tolerances may occur in subsequent electronics after position value comparison (contact manufacturer)
[2] With HEIDENHAIN cable; clock frequency ≤ 8 MHz
[3] In the application the LC must be protected from the intrusion of particles and liquids

LC 4x5 series

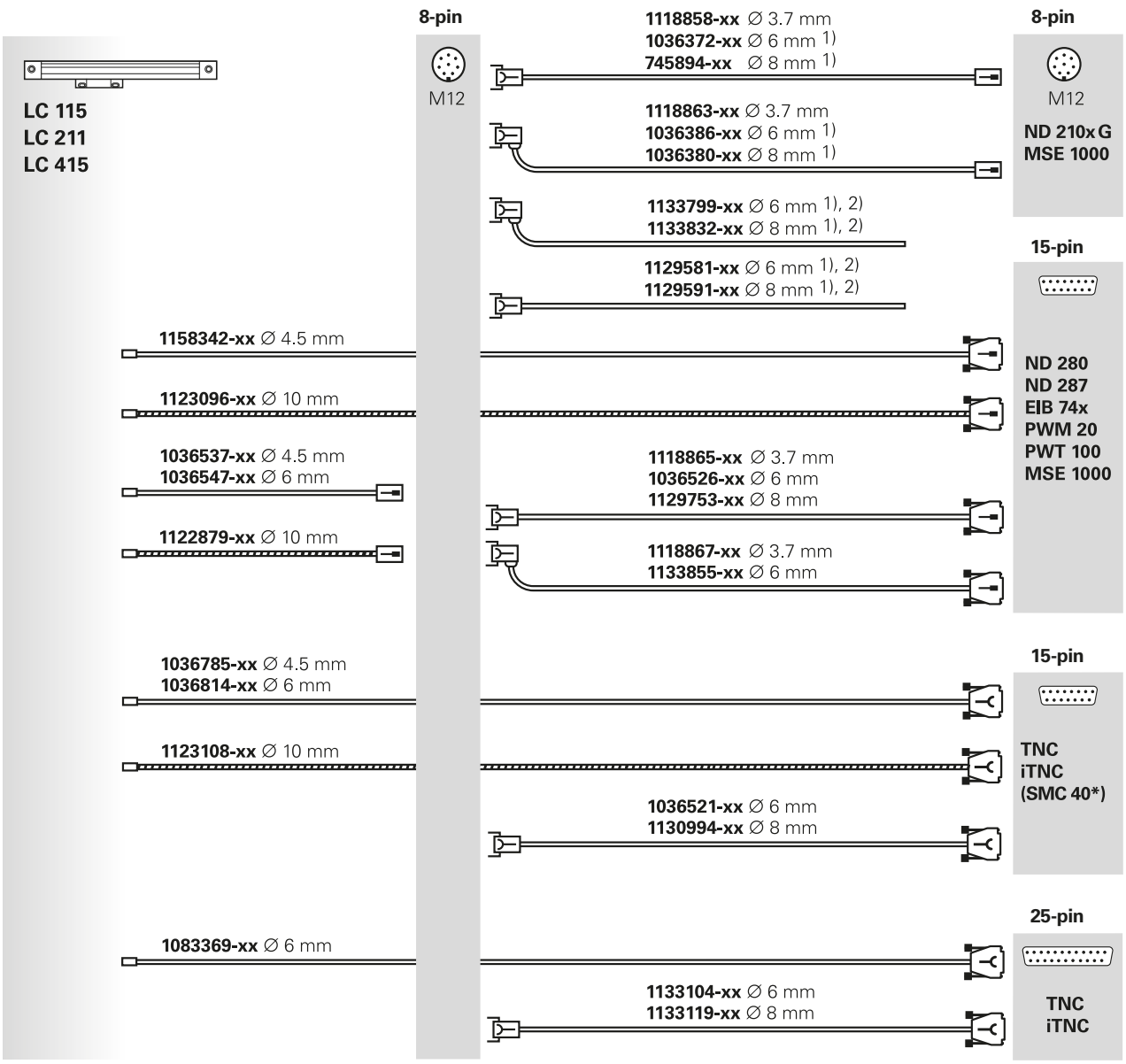
Absolute linear encoders with slimline scale housing
- **For limited installation space**
- **Identical dimensions for LC 415/LC 485/LC 495**

Specifications	**LC 495 S** Functional Safety	**LC 495 S**
Measuring standard Coefficient of linear expansion	DIADUR glass scale with absolute track and incremental track, grating period 20 µm $\alpha_{therm} \approx 8 \times 10^{-6}$ K^{-1} (mounting mode ①/⑪); *with mounting spar:* $\alpha_{therm} \approx 9 \times 10^{-6}$ K^{-1} (mounting mode ⑪)	
Accuracy grade*	± 3 µm, ± 5 µm	
Measuring length ML* in mm	Mounting spar* or clamping elements* up to ML 1240 optional, necessary as of ML 1340 70 120 170 220 270 320 370 420 470 520 570 620 670	
Functional safety for applications up to	• SIL-2 according to EN 61 508 • Category 3, PL "d" as per EN ISO 13 849-1:2008	–
PFH	25 x 10^{-9} (up to 1000 m above sea level)	–
Safe position[1]	*Encoder:* ±550 µm (safety-related measuring step SM = 220 µm)	–
	Mechanical connection: fault exclusions for loosening of the housing and scanning unit (page 21)	
Interface	DRIVE-CLiQ	
Ordering designation	DQ01	
Measuring step *With ±3 µm* *With ±5 µm*	 0.001 µm 0.010 µm	
Clock frequency (calculation time t_{cal})	–	
Electrical connection	Separate adapter cable (1 m/3 m/6 m/9 m) connectable on mounting block	
Cable length	≤ 30 m[2]	
Voltage supply	DC 10 V to 28.8 V	
Power consumption (max.)	*10 V:* ≤ 1.5 W; *28.8 V:* ≤ 1.7 W	
Traversing speed	≤ 180 m/min (max. acceleration in measuring direction ≤ 100 m/s^2)	
Required moving force	≤ 5 N	
Vibration 55 Hz to 2000 Hz *effecting the* **Shock** 11 ms	*Scanning unit:* ≤ 200 m/s^2 (EN 60 068-2-6) *Housing without mounting spar:* ≤ 100 m/s^2 (EN 60 068-2-6) *Housing with mounting spar, and cable outlet at right:* ≤ 150 m/s^2, *left:* ≤ 100 m/s^2 (EN 60 068-2-6) ≤ 300 m/s^2 (EN 60 068-2-27)	
Operating temperature	0 °C to 50 °C	
Protection EN 60 529[3]	IP 53 when installed according to instructions in the brochure, IP 64 with sealing air from DA 400	
Mass	*Encoder:* 0.2 kg + 0.55 kg/m measuring length; *mounting spar:* 0.9 kg/m	

***** Please select when ordering
1) Further tolerances may occur in subsequent electronics after position value comparison (contact the subsequent electronics manufacturer)
2) Larger cable lengths upon request
3) In the application the LC must be protected from the intrusion of particles and liquids

	LC 495 F	LC 495 M	LC 495 P
	720 770 820 920 1020 1140 1240 1340 1440 1540 1640 1740 1840 2040		
	Fanuc Serial Interface/αi interface	Mitsubishi high speed interface	Panasonic serial interface
	Fanuc05	Mit03-04	Pana01
	αi Interface/α Interface 0.00125 µm/0.010 µm 0.0125 µm/0.050 µm	0.001 µm 0.010 µm	
	≤ 50 m	≤ 30 m	≤ 50 m
	DC 3.6 V to 14 V		
	3.6 V: ≤ 1.1 W; *14 V:* ≤ 1.3 W		

Adapter cables and connecting cables – EnDat interface (EnDat22)



Connector, male/female

Coupling, male/female

D-sub connector, male/female

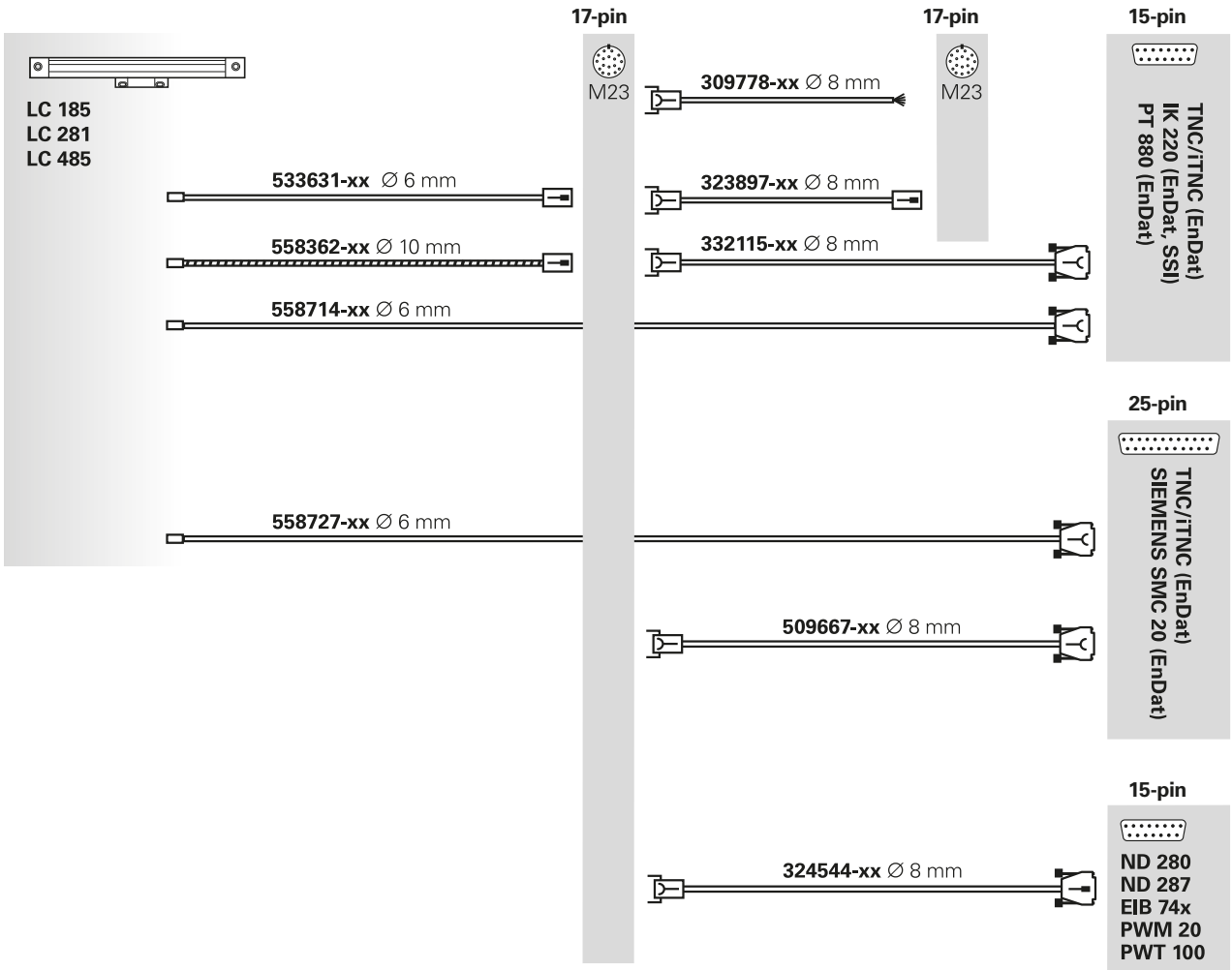
PUR cable

PUR cable in metal armor

* Connection to SIEMENS NC
1) Also suitable for Fanuc/Mitsubishi/ Panasonic/Yaskawa
2) Not the connecting element for 8 MHz signal transmission!

Note for safety-related applications:
Only completely assembled HEIDENHAIN cables are qualified.
Be sure to exchange connectors or modify cables only after consultation with HEIDENHAIN Traunreut.

Adapter cables and connecting cables – EnDat interface (EnDat02)



Connector, male/female

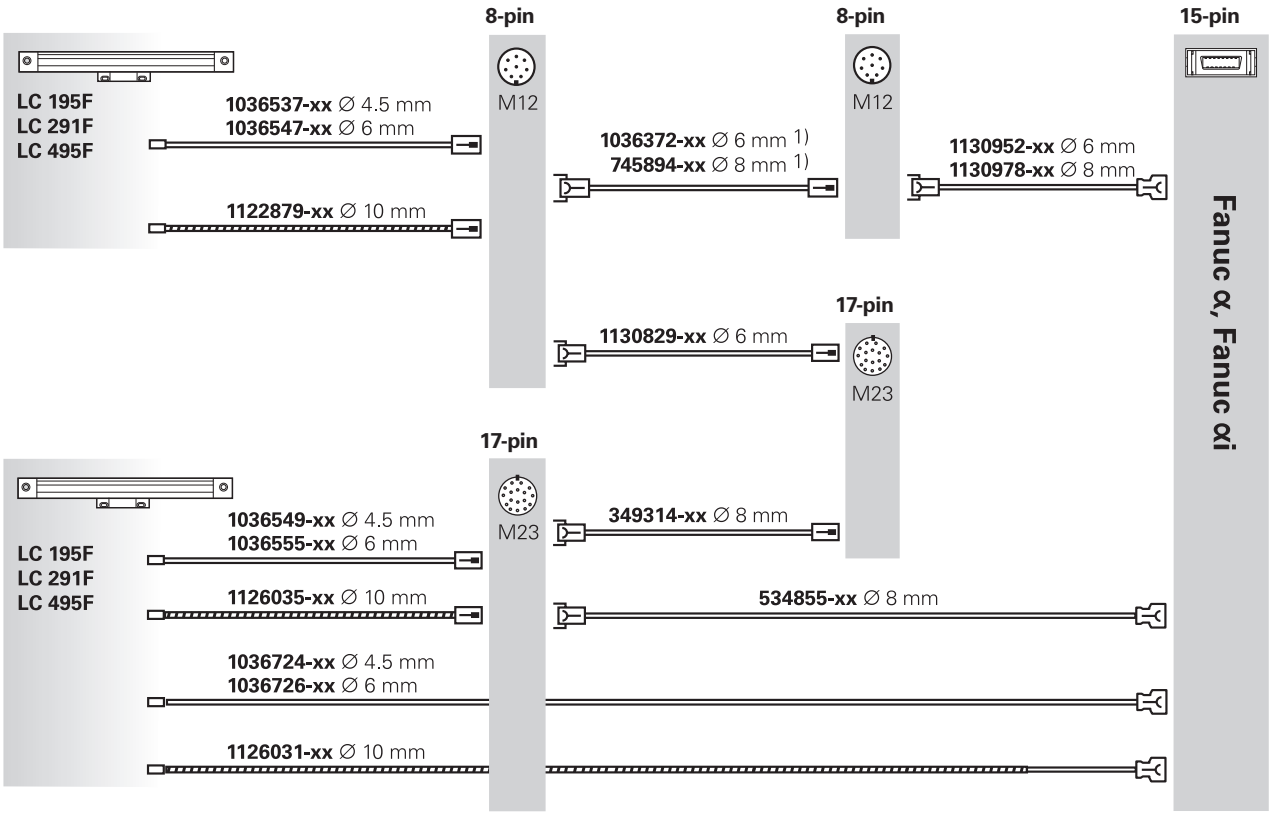
Coupling, male/female

D-sub connector, male/female

PUR cable

PUR cable in metal armor

Adapter cables and connecting cables – Fanuc Serial Interface



Connector, male/female

Coupling, male/female

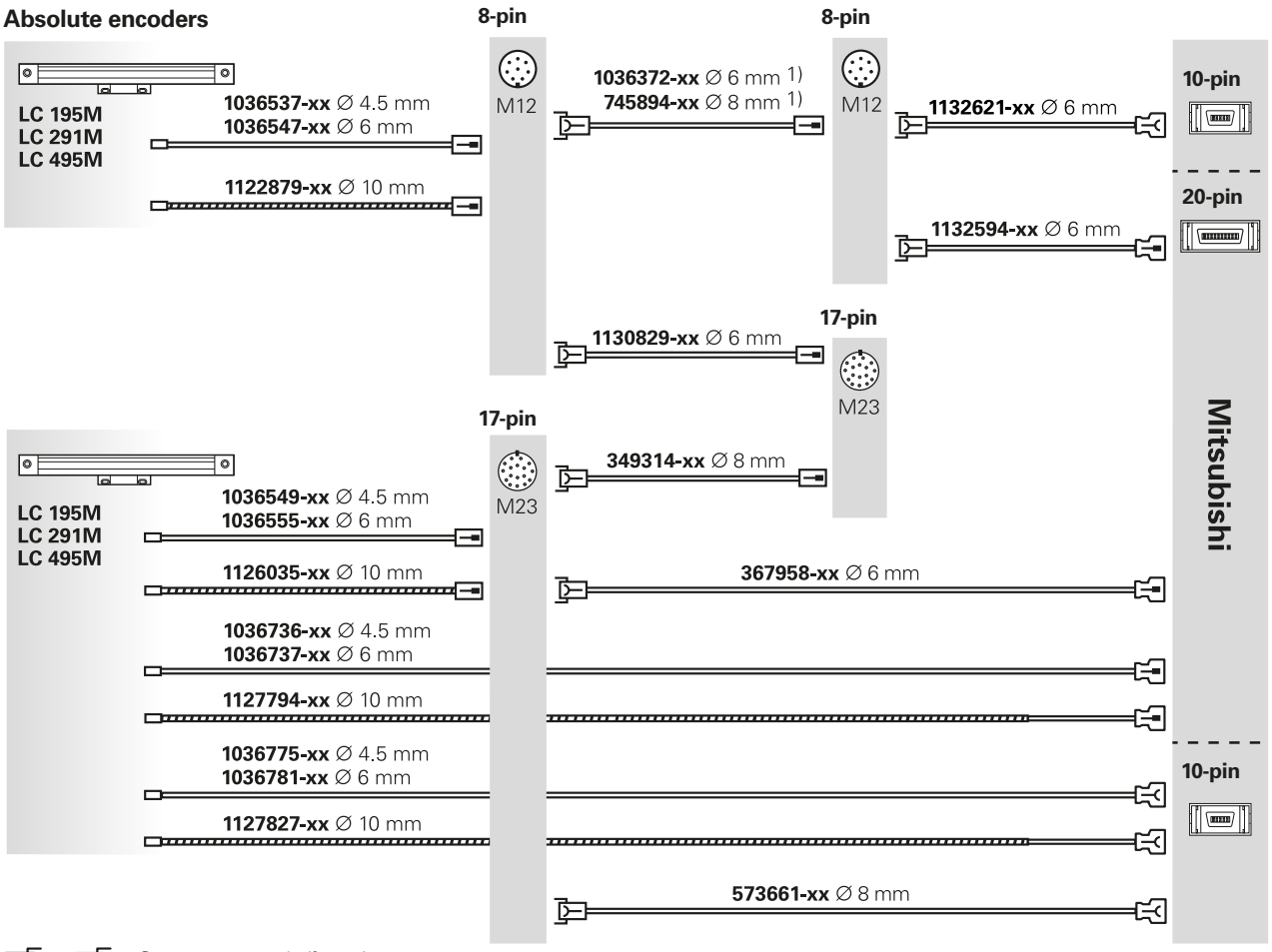
Fanuc connector

PUR cable

PUR cable in metal armor

[1] For more M12 connecting cables, see EnDat interface (EnDat22)

Adapter cables and connecting cables – Mitsubishi high speed interface



Connector, male/female

Coupling, male/female

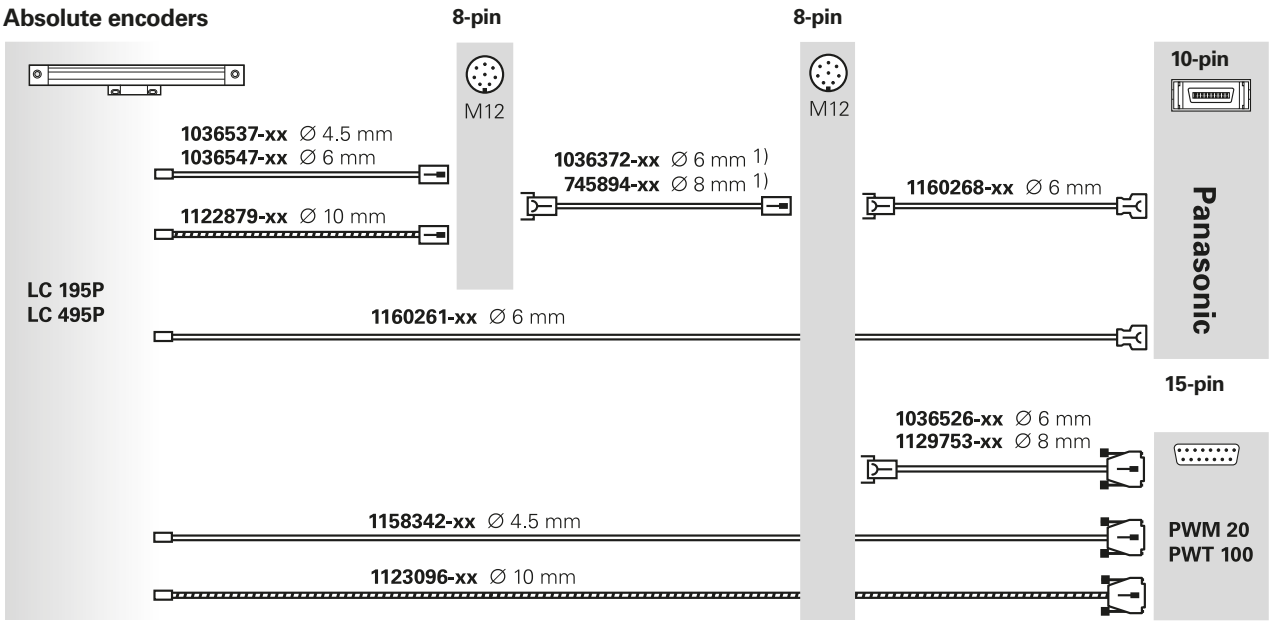
Mitsubishi connector

PUR cable

PUR cable in metal armor

[1] For more M12 connecting cables, see EnDat interface (EnDat22)

Adapter cables and connecting cables – Panasonic interface



Coupling, male

Connector, female

Panasonic connector

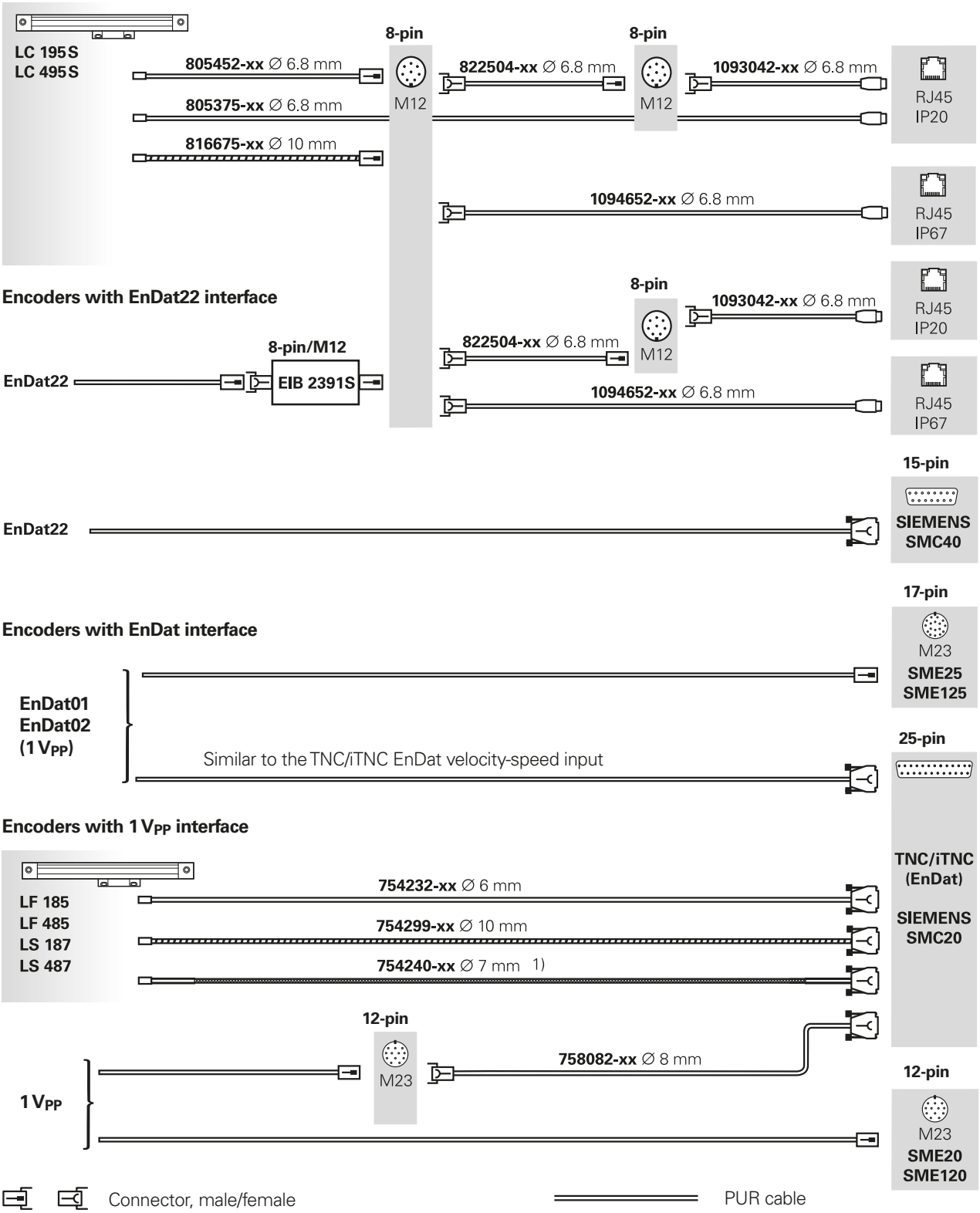
D-sub connector, male

PUR cable

PUR cable in metal armor

[1] For more M12 connecting cables, see EnDat interface (EnDat22)

Adapter cables and connecting cables – DRIVE-CLiQ



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