HEIDENHAIN

Product Information

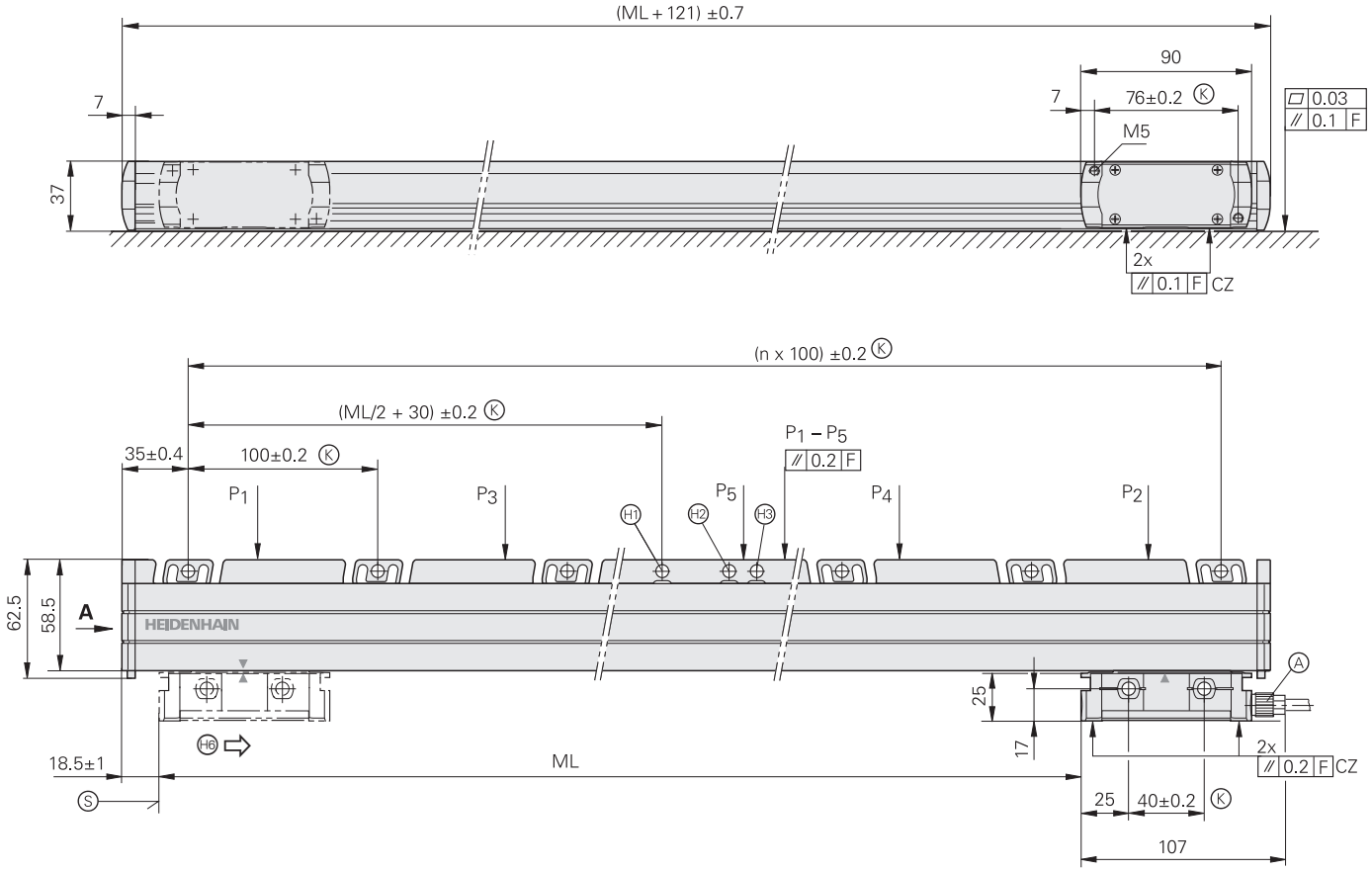
LC 1x3
LC 4x3

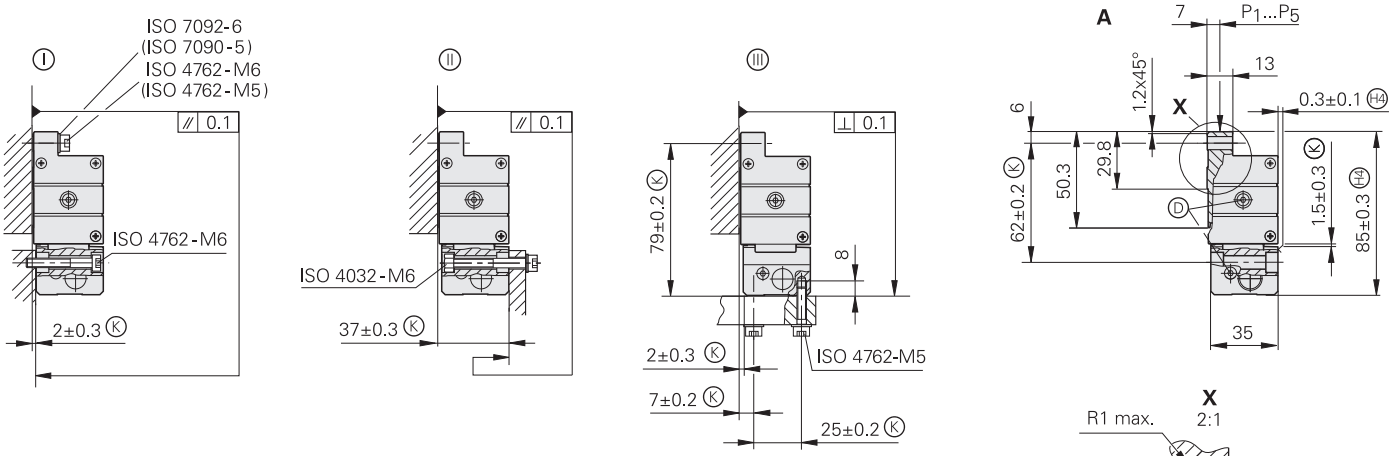
Absolute Linear Encoders

November 2012

LC 100 series

- **Absolute linear encoders for measuring steps to 0.1 µm (resolution to 0.005 µm)**
- **High vibration rating**
- **Horizontal mounting possible**
- **Up to two additional scanning units are possible**





mm

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

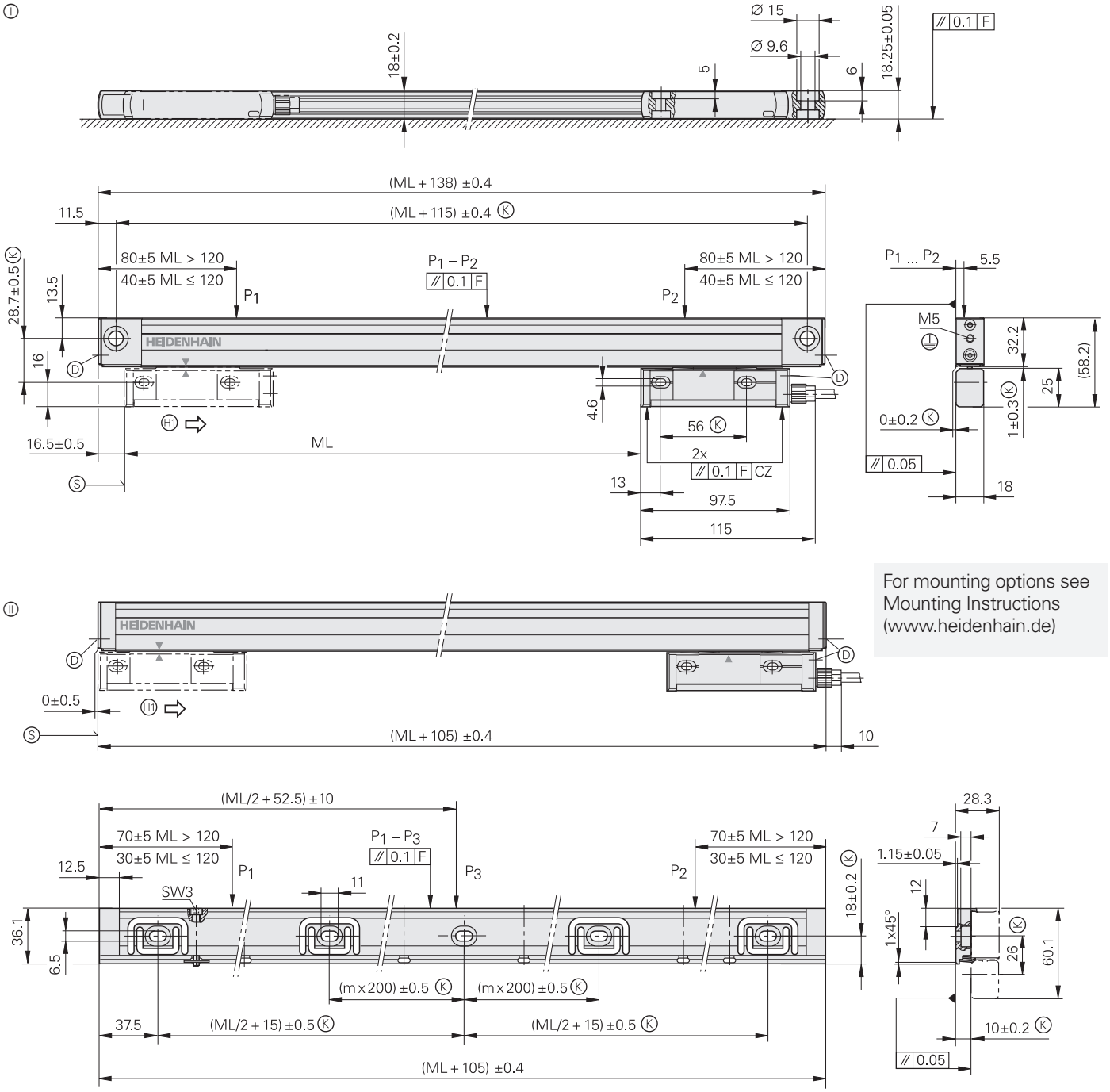
I, II,
III = Mounting options
F = Machine guideway
P = Gauging points for alignment
A = Cable connection usable at either end
K = Required mating dimensions
D = Compressed air inlet usable at either end
S = Beginning of measuring length ML (20 mm absolute)
H1 = Mechanical fixed point (to be preferred)
H2 = Mechanical fixed point, compatible to predecessor model
H3 = Mechanical fixed point (coincides with the spacing interval of 100 mm)
H4 = Alternative mating dimensions
H5 = Mating surfaces
H6 = Direction of scanning unit motion for output signals in accordance with interface description

Specifications	LC 183	LC 193F	LC 193M
Measuring standard Coefficient of linear expansion	DIADUR glass scale with absolute track and incremental track $\alpha_{therm} \approx 8 \times 10^{-6}\ K^{-1}$		
Accuracy grade*	± 3 µm (up to measuring length 3040); ± 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		
Absolute position values*	EnDat 2.2 *Ordering designation* EnDat 02	Fanuc 02 serial interface	Mitsubishi high speed serial interface, Mit 02-4 or Mitsu 01
Resolution *Accuracy ± 3 µm* *Accuracy ± 5 µm*	 0.005 µm 0.01 µm	 0.01 µm 0.05 µm	
Calculation time t_{cal} *EnDat 2.1 command set* *EnDat 2.2 command set*	 < 1 ms ≤ 5 µs	 – –	
Incremental signals	~ 1 V_{PP} [1]	–	
Grating period/signal period	20 µm	–	
Cutoff frequency –3dB	≥ 150 kHz	–	
Power supply Without load	3.6 to 5.25 V/< 300 mA		
Electrical connection	Separate adapter cable (1 m/3 m/6 m/9 m) connectable on both sides to mounting block		
Cable length [2]	≤ 150 m; depending on the interface and subsequent electronics	≤ 30 m	≤ 20 m
Traversing speed	≤ 180 m/min		
Required moving force	≤ 4 N		
Vibration 55 to 2000 Hz **Shock** 11 ms **Acceleration**	≤ 200 m/s^2 (EN 60068-2-6) ≤ 300 m/s^2 (EN 60068-2-27) ≤ 100 m/s^2 in measuring direction		
Operating temperature	0 to 50 °C (as of ML 3240, the storage temperature range is restricted to –10 °C to +50 °C)		
Protection EN 60529	IP 53 when mounted according to the instructions and mounting information IP 64 if compressed air is connected via DA 400		
Weight	0.4 kg + 3.3 kg/m measuring length		

***** Please select when ordering
[1] Depending on the adapter cable
[2] With HEIDENHAIN cable

LC 400 series

- **Absolute linear encoders for measuring steps to 0.1 µm (resolution to 0.005 µm)**
- **For limited installation space**
- **Up to two additional scanning units are possible**



For mounting options see Mounting Instructions (www.heidenhain.de)

mm

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

Ⓘ = Without mounting spar (with M8 screws)
Ⓘⓘ = Mounting with mounting spar (LC 483 with short end pieces shown; LC with normal end pieces can also be mounted)
F = Machine guideway
P = Gauging points for alignment
ML ≤ 820 $P_1 – P_2$
ML > 820 $P_1 – P_3$
Ⓚ = Required mating dimensions
Ⓓ = Compressed air inlet
Ⓢ = Beginning of measuring length (ML) at 20 mm
Ⓗ = Direction of scanning unit motion for output signals in accordance with interface description

Mounting spar

ML	m
70 ... 520	0
570 ... 920	1
1020 ... 1340	2
1440 ... 1740	3
1840 ... 2040	4

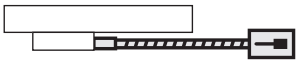
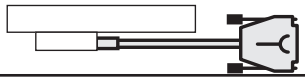
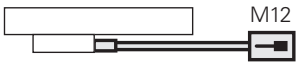
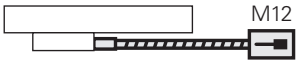
LC 483 without mounting spar

LC 483 with mounting spar

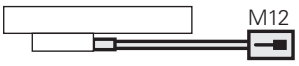
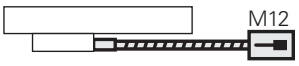
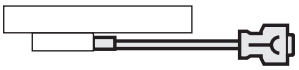
Specifications	LC 483	LC 493 F	LC 493 M
Measuring standard Coefficient of linear expansion	DIADUR glass scale with absolute track and incremental track $\alpha_{therm} \approx 8 \times 10^{-6}$ K^{-1} (mounting type ①); *with mounting spar:* $\alpha_{therm} \approx 9 \times 10^{-6}$ K^{-1} (mounting type ②)		
Accuracy grade*	± 3 µm; ± 5 µm		
Measuring length ML* in mm	Mounting spar* or clamping elements* optional 70 120 170 220 270 320 370 420 470 520 570 620 670 720 770 820 870 920 1 020 1 140 1 240		
	Mounting spar* or clamping elements* required 1 340 1 440 1 540 1 640 1 740 1 840 2 040		
Absolute position values*	EnDat 2.2 *Ordering designation* EnDat 02	Fanuc 02 serial interface	Mitsubishi high speed serial interface, Mit 02-4 or Mitsu 01
Resolution *Accuracy ± 3 µm* *Accuracy ± 5 µm*	 0.005 µm 0.01 µm	 0.01 µm 0.05 µm	
Calculation time t_{cal} *EnDat 2.1 command set* *EnDat 2.2 command set*	 < 1 ms ≤ 5 µs	 – –	
Incremental signals	~ 1 V_{PP} [1)]	–	
Grating period/signal period	20 µm	–	
Cutoff frequency –3dB	≥ 150 kHz	–	
Power supply Without load	3.6 to 5.25 V/< 300 mA		
Electrical connection	Separate adapter cable (1 m/3 m/6 m/9 m) connectable to mounting block		
Cable length[2)]	≤ 150 m; depending on the interface and subsequent electronics	≤ 30 m	≤ 20 m
Traversing speed	≤ 180 m/min		
Required moving force	≤ 5 N		
Vibration 55 to 2 000 Hz **Shock** 11 ms **Acceleration**	*Without mounting spar:* ≤ 100 m/s^2 (EN 60 068-2-6) *With mounting spar and cable outlet at right/left:* ≤ 200 m/s^2/100 m/s^2 (EN 60 068-2-6) ≤ 300 m/s^2 (EN 60 068-2-27) ≤ 100 m/s^2 in measuring direction		
Operating temperature	0 °C to 50 °C		
Protection EN 60 529	IP 53 when mounted according to the instructions and mounting information IP 64 if compressed air is connected via DA 400		
Weight	*Encoder:* 0.2 kg + 0.5 kg/m measuring length, *mounting spar:* 0.9 kg/m		

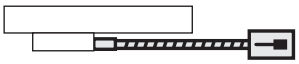
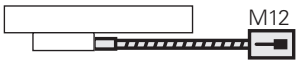
***** Please select when ordering
[1)] Depending on the adapter cable [2)] With HEIDENHAIN cable

Electrical connection
Adapter cables

For absolute linear encoders—EnDat		Cable Ø	LC 183 LC 483 With incremental signals	LC 183 LC 483 Without incremental signals
Adapter cable with M23 coupling (male), 17-pin		6 mm	533631-xx	–
Adapter cable in metal armor with M23 coupling (male), 17-pin		10 mm	558362-xx	–
Adapter cable with D-sub connector, 15-pin		6 mm	558714-xx	–
Adapter cable with M12 coupling (male), 8-pin		4.5 mm	–	533661-xx
Adapter cable in metal armor with M12 coupling (male), 8-pin		10 mm	–	550678-xx

Available cable lengths: 1 m/3 m/6 m/9 m

For absolute linear encoders—Fanuc		Cable Ø	LC 193F LC 493F
Adapter cable with M23 coupling (male), 17-pin		4.5 mm	547300-xx
Adapter cable in metal armor with M23 coupling (male), 17-pin		10 mm	555541-xx
Adapter cable with M12 coupling (male), 8-pin		4.5 mm	533661-xx
Adapter cable in metal armor with M12 coupling (male), 8-pin		10 mm	550678-xx
Adapter cable with Fanuc connector, 20-pin		4.5 mm	545547-xx
Adapter cable in metal armor with Fanuc connector, 20-pin		10 mm	551027-xx

For absolute linear encoders—Mitsubishi		Cable Ø	LC 193 M LC 493 M
Adapter cable **with M23 coupling (male),** 17-pin		4.5 mm	547300-xx
Adapter cable in metal armor **with M23 coupling (male),** 17-pin		10 mm	555541-xx
Adapter cable **with M12 coupling (male),** 8-pin		4.5 mm	533661-xx
Adapter cable in metal armor **with M12 coupling (male),** 8-pin		10 mm	550678-xx
Adapter cable **with Mitsubishi connector,** 10-pin **with Mitsubishi connector,** 20-pin	 	4.5 mm 4.5 mm	640915-xx 599685-xx
Adapter cable in metal armor **with Mitsubishi connector,** 10-pin **with Mitsubishi connector,** 20-pin	 	10 mm 10 mm	640916-xx 599688-xx

Available cable lengths: 1 m/3 m/6 m/9 m

Electrical connection

EnDat connecting cables

		17-pin M23	8-pin M12
		For EnDat with incremental signals	**For EnDat** without incremental signals
PUR connecting cables	**8-pin:** [(4 × 0.14 mm²) + (4 × 0.34 mm²)] **Ø 6 mm** **17-pin:** [(4 × 0.14 mm²) + 4(2 × 0.14 mm²) + (4 × 0.5 mm²)] **Ø 8 mm**		
Complete with connector (female) and coupling (male)		323897-xx	368330-xx
Complete with connector (female) and D-sub connector (female) for IK 220		332115-xx	533627-xx
Complete with connector (female) and D-sub connector (male) for IK 115/IK 215		324544-xx	524599-xx
With **one** connector (female)		309778-xx	559346-xx
Cable without connectors, Ø 8 mm		266306-01	–

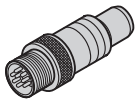
Connecting cables Fanuc
Mitsubishi

		Cable	Fanuc	Mitsubishi
PUR connecting cable for M23 connecting elements				
Complete with 17-pin M23 connector (female) and Fanuc connector [(2 x 2 x 0.14 mm²) + (4 x 1 mm²)]	 Fanuc	Ø 8 mm	534855-xx	–
Complete with 17-pin M23 connector (female) and 20-pin Mitsubishi connector [(2 x 2 x 0.14 mm²) + (4 x 0.5 mm²)]	 Mitsubishi 20-pin	Ø 6 mm	–	367958-xx
Complete with 17-pin M23 connector (female) and 10-pin Mitsubishi connector [(2 x 2 x 0.14 mm²) + (4 x 1 mm²)]	 Mitsubishi 10-pin	Ø 8 mm	–	573661-xx
Cable only [(2 x 2 x 0.14 mm²) + (4 x 1 mm²)]		Ø 8 mm	354608-01	

		Cable	Fanuc	Mitsubishi
PUR connecting cable for M12 connecting elements				
Complete with 8-pin M12 connector (female) and Fanuc connector [(1 x 4 x 0.14 mm²) + (4 x 0.34 mm²)]	 Fanuc	Ø 6 mm	646807-xx	–
Complete with 8-pin M12 connector (female) and 20-pin Mitsubishi connector [(1 x 4 x 0.14 mm²) + (4 x 0.34 mm²)]	 Mitsubishi 20-pin	Ø 6 mm	–	646806-xx
Complete with 8-pin M12 connector (female) and 10-pin Mitsubishi connector [(1 x 4 x 0.14 mm²) + (4 x 0.34 mm²)]	 Mitsubishi 10-pin	Ø 6 mm	–	647314-xx

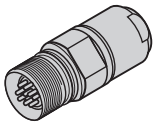
Pin layout
EnDat

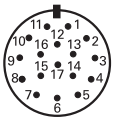
8-pin coupling, M12



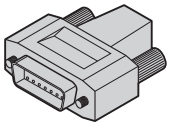
	Power supply				Absolute position values			
	8	**2**	**5**	**1**	**3**	**4**	**7**	**6**
	U_P	**Sensor** U_P	**0 V**	**Sensor** 0 V	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**
	Brown/Green	Blue	White/Green	White	Gray	Pink	Violet	Yellow

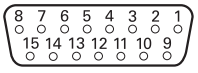
17-pin coupling, M23





15-pin D-sub connector
For HEIDENHAIN controls and IK 220



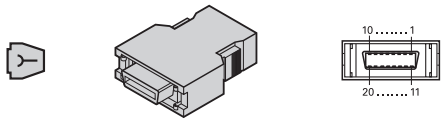


	Power supply					Incremental signals[1]				Absolute position values			
	7	**1**	**10**	**4**	**11**	**15**	**16**	**12**	**13**	**14**	**17**	**8**	**9**
	1	**9**	**2**	**11**	**13**	**3**	**4**	**6**	**7**	**5**	**8**	**14**	**15**
	U_P	**Sensor** U_P	**0 V**	**Sensor** 0 V	**Internal shield**	**A+**	**A–**	**B+**	**B–**	**DATA**	**$\overline{\text{DATA}}$**	**CLOCK**	**$\overline{\text{CLOCK}}$**
	Brown/ Green	Blue	White/ Green	White	/	Green/ Black	Yellow/ Black	Blue/ Black	Red/ Black	Gray	Pink	Violet	Yellow

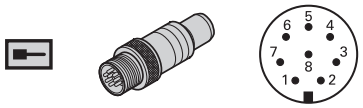
Cable shield connected to housing; **U_P** = Power supply voltage
Sensor: The sensor line is connected in the encoder with the corresponding power line.
Vacant pins or wires must not be used!
[1] Only with ordering designations EnDat 01 and EnDat 02

Fanuc and Mitsubishi

20-pin Fanuc connector



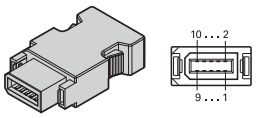
8-pin coupling, M12



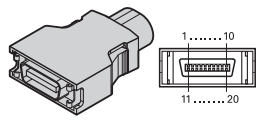
	Power supply					Absolute position values			
	9	**18/20**	**12**	**14**	**16**	**1**	**2**	**5**	**6**
	8	**2**	**5**	**1**	**–**	**3**	**4**	**7**	**6**
	U_P	**Sensor** U_P	**0 V**	**Sensor** 0 V	**Shield**	**Serial Data**	**$\overline{\text{Serial Data}}$**	**Request**	**$\overline{\text{Request}}$**
	Brown/ Green	Blue	White/ Green	White	–	Gray	Pink	Violet	Yellow

Cable shield connected to housing; **U_P** = power supply voltage
Sensor: The sensor line is connected in the encoder with the corresponding power line.
Vacant pins or wires must not be used!

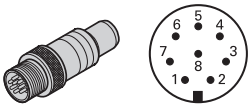
10-pin Mitsubishi connector



20-pin Mitsubishi connector



8-pin coupling, M12



		Power supply				Absolute position values			
	10-pin	**1**	**–**	**2**	**–**	**7**	**8**	**3**	**4**
	20-pin	**20**	**19**	**1**	**11**	**6**	**16**	**7**	**17**
		8	**2**	**5**	**1**	**3**	**4**	**7**	**6**
		U_P	**Sensor** U_P	**0 V**	**Sensor** 0 V	**Serial Data**	**$\overline{\text{Serial Data}}$**	**Request Frame**	**$\overline{\text{Request}}$ $\overline{\text{Frame}}$**
		Brown/Green	Blue	White/Green	White	Gray	Pink	Violet	Yellow

Cable shield connected to housing; **U_P** = power supply voltage
Sensor: The sensor line is connected in the encoder with the corresponding power line.
Vacant pins or wires must not be used!

HEIDENHAIN

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For more information:

- Catalog: *Linear Encoders for Numerically Controlled Machine Tools*

1036247-21 · 11/2012 · PDF