HEIDENHAIN

Product Information

HMC 6

Hybrid Motor Cable

November 2014

HMC 6
Single-cable solution for servo drives

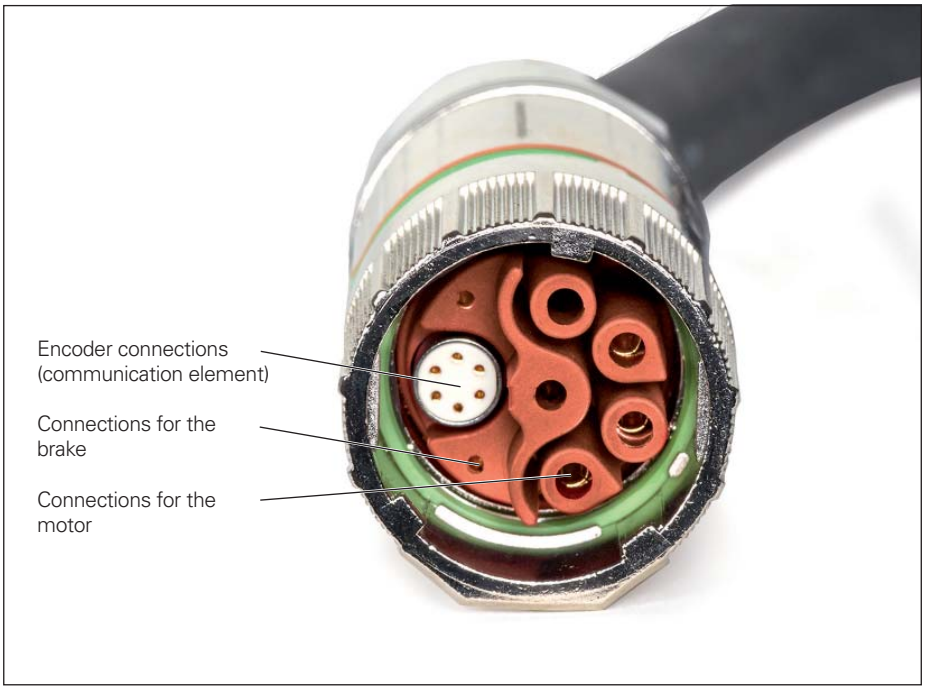
Motors normally need two separate cables:
- One cable for the motor encoder
- One cable for the motor power supply

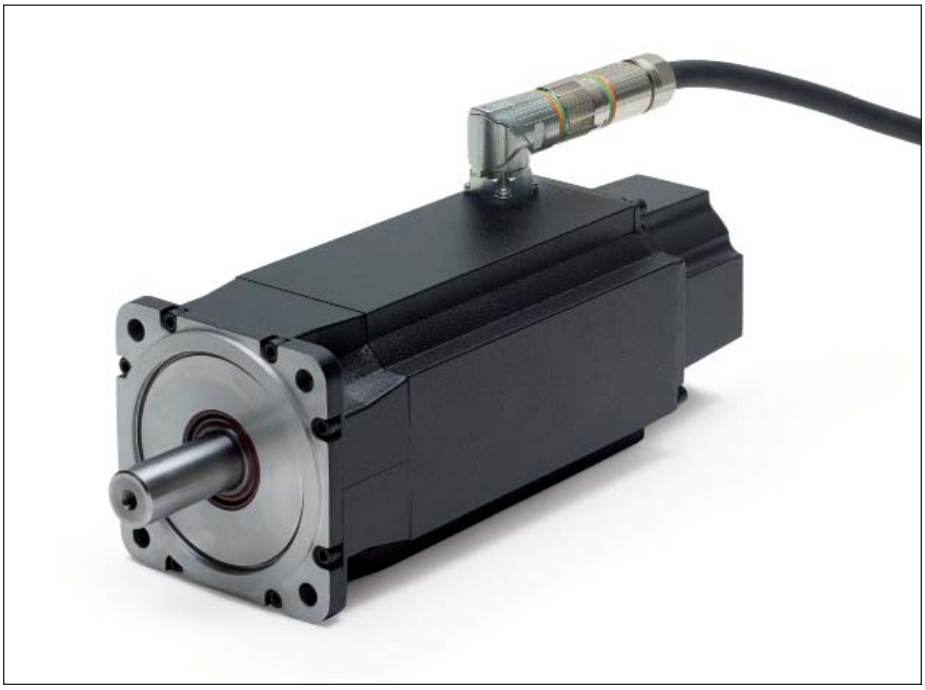
With its Hybrid Motor Cable **HMC 6,** HEIDENHAIN has integrated the encoder lines in the power cable. So now only **one cable** is needed between the motor and electrical cabinet.

The HMC 6 single-cable solution has been specially conceived for the HEIDENHAIN **EnDat22** interface with purely serial transmission over cable lengths up to 100 m. However, all other encoders with purely serial RS-485 interface can also be connected. This makes a broad range of encoders available without having to introduce a new interface.

The HMC 6 integrates the lines for encoders, motors and brakes in only one cable. It is connected to the motor via a special connector. For connection to the inverter, the cable is split into power connections and an encoder connector. This makes it compatible on the control side with all the same components as conventional cables.

If the components are correctly mounted, the connections will have the IP 67 degree of protection. Vibration protection against loosening of coupling joints is integrated in the connector, as also is the quick-release lock.





Advantages
The HMC 6 single-cable solution offers a series of cost and quality improvements both for the motor manufacturer and the machine tool builder:
- No need to replace existing interfaces.
- Allows smaller drag chains.
- A smaller number of cables significantly improves drag chain flexibility.
- A wide range of encoders is available for HMC 6 transmission.
- There is no assignment of cable contacts in the machine.
- Reduces mechanical requirements (flange socket on the motor, cable ducts in the machine housing).
- Lower shipping and storage costs for cables and connectors.
- Installation is simpler and faster.
- Lower cost of documentation.
- Fewer service components are required.
- The contour including the cable is smaller, making it easier to integrate the motor in the machine housing.
- The combination of power cable and encoder cable has been tested by HEIDENHAIN.

The universal design of the HMC 6 provides you—as motor manufacturer or machine tool builder—with the greatest possible flexibility, because you can use standard components—both on the motor and the control side.

One special benefit: **all HEIDENHAIN encoders with EnDat22 interface** or with purely serial data transfer without battery buffering as per RS 485 are suited for the HMC 6 single-cable solution. They include motor encoders for servo drives in their various sizes, as well as linear and angle encoders used in direct drives. And of course it also includes encoders for **functional safety** up to SIL 3.

But there is no need for acrobatics on the control side either: you can use the same inverter systems or controller units as before. The HMC 6 cable has been designed to be easy for you to wire it to the proper connector systems. And most importantly: there is no reduction in noise immunity.

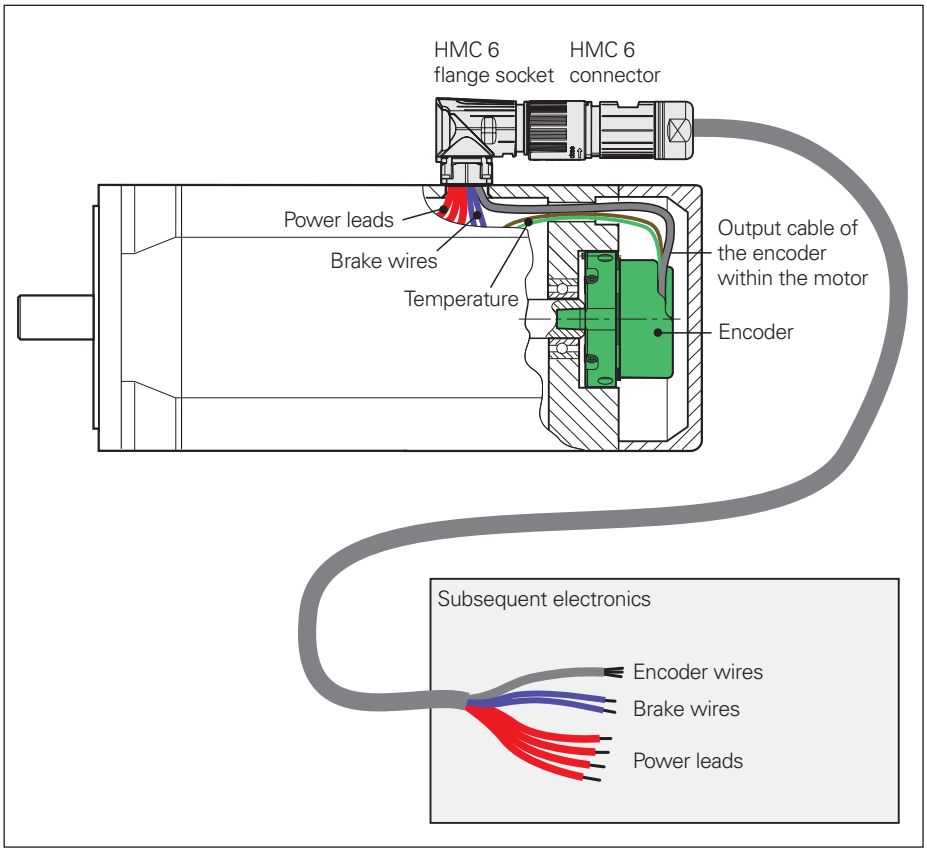
Components
You only need a few components to make your motor ready for the single-cable solution.

Connecting element on the motor
The motor housing must be equipped with a special angle flange socket, in which the contacts for the encoder, the motor power and the brake are included.

Crimp tools for the power lines
The crimp contacts for power and brake wires are assembled using the usual tools.

Cables inside the motor housing
The rotary encoder is connected through the output cable inside the motor: your ready-wired communication element is simply latched to the angle flange socket.

Cable with hybrid connector
Besides the wires to the encoder, the HMC connecting cable with the motor also includes those for the motor power and brake. It is wired at one end with a hybrid connector.



HMC 6
Components

Angle flange socket
A special angle flange socket serves to connect the motor to the subsequent electronics. It brings together the wires for the encoder (communication and encoder voltage supply); motor power and brakes are brought together.

There are angle flange sockets with fastening hole circles of Ø 28 mm or—to provide more space for wiring—with Ø 32 mm. Crimp contacts are possible for power wires with cross sections of 2.5 mm^2 and 4 mm^2. All versions feature an M23 outside thread for the connector.

The crimp contacts for the power and brake wires are provided with the angle flange socket. The encoder connections are latched into the contact insert as a ready-wired communication element. A protective cap is included to protect the flange socket thread. The angle flange socket and connector can be individually marked with color rings for unambiguous assignment. They are available from Intercontec.

Angle flange socket

Fastening hole circle	Ø 28 mm	Ø 32 mm
Cross section 2.5 mm^2	ID 1043027-01	ID 1043027-02
Cross section 4 mm^2	ID 1043027-03	ID 1043027-04

Crimping tool
The contacts to be used in the angle flange socket for power and brake lines are standard, commercially available crimp contacts. Their assembly requires the appropriate crimping tools and adjusting aids.

Please order the crimping tools from:

Intercontec Produkt GmbH
Bernriederstraße 15
94559 Niederwinkling, Germany
Phone: +49 9962 2002-0
Fax: +49 9962 2002-70
E-mail: info@intercontec.biz
Web: www.intercontec.biz

Digital crimping tool C0.236.00
with locater C0.245.00

Digital crimping tool C0.235.00
with locater C0.265.00

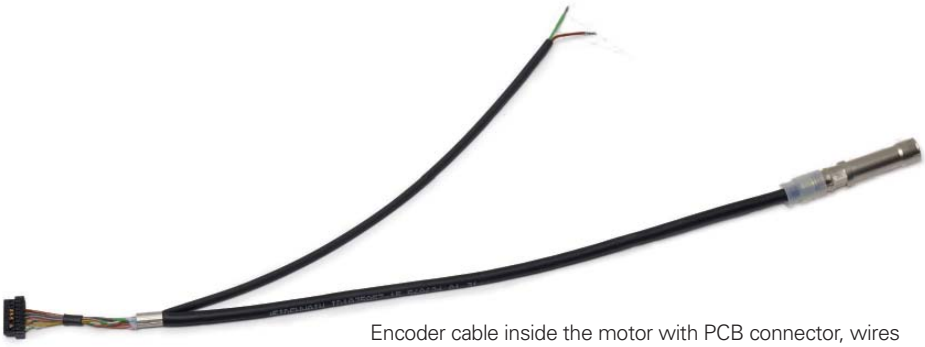
Manual crimping tool C0.201.00
with locater C0.138.00

Tool and contacts	Cross section	Order number		Crimping Tool	
		HEIDENHAIN	Intercontec	Crimping tool	Adjusting aid (locater)
Brake contacts	0.14 mm^2 to 1.0 mm^2 0.5 mm^2 to 1.5 mm^2	1043266-01 1043266-02	61.253.11 61.221.11	C0.235.00 C0.236.00	C0.265.00 C0.245.00
Power contacts	0.35 mm^2 to 2.5 mm^2	1043251-01	61.242.11	C0.235.00	C0.265.00
	2.5 mm^2 to 4.0 mm^2	1043251-02	61.243.11	C0.201.00	C0.138.00

Cables inside the motor housing
The connecting cables in the motor are pre-assembled. The plug-in PCB is connected to the rotary encoder while the communication element is simply latched into the angle flange socket. Integrated connecting cables are available for most series of ECN/EQN, ECI/EQI 1100, ECN/EQN and ECI/EQI 1300 encoders. They are available with or without leads (cross section 0.16 mm^2) for connection to a temperature sensor in the motor winding.

Information on the temperature sensors to be used are in the *Encoders for Servo Drives* catalog.

Cables inside the motor housing	ECN/EQN 11xx	ECI/EQI 11xx ECI 1xx	ECN/EQN 13xx ECI/EQI 13xx
Without leads for thermistor	ID 1034953-xx	–	ID 1034913-xx
With leads for thermistor	ID 1035857-xx	–	ID 1035387-xx
With leads for thermistor Includes cable clamp	–	ID 1072652-xx	–



Encoder cable inside the motor with PCB connector, wires for a temperature sensor and communication element

Cable with hybrid connector
Besides the wires to the encoder, the HMC connecting cable with the motor also includes those for the motor power and brake. It features one M23 hybrid connector fitting to the angle flange socket on the motor.

The HMC 6 cables are available with power wires with 1.5 mm^2 or 4 mm^2 cross sections. The cable end for the inverter is without connector.

For other cable lengths and quantities, please contact RSF Elektronik:

RSF Elektronik Ges.m.b.H.
A-5121 Tarsdorf 93, Austria
Phone: +43 6278 8192-517
Fax: +43 6278 8192-58
E-mail: info@rsf.at
Web: www.rsf.at

Cable with hybrid connector Cable length	Power wires (cross section) 1.5 mm^2	 4 mm^2
10 m	ID 1034933-10	ID 1076352-10
25 m	ID 1034933-25	ID 1076352-25
50 m	ID 1034933-50	ID 1076352-50

Power wires (cross section)	Cable Ø	Setup		
		Communication and voltage supply	*Brake*	*Power and PE*
1.5 mm^2	13.6 mm	2 x (2 x 0.09 mm^2) + 2 x 0.24 mm^2	1 x (2 x 1.0 mm^2)	1 x (3 x 1.5 mm^2) + 1 x 1.5 mm^2
4 mm^2	16.6 mm	2 x (2 x 0.09 mm^2) + 2 x 0.24 mm^2	1 x (2 x 1.0 mm^2)	1 x (3 x 4.0 mm^2) + 1 x 4.0 mm^2

Communication bundle	Bundle Ø	Setup	Ø Under shield
	5.1 mm ± 0.1 mm	2 x (2 x 0.09 mm^2) + 2 x 0.24 mm^2	3.95 mm ± 0.15 mm

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Components

Motor connecting cable
For some cases you will have to manufacture the motor connecting cable or an extension cable yourself. You can also order the required components individually.

The hybrid connector and coupling are shipped as service packs. They include the contact insert, all necessary crimp contacts for power, brake and encoder wires, the communication element as well as—with the coupling—a protective cover for the M23 thread.

The hybrid cable is shipped from RSF in lengths of 10 m, 20 m or 100 m in a bundle or on a drum with 1000 m.

RSF Elektronik Ges.m.b.H.
A-5121 Tarsdorf 93, Austria
Phone: +43 6278 8192-517
Fax: +43 6278 8192-58
E-mail: info@rsf.at
Web: www.rsf.at

Connecting Elements	Power wires (cross section)	
	1.5 mm²	4 mm²
Hybrid connector	ID 1075255-01	ID 1075255-02
Hybrid coupling	ID 1084549-01	ID 1084549-02

Hybrid connector

Hybrid coupling

Hybrid cable (available by meter)	Power wires (cross section)	
Length	1.5 mm²	4 mm²
10 m	ID 1088964-10	ID 1088965-10

Tools for communication element in the hybrid connector and coupling
In addition to the tools for crimping the power and brake contacts, other tools are required for manufacturing the hybrid cable. They are needed for mounting the encoder wires or the communication element.

Please order the tools for manufacturing the communication element directly from INTERCONTECT:

Intercontec Produkt GmbH
Bernriederstraße 15
94559 Niederwinkling, Germany
Phone: +49 9962 2002-0
Fax: +49 9962 2002-70
E-mail: info@intercontec.biz
Web: www.intercontec.biz

Digital crimping tool C0.235.00
with locater C0.265.00

Assembly pliers C0.323.00
with crimping and positioning insert

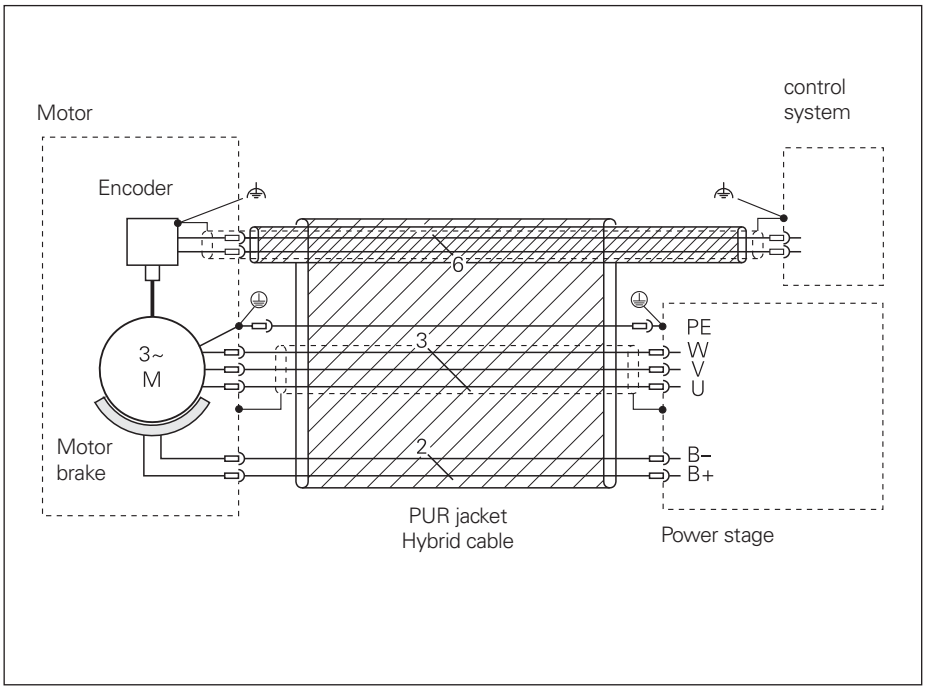
Tools	Cross section	Tool
Crimping the contacts for encoder leads	0.32 mm² to 2.5 mm²	C0.235.00 crimping tool with C0.265.00 locater
Crimping the shield for communication element	–	C0.323.00 assembly pliers and crimp insert C0.321.00
Sliding the locking sleeve for the communication element	–	C0.323.00 assembly pliers and C6.166.00 positioning insert

General electrical information

The general electrical information provided in the catalog *Interfaces of HEIDENHAIN Encoders* applies for the use of hybrid cables.

Please also note the following:
- The **shields** are to be made according to the grounding diagram.
- Unneeded **brake wires** must be grounded on the power module.
- The basic insulation (U/V/W working voltage) must be complied with as an **air clearance** between the stripped power wires and the brake or encoder lines.
- The shield of the power wire bundle is to be folded back over the protective jacket of the connecting cable, shortened and connected with the protective earth (PE).
- The temperature range of the output cable within the motor is -20 °C to 120 °C (motor at rest).

- The **UL certification** "AWM STYLE 20235 80 °C Voltage not specified E63216" is documented on the cable.
- The hybrid cable is **suited for drag chains** for at least 5 000 000 cycles at a bend radius of 7 times the cable diameter.
- The **current load capacity** of the hybrid cable complies with VDE 0891 Part 1
- **Cable lengths** are permissible up to 100 m and clock frequencies are in accordance with EnDat specifications (see brochure *Interfaces of HEIDENHAIN Encoders*).



Area of application as per EN 61800-5-1 / UL 20235

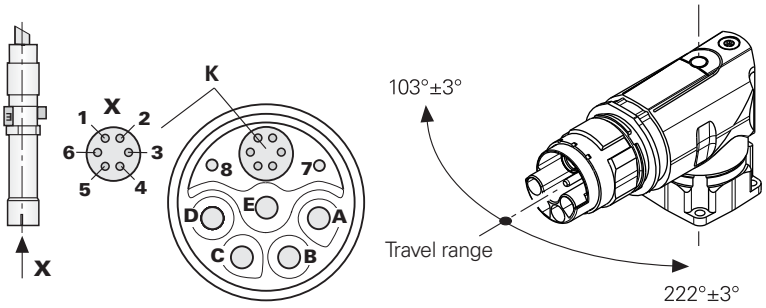
	Power leads	Encoder and brake wires
System voltage	300 V	50 V
Voltage class	C	
Operating (rated) voltage (for information)	1000 V EN 61800-5-1 600 V UL 20235	50 V EN 61800-5-1 30 V UL 20235
Overvoltage category	III	II

bend radius

Cable	Lateral	Weight	Bend radius R	
			Rigid configuration	Frequent flexing
Ø 13.6 mm	PUR	215 g/m	≥ 50 mm	≥ 80 mm
Ø 16.6 mm	PUR	380 g/m	≥ 65 mm	≥ 110 mm

Electrical connection and dimensions

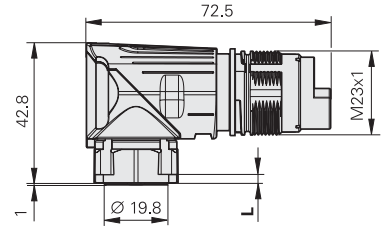
Pin layout

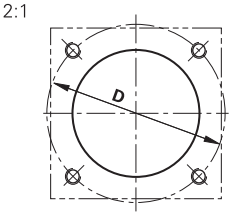


	Supply		Communication				Brake		Power				
	1	2	3	4	5	6	7	8	A	B	C	D	E
	U_P	0 V	DATA	$\overline{\text{DATA}}$	CLOCK	$\overline{\text{CLOCK}}$	BRAKE–	BRAKE+	U	V	W	/	PE
	Brown/ Green	White/ Green	Gray	Pink	Violet	Yellow	White	White/ Black	Blue	Brown	Black	/	Yellow/ Green

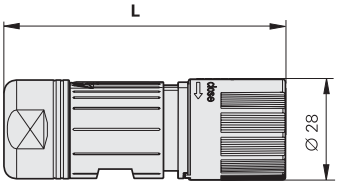
External shield of the encoder output cable on communication element housing **K**
Vacant pins or wires must not be used!

Dimensions

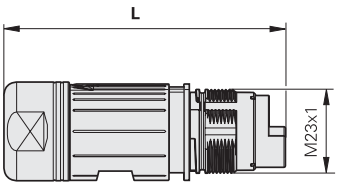




D	L
Ø 28	2.5
Ø 32	4.5



	L
Ø 9.5 mm – Ø 14.5 mm	78
Ø 14 mm – Ø 17 mm	80.5

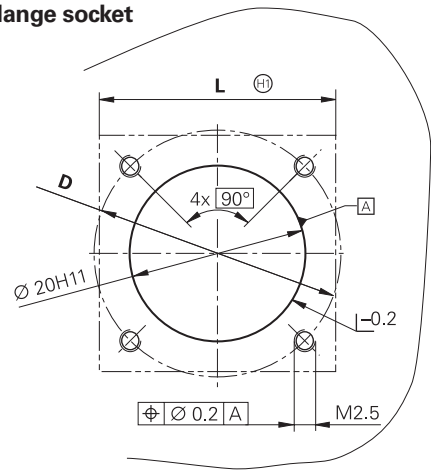


	L
Ø 9.5 mm – Ø 14.5 mm	78
Ø 14 mm – Ø 17 mm	80.5

mm

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

Required mating dimensions for flange socket



	D	L
ID 1043027-01 ID 1043027-03	Ø 28	□ 25.7
ID 1043027-02 ID 1043027-04	Ø 32	□ 28

At least 4 mm of load-bearing thread length.
Ⓗ = Comply with 0.05/Ra3.2 flatness and ensure cleanliness

HEIDENHAIN

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This Product Information supersedes all previous editions, which thereby become invalid. The basis for ordering from HEIDENHAIN is always the Product Information valid when the contract is made.

1091351 · 01 · A · 02 · 11/2014 · PDF

Crimping tools
Setting the crimping parameters

For contacts ≤ 2.5 mm²

Type of contact		60.216.xx	60.270.xx	60.278.xx	61.221.xx	61.242.xx	61.252.xx	61.253.xx
Crimping pliers with digital display		C0.236.00	C0.235.00		C0.236.00	C0.235.00		
Locater		C0.245.00	C0.265.00		C0.245.00	C0.265.00		
Locater setting		12	9	11	12	9	11	10
Wire cross section		**Crimping dimension setting [in mm or specified according to MIL 22520]**						
0.081 mm²	**AWG 28**			0.48/H2			0.48/H2	0.56/H3
0.102 mm²	**AWG 27**			0.48/H2			0.48/H2	0.65/H4
0.14 mm²	**AWG 26**			0.48/H2			0.48/H2	0.65/H4
0.2 mm²	**AWG 24**			0.56/H3			0.56/H3	0.74/H5
0.24 mm²	**AWG 23**			0.56/H3			0.56/H3	0.74/H5
0.34 mm²	**AWG 22**		0.90/–	0.65/H4		0.90/–	0.65/H4	0.84/H6
0.5 mm²	**AWG 20**	0.81/F2	1.06/–		0.81/F2	1.06/–		0.84/H6
0.75 mm²	**AWG 19**	0.81/F2	1.14/–		0.81/F2	1.14/–		0.94/H7
0.82 mm²	**AWG 18**	0.81/F2	1.22/–		0.81/F2	1.22/–		0.94/H7
1.0 mm²	**AWG 17**	0.91/F3	1.29/–		0.91/F3	1.29/–		1.04/H8
1.3 mm²	**AWG 16**	0.91/F3	1.30/–		0.91/F3	1.30/–		
1.5 mm²	**AWG 15**	0.99/F4	1.31/–		0.99/F4	1.31/–		
2.1 mm²	**AWG 14**		1.33/–			1.33/–		
2.5 mm²	**AWG 13**		1.34/–			1.34/–		

For contacts from 2.5 mm² to 4 mm²

Type of contact		60.272.xx	61.243.xx
Hand crimp tool		C0.201.00	
Locater		C0.138.00	
Locater setting		Blue	Blue
Wire cross section		**Plier setting**	
2.1 mm²	**AWG 14**	3	3
2.5 mm²	**–**	4	4
3.3 mm²	**AWG 12**	4	4
4.0 mm²	**–**	5	5

Green: Settings to be used for HEIDENHAIN connecting cables

Gray: Possible settings for motor connection wires

Please note the currently applicable version of the operating instructions for the crimping pliers from Intercontec.

Date of table: October 2014

Supplement to the Product Information: *HMC 6 – Hybrid Motor Cable* 1091351 · 01 · A · 02 · 11/2014
DR. JOHANNES HEIDENHAIN GmbH · 83301 Traunreut, Germany · www.heidenhain.de

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