Military, security and aerospace COTS connector solutions

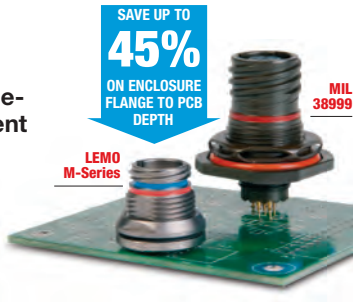
SERIES

LEMO

M Series micro-connectors

LEMO M Series range of triple-start micro-connectors provide significant space savings in comparison to MIL 38999 Series III connectors, and are LEMO's smallest multi-pin, fully shielded, vibration-secure and sealed connectors available, offering a lightweight connection with high pin-count density, 360° EMC shielding protection, and LEMO rugged quality.

- **Soldier and vehicle-mounted equipment**
- **Communications**
- **UAV's/UMV's**
- **Avionics and Aerospace**



LEMO M-Series high-strength aluminium connectors incorporate a triple-start fast-locking ratchet mechanism for use in high vibration and harsh environments, providing significant size and weight advantages over MIL-38999 connectors and other micro circular connectors. Already selected for use on the F1ECU and a number of military and avionics applications, the M Series is continuing the excellent reputation of LEMO connectors' for high quality and reliable interconnection solutions that meet customers requirements.

Main features and benefits include:

- **Triple-start thread ratchet coupling mechanism for fast (3/4 turn) & secure connection**
- **Small size with high contact density for significant space savings**
- **Multiple keys and keyways for ease of mating and security**
- **Short flange to pcb depth for greatly reduced enclosure sizes and cost savings**
- **Integral backshell, but with MIL backshell options if preferred**

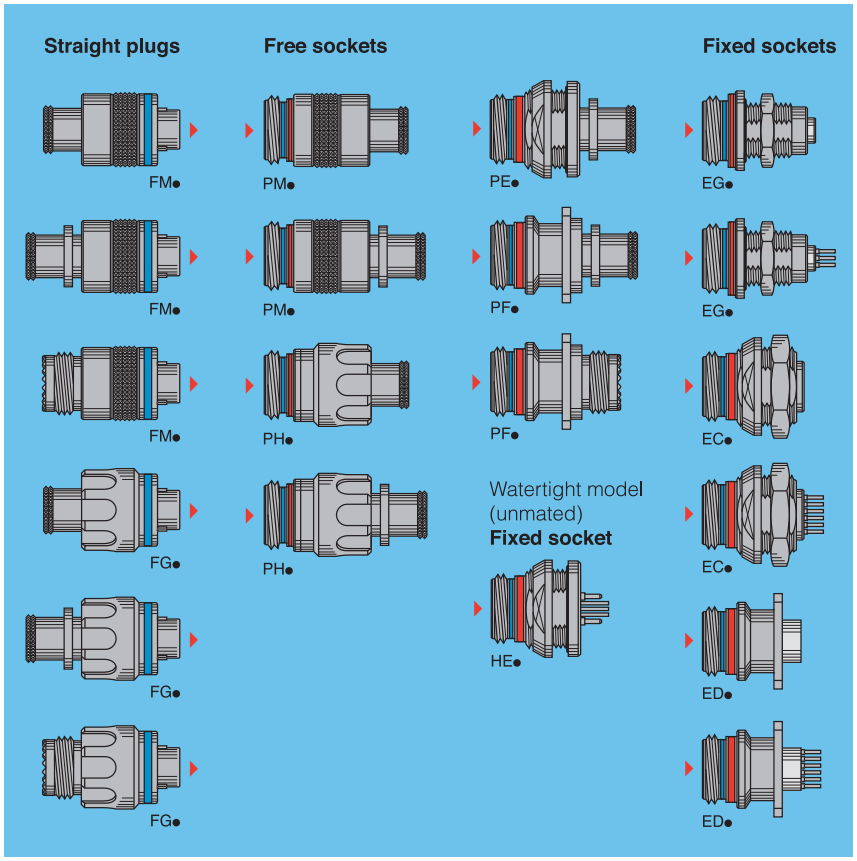
- **Unique LEMO precision gold-plated contact system for exceptional performance and long-term reliability**

- **With power pin and reduced crimp barrel contacts, accommodates wire from 16 to 32 AWG**

Designed for use in harsh environments, M Series connectors have been tested to the full range of MIL tests including vibration, gunfire, altitude, lightning, temperature, immersion,chemical and flammability, clearly demonstrating capability of the range to handle many aerospace, military and security applications.

This catalogue provides a summary of the M Series range and accessories with comparisons to some popular MIL 38999 shell sizes to demonstrate the potential equipment savings that can be made by adopting the M Series.

Note that this catalogue does not cover the whole M Series range and other housings are available – some examples below. The full catalogue giving full details of the complete M Series range is available via our website – **www.lemo.co.uk**



The M Series has a wide range of shell design options to suit customer requirements. Variants include:

- **In-line plugs (FM* & FG*) and sockets (PM* & PH*)**
- **Fixed sockets -front panel, back panel and bulkhead fixing**
- **Watertight pcb sockets when unmated**
- **Two coupling nut styles – knurled and arctic grip**
- **Three cable fixing options – metal tie-wrap or constant force spring clip, MIL backshell and overmoulding**

Examples of COTS alternatives

Possible COTS alternatives to popular MIL 38999 shell configurations selected from the M Series range below give an idea of the scope for significant space reductions whilst still meeting rating requirements for your application. These are some examples only and many other housings and contact configurations are available – see our full LEMO M Series catalogue for further information.

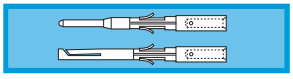
LEMO M Series a few examples with part numbers of COTS equivalent options

MIL 38999 Shell size		9-98	9-35	11-98	11-35
No of contacts		3	6	6	13
Contact size		20	22	20	22
Nominal dia mm		21.8	21.8	24.6	24.6
LEMO COTS alternative	**Description**	**0M.303**	**1M.308**	**2M.308**	**2M.319**
No of contacts	No	3	8	8	19
Wire sizes	AWG	20-22-24	22 -24- 26*	20-22-24	22 -24- 26*
Contact rating	Amps	8A	5A	10A	4A
Plug nominal dia	mm	13.1	14.6	17.6	17.6
	Straight plug with integral backshell, crimp contacts	FGN.0M.303.XLC	FGN.1M.308.XLC	FGN.2M.308.XLC	FGN.2M.319.XLC
	Bulkhead socket with integral backshell, crimp contacts	PEN.0M.303.XLMT	PEN.1M.308.XLMT	PEN.2M.308.XLMT	PEN.2M.319.XLMT
	Fixed socket, watertight when unmated, pcb contacts	HEN.0M.303.XLNP	HEN.1M.308.XLNP	HEN.2M.308.XLNP	HEN.2M.319.XLNP
	In-line socket with integral backshell, crimp contacts	PHN.0M.303.XLM	PHN.1M.308.XLM	PHN.2M.308.XLM	PHN.2M.319.XLM
Heatshrink boot					
	Straight boot	UKT.0001272	UKT.0001272	UKT.0001273	UKT.0001273
	Right angled boot	UKT.0001277	UKT.0001277	UKT.0001278	UKT.0001278
LEMO CABLE					
	Cable to DEF STAN 61-12, braided screen, or DIN, VDE, UL or proprietary cable as requested	7-2-3C	7-2-8C	16-2-8C	7-2-20C
For cable end to take overmoulding add "T" to end of part number					
	Optional back end for overmoulding	e.g. FGN.0M.303.XLCT PHN.0M.303.XLMT	e.g. FGN.1M.308.XLCT PHN.1M.308.XLMT	e.g. FGN.2M.308.XLCT PHN.2M.308.XLMT	e.g. FGN.2M.319.XLCT PHN.2M.319.XLMT
To add an optional MIL backshell fitting, add 'M' to the end of the part number					
	**Optional back end for fitting backshell	e.g. FGN.0M.303.XLCM PHN.0M.303.XLMM	e.g. FGN.1M.308.XLCM PHN.1M.308.XLMM	e.g. FGN.2M.308.XLCM PHN.2M.308.XLMM	e.g. FGN.2M.319.XLCM PHN.2M.319.XLMM
Backshell	Thread size	M12x1	N/A	M15x1	M15x1
	**Straight backshell option	N/A shell too small	UKT.B1.M12.04.1ZN	UKT.B1.M15.06.1ZN	UKT.B1.M15.08.1ZN
	**90° backshell option	N/A	UKT.B3.M12.04.1ZN	UKT.B3.M15.06.1ZN	UKT.B3.M15.08.1ZN

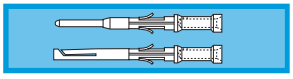
* Reduced barrel contacts available for smaller wire gauges down to 32AWG.
** Note standard M Series has integral backshell.

For reduced barrel contacts change the 14th character of the LEMO part number from “L” to “B” for male contacts and from “M” to “P” for female contacts.

Standard contacts



Reduced barrel contacts



Examples of COTS alternatives

A few more possible COTS alternatives to popular MIL 38999 configurations are given below.

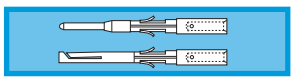
LEMO M Series a few examples with part numbers of COTS equivalent options

MIL 38999 Shell size		13-4	13-35	15-35	17-35
No of contacts		4	22	37	55
Contact size		16	22	22	22
Nominal dia mm		29	29	32	35
LEMO COTS alternative	**Description**	**2M.304**	**3M.330**	**TM.340**	**LM.368**
No of contacts	No.	4	30	40	68
Wire sizes	AWG	16-18-20	22-24-26*	22-24-26*	22-24-26*
Contact rating	Amps	12.0	3.5	3.0	2.5
Plug nominal dia	mm	17.6	20.9	23.4	29.4
	Straight plug with integral backshell, crimp contacts	FGN.2M.304.XLC	FGN.3M.330.XLC	FGN.TM.340.XLC	FGN.LM.368.XLC
	Bulkhead socket with integral backshell, crimp contacts	PEN.2M.304.XLMT	PEN.3M.330.XLCT	PEN.TM.340.XLMT	PEN.LM.368.XLMT
	Fixed socket, watertight when unmated, pcb contacts	HEN.2M.304.XLNP	HEN.3M.330.XLNP	HEN.TM.340.XLNP	HEN.LM.368.XLNP
	In-line socket with integral backshell, crimp contacts	PHN.2M.304.XLM	PHN.3M.330.XLM	PHN.TM.340.XLM	PHN.LM.368.XLM
Heatshrink boot					
	Straight boot	UKT.0001273	UKT.0001274	UKT.0001274	UKT.0001275
	Right angled boot	UKT.0001278	UKT.0001279	UKT.0001279	UKT.0001280
LEMO CABLE					
	Cable to DEF STAN 61-12, braided screen, or DIN, VDE, UL or proprietary cable as requested	16-2-4C	7-2-36C	On request	On request
For cable end to take overmoulding add "T" to end of part number					
	Optional back end for overmoulding	e.g. FGN.2M.304.XLCT PHN.2M.304.XLMT	e.g. FGN.3M.330.XLCT PHN.3M.330.XLMT	e.g. FGN.TM.340.XLCT PHN.TM.340.XLMT	e.g. FGN.LM.368.XLCT PHN.LM.368.XLMT
To add an optional MIL backshell fitting, add 'M' to the end of the part number					
	**Optional back end for fitting backshell	e.g. FGN.2M.304.XLCM PHN.2M.304.XLMM	e.g. FGN.3M.330.XLCM PHN.3M.330.XLMM	e.g. FGN.TM.340.XLCM PHN.TM.340.XLMM	e.g. FGN.LM.368.XLCM PHN.LM.368.XLMM
Backshell	Thread size	M15x1	M18x1	M18x1	M25x1
	**Straight backshell option	UKT.B1.M15.04.1ZN	UKT.B1.M18.07.1ZN	UKT.B1.M18.08.1ZN	UKT.B1.M18.10.1ZN
	**90° backshell option	UKT.B3.M15.04.1ZN	UKT.B3.M18.07.1ZN	UKT.B3.M18.08.1ZN	UKT.B3.M18.10.1ZN

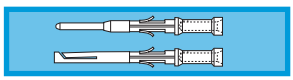
* Reduced barrel contacts available for smaller wire gauges down to 32AWG.
** Note standard M Series has integral backshell.

For reduced barrel contacts change the 14th character of the LEMO part number from “L” to “B” for male contacts and from “M” to “P” for female contacts.

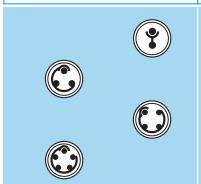
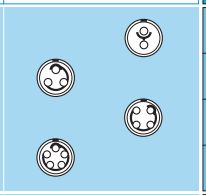
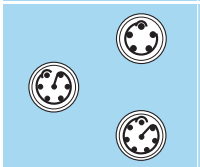
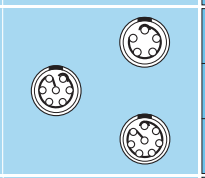
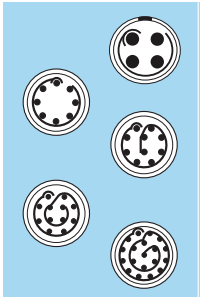
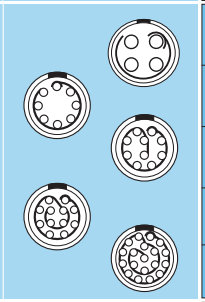
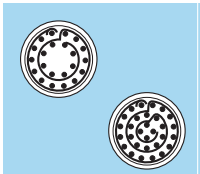
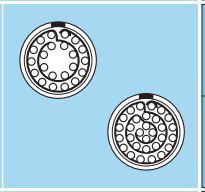
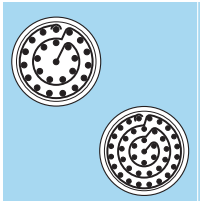
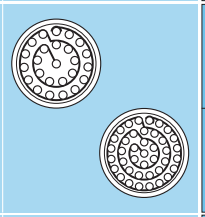
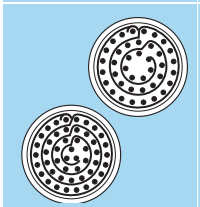
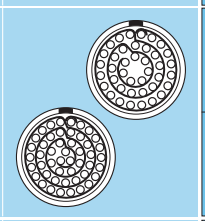
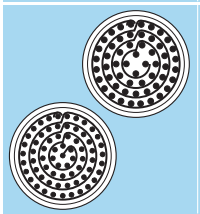
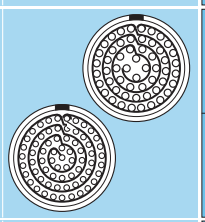
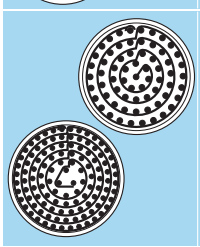
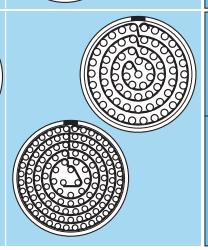
Standard contacts



Reduced barrel contacts

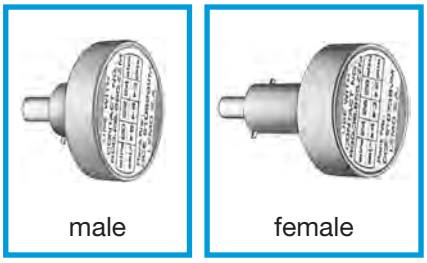


Contact configurations

	Male crimp contacts for plug	Female crimp contacts for sockets	Reference	Number of contacts	Contact dia. mm	AWG	Rated current	Code for positioner
0M			302	2	0.9	20-22-24	10.0	1
			303	3	0.9	20-22-24	8.0	1
			304	4	0.7	22-24-26	7.0	2
			305	5	0.7	22-24-26	6.5	2
1M			305	5	0.9	20-22-24	9.0	1
			307	7	0.7	22-24-26	7.00	2
			308	8	0.7	22-24-26	5.00	2
2M			304	4	1.3	16-18-20	12.0	5
			308	8	0.9	20-22-24	10.0	1
			310	10	0.9	20-22-24	8.0	1
			312	12	0.7	22-24-26	7.0	2
			319	19	0.7	22-24-26	4.0	2
3M			322	22	0.7	22-24-26	5.0	2
			330	30	0.7	22-24-26	3.5	2
TM			325	25	0.9	20-22-24	5.0	3
			340	40	0.7	22-24-26	3.0	4
4M			340	40	0.7	22-24-26	3.5	4
			348	48	0.7	22-24-26	tbd	4
LM			355	55	0.9	20-22-24	tbd	3
			368	68	0.7	22-24-26	2.5	4
5M			366	66	0.9	20-22-24	tbd	3
			114	114	0.7	22-24-26	2.0	4

The previous pages contain a selection of insert types to give an idea of how the M Series compares with MIL 38999 Series III configurations. However a much wider range of contact configurations is offered which is growing all the time. If you do not see what you are looking for please contact LEMO to see if the configuration you require is available. All contacts other than for pcb are crimp contacts for which you will need a standard style 701 crimp tool and LEMO positioner. Use the positioner code in the table opposite to select the relevant positioner below.

DCE Positioners for crimp contacts



Positioners part number

Code	For male contacts	For female contacts
1	DCE.91.090.5MVC	DCE.91.090.3MVM
2	DCE.91.070.5MVC	DCE.91.070.3MVM
3	DCE.91.090.5MVC	DCE.91.09T.5MVM
4	DCE.91.070.5MVC	DCE.91.07T.5MVM
5	DCE.91.130.5MVG	DCE.91.130.5MVU

DPC Manual crimping tool

Crimping tool to MIL-C-22520/7-01 for use with positioners above.

Part Number
DPC.91.701.V

Contact extraction tools

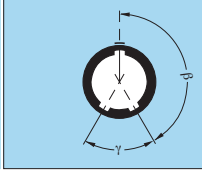
Contact diameter (mm)	Part Number
0.7	DCF.93.070.4LT
0.9	DCF.93.090.4LT
1.3	DCF.93.131.4LT

Keying options

Up to 5 keying options are available, some with reverse gender contacts. “N” key is the standard for sizes 0M to 3M, and “W” key is the standard for the remaining sizes. Change the 3rd character of the LEMO part number to select your required key as per the table below.

0M to 3M

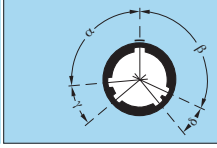
Front view of a socket



Model	Nb of keys	Angles β	Angles γ	Colour code	Contact type: Plug	Contact type: Socket
••N	3	165°	30°	blue	male	female
••P		150°	60°	yellow		
••U		130°	100°	green		
••S		155°	50°	red	female	male
••T		135°	90°	orange		

TM to 5M

Front view of a socket



Model	Nb of keys	Angles α	Angles β	Angles γ	Angles δ	Colour code	Contact type: Plug	Contact type: Socket
••W	5	95°	115°	35°	25°	blue	male	female
••R		105°	115°	30°	20°	yellow		
••X		100°	125°	40°	20°	red	female	male
••V		110°	120°	35°	25°	orange		

Blanking caps

To select the correct cap choose a part number with the same size/series as the connector. For chrome-plated brass caps for marine applications change the “X” to “C”.

Blanking caps for plugs

Part Number
BGF.0M.100.XAV
BGF.1M.100.XAV
BGF.2M.100.XAV
BGF.3M.100.XAV
BGF.TM.100.XAV
BGF.4M.100.XAV
BGF.LM.100.XAV
BGF.5M.100.XAV

BGF

Blanking caps for fixed sockets

Part Number
BGE.0M.200.XAZ
BGE.1M.200.XAZ
BGE.2M.200.XAZ
BGE.3M.200.XAZ
BGE.TM.200.XAZ
BGE.4M.200.XAZ
BGE.LM.200.XAZ
BGE.5M.200.XAZ

BGE

Blanking caps for in-line sockets

Part Number
BGF.0M.200.XAZ
BGF.1M.200.XAZ
BGF.2M.200.XAZ
BGF.3M.200.XAZ
BGF.TM.200.XAZ
BGF.4M.200.XAZ
BGF.LM.200.XAZ
BGF.5M.200.XAZ

BGF

Cable

A range of high quality cables is stocked at LEMO UK, including to DIN, VDE and UL specifications, with the DEF STAN 61-12 range being offered as standard for use with the M Series.

Some examples are shown in the tables on pages 3 & 4, and options are available to match the full range of inserts shown on page 5. A full cable assembly service is also available from LEMO UK – see page 8.

Cable can be made up to suit customer requirements.

Heatshrink boots

Straight and right-angled boots suitable for a range of connectors. They are manufactured from high quality elastomer suitable for a wide range of temperatures (-75ºC to +150ºC) and environments with excellent resistance to fuels in particular.

Adhesive-lined with a high-temperature (-75ºC to +200ºC) capability epoxy adhesive also with excellent resistance to fuels and oils, this range of heat-shrink boots complements the excellent performance of M Series connectors in demanding applications.

Series	Straight no lip, epoxy adhesive	Min cable OD	90° no lip, epoxy adhesive	Min cable OD
0M	UKT.0001272	3.8	UKT.0001277	2.5
1M	UKT.0001272	3.8	UKT.0001277	2.5
2M	UKT.0001273	5.6	UKT.0001278	5.6
3M	UKT.0001274	6.6	UKT.0001279	6.3
TM	UKT.0001274	6.6	UKT.0001279	6.3
4M	UKT.0001275	7.1	UKT.0001280	7.1
LM	UKT.0001275	7.1	UKT.0001280	7.1
5M	UKT.0001276	8.4	UKT.0001281	8.4

Backshells

A range of backshells have been specially designed to be fitted to the LEMO M Series connectors where customers require the additional benefits of a separate backshell – note that the M Series has an integral backshell. The design is shorter than standard MIL spec adaptors in order to complement the space savings offered by the M Series.

LEMO backshells are available in 3 primary models – straight, 45° and 90° – and are manufactured as standard from the same lightweight high strength aluminium as the M Series. Other materials are available on request.The rear fixing channel is designed to take metal tie-wraps or spring clips, depending upon the customer's preference.

A slotted option is available for termination of additional drain wires.

The connector interface is to the MIL 38999 Series III and IV shell sizes and a range of cable entry diameters are offered. Part number structure is shown below (add "M" to the end of M Series part number for the correct interface).

Part number structure

Part number example	UKT.B1.M12.04.1ZN
UKT.B	
1	1 = straight, 2 = 45°, 3 = 90°
M12	Interface thread size - see table
04	Cable entry size - see table
1	Material (aluminium as standard)
ZN	Plating (eg. zinc nickel black)
S	Add "S" if slots required for additional drain wire termination, else leave blank

Plating options include electroless nickel (C), electroless nickel + high phosphor for space applications (CHP), zinc cobalt black (ZK) and zinc nickel black (ZN).

Interface thread sizes

M Series	Thread size
1M	M12x1.0
2M	M15x1.0
3M	M18x1.0
TM	M18x1.0
4M	M22x1.0
LM	M25x1.0
5M	M31x1.0

Cable entry sizes

Cable entry nominal size	Max entry (mm)
03	4.7
04	6.3
05	7.9
06	9.5
07	11.1
08	12.7
10	15.8
12	19.0
14	22.2
16	25.4
18	28.6

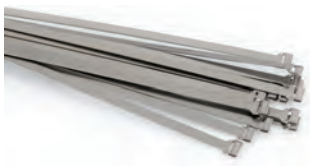
Microbands and Constant Force Spring clips for screen termination

Termination of the cable screen to M Series connectors can be achieved through the use of either metal microbands or constant force spring clips. The closing of microbands requires the use of a special tool to ensure sufficient tightening of the band, whereas the spring clips are manually applied and are contained by a the heatshrink boot.

Microband tool

Part Number
A30199

Metal microband



Part Number
A31189

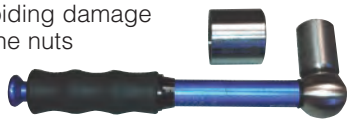
M Series Constant Force Spring Clips

A range of constant force spring clips are available for use with M Series connectors, which permits repair of cable terminations without having to discard any of the existing braid shield system. When used in conjunction with LEMO heatshrink boots, a fully sealed termination is achieved. An additional benefit of the constant force spring isthat it provides excellent resistance to shock or vibration due to its self-tensioning properties.

Series	Braid grounding location diameter (mm)	Part Number
0M	8	UKT.0001269
1M	9.7	UKT.0001269
2M	13	UKT.0001269
3M	15	UKT.0001270
TM	16.7	UKT.0001270
4M	19.5	UKT.0001271
LM	22.7	UKT.0001271
5M	28.5	UKT.0001271

Front conical nut tightening tools

A range of tightening tools consisting of 1/4" socket drives and calibrated wrenches has been developed for the conical front nuts to ensure correct torque is applied, as well as avoiding damage to the appearance of the nuts during assembly.



M Series size	LEMO socket drive Part Number	Torque Nm	LEMO wrench Part Number
0M	UKT.0001282	1.0	UKT.0001290
1M	UKT.0001283	1.5	
2M	UKT.0001284	2.0	
3M	UKT.0001285	2.5	
TM	UKT.0001286	4.0	UKT.0001291
4M	UKT.0001287	5.0	
LM	UKT.0001288	6.5	
5M	UKT.0001289	8.0	

Cable assembly

LEMO UK offers a full cable assembly service from its modern facilities with fully trained technicians, and we pride ourselves on the quality of the terminations provided.

CAD drawings are created for new assemblies and are fully structured on our system to provide appropriate controls & full traceability.

Whilst our emphasis is naturally on the termination of LEMO connectors, we have extensive experience of connectors from other manufacturers.

LEMO UK has the capability for termination of both copper and fibre optic cable assemblies.

At LEMO every cable assembly is fully inspected to ensure it meets the required standard.

In many instances the technical requirements for an assembly are the same for many different customers.

For this reason a part numbering system for M Series standard cable assemblies has been created, where the specification is a text description based on DEF STAN 61-12 standard cables and standard pin-outs to match

the connector. Variants according to customer requirements can be accommodated, though the part numbering will be different and will be generated at the time of an order.

Short run cables can be made up to suit customer requirements.

Part number structure description and example for standard M Series cable assemblies

Type	Size/series	Contact configuration	Primary model connector	Second model connector ("XXX" if none	Lengths in metres. Decimals of a metre preceded by "-"
UKS.	0M	304	FGN	PHN	010

Examples

Part number example	Description
UKS.1M308FGNPHN010	FGN.1M.308.XLC terminated to PHN.1M.308.XLM on a 10m length of cable to DEF STAN 61-12 construction (7-2-8C) and pin-out
UKS.2M310FGNPHN100	FGN.2M.308.XLC terminated to PHN.2M.308.XLM on a 10m length of cable to DEF STAN 61-12 construction (16-2-8C) and pin-out
UKS.2M319EGNXXX-025	EGN.2M.319.XLM terminated to a 250mm length of cable to DEF STAN 61-12 construction (7-2-20C) and pin-out

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