

# RUSSIAN KLM BUSBAR



# CATALOGUE 2017

JOINT UNITS WITH DIFFERENT **TYPES OF BUSBARS** 

**BUSBAR** DISTRIBUTION **SYSTEM** 100..800A

**BUSBAR** TRUNKING **SYSTEM** 800..6300A

LOW-VOLTAGE DISTRIBUTION **SWITCHBOARDS** 

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# ABOUT COMPANY

A promising direction in energy saving of enterprises and buildings is the use of busbar systems. Its main advantage lies in the effective energy savings, simplicity of use, compactness, speed of installation, high degree of protection IP55, IP65, IP66, IP67 or IP68.

KLM Engineering Company presents a product, which is the leader at the busbar market both in Russia and the CIS, and abroad as well with its technical characteristics and manufacturing flexibility. Through the use of new technologies, taking into account the physical foundations of the electrical conductivity of materials, the company provides a complete list of production of low-voltage busbar trunking systems for rated currents from 100 A to 6300 A with the parameters exceeding the parameters of foreign and domestic alternatives.

Manufacturing facilities of our company are distributed with several sites in the Central Russia. Manufacturers of the group perform following tasks:

- serial manufacture of all types of KLM busbars;
- research and development of new busbar samples with improved characteristics.

A team of professionals, national resources like, Russian copper and aluminum — all these allow not only to expand the applicaton area for energy saving technologies, but to fix lower price than imported ones', decrease the delivery time, and to provide full set of services like design, installation and maintenance in tight time frame with required quality.

Application KLM busbars in all type of projects allows to apply the modern technologies, to provide a customized approach, and search for mutual decisions for achievement the best results in safety transmission and distribution of power in commercial, residential, and industrial buildings.









# MADE IN RUSSIA

We carefully manufacture the busbars. Our strategic goal is to create the reliable, sustainable and flexible power transmission and distribution systems based on busbars.

KLM busbars designers take into account the busbars advantages and disadvantages all over the world.

Incidentally, this is the basis of our new concept in the market. We offer to our Clients not only the equipment, but our experience gathered all over the world, and modern technologies.

# HISTORY OF THE BUSBAR DEVELOPMENT

Today it is difficult to find buildings or facilities, which would not have a busbar for transmission and distribution of electricity. Busbar presented as insulated bars in a hard enclosure is preferable to traditional cable lines for power main line, which works at a big loads.

# ADVENT OF BUSBAR

Advent of the first busbar systems associated with the launch of induction heating in metallurgical processes. Using traditional cable systems had become impossible due to their low efficiency and bulkiness.

Conductors form, its mutual arrangement and connection scheme (due to skin and close effect) have an effect on technical characteristics of power transmission at the alternating current with frequency of 50 Hz and above (Pic. 1, 2).



**Pic. 1.** Current density distribution in a round conductor at alternating current.



**Pic. 2.** Current density distribution in two closely located conductors.

The skin effect occurs when alternating current flows in the conductor. It reduces the effective conduction area of the conductor to the outer circumferential portion of the cross section. Cable section is limited for this reason.

The proximity effect occurs in a closely spaced conductors. As a result of the mutual interaction between the electric charge carriers in conductors (the effect of the mutual attraction of electrons repulsion) occurs reduction in the effective cross-sectional area of the conductor, and the losses increase.

The maximum decrease in the impact of these two effects determines the physical basis for improving the design of busbars for more than 100 years of modern electronics history.

The number of cables must be increased or bus-conductors, which have a flat section and less skin effect, should be applied to ensure the required current carrying capacity (Pic. 3).

The challenge to reduce energy losses was the cause of heating units power supply via busbars. The number of bars mounted on phase increased to two, three or more in compliance with capacity incresing, which is called split-phase system (Pic. 4) and was a wrapped metal mesh of bars, fixed with insulator on its metal base. Protection degree of such a system is IP20. It was a busbar prototype. The efficiency of the transmission system can be estimated by the ratio of the Incremental losses coefficient (C) to the ratio of resistance to alternating current to direct current resistance (C > 1). The value of C for split phase system is 1.4 or more, which led to seek more advanced transmission system.



Pic. 3. Distribution diagram of current density δ, A/mm<sup>2</sup>.
a) conductor cross section (round shape) radius, r
b) conductor cross section (square shaper) thicknss, B.

First records of busbar systems appeared in the early 1930s and have been associated with the construction of high-rise buildings in the US. Necessity of energy distribution to the each floor leds to the developing the busbar distribution system which has bars with air gap placed inside of insulated steel enclosure.

Busbar trunking system was developed. New system designed in the United States in 1943, had coupled phases (Pic. 5). The essence of this system was application of two bars for each phase, but in contrast to the split phase system (Pic. 4), the bars of different phases were placed in compliance with coupled semi-phase (insulating partitions were set between semi-phase bars). Incremental losses coefficient had a value of 1.33, but the main advantage of this system was the extremely low impedance, since the currents in each bar were in phase opposition.

However, due to existing war first busbar trunking system with coupled phases at the 1500 A was produced only in 1950.









Pic. 5. Busbars schemes with coupled phases.

Search the power losses reducing system is continued in 1970s. Busbars designed with sequential order of phases and equal intervals between the bars were distributed in Europe (Pic. 6). Incremental losses coeficient value in this system was 1.2–1.25. The busbars with busbar systems with sequential order of phases, developed by the French and German companies, were leader in European market until the 2000s.

The disadvantages of busbars with coupled phase and sequential order of phase is low protection degree (IP20) of busbar enclosure, which upper and lower cover were perforated in order to convective heat transfer. The disadvantage of the busbar with



Pic. 6. Scheme of busbars with sequential order of phases.

sequential order of phase is hard installation works of joint units because bars had to be connected with addtional connectors.

The development of the chemical industry and the production of new electrical insulating materials that meet the requirements of high electrical and mechanical strength and heat resistance, has opened up the prospects for developers in the new type of busbar design. In 1972, busbar was designed based on completely different principles, which are following:

- bars continuous dense compression instead of the traditional air gaps between phases;
- thoughtful selection of the bar shape and cross-section;
- heat-resistant insulation powder of bars, which is sputtered in an electrostatic field, and then heated in a furnace;
- impact-resistant and heat-resistant insulator at the units mating are;
- solid galvanized steel enclosure with a well-developed surface;
- aluminum coated bars;
- adding to the phase and neutral tire safety bar PE.

The specific features of new type busbar mentioned above, "sandwich" or "package" made it different from previouse busbar types (Pic. 7).

Compression of bars allows to reduce inductance and eliminate air gap between the bars, preventing the heat removing. Bars shaperwith a large ratio of height to its thickness gave the best distribution of current density by a factor of the cross section with a incremental losses coefficient 1.1.Russian KLM busbar was developed based on physics law, tested and proven design solutions by KLM specialists in 2010 (Pic. 8). The main objective of the KLM busbar was safe transmission and distribution of electricity and electrical losses reduction. According to these objectives, copper and aluminum bars were chosen for busbar as well as suitable cross section shape.



Pic. 7. Modern layout of bars set.



Pic. 8. KLM-S Busbar unit section.

# **KLM BUSBAR DESCRIPTION**

KLM Engineering design, manufacture and install the KLM Russian Busbar. The advantages like as design simplicity, flexible prices, shortest delivery time, high speed of installation works and cost effeciency of power due to energy loss reducing make KLM Busbar one of the popular electrical product in the market.

# **BUSBAR STRUCTURE**

Design of KLM Busbar strucure is based on the research of the advantages and disadvantages of imported busbars according to the modern high requirements like energy efficiency, compactness and reliability to power transmission and distribution systems.

Due to high temperature resistance of modern insulation materials reducing the busbar cross-section for manufacture cost efficiency is practically in the world. The units structure of KLM busbar with increased bar cross-section, reduces the performance of impedance, allowing transmission of power with lower energy losses in compare with its imported analogues, with maintenance savings up to several million rubles annually. Conducting parts of the KLM busbar trunking system is tightly compressed and insulated bars of "sandwich" type. This design provides compactness and best conductors heat utilization. KLM busbars reduce losses up to 27% or save millions rubles anually during maintenance period in compare with the other busbar types and cables due to its current equal distribution via flat cross-section of conducting parts and reducing the impedance of compressed bars.



## Pic. 9. Busbar structure.

# ENCLOSURE

KLM busbar enclosure is made of galvanized steel or aluminium alloy. Busbar structure has additional stiffening plates, which provide high strength, short circuit dynamic (0.1 sec.) and thermic (1 sec.) resistance.

# **TYPES OF CONDUCTORS**

KLM Engineering manufactures busbars with 2, 3, 4 and 5 conductors for direct and alternating current at voltage up to 1000 V and rated current from 100 A to 6300 A. Manufacture of busbar with PE bar is possible for 50% (Pic. 10), 100% or 200% of L phasing conductor cross-section as well as doubled N protection conductor.



Pic. 10. Busbar with PE bar 50%.

Material of conducting bars can be in two types: aluminium (Pic. 11.A) and copper (Pic. 11.B) conductors.

В

Α



**Pic. 11.** Type of bars:  $\mathbf{A}$  – with aluminium bars,  $\mathbf{B}$  – with copper bars.

# INSULATION

Insulation materials as polyethylenterephtalat (PET-E) as fire-resistant mi-aramid fiber Nomex<sup>®</sup> are used for KLM busbar manufacture.

Multi-layer insulation is implemented in KLM busbar manufacture as following:

- 1. Each conducting part is insulated with 2 layers. Thickness of each layer is 125 mcm.
- 2. Additionally, insulation material with thickness of 300 mcm is laid between the bars.
- 3. Further, bars set is wrapped with insulation material with thickness of 500 mcm.

This type of insulation provides high reliability and durability of the busbar maintenance.

The standard temperature resistance of insulation materials 155 °C. Insulation material with temperature resistance up to 700 °C can be used upon Client's order.

# **ENCLOSURE COLOR**

KLM busbar with steel and aluminium enclosure can be painted in any color of RAL by order.

Painting in compliance with order individually is possible for KLM tap off box with BOLT-ON (into the joint) and PLUG-IN (into the door) type (Pic. 12).



**Pic. 12.** Type of painting KLM tap off boxes.

# **BUSBAR UNITS SAMPLES**

KLM busbar units full set includes the list of all units applied for power supply works of any complexity.

Standard length of straight busbar unit is 3 m. Manufacture of units with length 0.5–4 m is possible by order.

Acceptable route bend angle is 90–179 degrees. This catalog includes the detailed information on standard and special units of busbar. The manufacturing technicians and designers of KLM Engineering develop the non standard and non serial units of busbar for further manufacture.

# SWITCHGEAR

Packaging of busbar route with switchgear or protection devices of any other manufacturer is possible.



**POWER TAP-OFF** 

KLM tap-off boxes are installed not only into the two units mating area up to 1250 A, but also into the tap-off doors up to 630 A. 6 tap-off doors are considered on the standard straight unit. Besides, power tap-off or equipment power supply up to 6300 A is possible bia FEB end feed unit.

# **PROTECTION DEGREE**

Solid particle and liquid ingress standard protection degree is IP55. Manufacture of busbar in steel or aluminium enclosure with protection degree up to IP66 through the filling of joint unit unit special compound is possible by order. Protection degree of the cast resin busbar is IP68.

# **UNITS JOINT**

KLM busbar structure with separate joint unit provides easy and quick mounting (Pic. 13, 14). This joint unit allows to reduce the manpower cost for the installation works and increase the joint reliability. Stiffness of busbar enclosure, which made of galvalized steel and sealing elements of joint provide high mechanical and electrical strength of busbar fabricated structure. The contact joint plateds and conducting parts of bars could be covered with Ni-Sn by order. Joint unit bolts are supplied both standard and stud bolt type.

# **TERMPERATURE INDICATOR**

KLM busbar enclosure may have by order an indicator, which changes its color depends on increasing of busbar enclosure temperature over the normal value.



Pic. 14. Joint unit vs. standard joint unit.

Pic. 13. Dismantled joint unit.

# TRANSFORMER JOINT UNIT

KLM Engineering suggests to use the flexible bars for the sliding joint of busbar and transformer. Due to flexible bar, transformer vibration is not transmitted to the busbar line. Besides, these bars might be used as switchgear inside of distributional equipment.

Flexible bar is made of pressed double sided wire with thickness of 0.1–0.2 mm. There are holes on the contact surface. Contact surface might be of copper, tinned or silver covered. Bar can be insulated by Client wish.



Pic. 15. Joint unit with flexible bars.



Pic. 16. Flexible bar (pigtail) tinned.



Pic. 18. Flexible bar (pigtail) copper.



Pic. 17. Flexible bar (pigtail) copper, insulated.



Pic. 19. Flexible bar (set of plates), tinned.

# KLM BUSBAR ADVANTAGES

KLM Busbars have unique advantages in comparison with its analogues:

- The cross-sections of busbar trunking system, depending on the nominal current bigger of cross-sections of the best foreign analogues for 10-33%. As a result power losses decreased at the alternating current for 5-27%. It gives a million annual energy savings to enterprises;
- Production in Russia with Russian aluminum and copper, the low level of dependence on the dollar and the euro, allow to the KLM Engineering sales department sets prices considerably lower than prices of imported busbars;
- Taking into account the work of the two production sites in Russia, the delivery time of KLM busbar excludes a long transport time and customs procedures. Immediate delivery to any region of Russia and CIS countries is possible;
- KLM busbar delivery time is- 4-6 weeks, which is minimum time interval on the Russian market if electrical products. The delivery time of supplemental non standard busbar units is 3-14 days;
- KLM busbar trunking system for 6300 A can be manufactured both copper and aluminium bars;
- Protection degree of KLM busbar enclosure is from IP55 to IP68, which allows to install the indoor/outdoor power supply system in any construction site with any climate conditions;
- KLM busbar is supplied with full set of technical documentation;
- Electrical designers of company develop 3D-projects of busbar route in order to make easy a neighbour engineering networks approval process;
- Actual measurement of busbar route provides minimum defects in units dimensions during mounting works;
- Specialists of KLM Engineering will provide installation supervision on the Client construction site.



# **KLM BUSBAR TYPES**

KLM-S Busbar trunking system with protection degree IP55, IP65, IP66, aluminium and copper bars for current from 800 A to 6300 A in a steel enclosure, including KLM-S-xxM of Slim series with dimensions and weight reduction.

KLM-S Busbar trunking system with protection degree IP55, IP65, IP66, aluminium and copper bars for current from 800 A to 6300 A, in aluminium enclosure.

KLM-S Busbar trunking system with protection degree IP67, IP68, for current from 800 A to 6300 A in a cast resin enclosure.

KLM-R Busbar distribution system with protection degree IP55 for current from 100A to 800A, including KLM-R-xxM of Slim series with dimension and weight reduction.

KLM-T Trolley busbars with protection degree IP23 for current from 60 A to 280 A, contacts numbers from 4 to 7, up to 200 m/min.









# APPLICATION AREA

KLM busbar manufacture use modern technologies, which allows to create effective, compact and reliable power supply system at voltage up to 1000 V in following buildings:

- business centers and offices,
- residential buildings,
- hotels,
- shopping malls,
- sport centers,
- EXPO centers, museums and theatres,
- plants, warehouses,
- energy stations,
- military estalishments,
- local authorities,
- scientific research institutes and centers,
- airports and railway stations.







# COMPARISON OF CABLE SYSTEM AND KLM BUSBAR SYSTEM

# COMPACT SOLUTION

Busbar system has a compact structure. Compact strucutre is achieved by arrangement of insulated and impacted flat conductors inside of enclosure. Busbar system require less place in the building, especially at loads of1000A in compare with cable system.

# **COST EFFICIENCY OF POWER LOSS**

The minimum distance between the conductors axes reduces the inductance, and the flat, relatively thin bar provides optimal current density distribution in it, which reduces the active impedance. As a result of lower impedance, the voltage losses are lower than in cable systems at the case of similiar length and cross-section area.

# THE BEST COOLING

The compressed bars in a metal enclosure remove heat better than cable system.

# FLEXIBILITY AND MOBILITY

Moduled structure of busbar system allows to use it inside of any building, and busbar can be changed, be added or shifted into the other premise, building and be reinstalled without any additinal costs as opposed to cable system.

# SURFACE APPEREANCE

Busbar system is difference with its modern design of surface appereance.

# INFLAMMABLE, NO CHIMNEY EFFECT

Bars system is inflammable. Busbar has not a chimney effect due to its compact structure and fire partition set forseen in it.

# OUICK AND COST-EFFECTIVE

Low cost of works and manpower, required for busbar system installation is provided due to quick mounting in contrast to cable system. Installation of busbar system is quicker than cable system.

# HIGH RESISTANCE TO SHORT CIRCUIT

Rigid structure of busbar provides high stiffness to the short current effect in contrast to cable system.

# LOW ELECTROMAGNETIC INFLUENCES

Metal enclosure provides lower electromagnetic field around busbar system in contrast to cable system.

# TAP OFF UNIT AT ANY PLACE OF ROUTE

Busbar system allows easy and safety power tap-off via boxes at any required place of line. Boxes arrangement can be easily changed if required. Additionally, boxes numbers can be increased.

# MINIMUM DEFECTS CAUSED BY HUMAN ERRORS

Busbar system consists of certified standard units, which exclude the installation defects caused by human errors. Safety connection of cable system totally depends on experience of mounter.

# ADDITIONAL PROTECTION FROM EXTERNAL EFFECTS

Busbar metal enclosure protects the conducting parts from mechanical effects as opposed to unprotected cable system.

# SIMPLE TO DESIGN

The following features of busbar system, which makes design simple, might be emphasized as following are:

- Distributional panels numbers are decreased, connection of additional loads (from mechanisms, at the floors etc.) are possible directly from tap-off box,
- MDB dimensions are decreased,
- Automatic curcuit breakers numbers are decreased,
- A lot of accessories, required in cable system, are excluded,
- Project design schedule is shorten.
- Busbar route design in 3D provide not only full visiuality of the project, bu allows to precise all units and elements in the system.

Taking into consideration facts, mentioned above, busbars have indeniable advantages over the cables as following are: improved electrical characteristics, simplified and reliable schemes of power distribution, minimum space and dimensions, quick installation and tight time frame for installation, system flexibility, high protection degree, easy operation and saving power up to 27%.





# KLM-S

# Busbar trunking system 800..6300A

# Information on this chapter

This chapter contains the information on KLM-S busbar trunking system.

Indexes:



 $\square$ 

Busbar phasing is calculated in compliance with certain project.

Bolt-on box with rated current up to 1250 A can be installed at any place of two units mating area

Busbar cross-section dimension depends on rated current value and conductors numbers (see table on pg. 19).

# **KLM-S BUSBAR UNITS CODES**

# KLM-S - 32 - Cu - 55 - 4 - 1 - FE - S1

#### Busbar type

#### Busbar code

Busl	oar code	Rated current, A			
KLM-S	KLM-S-xxM				
08	08M	800			
10	10M	1000			
12	12M	1250			
16	16M	1600			
20	20M	2000			
25	25M	2500			
32	32M	3200			
40	40M	4000			
50	50M	5000			
63	63M	6300			

## **Conductor material**

Al – aluminium

Cu – copper

# Protection degree

55 – IP55

- 65 IP65
- 66 IP66

#### Numbers of insulated conductors

- 3 3L + PE(enclosure)
- 4 3L + N + PE(enclosure)
- 5 3L+N+PE
- 6 3L+2N+PE

#### Busbar enclosure material

1 – galvanized steel

2 – painted enclosure

3 – aluminium enclosure

4 - stainless steel

#### Notes to the units index

Non-standard unit from 500 to 999 mm	S1
Non-standard unit from 1000 to 1999 mm	S2
Non-standard unit from 1999 to 2999 mm	S3
Non-standard unit depends on angle value	SA

#### Unit index

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# Table of KLM-S busbar cross-section dimension and weight



	4P						5P				
Busbar	Rated current, A	Rated current, A Aluminiur		Copper			Aluminium		Copper		
code		A, mm	Weight, kg/m	A, mm	Weight, kg/m	B, mm	A, mm	Weight, kg/m	A, mm	Weight, kg/m	B, mm
08	800	110	18,4	110	33,2	208	110	20,2	110	40	235
10	1000	130	21,2	110	33,2	208	130	24,1	110	40	235
12	1250	150	24,1	110	33,2	208	150	27,5	110	40	235
16	1600	190	29,8	130	41,7	208	190	34,2	130	48,8	235
20	2000	210	32,7	150	51,6	208	210	37,5	150	61,5	235
25	2500	250	38,4	210	71	208	250	44,3	210	85,5	235
32	3200	332	53,1	250	88,7	208	332	61,5	250	106,5	235
40	4000	372	58,9	292	104,3	208	372	65,3	292	125,7	235
50	5000	482	70,5	468	155,6	208	482	83,3	468	192,2	235
63	6300	700	106,9	534	202,6	213	700	125	534	249,8	240

# Table of KLM-S-xxM busbar cross-section dimension and weight

	4P						5P				
Busbar	Rated current, A	Alı	uminium	(	Copper		Alı	uminium	C	Copper	
code		A, mm	Weight, kg/m	A, mm	Weight, kg/m	B, mm	A, mm	Weight, kg/m	A, mm	Weight, kg/m	B, mm
08M	800	84	17	60	19	150	84	18	60	23	178
10M	1000	114	19	84	24	150	114	21	84	28	178
12M	1250	134	21	114	29	150	134	23	114	36	178
16M	1600	174	24	134	34	150	174	27	134	40	178
20M	2000	214	27	174	41	150	214	31	174	50	178
25M	2500	254	30	214	49	150	254	35	214	60	178
32M	3200	334	36	254	56	150	334	42	254	69	178
40M	4000	414	43	334	71	150	414	50	334	89	178
50M	5000	494	50	414	87	150	494	58	414	109	178
63M	6300	574	56	494	103	150	574	65	494	129	178



# **KLM-S STRAIGHT UNITS**

**1 FE** Standard straight unit



FE unit is used for electrical power transmission.





Order sample: 1600 A, aluminium, IP55, with 4 conductors, steel enclosure

KLM-S -	16 -	Al -	55 -	4 -	1 -	FE -	
---------	------	------	------	-----	-----	------	--

2 Pi Straight unit with tap-off outlets



Pi unit is used for power transmission and distribution. This unit allows to install tap-off unit into the special doors of the box quickly and without hard mounting works. The maximum current, which can be taken from one door of the box is 630 A.





Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S -	10 -	Cu -	55 -	4	- 1	- Pi
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# **KLM-S STRAIGHT UNITS**

# FE-S Non-standard straight unit



This unit can be manufactured with different length: - S1 500-999 mm S2 S3

1000-1999 mm	-
2000-2999 mm	-





Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure, length 1100 mm\*

KLM-S - 10 - Cu - 55	- 4 - 1 - FE - S2
*Precise length is shown in the no	ote to specification of equipment.

#### Non-standard unit measurement and calculation



Non-standard unit dimension, required for installation between samples, is 560 mm. Dimension of unit is found as net distance between 2 units installed minus 30 mm. This distance is required for two joint units installation.

#### 3 | **CML** Circulating unit



Circulating unit is used for heat expansion in the straightroutes of busbars along more than 200 m.





Order sample: 1600 A, aluminium, IP55, with 4 conductors, steel enclosure

KLM-S - 16 - AL - 55 - 4 - 1 - CML -

# 4 CD Horizontal angle unit







Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - CD -





Horizontal angle joint enables the busbar trunking system to achieve all possible layouts on the horizontal plane. It can be used as vertical unit depends on certain project.

**Note:** manufacture of non standard angle joint unit with required length and angle value is possible.

5 CP Vertical angle unit





4P

5P









Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - CP -

The standard (minimum) length of joint unit sides is indexed on the drawings and tables. Manufacture of units with non-standard dimensions is possible by order.

Vertical angle joint enables the busbar trunking system to achieve all possible layouts on the vertical plane. It can be used as horizontal unit depends on certain project.

**Note:** manufacture of non-standard angle joint with required length and angle value is possible.

			4P, 5P					
Busbar	Rated current, A	Alumi	nium	Copper				
code		C <sub>min</sub> , mm	D <sub>min</sub> , mm	C <sub>min</sub> , mm	D <sub>min</sub> , mm			
08	800	310	255	310	255			
10	1000	330	265	310	255			
12	1250	350	275	310	255			
16	1600	390	295	330	265			
20	2000	410	305	350	275			
25	2500	452	326	412	306			
32	3200	537	371	452	326			
40	4000	577	391	497	351			
50	5000	687	446	673	439			
63	6300	900	550	739	472			

#### 6 **ZD Horizontal Z-joint**



Horizontal Z-joint is used in case of impossibility of standard horizontal joint application. It can be used both horizontal and vertical positions depends on certain project.

Note: this unit is non-standard one and be manufactured individually within certain project. Cmax is specified by equipment manufacturer.





Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - ZD -

#### 7 | **ZP Vertical Z-joint**



Vertical Z-joint is used in case of impossibility of standard vertical joint application. It can be used both horizontal and vertical positions depends on certain project.

Note: this unit is non-standard one and be manufactured individually within certain project. Cmax is specified by equipment manufacturer.





Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - ZP -

			4P,	, 5P			
Busbar	Rated current, A	Alumi	nium	Copper			
code		C <sub>min</sub> , mm	D, mm	C <sub>min</sub> , mm	D, mm		
08	800	220	596	220	596		
10	1000	260	616	220	596		
12	1250	300	636	220	596		
16	1600	380	676	260	616		
20	2000	420	696	300	636		
25	2500	504	738	424	698		
32	3200	664	818	504	738		
40	4000	744	858	584	788		
50	5000	964	968	936	964		
63	6300	1400	1186	1068	1030		



🛆 Dimension of non standard unit is indexed in the notes to the order code.

The standard (minimum) length of joint unit sides is indexed on the drawings and tables. Manufacture of units with non-standard dimensions is possible by order.

# 8 | TD Horizontal T-joint



Horizontal T-joint is used for taking power from busbar on the horizontal plane. It can be used both horizontal and vertical positions depends on certain project.

| Note: detail features are specified by equipment manufacturer.





Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - TD -

# 9 TP Vertical T-joint



Vertical T-joint is used for taking power from busbar on the vertical plane. It can be used both horizontal and vertical positions depends on certain project.

Busbar phasing is calculated within certan project.

| Note: detail features are specified by equipment manufacturer.

		4P, 5P				
Busbar	Rated current, A	Alumi	inium	Copper		
code		C, mm	D, mm	C, mm	D, mm	
08	800	596	353	596	353	
10	1000	616	373	596	353	
12	1250	636	393	596	353	
16	1600	676	433	616	373	
20	2000	696	453	636	393	
25	2500	736	493	698	455	
32	3200	818	575	738	495	
40	4000	858	615	788	540	
50	5000	968	725	964	716	
63	6300	1186	943	1030	782	



• 1

Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - TP -

The standard (minimum) length of joint unit sides is indexed on the drawings and tables. Manufacture of units with non-standard dimensions is possible by order.

10 ZDP Universal angle joint



Universal angle joint is used in case of impossibility of standard horizontal and vertical angle-joints application.

**Note:** this unit is non-standard one and be manufactured individually within certain project. Cmax is specified by equipment manufacturer.





Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - ZDP -

The standard (minimum) length of isint unit sides

The standard (minimum) length of joint unit sides is indexed on the drawings and tables. Manufacture of units with non-standard dimensions is possible by order.

				4F	)					5F			
Busbar	Rated current, A		Aluminiun	ı		Copper			Aluminium	1		Copper	
code		C, mm	D, mm	E <sub>min</sub> , mm	C, mm	D, mm	E <sub>min</sub> , mm	C, mm	D, mm	E <sub>min</sub> , mm	C, mm	D, mm	E <sub>min</sub> , mm
08	800	353	435	318	353	435	318	353	452	345	353	452	345
10	1000	373	435	338	353	435	318	373	452	365	373	452	345
12	1250	393	435	358	353	435	318	393	452	385	393	452	345
16	1600	433	435	398	373	435	338	433	452	425	433	452	365
20	2000	453	435	418	393	435	358	453	452	445	453	452	385
25	2500	493	435	460	455	435	420	493	452	487	493	452	447
32	3200	575	435	540	495	435	460	575	452	567	575	452	487
40	4000	615	435	580	540	435	500	615	452	607	615	452	527
50	5000	725	435	690	716	435	676	725	452	717	725	452	703
63	6300	943	435	908	782	435	742	943	452	935	943	452	769

11 EC Terminal unit





Terminal unit is used for insulation and closing the open conducting parts at the end of busbar route.

Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - EC -

#### **ATSC Panel joint unit** 12 |



This unit is used for entrance to the panel and busbar connection to the distribution board bars. This unit can be used for connection to the oil-type transformer too.

This unit can be manufactured with non-standard features:

- 1. Distance between units.
- 2. Units length.
- 3. Length from the flange to the bolt joint up to 1000 mm. -51

		4P, 5P				
Busbar	Rated current, A	Alum	inium	Copper		
code		C, mm	E, mm	C, mm	E, mm	
08	800	220	155	190	155	
10	1000	240	175	210	155	
12	1250	265	195	250	155	
16	1600	310	235	260	175	
20	2000	325	255	270	195	
25	2500	370	295	280	255	
32	3200	460	377	390	295	
40	4000	487	417	430	335	
50	5000	645	525	590	515	
63	6300	835	745	712	-	



# •

Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - ATSC -



Manufacturer provides Client with drawings if necessary.

# 13 | ATCP Joint unit with vertical angle



Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - ATCP -

Joint unit with vertical angle is used for entrance to the panel and connection to the distribution board bars in case of impossibility of standard joint units application.

This unit can be used for the connection to the oil-type transformer too.

**Note:** this unit is non-standard one and be manufactured individually within certain project.

		4P, 5P			
Busbar code	Rated current, A	Aluminium	Copper		
		C <sub>min</sub> , mm	C <sub>min</sub> , mm		
08	800	310	310		
10	1000	330	310		
12	1250	350	310		
16	1600	390	330		
20	2000	410	350		
25	2500	452	412		
32	3200	537	452		
40	4000	577	497		
50	5000	687	673		
63	6300	900	739		





Joint unit with horizontal angle is used for entrance to the panel and connection to the distribution board bars in case of impossibility of standard joint units application.

This unit can be used for the connection to the oil-type transformer too.

**Note:** this unit is non-standard one and be manufactured individually within certain project.



Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - ATCD -

# 15 | PTC Transitional tin plate



Transitional tin plate is used for providing the connection of aluminium and copper conductors, in low-voltage equipments or transformation substation as a rule. Dimension and numbers of transitional tin plate depend on busbar rated current and numbers of separate conductors.

Order sample: 1600 A, aluminium, IP55, with 5 conductors, steel enclosure

KLM-S - 16 - AL - 55 - 5 - 1 - PTC -

## **16** ATT Transformer joint unit





Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - ATT -

This unit is used for connnection to dry-type transformer.

This element can be manufactured with non-standard features:

- 1. Distance between units.
- 2. Units length.
- 3. Joint unit layout on the busbar enclosure.
- 4. Phasing.

**Note:** this unit is non-standard one and be manufactured individually within certain project .  $L_{max}$  is specified by equipment manufacturer.

Transformer technical drawing is required for ATT unit order.

# 17 | FEB End feed unit



This unit is used for supply/taking power from busbar via flexible cable in compliance with references.

This unit can be manufactured with non-standard features:

- 1. Position of straight joint on the junction box enclosure.
- 2. Numbers and internal diameter of cable glands on the plate coupling.
- 3. Automatic circuit breaker in junction box and control lever of any
- manufacturer.— Y1
- 4. Dimensions.



Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - FEB -

Tap-off up to 6300A.

# **KLM-S OTHER UNITS**

## **18** | ADP Joint unit with other busbar types



Busbar code	Rated current, A	A, mm	B, mm
08	800	130	110
12	1250	188	155
16	1600	215	190



Order sample: 1600 A, aluminium, IP55, with 4 conductors, steel enclosure

**Note:** dimensions of joint units with other busbar types and busbar rated current should be specified by manufacturer.

# **ATTENTION**

We have an experience and example of realized projects on joint units manufacturing for connection of existing busbar route with other manufacturer's busbar units.

# 19 | G Joint unit

Joint unit is used for connection of two busbar units. Set consists of up, down and side seals with terminal units for joint bolts.

Note: GF special joint unit is used for Bolt-in box.





Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - AL - 55 - 4 - 1 - G -

# **KLM-S OTHER UNITS**

20 FLX Flexible unit



Flexible unit is used for busbar route passing through the expansion joint of building with route level differences.

This unit can be manufactured with non-standard features:

1. Length of flexible part.

2. Different positions of bars at the busbar entrance and exit.

This unit is non standard one and be manufactured individually within certain project.

**Note:** detailed features are specified by equipment manufacturer. L value is specified in the note to the manufacture order.



•

Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 -	Cu -	55 - 4 -	1-	FLX -
--------------	------	----------	----	-------

## 21 | FB Fire barrier

Fire barrier provides busbar passing through the wall and floor structures of different fire zones with thickness 200 mm minimum.

It provides fire resistance of busbar passing through the walls and floor structures 180 minutes minimum according to GOST P 53310-2009. i.4.1.

It can be installed at any busbar part.

The manufacturer should separately include following materials for sealing of joints in the FB fire barrier specification:

- 1. Fireproof thermal expanding sealant;
- 2. Fireproof installation polyurethane foam.

**Note:** the unit which is supposed to be supplied with fireproof barrier should be indexed during order placement.



Order sample: 1000 A, copper, IP55, with 4 conductors, steel enclosure

KLM-S - 10 - Cu - 55 - 4 - 1 - **FB** -

# **KLM-S OTHER UNITS**

# 22 | RE Reducer

KLM-S - 32 - 16 - Cu - 55 - 4 - 1 - RE - Y1

Busbar type

#### Busbar code (entrance)

#### Busbar code (exit)

Busbar code	Rated current, A
00	100
01	160
02	250
03	315
04	400
05	500
06	630
08	800
10	1000
12	1250
16	1600
20	2000
25	2500
32	3200
40	4000
50	5000
63	6300

#### **Conductor material**

Al – aluminium

Cu – copper



Reducer is used for reducing the busbar discharge capacity with protection in less powerful line parts.

This unit can be manufactured with non-standard features:

- 1. Unit length.
- Switching/protection equipment (circuit breaker, releaser, fuse). Also
  installation of motor-operator with remote control is available.
- 3. Any step of busbar rated current reducing.
- 4. Phasing.
- 5 Control mechanisms layout.

# Notes to the units index

Availability of automatic curcuit breaker in a cast resin enclosure with control lever	Y1
Availability of automatic curcuit breaker in a cast resin enclosure without control lever	Y0
Unavailability of automatic circuit breaker (acceptable at the busbar rated current reducing for 2 rates maximum)	Η

Index

RE

#### Unit index

Unit description Reducer

Neuucei

#### Busbar enclosure material

- 1 galvanized steel
- 2 painted enclosure
- 3 aluminium enclosure
- 4 stainless steel

#### Numbers of insulated conductors

- 3 3L + PE(enclosure)
- 4 3L+N+PE(enclosure)
- 5 3L+N+PE
- 6 3L+2N+PE

Protection degree

55 – IP55



Order sample: 1600–800 A, copper, IP55, with 4 conductors, steel enclosure, with automatic circuit breaker in a cast resin enclosure with control lever

KLM-S - 16 - 8 - Cu - 55 - 4 - 1 - RE - Y1

**Note:** this unit is non-standard and be manufactured individually within certain project. Detailed features are specified by equipment manufacturer.

# KLM-S - 32 - Cu - 55 - 4 - 1 - PB - 160 - Y1

#### Busbar type

#### Busbar code

Busbar code	Rated current, A
08	800
10	1000
12	1250
16	1600
20	2000
25	2500
32	3200
40	4000
50	5000
63	6300

## **Conductor material**

Al – aluminium

Cu – copper

#### Protection degree

55 – IP55

#### Numbers of insulated conductors

- 3 3L+PE(enclosure)
- 4 3L+N+PE(enclosure)
- 5 3L+N+PE
- 6 3L+2N+PE

#### Busbar enclosure material

- 1 galvanized steel
- 2 painted enclosure
- 3 aluminium enclosure
- 4 stainless steel

#### Notes to the unit index

Availability of module automatic circuit breaker	mod
Availability of automatic circuit breaker in a cast resin enclosure with control lever	Y1
Availability of automatic circuit breaker in a cast resin enclosure without control lever	Y0
Power tap-off box with cable	Н

#### **Rated current**

For Plug-in box	160-630 A
For Bolt-on box	160-1250 A

#### Unit index

Unit description	Index.
Plug-in Box	PB
Bolt-on Box	BB
Joint unit for Bolt-on box	GF

# KLM-S TAP-OFF BOX

## 23 | PB Plug-in box



Plug-in box is installed on the tapping-off doors.

This unit can be manufactured with non-standard features:

- 1. Box dimension.
- 2. Numbers and dimension of cable gland in a wafer for socket.
- 3. Switching/protection equipment (automatic circuit breaker, releaser). Installation of drive motor with remote control is also possible.
- 4. Installation of protection device of any manufacturer.
- 5. Installation of protection device of Client.
- 6. Box door type (right, left, on bolts etc.).

Maximum current capacity, A	A, mm	B, mm	C, mm
Up to 160	500	285	220
160-250	700	285	220
250-630	850	350	290

## 24 BB Bolt-on box





Bolt-on box is installed at any mating area of two units.

This element can be manufactured with non-standard features:

- 1. Box dimension.
- 2. Numbers and dimension of cable gland in a wafer for socket.
- Switching/protection equipment (automatic circuit breaker, releaser). Installation of drive motor with remote control is also possible.
- 4. Installation of protection device of any manufacturer.
- 5. Installation of protection device of Client.
- 6. Box door type (right, left, on bolts etc.).

Maximum current capacity, A	A, mm	B, mm	C, mm
Up to 160	500	285	220
160	700	285	220
250	700	285	220
320-630	850	350	290
800-1250	1060	400	310



Order sample: Plug-in box 630 A with automatic circuit breaker in a cast resin enclosure with control lever, busbar trunking system 1600 A, IP55, with 4 copper conductors, steel enclosure

KLM-S - 16 - Cu - 55 - 4 - 1 - PB - 630 - Y1



Brand, type and automatic circuit breaker maximum current in the tap-off box is indexed separately in the notes to the order code.



Order sample: Bolt-on box 800 A with automatic circuit breaker in a cast resin enclosure with control lever, busbar trunking system 1600 A, IP55, with 4 copper conductors, steel enclosure

KLM-S - 16 - Cu - 55 - 4 - 1 - BB - 800 - Y1

Brand, type and automatic circuit breaker maximum current in the tap-off box is indexed separately in the notes to the order code.

**Note:** tap-off box is installed after the busbar turn off from the network and control of voltage availability only. Special GF joint unit is required for the installation.
# KLM-S - 32 - Cu - 68 - 4 - 5 - FE - S1

### Busbar type

### Busbar code

Busbar code	Rated current, A
08	800
10	1000
12	1250
16	1600
20	2000
25	2500
32	3200
40	4000
50	5000
63	6300

### **Conductor material**

Al – aluminium

Cu – copper

### Protection degree

67 – IP67

68 – IP68

### Numbers of insulated conductors

4 – 3L+PEN

5 – 3L+N+PE

6 – 3L+2N+PE

### Busbar enclosure material

5 - cast resin insulation with metall enclosure

6 - cast resin insulation without metall enclosure



### Table of busbar cross-section dimension and weight

	4P								5P						
Busbar	Rated current, A	Aluminium			Copper			Aluminium				Cop	per		
code		A, mm	B, mm	Weight, kg/m	A, mm	B, mm	Weight, kg/m	A, mm	B, mm	Weight, kg/m	A, mm	B, mm	Weight, kg/m		
08	800	110	208	48,7	110	208	63,5	110	235	50,5	110	235	75,8		
10	1000	130	208	57	110	208	65,5	130	235	59,9	110	235	75,8		
12	1250	150	208	65,4	110	208	63,5	150	235	68,8	110	235	75,8		
16	1600	190	208	82,1	130	208	94	190	235	86,5	130	235	101		
20	2000	210	208	90,5	150	208	109,4	210	235	95,3	150	235	120		
25	2500	250	208	107,2	210	208	139,8	250	235	113,1	210	235	154,3		
32	3200	340	208	146,7	250	208	182,2	340	235	155,1	250	235	200		
40	4000	380	208	163,5	300	208	208,9	380	235	169,9	300	235	125,7		
50	5000	460	208	197,1	450	208	282	460	235	209,9	450	235	318,8		
63	6300	690	213	296,9	520	208	392	690	240	315	520	235	439,8		

### Note to the units index

Non-standard unit from 500 to 999 mm	S1
Non-standard unit from 1000 to 1999 mm	S2
Non-standard unit from 1999 to 2999 mm	S3
Non-standard unit depends on angle value	SA

### Unit index

Unit description	Index
Standard straight unit	FE
Standard horizontal angle joint	CD
Standard vertical angle joint	СР
Horizontal Z-joint	ZD
Vertical Z-joint	ZP
Vertical T-joint	TP
Universal angle joint	ZDP
Terminal unit	EC
Panel joint unit	ATSC
Joint unit with vertical angle	ATCP
Joint unit with horizontal angle	ATCD
Transformer joint unit	ATT
End feed unit	FEB
Joint unit	G

# **KLM-S CAST RESIN INSULATED BUSBAR**





CD Horizontal angle joint



### ZP Vertical Z-joint





CP Vertical angle joint



ZDP Universal angle joint (up)



# **KLM-S CAST RESIN INSULATED BUSBAR**

# ZD Horizontal Z-joint



# ATSC Panel joint unit



# ATCP Joint unit with vertical angle



ZDP Universal angle joint (down)



**TP Vertical T-joint** 



ATT Transformer joint unit



# KLM-S Busbars with aluminium bars

A	800	1000	1250	1600	2000	2500	3200	4000	5000	6300	
V	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
٧	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Hz	50	50	50	50	50	50	50	50	50	50	
Ampacity											
kA	124	130	130	190	260	320	338	400	400	450	
kA	62	65	65	95	130	160	169	200	281	281	
mm×mm	10x60	10x80	10x100	10x140	10x160	10x200	2*10x140	2*10x160	2*10x200	3*10x200	
mm <sup>2</sup>	600	800	1000	1400	1600	2000	2800	3200	4000	6000	
m0m/m	0,041	0,027	0,017	0,016	0,015	0,013	0,011	0,009	0,008	0,005	
m0m/m	0,058	0,044	0,035	0,025	0,022	0,017	0,012	0,011	0,009	0,006	
	A V V Hz kA kA kA mm∗mm mm² mOm/m mOm/m	A 800   V 1000   V 1000   Hz 50   KA 124   KA 62   mm×mm 10x60   mm² 600   mOm/m 0,041   mOm/m 0,058	A 800 1000   V 1000 1000   V 1000 1000   Hz 50 50   kA 124 130   kA 62 65   mm∗mm 10x60 800   mDm/m 0,041 0,027   mOm/m 0,058 0,044	A 800 1000 1250   V 1000 1000 1000   V 1000 1000 1000   V 1000 1000 1000   Hz 50 50 50   KA 124 130 130   KA 62 65 65   mm×mm 10x60 10x80 10x100   mm² 600 800 1000   mOm/m 0,041 0,027 0,017   mOm/m 0,058 0,044 0,035	A 800 1000 1250 1600   V 1000 1000 1000 1000   V 1000 1000 1000 1000   Hz 50 50 50 50   KA 124 130 130 190   kA 62 65 65 95   mm×mm 10x60 10x80 10x100 10x140   mm² 600 800 1000 1400   mOm/m 0,041 0,027 0,017 0,016   mOm/m 0,058 0,044 0,035 0,025	A 800 1000 1250 1600 2000   V 1000 1000 1000 1000 1000   V 1000 1000 1000 1000 1000   V 1000 1000 1000 1000 1000   Hz 50 50 50 50 50   KA 124 130 130 190 260   kA 62 65 65 95 130   mm×mm 10x60 10x80 10x100 10x140 10x160   mm² 600 800 1000 1400 1600   mOm/m 0,041 0,027 0,017 0,016 0,015	A 800 1000 1250 1600 2000 2500   V 1000 1000 1000 1000 1000 1000 1000   V 1000 1000 1000 1000 1000 1000 1000   V 1000 1000 1000 1000 1000 1000 1000   Hz 50 50 50 50 50 50 50   KA 124 130 130 190 260 320   KA 62 65 65 95 130 160   mm*mm 10x60 10x80 10x100 10x140 10x160 10x200   mm² 600 800 1000 1400 1600 2000   mOm/m 0,041 0,027 0,017 0,016 0,015 0,013   mOm/m 0,058 0,044 0,035 0,025 0,022 0,017	A 800 1000 1250 1600 2000 2500 3200   V 1000 1000 1000 1000 1000 1000 1000 1000   V 1000 1000 1000 1000 1000 1000 1000 1000   V 1000 160 169 169 1000 1000 1000 1000 1000 1000 2000 2800 2800 2000 2800 2800 2001 2800 2001 2800 2001 20012 0,011 0,011 <td< td=""><td>A 800 1000 1250 1600 2000 2500 3200 4000   V 1000</td><td>A 800 1000 1250 1600 2000 2500 3200 4000 5000   V 1000</td></td<>	A 800 1000 1250 1600 2000 2500 3200 4000   V 1000	A 800 1000 1250 1600 2000 2500 3200 4000 5000   V 1000	

# KLM-S Busbars with copper bars

		L									
Rated current	A	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
General information											
Insulation Voltage	V	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Operational Voltage	V	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Frequency	Hz	50	50	50	50	50	50	50	50	50	50
Ampacity											
Phase rated peak short-circuit	kA	124	124	150	190	260	340	380	400	400	470
withstand (dynamic) 0,1 c											
Phase rated short-circuit	kA	62	62	75	95	130	170	191	200	281	281
withstand (thermic) 1 c											
Conductors											
Conductor dimension	mm×mm	10x40	10x50	10x60	10x80	10x100	10x120	2x10x100	2x10x120	4x10x100	4x10x120
Conductor cross-section	mm <sup>2</sup>	400	500	600	800	1000	1200	2000	2400	4000	4800
Inductance X1	mOm/m	0,041	0,04	0,031	0,024	0,021	0,017	0,013	0,012	0,011	0,009
Active impedance at rated current R1	mOm/m	0,054	0,043	0,036	0,027	0,022	0,018	0,01	0,009	0,005	0,005





# KLM-R

# Busbar distribution system **100..800A**

# Information on this chapter

This chapter contains the information on KLM-R busbar distribution system.

Indexes:



T

Busbar phasing is calculated in compliance with certain project.

Bolt-on box with rated current up to 630A can be installed in any mating area of two units.

Busbar cross-section dimension depends on rated current and numbers of conductors (see table on pg. 43).

# **KLM-R BUSBAR UNITS CODES**

# KLM-R - 06 - Cu - 55 - 4 - 1 - FE - S1

### Busbar type

### Busbar code

Bust	oar code	Rated current, A
KLM-R	KLM-R-xxM	
00	00M	100
01	01M	160
02	02M	250
03	03M	315
04	04M	400
05	05M	500
06	06M	630
08	08M	800

### Conductor material

Al – aluminium Cu – copper

### Protection degree

55 – IP55

### Number of insulated conductors

3 - 3L + PE(enclosure)

4 - 3L+N+PE(enclosure)

5 – 3L+N+PE

6 – 3L+2N+PE

### Material of busbar enclosure

1 – galvanized steel

- 2 painted enclosure
- 3 aluminium enclosure
- 4 stainless steel

### Notes to units index

Non-standard unit from 500 up to 999 mm	S1
Non-standard unit from 1000 up to 1999 mm	S2
Non-standard unit from 1999 up to 2999 mm	S3
Non-standard unit depends on angle value	SA

### Unit index

Nº	Unit description	Index	Pg.
1	Standard straight unit	FE	44
2	Straight unit with tap-off outlets	Pi	44
3	Circulating unit	CML	45
4	Standard horizontal angle joint	CD	46
5	Standard vertical angle joint	СР	47
6	Horizontal Z-joint	ZD	48
7	Vertical Z-joint	ZP	48
8	Horizontal T-joint	TD	49
9	Vertical T-joint	TP	49
10	Universal angle joint	ZDP	50
11	Terminal unit	EC	50
12	Panel joint unit	ATSC	51
13	Joint unit with vertical angle	ATCP	52
14	Center feed unit	AC	52
15	Joint unit with horizontal angle	ATCD	53
16	End feed unit	FEB	53
17	Flexible unit	FLX	54
18	Fire barrier	FB	54
19	Joint unit	G	

20	Reducer	RE	53
21	Bolt-on box	BB	55
22	Plug-in box	PB	55
23	Joint unit for Bolt-on box	GF	

### Table of KLM-R busbar cross-section dimension and weight

. -



			4	Р		5P						
Busbar	Rated current, A	Aluminium		Copper			Aluminium		Copper			
code		A, mm	Weight,kg/m	A, mm	Weight,kg/m	B, mm	A, mm	Weight,kg/m	A, mm	Weight, kg/m	B, mm	
00	100	74	8,6	-	-	125	74	9,6	-	-	137	
01	160	74	8,6	74	9,8	125	74	9,6	74	11,1	137	
02	250	74	8,6	74	9,8	125	74	9,6	74	11,1	137	
03	315	74	8,9	74	10,1	125	74	10	74	11,5	137	
04	400	74	8,9	74	10,1	125	74	10	74	11,5	137	
05	500	123	11,5	74	12,7	125	123	12,8	74	14,3	137	
06	630	123	12,1	74	13,1	125	123	13,5	74	15,0	137	
08	800	-	-	123	33,2	125	-	-	123	40,0	137	

### Table of KLM-R-xxM busbar cross-section dimension and weight

		4P						5P				
Busbar	Rated current, A	Aluminium		Copper			Aluminium		Copper			
code		A, mm	Weight,kg/m	A, mm	Weight,kg/m	B, mm	A, mm	Weight,kg/m	A, mm	Weight,kg/m	B, mm	
00	100	60	7,9	-	-	125	60	8,8	-	-	137	
01	160	60	7,9	60	9,2	125	60	8,8	60	10,5	137	
02	250	60	7,9	60	9,2	125	60	8,8	60	10,5	137	
03	315	60	7,9	60	9,6	125	60	9,5	60	10,8	137	
04	400	60	7,9	60	9,6	125	60	9,5	60	10,8	137	
05	500	123	11,5	60	11,9	125	123	11,5	123	13,5	137	
06	630	123	12,1	60	12,5	125	123	12,5	123	14,5	137	
08	800	-	-	123	29,5	125	-	-	123	40	137	



# **KLM-R STRAIGHT UNITS**

**1** FE Standard straight unit



FE straight unit is used for electrical power transmission.



2 Pi Straight unit with tap-off outlets



Pi unit is used for power transmission and distribution. This unit allows to install tap-off unit into the special doors of the box quickly and without hard mounting works. The maximum current, which can be taken from one door of the box is 250 A.



with 4 conductors, steel enclosure

KLM-R - 06 - Cu -	55 - 4	- 1 -	Pi
-------------------	--------	-------	----

# **KLM-R STRAIGHT UNITS**





Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure, length 1100 mm\*

\*Precise length is shown in the note to specification of equipment.

### Non-standard unit measurement and calculation



Non-standard unit dimension, required for installation between samples, is 640 mm. Dimension of unit is found as net distance between units installed minus 20 mm. This distance is required for two joint units installation.

### 3 CML Circulating unit



Circulating unit is used for heat expansion in the straight routes of busbars along more than 200 m.





Order sample: 630 A, aluminium, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - AL - 55 - 4 - 1 - CML -

# 4 | CD Horizontal angle joint







Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - CD -

- SA

Horizontal angle joint enables the busbar trunking system to achieve all possible layouts on the horizontal plane. It can be used as vertical unit depends on certain project.

**Note:** manufacture of non standard angle joint unit with required length and angle value is possible.

# 5 CP Vertical angle joint







Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 -	Cu - 55 -	4 - 1 -	- CP -
--------------	-----------	---------	--------

Vertical angle joint enables the busbar trunking system to achieve all possible layouts on the vertical plane. It can be used as horizontal unit depends on certain project.

**Note:** manufacture of non standard angle joint with required length and angle value is possible.

		4P, 5P				
Busbar	Rated current, A	Alumi	inium	Сор	per	
code		C, mm	D, mm	C, mm	D, mm	
00	100	218	181	-	-	
01	160	218	181	218	181	
02	250	218	181	218	181	
03	315	218	181	218	181	
04	400	218	181	218	181	
05	500	267	206	218	181	
06	630	267	206	218	181	
08	800	-	-	267	206	



### **ZD Horizontal Z-joint** 6



Horizontal Z-joint is used in case of impossibility of standard horizontal joint application. It can be used both horizontal and vertical positions depends on certain project.

Note: this unit is non standard one and be manufactured individually within certain project.  $C_{min}$ =250 mm,  $C_{max}$  is specified by equipment manufacturer.





Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - ZD -

#### **ZP Vertical Z-joint** 7 |



Vertical Z-joint is used in case of impossibility of standard vertical joint application. It can be used both horizontal and vertical positions depends on certain project.

Note: this unit is non standard one and be manufactured individually within certain project. C<sub>max</sub> is specified by equipment manufacturer.





Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - ZP -

		4P, 5P					
Busbar	Rated current, A	Alumi	nium	Сор	per		
code		C <sub>min</sub> , mm	D, mm	C <sub>min</sub> , mm	D, mm		
00	100	362	148	-	-		
01	160	362	148	362	148		
02	250	362	148	362	148		
03	315	362	148	362	148		
04	400	362	148	362	148		
05	500	411	246	362	148		
06	630	411	246	362	148		
08	800	-	-	411	246		



Dimension of non standard unit is indexed in the notes to the order code.

The standard (minimum) length of joint unit sides is indexed on the drawings and tables. Manufacture of units with non-standard dimensions is possible by order.

### 8 | TD Horizontal T-joint



Horizontal T-joint is used for taking power from busbar on the horizontal plane. It can be used both horizontal and vertical positions depends on certain project.

| Note: detail features are specified by equipment manufacturer.





Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - TD -

### 9 TP Vertical T-joint



Vertical T-joint is used for taking power from busbar on the vertical plane. It can be used both horizontal and vertical positions depends on certain project.

| Note: detail features are specified by equipment manufacturer.





⚠

Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - TP -

		4P, 5P					
Busbar	Rated current, A	Alumi	nium	Сор	per		
code		C, mm	D, mm	C, mm	D, mm		
00	100	362	218	-	-		
01	160	362	218	362	218		
02	250	362	218	362	218		
03	315	362	218	362	218		
04	400	362	218	362	218		
05	500	411	267	362	218		
06	630	411	267	362	218		
08	800	-	-	411	267		

The standard (minimum) length of joint unit sides is indexed on the drawings and tables. Manufacture of units with non-standard dimensions is possible by order.

10 | **ZDP** Universal angle joint



Universal angle joint is used in case of impossibility of standard horizontal and vertical angle-joints application.

Note: this unit is non standard one and be manufactured individually within certain project. Cmax is specified by equipment manufacturer.





Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - ZDP -

The standard (minimum) length of joint unit sides is indexed on the drawings and tables. Manufacture of units with non standard dimensions is possible by order.

		4P				5P							
Busbar	Rated current, A		Aluminiun	ı		Copper			Aluminium	ı		Copper	
code		C, mm	D, mm	E <sub>min</sub> , mm	C, mm	D, mm	E <sub>min</sub> , mm	C, mm	D, mm	E <sub>min</sub> , mm	C, mm	D, mm	E <sub>min</sub> , mm
00	100	218	309	199	-	-	-	248	321	211	-	-	-
01	160	218	309	199	218	309	199	248	321	211	218	309	199
02	250	218	309	199	218	309	199	248	321	211	218	309	199
03	315	218	309	199	218	309	199	248	321	211	218	309	199
04	400	218	309	199	218	309	199	248	321	211	218	309	199
05	500	267	309	248	218	309	199	267	309	260	218	309	199
06	630	267	309	248	218	309	199	267	309	260	218	309	199
08	800	-	-	-	267	309	248	-	-	-	267	309	248

**EC** Terminal unit 11





Order sample: 630 A, copper, IP55, with 4 conductors, Terminal unit is used for insulation and closing the open conducting parts at the end of steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - EC -

KLM Busbar

busbar route.

# **KLM-R JOINT UNITS**

### ATSC Panel joint unit 12 |









# •

Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - ATSC -



350 D=300



This unit is used for entrance to the panel and busbar connection to the distribution board bars. This unit can be used for connection to the oil-type transformer too.

This unit can be manufactured with non standard features:

- 1. Distance between units.
- 2. Units length.
- 3. Length from the flange to the bolt joint up to 1000 mm.- S1

			4P,5P					
Busbar	Rated current, A		Alum	inium	Сор	per		
code		D, mm	E, mm	C, mm	E, mm	C, mm		
00	100	300	146	200	-	-		
01	160	300	146	200	86	200		
02	250	300	146	200	86	200		
03	315	300	146	200	86	200		
04	400	300	146	200	86	200		
05	500	300	195	250	86	200		
06	630	300	195	250	86	200		
08	800	300	-	-	196	250		



Manufacturer provides Client with drawings if necessary.

# **KLM-R JOINT UNITS**

**13** ATCP Joint unit with vertical angle



Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - ATCP -

Joint unit with vertical angle is used for entrance to the panel and connection to the distribution board bars in case of impossibility of standard joint units application. This unit can be used for the connection to the oil-type transformer too.

Note: this unit is non standard one and be manufactured individually within certain project. D<sub>min</sub>=100 mm, D<sub>max</sub> is specified by the equipment manufacturer. "A" value see in the table on pg. 43.

		4P, 5P				
Busbar code	Rated current, A	Aluminium	Copper			
		C <sub>min</sub> , mm	C <sub>min</sub> , mm			
00	100	218	-			
01	160	218	218			
02	250	218	218			
03	315	218	218			
04	400	218	218			
05	500	267	218			
06	630	267	218			
08	800	-	267			

### 14 AC Center feed unit



Center feed unit is used for busbar route supply from the center line of the route.

| Note: detailed features are specified by equipment manufacturer.



Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - AC -

KLM Busbar

# **KLM-R JOINT UNITS**

### 15 ATCD Joint unit with horizontal angle



Joint unit with horizontal angle is used for entrance to the panel and connection to the distribution board bars in case of impossibility of standard joint units application. This unit can be used for the connection to the oil-type transformer too.

**Note:** this unit is non standard one and be manufactured individually within certain project. D<sub>min</sub>=100 mm, D<sub>max</sub> is specified by the equipment manufacturer. "B" value see in a table on pg. 43.



Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - ATCD -

### 16 FEB End feed unit



This unit is used for supply/taking power from busbar via flexible cable in compliance with references.

This unit can be manufactured with non standard features:

- 1. Position of straight joint on the junction box enclosure.
- 2. Numbers and internal diameter of cable glands on the plate coupling.
- 3. Automatic circuit breaker in junction box and control lever of any
- manufacturer. Y1
- 4. Dimensions.



Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - FEB -

# **KLM-R OTHER UNITS**

17 | FLX Flexible unit



Flexible unit is used for busbar route passing through the expansion joint of building with route level differences.

This unit can be manufactured with non standard features:

- 1. Length of flexible part.
- 2. Different positions of bars at the busbar entrance and exit.

This unit is non standard one and be manufactured individually within certain project.

**Note:** detailed features are specified by equipment manufacturer. "L" value is specified in the note to the manufacture order.





Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - 0	Cu - 55 - 4	- 1 - FLX -
----------------	-------------	-------------

### 18 | FB Fire barrier

Fire barrier provides busbar passing through the wall and floor structures of different fire zones with thickness 200 mm minimum.

It provides fire resistance of busbar passing through the walls and floor structures 180 minutes minimum according to GOST P 53310-2009. i.4.1.

It can be installed at any busbar part.

The manufacturer should separately include following materials for sealing of joints in the FB fire barrier specification:

- 1. Fireproof thermal expanding sealant;
- 2. Fireproof installation polyurethane foam.

**Note:** the unit which is supposed to be supplied with fireproof barrier should be indexed during order placement.



Order sample: 630 A, copper, IP55, with 4 conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - **FB** -

# **KLM-R OTHER UNITS**

### 20 | RE Reducer

# KLM-R - 06 - 02 - Cu - 55 - 4 - 1 - RE - Y1

**Busbar type** 

### **Busbar code (entrance)**

### Busbar code (exit)

Busbar code	Rated current, A
00	100
01	160
02	250
03	315
04	400
05	500
06	630
08	800

### **Conductor material**

Al – aluminium

Cu – copper



Reducer is used for reducing the busbar discharge capacity with protection in less powerful line parts.

This unit can be manufactured with non standard features:

- 1. Unit length.
- 2. Switching/protection equipment (circuit breaker, releaser, fuse). Also installation of motor-operator with remote control is available.
- 3. Any step of busbar rated current reducing.
- 4. Phasing.
- 5. Control mechanisms layout.

# Notes to the unit index

enclosure with control lever	Y1
Availability of automatic curcuit breaker in a cast resin enclosure without control lever	Y0
Unavailability of automatic circuit breaker (acceptable at the busbar rated current reducing for 2 rates maximum)	Н

### Unit index

Unit description	Index
Reducer	RE

### Busbar enclosure material

- 1 galvanized steel
- 2 painted enclosure
- 3 aluminium enclosure
- 4 stainless steel

### Numbers of insulated conductors

- 3 3L+PE(enclosure)
- 4 3L+N+PE(enclosure)
- 5 3L+N+PE
- 6 3L+2N+PE

Protection degree

55 – IP55



Order sample: 800–250 A, copper, IP55, with 4 conductors, steel enclosure, with automatic circuit breaker in a cast resin enclosure, with control lever

KLM-R - 08 - 02 - Cu - 55 - 4 - 1 - **RE - Y1** 

**Note:** this unit is non standard and be manufactured individually within certain project. Detailed features are specified by equipment manufacturer.

# **KLM-R TAP-OFF BOX**

# KLM-R - 06 - Cu - 55 - 4 - 1 - PB - 160 - Y1

### Busbar type

### Busbar code

Busbar code	Rated current, A				
00	100				
01	160				
02	250				
03	315				
04	400				
05	500				
06	630				
08	800				

### **Conductor material**

Al – aluminium Cu – copper

### **Protection degree**

55 – IP55

### Numbers of insulated conductors

3 – 3L+PE(enclosure)

- 4 3L+N+PE(enclosure)
- 5 3L+N+PE
- 6 3L+2N+PE

### Busbar enclosure material

1 – galvanized steel

- 2 painted enclosure3 aluminium enclosure

4 – stainless steel

### Notes to the unit index

Availability of module automatic circuit breaker	mod
Availability of automatic curcuit breaker in a cast resin enclosure with control lever	Y1
Availability of automatic curcuit breaker in a cast resin enclosure without control lever	Y0
Power tap-off box with cable	Н

### **Rated current**

For Plug-in box	160-250 A
For Bolt-on box	160-630 A

### Unit index

Unit description	Index
Plug-in box	PB
Bolt-on box	BB
Joint unit for Bolt-on box	GF

# **KLM-R TAP-OFF BOX**

#### **PB** Plug-in box 21



Plug-in box is installed on the tapping-off doors.

This unit can be manufactured with non standard features:

- 1. Box dimension.
- 2. Numbers and dimension of cable gland in a wafer for socket.
- 3. Switching/protection equipment (automatic circuit breaker, releaser). Installation of drive motor with remote control is also possible.
- 4. Installation of protection device of any manufacturer.
- 5. Installation of protection device of Client.
- 6. Box door type (right, left, on bolts etc.).

Maximum current capacity, A	A, mm	B, mm	C, mm
До 160	500	200	140
160-250	600	285	220



Order sample: Plug-in box160 A with automatic circuit breaker in a cast resin enclosure, without control lever, busbar distribution system 630 A, IP55, with 4 copper conductors, steel enclosure

KLM-R - 06 - Cu - 55 - 4 - 1 - PB - 160 - YO

Brand, type and automatic circuit breaker 八 maximum current in the tap-off box is indexed separately in the notes to the order code.

Note: tap-off box can be installed on/uninstalled from KLM-R busbar under the voltage, without contact to open conducting parts.

#### 22 | **BB Bolt-on box**



Bolt-on box is installed at any mating area of two units.

This element can be manufactured with non standard features:

- 1. Box dimension.
- 2. Numbers and dimension of cable gland in a wafer for socket.
- 3. Switching/protection equipment (automatic circuit breaker, releaser). Installation of drive motor with remote control is also possible.
- 4. Installation of protection device of any manufacturer.
- 5. Installation of protection device of Client.
- 6. Box door type (right, left, on bolts etc.).

Maximum current capacity, A	A, mm	B, mm	C, mm
250	750	350	290
400-630	850	350	290



Order sample: Bolt-on box 630 A with automatic circuit breaker in a cast resin enclosure, with control lever, busbar distribution system 800 A, IP55, with 4 copper conductors, steel enclosure

KLM-R - 08 - Cu - 55 - 4 - 1 - BB - 630 - Y1



/ Brand, type and automatic circuit breaker maximum current in the tap-off box is indexed separately in the notes to the order code.

Note: tap-off box is installed after the busbar turn off from the network and control of voltage availability only. Special GF joint unit is required for the installation.

# KLM-R Busbars with aluminium bars

Rated current	A	100	160	250	315	400	500	630	
General features									
Insulation voltage	V	1000	1000	1000	1000	1000	1000	1000	
Operational voltage	V	1000	1000	1000	1000	1000	1000	1000	
Frequency	Hz	50	50	50	50	50	50	50	
Ampacity									
Phase rated peak short-circuit	kA	41	41	41	45	45	75	93	
withstand (dynamic) 0,1 c									
Phase rated short-circuit withstand	kA	20	20	20	23	23	43	47	
(thermic) 1 c									
Conductors									
Conductor dimensions	mm×mm	2,7x60	2,7x60	3x60	3,5x60	3,5x60	3x109	3,5x109	
Conductor cross-section	mm <sup>2</sup>	162	162	180	210	210	327	381	
Inductance X1	m0m/m	0,183	0,183	0,165	0,149	0,149	0,107	0,091	
Active impedance at rated current R1	mOm/m	0,251	0,251	0,226	0,193	0,193	0,124	0,107	

# KLM-R Busbars with copper bars

Rated current	A	160	250	315	400	500	630	800	
General features									
Insulation voltage	V	1000	1000	1000	1000	1000	1000	1000	
Operational voltage	٧	1000	1000	1000	1000	1000	1000	1000	
Frequency	Hz	50	50	50	50	50	50	50	
Ampacity									
Phase rated peak short-circuit	kA	75	75	75	75	75	93	93	
withstand (dynamic) 0,1 c									
Phase rated short-circuit withstand	kA	43	43	43	43	43	47	47	
(thermic) 1 c									
Conductors									
Conductor dimensions	mm×mm	3x60	3x60	3x60	3x60	3x60	3,5x60	3,5x90	
Conductor cross-section	mm <sup>2</sup>	180	180	180	180	180	210	315	
Inductance X1	m0m/m	0,149	0,149	0,149	0,149	0,149	0,116	0,108	
Active impedance at rated current R1	mOm/m	0,14	0,14	0,14	0,14	0,14	0,071	0,067	

# Calculation of voltage losses ( $\Delta U$ ) in busbar route

 $\Delta U = \alpha \cdot \sqrt{3} \cdot I \cdot (R_1 \cdot \cos \varphi \cdot L + X_1 \cdot \sin \varphi \cdot L) \cdot 10^{-3}, [V]$ 

where:

- $\Delta U voltage loss value, V;$
- $R_1$  rated active impedance of busbar at rated current, mOm/m;
- $X_1$  rated inductance of busbar, mOm/m;
- L busbar route length, m;
- I busbar rated current, A;
- $\phi ~~$  phase angle between voltage and current, calculated in a chain, degree;
- $\alpha$  coefficient of load distribution.



# Calculation of incremental power loss in the busbar route

$$\Delta W=3 \cdot (R_1^{KLM} - R_1^{busbar}) \cdot I^2 \cdot L \cdot T_{max} \cdot 10^{-6}, [kW \cdot h]$$

where:

 $\Delta W$  – value of incremental power loss in the busbar, kW·h;

 $R_1^{\mbox{\tiny KLM}}$  – rated active impedance of KLM busbar at rated current, mOm/m;

- $R_1^{\text{busbar}}$  rated active impedance of busbar-analogue, mOm/m;
- L busbar route length, m;
- I busbar rated current, A;

 $\rm T_{\rm max}-$  numbers of hours for maximum load consumption, hour.

# Additional losses cost

 $\Delta C = \Delta W \cdot c_1$ , [RUB]

where:  $c_1 - power cost, RUB/kW \cdot h$ 

# Vertically fixing to the floor structure



# Vertically fixing to the wall



# Suggested minimum distance from floor structure to the wall



Picture1. Layout sample of busbar with bars placed vertically (A) and horizontally (B).



Picture 2. Layout sample of two busbars with bars placed vertically (A) and horizontally (B) under each other.





Picture 3. Layout sample of two busbars with bars vertically (A) and horizontally (B) side by side.

Dimensions mentioned above are suggested for easy installation. All the dimensions are given in mm.

# Horizontally fixing to the wall



# Horizontally fixing to the floor structure









Lighting busbars **25..40A** 

Information on this chapter

This chapter contains the information on lighting busbar KLM-L.

# **KLM-L BUSBAR UNITS CODES**

# KLM-L - 0040 - Cu - 55 - 5 - 3 - FE - S1

### Busbar type

### Busbar code

Dushar sada	Dated surrant A			
Buspar code	Rated current, A			
0025	25			
0040	40			

### Conductor material

Cu – copper

### Protection degree

55 – IP55

### Number of insulated conductors

- 2 L+N+PE(enclosure)
- 3 L+N+PE
- 4 3L+N+PE(enclosure)
- 5 3L+N+PE
- 10 (3L+N+PE)x2

### Material of busbar enclosure

3 – aluminium enclosure

### Notes to units index

Non-standard unit from 500 to 999 mm	S1
Non-standard unit from 1000 to 1999 mm	S2
Non-standard unit from 1999 to 2999 mm	S3

### Unit index

Nº	Section description	Index	Pg.
1	Standard straight unit	FE	19
2	Straight unit with tap-off outlets	Pi	19
3	Terminal unit	EC	24
4	Center feed unit	AC	25
5	Feed unit (right)	FEBR	25
6	Feed unit (left)	FEBL	25
7	Switch-disconnector	PB	28
8	Fused switch-disconnector	PBF	28
9	Flexible unit	FLX	28
10	Joint cover	FORC	28
11	Standard fixing unit	SFX	28

### **1** FE Standard straight unit





Order sample: 25A, copper, IP55, with 4 conductors, aluminium enclosure

KLM-L - 0025 - Cu - 55 - 4 - 3 - FE -

FE unit – straight supplying element without tap-off outlet. It is used for transit parts of lighting busbar route.

### 2 Pi Straight unit with tap-off outlets



Pi unit is used for power transfer and distribution, this unit allows to install tapping outlet into the special tap-off facilities quickly and without hard mounting works.

Maximum numbers of tap-off facilities on standard unit of lighting busbar along a 3000mm is 11 pcs. Required number of tap-off facilities is mentioned in the notes to the order code.



Order sample: 40A, copper, IP55, with 4 conductors, aluminium enclosure, 11 tap-off outlets

KLM-L - 0040 - Cu - 55 - 4 - 3 - Pi - 11

### 3 | EC Terminal unit



Terminal unit is used for insulation of conducting parts at the end of busbar route.



Order sample: 40A, copper, IP55, with 4 conductors, aluminium enclosure

KLM-L - 0040 - Cu - 55 - 4 - 3 - EC -

### AC Center feed unit 4 |





8





Center feed unit is used for busbar route feeding from the center of the route line.

# 5 | FEBR Feed unit (right)







Order sample: 40A, copper, IP55, with 4 conductors, aluminium enclosure



Feed unit is used for supply/take power from busbar via flexible cable in compliance with references.

# 6 FEBL Feed unit (left)







Feed unit is used for supply/take power from busbar via flexible cable in compliance with references.



Order sample: 40A, copper, IP55, with 10 conductors, aluminium enclosure

```
KLM-L - 0040 - Cu - 55 - 10 - 3 - FEBL -
```

### 7,8 | PB and PBF (max 10 A) Switch-disconnector





Order sample: line 25A, copper, IP55, with 5 conductors, aluminium enclosure, without fuse holder

KLM-L -	0025 -	Cu -	55 -	5 -	3	- PB -

Order sample: line 25A, copper, IP55, with 5 conductors, aluminium enclosure, with fuse holder

KLM-L - 0025 - Cu - 55 - 5 - 3 - PBF -

Switch-disconnector is used to take power from busbar via flexible cable in compliance with references.

| Note: it can be with fuse holder, then unit index should be PBF.



FLX Flexible unit

9 |





Order sample: 40A, copper, IP55, with 10 conductors, aluminium enclosure

KLM-L - 0040 - Cu - 55 - 10 - 3 - FLX -

Flexible unit enables the busbar route to achieve all possible layouts.

# 10 | FORC Joint cover

Joint cover is used at the mating area of two units. It is recommended to be applied in lots of lighting fixtures usage case.



Order sample: 40A, copper, IP55, with 10 conductors, aluminium enclosure



# 11 | SFX Standard fixing



Standard fixing is used for busbar installation in compliance with design layout.



Order sample: 25A, copper, IP55, with 5 conductors, aluminium enclosure

KLM-L -	0025	- Cu -	55 -	5 -	3 -	SFX -	
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# KLM-T TROLLEY BUSBARS

### KLM-T12 Single pole busbar





Rugged structure and specially selected conductive materials allow to operate even in harsh environments.

Structure safety and high-quality bar insulation provides protection against accidental contact with your fingers.

Simple installation is ensured by single mobile terminals or terminals for 3, 4, 5 poles.

Unlimited number of poles arranged in a single plane allow to use in a complex systems.

Getting curved paths through the use of circular arc.

Simple to increase the length of the existing system.

Main application area:

- crane systems with middle weight lifting capacity;
- passenger transportation systems;
- specialized systems.

Rated current (100% PV)	25 A   200 A   250 A   320 A   400 A
Design voltage	690 V
Bar standard length	4000 mm
Bar external dimensions	18x26 mm
Installation place	Indoor and outdoor
Bar packaging	Straight-line (with possibility to use circular arc)
Collector arrangement	Preferable down

### KLM-T42 Closed busbar





Quick and cost-efficient installation due to application of multipolar structure with a variety of connection technologies and simple suspension snap-fastening.

The ideal structure due to availability of 4, 5, 6, and 7-pole systems.

Maximum safety through the use of closed structure system (can be equipped with sealing tape).

Small size due to compact structure.

Many options to increase the length with the application of the joint modules, clamps, hangers, joint units.

Main application area:

- Crane systems
- Installations for building maintenance
- Green house
- Working place equipment

Rated current (100% PV)	10 A   35 A   60 A   100 A   140 A (80% PV )
Design voltage	690 V
Bar standard length	4000 mm
Bar external dimensions	56x90 mm
Installation place	Indoor and outdoor
Bar packaging	Straight-line (with possibility to use circular arc)
Pole numbers	4, 5, 6, or 7 poles
Collector arrangement	Preferable down
# LOW VOLTAGE EQUIPMENT

## MAIN DISTRIBUTION PANEL - MBP

Main distribution panel is used for accept the power with 380/220V after reducing transformer, distribution and metering. MDP protects power curcuit from overload. MDP mounting is performed on the Client site, when bars or cables entered to the MDP from 10-6/0,4 kV transformer secondary winding. According to modern references, MDP is completed with power meters and startup protection equipment for each consumer.

Protected ground is obligatory. PE bar in a set can be used as main grounding bar.

KLM Engineering manufactures low voltage equipment in a russian metal cabinets in compliance with import substitution program. The enclosures of best worls producers like ABB, Schneider Electric, Rittal, and Steam also can be used, for instance, MDP or Low voltage switchboards are put together based on supplements produced by ABB, Schneider Electric, Siemens, Legrand, LS, Hyundai, Schrack Technik, OEZ, DEKraft, Contactor, IEK.

Protection degree – from IP30 to IP55.

KLM Engineering manufactures MDB with rated current 1250 1600 A, 2500 A, 3200 A, 4000 A, 5000 A. MDB with 6300 A is manufactured by order. Current of distributional parts is 100 A up to rated input current.

# **INPUT DISTRIBUTION DEVICE – IDD**

IDD is used for power distribution to the consumers. Each consumer has his own cabinet. There is a cabinet which serves for two or three consumers. The control bottoms and control devices in a IDD can be installed both indoor and front panel by Client request.







There are different structure samples of IDD as following: with removable side panels or without side panels in a cabinet. Busbar and cable entrance and exit is possible both top and bottom side of cabinet. The delivery set of IDD include following are:

- IDD panel,
- key set for doors,
- technical documentation like IDD passport, maintenance manual and schemes set;
- power meter (by Client approval).

IDD is manufactured based on Client technical specification and pre-installed power capacity. IDD is completed with automatic circuit breaker and meters by Client order.





#### MCC AND AUTOMATION

MCC and automation allow to perform full automation of main technological process, which increase efficiency of technology.

MCC is produced in compliance with Client's technical specification. MCC can be prepared based on both russian and imported supplements like ABB, Legrand, Schneider Electric, Siemens, Rittal.





#### **DISTRIBUTION PANELS – DP**

DP are used for power distribution and metering as well as consumer power chain protection from emergency damage as a result of over loads or short curcuit.

Distribution panels have several modifications as distribution panels DP, PD, lighting distribution panels LDP, Premises panels PP and etc.







KLM Engineering Busbars are certified in compliance with Russian Federation and The Customs Union Standards. The positive test results for fire-resistance, flame-resistance, and seismic resitance (MSK-64 scale 9) are received. Quality management system is certified in compliance with GOST ISO 9001-2011.



















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